Check Sheet

Company Name: Harris Semiconductor
Permit Number: AR 09-160757
PSD Number:
Permit Engineer:

Application:

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

Cross References:

- [ ]
- [ ]
- [ ]

Intent:

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

Correspondence with:

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

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

Final Determination:

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

Post Permit Correspondence:

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

P 938 762 680

RECEIPT FOR CERTIFIED MAIL

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

Sent to Mr. L. R. Hutker, Harris	
Street and No. Semiconductor P.O. Box 883	
P.O., State and ZIP Code Melbourne, FL 32901	
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: 9-15-89 Permit: AC 05-165757	

PS Form 3800, June 1985

Bruce -
I don't think we'll ever get the green card on this - just purge + file
Patty

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. L. R. Hutker, P.E.
Director, Facilities Department
Harris Semiconductor
Post Office Box 883
Melbourne, Florida 32901

September 13, 1989

Enclosed is construction permit No. AC 05-165757 for Harris Semiconductor to consolidate permits previously issued for Building No. 4 and to construct two new two staged scrubber systems at Harris Semiconductor's existing facility in Palm Bay, Brevard 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

for W. H. Thomas

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

Copy furnished to:

C. Collins, Central District
N. Baldisseroto, Harris Semiconductor

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 9-15-89.

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

9-15-89
Date

Final Determination

Harris Semiconductor
Brevard County
Palm Bay, Florida

Construction Permit Number
AC 05-165757

Florida Department of Environmental Regulation
Division of Air Resources Management
Bureau of Air Regulation

September 8, 1989

Final Determination

The construction permit application has been reviewed by the Department. Public Notice of the Department's Intent to Issue was published in the Florida Today Newspaper on August 11, 1989. The Technical Evaluation and Preliminary Determination were available for public inspection at the DER's Central District and Division of Air Resources Management offices.

There were no comments received on the proposed action. Therefore, it is recommended that the proposed construction permit be issued as drafted.

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:
Harris Semiconductor
P. O. Box 883
Melbourne, FL 32901

Permit Number: AC 05-165757
Expiration Date: December 31, 1990
County: Brevard
Latitude/Longitude: 28°01'20"N
80°36'10"W
Project: Building 4

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 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:

For the permitting of Building 4, in order to consolidate multiple permits previously issued for this building/source and to allow the construction/installation of new two-staged (venturi and packed-bed) scrubber systems, which will remove acid emissions from various reactors and production systems, to replace the existing control systems and to allow for five additional reactor installations in the future.

- o F04S01: a Harrison 10,000 scfm horizontal cross-flow fume scrubber using polypropylene plastic saddle packing for acid gas and VOC/solvent vapor removal; Model No. HF-100;
- o F04S02: a Duall Ind. 6,900 cfm horizontal cross-flow fume scrubber using polypropylene packing for acid gas and VOC/solvent vapor removal; Model No. F-101;
- o F04S03: a Harrison 10,000 scfm horizontal cross-flow fume scrubber using polypropylene plastic saddle packing for acid gas and VOC/solvent vapor removal; Model No. HF-100;
- o F04S04: a 10,450 cfm fume scrubber for acid gas removal;
- o F04S05: a Beverly Pacific 1,000 scfm vertical counter-current fume scrubber using polypropylene packing for acid gas (sil-tet loading) removal; Model No. PS-2VT; and,
- o F04S06: Epi and poly reactor two-stage ejector venturi scrubber systems; also, a two-stage ejector venturi scrubber system to service the Tylan system: all to be updated once contracted, installed, tested and analyzed.

The building/source is located at the permittee's existing facility located on Palm Bay Road, in the City of Palm Bay. The UTM coordinates are Zone 17, 538.7 km East and 3100.9 km North.

The Source Classification Codes are: Major Group 36

o Cold Solvent Cleaning/ Stripping	4-01-003-99	Tons VOC/Solvent Consumed

PERMITTEE:
Harris Semiconductor

Permit Number: AC 05-165757
Expiration Date: December 31, 1990

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 to Construct Air Pollution Sources, DER Form 17-1.202(1), and Mr. L. R. Hutker's cover letter received June 2, 1989.
2. Ms. Nancy Baldisserotto's letter with attachment received July 17, 1989.
3. Technical Evaluation and Preliminary Determination dated August 3, 1989.

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth in this permit are "Permit Conditions" and are binding and enforceable pursuant to Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.

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. Neither 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 is not 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, or plant life, or property caused by the construction or operation of this

GENERAL CONDITIONS:

permitted source, or from penalties therefore; 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 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 and at a reasonable time, access to the premises, where the permitted activity is located or conducted to:

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

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

c. Sample or monitor 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 provide the Department with the following information:

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

b. the period of noncompliance, including 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 for 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 involving the permitted source arising under the Florida Statutes or Department rules, except where such use is proscribed by Sections 403.73 and 403.111, Florida Statutes. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

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 17-4.120 and 17-30.300, F.A.C., 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 or a copy thereof shall be kept at the work site of the permitted activity.

13. The permittee shall comply with the following:

a. Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.

b. The permittee shall hold 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) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.

GENERAL CONDITIONS:

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 dates analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

14. 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 corrected promptly.

SPECIFIC CONDITIONS:

1. The maximum allowable VOC/solvent emissions from Building No. 4 shall be 11.0 tons per year.

2. The VOC/solvent vapor and acid gas exhaust scrubbers must be on during the working hours.

3. Permitted hours of operation are 8760.

4. Objectionable odors shall not be allowed off plant property pursuant to F.A.C. Rule 17-2.620(2).

5. An inspection and maintenance plan shall be submitted to the DER's Central District office as part of the operating permit application. The plan shall include provisions for the prevention and correction of VOC/solvent losses from leaks and equipment malfunctions.

6. By March 31 of each calendar year, an annual operating report shall be submitted to the DER's Central District office demonstrating compliance with the VOC/solvent emissions limit for Building No. 4. The emissions shall be determined by a material balance scheme, verifiable on a monthly basis, and shall include the following:

a) a beginning inventory of full containers, cylinders and storage tanks at the beginning of each calendar year;

b) plus all purchased deliveries after the beginning inventory (verifiable by invoices);

SPECIFIC CONDITION:

c) minus all quantities picked-up and shipped-off the premise after the beginning inventory (verifiable by invoices);

d) minus all quantities deep well injected during the calendar year, justified by assumptions and established scrubber efficiencies; and,

e) minus an ending inventory of full containers, cylinders, and storage tanks; and, should occur at the beginning of the following calendar year.

7. Each scrubber system's efficiency and potential VOC/solvent emissions shall be established by a sampling and analysis program, which includes:

a) a sample shall be taken annually from each scrubber stack and analyzed using EPA Reference Method 25 or, with Department approval, EPA Reference Method 25A, 40 CFR 60, Appendix A;

b) the DER's Central Florida District office shall receive at least 15 days notice in writing prior to sampling; and,

c) the report, summarizing the sampling results, shall be submitted to the DER's Central District office within 45 days after the last test run is completed.

8. This permit will supercede all other permits previously issued on this source/Building No. 4.

9. The source/Building No. 4 is subject to all applicable provisions of F.A.C. Chapters 17-2 and 17-4.

10. Projected potential acid emissions are 1.5 TPY (to be amended after testing and analyses have been performed on the new scrubber systems for the epi and poly reactors and Tylan system).

11. Building No. 4 is subject to the provisions of F.A.C. Rules 17-2.240: Circumvention; 17-2.250: Excess Emissions; and, 17-4.130: Plant Operation - Problems.

12. Any modification pursuant to F.A.C. Rule 17-2.100(119), Modification, shall be submitted to the DER's Central District office and the Bureau of Air Regulation office for approval.

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

PERMITTEE:
Harris Semiconductor

Permit Number: AC 05-165757
Expiration Date: December 31, 1990

SPECIFIC CONDITIONS:

14. An application for an operation permit must be submitted to the Central District office at least 90 days prior to the expiration date of this construction permit or within 45 days after completion of compliance testing, whichever comes first. To properly apply for an operation permit, the applicant shall submit the appropriate application form, fee, 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 13th day
of September, 1989

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

John D. Shearer for
Dale Twachtmann, Secretary

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

For Routing To Other Than The Addressee

To: _____ Location: _____

To: _____ Location: _____

To: _____ Location: _____

From: _____ Date: _____

Interoffice Memorandum

TO: Dale Twachtmann

for FROM: Steve Smallwood

DATE: September 8, 1989

SUBJ: Approval of Construction Permit No. AC 05-165757
Harris Semiconductor

Attached for your approval and signature is a permit prepared by Central Air Permitting for the above mentioned Corporation to consolidate permits previously issued for Building No. 4, which is a source involved with materials fabrication of integrated circuits; and, to construct/install new two staged (venturi and packed-bed) scrubber systems, which will control acid emissions from various reactors and production systems, to replace the existing control systems and to allow for five additional reactor installations in the future at Harris Semiconductor's existing facility in Palm Bay, Brevard County, Florida.

No comments were submitted on the Department's Intent to Issue the permit.

Day 90, after which the permit will be issued by default, is September 22, 1989.

I recommend your approval and signature.

attachment

SS/BM/t

AC 05-165757
Bldg. #4

HARRIS SEMICONDUCTOR
HARRIS RCA GE INTERSIL

RECEIVED
DEC 17 1990
DER - BAQM

December 12, 1990

Mr. Garry Kuberski
Engineer
Florida Department of Environmental Regulation
3319 Maguire Boulevard, Suite 232
Orlando, Fl 32803

SUBJECT: HARRIS SEMICONDUCTOR, Source Test Report
Scrubber Systems F04S04, F51S03, F54S02, F63S02.

Dear Mr. Kuberski:

Enclosed are two copies of the test report for the aforementioned scrubber systems as required by the conditions of the Amendments to Construction permits AC 05-147321, AC 05-168460 and AC 05-157786 dated June 15, 1990.

The testing also included the remaining scrubber systems of Buildings 54 and 51 to evaluate the effects of certain chemical changes and structural solvent hood changes in the fabs. These changes were implemented over the last few months as part of a continuing effort to reduce VOC/Solvent emissions at the process level.

If you have any questions, please call our office at (407) 729-5301.

Sincerely,

Constantine Triantafyllidis

Constantine Triantafyllidis
Environmental Engineer
Environmental Services Dept.

cc: C. Collins, P.E., Central Distr.
B. Mitchell, Tallahassee
P. Sanabani, Central Distr.
K. Smith

AC 05-165757
Bldg. #4

HARRIS SEMICONDUCTOR
HARRIS · RCA · GE · INTERSIL

RECEIVED
OCT 5 1990
DER-BAQM

October 3, 1990

Mr. Garry Kuberski
Engineer
Florida Department of Environmental Regulation
3319 Maguire Boulevard, Suite 232
Orlando, Fl 32803

SUBJECT: HARRIS SEMICONDUCTOR, BUILDINGS 4, 51, 54, 63.
Notification of Monitoring
Scrubber Systems F04S04, F51S03, F54S02, F63S02.

Dear Mr. Kuberski:

Per our telephone conversation of 10/01/90 this letter is to notify the Central District Office that the monitoring of the above mentioned scrubber systems has been rescheduled for October 31, 1990. The monitoring period will last approximately three days.

The scrubber systems efficiency will be established utilizing EPA Method 25A or EPA Method 8 as required. The monitoring work will be performed by Air Consulting & Engineering, Inc. of Gainesville.

Should you have any questions or require any additional information please contact our office at (407) 729-5301.

Sincerely,

Constantine Triantafyllidis

Constantine Triantafyllidis, R.E.P.
Environmental Services

cc: C. Collins, P.E., Central Dist.
S. Smallwood, P.E., Tallahassee
B. Mitchell, Tallahassee
P. Sanabani
K. Smith

Enclosures

HARRIS SEMICONDUCTOR
HARRIS · RCA · GE · INTERSIL

September 12, 1990

Mr. Pius Sanabani
Engineer
Florida Department of Environmental Regulation
3319 Maguire Boulevard, Suite 232
Orlando, Fl 32803

SUBJECT: HARRIS SEMICONDUCTOR, bUILDINGS 4, 51, 54, 63.
Notification of Monitoring
Scrubber Systems F04S04, F51S03, F54S02, F63S02.

Dear Mr. Sanabani:

In accordance with the conditions of the Amendments to Construction Permit numbers AC 05-147321, AC 05-168460 and AC 05-157786 dated June 15, 1990, the purpose of this letter is to notify the Central Florida District Office that monitoring of scrubbers F51S03, F63S02 and F54S01 (previously named F63S01) has been scheduled for a three day period beginning October 2, 1990.

As mentioned in previous correspondence, the original scrubbers F54S01 and F54S02 servicing Building 54 have been replaced by scrubber F63S01 from Building 63. Scrubber F63S01 will be renamed F54S01. Furthermore, scrubber F04S04 will be monitored at this time because it was being repaired during the last round of monitoring in June, 1990.

The scrubber systems efficiency will be established utilizing EPA Method 25A or EPA Method 8 as required. The monitoring work will be performed by Air Consulting & Engineering, Inc. of Gainesville.

Should you have any questions or require any additional information please contact our office at (407) 729-5301.

Sincerely,

Constantine Triantafyllidis

Constantine Triantafyllidis, R.E.P.
Environmental Services

cc: C. Collins, P.E., Central Dist.
S. Smallwood, P.E., Tallahassee
B. Mitchell, Tallahassee

P 280 742 416

RECEIPT FOR CERTIFIED MAIL

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

Sent to Kent Smith	
Street and No. Harris Semicon.	
P.O., State and ZIP Code P.O. BOX 883	
Postage Melbourne,	$ FL
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 10 pmts. 8-4-90	

PS Form 3800, June 1985 ☆U.S.G.P.O. 1989-234-555

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:
Kent Smith
Harris Semiconductor
P.O. BOX 883
Melbourne, FL 32902-0883

4. Article Number
P 280-742-416

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

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature — Addressee
X

6. Signature — Agent
X Willie F. Lee

7. Date of Delivery 8-6-90

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

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

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

August 29, 1990

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Kent Smith, Environmental Manager
Harris Semiconductor
P. O. Box 883
Melbourne, Florida 32902-0883

Dear Mr. Smith:

Re: Amendment of Construction Permits

AC 05-165757	Bldg. 04
-157786	51
-147321	54
-164544	55
-161706	57
-159484	58
-150794	59
-168460	60
-157787	62
-158237	63

The Department has reviewed Constantine Triantafyllidis' letter received July 19, 1990, requesting that the above referenced air construction permits' expiration dates be extended. The Department is in agreement with the request and the following will be changed and added:

Expiration Date:

From: December 31, 1990
To: June 30, 1991

Attachment to be Incorporated:

o Constantine Triantafyllidis' letter received July 19, 1990.

This letter must be attached to your air construction permits, as referenced above, and shall become a part of the permits.

Sincerely,

for STEVE SMALLWOOD, P.E.
Director
Division of Air Resources
Management

SS/BM/plm

Attachment

c: C. Collins, Central Dist.
C. Triantafyllidis, HS

File Copy

HARRIS SEMICONDUCTOR
HARRIS · RCA · GE · INTERSIL

July 17, 1990

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

JUL 19 1990
DER-BAQM

Subject: Extension of Consolidated Construction Permits
Harris Semiconductor, Melbourne

Permit Nos.	Bldg.
AC 05-165757	04
AC 05-157786	51
AC 05-147321	54
AC 05-164544	55
AC 05-161706	57
AC 05-159484	58
AC 05-150794	59
AC 05-168460	60
AC 05-157787	62
AC 05-158237	63

Dear Mr. Fancy:

This letter is submitted, on behalf of Harris Semiconductor Sector, Inc. ("Semiconductor"), to request an extension of the expiration dates of the above-referenced permits until March 31, 1991. We believe the extension is justified for the following reasons. The current specific conditions of these permits require the submission of applications for operating permits by the end of September. As you are aware, over the last several months we have been working with the Department to reduce the potential for Semiconductor's operations to contribute to odors in the areas adjacent to the facility. It is possible that some of the projects we currently have underway to accomplish this objective may not be completed by the end of September. The stack extensions associated with the Building 54 operations should be completed by the end of September. However, another major element of our odor reduction efforts which consists of a facility-wide substitution of certain phenolic process chemicals with non-phenolic ones, where reasonably possible, may not be completed by October 1st. We believe this program is important because these non-phenolic compounds should prove to be much less odoriferous in nature.

This program is considerably more complex and difficult to implement than the stack extensions. Due to the sophisticated and sensitive nature of the integrated circuits manufactured at the facility, in many instances, a substitution of process chemicals requires customer (which in many instances is the U.S. Government) approval.

The whole project, including necessary customer approval and the actual chemical substitutions, may take several months or more. We believe, from the Department's and Semiconductor's perspective, it would be better to complete this process prior to submission of the applications for operating permits. It should be noted that some chemical changes may not be possible if the U.S. Government objects to the substitution. Should the Department have any questions or require any additional information, please contact our office at 407/729-5301.

Yours sincerely,

Constantine Triantafyllidis

Constantine Triantafyllidis
Environmental Engineer
Environmental Services

cc: T. Sawicki
B. Mitcell 7/24/90 RA
C. Collins

E/929/90

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

For Routing To Other Than The Addressee

To: _____ Location: _____

To: _____ Location: _____

To: _____ Location: _____

From: _____ Date: _____

Interoffice Memorandum

TO: Steve Smallwood

FROM: Clair Fancy

DATE: August 29, 1990

SUBJ: Amendment of Construction Permits
Harris Semiconductor

Attached for your approval and signature is a letter that will amend ten construction permits issued to the above mentioned company to extend their expiration dates. There is no controversy regarding this action.

I recommend your approval and signature.

CF/BM/plm

B. Mitchell

PM
11-2-89
Melbourne, FL

HARRIS

RECEIVED
NOV 6 1989
DER - BAQM

October 30, 1989

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

Subject: HARRIS SEMICONDUCTOR -- AIR EMISSION MONITORING
AC05-165757
Bldg. #4

Dear Mr. Fancy;

Enclosed is a copy of a letter of correction to the source test report submitted to your office last week. Please note the corrected emission rate for source no. F04S08. Please call me if you have any questions.

Sincerely,

Nancy Baldisserotto

Nancy Baldisserotto
Environmental Engineer
Harris Semiconductor, Melbourne

\cc B. Mitchell, Tallahassee

Air Consulting and Engineering, Inc.

October 24, 1989
187-89-02

Ms. Nancy Baldisserotto
Harris Corporation
Semiconductor Division
Post Office Box 883
Palm Bay, FL 32901

Dear Nancy:

Due to an error in the flow rate calculation for source FO4SO8, the average VOC mass emissions changed from 3.60 lb/hr to 1.94 lb/hr. Please include this letter, table, and flow calculation as addenda to the Source Test Report of August 1989.

I sincerely apologize for the mistake.

Respectfully,

AIR CONSULTING AND ENGINEERING, INC.

Dagmar A. Neck
Engineer

DAN:ctg

enclosure

2106 N.W. 67th Place, Suite 4 • Gainesville, Florida 32606 • (904) 335-1889

Table 2 VOC Emission Summary
Harris Corporation--Semiconductor Division
August 1989

Date	Source	Outlet Volumetric Flow Rate SCFMD	Average VOC as C_3H_8 ppm	Average VOC Mass Emissions as C_3H_8 lb/Hr
8/8/89	F04SO1	8569	0.44	0.03
8/7/89	F04SO2	13381	1.02	0.09
8/7/89	F04SO3	9015	7.06	0.04
8/8/89	F04SO8	4273	66.33	1.94
8/25/89	F51SO2	9202	42.62	2.69
8/25/89	F51SO3	20956	1.23	0.18
8/28/89	F51SO4	17958	1.15	0.14
8/28/89	F51SO5	14226	33.21	3.24
8/31/89	F54SO1	26384	13.98	2.53
8/23/89	F54SO3	26964	49.42	9.13
8/23/89	F57SO1	5813	7.74	0.31
8/22/89	F58SO1	6276	3.00	0.13
8/22/89	F58SO2	2622	1.40	0.03
8/24/89	F59SO2	7586	5.13	0.27
8/31/89	F60SO1	19054	1.02	0.13
8/28/89	F61SO1	no flow	0.11	0.00
8/25/89	F62SO2	11187	2.26	0.17
8/24/89	F63SO2	8135	19.13	1.07
8/24/89	F63SO3	6122	14.33	0.60
8/23/89	F58EO1	4214	20.60	0.59

Note: corrected for ambient air background and drift.

lb/Hr C_3H_8 = (ppm) (2.595 x 10^{-9}) (M) (SCFMD) (60), $M_{C_3H_8}$ = 44

FLOWRATE CALCULATIONS

	PLANT	HARRIS	
	STACK	FO4SO8	
	DATE	8/8/89	
	RUN NO.	1	
	BAROMETRIC PRESS.	30.10	IN.HG
	STACK PRESS.	30.11	IN.HG
	STACK AREA	3.210	SQ.FT
	AVG.STACK TEMP	85.00	F
	CP	0.99	
	AVG. SQRT VELOCITY HEAD	0.345	IN. H2O
ORSAT:	PERCENT CO2	0.0	
	PERCENT O2	20.9	
	PERCENT N2	79.1	
	FRACTION OF DRY AIR	0.980	
	MOISTURE FRACTION	0.020	
	MWGT. OF DRY STACK GAS	28.836	
	MWGT. OF WET STACK GAS	28.619	
	AVG.VELOCITY	23.22	FPS
	ACTUAL VOL. FLOW	4471.86	ACFM
	STD. VOL. FLOW	4272.69	SCFMD

VELOCITY TRAVERSE

PLANT	HARRIS
DATE	8/8/89
SOURCE	F04S08
BAROMETRIC PRESS.	30.100 IN.HG
STACK PRESS.	30.110 IN.HG
OPERATORS	HODGE/NECK

TRAVERSE POINT NUMBER	VEL. HEAD in. H2O	SQR VEL. HEAD	STACK TEMP. F
1-1	0.080	0.283	85
1-2	0.070	0.265	85
1-3	0.070	0.265	85
1-4	0.070	0.265	85
2-1	0.060	0.245	85
2-2	0.060	0.245	85
2-3	0.120	0.346	85
2-4	0.120	0.346	85
3-1	0.110	0.332	85
3-2	0.100	0.316	85
3-3	0.160	0.400	85
3-4	0.160	0.400	85
4-1	0.210	0.458	85
4-2	0.210	0.458	85
4-3	0.200	0.447	85
4-4	0.200	0.447	85
		0.345	85

9-15

Clair,

Judy set up a meeting with Shearer, you & Steve on 9/28, but I don't know what time —

17-4

Patty

Make appt for Ssm & CF to meet w Johns on this

Steve

We need to discuss formatting of these permits

Very busy and hard to read.

Bring to CF atty

28th
1:00 Best
1:30

Patty —

I am trying to schedule an appt with Shearer for 9/28 afternoon for Ssm & CF

Bring to Claire's attention

Thanks

Susan

CAPE PUBLICATIONS, INC.

The Times
Published Weekly on Wednesday

THE TRIBUNE
Published Weekly on Wednesday

RECEIVED
AUG 14 1989
DER - BAQM

FLORIDA TODAY
Published Daily

STATE OF FLORIDA
COUNTY OF BREVARD

Before the undersigned authority personally appeared **Linda L. Spicer** who on oath says that he/she is **Legal Advertising Clerk** of the **FLORIDA TODAY**, a newspaper published in Brevard County, Florida; that the attached copy of advertising being a Legal Notice in the matter of permit to consolidate multiple permits previously issued for Building No. 4 in the Court

was published in the **FLORIDA TODAY NEWSPAPER** in the issues of August 11, 1989

Affiant further says that the said **FLORIDA TODAY NEWSPAPER** is a newspaper published in said Brevard County, Florida and that the said newspaper has heretofore been continuously published in said Brevard County, Florida regularly as stated above, and has been entered as second class mail matter at the past office in **COCOA**, said Brevard County, Florida for a period of one year next preceeding 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 said newspaper.

Linda Spicer

Sworn and subscribed to before me this 11th day of August A.D. 89

Cathy S. Smith

Notary Public
State of Florida at Large
My Commission Expires March 29, 1992

CATHY S. SMITH
NOTARY PUBLIC
STATE OF FLORIDA

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

The Department of Environmental Regulation gives notice of its intent to issue a permit to consolidate multiple permits previously issued for Building No. 4, which is a source involved with materials fabrication where the initial steps in the manufacturing of integrated circuits take place; and, to construct/install new two-staged (venturi and packed-bed) scrubber systems, which will control acid emissions from various reactors and production systems, to replace the existing control systems and to allow for five additional reactor installations in the future. The proposed project will occur at the applicant's existing facility located on Palm Bay Road, City of Palm Bay, in Brevard 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.

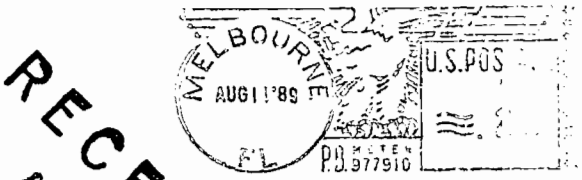
If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this Notice. Persons whose substantial interests will be affected by any decision of the Department with regard 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

Department of Environmental Regulation
Central District office
3319 Maguire Blvd., Suite 232
Orlando, Florida 32803-3767

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.
TO097265-17-8/11, 1989- Frida

FLORIDA TODAY/USA TODAY
GANNETT PLAZA
P.O. BOX 363000
MELBOURNE, FL 32936



THE SPACE COAST'S NEWSPAPER
FLORIDA TODAY
PUBLISHED IN BREVARD COUNTY

THE NATION'S NEWSPAPER
USA TODAY
PUBLISHED BY GANNETT

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

ATTN: C.H. FANCY, P.E.
BUREAU OF AIR QUALITY MANAGEMENT

P 938 762 641

RECEIPT FOR CERTIFIED MAIL

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

Sent to L. R. Hutker, P.E.	
Street and No. Director, Facilities Dept. Harris Semiconductor	
P.O. State and ZIP Code P.O. Box 883 Melbourne, FL 32901	
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: 8/3/89 AC 05-165757	

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: L. R. Hutker, P.E. Director, Facilities Dept. Harris Semiconductor P.O. Box 883 Melbourne, FL 32901	4. Article Number P 938 762 641
	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 Harris Semi	8. Addressee's Address *(ONLY if requested and fee paid)*
6. Signature — Agent X [signature]	
7. Date of Delivery 8-7-89	

PS Form **3811**, Mar. 1988 * U.S.G.P.O. 1988-212-885 **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

August 3, 1989

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. L. R. Hutker, P.E.
Director, Facilities Department
Harris Semiconductor
Post Office Box 883
Melbourne, Florida 32901

Dear Mr. Hutker:

Attached is one copy of the Technical Evaluation and Preliminary Determination and proposed permit for Harris Semiconductor to consolidate multiple permits previously issued for Building No. 4, which is a source involved with materials fabrication where the initial steps in the manufacturing of integrated circuits take place; and, to construct/install new two-staged (venturi and packed-bed) scrubber systems, which will control acid emissions from various reactors and production systems, to replace the existing control systems and to allow for five additional reactor installations in the future.

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/kt

Attachments

cc: C. Collins, C District
N. Baldisserotto, HS
Reading File
Bruce Mitchell } 8-3-89 RG

BEFORE THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

In the Matter of
Application for Permit by:

Harris Semiconductor
Post Office Box 883
Melbourne, Florida 32901

DER File No. AC 05-165757

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, Harris Semiconductor, applied on March 6, 1989, to the Department of Environmental Regulation for a permit to consolidate multiple permits previously issued for Building No. 4, which is a source involved with materials fabrication where the initial steps in the manufacturing of integrated circuits takes place; and, to construct/install new two-staged (venturi and packed-bed) scrubber systems, which will control acid emissions from various reactors and production systems, to replace the existing control systems and to allow for five additional reactor installations in the future.

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 application(s) 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:

C. Collins, C District
L. R. Hutker, P.E., HS

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 8-3-89.

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

8-3-89
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 consolidate multiple permits previously issued for Building No. 4, which is a source involved with materials fabrication where the initial steps in the manufacturing of integrated circuits take place; and, to construct/install new two-staged (venturi and packed-bed) scrubber systems, which will control acid emissions from various reactors and production systems, to replace the existing control systems and to allow for five additional reactor installations in the future. The proposed project will occur at the applicant's existing facility located on Palm Bay Road, City of Palm Bay, in Brevard 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 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;
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(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.

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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

Department of Environmental Regulation
Central District Office
3319 Maguire Blvd., Suite 232
Orlando, Florida 32803-3767

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

Harris Semiconductor
Brevard County
Palm Bay, Florida

Construction Permit Number:
AC 05-167757

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

August 3, 1989

I. Application

A. Applicant

Harris Semiconductor
Post Office Box 883
Melbourne, Florida 32901

B. Project and Location

The applicant has applied for a construction permit to consolidate multiple permits previously issued for Building No. 4, which is a source involved with materials fabrication where the initial steps in the manufacturing of integrated circuits take place; and, to construct/install new two-staged (venturi and packed-bed) scrubber systems, which will control acid emissions from various reactors and production systems, to replace the existing control systems and to allow for five additional reactor installations in the future.

The existing facility is located on Palm Bay Road, City of Palm Bay, Florida. The UTM coordinates are Zone 17, 538.7 km East and 3100.9 km North.

C. Process and Controls

1. Building 4

The primary manufacturing operations in Building 4 are materials fabrication where the initial steps in the manufacturing of integrated circuits take place. A variety of research and development experiements are performed under exhausted wet stations. Wet stations, water scrubbing units, bake ovens and spin rinse dryers are utilized for cleaning and drying of wafer surfaces. Exhausted chemical cabinets hold virgin chemicals until they are ready for use. In addition, several waste collection areas are also exhausted to control systems.

The source/building presently contains 31 exhausted wet stations. Approximately one-fifth of these house vats containing solvents. Three of these stations have heated solvent vats and three stations have covered solvent vats.

a. Epideposition and Polydeposition Reactor Scrubbers

The existing poly and epi reactor scrubber systems will be replaced with two-stage ejector venturi scrubber systems. Each reactor will have its own first-stage ejector venturi scrubber. After passing through an impingement section of the scrubber system, the gas will be forced through a liquid trap, combined with other scrubber gases, and fed to packed bed scrubbing units where second-stage scrubbing occurs. Each second stage unit will consist of an ejector venturi gas scrubber with a vertical packed bed.

The Tylan system, which is a support system to the poly reactors, will have its own dedicated first-stage scrubber system and will exhaust to a common second-stage unit as well.

Makeup water will be provided via a primary source, treated acid wastewater from Semiconductor's on-site wastewater treatment plant, and a secondary source, reclamation water from the Harris' groundwater remediation project. The water will be fed to closed top sumps that will provide the water supply to the scrubbers in the first stage, and to the packed bed scrubber sumps in the second stage. The water will be recirculated from the sumps to the individual venturi scrubbers in the first stage, and from the packed bed scrubber sumps to the venturi scrubbers in the second stage. Caustic will be automatically injected into the sumps in order to prevent solidfication of silane compounds. Scrubber sump blowdown water will be sent to Semiconductor's on-site wastewater treatment plant.

In addition to the poly and epi reactor scrubbers, other control equipment is employed to control emissions from process exhaust in Building 4. The following is a description of each of these exhaust systems:

F04S01 - Combined solvent/acid scrubber; services gas cabinets in HPM room as well as equipment in Tube Clean and Epi rooms. The gas cabinets are exhausted as a precautionary measure. Most of the contaminants entering this system would be a result of the cleaning operations under the exhausted hoods. It also provides purge line exhaust for the hydrogen chloride tube trailer outside of Building 4. When the hydrogen chloride lines are purged, the resulting pressure is relieved by venting the air to F04S01. The system also treats vent exhaust from the silicon tetrachloride ('sil-tet') storage area. In the sil-tet storage area, silicon tetrachloride is transferred from large drums to smaller drums for manufacturing use. The air displaced from the smaller drums is vented to F04S01. Air flow to the scrubber from both the HCl tube trailer and the sil-tet drums is manually controlled by valves.

F04S02 - Combined solvent/acid scrubber; services furnaces, wet stations, and process equipment in the Diffusion area.

F04S03 - Combined solvent/acid scrubber; services equipment in Backlap, Wet Chemistry, DI Grind, Electrochemistry, Polish, Final Screen, and Engineering lab areas.

F04S04 - Acid scrubber; services exhaust from equipment in Wet Chemistry, Diffusion, Electrochemistry/Polish, and Engineering lab areas.

F04S05 - Services the silicon tetrachloride storage area located outside of the building. The scrubber treats emissions that may occur in the storage confinement as a result of system leaks and/or spills. The unit is turned on as a precautionary measure for approximately one hour a day when silicon tetrachloride is being transferred from the large storage drum to smaller drums for manufacturing use.

F04S08 - Facilities I.D. number assigned to an exhaust fan (also referred to as fan No. F04E20), which provides exhaust to equipment in the Photoresist and Wet Chemistry areas.

In addition to the above mentioned systems, several fans are used to provide heat exhaust for process equipment (i.e., F04E07, F04E08 and F04E12, which exhaust heat generated from the Epi, Poly and Gemini reactors; and, F04E10, F04E12 and F04E27, which exhaust heat from diffusion furnaces). It should be noted that no chemically contaminated exhaust is contained in these heated air streams; in each case where contaminated exhaust exists, the exhaust is ducted through separate lines to wet scrubbers.

In addition, exhaust fans F04E18 and F04E23 handle process exhaust from wafer grinders.

2. General

A material balance scheme will be used to account for the annual VOC/solvent emissions released into the atmosphere by the building/source and facility. A program of sampling and analysis will be used to assess the VOC/solvent emissions from each building/source.

The Standard Industrial Classification Codes are:

- Major Group 36: Electrical and Electronic Machinery, Equipment, and Supplies
- Industry Group No. 367: Electronic Components and Accessories
- Industry No. 3674: Semiconductors and Related Devices

The Source Classification Codes are: Major Group 36 - Cold Solvent Cleaning/Stripping

- Building 4 4-01-003-99 Tons VOC/solvent consumed

II. Rule Applicability

The proposed project is subject to preconstruction review under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code (F.A.C.) Chapters 17-2 and 17-4.

The application package was deemed complete on June 2, 1989.

The existing facility is located in an area designated attainment for all pollutants.

Since the facility is not one of those contained in Table 500-1, F.A.C. Chapter 17-2, the VOC/solvent threshold for triggering new source review pursuant to F.A.C. Rule 17-2.500(5) is 250 TPY.

The following table presents the projected potential acid emissions from Building No. 4:

Table 1

Source	Potential Acid Emissions (TPY)
Building 4	
o F04S01	0.04
o F04S02	1.06
o F04S03	0.10
o F04S04	0.26
o F04S05	0.02
Total:	1.48

Note: o Annual hours of operation at 8760.
o The potential acid emissions from the proposed new epi and poly reactor scrubber systems are not included; to be quantified after installation through testing and analysis. The above also applies to the proposed new Tylan system scrubber system.

The following table presents the projected potential VOC/ solvent emissions from the entire facility:

Table 2

Building	Potential VOC/solvent Emissions (TPY)
4	10.96
51	33.29
54	95.65
57	1.66
58	3.24
59	0.50
60	trace
61	0.25
62	0.83
63	6.14
Total:	152.50

Note: Annual hours of operation at 8760.

Since the potential emissions are less than 250 TPY for the facility, the potential emissions projected from Building 4 will be reviewed pursuant to F.A.C. Rule 17-2.520, Sources Not Subject to Prevention of Significant Deterioration or Nonattainment Requirements.

Since there is no specific emission limiting standard contained in F.A.C. Rule 17-2.600 nor are there any standards of performance for new stationary sources contained in F.A.C. Rule 17-2.660, the source/Building 4 will be permitted in accordance with F.A.C. Rule 17-2.620, General Pollutant Emission Limiting Standards.

In F.A.C. Rule 17-2.620(1)(a), no person shall store, pump, handle, process, load, unload or use in any process or installation volatile organic compounds or organic solvents without applying known and existing vapor emission control devices or systems deemed necessary and ordered by the Department. Pursuant to F.A.C. Rule 17-2.620(2), no person shall cause, suffer, allow or permit the discharge of air pollutants which cause or contribute to an objectionable odor. Objectionable odor is defined as any odor present in the outdoor atmosphere which, by itself or in combination with other odors, is or may be harmful or injurious to human health or welfare, which unreasonably interferes with the comfortable use and enjoyment of life or property, or which creates a nuisance according to F.A.C. Rule 17-2.100(132).

The building operations/source is subject to the provisions of F.A.C. Rules 17-2.240: Circumvention; 17-2.250: Excess Emissions; and, 17-4.130: Plant Operation - Problems.

III. Summary of Emissions

A. Emission Limitations

The regulated pollutant emissions from this building/source are VOC/solvents in accordance with F.A.C. Rule 17-2.620.

Specific acid solutions are also being used during the manufacturing operations. There are no specific emission limiting standards for these specific acids. However, the acid vapors will be scrubbed to reduce emissions.

The following table presents the maximum allowable VOC/solvent emissions and the potential acid vapor emissions from Building 4 in TPY:

Table 3

Building	Maximum Allowable VOC/Solvent Emissions	Potential Acid Vapor Emissions
4	11.0	1.5

Note: o Annual hours of operation at 8760.
o Potential acid emissions to be revised after scrubber system installations (epi and poly reactors and Tylan system), testing and analysis.

The permitted emissions are in compliance with all requirements of F.A.C. Chapters 17-2 and 17-4.

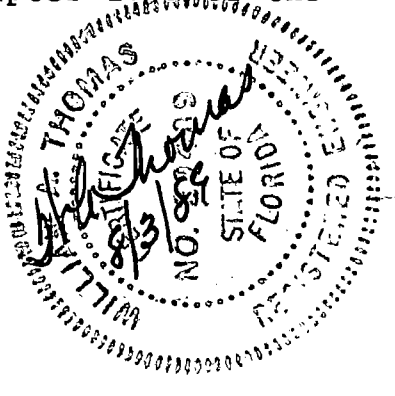
B. Air Quality Impacts

From the technical review of the application packages and supplementary material, an air quality analysis was not required.

V. Conclusion

A system of material balance and sampling/analysis will be used to account for and verify pollutant emissions from the facility and each building/source and their associated scrubber systems.

Based on the information provided by Harris Semiconductor, the Department has reasonable assurance that the consolidation of multiple permits previously issued for this source/building and the construction/installation of the new two-staged (venturi and packed-bed) scrubber systems, as described in this evaluation, and subject to the conditions proposed herein, will not cause or contribute to a violation of any air quality standard, PSD increment, or any other technical provision of Chapter 17-2 of the Florida Administrative Code.



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:
Harris Semiconductor
P. O. Box 883
Melbourne, FL 32901

Permit Number: AC 05-165757
Expiration Date: December 31, 1990
County: Brevard
Latitude/Longitude: 28°01'20"N
80°36'10"W
Project: Building 4

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 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:

For the permitting of Building 4, in order to consolidate multiple permits previously issued for this building/source and to allow the construction/installation of new two-staged (venturi and packed-bed) scrubber systems, which will remove acid emissions from various reactors and production systems, to replace the existing control systems and to allow for five additional reactor installations in the future.

- o F04S01: a Harrison 10,000 scfm horizontal cross-flow fume scrubber using polypropylene plastic saddle packing for acid gas and VOC/solvent vapor removal; Model No. HF-100;
- o F04S02: a Duall Ind. 6,900 cfm horizontal cross-flow fume scrubber using polypropylene packing for acid gas and VOC/solvent vapor removal; Model No. F-101;
- o F04S03: a Harrison 10,000 scfm horizontal cross-flow fume scrubber using polypropylene plastic saddle packing for acid gas and VOC/solvent vapor removal; Model No. HF-100;
- o F04S04: a 10,450 cfm fume scrubber for acid gas removal;
- o F04S05: a Beverly Pacific 1,000 scfm vertical counter-current fume scrubber using polypropylene packing for acid gas (sil-tet loading) removal; Model No. PS-2VT; and,
- o F04S06: Epi and poly reactor two-stage ejector venturi scrubber systems; also, a two-stage ejector venturi scrubber system to service the Tylan system: all to be updated once contracted, installed, tested and analyzed.

The building/source is located at the permittee's existing facility located on Palm Bay Road, in the City of Palm Bay. The UTM coordinates are Zone 17, 538.7 km East and 3100.9 km North.

The Source Classification Codes are: Major Group 36

o Cold Solvent Cleaning/ Stripping	4-01-003-99	Tons VOC/Solvent Consumed

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 to Construct Air Pollution Sources, DER Form 17-1.202(1), and Mr. L. R. Hutker's cover letter received June 2, 1989.
2. Ms. Nancy Baldisserotto's letter with attachment received July 17, 1989.
3. Technical Evaluation and Preliminary Determination dated August 3, 1989.

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth in this permit are "Permit Conditions" and are binding and enforceable pursuant to Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.

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. Neither 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 is not 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, or plant life, or property caused by the construction or operation of this

GENERAL CONDITIONS:

permitted source, or from penalties therefore; 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 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 and at a reasonable time, access to the premises, where the permitted activity is located or conducted to:

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

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

c. Sample or monitor 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 provide the Department with the following information:

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

b. the period of noncompliance, including 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 for 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 involving the permitted source arising under the Florida Statutes or Department rules, except where such use is proscribed by Sections 403.73 and 403.111, Florida Statutes. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

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 17-4.120 and 17-30.300, F.A.C., 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 or a copy thereof shall be kept at the work site of the permitted activity.

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:

a. Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.

GENERAL CONDITIONS:

b. The permittee shall hold 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) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained 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 dates 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 corrected promptly.

SPECIFIC CONDITIONS:

1. The maximum allowable VOC/solvent emissions from Building No. 4 shall be 11.0 tons per year.

2. The VOC/solvent vapor and acid gas exhaust scrubbers must be on during the working hours.

3. Permitted hours of operation are 8760.

4. Objectionable odors shall not be allowed off plant property pursuant to F.A.C. Rule 17-2.620(2).

5. An inspection and maintenance plan shall be submitted to the DER's Central Florida District office as part of the operating permit application. The plan shall include provisions for the prevention and correction of VOC/solvent losses from leaks and equipment malfunctions.

SPECIFIC CONDITION:

6. By March 31 of each calendar year, an annual operating report shall be submitted to the DER's Central Florida District office demonstrating compliance with the VOC/solvent emissions limit for Building No. 4. The emissions shall be determined by a material balance scheme, verifiable on a monthly basis, and shall include the following:

a) a beginning inventory of full containers, cylinders and storage tanks at the beginning of each calendar year;

b) plus all purchased deliveries after the beginning inventory (verifiable by invoices);

c) minus all quantities picked-up and shipped-off the premise after the beginning inventory (verifiable by invoices);

d) minus all quantities deep well injected during the calendar year, justified by assumptions and established scrubber efficiencies; and,

e) minus an ending inventory of full containers, cylinders, and storage tanks; and, should occur at the beginning of the following calendar year.

7. Each scrubber system's efficiency and potential VOC/solvent emissions shall be established by a sampling and analysis program, which includes:

a) a sample shall be taken annually from each scrubber stack and analyzed using EPA Reference Method 25 or, with Department approval, EPA Reference Method 25A, 40 CFR 60, Appendix A;

b) the DER's Central Florida District office shall receive at least 15 days notice in writing prior to sampling; and,

c) the report, summarizing the sampling results, shall be submitted to the DER's Central Florida District office within 45 days after the last test run is completed.

8. This permit will supercede all other permits previously issued on this source/Building No. 4.

9. The source/Building No. 4 is subject to all applicable provisions of F.A.C. Chapters 17-2 and 17-4.

10. Projected potential acid emissions are 1.5 TPY (to be amended after testing and analyses have been performed on the new scrubber systems for the epi and poly reactors and Tylan system).

PERMITTEE:
Harris Semiconductor

Permit Number: AC 05-165757
Expiration Date: December 31, 1990

SPECIFIC CONDITIONS:

11. Building No. 4 is subject to the provisions of F.A.C. Rules 17-2.240: Circumvention; 17-2.250: Excess Emissions; and, 17-4.130: Plant Operation - Problems.

12. Any modification pursuant to F.A.C. Rule 17-2.100(119), Modification, shall be submitted to the DER's Central Florida District office and the Bureau of Air Quality Management office for approval.

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

14. An application for an operation permit must be submitted to the Central District office at least 90 days prior to the expiration date of this construction permit or within 45 days after completion of compliance testing, whichever comes first. To properly apply for an operation permit, the applicant shall submit the appropriate application form, fee, 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 _____, 1989

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

_____
Dale Twachtmann, Secretary

7-14-89
Palm Bay, FL

file copy

HARRIS

July 14, 1989

Mr. Bruce Mitchell
Engineer
Bureau of Air Quality Management
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Subject: Bldg. 4 Consolidated Air Permit Application
Pending FDER Permit No. AC 05-165757
HARRIS SEMICONDUCTOR

Dear Mr. Mitchell:

This memo is in response to our phone conversation on July 13th, during which you requested clarification on the number of scrubber systems that are proposed to be installed as part of Semiconductor's epi/poly scrubber upgrade project. You may find it helpful to refer to Table 1 while reviewing the following information.

