→ P 4/1

Check Sheet

Company Name: Champion International
Permit Number: AC 17-164445
PSD Number:
County: Escambia
Permit Engineer:
Others involved:

Application:

- ☑ Initial Application
- ☑ Incompleteness Letters
- ☑ Responses
- ☐ Final Application (if applicable)
- ☐ Waiver of Department Action
- ☐ Department Response

Intent:

- ☑ Intent to Issue
- ☑ Notice to Public
- ☑ Technical Evaluation
- ☐ BACT Determination
- ☑ Unsigned Permit
  - Attachments:
    - ☐
    - ☐
    - ☐
- ☐ Correspondence with:
  - ☐ EPA
  - ☐ Park Services
  - ☐ County
  - ☐ Other
- ☑ Proof of Publication
- ☐ Petitions - (Related to extensions, hearings, etc.)

Final Determination:

- ☑ Final Determination
- ☑ Signed Permit
- ☐ BACT Determination

Post Permit Correspondence:

- ☐ Extensions
- ☐ Amendments/Modifications
- ☐ Response from EPA
- ☐ Response from County
- ☐ Response from Park Services

→ P 4/1

Check Sheet

Company Name: Champion International
Permit Number: AC 17-164445
PSD Number:
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Others involved:

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  Attachments:
  - ☐
  - ☐
  - ☐
- ☐ Correspondence with:
  - ☐ EPA
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- ☐ Extensions
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- ☐ Response from County
- ☐ Response from Park Services

P 938 762 639

RECEIPT FOR CERTIFIED MAIL

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

Sent to
William C. Bannan, VP/Oper. Mgr

Street and No.
Champion Int. Corp.
P.O. Box 87

P.O., State and ZIP Code
Cantonment, FL 32533-0087

Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt showing to whom and Date Delivered	
Return Receipt showing to whom, Date, and Address of Delivery	
TOTAL Postage and Fees	$

Postmark or Date
mailed: 8/2/89
AC 17-164445

PS Form 3800, June 1985

● SENDER: Complete items 1 and 2 when additional services are desired, and complete items 3 and 4.
Put your address in the "RETURN TO" Space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for additional service(s) requested.

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

3. Article Addressed to:
William C. Bannan, VP/Oper. Mgr.
Champion International Corp.
P.O. Box 87
Cantonment, FL 32533-0087

4. Article Number
P 938 762 639

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

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature — Address
X

6. Signature — Agent
X

7. Date of Delivery

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

PS Form 3811, Mar. 1988 ★ U.S.G.P.O. 1988-212-865 DOMESTIC RETURN RECEIPT

File Copy

Florida Department of Environmental Regulation

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

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

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
NOTICE OF PERMIT

Mr. William C. Bannan
Vice President/Operations Manager
Champion International Corporation
Post Office Box 87
Cantonment, Florida 32533-0087

August 2, 1989

Enclosed is construction permit No. AC 17-164445 which authorizes the construction/installation of a pine wood chip screening system that classifies chips according to thickness rather than length. This system will replace an existing system that classifies chips according to length at your facility in Cantonment, Escambia County, Florida. This permit is issued pursuant to Section 403, Florida Statutes.

Any party to this permit has the right to seek judicial review of the permit 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 of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 days from the date this permit is filed with the Clerk of the Department.

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality Management

Copy furnished to:

E. Middleswart, NW District
D. Smith, P.E.
D. Arceneaux, CIC
Reading File }
Mike Harley } 8-2-89 RRM

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this NOTICE OF PERMIT and all copies were mailed before the close of business on 8-2-89.

FILING AND ACKNOWLEDGEMENT
FILED, on this date, pursuant to §120.52(9), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Martha J. Wise
Clerk

8-2-89
Date

Final Determination

Champion International Corporation

Pine Wood Chip Thickness Screening System

Permit No. AC 17-164445

Florida Department of Environmental Regulation
Bureau of Air Quality Management
Central Air Permitting

July 28, 1989

Final Determination

The application by Champion International Corporation to replace the existing oversized pine chip thickness screening system that classifies chips according to length with a system that classifies pine chips according to thickness has been reviewed by the Bureau of Air Quality Management. The project is to be located at the kraft pulp mill owned by Champion International Corporation, 375 Muscogee Road, Cantonment, Escambia County, Florida. Public notice of the Department's intent to issue the permits appeared in the Pensacola News Journal on June 25, 1989.

Copies of the Technical Evaluation and Preliminary Determination and associated materials have been available at the Department's Northwest District office in Pensacola, and the Bureau of Air Quality Management office in Tallahassee.

Only one comment was received. The Department's Northwest District Office suggested that the permanent source identification number be changed from 10PEN17004203 to 10PEN17004258. The change has been made.

The final action of the Department is to issue the permit with the amendment described above.

Florida Department of Environmental Regulation

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

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

PERMITTEE:
Champion International Corp.
P. O. Box 87
Cantonment, Florida 32533-0087

Permit Number: AC 17-164445
Expiration Date: Dec. 31, 1989
County: Escambia
Latitude/Longitude: 30°36'30"N
87°19'30"W
Project: Installation of a Pine Chip Thickness Screening System

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rule(s) 17-2 and 17-4. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawing(s), plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

The replacement of the existing oversized pine chip thickness screening system that classifies chips according to length with a system that classifies pine chips according to thickness. Two chip screens, the No. 2 oversized chip re-chipper, and the No. 2 cyclone separator will be removed. One primary disc screen, one secondary disc screen, one tertiary gyratory screen, one air density separator rotary feeder, one air density separator cyclone (Fisher-Klosterman Model No. XQ120-36-1 or equivalent) and blower, two chip slicers, two gyratory fines screens, and one fines blower and two fines separator cyclones (one Fisher-Klosterman Model No. XQ465-56-1 and one Fisher-Klosterman Model No. XQ120-8-1 or equivalent) will be installed. The fines cyclones will be connected in series. The No. 1 cyclone separator (Rader Companies Model E Type 56 equivalent to Fisher-Klosterman Model No. XQ465-56-1), and the No. 1 oversized re-chipper will be retained.

The source shall be in accordance with the permit application, plans, documents, amendments and drawings, except as otherwise noted in the General and Specific Conditions.

Attachments are listed below:

1. Application for a permit to construct a re-chipper mill received May 3, 1989.

2. P. M. Johnson's letter to M. D. Harley dated May 22, 1989, and received May 24, 1989.

3. P. M. Johnson's letters (two) to M. D. Harley dated June 7, 1989, received June 9, 1989.

4. Technical Evaluation and Preliminary Determination dated June 21, 1989.

5. Final Determination dated July 28, 1989.

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions" and as such are binding upon the permittee and enforceable pursuant to the authority of Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is hereby placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of the "Permit Conditions" by the permittee, its agents, employees, servants or representatives.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.

3. As provided in Subsections 403.087(6) and 403.722(5), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Nor does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations. This permit does not constitute a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.

4. This permit conveys no title to land or water, does not constitute state recognition or acknowledgement of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the state. Only the Trustees of the Internal Improvement Trust Fund may express state opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, plant or aquatic life or property and penalties therefore caused by the construction or operation of this permitted source, nor does it

allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

6. The permittee shall at all times properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.

7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law, access to the premises, at reasonable times, where the permitted activity is located or conducted for the purpose of:

   a. Having access to and copying any records that must be kept under the conditions of the permit;

   b. Inspecting the facility, equipment, practices, or operations regulated or required under this permit; and

   c. Sampling or monitoring any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately notify and provide the Department with the following information:

   a. a description of and cause of non-compliance; and

   b. the period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

GENERAL CONDITIONS:

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source, which are submitted to the Department, may be used by the Department as evidence in any enforcement case arising under the Florida Statutes or Department rules, except where such use is proscribed by Sections 403.73 and 403.111, Florida Statutes.

10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance, provided however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.

11. This permit is transferable only upon Department approval in accordance with Florida Administrative Code Rules 17-4.12 and 17-30.30, as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.

12. This permit is required to be kept at the work site of the permitted activity during the entire period of construction or operation.

13. This permit also constitutes:

( ) Determination of Best Available Control Technology (BACT)
( ) Determination of Prevention of Significant Deterioration (PSD)
( ) Compliance with New Source Performance Standards

14. The permittee shall comply with the following monitoring and record keeping requirements:

a. Upon request, the permittee shall furnish all records and plans required under Department rules. The retention period for all records will be extended automatically, unless otherwise stipulated by the Department, during the course of any unresolved enforcement action.

GENERAL CONDITIONS:

b. The permittee shall retain at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation), copies of all reports required by this permit, and records of all data used to complete the application for this permit. The time period of retention shall be at least three years from the date of the sample, measurement, report or application unless otherwise specified by Department rule.

c. Records of monitoring information shall include:

- the date, exact place, and time of sampling or measurements;
- the person responsible for performing the sampling or measurements;
- the date(s) analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

15. When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be submitted or corrected promptly.

SPECIFIC CONDITIONS:

1. The pine chip thickness screening system is permitted to operate continuously, i.e. 8,760 hrs./yr.

2. The feed rate of pine wood chips to the pine chip thickness screening system shall neither exceed an hourly maximum of 237 tons/hr. nor a monthly average of 3,287 tons/day. The weight shall be determined on an as fed basis.

3. Visible emissions from the pine chip thickness screening system shall be subject to the following emission limitations:

a. Visible emissions from the No. 1 cyclone separator shall not exceed 5 percent opacity (no visible emissions).

b. Visible emissions from the air density separator shall not exceed 5 percent opacity (no visible emissions).

c. Visible emissions from the fines cyclones shall not exceed 5 percent opacity (no visible emissions).

Visible emissions shall be determined by EPA Method 9 (40 CFR 60 revised as of July 1, 1988).

4. Unconfined particulate emissions shall be controlled pursuant to F.A.C. Rule 17-2.610(3). Reasonable precautions shall include, but shall not be limited to the following:

a. Enclosing or covering all conveyor systems.

b. Maintenance of all drop distances at the minimum necessary for proper operation of the source.

c. Application of water or other dust suppressants where necessary to control emissions.

d. Good housekeeping practices including the regular collection and removal of accumulations of dust and spilled materials.

e. Use of hoods, fans, filters, and similar equipment to contain, capture, and/or vent particulate matter.

5. The permittee shall monitor and record the following parameters whenever the pine chip thickness screening system is in operation:

a. The hourly feed rate of pine chips to the pine chip thickness screening system. The hourly feed rate shall be monitored only during compliance testing, unless otherwise ordered by the Department.

b. The daily feed rate of pine chips to the pine chip thickness screening system.

c. The daily hours of operation of the pine chip thickness screening system.

SPECIFIC CONDITIONS:

6. All excess emissions from the pine chip thickness screening system shall be subject to the applicable requirements of F.A.C. Rules 17-2.240 [Circumvention], 17-2.250 [Excess Emissions], and 17-4.130 [Plant Operation Problems].

7. All monitoring and recording systems shall be regularly calibrated and maintained in proper working condition pursuant to written procedures and schedules based on the recommendations of the instrument manufacturer.

8. Point source compliance testing shall be conducted pursuant to the following requirements:

a. Initial compliance testing shall be conducted prior to the expiration date of this permit and annually, thereafter.

b. Point source compliance testing shall be conducted with all sources operating at 90 to 100 percent of operation rate allowed by Specific Condition No. 2.

c. Compliance test reports shall include all of the information required by F.A.C. Rule 17-2.700(7).

d. Compliance test reports shall be submitted within 45 days after completion of the testing.

e. Notification of testing shall be furnished to the DER Northwest District office at least 15 days prior to the date that testing is to commence.

9. For purposes of tracking PSD increment consumption the maximum particulate mass emissions from the pine chip thickness screening system are:

a. 0.006 lb./hr. (0.02 ton/yr.) from the No. 1 cyclone separator.

b. 0.21 lb./hr. (0.60 ton/yr.) from the air density separator.

c. 0.63 lb./hr. (1.59 tons/yr.) from the fines cyclone.

The mass emission increases of particulate matter and PM_{10} for

SPECIFIC CONDITIONS:

PSD purposes are estimated to be 2 tons/yr. and 0.7 ton/yr., respectively.

10. The permanent source identification number assigned to the permitted source is 10PEN17004258 pine chip thickness screening system. Please cite this number on all test reports and other correspondence concerning the permitted source.

11. The permittee for good cause, may request that this construction permit be extended. Such request shall be submitted to the BAQM prior to 60 days before the expiration date of the permit (F.A.C. Rule 17-4.090).

12. The application for an operation permit must be submitted to the Northwest District office at least 90 days prior to the expiration date of this construction permit or within 45 days after the completion of compliance testing whichever occurs first. To properly apply for an operation permit, the applicant shall submit the appropriate application form, fee, and certification that construction was completed noting any deviations from the conditions in the construction permit, and compliance test reports as required by this permit (F.A.C. Rule 17-4.220).

Issued this 1st day
of August, 1989

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

Dale Twachtmann, Secretary

Printing and Writing Papers
375 Muscogee Road
P.O. Box 87
Cantonment, Florida 32533-0087
(904) 968-2121

Champion
Champion International Corporation

RECEIVED
JUL 6 1989
DER - BAQM

July 3, 1989

Mr. William Thomas
State of Florida
Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

Dear Mr. Thomas:

The Notice of Proposed Agency Intent to issue a permit to construct a chip thickness screening facility at the Champion International Corporation Pensacola mill was published in the Pensacola News Journal on June 25, 1989. Enclosed is the required proof of publication.

Sincerely,

Paul M Johnson Jr.

Paul M. Johnson, Jr.
Process Engineer
Environmental Control

Attachment

cc: Mr. Clair Fancy
Mr. Mike Harley

State of Florida
Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

Mike -
Off P/N - 10 July
Day 90 = Oct. 14
This breaks the
all time record!

PENSACOLA
News
Journal

PUBLISHED DAILY
PENSACOLA, ESCAMBIA COUNTY, FLORIDA

State of Florida,
County of Escambia.

Before the undersigned authority personally appeared
J. Diane Deal
who on oath says that she is Legal Advertising Supervisor of the Pensacola News Journal, a daily newspaper published at Pensacola in Escambia County, Florida; with general circulation in Escambia, Santa Rosa, Okaloosa and Walton Counties that the attached copy of advertisement, being a NOTICE in the matter of

Department of Environmental Regulation

________________ in the ________________ Court,

was published in said newspaper in the issues of ________________
June 25, 1989

Affiant further say that the said The Pensacola News Journal is a newspaper published at Pensacola, in said Escambia County, Florida, and that the said newspaper has heretofore been continuously published in said Escambia County, Florida, each day and has been entered as second class mail matter at the post office in Pensacola, in said Escambia County, Florida, for a period of one year next preceding the first publication of the attached copy of advertisement; and affiant further says that he has neither paid nor promised any person, firm or corporation any discount, rebate, commission or refund for the purpose of securing this advertisement for publication in the said newspaper.

J. Diane Deal

Sworn to and subscribed before me this 26th
day of June A.D., 19 89

Betty J. Penton
NOTARY PUBLIC.

BETTY J. PENTON

My Commission Expires October 26, 1992

My Commission Expires October 26, 1992

State of Florida
Department of
Environmental
Regulation
Notice of Intent to Issu

The Department of Environmental Regulations, hereby gives notice of its intent to issue a permit to Champion International Corporation, P.O. Box 87, Cantonment, Florida, 32533-0087, to replace the existing oversized pine chip thickness screening system that classifies chips according to length with a system that classifies pine chips according to thickness. The project includes the removal of two chip screens, the No. 2 oversized re-chipper, and the No. 2 cyclone separator. One primary disc screen, one secondary disc screen, one tertiary gyratory screen, one air density separator rotary feeder, one air density separator cyclone and blower, two chip slicers, two gyratory fines screens, and one fines blower and two fines separator cyclones will be installed. The fines separator cyclones will be connected in series. The existing No. 1 cyclone separator, and the No. 1 oversized re-chipper will be retained. The project is expected to result in a particulate mass emissions increase of about 2 tons/yr. The physical location of the project is SR 184 ■ US 29 Cantonment, Escambia County, Florida. A determination of Best Available Control Technology (BACT) was not required. The Department is issuing this Intent to Issue for the reasons stated in the Technical Evaluation and Preliminary Determination.

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, Florida Statutes. 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, within fourteen (14) days of publication of this notice. 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, Florida Statutes.

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 Notice. 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 publication of this notice 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.

The application is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:

Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Dept. of Environmental Regulation
Northwest District Office
160 Governmental Center
Pensacola, Florida 32501-5794

Any person may send written comments on the proposed action to Mr. Bill Thomas at the Department's Tallahassee address. All comments mailed within 14 days of publication of this notice will be considered in the Department's final determination.

Legal No. 36295 1t
June 25, 1989

P 938 762 599

RECEIPT FOR CERTIFIED MAIL

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

Sent to Mr. William C. Bannan,	
Street and No. Champion Int. ~~P.O. Box 87~~	
P.O., State and ZIP Code Cantonment, FL 32533-0087	
Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt showing to whom and Date Delivered	
Return Receipt showing to whom, Date, and Address of Delivery	
TOTAL Postage and Fees	$
Postmark or Date Mailed: 6-22-89 Permit: AC 17-164445	

PS Form 3800, June 1985

● **SENDER:** Complete items 1 and 2 when additional services are desired, and complete items 3 and 4.
Put your address in the "RETURN TO" Space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for additional service(s) requested.

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

3. Article Addressed to:

Mr. William C. Bannan
Vice President/Operations Mgr.
Champion International Corp.
P. O. Box 87
Cantonment, FL 32533-0087

4. Article Number
P 938 762 599

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

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature — Address
X

6. Signature — Agent
X

7. Date of Delivery
23 June 89

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

PS Form **3811**, Mar. 1988 ★ U.S.G.P.O. 1988-212-865 **DOMESTIC RETURN RECEIPT**

BEST AVAILABLE COPY

DEPARTMENT OF ENVIRONMENTAL REGULATION

ROUTING AND TRANSMITTAL S

ACTION NO

…TION DUE DATE

~~[illegible]~~ Mike

Is this your permit? If so, change source #02 to source #58 in the final issue of the permit

make it 58

thanx! Pam

1. TO: (NAME, OFFICE, LOCATION) PAM HOUME

2. AIR PR

3. DER

4. TALLAHASSE

Initial

Date

REMARKS:

Champion Mill containment

Reference AC17-16445 I Champion International

If you enter this source as indicated in condition 10 of the DRAFT permit as 10PEN17004203 — Then delete my entry as 10PEN17004258

IF YOU CHOSE TO LEAVE 58 Then send note to BILL THOMAS TO AMEND CONDITION 10 IN FINAL ISSUE OF AC17-16445.

INFORMATION

☐ Review & Return

☐ Review & File

☐ Initial & Forward

DISPOSITION

☐ Review & Respond

☐ Prepare Response

☐ For My Signature

☐ For Your Signature

☐ Let's Discuss

☐ Set Up Meeting

☐ Investigate & Report

☐ Initial & Forward

☐ Distribute

☐ Concurrence

☐ For Processing

☐ Initial & Return

FROM: Jack Preece

DATE 6/28/89

PHONE SC 695-8364

Florida Department of Environmental Regulation

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

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

June 21, 1989

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. William C. Bannan
Vice President/Operations Manager
Champion International Corporation
P. O. Box 87
Cantonment, Florida 32533-0087

Dear Mr. Bannan:

Attached is one copy of the Technical Evaluation and Preliminary Determination and proposed permit for the replacement of the existing oversized pine chip thickness screening system that classifies chips according to length with a system that classifies pine chips according to thickness.

Please submit any written comments you wish to have considered concerning the Department's proposed action to Mr. Bill Thomas of the Bureau of Air Quality Management.

Sincerely,

C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality
Management

CHF/mdh

Attachments

cc: D. Smith, P.E.
D. Arceneaux
E. Middleswart

BEFORE THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

In the Matter of
Application for Permit by:

Champion International Corporation
P. O. Box 87
Cantonment, Florida 32533-0087

DER File No. AC 17-164445

INTENT TO ISSUE

The Department of Environmental Regulation hereby gives notice of its intent to issue a permit (copy attached) for the proposed project as detailed in the application specified above. The Department is issuing this Intent to Issue for the reasons stated in the attached Technical Evaluation and Preliminary Determination.

The applicant, Champion International Corporation applied on May 3, 1989 to the Department of Environmental Regulation for a permit to replace the existing oversized pine chip thickness screening system that classifies chips according to length with a system that classifies pine chips according to thickness. The project includes the removal of two chip screens, the No. 2 oversized re-chipper, and the No. 2 cyclone separator. One primary disc screen, one secondary disc screen, one tertiary gyratory screen, one air density separator rotary feeder, one air density separator cyclone and blower, two chip slicers, two gyratory fines screens, and one fines blower and two fines separator cyclones will be installed. The fines separator cyclones will be connected in series. The existing No. 1 cyclone separator, and the No. 1 oversized re-chipper will be retained.

The Department has permitting jurisdiction under Chapter 403, Florida Statutes, and Florida Administrative Code Rules 17-2 and 17-4. The project is not exempt from permitting procedures. The Department has determined that an air construction permit is required for the proposed work.

Pursuant to Section 403.815, F.S. and DER Rule 17-103.150, F.A.C., you (the applicant) are required to publish at your own expense the enclosed Notice of Intent to Issue Permit. The notice shall be published one time only within 30 days, in the legal ad section of a newspaper of general circulation in the area affected. For the purpose of this rule, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of Sections 50.011 and 50.031, F.S., in the county where the activity is to take place. The applicant shall provide proof of publication to the Department, at the address specified within seven days of publication. Failure to publish the notice and provide proof of publication within the allotted time may result in the denial of the permit.

The Department will issue the permit with the attached conditions unless a petition for an administrative proceeding (hearing) is filed pursuant to the provisions of Section 120.57, F.S.

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, Florida Statutes. 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 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, Florida Statutes.

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 notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the applicant 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 publication of this notice in the Office in 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.

Executed in Tallahassee, Florida

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality
Management

Copies furnished to:

D. Smith, P.E.
D. Arceneaux
E. Middleswart

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this NOTICE OF INTENT TO ISSUE and all copies were mailed before the close of business on 6-22-89.

FILING AND ACKNOWLEDGEMENT
FILED, on this date, pursuant to §120.52(9), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Martha J Wise 6-22-89
Clerk Date

State of Florida
Department of Environmental Regulation
Notice of Intent to Issue

The Department of Environmental Regulation hereby gives notice of its intent to issue a permit to Champion International Corporation, P.O. Box 87, Cantonment, Florida, 32533-0087, to replace the existing oversized pine chip thickness screening system that classifies chips according to length with a system that classifies pine chips according to thickness. The project includes the removal of two chip screens, the No. 2 oversized re-chipper, and the No. 2 cyclone separator. One primary disc screen, one secondary disc screen, one tertiary gyratory screen, one air density separator rotary feeder, one air density separator cyclone and blower, two chip slicers, two gyratory fines screens, and one fines blower and two fines separator cyclones will be installed. The fines separator cyclones will be connected in series. The existing No. 1 cyclone separator, and the No. 1 oversized re-chipper will be retained. The project is expected to result in a particulate mass emissions increase of about 2 tons/yr. The physical location of the project is SR 184 @ US 29, Cantonment, Escambia County, Florida. A determination of Best Available Control Technology (BACT) was not required. The Department is issuing this Intent to Issue for the reasons stated in the Technical Evaluation and Preliminary Determination.

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, Florida Statutes. 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, within fourteen (14) days of publication of this notice. 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, Florida Statutes.

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 Notice. 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 publication of this notice 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.

The application is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:

Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Dept. of Environmental Regulation
Northwest District Office
160 Governmental Center
Pensacola, Florida 32501-5794

Any person may send written comments on the proposed action to Mr. Bill Thomas at the Department's Tallahassee address. All comments mailed within 14 days of the publication of this notice will be considered in the Department's final determination.

Technical Evaluation
and
Preliminary Determination

Champion International Corporation

Pine Wood Chip Thickness Screening System

Permit No. AC 17-164445

Florida Department of Environmental Regulation
Bureau of Air Quality Management
Central Air Permitting

June 21, 1989

I. Project Description

A. Applicant

Champion International Corporation
Post Office Box 87
Cantonment, Florida 32533-0087

B. Project and Location

The applicant proposes to replace the existing oversized pine chip thickness screening system that classifies chips according to length with a system that classifies pine chips according to thickness. Two chip screens, the No. 2 oversized re-chipper, and the No. 2 cyclone separator will be removed. One primary disc screen, one secondary disc screen, a tertiary gyratory screen, one air density separator rotary feeder, one air density separator cyclone and blower, two chip slicers, two gyratory fines screens, one fines blower and a pair of fines separator cyclones will be installed. The No. 1 cyclone separator, and the No. 1 oversized re-chipper will be retained.

The Standard Industrial Classification Codes are Major Group 26, Industry 2611, Pulp Mills, and Industry 2621, Paper Mills. The Source Classification Code is 3-07-001-99, other not classified, for the pine chip thickness screening system. It should be noted that the Source Classification Code is not 3-07-001-02, washers/screens, because the wood chip screens are different in design from the pulp screens and emit different pollutants.

The projects are to located at the kraft pulp mill owned by Champion International Corporation, 375 Muscogee Road, Cantonment, Escambia County, Florida. The universal transverse mercator (UTM) coordinates of the project are Zone 16, 468.846 km East, and 3386.059 km North.

The application was received on May 3, 1989 and the Department determined to be complete on June 19, 1989.

C. Project Description and Controls

The kraft pulping process utilizes large batch or continuous plug flow reactor vessels called digesters. These reactor vessels react wood chips with chemicals under conditions of elevated temperature and pressure to remove lignin. The removal of the lignin produces the fibrous cellulose material that is referred to as kraft pulp. The pulp is then further refined and processed to produce either an industrial raw material or a commercial product.

The size of the wood chips that are used in the digesters is an important factor with regard to the efficiency of the pulping process and the quality of the pulp produced. If the chips fed to the digestibility are of a uniform size, then the quality of the pulp produced by the digesters will be more uniform. It is important for each chip to be cut so that the maximum amount of surface area will come into contact with the cooking chemicals for two reasons. First, the chemicals used in the kraft process diffuse through the chip in both the lateral and horizontal directions. Second, the quantity of partially cooked chips in the material sent to the boilers is reduced. Obviously, a reduction in the quantity of rejected materials that have been partially cooked will reduce the quantity of cooking chemicals that are wasted, because the partially cooked chips have been saturated with the cooking solution.

Presently, wood chips are fed to the scalping screens which separates the chips that are to be sent to the No. 1 oversized re-chipper. The chips are re-chipped in the No. 1 oversized re-chipper. The re-chipped material is then sent back to the scalping screens via the No. 1 cyclone separator for resegregation. The chips that pass the scalping screens are fed to the chip screens. The oversized chips that are separated by the chip screens are sent to the No. 2 oversized re-chipper. The re-chipped material from the No. 2 oversized re-chipper is sent back to the scalping screens via the No. 2 cyclone separator for resegregation. Chips from the chip screens are fed to the fines screens for the final segregation of materials. The fines are sent to the bark pile via the fines conveyor. The acceptably sized chips are sent to the chip storage.

The applicant proposes to continue to operate the No. 1 scalping screens, the No. 1 oversized re-chipper and the No. 1 cyclone separator (Rader Companies Model E Type 56 equivalent to Fisher-Klosterman Model No. XQ465-56-1) as described above. From this point on the applicant proposes to change the system in the following manner. The chips that pass the scalping screens will be sent to a new set of primary, secondary, and tertiary screens for further separation. Chips that are too thick will be sent to the new overthick chip slicers via a new air density separator (a Fisher-Klosterman Model No. XQ120-36-1 or equivalent cyclone) and then to the fines screens. The acceptable chips from the fines screens will be combined with the acceptable chips from the primary, secondary, and tertiary chip screens and sent to chip storage. The fines from the fines screens and the primary, secondary, and tertiary chip screens will be combined and sent to the bark pile via two new fines cyclones (a Fisher-Klosterman Model No. XQ465-56-1 and a Fisher-Klosterman Model No. XQ120-8-1 or equivalent cyclones). The two fines cyclones are connected in series to minimize particulate emissions.

The proposed cyclones and the air density separator act as emission control devices to limit the emissions from the source.

The applicant proposes to control unconfined particulate emissions through the installation of covers on all conveyors.

Champion International Corporation states that the proposed changes will neither increase the operation rate nor the capacity of the mill; and, that the project will not result in increased emissions from other equipment within the mill. Indications are that the proposed system will result in an additional 1.5% of the chips received being sent to the bark pile prior to digestion. According to the company, this additional 1.5% presently goes to the bark pile after being cooked in the digesters.

The applicant states that the project will not result in any PSD significant net emission increases or decreases. The company expects the project to result in slight increases in particulate and PM_{10} emissions, about 2.0 tons/yr. and 0.7 ton/yr., respectively. Champion International Corp. has provided information that indicates the projected particulate and PM_{10} emissions may be higher than those which will actually occur. For example, an actual particle size analysis shows that only 0.00006% of the particles are less than 38 um in diameter. The applicant's calculations assume 0.01% of the particles to be less than 10 um in diameter.

II. Rule Applicability

The Champion International Corporation's Cantonment mill is a major facility pursuant to Florida Administrative Code (F.A.C.) Rule 17-2.100(112) [Definitions-Major Facility]. The facility is a kraft pulp mill which is one of the 28 major facility categories listed in Table 500-1 of F.A.C. Rule 17-2.500 [Prevention of Significant Deterioration].

The proposed project is a modification pursuant to F.A.C. Rule 17-2.100(119) [Definitions-Modification] because an increase in actual emissions is expected to occur. Based on the applicant's statements, the Department presently does not believe that the proposed project is subject to the preconstruction review requirements of F.A.C. Rule 17-2.500(5) [PSD-Preconstruction Review Requirements]. The Department has relied upon the applicant's presentation that: (1) The proposed project will neither increase the operation rate nor the capacity of the mill and, (2) The proposed project will not result in a significant increase in mass emissions of any pollutant listed in Table 500-2 of F.A.C. Chapter 17-2.500 [PSD]. Pursuant to F.A.C. Rule 17-2.500(1)(d) [Prevention of Significant Deterioration-General Prohibitions], the Department is required to condition each permit to insure that the provisions of F.A.C. Rule 17-2.500 [Prevention of Significant Deterioration] are not violated. The source is also subject to the provisions of F.A.C. Rule 17-2.520 [Sources Not Subject to Prevention of Significant

Deterioration or Nonattainment Requirements] and F.A.C. Rule 17-4.070(3) [Standards of Issuing or Denying Permits].

Pursuant to the definitions in F.A.C. Rule 17-2.100(179) [Definitions-Source or Stationary Source] the proposed pine chip thickness screening system will be a source of air pollution with multiple emission points. The pine chip thickness screening system will consist of the No. 1 scalping screens, the No. 1 oversized re-chipper, the No. 1 cyclone separator (Rader Companies Model E Type 56 equivalent to Fisher-Klosterman Model No. XQ465-56-1), a primary disc screen, a secondary disc screen, and a tertiary gyratory screen, an air density separator rotary feeder, an air density separator cyclone (a Fisher-Klosterman Model No. XQ120-36-1 or equivalent) and blower, two gyratory fines screens, a fines blower, and two separator cyclones (Fisher-Klosterman Model Nos. XQ465-56-1 and XQ120-8-1 or equivalent) connected in series. The source also includes the conveyors and drop points directly associated with the pine chip thickness screening system. Pursuant to the definition in F.A.C. Rule 17-2.100(64) [Definitions-Emission or Discharge Point], the emission or discharge points include a vent for the No. 1 cyclone separator, a vent for the air density separator cyclone, and a vent for the two fines cyclones. The operation of the associated conveyors and drop points may result in unconfined emissions of particulate matter as defined in F.A.C. Rule 17-2.100(205) [Definitions-Unconfined Emissions]. The cyclones are also classified as air pollution control equipment pursuant to F.A.C. Rule 17-2.100(10) [Definitions-Air Pollution Control Equipment].

The particulate emissions from the operation of the proposed source would normally be subject to the particulate emission limiting standards in F.A.C. Rule 17-2.610(1) [General Particulate Emission Limiting Standards-Process Weight Table], and F.A.C. Rule 17-2.610(2) [General Visible Emissions Standard]. The application of the Process Weight Table would allow mass particulate mass emissions of 41.5 lbs./hr. and 166.6 tons/yr. And, the application of the General Visible Emissions Standard would allow visible emissions of up to 20% opacity. But, the applicant has proposed to comply with a more restrictive set of emission limiting standards. The company proposes to limit the total mass particulate emissions from the pine chip thickness screening system to 0.846 lb./hr. and 2.2 tons/yr. Champion International Corporation has volunteered to comply with an emission limiting standard of 5% opacity (no visible emissions). The company's proposed emission limitations are almost equivalent to the stringent reasonably available control technology (RACT) standards that have been applied to similar sources located in the Hillsborough and Duval County nonattainment areas.

The applicant shall be required to use reasonable precautions to minimize the release of unconfined particulate matter from the proposed source pursuant to F.A.C. Rule

17-2.610(3) [Unconfined Emissions of Particulate Matter]. The measures to be used by the applicant may include but are not limited to those listed in F.A.C. Rule 17-2.610(3)(c). Two of the specific measures to be implemented by the applicant include the covering of all conveyors and the minimization of all material drop distances.

Limitations have been placed upon the maximum operation rates of the proposed source pursuant to F.A.C. Rules 17-2.500(1)(d) [Prevention of Significant Deterioration-General Prohibitions], 17-2.520 [Sources Not Subject to Prevention of Significant Deterioration or Nonattainment Requirements], and 17-4.070(3) [Standards of Issuing or Denying Permits]. The limitations on operation rates are for establishing that the source is being properly operated and maintained for air emission purposes in a manner consistent with the parameters submitted to the Department. The applicant is also required to monitor, record, and report the operation rate of the permitted source.

The applicant's proposed project will also be subject to the applicable provisions of F.A.C. Rules 17-2.240 [Circumvention], 17-2.250 [Excess Emissions], and 17-4.130 [Plant Operation-Problems].

It is usually the practice of the Department to assign individual mass emission limitations to each emission point and require the applicant to install source sampling facilities. But, an aggregate total mass particulate emission limitation was assigned to the source because the mass emissions from each of the emission points was extremely small. If the proposed source is found to be consistently out of compliance with the proposed visible emission limiting standard, then individual mass particulate emission limits may be assigned to each source. The applicant may also be required to install source sampling facilities on each emission point and perform source testing for particulate in accordance with the provisions of F.A.C. Rule 17-2.700 [Stationary Point Source Emissions Test Procedures].

III. Summary of Emissions and Air Quality Analysis

A. Summary of Emissions

Based on the information supplied by the applicant, the Department expects the following changes in emissions to occur. The applicant estimates the mass emissions of particulate matter and PM_{10} from the No. 1 and No. 2 cyclone separator stacks of the present pine chip screening system to be about 0.23 ton/yr. and 0.10 ton/yr., respectively. **[NOTE: Particulate matter emissions consist of the sum total of the fraction of particulate that is greater than 10 um in size and that which is less than 10 um. The fraction that is less than 10 um in diameter is known as PM_{10}.]** The estimated mass emissions of particulate matter and PM_{10} from the proposed pine chip thickness screening system are expected to be about 2.2 tons/yr. and 0.8 ton/yr., respectively. Thus, completion of the proposed project is expected to result in estimated mass emission increases of 2.0 tons/yr. for particulate matter and 0.7 ton/yr. for PM_{10}.

B. Air Quality

Since the applicant predicted that there will not be any increase in mass emissions above the significance levels listed in Table 500-2 of F.A.C. Rule 17-2.500 [PSD], an ambient air quality analysis was not required.

IV. Conclusion

Based on the information provided by Champion International Corporation the Department has reasonable assurance that the proposed pine chip thickness screening system as described in this evaluation and subject to the conditions proposed herein, will not cause or contribute to a violation of any ambient air quality standard or PSD increment, or violate any other technical provision of Chapter 17-2 of the Florida Administrative Code.

THOMAS

Thomas

Florida Department of Environmental Regulation

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

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

PERMITTEE:
Champion International Corp.
P. O. Box 87
Cantonment, Florida 32533-0087

Permit Number: AC 17-164445
Expiration Date: Dec. 31, 1989
County: Escambia
Latitude/Longitude: 30°36'30"N
87°19'30"W
Project: Installation of a Pine Chip Thickness Screening System

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rule(s) 17-2 and 17-4. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawing(s), plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

The replacement of the existing oversized pine chip thickness screening system that classifies chips according to length with a system that classifies pine chips according to thickness. Two chip screens, the No. 2 oversized chip re-chipper, and the No. 2 cyclone separator will be removed. One primary disc screen, one secondary disc screen, one tertiary gyratory screen, one air density separator rotary feeder, one air density separator cyclone (Fisher-Klosterman Model No. XQ120-36-1 or equivalent) and blower, two chip slicers, two gyratory fines screens, and one fines blower and two fines separator cyclones (one Fisher-Klosterman Model No. XQ465-56-1 and one Fisher-Klosterman Model No. XQ120-8-1 or equivalent) will be installed. The fines cyclones will be connected in series. The No. 1 cyclone separator (Rader Companies Model E Type 56 equivalent to Fisher-Klosterman Model No. XQ465-56-1), and the No. 1 oversized re-chipper will be retained.

The source shall be in accordance with the permit application, plans, documents, amendments and drawings, except as otherwise noted in the General and Specific Conditions.

Attachments are listed below:

1. Application for a permit to construct a re-chipper mill received May 3, 1989.

2. P. M. Johnson's letter to M. D. Harley dated May 22, 1989, and received May 24, 1989.

3. P. M. Johnson's letters (two) to M. D. Harley dated June 7, 1989, received June 9, 1989.

4. Technical Evaluation and Preliminary Determination dated June 21, 1989.

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions" and as such are binding upon the permittee and enforceable pursuant to the authority of Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is hereby placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of the "Permit Conditions" by the permittee, its agents, employees, servants or representatives.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.

3. As provided in Subsections 403.087(6) and 403.722(5), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Nor does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations. This permit does not constitute a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.

4. This permit conveys no title to land or water, does not constitute state recognition or acknowledgement of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the state. Only the Trustees of the Internal Improvement Trust Fund may express state opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, plant or aquatic life or property and penalties therefore caused by the construction or operation of this permitted source, nor does it allow the permittee to cause pollution in contravention of

GENERAL CONDITIONS:

Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

6. The permittee shall at all times properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.

7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law, access to the premises, at reasonable times, where the permitted activity is located or conducted for the purpose of:

a. Having access to and copying any records that must be kept under the conditions of the permit;

b. Inspecting the facility, equipment, practices, or operations regulated or required under this permit; and

c. Sampling or monitoring any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately notify and provide the Department with the following information:

a. a description of and cause of non-compliance; and

b. the period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source, which are submitted to the Department, may be used by the Department as evidence in any enforcement case arising under the Florida Statutes or Department rules, except where such use is proscribed by Sections 403.73 and 403.111, Florida Statutes.

10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance, provided however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.

11. This permit is transferable only upon Department approval in accordance with Florida Administrative Code Rules 17-4.12 and 17-30.30, as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.

12. This permit is required to be kept at the work site of the permitted activity during the entire period of construction or operation.

13. This permit also constitutes:

- ( ) Determination of Best Available Control Technology (BACT)
- ( ) Determination of Prevention of Significant Deterioration (PSD)
- ( ) Compliance with New Source Performance Standards

14. The permittee shall comply with the following monitoring and record keeping requirements:

a. Upon request, the permittee shall furnish all records and plans required under Department rules. The retention period for all records will be extended automatically, unless otherwise stipulated by the Department, during the course of any unresolved enforcement action.

GENERAL CONDITIONS:

b. The permittee shall retain at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation), copies of all reports required by this permit, and records of all data used to complete the application for this permit. The time period of retention shall be at least three years from the date of the sample, measurement, report or application unless otherwise specified by Department rule.

c. Records of monitoring information shall include:

- the date, exact place, and time of sampling or measurements;
- the person responsible for performing the sampling or measurements;
- the date(s) analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

15. When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be submitted or corrected promptly.

SPECIFIC CONDITIONS:

1. The pine chip thickness screening system is permitted to operate continuously, i.e. 8,760 hrs./yr.

2. The feed rate of pine wood chips to the pine chip thickness screening system shall neither exceed an hourly maximum of 237 tons/hr. nor a monthly average of 3,287 tons/day. The weight shall be determined on an as fed basis.

3. Visible emissions from the pine chip thickness screening system shall be subject to the following emission limitations:

SPECIFIC CONDITIONS:

a. Visible emissions from the No. 1 cyclone separator shall not exceed 5 percent opacity (no visible emissions).

b. Visible emissions from the air density separator shall not exceed 5 percent opacity (no visible emissions).

c. Visible emissions from the fines cyclones shall not exceed 5 percent opacity (no visible emissions).

Visible emissions shall be determined by EPA Method 9 (40 CFR 60 revised as of July 1, 1988).

4. Unconfined particulate emissions shall be controlled pursuant to F.A.C. Rule 17-2.610(3). Reasonable precautions shall include, but shall not be limited to the following:

a. Enclosing or covering all conveyor systems.

b. Maintenance of all drop distances at the minimum necessary for proper operation of the source.

c. Application of water or other dust suppressants where necessary to control emissions.

d. Good housekeeping practices including the regular collection and removal of accumulations of dust and spilled materials.

e. Use of hoods, fans, filters, and similar equipment to contain, capture, and/or vent particulate matter.

5. The permittee shall monitor and record the following parameters whenever the pine chip thickness screening system is in operation:

a. The hourly feed rate of pine chips to the pine chip thickness screening system. The hourly feed rate shall be monitored only during compliance testing, unless otherwise ordered by the Department.

b. The daily feed rate of pine chips to the pine chip thickness screening system.

c. The daily hours of operation of the pine chip thickness screening system.

6. All excess emissions from the pine chip thickness screening system shall be subject to the applicable requirements of F.A.C. Rules 17-2.240 [Circumvention], 17-2.250 [Excess Emissions], and 17-4.130 [Plant Operation Problems].

7. All monitoring and recording systems shall be regularly calibrated and maintained in proper working condition pursuant to written procedures and schedules based on the recommendations of the instrument manufacturer.

8. Point source compliance testing shall be conducted pursuant to the following requirements:

   a. Initial compliance testing shall be conducted prior to the expiration date of this permit and annually, thereafter.

   b. Point source compliance testing shall be conducted with all sources operating at 90 to 100 percent of operation rate allowed by Specific Condition No. 2.

   c. Compliance test reports shall include all of the information required by F.A.C. Rule 17-2.700(7).

   d. Compliance test reports shall be submitted within 45 days after completion of the testing.

   e. Notification of testing shall be furnished to the DER Northwest District office at least 15 days prior to the date that testing is to commence.

9. For purposes of tracking PSD increment consumption the maximum particulate mass emissions from the pine chip thickness screening system are:

   a. 0.006 lb./hr. (0.02 ton/yr.) from the No. 1 cyclone separator.

   b. 0.21 lb./hr. (0.60 ton/yr.) from the air density separator.

   c. 0.63 lb./hr. (1.59 tons/yr.) from the fines cyclone.

The mass emission increases of particulate matter and PM_{10} for

SPECIFIC CONDITIONS:

PSD purposes are estimated to be 2 tons/yr. and 0.7 ton/yr., respectively.

10. The permanent source identification number assigned to the permitted source is 10PEN17004203 pine chip thickness screening system. Please cite this number on all test reports and other correspondence concerning the permitted source.

11. The permittee for good cause, may request that this construction permit be extended. Such request shall be submitted to the BAQM prior to 60 days before the expiration date of the permit (F.A.C. Rule 17-4.090).

12. The application for an operation permit must be submitted to the Northwest District office at least 90 days prior to the expiration date of this construction permit or within 45 days after the completion of compliance testing whichever occurs first. To properly apply for an operation permit, the applicant shall submit the appropriate application form, fee, and certification that construction was completed noting any deviations from the conditions in the construction permit, and compliance test reports as required by this permit (F.A.C. Rule 17-4.220).

Issued this ______ day
of _______________, 19____

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

____
Dale Twachtmann, Secretary

Printing and Writing Papers
375 Muscogee Road
P.O. Box 87
Cantonment, Florida 32533-0087
(904) 968-2121

RECEIVED
JUN 19 1989
DER - BAQM

Champion
Champion International Corporation

June 15, 1989

Mr. Mike Harley
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

Dear Mr. Harley:

In reference to our conversation of Tuesday, June 13, 1989, the #1 Cyclone Separator (existing) shown in Figure Two was supplied by Rader Companies, and is a Model "E" Type 56 which is of the Fisher-Klosterman Model No. XQ465-56-1 or equivalent.

Thanks for your help, and please call if further information is needed.

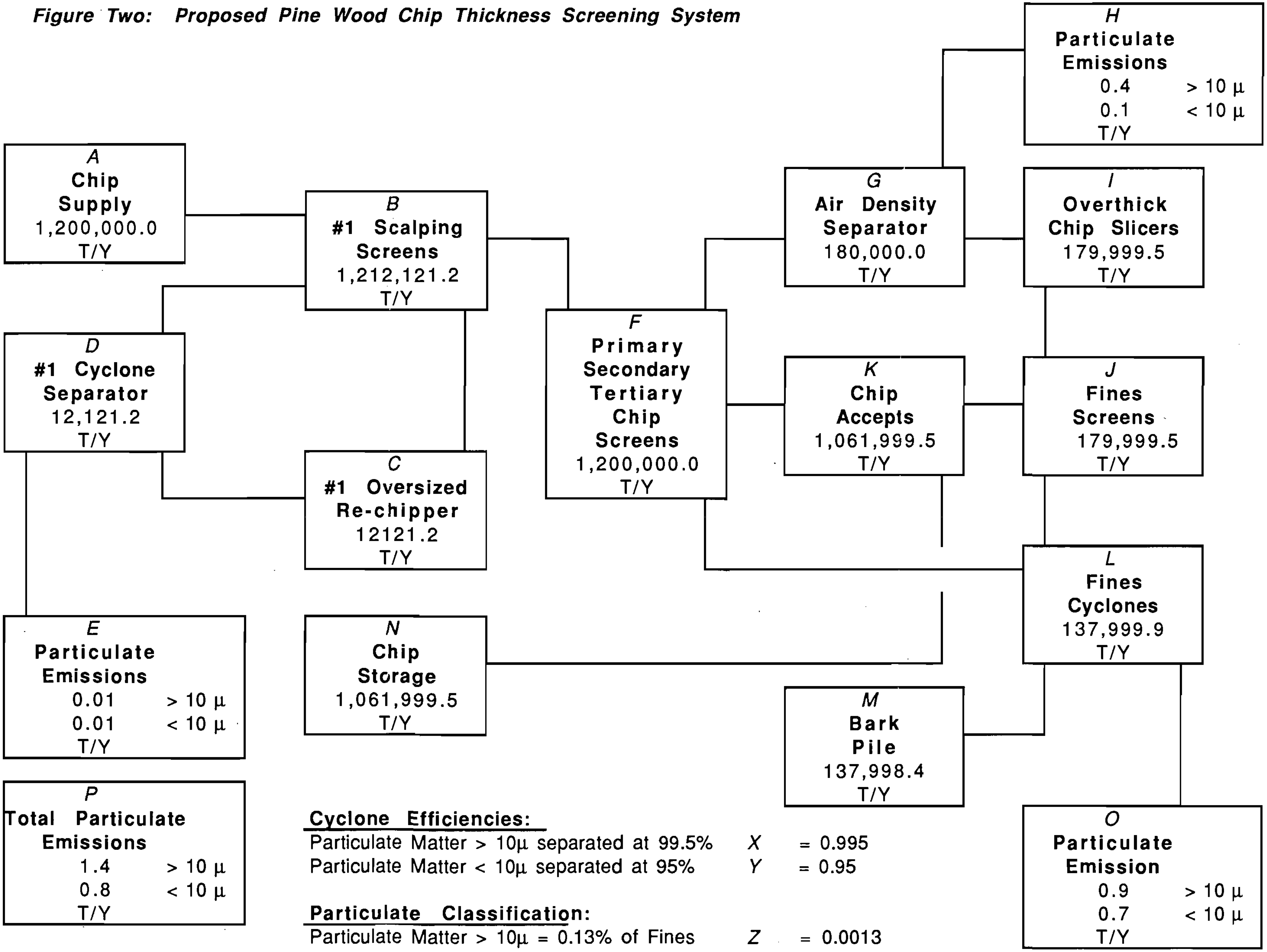
Sincerely,

Paul M. Johnson Jr.

Paul M. Johnson, Jr.
Process Engineer
Environmental Control

cc: Ed Middleswart - FDER
William Thomas - FDER
FDER - Northwest District

Figure Two: Proposed Pine Wood Chip Thickness Screening System



Cyclone Efficiencies:

Particulate Matter > 10μ separated at 99.5%	X	= 0.995
Particulate Matter < 10μ separated at 95%	Y	= 0.95

Particulate Classification:

Particulate Matter > 10μ = 0.13% of Fines	Z	= 0.0013
Particulate Matter < 10μ = 0.01% of Fines	V	= 0.0001

Encl. Exp. 214288797
6-7-89
Cantonment, FL

file copy

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Cantonment, Florida 32533-0087
(904) 968-2121

Champion
Champion International Corporation

RECEIVED
JUN 9 1989
DER - BAQM

June 7, 1989

Mr. Mike Harley
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

Dear Mr. Harley:

Pursuit to our conversation of Friday May 31, 1989, the following information is in clarification of my memo to you of May 22, 1989, and in response to your further questions. Thanks for your help, and please call if further information is needed.

Sincerely,

Paul M. Johnson Jr.

Paul M. Johnson, Jr.
Process Engineer
Environmental Control

cc: Ed Middleswart - FDER
William Thomas - FDER
FDER - Northwest District

Q: What are the correct Universal Transverse Mercator (UTM) Coordinates for the proposed construction site?

A: The correct UTM for the proposed construction site are:

North - 3,386,059
East - 468,846

Q: Does the proposed pine chip thickness screening system contain a tertiary screen? What type are the screens to be used (ie. disc, gyratory, etc.)?

A: A tertiary screen was inadvertently omitted from the listing of proposed equipment in the System Design under Part I of the Supplemental Information Section in the construction permit application of question. The proposed primary and secondary screens are disc, and the tertiary is gyratory.

Q: What is the maximum hourly and monthly particulate emissions rates in equivalent grain loading as gr/DSCF?

A:

Air Density Separator (Block H of Figure Two):

Maximum hourly = 0.0021 gr/DSCF
Maximum Monthly = 0.0013 gr/DSCF

Fines Cyclone Separators (Block O of Figure Two):

Maximum hourly = 0.0271 gr/DSCF
Maximum Monthly = 0.0158 gr/DSCF

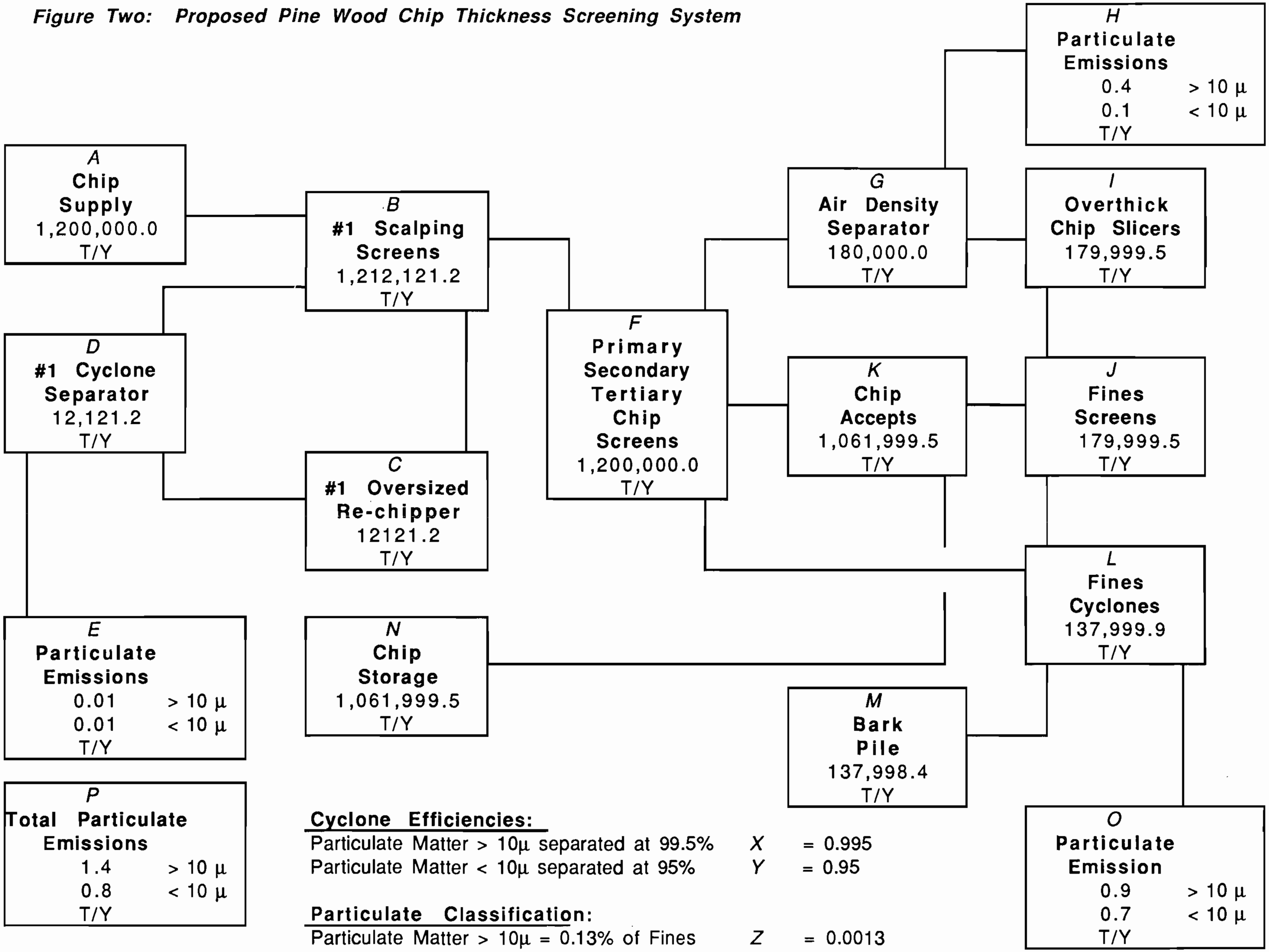
#1 Cyclone Separators (Block E of Figure Two):

Maximum hourly = 0.0004 gr/DSCF
Maximum Monthly = 0.0004 gr/DSCF

Total (Block P of Figure Two):

Maximum hourly = 0.03 gr/DSCF
Maximum Monthly = 0.02 gr/DSCF

Figure Two: Proposed Pine Wood Chip Thickness Screening System



Cyclone Efficiencies:

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Particulate Matter < 10µ separated at 95% Y = 0.95

Particulate Classification:

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Particulate Matter < 10µ = 0.01% of Fines V = 0.0001

Emery Exp. 214 248 797
6-7-89
Cantonment, FL

file copy

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P.O. Box 87
Cantonment, Florida 32533-0087
(904) 968-2121

Champion
Champion International Corporation

RECEIVED
JUN 9 1989
DER - BAQM

June 7, 1989

Mr. Mike Harley
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

Dear Mr. Harley:

In addition to the information that I sent to you earlier today, I have found that the cyclone separators in question have been specified. The Air Density Separator Cyclone in block G of Figure Two is of the Fisher-Klosterman, Inc. Model No. XQ120-36-1 or equivalent supplied by Acrowood Corporation. The first of two Fines Cyclone Separators in series will be supplied by Rader Companies Model "E" Type 56 which is of the Fisher-Klosterman Model No. XQ465-56-1 or equivalent. The second of two Fines Cyclone Separators in series in block L in Figure Two is of the Fisher-Klosterman, Inc. Model No. XQ120-8-1 or equivalent. These cyclones are all of the high efficiency separation type, and based on the efficiency curves provided in the Fisher-Klosterman, Inc. Bulletin 218-C, are at least consistent with the particulate emissions rates predicted in the Construction Permit Application submitted May 1, 1989.

This information is in reference to our conversation of Friday May 31, 1989. Thanks for your help, and please call if further information is needed.

Sincerely,

Paul Johnson Jr.

Paul M. Johnson, Jr.
Process Engineer
Environmental Control

cc: Ed Middleswart - FDER
William Thomas - FDER
FDER - Northwest District

RECEIVED
JUN 9 1989
Northwest Florida
DER

DEPARTMENT OF ENVIRONMENTAL REGULATION

ROUTING AND TRANSMITTAL SLIP

ACTION NO

ACTION DUE DATE

1. TO: (NAME, OFFICE, LOCATION) Bill Thomas	T.L. T.T.	Initial Date
2.		Initial Date
3.		Initial Date
4.		Initial Date

REMARKS:

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JUN 12 1989
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INFORMATION

☐ Review & Return
☐ Review & File
☐ Initial & Forward
☐

DISPOSITION

☐ Review & Respond
☐ Prepare Response
☐ For My Signature
☐ For Your Signature
☐ Let's Discuss
☐ Set Up Meeting
☐ Investigate & Report
☐ Initial & Forward
☐ Distribute
☐ Concurrence
☐ For Processing
☐ Initial & Return

FROM:
Ed Middleswart

DATE 6/9/89

PHONE

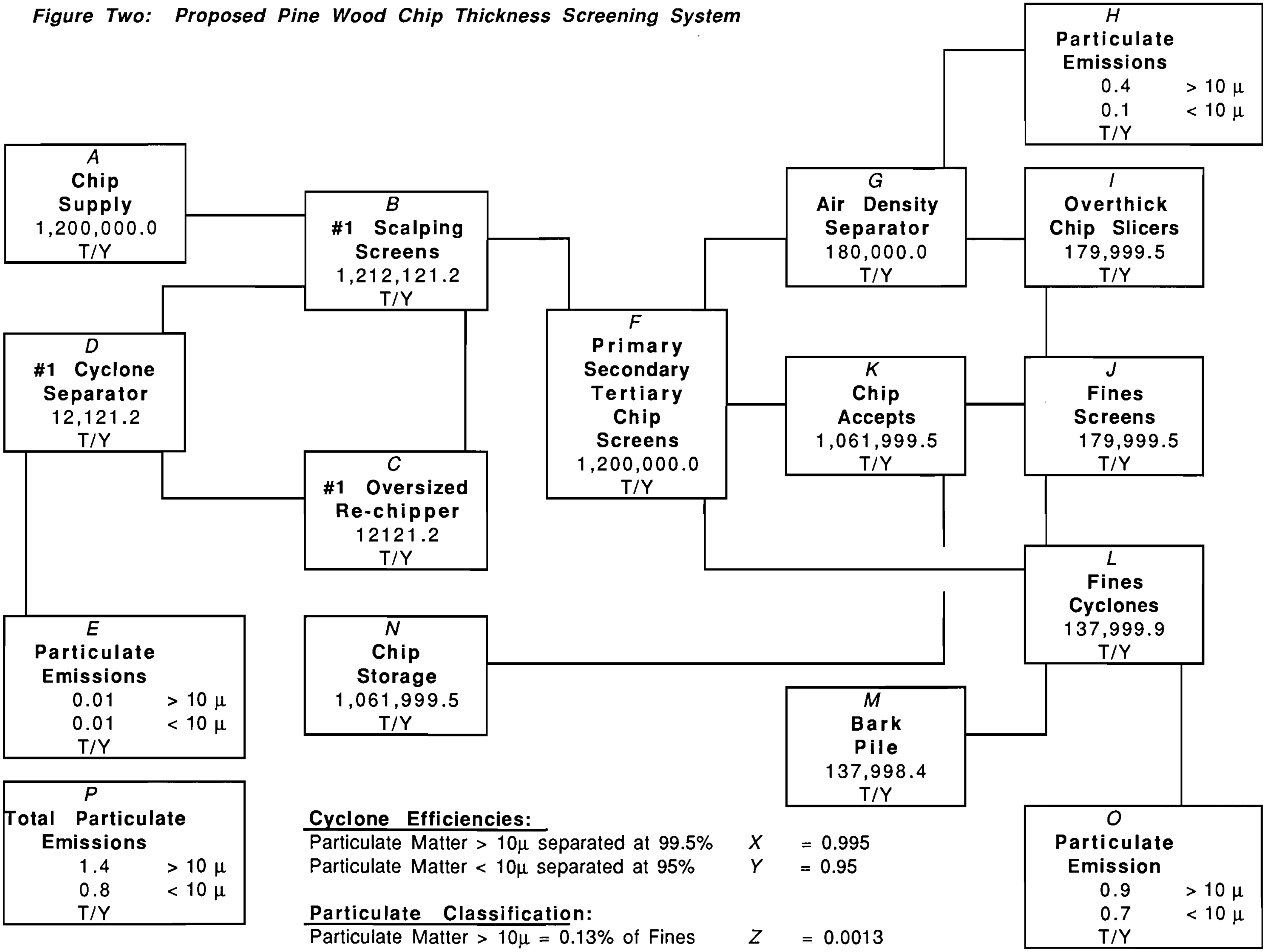

Figure Two: Proposed Pine Wood Chip Thickness Screening System

Cyclone Efficiencies:

Particulate Matter > 10µ separated at 99.5% X = 0.995
Particulate Matter < 10µ separated at 95% Y = 0.95

Particulate Classification:

Particulate Matter > 10µ = 0.13% of Fines Z = 0.0013
Particulate Matter < 10µ = 0.01% of Fines V = 0.0001

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Shipment Number: 214288797 8

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CANTONMENT FL
Canada ☐ ☐
Customer's Reference Numbers:
Zip: 32533

To:
Mr. Mike Harley
Florida Dept. of Environmental Reg.
2600 Blair Stone Road
Tallahassee FL
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Hold at Airport ☐
Canada ☐ ☐
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Zip: 323 01

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High Value
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☐ 1001-3000 ☐ B
☐ 3001-6000 ☐ C
☐ 6001-10,000 ☐ D
☐ 10,001-30,000 ☐ E
☐ 30,001-60,000 ☐ F
☐ 60,001-Over NVD ☐ G

Description and Marks	Pcs.	L	W	H	Total Pieces	Total Weight (In Lbs.)
Correspondence	1				1	

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7 8 9 0 1 2

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Pack 12X15 ☒

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Third Party Emery Account No.: E

At Origin
Base Charge
At Destination
TOTAL

Intl. Customs Value
Intl. Insurance
Total Transportation Charges $
Other Charges ☐ OC-

Delivery Information
Time Delivered
Date Delivered
Pieces Delivered
Delivery Comments

Goods Rec'd At: Shippers Door ☐ Emery Terminal ☐ Drop Box ☐ Carrier Advance ☐ ☐ A ☐ B
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Cantonment, FL

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AC17-164445

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Cantonment, Florida 32533-0087
904 968-2121

Champion
Champion International Corporation

RECEIVED
MAY 25 1989
DER-BAQM

May 22, 1989

Mr. Mike Harley
Florida Department of Environmental
  Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

Dear Mr. Harley:

Pursuit to our conversation of Friday, May 19, 1989, the following responses to your questions as they were understood. Please call if further information is needed.

Sincerely,

Paul M. Johnson Jr. SC

Paul M. Johnson, Jr.
Process Engineer
Environmental Control

PMJ/sc

Enclosure

cc: Ed Middleswart - FDER
    William Thomas - FDER /CHF 5-26-89 Rom
    FDER - Northwest District

5-26-89

~~CHF~~

FYI. Return to Patty for filing. Thanks

375 Muscogee Road
P.O. Box 87
Cantonment, Florida 32533-0087

CANTONMENT
MAY 22'89
FLA.

Champion
Champion International Corporation

Mr. Mike Harley
Florida Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32301

Q: What is the maximum hourly and monthly particulate emissions rates?

A: Hourly: Particulate Matter greater than 10 micron = 0.535 pounds per hour
(Refer to Figure Three enclosed)
Monthly = 233 pounds per month

Particulate Matter less than 10 micron = 0.31 pounds per hour
(Refer to Figure Three enclosed)
Monthly = 133 pounds per month

Q: What are the equivalent grain loadings?

A: Particulate Matter greater than 10 micron = 3745 grains per hour
Monthly = 1,631,000 grains per month

Particulate Matter less than 10 micron = 2170 grains per hour
Monthly = 931,000 grains per month

Q: What are the proper identification numbers for the referenced permits?

A: The following are the referenced construction and operating permit identification numbers:

- Woodyard Addition Construction Permit #AC17-113553
- Woodyard Operating Permit - #AO17-136583

Q: What is the name and address of the manufacturer of the Pine Chip Thickness Screening System?

A:
Acrowood Corporation
P. O. Box 1028
Everett, WA 98206
(206) 258-3555

Q: What are the model numbers of the cyclone particle separators?

A: The actual supplier of the cyclone particle separators have not been selected as of yet, but the cyclones will be of the efficiency of the XQ series of Fisher-Klosterman, Inc. manufactured cyclones. The supplier name and the cyclone model numbers will be forwarded to you with the application for the operating permit.

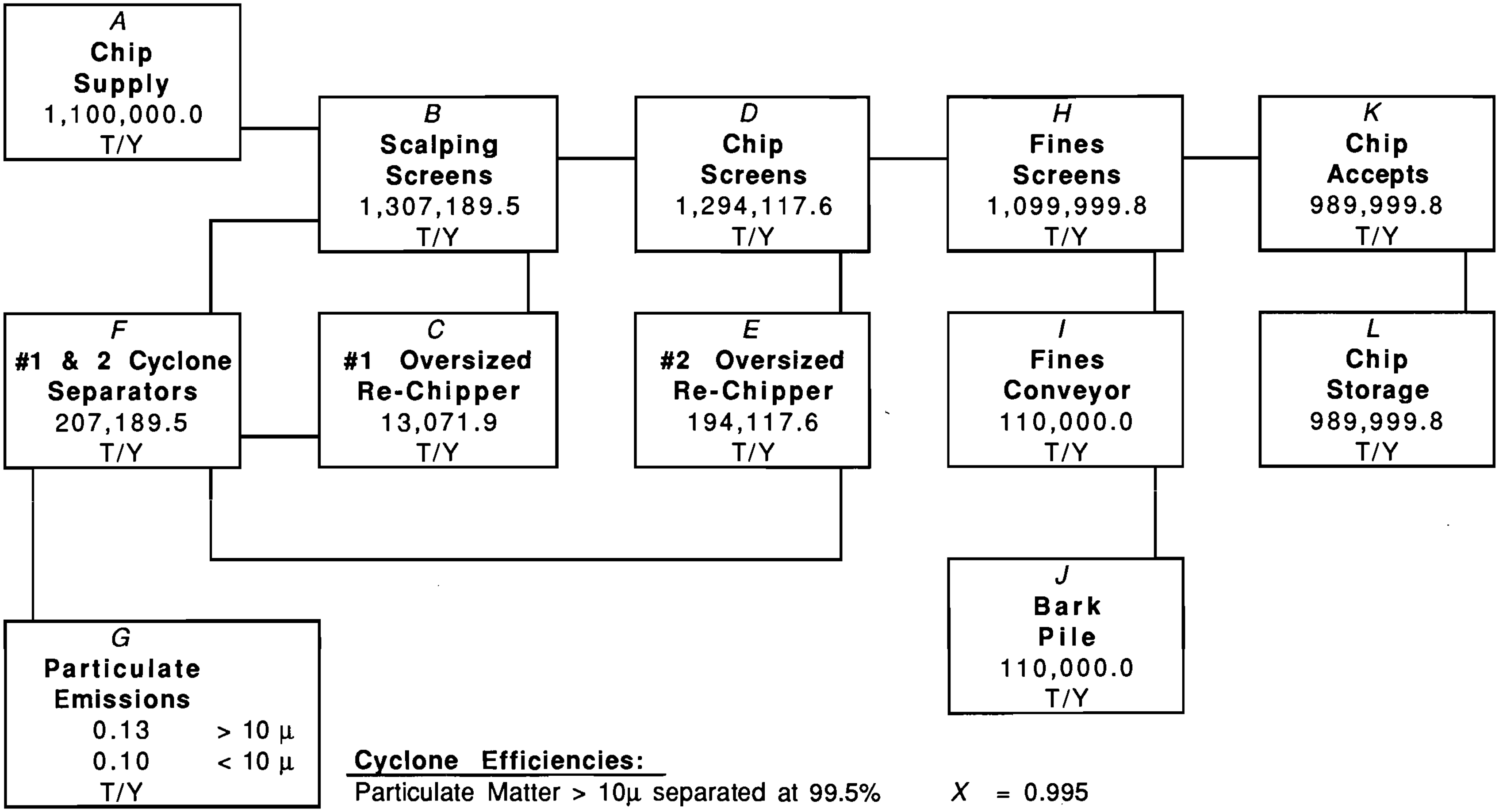
Q: What are the stack or outlet heights, diameters, and gas flow rates for present and proposed pollution control devices (cyclone particle separators)?

A: The #1 Cyclone Separator in Figure Two has an 18 inch diameter "cooly hat" vent at 45 feet in height with a gas flow rate of 1500 cfm at ambient temperature and moisture. The originally proposed fines cyclone in block L in Figure Two has been re-scoped to represent two cyclone separators in series. The second cyclone is fed from the exhaust of the first and will ensure that the predicted particulate emissions rates shown in Figure Two are conservative. The second cyclone will have a 16 inch diameter stack at 30 feet in height with a gas flow rate of 2700 cfm at ambient temperatures and moisture.

