Check Sheet

Company Name: FERtech Enviromental
Permit Number: AC 37-260641 / 7770263-001-AC
PSD Number:
Permit Engineer: HANKS

Application:

- [x] Initial Application
  - [x] Incompleteness Letters
  - [ ] Responses
  - [ ] Waiver of Department Action
  - [ ] Department Response
  - [x] Other

DENIED

Cross References:

- [ ]
- [ ]
- [ ]

Intent:

- [ ] Intent to Issue
- [ ] Notice of Intent to Issue
- [ ] Technical Evaluation
- [ ] BACT Determination
- [ ] Unsigned Permit

Correspondence with:

- [ ] EPA
- [ ] Park Services
- [ ] Other

- [ ] Proof of Publication
  - [ ] Petitions - (Related to extensions, hearings, etc.)
  - [ ] Waiver of Department Action
  - [ ] Other

Final Determination:

- [ ] Final Determination
- [ ] Signed Permit
- [ ] BACT Determination
  - [ ] Other

Post Permit Correspondence:

- [ ] Extensions/Amendments/Modifications
- [ ] Other

Department of Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Lawton Chiles
Governor

Virginia B. Wetherell
Secretary

October 10, 1995

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Shadi Nikfarjam
Vice President of Environmental Compliance
FERtech Environmental, Inc.
Post Office Box 918
Moberly, Missouri 65270

Dear Mr. Nikfarjam:

Re: DEP File No. AC 37-260641

The Department received an application for permit to construct a mobile soil thermal treatment facility from you on November 10, 1994. FERtech Environmental Incorporated has not responded to the Department's November 29, 1994, letter concerning this project.

Please let the Department know within 30 days of receipt of this letter if you still have a plan and schedule to obtain a permit to construct and operate this unit in Florida. If your plans have changed, we request you withdraw the application for permit. The Department will deny this permit if you do not withdraw the application, respond to our November 29, 1994 letter, or respond to this letter in a timely manner.

If you have any questions on this matter, please write to me or call Willard Hanks, review engineer, at (904)488-1344.

Sincerely,

A. A. Linero, P.E.
Administrator
New Source Review Section

AL/wh/t

no green card 7/98

Z 127 632 532

Receipt for Certified Mail

No Insurance Coverage Provided
Do not use for International Mail
(See Reverse)

UNITED STATES POSTAL SERVICE

Sent to Shadi Nikfarjam	
Street and No. FERtech	
P.O., State and ZIP Code Moberly, Missouri	
Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	$
Postmark or Date 10-10-95 AC 37-260641	

PS Form 3800, March 1993

FERtech
ENVIRONMENTAL, INC.

RECEIVED
NOV 10 1994
Bureau of
Air Regulation

Via UPS Overnight Package
Tracking Number 0619 2397 958

November 8, 1994

Mr. Willard Hanks
Florida Department of Environmental Regulation
Air Resources Management
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Dear Mr. Hanks:

Please find enclosed four copies of an application for a permit to operate/construct a Low Temperature Thermal Desorption unit in the State of Florida. We are seeking to receive a state-wide permit to allow us to operate in various locations throughout the state.

Included with the application is a process description and potential emissions calculations. We have also included copies of relevant sections of AP-42, and manufacturers' specifications for the equipment to be permitted.

An additional copy of this application is being forwarded from our consultant's office which will be signed and sealed by a professional engineer registered in the State of Florida.

Please contact either Dennis Elmore or myself at (816) 263-1000 if you have any questions or comments concerning this application

Sincerely,
FERtech Environmental, Inc.

Shadi Nikfarjam
Vice President of Environmental Compliance

PERMIT APPLICATION
LOW TEMPERATURE THERMAL DESORPTION SYSTEM

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
AIR RESOURCES MANAGEMENT

Application for a Permit to Construct/Operate

Low Temperature Thermal Desorption System
Mobile Soil Remediation System

Submitted to:

State of Florida
Department of Environmental Regulation
Air Resources Management

Submitted by:

Regulatory Compliance Department
FERtech Environmental, Inc.
630 N. Morley, Suite 107
Moberly, Missouri 65270

(816) 263-1000

November 8, 1994

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BEST AVAILABLE COPY

Florida Department of Environmental Regulation

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

Lawton Chiles, Governor — Carol M. Browner, Secretary

AC 37-260641 — $1,000 pd 11-10-94 Recpt # 224269

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: LTTD* System [X] New[1] [ ] Existing[1]

APPLICATION TYPE: [X] Construction [ ] Operation [ ] Modification

COMPANY NAME: FERtech Environmental, Inc. COUNTY: Various

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) LTTD* System

SOURCE LOCATION: Street Various City Various

UTM: East Various North Various

Latitude VA ° RIO ' US "N Longitude VA ° RIO ' US "W

APPLICANT NAME AND TITLE: Shadi Nikfarjam, VP of Environmental Compliance

APPLICANT ADDRESS: P.O. Box 918, 630 N. Morley, Moberly, MO 65270

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of FERtech Environmental, Inc.

I certify that the statements made in this application for a LTTD System 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: [signature]

Shadi Nikfarjam, VP of Environmental Compliance
Name and Title (Please Type)

Date: Nov 8, 94 Telephone No. 816/263-1000

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,

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

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

*Low-Temperature Thermal Desorption

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 ____________________

____
Name (Please Type)

____
Company Name (Please Type)

____
Mailing Address (Please Type)

Florida Registration No. __________ Date: __________ Telephone No. __________

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.

FERtech Environmental, Inc. proposes to operate a Low-Temperature Thermal Desorption unit to remediate soil contaminated with gasoline, deisel, jet fuel and PAHS. Particulate emissions are controlled with a baghouse. VOC's are controlled by an afterburner.

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

Start of Construction Various Completion of Construction Various

C. 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.)

Baghouse 92,000.00

Afterburner 120,000.00

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

None

E. Requested permitted equipment operating time: hrs/day 20 ; days/wk 6 ; wks/yr 52 ;
if power plant, hrs/yr NA ; if seasonal, describe: will be used on an as-needed basis.

F. 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. NO

3. Does the State "Prevention of Significant Deterioriation" (PSD) requirement apply to this source? If yes, see Sections VI and VII. NO

4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source? NO

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

H. 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.

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

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

Description	Contaminants Type	Contaminants % Wt	Utilization Rate - lbs/hr	Relate to Flow Diagram
SOIL	VOC	1% MAX	50,000	---
---	---	---	---	---
---	---	---	---	---
---	---	---	---	---
---	---	---	---	---

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

1. Total Process Input Rate (lbs/hr): 50,000

2. Product Weight (lbs/hr): 50,000

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

Name of Contaminant	Emission[1] Maximum lbs/hr	Emission[1] Actual T/yr	Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission lbs/yr	Potential[4] Emission T/yr	Relate to Flow Diagram
PM_{10}	See Attachment						
SO_x	See Attachment						
NO_x	See Attachment						
CO	See Attachment						
VOC	See Attachment						

[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).

D. 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)
Baghouse	PM10	99% +	10um @ 99% +	Design/Stack Test
Afterburner	VOC	97%	N/A	Design/Stack Test
- - -	- - -	- - -	- - -	- - -
- - -	- - -	- - -	- - -	- - -
- - -	- - -	- - -	- - -	- - -
- - -	- - -	- - -	- - -	- - -

E. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
Diesel * (A)	140.7 gal/hr	201 gal/hr	47
LPG * (B)	0.36 gal/hr	0.52 gal/hr	47
Natural Gas * (C)	32,900 cu ft/hr	47,000 cu ft/hr	47
*Will use only one fuel			

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

Fuel Analysis:

Percent Sulfur: 0.35(A); 0:05(B); 0.05(C) Percent Ash: Neg (A), (B), (C)

Density: 7.05(A) 4.24(B) lbs/gal Typical Percent Nitrogen: Neg (A), (B), (C)

Heat Capacity: 19,500(A), 22,169(B) BTU/lb 137,000(A), 94,000(B) BTU/gal

Other Fuel Contaminants (which may cause air pollution): None

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

Annual Average 0 (zero) Maximum 0 (zero)

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

Treated soil will be used a backfill or disposed at a permitted landfill.

* Natural gas 1,050 BTU/cu ft 1-lb/23.8 cu ft 24,990 BTU/lb

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

Stack Height: 25 ft. Stack Diameter: 3 ft.

Gas Flow Rate: 35000 ACFM 27840 DSCFM Gas Exit Temperature: 1400 - 1800 °F.

Water Vapor Content: 8 - 15 % Velocity: 83 FPS

SECTION IV: INCINERATOR INFORMATION

- - -N/A - - -

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	NA	NA	NA	NA	NA	NA	NA
Uncon-trolled (lbs/hr)	NA	NA	NA	NA	NA	NA	NA

Description of Waste NA

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

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

Manufacturer NA

Date Constructed NA Model No.

	Volume (ft)³	Heat Release (BTU/hr)	Fuel		Temperature (°F)
			Type	BTU/hr	
Primary Chamber	NA	NA	NA	NA	NA
Secondary Chamber	NA	NA	NA	NA	NA

Stack Height: NA ft. Stack Diamter: NA Stack Temp. NA

Gas Flow Rate: NA ACFM NA DSCFM* Velocity: NA FPS

*If 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.

Type of pollution control device: [NA] Cyclone [NA] Wet Scrubber [NA] Afterburner

[NA] Other (specify)

Brief description of operating characteristics of control devices: NA

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

NA

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

SECTION V: SUPPLEMENTAL REQUIREMENTS

Please provide the following supplements where required for this application.

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

2. 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.

3. 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.

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

10. 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

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

[ ] Yes [X] No

Contaminant	Rate or Concentration
NA	NA
NA	NA
NA	NA
NA	NA

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

[X] Yes [ ] No

Contaminant	Rate or Concentration
PM10	0.04 GRAINS/DSCF
– – –	– – –
– – –	– – –
– – –	– – –

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

Contaminant	Rate or Concentration
– – –	– – –
– – –	– – –
– – –	– – –
– – –	– – –

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

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

*Explain method of determining

5. Useful Life: See attachment

6. Operating Costs: See attachment

7. Energy: See attachment

8. Maintenance Cost: See attachment

9. Emissions: See attachment

Contaminant	Rate or Concentration
See attachment	See attachment

10. Stack Parameters

a. Height: 25 ft ft.

b. Diameter: 3 ft ft.

c. Flow Rate: 35000 ACFM ACFM

d. Temperature: 1400-1800F °F.

e. Velocity: 83 fps FPS

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

1.

a. Control Device: Baghouse

b. Operating Principles: Filtration

c. Efficiency:[1] 0.04 grains/dscf

d. Capital Cost: 92,000

e. Useful Life: Varies

f. Operating Cost: Varies

g. Energy:[2] Varies

h. Maintenance Cost: Varies

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: AFterburner

b. Operating Principles: Thermal Oxidation

c. Efficiency:[1] 97%

d. Capital Cost: $120,000

e. Useful Life: Varies

f. Operating Cost: Varies

g. Energy:[2] 25 MM BTU/hr

h. Maintenance Cost: Varies

i. Availability of construction materials and process chemicals:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

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:

F. 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:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(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

(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

A. Company Monitored Data

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

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

Other data recorded NA

Attach all data or statistical summaries to this application.

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

2. Instrumentation, Field and Laboratory

a. Was instrumentation EPA referenced or its equivalent? [NA] Yes [NA] No

b. Was instrumentation calibrated in accordance with Department procedures?

[NA] Yes [NA] No [NA] Unknown

B. Meteorological Data Used for Air Quality Modeling

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

2. Surface data obtained from (location) NA

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

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

C. Computer Models Used

1. NA Modified? If yes, attach description.

2. NA Modified? If yes, attach description.

3. NA Modified? If yes, attach description.

4. NA 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.

1. LTTD System and Controls Description

1.1 LTTD System Overview

This section describes each component of the proposed LTTD to be utilized at various locations in Florida for treatment of impacted soil. These components include feed hopper, conveyor mechanism, vibrating screen, impact crusher for oversized material, on-line belt scale, rotary dryer, baghouse for particulate filtration, thermal oxidizer for VOCs emission control, treated soil cooler and reconstitution mill, treated soil stacker and conveyor, and control room. A process flow diagram illustrating the entire soil treatment process follows this narrative.

1.2 Material Sizing/Handling Systems and Controls Description

Following excavation and placement on a storage pile the contaminated soil will be delivered to the LTTD's feed hopper by a front-end loader operated by FERtech. A heavy duty hydraulic tipping, bar-type grizzly with 8" spacing is mounted on top of the hopper. The grizzly section pre-screens feed material for very large particles. It is hinged at the base point on the charging side and is hydraulically raised/lowered to discharge oversized particles. Raising and lowering of the grizzly is controlled via a hand switch located in the control room or on the side of the feed hopper for ease of access and operation by the front-end loader operator. The hopper acts as a temporary on-line storage and regulates (meters) the volume of impacted soil entering the LTTD's vibrating screen. This hopper holds approximately 2-3 cubic yards of material at a time. This devices ensure constant flow of soil into the system. There exists a 4' x 14' vibrating screen down stream of the feed hopper. The material which passes through the grizzly (pre-screener) at the entrance point into the hopper are transferred to the vibrating screen where they fall a short distance to the deck of the vibrating screen for additional finer separation of feed material. This screen separates minus 2" material from plus 2" particles. The plus 2" particles are discharged off the end of the screen and enter into the on-line impact crusher for size reduction. When the oversized material is crushed they fall onto the crusher belt for discharge. Once discharged, the material is picked up by a front-end loader for re-introduction into the feed hopper. The minus 2" particles passing through the screen fall directly into a vertical wall bin and onto the flat pan of a variable speed slat feeder. The bin is equipped with a high level switch which activates an alarm in the control room and automatically shuts down the slat conveyor inside the hopper. The speed of the slat feeder is also controlled by a local speed-indicating controller mounted in the control room.

1.3 Belt Scale System and Controls Description

The screened contaminated soil is metered from the bin of the screen by the slat feeder and delivered onto a slinger conveyor which delivers feed stock to the rotary dryer. The slinger is a fixed speed conveyor which can be started and stopped via a hand switch mounted in the control room. It is equipped with a weigh bridge which also includes a speed pick-up sensor and a gravity take-up to enhance scale accuracy. The weigh indicator located in the LTTD's control room provide both running weigh and total accumulative weigh of the material traveling across the belt scale. The scale is calibrated at the beginning of each project by a certified scale calibrator representing the belt manufacturer.

1.4 Rotary Dryer System and Controls Description

The LTTD proposed for thermal desorption of the contaminated soil is equipped with a dryer that is rotated by a saddle chain drive system which can be started and stopped via a hand switch mounted in the control room. The dryer is 22 feet in length and 64 inches in diameter. The heat source for the dryer during this project will be either natural gas or liquid propane fired in a Hauck Starjet burner rated at 30 MMBtu/Hr. The pilot burner is supplied from the same fuel source via a separate line. The fuel line to the pilot burner is equipped with a pressure regulating valve, a local pressure gauge, and a solenoid valve which can be opened and closed via a hand switch mounted in the control room. There exists a flame sensor located at the pilot burner which transmits a signal to a pilot flame indicator located in the control room. This sensor has been interlocked by an alarm mechanism located inside the control room to notify the operator of possible flame outs. The burner fuel line is equipped with a flow indicator mounted inside the control room, high and low pressure alarms have been interlocked with this system and are located inside the control room. The fuel, prior to entering the burner, flows through a series of two solenoid valves. These valves are opened and closed via a hand switch that is mounted inside the control room. The fuel then flows through a motor operated valve which is equipped with a position indicator located in the control room and an alarm which is activated when the valve is in closed position. Within the burner mechanism, there is a flame sensor, an integrated part of the burner, which transmits a signal to a flame indicator located in the control room. The burner is also equipped with a low flame alarm at the control room. The combustion air and fuel gas valves are operated by a common motor and are connected by a mechanical linkage.

Inside the LTTD's rotary dryer, the contaminated soil, which moves countercurrent to the hot off-gas stream, is heated to temperatures of up to 950°F; therefore, a high performance and high temperature system.

The operating temperatures of the LTTD's rotary dryer is controlled automatically via a composite average of the three thermocouples located in the dryer chamber. The first thermocouple is located in the material discharge chute of the dryer and reads the treated soil's discharge temperature. The remaining two thermocouples are located in the rotary dryer exhaust gas discharge ductwork/hood. These thermocouples read the exhaust gas stream temperature and work in conjunction with the first thermocouple to automatically control the LTTD's rotary dryer burner firing rate by adjusting the position of the motor operated valves in the fuel and combustion air feed lines. Each thermocouple provides continuous temperature indication at the control room for LTTD's operator inspection. Also within the temperature controllers, there exists high and low temperature alarms. Additionally, the soil discharge and exhaust gas temperature are continuously recorded on a strip chart for documentation and to comply with various regulatory operating permits during the various soil remediaiton projects. An additional feature of the proposed LTTD's rotary dryer's temperature control system is a high/high temperature automatic shutdown devices, preset to automatically shut-down the entire LTTD unit operating system should the temperature set point for either the soil discharge or exhaust gas exceed the high/high temperature set point. Additionally, an electro-pneumatically controlled safety baffle automatically closes to prevent hot offgases from reaching the filterhouse, should the maximum set point temperature be exceeded inside the rotary dryer. This features prevents any damage to the LTTD and prevents emission of untreated gases and fumes into the atmosphere during potential system up-sets.

The internal flight mechanism in the dryer lift and spread soil across diameter of the dryer to thoroughly expose soil particles to heated air stream generated by the burner. The LTTD's patented Veil Modification Plates ("VMPs"), located at the soil feed end of the dryer, provide additional control of the offgas temperature exiting the rotary drum. By activating or raising the VMPs, a void is created in the feed material within the drum; therefore, raising the exhaust gas temperature leaving the LTTD's rotary dryer prior to entering into the filterhouse. By lowering the VMPs, the opposite of the above will occur inside the rotary dryer. This patented device assists the LTTD operator in maintaining the rotary dryer temperatures within the set-points to assure that all contaminated material are being exposed to the maximum heat prior to exiting the dryer to meet the soil clean-up criteria for all volatile and semi-volatile compounds. The VMPs are equipped with a motor which is used to adjust their position. This motor is started and stopped via a hand switch located inside the control room. Additionally, there exists a VMPs position indicator display inside the control room for the LTTD's operators view.

1.5 Treated Soil Discharge/Stockpiling Systems and Controls Description

The treated soil exiting the LTTD's rotary dryer is mixed with water in a reconstitution mill to control dust and to cool the hot soil with temperatures of up to 950°F. The water is applied via a series of spray nozzles that are strategically located throughout the reconstitution mil. The flow of water to the reconstitution mill is controlled using a motor operated valve which is adjustable via a hand switch mounted in the control room. The position of the valve and the water flow rate are indicated on meters mounted in the control room. The drive for the mil is controlled by a motor which can be started and stopped locally at the mill. The temperature of the treated soil exiting the mill is displayed inside the control room. The constitution mil is also equipped with a high/high temperature switch which activates an alarm in the control room if the soil discharge from the mil exceeds the set-point assigned by the LTTD's operator. The steam generated in the mil as the result of hot soil contacting the water, complete with the airborne particulate matter, is collected in a hood, mixed with exhaust gas from the thermal oxidizer, and ducted back to the filterhouse for particulate matter removal prior to introduction to the thermal oxidizer for secondary treatment. The treated and cooled soil from the reconstitution mill is discharged onto the reconstitution mill conveyor belt. This conveyor belt is a fixed speed type which can be started and stopped via a hand switch inside the control room. The treated soil dropped on the reconstitution mill conveyor belt is then transferred onto a radial elevating stacking conveyor belt which delivers the decontaminated soil to a stockpile. This radial stacking is a fixed speed conveyor which can be rotated, elevated, started, and stopped by a series of hand switches located inside the control room.