Current plans are to replace all existing epi and poly scrubbers with new venturis. As was previously the case, each reactor will have it's own dedicated scrubber, with epi reactors #08, #10 and #11 each being serviced by two. (This is because each of these three reactors operate at atmospheric and reduced pressure; the atmospheric reactor vents must be kept separate from the vacuum vents.) The Tylan system will have its own venturi scrubber as well. In addition, 5 venturi scrubbers will be installed for future reactor installations. These plans call for the installation of 34 venturi scrubbers. With the exception of the Tylan system scrubber, all first-stage exhaust will then be ducted to one of two packed bed scrubbers for second stage treatment. Five sumps are proposed to provide the gaseous/liquid interface for the first stage scrubbers.

The design engineering phase of this project is currently 30% complete. If you have any further questions, please feel free to call me at (401) 729-4061.

RECEIVED
JUL 17 1989
DER - BAQM

Sincerely,

Nancy Baldisserotto

Nancy Baldisserotto
Environmental Engineer

cc: C. Collins
CHF/13T

HARRIS SEMICONDUCTOR
PROPOSED SCRUBBER SYSTEMS
FOR EPI & POLY REACTORS
AND TYLAN SYSTEM

EPI/POLY REACTOR #	NEW FIRST STAGE VENTURI #	NEW SECOND STAGE SCRUBBER
POLY #01	P-01	
POLY #02	P-02	
POLY #03	P-03	
POLY #04	P-04	
POLY #05	P-05	
POLY #06	P-06	
POLY #07	P-07	PACKED BED
POLY #08	P-08	SCRUBBER #1
POLY #09	P-09	
POLY #10	P-10	
POLY #11	P-11	
POLY #12	P-12	
POLY #13	P-13	
FUTURE POLY	P-14	
EPI #01	E-01	
EPI #02	E-02	
EPI #03	E-03	
EPI #04	E-04	
EPI #05	E-05	
EPI #06	E-06	
EPI #07	E-07	
EPI #08 ATM	E-08	PACKED BED
EPI #08 RP	E-09	SCRUBBER #2
EPI #09	E-10	
EPI #10 ATM	E-11	
EPI #10 RP	E-12	
EPI #11 ATM	E-13	
EPI #11 RP	E-14	
EPI #12	E-15	
FUTURE EPI ATM	E-16	
FUTURE EPI RP	E-17	
FUTURE EPI ATM	E-18	
FUTURE EPI RP	E-19	
TYLAN SYSTEM	TYL-1	

HARRIS

May 30, 1989

Mr. C. H. Fancy
Deputy Bureau Chief
Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Florida 32301

Reference: HARRIS SEMICONDUCTOR
B-04 Consolidated Air Permit

Dear Mr. Fancy:

On February 17, 1988, representatives from Harris and the Florida DER met in Orlando to discuss the status of air permits at Harris Semiconductor's facility in Palm Bay. At that meeting it was agreed that Harris would submit modified air permits. The purpose of the permit modifications was as follows:

1. Consolidate permits on a by building basis to reduce the existing number of permits.

2. To accurately quantify the current air emissions.

Enclosed is the modified permit application for Semiconductor's Building 4.

If you should have any questions about the enclosed information, please feel free to contact me at (407) 724-7229.

Sincerely,

L. R. Hutker

L. R. Hutker, Director
Facilities Department

/nab

cc: A. T. Sawicki
L. R. Hutker
D. R. Erdley
R. R. Sands

1031

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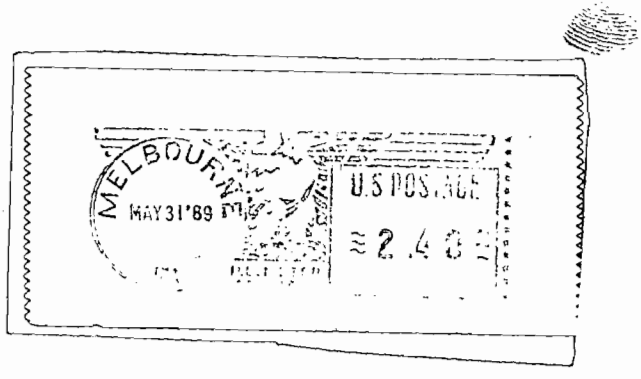

HARRIS

N. A. Baldisserotto, MS59-006

Mr. C. H. Fancy
Deputy Bureau Chief
Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Florida 32301

HARRIS CORPORATION, SEMICONDUCTOR SECTOR, P.O. Box 883, Melbourne, Florida 32901

M80

HARRIS

HARRIS CORPORATION
SEMICONDUCTOR SECTOR

THE FIRST NATIONAL BANK OF ATLANTA
AUGUSTA, GEORGIA

64-1327
611

059532

DATE	CHECK NO	NET AMOUNT
05/26/89	00059532	********200.00

PAY

TWO HUNDRED AND 00/100 DOLLARS

TO THE ORDER OF

DEPARTMENT OF ENVIRONMENTAL REGULATION
BUREAU OF AIR QUALITY MANAGE
2600 BLAIR STONE RD
TALLAHASSE, FL 32301

HARRIS CORPORATION
SEMICONDUCTOR SECTOR

Nancy Baldussero

COUNTERSIGNED

AUTHORIZED SIGNATURE

[redacted]

Reference: HARRIS SEMICONDUCTOR
B-04 Consolidated Air Permit

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1. Consolidate permits on a by building basis to reduce the existing number of permits.

2. To accurately quantify the current air emissions.

Enclosed is the modified permit application for Semiconductor's Building 4.

If you should have any questions about the enclosed information, please feel free to contact me at (407) 724-7229.

Sincerely,

L. R. Hutker

L. R. Hutker, Director
Facilities Department

/nab

cc: A. T. Sawicki
L. R. Hutker
D. R. Erdley
R. R. Sands

1081

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DEPARTMENT OF ENVIRONMENTAL REGULATION

$200 pd. 6-2-89 Receipt #11762

AC05-165757

WIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Stationary [ ] New[1] [X] Existing[1]

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

COMPANY NAME: Harris Semiconductor COUNTY: Brevard

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) Building 4 Materials Fab

SOURCE LOCATION: Street Palm Bay Road City Palm Bay

UTM: East 17-538700 North 17-3100900

Latitude 28 ° 01 ' 20 "N Longitude 80 ° 36 ' 10 "W

APPLICANT NAME AND TITLE: Lawrence R. Hutker; Director, Facilities Department

APPLICANT ADDRESS: P.O. Box 883, Melbourne, Fl 32901

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Harris Semiconductor

I certify that the statements made in this application for a modified 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: L. R. Hutker

L. R. Hutker, Director, Facilities Dept.
Name and Title (Please Type)

Date: _____ Telephone No. (407) 724-7229

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 Lawrence R. Hutker

Lawrence R. Hutker
Name (Please Type)

Harris Semiconductor
Company Name (Please Type)

P.O. Box 883, Melbourne, Florida 32901
Mailing Address (Please Type)

Florida Registration No. 35972 Date: _____ Telephone No. (407) 724-7229

SECTION II: GENERAL PROJECT INFORMATION

1. 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.

This is a modification and consolidation of existing air permits.

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

Start of Construction N/A Completion of Construction _____

3. 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.)

N/A

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

See insert One.

INSERT ONE.

LIST OF PREVIOUS FDER AIR PERMITS FOR BUILDING 4

PERMIT NO.	ISSUED	EXPIRES
AC 05-104524	1/15/86	6/30/86
AC 05-104525	1/15/86	6/30/86
AO 05-109845	11/05/85	cancelled
AO 05-109846	11/05/85	10/30/90
AO 05-109850	11/05/85	10/30/90
AO 05-109852	11/05/85	10/30/90
AO 05-115803	5/20/86	5/22/91
AO 05-121934	9/16/86	9/14/91

E. Requested permitted equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 52

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

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

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

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

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

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

2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. No

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

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

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

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

   a. If yes, for what pollutants?_____

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

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

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

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

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

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

1. Total Process Input Rate (lbs/hr): not applicable

2. Product Weight (lbs/hr): not applicable

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	
---SEE ATTACHMENT B ----							

[1]See Section V, Item 2.

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

[3]Calculated from operating rate and applicable standard.

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

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

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

E. Fuels

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.

Annual Average _____ Maximum _____

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

Waste water from air scrubbers is discharged to on-site Waste Water Treatment Plant--discharge to deepwell under UIC - Permit #UC05-126519.

--------SEE ATTACHMENT D--------

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 Diameter: _____ 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

Please provide the following supplements where required for this application.

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

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

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

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

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

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

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

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

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

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

SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY

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

[ ] Yes [ ] 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 operat 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 procees chemicals:

j. Applicability to manufacturing processes:

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

F. Describe the control technology selected:

1. Control Device:

2. Efficiency:[1]

3. Capital Cost:

4. Useful Life:

5. Operating Cost:

6. Energy:[2]

7. Maintenance Cost:

8. Manufacturer:

9. Other locations where employed on similar processes:

a. (1) Company:

(2) Mailing Address:

(3) City:

(4) State:

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

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

b. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

10. Reason for selection and description of systems:

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

SECTION VII - PREVENTION OF SIGNIFICANT DETERIORATION

A. Company Monitored Data

1. _____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.

HARRIS SEMICONDUCTOR

AIR PERMIT -- BUILDING 4

ATTACHMENT A

PROCESS DESCRIPTION

BUILDING 4 CONSOLIDATED AIR PERMIT

PROCESS DESCRIPTION

Building 4 is the materials fabrication building for Palm Bay Harris Semiconductor. It is in this building that the initial steps in the manufacturing of integrated circuits take place. The following narrative denotes the different processes and equipment employed.

Single crystal silicon slices undergo silicon and dopant deposition under high temperatures in epideposition ('epi'), polydeposition ('poly'), and Gemini reactors. Hydrogen acts as a reducing agent, promoting a reaction with the chlorinated silane gases introduced into the sealed reactor chamber. This results in the deposition of a layer of silicon on the wafer surface. Dopant gases may be introduced into the system at the time of this reaction. These dopants become embedded in the crystalline lattice of the wafer surface and modify it's electrical resistivity. Controlled concentrations of trichlorosilane are dispensed to the poly reactors by the Tylan system. Trichlorosilane is dispensed from a pressurized tank to a one of two bubbler tanks, where hydrogen is saturated with trichlorosilane; the saturated trichlorosilane is then sent to a concentration control panel, where hydrogen is used to trim the concentration for use in the reactors.

Batch processing in high-temperature diffusion furnaces takes place in order to grow a thin layer of oxide on each slice (or 'wafer.') Tube clean units clean the glass boats that hold the wafers when they are being oxidized. Photolithography techniques are used to form patterns on the slices. Coaters spin a thin layer of "photoresist" on the wafer; the circuit pattern is projected onto the wafers via "alligners", and developers are then used to remove unpolymerized areas of photoresist. Wafer surfaces are chemically etched in order to remove layers of silicon dioxide, silicon nitride, and polysilicon. The wet chemical etching solutions are contained in open-surface dip tanks within exhausted wet stations. Electrochemical etchers are also employed to etch silicon surfaces. Chemical baths are used to strip photoresist off the wafer. Wafers are physically ground to a desired thickness in grinders and sanders. Polishers are used to burnish product surfaces. Glassware and reactor parts are rinsed in hooded wet stations. The building contains areas dedicated to the storage of process gas cylinders in specially designed and monitored gas cabinets. A variety of research and development experiments are performed under exhausted wet stations. Throughout the building, wet stations, wafer scrubbing units, bake ovens and spin rinse dryers are utilized for cleaning and drying of wafer surfaces. Chemical cabinets safely hold virgin chemicals until they are ready for use. In addition, several waste collection areas are exhausted.

The building presently contains 31 exhausted wet stations; approximately one-fifth of these house vats containing solvents. Three of these stations are known to have heated solvent vats, and three stations have covered solvent vats.

EPIDEPOSITION & POLYDEPOSITION REACTOR SCRUBBERS

As previously mentioned, the materials fabrication area employs poly reactors and epi reactors in order to deposit silicon and dopants on the wafer surfaces. The effluent gases from these units are presently vented to water scrubbing systems residing on the roof of building 4 (see attachment E. for scrubber locations.)

The current scrubbers are a simple spray-type design; the water feed to the scrubbers is treated groundwater supplied from Harris's groundwater reuse project. The pH of this water is neutral (approximately 7.) Wastewater from the scrubbers is piped to sump T-101 which discharges to Semiconductor's on-site wastewater treatment plant.

Harris Semiconductor is presently planning to replace the existing epideposition and polydeposition scrubber systems in order to reduce maintenance labor and improve effluent contaminant treatment efficiency (see figure 3.2 for project schedule.)

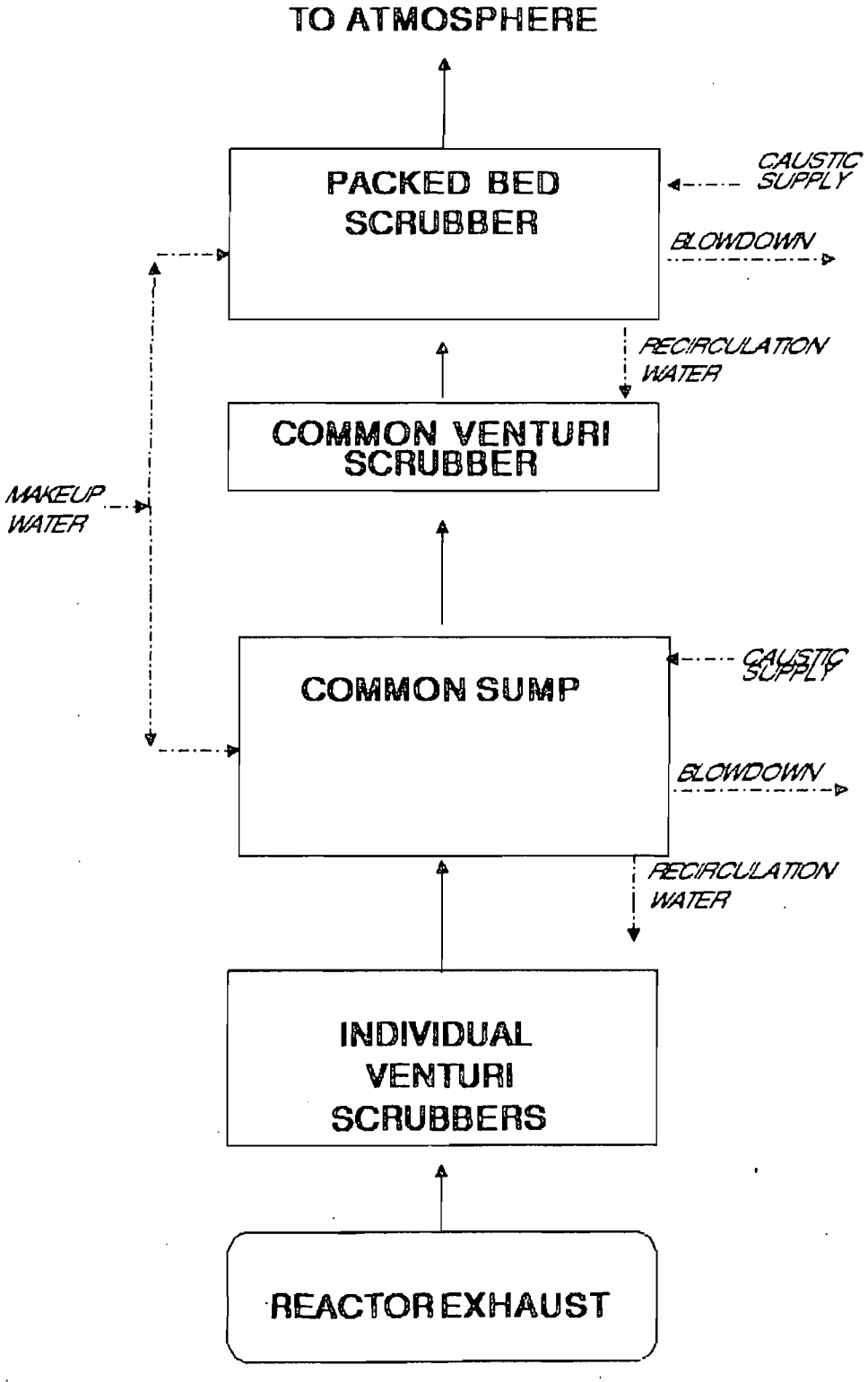
During April of 1989, an engineering firm examined the reactors' exhaust treatment requirements, and developed a customized scrubber system design for the reactor process exhaust (see process flow chart on the following page.) The suggested location for the scrubbing units is the northeast ground outside building 4 (see proposed location map in attachment E.)

In the proposed design, each reactor exhaust connects to an individual first-stage ejector venturi gas scrubber in a two-stage scrubbing system. Exhaust is drawn into the scrubber body by a high-velocity spray. This gas/liquid mixture then passes into the impingement section of the scrubber system. From there, the gas is forced through a liquid trap, combined, and fed to packed bed scrubbing units where second-stage scrubbing occurs. Each second-stage unit consists of an ejector venturi gas scrubber that draws the gas streams in and forces them out through a vertical packed bed. The exhaust from the bed is fed to the outlet of a scrubber unit and is discharged to atmosphere. The Tylan system feeds its own dedicated first-stage scrubber which exhausts to a common second-stage unit as well.

Makeup water will be provided via a primary source, treated acid wastewater from Semiconductor's on-site wastewater treatment plant, and a secondary source, reclamation water from the Harris's groundwater remediation project. The water will be fed to closed top sumps that will provide the water supply to the scrubbers in the first stage, and to the packed bed scrubber sumps in the second stage. The water will be recirculated from the sumps to the individual venturi scrubbers in the first stage, and from the packed bed scrubber sumps to the venturi scrubbers in the second stage. Caustic will be automatically injected into the sumps in order to prevent solidification of silane compounds. Scrubber sump blowdown water will be sent to Semiconductor's on-site wastewater treatment plant.

PROCESS FLOW DIAGRAM

PROPOSED EPI/POLY SCRUBBER SYSTEM



The following table identifies the estimated costs of Semiconductor's reactor scrubber replacement project:

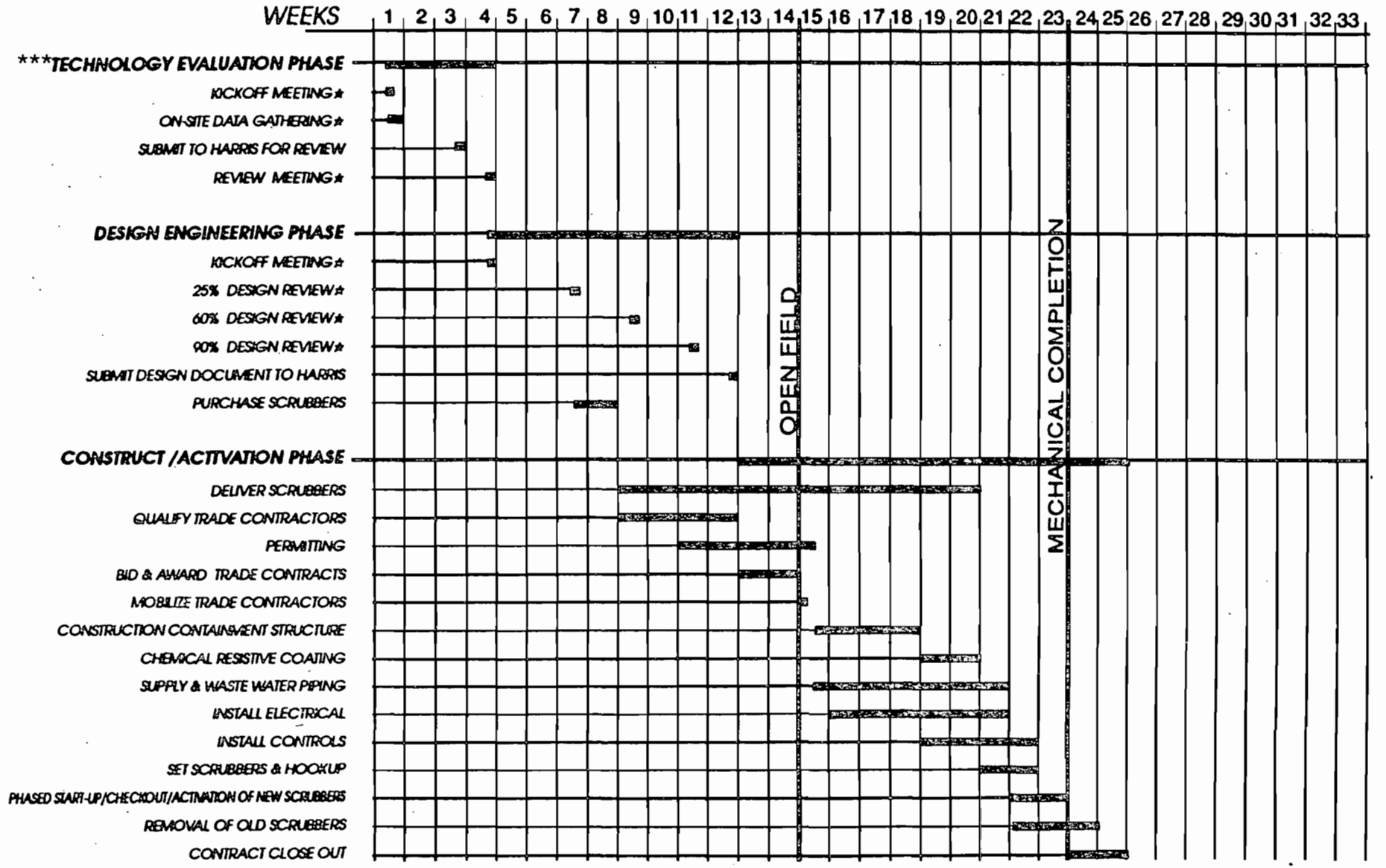
1. Technology Evaluation Phase (now complete).....$22,000.00*

2. Design Engineering Phase.....$74,000.00*

3. Construct/activation Phase.....$650,000.00**

* Capital money approved.

** Pending capital approval.



PRELIMINARY PROJECT SCHEDULE

HARRIS CORPORATION
REACTOR SCRUBBER SYSTEM REPLACEMENT
Melbourne, Florida

★ IN MELBOURNE, FLORIDA

*** NOW COMPLETE

FIGURE 3-2

EXHAUST SYSTEMS (CONTINUED)

In addition to the poly and epi reactor scrubbers, the following equipment is employed to control emissions from process exhaust in building 4 (see attachment E. for locations, and attachment D. for control equipment information.) The following is a description of each of these exhaust systems. Additional information on the units is contained in attachment D.

F04S01 - Combined solvent/acid scrubber; services gas cabinets in HPM room as well as equipment in Tube Clean and Epi rooms. The gas cabinets are exhausted as a precautionary measure. Most of the contaminants entering this system would be a result of the cleaning operations under the exhausted hoods. Also provides purge line exhaust for the hydrogen chloride tube trailer outside of building 4. When the hydrogen chloride lines are purged, the resulting pressure is relieved by venting the air to F04S01. The system also treats vent exhaust from the silicon tetrachloride ('sil-tet') storage area. In the sil-tet storage area, silicon tetrachloride is transferred from large drums to smaller drums for manufacturing use. The air displaced from the smaller drums is vented to F04S01. Air flow to the scrubber from both the HCl tube trailer and the sil-tet drums is manually controlled by valves.

F04S02 - Combined solvent/acid scrubber; services furnaces, wet stations, and process equipment in the Diffusion area.

F04S03 - Combined solvent/acid scrubber; services equipment in Backlap, Wet Chemistry, DI Grind, Electrochemistry, Polish, Final Screen, and Engineering lab areas.

F04S04 - Acid scrubber; services exhaust from equipment in Wet Chemistry, Diffusion, Electrochemistry/Polish, and Engineering Lab areas.

F04S05 - Services the silicon tetrachloride storage area located outside of the building. The scrubber treats emissions that may occur in the storage confinement as a result of system leaks and/or spills. The unit is turned on as a precautionary measure for approximately one hour a day when silicon tetrachloride is being transferred from the large storage drum to smaller drums for manufacturing use. Emissions were detected as hydrogen chloride due to the presence of the chloride ion.

F04S08 - Facilities I.D. number assigned to an exhaust fan (also referred to as fan no. F04E20) which provides exhaust to equipment in the Photoresist and Wet Chemistry areas.

In addition to the above mentioned systems, several fans are used to provide heat exhaust for process equipment. Examples of this are fan nos. F04E07, F04E08, and F04E12 which exhaust heat generated from the Epi, Poly and Gemini reactors, and fan no. F04E10, F04E12, and F04E27 that exhaust heat from diffusion furnaces. It should be noted that the no chemically contaminated exhaust is contained in these heated air streams; in each case, contaminated exhaust is ducted through separate lines to wet scrubbers.

In addition, exhaust fans F04E18 and F04E23 handle process exhaust from wafer grinders.

HARRIS SEMICONDUCTOR

AIR PERMIT - BUILDING 4

ATTACHMENT B

AIR EMISSIONS

SOLVENT MONITORING--BUILDING 4

Monitoring work was performed on the building 4 scrubber systems F04S01, F04S02, F04S03 and F04S08 during December of 1986 and August of 1987. Tests conducted include EPA methods 25A (flame ionization detection) and TO-1 (Tenax adsorption and GC/MS analysis.) The results of the testing is included in this application.

FID test results revealed that total accumulative monitored VOC emissions for the building were 10.96 tons/year expressed as propane. This figure is based on a hypothetical production schedule of 8760 hours a year. The following assumptions were made regarding monitoring work on this building:

-VOC values refer to all organic emissions including organic solvents.

-All data was corrected for 2 ppm background noise that is normally present in the ambient air.

-The F.I.D. accumulative emission figure is based on the maximum concentration of VOC's observed during the monitoring time frame.

EPA METHOD 25-A (F.I.D. ANALYSIS) BUILDING 04
VOC EMISSIONS DURING FULL PRODUCTION

TEST DATE	SCRUBBER #	PRODUCTN SCHEDULE (HRS/YR)	VOC EMISSIONS (TON/YR)
12/20/86	F04S01	8760	0.26
11/20/87	F04S02	8760	min
12/21/86	F04S03	8760	1.93
11/21/87	F04S08	8760	8.77

TOTAL PROJECTED VOC EMISSIONS FOR BUILDING 04 = 10.96 TONS/YEAR

EPA METHOD TO-1: GC/MASS SPEC ANALYSIS OF SCRUBBER EMISSIONS
NOVEMBER RESULTS-BUILDING 4

	F04S02	F04S08
ACETONE (LB/HR)	---	---
XYLENES (LB/HR)	---	0.50
ETHYL BENZENE (LB/HR)	---	0.08
1,2-DICHLOROBENZENE (LB/HR)	---	---
1,1-DICHLOROETHENE (LB/HR)	---	---
TETRACHLOROETHENE (LB/HR)	---	---
1,1,1-TRICHLOROETHANE (LB/HR)	---	---

ACID MONITORING--BUILDING 4

Monitoring was performed on the building 4 scrubber systems F04S01, F04S02, F04S03, F04S04, and F04S05 in December of 1988. Samples were collected using modified EPA method 8 sampling train. The impinger medium consisted of a 0.1 N sodium hydroxide solution. The analytical methodology utilized to determine the ions of highest concentration is as follows:

Chloride ion--EPA Method 325.3
Fluoride ion--EPA Method 340.2
Nitrate, phosphite, and sulfate ions--ion chromatography

All results were in pounds per hour as "X", where "X" represents the acid compound present in highest concentration.

The test results revealed that the total accumulative monitored acid emissions for the building were 1.476 tons/year expressed as hydrochloric, hydrofluoric, nitric, phosphoric and sulfuric acids. This figure is based on a hypothetical production schedule of 8760 hours a year. The monitoring was performed over an 8 hour time interval when the full production was occurring.

When a resulting acid concentration was expressed as a "less than 'y' " value, where 'y' represents the lowest detectable limit possible using the analytical methodology employed, acid emissions were taken to be equal to this 'y' limit value.

RESULTS OF ACID MONITORING--BUILDING 4

PERFORMED ON SCRUBBER OUTLET
IN DECEMBER OF 1988

Scrub #		HCl	HF	Nitric Acid	Phosphoric Acid	Sulfuric Acid	TOTAL (TON/YR)
F04S01	(LB/HR)	0.002	0.001	0.002	0.004	0.001	
	(TON/YR)	0.009	0.004	0.009	0.018	0.004	0.044
F04S02	(LB/HR)	0.18	0.038	0.005	0.015	0.003	
	(TON/YR)	0.788	0.166	0.022	0.066	0.013	1.056
F04S03	(LB/HR)	0.011	0.003	0.002	0.006	0.001	
	(TON/YR)	0.048	0.013	0.009	0.026	0.004	0.101
F04S04	(LB/HR)	0.042	0.004	0.003	0.008	0.002	
	(TON/YR)	0.184	0.018	0.013	0.035	0.009	0.258
F04S05	(LB/HR)	0.0040	N/A	N/A	N/A	N/A	
	(TON/YR)	0.018	0.000	0.000	0.000	0.000	0.018
							1.476

TOTAL EMISSIONS FROM SCRUBBER OUTLETS = 1.476 TONS/YEAR

HARRIS SEMICONDUCTOR

AIR PERMIT - - BUILDING 4

ATTACHMENT C

RAW MATERIALS AND CHEMICALS

HARRIS SEMICONDUCTOR

BUILDING 04
PROCESS CHEMICALS

2-methyl-4-isothiazolin-3-one
5-chloro-2-methyl-4
acetic acid
ammonium bifluoride
ammonium fluoride
ammonium hydroxide
ammonium persulfate
ammonium titrate
antioxident
bis-(tributyltin) oxide
calcium hypochlorite
cation exchange polymer
chromic acid
chromium trioxide
cupric nitrate
cupric sulfate
cyclized polyisoprene
diatomaceous earth
dichlorodifluoromethane
diethanolamine
ethylenediamine tetraacetic acid disodium sal
ferric chloride
glycol
graphite
hydrochloric acid
hydrofinished paraffinic petroleum oil
hydrofluoric acid
hydrogen peroxide
hydroquinone
inorganic acid
isoparaffinic hydrocarbons
lanthanum chloride
lead
lithium compound
mercury
monoethanolamine
morpholine
nitric acid
n-alkyl dimethyl benzyl ammonium chloride
paraffinic petroleum oil
parrafinic grease
phosphoric acid
photoactive compound
poly (methyl methacrylate)
polystyrene sulfonic acid
potassium chloride
potassium hydrate
polyglycol

(CONTINUED)

BUILDING 04 PROCESS CHEMICALS (CONT.)

potassium hydroxide
potassium monobasic phosphate
potassium monochloride
potassium silicate
resin
silicon
silicon dioxide
silicon tetrachloride
sodium bicarbonate
sodium dibasic phosphate
sodium hydroxide
sodium hypochlorite
sodium metasilicate
sodium molydate
sodium tetraborate
sulfuric acid
surfactant
synthetic rubber
terpene resin
tetramethyl ammonium hydroxide
thymol
trichlorosilane
trichlorotrifluoroethane
trisodium phosphate
white oil

HARRIS SEMICONDUCTOR

BUILDING 04
PROCESS GASES

acetylene
argon
arsine
boron tribromide
carbon dioxide
diborane
dichlorosilane
freon 11
helium
hydrogen
hydrogen chloride
nitrogen
oxygen
phosphine
propane
trichlorosilane

HARRIS SEMICONDUCTOR

BUILDING 04
SOLVENTS

1,1,1 trichloroethane
2-butanone
5-methyl-2-hexanone
acetone
ammonia
aromatic bisazide
butyl propanol
cellosolve acetate
cyclohexane
cyclopentanone
diacetone alcohol
dimethyl ether propellant
diodomethane
ethyl 3-ethoxyproprionate
ethyl alcohol
ethyl cyanoacrylate
ethylbenzene
ethylene glycol monobutyl ether
hexane
HMDS
isobutane
isopropanol
melamine resin
methyl alcohol
methyl ethyl ketone
methyl methacrylate
novalak resin
n-butyl acetate
n-butyl alcohol
n-hexane
n-methyl pyrrolidone
n-methyl-2-pyrrolidone
organic resin
oxtylphenol polyethoxylate
polytetrafluoroethylene
propylene glycol
propylene glycol monomethyl ether
propylene glycol monomethyl ether acetate
stoddard solvent
trichlorotrifluoroethane
xylene

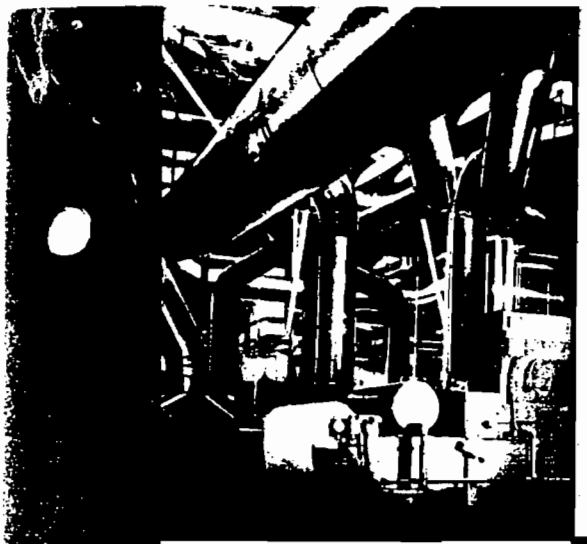
HARRIS SEMICONDUCTOR

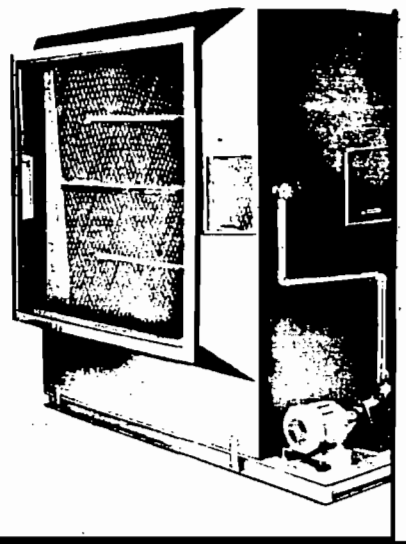
AIR PERMIT - - BUILDING 4

ATTACHMENT D

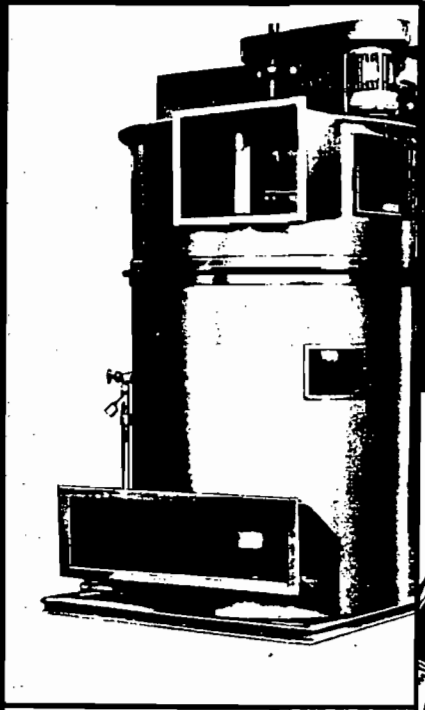
CONTROL EQUIPMENT

704 S02





MEET YOUR
POLLUTION CONTROL
REQUIREMENTS
WITH THE LEADER IN
PVC FABRICATIONS



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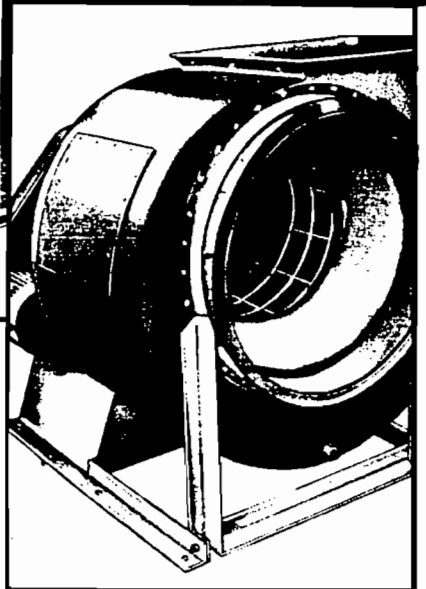
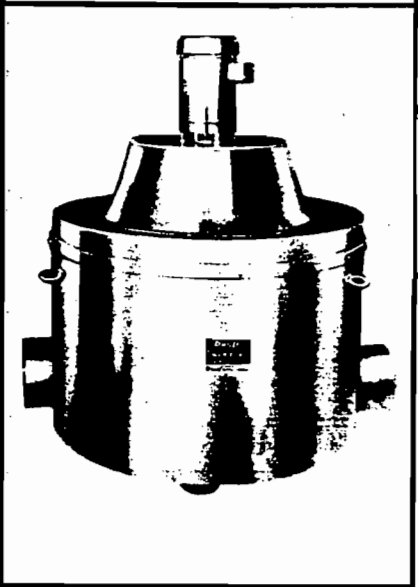
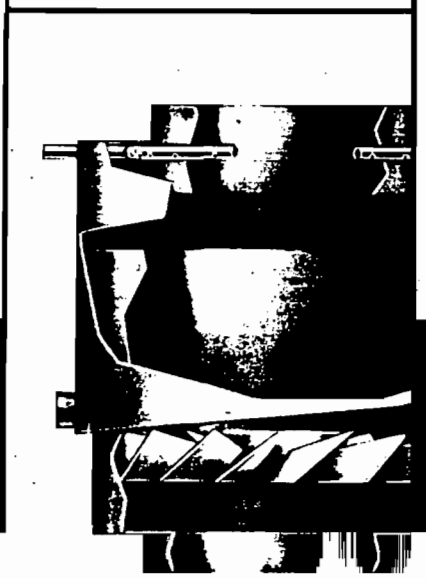


CONTROLLED ENVIRONMENTS FOR INDUSTRY
P. O. BOX 10428 – 904/396-7733
JACKSONVILLE, FLORIDA 32247-0428
DANIEL J. KLOS



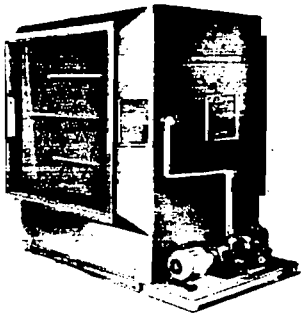
PVC CONSTRUCTED
FUME SCRUBBERS
CENTRIFUGAL FANS
DUCTING and HOODS
OIL MIST COLLECTORS
COMPLETE SYSTEMS



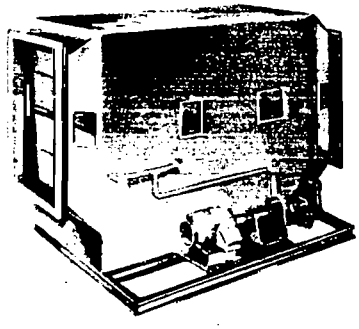
Duall
INDUSTRIES, INC.
700 S. McMillan Street • Owosso, Michigan 48867

Duall Fume Scrubbers in 6 Types

F-101 SERIES



Single Pack



Double Pack

Duall Single Pack (four Stage) Fume Scrubbers solve most industrial air pollution problems. They are especially effective on water soluble fumes and odors, or with pH control on many low soluble contaminants.

Some typical proven applications are:
- Acid fumes.
- Plating fumes.
- Cleaning fumes.
- Lab hood fumes.
- Anodizing fumes.
- Pickling fumes.
- Rust-proofing fumes.
- Die-casting fumes.
- Water soluble odors.

Duall Single Pack Fume Scrubbers incorporate these advantages:
- Low cost.
- Low maintenance.
- Low water consumption.
- Low static pressure drop.
- 100% corrosion resistant.

Duall Double Pack (six stage) Fume Scrubbers offer the broadest range of answers to industrial air pollution problems. By double scrubbing the air these scrubbers provide maximum efficiency on tough fumes and odors which can not be completely absorbed in a single pack type scrubber.

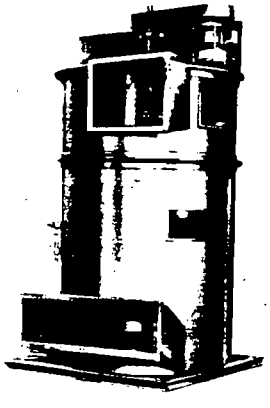
Duall's Double Pack Scrubbers have proven effective on the following typical applications:
- Bright dip fumes.
- Strip tank fumes.
- Etching fumes.
- Most low solubility fumes and odors.

Our Double Pack Fume Scrubbers offer all the advantages of the Single Pack units as well as the broadest range of applications.

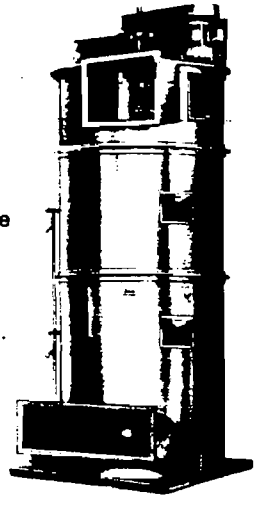
All Duall Fume Scrubbers can be modified for custom installation with multiple packs or extended depth packs. Multiple modular units are available for capacities larger than standard.

See page 6 for complete specs and performance data.

FW-300 SERIES

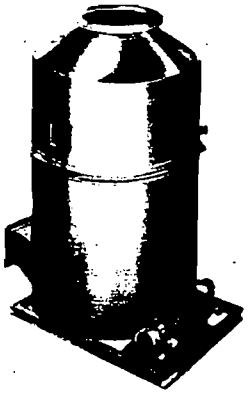


Single Pack

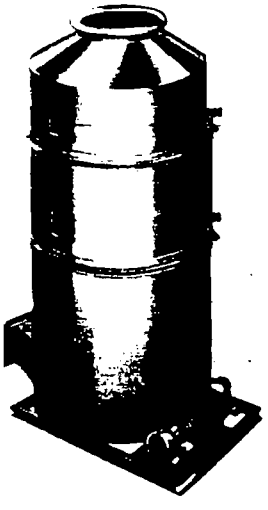


Double Pack

PT-500 SERIES

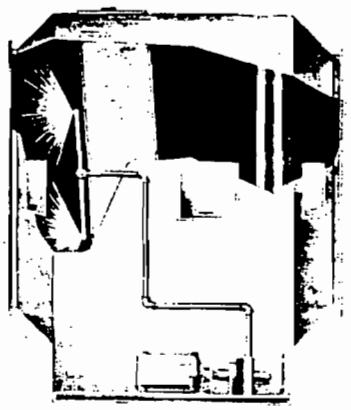


Single Pack



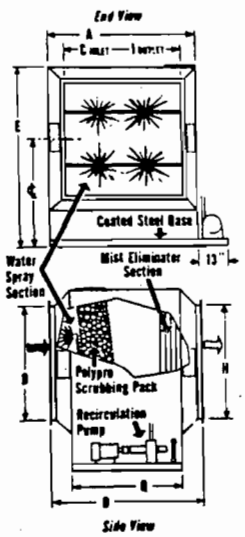
Double Pack

F-101 HORIZONTAL SINGLE FILTER PACK

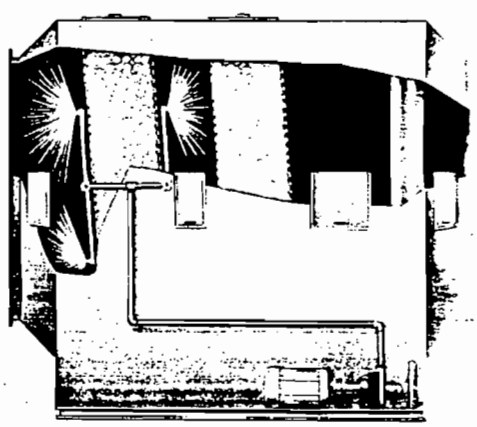


Being our most popular scrubber design, this compact 100% corrosion resistant P.V.C. unit has proven its efficiency nationwide. The Duall F-101 incorporates high efficiency, low maintenance filter media and the open orifice type spray nozzles, for the assurance of a thoroughly saturated collection chamber. Our mist eliminator outlet section gives four air direction changes to properly remove the entrained moisture. Where a horizontal installation is preferred, the F-101 should be your choice.

CFM in 000's	DIMENSIONS IN INCHES A	B	C	D	E	H	I	Q	℄	CFM in 000's	A	B	C	D	E	H	I	Q	℄
0.5	18	10	10	49	30	10	10	37	21	20	88	61	72	66	87	61	72	46	52½
1	22	14	14	50	34	14	14	38	23	22	97	61	81	66	87	61	81	46	52½
2	28	20	20	50	40	20	20	38	26	24	104	61	88	66	87	61	88	46	52½
3	32	24	24	51	44	24	24	39	28	26	112	61	96	66	87	61	96	46	52½
4	37	29	29	52	49	29	29	40	30½	28	123	61	107	66	87	61	107	46	52½
5	41	33	33	52	53	33	33	40	32½	30	135	61	119	66	87	61	119	46	52½
6	45	37	37	53	58	37	37	41	35½	35	157	61	141	66	87	61	141	46	52½
8	52	44	44	54	65	44	44	42	39	40	179	61	163	66	87	61	163	46	52½
10	58	46	46	59	71	46	46	43	42	45	102	61	186	66	87	61	186	46	52½
12	64	52	52	60	77	52	52	44	45	50	224	61	208	66	87	61	208	46	52½
14	69	57	57	60	82	57	57	44	47½	55	247	61	231	66	87	61	231	46	52½
16	74	62	62	61	87	62	62	45	50	60	269	61	253	66	87	61	253	46	52½
18	81	65	69	61	91	65	69	45	52½	◗	Larger sizes on request.								

