CHROMIUM ELECTROPLATING AND ANODIZING
AIR GENERAL PERMIT NOTIFICATION FORM

Part III. Notification of Intent to Use General permit

Prior to filling out this form, please read the instructions provided at the end of the form. Send completed form to the address listed in the instructions and keep a copy of the form for your files.

Facility Name and Location

1. Facility Owner/Company Name (Name of corporation, agency, or individual owner):
   PRAXAIR SURFACE TECHNOLOGIES, INC.
2. Site Name (For example, plant name or number):
   AIRCRAFT JET ENGINE COMPONENT REPAIR FACILITY
3. Hazardous Waste Generator Identification Number:
   APPLIED FOR, NOT RECEIVED
4. Facility Location:
   Street Address: 10313 NORTH COMMERCE PARKWAY
   City: MIRAMAR County: BROWARD Zip Code: 33023
5. Facility Identification Number (DEP Use ONLY - do not fill in): 0112482-001

Responsible Official

6. Name and Title of Responsible Official:
   Name: Terry W. Hunter Title: Business Group Manager
7. Responsible Official Mailing Address:
   Organization/Firm: Praxair Surface Technologies
   Street Address: 6400 NW 72nd Avenue
   City: Miami County: BROWARD Zip Code: 33166
8. Responsible Official Telephone Number:
   Telephone: (305) 894-8508 Fax: (305) 894-8539

Facility Contact (If different from Responsible Official)

9. Name and Title of Facility Contact (For example, plant manager):
   Russ Yenior, Senior Project Engineer
10. Facility Contact Address:
    Street Address: 6400 NW 72nd Avenue
    City: Miami County: BROWARD Zip Code: 33166
11. Facility Contact Telephone Number:
    Telephone: (305) 894-8508 Fax: (305) 894-8539

Facility Information

1.a. Provide the information below for each hard electroplating machine at the facility. Indicate the type of machine, the date of its purchase, and the date the control device was installed, if applicable.

HARD CHROMIUM PLATING TANKS

DATE PURCHASED	UNIT CLASS (circle one)	DATE CNTRL DEVICE INSTALLED	CONTROL DEVICE (see key)	APPLICABLE STANDARD (see key)
T26 – Dec. 1999	New	May 2000	CMP	c *
T27 – Dec. 1999	New	May 2000	CMP	c *
	New/Existing			
	New/Existing			
	New/Existing			
	New/Existing			
	New/Existing			
	New/Existing			

Key for Control Device Type

PBS = packed-bed scrubber
CMP = composite mesh pad
PBS/CMP = packed-bed scrubber and composite mesh pad
FS = fume suppressant only
FS/WA = fume suppressant with a wetting agent
FM = fiber-bed mist eliminator
WA = wetting agent

Applicable Standard Key

a = 0.03 mg/dscm
b = 0.015 mg/dscm
c = alternative standard for multiple tanks under common control
* Limit = 0.015 mg/dscm (from T26 + T27)

Is the facility's cumulative potential rectifier capacity greater than 60 million ampere-hours per year?

[X] Yes [ ] No

1.b. Provide the information below for each decorative electroplating or anodizing machine at the facility. Indicate the type of machine, the date of its purchase, and the date the control device was installed, if applicable.

DECORATIVE AND ANODIZING TANKS N/A

DATE PURCHASED	UNIT CLASS (circle one)	DATE CNTRL DEVICE INSTALLED	CONTROL DEVICE (see key)	APPLICABLE STANDARD (see key)
	New/Existing			
	New/Existing			
	New/Existing			
	New/Existing			
	New/Existing			
	New/Existing			
	New/Existing			
	New/Existing			
	New/Existing			
	New/Existing			

Key for Control Device Type

PBS = packed-bed scrubber
CMP = composite mesh pad
PBS/CMP = packed-bed scrubber and composite mesh pad
FS = fume suppressant only
FS/WA = fume suppressant with a wetting agent
FM = fiber-bed mist eliminator
WA = wetting agent

Applicable Standard Key

x = 0.01 mg/dscm
y = 45 dynes/cm
z = records of bath components (trivalent Cr tanks only)
c = alternative standard for multiple tanks under common control

2. Indicate the date by which the facility must meet the requirements of paragraph (5) of Part II:
(**Note:** if your facility contains both hard and decorative plating or anodizing units, you must check each applicable date)

[ ] January 25, 1996 [ ] January 25, 1997 **[X] UPON STARTUP**

3. Indicate how the facility will fulfill the compliance demonstration:

[X] The facility will conduct an initial performance test

[ ] The facility will use a wetting agent to reduce emissions and will meet the existing surface tension limit in No. 1 above.

4. Equipment Monitoring and Recordkeeping Information
Check all logs which are required to be kept on-site in accordance with the requirements of this general permit:

(a) Equipment maintenance	[X]	(b) Equipment inspection and repair	[X]
(c) Equipment malfunctions	[X]	(d) Operation and maintenance checklist	[X]
(e) Instrument calibration (used during initial performance test)	[X]	(f) Start-up, shutdown, malfunction plan	[X]
(g) Performance test results	[X]	(h) Equipment monitoring	[X]
(i) Excess emissions	[X]	(j) Operating periods	[ ]
(k) Rectifier capacity	[ ]	(l) Fume suppressant records	[ ]
(m) Purchase records of wetting agent components	[ ]		

5. Surrender of Existing DEP Air Permit(s)

Please indicate with an "X" the appropriate selection:

[ ] I hereby surrender all existing DEP air permits authorizing operation of the facility indicated in this notification form; the permit number(s) are:

_____.

[X] No DEP air permits currently exist for the operation of the facility indicated in this notification form.

Responsible Official Certification

I, the undersigned, am the responsible official, as defined in Part II of this form, of the facility addressed in this notification. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this notification are true, accurate and complete. Further, I agree to operate and maintain the air pollutant emissions units and air pollution control equipment described above so as to comply with all terms and conditions of this general permit as set forth in Part II of this notification form.

I will promptly notify the Department of any changes to the information contained in this notification.

TERRY W. HUNTER
Print name of responsible official

Terry W. Hunter
Signature

MARCH 6/00
Date

NOTIFICATION OF INTENT TO USE GENERAL PERMIT (AIR)

Metal Finishing Equipment
at the new

Praxair Surface Technologies, Inc.
Aircraft Jet Engine Component Repair Facility
10313 North Commerce Parkway
Miramar, Broward County, Florida 33023

Prepared By:

Praxair Surface Technologies, Inc.
6400 N.W. 72nd Avenue
Miami, Florida 33166

February 29, 2000

Praxair Surface Technologies

10301 N. Commerce Pkwy
Miramar, FL 33025

July 12, 2001

Sandy Bowman
Department of Environmental Protection
Division of Air Resource Management
2600 Blair Stone Rd.
MS 5510
Tallahassee, FL 32399-2400

Dear Ms. Bowman:

Included with this letter is the Initial Notification Report Form as required by 40 CFR Part 63 Subpart N. I had initially submitted this to Jarrett Mack's office at Broward DPEP. I was informed by his office that this form should be submitted to your office. If you have any concerns I can be reached at the numbers shown below.

Sincerely,

Russell A. Yenior
Senior Process Engineer
Ph. 954.447.0476
Fax 954.447.6007

INITIAL NOTIFICATION REPORT

Applicable Rule: 40 CFR Part 63, Subpart N--National Emission Standards for Chromium Emissions from Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks

1. Print or type the following for each plant in which chromium electroplating and/or chromium anodizing operations are performed.

Owner/Operator/Title PRAXAIR SURFACE TECHNOLOGIES INC.

Street Address 6400 NW 72nd AVE.

City MIAMI State FL Zip Code 33166

Plant Name PRAXAIR SURFACE TECHNOLOGIES INC.

Plant Phone Number (954) 447-0476

Plant Contact/Title RUSSELL YENIOR

Plant Address (if different than owner/operator's):

Street Address 10301 NORTH COMMERCE PARKWAY

City MIRAMAR State FL Zip Code 33025

2. Complete this section for all affected tanks using a chromic acid bath. If only trivalent chromium baths are used at the facility, go to No. 3.

A. Complete the following table. If additional lines are needed, make copies of this page.

Tank ID #	Type of tank	Startup date[1]	Total installed rectifier capacity (amperes)	Description of parts plated	Applicable emission limit	Compliance date[2]
T26	HARD CHROMIUM ELECTROPLATING	6/15/01	4000	AIRCRAFT, OTHER	0.015 MG/DSCM	STARTUP
T27	HARD CHROMIUM ELECTROPLATING	6/15/01	4000	AIRCRAFT, OTHER	0.015 MG/DSCM	STARTUP

[1]New or reconstructed tanks with an initial startup date after 1/25/95 must submit a NOTIFICATION OF CONSTRUCTION/RECONSTRUCTION form and notify the Administrator of the date construction/reconstruction commenced and the actual startup date in accordance with 40 CFR 63.347(c)(2).

[2]Compliance dates for existing tanks (i.e., tanks for which operation commenced on or before 12/16/93):
- Hard chromium plating tanks ⇒ 1/25/97
- Decorative chromium plating tanks ⇒ 1/25/96
- Chromium anodizing tanks ⇒ 1/25/97

Compliance dates for new tanks (i.e., tanks for which construction or reconstruction commenced after 12/16/93):
- If initial startup occurred between 12/16/93 and 1/25/95 ⇒ 1/25/95
- If initial startup occurred after 1/25/95 ⇒ upon startup

EXAMPLE RESPONSE:

Tank ID #	Type of tank	Startup date	Total installed rectifier capacity (amperes)	Description of parts plated	Applicable emission limit	Compliance date
1	Chrome anodizing	1/1/85	5,000	Aircraft landing gear	45 dynes/cm or 0.01 mg/dscm	1/25/97
2	Hard chrome plating	1/1/85	10,000	pistons	0.015 mg/dscm	1/25/97
3	Hard chrome plating	1/1/95	12,000	pistons	0.015 mg/dscm	1/25/95
4	Hard chrome plating	3/1/95	12,000	pistons	0.015 mg/dscm	3/1/95

B. Check the box that applies.

☐ Tanks are located at a facility that is a major source.
☒ Tanks are located at a facility that is an area source.

NOTE: A major source is a facility that emits greater than 10 tons per year of any one hazardous air pollutant (HAP) or 25 tons per year of multiple HAPs. All other sources are area sources. The major/area source determination is based on all HAP emission points inside the facility fenceline, not just the chromium electroplating and anodizing tanks.

C. Complete the following if hard chromium electroplating tanks are operated. Check the box(es) that apply.

☐ The maximum cumulative potential rectifier capacity of the hard chromium electroplating tanks is greater than or equal to 60 million amp-hr/yr. This was determined by taking the sum of the total installed rectifier capacity (amperes) multiplied by 8,400 hours/yr and by 0.7 for each tank.

☒ The maximum cumulative potential rectifier capacity of the hard chromium electroplating tanks is less than 60 million amp-hr/yr. This was determined by taking the sum of the total installed rectifier capacity (amperes) multiplied by 8,400 hours/yr and by 0.7 for each tank.

☐ Records show that the facility's previous 12-month cumulative current usage for the hard chromium electroplating tanks was less than 60 million amp-hr.

INITIAL NOTIFICATION REPORT (continued)

☐ The facility wishes to accept a Federally-enforceable limit of less than 60 million amp-hr/yr on the maximum cumulative potential rectifier capacity of the hard chromium electroplating tanks.

3. Complete this section for all decorative chromium electroplating tanks using a trivalent chromium bath. If only chromic acid baths are used at the facility, go to No. 4.

A. Complete the following table. If additional lines are needed, make copies of this page.

Tank ID #	Startup date[1]	Description of parts plated	Compliance date[2]
T26	6/15/01	AIRCRAFT, OTHER	STARTUP
T27	6/15/01	AIRCRAFT, OTHER	STARTUP

[1]New or reconstructed tanks with an initial startup date after 1/25/95 must submit a NOTIFICATION OF CONSTRUCTION/RECONSTRUCTION form and notify the Administrator of the date construction/reconstruction commenced and the actual startup date in accordance with 40 CFR 63.347(c)(2).
[2]Compliance date for existing tanks (i.e., tanks for which operation commenced on or before 12/16/93) ⇒ 1/25/96
Compliance dates for new tanks (i.e., tanks for which construction or reconstruction commenced after 12/16/93):
If initial startup occurred between 12/16/93 and 1/25/95 ⇒ 1/25/95
If initial startup occurred after 1/25/95 ⇒ upon startup

B. Provide a brief description of the trivalent chromium electroplating process used at your facility. Attach process flow diagrams for each plating line.

C. Check the box that applies.

☐ The trivalent process used at the facility incorporates a wetting agent.
☐ The trivalent process used at the facility does not incorporate a wetting agent.

INITIAL NOTIFICATION REPORT (continued)

D. List below (or attach a list of) the trivalent chromium bath components and clearly identify the wetting agent.

4. Print or type the name and title of the Responsible Official for the plant:

TERRY W HUNTER — (Name)

BUSINESS MANAGER — (Title)

A Responsible Official can be:

- The president, vice-president, secretary, or treasurer of the company that owns the plant;
- The owner of the plant;
- The plant engineer or supervisor;
- A government official if the plant is owned by the Federal, State, City, or County government; or
- A ranking military officer if the plant is located on a military base.

I Certify The Information Contained In This Report To Be Accurate And True To The Best Of My Knowledge.

Terry W Hunter
(Signature of Responsible Official)

6/11/01
(Date)

PRAXAIR
SURFACE TECHNOLOGIES

Praxair Surface Technologies, Inc.
6400 N.W. 72nd Avenue
Miami, Florida 33166-3627
Main: 305.894.8500 Customer Service: 305.894.8560
Main Fax: 305.894.8539 Customer Service Fax: 305.894.8550

March 6, 2000

General Permits Section
Bureau of Air Monitoring and
Mobile Services, MS 5510
Department of Environmental Protection
2600 Blair Street Road
Tallahassee, FL 32399-2400

Re: Praxair Surface Technologies, Inc. Notification of Intent to Use General Air Permit
UPS 1Z3405581340065582

Dear Sir:

Enclosed please find one copy of Notification of intent to Use General Permit (Air) for certain components of metal finishing equipment at the new Aircraft Jet Engine Component Repair Facility by Praxair Surface Technologies, Inc. at 10313 North Commerce Parkway, Miramar, Florida.

Please note that this facility will contain certain processes that are not subject to the General Permit, but each tank will have the applicable permits or approvals required by any other governing regulation.

Also, please note that Praxair Surface Technologies, Inc. requests that "startup" of Tanks T26 and T27, the two tanks whose emissions are subject to chromium MACT standards, be considered to be 45 days after the first test parts are plated in their tanks. This request will allow Praxair Surface Technologies, Inc. to debug the system and establish proper procedures for processing the parts, after which the Operation and Maintenance Plan can be prepared in a more orderly manner.

Thank you in advance for your cooperation.

Sincerely,

Terry W. Hunter
Business Group Manager

NOTIFICATION OF INTENT TO USE GENERAL PERMIT (AIR)

Metal Finishing Equipment
at the new

Praxair Surface Technologies, Inc.
Aircraft Jet Engine Component Repair Facility
10313 North Commerce Parkway
Miramar, Broward County, Florida 33023

Prepared By:

Praxair Surface Technologies, Inc.
6400 N.W. 72nd Avenue
Miami, Florida 33166

February 29, 2000

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* Note: Process Flow Diagrams sections include calculations, emissions factors, etc.

Department of Environmental Protection

#1

Division of Air Resources Management

CHROMIUM ELECTROPLATING AND ANODIZING
AIR GENERAL PERMIT NOTIFICATION FORM

Part I. Procedures For Use of General Permit

(1) Eligibility Determination. The Department of Environmental Protection has established a Title V air general permit under Rule 62-213.300(1)(d), F.A.C., for chromium electroplating and anodizing facilities, the terms and conditions of which are listed in Part II of this Chromium Electroplating and Anodizing Air General Permit Notification Form. A chromium electroplating and anodizing facility may use this Title V air general permit provided the facility meets the eligibility criteria set forth in the rule and, throughout the term of the general permit, maintains its eligibility to use the general permit and complies with all terms and conditions of the general permit. The responsible official of the chromium electroplating and anodizing facility shall determine the facility's eligibility for the Title V air general permit and notify the Department of intent to use the general permit.

(a) A chromium electroplating and anodizing facility is eligible to operate under the terms and conditions of the Title V air general permit established at Rule 62-213.300(1)(d), F.A.C., provided the responsible official has submitted a completed Part III of this notification form to the Department at least 30 days prior to beginning operations under the general permit and, throughout the term of the general permit, all of the following conditions are met:

1. The facility operates no emissions units other than chromium electroplating and anodizing units and emissions units which are considered insignificant pursuant to the criteria of Rule 62-213.300(2)(a)1. F.A.C., set forth in paragraph (1)(b).

2. The facility is classified as a Title V source pursuant to paragraph (f), only, of the definition of "major source of air pollution" at Rule 62-210.200, F.A.C.; that is, the facility is a Title V source by virtue of being subject to 40 CFR Part 63, Subpart N, but does not emit any pollutant in a major amount as set forth in paragraphs (a) through (e) of the definition of "major source of air pollution"; and

3. The facility complies with all general conditions of Rule 62-213.300(3), F.A.C., set forth in Part II of this notification form, and all requirements of 40 CFR Part 63, Subparts A and N, as applicable, also set forth in Part II of the notification form.

4. Exemptions. The requirements of this permit do not apply to the following operations:
   a. Process tanks with chromium solutions in which no electroplating or anodizing occurs.
   b. Process tanks with chromium solutions in which no electrolytic process occurs.
   c. Other metal (e.g. nickel, copper, cadmium) plating or anodizing operations.
   d. Research or laboratory chromium electroplating or chromium anodizing facilities.

(b) No facility which contains an emissions unit, other than chromium electroplating and anodizing units or a unit considered insignificant pursuant to this paragraph, shall be eligible to use this air general permit. No facility is eligible to use more than one air general permit. An emissions unit or activity shall be considered insignificant if all of the following criteria are met:

1. The emissions unit or activity would be subject to no unit-specific applicable requirement.

2. The emissions unit or activity would neither emit nor have the potential to emit:
   a. 500 pounds per year or more of lead and lead compounds expressed as lead;
   b. 1,000 pounds per year or more of any hazardous air pollutants;
   c. 2,500 pounds per year or more of total hazardous air pollutants; or

d. 5.0 tons per year or more each of any other regulated pollutant.

3. The emissions unit or activity, in combination with other units and activities at the facility, would neither cause the facility to emit nor have the potential to emit:

a. 100 tons per year or more of carbon monoxide, nitrogen oxides, particulate matter, sulfur dioxide, or volatile organic compounds;
b. 5 tons per year or more of lead and lead compounds expressed as lead;
c. 10 tons per year or more of any hazardous air pollutant;
d. 25 tons per year or more of total hazardous air pollutants; or
e. 100 tons per year or more of any other regulated pollutant.

(c) Any facility that would use a Title V air general permit under Rule 62-213.300, F.A.C., must surrender all existing air permits authorizing the operation of the facility.

(d) If a facility at any time becomes ineligible for the use of the Title V air general permit and is subject to the source-specific Title V air operation permit requirements of Chapter 62-213, F.A.C., it shall be subject to enforcement action for operating without an air operation permit.

(e) Notwithstanding the shield provisions of Rule 62-213.460, F.A.C., any facility utilizing a Title V air general permit will be subject to enforcement action for operation without a permit under Chapter 62-213, F.A.C., if it is determined to be initially ineligible for the air general permit which is being utilized.

(2) Notification. For each facility intending to operate under the provisions of this Title V air general permit, the responsible official must complete and submit Part III of this Chromium Electroplating and Anodizing Air General Permit Notification Form (DEP Form No. 62-213.900(5)) to give notice to the Department of intent to use such permit.

(3) Administrative Corrections. Within 30 days of any changes requiring corrections to information contained in this notification form, the responsible official shall notify the Department in writing. Such changes shall include:

(a) Any change in name of the responsible official or facility address or phone number;

(b) A change in facility status requiring more frequent monitoring or reporting by the responsible official from that noted on the most recent notification form; and

(c) Any other similar minor administrative change at the facility.

(4) Violation of Permit. This Title V air general permit is valid only for the specific activity indicated. Any deviation from the specified activity and the conditions for undertaking that activity is a violation of the permit. The responsible official is placed on notice that violation of the permit constitutes grounds for revocation and suspension pursuant to Rules 62-4.100 and 62-4.530(4), F.A.C., and initiation of enforcement action pursuant to s. 403.141 through 403.161, F.S. No revocation shall become effective except after notice is served by personal service, certified mail, or newspaper notice pursuant to Section 120.60(5), F.S., upon the person or persons named therein and a hearing held, if requested within the time specified in the notice. The notice shall specify the provision of the law or rule alleged to be violated, or the permit condition or Department order alleged to be violated, and the facts alleged to constitute a violation thereof.

