Shipbuilding and Ship Repair Surface Coating

NESHAP Compliance Inspection

How to Perform the Inspection

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**Ship Building and Ship Repair Surface Coating
NESHAP Compliance Inspection**

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An Overview

In November of 1995, the U. S. Environmental Protection Agency (EPA) issued national regulations to control hazardous air pollutant (HAP) materials from shipbuilding and ship repair facilities coating operations that are designated as major sources. The regulation appeared in the December 15, 1995 edition of the Federal Register [volume 60, beginning on page 64330].

Major sources are shipbuilding and repair facilities coating operations emitting over 9.1 mega grams per year (Mg/yr) (10 tons/yr) of an individual HAP or over 23 Mg/yr (25 tons/yr) of total HAP are regulated. Approximately 35 shipyards in the United States are estimated to be major sources of HAP emissions. The table on page C-2, Appendix C lists the U. S shipyards estimated to be NESHAP major sources.

Section 112 of the Clean Air Act as amended in 1990 (CAA) requires the EPA to evaluate and control HAP emissions. EPA inspectors may be assigned to inspect shipbuilding and repair facilities to make certain that the location is compliant with the volatile organic hazardous air pollutants (VOHAP) emission limits set forth in the federal regulation cited above.

The job of the inspector is to insure that a facility is complying with the emission limits set in the regulations. The determination of compliance may be viewed in the following steps:

1. Preparation for the inspection at the office.
2. An onsite inspection of the selected facility to insure that required records are being kept, proper storage and handling of coatings, employees are properly trained and that coatings as applied do not exceed VOHAP limits.
3. Returning to the office and using the data collected to determine compliance with emissions standards, and other requirements in the rules.
4. Writing a compliance report on the facility.

VOHAP limits set by the regulation are summarized in Table 1 for all the types of coatings normally used at shipbuilding and ship repair facilities. VOHAP limits are increased for working at temperatures below 4.5 ˚C (40.1 ˚F).

The shipyard is given four options for reporting the VOC or VOHAP contents of coatings as applied.

- Option 1 is used for certifying the VOC content of coatings that are used without thinning.
- Option 2 is for certifying coatings that have thinner added where compliance is determined on a coating-by-coating basis.
- Option 3 is for certifying coatings that are thinned where compliance is determined on a group basis.
- Option 4 is similar to Option 1 except that certification is based on the VOHAP content of coatings applied without thinning.

TABLE 1. VOLATILE ORGANIC HAP (VOHAP) LIMITS FOR MARINE COATINGS

Coating category	VOHAP limits[a,b,c]		
	Grams/liter coating (minus water and exempt compounds)	Grams/liter solids[d]	
		T ≥ .5° C	T < 4.5° C[e]
G1 General use	340	571	728
Specialty	--	--	--
S1 Airflask	340	571	728
S2 Antenna	530	1,439	--
S3 Antifoulant	400	765	971
S4 Heat resistant	420	841	1,069
S5 High-gloss	420	841	1.069
S6 High-temperature	500	1,237	1,597
S7 Inorganic zinc high-build	340	571	728
S8 Military exterior	340	571	728
S9 Mist	610	2,235	--
S10 Navigational aids	550	1,597	--
S11 Nonskid	340	571	728
S12 Nuclear	420	841	1,069
S13 Organic zinc	360	630	802
S14 Pre-treatment wash primer	780	11,095	--
S15 Repair and maint. of thermoplastics	550	1,597	--
S16 Rubber Camouflage	340	571	728
S17 Sealant for thermal spray aluminum	610	2.235	--
S18 Special marking	490	1,178	--
S19 Specialty interior	340	571	728
S20 Tack coat	610	2,235	--
S21 Undersea weapons systems	340	571	728
S22 Weld-through precon. Primer	650	2,885	--

[a]The limits are expressed in two sets of equivalent units. Either set of limits may be used for the compliance procedure described in §63.785(c)(1), but only the limits expressed in units of g/L (nonvolatiles) shall be used for the compliance procedures described §63.785(c)(2) through (4)

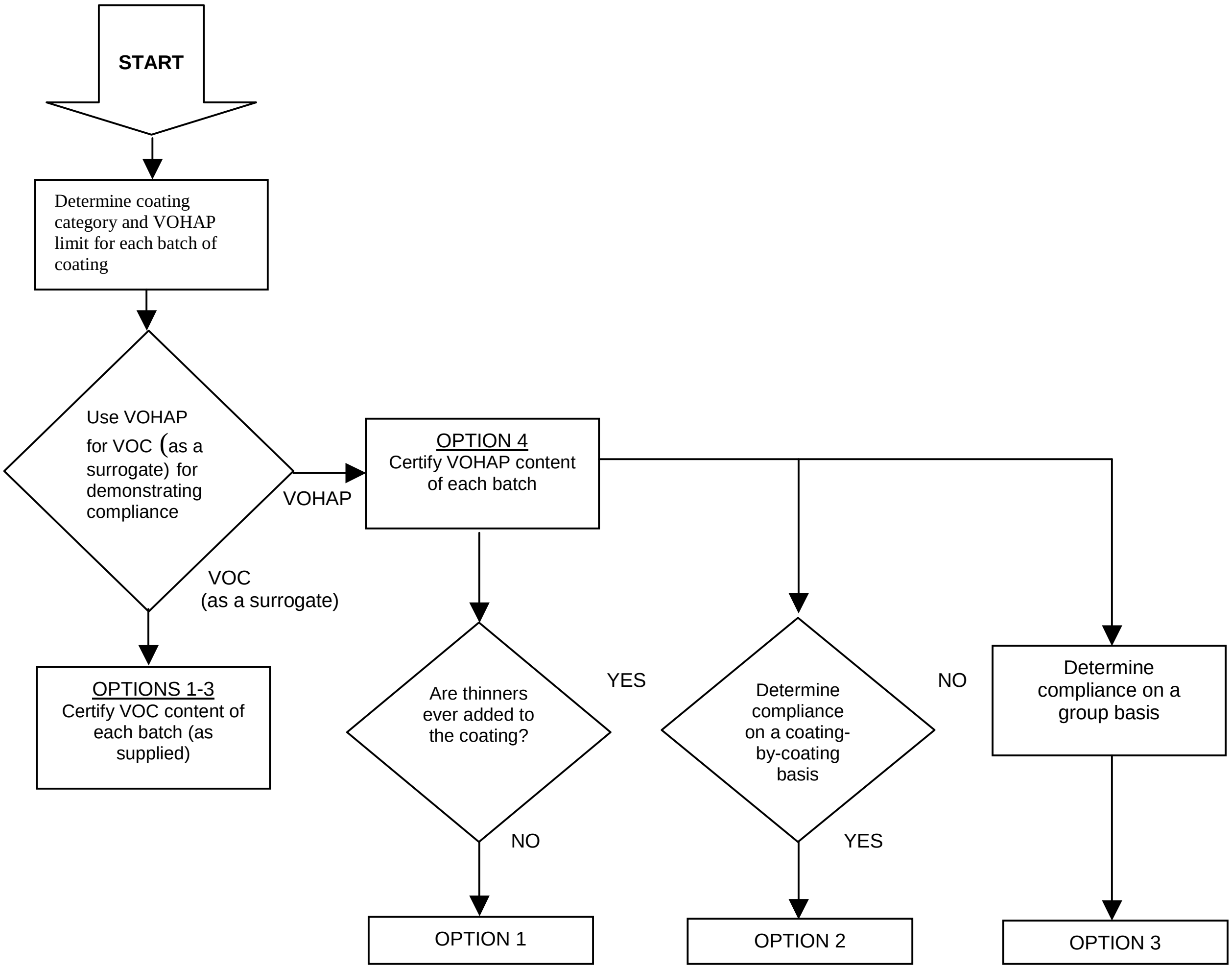
[b]VOC (including compounds listed as HAP) shall be used as a surrogate for VOHAP for those compliance procedures described in §63.785(c)(1) through (3).

[c]To convert from g/L to lb/gal, multiply by (3.785 L/gal (1 lb/453.6 g) or 1/120. For compliance purposes, metric units define the standards.

[d]VOHAP limits expressed in units of mass of VOHAPS per volume of solids (nonvolatiles) were derived from the VOHAP limits expressed in units of mass of VOHAP per volume of coating assuming the coatings contain no water or exempt compounds and that the volumes of all components within a coating are additive.

[e]These limits apply during cold weather time periods, as defined in §63.782. Cold weather allowances are not given to coatings in categories that permit over a 40 percent VOHAP content by volume. Such coatings are subject to the same limits regardless of weather conditions.

Compliance options are illustrated by the flow chart in Figure 1.



<u>Figure 1</u>. Compliance options

Getting Ready for Inspection

An inspector who has not been through recent training or is relatively inexperienced should study EPA Region 10's training document for inspectors found in Appendix B. Additional comprehensive information for the inspector can also be found in Multi-Media Investigation Manual, US EPA Office of Enforcement EPA-330/9-89-003-R

Inspectors are urged to conduct themselves in a professional manner and avoid conflict with the facility personnel. Keep in mind that your visit is simply to gather data to determine if the facility is in compliance. Compliance will be determined when you return to the office and analyze the data.

The United States Environmental Protection Agency, Office of Air Quality, Planning and Standards, Research Triangle Park, NC 27711 has issued A Guidebook on How to Comply with the Shipbuilding and Ship Repair (Surface Coating) Operations National Emission Standards for Hazardous Air Pollutants, EPA 453/B-97-001, to instruct shipyards on how to comply with the emissions regulations. The inspector should become thoroughly familiar with this document, which is in Appendix C.

The inspector who is not familiar with the shipbuilding and repair industry should review the EPA Sector Notebook, Profile of the Shipbuilding and Repair Industry, EPA/310-R-97-008.

EPA Region 10's training document suggests that about 50 percent of the inspector's time may be required in preparation for the site visit. Regardless of the time required, plan to do as many things that can be done before the visit in order to save your time and the time of those you will see during the inspection.

Check your files and review information about previous inspections. Things to look at are Title V annual certifications, semi-annual monitoring and periodic monitoring reports, and any other reports required by permit.

Talk with personnel in the EPA Regional Office along with any State or Local Office having jurisdiction that have made previous inspections or have knowledge of the facility.

EPA Region 4's policy is to conduct "unannounced" inspections, except in special circumstances. This "unannounced" approach varies from state/local to state/local agency.

Good record keeping is essential. A diary or a log of events that includes names, dates and time can be kept in a record book or on a laptop computer. In addition to ensuring the accuracy of your report, detailed records could be needed to support your findings in case of a violation.

Sampling and laboratory testing must also be carried out using standard methods. The use of standard methods ensures that results of the tests can withstand legal scrutiny.

Finally, use the Pre-Inspection Checklist (following this section) to be certain that all bases have been covered.

Pre-Inspection Checklist

Contacting shipyard

EPA Region 4's policy is to conduct "unannounced" inspections, except in special circumstances. This "unannounced" approach varies from state/local and to state/local agency.

1. ___ Before contacting shipyard, review files on previous inspections.
   a. Note any previous violations and how resolved.
   b. Make list of areas and things inspected on previous inspections. Note if paint samples for VOHAP and solids testing were collected.

2. ___ If, you plan to contact selected shipyard, call and identify yourself. Inform the facility that you want to conduct an inspection for compliance with national emissions standards for hazardous air pollutants (HAPs) for the shipyards surface coating operations.

3. ___ Get the name of a person to contact for making arrangements for the inspection including the contact's position and phone number — at the facility entrance if the visit is unannounced.

4. ___ Set the date and time of visit. EPA Region 4's policy is to conduct "unannounced" inspections. This "unannounced" approach varies from state/local to state/local agency.

Getting ready

1. ___ Locate shipyard on a map. Get driving directions to site.

2. ___ Contact certified testing laboratory about testing the paint samples. Samples must be tested by Method 24 (see Appendix D) or other EPA approved method for volatile matter content, water content, density, volume of solids and weight of solids. (For list of accredited laboratories see Appendix E.)

3. ___ You will need containers for paint samples. Laboratories will often supply sample containers. If not, ask the lab what kind of containers they will accept and buy containers from a local laboratory supply house.

4. ___ As you will probably have to collect your own paint samples, become familiar with Standard Procedure for Collection of Coating and Ink Samples for Analysis by Reference Methods 24 and 24A (Appendix D.)

5. ___ Get a camera and become familiar with its operation. If a camera is not available through your office, purchase a disposable camera.

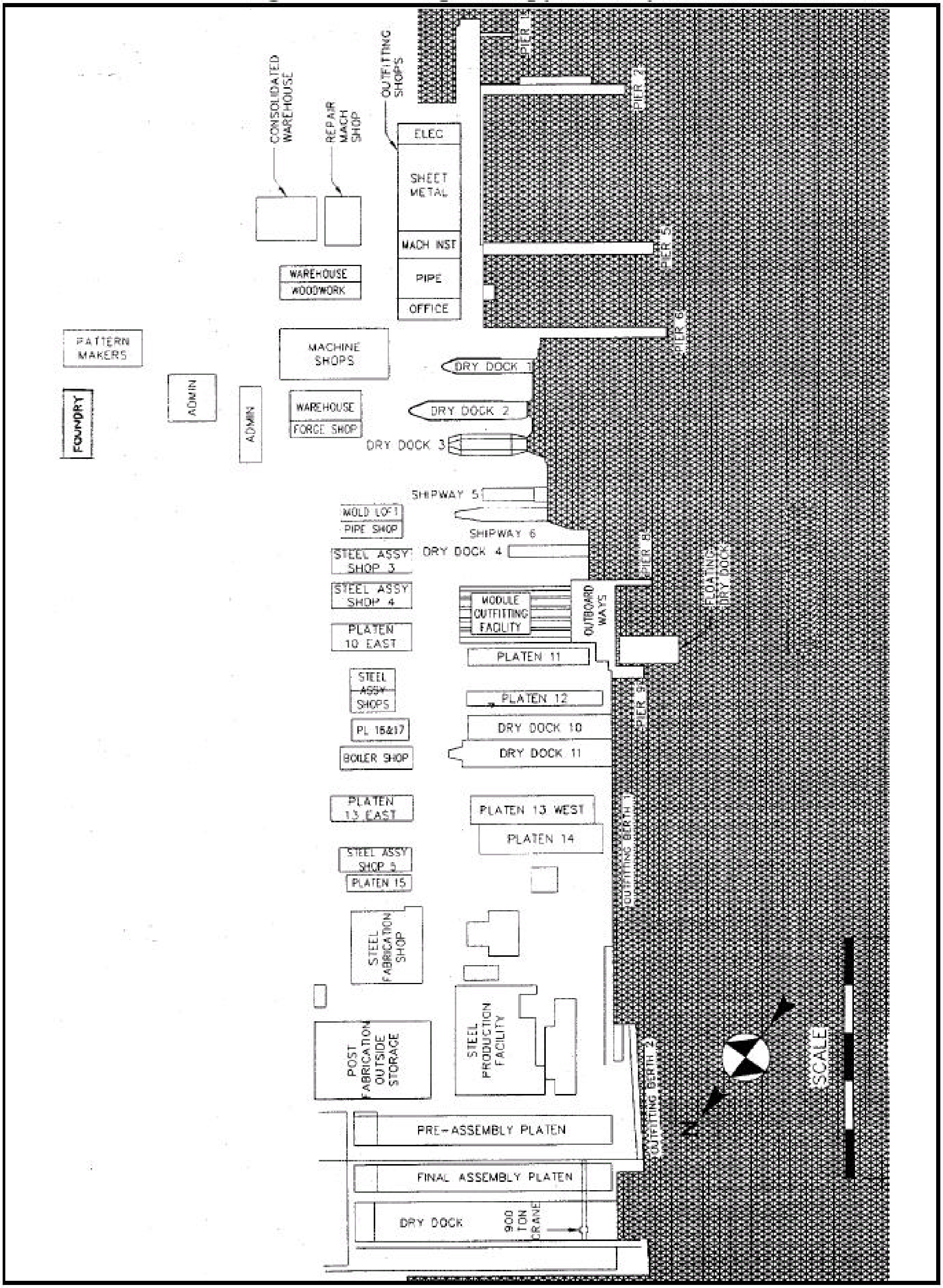
6. ___ Assemble your safety equipment. If safety equipment is not provided by your office, it can usually be purchased locally. *Most installations will require safety shoes, hardhat, eye protection and often hearing protection in some areas of the installation.*

7. ___ Wear comfortable clothing suitable for an industrial setting. If you are going to collect paint samples, take rubber gloves to protect your hands.

8. ___ Get a cart or hand truck to carry your equipment.

9. ___ Bring your identification and a name tag.

Figure 2: Example Shipyard Layout



Source: Maritime Administration, *Report on Survey of U. S. Shipbuilding and Repair Facilities*

The Inspection

The inspector should try to arrive at the shipyard location the day before the scheduled appointment. This time should be spent out side the facility locating the site to get a lay-of-the-land and to avoid delays in arriving at the appointed time.

In meeting the contact and other people at the site it is important to act in a professional manner and maintain a friendly attitude. The objective is to induce the site personnel to cooperate more readily and to complete the inspection in a timely manner.

The purpose of the visit is to gather information so that compliance can be determined. Compliance will be determined once the inspector returns to his or her office, has samples of coating analyzed, completes the necessary calculations and writes an inspection report. At the end of the visit, it is recommended that the inspector not venture an opinion regarding compliance, as this will be determined only after the data is analyzed.

The overall objectives of your investigation should include:

- Determine compliance status with applicable laws, regulations, permits, and Consent Decrees.

- Determine ability of a facility to achieve compliance.

- Identify need for remedial measures and enforcement action(s) to correct the cause of violations

- Evaluate a facility's waste: producing, treatment, management, and pollution control practices and equipment.

- Evaluate facility self-monitoring capability.

- Evaluate facility recordkeeping practices.

- Evaluate facility waste minimization/pollution prevention programs.

- Obtain appropriate samples.

The inspector also needs to know how to deal with denial of entry situations. Whenever entry consent is denied (or withdrawn during the course of the inspection), the inspector should explain the Agency authority to conduct the investigation and verify that the facility representative understands the authority.

If the person persists in denying entry or withdrawing consent, the inspector needs to fully document the circumstances and actions taken; this includes recording the name, title, and telephone number of the person denying entry or withdrawing consent. The inspector must never make threatening remarks to facility personnel.

Denied entry, the inspector should then contact his/her supervisor and Agency legal counsel. If the inspector and the supervisor suspect that a warrant will be necessary before entry is attempted, then actions to obtain a warrant should be initiated.

Ship Building and Ship Repair Surface Coating
NESHAP Compliance Inspection Checklist

Date of Inspection ____

Facility ____

Permit Number ____________________ Permit Type __________________

Location ____

Facility Contact Person ____

Inspector ____

<u>General Applicability</u>

1. Facility uses more than 1000 liters/yr. Y___ N___

If yes, shipbuilding NESHAP applies.

2. Facility emits 9.1 Mg/yr (10 tons/yr) or more of individual HAP. Y___ N___

If yes, facility is a major source and should provide inventory.

3. Facility emits 22.8 Mgt/yr (25 tons/yr) or more of all HAP combined. Y___ N___

If yes, facility is a major source and should provide inventory

<u>Coating storage, tanks, vats, drums and piping systems</u>

✓ Sec. 63.783 Required Standards

1. All handling and transfer of VOHAP-containing materials to and from containers, tanks, vats, drums, and piping systems is conducted in a manner that minimizes spills. Y___ N___

2. All containers, tanks, vats, drums, and piping systems are free of cracks, holes, and other defects and remain closed unless materials are being added to or removed from them**.**
Y___ N___

✓ P2 Measures

1. Areas orderly and free of spills. Y___ N___

2. Containers clearly labeled with manufacturer's name and contents. Y___ N___

3. Containers marked with thinning or no thinning labels. Y___ N___

4. MSDSs posted in appropriate locations. Y___ N___

5. Pictures of areas taken for future reference. Y___ N___

6. Containers/drums containing coatings thinners and solvents tightly closed except when in use. Y___ N___

7. Solvent contaminated rags, cloths and materials stored in a covered container, except when in use. Y___ N___

8. Does facility train painters and other employees dealing with coatings and solvents? Y___ N___

Recordkeeping

The regulations require that the facility keep records to document the facilities NESHAP compliance status. Reports must be submitted to the Administrator before the 60th day following the completion of each 6-month period after the compliance date. The "Administrator" is the appropriate Regional Office of the U. S. EPA. The facility must maintain the records for 5 years.

Required recordkeeping

✓ Applies to all options

1. Volume of coating applied at unaffected major sources. (*Refers to the volume of each low-usage exempt coating applied*.) Y___ N___

2. Volume of each low-usage-exempt coating applied at affected sources (Refers *to coatings applied with hand-held, non-refillable, aerosol containers or to unsaturated polyester resin coatings*.) Y___ N ___

3. ID of coatings used, their appropriate coating categories and applicable VOHAP limit Y___ N___

4. Do containers meet standards described in § 63.783(b)(2)? Y___ N___

5. Results of M-24 or other approved tests. Y___ N___

6. Certification of the as-supplied VOC content of each batch. Y___ N___

✓ Applies to Option 1 (*Overview, pp 2 and 3*)

7. Certification of the as-applied VOC content of each batch Y___ N___

8. Volume of each coating applied (record and report) Y___ N___

✓ Applies to Options 2 and 3 *(Overview, pp 2 and 3)*

9. Density of each thinner and volume fraction of solids (or non-volatiles) in each batch Y___ N___

10. Maximum allowable thinning ratio(s) for each batch. Y___ N___

11. Volume used of each batch, as supplied. Y___ N___

12. Total allowable volume of thinner. Y___ N___

13. Actual volume of thinner used. Y___ N___

✓ Applies to Option 3 only (Overview, pp 2 and 3)

14. Identification of each group of coatings and designated thinners. Y___ N___

Note: Check of records is complete. Get copies of records if further study is needed.

(Table 2 below is a summary of recordkeeping and reporting requirements)

Coatings certification

1. Data collected on Coating Certification Form 1 for each coating operation. (See Example Forms Appendix C, pp F-3 — F-6 .) Y___ N___

2. Samples collected by Standard Method given in EPA-340/1-91-010. (See Standard Method Appendix D.) Y___ N___

Note: The collection of samples is at the discretion of the inspector or as directed by his or her supervisor.

TABLE 2. SUMMARY OF RECORDKEEPING AND REPORTING REQUIREMENTS

Requirement	All options		Option 1		Option 2		Option 3	
	Rcd.	Rpt.	Rcd.	Rpt.	Rcd.	Rpt.	Rcd.	Rpt.
Initial notification (§ 63.9(a)-(d))	X	X						
Implementation plan (§ 63.787(b))	X	X						
Volume of coating applied at unaffected major sources (§ 63.781(b))	X							
Volume of each low-usage-exempt coating applied at affected sources (§ 63.781(c))	X	X						
ID of the coatings used, their appropriate coating categories, and the applicable VOHAP limit	X	X						
Determination of whether containers meet the standards described in § 63.783(b)(2)	X	X						
Results of M-24 or other approved tests	X	X						
Certification of the as-supplied VOC content of each batch	X							
Certification of the as-applied VOC content of each batch			X					
Volume of each coating applied			X	X				
Density of each thinner and volume fraction of solids (or nonvolatiles) in each batch					X	X	X	X
Maximum allowable thinning ratio(s) for each batch					X	X	X	X
Volume used of each batch, as supplied					X	X	X	X
Total allowable volume of thinner					X	X	X	X
Actual volume of thinner used					X	X	X	X
Identification of each group of coatings and designated thinners							X	X

Note: Option 4 requirements parallel those shown for Options 1 through 3, depending on whether or not and how thinners are used. When using Option 4, the term “VOHAP” should be used in lieu of the term “VOC”.

Data Collection:

The VOC Datasheet in Figures 3a and 3b below best shows the data needed to determine compliance.

VOC DATA SHEET

PROPERTIES OF THE MARINE COATING OR THINNER "AS SUPPLIED" BY THE MANUFACTURER

Manufacturer ________________________ Product Identification ________________________

Is this product a coating or thinner? COATING ________ THINNER ________

If product is a coating or paint please provide the information in the box below and provide all information for items A through J below:
If the product is thinner, please provide the information requested in items D through J below:

MACT Coating Category: General use _______ or Specialty Coating ________
If Coating is a Specialty Coating please list the specific Category Type (s) below. (Use attached list of marine coating specialty categories):

Properties of the coating or thinner as supplied to the customer:

A. Coating Density: (D_C) ______g/L [ ] ASTM D1475-90 [ ] Other

B. Total Volatiles: (M_V)_______ Mass Percent [ ] ASTM D2369-93 [ ] Other

C. Cure Volatiles Content: (C_{CV}) ______g/L [ ] Calculated [ ] Other

D. Organic Volatiles: (M_O) _______ Mass Percent [ ] Calculated [ ] Other

E. Water Content:

1. (M_W) ______ Mass Percent [ ] ASTM D3792-91 [ ] Other
2. (V_W) ______ Volume Percent [ ] Calculated [ ] Other

F. Exempt Compounds: (C_{ex}) ______g/L [ ] Calculated [ ] Other

G. Nonvolatiles: (V_S) _______ Volume Percent [ ] Calculated [ ] Other

H. VOC Content (VOC):

1. ______ g/L solids (nonvolatiles)
2. ______ g/L coating (less water and exempt compounds)

I. Thinner Density (D_{th}) _______g/L ASTM _______ [ ] Other

Figure 3a: VOC datasheet

J. Coating Speciation: Provide the percentage of each chemical component of this coating or thinner. (If only a percentage range can be supplied, the range mean will be used to calculate VOV and VHAP emissions.). This information is not required for compliance with shipyard MACT, however, other federal and/or state environmental regulations require this data. By providing this information it will avoid the possibility that the shipyard will make redundant requests for the data in the future

COATING OR THINNER COMPONENT	MASS PERCENTAGE
Nonvolatile Components, Water and Exempt Compounds	
1. ________________	________
2. ________________	________
3. ________________	________
4. ________________	________
5. ________________	________
6. ________________	________
7. ________________	________
8. ________________	________
9. ________________	________
10. ________________	________
Organic Volatile Compounds	
1. ________________	________
2. ________________	________
3. ________________	________
4. ________________	________
5. ________________	________
6. ________________	________
7. ________________	________
8. ________________	________
9. ________________	________
10. ________________	________

Signed: ______________________ Dated: ________

--English units in the original submittal were deleted to conform with Appendix A in the final regulation
(60 FR 64330).

Figure 3b: VOC datasheet

Definitions of shipyard marine coating expressions and equations are contained in Table 3 below.

Shipyard MACT Marine Coating Expressions and Equations

Fraction	Constituents	Volume Expression	Mass Expression
Organic	Volatile Organic Compounds	V_{VOC}	M_{VOC}
	Exempt-Volatiles	V_E	M_E
Aqueous	Water	V_W	M_W
Solid	Non-Volatiles	V_S	M_S
"Cure-Volatiles"	Reaction Volatiles		M_C

		Coating Property	Expression	Units
A*	$\mathbf{D_C}$	Coating Density	Mi / Vi	Grams/liter
B*	$\mathbf{M_T}$	Total Volatiles (mass percent)	$(M_{VOC} + M_E + M_W + M_C) / M_i$	%
C	$\mathbf{C_{CV}}$	Cure Volatiles Content	M_C / V_i	Grams/liter
D	$\mathbf{M_V}$	Organic Volatiles (mass percent)	$(M_V + M_E)/ M_i$	%
$\mathbf{E_1}$	$\mathbf{M_W}$	Water Content (mass percent)	M_W / M_i	%
$\mathbf{E_2}$	$\mathbf{V_W}$	Water Content (mass percent)	V_W / V_i	%
F	$\mathbf{C_{ex}}$	Exempt Compounds Content	M_E / V_i	Grams/liter
G	$\mathbf{V_S}$	Nonvolatiles (volume percent)	V_S / V_i	%
$\mathbf{H_1}$*		VOC content (nonvolatiles)	$(M_{VOC}) / V_S$	Grams/liter
$\mathbf{H_2}$*		VOC Content (less water & exempt compounds)	$(M_{VOC}) / (V_S + V_{VOC})$	Grams/liter
I	$\mathbf{D_{th}}$	Thinner Density	M_i / V_i	Grams/liter

Table 3: Shipyard Marine Coating and Equations

*Edited to conform with 60 FR 64330 symbols

Acetone was recently identified to have a low photochemical reactivity, as a result it was added to the list of "exempt " compounds. When method 24 in 40 CFR Part 60 was published, acetone was considered a VOC. Therefore, the method that will be used to determine the acetone content in a coating should be specified. This is also applicable to any new addition to the list of exempt compounds, unless a EPA approved test method already exists.

The metric system is used for units of measure where volumes are expressed in liters and mass in grams. Large units (such as for total annual emissions) are expressed as tonnes where 1 tonne is equal to 1000 kilograms.

Data sources:

Sources for the data needed to figure compliance are

- Provided to the shipyard by the coating supplier using Method 24 or other test methods accepted by the EPA,
- Tests on coating run by the shipyard using Method 24 or other test methods accepted by the EPA,
- Records maintained by the shipyard *(see example records in App. C, pp F3 – F6*), or
- The testing of samples gathered by the inspector at an accredited testing laboratory using Method 24 or other test method accepted by the EPA.

Figuring Compliance

Compliance is determined for each batch of coating received by the shipyard. A coating batch is coating produced in a single production run from a single supplier. The VOHAP content of the batch "as applied" is figured and then compared to the VOHAP applied to the coating category shown in Table 1 on page 2. Coatings, as applied, that do not exceed the limits set forth in Table 1 are in compliance.

The VOC/VOHAP content of a coating batch is figured by Equations 1, 2, or 3, shown below, according to the compliance option the shipyard chooses for reporting.

Compliance Options:

As previously discussed, the shipyard is given four options for reporting the VOC or VOHAP contents of coatings as applied.

- Option 1 is used for certifying the VOC content of coatings that are used without thinning.
- Option 2 is for certifying coatings that have thinner added where compliance is determined on a coating-by-coating basis.
- Option 3 is for certifying coatings that are thinned where compliance is determined on a group basis.
- Option 4 is similar to Option 1 except that certification is based on the VOHAP content of coatings applied without thinning.

Compliance options are illustrated by the flow chart in Figure 1 on page 3.

For Option 1, The VOC content can be obtained by testing each batch of coating. If the shipyard performs the test only one container in the batch needs to be tested. The analysis of the batch provided by the coating manufacturer is also acceptable. Finally, the inspecting party can sample and test the batch in question.

If the facility has chosen Option 2, the thinning ratio must be calculated using Eqn.1.

$$R = \frac{(V_s)(\text{VOHAP limit}) - m_{VOC}}{D_{th}} \quad \text{Eqn. 1}$$

Where:

R = Maximum allowable thinning ratio for a given batch (L thinner/L coating as supplied);
Vs = Volume fraction of solids in the batch as supplied (L solids/L coating as supplied);
VOHAP limit = Maximum allowable as- applied VOHAP content of the coating (g VOHAP/L solids);

mVOC = VOC content of the batch as supplied [g VOC (including cure volatiles and exempt compounds on the HAP list)/L coating (including water and exempt compounds) as supplied];
D_{th} = Density of the thinner (g/L).

(A sample calculation using Eqn. 1 is shown in Appendix C, page G-6)

If Vs is not supplied directly by the coating manufacturer, the shipyard will be required to determine Vs by Equation 2 below:

$$V_s = 1 - \frac{m_{volatiles}}{D_{avg}} \qquad \text{Eqn. 2}$$

where:

$m_{volatiles}$ = Total volatiles in the batch, including VOC, water, and exempt compounds (g/L); and
D_{avg} = Average density of volatiles in the batch (g/L).

If the facility has chosen Option 3, the total allowable volume of thinner used in the previous month (V_{th}) is calculated by equation 3.

$$V_{th} = \sum_{i=1}^{n} \left(R \times V_b\right)_i + \sum_{i=1}^{n} \left(R_{cold} \times V_{b-cold}\right)_i \qquad \text{Eqn. 3}$$

Where:

V_{th} = Total allowable volume of thinner for previous month (L thinner):

V_b = Volume of each batch, as supplied and before being thinned, used during non-cold-weather days during previous month (L coating as supplied):

R_{cold} = Maximum allowable thinning ratio used during cold weather days (L thinner/L coating as supplied):

$V_{b\text{-}cold}$ = Volume of each batch, as supplied and before being thinned, used during cold weather days of the previous month (L coating as supplied):

i = Each batch of coating; and

n = Total number of batches of coating.

If Option 4 is selected, the VOHAP content of the coating is used in place of the VOC as in Option 1.

An understanding of the shipyard MACT coating expressions and formulas is needed to interpret the regulations and the methods of determining compliance. These expressions are tabulated in Table 3 on page 17.

Step by Step Demonstration of Compliance

Step 1.0 Demonstrate compliance using VOC or VOHAP data.

Step 2.0 Set up a coating and thinning solvent database: determine category, VOHAP limit and VOC/VOHAP content of each batch of coating as supplied.

Step 3.0 Depending whether or not thinning solvents are added, determine compliance option.

<u>Option 1</u>

Step 4.1 Certify VOC/VOHAP content of each batch.

Step 5.1 Ascertain if painters properly notified that no thinning solvent may be added. View record of notification.

Step 6.1 View monthly record of VOC/VOHAP content of coating.

(Compliance is demonstrated if allowable limits not exceeded)

<u>Option 2</u>

Step 4.2 Determine volume of solids and maximum allowable thinning ratio for each batch. (Use Equations 1 and 2 as required)

Step 5.2 Determine notification of painters maximum allowable thinning ratio for specified solvent. View record of notification.

Step 6.2 View "as supplied" volume for each batch thinned in the previous month.

Step 7.2 View allowable amount of thinning solvent for each coating thinned during previous month. (Use Equation 3.)

Step 8.2 View monthly records show in the volume of thinner added to each batch of coating and that it does not exceed allowable volume.

(Compliance is demonstrated if volume of thinner does not exceed allowable volume)

<u>Option 3</u>

Step 4.3 Group all coatings using the same thinner type.

Step 5.3 Figure nonvolatile solids and maximum thinning ratio for each batch of coating. (Use Equations 1 and 2 as needed)

Step 6.3 View notification to painters of amount of solvent that can be added so as not to exceed maximum allowable ratio.

Step 7.3 Determine as supplied volume of thinner of each batch of coating during previous month.

Step 8.3 Determine the total volume of thinning solvent used for each coating thinned during the previous month using Equation 3.

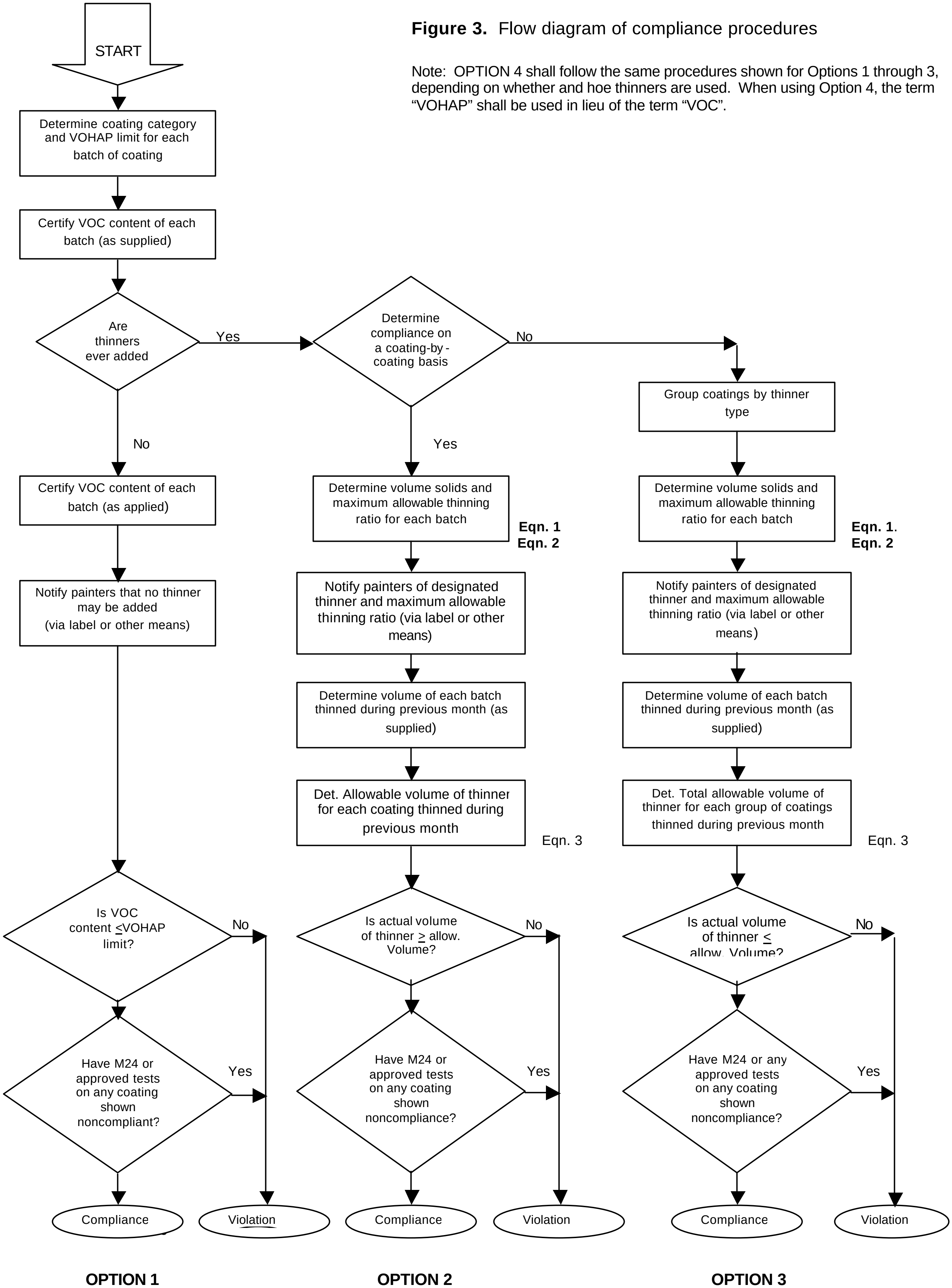
Step 9.3 View monthly records that volume of thinner does not exceed allowable volume.

(Compliance is demonstrated if allowable volume of solvent not exceeded.)

Compliance procedures are outlined by the flow diagram in Figure 3.

Figure 3. Flow diagram of compliance procedures

Note: OPTION 4 shall follow the same procedures shown for Options 1 through 3, depending on whether and hoe thinners are used. When using Option 4, the term “VOHAP” shall be used in lieu of the term “VOC”.



Pollution Prevention Opportunities in Shipyard Coating Operations*

The best way to reduce pollution is to prevent it in the first place. Some companies have creatively implemented pollution prevention techniques that improve efficiency and increase profits while at the same time minimizing environmental impacts. This can be done in many ways such as reducing material inputs, re-engineering processes to reuse by-products, improving management practices, and employing substitution of toxic chemicals. Some smaller facilities are able to actually get below regulatory thresholds just by reducing pollutant releases through aggressive pollution prevention policies.

The Pollution Prevention Act of 1990 established a national policy of managing waste through source reduction, which means preventing the generation of waste. The Pollution Prevention Act also established as national policy a hierarchy of waste management options for situations in which source reduction cannot be implemented feasibly. In the waste management hierarchy, if source reduction is not feasible the next alternative is recycling of wastes, followed by energy recovery, and waste treatment as a last alternative.

Painting and Coating

Painting and coating operations are typically the largest single source of VOC emissions from shipyards. In addition, paint waste can account for more than half of the total hazardous waste generated at shipyards. Paint waste at a shipyard may include leftover paint in containers, overspray, paint that is no longer usable (Non-spec paint),and rags and other materials contaminated with paint. In many cases, the amount of paint waste generated can be reduced through the use of improved equipment, alternative coatings, nd good operating practices.

Regulations under the CAA aimed at reducing VOC emissions by limiting VOC content in paints were finalized in 1996.Shipyards required to comply with these rules and wishing to implement the pollution prevention options discussed below, should consult the regulations to determine the practical and legal implications of these options.

Application Equipment

In order to effectively reduce paint waste and produce a quality coating, proper application techniques should be supplemented with efficient application equipment. Through the use of equipment with high transfer efficiencies, the amount of paint lost to overspray is minimized.

*From EPA Sector Notebook, Profile of the Shipbuilding and Repair Industry, EPA/310-R-97-008.

High Volume Low Pressure (HVLP)Spray Guns

The HVLP spray gun is basically a conventional air spray gun with modifications and special nozzles that atomize the paint at very low air pressures. The atomizing pressure of HVLP systems is often below 10 psi. The design of this gun allows better transfer efficiency and reduced overspray than that of conventional air guns. The low application pressure decreases excessive bounceback and allows better adhesion of the coating to the substrate.

Although improvements are consistently being made to overcome its limitations, most HVLP systems have some definite drawbacks, including difficulty atomizing viscous coatings, sensitivity to variations in incoming pressure, sensitivity to wind, and slow application rates.

Airless Spray Guns

Instead of air passing through the spray gun, an airless system applies static pressure to the liquid paint. As the paint passes through the nozzle, the sudden drop in pressure atomizes the paint and it is carried to the substrate by its own momentum. Pressure is applied to the paint by a pump located at a remote supply. These systems have become favorable over conventional air-spray systems for three main reasons: 1) reduced overspray and rebound, 2) high application rates and transfer efficiency, and 3) permits the use of high-build coatings with the result that fewer coats are required to achieve specific film thickness.

One major disadvantage of some airless spray systems is the difficulty applying very thin coats. If coatings with less than a mil in thickness are required, such as primers applied to objects that require weld ability, it may be difficult to use an airless system.

Electrostatic Spray

Electrostatic spray systems utilize paint droplets that are given a negative charge in the vicinity of a positively charged substrate. The droplets are attracted to the substrate and a uniform coating is formed. This system works well on cylindrical and rounded objects due to its “wrap-around” effect that nearly allows the object to be coated from one side. Very little paint is lost to overspray, and it has been noted to have a transfer efficiency of over 95%. In order for an electrostatic system to operate properly, the correct solvent balance is needed. The evaporation rate must be slow enough for the charged droplets to reach the substrate in a fluid condition to flow out into a smooth film, but fast enough to avoid sagging. The resistivity of the paint must also be low enough to enable the paint droplets to acquire the maximum charge.

Although the operating costs of electrostatic spray systems are relatively low, the initial capital investment can be high. This system has been found to work extremely well in small parts painting applications. Sometimes the installation of an electrostatic powder coating system can replace a water curtain spray paint booth.

Heated Spray

When paint is heated, its viscosity is reduced allowing it to be applied with a higher solids content, thus requiring less solvent. When the paint is heated in a special container and supplied to the gun at 140º to 160º .F, coatings of 2 to 4 mils dry-film thickness can be applied in one operation, resulting in considerable savings in labor cost. In addition, much of the associated solvent emissions are eliminated.

Heating the coating prior to application can be used with both conventional and airless spray applications. An in-line heater is used to heat the coating before it reaches the gun. As the coating is propelled through the air, it cools rapidly and increases viscosity after it hits the surface, allowing for better adhesion to the substrate.

Plural Component Systems

A common problem that shipyards face when working with two-part coatings is overmixing. Once the component parts of a catalyst coating are mixed, the coating must be applied. Otherwise, the excess unused coating will cure and require disposal. Additionally, the coating equipment must be cleaned immediately after use.

One large advantage of plural component technology is the elimination of paint waste generated by mixing an excess amount of a two-part coating. This is achieved through the use of a special mixing chamber that mixes the pigment and catalyst seconds before the coating is applied. Each component is pumped through a device that controls the mixing ratio and then is combined in a mixing chamber. From the mixing chamber, the mixed coating travels directly to the spray guns. The only cleaning that is required is the mixing chamber, gun, and the length of supply hose connecting them.

Recycle Paint Booth Water

Various methods and equipment are used to reduce or eliminate the discharge of the water used in water-wash booths (water curtain). These methods and equipment prevent the continuous discharge of booth waters by conditioning (i.e., adding detackifiers and paint-dispersing polymers) and removing paint solids. The most basic form of water maintenance is the removal of paint solids by manual skimming and/or raking. This can be performed without water conditioning since some portion of solvent-based paints usually float and/or sink. With the use of detackifiers and paint-dispersing polymer treatments, more advanced methods of solids removal can be implemented. Some common methods are discussed below.

<u>Wet-Vacuum Filtration</u>. Wet-vacuum filtration units consist of an industrial wet-vacuum head on a steel drum containing a filter bag. The unit is used to vacuum paint sludge from the booth. The solids are filtered by the bag and the water is returned to the booth. Large vacuum units are also commercially available that can be moved from booth to booth by forklift or permanently installed near a large booth.

Tank-Side Weir. A weir can be attached to the side of a side-draft booth tank, allowing floating material to overflow from the booth and be pumped to a filtering tank for dewatering.

Consolidator. A consolidator is a separate tank into which booth water is pumped. The water is then conditioned by the introduction of chemicals. Detackified paint floats to the surface of the tank, where it is skimmed by a continuously moving blade. The clean water is recycled to the booth.

Filtration. Various types of filtration units are used to remove paint solids from booth water. This is accomplished by pumping the booth water to the unit, where the solids are separated and the water returned to the booth. The simplest filtration unit consists of a gravity filter bed utilizing paper or cloth media. Vacuum filters are also employed, some of which require precoating with diatomaceous earth.

Centrifuge Methods. Two common types of centrifugal separators are the hydrocyclone and the centrifuge. The hydrocyclone is used to concentrate solids. The paint booth water enters a cone-shaped unit under pressure and spins around the inside surface. The spinning imparts an increased force of gravity, which causes most of the solid particles to be pulled outward to the walls of the cone. Treated water exits the top of the unit and the solids exit from the bottom. Some systems have secondary filtration devices to further process the solids. The centrifuge works in a similar manner, except that the booth water enters a spinning drum, which imparts the centrifugal force needed for separating the water and solids. Efficient centrifugation requires close control of the booth water chemistry to ensure a uniform feed. Also, auxiliary equipment such as booth water agitation equipment may be needed (EPA, 1995).

Convert Wash-Water Booths to Dry Filter Booths

Water-wash booths can be converted to or replaced by dry filter booths. The dry filter booths have the potential to eliminate the discharge of wastewater, but they create a solid waste stream. The choice between using a water-wash booth or a dry filter booth is primarily based on the quantity of overspray. It is usually cost effective to use a dry filter booth when paint usage does not exceed 20 gallons/8 hour shift/10 feet of chamber width. A 1989 Navy study concluded that conversion from wet to dry booths can be cost effective, when performed over a range of operational scenarios. The Navy work included a survey of military and industrial facilities that have successfully made the conversion and an economic analysis based on typical Navy painting operational parameters (EPA, 1995).

Alternative Coatings

The use of solvent-based coatings can lead to high costs to meet air and water quality regulations. In efforts to reduce the quantity and toxicity of waste paint disposal, alternative coatings have been developed that do not require the use of solvents and thinners.

Powder Coatings

Metal substrates can be coated with certain resins by applying the powdered resin to the surface, followed by application of heat. The heat melts the resin, causing it to flow and form a uniform coating. The three main methods in use for applying the powder coating are fluidized bed, electrostatic spray, and flame spraying.

Flame spraying is the most applicable method for shipyards. The resin powder is blown through the gun by compressed air. The particles are melted in a high temperature flame and propelled against the substrate. This process is used widely with epoxy powders for aluminum surfaces.

The electrostatic application method uses the same principles as the electrostatic spray. The resin powder is applied to the surface electrostatically. Heat is applied to the covered surface and the powder melts to form the coating. The transfer efficiency and recyclability of this method is very high.

The elimination of environmental problems associated with many liquid-based systems is one of the major advantages of powder coatings. The use of powder coatings eliminates the need for solvents and thereby emits negligible volatile organic compounds (VOCs). Powder coatings also reduce the waste associated with unused two-part coatings that have already been mixed. Since powder overspray can be recycled, material utilization is high and solid waste generation is low. Recent case studies demonstrate that powder coating systems can be cleaner, more efficient, and more environmentally acceptable, while producing a higher quality finish than many other coating systems.

Water-Based Paints

Water-based coatings are paints containing a substantial amount of water instead of volatile solvents. Alkyd, polyester, acrylic, and epoxy polymers can be dissolved and dispersed by water. In addition to reduction in environmental hazards due to substantially lower air emissions, a decrease in the amount of hazardous paint sludge generated can reduce disposal cost. The applications for water-based coatings in the shipyard are limited. Some of the areas of use may include the inside of the superstructure of a vessel, and other surfaces that are protected from extreme conditions.

100 % Solids Coatings

One hundred percent solids coatings contain little or no VOCs. Plural component polyurethane can be applied at 100% solids by mixing the reaction components at or just before the spray gun and cures as the components react after application. As the reaction is exothermic, the coating can be applied at lower temperatures.

Ultra violet cured coatings can also be applied at 100% solids and be rapidly cured on exposure to UV radiation.

Epoxy coatings are available at 100 % solids. The epoxy resin is mixed with a catalyst just before applying and cures after application.

Good Operating Practices

In many cases, simply altering a painting process can reduce wastes through better management.

Coating Application

A good manual coating application technique is very important in reducing waste. Most shipyards rely primarily on spraying methods for coating application. If not properly executed, spraying techniques have a high potential for creating waste; therefore, proper application techniques are very important.

Reducing Overspray. One of the most common means of producing paint waste at shipyards is overspray. Overspray not only wastes some of the coating, it also presents environmental and health hazards. It is important that shipyards try to reduce the amount of overspray as much as possible. Techniques for reducing overspray include: 1) triggering the paint gun at the end of each pass instead of carrying the gun past the edge of the surface before reversing directions, 2) avoiding excessive air pressure, and 3) keeping the gun perpendicular to the surface being coated.

Uniform Finish. Application of a good uniform finish provides the surface with quality coating with a higher performance than an uneven finish. An uneven coating does not dry evenly and commonly results in using excess paint.

Overlap

An overlap of 50 percent can reduce the amount of waste by increasing the production rate and overall application efficiency. Overlap of 50 percent means that for every pass that the operator makes with the spray gun, 50 percent of the area covered by the previous pass is also sprayed. If less than a 50 percent overlap is used, the coated surface may appear streaked. If more than a 50 percent overlap is used, the coating is wasted and more passes are required to coat the surface.

Material Application

Major waste reduction is available by optimizing material application processes. These processes include spray delivery systems and non-spray resin application methods. Non-spray application methods include closed mold systems, vacuum bag mold systems, resin roller dispensers, prespray fiber reinforcing, and in-house resin impregnation. These no-spray techniques reduce material waste and energy costs during application. The lower application pressures reduce the cost and maintenance of pressure lines, pumps, controls, and fittings. Routine cleanups of work areas are also reduced.

Spray Delivery Systems

The fabrication process for fiberglass construction and the wastes produced are highly dependent on the equipment and procedures used. The current system of resin and gelcoat delivery systems include high-pressure air, medium-pressure airless, and low-pressure air-assisted airless spray guns.

- The high-pressure air system is used less due to the large amount of expensive high-pressure compressed air required and significant air emissions generated.

- The airless method produces a pressurized resin stream electrostatically atomized through a nozzle. The nozzle orifice and spray angle can be varied by using different tips. The size of the orifice affects the delivery efficiency, with larger orifices resulting in greater raw material loss. Airless spray guns are considered to be very efficient in the delivery of resin to the work surface.

- The air-assisted airless technology modifies the airless gun by introducing pressurized air on the outer edge of the resin stream as it exits the pressure nozzle. The air stream forms an envelope, which focuses the resin to follow a controllable spray pattern. Since more resin ends up on the mold with this technology, the amount of spraying is reduced leading to a reduction in air emissions. It is estimated that a savings of 5 to 20 percent in net loss of resin spray waste for the air-assisted airless gun is achieved compared to the airless gun.

Resin Roller Application

This application uses pumped resin and catalyst from drums or bulk containers. The resin and catalyst are precisely metered in a gun-type line much like the paint plural component systems. A resin roller dispenser transfers the catalyzed resin to the mold surface. This eliminates the material lost due to overspray and bounceback of the resin. Air emissions are also greatly reduced with this type of delivery system.

Thermoplastic Resins

Thermoplastic resins have the advantage of being easily recycled by applying heat, which returns the resin to a liquid state. In its liquid state, the resin can be reused in the manufacture of other fiberglass components in shipbuilding. The use of thermoplastics offers faster curing cycles, lower emission during processing, lower costs per pound of raw material used, ease of recycling material, and, in some cases, lower labor costs. With the recent advances in the processing technologies and thermoplastic resin systems, the shipbuilding industries are reexamining the application of thermoplastics versus thermoset material systems.

References

1. National Emission Standards for Hazardous Air Pollutants for Shipbuilding and Ship Repair (Surface Coating) Operations — 40 CFR Part 63 — Federal Register / Vol. 60 / No. 241, p. 64330

2. EPA Sector Notebook — Profile of the Shipbuilding and Repair Industry, EPA/310-R-97-008

3. A Guidebook on How to Comply with the Shipbuilding and Ship Repair (Surface Coating) Operations National Emission Standards for Hazardous Air Pollutants EPA 453/B-97-001

4. Conducting Environmental Compliance Inspections, EPA Region 10

5. Multi-Media Investigation Manual, US EPA Office of Enforcement EPA-330/9-89-003-R

6. Pollution Prevention at Shipyards.

7. Method 24 – Determination of Volatile Matter Content, Density, Volume of Solids and Weight of Surface Coatings, EPA-340/9-98-003-011

8. Standard Procedure for Collection of Coating and Ink Samples by Reference Methods 24 and 24A, EPA-340/1-91-010

9. Accredited Testing Laboratories

Web Sites

1. U. S. Department of Transportation, Maritime Administration. Links page lists all U. S. shipyards.

2. U. S. Naval Shipyards. Information on U. S. Navy shipyards.

3. U. S. EPA, Technology Transfer Network.

Appendix A

Federal Regulations National Emission Standards for Hazardous Air Pollutants For Shipbuilding and Ship Repair (Surface Coating) Operations
40 CFR Part 63

Environmental Protection Agency, Region 4, Air Programs Branch, 345 Courtland Street, Atlanta, Georgia 30365.

Mississippi Department of Environmental Quality, Bureau of Pollution Control, Air Quality Division, P.O. Box 10385, Jackson, Mississippi 39289–0385.

Effective immediately, all requests, applications, reports and other correspondence required pursuant to the newly delegated standards should not be submitted to the Region 4 office, but should instead be submitted to the following address: Office of Pollution Control, Mississippi Department of Environmental Quality, P.O. Box 10385, Jackson, Mississippi 39289–0385.

FOR FURTHER INFORMATION CONTACT: Scott M. Martin, Regulatory Planning and Development Section, Air Programs Branch, United States Environmental Protection Agency, Region 4, 345 Courtland Street N.E., Atlanta, Georgia 30365, (404) 347–3555, x4216.

SUPPLEMENTARY INFORMATION: Section 301, in conjunction with Sections 110 and 111(c)(1) of the Clean Air Act as amended November 15, 1990, authorizes EPA to delegate authority to implement and enforce the standards set out in 40 CFR Part 60, (NSPS).

On November 10, 1981, EPA initially delegated the authority for implementation and enforcement of the NSPS programs to the state of Mississippi. On September 29, 1995, Mississippi requested a delegation of authority for implementation and enforcement of the following NSPS category found in 40 CFR Part 60.

Automobile and Light Duty Truck Surface Coating Operations, as amended by 59 FR 51383 (October 11, 1994), as specified in 40 CFR 60, Subpart MM.

After a thorough review of the request, the Regional Administrator determined that such a delegation was appropriate for this source category with the conditions set forth in the original delegation letter of November 30, 1981. Mississippi sources subject to the requirements of this subpart will now be under the jurisdiction of Mississippi.

Since review of the pertinent Mississippi laws, rules, and regulations showed them to be adequate for the implementation and enforcement of the aforementioned category of NSPS, the EPA hereby notifies the public that it has delegated the authority for the source category listed above on October 30, 1995. The Office of Management and Budget has exempted this rule from the requirements of section 6 of Executive Order 12866.

Authority: This notice is issued under the authority of sections 101, 111, and 301 of the Clean Air Act, as Amended (42 U.S.C. 7401, 7411, and 7601).

Dated: November 22, 1995.

Patrick M. Tobin,

Acting Regional Administrator.

[FR Doc. 95–30553 Filed 12–14–95; 8:45 am]

BILLING CODE 6560–50–P

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40 CFR Part 63

[AD–FRL–5335–3]

RIN 2060–AD98

National Emission Standards for Hazardous Air Pollutants for Shipbuilding and Ship Repair (Surface Coating) Operations

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: This action promulgates national emission standards for hazardous air pollutants (NESHAP) under Section 112 of the Clean Air Act as amended in 1990 (CAA) for shipbuilding and ship repair (surface coating) operations. The NESHAP requires existing and new major sources to control emissions using the maximum achievable control technology (MACT) to control hazardous air pollutants (HAP).

The MACT described herein is based on maximum HAP limits for various categories of marine coatings. Surface coating operations at shipyards are the focus of the NESHAP, and a variety of HAP are used as solvents in marine coatings. The HAP emitted by the facilities covered by this final rule include xylene, toluene, ethylbenzene, methyl ethyl ketone, methyl isobutyl ketone, ethylene glycol, and glycol ethers. All of these pollutants can cause reversible or irreversible toxic effects following exposure. The potential toxic effects include irritation of the eye, nose, throat, and skin and damage to the blood cells, heart, liver, and kidneys. The final rule is estimated to reduce baseline emissions of HAP by 24 percent or 318.5 megagrams per year (Mg/yr) (350 tons per year (tpy)).

The emissions reductions achieved by these standards, combined with the emissions reductions achieved by similar standards, will achieve the primary goal of the CAA, which is to ''enhance the quality of the Nation's air resources so as to promote the public health and welfare and productive capacity of its population''. The intent of this final regulation is to protect the public health by requiring the maximum degree of reduction in emissions of volatile organic hazardous air pollutants (VOHAP) from new and existing sources, taking into consideration the cost of achieving such emission reduction, any nonair quality, health and environmental impacts, and energy requirements.

DATES: The effective date is December 15, 1995. Incorporation by reference of certain publications listed in the regulations is approved by the director of the Federal Register as of December 15, 1995.

ADDRESSES: *Background Information Document.* The background information document (BID) for the promulgated standards may be obtained from the U.S. Department of Commerce, National Technical Information Service (NTIS), Springfield, Virginia, 22161, telephone number (703) 487–4650. Please refer to ''National Emission Standards for Hazardous Air Pollutants for Shipbuilding and Ship Repair Facilities (Surface Coating)—Background Information Document for Final Standards,'' EPA–453/R–95–016b. The BID contains (1) a summary of the changes made to the standards since proposal and (2) a summary of all the public comments made on the proposed standards and the Administrator's response to the comments.

Electronic versions of the promulgation BID as well as this final rule are available for download from the EPA's Technology Transfer Network (TTN), a network of electronic bulletin boards developed and operated by the Office of Air Quality Planning and Standards. The TTN provides information and technology exchange in various areas of air pollution control. The service is free, except for the cost of a phone call. Dial (919) 541–5742 for data transfer of up to a 14,400 bits per second. If more information on TTN is needed, contact the systems operator at (919) 541–5384.

Docket. Docket No. A–92–11, containing supporting information used in developing the promulgated standards, is available for public inspection and copying from 8 a.m. to 5:30 p.m., Monday through Friday, at the EPA's Air and Radiation Docket and Information Center, Waterside Mall, Room M–1500, Ground Floor, 401 M Street SW, Washington, DC 20460. A reasonable fee may be charged for copying.