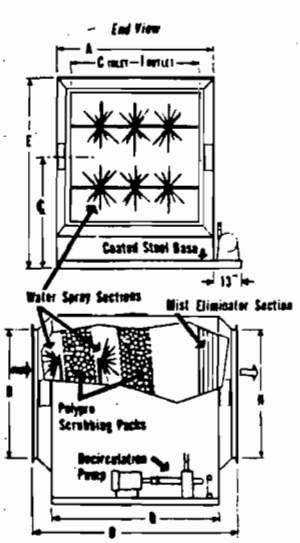


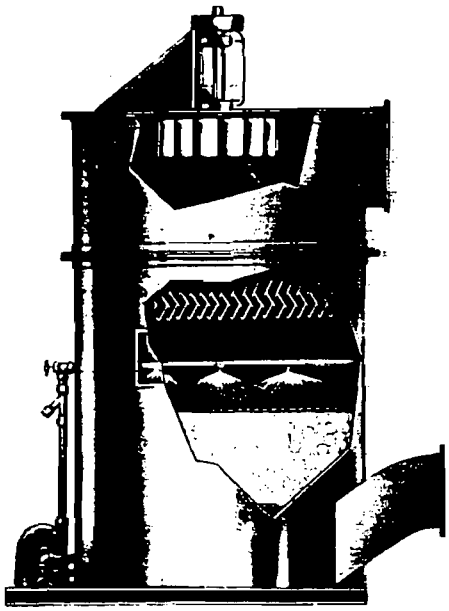
F-101D HORIZONTAL DOUBLE FILTER PACK

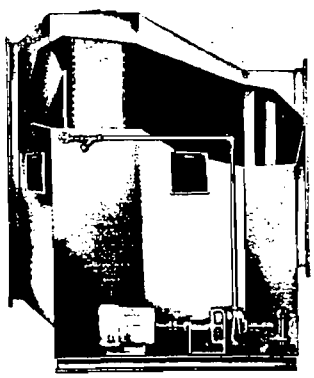


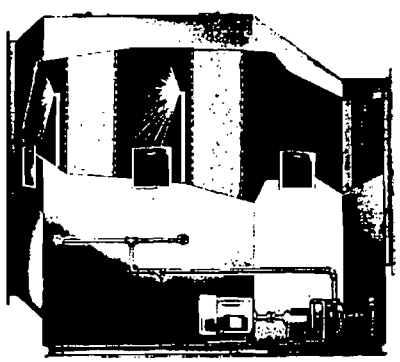
An extra heavy duty scrubber for real "tuffies". It incorporates *two* filter packs with *two* sets of sprays for more thorough scrubbing . . . plus an effective mist eliminator at the air outlet. Serious concentrations of rough fumes, such as nitric, hydrofluoric, and hydrochloric acid are double scrubbed through six stages for maximum efficiency. Use this high efficiency fume scrubber, at only a small increase in price.

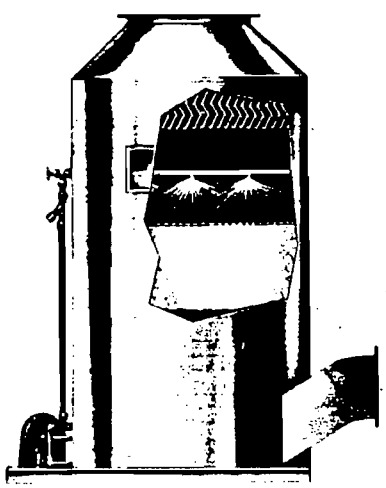
CFM in 000's	DIMENSIONS IN INCHES A	B	C	D	E	H	I	Q	℄	CFM in 000's	A	B	C	D	E	H	I	Q	℄
0.5	18	10	10	70	30	10	10	58	21	20	88	61	72	87	91	61	72	67	52½
1	22	14	14	71	34	14	14	59	23	22	97	61	81	87	91	61	81	67	52½
2	28	20	20	71	40	20	20	59	26	24	104	61	88	87	91	61	88	67	52½
3	32	24	24	72	44	24	24	60	28	26	112	61	96	87	91	61	96	67	52½
4	37	29	29	73	49	29	29	61	30½	28	123	61	107	87	91	61	107	67	52½
5	41	33	33	73	53	33	33	61	32½	30	135	61	119	87	91	61	119	67	52½
6	45	37	37	74	58	37	37	62	35½	35	157	61	141	87	91	61	141	67	52½
8	52	44	44	75	65	44	44	63	39	40	179	61	163	87	91	61	163	67	52½
10	58	46	46	80	71	46	46	64	42	45	202	61	186	87	91	61	186	67	52½
12	64	52	52	81	77	52	52	65	45	50	224	61	208	87	91	61	208	67	52½
14	69	57	57	81	82	57	57	65	47½	55	247	61	231	87	91	61	231	67	52½
16	74	62	62	82	87	62	62	66	50	60	269	61	253	87	91	61	253	67	52½
18	81	65	69	82	91	65	69	66	52½	◗	Larger sizes on request.								











Duall INDUSTRIES

PVC Constructed, 100% Corrosion Free

FUME SCRUBBERS

FW-300 Vertical Pack with Blower

500 TO 12,000 C.F.M. . . *plus multiple installations*

This packed tower type scrubber is not only a space saver, it's also a true economy model. It incorporates a built-in rugged fan with convenient exterior, belt driven, TEFCBB motor. During installation, the horizontal air discharge can be swivelled 360° before sealing into permanent position. Efficiency is equal to the F-101 and the PT-500. Compactness and versatility make it an unusually popular model. This FW-300 saves three ways . . . in initial cost, installation, and in space. Also available with double pack.

F-101 Horizontal Single Filter Pack

500 TO OVER 60,000 C.F.M. . . *plus multiple installations*

Being our most popular scrubber design, this compact 100% corrosion resistant P.V.C. unit has proven its efficiency in 46 states. The Duall F-101 incorporates high efficiency, low maintenance filter media and the open orifice type spray nozzles, for the assurance of a thoroughly saturated collection chamber. Our mist eliminator outlet section gives four air direction changes to properly remove the entrained moisture. Where a horizontal installation is preferred, the F-101 should be your choice.

F-101-D Horizontal Double Filter Pack

500 TO OVER 60,000 C.F.M. . . *plus multiple installations*

An extra heavy duty scrubber for real "tuffies". It incorporates *two* filter packs with *two* sets of sprays for more thorough scrubbing . . . plus an effective mist eliminator at the air outlet. Serious concentrations of rough fumes, such as nitric, hydrofluoric, and hydrochloric acid are double scrubbed through six stages for maximum efficiency. For such problems in your plant, use this high efficiency fume scrubber, at only a small increase in price.

PT-500 Vertical Pack

500 TO OVER 30,000 C.F.M. . . *plus multiple installations*

The upright PT-500 is the space saver. This scrubber is a vertical packed tower type designed to fit into restricted spaces where floor space is at a premium. Its efficiency is equal to the F-101, and also 100% corrosion-free. Air flow is up through a thoroughly water saturated bed of filter media. The mist eliminator pack near the top outlet assures properly dried air. If space is your problem, take a good look at the PT-500. Also available with double pack.

Duall | 770 South McMillan St. Owosso, Michigan 48867 | P.O. Box 1000 Forest City, N.C. 28043

Duall FUME SCRUBBERS

SPECIFICATIONS and PERFORMANCE DATA

DESCRIPTIONS

F-101. Horizontal (cross-flow), four stage, wet scrubber. This model has maximum efficiency on water soluble contaminants and odors, but is also effective on low soluble contaminants with the use of chemical neutralizers.

F-101D. Horizontal (cross-flow), six stage, wet scrubber. The F-101D is especially designed for use on stubborn low solubility contaminants or where extremely high scrubbing efficiency is required on normal contaminants.

FW-300. Vertical (counter-flow), four stage, wet scrubber with integral blower. Efficency is equal to the F-101.

FW-300D. Vertical (counter-flow), six stage, wet scrubber with integral blower. Efficiency is equal to the F-101D.

PT-500. Vertical (counter-flow), four stage, wet scrubber. Efficiency is equal to the F-101.

PT-500D. Vertical (counter-flow), six stage, wet scrubber. Efficiency is equal to the F-101D.

All Duall Fume Scrubbers are constructed of P.V.C. and Polypropylene corrosion resistant materials and include a rugged coated steel base with lifting luggs. All above units are available with extended depth packing.

SCRUBBING PRINCIPLES

Contaminant removal is accomplished by first slowing the fumes to a velocity below 500 fpm and then passing the fumes through two scrubbing stages in the single pack models and four stages in the double pack types. The fumes first pass through a water spray or curtain during which a percentage of the larger contaminant particles drop out and the remaining fumes are saturated. The second stage consists of a 12" deep pack of polypropylene high surface, non-clogging, spherical plate packing media* which is continuously wetted by the spray nozzles. The saturated fumes are impinged upon the packing and the contaminants are absorbed and carried away in the wash water. The first and second stages are repeated in the double pack fume scrubbers.

*Several types of alternate packing media are available on request.

MIST ELIMINATION

After passing through the scrubbing sections, the air is moisture laden and must pass through a two stage gravity mist eliminator section. This final stage of P.V.C. eliminator blades provides four 30° changes in direction and eliminates entrained water.

WATER SUPPLY

All Duall Fume Scrubbers may be supplied with water either directly from your supply or from an integral or remote recirculation system supplied with the scrubber. It is generally recommended that a recirculation system be used to conserve water except on very low cfm units. The actual fresh water consumption on the single pack series with recirculation is only 0.05 to 0.15 gpm/1000 cfm depending on the contaminant involved. On the double pack models, water consumption ranges from 0.1 to 0.3 gpm/1000 cfm. This represents 5% of the water being recirculated. Duall scrubbers are self-draining and may be installed out-doors in sub-zero conditons without freeze-up. If these conditions exsist, a remote recirculation system should be specified for placement in a heated area.

All Duall Scrubbers come complete with fittings for the additon of chemical neutralizers, if required. A complete chemical metering and pumping system is available upon request.

MATERIALS

Every Duall Fume Scrubber is shipped complete with an integral coated steel base. No special mounting is required. Simply connect the duct, the water and power supply, and the unit is ready for operation. Complete installation and operating instructions are supplied with all Duall Scrubbers.

PRESSURE DROP

The following pressure drops are applicable for Scrubbers operated at design CFM:

F-101	2.0" w.g.	FW-300D	3.0" w.g.
F-101D	3.0" w.g.	PT-500	2.0" w.g.
FW-300	2.0" w.g.	PT-500D	3.0" w.g.

On the FW-300 series, the blower is designed for 2.0" external static pressure.

FW-300 BLOWER SECTION

The top section of the FW-300 Fume Scrubber consists of a Duall P.V.C. centrifugal blower complete with motor and OSHA belt guard and shaft cover. The blower section may be rotated through 360° to obtain any desired angle between scrubber inlet and blower outlet. This blower section is same low maintenance, guaranteed corrosion resistant blower described in Duall Brochure No. CI-131, and NH-151.

MAINTENANCE

All Duall Fume Scrubbers incorporate low maintenance components from front to back, including the packing, plumbing system and eliminators. Quick opening inspection doors are at all critical points.

DUALL FUME SCRUBBERS
Typical Average Fume Removal Efficiencies

CONTAMINATES ▼ / MODELS ▶	Single Pack Series: F-101 PT-500 FW-300	Double Pack Series: F-101D PT-500D FW-300D	Single Pack Series: with added Chemical Neutralizer (pH Control)	Double Pack Series: with added Chemical Neutralizer (pH Control)
Acetic Acid	95-98	98-99	—	—
Alkaline Cleaners	96-99	98-99	—	—
Aluminum Bright Dip *	80-85	85-90	—	—
Anodizing	96-99	98-99	—	—
Aqua Regia	80-85	85-90	85-90	90-95
Boric Acid	85-90	90-95	—	—
Caustic Cleaners	98-99	99	—	—
Caustic Soda	98-99	99	—	—
Chlorine	80-85	85-90	85-90	90-95
Chromic Acid	98-99	99	—	—
Copper Chloride	75-80	80-85	85-90	90-95
Cyanide Solutions	98-99	99	—	—
Ferric Chloride	80-85	83-88	—	—
Ferric Nitrate	96-98	98-99	—	—
Ferrous Chloride	90-95	95-98	—	—
Ferrous Sulfate	95-97	96-98	—	—
Fluosilicic Acid	95-98	98-99	—	—
Hydrochloric Acid	80-85	85-90	90-95	95-98
Hydrogen Cyanide	85-90	90-95	—	—
Hydrofluoric Acid	90-93	95-98	—	—
Hydrofluosilicic Acid	95-98	98-99	—	—
Hydrogen Peroxide	90-95	95-99	—	—
Hydrogen Sulfide	70-75	75-80	85-90	95-98
Nickel Chloride	80-85	85-90	90-95	95-98
Nickel Sulfate	80-85	85-90	90-95	95-98
Nitric Acid	75-80	85-90	—	—
Nitrogen Dioxide (NO_2)	45-50	50-60	65-70	70-75
Nitric — HF Acid	75-80	85-90	—	—
Perchloric Acid	95-98	96-99	—	—
Phosphoric Acid	96-99	98-99	—	—
Potassium Dichromate	96-98	98-99	—	—
Selenium Sulfide	96-98	98-99	—	—
Sodium Chloride	96-98	98-99	—	—
Sodium Fluoride	90-95	95-98	—	—
Sodium Glutenate	96-98	98-99	—	—
Sodium Hydroxide	98-99	99	—	—
Sulfur Dioxide	70-75	75-80	80-85	85-90
Sulfuric Acid	96-98	98-99	—	—
Tin Chlorides	75-80	80-85	85-90	90-95
Zinc Chloride	75-80	80-85	—	—
Zinc Nitrate	96-98	98-99	—	—
Zinc Sulfate	96-98	98-99	—	—

* These efficiencies are for the combined nitric and phosphoric fume. The efficiency for the NO_2 portion of the fume only will be as listed above.

● The above efficiencies are intended as guide representing average values. Specific combinations and concentrations of fumes may result in a significant variation from the above.

TECHNICAL BULLETIN

Duall Industries

No. 121-9

Duall Industries, Inc. 700 South McMillan St., Owosso, Michigan, 48867 Area Code 517/ 725-8184

DUALL SCRUBBERS
INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

1. AIR FLOW
Units are normally designed to be on the suction side of the fan. Air flow through units must be in the direction indicated. Too large a deviation from the design flow (CFM) will affect the efficiency of the scrubber.

2. SUPPORTING THE UNIT
The scrubber rests on a steel channel base making the unit self-supporting. This steel base may be suspended from overhead structure or rest on any media suitable to support the unit's weight.

3. CONNECTION TO VENTILATION DUCT
To eliminate the possibility of water running down the duct, there should be a minimum of 4 ft. of horizontal duct before the scrubber transition. This should be sloped slightly towards the bottom of the scrubber. The flanges should be field drilled on approximately 4"-5" centers. A soft foam type chemically compatible gasket material is recommended between the scrubber flange and the duct flange.

4. ELECTRICAL CONNECTION
Proper electrical connection complying with local codes should be made to the pump motor.

5. UNITS WITH INTERNAL RECIRCULATION SYSTEM
Units should be installed in heated areas or protected from freezing. Fresh water must be supplied by connecting the supply line to the flowmeter provided. This flowmeter is mounted on the side of the scrubber. The make-up water line should be valved to provide a maximum of 5% of the recirculation rate as shown on the side of the scrubber. The scrubber drain is connected to customer's waste drain line. If this line must go to a sump, it must be submerged 6"-8" below the lowest expected level, or a plumber's "P" trap should be installed. This will prevent air from flowing into the drain line and interfering with proper drainage of the scrubber. Liquid build-up in the scrubber can interfere seriously with the proper operation of the scrubber.

BEFORE START-UP, INSPECT THE INSIDE OF THE SCRUBBER AND REMOVE ANY FOREIGN MATERIAL FROM THE UNIT. SHUT THE WASTE DRAIN VALVE AND FILL THE SCRUBBER BASE SUMP WITH WATER UNTIL WATER FLOWS FROM THE OVERFLOW DRAIN. WATER IS INTRODUCED THRU THE FLOWMETER AND CAN ALSO BE INTRODUCED BY A HOSE PLACED THRU THE INSPECTION DOORS. When the water reaches the overflow level, the pump and fan may be started.

6. UNITS DESIGNED WITH REMOTE RECIRCULATION TANK AND PUMP

All units designed for remote recirculation require a separate recirculation tank with an adequately sized overflow and waste drain. The use of the remote recirculation tank will permit the installation of self-draining scrubber outside the building and the recirculation tank inside the building. The scrubber must be elevated for proper drain return to the recirculation tank. The scrubber drain pipe must be submerged 6" to 8" below the lowest expected liquid level in the tank and on the opposite side from the pump suction. The pipe end should be cut on a 60^{o} angle with the long opening facing the tank side. For information on start-up and make-up water, please refer to Section 5 above. Make-up water may be introduced into the recirculation tank through the separate flowmeter provided for installation into water line.

7. PUMPS

Pumps should be operated in accordance with the enclosed manufacturer's instructions. Pumps with mechanical seals should be given particularly special attention to assure operation as directed. Pump motor should be electrically bumped to check for proper rotation. Motors and pumps are aligned and checked for proper operation before shipment. Customer is cautioned that misalignment may occur during shipment. Check for misalignment by manually rotating the shaft while observing coupling alignment using a straight edge or a dial indicator. Pumps provided with a packing gland are pre-adjusted to drip approximately 30 drops per minute. Drain fittings are provided on the pump or on a collection pan which should be plumbed to the waste drain. Pump motor should be interlocked with fan to provide approximately two (2) minutes pump operation before fan may be started. Pumps should not be started until the scrubber base or remote recirculation tank are filled to the overflow level. During the early break-in period, the pump packing gland should be checked for proper weeping. If incorrect, check pump manufacturer's instructions for correction procedure.

8. CHEMICAL ADDITIONS

In some cases, liquid caustic (sodium hydroxide solution) or an acid solution may be metered into the recirculation system to increase scrubber efficiency. A threaded coupling is provided in the side of the self-contained recirculation scrubbers for introduction of this chemical addition. Chemical addition for scrubbers provided with remote recirculation tanks is made by adding the solution to the recirculation tank. When using solid caustic, care should be taken in mixing to assure that no solid material is pumped into the scrubber or recirculation tank which may cause a build-up. The pH of the recirculation tank should be maintained in a range that will achieve the desired scrubber efficiency while preventing the appearance of a build-up on the packing. A pH control package may be purchased from Duall to provide a chemical feed pump and pH control to maintain the recirculation solution in the satisfactory range.

Duall Industries, Inc. 700 South McMillan St., Owosso, Michigan, 48867 Area Code 517/ 725-8184

TECHNICAL BULLETIN

Duall Industries

No. 121-9

DUALL SCRUBBERS
INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

9. PERIODIC MAINTENANCE SCHEDULE

Inspection doors are provided in all scrubber units for periodic inspection. While it is not expected that maintenance will be required, periodic inspection on a monthly basis is suggested. This inspection should include the following:

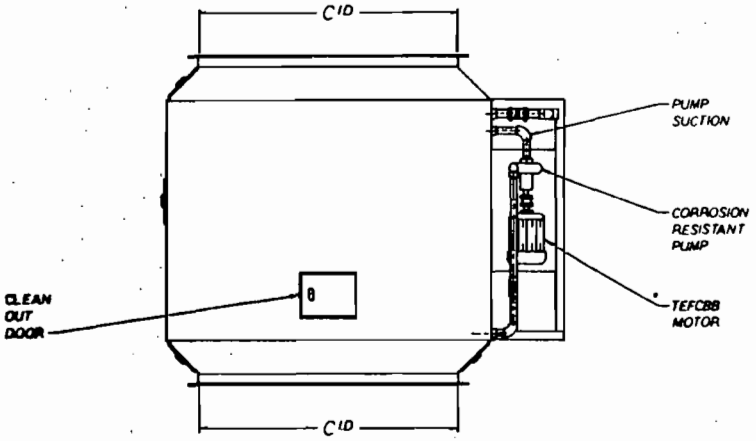
A. Check spray nozzles with the pump and fan in operation. All nozzles should produce a full 360° spray pattern. If any nozzles are found to be spraying incorrectly, the pump should be stopped, the header pipe removed, and each nozzle cleaned individually. When the cleaned header system has been replaced, the pump may be restarted.

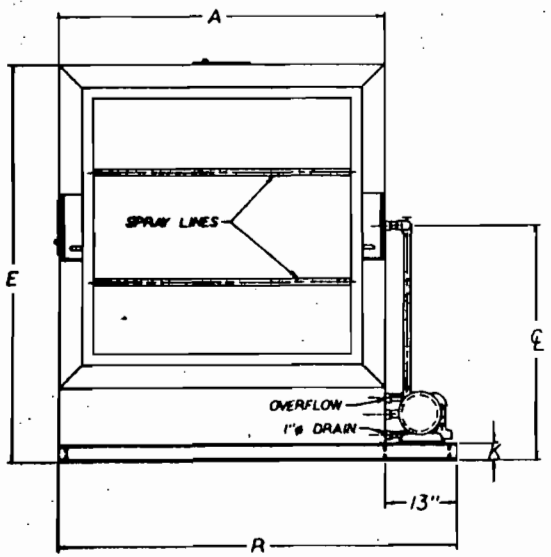
B. Check the face of the scrubber and the spray nozzles for any indication of a build-up of solids. If a surface build-up has occurred, it may be removed by spraying the pack with high pressure water, by chemical treatment of the scrubbing solution to dissolve the scale, or by manually removing the surface build-up. An analysis of the material build-up can be made to determine its nature. A dissolving additive, compatible with P.V.C. then could be added to the recycling reservoir for closed loop cleaning. During this type of cleaning, the drain and make-up water valves should be closed. During this operation, someone should frequently check the operation of the nozzles, and solution level to prevent pump damage. Prior to putting the system back in service, the cleaning solution should be drained and the scrubber refilled with fresh water. Steam should not be used to clean the scrubber.

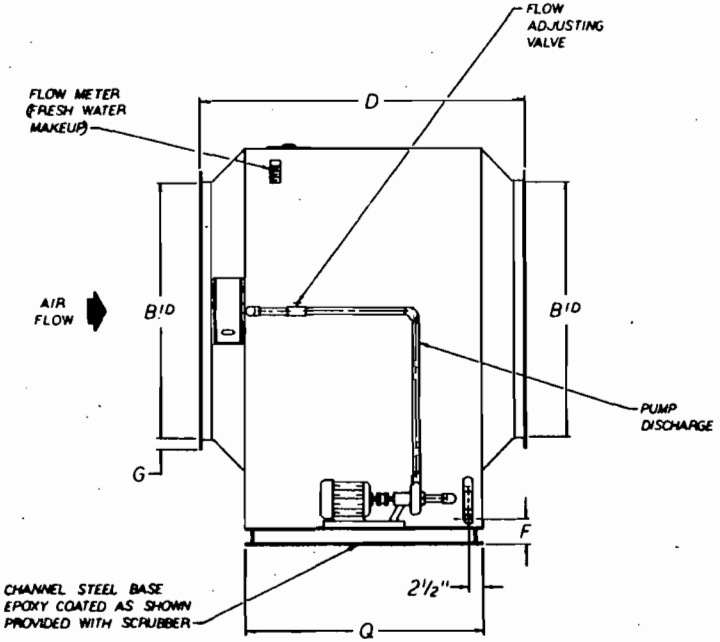
C. Check the water level in the scrubber. While the scrubber is in operation, it should maintain a solution of approximately 3"-6" in the bottom of the scrubber on a remote recirculation system and to the overflow on others.

CFM	0.5	1	2	3	4	5	6	8	10	12	14	16	18	20	22	24	26	28	30	35	40	45	50	55	60
A	18	22	28	32	37	41	45	52	58	64	69	74	81	88	97	104	112	123	135	157	179	202	224	247	269
B	10	14	20	24	29	33	37	44	46	52	57	62	65	61	61	61	61	61	61	61	61	61	61	61	61
C	10	14	20	24	29	33	37	44	46	52	57	62	69	72	81	88	96	107	119	141	163	186	208	231	253
D	49	50	50	51	52	52	53	54	59	60	60	61	61	66	66	66	66	66	66	66	66	66	66	66	66
E	30	34	40	44	49	53	58	65	71	77	82	87	91	91	91	91	91	91	91	91	91	91	91	91	91
F	3½	3½	3½	3½	3½	3½	4½	4½	4½	4½	4½	4½	5½	5½	5½	5½	5½	5½	5½	5½	5½	5½	5½	5½	5½
G	1½	1½	1½	1½	1½	1½	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
K	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4
Q	37	38	38	39	40	40	41	42	43	44	44	45	45	46	46	46	46	46	46	46	46	46	46	46	46
R	31	35	41	45	50	54	58	65	71	77	82	87	94	101	110	117	125	136	148	170	192	215	237	260	282
℄	21	23	26	28	30½	32½	35½	39	42	45	47½	50	52½	52½	52½	52½	52½	52½	52½	52½	52½	52½	52½	52½	52½
OVERFLOW	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½
PUMP SUCTION	1	1	1	1	1	1	1	1¼	1¼	1½	1½	2	2	2	2	2	3	3	3	3	3	3	3	3	3
PUMP DISCHARGE	¾	¾	¾	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2	2	3	3	3	3	3
LIQUID RATE GPM	15	3	6	9	12	15	18	24	30	36	42	48	54	60	66	72	78	84	90	105	120	135	150	165	180

NOTE: CFM IN THOUSANDS







F-101 FUME SCRUBBER

WITH SELF CONTAINED RECIRCULATION

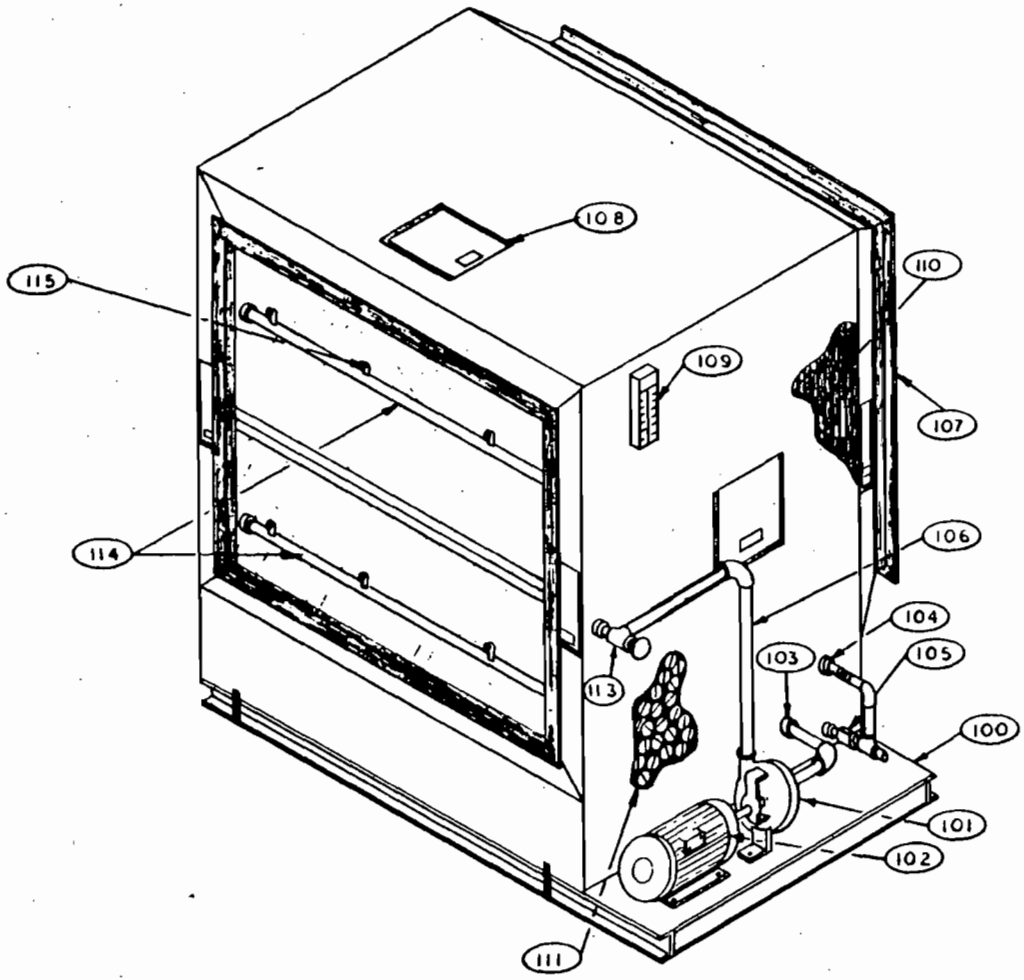
DUALL INDUSTRIES, INC. OWOSSO, MI.

DATE	DUALL JOB NO.	
PURCHASER		
PURCHASER P.O. NO.		
PURCHASER LOCATION		
JOB NAME		
JOB LOCATION		
SPECIFICATION NO.	ITEM NO.	
CAPACITY		CFM
PRESSURE DROP		W.G.
LIQUID RECIRCULATION RATE		GPM
LIQUID PRESSURE		TDH
MAKEUP RATE		GPM
RECIRCULATION PUMP		
PUMP CAPACITY	GPM	TDH
PUMP HP		
PUMP VOLTAGE	V PH.	HZ.

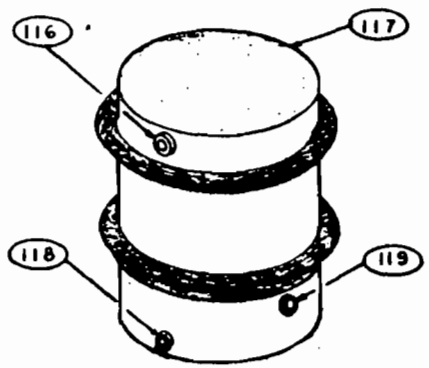
TAG:

D-101-1016

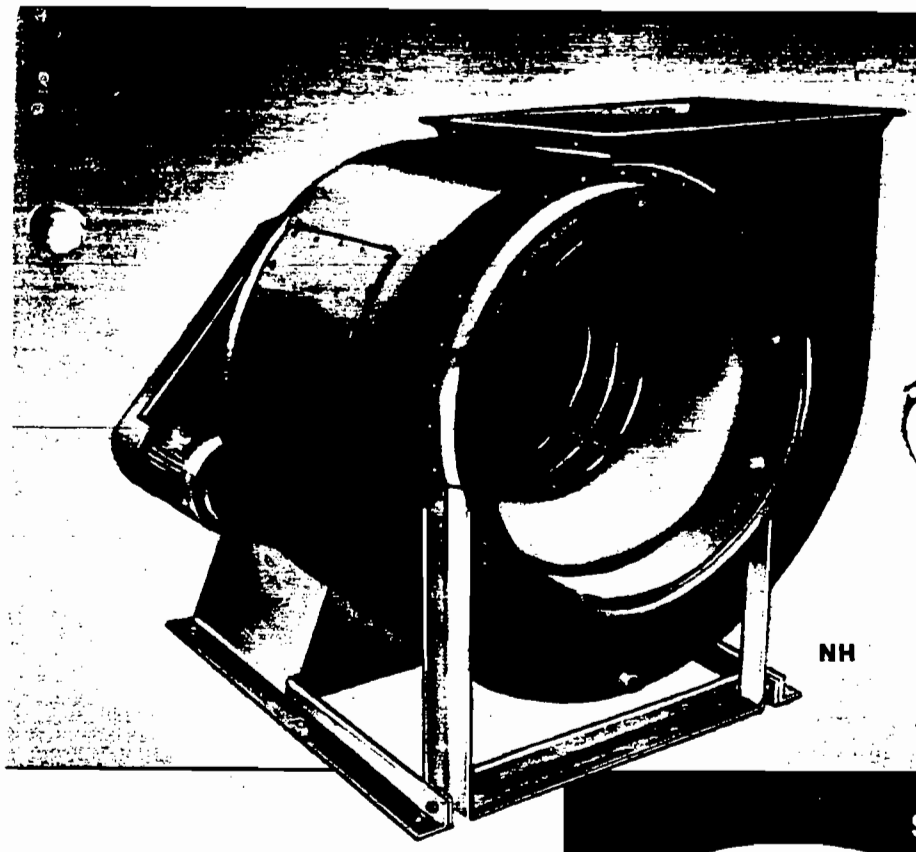
F-101 FUME SCRUBBER		D.I.
WITH SELF CONTAINED RECIRCULATION		J.F.
SCALE	SHEET OF DATE	M.R.
DUALL INDUSTRIES Inc. Owosso, Mich.		



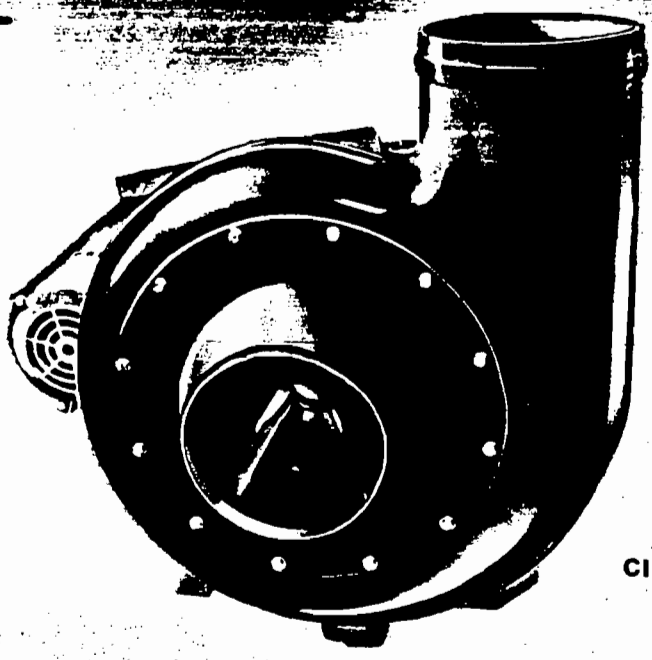
DUALL F-101 FUME SCRUBBER PARTS LIST	
NO:	**PART**
100	EPOXY COATED STEEL BASE
101	CORROSION RESISTANT PUMP
102	TEFCBB MOTOR ___ ___V./ PH./ ___CY. ___H.P. ___R.P.M.
103	PUMP SUCTION COUPLING (P.V.C.)
104	OVERFLOW COUPLING (P.V.C.)
105	DRAIN VALVE (P.V.C.)
106	PUMP DISCHARGE LINE (P.V.C.)
107	FLANGE (P.V.C.)
108	CLEAR OR P.V.C. CLEANOUT DOORS
109	FLOW METER ___ ___ ___.
110	ELIMINATOR SECTION (P.V.C.)
111	POLYPROPYLENE PACKING
113	SPRAY HEADER VALVE (P.V.C.)
114	SPRAY HEADER (P.V.C.)
115	SPRAY NOZZLES



PARTS LIST FOR REMOTE RECIRCULATION TANK	
116	OVERFLOW (P.V.C.)
117	REMOTE TANK (P.V.C.)
118	DRAIN (P.V.C.)
119	PUMP SUCTION COUPLING (P.V.C.)



NH



CI

SPECIFY THE BEST . . .

Duall

INDUSTRIES

HIGH EFFICIENCY

●

BROAD PERFORMANCE RANGE

●

LOW OPERATING COST

●

QUIET OPERATION

FANS

PVC FABRICATED CENTRIFUGAL TYPES CI, NH, and RV IN SIZES TO OVER 70,000 CFM. CORROSION RESISTANT

AMCA Test Codes

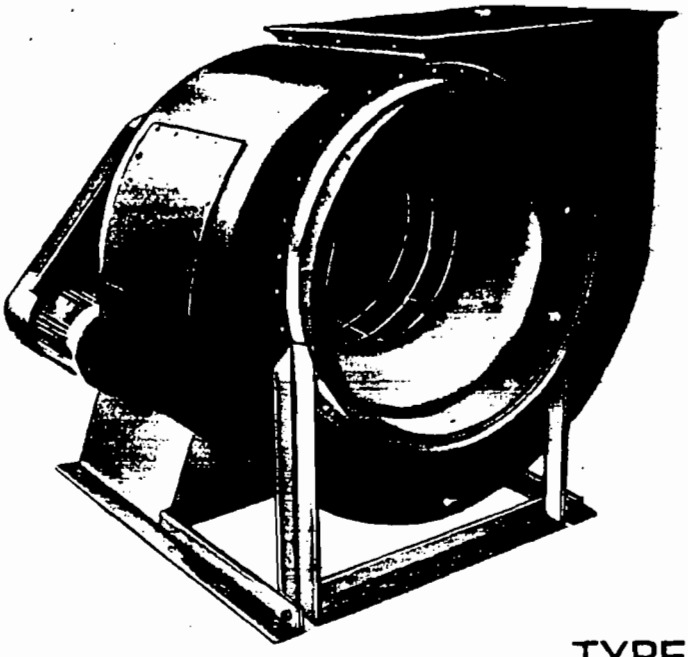
CHEMICALS
ELECTRONICS
PAPER MAKING
NUCLEAR METALS
MARINE
PLATING
UTILITIES
TEXTILES
PHOTOGRAPHY
PETROLEUM
PICKLING
MISC. INDUSTRIES

Capacity tables listed in this catalog are calculated based on tests made in accordance with the applicable AMCA Standard Test Code. Rated capacities are based on standard air density of .075 pounds per cubic foot at sea level (29.92" Barometric Pressure), dry air, and 70°F.

Duall INDUSTRIES, INC.

700 South McMillan St.
Owosso, Michigan 48867
Telephone: (517) 725-8184

P.O. Box 1000
Forest City, N.C. 28043



Duall
INDUSTRIES

PVC
CONSTRUCTED
CENTRIFUGAL
FANS

TYPE **NH** TO OVER **70,000** CFM

- HIGH EFFICIENCY.
- ECONOMICAL OPERATION.
- QUIET, SMOOTH RUNNING.
- GREAT CORROSION RESISTANCE.
- LOW MAINTENANCE.
- QUICK, EASY INSTALLATION.

To Accurately Specify Your Requirements You Will Need . . .

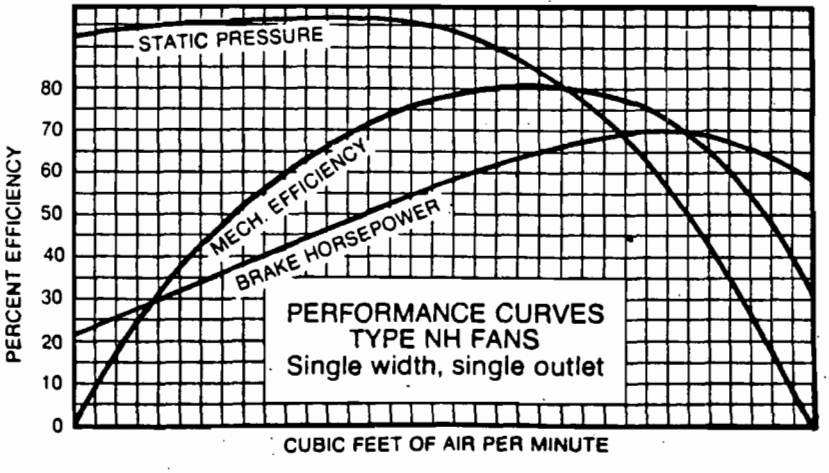
1. *Volume at the inlet in CFM.*
2. *The inlet static pressure.*
3. *The inlet air temperature.*
4. *If gas, not air, the density or specific gravity.*
5. *Elevation above sea level.*
6. *Characteristics of the electric current.*

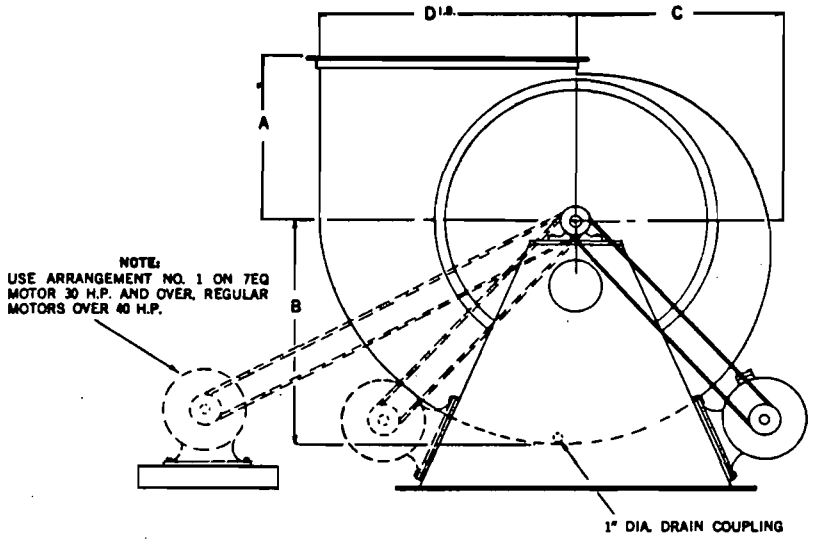
These large corrosion resistant P.V.C. constructed fans with their stable and efficient performance are preferred in most plants where a corrosive atmosphere prevails. The P.V.C., heavy duty constructed housings, with the steel reinforced plastisol coated wheel, make this excellent fan inherently quiet. Among the other fine features included are phenolic coated steel base, TEFCBB motor, drain, flanged inlet and outlet, OSHA approved shaft cover and belt guard, and a readily accessible access door. All offered as standard equipment at no increase in price. All Duall fans carry a one year warranty against corrosion.

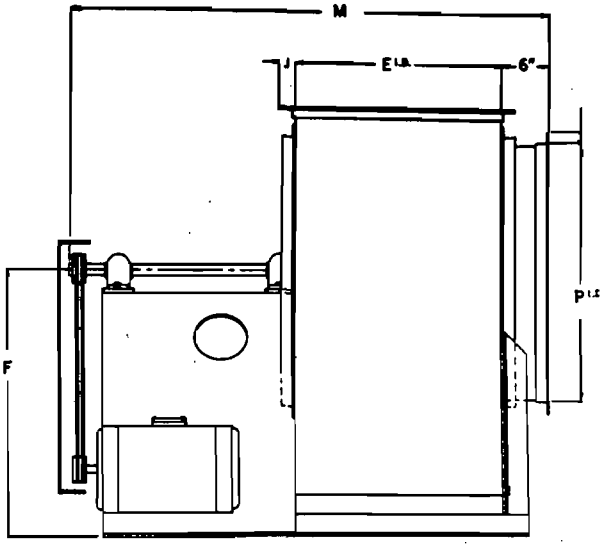
Construction Features

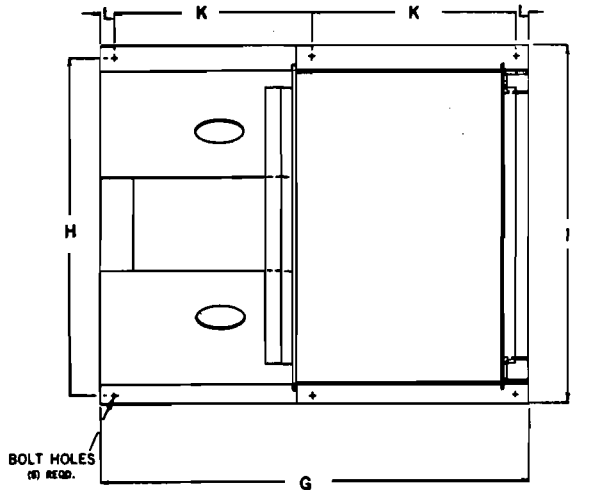
DUALL PVC FANS are built to last. Features include: Heavy angle iron bracing. Over-capacity shaft and bearings. Formed PVC venturi inlet for streamlined flow into the wheel with its own matching cone, resulting in very high efficiency and quiet operation. Operating temperatures up to 155°F. All PVC housing. PVC coated steel wheel. PVC inlet and outlet angle flanges. Phenolic coated steel frame. PVC drain. OSHA belt and shaft guards.

Excellent Performance









NOTE: Do not use this drawing for Dimension for Bottom Horizontal Discharge Fans.

CENTRIFUGAL NH FAN NO.		
DUALL INDUSTRIES, Inc. OWOSSO, MICH.		
DRAWN BY	USER	CLASS
DATE	LOCA.	ARR
ROTATION	PURCH.	CFM
V PH CY	LOCA.	SP
CERTIFIED BY	JOB NO.	BHP

DIMENSIONS IN INCHES

CENTRIFUGAL NH FAN NO.

