AP-42 Section Number: 9.10.2.1

Reference Number: 2

Title: Proposal to Almond Hullers and Processors Association for Pooled Source Test

Eckley Engineering

Eckley Engineering

December 1990

EIB
Dale

ECKLEY ENGINEERING

(209) 233-1217

255 North Fulton Street • Suite 105 • Fresno, California 93701

AP-42 Section 9.10.2.1
Reference 2
Report Sect. ____
Reference ____

December 2, 1990

Mr. Dale Chapman
Fresno County APCD
P. O. Box 11867
Fresno, California 93775

Dear Mr. Chapman:

Additional information you requested to clarify the Almond Hullers and Processors Association pooled source testing proposal follows.

The facilities tested were chosen by the association members both to be representative of the group and to show the widest possible range of variation within the group. The criteria we considered included the widest geographic range, in order to represent the greatest variety of soils and growing conditions, and the greatest range of installed pollution control equipment, in order to compensate for any variation in AB 2588 substances that might be caused by, for example, baghouses in contrast to cyclones. In order to see how close a resemblance would be found in the particulates from two facilities within the same county, we tested a second site from Merced County.

Facilities Tested

1. Butte County: Mead Orchards, Inc., Chico
2. Kern County: Kernpareil, Inc., Wasco
3. Merced County: Minturn Huller, Chowchilla
4. Merced County: Northern Merced Hulling Association, Ballico
5. Stanislaus County: Waterford Almond Huller, Waterford
6. Madera County: Almond Tree Hulling, Chowchilla.

Of the six facilities, two have cyclones only, two have baghouses only, and the other two have both types of control equipment. The operating permits we have show from 3 to 18 tons per hour for hulling, with somewhat greater pre-cleaning tonnage. Operating seasons range from two to four months a year.

Test Protocol

Equipment to be used:
CS3, Inc., High Volume Stack Sampler, Model AS1100, Serial No. 1439
[See Figure 1 for assembly]
TE35, Teflon filters, 0.2 micron PTFE, 8"x10"

Procedure:
Filters shall be preweighed after drying at 50°C for one hour, then inserted into polyethylene Zip-Loc bags. Each filter shall be removed from its bag only when it is required for sampling and shall be reinserted immediately after sampling. Filters shall be delivered to Curtis & Tompkins, Ltd., Analytical Laboratories for the required full metals panel and crystalline silica testing as chosen by the laboratory in the absence of ARB-adopted test methods and described in the attached pages.

Notes:
1. Intent of sampling is to collect a representative sample of particulate matter from various control devices.
2. No attempt will be made to determine the amount of PM discharged per cubic foot of air.
3. The high volume stack sampler is not an approved device for performing source tests at stationary sources.

Inlet nozzle with a one-half inch I.D. inlet adapter will be used for extracting a dust sample from the air discharged from each tested emission control device.

Control valve (Item #2, Figure 1) will be adjusted in accordance with the enclosed sampler instructions for isokinetic sampling.

Sampling time will vary depending on the particulate matter in the specific air stream. Sampling will continue until a layer of particulate has formed on the filter as determined by visual inspection at periodic intervals.

The sampling train will be cleaned with brush and air in the intervals between tests to eliminate inter-sample contamination.

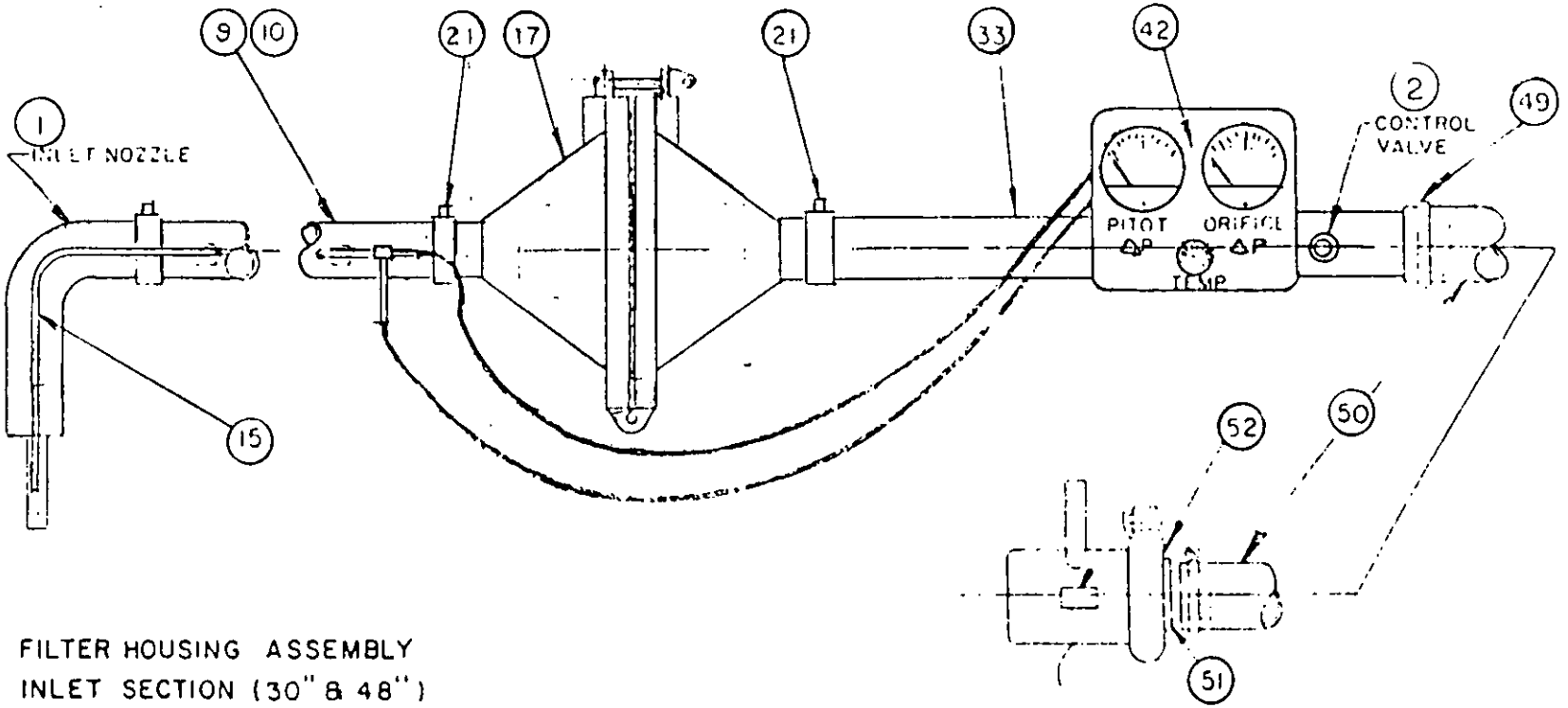
Results of the metals and crystalline silica testing will be applied to the emissions factors developed from the CARB tests, as described in the proposal. Factors will be developed that can be applied on the basis of process weight for each facility. The test results will determine which statistical measures of central tendency and dispersion will be applicable. Factors, charts, and/or formulae that can be applied by the individual facilities to their reporting forms will be developed. At the request of Jeanne Dautrich, Tulare County Air Pollution Control District, the emission factors will be expressed in pounds per ton. Calculations will be submitted to you and to Ms. Dautrich for your joint approval both of accuracy and of usability prior to their being distributed with instructions for reporting.

Also enclosed are a complete set of flow diagrams from Northern Merced Hulling Association and sufficient additional informational charts to meet your criterion of demonstrating the facility-to-facility compatibility of points from which samples were drawn. A full set of 24"x36" shop drawings of an almond huller is available in addition to the flow diagrams, if you wish to have copies.

Sincerely,

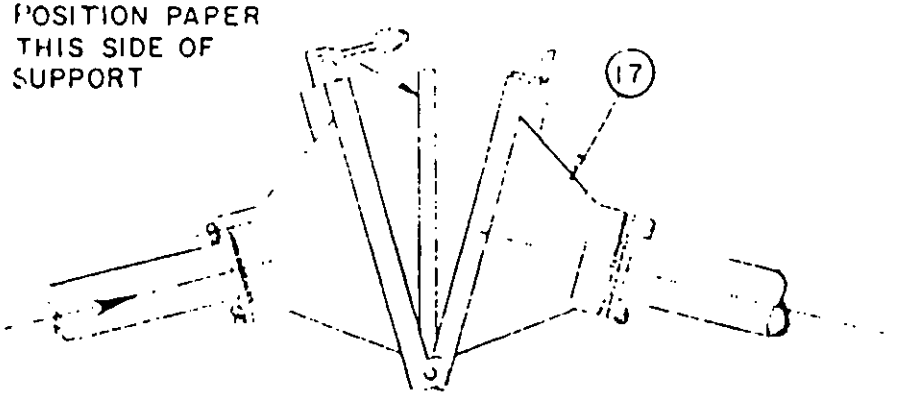
Robert C. Eckley, P.E.

REGISTERED PROFESSIONAL ENGINEER
ROBERT CLARK ECKLEY
No. 16357
Exp. 12/31/91
MECHANICAL
STATE OF CALIFORNIA



17. FILTER HOUSING ASSEMBLY
9&10. INLET SECTION (30" & 48")
33. CONTROL SECTION
42. TEST PANEL
15. PITOT TUBE
21. NEOPRENE GASKETS
50. FLEX HOSE
52. SUCTION BLOWER
1. INLET NOZZLE
51 BLOWER HOSE ADAPTOR
49. HOSE CLAMPS
2. CONTROL VALVE

POSITION PAPER THIS SIDE OF SUPPORT



TITLE HI-VOLUME SAMPLER

SCALE —

DRWN.

DATE

CAD.

FIGURE 1

ECKLEY ENGINEERING

PROPOSAL FOR
POOLED SOURCE TESTING

The Almond Hullers and Processors Association has developed the following pooled source testing plan proposal and prototype inventory plan in an effort to provide in a complete and comprehensive form the information required for the Air Toxics "Hot Spots" Information and Assessment Act of 1987.

Two flow diagrams have been developed in order that each facility may include those that apply to its functional pattern. The first diagram is typical of pre-cleaning facilities; the second of hulling operations. Each stationary source using the diagrams is encouraged to modify them as needed to fit the flow within its facility.

Within each flow diagram it is proposed that an emission factor be developed to characterize the AB-2588 emissions. The sum of the emissions from the applicable flow diagrams will characterize the emissions from each stationary source that has not performed source testing at its facility. In the latter event, of course, the applicable data will be used.

File Number C-4-029 State of California Air Resources Board, 1974: *Report on Test of Emissions from Almond Hullers in the San Joaquin Valley*, in which particulate matter concentration tests were conducted using EPA Method Number 5 on "14 cyclones, one air leg, and two baghouses," will be used for the source testing of pollution control devices. Emissions factors per unit of process weight will be derived for both cyclones and baghouses.

In order to develop a factor for fugitive emissions, it is suggested that members of one or more county APCD's meet with representatives from the AH&PA and Eckley Engineering on sites as decided among them. The factor will be combined additively with the emission factor developed for each flow diagram to produce a combination factor specific to each.