FOR FURTHER INFORMATION CONTACT: Dr. Mohamed Serageldin at (919) 541–2379, Emission Standards Division (MD–13), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711.

SUPPLEMENTARY INFORMATION: Under Section 307(b)(1) of the CAA, judicial review of NESHAP is available only by the filing of a petition for review in the U.S. Court of Appeals for the District of Columbia Circuit within 60 days of publication of this rule. Under Section 307(b)(2) of the CAA, the requirements that are the subject of this action may not be challenged later in civil or criminal proceedings brought by the EPA to enforce these requirements.

The information presented in this preamble is organized as follows:

I. Regulatory Background and Purpose

Section 112 of the CAA requires the EPA to evaluate and control HAP emissions. The control of HAP is to be achieved through promulgation of emission standards under Sections 112(d) and (f), and of work practice standards under Section 112(h) where appropriate, for categories of sources that emit HAP. Pursuant to Section 112(c) of the CAA, the EPA published in the Federal Register the initial list of source categories that emit HAP on July 16, 1992 (57 FR. 31576). This list includes major and area sources of HAP for which the EPA intends to issue regulations between November 1992 and November 2000.

The CAA was created, in part, ''to protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and productive capacity of its population'' 42 U.S.C. § 7401(b). This final regulation will protect the public health by reducing emissions of HAP from surface coating operations at shipbuilding and ship repair facilities (shipyards).

Many shipyards are major sources of HAP emissions, emitting over 23 Mg/yr (25 tpy) of organic HAP, including toluene, xylene, ethylbenzene, methanol, methyl ethyl ketone, methyl isobutyl ketone, ethylene glycol and glycol ethers. All of these pollutants can cause reversible or irreversible toxic effects following exposure. The potential toxic effects include irritation of the eyes, nose, throat, and skin, irritation and damage to the blood cells, heart, liver, and kidneys. These adverse health effects are associated with a wide range of ambient concentrations and exposure times and are influenced by source-specific characteristics such as emission rates and local meteorological conditions. Health impacts are also dependent on multiple factors that affect human variability, such as genetics, age, health status (e.g., the presence of pre-existing disease), and lifestyle.

The final standards will reduce VOHAP emissions from shipyard surface coating operations by 318.5 Mg/yr (350 tpy) from a baseline level of 1,362 Mg/yr (1,497 tpy). No significant economic impacts are associated with the final standards. No firms or facilities are at risk of closure as a result of the final standards, and there will not be a significant economic impact on a substantial number of small entities.

II. The Standards

The final rule is applicable to all existing and new shipbuilding and repair facilities that are major sources of HAP or are located at plant sites that are major sources. Major source facilities that are subject to this rule must not apply any marine coating with a VOHAP content in excess of the applicable limit and must implement the work practices required in the rule. Section 112(a) of the CAA defines major source as a source, or group of sources, located within a contiguous area and under common control that emits or has the potential to emit, considering controls, 9.1 Mg/yr (10 tpy) or more of any individual HAP or 22.7 Mg/yr (25 tpy) or more of any combination of HAP. Area sources are stationary sources that do not qualify as ''major.'' The term ''affected source'' as used in this rule means the total of all HAP emission points at each shipbuilding and ship repair facility that is subject to the rule. ''Potential to emit'' is defined in the Section 112 General Provisions (40 CFR 63.2) as ''the maximum capacity of a stationary source to emit a pollutant under its physical or operational design.''

To determine the applicability of this rule to facilities that are within a contiguous area of other HAP-emitting emission sources that are not part of the source category covered by this rule, the owner or operator must determine whether the plant site as a whole is a major source. A formal HAP emissions inventory must be used to determine if total HAP emissions from all HAP emission sources at the plant site meets the definition of a major source. The actual emissions of HAP from most shipyards are substantially less than the major source cutoff limits [i.e., 9.1 Mg/yr (10 tpy) of any single HAP, or 22.8 Mg/yr (25 tpy) of all HAP combined]. If the source becomes a synthetic minor source through accepting enforceable restrictions that ensure potential and actual HAP emissions will be below the major source cutoffs, the NESHAP does not apply. See promulgation BID Section 2.4 for additional details and the associated recordkeeping provisions (see **ADDRESSES** section of this preamble).

Existing major sources may switch to area source status by obtaining and complying with a federally enforceable limit on their potential to emit prior to the ''compliance date'' of the regulation. The ''compliance date'' for this regulation is defined as December 16, 1996. New major sources are required to comply with the NESHAP requirements upon start up or the promulgation date, whichever is later. Existing major sources may switch to area source status by obtaining and complying with a federally enforceable limit on their potential to emit that makes the facility an area source prior to the ''compliance date'' of the regulation. The compliance date for this regulation is December 16, 1996. A facility that has not obtained federally enforceable limits on its potential to emit by the compliance date, and that has not complied with the NESHAP requirements, will be in violation of the NESHAP. New major sources are required to comply with the NESHAP requirements upon start-up or the promulgation date, whichever is later. All sources that are major sources for HAP on the compliance date are required to comply permanently with the NESHAP to ensure that the maximum achievable reductions in toxic emissions are achieved and maintained. All major sources for HAP on the ''compliance date'' are required to comply permanently with the NESHAP to ensure that the maximum achievable reductions in toxic emissions are achieved and maintained.

The final standards impose limits on the VOHAP content of 23 types of coatings used at shipyards. Compliance with the VOHAP limits must be demonstrated on a monthly basis. The promulgated standards include four compliance options to allow owners or operators flexibility in demonstrating compliance with the VOHAP limits. The final standards also allow for an alternative means of compliance other than using compliant coatings, if approved by the Administrator. The Administrator shall approve the alternative means of limiting emissions if, in the Administrator's judgment, (after control) emissions of VOHAP per volume solids applied will be no greater than those from the use of coatings that comply with the applicable VOHAP limits.

The final standards also require that all handling and transfer of VOHAP containing materials to and from containers, tanks, vats, vessels, and piping systems be conducted in a manner that minimizes spills and other factors leading to emissions. (This requirement includes hand- or brush-application of coatings.) In addition, containers of thinning solvent or waste that hold any VOHAP must be normally closed (to minimize evaporation) unless materials are being added to or removed from them.

Owners or operators of existing shipbuilding and ship repair (surface coating) operations subject to the requirements promulgated under Section 112(d) of the CAA are required to comply with the standards within 1 year from December 15, 1995. Owners or operators of new shipbuilding and ship repair (surface coating) operations with initial startup before or after December 15, 1996 are required to comply with all requirements of the standards upon startup. The first requirement is the initial notification due 6 months before start up.

III. Summary of Impacts

These standards will reduce nationwide emissions of HAP from shipbuilding and ship repair (surface coating) operations by approximately 318.5 Mg (350 tons) in 1997 compared to the emissions that would result in the absence of the standards. These standards will also reduce volatile organic compounds (VOC) emissions from those same shipbuilding and ship repair (surface coating) operations by approximately 837 Mg (920 tons) in 1997 compared to the emissions that would result in the absence of the standards. No significant adverse secondary air, water, solid waste, or energy impacts are anticipated from the promulgation of these standards.

Implementation of this regulation is expected to result in nationwide annualized costs for existing shipyards of about $2 million beyond baseline. This estimation is based on an analysis of the application of VOHAP limits on marine coatings at all existing major source facilities not currently controlled to the level of the standards.

The economic impact analysis conducted prior to proposal showed that the economic impacts from the proposed standard would be insignificant. An update of the economic impact analysis (due to revisions to the final rule) indicates that the original conclusion still holds true. Implementation of the rule is not expected to cause significant economic impacts for the 35 major source facilities in this industry.

IV. Significant Changes to the Proposed Standards

A. Public Participation

The standards were proposed and the preamble was published in the Federal Register on December 6, 1994 (59 FR 62681). The preamble to the proposed standards discussed the availability of the regulatory text and proposal BID, which described the regulatory alternatives considered and the impacts of those alternatives. Public comments were solicited at the time of proposal, and copies of the regulatory text and BID were distributed to interested parties. Electronic versions of the preamble, regulation, and BID were made available to interested parties via the TTN (see **SUPPLEMENTARY INFORMATION** section of this preamble).

To provide interested persons the opportunity for oral presentation of data, views, or arguments concerning the proposed standards, a public hearing was held on January 18, 1995 in Research Triangle Park, North Carolina. The public comment period was from December 6, 1994 to February 17, 1995. In all, 22 comment letters were received (including one duplicate). The comments have been carefully considered, and changes have been made to the proposed standards when determined by the Administrator to be appropriate.

B. Comments on the Proposed Standards

Comments on the proposed standards were received from 22 commenters; the commenters were comprised mainly of States, shipyard owners or operators, marine coating manufacturers, environmental groups, and trade associations. A detailed discussion of these comments and responses can be found in the promulgation BID, which is referred to in the **ADDRESSES** section of this preamble. The summary of comments and responses in the BID serve as the basis for the revisions that have been made to the standards between proposal and promulgation. (Some additional changes have been made to clarify the standards and improve their organization.) Most of the comment letters contained multiple comments. For summary purposes, the comments were grouped into several topic areas.

C. Significant Comments/Changes

Several changes have been made since the proposal of these standards. The majority of the changes have been made to clarify portions of the rule that were unclear to the commenters. A summary of the major comments and changes is presented below.

(1) Applicability to Coating Manufacturers

Several commenters asked the EPA to regulate the manufacture and sale of marine coatings rather than the end users (shipyards). While this approach has some obvious advantages, the EPA does not have authority to regulate (with this NESHAP) the manufacture and sale of coatings under Section 112(d). The EPA plans to address requirements for coating manufacturers under Section 183(e) of the CAA by March 1997 through either a national rule or a control techniques guidelines (CTG).

(2) Number of Major Sources/MACT Floor

Some commenters thought the EPA underestimated the number of major source shipyards, and thereby erred in the MACT floor determination. Although the EPA based the proposed number of major sources on the best available information at the time, there has been recent additional information provided by the Louisiana Department of Environmental Quality (Louisiana having more shipyards than any other State) showing there are four other shipyards with HAP emissions greater than the major source cutoffs. At the same time, however, the same additional information indicated that one of the shipyards identified in the original list of 25 has HAP emissions well below the major source cutoffs (based on recent operating permit data).

This information along with other State permit data on annual paint usage and VOC/VOHAP emissions indicates that there are 35 major sources, instead of the estimated 25 discussed in the proposal preamble. Even though 10 additional major sources have been identified, the MACT floor would not change. At proposal, the EPA based the MACT floor on the control achieved by the best-performing 5 sources, as required by Section 112 (d)(3) of the CAA when there are less than 30 sources in the category. If there are 35 sources in the category, the MACT floor would be based on the best-performing 4.2 sources (12 percent of the 35) as required by Section 112 (d)(3). Under both situations, the MACT floor is the same.

Another point to be considered is that even if there are 45 major source shipyards, the best 12 percent is still represented by the best $0.12 \times 45 = 5.4$ or best 5 yards. Both the MACT floor and the associated marine coating VOHAP limits would be identical. Since the NESHAP proposal date, the Navy has adopted VOC limits identical to (or more stringent than) the 1992 California limits for all Naval shipyards and Navy-related work. Since at least two of the Naval shipyards qualify as major sources, if the MACT floor were to be recalculated today, the limits would be identical to the proposed (and promulgated) limits, regardless of the approach used to determine the mean or median level of control. The Louisiana limits, which are less stringent for the major use categories of coatings, would not enter into any of the floor calculations.

Recent indications from the Navy and other industry representatives reveal that fewer affected sources exist today because of base closings and consolidation efforts. The original estimation of 25 major source shipyards was based on annual paint and solvent usage, type of work conducted (new construction versus repair), number of employees, and type (size) of vessels serviced. The (weighted) average HAP concentration of all marine coatings is an integral part of emissions estimates and determining if a shipyard qualifies as a major source facility. Other HAP-emitting processes at most shipyards such as welding, metal forming/cutting, and abrasive blasting exist, but the vast majority of HAP emissions come from organic solvents used in marine paints and solvents used for thinning and cleaning.

(3) Elimination of Compliance Option 1

Proposed compliance option 1 required that each and every container of coating be tested or certified prior to application. Based on comments pertaining to its impracticality and the unrealistic costs associated with testing/certifying every container of coating, compliance option 1 was eliminated from the final rule. The flow diagram (included as Figure 1 in the regulation) summarizing the various compliance options was similarly revised and simplified.

(4) Training Requirements

In the proposed rule, the EPA required training and certification for all personnel involved with paints and/or solvents. There were several comments regarding the inappropriate amount and level of detail involved with the training and annual personnel certifications. Some commenters indicated that there was a high turnover rate involving personnel, and the proposed training requirements would impose a significant impact for very little reduction in HAP emissions. The EPA has determined that it is appropriate to leave the details of training to the individual shipyards who can best define the real needs of their specific locations and applications. Affected sources are responsible for complying with the standards, and it is in their own best interest to ensure that workers are aware of the associated requirements. Therefore, all training requirements related to painting/thinning, handling/transfer of VOHAP-containing materials, and certification of all personnel involved with surface coating operations have been eliminated from the final rule.

(5) Definition of Pleasure Craft

A definition of pleasure craft has been added to ensure that the standards apply only to those coatings (and solvents) used on commercial and military vessels. Some commenters were concerned that, as proposed, the rule could be interpreted to regulate coatings used on pleasure crafts. Other commenters suggested that pleasure crafts should be included. The EPA did not intend to include coatings used on pleasure crafts in these standards. Such coatings (applications) will be considered under the development of the Boat Manufacturing NESHAP.

(6) Definition of Affected Source

The definition of affected source was modified to ensure that the requirements of the standards apply only to those sources (major source shipyards) with a minimum annual marine coating usage of 1,000 L (264.2 gal). The primary focus of this NESHAP is surface coating operations and this clarification will minimize/eliminate the impact on shipyards with minimal surface coating emissions.

(7) Reporting and Notification Changes

Changes have also been made to the notification and reporting schedules. The initial notification deadline has been extended from 120 to 180 days. The frequency of reporting has also been reduced from the proposed quarterly requirement to semiannual. This change was made to allow shipyards to be consistent with current/upcoming Title V permit requirements. The first compliance certification report is due 6 months after the compliance date.

(8) Exemptions

Several commenters recommended that the EPA adopt some of the exemptions provided in various State regulations. Since the MACT floor was based on three shipyards located in California and those yards have exemptions similar to those requested, the EPA determined there would be no significant impact and adopted the following exemptions:

a. Any individual coating with annual usage less than 200 liters (52.8 gallons) is exempt from the requirements of the standards (i.e., the applicable VOHAP limit). The total amount of all coatings exempted in any given year cannot exceed 1,000 liters (264.2 gallons); and

b. Any coating applied via nonrefillable hand-held aerosol cans is exempt from the requirements of the standards.

(9) Revision of Equations

The equations used with compliance options 2 and 3 (proposed options 3 and 4) have been changed so that calculations are based on volume solids. The revised equations require the VOHAP limits based on volume solids be used in place of the VOHAP limits based on volume of coating less water and non-HAP exempt solvents. This change was made to provide a uniform basis for calculating emission reductions (i.e., associated with thinning additions or add-on control devices).

(10) Weather-related VOHAP limits

The proposal preamble requested comments on how to handle thinning issues for various climatic conditions. The EPA reviewed the comments and collected additional information on both cold-and hot/humid-weather thinning practices. As a result of this information, cold-weather VOHAP limits are included as part of the final rule. If the temperature is below 4.5°C (40°F) at the time the coating is applied and the source needs to thin that coating beyond the applicable VOHAP limit, the date, time, and temperature (including units) must be documented, and the applicable cold-weather VOHAP limit may be used. The cold-weather VOHAP limits on a solids basis were increased equivalently, but the actual values vary for each coating category. The cold-weather VOHAP limits are applicable only to as-supplied coatings that are greater than 40 percent solids by volume.

With regards to hot/humid weather conditions, the data and responses to Section 114 information requests sent by EPA to nine shipyards and other information received did not provide a basis for including a humid weather thinning allowance. Respondents identified meteorological conditions under which coatings must be thinned or not applied at all. Only one shipyard, which uses large quantities of water-based preconstruction primer, maintained that a humid weather thinning allowance should be adopted. However, the shipyard did not explain how hydrocarbon-based thinners would relate to its water-based operation.

Hot and humid weather conditions appear to inhibit coating operations work less frequently than does cold weather. The different responses can best be understood as they relate to the specifications for thinning under different climatic conditions, which are dependent on paint type and manufacturer. Some coating formulations lose at high temperature more organic solvent than others which could lead to thickening (increase in viscosity) of the paint. This occurs where the rate of application is low and paint containers remain uncovered. Nevertheless, beginning in September 1994, shipyards performing work for the Navy in humid climates such as Louisiana, Florida, and Virginia are required by the Navy to use paints with VOHAP contents levels that are in compliance with the limits in the NESHAP, without provision for additional thinning. There is no reason that VOHAP limits that are achievable for paints used by the Navy cannot also be achieved for paints used by commercial shipyards located in humid climates and that, therefore, a thinning allowance for hot/humid weather conditions is not necessary. If conditions necessitate application of small amount of noncompliant coatings, the regulation provides a low usage exemption of 1,000 liters of coating per year.

D. Minor Changes

This section contains a list of several of the minor changes to the final rule. A discussion of these changes can be found in the promulgation BID. (See **ADDRESSES** section of this preamble.)

(1) Revisions to definitions and phrasing have been made to clarify the regulation.

(2) Based on comments received and on changes to the notification and recordkeeping and reporting requirements, those sections of the standard have been reorganized and overlapping requirements clarified or eliminated.

(3) Table 2, which contains the VOHAP limits for the various coating categories, has been simplified to contain only one set of units (metric). The conversion factor for English units is included as a footnote to the table.

V. Control Techniques Guidelines (CTG)

Section 183(b)(4) of the CAA requires the Administrator to issue a CTG document for limiting VOC and particulate matter emissions from coatings (paints) and solvents used in the shipbuilding and ship repair industry. Since VOHAP emissions from this industry are generally a subset of VOC emissions, the control techniques evaluated for the MACT standard are also applicable to VOC emissions. Therefore, the EPA has developed the CTG concurrently with the NESHAP and will be issuing final guidance under a separate notice. As explained in the proposal notice (AD–FR–), no CTG is being issued for particulate matter emissions.

VI. Administrative Requirements

A. Docket

The Docket is an organized and complete file of all the information considered by the EPA in the development of this rulemaking. The Docket is a dynamic file, since material is added throughout the rulemaking development. The docketing system is intended to allow members of the public and industries involved to readily identify and locate documents so that they can effectively participate in the rulemaking process. Along with the statement of basis and purpose of the proposed and promulgated standards and the EPA responses to significant comments, the contents of the Docket will serve as the record in case of judicial review [see 42 U.S.C. 7607(d)(7)(A)].

B. Paperwork Reduction Act

The Office of Management and Budget (OMB) is currently reviewing the information collection request (ICR) requirements contained in this rule under the provisions of the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.* and has assigned OMB control number 2060–0330 and EPA ICR number 1712.2.

The information required to be collected by this rule is needed as part of the overall compliance and enforcement program. It is necessary to identify the regulated entities who are subject to the rule and to ensure their compliance with the rule. The recordkeeping and reporting requirements are mandatory and are being established under authority of Section 114 of the Act. All information submitted to the EPA for which a claim of confidentiality is made will be safeguarded according to the EPA policies set forth in Title 40, Chapter 1, Part 2, Subpart B—Confidentiality of Information (see 40 CFR part 2; 41 FR 36902, September 1, 1976; amended by 43 FR 39999, September 8, 1978; 43 FR 42251, September 28, 1978; 44 FR 17674, March 23, 1979).

The total annual reporting and recordkeeping burden for this collection averaged over the first 3 years is estimated to be $26,218 per year. The average burden, per respondent, is 772 hours per year. This estimate includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information. The total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information. The rule requires an initial one-time notification from each respondent and subsequent notification every 6 months to indicate their compliance status. At the time of the initial notification each respondent would also be required to submit an implementation plan that describes compliance procedures. A respondent would also be required to keep necessary records of data to determine compliance with the standards in the regulation. The data would be recorded monthly. A report would need to be submitted semi-annually by each respondent. There would be an estimated 35 respondents to the proposed collection requirements.

Send comments on the EPA's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, OPPE

Regulatory Information Division; U. S. Environmental Protection Agency (2136); 401 M Street SW.; Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street NW.; Washington, DC 20503; marked ''Attention: Desk Officer for EPA.'' Include the OMB number and the EPA ICR number in any correspondence.

C. Executive Order 12866: Administrative Designation and Regulatory Analysis

Under Executive Order 12866 [58 FR 51735 (October 4, 1993)], the EPA is required to judge whether a regulation is ''significant'' and therefore subject to OMB review and the requirements of this Executive Order to prepare a regulatory impact analysis (RIA). The Order defines ''significant regulatory action'' as one that is likely to result in a rule that may (1) have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities; (2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; (3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs, or the rights and obligation of recipients thereof; or (4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

Pursuant to the terms of Executive Order 12866, it has been determined that this rule is not a ''significant regulatory action'' and is therefore not subject to OMB review.

D. Executive Order 12875

To reduce the burden of federal regulations on States and small governments, the President issued Executive Order 12875 on October 26, 1993, entitled Enhancing the Intergovernmental Partnership. In particular, this executive order is designed to require agencies to assess the effects of regulations that are not required by statute and that create mandates upon State, local, or tribal governments. Two methods exist for complying with the requirements of the executive order: (1) Assure that funds necessary to pay direct costs of compliance with a regulation are provided, or (2) provide OMB a description of the communications and consultations with State/local/tribal governments, the nature of their concerns, any written submission from them, and the EPA's position supporting the need to issue the regulation.

The EPA has always been concerned about the effect of the cost of regulations on small entities; the EPA has consulted with and sought input from public entities to explain costs and burdens they may incur.

The EPA advised interested parties on July 16, 1992 (57 FR 21592), of the categories considered as major and area sources of HAP, and shipbuilding and ship repair (surface coating) industry was listed as a category of both major and area sources. The EPA made significant effort to hear from all levels of interest and all segments of the shipbuilding and ship repair industry. To facilitate comments and input, the EPA conducted comprehensive mailouts of draft and proposal package materials in 1993 and 1994 to shipyards, Department of the Navy (Naval Sea Systems Command), marine coating manufacturers, and State and local government officials. All were given opportunity to comment on the presented regulatory development activities of the standard. Throughout the regulatory development process and more specifically in consultation meetings, industry representatives from commercial/private shipyards, the U.S. Navy, and various trade associations were given an opportunity to comment on the proposed regulatory approach and the MACT alternatives being developed. The major topic areas resulting from these discussions included the need for cold-weather thinning limits, flexibility in compliance approaches, and the need for additional data regarding certain coating categories (i.e., inorganic zincs). Some of these meetings were held at EPA, while others were conducted at shipyard locations. In addition, individual consultations were conducted with three local (air quality management) districts in California regarding the use of the mass of VOHAP/volume of solids for determining compliance when the coating is thinned.

The EPA addressed many of the suggestions and comments received from State and local agencies during the public comment period, many of which will reduce the impact to small businesses. Some of these suggestions resulted in changes to the rule, including modification of the definition of pleasure craft to clarify that the standards apply only to coatings (and solvents) used on commercial and military vessels and not to boats in non-military shipyards less than 20 meters in length; modification of the definition of affected source to ensure that the requirements of the standards apply only to those sources (major source shipyards) with a minimum annual marine coating usage of 1,000 Liters (264.2 gallons); exemption of any individual coating with annual usage less than 200 liters (52.8 gallons) (i.e., the applicable VOHAP limit); exemption of any coating applied via nonrefillable hand-held aerosol cans; making the equations used to determine thinning allowance the same for all options to provide a uniform basis for calculating emission reductions (i.e., associated with thinning additions or add-on control devices); extension of the initial notification deadline from 120 to 180 days and reduction of the frequency of reporting from the proposed quarterly requirement to semiannual, which allows shipyards to be consistent with current/upcoming Title V permit requirements; reorganization and clarification of the notification and recordkeeping and reporting requirement, including revision of the definitions and phrasing to ensure that the terminology is understandable; and the addition of 10 major sources based on data provided by Louisiana and Texas State agencies.

Some of the other major concerns that were noted in the State and/or local agency comments and that were considered by the EPA in developing the proposed and final rule involved realistic work practice standards, multiple compliance options to provide flexibility for shipyard owners/operators and State regulators, and streamlining (or eliminating) any overlapping recordkeeping and reporting requirements. Documentation of all meetings and public comments can be found in Docket A–92–11.

The EPA has considered the purpose and intent of Executive Order 12875 and has determined that shipbuilding and ship repair facility NESHAP are needed. The rule is generally required by statute under Section 112 of the CAA because shipbuilding and ship repair facilities emit significant quantities of air pollutants. Through meetings and consultations during project development and proposal, efforts were made to inform entities of the costs required to comply with the regulation; in addition, modifications were made to reduce the burden to small entities.

E. Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires the EPA to consider potential impacts of proposed regulations on small business ''entities.'' If a preliminary analysis indicates that a proposed regulation would have a significant economic impact on 20 percent or more of small entities, then a regulatory flexibility analysis must be prepared. The EPA's analysis of these impacts was provided in the preamble to the proposed rule (59 FR 62681) and no negative impacts for small businesses will result from the changes incorporated into the final rule.

Pursuant to the provisions of 5 U.S.C. 605(b), I hereby certify that this rule will not have a significant economic impact on a substantial number of small business entities.

F. Unfunded Mandates Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), Public Law 104–4, establishes requirements for Federal agencies to assess the effects of their regulatory actions on State, local, and tribal governments and the private sector. Under Section 202 of the UMRA, the EPA generally must prepare a written statement including a cost-benefit analysis, for proposed and final rules with ''Federal mandates'' that may result in expenditures to State, local, and tribal governments, in the aggregate, or to the private sector, of $100 million or more in any 1 year. Before promulgating an EPA rule for which a written statement is needed, Section 205 of the UMRA generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective or least burdensome alternative that achieves the objectives of the rule. The provisions of Section 205 do not apply when they are inconsistent with applicable law. Moreover, Section 205 allows EPA to adopt an alternative other than the least costly, most cost-effective or least burdensome alternative if the Administrator publishes with the final rule an explanation why that alternative was not adopted. Before EPA establishes any regulatory requirements that may significantly or uniquely affect small governments, including tribal governments, it must have developed under Section 203 of the UMRA a small government agency plan. The plan must provide for notifying potentially affected small governments, enabling officials of affected small governments to have meaningful and timely input in the development of EPA regulatory proposals with significant Federal intergovernmental mandates and informing, educating, and advising small governments on compliance with the regulatory requirements.

The EPA has determined that the action promulgated today does not include a Federal mandate that may result in estimated costs of $100 million or more to either State, local, or tribal governments in the aggregate, or to the private sector. Therefore, the requirements of the Unfunded Mandates Act do not apply to this action.

List of Subjects in 40 CFR Part 63

Environmental protection, Air pollution control, Incorporation by reference, Marine coating limits, Reporting and recordkeeping requirements, Shipbuilding and ship repair standards.

Dated: November 14, 1995.

Carol M. Browner,

Administrator.

For the reasons set out in the preamble, title 40, chapter I, part 63 of the Code of Federal Regulations is amended as follows:

PART 63—NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FOR SHIPBUILDING AND SHIP REPAIR (SURFACE COATING)

1. The authority citation for part 63 continues to read as follows:

Authority: Sections 101, 112, 114, 116, and 301 of the Clean Air Act (42 U.S.C. 7401 *et seq.*, as amended by Pub. L. 101–549, 104 Stat. 2399).

2. Section 63.14 is amended by adding paragraph (b)(4) through (b)(14) to read as follows:

§ 63.14 Incorporation by reference.

* * * * *

(b) * * *

(4) ASTM D523–89, Standard Test Method for Specular Gloss, IBR approved for § 63.782.

(5) ASTM D1475–90, Standard Test Method for Density of Paint, Varnish, Lacquer, and Related Products, IBR approved for § 63.788 appendix A.

(6) ASTM D2369–93, Standard Test Method for Volatile Content of Coatings, IBR approved for § 63.788 appendix A.

(7) ASTM D3912–80, Standard Test Method for Chemical Resistance of Coatings Used in Light-Water Nuclear Power Plants, IBR approved for § 63.782.

(8) ASTM D4017–90, Standard Test Method for Water and Paints and Paint Materials by Karl Fischer Method, IBR approved for § 63.788 appendix A.

(9) ASTM D4082–89, Standard Test Method for Effects of Gamma Radiation on Coatings for Use in Light-Water Nuclear Power Plants, IBR approved for § 63.782.

(10) ASTM D4256–89 [reapproved 1994], Standard Test Method for Determination of the Decontaminability of Coatings Used in Light-Water Nuclear Power Plants, IBR approved for § 63.782.

(11) ASTM D3792–91, Standard Test Method for Water Content of Water-Reducible Paints by Direct Injection into a Gas Chromatograph, IBR approved for § 63.788 appendix A.

(12) ASTM D3257–93, Standard Test Methods for Aromatics in Mineral Spirits by Gas Chromatography, IBR approved for § 63.786(b).

(13) ASTM E260–91, Standard Practice for Packed Column Gas Chromatography, IBR approved for § 63.786(b).

(14) ASTM E180–93, Standard Practice for Determining the Precision of ASTM Methods for Analysis and Testing of Industrial Chemicals, IBR approved for § 63.786(b).

3. Part 63 is amended by adding subpart II to read as follows:

Subpart II—National Emission Standards for Shipbuilding and Ship Repair (Surface Coating)

Secs.

Subpart II—National Emission Standards for Shipbuilding and Ship Repair (Surface Coating)

§ 63.780 Relationship of subpart II to subpart A of this part.

Table 1 of this subpart specifies the provisions of subpart A of this part that apply to owners and operators of sources subject to the provisions of this subpart.

§ 63.781 Applicability.

(a) The provisions of this subpart apply to shipbuilding and ship repair operations at any facility that is a major source.

(b) The provisions of this subpart do not apply to coatings used in volumes of less than 200 liters (52.8 gallons) per year, provided the total volume of coating exempt under this paragraph does not exceed 1,000 liters per year (264 gallons per year) at any facility. Coatings exempt under this paragraph shall be clearly labeled as ''low-usage exempt,'' and the volume of each such coating applied shall be maintained in the facility's records.

(c) The provisions of this subpart do not apply to coatings applied with hand-held, nonrefillable, aerosol containers or to unsaturated polyester resin (i.e., fiberglass lay-up) coatings. Coatings applied to suitably prepared fiberglass surfaces for protective or decorative purposes are subject to this subpart.

(d) The provisions in subpart A of this part pertaining to startups, shutdowns, and malfunctions and continuous monitoring do not apply to this source category unless an add-on control system is used to comply with this subpart in accordance with § 63.783(c).

§ 63.782 Definitions.

Terms used in this subpart are defined in the Clean Air Act (CAA), in subpart A of part 63, or in this section as follows:

Add-on control system means an air pollution control device such as a carbon absorber or incinerator that reduces pollution in an air stream by destruction or removal prior to discharge to the atmosphere.

Affected source means any shipbuilding or ship repair facility having surface coating operations with a minimum 1,000 liters (L) (264 gallons [gal]) annual marine coating usage that is subject to this subpart.

Air flask specialty coating means any special composition coating applied to interior surfaces of high pressure breathing air flasks to provide corrosion resistance and that is certified safe for use with breathing air supplies.

Antenna specialty coating means any coating applied to equipment through which electromagnetic signals must pass for reception or transmission.

Antifoulant specialty coating means any coating that is applied to the underwater portion of a vessel to prevent or reduce the attachment of biological organisms and that is registered with the EPA as a pesticide under the Federal Insecticide, Fungicide, and Rodenticide Act.

As applied means the condition of a coating at the time of application to the substrate, including any thinning solvent.

As supplied means the condition of a coating before any thinning, as sold and delivered by the coating manufacturer to the user.

Batch means the product of an individual production run of a coating manufacturer's process. A batch may vary in composition from other batches of the same product.

Bitumens mean black or brown materials that are soluble in carbon disulfide and consist mainly of hydrocarbons.

Bituminous resin coating means any coating that incorporates bitumens as a principal component and is formulated primarily to be applied to a substrate or surface to resist ultraviolet radiation and/or water.

Certify means, in reference to the volatile organic compounds (VOC) content or volatile organic hazardous air pollutants (VOHAP) content of a coating, to attest to the VOC content as determined through analysis by Method 24 of appendix A to 40 CFR part 60 or through use of forms and procedures outlined in appendix A of this subpart, or to attest to the VOHAP content as determined through an Administrator-approved test method. In the case of conflicting results, Method 24 of Appendix A to 40 CFR part 60 shall take precedence over the forms and procedures outlined in appendix A to this subpart for the options in which VOC is used as a surrogate for VOHAP.

Coating means any material that can be applied as a thin layer to a substrate and which cures to form a continuous solid film.

Cold-weather time period means any time during which the ambient temperature is below 4.5°C (40°F) and coating is to be applied.

Container of coating means the container from which the coating is applied, including but not limited to a bucket or pot.

Cure volatiles means reaction products which are emitted during the chemical reaction which takes place in some coating films at the cure temperature. These emissions are other than those from the solvents in the coating and may, in some cases, comprise a significant portion of total VOC and/or VOHAP emissions.

Epoxy means any thermoset coating formed by reaction of an epoxy resin (i.e., a resin containing a reactive epoxide with a curing agent).

Exempt compounds means specified organic compounds that are not considered VOC due to negligible photochemical reactivity. Exempt compounds are specified in 40 CFR 51.100(s).

Facility means all contiguous or adjoining property that is under common ownership or control, including properties that are separated only by a road or other public right-of-way.

General use coating means any coating that is not a specialty coating.

Hazardous air pollutants (HAP) means any air pollutant listed in or pursuant to section 112(b) of the CAA.

Heat resistant specialty coating means any coating that during normal use must withstand a temperature of at least 204°C (400°F).

High-gloss specialty coating means any coating that achieves at least 85 percent reflectance on a 60 degree meter when tested by ASTM Method D523 (incorporation by reference—see § 63.14).

High-temperature specialty coating means any coating that during normal use must withstand a temperature of at least 426°C (800°F).

Inorganic zinc (high-build) specialty coating means a coating that contains 960 grams per liter (8 pounds per gallon) or more elemental zinc incorporated into an inorganic silicate binder that is applied to steel to provide galvanic corrosion resistance. (These coatings are typically applied at more than 2 mil dry film thickness.)

Major source means any source that emits or has the potential to emit, in the aggregate, 9.1 megagrams per year (10 tons per year) or more of any HAP or 22.7 megagrams per year (25 tons per year) or more of any combination of HAP.

Maximum allowable thinning ratio means the maximum volume of thinner that can be added per volume of coating without violating the standards of § 63.783(a), as determined using Equation 1 of this subpart.

Military exterior specialty coating or Chemical Agent Resistant Coatings (''CARC'') means any exterior topcoat applied to military or U.S. Coast Guard vessels that are subject to specific chemical, biological, and radiological washdown requirements.

Mist specialty coating means any low viscosity, thin film, epoxy coating applied to an inorganic zinc primer that penetrates the porous zinc primer and allows the occluded air to escape through the paint film prior to curing.

Navigational aids specialty coating means any coating applied to Coast Guard buoys or other Coast Guard waterway markers when they are recoated aboard ship at their usage site and immediately returned to the water.

Nonskid specialty coating means any coating applied to the horizontal surfaces of a marine vessel for the specific purpose of providing slip resistance for personnel, vehicles, or aircraft.

Nonvolatiles (or volume solids) means substances that do not evaporate readily. This term refers to the film-forming material of a coating.

Normally closed means a container or piping system is closed unless an operator is actively engaged in adding or removing material.

Nuclear specialty coating means any protective coating used to seal porous surfaces such as steel (or concrete) that otherwise would be subject to intrusion by radioactive materials. These coatings must be resistant to long-term (service life) cumulative radiation exposure (ASTM D4082–89 [incorporation by reference—see § 63.14]), relatively easy to decontaminate (ASTM D4256–89 [reapproved 1994] [incorporation by reference—see § 63.14]), and resistant to various chemicals to which the coatings are likely to be exposed (ASTM D3912–80 [incorporation by reference—see § 63.14]). [For nuclear coatings, see the general protective requirements outlined by the U.S. Nuclear Regulatory Commission in a report entitled ''U.S. Atomic Energy Commission Regulatory Guide 1.54'' dated June 1973, available through the Government Printing Office at (202) 512–2249 as document number A74062–00001.]

Operating parameter value means a minimum or maximum value established for a control device or process parameter that, if achieved by itself or in combination with one or more other operating parameter values, determines that an owner or operator has complied with an applicable emission limitation or standard.

Organic zinc specialty coating means any coating derived from zinc dust incorporated into an organic binder that contains more than 960 grams of elemental zinc per liter (8 pounds per gallon) of coating, as applied, and that is used for the expressed purpose of corrosion protection.

Pleasure craft means any marine or fresh-water vessel used by individuals for noncommercial, nonmilitary, and recreational purposes that is less than 20 meters in length. A vessel rented exclusively to or chartered by individuals for such purposes shall be considered a pleasure craft.

Pretreatment wash primer specialty coating means any coating that contains a minimum of 0.5 percent acid, by mass, and is applied only to bare metal to etch the surface and enhance adhesion of subsequent coatings.

Repair and maintenance of thermoplastic coating of commercial vessels (specialty coating) means any vinyl, chlorinated rubber, or bituminous resin coating that is applied over the same type of existing coating to perform the partial recoating of any in-use commercial vessel. (This definition does not include coal tar epoxy coatings, which are considered ''general use'' coatings.)

Rubber camouflage specialty coating means any specially formulated epoxy coating used as a camouflage topcoat for exterior submarine hulls and sonar domes. Sealant for thermal spray aluminum means any epoxy coating applied to thermal spray aluminum surfaces at a maximum thickness of 1 dry mil.

Ship means any marine or fresh-water vessel used for military or commercial operations, including self-propelled vessels, those propelled by other craft (barges), and navigational aids (buoys). This definition includes, but is not limited to, all military and Coast Guard vessels, commercial cargo and passenger (cruise) ships, ferries, barges, tankers, container ships, patrol and pilot boats, and dredges. For purposes of this subpart, pleasure crafts and offshore oil and gas drilling platforms are not considered ships.

Shipbuilding and ship repair operations means any building, repair, repainting, converting, or alteration of ships.

Special marking specialty coating means any coating that is used for safety or identification applications, such as markings on flight decks and ships' numbers.

Specialty coating means any coating that is manufactured and used for one of the specialized applications described within this list of definitions.

Specialty interior coating means any coating used on interior surfaces aboard U.S. military vessels pursuant to a coating specification that requires the coating to meet specified fire retardant and low toxicity requirements, in addition to the other applicable military physical and performance requirements.

Tack specialty coating means any thin film epoxy coating applied at a maximum thickness of 2 dry mils to prepare an epoxy coating that has dried beyond the time limit specified by the manufacturer for the application of the next coat.

Thinner means a liquid that is used to reduce the viscosity of a coating and that evaporates before or during the cure of a film.

Thinning ratio means the volumetric ratio of thinner to coating, as supplied.

Thinning solvent: see Thinner.

Undersea weapons systems specialty coating means any coating applied to any component of a weapons system intended to be launched or fired from under the sea.

Volatile organic compounds (VOC) is as defined in § 51.100(s) of this chapter.

Volatile organic hazardous air pollutants (VOHAP) means any compound listed in or pursuant to section 112(b) of the CAA that contains carbon, excluding metallic carbides and carbonates. This definition includes VOC listed as HAP and exempt compounds listed as HAP.

Weld-through preconstruction primer (specialty coating) means a coating that provides corrosion protection for steel during inventory, is typically applied at less than 1 mil dry film thickness, does not require removal prior to welding, is temperature resistant (burn back from a weld is less than 1.25 centimeters [0.5 inch]), and does not normally require removal before applying film-building coatings, including inorganic zinc high-build coatings. When constructing new vessels, there may be a need to remove areas of weld-through preconstruction primer due to surface damage or contamination prior to application of film-building coatings.

§ 63.783 Standards.

(a) No owner or operator of any existing or new affected source shall cause or allow the application of any coating to a ship with an as-applied VOHAP content exceeding the applicable limit given in Table 2 of this subpart, as determined by the procedures described in § 63.785 (c)(1) through (c)(4). For the compliance procedures described in § 63.785 (c)(1) through (c)(3), VOC shall be used as a surrogate for VOHAP, and Method 24 of Appendix A to 40 CFR part 60 shall be used as the definitive measure for determining compliance. For the compliance procedure described in § 63.785(c)(4), an alternative test method capable of measuring independent VOHAP shall be used to determine compliance. The method must be submitted to and approved by the Administrator.

(b) Each owner or operator of a new or existing affected source shall ensure that:

(1) All handling and transfer of VOHAP-containing materials to and from containers, tanks, vats, drums, and piping systems is conducted in a manner that minimizes spills.

(2) All containers, tanks, vats, drums, and piping systems are free of cracks, holes, and other defects and remain closed unless materials are being added to or removed from them.

(c) *Approval of alternative means of limiting emissions.* (1) The owner or operator of an affected source may apply to the Administrator for permission to use an alternative means (such as an add-on control system) of limiting emissions from coating operations. The application must include:

(i) An engineering material balance evaluation that provides a comparison of the emissions that would be achieved using the alternative means to those that would result from using coatings that comply with the limits in Table 2 of this subpart, or the results from an emission test that accurately measures the capture efficiency and control device efficiency achieved by the control system and the composition of the associated coatings so that the emissions comparison can be made;

(ii) A proposed monitoring protocol that includes operating parameter values to be monitored for compliance and an explanation of how the operating parameter values will be established through a performance test; and

(iii) Details of appropriate recordkeeping and reporting procedures.

(2) The Administrator shall approve the alternative means of limiting emissions if, in the Administrator's judgment, postcontrol emissions of VOHAP per volume applied solids will be no greater than those from the use of coatings that comply with the limits in Table 2 of this subpart.

(3) The Administrator may condition approval on operation, maintenance, and monitoring requirements to ensure that emissions from the source are no greater than those that would otherwise result from this subpart. § 63.784 Compliance dates.

(a) Each owner or operator of an existing affected source shall comply within 1 year after the effective date of this subpart.

(b) Each owner or operator of an existing unaffected area source that increases its emissions of (or its potential to emit) HAP such that the source becomes a major source that is subject to this subpart shall comply within 1 year after the date of becoming a major source.

(c) Each owner or operator of a new or reconstructed source shall comply with this subpart according to the schedule in § 63.6(b).

§ 63.785 Compliance procedures.

(a) For each batch of coating that is received by an affected source, the owner or operator shall (see Figure 1 of this section for a flow diagram of the compliance procedures):

(1) Determine the coating category and the applicable VOHAP limit as specified in § 63.783(a).

(2) Certify the as-supplied VOC content of the batch of coating. The owner or operator may use a certification supplied by the manufacturer for the batch, although the owner or operator retains liability should subsequent testing reveal a violation. If the owner or operator performs the certification testing, only one of the containers in which the batch of coating was received is required to be tested.

(b)(1) In lieu of testing each batch of coating, as applied, the owner or operator may determine compliance with the VOHAP limits using any combination of the procedures described in paragraphs (c)(1), (c)(2), (c)(3), and (c)(4) of this section. The procedure used for each coating shall be determined and documented prior to application.

(2) The results of any compliance demonstration conducted by the affected source or any regulatory agency using Method 24 shall take precedence over the results using the procedures in paragraphs (c)(1), (c)(2), or (c)(3) of this section.

(3) The results of any compliance demonstration conducted by the affected source or any regulatory agency using an approved test method to determine VOHAP content shall take precedence over the results using the procedures in paragraph (c)(4) of this section.

(c)(1) *Coatings to which thinning solvent will not be added.* For coatings to which thinning solvent (or any other material) will not be added under any circumstance or to which only water is added, the owner or operator of an affected source shall comply as follows:

(i) Certify the as-applied VOC content of each batch of coating.

(ii) Notify the persons responsible for applying the coating that no thinning solvent may be added to the coating by affixing a label to each container of coating in the batch or through another means described in the implementation plan required in § 63.787(b).

(iii) If the certified as-applied VOC content of each batch of coating used during a calendar month is less than or equal to the applicable VOHAP limit in § 63.783(a) (either in terms of g/L of coating or g/L of solids), then compliance is demonstrated for that calendar month, unless a violation is revealed using Method 24 of Appendix A to 40 CFR part 60.

(2) *Coatings to which thinning solvent will be added—coating-by-coating compliance.* For a coating to which thinning solvent is routinely or sometimes added, the owner or operator shall comply as follows:

(i) Prior to the first application of each batch, designate a single thinner for the coating and calculate the maximum allowable thinning ratio (or ratios, if the affected source complies with the cold-weather limits in addition to the other limits specified in Table 2 of this subpart) for each batch as follows:

$$R = \frac{(V_s)(\text{VOHAP limit}) - m_{VOC}}{D_{th}} \quad \text{Eqn. 1}$$

where:

R=Maximum allowable thinning ratio for a given batch (L thinner/L coating as supplied);

V_s=Volume fraction of solids in the batch as supplied (L solids/L coating as supplied);

VOHAP limit=Maximum allowable as-applied VOHAP content of the coating (g VOHAP/L solids);

m_{VOC}=VOC content of the batch as supplied [g VOC (including cure volatiles and exempt compounds on the HAP list)/L coating (including water and exempt compounds) as supplied];

D_{th}=Density of the thinner (g/L).

If V_s is not supplied directly by the coating manufacturer, the owner or operator shall determine V_s as follows:

$$V_s = 1 - \frac{m_{volatiles}}{D_{avg}} \quad \text{Eqn. 2}$$

where:

$m_{volatiles}$=Total volatiles in the batch, including VOC, water, and exempt compounds (g/L coating); and

D_{avg}=Average density of volatiles in the batch (g/L).

The procedures specified in § 63.786(d) may be used to determine the values of variables defined in this paragraph. In addition, the owner or operator may choose to construct nomographs, based on Equation 1 of this subpart, similar or identical to the one provided in appendix B of this subpart as a means of easily estimating the maximum allowable thinning ratio.

(ii) Prior to the first application of each batch, notify painters and other persons, as necessary, of the designated thinner and maximum allowable thinning ratio(s) for each batch of the coating by affixing a label to each container of coating or through another means described in the implementation plan required in § 63.787(b).

(iii) By the 15th day of each calendar month, determine the volume of each batch of the coating used, as supplied, during the previous month.

(iv) By the 15th day of each calendar month, determine the total allowable volume of thinner for the coating used during the previous month as follows:

$$V_{th} = \sum_{i=1}^{n} \left(R \times V_b\right)_i + \sum_{i=1}^{n} \left(R_{cold} \times V_{b-cold}\right)_i \qquad \text{Eqn. 3}$$

where:

V_{th}=Total allowable volume of thinner for the previous month (L thinner);

V_b=Volume of each batch, as supplied and before being thinned, used during non-cold-weather days of the previous month (L coating as supplied);

R_{cold}=Maximum allowable thinning ratio for each batch used during cold-weather days (L thinner/L coating as supplied);

$V_{b\text{-}cold}$=Volume of each batch, as supplied and before being thinned, used during cold-weather days of the previous month (L coating as supplied);

i=Each batch of coating; and

n=Total number of batches of the coating.

(v) By the 15th day of each calendar month, determine the volume of thinner actually used with the coating during the previous month.

(vi) If the volume of thinner actually used with the coating [paragraph (c)(3)(v) of this section] is less than or equal to the total allowable volume of thinner for the coating [paragraph (c)(3)(iv) of this section], then compliance is demonstrated for the coating for the previous month, unless a violation is revealed using Method 24 of Appendix A to 40 CFR part 60.

(3) *Coatings to which the same thinning solvent will be added—group compliance.* For coatings to which the same thinning solvent (or other material) is routinely or sometimes added, the owner or operator shall comply as follows:

(i) Designate a single thinner to be added to each coating during the month and ‘‘group’’ coatings according to their designated thinner.

(ii) Prior to the first application of each batch, calculate the maximum allowable thinning ratio (or ratios, if the affected source complies with the cold-weather limits in addition to the other limits specified in Table 2 of this subpart) for each batch of coating in the group using the equations in paragraph (c)(2) of this section.

(iii) Prior to the first application of each ‘‘batch,’’ notify painters and other persons, as necessary, of the designated thinner and maximum allowable thinning ratio(s) for each batch in the group by affixing a label to each container of coating or through another means described in the implementation plan required in § 63.787(b).

(iv) By the 15th day of each calendar month, determine the volume of each batch of the group used, as supplied, during the previous month.

(v) By the 15th day of each calendar month, determine the total allowable volume of thinner for the group for the previous month using Equation 3 of this subpart.

(vi) By the 15th day of each calendar month, determine the volume of thinner actually used with the group during the previous month.

(vii) If the volume of thinner actually used with the group [paragraph (c)(3)(vi) of this section] is less than or equal to the total allowable volume of thinner for the group [paragraph (c)(3)(v) of this section], then compliance is demonstrated for the group for the previous month, unless a violation is revealed using Method 24 of Appendix A to 40 CFR part 60.

(4) *Demonstration of compliance through an alternative (i.e., other than Method 24 of Appendix A to 40 CFR part 60) test method.* The owner or operator shall comply as follows:

(i) Certify the as-supplied VOHAP content (g VOHAP/L solids) of each batch of coating.

(ii) If no thinning solvent will be added to the coating, the owner or operator of an affected source shall follow the procedure described in § 63.785(c)(1), except that VOHAP content shall be used in lieu of VOC content.

(iii) If thinning solvent will be added to the coating, the owner or operator of an affected source shall follow the procedure described in § 63.785(c)(2) or (3), except that in Equation 1 of this subpart: the term ‘‘m_{VOC}’’ shall be replaced by the term ‘‘m_{VOHAP},’’ defined as the VOHAP content of the coating as supplied (g VOHAP/L coating) and the term ‘‘D_{th}’’ shall be replaced by the term ‘‘$D_{th(VOHAP)}$’’ defined as the average density of the VOHAP thinner(s) (g/L).

(d) A violation revealed through any approved test method shall result in a 1-day violation for enforcement purposes. A violation revealed through the recordkeeping procedures described in paragraphs (c)(1) through (c)(4) of this section shall result in a 30-day violation for enforcement purposes, unless the owner or operator provides sufficient data to demonstrate the specific days during which noncompliant coatings were applied.

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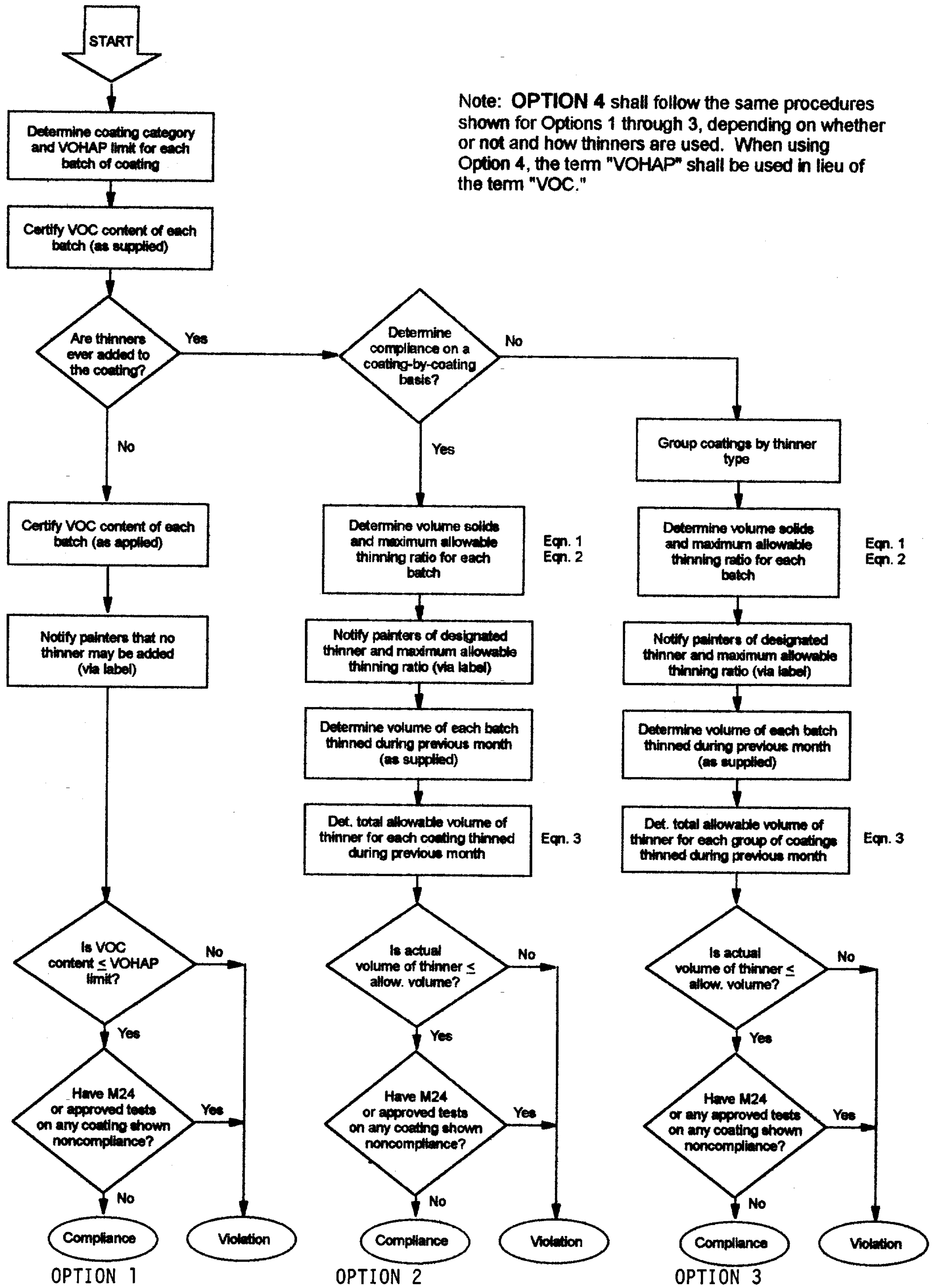
Figure 1 to §63.785 Flow diagram of compliance procedures



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§ 63.786 Test methods and procedures.

(a) For the compliance procedures described in § 63.785(c) (1) through (c)(3), Method 24 of 40 CFR part 60, appendix A, is the definitive method for determining the VOC content of coatings, as supplied or as applied. When a coating or thinner contains exempt compounds that are volatile HAP or VOHAP, the owner or operator shall ensure, when determining the VOC content of a coating, that the mass of these exempt compounds is included.

(b) For the compliance procedure described in § 63.785(c)(4), the Administrator must approve the test method for determining the VOHAP content of coatings and thinners. As part of the approval, the test method must meet the specified accuracy limits indicated below for sensitivity, duplicates, repeatability, and reproducibility coefficient of variation each determined at the 95 percent confidence limit. Each percentage value below is the corresponding coefficient of variation multiplied by 2.8 as in the ASTM Method E180–93: Standard Practice for Determining the Precision of ASTM Methods for Analysis and Testing of Industrial Chemicals (incorporation by reference—see § 63.14).

(1) *Sensitivity.* The overall sensitivity must be sufficient to identify and calculate at least one mass percent of the compounds of interest based on the original sample. The sensitivity is defined as ten times the noise level as specified in ASTM Method D3257–93: Standard Test Methods for Aromatics in Mineral Spirits by Gas Chromatography (incorporation by reference—see § 63.14). In determining the sensitivity, the level of sample dilution must be factored in.

(2) *Repeatability.* First, at the 0.1–5 percent analyte range the results would be suspect if duplicates vary by more than 6 percent relative and/or day to day variation of mean duplicates by the same analyst exceeds 10 percent relative. Second, at greater than 5 percent analyte range the results would be suspect if duplicates vary by more than 5 percent relative and/or day to day variation of duplicates by the same analyst exceeds 5 percent relative.

(3) *Reproducibility.* First, at the 0.1–5 percent analyte range the results would be suspect if lab to lab variation exceeds 60 percent relative. Second, at greater than 5 percent range the results would be suspect if lab to lab variation exceeds 20 percent relative.

(4) Any test method should include information on the apparatus, reagents and materials, analytical procedure, procedure for identification and confirmation of the volatile species in the mixture being analyzed, precision and bias, and other details to be reported. The reporting should also include information on quality assurance (QA) auditing.

(5) Multiple and different analytical techniques must be used for positive identification if the components in a mixture under analysis are not known. In such cases a single column gas chromatograph (GC) may not be adequate. A combination of equipment may be needed such as a GC/mass spectrometer or GC/infrared system. (If a GC method is used, the operator must use practices in ASTM Method E260–91: Standard Practice for Gas Chromatography [incorporation by reference—see § 63.14].)

(c) A coating manufacturer or the owner or operator of an affected source may use batch formulation data as a test method in lieu of Method 24 of Appendix A to 40 CFR part 60 to certify the as-supplied VOC content of a coating if the manufacturer or the owner or operator has determined that batch formulation data have a consistent and quantitatively known relationship to Method 24 results. This determination shall consider the role of cure volatiles, which may cause emissions to exceed an amount based solely upon coating formulation data. Notwithstanding such determination, in the event of conflicting results, Method 24 of appendix A of 40 CFR part 60 shall take precedence.

(d) Each owner or operator of an affected source shall use or ensure that the manufacturer uses the form and procedures mentioned in appendix A of this subpart to determine values for the thinner and coating parameters used in Equations 1 and 2 of this subpart. The owner or operator shall ensure that the coating/thinner manufacturer (or supplier) provides information on the VOC and VOHAP contents of the coatings/thinners and the procedure(s) used to determine these values.

§ 63.787 Notification requirements.

(a) Each owner or operator of an affected source shall comply with all applicable notification requirements in § 63.9(a) through (d) and (i) through (j), with the exception that the deadline specified in § 63.9(b) (2) and (3) shall be extended from 120 days to 180 days. Any owner or operator that receives approval pursuant to § 63.783(c) to use an add-on control system to control coating emissions shall comply with the applicable requirements of § 63.9(e) through (h).

(b) *Implementation plan.* The provisions of § 63.9(a) apply to the requirements of this paragraph.

(1) Each owner or operator of an affected source shall:

(i) Prepare a written implementation plan that addresses each of the subject areas specified in paragraph (b)(3) of this section; and

(ii) Not later than 180 days after the effective date of this subpart, submit the implementation plan to the Administrator for approval along with the notification required by § 63.9(b) (2) or (5), as applicable.

(2) The Administrator may require revisions to the initial plan where the Administrator finds that the plan does not adequately address each subject area listed in paragraph (b)(3) of this section or that the requirements in the plan are unclear.

(3) *Implementation plan contents.* Each implementation plan shall address the following subject areas:

(i) *Coating compliance procedures.* The implementation plan shall include the compliance procedure(s) under § 63.785(c) that the source intends to use.

(ii) *Recordkeeping procedures.* The implementation plan shall include the procedures for maintaining the records required under § 63.788, including the procedures for gathering the necessary data and making the necessary calculations.

(iii) *Transfer, handling, and storage procedures.* The implementation plan shall include the procedures for ensuring compliance with § 63.783(b).

(4) *Major sources that intend to become area sources by the compliance date.* Existing major sources that intend to become area sources by the compliance date December 16, 1996 may choose to submit, in lieu of the implementation plan required under paragraph (b)(1) of this section, a statement that, by the compliance date, the major source intends to obtain and comply with federally enforceable limits on their potential to emit which make the facility an area source. § 63.788 Recordkeeping and reporting requirements.