FAN NO.	A	B	C	D I.D.	E I.D.	F	G	H	I	J	K	L	M	P I.D.	SHAFT DIA.	KEYWAY	BOLT HOLES DIA.
24½	10 3/16	11 19/64	9¾	12¾	9¾	14½	26 1/16	19¼	21¼	1½	12 1/32	1	33⅝	13¼	1 3/16	¼ x ⅛	½
27	10⅞	12 23/64	10⅝	14	10¾	16	27 1/16	20¼	22¼	1½	12 17/32	1	34⅝	14¼	1 3/16	¼ x ⅛	½
30	11 1/16	13 45/64	11 1/16	15⅝	11¾	17½	35	22	24	1½	16½	1	43	15½	1 5/16	5/16 x ⅛	½
33	12 5/16	14 31/32	12⅝	17⅛	13⅛	19½	38⅞	23⅜	25⅜	1½	18 7/16	1	43 5/16	17⅜	1 3/16	5/16 x ⅛	½
36½	13½	16 37/64	14 1/32	19	14½	20½	39¾	25	27	1½	18⅞	1	48⅛	19¼	1 7/16	⅜ x 3/16	½
40	14⅝	18 3/16	15⅜	20⅞	15⅞	23½	43⅛	27½	30	1½	20 5/16	1¼	51 3/16	21	1 11/16	⅜ x 3/16	½
44½	16	20 35/64	17 3/32	23¼	17⅝	25	45	31	33½	1½	21¼	1¼	52	23⅝	1 11/16	⅜ x 3/16	½
49	17⅜	22 5/32	18 13/16	25½	19½	27	47½	33⅛	35⅝	1½	22½	1¼	55 5/16	26	1 13/16	½ x ¼	½
54	18 13/16	24 13/32	20¾	28⅛	21½	30	49½	36¼	38¾	1½	23½	1¼	57 13/16	29	1 13/16	½ x ¼	½
60	20 13/16	27 13/64	23 1/32	31¼	23¾	33	51⅞	40	42½	1½	24 1/16	1¼	60 9/16	32	2 3/16	½ x ¼	½
66	22⅝	30	25 1/16	34⅜	26¼	36	55½	44	47	1½	26¼	1½	63 13/16	34½	2 1/16	⅝ x 5/16	⅝
73	24⅞	33 5/32	28	38	29	40	59¼	48	51	1½	28⅜	1½	66 1/16	38½	2 1/16	⅝ x 5/16	⅝
80½	27¾	36 13/32	30⅞	42	32	43¾	63	53	56	2	30	1½	72	42¼	2 11/16	⅝ x 5/16	⅝
89	30½	40 31/64	34 5/32	46½	35⅜	44¾	66⅞	58	61	2	31 13/16	1½	76 9/16	46¼	2 13/16	¾ x ⅜	⅝
98	33¾	44 1/16	37⅝	51⅛	39	48	77½	64	67	2	37¼	1½	81 3/16	51¼	3 1/16	¾ x ⅜	⅝
108	37	49 5/16	41⅝	56½	43⅛	52	81½	69	72	2	39¼	1½	91 13/16	56	3 7/16	¾ x ⅜	⅝
120	41	54 13/32	46 1/16	62½	47¾	57¾	86	75	78	2	41½	1½	98⅜	62	3 15/16	1 x ½	⅝

CLASSES

I AND II

DUALL TYPE NH FANS

NON-OVERLOADING MEDIUM SPEED HIGH EFFICIENCY

SIZE 60

SINGLE WIDTH SINGLE INLET

Outlet Size 23¾" x 31¼" I.D. **Wheel Diameter 30 in.**

Inlet Size 32" I.D. **Outlet Area 5.15 Sq. Ft. Inside**

Tip Speed = RPM × 7.85 **Max. BHP = 6.71 $\left(\frac{RPM}{1000}\right)^3$**

6900 CFM @ 4" SP

Volume of Air CFM	Outlet Velocity Feet per Minute	¼" SP		⅜" SP		½" SP		⅝" SP		¾" SP		⅞" SP		1" SP		1¼" SP		1½" SP		1¾" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
4120	800	402	.30	434	.40	466	.50	498	.61	528	.73	559	.85	588	.99	644	1.29	699	1.61	752	1.94
4635	900	427	.36	457	.46	486	.58	515	.70	544	.82	573	.95	601	1.08	654	1.38	705	1.70	755	2.05
5150	1000	453	.43	481	.55	508	.66	535	.79	562	.92	589	1.06	615	1.19	666	1.48	715	1.81	762	2.17
5665	1100	480	.52	506	.63	531	.76	556	.90	581	1.03	606	1.17	631	1.32	680	1.62	726	1.94	771	2.30
6180	1200	507	.61	531	.74	555	.87	578	1.01	602	1.16	625	1.31	649	1.46	695	1.78	740	2.10	783	2.45
6695	1300	535	.72	557	.85	580	.99	602	1.14	624	1.29	645	1.45	667	1.61	711	1.94	754	2.28	796	2.64
7210	1400	563	.84	584	.99	605	1.14	626	1.29	647	1.45	667	1.61	688	1.78	729	2.12	770	2.48	811	2.85
7725	1500	591	.98	611	1.14	630	1.29	651	1.46	671	1.62	690	1.79	710	1.96	748	2.32	788	2.70	826	3.08
8240	1600	621	1.14	638	1.29	657	1.46	676	1.63	695	1.80	714	1.98	732	2.16	769	2.53	806	2.93	843	3.32
8755	1700			666	1.47	684	1.65	701	1.83	720	2.00	738	2.19	755	2.37	791	2.77	825	3.17	861	3.59
9270	1800			694	1.67	711	1.85	728	2.05	745	2.24	763	2.42	779	2.62	813	3.02	846	3.44	879	3.87
9785	1900			722	1.88	739	2.08	755	2.28	770	2.48	788	2.67	804	2.87	836	3.29	868	3.72	900	4.17
10300	2000					767	2.32	782	2.53	797	2.75	813	2.95	829	3.15	860	3.58	891	4.02	922	4.48
10815	2100					795	2.59	810	2.80	824	3.02	838	3.24	854	3.46	884	3.89	914	4.35	944	4.83
11330	2200					823	2.87	838	3.10	857	3.33	865	3.55	879	3.79	909	4.23	937	4.70	966	5.20
11845	2300							866	3.41	885	3.65	893	3.90	906	4.13	934	4.60	961	5.06	989	5.61
12360	2400							921	3.76	934	4.00	945	4.25	960	4.50	984	5.00	1010	5.51	1037	6.03
12875	2500							980	4.13	990	4.37	1001	4.65	1014	4.89	1037	5.41	1061	5.92	1086	6.44
13390	2600									1048	5.20	1058	5.51	1069	5.77	1092	6.28	1113	6.85	1136	7.42
14420	2800									1106	6.18	1116	6.44	1125	6.70	1145	7.31	1168	7.93	1187	8.50
15450	3000									1164	7.26	1174	7.57	1182	7.83	1202	8.45	1224	9.12	1241	9.73

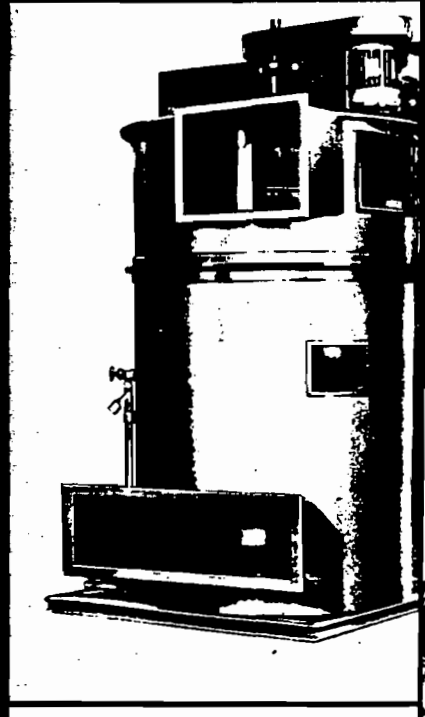
Volume of Air CFM	Outlet Velocity ft per M	2" SP		2½" SP		3" SP		3½" SP		4" SP		4½" SP		5" SP		5½" SP		6" SP		6½" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
5150	1000	808	2.55	898	3.34																
5665	1100	815	2.69	901	3.52																
6180	1200	825	2.84	907	3.68	986	4.60	1062	5.51	1133	6.70										
6695	1300	837	3.01	915	3.86	991	4.80	1065	5.77	1135	6.80										
7210	1400	850	3.23	925	4.06	998	5.01	1069	6.03	1139	7.06										
7725	1500	864	3.47	937	4.30	1007	5.20	1075	6.23	1141	7.31	1207	8.45	1269	9.58	1329	10.76	1387	11.95	1442	13.18
8240	1600	879	3.73	950	4.59	1018	5.46	1083	6.49	1147	7.57	1211	8.76	1272	9.94	1332	11.07	1389	12.36	1444	13.70
8755	1700	896	4.01	964	4.89	1030	5.82	1094	6.80	1155	7.93	1216	9.12	1275	10.30	1335	11.48	1391	12.88	1446	14.16
9270	1800	913	4.31	979	5.25	1043	6.18	1105	7.14	1165	8.24	1223	9.42	1281	10.66	1338	11.85	1394	13 29		
9785	1900	932	4.64	995	5.56	1057	6.54	1118	7.57	1176	8.60	1232	9.79	1288	11.02	1343	12.21	1398	13.65		
10300	2000	951	4.95	1012	5.92	1073	6.95	1131	7.98	1188	9.06	1243	10.20	1297	11.38	1350	12.72	1403	14.06		
10815	2100	972	5.30	1030	6.33	1089	7.36	1146	8.45	1201	9.53	1255	10.66	1308	11.85	1359	13.13	1410	14.47		
11330	2200	994	5.67	1049	6.70	1106	7.78	1161	8.91	1215	10.04	1268	11.18	1320	12.36	1370	13.60	1419	14.99		
11845	2300	1016	6.08	1069	7.16	1124	8.24	1178	9.37	1231	10.56	1283	11.74	1332	12.93	1381	14.21	1430	15.50		
12360	2400	1062	6.54	1112	7.62	1161	8.76	1211	9.88	1262	11.07	1311	12.31	1359	13.54	1406	14.83	1453	16.12		
12875	2500	1110	6.95	1157	8.60	1203	9.27	1249	10.45	1296	11.69	1344	12.83	1389	14.16	1435	15.45	1480	16 79		
13390	2600	1159	7.93	1204	9.12	1247	10.35	1290	11.59	1335	12.88	1379	14.21	1423	15.55	1466	16.89	1509	18.23		
14420	2800	1209	9.12	1253	10.30	1293	11.59	1335	12.88	1376	14.27	1417	15.60	1458	17.00	1498	18.38	1541	19.79		
15450	3000	1260	10.35	1302	11.64	1341	12.93	1380	14.32	1421	15.69	1458	17.10	1496	18.54	1536	20.03				
16480	3200	1314	11.69	1352	13.03	1390	14 42	1427	15.81	1465	17.25	1502	18.75	1538	20.29	1574	21.84				
17510	3400	1369	13.18	1403	14.63	1441	16.02	1476	17.51	1511	19.00	1547	20.55	1583	22.15	1616	23.74				

All Capacities Based on Standard Air (Density .075#/cu.ft.—70° F.—29.92" Hg. Bar.)

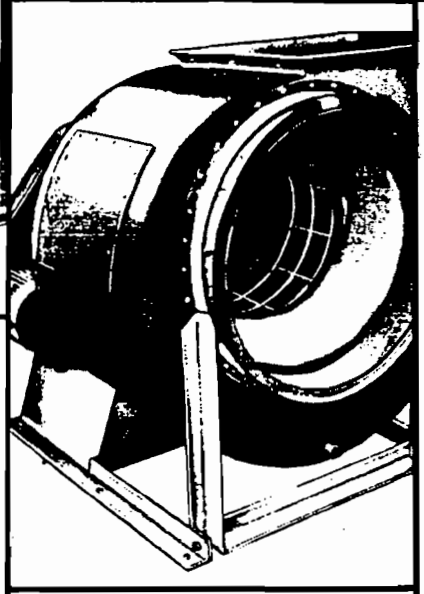
NOTES: (1) These ratings cover the performance of BOTH Class I and Class II Type NH Fans. Class I Fans can be used for ratings printed in black ONLY. Class II Fans can be used for ALL ratings printed in both black and grey. (2) Ball bearings are standard on all Type NH Fans. Sleeve bearings can be supplied for ratings printed ABOVE SOLID color line only. (3) Values underlined indicate the most efficient point of operation for each pressure.

704502

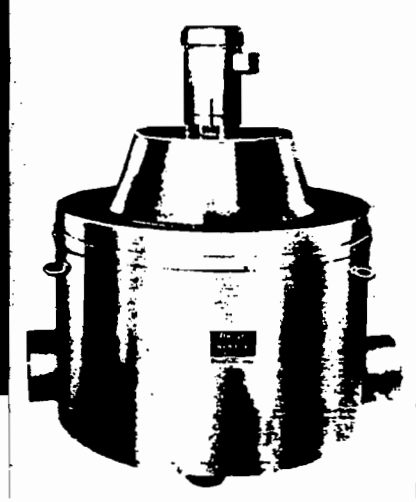
MEET YOUR
POLLUTION CONTROL
REQUIREMENTS
WITH THE LEADER IN
PVC FABRICATIONS



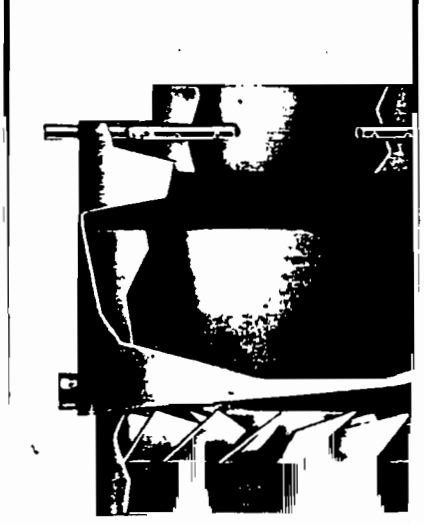
Duall



CONTROLLED ENVIRONMENTS FOR INDUSTRY
P. O. BOX 10428 — 904/396-7733
JACKSONVILLE, FLORIDA 32247-0428
DANIEL J. KLOS



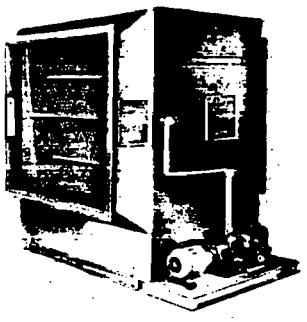
PVC CONSTRUCTED
FUME SCRUBBERS
CENTRIFUGAL FANS
DUCTING and HOODS
OIL MIST COLLECTORS
COMPLETE SYSTEMS



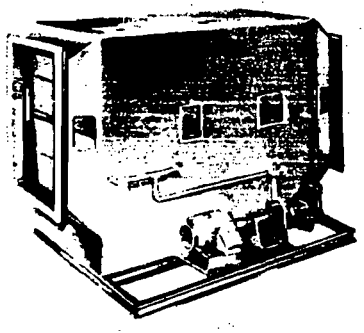
Duall
INDUSTRIES, INC.
McMillan Street [illegible] Wixom, Michigan

Duall Fume Scrubbers in 6 Types

F-101 SERIES



Single Pack



Double Pack

Duall Single Pack (four Stage) Fume Scrubbers solve most industrial air pollution problems. They are especially effective on water soluble fumes and odors, or with pH control on many low soluble contaminants.

Some typical proven applications are:
- Acid fumes.
- Plating fumes.
- Cleaning fumes.
- Lab hood fumes.
- Anodizing fumes.
- Pickling fumes.
- Rust-proofing fumes.
- Die-casting fumes.
- Water soluble odors.

Duall Single Pack Fume Scrubbers incorporate these advantages:
- Low cost.
- Low maintenance.
- Low water consumption.
- Low static pressure drop.
- 100% corrosion resistant.

Duall Double Pack (six stage) Fume Scrubbers offer the broadest range of answers to industrial air pollution problems. By double scrubbing the air these scrubbers provide maximum efficiency on tough fumes and odors which can not be completely absorbed in a single pack type scrubber.

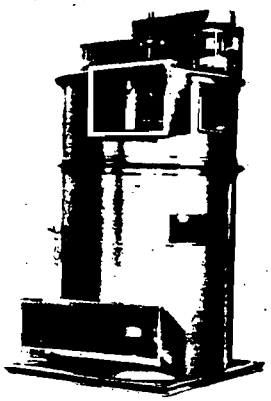
Duall's Double Pack Scrubbers have proven effective on the following typical applications:
- Bright dip fumes.
- Strip tank fumes.
- Etching fumes.
- Most low solubility fumes and odors.

Our Double Pack Fume Scrubbers offer all the advantages of the Single Pack units as well as the broadest range of applications.

All Duall Fume Scrubbers can be modified for custom installation with multiple packs or extended depth packs. Multiple modular units are available for capacities larger than standard.

See page 6 for complete specs and performance data.

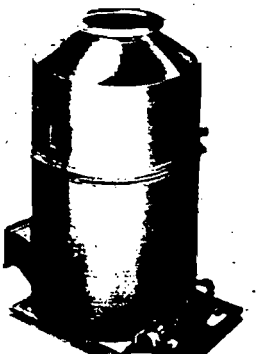
FW-300 SERIES



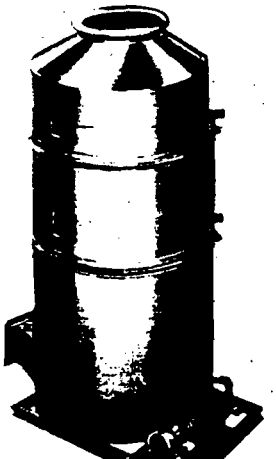
Single Pack

Double Pack

PT-500 SERIES

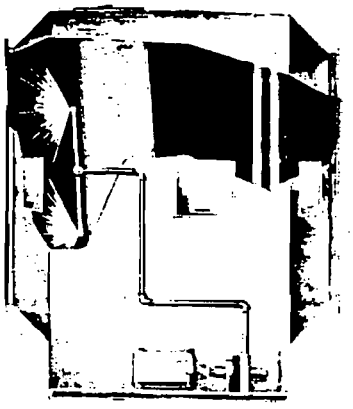


Single Pack



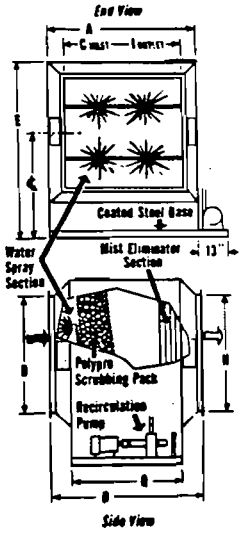
Double Pack

F-101 HORIZONTAL SINGLE FILTER PACK

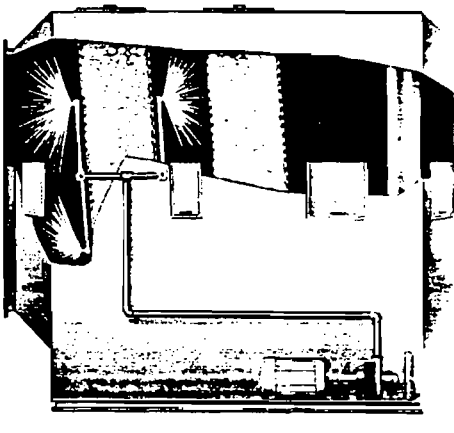


Being our most popular scrubber design, this compact 100% corrosion resistant P.V.C. unit has proven its efficiency nationwide. The Duall F-101 incorporates high efficiency, low maintenance filter media and the open orifice type spray nozzles, for the assurance of a thoroughly saturated collection chamber. Our mist eliminator outlet section gives four air direction changes to properly remove the entrained moisture. Where a horizontal installation is preferred, the F-101 should be your choice.

CFM in 000's	DIMENSIONS IN INCHES A	B	C	D	E	H	I	Q	¢	CFM in 000's	A	B	C	D	E	H	I	Q	¢
0.5	18	10	10	49	30	10	10	37	21	20	88	61	72	66	87	61	72	46	52½
1	22	14	14	50	34	14	14	38	23	22	97	61	81	66	87	61	81	46	52½
2	28	20	20	50	40	20	20	38	26	24	104	61	88	66	87	61	88	46	52½
3	32	24	24	51	44	24	24	39	28	26	112	61	96	66	87	61	96	46	52½
4	37	29	29	52	49	29	29	40	30½	28	123	61	107	66	87	61	107	46	52½
5	41	33	33	52	53	33	33	40	32½	30	135	61	119	66	87	61	119	46	52½
6	45	37	37	53	58	37	37	41	35½	35	157	61	141	66	87	61	141	46	52½
8	52	44	44	54	65	44	44	42	39	40	179	61	163	66	87	61	163	46	52½
10	58	46	46	59	71	46	46	43	42	45	102	61	186	66	87	61	186	46	52½
12	64	52	52	60	77	52	52	44	45	50	224	61	208	66	87	61	208	46	52½
14	69	57	57	60	82	57	57	44	47½	55	247	61	231	66	87	61	231	46	52½
16	74	62	62	61	87	62	62	45	50	60	269	61	253	66	87	61	253	46	52½
18	81	65	69	61	91	65	69	45	52½	◗	Larger sizes on request.								

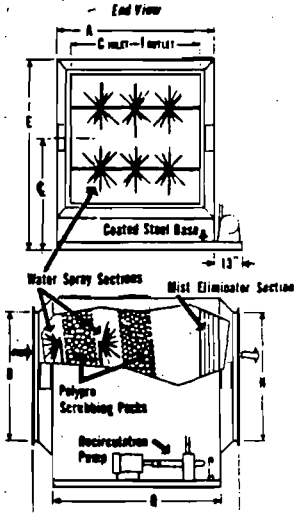


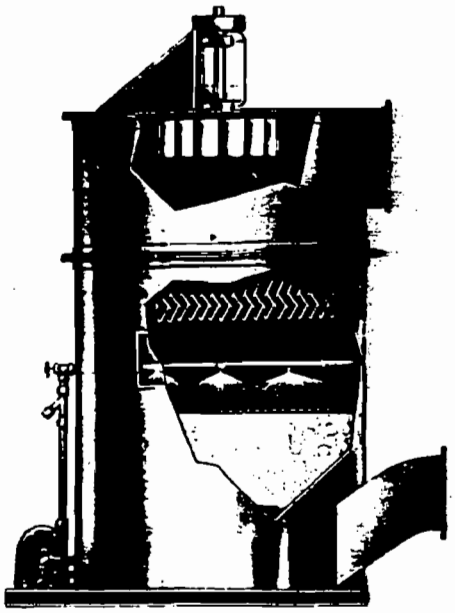
F-101D HORIZONTAL DOUBLE FILTER PACK

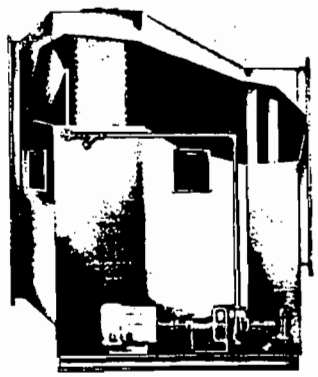


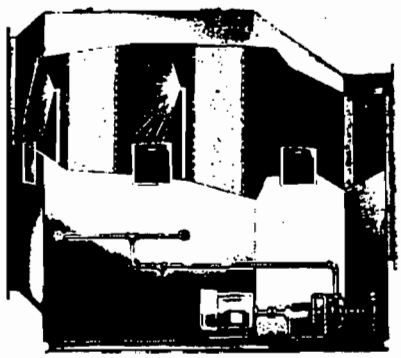
An extra heavy duty scrubber for real "tuffies". It incorporates *two* filter packs with *two* sets of sprays for more thorough scrubbing . . . plus an effective mist eliminator at the air outlet. Serious concentrations of rough fumes, such as nitric, hydrofluoric, and hydrochloric acid are double scrubbed through six stages for maximum efficiency. Use this high efficiency fume scrubber, at only a small increase in price.

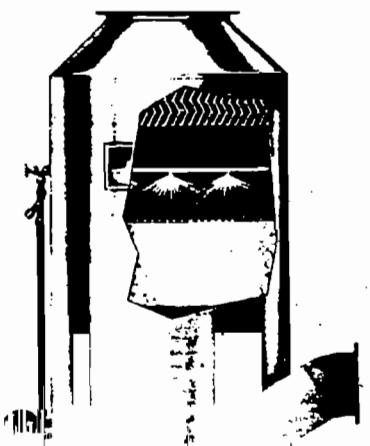
CFM in 000's	DIMENSIONS IN INCHES A	B	C	D	E	H	I	Q	¢	CFM in 000's	A	B	C	D	E	H	I	Q	¢
0.5	18	10	10	70	30	10	10	58	21	20	88	61	72	87	91	61	72	67	52½
1	22	14	14	71	34	14	14	59	23	22	97	61	81	87	91	61	81	67	52½
2	28	20	20	71	40	20	20	59	26	24	104	61	88	87	91	61	88	67	52½
3	32	24	24	72	44	24	24	60	28	26	112	61	96	87	91	61	96	67	52½
4	37	29	29	73	49	29	29	61	30½	28	123	61	107	87	91	61	107	67	52½
5	41	33	33	73	53	33	33	61	32½	30	135	61	119	87	91	61	119	67	52½
6	45	37	37	74	58	37	37	62	35½	35	157	61	141	87	91	61	141	67	52½
8	52	44	44	75	65	44	44	63	39	40	179	61	163	87	91	61	163	67	52½
10	58	46	46	80	71	46	46	64	42	45	202	61	186	87	91	61	186	67	52½
12	64	52	52	81	77	52	52	65	45	50	224	61	208	87	91	61	208	67	52½
14	69	57	57	81	82	57	57	65	47½	55	247	61	231	87	91	61	231	67	52½
16	74	62	62	82	87	62	62	66	50	60	269	61	253	87	91	61	253	67	52½
18	81	65	69	82	91	65	69	66	52½	◗	Larger sizes on request.								











Duall INDUSTRIES

PVC Constructed, 100% Corrosion Free

FUME SCRUBBERS

FW-300 Vertical Pack with Blower

500 TO 12,000 C.F.M. . . . ***plus multiple installations***

This packed tower type scrubber is not only a space saver, it's also a true economy model. It incorporates a built-in rugged fan with convenient exterior, belt driven, TEFCBB motor. During installation, the horizontal air discharge can be swivelled 360° before sealing into permanent position. Efficiency is equal to the F-101 and the PT-500. Compactness and versatility make it an unusually popular model. This FW-300 saves three ways . . . in initial cost, installation, and in space. Also available with double pack.

F-101 Horizontal Single Filter Pack

500 TO OVER 60,000 C.F.M. . . . ***plus multiple installations***

Being our most popular scrubber design, this compact 100% corrosion resistant P.V.C. unit has proven its efficiency in 46 states. The Duall F-101 incorporates high efficiency, low maintenance filter media and the open orifice type spray nozzles, for the assurance of a thoroughly saturated collection chamber. Our mist eliminator outlet section gives four air direction changes to properly remove the entrained moisture. Where a horizontal installation is preferred, the F-101 should be your choice.

F-101-D Horizontal Double Filter Pack

500 TO OVER 60,000 C.F.M. . . . ***plus multiple installations***

An extra heavy duty scrubber for real "tuffies". It incorporates *two* filter packs with *two* sets of sprays for more thorough scrubbing . . . plus an effective mist eliminator at the air outlet. Serious concentrations of rough fumes, such as nitric, hydrofluoric, and hydrochloric acid are double scrubbed through six stages for maximum efficiency. For such problems in your plant, use this high efficiency fume scrubber, at only a small increase in price.

PT-500 Vertical Pack

500 TO OVER 30,000 C.F.M. . . . ***plus multiple installations***

The upright PT-500 is the space saver. This scrubber is a vertical packed tower type designed to fit into restricted spaces where floor space is at a premium. Its efficiency is equal to the F-101, and also 100% corrosion-free. Air flow is up through a thoroughly water saturated bed of filter media. The mist eliminator pack near the top outlet assures properly dried air. If space is your problem, take a good look at the PT-500. Also available with double pack.

Duall FUME SCRUBBERS

SPECIFICATIONS and PERFORMANCE DATA

DESCRIPTIONS

F-101. Horizontal (cross-flow), four stage, wet scrubber. This model has maximum efficiency on water soluble contaminants and odors, but is also effective on low soluble contaminants with the use of chemical neutralizers.

F-101D. Horizontal (cross-flow), six stage, wet scrubber. The F-101D is especially designed for use on stubborn low solubility contaminants or where extremely high scrubbing efficiency is required on normal contaminants.

FW-300. Vertical (counter-flow), four stage, wet scrubber with integral blower. Efficency is equal to the F-101.

FW-300D. Vertical (counter-flow), six stage, wet scrubber with integral blower. Efficiency is equal to the F-101D.

PT-500. Vertical (counter-flow), four stage, wet scrubber. Efficiency is equal to the F-101.

PT-500D. Vertical (counter-flow), six stage, wet scrubber. Efficiency is equal to the F-101D.

All Duall Fume Scrubbers are constructed of P.V.C. and Polypropylene corrosion resistant materials and include a rugged coated steel base with lifting luggs. All above units are available with extended depth packing.

SCRUBBING PRINCIPLES

Contaminant removal is accomplished by first slowing the fumes to a velocity below 500 fpm and then passing the fumes through two scrubbing stages in the single pack models and four stages in the double pack types. The fumes first pass through a water spray or curtain during which a percentage of the larger contaminant particles drop out and the remaining fumes are saturated. The second stage consists of a 12" deep pack of polypropylene high surface, non-clogging, spherical plate packing media* which is continuously wetted by the spray nozzles. The saturated fumes are impinged upon the packing and the contaminants are absorbed and carried away in the wash water. The first and second stages are repeated in the double pack fume scrubbers.

*Several types of alternate packing media are available on request.

MIST ELIMINATION

After passing through the scrubbing sections, the air is moisture laden and must pass through a two stage gravity mist eliminator section. This final stage of P.V.C. eliminator blades provides four 30° changes in direction and eliminates entrained water.

WATER SUPPLY

All Duall Fume Scrubbers may be supplied with water either directly from your supply or from an integral or remote recirculation system supplied with the scrubber. It is generally recommended that a recirculation system be used to conserve water except on very low cfm units. The actual fresh water consumption on the single pack series with recirculation is only 0.05 to 0.15 gpm/1000 cfm depending on the contaminant involved. On the double pack models, water consumption ranges from 0.1 to 0.3 gpm/1000 cfm. This represents 5% of the water being recirculated. Duall scrubbers are self-draining and may be installed out-doors in sub-zero conditons without freeze-up. If these conditions exsist, a remote recirculation system should be specified for placement in a heated area.

All Duall Scrubbers come complete with fittings for the additon of chemical neutralizers, if required. A complete chemical metering and pumping system is available upon request.

MATERIALS

Every Duall Fume Scrubber is shipped complete with an integral coated steel base. No special mounting is required. Simply connect the duct, the water and power supply, and the unit is ready for operation. Complete installation and operating instructions are supplied with all Duall Scrubbers.

PRESSURE DROP

The following pressure drops are applicable for Scrubbers operated at design CFM:

F-101	2.0" w.g.	FW-300D	3.0" w.g.
F-101D	3.0" w.g.	PT-500	2.0" w.g.
FW-300	2.0" w.g.	PT-500D	3.0" w.g.

On the FW-300 series, the blower is designed for 2.0" external static pressure.

FW-300 BLOWER SECTION

The top section of the FW-300 Fume Scrubber consists of a Duall P.V.C. centrifugal blower complete with motor and OSHA belt guard and shaft cover. The blower section may be rotated through 360° to obtain any desired angle between scrubber inlet and blower outlet. This blower section is same low maintenance, guaranteed corrosion resistant blower described in Duall Brochure No. CI-131, and NH-151.

MAINTENANCE

All Duall Fume Scrubbers incorporate low maintenance components from front to back, including the packing, plumbing system and eliminators. Quick opening inspection doors are at all critical points.

DUALL FUME SCRUBBERS
Typical Average Fume Removal Efficiencies

CONTAMINATES ▼ / MODELS ▶	Single Pack Series: F-101 PT-500 FW-300	Double Pack Series: F-101D PT-500D FW-300D	Single Pack Series: with added Chemical Neutralizer (pH Control)	Double Pack Series: with added Chemical Neutralizer (pH Control)
Acetic Acid	95-98	98-99	—	—
Alkaline Cleaners	96-99	98-99	—	—
Aluminum Bright Dip *	80-85	85-90	—	—
Anodizing	96-99	98-99	—	—
Aqua Regia	80-85	85-90	85-90	90-95
Boric Acid	85-90	90-95	—	—
Caustic Cleaners	98-99	99	—	—
Caustic Soda	98-99	99	—	—
Chlorine	80-85	85-90	85-90	90-95
Chromic Acid	98-99	99	—	—
Copper Chloride	75-80	80-85	85-90	90-95
Cyanide Solutions	98-99	99	—	—
Ferric Chloride	80-85	83-88	—	—
Ferric Nitrate	96-98	98-99	—	—
Ferrous Chloride	90-95	95-98	—	—
Ferrous Sulfate	95-97	96-98	—	—
Fluosilicic Acid	95-98	98-99	—	—
Hydrochloric Acid	80-85	85-90	90-95	95-98
Hydrogen Cyanide	85-90	90-95	—	—
Hydrofluoric Acid	90-93	95-98	—	—
Hydrofluosilicic Acid	95-98	98-99	—	—
Hydrogen Peroxide	90-95	95-99	—	—
Hydrogen Sulfide	70-75	75-80	85-90	95-98
Nickel Chloride	80-85	85-90	90-95	95-98
Nickel Sulfate	80-85	85-90	90-95	95-98
Nitric Acid	75-80	85-90	—	—
Nitrogen Dioxide (NO_2)	45-50	50-60	65-70	70-75
Nitric — HF Acid	75-80	85-90	—	—
Perchloric Acid	95-98	96-99	—	—
Phosphoric Acid	96-99	98-99	—	—
Potassium Dichromate	96-98	98-99	—	—
Selenium Sulfide	96-98	98-99	—	—
Sodium Chloride	96-98	98-99	—	—
Sodium Fluoride	90-95	95-98	—	—
Sodium Glutenate	96-98	98-99	—	—
Sodium Hydroxide	98-99	99	—	—
Sulfur Dioxide	70-75	75-80	80-85	85-90
Sulfuric Acid	96-98	98-99	—	—
Tin Chlorides	75-80	80-85	85-90	90-95
Zinc Chloride	75-80	80-85	—	—
Zinc Nitrate	96-98	98-99	—	—
Zinc Sulfate	96-98	98-99	—	—

* These efficiencies are for the combined nitric and phosphoric fume. The efficiency for the NO_2 portion of the fume only will be as listed above.

● The above efficiencies are intended as guide representing average values. Specific combinations and concentrations

Duall Industries, Inc. 700 South McMillan St., Owosso, Michigan, 48867 Area Code 517/ 725-8184

TECHNICAL BULLETIN

Duall Industries

No. 121-9

DUALL SCRUBBERS
INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

1. AIR FLOW
Units are normally designed to be on the suction side of the fan. Air flow through units must be in the direction indicated. Too large a deviation from the design flow (CFM) will affect the efficiency of the scrubber.

2. SUPPORTING THE UNIT
The scrubber rests on a steel channel base making the unit self-supporting. This steel base may be suspended from overhead structure or rest on any media suitable to support the unit's weight.

3. CONNECTION TO VENTILATION DUCT
To eliminate the possibility of water running down the duct, there should be a minimum of 4 ft. of horizontal duct before the scrubber transition. This should be sloped slightly towards the bottom of the scrubber. The flanges should be field drilled on approximately 4"-5" centers. A soft foam type chemically compatible gasket material is recommended between the scrubber flange and the duct flange.

4. ELECTRICAL CONNECTION
Proper electrical connection complying with local codes should be made to the pump motor.

5. UNITS WITH INTERNAL RECIRCULATION SYSTEM
Units should be installed in heated areas or protected from freezing. Fresh water must be supplied by connecting the supply line to the flowmeter provided. This flowmeter is mounted on the side of the scrubber. The make-up water line should be valved to provide a maximum of 5% of the recirculation rate as shown on the side of the scrubber. The scrubber drain is connected to customer's waste drain line. If this line must go to a sump, it must be submerged 6"-8" below the lowest expected level, or a plumber's "P" trap should be installed. This will prevent air from flowing into the drain line and interfering with proper drainage of the scrubber. Liquid build-up in the scrubber can interfere seriously with the proper operation of the scrubber.

BEFORE START-UP, INSPECT THE INSIDE OF THE SCRUBBER AND REMOVE ANY FOREIGN MATERIAL FROM THE UNIT. SHUT THE WASTE DRAIN VALVE AND FILL THE SCRUBBER BASE SUMP WITH WATER UNTIL WATER FLOWS FROM THE OVERFLOW DRAIN. WATER IS INTRODUCED THRU THE FLOWMETER AND CAN ALSO BE INTRODUCED BY A HOSE PLACED THRU THE INSPECTION DOORS. When the water reaches the overflow level, the pump and fan may be started.

6. UNITS DESIGNED WITH REMOTE RECIRCULATION TANK AND PUMP

All units designed for remote recirculation require a separate recirculation tank with an adequately sized overflow and waste drain. The use of the remote recirculation tank will permit the installation of self-draining scrubber outside the building and the recirculation tank inside the building. The scrubber must be elevated for proper drain return to the recirculation tank. The scrubber drain pipe must be submerged 6" to 8" below the lowest expected liquid level in the tank and on the opposite side from the pump suction. The pipe end should be cut on a 60° angle with the long opening facing the tank side. For information on start-up and make-up water, please refer to Section 5 above. Make-up water may be introduced into the recirculation tank through the separate flowmeter provided for installation into water line.

7. PUMPS

Pumps should be operated in accordance with the enclosed manufacturer's instructions. Pumps with mechanical seals should be given particularly special attention to assure operation as directed. Pump motor should be electrically bumped to check for proper rotation. Motors and pumps are aligned and checked for proper operation before shipment. Customer is cautioned that misalignment may occur during shipment. Check for misalignment by manually rotating the shaft while observing coupling alignment using a straight edge or a dial indicator. Pumps provided with a packing gland are pre-adjusted to drip approximately 30 drops per minute. Drain fittings are provided on the pump or on a collection pan which should be plumbed to the waste drain. Pump motor should be interlocked with fan to provide approximately two (2) minutes pump operation before fan may be started. Pumps should not be started until the scrubber base or remote recirculation tank are filled to the overflow level. During the early break-in period, the pump packing gland should be checked for proper weeping. If incorrect, check pump manufacturer's instructions for correction procedure.

8. CHEMICAL ADDITIONS

In some cases, liquid caustic (sodium hydroxide solution) or an acid solution may be metered into the recirculation system to increase scrubber efficiency. A threaded coupling is provided in the side of the self-contained recirculation scrubbers for introduction of this chemical addition. Chemical addition for scrubbers provided with remote recirculation tanks is made by adding the solution to the recirculation tank. When using solid caustic, care should be taken in mixing to assure that no solid material is pumped into the scrubber or recirculation tank which may cause a build-up. The pH of the recirculation tank should be maintained in a range that will achieve the desired scrubber efficiency while preventing the appearance of a build-up on the packing. A pH control package may be purchased from Duall to provide a chemical feed pump and pH control to maintain the recirculation solution in the satisfactory range.

Duall Industries, Inc. 700 South McMillan St., Owosso, Michigan, 48867 Area Code 517/ 725-8184

9. PERIODIC MAINTENANCE SCHEDULE

Inspection doors are provided in all scrubber units for periodic inspection. While it is not expected that maintenance will be required, periodic inspection on a monthly basis is suggested. This inspection should include the following:

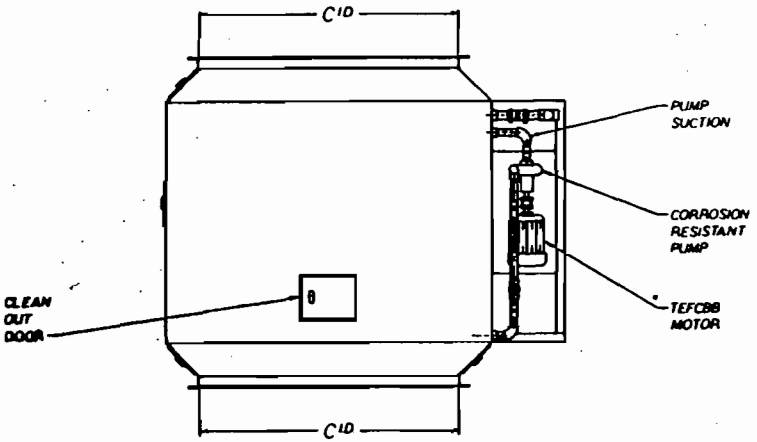
A. Check spray nozzles with the pump and fan in operation. All nozzles should produce a full 360° spray pattern. If any nozzles are found to be spraying incorrectly, the pump should be stopped, the header pipe removed, and each nozzle cleaned individually. When the cleaned header system has been replaced, the pump may be restarted.

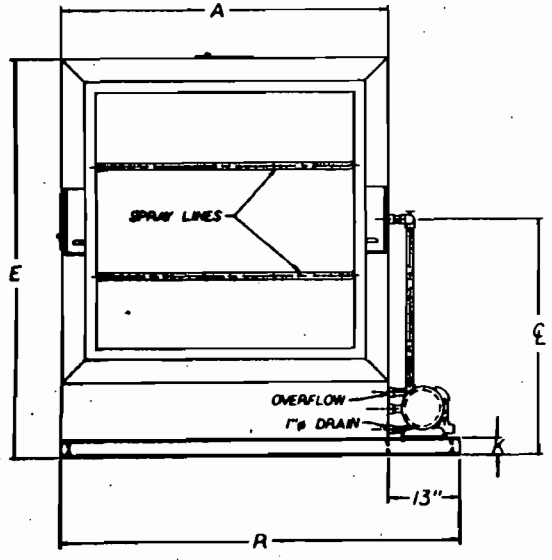
B. Check the face of the scrubber and the spray nozzles for any indication of a build-up of solids. If a surface build-up has occurred, it may be removed by spraying the pack with high pressure water, by chemical treatment of the scrubbing solution to dissolve the scale, or by manually removing the surface build-up. An analysis of the material build-up can be made to determine its nature. A dissolving additive, compatible with P.V.C. then could be added to the recycling reservoir for closed loop cleaning. During this type of cleaning, the drain and make-up water valves should be closed. During this operation, someone should frequently check the operation of the nozzles, and solution level to prevent pump damage. Prior to putting the system back in service, the cleaning solution should be drained and the scrubber refilled with fresh water. Steam should not be used to clean the scrubber.

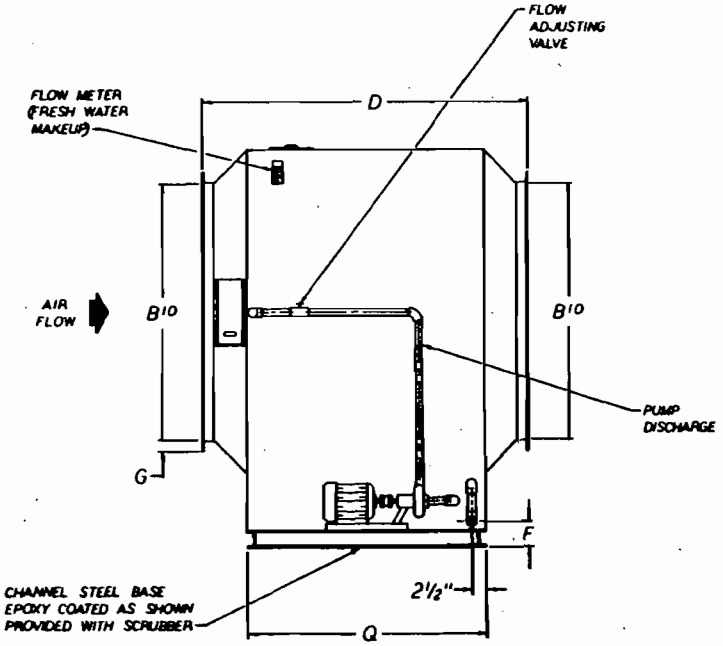
C. Check the water level in the scrubber. While the scrubber is in operation, it should maintain a solution of approximately 3"-6" in the bottom of the scrubber on a remote recirculation system and to the overflow on others.