(5) Nullification of Eligibility. Eligibility for use of a Title V air general permit is automatically nullified by:

(a) Submission of false or inaccurate information in the notification form for use of the Title V air general permit or in the required reports;

(b) Refusal of lawful inspection by Department staff;

(c) Failure to submit operational reports or other information required by the general permit; or

(d) Failure to timely pay the required annual emissions fee, penalty, or interest.

(6) Use of Permit. Any facility eligible to operate under the terms of a Title V air general permit may use the permit 30 days after giving notice to the Department without any agency action.

Part II. Permit Terms and Conditions

(Keep this Part onsite for use by facility staff.)

(1) Applicability. This part of the Chromium Electroplating and Anodizing Air General Permit Notification Form (DEP Form No. 62-213.900(5)) establishes the terms and conditions of this Title V air general permit. Throughout the term of this air general permit, the responsible official shall ensure that the facility maintains its eligibility to use the general permit and complies with all general conditions of Rule 62-213.300(3), F.A.C., set forth below, and all requirements of 40 CFR Part 63, Subpart N, as applicable, also set forth in this part of the notification form.

(2) General Conditions. All terms, conditions, requirements, limitations, and restrictions set forth in Rule 62-213.300(3), F.A.C., and listed below (Rule 62-213.300(3)(a) through (r), F.A.C.) are "general permit conditions" and are binding upon the owner or operator and upon the responsible official of the facility utilizing this Title V air general permit.

(a) The duration of this general permit is five years. No later than 30 days prior to the fifth anniversary of the filing of intent to use this general permit, the responsible official shall submit a new notice of intent which shall contain all current information regarding the facility. The general permit is not transferable and does not follow a change in ownership of the facility. Prior to any sale, other change of ownership, or permanent shutdown of the facility, the responsible official shall notify the Department.

(b) The owner or operator of the facility must, upon written notice from the Department, submit payment of an annual operation fee in the amount of $50.00. This fee is due and payable annually between January 15 and March 1 for the preceding year which the facility was in operation and subject to the requirements of this general permit.

(c) This general permit is valid only for the specific activity indicated. Any deviation from the specified activity and the conditions for undertaking that activity shall constitute a violation of the permit.

(d) This general permit does not convey any vested rights or any exclusive privileges, nor does it authorize any injury to public or private property nor any invasion of personal rights. It does not authorize any infringement of federal, state, or local laws or regulations.

(e) This general permit does not relieve the responsible official or the owner or operator of the facility from liability and penalties when the operation of the permitted activity causes harm or injury to human health or welfare; causes harm or injury to animal, plant or aquatic life; or causes harm or injury to property. It does not allow the responsible official, owner, or operator to cause pollution in contravention of Florida law.

(f) This general permit conveys no title to land or water, nor does it constitute state recognition or acknowledgment of title.

(g) The responsible official shall make every reasonable effort to conduct the specific activity authorized by this general permit in a manner that will minimize any adverse effects on adjacent property or on public use of the adjacent property, where applicable, and on the environment, including fish, wildlife, natural resources, water quality, or air quality.

(h) The responsible official shall allow a duly authorized representative of the Department access to the permitted facility or activity at reasonable times to inspect and test, upon presentation of credentials or other documents as may be required by law, to determine compliance with this general permit and Department rules.

(i) The responsible official shall maintain any permitted facility or activity in good condition.

(j) This general permit shall be effective until suspended, revoked, surrendered, expired, or nullified pursuant to Rule 62-213.300, F.A.C

(k) Monitoring and Related Recordkeeping and Reporting Requirements.

1. The responsible official shall maintain records of monitoring information that specify the date, place, time, and operating conditions of measurement; the methodology used; the company or entity which performed the monitoring; and the analytical results. These shall include all calibration and maintenance records, original strip-chart recordings for continuous monitoring instrumentation, and copies of all reports required by this permit.

2. The responsible official shall retain records of all monitoring data and supporting information for a period of at least five years from the date of collection.

3. The responsible official shall keep records in which all occurrences of deviations from any specific monitoring requirements shall be clearly identified. Reports of these deviations shall be submitted to the Department during facility inspections and also submitted with the annual compliance certification as required by paragraph (2)(m)2. The responsible official shall certify each report as true, accurate, and complete.

4. The responsible official shall ensure that the Department is promptly notified of deviations from any specific monitoring requirements, including those attributable to upset conditions. Notification shall include the probable cause of such deviations and any corrective actions or preventive measures taken. Notification shall be provided within one working day of occurrence of the deviation and may be given by telephone.

(l) Compliance Plan Requirements.

1. For each applicable permit condition with which the facility is not in compliance at the time of giving notice to the Department of intent to use this general permit and for which the facility has not come into compliance within 30 days after the giving of such notice, the responsible official shall submit to the Department a compliance plan. The compliance plan shall contain measurable and enforceable milestones, including specific dates for completion of each milestone.

2. The responsible official shall notify the Department in writing, within 15 days after the date for completion of each milestone, detailing the achievement of compliance, of progress achieved, requirements met or unmet, corrective measures adopted, and an explanation of any measures not met by the completion date for the compliance milestone. The responsible official shall certify that such notice is complete and accurate. Any deviation from the compliance plan shall constitute a violation of the permit condition and shall be subject to the provisions of Rule 62-213.300(2)(d), F.A.C.

(m) Compliance Certification.

1. For each applicable requirement with which the facility is in compliance, the responsible official shall submit a statement certifying such compliance to the Department annually. The responsible official shall certify each statement as true, accurate, and complete.

2. The statement of compliance shall identify each term or condition of the permit with which the facility has remained in compliance during the period covered by the statement and shall specify the method used to demonstrate compliance. It shall identify each term or condition of the permit with which the facility has not been in continuous compliance during that reporting period. It shall also include the monitoring report required pursuant to paragraph (3)(k)3.

3. For those terms or conditions which the facility has not been in continuous compliance during any reporting period, the statement shall include the exact period of non-compliance, actions taken to achieve compliance, and the method used to demonstrate compliance.

(n) This general permit does not authorize any demolition or renovation of the facility or its parts or components which involves asbestos removal. This permit does not constitute a waiver of any of the requirements of Chapter 62-257, F.A.C., and 40 CFR Part 61, Subpart M, National Emission Standard for Asbestos, adopted and incorporated by reference in Rule 62-204.800, F.A.C.

(o) Refrigerant Requirements. Any facility having appliances or refrigeration equipment, including air conditioning equipment, which use Class I or II ozone-depleting substances such as chlorofluorocarbons and hydrochlorofluorocarbons listed as refrigerants in 40 CFR Part 82 Subpart A, Appendices A and B, which are adopted and incorporated by reference in Rule 62-204.800, F.A.C., shall service, repair, and maintain such equipment according to the work practices, personnel certification requirements, reporting and recordkeeping requirements, and certified recycling and recovery equipment specified in 40 CFR Part 82, Subpart F, adopted and incorporated in Rule 62-204.800, F.A.C. No person shall knowingly vent or otherwise release any Class I or II substance into the environment during the repair, servicing, maintenance, or disposal of any such device except as provided in 40 CFR Part 82, Subpart F.

(p) This general permit does not authorize any open burning nor does it constitute any waiver of the requirements of Chapter 62-256, F.A.C.

(q) No person shall circumvent any air pollution control device or allow the emission of air pollutants without the proper operation of all applicable air pollution control devices.

(r) All reports and notices submitted by the facility and all records required to be maintained according to Part II, Paragraph (2)(k)3., shall contain a certification statement signed by the responsible official that the documentation is true, accurate, and complete, based upon the information and belief formed after reasonable inquiry.

(3) Definitions. The following words and phrases, when used in this notification form, shall have the following meanings:

(a) "Add-on Air Pollution Control Device" - Equipment installed in the ventilation system of chromium electroplating and anodizing tanks for the purpose of collecting and containing chromium emissions from the tank(s).

(b) "Air Pollution Control Technique" - Any method, such as an add-on air pollution control device or a chemical fume suppressant, that is used to reduce chromium emissions from chromium electroplating and chromium anodizing tanks.

(c) "Base Metal" - The metal or metal alloy that comprises the workpiece.

(d) "Bath Component" - The trade or brand name of each component(s) in trivalent chromium plating baths. For trivalent chromium baths, the bath composition is proprietary in most cases. Therefore, the trade or brand name for each component(s) can be used; however, the chemical name of the wetting agent contained in that component must be identified.

(e) "Chemical Fume Suppressant" - Any chemical agent that reduces or suppresses fumes or mists at the surface of an electroplating or anodizing bath; another term for fume suppressant is mist suppressant.

(f) "Chromic Acid" - The common name for chromium anhydride (CrO_3).

(g) "Chromium Anodizing" - The electrolytic process by which an oxide layer is produced on the surface of a base metal for functional purposes (e.g. , corrosion resistance or electrical insulation) using a chromic acid solution. In chromium anodizing, the part to be anodized acts as the anode in the electrical circuit, and the chromic acid solution, with a concentration typically ranging from 50 to 100 grams per liter (g/L), serves as the electrolyte.

(h) "Chromium Electroplating or Chromium Anodizing Tank" - The receptacle or container in which hard or decorative chromium electroplating or chromium anodizing occurs.

(i) "Composite Mesh-pad System" - An add-on air pollution control device typically consisting of several mesh-pad stages. The purpose of the first stage is to remove large particles. Smaller particles are removed in the second stage, which consists of the composite mesh pad. A final stage may remove any retrained particles not collected by the composite mesh pad.

(j) "Construction" - The fabrication (on-site), erection, or installation of a chromium electroplating or anodizing unit.

(k) "Decorative Chromium Electroplating" - The process by which a thin layer of chromium (typically 0.003 to 2.5 microns) is electrodeposited on a base metal, plastic, or undercoating to provide a bright surface with wear and tarnish resistance. In this process, the part(s) serves as the cathode in the electrolytic cell and the solution serves as the electrolyte. Typical current density applied during this process ranges from 540 to 2,400 amperes per square meter (A/m3) for the total plating periods of 0.5 to 5 minutes.

(l) "Electroplating or Anodizing Bath" - The electrolytic solution used as the conducting medium in which the flow of current is accompanied by movement of metal ions for the purposes of electroplating metal out of the solution onto the workpiece or for oxidizing the base metal.

(m) "Emission Standard" - For the purposes of this permit, the concentration of total chromium allowed to be emitted expressed in milligrams per dry cubic meter (mg/dscm) of air, or the allowable surface tension expressed in dynes per centimeter (dynes/cm).

(n) "Emissions Unit" - Any part or activity of a facility that emits or has the potential to emit any air pollutant.

(o) "Existing" - Any chromium electroplating or chromium anodizing tank the construction or reconstruction of which was commenced on or before December 16, 1993. An existing chromium electroplating or anodizing tank moved within a contiguous facility or to another facility under the same ownership will continue to be regulated as an existing tank.

(p) "Facility" - The major or area source at which chromium electroplating or chromium anodizing is performed.

(q) "Fiber-bed Mist Eliminator" - An add-on air pollution control device that removes contaminants from a gas stream through the mechanisms of inertial impaction and Brownian diffusion. These devices are typically installed downstream of another control device, which serves to prevent plugging, and consists of one or more fiber beds. Each bed consists of a hollow cylinder formed from two concentric screens; the fiber between the screens may be fabricated from glass, ceramic, plastic, or metal.

(r) "Foam Blanket" - A type of chemical fume suppressant that generates a layer of foam across the surface of a solution when current is applied to that solution.

(s) "Fresh Water" - Water, such as tap water, that has not been previously used in a process operation or, if the water has been recycled from a process operation, it has been treated and meets the effluent guidelines for chromium wastewater.

(t) "Hard Chromium Electroplating or Industrial Electroplating" - A process by which a thick layer of chromium (typically 1.3 to 760 microns) is electrodeposited on a base material to provide a surface with functional properties such as wear resistance, a low coefficient of friction, hardness, and corrosion resistance. In this process, the part serves as the cathode in the electrolytic cell and the solution serves as the electrolyte. Hard chromium electroplating process is performed at current densities typically ranging from 1,600 to 6,500 A/m3 for total plating periods of 20 minutes to 36 hours, depending upon the desired plate thickness.

(u) "Hexavalent Chromium" - The form of chromium in a valence state of +6.

(v) "Large, Hard Chromium Electroplating Facility" - A facility that performs hard chromium electroplating and has a maximum cumulative potential rectifier capacity greater than or equal to 60 million ampere-hours per year (A-hr/yr).

(w) "Major Source" - Any affected source which emits or has the potential to emit 10 or more tons per year of any hazardous air pollutant or 25 or more tons per year of any combination of hazardous air pollutants.

(x) "Maximum Cumulative Potential Rectifier Capacity" - The summation of the total installed rectifier capacity associated with all hard chromium electroplating tanks at a facility, expressed in amperes, multiplied by the maximum potential operating schedule of 8,400 hours per year and 0.7, which assumes that electrodes are energized 70 percent of the total operating time. The maximum potential operating schedule is based on operating 8,400 hours per year.

(y) "New" - Any chromium electroplating or chromium anodizing tank the construction or reconstruction of which commenced after December 16, 1993.

(z) "Operating Parameter Value" - A minimum or maximum value established for a control device or process parameter which, if achieved by itself or in combination with one or more other operating parameter values, determines that an owner or operator is in continuous compliance with the applicable emission limitation or standard.

(aa) "Packed-bed Scrubber" - An add-on air pollution control device consisting of a single or double packed bed that contains packing media on which the chromic acid droplets impinge. The packed-bed section of the scrubber is followed by a mist eliminator to remove any water entrained from the packed-bed section

(bb) "Reconstruction" - The replacement of a chromium electroplating or anodizing tank; or replacement of any components of a chromium electroplating or anodizing system to such an extent that the fixed capital cost of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable new system.

(cc) "Research or Laboratory Operation" - An operation whose primary purpose is for research and development of new processes and products, that is conducted under the close supervision of technically trained personnel, and that is not involved in the manufacture of products for commercial sale in commerce, except in a de minimus manner.

(dd) "Responsible Official" -

1. For a corporation: a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or a duly authorized representative of such person if the representative is responsible for the overall operation of one or more manufacturing, production, or operating facilities applying for or subject to a permit under Chapter 62-213, F.A.C.;
2. For a partnership: a general partner;
3. For a sole proprietorship: the owner;
4. For a municipality, state, federal, or other public agency: either a principal executive officer or ranking official

(ee) "Small, Hard Chromium Electroplating Facility" - A facility that performs hard chromium electroplating and has a maximum cumulative potential rectifier capacity less than 60 million A-hr/yr.

(ff) "Source" - Each chromium electroplating or anodizing facility.

(gg) "Stalagmometer" - A device used to measure the surface tension of a solution.

(hh) "Surface Tension" - The property, due to molecular forces, that exists in the surface film of all liquids and tends to keep the liquid from spreading.

(ii) "Tank Operation" - The time during which current and/or voltage is being applied to a chromium electroplating tank or chromium anodizing tank.

(jj) "Tensiometer" - A device used to measure the surface tension of a solution.

(kk) "Trivalent Chromium" - The form of chromium in a valence state of +3.

(ll) "Trivalent Chromium Process" - The process used for electrodeposition of a thin layer of chromium onto a base material using a trivalent chromium solution instead of a chromic acid solution.

(mm)"Wetting Agent" - A type of chemical fume suppressant that reduces the surface tension of a liquid.

(nn) "Year or Yearly" - Any consecutive 12-month period of time.

(4) Basic Requirements.

(a) The responsible official shall determine the eligibility of the facility for this permit and shall submit a completed Part III of this Chromium Electroplating and Anodizing Air General Permit Notification Form (DEP Form No. 62-213.900(5)) at least 30 days prior to beginning operations under this general permit.

(b) The responsible official shall certify in the initial notification form and annually thereafter that the annual emissions of chromium do not exceed 10 tons per year. The total volume of emissions shall be determined by the procedures required in paragraph (5) of this Part.

(c) New facilities shall comply with all applicable requirements upon start-up. Hard chromium electroplating facilities and chromium anodizing facilities which commenced operation on or before December 16, 1993, shall comply with the chromium emission standards of section (5) of this part of the notification form not later than January 25, 1997. Decorative chromium electroplating facilities which commenced operation on or before December 16, 1993, shall comply with the chromium emission standards of paragraph (5) of this Part not later than January 25, 1996.

(5) Chromium Emission Standards.

(a) Applicability of Emission Standards. The emission standards in this section apply only during tank operation and during periods of startup and shutdown. The emission standards do not apply during periods of malfunction, but the work practice standards that address operation and maintenance specified in paragraph (6) of this Part must be followed during malfunctions. Chromium emission standards are based upon the type of chromium electroplating or anodizing performed, and the date of commencement of operations at the facility. If the chromium emissions from one or more chromium electroplating and/or chromium anodizing tanks on-site equal or exceed 10 tons per year (tpy), the facility shall comply with all additional requirements of 40 CFR Part 63, Subpart N, and must apply for a major source permit under Chapter 62-213, F.A.C., within 180 days of that occurrence. The facility shall operate and maintain equipment according to the manufacturer's specifications.

(b) Multiple Tanks Controlled by a Single Air Pollution Control Device. If an owner or operator is controlling a group of tanks with a common add-on air pollution control device, the emission standard that applies to the group of affected sources is:

1. The emission standard identified in paragraph (5)(c), (d), or (e) of this Part, if the affected sources are performing the same type of operation (e.g., hard chromium electroplating), are subject to the same emission standard, and are not controlled by an add-on air pollution control device also controlling nonaffected sources;

2. The emission standard calculated according to the requirements of paragraph (5)(f) of this Part, if affected sources are performing the same type of operation, are subject to the same emission standard, and are controlled with an add-on air pollution control device that is also controlling nonaffected sources; and

3. The emission standard calculated according to the requirements of paragraph (5)(f) of this Part, if affected sources are performing different types of operations, or affected sources are performing the same operations but are subject to different emission standards, and are controlled with an add-on air pollution control device that may also be controlling emissions from nonaffected sources.

(c) Standards for Hard Chromium Electroplating Tanks.

1. During tank operation, each owner or operator of an existing, new, or reconstructed affected source shall ensure that the maximum concentration of chromium emissions in the exhaust gas stream discharged to the atmosphere is no more than 0.015 milligrams of total chromium per dry standard cubic meter (mg/dscm) of ventilation air (6.6x10-6 grains per dry standard cubic foot [gr/dscf]) for large existing sources and all new sources; or 0.03 mg/dscm (1.3x10-5 gr/dscf) for small existing sources.

2. Alternative Standard. An existing source owner or operator with a maximum cumulative potential rectifier capacity of 60 million A-hr/yr or more may choose to demonstrate that they operate a small, hard chromium electroplating facility by maintaining records that show that the facility's previous annual actual rectifier capacity was less than 60 million A-hr/yr, by using nonresettable A-hr meters and keeping monthly records of actual A-hr usage for each 12-month rolling period following the compliance date in accordance with paragraph (12)(l) of this Part. The actual cumulative rectifier capacity for the previous 12-month rolling period shall be tabulated monthly by adding the capacity for the current month to the capacities for the previous 11 months.

(d) Standards for Decorative Chromium Electroplating Tanks Using a Chromic Acid Bath and Chromium Anodizing Tanks. During tank operation, the owner or operator shall control chromium emissions discharged to the atmosphere from that affected source by either limiting the concentration of total chromium in the exhaust gas stream to 0.01 mg/dscm (4.4×10^{-6} gr/dscf); or by reducing the surface tension of the electroplating or anodizing bath to 45 dynes per centimeter (dynes/cm) (3.1×10^{-3} pound-force per foot [lb-f/ft]), if a chemical fume suppressant containing a wetting agent is used.

(e) Standards for Decorative Chromium Electroplating Tanks Using a Trivalent Chromium Bath.

1. Each owner or operator of an existing, new, or reconstructed decorative chromium electroplating tank that uses a trivalent chromium bath incorporating a wetting agent as an ingredient is subject to the recordkeeping requirements of paragraph (12)(n) of this Part and is exempt from the work practice requirements of paragraph (6) and the continuous compliance monitoring requirements in paragraph (10) of this Part. The wetting agent must be an ingredient in the trivalent chromium bath components purchased from vendors.

2. Each owner or operator of an existing, new, or reconstructed decorative chromium electroplating tank that uses a trivalent chromium bath which does not incorporate a wetting agent as a bath ingredient is subject to the requirements of section (5)(d) of this part of the notification form.

3. Each owner or operator of an existing, new, or reconstructed decorative chromium electroplating tank that had been using a trivalent chromium bath that incorporates a wetting agent and ceases using this type of bath must comply with the applicable emission standards within 1 year of switching bath operations.

(f) Special Compliance Provisions for Multiple Sources Controlled by a Common Add-on Air Pollution Control Device.

1. This section identifies procedures for measuring the outlet chromium concentration from an add-on air pollution control device that is used to control multiple sources that may or may not include sources not affected by this general permit.