1.6 Baghouse System and Controls Description

The off-gases exiting the LTTD's rotary dryer are exhausted into the primary collector (knock-out-box) for initial (coarse) particulate matter ("PM")removal. From the primary collector, the off-gases enter the fabric filter collector (also known and referred to as filterhouse or baghouse) where further PM (fines) removal is accomplished prior to entering the LTTD's thermal oxidizer. Inside the baghouse, the fines, which are collected onto the filter bags, are removed by pulsing air into each individual bag. The baghouse is equipped with an air compressor that supplies air for pulsating the bags during the operation of the LTTD. The filtering of airborne fines is controlled by pressure drop across the baghouse form the clean to the unclean side. The normal pressure drop between the two section are between 2"-8" water column. This differential pressure is automatically controlled by increasing or decreasing the cleaning cycle time, bag pulsations inside the baghouse. The baghouse is equipped with a differential pressure indicator that allows the LTTD's operator to monitor the baghouse performance during operation. The cleaning of bags is accomplished by injecting pulses of air at preset intervals into the bags from the clean side of the air stream. The air pulses intervals are controlled by a timer switch which opens and closes a series of solenoid valves mounted along the top of the baghouse. The intervals are timed by the LTTD's operator based on the system performance and soil type (amount of fines in the soil) to maintain the desired pressure differential in the baghouse. Should the differential pressure exceed or drop below the set points, the timer will be overridden and the pulse of air will be automatically controlled until the pressure differential returns to set points assigned to the unit by the LTTD's operator to achieve maximum PM removal during the project.

The fines removed during both stages inside the primary and secondary collectors of the baghouse are gathered into a hopper in the bottom of the baghouse. This hopper is equipped with a fixed speed slat conveyor and auger which delivers all collected fines to a common discharge point. The slat conveyor and auger can be started and stopped via a control switch mounted inside the control room. The fines collected is discharged into a rotary vane feeder (via a check valve) and metered into a discharge line which is connected to a mechanical (auger) return mechanism. This system returns all collected fines to the rotary dryer for decontamination and discharge to the reconstitution mill. The entire fines return mechanism including a series of augers and their corresponding electric motors are controlled by series of switches inside the LTTD's control room.

1.7 Thermal Oxidizer System and Controls Description

The particulate matter free off-gases from the baghouse are blown into the LTTD's thermal oxidizer via the baghouse exhaust fan rated at 12,000 cfm, which imparts a slightly negative pressure to the up-stream equipment including the baghouse and rotary dryer. An electrically actuated damper located in the fan's discharge line regulates the off-gas flow into the thermal oxidizer. This valve receives a pressure signal from the rotary dryer and adjusts the damper's position as percent open. The damper's position is also controlled from the control room. A damper position indicator is located inside the control room for the LTTD's operator's viewing. The temperature of the off-gases to the afterburner is displayed and permanently recorded inside the control room. Inside the thermal oxidizer, the volatilized contaminants are destructed by applying necessary heat for oxidation. The automatic control system for the afterburner is very similar to that of the rotary dryer described earlier. The thermal oxidizer can be operated on natural gas or liquid propane used to fire a total air burner. The pilot burner fuel is supplied from a separate fuel line; it is equipped with a pressure regulating valve, a local pressure gauge, and a solenoid valve which is opened and closed by a hand switch from the control room. There is a flame sensor which transmits signal to a pilot flame indicator located in the control room. The thermal oxidizer's main fuel line is equipped with a series of sensors and displays including flow indicator, high and low pressure alarms located in the control room, and a local pressure gauge. The fuel flows through a series of two solenoid valves that are remote operated from the control room. The fuel then flows through a motor operated valve which is equipped with a position indicator that is displayed in the control room in addition to an alarm which is activated when the valve is in close position. The combustion air for thermal oxidizer is provided by the burner air blower. The blower can be started and stopped via a hand switch located in the control room. The blower is equipped with a local pressure gauge and a low discharge pressure switch which activates an alarm in the control room. Prior to entering the afterburner, the combustion air flows through a damper which is equipped with a position indicator display module located in the control room. The operating temperatures of the thermal oxidizer is controlled automatically via a composite average of the two thermocouples located in the afterburner chamber. These units read the afterburner gas stream temperature and work to automatically control the burner output (firing rate) by adjusting the position of the valves in the fuel and combustion air feed lines. A continuous temperature display for the thermal oxidizer is located in the control room. Thermal oxidizer temperature is registered permanently on a strip chart recorder. The thermal oxidizer is equipped with several safety features including a high temperature automatic shutdown device, preset to automatically shutdown the entire LTTD operating system should the thermal oxidizer's temperature set point exceeds the high/high temperature set point. The automatic burner controls for the thermal oxidizer are backed up with manual controls should a failure occur during operations. All safety alarms and shutdown systems are fully functional while operating in manual mode.

1.8 LTTD Process Control Room Description

The control room is single level type with tinted windows providing a full 270 degrees view of the entire LTTD system. The control room is built with steel framing, siding and insulation. The interior features paneled walls, lights and 120 V outlets, vinyl flooring, air conditioning and central heating. The control room will house: (1) the readouts and recorders for all of the monitors measuring critical operating conditions, (2) all of the controls necessary for real-time management of operating conditions, and (3) all of the interlocks for automatic reaction to abnormal operating conditions and emergency shutdown conditions.

The burner controls include the following safeguard interlocks: burner, air, LTTD exhaust air, flame verification, burner modulator closed, purge cycle, trial for ignition timing, low fire verification, material temperature limit, stack temperature limit and thermocouple break protection. The exhaust temperature and burner position are digitally displayed in the control room. The baghouse controls include the following interlocks: high temperature, high baghouse hopper dust level, screw conveyor rotation and differential pressure indication. Automatic controls include baghouse pulse control system and draft control system. Exhaust fan outlet damper percent open meter with manual open/close controls. The readout and recording instruments and the control activators will be mounted on a control panel to facilitate the operator's management of the system.

1. Description of Emission Points

1.1 Untreated Soil Pile (EP-01)

1.1.1 Description of Emission Source

After contaminated soil is excavated, it is placed on the Untreated Soil Pile (EP-01) for subsequent treatment by FERtech's Low Temperature Thermal Desorption (LTTD) unit. The resulting pile of untreated soil may grow to as much as 100 feet in diameter. Soil is removed from the pile by the Front-End Loader (EP-02), which carries the untreated soil to the Feed Hopper (EP-03).

1.1.2 Determination of Emission Factor

The PM_{10} emission factor was taken from AP-42, Section 8.19.1. In Table 1 of that section, an emission factor of 6.3 pounds of PM_{10} per acre per day is provided. The emission factor used is intended to be applied to active storage piles. Although this pile will not be active continuously throughout the course of the project, it is assumed herein that it will be active, thus providing an extra margin of safety. PM_{10} is the only criteria pollutant that will be emitted from this source.

Although the soil is expected to be quite moist upon excavation, water is sprayed onto the pile in order to keep fugitive dust emissions to a minimum. In addition, a plastic cover utilized to prevent contact with precipitation will reduce emissions even further. Based on the moisture in the untreated soil due to watering, a PM_{10} control efficiency of 50 percent was assigned to the pile.

1.1.3 Determination of Throughputs

1.1.3.1 Potential Annual

The calculation of the area of the pile was the same for the potential annual throughput as it was for the actual project throughput. The residence time, however was increased to 365 days. Therefore the value for the potential annual throughput is 65.773 acre-days.

1.1.3.2 Potential Hourly

The calculation of the area of the pile was the same for the potential hourly throughput as it was for the actual project throughput. The residence time, however was reduced to 1/24 of a day. Therefore the value for the potential hourly throughput is 0.007508 acre-days.

1.2 Front-End Loader (EP-02)

1.2.1 Description of Emission Source

A Front-End Loader (EP-02) is utilized to carry soil from the Untreated Soil Pile (EP-01) to the Feed Hopper (EP-03). It is also used to carry untreated soil from the Oversize Pile (EP-10) to the Feed Hopper (EP-03). The loader has a bucket capacity of 3 cubic yards and a weight of approximately 10 tons. It generates fugitive dust emissions from each of its six wheels as it travels at an average speed of 5 miles per hour.

1.2.2 Determination of Emission Factor

The PM_{10} emission factor for the loader was established by using consulting AP-42, Section 11.2.1, Equation 1. PM_{10} is the only criteria pollutant that will be emitted from this source. The empirical formula given for PM_{10} emissions from unpaved roads is:

$$E = (k)(s/12)(S/30)(W/3)^{0.7}(w/4)^{0.5}[(365-p)/365]$$

Where:

k = the aerodynamic particle size multiplier (0.36)
s = the silt content of the roadway's surface (20%)
S = the mean vehicle speed (5 mph)
W = the mean vehicle weight (14 tons)
w = the number of wheels (6 wheels)
p = the number of days with > 0.01" of precipitation per year (120 days)
E = the emission factor (1.42 pounds PM_{10} per VMT)

1.2.3 Determination of Throughputs

Once the emission factor was determined, it was next necessary to calculate the number of miles the loader will travel. This was done by determining the number of trips the loader will make in carrying soil from the piles to the feed hopper. Since the loader the loader has a bucket capacity of 3 cubic yards and a cubic yard of soil weighs about 1.5 tons, we may assume that the loader carries an average load of 4.5 tons of untreated soil per load. The average distance from the piles to the feed hopper is expected to be 100 feet.

1.2.3.1 *Potential Annual*

The potential annual throughput represents the amount of soil that could be processed under ideal conditions if the plant operated continuously (24 hours per day) for one calendar year (365 days). At 40 tons of soil per hour the unit could process 350,400 tons of soil annually. If the loader carries all the soil from the Untreated Soil Pile and the Oversize Pile, it would carry a total of 367,920 tons of soil. The loader would therefore have to carry 81,760 loads at 4.5 tons per load. It would make two trips of 100 feet for each load. Therefore, the loader would have to travel a total of 3,097 miles during the course of a year.

1.2.3.2 *Potential Hourly*

The amount of soil that could be treated under ideal conditions would be 40 tons per hour. If the loader carries all the soil from the Untreated Soil Pile and the Oversize Pile, it would carry a total of 42 tons of soil per hour. The loader would therefore carry 10 loads per hour at 4.5 tons per load. It would have to make two trips of 100 feet for each load. Therefore, the loader would have to travel 0.337 miles per each hour of production.

1.3 Feed Hopper (EP-03)

1.3.1 Description of Emission Source

Once the Front-End Loader (EP-02) carries untreated soil from either the Untreated Soil Pile (EP-01) or the Oversize Pile (EP-10), that soil is carried to the Feed Hopper (EP-03). From there, it is carried away by Conveyor #1 (EP-04) to the Single-Deck Screen (EP-05).

The untreated soil is scalped of any very large particles (greater than 8 inches) by a vibrating bar-type grizzly. After the soil falls through the grizzly, it is collected onto an underscreen conveyor and is carried away. Fugitive emissions are generated at the hopper by both the vibrating action of the grizzly and the short fall the soil takes as it is dropped onto the conveyor. Emissions are controlled by virtue of the untreated soil being quite moist, typically from 8 to 14 percent by weight.

1.3.2 Determination of Emission Factor

The emission factor was determined by consulting AP-42, Section 8.19.1. The emission factor for screening wet material is given as 0.017 pounds of PM_{10} per ton. A control efficiency of 50 percent was assigned to the hopper based on the high moisture content of the soil.

1.3.3 Determination of Throughputs

1.3.3.1 Potential Annual

The potential annual throughput represents the amount of untreated soil that could be processed under ideal conditions if the plant operated continuously (24 hours per day) for one calendar year (365 days). At 40 tons of soil per hour the unit could process 350,400 tons annually. In addition the Feed Hopper would also process 17,520 tons of untreated soil (five percent of total) that would be recirculated through the Impact Crusher. Therefore, the potential annual throughput for the Feed Hopper is 367,920 tons.

1.3.3.2 Potential Hourly

The potential hourly throughput represents the maximum amount of untreated soil that could be processed under ideal conditions in one hour. Under ideal conditions, the maximum plant production is not capable of exceeding 40 tons per hour. In addition the Feed Hopper would also process 2 tons per hour of untreated soil (five percent of total) that would be recirculated through the Impact Crusher. Therefore, the potential hourly throughput for the Feed Hopper is 42 tons per hour.

1.4 Conveyor #1 (EP-04)

1.4.1 Description of Emission Source

When untreated soil falls out of the Feed Hopper (EP-03) it is collected by Conveyor #1 (EP-04) and carried to the Single-Deck Screen (EP-05). Emissions from the conveyor are created by both the wind and the short fall the soil takes as it comes off the end of the conveyor. Emissions are reduced due to the moisture (8-14 percent) in the untreated soil.

1.4.2 Determination of Emission Factor

The emission factor for the conveyor was determined by consulting AP-42, Section 8.19.2, Table 2. In Table 2, the emission factor for conveying is 0.0002 pounds of PM_{10} per ton. Due to the moisture content of the soil, a control efficiency of 50 percent was assigned to this conveyor.

1.4.3 Determination of Throughputs

1.4.3.1 Potential Annual

The potential annual throughput represents the amount of untreated soil that could be processed under ideal conditions if the plant operated continuously (24 hours per day) for one calendar year (365 days). At 40 tons of soil per hour the unit could process 350,400 tons annually. In addition Conveyor #1 would also process 17,520 tons of untreated soil (five percent of total) that would be recirculated through the Impact Crusher. Therefore, the potential annual throughput for Conveyor #1 is 367,920 tons.

1.4.3.2 Potential Hourly

The potential hourly throughput represents the maximum amount of untreated soil that could be processed under ideal conditions in one hour. Under ideal conditions, the maximum plant production is not capable of exceeding 40 tons per hour. In addition Conveyor #1 would also process 2 tons per hour of untreated soil (five percent of total) that would be recirculated through the Impact Crusher. Therefore, the potential hourly throughput for Conveyor #1 is 42 tons per hour.

1.5 Single-Deck Screen (EP-05)

1.5.1 Description of Emission Source

After untreated soil leaves the Feed Hopper (EP-03), it is carried to the Single-Deck Screen (EP-05) by Conveyor #1 (EP-04). There the untreated soil is segregated into particles greater than 2 inches and particles less than 2 inches. Those particles under two inches fall through the Single-Deck Screen onto Conveyor #2 (EP-06) where they are carried into the Rotary Dryer (EP-12). Particles greater than 2 inches slide over the top of the screen into the Impact Crusher (EP-08) where they are reduced in size and placed on the Oversize Pile (EP-10).

Fugitive emissions are generated by the screen when it shakes the untreated soil in a rapid fashion. the smaller particles in the soil may become entrained in the air upon this shaking action. Emissions are reduced however, due to the moisture content of the soil.

1.5.2 Determination of Emission Factor

The emission factor was determined by the consulting AP-42, Section 8.19.1, Table 1. In Table 1, the emission factor for screening was found to be 0.017 pounds of PM_{10} per ton. A control efficiency of 50 percent was assigned due to the moisture (8 to 14 percent) in the soil.

1.5.3 Determination of Throughputs

The actual hourly throughput represents the amount of untreated soil expected to be processed during any typical hour of operation. Based on FERtech's previous experience in soil treatment, typical production for this project will not exceed 25 tons per hour. In addition the Single-Deck Screen will also process 1.25 tons per hour of untreated soil (five percent of total) that will be recirculated through the Impact Crusher. Therefore, the actual hourly throughput for the Single-Deck Screen is 26.25 tons per hour.

1.5.3.1 Potential Annual

The potential annual throughput represents the amount of untreated soil that could be processed under ideal conditions if the plant operated continuously (24 hours per day) for one calendar year (365 days). At 40 tons of soil per hour the unit could process 350,400 tons annually. In addition the Single-Deck Screen would also process 17,520 tons of untreated soil (five percent of total) that would be recirculated through the Impact Crusher. Therefore, the potential annual throughput for the Single-Deck Screen is 367,920 tons.

1.5.3.2 Potential Hourly

The potential hourly throughput represents the maximum amount of untreated soil that could be processed under ideal conditions in one hour. Under ideal conditions, the maximum plant production is not capable of exceeding 40 tons per hour. In addition the Single-Deck Screen would also process 2 tons per hour of untreated soil (five percent of total) that would be recirculated through the Impact Crusher. Therefore, the potential hourly throughput for the Single-Deck Screen is 42 tons per hour.

1.6 Conveyor #2 (EP-06)

1.6.1 Description of Emission Source

When untreated soil falls through the Single-Deck Screen (EP-05) it is collected by Conveyor #2 (EP-06) and carried to the Rotary Dryer/Reconstitution Mill (EP-12).

Emissions from the conveyor are created by both the wind and the short fall the soil takes as it comes off the end of the conveyor. Emissions are reduced due to the moisture (8-14 percent) in the untreated soil.

1.6.2 Determination of Emission Factor

The emission factor for the conveyor was determined by consulting AP-42, Section 8.19.2, Table 2. In Table 2, the emission factor for conveying is 0.0002 pounds of PM_{10} per ton. Due to the moisture content of the soil, a control efficiency of 50 percent was assigned to this conveyor.

1.6.3 Determination of Throughputs

1.6.3.1 Potential Annual

The potential annual throughput represents the amount of untreated soil that could be processed under ideal conditions if the plant operated continuously (24 hours per day) for one calendar year (365 days). At 40 tons of soil per hour the unit could process 350,400 tons annually. Therefore, the potential annual throughput for Conveyor #2 is 350,400 tons.

1.6.3.2 Potential Hourly

The potential hourly throughput represents the maximum amount of untreated soil that could be processed under ideal conditions in one hour. Under ideal conditions, the maximum plant production is not capable of exceeding 40 tons per hour. Therefore, the potential hourly throughput for Conveyor #2 is 40 tons per hour.

1.7 Conveyor #3 (EP-07)

1.7.1 Description of Emission Source

When untreated soil falls out of the Feed Hopper (EP-03) it is collected by Conveyor #1 (EP-04) and carried to the Single-Deck Screen (EP-05).

Emissions from the conveyor are created by both the wind and the short fall the soil takes as it comes off the end of the conveyor. Emissions are reduced due to the moisture (8-14 percent) in the untreated soil.

1.7.2 Determination of Emission Factor

The emission factor for the conveyor was determined by consulting AP-42, Section 8.19.2, Table 2. In Table 2, the emission factor for conveying is 0.0002 pounds of PM_{10} per ton. Due to the moisture content of the soil, a control efficiency of 50 percent was assigned to this conveyor.