CFM	05	1	2	3	4	5	6	8	10	12	14	16	18	20	22	24	26	28	30	35	40	45	50	55	60
A	18	22	28	32	37	41	45	52	58	64	69	74	81	88	97	104	112	123	135	157	179	202	224	247	269
B	10	14	20	24	29	33	37	44	46	52	57	62	65	61	61	61	61	61	61	61	61	61	61	61	61
C	10	14	20	24	29	33	37	44	46	52	57	62	69	72	81	88	96	107	119	141	163	186	208	231	253
D	49	50	50	51	52	52	53	54	59	60	60	61	61	66	66	66	66	66	66	66	66	66	66	66	66
E	30	34	40	44	49	53	58	65	71	77	82	87	91	91	91	91	91	91	91	91	91	91	91	91	91
F	3½	3½	3½	3½	3½	3½	4½	4½	4½	4½	4½	4½	5½	5½	5½	5½	5½	5½	5½	5½	5½	5½	5½	5½	5½
G	1½	1½	1½	1½	1½	1½	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
K	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4
Q	37	38	38	39	40	40	41	42	43	44	44	45	45	46	46	46	46	46	46	46	46	46	46	46	46
R	31	35	41	45	50	54	58	65	71	77	82	87	94	101	110	117	125	136	148	170	192	215	237	260	282
℄	21	23	26	28	30½	32½	35½	39	42	45	47½	50	52½	52½	52½	52½	52½	52½	52½	52½	52½	52½	52½	52½	52½
OVERFLOW	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½
PUMP SUCTION	1	1	1	1	1	1	1	1¼	1¼	1½	1½	2	2	2	2	2	3	3	3	3	3	3	3	3	3
PUMP DISCHARGE	¾	¾	¾	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2	2	3	3	3	3	3
LIQUID RATE GPM	15	3	6	9	12	15	18	24	30	36	42	48	54	60	66	72	78	84	90	105	120	139	150	165	180

NOTE: CFM IN THOUSANDS







F-101 FUME SCRUBBER

WITH SELF CONTAINED RECIRCULATION

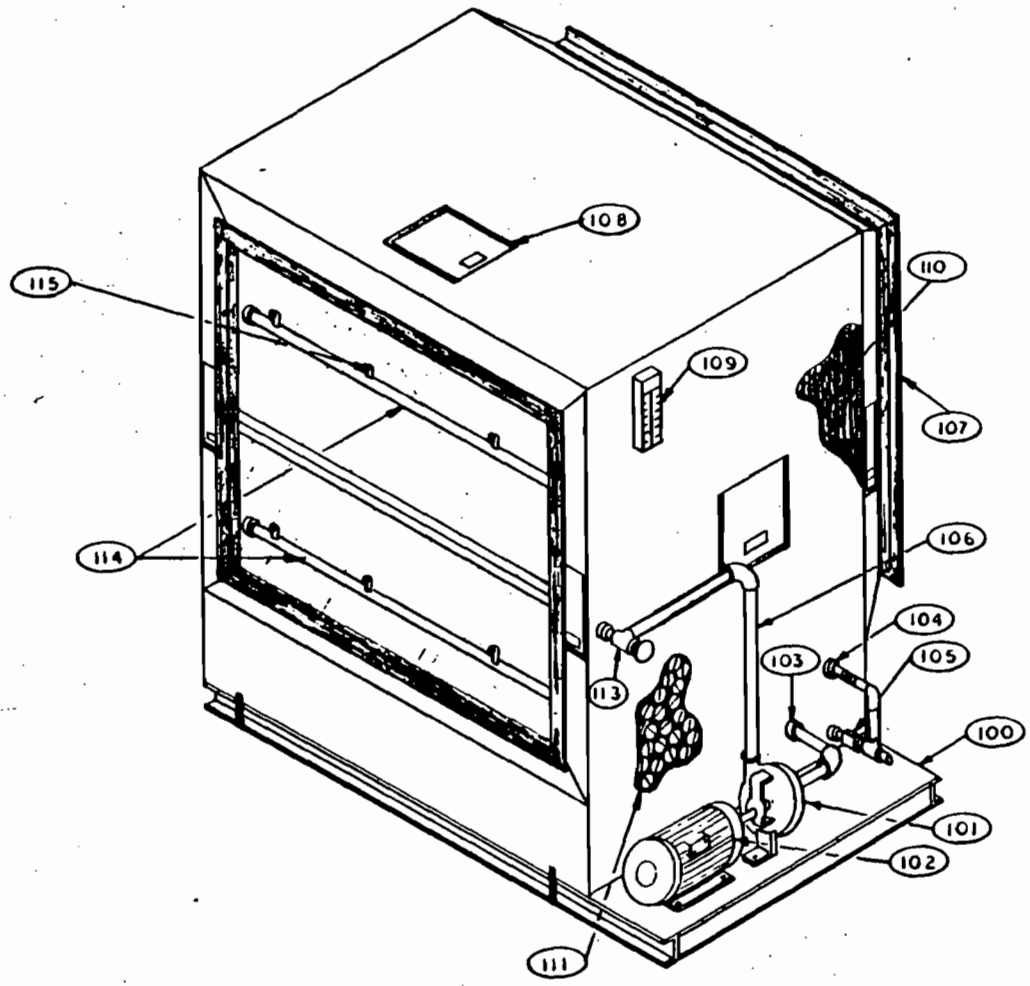
DUALL INDUSTRIES, INC. OWOSSO, MI.

DATE	DUALL JOB NO.	
PURCHASER		
PURCHASER P.O. NO.		
PURCHASER LOCATION		
JOB NAME		
JOB LOCATION		
SPECIFICATION NO.	ITEM NO.	
CAPACITY		CFM
PRESSURE DROP		W.G.
LIQUID RECIRCULATION RATE		GPM
LIQUID PRESSURE		TDH
MAKEUP RATE		GPM
RECIRCULATION PUMP		
PUMP CAPACITY	GPM	TDH
PUMP HP		
PUMP VOLTAGE	V PH.	HZ.

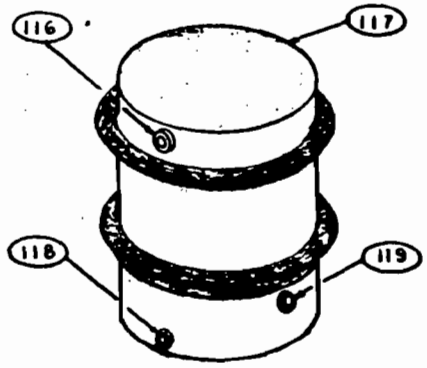
TAG:

D-101-1016

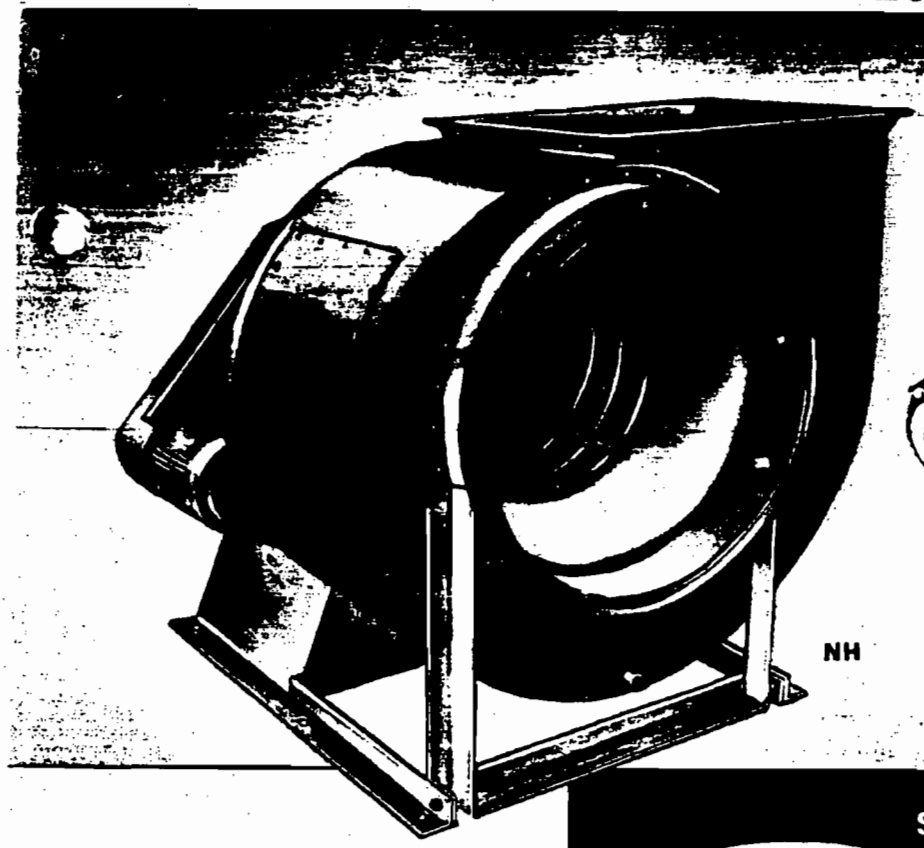
F-101 FUME SCRUBBER WITH SELF CONTAINED RECIRCULATION		D.L.
		J.F.
SCALE	SHEET OF DATE	NUL



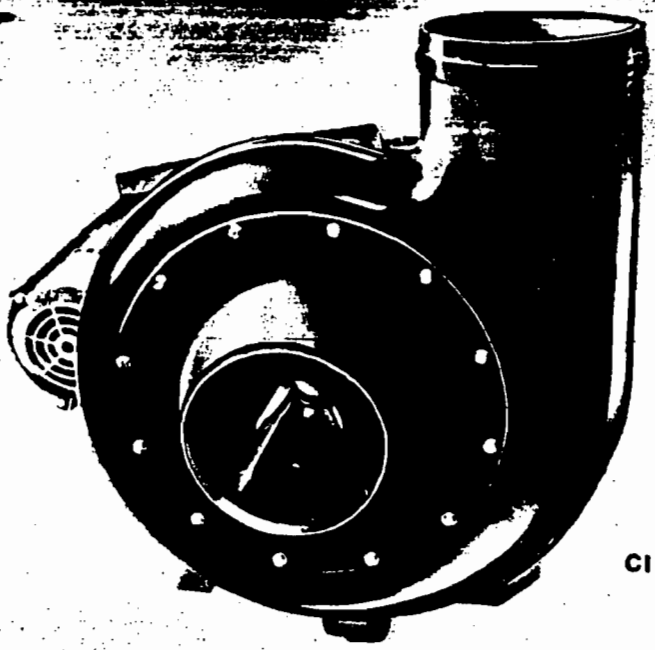
DUALL F-101 FUME SCRUBBER PARTS LIST	
NO:	PART
100	EPOXY COATED STEEL BASE
101	CORROSION RESISTANT PUMP
102	TEFCBB MOTOR ___ ___V./ PH./ ___CY. ___H.P. ___R.P.M.
103	PUMP SUCTION COUPLING (P.V.C.)
104	OVERFLOW COUPLING (P.V.C.)
105	DRAIN VALVE (P.V.C.)
106	PUMP DISCHARGE LINE (P.V.C.)
107	FLANGE (P.V.C.)
108	CLEAR OR P.V.C. CLEANOUT DOORS
109	FLOW METER ___ ___ ___.
110	ELIMINATOR SECTION (P.V.C.)
111	POLYPROPYLENE PACKING
113	SPRAY HEADER VALVE (P.V.C.)
114	SPRAY HEADER (P.V.C.)
115	SPRAY NOZZLES



PARTS LIST FOR REMOTE RECIRCULATION TANK	
116	OVERFLOW (P.V.C.)
117	REMOTE TANK (P.V.C.)
118	DRAIN (P.V.C.)
119	PUMP SUCTION COUPLING (P.V.C.)



NH



CI

SPECIFY THE BEST . . .

Duall

INDUSTRIES

HIGH EFFICIENCY

●

BROAD PERFORMANCE RANGE

●

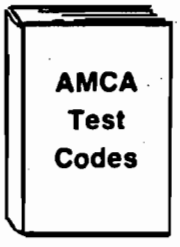
LOW OPERATING COST

●

QUIET OPERATION

FANS

PVC FABRICATED CENTRIFUGAL TYPES CI, NH, and RV IN SIZES TO OVER 70,000 CFM. CORROSION RESISTANT



Capacity tables listed in this catalog are calculated based on tests made in accordance with the applicable AMCA Standard Test Code. Rated capacities are based on standard air density of .075 pounds per cubic foot at sea level (29.92" Barometric Pressure), dry air, and 70°F.

CHEMICALS
ELECTRONICS
PAPER MAKING
NUCLEAR METALS
MARINE
PLATING
UTILITIES
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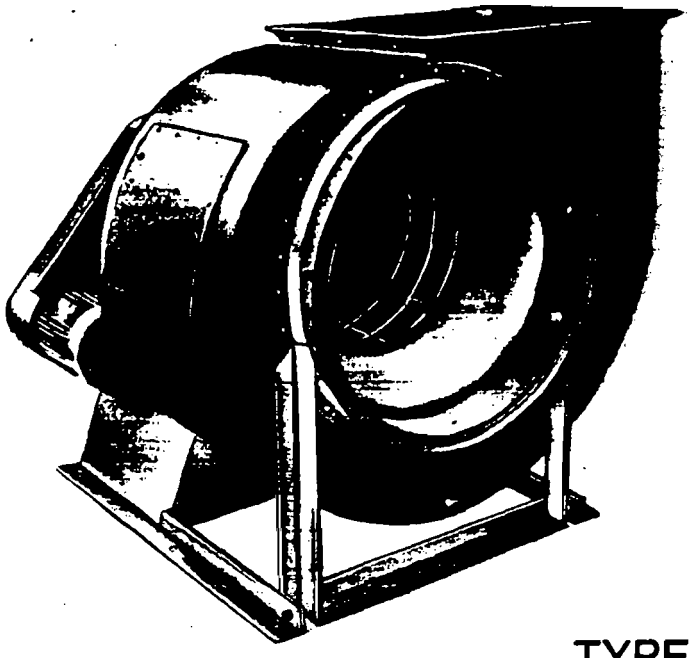
PHOTOGRAPHY
PETROLEUM
PICKLING
MISC. INDUSTRIES

Duall INDUSTRIES, INC.

700 South McMillan St.
Owosso, Michigan 48867

P.O. Box 1000



Duall
INDUSTRIES

PVC
CONSTRUCTED
CENTRIFUGAL
FANS

TYPE **NH** TO OVER **70,000** CFM

- HIGH EFFICIENCY.
- ECONOMICAL OPERATION.
- QUIET, SMOOTH RUNNING.
- GREAT CORROSION RESISTANCE.
- LOW MAINTENANCE.
- QUICK, EASY INSTALLATION.

To Accurately Specify Your Requirements You Will Need . . .

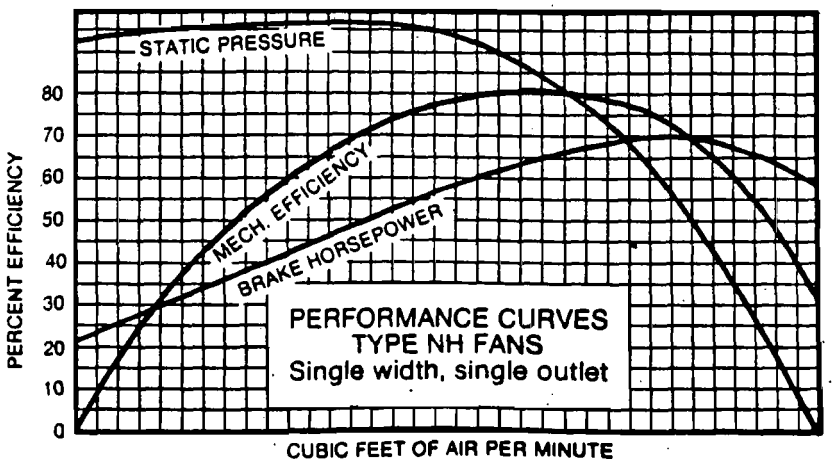
1. *Volume at the inlet in CFM.*
2. *The inlet static pressure.*
3. *The inlet air temperature.*
4. *If gas, not air, the density or specific gravity.*
5. *Elevation above sea level.*
6. *Characteristics of the electric current.*

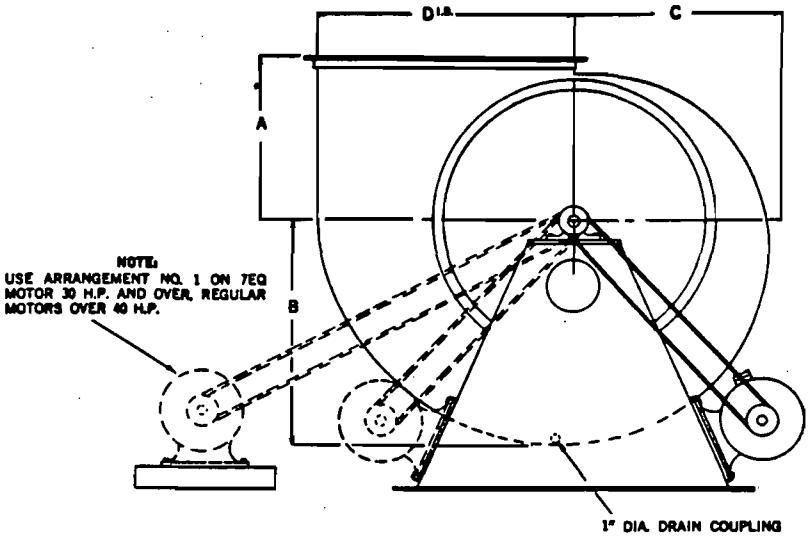
These large corrosion resistant P.V.C. constructed fans with their stable and efficient performance are preferred in most plants where a corrosive atmosphere prevails. The P.V.C., heavy duty constructed housings, with the steel reinforced plastisol coated wheel, make this excellent fan inherently quiet. Among the other fine features included are phenolic coated steel base, TEFCBB motor, drain, flanged inlet and outlet, OSHA approved shaft cover and belt guard, and a readily accessible access door. All offered as standard equipment at no increase in price. All Duall fans carry a one year warranty against corrosion.

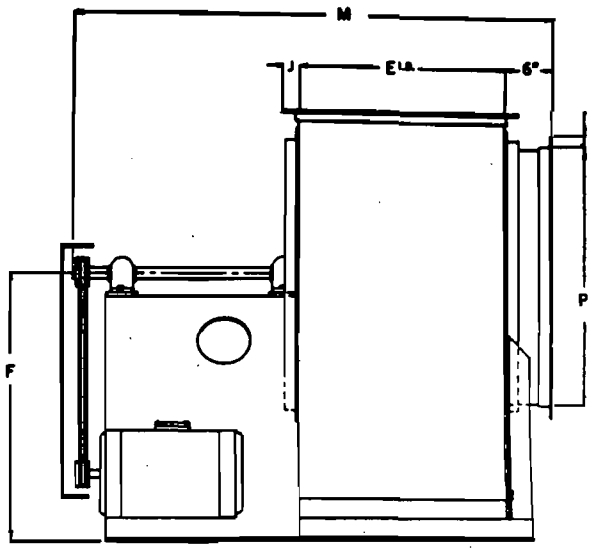
Construction Features

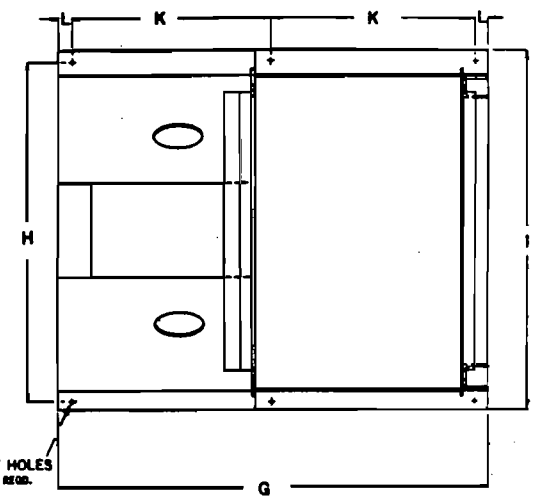
DUALL PVC FANS are built to last. Features include: Heavy angle iron bracing. Over-capacity shaft and bearings. Formed PVC venturi inlet for streamlined flow into the wheel with its own matching cone, resulting in very high efficiency and quiet operation. Operating temperatures up to 155°F. All PVC housing. PVC coated steel wheel. PVC inlet and outlet angle flanges. Phenolic coated steel frame. PVC drain. OSHA belt and shaft guards.

Excellent Performance









NOTE: Do not use this drawing for Dimension for Bottom Horizontal Discharge Fans.

CENTRIFUGAL NH FAN NO.		
DUALL INDUSTRIES, Inc. OWOSSO, MICH.		
DRAWN BY	USER	CLASS
DATE	LOCA.	ARR
ROTATION	PURCH.	CFM
V PH CY	LOCA.	SP
CERTIFIED BY	JOB NO.	BHP

DIMENSIONS IN INCHES

CENTRIFUGAL NH FAN NO.

FAN NO.	A	B	C	D I.D.	E I.D.	F	G	H	I	J	K	L	M	P I.D.	SHAFT DIA.	KEYWAY	BOLT HOLES DIA.
24½	10 5/16	11 11/64	9¾	12¾	9¾	14½	26 1/16	19¼	21¼	1½	12 1/32	1	33⅝	13¼	1 3/16	¼ x ⅛	½
27	10⅞	12 3/64	10⅝	14	10¾	16	27 1/16	20¼	22¼	1½	12 17/32	1	34⅝	14¼	1 3/16	¼ x ⅛	½
30	11 1/16	13 5/64	11 1/16	15⅝	11¾	17½	35	22	24	1½	16½	1	43	15½	1 5/16	5/16 x ⅛	½
33	12 5/16	14 3/32	12⅝	17⅛	13⅛	19½	38⅞	23⅜	25⅜	1½	18 1/16	1	43 5/16	17⅜	1 5/16	5/16 x ⅛	½
36½	13½	16 3/64	14 1/32	19	14½	20½	39¾	25	27	1½	18⅞	1	48⅛	19¼	1 7/16	⅜ x 3/16	½
40	14⅝	18 1/16	15⅜	20⅞	15⅞	23½	43⅛	27½	30	1½	20 5/16	1¼	51 1/16	21	1 11/16	⅜ x 3/16	½
44½	16	20 3/64	17 1/32	23¼	17⅝	25	45	31	33½	1½	21¼	1¼	52	23⅝	1 11/16	⅜ x 3/16	½
49	17⅜	22 1/32	18 1/16	25½	19½	27	47½	33⅛	35⅝	1½	22½	1¼	55 5/16	26	1 13/16	½ x ¼	½
54	18 1/16	24 1/32	20¾	28⅛	21½	30	49½	36¼	38¾	1½	23½	1¼	57 13/16	29	1 13/16	½ x ¼	½
60	20 5/16	27 1/64	23 1/32	31¼	23⅜	33	51⅞	40	42½	1½	24 11/16	1¼	60 5/16	32	2 3/16	½ x ¼	½
66	22⅝	30	25 5/16	34⅜	26¼	36	55½	44	47	1½	26¼	1½	63 13/16	34½	2 7/16	⅝ x 5/16	⅝
73	24⅞	33 1/32	28	38	29	40	59¼	48	51	1½	28⅜	1½	66 11/16	38½	2 7/16	⅝ x 5/16	⅝
80½	27¾	36 17/32	30⅞	42	32	43¾	63	53	56	2	30	1½	72	42¼	2 11/16	⅝ x 5/16	⅝
89	30½	40 1/64	34 3/32	46½	35⅜	44¾	66⅞	58	61	2	31 15/16	1½	76 5/16	46¼	2 15/16	¾ x ⅜	⅝
98	33¾	44 1/16	37⅝	51⅛	39	48	77½	64	67	2	37¼	1½	81 3/16	51¼	3 3/16	¾ x ⅜	⅝
108	37	49 5/16	41⅝	56½	43⅛	52	81½	69	72	2	39¼	1½	91 13/16	56	3 7/16	¾ x ⅜	⅝
120	41	54 17/32	46 1/16	62½	47¾	57¾	86	75	78	2	41½	1½	98⅜	62	3 15/16	1 x ½	⅝

CLASSES

I AND II

DUALL TYPE NH FANS

NON-OVERLOADING MEDIUM SPEED HIGH EFFICIENCY

SIZE 60

SINGLE WIDTH SINGLE INLET

Outlet Size 23¾" x 31¼" I.D. — **Wheel Diameter 30 in.**

Inlet Size 32" I.D. — **Outlet Area 5.15 Sq. Ft. Inside**

Tip Speed = RPM × 7.85 — **Max. BHP = 6.71 $\left(\frac{RPM}{1000}\right)^3$**

6900 CFM @ .4" SP

Volume of Air CFM	Outlet Velocity Feet per Minute	⅛" SP		¼" SP		⅜" SP		½" SP		⅝" SP		¾" SP		⅞" SP		1" SP		1¼" SP		1½" SP		1¾" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
4120	800	402	.30	434	.40	466	.50	498	.61	528	.73	559	.85	588	.99	644	1.29	699	1.61	752	1.94		
4635	900	427	.36	457	.46	486	.58	515	.70	544	.82	573	.95	601	1.08	654	1.38	705	1.70	755	2.05		
5150	1000	453	.43	481	.55	508	.66	535	.79	562	.92	589	1.06	615	1.19	666	1.48	715	1.81	762	2.17		
5665	1100	480	.52	506	.63	531	.76	556	.90	581	1.03	606	1.17	631	1.32	680	1.62	726	1.94	771	2.30		
6180	1200	507	.61	531	.74	555	.87	578	1.01	602	1.16	625	1.31	649	1.46	695	1.78	740	2.10	783	2.45		
6695	1300	535	.72	557	.85	580	.99	602	1.14	624	1.29	645	1.45	667	1.61	711	1.94	754	2.28	796	2.64		
7210	1400	563	.84	584	.99	605	1.14	626	1.29	647	1.45	667	1.61	688	1.78	729	2.12	770	2.48	811	2.85		
7725	1500	591	.98	611	1.14	630	1.29	651	1.46	671	1.62	690	1.79	710	1.96	748	2.32	788	2.70	826	3.08		
8240	1600	621	1.14	638	1.29	657	1.46	676	1.63	695	1.80	714	1.98	732	2.16	769	2.53	806	2.93	843	3.32		
8755	1700			666	1.47	684	1.65	701	1.83	720	2.00	738	2.19	755	2.37	791	2.77	825	3.17	861	3.59		
9270	1800			694	1.67	711	1.85	728	2.05	745	2.24	763	2.42	779	2.62	813	3.02	846	3.44	879	3.87		
9785	1900			722	1.88	739	2.08	755	2.28	770	2.48	788	2.67	804	2.87	836	3.29	868	3.72	900	4.17		
10300	2000					767	2.32	782	2.53	797	2.75	813	2.95	829	3.15	860	3.58	891	4.02	922	4.48		
10815	2100					795	2.59	810	2.80	824	3.02	838	3.24	854	3.46	884	3.89	914	4.35	944	4.83		
11330	2200					823	2.87	838	3.10	857	3.33	865	3.55	879	3.79	909	4.23	937	4.70	966	5.20		
11845	2300							866	3.41	885	3.65	893	3.90	906	4.13	934	4.60	961	5.06	989	5.61		
12360	2400							921	3.76	934	4.00	945	4.25	960	4.50	984	5.00	1010	5.51	1037	6.03		
12875	2500							980	4.13	990	4.37	1001	4.65	1014	4.89	1037	5.41	1061	5.92	1086	6.44		
13390	2600									1048	5.20	1058	5.51	1069	5.77	1092	6.28	1113	6.85	1136	7.42		
14420	2800									1106	6.18	1116	6.44	1125	6.70	1145	7.31	1168	7.93	1187	8.50		
15450	3000									1164	7.26	1174	7.57	1182	7.83	1202	8.45	1224	9.12	1241	9.73		

Volume of Air CFM	Outlet Velocity ft per M	2" SP		2½" SP		3" SP		3½" SP		4" SP		4½" SP		5" SP		5½" SP		6" SP		6½" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
5150	1000	808	2.55	898	3.34																
5565	1100	815	2.69	901	3.52																
6180	1200	825	2.84	907	3.68	986	4.60	1062	5.51	1133	6.70										
6695	1300	837	3.01	915	3.86	991	4.80	1065	5.77	1135	6.80										
7210	1400	850	3.23	925	4.06	998	5.01	1069	6.03	1139	7.06										
7725	1500	864	3.47	937	4.30	1007	5.20	1075	6.23	1141	7.31	1207	8.45	1269	9.58	1329	10.76	1387	11.95	1442	13.18
8240	1600	879	3.73	950	4.59	1018	5.46	1083	6.49	1147	7.57	1211	8.76	1272	9.94	1332	11.07	1389	12.36	1444	13.70
8755	1700	896	4.01	964	4.89	1030	5.82	1094	6.80	1155	7.93	1216	9.12	1275	10.30	1335	11.48	1391	12.88	1446	14.16
9270	1800	913	4.31	979	5.25	1043	6.18	1105	7.14	1165	8.24	1223	9.42	1281	10.66	1338	11.85	1394	13.29		
9785	1900	932	4.64	995	5.56	1057	6.54	1118	7.57	1176	8.60	1232	9.79	1288	11.02	1343	12.21	1398	13.65		
10300	2000	951	4.95	1012	5.92	1073	6.95	1131	7.98	1188	9.06	1243	10.20	1297	11.38	1350	12.72	1403	14.06		
10815	2100	972	5.30	1030	6.33	1089	7.36	1146	8.45	1201	9.53	1255	10.66	1308	11.85	1359	13.13	1410	14.47		
11330	2200	994	5.67	1049	6.70	1106	7.78	1161	8.91	1215	10.04	1268	11.18	1320	12.36	1370	13.60	1419	14.99		
11845	2300	1016	6.08	1069	7.16	1124	8.24	1178	9.37	1231	10.56	1282	11.74	1332	12.93	1381	14.21	1430	15.50		
12360	2400	1062	6.54	1112	7.62	1161	8.76	1211	9.88	1262	11.07	1311	12.31	1359	13.54	1406	14.83	1453	16.12		
12875	2500	1110	6.95	1157	8.60	1203	9.27	1249	10.45	1296	11.69	1344	12.82	1389	14.16	1435	15.45	1480	16.79		
13390	2600	1159	7.93	1204	9.12	1247	10.35	1290	11.53	1335	12.88	1379	14.21	1423	15.55	1466	16.89	1509	18.23		
14420	2800	1209	9.12	1253	10.30	1293	11.59	1335	12.88	1376	14.27	1417	15.60	1458	17.00	1498	18.38	1541	19.79		
15450	3000	1260	10.35	1302	11.64	1341	12.93	1380	14.32	1421	15.69	1458	17.10	1496	18.54	1536	20.03				
16480	3200	1314	11.69	1352	13.03	1390	14.42	1427	15.81	1465	17.25	1502	18.75	1538	20.29	1574	21.84				
17510	3400	1369	13.18	1403	14.63	1441	16.02	1476	17.51	1511	19.00	1547	20.55	1583	22.15	1616	23.74				

All Capacities Based on Standard Air (Density .075#/cu.ft.—70° F.—29.92" Hg. Bar.)

NOTES: (1) These ratings cover the performance of BOTH Class I and Class II Type NH Fans. Class I Fans can be used for ratings printed in black ONLY. Class II Fans can be used for ALL ratings printed in both black and grey. (2) Ball bearings are standard on all Type NH Fans. Sleeve bearings can be supplied for ratings printed ABOVE SOLID color line only. (3) Values underlined indicate the most efficient point of operation for each pressure.

TECHNICAL BULLETIN

Duall Industries

No. 131-7

DUALL CI & NH FANS, & ROOF VENTILATORS
INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

Date 4/24/79 Superseding Bulletin 10/13/75 Page 1

Duall Industries, Inc. 700 South McMillan St., Owosso, Michigan, 48867 Area Code 517/ 725-8184

1. INSTALLATION
All applicable electrical codes should be followed.
Do Not Lift By The Shaft.
The fan frame must be securely bolted to a rigid support using the holes provided. The frame should be level and care taken in tightening the bolts so that no torque is applied to the frame. If vibration appears, isolators should be installed.
On fans, the drain coupling should be plumbed to the waste drain. The CI and NH fans are also used on FW-300 fan-scrubbers and roof ventilators. On the FW-300, the fan is either shipped separately or attached to the scrubber, depending on the height of units.

2. OPERATION
Each Duall fan is completely tested statically and dynamically balanced in our plant, but prior to operating, the belt tension should be checked in case that rough handling during shipment has caused them to go out of adjustment. The interior of the fan housing should also be inspected for the presence of any foreign objects which, if found, must be removed prior to operation. The fan may now be operated. Any severe out of balance condition should be noted and reported to Duall Industries immediately. Do not run the fan in an out of balance condition as damage could occur.
Don't Forget To Check For Proper Rotation.

3. MAINTENANCE
Motor and Bearings: Routine maintenance required. See manufacturer's recommendations.
IMPORTANT: Be sure fan is shut off prior to removal of inspection doors or any maintenance or inspection procedure.
Fan Wheel: The inspection door should be periodically removed and the wheel inspected. Any build-up of foreign material on the wheel should be carefully removed and the coating inspected for damage. If the coating is found to be damaged, this condition should be reported to Duall Industries immediately.
For systems ventilating nitric acid fumes, FRP wheels are recommended on NH fans. Ask for a recommended coating for CI fan wheels.

P.V.C. FAN WEIGHTS WITH ADD-ON WEIGHTS FOR MOTORS

BLOWER SIZE	WEIGHT
6 CI	130
8 CI	170
10 CI	210
24½NH	225
27 NH	245
30 NH	250
33 NH	342
36½NH	390
40 NH	440
44½NH	490
49 NH	550
54 NH	650
60 NH	758
66 NH	954
73 NH	1240
80½NH	1400
89 NH	1650
98 NH	2070
108½NH	2205
120 NH	2755

MOTOR FRAME	H.P.	WEIGHT
143T	1	43
145T	1½	48
145T	2	48
182T	3	72
184T	5	82
213T	7½	145
215T	10	160
254T	15	230
256T	20	250
284T	25	355
286T	30	390
324T	40	550
326T	50	610
364T	60	835
365T	75	920
404T	100	1145

TECHNICAL BULLETIN

Duall Industries

No. 131-4

GENERAL DESIGN DATA
BLOWERS

Date 1/8/80 Page 1

A. Determine total CFM required (consider CFM required for future additions to system).

B. Determine static pressure at which blower must operate.
   1. Small duct system (5 drops or less) use 1"
   2. Larger duct system (15 drops or less) use 2"
   3. Scrubber - 2"
   4. Moisture extractor - 3/4"

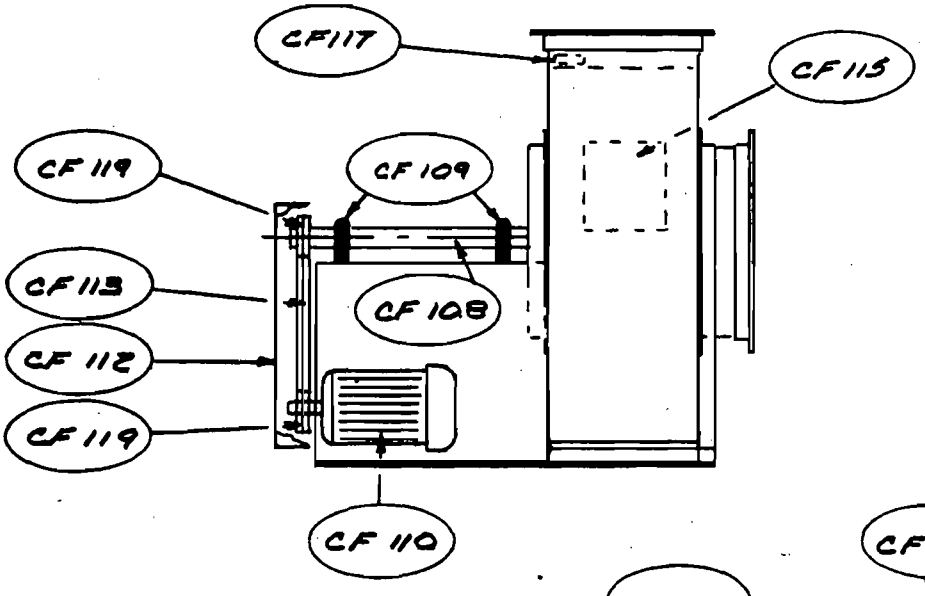
C. Determine proper blower size and horsepower.
   1. Consider any specified factors such as outlet velocity.
   2. Refer to Duall rating tables and choose a size and horsepower based on the above factors. The blower should be selected from the second or third set of ratings from the bottom of the table to allow for variation in CFM or static pressure.
   3. Class 2 ratings are printed in light grey. The Class must be noted.

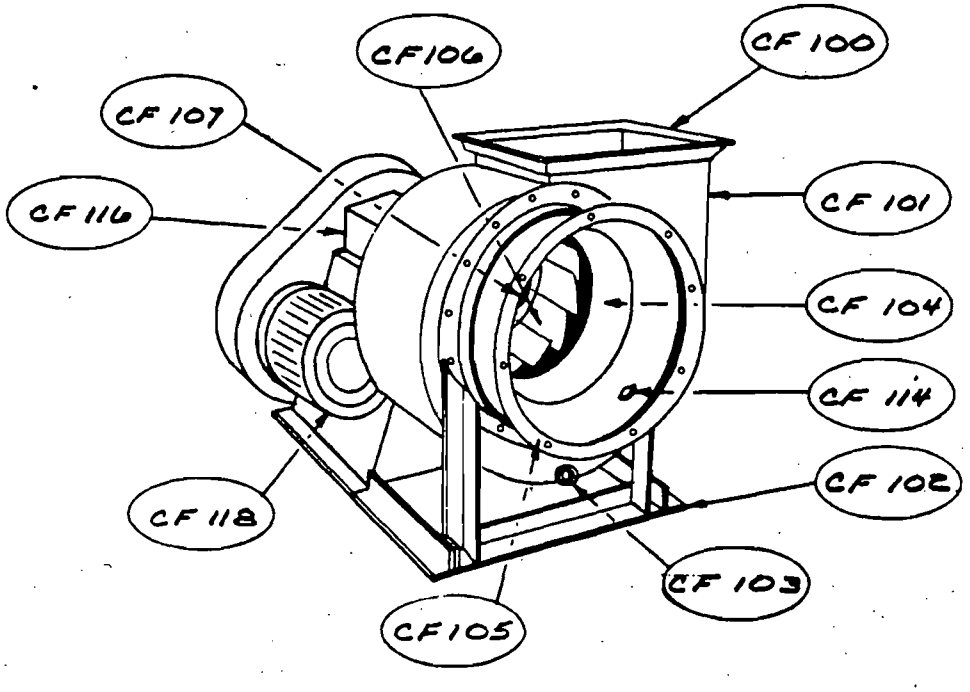
Duall Industries, Inc. 700 South McMillan St., Owosso, Michigan, 48867 Area Code 517/ 725-8184

DUALL IND. CENTRIFUGAL FAN
PARTS LIST

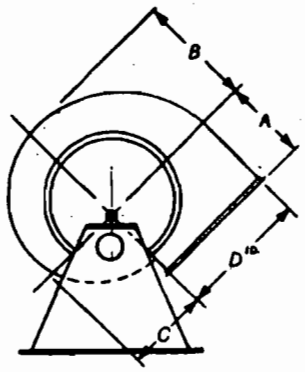
No.	Part
CF100	P.V.C. Outlet Flange
CF101	P.V.C. Fan Housing
CF102	Plastisol Coated Steel Base
CF103	P.V.C. Drain
CF104	P.V.C. Inlet Cone
CF105	P.V.C. Inlet Flange
CF106	Plastisol Coated Steel Wheel (No.)
CF107	Plastisol Coated Steel Wheel Hub
CF108	Shaft
CF109	Shaft Bearings
CF110	Motor
CF112	Belt Guard (Fully Enclosed)
CF113	Belts
CF114	P.V.C. Bolt Cap
CF115	P.V.C. Clean Out
CF116	P.V.C. Shaft Cover
CF117	Fan Serial No. (Plate)
CF118	Adjustable (Sliding) Base
CF119	Fan and Motor Sheves

_____CFM NH FAN
_____H.P._____R.P.M. MOTOR





TADD-45°



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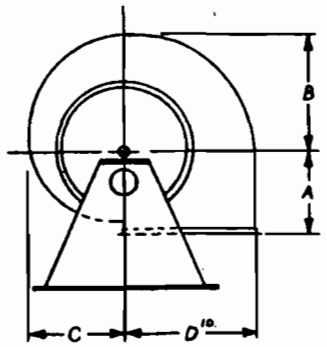

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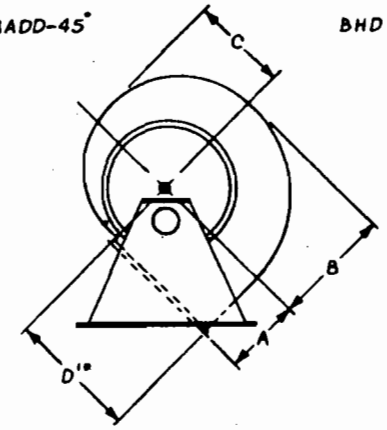

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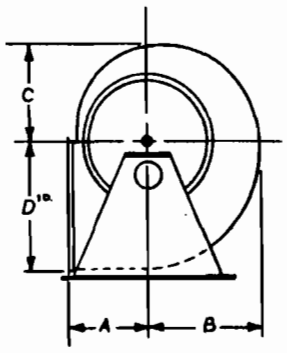

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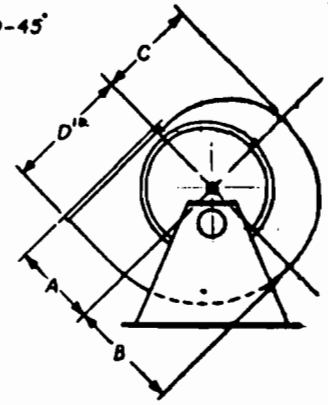
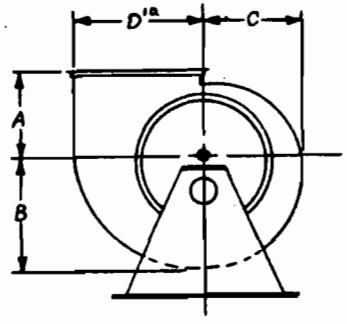


UBD



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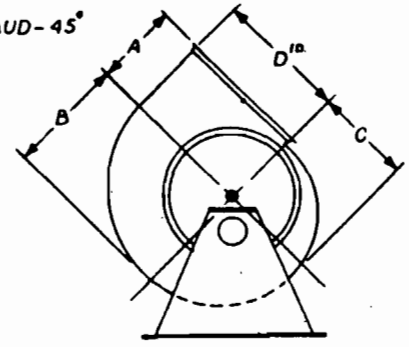
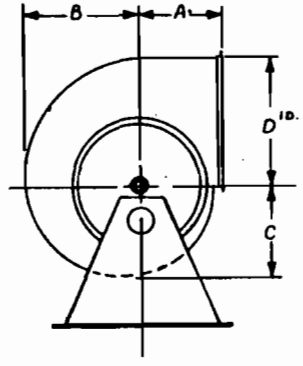
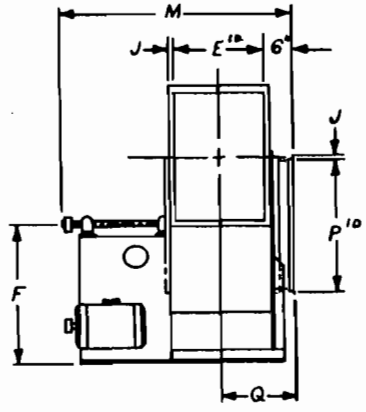
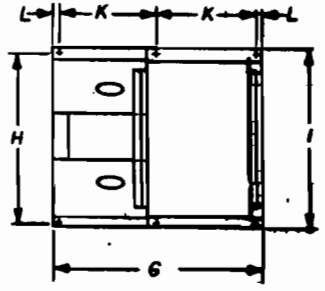


THD







FAN NO.	A	B	C	D'ID.	E'ID.	F	G	H	I	J	K	L	M	P'ID.	Q	SHAFT DIA	KEYWAY	BOLT HOLES DIA
24½	10 3/16	11 19/64	9¾	12¾	9¾	14½	26 1/16	19¼	21¼	1½	12 1/32	1	33⅜	13¼	10⅞	1 3/16	¼ × ⅛	½
27	10⅞	12 53/64	10 5/16	14	10¾	16	27 1/16	20¼	22¼	1½	12 17/32	1	34 5/8	14¼	11 3/16	1 3/16	¼ × ⅛	½
30	11 1/16	13 43/64	11 11/16	15 3/8	11¾	17½	35	22	24	1½	16½	1	43	15½	11⅞	1 3/16	⅜ × ⅛	½
33	12 5/16	14 31/32	12 5/8	17⅛	13⅛	19½	38⅞	23⅜	25⅜	1½	18 7/16	1	43 5/16	17 3/8	12 9/16	1 5/16	5/16 × ⅛	½
36½	13½	16 33/64	14 1/32	19	14½	20½	39¾	25	27	1½	18⅞	1	48⅛	19¼	13¼	1 7/16	⅜ × 3/16	½
40	14⅝	18 3/16	15⅜	20⅞	15⅞	23½	43⅜	27½	30	1½	20 5/16	1¼	51 3/16	21	13 15/16	1 11/16	⅜ × 3/16	½
44½	16	20 35/64	17 3/32	23¼	17⅜	25	45	31	33½	1½	21¼	1¼	52	23⅜	14 11/16	1 11/16	⅜ × 3/16	½
49	17⅜	22 3/16	18 7/16	25½	19½	27	47½	33⅛	35⅝	1½	22½	1¼	55 5/16	26	15¼	1 13/16	½ × ¼	½
54	18 15/16	24 49/64	20¾	28⅛	21½	30	49⅛	36¼	38¾	1½	23½	1¼	57 11/16	29	16¼	1 15/16	½ × ¼	½
60	20 13/16	27 19/64	23 1/32	31¼	23¾	33	51⅞	40¼	42⅝	1⅝	24 11/16	1¼	60 3/16	32	17⅞	2 3/16	⅝ × ¼	½
66	22⅝	30	25 5/16	34⅜	26¼	36	55½	44	47	1⅝	26¼	1½	63 11/16	34½	19⅛	2 7/16	⅜ × 5/16	⅝
73	24 7/8	33 3/32	28	38	29	40	59¼	48	51	1½	28⅜	1½	66 11/16	38½	20½	2 7/16	⅜ × 5/16	⅝
80½	27¾	36 13/32	30⅞	42	32	43¾	63	53	56	2	30	1½	72	42¼	22	2 11/16	⅝ × 7/16	⅝
89	30 1/16	40 11/64	34 5/32	46½	35⅜	44¾	66⅞	58	61	2	31 15/16	1½	76 5/16	46¼	23 11/16	2 15/16	¾ × ⅜	⅝
98	33¾	44⅜	37⅝	51⅞	39	48	77½	64	67	2	37¼	1½	81 3/16	51¼	25½	3 3/16	¾ × ⅜	⅝
108	37	49 5/16	41 3/8	56½	43⅛	52	81½	69	72	2	39¼	1½	91 13/16	56	27 5/16	3 7/16	¾ × ⅜	⅝
120	41	54 13/32	46⅛	62⅝	47¼	57¾	86	75	78	2	41½	1½	98⅞	62	29⅞	3 15/16	1 × ½	⅝

NOTE:
ON DBD, BADD AND BHD UNITS CONSULT FACTORY FOR ℄ DIMENSION AS HOUSING COULD COME BELOW FRAME OR INTERFERE WITH CONNECTING ANGLES.