Because arboricultural practices, soil composition, harvesting practices, etc., are similar for almond growers, there seems little doubt the the in-hull product arriving for pre-cleaning is substantially identical regardless of its county of origin. It is suggested that representative dust samples be collected in strict accordance with the manufacturer's instructions by a high-volume sampler (from dust collector emissions at the two systems (precleaning and hulling) at each of five different stationary sources (one from each of the following counties: Butte, Kern, Madera, Merced, and Stanislaus); that the ten samples then be transmitted to BTC Environmental, Inc., for full metals panel testing; and that statistical methods be employed to develop representative emissions factors for particulate matter. (EPA Methods to be employed: 7060, 6010, 7196, 7471, 7740, or any improved method required.)

Since very few respondents to the questionnaire submitted to them replied in the affirmative to burning of sticks and leaves, it is suggested that only one *Appendix D-6* set of agricultural waste combustion waste tests be run, to include EPA draft multiple methods train and tests 429, 428, and 430 for, respectively, metals, PAH's, dioxins, and formaldehyde. If required in any particular case, a factor for unpressurized storage tank emissions will be included in accordance with published emissions factors.

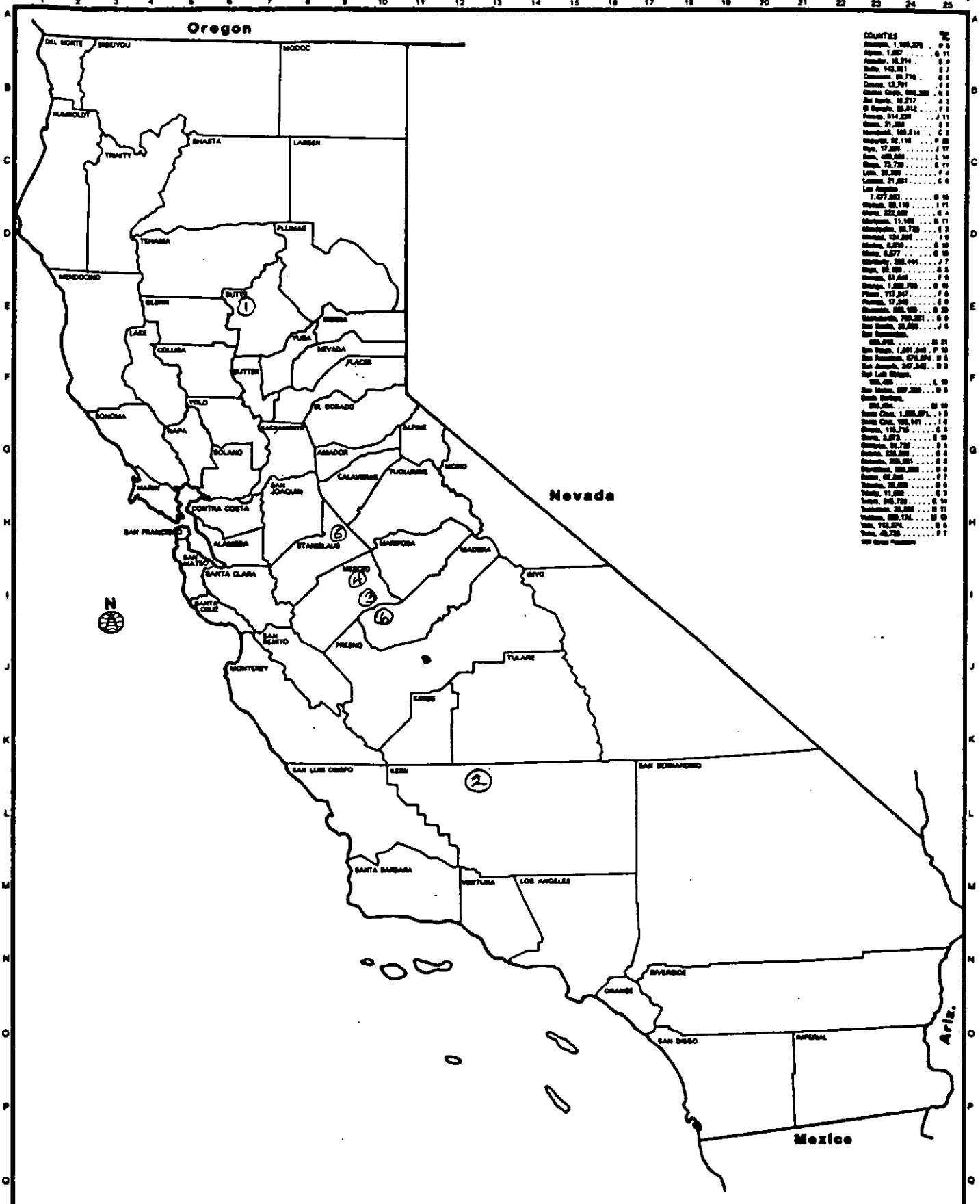
Only one reportable chemical is being used at facilities: aluminum phosphide. A major study is currently being completed in North Carolina to determine if any hydrogen phosphide (phosphine) that is not immediately converted into aluminum phosphate escapes into the surrounding air. Eckley Engineering has been promised a prepublication copy; the results will determine whether an emissions factor need be developed.

Currently more than fifty stationary sources plan to use this proposal. The method of developing emissions factors for each segment of a multilevel operation has been used because not all sources have both operations; and not all have same air pollution control devices. A pre-cleaning operation, for example, with a baghouse will have a different factor from one with a cyclone. In the same vein, a source consisting of hulling and processing may need to use different additive factors from that of a pre-cleaner only.

Rand McNally MARKETMAPS

California

County – State (8 1/2 x 11)



0 10 20 40 60 Miles

0 10 20 40 60 80 Kilometers

For statistical and locational information relating to places shown on this map see the Rand McNally *Green Guide, Yellow Guide* and *Commercial Reference Map and Guide.*

CS_3, INC.

High-Volume Stack Sampler

Operation Instructions

Model AS 1100

INTRODUCTION

These operating instructions are designed to acquaint the operator with normal handling of this equipment. A formal method which is very specific and covers all areas of design and qualitative information is included as a part of this instruction manual.

The **Model AS 1100 Stack Sampler** is illustrated in Fig. 1. It consists of four (4) subassemblies: 1) The nozzle and inlet probe with pitot tube. Configuration shown is with a P-type pitot tube, probes for special applications and 4" sampling ports are available. The nozzles available without special order handle gas flows from .1m/sec. (1 to 12,000 fpm). 2) Filter holder assembly which consists of a filter support screen, high temperature gaskets and quick connect clamps. 3) Control section assembly for measuring gas velocities, gas temperature and flow control for maintaining isokinetic sampling rates. 4) Flex hose and suction/blower for extraction of gas from the stream to be sampled.

The theoretical considerations of flow measurement, isokinetic sampling, pressure adjustments, and other necessary parameters have been applied to ensure the operating curves and calculations used with this equipment will result in accurate data.

SECTION A

Step 1 Pre-test

1 The filters should be of a type that will have a minimum weight change under sampling conditions so that the weighings accurately reflect the particulate collected. Glass fiber filters are recommended.

2 The number of filters needed for a particular test will be a function of the number of samples needed, dust loading, etc. As a general rule a thorough test of a specific source to establish the emission mean and standard deviation can be made using a maximum of 10 filters: 7 for the actual sampling, and 3 for blanks to determine weight changes necessary for final adjustments.

3 Each of the filters for a given test should be placed in individual, numbered, manila file folders. This includes the filters required for blanks. The file folders and their enclosed filters should then be conditioned by allowing them to stand for 14 hours in a room of constant temperature with a constant relative humidity of approximately 50% (most air conditioned buildings will satisfy this requirement). An alternative procedure is to condition the filters in desicator for 12 hours before weighing.

4 The filters are weighed on a balance sensitive to 0.5 milligrams. Weighing can be accomplished by using a pan balance designed for 200 x 250 mm (8 x 10") filters. All filter tare weights should be recorded on the **Weight Data Sheet**. (A Weight Data Sheet is included at the end of **Section C**).

5 The entire Sampler ahead of the filter should be thoroughly cleaned before the test by scrubbing with methyl alcohol or other suitable reagent grade solvent to remove all previous residue.

6 The Sampler should be checked for leakage prior to any sample run. Insert the filter screen and the filter paper into the filter holder and close the clamps. With orifice air lines attached to a magnehelic gauge, plug the inlet nozzle and switch on the suction/blower. Indication of less than 0.5mm (0.02") H_2O on the magnehelic gauge assures the Sampler is gas tight. If the gauge registers more than this figure the leaks must be sealed to insure a valid test.

7 The operator should assemble the Sampler and all auxilliary equipment for the test. A **Check List** at the end of this section is supplied to assure nothing is left behind. For some tests some items may be omitted, but it is better to carry too much equipment to a site than too little.

8 The Sampler may be used in any operating position. The magnehelic gauge must be zeroed.

9 The suction/blower should be running before the inlet nozzle is inserted into the stack gas stream, as a negative pressure in the gas stream will make the filter sheet flutter and burst with out a vacuum being pulled on it.

SECTION B

STEP 2 TEST

1 The sampling location must be chosen so the sample is representative of the material emitted to the atmosphere. The location should be as close as possible to the ideal location described in source sampling literature (10 diameters downstream and 2 diameters upstream from any obstruction or bend). Other considerations such as safety, access holes,etc., must also be considered. Enough samples must be taken to insure that a totally representative sample is obtained. In general, seven (7) individual samples per source will be adequate for a complete statistical analysis.

2 The wet and dry bulb temperature of the emission must be taken. The dry bulb temperature is necessary to set the proper sampling rate and both are used later to adjust the sample flow to standard conditions. The moisture measuring accessory is useful for this measurement.

3 A pitot traverse (or other velocity measuring instrument) must be used to determine the gas flow rate. When testing cyclones and similar devices, a pitot traverse must be made ahead of the device to determine the total gas flow and then after the device to determine the gas velocities at the sampling points. (See TEST DATA SHEET for recording data.)

4 A temporary support of sling system should be fabricated to hold the sampler in the sampling location while the sample is being collected.

5 The operating graphs for the sampler must be consulted to select the flow rate for isokinetic sampling. The operating curves and their instructions for use follow. (see TEST DATA SHEET for recording data.)

ISOKINETIC SAMPLING

For 47.6mm (1-7/8") I.D. Nozzle, 3 -12m/sec. (600 -2500 fpm)

a Read stack gas velocity pressure on the 0 -80mm (0 -3") H_2O gauge connected to the Pitot Tube. Also read the stack temperature (T_s) at the selected sample location. If the Pitot Tube is in place on the Sampler, use another Pitot Tube or other velocity measuring device.