1.7.3 Determination of Throughputs

1.7.3.1 Potential Annual

The potential annual throughput represents the amount of untreated soil that could be processed under ideal conditions if the plant operated continuously (24 hours per day) for one calendar year (365 days). At 40 tons of soil per hour the unit could process 350,400 tons annually. Therefore, the potential annual throughput for Conveyor #3 is 350,400 tons.

1.7.3.2 Potential Hourly

The potential hourly throughput represents the maximum amount of untreated soil that could be processed under ideal conditions in one hour. Under ideal conditions, the maximum plant production is not capable of exceeding 40 tons per hour. Therefore, the potential hourly throughput for Conveyor #3 is 40 tons per hour.

1.8 Impact Crusher (EP-08)

1.8.1 Description of Emission Source

When particles greater than 2 inches pass over the Single- Deck Screen (EP-05), they fall into the Impact Crusher (EP-08) where they are reduced in size. After the particles are reduced in size, they fall onto Conveyor #5 (EP-11) and are carried away and dropped onto the Oversize Pile (EP-10).

Emissions from the crusher are generated when the oversize particles are reduced in size. Along the surfaces of the resulting fractures, small particles are entrained into the air. These emissions are reduced by virtue of the moisture content of the untreated soil. Under the least favorable conditions (large number oversize particles) only 5 percent of the total soil treated will be processed in the crusher.

1.8.2 Determination of Emission Factor

The emission factor for the impact crusher was determined by consulting AP-42 Section 8.19.2. In Table 1 of that section, the emission factor for crushing wet material is 0.018 pounds of TSP per ton. For purposes of this document, PM_{10} emissions were assumed to be equal to TSP emissions for the crusher. A control efficiency of 50 percent was assigned due to the moisture content of the soil.

1.8.3 Determination of Throughputs

1.8.3.1 Potential Annual

The potential annual throughput represents the amount of untreated soil that could be processed under ideal conditions if the plant operated continuously (24 hours per day) for one calendar year (365 days). At 40 tons of soil per hour the unit could process 350,400 tons annually. The Impact Crusher would process a maximum of 5 percent of this total. Therefore, the potential annual throughput for the Impact Crusher is 17,520 tons.

1.8.3.2 Potential Hourly

The potential hourly throughput represents the maximum amount of untreated soil that could be processed under ideal conditions in one hour. Under ideal conditions, the maximum plant production is not capable of exceeding 40 tons per hour. The Impact Crusher would process a maximum of 5 percent of this total. Therefore, the potential hourly throughput for the Impact Crusher is 2 tons per hour.

1.9 Conveyor #4 (EP-09)

1.9.1 Description of Emission Source

When untreated soil falls out of the Feed Hopper (EP-03) it is collected by Conveyor #1 (EP-04) and carried to the Single-Deck Screen (EP-05). Emissions from the conveyor are created by both the wind and the short fall the soil takes as it comes off the end of the conveyor. Emissions are reduced due to the moisture (8-14 percent) in the untreated soil.

1.9.2 Determination of Emission Factor

The emission factor for the conveyor was determined by consulting AP-42, Section 8.19.2, Table 2. In Table 2, the emission factor for conveying is 0.0002 pounds of PM_{10} per ton. Due to the moisture content of the soil, a control efficiency of 50 percent was assigned to this conveyor.

1.9.3 Determination of Throughputs

1.9.3.1 Potential Annual

The potential annual throughput represents the amount of untreated soil that could be processed under ideal conditions if the plant operated continuously (24 hours per day) for one calendar year (365 days). At 40 tons of soil per hour the unit could process 350,400 tons annually. Therefore, the potential annual throughput for Conveyor #4 is 350,400 tons.

1.9.3.2 Potential Hourly

The potential hourly throughput represents the maximum amount of untreated soil that could be processed under ideal conditions in one hour. Under ideal conditions, the maximum plant production is not capable of exceeding 40 tons per hour. Therefore, the potential hourly throughput for Conveyor #4 is 40 tons per hour.

1.10 Oversize Pile (EP-10)

1.10.1 Description of Emission Source

After oversize particles are reduced in the Impact Crusher (EP-08) they are carried away by Conveyor #5 (EP-11) to the Oversize Pile (EP-010) From there, the size-reduced untreated soil is picked up by the Front-End Loader (EP-02) and transported to the Feed Hopper (EP-03) for treatment.

1.10.2 Determination of Emission Factor

The emission factor was taken from AP-42, Section 8.19.1. In Table 1 of that section, an emission factor of 6.3 pounds of PM_{10} per acre per day is provided. The emission factor is for active storage piles. Although the pile will not be active continuously throughout the course of the project, it is assumed herein that it is active, thus providing an extra margin of safety.

1.10.3 Determination of Throughputs

1.10.3.1 Potential Annual

The calculation of the area of the pile was the same for the potential annual throughput as it was for the actual project throughput. The residence time, however was increased to 365 days. The actual hourly throughput was therefore determined to be 16.44 acre-days.

1.10.3.2 Potential Hourly

The calculation of the area of the pile was the same for the potential hourly throughput as it was for the actual project throughput. The residence time, however was reduced to 1/24 of a day. The potential hourly throughput was therefore determined to be 0.001877 acre-days.

1.11 Conveyor #5 (EP-11)

1.11.1 Description of Emission Source

When untreated soil falls out of the Impact Crusher (EP-08) it is collected by Conveyor #5 (EP-11) and carried to the Oversize Pile (EP-10). Emissions from the conveyor are created by both the wind and the short fall the soil takes as it comes off the end of the conveyor. Emissions are reduced due to the moisture (8-14 percent) in the untreated soil.

1.11.2 Determination of Emission Factor

The emission factor for the conveyor was determined by consulting AP-42, Section 8.19.2, Table 2. In Table 2, the emission factor for conveying is 0.0002 pounds of PM_{10} per ton. Due to the moisture content of the soil, a control efficiency of 50 percent was assigned to this conveyor.

1.11.3 Determination of Throughputs

The emission factor for the conveyor was determined by consulting AP-42, Section 8.19.2, Table 2. In Table 2, the emission factor for conveying is 0.0002 pounds of PM_{10} per ton. Due to the moisture content of the soil, a control efficiency of 50 percent was assigned to this conveyor.

1.11.3.1 Potential Annual

The potential annual throughput represents the amount of untreated soil that could be processed under ideal conditions if the plant operated continuously (24 hours per day) for one calendar year (365 days). At 40 tons of soil per hour the unit could process 350,400 tons annually. The Impact Crusher would process a maximum of 5 percent of this total. Therefore, the potential annual throughput for Conveyor # 5 is 17,520 tons.

1.11.3.2 Potential Hourly

The potential hourly throughput represents the maximum amount of untreated soil that could be processed under ideal conditions in one hour. Under ideal conditions, the maximum plant production is not capable of exceeding 40 tons per hour. The Impact Crusher would process a maximum of 5 percent of this total. Therefore, the potential hourly throughput for Conveyor # 5 is 2 tons per hour.

1.12 Rotary Dryer/Reconstitution Mill (EP-12)

1.12.1 Description of Emission Source

At the heart of the LTTD unit are the Rotary Dryer and Reconstitution Mill (EP-12). Untreated soil is delivered to the Rotary Dryer by Conveyor #1 (EP-04). Then the soil is exposed to temperatures ranging from 450 to 900 degrees Fahrenheit which vaporizes the liquid petroleum products in the soil. Once the petroleum products are vaporized, they are drawn out of the dryer into a baghouse and afterburner.

The treated soil is discharged into the Reconstitution Mill where the soil is watered heavily to reduce the temperature of the soil. From there, the soil is dropped onto Conveyor #3 (EP-04) where it is carried to Conveyor #4 (EP-09) and finally onto the Treated Soil Pile (EP-14). Since emissions from the Rotary Dryer and the Reconstitution Mill are both emitted through the LTTD's stack they are grouped together in this emissions analysis.

Due to the negative pressure that is maintained on the dryer/mill, there are no fugitive emissions from this source. All emissions are ducted through the control devices before being emitted out of the LTTD's stack.

1.12.2 Determination of Emission Factors

FERtech consulted with the unit's manufacturer, Cedarapids, to determine emission factors for this emission source. Cedarapids input a number of process variables, such as soil moisture, petroleum contamination levels, soil exit temperature and afterburner temperature. Upon placing such input into a proprietary computer model, emission factors were determined. The emission factors were determined from worst-case inputs in each scenario.

1.12.3 Determination of Throughputs

1.12.3.1 Potential Annual

The potential annual throughput represents the amount of untreated soil that could be processed under ideal conditions if the plant operated continuously (24 hours per day) for one calendar year (365 days). At 40 tons of soil per hour the unit could process 350,400 tons annually. Therefore, the potential annual throughput for the Rotary Dryer is 350,400 tons.

1.12.3.2 Potential Hourly

The potential hourly throughput represents the maximum amount of untreated soil that could be processed under ideal conditions in one hour. Under ideal conditions, the maximum plant production is not capable of exceeding 40 tons per hour. Therefore, the potential hourly throughput for the Rotary Dryer is 40 tons per hour.

1.13 Treated Soil Pile (EP-13)

1.13.1 Description of Emission Source

Once the treated soil is carried from the Rotary Dryer and Reconstitution Mill (EP-12), it is placed on the Treated Soil Pile (EP-13) for its final disposition. Since a large amount of water is added to the treated soil as it is processed in the reconstitution mill, emissions are kept low. Emissions may be generated if a sufficiently strong wind were to blow small particles of dust in the air.

1.13.2 Determination of Emission Factor

The emission factor was taken from AP-42, Section 8.19.1. In Table 1 of that section, an emission factor of 6.3 pounds of PM_{10} per acre per day is provided. The emission factor is for active storage piles. Although the pile will not be active continuously throughout the course of the project, it is assumed herein that it is active, thus providing an extra margin of safety. Based on the moisture content of the soil, a control efficiency of 50 percent was assigned to the pile.

1.13.3 Determination of Throughputs

1.13.3.1 Potential Annual

The calculation of the area of the pile was the same for the potential annual throughput as it was for the actual project throughput. The residence time, however was increased to 365 days. Therefore the value for the actual hourly throughput is 65.773 acre-days.

1.13.3.2 Potential Hourly

The calculation of the area of the pile was the same for the potential hourly throughput as it was for the actual project throughput. Like the actual hourly throughput, the residence time was reduced to 1/24 of a day. Therefore the value for the potential hourly throughput is 0.007508 acre-days.

1.14 Calculation of Emissions

Below is a summary of the potential emissions from each of the thirteen emission points. For each emission point, the potential hourly and annual emissions have been caluclated. The potential emissions have been calculated on the basis of operating 8,760 hours per year (24 hours per day, 7 days per week, 52 weeks per year.) In practice, this unit will not operate anywhere near this potential rate. Below is a table summarizing emissions from all emission sources.

Summary of Potential Emissions
All Sources

Criteria Pollutant	Annual (ton/yr)	Hourly (lb/hr)
PM_{10}	8.73	2.031
SO_x	0.13	0.030
NO_x	24.18	5.520
CO	7.14	1.630
VOC	11.43	2.610
Pb	0.00	0.000

The following tables summarize the potential emissions from each of the individual sources. The emission factor, control efficiency, and throughput used in each calculation are included.

Summary of Emissions
Untreated Soil Pile

Criteria Pollutant	Emission Factor	Control Efficiency	Throughputs		Potential Emissions	
			Annual	Hourly	Annual	Hourly
	(lb/ton)	(percent)	(ton/hr)	(ton/hr)	(ton/yr)	(ton/hr)
PM_{10}	6.3	50	65.773	0.007508	0.10	0.024
SO_x	0	0	65.773	0.007508	0.00	0.000
NO_x	0	0	65.773	0.007508	0.00	0.000
CO	0	0	65.773	0.007508	0.00	0.000
VOC	0	0	65.773	0.007508	0.00	0.000
Pb	0	0	65.773	0.007508	0.00	0.000

Summary of Emissions
Front-End Loader

Criteria Pollutant	Emission Factor	Control Efficiency	Throughputs		Potential Emissions	
			Annual	Hourly	Annual	Hourly
	(lb/ton)	(percent)	(ton/hr)	(ton/hr)	(ton/yr)	(ton/hr)
PM_{10}	1.42	0	3097	0.38	2.20	0.540
SO_x	0	0	3097	0.38	0.00	0.000
NO_x	0	0	3097	0.38	0.00	0.000
CO	0	0	3097	0.38	0.00	0.000
VOC	0	0	3097	0.38	0.00	0.000
Pb	0	0	3097	0.38	0.00	0.000

Summary of Emissions
Feed Hopper

Criteria Pollutant	Emission Factor	Control Efficiency	Throughputs		Potential Emissions	
			Annual	Hourly	Annual	Hourly
	(lb/ton)	(percent)	(ton/hr)	(ton/hr)	(ton/yr)	(ton/hr)
PM_{10}	0.017	50	367920	42	1.56	0.357
SO_x	0	0	367920	42	0.00	0.000
NO_x	0	0	367920	42	0.00	0.000
CO	0	0	367920	42	0.00	0.000
VOC	0	0	367920	42	0.00	0.000
Pb	0	0	367920	42	0.00	0.000

Summary of Emissions
Conveyor #1

Criteria Pollutant	Emission Factor	Control Efficiency	Throughputs		Potential Emissions	
			Annual	Hourly	Annual	Hourly
	(lb/ton)	(percent)	(ton/hr)	(ton/hr)	(ton/yr)	(ton/hr)
PM_{10}	0.0002	50	367920	42	0.02	0.004
SO_x	0	0	367920	42	0.00	0.000
NO_x	0	0	367920	42	0.00	0.000
CO	0	0	367920	42	0.00	0.000
VOC	0	0	367920	42	0.00	0.000
Pb	0	0	367920	42	0.00	0.000

Summary of Emissions
Single-Deck Screen

Criteria Pollutant	Emission Factor	Control Efficiency	Throughputs		Potential Emissions	
			Annual	Hourly	Annual	Hourly
	(lb/ton)	(percent)	(ton/hr)	(ton/hr)	(ton/yr)	(ton/hr)
PM_{10}	0.017	50	367920	42	1.56	0.357
SO_x	0	0	367920	42	0.00	0.000
NO_x	0	0	367920	42	0.00	0.000
CO	0	0	367920	42	0.00	0.000
VOC	0	0	367920	42	0.00	0.000
Pb	0	0	367920	42	0.00	0.000

Summary of Emissions
Conveyor #2

Criteria Pollutant	Emission Factor	Control Efficiency	Throughputs		Potential Emissions	
			Annual	Hourly	Annual	Hourly
	(lb/ton)	(percent)	(ton/hr)	(ton/hr)	(ton/yr)	(ton/hr)
PM_{10}	0.0002	50	350400	40	0.02	0.004
SO_x	0	0	350400	40	0.00	0.000
NO_x	0	0	350400	40	0.00	0.000
CO	0	0	350400	40	0.00	0.000
VOC	0	0	350400	40	0.00	0.000
Pb	0	0	350400	40	0.00	0.000

Summary of Emissions
Conveyor #3

Criteria Pollutant	Emission Factor	Control Efficiency	Throughputs		Potential Emissions	
			Annual	Hourly	Annual	Hourly
	(lb/ton)	(percent)	(ton/hr)	(ton/hr)	(ton/yr)	(ton/hr)
PM_{10}	0.0002	50	350400	40	0.02	0.004
SO_x	0	0	350400	40	0.00	0.000
NO_x	0	0	350400	40	0.00	0.000
CO	0	0	350400	40	0.00	0.000
VOC	0	0	350400	40	0.00	0.000
Pb	0	0	350400	40	0.00	0.000

Summary of Emissions
Impact Crusher

Criteria Pollutant	Emission Factor	Control Efficiency	Throughputs		Potential Emissions	
			Annual	Hourly	Annual	Hourly
	(lb/ton)	(percent)	(ton/hr)	(ton/hr)	(ton/yr)	(ton/hr)
PM_{10}	0.018	50	17520	2	0.08	0.018
SO_x	0	0	17520	2	0.00	0.000
NO_x	0	0	17520	2	0.00	0.000
CO	0	0	17520	2	0.00	0.000
VOC	0	0	17520	2	0.00	0.000
Pb	0	0	17520	2	0.00	0.000

Summary of Emissions
Conveyor #4

Criteria Pollutant	Emission Factor	Control Efficiency	Throughputs		Potential Emissions	
			Annual	Hourly	Annual	Hourly
	(lb/ton)	(percent)	(ton/hr)	(ton/hr)	(ton/yr)	(ton/hr)
PM_{10}	0.0002	50	350400	40	0.02	0.004
SO_x	0	0	350400	40	0.00	0.000
NO_x	0	0	350400	40	0.00	0.000
CO	0	0	350400	40	0.00	0.000
VOC	0	0	350400	40	0.00	0.000
Pb	0	0	350400	40	0.00	0.000

Summary of Emissions
Oversize Pile

Criteria Pollutant	Emission Factor	Control Efficiency	Throughputs		Potential Emissions	
			Annual	Hourly	Annual	Hourly
	(lb/ton)	(percent)	(ton/hr)	(ton/hr)	(ton/yr)	(ton/hr)
PM_{10}	6.3	50	16.44	0.001877	0.03	0.006
SO_x	0	0	16.44	0.001877	0.00	0.000
NO_x	0	0	16.44	0.001877	0.00	0.000
CO	0	0	16.44	0.001877	0.00	0.000
VOC	0	0	16.44	0.001877	0.00	0.000
Pb	0	0	16.44	0.001877	0.00	0.000

Summary of Emissions
Conveyor #5

Criteria Pollutant	Emission Factor	Control Efficiency	Throughputs		Potential Emissions	
			Annual	Hourly	Annual	Hourly
	(lb/ton)	(percent)	(ton/hr)	(ton/hr)	(ton/yr)	(ton/hr)
PM_{10}	0.0002	50	17520	2	0.00	0.000
SO_x	0	0	17520	2	0.00	0.000
NO_x	0	0	17520	2	0.00	0.000
CO	0	0	17520	2	0.00	0.000
VOC	0	0	17520	2	0.00	0.000
Pb	0	0	17520	2	0.00	0.000

Summary of Emissions
Rotary Dryer/Reconstitution Mill

Criteria Pollutant	Emission Factor	Control Efficiency	Throughputs		Potential Emissions	
			Annual	Hourly	Annual	Hourly
	(lb/ton)	(percent)	(ton/hr)	(ton/hr)	(ton/yr)	(ton/hr)
PM_{10}	0.6900	0	8760	1	3.02	0.690
SO_x	0.0300	0	8760	1	0.13	0.030
NO_x	5.5200	0	8760	1	24.18	5.520
CO	1.6300	0	8760	1	7.14	1.630
VOC	2.6100	0	8760	1	11.43	2.610
Pb	0.0000	0	8760	1	0.00	0.000

Summary of Emissions
Treated Soil Pile

Criteria Pollutant	Emission Factor	Control Efficiency	Throughputs		Potential Emissions	
			Annual	Hourly	Annual	Hourly
	(lb/ton)	(percent)	(ton/hr)	(ton/hr)	(ton/yr)	(ton/hr)
PM_{10}	6.3	50	65.77	0.007508	0.10	0.024
SO_x	0	0	65.77	0.007508	0.00	0.000
NO_x	0	0	65.77	0.007508	0.00	0.000
CO	0	0	65.77	0.007508	0.00	0.000
VOC	0	0	65.77	0.007508	0.00	0.000
Pb	0	0	65.77	0.007508	0.00	0.000

8.19 CONSTRUCTION AGGREGATE PROCESSING

General[1-2]

The construction aggregate industry covers a range of subclassifications of the nonmetallic minerals industry (see Section 8.23, Metallic Minerals Processing, for information on that similar activity). Many operations and processes are common to both groups, including mineral extraction from the earth, loading, unloading, conveying, crushing, screening, and loadout. Other operations are restricted to specific subcategories. These include wet and dry fine milling or grinding, air classification, drying, calcining, mixing, and bagging. The latter group of operations is not generally associated with the construction aggregate industry but can be conducted on the same raw materials used to produce aggregate. Two examples are processing of limestone and sandstone. Both substances can be used as construction materials and may be processed further for other uses at the same location. Limestone is a common source of construction aggregate, but it can be further milled and classified to produce agricultural limestone. Sandstone can be processed into construction sand and also can be wet and/or dry milled, dried, and air classified into industrial sand.