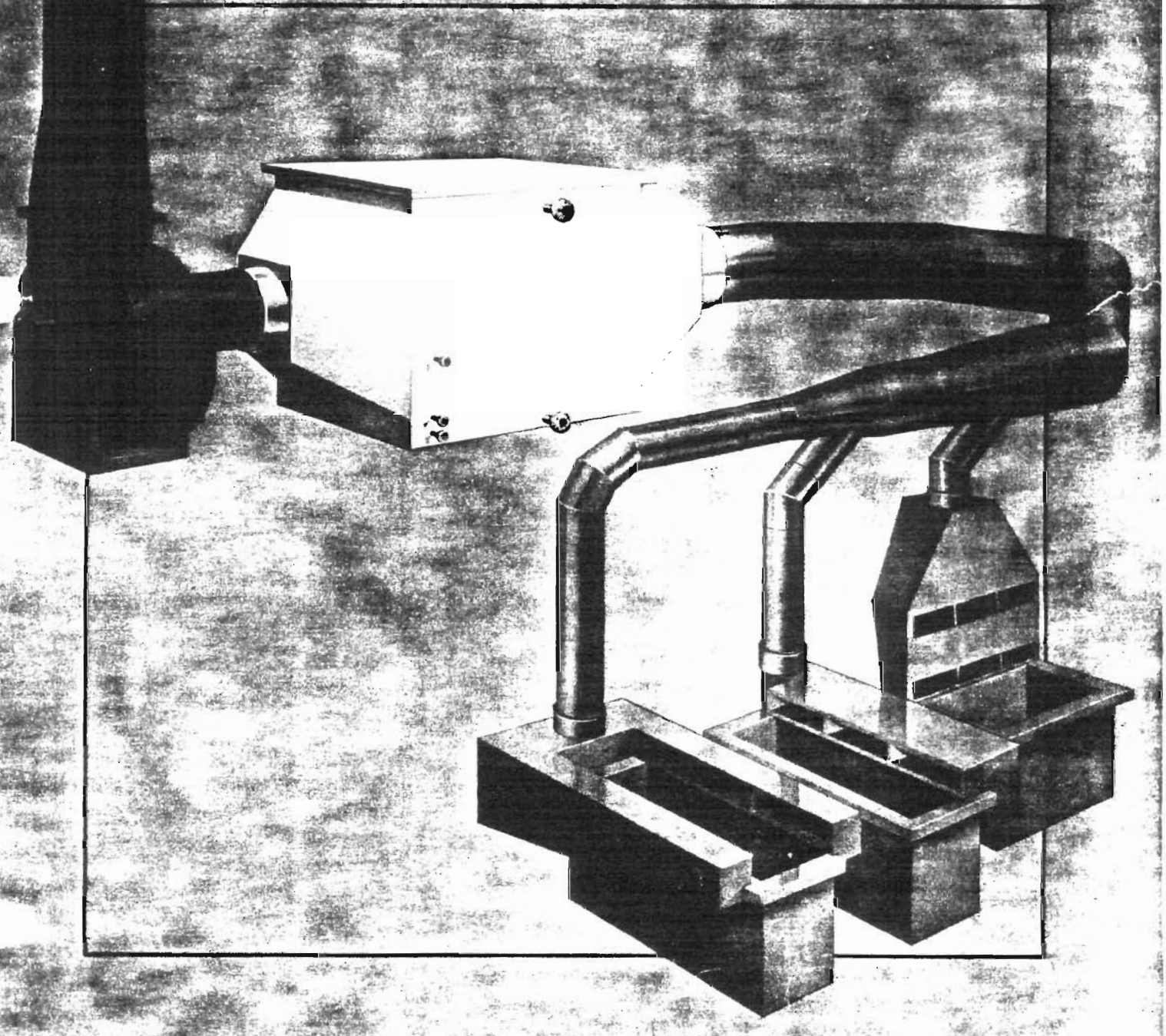
CENTRIFUGAL
NH FAN NO.

DUALL INDUSTRIES, Inc. OWOSSO, MICH.

DRAWN BY	USER	CLASS
DATE	LOCA.	ARR
ROTATION	PURCH.	CFM
V PH CY	LOCA.	SP
CERTIFIED BY	JOB NO.	BHP

Harrison

Plastic Packed Scrubbers



THE HARRISON SYSTEM

Harrison is a prime designer and producer of complete plastic exhaust systems, custom engineered scrubbing systems, as well as duct and fittings, tanks, and hoods. As a result of this capability and experience, design and manufacture of standard, pre-engineered fume scrubbers is a natural extension.

MATERIALS

Self-supporting or fiberglass armored PVC and Polypropylene, fiberglass armored Kynar, and solid fiberglass construction offers a wide range of resistance to acids, alkalis, solvents, and other corrosives at operating temperatures to approximately 250°F. Harrison systems do not use any metal in contact with the process stream.

PRE-ENGINEERING

Pre-engineered design reduces cost by eliminating the necessity to re-invent each item ordered. It results in more reliable service thru improved workmanship achieved by repetitive production control, and speeds quotations and approval drawings because costs and designs are immediately available. In addition to significant savings in approval and order time, Harrison reduces delivery time by stocking scrubber components including packing, support grids, distributor plates, nozzles, duct reducers, and sheet stock.

SCRUBBER CONFIGURATION

Most fume removal applications can be served by the two scrubber designs shown in this catalog Vertical Counter Current style directs liquid down vertically, and unwanted fumes upward in the opposite direction. Horizontal Cross Flow unit directs liquid down vertically, but unwanted fumes are driven horizontally at 90° to the liquid. In both designs, liquid and fumes are inter-mixed in the packed bed section of the scrubber where fumes are removed by chemical reaction or water solubility. Scrubber shape does not affect performance. Horizontal design presents a low profile and is suitable where head room is limited. Verticals require more head room, but use only minimum floor space.

SCRUBBER DESIGN AND OPERATION

Highest scrubber efficiency (volumetric % of contaminate removed) is obtained by having the proper amount of contact surface area (packing) wetted by sufficient liquid (recirculated liquid rate) for an optimum residence time (packing depth) to allow unwanted fumes to take a treacherous path thru the wetted packing to permit their maximum removal from the carrier air stream by chemical reaction or water solubility

Air stream resistance encountered in the packing (static pressure loss) is a function of air velocity, cross-sectional packing area, and packing depth. Harrison scrubbers utilize proven packing depth to achieve efficiencies approaching 99+%, when operated within recommendations.

LIQUID DISTRIBUTION AND MIST ELIMINATION

Simple liquid distribution is achieved thru a main header pipe feeding perforated laterals, without use of troublesome spray nozzles. Nozzles are subject to plugging, and produce a difficult-to-remove atomized mist carryover. In the Harrison design, any large droplets of liquid caught in the upward moving air stream are easily and efficiently removed by a short bed of dry packing located above the liquid distributor.

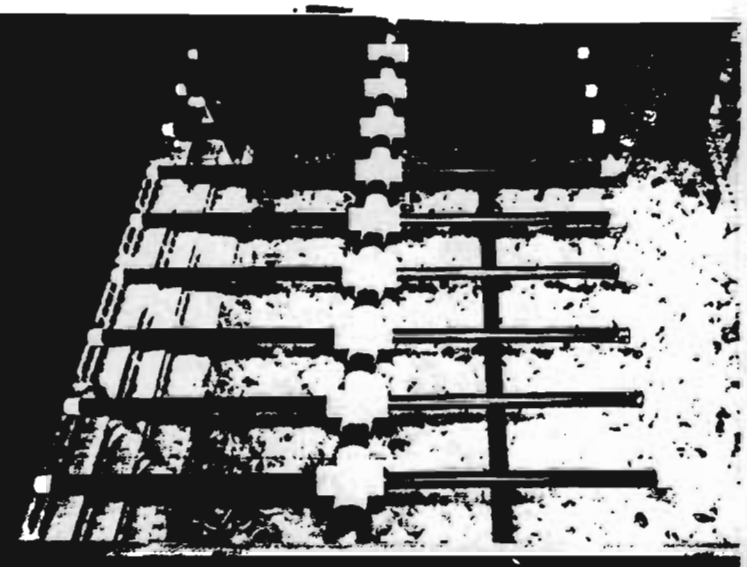
STATIC PRESSURE LOSS

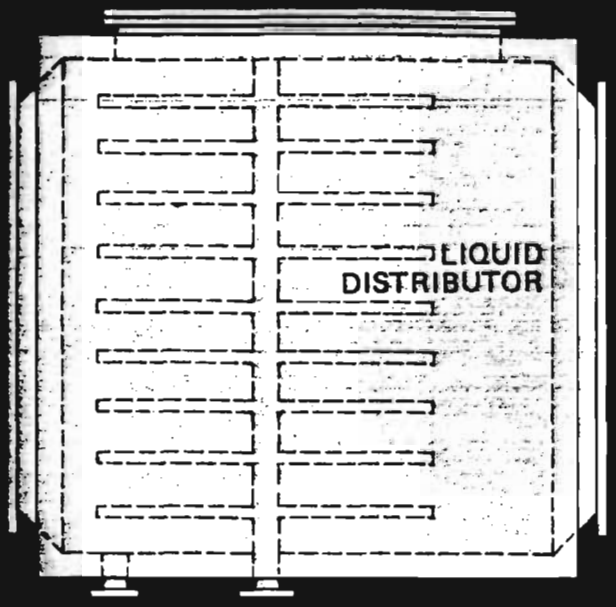
Use of high-surface-area, low-pressure-drop plastic saddles in a balanced design result in low static pressure loss of only 0.4 inches H_2O (w.g.) per foot of packed depth in Vertical Counter Current scrubbers, and 0.33 in Horizontal Cross Flow units. At the same time, sufficient irrigation rates constantly keep saddles clear of potential sludge buildup. Thereby, continuous, non-clogging operation at a proper rate of intermixing turbulence between liquid and fumes is achieved for 99+% efficiency.

LIQUID SUMP OPERATION

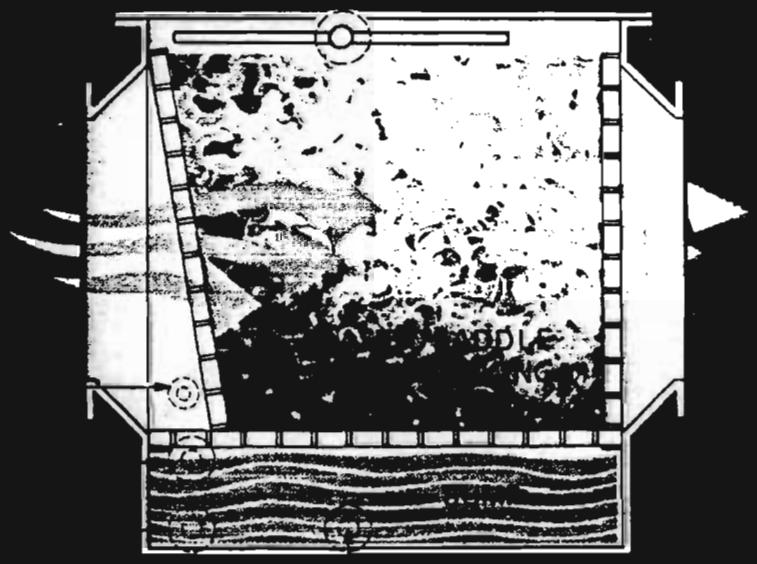
Harrison scrubbers employ an integral liquid recirculating sump which reduces amount of liquid consumption required by 90 to 95% in most applications. Therefore, considerably less effluent must be handled and treated. The sump reservoir is contained within the scrubber itself. Harrison recommends optimum rate of effluent removal. When effluent is acidic only, additional liquid conservation can be obtained with either scrubber design with the simple optional recovery system shown with the vertical scrubber drawing on page 4. If central treating facilities exist, no sump, recirculation, or independent recovery is needed. In this case, treated liquid would be directed over the packing in a single pass, then treated, then returned to the scrubber, etc. In both instances where effluent is treated, liquid consumption would be reduced to only that amount lost by evaporation.

Harrison
Box 184 Aurora Ohio 44202/216-562-9545

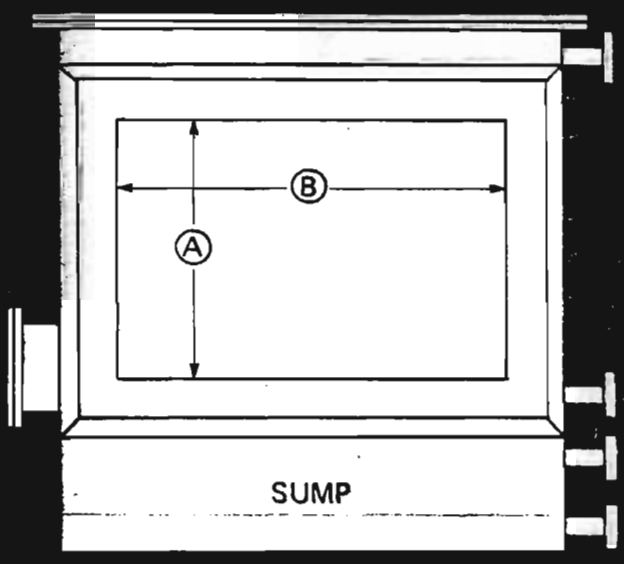




TOP VIEW



SIDE VIEW (CUT-A-WAY)



INLET SIDE VIEW

HORIZONTAL CROSS-FLOW

Model	CFM	Outlet A x B in.	Length L Ft.	Width W Ft.	[illegible]	D in.	[illegible] Ft.	[illegible] in.	[illegible] in.	Sump [illegible]	[illegible]	[illegible]	Ship Wt. Lbs.	Operating Wt. Lbs.
HF-8	800	11x1[illegible]	6	17	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	182	646
HF-12	1,200	[illegible]	[illegible]	20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	781
HF-17	1,700	18x18	8	24	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	215	826
HF-21	2,100	21x21	6	27	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1028
HF-25	2,500	24x[illegible]	[illegible]	30	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1166
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1813
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	216	1660
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	416	[illegible]

Selection Guide

41-27-GN3

HARTZELL MODEL CODE 41-33GO3

- Blower Series No.
- Wheel Diameter, Inches
- Wheel Type
- Horsepower Code
- Motor RPM/Phase

3 Phase: 3 = 1750 | 1 Phase: C = 1750

How To Use Capacity Tables

(1) Select size, RPM and BHP for a given air delivery and pressure of a centrifugal blower from rating tables, pages 10 through 21. Performance ratings are based on standard air conditions, sea level 70°F. and 29.92 inches barometric pressure giving an air density of .075 lbs. per cubic foot. The specific gravity of air equals 1.00 at these conditions.

(2) If non-standard temperature or altitude is involved, correct to standard air density (see Table 1).

(3) For speeds above ratings consult factory.

How to use Hartzell Model Code

EXAMPLE:

Assume the required performance to be 16,276 CFM at 3" SP standard air. Reading across the 33" Rating Table, page 13, we find a blower RPM of 1306 and brake horsepower of 14.5. Motor horsepower required is 15; therefore, horsepower code is "O". Type specification would be "GO3". The complete blower specification would read: Series 41-33-GO3.

Horsepower Code

Horsepower	¼	⅓	½	¾	1	1½	2	3	5	7½	10	15	20	25	30	40	50	60	75	100
Code Letter	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W

Altitude – Temperature Correction

Temperatures above or below 70° at sea level (O ft.) are read vertically between the double lines, giving the proper correction factors. Altitudes above sea level at a constant 70°F. temperature are read horizontally between the double lines giving those factors. Any other factors are obtained by reading down to the desired temperature, then across to the desired altitude.

Example:

Assume the required performance to be 12,520 CFM at 6.15" SP, 175° F. and 2000 feet altitude.

1. Table 1 gives a factor of 1.30.
2. 6.15" SP × 1.30 = 8.0" SP for 70° F. at sea level.
3. A backward curved centrifugal blower, size 33", selected from the rating tables for the new condition shows 12,520 CFM at 8.0" SP, 1537 RPM and 23.9 BHP.
4. Correct the horsepower and static pressure in Item 3 to non-standard performance by dividing by the factor:
   8.0" SP ÷ 1.30 = 6.15 SP
   23.9 BHP ÷ 1.30 = 18.38 BHP
5. Final performance of this size 33" backward curved centrifugal blower at assumed conditions:
   12,520 CFM at 6.15" SP, 1537 RPM, 18.38 BHP. 175° F. and 2000 Ft.

Table 1 – Combined Altitude - Temperature Correction Factors

°F. TEMP. \ ALT. FT.	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
−50	0.77	0.80	0.83	0.86	0.89	0.92	0.96	1.00	1.04	1.08	1.12	1.16	1.21
−25	0.82	0.85	0.89	0.92	0.95	0.98	1.03	1.07	1.11	1.15	1.20	1.24	1.29
0	0.87	0.90	0.94	0.97	1.01	1.04	1.09	1.13	1.17	1.22	1.27	1.31	1.37
25	0.91	0.95	0.98	1.02	1.06	1.09	1.14	1.18	1.23	1.27	1.33	1.37	1.43
50	0.96	1.00	1.04	1.08	1.11	1.15	1.20	1.25	1.30	1.34	1.40	1.45	1.51
70	1.00	1.04	1.08	1.12	1.16	1.20	1.25	1.30	1.35	1.40	1.46	1.51	1.57
100	1.06	1.10	1.14	1.19	1.23	1.27	1.33	1.38	1.43	1.48	1.55	1.60	1.66
125	1.10	1.14	1.19	1.23	1.28	1.32	1.38	1.43	1.49	1.54	1.61	1.66	1.73
150	1.15	1.20	1.24	1.29	1.33	1.38	1.44	1.50	1.55	1.61	1.68	1.74	1.81
175	1.20	1.25	1.30	1.34	1.39	1.44	1.50	1.56	1.62	1.68	1.75	1.81	1.88
200	1.25	1.30	1.35	1.40	1.45	1.50	1.56	1.63	1.69	1.75	1.83	1.89	1.96
250	1.34	1.39	1.45	1.50	1.55	1.61	1.68	1.74	1.81	1.88	1.96	2.02	2.10
300	1.43	1.49	1.54	1.60	1.66	1.72	1.79	1.86	1.93	2.00	2.09	2.16	2.25
350	1.53	1.59	1.65	1.71	1.77	1.84	1.91	1.99	2.07	2.14	2.23	2.31	2.40
400	1.62	1.69	1.75	1.82	1.89	1.96	2.04	2.12	2.20	2.27	2.35	2.45	2.55
450	1.72	1.79	1.86	1.93	2.00	2.08	2.16	2.24	2.33	2.41	2.50	2.60	2.70
500	1.81	1.88	1.96	2.03	2.11	2.19	2.28	2.36	2.46	2.54	2.62	2.74	2.85
550	1.91	1.98	2.06	2.14	2.22	2.30	2.40	2.49	2.58	2.68	2.77	2.89	3.00
600	2.00	2.08	2.16	2.24	2.33	2.42	2.50	2.61	2.71	2.80	2.90	3.03	3.14

NOTE: Above table has inverted values. Actual density is the *reciprocal* of the above values.

Abrasive/Erosive Atmospheres

HartKoate is an abrasive/erosive resistant coating developed by Hartzell for application in environments where abrasive/erosive conditions may exist. HartKoate helps prevent premature deterioration of equipment in environments where uncoated fans may fail.

Impact resistant HartKoate is applied to a 50-60 mil thickness suitable for temperatures to 200°F.

HartKoate is particularly appropriate for use when water mist and/or abrasive particles exist in the air stream.

Contact your Hartzell representative for further details concerning the application of HartKoate coating to fiberglass fans in corrosive atmospheres.

Installation Weights-Bearing/Shaft Sizes

Series 41

Size	Type	Net Wt. (lbs.)	Shaft/ Bearing Sizes
15"	GH3	526	$1^{7}/_{16}$"
	GI3	526	$1^{7}/_{16}$"
	GJ3	529	$1^{7}/_{16}$"
	GK3	529	$1^{7}/_{16}$"
	GL3	549	$1^{7}/_{16}$"
	GM3	554	$1^{7}/_{16}$"
22"	GH3	772	$1^{11}/_{16}$"
	GI3	772	$1^{11}/_{16}$"
	GJ3	776	$1^{11}/_{16}$"
	GK3	776	$1^{11}/_{16}$"
	GL3	806	$1^{11}/_{16}$"
	GM3	813	$1^{11}/_{16}$"
	GN3	854	$1^{11}/_{16}$"
	GO3	865	$1^{11}/_{16}$"
	GP3	926	$1^{11}/_{16}$"
26"	GI3	954	$1^{15}/_{16}$"
	GJ3	959	$1^{15}/_{16}$"
	GK3	959	$1^{15}/_{16}$"
	GL3	996	$1^{15}/_{16}$"
	GM3	1004	$1^{15}/_{16}$"
	GN3	1054	$1^{15}/_{16}$"
	GO3	1069	$1^{15}/_{16}$"
	GP3	1144	$1^{15}/_{16}$"
	GQ3	1164	$1^{15}/_{16}$"
	GR3	1190	$1^{15}/_{16}$"
33"	GI3	1355	$2^{3}/_{16}$"
	GJ3	1355	$2^{3}/_{16}$"
	GK3	1382	$2^{3}/_{16}$"
	GL3	1397	$2^{3}/_{16}$"
	GM3	1454	$2^{3}/_{16}$"
	GN3	1482	$2^{3}/_{16}$"
	GO3	1514	$2^{3}/_{16}$"
	GP3	1544	$2^{3}/_{16}$"
	GQ3	1594	$2^{3}/_{16}$"
	GR3	1644	$2^{3}/_{16}$"
40"	GI3	1885	$2^{7}/_{16}$"
	GJ3	1885	$2^{7}/_{16}$"
	GK3	1912	$2^{7}/_{16}$"
	GL3	1932	$2^{7}/_{16}$"
	GM3	1972	$2^{7}/_{16}$"
	GN3	1987	$2^{7}/_{16}$"
	GO3	2047	$2^{7}/_{16}$"
	GP3	2077	$2^{7}/_{16}$"
	GQ3	2127	$2^{7}/_{16}$"
	GR3	2177	$2^{7}/_{16}$"
	GS3	2277	$2^{7}/_{16}$"
	GT3	2327	$2^{7}/_{16}$"
49"	GL3	2415	$2^{15}/_{16}$"
	GM3	2465	$2^{15}/_{16}$"
	GN3	2483	$2^{15}/_{16}$"
	GO3	2558	$2^{15}/_{16}$"
	GP3	2596	$2^{15}/_{16}$"
	GQ3	2658	$2^{15}/_{16}$"
	GR3	2721	$2^{15}/_{16}$"
	GS3	2846	$2^{15}/_{16}$"
	GT3	2908	$2^{15}/_{16}$"
	GU3	2958	$2^{15}/_{16}$"
	GV3	3063	$2^{15}/_{16}$"
	GW3	3123	$2^{15}/_{16}$"

Series 43

Size	Type	Net Wt. (lbs.)	Shaft/ Bearing Sizes
16"	FH3	302	$1^{3}/_{16}$"
	FI3	302	$1^{3}/_{16}$"
	FJ3	302	$1^{3}/_{16}$"
	FK3	338	$1^{3}/_{16}$"
	FL3	358	$1^{3}/_{16}$"
	FM3	361	$1^{3}/_{16}$"
	FN3	380	$1^{3}/_{16}$"
	FO3	431	$1^{3}/_{16}$"
	FP3	460	$1^{3}/_{16}$"
19"	FI3	372	$1^{7}/_{16}$"
	FJ3	372	$1^{7}/_{16}$"
	FK3	399	$1^{7}/_{16}$"
	FL3	444	$1^{7}/_{16}$"
	FM3	447	$1^{7}/_{16}$"
	FN3	466	$1^{7}/_{16}$"
	FO3	517	$1^{7}/_{16}$"
	FP3	547	$1^{7}/_{16}$"
	FQ3	587	$1^{7}/_{16}$"
	FR3	667	$1^{7}/_{16}$"
23"	FJ3	404	$1^{11}/_{16}$"
	FK3	431	$1^{11}/_{16}$"
	FL3	451	$1^{11}/_{16}$"
	FM3	496	$1^{11}/_{16}$"
	FN3	516	$1^{11}/_{16}$"
	FO3	535	$1^{11}/_{16}$"
	FP3	565	$1^{11}/_{16}$"
	FQ3	605	$1^{11}/_{16}$"
	FR3	695	$1^{11}/_{16}$"
	FS3	735	$1^{11}/_{16}$"
26"	FK3	489	$1^{11}/_{16}$"
	FL3	509	$1^{11}/_{16}$"
	FM3	555	$1^{11}/_{16}$"
	FN3	574	$1^{11}/_{16}$"
	FO3	625	$1^{11}/_{16}$"
	FP3	655	$1^{11}/_{16}$"
	FQ3	715	$1^{11}/_{16}$"
	FR3	805	$1^{11}/_{16}$"
	FS3	845	$1^{11}/_{16}$"
	FT3	940	$1^{11}/_{16}$"
30"	FL3	626	$1^{15}/_{16}$"
	FM3	629	$1^{15}/_{16}$"
	FN3	649	$1^{15}/_{16}$"
	FO3	709	$1^{15}/_{16}$"
	FP3	739	$1^{15}/_{16}$"
	FQ3	779	$1^{15}/_{16}$"
	FR3	869	$1^{15}/_{16}$"
	FS3	909	$1^{15}/_{16}$"
	FT3	1004	$1^{15}/_{16}$"
	*FU3	529	$1^{15}/_{16}$"
33"	FL3	692	$1^{15}/_{16}$"
	FM3	695	$1^{15}/_{16}$"
	FN3	705	$1^{15}/_{16}$"
	FO3	775	$1^{15}/_{16}$"
	FP3	805	$1^{15}/_{16}$"
	FQ3	855	$1^{15}/_{16}$"
	FR3	945	$1^{15}/_{16}$"
	FS3	985	$1^{15}/_{16}$"
	FT3	1075	$1^{15}/_{16}$"
	*FU3	600	$1^{15}/_{16}$"
	*FV3	600	$1^{15}/_{16}$"
	*FW3	600	$1^{15}/_{16}$"

Series 42

Size	Type	Net Wt. (lbs.)	Shaft/ Bearing Sizes
10"	FC3	63	
12"	FF3	78	
14"	FG3	96	

***Net installation weights are for Arrangement 1. (Less motor & drive.)**

Metric Conversion Table

FROM	TO	MULTIPLY BY
Inches (in.)	Millimeter (mm)	25.400
Feet (ft.)	Meter (m)	0.3048
Velocity (ft./min.)	Meter/Second (m/s)	0.00508
Volume Flow (cfm)	Cubic Meter/Second (m^3/s)	0.00047195
Pressure (in. w.g.)	Pascal (N/m^2)	248.36
Density ($lb./ft.^3$)	Kilogram /Cubic Meter (Kg/m^3)	16.018
Power (hp)	Watt (w)	745.70
Square Foot ($ft.^2$)	Square Meter (m^2)	0.09290
Square Inch ($in.^2$)	Square Meter (m^2)	0.0006451

Inlet diameter: 28" I.D. **Wheel diameter: 27.250"**
Outlet area: 4.21 sq. ft. inside **Wheel circumference: 7.003 ft.**

10 000 CFM @ 4" TSP

	OV	½" SP		1" SP		1½" SP		2" SP		3" SP		4" SP		5" SP		6" SP		7" SP	
CFM	FPM	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
4210	1000					859	1.45	936	1.90	1097	3.20	1249	4.30						
4631	1100					889	1.60	967	2.15	1123	3.45	1257	4.60	1391	5.80				
5052	1200					911	1.90	1008	2.45	1146	3.55	1275	5.00	1406	6.40	1522	7.50		
5473	1300			850	1.45	936	1.90	1043	2.60	1171	3.90	1296	5.35	1411	6.70	1535	8.10	1647	9.50
5894	1400			890	1.70	970	2.10	1061	3.00	1207	4.40	1321	5.60	1435	7.10	1553	8.60	1660	10.30
6315	1500			932	1.90	1005	2.40	1086	3.10	1240	4.60	1353	5.90	1460	7.60	1572	9.25	1671	10.90
6736	1600	886	1.55	970	2.15	1045	2.70	1113	3.40	1273	4.90	1390	6.45	1488	8.00	1591	9.80	1687	11.50
7157	1700	925	1.75	1010	2.45	1081	3.00	1146	3.60	1294	5.00	1425	6.80	1517	8.20	1616	10.10	1709	12.00
7578	1800	977	2.10	1050	2.60	1121	3.30	1184	3.90	1318	5.20	1456	7.20	1556	9.00	1644	10.55	1736	12.45
7999	1900	1025	2.30	1092	2.90	1158	3.60	1225	4.30	1343	5.60	1479	7.60	1594	9.70	1675	11.25	1764	13.10
8420	2000	1067	2.50	1142	3.30	1200	4.00	1265	4.75	1379	6.10	1500	7.65	1627	10.10	1717	12.10	1794	13.75
9262	2200	1158	3.30	1217	3.90	1281	4.80	1342	5.60	1450	7.25	1558	8.75	1673	10.90	1787	13.60	1869	15.50
10104	2400	1250	4.00	1313	5.00	1368	5.80	1420	6.60	1529	8.60	1623	10.20	1725	11.90	1831	14.20	1934	17.10
10946	2600	1352	5.10	1404	6.00	1458	7.00	1506	7.60	1607	9.90	1700	11.70	1788	13.50	1882	15.30	1979	17.90
11788	2800	1446	6.30	1496	7.25	1540	8.10	1589	9.10	1684	10.90	1777	13.10	1858	15.20	1937	17.00	2026	19.20
12630	3000	1543	7.50	1589	8.50	1634	9.55	1678	10.50	1772	12.80	1858	15.00	1941	17.60	2014	19.40	2087	21.30
13472	3200	1639	8.90	1680	9.85	1721	11.00	1767	12.25	1854	14.50	1942	17.00	2015	19.40	2089	21.60	2159	23.90
14314	3400	1740	10.60	1773	11.55	1817	13.10	1860	14.00	1944	16.60	2022	19.20	2097	21.90	2167	24.50	2231	26.50
15156	3600	1832	12.40	1872	13.75	1912	14.80	1953	16.00	2026	18.50	2104	21.00	2178	24.00	2249	27.00		
15998	3800	1936	14.50	1969	15.60	2006	16.70	2038	18.40	2118	21.20	2187	23.90	2261	26.60				
16840	4000	2029	16.80	2064	18.00	2097	19.40	2134	20.50	2200	23.20	2280	26.50						
17682	4200	2127	19.40	2160	20.90	2186	21.90	2239	23.80										
18524	4400	2232	22.30	2266	23.80														

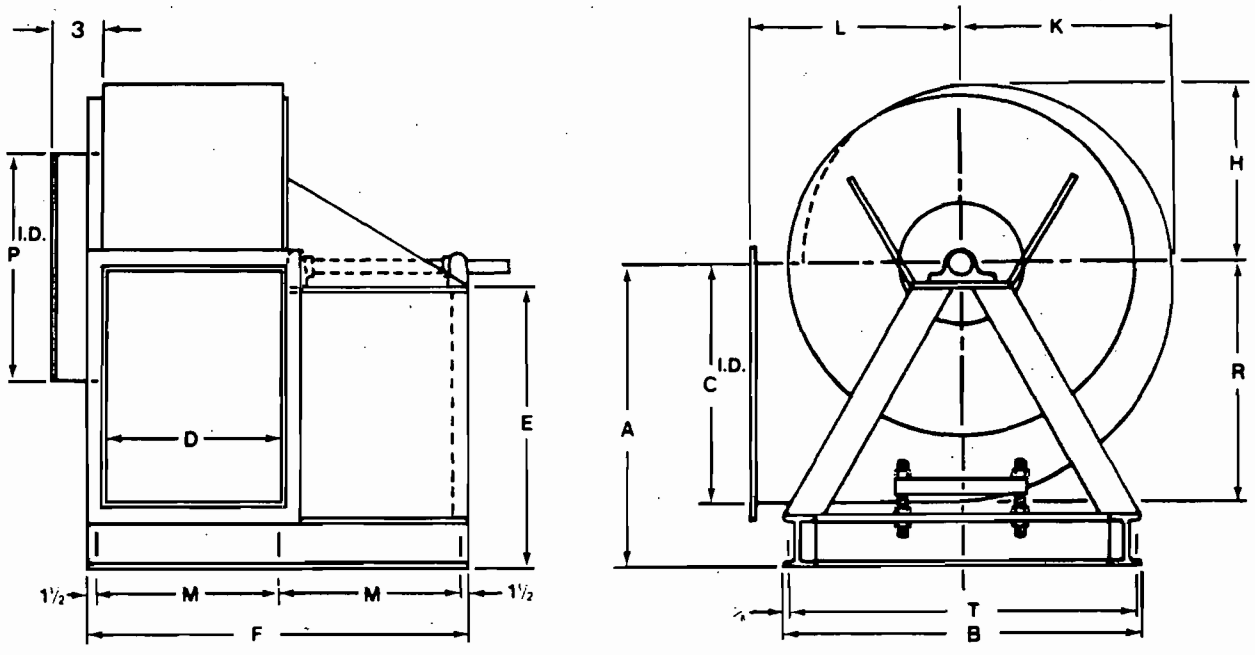
	OV	8" SP		9" SP		10" SP		11" SP		12" SP	
CFM	FPM	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
5894	1400	1762	11.90								
6315	1500	1774	12.40	1870	14.30						
6736	1600	1785	13.20	1884	15.20	1974	16.90				
7157	1700	1803	13.90	1900	16.00	1986	18.00	2073	19.75	2154	21.60
7578	1800	1825	14.55	1917	16.85	2003	18.70	2085	20.70	2166	22.60
7999	1900	1848	15.10	1934	17.40	2019	19.60	2100	21.70	2180	24.00
8420	2000	1875	15.75	1957	18.10	2039	20.50	2118	22.60	2200	25.10
9262	2200	1939	17.30	2008	19.25	2087	21.80	2161	24.40	2239	27.00
10104	2400	2020	19.60	2089	21.60	2149	23.70	2221	26.10	2289	28.70
10946	2600	2076	21.00	2159	23.80	2223	26.00	2283	28.20		
11788	2800	2117	22.00	2216	25.50	2293	28.40				
12630	3000	2168	23.70	2267	27.20						
13472	3200	2230	25.80								

Performance shown is with inlet and outlet ducts.
RPM shown is nominal and performance is based on actual speed of test.
BHP includes belt drive losses.

Principal Dimensions

Size	Wheel Dia.	A	B	C	D	E	F	H	K	L	M	P	R	T	Max. Motor Frame Size ODP	Max. Motor Frame Size TEFC
15	15⅝	32¼	33½	16⅛	11 11/16	30¼	41	12 11/16	14 9/16	16 3/16	19	16	16 7/16	31¾	326T	286T
22	22 9/16	32½	33½	23⅝	17⅛	30¼	46	18 7/16	21 3/16	21⅛	21½	23	23 15/16	31¾	326T	286T
27	27¼	38¼	45	29	21	35⅞	51	22¾	26⅞	24	24	28	29½	41¼	326T	286T
33	33 13/16	43¼	50	35 7/16	25 11/16	40⅝	56	27 11/16	31 13/16	29 5/16	26½	34¼	35 15/16	48¼	326T	286T
40	41½	51¼	59	43 5/16	31⅜	48⅜	62	33 13/16	38 13/16	35⅞	29¼	41⅞	43⅞	57¼	326T	286T
49	50 5/16	61⅜	73	52⅝	38⅛	58	92	41	47⅛	40	44½	50 13/16	53¼	71¼	447T	447T

NOTES: ON 15 AND 22 SIZES WITH 254T FR. AND LARGER MOTORS, BASE DIMENSIONS MUST BE CERTIFIED BY THE FACTORY. DIMENSIONS AND SPECIFICATIONS ARE SUBJECT TO CHANGE. CERTIFIED PRINTS ARE AVAILABLE.

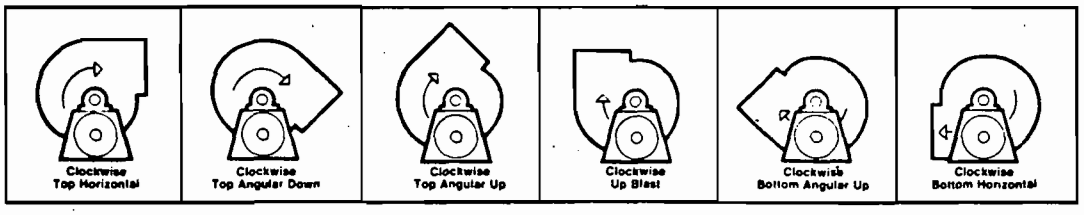


Material Specifications — Inches

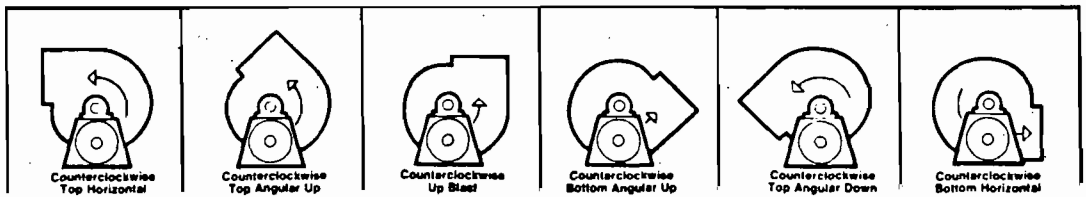
Size	HOUSING (Thickness) Scroll	Inlet Cone	Flanges Inlet	Flanges Outlet	(H.R.S.) FAN STAND Back Plate	H-Beam	Channel	WHEEL (Thickness) Blade	Back Plate	Outer Panel
15	5/16	5/16	3/16	5/16	½	6 × 4	4	¼	½	½
22	5/16	7/16	¼	5/16	½	6 × 4	4	¼	⅝	⅝
27	½	½	5/16	½	½	6 × 4	4	5/16	¾	¾
33	½	⅝	⅜	½	½	6 × 4	4	⅜	⅞	⅞
40	9/16	¾	7/16	9/16	½	6 × 4	4	7/16	1	1
49	⅝	15/16	9/16	⅝	½	6 × 4	4	1	1⅜	1⅜

Blower Discharges

Clockwise



Counterclockwise



HARTZELL FAN

BELT DRIVE FANS
MAINTENANCE AND LUBRICATION

THE MOTOR BEARINGS AND FAN BEARINGS ON BELT DRIVE FANS SHOULD BE GREASED AT REGULAR INTERVALS. MTR.MFG.GREASING INSTRUCTIONS & RECOMMENDATIONS SHOULD BE FOLLOWED CLOSELY. AVOID THE USE OF A PRESSURE GREASING SYSTEM WHICH TENDS TO FILL THE BEARING CHAMBER COMPLETELY. DO NOT OVER GREASE. NOTE: ON MOTORS WITH NON-REGREASABLE, SEALED BEARING, NO LUBRICATION IS REQUIRED FOR THE LIFE OF THE BEARING. THE FOLLOWING TABLE LISTS THE TIME INTERVALS BETWEEN FAN GREASING TO INSURE PROPER LUBRICATION IN ADVERSE CONDITIONS OF HEAT & DUST. USE ONLY 1 OR 2 SHOTS WITH A HAND GUN IN MOST CASES. MAXIMUM HANDGUN RATING 40 P.S.I.

CONDITIONS AROUND BEARING	OPERATING TEMPERATURE OF FAN	** GREASING INTERVALS
FAIRLY CLEAN	UP TO 120 F	6 MONTHS TO 12 MONTHS
	120 F TO 160 F	2 MONTHS TO 3 MONTHS
	160 F TO 200 F PLUS*	1 MONTH TO 2 MONTHS
MODERATE TO EXTREMELY DIRTY	UP TO 160 F	1 MONTH TO 2 MONTHS
	160 F TO 200 F PLUS*	2 WEEKS TO 4 WEEKS
COLD STORAGE ROOM		EVERY DEFROSTING PERIOD OR NO MORE THAN 4 MONTHS

** FOR VERTICAL INSTALLATIONS GREASING INTERVALS SHOULD BE TWICE AS FREQUENT AS TABLE VALUES

*FOR FAN APPLICATIONS OVER 200 F GREASING INTERVALS SHOULD BE FROM SEVERAL DAYS TO 2 WEEKS, DEPENDING ON THE TEMPERATURE

THE FOLLOWING GREASES, OR ONE THAT IS EQUIVALENT TO THE GENERAL DESCRIPTION, ARE RECOMMENDED FOR THE FOLLOWING TEMPERATURES OR EXCESSIVE MOISTURE APPLICATIONS:

OPERATING CONDITIONS	USE GREASE EQUIVALENT TO THESE GRADES
TEMPERATURES -85 F TO 0 F	ESSO-BEACON #325 (-65 F) MOBIL GREASE #28 (-65 F) SHELL OIL-AEROSHELL NO. 16 (-85 F) SHELL OIL AEROSHELL NO. 22 (-85 F) SHELL OIL AEROSHELL NO. 7 (-100 F) ++ DOW CORNING-DC33, DC41, DC44 (-40 F) NOTE: NOT MISCIBLE WITH NON-SILICON BASED GREASES.

GENERAL DESCRIPTION: VERSATILE MULTIPURPOSE MICROGEL THICKENED SYNTHETIC HYDROCARBON GREASE WITH CORROSION INHIBITORS, ANTIOXIDANT ADDITIVES, WATER RESISTANCE TENDENCIES AND EP CHARACTERISTICS.

TEMPERATURE 0 F TO 200 F INCLUSIVE (ALSO USE FOR HEAVY CONDENSATION OR DIRECT SPLASH OF WATER)	TEXACO-PREMIUM RP#2 OR REGAL AFB#2 AMERICAN OIL-AYKON PREMIUM#2 OR AMOLITH#2 UNION 76-UNOBA EP#2 (275 F) GULF OIL CORP.-GULF CROWN EP#2 MOBIL OIL-MOBILUX EP#2 SHELL OIL-SHELL ALVANIA EP#2 CHEVRON-CHEVRON SRI #2 ATLANTIC RICHFIELD-LITHOLENE EP#2 STANDARD OIL-FACTRAN EP#2 CONOCO-CONOLITH EP#2

GENERAL DISCRIPTION: MULTIPURPOSE NLGI#2 GREASE FROM LITHIUM SOAP WITH EP CHARACTERISTICS, RUST INHIBITORS, ANTI-OXIDANT ADDITIVES & GOOD WATER RESISTANCE TENDENCIES.

TEMPERATURES OVER 200 F CONSULT WITH HARTZELL ENGINEERS ON HI TEMP FAN APPLICATIONS.	MOBIL OIL-MOBIL GREASE #28 (350 F) ESSO-BEACON #325 (350 F) SHELL OIL-AEROSHELL NOS. 16 & 22 (400 F) ++DOW CORNING-DC44 & DC41 (400 F) NOTE: NOT MISCIBLE WITH NON-SILICON BASED GREASES.

GENERAL DESCRIPTION: VERSATILE MULTIPURPOSE MICROGEL THICKENED SYNTHETIC HYDROCARBON GREASE WITH CORROSION INHIBITORS, ANTIOXIDANT ADDITIVES, WATER RESISTANCE TENDENCIES AND EP CHARACTERISTICS.