Q: What are the proposed measures to demonstrate compliant performance?

A: Compliant performance will be demonstrated by a proposed yearly visible emissions test yielding no visible emissions.

Figure One: Existing Pine Wood Oversized Chip Screening System



Cyclone Efficiencies:

Particulate Matter > 10µ separated at 99.5% X = 0.995

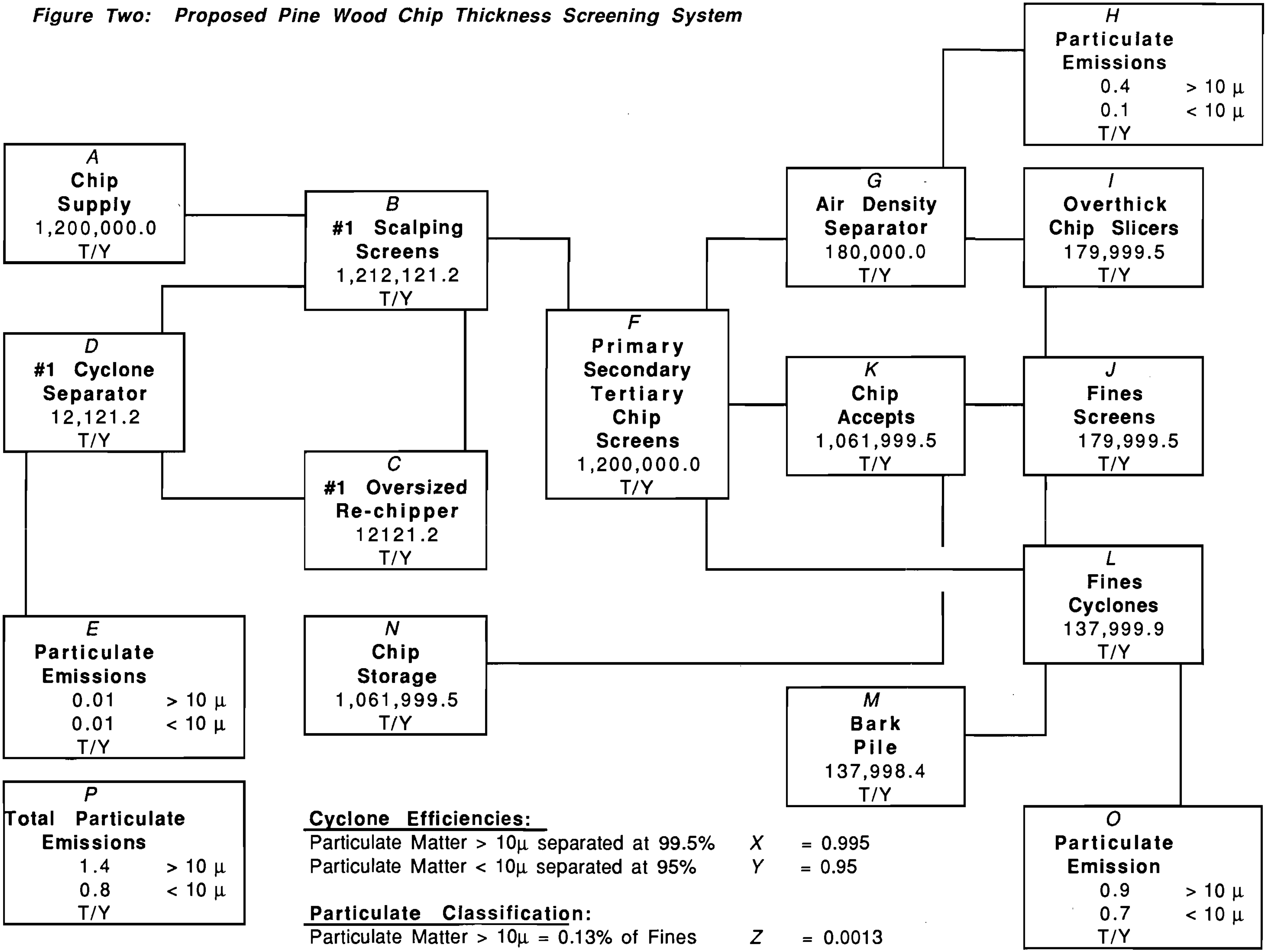
Particulate Matter < 10µ separated at 95% Y = 0.95

Particulate Classification:

Particulate Matter > 10µ = 0.13% of Fines Z = 0.0013

Particulate Matter < 10µ = 0.01% of Fines V = 0.0001

Figure Two: Proposed Pine Wood Chip Thickness Screening System



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Particulate Classification:

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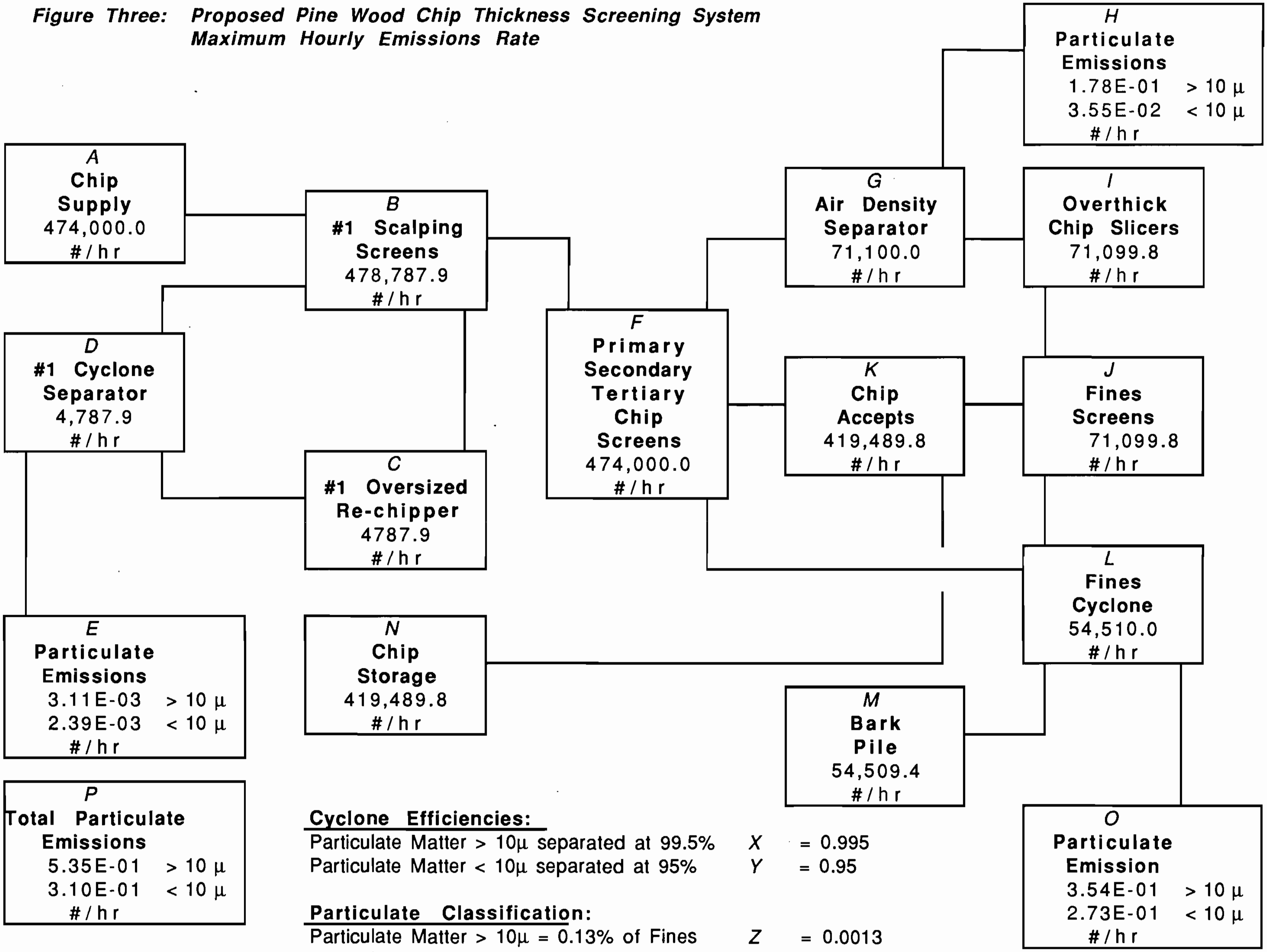
Particulate Matter < 10µ = 0.01% of Fines V = 0.0001

Figure Three: Proposed Pine Wood Chip Thickness Screening System Maximum Hourly Emissions Rate



Cyclone Efficiencies:

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Particulate Matter < 10μ separated at 95% Y = 0.95

Particulate Classification:

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Particulate Matter < 10μ = 0.01% of Fines V = 0.0001

May 20, 1989

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. William C. Bannon
Vice President/Operations Manager
Champion International Corporation
P. O. Box 87
Cantonment, Florida 32533-0087

Dear Mr. Bannon:

RE: Application For A Permit To Construct A Re-chipper Mill - File No. AC 17-164445

We have reviewed the permit application that you submitted for the above referenced source. The application is incomplete and fails to provide the required reasonable assurance. In order to continue our review of the construction permit application, we need the following additional information:

max hourly

yearly/17

- Please provide the present and proposed maximum wood chip processing rates in both maximum lbs./hr., tons/month, and tons/yr. We will also need to know the moisture content of the wood chips at the maximum wood chip processing rates.

- Identify each of the existing emission points. Provide the maximum quantities of particulate matter and PM_{10} that are emitted from each of the existing emission points. The emissions are to be expressed in lbs./hr. and tons/yr.

- Identify each of the emission points that will exist upon completion of the proposed project. Provide the maximum quantities of particulate matter and PM_{10} that are to be emitted from each of the proposed emission points. The emissions are to be expressed in lbs./hr. and tons/yr.

- Provide the make, model, size range of collected particulate matter, and efficiency of each of the presently installed emission control devices. Also, provide the stack height,

12

Fisher Klosterman

Mr. William C. Bannon
May 20, 1989
Page Two

stack diameter, flue gas flow rate (ACFM and DSCFM), flue gas exit temperature, flue gas moisture content, and flue gas exit velocity associated with each of the presently installed emissions control devices.

- Provide the make, model, size range of collected particulate matter, and efficiency of each of the emission control devices that will exist upon completion of the proposed project. Please include a copy of the manufacturer's guarantee for each of the emission control devices. Also, provide the stack height, stack diameter, flue gas flow rate (ACFM and DSCFM), flue gas exit temperature, flue gas moisture content, and flue gas exit velocity associated with each of the emission control devices that will exist upon completion of the proposed project.
- Please state the specific mass and visible emission limitations that are applicable to the each of the existing emission points. The limitations should be expressed in terms of the applicable standard, lbs./hr., and tons/yr.
- Please state the specific mass and visible emission limitations that ~~do~~ you propose for each of the proposed emission points in gr./DSCF, lbs./hr., and tons/yr.?
- Please explain the relationship between this permit application and construction permit AC 17-113551. W → Construction P — correct :D's Const. Wood[illegible] Longlog Chipper
- Will the installation of the proposed system result in additional emissions of unconfined particulates? If so, please describe the emission points and quantify the emissions in lbs./hr. and tons/yr.

Please state and justify all assumptions, provide copies of documentation, and show all calculations. We will proceed with our review of your application upon receipt of the requested information.

Please identify the drop points that will be installed

Sincerely,

C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality Management

CHF/mdh

cc: D. Smith, P.E.
P. Johnson
D. Arceneaux
E. Middleswart

Ext
~~E~~ 8/15/1989
11/28/1989

(Akerwood

Reason For

Liquor attacks From All surfaces in SO_4
Versus Ends in SO_3

What major pieces of equipment will the final system consist of?

~~Et~~ The ~~volume~~ quantity of chips to digestors will be 58.5% instead of 90%

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DER - BAQM

5/1/89

Mr. William Thomas
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

Dear Mr. Thomas:

Enclosed are three copies of an Application To Construct Air Pollution Sources [DER Form 17 - 1.202(1)] along with the $200 application fee for a proposed pine wood chip thickness screening system at Champion International Corporation's Pensacola facility. To meet the scheduled October, 1989 start-up date, we need to begin construction by as soon as possible. Copies have been sent to Mr. Mike Harley as the reviewer, and to the FDER Northwest District.

We would appreciate a prompt review of this application. If there is any additional information needed, please don't hesitate to call.

Sincerely,

Paul M. Johnson Jr.

Paul M. Johnson, Jr.
Process Engineer - Environmental Control

cc: Mike Harley *
Ed Middleswart *
FDER - Northwest District

bc: D. Arceneaux *
C. Ayer *
W. Dorman *
E. Johnson *
P. Muehlemann **
B. Rhodes **
B. Romnes **
B. Shoemoe **
W. Tims *
File *

* With application
** Letter only

1031

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Department/Floor No.:
Street Address: S BAYLEN STE 300
City: NSACOLA
State: FL
ZIP Required: 3 2 5 0 1

2 To (Recipient's Name) Please Print: Air Permit Section
Recipient's Phone Number (Very Important): ( )
Company: FL Department of Environmental Re
Department/Floor No.:
Exact Street Address (**We Cannot Deliver to P.O. Boxes or P.O.® Zip Codes.**): Twin Towers Office Bldg 2600 Blair Stone R
City: Tallahassee, Florida
State:
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Other 2	
Total Charges	

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Rept# 117612

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

AC17-164445

RECEIVED
MAY 3 1989
DER-BAQM

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Major [ ] New[1] [XX] Existing[1]

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

COMPANY NAME: Champion International Corporation COUNTY: Escambia

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) Re-chipper Mill

SOURCE LOCATION: Street State Road 184 at U. S. 29 City Cantonment

UTM: East 1,111,700 North 596,100

Latitude 30 ° 36 ' 30 "N Longitude 87 ° 19 ' 30 "W

APPLICANT NAME AND TITLE: Champion International Corporation

APPLICANT ADDRESS: P. O. Box 87, Cantonment, Florida

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Champion

I certify that the statements made in this application for a Construction 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: William Bannan

William C. Bannan, VP/Operations Manager
Name and Title (Please Type)

Date: 4/14/89 Telephone No. (904) 968-2121

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

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

---

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

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 __________

Daniel B. Smith, P.E.
Name (Please Type)

Baskerville Donovan Engineers, Inc.
Company Name (Please Type)

316 South Baylen Suite 300 Pensacola 32501
Mailing Address (Please Type)

Florida Registration No. 35633 Date: May 2, 1989 Telephone No. 904-438-9661

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.

Installation of a Pine Chip Thickness Screening System to separate and reprocess oversized chips. (see attached supplement)

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

Start of Construction May, 1989 Completion of Construction October, 1989

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.)

Air Density Separator Cyclone - $10,000

Air-Vevor Cyclone - $10,000

Conveyor Covers - $17,500

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

Construction Permit Application No. AC17-113551

Operating Permit No. AC17-145671

E. Requested permitted equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 52 ;
if power plant, hrs/yr N/A ; if seasonal, describe: N/A

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: See Attached Supplement

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		

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

1. Total Process Input Rate (lbs/hr): ______

2. Product Weight (lbs/hr): ______

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]		Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/yr	T/yr	

[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) See Attached Supplement

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (If applicable)	Basis for Efficiency (Section V Item 5)

E. Fuels Not Applicable

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	

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

Fuel Analysis:

Percent Sulfur: __________ Percent Ash: __________

Density: __________ lbs/gal Typical Percent Nitrogen: __________

Heat Capacity: __________ BTU/lb __________ BTU/gal

Other Fuel Contaminants (which may cause air pollution): __________

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

Annual Average __________ Maximum __________

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

All liquid and solid waste generated will be returned to the process or treated in the mill's treatment plant before discharge to Eleven Mile Creek.

See Attached Supplement

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

Stack Height: ______________ ft. Stack Diameter: ______________ ft.

Gas Flow Rate: __________ ACFM __________ DSCFM Gas Exit Temperature: ______________ °F.

Water Vapor Content: ______________ % Velocity: ______________ FPS

SECTION IV: INCINERATOR INFORMATION

Not Applicable

Type of Waste	Type O (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Patholog-ical)	Type V (Liq.& Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Inciner-ated							
Uncon-trolled (lbs/hr)							

Description of Waste ______________

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

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

Manufacturer ______________ ______

Date Constructed ______________ Model No. ______________

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

Stack Height: __________ ft. Stack Diamter: ______________ Stack Temp. __________

Gas Flow Rate: ______________ ACFM ______________ DSCFM* Velocity: ______________ 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: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ______________

Brief description of operating characteristics of control devices: ____________

____

____

____

____

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

____

____

____

____

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

SECTION V: SUPPLEMENTAL REQUIREMENTS (See Attached Supplement)

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)]
   See pages 4 and 5, and figures one and two.
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. See pages 4, 5, and figures one and two.
3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).
   See appended test data and manufacturer's data.
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.)
   See appended manufacturer's data.
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). See pages 4, 5, and figures one and two.
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. See figures one and two.
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).
   See Part III in supplement.
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.
   See Part III in supplement.

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 (Not Applicable)

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

☐ Yes ☐ No

Contaminant	Rate or Concentration

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

☐ Yes ☐ No

Contaminant	Rate or Concentration

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).

1. Control Device/System:

2. Operating Principles:

3. Efficiency:*

4. Capital Costs:

*Explain method of determining

5. Useful Life:

6. Operating Costs:

7. Energy:

8. Maintenance Cost:

9. Emissions:

Contaminant	Rate or Concentration

10. Stack Parameters

a. Height: ft.

b. Diameter: ft.

c. Flow Rate: ACFM

d. Temperature: °F.

e. Velocity: FPS

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

1.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

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

2.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

[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.
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 (Not Applicable)

A. Company Monitored Data

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

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

Other data recorded ____

Attach all data or statistical summaries to this application.

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

2. Instrumentation, Field and Laboratory

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

b. Was instrumentation calibrated in accordance with Department procedures?

[ ] Yes [ ] No [ ] Unknown

B. Meteorological Data Used for Air Quality Modeling

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

2. Surface data obtained from (location)_______________

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

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

C. Computer Models Used

1. _______________ Modified? If yes, attach description.

2. _______________ Modified? If yes, attach description.

3. _______________ Modified? If yes, attach description.

4. _______________ Modified? If yes, attach description.

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

D. Applicants Maximum Allowable Emission Data

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

E. Emission Data Used in Modeling

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

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

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

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

Fisher-Klosterman, Inc.

Bulletin 218-C

GMT
7-88

XQ Series High Performance Cyclones
Custom-Engineered Pollution Control/Product Recovery Systems

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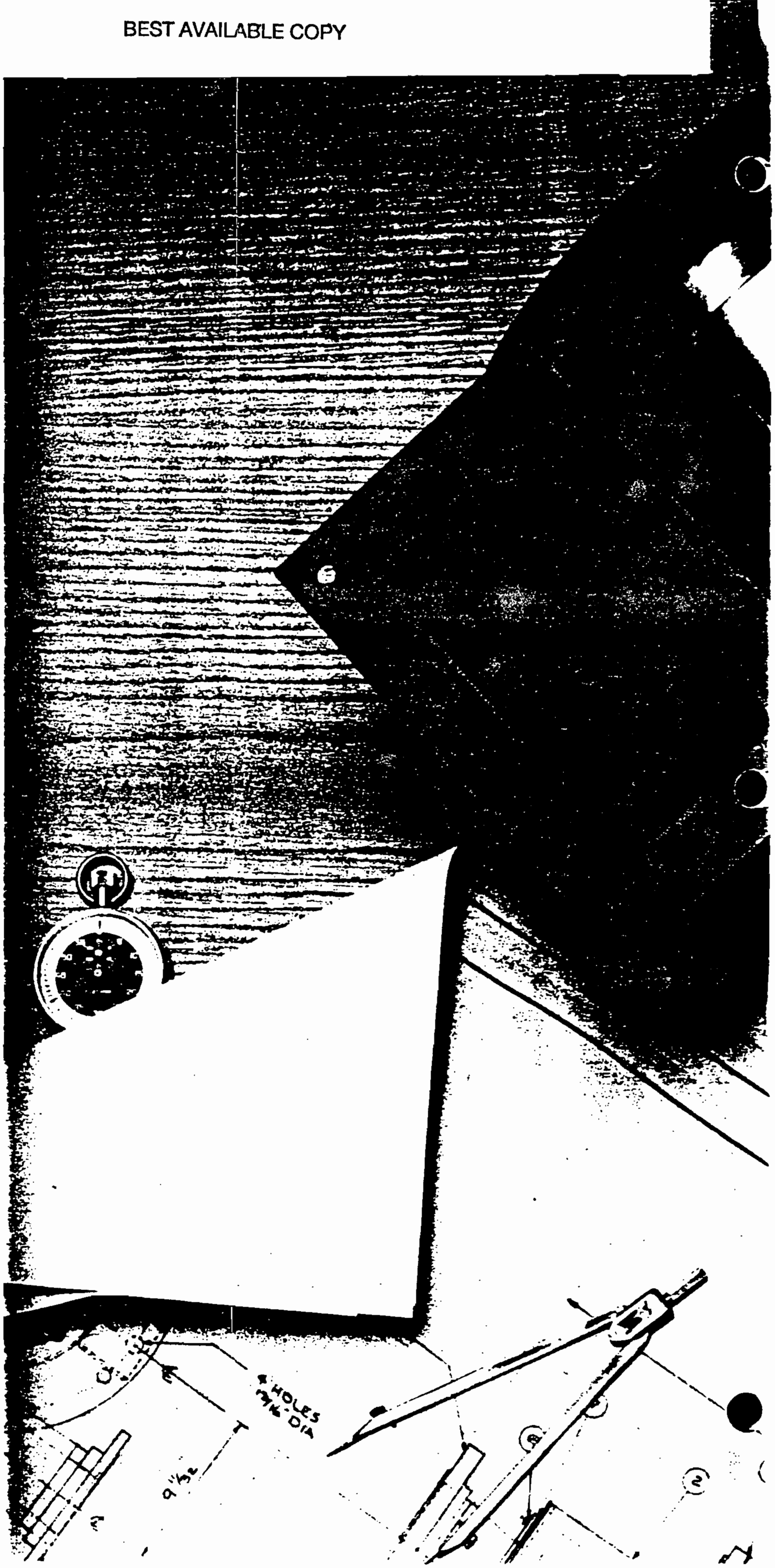
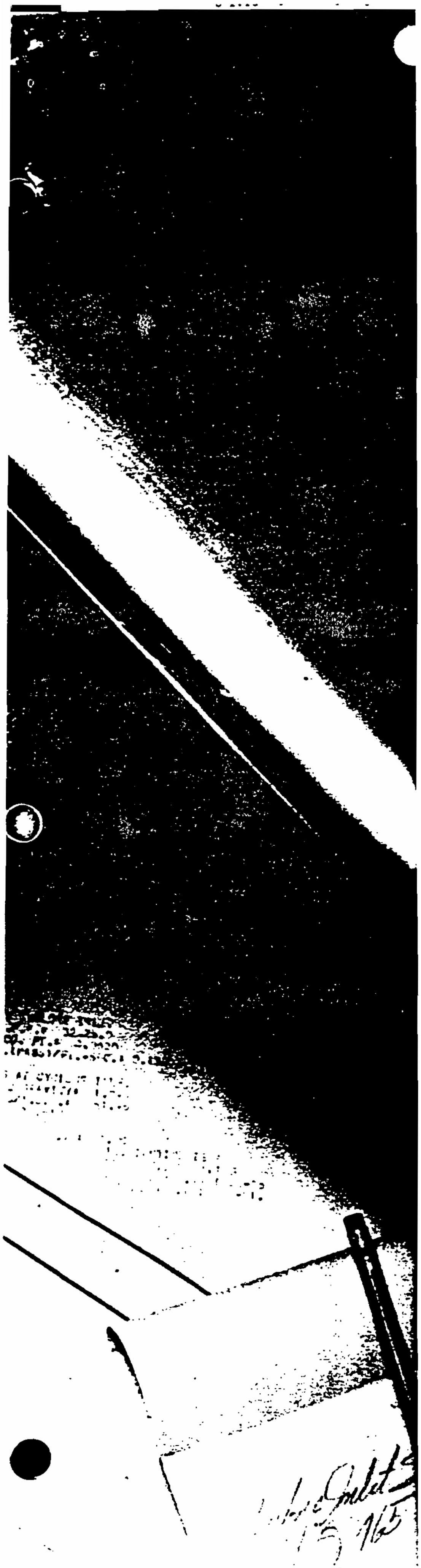




Fisher-Klosterman, Inc. Innovative Pollution Control Equipment Since 1948

For decades, Fisher-Klosterman has earned recognition as playing a leading role in the engineering, fabrication and installation of high-performance, custom-designed dust collection equipment and systems. By operating on the cutting edge of gas/particulate separation technology, they have repeatedly provided their customers with innovative, cost-effective means of controlling particulate pollution.

Fisher-Klosterman pioneered the use of digital computers to aid in the selection and performance prediction of air pollution control and dust collection equipment such as high-performance cyclones and venturi scrubbers. They are the first in the field to have a complete library of proprietary computer programs to aid in the design of equipment to handle *any* set of pollution control conditions economically.

Accurately predicting the performance of a cyclone separator under any given set of conditions involves solving a number of inter-related problems in physics, three dimensional, multi-phase fluid dynamics, and statistics and probability; problems so complex that it can, in some cases, take even the most experienced engineer up to a full day for just the mathematics, with the aid of a sophisticated electronic calculator.

With the proper information supplied, Fisher-Klosterman can respond to a customer with cyclone selection and accurate performance data in as little as *30 minutes!*

As specialists in custom-designed, high performance cyclones, Fisher-Klosterman is the top-ranked supplier of cyclones for exotic pollution control situations: refractory brick and ceramic, castable refractories, and many other linings for high abrasion/high temperature conditions; ASME certified and code-stamped cyclones for use in high pressure or vacuum systems; food-grade welding; designs to withstand or to dissipate explosions; ultra high temperature designs; rubber and cast polyurethane linings; and special alloys to resist chemical attack and corrosion. The variety of specialized applications is virtually limitless.

Performance Assurance

The first step in designing a cyclone is to determine the aerodynamic characteristics of the particulates that are to be separated from the gas. To do this, Fisher-Klosterman's modern Materials Laboratory measures such variables as the specific gravity and aerodynamic particle size distribution of representative dust samples supplied by the client.

Samples can also be subjected to rigorous analysis under scaled-down operating conditions in Fisher-Klosterman's Pilot Testing Lab.

Data from these tests are computer-analyzed, using sophisticated, field-proven modeling and scale-up programs to produce accurate, detailed performance predictions of the full-scale system. Laboratory services and analyses are performed at cost as an aid to our customers in the selection of the proper equipment for any job.

Total-System Engineering

Using the computer-generated analyses obtained from the labs, and drawing on more than thirty years of experience, Fisher-Klosterman engineers can design a complete pollution control or solids collection system to meet the client's criteria of performance, structural compatibility, space and arrangement constraints, and economy. Depending on the customer's requirements, this system can entail anything from a single small cyclone to a complex, turnkey installation that utilizes cyclones, scrubbers and even more exotic pollution control equipment.

Prompt, Personal Service

A key factor in Fisher-Klosterman's achieving their leadership position in the industry is their insistence on speedy delivery and on maintaining a close, one-on-one relationship with their customers throughout the design, *installation and start-up periods* of any equipment. Fisher-Klosterman feels that this is the only way to learn all of a client's requirements and to assure a totally satisfactory installation of pollution control equipment.

BEST AVAILABLE COPY

Fisher-Klosterman XQ Series Cyclones

Performance Engineered to Suit Your Needs and Budget

A Proven Concept

For over 100 years, cyclones have proven themselves as the most economical, reliable, effective means of controlling particulate pollution or recovering suspended product from process gas streams.

Simply stated, a cyclone operates by generating, within itself, a high velocity vortex of particulate-laden gases. Centrifugal force hurls the denser particles toward the cyclone walls, where they spiral downward into a collection receptacle. The lighter and, by now, relatively particulate-free gases are then exhausted from the cyclone's outlet.

In addition to the size, density and aerodynamic characteristics of the particulate matter, a number of complex inter-related factors affect the relative efficiency of any cyclone. These factors include the cyclone configuration and size; the volume, velocity and rotational or angular acceleration of the particulate-laden gas stream; and the residence time of the gas in the cyclone.

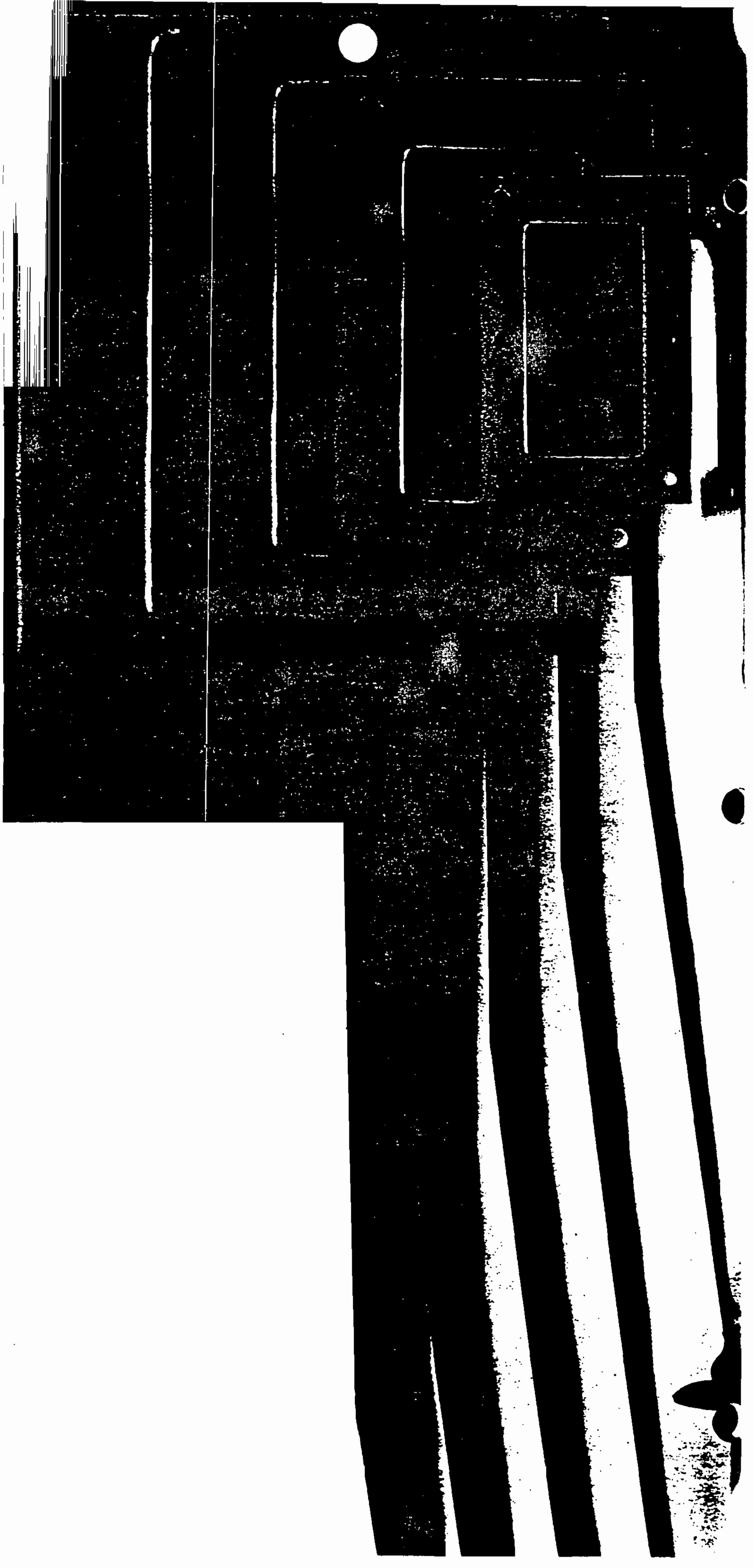
The XQ Series

An Innovative Approach to High-Performance Cyclones.

Fisher-Klosterman's new XQ Series of cyclones represents not only the newest state-of-the-art in cyclone design, but also a revolutionary concept in matching performance and cost to the customer's individual needs.

Unlike other manufacturers, who offer one or two basic models, Fisher-Klosterman offers six basic families in their XQ Series: XQ465, XQ405, XQ340, XQ240, XQ170 and XQ120, in order of increasing efficiency. The XQ465, for example, is less costly but, with a shorter residence time, removes a lower percentage of particulates than a more costly XQ405, under the same operating conditions.

If your needs call for the removal of only relatively large, easily separated particles, the XQ465 may be the most cost-effective means of dust collection or pollution control. If, however, you are faced with tougher particulate-removal demands, it becomes necessary to select one of the more efficient families to handle your needs.



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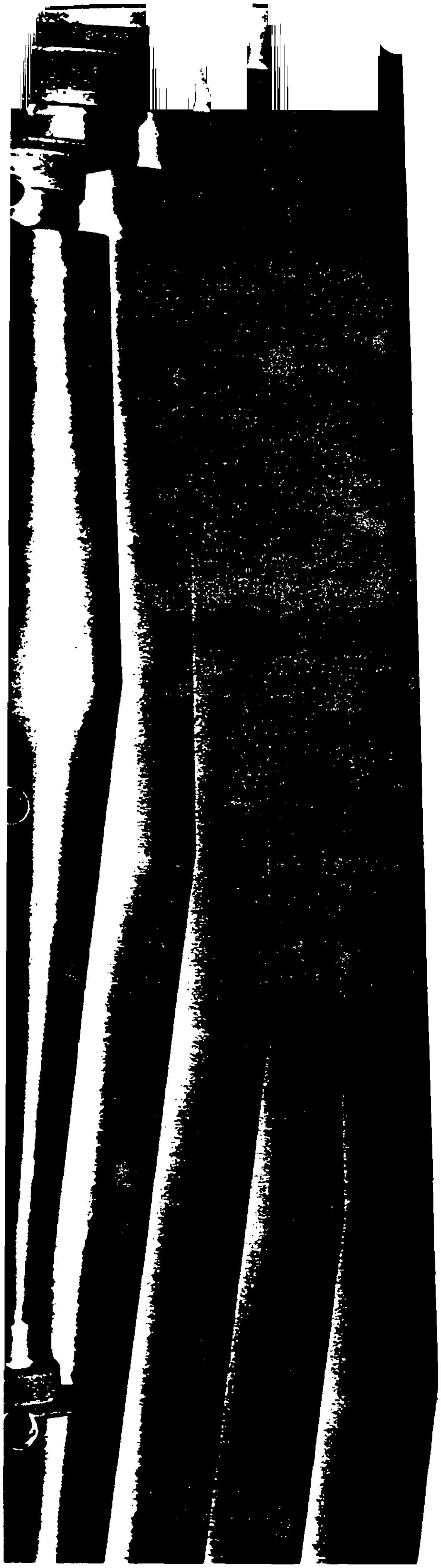
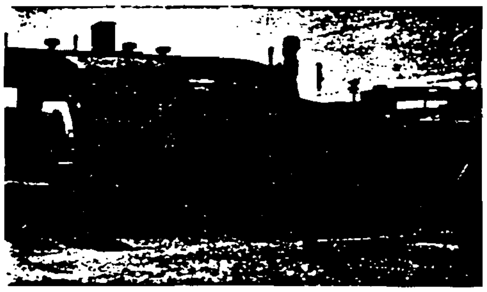


Cyclone size is another factor affecting performance. Within each of the six XQ Series families, the larger the cyclone, the greater the volume of gases it can handle effectively. While the dimensional drawings on pages 10-15 indicate a number of sizes in each family, there is in fact an infinite spectrum of sizes, from the smallest it is possible to fabricate to the largest it is possible to ship or field assemble. Since the geometric proportions within each family remain constant, it is a simple matter to project the dimensions of any cyclone whose size is not shown in the charts.

In general, two or more smaller cyclones operating in parallel and under the same conditions will remove particulates more efficiently than one large cyclone of the same family. On the other hand, one large cyclone is significantly less costly than two or more smaller ones. However, limited headroom, structural requirements at the point of installation and other factors may dictate the size limitations of the cyclone selected. In all cases, Fisher-Klosterman will engineer the cyclone collector that will optimize cost and performance.

The six basic families of XQ Cyclones essentially span the entire spectrum of possible performance characteristics. However, if Fisher-Klosterman's lab tests or analysis of your problem indicate the need for a cyclone with performance characteristics somewhere in between those offered by two of their six basic families, Fisher-Klosterman can readily engineer precisely the high-performance cyclone you need.

An unlimited range of sizes and performance characteristics, plus higher efficiencies than ever achieved before, assure you that there's a Fisher-Klosterman XQ Series Cyclone that's right for your needs...and at the right price.



Factors to Consider in Selecting Your XQ Series Cyclone

Four Basic Uses

Cyclones are the oldest, simplest, most economical and most widely used method of separating solids from gas streams. Their uses fall into four categories:

1. Pollution Control

This is a very important and, with the development of the XQ Series, a rapidly expanding application of cyclones. In many cases where, previously, more exotic dust collectors were required, there's a Fisher-Klosterman XQ Series Cyclone efficient enough to meet the most stringent air pollution control codes, with no other equipment needed.

2. Product Recovery

Fisher-Klosterman cyclones are widely used in process industries for removing valuable product from gas streams, either at intermediate stages or at the end of the production process. For example, a cyclone is an extremely economical means of recovering many types of products from spray dryers, kilns, fluid bed reactors and similar process equipment. Another common application is the recovery of catalyst, as in petroleum refinery cat-crackers.

3. Pre-Cleaner Ahead of More Exotic Pollution Control Equipment

Other types of collectors, such as scrubbers, fabric collectors, and precipitators, are sensitive to high loadings of particulates. Excessive amounts of particulate matter overload them and cause them to malfunction. Fisher-Klosterman XQ Series Cyclones protect these devices and allow them to function at peak efficiency.

4. Particulate Size Classification

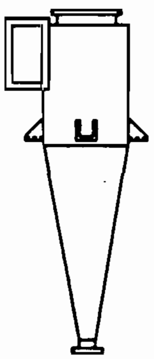
XQ Series Cyclones from Fisher-Klosterman provide effective, economical classification of gas-borne particulates by matching performance characteristics of the cyclone with the range of particle sizes it is desired to extract.

Installation Options

Depending on a number of considerations, including performance requirements, space and structural limitations, there are a number of installation options available for Fisher-Klosterman XQ Series Cyclones.

Single Cyclone

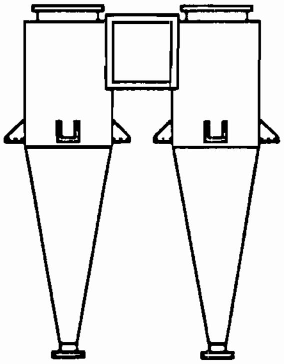
In many instances, this is the most economical option in installing a Fisher-Klosterman XQ Series Cyclone. Within limits determined by materials, shipping or field assembly and installation, this is generally the first choice when headroom and structural requirements are not limiting factors.



SINGLE CYCLONE

Parallel Cyclones

XQ Series Cyclones operating in parallel offer comparably higher efficiencies per volume of gas handled, with the efficiency increasing as an inverse function of the size of the cyclones. This is a more costly installation than a single cyclone, but is frequently necessitated by limited headroom or other structural requirements.



PARALLEL CYCLONES

There is no theoretical limit on the number of XQ Series Cyclone that may be installed in parallel, but there are a number of precautions that must be observed:

1. Through proper manifolding and, if necessary, use of dampers, each cyclone must receive a nearly equal share of the gas stream.

2. Product discharges into collection receivers MUST be isolated from one another.

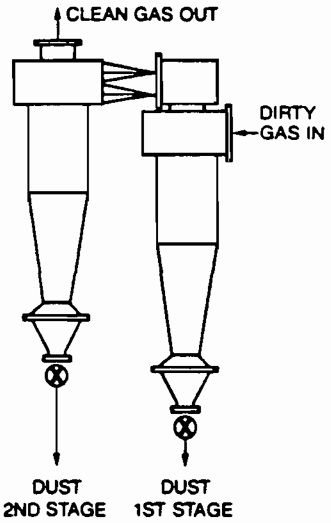
If this precaution is not rigorously observed, minute imbalances in gas volume and pressure will generate a feedback of particulates from the higher pressure cyclones, creating far lower operating efficiencies than predicted.

Discharges may be isolated either by each cyclone's discharging into its own sealed container or by all cyclones' discharging into a single compartmentalized receiver in which each compartment is sealed off from the others.

Cyclones in Series

If there is sufficient pressure available, Fisher-Klosterman XQ Series Cyclones may be operated in series to achieve even greater collection efficiency.

In a series installation, the exhaust gas stream from one cyclone is fed into the inlet of the next cyclone. The effect of such a series is cumulative: if the first cyclone collects 90% of, for example, the 10 micron particles from the gas stream, a second identical cyclone will also collect 90% of the 10 micron particles remaining in the stream exhausted from the first cyclone. This creates a cumulative collection efficiency of 99% at 10 microns. A third such cyclone in series would boost the cumulative efficiency to 99.9%, and so on.



CYCLONES IN SERIES

The factor limiting the number of cyclones that can be used in series is pressure drop. Each cyclone in a series generates its own pressure drop, so that two cyclones will have double the drop of one and so on. However, in some applications, cyclones are the only feasible type of collector for particulate separation and, in such cases, increased pressure drop must be tolerated to achieve the required performance levels.

It is *extremely important* that each cyclone in a series have a *totally* isolated discharge receiver. Compartmentalization in a single receiver, as for parallel installations, is *not* sufficient. If isolation is not achieved, particles collected by the first stage cyclone will be re-entrained in the second stage cyclone, and so on.

Performance Assurance

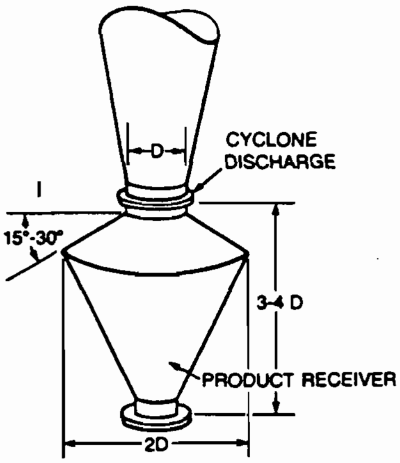
For us to guarantee that a Fisher-Klosterman XQ Series Cyclone performs as specified, the following conditions must be met:

Product Discharge

The single most common cause of poor performance in cyclones is faulty design of the product discharge receiver.

Any high-performance cyclone *must* have an air-tight receiver at its product discharge. At the bottom of every well-designed cyclone, there is a tendency to create an induced flow of air into the product discharge from the outside. If the receiver is not air-tight, this can set up currents which will drive already collected particulates back into the cyclone.

Also, because the vortex at the product discharge creates extreme turbulence, re-entrainment will occur if material is allowed to accumulate close to the discharge. For this reason, rotary locks, feeder valves or air-tight screw conveyors should be installed some distance below the discharge, if high performance is expected.



The figure above illustrates the typical proportions of a well-designed receiver. The proportions are subject both to engineering judgment and space limitations. For coarse, dense, easy-to-collect dusts, the height and diameter may be reduced. Extremely fine, hard-to-collect materials, on the other hand, require as large a receiver as is practical. In any event, no material should be stored or allowed to accumulate in the receiver.

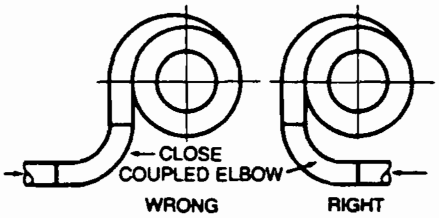
Inlet Velocity

The inlet velocity of the gas stream must be high enough to keep materials airborne and prevent them from clogging the cyclone at this critical point. However, it should be remembered that higher inlet velocities generate higher inlet wear, particularly with highly abrasive materials. If abrasion is a critical factor, it would be advisable to move to the higher efficiency (i.e. *lower* family number) XQ Series Cyclones that can achieve the desired efficiency at lower velocities.

Inlet Ductwork Design

To assure proper performance, ductwork must be designed to maintain sufficiently high velocities to keep particulates airborne and to convey them into the cyclone. This is particularly critical with dense, heavy material, as well as with very fine dusts which have a tendency to adhere to surfaces with which they come in contact.

For maximum efficiency, it is important that any bends or elbows just ahead of the cyclone be made in the proper direction. Where the gas is flowing vertically up or down through the ductwork, close-coupled elbows that turn the flow horizontally are acceptable. For horizontal ductwork, it is *extremely important* that any close-coupled elbows turn in the *same direction as the flow in the cyclone* (i.e. clockwise elbows for cyclones with a clockwise rotation). Elbows in the opposite direction from the cyclone's flow can severely reduce the cyclone's efficiency.



PLAN VIEW OF HORIZONTAL DUCT AT CYCLONE INLET

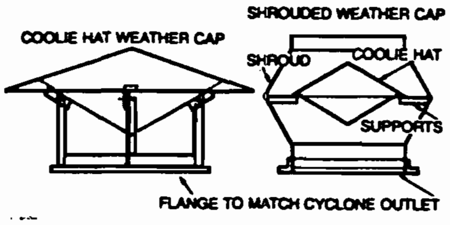
In any event, if round ductwork is used, a gradual transition (15°incl. angle recommended) to the rectangular cyclone inlet is mandatory.

Accessories

A number of performance-compatible accessories are available for XQ Series Cyclones. The following items are standard. Custom designs are also available.

Cyclone Outlet Accessories

Standard Weather Caps for direct-to-atmosphere discharge, in both "coolie-hat" and shrouded designs.



Scroll Outlets, when outlet ducting is required and wherever headroom is limited. Scroll outlets turn the vertical, spinning exhaust in a horizontal direction in minimum headroom and eliminate most of the gases' residual spin. This results in a small savings in pressure loss and is less expensive than a custom-fabricated elbow.

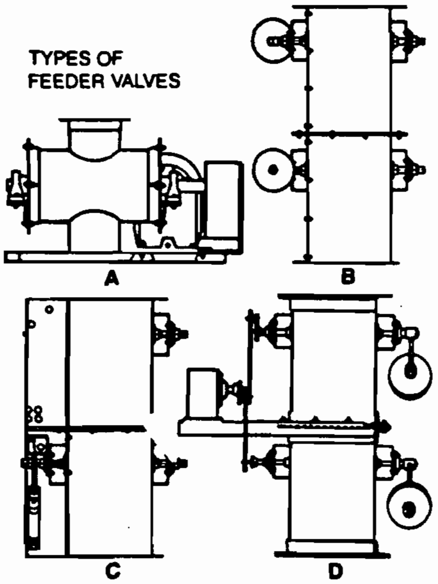
Product Discharge Outlet Accessories

Dust Receivers that meet the air-tight requirements of high-performance cyclones and act as transitions between the cyclones and various types of air-tight feeder valves for solids discharge.

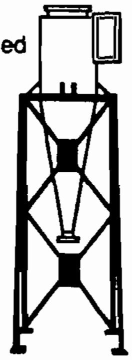
Feeder Valves designed for Fisher-Klosterman XQ Series Cyclones maintain the air-tight integrity required for good cyclone performance, while making it possible to discharge the collected material from the receiver continuously.

Several types of feeder valves are available:

A. Rotary air locks
B. Counterweighted, gravity operated double-dump valves
C. Counterweighted, air cylinder operated double-dump valves
D. Counterweighted, motor operated double-dump valves



Support Stands designed specifically for the XQ Series Cyclones and their accessories.



SUPPORT STAND

Technical Guide to the Selection of Fisher-Klosterman XQ Series High-Performance Cyclones

This section is intended for use by the Application Engineer in specifying the correct XQ Series Cyclone for his needs. Naturally, Fisher-Klosterman will be happy to provide all the assistance needed, or to undertake the complete engineering project, if desired.

Selection Factors

Three factors must be considered in selecting a cyclone for any application:

1. Inlet Velocity
2. Pressure Loss
3. Collection Efficiency.

Proper calculation of these variables insures the selection of an XQ Series Cyclone that will perform with maximum efficiency and cost effectiveness.

Inlet Velocity

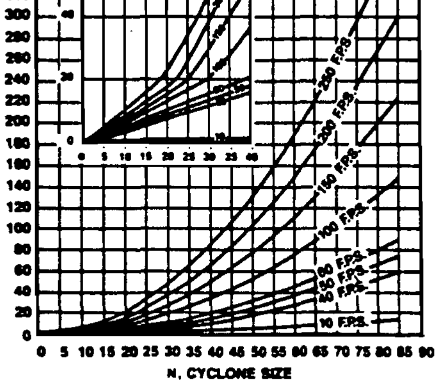
Most cyclone literature assumes an inlet velocity range from 20 to 100 feet per second. Most industrial applications have historically fallen in the 40 to 60 f.p.s. range. However, the range you consider need not be so narrow. Extensive testing and field experience have shown that Fisher-Klosterman XQ Series Cyclones perform predictably at velocities as low as 10 f.p.s. and well beyond 150 f.p.s.

The choice of inlet velocity is generally dictated by the aerodynamic characteristics of the particulates to be collected and the possibility of abrasion, as well as available space, equipment cost and power consumption.

Figure 1 shows the relationship between cyclone size (N), volumetric gas flow rate (Q) in ACFM, and inlet velocity (v_i) in f.p.s.

Application Engineers should consider that collection efficiency will increase as a complex exponential function of the inlet velocity. (This will be discussed in greater detail in a later section on collection efficiency.) Power consumption will increase approximately as the square of the inlet velocity. When abrasion is not a significant factor, these two criteria alone will determine the proper cyclone for the intended application.

FIG. 1

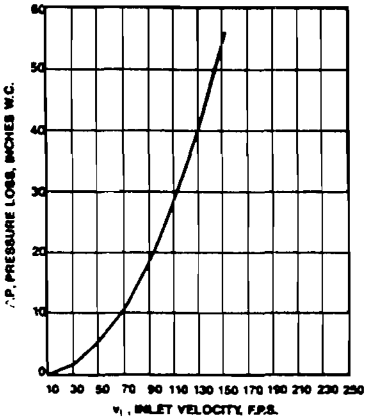


Pressure Loss

Energy is consumed in the passage of the gas through the cyclone. This is expressed as the pressure drop between the gas inlet and gas outlet of the cyclone, and is usually measured in inches of water column (in. w.c.). In any cyclone, the pressure loss increases approximately as the square of either the volumetric flow rate (Q) or the inlet velocity (v_i), and directly as the density (λ_g) of the gas.

Figure 2 shows the relationship between inlet velocity (v_i) and pressure loss (ΔP) in an XQ Series Cyclone with air at 70°F and 14.7 p.s.i.a.

FIG. 2



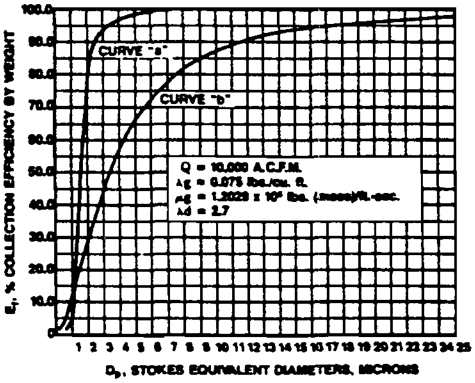
Fractional Efficiency

Efficiency is expressed in percentage by weight. In the Fractional or Particle Size or Grade Efficiency (E_f) Curve, the independent variable is the Stokes Equivalent Particle Diameter (D_p), in microns. The curve is a complex exponential function of:

1. inlet velocity (v_i) and absolute gas viscosity (μ_g).
2. particle mass, particle size, shape and surface roughness, usually measured as terminal velocity, feet/sec., in still air, and expressed as Stokes Equivalent Diameters (D_p) in microns.
3. cyclone size and proportions (shape).

Figure 3 illustrates two cyclone fractional efficiency curves. Each is for a single cyclone. Both are plotted at identical conditions: gas flow rates, densities and absolute viscosities are equal, as are cyclone pressure drops and particle density for both cyclones. Curve "a" is for an XQ120 cyclone, and Curve "b" is for an XQ465.

FIG. 3



Manual calculation of a fractional efficiency curve for just a single case is a complex and tedious problem, even for an experienced engineer. Fisher-Klosterman, however, has reduced this task to simplicity itself by the use of the digital computer. To determine a fractional efficiency curve, the following data are required:

- Volumetric gas flow rate, A.C.F.M., Q
- Gas density, lbs./cu. ft., λ_g
- Gas absolute viscosity, lbs. (mass)/ft.—sec., μ_g
- Particle specific gravity (dimensionless), or true particle density, gms/c.c., λ_d

If gas density and viscosity are not known, the gas analysis plus its temperature and pressure should be specified. Also, to aid in the selection of the best and most economical cyclone for your needs, either or both of the following should be specified:

- Maximum pressure drop, inches w.c.
- Desired efficiency at some specified particle size.

Helpful, but not mandatory, the following data should be furnished if available:

- Dust fineness, typically expressed as % by weight finer than 1.5 microns
- Inlet dust loading, grains/A.C.F.

With this information, our experienced application engineers can provide complete computer-calculated fractional efficiency curves in a matter of minutes.

Total Efficiency

Total Collection Efficiency (E_t) is defined as the percent by weight of the gas-borne particulate separated by the cyclone. To calculate Total Efficiency, not only must the Fractional Efficiency curve of the cyclone be known, but also the size distribution of the particulate.

The independent variable in the particle size distribution should be Stokes Equivalent Diameters, usually expressed in microns (one-millionth of a meter). This is a hypothetical aerodynamic diameter which accounts for the size, shape, mass and texture of the particle.

One word of caution: Optical techniques, screening, analytical instrumentation which measures particle size by determining the amount of liquid a particle displaces and other non-standardized methods do not give data which can be used with any degree of confidence or accuracy in calculating cyclone performance. If you have any doubts about your data, you should utilize our laboratory services. (See page 3).

The dependent variable in the Particle Size Distribution is generally expressed as "percent by weight finer" than a specified Stokes Equivalent Diameter in microns. Equally usable is data specifying the percent by weight falling in the range between two specified diameters.

The calculation of Total Efficiency involves the following steps:

- If it is not already in that form, convert the Particle Size Distribution to a cumulative % by weight finer than any specified diameter.
- Find the derivative of the Particle Size Distribution.
- Multiply the derivative by the Cyclone Fractional Efficiency Curve.
- Integrate the resulting product from zero particle diameter to infinity to find Total Collection Efficiency.

Although the above process sounds straightforward, the product to be integrated does not, in fact, have a rational integral. The problem must therefore be solved by one of three techniques:

- Graphical methods, or;
- Express the product as an infinite series which can be integrated term by term, or;
- Find the integral of the product by Numerical Calculus.

The latter method lends itself ideally to the digital computer. Given the same data as outlined for the computation of the Fractional Efficiency Curve (see page 8), plus the Particle Size Distribution, we can calculate and report Total Collection Efficiency to you in just a few minutes.

However, in many cases, you may wish to make an approximate calculation of Total Collection Efficiency yourself. A method for doing so involves the use of an "Average Limit Particle," and its use permits you to examine the consequences of varying both the type of cyclone and the number in parallel that you are considering. You must be aware that this method is only an approximation. Its accuracy decreases in two cases:

- When the particle size distribution is very narrow. Much more accurate results are obtained if the distribution ranges, for example, between 1.0 and 100.0 microns than if all particles fall between 1.0 and 10.0 microns.
- The lower the Total Collection Efficiency (the finer the particulate), the lower the accuracy of this method.

The Average Limit Particle size is calculated by:

$$D_l = k\sqrt{\frac{\mu_g \times N^3}{\lambda_d \times Q}},$$

where D_l = Average Limit Particle, microns.
μ_g = Absolute viscosity of gas, lbs. (mass)/ft.—sec.
N = Cyclone size.
λ_d = Particulate specific gravity, or true particle density, grams/c.c.
Q = Volumetric gas flow rate, A.C.F.M.

k, a constant, is given in Table 1 for each family of cyclones in the XQ Series.

Table 1

Cyclone Family	XQ465	XQ405	XQ340	XQ240	XQ170	XQ120
k	1254.27	1069.19	923.120	741.378	621.110	543.522

The approximate Total Collection Efficiency is calculated by:

$$\varepsilon_t = 100.0 - f_l,$$

where ε_t = Approximate Total Collection Efficiency, % by weight.
f_l = The percent finer by weight, in the Particle Size Distribution at the Average Limit Particle Size.

Examples of Cyclone Calculations

Example #1

Given:

Q = 6,800 A.C.F.M.
Gas = Air at 460° F. and 14.7 p.s.i.a.
λ_g = 0.036 lbs./cu. ft.
$\mu_g = 1.76 \times 10^{-5}$ lbs. (mass)/ft.—sec.

Specifications:

v_i = 70. f.p.s., maximum
ΔP = 3.0 in. w.c., maximum

Calculations:

1. From Figure 1, smallest single cyclone at $v_i \leq 70.$ f.p.s. is SIZE 22.
2. Allowable maximum pressure drop at specified conditions must be corrected to the gas density of air at 70°F. and 14.7 p.s.i.a., 0.075 lbs./cu. ft. $\Delta P_{(corr)} = 0.075 \times 3.0/0.036 = 6.25$ in. w.c.
3. From Figure 2, at $\Delta P_{(corr)} = 6.25$ in. w.c., $v_i = 53.$ f.p.s. The cyclone will have to be resized to this inlet velocity.
4. Returning to Figure 1, smallest single cyclone at v_i 53. f.p.s. is <u>SIZE 25</u>.

Example #2

Given:

Q = 12,500 A.C.F.M.
λ_g = 0.075 lbs./cu. ft.
$\mu_g = 1.2029 \times 10^{-5}$ lbs. (mass)/ft.—sec.
λ_d = 3.15
Particle Size Distribution: See Figure 4.

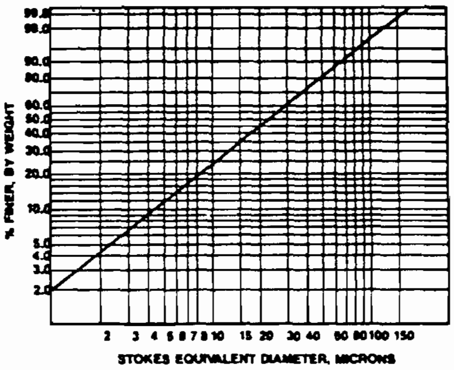
Specifications:

Required Total Efficiency by weight, ε_t = 86.5%
Maximum allowable pressure drop, ΔP = 7.5 in. w.c.
Maximum allowable inlet velocity, v_i = 55 f.p.s.

Calculations:

1. Assume cyclone will be type XQ340
2. From Figure 1 at v_i = 55 f.p.s., Size = 33
3. From Figure 2 at v_i = 55 f.p.s., ΔP = 6.8 in. w.c.
4. From Table 1, k = 923.120
5. By equation (1), $D_l = 923.120 \times \sqrt{\frac{1.2029 \times 10^{-5} \times 33^3}{3.15 \times 12500}}$ = 3.06
6. From Figure 4, f_l = 7.1
7. By equation (2), $\varepsilon_t = 100.0 - 7.1 = \underline{92.9\%}$

FIG. 4



A typical XQ Series Model Number and What it Means

$$\underbrace{\text{XQ465}}_{A}\text{-}\underline{\text{20}}_{B}\text{-}\underline{\text{2}}_{C}\text{-}\underline{\text{CR1}}_{D}$$

A. "XQ" *plus a 3-digit number* designates the family of the cyclone.

B. "-" *plus a number* designates the cyclone size which equals the height of the cyclone inlet in inches. This may be a 1- or 2-digit number, or a decimal.

C. "-" *plus an integer* indicates the number of cyclones in parallel that make up the complete collection system.

D. "-" *plus a special suffix* designates special construction features. Some examples are:

PV	=	Pressure Vessel
CR1	=	1-inch Castable Refractory Lining
CR2	=	2-Inch Castable Refractory Lining
RB3	=	3-Inch Refractory Brick Lining
RB9	=	9-Inch Refractory Brick Lining
C.5	=	½-Inch Alumina Ceramic Tile Lining
C1	=	1-Inch Alumina Ceramic Tile Lining

Use the above information when specifying your XQ Series Cyclone. In addition, orders should specify separately:

Material(s) of Construction or (if Fisher-Klosterman is to determine the materials) special construction considerations such as high abrasion or corrosive conditions.

Special Construction Features, such as:

Break-Apart Construction for installations requiring cleaning and maintenance.

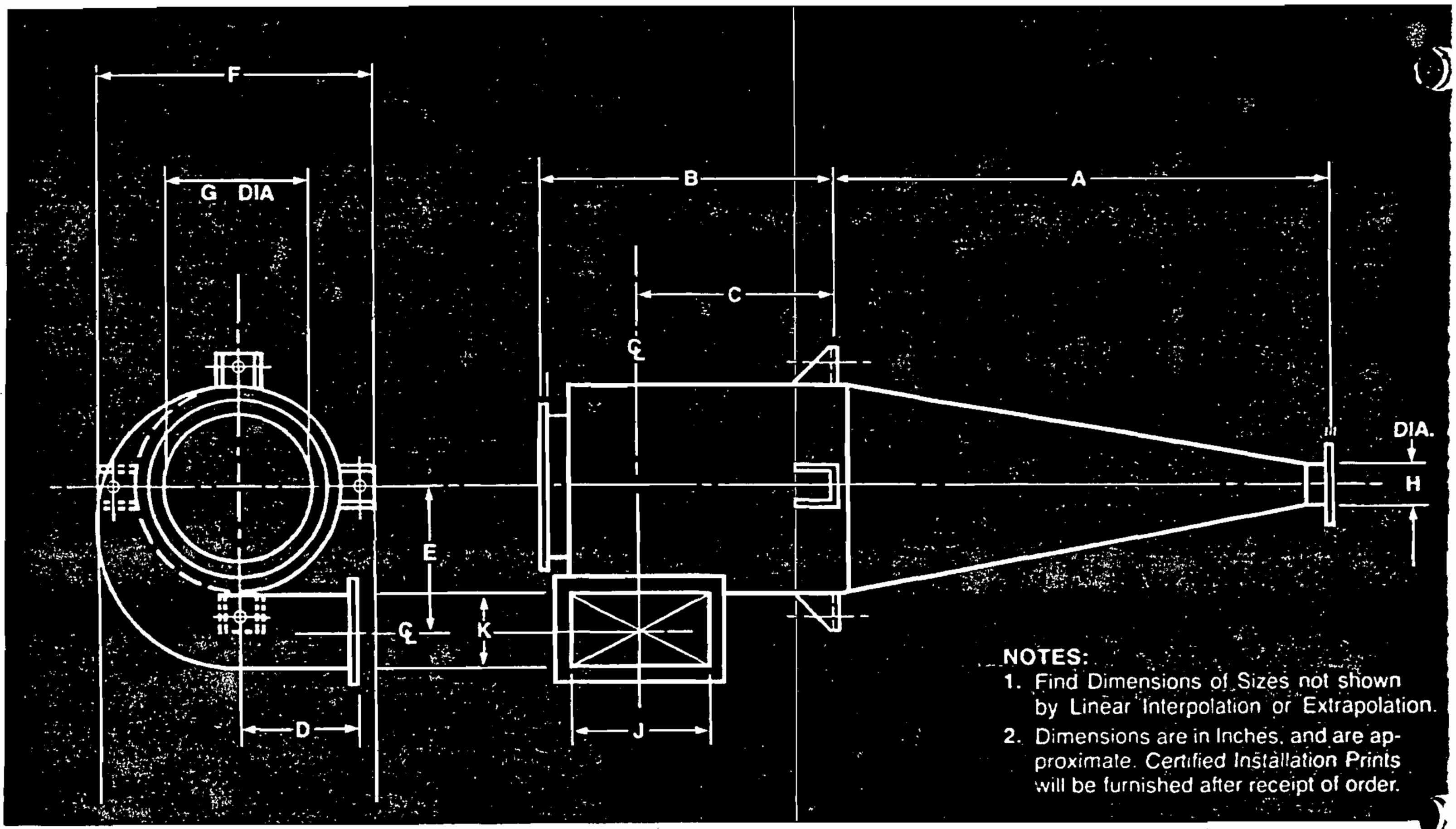
Externally Replaceable Wear Plates/Sections or special linings for highly abrasive dusts.

Access Doors (not recommended for the active portion of the cyclone when collection performance is critical).

Explosion Reliefs for use with explosive dusts.

Plus a variety of other features demanded by the individual cyclone's application.

XQ Series Single Cyclone



NOTES:
1. Find Dimensions of Sizes not shown by Linear Interpolation or Extrapolation.
2. Dimensions are in Inches, and are approximate. Certified Installation Prints will be furnished after receipt of order.