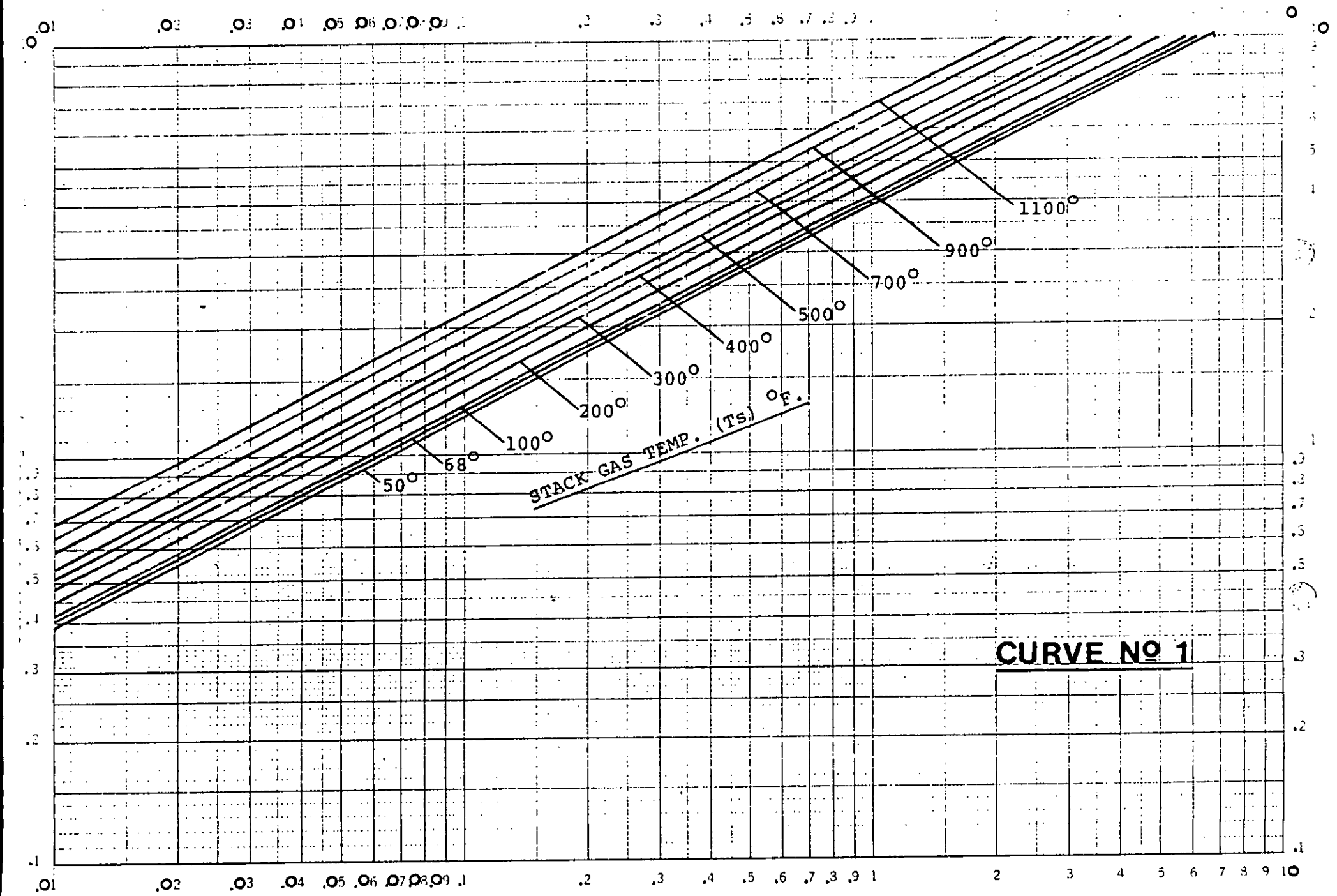
b Use curve No.1 to convert stack gas velocity pressure to stack gas velocity in m/sec. (fpm). If a device other than a Pitot Tube is used the appropriate gas velocity must be determined.

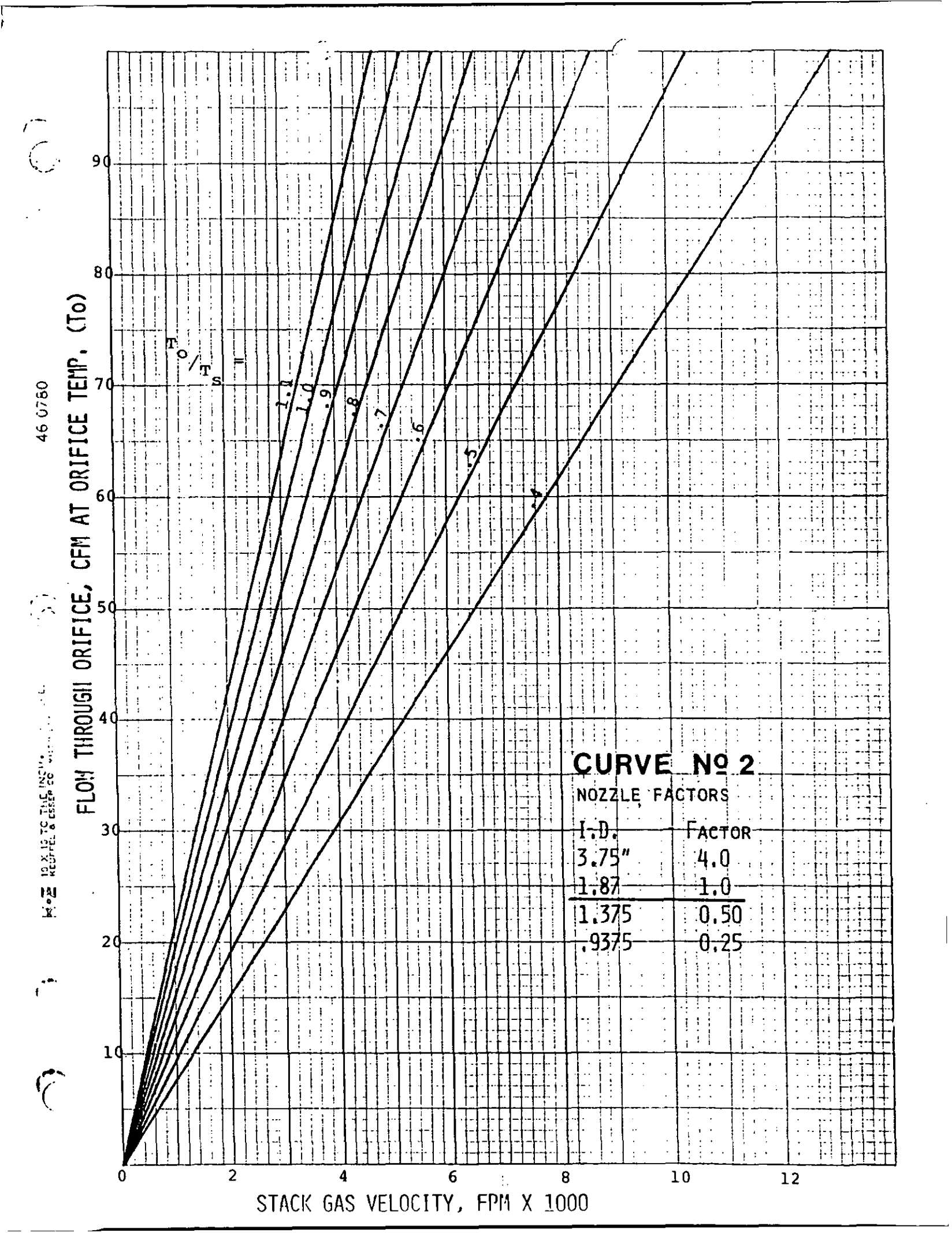
c Use curve No.2 to convert stack gas velocity in m/sec. (fpm) to m^3/sec. (cfm) flow through orifice at orifice temperature (T_o). Use factors shown for orifice temperature (T_o) over stack gas temperature (T_s). Add 273^0 if temperatures used are Celcius or 460^0 if temperatures used are Faherinheit. This will give absolute temperatures to obtain T_o/T_s factor. Note on the first test run an estimate (T_o) value must be selected. If the stack temperature is low or ambient use 1.0, if the stack temperature is high, i.e. 150^0C (300^0F), a selection of .8 may be better suited until an orifice temperature average can be determined.

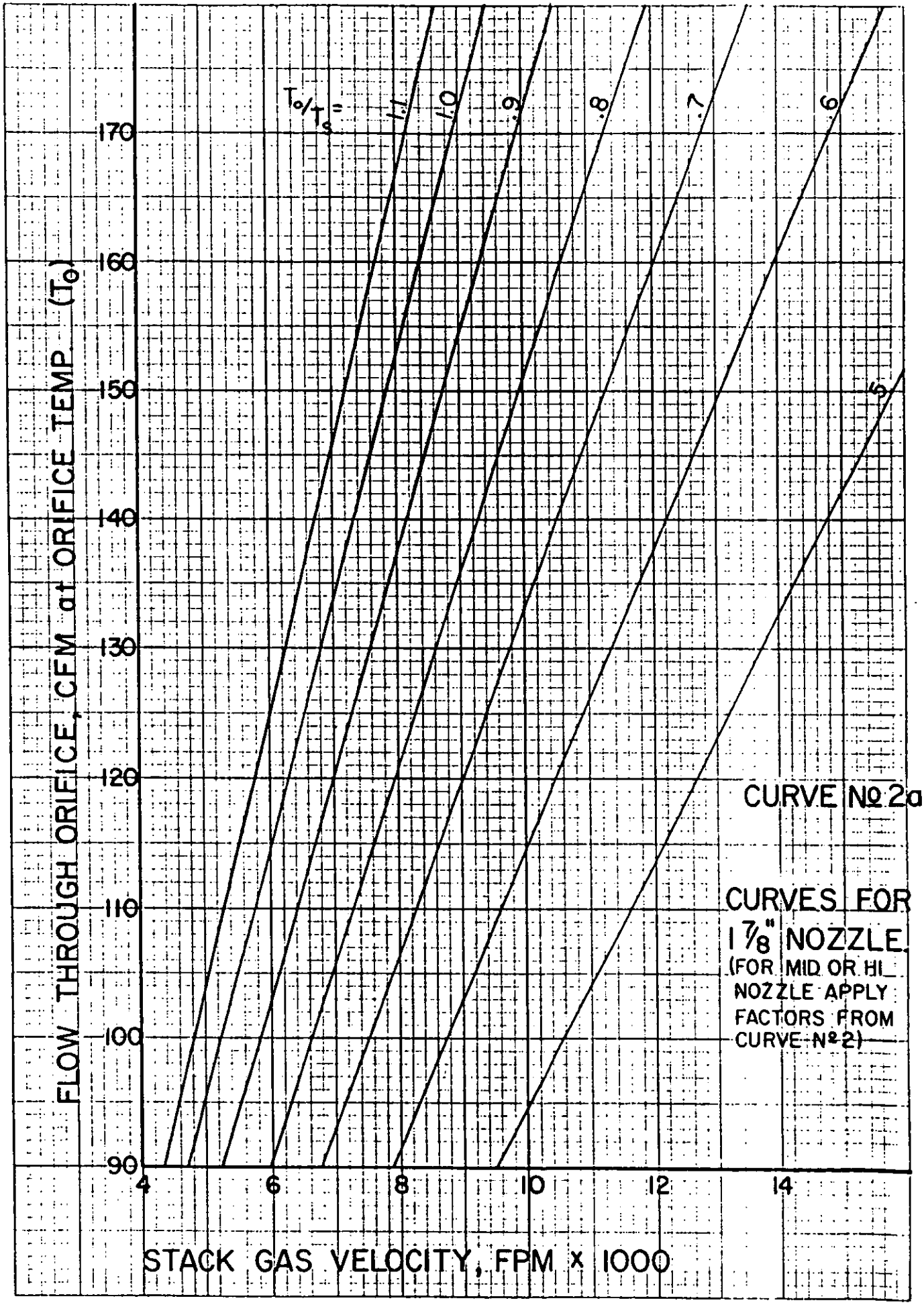
d Use curve No. 3 to convert m^3/sec. (cfm) flow through orifice at orifice temperature (T_o) to m^3/sec. (cfm) flow through orifice at 20^0C (68^0F).