THE BEARINGS ON THIS FAN SHAFT HAVE BEEN GREASED AT THE FACTORY FOR THE FOLLOWING APPLICATION:

- ☐ GENERAL PURPOSE (UNION 76 UNOBA EP#2)
- ☐ HIGH TEMPERATURE (MOBIL GREASE #28)
- ☐ LOW TEMPERATURE (MOBIL GREASE #28)
- ☐ EXTREME MOISTURE (UNION 76 UNOBA EP#2)
- ☐ OTHER _____

BELT TENSION--EXCESSIVE TENSION OF THE BELTS PUTS AN ADDED LOAD ON THE BEARING & REDUCES BEARING LIFE. TO AVOID THIS CONDITION, TIGHTEN BELTS AS SHOWN ON THE REVERSE SIDE.

++NOTE: WHEN USING DOW CORNING SILICON BASED GREASES, FAN BEARINGS SHOULD BE COMPLETELY PURGED OF EXISTING GREASE. BEARINGS SHOULD BE ROTATED WHILE PURGING TO INSURE EXISTING GREASE IS PURGED AS BEST POSSIBLE. DO NOT USE SILICON GREASE IN MOTORS UNLESS MTR. MANUFACTURER'S INSTRUCTIONS OR STATE

INSTALLING, TENSIONING AND CHECKING V-DRIVES

GENERAL DRIVE TENSIONING GUIDELINES:

1. IDEAL TENSION IS THE TENSION AT WHICH THE BELT WILL NOT SLIP UNDER PEAK LOAD CONDITIONS.
2. OVER TENSIONING SHORTENS BELT AND BEARING LIFE.
3. KEEP BELTS FREE FROM FOREIGN MATERIAL WHICH MAY CAUSE SLIPPING.
4. MAKE PERIODIC V-DRIVE INSPECTION. TENSION WHEN SLIPPING. THE USE OF BELT DRESSING IS NOT RECOMMENDED.
5. BEFORE INSTALLING A NEW SET OF V-BELTS, CHECK THE CONDITION OF THE SHEAVES. DIRTY OR RUSTY SHEAVES IMPAIR THE DRIVES EFFICIENCY AND ABRADE THE BELTS, RESULTING IN PREMATURE FAILURE. ALSO, WORN SHEAVES CAN SHORTEN THE BELT LIFE BY AS MUCH AS 50%.
6. DO NOT USE A NEW OR USED BELT AS A REPLACEMENT FOR A UNIT OF A SET. IF A BELT BREAKS A NEW SET OF MATCHED BELTS IS NECESSARY. ALWAYS REPLACE BELTS WITH THE SAME KIND THAT WERE ON THE FAN BEFORE.
7. AFTER PROPERLY TENSIONING THE BELTS, DOUBLE-CHECK TO BE SURE THE SHEAVE GROOVES ARE CORRECTLY ALIGNED, AND THAT ALL SHAFTING IS PARALLEL.

INSTALLATION AND CHECKING METHODS:

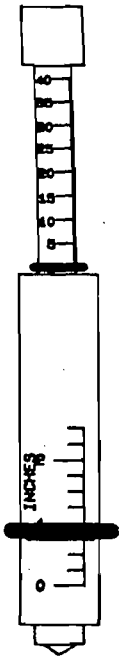
I. VISUAL METHOD

1. WHEN INSTALLING BELTS, REDUCE THE CENTER DISTANCE SO THAT THE BELTS MAY BE PLACED IN THE SHEAVE GROOVES WITHOUT FORCING. ARRANGE THE BELTS SO THAT THE TOP AND BOTTOM SPANS HAVE ABOUT THE SAME AMOUNT OF SAG. APPLY TENSION TO THE BELTS BY INCREASING THE CENTER DISTANCE UNTIL BELTS ARE SNUG AND HAVE A LIVE SPRINGING ACTION WHEN STRUCK WITH THE HAND.
2. OPERATE THE DRIVE A FEW MINUTES TO SEAT THE BELTS IN THE SHEAVE GROOVES. OBSERVE THE OPERATION OF THE DRIVE UNDER ITS HIGHEST LOAD CONDITIONS (USUALLY STARTING). A SLIGHT BOWING OF THE SLACK SIDE OF THE DRIVE INDICATES ADEQUATE TENSION. EXCESSIVE BOWING OR SLIPPAGE INDICATES INSUFFICIENT TENSION. IF THE SLACK SIDE REMAINS TAUT DURING THE PEAK LOAD, THE DRIVE IS TOO TIGHT.
3. NEW DRIVE TENSION SHOULD BE CHECKED SEVERAL TIMES DURING THE FIRST 24 HOURS OF OPERATION, BY OBSERVING THE SLACK SIDE SPAN.

II. TENSIONING GAGE METHOD

WHEN A TENSION GAGE IS AVAILABLE & THE CENTER OF THE BELT SPAN IS ACCESSIBLE, THE FOLLOWING METHOD MAY BE USED. TO DETERMINE THE POUNDS FORCE REQUIRED TO TENSION A DRIVE WITH A BELT TENSIONER, PROCEED AS FOLLOWS:

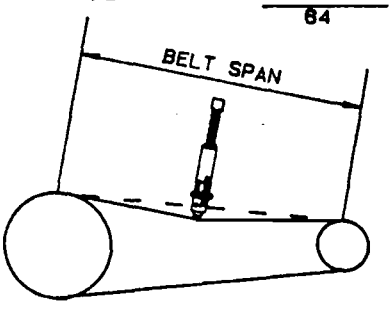
1. MEASURE THE BELT SPAN AS SHOWN & CALCULATE THE DEFLECTION INCHES USING THE GIVEN EQUATION . SET LARGE O-RING FOR CALCULATED INCHES OF DEFLECTION.
2. SET SMALL O-RING AT 0 AND PRESS DOWN THE BELT TENSIONER AT CENTER OF BELT SPAN AS SHOWN.
   A. ON A SINGLE BELT DRIVE, DEPRESS BELT TENSIONER UNTIL THE LARGE O-RING IS EVEN WITH BOTTOM OF A STRAIGHT EDGE PLACED ACROSS THE OUTSIDE EDGE OF THE TWO SHEAVES.
   B. ON MULTIPLE BELT DRIVE, DEPRESS BELT TENSIONER UNTIL LARGE O-RING IS EVEN WITH THE TOP OF THE NEXT BELT. AVERAGE READINGS FROM ALL BELTS IS THE VALUE TO USE IN THE TABLES BELOW.
3. REMOVE TENSION GAGE & OBSERVE THE NEW POSITION OF THE SMALL O-RING IS SET AT THE NUMBER OF DEFLECTION POUNDS FOR THE SET NUMBER OF INCHES.
4. COMPARE THIS READING, OR THE AVERAGE OF SEVERAL READINGS IN THE CASE OF MULTIPLE BELTS, TO THE NEW/USED VALUES IN THE TABLES BELOW FOR THE PROPER BELT CROSS SECTION. IF READINGS DO NOT FALL IN THIS RANGE, READJUST THE BELT TENSION AS DESCRIBED IN THE VISUAL METHOD AND REPEAT MEASUREMENT.



EXAMPLE:

1. BELT SPAN =64" AND SMALL SHEAVE IS 8.0 P.D. WITH COG BELTS.
2. 64"/64=1" REQUIRED DEFLECTION.
3. SET LARGE O-RING AT 1" ON GAGE INCHE SCALE.
4. SET SMALL O-RING AT ZERO ON PLUNGER.
5. PRESS DOWN ON BELTS WITH GAGE UNTIL LARGE O-RING IS EVEN WITH THE NEXT BELT OR A STRAIGHT EDGE, WHICHEVER THE CASE MAY BE. WITH MULTIPLE BELTS, SEVERAL READINGS ARE NEEDED TO GET AN AVERAGE.
6. USE THE POUND FORCE READING OR AVERAGE OF SEVERAL READINGS REQUIRED FOR 1" DEFLECTION IN THE TABLES BELOW.
7. THE "B" BELT TABLE FOR 8.0" P.D. SMALL SHEAVE SHOULD HAVE A DEFLECTION FORCE BETWEEN 7.3 & 10.3 LBS.
8. INCREASE OR DECREASE THE TENSION ON BELTS UNTIL THE DEFLECTION FORCE IS BETWEEN 7.3 & 10.3 LBS.

DEFLECTION = $\frac{\text{BELT SPAN}}{64}$



CROSS SECTION	SMALLEST SHEAVE DIAMETER	R.P.M. RANGE	BELT DEFLECTION FORCE			
			STD. BELTS		COG BELTS	
			USED	NEW	USED	NEW
A, AX	3.0-3.6	1000-2500	3.7	5.5	4.1	6.1
		2501-4000	2.8	4.2	3.4	5.0
	3.8-4.8	1000-2500	4.5	6.8	5.0	7.4
		2501-4000	3.8	5.7	4.3	6.4
	5.0-7.0	1000-2500	5.4	8.0	6.7	8.4
		2501-4000	4.7	7.0	5.1	7.8
B, BX	3.4-4.2	650-2500	5.3	7.8	4.8	7.2
		2501-4000	4.8	6.8	4.2	6.2
	4.4-5.8	650-2500	5.3	7.8	7.1	10.5
		2501-4000	4.5	6.7	7.1	8.1
	5.6-8.8	650-2500	8.5	8.4	8.5	12.8
		2501-4000	8.0	8.8	7.3	10.3
C, CX	7.0-8.0	500-1740	11.5	17.0	14.7	21.8
		1741-3000	8.4	12.8	11.8	17.5
	8.5-10.0	500-1740	14.1	21.0	15.8	23.5
		1741-3000	12.5	18.5	14.8	21.8
D	12.0-18.0	200-850	24.8	37.0	25.0	37.0
		851-1500	21.2	31.3	21.0	31.0
	18.0-20.0	200-850	30.4	45.2	30.1	45.0
		851-1500	25.8	38.0	25.8	38.0

CROSS SECTION	SMALLEST SHEAVE DIAMETER	R.P.M. RANGE	BELT DEFLECTION FORCE			
			STD. BELTS		COG BELTS	
			USED	NEW	USED	NEW
3V, 3VX	2.2-2.4	1000-2500	N/R	N/R	3.3	4.8
		2501-4000	N/R	N/R	2.8	4.3
	2.65-3.35	1000-2500	3.8	5.1	4.2	6.2
		2501-4000	3.0	4.4	3.6	5.6
	4.12-6.8	1000-2500	4.9	7.3	5.3	7.8
		2501-4000	4.4	6.6	4.8	7.3
5V, 5VX	4.4-6.7	500-1749	N/R	N/R	10.2	15.2
		1750-3000	N/R	N/R	8.8	13.2
		3001-4000	N/R	N/R	5.6	8.5
	7.1-10.6	500-1740	12.7	18.8	14.8	22.1
		1741-3000	11.2	16.7	13.7	20.1
	11.8-16.0	500-1740	15.8	23.4	17.1	25.5
		1741-3000	14.8	21.8	16.8	25.0
8V	12.5-17.0	200-850	33.0	49.3	N/A	N/A
		851-1500	26.8	39.8	N/A	N/A
	18.0-22.4	200-850	36.8	55.2	N/A	N/A
		851-1500	36.3	52.7	N/A	N/A

INDUSTRIAE
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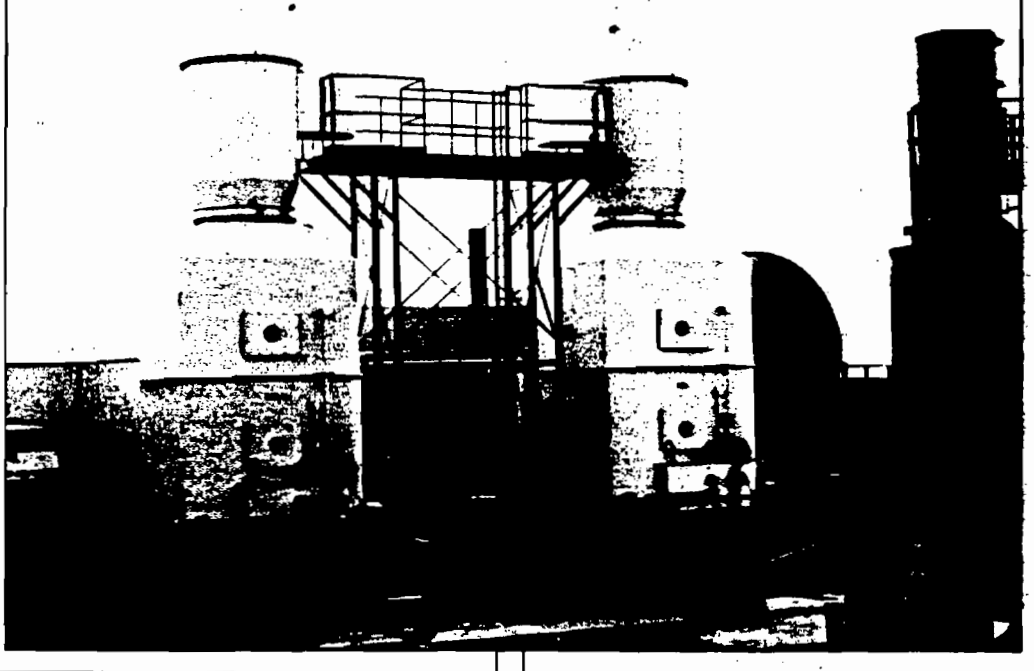
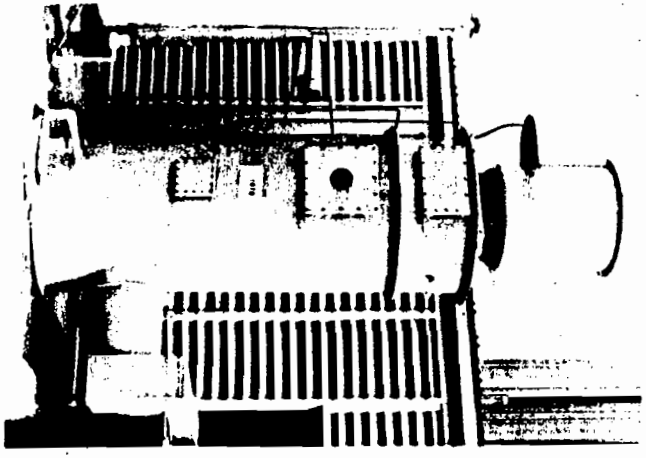
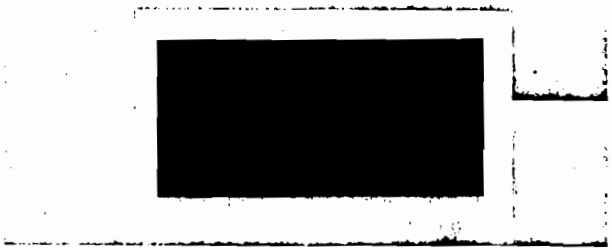
BEVERLY PACIFIC CORPORATION
Industrial Systems Division

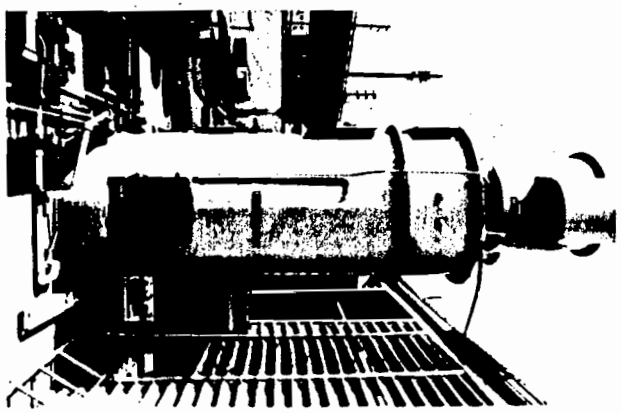
SCRUBBERS

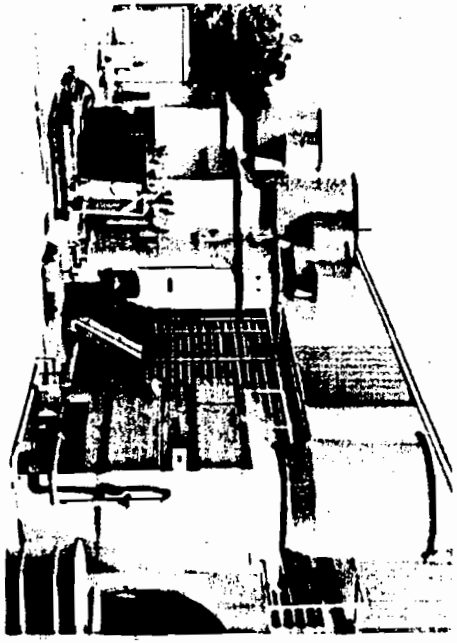


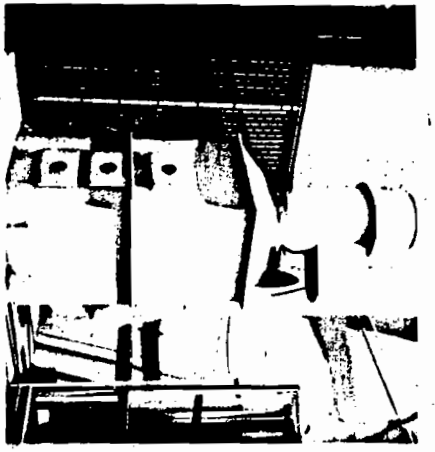
FIBERGLASS REINFORCED PLASTIC

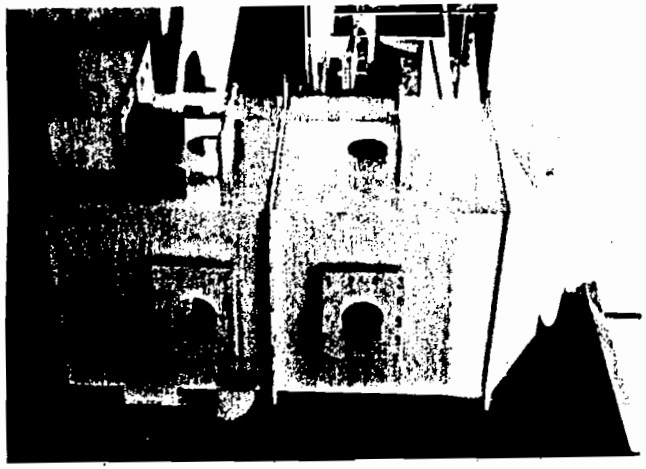


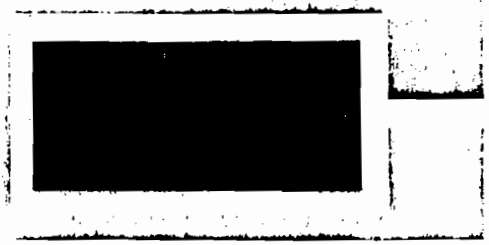


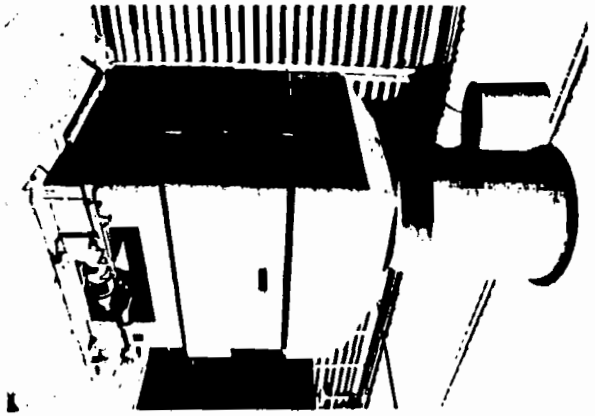








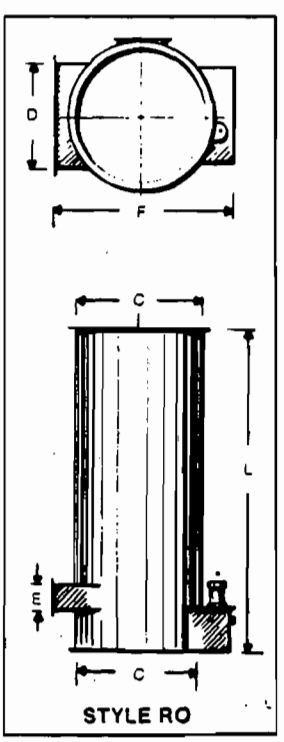




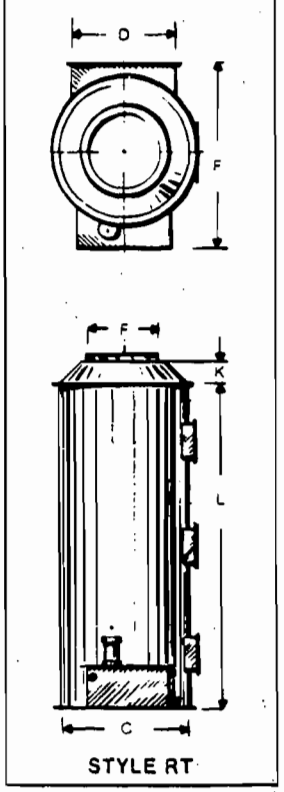
PACKED SCRUBBER DIMENSIONAL CHART

MODEL NUMBERS
DIMENSIONS IN INCHES

	PS-2	PS-4	PS-6	PS-8	PS-12	PS-18	PS-24	PS-30	PS-40	PS-50
A	78	82	84	94	101	108	112	114	118	118
B	24	36	42	48	60	72	84	96	108	120
C	28	40	48	58	72	84	96	108	120	136
D	22	34	40	46	58	70	80	92	104	116
E	6	8	10	11	12	16	18	20	24	24
F	46	58	66	76	90	102	114	126	138	154
G	42	54	60	66	78	90	102	114	126	138
H	13⅜	16⅜	22½	26¼	29½	35¼	39	47¼	52⅜	63⅞
I	10⅜	12⅞	17	20½	22¾	27	30	37½	40¾	49¾
J	18	22	28	34	38	45	50	62	66	80
K	6	8	10	10	12	16	19	20	24	24
L	84	87	89	104	112	118	122	124	128	128
M	64	64	70	77	89	102	102	102	114	114
N	35	49	55	62	76	88	103	116	128	142
O	38	52	58	65	79	91	106	119	131	145
P	14	18	22	26	30	36	42	50	54	66
Q	45	50	61	64	68	72	78	86	93	103
R	35	44	55	65	75	85	94	108	120	141
S	46	52	59	69	72	79	82	97	100	110
T	36	48	54	60	72	84	96	108	120	132
WHEEL DIA.	12¼	15	20	24½	27	33	36½	44½	49	60
CFM x 1000	1-2	2-4	4-6	6-8	8-12	12-18	18-24	24-30	30-40	40-50
RECIRC. GPM	7	15	25	35	45	75	105	135	175	225
MAKE-UP GPM	0.7	1.5	2.0	3.0	4.0	7.0	10.0	13.0	17.0	22.0
HT OP. WT.	388	745	1110	1570	2690	4085	5670	7595	11790	16040
HT SHIP WT.	220	385	550	770	1210	1925	2750	3795	5390	7040
VT OP. WT.	318	660	1060	1500	2630	3910	5470	7400	11650	15800
VT SHIP WT.	150	300	500	700	1150	1750	2550	3600	5250	6800



STYLE RO



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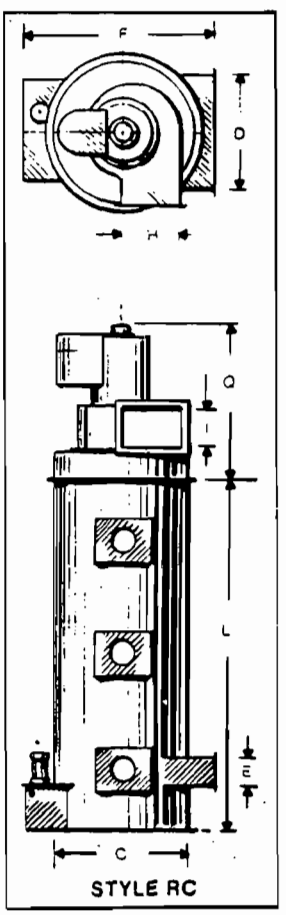

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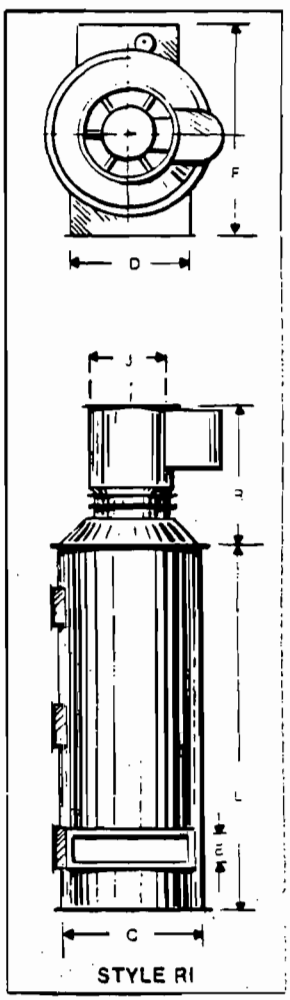
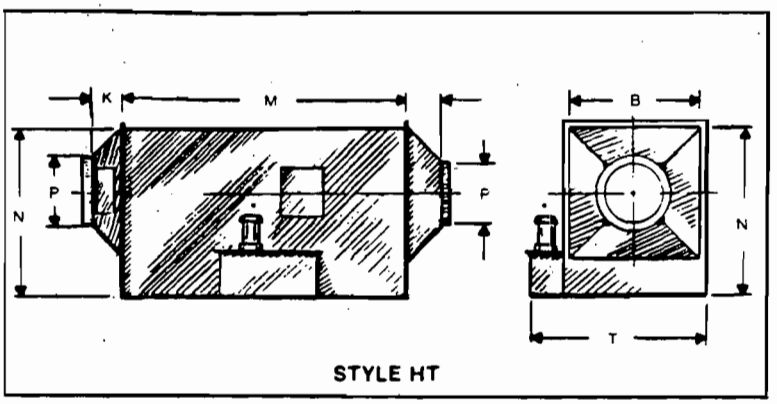
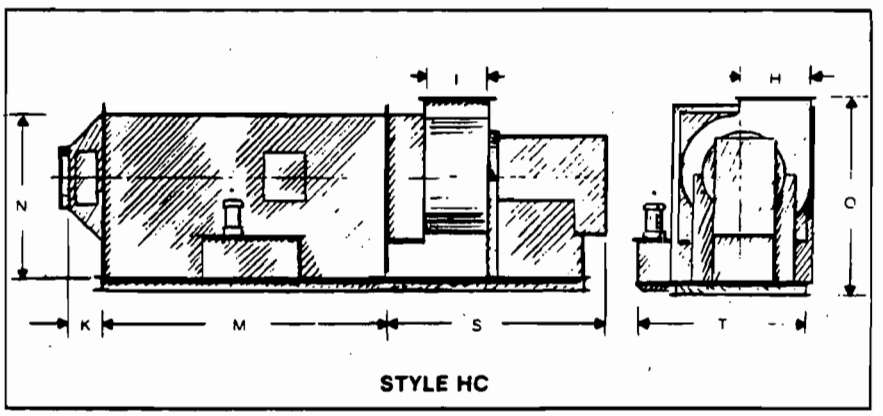


STYLE RI

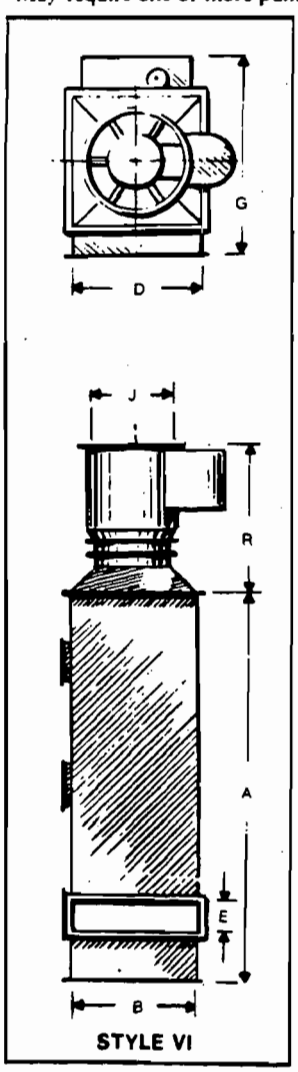


STYLE HT

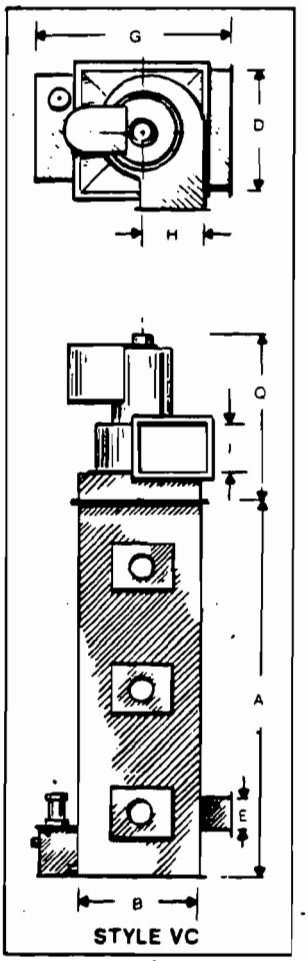


STYLE HC

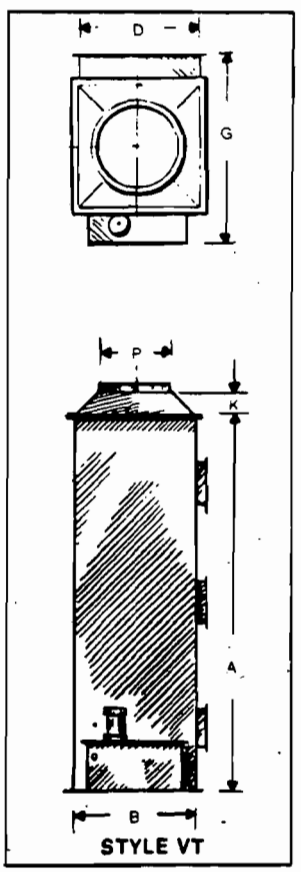
*May require one or more pumps.



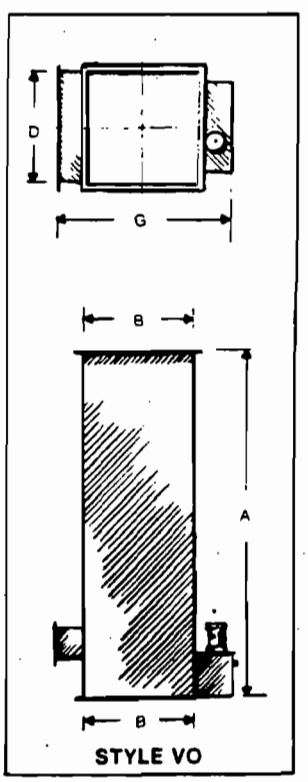
STYLE VI



STYLE VC



STYLE VT



STYLE VO

COMPUTERIZED PACKING MEDIA SELECTION

The most common mistake made by scrubber manufacturers today is the use of only one type of packing media for all types of contaminant removal. Beverly Pacific Corporation scrubbers are designed with a computer program assist to determine the most beneficial packing media to achieve high removal efficiency coupled with low pressure drop providing the user with the ultimate in lower operating costs consistent with the contaminant removal requirements.

SCRUBBER CONFIGURATIONS

Beverly Pacific Corporation manufactures scrubbers of both crossflow and counter-current configurations.

The CROSSFLOW design is of low profile, rectangular shape wherein the contaminated air stream moves horizontally through the packing media and is scrubbed by the liquid flowing downward through the packing. This configuration is ideal for roof-top mounting and is available in ten (10) standard sizes with or without integral centrifugal fans.

The COUNTER-CURRENT design is offered in two (2) configurations, round or rectangular. While the round tower unit is the most economical in initial cost, the rectangular tower unit permits larger CFM volume using the same amount of floor space. In the counter-current design, the contaminated airstream flows up through the packing media and is scrubbed by the liquid flowing downward. The round and rectangular tower units are each offered in ten (10) sizes and are available with or without integral inline or centrifugal fans.

SCRUBBER MAKE-UP WATER CONSUMPTION

Beverly Pacific's scrubber design is based on a scrubbing liquid recirculation rate of 5 GPM per 1000 CFM of contaminated air. Of that 5 GPM, losses due to absorption and/or evaporation range from 0.2 GPM to 0.6 GPM, depending on inlet gas temperature and gas stream dust load.

ENTRAINMENT SEPARATION

The unique design of Beverly Pacific's mist eliminator section provides up to 99+% moisture particle entrapment at a pressure drop of approximately 0.5" W.G.

CONSTRUCTION

The structural housings are fabricated of Fiberglass Reinforced Plastic (FRP) materials which provide structural strength, are corrosion-resistant and light in weight. Resin selection depends on the corrosive element involved. Resins can also be of fire-retardant grade if required. Our construction technique employs the use of female molds resulting in an extremely smooth, attractive, gelcoated exterior surface (note the upper right photo on the facing page). Beverly Pacific Corporation's construction methods meet or exceed the requirements of NBS-PS 15-69 for custom contact-molded reinforced polyester chemical resistant process equipment.

OPTIONAL EQUIPMENT, FITTINGS AND ACCESSORIES

FITTINGS, such as drain, overflow, make-up water, access doors, etc. can usually be located to facilitate installation and maintenance.

RECIRCULATION RESERVOIR(S) are normally an integral part of the scrubber but, if required, can be furnished for remote installation.

RECIRCULATION PUMP(S) can be located within the built-in reservoir, but can also be installed in remote reservoir units.

SPECIAL RESERVOIR(S) can be furnished in applications where it is necessary to remove non-soluble particulate accumulation to prevent pump damage and minimize maintenance.

pH CONTROL SENSING/METERING equipment can be provided where contaminate absorption requires the addition of acid or caustic to the recirculated scrubbing liquid.

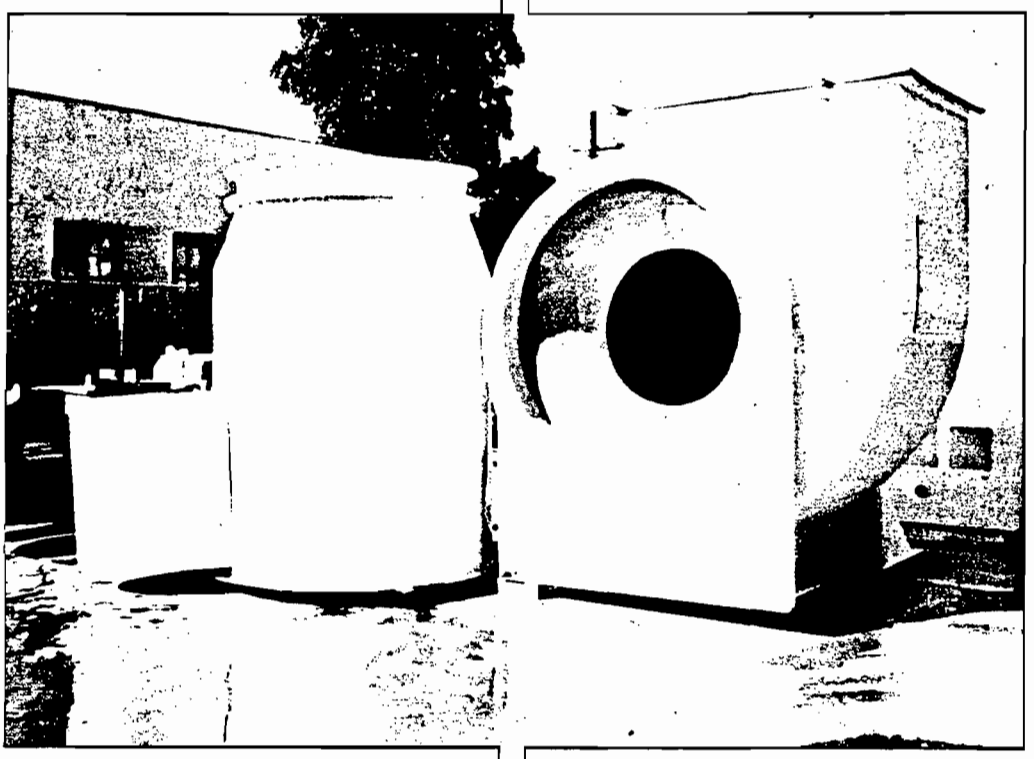
INDUSTRIAL
SALES & SUPPLY CO.

11 Wimbledon Road
LAKE BLUFF, ILLINOIS 60044
(312) 295-5272

BEVERLY PACIFIC CORPORATION

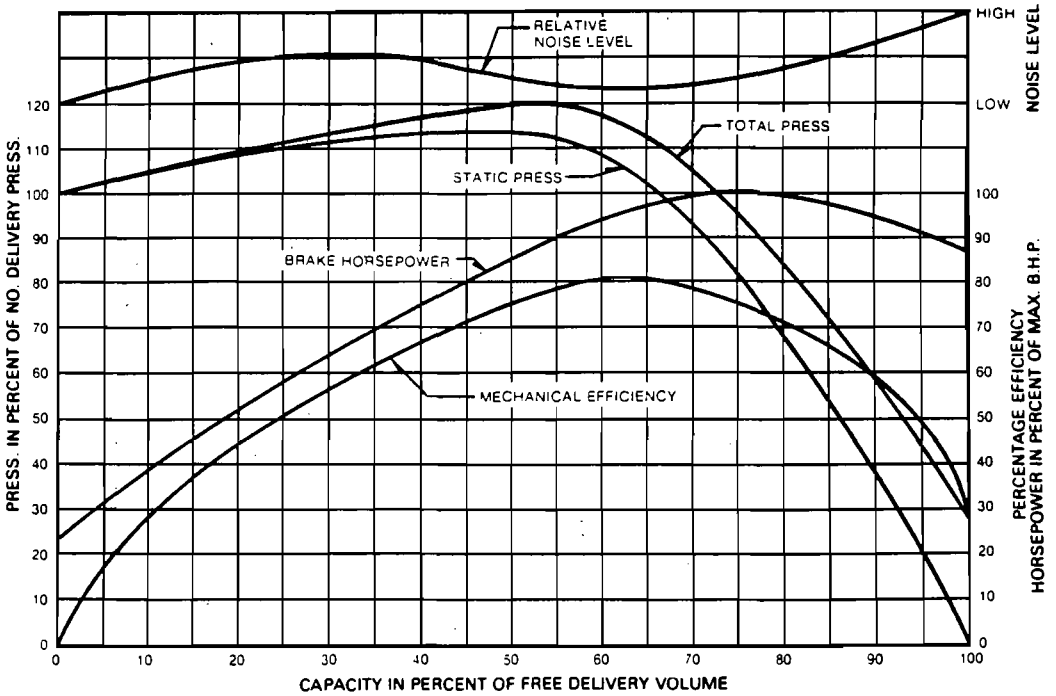
Industrial Systems Division

EXHAUST FANS

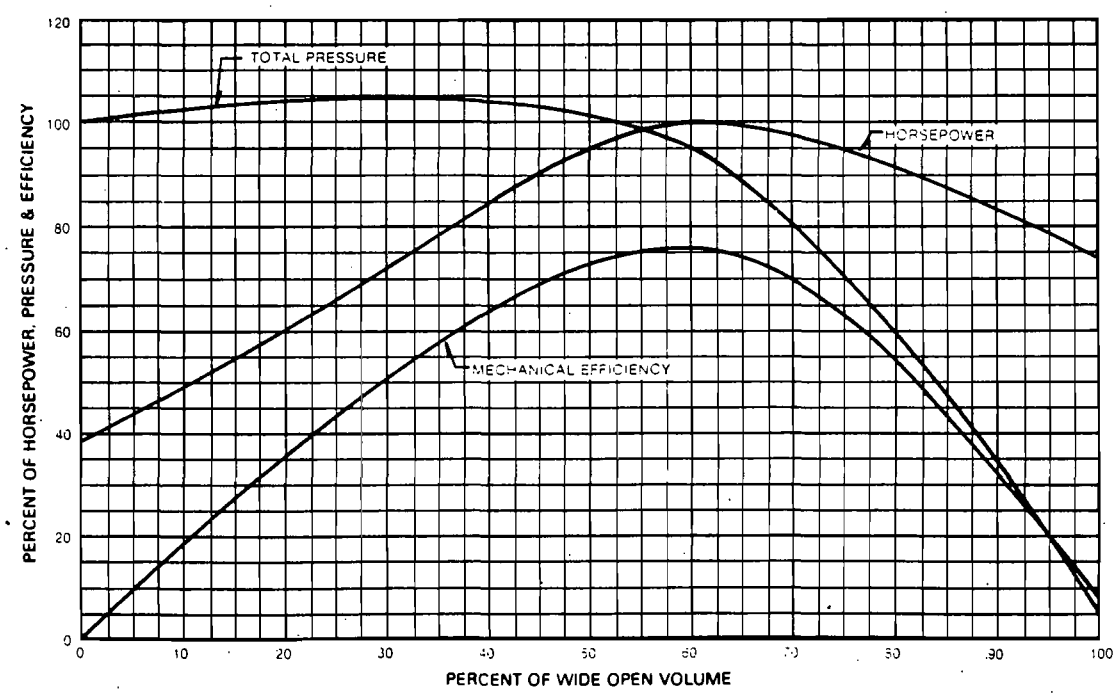


FIBERGLASS REINFORCED PLASTIC

BEVERLY PACIFIC CORPORATION
CENTRIFUGAL FAN CHARACTERISTIC CURVE



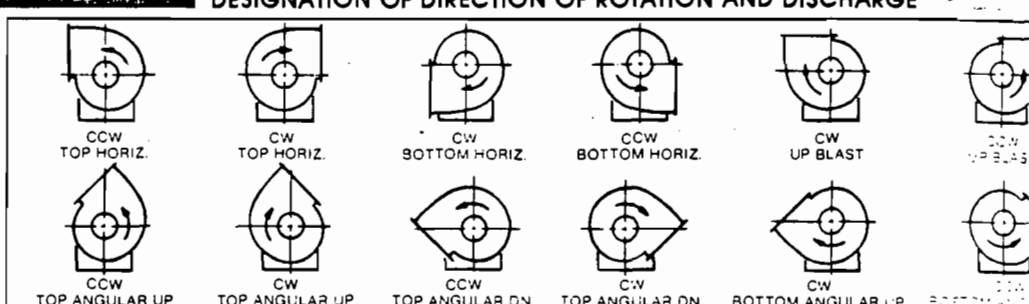
BEVERLY PACIFIC CORPORATION
INLINE FAN CHARACTERISTIC CURVE



CENTRIFUGAL INDUSTRIAL EXHAUST FANS

	CB-12	CB-13	CB-15	CB-16	CB-18	CB-20	CB-22	CB-24	CB-27	CB-30	CB-33
MID-RANGE CFM RECOMMENDED	2,150	2,625	3,200	3,900	4,750	5,800	7,075	8,650	10,550	12,875	15,700
FAN WHEEL DIAMETER	12¼	13½	15	16½	18¼	20	22¼	24½	27	30	33
A	13½	14½	16½	18¼	20	22	24½	26	29¼	32¼	36
B	10⅜	11⅜	12⅞	14⅜	15	17	18¾	20½	22¾	25	27
C	13⅜	14⅞	16⅜	18⅜	20	22½	24	26¼	29½	32	35¼
D	34¼	35¼	40 7/16	42 7/16	45	47¾	54	57¼	61½	64¾	66¾
E	22¼	22½	27¼	29¾	32⅜	36½	39¼	43¼	49	53	58¾
F	15	16	18	19	20	23	26	28	30	33	36
G	11	11½	12½	14	15½	17¼	19	21½	23	25½	28½
H	13⅜	14⅜	15⅞	17⅜	18	21	22¾	24½	26¾	29	31
I	16	16	18¼	18¾	20	20½	23	23	25	26	26
J	3	3	4	4	4	4	6	6	6	6	6
K	9¼	10¼	11¼	12½	13½	15	16	18	20½	22	24
L	9¼	10¼	11¼	12½	13½	15	16	18	20½	22	24
M	3½	3¾	4¼	4½	5	5¾	6⅞	6⅞	7⅞	8¼	9½
DRIVE SHAFT DIAMETER	1	1	1 3/16	1 3/16	1 7/16	1 7/16	1 11/16	1 11/16	1 15/16	1 15/16	1 15/16
SHIPPING WEIGHT POUNDS	170	205	230	400	550	600	650	720	850	1,000	1,380

DESIGNATION OF DIRECTION OF ROTATION AND DISCHARGE



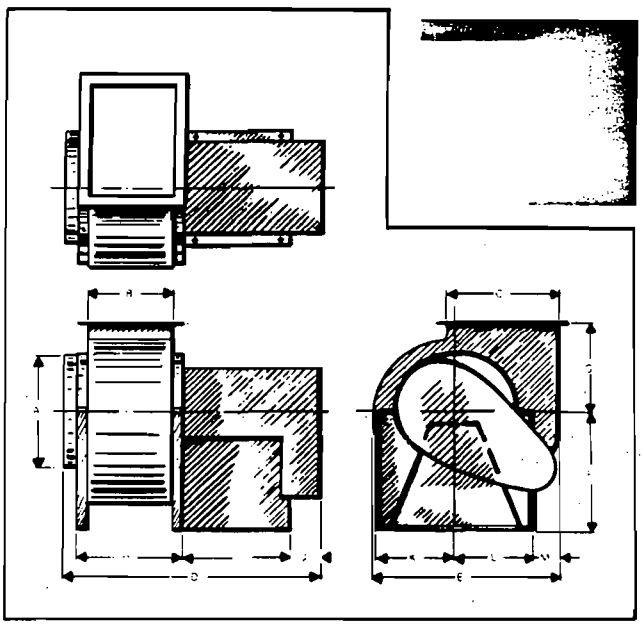
DIRECTION OF ROTATION IS DETERMINED FROM DRIVE SIDE

INLINE EXHAUST FANS

	IB-12	IB-15	IB-18	IB-20	IB-22	IB-24	IB-27	IB-30	IB-33	IB-36	IB-40
MID-RANGE CFM RECOMMENDED	2,550	3,842	4,648	5,614	6,948	8,424	10,242	12,644	15,300	18,718	22,761
FAN WHEEL DIAMETER	12¼	15	18¼	20	22¼	24½	27	30	33	36½	40½
P	21"	28"	32½"	36½"	40"	47"	53"	55"	58"	63¾"	70"
Q	14"	16"	20"	22"	24"	26"	30"	32"	36"	42"	46"
R	18"	22"	26"	28"	32"	34"	38"	42"	45"	50"	56"
S	2"	2"	2"	2"	2"	3"	3"	3"	3"	3"	3"
T	23"	28"	31"	32"	34"	35"	37"	39"	40½"	45"	52"
U	2"	2"	2"	2"	2"	3"	3"	3"	3"	3"	3"
DRIVE SHAFT DIAMETER	1	1 3/16	1 7/16	1 7/16	1 11/16	1 11/16	1 15/16	1 15/16	1 15/16	2 3/16	2 3/16
SHIPPING WEIGHT POUNDS	90	130	290	320	350	380	450	525	730	850	1,110

DIMENSIONAL CHART

CB-40	CB-44	CB-49	CB-54	CB-60	CB-66	
23,375	28,525	34,775	42,450	51,775	63,175	MID-RANGE CFM RECOMMENDED
40¼	44½	49	54¼	60	66	FAN WHEEL DIAMETER
44½	49	54	60	66	72	A
34½	37½	40¾	44¾	49¾	54¾	B
43	47¼	52⅜	57⅜	63⅞	70¼	C
79¾	84¾	88	93	97⅜	104⅜	D
72½	79½	88¼	97	108	119	E
42	49¾	49	54	59	64	F
34½	37½	41	46	50½	55	G
40½	43½	46¾	50¾	53¾	60¾	H
27½	29½	29½	31¼	33	33	I
8	8	8	8	8	8	J
25¾	26¾	30	34	37	40	K
25¾	26¾	30	34	37	40	L
11¼	12¼	14⅝	15⅝	17⅝	19⅞	M
2⅜	2⅞	2⅞	2⅞	2⅞	2⅞	DRIVE SHAFT DIAMETER
2,050	2,300	2,650	3,110	3,525	4,000	SHIPPING WEIGHT POUNDS



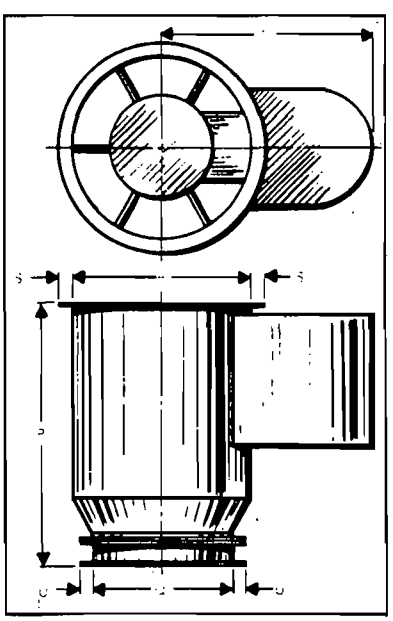
Beverly Pacific's FRP constructed fans have a Type "A" classification for spark resistance.