The construction aggregate industry can be categorized by source, mineral type or form, wet versus dry, washed or unwashed, and end uses, to name but a few. The industry is divided in this document into Section 8.19.1, Sand And Gravel Processing, and Section 8.19.2, Crushed Stone Processing. Sections on other categories of the industry will be published when data on these processes become available.

Uncontrolled construction aggregate processing can produce nuisance problems and can have an effect upon attainment of ambient particulate standards. However, the generally large particles produced often can be controlled readily. Some of the individual operations such as wet crushing and grinding, washing, screening, and dredging take place with "high" moisture (more than about 1.5 to 4.0 weight percent). Such wet processes do not generate appreciable particulate emissions.

References for Section 8.19

1. Air Pollution Control Techniques for Nonmetallic Minerals Industry, EPA-450/3-82-014, U. S. Environmental Protection Agency, Research Triangle Park, NC, August 1982.

2. Review Emissions Data Base And Develop Emission Factors For The Construction Aggregate Industry, Engineering-Science, Inc., Arcadia, CA, September 1984.

8.19.1 SAND AND GRAVEL PROCESSING

8.19.1.1 Process Description[1-3]

Deposits of sand and gravel, the consolidated granular materials resulting from the natural disintegration of rock or stone, are generally found in near-surface alluvial deposits and in subterranean and subaqueous beds. Sand and gravel are products of the weathering of rocks and unconsolidated or poorly consolidated materials and consist of siliceous and calcareous components. Such deposits are common throughout the country.

Depending upon the location of the deposit, the materials are excavated with power shovels, draglines, front end loaders, suction dredge pumps or other apparatus. In rare situations, light charge blasting is done to loosen the deposit. The materials are transported to the processing plant by suction pump, earth mover, barge, truck or other means. The processing of sand and gravel for a specific market involves the use of different combinations of washers, screens and classifiers to segregate particle sizes; crushers to reduce oversize material; and storage and loading facilities. Crushing operations, when used, are designed to reduce production of fines, which often must be removed by washing. Therefore, crusher characteristics, size reduction ratios and throughput, among other factors, are selected to obtain the desired product size distribution.

In many sand and gravel plants, a substantial portion of the initial feed bypasses any crushing operations. Some plants do no crushing at all. After initial screening, material is conveyed to a portion of the plant called the wet processing section, where wet screening and silt removal are conducted to produce washed sand and gravel. Negligible air emissions are expected from the wet portions of a sand and gravel plant.

Industrial sand processing is similar to that of construction sand, insofar as the initial stages of crushing and screening are concerned. Industrial sand has a high (90 to 99 percent) quartz or silica content and is frequently obtained from quartz rich deposits of sand or sandstone. At some plants, after initial crushing and screening, a portion of the sand may be diverted to construction sand use. Industrial sand processes not associated with construction sand include wet milling, scrubbing, desliming, flotation, drying, air classification and cracking of sand grains to form very fine sand products.

8.19.1.2 Emissions and Controls[1]

Dust emissions can occur from many operations at sand and gravel processing plants, such as conveying, screening, crushing, and storing operations. Generally, these materials are wet or moist when handled, and process emissions are often negligible. A substantial portion of these emissions may consist of heavy particles that settle out within the plant. Emission factors (for process or fugitive dust sources) from sand and gravel processing plants are shown in Table 8.19.1-1. (If processing is dry, expected emissions could be similar to those given in Section 8.19.2, Crushed Stone Processing).

Emission factors for crushing wet materials can be applied directly or on a dry basis, with a control efficiency credit being given for use of wet materials (defined as 1.5 to 4.0 percent moisture content or greater) or wet suppression. The latter approach is more consistent with current practice.

The single valued fugitive dust emission factors given in Table 8.19.1-1 may be used for an approximation when no other information exists. Empirically derived emission factor equations presented in Section 11.2 of this document are preferred and should be used when possible. Each of those equations has been developed for a single source operation or dust generating mechanism which crosses industry lines, such as vehicle traffic on unpaved roads. The predictive equation explains much of the observed variance in measured emission factors by relating emissions to the differing source variables. These variables may be grouped as (1) measures of source activity or expended energy (e. g., feed rate, or speed and weight of a vehicle traveling on an unpaved road), (2) properties of the material being disturbed (e. g., moisture content, or content of suspendable fines in the material) and (3) climate (e. g., number of precipitation free days per year, when emissions tend to a maximum).

Because predictive equations allow for emission factor adjustment to specific conditions, they should be used instead of the factors given in Table 8.19.1-1 whenever emission estimates are needed for sources in a specific sand and gravel processing facility. However, the generally higher quality ratings assigned to these equations are applicable only if (1) reliable values of correction parameters have been determined for the specific sources of interest, and (2) the correction parameter values lie within the ranges found in developing the equations. Section 11.2 lists measured properties of aggregate materials used in operations similar to the sand and gravel industry, and these properties can be used to approximate correction parameter values for use in the predictive emission factor equations, in the event that site specific values are not available. Use of mean correction parameter values from Chapter 11 reduces the quality ratings of the emission factor equations by at least one level.

Since emissions from sand and gravel operations usually are in the form of fugitive dust, control techniques applicable to fugitive dust sources are appropriate. Some successful control techniques used for haul roads are application of dust suppressants, paving, route modifications, soil stabilization, etc.; for conveyors, covering and wet suppression; for storage piles, wet dust suppression, windbreaks, enclosure and soil stablizers; and for conveyor and batch transfer points (loading and unloading, etc.), wet suppression and various methods to reduce freefall distances (e. g., telescopic chutes, stone ladders, and hinged boom stacker conveyors); for screening and other size classification, covering and wet suppression.

Wet suppression techniques include application of water, chemicals and/or foam, usually at crusher or conveyor feed and/or discharge points. Such spray systems at transfer points and on material handling operations have been estimated to reduce emissions 70 to 95 percent.[7] Spray systems can also reduce loading and wind erosion emissions from storage piles of various materials 80 to 90 percent.[8] Control efficiencies depend upon local climatic conditions, source properties and duration of control effectiveness. Wet suppression has a carryover effect downstream of the point of application of water or other wetting agents, as long as the surface moisture content is high enough to cause the fines to adhere to the larger rock particles.

Uncontrolled Operation	Emissions by Particle Size Range (aerodynamic diameter)[b]				Emission Factor Rating
	Total Particulate	TSP (≤ 30 μm)	PM_{10} (≤ 10 μm)	Units	
Process Sources[c]					
Primary or secondary crushing (wet)	NA	0.009 (0.018)	NA	kg/Mg (lb/ton)	D
Open Dust Sources[c]					
Screening[d]					
Flat screens (dry product)	NA	0.08 (0.16)	0.06 (0.12)	kg/Mg (lb/ton)	C
Continous drop[c]					
Transfer station	0.014 (0.029)	NA	NA	kg/Mg (lb/ton)	E
Pile formation - stacker	NA	0.065 (0.13)	0.03 (0.06)[e]	kg/Mg (lb/ton)	E
Batch drop[c]					
Bulk loading	0.12 (0.024)	0.028 (0.056)[f]	0.0012 (0.0024)[f]	kg/Mg (lb/ton)	E
Active storage piles[g]					
Active day	NA	14.8 (13.2)	7.1 (6.3)[e]	kg/hectare/day[h] (lb/acre/day)	D
Inactive day (wind erosion only)	NA	3.9 (3.5)	1.9 (1.7)[e]	kg/hectare/day[h] (lb/acre/day)	D
Unpaved haul roads					
Wet materials	i	i	i		D

[a]NA = not available. TSP = total suspended particulate. Predictive emission factor equations, which generally provide more accurate estimates of emissions under specific conditions, are presented in Chapter 11. Factors for open dust sources are not necessarily representative of the entire industry or of a "typical" situtation.
[b]Total particulate is airborne particles of all sizes in the source plume. TSP is what is measured by a standard high volume sampler (see Section 11.2).
[c]References 5-9.
[d]References 4-5. For completely wet operations, emissions are likely to be negligible.
[e]Extrapolation of data, using k factors for appropriate operation from Chapter 11.
[f]For physical, not aerodynamic, diameter.
[g]Reference 6. Includes the following distinct source operations in the storage cycle: (1) loading of aggregate onto storage piles (batch or continuous drop operations), (2) equipment traffic in storage areas, (3) wind erosion of pile (batch or continuous drop operations). Assumes 8 to 12 hours of activity/24 hours.
[h]Kg/hectare (lb/acre) of storage/day (includes areas among piles).
[i]See Section 11.2 for empirical equations.

References for Section 8.19.1

1. Air Pollution Control Techniques For Nonmetallic Minerals Industry, EPA-450/3-82-014, U. S. Environmental Protection Agency, Research Triangle Park, NC, August 1982.

2. S. Walker, "Production of Sand and Gravel", Circular Number 57, National Sand and Gravel Association, Washington, DC, 1954.

3. Development Document For Effluent Limitations Guidelines And Standards - Mineral Mining And Processing Industry, EPA-440/1-76-059b, U. S. Environmental Protection Agency, Washington, DC, July 1979.

4. Review Emissions Data Base And Develop Emission Factors For The Construction Aggregate Industry, Engineering-Science, Inc., Arcadia, CA, September 1984.

5. "Crushed Rock Screening Source Test Reports on Tests Performed at Conrock Corp., Irwindale and Sun Valley, CA Plants", Engineering-Science, Inc., Arcadia, CA, August 1984.

6. C. Cowherd, Jr., et al., Development Of Emission Factors For Fugitive Dust Sources, EPA-450/3-74-037, U. S. Environmental Protection Agency, Research Triangle Park, NC, June 1974.

7. R. Bohn, et al., Fugitive Emissions From Integrated Iron And Steel Plants, EPA-600/2-78-050, U. S. Environmental Protection Agency, Washington, DC, March 1978.

8. G. A. Jutze and K. Axetell, Investigation Of Fugitive Dust, Volume I: Sources, Emissions and Control, EPA-450/3-74-036a, U. S. Environmental Protection Agency, Research Triangle Park, NC, June 1974.

9. Fugitive Dust Assessment At Rock And Sand Facilities In The South Coast Air Basin, Southern California Rock Products Association and Southern California Ready Mix Concrete Association, P.E.S., Santa Monica, CA, November 1979.

8.19.2 CRUSHED STONE PROCESSING

8.19.2.1 Process Description[1]

Major rock types processed by the rock and crushed stone industry include limestone, dolomite, granite, traprock, sandstone, quartz and quartzite. Minor types include calcareous marl, marble, shell and slate. Industry classifications vary considerably and, in many cases, do not reflect actual geological definitions.

Rock and crushed stone products generally are loosened by drilling and blasting, then are loaded by power shovel or front end loader and transported by heavy earth moving equipment. Techniques used for extraction vary with the nature and location of the deposit. Further processing may include crushing, screening, size classification, material handling, and storage operations. All of these processes can be significant sources of dust emissions if uncontrolled. Some processing operations also include washing, depending on rock type and desired product.

Quarried stone normally is delivered to the processing plant by truck and is dumped into a hoppered feeder, usually a vibrating grizzly type, or onto screens, as illustrated in Figure 8.19.2-1. These screens separate or scalp large boulders from finer rocks that do not require primary crushing, thus reducing the load to the primary crusher. Jaw, or gyratory, crushers are usually used for initial reduction. The crusher product, normally 7.5 to 30 centimeters (3 to 12 inches) in diameter, and the grizzly throughs (undersize material) are discharged onto a belt conveyor and usually are transported either to secondary screens and crushers or to a surge pile for temporary storage.

Further screening generally separates the process flow into either two or three fractions (oversize, undersize and throughs) ahead of the secondary crusher. The oversize is discharged to the secondary crusher for further reduction, and the undersize usually bypasses the secondary crusher. The throughs sometimes are separated, because they contain unwanted fines, and are stockpiled as crusher run material. Gyratory crushers or cone crushers are commonly used for secondary crushing, although impact crushers are sometimes found.

The product of the secondary crushing stage, usually 2.5 centimeters (1 inch) diameter or less, is transported to secondary screens for further sizing. Oversize material is sent back for recrushing. Depending on rock type and desired product, tertiary crushing or grinding may be necessary, usually using cone crushers or hammermills. (Rod mills, ball mills and hammer mills normally are used in milling operations, which are not considered a part of the construction aggregate industry.) The product from tertiary crushing may be conveyed to a classifier, such as a dry vibrating screen system, or to an air separator. Any oversize is returned to the tertiary crusher for further reduction. At this point, end products of the desired grade are conveyed or trucked directly to finished product bins or to open area stockpiles.

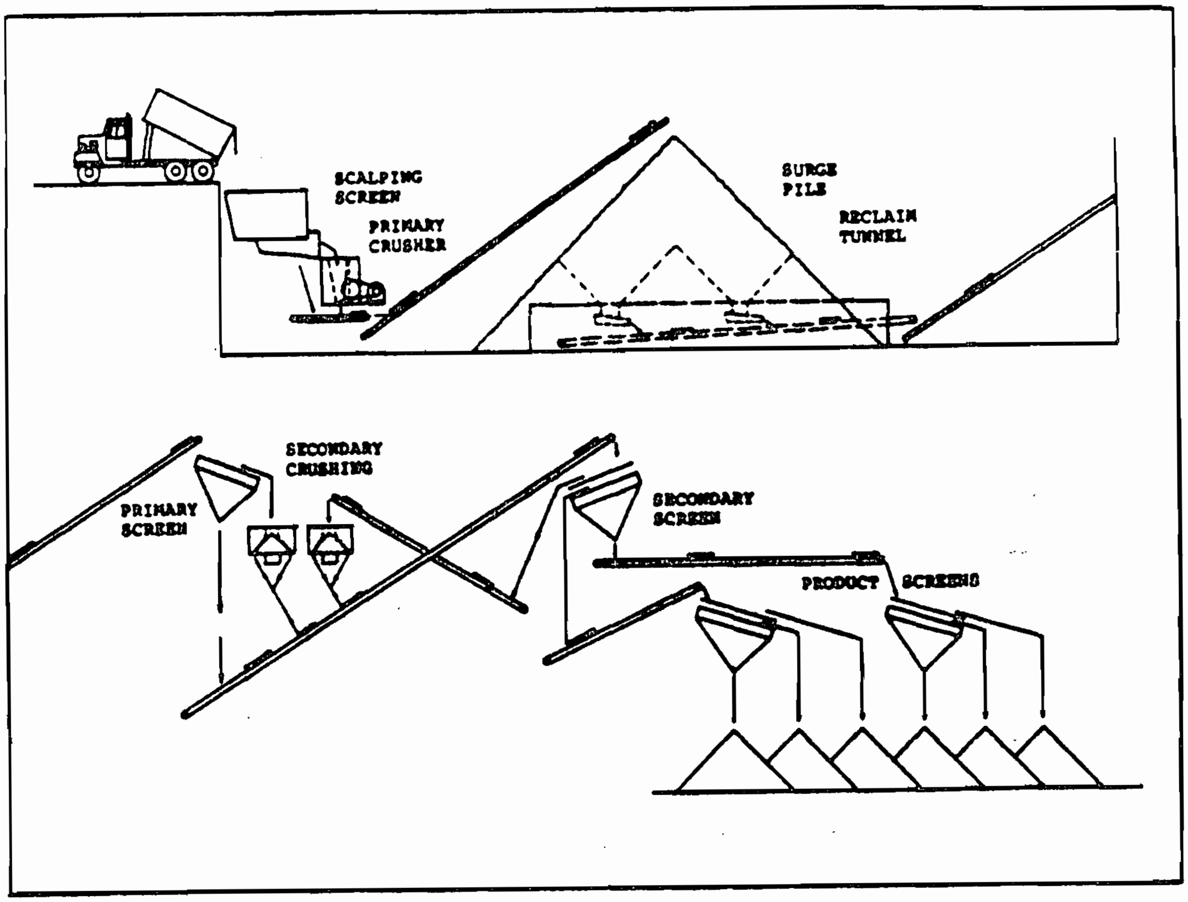

FIGURE 8.19.2-1. Typical stone processing plant.

In certain cases, stone washing is required to meet particular end product specifications or demands, as with concrete aggregate processing. Crushed and broken stone normally are not milled but are screened and shipped to the consumer after secondary or tertiary crushing.

8.19.2.2 Emissions And Controls[1-3]

Dust emissions occur from many operations in stone quarrying and processing. A substantial portion of these emissions consists of heavy particles that may settle out within the plant. As in other operations, crushed stone emission sources may be categorized as either process sources or fugitive dust sources. Process sources include those for which emissions are amenable to capture and subsequent control. Fugitive dust sources generally involve the reentrainment of settled dust by wind or machine movement. Factors affecting emissions from either source category include the type, quantity and surface moisture content of the stone processed; the type of equipment and operating practices employed; and topographical and climatic factors.

Of geographic and seasonal factors, the primary variables affecting uncontrolled particulate emissions are wind and material moisture content. Wind parameters vary with geographical location, season and weather. It can be expected that the level of emissions from unenclosed sources (principally fugitive dust sources) will be greater during periods of high winds. The material moisture content also varies with geographic location, season and weather. Therefore, the levels of uncontrolled emissions from both process emission sources and fugitive dust sources generally will be greater in arid regions of the country than in temperate ones, and greater during the summer months because of a higher evaporation rate.

The moisture content of the material processed can have a substantial effect on uncontrolled emissions. This is especially evident during mining, initial material handling, and initial plant process operations such as primary crushing. Surface wetness causes fine particles to agglomerate on, or to adhere to, the faces of larger stones, with a resulting dust suppression effect. However, as new fine particles are created by crushing and attrition, and as the moisture content is reduced by evaporation, this suppressive effect diminishes and may disappear. Depending on the geographic and climatic conditions, the moisture content of mined rock may range from nearly zero to several percent. Since moisture content is usually expressed on a basis of overall weight percent, the actual moisture amount per unit area will vary with the size of the rock being handled. On a constant mass fraction basis, the per unit area moisture content varies inversely with the diameter of the rock. Therefore, the suppressive effect of the moisture depends on both the absolute mass water content and the size of the rock product. Typically, a wet material will contain 1.5 to 4 percent water or more.