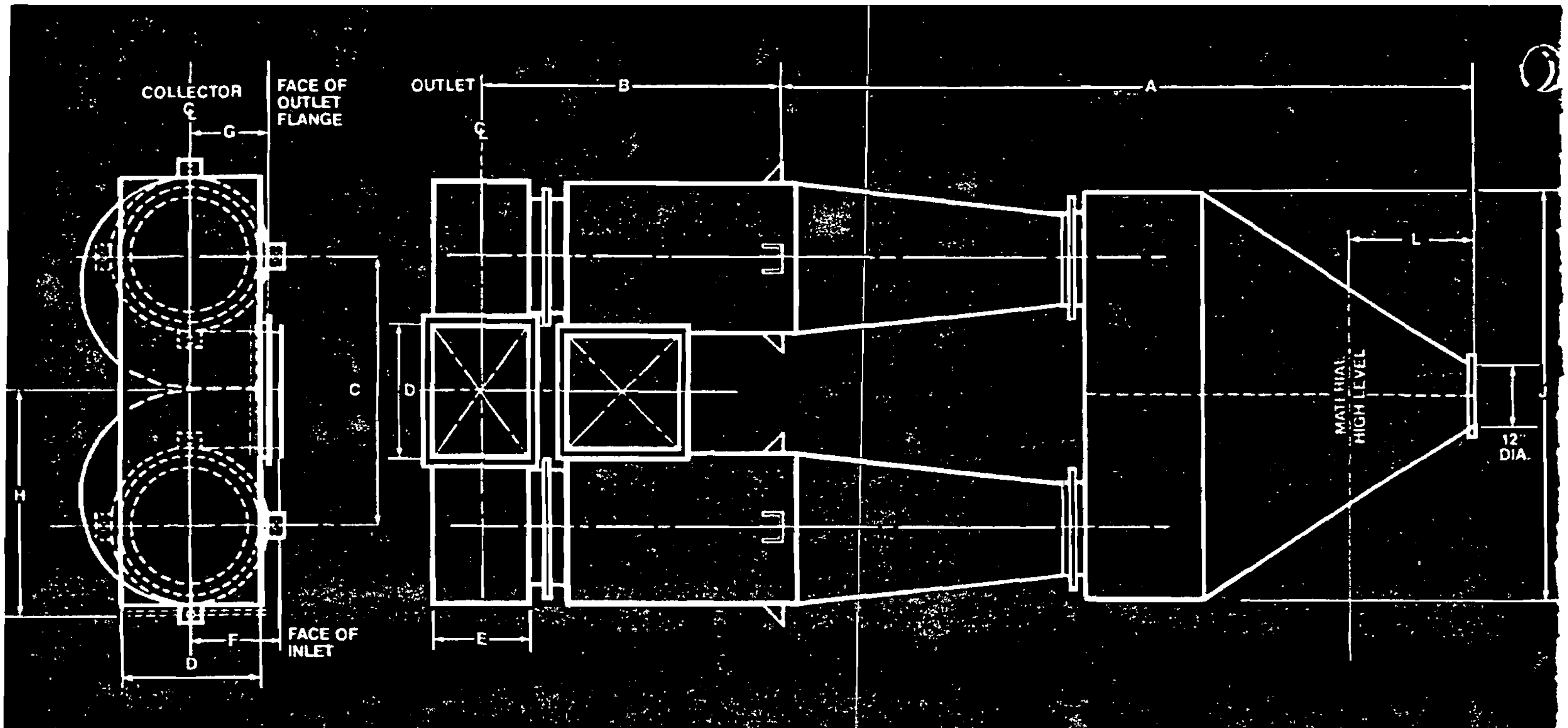
		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 3	A	10½	11⅞	12⅝	14¾	17¼	20½
	B	7½	8	8⅝	10	11⅝	13½
	C	4	4½	5⅛	6½	8⅛	10
Inlet Height: 3 in.	D	5	5	5	6	6	6
	E	2⅞	3 1/16	3¼	3 11/16	4¼	4⅞
	F	8½	9	9½	10	11½	12½
Inlet Width: 1½ in.	G	3	3	3	4	4	4
	H	2	2	2	2	3	3
Cyclone Size: 4	A	13¾	15	16¼	19¼	23	27
	B	9½	10¼	11	12¾	15	17½
	C	5½	6¼	7	8¾	11	13½
Inlet Height: 4 in.	D	6	6	6	6	7	7
	E	3¾	4	4 5/16	4⅞	5⅝	6 7/16
	F	10	10½	11	12	13½	15
Inlet Width: 2 in.	G	4	4	4	5	5	5
	H	2	2	3	3	4	4
Cyclone Size: 5	A	17¼	18¾	20¼	24	28½	36½
	B	11½	12⅜	13⅝	15¾	18¼	19
	C	7	7⅞	8⅞	11¼	13¾	14½
Inlet Height: 5 in.	D	6	6	6	7	7	8
	E	4 11/16	5	5 5/16	6 1/16	7	8
	F	11	2	12½	14	16	18
Inlet Width: 2½ in.	G	5	5	5	6	6	6
	H	3	3	3	4	5	5

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 6	A	20½	22¼	24¼	29	36½	43
	B	13½	14½	15¾	18½	19¼	23
	C	8½	9½	10¾	13½	14¼	18
Inlet Height: 6 in.	D	6	7	7	7	8	8
	E	5⅝	6	6⅜	7¼	8⅜	9⅝
	F	12½	13½	14	16	18	20½
Inlet Width: 3 in.	G	6	6	6	7	7	7
	H	3	4	4	5	5	6
Cyclone Size: 7	A	23¾	26	28	36	42	49½
	B	15½	16¾	18¼	18¾	22½	27
	C	10	11¼	12¾	13¼	17	21½
Inlet Height: 7 in.	D	7	7	7	8	8	9
	E	6 9/16	6 15/16	7 7/16	8½	9¾	11¼
	F	14	14½	15½	18	20½	25½
Inlet Width: 3½ in.	G	7	7	7	8	9	9
	H	4	4	4	5	6	8
Cyclone Size: 8	A	27	29½	32	40½	48	56
	B	17½	19	20½	21½	26	31
	C	11½	13	14½	15½	20	25
Inlet Height: 8 in.	D	7	7	8	8	9	10
	E	7 7/16	7 15/16	8½	9⅝	11⅛	12¾
	F	15	16	17½	19½	24½	28
Inlet Width: 4 in.	G	8	8	8	10	10	10
	H	4	5	5	6	7	9

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 9	A	30½	33	38½	45½	53	63
	B	19½	21	20½	24½	29	35
	C	13	14½	14	18	22½	28½
Inlet Height: 9 in.	D	8	8	8	9	9	10
	E	8⅜	8⅞	9½	10⅞	12½	14⅜
	F	16½	17½	19	23½	27	30½
Inlet Width: 4½ in.	G	9	9	9	11	11	11
	H	5	5	6	7	8	10
Cyclone Size: 11	A	37	43	46½	55	65	76
	B	25½	25	27	32	38	45
	C	16	15½	17½	22½	28½	35½
Inlet Height: 11 in.	D	9	9	10	10	11	12
	E	10¼	10⅞	11⅝	13¼	15¼	17⅝
	F	19½	20½	24	27½	31½	36
Inlet Width: 5½ in.	G	11	11	10	13	13	14
	H	6	6	7	8	10	12
Cyclone Size: 13	A	46½	50	55	64	76	90
	B	27	29½	32	38	44½	53
	C	16½	19	21½	27½	34	42½
Inlet Height: 13 in.	D	10	10	10	11	12	13
	E	12	12¾	13⅝	15⅝	17⅞	20⅝
	F	24	25½	27	31	35½	43
Inlet Width: 6½ in.	G	13	13	12	16	16	16
	H	7	8	8	10	12	14
Cyclone Size: 15	A	53	57	62	74	87	103
	B	31	33½	36½	43½	51	61
	C	19½	22	25	32	39½	49½
Inlet Height: 15 in.	D	11	11	11	12	13	14
	E	13⅞	14¾	15¾	18⅛	20⅝	23⅞
	F	26½	28½	30½	35	42	48½
Inlet Width: 7½ in.	G	15	15	14	18	18	18
	H	8	9	10	11	14	16
Cyclone Size: 18	A	63	68	74	88	104	123
	B	37	40	44	52	61	73
	C	24	27	31	39	48	60
Inlet Height: 18 in.	D	12	12	12	13	14	16
	E	16⅝	17⅝	18⅞	21⅝	24⅞	28⅝
	F	30½	32½	35	42½	49	56½
Inlet Width: 9 in.	G	18	17	17	21	22	22
	H	10	11	11	14	16	19
Cyclone Size: 21	A	73	79	86	102	121	143
	B	43	46½	51	60	72	85
	C	28½	32	36½	45½	57½	70½
Inlet Height: 21 in.	D	13	13	13	14	16	17
	E	19⅝	20⅝	22⅛	25⅛	28⅞	33⅜
	F	34½	37	42	48	55½	88½
Inlet Width: 10½ in.	G	21	20	20	25	26	26
	H	11	12	13	16	19	23

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 25	A	86	94	102	121	143	170
	B	51	55	60	72	85	101
	C	34½	38½	43½	55½	68½	84½
Inlet Height: 25 in.	D	14	14	14	16	17	18
	E	23⅛	24⅝	26⅛	29⅞	34⅜	39¹⁵⁄₁₆
	F	42	45	48	55½	68½	79½
Inlet Width: 12½ in.	G	25	24	24	30	30	31
	H	13	15	16	19	23	27
Cyclone Size: 30	A	103	112	122	144	171	203
	B	61	66	72	86	102	121
	C	42	47	53	67	83	102
Inlet Height: 30 in.	D	15	15	16	17	19	20
	E	27⅝	29⅜	31⅜	36⅛	41³⁄₁₆	47¹¹⁄₁₆
	F	48½	52	56	69½	79½	92½
Inlet Width: 15 in.	G	30	29	28	36	36	37
	H	16	18	19	23	27	32
Cyclone Size: 36	A	123	134	146	173	205	243
	B	73	79	87	103	122	145
	C	51	57	65	81	100	123
Inlet Height: 36 in.	D	16	16	17	19	20	22
	E	33⅛	35⅛	37⅝	43³⁄₁₆	49¹¹⁄₁₆	57¼
	F	56	60	69½	80½	93½	109
Inlet Width: 18 in.	G	36	35	34	43	44	44
	H	19	21	23	27	33	39
Cyclone Size: 43	A	146	159	173	206	244	290
	B	87	95	103	123	146	173
	C	61½	69½	77½	97½	120½	147½
Inlet Height: 43 in.	D	18	18	19	20	22	24
	E	39⅝	41¹⁵⁄₁₆	44¹⁵⁄₁₆	51⁷⁄₁₆	59	68⅝
	F	69½	74½	80½	93½	109	128
Inlet Width: 21½ in.	G	43	42	51	51	52	53
	H	23	25	28	33	39	46
Cyclone Size: 51	A	173	188	206	243	289	343
	B	103	112	122	145	172	205
	C	73½	82½	92½	115½	142½	175½
Inlet Height: 51 in.	D	19	19	20	22	24	26
	E	46¹⁵⁄₁₆	49¹⁵⁄₁₆	53⁷⁄₁₆	61	70⅛	81⅛
	F	80½	86½	93½	109	127	149
Inlet Width: 25½ in.	G	51	49	58	60	62	62
	H	27	30	33	39	46	54
Cyclone Size: 60	A	203	221	241	286	339	403
	B	121	132	144	171	203	241
	C	87	98	110	137	169	207
Inlet Height: 60 in.	D	21	21	22	24	26	28
	E	55⁷⁄₁₆	58¾	62⅝	71⅞	82⅝	95⅜
	F	92½	100	108	126	147	173
Inlet Width: 30 in.	G	50	58	56	71	72	73
	H	32	35	38	45	54	64

XQ Series Dual Cyclone



NOTES:
1. Find Dimensions of Sizes not shown by Linear Interpolation or Extrapolation.
2. Dimensions are in Inches, and are approximate. Certified Installation Prints will be furnished after receipt of order.
3. Dimension "K" is the Maximum Front-Back Depth of the Dust Hopper.

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
	A	50½	55	61½	72½	84	99
	B	24¾	25¾	25¼	30¾	35¾	41¾
Cyclone Size: 9-2	C	21⅜	22⅜	23⅝	26⅛	29⅝	33⅜
	D	13	13	13	15	15	15
Inlet Height: 9 in.	E	10	9	9	12	13	13
	F	14	14	14	15	15	16
	G	7½	7½	7½	8½	8½	8½
Inlet Width: 9⅛ in.	H	22	22	23	26	28	30
	J	35	37	38	43	48	54
	K	14	14	15	16	19	21
	L	2	3	2	2	2	1

	A	62	70	75½	89	104	122
	B	32¼	31¼	33¼	40¼	46¼	53¼
Cyclone Size: 11-2	C	26⅛	27⅜	28⅞	32⅛	36⅛	40⅞
	D	15	15	15	17	18	18
Inlet Height: 11 in.	E	13	12	12	16	16	16
	F	15	15	16	16	17	18
	G	9½	9½	9½	10½	11	11
Inlet Width: 11⅛ in.	H	26	27	27	31	34	36
	J	41	43	46	51	57	65
	K	15	16	17	19	21	24
	L	3	4	4	4	3	4

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
	A	76½	83	90	105	123	145
	B	35¼	37¼	39¼	47¾	54¾	63¼
Cyclone Size: 13-2	C	30⅝	32⅛	33⅞	37⅞	42⅜	47⅞
	D	17	17	17	20	20	20
Inlet Height: 13 in.	E	16	15	14	19	20	20
	F	16	16	16	17	18	19
	G	10½	10½	10½	12	12	12
Inlet Width: 13⅛ in.	H	31	31	31	37	39	42
	J	47	50	52	59	66	75
	K	17	18	19	21	24	27
	L	5	6	5	6	5	6

	A	89	95	104	122	142	167
	B	40¾	42¾	45¼	55¼	62¾	72¼
Cyclone Size: 15-2	C	35⅜	37⅛	39⅛	43⅞	48⅞	55⅜
	D	19	19	18	22	22	23
Inlet Height: 15 in.	E	19	18	17	23	23	23
	F	17	17	17	18	19	20
	G	11½	11½	11	13	13	13½
Inlet Width: 15⅛ in.	H	35	35	36	42	45	48
	J	54	56	60	67	75	86
	K	18	19	21	23	27	30
	L	7	6	8	8	7	7

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Cyclone Size: 18-2
Inlet Height: 18 in.
Inlet Width: 18⅛ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	107	115	124	146	171	201
B	48¾	50¾	55¼	66¼	75¾	87¾
C	42⅜	44⅜	46⅞	52⅜	58⅞	66⁷⁄₁₆
D	22	22	21	26	28	26
E	23	21	22	28	29	29
F	18	18	18	19	20	22
G	13	13	12½	15	15	15
H	41	42	43	50	53	57
J	63	66	70	79	89	102
K	21	22	23	27	31	35
L	9	9	9	10	9	10

Cyclone Size: 21-2
Inlet Height: 21 in.
Inlet Width: 21⅛ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	125	134	146	170	200	234
B	57¼	59¾	64¼	76¾	89¼	102¼
C	49⅜	51⅞	54⅞	60⅞	68⅛	77⁷⁄₁₆
D	25	25	24	29	30	30
E	28	26	26	33	34	34
F	19	19	19	20	22	23
G	14½	14½	14	16½	17	17
H	48	48	49	57	62	66
J	72	76	81	91	93	117
K	23	25	26	30	34	40
L	12	11	13	12	12	11

Cyclone Size: 25-2
Inlet Height: 25 in.
Inlet Width: 25³⁄₁₆ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	149	162	174	203	237	280
B	68¼	71¼	75¾	92¼	106¼	122⁵⁄₁₆
C	58⅞	61⅞	64⅞	72⅜	81⁷⁄₁₆	92⅝
D	29	29	28	34	34	35
E	34	32	31	40	42	42
F	20	20	20	22	23	24
G	16½	16½	16	19	19	19½
H	57	57	58	68	73	79
J	85	90	95	107	121	139
K	26	28	30	34	40	46
L	16	16	16	15	14	16

Cyclone Size: 30-2
Inlet Height: 30 in.
Inlet Width: 30³⁄₁₆ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	180	193	208	244	285	336
B	82¼	86¼	91¾	111¼	127¹³⁄₁₆	146¹³⁄₁₆
C	70⅝	73⅞	77⅞	87⁷⁄₁₆	97⅝	110⅝
D	34	33	32	40	40	41
E	42	40	39	50	[illegible]	51
F	21	21	22	23	25	26
G	19	18½	18	22	22	22½
H	67	68	69	81	74	94
J	101	106	113	128	144	165
K	30	32	35	40	47	54
L	20	19	20	20	19	20

Cyclone Size: 36-2
Inlet Height: 36 in.
Inlet Width: 36¼ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	217	233	252	293	344	403
B	98¾	103¼	111¼	133¹³⁄₁₆	153⁵⁄₁₆	177⁵⁄₁₆
C	84⁷⁄₁₆	88⁷⁄₁₆	93⁷⁄₁₆	104⅝	117⅝	132¹³⁄₁₆
D	40	39	38	47	48	48
E	51	48	48	61	62	64
F	22	22	23	25	26	28
G	22	21½	21	25½	26	26
H	80	81	83	97	105	113
J	120	126	134	151	172	197
K	35	38	40	47	55	64
L	26	25	25	25	24	24

Cyclone Size: 43-2
Inlet Height: 43 in.
Inlet Width: 43⅜ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	258	278	300	351	410	482
B	118¼	124¹³⁄₁₆	132⁹⁄₁₆	160¹³⁄₁₆	184⁵⁄₁₆	212⅜
C	100⁷⁄₁₆	105⅝	111⅝	124⅝	139¹³⁄₁₆	159⅛
D	[illegible]	46	45	55	56	57
E	[illegible]	59	58	75	76	78
F	[illegible]	24	25	26	28	30
G	25½	25	24½	29½	30	30½
H	[illegible]	97	99	116	124	135
J	[illegible]	149	159	179	204	234
K	[illegible]	44	47	55	64	75
L	[illegible]	31	30	30	30	30

Cyclone Size: 51-2
Inlet Height: 51 in.
Inlet Width: 51⅜ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	306	330	357	416	486	571
B	140¹³⁄₁₆	147¹³⁄₁₆	157⁵⁄₁₆	189¹³⁄₁₆	218⅜	251⅜
C	119⅝	125⅝	132⅝	147¹³⁄₁₆	166⅛	188⅛
D	55	53	52	64	66	66
E	75	71	70	89	92	92
F	25	25	26	28	30	32
G	29½	28½	28	34	35	35
H	113	114	117	136	147	158
J	168	176	187	212	240	275
K	47	51	55	64	74	87
L	38	38	37	37	37	38

Cyclone Size: 60-2
Inlet Height: 60 in.
Inlet Width: 60⅜ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	361	389	420	490	573	672
B	165¹³⁄₁₆	174¹³⁄₁₆	185⁵⁄₁₆	224⅜	256⅞	295⅞
C	140⅝	147¹³⁄₁₆	155¹³⁄₁₆	174⅛	195⅛	221⅛
D	[illegible]	62	60	75	76	77
E	[illegible]	85	82	106	107	109
F	[illegible]	27	28	30	32	34
G	[illegible]	33	32	39½	40	40½
H	133	134	136	160	172	186
J	195	206	219	248	282	323
K	[illegible]	58	53	74	87	102
L	[illegible]	45	45	46	44	44

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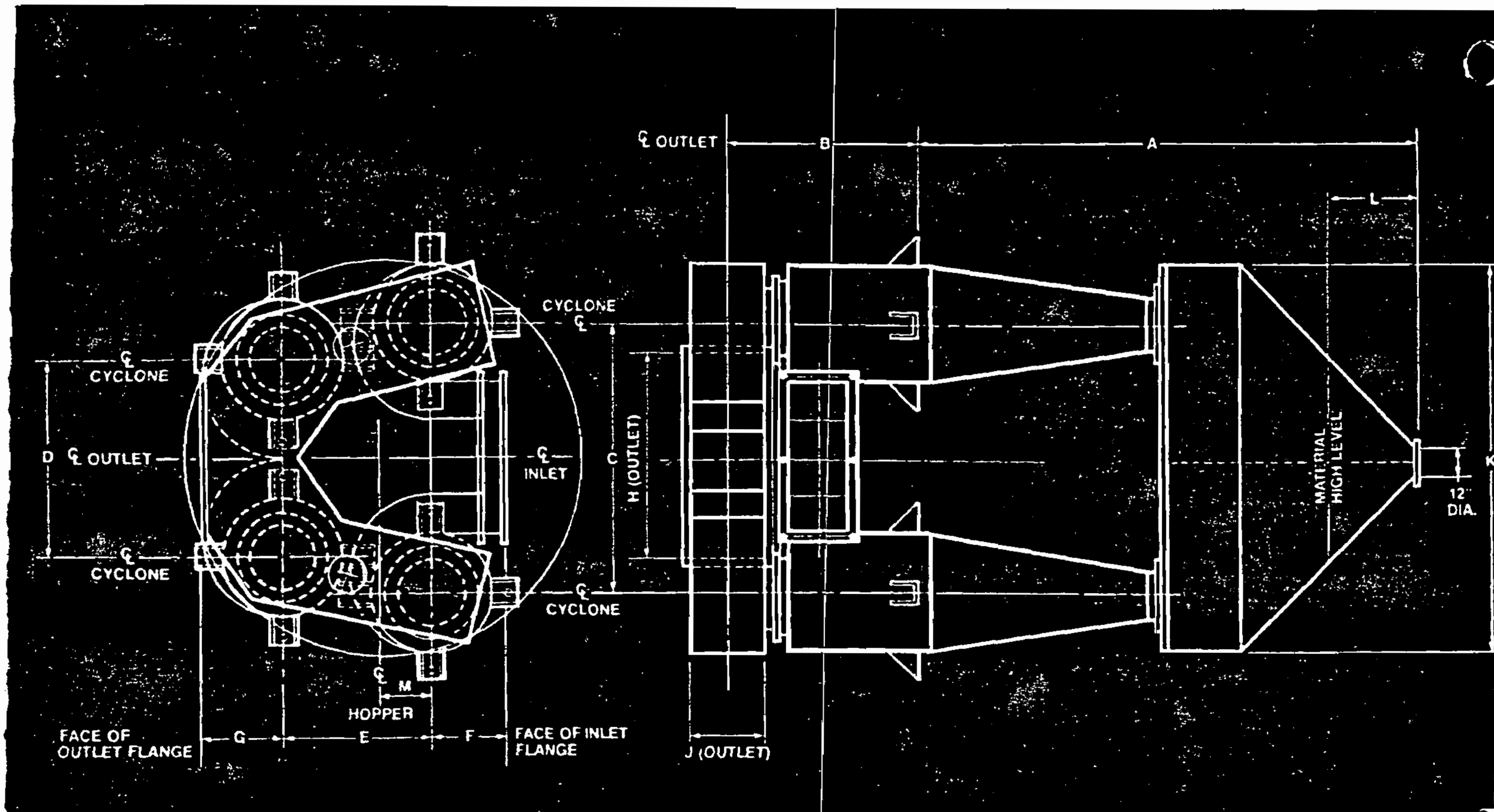
XQ Series Quad Cyclone



NOTES:

1. Find Dimensions of Sizes not shown by Linear Interpolation or Extrapolation.
2. Dimensions are in Inches, and are approximate. Certified Installation Prints will be furnished after receipt of order.

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 9-4	A	59½	64	71½	82½	96	112
	B	28	29	28½	34	39	45
	C	30⅝	31⅜	32⅞	35⅜	38⅞	42⅝
	D	21⅜	22⅜	23⅝	26⅜	29⅝	33⅜
Inlet Height: 9 in.	E	17	18	20	22	26	29
	F	14	14	14	15	15	16
	G	8	9	9	10	11	13
	H	26	26	26	30	30	30
Inlet Width: 18⅜ in.	J	10	9	9	12	13	13
	K	46	48	50	55	62	69
	L	11	12	12	12	14	14
	M	4 15/16	5½	6¾	7¾	10	11½
Cyclone Size: 11-4	A	73	82	87½	102	119	137
	B	35½	34½	36½	43½	49½	56½
	C	37⅜	38⅝	40⅛	43⅜	47⅜	52⅛
	D	26⅛	27⅜	28⅞	32⅛	36⅛	40⅞
Inlet Height: 11 in.	E	20	22	23	27	31	35
	F	15	15	16	16	17	18
	G	10	11	11	12	13	15
	H	30	30	30	34	36	36
Inlet Width: 22⅜ in.	J	13	12	12	16	16	16
	K	54	57	59	66	74	83
	L	14	16	16	17	18	19
	M	5 9/16	6¾	7¼	9⅝	11¾	13¾

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 13-4	A	89½	96	104	119	139	163
	B	38½	40½	42½	51	58	66½
	C	43⅞	45⅜	47⅛	51⅛	55⅝	61⅛
	D	30⅝	32⅛	33⅞	37⅞	42⅜	47⅞
Inlet Height: 13 in.	E	23	25	27	31	35	41
	F	16	16	16	17	18	19
	G	12	12	13	14	15	18
	H	34	34	34	40	40	40
Inlet Width: 26⅜ in.	J	16	15	14	19	20	20
	K	62	65	69	76	85	96
	L	18	19	19	20	21	24
	M	6⅛	7⅜	8½	10¾	12¾	16
Cyclone Size: 15-4	A	104	111	119	139	161	188
	B	44	46	48½	58½	66	76
	C	50⅝	52⅜	54⅜	59⅛	64⅛	70⅝
	D	35⅜	37⅛	39⅛	43⅞	48⅞	55⅜
Inlet Height: 15 in.	E	27	28	30	35	40	47
	F	17	17	17	18	19	20
	G	13	14	15	16	18	20
	H	38	38	36	44	44	46
Inlet Width: 30⅜ in.	J	19	18	17	23	23	23
	K	71	74	78	87	97	110
	L	22	22	23	25	26	28
	M	7⅜	7⅞	9	11⅞	14½	18½

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		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 18-4	A	124	133	143	166	193	226
	B	52	54	58½	69½	79	91 1/16
	C	60⅜	62⅜	65⅛	70⅜	77⅛	84¾
	D	42⅜	44⅜	46⅞	52⅜	58⅞	66 7/16
Inlet Height: 18 in.	E	31	33	36	41	48	56
	F	18	18	18	19	20	22
	G	16	17	18	19	21	25
	H	44	44	42	52	52	52
Inlet Width: 36 7/16 in.	J	23	21	22	28	29	29
	K	83	87	92	102	115	131
	L	26	27	28	30	31	35
	M	7⅞	9⅛	10⅞	13¾	17½	21¾
Cyclone Size: 21-4	A	146	156	167	194	225	263
	B	60½	63	67½	80	92½	105 9/16
	C	70⅝	73⅛	76⅛	82⅛	89⅝	98¾
	D	49⅜	51⅞	54⅞	60⅞	68⅜	77 7/16
Inlet Height: 21 in.	E	36	39	42	48	55	64
	F	19	19	19	20	22	23
	G	19	19	21	22	25	29
	H	50	50	48	58	60	60
Inlet Width: 42 7/16 in.	J	28	26	26	33	34	34
	K	96	101	106	118	132	150
	L	33	33	34	36	37	40
	M	9⅛	11	12¾	16	19¾	24¾
Cyclone Size: 25-4	A	173	186	200	231	268	314
	B	71½	74½	79	95½	109 9/16	125 9/16
	C	84⅛	87⅛	90⅛	97⅝	106¾	118 1/16
	D	58⅞	61⅞	64⅞	72⅜	81 7/16	92⅝
Inlet Height: 25 in.	E	42	45	49	56	65	76
	F	20	20	20	22	23	24
	G	22	23	25	26	30	34
	H	58	58	56	68	68	70
Inlet Width: 50⅝ in.	J	34	32	31	40	42	42
	K	113	118	125	139	156	178
	L	40	40	42	43	45	50
	M	10¼	12	14½	18½	23¼	29
Cyclone Size: 30-4	A	209	223	240	277	322	375
	B	85½	89½	95	114 9/16	131 9/16	150 1/16
	C	100⅝	104⅛	108⅛	117¾	128 5/16	141 1/16
	D	70⅜	73⅞	77⅞	87 7/16	97⅝	110⅝
Inlet Height: 30 in.	E	50	54	58	67	77	90
	F	21	21	22	23	25	26
	G	26	28	30	31	35	41
	H	68	66	64	80	80	82
Inlet Width: 60⅝ in.	J	42	40	39	50	51	51
	K	134	140	148	166	186	211
	L	49	49	51	53	56	59
	M	12	14½	16¾	22	27½	34½

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 36-4	A	250	268	288	333	388	452
	B	102 1/16	106 9/16	114 9/16	137 1/16	156 9/16	180⅝
	C	120¾	124¾	129¾	141 1/16	154 1/16	169⅜
	D	84 7/16	88 7/16	93 7/16	104⅜	117⅝	132 13/16
Inlet Height: 36 in.	E	60	64	69	80	93	108
	F	22	22	23	25	26	28
	G	31	33	35	37	42	49
	H	80	78	76	94	96	96
Inlet Width: 72 13/16 in.	J	51	48	48	61	62	64
	K	159	167	176	197	223	253
	L	59	60	61	65	68	73
	M	14½	17	19¾	26	33	41
Cyclone Size: 43-4	A	298	320	344	397	462	540
	B	121 9/16	128 1/16	135 9/16	164 1/16	187⅝	215 11/16
	C	143¾	149 1/16	155 1/16	168 1/16	183⅜	202⅞
	D	100 7/16	105⅝	111⅝	124⅝	139 13/16	159⅛
Inlet Height: 43 in.	E	70	75	81	94	110	129
	F	24	24	25	26	28	30
	G	37	39	42	44	50	58
	H	94	92	90	110	112	114
Inlet Width: 87⅛ in.	J	62	59	58	75	76	78
	K	188	198	209	233	264	301
	L	71	73	74	76	82	88
	M	16	19	22½	30	39	49
Cyclone Size: 51-4	A	355	379	408	472	548	638
	B	144 1/16	151 1/16	160 9/16	193⅛	221 11/16	254 11/16
	C	171 1/16	177 1/16	184 1/16	199⅜	217⅞	239⅞
	D	119⅝	125⅝	132⅝	147 13/16	166⅛	188⅛
Inlet Height: 51 in.	E	83	89	96	111	130	152
	F	25	25	26	28	30	32
	G	44	47	50	52	59	69
	H	110	106	104	128	132	132
Inlet Width: 103⅛ in.	J	75	71	70	89	92	92
	K	222	233	248	276	311	353
	L	87	87	88	93	99	105
	M	19	22¾	27	35½	46	58
Cyclone Size: 60-4	A	418	447	480	555	645	752
	B	169 1/16	178⅛	188⅝	227 11/16	260 7/16	299 3/16
	C	201 1/16	208⅜	216⅝	234⅞	255⅞	281⅞
	D	140⅝	147 13/16	155 13/16	174⅛	195⅛	221⅛
Inlet Height: 60 in.	E	97	104	112	131	152	178
	F	27	27	28	30	32	34
	G	52	55	59	61	70	81
	H	128	124	120	150	152	154
Inlet Width: 121⅛ in.	J	89	85	82	106	107	109
	K	260	273	288	323	365	415
	L	102	103	105	111	116	124
	M	22	26	31	42	53	68

Table 2

Standard Material Thicknesses (See Note 1)
Maximum Cyclone Size (See Note 2)

U.S.S. GAUGE	INCHES	XQ465	XQ405	XQ340	XQ240	XQ170	XQ120
16	.0598	36	33	30	25	21	18
14	.0747	45	41	37	32	27	22
12	.1046	62	57	52	44	37	31
10	.1345	80	74	67	57	48	40
3/16 P.	.1875	112	103	94	79	67	56
¼ P.	.2500	149	137	125	105	89	75
⅜ P.	.3750	224	206	188	158	133	112

NOTES:

1. Any thickness of material in all carbon steel, alloy or stainless steel, high nickel, aluminum and other non-ferrous alloys is available as required by operating conditions.

2. The above sizes will withstand −15 in. w.c. absolute internal pressure in commercial quality hot rolled steel.

Table 3
Installed Weights of Single Cyclones (See Note 1)

CYCLONE SIZE	XQ465 THK.	XQ465 LBS.	XQ405 THK.	XQ405 LBS.	XQ340 THK.	XQ340 LBS.	XQ240 THK.	XQ240 LBS.	XQ170 THK.	XQ170 LBS.	XQ120 THK.	XQ120 LBS.
3	.0598	5	.0598	6	.0598	7	.0598	9	.0598	12	.0598	16
4	.0598	8	.0598	10	.0598	11	.0598	15	.0598	21	.0598	29
5	.0598	13	.0598	15	.0598	18	.0598	24	.0598	33	.0598	45
6	.0598	19	.0598	22	.0598	26	.0598	35	.0598	47	.0598	65
7	.0598	25	.0598	30	.0598	35	.0598	47	.0598	64	.0598	88
9	.0598	42	.0598	50	.0598	58	.0598	78	.0598	105	.0598	145
11	.0598	63	.0598	75	.0598	86	.0598	115	.0598	160	.0598	220
13	.0598	88	.0598	105	.0598	120	.0598	165	.0598	220	.0598	305
16	.0598	135	.0598	155	.0598	180	.0598	245	.0598	335	.0598	460
20	.0598	205	.0598	245	.0598	285	.0598	385	.0598	525	.0747	900
24	.0598	300	.0598	355	.0598	410	.0598	555	.0747	945	.1046	1800
29	.0598	435	.0598	515	.0598	600	.0747	1000	.1046	1950	.1046	2650
36	.0598	670	.0747	1000	.0747	1150	.1046	2200	.1046	2950	.1345	5250
44	.0747	1250	.1046	2100	.1046	2410	.1046	3250	.1345	5700	.1875	10,700
54	.1046	2650	.1046	3150	.1345	4750	.1345	6350	.1875	11,700	.1875	16,100
66	.1345	5100	.1345	6000	.1345	6950	.1875	12,900	.1875	17,500	.2500	32,000
76	.1345	6750	.1875	10,900	.1875	12,600	.1875	17,000	.2500	30,900	.3750	63,600
81	.1875	10,400	.1875	12,300	.1875	14,300	.2500	25,800	.2500	35,100	.3750	72,300

NOTES:

1. Weights are based on commercial quality hot rolled steel.
2. For sizes and/or thicknesses not shown, use the following procedure:
   A. Select the nearest size, $N_{(tab)}$, and find $t_{(tab)}$, the tabulated thickness and $W_{(tab)}$, the tabulated weight for the XQ cyclone family being considered.
   B. Calculate the weight, W, by
   $$W = \frac{W_{(tab)} \times t}{t_{(tab)}} \times \left(\frac{N}{N_{(tab)}}\right)^2,$$
   where t = desired thickness, inches
   N = desired cyclone size.
3. For DUAL cyclones, including dust hopper and inlet and outlet manifolds, calculate W as in Note 2. Then, find the total weight, $W_{(tot)}$ by $W_{(tot)} = 3.708 \times W$.
4. For QUAD cyclones, the procedure is as in Note 3 EXCEPT $W_{(tot)} = 8.207 \times W$.

Table 4
Shipping Limitations

The following are the largest sizes of single cyclones that can be shipped completely pre-assembled. Larger sizes will, in all cases, require knockdown (K.D.) construction flanged for bolted field assembly. Depending on routing, in some states the maximum sizes will be even smaller.

XQ465—87
XQ405—82
XQ340—77
XQ240—67
XQ170—58
XQ120—51

Table 5
English To Metric Conversions

	Multiply English Units	By	To Convert to Metric Units
Dimensions	Inches	2.540	cm.
Weights	Pounds	0.454	kg.
Volumetric Flow Rate	C.F.M.	4.720×10^{-4}	M^3/sec.
Velocity	Ft./Sec.	0.305	M/sec.
Pressure Drop	Inches—Water	1.863	mm—Mercury
Density	Lbs./Cu. Ft.	0.160	g/cc
Absolute Viscosity	Lbs. (Mass)/Ft.—Sec.	1488.2	Centipoise
Temperature	One (1) Degree F	0.555	One (1) Degree C
Pressure	P.S.I.	51.714	mm—Mercury
Dust Loading	Grains/Cu. Ft.	2.29×10^{-3}	kg/M^3

fk **Fisher-Klosterman, Inc.**
P.O. Box 11190, Station H
Louisville, Kentucky 40211
(502) 776-1505

Part I: Supplemental Information 1

Description of Process 1

System Design 1

Wood Usage 1

Emissions 2

Emissions Control Devices 2

Part II: Airborne Contaminants Emitted Data and 3

Table One: Pensacola Mill Pine Chip Thickness Screening 3

Calculations: 3

Part III: Appended Diagrams and Data 6

Mill Location Plot Plan 6

Affected Facility Plot Plan 6

Process Flow Diagrams 6

Calculations Basis Literature and Data 6

Part I: Supplemental Information

Description of Process

Champion International Corporation is proposing to construct a pine wood chip thickness screening system at its Pensacola facility, located in Cantonment, Escambia County, Florida. The new thickness screening system will replace an existing oversized chip screen system which classifies chips according to length rather than thickness. The effect of this project will be to increase chip quality to existing chip digesters and therefore will enhance pulp quality to the bleach plant and paper machines. The project objective will not increase production or throughput and will have no effect on any other mill equipment emissions.

System Design

The proposed pine wood chip thickness screening system will consist of the following equipment:

- 1 Primary Disc Screen
- 1 Secondary Disc Screen
- 1 Air Density Separator Rotary Feeder
- 1 Air Density Separator Cyclone and Blower
- 2 Chip Slicers
- 2 Gyratory Fines Screens
- 1 Fines Blower and Separator Cyclone

The existing system to be replaced consists of the following equipment:

- 2 - Chip Screens
- 1 - #2 Oversized Chip Re-Chipper
- 1 - #2 Cyclone Separator

Figures One and Two in Part III of this Supplement are process flow sheets illustrating the proposed and existing systems.

Wood Usage

Installation of the chip thickness screening system to replace components of the existing oversized chip screening system will improve chip quality to the pulp digesters but not increase chip

throughput. The difference between wood throughput of 1988 compared to post construction tabulated in Table One is actual usage in 1988 versus mill design usage. The wood throughput of 1987 is not compared due to 1986 and 1987 mill conversion startup affects.

Emissions

Emissions associated with the installation of the pine wood chip thickness screening system emanate from two new point sources and one existing point source as shown in Figures One and Two and tabulated in Table One. The two new point sources are a fines "airveyor" high efficiency cyclone separator (shown in Figure Two as block L) and an Air Density Separator cyclone (shown in Figure Two as block G). The net increase in point source total particulate emissions resulting from the installation is +2.0 tons per year. Because no external woodyard modifications are taking place associated with this project fugitive emissions are expected to at least remain the same. Any new or altered conveyor systems will be fitted with covers.

Contemporaneous changes since the 1986 mill conversion project were noted in the construction permit No. AC 17-113551. Table one is based on Table II of that permit which is attached in Part III. When added to contemporaneous changes, net emissions are -8.7 tons per year. These are well below the PM10 (Particulate Matter less than 10 microns in size) and TSP (Total Suspended Particulate) PSD (Prevention of Significant Deterioration) significance levels of 15 and 25 tons per year, respectively.

Emissions Control Devices

Fugitive emissions are controlled by covers on all belt conveyors. Two high efficiency cyclone separators are included in the installation (Shown in Figure One). Manufacturer efficiency curves (enclosed) with mill chip classifications were used to rate cyclone separation efficiencies.

The stack of the induced draft fan for the Air Density Separator cyclone is approximately 70 feet in height, and is 1.5 feet in diameter. The air flow rate is 12,000 ACFM maximum, and is at ambient temperatures and water vapor content. The fines cyclone has its own vent in the top.

Part II: Airborne Contaminants Emitted Data and Calculations

Table One: Pensacola Mill Pine Chip Thickness Screening System Installation Data

	(Tons/Year)
Chip Supply	
1988 Usage	1,100,000
Mill Design	1,200,000
PM10 Emissions:	
Proposed	0.8
Present	0.1
Net PM10	**0.7**
Net TSP Emissions:	
Proposed	2.2
Present	0.2
Net TSP	**2.0**
Contemporaneous:	
Present	-10.7
Proposed Increase	2.0
Net	***-8.7***

Calculations:

The flowsheets include recycle loops that were calculated by iteration using the following equations with reference to the respective flowsheets.

Constants:

Scrubber Efficiencies:

Where Particulate Matter > 10μ the cyclone separation efficiency at 99.5%; Therefore X = 0.995

Particulate Matter < 10μ the cyclone separation efficiency at 95%; Therefore Y = 0.95

Particulate Classification:

0.13% of Fines are Particulate Matter greater than 10 microns in size but less than 200 microns; Therefore $Z = 0.0013$

0.01% of Fines are Particulate Matter less than 10 microns in size; Therefore $V = 0.0001$

Calculations and Derivations For Figure One

$B = A + F$
$C = B * 0.01$
$D = B - C$
$E = D * 0.15$
$F = E + C$

Therefore:

$G > 10\ \mu = F * 0.1 * Z * (1 - X)$
$G < 10\ \mu = F * 0.1 * V * (1 - Y)$

And:

$H = D - E - G$
$K = H - I$
$I = H * 0.1$
$L = K$
$J = I$

Calculations and Derivations For Figure Two

$B = A + D$
$C = B * 0.01$
$D = C$

Therefore:

$E > 10\ \mu = D * 0.1 * Z * (1 - X)$
$E < 10\ \mu = D * 0.1 * V * (1 - Y)$

And:

$F = B - C - E$
$G = F * 0.15$

Therefore:

$H > 10\ \mu = G * 0.0005 * (1 - X)$
$H < 10\ \mu = G * 0.00001 * (1 - Y)$

And:

$I = G - H$
$J = I$
$K = F - L - H$
$L = (F + J) * 0.1$
$M = L - O$
$N = K$

Therefore:

$O > 10\ \mu = L * Z * (1 - X)$
$O < 10\ \mu = L * V * (1 - Y)$

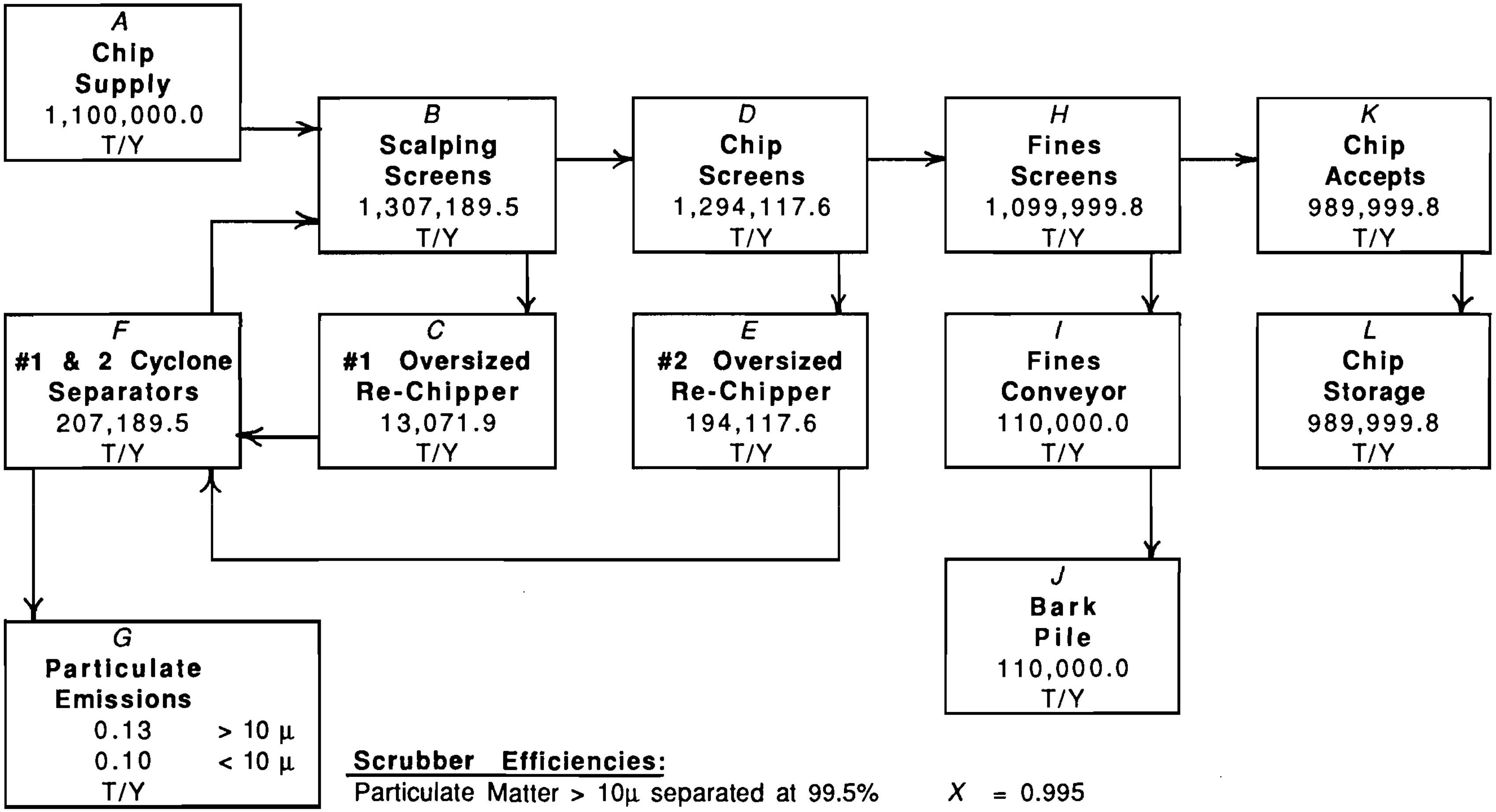
Finally:

$P = O + H + E$

Part III: Appended Diagrams and Data

- Mill Location Plot Plan
- Affected Facility Plot Plan
- Process Flow Diagrams
- Calculations Basis Literature and Data

Figure One: Existing Pine Wood Oversized Chip Screening System



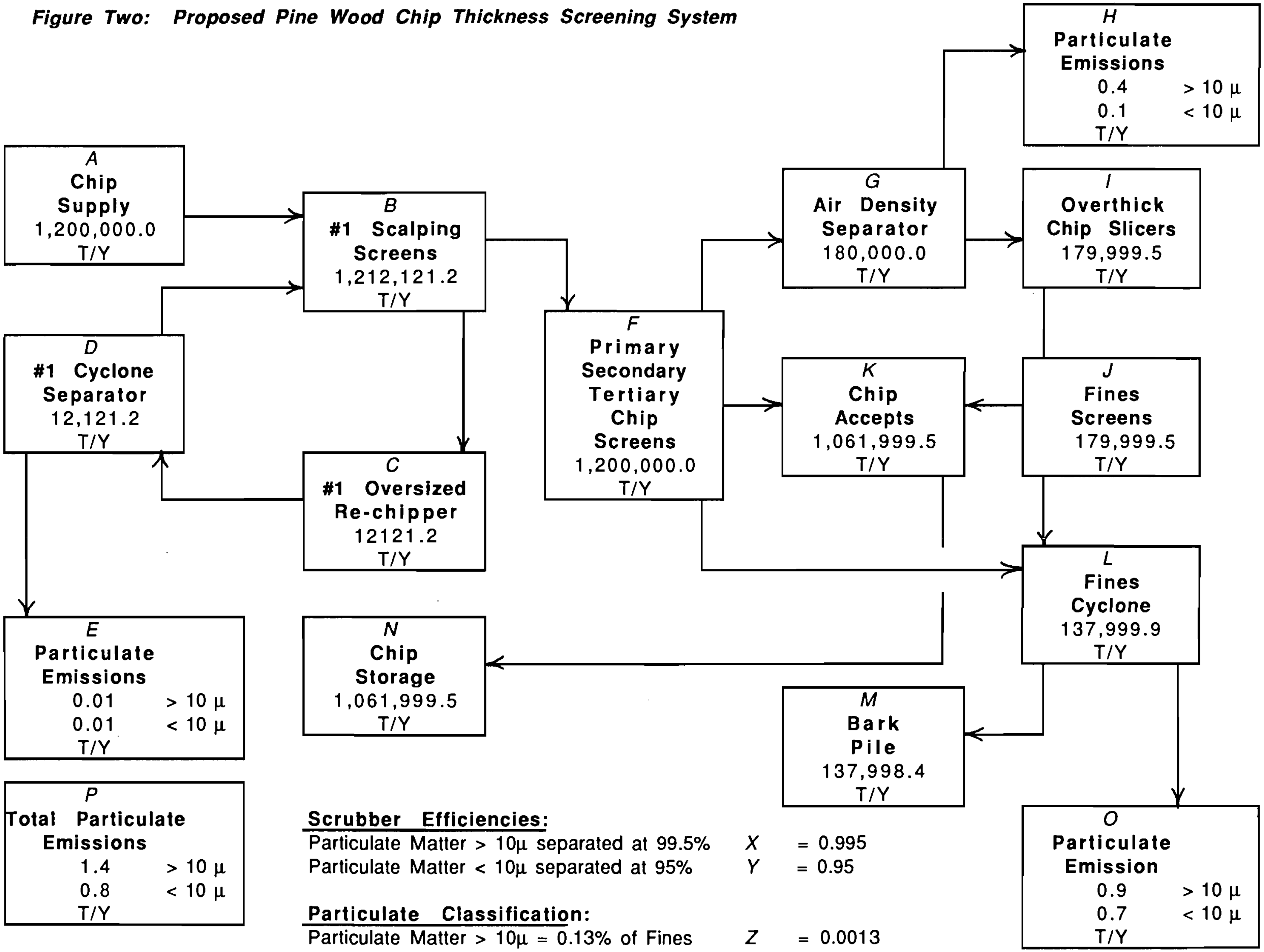
Scrubber Efficiencies:

Particulate Matter > 10µ separated at 99.5%	$X = 0.995$
Particulate Matter < 10µ separated at 95%	$Y = 0.95$

Particulate Classification:

Particulate Matter > 10µ = 0.13% of Fines	$Z = 0.0013$
Particulate Matter < 10µ = 0.01% of Fines	$V = 0.0001$

Figure Two: Proposed Pine Wood Chip Thickness Screening System



Scrubber Efficiencies:

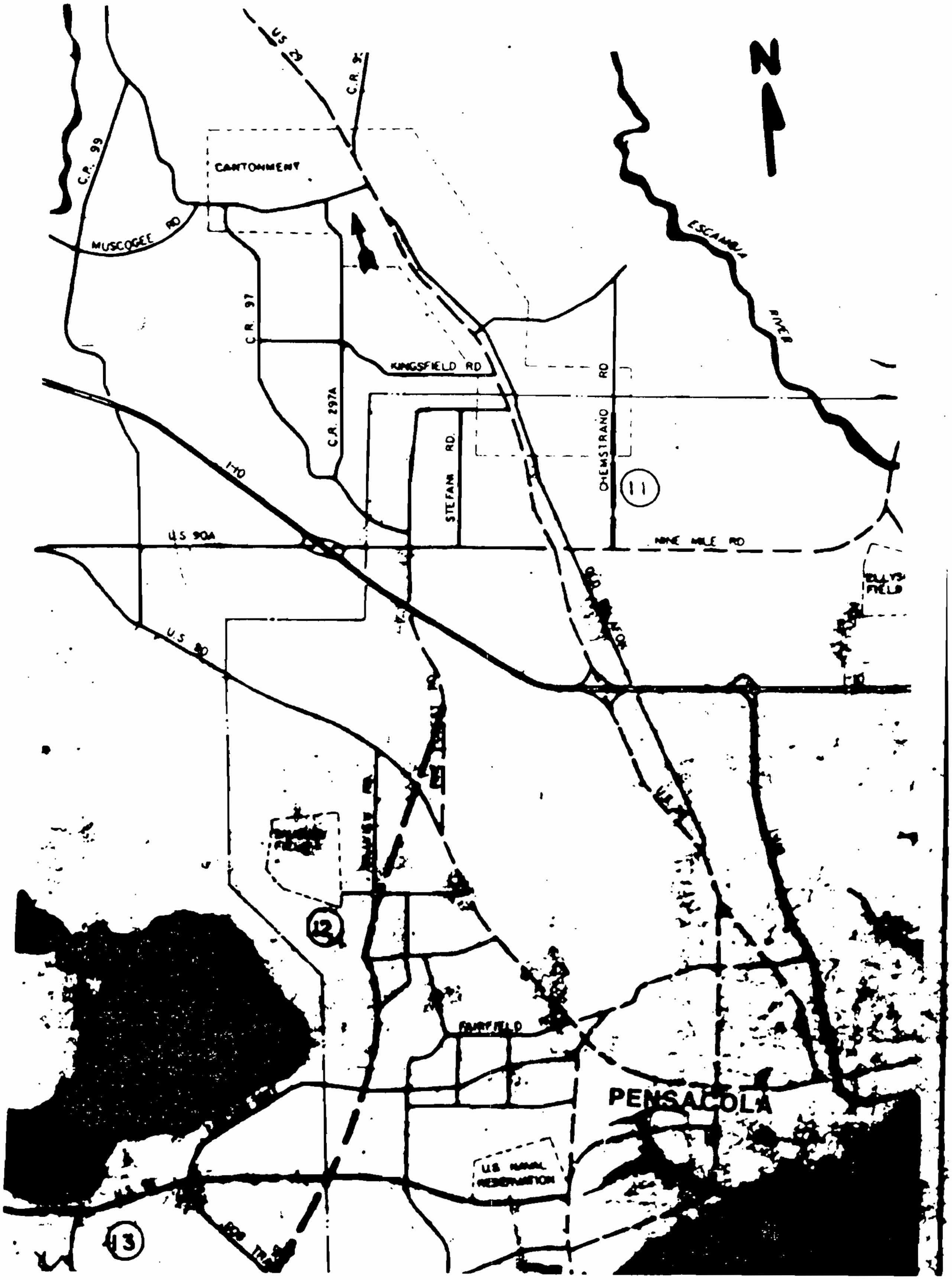
Particulate Matter > 10µ separated at 99.5%	X	= 0.995
Particulate Matter < 10µ separated at 95%	Y	= 0.95

Particulate Classification:

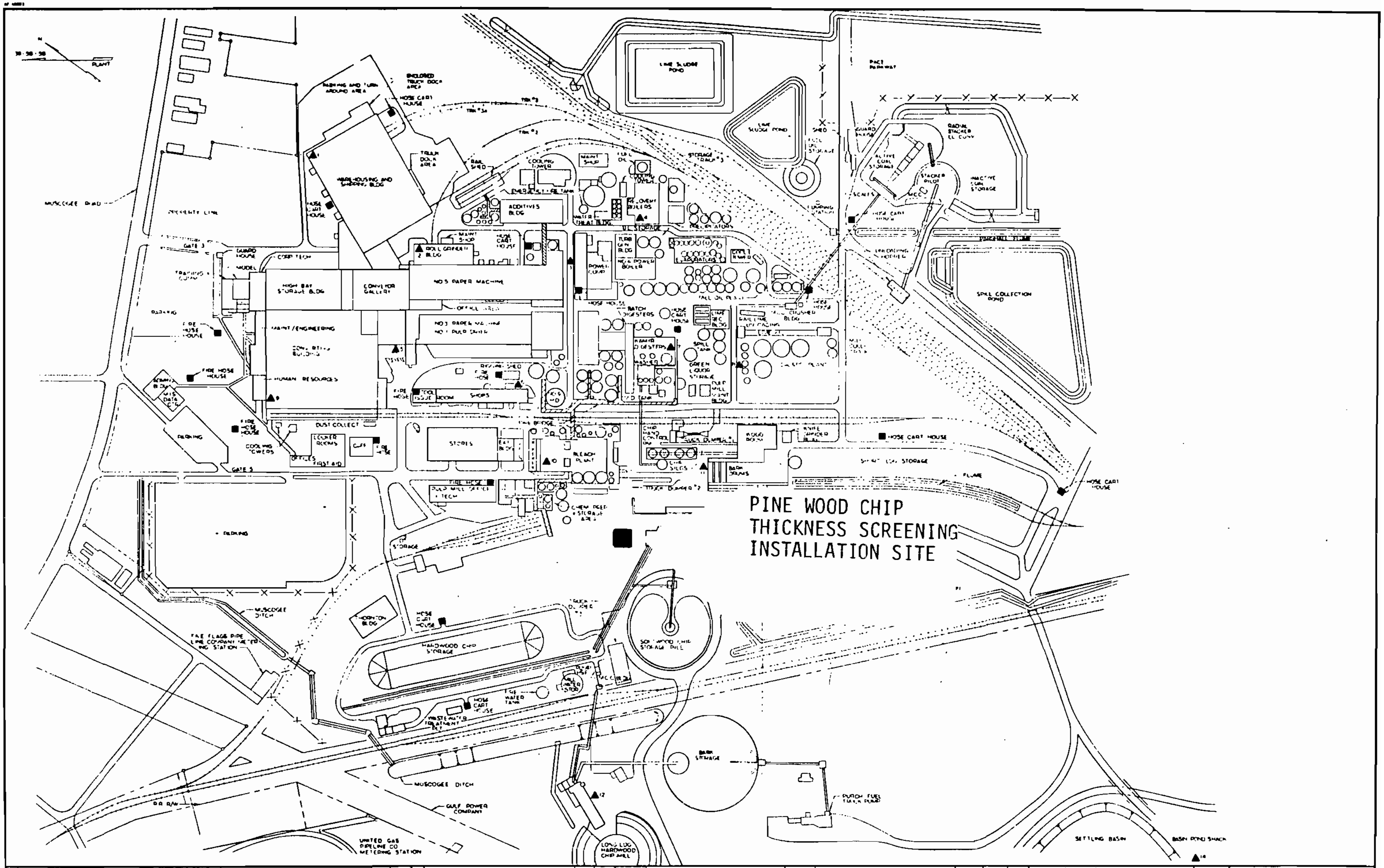
Particulate Matter > 10µ = 0.13% of Fines	Z	= 0.0013
Particulate Matter < 10µ = 0.01% of Fines	V	= 0.0001

LOCATION MAP

BEST AVAILABLE COPY



2



PINE WOOD CHIP THICKNESS SCREENING INSTALLATION SITE

TB.

NONE

PLOT PLAN FOR MILL LOCATION

Champion
Champion International Corporation
Printing and Writing Papers
PENSACOLA, FLORIDA

Printing and Writing Papers
375 Muscogee Road
P. O. Box 87
Cantonment, Florida 32533-0087
904 968-2121

Champion
Champion International Corporation

To:
Peter Muehlemann

Date:
April 6, 1989

From:
Eric Johnson

Subject:
Pine Fines Classification

FTM-498

Shown below is a table summarizing the classification of the Pensacola mill pine wood fines. A sample of the fines material retained on a 3/64 inch Tyler screen from Bill Dorman's work dated March 10, 1989 (report #1513001) was further classified on a Tyler screen classifier.

In summary, the fines classification results are as follows:

% of Total Pine Wood Fines . . .	Are Greater Than . . .	Less Than
18.3	6410 u	----
21.0	4795 u	6410 u
39.3	2403 u	4795 u
5.6	2018 u	2403 u
7.5	1203 u	2018 u
7.72	300 u	1203 u
0.44	212 u	300 u
0.13	75 u	212 u
0.009	38 u	75 u
6.0×10^{-5}	--	38 u

u = micron

Eric Johnson

Eric Johnson

EJJ/hs

cc: David Arceneaux
Bill Dorman
Paul Johnson
Buddy Rhodes
Bob Romnes
Bernie Shoemoe
Willie Tims

NOTE COPY W/ REVIEW ENGINEERS CALCULATIONS

Printing and Writing Papers
375 Muscogee Road
P.O. Box 87
Cantonment, Florida 32533-0087
(904) 968-2121

Champion
Champion International Corporation

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DER - MAIL ROOM
1989 MAY -3 AM 9:48

RECEIVED
MAY 3 1989
DER - BAQM

5/1/89

Mr. William Thomas
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

Dear Mr. Thomas:

Enclosed are three copies of an Application To Construct Air Pollution Sources [DER Form 17 - 1.202(1)] along with the $200 application fee for a proposed pine wood chip thickness screening system at Champion International Corporation's Pensacola facility. To meet the scheduled October, 1989 start-up date, we need to begin construction by as soon as possible. Copies have been sent to Mr. Mike Harley as the reviewer, and to the FDER Northwest District.

We would appreciate a prompt review of this application. If there is any additional information needed, please don't hesitate to call.

Sincerely,

Paul M. Johnson Jr.
Paul M. Johnson, Jr.
Process Engineer - Environmental Control

cc: Mike Harley *
Ed Middleswart *
FDER - Northwest District

bc: D. Arceneaux *
C. Ayer *
W. Dorman *
E. Johnson *
P. Muehlemann **
B. Rhodes **
B. Romnes **
B. Shoemoe **
W. Tims *
File *

* With application
** Letter only

Champion
Champion International Corporation

Knightsbridge Hamilton, Ohio 45020 [redacted]

No. 447839

Pay to the Order of
Dept. of Environmental Regulation
2400 Blair Stone Dr.
Tallahassee, Fl. 32301-8241

Date: 04/17/89 Check No. 447839

Pay the amount of ****200.00****

PAY *** Two Hundred Dollars and 00/100 ***

Milford Office
First National Bank of Cincinnati
Milford, Ohio

Kneisel 249

[redacted]

#200 pd
5-3-89
Rcpt.#117612

STATE OF FLORIDA AC17-164445

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

RECEIVED
MAY 3 1989
DER-BAQM

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Major [ ] New^1 [XX] Existing^1

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

COMPANY NAME: Champion International Corporation COUNTY: Escambia

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) Re-chipper Mill

SOURCE LOCATION: Street State Road 184 at U. S. 29 City Cantonment

UTM: East 1,111,700 468.846 North 596,100 3386.059

Latitude 30 ° 36 ' 30 "N Longitude 87 ° 19 ' 30 "W

APPLICANT NAME AND TITLE: Champion International Corporation

APPLICANT ADDRESS: P. O. Box 87, Cantonment, Florida

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Champion

I certify that the statements made in this application for a Construction 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: William C Bannan

William C. Bannan, VP/Operations Manager
Name and Title (Please Type)

Date: 4/14/89 Telephone No. (904) 968-2121

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

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

---

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

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

Daniel B. Smith, P.E.
Name (Please Type)

Baskerville Donovan Engineers, Inc.
Company Name (Please Type)

316 South Baylen Suite 300 Pensacola 32501
Mailing Address (Please Type)

Florida Registration No. 35633 Date: May 2, 1989 Telephone No. 904-438-9661

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.

Installation of a Pine Chip Thickness Screening System to separate and reprocess oversized chips. (see attached supplement)

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

Start of Construction May, 1989 Completion of Construction October, 1989

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.)

Air Density Separator Cyclone - $10,000

Air-Veyor Cyclone - $10,000

Conveyor Covers - $17,500

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

Construction Permit Application No. AC17-113551

Operating Permit No. AC17-145671

E. Requested permitted equipment operating time: hrs/day 24; days/wk 7; wks/yr 52; if power plant, hrs/yr N/A; if seasonal, describe: N/A

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: See Attached Supplement

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		

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

1. Total Process Input Rate (lbs/hr): ______

2. Product Weight (lbs/hr): ______

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]		Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/yr	T/yr	

[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) See Attached Supplement

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (If applicable)	Basis for Efficiency (Section V Item 5)

E. Fuels Not Applicable

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	

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

Fuel Analysis:

Percent Sulfur: ____________ Percent Ash: ____________

Density: ____________ lbs/gal Typical Percent Nitrogen: ____________

Heat Capacity: ____________ BTU/lb ____________ BTU/gal

Other Fuel Contaminants (which may cause air pollution): ____________

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

Annual Average ____________ Maximum ____________

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

All liquid and solid waste generated will be returned to the process or treated in the mill's treatment plant before discharge to Eleven Mile Creek.

See Attached Supplement

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

Stack Height: ______ ft. Stack Diameter: ______ ft.

Gas Flow Rate: ______ ACFM ______ DSCFM Gas Exit Temperature: ______ °F.

Water Vapor Content: ______ % Velocity: ______ FPS

SECTION IV: INCINERATOR INFORMATION

Not Applicable

Type of Waste	Type 0 (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq.& Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated							
Uncontrolled (lbs/hr)							

Description of Waste ______

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

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

Manufacturer ______ ______

Date Constructed ______ Model No. ______

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

Stack Height: ______ ft. Stack Diamter: ______ Stack Temp. ______

Gas Flow Rate: ______ ACFM ______ DSCFM* Velocity: ______ 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: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ______

Brief description of operating characteristics of control devices: ____________

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

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

SECTION V: SUPPLEMENTAL REQUIREMENTS (See Attached Supplement)

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)]
See pages 4 and 5, and figures one and two.
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. See pages 4, 5, and figures one and two.
3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).
See appended test data and manufacturer's data.
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.)
See appended manufacturer's data.
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). See pages 4, 5, and figures one and two.
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. See figures one and two.
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).
See Part III in supplement.
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.
See Part III in supplement.

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 (Not Applicable)

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

☐ Yes ☐ No

Contaminant	Rate or Concentration

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

☐ Yes ☐ No

Contaminant	Rate or Concentration

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).

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

*Explain method of determining

5. Useful Life:

6. Operating Costs:

7. Energy:

8. Maintenance Cost:

9. Emissions:

Contaminant	Rate or Concentration

10. Stack Parameters

a. Height: ft.

b. Diameter: ft.

c. Flow Rate: ACFM

d. Temperature: °F.

e. Velocity: FPS

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

1.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

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

2.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

---

[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:

Explain method of determining efficiency.

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 (Not Applicable)

A. Company Monitored Data

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

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

Other data recorded ______________________

Attach all data or statistical summaries to this application.

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

2. Instrumentation, Field and Laboratory

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

b. Was instrumentation calibrated in accordance with Department procedures?

[ ] Yes [ ] No [ ] Unknown

B. Meteorological Data Used for Air Quality Modeling

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

2. Surface data obtained from (location)____________________

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

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

C. Computer Models Used

1. ____________________ Modified? If yes, attach description.

2. ____________________ Modified? If yes, attach description.

3. ____________________ Modified? If yes, attach description.

4. ____________________ Modified? If yes, attach description.

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

D. Applicants Maximum Allowable Emission Data

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

E. Emission Data Used in Modeling

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

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

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

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

Fisher-Klosterman, Inc.

Bulletin 218-C

GMT
3-88

XQ Series High Performance Cyclones
Custom-Engineered Pollution Control/Product Recovery Systems

IGCI

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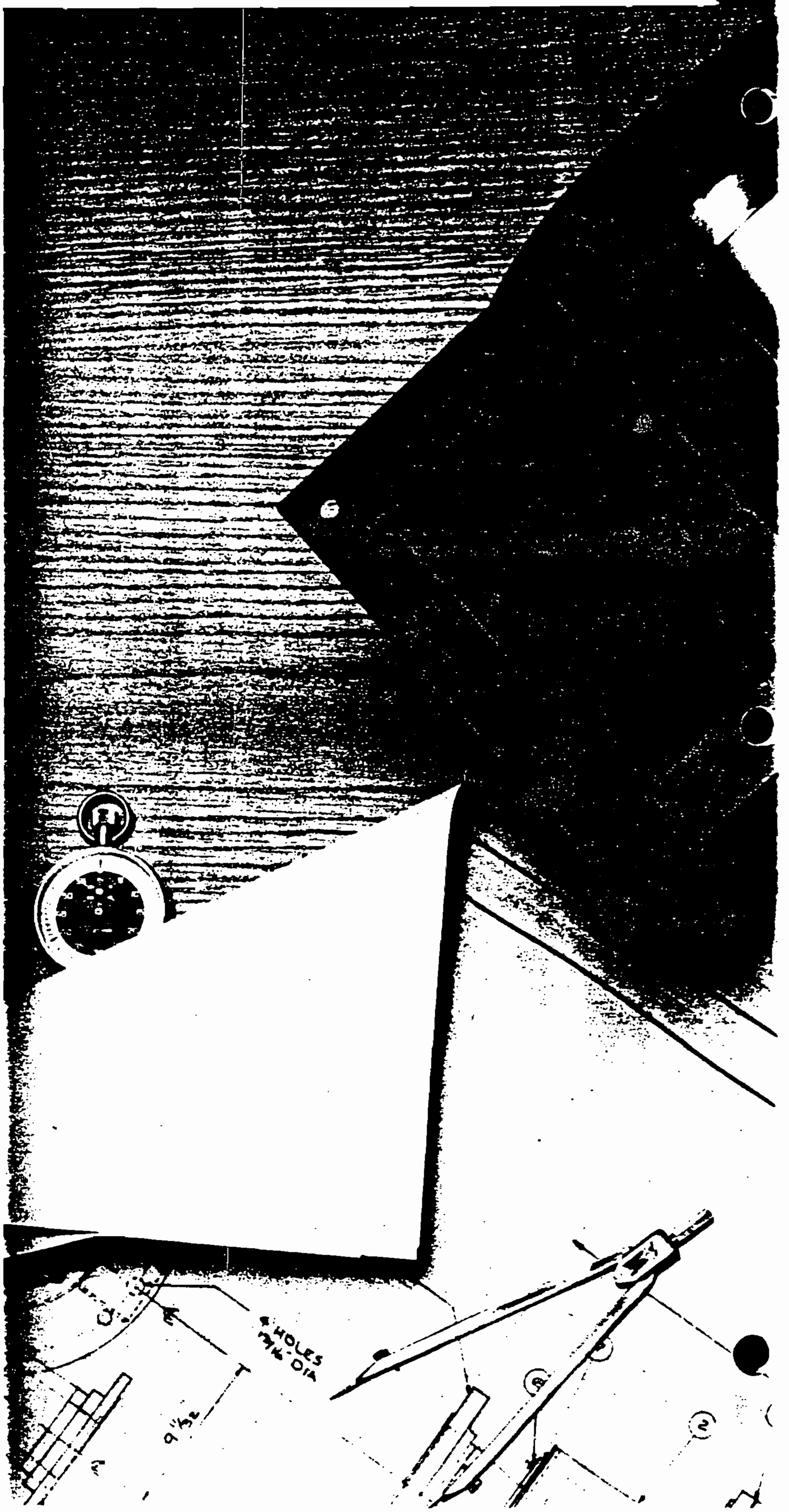
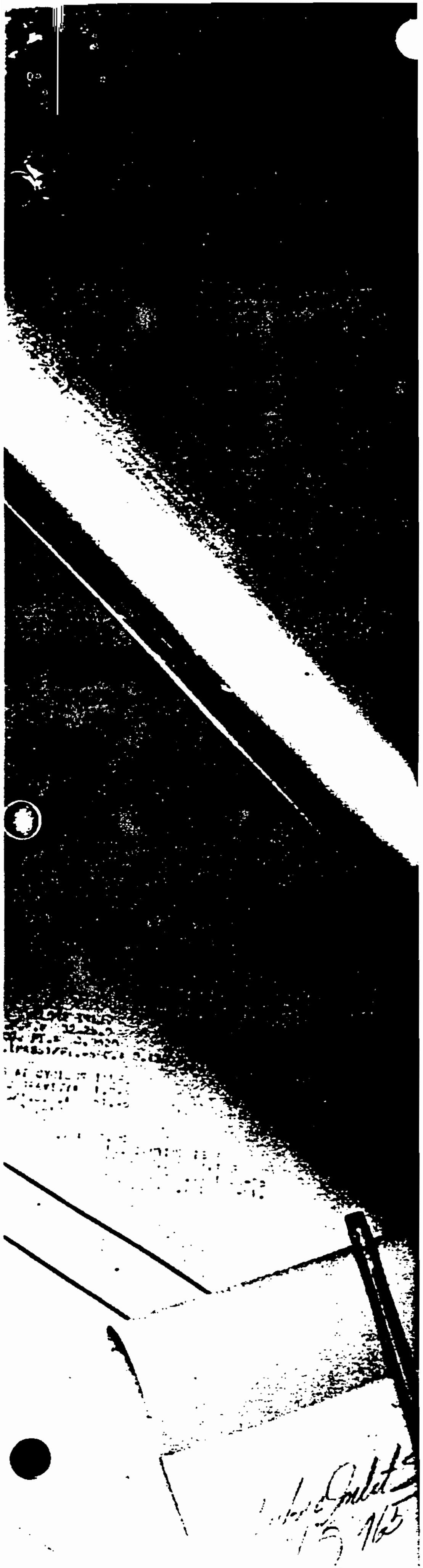




Fisher-Klosterman, Inc. Innovative Pollution Control Equipment Since 1948

For decades, Fisher-Klosterman has earned recognition as playing a leading role in the engineering, fabrication and installation of high-performance, custom-designed dust collection equipment and systems. By operating on the cutting edge of gas/particulate separation technology, they have repeatedly provided their customers with innovative, cost-effective means of controlling particulate pollution.

Fisher-Klosterman pioneered the use of digital computers to aid in the selection and performance prediction of air pollution control and dust collection equipment such as high-performance cyclones and venturi scrubbers. They are the first in the field to have a complete library of proprietary computer programs to aid in the design of equipment to handle *any* set of pollution control conditions economically.

Accurately predicting the performance of a cyclone separator under any given set of conditions involves solving a number of inter-related problems in physics, three dimensional, multi-phase fluid dynamics, and statistics and probability; problems so complex that it can, in some cases, take even the most experienced engineer up to a full day for just the mathematics, with the aid of a sophisticated electronic calculator.

With the proper information supplied, Fisher-Klosterman can respond to a customer with cyclone selection and accurate performance data in as little as *30 minutes!*

As specialists in custom-designed, high performance cyclones, Fisher-Klosterman is the top-ranked supplier of cyclones for exotic pollution control situations: refractory brick and ceramic, castable refractories, and many other linings for high abrasion/high temperature conditions; ASME certified and code-stamped cyclones for use in high pressure or vacuum systems; food-grade welding; designs to withstand or to dissipate explosions; ultra high temperature designs; rubber and cast polyurethane linings; and special alloys to resist chemical attack and corrosion. The variety of specialized applications is virtually limitless.