(a) Each owner or operator of an affected source shall comply with the applicable recordkeeping and reporting requirements in § 63.10 (a), (b), (d), and (f). Any owner that receives approval pursuant to § 63.783(c) to use an add-on control system to control coating emissions shall also comply with the applicable requirements of § 63.10 (c) and (e). A summary of recordkeeping and reporting requirements is provided in Table 3 of this subpart.

(b) *Recordkeeping requirements.* (1) Each owner or operator of an unaffected major source, as described in § 63.781(b), shall record the total volume of coating applied at the source to ships. Such records shall be compiled monthly and maintained for a minimum of 5 years.

(2) Each owner or operator of an affected source shall compile records on a monthly basis and maintain those records for a minimum of 5 years. At a minimum, these records shall include:

(i) All documentation supporting initial notification;

(ii) A copy of the affected source's approved implementation plan;

(iii) The volume of each low-usage-exempt coating applied;

(iv) Identification of the coatings used, their appropriate coating categories, and the applicable VOHAP limit;

(v) Certification of the as-supplied VOC content of each batch of coating;

(vi) A determination of whether containers meet the standards as described in § 63.783(b)(2); and

(vii) The results of any Method 24 of appendix A to 40 CFR part 60 or approved VOHAP measurement test conducted on individual containers of coating, as applied.

(3) The records required by paragraph (b)(2) of this section shall include additional information, as determined by the compliance procedure(s) described in § 63.785(c) that each affected source followed:

(i) *Coatings to which thinning solvent will not be added.* The records maintained by facilities demonstrating compliance using the procedure described in § 63.785(c)(1) shall contain the following information:

(A) Certification of the as-applied VOC content of each batch of coating; and

(B) The volume of each coating applied.

(ii) *Coatings to which thinning solvent will be added—coating-by-coating compliance.* The records maintained by facilities demonstrating compliance using the procedure described in § 63.785(c)(2) shall contain the following information:

(A) The density and mass fraction of water and exempt compounds of each thinner and the volume fraction of solids (nonvolatiles) in each batch, including any calculations;

(B) The maximum allowable thinning ratio (or ratios, if the affected source complies with the cold-weather limits in addition to the other limits specified in Table 2 of this subpart for each batch of coating, including calculations;

(C) If an affected source chooses to comply with the cold-weather limits, the dates and times during which the ambient temperature at the affected source was below 4.5°C (40°F) at the time the coating was applied and the volume used of each batch of the coating, as supplied, during these dates;

(D) The volume used of each batch of the coating, as supplied;

(E) The total allowable volume of thinner for each coating, including calculations; and

(F) The actual volume of thinner used for each coating.

(iii) *Coatings to which the same thinning solvent will be added—group compliance.* The records maintained by facilities demonstrating compliance using the procedure described in § 63.785(c)(3) shall contain the following information:

(A) The density and mass fraction of water and exempt compounds of each thinner and the volume fraction of solids in each batch, including any calculations;

(B) The maximum allowable thinning ratio (or ratios, if the affected source complies with the cold-weather limits in addition to the other limits specified in Table 2 of this subpart) for each batch of coating, including calculations;

(C) If an affected source chooses to comply with the cold-weather limits, the dates and times during which the ambient temperature at the affected source was below 4.5°C (40°F) at the time the coating was applied and the volume used of each batch in the group, as supplied, during these dates;

(D) Identification of each group of coatings and their designated thinners;

(E) The volume used of each batch of coating in the group, as supplied;

(F) The total allowable volume of thinner for the group, including calculations; and

(G) The actual volume of thinner used for the group.

(iv) *Demonstration of compliance through an alternative (i.e., non-Method 24 in appendix A to 40 CFR part 60) test method.* The records maintained by facilities demonstrating compliance using the procedure described in § 63.785(c)(4) shall contain the following information:

(A) Identification of the Administrator-approved VOHAP test method or certification procedure;

(B) For coatings to which the affected source does not add thinning solvents, the source shall record the certification of the as-supplied and as-applied VOHAP content of each batch and the volume of each coating applied;

(C) For coatings to which the affected source adds thinning solvent on a coating-by-coating basis, the source shall record all of the information required to be recorded by paragraph (b)(3)(ii) of this section; and

(D) For coatings to which the affected source adds thinning solvent on a group basis, the source shall record all of the information required to be recorded by paragraph (b)(3)(iii) of this section.

(4) If the owner or operator of an affected source detects a violation of the standards specified in § 63.783, the owner or operator shall, for the remainder of the reporting period during which the violation(s) occurred, include the following information in his or her records:

(i) A summary of the number and duration of deviations during the reporting period, classified by reason, including known causes for which a Federally-approved or promulgated exemption from an emission limitation or standard may apply.

(ii) Identification of the data availability achieved during the reporting period, including a summary of the number and total duration of incidents that the monitoring protocol failed to perform in accordance with the design of the protocol or produced data that did not meet minimum data accuracy and precision requirements, classified by reason.

(iii) Identification of the compliance status as of the last day of the reporting period and whether compliance was continuous or intermittent during the reporting period.

(iv) If, pursuant to paragraph (b)(4)(iii) of this section, the owner or operator identifies any deviation as resulting from a known cause for which no Federally-approved or promulgated exemption from an emission limitation or standard applies, the monitoring report shall also include all records that the source is required to maintain that pertain to the periods during which such deviation occurred and:

(A) The magnitude of each deviation;

(B) The reason for each deviation;

(C) A description of the corrective action taken for each deviation, including action taken to minimize each deviation and action taken to prevent recurrence; and

(D) All quality assurance activities performed on any element of the monitoring protocol.

(c) *Reporting requirements.* Before the 60th day following completion of each 6-month period after the compliance date specified in § 63.784, each owner or operator of an affected source shall submit a report to the Administrator for each of the previous 6 months. The report shall include all of the information that must be retained pursuant to paragraphs (b) (2) through (3) of this section, except for that information specified in paragraphs (b)(2) (i) through (ii), (b)(2)(v), (b)(3)(i)(A), (b)(3)(ii)(A), and (b)(3)(iii)(A). If a violation at an affected source is detected, the source shall also report the information specified in paragraph (b)(4) of this section for the reporting period during which the violation(s) occurred. To the extent possible, the report shall be organized according to the compliance procedure(s) followed each month by the affected source.

TABLE 1 TO SUBPART II OF PART 63—GENERAL PROVISIONS APPLICABILITY TO SUBPART II

Reference	Applies to subpart II	Comment
63.1(a)(1)–(3)	Yes.	
63.1(a)(4)	Yes	Subpart II clarifies the applicability of each paragraph in subpart A to sources subject to subpart II.
63.1(a)(5)–(7)	Yes.	
63.1(a)(8)	No	Discusses State programs.
63.1(a)(9)–(14)	Yes.	
63.1(b)(1)	Yes	§ 63.781 specifies applicability in more detail.
63.1(b)(2)–(3)	Yes.	
63.1(c)–(e)	Yes.	
63.2	Yes	Additional terms are defined in § 63.782; when overlap between subparts A and II occurs, subpart II takes precedence.
63.3	Yes	Other units used in subpart II are defined in that subpart.
63.4	Yes.	
63.5(a)–(c)	Yes.	
63.5(d)	Yes	Except information on control devices and control efficiencies should not be included in the application unless an add-on control system is or will be used to comply with subpart II in accordance with § 63.783(c).
63.5(e)–(f)	Yes.	
63.6(a)–(b)	Yes.	
63.6(c)–(d)	Yes	Except § 63.784(a) specifies the compliance date for existing affected sources.
63.6(e)–(f)	No	If an alternative means of limiting emissions (e.g., an add-on control system) is used to comply with subpart II in accordance with § 63.783(c), then these paragraphs do apply.
63.6(g)	No	§ 63.783(c) specifies procedures for application and approval of alternative means of limiting emissions.
63.6(h)	No	Subpart II does not contain any opacity or visible emission standards.
63.6(i)–(j)	Yes.	
63.7	No	If an alternative means of limiting emissions (e.g., an add-on control system) is used to comply with subpart II in accordance with § 63.783(c), then this section does apply.
63.8	No	If an alternative means of limiting emissions (e.g., an add-on control system) is used to comply with subpart II in accordance with § 63.783(c), then this section does apply.
63.9(a)–(d)	Yes	§ 63.787(a) extends the initial notification deadline to 180 days. § 63.787(b) requires an implementation plan to be submitted with the initial notification.
63.9(e)	No	If an alternative means of limiting emissions (e.g., an add-on control system) is used to comply with subpart II in accordance with § 63.783(c), then this paragraph does apply.
63.9(f)	No	Subpart II does not contain any opacity or visible emission standards
63.9(g)–(h)	No	If an alternative means of limiting emissions (e.g., an add-on control system) is used to comply with subpart II in accordance with § 63.783(c) then these paragraphs do apply.
63.9(i)–(j)	Yes.	
63.10(a)–(b)	Yes	§ 63.788(b)–(c) list additional recordkeeping and reporting requirements.
63.10(c)	No	If an alternative means of limiting emissions (e.g., an add-on control system) is used to comply with subpart II in accordance with § 63.783(c), then this paragraph does apply.
63.10(d)	Yes.	
63.10(e)	No	If an alternative means of limiting emissions (e.g., an add-on control system) is used to comply with subpart II in accordance with § 63.783(c), then this paragraph does apply.
63.10(f)	Yes.	
63.11	No	If an alternative means of limiting emissions (e.g., an add-on control system) is used to comply with subpart II in accordance with § 63.783(c), then this section does apply.
63.12–63.15	Yes.	

TABLE 2 TO SUBPART II OF PART 63.—VOLATILE ORGANIC HAP (VOHAP) LIMITS FOR MARINE COATINGS

Coating category	VOHAP limits [a b c]		
	Grams/liter coating (minus water and exempt compounds)	Grams/liter solids [d]	
		$t \geq 4.5°$ C	$t < 4.5°$ C [e]
General use	340	571	728
Specialty:			
Air flask	340	571	728
Antenna	530	1,439	
Antifoulant	400	765	971
Heat resistant	420	841	1,069
High-gloss	420	841	1,069
High-temperature	500	1,237	1,597

TABLE 2 TO SUBPART II OF PART 63.—VOLATILE ORGANIC HAP (VOHAP) LIMITS FOR MARINE COATINGS—Continued

Coating category	VOHAP limits [a b c]		
	Grams/liter coating (minus water and exempt compounds)	Grams/liter solids [d]	
		t ≥ 4.5° C	t < 4.5° C [e]
Inorganic zinc high-build	340	571	728
Military exterior	340	571	728
Mist	610	2,235	
Navigational aids	550	1,597	
Nonskid	340	571	728
Nuclear	420	841	1,069
Organic zinc	360	630	802
Pretreatment wash primer	780	11,095	
Repair and maint. of thermoplastics	550	1,597	
Rubber camouflage	340	571	728
Sealant for thermal spray aluminum	610	2,235	
Special marking	490	1,178	
Specialty interior	340	571	728
Tack coat	610	2,235	
Undersea weapons systems	340	571	728
Weld-through precon. primer	650	2,885	

[a] The limits are expressed in two sets of equivalent units. Either set of limits may be used for the compliance procedure described in § 63.785(c)(1), but only the limits expressed in units of g/L solids (nonvolatiles) shall be used for the compliance procedures described § 63.785(c) (2) through (4).

[b] VOC (including exempt compounds listed as HAP) shall be used as a surrogate for VOHAP for those compliance procedures described in § 63.785(c) (1) through (3).

[c] To convert from g/L to lb/gal, multiply by (3.785 L/gal)(1/453.6 lb/g) or 1/120. For compliance purposes, metric units define the standards.

[d] VOHAP limits expressed in units of mass of VOHAP per volume of solids were derived from the VOHAP limits expressed in units of mass of VOHAP per volume of coating assuming the coatings contain no water or exempt compounds and that the volumes of all components within a coating are additive.

[e] These limits apply during cold-weather time periods, as defined in § 63.782. Cold-weather allowances are not given to coatings in categories that permit over a 40 percent VOHAP content by volume. Such coatings are subject to the same limits regardless of weather conditions.

TABLE 3 TO SUBPART II OF PART 63.—SUMMARY OF RECORDKEEPING AND REPORTING REQUIREMENTS [a b c]

Requirement	All Opts.		Option 1		Option 2		Option 3	
	Rec	Rep	Rec	Rep	Rec	Rep	Rec	Rep
Notification (§ 63.9(a)–(d))	X	X						
Implementation plan (§ 63.787(b)) [d]	X	X						
Volume of coating applied at unaffected major sources (§ 63.781(b))	X							
Volume of each low-usage-exempt coating applied at affected sources (§ 63.781(c))	X	X						
ID of the coatings used, their appropriate coating categories, and the applicable VOHAP limit	X	X						
Determination of whether containers meet the standards described in § 63.783(b)(2)	X	X						
Results of M–24 or other approved tests	X	X						
Certification of the as-supplied VOC content of each batch	X							
Certification of the as-applied VOC content of each batch			X					
Volume of each coating applied			X	X				
Density of each thinner and volume fraction of solids in each batch					X	X		
Maximum allowable thinning ratio(s) for each batch					X	X	X	X
Volume used of each batch, as supplied					X	X	X	X
Total allowable volume of thinner					X	X	X	X
Actual volume of thinner used					X	X	X	X
Identification of each group of coatings and designated thinners							X	X

[a] Affected sources that comply with the cold-weather limits must record and report additional information, as specified in § 63.788(b)(3) (ii)(C), (iii)(C), and (iv)(D).

[b] Affected sources that detect a violation must record and report additional information, as specified in § 63.788(b)(4).

[c] OPTION 4: the recordkeeping and reporting requirements of Option 4 are identical to those of Options 1, 2, or 3, depending on whether and how thinners are used. However, when using Option 4, the term ''VOHAP'' shall be used in lieu of the term ''VOC,'' and the owner or operator shall record and report the Administrator-approved VOHAP test method or certification procedure.

[d] Major sources that intend to become area sources by the compliance date may, in lieu of submitting an implementation plan, choose to submit a statement of intent as specified in § 63.787(b)(4).

Appendix A to Subpart II of Part 63—VOC Data Sheet [1]

Properties of the Coating ''As Supplied'' by the Manufacturer [2]

Coating Manufacturer: ____________________
Coating Identification: ____________________
Batch Identification: ____________________

* Incorporation by reference—see § 63.14.

[1] Adapted from EPA–340/1–86–016 (July 1986), p. II–2.

[2] The subscript ''s'' denotes each value is for the coating ''as supplied'' by the manufacturer.

Supplied To: ____________________________

Properties of the coating as supplied [1] to the customer:

A. Coating Density: $(D_c)_s$ ____ g/L
[ ] ASTM D1475–90 * [ ] Other [3]
B. Total Volatiles: $(m_v)_s$ ____ Mass Percent
[ ] ASTM D2369–93 * [ ] Other [3]
C. Water Content: 1. $(m_w)_s$ ____ Mass Percent
[ ] ASTM D3792–91 * [ ] ASTM D4017–90 * [ ] Other [3]
2. $(v_w)_s$ ____ Volume Percent
[ ] Calculated [ ] Other [3]
D. Organic Volatiles: $(m_o)_s$ ____ Mass Percent
E. Nonvolatiles: $(v_n)_s$ ____ Volume Percent
[ ] Calculated [ ] Other [3]
F. VOC Content $(VOC)_s$:
1. ____ g/L solids (nonvolatiles)
2. ____ g/L coating (less water and exempt compounds)
G. Thinner Density: D_{th} ____ g/L
ASTM ____ [ ] Other [3]

[3] Explain the other method used under ''Remarks.''

Remarks: (use reverse side)

Signed: ______________ Date: ____

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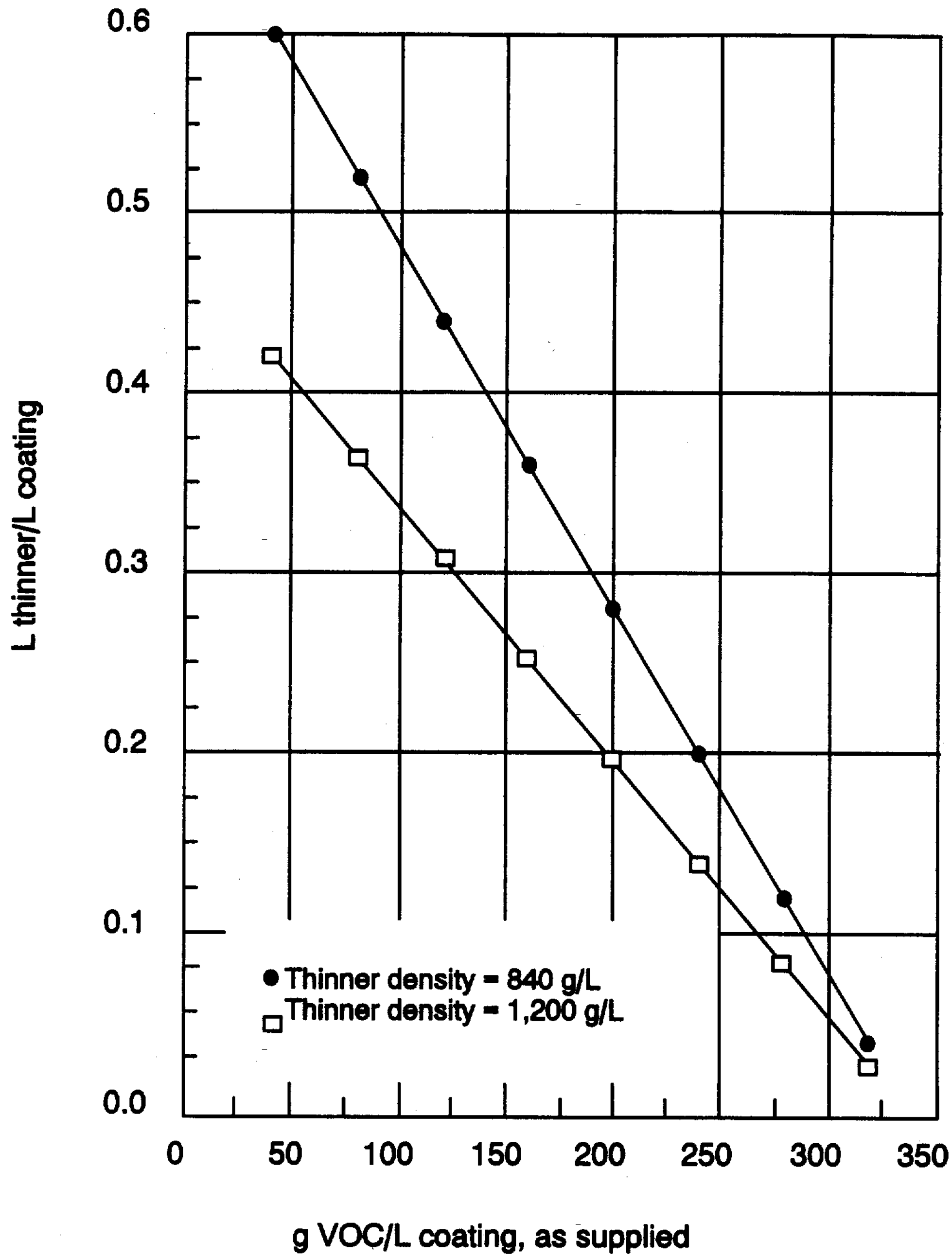
Appendix B To Subpart II of Part 63 -- Maximum Allowable Thinning Rates As A Function Of As Supplied VOC Content And Thinner Density[a,b]



[a] These graphs represent maximum allowable thinning ratios for general use coatings without water or exempt compounds.
[b] The average density of the volatiles in the coating was assumed = 840 g solvent/L solvent.

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Appendix B

Inspector Training

Conduction Environmental Compliance Inspection Training

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What is a Government inspector?

The inspector is often the personification of the entire agency he/she represents. It is the inspector who knocks at the door. The inspector is often the only image many will ever have of your agency. Polite diplomacy is therefore a mandatory skill. Aggressiveness should show itself in thorough work rather than the inspector's overbearing demeanor. Inspectors are the agency's five senses to the real world. How accurately those senses will record that world is the subject of this document.

Every inspection must be conducted as if it would go to court and be hotly contested. Inspectors should imagine themselves on the stand, under cross examination by highly skilled counsel for the defense. Every shred of evidence and documentation supporting that evidence may be contested as inaccurate, misinterpreted or compromised. It becomes obvious that the agency's entire case often hinges upon the expertise and professionalism of the inspector as the witness of fact.

What does professional mean? You are an agent of the government, representing the very people you must regulate. Fairness and equity are cornerstones of your position. It is not uncommon for some individuals to become obsessive in the authority and power given to them. The axiom "... Power corrupts..." is true and requires constant attention to prevent. We are all equal citizens, subject to the same rules and social responsibilities. The following is an example of erroding ethics.

In a basic inspector training class, a veteran inspector related the following photo documentation story. The trainer bragged that he had conducted more than 500 inspections in his 18 year career. He said that photography was a vital part of documentation but in his opinion, it was often dangerously over used. As an example of this over use, the inspector showed half a dozen slides taken at an alleged hazardous waste site. The photographs clearly showed the government's site manager on his knees, in street clothes, scooping a sample with his bare hands. The instructor said that the photographs should not have been taken or should have been destroyed, because they eventually hurt the agency's case by making the site appear less hazardous. This "veteran" had totally missed the point.

Improper protocol and cover up is neither professional or ethical. The error was not following the proper sampling procedure, not the photography. It is imperative that the inspector set the example in the implementation of proper procedure. Those procedures must routinely be better implemented by the regulators than those performed by the regulated community. Comparisons between the government's work and that of the regulated community is often at issue in court. Agents of the government should never feel justified in hiding their own impropriety in order to enforce against those they regulate. A little bias can rapidly lead to decay if unattended.

How would you like to be treated by a government inspector? Apply the "Golden Rule" to your work. As an agent of the government you must constantly strive to maintain the highest standards of thoroughness, ethical conduct and quality assurance. Inspectors must train and retrain so that he or she can set an unimpeachable example for those whose laws they enforce.

Pre-Inspection Preparation
Half the Fun is Getting There

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In The Office and Off Site

About 50% of your time should be spent planning and preparing for your inspection. This will prevent classic oversights; like being on the road and realizing you have no clue how to get to your facility, or walking right past the operation which received a Notice of Violation (NOV) in five previous inspections.

History and Liaison Work

Your first objective should be to check with the program staff and files to gain all the knowledge you can about the site. There may be personnel assigned to the specific facility you are to inspect. Other considerations are permits, litigation, or special agreements. There may be other inspectors who have experience with facility.

There may be other agencies or programs which have been involved or should be involved. Not informing an entity that feels territorial about a facility can cause serious backlash. Showing up at a facility used to seeing a particular individual or agency will usually alarm the facility. If that individual or agency does not support your bing there, life can be difficult. Make sure your immediate chain of command is familiar with your objectives and schedule. New inspectors often complain that there is little supervisory support for their field work. This is usually because supervisory staff was not fully informed and prepared bfore you did the work.

Reconnaissance

Drive by and have a look before you leap into the inspection. Have a cup of coffee at the local diner and consider the possibilities and organize your approach. Use the time to review your kit and checklist. The facility is never what you anticipated at the office. Just when you begin to think you can dance around any contingency, one comes up and nails you. Consider the site layout, safety considerations, places and operations you want to include in your tour, **and what is *"going on"* before they know you are there and the *"going on"* stops.**

Prepare Your Kit For Action

Load your camera. Fill out your paperwork as much as you can before entering the site. It is a nuisance when you end up hurriedly doing it in front of an impatient plant manager, who has taken time off from a union negotiation or a critical break down just to deal with you. Exchanging business cards is a good way to introduce yourself and get information about your site contacts without lengthy and redundant questioning. You may even want to write a few reminders in your notebook to make sure you cover a topic or see an operation before you leave. One recommended item is athe "post it®" that can be used to mark things you want to copy, or to identify things in photographs.

Sampling

Are you prepared to sample? Do you have a sample plan? Have you notified the laboratory of your intentions? Labs do not like unannounced, high priority samples.

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The report is the clear, succinct, factual and objective description of everything relevant to what you did.

The permanent product of an inspection or investigation is the report. You probably won't be the one that uses the report so you should write it so that the case could proceed without you. One clue of an inadequate report is if agency counsel or the program review staff have to keep calling you to clarify things in the report.

The report is the collection of everywhere you went, everything you did and everything you obtained. It answers the questions of who, what, where, when, why and how. It is logical and accurate. It is concise yet complete. It identifies all areas of regulatory concern that were covered and what was found. And it does this clearly, succinctly, factually and objectively.

HOW IS THIS DONE?

A. The report is constructed so that it has a professional appearance.

1. It should be written in the active voice. "Joe asked Susan where the waste drums were."
2. It should be written in the first person. "I asked Joe where he lived."
3. It should be written in a logical order.
4. It should be written so that information in clear and easy to find.

B. The report is grammatically sound. This does not mean that it is written in excessively formal or technical language. It means that it avoids the use of colloquialisms, jargon, or offensive language. It uses good sentence and paragraph structure. Words are used and spelled correctly.

1. Sentences should be simple and direct rather than complex or convoluted. Clarify information rather than making it unnecessarily complicated.
2. Use words appropriately and use words that are found in common usage. The report is often read by those with less technical knowledge than you have.

C. The report is factual and objective.

1. Who did what, when, where, why and how?
2. State opinions as opinions and not as facts.
3. Write so that the reader can reach their own conclusion from the logically ordered facts presented in the report.
4. If you choose to state a conclusion, you should identify the logic, information and procedure you used to reach that conclusion.
5. All mathematical, scientific or technical

conclusions must be accompanied by the method and calculations.

Write the report as you did the inspection.

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1. I did this...
2. I asked Joe Dokes...
3. I sampled the...
4. Mary Dokes said...

Style is often interpreted as discretionary by various program offices. In the court room, style is strictly "first person singular." If your office insists upon passive voice such as "it was determined" rather than the active "I" or "Joe determined," they should consult appropriate experienced counsel. The less translation between the report and testimony, the better.

Good reports are not great prose. Good reports are a detailed narrative of what happened during a specific event in time. Clarity is far more important than sounding academic.

Avoid unnecessary or "cop talk" jargon. Say "Joe Dokes got out of the GMC truck," rather than, "The perpetrator exited the utility vehicle."

Avoid drawing conclusions. Write the facts in such clarity that the reader can draw their own conclusion. "Joe was very hostile," is a conclusion. "Joe began swearing and punching holes in the wall," is a statement of events from which the reader can draw their own conclusions.

Avoid making assumptions. "I determined that the records were acceptable after a review of several examples." The most you can say is that in your opinion, the specific records reviewed appeared acceptable to you. In most cases you should take example copies of those records and also allow the program to review them and make a determination.

Report Contents: The 5 'W's

1. **What** is it?
2. **Where** did you do What?
3. **Who** let you do it and who did you do it with?
4. **When** did it happen?
5. **Were** samples taken?

The following outline of report subsections has been generally accepted throughout the program offices of most EPA Regions, National Enforcement Investigations Center (NEIC) and the Office of Regional Counsel.

- **Heading**
  This should include the type of inspection, site or activity name, and date of the inspection.
- **Facility Address**
  Corporate or head office address.
- **Site Address**
  Exact geographic location of the site.
- **Site Contacts**
  Name, position or title, and telephone number.
- **Inspection Team**
  Leader and all members of the inspection team. Name, position or title, and telephone number.
- **Site History**
  This includes compliance history, and the history of the facility site location.
- **Inspection Times**
  The hour, day and year for the inspection (e.g. 2-19-1996 @ 0800 hours)
- **Opening Conference**
  Who did you show your credentials to; all persons present; titles or positions; what was discussed (i.e. scope and timing of the inspection events); specific arrangements; if entry was granted or

denied..

- **Field Inspection**

  Narrative of the field inspection events and observations. Where did you go? What did you see? What did you do?

- **Record Inspection**

  What was reviewed, copied and taken? Where were the records kept and who was in charge of them? What selection method was used?

- **Closing Conference**

  Who was there? What was discussed? What was agreed to?

- **Samples**

  Were samples taken? Of what? Were there splits?

- **Compliance Concerns**

  State as your opinion only. Regulations may be cited in the report or may be cited in an "enforcement confidential" memorandum to the program chief or attorney in ORC. Some attorneys have strong feelings against the inspector drawing any enforcement conclusions at all, because it may complicate the agency's discretionary powers.

- **Attachments**

  List and identify all notes, documents, photographs, notices, and documentation. This may be done in an index of attachments or in the inspection narrative itself.

- **Date and Signature**

  It is your report, so sign it!

It is often a good idea to have someone else read your draft report before placing it in final. They are often able to point out ways to clarify things you may have overlooked.

Report Writing:
Words and Phrases to Avoid

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So why is it so important to avoid some words and phrases? They are beyond the knowledge of the inspector, they are ambiguous, or they are not substantiated or supportable by documentation. They can limit the choices open to the agency by seeming to prejudge the issue by drawing a premature conclusion. They can also be so vague that they do not answer the who, what, where, why, and how questions your report must address.

1. **All** is so absolute that any exception can throw the issue into question. For example don't say you saw all the records. You might be able to say that you saw all the drums in the storage area with more confidence.
2. **Always**, again, is an absolute term. Always does not allow for an exception, and exceptions usually exist.
3. **Never** is also an absolute term. One exception and you may have trouble.
4. **Violations**, as in "there were violations, " or "that was a violation," is reaching a conclusion. Rarely should the inspector also be the one who determines if there is a violation. What if you were wrong? The company could sue you for expenses or damages. You may not have supplied enough credible documentation to substantiate the violation. You would be making an institutional decision without using the system of checks and balances built into the program. If you have that authority, recognize your liability.
5. **No Violations** is also reaching a conclusion. Changes in interpretations can alter whether action is possible or not. Only the appropriate counsel may know recent court decisions.
6. **It Was Determined** is vague and does not say who determined. If you made a judgment call, say so. "I determined that the transformer was leaking because dielectric fluid was flowing from a hole in the side." If you reach a conclusion make sure that (1) *you are qualified to make that determination*, and (2) *you document it well enough that others can reach the same conclusion*.
7. **They Said** is also vague. Who said? I said. Joe said. The woman receptionist in the red dress said.

These are far more specific and who said what can be critical to a case.

The report should clarify information. It should also simplify, so that readers less qualified than the writer can reach their own conclusions. Avoid unnecessary high tech language. Judges or attorneys seldom have engineering or chemistry degrees.

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Sampling: When, Why, How

When to Consider Taking Samples

1. There is no data available
2. There is insufficient data
3. The available data is in doubt
4. Data is needed to document an event
5. Sampling is required by law or permit

Sampling and sample analysis may be necessary to document potential evidence of noncompliance or compliance. Samples are expensive. Make sure they are necessary. At the most fundamental there are two types of sampling: (1) Composite samples and (2) Grab samples. However, either of these may be planned or samples of opportunity.

Samples of opportunity are events that were not generally anticipated. They may be required because of a new process or expansion or they may be necessary because of a spill or discharge.

Regardless of the circumstances there must be a project plan and a method identified for the specificity (what chemical to look for) and chemical concentration (such as parts per million) required from the analysis. If it was not in the site specific project plan then it should be in a Standard Operating Procedure (SOP) kept on file. Regardless of the SOP or QA requiements, all samples must be representative of the material or event.

SOPs are written documented procedures that should be used for collecting any type of sample. Each organization or agency should have SOPs on file. This insures defensible repeatability and consistency and a written record of what was done which may have to be referred to several years after the sampling event. Use only laboratories that adhere to written SOPs. While there may be modifications of the method to fit unique circumstances, all deviations from the SOP must be thoroughly documented.

This is a big responsibility for the inspector. Lets summarize what we have so far. Your sample must be representative. It must have been taken and analysed using an appropriate SOP. You must identify the appropriate method of analysis in your site specific quality assurance project plan (QAPjP) and you must have notified the laboratory of the specificity and chemical concentration required in their analytical report.

This brings us to the area of overall responsibility for quality assurance and quality control of the entire sampling event. That falls squarely upon the lead inspector. The inspector must control and insure that proper methods and procedures are followed throughout the entire process from acquiring "clean" sample containers, transporting those containers in the field without contaminating them, taking the samples, transporting them back to the laboratory without contaminating them, determining the method of analysis, what chemicals to analize for and how small of a concentration they should look for. This is a big order and may require assistance from QA or Lab personnel.

Sampling: Quality Assurance/Quality Control

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What and Why You Are Sampling Will Determine the Method the Method You Should Use

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There are many confusing terms used in various programs which relate to the same general issues. It is the inspector/investigator's responsibility to keep track of his/her own objectives and translate those objectives into the jargon of each media. Help is available from the QA office.

The Quality Assurance Project Plan (QAPjP) is the overall recipe for a legally supportable activity with subsets that cause data translation into a language required for enforcement and eventual referral to the agency counsel. Even the best and most experienced inspectors have trouble with these translations from time to time. A major function of the QA/QC program office is to assist the inspector or Project Manager (PM) in assigning tasks and setting sample parameters and language for reporting data.

The lead inspector is the on-scene Project Manager (PM) and responsible for generating a viable package for case referral. No one else has the overall perspective to generate the QAPjP and determine the methods, protocols, and field modifications necessary to make a good case. If you have a Quality Assurance office they will help you. If not, you can contact your laboratory and thoroughly review what is required to make the sampling event productive and useful.

Once the appropriate method is selected, the inspector must then determine the *precision* and *accuracy*. This means the analysis will identify the proper chemical and concentration of that chemical with an acceptable level of accuracy and confidence. Precision and Accuracy impact QA/QC, the laboratory, media programs and enforcement. For example, the inspector knows that for a particular substance 1,000 ppm is the action point for enforcement, yet the methodologies may produce data in + or - percentiles. The inspector must insure that the laboratory uses a methodology that will report results in a usable format for taking action. The inspector must understand and manage how precision and accuracy is applied to both field sampling and lab analysis.

The Project Manager (PM) is responsible for QA/QC. The PM is accountable for the technical accuracy and legal supportability of the entire referral package.

The QAPjP is the recipe for all technical activities. It must be technically accurate and legally supportable through ties to policy and established standards acceptable to a judge.

What and why you are sampling will determine the method you should use. It is the PM's responsibility to assure that the correct methods are selected and documented satisfactorily.

The QA/QC office should be able and willing to assist the PM in developing the best methodologies to insure appropriate and technically supportable data.

The PM's name is on the bottom line. They will have to take the stand in court to defend all activities. Take charge and know what you are doing.

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Sampling: Doing the Right Thing

If you cannot maintain Quality Assurance (QA) and Quality Control (QC) you should not take the samples at all. Each sample must be supported with documentation providing the **5-W's** and the key word **How**. Without that documentation, it will be impossible to establish the three criteria (F.A.R) for evidence admissibility.

When and why should you take samples? The first call on that is the lead person in the field...you!

- **When** to sample is determined by the best chance to obtain a representative sample.
- **Why** a sample is taken is more subjective. It is initiated if there is a lack of confidence in available data or because of incomplete data at the facility or home office.

Sample documentation centers around three prime issues: **representativeness, tracking and methodology:**

- Was the **representative** of what you needed to evaluate for compliance? Does it represent a specific waste stream, site, event or activity?
- Can you prove where it came from, where it went, what was done to it, and that there was not an opportunity to compromise the sample along the way through your **tracking** documentation?
- Was the correct **methodology** followed to insure that your sample was (1) taken properly for the substance in question, and (2) the proper analytical method was used to make an accurate evaluation of its presence.

What are some of the tools used to accomplish thorough tracking?

- Field Log or Notebook
    - Field Photography
    - Field Lab Data Sheet
    - Sample Number
- Analysis Request
- QAPjP
- Sample Plan
- Check Lists
- Field Generated Diagrams and Maps
- Chain of Custody
- Lab Sample Traffic Report

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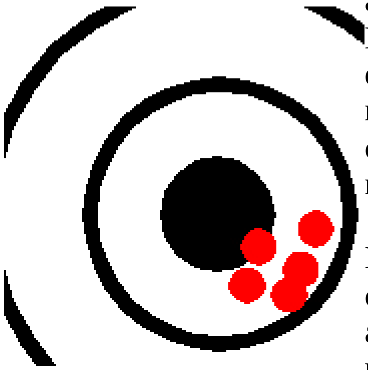
Sampling: Precision and Accuracy

All of these things we just talked about should be included in a site specific **Quality Assurance Project Plan (QAPjP)**. This can be burdensome but it's the lynch pin of successful case development. Remember your data must be better than their data. Only the inspector has the perspective to control all these sample steps. If the inspector is weak in the technical or chemical aspects of sampling, it falls to them to make the necessary liaison contacts to ensure that there is a qualified team approach to sampling procedure and handling. Get to know your lab and quality assurance personnel and make sure that they understand the need to



apply appropriate protocols. Help them to understand the difficulties in applying some methods in the field where conditions change minute by minute.

Now we come to a really complicated aspect of sampling and what is required when you request an analysis. The method you choose must provide the necessary the precision and accuracy. Technically here are acceptable analytical chemistry definitions for these terms:

- ***Accuracy*** denotes the nearness of a measurement to its accepted true value and is expressed in terms of error.
- ***Precision*** refers to the reproducibility of results. It is the agreement between the numerical value of two or more measurements that have been made in an identical fashion. Still not clear?

Let's try a metaphor. Think of shooting at a bull's-eye in target practice. ***Accuracy*** refers to selecting and hitting the bull's eye. ***Precision*** refers to how small your group will be and how close they will average to that bull's eye. The bull's-eye's center represents the exact true value of the target chemical and anything away from that center is measured as the amount of error. The closer to the center of the bull's eye the greater the *accuracy* or detection of the true value. **Deviation** has two major considerations. Even if you use the same shooter, the same gun, the same distance, weight and speed of bullet and every other variable you can think of, you will still not put all shots into the same hole. They will differ in their distance from the true value center of the bull's-eye and how closely they group together. These are often referred in terms of deviation and variance. This error in the ability to repeat each shot is a measurement of *precision*.

DISCUSSION: The above metaphor is a little faulty. Discuss how other variables such as sample technique, calibration of field and/or lab equipment, etc. can add to the considerations. Lab reports are frequently given with a confidence factor which may be measured in + or - percentiles. There may be other chemicals that mask the target chemical or a flyer which is a wild outlying data point. Can the data still be used? How would precision and accuracy relate to the quantity of target material.

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Conducting Multimedia Inspections

The steps required for a single media inspection stay in effect for Multimedia inspections. However, Coordination, Chain of Command, Confidentiality and Communication gain a higher sensitivity and importance.

Multimedia inspections are *broad spectrum, politically sensitive* and *resource consumptive* compliance activities. Multimedia inspections have high visibility. They achieve a "snap shot in time" of a facility's compliance under several or many regulatory authorities. Along with criminal enforcement , multimedia inspections represent a significant portion of the total compliance impact on the regulated community and can provide a better foundation to establish more efficient and innovative routes to compliance.

Multimedia inspection activities require all the methods used in single media inspections but differ from single media inspections by elevating the importance of **teamwork, confidentiality, chain of command, communication** and **coordination**:

1. *Teamwork* is vital to the ultimate success of every activity in a Multimedia inspection. No "Lone

Rangers". Neophyte or even veteran single media inspectors may not realize the necessity to work as a member of a team.

2. *Enforcement Confidentiality* must be maintained throughout the entire process from the earliest planning stages to enforcement referral. This applies to all activities and communications. The routineness of some single media inspections may cause some inspectors to forget they are part of a team
3. *A Chain of Command* must be maintained. Activities must be coordinated carefully to insure efficient management, QAQC and controlled communication of confidential communications.
4. *Communication* must be maintained through all phases of the planning, preparation and execution of the inspection.
5. *Coordination* between all of the regulatory actors is crucial.

Note: Multimedia inspections are an Agency level activity rather than an individual media or program activity. That means you must use **"Teamwork",** **C**onfidentiality, **C**hain of Command, **C**ommunication and **C**oordination in all the preparation.

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Multimedia Inspections: Preparation and Management Part 1

Some typical sensitive issues are: The facility may have heard about it through the grapevine. Facility representatives may ask why the facility was picked. You may hear complaints from your own agency that the inspection conflicts with complex negotiations in other programs, even when every effort was made to keep them on board with every phase of planning. One of the regulatory program offices may ask you to postpone or cancel the inspection at the eleventh hour because they have a conflict. Site project managers from special programs like emergency clean up or Superfund may say you didn't give them proper warning or get their permission. And God help you if the press gets hold of it. What else could go wrong? How can you minimize conflicts?

The following are typical of the early planning phases of a Multimedia inspection:

1. **Targeting** through a neutral inspection scheme by the cooperative input of EPA and State Agencies.
2. **"Need to Know"** distribution of information to State and EPA Managers .
3. **Deciding which media** should be covered at each targeted site.
4. **Selection of specific MM field coordinators** for each site inspection.
5. **Scheduling** by those responsible for coordinating and conducting the inspections.
6. **Establishment of the inspection team** for each site and which inspector will be responsible for which media.

It is imperative that ***confidentiality*** be maintained throughout Multimedia planning and scheduling. Even the most casual mention of a targeted site can leak out and create frustrating and unnecessary damage control. Communication should be kept to face to face contact, controlled telephone access, or written communication stamped "Enforcement Confidential".

Avoid the following:

1. Public mention of the site
2. Uncontrolled notes or memos
3. Mention of the site to those not involved directly with the inspection

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Multimedia Inspections: Preparation and Management Part 2

Keep these things in mind when participating in a Multimedia Inspection:

1. Maintain strict confidentiality at all times.
2. Keep the Inspection Team Coordinator informed prior to and during the inspection.
3. Find out if you will be participating with a state or EPA counterpart and communicate directly with that person when planning the inspection.
4. All written or electronic communications regarding the site or inspection should have "Enforcement Confidential, Do not release under FOIA" clearly noted on their cover.
5. Strive to work as a team member during the planning and execution of the inspection.
6. Don't telegraph the inspection to the facility. If it is to be an announced inspection, it should be done by a person and method that is mutually agreeable with all the programs and agencies involved.
7. Get your inspection report drafted quickly so that debriefing can take place promptly after the inspection is completed. Many will need a general idea of the compliance issues resulting from the inspection.
8. Insure that the program office does not undertake unilateral action without informing the appropriate Multimedia enforcement coordinator.

MM-Inspections require journeyman level personnel in each lead position.

Inspectors taking the lead for any individual media must meet minimal criteria which include the following:

1. Completion of basic inspector training certification (Required by EPA Order 3500.1).

2. Completion of minimal specific media training
3. Knowledge of agency's policies and procedures on the following topics:

    a. Inspection authorities
    b. Entry procedures/problems
    c. Enforcement action procedures and policies
    d.Common legal issues encountered during and resulting from inspections
    e. Basic safety procedures and concerns
    f. Specific safety concerns for the facility being inspected

4. Thorough familiarity with Quality Assurance requirements:

    a. Sample collection
    b. Identification and preservation
    c. Chain of custody procedures

5. Knowledge of relevant industrial processes, waste control and waste monitoring
6. Documentation skills through uses of the following:

    a. Interviews
    b. Photography
    c. Document and record review
    d. Technical and investigatory deductive reasoning
    e. Communication skills (verbal and written)

7. Basic understanding of the procedures for obtaining administrative warrants, affidavits, technical requirements for warrant application and warrant procedures for serving warrants and obtaining and documenting warrant returns.

Team leaders should be senior journeymen with expertise in leading at least two media investigations. In addition team leaders should have experience and skills in the following:

1. Demonstrated leadership skills
2. Skills in project management
3. Experience leading one or more single media inspections as part of a Multimedia inspection
4. Demonstrated tact and diplomacy in dealing with the regulated community and other regulatory authorities
5. They must also serve as liaison, project coordinator and insure QAQC.

Other Concerns in the Field

1. Report any observations, materials or events that may be of interest to other team members. This is a team effort and information should be freely exchanged among inspection team members.
2. Keep confidential information under strict control.
    a. Keep confidential information and subjective observations with team members private.
    b. Keep all team documentation, project plans, safety plans and logbooks secure and under strict document control.
    c. Sensitive discussions should not take place on facility telephones where they may be overheard.
3. Laboratory samples and materials must be maintained under chain-of-custody at all times.
4. Restrict on-site activities to normal working hours as much as possible.
5. Keep the Team Leader informed of all contingencies and events that may alter existing schedules or procedures.
6. Single media inspection leaders should not talk to the press without coordinating with the Team Leader first. Usually the Team Leader should handle all media contacts and those should be very limited and planned beforehand. Agency coordination is usually advisable.
7. Always maintain a thorough, polite, and professional demeanor.
8. Do not criticize any team activity, another member of the team or associated agency in public or private at any time during the inspection.

Scheduling

Sequencing of specific media may vary based upon inspection priorities. If the inspection is broad in scope, complex because of an extensive permit or involves sampling, it will usually be scheduled toward the beginning of the inspection period to allow extra time for contingencies. The following is a typical sequence:

Every site requires continual adjustment and modification of the team schedule and methodologies. Each step must be justified and defensible through QAQC documentation. Not doing this could negate the viability of the entire effort.

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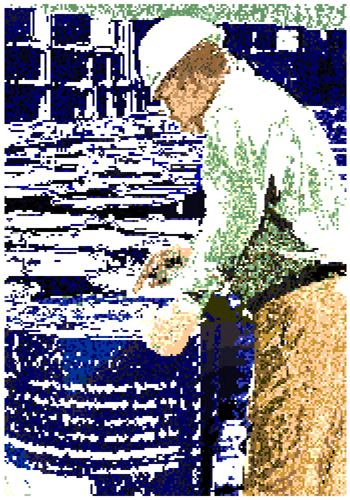

Conducting Environmental Compliance Inspections

Conducting Environmental Compliance Inspections
U.S. Environmental Protection Agency Region 10, Office of Environmental Assessment, Investigations and Engineering Unit

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Contact: Doug Smith
Last Update: March 12, 1997

Appendix C

A Guidebook on How to Comply with the Shipbuilding And Ship Repair (Surface Coating) Operations National Emissions Standards for Hazardous Air Pollutants

EPA 453/B-97-001

January 1997

United States Environmental Protection Agency | Office of Air Quality Planning and Standards Research Triangle Park, NC 27711 | EPA 453/B-97-001 January 1997

Air

EPA

A Guidebook on How to Comply with the Shipbuilding and Ship Repair (Surface Coating) Operations National Emission Standards for Hazardous Air Pollutants

A GUIDEBOOK ON HOW TO COMPLY WITH THE SHIPBUILDING AND SHIP REPAIR (SURFACE COATING) OPERATIONS NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS

Coatings and Consumer Products Group
Emission Standards Division
Office of Air Quality Planning and Standards
U. S. Environmental Protection Agency
Research Triangle Park, NC 27711

This report has been reviewed by the Emission Standards Division (ESD), Office of Air Quality Planning and Standards (OAQPS), U. S. Environmental Protection Agency (EPA), and approved for publication. Mention of trade names or commercial products is not intended to constitute endorsement or recommendation for use. For more information on this regulation, please call your State or local air pollution control agency; your local, regional, or national shipbuilding trade association; or your EPA Regional Office. Contact EPA's Control Technology Center (CTC) Hotline at (919) 541-0800 to get information on air program contacts. To order single copies of this guidebook, contact the Library Services Office (MD-35), U. S. EPA, Research Triangle Park, NC 27711; the OAQPS Technology Transfer Network (TTN), (919) 541-5742 via modem (for assistance with the TTN, call (919) 541-5384) or via the Internet at http:\\ttnwww.rtpnc.epa.gov; or the National Technical Information Services, 5285 Port Royal Road, Springfield, VA 22161.

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INTRODUCTION

BACKGROUND

In November of 1995, the U. S. Environmental Protection Agency (EPA) issued national regulations to control hazardous air pollutant (HAP) materials from shipbuilding and ship repair facilities designated as major sources. The regulation appeared in the December 15, 1995 edition of the Federal Register [volume 60, beginning on page 64330].

Why is EPA regulating the shipbuilding and ship repair industry? Section 112 of the Clean Air Act as amended in 1990 (CAA) requires the EPA to evaluate and control HAP emissions. Pursuant to Section 112(c) of the CAA, the EPA published in the Federal Register the initial list of source categories that emit HAP on July 16, 1992 (57 FR 31576). This list included shipbuilding and ship repair (surface coating) operations as major sources of HAP emissions.

The CAA was created, in part, "to protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and productive capacity of its population" 42 U.S.C. §7401(b). The final regulation will protect the public health by reducing emissions of HAP material from surface coating operations at shipbuilding and ship repair facilities.

Approximately 35 shipyards are estimated to be major sources of HAP emissions, emitting over 9.1 megagrams per year (Mg/yr) (10 tons/yr) of an individual HAP or over 23 Mg/yr (25 tons/yr) of total HAP, including toluene, xylene, ethylbenzene, methanol, methyl ethyl ketone, methyl isobutyl ketone, ethylene glycol, and glycol ethers. All of these pollutants can cause reversible or irreversible toxic effects following exposure. The potential toxic effects include irritation of the eyes, nose, throat, and skin, and damage to the blood cells, heart, liver, and kidneys.

All existing major source facilities must be in compliance with the requirements of the regulation on December 16, 1997. The final standards will reduce nationwide HAP emissions from shipyard surface coating operations by at least 318.5 Mg/yr (350 tons/yr) from a baseline level of 1,362 Mg/yr (1,497 tons/yr).

PURPOSE OF GUIDEBOOK

The purpose of this guidebook is to provide a straightforward overview of this regulation and to equip facilities with the basic information they need to comply with the regulation. This guidebook is not a complete and full statement of the legal and technical requirements of the regulation. See the Federal Register notice (included as Appendix A to this guidebook) for the complete text of the regulation.

Several example questions and responses have been included in this guidebook. The responses represent the Agency's best guidance on issues raised by industry or State/Regional representatives. They are included to provide some basis of consistency for all interested parties.

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CHAPTER 2

OVERVIEW OF THE REGULATION

The final regulation is applicable to all existing and new shipbuilding and ship repair facilities that are major sources of HAP or are located at plant sites that are major sources. Major source facilities that are subject to this regulation must not apply any marine coating with a volatile organic HAP (VOHAP) content in excess of the applicable "as-applied" limit and must implement the work practices required in the regulation. In addition, these sources must keep specified records and submit periodic reports.

APPLICABILITY

Section 112(a) of the CAA defines major source as a source, or group of sources, located within a contiguous area and under common control that emits or has the potential to emit, considering controls, 9.1 Mg/yr (10 tons/yr) or more of any individual HAP or 22.8 Mg/yr (25 tons/yr) or more of any combination of HAP. Area sources are stationary sources that do not qualify as "major" on the basis of their "potential to emit". "Potential to emit" is defined in the Section 112 General Provisions (40 CFR part 63.2) as "the maximum capacity of a stationary source to emit a pollutant under its physical or operational design." To determine whether or not it is a major source subject to the rule, a shipbuilding and/or ship repair facility would need to determine the total HAP emissions from its surface coating operations, as well as the total HAP emissions from all other operations at the plant site. The sum of these emissions would be used to determine major source status. See Chapter 3 for additional information. The term "affected source" as used in this regulation means the shipbuilding and ship repair facility that is subject to the regulation.

COMPLIANCE SCHEDULE

EXISTING SOURCES--

Effective Date: . . . . **December 15, 1995**

Initial Notification Due: . . . . . **June 13, 1996**

Implementation Plan Due: **December 16, 1996**

Compliance Date: . . . . . **December 16, 1997**

First Reporting Period Ends: . **June 16, 1998**

First Compliance Report Due: **August 16, 1998**

NEW SOURCES--

Initial Notification and Implementation Plan Due: . . . . **6 months prior to start-up**

Compliance Date: . . . . **Date of start-up**

First Reporting Period Ends: . . . . . **6 months after start-up**

First Compliance Report Due: . . . . . **8 months after start-up**

REQUIREMENTS

In general, the regulation specifies:

- ✓ VOHAP content limits on marine coatings
- ✓ Work practice standards

✓ Recordkeeping

✓ Reporting

Each of these requirements is summarized in the following sections.

VOHAP CONTENT LIMITS

No coating may be applied to a ship with an "as-applied" VOHAP content exceeding the applicable limit in Table 2-1. "As applied" includes any thinning; therefore, it is important to use only compliant coatings and not exceed the maximum thinning allowance (if any) for each and every coating.

The final standards impose limits on the VOHAP content of 23 types of coatings used at shipyards. Compliance with the VOHAP limits must be demonstrated on a monthly basis. The promulgated standards include four compliance options to allow owners or operators flexibility in demonstrating compliance with the VOHAP limits. The final standards also allow for an alternative means of compliance other than using compliant coatings, if approved by the Administrator. The Administrator shall approve the alternative means of limiting emissions if, in the Administrator's judgment, (after control) emissions of VOHAP per volume solids (nonvolatiles) applied will be no greater than those from the use of coatings that comply with the applicable VOHAP limits.

WORK PRACTICES

The regulation includes work practice standards to ensure that air pollution resulting from transfer, storage, and handling of paints and solvents associated with surface coating operations are minimized or eliminated. (See § 63.783(b)(1) and (2)).

The final standards also require that all handling and transfer of VOHAP containing materials to and from containers, tanks, vats, vessels, and piping systems be conducted in a manner that minimizes spills and other factors leading to emissions. (This requirement includes hand- or brush-application of coatings.) In addition, containers of paint, thinning solvent, or waste that hold any VOHAP materials must be normally closed (to minimize evaporation) unless materials are being added to or removed from them.

RECORDKEEPING

The regulation requires sources to keep monthly records to document compliance with the regulation. The required documentation includes:

1. All documentation supporting the initial notification;
2. A copy of the affected source's approved implementation plan;
3. The volume of each low-usage-exempt coating applied during the month;
4. Identification of the coatings used during the month, their appropriate coating categories, and the applicable VOHAP limit;
5. Certification of the as-supplied VOC content of each batch of coating and thinning solvent used during the month;
6. A determination of whether containers meet the standards as described in § 63.783(b)(2);
7. The results of any Method 24 or approved VOHAP measurement test conducted on individual containers of coating and thinning solvent, as applied; and

8. Additional information, as determined by the compliance procedure(s) that each affected source followed.

An example monthly record is provided in Appendix F. If the source you operate qualifies as an area source or a synthetic area source, you only need to record the total annual volume of coating applied to ships. All records must be kept and maintained for 5 years. A summary of recordkeeping requirements is provided in Table 2-2. (See also Chapter 6 and § 63.788(b).)

REPORTING

For affected sources, the regulation requires an initial notification that you are subject to the regulation, an implementation plan, an initial compliance status report, and then compliance status reports every 6 months. A summary of reporting requirements is provided in Table 2-2. (See also Chapter 6 and § 63.788(c).) An example initial notification is also provided in Appendix D.

For major sources that intend to become (synthetic) area sources by the compliance date, the regulation requires an initial notification that documents your intention to apply an enforceable limitation to keep actual HAP emissions below the major source level(s).

UNITS OF MEASURE

The NESHAP uses the International System of Units (SI) defined in *Standard Practice for Use of the International System of Units (SI) (the Modernized Metric System)*, published by the American Society for Testing and Materials as publication No. E 380-91. The EPA guidelines require that SI, or metric, units be used. See reference (cover page) on page 8 of this document. Many of the existing State regulations involving marine coatings are expressed in metric units (i.e., grams per liter, g/L). The Metric Conversion Act of 1975 (Section 3 of Public Law 94-168) also supports this approach for the NESHAP units of measure and the examples in this guidebook for demonstrating compliance with the NESHAP.

TABLE 2-1. VOLATILE ORGANIC HAP (VOHAP) LIMITS FOR MARINE COATINGS

Coating Category	VOHAP limits[a,b,c]		
	grams/liter coating (minus water and exempt compounds)	grams/liter solids[d]	
		t ≥ 4.5°C	t < 4.5°C[e]
General use	340	571	728
Specialty	--	--	--
Air flask	340	571	728
Antenna	530	1,439	--
Antifoulant	400	765	971
Heat resistant	420	841	1,069
High-gloss	420	841	1,069
High-temperature	500	1,237	1,597
Inorganic zinc high-build	340	571	728
Military exterior	340	571	728
Mist	610	2,235	--
Navigational aids	550	1,597	--
Nonskid	340	571	728
Nuclear	420	841	1,069
Organic zinc	360	630	802
Pretreatment wash primer	780	11,095	--
Repair and maint. of thermoplastics	550	1,597	--
Rubber camouflage	340	571	728
Sealant for thermal spray aluminum	610	2,235	--
Special marking	490	1,178	--
Specialty interior	340	571	728
Tack coat	610	2,235	--
Undersea weapons systems	340	571	728
Weld-through precon. primer	650	2,885	--

[a]The limits are expressed in two sets of equivalent units. Either set of limits may be used for the compliance procedure described in §63.785(c)(1), but only the limits expressed in units of g/L solids (nonvolatiles) shall be used for the compliance procedures described §63.785(c)(2)-(4).
[b]VOC (including exempt compounds listed as HAP) shall be used as a surrogate for VOHAP for those compliance procedures described in §63.785(c)(1)-(3).
[c]To convert from g/L to lb/gal, multiply by (3.785 L/gal)(1 lb/453.6 g) or 1/120. For compliance purposes, metric units define the standards.
[d]VOHAP limits expressed in units of mass of VOHAP per volume of solids (nonvolatiles) were derived from the VOHAP limits expressed in units of mass of VOHAP per volume of coating assuming the coatings

TABLE 2-2. SUMMARY OF RECORDKEEPING AND REPORTING REQUIREMENTS

Requirement	All options		Option 1		Option 2		Option 3	
	Rcd.	Rpt.	Rcd.	Rpt.	Rcd.	Rpt.	Rcd.	Rpt.
Initial notification (§ 63.9(a)-(d))	✓	✓						
Implementation plan (§ 63.787(b))	✓	✓						
Volume of coating applied at unaffected major sources (§ 63.781(b))	✓							
Volume of each low-usage-exempt coating applied at affected sources (§ 63.781(c))	✓	✓						
ID of the coatings used, their appropriate coating categories, and the applicable VOHAP limit	✓	✓						
Determination of whether containers meet the standards described in § 63.783(b)(2)	✓	✓						
Results of M-24 or other approved tests	✓	✓						
Certification of the as-supplied VOC content of each batch	✓							
Certification of the as-applied VOC content of each batch			✓					
Volume of each coating applied			✓	✓				
Density of each thinner and volume fraction of solids (or nonvolatiles) in each batch					✓	✓	✓	✓
Maximum allowable thinning ratio(s) for each batch					✓	✓	✓	✓
Volume used of each batch, as supplied					✓	✓	✓	✓
Total allowable volume of thinner					✓	✓	✓	✓
Actual volume of thinner used					✓	✓	✓	✓
Identification of each group of coatings and designated thinners							✓	✓

Note: Option 4 requirements parallel those shown for Options 1 through 3, depending on whether or not and how thinners are used. When using Option 4, the term "VOHAP" should be used in lieu of the term "VOC".

-CITE-
15 USC Sec. 205a 01/24/94

-EXPCITE-
TITLE 15 - COMMERCE AND TRADE
CHAPTER 6 - WEIGHTS AND MEASURES AND STANDARD TIME
SUBCHAPTER II - METRIC CONVERSION

-HEAD-
Sec. 205a. Congressional statement of findings

-STATUTE-
The Congress finds as follows:

(1) The United States was an original signatory party to the 1875 Treaty of the Meter (20 Stat. 709), which established the General Conference of Weights and Measures, the International Committee of Weights and Measures and the International Bureau of Weights and Measures.

(2) Although the use of metric measurement standards in the United States has been authorized by law since 1866 (Act of July 28, 1866; 14 Stat. 339), this Nation today is the only industrially developed nation which has not established a national policy of committing itself and taking steps to facilitate conversion to the metric system.

(3) World trade is increasingly geared towards the metric system of measurement.

(4) Industry in the United States is often at a competitive disadvantage when dealing in international markets because of its nonstandard measurement system, and is sometimes excluded when it is unable to deliver goods which are measured in metric terms.