2. When multiple affected sources performing the same type of operation (e.g., all are performing hard chromium electroplating) subject to the same emission standard, and are controlled with an add-on air pollution control device that is not controlling emissions from any other type of affected operation or from any nonaffected sources, the applicable emission standard identified in this section must be met at the outlet of the add-on air pollution control device.

3. When multiple affected sources performing the same type of operation and subject to the same emission standard are controlled with a common add-on air pollution control device that is also controlling emissions from sources not affected by these standards, the following procedures shall be used to determine compliance with the applicable emission standard in this section.

a. Calculate the cross-sectional area of each inlet duct (i.e., uptakes from each hood), including those not covered by this permit.

b. Determine the total sample time per test run by dividing the total inlet area from all tanks connected to the control system by the total inlet area for all ducts associated with affected sources, and then multiply this number by 2 hours. The calculated time is the minimum sampling time required per test run.

c. Perform Method 306 testing and calculate an outlet mass emission rate.

d. Determine the total ventilation rate from the affected sources by using the following equation:

$$VR_{total} \times IDA_i / \text{sum of } IA_{total} = VR_{inlet}$$

where VR_{total} is the average total ventilation rate in dscm/min for the three test runs as determined at the outlet by means of Method 306 testing; IDA_i is the total inlet area for all ducts associated with affected sources; IA_{total} is the sum of all inlet duct areas from both affected and nonaffected sources; and VR_{inlet} is the total ventilation rate from all inlet ducts associated with affected sources.

e. Establish the allowable mass emission rate of the system (AMR_{system}) in milligrams of total chromium per hour (mg/hr) using the following equation:

$$\text{sum of } VR_{inlet} \times EL \times 60 \text{ minutes/hours} = AMR_{system}$$

where sum of VR_{inlet} is the total ventilation rate in dscm/min from the affected sources, and EL is the applicable emission standard in mg/dscm from paragraph (5)(c), (d), or (e) of this Part. The allowable mass emission rate (AMR_{system}) calculated from the equation above should be equal to or less than the outlet three-run average mass emission rate determined from Method 306 testing in order for the source to be in compliance with the standard.

4. When multiple affected sources performing different types of operations (e.g., hard chromium electroplating, decorative chromium electroplating, or chromium anodizing) are controlled by a common add-on air pollution control device that may or may not also be controlling emissions from nonaffected sources, or if the affected sources controlled by the common add-on air pollution control device perform the same operation but are subject to different standards (e.g., a new hard chromium electroplater and an existing, small hard chromium electroplater), the following procedures should be followed to determine compliance with the applicable emission standard.

a. Follow the steps outlined in paragraph (5)(f)3.a. through (5)(f)3.c. of this Part.

b. Determine the total ventilation rate for each type of affected source using the following equation:

$$VR_{total} \times IDA_{ia} / \text{sum of } IA_{total} = VR_{inlet,a}$$

where VR_{total} is the average total ventilation rate in dscm/min for the three test runs as determined at the outlet by means of the Method 306 testing and IDA_{ia} is the total inlet duct area for all ducts conveying chromic acid from each type of affected source performing the same operation, or each type of affected source subject to the same emission standard and IA_{total} is as previously defined in paragraph (5)(f)3.d. of this Part. $VR_{inlet,a}$ is the total ventilation rate from all inlet ducts conveying chromic acid from each type of affected source performing the same operation, or each type of affected source subject to the same emission standard.

c. Establish the allowable mass emission rate in mg/hr for each type of affected source that is controlled by the add-on air pollution control device using the following equations as appropriate:

$$VR_{hc1} \times EL_{hc1} \times 60 \text{ minutes/hour} = AMR_{hc1}$$

$$VR_{hc2} \times EL_{hc2} \times 60 \text{ minutes/hour} = AMR_{hc2}$$

$$VR_{dc} \times EL_{dc} \times 60 \text{ minutes/hour} = AMR_{dc}$$

$$VR_{ca} \times EL_{ca} \times 60 \text{ minutes/hour} = AMR_{ca}$$

where "hc" applies to the total of ventilation rates for all hard chromium electroplating tanks subject to the same emission standard, "dc" applies to the total of ventilation rates for the decorative chromium electroplating tanks, "ca" applies to the total of ventilation rates for the chromium anodizing tanks, and EL is the applicable emission standard in mg/dscm referenced in paragraph (5)(c), (d), or (e) of this Part. There are two equations for hard

chromium electroplating tanks because different emission standards may apply (e.g., a new tank versus an existing, small tank).

d. Establish the allowable mass emission rate (AMR) in mg/hr for the system using the following equation, including each type of affected source as appropriate:

$$AMR_{hc1} + AMR_{hc2} + AMR_{dc} + AMR_{ca} = AMR_{system}$$

The allowable mass equation rate calculated from this equation should be equal to or less than the outlet three-run average mass emission rate determined from Method 306 testing in order for the source to be in compliance with the standards.

5. Each owner or operator that uses the special compliance provisions of this section to demonstrate compliance with the emission standards of paragraph (5) of this Part shall submit the measurements and calculations to support these compliance methods with the notification of compliance status required by this permit.

6. Each owner or operator that uses the special compliance provisions of this section to demonstrate compliance with the emission standards shall repeat these procedures if a tank is added or removed from the control system, regardless of whether that tank is a nonaffected source. If the new nonaffected tank replaces an existing nonaffected tank of the same size and is connected to the same control system through the same size inlet duct, this procedure does not have to be repeated.

(6) Work Practice Standards. The work practice standards of this section address operation and maintenance practices. All owners and operators subject to the emission standards in paragraph (5)(c) and (d) are subject to these work practice standards, unless otherwise noted.

(a) Composite Mesh-pad Systems and Packed-bed Scrubbers with Composite Mesh-pad Systems. Owners or operators of these devices shall:

1. Visually inspect the device on a quarterly basis, to ensure there is proper drainage, no chromic acid buildup on the pads, and no evidence of chemical attack.

2. Visually inspect back portion of the mesh closest to the fan on a quarterly basis for possible breakthrough of chromic acid mist.

3. Visually inspect duct work from tank to the control device for leakage on a quarterly basis.

4. Perform washdown of the composite-mesh pads in accordance with the manufacturer's recommendations.

(b) Packed-bed Scrubbers. Owners or operators of these devices shall perform the following work practices:

1. Visually inspect the device on a quarterly basis, to ensure there is proper drainage, no chromic acid buildup on the packed beds, and no evidence of chemical attack.

2. Visually inspect the back portion of the chevron blade mist eliminator on a quarterly basis for dryness and possible breakthrough of chromic acid mist.

3. Visually inspect duct work from tank to the control device for leakage on a quarterly basis.

4. Add fresh makeup water to the top of the packed bed whenever makeup water is added.

(c) Fiber-bed Mist Eliminator. Owners or operators of these devices shall:

1. Visually inspect the fiber-bed unit and prefiltering device on a quarterly basis to ensure there is proper drainage, no chromic acid buildup in the units, and no evidence of chemical attack.

2. Visually inspect ductwork from the tank or tanks to the control device for leakage on a quarterly basis.

3. Perform washdown of fiber elements in accordance with the manufacturer's recommendations.

(d) Owners or operators of air pollution control devices not listed in this section shall submit a proposal for an alternate work practice plan to the Department for approval.

(7) Operation and Maintenance Plan.

(a) The owner or operator of an affected source subject to the work practices of paragraph (6) of this Part shall prepare an operation and maintenance plan to be implemented no later than the compliance date. The plan shall incorporate the requirements of paragraph (2) of this Part and the following elements:

1. Operation and maintenance criteria for the affected source, the add-on air pollution control device if such a device is used to comply with the emission standards, and the process and control system monitoring equipment; and shall include a standardized checklist to document the operation and maintenance of this equipment.

2. For sources using an add-on air pollution control device or monitoring equipment to comply with this rule, work practice standards for that device or monitoring equipment, as identified in paragraph (6) of this Part.

3. If the specific equipment used is not identified in paragraph (6) of this Part, the plan shall incorporate proposed work practice standards. These proposed work practice standards shall be submitted to the Department for approval as part of the submittal required under paragraph (13) of this Part.

4. Procedures to be followed to ensure that equipment or process malfunctions due to poor maintenance or other preventable conditions do not occur; and

5. A systematic procedure for identifying malfunctions of process equipment, add-on air pollution control devices and process and control system monitoring equipment, and for implementing corrective actions to address such malfunctions.

(b) If the operation and maintenance plan fails to address or inadequately addresses an event that meets the characteristics of a malfunction at the time the plan is initially developed, the owner or operator shall revise the operation and maintenance plan within 45 days after such an event occurs. The revised plan shall include procedures for operating and maintaining the process equipment, add-on air pollution control device, or monitoring equipment during similar malfunction events, and a program for corrective action for such events.

(c) The owner or operator shall keep the written operation and maintenance plan on record after it is developed to be made available for inspection, upon request, by the Department for the life of the affected source or until the source is no longer subject to the provisions of this permit. In addition, if the operation and maintenance plan is revised, the owner or operator shall keep previous (i.e., superseded) versions of the operation and maintenance plan on record to be made available for inspection, upon request, by the Department for a period of 5 years after each revision to the plan.

(d) To satisfy the requirements of this permit, the owner or operator may use applicable standard operating procedure (SOP) manuals, Occupational Safety and Health Administration (OSHA) plans, or other existing plans, provided the alternative plans meet the requirements of this permit.

(e) The standards in this section that apply to chromic acid baths shall not be met by using a reducing agent to change the form of chromium from hexavalent to trivalent.

(8) Compliance Dates.

(a) A new or reconstructed affected source that has an initial startup after December 16, 1993, but before January 25, 1995, shall follow the compliance schedule of this permit.

(b) An owner or operator of an existing hard chromium electroplating tanks or tanks located at a small facility that increases its maximum cumulative potential rectifier capacity, or its actual cumulative rectifier capacity, such that the facility becomes a large, hard chromium electroplating facility must comply with the requirements of paragraph (5)(c)1. of this Part for all hard chromium electroplating tanks at the facility no later than 1 year after the month in which monthly records required by paragraph (5)(c)2. and (12)(l) of this Part show that the large designation is met.

(c) An owner or operator of a decorative chromium electroplating tank that uses a trivalent chromium bath that incorporates a wetting agent, and then ceases using the trivalent process, must comply with the requirements of this permit now applicable to the tank within 1 year of switching bath operations.

(9) Initial Compliance Demonstration. An owner or operator of an affected source subject to the requirements of this permit shall conduct an initial performance test using the procedures and test methods listed in Appendix A of 40 CFR Part 63, unless the following conditions are met:

(a) The affected source is a decorative chromium electroplating tank or chromium anodizing tank; using a wetting agent in the plating or anodizing bath to inhibit chromium emissions from the affected source; and

(b) The owner or operator complies with the applicable surface tension limit of paragraph (5)(d) of this Part, as demonstrated through the continuous compliance monitoring requirements by paragraph (10)(e) of this Part.

(10) Monitoring to Demonstrate Continuous Compliance.

(a) The owner or operator of a composite mesh-pad system shall determine the outlet chromium concentration using the test methods and procedures in paragraph (11) of this Part and shall determine during the initial performance test the pressure drop across the system obtained when the system was in compliance with all applicable standards, and shall establish that pressure drop value as the site-specific operating parameter for demonstrating continuous compliance. An owner or operator may choose to conduct multiple performance tests to establish a range of permissible pressure drop values, or average the pressure drops measured over three test runs of one performance test and accept plus or minus 1 inch of water column from this value as the permissible range.

1. On and after the date on which the initial performance test is required to be completed, the owner or operator of an affected source or group of affected sources under common control shall monitor and record the pressure drop across the composite mesh-pad system daily during operation.

2. To be in compliance with the standards, the composite mesh-pad system shall operate within the permissible range of water column height established during the initial performance test, or shall be operated within the range of permissible values established during multiple performance tests.

(b) The owner or operator of a packed-bed scrubber system shall determine the outlet chromium concentration using the test methods and procedures in paragraph (11) of this Part and shall determine during the initial performance test the pressure drop across the system and the velocity pressure at the common inlet of the scrubber obtained when the system was in compliance with all applicable standards, and shall establish the measured pressure drop and velocity pressure values as the site-specific operating values for demonstrating continuous compliance. The owner or operator may choose to conduct multiple performance tests to establish a range of permissible operating parameter values. Alternatively, the owner or operator shall set as the permissible value the average pressure drop and inlet velocity pressure measured over three test runs of one performance test, and accept values within 1 inch of water column from the pressure drop value and inlet velocity pressure readings within 10 percent of the established value.

1. On a daily basis, the owner or operator of an affected source or group of affected sources shall monitor and record the velocity pressure at the inlet to the packed-bed scrubber and the pressure drop across the scrubber system.

2. To be in compliance with the standards, the scrubber system shall be operated within plus or minus 10 percent of the velocity pressure value and within plus or minus 1 inch of water column of the pressure drop value established during the initial performance test, or within the range of permissible operating parameter values established during multiple performance tests.

(c) The owner or operator of a packed-bed scrubber/composite mesh-pad system shall comply with the monitoring requirements for composite mesh-pad systems as identified in paragraph (10)(a) of this Part.

(d) The owner or operator of a fiber-bed mist eliminator shall determine the outlet chromium concentration using the test methods and procedures in paragraph (11) of this Part and shall determine during the initial performance test the pressure drop across the fiber-bed mist eliminator and the pressure drop across the control device installed upstream of the fiber bed obtained when the system was in compliance with all applicable standards, and shall establish the measured pressure drop across the fiber-bed mist eliminator and the pressure drop across the upstream control device as the site-specific operating parameters for demonstrating continuous compliance. An owner or operator may conduct multiple performance tests to establish a range of permissible operating parameter values. Alternatively, the owner or operator may set as the compliant value the average pressure drop measured over three test runs of one performance test, and accept plus or minus 1 inch of water column for the pressure drop value as the permissible range.

1. On a daily basis, the owner or operator of an affected source or group of affected sources shall monitor and record the pressure drop across the fiber-bed mist eliminator, and the pressure drop across the upstream control device.

2. To be in compliance with the permit, the scrubber system shall be operated within plus or minus 1 inch of water column of the pressure drop value established during the initial performance test, or within the range of permissible operating parameter values established during multiple performance tests.

(e) The owner or operator of a chromium electroplating or chromium anodizing tank that incorporates a wetting agent or combination of a wetting agent and foam blanket fume suppressant shall determine the outlet chromium concentration using the test methods and procedures in paragraph (11) of this Part and shall determine during the initial compliance test the maximum surface tension of the bath using Method 306B of 40 CFR Part 63, Appendix A. Alternatively, in lieu of establishing the maximum surface tension during the performance test, the owner or operator shall accept 45 dynes/cm as the maximum surface tension value for compliance with the applicable emission limitation. However, the owner or operator is exempt from conducting a performance test only if the criteria of paragraph (9)(a) of this Part are met.

1. On or after the date on which the initial performance test is required to be completed, the owner or operator of an affected source shall monitor the surface tension of the electroplating or anodizing bath. Operation of the affected source at a surface tension greater than the value established during the performance test, or greater than 45 dynes/cm if the owner or operator is using this value in lieu of the initial performance test demonstration shall constitute noncompliance with the standards. The surface tension shall be monitored according to the following schedule:

2. The surface tension shall be measured once every 4 hours during operation of the tank with a stalagmometer or a tensiometer as specified in Method 306B of 40 CFR Part 63.

3. Monitoring frequency shall be decreased if no exceedances have occurred. The surface tension shall be measured once every 4 hours of tank operation for the first 40 hours of tank operation after the compliance date. If no exceedances occur during 40 hours of tank operation, surface tension measurement shall be conducted once every 8 hours of tank operation. If no exceedances occur during the following 40 hours of tank operation, surface tension measurement shall be conducted once every 40 hours of tank operation on an ongoing basis, until an exceedance occurs.

4. Once an exceedance occurs as indicated through surface tension monitoring, the original schedule of once every 4 hours must be resumed. A subsequent decrease in frequency shall follow the schedule specified in paragraph (10)(e)3. of this Part.

5. Once a bath solution is drained from the affected tank and a new solution added, the original monitoring schedule of once every 4 hours must be resumed.

(f) The owner or operator of an affected source which uses a foam blanket-type fume suppressant shall determine the outlet chromium concentration using the test methods and procedures in paragraph (11) of this Part and shall determine during the initial performance test the minimum thickness of the foam blanket that corresponds with the tank being in compliance with all applicable requirements. In lieu of establishing the minimum foam thickness during the performance test, the owner or operator may accept 1 inch (2.54 cm) as the minimum foam blanket thickness that corresponds to compliance with the applicable emission standard. All foam blanket measurements must be taken in close proximity to the workpiece or cathode area in the plating tank(s).

1. On and after the date on which the initial performance test is required to be completed, the owner or operator of an affected source shall measure the foam blanket thickness of the electroplating or anodizing bath. Operation of the affected source at a foam blanket thickness less than the value established during the performance test or a default value of 1 inch shall constitute noncompliance with the standards. The foam blanket thickness shall be measured according to the following schedule:

2. The foam blanket thickness shall be measured hourly during tank operation.

3. Monitoring frequency shall be decreased if there have been no exceedances. The foam blanket thickness shall be measured once every hour of tank operation for the first 40 hours of tank operation after the compliance date. If no exceedances have occurred during 40 hours of tank operation, foam blanket thickness shall be measured once every 4 hours of tank operation. If no exceedances have occurred during the following 40 hours of tank operation, foam blanket thickness shall be measured once every 8 hours of tank operation on an ongoing basis, until an exceedance occurs. The minimum frequency of monitoring allowed by this permit is once per 8 hours of tank operation.

4. Once an exceedance occurs as indicated through foam blanket thickness monitoring, the original hourly monitoring schedule must be resumed. A subsequent decrease in frequency shall follow the schedule laid out in paragraph (10)(f)3. of this Part.

5. Once a bath solution is drained from the affected tank and a new solution added, the original hourly monitoring schedule must be resumed, with a decrease in monitoring frequency allowed following the procedures of paragraph (10)(f)3. of this Part.

(g) Owners and operators of affected sources that use both a fume suppressant and an add-on control device to comply with the applicable emission standard are subject to the monitoring requirements identified in section (10) and the work practice standards of paragraph (6) of this Part, for each of the control techniques used.

(11) Performance Test Requirements and Test Methods. Performance test requirements shall be conducted using the test methods and procedures specified in Appendix A of 40 CFR Part 63, including Methods 306, 306A, 306 B, CARB Method 425, and any alternative test methods if validated using Method 301, Appendix A of Part 63 and if approved by the Department. The performance test results shall be documented in complete test reports that contain the information required by that section and submitted to the Department within 90 days following completion of the test.

(12) Recordkeeping Requirements. The owner or operator of an affected source subject to the provisions of this permit shall maintain the following records on-site for a period of 5 years:

(a) Inspection records for the add-on air pollution control device and monitoring equipment, to document that the inspection and maintenance required by the work practice standards in paragraph (6) of this Part. The record can take the form of a checklist and shall identify the device inspected, the date of the inspection, and any actions taken to correct deficiencies found during the inspection.

(b) Records of all maintenance performed on the affected source, the add-on air pollution control device, and monitoring equipment.

(c) Records of the occurrence, duration and cause (if known) of each malfunction of process, add-on air pollution control, and monitoring equipment.

(d) Records of actions taken during periods of malfunction when such actions are inconsistent with the operation and maintenance plan.

(e) Other records, which may take the form of checklists, necessary to demonstrate consistency with the provisions of the operation and maintenance plan.

(f) Test results of all performance tests.

(g) All measurements necessary to determine the conditions of performance tests.

(h) Records of monitoring data required by paragraph (10) of this Part that are used to demonstrate compliance with the standard including the date and time the data are collected.

(i) The specific identification (i.e., the date and time of commencement and completion) of each period of excess emissions, as indicated by monitoring data, that occurs during malfunction of the process, add-on air pollution control, or monitoring equipment.

(j) The specific identification of each period of excess emissions that occurs during periods other than malfunction of the process, add-on air pollution control, or monitoring equipment.

(k) The total process operating time of the affected source during the reporting period.

(l) Records of the actual cumulative rectifier capacity of hard chromium electroplating tanks at a facility expended during each month of the reporting period, and the total capacity expended to date for a reporting period, if the owner or operator is using the actual cumulative rectifier capacity to determine facility size in accordance with paragraph (5)(c)2. of this Part.

(m) For sources using fume suppressants, records of the date and time that fume suppressants are added to the electroplating or anodizing bath.

(n) For sources using wetting agents, records of the bath components purchased.

(13) Reporting Requirements.

(a) Notification of Performance Test. The owner or operator of an affected source shall notify the Department in writing of his or her intention to conduct a performance test at least 60 calendar days before the test is scheduled to begin to allow the Department to have an observer present during the test. Observation of the performance test by the Department is optional. In the event the owner or operator is unable to conduct the performance test on the date specified in the notification requirement, the owner or operator shall notify the Department within 5 days prior to the scheduled performance test date and specify the date when the performance test has been rescheduled.