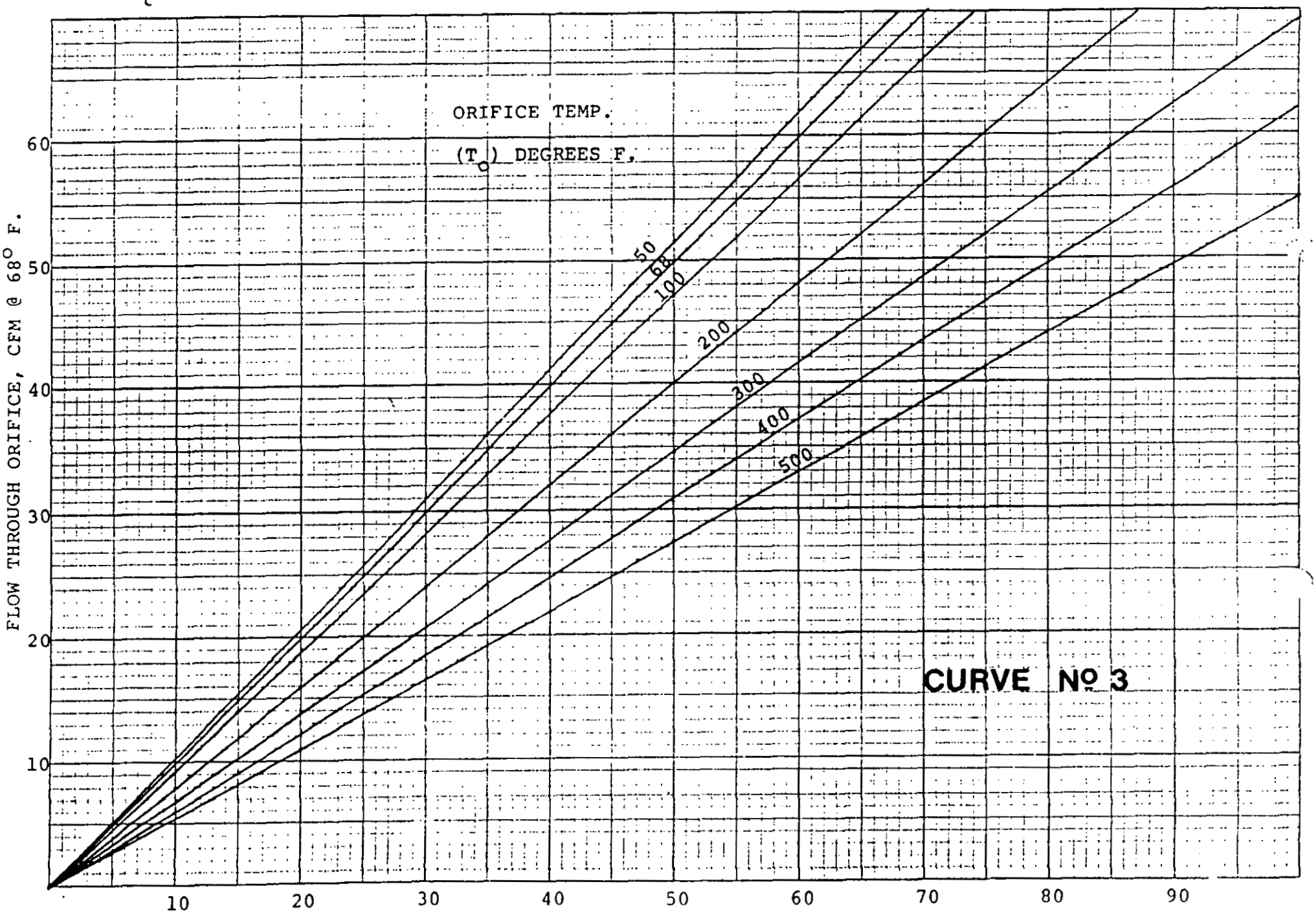
e Use curve No. 4 to convert flow through orifice at 20^0C (68^0F) to pressure drop across orifice in mm H_2O (inches H_2O).

f With preliminary run filter place and blower running, set control valve to obtain pressure drop reading from curve No. 4 on 0 -30mm (0 -1") Magnehelic gauge. This is done outside of the stack in a relatively clean environment.

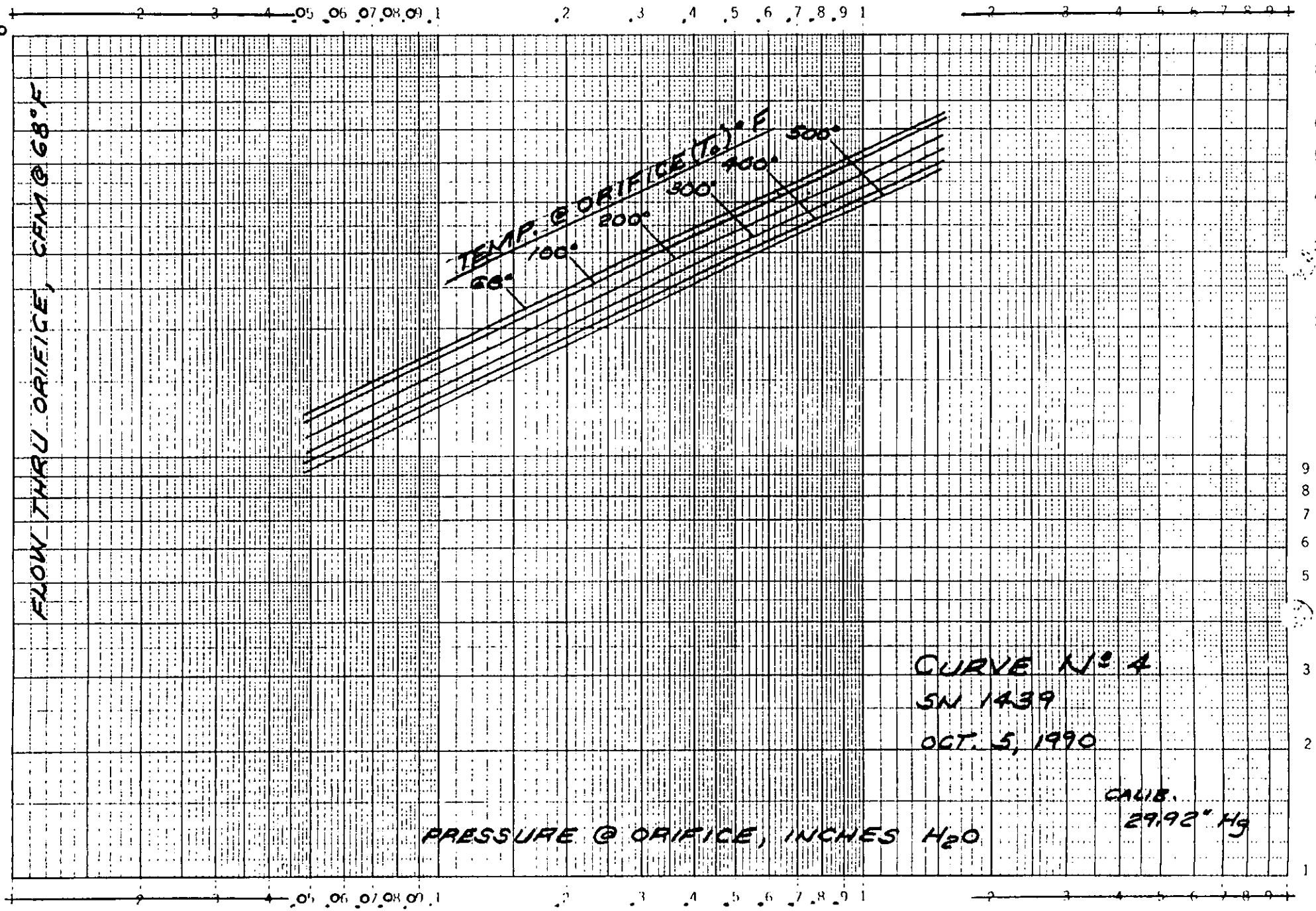

1100°
900°
700°
500°
400°
300°
200°
100°
68°
50°
STACK GAS TEMP. (TS) °F.
CURVE Nº 1


FLOW THROUGH ORIFICE, CFM AT ORIFICE TEMP. (To)
STACK GAS VELOCITY, FPM X 1000
To/Ts =
1.2
1.0
.9
.8
.7
.6
.5
.4
0
2
4
6
8
10
12
10
20
30
40
50
60
70
80
90
CURVE Nº 2
NOZZLE FACTORS
I.D. Factor
3.75" 4.0
1.87 1.0
1.375 0.50
.9375 0.25
46 0760


T_o/T_s = 1.1
1.0
.9
.8
.7
.6
FLOW THROUGH ORIFICE, CFM at ORIFICE TEMP (T_o)
170
160
150
140
130
120
110
100
90
4
6
8
10
12
14
STACK GAS VELOCITY, FPM x 1000
CURVE Nº 2a
CURVES FOR 1 7/8" NOZZLE.
(FOR MID OR HI NOZZLE APPLY FACTORS FROM CURVE Nº 2)


ORIFICE TEMP.
(T_o) DEGREES F.
50
68
100
200
300
400
500
FLOW THROUGH ORIFICE, CFM @ 68° F.
10
20
30
40
50
60
10
20
30
40
50
60
70
80
90
CURVE Nº 3

46 7320



Note For (34.9mm (1-3/8") I.D. Nozzle, Mid-Velocity 10 -23 m/sec. (2000 -4500 fpm), and 23.8 (15/16") I.D. Nozzle, High-Velocity) 20 -60 m/sec. (4000 -12000 fpm), use all the same steps as for the 47.6mm (1-7/8") I.D. Nozzle except as noted on curve **No.2**. As noted the flow through the orifice, m^3/sec. (CFM) at orifice temperature is multiplied by 0.50 for the Mid nozzle and by 0.25 for the High nozzle to get isokinetic.

6 The Sampler is then inserted and a trail sample is taken with the final flow adjustments made at this time. For a valid sample, the sample flow must be ± 10% of the ideal flow. Duration of trail sample must be noted and accounted for in adjusted particulate weight. **(See Weight Data Sheet.)**

7 The time necessary for sample collection will depend upon the grain loading and the sample flow rate. The objective is to collect the maximum practical loading on the filter --but not to the extent as to lose any of the sample from excessive buildup on the filter. If the stack loading is 0.01543 milligrams per m^3/min. (0.1 grains per CFM), and a sample collection rate of .0094 m^3/sec. (20 CFM) is selected (for isokinetic sampling), a sampling time of one (1) minute is sufficient at each point.