(5) The inherent simplicity of the metric system of measurement and standardization of weights and measures has led to major cost savings in certain industries which have converted to that system.

(6) The Federal Government has a responsibility to develop procedures and techniques to assist industry, especially small business, as it voluntarily converts to the metric system of measurement.

(7) The metric system of measurement can provide substantial advantages to the Federal Government in its own operations.

-SOURCE-
(Pub. L. 94-168, Sec. 2, Dec. 23, 1975, 89 Stat. 1007; Pub. L. 100-418, title V, Sec. 5164(a), Aug. 23, 1988, 102 Stat. 1451.)

-REFTEXT-
REFERENCES IN TEXT

CHAPTER 3

DOES THIS REGULATION APPLY TO ME?

APPLICABILITY OF THE REGULATION

The shipbuilding NESHAP is applicable to any major source of HAP emissions using more than 1,000 liters of marine coatings annually. The actual and potential emissions of HAP materials from most shipyards are substantially less than the major source cutoff limits [i.e., 9.1 Mg/yr (10 tons/yr) of any single HAP, or 22.8 Mg/yr (25 tons/yr) of all HAP combined]. To determine the applicability of this regulation to your facility, you must determine whether the plant site as a whole is a major source. A formal HAP emissions inventory should be used to determine if total potential HAP emissions from all HAP emission sources at the plant site meets the definition of a major source. This inventory should include <u>all</u> activities resulting in HAP emissions (whether shipbuilding/repair related or not).

Existing major sources may switch to "synthetic area source" status by obtaining and complying with an enforceable limit on their potential to emit prior to the "compliance date" of the regulation. The "compliance date" for this regulation is December 16, 1997. New major sources are required to comply with the NESHAP requirements upon start up or the promulgation date, whichever is later. If your facility with potential HAP emissions greater than the cutoff limit(s) has not obtained enforceable limits on its potential to emit by the compliance date, and has not complied with the NESHAP requirements, you will be in violation of the NESHAP. All sources that are major sources for HAP on the compliance date are required to comply permanently with the NESHAP to ensure that the maximum achievable reductions in toxic emissions are achieved and maintained.

Are there any small usage provisions? Any source having surface coating operations with less than 1,000 liters annual marine coating usage does not have to comply with the MACT standard. This provision gives relief to a source that qualifies as a major source because of activities other than shipbuilding/repair surface coating operations. However, the source is required to keep records of the volume of coating used in a year.

How many facilities are affected and where are they located? The EPA estimates that there are about 437 shipbuilding and ship repair facilities (i.e., shipyards) nationwide. Of the estimated 437 shipyards, 35 are estimated to be major sources of HAP emissions. Figure 3-1 and Table 3-1 show the approximate distribution of the facilities by State. Appendix C lists the known facilities that are believed to be affected by this regulation.

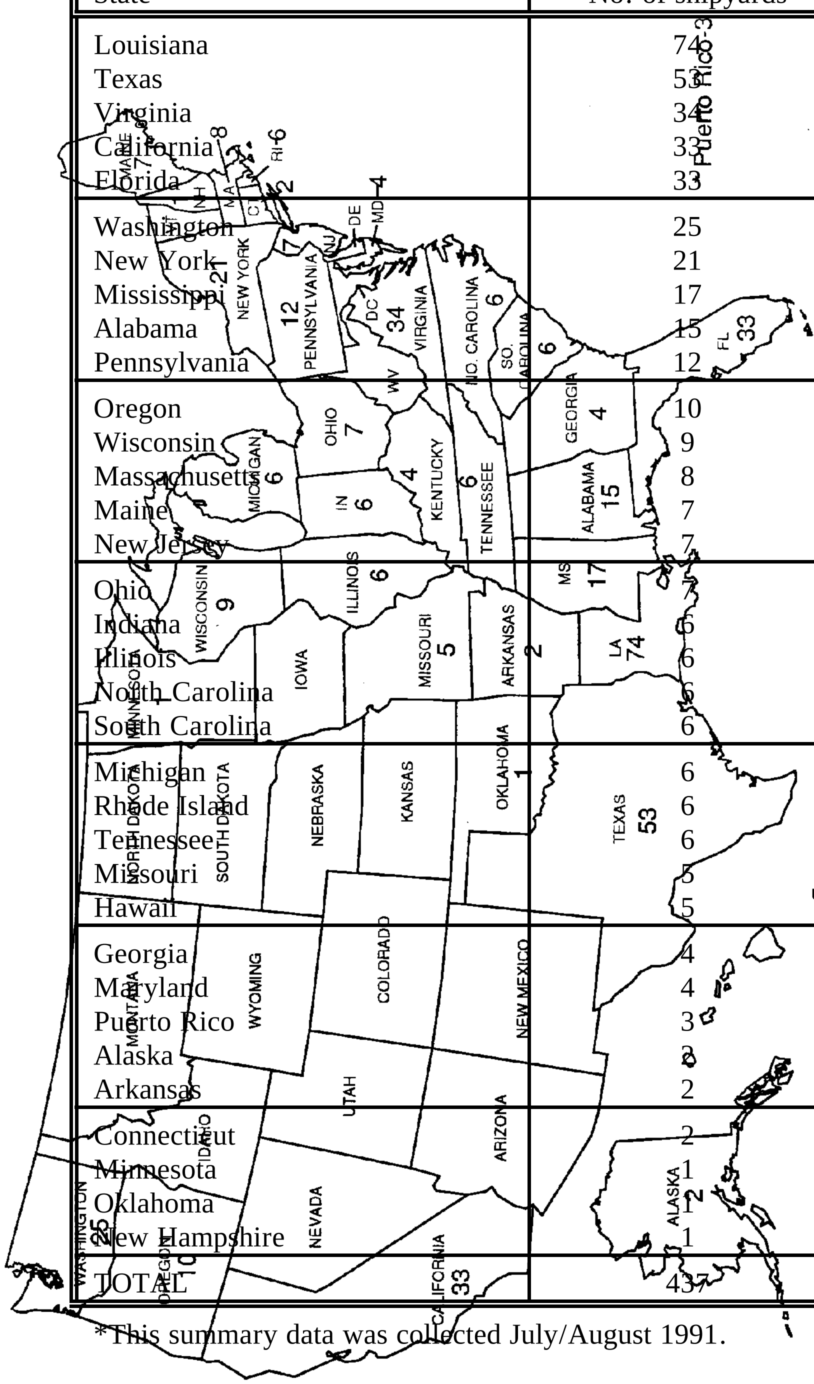
If a major source facility has several painting operations and only some of those operations exceed the minimum 1,000 liters annual marine coating usage, is the shipbuilding NESHAP applicable? The shipbuilding NESHAP is applicable to any major source of HAP (and <u>all</u> associated operations or process steps) that has total marine coating usage greater than the 1,000 liter cutoff. The cutoff was intended to minimize the recordkeeping and reporting burden for those facilities doing

Figure 3-1. 437 active U.S. shipbuilding facilities (August 1991).

TABLE 3-1. U.S. SHIPYARD LOCATIONS*

State	No. of shipyards
Louisiana	74
Texas	53
Virginia	34
California	33
Florida	33
Washington	25
New York	21
Mississippi	17
Alabama	15
Pennsylvania	12
Oregon	10
Wisconsin	9
Massachusetts	8
Maine	7
New Jersey	7
Ohio	7
Indiana	6
Illinois	6
North Carolina	6
South Carolina	6
Michigan	6
Rhode Island	6
Tennessee	6
Missouri	5
Hawaii	5
Georgia	4
Maryland	4
Puerto Rico	3
Alaska	2
Arkansas	2
Connecticut	2
Minnesota	1
Oklahoma	1
New Hampshire	1
TOTAL	437

*This summary data was collected July/August 1991.



minimal or touch-up painting with marine coatings.

If a ship is docked in a major source facility, are any painting activities conducted by the ship's crew covered by the regulation? All activities conducted within the boundaries of the shipyard must be accounted for, are subject to the requirements of the regulation, and are the responsibility of the shipyard owner/operator. When the Agency collected coatings and solvent usage information from the industry, there was no differentiation made regarding who was applying the various coatings and/or solvents.

What about shipyard painting operations or activities that are conducted away from the actual land-based facilities (i.e., downstream or "down the river")? Some determination would have to be made regarding how far into the water the shipyard's boundaries extend. As initial guidance on this issue, we would recommend that such activities be considered the same as other painting activities and subject to the same requirements.

If a shipyard company uses (leases) facilities owned by the State or Port Authority, who is responsible for determining applicability? The owner or operator of the "affected source" should conduct an emissions inventory to determine major source status based on aggregate air emissions of all HAP material. If it is determined that the facility is a major source, any details involving compliance demonstration and/or reporting would have to be worked with the appropriate enforcement agency.

RULE OF THUMB - RED FLAG ALERTS

If a shipyard answers yes to one or more of the following questions it would suggest that a more in-depth review would be appropriate to determine if the facility is subject to the NESHAP.

1. Did your shipyard use in the last year or does it anticipate using in the current year 75,000 or more liters of paints and solvents?

2. Did your shipyard paint in the last year, or does it anticipate painting in the current year 10 or more ships?

3. Did your shipyard paint in the last year or does it anticipate painting in the current year more than 140,000 sq.meters of ship or vessel surfaces?

4. Did your shipyard's estimating department allocate for its paint shops during the last year or does it anticipate allocating in the current year more than 6000 manhours of painting?

5. Did your shipyard generate and list on a hazardous waste manifest form in the last year more than 15,000 liters of waste solvent?

CHAPTER 4

WHAT DO I NEED TO DO TO COMPLY?

OVERVIEW

The following four principles should be followed to comply with all requirements of the regulation:

1. Buy/Use only compliant coatings;
2. Do not thin any coating beyond the associated maximum allowable thinning ratio;
3. Use good work practices when handling or transferring coatings, solvents, and/ or resulting wastes; and
4. Follow all recordkeeping and reporting requirements.

COATING COMPLIANCE OPTIONS

Because different shipyards track coating and solvent usage in various ways, four compliance options were developed and included in the regulation. Shipyards can choose one or more (and any combination of) compliance options to demonstrate compliance in their monthly records and semiannual compliance report. Options 1-3 are based on VOC being used as a surrogate for VOHAP.

- Option 1: *Coatings to which thinning solvent will not be added*--If you never thin coating prior to application, you will probably want to choose option 1, which is the most straightforward and least burdensome in terms of recordkeeping and reporting requirements. Compliance is determined on a coating-by-coating basis.
- Option 2: *Coatings to which thinning solvent will be added - coating-by-coating compliance*--Should be used when coatings are thinned and you want to determine compliance on a coating-by-coating basis.
- Option 3: *Coatings to which the same thinning solvent will be added - group compliance* --Similar to Option 2, with the exception that compliance is demonstrated for a group of coatings that are "grouped" by thinner type.
- Option 4: *Demonstration of compliance through an alternative test method*--Involves demonstration of compliance using an alternative test method that measures VOHAP content of a coating rather than VOC content as in options 1 through 3. Similar/parallel options to those under 1 through 3 are implied under option 4. (See Figure 4-1.)

Additional detail on these options is provided in Chapter 5.

Is averaging allowed? No. For purposes of complying with the NESHAP, no marine coating with a VOHAP content exceeding the applicable limit in Table 2-1 can be applied. The issue of averaging was considered during the development of the NESHAP, and average limits were proposed to industry representatives as part of the regulatory alternatives evaluated prior to proposal. (The average limits were significantly lower than the maximum never-to-be-exceeded limits.) Industry, as represented by those participants in the meetings held with

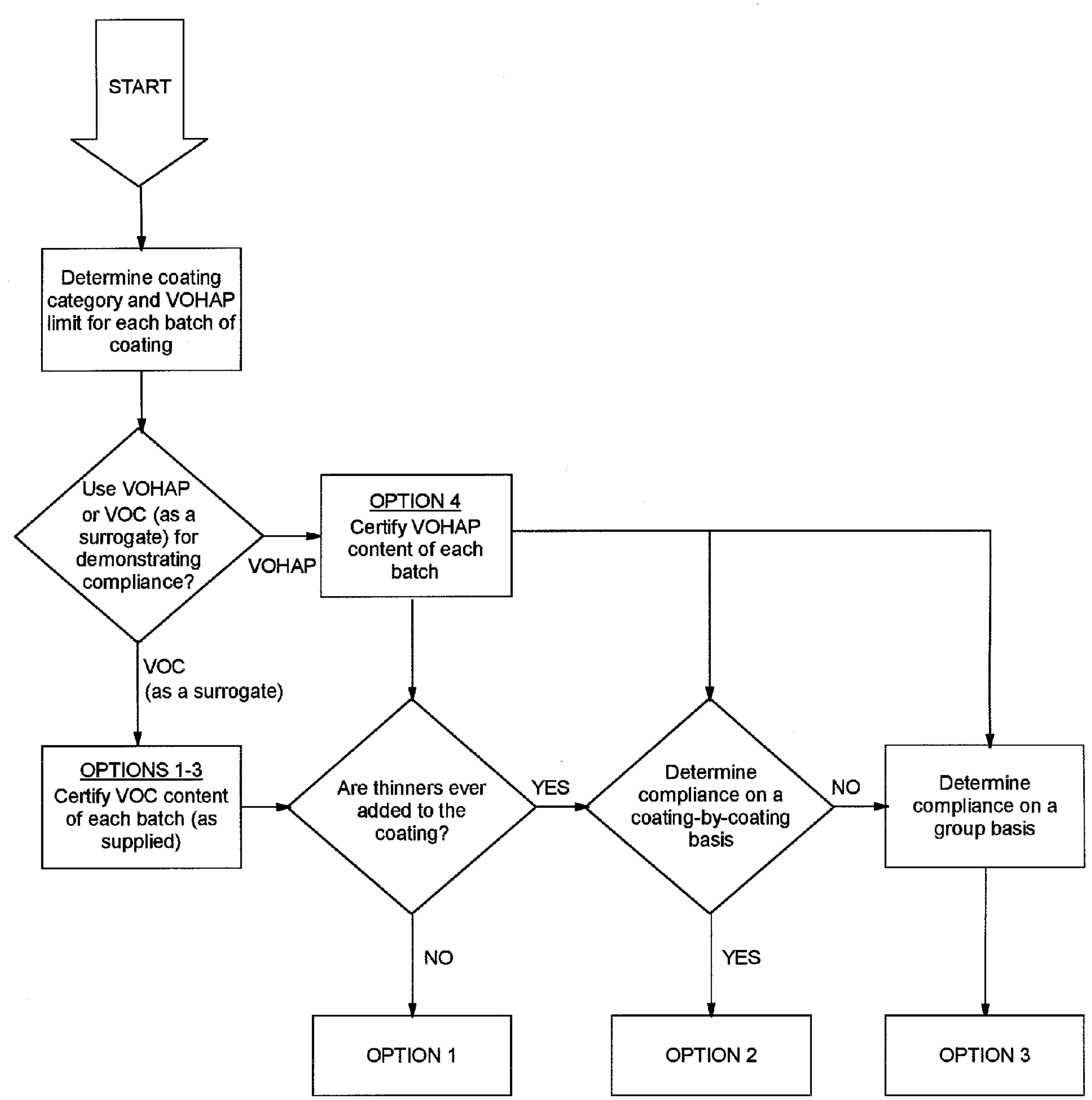


Figure 4-1. Compliance options.

EPA, did not want average limits because of the additional recordkeeping burden and the fact that most existing State regulations utilize the same type of maximum never-to-be-exceeded limits for marine coatings.

It is important to note that a type of averaging is allowed for certain recordkeeping and reporting purposes (compliance option 3). This "averaging" of recordkeeping/reporting data associated with coatings grouped together by the type of thinning solvent is only meant to provide flexibility to shipyards and hopefully reduce the paperwork burden (i.e., labor hours) needed to compile monthly records. This approach will be beneficial to any facility doing minimal thinning or using one or two particular thinners for all of their marine coatings.

The limits for this regulation are set in terms of grams of VOHAP per liter of solids (g/L) and are "never to be exceeded." What does this mean from a compliance perspective? The regulation requires that each and every container of "as applied" coating must comply with the applicable maximum or "never to be exceeded" VOHAP content limit. Averaging of compliant and noncompliant paints is not allowed. The semi-annual compliance reports can be completed using units of g VOHAP/L of solids or g VOHAP/L of coating for shipyards using compliance option 1. The NESHAP provides this flexibility to allow shipyards to report coating compliance in those terms with which they are most familiar or comfortable. However, the solids (nonvolatiles) based units are to be used with compliance options 2, 3, and 4 and in resolving any "equivalency" questions.

What if I want to use a different control technique? You may use another control technique, as long as you meet and can demonstrate an equivalent emission reduction for your facility. You will need EPA approval to choose another technique, as well as get EPA approval on the monitoring parameters or alternative test methods that you will use.

WORK PRACTICES

Besides complying with the VOHAP emission limits discussed in the above compliance options, you will also be required to meet work practice standards. The procedures, equipment, training, etc., to meet work practice standards are to be identified and explained in your implementation plan. Also, the procedures to be used for documenting (record and report compliance) that the work practice standards are being met have to be described in your implementation plan as well. Examples of specific work practice standards are included as part of the example implementation plan in Appendix E.

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CHAPTER 5

HOW WILL I DEMONSTRATE COMPLIANCE?

Once you have selected which compliance option(s) you intend to use (documented in your implementation plan), you have until the 15th day of each calendar month to compile the required information to demonstrate compliance for the previous month. Figure 5-1

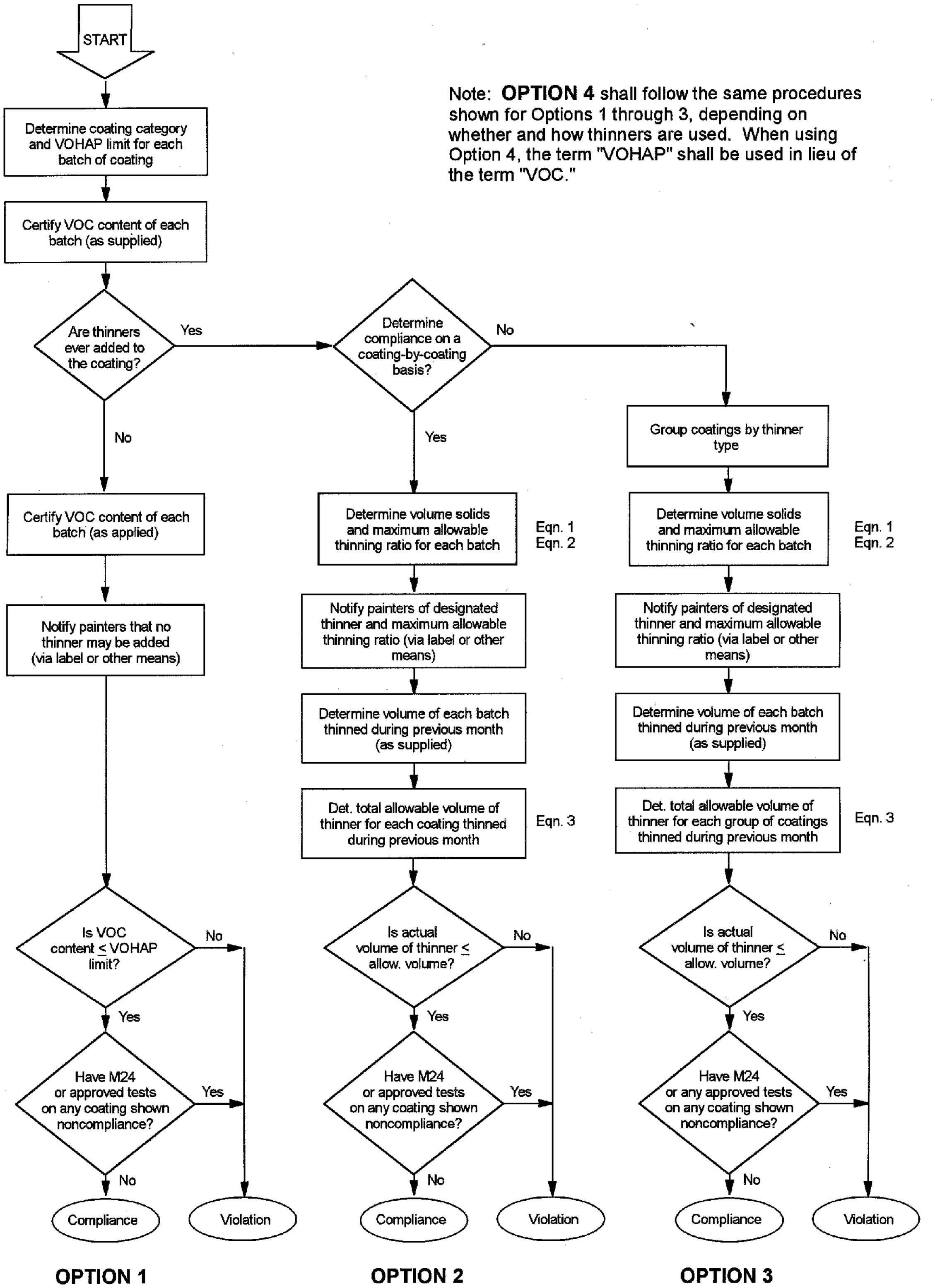

Figure 5-1. Flow diagram of compliance procedures.

provides a flow diagram of all four compliance procedures and Table 5-1

TABLE 5-1. STEP-BY-STEP COMPLIANCE OPTIONS

Step 1.0	Do you want to demonstrate compliance using VOC data (Options 1, 2, and 3) or VOHAP data (Option 4)?
Step 2.0	Set up a coatings and thinning solvent database: determine coating category, VOHAP limit, and VOC/VOHAP content of each batch of coating and thinning solvent (as supplied).
Step 3.0	Depending on whether or not and how thinning solvents are added to a specific coating or group of coatings, select compliance options 1, 2, or 3.
OPTION 1	
Step 4.1	Certify VOC/VOHAP content of each batch of coating (as applied).
Step 5.1	Notify painters that no thinning solvent may be added to the coating and maintain a sample of the documentation.
Step 6.1	Document in monthly records that the VOC/VOHAP content of each coating is less than or equal to the applicable VOHAP limit. (Compliance is thereby demonstrated.)
OPTION 2	
Step 4.2	Determine volume solids (nonvolatiles) and maximum allowable thinning ratio for each batch of coating (using Equations 1 and 2, if necessary).
Step 5.2	Notify painters of designated thinning solvent that may be added and the maximum allowable thinning ratio and maintain a sample of the documentation.
Step 6.2	Determine the "as supplied" amount (volume) of each batch of coating that was thinned during the previous month.
Step 7.2	Determine the total allowable amount (volume) of thinning solvent for each coating thinned during the previous month using Equation 3.
Step 8.2	Document in monthly records that the volume of actual thinner added to each batch of coating is less than or equal to the allowable volume. (Compliance is thereby demonstrated.)
OPTION 3	
Step 4.3	Group coatings by thinner type (e.g., all coatings thinned with the same thinning solvent).
Step 5.3	Determine volume nonvolatiles (solids) and maximum allowable thinning ratio for each batch of coating (using Equations 1 and 2, if necessary).
Step 6.3	Notify painters of designated thinning solvent that may be added and the maximum allowable thinning ratio and maintain a sample of the documentation.
Step 7.3	Determine the "as supplied" amount (volume) of each batch of coating that was thinned during the previous month.
Step 8.3	Determine the total allowable amount (volume) of thinning solvent for each group of coatings thinned during the previous month using Equation 3.
Step 9.3	Document in monthly records that the volume of actual thinner added to the group of coatings is less than or equal to the allowable volume. (Compliance is thereby demonstrated.)

gives step-by-step instructions for demonstrating compliance using each of the compliance options. The required information varies slightly, depending on the selected compliance option, but generally involves certifying the total amount of each type (i.e., category) of coating applied during the month compiled with the applicable VOHAP limit in Table 2-1.

The "certification" of each coating is the key to demonstrating compliance. Figure 5-2

VOC DATA SHEET:[1]

PROPERTIES OF THE COATING "AS SUPPLIED" BY THE MANUFACTURER[2]

Coating Manufacturer:____________________________________

Coating Identification:____________________________________

Batch Identification:____________________________________

Supplied To:____________________________________

Properties of the coating as supplied[2] to the customer:

A. Coating Density: $(D_c)_s$ ______ g/L

G ASTM D1475-90 G Other[3]

B. Total Volatiles: $(m_v)_s$ ______ Mass Percent

G ASTM D2369-93 G Other[3]

C. Water Content:

1. $(m_w)_s$ ______ Mass Percent

G ASTM D3792-91 G ASTM D4017-90 G Other[3]

2. $(v_w)_s$ ______ Volume Percent

G Calculated G Other[3]

D. Organic Volatiles: $(m_o)_s$ _______ Mass Percent

E. Nonvolatiles: $(v_n)_s$ _______ Volume Percent

G Calculated G Other[3]

F.[4] VOC Content $(VOC)_s$:

1. _______ g/L solids (nonvolatiles)

2. _______ g/L coating (less water and exempt compounds)

G. Thinner Density: D_{th} ______ g/L

ASTM ______ G Other[3]

Remarks: (use reverse side)

Signed:________________________ Date:________________________

[1]Adapted from EPA-340/1-86-016 (July 1986), p. II-2.
[2]The subscript "s" denotes each value is for the coating "as supplied" by the manufacturer.
[3]Explain the other method used under "Remarks."
[4]Include mass of HAP "exempt" compounds.

Figure 5-2. VOC Data Sheet.

VOHAP DATA SHEET:[1]

PROPERTIES OF THE COATING "AS SUPPLIED" BY THE MANUFACTURER[2]

Coating Manufacturer:____

Coating Identification:____

Batch Identification:____

Supplied To:____

Properties of the coating as supplied[2] to the customer:

A. Coating Density: $(D_c)_s$ ______ g/L

G ASTM D1475-90 G Other[3]

B. Total Volatiles: $(m_v)_s$ ______ Mass Percent

G ASTM D2369-93 G Other[3]

C. Water Content:

1. $(m_w)_s$ ______ Mass Percent

G ASTM D3792-91 G ASTM D4017-90 G Other[3]

2. $(v_w)_s$ ______ Volume Percent

G Calculated G Other[3]

D. HAP Volatiles: $(m_{HAP})_s$ _______ Mass Percent

E. Nonvolatiles: $(v_n)_s$ _______ Volume Percent

G Calculated G Other[3]

F. VOHAP Content $(VOHAP)_s$:

1. _______ g/L solids (nonvolatiles)

2. _______ g/L coating (less water and exempt compounds)

G. Thinner VOHAP Density: $D_{th(VOHAP)}$ ______ g/L

ASTM ______ G Other[3]

Remarks: (use reverse side)

Signed:______________________________ Date:______________________________

[1]Adapted from EPA-340/1-86-016 (July 1986), p. II-2.

[2]The subscript "s" denotes each value is for the coating "as supplied" by the manufacturer.

[3]Explain the other method used under "Remarks."

Figure 5-3. VOHAP Data Sheet.

can be used for certifying the VOC content of a specific coating, and Figure 5-3 can be used for certifying the VOHAP content of a specific coating. Other forms may be used to certify either the VOC or VOHAP content of a marine coating (see examples in Appendix E) and it should be noted that the majority of the work associated with the certification and compliance demonstration needs to be done once the coatings are ordered or received by the shipyard. Many of the coatings will be used repeatedly and having a good database of coating compliance certification information will greatly simplify the monthly compliance burden.

If thinning solvents are sometimes or routinely added to coatings prior to application, there are equations to be used (see § 3.785(c)(2)) to calculate the maximum allowable thinning ratio and the total allowable volume of thinner. Once again, you can save yourself a lot of time by collecting the relevant coating and solvent data prior to the actual application in the field. Similar provisions are included for cold weather (temperatures < 4.5 °C) conditions, as well as separate VOHAP limits (see Table 2-1).

The source has an existing inventory of paints that may exceed the NESHAP limits. Can the source finish its inventory after the compliance date? Can the source enter into consent orders or have a grace period to use it up? The other alternative would be to dispose of it as hazardous waste. In light of the recent direct final regulation (June 18, 1996), which extended the compliance date from December 16, 1996 to December 16, 1997, the EPA believes there should be no reason to have noncompliant coatings in inventory at any shipyard on the new compliance date. Industry representatives and trade associations have worked with the EPA for the past 5 years in developing the NESHAP and the CTG and are well aware of the limits. The coating manufacturers and the National Paint and Coatings Association (NPCA) are similarly informed.

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CHAPTER 6

WHAT RECORDKEEPING AND REPORTING WILL I NEED TO DO?

RECORDKEEPING

This regulation requires that you keep records to document your compliance status with the regulation. It is recommended that someone at each facility be identified to maintain all NESHAP compliance recordkeeping information as required for each option used during the reporting periods. These records must be maintained for 5 years. Many, but not all, recordkeeping items are reported. The recordkeeping requirements are summarized in Table 2-2.

REPORTING

You must submit all reports to the Administrator before the 60th day following completion of each 6-month period after the compliance date. The "Administrator" is the appropriate Regional Office of the U. S. Environmental Protection Agency (as listed in Table 10-1 of this guidebook) or the delegated State or local authority. You may contact the appropriate EPA Regional Office to identify those State or local agencies with delegated authority. The required reports may be sent by U.S. Mail, fax, or by another courier (including electronic submission). The reporting requirements are summarized in Table 2-2. For existing sources, the first six month compliance period ends June 16, 1998, and the associated compliance report is due August 16, 1998.

RECORDKEEPING AND REPORTING REQUIREMENTS

For both recordkeeping and reporting, specific requirements vary according to which particular compliance option you choose. (These compliance options are detailed in Chapter 4.) Regardless of which option you choose, you must record and, in most cases, report the following items:

- **Initial notifications**

  If your source had an initial start-up date before December 15, 1996, (this would include all affected existing facilities), you should have submitted an initial notification by June 15, 1996. Any new source (with an initial start-up date on or after December 15, 1996) must submit an initial notification 6 months prior to start-up. (See Appendix D.)

- **Implementation Plan**

  Existing sources must submit an implementation plan by December 16, 1996. A sample implementation plan is included as Appendix E. The sample implementation plan is only an example; you can use any format as long as your implementation plan provides the following information:

(1) Coating Compliance Procedures

(2) Recordkeeping Procedures. You must include the procedures for maintaining all required records, including the procedures for gathering necessary data and making calculations

(3) Transfer, Handling, and Storage Procedures. You must include the procedures for ensuring compliance with the requirements of the regulation as discussed in Chapter 5

- **Monthly records**

  (1) Volume of each low-usage-exempt coating applied (by month)

  (2) Identification of the coatings used, their EPA categories, and VOHAP limits

  (3) Results of Method 24 or other approved measurements on individual containers

  (4) Certification of as-supplied VOC content for each batch of coating* (See examples in Appendix F)

Additional recordkeeping and reporting requirements depend on your facility's specific compliance procedures. (These procedures are described in Chapter 5 of this guidebook.) The following discussion presents these requirements according to the specific compliance procedures.

Option 1 - No Thinning Solvents Added

If your facility does not add any thinning solvents to coatings, you may opt to use option 1. If you choose this option, you must record the following information:

*Must be recorded, but not reported.

- Certification of the as-applied VOC content of each batch of coating (which is the same as the as-supplied VOC content)
- The volume of each coating applied*
- Compliance violations, if applicable

Option 2 - Coating-By-Coating Compliance

If you choose this type of compliance, you must record the following information for each coating for each month:

- Designated thinner for the coating and its density
- Volume fraction of solids (nonvolatiles) for each batch of the coating, including calculations *
- Maximum allowable thinning ratio for each batch of the coating, including calculations *
- Cold weather dates and times, below 4.5°C (if cold weather VOHAP content limits are used) *
- Volume of each batch of the coating applied *
- Total allowable volume of thinner, including calculations *
- Actual volume of thinner used
- Compliance violations, if applicable

Option 3 - Group Compliance

If you choose this type of compliance, you must record the following information:

- Designated thinner for the group of coatings and its density
- Mass fraction and volume fraction of solids (nonvolatiles) for each batch of each coating in the group, including calculations *
- Maximum allowable thinner ratio for each batch, including calculations *
- Cold weather dates and times, below 4.5°C *
- Identification of coating groups and thinners *
- Volume applied of each batch of each coating in the group *
- Total allowable volume of thinner, including calculations *
- Actual volume of thinner used*
- Compliance violations, if applicable

Option 4 - Alternative Test Method

Compliance may be demonstrated through an alternative (i.e., other than EPA Method 24) test method. If you choose an alternative test method where compliance is based on actual VOHAP content, rather than the VOC surrogate used under Options 1-3, you must record and report the Administrator-approved VOHAP test method or certification procedure. The other recordkeeping and reporting requirements are identical to those of Options 1, 2, or 3, depending on if and how thinners are used.

Method 311 - Analysis of Hazardous Air Pollutant Compounds in Paints and Coatings by Direct Injection into a Gas Chromatograph was developed by EPA as a result of the Wood Furniture (Surface Coating) NESHAP. However, any alternative test method must meet the specified accuracy limits for sensitivity, duplicates, repeatability, and reproducibility coefficient of variation described in Section 63.786 Test methods and Procedures of the final regulation (see Appendix A).

(Note: When using Option 4, the term "VOHAP" should be used instead of the term "VOC" since compliance is to be demonstrated using actual VOHAP content--see Figure 5-1 and Table 5-1.)

What if a violation in the standard occurs?

If you detect a violation of the standards, you must record additional information for the remainder of the reporting period during which the violation occurred. Your violation may be covered by a Federally-approved exemption (e.g., a promulgated exemption from an emission limitation or standard published in the Federal Register). If it is, you must report the following information:

- A summary of the number and duration of the violations, classified by reason
- A summary of the number and total duration of incidents in which the monitoring procedures did not operate smoothly or produced data that was inaccurate, classified by reason.
- The compliance status on the last day of the reporting period and information on whether compliance was continuous or interrupted during the reporting period.

For other violations, a federally-approved exemption may not apply to the violation. In these instances, you must report the following information:

- The magnitude of each violation
- The reason for each violation
- A description of the corrective action taken for each violation, which should include actions taken to minimize each violation and the action taken to prevent reoccurrences
- All quality assurance activities performed on any monitoring procedures.

There has been some confusion regarding the initial notification and the implementation plan for complying with the shipbuilding NESHAP. When are they due? When the final regulation was published in the Federal Register on December 15, 1995 (see Appendix A), both the initial notification and implementation plan were to be submitted by June 15, 1996. However, the direct final regulation published on June 18, 1996 in the Federal Register extended the due date for submitting your implementation plan until December 16, 1996, and extended the compliance date to December 16, 1997. It was EPA's intent to only extend the due date for submitting the implementation plan and extend the compliance date. Initial notifications were never an issue and were due June 13, 1996.

CHAPTER 7

WHAT ARE MY POLLUTION PREVENTION OPTIONS?

What is Pollution Prevention? As stated in the Pollution Prevention Act of 1990, Congress has declared it to be the nation's policy that, wherever feasible, pollution should be prevented or reduced at the source. The Act states that source reduction is more desirable than waste management and pollution control. Source reduction is defined as any practice that reduces the amount of any hazardous substance entering the waste stream or otherwise released into the environment (from a process) prior to recycling, treatment, or disposal. Therefore, you must also consider wastewater, hazardous waste, and solid waste effects and regulations as well as air pollutant emissions in selecting any method of control.

What are my options? This regulation allows for pollution prevention measures to be used when complying with the requirements of the regulation. The entire regulation focuses on pollution prevention in that the marine coating limits are based on switching to lower VOC/VOHAP coatings (alternatives are allowed, but require special approval) and the work practice standards are intended to reduce evaporative losses and prevent spills and accidental emissions.

There are several potential pollution prevention options for the shipbuilding and ship repair industry, many of which can be included as work practice standards in the facility-specific implementation plan.

These options include:

- More efficient application equipment
- Extensive operator training
- Reformulated marine coatings
- Recycling of cleaning solvents
- Alternative cleaning materials
- Containment around storage areas for VOC/VOHAP-containing materials

Other pollution prevention measures include (1) carefully handling and transferring all VOC/ VOHAP containing materials to and from containers, tanks, vats, vessels, and piping systems so that spills are minimized and (2) closing all thinning solvent and waste containers that hold any VOC/VOHAP unless adding or removing materials from them.

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CHAPTER 8

HOW DOES THIS REGULATION RELATE TO OTHER FEDERAL AND STATE OR LOCAL REQUIREMENTS?

PERMITTING

Will I need a State operating permit? Yes. Under title V, all major sources are required to obtain permits--no deferrals or exemptions are allowed for these major sources.

Title V operating permit program background. Title V of the CAA as amended in 1990 requires the establishment of State-implemented operating permits programs with Federal oversight. Prior to the 1990 amendments, sources were not required by Federal law to obtain operating permits for sources of air pollution emissions. However, many States issued their own operating permits to certain sources. You may have been required to obtain an operating permit for your facility under a State permit program in the past. Now, all major sources are required to obtain a title V operating permit.

Permit requirements in general. The operating permit program will incorporate all applicable Federal CAA regulation requirements and any State or local government requirements. Therefore, permit requirements will be at least as stringent as requirements mandated by the Federal CAA regulations (e.g., the shipbuilding and ship repair NESHAP).

The basic format of operating permits is detailed (codified) in part 70 of title 40 of the *Code of Federal Regulations* (40 CFR part 70). Owners or operators of facilities subject to Federal CAA regulations will have to:

- submit a permit application;
- submit compliance plans and schedules;
- comply with all applicable air emission limits and standards listed in the permit (e.g., the shipbuilding and ship repair NESHAP);
- conduct monitoring (if required), submit monitoring reports, and make semi-annual certifications of the source's compliance status;
- submit applications for any permit modifications;
- submit applications for permit renewals every 5 years; and
- pay a permit or emission fee.

Does my State have a permitting program? All States must develop a title V operating permits program. States were required to submit their permitting programs to EPA for approval by November 15, 1993. One year later, the EPA was to have approved the States' permitting programs and authorized the States to administer their programs. As of July 1996, approvals have been published in the Federal Register for 42 State and 56 local programs; additionally, EPA has proposed to approve another 4 State agency programs and 3 local agency programs. The EPA's Technology Transfer Network (TTN), an electronic bulletin board system, has the latest status of permit program submittals and approvals. (See Chapter 10 for instructions on how to access the TTN.) You may also contact your State or local air pollution control agency for more information on the status of your State's title V operating permit program.

When do I apply for my operating permit? Your deadline for submitting a title V operating permit application will depend on when your State or local title V permitting program is approved by the EPA. In general, your application will be due within 12 months after the title V program approval date. However, some State and local permitting authorities have shorter deadlines. Once you have your operating permit, it must be renewed or updated at least every 5 years.

EPA's GENERAL PROVISIONS

On March 16, 1994, EPA published the General Provisions for all regulations codified in part 63 (i.e., all NESHAP) of the Code of Federal Regulations (CFR). These General Provisions were published in the Federal Register in volume 59, beginning on page 12408. When a source becomes subject to a regulation in part 63, it automatically is subject to the General Provisions as well. However, individual regulations in part 63 may override part or all of the General Provisions. In the case of this regulation, EPA has over-ridden some of the requirements of the General Provisions. Table 1 of the shipbuilding regulation (located on page 64344 of the Federal Register text, see Appendix A) explains in detail which sections apply and which sections are overridden.

STATE OR LOCAL MARINE COATING REGULATIONS

State or local requirements that may have affected you prior to the new Federal regulation for shipbuilding and ship repair continue to apply. The new Federal regulation is the minimum emission control that is required nationally. Some State and local agencies do require stricter limits. If the current State or local standard is less stringent than the Federal regulation, the Federal regulation must be met.

The format of State or local standards may be different also. For example, the California Air Resources Board (CARB), the various air quality management districts in California, and the State of Louisiana have marine coating limits expressed in terms of mass (g) of VOC per volume (L) of coating less water and exempt compounds. State regulations typically relate to VOC rather than VOHAP. Accordingly, State rules may have shorter compliance periods (e.g., daily rather than monthly). The NESHAP was based primarily on the marine coating limits in California, and the solids- (nonvolatiles) based limits of the NESHAP are equivalent to those limits expressed in the California marine coating regulation.

In addition to air pollution regulations, shipyard surface coating operations may also be subject to wastewater and solid waste disposal regulations. Contact your State or local permitting authority for more information.

CHAPTER 9

HOW MUCH WILL IT COST?

OVERVIEW

The cost of complying with the regulation will typically involve additional material (coatings) and recordkeeping and reporting costs. As summarized in Chapters 4 and 5, you only have to use compliant coatings (which are readily available in today's market) and good work practices to comply with the regulation. Compliant coatings may be more expensive than the conventional coatings they replace. In addition, demonstrating compliance to the appropriate enforcement official will involve more paperwork and labor to complete that paperwork. Many of the larger (i.e., Tier I) shipyards have tracking systems currently in place that will only have to be modified slightly or not at all. Shipyards located in states such as California and Louisiana that have been complying with similar requirements for several years should have minimal cost impacts as well.

In developing cost impacts of the regulation, EPA used model plants to analyze separate costs. Table 9-1 summarizes the costs for each size and type of model shipyard. These results represent the original shipyard costs to comply and were calculated as the difference between before (baseline) and after NESHAP costs. The average shipyard was projected to spend $58,000/yr to comply with the regulation.

MATERIAL (COATING) COSTS

The net cost associated with switching to lower-VOHAP coatings was assumed to be the sum of the additional cost of compliant coatings, the savings associated with higher solids content, the savings associated with decreased thinner usage. Costs were developed for "baseline" (all coatings being used currently) and for those coatings meeting the VOHAP limits in Table 2-1. The difference between the use of baseline and compliant coatings is presented in Table 9-1.

For the impact analysis, it was assumed that the total build of a lower-VOHAP coating (the dry film thickness) would equal that of the conventional counterpart, i.e., the total amount of solids (nonvolatiles) applied would remain constant. Because lower-VOHAP solvent-borne coatings contain more nonvolatiles (solids), the total volume of paint needed to coat a given area is less than for the conventional, lower-solids coatings (assuming constant transfer efficiency). The lower-VOHAP coatings, however, are more expensive on a dollar-per-unit volume basis.

In evaluating the use of lower-VOHAP solvent-borne coatings, it was assumed that lower-VOHAP coatings require the same amount of thinning solvent, liter for liter, as conventional coatings. Because fewer liters of lower-VOHAP coatings are required (as a result of their higher solids content), thinner use would decrease. A decrease in the amount of thinner used results in VOHAP emission reductions and a cost savings.

RECORDKEEPING AND REPORTING

Recordkeeping and reporting (R&R) practices are established by permit conditions, and in some instances, the requirements of section 313 of the Superfund Amendments and Reauthorization Act of 1986 (SARA 313). For that reason, the cost of recordkeeping to comply with permit and SARA 313 requirements are considered as the baseline from which to measure the incremental cost of this regulation. Complying with the NESHAP will require more involved recordkeeping practices than those necessary at the baseline.

Recordkeeping and reporting costs are a function of the equipment and labor required. A computer (and software) will probably be used. Labor requirements include training, data recording and analysis, and report preparation.

Most large and medium shipyards already maintain records to comply with State or local permits as well as SARA 313 requirements. It has been assumed that the operations at these facilities are complex enough and the facilities sophisticated enough that they already use a computerized system for R&R.

The current reporting requirements for large and medium yards (at baseline) are assumed to consist of an annual SARA 313 report and an annual report of VOC emissions. To prepare these reports, it is assumed that the facilities have adapted their central inventory tracking system to record the quantity of each paint and thinner used at the yard. It is also assumed that this information is coupled with a data base in which the HAP and VOC contents of each paint and thinner are stored. The total technical labor devoted to recordkeeping and reporting for large and medium yards prior to promulgation of the NESHAP is estimated to be 159 hours per years (hr/yr). To comply with the NESHAP it was assumed that no additional equipment is required for any affected facility.

Most of the additional costs associated with the NESHAP will result from the higher costs of compliant coatings compared to those being used currently. The recordkeeping and reporting burden only accounts for approximately 25 percent of the total costs.

TOTAL COSTS

Table 9-1 summarizes the total industry annual costs resulting from implementing the NESHAP, which were estimated to be about $2.0 million. The average facility cost to comply with the final regulation is estimated to be $58,000/yr. These estimates presume that all incremental environmental costs are imposed as a consequence of implementing MACT. In fact, those shipyards located in nonattainment areas (which is thought to include most of the 35) will likely be required to bear essentially the same costs to meet State requirements for limiting VOC emissions as the States impose rules based on EPA's recommendations on best available control measures (BACM) for control of VOC.

PERMITTING FEES

As discussed in Chapter 8, you may be required by the regulation to obtain an operating permit under title V of the CAA. If so, you will be charged a permit or emission fee by your State or local permitting authority when you apply for your title V permit. This fee will vary from State to State. For more information on title V operating permit fees, contact your State or local permitting authority or the EPA Regional Office for your State.

TABLE 9-1. ESTIMATED COSTS FOR COMPLYING WITH NESHAP, $/YR[a]

	Model Yards			
	Construction		Repair	
	Medium	Large	Medium	Large
Average total coating usage, L/yr (gal/yr)	158,726 (41,931)	510,560 (134,876)	131,228 (34,667)	453,718 (119,860)
Average total solvent usage, L/yr (gal/yr)	43,532 (11,500)	162,132 (42,831)	20,562 (5,432)	23,091 (6,100)
Additional (net) material - coating and solvent costs, $/yr	40,217	124,783	12,306	43,448
Recordkeeping and reporting costs (above baseline level), $/yr	9,825	32,627	9,825	32,627
Total additional costs, $/yr	50,042	157,410	22,131	76,075
Estimated number of affected facilities	8	6	17	4
Total costs, $/yr	400,336	944,460	376,227	304,300
Total industry costs = $2,025,323				
Average facility costs = $57,866				

[a]Based on 1992 dollars.

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CHAPTER 10

WHERE CAN I GO FOR MORE INFORMATION AND ASSISTANCE?

TELEPHONE CONTACTS

For more information on how to comply with this regulation, please call:

- ☎ your State or local air pollution control agency;
- ☎ your local, regional, or national trade association;
- ☎ your State Small Business Assistance Program; or
- ☎ your State Small Business Ombudsman.

For information on your State Small Business Assistance Program contacts, call EPA's Control Technology Center Hotline at (919) 541-0800.

Also, for more information, you may call the EPA Regional Office that serves your State or territory. Table 10-1 lists the telephone numbers of the 10 EPA Regional Offices and the States and territories that they serve.

EPA's ELECTRONIC BULLETIN BOARD SYSTEM

The EPA operates an electronic bulletin board, the *Technology Transfer Network* or *"TTN,"* which contains copies of preambles and regulations, background information documents, policy memoranda, and other guidance materials. You may access the TTN via modem by dialing (919) 541-5742 or the Internet at http:\\ttnwww.rtpnc.epa.gov. Assistance with the TTN is available by calling (919) 541-5384.

OTHER EPA GUIDANCE MATERIALS

In developing this regulation, EPA has prepared other materials that provide more information on the technical aspects of the regulation. These include:

- *Surface Coating Operations at Ship-building and Ship Repair Facilities--Background Information for Proposed Standards (Volume I).*

  EPA-453/R-93-030a. February 1994.
- *National Emission Standards for Hazardous Air Pollutants for Ship-building and Ship Repair Facilities (Surface Coating)--Background Information for Final Standards*.

  EPA-453/R-95-016b. November 1995.

Copies of these reports are available through EPA's Library Services Office (MD-35), U. S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, (919) 541-2777; on EPA's TTN; or, for a fee, from the National Technical Information Services, 5285 Port Royal Road, Springfield, Virginia 22161, (703) 487-4600.

Also, EPA has developed an informational pamphlet which has summarized much of the general information contained in this guidebook. A copy of the pamphlet may be obtained by contacting Dr. Mohamed Serageldin of EPA's Emission Standards Division, Research Triangle Park, North Carolina. His telephone, fax, and email are (919) 541-2379, (919) 541-5689, and serageldin.mohamed@epamail.epa.gov, respectively. You may also contact

Ms. Suzanne Childress of EPA's Office of Enforcement and Compliance Assurance (OECA), Mail Station 2223-A, 401 M Street, S.W., Washington, D.C. 20460. Her telephone and fax numbers are (202) 564-7018 and (202) 564-7018, respectively.

TABLE 10-1. EPA REGIONAL OFFICE CONTACTS

Region	Telephone #	States covered	Address
1	(617) 565-3728	CT, ME, MA, NH, RI & VT	Director, Air, Pesticides and Toxics Division J.F.K. Federal Building Boston, MA 02203-2211
2	(212) 637-4023	NJ, NY, Puerto Rico & Virgin Islands	Director, Air and Waste Management Division 290 Broadway 21st Floor New York, NY 10007-1866
3	(215) 597-3237	DE, MD, PA, VA, WV & District of Columbia	Director, Air, Radiation and Toxics Division 841 Chestnut Street Philadelphia, PA 19107
4	(404) 347-2864	AL, FL, GA, KY, MS, NC, SC & TN	Director, Air, Pesticides and Toxics Management Division 345 Courtland Street, NE Atlanta, GA 30365
5	(312) 886-6793	IL, IN, MI, WI, MN & OH	Director, Air and Radiation Division 77 West Jackson Blvd. Chicago, IL 60604-3507
6	(214) 665-7225	AR, LA, NM, OK & TX	Director, Air, Pesticides and Toxics 1445 Ross Avenue Dallas, TX 75202-2733
7	(913) 551-7556	IA, KS, MO & NE	Director, Air RCRA and Toxics Division 726 Minnesota Avenue Kansas City, KS 66101
8	(303) 293-1886	CO, MT, ND, SD, UT & WY	Director, Air and Toxics Division 999 18th Street 1 Denver Place, Suite 500 Denver, CO 80202-2405
9	(415) 744-1143	AZ, CA, HI, NV, American Samoa & Guam	Director, Air and Toxics Division 75 Hawthorne Street San Francisco, CA 94105
10	(206) 553-1949	AK, ID, WA & OR	Director, Air and Toxics Division 1200 Sixth Avenue Seattle, WA 98101

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APPENDIX A

**FEDERAL REGISTER NOTICE:
FINAL RULE AND DIRECT FINAL RULE**

APPENDIX B

GLOSSARY OF TERMS

Terms used in the NESHAP and in this Guidebook are defined in the Clean Air Act (Act), or in this section as follows:

Add-on control system means an air pollution control device such as a carbon absorber or incinerator that reduces pollution in an air stream by destruction or removal prior to discharge to the atmosphere.

Affected source means any shipbuilding or ship repair facility having surface coating operations with a minimum 1,000 liters (L) (264 gallons [gal]) annual marine coating usage.

Air flask specialty coating means any special composition coating applied to interior surfaces of high pressure breathing air flasks to provide corrosion resistance and that is certified safe for use with breathing air supplies.

Antenna specialty coating means any coating applied to equipment through which electromagnetic signals must pass for reception or transmission.

Antifoulant specialty coating means any coating that is applied to the underwater portion of a vessel to prevent or reduce the attachment of biological organisms and that is registered with the EPA as a pesticide under the Federal Insecticide, Fungicide, and Rodenticide Act.

As applied means the condition of a coating at the time of application to the substrate, including any thinning solvent.

As supplied means the condition of a coating before any thinning, as sold and delivered by the coating manufacturer to the user.

Batch means the product of an individual production run of a coating manufacturer's process. (A batch may vary in composition from other batches of the same product.)

Bitumens mean black or brown materials that are soluble in carbon disulfide, which consist mainly of hydrocarbons.

Bituminous resin coating means any coating that incorporates bitumens as a principal component and is formulated primarily to be applied to a substrate or surface to resist ultraviolet radiation and/or water.

Certify means, in reference to the volatile organic compound (VOC) content or volatile organic hazardous air pollutant (VOHAP) content of a coating, to attest to the VOC content as determined through analysis by Method 24 of appendix A to part 60 of title 40 of the Code of Federal Regulations (40 CFR 60) or through the use of forms and procedures outlined in Figure 5-2, or to attest to the VOHAP content as determined through an EPA approved test method. In the case of conflicting results, Method 24 of Appendix A to 40 CFR Part 60 shall take precedence over the forms and procedures outlined in Figure 5-2 for the options in which VOC is used as a surrogate for VOHAP.

Coating means any material that can be applied as a thin layer to a substrate and which cures to form a continuous solid film.

Cold-weather time period means any time during which the ambient temperature is below 4.5°C (40°F) and coating is to be applied.

Container of coating means the container from which the coating is applied, including but not limited to a bucket or pot.

Cure volatiles means reaction products that are emitted during the chemical reaction which takes place in some coating films at the cure temperature. These emissions are other than those from the solvents in the coating and may, in some cases, comprise a significant portion of total VOC and/or VOHAP emissions.

Epoxy means any thermoset coating formed by reaction of an epoxy resin (i.e., a resin containing a reactive epoxide with a curing agent).

Exempt compounds means specified organic compounds that are not considered VOC due to negligible photochemical reactivity. Exempt compounds are specified in 40 CFR §51.100(s).

Facility means all contiguous or adjoining property that is under common ownership or control, including properties that are separated only by a road or other public right-of-way.

General use coating means any coating that is not a specialty coating.

Hazardous air pollutant (HAP) means any air pollutant listed in or pursuant to Section 112(b) of the CAA.

Heat resistant specialty coating means any coating that during normal use must withstand a temperature of at least 204°C (400°F).

High-gloss specialty coating means any coating that achieves at least 85 percent reflectance on a 60 degree meter when tested by ASTM Method D-523.

High-temperature specialty coating means any coating that during normal use must withstand a temperature of at least 426°C (800°F).

Inorganic zinc (high-build) specialty coating means a coating that contains 960 grams per liter (8 pounds per gallon) or more elemental zinc incorporated into an inorganic silicate binder that is applied to steel to provide galvanic corrosion resistance. (These coatings are typically applied at more than 2 mil dry film thickness.)

Major source means any source that emits or has the potential to emit in the aggregate 9.1 megagrams per year (10 tons per year) or more of any HAP or 22.7 megagrams per year (25 tons per year) or more of any combination of HAP.

Maximum allowable thinning ratio means the maximum volume of thinner that can be added per volume of coating without violating the applicable VOHAP limit (see Table 2-1).

Military exterior specialty coating or Chemical Agent Resistant Coatings ("CARC") means any exterior topcoat applied to military or U.S. Coast Guard vessels that are subject to specific chemical, biological, and radiological washdown requirements.

Mist specialty coating means any low viscosity, thin film, epoxy coating applied to an inorganic zinc primer that penetrates the porous zinc primer and allows the occluded air to escape through the paint film prior to curing.

Navigational aids specialty coating means any coating applied to Coast Guard buoys or other Coast Guard waterway markers when they are recoated aboard ship at their usage site and immediately returned to the water.

Nonskid specialty coating means any coating applied to the horizontal surfaces of a marine vessel for the specific purpose of providing slip resistance for personnel, vehicles, or aircraft.

Nonvolatiles (or volume solids) means substances that do not evaporate readily. This term refers to the film-forming material of a coating.

Normally closed means a container or piping system is closed unless an operator is actively engaged in adding or removing material.

Nuclear specialty coating means any protective coating used to seal porous surfaces such as steel (or concrete) that otherwise would be subject to intrusion by radioactive materials. These coatings must be resistant to long-term (service life) cumulative radiation exposure (ASTM D4082-83), relatively easy to decontaminate (ASTM D4256-83), and resistant to various chemicals to which the coatings are likely to be exposed (ASTM 3912-80). [For nuclear coatings, see the general protective requirements outlined by the U.S. Atomic Energy Commission in a report entitled “U.S Atomic Energy Commission Regulatory Guide 1.54" dated June 1973, available through the Government Printing Office at (202) 512-2249 as document number A74062-00001.]

Operating parameter value means a minimum or maximum value established for a control device or process parameter that, if achieved by itself or in combination with one or more other operating parameter values, determines that an owner or operator has complied with an applicable emission limitation or standard.

Organic zinc specialty coating means any coating derived from zinc dust incorporated into an organic binder that contains more than 960 grams of elemental zinc per liter (8 pounds per gallon) of coating, as applied, and that is used for the expressed purpose of corrosion protection.

Pleasure craft means any marine or fresh-water vessel used by individuals for noncommercial, nonmilitary, and recreational purposes that is less than 20 meters in length. A vessel rented exclusively to or chartered for individuals for such purposes shall be considered a pleasure craft.

Pretreatment wash primer specialty coating means any coating that contains a minimum of 0.5 percent acid, by mass, and is applied only to bare metal to etch the surface and enhance adhesion of subsequent coatings.

Repair and maintenance of thermoplastic coating of commercial vessels (specialty coating) means any vinyl, chlorinated rubber, or bituminous resin coating that is applied over the same type of existing coating to perform the partial recoating of any in-use commercial vessel. (This definition does not include coal tar epoxy coatings, which are considered "general use" coatings.)

Rubber camouflage specialty coating means any specially formulated epoxy coating used as a camouflage topcoat for exterior submarine hulls and sonar domes.

Sealant for thermal spray aluminum means any epoxy coating applied to thermal spray aluminum surfaces at a maximum thickness of 1 dry mil.

Ship means any marine or fresh-water vessel used for military or commercial operations, including self-propelled vessels, those propelled by other craft (barges), and navigational aids (buoys). This definition includes, but is not limited to, all military and Coast Guard vessels, commercial cargo and passenger (cruise) ships, ferries, barges, tankers, container ships, patrol and pilot boats, and dredges. Pleasure crafts and offshore oil and gas drilling platforms are not considered ships.

Shipbuilding and ship repair operations means any building, repair, repainting, converting, or alteration of ships.

Special marking specialty coating means any coating that is used for safety or identification applications, such as markings on flight decks and ships' numbers.

Specialty coating means any coating that is manufactured and used for one of the specialized applications described within this list of definitions.

Specialty interior coating means any coating used on interior surfaces aboard U.S. military vessels pursuant to a coating specification that requires the coating to meet specified fire retardant and low toxicity requirements, in addition to the other applicable military physical and performance requirements.

Tack specialty coating means any thin film epoxy coating applied at a maximum thickness of 2 dry mils to prepare an epoxy coating that has dried beyond the time limit specified by the manufacturer for the application of the next coat.

Thinner means a liquid that is used to reduce the viscosity of a coating and that evaporates before or during the cure of a film.

Thinning ratio means the volumetric ratio of thinner to coating, as supplied.

Thinning solvent: see Thinner.

Undersea weapons systems specialty coating means any coating applied to any component of a weapons system intended to be launched or fired from under the sea.

Volatile organic compound (VOC) means any organic compound that participates in atmospheric photochemical reactions; that is, any organic compound other than those that the Administrator designates as having negligible photochemical reactivity. VOC is measured by a reference method, an equivalent method, an alternative method, or by procedures specified under any regulation. A reference method, an equivalent method, or an alternative method, however, may also measure nonreactive organic compounds. In such cases, any owner or operator may exclude the nonreactive organic compounds when determining compliance with a standard. For a list of compounds that the Administrator has designated as having negligible photochemical reactivity, refer to 40 CFR 51.00.

Volatile organic hazardous air pollutant (VOHAP) means any compound listed in or pursuant to section 112(b) of the Act that contains carbon, excluding metallic carbides and carbonates. This definition includes VOC listed as HAP and exempt compounds listed as HAP.

Weld-through preconstruction primer (specialty coating) means a coating that provides corrosion protection for steel during inventory, is typically applied at less than 1 mil dry film thickness, does not require removal prior to welding, is temperature resistant (burn back from a weld is less than 1.25 centimeters [0.5 inches]), and does not normally require removal before applying film-building coatings, including inorganic zinc high-build coatings. When constructing new vessels, there may be a need to remove areas of weld-through preconstruction primer due to surface damage or contamination prior to application of film-building coatings.