There are a large number of material, equipment and operating factors which can influence emissions from crushing. These include: (1) rock type, (2) feed size and distribution, (3) moisture content, (4) throughput rate, (5) crusher type, (6) size reduction ratio, and (7) fines content. Insufficient data are available to present a matrix of rock crushing emission factors detailing the above classifications and variables. Data available from which to prepare emission factors also vary considerably, for both extractive testing and plume profiling. Emission factors from extractive testing are generally higher than those based upon plume profiling tests, but they have a greater degree of reliability. Some test data for primary crushing indicate higher emissions than from secondary crushing, although factors affecting emission rates and visual observations suggest that the secondary crushing emission factor, on a throughput basis, should be higher. Table 8.19.2-1 shows single factors for either primary or secondary crushing reflecting a combined data base. An emission factor for tertiary crushing is given, but it is based on extremely limited data. All factors are rated low because of the limited and highly variable data base.

TABLE 8.19.2-1. UNCONTROLLED PARTICULATE EMISSION FACTORS FOR CRUSHING OPERATIONS[a]

Type of crushing[b]	Particulate		Emission Factor Rating
	≤ 30 um kg/Mg (lb/ton)	≤ 10 um kg/Mg (lb/ton)	
Primary or secondary			
Dry material	0.14 (0.28)	0.0085 (0.017)	D
Wet material[c]	0.009 (0.018)	-	D
Tertiary dry material[d]	0.93 (1.85)	-	E

[a]Based on actual feed rate of raw material entering the particular operation. Emissions will vary by rock type, but data available are insufficient to characterize these phenomena. Dash = no data.
[b]References 4-5. Typical control efficiencies for cyclone, 70 - 80%; fabric filter, 99%; wet spray systems, 70 - 90%.
[c]References 5-6. Refers to crushing of rock either naturally wet or moistened to 1.5 - 4 weight % with wet suppression techniques.
[d]Range of values used to calculate emission factor is 0.0008 - 1.38 kg/Mg.

Emission factor estimates for stone quarry blasting operations are not presented here because of the sparsity and unreliability of available test data. While a procedure for estimating blasting emissions is presented in Section 8.24, Western Surface Coal Mines, that procedure should not be applied to stone quarries because of dissimilarities in blasting techniques, material blasted and size of blast areas.

There are no screening emission factors presented in this Section. However, the screening emission factors given in Section 8.19.1, Sand and Gravel Processing, should be similar to those expected from screening crushed rock. Milling of fines is also not included in this Section as this operation is normally associated with non construction aggregate end uses and will be covered elsewhere in the future when information is adequate.

Open dust source (fugitive dust) emission factors for stone quarrying and processing are presented in Table 8.19.2-2. These factors have been determined

TABLE 8.19.2-2. UNCONTROLLED PARTICULATE EMISSION FACTORS FOR OPEN DUST SOURCES AT CRUSHED STONE PLANTS

Operation	Material	Emissions by particle size range (aerodynamic diameter)[a] TSP ≤ 30 um	PM10 ≤ 10 um	Units[b]	Emission Factor Rating
Wet quarry drilling	Unfractured stone[c]	0.4 (0.0008)	0.04 (0.0001)	g/Mg (lb/ton)	E
Batch drop					
Truck unloading	Fractured stone[c]	0.17 (0.0003)	0.008 (0.00002)	g/Mg (lb/ton)	D
Truck loading					
Conveyor	Crushed stone[d]	0.17 (0.0003)	0.05 (0.0001)	g/Mg (lb/ton)	E
Front end loader	Crushed stone[e]	29.0 (0.06)	NA	g/Mg (lb/ton)	E
Conveying					
Tunnel belt	Crushed stone[c]	1.7 (0.0034)	0.11 (0.0002)	g/Mg (lb/ton)	E
Unpaved haul roads		f	f		
Blasting	Quarried stone	g	g		

[a]Total suspended particulate (TSP) is that measured by a standard high volume sampler (See Section 11.2). Use of empirical equations in Chapter 11 is preferred to single value factors in this Table. Factors in this Table are provided for convenience in quick approximations and/or for occasions when equation variables can not be reasonably estimated. NA = not available.

[b]Expressed as g/Mg (lb/ton) of material through primary crusher, except for front end loading, which is g/Mg (lb/ton) of material transferred.

[c]Reference 2.

[d]Reference 3.

[e]Reference 6.

[f]See Section 11.2 for empirical equations.

[g]Not presented because of sparsity and unreliability of test data.

through tests at various quarries and processing plants.[6-7] The single valued open dust emission factors given in Table 8.19.2-2 may be used when no other information exists. Empirically derived emission factor equations presented in Section 11.2 of this document are preferred and should be used when possible. Because these predictive equations allow the adjustment of emission factors for specific source conditions, these equations should be used instead of those in Table 8.19.2-2, whenever emission estimates applicable to specific stone quarrying and processing facility sources are needed. Chapter 11.2 provides measured properties of crushed limestone, as required for use in the predictive emission factor equations.

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11.2.1 UNPAVED ROADS

11.2.1.1 General

Dust plumes trailing behind vehicles traveling on unpaved roads are a familiar sight in rural areas of the United States. When a vehicle travels an unpaved road, the force of the wheels on the road surface causes pulverization of surface material. Particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong air currents in turbulent shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed.

11.2.1.2 Emissions And Correction Parameters

The quantity of dust emissions from a given segment of unpaved road varies linearly with the volume of traffic. Also, field investigations have shown that emissions depend on correction parameters (average vehicle speed, average vehicle weight, average number of wheels per vehicle, road surface texture and road surface moisture) that characterize the condition of a particular road and the associated vehicle traffic.[1-4]

Dust emissions from unpaved roads have been found to vary in direct proportion to the fraction of silt (particles smaller than 75 micrometers in diameter) in the road surface materials.[1] The silt fraction is determined by measuring the proportion of loose dry surface dust that passes a 200 mesh screen, using the ASTM-C-136 method. Table 11.2.1-1 summarizes measured silt values for industrial and rural unpaved roads.

The silt content of a rural dirt road will vary with location, and it should be measured. As a conservative approximation, the silt content of the parent soil in the area can be used. However, tests show that road silt content is normally lower than in the surrounding parent soil, because the fines are continually removed by the vehicle traffic, leaving a higher percentage of coarse particles.

Unpaved roads have a hard nonporous surface that usually dries quickly after a rainfall. The temporary reduction in emissions because of precipitation may be accounted for by not considering emissions on "wet" days (more than 0.254 millimeters [0.01 inches] of precipitation).

The following empirical expression may be used to estimate the quantity of size specific particulate emissions from an unpaved road, per vehicle kilometer traveled (VKT) or vehicle mile traveled (VMT), with a rating of A:

$$E = k(1.7)\left(\frac{s}{12}\right)\left(\frac{S}{48}\right)\left(\frac{W}{2.7}\right)^{0.7}\left(\frac{w}{4}\right)^{0.5}\left(\frac{365-p}{365}\right) \quad \text{(kg/VKT)} \qquad (1)$$

$$E = k(5.9)\left(\frac{s}{12}\right)\left(\frac{S}{30}\right)\left(\frac{W}{3}\right)^{0.7}\left(\frac{w}{4}\right)^{0.5}\left(\frac{365-p}{365}\right) \quad \text{(lb/VMT)}$$

TABLE 11.2.1-1. TYPICAL SILT CONTENT VALUES OF SURFACE MATERIALS ON INDUSTRIAL AND RURAL UNPAVED ROADS[a]

Industry	Road Use Or Surface Material	Plant Sites	Test Samples	Silt (%, w/w) Range	Silt (%, w/w) Mean
Copper smelting	Plant road	1	3	[15.9 - 19.1]	[17.0]
Iron and steel production	Plant road	9	20	4.0 - 16.0	8.0
Sand and gravel processing	Plant road	1	3	[4.1 - 6.0]	[4.8]
Stone quarrying and processing	Plant road	1	5	[10.5 - 15.6]	[14.1]
Taconite mining and processing	Haul road	1	12	[3.7 - 9.7]	[5.8]
	Service road	1	8	[2.4 - 7.1]	[4.3]
Western surface coal mining	Access road	2	2	4.9 - 5.3	5.1
	Haul road	3	21	2.8 - 18	8.4
	Scraper road	3	10	7.2 - 25	17
	Haul road (freshly graded)	2	5	18 - 29	24
Rural roads	Gravel	1	1	NA	[5.0]
	Dirt	2	5	5.8 - 68	28.5
	Crushed limestone	2	8	7.7 - 13	9.6

[a]References 4 - 11. Brackets indicate silt values based on samples from only one plant site.
NA = Not available.

where: E = emission factor
k = particle size multiplier (dimensionless)
s = silt content of road surface material (%)
S = mean vehicle speed, km/hr (mph)
W = mean vehicle weight, Mg (ton)
w = mean number of wheels
p = number of days with at least 0.254 mm (0.01 in.) of precipitation per year

The particle size multiplier, k, in Equation 1 varies with aerodynamic particle size range as follows:

Aerodynamic Particle Size Multiplier For Equation 1

≤30 μm	≤15 μm	≤10 μm	≤5 μm	≤2.5 μm
0.80	0.50	0.36	0.20	0.095

The number of wet days per year, p, for the geographical area of interest should be determined from local climatic data. Figure 11.2.1-1 gives the geographical distribution of the mean annual number of wet days per year in the United States.

Equation 1 retains the assigned quality rating if applied within the ranges of source conditions that were tested in developing the equation, as follows:

RANGES OF SOURCE CONDITIONS FOR EQUATION 1

Equation	Road silt content (%, w/w)	Mean vehicle weight		Mean vehicle speed		Mean no. of wheels
		Mg	ton	km/hr	mph	
1	4.3 - 20	2.7 - 142	3 - 157	21 - 64	13 - 40	4 - 13

Also, to retain the quality rating of the equation applied to a specific unpaved road, it is necessary that reliable correction parameter values for the specific road in question be determined. The field and laboratory procedures for determining road surface silt content are given in Reference 4. In the event that site specific values for correction parameters cannot be obtained, the appropriate mean values from Table 11.2.1-1 may be used, but the quality rating of the equation is reduced to B.

Equation 1 was developed for calculation of annual average emissions, and thus, is to be multiplied by annual vehicle distance traveled (VDT). Annual average values for each of the correction parameters are to be substituted into

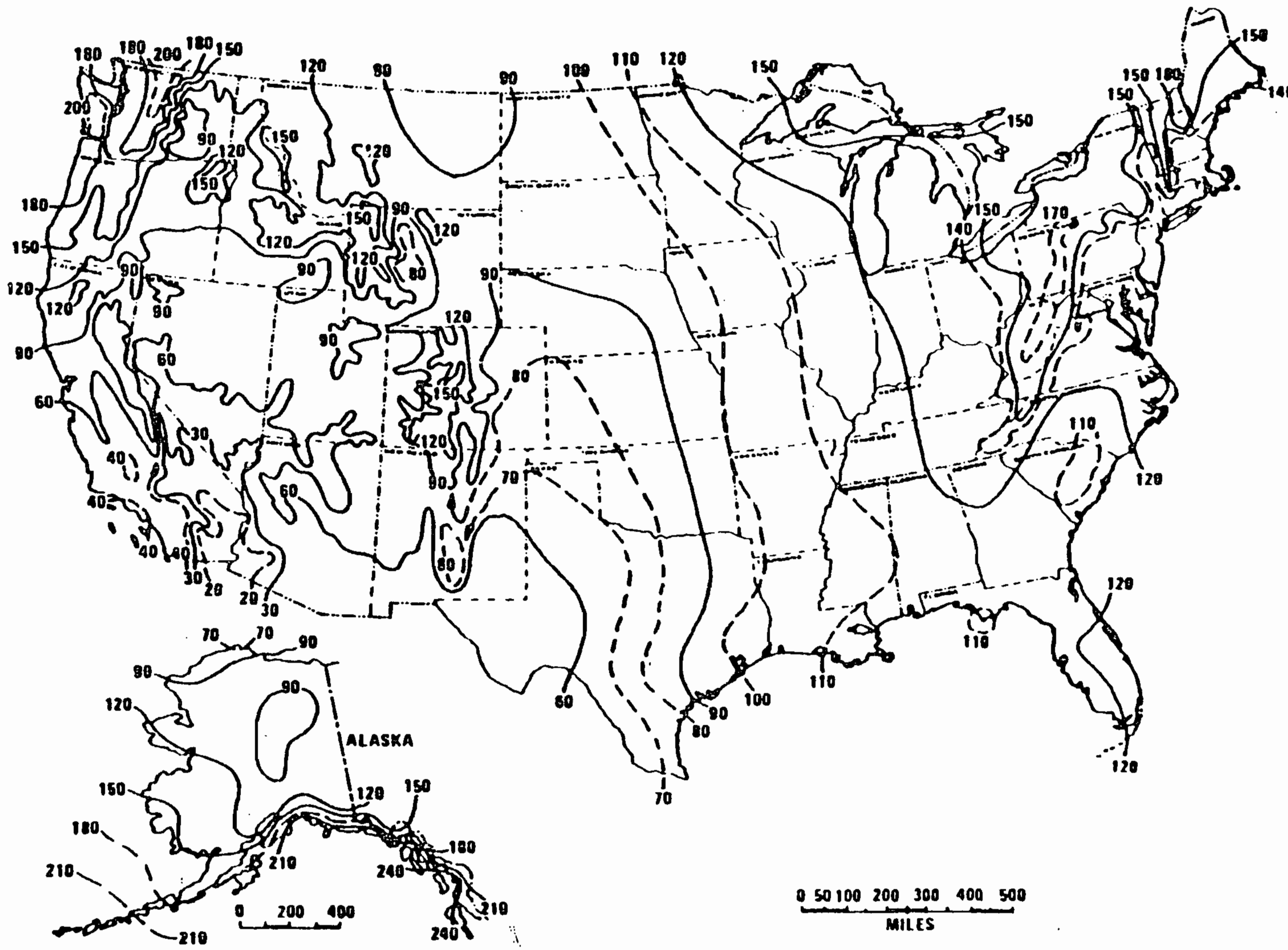

Figure 11.2.1-1. Mean number of days with 0.01 inch or more of precipitation in United States.[10]

the equation. Worst case emissions, corresponding to dry road conditions, may be calculated by setting p = 0 in the equation (which is equivalent to dropping the last term from the equation). A separate set of nonclimatic correction parameters and a higher than normal VDT value may also be justified for the worst case averaging period (usually 24 hours). Similarly, to calculate emissions for a 91 day season of the year using Equation 1, replace the term (365-p)/365 with the term (91-p)/91, and set p equal to the number of wet days in the 91 day period. Also, use appropriate seasonal values for the nonclimatic correction parameters and for VDT.

11.2.1.3 Control Methods

Common control techniques for unpaved roads are paving, surface treating with penetration chemicals, working into the roadbed of chemical stabilization chemicals, watering, and traffic control regulations. Chemical stabilizers work either by binding the surface material or by enhancing moisture retention. Paving, as a control technique, is often not economically practical. Surface chemical treatment and watering can be accomplished with moderate to low costs, but frequent retreatments are required. Traffic controls, such as speed limits and traffic volume restrictions, provide moderate emission reductions but may be difficult to enforce. The control efficiency obtained by speed reduction can be calculated using the predictive emission factor equation given above.

The control efficiencies achievable by paving can be estimated by comparing emission factors for unpaved and paved road conditions, relative to airborne particle size range of interest. The predictive emission factor equation for paved roads, given in Section 11.2.6, requires estimation of the silt loading on the traveled portion of the paved surface, which in turn depends on whether the pavement is periodically cleaned. Unless curbing is to be installed, the effects of vehicle excursion onto shoulders (berms) also must be taken into account in estimating control efficiency.

The control efficiencies afforded by the periodic use of road stabilization chemicals are much more difficult to estimate. The application parameters which determine control efficiency include dilution ratio, application intensity (mass of diluted chemical per road area) and application frequency. Between applications, the control efficiency is usually found to decay at a rate which is proportional to the traffic count. Therefore, for a specific chemical application program, the average efficiency is inversely proportional to the average daily traffic count. Other factors that affect the performance of chemical stabilizers include vehicle characteristics (e. g., average weight) and road characteristics (e. g., bearing strength).

Water acts as a road dust suppressant by forming cohesive moisture films among the discrete grains of road surface material. The average moisture level in the road surface material depends on the moisture added by watering and natural precipitation and on the moisture removed by evaporation. The natural evaporative forces, which vary with geographic location, are enhanced by the movement of traffic over the road surface. Watering, because of the frequency of treatments required, is generally not feasible for public roads and is used effectively only where water and watering equipment are available and where roads are confined to a single site, such as a construction location.

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HEAT AND MATERIAL BALANCE - SUMMARY

CASE NUMBER			IA	IB	IIA	IIB	IIIA	IIIB
SOIL FEED:	MOISTURE	(%)	10.00	10.00	12.00	12.00	20.00	20.00
	TOTAL FLOW	(tons/hr)	42.46	34.92	37.21	31.41	24.94	22.42
(NOTE 1)	HC CONC.	(ppm)	3079.46	3743.24	3512.84	4161.23	5242.66	5890.17
	SOIL Cp	(BTU/lb/F)	0.22	0.40	0.22	0.40	0.22	0.40
FUEL:	TYPE		NAT. GAS	NAT. GAS	NAT. GAS	NAT. GAS	NAT. GAS	NAT. GAS
DRYER:	EXCESS AIR	(%)	25.00	25.00	25.00	25.00	25.00	25.00
	EXHAUST FLOW	(ACFM)	11999.56	11999.86	[illegible]	11999.84	[illegible]	12300.01
	EXHAUST HC	(mol %)	0.10	0.09	0.10	0.10	0.10	0.10
	EXHAUST TEMP.	(F)	330.00	350.00	350.00	360.00	360.00	380.00
	PRODUCT TEMP.	(F)	550.00	650.00	550.00	900.00	560.00	650.00
	HEAT DUTY	(MMBTU/hr)	18.275	20.323	17.[illegible]	19.578	16.[illegible]	17.[illegible]
	FIRING RATE	(MMBTU/hr)	22.079	24.[illegible]	21.[illegible]	23.843	19.[illegible]	21.[illegible]
	FUEL REQUIRED	(lb/hr)	926.21	10[illegible]	896.90	891.08	[illegible]	804.67
AFTERBURNER:	EXCESS AIR	(%)	25.00	25.00	25.00	25.00	25.00	25.00
	EXHAUST FLOW	(ACFM)	55910.46	64084.01	[illegible]	61049.42	[illegible].13	[illegible]
	EXHAUST TEMP.	(F)	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00
	HEAT DUTY	(MMBTU/hr)	11.[illegible]	13.[illegible]	11.[illegible]	12.076	[illegible]	11.[illegible]
	FIRING RATE	(MMBTU/hr)	24.747	27.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	FUEL REQUIRED	(lb/hr)	1057.11	11[illegible]	[illegible]	1118.67	[illegible]	[illegible]
EMISSIONS:	NOx	(lb/hr)	[illegible]	7.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	CO	(lb/hr)	1.[illegible]	1.[illegible]	1.[illegible]	1.78	1.[illegible]	1.[illegible]
	SOx	(lb/hr)	[illegible]	0.60	[illegible]	[illegible]	[illegible]	[illegible]
	HCl	(lb/hr)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	PARTICULATE	(lb/hr)	[illegible]	0.75	[illegible]	0.[illegible]	[illegible]	[illegible]
	HC	(lb/hr)	2.61	2.61	2.61	2.61	2.61	2.61
PUGMILL:	WATER REQUIRED	(gpm)	17.5	20.8	16.[illegible]	16.[illegible]	[illegible].1	11.[illegible]
SPECIFIC TOTAL FUEL REQMT		(lb/ton)	46.[illegible]	[illegible]	51.9	[illegible]	[illegible]	[illegible]
SPECIFIC TOTAL FUEL REQMT		(scf/ton)	10[illegible]	14[illegible]	12[illegible]	1[illegible]	1[illegible]	[illegible]

NOTES:

1. HC CONTAMINANT IS ASSUMED TO BE DIESEL.

BEST AVAILABLE COPY

Cedarapids Inc
916 Sixteenth St NE
Cedar Rapids IA 52402

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FAX 319 399 4871
Sales Telex 46 4475

Quotation

Item	Qty	Description	List Price
1	1	Cedarapids Model 64MT Portable Soil Remediation Unit:	

Designed for use with 12,000 ACFM air system and Model 6422 Drier Drum. Complete with specially designed feed system to process gasoline and diesel fuel down to #4 variety petroleum contaminated soils. Maximum soil discharge temperature to be 850°F.(Note: heavier contaminants may be processed but must be approved by CEDARAPIDS on a case by case basis).