(b) Notification of Compliance Status. Each time a notification is required under this permit, the owner or operator of an affected source shall submit to the Department a notification of compliance status, signed by the responsible official who shall certify its accuracy, attesting to whether the affected source has complied with this permit. The notification shall list for each affected source:

1. The applicable emission standard and the methods that were used to determine compliance with the standard;

2. If a performance test is required , the test report documenting the results of the performance test, which contains the elements required by paragraph (11) of this Part;

3. The type and quantity of hazardous air pollutants emitted by the source reported in mg/dscm or mg/hr if the source is complying with the provisions of paragraph (5) of this Part. For sources not required to conduct a performance test in accordance with paragraph (9) of this Part, the surface tension measurement may fulfill this requirement;

4. For each monitored parameter for which a permissible value is to be established under section (10) of this part of the notification form; the specific operating parameter value, or range of values that corresponds to compliance with the applicable emission standard;

5. The methods that will be used to determine continuous compliance, including a description of monitoring and reporting requirements, if methods differ from those identified in this permit;

6. A description of the air pollution control technique for each emission point;

7. A statement that the owner or operator has completed and has on file the operation and maintenance plan as required by the work practice standards in paragraph (6) of this Part; and

8. If the owner or operator is determining facility size based on actual cumulative rectifier capacity, records to support that the facility is classified as small. For existing sources, records from any 12-month period preceding the compliance date shall be used or a description of how operations will change to meet a small designation shall be provided. For new sources, records of projected of projected rectifier capacity for the first 12-month period of tank operation shall be used;

(c) For sources required to conduct a performance test by paragraph (10) of this Part, the notification of compliance status shall be submitted to the Department no later than 90 calendar days following completion of the initial performance test and shall be submitted as part of the notification of compliance status.

(d) For sources that are not required to complete a performance test in accordance with paragraph (9) of this Part, the notification of compliance status shall be submitted to the Department no later than 30 calendar days after the compliance test.

(e) Reports of Exceedances. Semiannual reports shall be prepared and submitted to the Department on the following:

1. The total duration of excess emissions (as indicated by the monitoring data collected by the owner or operator of the affected source in accordance with paragraph (10) of this Part, if 1 percent or greater of the total operating time for the reporting period; and

2. The total duration of malfunctions of the add-on air pollution control device and monitoring equipment if 5 percent or greater of the total operating time.

STRATEGY FOR COMPLIANCE WITH EPA's MACT STANDARDS FOR CHROMIUM
from ELECTROPLATING AND ANODIZING SOURCES

(CHROMIUM NESHAP)

#2

On July 16, 1992, under Section 112(c) of the Clean Air Act, U.S. EPA published a list of source categories that emit one or more hazardous air pollutants. This list includes the hard chromium plating operation described in this permit application as an area source.

On Dec. 16, 1993, EPA released the *Proposed Standards For Chromium Emissions From Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks* (40CFR Part 63; AD-FRL-4810-5; Federal Register, Vol. 58, No. 240, FR Doc. 93-30115).

After addressing the many issues brought forth during the comment period, the regulation was revised, then promulgated on January 25, 1995 as the *National Emission Standards for Chromium Emissions from Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks* (40CFR Part 63; Federal Register, Vol. 60, Page 4948). This NESHAP is also referred to as the MACT standards for chromium emissions from chromium electroplating and anodizing operations.

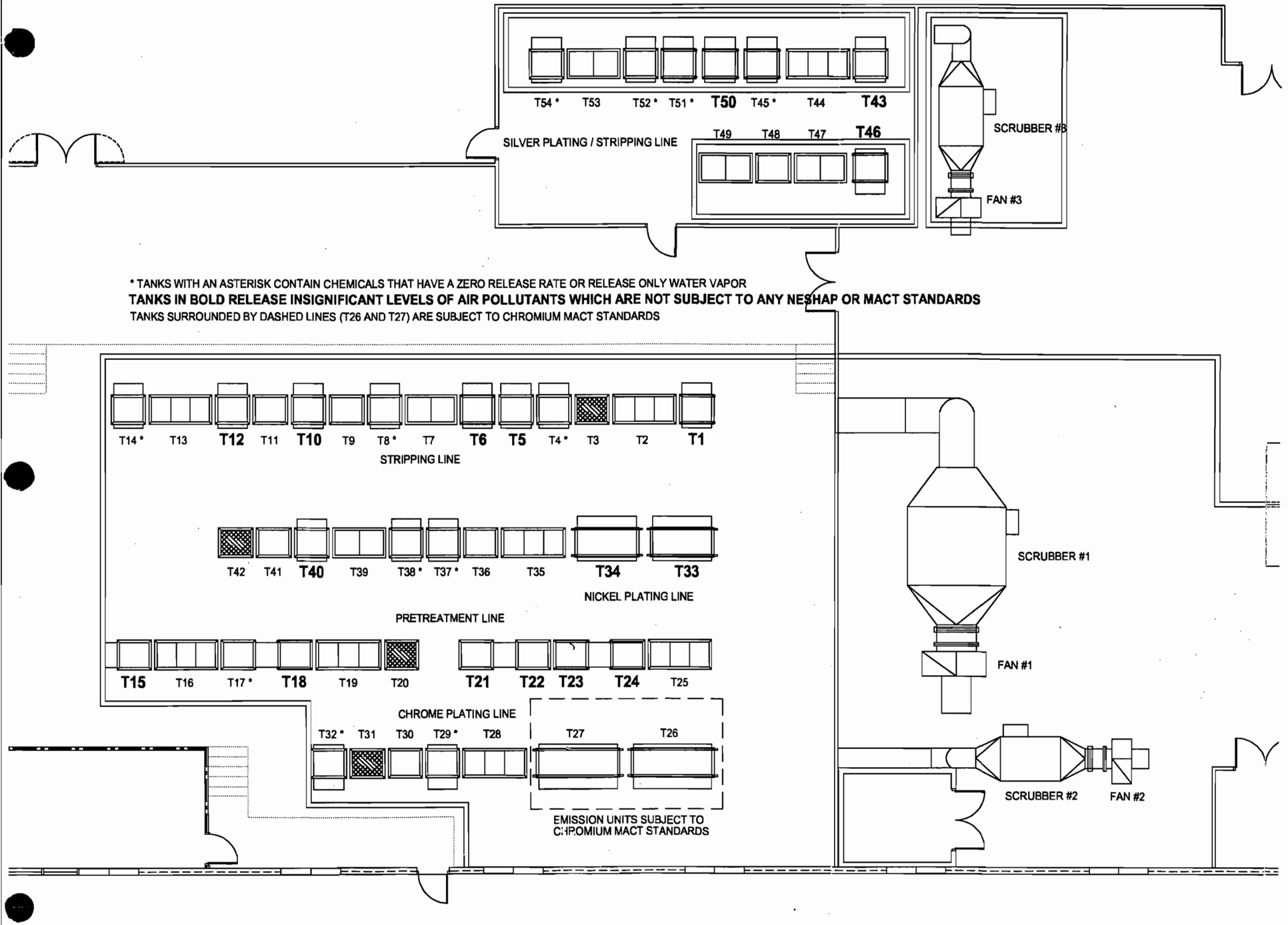
Praxair Surface Technologies, Inc. intends to comply with the chromium NESHAP upon startup of the hard chromium electroplating tanks T26 and T27, using the following strategy:

1. Install air pollution control equipment which is capable of meeting the concentration-based discharge limit of 0.015 mg/m^3 for all new hard chrome plating tanks.
2. Perform the mandatory Initial Performance Test (stack test) for the two hard chromium electroplating tanks T26 and T27, according to the schedule set forth in the standard (to be conducted within 180 days of startup of the source).
3. Institute procedures that satisfy the operation, maintenance, recordkeeping and reporting provisions of the standard *.

It should be noted that the composite meshpad mist eliminator technology, featured in Scrubber #2, was used by EPA for determining the most stringent MACT performance (for "large existing" and any size "new") sources in the standard. EPA found that the newer generation meshpad mist eliminators outperformed the wet packed-bed scrubbers traditionally used for controlling chromium emissions.

**** Note: Praxair Surface Technologies Inc. requests that "startup" of Tanks T26 and T27 be considered to be 45 days after the first test parts are plated in these tanks. This request is made to allow PST to debug the system and establish proper procedures for processing the parts. Many of the components required in the Operations and Maintenance Plan would be difficult to provide until the process equipment and procedures have been finalized and operators have been trained.***

#3



* TANKS WITH AN ASTERISK CONTAIN CHEMICALS THAT HAVE A ZERO RELEASE RATE OR RELEASE ONLY WATER VAPOR

TANKS IN BOLD RELEASE INSIGNIFICANT LEVELS OF AIR POLLUTANTS WHICH ARE NOT SUBJECT TO ANY NESHAP OR MACT STANDARDS

TANKS SURROUNDED BY DASHED LINES (T26 AND T27) ARE SUBJECT TO CHROMIUM MACT STANDARDS

LEGEND

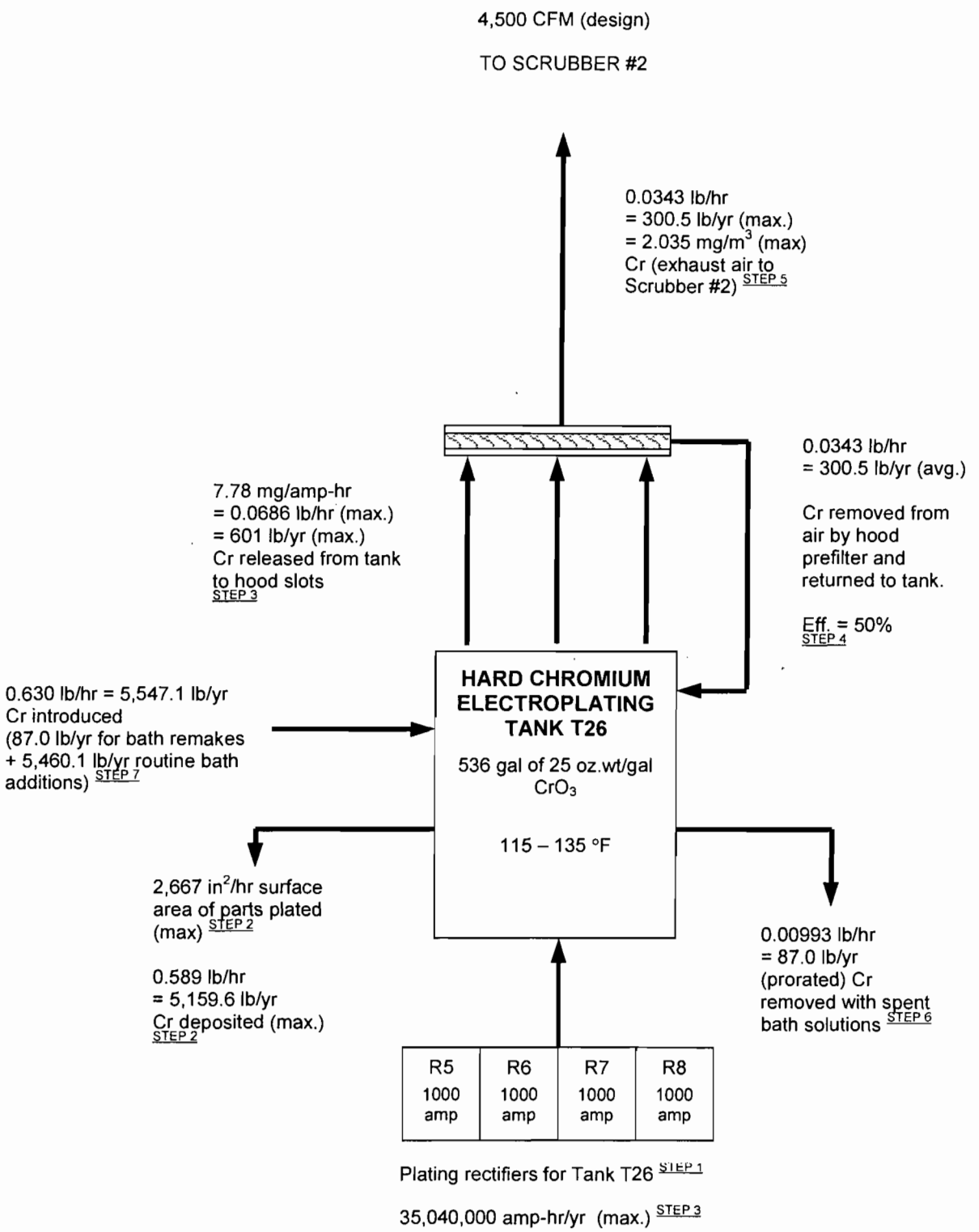
T1: ALKALINE ELECTROSTRIP OF CHROMIUM
T2: COLD WATER RINSE
T3: UNMASK
T4: HOT WATER RINSE
T5: MURATIC ACID IMMERSION STRIP OF CHROMIUM
T6: PHOSPHORIC ACID IMMERSION STRIP OF CHROMIUM
T7: COLD WATER RINSE
T8: HOT WATER RINSE
T9: NEUTRALIZE
T10: AMMONIUM NITRATE NICAD STRIP
T11: COLD WATER RINSE
T12: IMMERSION STRIP OF NICKEL
T13: COLD WATER RINSE
T14: HOT WATER RINSE
T15: EMULSION CLEAN / DEGREASE
T16: COLD WATER RINSE
T17: HOT WATER RINSE
T18: ALKALINE CLEAN / ELECTROCLEAN
T19: COLD WATER RINSE
T20: SCRUB
T21: 70% NITRIC / 10% HF ETCH
T22: 40% NITRIC / 2% HF ETCH
T23: 25% SULFURIC / 4-1/2% HF ETCH
T24: 40% SULFURIC ETCH
T25: COLD WATER RINSE
T26: HARD CHROMIUM ELECTROPLATE
T27: HARD CHROMIUM ELECTROPLATE
T28: COLD WATER RINSE
T29: NEUTRALIZE
T30: COLD WATER RINSE
T31: UNMASK
T32: HOT WATER RINSE
T33: NICKEL ELECTROPLATE
T34: NICKEL ELECTROPLATE
T35: COLD WATER RINSE
T36: NEUTRALIZE
T37: HOT WATER RINSE
T38: ZINCATE
T39: COLD WATER RINSE
T40: NICKEL STRIKE
T41: COLD WATER RINSE
T42: UNMASK
T43: IMMERSION STRIP OF SILVER
T44: COLD WATER RINSE
T45: HOT WATER RINSE
T46: NICKEL STRIKE
T47: COLD WATER RINSE
T48: NEUTRALIZE
T49: COLD WATER RINSE
T50: SILVER STRIKE
T51: SILVER ELECTROPLATE
T52: SILVER ELECTROPLATE
T53: COLD WATER RINSE
T54: HOT WATER RINSE

DRAWING No. AP-001, Rev. 1

PLAN VIEW OF EQUIPMENT

#4

PROCESS FLOW DIAGRAM FOR TANK T26
(hard chromium electroplating)



CALCULATIONS AND SUPPLEMENTAL INFORMATION FOR PROCESS FLOW DIAGRAM FOR HARD CHROMIUM ELECTROPLATING TANK T26.

STEP 1: DEFINE RECTIFIER CAPACITY.

This tank has four direct-current power supplies (rectifiers) to provide electrical power for the electroplating process. Each of the four rectifiers is rated for 1000 *amperes*.

STEP 2: CALCULATE MAXIMUM TANK UTILIZATION BASED UPON RECTIFIER CAPACITY.

Current density (CD) range is 1.5–3 amp/in^2 during plating. Constrained by rectifier size, maximum surface area plated in the tank at any one time would occur when all four rectifiers are delivering their maximum rated amperage, but parts are being plated at the minimum CD. Calculate maximum plated area of parts in tank as follows:

$$\left(\frac{4{,}000\,amp/tank}{1.5\,amp/in^2}\right) = 2{,}667\,in^2/tank \text{ max.}$$

Plating production rate (throughput) may also be expressed in terms of the mass of chromium deposited per hour. Calculations follow:

$$\left(2{,}667\,in^2\right)\left(\frac{0.00085\,in}{hr}\right) = 2.267\,in^3/hr \text{ max. chromium deposited.}$$

If the weight of metallic chromium = 0.260 lb/in^3, then

$$\left(\frac{2.267\,in^3}{hr}\right)\left(\frac{0.260\,lb}{in^3}\right) = 0.589\,lb/hr \text{ max. chromium deposited.}$$

STEP 3: ESTIMATE UNCONTROLLED EMISSION OF CHROMIUM FROM TANK SURFACE.

ASSUMPTIONS:
Assume maximum ampere-hours per year is $\left(4{,}000\,amp\right)\left(8{,}760\,hr\right) = 35{,}040{,}000\,amp-hr/yr$.

Estimate uncontrolled chromium emissions by using an EPA uncontrolled emission factor from Compilation of Air Pollutant Emission Factors AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources. From Table 12.20-1 on Page 12.20-15, EF = 0.12 grains Cr per ampere-hour energy input from the plating rectifiers.

Convert to mg/amp-hr as follows:

$$\left(\frac{0.12\,grains}{amp-hr}\right)\left(\frac{1\,mg}{0.015432\,grains}\right) = 7.78\,mg/amp-hr$$

Calculate the *time-based uncontrolled emission rate* (released from surface of tank and exhausted into hood slots) as follows:

$$\left(\frac{7.78\,mg}{amp-hr}\right)\left(\frac{4{,}000\,amp-hr}{hr}\right)\left(\frac{2.205x10^{-6}\,lb}{1mg}\right) = 0.0686\,lb/hr$$

$$\left(0.0686\,lb/hr\right)\left(8{,}760hr/yr\right) = 601\,lb/yr$$

STEP 4: ESTIMATE CHROMIUM RECOVERED BY HOOD PREFILTER

The tank's exhaust hood is fitted with a single-meshpad "prefilter", for the purpose of reducing the amount of chemicals that condense from the exhaust air stream into the downdraft ductwork. This prefilter is not necessary to meet stack outlet emission limits, because the performance of the air pollution control device (Scrubber #2) is high enough to accomplish this by itself.

Assume that this prefilter in the exhaust hood removes an average of 50% of the mist. This number is estimated, and actually varies directly with the amount of mist being generated in the tank. It would not be possible to determine the efficiency by emission testing, because although the outlet concentration could be measured, the inlet concentration could not. The chromium removed from the exhaust air stream by the prefilter is returned to its plating tank.

Calculate amount of chromium recovered by hood prefilter and returned to plating tank:

$\left(\frac{0.0686\,lb}{hr}\right)(0.5) = 0.0343\,lb/hr$ Cr (max.) recovered by hood prefilter. (0.0686 lb/hr from Step 3).

$\left(\frac{0.0343\,lb}{hr}\right)\left(\frac{8{,}760\,hr}{yr}\right) = 300.5\,lb/yr$ Cr (max.) recovered by hood prefilter.

STEP 5: ESTIMATE CHROMIUM ENTRAINED IN AIR STREAM BETWEEN EXHAUST HOOD AND INLET TO SCRUBBER #2.

See previous step for an explanation of the meshpad prefilters in the exhaust hood.

Efficiency is assumed to be 50% for calculations. This number is estimated, and actually varies directly with the amount of mist being generated in the tank. The efficiency increases with higher inlet loading. The material removed from the exhaust air stream by the prefilter is returned to its process tank.

Calculate the amount of chromium in the air stream *between the meshpad prefilter in the hood and the inlet of Scrubber #2*, using the 50% efficiency number and 4,500 *CFM* exhaust system flow rate. Note that since the chromium is now entrained in an air stream confined within exhaust ductwork, it is now possible to estimate concentration-based levels.

$\left(\frac{0.0686\,lb}{hr}\right)(0.5) = 0.0343\,lb/hr$ Cr conveyed by ductwork to Scrubber #2.

$\left(\frac{0.0343\,lb}{hr}\right)\left(\frac{8{,}760\,hr}{yr}\right) = 300.5\,lb/yr$ Cr (max.) conveyed by ductwork to Scrubber #2.

$\left(\frac{0.0343\,lb}{hr}\right)\left(\frac{1\,hr}{60\,min}\right)\left(\frac{1\,min}{4{,}500\,ft^3}\right)\left(\frac{4.536x10^5\,mg}{1\,lb}\right)\left(\frac{35.31\,ft^3}{1\,m^3}\right) = 2.035\,mg/m^3$ Cr conveyed by ductwork to Scrubber #2

STEP 6: CALCULATE AMOUNT OF CHROMIUM REMOVED WITH SPENT BATHS.

Assume that the life expectancy of the bath is 5 years, and that a spent bath has the same Cr concentration as original makeup.

A new bath contains 25 oz.wt/gal CrO_3.

The atomic weight of Cr is 51.99. The formula weight of CrO_3 is 99.99.