APPENDIX C

LIST OF ESTIMATED NESHAP MAJOR-SOURCE SHIPYARDS

U.S. SHIPYARDS ESTIMATED TO BE NESHAP MAJOR SOURCES[a]

Type	Shipyard	Location	Workforce
Large Construction (6)	Jeffboat	Jeffersonville, IN	700
	Ingalls	Pascagoula, MS	16,700
	NNS	Newport News, VA	26,000
	General Dynamics (Electric Boat)	Groton, CT	15,300
	Bath Iron Works	Bath, ME	5,900
	Avondale	New Orleans, LA	7,200
Large Repair (4)	West State, Inc.[b]	Portland, OR	800
	Norshipco	Norfolk, VA	3,000
	Norfolk Naval	Norfolk, VA	11,300
	Portland Ship Repair	Portland, OR	2,000
Medium Construction (8)	Equitable Yards (Halter Marine)	New Orleans, LA	600
	Moss Point Marine (Halter Marine)	Escatawpa, MS	450
	NASSCO	San Diego, CA	4,000
	BethShip	Sparrows Point, MD	700
	McDermott Inc.	Amelia, LA	800
	Bollinger	Lockport, LA	740
	Gretna Machine (Halter Marine)	Harvey, LA	150
	Platzer	Houston, TX	200
Medium Repair (17)	Todd Shipyards	Seattle, WA	850
	Lockport Shipyard (Halter Marine)	Lockport, LA	350
	Philadelphia Naval[b]	Philadelphia, PA	7,100
	Northwest Marine[b]	Portland, OR	800
	Southwest Marine[c]	San Diego, CA	1,500
	Southwest Marine (San Francisco Drydock)[c]	San Francisco, CA	350
	Bender	Mobile, AL	900
	Gunderson, Inc.	Portland, OR	1,000
	Tampa Shipyards	Tampa, FL	1,100
	Madisonville (Halter Marine)	Madisonville, LA	?
	Bethlehem Steel	Port Arthur, TX	250
	Halter Marine - Plant #84	???, LA	?
	Newpark	Houston, TX	260
	(4) Nonspecified	???	?

[a]Based on survey responses, Marine Log listing of U.S. Shipyards (June 1992), American Waterways Shipyard Conference (AWSC) handbook, comments from industry representatives, and State permit data. (Also, see related memoranda to project file and project WAM: documents II-B-24, IV-A-05, 06, and 07 in shipbuilding docket No. A-92-11.)

[b]Per D. Austin's 10/27/96 comments, these facilities are closed/out-of-business.

[c]Per D. Austin's 10/27/96 comments, these facilities have been determined to be area sources.

APPENDIX D

EXAMPLE INITIAL NOTIFICATION

NATIONAL STEEL AND SHIPBUILDING COMPANY

July 8, 1996

EPA Region IX
Director, Air and Radiation Division
75 Hawthorne St.
San Francisco, CA 94105

RE: 40 CFR PART 63, SUBPART II
National Emission Standards for Shipbuilding and Ship Repair (Surface Coating)

Dear Sir:

This is to notify you that National Steel & Shipbuilding Co. at Harbor Dr. and 28th St., San Diego, CA currently has a potential to emit of hazardous air pollutants (HAPs) in amounts greater than 25 tons per year of all combined HAPs and 10 tons per year of an individual HAP. As a result of our coating operations, National Steel & Shipbuilding Co. is, therefore, classified as a "major" source for hazardous air pollutants and is subject to the requirements of the National Emission Standards for Shipbuilding and Ship Repair (Surface Coating) Maximum Achievable Control Technology (MACT). We understand that the new submittal date for the implementation plan is December 16, 1996 and that the new compliance date is December 16, 1997.

Sincerely,

NATIONAL STEEL & SHIPBUILDING CO.

D. Buell

Dan Buell
Environmental Engineering Specialist

HARBOR DRIVE AND 28TH STREET • SAN DIEGO, CA 92113 • P.O. BOX 85278 • SAN DIEGO, CA 92186-5278
TELEPHONE (619) 544-3400 • TWX (910) 335-1250 • TELEX 695034

APPENDIX E

EXAMPLE IMPLEMENTATION PLAN

The following "Shipyard MACT Implementation Plan" was prepared by Mr. Dana Austin of Austin Environmental, Inc. for NSRP, Task N1-92-2, Subtask 12.

AOK SHIPYARDS
The Best in the West

SHIPYARD MACT IMPLEMENTATION PLAN

April 1996

Prepared for:
John Smith
US EPA Region XXX

123 Elm Street
Anytown, USA 98765-1234

Table of Contents

1. COATING COMPLIANCE PROCEDURES

AOK Shipyards intends to implement the following option(s) in compliance with 40 CFR §63:

- G Option 1 - No thinning solvent added
- G Option 2 - Thinning solvent added, Coating-by-coating compliance
- G Option 3 - Thinning solvent added, Thinner group compliance
- G Option 4 - Alternative test method (i.e., other than Method 24)

Our approach to ensure MACT compliance is to integrate the additional requirements into existing work practices and to assign responsibilities to the appropriate organizational level in the company. Fig. 1-1 presents a cross reference matrix identifying organizational elements and their involvement in MACT implementation.

Fig. 1-1
Organizations Performing MACT Compliance Activities

	MACT Compliance Activity	Initial Review	Receipt of Coatings	Certification	Dilution	Inspection	Mixing	Application	Reporting	Records	Testing
	Option(s)	All	All	All	2, 3 & 4	All	2, 3 & 4	All	All	All	All
Organization	Purchasing	X								X	
	Receiving		X	X		X				X	X
	Environmental				X				X	X	X
	Paint Dept.			X						X	
	Paint Crew					X	X	X		X	

1.0 COATING IDENTIFICATION AND CERTIFICATION (ALL OPTIONS)

1.0.1 Coating Identification

Coating identification will be made in conjunction with the existing normal business activities required for the receipt of goods within the facility. Specifically, the warehouseman, receiving clerk, paint foreman, or other designated person will be responsible for determination of the coating category[1] and VOHAP limit of each batch of coating received into the facility. This will be accomplished using information gathered from the company purchase order, bills of lading, and/or coating container labels. This information will be recorded on the *Coating Compliance Certification* form.[2]

[This activity meets the requirements of 40 CFR §63.785(a)(1) and -(2)]

1.0.2 VOC or VOHAP Content Above Limit

For its specific coating category, any batch of coating with an identified VOC or VOHAP content above the limit shown in the form will be rejected and returned to the supplier, customer, or government.

[This activity meets the requirements of 40 CFR §63.783(a)]

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[1] Identification codes for the categories prescribed in 40 CFR §63.783 are as follows:

G1	General use	S8	Military exterior	S15	Repair/ maintenance of thermoplastics
S1	Air flask	S9	Mist	S16	Rubber camouflage
S2	Antenna	S10	Navigational aids	S17	Sealant for thermal spray aluminum
S3	Antifoulant	S11	Nonskid	S18	Special marking
S4	Heat resistant	S12	Nuclear	S19	Specialty interior
S5	High-gloss	S13	Organic zinc	S20	Tack coat
S6	High-temperature	S14	Pretreatment wash primer	S21	Undersea weapons systems
S7	Inorganic zinc high-build			S22	Weld-through precon. primer

[2] Forms are located in ***Appendix A, Forms***.

1.0.3 Unknown VOC Content

The Purchasing Supervisor will be notified if the VOC content of any batch of coating cannot be identified. At his discretion, The Purchasing Supervisor may reject the batch and return it to the supplier, customer, or government; or, provisionally accept the batch pending further analysis using Method 24. If Method 24 tests are performed, the test results will be recorded on the *Method 24 Test Results Log* form.

[This activity meets the requirements of 40 CFR §63.783(a) and §63.788(b)(2)(vi)]

1.0.4 Container Inspection

We plan to use direct inspection of every equipment item (e.g., container, drum, vessel, vat, tank, pipe, etc.) involved in coating application to determine its integrity (see Section 3.1, *Self Inspection*). As applied to coating identification and certification, this involves at least receiving personnel, the Paint Shop Foreman, the Paint Crew Lead Men, and the Environmental personnel.

[This activity meets the requirements of 40 CFR §63.783(b)]

The warehouseman, receiving clerk, paint foreman, or other designated person will be responsible for inspecting the containers as received and completing the *Container Compliance* form for the receiving activity. Leaking containers or equipment will be identified and handled according to company spill handling procedures. The paint shop personnel will reinspect containers delivered for each day's activities, and inspect paint mixing, handling, and application equipment items. Any discrepancies will be reported to the Paint Shop Foreman, who will alert the spill response teams and/or maintenance crews to take appropriate action.

We will document these findings on the *Container Compliance* form, which will serve as a permanent record of ongoing inspections.

[This activity meets the requirements of 40 CFR §63.788(b)(2)(vi)]

1.1 OPTION 1 and OPTION 4

1.1.1 Certification

The Paint Department foreman, leadman, or supervisor will certify VOC (VOHAP) content "as-applied" prior to application of the work site using the *Coating Compliance Certification* form. This form will be returned to the Paint Department clerk, foreman, or supervisor at the end of the work shift.

[This activity satisfies the requirements of 40 CFR §63.785(c)(1)(I)]

Additionally, the volume of coating applied during the shift will be recorded by the paint crew foreman at the end of the work shift using the *Paint Crew Usage* form. Likewise, this form will be returned to the Paint Department clerk, foreman, or supervisor at the end of the work shift for recording in the *Paint and Thinner Usage Log*.

1.1.2 Notification

The Paint Department clerk, foreman, or company Environmental manager will maintain MACT compliance by notification of painters of the designated thinners by use of labels. The *"No Thinning"* label, will be used for this purpose. Alternatively, when use of labels is not practical or warranted, paint department gang box meetings, held prior to each work shift, will be used to notify painters that no thinning is allowed.

[This activity satisfies the requirements of 40 CFR §63.785(c)(1)(ii)]

1.2 OPTION 2, OPTION 3 and OPTION 4

1.2.1 Calculation of Thinning Ratios

The Paint Department clerk, foreman, or environmental manager will maintain MACT compliance by preparing required information on marine coatings to ensure compliance with MACT standards, including

(I) VOC Data Sheets, and

(ii) Thinning Ratio Calculations

The *VOC Data Sheet*, will be used to record the properties of marine coatings or thinners "As-Supplied." Note that this form accounts for exempt compounds and cure volatiles omitted from the VOC Data Sheet when the MACT was published, but necessary to complete the calculations. The *VOC Data Sheet* and attachments are provided as Appendix B.

Thinning ratio calculations will be completed before the application of each batch, using the equation 1, as provided in the MACT:

FOR OPTION 2 and OPTION 3:

where:

R = Maximum allowable thinning ratio for a given batch (L thinner/L coating as supplied);

V_s = Volume fraction of solids in the batch as supplied (L solids/L coating as supplied);

VOHAP limit = Maximum allowable as-applied VOHAP content of the coating (g VOHAP/L solids);

m_{VOC} = VOC content of the batch as supplied. [g VOC (including cure volatiles and exempt compounds on the HAP list)/L coating (including water and exempt compounds) as supplied];

D_{th} = Density of the thinner (g/L).

FOR OPTION 4:

where:

R = Maximum allowable thinning ratio for a given batch (L thinner/L coating as supplied);

V_s = Volume fraction of solids in the batch as supplied (L solids/L coating as supplied);

VOHAP limit = Maximum allowable as-applied VOHAP content of the coating (g VOHAP/L solids);

m_{VOHAP} = VOHAP content of the batch as supplied. [g VOHAP (including cure volatiles and exempt compounds on the HAP list)/L coating (including water and exempt compounds) as supplied];

$D_{th(VOHAP)}$ = Average density of the VOHAP thinner(S) (g/L).

Thinning Ratio Calculation Sheets for both Options 2 and 3, and Option 4 are provided in Appendix B.

Note: If V_s is not supplied directly by the coating manufacturer, V_S both Option 2 and Option 3, and Option 4 calculations will be determined using equation 2 as given by the MACT:

$$V_s = 1 - \frac{m_{volatiles}}{D_{avg}} \qquad \textbf{Eqn.}$$

where:

$m_{volatiles}$ = Total volatiles in the batch, including VOC, water, and exempt compounds (g/L coating), and

D_{avg} = Average density of volatiles in the batch (g/L).

1.2.2 Notification

The Paint Department clerk, foreman, or company Environmental manager will maintain MACT compliance by notification of painters of the designated thinners by use of labels. The "*Maximum Allowable Thinning Ratio*" label, will be used for this purpose. Alternatively, when use of labels is not practical or warranted, paint department gang box meetings, held before each work shift, will be used to notify painters that no thinning is allowed.

[This activity satisfies the requirements of 40 CFR §63.785(c)(2)(ii) and -(3)(ii)]

1.2.3 Paint Crew Daily Records

The paint crew foreman, leadman, or supervisor will be responsible for recording the ambient temperature, the actual volumes used for each coating, the total allowable thinner volume, and the actual volume of thinner used. This form will be returned to the Paint Department clerk, foreman, or supervisor at the end of the work shift for recording in the *Paint and Thinner Usage Log*.

[This activity meets the requirements of 40 CFR §63.785(c)(2)(iii), and -(3)(iii)]

1.2.4 Thinner Group Designation "By Use"

The coatings grouped with a particular thinner will be determined "by use," i.e., if a thinner is used with a particular coating during the monthly reporting period, then that coating has been "designated" to that thinner group.

[This activity meets the requirements of 40 CFR §63.785(c)(3)(I)]

1.2.5 Determination of Compliance

At the end of each calendar month, the Paint Department clerk will provide the master coating and thinner usage log to the designated responsible person, who will determine compliance for that period. MACT compliance determination under Options 2 and 3 will be completed for the previous month by the 15th day of each month. The data will be evaluated using Equation 3 of the Rule, as follows:

$$V_{th} = \sum_{i=1}^{n} (R \ x \ V_b)_i + \sum_{i=1}^{n} (R_{cold} \ x \ V_{b-cold})_i \qquad \textbf{Eqn.}$$

where:

V_{th} = Total allowable volume of thinner for the previous month (L thinner);

Vb = Volume of each batch, as supplied and before being thinned, used during non-cold-weather days of the previous month (L coating as supplied);

R_{cold} = Maximum allowable thinning ratio for each batch used during cold-weather days (L thinner/L coating as supplied);

$V_{b\text{-}cold}$ = Volume of each batch, as supplied and before being thinned, used during cold-weather days of the previous month (L coating as supplied);

I = Each batch of coating; and

n = Total number of batches of the coating.

[This activity meets the requirements of 40 CFR §63.785(c)(2)(iii), -(2)(iv), -(2)(v), -(2)(vi), (3)(iv), -(3)(v), -(3)(vi), and -(3)(vii).]

2. RECORD KEEPING PROCEDURES

The Paint Department clerk, foreman, and environmental manager will maintain all MACT compliance RECORD KEEPING information, including the information listed below, as required for each Option used during the reporting period. Records will be maintained for five years. Reporting will be provided before the 60th day following completion of each 6-month period after the compliance date. (Note: Some RECORD KEEPING items are not reported.)

BASIC CHECKLIST
☐ Initial Notification Documentation *
☐ Approved Implementation Plan *
☐ Volume of Low-Usage -Exempt Coatings by Month
☐ Identification of coatings used, EPA categories, and VOHAP limits
☐ Certification of As-Supplied VOC Content for each Batch of Coating *
☐ Determination whether containers meet standard §63.783(b)(2)
☐ Results of Method 24 or other approved measurements on individual containers

OPTIONS	1 & 4	2 & 4	3 & 4
☐ Certification of As-Applied VOC content by Batch *	X		
☐ Volume of each coating applied	X		
☐ Thinner Density and Vol Fraction Solids for each Batch*		X	X
☐ Maximum Allowable Thinner Ratio for each Batch		X	X
☐ Volume Used of each Batch, (As-Supplied)		X	X
☐ Cold weather dates and times		X	X
☐ Total Allowable Volume of thinner		X	X
☐ Actual Volume of thinner		X	X
☐ ID of coating groups/thinner			X

* Maintained on site but not reported.

[This activity satisfies the requirements of 40 CFR §63.788]

3. TRANSFER, HANDLING, AND STORAGE PROCEDURES

Our company management policy takes a proactive role in the development of measures to minimize the likelihood for air pollution. We therefore develop procedures, practices, and equipment on an ongoing basis. The sections below discuss our policy with respect to work practices, and to self-inspection, respectively.

3.0 Work Practices

Regarding the transfer and handling of VOHAP-containing materials in a way that minimizes spills, the following elements of our policy are of particular relevance:

(1) Maintain a neat and orderly work environment including storing hazardous materials and wastes in a way that minimizes the potential for accidental releases.

(2) Keep lids on liquid volatile material containers when not directly in use.

(3) Practice clean up procedures to ensure that accidentally spilled solvents and paints are cleaned-up immediately.

(4) Store solvent contaminated rags, cloths, and materials in a covered container.

(5) Keep drums closed when not in use and equip drums with tight-fitting lids.

(6) Use funnels when filling and replace the cap covering the hole once filling is completed (or replace the funnel's lid, if used).

(7) Dispose of solvent-wipe rags immediately in a covered container.

(8) Apply the volatile solvents directly to the rag and avoid spraying solvent directly on the surface.

(9) Avoid the use of VOCs for surface preparation whenever possible (i.e., substitute aqueous cleaners where possible).

(10) Maintain paint guns and pots to minimize the potential for leaks and improper spraying. (See also section 3.1, *Self-Inspection*, below.)

(11) Clean lines or paint guns in a closed system to capture solvents.

(12) Provide containment for VOC-containing material storage areas.

(13) Perform mixing and transfer operations only in designated areas with containment.

[This activity meets the requirements of 40 CFR §63.783(b)(1)]

3.1 Self-Inspection

Our facility policy already prescribes reactions to malfunctions and/or leaks both by maintenance crews and by spill response teams. There are existing notification protocols to alert the appropriate response organization. Effectively, we use self-inspection of every equipment item (e.g., container, drum, vessel, vat, tank, pipe, etc.) involved in coating application to determine its integrity. This strategy is executed for every activity and every organizational level associated with coating materials and thinning solvents, from initial receipt within the facility to final application.

[These policies and procedures meet the requirements of 40 CFR §63.783(b)(2).]

For compliance with MACT RECORD KEEPING requirements, we plan to document container self-inspection findings on the *Container Compliance* Form. This form will serve as a permanent record, and will be maintained for a minimum of 5 years.

[This activity assures compliance with 40 CFR §63.788(b)(2)(vi).]

Attachment A: FORMS

A-OK SHIPYARDS COATING COMPLIANCE CERTIFICATION

☐ AS SUPPLIED ☐ AS APPLIED

ID	Item	Description		Data	
A.	Coating	Name/ Identification			
B.	Coating Manufacturer	Name			
C.	Batch Identification	Count/Volume			
D.	Supplied By	Source (check one)		☐ Customer ☐ Manufacturer ☐ Government	
E.	VOC Content	Concentration, g/L			
		Source (check one)		☐ Batch test data (M-24) ☐ VOC Data Sheet	
F.	Coating Category (check one below)	Code	Description	VOC Limit, grams/liter coating	
	General	☐ G1	General use	340	
	Specialty	☐ S1	Air flask	340	
		☐S2	Antenna	530	
		☐S3	Antifoulant	400	
		☐S4	Heat resistant	420	
		☐S5	High-gloss	420	
		☐S6	High-temperature	500	
		☐S7	Inorganic zinc high-build	340	
		☐S8	Military exterior	340	
		☐S9	Mist	610	
		☐S10	Navigational aids	550	
		☐S11	Nonskid	340	
		☐S12	Nuclear	420	
		☐S13	Organic zinc	360	
		☐S14	Pretreatment wash primer	780	
		☐S15	Repair/ maintenance of thermoplastics	550	
		☐S16	Rubber camouflage	340	
		☐S17	Sealant for thermal spray aluminum	610	
		☐S18	Special marking	490	
		☐S19	Specialty interior	340	
		☐S20	Tack coat	610	
		☐S21	Undersea weapons systems	340	
		☐S22	Weld-through precon. primer	650	
G.	I certify that the VOC content of this product is less than or equal to the allowable federal VOC content for its applicable coating category. Signed			Date	

A-OK SHIPYARDS PAINT CREW USAGE FORM
MONTH OF ___________

JOB ID________ CREW ID_________ DATE ___________

Requirement	Activity	Item***	Description	Value
MACT	COATING (Complete Before Work)	(1)	Mfg. Name	
		(2)	ID	
		(3)	Batch	
		(4)	EPA Category (Note 1)	
		(5)	VOC Limit	
	THINNER (Complete Before Work)	(6)	Manufacturer's Name	
		(7)	ID	
		(8)	Mix Ratio, Normal	
		(9)	Mix Ratio, Cold	
		(10)	Actual Coating Volume	
	MIXING	(11)	Allowable Thinner Vol, Normal	
		(12)	Allowable Thinner Vol, Cold	
		(13)	Actual Thinner Volume	
		(14)	Temperature $< 40^{\circ}$F (Y/N)	
		(15)	Actual Temp ($^{\circ}$F)	
		(16)	Final Volume (Note 2)	
		(17)	Volume Applied	
CERTIFICATION		(21)	Date	
		(22)	By	

Note 1: EPA Coating Categories are identified below:

General

G1 General Use

Specialty

S1 Air flask
S2 Antenna
S3 Antifoulant
S4 Heat resistant
S5 High-gloss
S6 High-temperature
S7 Inorganic zinc high-build
S15 Repair/ maintenance of thermoplastics
S16 Rubber camouflage
S17 Sealant for thermal spray aluminum
S18 Special marking
S19 Specialty interior
S20 Tack coat
S21 Undersea weapons systems
S22 Weld-through precon. primer

Note 2: (16) = (10) + (12)

***From Paint and Thinner Usage Log

S8	Military exterior
S9	Mist
S10	Navigational aids
S11	Nonskid
S12	Nuclear
S13	Organic zinc
S14	Pretreatment wash primer

A-OK SHIPYARDS CONTAINER COMPLIANCE FORM
MONTH OF ____________

(1) Inspection Date	(2) By	(3) Equipment ID/No.	(4) Reference Drawing	(5) Cracks (Y/N)	(6) Holes (Y/N)	(7) Other (Y/N)	(8) Closed (Y/N)

A-OK SHIPYARDS METHOD 24 TEST RESULTS FORM [(1)]
MONTH OF ___________

		THINNER		COATING						
(1) Date	(2) Basis	(3) Mfg. Name	(4) ID	(5) Mfg. Name	(6) ID	(7) Batch	(8) EPA Category	(9) VOC Limit	(10) Method 24 VOC	(11) Lab ID

Note (2) R = Received
M = Mixed

Note (9) Use "*" for cold application (< 40˚F)

Note (11) L1 = ABC Labs
L2 = DEF Labs

Note (8) Select EPA Category from list below

G1 General use
S1 Air flask
S2 Antenna
S3 Antifoulant
S4 Heat resistant
S5 High-gloss
S6 High-temperature
S8 Military exterior
S9 Mist
S10 Navigational aids
S11 Nonskid
S12 Nuclear
S13 Organic zinc
S14 Pretreatment wash primer
S15 Repair and maintenance of thermoplastics
S16 Rubber camouflage
S17 Sealant for thermal spray aluminum
S18 Special marking
S19 Specialty interior
S20 Tack coat
S21 Undersea weapons systems
S22 Weld-through precon. primer

(1) In compliance with 40 CFR Part 63.788(b)(2).

A-OK SHIPYARDS PAINT AND THINNER USAGE LOG [1]

MONTH OF ____________

G OPTION 2: Coating Group __________________ G OPTION 3: Thinner Group __________________

MACT REQUIREMENTS																	VOHAP EMISSIONS CALCULATIONS			CERTIFICATION	
COATING (Complete Before Work)					THINNER (Complete Before Work)				MIXING												
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
							Mix Ratio			Allowable Thinner Volume											
Mfg. Name	ID	Batch	EPA Cat.	VOC Limit	Mfg. Name	ID	Norm	Cold	Actual Coating Volume	Norm	Cold	Actual Thinner Volume	Temp < 40 ˚F (Y/N)	Actual Temp (˚F)	Final Volume	Vol Applied	Coating Usage	Thinner Usage	Waste	Date	By

Note (16) (16) = (10) + 13)

Note (18) (18) = (17)*(10)/(16)

Note (19) (19) = (17)*(12)/(16)

Note (20) (20) = (16) - (17)

Note (4) Select EPA Category from list below

GENERAL
G1 General use
SPECIALTY
S1 Air flask
S2 Antenna
S3 Antifoulant
S4 Heat resistant
S5 High-gloss
S6 High-temperature
S8 Military exterior
S9 Mist
S10 Navigational aids
S11 Nonskid
S12 Nuclear
S13 Organic zinc
S14 Pretreatment wash primer
S15 Repair and maintenance of thermoplastics
S16 Rubber camouflage
S17 Sealant for thermal spray aluminum
S18 Special marking
S19 Specialty interior
S20 Tack coat
S21 Undersea weapons systems
S22 Weld-thru precon primer

[1] In compliance with 40 CFR Part 63.788(b)(2).

NO THINNING LABEL

NO THINNING

In compliance with 40 CFR Part 63.785.
Contact Paint Foreman or __________.

Maximum Allowable Thinning Label

Maximum Allowable Thinning Ratio

Ratio	**Normal (≥ 40 °F) _________** **Cold (< 40 °F) _________**
Thinner	***USE NO SUBSTITUTES*** **[1]** **Mfg. Name _________** **Product ID _________** **Use no more than _____ gal thinner per gallon paint.**

[1] In compliance with 40 CFR Part 63.785.
Contact Paint Foreman or __________.

MARINE COATING ALLOWABLE THINNING RATIO CALCULATION SHEET (SIDE 1) FOR OPTIONS 2 AND 3

A	**Coating**	**Batch Number** ______________________________ **Manufacturer** ______________________________ **ID** ______________________________ **Category** ______________________________
B	**Thinner**	**Manufacturer** ______________________________ **ID** ______________________________

Step	Instructions (Use VOC data collection sheet for this batch of coating)	Calculations
1	Enter V_S the volume fraction solids in the batch, as supplied, (liter solid/ liter coating) on lines 1a and 1b.	1a _______ % 1b ______ %
2	Enter $VOHAP_{LIMIT}$, for normal and for cold operation, based on the coating category (see side 2)	t ≥ 4.5°C 2a _________ t < 4.5°C 2b ________
3	Multiply line 1a times line 2a and enter the results on line 3a. Multiply line 1b times line 2b and enter the results on line 3b.	3a _________ 3b ________
4	Calculate M_{voc} the VOC Content of the Batch Enter Method 24 M_V, mass fraction Total Volatiles. 4.1 _______ % Enter M_w the mass fraction Water. 4.2 _______ % Subtract line 4.2 from line 4.1, enter difference. 4.3 _______ % Enter D_c the Coating Density, grams/liter. 4.4 _______ Multiply line 4.3 times line 4.4, enter result on lines 4a and 4b.	4a _________ 4b ________
5	Subtract line 4a from 3a and enter results on line 5a. Subtract line 4b from 3b and enter result on line 5b. STOP if negative. See Supervisor.	5a _________ 5b ________
6	Enter D_{th} the Thinner Density, grams/liter, on lines 6a and 6b.	6a_________ 6b_________
7	Divide line 5a by line 6a and enter result on line 7a . Divide line 5b by line 6b and enter result on line 7b.	R_N 7a _________ R_C 7b ________

8 **Enter line 7a: Use no more than _______ gallons thinner per gallon coating for normal temperatures.**

Enter line 7b: Use no more than _______ gallons thinner per gallon coating for cold temperatures.

A	**Coating**	**Batch Number** ______________________ **Manufacturer** ______________________ **ID** ______________________ **Category** ______________________
B	**Thinner**	**Manufacturer** ______________________ **ID** ______________________

MARINE COATING ALLOWABLE THINNING RATIO CALCULATION SHEET (SIDE 1) FOR OPTIONS 4

A	**Coating**	**Batch Number** ____________________ **Manufacturer** ____________________ **ID** ____________________ **Category** ____________________
B	**Thinner**	**Manufacturer** ____________________ **ID** ____________________

Step	Instructions (Use VOC data collection sheet for this batch of coating)	Calculations
1	Enter V_S the volume fraction solids in the batch, as supplied, (liter solid/ liter coating) on lines 1a and 1b.	1a _______ % 1b ______ %
2	Enter ***VOHAP*** ***LIMIT***, for normal and for cold operation, based on the coating category (see side 2)	$t \geq 4.5°C$ $t < 4.5°C$ 2a _________ 2b ________
3	Multiply line 1a times line 2a and enter the results on line 3a. Multiply line 1b times line 2b and enter the results on line 3b.	3a _________ 3b ________
4	Enter the VOHAP content, grams/liter, of the batch on lines 4a and 4b. ***Note: VOHAP content was determined using EPA approved test method:***	4a ________ 4b _______
5	Subtract line 4a from 3a and enter results on line 5a. Subtract line 4b from 3b and enter result on line 5b. STOP if negative. See Supervisor.	5a _________ 5b ________
6	Enter $D_{thvohap}$ the average Density of the VOHAP Thinners, grams/liter, on lines 6a and 6b.	6a_________ 6b_________
7	Divide line 5a by line 6a and enter result on line 7a . Divide line 5b by line 6b and enter result on line 7b.	R_N R_C 7a _________ 7b ________

8 **Enter line 7a: Use no more than _______ gallons thinner per gallon coating for normal temperatures.**

Enter line 7b: Use no more than _______ gallons thinner per gallon coating for cold temperatures.

A	**Coating**	**Batch Number** ____________ **Manufacturer** ____________ **ID** ____________ **Category** ____________
B	**Thinner**	**Manufacturer** ____________ **ID** ____________

MARINE COATING ALLOWABLE THINNING RATIO CALCULATION SHEET (SIDE 2)

Coating Category:			VOHAP limits grams/liter solids $t \geq 4.5°C$	$t < 4.5°C$
General	G1	General use	571	728
Specialty	S1	Air flask	571	728
	S2	Antenna	1,439	--
	S3	Antifoulant	765	971
	S4	Heat resistant	841	1,069
	S5	High-gloss	841	1,069
	S6	High-temperature	1,237	1,597
	S7	Inorganic zinc high-build	571	728
	S8	Military exterior	571	728
	S9	Mist	2,235	--
	S10	Navigational aids	1,597	--
	S11	Nonskid	571	728
	S12	Nuclear	841	1,069
	S13	Organic zinc	630	802
	S14	Pretreatment wash primer	11,095	--
	S15	Repair and maintenance of thermoplastics	1,597	--
	S16	Rubber camouflage	571	728
	S17	Sealant for thermal spray aluminum	2,235	--
	S18	Special marking	1,178	--
	S19	Specialty interior	571	728
	S20	Tack coat	2,235	--
	S21	Undersea weapons systems	571	728
	S22	Weld-through precon. primer	2,885	--

Note: To convert from g/L to lb/gal, multiply by (3.785 L/gal)(1/453.6 lb/g) or 1/120. For compliance purposes, metric units define the standards.

Note: Cold-weather allowances are not given to coatings in categories that permit over a 40 percent VOHAP content by volume. Such coatings are subject to the same limits regardless of weather conditions.

Attachment B:
MARINE COATING
DATA SHEETS

VOC DATA SHEET

PROPERTIES OF THE MARINE COATING OR THINNER "AS SUPPLIED" BY THE MANUFACTURER

Manufacturer:________________________ Product Identification:______________________

Is this product a coating or thinner? COATING______ THINNER______

If product is a coating or paint please provide the information in the box below and provide all information for Items A though J below:

MACT Coating Category: General Use____ or Specialty Coating _____   If Coating is a Specialty Coating please list the specific Category type(s) below.(Use attached list of marine coating specialty categories):

If the product is thinner or reducer, please provide the information requested in Items D though J below:

Properties of the coating or thinner as supplied to the customer:

A. Coating Density: (D_c) _______ g/L [ ] ASTM D1475-90 [ ] Other

B. Total Volatiles: (M_v) _______ Mass Percent [ ] ASTM D2369-93 [ ] Other

C. Cure Volatiles Content: (C_{cv}) _______ g/L [ ] Calculated [ ] Other

D. Organic Volatiles: (M_o) ________ Mass Percent [ ] Calculated [ ] Other

E. Water Content:

1. (M_w) _______ Mass Percent [ ] ASTM D3792-91 [ ] ASTM D4017-90 [ ] Other

2. (V_w) _______ Volume Percent [ ] Calculated [ ] Other

F. Exempt Compounds Content: (C_{ex}) _______ g/L [ ] Calculated [ ] Other

G. Nonvolatiles: (V_s) ________ Volume Percent [ ] Calculated [ ] Other

H. VOC Content (VOC):

1. _________ g/L solids (nonvolatiles)

2. ________ g/L coating (less water and exempt compounds)

I. Thinner Density: (D_{th})__________g/L ASTM ______ [ ] Other

---

J. Coating Speciation: Provide the percentage of each chemical component of this coating or thinner. (If only a percentage range can be supplied, the range mean will be used to calculate VOC and HAP emissions.) This information is not required for compliance with the shipyard MACT, however other federal and/or state environmental regulations require this data. By providing this information now it will avoid the possibility that the shipyard will make redundant requests for the data in the future.

COATING OR THINNER COMPONENT **MASS PERCENTAGE**

<u>Nonvolatile Components, Water and Exempt Compounds</u>

1.____________________ ________

2.____________________ ________

3.____________________ ________

4.____________________ ________

5.____________________ ________

6.____________________ ________

7.____________________ ________

8.____________________ ________

9.____________________ ________

10.____________________ ________

<u>Organic Volatile Components</u>:

1.____________________ ________

2.____________________ ________

3.____________________ ________

4.____________________ ________

5.____________________ ________

6.____________________ ________

7.____________________ ________

8.____________________ ________

9.____________________ ________

10.____________________ ________

Signed: ____________________ Dated: __________

--English units in the original submittal were deleted to conform with Appendix A in the final regulation (60 FR 64330).

VOLATILE ORGANIC HAP (VOHAP) LIMITS FOR MARINE COATINGS

Coating Category	VOHAP limits[a,b,c]		
	grams/liter coating (minus water and exempt compounds)	grams/liter solids[d]	
		$t \geq 4.5°C$	$t < 4.5°C$[e]
General use	340	571	728
Specialty	--	--	--
Air flask	340	571	728
Antenna	530	1,439	--
Antifoulant	400	765	971
Heat resistant	420	841	1,069
High-gloss	420	841	1,069
High-temperature	500	1,237	1,597
Inorganic zinc high-build	340	571	728
Military exterior	340	571	728
Mist	610	2,235	--
Navigational aids	550	1,597	--
Nonskid	340	571	728
Nuclear	420	841	1,069
Organic zinc	360	630	802
Pretreatment wash primer	780	11,095	--
Repair and maint. of thermoplastics	550	1,597	--
Rubber camouflage	340	571	728
Sealant for thermal spray aluminum	610	2,235	--
Special marking	490	1,178	--
Specialty interior	340	571	728
Tack coat	610	2,235	--
Undersea weapons systems	340	571	728
Weld-through precon. primer	650	2,885	--

[a] The limits are expressed in two sets of equivalent units. Either set of limits may be used for the compliance procedure described in §63.785(c)(1), but only the limits expressed in units of g/L solids (nonvolatiles) shall be used for the compliance procedures described §63.785(c)(2)-(4).

[b] VOC (including exempt compounds listed as HAP) shall be used as a surrogate for VOHAP for those compliance procedures described in §63.785(c)(1)-(3).

[c] To convert from g/L to lb/gal, multiply by (3.785 L/gal)(1/453.6 lb/g) or 1/120. For compliance purposes, metric units define the standards.

[d] VOHAP limits expressed in units of mass of VOHAP per volume of solids were derived from the VOHAP limits expressed in units of mass of VOHAP per volume of coating assuming the coatings contain no water or exempt compounds and that the volumes of all components within a coating are additive.

[e] These limits apply during cold-weather time periods, as defined in §63.782. Cold-weather allowances are not given to coatings in categories that permit over a 40 percent VOHAP content by volume. Such coatings are subject to the same limits regardless of weather conditions.

Shipyard MACT Marine Coating Expressions and Equations

Fraction	Constituents	Volume Expression	Mass Expression
Organic	Volatile Organic Compounds	V_{VOC}	M_{VOC}
	Exempt-Volatiles	V_E	M_E
Aqueous	Water	V_W	M_W
Solid	Non-Volatiles	V_S	M_S
"Cure-Volatiles"	Reaction Volatiles		M_C

		Coating Property	Expression	Units
A	D_C	Coating Density	M_i / V_i	grams/liter
B*	M_T	Total Volatiles (mass percent)	$(M_{VOC} + M_E + M_W + M_c) / M_i$	%
C	C_{CV}	Cure Volatiles Content	M_C / V_i	grams/liter
D	M_V	Organic Volatiles (mass percent)	$(M_V + M_E) / M_i$	%
E_1	M_W	Water Content (mass percent)	M_W / M_i	%
E_2	V_W	Water Content (volume percent)	V_W / V_i	%
F	C_{ex}	Exempt Compounds Content****	M_E / V_i	grams/liter
G	V_S	Nonvolatiles (volume percent)	V_S / V_i	%
H_1*		VOC Content (nonvolatiles)	$(M_{VOC}) / V_S$	grams/liter
H_2*		VOC Content (less water & exempt compounds)	$(M_{VOC}) / (V_S + V_{VOC})$	grams/liter
I	D_{TH}	Thinner Density	M_i / V_i	grams/liter

---

*Edited to conform with 60 FR 64330 symbols

Acetone was recently identified to have a low photochemical reactivity, as a result it was added to the list of "exempt" compounds. When Method 24 in 40 CFR Part 60 was published, acetone was considered a VOC. Therefore, the method that will be used to determine the acetone content in a coating should be specified. This is also applicable to any new addition to the list of exempt compounds, unless an EPA approved test method already exists.

40 CFR 51.100 (s) - Exempt Compounds

(s) Volatile organic compounds (VOC) means any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions.

(1) This includes any such organic compound other than the following, which have been determined to have negligible photochemical reactivity:

acetone;
methane;
ethane;
methylene chloride (dichloromethane);
1,1,1-trichloroethane (methyl chloroform);
1,1,1-trichloro-2,2,2-trifluoroethane (CFC-113);
trichlorofluoromethane (CFC-11);
dichlorodifluoromethane (CFC-12);
chlorodifluoromethane (CFC-22);
trifluoromethane (FC-23);
1,2-dichloro 1,1,2,2-tetrafluoroethane (CFC-114);
chloropentafluoroethane (CFC-115);
1,1,1-trifluoro 2,2-dichloroethane (HCFC-123);
1,1,1,2-tetrafluoroethane (HFC-134a);
1,1-dichloro 1-fluoroethane (HCFC-141b);
1-chloro 1,1-difluoroethane (HCFC-142b);
2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124);
pentafluoroethane (HFC-125);
1,1,2,2-tetrafluoroethane (HFC-134);
1,1,1-trifluoroethane (HFC-143a);
1,1-difluoroethane (HFC-152a);
and perfluorocarbon compounds which fall into these classes:
(I) Cyclic, branched, or linear, completely fluorinated alkanes;
(ii) Cyclic, branched, or linear, completely fluorinated ethers with no unsaturations;
(iii) Cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations; and
(iv) Sulfur containing perfluorocarbons with no unsaturations and with sulfur bonds only to carbon and fluorine.

(2) For purposes of determining compliance with emissions limits, VOC will be measured by the test methods in the approved State implementation plan (SIP) or 40 CFR part 60, appendix A, as applicable. Where such a method also measures compounds with negligible photochemical reactivity, these negligibly-reactive compounds may be excluded as VOC if the amount of such compounds is accurately quantified, and such exclusion is approved by the enforcement authority.

Attachment C:
COATING DEFINITIONS

General use coating

G1	General use coating	means any coating that is not a specialty coating.

Specialty coating		means any coating that is manufactured and used for one of the specialized applications described within this list of definitions.
S1	Air flask specialty coating	means any special composition coating applied to interior surfaces of high pressure breathing air flasks to provide corrosion resistance and that is certified safe for use with breathing air supplies.
S2	Antenna specialty coating	means any coating applied to equipment through which electromagnetic signals must pass for reception or transmission.
S3	Antifoulant specialty coating	means any coating that is applied to the underwater portion of a vessel to prevent or reduce the attachment of biological organisms and that is registered with the EPA as a pesticide under the Federal Insecticide, Fungicide, and Rodenticide Act.
S4	Heat resistant specialty coating	means any coating that during normal use must withstand a temperature of at least 204°C (400°F).
S5	High-gloss specialty coating	means any coating that achieves at least 85 percent reflectance on a 60 degree meter when tested by ASTM Method D523 (incorporation by reference--see §63.14).
S6	High-temperature specialty coating	means any coating that during normal use must withstand a temperature of at least 426°C (800°F).
S7	Inorganic zinc (high-build) specialty coating	means a coating that contains 960 grams per liter (8 pounds per gallon) or more elemental zinc incorporated into an inorganic silicate binder that is applied to steel to provide galvanic corrosion resistance. (These coatings are typically applied at more than 2 mil dry film thickness.)
S8	Military exterior specialty coating	or Chemical Agent Resistant Coatings ("CARC")means any exterior topcoat applied to military or U.S. Coast Guard vessels that are subject to specific chemical, biological, and radiological washdown requirements.
S9	Mist specialty coating	means any low viscosity, thin film, epoxy coating applied to an inorganic zinc primer that penetrates the porous zinc primer and allows the occluded air to escape through the paint film prior to curing.
S10	Navigational aids specialty coating	means any coating applied to Coast Guard buoys or other Coast Guard waterway markers when they are recoated aboard ship at their usage site and immediately returned to the water.
S11	Nonskid specialty coating	means any coating applied to the horizontal surfaces of a marine vessel for the specific purpose of providing slip resistance for personnel, vehicles, or aircraft.

S12	Nuclear specialty coating	means any protective coating used to seal porous surfaces such as steel (or concrete) that otherwise would be subject to intrusion by radioactive materials. These coatings must be resistant to long-term (service life) cumulative radiation exposure (ASTM D4082-89 [incorporation by reference--see §63.14]), relatively easy to decontaminate (ASTM D4256-89 [reapproved 1994] [incorporation by reference--see §63.14]), and resistant to various chemicals to which the coatings are likely to be exposed (ASTM D3912-80 [incorporation by reference--see §63.14]). [Nuclear coatings should meet the general protective requirements outlined by the Department of Energy (formerly U.S. Atomic Energy Commission Regulatory Guide 1.54).]
S13	Organic zinc specialty coating	means any coating derived from zinc dust incorporated into an organic binder that contains more than 960 grams of elemental zinc per liter (8 pounds per gallon) of coating, as applied, and that is used for the expressed purpose of corrosion protection.
S14	Pretreatment wash primer specialty coating	means any coating that contains a minimum of 0.5 percent acid, by mass, and is applied only to bare metal to etch the surface and enhance adhesion of subsequent coatings.
S15	Repair and maintenance of thermoplastic coating/commercial vessels	means any vinyl, chlorinated rubber, or bituminous resin coating that is applied over the same type of existing coating to perform the partial recoating of any in-use commercial vessel. (This definition does not include coal tar epoxy coatings, which are considered "general use" coatings.)
S16	Rubber camouflage specialty coating	means any specially formulated epoxy coating used as a camouflage topcoat for exterior submarine hulls and sonar domes.
S17	Sealant for thermal spray aluminum	means any epoxy coating applied to thermal spray aluminum surfaces at a maximum thickness of 1 dry mil.
S18	Special marking specialty coating	means any coating that is used for safety or identification applications, such as markings on flight decks and ships' numbers.
S19	Specialty interior coating	means any coating used on interior surfaces aboard U.S. military vessels pursuant to a coating specification that requires the coating to meet specified fire retardant and low toxicity requirements, in addition to the other applicable military physical and performance requirements.
S20	Tack specialty coating	means any thin film epoxy coating applied at a maximum thickness of 2 dry mils to prepare an epoxy coating that has dried beyond the time limit specified by the manufacturer for the application of the next coat.
S21	Undersea weapons systems specialty coating	means any coating applied to any component of a weapons system intended to be launched or fired from under the sea.
S22	Weld-through preconstruction primer (specialty coating)	means a coating that provides corrosion protection for steel during inventory, is typically applied at less than 1 mil dry film thickness, does not require removal prior to welding, is temperature resistant (burn back from a weld is less than 1.25 centimeters [0.5 inches]), and does not normally require removal before applying film-building coatings, including inorganic zinc high-build coatings. When constructing new vessels, there may be a need to remove areas of weld-through preconstruction primer due to surface damage or contamination prior to application of film-building coatings.

APPENDIX F

EXAMPLE FORMS

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Example 1. TOTAL (MONTHLY) PAINT USAGE -- AUGUST 1996

A	B	C	D	E	F	G	H	I	J	K	L	M
Paint ID	Usage (L)	VOC (g/L)	EPA Category	LIMIT (g/L solids)	Avg Solv Dens(g/L)	Vol Solids (L)	Max Allow Thin Ratio	Thinner ID	Density (g/L)	Actual Usage (L)	Allowed Usage (L)	Compliance Demonstrate
124 White DOD-E-24607	1067.4	338	Gen Use	571	845	0.600 [a]	<0.01	N/A	---	---	---	YES
150 Green Mil-P-24441/1C	507.2	338	Gen Use	571	845	0.600 [a]	<0.01	N/A	---	---	---	YES
5705 Haze Gr Mil-C-24635	522.3	334	Gen Use	571	790	0.577 [a]	<0.01	N/A	---	---	---	YES
BRA640 Red A/F	179.8	337	A/F	765	855	0.62 [b]	0.16	GTA007	860	18.9	28.7	YES
BRA642 Black A/F	283.9	337	A/F	765	855	0.62 [b]	0.16	GTA007	860	32.8	45.3	YES
FPD052/FPA327 White	2006.1	190	Gen Use	571	920	0.793 [a]	0.31	GTA007	860	510.9	613.0	YES
KHA303/A Red	4651.8	320	Gen Use	571	860	0.628 [a]	0.04	GTA007	860	68.1	208.7	YES
KHA302/A Grey	12518.9	320	Gen Use	571	860	0.628 [a]	0.04	GTA007	860	64.3	561.7	YES
CLCOOOS White	4201.4	334	Hi Gloss	841	771	0.567 [a]	0.17	N/A	---	---	---	YES
Color Topping MS-100	54.9	418	Sp Mark	1178	820	0.490 [a]	0.18	GTA013	888	1.9	9.9	YES

a - Calculated using Equation 2 in regulation: Volume Solids, G = 1 - (C / F).
b - Specified by manufacturer.

[guideexam 8/27/96]

F = From Table 2-2

H = [(G * E) - C] / J

L = B * H

M = YES if allowed thinner usage, L is > actual thinner usage, K.

Index of Column Headings in Example 1.

Column	Description
A	Coating identification - by the supplier or manufacturer (include batch number)
B	Monthly usage (liters, L)
C	As-supplied VOC content of the batch of coating (grams per liter of coating, minus water and exempt solvents, g/L coating)
D	Applicable marine coating category (see Table 2 and/or definitions section of regulation)
E	Applicable maximum VOHAP limit (see Table 2 of regulation)
F	Average solvent density of the coating (grams per liter, g/L)
G	Volume of solids (nonvolatiles) in the as-supplied batch of coating (liters, L)
H	Maximum allowable thinning ratio (liters of thinning solvent per liter of as-supplied coating)
I	Thinning solvent identification - by the supplier or manufacturer
J	Density of the thinning solvent (grams per liter, g/L)
K	Total monthly volume of thinning solvent used to thin particular coating (liters, L)
L	Total monthly volume of thinning solvent allowed based on maximum allowable thinning ratio calculations for a particular coating (liter, L)
M	Compliance determination: Yes/No (Is the actual thinner usage less than or equal to the allowable thinner usage for the month?)

Example 2. TOTAL (MONTHLY) PAINT USAGE -- JUNE 1995

A	B	C	D	E	F	G	H	I	J	K	L
PAINT (COATINGS) DATA									THINNER DATA		
Paint ID	Usage (L)	VOC (g/L)	EPA Category	EPA LIMIT (g/L ctg)	EPA LIMIT (g/L solids	Avg Solvent Density(g/L)	Vol Solids (L)	Max Allow Thinning Rati	Thinner ID	Density (g/L)	Allowed Usage (L)
Ameron 385AME	270.6	276	Gen Use	340	571	845	0.673 [a]	0.14	N/A	800	---
Ameron 70ESP	1438.3	336	A/F	400	765	845	0.602 [a]	0.16	N/A	800	---
Ameron 3279	1.9	336	Hi Temp	500	1237	790	0.575 [a]	0.47	N/A	800	---
Devoe 235 BAR	2246.4	288	Gen Use	340	571	850	0.68 [b]	0.13	N/A	800	---
Devoe 233	36.0	288	Gen Use	340	571	855	0.663 [a]	0.11	N/A	800	---
Devoe ABC-3	2384.6	336	A/F	400	765	840	0.600 [a]	0.15	N/A	800	---
Devoe 379	586.7	312	Hi Gloss	420	841	860	0.637 [a]	0.26	N/A	860	---
Devoe F129	37.8	400	A/F	400	765	840	0.524 [a]	0.00	N/A	860	---
Hempel 58030-10420	18.9	176	Gen Use	340	571	900	0.804 [a]	0.35	N/A	800	---
Intl 484-C	5.7	400	A/F	400	765	840	0.524 [a]	0.00	N/A	888	---
Intl CLB000S	37.8	336	Hi Gloss	420	841	845	0.602 [a]	0.20	N/A	870	---
Intl CLB134S	3.8	338	Gen Use	340	571	845	0.600 [a]	0.01	N/A	870	---
Intl CLL274S	47.3	336	Gen Use	340	571	840	0.600 [a]	0.01	N/A	870	---

COATING-BY-COATING COMPLIANCE DEMONSTRATED

Example 2. TOTAL (MONTHLY) PAINT USAGE -- JUNE 1995 (continued)

A	B	C	D	E	F	G	H	I	J	K	L
PAINT (COATINGS) DATA									THINNER DATA		
Paint ID	Usage (L)	VOC (g/L)	EPA Category	EPA LIMIT (g/L ctg)	EPA LIMIT (g/L solids	Avg Solvent Density(g/L)	Vol Solids (L)	Max Allow Thinning Ratio	Thinner ID	Density (g/L)	Allowed Usage (L)
Intl BRA570	1430.7	336	A/F	400	765	855	0.607 [a]	0.15	GTA415	870	211.1
Intl EPA075/076V	15.1	336	Gen Use	340	571	840	0.600 [a]	0.01	GTA415	870	---
Intl EPA490/489	75.7	85	Gen Use	340	571	870	0.902 [a]	0.49	GTA415	870	37.4
Intl EPA491/489	102.2	85	Gen Use	340	571	870	0.902 [a]	0.49	GTA415	870	50.5
Intl FPL274/FPA327	3.8	190	Gen Use	340	571	870	0.782 [a]	0.29	GTA415	870	1.1
Intl FPJ034/327	11.4	190	Gen Use	340	571	870	0.782 [a]	0.29	GTA415	870	3.4
Intl FPY999/FPA327	548.8	190	Gen Use	340	571	870	0.782 [a]	0.29	GTA415	870	161.7
Intl KHA302/062	287.7	320	Gen Use	340	571	845	0.621 [a]	0.04	GTA415	870	11.5
Intl KHA303/062	403.1	320	Gen Use	340	571	845	0.621 [a]	0.04	GTA415	870	16.1
Intl TQA374/375	7.6	0	Gen Use	340	571	870	1.000 [a]	0.66	GTA415	870	5.0
Intl 990	15.1	326	Hi Gloss	420	841	855	0.619 [a]	0.22	GTA415	870	3.4
Porter 904	7.6	176	Gen Use	340	571	820	0.785 [a]	0.31	GTA415	870	2.4

a = Calculated using 1-(C/G)
b = Specified by manufacturer

GROUP COMPLIANCE

Total allowable thinner usage = 503.6 L
Total actual thinner usage = 352 L

APPENDIX G

EXAMPLE CALCULATIONS

CALCULATIONS FOR DEMONSTRATING COMPLIANCE

Equation 1 is to be used to calculate the maximum allowable thinning ratio, R:

$$R = \frac{\text{(Vol Solids) (VOHAP limit) - (mass of VOC)}}{\text{Density of thinner}}$$

For a General Use coating with a VOC content of 300 g/L of coating, you must determine how much thinner (with a density of 810 g/L) can be added to the coating. The average density of the solvents (volatiles) in the coating is 855 g/L.

In trying to calculate "R" using Equation 1, we have everything except volume solids in the coating.

In the absence of actual manufacturer's data, Equation 2 is used to calculate volume solids:

$$\text{Volume solids} = 1 - \frac{\text{(mass of volatiles)}}{\text{(avg density of volatiles)}}$$

$$\text{Volume solids} = 1 - \frac{(300\ \text{g/L})}{(855\ \text{g/L})} = 0.649$$

Having calculated volume solids, the maximum allowable thinning ratio can be determined:

$$R = \frac{(0.649)\ (571\ \text{g/l solids}) - (300\ \text{g/L})}{(810\ \text{g/L})} = 0.087\ \frac{\text{L thinner}}{\text{L coating}}$$

Equation 3 is to be used to calculate the total allowable volume of thinner used during the month:

Total allowable volume of Thinner = Sum of (R * volume of each batch used during non-cold weather days) + Sum of (R * volume of each batch used during cold weather days)

If the total allowable volume of thinner (calculated using equation 3) is less than or equal to the actual volume of thinner used during the month, compliance is demonstrated.

NOTE: The proper mix ratio must be used for any multi-component coatings.

MARINE COATING ALLOWABLE THINNING RATIO CALCULATION SHEET (SIDE 1) FOR OPTIONS 2 AND 3

EXAMPLE

A	Coating BRA570	Batch Number: UHA10675B Manufacturer: International ID: BRA570 Category: Antifoulant - S3
B	Thinner GTA 415	Manufacturer: International ID: GTA 415

Step	Instructions (Use VOC data collection sheet for this batch of coating)			Calculations	
1	Enter V_S the volume fraction solids in the batch, as supplied, (liter solid/ liter coating) on lines 1a and 1b.			1a 60 %	1b 60 %
2	Enter *VOHAP LIMIT*, for normal and for cold operation, based on the coating category (see side 2)			t ≥ 4.5°C 2a 765	t < 4.5°C 2b 971
3	Multiply line 1a times line 2a and enter the results on line 3a. Multiply line 1b times line 2b and enter the results on line 3b.			3a 459	3b 583
4	Calculate M_{voc} the VOC Content of the Batch				
	Enter Method 24 MV, mass fraction Total Volatiles.	4.1	16 %		
	Enter M_w the mass fraction Water.	4.2	0 %		
	Subtract line 4.2 from line 4.1, enter difference.	4.3	16 %		
	Enter D_c the Coating Density, grams/liter.	4.4	2184		
	Multiply line 4.3 times line 4.4, enter result on lines 4a and 4b.			4a 349	4b 349
5	Subtract line 4a from 3a and enter results on line 5a. Subtract line 4b from 3b and enter result on line 5b. STOP if negative. See Supervisor.			5a 110	5b 234
6	Enter D_{th} the Thinner Density, grams/liter, on lines 6a and 6b.			6a 870	6b 870
7	Divide line 5a by line 6a and enter result on line 7a. Divide line 5b by line 6b and enter result on line 7b.			R_N 7a .126	R_C 7b .269

8 Enter line 7a: Use no more than .13 gallons thinner per gallon coating for normal temperatures.

Enter line 7b: Use no more than .27 gallons thinner per gallon coating for cold temperatures.

EXAMPLE

VOHAP DATA SHEET:[1]
PROPERTIES OF THE COATING "AS SUPPLIED"
BY THE MANUFACTURER[2]

Coating Manufacturer: SHIP-COATINGS-R-US
Coating Identification: 1A-2B-3C (HIGH-TEMP)
Batch Identification: XXX-YYY-ZZZ
Supplied To: AOK SHIPYARD

Properties of the coating as supplied[2] to the customer:

A. Coating Density: $(D_c)_s$ 1000 g/L
ASTM D1475-90 G Other[3]

B. Total Volatiles: $(m_v)_s$ 35 Mass Percent
ASTM D2369-93 G Other[3]

C. Water Content:
1. $(m_w)_s$ 0 Mass Percent
ASTM D3792-91 G ASTM D4017-90 G Other[3]
2. $(v_w)_s$ 0 Volume Percent
Calculated G Other[3]

D. HAP Volatiles: $(m_{HAP})_s$ 15 Mass Percent

E. Nonvolatiles: $(v_n)_s$ 38 Volume Percent
Calculated G Other[3]

F. VOHAP Content $(VOHAP)_s$:
1. 231 g/L solids (nonvolatiles)
2. 150 g/L coating (less water and NON-vohap exempt compounds)

G. Thinner VOHAP Density: $D_{th(VOHAP)}$ 310 g/L
ASTM 319 G Other[3]

Remarks: (use reverse side)

Signed: Debbie Bond Date: 9/17/96

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[1]Adapted from EPA-340/1-86-016 (July 1986), p. II-2.
[2]The subscript "s" denotes each value is for the coating "as supplied" by the manufacturer.
[3]Explain the other method used under "Remarks."

TECHNICAL REPORT DATA

(Please read Instructions on reverse before completing)

1. REPORT NO. EPA-453/R-97-001	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE A Guidebook on How to Comply with the Shipbuilding and Repair (Surface Coating) Operations National Standards for Hazardous Air Pollutants		5. REPORT DATE January 1997
		6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Office of Air Quality Planning and Standards Office of Air and Radiation U.S. Environmental Protection Agency Research Triangle Park, NC 27711		10. PROGRAM ELEMENT NO.
		11. CONTRACT/GRANT NO. 68-D1-0115
12. SPONSORING AGENCY NAME AND ADDRESS Director, Office of Air Quality Planning and Standards Office of Air and Radiation U.S. Environmental Protection Agency Research Triangle Park, NC 27711		13. TYPE OF REPORT AND PERIOD COVERED Final
		14. SPONSORING AGENCY CODE EPA/200/04
15. SUPPLEMENTARY NOTES		

16. ABSTRACT

This guidebook provides an overview of the shipbuilding and ship repair regulation. It is not a complete statement of the legal and technical requirements of the regulation: 60 FR 64330, (December 15, 1995) . The reader will have to refer to the original document (and amendments) for the complete text. The purpose of the information is to assist the major source facilities to comply with the regulation. The guidebook contains a copy of the regulation and contains several example questions and responses to questions that have been asked by industry or State/Regional representatives. The responses represent the Agency's best guidance and are included to provide some basis for consistency.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Environmental protection Air pollution control Marine coating limits Reporting and recordkeeping requirements Shipbuilding and ship repair standards	VOC, HAP, Shipbuilding, Ship repair	
18. DISTRIBUTION STATEMENT Release Unlimited	19. SECURITY CLASS *(Report)* Unclassified	21. NO. OF PAGES 146
	20. SECURITY CLASS *(Page)* Unclassified	22. PRICE

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Appendix D

Standard Methods for Testing and Collecting Samples:

Method 24 – Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings

Standard Procedure for Collection of Coating and Ink Samples for Analysis by Reference Methods 24 and 24A

METHOD 24 - DETERMINATION OF VOLATILE MATTER CONTENT, WATER CONTENT, DENSITY, VOLUME SOLIDS, AND WEIGHT SOLIDS OF SURFACE COATINGS

1.0 Scope and Application.

1.1 Analytes.

Analyte	CAS No.
Volatile organic compounds	No CAS Number assigned
Water	7732-18-5

1.2 Applicability. This method is applicable for the determination of volatile matter content, water content, density, volume solids, and weight solids of paint, varnish, lacquer, or other related surface coatings.