8 A pre-weighed filter is placed in the sampler being careful not to break or scrape the filter. The sample collection is then made by inserting the sampler into the gas stream as the blower is turned on. The nozzle must face into the gas stream to achieve the highest pitot tube reading, (velocity pressure). Any minor adjustments to the sample flow rate must immediately be made to assure isokinetic sampling. The pitot reading, gas temperature, and sampler temperature must be monitored during sampling to observe any changes in conditions which necessitate a flow rate change. Also monitor the orifice P of the sampler as in some cases the gradual buildup of particulate on the filter will necessitate adjustment of the control valve to maintain isokinetic sampling.

Should there be an abrupt increase in orifice P, stop sampling immediately. This is usally due to a rupture of the filter paper from to heavy a loading or excessive moisture. Decrease sampling period to a shorter interval to allow a complete sample to be obtained without rupturing the filter. At the conclusion of the sample run, the Sampler is rapidly withdrawn from the gas stream and the blower stopped.

Caution: Do not let the Sampler touch the walls of the duct or stack. This could cause deposited material on the walls to enter the Sampler and invalidate the test results.

9 Remove the filter from the holder, being careful not to loosen or lose any of the collected material. Fold once with the soiled side facing in and place in the folder with the folded edge down to prevent loss of particulate.

10 At the completion of the smple runs, remove the last sample filter and insert a pre-weighed filter blank. Then plug the inlet nozzle prior to travel.

11 A TEST DATA SHEET follows.

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710. Phone (415) 486-0900

November 2, 1990

Eckley Engineering
255 North Fulton Suite 105
Fresno, California 93701

Dear Ms. Eckley:

The following information will serve as the confirmation of the prices I quoted you yesterday for analysis of your Teflon filters. Also please find the sample report format included with this letter.

Analysis	Cost Per Sample
Metals*	$200.00
Hexavalent Chromium	$ 65.00
Crystalline Silica	$ 45.00

* Metals will include: AS, BE, CD, CR, CU, HG, MG, NI, PB, SE, and ZN.

We understand that you will provide us with the tare weights to the filters. Also, in order to report the results on per sample basis, we want you to know we will be cutting the samples into quarters and normalizing the results back to account for entire filter.

If you have any questions or need any other information please give me a call.

Sincerely,

Mary E. Privitera
Client Services Manager

Attachments

Curtis & Tompkins Ltd

LABORATORY NUMBER:
CLIENT:
PROJECT #:
SAMPLE ID:

DATE RECEIVED:
DATE ANALYZED:
DATE REPORTED:

Metals on Filter
Digestion Method: EPA 3050

METAL	RESULT ug/sample	REPORTING LIMIT ug/sample	METHOD
Arsenic	ND	2.5	EPA 7060
Beryllium	ND	0.5	EPA 6010
Cadmium	ND	0.5	EPA 6010
Chromium (total)	ND	0.5	EPA 6010
Copper	ND	1	EPA 6010
Lead	ND	2.5	EPA 6010
Managanese	ND	0.5	EPA 6010
Mercury	ND	0.1	EPA 7471
Nickel	ND	0.5	EPA 6010
Selenium	ND	2.5	EPA 6010
Zinc	ND	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QA/QC SUMMARY

	RPD,%	RECOVERY,%		RPD,%	RECOVERY,%
Arsenic	<1		Lead	<1	
Beryllium	<1		Mercury	<1	
Cadmium	<1		Nickel	<1	
Chromium	<1		Selenium	<1	
Copper	<1		Zinc	<1	

Curtis & Tompkins Ltd

LABORATORY NUMBER:
CLIENT:
PROJECT ID:
LOCATION:

DATE RECEIVED:
DATE ANALYZED:
DATE REPORTED:

==========

ANALYSIS: CRYSTALLINE SILICA
ANALYSIS METHOD: NIOSH 7601

==========

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
			ug/Sample	

QA/QC SUMMARY

==========

RPD, %
RECOVERY, %

==========

Curtis & Tompkins Ltd

LABORATORY NUMBER:
CLIENT:
PROJECT ID:
LOCATION:

DATE RECEIVED:
DATE ANALYZED:
DATE REPORTED:

ANALYSIS: HEXAVALENT CHROMIUM
ANALYSIS METHOD: EPA 7195

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
			ug/Sample	

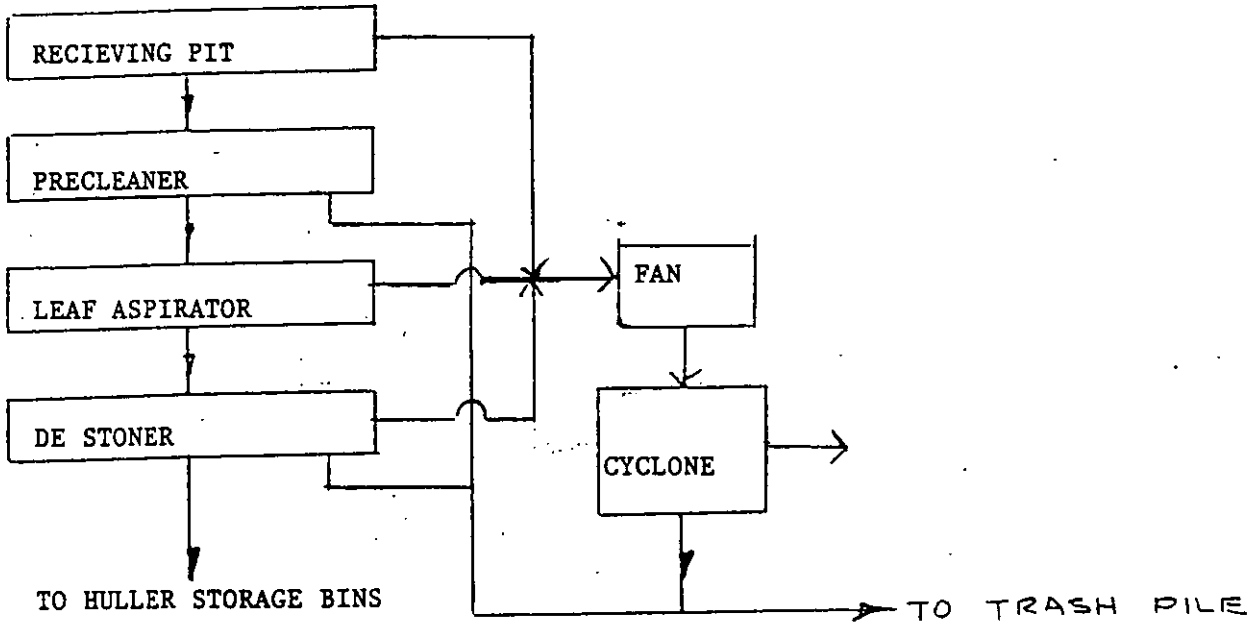
QA/QC SUMMARY

RPD, %
RECOVERY, %

NORTHERN MERCED HULLING ASSOCIATION

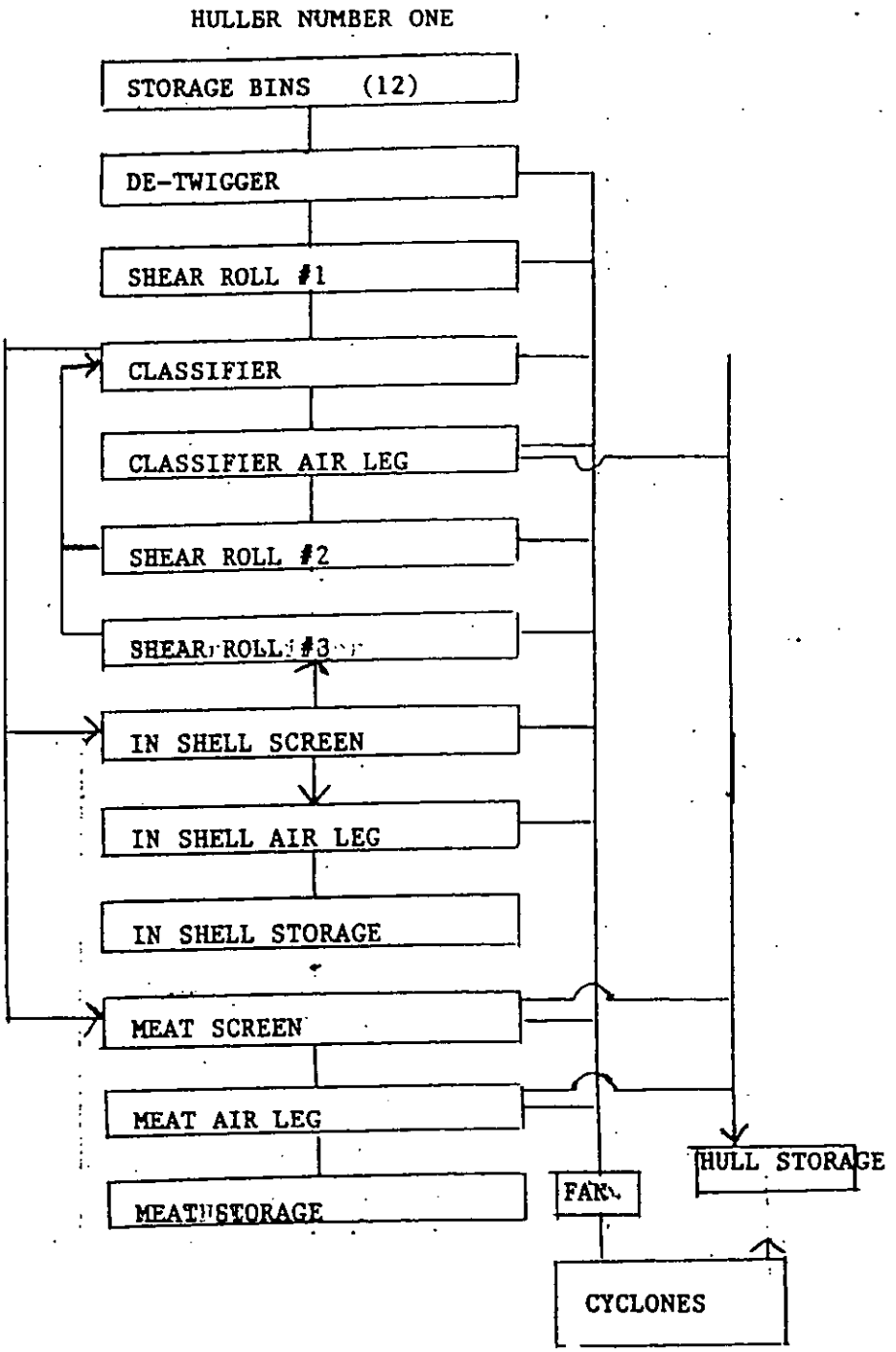
HULLING PLANT

FLOW DIAGRAM
UNLOADING AND PRECLEANING



NORTHERN MERCED HULLING ASSOCIATION

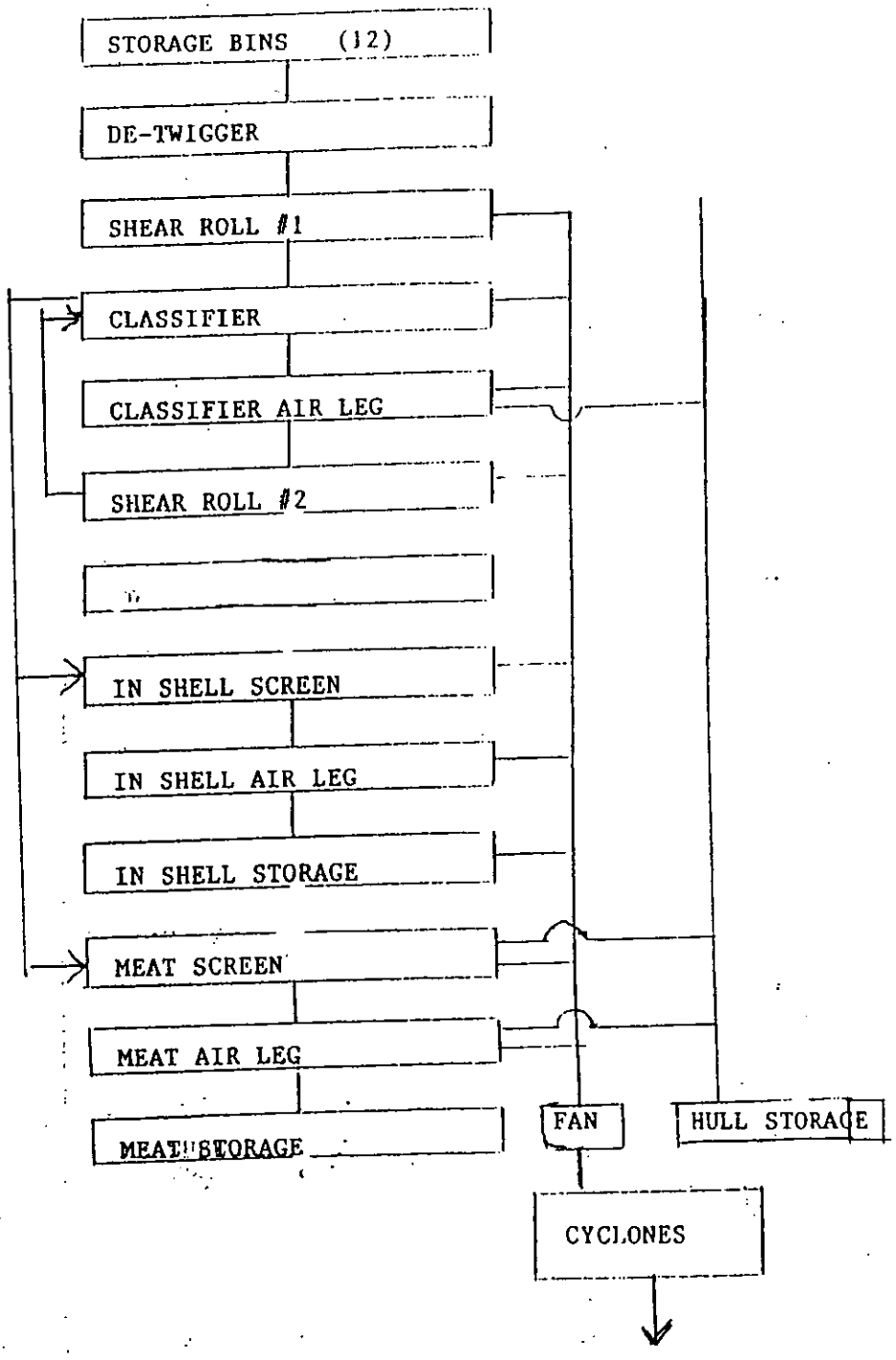
FLOW DIAGRAM
HULLING



NORTHERN MERCED HULLING ASSOCIATION

FLOW DIAGRAM
HULLING

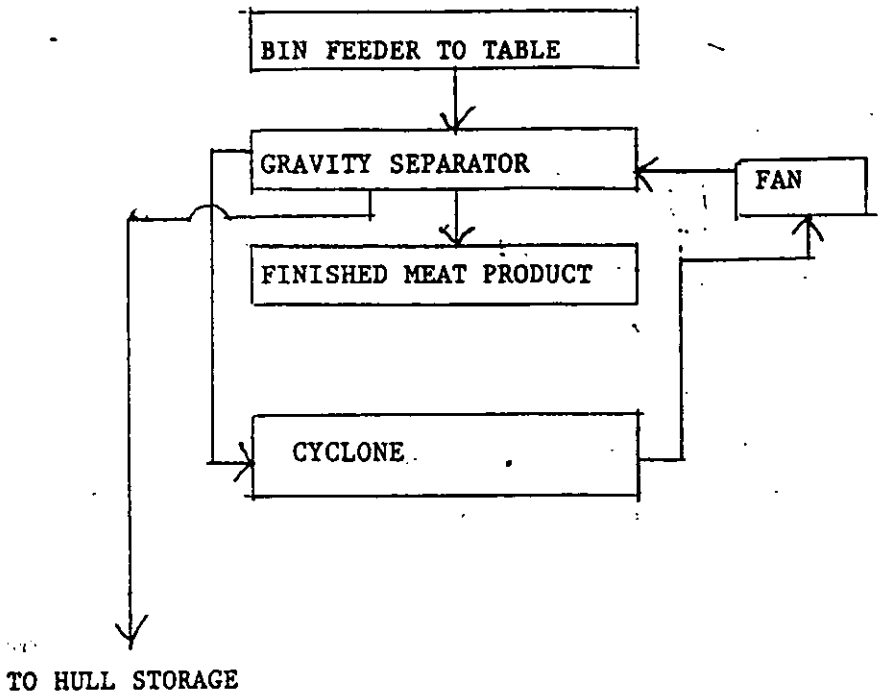
HULLER NUMBER TWO



NORTHERN MERCED HULLING ASSOCIATION

FLOW DIAGRAM

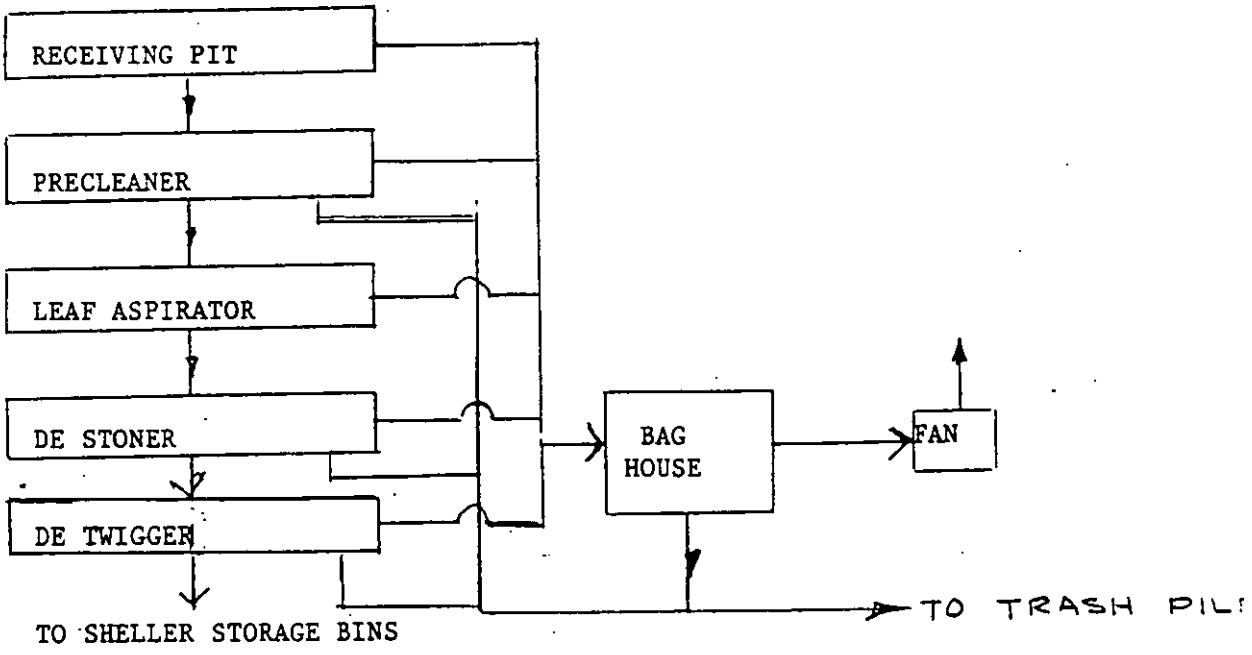
HULLER GRAVITY SEPARATOR



NORTHERN MERCED HULLI. . ASSOCIATION

SHELLING PLANT

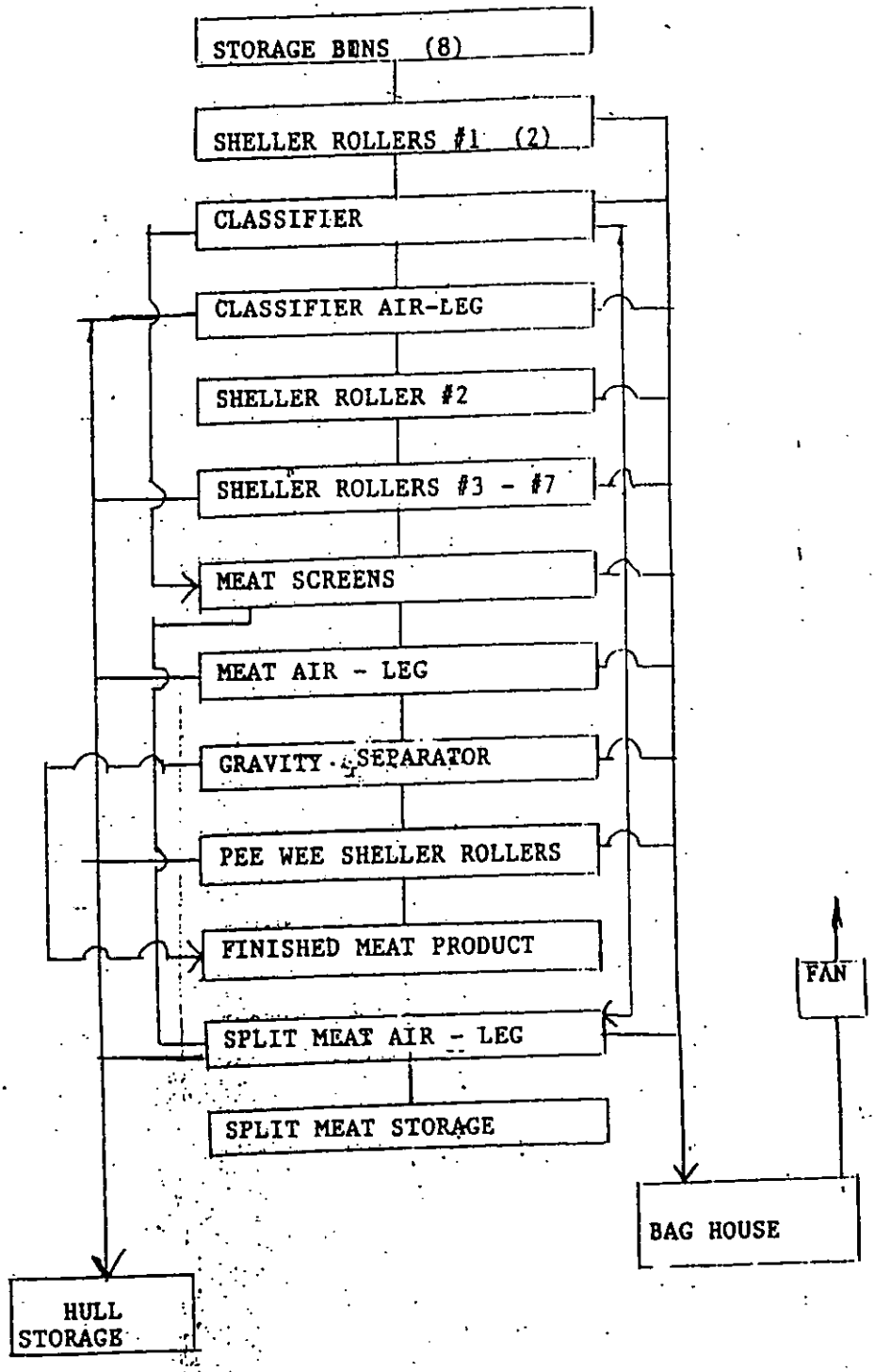
FLOW DIAGRAM
UNLOADING AND PRECLEANING



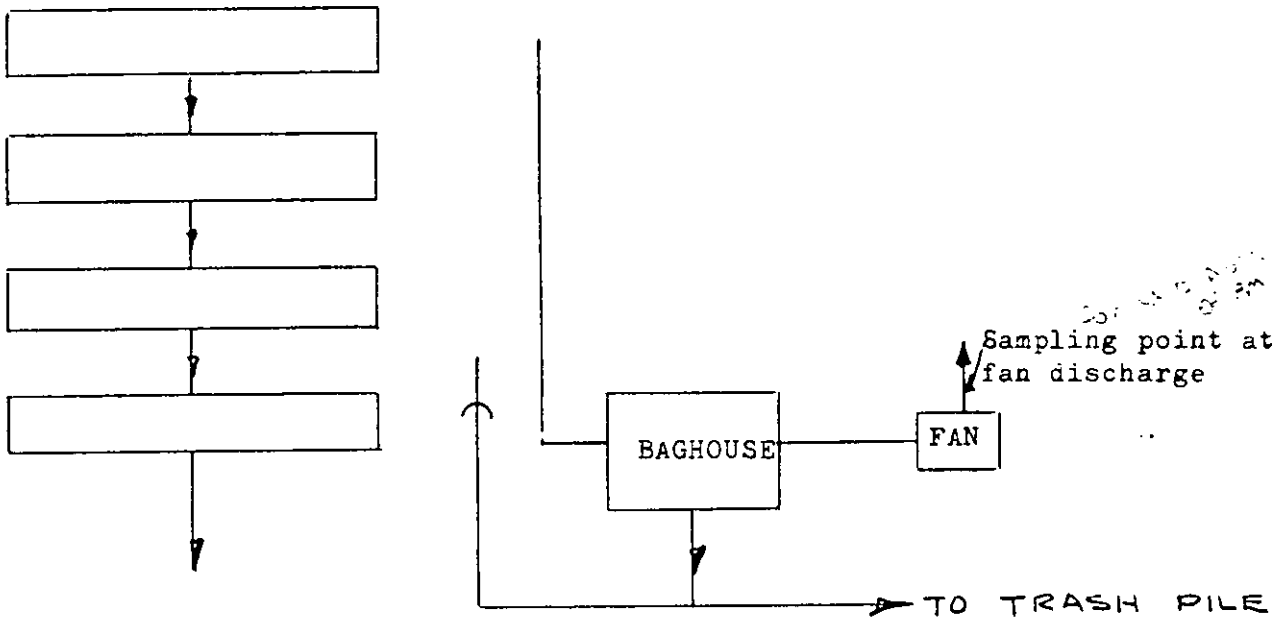
NORTHERN MERCED HULLING ASSOCIATION

SHELLER PLANT

FLOW DIAGRAM

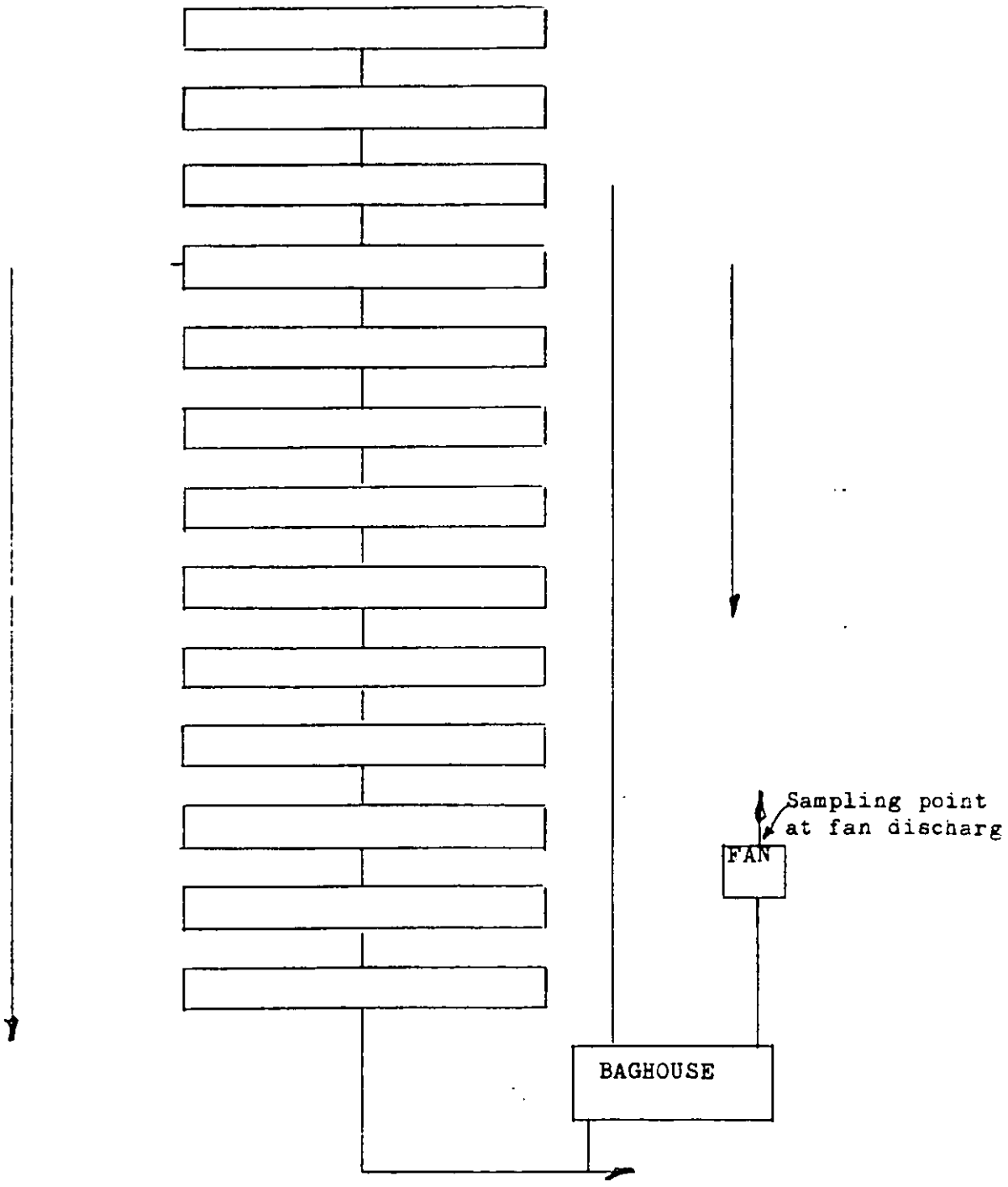


FLOW DIAGRAM
UNLOADING AND PRECLEANING



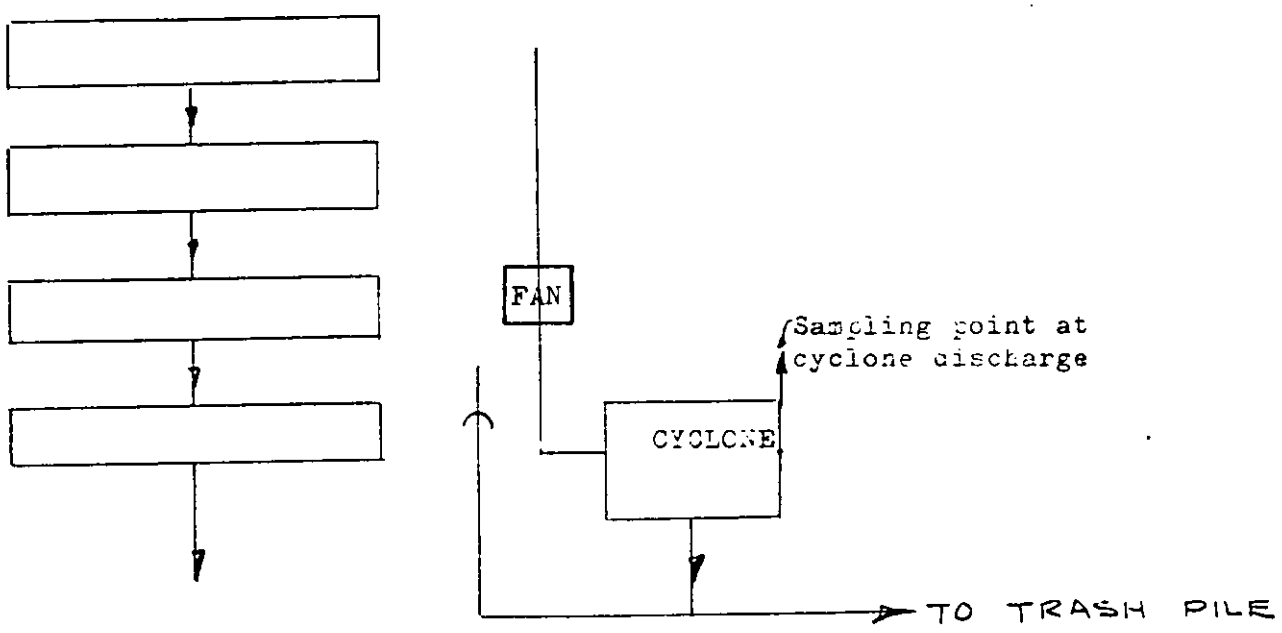
Kernpareil, Inc.
Almond Tree Hulling

FLOW DIAGRAM
HULLING



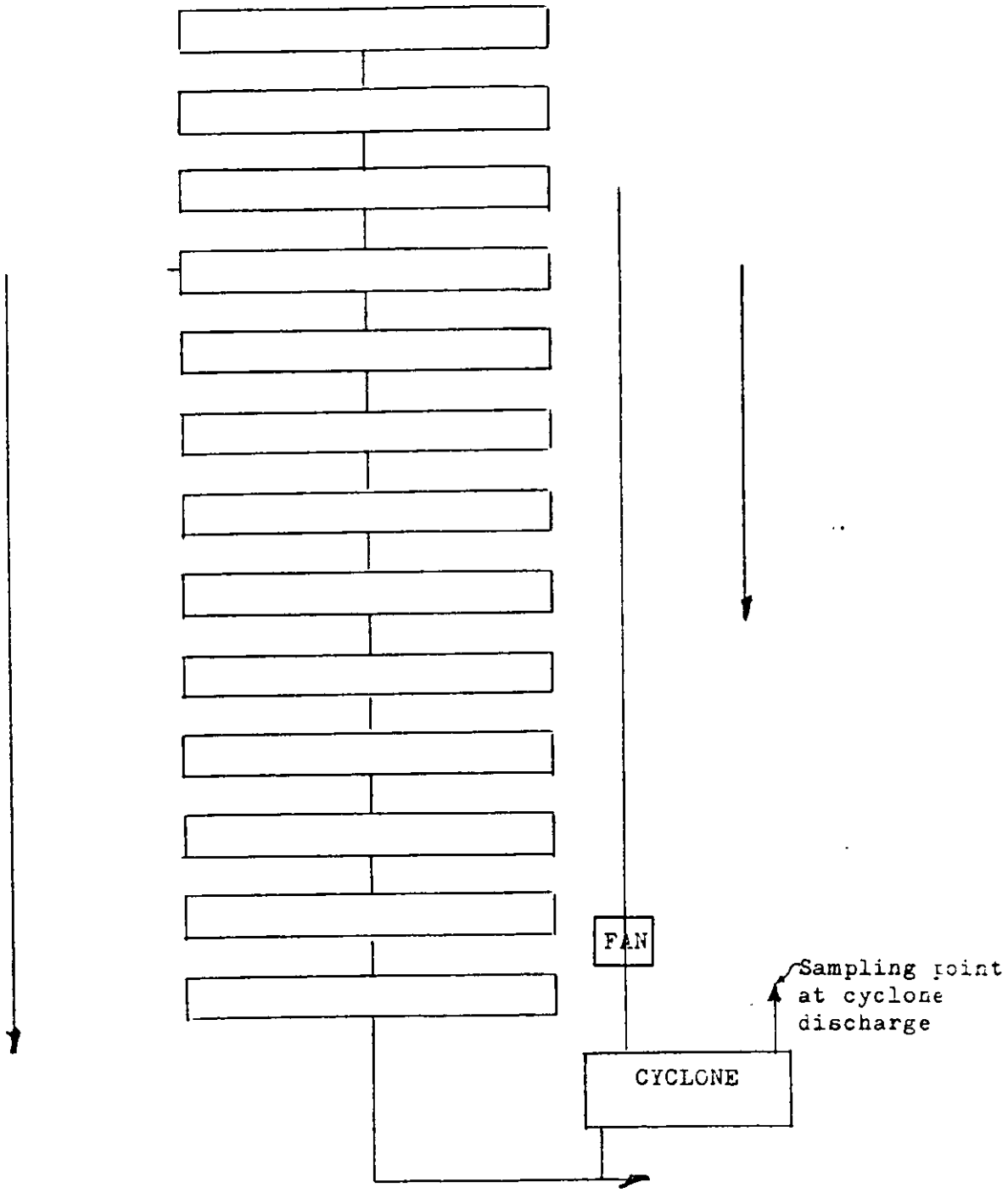
Kern pareil, Inc.
Almond Tree Hulling

FLOW DIAGRAM
UNLOADING AND PRECLEANING



Northern Merced Hulling Association	Pot-bellied cyclone
Waterford Almond Huller	Non-standard 2D-2D cyclone
Mead Orchards, Inc.	Non-standard 2D-2D cyclone
Minturn Huller	2D-2D cyclone

FLOW DIAGRAM
HULLING



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AIGNER FORM NO. 84015
PRINTED IN USA

AHPA AB-2588

Instructions

KEY:

A. Copy sample letter and mail to your APCD.
B. Report for 1990 (10-ton group).
C. Report for 1989 and 1990 (25 ton group).
D. Quantify crystalline silica.
E. Quantify nickel.

Note: Numbers below represent field weight tons.

AHPA Form Marked in top left margin

Facilities that have	A	B	C	D	E	
All baghouses (to 88,106)	X					N/A
All cyclones						
Below 10,810	X					N/A
10,811 to 18,517		X		X		5 - All Cyc I
18,518 to 27,027		X		X	X	6 - All Cyc II
27,028 up			X	X	X	6 - All Cyc I
Precleaner cyclone & Huller baghouse						
Below 17,241	X					N/A
17,242 to 29,410		X		X		5P - PreCyc
29,411 to 43,103		X		X	X	6P - PreCyc
43,104 up			X	X	X	6P - PreCyc I