The concentration, expressed as Cr instead of CrO_3, is $\left(\frac{25\,oz.wt}{gal}\right)\left(\frac{1\,lb}{16\,oz.wt}\right)\left(\frac{51.99}{99.99}\right) = 0.812\,lb/gal$ Cr

$\left(\frac{0.812\,lb}{gal}\right)(536\,gal) = 435.2\,lb$ Cr in 1 tank-volume.

$\left(\frac{435.2\,lb}{tankvolume}\right)\left(\frac{1\,tankvolume}{5\,yr}\right) = 87.0\,lb/yr$ Cr removed with spent baths (prorated).

Averaged on an hourly basis:

$\left(\frac{87.0\,lb}{yr}\right)\left(\frac{yr}{8{,}760\,hr}\right) = 0.00993\,lb/hr$ Cr removed with spent baths (prorated).

STEP 7: CALCULATE AMOUNT OF CHROMIUM ADDED TO PLATING TANK

The amount of Cr needed each year is the sum of the Cr needed for new bath remakes + Cr needed for routine additions.

Cr needed for new bath remakes is 435.2 *lb/tankvolume*, or 87.0 *lb/yr* (prorated) from Step 6.

Routine chromium additions are needed to:

a) provide Cr ions to replace metallic chromium deposited on the parts being plated, and

b) replace chromium that is entrained in the exhaust air stream downstream of the hoof prefilter.

Additions are quantified as follows:

Amount of Cr needed to replace deposited metal = 0.589 *lb/hr* max. = 5,159.6 *lb/yr* max., based upon 8,760 *hr/yr*. (from Step 2).

b) Amount of Cr entrained in the exhaust air stream downstream of the hoof prefilter = 0.0343 *lb/hr* = 300.5 *lb/yr* max. (from Step 5). T

Chromium required for routine additions = 5,159.6 *lb/yr* + 300.5 *lb/yr* = 5,460.1 *lb/yr* max

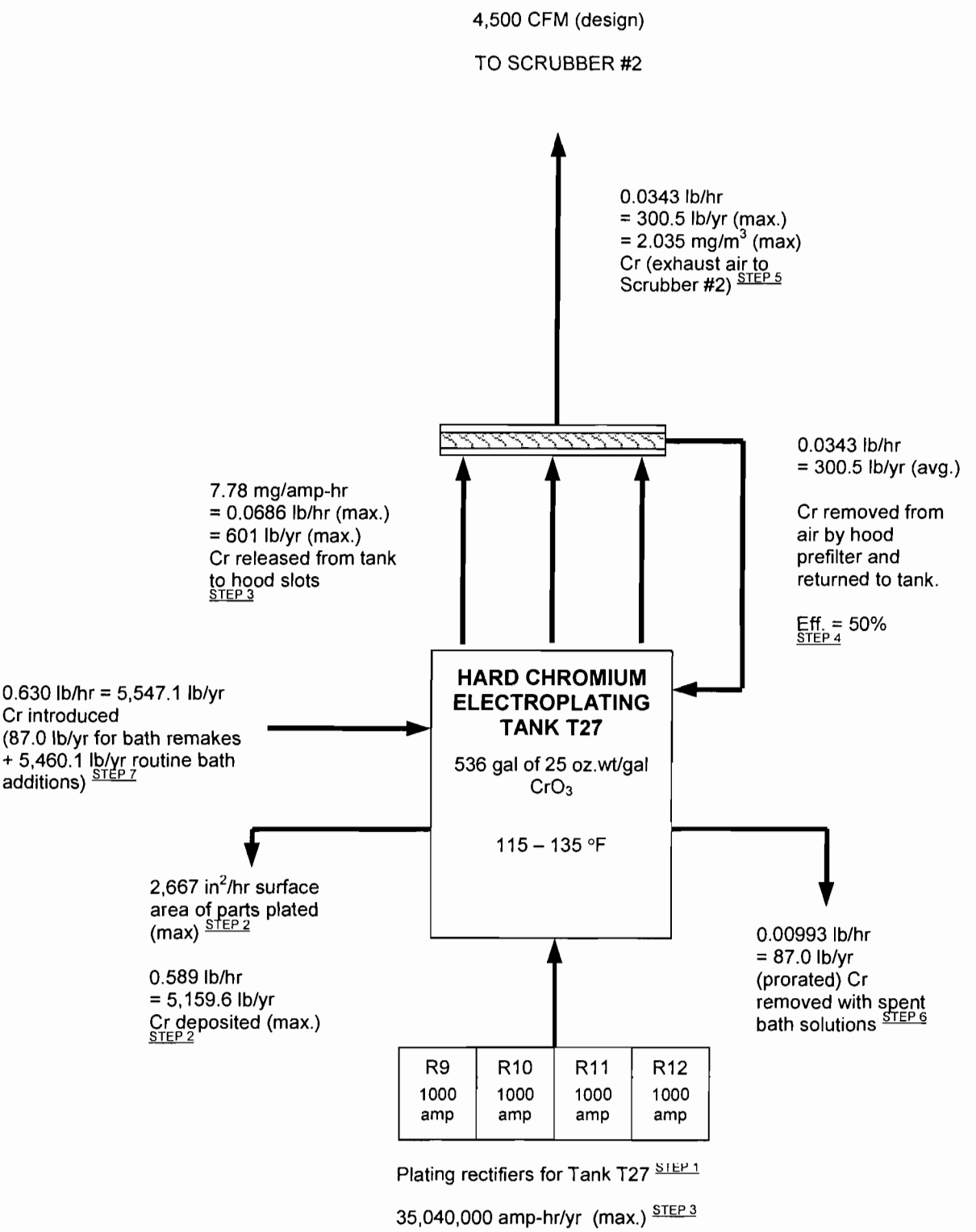
Total chromium needed for new bath makeups (prorated for 5 year life) and routine additions would be:

87.0 *lb/yr* + 5,460.1 *lb/yr* = 5,547.1 *lb/yr*

$\left(\frac{5{,}547.1\,lb}{yr}\right)\left(\frac{yr}{8{,}760\,hr}\right) = 0.633\,lb/hr$

PROCESS FLOW DIAGRAM FOR TANK T27
(hard chromium electroplating)

#5



CALCULATIONS AND SUPPLEMENTAL INFORMATION FOR PROCESS FLOW DIAGRAM FOR HARD CHROMIUM ELECTROPLATING TANK T27.

STEP 1: DEFINE RECTIFIER CAPACITY.

This tank has four direct-current power supplies (rectifiers) to provide electrical power for the electroplating process. Each of the four rectifiers is rated for 1000 *amperes*.

STEP 2: CALCULATE MAXIMUM TANK UTILIZATION BASED UPON RECTIFIER CAPACITY.

Current density (CD) range is 1.5–3 amp/in^2 during plating. Constrained by rectifier size, maximum surface area plated in the tank at any one time would occur when all four rectifiers are delivering their maximum rated amperage, but parts are being plated at the minimum CD. Calculate maximum plated area of parts in tank as follows:

$$\left(\frac{4{,}000\,amp/tank}{1.5\,amp/in^2}\right) = 2{,}667\,in^2/tank \text{ max.}$$

Plating production rate (throughput) may also be expressed in terms of the mass of chromium deposited per hour. Calculations follow:

$$\left(2{,}667\,in^2\right)\left(\frac{0.00085\,in}{hr}\right) = 2.267\,in^3/hr \text{ max. chromium deposited.}$$

If the weight of metallic chromium = 0.260 lb/in^3, then

$$\left(\frac{2.267\,in^3}{hr}\right)\left(\frac{0.260\,lb}{in^3}\right) = 0.589\,lb/hr \text{ max. chromium deposited.}$$

STEP 3: ESTIMATE UNCONTROLLED EMISSION OF CHROMIUM FROM TANK SURFACE.

ASSUMPTIONS:
Assume maximum ampere-hours per year is $\left(4{,}000\,amp\right)\left(8{,}760\,hr\right) = 35{,}040{,}000\ amp-hr/yr$.

Estimate uncontrolled chromium emissions by using an EPA uncontrolled emission factor from Compilation of Air Pollutant Emission Factors AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources. From Table 12.20-1 on Page 12.20-15, EF = 0.12 grains Cr per ampere-hour energy input from the plating rectifiers.

Convert to mg/amp-hr as follows:

$$\left(\frac{0.12\,grains}{amp-hr}\right)\left(\frac{1\,mg}{0.015432\,grains}\right) = 7.78\,mg/amp-hr$$

Calculate the *time-based uncontrolled emission rate* (released from surface of tank and exhausted into hood slots) as follows:

$$\left(\frac{7.78\,mg}{amp-hr}\right)\left(\frac{4{,}000\,amp-hr}{hr}\right)\left(\frac{2.205x10^{-6}\,lb}{1mg}\right) = 0.0686\,lb/hr$$

$$\left(0.0686\,lb/hr\right)\left(8{,}760hr/yr\right) = 601\,lb/yr$$

STEP 4: ESTIMATE CHROMIUM RECOVERED BY HOOD PREFILTER

The tank's exhaust hood is fitted with a single-meshpad "prefilter", for the purpose of reducing the amount of chemicals that condense from the exhaust air stream into the downdraft ductwork. This prefilter is not necessary to meet stack outlet emission limits, because the performance of the air pollution control device (Scrubber #2) is high enough to accomplish this by itself.

Assume that this prefilter in the exhaust hood removes an average of 50% of the mist. This number is estimated, and actually varies directly with the amount of mist being generated in the tank. It would not be possible to determine the efficiency by emission testing, because although the outlet concentration could be measured, the inlet concentration could not. The chromium removed from the exhaust air stream by the prefilter is returned to its plating tank.

Calculate amount of chromium recovered by hood prefilter and returned to plating tank:

$\left(\frac{0.0686\,lb}{hr}\right)(0.5) = 0.0343\,lb/hr$ Cr (max.) recovered by hood prefilter. (0.0686 lb/hr from Step 3).

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Efficiency is assumed to be 50% for calculations. This number is estimated, and actually varies directly with the amount of mist being generated in the tank. The efficiency increases with higher inlet loading. The material removed from the exhaust air stream by the prefilter is returned to its process tank.

Calculate the amount of chromium in the air stream *between the meshpad prefilter in the hood and the inlet of Scrubber #2*, using the 50% efficiency number and $4{,}500\ CFM$ exhaust system flow rate. Note that since the chromium is now entrained in an air stream confined within exhaust ductwork, it is now possible to estimate concentration-based levels.

$\left(\frac{0.0686\,lb}{hr}\right)(0.5) = 0.0343\,lb/hr$ Cr conveyed by ductwork to Scrubber #2.

$\left(\frac{0.0343\,lb}{hr}\right)\left(\frac{8{,}760\,hr}{yr}\right) = 300.5\,lb/yr$ Cr (max.) conveyed by ductwork to Scrubber #2.

$\left(\frac{0.0343\,lb}{hr}\right)\left(\frac{1hr}{60min}\right)\left(\frac{1min}{4{,}500\,ft^3}\right)\left(\frac{4.536x10^5\,mg}{1lb}\right)\left(\frac{35.31\,ft^3}{1m^3}\right) = 2.035\,mg/m^3$ Cr conveyed by ductwork to Scrubber #2

STEP 6: CALCULATE AMOUNT OF CHROMIUM REMOVED WITH SPENT BATHS.

Assume that the life expectancy of the bath is 5 years, and that a spent bath has the same Cr concentration as original makeup.

A new bath contains 25 oz.wt/gal CrO_3.

The atomic weight of Cr is 51.99. The formula weight of CrO_3 is 99.99.

The concentration, expressed as Cr instead of CrO_3, is $\left(\frac{25\,oz.wt}{gal}\right)\left(\frac{1\,lb}{16\,oz.wt}\right)\left(\frac{51.99}{99.99}\right) = 0.812\,lb/gal$ Cr

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The amount of Cr needed each year is the sum of the Cr needed for new bath remakes + Cr needed for routine additions.

Cr needed for new bath remakes is 435.2 *lb/tankvolume*, or 87.0 *lb/yr* (prorated) from Step 6.

Routine chromium additions are needed to:

a) provide Cr ions to replace metallic chromium deposited on the parts being plated, and

b) replace chromium that is entrained in the exhaust air stream downstream of the hoof prefilter.

Additions are quantified as follows:

Amount of Cr needed to replace deposited metal = 0.589 *lb/hr* max. = 5,159.6 *lb/yr* max., based upon 8,760 *hr/yr*. (from Step 2).

b) Amount of Cr entrained in the exhaust air stream downstream of the hoof prefilter = 0.0343 *lb/hr* = 300.5 *lb/yr* max. (from Step 5). T

Chromium required for routine additions = 5,159.6 *lb/yr* + 300.5 *lb/yr* = 5,460.1 *lb/yr* max

Total chromium needed for new bath makeups (prorated for 5 year life) and routine additions would be:

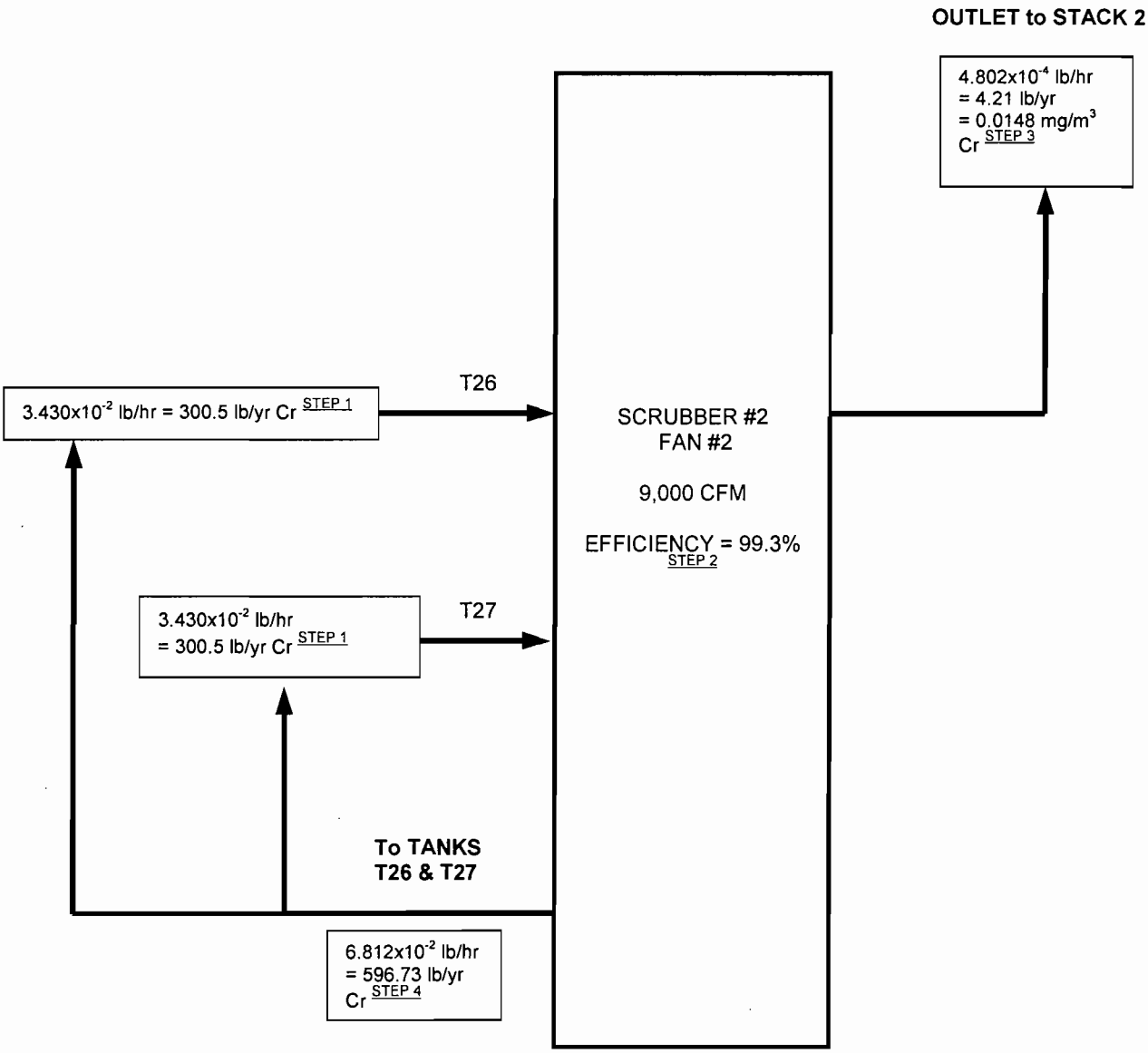
87.0 *lb/yr* + 5,460.1 *lb/yr* = 5,547.1 *lb/yr*

$\left(\frac{5{,}547.1\,lb}{yr}\right)\left(\frac{yr}{8{,}760\,hr}\right) = 0.633\,lb/hr$

PROCESS FLOW DIAGRAM FOR SCRUBBER #2

(These tanks are subject to EPA's chromium NESHAP or MACT standards)

#6



CALCULATIONS AND SUPPLEMENTAL INFORMATION
FOR PROCESS FLOW DIAGRAM FOR SCRUBBER #2.

STEP 1: IDENTIFY AND GROUP THE COMPONENTS ENTRAINED IN THE GAS STREAM ON THE INLET SIDE OF SCRUBBER #3.

Component #1 = Chromium. Cr is received from Tanks T26 & T27.

0.03430 *lb/hr* = 300.5 *lb/yr* Cr from T26.

0.03430 *lb/hr* = 300.5 *lb/yr* Cr from T27.

Total = 0.0686 *lb/hr* = 6.860×10^{-2} *lb/hr* Cr into Scrubber #2.

Total = 601 *lb/yr* Cr into Scrubber #2.

STEP 2: DESCRIBE SCRUBBER AND DECLARE EFFICIENCY

Scrubber #2 is to be a ScrubAir Vent Systems Model SCSH Chrome Separator. The unit is a horizontal, 3-stage composite meshpad unit. The design gas flow rate will be approximately 9,000 CFM.

The scrubber includes a PLC-based automatic washdown system to control periodic washdown and maintenance of the unit. Various sensors and instruments have been specified to provide real-time data pertaining to the operation and performance of the scrubber and its fan. Some of these are:

- Air pressure differential gage to monitor the pressure drop across the unit.
- Flow meter to monitor the fluid flow rate to the spray nozzles.
- RPM sensor on fan impeller.
- Static pressure gage at fan inlet

The scrubber is mated to a #24 New York Blower FRP fan. The initial gas flow rate will be approximately 9,000 CFM. The fan motor is to be a 15 HP, TEFC, 2-speed unit.

The scrubber and fan are to be sited in the interior of the building, with the discharge stack protruding through the roof.

ScrubAir Vent Systems has installed numerous units of this type in chromium electroplating applications, which have met the discharge limit of 0.015 mg/dscm in the EPA's MACT standards. In an attempt to be conservative, a reduced efficiency of 99.3% was used in the subsequent air permit calculations. This would tend to bias the controlled emissions high.

STEP 3: CALCULATE CONTROLLED EMISSIONS FROM SCRUBBER #2 / FAN #2 / STACK #2 .

The controlled (stack) release of chromium is calculated below, considering the removal efficiency of the scrubber. The multiplication factor 0.007 was derived using the following formula:

$\frac{100 - 99.3}{100}$ where 99.3% is the declared scrubber efficiency.

Component #1 = Chromium. Cr at inlet to scrubber is 0.06860 *lb/hr* = 6.860×10^{-2} *lb/hr*.

Controlled emission of Cr = $\left(\frac{6.860 x 10^{-2}\ lb}{hr}\right)(0.007) = 0.0004802 lb/hr = 4.802 x 10^{-4}\ lb/hr$

$$\left(\frac{4.802x10^{-4}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 4.21 lb/yr$$

$$\left(\frac{4.802x10^{-4}\ lb}{hr}\right)\left(\frac{1\ hr}{60\ min}\right)\left(\frac{min}{9{,}000\ ft^3}\right)\left(\frac{35.31\ ft^3}{1\ m^3}\right)\left(\frac{4.536x10^{5}\ mg}{1 lb}\right) = 0.0142\ mg/m^3$$ stack gas concentration.

Note: This would be 0.0142 mg/acfm. (actual cubic feet per minute)

Calculate concentration based upon dry standard cubic feet per minute, as follows:

First, convert acfm to dscfm:

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ or $V_2 = \frac{(V_1)(T_2)}{T_1}$ (Universal Gas Law, simplified for constant pressure.

$V_2 = \frac{(9{,}000)(68+460)}{(77+460)} = 8{,}849$ cfm (uncorrected for moisture).

$(8{,}949)(0.98) = 8{,}672$ dscfm (corrected for 2% moisture)

$$\left(\frac{4.802x10^{-4}\ lb}{hr}\right)\left(\frac{1\ hr}{60\ min}\right)\left(\frac{min}{8{,}672\ ft^3}\right)\left(\frac{35.31\ ft^3}{1\ m^3}\right)\left(\frac{4.536x10^{5}\ mg}{1 lb}\right) = 0.0148\ mg/dscfm$$ stack gas concentration.