1.3 Precision and Bias. Intra- and inter-laboratory analytical precision statements are presented in Section 13.1. No bias has been identified.

2.0 Summary of Method.

2.1 Standard methods are used to determine the volatile matter content, water content, density, volume solids, and weight solids of paint, varnish, lacquer, or other related surface coatings.

3.0 Definitions.

3.1 *Waterborne coating* means any coating which contains more than 5 percent water by weight in its volatile fraction.

3.2 *Multicomponent coatings* are coatings that are packaged in two or more parts, which are combined before application. Upon combination a coreactant from one part of the coating chemically reacts, at ambient conditions, with a coreactant from another part of the coating.

3.3 *Ultraviolet (UV) radiation-cured coatings* are coatings which contain unreacted monomers that are polymerized by exposure to ultraviolet light.

4.0 Interferences. [Reserved]

5.0 Safety.

5.1 Disclaimer. This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user of this test method to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to performing this test method.

5.2 Hazardous Components. Several of the compounds that may be contained in the coatings analyzed by this method may be irritating or corrosive to tissues (*e.g.*, heptane) or may be toxic (*e.g.*, benzene, methyl alcohol). Nearly all are fire hazards. Appropriate precautions can be found in reference documents, such as Reference 3 of Section 16.0.

6.0 Equipment and Supplies.

The equipment and supplies specified in the ASTM methods listed in Sections 6.1 through 6.6 (incorporated by reference - see § 60.17 for acceptable versions of the methods) are required:

6.1 ASTM D 1475-60, 80, or 90, Standard Test Method for Density of Paint, Varnish, Lacquer, and Related Products.

6.2 ASTM D 2369-81, 87, 90, 92, 93, or 95, Standard Test Method for Volatile Content of Coatings.

6.3 ASTM D 3792-79 or 91, Standard Test Method for Water Content of Water Reducible Paints by Direct Injection into a Gas Chromatograph.

6.4 ASTM D 4017-81, 90, or 96a, Standard Test Method for Water in Paints and Paint Materials by the Karl Fischer Titration Method.

6.5 ASTM 4457-85 (Reapproved 1991), Standard Test Method for Determination of Dichloromethane and 1,1,1-Trichloroethane in Paints and Coatings by Direct Injection into a Gas Chromatograph.

6.6 ASTM D 5403-93, Standard Test Methods for Volatile Content of Radiation Curable Materials.

7.0 Reagents and Standards.

7.1 The reagents and standards specified in the ASTM methods listed in Sections 6.1 through 6.6 are required.

8.0 Sample Collection, Preservation, Storage, and Transport.

8.1 Follow the sample collection, preservation, storage, and transport procedures described in Reference 1 of Section 16.0.

9.0 Quality Control.

9.1 Reproducibility (**NOTE:** Not applicable to UV radiation-cured coatings). The variety of coatings that may be subject to analysis makes it necessary to verify the ability of the analyst and the analytical procedures to obtain reproducible results for the coatings tested. Verification is accomplished by running duplicate analyses on each sample tested (Sections 11.2 through 11.4) and comparing the results with the intra-laboratory precision statements (Section 13.1) for each parameter.

9.2 Confidence Limits for Waterborne Coatings. Because of the inherent increased imprecision in the determination of the VOC content of waterborne coatings as the weight percent of water increases, measured parameters for waterborne coatings are replaced with appropriate confidence limits (Section 12.6). These confidence limits are based on measured parameters and inter-laboratory precision statements.

10.0 Calibration and Standardization.

10.1 Perform the calibration and standardization procedures specified in the ASTM methods listed in Sections 6.1 through 6.6.

11.0 Analytical Procedure.

Additional guidance can be found in Reference 2 of Section 16.0.

11.1 Non Thin-film Ultraviolet Radiation-cured (UV radiation-cured) Coatings.

11.1.1 Volatile Content. Use the procedure in ASTM D 5403 to determine the volatile matter content of the coating except the curing test described in NOTE 2 of ASTM D 5403 is required.

11.1.2 Water Content. To determine water content, follow Section 11.3.2.

11.1.3 Coating Density. To determine coating density, follow Section 11.3.3.

11.1.4 Solids Content. To determine solids content, follow Section 11.3.4.

11.1.5 To determine if a coating or ink can be classified as a thin-film UV cured coating or ink, use the equation in Section 12.2. If C is less than 0.2 g and A is greater than or equal to 225 cm^2 (35 in^2) then the coating or ink is considered a thin-film UV radiation-cured coating and ASTM D 5403 is not applicable.

NOTE: As noted in Section 1.4 of ASTM D 5403, this method may not be applicable to radiation curable materials wherein the volatile material is water.

11.2 Multi-component Coatings.

11.2.1 Sample Preparation.

11.2.1.1 Prepare about 100 ml of sample by mixing the components in a storage container, such as a glass jar with a screw top or a metal can with a cap. The storage container should be just large enough to hold the mixture. Combine the components (by weight or volume) in the ratio recommended by the manufacturer. Tightly close the container between additions and during mixing to prevent loss of volatile materials. However, most manufacturers mixing instructions are by volume. Because of possible error caused by expansion of the liquid when measuring the volume, it is recommended that the components be combined by weight. When weight is used to combine the components and the manufacturer’s recommended ratio is by volume, the density must be determined by Section 11.3.3.

11.2.1.2 Immediately after mixing, take aliquots from this 100 ml sample for determination of the total volatile content, water content, and density.

11.2.2 Volatile Content. To determine total volatile content, use the apparatus and reagents described in ASTM D2369 Sections 3 and 4 (incorporated by reference - see § 60.17 for the approved versions of the standard), respectively, and use the following procedures:

11.2.2.1 Weigh and record the weight of an aluminum foil weighing dish. Add 3 ± 1 ml of suitable solvent as specified in ASTM D2369 to the weighing dish. Using a syringe as specified in ASTM D2369, weigh to 1 mg, by difference, a sample of coating into the weighing dish. For coatings believed to have a volatile content less than 40 weight percent, a suitable size is 0.3 ± 0.10 g, but for coatings believed to have a volatile content greater than 40 weight percent, a suitable size is 0.5 ± 0.1 g.

NOTE: If the volatile content determined pursuant to Section 12.4 is not in the range corresponding to the sample size chosen repeat the test with the appropriate sample size. Add the specimen dropwise, shaking (swirling) the dish to disperse the specimen completely in the solvent. If the material forms a lump that cannot be dispersed, discard the specimen and prepare a new one. Similarly, prepare a duplicate. The sample shall stand for a minimum of 1 hour, but no more than 24 hours prior to being oven cured at 110 $\pm$ 5°C (230 $\pm$ 9°F) for 1 hour.

11.2.2.2 Heat the aluminum foil dishes containing the dispersed specimens in the forced draft oven for 60 min at 110 $\pm$ 5°C (230 $\pm$ 9°F). Caution -- provide adequate ventilation, consistent with accepted laboratory practice, to prevent solvent vapors from accumulating to a dangerous level.

11.2.2.3 Remove the dishes from the oven, place immediately in a desiccator, cool to ambient temperature, and weigh to within 1 mg.

11.2.2.4 Run analyses in pairs (duplicate sets) for each coating mixture until the criterion in Section 11.4 is met. Calculate W_v following Equation 24-2 and record the arithmetic average.

11.2.3 Water Content. To determine water content, follow Section 11.3.2.

11.2.4 Coating Density. To determine coating density, follow Section 11.3.3.

11.2.5 Solids Content. To determine solids content, follow Section 11.3.4.

11.2.6 Exempt Solvent Content. To determine the exempt solvent content, follow Section 11.3.5.

NOTE: For all other coatings (i.e., water- or solvent-borne coatings) not covered by multicomponent or UV radiation-cured coatings, analyze as shown below:

11.3 Water- or Solvent-borne coatings.

11.3.1 Volatile Content. Use the procedure in ASTM D 2369 to determine the volatile matter content (may include water) of the coating.

11.3.1.1 Record the following information:

W_1 = weight of dish and sample before heating, g

W_2 = weight of dish and sample after heating, g

W_3 = sample weight, g.

11.3.1.2 Calculate the weight fraction of the volatile matter (W_v) for each analysis as shown in Section 12.3.

11.3.1.3 Run duplicate analyses until the difference between the two values in a set is less than or equal to the intra-laboratory precision statement in Section 13.1.

11.3.1.4 Record the arithmetic average ($\overline{W}_v$).

11.3.2 Water Content. For waterborne coatings only, determine the weight fraction of water (W_w) using either ASTM D 3792 or ASTM D 4017.

11.3.2.1 Run duplicate analyses until the difference between the two values in a set is less than or equal to the intra-laboratory precision statement in Section 13.1.

11.3.2.2 Record the arithmetic average ($\overline{W}_w$).

11.3.3 Coating Density. Determine the density (D_c, kg/l) of the surface coating using the procedure in ASTM D 1475.

11.3.3.1 Run duplicate analyses until each value in a set deviates from the mean of the set by no more than the intra-laboratory precision statement in Section 13.1.

11.3.3.2 Record the arithmetic average ($\overline{D}_c$).

11.3.4 Solids Content. Determine the volume fraction (V_s) solids of the coating by calculation using the manufacturer's formulation.

11.3.5 Exempt Solvent Content. Determine the weight fraction of exempt solvents (W_E) by using ASTM Method D4457. Run a duplicate set of determinations and record the arithmetic average (W_E).

11.4 Sample Analysis Criteria. For W_v and W_w, run duplicate analyses until the difference between the two values in a set is less than or equal to the intra-laboratory precision statement for that parameter. For D_c, run duplicate analyses until each value in a set deviates from the mean of the set by no more than the intra-laboratory precision statement. If, after several attempts, it is concluded that the ASTM procedures cannot be used for the specific coating with the established intra-laboratory precision (excluding UV radiation-cured coatings), the U.S.

Environmental Protection Agency (EPA) will assume responsibility for providing the necessary procedures for revising the method or precision statements upon written request to: Director, Emissions, Monitoring, and Analysis Division, MD-14, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711.

12.0 Calculations and Data Analysis.

12.1 Nomenclature.

A = Area of substrate, cm^2, (in^2).

C = Amount of coating or ink added to the substrate, g.

D_c = Density of coating or ink, g/cm^3 (g/in^3).

F = Manufacturer's recommended film thickness, cm (in).

W_o = Weight fraction of nonaqueous volatile matter, g/g.

W_s = Weight fraction of solids, g/g.

W_v = Weight fraction of the volatile matter, g/g.

W_w = Weight fraction of the water, g/g.

12.2 To determine if a coating or ink can be classified as a thin-film UV cured coating or ink, use the following equation:

$$C = F\,A\,D_c \qquad \textbf{Eq. 24-1}$$

12.3 Calculate W_v for each analysis as shown below:

$$W_v = \frac{W_1 - W_2}{W_3} \qquad \textbf{Eq. 24-2}$$

12.4 Nonaqueous Volatile Matter.

12.4.1 Solvent-borne Coatings.

$$W_o = W_v \qquad \textbf{Eq. 24-3}$$

12.4.2 Waterborne Coatings.

$$W_o = W_v - W_w \qquad \textbf{Eq. 24-4}$$

12.4.3 Coatings Containing Exempt Solvents.

$$W_o = W_v - W_E - W_w \qquad \textbf{Eq. 24-5}$$

12.5 Weight Fraction Solids.

$$W_s = 1 - W_v \qquad \textbf{Eq. 24-6}$$

12.6 Confidence Limit Calculations for Waterborne Coatings. To calculate the lower confidence limit, subtract the appropriate inter-laboratory precision value from the measured mean value for that parameter. To calculate the upper confidence limit, add the appropriate inter-laboratory precision value to the measured mean value for that parameter. For W_v and D_c, use the lower confidence limits;

for W_w, use the upper confidence limit. Because W_s is calculated, there is no adjustment for this parameter.

13.0 Method Performance.

13.1 Analytical Precision Statements. The intra- and inter-laboratory precision statements are given in Table 24-1 in Section 17.0.

14.0 Pollution Prevention. [Reserved]

15.0 Waste Management. [Reserved]

16.0 References.

Same as specified in Section 6.0, with the addition of the following:

1. Standard Procedure for Collection of Coating and Ink Samples for Analysis by Reference Methods 24 and 24A. EPA-340/1-91-010. U.S. Environmental Protection Agency, Stationary Source Compliance Division, Washington, D.C. September 1991.

2. Standard Operating Procedure for Analysis of Coating and Ink Samples by Reference Methods 24 and 24A. EPA-340/1-91-011. U.S. Environmental Protection Agency, Stationary Source Compliance Division, Washington, D.C. September 1991.

3. Handbook of Hazardous Materials: Fire, Safety, Health. Alliance of American Insurers. Schaumberg, IL. 1983.

17.0 Tables, Diagrams, Flowcharts, and Validation Data.

TABLE 24-1. ANALYTICAL PRECISION STATEMENTS.

	Intra-laboratory	Inter-laboratory
Volatile matter content, W_v	$\pm$ 0.015 $\overline{W}_v$	$\pm$ 0.047 $\overline{W}_v$
Water content, W_w	$\pm$ 0.029 $\overline{W}_w$	$\pm$ 0.075 $\overline{W}_w$
Density, D_c	$\pm$ 0.001 kg/l	$\pm$ 0.002 kg/l

United States
Environmental Protection
Agency

Air Quality and Planning
Standards

EPA340/1-91-010
September 1991

EPA

Standard Procedure For Collection of Coating and Ink Samples For Analysis By Reference Methods 24 and 24A

Printed on Recycled Paper

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STANDARD PROCEDURE FOR COLLECTION OF COATING AND INK SAMPLES FOR ANALYSIS BY REFERENCE METHODS 24 AND 24A

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Radiation
Office of Air Quality Planning and Standards
Stationary Source Compliance Division
Washington, DC 20460

September 1991

DISCLAIMER

This document is a draft report submitted to the Stationary Source Compliance Division for circulation and subsequent comment on the technical adequacy of the contents. Any views or opinions contained herein are those of the authors and do not necessarily reflect the conclusions of the U.S. Environmental Protection Agency.

Any mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. Environmental Protection Agency.

CONTENTS

SECTION 1

INTRODUCTION

This standard operating procedure (SOP) document is prepared with the intent of providing simple step-by-step instructions, covering all aspects of sampling coatings and inks, for use by EPA, State, and local regulatory agencies nationwide. The instructions are presented in general terms as much as possible while providing sufficient details for actual field sampling. The procedure should be used in conjunction with existing health and safety programs and in accordance with existing EPA or other agency training guidelines.

Standard procedures are presented for sampling and handling of coatings and inks that require analysis by EPA Reference Methods 24 or 24A (RM 24/24A) as found in 40 CFR 60, Appendix A. This SOP has been expanded from an original version obtained from EPA Region II. For the purpose of developing consistency among agency inspectors nationwide in terms of sampling conducted, it delineates the activities deemed proper and necessary to ensure that the sample taken is representative of the coating or ink as applied. If the activities are conducted as described, questions concerning the credibility of sampling performed can be avoided.

Agency inspectors are generally responsible for a) planning for sampling (*i.e.*, deciding on the date, process, and location of sampling), b) ensuring that the samples are drawn properly, and c) handling and transporting samples to the laboratory responsible for analysis. The inspector rarely draws the sample. On-site the inspector typically requests the facility representative to assign a facility employee to draw the sample under the agency supervision, while providing the necessary equipment and guidance for sampling.

The use of common sense and care are required in procuring and submitting representative samples of industrial surface coatings and printing inks for analysis. Several EPA offices as well as State and local agencies have developed procedures for their staff, covering various aspects of sampling (*i.e.*, sampling techniques, containers, as well as storage and transfer of samples.) ASTM also has published several specific and detailed sampling procedures.[1,2,3,4]

The Standard Operating Procedure (SOP) presented in this document covers all types of industrial coating and printing ink operations, regardless of the method of application of coating or ink (*i.e.*, dip, spray, roll, flow, electrostatic, or electro-deposition). The only exceptions are the source categories such as consumer, architectural, or aerosol coatings, for which little compliance sampling experience is available. For these categories, the local process conditions, such as the coating storage and application methods, may dictate some minor changes in the way the sample is collected.

The sampling, handling, labeling, chain of custody, and quality assurance/ quality control conditions and procedures are addressed in the following sections. The equipment, supply material, data recording forms, and labels that must be either carried or readily available to the inspector in the field are listed below. However, the actual use of equipment will depend upon the local process conditions existing at the source sampled.

Sampling Supplies:

- Dual seal tin sample containers, one cup (8 fl.oz.), 1 pint (16 fl.oz.), 1 liter (equivalent to 1 quart or 32 fl.oz.) or special plastic sample containers for corrosive coatings
- Waterproof/solvent-proof marking pen
- Small scraper or knife/spatula
- Clean rag, paper towels
- Cooler/ice
- Long handled tongs
- Tubing
- Mixing/stirring paddles

Personal Safety Equipment:

- Eye protection
- Respiratory protection
- Hearing protection
- Steel toe shoes and gloves
- Hard hat
- Anti-sparking equipment (clamp-ended grounding cables)

Shipping Supplies:

- Packing and/or shipping box(es)

- Packing material: bubble paper, newspaper
- Shipping labels/forms
- Strapping tape

Data Recording Forms and Labels:

Listed below are standard forms and labels which will be required to properly record and identify samples. The inspector should plan to have an ample supply on hand at the source as deemed necessary.

- Coating Data Sheets[5] - (see Appendix A)
- Chain of Custody (C of C) strip seal (see Appendix B)
- Sample can label (see Appendix C)
- Chain of Custody (C of C) Record (see Appendix D)

SECTION 2

PROCUREMENT OF SAMPLES

The recommended step-by-step activities for proper sampling are presented below:

1. Confirm sample analysis arrangements (with the laboratory assigned to perform the analysis) prior to taking samples, particularly if they are non-routine.

2. Identify coatings or inks and the processes from which they are to be sampled:

   a. Identify the location in the operation where samples can best be obtained. The sample should be taken at the point of application of coating or ink, or as close to that point as possible, in order for the sample to be representative of the coating material "as applied" to the web or substrate.

   b. Multi-component coatings that harden upon mixing and application to the substrate must be sampled differently since a representative "as applied" sample cannot be obtained in the field. Examples of these coatings are the two and three part catalyzed polyurethane coatings. Each component of these coatings must be sampled separately and submitted for laboratory analysis as a multi-part sample. The component mix ratio must be obtained from the facility at the time of sampling and submitted to the analytical laboratory. This will enable the laboratory to mix the components using the same proportions as in the actual coating operation prior to the analysis.

3. Make sure the coating is thoroughly mixed before sampling. During operation of the coating application equipment, the coatings may be shaken mechanically or stirred with various agitators or circulation systems. Lacquers and other coatings containing highly volatile solvents should be agitated in closed containers to avoid evaporation. Water-thinned coatings tend to incorporate air bubbles if stirred too vigorously, so they should be stirred slowly. The risk of stratification or separation of components into a non-homogeneous mixture depends on the type of coating and is also directly proportional to the size of the reservoir being sampled. To ensure that a representative sample is obtained, it is essential that it be taken during steady process operation and at the point of application to the web or substrate (or as close to it as possible).

4. Most New Source Performance Standards (NSPS) regulations cited in 40 CFR 60 for surface coating operations require the use of at least a one liter (approximately 32 fl.oz.) sample container.

For sampling of all sources other than NSPS sources, use a tin dual seal 8 fl.oz. sampling container. A 16 fl. oz. container may be used, but it will result in excessive material for later disposal. Small 4 fl. oz. sample containers may be used for the catalyst that will be added to multi-component formulations in the laboratory since only small proportions are normally used.

Special plastic containers or glass sample bottles have been used for corrosive substances such as acid etch primers and paint catalysts such as MEK peroxide.[6] If a plastic container is used it must be impermeable to VOC diffusion through the walls of the plastic container.[1] Sample containers, caps, and inner seal liners must be inert to the chemically reactive compounds in the sample and must therefore be selected on a special case-by case basis by the agency affected.

5. Request a copy of the blender's worksheet to obtain data on the exact coating being sampled. Also collect manufacturer's formulation information from product data sheets. The ink, coating, and solvent data should be available on-site in the form of Material Safety Data Sheets (MSDS). The MSDS forms contain recommendations for safe handling of materials as well as physical and chemical properties data. Request data on the coating cure time and conditions if not provided in product data sheets and MSDS forms. Determine if exempt solvents are present or if any special handling or safety precautions will be required.

6. Bring a blank Coating Data Sheet form[5] (see Appendix A) for reference purposes to ensure that sufficient information is gathered from plant documents to fill out or calculate the necessary input data.

7. Only one sample is required for each coating to be characterized. The sample can be used in the analytical laboratory for a number of repeat analyses as required. One field replicate sample should be taken for every 10 samples collected. A minimum of one field replicate sample should be taken for each facility visit, even if less than 10 samples are taken. This provides a means to check the accuracy of the methods used. If a company requests a set of samples for its own analysis, an entirely separate set of samples should be taken concurrently using new sample containers. A fresh new sample should be taken if a repeat or follow-up sample is required for any reason.

8. When coating samples are procured on-site, the inspectors and other personnel should protect themselves from exposure to potentially hazardous chemicals as discussed below:

   a. Wear proper personal protecting equipment. The MSDS may indicate the manufacturer recommended personal protective equipment (PPE) for use during handling of samples. The MSDS forms for the coating materials, including dilution solvents, should be readily available at the point of use in the facility.

b. If a site safety plan is in effect, adhere to all of the provisions which relate to the coating operations being sampled. These requirements may include, but are not limited to: respiratory protective devices (e.g., air purifying respirators, air-supplied respirators), protective clothing (e.g., gloves, apron), eye protection (e.g., safety goggles, face shield), hearing protection (e.g., ear plugs or muffs), use of non-sparking tools and equipment, and other requirements as deemed necessary by the on-site safety personnel.

c. If no safety plans, MSDS, or on-site safety personnel are available, then the manufacturer of the coating materials and/or the regional OSHA office may be contacted for guidance on safety practices and the types of PPE to be utilized during sampling.

d. At a minimum, the applicable federal and state safety and health laws such as those found in Title 29 of the Code of Federal Regulations, Part 1910[7], shall be complied with by all inspection personnel supervising the sample procurement.

9. Have a sample of the selected coating or ink drawn by the facility's designated person. A clean rag or paper towels should be kept handy, since the filling of the sample container may result in some spillage.

a. Inspect the sample container to ensure that the inside and outside are clean and dry. Then hand it to the facility operator assigned to draw the sample.

b. Have the sample container connected to an electrical ground using grounding clips. This is particularly important when sampling from coating operations using electrostatic or electro-deposition technologies.

c. Have the facility operator assigned to the task draw samples by filling each sample container one-at-a-time. Work as fast as possible to avoid loss of VOC from the sample. Depending upon the location in the process from where the sample is taken, the steps presented below must be followed in drawing samples.

Usually, a sample is taken from 1) a spray nozzle or other applicator; 2) a coating bath/agitated reservoir holding coating ready for application; or 3) a bleed valve, hose, tank, or other location upstream of the point of application. Usually it is best to take the sample at the application point, i.e., a spray gun or nozzle. When sampling at locations other than the spray gun, one must make sure that the coating or ink is not thinned beyond the sample point.

(1) When sampling from a spray gun or other application device:

- Shut off the compressed air or atomizing fluid pressure and tilt the nozzle to about a 60° angle.

- Tilt the sample container to the same angle, insert the nozzle or application device into the sample container, and begin to fill the sample container using the liquid feed pressure to provide flow, gradually tilting the sample container upright as it fills.

- Slowly fill the container to overflowing to ensure that a representative sample is obtained and to avoid any loss of VOC due to volatilization to the headspace. Do not insert the applicator tip into the coating. This may contaminate the sample or create bubbles leading to VOC loss.

- Obtaining a representative sample from high pressure spray gun applicators or from coatings or inks that contain high vapor pressure VOC's may prove difficult.

(2) When sampling from an agitated/circulating coating bath or container holding coating ready for application:

- Wipe off the sample container or make sure it is clean before dipping it into the coating reservoir. Turn the sample container upside down and place it in the coating, approximately halfway down. (Do not take the sample from the top surface.) This can be done with a clean pair of long handled tongs to avoid contaminating the reservoir.

- Turn the sample container over and slowly bring it to the top of the coating reservoir.

- It is important to completely fill the container to avoid any loss of VOC due to volatilization to the headspace. A sample filled to the top and spilling over is acceptable. This requirement applies to the catalyst of multi-component coatings as well as to the uncatalyzed coating.

  When sampling inks, a sample may be taken directly from the ink trough using a metal ladle, glass jar, or a clean paper cup to fill the sample container. A foam cup which may dissolve upon contact with solvents should not be used.

(3) If it is not possible to sample from the coating container or applicator, a sample may be taken from a tap, bleed valve, paint hose, drum, tank, or other location in the system which is as close to the point of application as possible and therefore will provide the best possible "as applied" coating sample. Sampling at each of these alternate points will require some judgement, since each coating line or process may have a different orientation and layout of taps, valves, hoses, and reservoirs. If additional information or guidance is needed, refer to ASTM Method D4057-88 for Standard Practice for Manual Sampling of Petroleum and Petroleum Products[3] and ASTM Method E300-86 for Standard Practice for Sampling Industrial Chemicals[4] for detailed procedures and recommendations. Basic instructions for sampling from larger reservoirs or containers are:

- Flush any tap, valve, hose, or other sample line thoroughly before sampling. Sampling from 55 gallon drums or larger tanks should be avoided because stratification or separation of components may occur under all but the most ideal mixing conditions. Hold the sample container upright or at a slight angle so that the sample tap may be inserted into the container.

- Insert the tap, valve or hose into the sample container and begin to fill it while attempting to avoid contamination of the sample by contact with external parts of the sample line.

- It is important to completely fill the container to avoid any loss of VOC due to volatilization to the headspace.

d. Once the sample is taken, the steps presented below must be followed:

- Place the sample container on the floor or ground and insert the inner seal on the container. The most efficient way to do this is to place the seal inside the rim of container, invert a screw cap, and with the open palm of the hand press down on the screw cap; this will evenly force the inner seal into the container for a tight fit.

- Screw cap onto can.

- Wipe all residual coating material off the sample container. To avoid contamination, do not allow cleaning of the container prior to inserting the inner seal.

- Sign and date the Chain of Custody (C of C) strip seal (see Appendix B), place it over top of the screw cap and down sides of the sample container tightly, following contours.

- Each sample should be numbered with a unique number.

- Completely fill out the sample container label. The label should contain the following information (An example label is given in Appendix C):

  -- Name of Agency and inspector who obtained the sample.

  -- Sample ID No.

  -- Sample date and time.

  -- Source identification and sample point (*e.g.*, coating line and coating station identification for the collection site).

  -- Sample description - color, type, solids/water content, or multi-component portion.

  -- Set-up time of multi-component coatings, if applicable.

  -- Plant witness (signature).

  -- Analysis required - RM 24 or RM 24A.

  -- Presence of exempt solvents and their identification.

  -- Special handling procedures that may be required.

- Finally, affix the completed label onto the side of the sample container over the C of C seal ends.

10. Complete the C of C form (given in Appendix D) for each sample. The inspector should retain a copy of the C of C until the original comes back from the analytical laboratory. All other copies and original should remain with the sample to be sent for analysis.

SECTION 3

CHAIN OF CUSTODY (C of C)

Chain of custody procedures are very important. They show who controlled or handled the samples. Proper documentation of each sample handler is essential to preserving the integrity of the sample and its use as evidence.

1. Each person who handles the sample must be identified on the accompanying C of C Record form. (A suitable blank C of C record form is presented in Appendix D along with a completed example.) More than one sample can be included on a C of C record if each sample is clearly identified and the analysis/handling instructions for each are clearly and unambiguously given.

2. If shipping of the sample is required, the C of C sheet should be enclosed in an envelope and should travel with the sample inside the shipping box. The analytical laboratory personnel receiving the sample are responsible for signing the original C of C and returning it to the agency.

3. If air shipping is required the Air Cargo bill of lading (or other shipping bill/ receipt documents) becomes part of the C of C and should be attached to the original C of C by the person receiving the delivery.

4. Before enclosing it in the shipping box, ensure that all portions of the C of C form are filled out including specification that the RM 24 or 24A analysis is to be performed by the analytical laboratory and including identification of exempt solvents that may be present in the sample.

5. In most cases, use one C of C form for each sample.

6. The agency inspector should retain one copy of the C of C.

7. The original C of C form will be returned by the analytical laboratory receiving the sample to the designated agency representative. The C of C form should have signatures from the agency inspector, the sample custodian, the person in charge of shipping samples, and the responsible analytical laboratory representative before it is returned to the agency. When the C of C is returned to the agency, a copy of the C of C should be given to the inspector and the original kept by the person responsible for shipping or recordkeeping.

SECTION 4

QUALITY ASSURANCE/QUALITY CONTROL

Documentation

1. All required information should be completely recorded on appropriate C of C, strip seal, or label forms. Each sample recipient should check C of C, strip seal, or label forms for completeness and should not accept samples if C of C, strip seal, or label forms are incomplete. The recipient should require that any key missing information be provided to adhere with procedures intended to ensure integrity and C of C documentation of the sample.

2. Sampling activities should be documented in a logbook or recordbook in the event verification or testimony is required at a later date.

3. The C of C form should be legibly and completely filled out, including directions for which reference method analysis (*i.e.*, 24 and/or 24A) should be performed and identifying any exempt solvents that may be present.

4. MSDS or other product data sheets, blender's worksheets, coating manufacturer's data, or trade names (as well as multi-component coating formulation blend and set-up time information) should only be sent with samples to the laboratory for analysis if reference to % volatile, % H_2O, % exempt solvents, VOC lbs/gallon, specific gravity, or specific information about the origin of the sample are removed or excluded from the data. This is to ensure objective and unbiased analysis of the sample. MSDS and other qualitative information describing the sample is essential to proper and safe handling in the laboratory.

5. The person submitting the samples should indicate the presence of water, ask for % water analysis only when applicable, identify the presence of exempt solvents, and specifically request analysis for exempt solvents when present.

6. The shipping documents should be filled out correctly.

Labeling

7. C of C strip seal tape should be placed on container properly and securely.

8. The sample label should be completely and accurately filled out indicating the analysis requested, the presence of exempt solvents, or if special handling is required. It should be placed on the container so that it is readily visible.

9. When the sample contains an exempt solvent or a multi-component coating to be specially blended (mixed) by the analytical laboratory, a special tag should be completed and affixed to the sample (such as a 2½" by 4½" label tied to the sample can with a string) to notify the lab that the sample requires special handling or analysis.

10. The shipping labels should be filled out correctly.

Sample Integrity

11. The sample container should be filled to overflowing prior to placing inner seal in container. A partially filled container indicates potential VOC loss or some other problem with the sample. A repeat sample is required.

12. To avoid potential sample contamination, the outside of the sample container should be wiped clean immediately after being sealed.

13. If analytical laboratory personnel receive samples stored in inappropriate containers or if there are any other problems associated with sample integrity or documentation, they should immediately report these problems to agency personnel.

SECTION 5

HANDLING

Simple common sense should be used in handling collected samples to ensure sample integrity and custody control.

1. Maintain samples at room temperature, preferably at 70°F but within the range of 40 to 100°F. Do not store sample containers in hot areas such as a closed vehicle. Keep out of direct sunlight and keep from freezing.

2. After properly sealing the sample container, the sample should be secured in a safe place and maintained at a temperature that is compatible with the coating. The packing requirements of individual samples depend on the coating's physical and chemical properties. Coatings with relatively high vapor pressures (*i.e.*, those containing volatile solvents with boiling points below 100°F) should be packed in ice to keep them within the temperature range of 40 to 100°F. The inspector or person responsible for samples should use ice packs or other more durable means to keep samples cool if they must be held for extended times or may be exposed to extreme heat. Use special insulated containers to avoid volatilization, particularly in warm climates. The temperature sensitivity of the coating should also be checked to determine if packing in ice may have a detrimental effect on the sample by causing solidification, separation, or any other change in its properties. Other samples which are not volatile at low temperatures, such as those with boiling points higher than 100°F, may be packed and shipped at room temperature. The MSDS on coatings and dilution solvents supply sufficient information to determine the coating properties.

3. When packaging samples for shipment, use bubble packing or crumpled paper to line the bottom of the box. The box should be firm, adhering to specifications given by the US Department of Transportation - DOT 12-B.[8,9] Place the sample container in the box with the top up. Pack additional bubble pack or paper around the container so that the entire inner space of the box is sufficiently filled, to keep the sample container in the upright position and to prevent the container from shifting while in transit.

4. Enclose both the completed C of C form and a stamped envelope addressed to the agency for return of the C of C form in a larger envelope addressed to the analytical laboratory to which the sample is being sent. Place it on top of the packing over the sample containers and close the box.

5. Seal the box with strapping tape.

6. Paint and coating samples are considered hazardous material and should be shipped as a restricted article by Federal Express or another suitable carrier that can provide special handling. Label the outside of the box with sender/ receiver addresses. If used, insert the completed air bill/cargo bill in its proper pocket and seal.

7. For all mail, courier, or special delivery service shipping, the box should have the following designations:

   - On top of box: "TOP - THIS SIDE UP."
   - On all sides of box: arrows pointing up.
   - On bottom of box: "OTHER END UP."
   - On one side of box: "Flammable liquid UN No. 1263."
   - On opposite sides of box: "Danger" and "Flammable Liquid" labels.
   - On fourth side of box: Name and address of the person shipping the samples.
   - On top of box: Shipping destination name and address along with any additional labels required by shipping company, such as the restricted article form used by Federal Express.

8. DO NOT HOLD. Ideally, a sample should be delivered to the laboratory for analysis on the same day it is obtained. If a sample must be stored overnight, it should be kept in a secure place, away from extreme temperatures and away from danger of breakage, leakage, or tampering, preferably in a locked storage cabinet. Maintain a sample log for those samples stored overnight. The log should contain the following information:

   - Sample number.
   - Facility name and location.
   - Date/time sample obtained.
   - Date sample was placed into locked storage cabinet.
   - Date when sample was mailed to the laboratory for analysis.

NOTE: SAMPLES SHOULD NOT BE MAILED ON A FRIDAY BECAUSE THEY WILL NOT BE DELIVERED UNTIL MONDAY. THIS MAY INTRODUCE SOME SUBSEQUENT QUESTION ABOUT ADEQUATE CHAIN OF CUSTODY OR SAMPLE INTEGRITY.

6. REFERENCES

1. Standard Practice for Sampling Liquid Paints and Related Pigmented Coatings, ASTM D3925-81 (Re-approved 1985). 1990 Annual Book of ASTM Standards, Volume 6.01, Philadelphia, PA, 1990.

2. Standard Methods for Sampling of Testing Shellac Varnish, ASTM D1650-76, 1990 Annual Book of ASTM Standards, Volume 6.02, Philadelphia, PA, 1990.

3. Standard Practice for Manual Sampling of Petroleum Products, ASTM Method D4057-88, Volume 5.01, Philadelphia, PA, 1990.

4. Standard Practice for Sampling Industrial Chemicals, ASTM Method E300-86, Volume 6.03, Philadelphia, PA, 1990

5. EPA-340/1-88-003, Recordkeeping Guidance Document for Surface Coating Operations and the Graphics Arts Industry, U.S. EPA, Stationary Source Compliance Division, Washington, DC, May 1989.

6. "Information on Sample Taking and Sample Transport/ Field Sampling Guidelines," (Draft), Bay Area Quality Management District, San Francisco, California, July 1990.

7. Code of Federal Regulations, Title 29, Part 1910, Occupational Safety and Health Standards, Department of Labor, July 1, 1989.

8. Dangerous Goods Regulations, 31st Edition, International Air Transport Association, Montreal, Quebec, Canada, 1990.

9. Code of Federal Regulations, Title 49, Part 178, Subpart F- Specifications for Fiberboard Boxes, Specification 12-B, Department of Transportation (49 CFR 178.205), October 1, 1989.

10. EPA-450/3-84-019, Procedures for Certifying Quantity of Volatile Organic Compounds Emitted by Paint, Ink, and Other Coatings, U.S. EPA, OAQPS, ESED, Research Triangle Park, NC, December 1984.

11. "EPA Region II Sampling Procedure," (Draft), New York, New York, June 1990.

12. "EPA Region I: VOC Sampling/Analysis," (Draft), McCusker, Boston, Massachusetts, June 7, 1990.

13. "Sampling Techniques & Test Methods," (Draft), California Air Resources Board, Sacramento, California, July 30, 1990.

14. Federal Test Method Standard No. 141c, Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling, and Testing. General Services Administration, January 24, 1986.

15. EPA-600/9-76-005, Quality Assurance Handbook for Air Pollution Measurement Systems: Volume I. Principles. U.S. EPA, EMSL, Research Triangle Park, NC, December 1984.

16. EPA-600/4-77-027b, Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III. Stationary Source Specific Methods. U.S. EPA, EMSL, Research Triangle Park, NC, November 1976.

Note: References 10 through 16 were not directly cited in the Sampling SOP for RM 24/24A but the methods outlined in those references were generally incorporated. They are considered generally relevant and useful sources for sampling information.

APPENDIX A
COATING DATA SHEET

Date:____________________ COATING DATA Source:____________________

Data		
Coating: Supplier Name		
Name and Color of Coating		
Type of Coating (primer, clearcoat, etc.)		
Identification Number for Coating		
Coating Density (lbs/gal)		
Total Volatiles Content (wt%)		
VOC Content (wt%)		
Solids Content (vol%)		
Dilutent Properties: Name		
Identification Number		
Diluent Solvent Density (lbs/gal)		
VOC Content (wt%)		
Water Content (wt%)		
Exempt Solvent Content (wt%)		
Diluent/Solvent Ratio (gal diluent solvent/gal coating)		

NOTE: If the solids content is not available from the manufacturer as a volume percent, it should be calculated. A copy of this calculation must be provided.

APPENDIX B
CHAIN OF CUSTODY (C of C) STRIP SEAL

SEALED

Date: ____________________

Initials: ____________________

SEALED

APPENDIX C
SAMPLE CONTAINER LABEL

Agency:______________ Inspector:______________
Sample ID#:______________ Date/Time:______________
Source ID#:______________________________
Coating Name/Type:______________________________
Plant Witness (Signature):______________________________

Circle analysis required: RM 24 RM 24A

Exempt Solvents:______________________________
Special Handling:______________________________

APPENDIX D
CHAIN OF CUSTODY FORM

CHAIN OF CUSTODY RECORD

Agency Inspector/Address:	Source Description: Inspection Time/Date:

Sample ID No.	Description of Sample

Type of Analysis to be Performed/Remarks:

Person Responsible for Sample (Inspector's Signature:)	Time	Date

Relinquished By:	Received By:	Time	Date	Reason for Transfer:
Relinquished By:	Received By:	Time	Date	Reason for Transfer:
Relinquished By:	Received By:	Time	Date	Reason for Transfer:
Relinquished By:	Received By:	Time	Date	Reason for Transfer:

Page ____ of ____

CHAIN OF CUSTODY RECORD

<table>
<tr><td colspan="2">Agency Inspector/Address:
John Smith
USEPA-Region II
Air Compliance Branch
26 Federal Plaza
New York, NY 10278</td><td colspan="3">Source Description:
Use a code name or number to avoid revealing source/coating information

Inspection Time/Date:
1500 hrs/May 7, 1991</td></tr>
<tr><td>Sample ID No.</td><td colspan="4">Description of Sample</td></tr>
<tr><td>12345</td><td colspan="4">One (1) 8 fl. oz. can of red enamel coating from coating machine 12B, station 3.

If it is known that the coating contains an exempt solvent, or is a known (or suspected) water-borne coating, indicate this fact also. If the sample is a multi-part coating, indicate this here and identify the other sample ID numbers that are part of the multi-part coating. Identify the mix ratios of each component and the set-up time of the formulation.</td></tr>
<tr><td colspan="5">Type of Analysis to be Performed/Remarks:

Method 24 or 24A</td></tr>
<tr><td colspan="3">Person Responsible for Sample (Inspector's Signature:)

John Smith</td><td>Time

1500</td><td>Date
May 7
1991</td></tr>
<tr><td>Relinquished By:

John Smith</td><td>Received By:

Joe Andrews</td><td>Time

1700</td><td>Date
May 7
1991</td><td>Reason for Transfer:

to custodian</td></tr>
<tr><td>Relinquished By:

Joe Andrews</td><td>Received By:

Bill Williams</td><td>Time

0900</td><td>Date
May 8
1991</td><td>Reason for Transfer:

to shipping dept.</td></tr>
<tr><td>Relinquished By:

Bill Williams</td><td>Received By:

-------------</td><td>Time

1000</td><td>Date
May 8
1991</td><td>Reason for Transfer:
shipped Fed Ex to analytical lab</td></tr>
<tr><td>Relinquished By:

--------------</td><td>Received By:

Mary Long</td><td>Time

1100</td><td>Date
May 9
1991</td><td>Reason for Transfer:
received at lab for analysis</td></tr>
</table>

--EXAMPLE-- Page ___ of ___

APPENDIX E
DOT SPECIFICATION 12-B
FOR FIBERBOARD BOXES AS
SHIPPING CONTAINERS

Subpart F—Specifications for Fiberboard Boxes, Drums, and Mailing Tubes

SOURCE: 29 FR 18951, Dec. 29, 1964, unless otherwise noted. Redesignated at 32 FR 5606, Apr. 5, 1967.

§ 178.205 Specification 12B; fiberboard boxes.

§ 178.205-1 Compliance.

(a) Required in all details.

(b) [Reserved]

§ 178.205-2 Definitions.

(a) Terms such as "200-pound test" mean minimum strength, Mullen or Cady test.

(b) "Joints" are where edges of parts of box, except recessed flanged heads, are connected together in setting up the box. Generally done by box maker.

(c) "Seams" are where edges of parts of box are visible, except joints, when box is closed.

§ 178.205-3 Classification of board.

(a) Fiberboard is hereby classified by strength[1] of completed board as in first column of the following table; weights specified in the table are the minimums authorized.

Classified strength[1] of completed board	Solid fiberboard-Minimum combined weight of component plies exclusive of adhesives (pounds per 1,000 sq. ft.)	Facings for corrugated fiberboard	
		Double faced—Minimum combined weight of facings (pounds per 1,000 sq. ft.)	Double wall—Minimum combined weight of facings including center liner (pounds per 1,000 sq. ft.)
175	149	75	
200	190	84	92
275	237	138	110
325	237	138	110
350	283	180	126
375	283	180	180
400	283	180	180
450	283	180	180

[1] Mullen or Cady test (minimum).

(b) [Reserved]

[1]Mullen or Cady test (minimum).

§ 178.205–4 Solid fiberboard.

(a) To be 3-ply or more; both outer plies water resistant.

(b) [Reserved]

§ 178.205–5 Corrugated fiberboard.

(a) Both outer facings water resistant; corrugated sheets must be at least 0.009 inch thick and weigh not less than 26 pounds per 1000 square feet; all parts must be securely glued together throughout all contact areas.

(b) [Reserved]

§ 178.205–6 Stitching staples.

Stitching staples must be made in such a configuration that their holding capability as installed will not be less than that of flat steep staples $3/32 \times 0.019$ inch in cross section and not less than 7/16-inch wide.

[Amdt. 178–12, 35 FR 11686, July 22, 1970]

§ 178.205–7 Tape.

(a) Coated with glue at least equal to No. 1¾ Peter Cooper standard. Cloth tape of strength, across the woof, at least 70 units, Elmendorf test. Sisal tape of 2 sheets of No. 1 Kraft paper, total weight 80 pounds per ream (500 sheets, 24″×36″); sheets to be combined with asphalt and reinforced by unspun sisal fibers completely embedded in the asphalt and extending across the tape, except as provided in § 178.205–11(d). Other tapes of equal strength and efficiency are authorized.

(b) Tape for closure of slotted containers complying with the following requirements is authorized when applied as prescribed in § 178.205–17(a)(3):

(1) Tape must be not less than 3 inches wide and shall be made of two sheets of 100 percent sulfate Kraft each not less than 30 pounds basis weight, reinforced with glass, sisal, or rayon fiber, combined with a laminant of asphalt or other material not affected by temperature extremes any more than would standard 180°F. to 200°F. softening point asphalt.

(2) Tape must be reinforced by lengthwise fibers spaced not more than an average of ½ inch apart, and by crosswise fibers spaced not less than an average of 2 per inch except that when a diamond pattern is employed for crosswise reinforcement, the spacing between the parallel sides of the diamond measured in the machine direction must be not more than 1 inch.

(3) Glass or sisal reinforced tape must have a minimum tensile strength in the machine direction of 75 pounds per inch of width and a minimum tensile strength in the cross direction of 45 pounds per inch of width; rayon reinforced tape must have a minimum tensile strength in the machine direction of 57 pounds per inch of width and a minimum tensile strength in the cross direction of 27 pounds per inch of width with elongation not exceeding 15 percent. Tensile tests on the finished product shall be made on a 3-inch width sample.

[29 FR 18951, Dec. 29, 1964. Redesignated at 32 FR 5606, Apr. 5, 1967, and amended by Amdt. 178–51, 43 FR 48645, Oct. 19, 1978]

§ 178.205–8 Test.

(a) Acceptable board must have prescribed strength, Mullen or Cady test, after exposure for at least 3 hours to normal atmospheric conditions (50 to 70 percent relative humidity), under test as follows:

(1) Clamp board firmly in machine and turn wheel thereof at constant speed of approximately 2 revolutions per second.

(2) Six punctures required, 3 from each side; all results but one must show prescribed strength.

(3) Board failing may be retested by making 24 punctures, 12 from each side; when all results but 4 show prescribed strength the board is acceptable.

(4) For corrugated fiberboard, doublepop tests may be disregarded.

(b) [Reserved]

§ 178.205–9 Types authorized.

(a) To be of solid or corrugated fiberboard of the following types, or as specifically provided for in § 178.205–19 to § 178.205–37;

(1) Slotted box; three-piece box without recessed ends; three-piece box of solid fiberboard with recessed ends; double-slide box; triple-slide box; telescope box, with sections of equal depth, or with covers, top or bottom or

both, with 3 inches overlap. (See § 178.205-14 (d) for boxes with single-flap closures.)

(2) [Reserved]

§ 178.205-10 Forming.

(a) Parts must be cut true to size and so creased and slotted as to fit closely into position without cracking, surface breaks, separation of parts outside of crease, or undue binding.

(b) [Reserved]

§ 178.205-11 Joints.

(a) For solid and corrugated fiberboard slotted containers: Lapped 1½ inches from center of scoreline except as in § 178.205-12; stitched at 2½ inch intervals and within 1 inch of each end of joint; body joint must be double-stitched (2 parallel stitches) at each end of joint over 18 inches long.

(b) For corrugated fiberboard slotted containers only: One butt joint taped (See § 178.205-7) is authorized; 3 inch tape required for boxes over 30 pounds authorized gross weight and 2 inch tape for others.

(c) For triple and double slide boxes: Joints of all slides must be taped (see § 178.205-7) for stitched; 3-inch tape required for boxes over 30 pounds authorized gross weight and 2-inch for others.

(d) For corrugated fiberboard only: One butt joint taped inside and outside with strips of one thickness of sulphate paper not less than 2 inches wide extending entire length of joint and firmly glued to box. For boxes not exceeding 65 pounds gross weight, outside strip of sulphate paper to be of basis weight not less than 60 pounds testing not less than 60 pounds and inside strip of sulphate paper to be of basis weight not less than 40 pounds testing not less than 40 pounds. For boxes exceeding 65 pounds gross weight, outside and inside with strips of sulphate paper which must each be of basis weight not less than 90 pounds testing not less than 90 pounds. Basis weight of paper shown is for 500 sheets, 24×36 inches.

(1) For glued lap joint, the sides of box forming joint must lap not less than 1¼" and be firmly glued throughout entire area of contact with a glue or adhesive which cannot be dissolved in water after the film application has dried.

§ 178.205-12 Flanged heads.

(a) Must have 4 flanges, at least 1" long above fillet, on each head. Recessed flanged heads not authorized for boxes of corrugated fiberboard.

(b) [Reserved]

§ 178.205-13 Seams which are to be stitched.

(a) Overlap, if any, required to be at least 1½ inches from center of scoreline except as in § 178.205-12.

(b) [Reserved]

[29 FR 18951, Dec. 29, 1964. Redesignated at 32 FR 5606, Apr. 5, 1967, and amended by Amdt. 178-64, 45 FR 81573, Dec. 11, 1980]

§ 178.205-14 Flap closures.

(a) Fill-in pieces, of the same type fiberboard as used in construction of the container, are required where it is necessary to prevent an opening between the inner flaps, unless otherwise provided by paragraphs (b) and (c) of this section or by Part 173 of this chapter.

(b) If to be closed by adhesive, each inner flap must cover at least one-third of face; inner flaps must butt or have full overlap, or fill-in pieces must be used, unless otherwise provided by Part 173 of this chapter, except that fill-in pieces are not required when outer flaps have full overlap. Outer flaps must butt or have full overlap.

(c) In lieu of fill-in pieces between inner flaps which do not butt, the following is authorized when linings are not prescribed in § 178.205.16.

(1) Top and bottom pads the same dimensions as interior of container of solid or corrugated fiberboard at least 125 pound test (Mullen or Cady).

(2) Minimum combined weight of facings for corrugated fiberboard pads must be at least 52 pounds per thousand square feet.

(3) Minimum combined weight of component plies for solid fiberboard pads must be at least 114 pounds per thousand square feet, exclusive of adhesives.

(4) Complete inner box or boxes.

(d) Single-flap closures are authorized for boxes with one dimension not over 2"; each flap must be scored and form one of the small faces of the box and lap at least 5" on one of the largest faces.

[29 FR 18951, Dec. 29, 1964, as amended by Order 67, 30 FR 7425, June 5, 1965. Redesignated at 32 FR 5606, Apr. 5, 1967]

§ 178.205-15 Linings (when prescribed by § 178.205-16).

(a) Of 1-piece to extend around 4 faces with joint at center of 1 face and with 4 flanges, at least 1½" long, on each end (corners may be mitered) to bend over the other 2 faces; also 2 pads to cover the other 2 faces. Pads may be omitted if closing flaps afford 3 thicknesses throughout face. For boxes with 1 dimension not over 3", one of the widest flanges may be lengthened to cover entire face and lap 6" on the adjoining face and the other flanges and the pads may then be omitted.

(b) [Reserved]

[29 FR 18951, Dec. 29, 1964, as amended by Order 67, 30 FR 7425, June 5, 1965. Redesignated at 32 FR 5606, Apr. 5, 1967]

§ 178.205-16 Authorized gross weight and parts required.

(a) The authorized gross weight (when packed) and the parts required are as follows:

Authorized gross weight (pounds)	Strength of fiberboard (minimum) Mullen or Cady test						
	Solid board			Doublefaced corrugated		Doublewall corrugated	
	Box	Lining [2]	Heads [1]	Box	Lining [2]	Box	Lining [2]
15	175		([3])	175		200	
30	200		275	200		200	
40	275		350	275		200	
				200	175		
55	325		([3])	325		275	
65 [4]	375		([3])	375			
				275	175	275	
	275	175	350	200	200		

[1] For recessed heads when used. In other cases same as for the box.
[2] As prescribed in § 178.205-15. A complete box is acceptable in place of the lining.
[3] Recessed heads are not authorized.
[4] Except as otherwise authorized herein or by Part 173 of this chapter.

(b) Triple slide boxes authorized for gross weights as follows: Of board at least 175-pound test for 40 pounds; of board at least 200-pound test for 65 pounds.

[29 FR 18951, Dec. 29, 1964. Redesignated at 32 FR 5606, Apr. 5, 1967, and amended by Amdt. 178-85, 51 FR 5976, Feb. 18, 1986]

§ 178.205-17 Closing for shipment.

(a) Slotted container, by coating with adhesive the entire contact surfaces of closing flaps and fill-in pieces where required or as prescribed in paragraph (a) (1), (2), or (3) of this section.

(1) By stitching with staples as prescribed by § 178.205-6 at 2½-inch intervals along all seams (one 5-inch space allowed when necessary to permit use of stitching device); or with staples made of flat wire of hardness not less than equivalent of Rockwell B90, and not less than 0.037 inch thick and not less than 0.074 inch wide, with not less than 1¼ inch crown, may be spaced not more than 5 inches apart. Such staples may be used across center seam where outside flaps meet in lieu of on both sides of center seam but need only be used where outside flaps overlay inner flaps; or staples made of arcuate wire of hardness not less than equivalent of Rockwell B90, and not less than 0.027 inch thick and not less than 0.095 inch wide, with not less than 1 inch crown, may be spaced not more than 5 inches apart. Such stitches when spaced not more than 2½ inches apart may be used across center seam where outside flaps meet in lieu of on both sides of center seam but need only be used where outside flaps overlay inner flaps.

(2) For fiberboard boxes containing not more than 1 inside metal can not

exceeding 1 gallon nominal capacity, and as otherwise authorized by Part 173 of this chapter, by application of 2 strips of pressure-sensitive tape not less than ½ inch in width, 1 strip to be placed approximately equal distance over the seam of abutting outer flaps, the other at a right angle to the first and spaced approximately equal distance on the closure face; strips must be of sufficient length to extend not less than 1 inch beyond score lines on side and end panels. Tape shall have a minimum tensile strength of 160 pounds per inch of width; minimum adhesion value of 18 ounces per inch of width; and minimum elongation of 12 percent at break, or having a minimum longitudinal tensile strength of not less than 240 pounds per inch of width; minimum adhesion value of 18 ounces per inch of width and a minimum elongation of 3 percent at break.

(3) For slotted containers only, reinforced tape complying with the requirements of § 178.205-7(b) is authorized for application over the center seam only. Tape must extend over the ends of box not less than 2½ inches.

(4) All closing flaps may be firmly glued with a hot-melt adhesive of 100 percent solid content of thermoplastic material which will maintain bond at temperature ranging from 20° F. below zero to 165° F. above zero. Adhesive must be applied in not less than eight stripes (except as specified below) on each inner flap, each stripe having a minimum width of 3/16-inch after compression. Stripes may not be more than 1½ inches apart and not less than four stripes must be applied on each side of center seam on each inner flap for full length of flap overlap area with one stripe not more than ½-inch from each side of center seam. If less than eight such stripes are applied on each inner flap, adhesive must cover and securely bond not less than 25 percent of flap contact area with bonded areas extending to within ½-inch or less of center seam.

(5) For regular slotted containers, pressure-sensitive tape is authorized for application over the center seams only and extending not less than two inches over the ends of the box. Tape must be not less than 2 inches wide and have a plastic film backing of polyester, polypropylene, or equivalent material. Tape must have a minimum tensile strength of 45 pounds per inch of width in the machine direction and not less than 55 pounds per inch of width in the cross direction and may not be affected by temperature extremes normally encountered during transportation. Boxes closed by means of this pressure-sensitive tape must be capable of passing performance tests prescribed in § 178.210-10.

(b) Double slide boxes or triple slide boxes, by coating the inner slides with adhesive, or by closing with reinforced tape capable of withstanding test prescribed by paragraph (b)(1) of this section; for single-flap closures as authorized for boxes with one dimension not over 2 inches, the flaps must be fastened to the body with adhesive.

(1) Boxes selected at random, containing dummy contents similar to that to be shipped and packed to authorized gross weight, closed with reinforced tape across the ends and onto opposite side panels at least 2 inches, must be capable of withstanding a drop on each end from a height of 4 feet onto solid concrete without closure failure.

(c) Fiberboard boxes with covers extending over sides but not to bottom, covers resting on walls of box, or telescope boxes of equal depth section, covers extending to bottom, must be secured by one of the following methods:

(1) By not less than three metal straps, one lengthwise and others at right angles thereto.

(2) When cover extends not less than 3 inches over the walls of the box, by coating with adhesive the entire contact area of the cover.

(3) Telescope boxes having equal depth sections may be closed by application of reinforced water activated tape or pressure sensitive tape under conditions and for commodities as prescribed in Part 173 of this chapter.

(d) When metal straps are specified, boxes must be strapped with the required number; size at least ⅝ inch×0.015 inch.

[29 FR 18951, Dec. 29, 1964. Redesignated at 32 FR 5606, Apr. 5, 1967, and amended by Amdt. 178-41, 42 FR 28135, June 2, 1977]

§ 178.205-18 Marking.

(a) *On each container.* Symbol in rectangle as follows:

DOT-12B * * *

(1) Stars to be replaced by authorized gross weight (for example, DOT-12B40, etc.).

(2) Name and address or symbol of person making the mark specified in paragraph (a)(1) of this section and located just above or below that mark. Symbol, if used, must be registered with the Director, OHMT.

(3) When metal straps are prescribed, boxes must be marked "——— (number) METAL STRAPS REQUIRED" just above or below the mark specified in this paragraph.

(4) Size of markings: Specification markings prescribed in paragraph (a)(1) of this section must be at least ½ inch high; other markings must be legible.

(b) [Reserved]

[29 FR 18951, Dec. 29, 1964. Redesignated at 32 FR 5606, Apr. 5, 1967, and amended by Amdt. 178-40, 41 FR 38182, Sept. 9, 1976]

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA-340/1-91-010	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE Standard Procedure for Collection of Coating and Ink Samples for VOC Content Analysis by Reference Method 24 and 24A		5. REPORT DATE May 1991 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) Bruce A. Olson, Melinda K. Wood, John T. Chehaske		8. PERFORMING ORGANIZATION REPORT NO. 91-133-T4/S
9. PERFORMING ORGANIZATION NAME AND ADDRESS Pacific Environmental Services, Inc. (PES) 560 Herndon Parkway, Suite 200 Herndon, Virginia 22070-5225		10. PROGRAM ELEMENT NO. WA 91-133 11. CONTRACT/GRANT NO. 68-02-4464
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency Office of Air Quality Planning and Standards Stationary Source Compliance Division Washington, D.C. 20460		13. TYPE OF REPORT AND PERIOD COVERED Final 14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

SSCD, Organic Chemicals Section, 401 M St., S.W., (EN-34W) Washington, D.C. 20460 Phone: (703) 308-8668

See also:
EPA-340/1-91-011: Analysis
EPA-340/1-91-012: References

16. ABSTRACT

This standard operating procedure (SOP) document is prepared with the intent of providing simple step-by-step instructions, covering all aspects of sampling coatings and inks, for use by EPA, State, and local regulatory agencies nationwide. The instructions are presented in general terms as much as possible while providing sufficient details for actual field sampling. The procedure should be used in conjunction with existing health and safety programs and in accordance with existing EPA or other agency training guidelines.

Standard procedures are presented for sampling and handling of coatings and inks that require analysis by EPA Reference Methods 24 or 24A (RM 24/24A) as found in 40 CFR 60, Appendix A. This SOP has been expanded from an original version obtained from EPA Region II. For the purpose of developing consistency among agency inspectors nationwide in terms of sampling conducted, it delineates the activities deemed proper and necessary to ensure that the sample taken is representative of the coating or ink as applied. If the activities are conducted as described, questions concerning the credibility of sampling performed can be avoided.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air Pollution, Coatings, Inks, Analysis, Solvents, Sampling, VOC, ASTM Methods	Sampling of Coatings and Inks	

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(This Report)* Unclassified	21. NO. OF PAGES 36
	20. SECURITY CLASS *(This page)* Unclassified	22. PRICE

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE

Appendix E

Accredited Laboratories

Showing only laboratories accredited for Clean Air Act (CCA) testing

Note: This list of laboratories is provided by the respective Acrediting Authority. Please contact the Laboratory's Primary Accrediting Authority, or when appropriate, the Secondary Accrediting Authority for 1) specific details of the laboratory's accredited Fields of Testing, 2) methods and analytes, or 3) when there is a descrepancy with the information given.