STANDARD CLASSIFICATIONS FOR SPARK RESISTANT CONSTRUCTION

TYPE	CONSTRUCTION
A	All parts of the fan in contact with the air or gas being handled shall be made of non-ferrous material.
B	The fan shall have an entirely non-ferrous wheel and non-ferrous ring about the opening through which the shaft passes.
C	The fan shall be so constructed that a shift of the wheel or shaft will not permit two ferrous parts of the fan to rub or strike.

DIMENSIONAL CHART

IB-49	IB-54	IB-60	IB-66	
33,733	41,349	50,579	61,201	MID-RANGE CFM RECOMMENDED
49	54¼	60	66	FAN WHEEL DIAMETER
84"	93"	104"	116"	P
54"	60"	66"	72"	Q
66"	72"	80"	88"	R
3"	3"	3"	3"	S
65"	68"	72"	76"	T
3"	3"	3"	3"	U
2⅞	2⅞	2⅞	2⅞	DRIVE SHAFT DIAMETER
1,420	1,650	1,800	2,100	SHIPPING WEIGHT POUNDS



EXHAUST FAN INTRODUCTION

Beverly Pacific's complete line of centrifugal and inline exhaust fans have proven their reliability with years of successful, continuous corrosive service throughout the nation and around the world.

Our solid "FRP" construction defies corrosion and each is designed to provide smooth, quiet and maintenance-free operation . . . this superior combination permits peak performance with the lowest possible power consumption.

A wide selection of standard models, types and sizes are available to meet your specific requirements.

FAN WHEEL SUPERIORITY

The Beverly Pacific fan wheels are fabricated of corrosion-resistant Fiberglass Reinforced Plastic (FRP) materials. The fan wheel design is that of a "backward curve blade," Class II construction, and are available in standard sizes of 12¼" through 66" diameters.

All of Beverly Pacific's fan wheels are both statically and dynamically balanced and run on a test stand prior to final assembly to insure continuous, vibration-free performance.

Every surface in contact with the air stream is corrosion resistant. The steel hub (providing the positive-lock connection to the drive shaft) is totally encapsulated in the wheel laminate and even the weight added during the wheel balancing process is corrosion resistant, Fiberglass Reinforced Plastic materials.

Should your particular requirement involve moving a volume of only a few hundred CFM at ¼" S.P. or over 80,000 CFM at 6" S.P., Beverly Pacific has a proven standard size to meet your requirement.

EXHAUST FANS STANDARD AND OPTIONAL EQUIPMENT

Standard Equipment: Beverly Pacific's centrifugal fans are equipped with a scroll bottom drain and flanged discharge outlet, and are furnished with a purchaser's choice of twelve (12) discharge outlet directions and a choice of right or left fan wheel rotation. Both of our fan styles, centrifugal and inline, are equipped with an OSHA approved belt guard and powered by 230-460/30/60 Hz motors . . . totally enclosed, fan-cooled, (TEFC) up to 20 horsepower, and Multi-guard motors are furnished when horsepower requirements are 25 or larger. Also, as standard equipment, Beverly Pacific furnishes the following list of first-line, top quality drive components which were selected based on motor horsepower, RPM, tip speed and weight of fan wheel, with a safety factor of 1.3 times the motor horsepower.

a. BEARINGS — Beverly Pacific furnishes Dodge-Type K pillow blocks on the inline model. These Dodge bearings have Timken-tapered roller bearings, are fully self-aligning and designed to meet the stringent demands of power transmission. Based on radial and thrust load computations, bearing life expectancy is in excess of 100,000 hours.

b. SHEAVES — Beverly Pacific Corporation furnishes Dodge sheaves, which are cast from the finest quality gray iron and machined to rigid quality control specifications. Groove design and spacing conforms to ASA, MPTA and RMA standards. These sheaves are equipped with Taper-Lock bushings, a superior mounting well recognized and widely used in industry.

c. V-BELTS — Beverly Pacific furnishes Dodge Sealed-Life Belts, Type A, B and C which have a longer wearing protective cover, crowned top, concave sidewall, exceptional stability and an improved cord section which prevents failures caused by cord separation.

d. WHEEL BACKING PLATES — Beverly Pacific uses Rex taper-lock, single-duty, Type B, steel sprocket, in the backing plate of all FRP fan wheels. This steel sprocket is completely embedded and encased with FRP materials to prevent corrosion attack.

e. DRIVE SHAFTS — Beverly Pacific uses ground and polished, 1045 TGP shafting rounds, as produced by Inland Steel. This medium carbon steel is used because of its greater strength and hardness. The mechanical properties, based on ¾" — 1¼" diameter round bars of 1045, include a tensile strength of 98,000 PSI, yield strength of 59,000 PSI and a Brinnel Hardness of 212.

HARRIS SEMICONDUCTOR -- AIR PERMIT INFORMATION

CURRENT PERMIT

BUILDING: 04
PERMIT NUMBER: AC 05-104525
PERMIT TYPE : CONSTRUCTION

DATE ISSUED : 01/15/86
RENEWAL DATE: 04/01/86
DATE EXPIRES: 06/30/86

AREA SERVED: EPITAXIAL. HCL VENT
PROCESS DESCRIPTION: NORTH CHEMICAL VAPOR SCRUBBER

PERMIT LIMITS

VOL. RATE (SCFM): 10.000
ACID MIST (LB/HR): 0.0005
SOLVENTS (LB/HR): 0.0005
VOCS (LB/HR): --
OPER. (HRS/YEAR): 8760

SPECIFIC CONDITIONS

ANNUAL OPERATING REPORT :
NOTIFICATION OF VE TEST :
ANNUAL VIS EMISSION TEST:

EQUIPMENT INFORMATION

MANUFACTURER : HARRISON
LOCATION : B04 ROOF
HARRIS ID NUMBER : F04S01
VOLUME FLOW RATE (CFM): 10,000
RECIRCULATION RATE (GPM): 65
MAKEUP WATER RATE (GPM): 6.0

MODEL NUMBER : HF-100
STACK HEIGHT (FT): 13.5
STACK DIAMETER (IN): 26
STACK VELOCITY (FPM): 2712
DUCT MATERIAL :

PERMIT HISTORY

PERMIT NUMBER: AC 05-104525
DATE EXPIRED : 06/30/86

PERMIT NUMBER:
DATE EXPIRED :

PERMIT NUMBER:
DATE EXPIRED :

SCRUBBER INFORMATION

HARRIS ID # : F04S01
MANUFACTURER : HARRISON — MODEL NUMBER : HF-100
SERIAL NUMBER: N/A — MATERIAL : POLYPRO
DESCRIPTION : HORIZONTAL CROSS-FLOW, PLASTIC SADDLE PACKING, LIQUID DISTRIBUTION THROUGH MAIN HEADER, NO SPRAY NOZZLES

DESIGN DATA
VOLUME FLOW RATE (CFM): 10000 — PRESSURE DROP (IN):
RECIRCULATION RATE (GPM): 65 — MAKE UP RATE (GPM): 6.0

ACTUAL DATA
VOLUME FLOW RATE (CFM): 8220 — PRESSURE DROP (IN): (0.7) DATE: 12/20/86
RECIRCULATION RATE (GPM): NR — MAKE UP RATE (GPM): 2 DATE: 6/3/87

RECIRCULATION PUMP INFORMATION

MANUFACTURER : LELAND FARADAY — MODEL NUMBER : 92J310A
SERIAL NUMBER: N/A — HP : 1 RPM : 3450
BRKR LOCATION: #8 — FED FROM MCC :

FAN INFORMATION

HARRIS ID # : F04E01
MANUFACTURER : HARTZELL — MODEL NUMBER: 41-27-GN3
SERIAL NUMBER: 50043 — MATERIAL : FIBERGLASS
DESCRIPTION : CENTRIFUGAL BLOWER, BACKWARD CURVED BLADES

DESIGN DATA
VOLUME FLOW RATE (CFM): 10,000 — STATIC PRESS (IN): 4.0

ACTUAL DATA — SPEED (RPM): — DATE:
VOLUME FLOW RATE (CFM): 8,220 — STATIC PRESS (IN): — DATE: 12/20/86

FAN MOTOR INFORMATION

MANUFACTURER : — MODEL NUMBER :
SERIAL NUMBER: — HP : 10 RPM : 1725
BRKR LOCATION: #6 — FED FROM MCC :

HARRIS SEMICONDUCTOR -- AIR PERMIT INFORMATION

CURRENT PERMIT

BUILDING: 04
PERMIT NUMBER: AO 05-115803
PERMIT TYPE : OPERATING

DATE ISSUED : 05/20/86
RENEWAL DATE: 03/23/91
DATE EXPIRES: 05/22/91

AREA SERVED: DIFFUSION
PROCESS DESCRIPTION: OXI/DIFFUSION EXPANSION EXHAUST SCRUBBER

PERMIT LIMITS

VOL. RATE (SCFM): NOT SPEC.
ACID MIST (LB/HR): 0.0104
SOLVENTS (LB/HR): 0.0068
VOCS (LB/HR): --
OPER. (HRS/YEAR): 8760

SPECIFIC CONDITIONS

ANNUAL OPERATING REPORT : 03/01
NOTIFICATION OF VE TEST : NOT SPEC.
ANNUAL VIS EMISSION TEST: NOT SPEC.

EQUIPMENT INFORMATION

MANUFACTURER : DUALL IND.
LOCATION : B04 ROOF
HARRIS ID NUMBER : F04S02
VOLUME FLOW RATE (CFM): 6,900
RECIRCULATION RATE (GPM): 42
MAKEUP WATER RATE (GPM): 2.0

MODEL NUMBER : F-101
STACK HEIGHT (FT):
STACK DIAMETER (IN):
STACK VELOCITY (FPM):
DUCT MATERIAL :

PERMIT HISTORY

PERMIT NUMBER: AO 05-38485 (FAN 25, SCRUB 26)
DATE EXPIRED : 04/08/86

PERMIT NUMBER:
DATE EXPIRED :

PERMIT NUMBER:
DATE EXPIRED :

SCRUBBER INFORMATION

HARRIS ID # : F04S02
MANUFACTURER : DUALL IND. MODEL NUMBER : F-101
SERIAL NUMBER: 7512 MATERIAL : PVC
DESCRIPTION : HORIZONTAL CROSS-FLOW, FOUR STAGE, MIST ELIMINATOR, SINGLE FILTER PACK, OPEN ORIFICE TYPE SPRAY NOZZLES

DESIGN DATA
VOLUME FLOW RATE (CFM): 14,000 PRESSURE DROP (IN):
RECIRCULATION RATE (GPM): 42 MAKE UP RATE (GPM): 2.0

ACTUAL DATA
VOLUME FLOW RATE (CFM): PRESSURE DROP (IN): DATE:
RECIRCULATION RATE (GPM): MAKE UP RATE (GPM): DATE:

RECIRCULATION PUMP INFORMATION

MANUFACTURER : FLOTEC MODEL NUMBER : C7P8-11917
SERIAL NUMBER: 1.25. HP : 1 RPM : 3450
BRKR LOCATION: NEXT TO UNIT FED FROM MCC :

FAN INFORMATION

HARRIS ID # : F04E02
MANUFACTURER : DUALL IND. MODEL NUMBER: 60
SERIAL NUMBER: 7512 MATERIAL : PVC
DESCRIPTION : CENTRIFUGAL BLOWER: PVC CONSTRUCTION

DESIGN DATA
VOLUME FLOW RATE (CFM): 6900 STATIC PRESS (IN): 4.0

ACTUAL DATA SPEED (RPM): DATE:
VOLUME FLOW RATE (CFM): STATIC PRESS (IN): DATE:

FAN MOTOR INFORMATION

MANUFACTURER : MODEL NUMBER :
SERIAL NUMBER: HP : 15 RPM : 1750
BRKR LOCATION: FED FROM MCC :

HARRIS SEMICONDUCTOR -- AIR PERMIT INFORMATION

CURRENT PERMIT

BUILDING: 04
PERMIT NUMBER: AC 05-104524
PERMIT TYPE : CONSTRUCTION

DATE ISSUED : 01/15/86
RENEWAL DATE: 04/01/86
DATE EXPIRES: 06/30/86

AREA SERVED: FINAL SCREEN CLEAN, GRIND, BACKLAP
PROCESS DESCRIPTION: SOUTH CHEMICAL VAPOR SCRUBBER

PERMIT LIMITS

VOL. RATE (SCFM): 10.000
ACID MIST (LB/HR): 0.0008
SOLVENTS (LB/HR): 0.0091
VOCS (LB/HR): --
OPER. (HRS/YEAR): 8760

SPECIFIC CONDITIONS

ANNUAL OPERATING REPORT :
NOTIFICATION OF VE TEST :
ANNUAL VIS EMISSION TEST:

EQUIPMENT INFORMATION

MANUFACTURER : HARRISON
LOCATION : B04 ROOF
HARRIS ID NUMBER : F04S03
VOLUME FLOW RATE (CFM): 10,000
RECIRCULATION RATE (GPM): 65
MAKEUP WATER RATE (GPM): 6.0

MODEL NUMBER : HF-100
STACK HEIGHT (FT): 15
STACK DIAMETER (IN): 26
STACK VELOCITY (FPM): 2712
DUCT MATERIAL :

PERMIT HISTORY

PERMIT NUMBER: AC 05-104524
DATE EXPIRED : 06/30/86

PERMIT NUMBER:
DATE EXPIRED :

PERMIT NUMBER:
DATE EXPIRED :

SCRUBBER INFORMATION

HARRIS ID # : F04S03
MANUFACTURER : HARRISON MODEL NUMBER : HF-100
SERIAL NUMBER: N/A MATERIAL : POLYPRO
DESCRIPTION : HORIZONTAL CROSS-FLOW, PLASTIC SADDLE PACKING, LIQUID DISTRIBUTION THROUGH MAIN HEADER, NO SPRAY NOZZLES

DESIGN DATA
VOLUME FLOW RATE (CFM): 10,000 PRESSURE DROP (IN):
RECIRCULATION RATE (GPM): 65 MAKE UP RATE (GPM): 6.0

ACTUAL DATA
VOLUME FLOW RATE (CFM): 10,600 PRESSURE DROP (IN): (1.2) DATE: 12/21/86
RECIRCULATION RATE (GPM): N/R MAKE UP RATE (GPM): 5 DATE: 06/03/87

RECIRCULATION PUMP INFORMATION

MANUFACTURER : A. O. SMITH CORP MODEL NUMBER : P56M247
SERIAL NUMBER: 6A84 HP : 1.5 RPM : 3450/2850
BRKR LOCATION: #7 FED FROM MCC :

FAN INFORMATION

HARRIS ID # : F04E03
MANUFACTURER : HARTZELL MODEL NUMBER: 41-27-GN3
SERIAL NUMBER: 50043 MATERIAL : FIBERGLASS
DESCRIPTION : CENTRIFUGAL BLOWER, BACKWARD CURVED BLADES

DESIGN DATA
VOLUME FLOW RATE (CFM): 10,000 STATIC PRESS (IN): 4.0

ACTUAL DATA SPEED (RPM): DATE:
VOLUME FLOW RATE (CFM): 10,600 STATIC PRESS (IN): DATE: 12/21/86

FAN MOTOR INFORMATION

MANUFACTURER : MODEL NUMBER :
SERIAL NUMBER: HP : 10 RPM : 1725
BRKR LOCATION: #5 FED FROM MCC :

HARRIS SEMICONDUCTOR -- AIR PERMIT INFORMATION

CURRENT PERMIT

BUILDING: 04
PERMIT NUMBER: AO 05-109850
PERMIT TYPE : OPERATING

DATE ISSUED : 11/05/85
RENEWAL DATE: 08/31/90
DATE EXPIRES: 10/30/90

AREA SERVED: WET CHEMISTRY, ENGINEERING LAB, GRIND
PROCESS DESCRIPTION: SILICON WAFER CHEM TREAT SCRUBBER (SYS 9)

PERMIT LIMITS

VOL. RATE (SCFM): NOT SPEC.
ACID MIST (LB/HR): 0.279
SOLVENTS (LB/HR): --
VOCS (LB/HR): --
OPER. (HRS/YEAR): 6336

SPECIFIC CONDITIONS

ANNUAL OPERATING REPORT : 03/01
NOTIFICATION OF VE TEST : 11/06
ANNUAL VIS EMISSION TEST: 11/21

EQUIPMENT INFORMATION

MANUFACTURER : UNKNOWN
LOCATION : B04 ROOF
HARRIS ID NUMBER : F04S04
VOLUME FLOW RATE (CFM):
RECIRCULATION RATE (GPM):
MAKEUP WATER RATE (GPM):

MODEL NUMBER :
STACK HEIGHT (FT):
STACK DIAMETER (IN):
STACK VELOCITY (FPM):
DUCT MATERIAL :

PERMIT HISTORY

PERMIT NUMBER: AO 05-36152 (10450 CFM, F350, S351)
DATE EXPIRED : 11/19/85

PERMIT NUMBER:
DATE EXPIRED :

PERMIT NUMBER:
DATE EXPIRED :

SCRUBBER INFORMATION

HARRIS ID # : F04S04
MANUFACTURER : UNKNOWN — MODEL NUMBER :
SERIAL NUMBER: — MATERIAL :
DESCRIPTION :

DESIGN DATA
VOLUME FLOW RATE (CFM): — PRESSURE DROP (IN):
RECIRCULATION RATE (GPM): — MAKE UP RATE (GPM):

ACTUAL DATA
VOLUME FLOW RATE (CFM): — PRESSURE DROP (IN): N/E DATE: 6/3/87
RECIRCULATION RATE (GPM): 10 — MAKE UP RATE (GPM): 5 DATE: "

RECIRCULATION PUMP INFORMATION

MANUFACTURER : DELCO — MODEL NUMBER : F4324
SERIAL NUMBER: 8RGSND77503 — HP : 2 RPM : 3465
BRKR LOCATION: ON BLOWER — FED FROM MCC :

FAN INFORMATION

HARRIS ID # : F04E04
MANUFACTURER : HARTZELL — MODEL NUMBER: 41-33-GP3
SERIAL NUMBER: 15748 — MATERIAL : FIBERGLASS
DESCRIPTION : CENTRIFUGAL BLOWER. BACKWARD CURVED BLADES

DESIGN DATA
VOLUME FLOW RATE (CFM): — STATIC PRESS (IN):

ACTUAL DATA — SPEED (RPM): — DATE:
VOLUME FLOW RATE (CFM): — STATIC PRESS (IN): — DATE:

FAN MOTOR INFORMATION

MANUFACTURER : — MODEL NUMBER :
SERIAL NUMBER: — HP : 20 RPM :
BRKR LOCATION: — FED FROM MCC :

HARRIS SEMICONDUCTOR -- AIR PERMIT INFORMATION

CURRENT PERMIT

BUILDING: 04
PERMIT NUMBER: AO 05-121934
PERMIT TYPE : OPERATING

DATE ISSUED : 09/16/86
RENEWAL DATE: 07/16/91
DATE EXPIRES: 09/14/91

AREA SERVED: SIL-TET LOAD
PROCESS DESCRIPTION: ACID VAPOR SCRUBBER (SIL-TET LOADING)

PERMIT LIMITS

VOL. RATE (SCFM): 1000
ACID MIST (LB/HR): 0.0095
SOLVENTS (LB/HR): --
VOCS (LB/HR): --
OPER. (HRS/YEAR): 1560

SPECIFIC CONDITIONS

ANNUAL OPERATING REPORT : 03/01
NOTIFICATION OF VE TEST : 10/26
ANNUAL VIS EMISSION TEST: 11/10

EQUIPMENT INFORMATION

MANUFACTURER : BEVERLY PACIFIC
LOCATION : B04 EAST GROUND
HARRIS ID NUMBER : F04S05
VOLUME FLOW RATE (CFM): 2,000
RECIRCULATION RATE (GPM): 10
MAKEUP WATER RATE (GPM): 0.5

MODEL NUMBER : PS-2VT
STACK HEIGHT (FT): 34
STACK DIAMETER (IN): 14
STACK VELOCITY (FPM):
DUCT MATERIAL : polypro

PERMIT HISTORY

PERMIT NUMBER: AC 05-108258
DATE EXPIRED : 06/30/86

PERMIT NUMBER:
DATE EXPIRED :

PERMIT NUMBER:
DATE EXPIRED :

SCRUBBER INFORMATION

HARRIS ID # : F04S05
MANUFACTURER : BEVERLY PACIFIC MODEL NUMBER : PS-2VT
SERIAL NUMBER: F-600 MATERIAL : FIBERGLASS
DESCRIPTION : VERTICAL COUNTER-CURRENT, NON-CLOGGING PVC SPRAY NOZZLES. POLYPROPYLENE PACKING, PVC MIST ELIMINATOR

DESIGN DATA
VOLUME FLOW RATE (CFM): 2,000 PRESSURE DROP (IN):
RECIRCULATION RATE (GPM): 10 MAKE UP RATE (GPM): 0.5

ACTUAL DATA
VOLUME FLOW RATE (CFM): 1,000 PRESSURE DROP (IN): N/E DATE: 6/3/87
RECIRCULATION RATE (GPM): N/E MAKE UP RATE (GPM): N/E DATE: "

RECIRCULATION PUMP INFORMATION

MANUFACTURER : FILTER PUMP IND MODEL NUMBER : 350205-79
SERIAL NUMBER: F981 HP : 0.5 RPM : 2850/3450
BRKR LOCATION: NEXT TO UNIT FED FROM MCC :

FAN INFORMATION

HARRIS ID # : F04E26
MANUFACTURER : BEVERLY PACIFIC MODEL NUMBER: 1B-12
SERIAL NUMBER: MATERIAL : FIBERGLASS
DESCRIPTION : IN LINE DUCT-AXIAL BLOWER

DESIGN DATA
VOLUME FLOW RATE (CFM): 2,000 STATIC PRESS (IN):

ACTUAL DATA SPEED (RPM): DATE:
VOLUME FLOW RATE (CFM): 1,000 STATIC PRESS (IN): DATE:

FAN MOTOR INFORMATION

MANUFACTURER : MODEL NUMBER :
SERIAL NUMBER: HP : RPM :
BRKR LOCATION: FED FROM MCC :

HARRIS SEMICONDUCTOR -- AIR PERMIT INFORMATION

CURRENT PERMIT

BUILDING: 04
PERMIT NUMBER: AO 05-109846
PERMIT TYPE : OPERATING

DATE ISSUED : 11/05/85
RENEWAL DATE: 08/31/90
DATE EXPIRES: 10/30/90

AREA SERVED: EPITAXIAL, POLYSILICON DEPOSITION
PROCESS DESCRIPTION: 4 EPI REACTORS WITH 4 SCRUBBERS (SYS 6, 7 AND 8)

PERMIT LIMITS

VOL. RATE (SCFM): NOT SPEC.
ACID MIST (LB/HR): 0.49
SOLVENTS (LB/HR): --
VOCS (LB/HR): --
OPER. (HRS/YEAR):

SPECIFIC CONDITIONS

ANNUAL OPERATING REPORT : 03/01
NOTIFICATION OF VE TEST : 11/06
ANNUAL VIS EMISSION TEST: 11/21

EQUIPMENT INFORMATION

MANUFACTURER : IN-HOUSE
LOCATION : BLDG 4 ROOF
HARRIS ID NUMBER : F04S06
VOLUME FLOW RATE (CFM):
RECIRCULATION RATE (GPM):
MAKEUP WATER RATE (GPM):

MODEL NUMBER :
STACK HEIGHT (FT):
STACK DIAMETER (IN):
STACK VELOCITY (FPM):
DUCT MATERIAL :

PERMIT HISTORY

PERMIT NUMBER: AO 05-36148 (SYSTEM 6, 800 CFM)
DATE EXPIRED : 11/18/85

PERMIT NUMBER: AO 05-36149 (SYSTEM 7, 800 CFM)
DATE EXPIRED : 11/18/85

PERMIT NUMBER: AO 05-36150 (SYSTEM 8, 800 CFM)
DATE EXPIRED : 11/18/85

SCRUBBER INFORMATION

HARRIS ID # : N/A (F04S06)
MANUFACTURER : MODEL NUMBER :
SERIAL NUMBER: MATERIAL :
DESCRIPTION : 4 EPI SCRUBBERS

DESIGN DATA
VOLUME FLOW RATE (CFM): PRESSURE DROP (IN):
RECIRCULATION RATE (GPM): MAKE UP RATE (GPM):

ACTUAL DATA
VOLUME FLOW RATE (CFM): PRESSURE DROP (IN): DATE:
RECIRCULATION RATE (GPM): MAKE UP RATE (GPM): DATE:

RECIRCULATION PUMP INFORMATION

MANUFACTURER : MODEL NUMBER :
SERIAL NUMBER: HP : RPM :
BRKR LOCATION: FED FROM MCC :

FAN INFORMATION

HARRIS ID # :
MANUFACTURER : MODEL NUMBER:
SERIAL NUMBER: MATERIAL :
DESCRIPTION :

DESIGN DATA
VOLUME FLOW RATE (CFM): STATIC PRESS (IN):

ACTUAL DATA SPEED (RPM): DATE:
VOLUME FLOW RATE (CFM): STATIC PRESS (IN): DATE:

FAN MOTOR INFORMATION

MANUFACTURER : MODEL NUMBER :
SERIAL NUMBER: HP : RPM :
BRKR LOCATION: FED FROM MCC :

HARRIS SEMICONDUCTOR -- AIR PERMIT INFORMATION

CURRENT PERMIT

BUILDING: 04
PERMIT NUMBER: AO 05-109852
PERMIT TYPE : OPERATING

DATE ISSUED : 11/05/85
RENEWAL DATE: 08/31/90
DATE EXPIRES: 10/30/90

AREA SERVED: PHOTORESIST, WET CHEMISTRY
PROCESS DESCRIPTION: SILICON WAFER CHEMICAL TREATMENT (SYS 10)

PERMIT LIMITS

VOL. RATE (SCFM): 3620
ACID MIST (LB/HR): --
SOLVENTS (LB/HR): 0.473
VOCS (LB/HR): --
OPER. (HRS/YEAR): 6336

SPECIFIC CONDITIONS

ANNUAL OPERATING REPORT : 03/01
NOTIFICATION OF VE TEST : 11/06
ANNUAL VIS EMISSION TEST: 11/21

EQUIPMENT INFORMATION

MANUFACTURER : N/A
LOCATION :
HARRIS ID NUMBER : F04S08
VOLUME FLOW RATE (CFM):
RECIRCULATION RATE (GPM): N/A
MAKEUP WATER RATE (GPM): N/A

MODEL NUMBER : N/A
STACK HEIGHT (FT):
STACK DIAMETER (IN):
STACK VELOCITY (FPM):
DUCT MATERIAL : GALV

PERMIT HISTORY

PERMIT NUMBER: AO 05-36154 (FAN 349)
DATE EXPIRED : 11/19/85

PERMIT NUMBER:
DATE EXPIRED :

PERMIT NUMBER:
DATE EXPIRED :

SCRUBBER INFORMATION

HARRIS ID # : N/A (F04S08)
MANUFACTURER : N/A MODEL NUMBER : N/A
SERIAL NUMBER: N/A MATERIAL : N/A
DESCRIPTION : N/A (NO SCRUBBER PRESENT)

DESIGN DATA
VOLUME FLOW RATE (CFM): N/A PRESSURE DROP (IN): N/A
RECIRCULATION RATE (GPM): N/A MAKE UP RATE (GPM): N/A

ACTUAL DATA
VOLUME FLOW RATE (CFM): N/A PRESSURE DROP (IN): N/A DATE: N/A
RECIRCULATION RATE (GPM): N/A MAKE UP RATE (GPM): N/A DATE: N/A

RECIRCULATION PUMP INFORMATION

MANUFACTURER : N/A MODEL NUMBER : N/A
SERIAL NUMBER: N/A HP : N/A RPM : N/A
BRKR LOCATION: N/A FED FROM MCC : N/A

FAN INFORMATION

HARRIS ID # : F04E20
MANUFACTURER : LOREN COOK MODEL NUMBER: 24
SERIAL NUMBER: 74080-9742 MATERIAL :
DESCRIPTION : CENTRIFUGAL BLOWER

DESIGN DATA
VOLUME FLOW RATE (CFM): 3620 STATIC PRESS (IN):

ACTUAL DATA SPEED (RPM): DATE:
VOLUME FLOW RATE (CFM): 4545 STATIC PRESS (IN): DATE: 01/13/87

FAN MOTOR INFORMATION

MANUFACTURER : MODEL NUMBER :
SERIAL NUMBER: HP : 7.5 RPM :
BRKR LOCATION: FED FROM MCC :

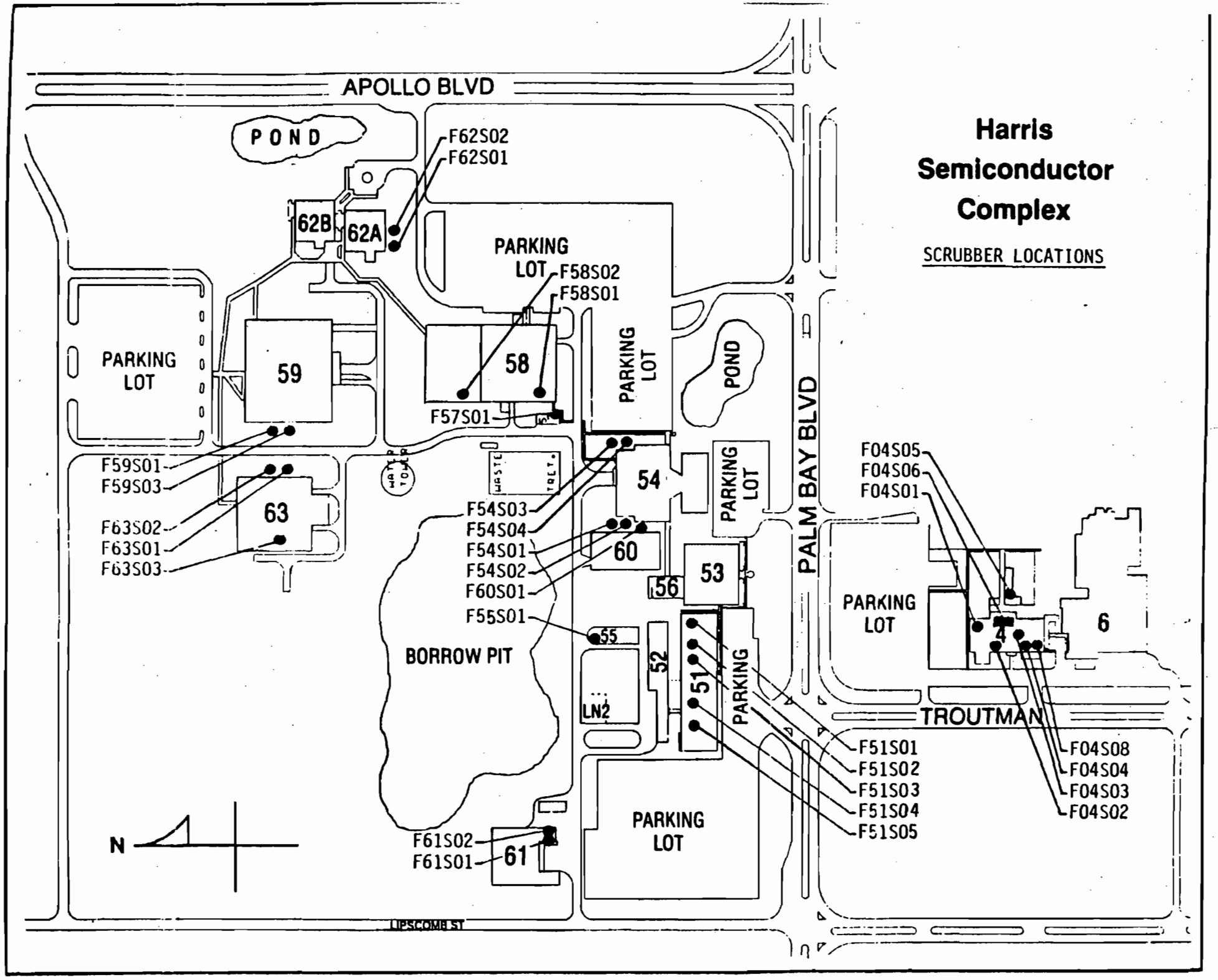
Attachment :

HARRIS SEMICONDUCTOR

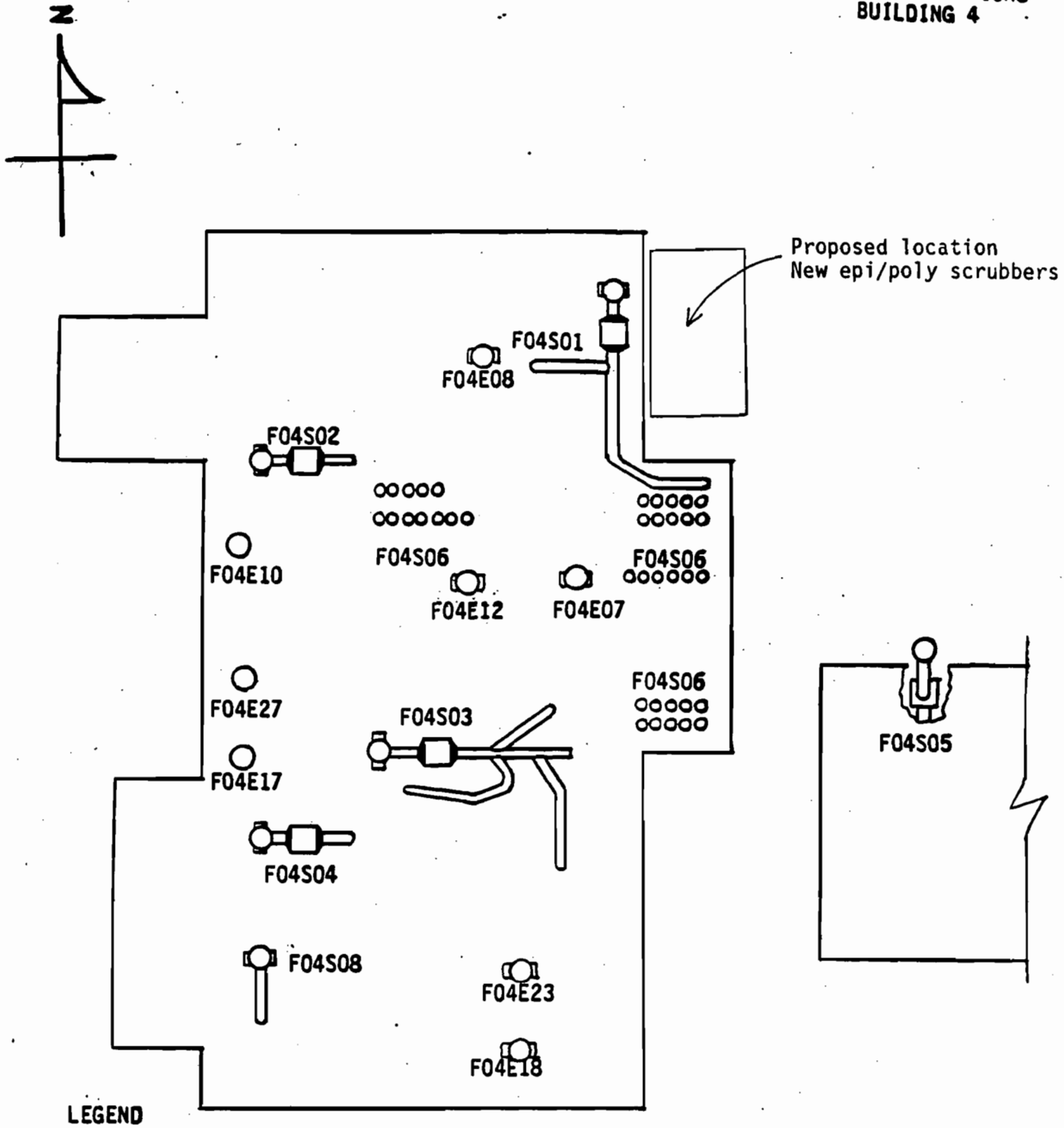
AIR PERMIT -- BUILDING 4

ATTACHMENT E

SITE LOCATION MAPS

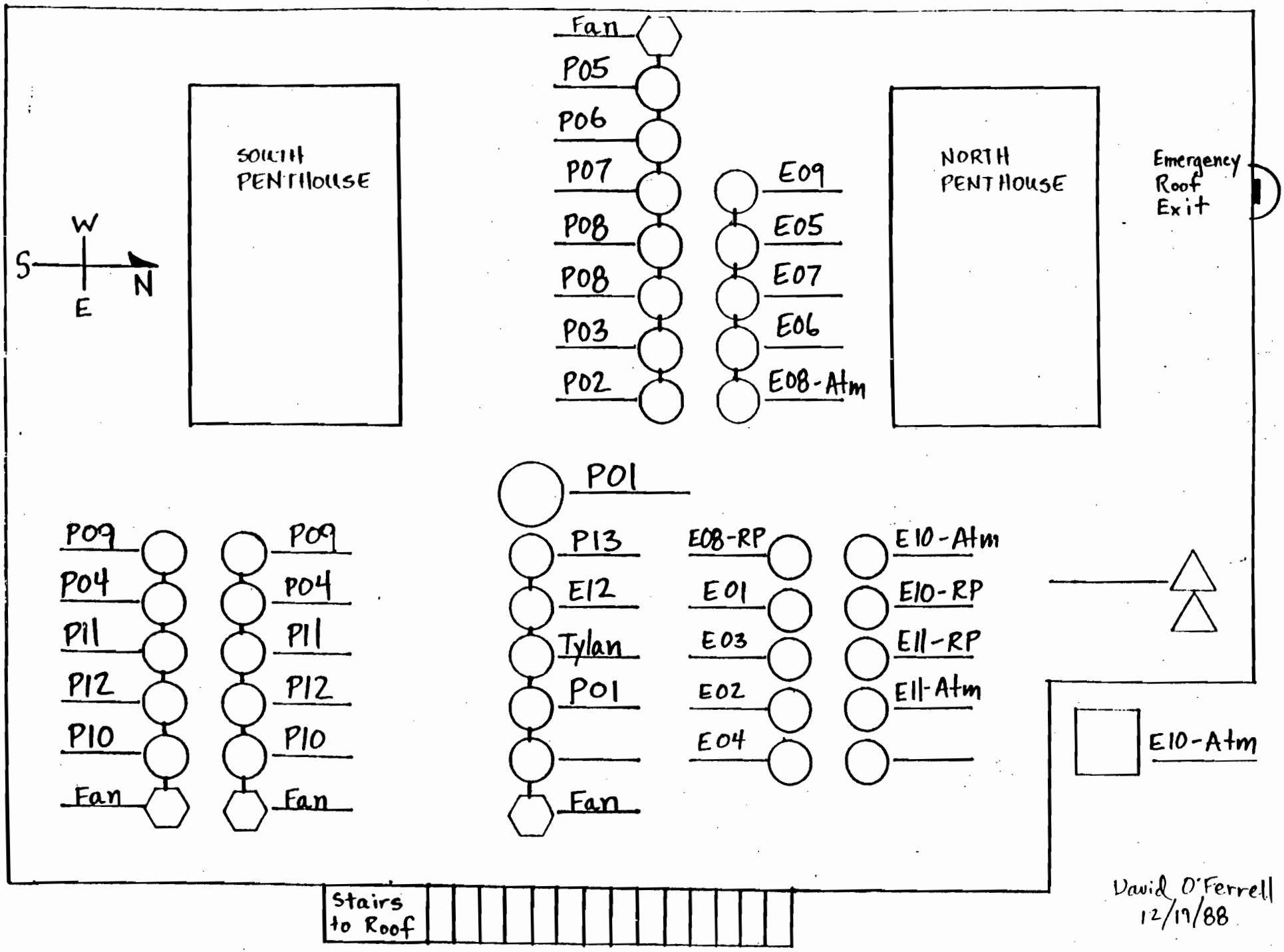

Harris
Semiconductor
Complex
SCRUBBER LOCATIONS
APOLLO BLVD
POND
F62S02
F62S01
62B
62A
PARKING
LOT
F58S02
F58S01
PARKING
LOT
59
58
PARKING
LOT
POND
F57S01
PALM BAY BLVD
F59S01
F59S03
63
WATER
TOWER
WASTE
TREAT.
54
PARKING
LOT
F04S05
F04S06
F04S01
F54S03
F54S04
F54S01
F54S02
F60S01
F55S01
60
53
56
PARKING
LOT
4
6
BORROW PIT
55
52
51
PARKING
LN2
TROUTMAN
F63S02
F63S01
F63S03
F51S01
F51S02
F51S03
F51S04
F51S05
F04S08
F04S04
F04S03
F04S02
N
F61S02
F61S01
61
PARKING
LOT
UPSCOMB ST

HARRIS SEMICONDUCTOR SCRUBBER LOCATIONS BUILDING 4



Facilities : x-5550

Building 4 Epi and Poly Reactor Scrubber Layout



David O'Ferrell
12/19/88