STEP 4: CALCULATE CHROMIUM RECOVERED FROM EXHAUST AIR BY SCRUBBER #2.

Recovered chromium is returned to hard chromium electroplating tanks T26 & T27. The quantity is calculated below, considering the 99.3% removal efficiency of the scrubber.

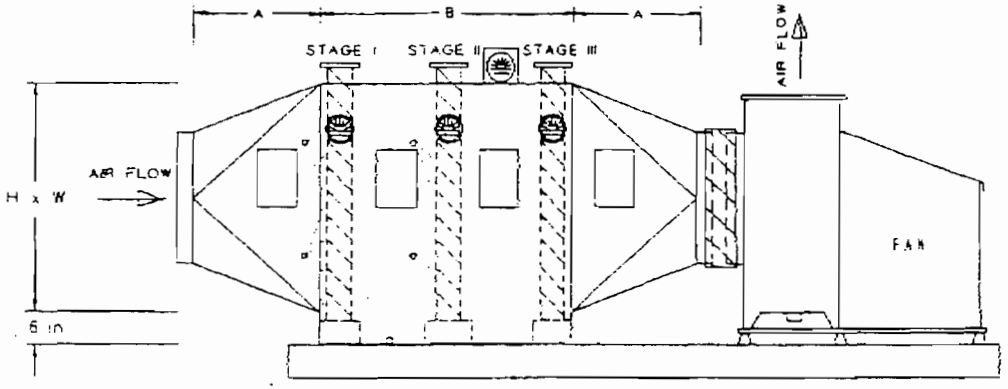
Component #1 = Chromium. Cr at inlet to scrubber is $0.06860\ lb/hr = 6.860x10^{-2}\ lb/hr$.

Controlled emission of Cr = $\left(\frac{6.860x10^{-2}\ lb}{hr}\right)(0.993) = 0.06812 lb/hr = 6.812x10^{-2}\ lb/hr$

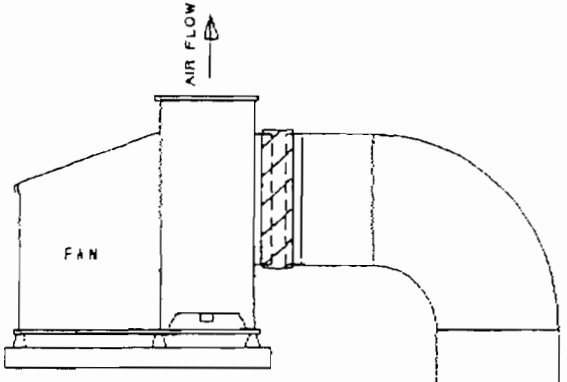
$$\left(\frac{6.812x10^{-2}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 596.73 lb/yr$$

SCRUBAIR CHROME SEPARATORS

3-STAGE COMPOSITE MESH PAD SYSTEMS



HORIZONTAL MODEL SCSH

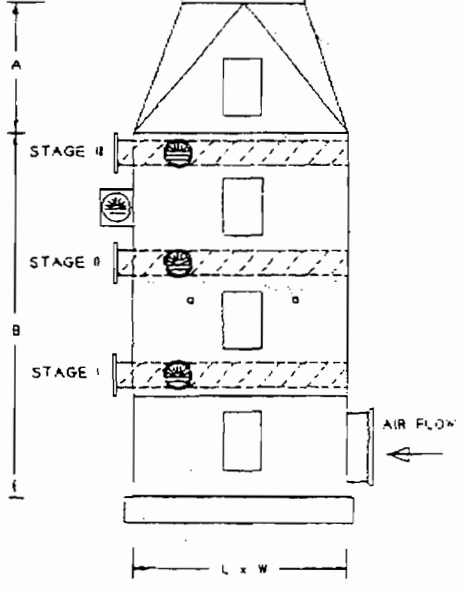


ScrubAir Chrome Separators are:

- Guaranteed to **SURPASS** the MACT Standard requirement of 0.015 mg/dscm.
- Designed with a gradual step-down particle removal process which eliminates rapid plugging of pads.
- Operated at 500 to 600 feet per minute.
- Custom designed to fit the customers space requirements.
- Available as rooftop or in-house mount.
- Available in sizes from 1,000 to 30,000 cfm. (Larger units can be provided, but multiple units are recommended for systems over 30,000 cfm.)

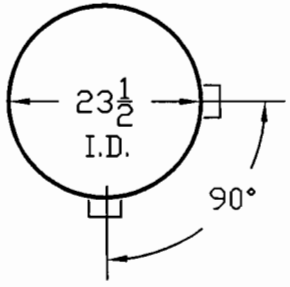
Standard Features:

⇒ Fabricated from 1/2 inch thick Type I PVC
⇒ Clear sliding access doors
⇒ Kimre composite mesh pads (removable through covers with screw on knobs)
⇒ Automatic wash down system
⇒ Removable spray headers (for wash down system)
⇒ Drain
⇒ Four (4) magnehelic gages to monitor air pressure differential across each pad and the overall system
⇒ Control panel with:
  - Disconnect
  - Blower starter
  - Meter to display overall system air pressure differential
  - Two variable setting timers for control of wash down cycles
⇒ Centrifugal blower with TEFC belt-driven motor
⇒ Exhaust stack with emission test ports
⇒ Mounting base

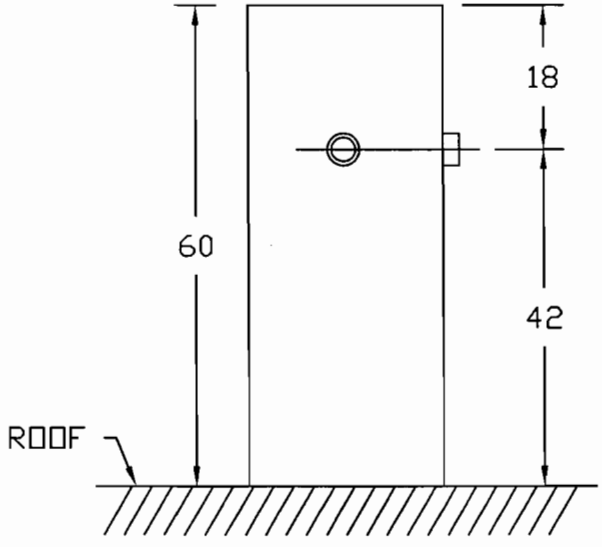


VERTICAL MODEL SCSV

#7



STACK #2
FROM SCRUBBER #2
HARD CHROME PLATING
TANKS T26 & T27



APPROXIMATE HEIGHT OF PORTS

SAMPLING PORTS ARE TO BE LOCATED AT A LOCATION THAT IS GREATER THAN 2 1/2 DUCT DIAMETERS DOWNSTREAM AND 1/2 DUCT DIAMETER UPSTREAM OF ANY FLOW DISTURBANCE PER 40 CFR PART 60, APPENDIX A SECTION 2.1 OF EPA METHOD 1

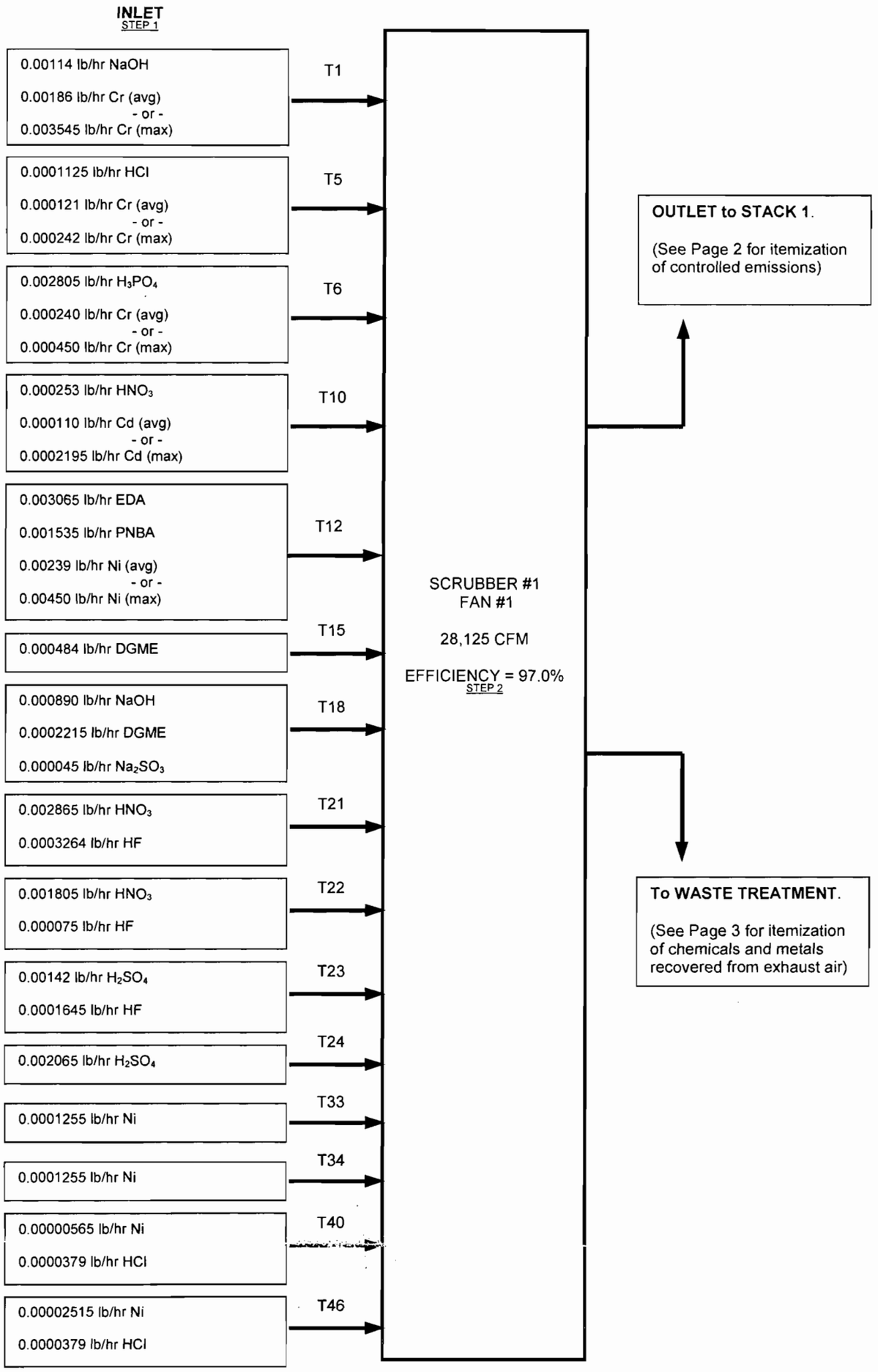
#8

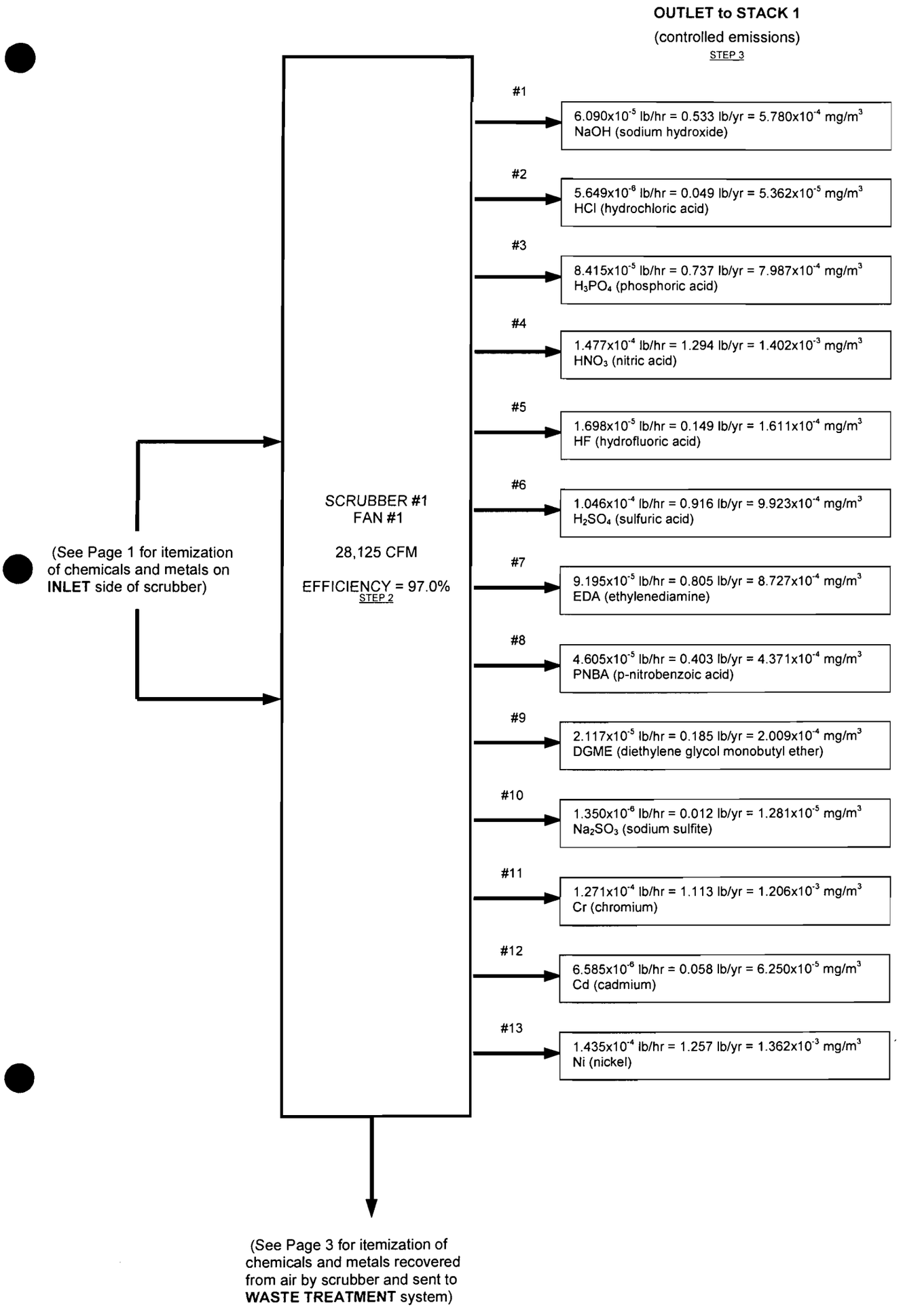
DRAWING No. AP–003
SAMPLING PORTS

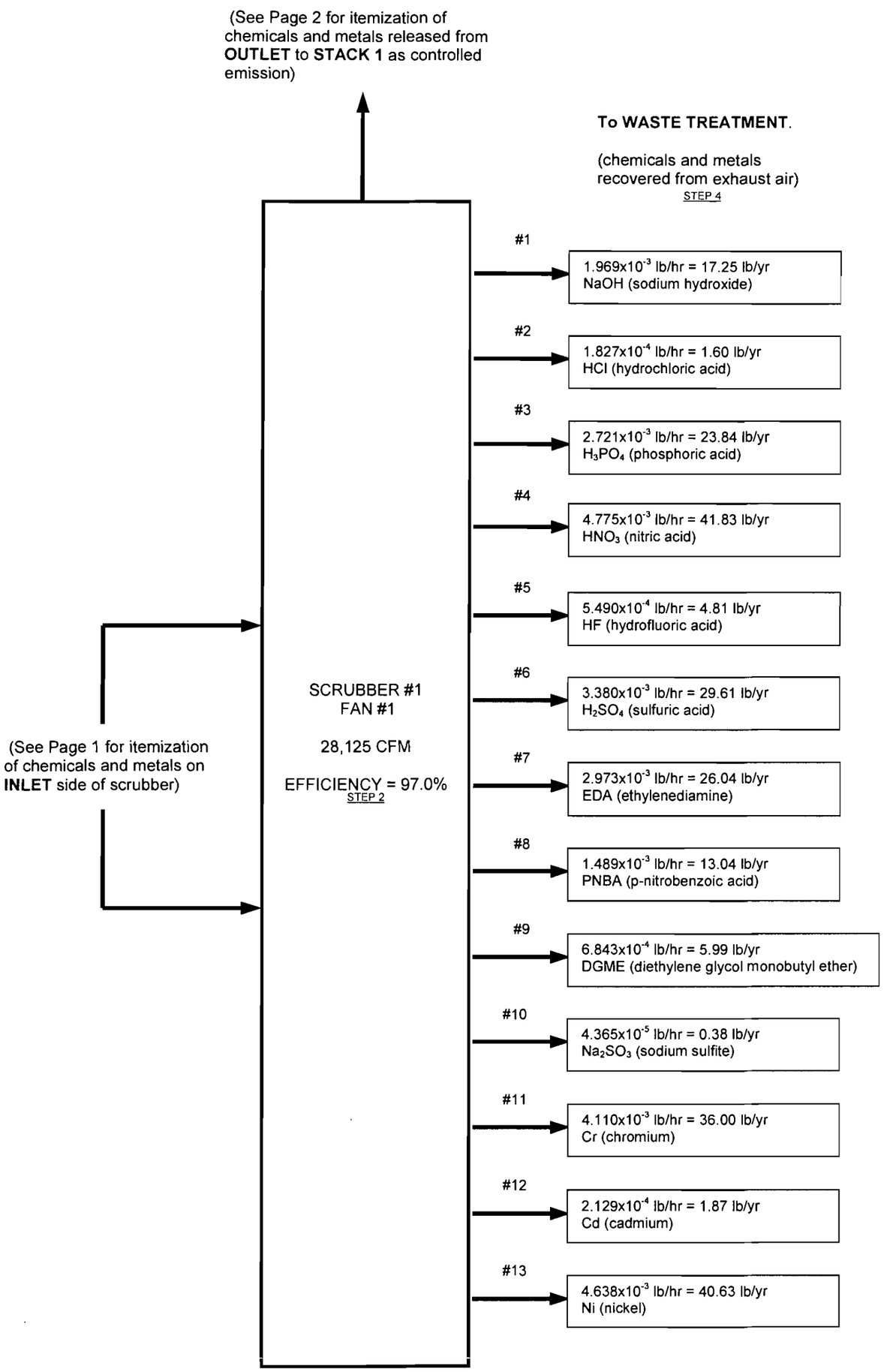
PROCESS FLOW DIAGRAM FOR SCRUBBER #1

(Note: Cr from these emission units are not subject to EPA's chromium NESHAP)

#9




OUTLET to STACK 1
(controlled emissions)
STEP 3
#1
6.090x10-5 lb/hr = 0.533 lb/yr = 5.780x10-4 mg/m3
NaOH (sodium hydroxide)
#2
5.649x10-6 lb/hr = 0.049 lb/yr = 5.362x10-5 mg/m3
HCl (hydrochloric acid)
#3
8.415x10-5 lb/hr = 0.737 lb/yr = 7.987x10-4 mg/m3
H3PO4 (phosphoric acid)
#4
1.477x10-4 lb/hr = 1.294 lb/yr = 1.402x10-3 mg/m3
HNO3 (nitric acid)
#5
1.698x10-5 lb/hr = 0.149 lb/yr = 1.611x10-4 mg/m3
HF (hydrofluoric acid)
#6
1.046x10-4 lb/hr = 0.916 lb/yr = 9.923x10-4 mg/m3
H2SO4 (sulfuric acid)
#7
9.195x10-5 lb/hr = 0.805 lb/yr = 8.727x10-4 mg/m3
EDA (ethylenediamine)
#8
4.605x10-5 lb/hr = 0.403 lb/yr = 4.371x10-4 mg/m3
PNBA (p-nitrobenzoic acid)
#9
2.117x10-5 lb/hr = 0.185 lb/yr = 2.009x10-4 mg/m3
DGME (diethylene glycol monobutyl ether)
#10
1.350x10-6 lb/hr = 0.012 lb/yr = 1.281x10-5 mg/m3
Na2SO3 (sodium sulfite)
#11
1.271x10-4 lb/hr = 1.113 lb/yr = 1.206x10-3 mg/m3
Cr (chromium)
#12
6.585x10-6 lb/hr = 0.058 lb/yr = 6.250x10-5 mg/m3
Cd (cadmium)
#13
1.435x10-4 lb/hr = 1.257 lb/yr = 1.362x10-3 mg/m3
Ni (nickel)
SCRUBBER #1
FAN #1
28,125 CFM
EFFICIENCY = 97.0%
STEP 2
(See Page 1 for itemization of chemicals and metals on INLET side of scrubber)
(See Page 3 for itemization of chemicals and metals recovered from air by scrubber and sent to WASTE TREATMENT system)


(See Page 2 for itemization of chemicals and metals released from **OUTLET** to **STACK 1** as controlled emission)
To WASTE TREATMENT.
(chemicals and metals recovered from exhaust air)
STEP 4
#1
1.969x10-3 lb/hr = 17.25 lb/yr
NaOH (sodium hydroxide)
#2
1.827x10-4 lb/hr = 1.60 lb/yr
HCl (hydrochloric acid)
#3
2.721x10-3 lb/hr = 23.84 lb/yr
H3PO4 (phosphoric acid)
#4
4.775x10-3 lb/hr = 41.83 lb/yr
HNO3 (nitric acid)
#5
5.490x10-4 lb/hr = 4.81 lb/yr
HF (hydrofluoric acid)
#6
3.380x10-3 lb/hr = 29.61 lb/yr
H2SO4 (sulfuric acid)
#7
2.973x10-3 lb/hr = 26.04 lb/yr
EDA (ethylenediamine)
#8
1.489x10-3 lb/hr = 13.04 lb/yr
PNBA (p-nitrobenzoic acid)
#9
6.843x10-4 lb/hr = 5.99 lb/yr
DGME (diethylene glycol monobutyl ether)
#10
4.365x10-5 lb/hr = 0.38 lb/yr
Na2SO3 (sodium sulfite)
#11
4.110x10-3 lb/hr = 36.00 lb/yr
Cr (chromium)
#12
2.129x10-4 lb/hr = 1.87 lb/yr
Cd (cadmium)
#13
4.638x10-3 lb/hr = 40.63 lb/yr
Ni (nickel)
SCRUBBER #1
FAN #1
28,125 CFM
EFFICIENCY = 97.0%
STEP 2
(See Page 1 for itemization of chemicals and metals on **INLET** side of scrubber)

CALCULATIONS AND SUPPLEMENTAL INFORMATION FOR PROCESS FLOW DIAGRAM FOR SCRUBBER #1.