Showing only laboratories accredited for Clean Air Act (CCA) testing.

LabName	City	State	Phone	Primary AA	Secondary AA	CAA	CWA	RCRA	SDWA	CERCLA
A & B Laboratories, Inc	Houston	TX	(713) 453-6060	FL		X	X	X	X	
AAC Trinity Inc	Farmington Hills	MI	(248) 848-9656	NY		X	X	X	X	
Adirondack Environmental Services Inc	Albany	NY	(518) 434-4546	NY		X	X	X	X	
AES-Creative Resources	Johnson City	NY	(607) 729-6950	NY		X	X	X		
Air Toxics Limited	Folsom	CA	(916) 985-1000	FL		X				
Air Toxics Ltd	Folsom	CA	(916) 985-1000	NY		X				
Alcoa-Massena Chemistry Lab	Massena	NY	(315) 764-4295	NY		X	X	X	X	
Alpha Energy Labs	Carrolton	TX	(972) 242-2479		NJ	X				
Alta Analytical Perspectives	Wilmington	NC	(910) 794-1613	FL		X	X	X	X	
Alta Analytical Perspectives, LLC	Wilmington	NC	(910) 794-1613		LA DEQ	X	X	X		
Ambient Laboratories	Glen Cove	NY	(212) 463-7812	NY		X	X	X	X	
American Analytical Laboratories	Farmingdale	NY	(631) 454-6100	NY		X	X	X	X	
Analytics Corporation	Richmond	VA	(804) 264-7100	NY		X	X	X	X	
ATC Associates Inc	New York	NY	(212) 353-8280	NY		X	X	X	X	
Buck Environmental Laboratories Inc	Cortland	NY	(607) 753-3403	NY		X	X	X	X	
Carnell Environmental Inspections Inc	Valhalla	NY	(914) 946-4300	NY		X			X	
Certified Environmental Services Inc	Syracuse	NY	(315) 478-2374	NY		X	X	X	X	
CH2MHill Applied Sciences Laboratory	Corvallis	OR	(541) 752-4271	OR		X	X	X	X	
Chopra-Lee Inc	Grand Island	NY	(716) 773-7625	NY		X	X	X	X	
Coast to Coast Analytical Specialists, Inc. (CCAS)	Dallas	TX	(214) 221-2786	LA DEQ		X		X		
Columbia Analytical Services	Rochester	NY	(716) 288-5380	NY		X	X	X	X	
Con Ed Co of NY - EH&S Chemlab	Long Island City	NY	(718) 204-4148	NY		X	X	X		
Con-Test Environmental Lab	East Longmeadow	MA	(413) 525-2332	NY		X	X	X	X	

LabName	City	State	Phone	Primary	Secondary	CAA	CWA	RCRA	SDWA	CERCLA
Corrosion Control Consultants and Labs Inc	KentwooD	MI	(616) 940-3112	NY		X	X	X		
Data Analysis Technologies, Inc.	Plain City	OH	(800) 733-8644	LA DEQ		X		X		
Dunkirk Steam Station	Dunkirk	NY	(716) 366-2844	NY		X	X			
EAS Inc - Eastern Analytical Services Inc	Elmsford	NY	(914)939-6992	NY		X	X	X	X	
EAS Laboratories	Watertown	CT	(860) 274-5461	NY		X	X	X	X	
Eastern Research Group, Inc.	Morrisville	NC	(919) 379-4004	FL		X		X		
Eastman Kodak EnvironAnalytical Svcs.	Rochester	NY	(716) 722-3331	NY		X	X	X	X	
Ecology & Environment Inc	Lancaster	NY	(716) 685-8080	NY		X	X	X	X	
Ecotest Laboratories Inc	North Babylon	NY	(631) 422-5777	NY		X	X	X	X	
Electron Microscopy Services Labs	Carle Place	NY	(516) 997-7251	NY		X	X	X	X	
EMSL Analytical, Inc.	Westmont	NJ	(856) 858-4800	NY		X				
ENSR	Harvard	MA	(978) 772-2345	NY		X	X			
Environmental Conservation Laboratories, Inc.	Jacksonville	FL	(904) 296-3007	FL		X	X	X		
Environmental Laboratory Services	North Syracuse	NY	(315) 458-8033	NY		X	X	X	X	
Environmental Management Solutions	Briarcliff Manor	NY	(914) 345-1498	NY		X				
Environmental Testing Labs Inc	Farmingdale	NY	(631) 249-3150	NY		X	X	X	X	
Expresslab	Middlesex	NY	(800) 843-5227	NY		X	X	X	X	
Fibers Id Inc	Albany	NY	(518) 456-4501	NY		X				
Free-col Labs, a Div of Modern Industries Inc	Meadville	PA	(814) 724-6242	NY		X	X	X		
Friend Laboratory Inc	Waverly	NY	(607) 565-3500	NY		X	X	X	X	
Galson Laboratories	East Syracuse	NY	(315) 432-5227	NY		X	X	X	X	
GD Air Testing, Inc.	Richardson	TX	(972) 480-8908	LA DEQ		X		X		
General Electric Company WTFD	Waterford	NY	(518) 237-3330	NY		X	X	X		
H2M Labs Inc	Melville	NY	(631) 694-3040	NY		X	X	X	X	
Hematology & Environmental Labs	Cincinnati	OH	(513) 558-1705	NY		X	X	X	X	
Hudson Environmental Services Inc	South Glens Falls	NY	(518) 747-1060	NY		X	X	X	X	
IBM EF Environmental Service	Hopewell Jct	NY	(845) 894-9273	NY		X	X			
Independent Testing Laboratories Inc	College Point	NY	(718) 961-8530	NY		X	X	X	X	
Industrial Hygiene & Env Consultants	Olean	NY	(716) 372-6393	NY		X	X	X	X	
JLC Environmental Consultants Inc	New York	NY	(212) 420-8119	NY		X	X	X		
Kam Consultants	Long Island City	NY	(718) 729-1997	NY		X	X	X		
Lancaster Laboratories Inc	Lancaster	PA	(717)656-2300	NY		X	X	X		
Lancaster Laboratories, Inc.	Lancaster	PA	(717) 656-2300 x1		FL	X	X	X	X	
Life Science Laboratories, Inc	East Syracuse	NY	(315) 445-1105	NY		X	X	X	X	
Lionville Lab, Inc.	Exton	PA	(610) 280-3000	NY		X	X	X		
Lozier Laboratories	Middlesex	NY	(716) 654-6350	NY		X	X	X	X	

LabName	City	State	Phone	Primary	Secondary	CAA	CWA	RCRA	SDWA	CERCLA
Microbac Labs Inc Erie Test Lab Div	Erie	PA	(814) 825-8533	NY		X	X	X		
Midwest Research Institute	Kansas City	MO	(816) 753-7600	NY		X	X			
Nassau County Dept of Health	Hempstead	NY	(516) 572-1200	NY		X	X	X	X	
Neilson Research Corporation	Medford	OR	(541) 770-5678	OR		X	X	X	X	
Norlite Corporation	Cohoes	NY	(518) 235-0401	NY		X	X	X		
Northeast Analytical Inc	Schenectady	NY	(518) 346-4592	NY		X	X	X	X	
Northrop Grumman Corporation	Bethpage	NY	(516) 575-3073	NY		X	X	X		
NYSDOH Inorganic & Nuclear Chem Lab	Albany	NY	(518) 473-4854	NY		X	X	X	X	
OBG Labs - Environmental Div	Syracuse	NY	(315) 437-0200	NY		X	X	X	X	
PACE Analytical Services, Inc - Huntersville	Huntersville	NC	(704) 875-9092	FL		X	X	X	X	
PACE Analytical Services, Inc - MN	Minneapolis	MN	(612) 607-6330	FL		X	X	X	X	
Pace Analytical Services, Inc.	Minneapolis	MN	(612) 607-6391		OR	X	X	X	X	
Paradigm Environmental Services Inc	Rochester	NY	(716) 647-2530	NY		X	X	X	X	
Pedneault Associates Inc	Bohemia	NY	(631) 467-8477	NY		X	X	X	X	
Phoenix Environmental Labs	Manchester	CT	(860) 645-1102	NY		X	X	X	X	
Prism Laboratories, Inc	Charlotte	NC	(704) 529-6364	FL		X	X	X	X	
Proscience Analytical	Woburn	MA	(781) 935-3212	NY		X	X	X	X	
Public Service Testing Lab	Woodside	NY	(718) 476-9202	NY		X	X	X		
Radon Testing Corp of America	Elmsford	NY	(914) 345-3380		NJ	X			X	
Reynolds Metals Company Lab	Massena	NY	(315) 764-6233	NY		X	X		X	
Rochester G & E Corp-chem Envir Lab	Rochester	NY	(716) 546-2700	NY		X	X	X		
Schneider Laboratories Inc	Richmond	VA	(804) 353-6778	NY		X	X	X	X	
Scilab Boston Inc	Weymouth	MA	(781) 337-9334	NY		X	X	X	X	
Scilab Boston Inc	Weymouth	MA	(781) 337-9334	NJ		X				
Severn Trent Laboratories - Houston	Houston	TX	(713) 690-4444	FL		X	X	X		
Severn Trent Laboratories - Los Angeles	Santa Ana	CA	(714) 258-8610	FL		X				
Severn Trent Laboratories - VT	Colchester	VT	(802) 655-1203	FL		X	X	X	X	
Severn Trent Laboratories - West Sacramento	West Sacramento	CA	(916) 374-4342	FL		X	X	X		
Shapiro Engineering PC	Valley Stream	NY	(516) 791-2300	NY		X	X	X		
South Mall Analytical Labs	Plainview	NY	(516) 293-2191	NY		X	X	X		
Southwest Laboratory of Oklahoma	Broken Arrow	OK	(918) 251-2858		OR	X	X	X	X	
Southwest Laboratory of Oklahoma	Broken Arrow	OK	(918) 251-2858	FL		X	X	X	X	
Southwest Labs of Oklahoma	Broken Arrow	OK	(918) 251-2858		LA DEQ	X	X	X		
STL Austin	Austin	TX	(512) 310-5206		LA DEQ	X	X	X		
STL Austin	Austin	TX	(512) 244-0855	NY		X	X	X		
STL Buffalo	Amherst	NY	(716) 691-2600	NY		X	X	X	X	

STL Burlington	Colchester	VT	(802) 655-1203	NY		X	X	X	X	
STL Connecticut	Shelton	CT	(203)929-8140	NY		X	X	X	X	
STL Houston	Houston	TX	(713) 690-4444		LA DEQ	X	X	X		
STL Knoxville	Knoxville	TN	(865)588-6401		NY	X	X	X	X	
STL Knoxville	Knoxville	TN	(423) 588-6401	FL		X	X	X	X	
STL Newburgh	Newburgh	NY	(845) 562-0890	NY		X	X	X	X	
STL Pensacola	Pensacola	FL	(850) 474-1001	LA DEQ		X	X	X		
STL Pensacola	Pensacola	FL	(850) 474-1001	FL		X	X	X	X	
STL Savannah Laboratories - Savannah	Savannah	GA	(912) 354-7858	FL		X	X	X	X	
Suffolk Co Public & Env Health Lab	Hauppauge	NY	(631) 853-5528	NY		X	X	X	X	
TRC Environmental Corp	Windsor	CT	(860) 298-9692	NY		X				
Triangle Laboratories	Durham	NC	(919) 544-5729		OR	X	X	X	X	
Triangle Laboratories of Research Triangle Park, Inc.	Durham	NC	(919) 544-5729	FL		X	X	X	X	
Upstate Laboratories Inc	East Syracuse	NY	(315) 437-0255	NY		X	X	X	X	
US Biosystems, Inc.	Boca Raton	FL	(561) 447-7373		IL	X	X	X	X	
US Military Academy Lusk Water Plant	West Point	NY	(845) 938-3224	NY		X	X		X	
Volumetric Techniques Ltd	Bayport	NY	(631) 472-4848	NY		X	X	X	X	
Westchester Co Labs and Res	Valhalla	NY	(914) 231-1768	NY		X	X	X	X	
York Analytical Labs	Stamford	CT	(203) 325-1371	NY		X	X	X	X	
Yorktown Medical Laboratory Inc	Yorktown Heights	NY	(914) 245-3203	NY		X	X	X	X	

N.C. Division of Pollution Prevention and Environmental Assistance
1639 Mail Service Center - Raleigh, NC 27699-1639 - (919) 715-6500

Large Shipyards in Washington: P2 & BMP Opportunities

A Northwest Industry Roundtable Report

Last Updated: 6 November 1997

Cover Title: Pollution Prevention at Shipyards

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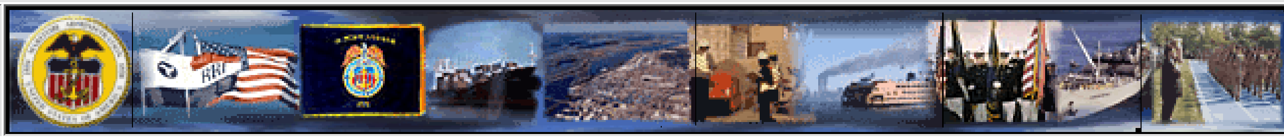
Maritime Administration
Department of Transportation



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As an agency of the U.S. Department of Transportation, the mission of the Maritime Administration (MARAD) is to promote the development and maintenance of an adequate, well-balanced United States merchant marine, sufficient to carry the Nation's domestic waterborne commerce and a substantial portion of its waterborne foreign commerce, and capable of serving as a naval and military auxiliary in time of war or national emergency.

Welcome to the Maritime Administration

Maritime Administration Activates Ready Reserve Force Ships

The Cape Intrepid, one of 13 Ready Reserve Force vessels activated.

The U.S. Department of Transportation's Maritime Administration activated 13 Ready Reserve Force (RRF) ships on Friday, Jan. 24 to support Operation Enduring Freedom. The activations follow orders received from the U.S. Navy's Military Sealift Command. Click here for more information.

Headlines

New Reemployment Rights for U.S. Merchant Seamen

New Secretary Mineta Announces $148 million for Transportation Security Programs to Fund Port, Intercity Bus, and Cargo Grants

New MARAD Enhances Web Site for Humanitarian Food Aid Program

New The Maritime Administration has received the first monthly bills-of-lading submission filed electronically.

New Port Security information now online

New Short Sea Shipping information now online

Reserve Fleet Tech Library now online

MARAD launches Cargo Service Web Site to assist customers in identifying U.S.-flag carriers.

EXIM Bank Form F now available online (monthly Report of Ocean Shipments moving under Export-Import Bank Financing)

more news...

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Shipyards in Review
Nineteen Ninety Nine

Strategic Plan
Plan of the Naval Shipyards

Norfolk

"Service to the fleet under four flags"

Pearl Harbor

"We keep them fit to fight"

Portsmouth

"Sails to Atoms"

Puget Sound

"Naval Strength Through Quality Work"

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FACA
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NAAQS
NELAC
NSR
OAR P & G
SBAP
SCRAM

TTN*Web*

AQS	Air Quality System	FACA	Advisory Committee for Ozone and PM
AMTIC	Air Quality Monitoring	GEI	Geographical/Ecosystems Initiatives
ATW	Air Toxics Web site	NAAQS	National Ambient Air Quality Standards
CATC/RBLC	Prevention and Control Technologies	NELAC	Lab Accreditation Performance Standards
CHIEF	Inventories and Emission Factors	NSR	New Source Review Permitting
CICA	U.S. - Mexico Information Center	OAR P&G	OAR Rules, Policy and Guidance
ECAS	Economic Analysis	SBAP	Small Business Assistance Activities
EMC	Emission Test Methods and Information	SCRAM	Air Quality Models

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Pacific Northwest Pollution Prevention Resource Center

... the Northwest's leading resource for promoting a cleaner environment through pollution prevention. PPRC provides high quality, unbiased information, facilitates information exchange, and catalyzes pollution prevention projects...

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Greening Supply Chains

Quick Sector Finder!

All Industry Sectors

New Metal Finishing Resource

Features P2 opportunities, vendors, case studies, and efficiency worksheets

Environmental Measurement

Quickly find basic environmental measurement information, as well as a compilation of pertinent on-line resources.

Office Space Available

PPRC is offering attractive office space under the shadow of the Space Needle!

NEWS!

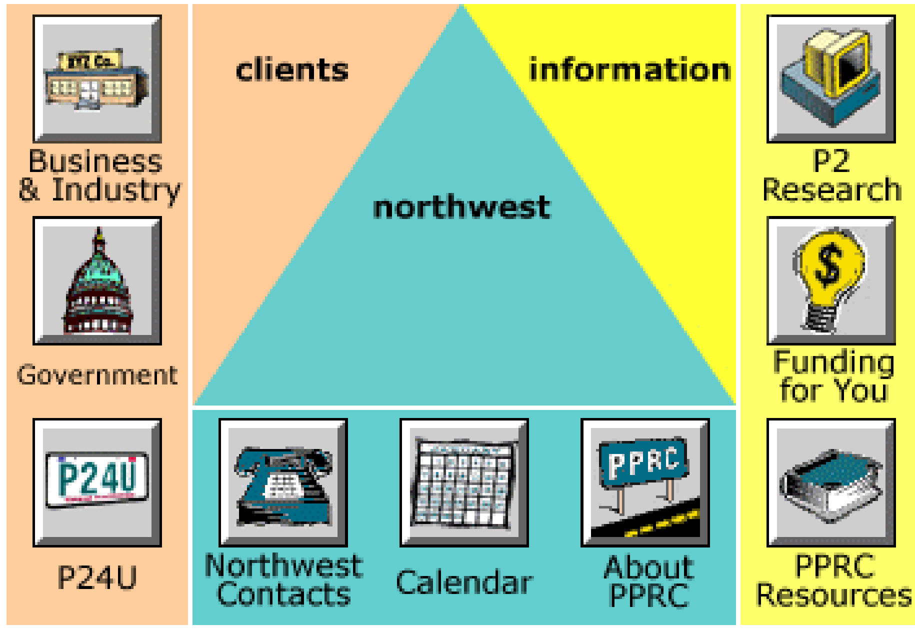
Sign up for PPRC's free information services

POLLUTION PREVENTION Northwest

Doing More, With Less

(New Year's 2003)

All of us promoting pollution prevention - from corporate purchasers to government policymakers - are finding ourselves in a fiscal crunch. The economy is in a slump and governments and businesses are



We are a proud member of the Pollution Prevention Resource Exchange, P2Rx, a national network of regional pollution prevention information centers. Through P2Rx, we can provide information retrieval services from experts around the United States.

POLLUTION PREVENTION P2R RESOURCE EXCHANGE

Did You Know?

Cut Loads of Energy While Doing the Laundry! It's easy to cut your energy costs for laundry. About 80-85% of the energy used for washing clothes is used to heat the water. You can reduce this cost by using less water by washing full loads and using cooler water and cold-water detergents - switching the temperature setting from hot to warm cuts a load's energy use in half. You can reduce drying costs as well: clean the lint filter after every load to improve air circulation, and don't over-dry clothes. Use the cool-down cycle to allow clothes to finish drying with residual heat. Also, periodically inspect your dryer vent to ensure it's not blocked. For more tips on saving energy at home, visit http://www.energysavers.gov.

last updated: 3 January 2003

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phone: 206-352-2050, fax: 206-352-2049
e-mail: office@pprc.org, web: www.pprc.org

how to use this site

feedback

experiencing budget cuts, often severe. So, how do we stretch our ability to achieve P2 results?

Industry Sectors / Business Assistance

"Staying Competitive through Environmental Compliance and Waste Reduction"

Index:

- Resources
- Industry Sectors
- Contacts

This information is intended to help businesses in the region learn about pollution prevention, and how it may help them become more efficient and compliant with environmental regulations.

RESOURCES:

Adhesives & P2
Alternative Fuels
Cleaning in Manufacturing
Environmental Management System Implementation Guide
Environmental Purchasing
How to Inventory Your Wastes for Environmental Compliance
PBTs
P2 Quiz
PPRC Publications List
Total Cost Accounting

Fact Sheets:

Understanding Regulations on Solvent Cleaning Equipment
How to Read a Materials Safety Data Sheet
Emission Estimating Worksheet
List of 189 Hazardous Air Pollutants
What You Need to Know About Risk Management Planning
Chromium Electroplating and Anodizing
Aerospace Manufacturing, Repair Operations
Using the Internet to Find Regulatory and P2 Information
Is Your Business Using Regulated Chemicals?
Calculating True Costs of Paints and Coatings

CONTACTS:

If you are looking for a **single contact** to help answer questions about compliance and pollution prevention, use the list of **Northwest Small Business Assistance Program Contacts**.

If you are seeking information about P2 policy or program development, compliance assistance, technical assistance, or other P2 topics, examine the **full list** of **Northwest P2 Contacts**.

INDUSTRY SECTOR INFORMATION:

- **Auto Repair**
- **Aerospace**
- **Fiberglass Fabrication** ◆
- **Food Processing** ◆
- **Hospitality**
- **Industrial Laundries** ◆
- **Metal Fabrication** ◆
- **Metal Finishing**
- **Metal Machining** ◆
- **Paint and Coating Manufacturing** ◆
- **Printing** ◆
- **Semiconductor Manufacturing**
- **Ship Building and Repair** ◆
- **Wood Furniture Manufacturing** ◆

◆ = extensive resources are available online for this sector.

If you have questions or comments about this industry sector and business assistance information, please contact Chris Wiley at 206-352-2050 (cwiley@pprc.org).

This section of the PPRC Web site is a joint project of the Small Business Assistance Programs in Alaska, Idaho, Oregon and Washington and is funded by a grant from the U.S. Environmental Protection Agency, as well as other federal, state and local governments and the industrial community.

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phone: 206-352-2050, e-mail: office@pprc.org, web: www.pprc.org

Business Assistance
Ship Building and Repair Industry Resources

PPRC's resources for the ship building and repair industry include:

- Northwest Shipyard Industry Roundtable Reports
- Environmental Compliance and P2 Fact Sheets
- Ship Building & Repair Topic Hub - Industry Overview, Descriptions & Links
- Technical and Regulatory Information Links
- Research Projects Links

Many of these files are available to download to your computer as PDF (portable data format) files which appear on-screen as snapshots of the printed pages and include all formatting. To read and print PDF files, you will need to download a *free* Acrobat Reader from Adobe.

Northwest Shipyard Industry Roundtable Reports

The purpose of these roundtables were for participants to learn more about alternative pollution prevention and treatment technologies, become familiar with tools to analyze alternatives, find out how to work productively with government agencies in complying with stormwater regulatory requirements, share experiences and ideas with industry peers, and generate ideas for future projects that will benefit the environment and the industry.

- Large Shipyards in Washington: P2 & BMP Opportunities
- Small Shipyards and Boatyards in Oregon: Environmental Issues & P2 Opportunities
- Large Shipyards in Oregon: Coating Choice Drivers & P2 Opportunities
- Depainting Technology Demonstrations: P2 Benefits & Production Issues

Fact Sheets

These fact sheets are intended to inform metal fabricators about the implications of the Clean Air Act Amendments on their businesses and how to achieve compliance through the use of pollution prevention methods and ideologies.

- **Understanding Regulations on Solvent Cleaning Equipment: What You Need to Know to Comply**
- **How to Read a Materials Safety Data Sheet to Determine if You Use Regulated Chemicals**
- **Emission Estimating Worksheet**
- **List of 189 Hazardous Air Pollutants**
- **What You Need to Know About Risk Management Planning**
- **Using the Internet to Find Regulatory and Pollution Prevention Information**
- **Is Your Business Using Regulated Chemicals? Watch Your Profits Evaporate**
- **Shipbuilding and Repair — What You Need to Know To Comply**
- **Evaluating Less Toxic Paints and Coatings ? — Calculate True Costs**

Ship Building & Repair Topic Hub - Industry Overview, Descriptions & Links

Ship Building and Repair Industry Links

These links include general and specific information of interest to the shipyard industry to prevent pollution and comply with environmental regulations.

Technical and Regulatory Information

- Energy User News (http://www.energyusernews.com)
  This section of the Energy User News (EUN) web site is an energy management training series. The EUN and the Association of Professional Energy Managers designed this series of monthly training modules to provide nonspecialists with an introduction to the fundamentals of energy management.
- Enviroene (http://es.epa.gov)
  Enviroene, part of the U.S. Environmental Protection Agency's Web site, is a repository for pollution prevention, compliance assurance, and enforcement information and databases. Included are pollution prevention case studies, technologies, points of contact, environmental statutes, executive orders, regulations, and compliance and enforcement policies and guidelines. The site includes a search engine. Two publications of interest to shipyards that can be found on the site are *Waste Reduction Guide: Shipyards* and *Guides to Pollution Prevention: The Marine Maintenance and Repair Industry*.
- Maritime Environmental Resources & Information Center (http://www.uno.edu/~engr/meric/briefs.html)

This site provides links to technical briefs. Some of the technical briefs are related to pollution prevention measures dealing with paint management, solvent usage, machine shop wastes and spill cleanup.

- Research Triangle Institute: Abrasive Blasting Operations (http://clean.rti.org/altern.cfm)
  This site provides information on alternative blasting technologies such as wheat starch blasting, and includes case studies, economics data, and environmental requirements.
- SAGE (http://clean.rti.org/altern.cfm)
  SAGE is expert system software used to determine solvent/process alternatives most likely to work in a given case.
- Tacoma-Pierce County Health Department Boating Page (http://www.healthdept.co.pierce.wa.us/eh/boat.html)
  This site contains pollution prevention ideas, boat maintenance tips, and a list of alternative boat maintenance products.
- Tri-Services' Pollution Prevention Technical Library (http://p2library.nfesc.navy.mil/)
  Maintained by the Naval Facilities Engineering Service Center (NFESC), this Web site contains process data sheets including information on technology, materials compatibility, safety and health, benefits, disadvantages, economic analysis, points of contact and vendors. Online topics include painting, paint removal and stormwater issues.

Shipyard Industry Trade Associations

- American Waterways Operators (http://www.ribb.com/awo/awo.htm)
  The American Waterways Operators is the national association representing the inland and coastal tugboat, towboat, and barge industry. The organization has defined and advocated industry views with policymakers and federal officials and promoted a greater understanding of the domestic waterborne transportation industry's safe and environmentally sound contribution to the U.S. economy.
- International Marina Institute (http://www.imimarina.com/)
  This organization is a non-profit membership organization serving the global marina industry with management training and education, research, legislation and information about environmental issues effecting the marina industry.
- International Maritime Organization (http://www.imo.org/)
  The International Maritime Organization is the United Nations' specialized agency responsible for improving maritime safety and preventing pollution from ships.
- Marine Technology Society (http://www.phys.washington.edu/~wilkes/mts)
  The Marine Technology Society is a non-profit international professional organization established to promote the exchange of information in ocean and marine engineering, science, and policy.
- The National Paint and Coatings Association (http://www.paint.org/)
  The National Paint and Coatings Association is a nonprofit trade group representing some 400 paint and coatings manufacturers, raw materials suppliers and distributors in the United States.
- The Society of Naval Architects and Marine Engineers (http://www.sname.org/)
  This organization is an internationally recognized nonprofit, technical, professional society of

individual members serving the maritime and offshore industries and their suppliers. The Society of Naval Architects and Marine Engineers (SNAME) is dedicated to advancing the art, science and practice of naval architecture; shipbuilding and marine engineering; and sponsoring applied research.

Shipyard-related Projects in the Pacific Northwest Pollution Prevention Resource Center's Research Projects Database

The PPRC Research Projects Database contains over 500 pollution prevention research and demonstration projects. Each of the following links will take you to one project listed in the database, and includes a project summary and information about the project researcher and funder. If you would like to learn more about a project, contact the project researcher or funder.

- Aircraft Depainting Technology (http://www.pprc.org/pprc/rpd/fedfund/dod/serdp/aircraft.html)
- Applied Innovative Coatings Research (http://www.pprc.org/pprc/rpd/fedfund/epa/epaappcd/appliedi.html)
- Bicarbonate of Soda Blasting Technology for Aircraft Wheel Depainting (http://www.pprc.org/pprc/rpd/fedfund/epa/epastd/bicarbon.html)
- Development and Testing of Pollution Prevention Design Aids for Process Analysis and Decision Making (http://www.pprc.org/pprc/rpd/fedfund/epa/epaeed/develop1.html)
- Environmental Fate and Risk Assessment Tool (EFRAT) (http://www.pprc.org/pprc/rpd/fedfund/epa/epaeed/environ1.html)
- Evaluation of Alternative Paint Stripping Technologies Used in Aircraft and Space Vehicles (http://www.pprc.org/pprc/rpd/fedfund/epa/epaappcd/evaluat2.html)
- Evaluation of Five Waste Minimization Technologies at the General Dynamics Pomona Division: Robotic Painting (http://www.pprc.org/pprc/rpd/fedfund/epa/epastd/evalrobo.html)
- Evaluation of New Multi-component HVLP Spray Equipment For the Application of Linear Polyurethane Exterior Paint to Fiberglass Yachts (http://www.pprc.org/pprc/rpd/statefnd/nc_owr/evaluat2.html)
- Fluorinated Ship-Hull Coatings for Non-Polluting Fouling Control (http://www.pprc.org/pprc/rpd/fedfund/dod/serdp/fluorina.html)
- Identification of Chemical Coating/Depainting Alternatives for Selected DoD Operations (http://www.pprc.org/pprc/rpd/fedfund/epa/epastd/identifi.html)

- [Large Aircraft Robotic Paint Stripping (LARPS) (http://www.pprc.org/pprc/rpd/fedfund/dod/serdp/largeair.html)]
- [Large Area Powder Coating (http://www.pprc.org/pprc/rpd/fedfund/dod/serdp/largeare.html)]
- [Organic Protective Coatings and Application Technology (http://www.pprc.org/pprc/rpd/fedfund/dod/serdp/organicp.html)]
- [Overspray Paint Recycled at Caterpillar, Inc. (http://www.pprc.org/pprc/rpd/fedfund/doe/doe_oit/overspra.html)]
- [Pollution Prevention of an Electrodeposition Coating and Pre-treatment System (http://www.pprc.org/pprc/rpd/fedfund/epa/epaeed/p2ecoat.html)]
- [Recycle Boiler Nitrite Solution (http://www.pprc.org/pprc/rpd/fedfund/dod/serdp/recy_boi.html)]
- [Reducing Use of Fast-Evaporating Solvents in Paint and Coating Equipment (http://www.pprc.org/pprc/rpd/statefnd/minn_oea/reducin2.html)]
- [Spray Gun Cleaning (http://www.pprc.org/pprc/rpd/fedfund/epa/epaappcd/spraygun.html)]

If you have questions or comments about this business information, please send an e-mail message to Chris Wiley at cwiley@pprc.org.

Back to the main **Business Assistance** page.

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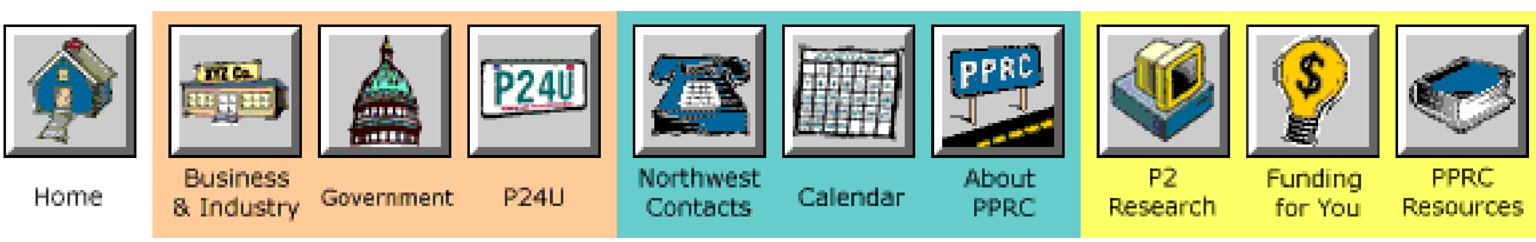

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ENFORCEMENT

EPA-330/9-89-003-R

MULTI-MEDIA INVESTIGATION MANUAL

Revised March 1992

NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
Denver, Colorado

Prepared in cooperation with Environmental Services Divisions
Regions I through X

Mention of commercial names is for example purposes and does not constitute endorsement by EPA. Additionally, this manual supplements, not supersedes, Standard Operating Procedures, Policy and Procedures Manuals, and any other EPA guidance.

CONTENTS

INTRODUCTION

This manual is intended as a guide for investigators who conduct multi-media environmental compliance investigations of facilities that discharge, emit, prepare, manage, store, or dispose of pollutants controlled by Federal, State, or local environmental laws and regulations. Investigative methods are presented that integrate the enforcement programs for air, water, solid waste, pesticides, and toxic substances. This manual describes general activities and functions of multi-media investigations, and provides information on special features of specific media and associated statutes. This manual is intended to supplement the various media-specific investigation guides listed in the reference section.

Multi-media compliance investigations are intended to determine a facility's status of compliance with applicable laws, regulations, and permits.

The environmental laws which EPA administers and enforces are summarized in Appendix A. Emphasis is given to identifying violations of regulations, permits, approvals, orders and consent decrees, and the underlying causes of such violations. Investigators should thoroughly identify and document violations and problems that have an existing or potential effect on human health and the environment.

All inspections can be grouped into four categories of increasing complexity, moving from Category A (a program-specific compliance inspection) to Category D, (a complex multi-media investigation) depending upon the complexity of the facility and the objectives of the investigation. Factors in categorizing the investigation include the complexity of pollution sources, facility size, process operations, pollution controls, and the personnel and time resources which are required to conduct the compliance investigation. The four categories of investigations are described below [Appendix B]:

Category A: Program-specific compliance inspections, conducted by one or more inspectors. The objective is to determine facility compliance status for program-specific regulations.

Category B: Program-specific compliance inspections (e.g., compliance with hazardous waste regulations), which are conducted by one or more inspectors; however, the inspector(s) screen for and report on obvious, key indicators of possible noncompliance in other environmental program areas.

Category B multi-media inspections have limited, focused objectives and are most appropriate for smaller, less complex facilities that are subject to only a few environmental laws. The objective is to determine compliance for program specific regulations and to refer information to other programs based on screening inspections.

Category C: Several concurrent and coordinated program-specific compliance investigations conducted by a team of investigators representing two or more program offices. The team, which is headed by a team leader, conducts a detailed compliance evaluation for each of the target programs.

Category C multi-media investigations have more compliance issues to address than the Category B inspection and are more appropriate for intermediate to large facilities that are subject to a variety of environmental laws. The objective is to determine compliance for several targeted program-specific areas. Reports on obvious, key indicators of possible noncompliance in other environmental program areas are also made.

Category D: These comprehensive facility evaluations address not only compliance in targeted program specific regulations, but also try to identify environmental problems that might otherwise be overlooked. The initial focus is normally on facility processes to identify activities (e.g., new chemical manufacturing) and byproducts/waste streams potentially subject to regulation. The byproducts/waste streams are traced to final disposition (on-site or off-site treatment, storage, and/or disposal). When regulated activities or waste streams are identified, a compliance evaluation is made with respect to applicable requirements.

The investigation team, headed by a team leader, is comprised of staff thoroughly trained in different program areas. For example, a large industrial facility with multiple process operations may be regulated under numerous environmental statutes, such as the Clean Water Act (CWA), Clean Air Act (CAA), Resource Conservation and Recovery Act (RCRA), Toxic Substances Control Act (TSCA), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and the Federal Insecticide and Rodenticide Act (FIFRA). The on-site investigation is conducted during one or more time periods, during which intense concurrent program-specific compliance evaluations are conducted, often by the same cross-trained personnel.

Category D multi-media investigations are thorough and, consequently, resource intensive. They are appropriate for intermediate to large, complex facilities that are subject to a variety of environmental laws. Compliance determinations are made for several targeted program-specific areas. Reports on possible noncompliance are made for other program areas.

Generally, all investigations will use essentially the same protocols, including pre-inspection planning, use of a project plan, sampling, inspection procedures, and final report. The major difference will be in the number of different regulations Categories C and D investigations address.

The multi-media approach to investigations (which is described in Categories C and D) has several advantages over a program-specific inspection, including:

- A more comprehensive and reliable assessment of a facility's compliance with fewer missed violations

- Improved enforcement support and better potential for enforcement

- A higher probability to uncover/prevent problems before they occur or before they manifest an environmental or public health risk

- Ability to respond more effectively to non-program specific complaints, issues, or needs and develop a better understanding of cross-media problems and issues, such as waste minimization

The success of a multi-media investigation program is contingent upon a good managerial system and the support of upper management. Since these investigations will often be conducted at larger facilities, adequate resources (time and personnel) must be provided. Good communications during the planning phase are essential to define the scope of work and each team member's role in the inspection. Communications could also include state officials since state inspectors might also participate as team members. Often, because of the extent of the state's knowledge of the facility and its problems, state involvement is critical to the success of the investigation. Similarly, coordination with other Federal or local agencies needs to be addressed, as necessary.

Branch Chiefs and Section Chiefs are important in implementing the multi-media inspection program and identifying areas of responsibility and accountability. Some of their duties include:

- Identify team leaders
- Form investigation teams
- Provide access to training and other means necessary to develop multi-media investigation expertise
- Participate in targeting investigations
- Ensure that team activities both internal and external to their Divisions are coordinated
- Market multi-media investigations to programs
- Oversee the preparation of a site-specific project plan and safety plan prior to the investigation
- Provide managerial support while teams are in the field
- Ensure quality of final reports

The roles and areas of responsibility and accountability of other managers, technical staff, and team leaders must be defined. Participants need to identify and agree on what evidence is needed and the scope of work to be conducted. Next, a project plan and safety plan that outlines the desired objectives and safety considerations must next be prepared by the team leader. Other responsibilities for the technical staff, which often mirror or complement those of managers, are as follows:

- Contact state counterparts
- Assist in investigation preparation, including logistical considerations
- Coordinate activities internal and external to their Division
- Provide legal support for obtaining warrants when necessary
- Provide training for investigators
- Prepare reports
- Distribute reports and followup for multi-media enforcement

Purpose and Scope of this Manual

Multi-media investigations are carried out in response to specific requests from the EPA program offices, legal staff, or state environmental offices. All investigations will result in a written report that documents non-compliance or other areas of concern identified during the investigation. Report guidelines for documenting a multi-media investigation are discussed later in this document.

This manual provides guidelines for conducting Categories C and D multi-media investigations, as well as, suggests principles and procedures which will also apply to Categories A and B or single media investigations. Moreover, this manual identifies multi-media objectives and also focuses on specific environmental laws and associated statutes.

The manual's organization follows the steps involved in a multi-media investigation beginning with the project request and leading ultimately to enforcement case support.

Multi-media investigations are conducted as a series of tasks or phases, which usually include:

- Project request/identification of objectives
- Project team formation

- Background information review
- Project Plan preparation
- On-site field inspection
- Report preparation
- Enforcement case support

These phases are depicted in Figure 1 and discussed in detail in the following sections. Each phase is not necessarily a discrete step to be completed, in order, before initiating the next phase. The background information review, for example, usually continues through enforcement case support.

Where established policies and procedures do not exist, common sense, professional judgment, and experience should be applied. Investigators need to collect valid, factual information and supporting data to document violations adequately. The documentation must be admissible as evidence in any subsequent enforcement action.

Figure 1 - Project Phases (Missing)

Each investigation should be conducted as though it will be contested in court. The investigation and all supporting evidence and documentation may be contested by highly skilled defense counsel as unprofessional, inaccurate, misinterpreted, etc. Because the Agency's case will depend heavily on the investigative findings, the investigation must be complete and accurate.

Since a multi-media investigation by its very nature probes into a facility's processes under multiple environmental regulations, it provides a highly effective way of looking at a non-complying facility. Overall objectives of a multi-media investigation include:

- Determine compliance status with applicable laws, regulations, permits, and consent decrees

- Determine ability of a facility to achieve compliance across all environmental areas
- Identify need for remedial measures and enforcement action(s) to correct the causes of violations
- Evaluate a facility's waste producing, treatment, management, and pollution control practices and equipment
- Evaluate facility self-monitoring capability
- Evaluate facility recordkeeping practices
- Evaluate facility waste minimization/pollution prevention programs
- Obtain appropriate samples

PROJECT REQUEST/IDENTIFICATION

The success of a multi-media investigation depends on thorough, up-front planning. Coordination with all interested and knowledgeable parties [i.e., Region, State, National Enforcement Investigations Center (NEIC), investigation team members, supervisory staff] is essential to ensure an efficient and thorough investigation. Each program office should be contacted to assure that all interested parties are aware of the planned multi-media investigation. Furthermore, depending upon State/EPA agreements, the State should (may) be notified of the pending investigation. All concerned parties should be involved as soon as possible to facilitate coordination. Coordination with other Federal agencies, such as Occupational Safety and Health Administration (OSHA) or Corps of Engineers, may be needed in joint Federal investigations.

There must be agreement on the part of program and support offices and Regional Counsel, and perhaps the State as well, on the overall scope of work for a particular investigation. The scope must be clearly communicated to managers and the investigators and stated in the project plan. Clearly defined objectives are critical to the success of any investigation; the objectives should be well defined at the time of the initial request. At the time the project plan is developed, the objectives will be further refined (see section titled Project Plan Formation). Communication among the involved parties should be the initial step of pre-investigation planning but should also continue throughout the investigation, because of unanticipated events often associated with field work.

PROJECT TEAM FORMATION

REQUIRED SKILLS AND QUALIFICATIONS

Each multi-media investigation team should be composed of qualified field inspectors. Each team member should bring special program expertise and experience and must be well trained in most facets of conducting a field investigation, including sampling.

Most of the investigators on the team, including the team leader, should be current field investigators who already possess most of the necessary skills and qualifications. However, flexibility in team selection must exist in order to use skills in the organization and ensure that the expertise is represented for a given situation. There may be circumstances where a permit writer, hydrogeologist, toxicologist, or some other special discipline will be needed on the team.

The team leader has overall responsibility for the successful completion of the multi-media investigation. (Team leader responsibilities and authorities are presented in Appendix C.) In addition, other investigators may be designated as leads for each of the specific media/programs that will be addressed. These individuals may work alone or have one or more inspectors/samplers as assistants, depending on workloads and training objectives. However, all investigation team members should report directly to, and be accountable to, the team leader.

Some of the more important skills and qualifications that are necessary for team members, are as follows:

- Knowledge of the Agency's policies and procedures regarding inspection authority, entry procedures/problems, enforcement actions, legal issues, and safety

- Thorough familiarity with sampling equipment, quality assurance (QA) requirements for sample collection, identification and preservation, and chain-of-custody procedures
- Knowledge of manufacturing/waste producing processes, pollution control technology, principles of waste management, flow

measurement theory and procedures, and waste monitoring techniques/equipment

- Investigatory skills including ability to gather evidence through good interviewing techniques and astute observations

- Up-to-date experience in conducting compliance inspections

- Communication skills

- Basic understanding of the procedures for obtaining administrative warrants, including preparation of affidavits, technical content of the warrant application, and warrant and procedures for serving a warrant

- For each of the areas addressed in the multi-media investigations, there should be at least one team member trained in that area. Furthermore, at least one team member should have considerable knowledge of laboratory (analytical) methods and quality assurance (QA) requirements, if a laboratory evaluation is to be conducted.

EPA Order 3500.1 sets forth specific training requirements for any EPA investigator who is leading a single media investigation. These training requirements include both general inspection procedures and media specific procedures. While an individual leading a multi-media investigation may not have had the media-specific training for each media covered during that multi-media investigation, the team leader should have the media specific training for at least two of the media. In addition, the team leader should have experience and skills in the following areas.

- Leadership
- Project management
- Lead for inspections in more than one program/media
- Multi-media investigations

INVESTIGATOR RESPONSIBILITY

Investigators must conduct themselves in a professional manner and maintain credibility. A cooperative spirit should be cultivated with facility representatives, when possible. All investigators should maintain a sensitivity to multi-media issues and implications and freely discuss, with other members of the team, observations/findings relating to one or more programs (or cross-program lines). Moreover, investigators must remember to adhere to the project plan,[1] as well as both the Agency's and the facility's safety plans or requirements.

Investigators should restrict their on-site activities to the normal working hours of the facility, as much as possible. Investigators will need to keep abreast of specific program regulations and should also coordinate, as necessary, with other EPA and State inspectors and laboratory staff (if samples will be collected). The investigation team should implement appropriate field note taking methods and proper document control procedures, particularly when the company asserts a "confidential" claim. Investigators must assume that important documents (e.g., project plan, safety plan, and logbooks) are not left unattended at the facility. Sensitive discussions do not take place in front of facility personnel or on company telephones.

[*] *Field conditions may dictate plan modifications. Reasons for modifications should be thoroughly documented.*

BACKGROUND INFORMATION REVIEW

FEDERAL/STATE/LOCAL FILE REVIEW

The investigation team must collect and analyze available background information in order to better plan and perform the multi-media investigation. The objective of the review is to allow EPA staff to (1) become familiar with the facility, (2) clarify technical and legal issues prior to the inspection, (3) use resources wisely, and (4) provide information to allow each inspector to develop a list of questions to be answered and documents to be obtained during the on-site inspection. For example, the investigators should understand the facility's process(es) to the extent possible and know where past problems have occurred, based on file/data reviews. Much of the total time spent on an investigation should be spent on planning and preparing for the investigation. This will prevent classic oversights such as being on the road and not knowing where the facility is, or walking past the operation that received a Notice of Violation in five previous inspections. Investigators should check with the program staff (Federal/State/local, etc.) to gain as much knowledge as possible about the site. Federal/State/local file reviewers should pay particular attention to the following:

- Permits and permit applications
- Process and wastewater flow charts
- Prior inspection reports
- Enforcement documents including Administrative Orders, Complaints, Consent Decrees/Agreements, Notices of Noncompliance (NONs), Deficiency Notices, Compliance Schedules, Cease and Desist Orders, Closeout Documents, Notices of Violations, etc.
- Facility responses to all of the above
- Facility records, reports, and self-monitoring data
- QA documentation
- Exemptions and waivers
- Maps showing facility layout and waste management/ discharge sites
- Records of citizen complaints
- Consultant's reports
- Potential cross-program issues
- Annual reports
- Hazardous waste manifests
- Spill reports

A more detailed list of types of information which may be acquired and reviewed is presented in Appendix D.

RECONNAISSANCE

A reconnaissance inspection of the facility may be conducted in conjunction with gathering background information from State and local files. Administrative details and logistics are usually discussed during a reconnaissance that will help the on-site inspection proceed more efficiently. A reconnaissance inspection is particularly important if a complex facility is being investigated or if the facility has never been inspected by the team leaders. At least the team leader should participate in the reconnaissance. No reconnaissance is conducted if the investigation will be unannounced, or if the team has extensive knowledge of the facility (see Project Plan Formation Section).

EPA DATABASE REVIEWS

Additional facility background material should be obtained from EPA databases. (Acronyms are defined in Appendix E.) At a minimum, the inspectors should use the following:

- TRIS (provides facility data on past releases of toxic/hazardous substances to the environment, as required by Section 311 of SARA)

- DUNS Market Identifiers: Commercial systems that tracks the owners and financial information for publicly- and privately-owned companies in the U.S.

- PCS (provides CWA/NPDES permit related information, DMR data, receiving stream data, some enforcement related material, and inspection history for "major" wastewater discharges)

- RCRIS/HWDMS (provides RCRA-related information on a facility such as location, hazardous waste handled, inspection history, nature of past violations, and results of enforcement actions)

- FTTS (provides TSCA-related information on a facility such as inspection history, and case development information, including violations, and types/results of enforcement actions)

- FINDS (EPA database that identifies regulations applicable to the target facility, including some related to compliance/ enforcement issues)

- CERCLIS (Superfund's national database system provides information on CERCLA sites)

- AFS/AIRS (the Air Compliance Program's national database system provides air compliance information for major sources)

A more extensive list of sources of information, including both computer databases and other sources, is presented in Appendix E. Following file/data reviews, the investigation team may prepare a fact sheet for the facility along with a list of questions that need to be answered either before or during the on-site actual investigation.

PROJECT PLAN DEVELOPMENT

PROJECT PLAN

A site-specific project plan should be developed for all multi-media inspections. Each project plan should reflect the requirements/scope of work associated with each individual facility. The plan describes the project objectives and tasks required to fulfill these objectives. In addition to methods, procedures, resources required, and schedules, a safety plan is included as an appendix and identifies potential site safety issues, procedures, and safety equipment [Appendix E].

Generally, a draft project plan is prepared to give all involved parties/regional management an opportunity to review the planned project activities and schedule. The team leader, with the assistance of other investigators, is responsible for preparing the site-specific project plan. After agreement on the draft is reached, the plan should be finalized as soon as possible. It must be available before the on-site inspection starts. A comprehensive project plan provides a means for informing all involved parties of the proposed activities and helps ensure an effective multi-media investigation; team members must be familiar with the project plan.

The following generally form the outline for the project plan:

Objectives - This is probably the most important part of the project plan and should be well defined, complete, and clear The objectives should also have been discussed and agreed upon by all appropriate management personnel. The objectives define what the investigation is to accomplish (e.g., to assess environmental compliance with the regulations that apply to the source--water, air, *et al*.).

Background - Discusses, in general, facility processes and, based on available information, identifies laws, regulations, permits, and consent decrees applicable to the facility.

Tasks - The plan defines tasks for accomplishing the objectives and spells out procedures for obtaining the necessary information and evaluating facility compliance. The tasks usually involve an evaluation of process operations, pollution control/treatment and disposal practices, operation and maintenance practices, self-monitoring, recordkeeping and reporting practices, and pollution abatement/control needs. Tasks will probably be sequenced, based on: facility factors, investigation objectives, logistical factors, constraints imposed by the company, and complexity and overlap of regulatory programs (see section on Field Inspections).

Methods/Procedures - The plan provides or references policies and procedures for document control, chain-of-custody, quality assurance, and handling and processing of confidential information. Specific instructions for the particular investigation may be provided.

Safety - A safety plan attached to the project plan identifies safety equipment and procedures which the investigation team must follow [Appendix F]. The safety procedures and equipment are typically the more stringent of EPA or company procedures. EPA procedures are documented in EPA Transmittal 1440 - Occupational Health and Safety Manual dated March 18, 1986. Additional safety issues for extensive or prolonged investigations, if necessary, should also be addressed in the plan.

Resources - The plan describes special personnel needs and equipment requirements. As noted earlier, experienced and knowledgeable personnel shall compose the investigation team. An example of an equipment list is presented in Appendix G.

Schedules - The plan usually provides general schedules for investigation activities. This information is important to the team members as well as Headquarters, Regional, and/or State officials who requested the project. The dates for (a) starting and finishing the field activities, (b) analytical work, and (c) draft and final reports should be established and agreed upon by the participants.

The project plan will serve as the basis for explaining inspection activities and scheduling to facility personnel during the opening conference. The company may be provided general details but should not be provided with a copy of the project plan; it is an internal document and usually considered an enforcement confidential document. (The company may get a copy of the plan by court order.) Because conditions in the field may not be as anticipated, the project plan is always subject to modification and so marked. Any deviations from the plan should be well thought out, approved by the team leader, and if appropriate, discussed with senior management or the laboratory (if monitoring/sampling requirements change) and well documented.

NOTIFICATIONS/SCHEDULING

Notification of the inspection, normally by telephone, should be given to the facility unless the inspection is to be unannounced. There are advantages to both announced and unannounced inspections. Some of the advantages to announced inspections include assuring that the right people are available, the processes of interest are operating, and the necessary documents are available. A major consideration of announced inspections is that the company may be able to alter operations to conceal violations. Following the telephone notification, it may be necessary to prepare a more formal notification letter or notification form that is served when entering the facility.

If a letter is prepared, it should cite the appropriate inspection authorities, the general areas to be covered, and special informational needs/requests. By citing broad EPA authorities, the investigation will not be restricted if investigators need to pursue additional areas based on field observations. The notification should specify records to be reviewed/collected/copied, address safety/security issues, and include any questions that need answering to help facilitate the investigation. These issues and questions can also be addressed during a reconnaissance inspection, if desired, or through telephone conversations with appropriate facility personnel.

Typical information requested in a notification letter may include the following:

- Raw materials, imports, intermediates, products, byproducts, production levels
- Facility maps identifying process areas, discharge and emission points, waste management and disposal sites
- Flow diagrams or descriptions of processes and waste control, treatment and disposal systems, showing where wastewater, air emission, and solid waste sources are located

- Description and design of pollution control and treatment systems and normal operating parameters

- Operations and maintenance procedures and problems

- Self-monitoring reports and inventories of discharges and emissions

- Self-monitoring equipment in use, normal operating levels, and available data

- Required plans, records, and reports

Appendix H identifies specific documents/records by statute which might be requested. Each regional office should decide if and when state regulatory officials will be notified of the investigation and who will make the contact. By reviewing State files, EPA will have, in effect, notified the State of its intention to inspect this facility. The State should be requested to allow only EPA to notify the facility regarding the multi-media inspection. If sampling is anticipated, the laboratory should be notified as soon as possible, and informed as to when samples will arrive and the approximate analytical work load. The project plan, which is reviewed by laboratory personnel, should also identify analytical support required.

The investigation should be scheduled at a time mutually agreed upon by all participants. Sufficient time should be allotted to conduct a thorough investigation. Appropriate travel arrangements should be made as soon as possible.

FIELD INSPECTION

Once the project plan is completed, the team's focus shifts to the on-site portion of the investigation. This section first addresses developing a site-specific inspection strategy for evaluating processes and regulated waste management activities, then discusses on-site activities from entry through the closing conference.

The primary objectives of the field inspection are to determine whether the facility is complying with environmental regulations, permits, etc., and to determine if facility activities are creating environmental problems. The investigation team should also determine if the facility has environmental management controls in place to maintain regulatory compliance (i.e., a system for becoming aware of regulatory requirements, then implementing appropriate compliance actions) and whether the controls are working. By satisfying these objectives, areas of non-compliance, environmental problems, and insight into root causes can be identified during the investigation. The information will be useful later in followup actions.

DEVELOPING AN INSPECTION STRATEGY

Inspection planning includes formulating a strategy to ensure that information is obtained from the company in a logical, understandable manner. This applies to both the process and compliance evaluations, and the environmental management control evaluation. To formulate an effective strategy, knowledge of general facility operations, waste management procedures, and applicable regulations is critical. Much of this information should have been obtained during the background information review and inspection reconnaissance. This section first discusses strategy development, then presents an example.

The process evaluation strategy to sequence inspections for major facility operations and waste management activities may be based on:

- Facility factors such as size, complexity, waste producing potential, and waste characteristics

- Administrative factors such as the priority of inspection objectives (i.e., which compliance evaluations are the most important)

- Logistical factors such as personnel availability, operating schedules, and assignment schedules

- Constraints imposed by the company such as limitations on the number of inspection teams that can operate on-site concurrently

The final strategy usually involves prioritizing the processes and waste management activities, in consideration of all these factors, then systematically moving from the beginning to the end of a process with emphasis on regulated waste stream generation and final disposition. The strategy should be somewhat flexible so that "mid-course corrections" can be made.

The compliance evaluations also need to be "sequenced" in a similar manner to progress, generally, from the most to least time-consuming regulatory program. Personnel training and availability , and other logistical factors may result in a combining of compliance evaluations. Figure 2 (Investigative Approach) illustrates a sequence of compliance evaluations where the initial focus was on RCRA, then CWA, etc. RCRA is often chosen as the initial law to focus on because of the close relationship between process evaluations and generator requirements. A quick visual inspection of hazardous waste storage areas and PCB transformers is often conducted early in the inspection. Compliance with regulatory programs that principally involve records reviews, such as TSCA (Sections 5 and 8) and EPCRA are usually scheduled later in the inspection or elsewhere, as time permits.

Figure 2 (Missing)

The strategy for process and compliance evaluations should be developed by the project coordinator and discussed with inspection team members. This will serve as the basis for explaining inspection activities and scheduling to the company during the opening conference, as described below.

The strategy may also include checklists. Some may address potential process wastestreams to be looked for, while others may address media-specific compliance issues. Checklists can be a vital component of a compliance investigation to help ensure that an investigator does not overlook anything important. Checklists serve as a reminder of what needs to be asked or examined and to help an investigator remember the basic regulatory requirements. They can provide another means of documenting violations or supplying background material to judge potential violations, however:

- An inspector must never fill out a checklist blindly or too mechanically. The answers to the questions should not be based solely on what the facility representatives say, but also on what the investigator observes.

- Media-specific checklists may be used and they may be completed by the lead investigator for each given program, both during and after the facility tours and the document review phases.

A list of media-specific checklists is presented in Appendix I. Copies of multi-media checklists are kept in a three-ring binder at NEIC.

One of the unique benefits of the Category D approach with a cross-trained team is that information obtained on processes, material and waste movements, and scale of operations can later aid in focusing other program-specific compliance evaluations, such as TSCA (Sections 5 and 8) and EPCRA. Like the project phases, the sequence of process and compliance evaluations should not be considered as discrete steps to be completed, in order. Information obtained during subsequent program-specific evaluations may also provide new information regarding compliance in a program area already addressed or indicate a need to inspect a process/support operation not previously identified [Figure 3] THIS ITERATIVE PROCESS IS PURSUED UNTIL THE INSPECTION OBJECTIVES HAVE BEEN ACCOMPLISHED.

At larger facilities, multiple site visits coordinated by the team leader may be necessary and desirable for completing the inspection. This approach can lead to a better inspection because of the opportunity to review information obtained in the office, then refine the inspection/strategy to "fill in the gaps" during a subsequent site visit.

An inspection strategy example for a typical facility is presented below:

INSPECTION STRATEGY EXAMPLE

1. SITE OVERVIEW/PROCESS OVERVIEW
2. WINDSHIELD TOUR
3. SPLIT INTO TEAMS FOR DETAILED PROCESS REVIEW AND PROCESS AND LABORATORY INSPECTIONS
4. RECORD REVIEW PERIOD
5. FOLLOW-UP INTERVIEWS

After the opening conference to explain inspection activities, the company would be requested to provide an overview of facility operations to the entire team. A general "windshield" site tour usually follows the overview presentation. Next, process operations would usually be described in some detail; the order typically parallels the flow of raw materials and intermediate products toward subsequent processes and the final product(s). During these discussions, waste streams and respective management procedures and related control equipment should be identified.

Process inspections to verify the information presented and discover "missing" details are then conducted. These may be done after each process or group of processes is described. The RCRA inspection begins while touring the processes by identifying any waste generation and accumulation areas. The presence of wastewater sumps, separators, or trap tanks in or near the process building may also result in initiating the CWA inspection.[2] The example plan indicates that the inspection team subdivided before proceeding with the detailed process descriptions. This is because the people gathering process information were beginning some of the compliance evaluations; other team members could begin concurrent evaluations such as the laboratory inspection.

Inspection of waste management units may be interspersed with process inspections depending on their location and facility complexity; a primary consideration is the logical flow of information. Logic or the physical situation may dictate that a waste stream be followed to final disposition for a particular process. Time must also be scheduled to review and copy relevant records, then for additional interviews to answer questions about the records.

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[*] *The CWA regulates outfalls from wastewater treatment plants and other point discharges. If the sumps, separators, and trap tanks are used to manage hazardous waste, they may be exempt from RCRA if they discharge to an on-site treatment plant that has a CWA permit. Part of the CWA inspection, therefore, is identifying all treatment units related to the permitted (or unpermitted outfall.*

The evaluation of environmental management controls is blended into the process and compliance evaluations discussed above. Investigation team members should allow facility personnel to explain their operations until the management system is understood. Document the management system with narrative notes, gather copies of all documents used in the processes, and formulate flowcharts to illustrate decision responsibilities, accountabilities, and process matrices. Environmental regulations, permits, etc., are the standards, and the internal management systems and procedures are the controls established to direct compliance or conformance to the standards.