Precleaner baghouse & Huller cyclone						
Below 21,716	X					N/A
21,717 to 37,037		X		X		5H - PreBag
37,038 to 54,288		X		X	X	6H - PreBag
54,289 up			X	X	X	6H - PreBag I

AHPA calcs

All cyclones 1.85 * emissions / FWT

(0.00712)(1.85) = 0.013 lb. SiO_2 / FWT

(0.0000294)(1.85) = 0.000054 lb. N_i / FWT

3 combinations

Precln cyc + Huller b.h. 1.16 * emissions / FWT

(0.00712)(1.16) = 0.008 lb. SiO_2 / FWT

(0.0000294)(1.16) = 0.000034 lb. N_i / FWT

Precln b.h. + Huller cyc 0.921 * emissions / FWT

(0.00712)(0.921) = 0.006 lb. SiO_2 / FWT

(0.0000294)(0.921) = 0.000027 lb. N_i / FWT

is this N_1 or N_i?

Nitrogen or Nickel?

"ALL CYCLONES"

Does this include the gravity seperator?

Where does the gravity seperator fit into the other figures. The flow diagram makes it look as if it has it's own cyclone?

AHPA calcs

Use 10% of cyclone emissions as fugitive dust (only estimated ↓↓ not tested!!)

Dirt & twigs average 27% of field weight
10,200 to 8000 lb. dirt and 6,800 to 2000 lb. twigs per 50,000 lb. load.

$$\frac{\left(\frac{10{,}200 + 8000}{2}\right) + \left(\frac{6800+2000}{2}\right)}{\left(\frac{50{,}000}{2000}\right)}$$

or 540 lb./ field weight ton

So, for every ton entering precleaner, $\frac{1460}{2000}$ lb. or 0.73 T enters huller

Huller cyclone factor is (1.01)(110%) lb/ field wt

or (0.73)(1.01)(110%) → 0.81 lb/ field wt T

or $\left[\frac{FWT}{1.37}\right)(1.01)(1.10) = 0.8\right]$

Pre-cleaner cyclone factor is (0.950)(110%) lb/ field wt

or 1.04 lb/ field wt T

For all-cyclone facility, (0.81 + 1.04) → 1.85 #/FW
includes 10% fugitive dust

Fugitive Dust: BH

For Pre-clnr baghouse, add (10%)(0.950*) = 0.095 #
Huller baghouse, add (10%)(0.81*) = 0.081 #
All-baghouse facility, Σ of two → 0.176 #
[all per field wt. ton]

* This is from a cyclone!!

AH.PA calcs

lb/ton processed

Pre-clnr Cyclone

from Table I P.IV

1.98
0.231
0.735
0.876
1.44
1.78
0.351
0.207

$\bar{X} = 0.950$

$\sigma_{X_{n-1}} = 0.70$

0.950 lb/FW ton

Huller & Lf Asp Cyclone, Classifier & Screen Decks

from Table I P.III

1.39
1.78
0.753
1.30
0.400
0.441

$\bar{X} = 1.01$ $\bar{X} = 1.13$

$\sigma_{X_{n-1}} = 0.56$

0.400 → from Merced; ~~Classifier Cyclone~~ & Screen Decks Cyclone ⇒ is that the same as Huller and Leaf Aspirator Cyclone?