Performance Assurance

The first step in designing a cyclone is to determine the aerodynamic characteristics of the particulates that are to be separated from the gas. To do this, Fisher-Klosterman's modern Materials Laboratory measures such variables as the specific gravity and aerodynamic particle size distribution of representative dust samples supplied by the client.

Samples can also be subjected to rigorous analysis under scaled-down operating conditions in Fisher-Klosterman's Pilot Testing Lab.

Data from these tests are computer-analyzed, using sophisticated, field-proven modeling and scale-up programs to produce accurate, detailed performance predictions of the full-scale system. Laboratory services and analyses are performed at cost as an aid to our customers in the selection of the proper equipment for any job.

Total-System Engineering

Using the computer-generated analyses obtained from the labs, and drawing on more than thirty years of experience, Fisher-Klosterman engineers can design a complete pollution control or solids collection system to meet the client's criteria of performance, structural compatibility, space and arrangement constraints, and economy. Depending on the customer's requirements, this system can entail anything from a single small cyclone to a complex, turnkey installation that utilizes cyclones, scrubbers and even more exotic pollution control equipment.

Prompt, Personal Service

A key factor in Fisher-Klosterman's achieving their leadership position in the industry is their insistence on speedy delivery and on maintaining a close, one-on-one relationship with their customers throughout the design, installation and start-up periods of any equipment. Fisher-Klosterman feels that this is the only way to learn all of a client's requirements and to assure a totally satisfactory installation of pollution control equipment.

BEST AVAILABLE COPY

Fisher-Klosterman XQ Series Cyclones

Performance Engineered to Suit Your Needs and Budget.

A Proven Concept

For over 100 years, cyclones have proven themselves as the most economical, reliable, effective means of controlling particulate pollution or recovering suspended product from process gas streams.

Simply stated, a cyclone operates by generating, within itself, a high velocity vortex of particulate-laden gases. Centrifugal force hurls the denser particles toward the cyclone walls, where they spiral downward into a collection receptacle. The lighter and, by now, relatively particulate-free gases are then exhausted from the cyclone's outlet.

In addition to the size, density and aerodynamic characteristics of the particulate matter, a number of complex inter-related factors affect the relative efficiency of any cyclone. These factors include the cyclone configuration and size; the volume, velocity and rotational or angular acceleration of the particulate-laden gas stream; and the residence time of the gas in the cyclone.

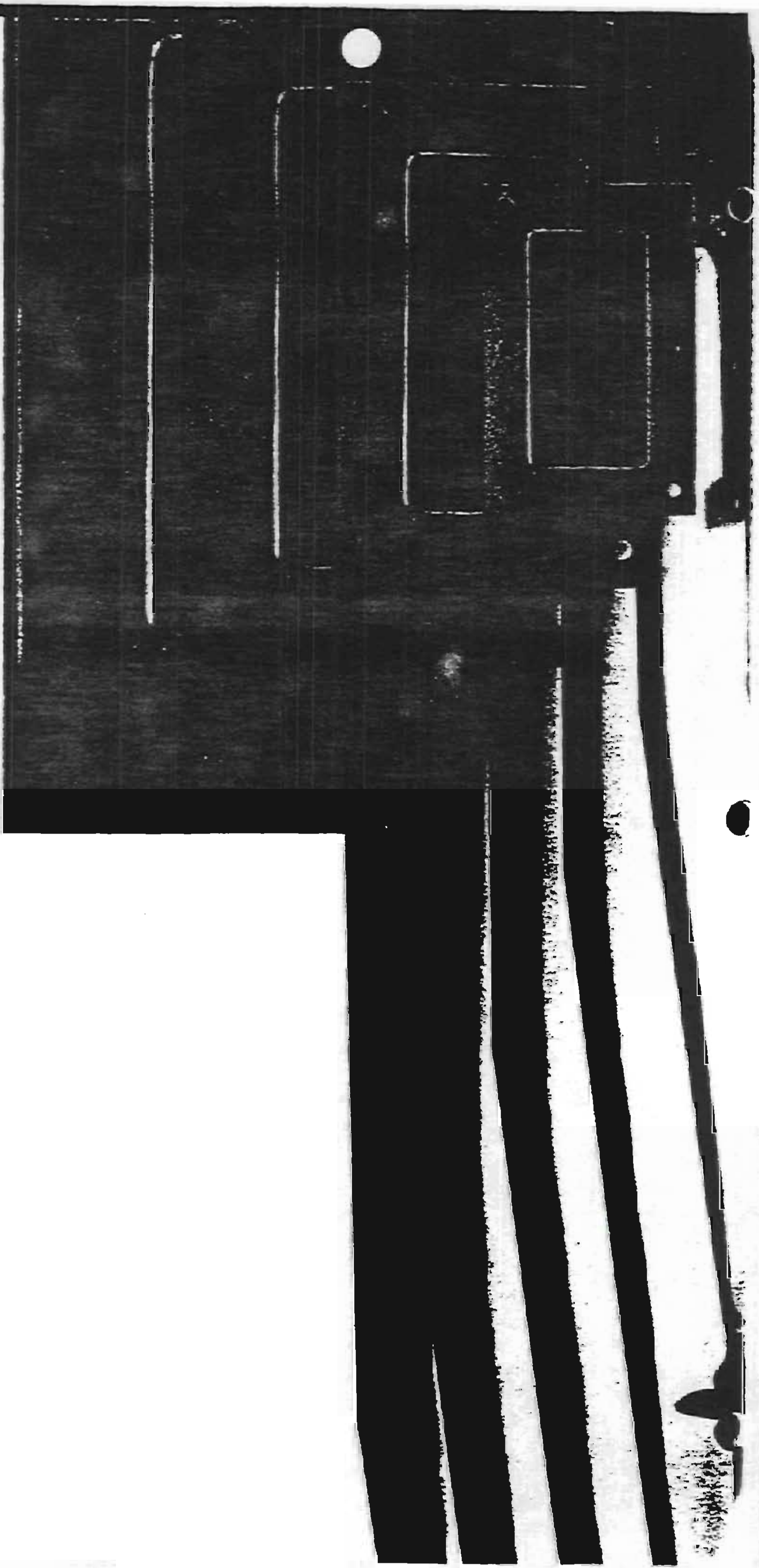
The XQ Series

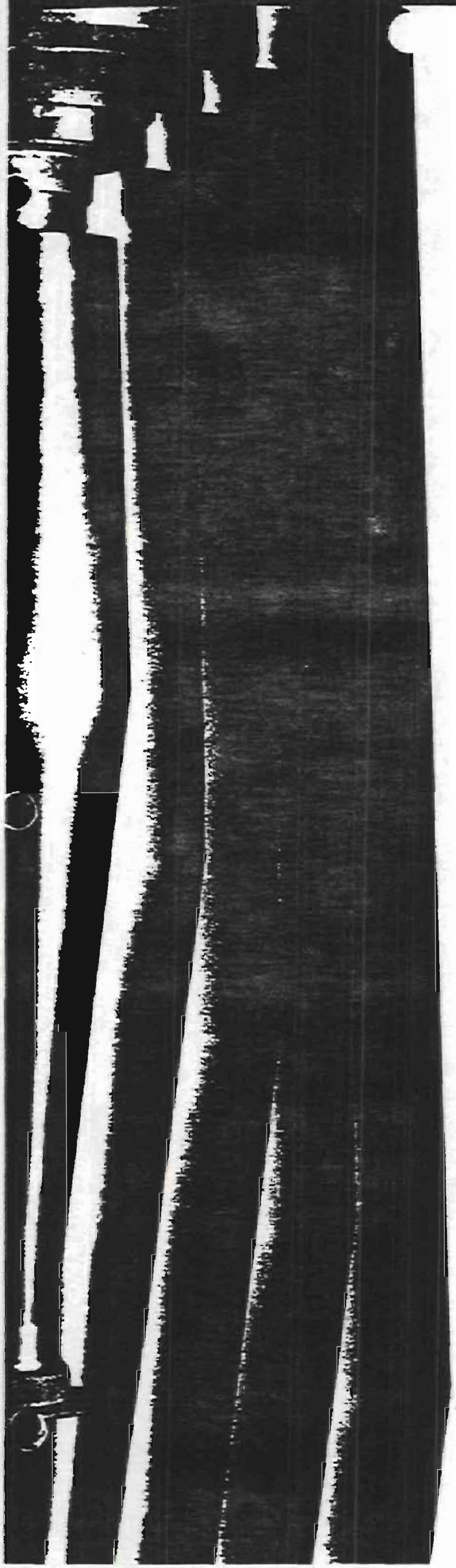
An Innovative Approach to High-Performance Cyclones.

Fisher-Klosterman's new XQ Series of cyclones represents not only the newest state-of-the-art in cyclone design, but also a revolutionary concept in matching performance and cost to the customer's individual needs.

Unlike other manufacturers, who offer one or two basic models, Fisher-Klosterman offers six basic families in their XQ Series: XQ465, XQ405, XQ340, XQ240, XQ170 and XQ120, in order of increasing efficiency. The XQ465, for example, is less costly but, with a shorter residence time, removes a lower percentage of particulates than a more costly XQ405, under the same operating conditions.

If your needs call for the removal of only relatively large, easily separated particles, the XQ465 may be the most cost-effective means of dust collection or pollution control. If, however, you are faced with tougher particulate-removal demands, it becomes necessary to select one of the more efficient families to handle your needs.





Cyclone size is another factor affecting performance. Within each of the six XQ Series families, the larger the cyclone, the greater the volume of gases it can handle effectively. While the dimensional drawings on pages 10-15 indicate a number of sizes in each family, there is in fact an infinite spectrum of sizes, from the smallest it is possible to fabricate to the largest it is possible to ship or field assemble. Since the geometric proportions within each family remain constant, it is a simple matter to project the dimensions of any cyclone whose size is not shown in the charts.

In general, two or more smaller cyclones operating in parallel and under the same conditions will remove particulates more efficiently than one large cyclone of the same family. On the other hand, one large cyclone is significantly less costly than two or more smaller ones. However, limited headroom, structural requirements at the point of installation and other factors may dictate the size limitations of the cyclone selected. In all cases, Fisher-Klosterman will engineer the cyclone collector that will optimize cost and performance.

The six basic families of XQ Cyclones essentially span the entire spectrum of possible performance characteristics. However, if Fisher-Klosterman's lab tests or analysis of your problem indicate the need for a cyclone with performance characteristics somewhere in between those offered by two of their six basic families, Fisher-Klosterman can readily engineer precisely the high-performance cyclone you need.

An unlimited range of sizes and performance characteristics, plus higher efficiencies than ever achieved before, assure you that there's a Fisher-Klosterman XQ Series Cyclone that's right for your needs . . . and at the right price.

Factors to Consider in Selecting Your XQ Series Cyclone

Four Basic Uses

Cyclones are the oldest, simplest, most economical and most widely used method of separating solids from gas streams. Their uses fall into four categories:

1. Pollution Control

This is a very important and, with the development of the XQ Series, a rapidly expanding application of cyclones. In many cases where, previously, more exotic dust collectors were required, there's a Fisher-Klosterman XQ Series Cyclone efficient enough to meet the most stringent air pollution control codes, with no other equipment needed.

2. Product Recovery

Fisher-Klosterman cyclones are widely used in process industries for removing valuable product from gas streams, either at intermediate stages or at the end of the production process. For example, a cyclone is an extremely economical means of recovering many types of products from spray dryers, kilns, fluid bed reactors and similar process equipment. Another common application is the recovery of catalyst, as in petroleum refinery cat-crackers.

3. Pre-Cleaner Ahead of More Exotic Pollution Control Equipment

Other types of collectors, such as scrubbers, fabric collectors, and precipitators, are sensitive to high loadings of particulates. Excessive amounts of particulate matter overload them and cause them to malfunction. Fisher-Klosterman XQ Series Cyclones protect these devices and allow them to function at peak efficiency.

4. Particulate Size Classification

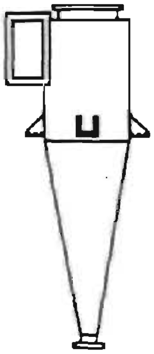
XQ Series Cyclones from Fisher-Klosterman provide effective, economical classification of gas-borne particulates by matching performance characteristics of the cyclone with the range of particle sizes it is desired to extract.

Installation Options

Depending on a number of considerations, including performance requirements, space and structural limitations, there are a number of installation options available for Fisher-Klosterman XQ Series Cyclones.

Single Cyclone

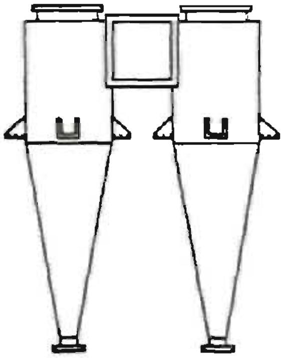
In many instances, this is the most economical option in installing a Fisher-Klosterman XQ Series Cyclone. Within limits determined by materials, shipping or field assembly and installation, this is generally the first choice when headroom and structural requirements are not limiting factors.



SINGLE CYCLONE

Parallel Cyclones

XQ Series Cyclones operating in parallel offer comparably higher efficiencies per volume of gas handled, with the efficiency increasing as an inverse function of the size of the cyclones. This is a more costly installation than a single cyclone, but is frequently necessitated by limited headroom or other structural requirements.



PARALLEL CYCLONES

There is no theoretical limit on the number of XQ Series Cyclone that may be installed in parallel, but there are a number of precautions that must be observed:

1. Through proper manifolding and, if necessary, use of dampers, each cyclone must receive a nearly equal share of the gas stream.

2. Product discharges into collection receivers MUST be isolated from one another.

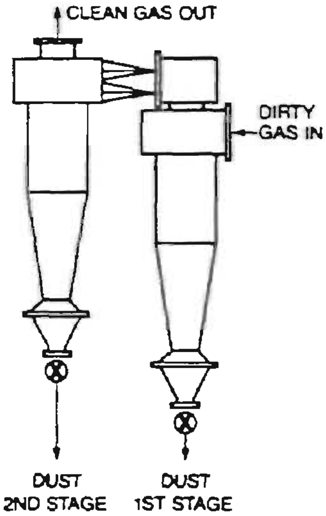
If this precaution is not rigorously observed, minute imbalances in gas volume and pressure will generate a feedback of particulates from the higher pressure cyclones, creating far lower operating efficiencies than predicted.

Discharges may be isolated either by each cyclone's discharging into its own sealed container or by all cyclones' discharging into a single compartmentalized receiver in which each compartment is sealed off from the others.

Cyclones in Series

If there is sufficient pressure available, Fisher-Klosterman XQ Series Cyclones may be operated in series to achieve even greater collection efficiency.

In a series installation, the exhaust gas stream from one cyclone is fed into the inlet of the next cyclone. The effect of such a series is cumulative: if the first cyclone collects 90% of, for example, the 10 micron particles from the gas stream, a second identical cyclone will also collect 90% of the 10 micron particles remaining in the stream exhausted from the first cyclone. This creates a cumulative collection efficiency of 99% at 10 microns. A third such cyclone in series would boost the cumulative efficiency to 99.9%, and so on.



CYCLONES IN SERIES

The factor limiting the number of cyclones that can be used in series is pressure drop. Each cyclone in a series generates its own pressure drop, so that two cyclones will have double the drop of one and so on. However, in some applications, cyclones are the only feasible type of collector for particulate separation and, in such cases, increased pressure drop must be tolerated to achieve the required performance levels.

It is *extremely important* that each cyclone in a series have a *totally* isolated discharge receiver. Compartmentalization in a single receiver, as for parallel installations, is *not* sufficient. If isolation is not achieved, particles collected by the first stage cyclone will be re-entrained in the second stage cyclone, and so on.

Performance Assurance

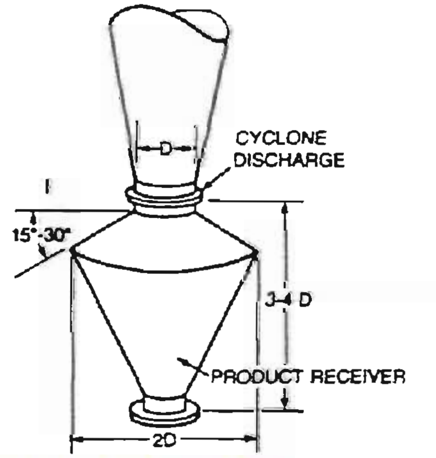
For us to guarantee that a Fisher-Klosterman XQ Series Cyclone performs as specified, the following conditions must be met:

Product Discharge

The single most common cause of poor performance in cyclones is faulty design of the product discharge receiver.

Any high-performance cyclone *must* have an air-tight receiver at its product discharge. At the bottom of every well-designed cyclone, there is a tendency to create an induced flow of air into the product discharge from the outside. If the receiver is not air-tight, this can set up currents which will drive already collected particulates back into the cyclone.

Also, because the vortex at the product discharge creates extreme turbulence, re-entrainment will occur if material is allowed to accumulate close to the discharge. For this reason, rotary locks, feeder valves or air-tight screw conveyors should be installed some distance below the discharge, if high performance is expected.



The figure above illustrates the typical proportions of a well-designed receiver. The proportions are subject both to engineering judgment and space limitations. For coarse, dense, easy-to-collect dusts, the height and diameter may be reduced. Extremely fine, hard-to-collect materials, on the other hand, require as large a receiver as is practical. In any event, no material should be stored or allowed to accumulate in the receiver.

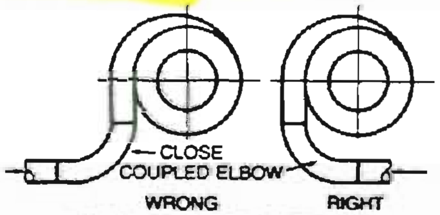
Inlet Velocity

The inlet velocity of the gas stream must be high enough to keep materials airborne and prevent them from clogging the cyclone at this critical point. However, it should be remembered that higher inlet velocities generate higher inlet wear, particularly with highly abrasive materials. If abrasion is a critical factor, it would be advisable to move to the higher efficiency (i.e. *lower* family number) XQ Series Cyclones that can achieve the desired efficiency at lower velocities.

Inlet Ductwork Design

To assure proper performance, ductwork must be designed to maintain sufficiently high velocities to keep particulates airborne and to convey them into the cyclone. This is particularly critical with dense, heavy material, as well as with very fine dusts which have a tendency to adhere to surfaces with which they come in contact.

For maximum efficiency, it is important that any bends or elbows just ahead of the cyclone be made in the proper direction. Where the gas is flowing vertically up or down through the ductwork, close-coupled elbows that turn the flow horizontally are acceptable. For horizontal ductwork, it is *extremely important* that any close-coupled elbows turn in the *same direction as the flow in the cyclone* (i.e. clockwise elbows for cyclones with a clockwise rotation). Elbows in the opposite direction from the cyclone's flow can severely reduce the cyclone's efficiency.



PLAN VIEW OF HORIZONTAL DUCT AT CYCLONE INLET

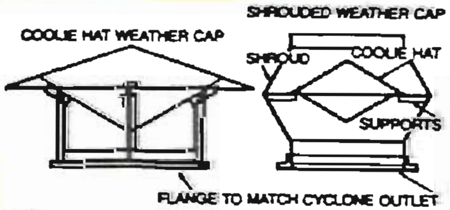
In any event, if round ductwork is used, a gradual transition (15°incl. angle recommended) to the rectangular cyclone inlet is mandatory.

Accessories

A number of performance-compatible accessories are available for XQ Series Cyclones. The following items are standard. Custom designs are also available.

Cyclone Outlet Accessories

Standard Weather Caps for direct-to-atmosphere discharge, in both "coolie-hat" and shrouded designs.



Scroll Outlets, when outlet ducting is required and wherever headroom is limited. Scroll outlets turn the vertical, spinning exhaust in a horizontal direction in minimum headroom and eliminate most of the gases' residual spin. This results in a small savings in pressure loss and is less expensive than a custom-fabricated elbow.

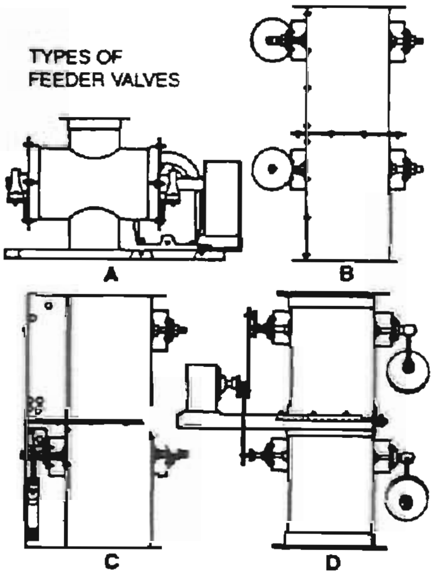
Product Discharge Outlet Accessories

Dust Receivers that meet the air-tight requirements of high-performance cyclones and act as transitions between the cyclones and various types of air-tight feeder valves for solids discharge.

Feeder Valves designed for Fisher-Klosterman XQ Series Cyclones maintain the air-tight integrity required for good cyclone performance, while making it possible to discharge the collected material from the receiver continuously.

Several types of feeder valves are available:

A. Rotary air locks
B. Counterweighted, gravity operated double-dump valves
C. Counterweighted, air cylinder operated double-dump valves
D. Counterweighted, motor operated double-dump valves



Support Stands designed specifically for the XQ Series Cyclones and their accessories.

Technical Guide to the Selection of Fisher-Klosterman XQ Series High-Performance Cyclones

This section is intended for use by the Application Engineer in specifying the correct XQ Series Cyclone for his needs. Naturally, Fisher-Klosterman will be happy to provide all the assistance needed, or to undertake the complete engineering project, if desired.

Selection Factors

Three factors must be considered in selecting a cyclone for any application:

1. Inlet Velocity
2. Pressure Loss
3. Collection Efficiency.

Proper calculation of these variables insures the selection of an XQ Series Cyclone that will perform with maximum efficiency and cost effectiveness.

Inlet Velocity

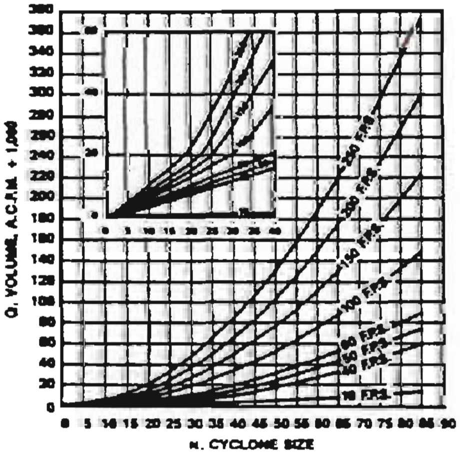
Most cyclone literature assumes an inlet velocity range from 20 to 100 feet per second. Most industrial applications have historically fallen in the 40 to 60 f.p.s. range. However, the range you consider need not be so narrow. Extensive testing and field experience have shown that Fisher-Klosterman XQ Series Cyclones perform predictably at velocities as low as 10 f.p.s. and well beyond 150 f.p.s.

The choice of inlet velocity is generally dictated by the aerodynamic characteristics of the particulates to be collected and the possibility of abrasion, as well as available space, equipment cost and power consumption.

Figure 1 shows the relationship between cyclone size (N), volumetric gas flow rate (Q) in ACFM, and inlet velocity (v_i) in f.p.s.

Application Engineers should consider that collection efficiency will increase as a complex exponential function of the inlet velocity. (This will be discussed in greater detail in a later section on collection efficiency.) Power consumption will increase approximately as the square of the inlet velocity. When abrasion is not a significant factor, these two criteria alone will determine the proper cyclone for the intended application.

FIG. 1

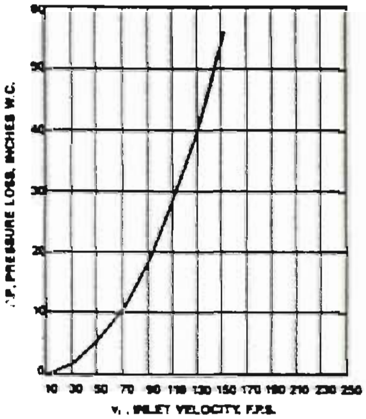


Pressure Loss

Energy is consumed in the passage of the gas through the cyclone. This is expressed as the pressure drop between the gas inlet and gas outlet of the cyclone, and is usually measured in inches of water column (in. w.c.). In any cyclone, the pressure loss increases approximately as the square of either the volumetric flow rate (Q) or the inlet velocity (v_i), and directly as the density (λ_g) of the gas.

Figure 2 shows the relationship between inlet velocity (v_i) and pressure loss (ΔP) in an XQ Series Cyclone with air at 70°F and 14.7 p.s.i.a.

FIG. 2



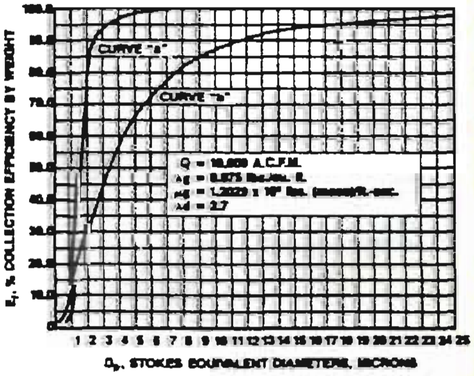
Fractional Efficiency

Efficiency is expressed in percentage by weight. In the Fractional or Particle Size or Grade Efficiency (E_f) Curve, the independent variable is the Stokes Equivalent Particle Diameter (D_p), in microns. The curve is a complex exponential function of:

1. inlet velocity (v_i) and absolute gas viscosity (μ_g).
2. particle mass, particle size, shape and surface roughness, usually measured as terminal velocity, feet/sec., in still air, and expressed as Stokes Equivalent Diameters (D_p) in microns.
3. cyclone size and proportions (shape).

Figure 3 illustrates two cyclone fractional efficiency curves. Each is for a single cyclone. Both are plotted at identical conditions: gas flow rates, densities and absolute viscosities are equal, as are cyclone pressure drops and particle density for both cyclones. Curve "a" is for an XQ120 cyclone, and Curve "b" is for an XQ465.

FIG. 3



Manual calculation of a fractional efficiency curve for just a single case is a complex and tedious problem, even for an experienced engineer. Fisher-Klosterman, however, has reduced this task to simplicity itself by the use of the digital computer. To determine a fractional efficiency curve, the following data are required:

- Volumetric gas flow rate, A.C.F.M., Q
- Gas density, lbs./cu. ft., λ_g
- Gas absolute viscosity, lbs. (mass)/ft.—sec., μ_g
- Particle specific gravity (dimensionless), or true particle density, gms/c.c., λ_d

If gas density and viscosity are not known, the gas analysis plus its temperature and pressure should be specified. Also, to aid in the selection of the best and most economical cyclone for your needs, either or both of the following should be specified:

- Maximum pressure drop, inches w.c.
- Desired efficiency at some specified particle size.

Helpful, but not mandatory, the following data should be furnished if available:

- Dust fineness, typically expressed as % by weight finer than 1.5 microns
- Inlet dust loading, grains/A.C.F.

With this information, our experienced application engineers can provide complete computer-calculated fractional efficiency curves in a matter of minutes.

Total Efficiency

Total Collection Efficiency (E_t) is defined as the percent by weight of the gas-borne particulate separated by the cyclone. To calculate Total Efficiency, not only must the Fractional Efficiency curve of the cyclone be known, but also the size distribution of the particulate.

The independent variable in the particle size distribution should be Stokes Equivalent Diameters, usually expressed in microns (one-millionth of a meter). This is a hypothetical aerodynamic diameter which accounts for the size, shape, mass and texture of the particle.

One word of caution: Optical techniques, screening, analytical instrumentation which measures particle size by determining the amount of liquid a particle displaces and other non-standardized methods do not give data which can be used with any degree of confidence or accuracy in calculating cyclone performance. If you have any doubts about your data, you should utilize our laboratory services. (See page 3).

The dependent variable in the Particle Size Distribution is generally expressed as "percent by weight finer" than a specified Stokes Equivalent Diameter in microns. Equally usable is data specifying the percent by weight falling in the range between two specified diameters.

The calculation of Total Efficiency involves the following steps:

- If it is not already in that form, convert the Particle Size Distribution to a cumulative % by weight finer than any specified diameter.
- Find the derivative of the Particle Size Distribution.
- Multiply the derivative by the Cyclone Fractional Efficiency Curve.
- Integrate the resulting product from zero particle diameter to infinity to find Total Collection Efficiency.

Although the above process sounds straightforward, the product to be integrated does not, in fact, have a rational integral. The problem must therefore be solved by one of three techniques:

- Graphical methods, or;
- Express the product as an infinite series which can be integrated term by term, or;
- Find the integral of the product by Numerical Calculus.

The latter method lends itself ideally to the digital computer. Given the same data as outlined for the computation of the Fractional Efficiency Curve (see page 8), plus the Particle Size Distribution, we can calculate and report Total Collection Efficiency to you in just a few minutes.

However, in many cases, you may wish to make an approximate calculation of Total Collection Efficiency yourself. A method for doing so involves the use of an "Average Limit Particle," and its use permits you to examine the consequences of varying both the type of cyclone and the number in parallel that you are considering. You must be aware that this method is only an approximation. Its accuracy decreases in two cases:

- When the particle size distribution is very narrow. Much more accurate results are obtained if the distribution ranges, for example, between 1.0 and 100.0 microns than if all particles fall between 1.0 and 10.0 microns.
- The lower the Total Collection Efficiency (the finer the particulate), the lower the accuracy of this method.

The Average Limit Particle size is calculated by:

$$D_l = k\sqrt{\frac{\mu_g \times N^3}{\lambda_d \times Q}},$$

where D_l = Average Limit Particle, microns.

μ_g = Absolute viscosity of gas, lbs. (mass)/ft.—sec.

N = Cyclone size.

λ_d = Particulate specific gravity, or true particle density, grams/c.c.

Q = Volumetric gas flow rate, A.C.F.M.

k, a constant, is given in Table 1 for each family of cyclones in the XQ Series.

Table 1

Cyclone Family	XQ465	XQ405	XQ340	XQ240	XQ170	XQ120
k	1254.27	1069.19	923.120	741.378	621.110	543.522

The approximate Total Collection Efficiency is calculated by:

$$\varepsilon_t = 100.0 - f_l,$$

where ε_t = Approximate Total Collection Efficiency, % by weight.

f_l = The percent finer by weight, in the Particle Size Distribution at the Average Limit Particle Size.

Examples of Cyclone Calculations

Example #1

Given:

Q = 6,800 A.C.F.M.

Gas = Air at 460° F. and 14.7 p.s.i.a.

λ_g = 0.036 lbs./cu. ft.

$\mu_g = 1.76 \times 10^{-5}$ lbs. (mass)/ft.—sec.

Specifications:

v_i = 70. f.p.s., maximum

ΔP = 3.0 in. w.c., maximum

NOTE ACTUALLY ASSUMES 40 fps

Calculations:

1. From Figure 1, smallest single cyclone at $v_i \leq 70.$ f.p.s. is SIZE 22. ? HARD TO TELL BY 150
2. Allowable maximum pressure drop at specified conditions must be corrected to the gas density of air at 70°F. and 14.7 p.s.i.a., 0.075 lbs./cu. ft. $\Delta P_{(corr)} = 0.075 \times 3.0/0.036 = 6.25$ in. w.c.
3. From Figure 2, at $\Delta P_{(corr)}$ = 6.25 in. w.c., v_i = 53. f.p.s. The cyclone will have to be resized to this inlet velocity.
4. Returning to Figure 1, smallest single cyclone at v_i 53. f.p.s. is <u>SIZE 25</u>. ? HARD TO TELL BY [illegible]

Example #2

Given:

Q = 12,500 A.C.F.M.

λ_g = 0.075 lbs./cu. ft.

$\mu_g = 1.2029 \times 10^{-5}$ lbs. (mass)/ft.—sec.

λ_d = 3.15

Particle Size Distribution: See Figure 4.

Specifications:

Required Total Efficiency by weight, ε_t = 86.5%

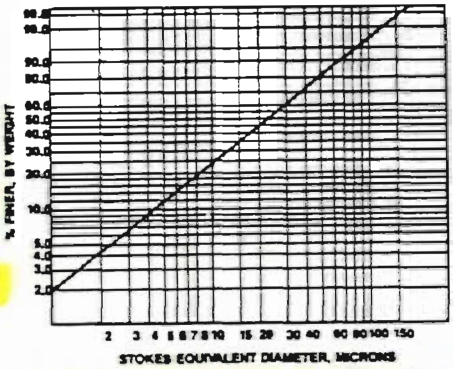
Maximum allowable pressure drop, ΔP = 7.5 in. w.c.

Maximum allowable inlet velocity, v_i = 55 f.p.s.

Calculations:

1. Assume cyclone will be type XQ340
2. From Figure 1 at v_i = 55 f.p.s., Size = 33
3. From Figure 2 at v_i = 55 f.p.s., ΔP = 6.8 in. w.c.
4. From Table 1, k = 923.120
5. By equation (1), $$D_l = 923.120 \times \sqrt{\frac{1.2029 \times 10^{-5} \times 33^3}{3.15 \times 12500}} = 3.06$$
6. From Figure 4, f_l = 7.1
7. By equation (2), $\varepsilon_t = 100.0 - 7.1 = \underline{92.9\%}$

FIG. 4



A typical XQ Series Model Number and What it Means

$$\underbrace{\text{XQ465}}_{A}\text{-}\underbrace{\text{20}}_{B}\text{-}\underbrace{\text{2}}_{C}\text{-}\underbrace{\text{CR1}}_{D}$$

A. *"XQ" plus a 3-digit number* designates the family of the cyclone.

B. *"-" plus a number* designates the cyclone size which equals the height of the cyclone inlet in inches. This may be a 1- or 2-digit number, or a decimal.

C. *"-" plus an integer* indicates the number of cyclones in parallel that make up the complete collection system.

D. *"-" plus a special suffix* designates special construction features. Some examples are:

PV = Pressure Vessel

CR1 = 1-inch Castable Refractory Lining

CR2 = 2-Inch Castable Refractory Lining

RB3 = 3-Inch Refractory Brick Lining

RB9 = 9-Inch Refractory Brick Lining

C.5 = ½-Inch Alumina Ceramic Tile Lining

C1 = 1-Inch Alumina Ceramic Tile Lining

Use the above information when specifying your XQ Series Cyclone. In addition, orders should specify separately:

Material(s) of Construction or (if Fisher-Klosterman is to determine the materials) special construction considerations such as high abrasion or corrosive conditions.

Special Construction Features, such as:

Break-Apart Construction for installations requiring cleaning and maintenance.

Externally Replaceable Wear Plates/Sections or special linings for highly abrasive dusts.

Access Doors (not recommended for the active portion of the cyclone when collection performance is critical).

Explosion Reliefs for use with explosive dusts.

Plus a variety of other features demanded by the individual cyclone's application.

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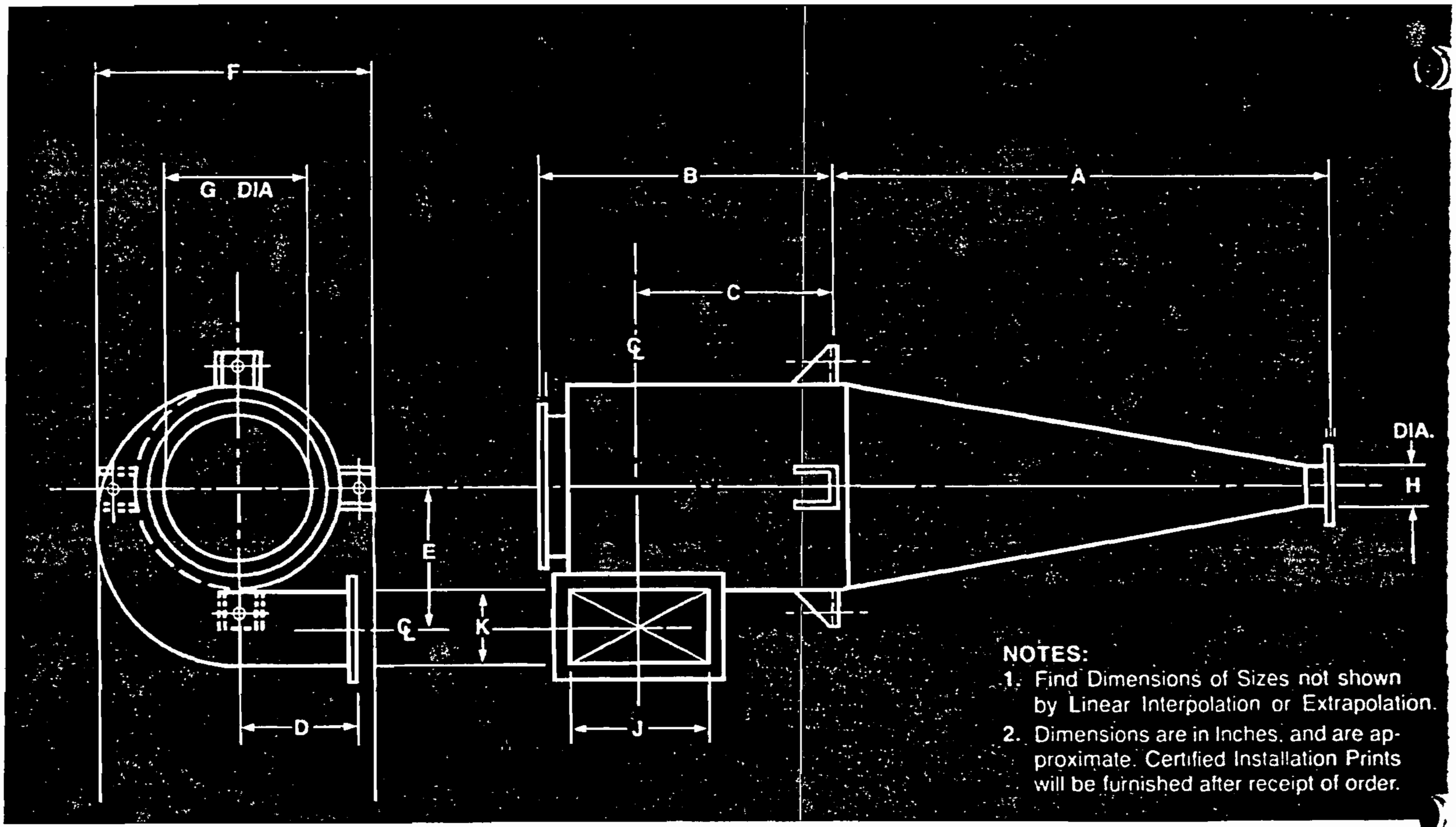
XQ Series Single Cyclone



NOTES:

1. Find Dimensions of Sizes not shown by Linear Interpolation or Extrapolation.
2. Dimensions are in Inches. and are approximate. Certified Installation Prints will be furnished after receipt of order.

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 3	A	10½	11⅜	12⅝	14¾	17¼	20½
	B	7½	8	8⅝	10	11⅝	13½
	C	4	4½	5⅛	6½	8⅛	10
Inlet Height: 3 in.	D	5	5	5	6	6	6
	E	2⅞	3¹⁄₁₆	3¼	3¹¹⁄₁₆	4¼	4⅞
	F	8½	9	9½	10	11½	12½
Inlet Width: 1½ in.	G	3	3	3	4	4	4
	H	2	2	2	2	3	3
Cyclone Size: 4	A	13¾	15	16¼	19¼	23	27
	B	9½	10¼	11	12¾	15	17½
	C	5½	6¼	7	8¾	11	13½
Inlet Height: 4 in.	D	6	6	6	6	7	7
	E	3¾	4	4⁵⁄₁₆	4⅞	5⅝	6⁷⁄₁₆
	F	10	10½	11	12	13½	15
Inlet Width: 2 in.	G	4	4	4	5	5	5
	H	2	2	3	3	4	4
Cyclone Size: 5	A	17¼	18¾	20¼	24	28½	36½
	B	11½	12⅜	13⅜	15¾	18¼	19
	C	7	7⅞	8⅞	11¼	13¾	14½
Inlet Height: 5 in.	D	6	6	6	7	7	8
	E	4¹¹⁄₁₆	5	5⁵⁄₁₆	6¹⁄₁₆	7	8
	F	11	2	12½	14	16	18
Inlet Width: 2½ in.	G	5	5	5	6	6	6
	H	3	3	3	4	5	5
Cyclone Size: 6	A	20½	22¼	24¼	29	36½	43
	B	13½	14½	15¾	18½	19¼	23
	C	8½	9½	10¾	13½	14¼	18
Inlet Height: 6 in.	D	6	7	7	7	8	8
	E	5⅝	6	6⅜	7¼	8⅜	9⅝
	F	12½	13½	14	16	18	20½
Inlet Width: 3 in.	G	6	6	6	7	7	7
	H	3	4	4	5	5	6
Cyclone Size: 7	A	23¾	26	28	36	42	49½
	B	15½	16¾	18¼	18¾	22½	27
	C	10	11¼	12¾	13¼	17	21½
Inlet Height: 7 in.	D	7	7	7	8	8	9
	E	6⁹⁄₁₆	6¹⁵⁄₁₆	7⁷⁄₁₆	8½	9¾	11¼
	F	14	14½	15½	18	20½	25½
Inlet Width: 3½ in.	G	7	7	7	8	9	9
	H	4	4	4	5	6	8
Cyclone Size: 8	A	27	29½	32	40½	48	56
	B	17½	19	20½	21½	26	31
	C	11½	13	14½	15½	20	25
Inlet Height: 8 in.	D	7	7	8	8	9	10
	E	7⁷⁄₁₆	7¹⁵⁄₁₆	8½	9⅝	11⅛	12¾
	F	15	16	17½	19½	24½	28
Inlet Width: 4 in.	G	8	8	8	10	10	10
	H	4	5	5	6	7	9

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		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 9	A	30½	33	38½	45½	53	63
	B	19½	21	20½	24½	29	35
	C	13	14½	14	18	22½	28½
Inlet Height: 9 in.	D	8	8	8	9	9	10
	E	8⅜	8⅞	9½	10⅞	12½	14⅜
	F	16½	17½	19	23½	27	30½
Inlet Width: 4½ in.	G	9	9	9	11	11	11
	H	5	5	6	7	6	10
Cyclone Size: 11	A	37	43	46½	55	65	76
	B	25½	25	27	32	38	45
	C	16	15½	17½	22½	28½	35½
Inlet Height: 11 in.	D	9	9	10	10	11	12
	E	10¼	10⅞	11⅝	13¼	15¼	17⅝
	F	19½	20½	24	27½	31½	36
Inlet Width: 5½ in.	G	11	11	10	13	13	14
	H	6	6	7	8	10	12
Cyclone Size: 13	A	46½	50	55	64	76	90
	B	27	29½	32	38	44½	53
	C	16½	19	21½	27½	34	42½
Inlet Height: 13 in.	D	10	10	10	11	12	13
	E	12	12¾	13⅝	15⅝	17⅞	20⅝
	F	24	25½	27	31	35½	43
Inlet Width: 6½ in.	G	13	13	12	16	16	16
	H	7	8	8	10	12	14
Cyclone Size: 15	A	53	57	62	74	87	103
	B	31	33½	36½	43½	51	61
	C	19½	22	25	32	39½	49½
Inlet Height: 15 in.	D	11	11	11	12	13	14
	E	13⅞	14¾	15¾	18⅛	20⅝	23⅞
	F	26½	28½	30½	35	42	48½
Inlet Width: 7½ in.	G	15	15	14	18	18	18
	H	8	9	10	11	14	16
Cyclone Size: 18	A	63	68	74	88	104	123
	B	37	40	44	52	61	73
	C	24	27	31	39	48	60
Inlet Height: 18 in.	D	12	12	12	13	14	16
	E	16⅝	17⅝	18⅞	21⅝	24⅞	28⅝
	F	30½	32½	35	42½	49	56½
Inlet Width: 9 in.	G	18	17	17	21	22	22
	H	10	11	[illegible]	14	16	19
Cyclone Size: 21	A	73	79	86	102	121	143
	B	43	46½	51	60	72	85
	C	28½	32	36½	45½	57½	70½
Inlet Height: 21 in.	D	13	13	13	14	16	17
	E	19⅜	20⅝	22⅛	25⅛	28⅞	33⅜
	F	34½	37	42	48	55½	68½
Inlet Width: 10½ in.	G	21	20	20	25	26	26
	H	11	12	13	16	19	23

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 25	A	86	94	102	121	143	170
	B	51	55	60	72	85	101
	C	34½	38½	43½	55½	68½	84½
Inlet Height: 25 in.	D	14	14	14	16	17	18
	E	23⅛	24⅝	26⅛	29⅞	34⅜	39 15/16
	F	42	45	48	55½	68½	79½
Inlet Width: 12½ in.	G	25	24	24	30	30	31
	H	13	15	16	19	23	27
Cyclone Size: 30	A	103	112	122	144	171	203
	B	61	66	72	86	102	121
	C	42	47	53	67	83	102
Inlet Height: 30 in.	D	15	15	16	17	19	20
	E	27⅜	29⅜	31⅜	36⅛	41 3/16	47 11/16
	F	48½	52	56	69½	79½	92½
Inlet Width: 15 in.	G	30	29	28	36	36	37
	H	16	18	19	23	27	32
Cyclone Size: 36	A	123	134	146	173	205	243
	B	73	79	87	103	122	145
	C	51	57	65	81	100	123
Inlet Height: 36 in.	D	16	16	17	19	20	22
	E	33⅛	35⅛	37⅝	43 3/16	49 11/16	57¼
	F	56	60	69½	80½	93½	109
Inlet Width: 18 in.	G	36	35	34	43	44	44
	H	19	21	23	27	33	39
Cyclone Size: 43	A	146	159	173	206	244	290
	B	87	95	103	123	146	173
	C	61½	69½	77½	97½	120½	147½
Inlet Height: 43 in.	D	18	18	19	20	22	24
	E	39⅜	41 15/16	44 15/16	51 7/16	59	68⅝
	F	69½	74½	80½	93½	109	128
Inlet Width: 21½ in.	G	43	42	41	51	52	53
	H	23	25	28	33	39	46
Cyclone Size: 51	A	173	188	205	243	289	343
	B	103	112	122	145	172	205
	C	73½	82½	92½	115½	142½	175½
Inlet Height: 51 in.	D	19	19	20	22	24	26
	E	46 15/16	49 15/16	53 7/16	61	70⅛	81⅛
	F	80½	86½	93½	109	127	149
Inlet Width: 25½ in.	G	51	49	58	60	62	62
	H	27	30	33	39	46	54
Cyclone Size: 60	A	203	221	[illegible]	286	339	403
	B	121	132	[illegible]	171	203	241
	C	87	98	100	137	169	207
Inlet Height: 60 in.	D	21	21	22	24	26	28
	E	55 7/16	56¾	[illegible]	71⅞	82⅝	95⅝
	F	92½	100	108	126	147	173
Inlet Width: 30 in.	G	60	58	[illegible]	71	72	73
	H	32	35	38	45	54	64

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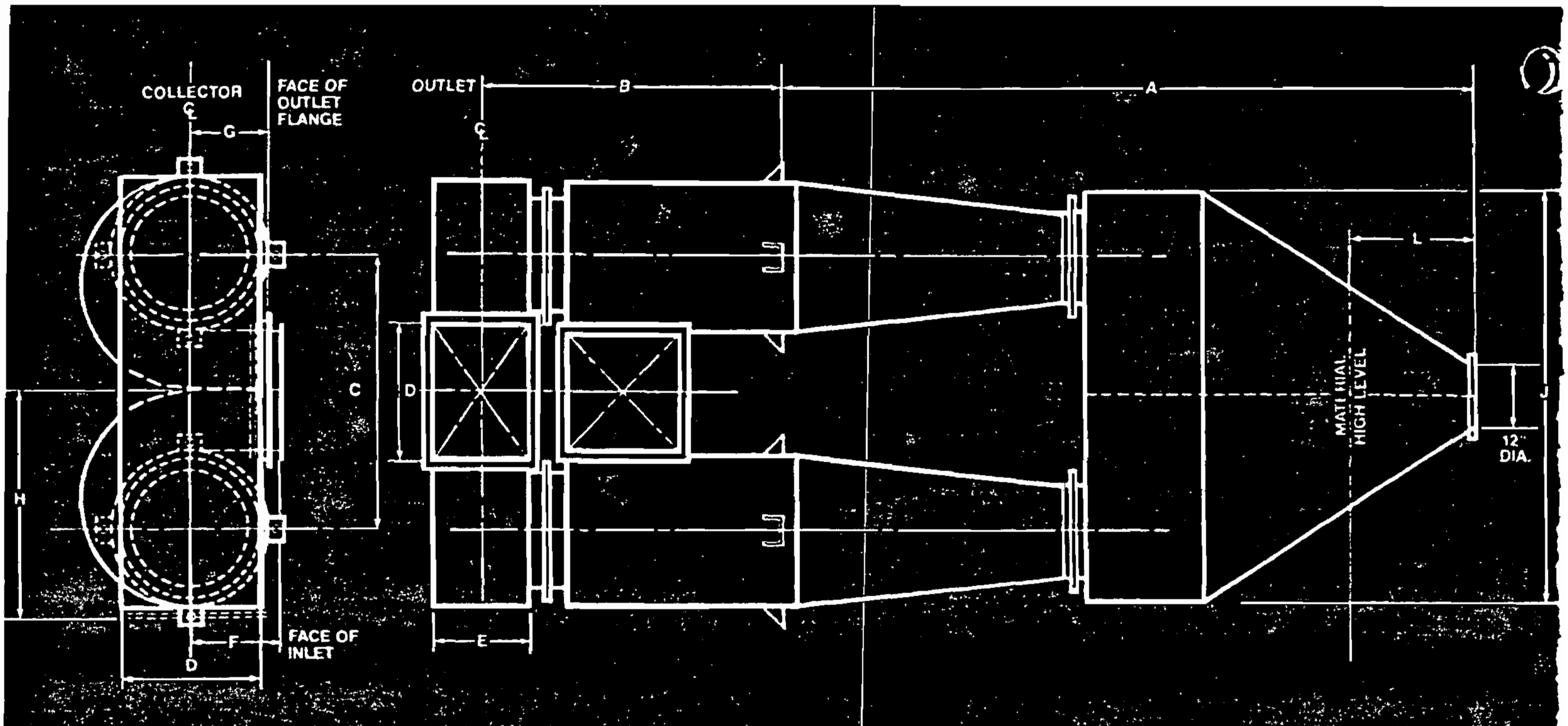
XQ Series Dual Cyclone



NOTES:

1. Find Dimensions of Sizes not shown by Linear Interpolation or Extrapolation.
2. Dimensions are in Inches, and are approximate. Certified Installation Prints will be furnished after receipt of order.
3. Dimension "K" is the Maximum Front-Back Depth of the Dust Hopper.

		XQ-485	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 9-2 Inlet Height: 9 in. Inlet Width: 9⅛ in.	A	50½	55	61½	72½	84	99
	B	24¾	25¾	25¼	30¾	35¾	41¾
	C	21⅜	22⅜	23⅜	26⅜	29⅝	33⅜
	D	13	13	13	15	15	15
	E	10	9	9	12	13	13
	F	14	14	14	15	15	16
	G	7½	7½	7½	8½	8½	8½
	H	22	22	23	26	28	30
	J	35	37	38	43	48	54
	K	14	14	15	16	19	21
	L	2	3	2	2	2	1

		XQ-485	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 13-2 Inlet Height: 13 in. Inlet Width: 13⅛ in.	A	76½	83	90	105	123	145
	B	35¼	37¼	39¼	47¾	54¾	63¼
	C	30⅝	32⅛	33⅞	37⅞	42⅜	47⅞
	D	17	17	17	20	20	20
	E	16	15	14	19	20	20
	F	16	16	16	17	18	19
	G	10½	10½	10½	12	12	12
	H	31	31	31	37	39	42
	J	47	50	52	59	66	75
	K	17	18	19	21	24	27
	L	5	6	5	6	5	6

		XQ-485	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 11-2 Inlet Height: 11 in. Inlet Width: 11⅛ in.	A	62	70	75½	89	104	122
	B	32¼	31¼	33¼	40¼	46¼	53¼
	C	26⅛	27⅜	28⅞	32⅛	36⅛	40⅞
	D	15	15	15	17	18	18
	E	13	12	12	16	16	16
	F	15	15	16	16	17	18
	G	9½	9½	9½	10½	11	11
	H	26	27	27	31	34	36
	J	41	43	46	51	57	65
	K	15	16	17	19	21	24
	L	3	4	4	4	3	4

		XQ-485	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 15-2 Inlet Height: 15 in. Inlet Width: 15⅛ in.	A	89	95	104	122	142	167
	B	40¾	42¾	45¼	55¼	62¾	72¾
	C	35⅜	37⅛	39⅛	43⅞	48⅞	55⅜
	D	19	19	18	22	22	23
	E	19	18	17	23	23	23
	F	17	17	17	18	19	20
	G	11½	11½	11	13	13	13½
	H	35	35	36	42	45	48
	J	54	56	60	67	75	86
	K	18	19	21	23	27	30
	L	7	6	8	8	7	7

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Cyclone Size: 18-2
Inlet Height: 18 in.
Inlet Width: 18⅛ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	107	115	124	146	171	201
B	48¾	50¾	55¼	66¼	75¾	87¾
C	42⅜	44⅜	46⅞	52⅜	58⅞	66 7/16
D	22	22	21	26	26	26
E	23	21	22	28	29	29
F	18	18	18	19	20	22
G	13	13	12½	15	15	15
H	41	42	43	50	53	57
J	63	66	70	79	89	102
K	21	22	23	27	31	35
L	9	9	9	10	9	10

Cyclone Size: 21-2
Inlet Height: 21 in.
Inlet Width: 21⅛ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	125	134	146	170	200	234
B	57¼	59¾	64¼	76¾	89¼	102¼
C	49⅜	51⅞	54⅞	60⅞	68⅜	77 7/16
D	25	25	24	29	30	30
E	28	26	26	33	34	34
F	19	19	19	20	22	23
G	14½	14½	14	16½	17	17
H	48	48	49	57	62	66
J	72	76	81	91	93	117
K	23	25	26	30	34	40
L	12	11	13	12	12	11

Cyclone Size: 25-2
Inlet Height: 25 in.
Inlet Width: 25 5/16 in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	149	162	174	203	237	280
B	68¼	71¼	75¾	92¼	106¼	122 5/16
C	58⅞	61⅞	64⅞	72⅜	81 7/16	92⅜
D	29	29	28	34	34	35
E	34	32	31	40	42	42
F	20	20	20	22	23	24
G	16½	16½	16	19	19	19½
H	57	57	58	68	73	79
J	85	90	95	107	121	139
K	26	28	30	34	40	46
L	16	16	16	15	[illegible]	16

Cyclone Size: 30-2
Inlet Height: 30 in.
Inlet Width: 30 5/16 in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	180	193	209	244	285	336
B	82¼	86¼	91¾	111¼	127 13/16	146 13/16
C	70⅝	73⅞	77⅞	87 7/16	97⅝	110⅝
D	34	33	32	40	40	41
E	42	40	39	50	[illegible]	51
F	21	21	22	23	25	26
G	19	18½	18	22	22	22½
H	67	68	69	81	[illegible]	94
J	101	106	113	128	[illegible]	165
K	30	32	35	40	[illegible]	54
L	20	19	20	20	19	20

Cyclone Size: 36-2
Inlet Height: 36 in.
Inlet Width: 36¼ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	217	233	252	293	344	403
B	98¾	103¼	111¼	133 13/16	153 5/16	177 5/16
C	84 7/16	88 7/16	93 7/16	104⅝	117⅝	132 13/16
D	40	39	38	47	48	48
E	51	48	48	61	62	64
F	22	22	23	25	26	28
G	22	21½	21	25½	26	26
H	80	81	83	97	105	113
J	120	126	134	151	172	197
K	35	38	40	47	55	64
L	26	25	25	25	24	24

Cyclone Size: 43-2
Inlet Height: 43 in.
Inlet Width: 43⅜ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	258	278	300	351	410	482
B	118¼	124 13/16	132 5/16	160 13/16	184 5/16	212⅜
C	100 7/16	105⅝	111⅝	124⅝	139 13/16	159⅛
D	[illegible]	46	45	55	56	57
E	[illegible]	59	58	75	76	78
F	[illegible]	24	25	26	28	30
G	25½	25	24½	29½	30	30½
H	[illegible]	97	99	116	124	135
J	[illegible]	149	159	179	204	234
K	[illegible]	44	[illegible]	55	64	75
L	[illegible]	31	30	30	30	30

Cyclone Size: 51-2
Inlet Height: 51 in.
Inlet Width: 51⅜ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	306	330	357	416	486	571
B	140 13/16	147 13/16	157 5/16	189 13/16	218⅜	251⅜
C	119⅝	125⅝	132⅝	147 13/16	166⅛	188⅛
D	55	53	52	64	66	66
E	75	71	70	89	92	92
F	25	25	26	28	30	32
G	29½	28½	28	34	35	35
H	113	114	[illegible]	136	147	158
J	166	176	187	212	240	275
K	[illegible]	51	55	64	74	87
L	38	38	37	37	37	38

Cyclone Size: 60-2
Inlet Height: 60 in.
Inlet Width: 60⅜ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	361	389	420	490	573	672
B	165 13/16	174 13/16	185 5/16	224⅜	256⅞	295⅞
C	140⅝	147 13/16	155 13/16	174⅛	195⅛	221⅛
D	[illegible]	62	60	75	76	77
E	[illegible]	85	82	106	107	109
F	[illegible]	27	28	30	32	34
G	[illegible]	33	32	39½	40	40½
H	133	134	136	160	172	186
J	195	206	219	248	282	323
K	[illegible]	58	63	74	87	102
L	[illegible]	45	[illegible]	46	44	44

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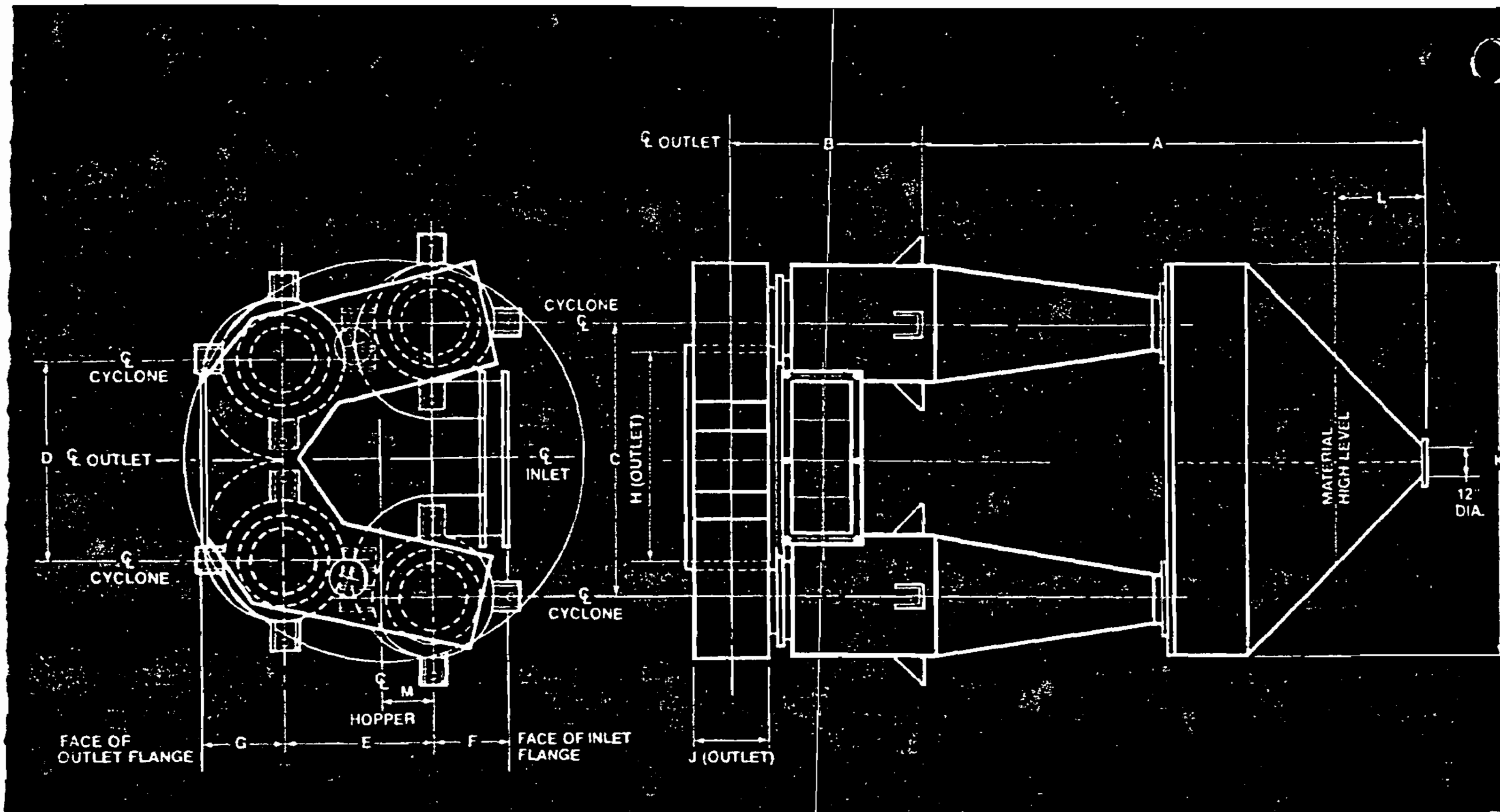
XQ Series Quad Cyclone



NOTES:

1. Find Dimensions of Sizes not shown by Linear Interpolation or Extrapolation.
2. Dimensions are in Inches, and are approximate. Certified Installation Prints will be furnished after receipt of order.

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 9-4	A	59½	64	71½	82½	96	112
	B	28	29	28½	34	39	45
	C	30⅝	31⅝	32⅞	35⅝	38⅞	42⅝
	D	21⅜	22⅜	23⅝	26⅜	29⅝	33⅜
Inlet Height: 9 in.	E	17	18	20	22	26	29
	F	14	14	14	15	15	16
	G	8	9	9	10	11	13
	H	26	26	26	30	30	30
Inlet Width: 18⅜ in.	J	10	9	9	12	13	13
	K	46	48	50	55	62	69
	L	11	12	12	12	14	14
	M	4¹⁵⁄₁₆	5½	6¾	7¾	10	11½
Cyclone Size: 11-4	A	73	82	87½	102	119	137
	B	35½	34½	36½	43½	49½	56½
	C	37⅜	38⅝	40⅛	43⅜	47⅜	52⅛
	D	26⅛	27⅜	28⅞	32⅛	36⅛	40⅞
Inlet Height: 11 in.	E	20	22	23	27	31	35
	F	15	15	16	16	17	18
	G	10	11	11	12	13	15
	H	30	30	30	34	36	36
Inlet Width: 22⅜ in.	J	13	12	12	16	16	16
	K	54	57	59	66	74	83
	L	14	16	16	17	18	19
	M	5⁹⁄₁₆	6¾	7¼	9⅝	11¾	13¾

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 13-4	A	89½	96	104	119	139	163
	B	38½	40½	42½	51	58	66½
	C	43⅞	45⅜	47⅛	51⅛	55⅝	61⅛
	D	30⅝	32⅛	33⅞	37⅞	42⅜	47⅞
Inlet Height: 13 in.	E	23	25	27	31	35	41
	F	16	16	16	17	18	19
	G	12	12	13	14	15	18
	H	34	34	34	40	40	40
Inlet Width: 26⅜ in.	J	16	15	14	19	20	20
	K	62	65	69	76	85	96
	L	18	19	19	20	21	24
	M	6⅛	7⅜	8½	10¾	12¾	16
Cyclone Size: 15-4	A	104	111	119	139	161	188
	B	44	46	48½	58½	66	76
	C	50⅝	52⅜	54⅜	59⅛	64⅛	70⅝
	D	35⅜	37⅛	39⅛	43⅞	48⅞	55⅜
Inlet Height: 15 in.	E	27	28	30	35	40	47
	F	17	17	17	18	19	20
	G	13	14	15	16	18	20
	H	38	38	36	44	44	46
Inlet Width: 30⅜ in.	J	19	18	17	23	23	23
	K	71	74	78	87	97	110
	L	22	22	23	25	26	28
	M	7⅜	7⅞	9	11⅞	14½	18½

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		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 18-4	A	124	133	143	166	193	226
	B	52	54	58½	69½	79	91 1/16
	C	60⅝	62⅜	65⅛	70⅝	77⅛	84¾
	D	42⅜	44⅜	46⅞	52⅜	58⅞	66 7/16
Inlet Height: 18 in.	E	31	33	36	41	48	56
	F	18	18	18	19	20	22
	G	16	17	18	19	21	25
	H	44	44	42	52	52	52
Inlet Width: 36 7/16 in.	J	23	21	22	28	29	29
	K	83	87	92	102	115	131
	L	26	27	28	30	31	35
	M	7⅞	9⅛	10⅞	13¾	17½	21¾
Cyclone Size: 21-4	A	146	156	167	194	225	263
	B	60½	63	67½	80	92½	105 9/16
	C	70⅝	73⅛	76⅛	82⅛	89⅝	98¾
	D	49⅜	51⅞	54⅞	60⅞	68⅜	77 7/16
Inlet Height: 21 in.	E	36	39	42	48	55	64
	F	19	19	19	20	22	23
	G	19	19	21	22	25	29
	H	50	50	48	58	60	60
Inlet Width: 42 7/16 in.	J	28	26	26	33	34	34
	K	96	101	106	118	132	150
	L	33	33	34	36	37	40
	M	9⅛	11	12¾	16	19¾	24¾
Cyclone Size: 25-4	A	173	186	200	231	268	314
	B	71½	74½	79	95½	109 9/16	125 9/16
	C	84⅛	87⅛	90⅛	97⅜	106¾	118 1/16
	D	58⅞	61⅞	64⅞	72⅜	81 7/16	92⅝
Inlet Height: 25 in.	E	42	45	49	56	65	76
	F	20	20	20	22	23	24
	G	22	23	25	26	30	34
	H	58	58	56	68	68	70
Inlet Width: 50⅝ in.	J	34	32	31	40	42	42
	K	113	118	125	139	156	178
	L	40	40	42	43	45	50
	M	10¼	12	14½	18½	23¼	29
Cyclone Size: 30-4	A	209	223	240	277	322	375
	B	85½	89½	95	114 9/16	131 1/16	150 1/16
	C	100⅝	104⅛	108⅛	117¾	128 1/16	141 1/16
	D	70⅜	73⅞	77⅞	87 7/16	97⅝	110⅝
Inlet Height: 30 in.	E	50	54	58	67	77	90
	F	21	21	22	23	25	26
	G	26	28	30	31	35	41
	H	68	66	64	80	80	82
Inlet Width: 60⅝ in.	J	42	40	39	50	51	51
	K	134	140	148	166	186	211
	L	49	49	51	53	56	59
	M	12	14½	16¾	22	27½	34½

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 36-4	A	250	268	288	333	388	452
	B	102 1/16	106 9/16	114 9/16	137 1/16	156 9/16	180⅝
	C	120¾	124¾	129¾	141 1/16	154 1/16	169⅜
	D	84 7/16	88 7/16	93 7/16	104⅝	117⅝	132 13/16
Inlet Height: 36 in.	E	60	64	69	80	93	108
	F	22	22	23	25	26	28
	G	31	33	35	37	42	49
	H	80	78	76	94	96	96
Inlet Width: 72 13/16 in.	J	51	48	48	61	62	64
	K	159	167	176	197	223	253
	L	59	60	61	65	68	73
	M	14½	17	19¾	26	33	41
Cyclone Size: 43-4	A	298	320	344	397	462	540
	B	121 9/16	128 1/16	135 9/16	164 1/16	187⅝	215 11/16
	C	143¾	149 1/16	155 1/16	168 1/16	183⅜	202⅞
	D	100 7/16	105⅝	111⅝	124⅝	139 13/16	159⅛
Inlet Height: 43 in.	E	70	75	81	94	110	129
	F	24	24	25	26	28	30
	G	37	39	42	44	50	58
	H	94	92	90	110	112	114
Inlet Width: 87⅛ in.	J	62	59	58	75	76	78
	K	188	198	209	233	264	301
	L	71	73	74	76	82	88
	M	16	19	22½	30	39	49
Cyclone Size: 51-4	A	355	379	408	472	548	638
	B	144 1/16	151 1/16	160 9/16	193⅛	221 11/16	254 11/16
	C	171 1/16	177 1/16	184 1/16	199⅜	217⅞	239⅞
	D	119⅝	125⅝	132⅝	147 13/16	166⅛	188⅛
Inlet Height: 51 in.	E	83	89	96	111	130	152
	F	25	25	26	28	30	32
	G	44	47	50	52	59	69
	H	110	106	104	128	132	132
Inlet Width: 103⅛ in.	J	75	71	70	89	92	92
	K	222	233	246	276	311	353
	L	87	87	88	93	99	105
	M	19	22¾	27	35½	46	58
Cyclone Size: 60-4	A	418	447	480	555	645	752
	B	169 1/16	178⅛	188⅝	227 11/16	260 7/16	299 3/16
	C	201 1/16	208⅜	216⅝	234⅞	255⅞	281⅞
	D	140⅝	147 13/16	155 13/16	174⅛	195⅛	221⅛
Inlet Height: 60 in.	E	97	104	112	131	152	178
	F	27	27	28	30	32	34
	G	52	55	59	61	70	81
	H	128	124	120	150	152	154
Inlet Width: 121⅛ in.	J	89	85	82	106	107	109
	K	260	273	288	323	365	415
	L	102	103	105	111	116	124
	M	22	26	31	42	53	68

Table 2

Standard Material Thicknesses (See Note 1)
Maximum Cyclone Size (See Note 2)

U.S.S. GAUGE	INCHES	XQ465	XQ405	XQ340	XQ240	XQ170	XQ120
16	.0598	36	33	30	25	21	18
14	.0747	45	41	37	32	27	22
12	.1046	62	57	52	44	37	31
10	.1345	80	74	67	57	48	40
3/16 PL	.1875	112	103	94	79	67	56
¼ PL	.2500	149	137	125	105	89	75
⅜ PL	.3750	224	206	188	158	133	112

NOTES:

1. Any thickness of material in all carbon steel, alloy or stainless steel, high nickel, aluminum and other non-ferrous alloys is available as required by operating conditions.
2. The above sizes will withstand −15 in. w.c. absolute internal pressure in commercial quality hot rolled steel.