64" x 22' Counterflow Aggregate Drier is constructed of high strength, abrasion-resistant steel to assure long life. Drum tires and trunnions are castings machined to ensure correct operation. Drier burner for LP fuel oil is supplied with automatic control.

Cedarapids driers feature saddle chain drive systems which assure positive drier drive under the most severe conditions. Drier drive motor is 25 HP. Included with the drier is the exhaust chamber with dust seal, combustion chamber and high lift discharge hood.

Drier is fed by slinger feed conveyor with weighing device. Drives are 5 HP. Material from the slinger is distributed into the drier by intake distribution flights.

Specially designed, heat-resistant basket flights begin lifting and veiling the material for drying. Contaminated soils cascade through the gas stream forming a dense curtain and are heated and dried by utilizing the heat transfer principles of convection and conduction.

To aid in the drying process and provide additional control of exhaust gas temperatures, patented veil modification plates (VMPs) are included. Application of veil modification plates provides the ability to adjust the material curtain during the drying operation. This in turn directly affects gas stream temperature and soil temperature, which is a necessary advantage when processing contaminated soils.

Once processed, heated and decontaminated, soils are discharged by specially designed, heat-resistant high lift flights over the frame of the drier into the discharge material handling device.

All electric power and controls are 460-3-60 Hz mounted in control panel in weathertight NEMA

12 type enclosure (line start through 75 HP, IRCS 100 HP and larger). Included are power cables, type "G" neoprene covered; quick disconnect couplings, remote operator pushbutton station with control cable to operator's station within 50' of burner.

Feed System is mounted on board. The specially designed feed system includes a Cedarapids

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4' x 14' inclined vibrating single deck screen with 2" SCO screenwire. A heavy-duty, hydraulic tipping, bar type grizzly with 8" nominal bar spacing is mounted over the screen to pre-size material. The grizzly is hinged at its base point and is pneumatically raised to aid in clearing oversized material. Bulkheads are mounted over right side of unit for building a feed ramp.

Material passing 2" screen cloth enters into a small vertical wall bin with a live floor. This live floor consists of a slat type 10 HP variable speed feeder for conveying material to the drier feed conveyor at a predetermined rate.

The drier feed conveyor conveys material into the 64" rotary drier. Feed conveyor includes weighbridge. Material is fed directly onto the drier flighting, which assures positive feed motion -- a must when handling contaminated feed stocks.

The total apparatus is designed as a unitized system within a single frame, creating a highly portable feed and drying system.

Summary

Cedarapids System 64MT Portable Soil Remediation System designed for use with 12,000 CFM air movement and specially engineered feed system to process gasoline and diesel fuel (down to #4 varieties) petroleum contaminated soils. (Note: heavier hydrocarbons may be processed in this system, but must be approved by CEDARAPIDS INC on a case by case basis).
All motors, motor control and wiring with quick disconnect couplings are supplied with unit.
Complete with portable frame with triple axle, air brakes, quick set jacks, fifth wheel plate, kingpin, brake and turn signals and mud flaps.

Options for Item 1:

1. **Cedarapids Model 4033 Impact Mill:** Unit mounts on the same frame, adjacent to the feed system. The express purpose of the 4033 Impact Mill is to reduce oversize rubble (of aggregate origin) to a processable size.

   Unit, complete with motor controls and wiring, mounts at the discharge end of the 4' x 14' screen and accepts feed material that passes the grizzly, but is retained on the 2" screen cloth. Once material has passed through the 4033 mill, it is discharged onto a discharge conveyor which conveys it to the rear of the unit. From this point, the material is to be picked up and refed into the system. Includes bypass chute for dual purpose operation ....

A [illegible] Company

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Item	Qty	Description	List Price

2. *Cedarapids Model 3-in-1 Contaminated Soil Feed System*: Unit is a complete, separate trailer containing:

   a) *Feed Hopper* with positive live bottom feed slat type feed conveyor (with metal detector) that delivers feed material to the 4' x 14' screen: Note: Magnetic ejector available as an option.

   b) *Bar Type 8" Nominal Spacing Grizzly* with hydraulic adjusting and tipping cylinders.

   c) *10' x 16' Operator's Control Cabin* with recordation and pushbotton control panels installed. Additional space for transportation of system components supplied.

   Unit is mounted on tandem axle running gear and is complete with fifth wheel plate, kingpin, turn signals, brake lights and mud flaps ....

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Quotation

Item	Qty	Description	List Price
II	1	Cedarapids Model 3520/PC Portable Baghouse Unit for Use with Cedarapids System 64MT:	

Baghouse is designed for 12,000 ft^3 CFM and 3.4/1 air to cloth ratio.

The unit is all-welded, 12 gauge, reinforced construction. The inside housing and outside surface are is coated with reflective insulation material to guard against heat loss. Wrenchless, removable bag access panels are tightly sealed against leaks. Special high temperature bags provide for operation up to 475°F.

Primary Section: Included as standard equipment. The primary removes coarse particles from the air stream prior to entry into the secondary cleaning chamber. Abrasion and heavy particle loading of the bags are held to a minimum. Collected particles fall from the primary into the transfer screw.

A safety baffle, electropneumatically controlled, automatically closes off hot incoming exhaust gases from the filter house should maximum setpoint temperatures be detected.

The secondary section features a centrally located plenum. Screen type material forms the side walls of the plenum and functions as a trap for airborne debris, which is hazardous to the secondary section. The central plenum also provides equalized airstream distribution, which results in even bag loading and virtually no loss of velocity and pressure across the secondary section.

Bag cleaning is continuous. Pulse-jet blasts of compressed air are jetted through a venturi at the top of each bag. Cleaning intervals are adjustable to match dust loading conditions.

Dust is collected and conveyed across the floor of the filter house by a drag type conveyor. Drag bars ride on replaceable liners, welded in to protect the hopper floor from wear. Hardened chain drive sprockets and idlers, plus oversize shafts and bearings, assure trouble-free operation.

Dust Screw: Abrasion-resistant screw flights carry dust to the discharge chute. Screw shaft bearings are mounted outside the collecting trough to prevent dust contamination.

Dust is returned to the drier by a pneumatic fines return system. This system consists of a blower, blower motor, motor control, piping and fittings from the collector to the drier.

Note: All prices are F O B Cedar Rapids, Iowa, unless otherwise shown, and are subject to change without notice. This Quotation is for acceptance within ___ days and is subject to "Conditions of Sale" on reverse side hereof.

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Sales Telex 46 4475

Quotation

Item	Qty	Description	List Price

Blower motor is 15 HP.

Mounted on the drier is a small separation cyclone and fines return valve. Cyclone separates fines from the airstream and deposits them in the return valve. The valve directs them into the drier just above the discharge chute.

Exhaust Section: Fan is located on outlet side of collector to cut abrasive wear to blades. Electric motor drive with high efficiency fans are standard. A 50 HP fan drive is provided.

Damper: The electrically actuated damper mounts on the outlet of the fan and is remotely adjustable from the control center. It is used to regulate exhaust flow or correct draft through the drum and collector system and is correlated with the drying load. A dial on the control console shows the percent opening. The damper is also used to reduce "cold air" starting load on the motor. Ductwork from the drier unit to the filter house is supplied.

As a safety feature, the damper cannot be fully closed, so all burner fuel fumes are purged from the system before start-up.

Air Supply: The 25 HP air compressor mounts on the rear deck of the unit and is complete with electric drive. Hose connections to air headers are fully installed.

Monitoring & Safeguard Controls: Two magnehelic gauges provide a check on the proper operating conditions. Each gauge shows if pressure differential is rising and gives the operator a way to identify build-up of material or other blockage. One gauge is mounted on the filter house and the other in the control house.

A dual set point, over temperature protection system operates the primary section baffle and automatically shuts off the burner if temperature in the bag chamber rises too high, preventing burner restart until temperatures fall to a safe operating level.

Electric Motor Controls: Controls are 460-3-60 to power fan, slat/screw/air lock and compressor. Controls are increment reduced current type for all motors over 75 HP. All motors, motor controls and wiring with quick disconnects are supplied with unit.

Model 12120 Afterburner: Unit is mounted on the extended gooseneck frame of the baghouse. The afterburner receives pre-cleaned exhaust gases from the baghouses. Afterburner is designed to elevate and maintain gas stream temperature at 1600-2000°F. Burner and controls for afterburner are included. Afterburner is supplied with LP style burner. Exhaust stack for the afterburner is included.

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Item	Qty	Description	List Price

Mounted on the rear of the filter house is a 315 Kw Cummins generator set that provides power for the operation of the system. The motor control center for the entire system is mounted next to the generator set, thereby providing extreme portability.

Summary

Cedarapids Model 3520/PC Portable Baghouse Unit for use with System 64MT:
All motors, motor controls and wiring with quick disconnect couplings are supplied with unit. Complete with 12,000 CFM system, Model 12120 Afterburner, 315 Kw Generator Set and triple axle portable frame with air brakes, fifth wheel plate with kingpin, brake and turn signals and mud flaps.

Note: All prices are F.O.B. Cedar Rapids, Iowa, unless otherwise shown, and are subject to change without notice. This Quotation is for acceptance within ___ days and is subject to "Conditions of Sale" on reverse side hereof.

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Quote No. 28618
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Item	Qty	Description	List Price
III	1	**Cedarapids Model 64 Material Processing & Stockpiling System:**	

System includes 26" x 12' single shaft pugmill with covers and water spray nozzles. Mill receives decontaminated soils from drier discharge and mixes with water to contain dust emissions. Pugmill is complete with drives, motor and motor control. Mounted on the same frame with the pugmill is a channel frame conveyor that conveys premixed materials to the stockpiling conveyor. A collection hood and piping for controlling fugitive dust is included. Piping returns dust and steam to the filterhouse.

Once premixed material has been delivered to the 24" x70' stockpiling conveyor it can be stacked in a radial pile. Conveyor is complete with drives, motors, motor controls, wiring and conveyor belting.

Summary

Cedarapids Model 64 Material Handling & Stockpiling System including 26" diameter x 12' long mixing mill and 24" x70' long stacking conveyor.

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Item	Qty	Description	List Price
IV	1	**Cedarapids Model GBC Recording Controls & Control Center:**	

Complete with automatic recording control. Recording control tracks incoming soil rate and temperature, soil temperature discharge, drier exhaust temperature, filter house exhaust temperature, baghouse dust return temperature and afterburner exhaust temperature. Record is printed on a self-scaling strip chart.

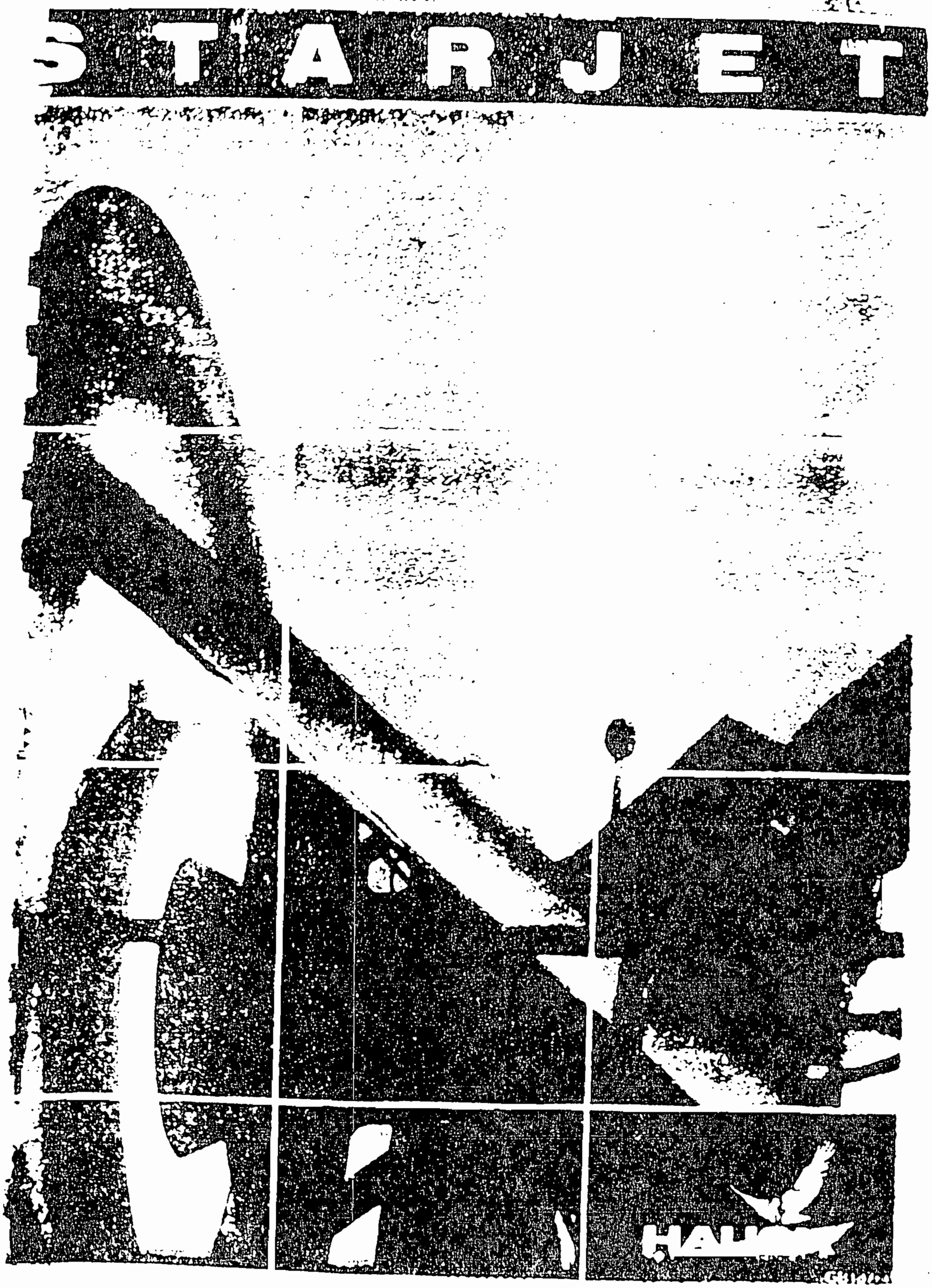
Control circuits for process and pushbutton controls are interlocked and operate on 110-1-60 Hz. Control circuits are wired from motor control panel to pushbutton panels. 110V power is supplied for general use in the center. Starters up to 75 HP are line start. Larger motors are IRCS start.

Control house is 10' x 24' with 270° operator visibility. GBC recording controls, operator's controls and pushbuttons are mounted in the front section of the house. The rear portion of the house serves as a field office. The unit has triple axle running gear and ball hitch type pulling tongue.

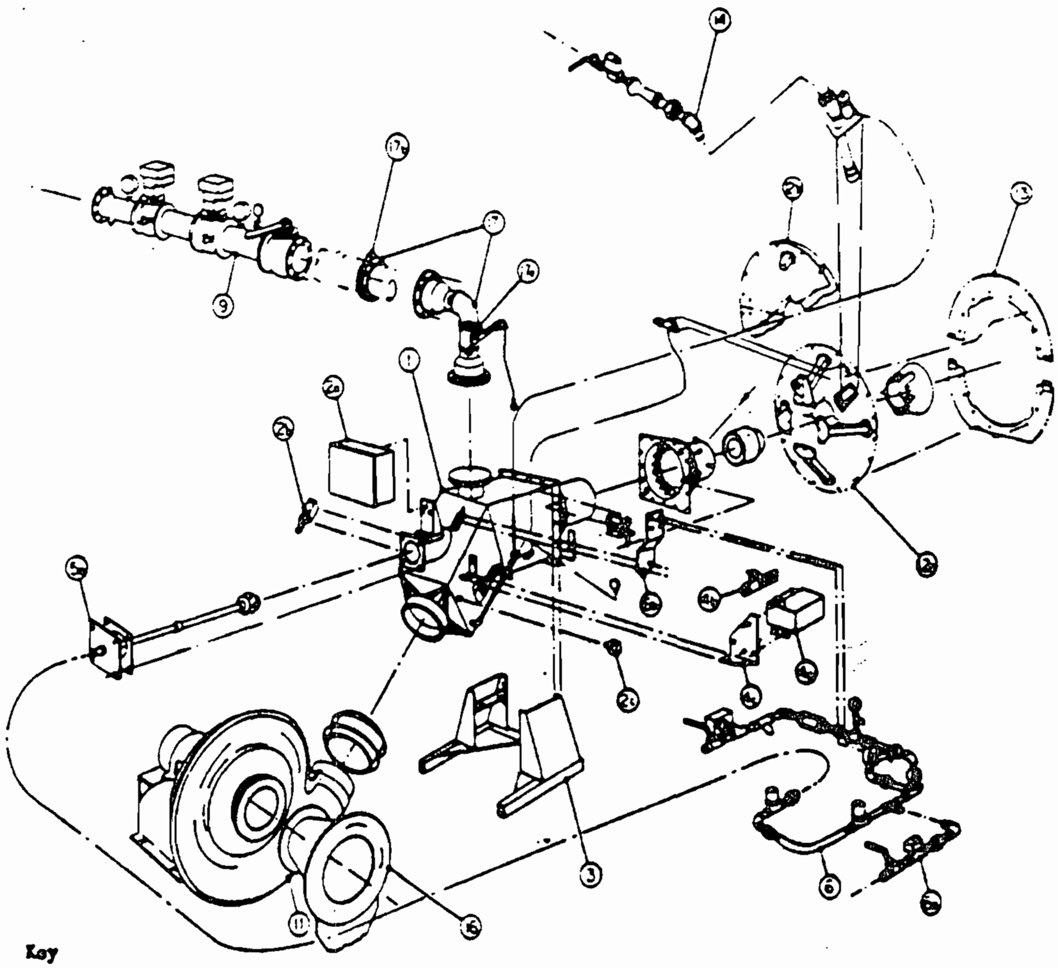
Summary

Cedarapids Model GBC Recording & Operating Controls installed in a 10' x 24' portable control house.