(0.73)(1.01) = 0.745 lb/FW Ton

Pre-clnr cyclone & huller baghouse → 1.04 + 0.116 = 1.16 lb/FW

Pre-clnr baghouse & huller cyclone → 0.111 + 0.81 = 0.921 lb/FW

Baghouse

ARE FUGITIVE EMISSIONS figured using cyclones } ONLY GUESSTIMATES!!!

Pre-clnr	0.0164 + 0.095(FO)	= 0.111 lb/FW ton
Huller	0.0355 + 0.081(FO)	= 0.116 lb/FW ton

All-baghouse facility → 0.227 lb/FW ton

Baghouse tests

		Huller BH (lb/FW Ton)	Preclnr BH
1994	CARB	0.0155	0.0014
1981	MesaFarms	0.0898	0.0326
1988	Paramount	0.0072	0.0153

Do we know anything about the tests for these #'s??

$\bar{X} = 0.0355$ $\bar{X} = 0.0164$

lbs substance / lb ...

sample	sample wt mg	As	Be	Cd	Cu	Pb	Mn	Hg	Ni	SO4 ...
1900	-	0	0	-	-	-	-	-	-	-
1901	-	0	0	0	-	-	-	-	0	-
1902	-	0	0	0	-	-	-	0	-	-
1903	-	0	0	0	-	-	-	0	0	-
1904	-	0	0	0	-	-	-	0	0	-
1905	807,000	0.00000[illegible]	[illegible]	0.00000[illegible]	0.000854	0.0000639	0.000629	[illegible]	0.000017[illegible]	0.00446
1906	769,000	0	0	0	0.0000520	0.0000[illegible]	0.000181	0	0.0000[illegible]	0.00286
1907	120,000	0.00000[illegible]	0.00000[illegible]	0.00000[illegible]	0.000167	0.000018[illegible]	0.000600	[illegible]	0.0000210	0.00446
1908	1,160,000	0.00000[illegible]	[illegible]	0.0000[illegible]	0.000226	0.0000320	0.000956	[illegible]	0.000045[illegible]	0.00348
1909	219,000	0.00000[illegible]	0	0.00000[illegible]	0.000[illegible]	0.0000502	0.000443	0	0.0000781	0.0164
1910	276,000	0	0	0.00000[illegible]	0.0000471	0.0000272	0.000156	0	0.0000[illegible]	0.00797
1911	331,000	0.00000[illegible]	0.00000[illegible]	0.00000[illegible]	0.000176	0.0000[illegible]	0.000[illegible]16	0	0.000106	0.00997
1912	579,000	0.00000[illegible]	0	0.00000[illegible]	0.0000[illegible]	0.0000[illegible]	0.000190	0.00000[illegible]	0.0000[illegible]	0.00666
	$\bar{x}$ =	0.00000[illegible] / 13	0.00000[illegible] / 13	0.00000[illegible] / 12	0.000129 / 9	0.0000352 / 8	0.000464 / 9	[illegible] / 11	0.0000[illegible] / 11	0.00412 / 9
		2×10^{-6}	2×10^{-7}	3×10^{-6}	1×10^{-4}	4×10^{-5}	5×10^{-4}	5×10^{-5}	3×10^{-5}	7×10^{-3}

The above substances were found.

WHERE DO THESE #'s COME FROM?
I found no testing data for these
or lab results for these figures!!

4/4