Table 3
Installed Weights of Single Cyclones (See Note 1)

CYCLONE SIZE	XQ465 THK.	XQ465 LBS.	XQ405 THK.	XQ405 LBS.	XQ340 THK.	XQ340 LBS.	XQ240 THK.	XQ240 LBS.	XQ170 THK.	XQ170 LBS.	XQ120 THK.	XQ120 LBS.
3	.0598	5	.0598	6	.0598	7	.0598	9	.0598	12	.0598	16
4	.0598	8	.0598	10	.0598	11	.0598	15	.0598	21	.0598	29
5	.0598	13	.0598	15	.0598	18	.0598	24	.0598	33	.0598	45
6	.0598	19	.0598	22	.0598	26	.0598	35	.0598	47	.0598	65
7	.0598	25	.0598	30	.0598	35	.0598	47	.0598	64	.0598	88
9	.0598	42	.0598	50	.0598	58	.0598	78	.0598	105	.0598	145
11	.0598	63	.0598	75	.0598	86	.0598	115	.0598	160	.0598	220
13	.0598	88	.0598	105	.0598	120	.0598	165	.0598	220	.0598	305
16	.0598	135	.0598	155	.0598	180	.0598	245	.0598	335	.0598	460
20	.0598	205	.0598	245	.0598	285	.0598	385	.0598	525	.0747	900
24	.0598	300	.0598	355	.0598	410	.0598	555	.0747	945	.1046	1800
29	.0598	435	.0598	515	.0598	600	.0747	1000	.1046	1950	.1046	2650
36	.0598	670	.0747	1000	.0747	1150	.1046	2200	.1046	2950	.1345	5250
44	.0747	1250	.1046	2100	.1046	2410	.1046	3250	.1345	5700	.1875	10,700
54	.1046	2650	.1046	3150	.1345	4750	.1345	6350	.1875	11,700	.1875	16,100
66	.1345	5100	.1345	6000	.1345	6950	.1875	12,900	.1875	17,500	.2500	32,000
76	.1345	6750	.1875	10,900	.1875	12,600	.1875	17,000	.2500	30,900	.3750	63,600
81	.1875	10,400	.1875	12,300	.1875	14,300	.2500	25,800	.2500	35,100	.3750	72,300

NOTES:

1. Weights are based on commercial quality hot rolled steel.
2. For sizes and/or thicknesses not shown, use the following procedure:
   A. Select the nearest size, $N_{(tab)}$, and find $t_{(tab)}$, the tabulated thickness and $W_{(tab)}$, the tabulated weight for the XQ cyclone family being considered.

   B. Calculate the weight, W, by

   $$W = \frac{W_{(tab)} \times t}{t_{(tab)}} \times \left(\frac{N}{N_{(tab)}}\right)^2,$$

   where t = desired thickness, inches
   N = desired cyclone size.
3. For DUAL cyclones, including dust hopper and inlet and outlet manifolds, calculate W as in Note 2. Then, find the total weight, $W_{(tot)}$ by
   $W_{(tot)} = 3.708 \times W$.
4. For QUAD cyclones, the procedure is as in Note 3 EXCEPT $W_{(tot)} = 8.207 \times W$.

Table 4
Shipping Limitations

The following are the largest sizes of single cyclones that can be shipped completely pre-assembled. Larger sizes will, in all cases, require knockdown (K.D.) construction flanged for bolted field assembly. Depending on routing, in some states the maximum sizes will be even smaller.

XQ465—87
XQ405—82
XQ340—77
XQ240—67
XQ170—58
XQ120—51

Table 5
English To Metric Conversions

	Multiply English Units	By	To Convert to Metric Units
Dimensions	Inches	2.540	cm.
Weights	Pounds	0.454	kg.
Volumetric Flow Rate	C.F.M.	4.720×10^{-4}	M^3/sec.
Velocity	Ft./Sec.	0.305	M/sec.
Pressure Drop	Inches—Water	1.863	mm—Mercury
Density	Lbs./Cu. Ft.	0.160	g/cc
Absolute Viscosity	Lbs. (Mass)/Ft.—Sec.	1488.2	Centipoise
Temperature	One (1) Degree F	0.555	One (1) Degree C
Pressure	P.S.I.	51.714	mm—Mercury
Dust Loading	Grains/Cu. Ft.	2.29×10^{-3}	kg/M^3

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Part I: Supplemental Information 1

Description of Process 1

System Design 1

Wood Usage 1

Emissions 2

Emissions Control Devices 2

Part II: Airborne Contaminants Emitted Data and 3

Table One: Pensacola Mill Pine Chip Thickness Screening 3

Calculations: 3

Part III: Appended Diagrams and Data 6

Mill Location Plot Plan 6

Affected Facility Plot Plan 6

Process Flow Diagrams 6

Calculations Basis Literature and Data 6

Part I: Supplemental Information

Description of Process

Champion International Corporation is proposing to construct a pine wood chip thickness screening system at its Pensacola facility, located in Cantonment, Escambia County, Florida. The new thickness screening system will replace an existing oversized chip screen system which classifies chips according to length rather than thickness. The effect of this project will be to increase chip quality to existing chip digesters and therefore will enhance pulp quality to the bleach plant and paper machines. The project objective will not increase production or throughput and will have no effect on any other mill equipment emissions.

System Design

The proposed pine wood chip thickness screening system will consist of the following equipment:

- 1 Primary Disc Screen
- 1 Secondary Disc Screen
- 1 Air Density Separator Rotary Feeder
- 1 Air Density Separator Cyclone and Blower
- 2 Chip Slicers
- 2 Gyratory Fines Screens
- 1 Fines Blower and Separator Cyclone

The existing system to be replaced consists of the following equipment:

- 2 - Chip Screens
- 1 - #2 Oversized Chip Re-Chipper
- 1 - #2 Cyclone Separator

Figures One and Two in Part III of this Supplement are process flow sheets illustrating the proposed and existing systems.

Wood Usage

Installation of the chip thickness screening system to replace components of the existing oversized chip screening system will improve chip quality to the pulp digesters but not increase chip

present & proposed process Rates in Max. lbs/hr & Tons/yr

throughput. The difference between wood throughput of 1988 compared to post construction tabulated in Table One is actual usage in 1988 versus mill design usage. The wood throughput of 1987 is not compared due to 1986 and 1987 mill conversion startup affects.

Emissions

Max. lbs/hr & Tons/yr for each of the 2 New Emission Points, plus one that will remain

Emissions associated with the installation of the pine wood chip thickness screening system emanate from two new point sources and one existing point source as shown in Figures One and Two and tabulated in Table One. The two new point sources are a fines "airveyor" high efficiency cyclone separator (shown in Figure Two as block L) and an Air Density Separator cyclone (shown in Figure Two as block G). The net increase in point source total particulate emissions resulting from the installation is +2.0 tons per year. Because no external woodyard modifications are taking place associated with this project fugitive emissions are expected to at least remain the same. Any new or altered conveyor systems will be fitted with covers.

Same info for each of the existing emission points

Contemporaneous changes since the 1986 mill conversion project were noted in the construction permit No. AC 17-113551. Table one is based on Table II of that permit which is attached in Part III. When added to contemporaneous changes, net emissions are -8.7 tons per year. These are well below the PM10 (Particulate Matter less than 10 microns in size) and TSP (Total Suspended Particulate) PSD (Prevention of Significant Deterioration) significance levels of 15 and 25 tons per year, respectively.

Emissions Control Devices

Fugitive emissions are controlled by covers on all belt conveyors. Two high efficiency cyclone separators are included in the installation (Shown in Figure One). Manufacturer efficiency curves (enclosed) with mill chip classifications were used to rate cyclone separation efficiencies.

what emission limitations do you propose for each emission control device & emission point in gr/DSCFM, lbs/hr, & tons/yr.

The stack of the induced draft fan for the Air Density Separator cyclone is approximately 70 feet in height, and is 1.5 feet in diameter. The air flow rate is 12,000 ACFM maximum, and is at ambient temperatures and water vapor content. The fines cyclone has its own vent in the top.

Mfg's guarantee

Provide the Make, Model, Size Range of Particles To Be Collected, & Efficiency of each of the presently installed emission control devices and each of the proposed emission control devices. Provide the stack height, stack diameter, gas flow rate (ACFM & DSCFM), gas exit temperature for each of the existing ~~emission~~ control devices and emission points. Provide the same information for each of the proposed emission control devices & emission points.

Part II: Airborne Contaminants Emitted Data and Calculations

Table One: Pensacola Mill Pine Chip Thickness Screening System Installation Data

	(Tons/Year)
Chip Supply	
1988 Usage	1,100,000
Mill Design	1,200,000
PM10 Emissions:	
Proposed	0.8
Present	0.1
Net PM10	**0.7**
Net TSP Emissions:	
Proposed	2.2
Present	0.2
Net TSP	**2.0**
Contemporaneous:	
Present	-10.7
Proposed Increase	2.0
Net	***-8.7***

Calculations:

The flowsheets include recycle loops that were calculated by iteration using the following equations with reference to the respective flowsheets.

Constants:

Scrubber Efficiencies:

Where Particulate Matter > 10μ the cyclone separation efficiency at 99.5%; Therefore $X = 0.995$

Particulate Matter < 10μ the cyclone separation efficiency at 95%; Therefore $Y = 0.95$

Particulate Classification:

0.13% of Fines are Particulate Matter greater than 10 microns in size but less than 200 microns; Therefore $Z = 0.0013$

0.01% of Fines are Particulate Matter less than 10 microns in size; Therefore $V = 0.0001$

Calculations and Derivations For Figure One

$B = A + F$
$C = B * 0.01$
$D = B - C$
$E = D * 0.15$
$F = E + C$

Therefore:

$G > 10\,\mu = F * 0.1 * Z * (1 - X)$
$G < 10\,\mu = F * 0.1 * V * (1 - Y)$

And:

For existing appears in error

$H = D - E - G$ — No
$K = H - I$ — See 150/6 k also in error
$I = H * 0.1$
$L = K$
$J = I$

Calculations and Derivations For Figure Two

$B = A + D$
$C = B * 0.01$
$D = C$

Therefore:

$E > 10\,\mu = D * 0.1 * Z * (1 - X)$
$E < 10\,\mu = D * 0.1 * V * (1 - Y)$

And:

$F = B - C - E$
$G = F * 0.15$

Therefore:

$H > 10\ \mu = G * 0.0005 * (1 - X)$
$H < 10\ \mu = G * 0.00001 * (1 - Y)$

And:

$I = G - H$
$J = I$
$K = F - L - H$ — NO
$L = (F + J) * 0.1$
$M = L - O$
$N = K$

SUGGEST SOME OF THE CALCULATIONS SHOULD BE CHECKED

Therefore:

$O > 10\ \mu = L * Z * (1 - X)$
$O < 10\ \mu = L * V * (1 - Y)$

Finally:

$P = O + H + E$

SHOW THOSE POINTS WHERE COVERED CONVEYORS WILL BE INSTALLED ~~WILL~~ & EXPLAIN THE OTHER TECHNIQUES TO BE USED TO CONTROL FUGITIVE EMISSIONS,

Part III: Appended Diagrams and Data

- Mill Location Plot Plan
- Affected Facility Plot Plan
- Process Flow Diagrams
- Calculations Basis Literature and Data

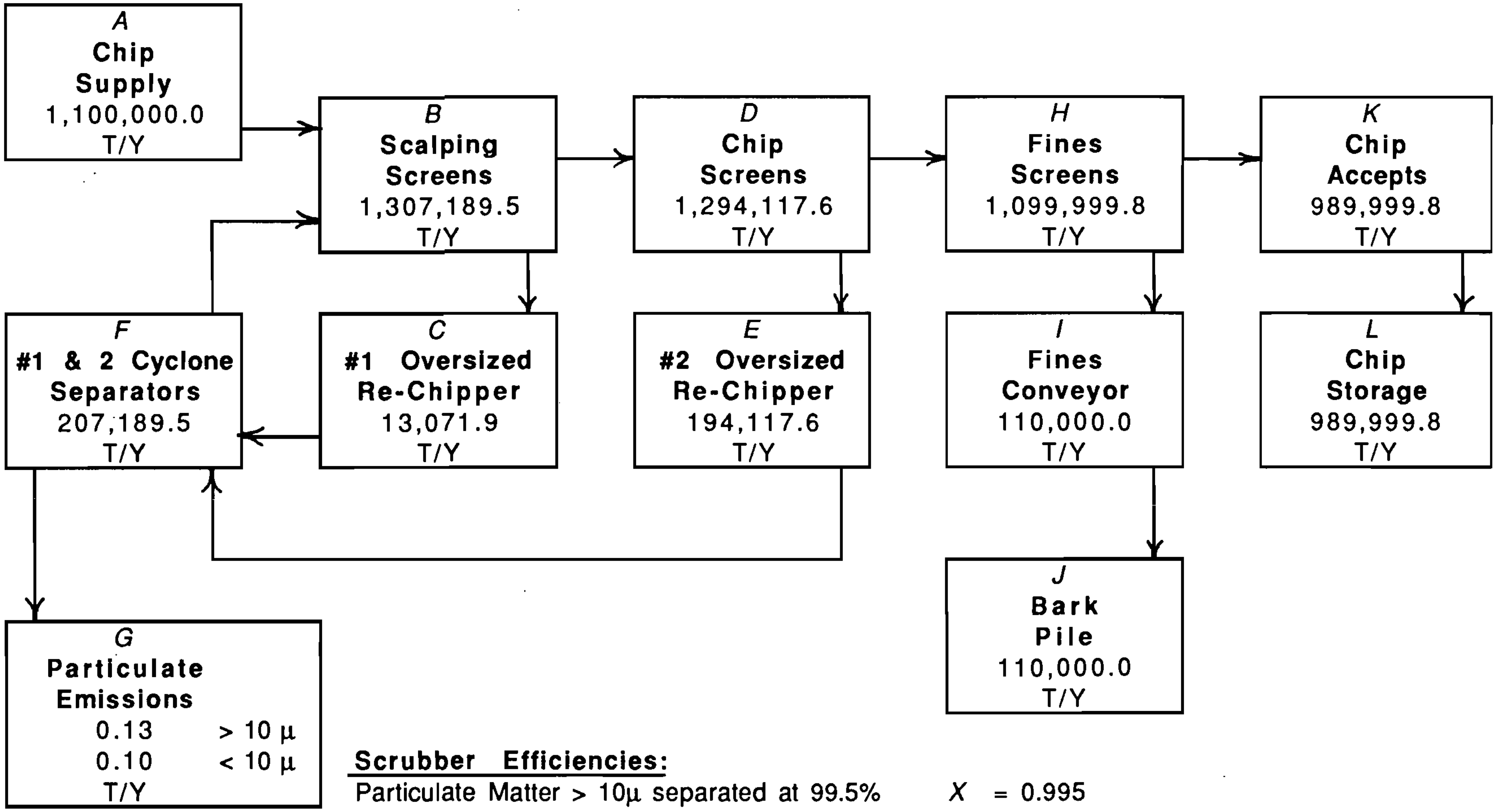
#1 Cyclone Separator	1500 ACFM	0.00550 lb/hr	0.00043 gr/DSCF
Air Density Separator	12000 ACFM	0.2135 lb/hr	0.00208 gr/DSCF
Fines Cyclones	2700 ACFM	0.627 lb/hr	0.02709 gr/DSCF
			3.705 T/Y MAX

E = (12121.2)(0.1)(0.0013)(1 − 0.995) = 0.00788 T/Y
(12121.2)(0.1)(0.0001)(1 − 0.95) = 0.00606 T/Y

H = (180,000)(0.0005)(1 − 0.995) = 0.45 T/Y
(180,000)(0.00001)(1 − 0.95) = 0.09 T/Y

O = (137,999.9)(0.0013)(1 − 0.995) = 0.897
(137,999.9)(0.0001)(1 − 0.95) = 0.690

Figure One: Existing Pine Wood Oversized Chip Screening System



Scrubber Efficiencies:

Particulate Matter > 10µ separated at 99.5% $X = 0.995$

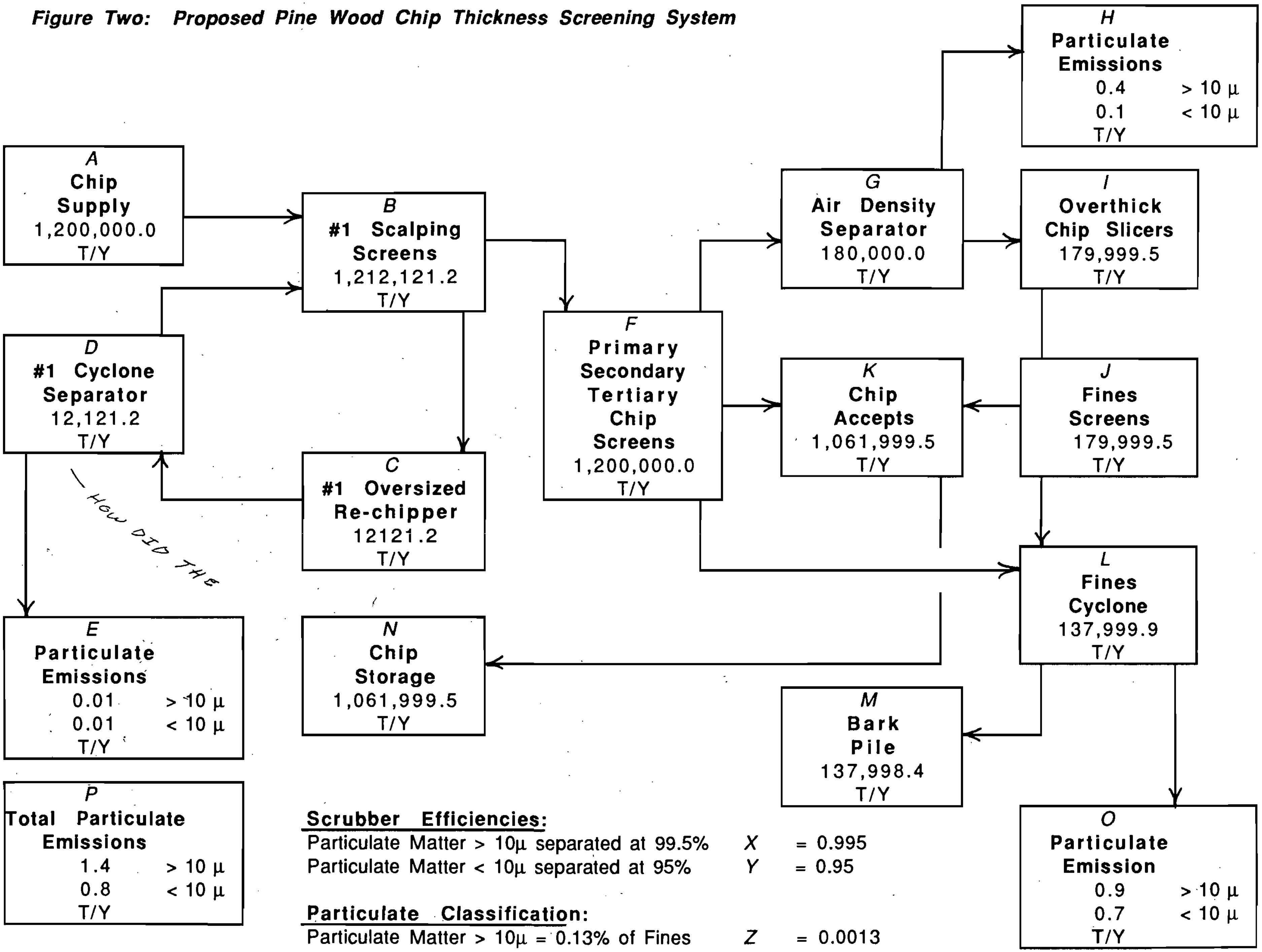
Particulate Matter < 10µ separated at 95% $Y = 0.95$

Particulate Classification:

Particulate Matter > 10µ = 0.13% of Fines $Z = 0.0013$

Particulate Matter < 10µ = 0.01% of Fines $V = 0.0001$

Figure Two: Proposed Pine Wood Chip Thickness Screening System



Scrubber Efficiencies:

Particulate Matter > 10µ separated at 99.5% X = 0.995

Particulate Matter < 10µ separated at 95% Y = 0.95

Particulate Classification:

Particulate Matter > 10µ = 0.13% of Fines Z = 0.0013

Particulate Matter < 10µ = 0.01% of Fines V = 0.0001

LOCATION MAP

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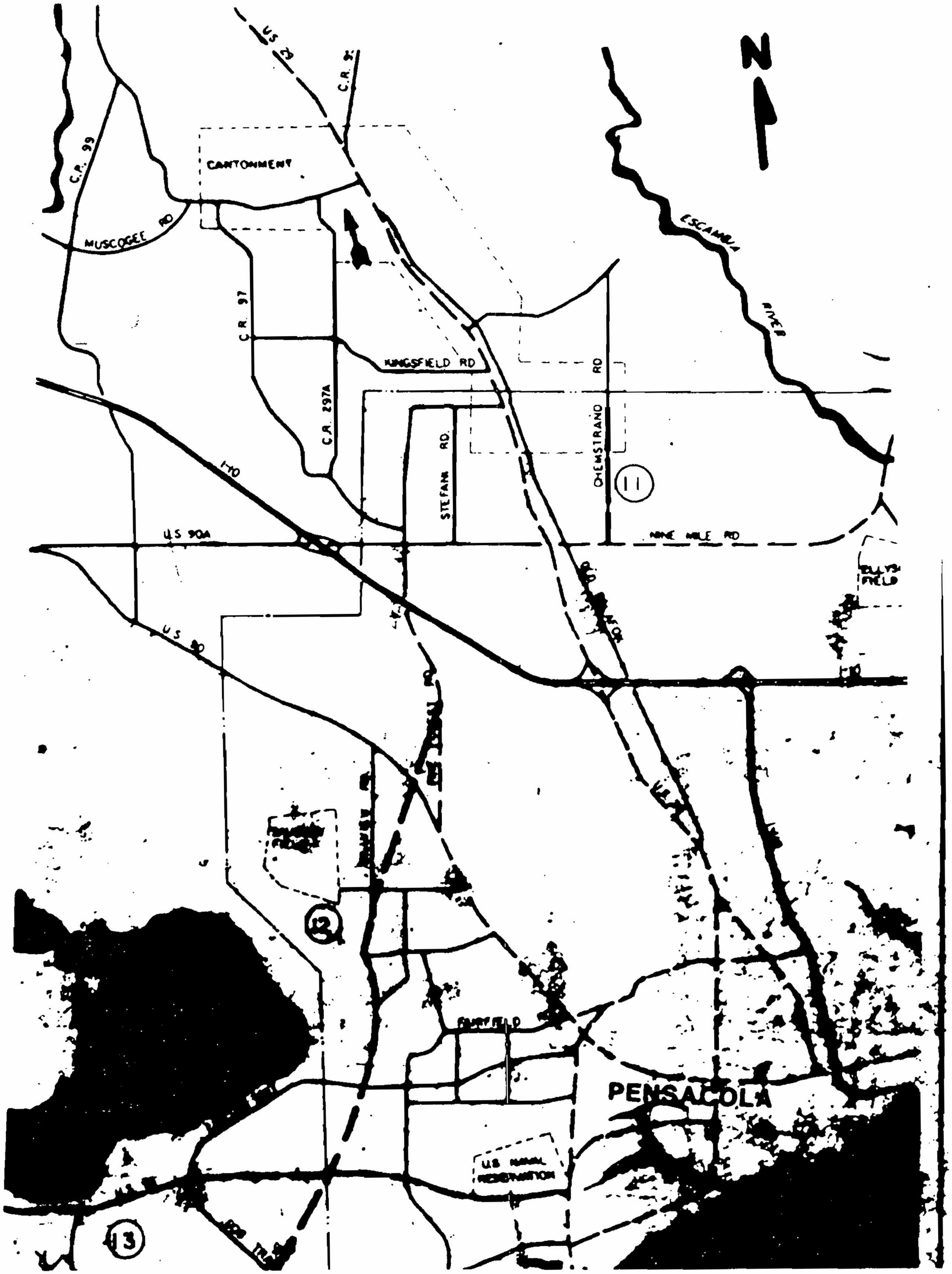

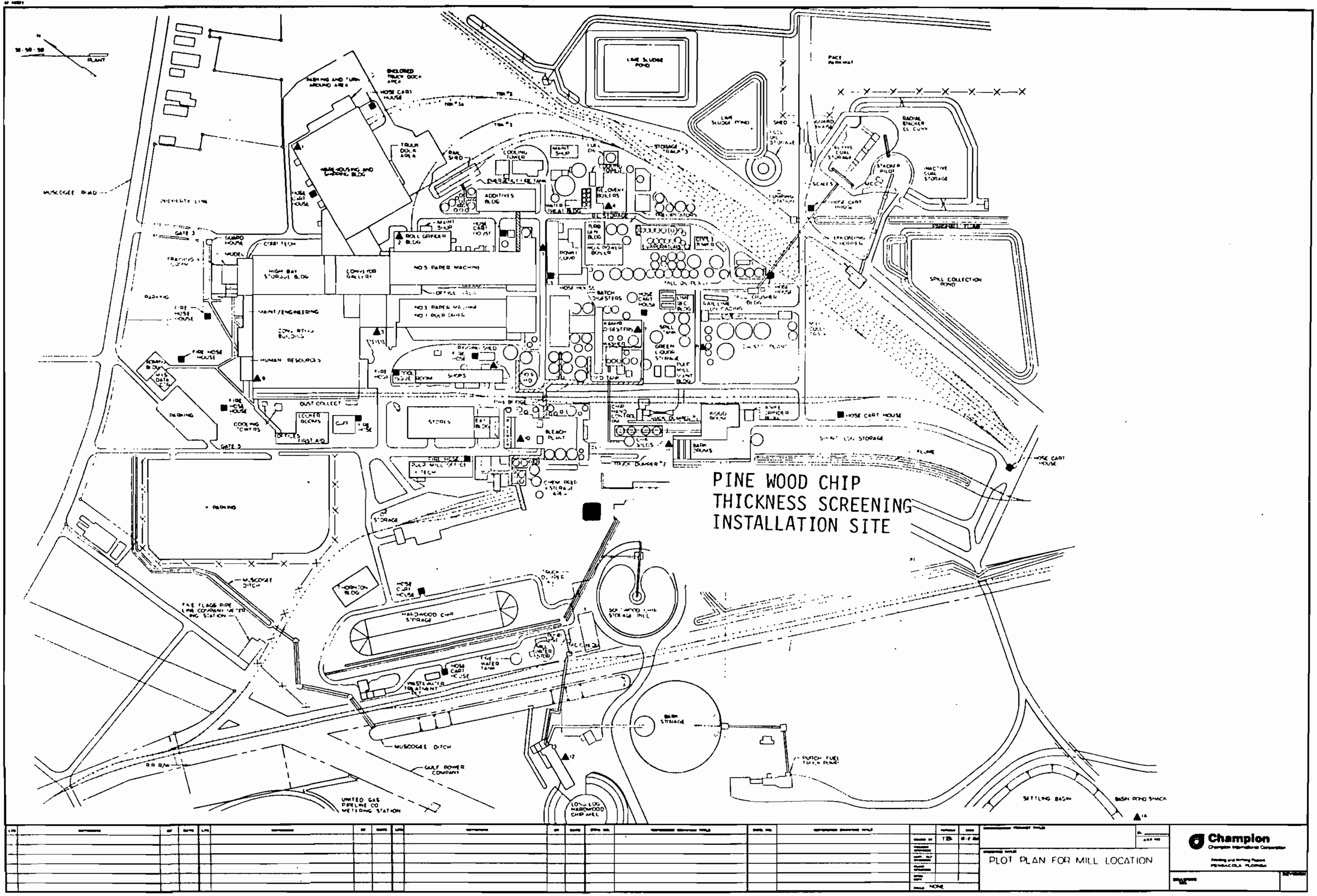

PINE WOOD CHIP THICKNESS SCREENING INSTALLATION SITE

PLOT PLAN FOR MILL LOCATION

SCALE NONE

Champion
Champion International Corporation
Printing and Writing Papers
PENSACOLA FLORIDA

Printing and Writing Papers
375 Muscogee Road
P.O. Box 87
Cantonment, Florida 32533-0087
904 968-2121

Champion
Champion International Corporation

To:
Peter Muehlemann

Date:
April 6, 1989

From:
Eric Johnson

Subject:
Pine Fines Classification

FTM-498

Shown below is a table summarizing the classification of the Pensacola mill pine wood fines. A sample of the fines material retained on a 3/64 inch Tyler screen from Bill Dorman's work dated March 10, 1989 (report #1513001) was further classified on a Tyler screen classifier.

In summary, the fines classification results are as follows:

% of Total Pine Wood Fines . . .	Are Greater Than . . .	Less Than
18.3	6410 u	--
21.0	4795 u	6410 u
39.3	2403 u	4795 u
5.6	2018 u	2403 u
7.5	1203 u	2018 u
7.72	300 u	1203 u
0.44	212 u	300 u
0.13	75 u	212 u
0.009	38 u	75 u
6.0×10^{-5}	--	38 u

u = micron

Eric Johnson

Eric Johnson

EJJ/hs

cc: David Arceneaux
Bill Dorman
Paul Johnson
Buddy Rhodes
Bob Romnes
Bernie Shoemoe
Willie Tims

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¼ Hr

5/9

~~5/11~~ 1 HR

5/12

1 HR

~~5/15 REVIEW & INCMPLTNSS~~

~~4 HR~~

~~5/16 TELECON w/COMPANY~~

~~5/16 TELECON w/COMPANY ¼ HR~~

~~5/16 REVIEW & INCMPLTNSS LTTR ½ HR~~

~~5/16 TELECON w/COMPANY 3 HR~~

~~5/17 REVIEW 2HRS ¼ HR~~

2 HR

5/18 [illegible] 9:30 - 10:00 ½ HR

5/19

10:00 11:00 1 HR

5/19

2:30 4:00 1½ HR

5/19

7:00 730 1 HR

$$\frac{110,000}{1,100,000} \times 100 = 10\%$$

$$\frac{137,998.4}{1,260,000} \times 100 = 11.5\%$$

1 Cyclone Separator

1500 ACFM

$E_y = (12121.2)(0.1)(0.0013)(1-0.995) = 0.00788$
$(12121.2)(0.1)(0.0001)(1-0.95) = 0.00606$
$= 0.01394$ TPY

$E_{HR} = (4787.9)(0.1)(0.0013)(1-0.995) = 0.00311$
$(4787.9)(0.1)(0.0001)(1-0.95) = 0.00239$
$= 0.00550$ lb/hr 0.00043 gr/DSCF

0.03 gr would be 1.52 TPY & 0.31 lb/hr 0.013 gr = 0.17 lbs/hr & 0.43 TPY

Air Density Separator

12000 ACFM

$H_y = (180000)(0.0005)(1-0.995) = 0.45000$
$(180000)(0.00001)(1-0.95) = 0.09000$
$= 0.54000$ TPY

$H_{HR} = (71100)(0.0005)(1-0.995) = 0.17775$
$(71100)(0.00001)(1-0.95) = 0.03555$
$= 0.21330$ lb/hr 0.00207 gr/DSCF

0.013 gr = 1.34 lbs/hr & 3.39 TPY

Fines Cyclones

2700 ACFM

$O_y = (137999.9)(0.0013)(1-0.995) = 0.89700$
$(137999.9)(0.0001)(1-0.95) = 0.69000$
$= 1.58700$

$O_{HR} = (54510.0)(0.0013)(1-0.995) = 0.35432$
$(54510.0)(0.0001)(1-0.95) = 0.27255$
$= 0.62687$ 0.02709 gr/DSCF

0.03 gr = 0.69 lb/hr & 1.75 TPY

$T_y = 2.14094$

$T_{HR} = 0.84567$

0.03 gr/DSCF WOULD BE
#1 cyclone = 0.99 TPY & 0.39 lb/hr Req'd E = 42% Assume size 10 X9465 Di = 12 µm E = 70%
A.P. Separator - 7.82 TPY & 3.09 lb/hr Req'd E = 91% Assume size 30 X9465 Di = 4. µm E = 91%
Fines Cyclone - 1.74 TPY & 0.69 lb/hr Req'd E = 99% Assume Size 15 X9465 Di = 3 µm E = 93%

Two in series for fines

APP X9 456-56 - Di = 26 µ E = 50%
AP SEPARATOR APP. X9 120-36 - Di = 2. µ E = 76%
FINES APP X9 465-56 - Di = 20 µ E = 55%
X9 120-8 Di = 0.5 µ E = 97.5% — 98.9 - SAY 99%

MDL METHOD 5 FOR 30 DSCF SAMPLE ABOUT 25 mg -
or 0.013 gr./DSCF

$200 pd.
5-3-89
Rcpt.# 117612

STATE OF FLORIDA AC 17-164445

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301

RECEIVED
MAY 3 1989
DER - BAQM

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Major [ ] New[1] [XX] Existing[1]

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

COMPANY NAME: Champion International Corporation COUNTY: Escambia

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) Re-chipper Mill

SOURCE LOCATION: Street State Road 184 at U. S. 29 City Cantonment

UTM: East 1,111,700 North 596,100

Latitude 30 ° 36 ' 30 "N Longitude 87 ° 19 ' 30 "W

APPLICANT NAME AND TITLE: Champion International Corporation

APPLICANT ADDRESS: P. O. Box 87, Cantonment, Florida

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Champion

I certify that the statements made in this application for a Construction 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: William C Bannan

William C. Bannan, VP/Operations Manager
Name and Title (Please Type)

Date: 4/14/89 Telephone No. (904) 968-2121

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

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

---

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

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

Daniel B. Smith, P.E.
Name (Please Type)

Baskerville Donovan Engineers, Inc.
Company Name (Please Type)

316 South Baylen Suite 300 Pensacola 32501
Mailing Address (Please Type)

Florida Registration No. 35633 Date: May 2, 1989 Telephone No. 904-438-9661

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.

Installation of a Pine Chip Thickness Screening System to separate and reprocess oversized chips. (see attached supplement)

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

Start of Construction May, 1989 Completion of Construction October, 1989

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.)

Air Density Separator Cyclone - $10,000

Air-Veyor Cyclone - $10,000

Conveyor Covers - $17,500

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

Construction Permit Application No. AC17-113551

Operating Permit No. AC17-145671

E. Requested permitted equipment operating time: hrs/day 24; days/wk 7; wks/yr 52;
if power plant, hrs/yr N/A; if seasonal, describe: N/A

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: See Attached Supplement

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		

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

1. Total Process Input Rate (lbs/hr): ____________________

2. Product Weight (lbs/hr): ____________________

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]		Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/yr	T/yr	

---

[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) See Attached Supplement

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (If applicable)	Basis for Efficiency (Section V Item 5)

E. Fuels Not Applicable

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	

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

Fuel Analysis:

Percent Sulfur: ______ Percent Ash: ______

Density: ______ lbs/gal Typical Percent Nitrogen: ______

Heat Capacity: ______ BTU/lb ______ BTU/gal

Other Fuel Contaminants (which may cause air pollution): ______

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

Annual Average ______ Maximum ______

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

All liquid and solid waste generated will be returned to the process or treated in the mill's treatment plant before discharge to Eleven Mile Creek.

See Attached Supplement

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

Stack Height: ______________________ ft. Stack Diameter: ______________________ ft.

Gas Flow Rate: __________ACFM____________DSCFM Gas Exit Temperature: ______________________ °F.

Water Vapor Content: ______________________ % Velocity: ______________________ FPS

SECTION IV: INCINERATOR INFORMATION

Not Applicable

Type of Waste	Type 0 (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							
Uncon-trolled (lbs/hr)							

Description of Waste ______________________

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

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

Manufacturer ______________________________ ______________

Date Constructed ______________________ Model No. ______________________

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

Stack Height: __________ ft. Stack Diamter: ______________ Stack Temp. ______________

Gas Flow Rate: ______________ACFM ______________ DSCFM* Velocity: ______________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: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ______________________

Brief description of operating characteristics of control devices: ____________________

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

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

SECTION V: SUPPLEMENTAL REQUIREMENTS (See Attached Supplement)

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)]
   See pages 4 and 5, and figures one and two.
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. See pages 4, 5, and figures one and two.
3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).
   See appended test data and manufacturer's data.
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.)
   See appended manufacturer's data.
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). See pages 4, 5, and figures one and two.
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. See figures one and two.
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).
   See Part III in supplement.
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.
   See Part III in supplement.

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 (Not Applicable)

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

☐ Yes ☐ No

Contaminant	Rate or Concentration

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

☐ Yes ☐ No

Contaminant	Rate or Concentration

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).

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

*Explain method of determining

5. Useful Life:

6. Operating Costs:

7. Energy:

8. Maintenance Cost:

9. Emissions:

Contaminant	Rate or Concentration

10. Stack Parameters

a. Height: ft.

b. Diameter: ft.

c. Flow Rate: ACFM

d. Temperature: °F.

e. Velocity: FPS

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

1.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

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

2.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

---

[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.

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 (Not Applicable)

A. Company Monitored Data

1. __________ no. sites __________ TSP __________( ) SO^{2*} __________ Wind spd/dir

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

Other data recorded ______________________________

Attach all data or statistical summaries to this application.

Specify bubbler (B) or continuous (C).

2. Instrumentation, Field and Laboratory

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

b. Was instrumentation calibrated in accordance with Department procedures?

[ ] Yes [ ] No [ ] Unknown

B. Meteorological Data Used for Air Quality Modeling

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

2. Surface data obtained from (location)________________________

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

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

C. Computer Models Used

1. ________________________ Modified? If yes, attach description.

2. ________________________ Modified? If yes, attach description.

3. ________________________ Modified? If yes, attach description.

4. ________________________ Modified? If yes, attach description.

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

D. Applicants Maximum Allowable Emission Data

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

E. Emission Data Used in Modeling

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

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

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

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

Fisher-Klosterman, Inc. fk

Bulletin 218-C

EMT
3-88

XQ Series High Performance Cyclones

Custom-Engineered Pollution Control/Product Recovery Systems

IGCI

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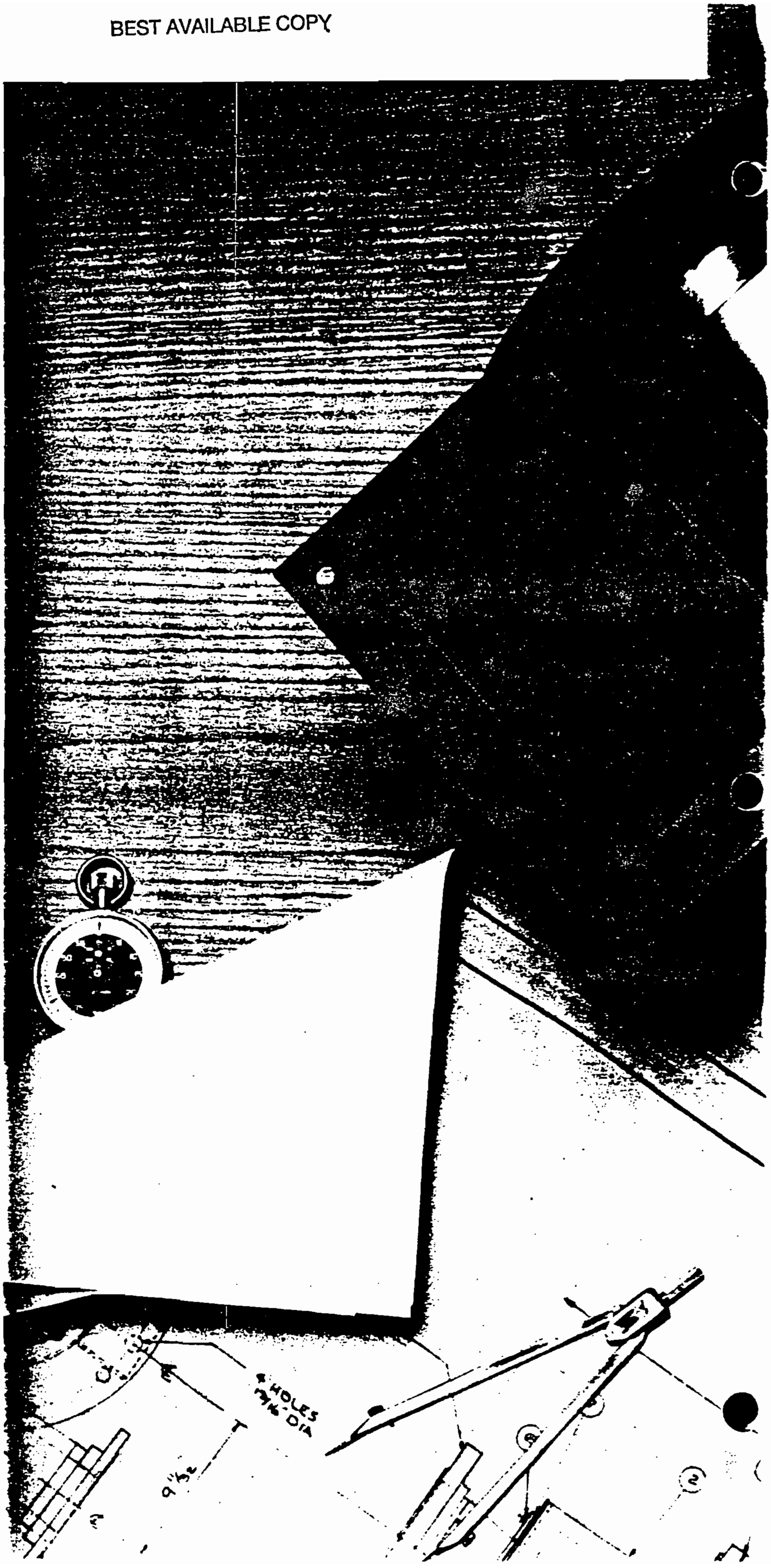

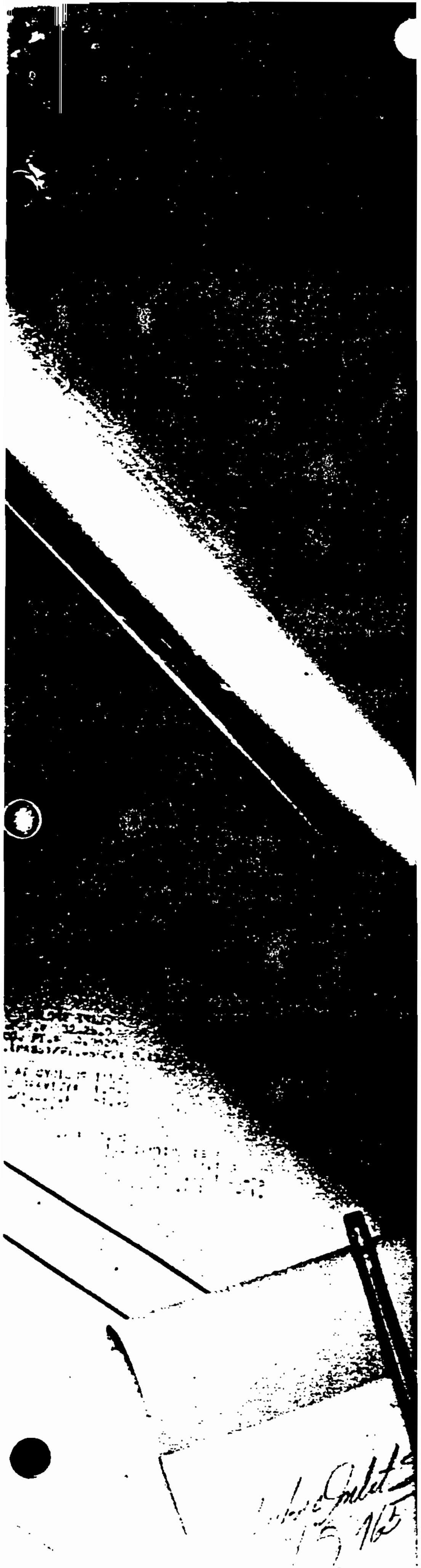

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Fisher-Klosterman, Inc.

Innovative Pollution Control Equipment Since 1948

For decades, Fisher-Klosterman has earned recognition as playing a leading role in the engineering, fabrication and installation of high-performance, custom-designed dust collection equipment and systems. By operating on the cutting edge of gas/particulate separation technology, they have repeatedly provided their customers with innovative, cost-effective means of controlling particulate pollution.

Fisher-Klosterman pioneered the use of digital computers to aid in the selection and performance prediction of air pollution control and dust collection equipment such as high-performance cyclones and venturi scrubbers. They are the first in the field to have a complete library of proprietary computer programs to aid in the design of equipment to handle *any* set of pollution control conditions economically.

Accurately predicting the performance of a cyclone separator under any given set of conditions involves solving a number of inter-related problems in physics, three dimensional, multi-phase fluid dynamics, and statistics and probability; problems so complex that it can, in some cases, take even the most experienced engineer up to a full day for just the mathematics, with the aid of a sophisticated electronic calculator.

With the proper information supplied, Fisher-Klosterman can respond to a customer with cyclone selection and accurate performance data in as little as *30 minutes!*

As specialists in custom-designed, high performance cyclones, Fisher-Klosterman is the top-ranked supplier of cyclones for exotic pollution control situations: refractory brick and ceramic, castable refractories, and many other linings for high abrasion/high temperature conditions; ASME certified and code-stamped cyclones for use in high pressure or vacuum systems; food-grade welding; designs to withstand or to dissipate explosions; ultra high temperature designs; rubber and cast polyurethane linings; and special alloys to resist chemical attack and corrosion. The variety of specialized applications is virtually limitless.

Performance Assurance

The first step in designing a cyclone is to determine the aerodynamic characteristics of the particulates that are to be separated from the gas. To do this, Fisher-Klosterman's modern Materials Laboratory measures such variables as the specific gravity and aerodynamic particle size distribution of representative dust samples supplied by the client.

Samples can also be subjected to rigorous analysis under scaled-down operating conditions in Fisher-Klosterman's Pilot Testing Lab.

Data from these tests are computer-analyzed, using sophisticated, field-proven modeling and scale-up programs to produce accurate, detailed performance predictions of the full-scale system. Laboratory services and analyses are performed at cost as an aid to our customers in the selection of the proper equipment for any job.

Total-System Engineering

Using the computer-generated analyses obtained from the labs, and drawing on more than thirty years of experience, Fisher-Klosterman engineers can design a complete pollution control or solids collection system to meet the client's criteria of performance, structural compatibility, space and arrangement constraints, and economy. Depending on the customer's requirements, this system can entail anything from a single small cyclone to a complex, turnkey installation that utilizes cyclones, scrubbers and even more exotic pollution control equipment.

Prompt, Personal Service

A key factor in Fisher-Klosterman's achieving their leadership position in the industry is their insistence on speedy delivery and on maintaining a close, one-on-one relationship with their customers throughout the design, installation and start-up periods of any equipment. Fisher-Klosterman feels that this is the only way to learn all of a client's requirements and to assure a totally satisfactory installation of pollution control equipment.

Fisher-Klosterman XQ Series Cyclones

Performance Engineered to Suit Your Needs and Budget.

A Proven Concept

For over 100 years, cyclones have proven themselves as the most economical, reliable, effective means of controlling particulate pollution or recovering suspended product from process gas streams

Simply stated, a cyclone operates by generating, within itself, a high velocity vortex of particulate-laden gases. Centrifugal force hurls the denser particles toward the cyclone walls, where they spiral downward into a collection receptacle. The lighter and, by now, relatively particulate-free gases are then exhausted from the cyclone's outlet.

In addition to the size, density and aerodynamic characteristics of the particulate matter, a number of complex inter-related factors affect the relative efficiency of any cyclone. These factors include the cyclone configuration and size; the volume, velocity and rotational or angular acceleration of the particulate-laden gas stream; and the residence time of the gas in the cyclone.

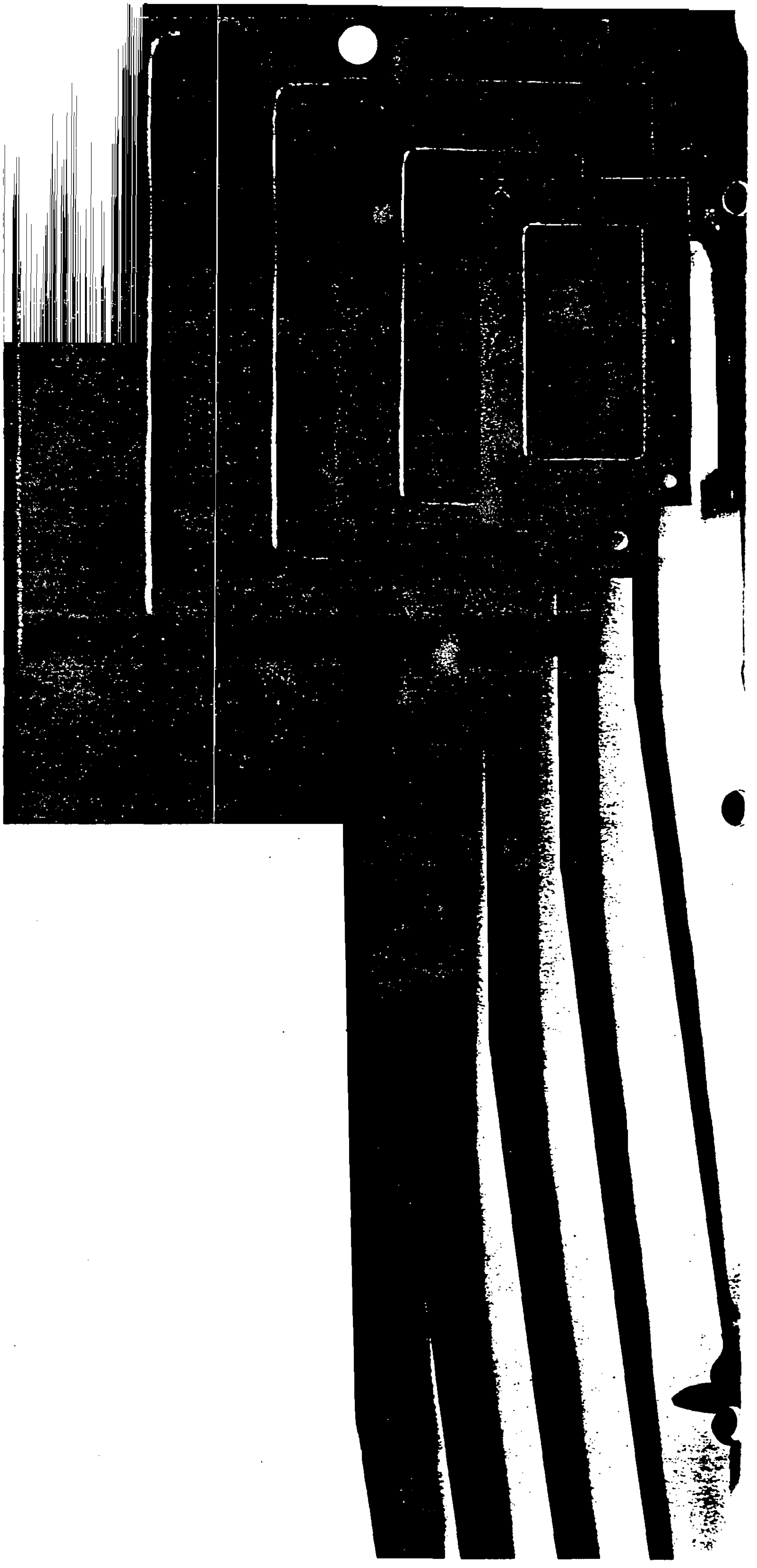
The XQ Series

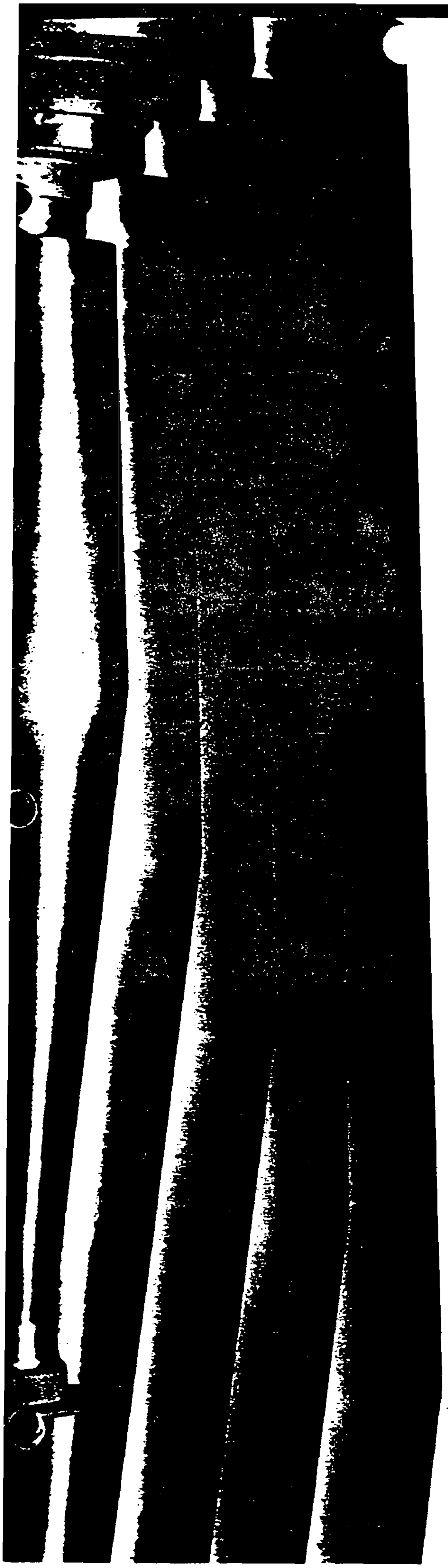
An Innovative Approach to High-Performance Cyclones.

Fisher-Klosterman's new XQ Series of cyclones represents not only the newest state-of-the-art in cyclone design, but also a revolutionary concept in matching performance and cost to the customer's individual needs.

Unlike other manufacturers, who offer one or two basic models, Fisher-Klosterman offers six basic families in their XQ Series: XQ465, XQ405, XQ340, XQ240, XQ170 and XQ120, in order of increasing efficiency. The XQ465, for example, is less costly but, with a shorter residence time, removes a lower percentage of particulates than a more costly XQ405, under the same operating conditions.

If your needs call for the removal of only relatively large, easily separated particles, the XQ465 may be the most cost-effective means of dust collection or pollution control. If, however, you are faced with tougher particulate-removal demands, it becomes necessary to select one of the more efficient families to handle your needs.





Cyclone size is another factor affecting performance. Within each of the six XQ Series families, the larger the cyclone, the greater the volume of gases it can handle effectively. While the dimensional drawings on pages 10-15 indicate a number of sizes in each family, there is in fact an infinite spectrum of sizes, from the smallest it is possible to fabricate to the largest it is possible to ship or field assemble. Since the geometric proportions within each family remain constant, it is a simple matter to project the dimensions of any cyclone whose size is not shown in the charts.

In general, two or more smaller cyclones operating in parallel and under the same conditions will remove particulates more efficiently than one large cyclone of the same family. On the other hand, one large cyclone is significantly less costly than two or more smaller ones. However, limited headroom, structural requirements at the point of installation and other factors may dictate the size limitations of the cyclone selected. In all cases, Fisher-Klosterman will engineer the cyclone collector that will optimize cost and performance.

The six basic families of XQ Cyclones essentially span the entire spectrum of possible performance characteristics. However, if Fisher-Klosterman's lab tests or analysis of your problem indicate the need for a cyclone with performance characteristics somewhere in between those offered by two of their six basic families, Fisher-Klosterman can readily engineer precisely the high-performance cyclone you need.

An unlimited range of sizes and performance characteristics, plus higher efficiencies than ever achieved before, assure you that there's a Fisher-Klosterman XQ Series Cyclone that's right for your needs...and at the right price.

Factors to Consider in Selecting Your XQ Series Cyclone

Four Basic Uses

Cyclones are the oldest, simplest, most economical and most widely used method of separating solids from gas streams. Their uses fall into four categories:

1. Pollution Control

This is a very important and, with the development of the XQ Series, a rapidly expanding application of cyclones. In many cases where, previously, more exotic dust collectors were required, there's a Fisher-Klosterman XQ Series Cyclone efficient enough to meet the most stringent air pollution control codes, with no other equipment needed.

2. Product Recovery

Fisher-Klosterman cyclones are widely used in process industries for removing valuable product from gas streams, either at intermediate stages or at the end of the production process. For example, a cyclone is an extremely economical means of recovering many types of products from spray dryers, kilns, fluid bed reactors and similar process equipment. Another common application is the recovery of catalyst, as in petroleum refinery cat-crackers.

3. Pre-Cleaner Ahead of More Exotic Pollution Control Equipment

Other types of collectors, such as scrubbers, fabric collectors, and precipitators, are sensitive to high loadings of particulates. Excessive amounts of particulate matter overload them and cause them to malfunction. Fisher-Klosterman XQ Series Cyclones protect these devices and allow them to function at peak efficiency.

4. Particulate Size Classification

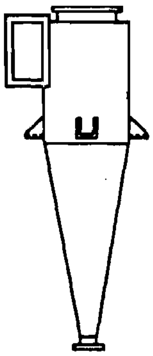
XQ Series Cyclones from Fisher-Klosterman provide effective, economical classification of gas-borne particulates by matching performance characteristics of the cyclone with the range of particle sizes it is desired to extract.

Installation Options

Depending on a number of considerations, including performance requirements, space and structural limitations, there are a number of installation options available for Fisher-Klosterman XQ Series Cyclones.

Single Cyclone

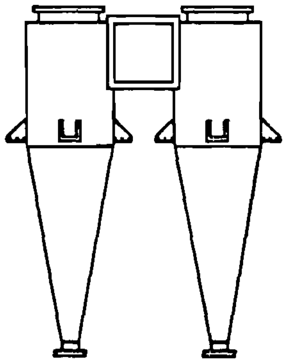
In many instances, this is the most economical option in installing a Fisher-Klosterman XQ Series Cyclone. Within limits determined by materials, shipping or field assembly and installation, this is generally the first choice when headroom and structural requirements are not limiting factors.



SINGLE CYCLONE

Parallel Cyclones

XQ Series Cyclones operating in parallel offer comparably higher efficiencies per volume of gas handled, with the efficiency increasing as an inverse function of the size of the cyclones. This is a more costly installation than a single cyclone, but is frequently necessitated by limited headroom or other structural requirements.



PARALLEL CYCLONES

There is no theoretical limit on the number of XQ Series Cyclone that may be installed in parallel, but there are a number of precautions that must be observed:

1. Through proper manifolding and, if necessary, use of dampers, each cyclone must receive a nearly equal share of the gas stream.
2. Product discharges into collection receivers MUST be isolated from one another.

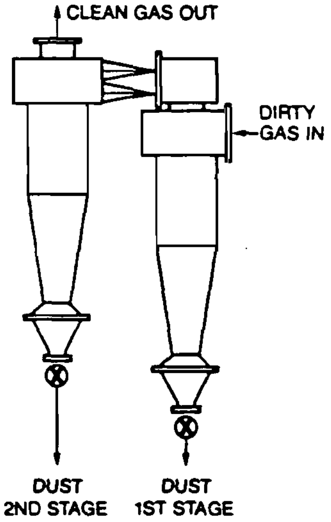
If this precaution is not rigorously observed, minute imbalances in gas volume and pressure will generate a feedback of particulates from the higher pressure cyclones, creating far lower operating efficiencies than predicted.

Discharges may be isolated either by each cyclone's discharging into its own sealed container or by all cyclones' discharging into a single compartmentalized receiver in which each compartment is sealed off from the others.

Cyclones in Series

If there is sufficient pressure available, Fisher-Klosterman XQ Series Cyclones may be operated in series to achieve even greater collection efficiency.

In a series installation, the exhaust gas stream from one cyclone is fed into the inlet of the next cyclone. The effect of such a series is cumulative: if the first cyclone collects 90% of, for example, the 10 micron particles from the gas stream, a second identical cyclone will also collect 90% of the 10 micron particles remaining in the stream exhausted from the first cyclone. This creates a cumulative collection efficiency of 99% at 10 microns. A third such cyclone in series would boost the cumulative efficiency to 99.9%, and so on.



CYCLONES IN SERIES

The factor limiting the number of cyclones that can be used in series is pressure drop. Each cyclone in a series generates its own pressure drop, so that two cyclones will have double the drop of one and so on. However, in some applications, cyclones are the only feasible type of collector for particulate separation and, in such cases, increased pressure drop must be tolerated to achieve the required performance levels.

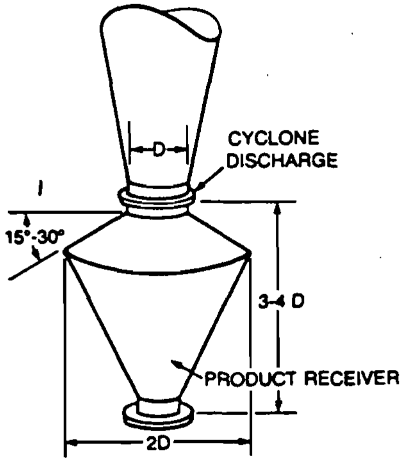
It is *extremely important* that each cyclone in a series have a *totally* isolated discharge receiver. Compartmentalization in a single receiver, as for parallel installations, is *not* sufficient. If isolation is not achieved, particles collected by the first stage cyclone will be re-entrained in the second stage cyclone, and so on.

Performance Assurance
For us to guarantee that a Fisher-Klosterman XQ Series Cyclone performs as specified, the following conditions must be met:

Product Discharge
The single most common cause of poor performance in cyclones is faulty design of the product discharge receiver.

Any high-performance cyclone *must* have an air-tight receiver at its product discharge. At the bottom of every well-designed cyclone, there is a tendency to create an induced flow of air into the product discharge from the outside. If the receiver is not air-tight, this can set up currents which will drive already collected particulates back into the cyclone.

Also, because the vortex at the product discharge creates extreme turbulence, re-entrainment will occur if material is allowed to accumulate close to the discharge. For this reason, rotary locks, feeder valves or air-tight screw conveyors should be installed some distance below the discharge, if high performance is expected.

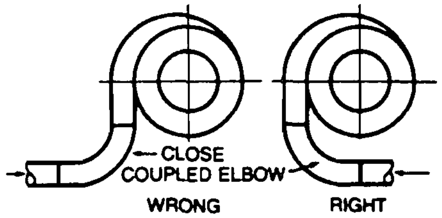


The figure above illustrates the typical proportions of a well-designed receiver. The proportions are subject both to engineering judgment and space limitations. For coarse, dense, easy-to-collect dusts, the height and diameter may be reduced. Extremely fine, hard-to-collect materials, on the other hand, require as large a receiver as is practical. In any event, no material should be stored or allowed to accumulate in the receiver.

Inlet Velocity
The inlet velocity of the gas stream must be high enough to keep materials airborne and prevent them from clogging the cyclone at this critical point. However, it should be remembered that higher inlet velocities generate higher inlet wear, particularly with highly abrasive materials. If abrasion is a critical factor, it would be advisable to move to the higher efficiency (i.e. *lower* family number) XQ Series Cyclones that can achieve the desired efficiency at lower velocities.

Inlet Ductwork Design
To assure proper performance, ductwork must be designed to maintain sufficiently high velocities to keep particulates airborne and to convey them into the cyclone. This is particularly critical with dense, heavy material, as well as with very fine dusts which have a tendency to adhere to surfaces with which they come in contact.

For maximum efficiency, it is important that any bends or elbows just ahead of the cyclone be made in the proper direction. Where the gas is flowing vertically up or down through the ductwork, close-coupled elbows that turn the flow horizontally are acceptable. For horizontal ductwork, it is *extremely important* that any close-coupled elbows turn in the *same direction as the flow in the cyclone* (i.e. clockwise elbows for cyclones with a clockwise rotation). Elbows in the opposite direction from the cyclone's flow can severely reduce the cyclone's efficiency.



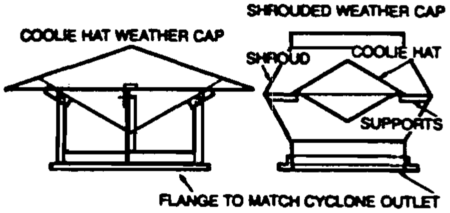
PLAN VIEW OF HORIZONTAL DUCT AT CYCLONE INLET

In any event, if round ductwork is used, a gradual transition (15°*incl.* angle recommended) to the rectangular cyclone inlet is mandatory.

Accessories

A number of performance-compatible accessories are available for XQ Series Cyclones. The following items are standard. Custom designs are also available.

Cyclone Outlet Accessories
Standard Weather Caps for direct-to-atmosphere discharge, in both "coolie-hat" and shrouded designs.



Scroll Outlets, when outlet ducting is required and wherever headroom is limited. Scroll outlets turn the vertical, spinning exhaust in a horizontal direction in minimum headroom and eliminate most of the gases' residual spin. This results in a small savings in pressure loss and is less expensive than a custom-fabricated elbow.

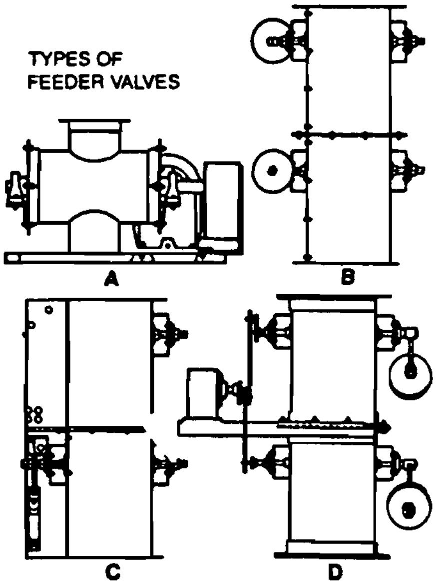
Product Discharge Outlet Accessories
Dust Receivers that meet the air-tight requirements of high-performance cyclones and act as transitions between the cyclones and various types of air-tight feeder valves for solids discharge.

Feeder Valves designed for Fisher-Klosterman XQ Series Cyclones maintain the air-tight integrity required for good cyclone performance, while making it possible to discharge the collected material from the receiver continuously.

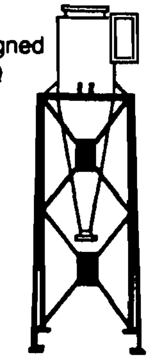
Several types of feeder valves are available:

A. Rotary air locks
B. Counterweighted, gravity operated double-dump valves
C. Counterweighted, air cylinder operated double-dump valves
D. Counterweighted, motor operated double-dump valves

TYPES OF FEEDER VALVES



Support Stands designed specifically for the XQ Series Cyclones and their accessories.



SUPPORT STAND

Technical Guide to the Selection of Fisher-Klosterman XQ Series High-Performance Cyclones

This section is intended for use by the Application Engineer in specifying the correct XQ Series Cyclone for his needs. Naturally, Fisher-Klosterman will be happy to provide all the assistance needed, or to undertake the complete engineering project, if desired.

Selection Factors

Three factors must be considered in selecting a cyclone for any application:

1. Inlet Velocity
2. Pressure Loss
3. Collection Efficiency.

Proper calculation of these variables insures the selection of an XQ Series Cyclone that will perform with maximum efficiency and cost effectiveness.

Inlet Velocity

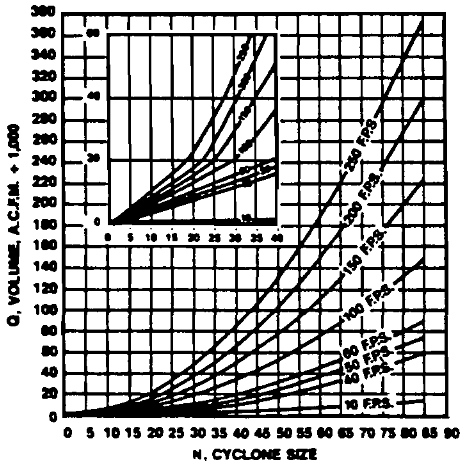
Most cyclone literature assumes an inlet velocity range from 20 to 100 feet per second. Most industrial applications have historically fallen in the 40 to 60 f.p.s. range. However, the range you consider need not be so narrow. Extensive testing and field experience have shown that Fisher-Klosterman XQ Series Cyclones perform predictably at velocities as low as 10 f.p.s. and well beyond 150 f.p.s.