Note: When Option 2 on page five is selected, the 10' x 24' control center is replaced by the 10' x 16' control center mounted on the feed chassis.


STARJET

OPEN FIRED STARJET BURNER UNIT SJ075 – SJ260



Key No.	Description	SJ075	SJ150	SJ200	SJ260
1	Burner, Basic	46965	47008	45246	44436
		GF133	GF133	GF133	GF133
2	Kit, Junction Box *	45842x	45842x	45842x	45842x
a.	Junction Box~	40576x	40576x	40576x	40576x
	1. Transformer	10805	10805	10805	10805
	2. Resistor	15887	15887	15887	15887
b.	Low Fire Limit Switch	20533	20533	20533	20533
c.	Air Pressure Switch	19298	19298	19298	19298
3	Skid, Mini				
	17" Centerline	46950x002	46950x002	N/A	N/A
	20" Centerline	N/A	N/A	47373	47373
	24" Centerline	46950x001	46950x001	44453	44453

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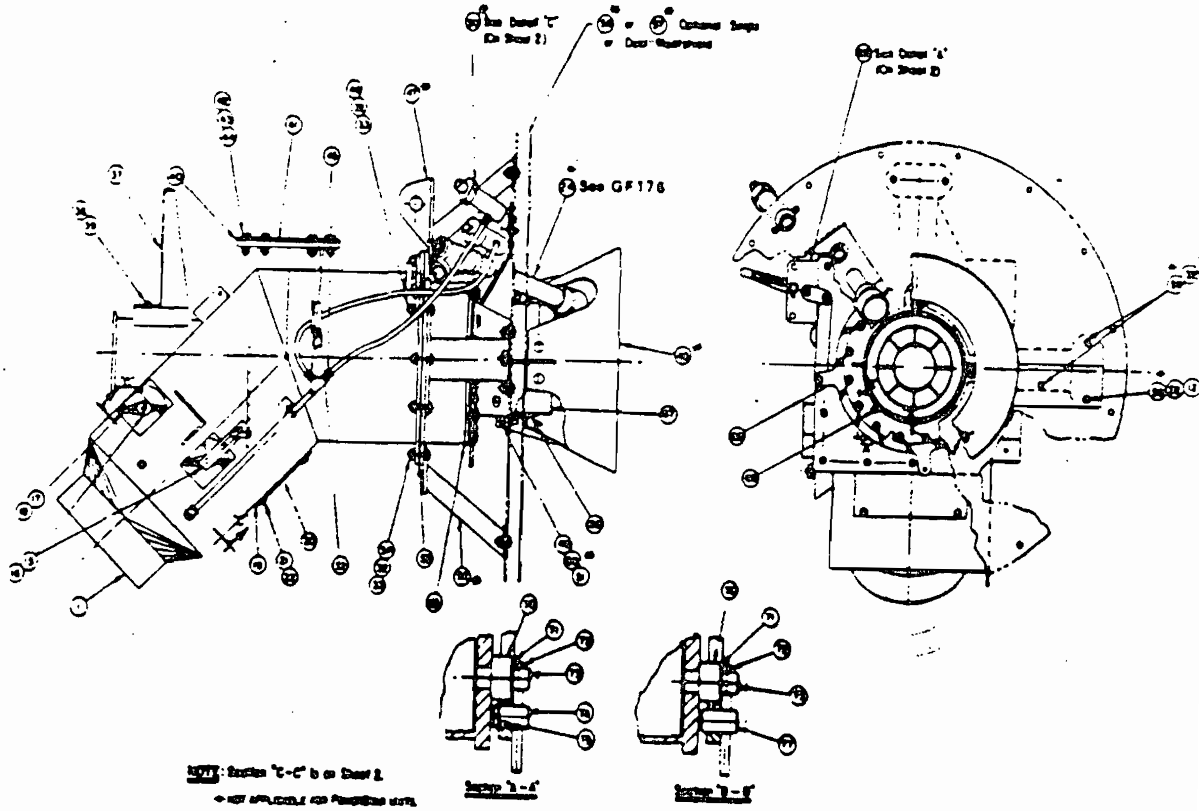
Key No.	Description	SJ075	SJ150	SJ200	SJ260
4	Kit, Control Motor				
	3 & 6 o'clock	45844x002	45844x002	45844x002	45844x002
	9 & 12 o'clock	45844x001	45844x001	45844x001	45844x001
a.	Medium Torque Motor	16847	16847	16847	16847
b.	Triple Bearing Lever Assy	45829	45829	45829	45829
c.	Motor Mt'g Bracket 3 & 6 o'clock	48015	48015	48015	48015
	Motor Mt'g Bracket 9 & 12 o'clock	48026	48026	48026	48026
5	Insert, Primary Air				
a.	Oil/Gas	47349	47349	48418	48418
		GF135	GF135	GF135	GF135
b.	LP/Gas (Not Shown)	47524x001	47524x002	45235x001	45235x002
		GF137	GF137	GF137	GF137
6	Manifold, Oil				
	3 & 6 o'clock	48100x001	48101x001	48089x001	48090x001
	9 & 12 o'clock	48100x002	48101x002	48089x002	48090x002
a.	Kit, Heavy Oil (Option)	45904	45904	45904	45904
b.	Oil Valve Mt'g Bracket 3 & 6 o'clock	48085	48085	48085	48085
	Oil Valve Mt'g Bracket 9 & 12 o'clock	48087	48087	48087	48087
		GF139	GF139	GF139	GF139
9	Manifold, Gas	47389	47389	47390	47390
		PGM3120	PGM3120	PGM3125	PGM3125
				47391	47391
				PGM3130	PGM3130
10	Manifold, LP (Not Shown)				
	3 & 6 o'clock	48140x001	48154x001	48139x001	48584x001
	9 & 12 o'clock	48140x002	48154x002	48139x002	48584x002
				GF163	GF163
11	Blower	GF107	GF107	GF107	GF107
	24 osi	TBA-24-10-0	TBA-24-15-0	TBA-24-20-0	TBA-24-25-0
		18598x	18599x	18600x	18601x
	36 osi	TBA-36-20-0	TBA-36-25-0	TBA-36-40-0	TBA-36-50-0
		44045x	44048x	44059x	44067x
12 a.	Heatshield	46988	46988	46718	46718
b.	Dual Heatshield	47111	47111	46868	46868
13	Extension Kit, Heatshield (Option)	46994	46994	45847	45847
14	Manifold Assy, Pilot Gas	48687	48687	48682	48682
16	Transition Assy, Blower Inlet	N/A	48577x	48446x	48446x
17	Kit, Gas Valve Metering	N/A	48566	48535x	48535x
a.	Manifold Assy, Gas				
	W/ 24 osi Blower	48561	48561	48756	48534
	W/ 36 osi Blower	48561	48561	48534	48534
	1. Valve, Butterfly W/Lever & Pointer				
	W/ 24 osi Blower	48552	48552	48757	48338
	W/ 36 osi Blower	48552	48552	48338	48338
b.	Orifice Plate				
	W/ 24 osi Blower	N/A	19755x013	19755x013	19755x023
	W/ 36 osi Blower	N/A	19755x013	19755x023	19755x023

* Specify Control System In Use

OPEN FIRED/POWERSTAR STARJET BASIC BURNER SJ075 - SJ260



Key No.	Description		SJ075	SJ150	SJ200	SJ260
1	Body Assembly, Basic	(Open Fired)	47119	47119	47476	47476
		(PowerStar)	---	48802	49774	49774
	Note Items #2 through #22 are part of #1					
2	Gasket, Bearing	4 Req'd	43450	43450	43450	43450
3	Bearing, Damper	4 Req'd	43411	43411	43411	43411
4	Screw, Hex Hd Cap 1/4-20x3/4		6938x006	6938x006	6938x006	6938x006
5	Lock Washer, Std Med Spring, 1/4"		7273	7273	7273	7273
6	Nut, Hex Machine 1/4-20		7016	7016	7016	7016
7	Shaft, Primary Air Damper		47025	47025	44454	44454
8	Shaft, Secondary Air Damper		47024	47024	47230	47230
9	Damper, Primary Air		47026	47026	44455	44455
10	Washer, Std Plain 33/64 I.D.		7253	7253	7253	7253
11	Disc, Secondary Air Damper		1324	1324	47231	47231
*12	Washer, Plain 9/16 I.D.		7073	7073	7073	7073
13	Screw, Hex Soc Hd Cap 1/4-20x3/4"		6966x006	6966x006	6966x006	6966x006

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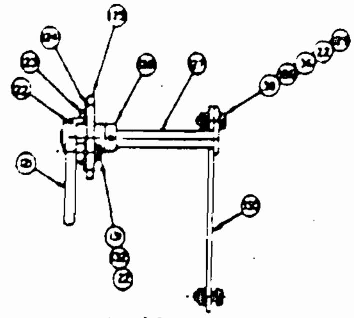
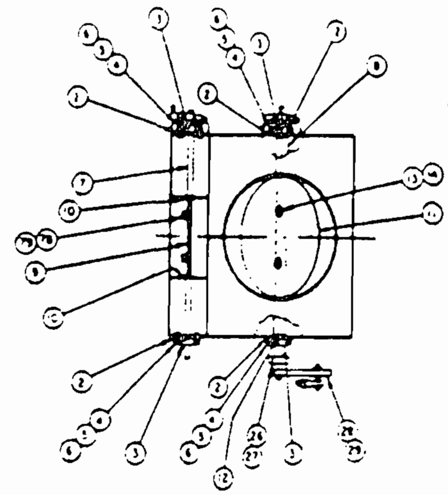
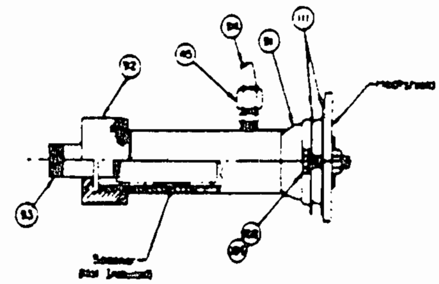


Detail "A"



Section "C-C"



Detail "C"

Key No.	Description		SJ075	SJ150	SJ200	SJ260
14	Lock Washer, Std. Med Spring 1/4"		7103	7103	7103	7103
15	Pointer	2 Req'd	2742C	2742C	2742C	2742C
16	Pin, Roll 1/8 dia. x 1-1/2"		7148x024	7148x024	7148x024	7148x024
17	Thumb Screw, 5/16-18x1/2"		6990x004	6990x004	6990x004	6990x004
18	Pin, Friction		5024	5024	5024	5024
19	Gasket, Access Port		47020	47020	41752	41752
20	Cover, Access Port		47019	47019	41695x004	41695x006
21	Screw, Hex Hd Cap 3/8-16x1"		7236x008	7236x008	7236x008	7236x008
22	Lock Washer, Std Med Spring 3/8"		7105	7105	7105	7105
23	Washer, Plain 9/16 I.D. (Not Shown)		7073	7073	7073	7073
*24	Pilot Assy		48551	48551	47782x001	47782x001
26	Cam		45846	45846	45846	45846
27	Screw, Hex Soc Hd #10-32x1"		6968x008	6968x008	6968x008	6968x008
28	Lever		45827	45827	45827	45827
29	Rod, Connection		9650x014	9650x014	9650x012	9650x012
*32	Lock Washer, Std Light Spring 1/2"		7247	7247	7247	7247
33	Nut, Hex Heavy 1/2-13		7240	7240	7240	7240
35	Screw, Hex Hd Cap 3/8-16x1-1/4"		6940x010	6940x010	6940x010	6940x010
36	Nut, Hex Heavy 3/8-16		7023	7023	7023	7023
37	Bracket		46705x001	46705x001	46705x002	46705x002
38	Screw, Hex Hd Cap 5/16-18x1-1/4"		7241x010	7241x010	7241x010	7241x010
39	Lock Washer, Std Light Spring 5/16"		7104	7104	7104	7104
40	Gasket		4124	4124	4124	4124

Key No.	Description		SJ075	SJ150	SJ200	SJ260
---	-----------		-----	-----	-----	-----
41	Cover		9851	9851	9851	9851
42	Screw, Hex Hd Cap 3/8-16x1"		7236x008	7236x008	7236x008	7236x008
43	Lock Washer, Std Light Spring 3/8"		7246	7246	7246	7246
44	Nut, Hex Heavy 3/8-16		7227	7227	7227	7227
45	Fitting, Compression	4 Req'd	12652	12652	12652	12652
46	Screw, Hex Hd Cap 1/2-113-2-1/2"		7239x020	7239x020	7239x020	7239x020
*47	Lifting Lug Bracket		46061x001	46061x001	46061x001	46061x001
48	Flame Holder		46974	46974	47484	44445
*49	Screw, Hex Hd Cap Type 309 STSTL 3/8-16x1"		7196x008	7196x008	7196x008	7196x008
*50	Lock Washer, Std Light Spring 3/8"		7246	7246	7246	7246
*51	Nut, Hex Heavy STSTL 3/8-16		7227	7227	7227	7227
*52	Bracket	4 Req'd	46972	46972	45240	45240
53	Gasket		46987	46987	44473	44473
54	Screw, Hex Hd Cap 1/2-13x2"		7239x016	7239x016	7239x016	7239x016
55	Gauge		20709	20709	20709	20709
*56	Heatshield Single (Optional)		46988	46988	46718	46718
*57	Heatshield Dual (Optional)		47111	47111	46868	46868
*58	Screw, Hex Hd Cap 1/2-13x1-3/4"		7239x014	7239x014	7239x014	7239x014
*59	Screw, Hex Hd Cap 1/2-13x1-1/2"		7239x012	7239x012	7239x012	7239x012
*60	Nut, Hex Heavy Brass 1/2-13		7310	7310	7310	7310
65	Nozzle Assy, Secondary Air	(Open Fired)	46997	47005	47482	47483
		(PowerStar)	---	48802	49821	49775
	Note: Items #66 through #77 are part of #65					
66	Body Assy, Secondary Air		46998	77006	44857	44468
67	Sleeve, Secondary Air		47004	47414	46545x001	49978
68	Ring, Secondary Air		47002	47002	44476	44476
69	Screw, Hex Hd Cap Type 309 STSTL 3/8-10x3/4"		7196x006	7196x006	7196x006	7196x006
70	Bearing		46276	46276	46276	46276
71	Washer, Plain		7253	7253	7253	7253
72	Pin, Roll 1/4x2-1/2"		7314x020	7314x020	7314x020	7314x020
73	Vane, Spin		47003	47003	44851	44483
74	Pin		46352	46352	46352	66352
75	Ring		44186	44186	44186	44186
76	Spacer		45062	45062	45062	45062
77	Pin		45047	45047	45047	45047
78	Screw, Hex Soc Hd Cap 1/4-20x3"		6966	6966	6966	6966
79	Washer, Med Spring Lock 1/4"		7103	7103	7103	7103
90	Scanner Adapter Assy	2 Req'd	46682	46682	46682	46682
	Note: Items #91 through #102 are part of #90					
91	Adapter, Scanner		46683	46683	46683	46683
92	Nut, Scanner Adapter		46685	46685	46685	46685
93	Support, Scanner		46684	46684	46684	46684
94	Tubing, Copper 3/8" O.D. 30" Lg.		20548	20548	20548	20548
111	Flange, Ball Retaining		46681	46681	46681	46681
120	Bracket & Linkage Spin Vane Adj.		46982x001	46982x001	46353x001	46353x001
	Note: Items #121 through #132 part of #120					

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ENVIRONMENTAL, INC.

Key No.	Description	SJ075	SJ150	SJ200	SJ260
---	-----------	-----	-----	-----	-----
121	Lever	44188x002	44188x002	44188x002	44188x002
122	Setscrew, Hex Soc Hd Cone Pt 3/8-16x3/4"	7317x006	7317x006	7317x006	7317x006
123	Screw, Hex Soc Hd Cap 1/4-20x3/8"	6964x003	6964x003	6964x003	6964x003
124	Dialplate	46343	46343	46343	46343
125	Bracket	46985	46985	46350	46350
126	Collar	8857	8857	8857	8857
127	Shaft	46983x001	46983x001	46351x001	46351x001
128	Washer, Std Plain 13/32"	7071	7071	7071	7071
129	Guide	6410	6410	6410	6410
130	Link	46984	46984	46348x001	46348x001
131	Screw, Hex Hd Cap 3/8-16x1-1/2"	7236x012	7236x012	7236x012	7236x012
132	Washer, Std Plain 3/8"	7077	7077	7077	7077
198	Screw, Hex Hd Cap 5/16-18x1"	6966	6966	7241x008	7241x008
199	Washer, Light Spring Lock 5/16"	7245	7245	7245	7245

* These Parts Not Applicable For Powerstar Units

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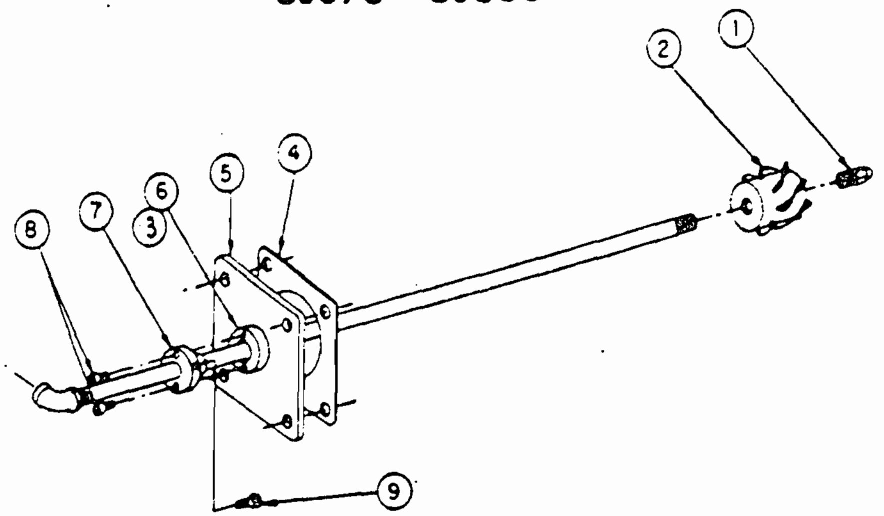
PARTS LIST

LP INSERT
SJ075 - SJ580



Key No.	Description	SJ075	SJ150	SJ200	SJ260
	LP Insert (Open Fired)	47524x001	47524x001	45235x001	45235x001
	(PowerStar)	---	52021	52020x001	52020x002
1	LP Nozzle	18538x013	18538x014	18538x010	18538x001
2	LP Nozzle Assembly	47525	47525	46442	46442
3	Packing, Graphite 1/8" diameter	20934 12" Lg.	20934 12" Lg.	20934 12" Lg.	20934 12" Lg.
4	LP Tube Gasket	47050	47050	46449	46449
5	LP Tube Backplate	47527	47527	45236	45236
6	Bushing, Tube Packing	18526	18526	18526	18526
7	Gland, Tube Packing	18527	18527	18527	18527
8	Screw, Hex Soc Hd Cap 1/4-20x1-1/4" Lg.	6966x010	6966x010	6966x010	6966x010
9	Setscrew, Hex Soc Hd Cup Pt 1/4-20x5/8" Lg.	6955x005	6955x005	6955x005	6955x005