STEP 1: IDENTIFY AND GROUP THE COMPONENTS ENTRAINED IN THE GAS STREAM ON THE INLET SIDE OF SCRUBBER #1.

Component #1 = Sodium hydroxide. NaOH is received from Tanks T1 and T18.

0.00114 *lb/hr* NaOH from T1.
0.00089 *lb/hr* NaOH from T18.
Total = 0.00114 + 0.00089 = 0.00203 *lb/hr* NaOH into Scrubber #1.

Component #2 = Hydrochloric acid. HCl is received from Tanks T5, T40 and T46.

0.0001125 *lb/hr* HCl from T5.
0.0000379 *lb/hr* HCl from T40.
0.0000379 *lb/hr* HCl from T46.
Total = 0.0001125 + 0.0000379 + 0.0000379 = 0.0001883 *lb/hr* HCl into Scrubber #1.

Component #3 = Phosphoric acid. H_3PO_4 is received from Tank T6.

0.002805 *lb/hr* H_3PO_4 from T6.
Total = 0.002805 *lb/hr* H_3PO_4 into Scrubber #1.

Component #4 = Nitric acid. HNO_3 is received from Tanks T10, T21 and T22.

0.000253 *lb/hr* HNO_3 from T10.
0.002865 *lb/hr* HNO_3 from T21.
0.001805 *lb/hr* HNO_3 from T22.
Total = 0.000253 + 0.0002865 + 0.0001805 = 4.923×10^{-3} = 0.004923 *lb/hr* HNO_3 into Scrubber #1.

Component #5 = Hydrofluoric acid. HF is received from Tanks T21, T22 and T23.

0.0003264 *lb/hr* HF from T21.
0.000075 *lb/hr* HF from T22.
0.0001645 *lb/hr* HF from T23.
Total = 0.0003264 + 0.000075 + 0.0001645 = 0.0005660 *lb/hr* HF into Scrubber #1.

Component #6 = Sulfuric acid. H_2SO_4 is received from Tanks T23 and T24.

0.00142 *lb/hr* H_2SO_4 from T23.
0.002065 *lb/hr* H_2SO_4 from T24.
Total = 0.00142 + 0.002065 = 0.003485 *lb/hr* H_2SO_4 into Scrubber #1.

Component #7 = Ethylenediamine. EDA is received from Tank T12.

0.003065 *lb/hr* EDA from T12.
Total = 0.003065 *lb/hr* EDA into Scrubber #1.

Component #8 = p-Nitrobenzoic acid. PNBA is received from Tank T12.

0.001535 *lb/hr* PNBA from T12.
Total = 0.001535 *lb/hr* PNBA into Scrubber #1.

Component #9 = Diethylene Glycol Monobutyl Ether. DGME is received from Tanks T15 and T18.

0.000484 *lb/hr* DGME from T15.
0.0002215 *lb/hr* DGME from T18.
Total = 0.000484 + 0.0002215 = 0.0007055 *lb/hr* DGME into Scrubber #1.

Component #10 = Sodium sulfite. Na_2SO_3 is received from Tank T18.

0.000045 *lb/hr* Na_2SO_3 from T12.
Total = 0.000045 *lb/hr* Na_2SO_3 into Scrubber #1.

Component #11 = Chromium. Cr is received from Tanks T1, T5 and T6. The air emission of metal from some of the tanks varies throughout the life of the bath. In these cases, both maximum and average values are given.

0.00186 *lb/hr* (avg). or 0.003545 *lb/hr* (max.) Cr from T1.
0.000121 *lb/hr* (avg). or 0.000242 *lb/hr* (max.) Cr from T5.
0.000240 *lb/hr* (avg). or 0.000450 *lb/hr* (max.) Cr from T6.
Total = 0.003545 + 0.000242 + 0.000450 = 0.004237 *lb/hr* Cr (max.) into Scrubber #1.

Component #12 = Cadmium. Cd is received from Tank T10. The air emission of metal varies throughout the life of the bath. Both maximum and average values are given.

0.000110 *lb/hr* (avg). or 0.0002195 *lb/hr* (max.) Cd from T10.
Total = 0.0002195 *lb/hr* Cd into Scrubber #1.

Component #13 = Nickel. Ni is received from Tanks T12, T33, T34, T40 and T46. The air emission of metal from some of the tanks varies throughout the life of the bath. In these cases, both maximum and average values are given.

0.00239 *lb/hr* (avg). or 0.00450 *lb/hr* (max.) Ni from T12.
0.0001255 *lb/hr* Ni from T33.
0.0001255 *lb/hr* Ni from T34.
0.00000565 *lb/hr* Ni from T40.
0.00002515 *lb/hr* Ni from T46.
Total = 0.00450 + 0.0001255 + 0.0001255 + 0.00000565 + 0.00002515 = 0.004781 *lb/hr* Ni (max.) into Scrubber #1.

STEP 2: DESCRIBE SCRUBBER AND DECLARE EFFICIENCY

Scrubber #1 is to be a ScrubAir Vent Systems Model SSQH. The unit is a horizontal packed-bed (wet) scrubber, incorporating a 5' deep polypropylene dump pack. The initial gas flow rate will be approximately 28,125 CFM, but is designed to be adjustable to 31,000 CFM if desired.

The bed is wetted through the use of recirculation system, complete with spray nozzles, pump and piping. An internal meshpad mist eliminator section is located in the main scrubber housing, downstream of the packed bed. A pH control system is included, for the purpose of maintaining a pH range of 6-8 in the recirculated scrubbing liquor.

The scrubber includes a PLC-based automatic washdown system to control periodic washdown and maintenance of the unit. Various sensors and instruments have been specified to provide real-time data pertaining to the operation and performance of the scrubber and its fan. Some of these are:

- Air pressure differential gage to monitor the pressure drop across the unit.
- Flow meter to monitor the fluid flow rate to the spray nozzles.
- pH of recirculated scrubber liquor.
- Velocity pressure gage for gas stream at scrubber inlet.

- RPM sensor on fan impeller.
- Static pressure gage at fan inlet

The scrubber is mated to a #42 New York Blower FRP fan. The initial gas flow rate will be approximately 28,125 CFM, but is designed to be adjustable to 31,000 CFM if desired. The fan motor is to be a 40 HP, TEFC, 2-speed unit.

The scrubber and fan are to be sited in the interior of the building, with the discharge stack protruding through the roof.

ScrubAir Vent Systems has supplied an average efficiency rating of 99.8% for the unit. In an attempt to be conservative, a reduced efficiency of 97.0% was used in the subsequent air permit calculations. This would tend to bias the controlled emissions high.

STEP 3: CALCULATE CONTROLLED EMISSIONS FROM SCRUBBER #1 / FAN #1 / STACK #1 .

The controlled (stack) release of each component is calculated below, considering the removal efficiency of the scrubber. The multiplication factor 0.03 was derived using the following formula:

$\frac{100-97.0}{100}$ where 97.0% is the declared scrubber efficiency.

Component #1 = Sodium hydroxide. NaOH at inlet to scrubber is 0.00203 *lb/hr* = $2.030\text{x}10^{-3}$ *lb/hr*.

Controlled emission of NaOH = $\left(\frac{0.00203 lb}{hr}\right)(0.03) = 6.090x10^{-5}\ lb/hr$

$\left(\frac{6.090x10^{-5}\ lb}{hr}\right)\left(\frac{8{,}760\,hr}{yr}\right) = 0.533\,lb/yr$

$\left(\frac{6.090x10^{-5}\ lb}{hr}\right)\left(\frac{1\,hr}{60\,min}\right)\left(\frac{min}{28{,}125\,ft^3}\right)\left(\frac{35.31\,ft^3}{1\,m^3}\right)\left(\frac{4.536x10^{5}\ mg}{1\,lb}\right) = 5.780x10^{-4}\ mg/m^3$ stack gas concentration.

Component #2 = Hydrochloric acid. HCl at inlet to scrubber is 0.0001883 *lb/hr* = $1.883\text{x}10^{-4}$ *lb/hr*.

Controlled emission of HCl = $\left(\frac{0.0001883 lb}{hr}\right)(0.03) = 5.649x10^{-6}\ lb/hr$

$\left(\frac{5.649x10^{-6}\ lb}{hr}\right)\left(\frac{8{,}760\,hr}{yr}\right) = 0.049\,lb/yr$

$\left(\frac{5.649x10^{-6}\ lb}{hr}\right)\left(\frac{1\,hr}{60\,min}\right)\left(\frac{min}{28{,}125\,ft^3}\right)\left(\frac{35.31\,ft^3}{1\,m^3}\right)\left(\frac{4.536x10^{5}\ mg}{1\,lb}\right) = 5.362x10^{-5}\ mg/m^3$ stack gas concentration.

Component #3 = Phosphoric acid. H_3PO_4 at inlet to scrubber is 0.002805 *lb/hr* = $2.805\text{x}10^{-3}$ *lb/hr*.

Controlled emission of H_3PO_4 = $\left(\frac{0.002805 lb}{hr}\right)(0.03) = 8.415x10^{-5}\ lb/hr$

$\left(\frac{8.415x10^{-5}\ lb}{hr}\right)\left(\frac{8{,}760\,hr}{yr}\right) = 0.737\,lb/yr$

$$\left(\frac{8.415x10^{-5}\,lb}{hr}\right)\left(\frac{1\,hr}{60\,min}\right)\left(\frac{min}{28{,}125\,ft^3}\right)\left(\frac{35.31\,ft^3}{1\,m^3}\right)\left(\frac{4.536x10^{5}\,mg}{1\,lb}\right) = 7.987x10^{-4}\,mg/m^3$$ stack gas concentration.

Component #4 = Nitric acid. HNO_3 at inlet to scrubber is $0.004923\ lb/hr = 4.923x10^{-3}\ lb/hr$.

Controlled emission of HNO_3 = $\left(\frac{4.923x10^{-3}\,lb}{hr}\right)(0.03) = 1.477x10^{-4}\,lb/hr$

$$\left(\frac{1.477x10^{-4}\,lb}{hr}\right)\left(\frac{8{,}760\,hr}{yr}\right) = 1.294\,lb/yr$$

$$\left(\frac{1.477x10^{-4}\,lb}{hr}\right)\left(\frac{1\,hr}{60\,min}\right)\left(\frac{min}{28{,}125\,ft^3}\right)\left(\frac{35.31\,ft^3}{1\,m^3}\right)\left(\frac{4.536x10^{5}\,mg}{1\,lb}\right) = 1.402x10^{-3}\,mg/m^3$$ stack gas concentration.

Component #5 = Hydrofluoric acid. HF at inlet to scrubber is $0.000566\ lb/hr = 5.660x10^{-4}\ lb/hr$.

Controlled emission of HF = $\left(\frac{5.660x10^{-4}\,lb}{hr}\right)(0.03) = 1.698x10^{-5}\,lb/hr$

$$\left(\frac{1.698x10^{-5}\,lb}{hr}\right)\left(\frac{8{,}760\,hr}{yr}\right) = 0.149\,lb/yr$$

$$\left(\frac{1.698x10^{-5}\,lb}{hr}\right)\left(\frac{1\,hr}{60\,min}\right)\left(\frac{min}{28{,}125\,ft^3}\right)\left(\frac{35.31\,ft^3}{1\,m^3}\right)\left(\frac{4.536x10^{5}\,mg}{1\,lb}\right) = 1.611x10^{-4}\,mg/m^3$$ stack gas concentration.

Component #6 = Sulfuric acid. H_2SO_4 at inlet to scrubber is $0.003485\ lb/hr = 3.485x10^{-3}\ lb/hr$.

Controlled emission of H_2SO_4 = $\left(\frac{3.485x10^{-3}\,lb}{hr}\right)(0.03) = 1.0455x10^{-4}\,lb/hr$

$$\left(\frac{1.0455x10^{-4}\,lb}{hr}\right)\left(\frac{8{,}760\,hr}{yr}\right) = 0.916\,lb/yr$$

$$\left(\frac{1.0455x10^{-4}\,lb}{hr}\right)\left(\frac{1\,hr}{60\,min}\right)\left(\frac{min}{28{,}125\,ft^3}\right)\left(\frac{35.31\,ft^3}{1\,m^3}\right)\left(\frac{4.536x10^{5}\,mg}{1\,lb}\right) = 9.923x10^{-4}\,mg/m^3$$ stack gas concentration.

Component #7 = Ethylenediamine. EDA at inlet to scrubber is $0.003065\ lb/hr = 3.065x10^{-3}\ lb/hr$.

Controlled emission of EDA = $\left(\frac{3.065x10^{-3}\,lb}{hr}\right)(0.03) = 9.195x10^{-5}\,lb/hr$

$$\left(\frac{9.195x10^{-5}\,lb}{hr}\right)\left(\frac{8{,}760\,hr}{yr}\right) = 0.805\,lb/yr$$

$$\left(\frac{9.195x10^{-5}\ lb}{hr}\right)\left(\frac{1\,hr}{60\,min}\right)\left(\frac{min}{28{,}125\,ft^3}\right)\left(\frac{35.31\,ft^3}{1\,m^3}\right)\left(\frac{4.536x10^5\ mg}{1lb}\right) = 8.727x10^{-4}\ mg/m^3$$ stack gas concentration.

Component #8 = p-Nitrobenzoic acid. PNBA at inlet to scrubber is 0.001535 *lb/hr* = 1.5350x10^{-3} *lb/hr*.

Controlled emission of PNBA = $\left(\frac{1.535x10^{-3}\ lb}{hr}\right)(0.03) = 4.605x10^{-5}\ lb/hr$

$$\left(\frac{4.605x10^{-5}\ lb}{hr}\right)\left(\frac{8{,}760\,hr}{yr}\right) = 0.403\,lb/yr$$

$$\left(\frac{4.605x10^{-5}\ lb}{hr}\right)\left(\frac{1\,hr}{60\,min}\right)\left(\frac{min}{28{,}125\,ft^3}\right)\left(\frac{35.31\,ft^3}{1\,m^3}\right)\left(\frac{4.536x10^5\ mg}{1lb}\right) = 4.371x10^{-4}\ mg/m^3$$ stack gas concentration.

Component #9 = Diethylene Glycol Monobutyl Ether. DGME at inlet to scrubber is 0.0007055 *lb/hr* = 7.055x10^{-4} *lb/hr*.

Controlled emission of DGME = $\left(\frac{7.055x10^{-4}\ lb}{hr}\right)(0.03) = 2.117x10^{-5}\ lb/hr$

$$\left(\frac{2.117x10^{-5}\ lb}{hr}\right)\left(\frac{8{,}760\,hr}{yr}\right) = 0.185\,lb/yr$$

$$\left(\frac{2.117x10^{-5}\ lb}{hr}\right)\left(\frac{1\,hr}{60\,min}\right)\left(\frac{min}{28{,}125\,ft^3}\right)\left(\frac{35.31\,ft^3}{1\,m^3}\right)\left(\frac{4.536x10^5\ mg}{1lb}\right) = 2.009x10^{-4}\ mg/m^3$$ stack gas concentration.

Component #10 = Sodium sulfite. Na_2SO_3 at inlet to scrubber is 0.000045 *lb/hr* = 4.500x10^{-5} *lb/hr*.

Controlled emission of PNBA = $\left(\frac{4.500x10^{-5}\ lb}{hr}\right)(0.03) = 1.350x10^{-6}\ lb/hr$

$$\left(\frac{1.350x10^{-6}\ lb}{hr}\right)\left(\frac{8{,}760\,hr}{yr}\right) = 0.012\,lb/yr$$

$$\left(\frac{1.350x10^{-6}\ lb}{hr}\right)\left(\frac{1\,hr}{60\,min}\right)\left(\frac{min}{28{,}125\,ft^3}\right)\left(\frac{35.31\,ft^3}{1\,m^3}\right)\left(\frac{4.536x10^5\ mg}{1lb}\right) = 1.281x10^{-5}\ mg/m^3$$ stack gas concentration.

Component #11 = Chromium. Cr at inlet to scrubber is 0.004237 *lb/hr* = 4.237x10^{-3} *lb/hr*.

Controlled emission of Cr = $\left(\frac{4.237x10^{-3}\ lb}{hr}\right)(0.03) = 1.271x10^{-4}\ lb/hr$

$\left(\frac{1.271x10^{-4}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 1.113\ lb/yr$

$\left(\frac{1.271x10^{-4}\ lb}{hr}\right)\left(\frac{1\ hr}{60\ min}\right)\left(\frac{min}{28{,}125\ ft^3}\right)\left(\frac{35.31\ ft^3}{1\ m^3}\right)\left(\frac{4.536x10^5\ mg}{1\ lb}\right) = 1.206x10^{-3}\ mg/m^3$ stack gas concentration.

Component #12 = Cadmium. Cd at inlet to scrubber is 0.0002195 *lb/hr* = 2.195x10^{-4} *lb/hr*.

Controlled emission of Cd = $\left(\frac{2.195x10^{-4}\ lb}{hr}\right)(0.03) = 6.585x10^{-6}\ lb/hr$

$\left(\frac{6.585x10^{-6}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 0.058\ lb/yr$

$\left(\frac{6.585x10^{-6}\ lb}{hr}\right)\left(\frac{1\ hr}{60\ min}\right)\left(\frac{min}{28{,}125\ ft^3}\right)\left(\frac{35.31\ ft^3}{1\ m^3}\right)\left(\frac{4.536x10^5\ mg}{1\ lb}\right) = 6.250x10^{-5}\ mg/m^3$ stack gas concentration.

Component #13 = Nickel. Ni at inlet to scrubber is 0.004782 *lb/hr* = 4.782x10^{-3} *lb/hr*.

Controlled emission of Ni = $\left(\frac{4.782x10^{-3}\ lb}{hr}\right)(0.03) = 1.435x10^{-4}\ lb/hr$

$\left(\frac{1.435x10^{-4}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 1.257\ lb/yr$

$\left(\frac{1.435x10^{-4}\ lb}{hr}\right)\left(\frac{1\ hr}{60\ min}\right)\left(\frac{min}{28{,}125\ ft^3}\right)\left(\frac{35.31\ ft^3}{1\ m^3}\right)\left(\frac{4.536x10^5\ mg}{1\ lb}\right) = 1.362x10^{-3}\ mg/m^3$ stack gas concentration.

STEP 4: CALCULATE CHEMICALS AND METALS RECOVERED FROM EXHAUST AIR BY SCRUBBER #1.

Recovered chemicals and dissolved metals are sent by the scrubber to the waste treatment system. The quantity of each component is calculated below, considering the 97% removal efficiency of the scrubber.

Component #1 = Sodium hydroxide. NaOH at inlet to scrubber is 0.00203 *lb/hr* = 2.030x10^{-3} *lb/hr*.

NaOH recovered = $\left(\frac{2.030x10^{-3}\ lb}{hr}\right)(0.97) = 1.969x10^{-3}\ lb/hr$

$\left(\frac{1.969x10^{-3}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 17.249\ lb/yr$

Component #2 = Hydrochloric acid. HCl at inlet to scrubber is 0.0001883 *lb/hr* = 1.883×10^{-4} *lb/hr*.