The choice of inlet velocity is generally dictated by the aerodynamic characteristics of the particulates to be collected and the possibility of abrasion, as well as available space, equipment cost and power consumption.

Figure 1 shows the relationship between cyclone size (N), volumetric gas flow rate (Q) in ACFM, and inlet velocity (v_i) in f.p.s.

Application Engineers should consider that collection efficiency will increase as a complex exponential function of the inlet velocity. (This will be discussed in greater detail in a later section on collection efficiency.) Power consumption will increase approximately as the square of the inlet velocity. When abrasion is not a significant factor, these two criteria alone will determine the proper cyclone for the intended application.

FIG. 1

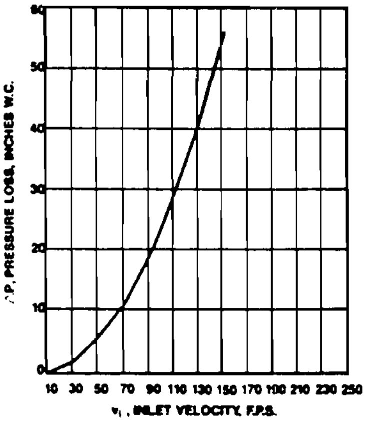


Pressure Loss

Energy is consumed in the passage of the gas through the cyclone. This is expressed as the pressure drop between the gas inlet and gas outlet of the cyclone, and is usually measured in inches of water column (in. w.c.). In any cyclone, the pressure loss increases approximately as the square of either the volumetric flow rate (Q) or the inlet velocity (v_i), and directly as the density (λ_g) of the gas.

Figure 2 shows the relationship between inlet velocity (v_i) and pressure loss (ΔP) in an XQ Series Cyclone with air at 70°F and 14.7 p.s.i.a.

FIG. 2



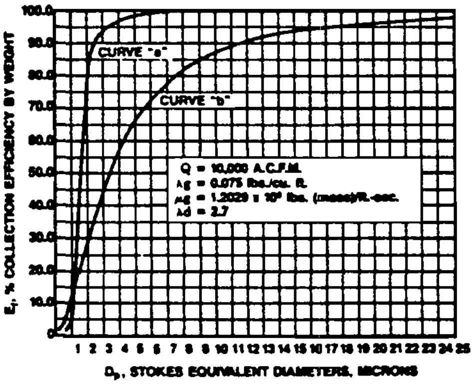
Fractional Efficiency

Efficiency is expressed in percentage by weight. In the Fractional or Particle Size or Grade Efficiency (E_f) Curve, the independent variable is the Stokes Equivalent Particle Diameter (D_p), in microns. The curve is a complex exponential function of:

1. inlet velocity (v_i) and absolute gas viscosity (μ_g).
2. particle mass, particle size, shape and surface roughness, usually measured as terminal velocity, feet/sec., in still air, and expressed as Stokes Equivalent Diameters (D_p) in microns.
3. cyclone size and proportions (shape).

Figure 3 illustrates two cyclone fractional efficiency curves. Each is for a single cyclone. Both are plotted at identical conditions: gas flow rates, densities and absolute viscosities are equal, as are cyclone pressure drops and particle density for both cyclones. Curve "a" is for an XQ120 cyclone, and Curve "b" is for an XQ465.

FIG. 3



Manual calculation of a fractional efficiency curve for just a single case is a complex and tedious problem, even for an experienced engineer. Fisher-Klosterman, however, has reduced this task to simplicity itself by the use of the digital computer. To determine a fractional efficiency curve, the following data are required:

- Volumetric gas flow rate, A.C.F.M., Q
- Gas density, lbs./cu. ft., λ_g
- Gas absolute viscosity, lbs. (mass)/ft.—sec., μ_g
- Particle specific gravity (dimensionless), or true particle density, gms/c.c., λ_d

If gas density and viscosity are not known, the gas analysis plus its temperature and pressure should be specified. Also, to aid in the selection of the best and most economical cyclone for your needs, either or both of the following should be specified:

- Maximum pressure drop, inches w.c.
- Desired efficiency at some specified particle size.

Helpful, but not mandatory, the following data should be furnished if available:

- Dust fineness, typically expressed as % by weight finer than 1.5 microns
- Inlet dust loading, grains/A.C.F.

With this information, our experienced application engineers can provide complete computer-calculated fractional efficiency curves in a matter of minutes.

Total Efficiency

Total Collection Efficiency (E_t) is defined as the percent by weight of the gas-borne particulate separated by the cyclone. To calculate Total Efficiency, not only must the Fractional Efficiency curve of the cyclone be known, but also the size distribution of the particulate.

The independent variable in the particle size distribution should be Stokes Equivalent Diameters, usually expressed in microns (one-millionth of a meter). This is a hypothetical aerodynamic diameter which accounts for the size, shape, mass and texture of the particle.

One word of caution: Optical techniques, screening, analytical instrumentation which measures particle size by determining the amount of liquid a particle displaces and other non-standardized methods do not give data which can be used with any degree of confidence or accuracy in calculating cyclone performance. If you have any doubts about your data, you should utilize our laboratory services. (See page 3).

The dependent variable in the Particle Size Distribution is generally expressed as "percent by weight finer" than a specified Stokes Equivalent Diameter in microns. Equally usable is data specifying the percent by weight falling in the range between two specified diameters.

The calculation of Total Efficiency involves the following steps:

- If it is not already in that form, convert the Particle Size Distribution to a cumulative % by weight finer than any specified diameter.
- Find the derivative of the Particle Size Distribution.
- Multiply the derivative by the Cyclone Fractional Efficiency Curve.
- Integrate the resulting product from zero particle diameter to infinity to find Total Collection Efficiency.

Although the above process sounds straightforward, the product to be integrated does not, in fact, have a rational integral. The problem must therefore be solved by one of three techniques:

- Graphical methods, or;
- Express the product as an infinite series which can be integrated term by term, or;
- Find the integral of the product by Numerical Calculus.

The latter method lends itself ideally to the digital computer. Given the same data as outlined for the computation of the Fractional Efficiency Curve (see page 8), plus the Particle Size Distribution, we can calculate and report Total Collection Efficiency to you in just a few minutes.

However, in many cases, you may wish to make an approximate calculation of Total Collection Efficiency yourself. A method for doing so involves the use of an "Average Limit Particle," and its use permits you to examine the consequences of varying both the type of cyclone and the number in parallel that you are considering. You must be aware that this method is only an approximation. Its accuracy decreases in two cases:

- When the particle size distribution is very narrow. Much more accurate results are obtained if the distribution ranges, for example, between 1.0 and 100.0 microns than if all particles fall between 1.0 and 10.0 microns.
- The lower the Total Collection Efficiency (the finer the particulate), the lower the accuracy of this method.

The Average Limit Particle size is calculated by:

$$D_l = k\sqrt{\frac{\mu_g \times N^3}{\lambda_d \times Q}},$$

where D_l = Average Limit Particle, microns.

μ_g = Absolute viscosity of gas, lbs. (mass)/ft.—sec.

N = Cyclone size.

λ_d = Particulate specific gravity, or true particle density, grams/c.c.

Q = Volumetric gas flow rate, A.C.F.M.

k, a constant, is given in Table 1 for each family of cyclones in the XQ Series.

Table 1

Cyclone Family	XQ465	XQ405	XQ340	XQ240	XQ170	XQ120
k	1254.27	1069.19	923.120	741.378	621.110	543.522

The approximate Total Collection Efficiency is calculated by:

$$\varepsilon_t = 100.0 - f_l,$$

where ε_t = Approximate Total Collection Efficiency, % by weight.

f_l = The percent finer by weight, in the Particle Size Distribution at the Average Limit Particle Size.

Examples of Cyclone Calculations

Example #1

Given:

Q = 6,800 A.C.F.M.

Gas = Air at 460° F. and 14.7 p.s.i.a.

λ_g = 0.036 lbs./cu. ft.

$\mu_g = 1.76 \times 10^{-5}$ lbs. (mass)/ft.—sec.

Specifications:

v_i = 70. f.p.s., maximum

ΔP = 3.0 in. w.c., maximum

Calculations:

1. From Figure 1, smallest single cyclone at $v_i \leq 70.$ f.p.s. is SIZE 22.
2. Allowable maximum pressure drop at specified conditions must be corrected to the gas density of air at 70°F. and 14.7 p.s.i.a., 0.075 lbs./cu. ft. $\Delta P_{(corr)} = 0.075 \times 3.0/0.036 = 6.25$ in. w.c.
3. From Figure 2, at $\Delta P_{(corr)} = 6.25$ in. w.c., v_i = 53. f.p.s. The cyclone will have to be resized to this inlet velocity.
4. Returning to Figure 1, smallest single cyclone at v_i 53. f.p.s. is SIZE 25.

Example #2

Given:

Q = 12,500 A.C.F.M.

λ_g = 0.075 lbs./cu. ft.

$\mu_g = 1.2029 \times 10^{-5}$ lbs. (mass)/ft.—sec.

λ_d = 3.15

Particle Size Distribution: See Figure 4.

Specifications:

Required Total Efficiency by weight, ε_t = 86.5%

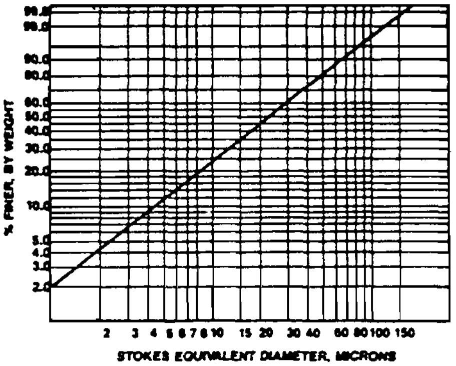
Maximum allowable pressure drop, ΔP = 7.5 in. w.c.

Maximum allowable inlet velocity, v_i = 55 f.p.s.

Calculations:

1. Assume cyclone will be type XQ340
2. From Figure 1 at v_i = 55 f.p.s., Size = 33
3. From Figure 2 at v_i = 55 f.p.s., ΔP = 6.8 in. w.c.
4. From Table 1, k = 923.120
5. By equation (1), $D_l = 923.120 \times \sqrt{\frac{1.2029 \times 10^{-5} \times 33^3}{3.15 \times 12500}}$ = 3.06
6. From Figure 4, f_l = 7.1
7. By equation (2), $\varepsilon_t = 100.0 - 7.1$ = 92.9%

FIG. 4



A typical XQ Series Model Number and What it Means

$$\underbrace{XQ465}_{A}\text{-}\underbrace{20}_{B}\text{-}\underbrace{2}_{C}\text{-}\underbrace{CR1}_{D}$$

A. "XQ" *plus a 3-digit number* designates the family of the cyclone.

B. "-" *plus a number* designates the cyclone size which equals the height of the cyclone inlet in inches. This may be a 1- or 2-digit number, or a decimal.

C. "-" *plus an integer* indicates the number of cyclones in parallel that make up the complete collection system.

D. "-" *plus a special suffix* designates special construction features. Some examples are:

PV = Pressure Vessel
CR1 = 1-inch Castable Refractory Lining
CR2 = 2-Inch Castable Refractory Lining
RB3 = 3-Inch Refractory Brick Lining
RB9 = 9-Inch Refractory Brick Lining
C.5 = ½-Inch Alumina Ceramic Tile Lining
C1 = 1-Inch Alumina Ceramic Tile Lining

Use the above information when specifying your XQ Series Cyclone. In addition, orders should specify separately:

Material(s) of Construction or (if Fisher-Klosterman is to determine the materials) special construction considerations such as high abrasion or corrosive conditions.

Special Construction Features, such as:

Break-Apart Construction for installations requiring cleaning and maintenance.

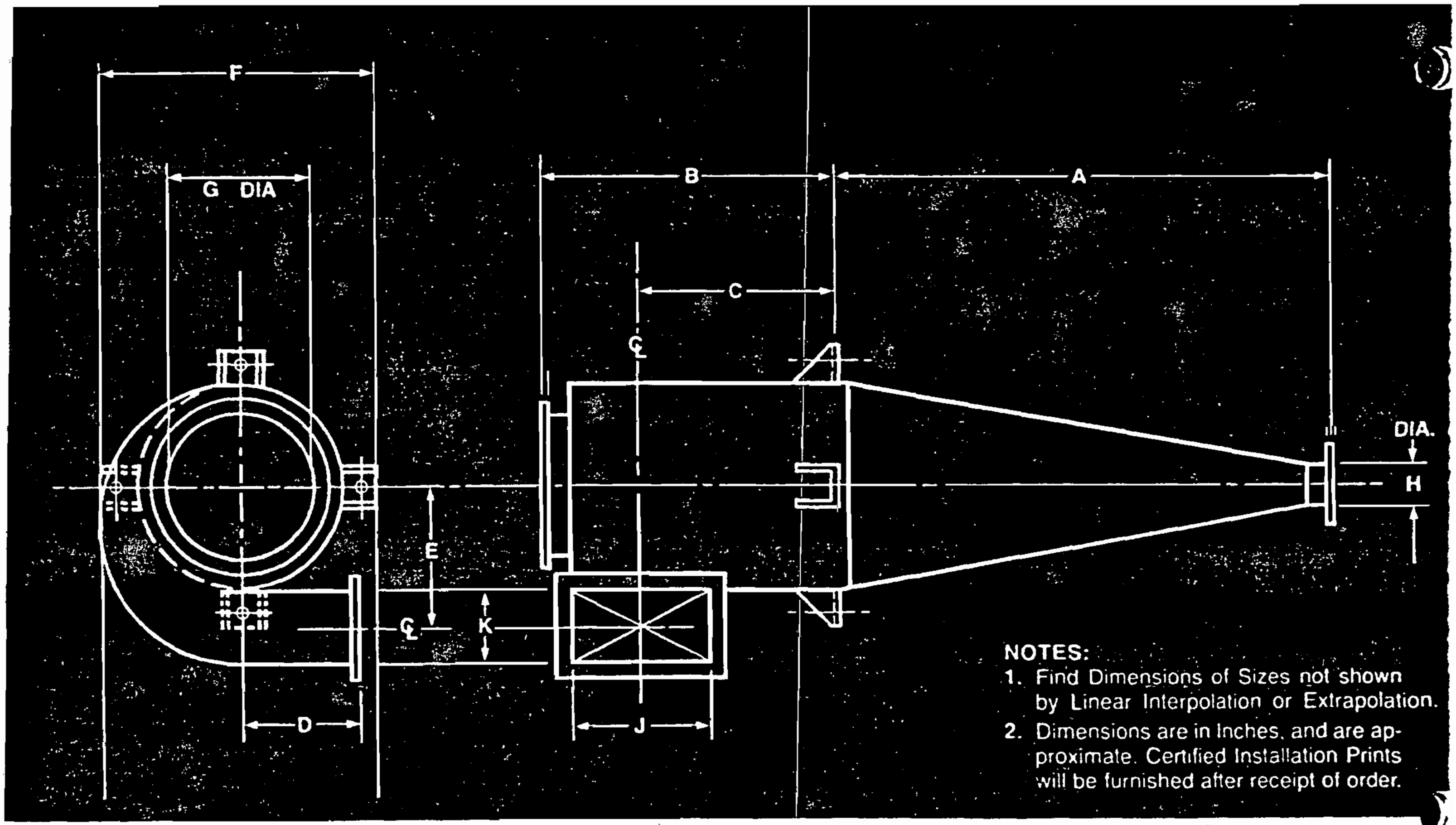
Externally Replaceable Wear Plates/Sections or special linings for highly abrasive dusts.

Access Doors (not recommended for the active portion of the cyclone when collection performance is critical).

Explosion Reliefs for use with explosive dusts.

Plus a variety of other features demanded by the individual cyclone's application.

XQ Series Single Cyclone



NOTES:
1. Find Dimensions of Sizes not shown by Linear Interpolation or Extrapolation.
2. Dimensions are in Inches, and are approximate. Certified Installation Prints will be furnished after receipt of order.

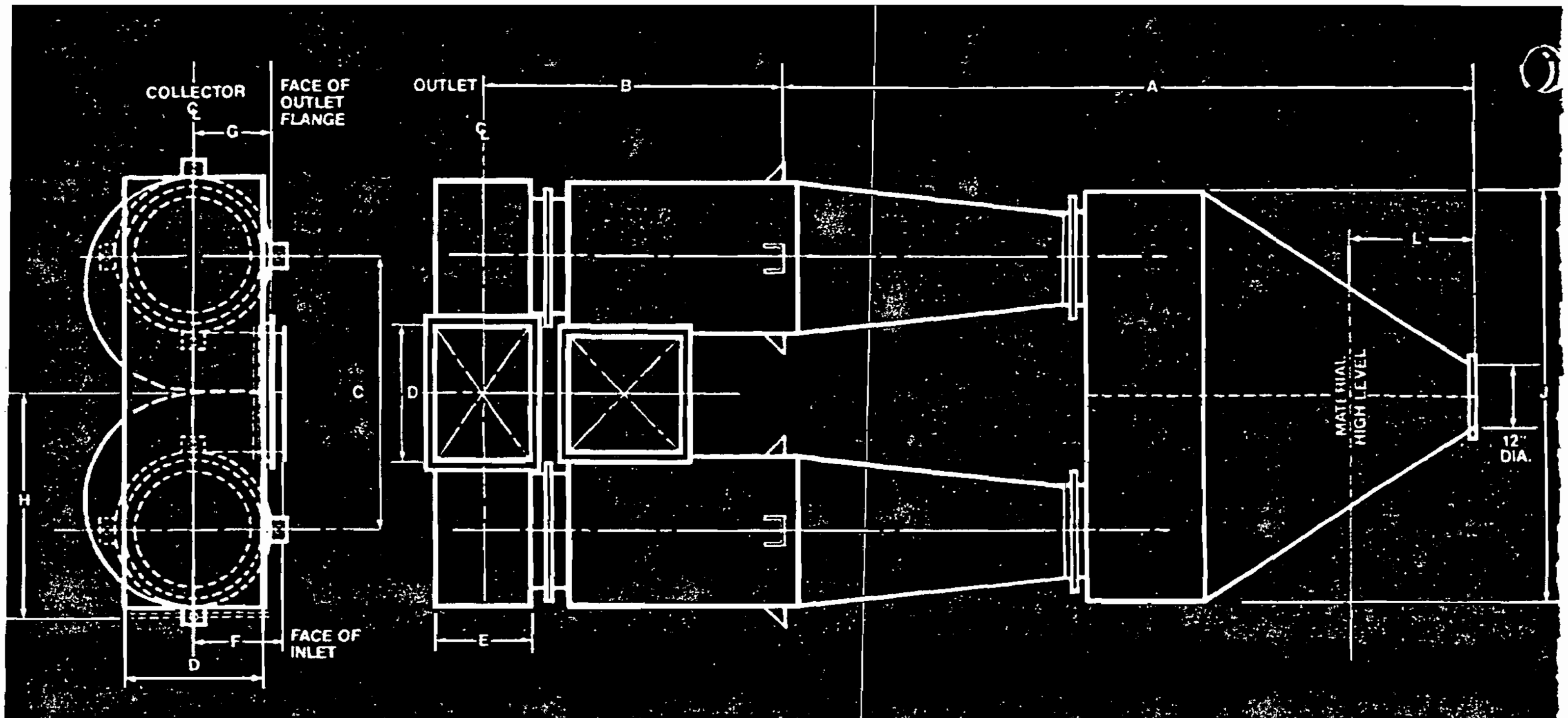
		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 3	A	10½	11⅜	12⅝	14¾	17¼	20½
	B	7½	8	8⅝	10	11⅝	13½
	C	4	4½	5⅛	6½	8⅛	10
Inlet Height: 3 in.	D	5	5	5	6	6	6
	E	2⅞	3¹/₁₆	3¼	3¹¹/₁₆	4¼	4⅞
	F	8½	9	9½	10	11½	12½
Inlet Width: 1½ in.	G	3	3	3	4	4	4
	H	2	2	2	2	3	3
Cyclone Size: 4	A	13¾	15	16¼	19¼	23	27
	B	9½	10¼	11	12¾	15	17½
	C	5½	6¼	7	8¾	11	13½
Inlet Height: 4 in.	D	6	6	6	6	7	7
	E	3¾	4	4⁵/₁₆	4⅞	5⅝	6⁷/₁₆
	F	10	10½	11	12	13½	15
Inlet Width: 2 in.	G	4	4	4	5	5	5
	H	2	2	3	3	4	4
Cyclone Size: 5	A	17¼	18¾	20¼	24	28½	36½
	B	11½	12⅜	13⅜	15¾	18¼	19
	C	7	7⅞	8⅞	11¼	13¾	14½
Inlet Height: 5 in.	D	6	6	6	7	7	8
	E	4¹¹/₁₆	5	5⁵/₁₆	6¹/₁₆	7	8
	F	11	2	12½	14	16	18
Inlet Width: 2½ in.	G	5	5	5	6	6	6
	H	3	3	3	4	5	5

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 6	A	20½	22¼	24¼	29	36½	43
	B	13½	14½	15¾	18½	19¼	23
	C	8½	9½	10¾	13½	14¼	18
Inlet Height: 6 in.	D	6	7	7	7	8	8
	E	5⅜	6	6⅜	7¼	8⅜	9⅝
	F	12½	13½	14	16	18	20½
Inlet Width: 3 in.	G	6	6	6	7	7	7
	H	3	4	4	5	5	6
Cyclone Size: 7	A	23¾	26	28	36	42	49½
	B	15½	16¾	18¼	18¾	22½	27
	C	10	11¼	12¾	13¼	17	21½
Inlet Height: 7 in.	D	7	7	7	8	8	9
	E	6⁹/₁₆	6¹⁵/₁₆	7⁷/₁₆	8½	9¾	11¼
	F	14	14½	15½	18	20½	25½
Inlet Width: 3½ in.	G	7	7	7	8	9	9
	H	4	4	4	5	6	8
Cyclone Size: 8	A	27	29½	32	40½	48	56
	B	17½	19	20½	21½	26	31
	C	11½	13	14½	15½	20	25
Inlet Height: 8 in.	D	7	7	8	8	9	10
	E	7⁷/₁₆	7¹⁵/₁₆	8½	9⅝	11⅛	12¾
	F	15	16	17½	19½	24½	28
Inlet Width: 4 in.	G	8	8	8	10	10	10
	H	4	5	5	6	7	9

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 9	A	30½	33	38½	45½	53	63
	B	19½	21	20½	24½	29	35
	C	13	14½	14	18	22½	28½
Inlet Height: 9 in.	D	8	8	8	9	9	10
	E	8⅜	8⅞	9½	10⅞	12½	14⅜
	F	16½	17½	19	23½	27	30½
Inlet Width: 4½ in.	G	9	9	9	11	11	11
	H	5	5	6	7	8	10
Cyclone Size: 11	A	37	43	46½	55	65	76
	B	25½	25	27	32	38	45
	C	16	15½	17½	22½	28½	35½
Inlet Height: 11 in.	D	9	9	10	10	11	12
	E	10¼	10⅞	11⅝	13¼	15¼	17⅝
	F	19½	20½	24	27½	31½	36
Inlet Width: 5½ in.	G	11	11	10	13	13	14
	H	6	6	7	8	10	12
Cyclone Size: 13	A	46½	50	55	64	76	90
	B	27	29½	32	38	44½	53
	C	16½	19	21½	27½	34	42½
Inlet Height: 13 in.	D	10	10	10	11	12	13
	E	12	12¾	13⅝	15⅝	17⅞	20⅝
	F	24	25½	27	31	35½	43
Inlet Width: 6½ in.	G	13	13	12	16	16	16
	H	7	8	8	10	12	14
Cyclone Size: 15	A	53	57	62	74	87	103
	B	31	33½	36½	43½	51	61
	C	19½	22	25	32	39½	49½
Inlet Height: 15 in.	D	11	11	11	12	13	14
	E	13⅞	14¾	15¾	18⅛	20⅝	23⅞
	F	26½	28½	30½	35	42	48½
Inlet Width: 7½ in.	G	15	15	14	18	18	18
	H	8	9	10	11	14	16
Cyclone Size: 18	A	63	68	74	88	104	123
	B	37	40	44	52	61	73
	C	24	27	31	39	48	60
Inlet Height: 18 in.	D	12	12	12	13	14	16
	E	16⅝	17⅝	18⅝	21⅝	24⅞	28⅝
	F	30½	32½	35	42½	49	56½
Inlet Width: 9 in.	G	18	17	17	21	22	22
	H	10	11	11	14	16	19
Cyclone Size: 21	A	73	79	86	102	121	143
	B	43	46½	51	60	72	85
	C	28½	32	38½	45½	57½	70½
Inlet Height: 21 in.	D	13	13	13	14	16	17
	E	19⅛	20⅝	22⅛	25⅛	28⅞	33⅜
	F	34½	37	42	48	55½	68½
Inlet Width: 10½ in.	G	21	20	20	25	26	26
	H	11	12	13	16	19	23

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 25	A	86	94	102	121	143	170
	B	51	55	80	72	85	101
	C	34½	38½	43½	55½	68½	84½
Inlet Height: 25 in.	D	14	14	14	16	17	18
	E	23⅛	24⅝	26⅛	29⅞	34⅜	39 15/16
	F	42	45	48	55½	68½	79½
Inlet Width: 12½ in.	G	25	24	24	30	30	31
	H	13	15	16	19	23	27
Cyclone Size: 30	A	103	112	122	144	171	203
	B	61	66	72	86	102	121
	C	42	47	53	67	83	102
Inlet Height: 30 in.	D	15	15	16	17	19	20
	E	27⅝	29⅜	31⅜	36⅛	41 3/16	47 11/16
	F	48½	52	56	69½	79½	92½
Inlet Width: 15 in.	G	30	29	28	36	36	37
	H	16	18	19	23	27	32
Cyclone Size: 36	A	123	134	146	173	205	243
	B	73	79	87	103	122	145
	C	51	57	65	81	100	123
Inlet Height: 36 in.	D	16	16	17	19	20	22
	E	33⅛	35⅛	37⅝	43 3/16	49 11/16	57¼
	F	56	60	69½	80½	93½	109
Inlet Width: 18 in.	G	36	35	34	43	44	44
	H	19	21	23	27	33	39
Cyclone Size: 43	A	146	159	173	206	244	290
	B	87	95	103	123	146	173
	C	61½	69½	77½	97½	120½	147½
Inlet Height: 43 in.	D	18	18	19	20	22	24
	E	39⅝	41 15/16	44 15/16	51 7/16	59	68⅝
	F	69½	74½	80½	93½	109	128
Inlet Width: 21½ in.	G	43	42	41	51	52	53
	H	23	25	28	33	39	46
Cyclone Size: 51	A	173	188	206	243	289	343
	B	103	112	122	145	172	205
	C	73½	82½	92½	115½	142½	175½
Inlet Height: 51 in.	D	19	19	20	22	24	26
	E	46 15/16	49 15/16	53 7/16	61	70⅛	81⅛
	F	80½	86½	93½	109	127	149
Inlet Width: 25½ in.	G	51	49	48	60	62	62
	H	27	30	33	39	46	54
Cyclone Size: 60	A	203	221	241	286	339	403
	B	121	132	[illegible]	171	203	241
	C	87	98	100	137	169	207
Inlet Height: 60 in.	D	21	21	22	24	26	28
	E	55 7/16	58¾	62⅝	71⅞	82⅝	95⅜
	F	92½	100	108	126	147	173
Inlet Width: 30 in.	G	60	58	58	71	72	73
	H	32	35	38	45	54	64

XQ Series Dual Cyclone



NOTES:

1. Find Dimensions of Sizes not shown by Linear Interpolation or Extrapolation.
2. Dimensions are in Inches, and are approximate. Certified Installation Prints will be furnished after receipt of order.
3. Dimension "K" is the Maximum Front-Back Depth of the Dust Hopper.

		XQ-485	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
	A	50½	55	61½	72½	84	99
Cyclone Size: 9-2	B	24¾	25¾	25¼	30¾	35¾	41¾
	C	21⅜	22⅜	23⅜	26⅜	29⅜	33⅜
	D	13	13	13	15	15	15
Inlet Height: 9 in.	E	10	9	9	12	13	13
	F	14	14	14	15	15	16
	G	7½	7½	7½	8½	8½	8½
Inlet Width: 9⅛ in.	H	22	22	23	26	28	30
	J	35	37	38	43	48	54
	K	14	14	15	16	19	21
	L	2	3	2	2	2	1

		XQ-485	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
	A	76½	83	90	105	123	145
Cyclone Size: 13-2	B	35¼	37¼	39¼	47¾	54¾	63¼
	C	30⅝	32⅛	33⅞	37⅞	42⅝	47⅞
	D	17	17	17	20	20	20
Inlet Height: 13 in.	E	16	15	14	19	20	20
	F	16	16	16	17	18	19
	G	10½	10½	10½	12	12	12
Inlet Width: 13⅛ in.	H	31	31	31	37	39	42
	J	47	50	52	59	66	75
	K	17	18	19	21	24	27
	L	5	6	5	6	5	6

		XQ-485	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
	A	62	70	75½	89	104	122
Cyclone Size: 11-2	B	32¼	31¼	33¼	40¼	46¼	53¼
	C	26⅛	27⅜	28⅞	32⅛	36⅛	40⅞
	D	15	15	15	17	18	18
Inlet Height: 11 in.	E	13	12	12	16	16	16
	F	15	15	16	16	17	18
	G	9½	9½	9½	10½	11	11
Inlet Width: 11⅛ in.	H	26	27	27	31	34	36
	J	41	43	46	51	57	65
	K	15	16	17	19	21	24
	L	3	4	4	4	3	4

		XQ-485	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
	A	89	95	104	122	142	167
Cyclone Size: 15-2	B	40¾	42¾	45¼	55¼	62¾	72¾
	C	35⅜	37⅛	39⅛	43⅞	48⅞	55⅜
	D	19	19	18	22	22	23
Inlet Height: 15 in.	E	19	18	17	23	23	23
	F	17	17	17	18	19	20
	G	11½	11½	11	13	13	13½
Inlet Width: 15⅛ in.	H	35	35	36	42	45	48
	J	54	56	60	67	75	86
	K	18	19	21	23	27	30
	L	7	6	8	8	7	7

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Cyclone Size: 18-2

Inlet Height: 18 in.

Inlet Width: 18⅛ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	107	115	124	146	171	201
B	48¾	50¾	55¼	66¼	75¾	87¾
C	42⅜	44⅜	46⅞	52⅜	58⅞	66⁷⁄₁₆
D	22	22	21	26	26	26
E	23	21	22	28	29	29
F	18	18	18	19	20	22
G	13	13	12½	15	15	15
H	41	42	43	50	53	57
J	63	66	70	79	89	102
K	21	22	23	27	31	35
L	9	9	9	10	9	10

Cyclone Size: 21-2

Inlet Height: 21 in.

Inlet Width: 21⅛ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	125	134	146	170	200	234
B	57¼	59¾	64¼	76¾	89¼	102¼
C	49⅜	51⅞	54⅞	60⅞	68⅜	77⁷⁄₁₆
D	25	25	24	29	30	30
E	28	26	26	33	34	34
F	19	19	19	20	22	23
G	14½	14½	14	16½	17	17
H	48	48	49	57	62	66
J	72	76	81	91	103	117
K	23	25	26	30	34	40
L	12	11	13	12	12	11

Cyclone Size: 25-2

Inlet Height: 25 in.

Inlet Width: 25³⁄₁₆ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	149	162	174	203	237	280
B	68¼	71¼	75¾	92¼	106¼	122⁵⁄₁₆
C	58⅞	61⅞	64⅞	72⅜	81⁷⁄₁₆	92⅝
D	29	29	28	34	34	35
E	34	32	31	40	42	42
F	20	20	20	22	23	24
G	16½	16½	16	19	19	19½
H	57	57	58	68	73	79
J	85	90	95	107	121	139
K	26	28	30	34	40	46
L	16	16	16	15	14	16

Cyclone Size: 30-2

Inlet Height: 30 in.

Inlet Width: 30³⁄₁₆ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	180	193	208	244	285	336
B	82¼	86¼	91¾	111¼	127¹³⁄₁₆	146¹³⁄₁₆
C	70⅝	73⅞	77⅞	87⁷⁄₁₆	97⅝	110⅝
D	34	33	32	40	40	41
E	42	40	39	50	[illegible]	51
F	21	21	22	23	25	26
G	19	18½	18	22	22	22½
H	67	68	69	81	[illegible]	94
J	101	106	113	128	[illegible]	165
K	30	32	35	40	[illegible]	54
L	20	19	20	20	[illegible]	20

Cyclone Size: 36-2

Inlet Height: 36 in.

Inlet Width: 36¼ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	217	233	252	293	344	403
B	98⅜	103¼	111¼	133¹³⁄₁₆	153⁵⁄₁₆	177⁵⁄₁₆
C	84⁷⁄₁₆	88⁷⁄₁₆	93⁷⁄₁₆	104⅝	117⅝	132¹³⁄₁₆
D	40	39	38	47	48	48
E	51	48	48	61	62	64
F	22	22	23	25	26	28
G	22	21½	21	25½	26	26
H	80	81	83	97	105	113
J	120	126	134	151	172	197
K	35	38	40	47	55	64
L	26	25	25	25	24	24

Cyclone Size: 43-2

Inlet Height: 43 in.

Inlet Width: 43⅜ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	258	278	300	351	410	482
B	118⅛	124¹³⁄₁₆	132⁵⁄₁₆	160¹³⁄₁₆	184⁵⁄₁₆	212⅜
C	100⁷⁄₁₆	105⅝	111⅝	124⅝	139¹³⁄₁₆	159⅛
D	[illegible]	46	45	55	56	57
E	[illegible]	59	58	75	76	78
F	[illegible]	24	25	26	28	30
G	25½	25	24½	29½	30	30½
H	[illegible]	97	99	116	124	135
J	[illegible]	149	159	179	204	234
K	[illegible]	44	47	55	64	75
L	[illegible]	31	30	30	30	30

Cyclone Size: 51-2

Inlet Height: 51 in.

Inlet Width: 51⅜ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	306	330	357	416	486	571
B	140¹³⁄₁₆	147¹³⁄₁₆	157⁵⁄₁₆	189¹³⁄₁₆	218⅜	251⅜
C	119⅝	125⅝	132⅝	147¹³⁄₁₆	166⅛	188⅛
D	55	53	52	64	66	66
E	75	71	70	89	92	92
F	25	25	26	28	30	32
G	29½	28½	28	34	35	35
H	113	114	117	136	147	158
J	166	176	187	212	240	275
K	47	51	55	64	74	87
L	38	38	37	37	37	38

Cyclone Size: 60-2

Inlet Height: 60 in.

Inlet Width: 60⅜ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	381	389	420	490	573	672
B	165¹³⁄₁₆	174¹³⁄₁₆	185⁵⁄₁₆	224⅜	256⅞	295⅞
C	140⅝	147¹³⁄₁₆	155¹³⁄₁₆	174⅛	195⅛	221⅛
D	[illegible]	62	60	75	76	77
E	[illegible]	85	82	106	107	109
F	[illegible]	27	28	30	32	34
G	[illegible]	33	32	39½	40	40½
H	133	134	136	160	172	186
J	195	206	219	248	282	323
K	[illegible]	58	63	74	87	102
L	[illegible]	45	[illegible]	46	44	44

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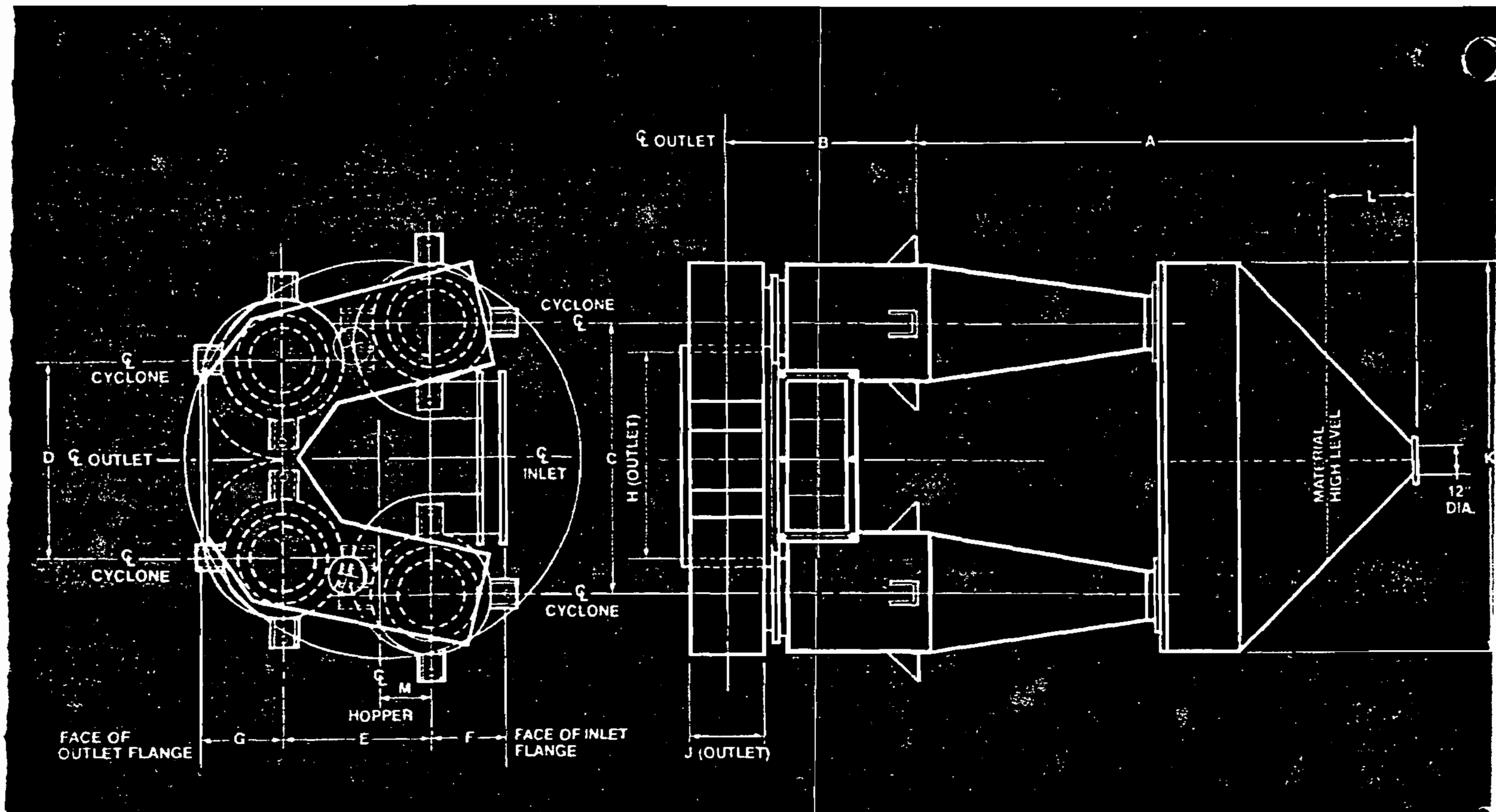
XQ Series Quad Cyclone



NOTES:

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2. Dimensions are in Inches, and are approximate. Certified Installation Prints will be furnished after receipt of order.

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 9-4	A	59½	64	71½	82½	96	112
	B	28	29	28½	34	39	45
	C	30⅝	31⅝	32⅞	35⅜	38⅞	42⅝
	D	21⅜	22⅜	23⅝	26⅜	29⅝	33⅜
Inlet Height: 9 in.	E	17	18	20	22	26	29
	F	14	14	14	15	15	16
	G	8	9	9	10	11	13
	H	26	26	26	30	30	30
Inlet Width: 18⅜ in.	J	10	9	9	12	13	13
	K	46	48	50	55	62	69
	L	11	12	12	12	14	14
	M	4¹⁵⁄₁₆	5½	6¾	7¾	10	11½
Cyclone Size: 11-4	A	73	82	87½	102	119	137
	B	35½	34½	36½	43½	49½	56½
	C	37⅜	38⅝	40⅛	43⅜	47⅜	52⅛
	D	26⅛	27⅜	28⅞	32⅛	36⅛	40⅞
Inlet Height: 11 in.	E	20	22	23	27	31	35
	F	15	15	16	16	17	18
	G	10	11	11	12	13	15
	H	30	30	30	34	36	36
Inlet Width: 22⅜ in.	J	13	12	12	16	16	16
	K	54	57	59	66	74	83
	L	14	16	16	17	18	19
	M	5⁹⁄₁₆	6¾	7¼	9⅝	11¾	13¾

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 13-4	A	89½	96	104	119	139	163
	B	38½	40½	42½	51	58	66½
	C	43⅞	45⅜	47⅛	51⅛	55⅝	61⅛
	D	30⅝	32⅛	33⅞	37⅞	42⅜	47⅞
Inlet Height: 13 in.	E	23	25	27	31	35	41
	F	16	16	16	17	18	19
	G	12	12	13	14	15	18
	H	34	34	34	40	40	40
Inlet Width: 26⅜ in.	J	16	15	14	19	20	20
	K	62	65	69	76	85	96
	L	18	19	19	20	21	24
	M	6⅛	7⅜	8½	10¾	12¾	16
Cyclone Size: 15-4	A	104	111	119	139	161	188
	B	44	46	48½	58½	66	76
	C	50⅝	52⅜	54⅜	59⅛	64⅛	70⅝
	D	35⅜	37⅛	39⅛	43⅞	48⅞	55⅜
Inlet Height: 15 in.	E	27	28	30	35	40	47
	F	17	17	17	18	19	20
	G	13	14	15	16	18	20
	H	38	38	36	44	44	46
Inlet Width: 30⅜ in.	J	19	18	17	23	23	23
	K	71	74	78	87	97	110
	L	22	22	23	25	26	28
	M	7⅜	7⅞	9	11⅞	14½	18½

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 18-4	A	124	133	143	166	193	226
	B	52	54	58½	69½	79	91 1/16
	C	60⅝	62⅝	65⅛	70⅝	77⅛	84¾
	D	42⅜	44⅜	46⅞	52⅜	58⅞	66 7/16
Inlet Height: 18 in.	E	31	33	36	41	48	56
	F	18	18	18	19	20	22
	G	16	17	18	19	21	25
	H	44	44	42	52	52	52
Inlet Width: 36 7/16 in.	J	23	21	22	28	29	29
	K	83	87	92	102	115	131
	L	26	27	28	30	31	35
	M	7⅞	9⅛	10⅞	13¾	17½	21¾
Cyclone Size: 21-4	A	146	156	167	194	225	263
	B	60½	63	67½	80	92½	105 9/16
	C	70⅝	73⅛	76⅛	82⅛	89⅝	98¾
	D	49⅜	51⅞	54⅞	60⅞	68⅜	77 7/16
Inlet Height: 21 in.	E	36	39	42	48	55	64
	F	19	19	19	20	22	23
	G	19	19	21	22	25	29
	H	50	50	48	58	60	60
Inlet Width: 42 7/16 in.	J	28	26	26	33	34	34
	K	96	101	106	118	132	150
	L	33	33	34	36	37	40
	M	9⅛	11	12¾	16	19¾	24¾
Cyclone Size: 25-4	A	173	186	200	231	268	314
	B	71½	74½	79	95½	109 9/16	125 9/16
	C	84⅛	87⅛	90⅛	97⅝	106¾	118 1/16
	D	58⅞	61⅞	64⅞	72⅜	81 7/16	92⅝
Inlet Height: 25 in.	E	42	45	49	56	65	76
	F	20	20	20	22	23	24
	G	22	23	25	26	30	34
	H	58	58	56	68	68	70
Inlet Width: 50⅝ in.	J	34	32	31	40	42	42
	K	113	118	125	139	156	178
	L	40	40	42	43	45	50
	M	10¼	12	14½	18½	23¼	29
Cyclone Size: 30-4	A	209	223	240	277	322	375
	B	85½	89½	95	114 9/16	131 9/16	150 1/16
	C	100⅝	104⅛	108⅛	117¾	128 9/16	141 1/16
	D	70⅜	73⅞	77⅞	87 7/16	97⅝	110⅝
Inlet Height: 30 in.	E	50	54	58	67	78	90
	F	21	21	22	23	25	26
	G	26	28	30	31	35	41
	H	68	66	64	80	80	82
Inlet Width: 60⅝ in.	J	42	40	39	50	51	51
	K	134	140	148	166	186	211
	L	49	49	51	53	56	59
	M	12	14½	16¾	22	27½	34½

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 36-4	A	250	268	288	333	388	452
	B	102 1/16	106 9/16	114 9/16	137 1/16	156 9/16	180⅝
	C	120¾	124¾	129¾	141 1/16	154 1/16	169⅜
	D	84 7/16	88 7/16	93 7/16	104⅝	117⅝	132 13/16
Inlet Height: 36 in.	E	60	64	69	80	93	108
	F	22	22	23	25	26	28
	G	31	33	35	37	42	49
	H	80	78	76	94	96	96
Inlet Width: 72 13/16 in.	J	51	48	48	61	62	64
	K	159	167	176	197	223	253
	L	59	60	61	65	68	73
	M	14½	17	19¾	26	33	41
Cyclone Size: 43-4	A	298	320	344	397	462	540
	B	121 9/16	128 1/16	135 9/16	164 1/16	187⅜	215 11/16
	C	143¾	149 1/16	155 1/16	168 1/16	183⅜	202⅞
	D	100 7/16	105⅝	111⅝	124⅝	139 13/16	159⅛
	E	70	75	81	94	110	129
Inlet Height: 43 in.	F	24	24	25	26	28	30
	G	37	39	42	44	50	58
	H	94	92	90	110	112	114
	J	62	59	58	75	76	78
Inlet Width: 87⅛ in.	K	188	198	209	233	264	301
	L	71	73	74	76	82	88
	M	16	19	22½	30	39	49
Cyclone Size: 51-4	A	355	379	408	472	548	638
	B	144 1/16	151 1/16	160 9/16	193⅛	221 11/16	254 11/16
	C	171 1/16	177 1/16	184 1/16	199⅜	217⅞	239⅞
	D	119⅝	125⅝	132⅝	147 13/16	166⅛	188⅛
Inlet Height: 51 in.	E	83	89	96	111	130	152
	F	25	25	26	28	30	32
	G	44	47	50	52	59	69
	H	110	106	104	128	132	132
Inlet Width: 103⅛ in.	J	75	71	70	89	92	92
	K	222	233	246	276	311	353
	L	87	87	88	93	99	105
	M	19	22¾	27	35½	46	58
Cyclone Size: 60-4	A	418	447	480	555	645	752
	B	169 1/16	178⅛	188⅝	227 11/16	260 5/16	299 3/16
	C	201 1/16	208⅜	216⅝	234⅞	255⅞	281⅞
	D	140⅝	147 13/16	155 13/16	174⅛	195⅛	221⅛
Inlet Height: 60 in.	E	97	104	112	131	152	178
	F	27	27	28	30	32	34
	G	52	55	59	61	70	81
	H	128	124	120	150	152	154
Inlet Width: 121⅛ in.	J	89	85	82	106	107	109
	K	260	273	288	323	365	415
	L	102	103	105	111	116	124
	M	22	26	31	42	53	68

Table 2

Standard Material Thicknesses (See Note 1)
Maximum Cyclone Size (See Note 2)

U.S.S. GAUGE	INCHES	XQ465	XQ405	XQ340	XQ240	XQ170	XQ120
16	.0598	36	33	30	25	21	18
14	.0747	45	41	37	32	27	22
12	.1046	62	57	52	44	37	31
10	.1345	80	74	67	57	48	40
3/16 Pl.	.1875	112	103	94	79	67	56
¼ Pl.	.2500	149	137	125	105	89	75
⅜ Pl.	.3750	224	206	188	158	133	112

NOTES:

1. Any thickness of material in all carbon steel, alloy or stainless steel, high nickel, aluminum and other non-ferrous alloys is available as required by operating conditions.

2. The above sizes will withstand −15 in. w.c. absolute internal pressure in commercial quality hot rolled steel.

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Table 3
Installed Weights of Single Cyclones (See Note 1)

CYCLONE	XQ465		XQ405		XQ340		XQ240		XQ170		XQ120	
SIZE	THK.	LBS.	THK.	LBS.	THK.	LBS.	THK.	LBS.	THK.	LBS.	THK.	LBS.
3	.0598	5	.0598	6	.0598	7	.0598	9	.0598	12	.0598	16
4	.0598	8	.0598	10	.0598	11	.0598	15	.0598	21	.0598	29
5	.0598	13	.0598	15	.0598	18	.0598	24	.0598	33	.0598	45
6	.0598	19	.0598	22	.0598	26	.0598	35	.0598	47	.0598	65
7	.0598	25	.0598	30	.0598	35	.0598	47	.0598	64	.0598	88
9	.0598	42	.0598	50	.0598	58	.0598	78	.0598	105	.0598	145
11	.0598	63	.0598	75	.0598	86	.0598	115	.0598	160	.0598	220
13	.0598	88	.0598	105	.0598	120	.0598	165	.0598	220	.0598	305
16	.0598	135	.0598	155	.0598	180	.0598	245	.0598	335	.0598	460
20	.0598	205	.0598	245	.0598	285	.0598	385	.0598	525	.0747	900
24	.0598	300	.0598	355	.0598	410	.0598	555	.0747	945	.1046	1800
29	.0598	435	.0598	515	.0598	600	.0747	1000	.1046	1950	.1046	2650
36	.0598	670	.0747	1000	.0747	1150	.1046	2200	.1046	2950	.1345	5250
44	.0747	1250	.1046	2100	.1046	2410	.1046	3250	.1345	5700	.1875	10,700
54	.1046	2650	.1046	3150	.1345	4750	.1345	6350	.1875	11,700	.1875	16,100
66	.1345	5100	.1345	6000	.1345	6950	.1875	12,900	.1875	17,500	.2500	32,000
76	.1345	6750	.1875	10,900	.1875	12,600	.1875	17,000	.2500	30,900	.3750	63,600
81	.1875	10,400	.1875	12,300	.1875	14,300	.2500	25,800	.2500	35,100	.3750	72,300

NOTES:

1. Weights are based on commercial quality hot rolled steel.
2. For sizes and/or thicknesses not shown, use the following procedure:
   A. Select the nearest size, $N_{(tab)}$, and find $t_{(tab)}$, the tabulated thickness and $W_{(tab)}$, the tabulated weight for the XQ cyclone family being considered.

   B. Calculate the weight, W, by

$$W = \frac{W_{(tab)} \times t}{t_{(tab)}} \times \left(\frac{N}{N_{(tab)}}\right)^2,$$

   where t = desired thickness, inches
   N = desired cyclone size.
3. For DUAL cyclones, including dust hopper and inlet and outlet manifolds, calculate W as in Note 2. Then, find the total weight, $W_{(tot)}$ by $W_{(tot)} = 3.708 \times W$.
4. For QUAD cyclones, the procedure is as in Note 3 EXCEPT $W_{(tot)} = 8.207 \times W$.

Table 4
Shipping Limitations

The following are the largest sizes of single cyclones that can be shipped completely pre-assembled. Larger sizes will, in all cases, require knockdown (K.D.) construction flanged for bolted field assembly. Depending on routing, in some states the maximum sizes will be even smaller.

XQ465—87
XQ405—82
XQ340—77
XQ240—67
XQ170—58
XQ120—51

Table 5
English To Metric Conversions

	Multiply		*To Convert to*
	English Units	**By**	**Metric Units**
Dimensions	Inches	2.540	cm.
Weights	Pounds	0.454	kg.
Volumetric Flow Rate	C.F.M.	4.720×10^{-4}	M^3/sec.
Velocity	Ft./Sec.	0.305	M/sec.
Pressure Drop	Inches—Water	1.863	mm—Mercury
Density	Lbs./Cu. Ft.	0.160	g/cc
Absolute Viscosity	Lbs. (Mass)/Ft.—Sec.	1488.2	Centipoise
Temperature	One (1) Degree F	0.555	One (1) Degree C
Pressure	P.S.I.	51.714	mm—Mercury
Dust Loading	Grains/Cu. Ft.	2.29×10^{-3}	kg/M^3

fk **Fisher-Klosterman, Inc.**
P.O. Box 11190, Station H
Louisville, Kentucky 40211
(502) 776-1505

Part I: Supplemental Information 1

Description of Process 1

System Design 1

Wood Usage 1

Emissions 2

Emissions Control Devices 2

Part II: Airborne Contaminants Emitted Data and 3

Table One: Pensacola Mill Pine Chip Thickness Screening 3

Calculations: 3

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Part I: Supplemental Information

Description of Process

Champion International Corporation is proposing to construct a pine wood chip thickness screening system at its Pensacola facility, located in Cantonment, Escambia County, Florida. The new thickness screening system will replace an existing oversized chip screen system which classifies chips according to length rather than thickness. The effect of this project will be to increase chip quality to existing chip digesters and therefore will enhance pulp quality to the bleach plant and paper machines. The project objective will not increase production or throughput and will have no effect on any other mill equipment emissions.

System Design

The proposed pine wood chip thickness screening system will consist of the following equipment:

- 1 Primary Disc Screen
- 1 Secondary Disc Screen
- 1 Air Density Separator Rotary Feeder
- 1 Air Density Separator Cyclone and Blower
- 2 Chip Slicers
- 2 Gyratory Fines Screens
- 1 Fines Blower and Separator Cyclone

The existing system to be replaced consists of the following equipment:

- 2 - Chip Screens
- 1 - #2 Oversized Chip Re-Chipper
- 1 - #2 Cyclone Separator

Figures One and Two in Part III of this Supplement are process flow sheets illustrating the proposed and existing systems.

Wood Usage

Installation of the chip thickness screening system to replace components of the existing oversized chip screening system will improve chip quality to the pulp digesters but not increase chip

throughput. The difference between wood throughput of 1988 compared to post construction tabulated in Table One is actual usage in 1988 versus mill design usage. The wood throughput of 1987 is not compared due to 1986 and 1987 mill conversion startup affects.

Emissions

Emissions associated with the installation of the pine wood chip thickness screening system emanate from two new point sources and one existing point source as shown in Figures One and Two and tabulated in Table One. The two new point sources are a fines "airveyor" high efficiency cyclone separator (shown in Figure Two as block L) and an Air Density Separator cyclone (shown in Figure Two as block G). The net increase in point source total particulate emissions resulting from the installation is +2.0 tons per year. Because no external woodyard modifications are taking place associated with this project fugitive emissions are expected to at least remain the same. Any new or altered conveyor systems will be fitted with covers.

Contemporaneous changes since the 1986 mill conversion project were noted in the construction permit No. AC 17-113551. Table one is based on Table II of that permit which is attached in Part III. When added to contemporaneous changes, net emissions are -8.7 tons per year. These are well below the PM10 (Particulate Matter less than 10 microns in size) and TSP (Total Suspended Particulate) PSD (Prevention of Significant Deterioration) significance levels of 15 and 25 tons per year, respectively.

Emissions Control Devices

Fugitive emissions are controlled by covers on all belt conveyors. Two high efficiency cyclone separators are included in the installation (Shown in Figure One). Manufacturer efficiency curves (enclosed) with mill chip classifications were used to rate cyclone separation efficiencies.

The stack of the induced draft fan for the Air Density Separator cyclone is approximately 70 feet in height, and is 1.5 feet in diameter. The air flow rate is 12,000 ACFM maximum, and is at ambient temperatures and water vapor content. The fines cyclone has its own vent in the top.

Part II: Airborne Contaminants Emitted Data and Calculations

Table One: Pensacola Mill Pine Chip Thickness Screening System Installation Data

	(Tons/Year)
Chip Supply	
1988 Usage	1,100,000
Mill Design	1,200,000
PM10 Emissions:	
Proposed	0.8
Present	0.1
Net PM10	**0.7**
Net TSP Emissions:	
Proposed	2.2
Present	0.2
Net TSP	**2.0**
Contemporaneous:	
Present	-10.7
Proposed Increase	2.0
Net	***-8.7***

Calculations:

The flowsheets include recycle loops that were calculated by iteration using the following equations with reference to the respective flowsheets.

Constants:

Scrubber Efficiencies:

Where Particulate Matter > 10μ the cyclone separation efficiency at 99.5%; Therefore $X = 0.995$

Particulate Matter < 10μ the cyclone separation efficiency at 95%; Therefore $Y = 0.95$

Particulate Classification:

0.13% of Fines are Particulate Matter greater than 10 microns in size but less than 200 microns; Therefore $Z = 0.0013$

0.01% of Fines are Particulate Matter less than 10 microns in size; Therefore $V = 0.0001$

Calculations and Derivations For Figure One

$B = A + F$
$C = B * 0.01$
$D = B - C$
$E = D * 0.15$
$F = E + C$

Therefore:

$G > 10\,\mu = F * 0.1 * Z * (1 - X)$
$G < 10\,\mu = F * 0.1 * V * (1 - Y)$

And:

$H = D - E - G$
$K = H - I$
$I = H * 0.1$
$L = K$
$J = I$

Calculations and Derivations For Figure Two

$B = A + D$
$C = B * 0.01$
$D = C$

Therefore:

$E > 10\,\mu = D * 0.1 * Z * (1 - X)$
$E < 10\,\mu = D * 0.1 * V * (1 - Y)$

And:

$F = B - C - E$
$G = F * 0.15$

Therefore:

$H > 10\ \mu = G * 0.0005 * (1 - X)$
$H < 10\ \mu = G * 0.00001 * (1 - Y)$

And:

$I = G - H$
$J = I$
$K = F - L - H$
$L = (F + J) * 0.1$
$M = L - O$
$N = K$

Therefore:

$O > 10\ \mu = L * Z * (1 - X)$
$O < 10\ \mu = L * V * (1 - Y)$

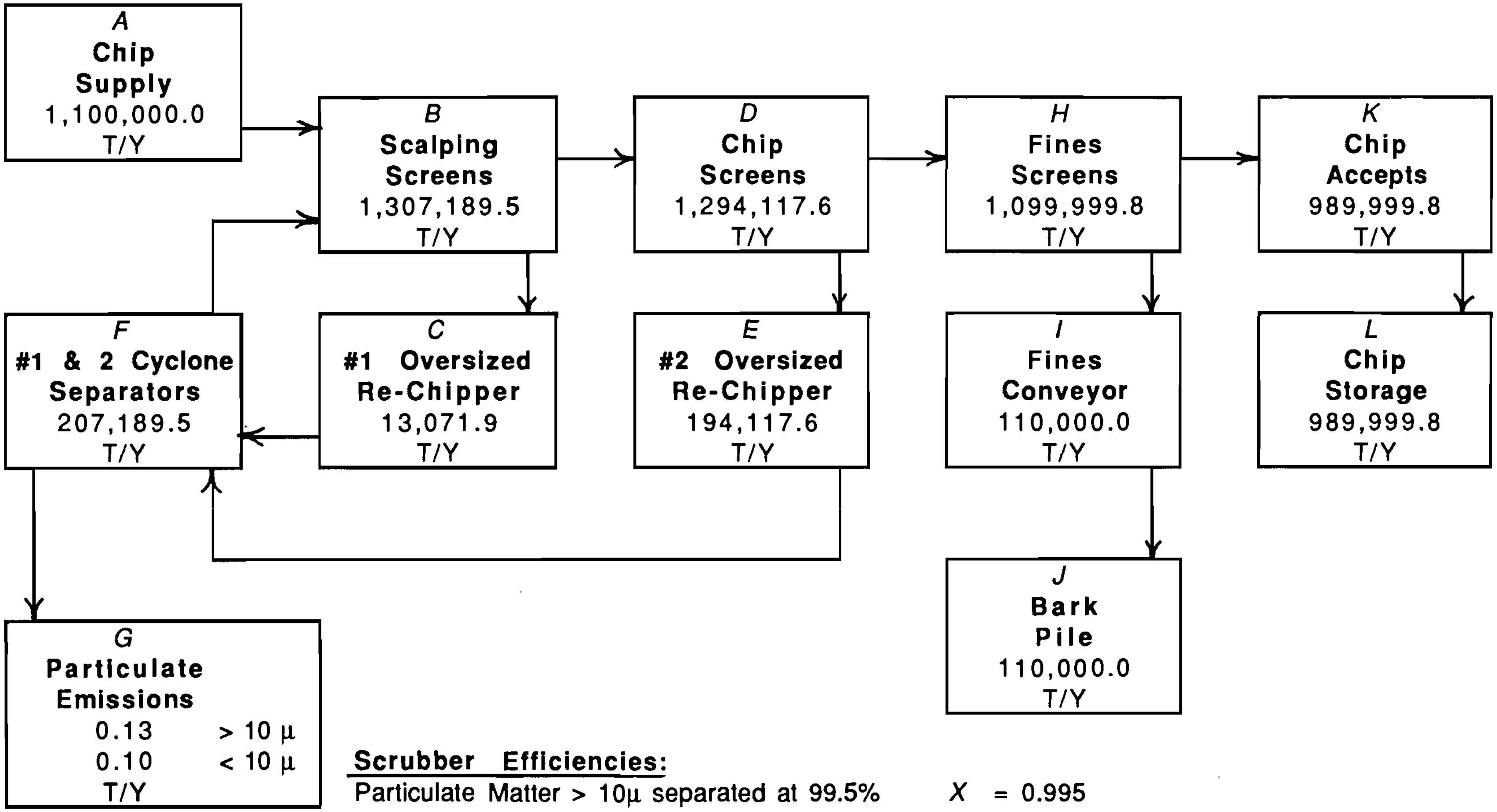
Finally:

$P = O + H + E$

Part III: Appended Diagrams and Data

- Mill Location Plot Plan
- Affected Facility Plot Plan
- Process Flow Diagrams
- Calculations Basis Literature and Data

Figure One: Existing Pine Wood Oversized Chip Screening System



Scrubber Efficiencies:

Particulate Matter > 10µ separated at 99.5% $X = 0.995$

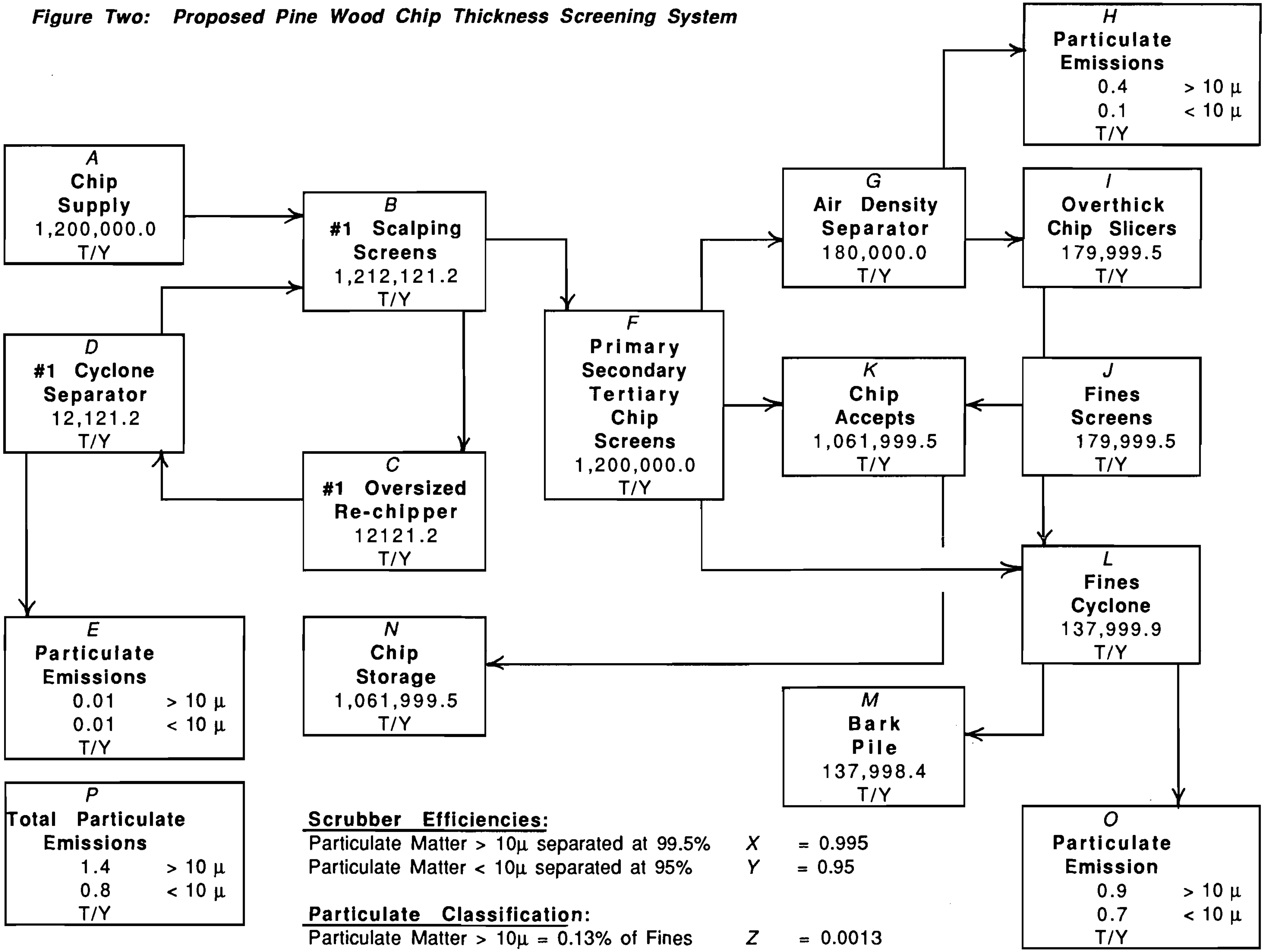
Particulate Matter < 10µ separated at 95% $Y = 0.95$

Particulate Classification:

Particulate Matter > 10µ = 0.13% of Fines $Z = 0.0013$

Particulate Matter < 10µ = 0.01% of Fines $V = 0.0001$

Figure Two: Proposed Pine Wood Chip Thickness Screening System



Scrubber Efficiencies:

Particulate Matter > 10μ separated at 99.5% X = 0.995
Particulate Matter < 10μ separated at 95% Y = 0.95

Particulate Classification:

Particulate Matter > 10μ = 0.13% of Fines Z = 0.0013
Particulate Matter < 10μ = 0.01% of Fines V = 0.0001

LOCATION MAP

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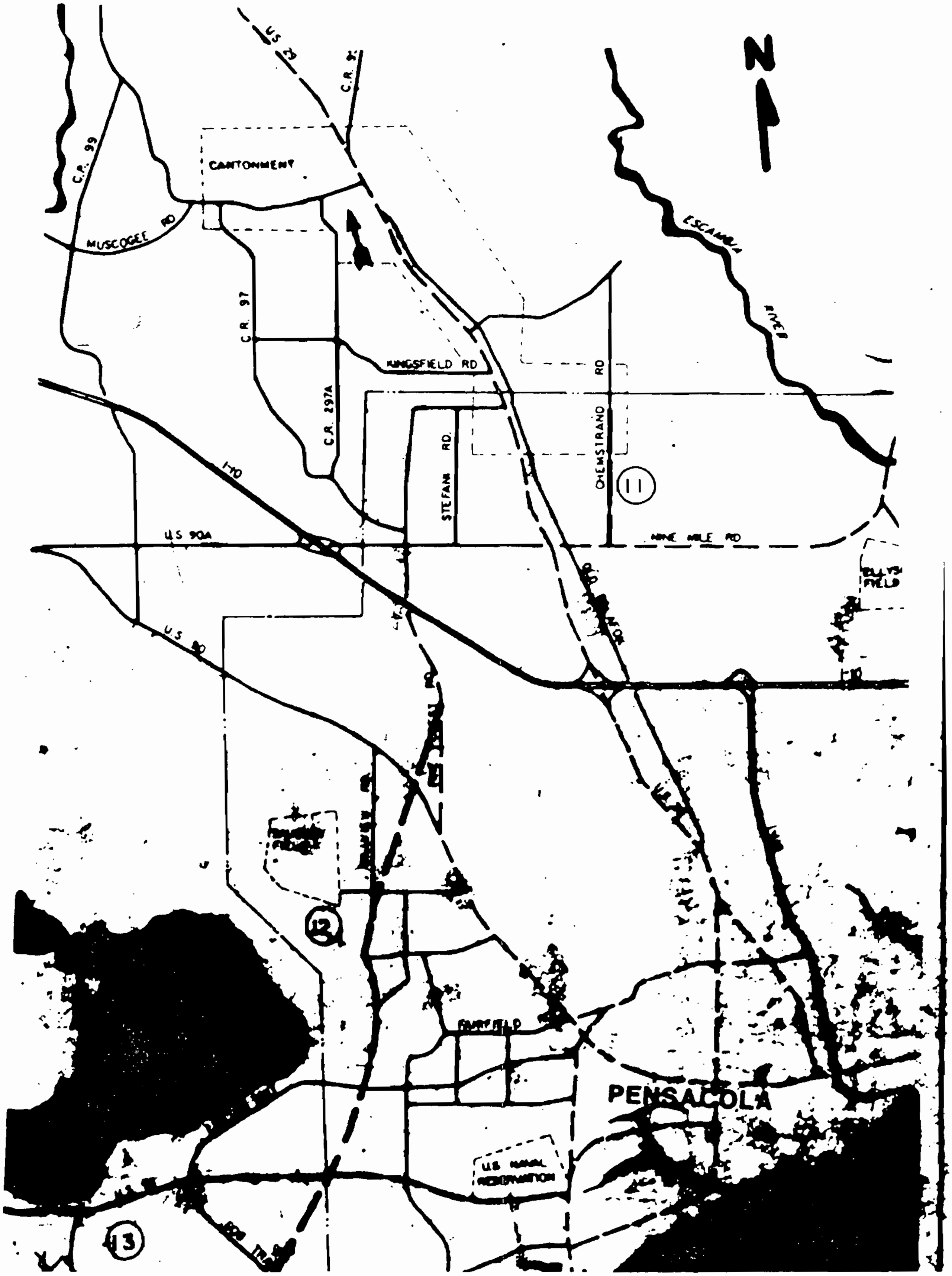

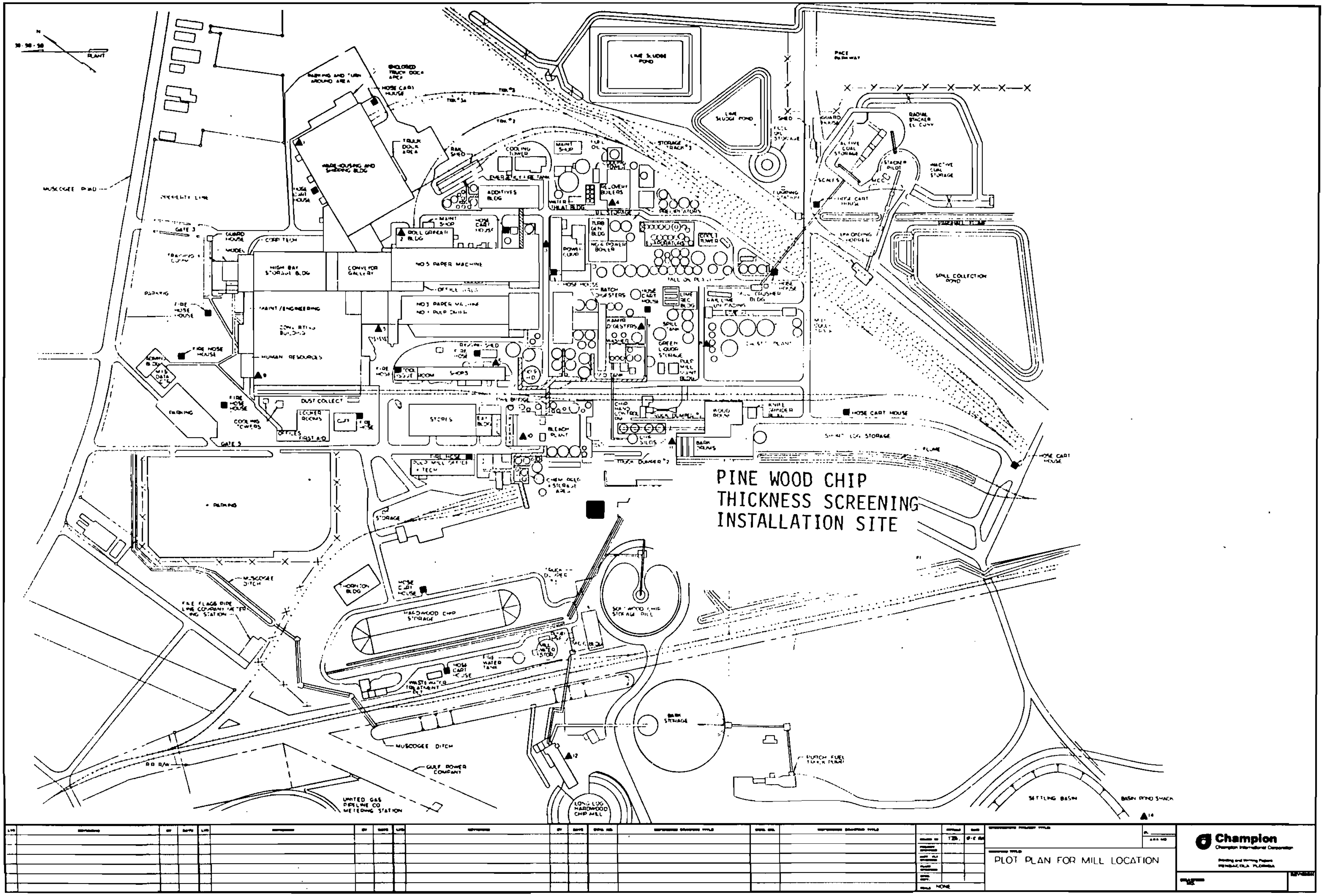
PINE WOOD CHIP
THICKNESS SCREENING
INSTALLATION SITE
N
PLANT
MUSCOGEE ROAD
PROPERTY LINE
PARKING AND TURN AROUND AREA
ENCLOSED TRUCK DOCK AREA
HOSE CART HOUSE
TRK #3
TRK #3A
TRK #2
TRUCK DOCK AREA
WAREHOUSING AND SHIPPING BLDG
RAIL SHED
COOLING TOWER
MAINT SHOP
FUEL OIL
EMERGENCY FIRE TANK
ADDITIVES BLDG
WATER TREAT BLDG
RECOVERY BOILERS
OIL STORAGE
PRECIPITATORS
STORAGE TRACK #3
LIME SLUDGE POND
LIME SLUDGE POND
SHED
FUEL OIL STORAGE
PUMPING STATION
PACE PARKWAY
GUARD HOUSE
RADIAL STACKER CONV
ACTIVE COAL STORAGE
STACKER PILOT
INACTIVE COAL STORAGE
SCALES
MCC
HOSE CART HOUSE
UNLOADING HOPPER
SPILL COLLECTION POND
GATE 3
GUARD HOUSE
CORP TECH
MODEL
TRAINING CENTER
HIGH BAY STORAGE BLDG
CONVEYOR GALLERY
NO 5 PAPER MACHINE
ROLL GRINDER 2 BLDG
MAINT SHOP
HOSE CART HOUSE
OFFICE AREA
NO 3 PAPER MACHINE
NO 1 PULP DRYER
POWER CONP
TURB GEN BLDG
NO 4 POWER BOILER
EVAPORATORS
COOL TOWER
TALL OIL PLANT
HOSE HOUSE
BATCH DIGESTERS
HOSE CART HOUSE
LIME REC BLDG
TALL CRUSHER BLDG
RAIL LIME UNLOADING
KAMYR DIGESTERS
WASHER
SPILL TANK
GREEN LIQUOR STORAGE
PULP MILL PAINT BLDG
CHLOR PLANT
MILL COAL STORAGE
PARKING
FIRE HOSE HOUSE
MAINT/ENGINEERING
CONVERTING BUILDING
HUMAN RESOURCES
FIRE HOSE HOUSE
ADMIN BLDG
MIS DATA CTR
REPAIR SHED
FIRE HOSE
FIRE HOSE
TOOL ISSUE ROOM
SHOPS
K/P HD
FIRE HOSE HOUSE
DUST COLLECT
LOCKER ROOMS
CAFE
FIRE HOSE
COOLING TOWERS
OFFICES
FIRST AID
PARKING
GATE 5
STORES
EAT BLDG
PIPE BRIDGE
BLEACH PLANT
CHIP HAND CONTROL
TRUCK DUMPER #1
WOOD ROOM
KNIFE GRINDER BLDG
HOSE CART HOUSE
CHIP SILOS
BARK DRUMS
SHORT LOG STORAGE
FLUME
HOSE CART HOUSE
TRUCK DUMPER #2
FIRE HOSE
PULP MILL OFFICE + TECH
CHEM PREP + STORAGE AREA
PARKING
STORAGE
MUSCOGEE DITCH
FIRE FLAGS PIPE LINE COMPANY METERING STATION
THORNTON BLDG
HOSE CART HOUSE
TRUCK DUMPER #3
HARDWOOD CHIP STORAGE
SOFTWOOD CHIP STORAGE PILE
MILL WATER STOR
MCC BLDG
FIRE WATER TANK
HOSE CART HOUSE
WASTEWATER TREATMENT
MUSCOGEE DITCH
R R R/W
GULF POWER COMPANY
UNITED GAS PIPELINE CO METERING STATION
BARK STORAGE
DUTCH FUEL TRUCK DUMP
LONG LOG HARDWOOD CHIP MILL
SETTLING BASIN
BASIN POND SHACK
1
2
3
4
5
6
7
8
9
10
11
12
14
NONE
PLOT PLAN FOR MILL LOCATION
Champion
Champion International Corporation
Printing and Writing Papers
PENSACOLA FLORIDA

Printing and Writing Papers
375 Muscogee Road
P.O. Box 87
Cantonment, Florida 32533-0087
904 968-2121

Champion
Champion International Corporation

To:
Peter Muehlemann

Date:
April 6, 1989

From:
Eric Johnson

Subject:
Pine Fines Classification

FTM-498

Shown below is a table summarizing the classification of the Pensacola mill pine wood fines. A sample of the fines material retained on a 3/64 inch Tyler screen from Bill Dorman's work dated March 10, 1989 (report #1513001) was further classified on a Tyler screen classifier.