Key No.	Description	SJ360	SJ520	SJ580
	LP Insert (Open Fired)	45909x001	45909x002	45909x003
	(PowerStar)	52019x001	52019x002	52019x003
1	LP Nozzle	9797x012	9797x013	9797x014
2	LP Nozzle Assembly	46443	46443	46443
3	Packing, Graphite 1/8" diameter	20934 14" Lg.	20934 14" Lg.	20934 14" Lg.
4	LP Tube Gasket	43415	43415	43415
5	LP Tube Backplate	45939	45939	45939
6	Bushing, Tube Packing	9799	9799	9799
7	Gland, Tube Packing	9798	9798	9798
8	Screw, Hex Soc Hd Cap 1/4-20x1-1/4" Lg.	6966x010	6966x010	6966x010
9	Setscrew, Hex Soc Hd Cup Pt 1/4-20x5/8" Lg.	6955x005	6955x005	6955x005

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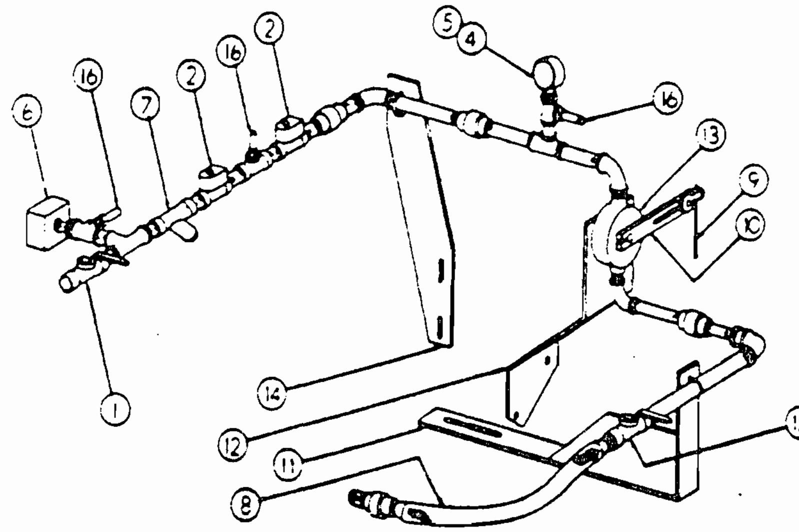
PARTS LIST

LP MANIFOLD
SJ075 - SJ750



Key No.	Description		SJ075	SJ150	SJ200	SJ260
	LP Manifold	3 o'clock	48140x001	48154x001	48139x001	48584x001
		6 o'clock	48140x001	48154x001	48139x001	48584x001
		9 o'clock	48140x002	48154x002	48139x002	48584x002
		12 o'clock	48140x002	48154x002	48139x002	48584x002
1	Ball Valve		41607	41607	41607	41607
			3/4" NPT	3/4" NPT	3/4" NPT	3/4" NPT
2	Solenoid Valve		20405	20405	20405	20405
3	Flow Meter		43103x002	43103x002	43103x002	43103x002
4	Gauge, Liquid Filled 2-1/2" 0-400 psi		37353	37353	37353	37353
5	Snubber 1/4"		37354	37354	37354	37354
6	Pressure Switch		46476	46476	46476	46476
7	Strainer		20607	20607	20607	20607
			3/4" NPT	3/4" NPT	3/4" NPT	3/4" NPT
8	Hose		45754	45754	45754	45754
			1/2" NPT	1/2" NPT	1/2" NPT	1/2" NPT
9	Rod, Connection		9650x012	9650x012	9650x012	9650x012
10	Lever, Adj.		11676	11676	11676	11676
11	Bracket, LP Manifold		48088	48088	48088	48088
12	Bracket, Micro Valve	3 & 6 o'clock	48085	48085	48085	48085
		9 & 12 o'clock	48087	48087	48087	48087
13	Micro Valve		47554	47555	16937	16937
			HB-1/2-16W	HB-1/2-18W	H-1/2-20	H-1/2-20
14	Bracket, Inlet		48017	48017	48084	48084
15	Ball Valve		41694	41694	41694	41694
			1/2" NPT	1/2" NPT	1/2" NPT	1/2" NPT
16	Relief Valve		46956	46956	46956	46956

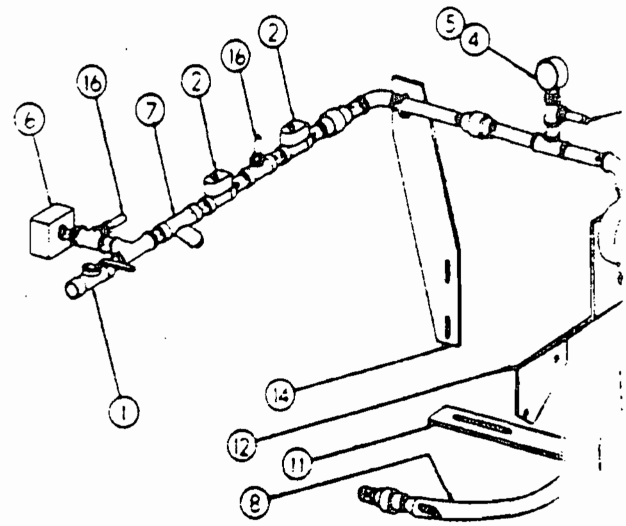
GF143F[illegible]

HAUCK MANUFACTURING CO., P.O. Box 90, Lebanon, PA 17042 717-272-3051
Fax: 717-273-9882 Telex: 671-1457

2/89

HAUCK

LP MANIFOLD
SJ075 - SJ750



Key No.	Description		SJ075	SJ15
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	LP Manifold	3 o'clock	48140x001	48154x001
		6 o'clock	48140x001	48154x001
		9 o'clock	48140x002	48154x002
		12 o'clock	48140x002	48154x002
1	Ball Valve		41607	41607
			3/4" NPT	3/4" NPT
2	Solenoid Valve		20405	20405
3	Flow Meter		43103x002	43103x002
4	Gauge, Liquid Filled 2-1/2" 0-400 psi		37353	37353
5	Snubber 1/4"		37354	37354
6	Pressure Switch		46476	46476
7	Strainer		20607	20607
			3/4" NPT	3/4" NPT
8	Hose		45754	45754
			1/2" NPT	1/2" NPT
9	Rod, Connection		9650x012	9650x012
10	Lever, Adj.		11676	11676
11	Bracket, LP Manifold		48088	48088
12	Bracket, Micro Valve	3 & 6 o'clock	48085	48085
		9 & 12 o'clock	48087	48087
13	Micro Valve		47554	47555
			HB-1/2-16W	HB-1/2-1
14	Bracket, Inlet		48017	48017
15	Ball Valve		41694	41694
			1/2" NPT	1/2" NPT
16	Relief Valve		46956	46956

HAUCK MANUFACTURING CO., P.O. Box 90, Lebanon, PA 17042
Fax: 717-273-9882 Te

2/89

Key No.	Description		SJ360	SJ520	SJ580	SJ750
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	LP Manifold	3 o'clock	48131x001	48138x001	48138x001	48155x003
		6 o'clock	48131x001	48138x001	48138x001	48155x001
		9 o'clock	48131x002	48138x002	48138x002	48155x004
		12 o'clock	48131x002	48138x002	48138x002	48155x002
1	Ball Valve		41607	41608	41608	41609
			3/4" NPT	3/4" NPT	3/4" NPT	1-1/4" NPT
2	Solenoid Valve		20701	20701	20701	47529
3	Flow Meter		43104x002	43103x004	43104x002	43105
4	Gauge, Liquid Filled 2-1/2" 0-400 psi		37353	37353	37353	37353
5	Snubber 1/4"		37354	37354	37354	37354
6	Pressure Switch		46476	46476	46476	46476
7	Strainer		20607	20607	20607	20608
			3/4" NPT	1" NPT	1" NPT	1-1/4" NPT
8	Hose		45755	45755	45755	47533
			1" NPT	1" NPT	1" NPT	1-1/4" NPT
9	Rod, Connection		9650x022	9650x002	9650x022	9650x012
10	Lever, Adj.		11676	11676	11676	11676
11	Bracket, LP Manifold		48018	48018	48018	48156
12	Bracket, Micro Valve	3 & 6 o'clock	48016	48016	48016	48085
		9 & 12 o'clock	48025	48025	48025	48087
13	Micro Valve		16938	16939	16939	46961
			B-1/2-24	J-1-29	J-1-29	K-1-28
14	Bracket, Inlet		48017	48017	48017	48158
15	Ball Valve		41608	41608	41608	41609
			1" NPT	1" NPT	1" NPT	1-1/4" NPT
16	Relief Valve		46956	46956	46956	46956

Z 127 632 582

Receipt for Certified Mail

No Insurance Coverage Provided
Do not use for International Mail
(See Reverse)

UNITED STATES POSTAL SERVICE

Sent to Shadi Nikfarjam	
Street and No. Terrtech Envir.	
P.O., State and ZIP Code Moberly, Missouri	
Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	$
Postmark or Date 11-27-95 AC 37-260641 Mobile Unit	

(DENIAL)

PS Form 3800, March 1993

Is your RETURN ADDRESS completed on the reverse side?

SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, and 4a & b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):
1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
Shadi Nikfarjam
Terrtech Environmental, Inc
PO Box 918
Moberly, Missouri
65270

4a. Article Number
Z 127 632 582

4b. Service Type
☐ Registered ☐ Insured
☒ Certified ☐ COD
☐ Express Mail ☐ Return Receipt for Merchandise

7. Date of Delivery
12. 7-95

5. Signature (Addressee)
R. Summers

8. Addressee's Address (Only if requested and fee is paid)

6. Signature (Agent)

PS Form 3811, December 1991 ☆U.S. GPO: 1993—352-714 **DOMESTIC RETURN RECEIPT**

Thank you for using Return Receipt Service.

Department of
Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

State of Florida
Department of Environmental Protection
Notice of Permit Denial

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

In the matter of an Application for Permit by: DEP File No. AC 37-260641 Mobile Unit

Mr. Shadi Nikfarjam
Vice President of Environmental Compliance
FERtech Environmental, Inc.
Post Office Box 918
Moberly, Missouri 65270

The applicant, FERtech Environmental, Inc., applied on November 19, 1994, to the Department of Environmental Protection for a permit to construct a mobile soil thermal treatment facility (low temperature thermal desorption system).

The Department has permitting jurisdiction under Chapter 403, Florida Statutes (F.S.), and Chapter 62-210, Florida Administrative Code (F.A.C.). The Department has determined that an air construction permit is required for the proposed work.

The Department hereby denies the permit for the following reasons:

1. The applicant did not supply the information requested in the Department's November 29, 1994, letter that is needed to process the application.

2. The applicant did not submit proof of publication of the Notice of Application that is required for this project.

3. The applicant did not respond to the Department's October 10, 1995, letter requesting a plan and schedule to complete this project.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, F.S. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida

32399-2400. Petitions filed by the permit applicant and the parties listed below must be filed within 14 days of receipt of this intent. Petitions filed by other persons must be filed within 14 days of publication of the public notice or within 14 days of their receipt of this intent, whichever first occurs. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, F.S.

The Petition shall contain the following information;

(a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;
(b) A statement of how and when each petitioner received notice of the Department's action or proposed action;
(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;
(d) A statement of the material facts disputed by Petitioner, if any;
(e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;
(f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and,
(g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this intent. Persons whose substantial interests will be affected by any decision of the Department with regard to the application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of receipt of this intent in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

This Notice constitutes final agency action unless a petition is filed in accordance with the above paragraphs or unless a request for extension of time in which ato file a petition is filed within the time specified for filing a petition and conforms to Rule

62-103.070, F.A.C. Upon timely filing of a petition or a request for an extension of time this Notice will not be effective until further Order of the Department.

Any party to this Notice of Permit Denial has the right to seek judicial review pursuant to Section 120.68, Florida Statutes, by the filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, with the Clerk of the Department in the Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400; and by filing a copy with the appropriate.

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

Howard L. Rhodes
Howard L. Rhodes, Director
Division of Air Resources Management
2600 Blair Stone Road-Twin Towers
Tallahassee, Florida 32399-2400

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this **NOTICE OF PERMIT DENIAL** and all copies were mailed by certified mail before the close of business on 11-27-95 to the listed persons.

Clerk Stamp

FILING AND ACKNOWLEDGMENT
FILED, on this date, pursuant to §120.52(11), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

[signature] 11-27-95
Clerk Date

Copies furnished to:

District Air Program Administrators
County Air Program Administrators

Florida Department of

Environmental Protection

Memorandum

Howard L Rhodes

To: Clair Fancy

Thru: A.A. Linero 11/22

From: Willard Hanks

Date: November 22, 1995

Subject: Denial of Permit
FERtech Environmental, Inc.

Attached for your approval and signature is a Notice of Permit Denial for a mobile soil thermal treatment facility. The permit is being denied because the applicant failed to respond to a letter requesting additional information, failed to publish the Notice of Application, and failed to respond to a letter requesting the status of the project.

I recommend the permit be denied.

Attachment

CHF/wh/t

Z 751 860 004

Receipt for Certified Mail

No Insurance Coverage Provided
Do not use for International Mail
(See Reverse)

UNITED STATES POSTAL SERVICE

Sent to Mr. Shadi Nikfarjam	
Street and No. P. O. Box 918	
P.O., State and ZIP Code Moberly, Missouri 65270	
Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	$
Postmark or Date Mailed: 11/29/94 AC 37-260641	

PS Form **3800**, March 1993

[redacted]

Is your RETURN ADDRESS completed on the reverse side?

- Complete items 1 and/or 2 for additional services.
- Complete items 3, and 4a & b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):

1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
Mr. Shadi Nikfarjam
Vice President
FERtech Environmental, Inc.
P. O. Box 918
Moberly, Missouri 65270

4a. Article Number
Z 751 860 004

4b. Service Type
☐ Registered ☐ Insured
☒ Certified ☐ COD
☐ Express Mail ☐ Return Receipt for Merchandise

7. Date of Delivery 12-2-94

5. Signature (Addressee) Eric A. Summers

6. Signature (Agent)

8. Addressee's Address (Only if requested and fee is paid)

Thank you for using Return Receipt Service.

PS Form **3811**, December 1991 ☆U.S. GPO: 1992—323-402 **DOMESTIC RETURN RECEIPT**

Department of Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Lawton Chiles
Governor

Virginia B. Wetherell
Secretary

November 29, 1994

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Shadi Nikfarjam
Vice President of Environmental Compliance
FERtech Environmental, Inc.
P. O. Box 918
Moberly, Missouri 65270

Dear Mr. Nikfarjam:

Re: FERtech Environmental, Inc.
File No. AC 37-260641

The Department has reviewed your application for permit to construct a mobile soil remediation unit in Florida. Additional information is needed before this application can be processed. Please provide the following:

1. The application needs to be signed and sealed by a professional engineer registered to practice in Florida.

2. How many months will be needed to obtain a job and move this unit to Florida?

3. Is the 20 hours per day operation of this unit an average or maximum operation time?

4. What is the minimum temperature and residence time of the afterburner that this unit will operate at in Florida? Florida regulations set a minimum temperature of 1500 °F.

5. Describe the reasonable precautions that will be used to minimize fugitive emissions during the storage, backfill and landfill of the treated soil.

6. Have you applied to the Bureau of Waste Cleanup for a general permit to operate a soil thermal treatment facility?

7. What is the maximum particulate matter emissions from the unit's stack in grains per dry standard cubic foot and pounds per hour? Please provide a copy of any recent Method 5 test report conducted on this unit.

8. Is there a bypass stack around the baghouse? How are the hot gases discharged when the electro-pneumatically controlled safety baffle is closed?

9. Is the pressure drop across the baghouse continuously recorded

or logged?

10. Is the unit equipped with a continuously emissions monitor for carbon monoxide that meets the performance specifications given in 40 CFR 60, Appendix B?

11. The Department believes there will be fugitive VOC emissions from the storage and handling of the untreated soil. Please estimate the range of these emissions (lbs/hr and TPY).

12. Please summarize the maximum emissions of all criteria pollutants from the unit's stack in lbs/hr and TPY.

13. Please provide a process flow sheet and a plot plan showing all major components of the soil thermal treatment facility.

14. Provide proof of publication to the Notice of Application which is described in the following paragraph.

Applicants for permits to construct soil remediation units are required to publish a Notice of Application in a newspaper having circulation in each county they intend to operate and provide the Department with proof of each publication. A proposed Notice of Application is enclosed. You will also be required to publish a Notice of Intent to Issue in the same newspapers should the Department approve your application. Any construction permit issued will limit you to operating in these counties. To operate in any other county, you must satisfy the public notice requirements for that county and have your permit amended to authorize operation in that county. The public will have an opportunity to comment or petition for an administrative hearing in response to any Notice of Intent published for your unit.

The Department will resume processing your application after the requested information is received. If you have any questions on this matter, please write to me or call Willard hanks at (904) 488-1344.

Sincerely,

for John C. Brown, Jr., P.E.
Administrator
Air Permitting and Standards

JCB/WH/

Enclosure

cc: District Air Program Administrators
County Air Program Administrators

NOTICE OF APPLICATION

The Department of Environmental Protection announces receipt of an application for permit from FERtech Environmental, Inc. of Moberly, Missouri. The application is for a permit to construct a mobile soil thermal treatment facililty that will evaporate and incinerate petroleum fuels and lubricants for soils contaminated by leaking fuel tanks, spills, etc. This unit may, upon permit issuance, be operated in the following counties:

(APPLICANT FILL IN PRIOR TO PUBLICATION)

The application is being reviewed at the Department of Environmental Protection, 2600 Blair Stone Road, Tallahassee, FL 32399-2400. The application is available for public inspection during normal business hours, 8:00am - 5:00pm, Monday through Friday, except for legal holidays, at the Department of Environmental Protection offices located at:

111 S. Magnolia Drive, Tallahassee, FL 32399-2400.
160 Governmental Center, Pensacola, FL 32501-5794
3804 Coconut Palm Drive, Tampa, FL 33619-8218
2295 Victoria Avenue, Suite 364, Ft. Myers, FL 33901
7825 Baymeadows Way, Suite B200, Jacksonville, FL 32256-7577
3319 Maguire Boulevard, Suite 232, Orlando, FL 32803-3767
1900 S. Congress Ave., Suite A, West Palm Beach, FL 33406

and county offices located at:

218 S.W. First Avenue, Ft. Lauderdale, FL 33301
33 S.W. 2nd Avenue, Suite 9-223, Miami, FL 33130
421 W. Church St., Suite 412, Jacksonville, FL 32202-4111
1410 North 21st Street, Tampa, FL 33605
300 S. Garden Avenue, Clearwater, FL 34616
1301 Cattleman Road, Bldg. B, Sarasota, FL 34232-6299
2002 E. Michigan Avenue, Orlando, FL 32806
202 6th Avenue East, Bradenton, FL 34208
330 W. Church Street, Bartow, FL 33830