HCl recovered = $\left(\frac{1.883x10^{-4}\ lb}{hr}\right)(0.97) = 1.827x10^{-4}\ lb/hr$

$\left(\frac{1.827x10^{-4}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 1.60\ lb/yr$

Component #3 = Phosphoric acid. H_3PO_4 at inlet to scrubber is 0.002805 *lb/hr* = 2.805×10^{-3} *lb/hr*.

H_3PO_4 recovered = $\left(\frac{2.805x10^{-3}\ lb}{hr}\right)(0.97) = 2.721x10^{-3}\ lb/hr$

$\left(\frac{2.721x10^{-3}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 23.84\ lb/yr$

Component #4 = Nitric acid. HNO_3 at inlet to scrubber is 0.004923 *lb/hr* = 4.923×10^{-3} *lb/hr*.

HNO_3 recovered = $\left(\frac{4.923x10^{-3}\ lb}{hr}\right)(0.97) = 4.775x10^{-3}\ lb/hr$

$\left(\frac{4.775x10^{-3}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 41.83\ lb/yr$

Component #5 = Hydrofluoric acid. HF at inlet to scrubber is 0.0005660 *lb/hr* = 5.660×10^{-4} *lb/hr*.

HF recovered = $\left(\frac{5.660x10^{-4}\ lb}{hr}\right)(0.97) = 5.490x10^{-4}\ lb/hr$

$\left(\frac{5.490x10^{-4}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 4.81\ lb/yr$

Component #6 = Sulfuric acid. H_2SO_4 at inlet to scrubber is 0.003485 *lb/hr* = 3.485×10^{-3} *lb/hr*.

H_2SO_4 recovered = $\left(\frac{3.485x10^{-3}\ lb}{hr}\right)(0.97) = 3.380x10^{-3}\ lb/hr$

$\left(\frac{3.380x10^{-3}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 29.61\ lb/yr$

Component #7 = Ethylenediamine. EDA at inlet to scrubber is 0.003065 *lb/hr* = 3.065×10^{-3} *lb/hr*.

$$\text{EDA recovered} = \left(\frac{3.065x10^{-3}\ lb}{hr}\right)(0.97) = 2.973x10^{-3}\ lb/hr$$

$$\left(\frac{2.973x10^{-3}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 26.04\ lb/yr$$

Component #8 = p-Nitrobenzoic acid. PNBA at inlet to scrubber is 0.001535 *lb/hr* = 1.535×10^{-3} *lb/hr*.

$$\text{PNBA recovered} = \left(\frac{1.535x10^{-3}\ lb}{hr}\right)(0.97) = 1.489x10^{-3}\ lb/hr$$

$$\left(\frac{1.489x10^{-3}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 13.04\ lb/yr$$

Component #9 = Diethylene Glycol Monobutyl Ether. DGME at inlet to scrubber is 0.0007055 *lb/hr* = 7.055×10^{-4} *lb/hr*.

$$\text{DGME recovered} = \left(\frac{7.055x10^{-4}\ lb}{hr}\right)(0.97) = 6.843x10^{-4}\ lb/hr$$

$$\left(\frac{6.843x10^{-4}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 5.99\ lb/yr$$

Component #10 = Sodium sulfite. Na_2SO_3 at inlet to scrubber is 0.000045 *lb/hr* = 4.500×10^{-5} *lb/hr*.

$$\text{PNBA recovered} = \left(\frac{4.500x10^{-5}\ lb}{hr}\right)(0.97) = 4.365x10^{-5}\ lb/hr$$

$$\left(\frac{4.365x10^{-5}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 0.38\ lb/yr$$

Component #11 = Chromium. Cr at inlet to scrubber is 0.004237 *lb/hr* = 4.237×10^{-3} *lb/hr*.

$$\text{Cr recovered} = \left(\frac{4.237x10^{-3}\ lb}{hr}\right)(0.97) = 4.110x10^{-3}\ lb/hr$$

$$\left(\frac{4.110x10^{-3}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 36.00\ lb/yr$$

Component #12 = Cadmium. Cd at inlet to scrubber is $0.0002195\ lb/hr = 2.195 \times 10^{-4}\ lb/hr$.

Cd recovered = $\left(\frac{2.195x10^{-4}\ lb}{hr}\right)(0.97) = 2.129x10^{-4}\ lb/hr$

$\left(\frac{2.129x10^{-4}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 1.87\ lb/yr$

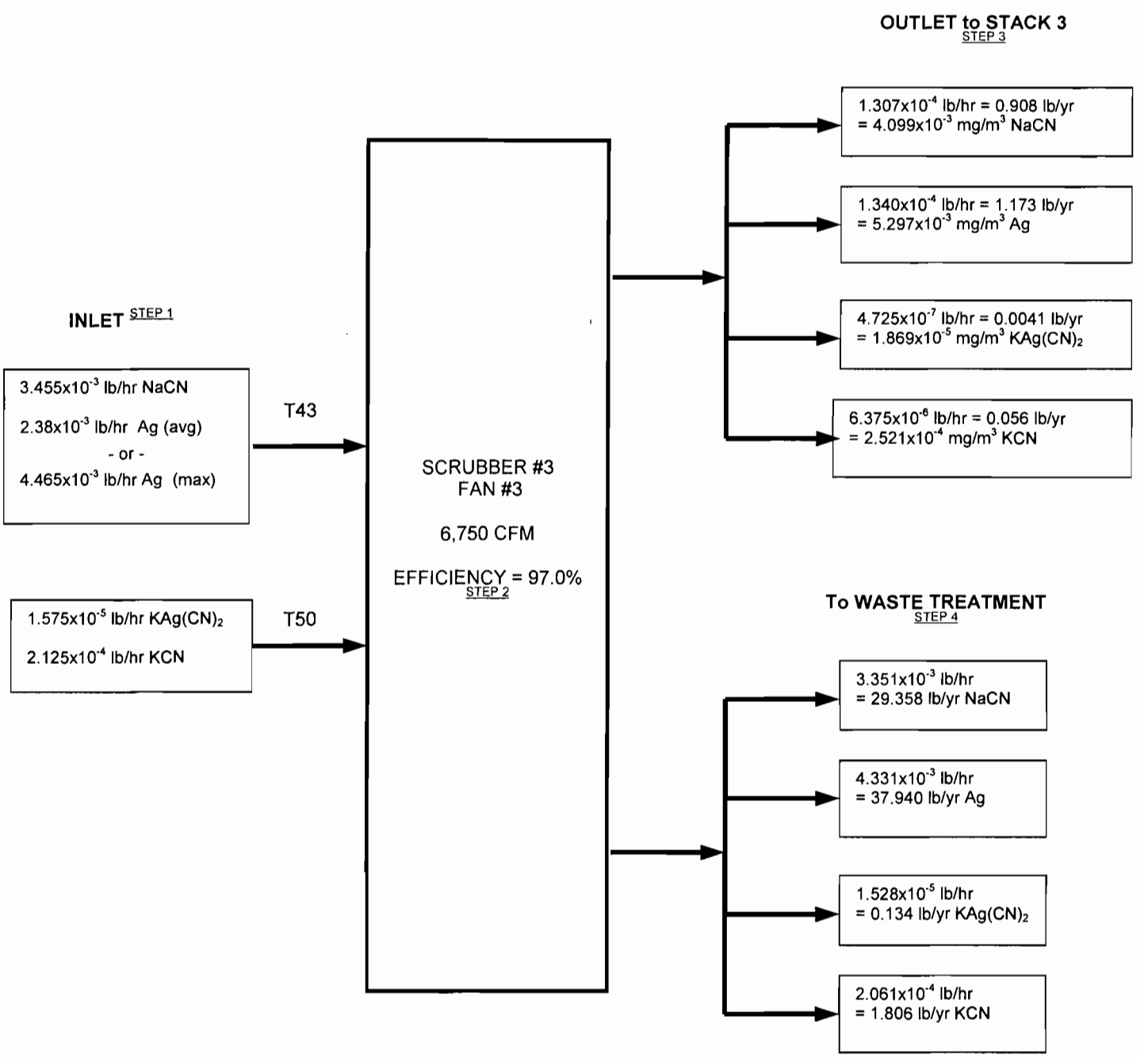
Component #13 = Nickel. Ni at inlet to scrubber is $0.004782\ lb/hr = 4.782 \times 10^{-3}\ lb/hr$.

Ni recovered = $\left(\frac{4.782x10^{-3}\ lb}{hr}\right)(0.97) = 4.638x10^{-3}\ lb/hr$

$\left(\frac{4.638x10^{-3}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 40.64\ lb/yr$

PROCESS FLOW DIAGRAM FOR SCRUBBER #3

(Note: None of these emission units are subject to any NESHAP or MACT standards)



CALCULATIONS AND SUPPLEMENTAL INFORMATION FOR PROCESS FLOW DIAGRAM FOR SCRUBBER #3.

STEP 1: IDENTIFY AND GROUP THE COMPONENTS ENTRAINED IN THE GAS STREAM ON THE INLET SIDE OF SCRUBBER #3.

Component #1 = Sodium cyanide. NaCN is received from Tank T43.

0.003455 *lb/hr* NaCN from T43.
Total = 0.003455 *lb/hr* = 3.455×10^{-3} *lb/hr* NaCN into Scrubber #3.

Component #2 = Silver. Ag is received from Tank T43.

0.004465 *lb/hr* Ag from T43.
Total = 0.004465 *lb/hr* = 4.465×10^{-3} *lb/hr* Ag into Scrubber #3.

Component #3 = Potassium silver cyanide. $KAg(CN)_2$ is received from Tank T50.

0.00001575 *lb/hr* $KAg(CN)_2$ from T50.
Total = 0.00001575 *lb/hr* = 1.575×10^{-5} *lb/hr* $KAg(CN)_2$ into Scrubber #3.

Component #4 = Potassium cyanide. KCN is received from Tank T50.

0.0002125 *lb/hr* KCN from T50.
Total = 0.0002125 *lb/hr* = 2.125×10^{-4} KCN into Scrubber #3.

NOTE: Emissions from silver plating tanks T51 and T52 are estimated to be zero. (See Process Flow Diagrams for Tanks T51 and T52 for explanation).

STEP 2: DESCRIBE SCRUBBER AND DECLARE EFFICIENCY

Scrubber #3 is to be a ScrubAir Vent Systems Model SSQH. The unit is a vertical counterflow design packed-bed (wet) scrubber, incorporating a 3' deep polypropylene dump pack. The initial gas flow rate will be approximately 6,750 CFM, but is designed to be adjustable to 8,000 CFM or higher if desired.

The bed is wetted through the use of recirculation system, complete with spray nozzles, pump and piping. An internal meshpad mist eliminator section is located in the main scrubber housing, downstream of the packed bed. A pH control system is included, for the purpose of maintaining a pH >8.0 in the recirculated scrubbing liquor.

The scrubber includes a PLC-based automatic washdown system to control periodic washdown and maintenance of the unit. Various sensors and instruments have been specified to provide real-time data pertaining to the operation and performance of the scrubber and its fan. Some of these are:

- Air pressure differential gage to monitor the pressure drop across the unit.
- Flow meter to monitor the fluid flow rate to the spray nozzles.
- pH of recirculated scrubber liquor.
- Velocity pressure gage for gas stream at scrubber inlet.
- RPM sensor on fan impeller.
- Static pressure gage at fan inlet

The scrubber is mated to a #24 New York Blower FRP fan. The initial gas flow rate will be approximately 6,750 CFM, but is designed to be adjustable to 8,000 CFM or higher if desired. The fan motor is to be a 15 HP, TEFC, 2-speed unit.

The scrubber and fan are to be sited in the interior of the building, with the discharge stack protruding through the roof.

ScrubAir Vent Systems has supplied an average efficiency rating of 99.8% for the unit. In an attempt to be conservative, a reduced efficiency of 97.0% was used in the subsequent air permit calculations. This would tend to bias the controlled emissions high.

STEP 3: CALCULATE CONTROLLED EMISSIONS FROM SCRUBBER #3 / FAN #3 / STACK #3 .

The controlled (stack) release of each component is calculated below, considering the removal efficiency of the scrubber. The multiplication factor 0.03 was derived using the following formula:

$\frac{100-97.0}{100}$ where 97.0% is the declared scrubber efficiency.

Component #1 = Sodium cyanide. NaCN at inlet to scrubber is 0.003455 *lb/hr* = $3.455\text{x}10^{-3}$ *lb/hr*.

Controlled emission of NaCN = $\left(\frac{3.455x10^{-3}\,lb}{hr}\right)(0.03) = 1.037x10^{-4}\,lb/hr$

$\left(\frac{1.307x10^{-3}\,lb}{hr}\right)\left(\frac{8{,}760\,hr}{yr}\right) = 0.908\,lb/yr$

$\left(\frac{1.037x10^{-4}\,lb}{hr}\right)\left(\frac{1\,hr}{60\,min}\right)\left(\frac{min}{6{,}750\,ft^3}\right)\left(\frac{35.31\,ft^3}{1\,m^3}\right)\left(\frac{4.536x10^{5}\,mg}{1\,lb}\right) = 4.099x10^{-3}\,mg/m^3$ stack gas concentration.

Component #2 = Silver. Ag at inlet to scrubber is 0.004465 *lb/hr* = $4.465\text{x}10^{-3}$ *lb/hr*.

Controlled emission of Ag = $\left(\frac{4.465x10^{-3}\,lb}{hr}\right)(0.03) = 1.340x10^{-4}\,lb/hr$

$\left(\frac{1.340x10^{-4}\,lb}{hr}\right)\left(\frac{8{,}760\,hr}{yr}\right) = 1.173\,lb/yr$

$\left(\frac{1.340x10^{-4}\,lb}{hr}\right)\left(\frac{1\,hr}{60\,min}\right)\left(\frac{min}{6{,}750\,ft^3}\right)\left(\frac{35.31\,ft^3}{1\,m^3}\right)\left(\frac{4.536x10^{5}\,mg}{1\,lb}\right) = 5.297x10^{-3}\,mg/m^3$ stack gas concentration.

Component #3 = Potassium silver cyanide. $KAg(CN)_2$ at inlet to scrubber is 0.00001575 *lb/hr* = $1.575\text{x}10^{-5}$ *lb/hr*.

Controlled emission of $KAg(CN)_2$ = $\left(\frac{1.575x10^{-5}\,lb}{hr}\right)(0.03) = 4.725x10^{-7}\,lb/hr$

$\left(\frac{4.725x10^{-7}\,lb}{hr}\right)\left(\frac{8{,}760\,hr}{yr}\right) = 0.0041\,lb/yr$

$\left(\frac{4.725x10^{-7}\,lb}{hr}\right)\left(\frac{1\,hr}{60\,min}\right)\left(\frac{min}{6{,}750\,ft^3}\right)\left(\frac{35.31\,ft^3}{1\,m^3}\right)\left(\frac{4.536x10^{5}\,mg}{1\,lb}\right) = 1.869x10^{-5}\,mg/m^3$ stack gas concentration.

Component #4 = Potassium cyanide. KCN at inlet to scrubber is 0.0002125 *lb/hr* = 2.125×10^{-4}.

Controlled emission of KCN = $\left(\frac{2.125x10^{-4}\ lb}{hr}\right)(0.03) = 6.375x10^{-6}\ lb/hr$

$\left(\frac{6.375x10^{-6}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 0.056\ lb/yr$

$\left(\frac{6.375x10^{-6}\ lb}{hr}\right)\left(\frac{1\ hr}{60\ min}\right)\left(\frac{min}{6{,}750\ ft^3}\right)\left(\frac{35.31\ ft^3}{1\ m^3}\right)\left(\frac{4.536x10^5\ mg}{1\ lb}\right) = 2.521x10^{-4}\ mg/m^3$ stack gas concentration.

STEP 4: CALCULATE CHEMICALS AND METALS RECOVERED FROM EXHAUST AIR BY SCRUBBER #3.

Recovered chemicals and dissolved metals are sent by the scrubber to the waste treatment system. The quantity of each component is calculated below, considering the 97% removal efficiency of the scrubber.

Component #1 = Sodium cyanide. NaCN at inlet to scrubber is 0.003455 *lb/hr* = 3.455×10^{-3} *lb/hr*.

NaCN recovered = $\left(\frac{3.455x10^{-3}\ lb}{hr}\right)(0.97) = 3.351x10^{-3}\ lb/hr$

$\left(\frac{3.351x10^{-3}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 29.36\ lb/yr$

Component #2 = Silver. Ag at inlet to scrubber is 0.004465 *lb/hr* = 4.465×10^{-3} *lb/hr*.

Ag recovered = $\left(\frac{4.465x10^{-3}\ lb}{hr}\right)(0.97) = 4.331x10^{-3}\ lb/hr$

$\left(\frac{4.331x10^{-3}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 37.94\ lb/yr$

Component #3 = Potassium silver cyanide. $KAg(CN)_2$ at inlet to scrubber is 0.00001575 *lb/hr* = 1.575×10^{-5} *lb/hr*.

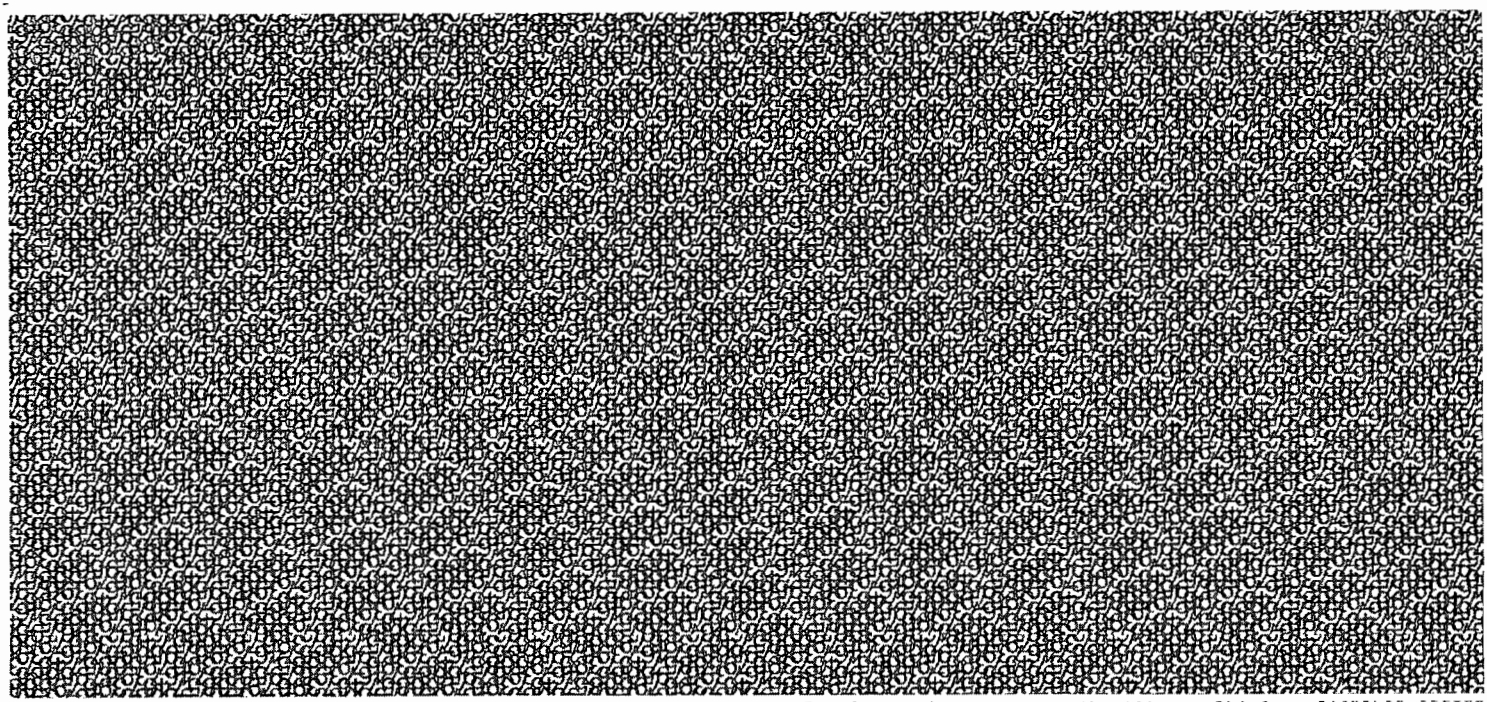
$KAg(CN)_2$ recovered = $\left(\frac{1.575x10^{-5}\ lb}{hr}\right)(0.97) = 1.528x10^{-5}\ lb/hr$

$\left(\frac{1.528x10^{-5}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 0.1338\ lb/yr$

Component #4 = Potassium cyanide. KCN at inlet to scrubber is 0.0002125 *lb/hr* = 2.125×10^{-4}.

KCN recovered = $\left(\frac{2.125x10^{-4}\ lb}{hr}\right)(0.97) = 2.061x10^{-4}\ lb/hr$

$\left(\frac{2.061x10^{-4}\ lb}{hr}\right)\left(\frac{8{,}760\ hr}{yr}\right) = 1.806\ lb/yr$



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