In summary, the fines classification results are as follows:

% of Total Pine Wood Fines . . .	Are Greater Than . . .	Less Than
18.3	6410 u	--
21.0	4795 u	6410 u
39.3	2403 u	4795 u
5.6	2018 u	2403 u
7.5	1203 u	2018 u
7.72	300 u	1203 u
0.44	212 u	300 u
0.13	75 u	212 u
0.009	38 u	75 u
6.0×10^{-5}	--	38 u

u = micron

Eric Johnson

Eric Johnson

EJJ/hs

cc: David Arceneaux
Bill Dorman
Paul Johnson
Buddy Rhodes
Bob Romnes
Bernie Shoemoe
Willie Tims

AC17-164445

$200 pd.
5-3-89
Recpt. # 117612

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301

RECEIVED
MAY 3 1989
DER-BAQM

BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Major [ ] New¹ [XX] Existing¹

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

COMPANY NAME: Champion International Corporation COUNTY: Escambia

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) Re-chipper Mill

SOURCE LOCATION: Street State Road 184 at U. S. 29 City Cantonment

UTM: East 1,111,700 North 596,100

Latitude 30 ° 36 ' 30 "N Longitude 87 ° 19 ' 30 "W

APPLICANT NAME AND TITLE: Champion International Corporation

APPLICANT ADDRESS: P. O. Box 87, Cantonment, Florida

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Champion

I certify that the statements made in this application for a Construction 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: William Bannan

William C. Bannan, VP/Operations Manager
Name and Title (Please Type)

Date: 4/14/89 Telephone No. (904) 968-2121

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

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

---

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

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

Daniel B. Smith, P.E.
Name (Please Type)

Baskerville Donovan Engineers, Inc.
Company Name (Please Type)

316 South Baylen Suite 300 Pensacola 32501
Mailing Address (Please Type)

Florida Registration No. 35633 Date: May 2, 1989 Telephone No. 904-438-9661

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.

Installation of a Pine Chip Thickness Screening System to separate and reprocess oversized chips. (see attached supplement)

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

Start of Construction May, 1989 Completion of Construction October, 1989

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.)

Air Density Separator Cyclone - $10,000

Air-Veyor Cyclone - $10,000

Conveyor Covers - $17,500

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

Construction Permit Application No. AC17-113551

Operating Permit No. AC17-145671

E. Requested permitted equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 52 ; if power plant, hrs/yr N/A ; if seasonal, describe: N/A

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: See Attached Supplement

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		

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

1. Total Process Input Rate (lbs/hr):__________

2. Product Weight (lbs/hr):__________

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]		Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/yr	T/yr	

[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) See Attached Supplement

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (If applicable)	Basis for Efficiency (Section V Item 5)

E. Fuels Not Applicable

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	

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

Fuel Analysis:

Percent Sulfur: ______ Percent Ash: ______

Density: ______ lbs/gal Typical Percent Nitrogen: ______

Heat Capacity: ______ BTU/lb ______ BTU/gal

Other Fuel Contaminants (which may cause air pollution): ______

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

Annual Average ______ Maximum ______

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

All liquid and solid waste generated will be returned to the process or treated in the mill's treatment plant before discharge to Eleven Mile Creek.

See Attached Supplement

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

Stack Height: ____ ft. Stack Diameter: ____ ft.

Gas Flow Rate: ____ ACFM ____ DSCFM Gas Exit Temperature: ____ °F.

Water Vapor Content: ____ % Velocity: ____ FPS

SECTION IV: INCINERATOR INFORMATION

Not Applicable

Type of Waste	Type O (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq.& Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated							
Uncontrolled (lbs/hr)							

Description of Waste ____

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

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

Manufacturer ____

Date Constructed ____ Model No. ____

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

Stack Height: ____ ft. Stack Diamter: ____ Stack Temp. ____

Gas Flow Rate: ____ ACFM ____ DSCFM* Velocity: ____ 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: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ____

Brief description of operating characteristics of control devices: ______

______

______

______

______

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

______

______

______

______

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

SECTION V: SUPPLEMENTAL REQUIREMENTS (See Attached Supplement)

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)]
   See pages 4 and 5, and figures one and two.
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. See pages 4, 5, and figures one and two.
3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).
   See appended test data and manufacturer's data.
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.)
   See appended manufacturer's data.
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). See pages 4, 5, and figures one and two.
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. See figures one and two.
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).
   See Part III in supplement.
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.
   See Part III in supplement.

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 (Not Applicable)

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

[ ] Yes [ ] No

Contaminant	Rate or Concentration

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

[ ] Yes [ ] No

Contaminant	Rate or Concentration

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).

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

*Explain method of determining

5. Useful Life: 6. Operating Costs:

7. Energy: 8. Maintenance Cost:

9. Emissions:

Contaminant	Rate or Concentration

10. Stack Parameters

a. Height: ft. b. Diameter: ft.

c. Flow Rate: ACFM d. Temperature: °F.

e. Velocity: FPS

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

1.

a. Control Device: b. Operating Principles:

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

e. Useful Life: f. Operating Cost:

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

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

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

2.

a. Control Device: b. Operating Principles:

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

e. Useful Life: f. Operating Cost:

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

i. Availability of construction materials and process chemicals:

[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.

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 (Not Applicable)

A. Company Monitored Data

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

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

Other data recorded ____

Attach all data or statistical summaries to this application.

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

2. Instrumentation, Field and Laboratory

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

b. Was instrumentation calibrated in accordance with Department procedures?

☐ Yes ☐ No ☐ Unknown

B. Meteorological Data Used for Air Quality Modeling

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

2. Surface data obtained from (location)______________________________

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

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

C. Computer Models Used

1. ______________________________ Modified? If yes, attach description.

2. ______________________________ Modified? If yes, attach description.

3. ______________________________ Modified? If yes, attach description.

4. ______________________________ Modified? If yes, attach description.

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

D. Applicants Maximum Allowable Emission Data

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

E. Emission Data Used in Modeling

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

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

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

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

Printing and Writing Papers
375 Muscogee Road
P.O. Box 87
Cantonment, Florida 32533-0087
(904) 968-2121

Champion
Champion International Corporation

5/1/89

Mr. William Thomas
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

Dear Mr. Thomas:

Enclosed are three copies of an Application To Construct Air Pollution Sources [DER Form 17 - 1.202(1)] along with the $200 application fee for a proposed pine wood chip thickness screening system at Champion International Corporation's Pensacola facility. To meet the scheduled October, 1989 start-up date, we need to begin construction by as soon as possible. Copies have been sent to Mr. Mike Harley as the reviewer, and to the FDER Northwest District.

We would appreciate a prompt review of this application. If there is any additional information needed, please don't hesitate to call.

Sincerely,

Paul M Johnson Jr.
Paul M. Johnson, Jr.
Process Engineer - Environmental Control

cc: Mike Harley *
Ed Middleswart *
FDER - Northwest District

bc: D. Arceneaux *
C. Ayer *
W. Dorman *
E. Johnson *
P. Muehlemann **
B. Rhodes **
B. Romnes **
B. Shoemoe **
W. Tims *
File *

* With application
** Letter only

Fisher-Klosterman, Inc.

Bulletin 218-C

GMT
7-88

XQ Series High Performance Cyclones
Custom-Engineered Pollution Control/Product Recovery Systems

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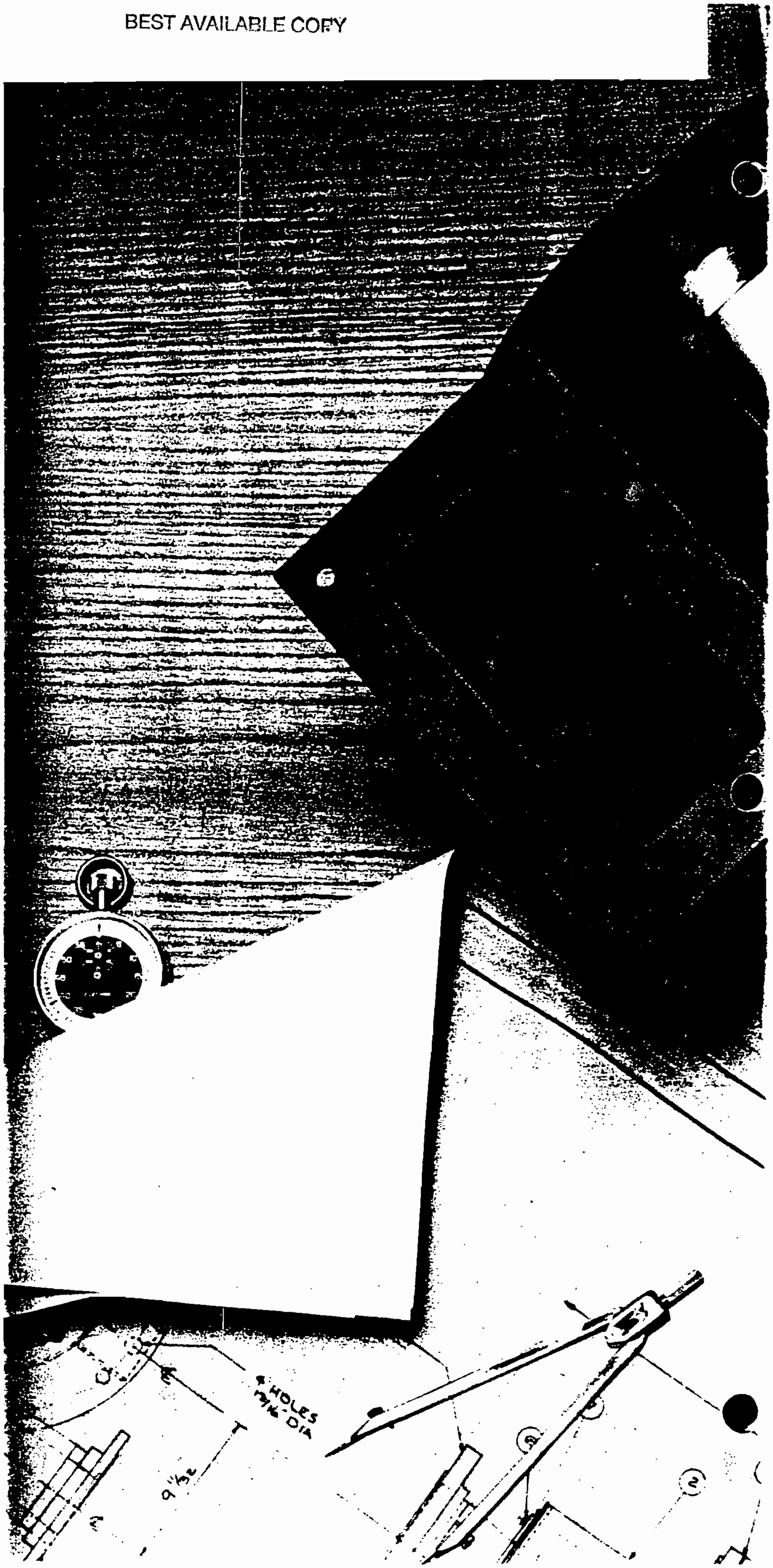
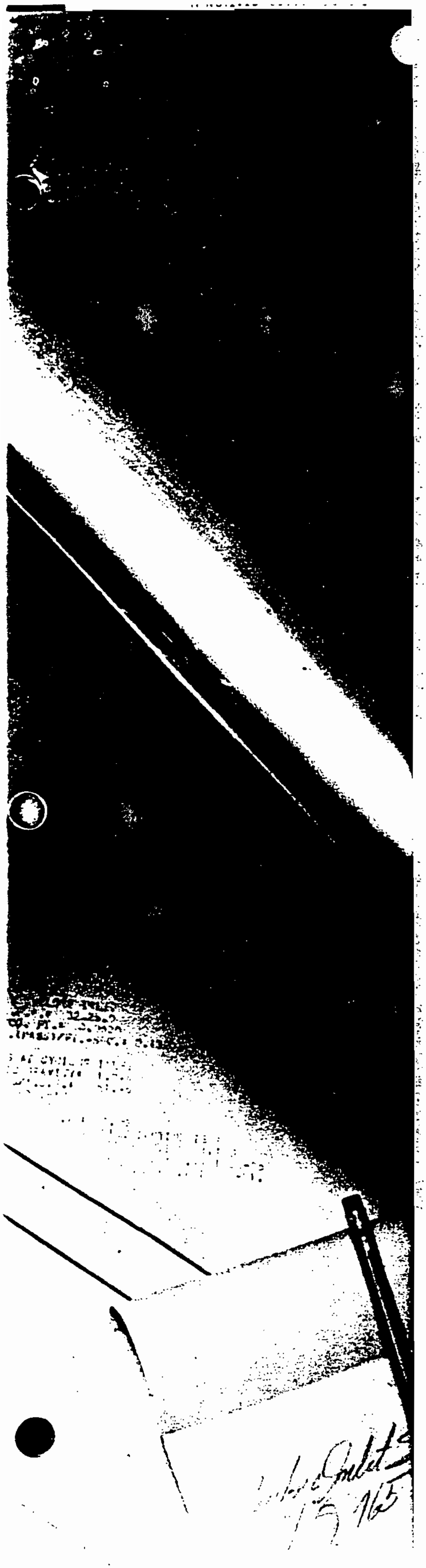




Fisher-Klosterman, Inc. Innovative Pollution Control Equipment Since 1948

For decades, Fisher-Klosterman has earned recognition as playing a leading role in the engineering, fabrication and installation of high-performance, custom-designed dust collection equipment and systems. By operating on the cutting edge of gas/particulate separation technology, they have repeatedly provided their customers with innovative, cost-effective means of controlling particulate pollution.

Fisher-Klosterman pioneered the use of digital computers to aid in the selection and performance prediction of air pollution control and dust collection equipment such as high-performance cyclones and venturi scrubbers. They are the first in the field to have a complete library of proprietary computer programs to aid in the design of equipment to handle *any* set of pollution control conditions economically.

Accurately predicting the performance of a cyclone separator under any given set of conditions involves solving a number of inter-related problems in physics, three dimensional, multi-phase fluid dynamics, and statistics and probability; problems so complex that it can, in some cases, take even the most experienced engineer up to a full day for just the mathematics, with the aid of a sophisticated electronic calculator.

With the proper information supplied, Fisher-Klosterman can respond to a customer with cyclone selection and accurate performance data in as little as *30 minutes!*

As specialists in custom-designed, high performance cyclones, Fisher-Klosterman is the top-ranked supplier of cyclones for exotic pollution control situations: refractory brick and ceramic, castable refractories, and many other linings for high abrasion/high temperature conditions; ASME certified and code-stamped cyclones for use in high pressure or vacuum systems; food-grade welding; designs to withstand or to dissipate explosions; ultra high temperature designs; rubber and cast polyurethane linings; and special alloys to resist chemical attack and corrosion. The variety of specialized applications is virtually limitless.

Performance Assurance

The first step in designing a cyclone is to determine the aerodynamic characteristics of the particulates that are to be separated from the gas. To do this, Fisher-Klosterman's modern Materials Laboratory measures such variables as the specific gravity and aerodynamic particle size distribution of representative dust samples supplied by the client.

Samples can also be subjected to rigorous analysis under scaled-down operating conditions in Fisher-Klosterman's Pilot Testing Lab.

Data from these tests are computer-analyzed, using sophisticated, field-proven modeling and scale-up programs to produce accurate, detailed performance predictions of the full-scale system. Laboratory services and analyses are performed at cost as an aid to our customers in the selection of the proper equipment for any job.

Total-System Engineering

Using the computer-generated analyses obtained from the labs, and drawing on more than thirty years of experience, Fisher-Klosterman engineers can design a complete pollution control or solids collection system to meet the client's criteria of performance, structural compatibility, space and arrangement constraints, and economy. Depending on the customer's requirements, this system can entail anything from a single small cyclone to a complex, turnkey installation that utilizes cyclones, scrubbers and even more exotic pollution control equipment.

Prompt, Personal Service

A key factor in Fisher-Klosterman's achieving their leadership position in the industry is their insistence on speedy delivery and on maintaining a close, one-on-one relationship with their customers throughout the design, installation and start-up periods of any equipment. Fisher-Klosterman feels that this is the only way to learn all of a client's requirements and to assure a totally satisfactory installation of pollution control equipment.

Fisher-Klosterman XQ Series Cyclones

Performance Engineered to Suit Your Needs and Budget.

A Proven Concept

For over 100 years, cyclones have proven themselves as the most economical, reliable, effective means of controlling particulate pollution or recovering suspended product from process gas streams.

Simply stated, a cyclone operates by generating, within itself, a high velocity vortex of particulate-laden gases. Centrifugal force hurls the denser particles toward the cyclone walls, where they spiral downward into a collection receptacle. The lighter and, by now, relatively particulate-free gases are then exhausted from the cyclone's outlet.

In addition to the size, density and aerodynamic characteristics of the particulate matter, a number of complex inter-related factors affect the relative efficiency of any cyclone. These factors include the cyclone configuration and size; the volume, velocity and rotational or angular acceleration of the particulate-laden gas stream; and the residence time of the gas in the cyclone.

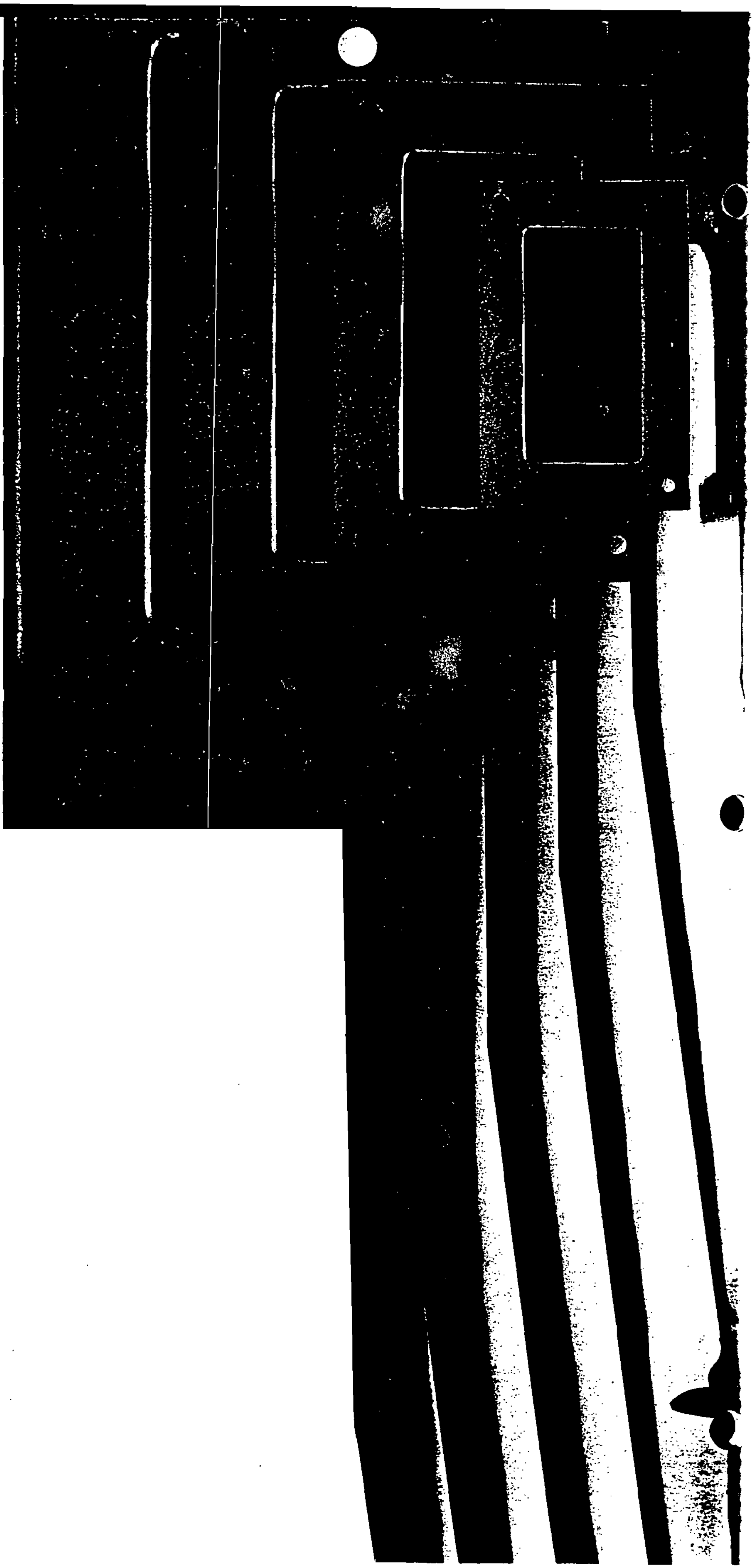
The XQ Series

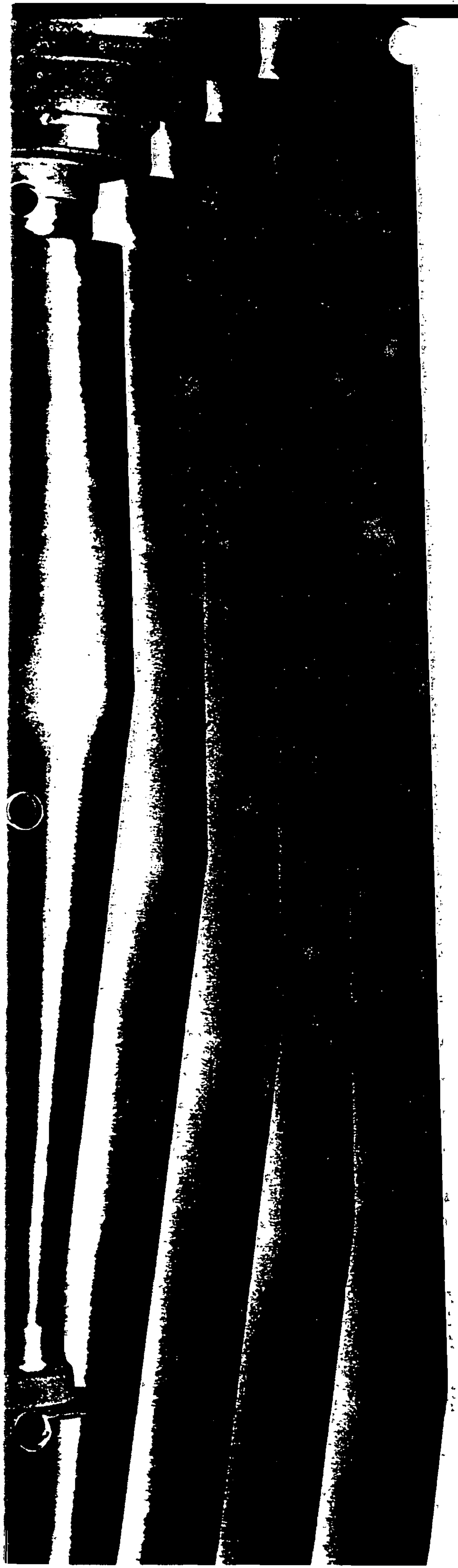
An Innovative Approach to High-Performance Cyclones.

Fisher-Klosterman's new XQ Series of cyclones represents not only the newest state-of-the-art in cyclone design, but also a revolutionary concept in matching performance and cost to the customer's individual needs.

Unlike other manufacturers, who offer one or two basic models, Fisher-Klosterman offers six basic families in their XQ Series: XQ465, XQ405, XQ340, XQ240, XQ170 and XQ120, in order of increasing efficiency. The XQ465, for example, is less costly but, with a shorter residence time, removes a lower percentage of particulates than a more costly XQ405, under the same operating conditions.

If your needs call for the removal of only relatively large, easily separated particles, the XQ465 may be the most cost-effective means of dust collection or pollution control. If, however, you are faced with tougher particulate-removal demands, it becomes necessary to select one of the more efficient families to handle your needs.





Cyclone size is another factor affecting performance. Within each of the six XQ Series families, the larger the cyclone, the greater the volume of gases it can handle effectively. While the dimensional drawings on pages 10-15 indicate a number of sizes in each family, there is in fact an infinite spectrum of sizes, from the smallest it is possible to fabricate to the largest it is possible to ship or field assemble. Since the geometric proportions within each family remain constant, it is a simple matter to project the dimensions of any cyclone whose size is not shown in the charts.

In general, two or more smaller cyclones operating in parallel and under the same conditions will remove particulates more efficiently than one large cyclone of the same family. On the other hand, one large cyclone is significantly less costly than two or more smaller ones. However, limited headroom, structural requirements at the point of installation and other factors may dictate the size limitations of the cyclone selected. In all cases, Fisher-Klosterman will engineer the cyclone collector that will optimize cost and performance.

The six basic families of XQ Cyclones essentially span the entire spectrum of possible performance characteristics. However, if Fisher-Klosterman's lab tests or analysis of your problem indicate the need for a cyclone with performance characteristics somewhere in between those offered by two of their six basic families, Fisher-Klosterman can readily engineer precisely the high-performance cyclone you need.

An unlimited range of sizes and performance characteristics, plus higher efficiencies than ever achieved before, assure you that there's a Fisher-Klosterman XQ Series Cyclone that's right for your needs...and at the right price.

Factors to Consider in Selecting Your XQ Series Cyclone

Four Basic Uses

Cyclones are the oldest, simplest, most economical and most widely used method of separating solids from gas streams. Their uses fall into four categories:

1. Pollution Control

This is a very important and, with the development of the XQ Series, a rapidly expanding application of cyclones. In many cases where, previously, more exotic dust collectors were required, there's a Fisher-Klosterman XQ Series Cyclone efficient enough to meet the most stringent air pollution control codes, with no other equipment needed.

2. Product Recovery

Fisher-Klosterman cyclones are widely used in process industries for removing valuable product from gas streams, either at intermediate stages or at the end of the production process. For example, a cyclone is an extremely economical means of recovering many types of products from spray dryers, kilns, fluid bed reactors and similar process equipment. Another common application is the recovery of catalyst, as in petroleum refinery cat-crackers.

3. Pre-Cleaner Ahead of More Exotic Pollution Control Equipment

Other types of collectors, such as scrubbers, fabric collectors, and precipitators, are sensitive to high loadings of particulates. Excessive amounts of particulate matter overload them and cause them to malfunction. Fisher-Klosterman XQ Series Cyclones protect these devices and allow them to function at peak efficiency.

4. Particulate Size Classification

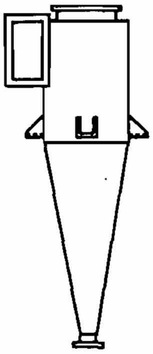
XQ Series Cyclones from Fisher-Klosterman provide effective, economical classification of gas-borne particulates by matching performance characteristics of the cyclone with the range of particle sizes it is desired to extract.

Installation Options

Depending on a number of considerations, including performance requirements, space and structural limitations, there are a number of installation options available for Fisher-Klosterman XQ Series Cyclones.

Single Cyclone

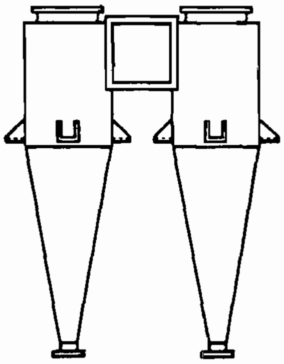
In many instances, this is the most economical option in installing a Fisher-Klosterman XQ Series Cyclone. Within limits determined by materials, shipping or field assembly and installation, this is generally the first choice when headroom and structural requirements are not limiting factors.



SINGLE CYCLONE

Parallel Cyclones

XQ Series Cyclones operating in parallel offer comparably higher efficiencies per volume of gas handled, with the efficiency increasing as an inverse function of the size of the cyclones. This is a more costly installation than a single cyclone, but is frequently necessitated by limited headroom or other structural requirements.



PARALLEL CYCLONES

There is no theoretical limit on the number of XQ Series Cyclone that may be installed in parallel, but there are a number of precautions that must be observed:

1. Through proper manifolding and, if necessary, use of dampers, each cyclone must receive a nearly equal share of the gas stream.
2. Product discharges into collection receivers MUST be isolated from one another.

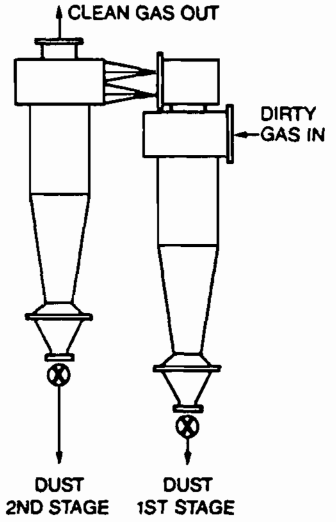
If this precaution is not rigorously observed, minute imbalances in gas volume and pressure will generate a feedback of particulates from the higher pressure cyclones, creating far lower operating efficiencies than predicted.

Discharges may be isolated either by each cyclone's discharging into its own sealed container or by all cyclones' discharging into a single compartmentalized receiver in which each compartment is sealed off from the others.

Cyclones in Series

If there is sufficient pressure available, Fisher-Klosterman XQ Series Cyclones may be operated in series to achieve even greater collection efficiency.

In a series installation, the exhaust gas stream from one cyclone is fed into the inlet of the next cyclone. The effect of such a series is cumulative: if the first cyclone collects 90% of, for example, the 10 micron particles from the gas stream, a second identical cyclone will also collect 90% of the 10 micron particles remaining in the stream exhausted from the first cyclone. This creates a cumulative collection efficiency of 99% at 10 microns. A third such cyclone in series would boost the cumulative efficiency to 99.9%, and so on.



CYCLONES IN SERIES

The factor limiting the number of cyclones that can be used in series is pressure drop. Each cyclone in a series generates its own pressure drop, so that two cyclones will have double the drop of one and so on. However, in some applications, cyclones are the only feasible type of collector for particulate separation and, in such cases, increased pressure drop must be tolerated to achieve the required performance levels.

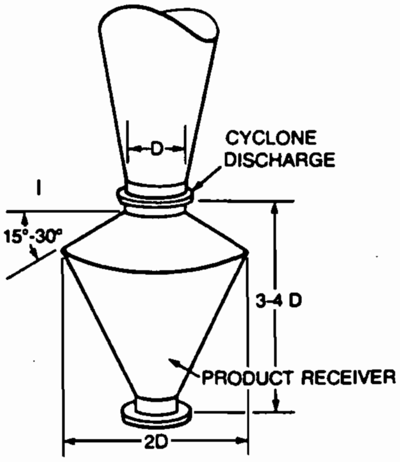
It is *extremely important* that each cyclone in a series have a *totally* isolated discharge receiver. Compartmentalization in a single receiver, as for parallel installations, is *not* sufficient. If isolation is not achieved, particles collected by the first stage cyclone will be re-entrained in the second stage cyclone, and so on.

Performance Assurance
For us to guarantee that a Fisher-Klosterman XQ Series Cyclone performs as specified, the following conditions must be met:

Product Discharge
The single most common cause of poor performance in cyclones is faulty design of the product discharge receiver.

Any high-performance cyclone *must* have an air-tight receiver at its product discharge. At the bottom of every well-designed cyclone, there is a tendency to create an induced flow of air into the product discharge from the outside. If the receiver is not air-tight, this can set up currents which will drive already collected particulates back into the cyclone.

Also, because the vortex at the product discharge creates extreme turbulence, re-entrainment will occur if material is allowed to accumulate close to the discharge. For this reason, rotary locks, feeder valves or air-tight screw conveyors should be installed some distance below the discharge, if high performance is expected.

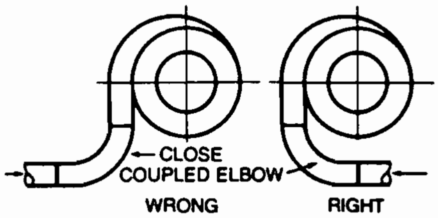


The figure above illustrates the typical proportions of a well-designed receiver. The proportions are subject both to engineering judgment and space limitations. For coarse, dense, easy-to-collect dusts, the height and diameter may be reduced. Extremely fine, hard-to-collect materials, on the other hand, require as large a receiver as is practical. In any event, no material should be stored or allowed to accumulate in the receiver.

Inlet Velocity
The inlet velocity of the gas stream must be high enough to keep materials airborne and prevent them from clogging the cyclone at this critical point. However, it should be remembered that higher inlet velocities generate higher inlet wear, particularly with highly abrasive materials. If abrasion is a critical factor, it would be advisable to move to the higher efficiency (i.e. *lower* family number) XQ Series Cyclones that can achieve the desired efficiency at lower velocities.

Inlet Ductwork Design
To assure proper performance, ductwork must be designed to maintain sufficiently high velocities to keep particulates airborne and to convey them into the cyclone. This is particularly critical with dense, heavy material, as well as with very fine dusts which have a tendency to adhere to surfaces with which they come in contact.

For maximum efficiency, it is important that any bends or elbows just ahead of the cyclone be made in the proper direction. Where the gas is flowing vertically up or down through the ductwork, close-coupled elbows that turn the flow horizontally are acceptable. For horizontal ductwork, it is *extremely important* that any close-coupled elbows turn in the *same direction as the flow in the cyclone* (i.e. clockwise elbows for cyclones with a clockwise rotation). Elbows in the opposite direction from the cyclone's flow can severely reduce the cyclone's efficiency.



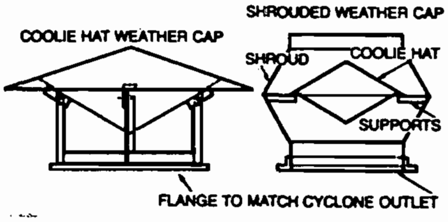
PLAN VIEW OF HORIZONTAL DUCT
AT CYCLONE INLET

In any event, if round ductwork is used, a gradual transition (15°incl. angle recommended) to the rectangular cyclone inlet is mandatory.

Accessories

A number of performance-compatible accessories are available for XQ Series Cyclones. The following items are standard. Custom designs are also available.

Cyclone Outlet Accessories
Standard Weather Caps for direct-to-atmosphere discharge, in both "coolie-hat" and shrouded designs.



Scroll Outlets, when outlet ducting is required and wherever headroom is limited. Scroll outlets turn the vertical, spinning exhaust in a horizontal direction in minimum headroom and eliminate most of the gases' residual spin. This results in a small savings in pressure loss and is less expensive than a custom-fabricated elbow.

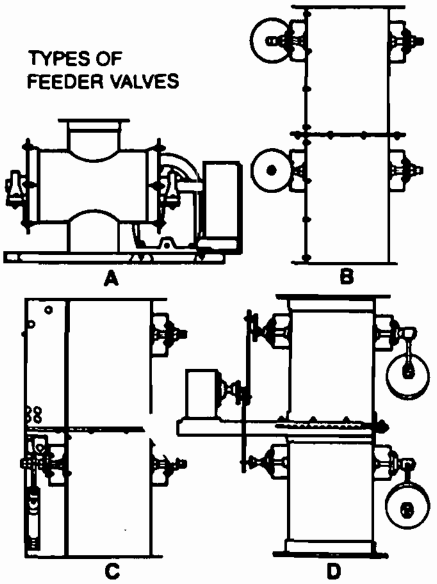
Product Discharge Outlet Accessories
Dust Receivers that meet the air-tight requirements of high-performance cyclones and act as transitions between the cyclones and various types of air-tight feeder valves for solids discharge.

Feeder Valves designed for Fisher-Klosterman XQ Series Cyclones maintain the air-tight integrity required for good cyclone performance, while making it possible to discharge the collected material from the receiver continuously.

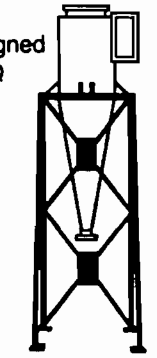
Several types of feeder valves are available:

A. Rotary air locks
B. Counterweighted, gravity operated double-dump valves
C. Counterweighted, air cylinder operated double-dump valves
D. Counterweighted, motor operated double-dump valves

TYPES OF FEEDER VALVES



Support Stands designed specifically for the XQ Series Cyclones and their accessories.



SUPPORT STAND

Technical Guide to the Selection of Fisher-Klosterman XQ Series High-Performance Cyclones

This section is intended for use by the Application Engineer in specifying the correct XQ Series Cyclone for his needs. Naturally, Fisher-Klosterman will be happy to provide all the assistance needed, or to undertake the complete engineering project, if desired.

Selection Factors

Three factors must be considered in selecting a cyclone for any application:

1. Inlet Velocity
2. Pressure Loss
3. Collection Efficiency.

Proper calculation of these variables insures the selection of an XQ Series Cyclone that will perform with maximum efficiency and cost effectiveness.

Inlet Velocity

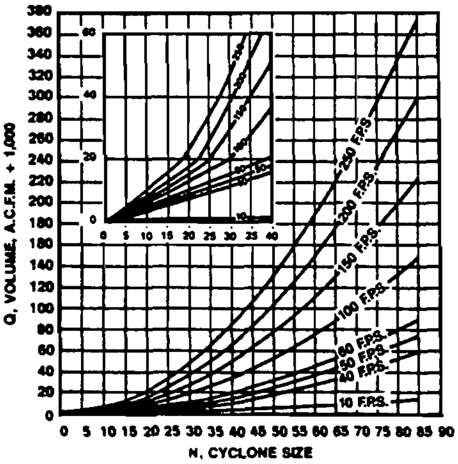
Most cyclone literature assumes an inlet velocity range from 20 to 100 feet per second. Most industrial applications have historically fallen in the 40 to 60 f.p.s. range. However, the range you consider need not be so narrow. Extensive testing and field experience have shown that Fisher-Klosterman XQ Series Cyclones perform predictably at velocities as low as 10 f.p.s. and well beyond 150 f.p.s.

The choice of inlet velocity is generally dictated by the aerodynamic characteristics of the particulates to be collected and the possibility of abrasion, as well as available space, equipment cost and power consumption.

Figure 1 shows the relationship between cyclone size (N), volumetric gas flow rate (Q) in ACFM, and inlet velocity (v_i) in f.p.s.

Application Engineers should consider that collection efficiency will increase as a complex exponential function of the inlet velocity. (This will be discussed in greater detail in a later section on collection efficiency.) Power consumption will increase approximately as the square of the inlet velocity. When abrasion is not a significant factor, these two criteria alone will determine the proper cyclone for the intended application.

FIG. 1

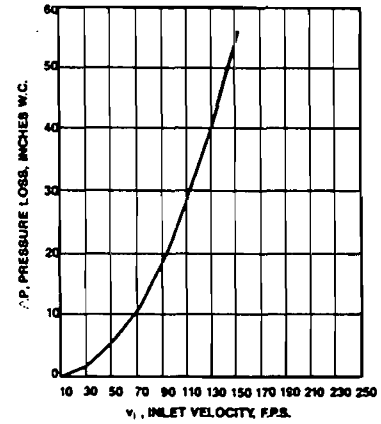


Pressure Loss

Energy is consumed in the passage of the gas through the cyclone. This is expressed as the pressure drop between the gas inlet and gas outlet of the cyclone, and is usually measured in inches of water column (in. w.c.). In any cyclone, the pressure loss increases approximately as the square of either the volumetric flow rate (Q) or the inlet velocity (v_i), and directly as the density (λ_g) of the gas.

Figure 2 shows the relationship between inlet velocity (v_i) and pressure loss (ΔP) in an XQ Series Cyclone with air at 70°F and 14.7 p.s.i.a.

FIG. 2



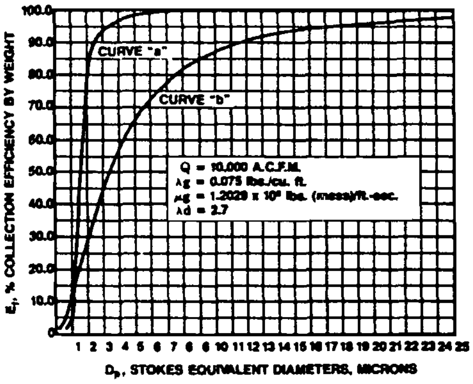
Fractional Efficiency

Efficiency is expressed in percentage by weight. In the Fractional or Particle Size or Grade Efficiency (E_f) Curve, the independent variable is the Stokes Equivalent Particle Diameter (D_p), in microns. The curve is a complex exponential function of:

1. inlet velocity (v_i) and absolute gas viscosity (μ_g).
2. particle mass, particle size, shape and surface roughness, usually measured as terminal velocity, feet/sec., in still air, and expressed as Stokes Equivalent Diameters (D_p) in microns.
3. cyclone size and proportions (shape).

Figure 3 illustrates two cyclone fractional efficiency curves. Each is for a single cyclone. Both are plotted at identical conditions: gas flow rates, densities and absolute viscosities are equal, as are cyclone pressure drops and particle density for both cyclones. Curve "a" is for an XQ120 cyclone, and Curve "b" is for an XQ465.

FIG. 3



Manual calculation of a fractional efficiency curve for just a single case is a complex and tedious problem, even for an experienced engineer. Fisher-Klosterman, however, has reduced this task to simplicity itself by the use of the digital computer. To determine a fractional efficiency curve, the following data are required:

- Volumetric gas flow rate, A.C.F.M., Q
- Gas density, lbs./cu. ft., λ_g
- Gas absolute viscosity, lbs. (mass)/ft.—sec., μ_g
- Particle specific gravity (dimensionless), or true particle density, gms/c.c., λ_d

If gas density and viscosity are not known, the gas analysis plus its temperature and pressure should be specified. Also, to aid in the selection of the best and most economical cyclone for your needs, either or both of the following should be specified:

- Maximum pressure drop, inches w.c.
- Desired efficiency at some specified particle size.

Helpful, but not mandatory, the following data should be furnished if available:

- Dust fineness, typically expressed as % by weight finer than 1.5 microns
- Inlet dust loading, grains/A.C.F.

With this information, our experienced application engineers can provide complete computer-calculated fractional efficiency curves in a matter of minutes.

Total Efficiency

Total Collection Efficiency (E_t) is defined as the percent by weight of the gas-borne particulate separated by the cyclone. To calculate Total Efficiency, not only must the Fractional Efficiency curve of the cyclone be known, but also the size distribution of the particulate.

The independent variable in the particle size distribution should be Stokes Equivalent Diameters, usually expressed in microns (one-millionth of a meter). This is a hypothetical aerodynamic diameter which accounts for the size, shape, mass and texture of the particle.

One word of caution: Optical techniques, screening, analytical instrumentation which measures particle size by determining the amount of liquid a particle displaces and other non-standardized methods do not give data which can be used with any degree of confidence or accuracy in calculating cyclone performance. If you have any doubts about your data, you should utilize our laboratory services. (See page 3).

The dependent variable in the Particle Size Distribution is generally expressed as "percent by weight finer" than a specified Stokes Equivalent Diameter in microns. Equally usable is data specifying the percent by weight falling in the range between two specified diameters.

The calculation of Total Efficiency involves the following steps:

- If it is not already in that form, convert the Particle Size Distribution to a cumulative % by weight finer than any specified diameter.
- Find the derivative of the Particle Size Distribution.
- Multiply the derivative by the Cyclone Fractional Efficiency Curve.
- Integrate the resulting product from zero particle diameter to infinity to find Total Collection Efficiency.

Although the above process sounds straightforward, the product to be integrated does not, in fact, have a rational integral. The problem must therefore be solved by one of three techniques:

- Graphical methods, or;
- Express the product as an infinite series which can be integrated term by term, or;
- Find the integral of the product by Numerical Calculus.

The latter method lends itself ideally to the digital computer. Given the same data as outlined for the computation of the Fractional Efficiency Curve (see page 8), plus the Particle Size Distribution, we can calculate and report Total Collection Efficiency to you in just a few minutes.

However, in many cases, you may wish to make an approximate calculation of Total Collection Efficiency yourself. A method for doing so involves the use of an "Average Limit Particle," and its use permits you to examine the consequences of varying both the type of cyclone and the number in parallel that you are considering. You must be aware that this method is only an approximation. Its accuracy decreases in two cases:

- When the particle size distribution is very narrow. Much more accurate results are obtained if the distribution ranges, for example, between 1.0 and 100.0 microns than if all particles fall between 1.0 and 10.0 microns.
- The lower the Total Collection Efficiency (the finer the particulate), the lower the accuracy of this method.

The Average Limit Particle size is calculated by:

$$D_l = k\sqrt{\frac{\mu_g \times N^3}{\lambda_d \times Q}},$$

where D_l = Average Limit Particle, microns.

μ_g = Absolute viscosity of gas, lbs. (mass)/ft.—sec.

N = Cyclone size.

λ_d = Particulate specific gravity, or true particle density, grams/c.c.

Q = Volumetric gas flow rate, A.C.F.M.

k, a constant, is given in Table 1 for each family of cyclones in the XQ Series.

Table 1

Cyclone Family	XQ465	XQ405	XQ340	XQ240	XQ170	XQ120
k	1254.27	1069.19	923.120	741.378	621.110	543.522

The approximate Total Collection Efficiency is calculated by:

$$\varepsilon_t = 100.0 - f_l,$$

where ε_t = Approximate Total Collection Efficiency, % by weight.

f_l = The percent finer by weight, in the Particle Size Distribution at the Average Limit Particle Size.

Examples of Cyclone Calculations

Example #1

Given:

Q = 6,800 A.C.F.M.

Gas = Air at 460° F. and 14.7 p.s.i.a.

$\lambda_g = 0.036$ lbs./cu. ft.

$\mu_g = 1.76 \times 10^{-5}$ lbs. (mass)/ft.—sec.

Specifications:

$v_i = 70.$ f.p.s., maximum

$\Delta P = 3.0$ in. w.c., maximum

Calculations:

1. From Figure 1, smallest single cyclone at $v_i \leq 70.$ f.p.s. is SIZE 22.
2. Allowable maximum pressure drop at specified conditions must be corrected to the gas density of air at 70°F. and 14.7 p.s.i.a., 0.075 lbs./cu. ft. $\Delta P_{(corr)} = 0.075 \times 3.0/0.036 = 6.25$ in. w.c.
3. From Figure 2, at $\Delta P_{(corr)} = 6.25$ in. w.c., $v_i = 53.$ f.p.s. The cyclone will have to be resized to this inlet velocity.
4. Returning to Figure 1, smallest single cyclone at v_i 53. f.p.s. is SIZE 25.

Example #2

Given:

Q = 12,500 A.C.F.M.

$\lambda_g = 0.075$ lbs./cu. ft.

$\mu_g = 1.2029 \times 10^{-5}$ lbs. (mass)/ft.—sec.

$\lambda_d = 3.15$

Particle Size Distribution: See Figure 4.

Specifications:

Required Total Efficiency by weight, $\varepsilon_t = 86.5\%$

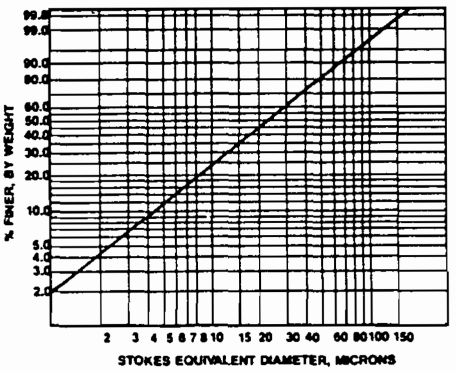
Maximum allowable pressure drop, $\Delta P = 7.5$ in. w.c.

Maximum allowable inlet velocity, $v_i = 55$ f.p.s.

Calculations:

1. Assume cyclone will be type XQ340
2. From Figure 1 at $v_i = 55$ f.p.s., Size = 33
3. From Figure 2 at $v_i = 55$ f.p.s., $\Delta P = 6.8$ in. w.c.
4. From Table 1, k = 923.120
5. By equation (1), $D_l = 923.120 \times \sqrt{\frac{1.2029 \times 10^{-5} \times 33^3}{3.15 \times 12500}}$ $= 3.06$
6. From Figure 4, $f_l = 7.1$
7. By equation (2), $\varepsilon_t = 100.0 - 7.1$ $\underline{= 92.9\%}$

FIG. 4



A typical XQ Series Model Number and What it Means

$$\underbrace{\text{XQ465}}_{A}\text{-}\underbrace{\text{20}}_{B}\text{-}\underbrace{\text{2}}_{C}\text{-}\underbrace{\text{CR1}}_{D}$$

A. *"XQ" plus a 3-digit number* designates the family of the cyclone.

B. *"-" plus a number* designates the cyclone size which equals the height of the cyclone inlet in inches. This may be a 1- or 2-digit number, or a decimal.

C. *"-" plus an integer* indicates the number of cyclones in parallel that make up the complete collection system.

D. *"-" plus a special suffix* designates special construction features. Some examples are:

PV = Pressure Vessel
CR1 = 1-inch Castable Refractory Lining
CR2 = 2-Inch Castable Refractory Lining
RB3 = 3-Inch Refractory Brick Lining
RB9 = 9-Inch Refractory Brick Lining
C.5 = ½-Inch Alumina Ceramic Tile Lining
C1 = 1-Inch Alumina Ceramic Tile Lining

Use the above information when specifying your XQ Series Cyclone. In addition, orders should specify separately:

Material(s) of Construction or (if Fisher-Klosterman is to determine the materials) special construction considerations such as high abrasion or corrosive conditions.

Special Construction Features, such as:

Break-Apart Construction for installations requiring cleaning and maintenance.

Externally Replaceable Wear Plates/Sections or special linings for highly abrasive dusts.

Access Doors (not recommended for the active portion of the cyclone when collection performance is critical).

Explosion Reliefs for use with explosive dusts.

Plus a variety of other features demanded by the individual cyclone's application.

XQ Series Single Cyclone

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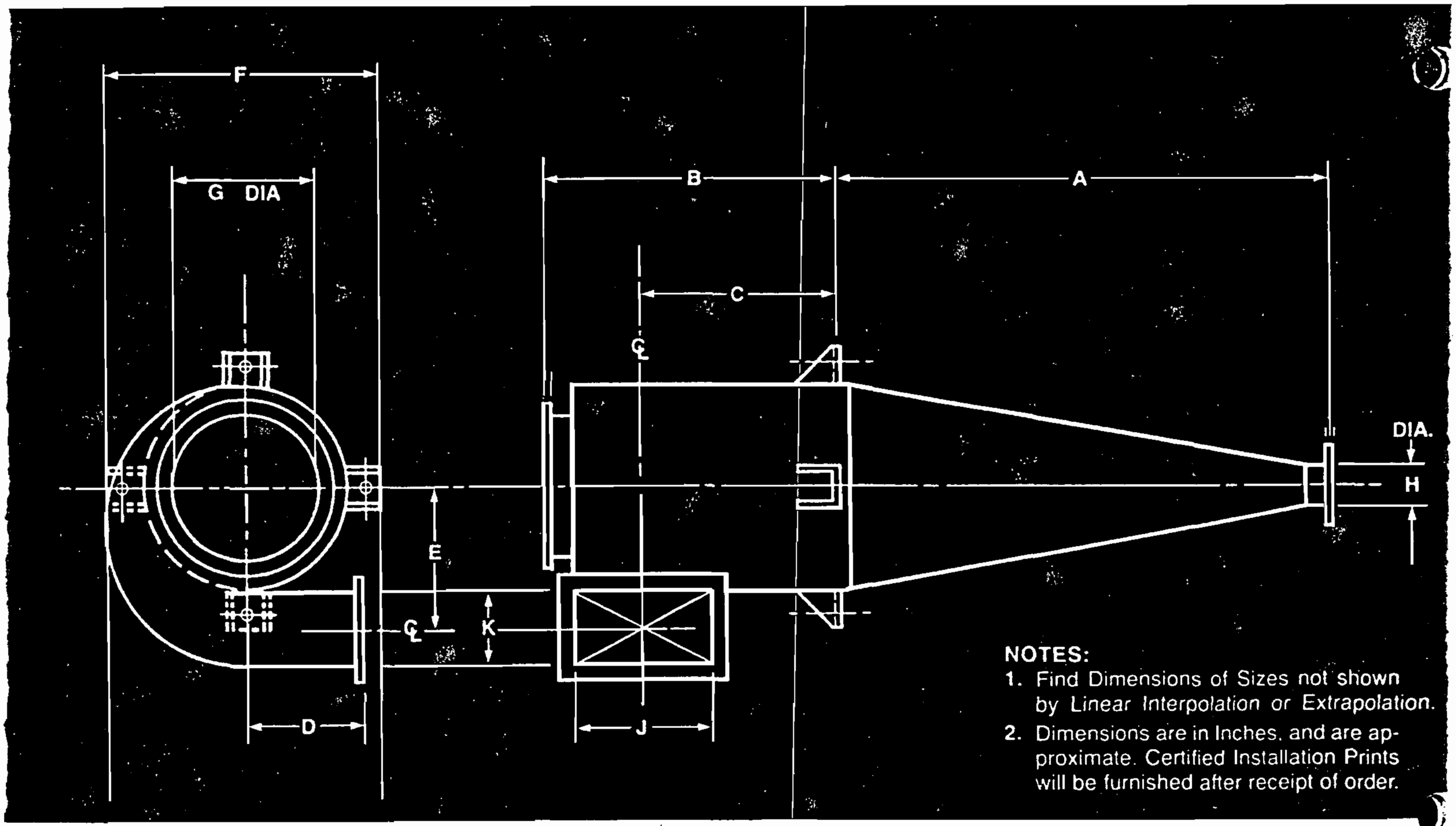

NOTES:

1. Find Dimensions of Sizes not shown by Linear Interpolation or Extrapolation.
2. Dimensions are in Inches, and are approximate. Certified Installation Prints will be furnished after receipt of order.

		XQ-485	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 3	A	10½	11⅜	12⅜	14¾	17¼	20½
	B	7½	8	8⅝	10	11⅝	13½
	C	4	4½	5⅛	6½	8⅛	10
Inlet Height: 3 in.	D	5	5	5	6	6	6
	E	2⅞	3 1/16	3¼	3 11/16	4¼	4⅞
	F	8½	9	9½	10	11½	12½
Inlet Width: 1½ in.	G	3	3	3	4	4	4
	H	2	2	2	2	3	3
Cyclone Size: 4	A	13¾	15	16¼	19¼	23	27
	B	9½	10¼	11	12¾	15	17½
	C	5½	6¼	7	8¾	11	13½
Inlet Height: 4 in.	D	6	6	6	6	7	7
	E	3¾	4	4 5/16	4⅞	5⅝	6 7/16
	F	10	10½	11	12	13½	15
Inlet Width: 2 in.	G	4	4	4	5	5	5
	H	2	2	3	3	4	4
Cyclone Size: 5	A	17¼	18¾	20¼	24	28½	36½
	B	11½	12⅜	13⅜	15¾	18¼	19
	C	7	7⅞	8⅞	11¼	13¾	14½
Inlet Height: 5 in.	D	6	6	6	7	7	8
	E	4 11/16	5	5 5/16	6 1/16	7	8
	F	11	2	12½	14	16	18
Inlet Width: 2½ in.	G	5	5	5	6	6	6
	H	3	3	3	4	5	5
Cyclone Size: 6	A	20½	22¼	24¼	29	36½	43
	B	13½	14½	15¾	18½	19¼	23
	C	8½	9½	10¾	13½	14¼	18
Inlet Height: 6 in.	D	6	7	7	7	8	8
	E	5⅝	6	6⅜	7¼	8⅜	9⅝
	F	12½	13½	14	16	18	20½
Inlet Width: 3 in.	G	6	6	6	7	7	7
	H	3	4	4	5	5	6
Cyclone Size: 7	A	23¾	26	28	36	42	49½
	B	15½	16¾	18¼	18¾	22½	27
	C	10	11¼	12¾	13¼	17	21½
Inlet Height: 7 in.	D	7	7	7	8	8	9
	E	6 9/16	6 15/16	7 7/16	8½	9¾	11¼
	F	14	14½	15½	18	20½	25½
Inlet Width: 3½ in.	G	7	7	7	8	9	9
	H	4	4	4	5	6	8
Cyclone Size: 8	A	27	29½	32	40½	48	56
	B	17½	19	20½	21½	26	31
	C	11½	13	14½	15½	20	25
Inlet Height: 8 in.	D	7	7	8	8	9	10
	E	7 7/16	7 15/16	6½	9⅝	11⅛	12¾
	F	15	16	17½	19½	24½	28
Inlet Width: 4 in.	G	8	8	8	10	10	10
	H	4	5	5	6	7	9

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Cyclone Size: 9
Inlet Height: 9 in.
Inlet Width: 4½ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	30½	33	38½	45½	53	63
B	19½	21	20½	24½	29	35
C	13	14½	14	18	22½	28½
D	8	8	8	9	9	10
E	8⅜	8⅞	9½	10⅞	12½	14⅜
F	16½	17½	19	23½	27	30½
G	9	9	9	11	11	11
H	5	5	6	7	8	10

Cyclone Size: 11
Inlet Height: 11 in.
Inlet Width: 5½ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	37	43	46½	55	65	76
B	25½	25	27	32	38	45
C	16	15½	17½	22½	28½	35½
D	9	9	10	10	11	12
E	10¼	10⅞	11⅝	13¼	15¼	17⅝
F	19½	20½	24	27½	31½	36
G	11	11	10	13	13	14
H	6	6	7	8	10	12

Cyclone Size: 13
Inlet Height: 13 in.
Inlet Width: 6½ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	46½	50	55	64	76	90
B	27	29½	32	38	44½	53
C	16½	19	21½	27½	34	42½
D	10	10	10	11	12	13
E	12	12¾	13⅝	15⅝	17⅞	20⅝
F	24	25½	27	31	35½	43
G	13	13	12	16	16	16
H	7	8	8	10	12	14

Cyclone Size: 15
Inlet Height: 15 in.
Inlet Width: 7½ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	53	57	62	74	87	103
B	31	33½	36½	43½	51	61
C	19½	22	25	32	39½	49½
D	11	11	11	12	13	14
E	13⅞	14¾	15¾	18⅛	20⅝	23⅞
F	26½	28½	30½	35	42	48½
G	15	15	14	18	18	18
H	8	9	10	11	14	16

Cyclone Size: 18
Inlet Height: 18 in.
Inlet Width: 9 in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	63	68	74	88	104	123
B	37	40	44	52	61	73
C	24	27	31	39	48	60
D	12	12	12	13	14	16
E	16⅝	17⅝	18⅞	21⅝	24⅞	28⅝
F	30½	32½	35	42½	49	56½
G	18	17	17	21	22	22
H	10	11	11	14	16	19

Cyclone Size: 21
Inlet Height: 21 in.
Inlet Width: 10½ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	73	79	86	102	121	143
B	43	46½	51	60	72	85
C	28½	32	36½	45½	57½	70½
D	13	13	13	14	16	17
E	19⅜	20⅝	22⅛	25⅛	28⅞	33⅜
F	34½	37	42	48	55½	68½
G	21	20	20	25	26	26
H	11	12	13	16	19	23

Cyclone Size: 25
Inlet Height: 25 in.
Inlet Width: 12½ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	86	94	102	121	143	170
B	51	55	60	72	85	101
C	34½	38½	43½	55½	68½	84½
D	14	14	14	16	17	18
E	23⅛	24⅝	26⅛	29⅞	34⅜	39¹⁵⁄₁₆
F	42	45	48	55½	68½	79½
G	25	24	24	30	30	31
H	13	15	16	19	23	27

Cyclone Size: 30
Inlet Height: 30 in.
Inlet Width: 15 in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	103	112	122	144	171	203
B	61	66	72	86	102	121
C	42	47	53	67	83	102
D	15	15	16	17	19	20
E	27⅝	29⅜	31⅜	36⅛	41³⁄₁₆	47¹¹⁄₁₆
F	48½	52	56	69½	79½	92½
G	30	29	28	36	36	37
H	16	18	19	23	27	32

Cyclone Size: 36
Inlet Height: 36 in.
Inlet Width: 18 in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	123	134	146	173	205	243
B	73	79	87	103	122	145
C	51	57	65	81	100	123
D	16	16	17	19	20	22
E	33⅛	35⅛	37⅝	43³⁄₁₆	49¹¹⁄₁₆	57¼
F	56	60	69½	80½	93½	109
G	36	35	34	43	44	44
H	19	21	23	27	33	39

Cyclone Size: 43
Inlet Height: 43 in.
Inlet Width: 21½ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	146	159	173	206	244	290
B	87	95	103	123	146	173
C	61½	69½	77½	97½	120½	147½
D	18	16	19	20	22	24
E	39⅜	41¹⁵⁄₁₆	44¹⁵⁄₁₆	51⁷⁄₁₆	59	68⅝
F	69½	74½	80½	93½	109	128
G	43	42	41	51	52	53
H	23	25	28	33	39	46

Cyclone Size: 51
Inlet Height: 51 in.
Inlet Width: 25½ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	173	188	205	243	289	343
B	103	112	122	145	172	205
C	73½	82½	92½	115½	142½	175½
D	19	19	20	22	24	26
E	46¹⁵⁄₁₆	49¹⁵⁄₁₆	53⁷⁄₁₆	61	70⅛	81⅛
F	80½	86½	93½	109	127	149
G	51	49	48	60	62	62
H	27	30	33	39	46	54

Cyclone Size: 60
Inlet Height: 60 in.
Inlet Width: 30 in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	203	221	241	286	339	403
B	121	132	144	171	203	241
C	87	98	110	137	169	207
D	21	21	22	24	26	28
E	55⁵⁄₁₆	58¾	62⅝	71⅞	82⅜	95⅜
F	92½	100	108	126	147	173
G	60	58	56	71	72	73
H	32	35	38	45	54	64

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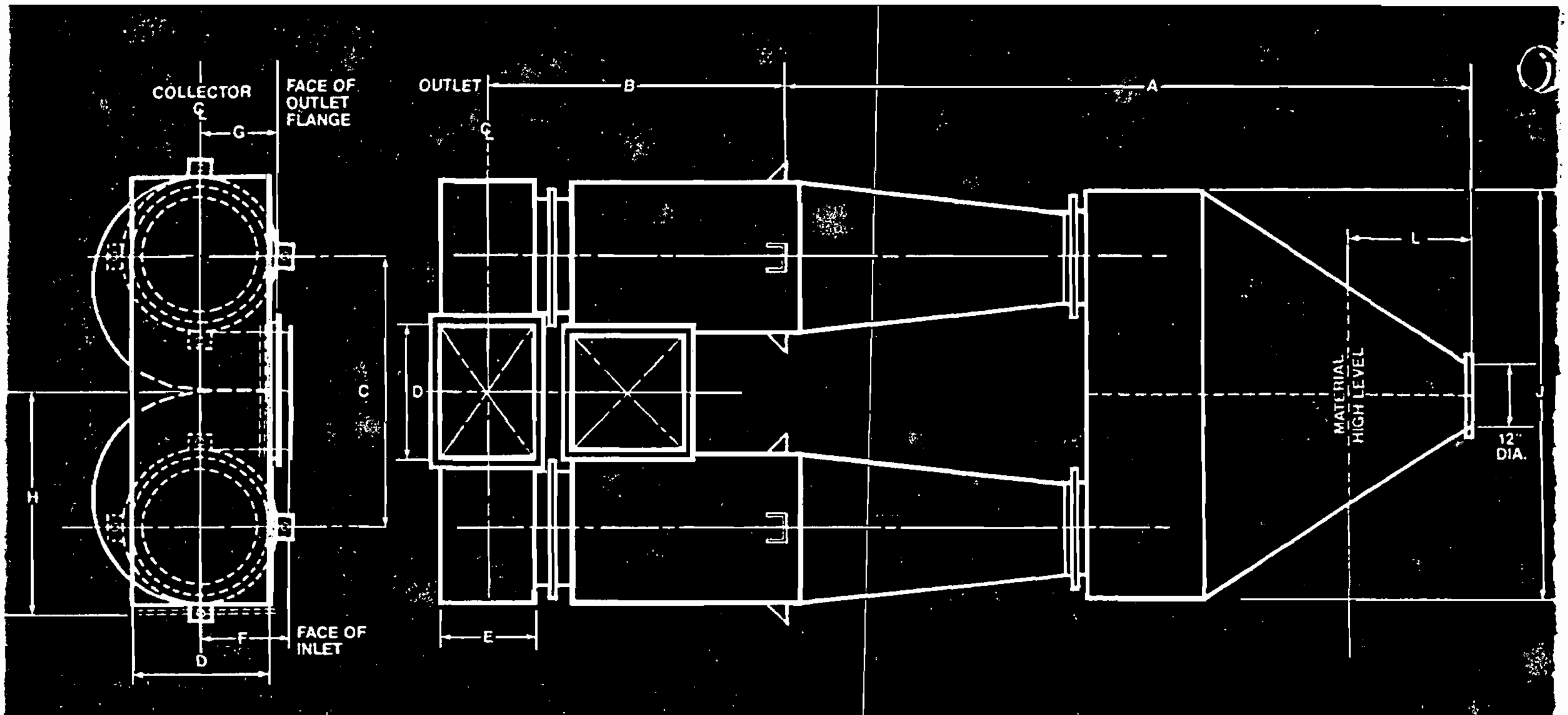
XQ Series Dual Cyclone



NOTES:

1. Find Dimensions of Sizes not shown by Linear Interpolation or Extrapolation.
2. Dimensions are in Inches, and are approximate. Certified Installation Prints will be furnished after receipt of order.
3. Dimension "K" is the Maximum Front-Back Depth of the Dust Hopper.

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 9-2	A	50½	55	61½	72½	84	99
	B	24¾	25¾	25¼	30¾	35¾	41¾
	C	21⅜	22⅜	23⅝	26⅜	29⅝	33⅜
	D	13	13	13	15	15	15
Inlet Height: 9 in.	E	10	9	9	12	13	13
	F	14	14	14	15	15	16
	G	7½	7½	7½	8½	8½	8½
Inlet Width: 9⅛ in.	H	22	22	23	26	28	30
	J	35	37	38	43	48	54
	K	14	14	15	16	19	21
	L	2	3	2	2	2	1

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 13-2	A	76½	83	90	105	123	145
	B	35¼	37¼	39¼	47¾	54¾	63¼
	C	30⅝	32⅛	33⅞	37⅞	42⅜	47⅞
	D	17	17	17	20	20	20
Inlet Height: 13 in.	E	16	15	14	19	20	20
	F	16	16	16	17	18	19
	G	10½	10½	10½	12	12	12
Inlet Width: 13⅛ in.	H	31	31	31	37	39	42
	J	47	50	52	59	66	75
	K	17	18	19	21	24	27
	L	5	6	5	6	5	6

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 11-2	A	62	70	75½	89	104	122
	B	32¼	31¼	33¼	40¼	46¼	53¼
	C	26⅛	27⅜	28⅞	32⅛	36⅛	40⅞
	D	15	15	15	17	18	18
Inlet Height: 11 in.	E	13	12	12	16	16	16
	F	15	15	16	16	17	18
	G	9½	9½	9½	10½	11	11
Inlet Width: 11⅛ in.	H	26	27	27	31	34	36
	J	41	43	46	51	57	65
	K	15	16	17	19	21	24
	L	3	4	4	4	3	4

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 15-2	A	89	95	104	122	142	167
	B	40¾	42¾	45¼	55¼	62¾	72¾
	C	35⅜	37⅛	39⅛	43⅞	48⅞	55⅜
	D	19	19	18	22	22	23
Inlet Height: 15 in.	E	19	18	17	23	23	23
	F	17	17	17	18	19	20
	G	11½	11½	11	13	13	13½
Inlet Width: 15⅛ in.	H	35	35	36	42	45	48
	J	54	56	60	67	75	86
	K	18	19	21	23	27	30
	L	7	6	8	8	7	7

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Cyclone Size: 18-2
Inlet Height: 18 in.
Inlet Width: 18⅛ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	107	115	124	146	171	201
B	48¾	50¾	55¼	66¼	75¾	87¾
C	42⅜	44⅜	46⅞	52⅜	58⅞	66⁷⁄₁₆
D	22	22	21	26	26	26
E	23	21	22	28	29	29
F	18	18	18	19	20	22
G	13	13	12½	15	15	15
H	41	42	43	50	53	57
J	63	66	70	79	89	102
K	21	22	23	27	31	35
L	9	9	9	10	9	10

Cyclone Size: 36-2
Inlet Height: 36 in.
Inlet Width: 36¼ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	217	233	252	293	344	403
B	98¾	103¼	111¼	133¹³⁄₁₆	153⁵⁄₁₆	177⁵⁄₁₆
C	84⁷⁄₁₆	88⁷⁄₁₆	93⁷⁄₁₆	104⅝	117⅝	132¹³⁄₁₆
D	40	39	38	47	48	48
E	51	48	48	61	62	64
F	22	22	23	25	26	28
G	22	21½	21	25½	26	26
H	80	81	83	97	105	113
J	120	126	134	151	172	197
K	35	38	40	47	55	64
L	26	25	25	25	24	24

Cyclone Size: 21-2
Inlet Height: 21 in.
Inlet Width: 21⅛ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	125	134	146	170	200	234
B	57¼	59¾	64¼	76¾	89¼	102¼
C	49⅝	51⅞	54⅞	60⅞	68⅝	77⁷⁄₁₆
D	25	25	24	29	30	30
E	28	26	26	33	34	34
F	19	19	19	20	22	23
G	14½	14½	14	16½	17	17
H	48	48	49	57	62	66
J	72	76	81	91	103	117
K	23	25	26	30	34	40
L	12	11	13	12	12	11

Cyclone Size: 43-2
Inlet Height: 43 in.
Inlet Width: 43⅜ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	258	278	300	351	410	482
B	118¼	124¹³⁄₁₆	132⁵⁄₁₆	160¹³⁄₁₆	184⁵⁄₁₆	212⅜
C	100⁷⁄₁₆	105⅝	111⅛	124⅝	139¹³⁄₁₆	159⅛
D	[illegible]	46	45	55	56	57
E	[illegible]	59	58	75	76	78
F	[illegible]	24	25	26	28	30
G	25½	25	24½	29½	30	30½
H	95	97	99	116	124	135
J	[illegible]	149	159	179	204	234
K	[illegible]	44	47	55	64	75
L	[illegible]	31	30	30	30	30

Cyclone Size: 25-2
Inlet Height: 25 in.
Inlet Width: 25³⁄₁₆ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	149	162	174	203	237	280
B	68¼	71¼	75¾	92¼	106¼	122⁵⁄₁₆
C	58⅞	61⅞	64⅞	72⅜	81⁷⁄₁₆	92⅝
D	29	29	28	34	34	35
E	34	32	31	40	42	42
F	20	20	20	22	23	24
G	16½	16½	16	19	19	19½
H	57	57	58	68	73	79
J	85	90	95	107	121	139
K	26	28	30	34	40	46
L	16	16	16	15	14	16

Cyclone Size: 51-2
Inlet Height: 51 in.
Inlet Width: 51⅜ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	306	330	957	416	486	571
B	140¹³⁄₁₆	147¹³⁄₁₆	157⁵⁄₁₆	189¹³⁄₁₆	218⅜	251⅜
C	119⅝	125⅝	132⅝	147¹³⁄₁₆	166⅛	188⅛
D	55	53	52	64	66	66
E	75	71	70	89	92	92
F	25	25	26	28	30	32
G	29½	28½	28	34	35	35
H	113	114	127	136	147	158
J	166	176	187	212	240	275
K	47	51	55	64	74	87
L	38	38	37	37	37	38

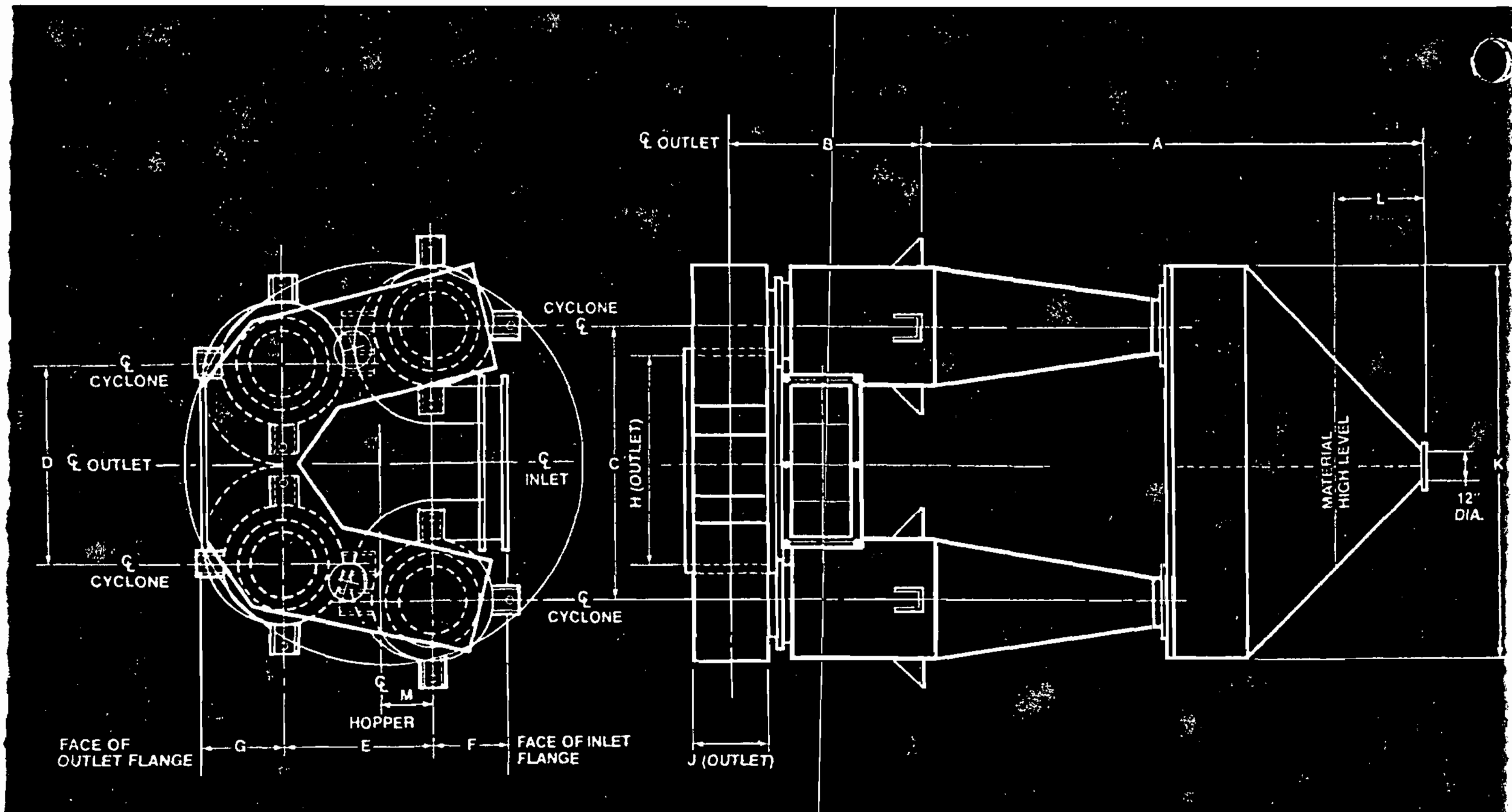
Cyclone Size: 30-2
Inlet Height: 30 in.
Inlet Width: 30³⁄₁₆ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	180	193	209	244	285	336
B	82¼	86¼	91¾	111¼	127¹³⁄₁₆	146¹³⁄₁₆
C	70⅝	73⅞	77⅞	87⁷⁄₁₆	97⅝	110⅝
D	34	33	32	40	40	41
E	42	40	39	50	[illegible]	51
F	21	21	22	23	25	26
G	19	18½	18	22	22	22½
H	67	68	69	81	87	94
J	101	106	113	128	[illegible]	165
K	30	32	35	40	[illegible]	54
L	20	19	20	20	19	20

Cyclone Size: 60-2
Inlet Height: 60 in.
Inlet Width: 60⅜ in.

	XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
A	361	389	420	490	573	672
B	165¹³⁄₁₆	174¹³⁄₁₆	185⁵⁄₁₆	224⅜	256⅞	295⅞
C	140⅝	147¹³⁄₁₆	155¹³⁄₁₆	174⅛	195⅛	221⅛
D	[illegible]	62	60	75	76	77
E	[illegible]	85	82	106	107	109
F	[illegible]	27	28	30	32	34
G	[illegible]	33	32	39½	40	40½
H	133	134	136	160	172	186
J	195	206	219	248	282	323
K	[illegible]	58	63	74	87	102
L	[illegible]	45	45	46	44	44

XQ Series Quad Cyclone



NOTES:

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2. Dimensions are in Inches, and are approximate. Certified Installation Prints will be furnished after receipt of order.

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 9-4 **Inlet Height: 9 in.** **Inlet Width: 18⅜ in.**	A	59½	64	71½	82½	96	112
	B	28	29	28½	34	39	45
	C	30⅝	31⅝	32⅞	35⅝	38⅞	42⅝
	D	21⅜	22⅜	23⅝	26⅜	29⅝	33⅜
	E	17	18	20	22	26	29
	F	14	14	14	15	15	16
	G	8	9	9	10	11	13
	H	26	26	26	30	30	30
	J	10	9	9	12	13	13
	K	46	48	50	55	62	69
	L	11	12	12	12	14	14
	M	4¹⁵⁄₁₆	5½	6¾	7¾	10	11½
Cyclone Size: 11-4 **Inlet Height: 11 in.** **Inlet Width: 22⅜ in.**	A	73	82	87½	102	119	137
	B	35½	34½	36½	43½	49½	56½
	C	37⅜	38⅝	40⅛	43⅜	47⅜	52⅛
	D	26⅛	27⅜	28⅞	32⅛	36⅛	40⅞
	E	20	22	23	27	31	35
	F	15	15	16	16	17	18
	G	10	11	11	12	13	15
	H	30	30	30	34	36	36
	J	13	12	12	16	16	16
	K	54	57	59	66	74	83
	L	14	16	16	17	18	19
	M	5⁹⁄₁₆	6¾	7¼	9⅝	11¾	13¾

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 13-4 Inlet Height: 13 in. Inlet Width: 26⅜ in.	A	89½	96	104	119	139	163
	B	38½	40½	42½	51	58	66½
	C	43⅞	45⅜	47⅛	51⅛	55⅝	61⅛
	D	30⅝	32⅛	33⅞	37⅞	42⅜	47⅞
	E	23	25	27	31	35	41
	F	16	16	16	17	18	19
	G	12	12	13	14	15	18
	H	34	34	34	40	40	40
	J	16	15	14	19	20	20
	K	62	65	69	76	85	96
	L	18	19	19	20	21	24
	M	6⅛	7⅜	8½	10¾	12¾	16
Cyclone Size: 15-4 Inlet Height: 15 in. Inlet Width: 30⅜ in.	A	104	111	119	139	161	188
	B	44	46	48½	58½	66	76
	C	50⅝	52⅜	54⅜	59⅛	64⅛	70⅝
	D	35⅜	37⅛	39⅛	43⅞	48⅞	55⅜
	E	27	28	30	35	40	47
	F	17	17	17	18	19	20
	G	13	14	15	16	18	20
	H	38	38	36	44	44	46
	J	19	18	17	23	23	23
	K	71	74	78	87	97	110
	L	22	22	23	25	26	28
	M	7⅜	7⅞	9	11⅞	14½	18½

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 18-4	A	124	133	143	166	193	226
	B	52	54	58½	69½	79	91 1/16
	C	60⅝	62⅝	65⅛	70⅝	77⅛	84¾
	D	42⅜	44⅜	46⅞	52⅜	58⅞	66 7/16
Inlet Height: 18 in.	E	31	33	36	41	48	56
	F	18	18	18	19	20	22
	G	16	17	18	19	21	25
	H	44	44	42	52	52	52
Inlet Width: 36 7/16 in.	J	23	21	22	28	29	29
	K	83	87	92	102	115	131
	L	26	27	28	30	31	35
	M	7⅞	9⅛	10⅞	13¾	17½	21¾
Cyclone Size: 21-4	A	146	156	167	194	225	263
	B	60½	63	67½	80	92½	105 9/16
	C	70⅝	73⅛	76⅛	82⅛	89⅝	98¾
	D	49⅜	51⅞	54⅞	60⅞	68⅜	77 7/16
Inlet Height: 21 in.	E	36	39	42	48	55	64
	F	19	19	19	20	22	23
	G	19	19	21	22	25	29
	H	50	50	48	58	60	60
Inlet Width: 42 7/16 in.	J	28	26	26	33	34	34
	K	96	101	106	118	132	150
	L	33	33	34	36	37	40
	M	9⅛	11	12¾	16	19¾	24¾
Cyclone Size: 25-4	A	173	186	200	231	268	314
	B	71½	74½	79	95½	109 9/16	125 9/16
	C	84⅛	87⅛	90⅛	97⅝	106¾	118 1/16
	D	58⅞	61⅞	64⅞	72⅜	81 7/16	92⅝
Inlet Height: 25 in.	E	42	45	49	56	65	76
	F	20	20	20	22	23	24
	G	22	23	25	26	30	34
	H	58	58	56	68	68	70
Inlet Width: 50⅝ in.	J	34	32	31	40	42	42
	K	113	118	125	139	156	178
	L	40	40	42	43	45	50
	M	10¼	12	14½	18½	23¼	29
Cyclone Size: 30-4	A	209	223	240	277	322	375
	B	85½	89½	95	114 9/16	131 1/16	150 1/16
	C	100⅝	104⅛	108⅛	117¾	128 1/16	141 1/16
	D	70⅜	73⅞	77⅞	87 7/16	97⅝	110⅝
Inlet Height: 30 in.	E	50	54	58	67	74	90
	F	21	21	22	23	25	26
	G	26	28	30	31	35	41
	H	68	66	64	80	80	82
Inlet Width: 60⅝ in.	J	42	40	39	50	51	51
	K	134	140	148	166	186	211
	L	49	49	51	53	56	59
	M	12	14½	16¾	22	27½	34½

		XQ-465	XQ-405	XQ-340	XQ-240	XQ-170	XQ-120
Cyclone Size: 36-4	A	250	268	288	333	388	452
	B	102 1/16	106 9/16	114 9/16	137 1/16	156 9/16	180⅝
	C	120¾	124¾	129¾	141 1/16	154 1/16	169⅜
	D	84 7/16	88 7/16	93 7/16	104⅝	117⅝	132 13/16
Inlet Height: 36 in.	E	60	64	69	80	93	108
	F	22	22	23	25	26	28
	G	31	33	35	37	42	49
	H	80	78	76	94	96	96
Inlet Width: 72 13/16 in.	J	51	48	48	61	62	64
	K	159	167	176	197	223	253
	L	59	60	61	65	68	73
	M	14½	17	19¾	26	33	41
Cyclone Size: 43-4	A	298	320	344	397	462	540
	B	121 9/16	128 1/16	135 9/16	164 1/16	187⅝	215 11/16
	C	143¾	149 1/16	155 1/16	168 1/16	183⅜	202⅞
	D	100 7/16	105⅝	111⅝	124⅝	139 13/16	159⅛
	E	70	75	81	94	110	129
Inlet Height: 43 in.	F	24	24	25	26	28	30
	G	37	39	42	44	50	58
	H	94	92	90	110	112	114
	J	62	59	58	75	76	78
Inlet Width: 87⅛ in.	K	188	198	209	233	264	301
	L	71	73	74	76	82	88
	M	16	19	22½	30	39	49
Cyclone Size: 51-4	A	355	379	408	472	548	638
	B	144 1/16	151 1/16	160 9/16	193⅛	221 11/16	254 11/16
	C	171 1/16	177 1/16	184 1/16	199⅜	217⅞	239⅞
	D	119⅝	125⅝	132⅝	147 13/16	166⅛	188⅛
Inlet Height: 51 in.	E	83	89	96	111	130	152
	F	25	25	26	28	30	32
	G	44	47	50	52	59	69
	H	110	106	104	128	132	132
Inlet Width: 103⅛ in.	J	75	71	70	89	92	92
	K	222	233	246	276	311	353
	L	87	87	88	93	99	105
	M	19	22¾	27	35½	46	58
Cyclone Size: 60-4	A	418	447	480	555	645	752
	B	169 1/16	178⅛	188⅝	227 11/16	260 3/16	299 3/16
	C	201 1/16	208⅜	216⅝	234⅞	255⅞	281⅞
	D	140⅝	147 13/16	155 13/16	174⅛	195⅛	221⅛
Inlet Height: 60 in.	E	97	104	112	131	152	178
	F	27	27	28	30	32	34
	G	52	55	59	61	70	81
	H	128	124	120	150	152	154
Inlet Width: 121⅛ in.	J	89	85	82	106	107	109
	K	260	273	288	323	365	415
	L	102	103	105	111	116	124
	M	22	26	31	42	53	68

Table 2

Standard Material Thicknesses (See Note 1)
Maximum Cyclone Size (See Note 2)

U.S.S. GAUGE	INCHES	XQ465	XQ405	XQ340	XQ240	XQ170	XQ120
16	.0598	36	33	30	25	21	18
14	.0747	45	41	37	32	27	22
12	.1046	62	57	52	44	37	31
10	.1345	80	74	67	57	48	40
3/16 PL	.1875	112	103	94	79	67	56
¼ PL	.2500	149	137	125	105	89	75
⅜ PL	.3750	224	206	188	158	133	112

NOTES:

1. Any thickness of material in all carbon steel, alloy or stainless steel, high nickel, aluminum and other non-ferrous alloys is available as required by operating conditions.

2. The above sizes will withstand −15 in. w.c. absolute internal pressure in commercial quality hot rolled steel.

Table 3
Installed Weights of Single Cyclones (See Note 1)

CYCLONE	XQ465		XQ405		XQ340		XQ240		XQ170		XQ120	
SIZE	THK.	LBS.	THK.	LBS.	THK.	LBS.	THK.	LBS.	THK.	LBS.	THK.	LBS.
3	.0598	5	.0598	6	.0598	7	.0598	9	.0598	12	.0598	16
4	.0598	8	.0598	10	.0598	11	.0598	15	.0598	21	.0598	29
5	.0598	13	.0598	15	.0598	18	.0598	24	.0598	33	.0598	45
6	.0598	19	.0598	22	.0598	26	.0598	35	.0598	47	.0598	65
7	.0598	25	.0598	30	.0598	35	.0598	47	.0598	64	.0598	88
9	.0598	42	.0598	50	.0598	58	.0598	78	.0598	105	.0598	145
11	.0598	63	.0598	75	.0598	86	.0598	115	.0598	160	.0598	220
13	.0598	88	.0598	105	.0598	120	.0598	165	.0598	220	.0598	305
16	.0598	135	.0598	155	.0598	180	.0598	245	.0598	335	.0598	460
20	.0598	205	.0598	245	.0598	285	.0598	385	.0598	525	.0747	900
24	.0598	300	.0598	355	.0598	410	.0598	555	.0747	945	.1046	1800
29	.0598	435	.0598	515	.0598	600	.0747	1000	.1046	1950	.1046	2650
36	.0598	670	.0747	1000	.0747	1150	.1046	2200	.1046	2950	.1345	5250
44	.0747	1250	.1046	2100	.1046	2410	.1046	3250	.1345	5700	.1875	10,700
54	.1046	2650	.1046	3150	.1345	4750	.1345	6350	.1875	11,700	.1875	16,100
66	.1345	5100	.1345	6000	.1345	6950	.1875	12,900	.1875	17,500	.2500	32,000
76	.1345	6750	.1875	10,900	.1875	12,600	.1875	17,000	.2500	30,900	.3750	63,600
81	.1875	10,400	.1875	12,300	.1875	14,300	.2500	25,800	.2500	35,100	.3750	72,300

NOTES:

1. Weights are based on commercial quality hot rolled steel.
2. For sizes and/or thicknesses not shown, use the following procedure:
   A. Select the nearest size, $N_{(tab)}$, and find $t_{(tab)}$, the tabulated thickness and $W_{(tab)}$, the tabulated weight for the XQ cyclone family being considered.

   B. Calculate the weight, W, by

   $$W = \frac{W_{(tab)} \times t}{t_{(tab)}} \times \left(\frac{N}{N_{(tab)}}\right)^2,$$

   where t = desired thickness, inches
   N = desired cyclone size.
3. For DUAL cyclones, including dust hopper and inlet and outlet manifolds, calculate W as in Note 2. Then, find the total weight, $W_{(tot)}$ by $W_{(tot)} = 3.708 \times W$.
4. For QUAD cyclones, the procedure is as in Note 3 EXCEPT $W_{(tot)} = 8.207 \times W$.

Table 4
Shipping Limitations

The following are the largest sizes of single cyclones that can be shipped completely pre-assembled. Larger sizes will, in all cases, require knockdown (K.D.) construction flanged for bolted field assembly. Depending on routing, in some states the maximum sizes will be even smaller.

XQ465—87
XQ405—82
XQ340—77
XQ240—67
XQ170—58
XQ120—51

Table 5
English To Metric Conversions

	Multiply English Units	By	To Convert to Metric Units
Dimensions	Inches	2.540	cm.
Weights	Pounds	0.454	kg.
Volumetric Flow Rate	C.F.M.	4.720×10^{-4}	M^3/sec.
Velocity	Ft./Sec.	0.305	M/sec.
Pressure Drop	Inches—Water	1.863	mm—Mercury
Density	Lbs./Cu. Ft.	0.160	g/cc
Absolute Viscosity	Lbs. (Mass)/Ft.—Sec.	1488.2	Centipoise
Temperature	One (1) Degree F	0.555	One (1) Degree C
Pressure	P.S.I.	51.714	mm—Mercury
Dust Loading	Grains/Cu. Ft.	2.29×10^{-3}	kg/M^3

fk **Fisher-Klosterman, Inc.**
P.O. Box 11190, Station H
Louisville, Kentucky 40211
(502) 776-1505

Part I: Supplemental Information 1

Description of Process 1

System Design 1

Wood Usage 1

Emissions 2

Emissions Control Devices 2

Part II: Airborne Contaminants Emitted Data and 3

Table One: Pensacola Mill Pine Chip Thickness Screening 3

Calculations: 3

Part III: Appended Diagrams and Data 6

Mill Location Plot Plan 6

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Process Flow Diagrams 6

Calculations Basis Literature and Data 6

Part I: Supplemental Information

Description of Process

Champion International Corporation is proposing to construct a pine wood chip thickness screening system at its Pensacola facility, located in Cantonment, Escambia County, Florida. The new thickness screening system will replace an existing oversized chip screen system which classifies chips according to length rather than thickness. The effect of this project will be to increase chip quality to existing chip digesters and therefore will enhance pulp quality to the bleach plant and paper machines. The project objective will not increase production or throughput and will have no effect on any other mill equipment emissions.

System Design

The proposed pine wood chip thickness screening system will consist of the following equipment:

- 1 Primary Disc Screen
- 1 Secondary Disc Screen
- 1 Air Density Separator Rotary Feeder
- 1 Air Density Separator Cyclone and Blower
- 2 Chip Slicers
- 2 Gyratory Fines Screens
- 1 Fines Blower and Separator Cyclone

The existing system to be replaced consists of the following equipment:

- 2 - Chip Screens
- 1 - #2 Oversized Chip Re-Chipper
- 1 - #2 Cyclone Separator

Figures One and Two in Part III of this Supplement are process flow sheets illustrating the proposed and existing systems.

Wood Usage

Installation of the chip thickness screening system to replace components of the existing oversized chip screening system will improve chip quality to the pulp digesters but not increase chip

throughput. The difference between wood throughput of 1988 compared to post construction tabulated in Table One is actual usage in 1988 versus mill design usage. The wood throughput of 1987 is not compared due to 1986 and 1987 mill conversion startup affects.

Emissions

Emissions associated with the installation of the pine wood chip thickness screening system emanate from two new point sources and one existing point source as shown in Figures One and Two and tabulated in Table One. The two new point sources are a fines "airveyor" high efficiency cyclone separator (shown in Figure Two as block L) and an Air Density Separator cyclone (shown in Figure Two as block G). The net increase in point source total particulate emissions resulting from the installation is +2.0 tons per year. Because no external woodyard modifications are taking place associated with this project fugitive emissions are expected to at least remain the same. Any new or altered conveyor systems will be fitted with covers.

Contemporaneous changes since the 1986 mill conversion project were noted in the construction permit No. AC 17-113551. Table one is based on Table II of that permit which is attached in Part III. When added to contemporaneous changes, net emissions are -8.7 tons per year. These are well below the PM10 (Particulate Matter less than 10 microns in size) and TSP (Total Suspended Particulate) PSD (Prevention of Significant Deterioration) significance levels of 15 and 25 tons per year, respectively.

Emissions Control Devices

Fugitive emissions are controlled by covers on all belt conveyors. Two high efficiency cyclone separators are included in the installation (Shown in Figure One). Manufacturer efficiency curves (enclosed) with mill chip classifications were used to rate cyclone separation efficiencies.

The stack of the induced draft fan for the Air Density Separator cyclone is approximately 70 feet in height, and is 1.5 feet in diameter. The air flow rate is 12,000 ACFM maximum, and is at ambient temperatures and water vapor content. The fines cyclone has its own vent in the top.

Part II: Airborne Contaminants Emitted Data and Calculations

Table One: Pensacola Mill Pine Chip Thickness Screening System Installation Data

	(Tons/Year)
Chip Supply	
1988 Usage	1,100,000
Mill Design	1,200,000
PM10 Emissions:	
Proposed	0.8
Present	0.1
Net PM10	**0.7**
Net TSP Emissions:	
Proposed	2.2
Present	0.2
Net TSP	**2.0**
Contemporaneous:	
Present	-10.7
Proposed Increase	2.0
Net	***-8.7***

Calculations:

The flowsheets include recycle loops that were calculated by iteration using the following equations with reference to the respective flowsheets.

Constants:

Scrubber Efficiencies:

Where Particulate Matter > 10µ the cyclone separation efficiency at 99.5%; Therefore X = 0.995

Particulate Matter < 10µ the cyclone separation efficiency at 95%; Therefore Y = 0.95

Particulate Classification:

0.13% of Fines are Particulate Matter greater than 10 microns in size but less than 200 microns; Therefore $Z = 0.0013$

0.01% of Fines are Particulate Matter less than 10 microns in size; Therefore $V = 0.0001$

Calculations and Derivations For Figure One

$B = A + F$
$C = B * 0.01$
$D = B - C$
$E = D * 0.15$
$F = E + C$

Therefore:

$G > 10\,\mu = F * 0.1 * Z * (1 - X)$
$G < 10\,\mu = F * 0.1 * V * (1 - Y)$

And:

$H = D - E - G$
$K = H - I$
$I = H * 0.1$
$L = K$
$J = I$

Calculations and Derivations For Figure Two

$B = A + D$
$C = B * 0.01$
$D = C$

Therefore:

$E > 10\,\mu = D * 0.1 * Z * (1 - X)$
$E < 10\,\mu = D * 0.1 * V * (1 - Y)$

And:

$F = B - C - E$
$G = F * 0.15$

Therefore:

$H > 10\ \mu = G * 0.0005 * (1 - X)$
$H < 10\ \mu = G * 0.00001 * (1 - Y)$

And:

$I = G - H$
$J = I$
$K = F - L - H$
$L = (F + J) * 0.1$
$M = L - O$
$N = K$

Therefore:

$O > 10\ \mu = L * Z * (1 - X)$
$O < 10\ \mu = L * V * (1 - Y)$

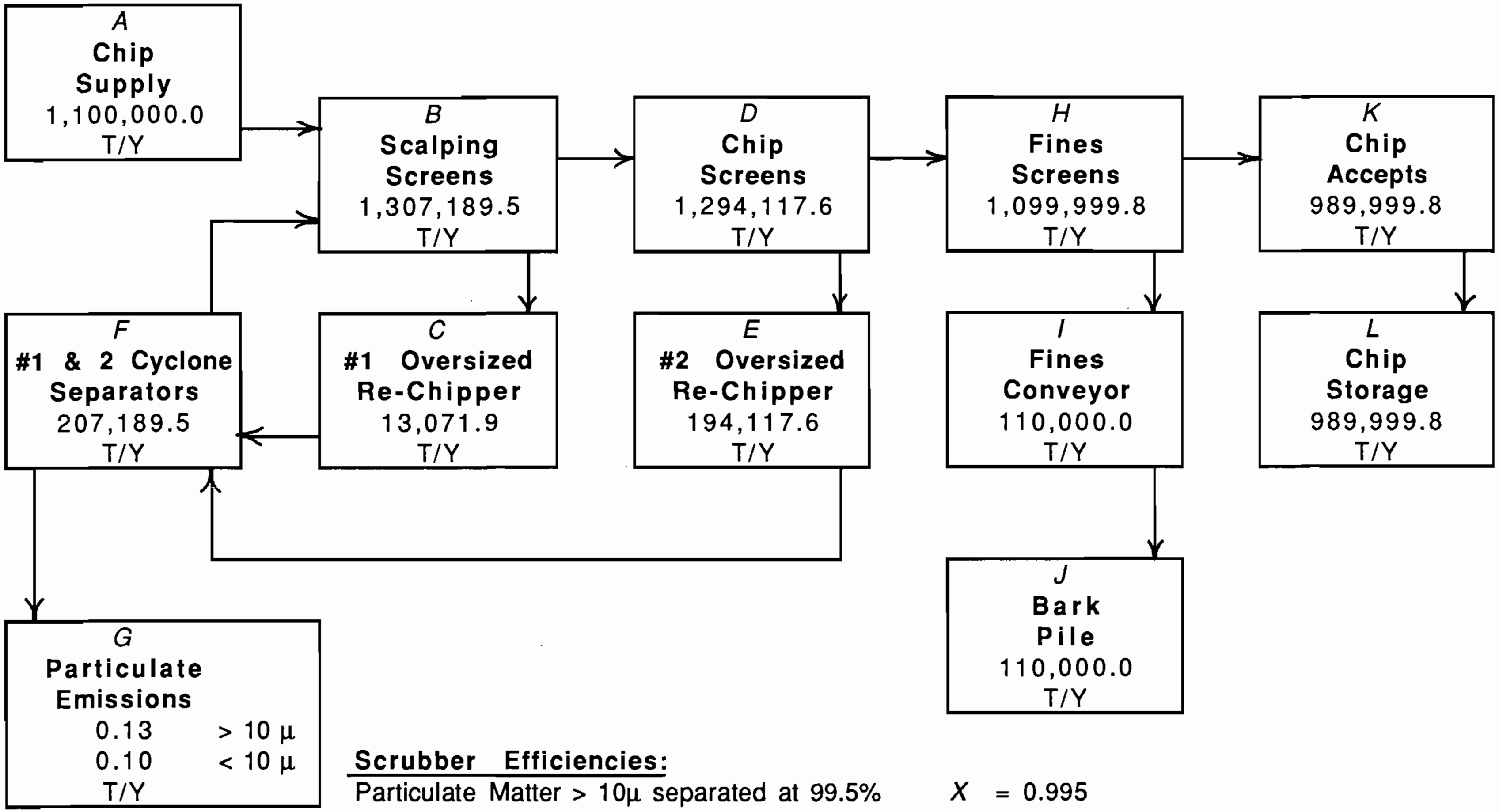
Finally:

$P = O + H + E$

Part III: Appended Diagrams and Data

- Mill Location Plot Plan
- Affected Facility Plot Plan
- Process Flow Diagrams
- Calculations Basis Literature and Data

Figure One: Existing Pine Wood Oversized Chip Screening System



Scrubber Efficiencies:

Particulate Matter > 10μ separated at 99.5%	$X = 0.995$
Particulate Matter < 10μ separated at 95%	$Y = 0.95$

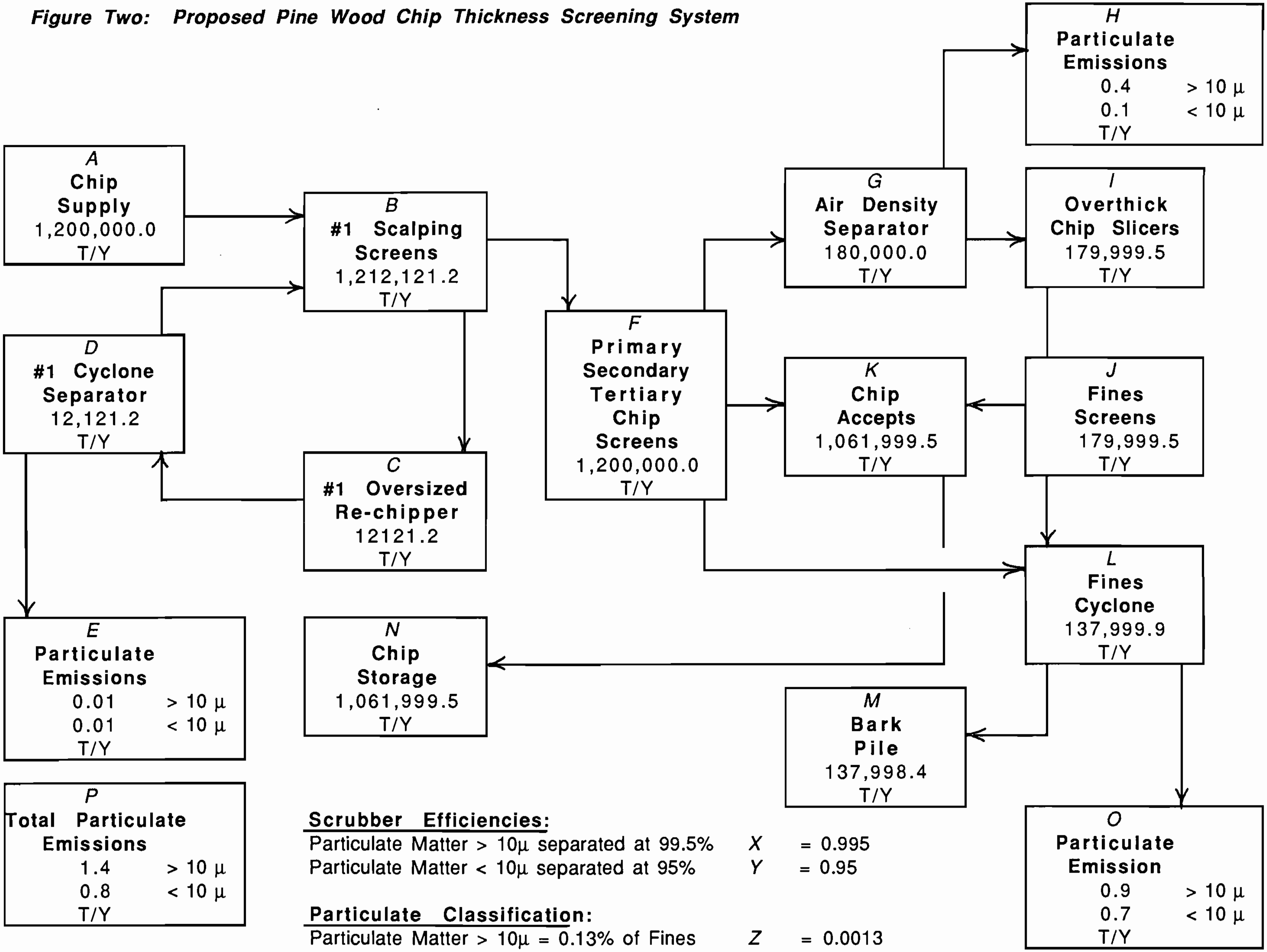
Particulate Classification:

Particulate Matter > 10μ = 0.13% of Fines	$Z = 0.0013$
Particulate Matter < 10μ = 0.01% of Fines	$V = 0.0001$

Environmental Control - Pensacola Mill

PMJ 5/1/89

Figure Two: Proposed Pine Wood Chip Thickness Screening System



Scrubber Efficiencies:

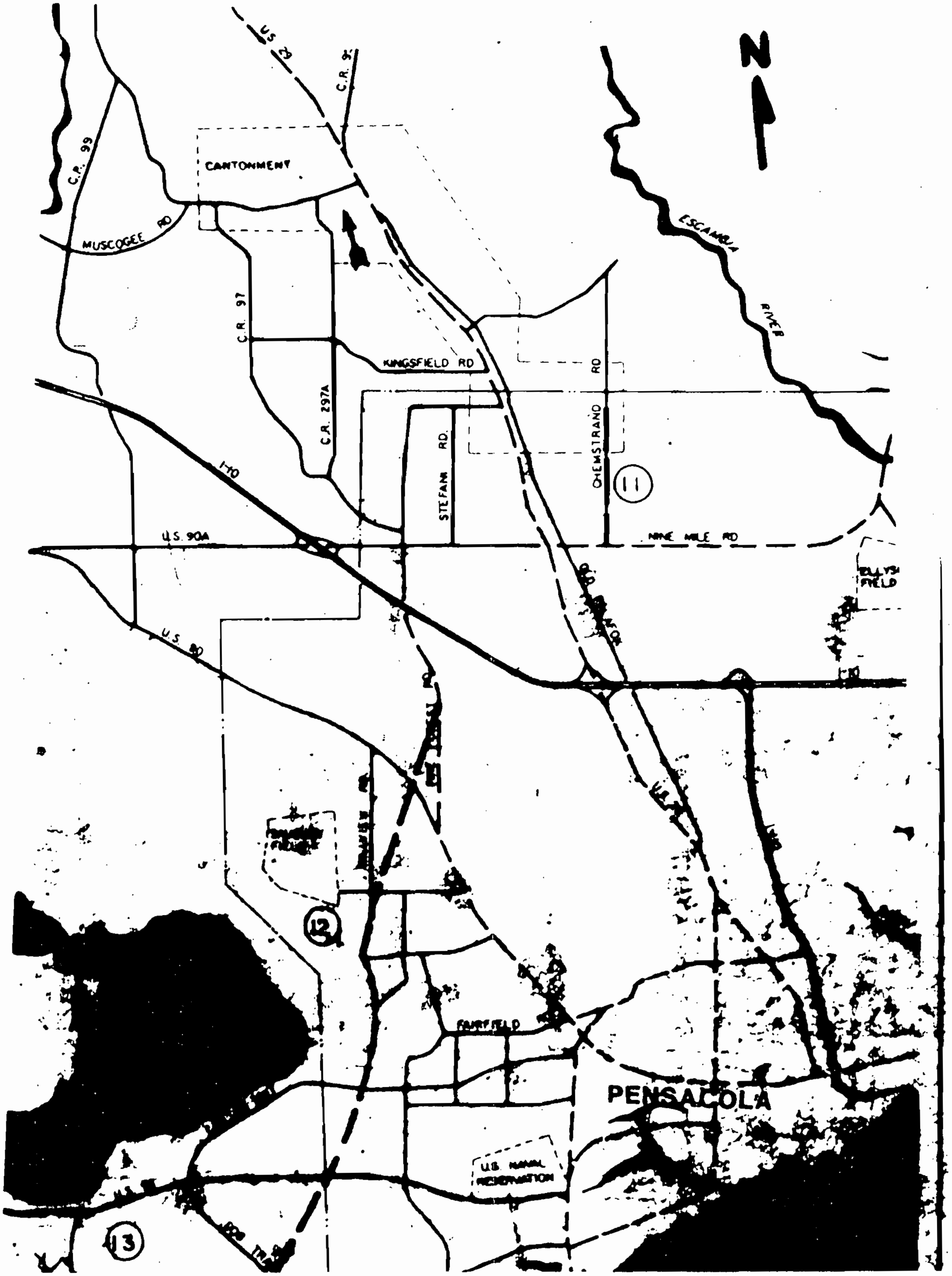
Particulate Matter > 10µ separated at 99.5% X = 0.995
Particulate Matter < 10µ separated at 95% Y = 0.95

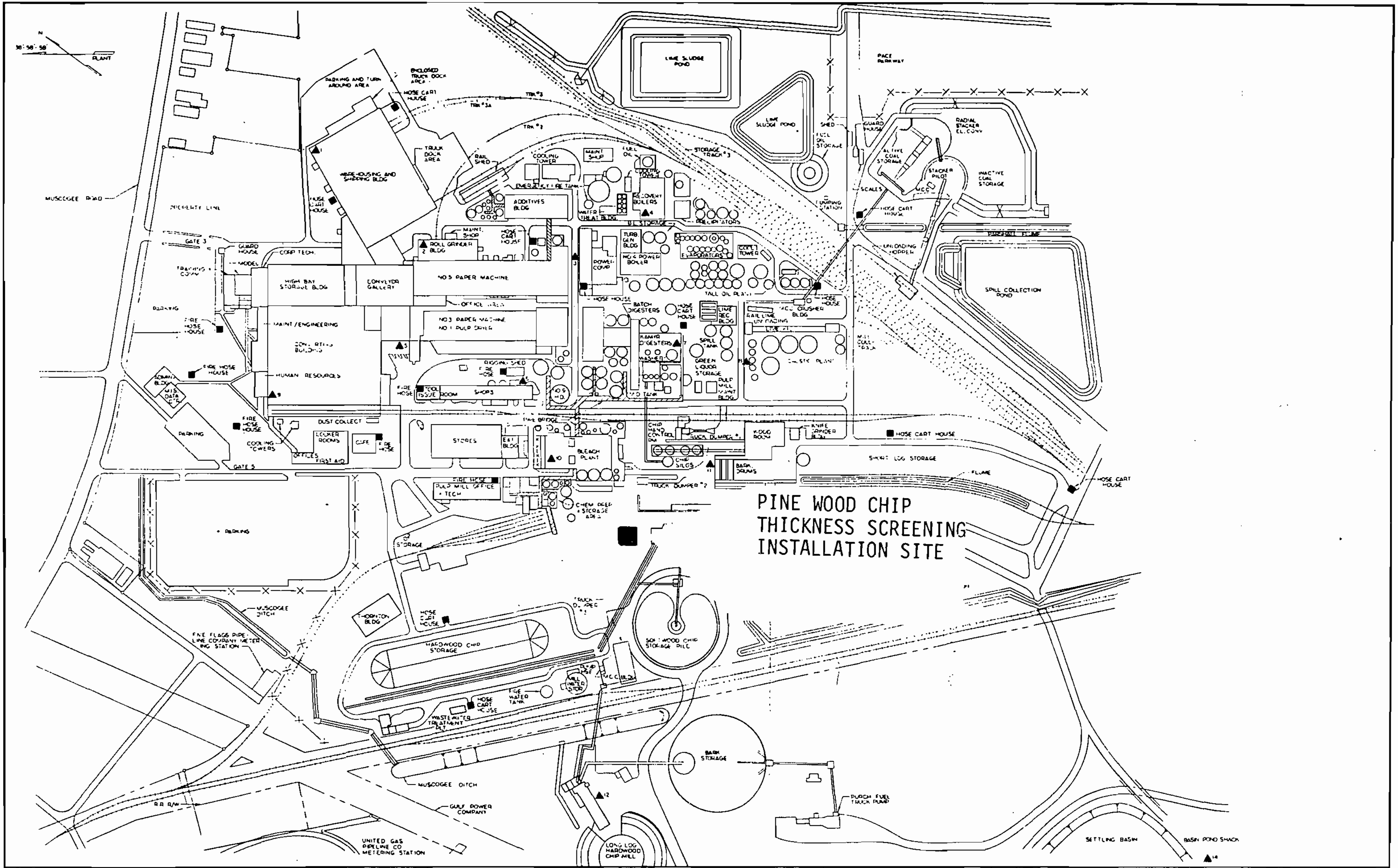
Particulate Classification:

Particulate Matter > 10µ = 0.13% of Fines Z = 0.0013
Particulate Matter < 10µ = 0.01% of Fines V = 0.0001

LOCATION MAP

BEST AVAILABLE COPY





TB. 6-2

SCALE NONE

PLOT PLAN FOR MILL LOCATION

Champion
Champion International Corporation

Printing and Writing Papers
PENSACOLA, FLORIDA

DRAWING NO.

REVISION

Printing and Writing Papers
375 Muscogee Road
P.O. Box 87
Cantonment, Florida 32533-0087
904 968-2121

Champion
Champion International Corporation

To:
Peter Muehlemann

From:
Eric Johnson

Date:
April 6, 1989

Subject:
Pine Fines Classification

FTM-498

Shown below is a table summarizing the classification of the Pensacola mill pine wood fines. A sample of the fines material retained on a 3/64 inch Tyler screen from Bill Dorman's work dated March 10, 1989 (report #1513001) was further classified on a Tyler screen classifier.

In summary, the fines classification results are as follows:

% of Total Pine Wood Fines . . .	Are Greater Than . . .	Less Than
18.3	6410 u	
21.0	4795 u	6410 u
39.3	2403 u	4795 u
5.6	2018 u	2403 u
7.5	1203 u	2018 u
7.72	300 u	1203 u
0.44	212 u	300 u
0.13	75 u	212 u
0.009	38 u	75 u
6.0×10^{-5}	--	38 u

u = micron

Eric Johnson

Eric Johnson

EJJ/hs

cc: David Arceneaux
Bill Dorman
Paul Johnson
Buddy Rhodes
Bob Romnes
Bernie Shoemoe
Willie Tims

Technical Evaluation
and
Preliminary Determination

Champion International Corporation
Cantonment, Escambia County, Florida

Gas Fired Package Boiler
Permit No. AC 17-140962
PSD-FL-126

Florida Department of Environmental Regulation
Bureau of Air Quality Management
Central Air Permitting

November 6, 1987

I. Application

A. Applicant

Champion International Corporation
Post Office Box 87
Cantonment, Florida 32533

B. Project and Location

The applicant proposes to install a skid mounted temporary gas fired package boiler, generating 125,000 lbs/hr steam at 600 psig, at Champion's plant site in Escambia County, Florida. The 195 MMBtu/hr boiler will allow Champion to operate through winter months and repair down time on existing boilers, for a maximum period of two years. The proposed project will emit the pollutants nitrogen oxides (NOx), sulfur dioxide (SO_2), particulate matter (PM), carbon monoxide (CO) and volatile organic compounds (VOC).

The UTM coordinates of this facility are Zone 16, 469.3 km East and 3385.72 km North.

C. Sources Reviewed

The sources reviewed in this technical evaluation will be the proposed temporary boiler and Boiler Nos. 1, 3, and 4 which have been shut down.

Champion applied for a construction permit for the proposed project on October 29, 1987, and the application was deemed complete on November 6, 1987.

D. Facility Category

Champion's facility in Cantonment is classified in accordance with the Standard Industrial Classification (SIC) Code as Major Group 26, Paper and Allied Products; Group No. 262, Paper Mills; Industry No. 2621, Paper Mills.

The proposed project will be a major modification to a major facility, as defined by Chapter 17-2 of the Florida Administrative Code (FAC).

II. Project Description

The applicant proposes to operate a rental skid mounted temporary gas fired boiler to supply 125,000 lbs/hr steam at 600 psig. Temporary gas, water, and steam lines will be run to the boiler. A rental stack will also be installed. The maximum heat input capacity of the boiler will be 195 MMBtu/hr.

This boiler is needed due to less than design steam production from the existing No. 1 and 2 Power Boilers. The package boiler will allow Champion to operate through winter months and repair down time on existing boilers. The temporary boiler is anticipated to be needed for a maximum of two years.

III. Rule Applicability

The proposed project will result in emissions of NOx, SO_2, PM, CO and VOCs. It is subject to preconstruction review in accordance with Chapter 403 of the Florida Statutes and Chapters 17-2 and 17-4 of the Florida Administrative Code (FAC).

The proposed project will be located in Escambia County, an area designated as unclassifiable for PM, but attainment for NOx, SO_2, CO and VOCs, in accordance with Rules 17-2.420 and 17-2.430, FAC.

Although Boiler Nos. 1, 3, and 4 have been considered in this review, emission credits cannot be granted for their shut-down since operations were ceased prior to the contemporaneous period of this application, in accordance with Rule 17-2.500(2), FAC.

Therefore, the proposed project will be a major modification to a major facility and will be subject to a Prevention of Significant Deterioration (PSD) Review in accordance with Rule 17-2.500(2)(d)4, FAC.

However, since the pollutant emitting period will not exceed two years, the proposed project will be exempt from the requirements of Rules 17-2.500(5)(d), (e), (f), and (g), FAC, in accordance with Rule 17-2.500(3)(c), FAC.

The proposed project will not be subject to New Source Performance Standards in accordance with 40 CFR 60 Subpart Db - Standards of Performance for Industrial Steam Generating Units, because the rental boiler was built before 1984, the NSPS applicability date.

The applicable emission limiting standards will be determined by the Best Available Control Technology (BACT) for PM, SO_2, NOx, CO, and visible emissions (VE) in accordance with Rule 17-2.630, FAC.

The proposed project will be required to show compliance in accordance with Rule 17-2.700, FAC, with the emission limiting standards for:

a) NOx, by EPA Method 7.
b) CO, by EPA Method 10.
c) VE, by DER Method 9.

Note: Other DER Approved Methods may be used with prior Departmental approval.

IV. Emission Limitations

The proposed project will be in operation no longer than two years, at 8760 hrs/yr, and will be limited by the attached BACT determination. Emission estimates are as follows:

Pollutant	lb/MMBtu	lb/hr	TPY
NOx	0.2	39	147
CO	0.24	47	205
SO_2	0.0006	0.12	1
PM	0.005	1	4
VOC	0.003	1	4

Visible emissions will be limited to 5% opacity.

Note: Except for the NOx NSPS standard based estimates, and the CO manufacturer's estimates, the other criteria pollutant emission estimates are based on AP-42.

V. Air Quality Analysis

A. Introduction

Champion proposes to temporarily lease and operate a gas-fired package boiler. The duration of operation is not to exceed two years. The operation of this boiler will have the potential to emit NOx and CO in PSD significant quantities. Both of these pollutants are, thus, subject to the requirements of the PSD regulations as defined in Rule 17-2.500, of the Florida Administrative Code.

An exemption for temporary sources from several of the specific requirements is contained in Rule 17-2.500(3)(c), FAC. This exemption applies to the preconstruction review requirements contained in paragraphs 17-2.500(5)(d), (e), (f), and (g), FAC. It is applicable only if the duration of emissions would not exceed two years and the applicant has provided the Department with reasonable assurance that the increased emissions will not cause or contribute to a violation of an ambient air quality standard or have a significant impact on any Class I area or area where a PSD increment is violated.

The preconstruction review requirements applicable to Champion include:

- A Best Available Control Technology (BACT) analysis, and;
- An Ambient Air Quality Standards (AAQS) analysis.

Based on these analyses, the Department has reasonable assurance that the proposed project as described in this permit and subject to the conditions, of approval proposed herein, will not cause or contribute to a violation of an ambient air quality standard. A discussion of the required AAQS analysis follows.

B. Ambient Air Quality Standards Analysis

In order to satisfy the reasonable assurance requirement, the applicant submitted the ambient air quality analysis previously completed at the Champion (formerly St. Regis) facility for the construction of the No. 4 Bark Boiler. A series of PSD permits have been associated with this bark boiler. The permit PSD-FL-041 addressed the original construction of the No. 4 Bark Boiler; the permit PSD-FL-066 addressed allowance for coal burning in the No. 3 and No. 4 boilers; and, the permit PSD-FL-070 addressed an increase in sulfur content of the coal used in the boilers. The air quality analyses for these permits included dispersion modeling for both NOx and CO. The modeling showed that the maximum ambient air concentrations expected due to the increased emissions from the new No. 4 boiler in conjunction with all other sources of NO_2 and CO were much less than the air quality standards for these pollutants. Included in these other sources were emissions from power boiler Nos. 1, 3, and 4 which have been subsequently shut down. The emission decreases from these power boilers offsets much, if not all, of the currently proposed increase. There have been no significant, new sources of NOx or CO in the area surrounding the Champion facility and the background levels have not significantly changed.

The Department, in addition, completed a screening analysis using the PTPLU dispersion model. The emissions increase associated with the maximum operation of the proposed temporary boiler was input to the model. The results indicate that the emissions from the temporary boiler, in and of itself, will result in minimal ambient impacts. The maximum one-hour CO concentration is predicted to be less than 0.05 mg/m^3, while the maximum one-hour NO_2 concentration is 30 ug/m^3. These concentration increases can be compared to the ambient air quality standards for CO and NO_2.

Pollutant	Florida AAQS
CO	
1-hour	40 mg/m^3
8-hour	10 mg/m^3
NO_2	
annual	100 ug/m^3

Although the predicted concentrations are applicable to a one-hour average, a reasonable extrapolation of these results to the longer averaging times associated with the standards produces very small concentration levels.

The pollutants subject to PSD review, NOx and CO, do not have maximum allowable increases (increments) defined for them. As such, an increment analysis is not applicable. Also, the Champion facility is not located within 100 km of any Class I area, therefore, no analysis is necessary.

In summary, the emissions increase of NOx and CO from the temporary boiler will have minimal air quality impacts. The Department is reasonably assured that the operation of the temporary boiler will not cause or contribute to a violation of an ambient air quality standard.

VI. Conclusion

Based on the information provided by Champion, the Department has reasonable assurance that the proposed temporary gas-fired boiler, as described in this evaluation, and subject the conditions proposed herein, will not cause or contribute to a violation of an ambient air quality standard or PSD increment, or any other provisions of Chapter 17-2, FAC.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

BOB MARTINEZ
GOVERNOR

DALE TWACHTMANN
SECRETARY

PERMITTEE:
Champion International Corp.
Post Office Box 87
Cantonment, FL 32533

Permit Number:AC 17-140962
Expiration Date: June 1, 1988
County: Escambia
Latitude/Longitude: 30° 36' 19"N
87° 19' 13"W
Project: Gas Fired Package Boiler

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rule(s) 17-2 and 17-4. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawings, plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

For the construction of a steam generating facility consisting of a temporary rental gas-fired skid mounted package boiler, at Champion's plant site in Escambia County, Florida. The boiler will have a maximum heat input capacity of 195 MMBtu/hr producing 125,000 lbs/hr steam at 600 psig.

Construction will be in accordance with the permit application and plans, documents and reference material submitted unless otherwise stated in the General and Specific Conditions herein.

This project's federal permit number: PSD-FL-126

Attachments:

1. Champion's Application package dated October 22, 1987.

2. Additional information submitted by Champion, dated October 29, 1987.

3. Champion's letter on boiler details dated, November 6, 1987.

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions" and as such are binding upon the permittee and enforceable pursuant to the authority of Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is hereby placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of the "Permit Conditions" by the permittee, its agents, employees, servants or representatives.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.

3. As provided in Subsections 403.087(6) and 403.722(5), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Nor does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations. This permit does not constitute a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.

4. This permit conveys no title to land or water, does not constitute state recognition or acknowledgement of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the state. Only the Trustees of the Internal Improvement Trust Fund may express state opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, plant or aquatic life or property and penalties therefore caused by the construction or operation of this permitted source, nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

GENERAL CONDITIONS:

6. The permittee shall at all times properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.

7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law, access to the premises, at reasonable times, where the permitted activity is located or conducted for the purpose of:

a. Having access to and copying any records that must be kept under the conditions of the permit;

b. Inspecting the facility, equipment, practices, or operations regulated or required under this permit; and

c. Sampling or monitoring any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately notify and provide the Department with the following information:

a. a description of and cause of non-compliance; and

b. the period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance.

GENERAL CONDITIONS:

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source, which are submitted to the Department, may be used by the Department as evidence in any enforcement case arising under the Florida Statutes or Department rules, except where such use is proscribed by Sections 403.73 and 403.111, Florida Statutes.

10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance, provided however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.

11. This permit is transferable only upon Department approval in accordance with Florida Administrative Code Rules 17-4.12 and 17-30.30, as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.

12. This permit is required to be kept at the work site of the permitted activity during the entire period of construction or operation.

13. This permit also constitutes:

- (x) Determination of Best Available Control Technology (BACT)
- (x) Determination of Prevention of Significant Deterioration (PSD)
- ( ) Compliance with New Source Performance Standards.

14. The permittee shall comply with the following monitoring and record keeping requirements:

   a. Upon request, the permittee shall furnish all records and plans required under Department rules. The retention period for all records will be extended automatically, unless otherwise stipulated by the Department, during the course of any unresolved enforcement action.

GENERAL CONDITIONS:

b. The permittee shall retain at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation), copies of all reports required by this permit, and records of all data used to complete the application for this permit. The time period of retention shall be at least three years from the date of the sample, measurement, report or application unless otherwise specified by Department rule.

c. Records of monitoring information shall include:

- the date, exact place, and time of sampling or measurements;
- the person responsible for performing the sampling or measurements;
- the date(s) analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

15. When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be submitted or corrected promptly.

SPECIFIC CONDITIONS:

1. The package boiler may operate continuously (8760 hrs/yr) for a maximum period of two years.

2. Only natural gas shall be fired into the boiler. The maximum heat input shall not exceed 195 MMBtu/hr, reflecting a steam generation rate of 125,000 lbs/hr at 600 psig.

3. The maximum allowable emission shall not exceed the following quantities:

SPECIFIC CONDITIONS:

a) NOx - 0.2 lb/MMBtu heat input
- 39 lbs/hr
- 147 tons/yr

b) CO - 47 lbs/hr
- 205 tons/yr

c) Visible Emissions (VE) - 5% opacity

Note: For inventory purposes only the emissions of SO_2, PM, and VOC are tabulated below:

Pollutant	lb/MMBtu	lb/hr	TPY (tons per year)
SO_2	0.0006	0.12	1
PM	0.005	1	4
VOC	0.003	1	4

Good combustion practices shall be observed as control measures for PM, SO_2, and VOC.

4. Initial and annual compliance tests shall be conducted as follows:

a) EPA Method 7 for NOx
b) EPA Method 10 for CO
c) DER Method 9 for VE

Other DER approved methods may be used in place of the above tests, only after prior approval from the Department.

5. DER's district office shall be notified in writing 15 days prior to source testing. Written reports of the tests shall be submitted to the district office with 45 days of test completion.

TO BE CHANGED

The construction shall reasonably conform to the plans and schedule submitted in the application. If the permittee is unable to complete construction on schedule, he must notify the Department in writing 60 days prior to the expiration of the construction permit and submit a new schedule and request for an extension of the construction permit. (FAC Rule 17-2, FAC)

SPECIFIC CONDITIONS:

TO BE CHANGED

To obtain a permit to operate, the permittee must demonstrate compliance with the conditions of the construction permit and submit a complete application for an operating permit, including the application fee, along with test results and Certificate of Completion, to the Department's District office 90 days prior to the expiration date of the construction permit. The permittee may continue to operate in compliance with all terms of the construction permit until its expiration date. Operation beyond the construction permit expiration date requires a valid permit to operate. (FAC Rule 17-2 and 17-4)

If the construction permit expires prior to the permittee requesting an extension or obtaining a permit to operate, then all activities at the project must cease and the permittee must apply for a new permit to construct which can take up to 90 days to process a complete application. (FAC Rule 17-4)

6. Any change in the method of operation, fuels, equipment or operating hours shall be submitted for approval to DER's District office.

Issued this_____day of_____, 19___

STATE OF FLORIDA DEPARTMENT OF
ENVIRONMENTAL REGULATION

____
Dale Twachtmann, Secretary

____ pages attached

Best Available Control Technology (BACT) Determination
Champion International Corporation
Escambia County

The applicant plans to install a 195 MMBtu/hr natural gas fired boiler at their facility in Cantonment, Florida. The boiler, a skid mounted rental package unit, will be used only temporarily until existing boilers can be repaired or replaced to supply the necessary steam load. The temporary boiler is scheduled to operate 8,760 hours per year.

A BACT determination is required for particulates and sulfur dioxide as set forth in the Florida Administrative Code Rule 17-2.600 (6) - Emissions Limiting and Performance Standards. In addition, the Department has performed a BACT determination for nitrogen oxides (NOx) and carbon monoxide (CO) based on the assumption that the emissions increase of NOx and CO could be greater than the PSD significant rate of 40 and 100 tons per year respectively. The Department which is presently awaiting information that would indicate if BACT for NOx and CO would indeed apply, has decided to go ahead with making a determination of BACT for NOx and CO to expedite the processing of the permit.

BACT Determination Request by the Applicant:

Particulate, sulfur dioxide, nitrogen oxides and carbon monoxide emissions to be controlled by the firing of natural gas.

Date of Receipt of a BACT Application:

October 22, 1987

Review Group Members:

The determination was based upon comments received from the Stationary Source Control Section.

BACT Determined by DER:

The amount of particulate and sulfur dioxide emissions from the boiler will be limited by the firing of natural gas.

Visible Emissions Not to exceed 5% opacity.

DER Method 9 (17-2.700(6)(a)9, FAC) will be used to determine compliance with the opacity standard.

Nitrogen oxides emissions shall not exceed 0.20 lb/MMBtu heat input.

Carbon monoxide emissions shall not exceed 46.8 pounds per hour.

BACT Determination Rationale:

Sulfur in fuel is a primary air pollution concern in that most of the fuel sulfur becomes SO_2 and particulate emissions from fuel burning are related to the sulfur content. The department agrees with the applicant's proposal that the firing of natural gas is BACT for particulates and SO_2.

The emission rate of nitrogen oxides proposed by the applicant is equivalent to 0.20 pounds per million Btu heat input. This proposed emission rate is equal to the New Source Performance Standard (NSPS) for natural gas steam generating units with heat input capacities greater than 100 million Btu/hr and maximum design heat release rates greater than 70,000 Btu/hr-ft^3. In addition to meeting the NSPS for these steam generating units, a review of other BACT determinations for natural gas fired boilers indicates that the proposed emission level for both nitrogen oxides and carbon monoxide is consistent with several of the determinations on record. In accordance with this criteria and the temporary nature of this installation, the applicant's proposed NOx and CO emission rates are justified as being BACT for this source.

Details of the Analysis May be Obtained by Contacting:

Barry Andrews, P.E. BACT Coordinator
Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blairstone Road
Tallahassee, Florida 32399-2400

Recommended by:

C. H. Fancy, P.E.
Deputy Bureau Chief, BAQM

Date

Approved by:

Dale Twachtmann, Secretary

Date