The system should be tested by tracking information from the internal management systems through the regulated activity locations (i.e., follow known events through entire processes). For example, if a facility's environmental coordinator states that a particular waste analysis plan (a RCRA requirement) is being used at the facility, the investigation team would "test" the system by verifying that personnel at the waste receiving station and laboratory (1) had a copy of the plan, (2) were familiar with it, and (3) were following it.

Finally, continuing communication between team members is a key to successful strategy implementation. The team leader should encourage daily team meetings (usually in the evenings) to discuss findings and observations made during the day. Ensuing discussions may help to clarify any troublesome issues or open up new avenues for investigation.

CONDUCTING THE ON-SITE INSPECTION

The field portion of a multi-media investigation involves entering the facility and conducting an on-site inspection. The following discusses several key inspection activities including: entering the facility, conducting an opening conference, systematically gathering pertinent information while on-site, and discussing findings in a closing conference.

Entry

Entry into a facility to conduct a multi-media inspection is usually a straightforward process where the team leader notifies a guard and/or receptionist that he/she wants to meet with the designated facility environmental contact. The environmental contact is notified and the team is then escorted into the facility to begin the inspection, usually with an opening conference, where credentials are officially presented. [3]

Many facilities request inspection team members sign a visitor's log or some other document that will provide a written list of inspectors to the company. This is acceptable so long as there is no waiver of liability or restriction of inspection statements contained on the document being signed (check both sides of the paper for such statements, or the first page of a bound sign-in log). Liability waivers must not be signed; signature documents containing any statements that appear to limit inspection activities should be first discussed with Agency attorneys (if in doubt, consult), or sign in only on blank sheets.

Occasionally, entry is denied, usually in situations where the inspection is unannounced or enforcement action is pending (e.g., outstanding Notice of Violation ongoing Administrative Order negotiations, etc.). Consequently, the team leader needs to know how to deal with denial of entry situations. [4*] Whenever entry consent is denied (or withdrawn during the course of the inspection), the team leader should explain the Agency authority to conduct the investigation and verify that the authority is understood by the facility representative. If the person persists in denying entry or withdrawing consent, the team leader needs to fully document the circumstances and actions taken; this includes recording the name, title, and telephone number of the person denying entry or withdrawing consent. Inspection team members must never make threatening remarks to facility personnel. The team leader should then contact his/her supervisor and Agency legal counsel.

If the team leader suspects that a warrant will be necessary before entry is attempted, then actions to obtain a warrant (e.g., get attorney assigned to the project and prepare draft affidavits) should be initiated well in advance to minimize the time between arrival at the facility and entry. [5*] This would lessen the opportunity for the facility to take drastic, last-

3 *In an unannounced inspection, it may be beneficial to immediately go to the regulated areas of concern (drum storage, etc.) to conduct an inspection before the facility has time to make changes.*

4 *An attempt by the company to unreasonably limit legitimate team activities during the inspection is tantamount to denial of entry and should be treated as such.*

5 *A warrant is only one of several legal vehicles that should be considered. A TSCA subpoena, issued to a high-ranking corporate official, was used successfully in one instance as a vehicle to gain consensual entry; the limitations imposed by a warrant were avoided.*

minute corrective actions (e.g., improve "housekeeping") and thereby give the investigators a false impression. If a warrant becomes necessary, it is obtained from a local magistrate or judge; an EPA special agent, a Federal Marshal, or sheriff will be needed to serve the warrant. The team leader must be familiar with the warrant provisions and be aware of both opportunities and constraints imposed on the investigation.

Opening Conference

The opening conference is held to advise facility personnel of the investigation objectives, and to discuss logistics and scheduling of inspection activities. An important aspect of this meeting is to set the "proper tone" with facility personnel (i.e., encourage cooperation). A typical conference agenda includes:

- Introduction of investigators and presentation of credentials (be prepared to cite investigation authorities - Appendix J)

- Description of investigation objectives:

  The investigation objectives have been generally identified in the project plan; however, the project plan should not be shown to the company. As noted earlier, this is an internal document and not to be released by the field investigation team to the company. Additionally, during the discussion of investigation objectives, the investigators should take care not to limit the investigation if as a result of their findings, a new objective becomes apparent.

  The purpose of identifying the investigation objectives to the company is to enable the company to identify what people and what documents are necessary to assist in the investigation.

- Description of investigation procedures and personnel needed (develop schedule of events)

  Let the management know approximately how long the investigation will take so they can assist with the least interruption of their regular schedules. This is often as long as it takes until we get the information requested from the facility.

While the government has a right to inspect at any time during normal working hours, it is appropriate to give some consideration to the needs of the facility. For example, perhaps giving company personnel one half hour in the morning to get their business in order would be beneficial and would win "good will" for the investigators.

- Presentation of inspection notices/forms

- Discussion of prospective sampling and whether company splits will be made available

- Discussion of safety issues including the company's safety requirements [Appendix F]

The government investigators may not have the same restraints as facility personnel. However, it is prudent to determine what safety requirements the facility personnel have to follow and to follow those if they are more stringent than the government requirements. Of particular importance is to determine emergency signals and escape routes if a plant emergency occurs. Commonly, investigators may attend a short safety briefing and be asked to sign that they attended that briefing. It is all right to sign an acknowledgement that a safety briefing was attended; it is not all right to agree to anything else or to relinquish any rights CHECK WITH THE GOVERNMENT ATTORNEYS IF THERE ARE ANY QUESTIONS.

- Discussion on how photographs will be taken

Photographs are used to prepare a thorough and accurate investigation report, as evidence in enforcement proceedings and to explain conditions found at the plant. The facility, however, may object to the use of cameras in their facility and on their property. If a mutually acceptable solution cannot be reached and photographs are considered essential to the investigation, Agency supervisory and legal staff should be contacted for advice.

Facility personnel may also request that photographs taken during the visitation be considered confidential, and the Agency is obliged to comply, pending further legal determination. Self-developing film, although often of less satisfactory quality, is useful in these situations. A facility may refuse permission to take photographs unless they can see the finished print. Duplicate photographs (one for the investigator and the other for the facility) should satisfy this need. When taking photographs considered TSCA Confidential Business Information (CBI), self-developing film eliminates processing problems; otherwise, the film processor must also have TSCA CBI clearance. Note, however, that some self-developing film may contain disposable negatives which must also be handled in accordance with the TSCA CBI requirements. Giving the facility the option of developing the film may resolve national defense security problems when self-developing film is not satisfactory.

Photographs must be fully documented, following procedures for handling evidentiary materials [Appendix K].

- Arrangement for document availability and copying

The Federal statutes provide broad authorities for document review and copying. If the investigators decide that documents need to be copied, then the investigators should either attempt to use the facility's copier, paying a fee if necessary, or come equipped with a portable copier (Note: renting a portable copier from a local business store often requires advance reservations). A company's refusal to provide documents or refusal to allow copying can be considered similar to a denial of entry [note that the company is NOT required to copy documents for the government without a court order; refusal to copy even with payment is not the same as refusal to provide the documents]. The investigators should note the refusal in log books (including names, titles, and times) and continue with the on-site inspection.

At the earliest possible time, supervisors and Federal attorneys should be consulted.

- Company provides overview of facility operations

  This provides an opportunity for investigators to learn process operations and to initially identify waste sources.

At the conclusion of the opening conference, information gathering activities begin in earnest. As discussed in preceding inspection strategy section, the next steps may include:

- A general "windshield" tour of the facility
- Split into teams, according to media and process/waste management responsibilities
- Process and laboratory inspections
- Record/document review
- Follow-up interviews

General Facility Tour

The purpose of the general facility tour is to provide investigation team members an "on the ground" orientation and to identify/verify activities requiring further evaluation. The team leader should compile a list of "must see" items, based on the background information review and information obtained during the facility operations overview portion of the opening conference. These could include key process/operations, waste management areas, and areas where suspected violations are occurring. The facility tour (attended by all team members) should include these items; whether facility personnel are provided the specific list depends on whether the company could potentially hide or correct violations. It may be prudent to present the list of specific items in terms of general plant areas to be toured.

The facility tour must be properly structured and knowledgeable facility personnel must accompany the investigators. The route taken may be dictated by facility layout, but material flow should be followed, to the extent possible. The tour should include, as a minimum, raw material storage facilities, manufacturing areas, and waste management units. Team members need to be constantly alert for operations, processes, materials, and waste management activities not previously identified. If a potentially significant operation, unit, or activity (e.g., a waste spill) is observed, "stop the bus" and take a closer look. Any regulatory violations should be properly documented at that time.

The general site tour is also a good time to document conditions with photographs.

Process/Waste Management Evaluation

Once the general site tour is completed, the investigation team may split into smaller units (usually two, sometimes three) that focus on the detailed process evaluations, specific media compliance, or other activities such as laboratory inspection and sample collection. This allows one team to gather process information and begin the compliance evaluation while another team begins concurrent evaluations; all investigators should be watching for potential problems in all media and possible regulatory implications throughout the investigation.

Two key techniques are employed during this part of the investigation: interviews and visual observations. Investigators should employ good interviewing techniques so that the necessary information can be clearly and accurately obtained from facility personnel. Appendix K gives interviewing techniques. Investigators should ask probing questions but never leading questions. Often, the investigator is required to rephrase questions and ask them many times until he/she gets a satisfactory and consistent answer. Body language should also be observed for clues that the facility representative is hedging or that the investigator is starting to key in on a particularly sensitive subject. The investigator should always write down unexpected questions that occur to him/her, especially in situations where these questions cannot be asked promptly. Special care should be taken so that one investigator does not answer another investigator's questions. If the question is posed to a company official, the official should answer even if another investigator knows the answer.

Questioning Facility Personnel

How you ask a question can be more important than the question itself. Try not to give a possible answer when asking a question. For example, the following are poor ways to phrase a question:

- "You don't have any toxic materials around here, do you?"
- "There aren't any buried drums on your property, are there?"

- "You have all the necessary records, don't you?"
- "Your SPCC plan is up to date, isn't it?"

The following questions are better:

- "What kinds of material do you handle?"
- "Are there any materials buried on your property?"
- "Where do you keep the ________ records?"
- "May I see your SPCC plan?" (Then ask an employee about the procedure mentioned in it to verify its application.)

A conclusive question and follow up is often overlooked and taken for granted; however, it is the meat of the inquiry. Without the affirmation of a direct answer to the question at issue, the previous questions were of little value.

Sometimes it is useful to convey the impression that you are there to learn about a facility or its operations and are going to ask a lot of basic questions. This type of "help me learn" attitude will often allow a better line of questioning and more persistence when things become unclear or

contradictory. Generally ask open-ended questions first and then clarifying questions as necessary.

Knowledgeable process personnel are usually not used to being interviewed, so it is necessary to operate, initially, in their "comfort zone." They should be asked to describe the process in some detail; the order typically parallels the flow of raw materials and intermediate products toward subsequent processes and the final product(s). During these discussions, waste streams and respective management procedures and related control equipment should be identified. Clarifying questions should focus on raw material/ intermediate movements and waste streams produced.

Specifically, information should be obtained on where/how waste is produced, production rates and cycles, spillage or other emissions, house-keeping, floor drains/outlets, waste products, waste minimization, waste mixing/dilution, recent or anticipated modifications, etc. Areas of waste management, treatment, and disposal should also be addressed. Major items of interest include waste spillage/leaks/discharges, how the facility differentiates regulated waste from unregulated waste, physical condition of pollution control equipment, units out of service, operation and maintenance issues, diversions, bypasses and overflows, emergency response capabilities, safety, secondary containment, overloads, waste residuals management, and self-monitoring procedures.

Questions should also be asked about the environmental management program at the facility. Process personnel should explain how they become aware of environmental regulatory requirements and what support they get in taking required compliance actions. Probing follow-up questions may be asked to determine corporate policy toward regulatory compliance. Documenting recalcitrant behavior may have major ramifications in Agency follow-up actions.

Process inspections are then conducted to verify the information presented and discover/discuss "missing" details. These may be done after each process or group of processes is described. Inspection of waste management units may be interspersed with process inspections, depending on their location and facility complexity; a primary consideration is the logical flow of information. Time must also be scheduled to review and copy relevant records, and then for additional interviews to answer questions about the records.

<u>Document Reviews</u>

Before the field investigation begins, each team member should know which reports/records he/she will be responsible for reviewing. These may include inspection logs, annual documents, operating reports, self-monitoring procedures and data, spill clean-up reports, manifests, notifications/ certifications, emergency response plans, training records, etc. However, some on-the-spot decisions may have to be made in situations where unexpected information becomes available. The investigator should not limit review to documents specified during the notification or opening conference.

The document review should include determining whether (1) facility personnel have prepared and maintained the required documents, (2) the documents contain all necessary information, (3) the documents have been prepared on time, (4) the documents have been distributed to all necessary parties, and (5) document information is consistent by crosschecking information recorded on more than one document. Document reviews should be done systematically. The investigator should always plan to make copies of documents that cannot be reviewed on-site, or are vitally important in documenting or describing a potential violation. The use of a portable copier should be considered to expedite this procedure.

Sampling

Sampling and sample analysis may be necessary to document noncompliance. Normally, grab samples that are representative and collected by acceptable methods will suffice unless a permit or other legally enforceable document specifies a composite sample (Appendix M presents an example of a sampling guideline to be used in conjunction with detailed SOPs). Samples taken to identify noncompliance with permit requirements must be collected and analyzed consistent with facility permit requirements. Sampling should be considered when the investigator feels that sampling would strengthen a potential enforcement case or help document a potential violation or establish that a facility is subject to regulation. Some situations that may require sampling are:

- Sampling requested by program office (e.g., CWA/NPDES Compliance Sampling Inspection, RCRA Compliance Monitoring Evaluation)
- Leaking drums, tanks, transformers, other containers holding hazardous waste, other toxic materials, or other unexpected or improper releases to the environment
- Unknown waste is found
- Facility's waste analysis data is questionable
- Potential waste misclassification problem is suspected
- Suspicious looking stains or discoloration in waste production/ management areas are unexplained
- Unpermitted discharges are found

- Permitted discharges have a particu larly bad appearance or need to be characterized for toxicity/compliance
- Stormwater runoff is suspected of being contaminated
- Receiving waters/sediments are likely to contain toxic/ hazardous pollutants
- Contaminated sludges or other waste residuals are being improperly disposed

Closing Conference

The primary purpose of the closing conference is to provide an opportunity for the investigators to discuss preliminary findings with facility representatives, including any potential violations or problems that are uncovered during the investigation. Judgment must be exercised in deciding wh at findings are presented and how they are represented to facility personnel. Nearly any finding can be discussed if it is presented in the right context. However, the less certain the team leader is about a specific violation or issue, the more reason not to discuss it a t the closing conference. In any case, the investigators must clearly state that information provided dur ing the closing conference is preliminary and may change, as a result of additional review. Pollution prevention strategies can also be discussed.

Another important purpose of the closing conference is to resolve any outstanding questions or issues and verify information. Questions or outstanding information requests that cannot be resolved in the closing conference should be compiled into a written, agreed upon document, which is provided to facility representatives before the investigation team leaves the facility, if possible. Each question or information request should be uniquely numbered in this document. Subsequently provided responses should be referenced to the specific request.

Some additional paperwork may need to be c ompleted during the closing conference. This would include signing appropriate inspection forms such as receipt for samples or documents received and declaration of TSCA CBI or the issuance of field citations. Multi-media investigators must be CBI-cleared before they accept any company TSCA CBI information.

Finally, the team leader should be prepared to discuss with facility personnel how and when a copy of the final inspection report can be obtained (e.g., a FOIA request, etc.).

MEDIA SPECIFIC INVESTIGATION PROCEDURES

Presented here, are many of the significant tasks that must be included in each of the media specific inspections. Sample collection and inspection checklists are addressed elsewhere in this manual (Appendix I lists media specific checklists). Media discussed include hazardous waste, water, air, drinking water, toxic substances, pesticides, as well as emergency planning/community right-to-know and Superfund issues. General information on each Act is covered in Appendix A.

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

Basic Program

The Resource Conservation and Recovery Act (RCRA) of 1976 is the primary statute regulating the management and disposal of municipal and industrial solid and hazardous wastes. In 1984, RCRA was amended by the Hazardous and Solid Waste Amendments (HSWA) and in 1988 by the Medical Waste Tracking Act (Subpart J of RCRA). The principal objectives of RCRA, as amended, are:

- Promoting the protection of human health and the environment from potential adverse effects of improper solid and hazardous waste management

- Conserving material and energy resources through waste recycling and recovery

- Reducing or eliminating the generation of hazardous waste as expeditiously as possible

The RCRA program consists of four waste management sub-programs designed to meet the Congressional objectives: (1) Subtitle D - Solid Wastes, (2) Subtitle C - Hazardous Wastes, (3) Subtitle I - Underground Storage Tanks

(UST), and (4) Subtitle J - Medical Wastes. This section discusses evaluating compliance under Subtitles C, I, and J. [6]

Subtitle C, Hazardous Wastes

Evaluating Compliance

Under Subtitle C, hazardous wastes are subject to extensive regulations on generation, transportation, storage, treatment, and disposal. A manifest system tracks shipments of hazardous wastes from the generator until ultimate disposal. This "cradle to grave" management is implemented through regulations and permits.

The investigator must clearly identify investigation objectives, the RCRA regulatory authority (or authorities) with jurisdiction, and establish the facility status under RCRA. RCRA investigations may be performed for several reasons, including:

- Assessing RCRA compliance with regulations and permits
- Reviewing compliance status with respect to an administrative enforcement action
- Reviewing compliance with deadlines in a facility permit
- Responding to alleged violations and/or complaints
- Supporting case development

The regulatory agencies with RCRA authority may be EPA, a designated State agency with full or partial authority, local agencies working with the State, or a combination of the three.

In determining the facility status under RCRA, the investigator must decide whether the facility is a generator, transporter, and/or treatment, storage, and disposal facility (TSDF), and whether the facility is permitted or has interim status. Generally, EPA Regional and State offices maintain files for the facility to be inspected. Information may include:

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* *The waste management programs are presented here out of alphabetical sequence because Subtitle D contains the definition of "solid waste" which is helpful in understanding hazardous wastes in Subtitle C. Hazardous wastes are a subset of solid wastes. Subtitle C hazardous wastes are defined specifically in Title 40 of the Code of Federal Regulations (CFR), Part 261.*

- A summary of names, titles, locations, and phone numbers of responsible persons involved in the hazardous waste program

- A list of wastes that are treated, stored, and disposed and how each is managed (for TSDFs)

- A list of wastes generated, their origins, and accumulation areas (for generators)

- Biennial, annual, or other reports required by RCRA and submitted to the regulatory agencies; these include any required monitoring reports

- A detailed map or plot plan showing the facility layout and location(s) of waste management areas

- The facility RCRA Notification Form (Form 8700-12)

- The RCRA Part A Permit Application (for TSDFs)

- The RCRA Part B Permit Application (for TSDFs, if applicable)

- The RCRA permit (for TSDFs, if applicable)

- Notifications and/or certifications for land disposal restrictions (for generators)

Generators

Hazardous waste generators are regulated under 40 CFR Parts 262 and 268. These regulations contain requirements for:

- Obtaining an EPA Identification number
- Determining whether a waste is hazardous
- Managing wastes before shipment
- Accumulating and storing hazardous wastes

- Manifesting waste shipments
- Recordkeeping and Reporting
- Restricting wastes from land disposal (also regulated under Part 268)

The generator regulations vary, depending upon the volume of hazardous wastes generated. The investigator must determine which regulations apply. Additionally, the investigator should do the following:

- Verify that the generator has an EPA Identification Number which is used on all required documentation (e.g. reports, manifests, etc.)

- Confirm that the volume of hazardous wastes generated is consistent with reported volumes. Examine the processes generating the wastes to show that all generated hazardous wastes have been identified. Look for improper mixing or dilution.

- Ascertain how the generator determines/documents that a waste is hazardous. Check to see wastes are properly classified. Collect samples, if necessary.

- Determine whether pre-transport requirements are satisfied, including those for packaging, container condition, labeling and marking, and placarding.

- Determine the length of time that hazardous wastes are being stored or accumulated. Storage or accumulation for more than 90 days requires a permit. Generators storing for less than 90 days must comply with requirements outlined in 40 CFR 262.34.

- Verify RCRA reports and supporting documentation for accuracy, including inspection logs, biennial reports, exception reports, and manifests (with land disposal restriction notifications/ certifications).

- Watch for accumulation areas which are in use but have not been identified by the generator. Note: Some authorized State regulations do not have provisions for "satellite storage" accumulation areas.

- Determine whether a generator has the required contingency plan and emergency procedures, whether the plan is complete, and if the generator follows the plan/procedures.

- Determine whether hazardous waste storage areas comply with applicable requirements.

Transporters

Hazardous waste transporters (e.g., by truck, ship, or rail) are regulated under 40 CFR Part 263, which contains requirements for:

- Obtaining an EPA identification number
- Manifesting hazardous waste shipments
- Recordkeeping and reporting
- Sending bulk shipments (by water, rail)

Storage regulations apply if accumulation times at transfer stations are exceeded. Transporters importing hazardous wastes, or mixing hazardous wastes of different Department of Transportation (DOT) shipping descriptions in the same container, are classified as generators and must comply with 40 CFR Parts 262 and 268. Investigators evaluating transporter compliance should do the following:

- Verify that the transporter has an EPA identification number which is used on all required documentation (e.g., manifests)

- Determine whether hazardous waste containers stored at a transfer facility meet DOT pre-transport requirements

- Determine how long containers have been stored at a transfer facility. Storage over 10 days makes the transporter subject to storage requirements

- Verify whether the transporter is maintaining recordkeeping and reporting documents, including manifests, shipping papers (as required), and discharge reports. All required documents should be both present and complete

Treatment, Storage, and Disposal Facilities

Permitted and interim status TSDFs are regulated under 40 CFR Parts 264 and 265, respectively. [Part 264 applies only if the facility has a RCRA permit (i.e., a permitted facility); Part 265 applies if the facility does not have a RCRA permit (i.e., an interim status facility)]. These requirements include three categories of regulations consisting of administrative requirements, general standards, and specific standards (see Table on following page). The investigator should do the following items to determine compliance with Subparts A through E:

- Verify that the TSDF has an EPA identification number which is used on all required documentation.

- Determine what hazardous wastes are accepted at the facility, how they are verified and how they are managed.

- Compare wastes managed at the facility with those listed in the Hazardous Waste Activity Notification (Form 8700-12); the Parts A and B permit applications; and any revisions, and/or the permit.

- Verify that the TSDF has and is following a waste analysis plan kept at the facility; inspect the plan contents.

- Identify and inspect security measures and equipment.

- Review inspection logs to ensure they are present and complete. Note problems and corrective measures.

- Review training documentation to ascertain that required training has been given to employees.

- Inspect waste management areas to determine whether reactive, ignitable, and incompatible wastes are handled pursuant to requirements.

- Review preparedness and prevention practices and inspect related equipment.

- Review contingency plans; examine emergency equipment and documented arrangements with local authorities.

- Examine the waste tracking system and associated recordkeeping/reporting requirements. Required documentation includes manifests and biennial reports, and may include unmanifested waste reports, and spill/release reports. Relevant documents may include on-site waste tracking forms.

- Verify that the operating record is complete according to 40 CFR 264.73 or 265.73.

Table - Permitted vs. Interim Status (Missing)

The investigator can determine compliance with standards in Subparts F through H by doing the following items:

- For permitted facilities, verify compliance with permit standards with respect to groundwater monitoring, releases from solid waste management units, closure/post-closure, and financial requirements (Part 264).

- For interim status facilities required to monitor groundwater, determine what kind of monitoring program applies.

- Depending on the type of investigation, examine the following items to determine compliance:

  - Characterization of site hydrogeology
  - Sampling and analytical records
  - Statistical methods used to compare analytical data
  - Analytical methods
  - Compliance with reporting requirements and schedules
  - Sampling and analysis plan (for content, completeness, and if it is being followed)
  - Condition, maintenance, and operation of monitoring equipment, including wellheads, field instruments, and sampling materials

- Construction/design of monitoring system
- Assessment monitoring outline and/or plan
- Corrective action plan (permitted facilities)

- For waste management units that undergo closure, review the closure plan (including amendments and modifications), plan approval, closure schedule, and facility and regulatory certifications. Examine response actions to any release of hazardous waste constituents from a closed or closing regulated unit.

- For waste management units in post closure care, inspect security measures, groundwater monitoring and reporting, and the maintenance and monitoring of waste containment systems.

- Verify that the owner/operator has demonstrated financial assurance regarding closure.

The technical standards in Part 264 (Subparts I through O and X) and Part 265 (Subparts I through R) govern specific hazardous waste management units used for storage, disposal, or treatment (e. g., tanks, landfills, incinerators). Standards for chemical, physical, and biological treatment at permitted facilities under Part 264 have been incorporated under Miscellaneous Units, Subpart X. [7] The investigator should do the following:

- Identify all hazardous waste management areas and the activity at each; compare the areas identified in the field with those listed in the permit or permit application, as appropriate. Investigate disparities between actual practice and the information submitted to regulatory agencies.

- Verify that the owner/operator is complying with applicable design, installation, and integrity standards; field-check the design, condition, and operation of waste management areas and equipment.

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[7] *The regulations governing miscellaneous units are intended to address technologies that were difficult to fit into the framework of prior regulations. Miscellaneous units, defined in 40 CFR 260.10, include but are not limited to: open burning/detonation areas, thermal treatment units, deactivated missile silos, and geologic repositories.*

- Determine how incompatible wastes and ignitable or reactive wastes are managed.

- Verify that the owner/operator is conducting self-inspections where and when required; determine what the inspections include.

- Identify and inspect required containment facilities for condition and capacity; identify leak detection facilities.

- Determine whether hazardous waste releases have occurred and how the owner/operator responds to leaks and spills.

- Verify that the owner/operator is complying with additional waste analysis and trial test requirements, where applicable.

- Check the closure/post-closure procedures for specific waste management units (e.g., surface impoundments, waste piles, etc.) for regulatory compliance.

- For landfills, determine how the owner/operator manages bulk and contained liquids.

- Field-check security and access to waste management units.

- Determine what are the facility monitoring requirements (for air emissions, groundwater, leak detection, instrumentation, equipment, etc.) and inspect monitoring facilities and records.

When inspecting land treatment facilities, the investigator should also review the following items:

- Soil monitoring methods and analytical data

- Comparisons between soil monitoring data and background concentrations of constituents in untreated soils to detect migration of hazardous wastes

- Waste analyses done to determine toxicity, the concentrations of hazardous waste constituents, and, if food-chain crops are grown on the land, the concentrations of arsenic, cadmium, lead, and mercury. The concentrations must be such that hazardous waste constituents can be degraded, transformed, or immobilized by treatment

- Run-on and run-off management systems

When evaluating compliance of interim status incinerator facilities, the investigator also should review and/or inspect the following items:

- Waste analyses done to enable the owner/operator to establish steady state operating conditions and to determine the pollutant which might be emitted

- General procedures for operating the incinerator during start-up and shut-down

- Operation of equipment monitoring combustion and emissions control, monitoring schedules, and data output

- The incinerator and associated equipment

For permitted incinerators, the investigator must evaluate the incinerator operation against specific permit requirements for waste analysis, performance standards, operating requirements, monitoring, and inspections. The investigator also should do the following:

- Verify that the incinerator burns only wastes specified in the permit

- Verify methods to control fugitive emissions

- Determine waste management practices for burn residue and ash

The investigator evaluating compliance of thermal treatment facil ities in interim status also should review the following items:

- General operating requirements, to verify whether steady state operating conditions are achieved, as required

- Waste analysis records, to ensure that (a) the wastes are suitable for thermal treatment, and (b) the required analyses in Part 265.375 have been performed

Thermal treatment facilities permitted under 40 CFR Part 264 Subpart X will have specific permit requirements.

The investigator evaluating compliance of chemical, physical, and biological treatment facilities in interim status also should do the following:

- Determine the general operating procedures.

- Review the waste analysis records and methods to determine if the procedures are sufficient to comply with 40 CFR 265.13.

- Review trial treatment test methods and records to determine if the selected treatment method is appropriate for the particular waste.

- Examine procedures for treating ignitable, reactive, and incompatible wastes for compliance with Subpart Q requirements.

Chemical, physical, and biological treatment facilities permitted under Subpart X will have specific permit requirements.

Owners/operators of TSDFs must also comply with air emission standards contained in Subparts AA and BB of 40 CFR Parts 264 and 265. These subparts establish standards for equipment containing or contacting hazardous wastes with organic concentrations of at least 10%. This equipment includes:

- Process vents
- Pumps in light liquid service
- Compressors
- Sampling connecting systems

- Open-ended valves or lines
- Valves in gas/vapor service or in light liquid service
- Pumps and valves in heavy liquid service, pressure relief devices in light liquid or heavy liquid service, and flanges and other connections

Total organic emissions from process vents must be reduced below 1.4 kg/hr and 2.8 Mg/yr. The other equipment types above must be marked and monitored routinely to detect leaks. Repairs must be initiated within 15 days of discovering the leak.

The facility operating record should contain information documenting compliance with the air emission standards. A complete list of required information is in 40 CFR 264.1035, 264.1064, 265. 1035, and 265.1064. Permitted facilities must submit semiannual reports to the Regional Administrator outlining which valves and compressors were not fixed during the preceding 6 months. The investigator can do the following things:

- Visually inspect the equipment for marking.
- Review documentation in the operating record and cross-check this information with that submitted to the Regional Administrator in semiannual reports.

Land Disposal Restrictions

Land disposal restrictions (LDR) in 40 CFR Part 268 are phased regulations prohibiting land disposal[8] of hazardous wastes unless the waste meets applicable treatment standards [Appendix N].[9] The treatment standards are expressed as (1) contaminant concentrations in the extract or total waste, or (2) specified technologies.

Notifications and certifications comprise the majority of required LDR documentation. Notifications tell the treatment or storage facility the appropriate treatment

8 *Land disposal includes, but is not limited to, placement in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, underground mine or cave, or placement in a concrete vault or bunker intended for disposal purposes.*

9 *Treatment standards are in 40 CFR 268.40 through 43.*

standards and any prohibition levels (California List wastes) that apply to the waste. Certifications are signed statements telling the treatment or storage facility that the waste already meets the applicable treatment standards and prohibition levels.

The regulations divide hazardous wastes into restricted waste groups and applya compliance schedule of different effective dates for each group (40 CFR 268, Appendix VII).

Investigators evaluating hazardous waste generators for LDR compliance should do the following:

- Determine whether the generator produces restricted wastes; review how/if the generator determines a waste is restricted.

- Review documentation/data used to support the determination that a waste is restricted, based solely on knowledge.

- Learn how/if a generator determines the waste treatment standards and/or disposal technologies.

- Verify whether the generator satisfies documentation, recordkeeping, notification, certification, packaging, and manifesting requirements.

- Ascertain whether the generator is or might become a TSDF and subject to additional requirements.

- Determine who completes and signs LDR notifications and certifications and where these documents are kept.

- Review the waste analysis plan if the generator is treating a prohibited[10] waste in tanks or containers.

Investigators evaluating TSDFs should do the following:

[10] *Prohibitions on land disposal are explained in 40 CFR 268, Subpart C.*

- Ensure the TSDF is complying with generator recordkeeping requirements when residues generated from treating restricted wastes are manifested off-site.

- Verify whether the treatment standards have been achieved for particular wastes prior to disposal.

- Review documentation required for storage, treatment, and land disposal; documentation may include waste analyses and results, waste analysis plans, and generator and treatment facility notifications and certifications.

Subtitle I - Underground Storage Tanks (USTs)

Evaluating Compliance

Three basic methods are used to determine compliance in most inspections: (1) Interviews of facility personnel, (2) visual/field observations, and (3) document review. Because the tanks are located underground, visual/field observations have limited application in determining compliance for USTs. The UST program relies heavily on the use of documents to track the status and condition of any particular tank.

Interviews with facility personnel are an important starting point when determining compliance with any environmental regulation. Questions regarding how the facility is handling its UST program will give the inspector insight into the types of violations that may be found. Topics to be covered in the interview include:

- Age, quantity, and type of product stored for each tank on-site
- How and when tanks have been closed
- Type of release detection used on each tank (if any); some facilities may have release detection on tanks where it is not required
- Type of corrosion protection and frequency of inspections
- Which tanks have pressurized piping associated with them

Visual/field observations are used to determine if any spills or overfills have occurred that have not been immediately cleaned up. The presence of product around the fill pipe indicates a spill or overfill. Proper release detection methods can also be verified with field observations. During the interviews, ask the facility if monthly inventory control along with annual tightness testing is used. If monthly inventory control is used, check the measuring stick for divisions of 1/8 inch. A field check of the entire facility can also be done to determine if any tanks may have gone unreported. Fillports and vent lines can indicate the existence of a UST.

Documents take up the largest portion of time during a UST inspection. Documents that should be reviewed include:

- Notifications for all UST systems
- Reports of releases including suspected releases, spills and overfills, and confirmed releases
- Initial site characterization and corrective action plans
- Notifications before permanent closure
- Corrosion expert's analysis if corrosion protection is not used
- Documentation of operation of corrosion protection equipment
- Recent compliance with release detection requirements, including daily inventory sheets with the monthly reconciliation
- Results of site investigation conducted at permanent closure.

Document retention rules also apply, so be sure to get all of the documents a facility may be required to keep. To determine if the implementing agency has been notified of all tanks, compare the notifications to general UST lists from the facility. Usually, the facility will keep a list of tanks separate from the notifications and tanks may appear on that list that do not appear on a notification form. Also, compare the notifications to tank lists required in other documents, like the Spill Prevention Control and Countermeasures Plan.

Subtitle J - Medical Wastes

Subtitle J was added to RCRA in November 1988 to address concerns about the management of medical wastes. EPA enacted interim final regulations in March 1989. The regulations, found in 40 CFR Part 259, establish a demonstration program with requirements for medical waste generators, transporters, and treatment, destruction, and disposal facilities (TDDs). The demonstration program is effective in "Covered States" during the period June 22, 1989 to June 22, 1991. The regulations apply to regulated medical waste generated in Connecticut, New Jersey, New York, Rhode Island, and Puerto Rico.

Basic Program

Medical waste is defined in 40 CFR 259.10 as any solid waste generated in the diagnosis, treatment, or immunization of human beings or animals, in related research, biological production, or testing. The following are exempt from 40 CFR Part 259 requirements:

- Any hazardous waste identified or listed under 40 CFR Part 261
- Any household waste defined in 40 CFR 261.4(b)(1)
- Residues from treatment and destruction processes or from the incineration of regulated medical wastes
- Human remains intended to be buried or cremated
- Etiologic agents being shipped pursuant to other Federal regulations
- Samples of regulated medical waste shipped for enforcement purposes

Regulated medical waste is a subset of all medical wastes and includes seven categories:

1. Cultures and stocks of infectious agents
2. Human pathological wastes (e.g., tissues, body parts)
3. Human blood and blood products

4. Sharps (e.g., hypodermic needles and syringes used in animal or human patient care)
5. Certain animal wastes
6. Certain isolation wastes (e.g., waste from patients with highly communicable diseases)
7. Unused sharps (e.g., suture needles, scalpel blades, hypo-dermic needles)

Etiological agents being transported interstate and samples of regulated medical waste transported off-site by EPA- or State-designated enforcement personnel for enforcement purposes are exempt from the requirements during the enforcement proceedings.

Mixtures of solid waste and regulated medical waste are also subject to the requirements. Mixtures of hazardous and regulated medical waste are subject to the 40 CFR Part 259 requirements only if shipment of such a mixture is not subject to hazardous waste manifesting (e.g., the hazardous waste is shipped by a conditionally exempt generator).

Generators, transporters, and owners or operators of intermediate handling facilities or destination facilities who transport, offer for transport, or otherwise manage regulated medical waste generated in a Covered State must comply with the regulations even if such transport or management occurs in a non-Covered State. Vessels at port in a Covered State are subject to the requirements for those regulated medical wastes transported ashore in the Covered State. The owner or operator of the vessel and the person(s) removing or accepting waste from the vessel are considered co-generators of the waste.

A generator who either treats and destroys or disposes of regulated medical waste onsite [e.g., incineration, burial, or sewer disposal covered by section 307(b) through (d), of the Clean Water Act] is not subject to tracking requirements for that waste. However, such on-site waste management may subject the generator to additional Federal, State, or local laws and regulations.

Evaluating Compliance

The inspector should evaluate whether the generator has determined what regulated medical waste streams are generated and/or managed. Generators of less than 50 pounds per month are exempt from certain transportation, and tracking requirements. Compliance should also be evaluated by observing the following:

- Prior to shipping waste off-site: Are wastes segregated? Are wastes packed in the appropriate containers? If containers are reused, are they decontaminated? Are containers properly marked?

- Does the generator use tracking forms? Are copies of the forms and any exception reports kept for 3 years? Does the generator export medical waste for treatment, destruction, or disposal? If so, the generator must request that the destination facility provide written confirmation that the waste was received; an exception report must be filed if such a confirmation is not received within 45 days. If the generator incinerates medical waste on-site, are the recordkeeping and reporting regulations for on-site incinerators followed?

The transportation requirements apply to transporters, including generators who transport their own waste, and owners and operators of transfer facilities engaged in transporting regulated medical waste generated in a Covered State. The inspector should verify that:

- The proper labeling and marking of regulated medical waste accepted for transportation has taken place or has been done.

- If the waste is handled by more than one transporter, did each transporter attach a water resistant identification tag below the generator's marking? Is the required information on the tag?

- The transporter submitted the required notification(s) for each Covered State.

- The vehicles are fully enclosed, leakproof, maintained in sanitary condition, secured when unattended, and marked with the proper identification.

- The applicable requirements for rail shipments are followed.
- Tracking forms are used properly.
- Recordkeeping and reporting requirements are followed.

The requirements for treatment, destruction, and disposal facilities apply to owners and operators of facilities that receive regulated medical waste generated in a Covered State, including facilities located in non-Covered States that receive regulated medical waste generated in a Covered State. The facilities include destination facilities, intermediate handlers, and generators who receive regulated medical waste required to be accompanied by a tracking form. The inspector should verify the following:

- Are tracking forms used and properly completed?
- Are tracking form discrepancies resolved?
- Are the recordkeeping requirements followed?
- Is any additional information required by the Administrator reported?

For rail shipments of regulated medical waste, the inspector should determine whether the tracking forms are used properly.

Pollution Prevention

EPA is developing an Agency-wide policy for pollution prevention. Present authorities were established in the 1984 Hazardous and Solid Waste Amendments to RCRA [Section 3002]. The October 1990 Pollution Prevention Act established pollution prevention as a national priority.

Evaluating Compliance

EPA has developed a policy regarding the role of inspectors in promoting waste minimization (OSWER directory number 9938.10). As stated in the policy, to evaluate compliance, the inspector should:

- Check hazardous waste manifests for a correctly worded and signed waste minimization certification.

- Determine whether this certification was manually signed by the generator or authorized representative.

- Confirm that a waste minimization program is in place by requesting to see a written waste minimization plan, or requesting that the plan be described orally, or requesting that evidence of a waste minimization program be demonstrated. The inspector can, and should visually check for evidence of a "program in place" on-site.

- Check the Biennial Report and/or Operating Record of generators and TSDs, as appropriate. These documents are to contain descriptions of waste minimization progress and a certification statement. If known omissions, falsifications, or misrepresentations on any report or certification are suspected, criminal penalties may apply and the case should be referred for criminal investigation.

- Check any waste minimization language included in the facility's permits, any enforcement order, and settlement agreements. Verify that any waste minimization requirements are being satisfied.

The policy also states that the inspector should promote waste minimization by:

- Being familiar with recommending, and distributing waste minimization literature.

- Referring the facility to the appropriate technical assistance program for more specific or technical information.

- Providing limited, basic advice to the facility of obvious ways they can minimize their waste. This advice should be issued in an informal manner with the caveat that it is not binding in any way and is not related to regulatory compliance.

The multi-media inspection team can also document cross-media transfers of waste streams, which can result in false claims of waste minimization. For example, a facility could treat a solvent wastewater stream in an air stripper that has no air pollution control devices. On paper, the amount of solvent discharged to a land disposal unit or sewer system could show a reduction, but the pollutants are going into the air, possibly without a permit. Another example would be a facility claiming a reduction in hazardous waste generated because the waste stream was delisted.

CLEAN WATER ACT (CWA)

EPA establishes national water quality goals under the CWA. Water pollution from industrial and municipal facilities is controlled primarily through permits limiting discharges. Permit limits are based on effluent guidelines for specific pollutants, performance requirements for new sources, and/or water quality limits. Permits also set schedules and timetables for construction and installation of needed equipment. Sources which discharge indirectly to a municipal treatment plant are subject to pretreatment standards. Other key provisions of the CWA require permits for discharge of dredged and fill materials into waters (including wetlands) and requirements for reporting and cleaning up spills of oil or hazardous material. Nonpoint sources of water pollution, such as runoff from agricultural fields, are addressed through programs to implement Best Management Practices.

Although the investigator(s) responsible for determining facility compliance with Clean Water Act requirements should focus on issues identified below, they should be aware of the inter-relationship with other laws, regulations, etc. For example, sludge generated at a wastewater treatment plant (WWTP) may be regulated under solid waste disposal laws (Toxicity Characteristic) and substances used/generated at the WWTP may be subject to reporting requirements (EPCRA reporting for chlorine).

Basic Program

Wastewater compliance components can be generally categorized into the following groups:

- Control and treatment systems
- Self-monitoring systems (including both field and laboratory measurements)

- Operation and maintenance (O&M)
- Best Management Practices (BMP)
- Spill Prevention Control and Countermeasure (SPCC) Plan

Before the inspection, the investigators should determine the "yardstick" by which facility compliance will be measured. To do so, the investigator must obtain and review copies of the discharge permit, permit application, discharge monitoring reports (DMRs), treatment facility plot plans, and any additional required plans (SPCC, etc.).

Evaluating Compliance

Control and Treatment Systems

Wastewater control and treatment systems should be evaluated for adequacy and compliance with permit or other requirements (consent decrees, etc.) through record review and on-site inspection. This includes, but is not limited to, the following:

- Determine if all wastewaters generated by the facility are adequately controlled, recycled, directed to the wastewater treatment plant (on or offsite), discharged through an outfall regulated by a National Pollutant Discharge Elimination System (NPDES) permit, etc.

- Identify any wastewater discharges directly to a receiving waterbody that are not included in a facility NPDES Permit.

- For off-site wastewater treatment, determine if the discharge is required to meet pretreatment standards. Review any applicable standards and appropriate wastewater characterization data, as necessary. Pretreatment checklists are available in some Regional offices.

- For on-site wastewater treatment, determine if the wastewater treatment plant has the appropriate unit processes and is properly sized to effectively treat the quality and quantity of wastewater generated by the facility.

- Review operations records and DMRs to determine if the facility has exceeded its NPDES permit limits.

Self-monitoring Systems

Self-monitoring consists of flow and water quality measurements and sampling by the facility in addition to laboratory analyses of water samples required by the NPDES permit program. The NPDES/ pretreatment permits normally identify self-monitoring requirements. There are usually two components to the self-monitoring system evaluation, as discussed below:

Field - Confirm that acceptable sampling and flow measurements, as specified by the NPDES/pretreatment permits, are conducted at the correct locations, with the proper frequency, and by acceptable equipment and methods. Determine if all necessary calibrations and O&M are performed. Approved procedures are to be used in the collecting, preserving, and transporting of samples [40 CFR 136.3(e)].

Laboratory - Evaluate laboratory procedures affecting final reported results including:

- Sample preservation methods and holding times
- Chain-of-custody
- Use of approved procedures (40 CFR 136 or approved alternatives)
- Adequacy of personnel, equipment, and other components of laboratory operations
- Adequacy of quality assurance/quality control program
- Recordkeeping and calculations

Evaluate how the data are entered into laboratory notebooks or computers; sign-off procedures used; analysis of spikes, blanks, and reference samples; how the lab data are transposed onto the official, self-monitoring report forms (DMRs) sent to the regulatory agency; and the extent and capability of outside contract laboratories, if used.

Operation and Maintenance

Most NPDES discharge permits have standard language that requires proper facility operation and maintenance [40 CFR 122.41(e)]. The investigator should:

- Determine if waste water treatment processes are operated properly through visual inspection and records review.
- Observe the presence of solids, scum, grease, and floating oils or suspended materials (pinpoint floc, etc.), odors, and weed growth in the treatment units. Note appearance of wastewater in all units.
- Identify all out-of-service processes and determine cause.
- Determine level of maintenance by observing condition of equipment (pumps, basins, etc.) and reviewing records (outstanding work orders, spare parts inventories).
- Identify handling, treatment, and disposal of sludges and other residues generated from processes and wastewater treatment system.

Best Management Practices (BMP) Plan

Determine if the facility handles toxic materials and if a BMP plan is required (40 CFR 125, Subpart K or by NPDES permit). If applicable, review BMP Plan or BMP Permit requirements. Determine if facility is following required provisions. Review any records required by the plan for adequacy.

SPCC Plan

Determine if the facility is required to develop and implement an SPCC Plan (40 CFR 112) for storage/handling and spill control of specified substances. A facility is required to have an SPCC plan if it stores oil and/or oil products and:

- Underground capacity exceeds 42,000 gallons

- Aboveground storage capacity exceeds 1,320 gallons
- Any single aboveground container exceeds 660 gallons
- A spill could conceivably reach a water of the United States

Obtain a copy of the plan and required records to assess compliance with the plan provisions. The plan should be certified by a registered professional engineer with approval and implementation certified by the proper facility official. Identify and visually inspect all regulated tanks and equipment including containment and run-off control systems and procedures. Investigate any evidence of spilled materials. Discuss training and associated procedures with facility personnel. Review applicable records (spill reports, tank and piping inspection reports, and loading/unloading equipment inspection reports).

CLEAN AIR ACT (CAA)

The Clean Air Act is the legislative basis for air pollution control regulations. It was first enacted in 1955 and later amended in 1963, 1965, 1970, 1977, and 1990. The 1955 Act and the 1963 Amendments called for the abatement of air pollution through voluntary measures. The 1965 amendments gave Federal regulators the authority to establish automobile emission standards.

Basic Program

The Clean Air Act Amendments of 1970 significantly broadened the scope of the Act, forming the basis for Federal and State air pollution control regulations. Section 109 of the 1970 Amendments called for the attainment of national ambient air quality standards (NAAQS, 40 CFR 50) to protect public health and welfare from the known or anticipated adverse effects of six air pollutants (as of 1990 the standards were for small particulates, sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, and lead). The states were required to develop and submit to EPA implementation plans that were designed to achieve the NAAQS. These state implementation plans (SIPs) contained regulations that limited air emissions from stationary and mobile sources. They were developed and submitted to EPA on a continuing basis and became federally enforceable when approved.

Section 111 of the 1970 Amendments directed EPA to develop standards of performance for new stationary sources. These regulations, known as New Source

Performance Standards (NSPS, 40 CFR 60), limited air emissions from subject new sources. The standards are pollutant and source specific. Appendix L contains a list of the NSPS sources as of July 1, 1990 and also lists sources subject to NSPS continuous emission monitoring (CEM) and continuous opacity monitoring (COM) requirements.

Section 112 of the 1970 Amendments directed EPA to develop standards for hazardous air pollutants. These regulations, known as the National Emission Standards for Hazardous Air Pollutants (NESHAPs, 40 CFR 61), limited hazardous air emissions from both new and existing sources. (Appendix L) contains a list of sources subject to NESHAPs as of July 1, 1990. These standards are incorporated into the SIPs, usually by reference to the EPA standard.

The Clean Air Act Amendments of 1977 addressed the failure of the 1970 Amendments to achieve the NAAQS by requiring permits for major new sources. The permit requirements were based on whether the source was located in an area that met the NAAQS (attainment areas, 40 CFR 81) or in an area that did not meet the NAAQS (nonattainment areas). The permit program for sources in attainment areas was referred to as the prevention of significant deterioration (PSD) program.

The Clean Air Act Amendments of 1990 significantly expanded the scope of the Act. Section 112 amendments essentially replaced the NESHAPs with a new program called "Title III - Hazardous Air Pollutants." Title III listed 189 hazardous air pollutants [Appendix O] and required EPA to start setting standards for categories of sources that emit these pollutants within 2 years (1992) and finish setting all standards within 10 years (2000). It also contains provisions for a prevention-of-accidental-releases program.

Title V of the 1990 Amendments requires EPA to promulgate a permitting program that will be implemented by the states no later than November 15, 1994. The permits will include enforceable emission standards, and reporting, inspection, and monitoring requirements

Title VII of the 1990 Amendments gives EPA enhanced enforcement authority. The Agency may initiate enforcement proceedings for SIP and permit violations if the state does not take enforcement action. Title VII also provides for criminal penalties for Clean Air Act violations.

Evaluating Compliance

The following procedures are used to evaluate compliance with the Clean Air Act.

Before an on-site inspection the documents listed below should be obtained from state or EPA files and reviewed to determine what regulations apply and what compliance problems may exist.

- The state air pollution control regulations contained in the SIP (State regulations and permits form the basis for the air compliance inspection and will vary from state to state.)
- The state operating and construction permits
- The most current emissions inventory (check for sources subject to SIP, NSPS, and NESHAPs requirements)
- The volatile organic compound (VOC) emissions inventory (The VOC inventory may not be included in the emissions inventory but reported separately under Title III Form R submittals. See Emergency Planning and Community Right-to-Know section.)
- The consent decrees/orders/agreements still in effect and related correspondence
- The most recent inspection reports
- The most recent monthly or quarterly CEM/COM reports
- AIRS Facility Subsystem (AFS) reports
- Process descriptions, flow diagrams, and control equipment for air emission sources

- Facility plot plan that identifies and locates the air pollution emission points

The on-site inspection should include a review of the records and documents listed below:

- Process operating and monitoring records to determine if permit requirements are being followed

- Fuel analysis reports (including fuel sampling and analysis methods) to determine if sulfur dioxide emission limits and/or other fuel requirements are being met

- Reports of process/control equipment malfunctions causing reportable excess emissions (refer to SIP to determine reportable malfunctions and report requirements)

- Source test reports to determine if NSPS, NESHAPs, and/or major sources have demonstrated compliance with emission standards

- CEM reports to determine if NSPS and SIP reporting requirements are being met (reported emissions should be checked against raw data for accuracy and reported corrective actions should be checked for implementation)

- CEMS/COMS certification tests (relative accuracy and calibration drift) to verify that performance specifications at 40 CFR 60, Appendix B are met

- Records and reports specified in SIP regulations, NSPS and NESHAP subparts, and applicable permits

The on-site inspection should also include the following:

- Visible emission observations (VEOs), by inspectors certified to read smoke within the last 6 months, to determine compliance with SIP, NSPS, or NESHAPs opacity limits (document noncompliance with EPA Method 9, 40 CFR 60, Appendix A)

- A check of real time CEM measurements to determine compliance SIP, NSPS or NESHAPs limits (opacity CEM measurements can be compared against VEOs)

- A review of CEM/COMS calibration procedures and frequency to determine if the zero/span check requirements and analyzer adjustment requirements of 40 CFR 60 are being met

- Observations of process and control equipment operating conditions to determine compliance with permit conditions (if no permit conditions apply, control equipment operating conditions can be compared to baseline conditions from stack tests or manufacturers specifications for proper operation)

- A review of all sources to determine if existing, new, modified or reconstructed sources have construction and operating permits required by SIP (note other process changes that may not require a permit but could effect emissions)

- Observation of control equipment operating conditions and review of equipment maintenance practices and records to determine proper operation of control equipment

SAFE DRINKING WATER ACT (SDWA)

Basic Program

Public drinking water supply systems (i.e., serve at least 25 people) are regulated by the Safe Drinking Water Act (SDWA), as amended. EPA sets standards for the quality of water that can be served by public water systems, [known as Maximum Contaminant Levels (MCLs)]. Public systems must sample their water periodically and report findings to the State (or EPA, if the State has not been delegated the authority to enforce the SDWA). They must notify consumers if they do not meet the standards or have failed to monitor or report. EPA is on a statutory schedule for promulgating a large number of new MCLs.

Evaluating Compliance

Water Supply Systems

The Underground Injection Control (UIC) program was developed pursuant to the Safe Drinking Water Act (SDWA) (Public Law 93-523) , Part C - Protection of Underground Sources of Drinking Water (40 CFR Parts 124 and 144 through 148).

The UIC program regulates five classes of injection wells, summarized as follows:

Class I	Industrial, municipal, or hazardous waste disposal beneath the lowermost underground source of drinking water (USDW)
Class II	Oil- and gas-related wells used for produced fluid disposal, enhanced recovery, hydrocarbon storage, etc.
Class III	Mineral extraction wells
Class IV	Hazardous or radioactive waste disposal above or into a USDW
Class V	Injection wells not included in Classes I through IV

Monitoring requirements for water supply systems and whether or not the system can be reasonably expected to routinely provide safe potable water should be determined. Many facilities purchase their potable water supply from a nearby municipality. If no further treatment is provided (e.g., chlorination by the facility), the facility remains a "consumer" rather than becoming a "supplier," and consequently does not have the monitoring or reporting requirements that a supplier would have. Nevertheless, the facility does have a responsibility to assure that their actions do not result in contamination of the municipal water supply (e.g., through cross-connection). The audit team should be alert to these possibilities.

Inspectors should:

- Verify public water system records of monitoring and reports of exceeding MCLs.

- Interview water system personnel to identify potential operations and maintenance problems.

- Obtain water source, treatment, and service area information.

UIC inspector should determine the following:

- Injection well construction
- Potential pathways of endangerment to underground sources of drinking water (USDWs)
- Protection of USDWs from endangerment
- Frequency and type of mechanical integrity testing (MIT)
- Annular pressure
- Annular pressure monitoring
- Radioactive tracer surveys
- Installation methods for well plugging
- Remedial operations
- Applicability of Land Disposal Restrictions to injection well operations
- Recordkeeping and evidence documentation
- Outlets for floor drains
- Connection to "dry" wells

Several states and industries have requested approval of various alternative mechanical integrity testing methods or variances to accommodate special local hydrogeological conditions, historical practices, or industry interests. Inspectors and field investigators should be cautioned to keep current with special permit conditions and the status of any pending approvals/denials of alternative mechanical integrity testing procedures and variances.

TOXIC SUBSTANCES CONTROL ACT (TSCA)

This section describes those specific aspects of toxic chemical control that are addressed by the Toxic Substances Control Act (TSCA) and its associated rules and regulations (40 CFR Parts 702 through 799).

Basic Program

The regulation of toxics under TSCA is subdivided into two components for Agency enforcement program management purposes.

1. "Chemical control" covers enforcement aspects related to specific chemicals regulated under Section 6 of TSCA, such as polychlorinated biphenyls (PCBs), chlorofluorocarbons (CFCs), and asbestos.

2. "Hazard evaluation" refers to the various recordkeeping, reporting, and marketing submittal requirements specified in Sections 5, 8, 12, and 13 of TSCA; although, some elements of what might be termed "chemical control" are also addressed in these sections. Sections 12 and 13 of TSCA, which pertain to chemical exports and imports, respectively, will not be covered in this manual due to their special nature and unique requirements.

Prior to discussing TSCA activities [11*] at a facility, the investigator must present appropriate facility personnel with copies of the following two TSCA audit forms [Appendix P]:

1. Notice of Inspection - Shows purpose, nature, and extent of TSCA audit

2. TSCA Inspection Confidentiality Notice - Explains a facility's rights to claim that some or all the information regarding toxic substance handling at the facility is to be considered as TSCA Confidential Business Information (CBI)

Before leaving the site, the following two forms [Appendix P] must be completed, as appropriate.

1. Receipt for Samples and Documents - Itemizes all documents, photos, and samples received by the investigator during the audit

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[*] *All personnel handling material claimed as Confidential Business Information under TSCA must be cleared for access to that material in accordance with Agency procedures. An annual update is required.*

2. Declaration of CBI[12*] - Itemizes the information that the facility claims to be TSCA CBI

Evaluating Compliance

Chemical Control

Although the controlled substances most frequently encountered during multi-media investigations are polychlorinated biphenyls (PCBs), the investigator should determine if other regulated toxic substances are present at the facility. Currently these include metal working fluids (Part 747), fully halogenated chlorofluoroalkanes (40 CFR 762), and asbestos (40 CFR 763); additional toxic substances may be regulated in the future. Because the probability of finding PCBs and PCB items at a facility is greater than finding other TSCA-regulated substances, the following discussion is directed toward an evaluation of compliance with proper PCB and PCB item handling procedures. Should other TSCA-regulated substances be present, the investigator should consult the regulations for appropriate requirements.

Management of PCBs/PCB items is regulated under 40 CFR 761. In general, these regulations address recordkeeping, marking and labeling, inspections, storage, and disposal.

Facilities which store and/or dispose of PCBs and PCB items should have EPA-issued Letters of Approval which contain facility operating and recordkeeping requirements in addition to those specified in 40 CFR 761. The investigator must obtain a copy of these approvals and any subsequent notifications to evaluate facility compliance. The inspector should review Part 761.30 to identify uses of PCB transformers which are prohibited beginning October 1, 1990, but with effective dates extending to October 1, 1993. The inspector should also review the requirements found in Part 761.30 which allow the installation of PCB transformers for emergency use.

In general, the compliance evaluation includes obtaining and reviewing information from Federal, State, and local regulatory agency files; interviewing facility personnel

[*] *These forms are generally completed during the closing conference. During the opening conference, facility personnel should be made aware that the latter form is used to itemize TSCA CBI material.*

regarding material handling activity; examining facility records and inspecting material handling units. Specific investigation tasks include:

- Inspect all in-service electrical equipment, known or suspected of containing PCBs, for leaks or lack of proper marking. A similar inspection should also be made of any equipment that the facility is storing for reuse. Make certain that any remedial actions were quick and effective in the case of leaks, spills, etc.

- If the above equipment includes any PCB transformers make certain that all relevant prohibitions are being met, such as those involving enhanced electrical protection, as well as other requirements in the Use Authorization section of the PCB Rule. Likewise with large PCB capacitors. Make certain that any hydraulic or heat transfer systems suspected of containing PCB fluids have been properly tested.

- Determine whether the facility is involved with servicing PCB items or using/collecting/producing PCBs in any manner. If so, make certain that the appropriate requirements of the PCB Rule are being met.

- Determine whether the facility is involved with either the storage or disposal of PCBs/PCB items. Inspect all storage for disposal facilities for proper containment, leaking items, proper marking, dates/time limits, location, protection from elements, and other necessary requirements. If the facility disposes of PCBs, make certain that proper methods are being employed and that design and operation of disposal units is in accordance with regulatory requirements.

- Determine whether storage/disposal facilities are complying with the notification and manifesting requirements contained in Subpart K of the PCB Rule.

- Thoroughly review, for purposes of adequacy and regulatory compliance, all records and reports required by the PCB Rule including the following:

- Annual documents
- Inspection logs
- PCB transformer registration letters
- Manifests/certificates of destruction
- Test data
- Spill clean-up reports
- EPA issued permits or Letters of Approval
- SPCC plan, if one is necessary
- Operating records
- Notification of PCB activity

Hazard Evaluation

Establishing compliance with the various hazard evaluation aspects of TSCA is best accomplished through review and evaluation of the recordkeeping, reporting, and submittal data required by the various regulatory components of Sections 5 and 8. In general, Section 5 addresses new chemicals (i.e., those not on the TSCA Chemical Substances Inventory) and Section 8 provides for control of existing chemicals (i.e., those chemicals that are on the TSCA Chemical Substances Inventory).

Much of the information obtained and reviewed under these two sections of TSCA will be declared "TSCA Confidential Business Information" (CBI) by company officials and, thus, special security procedures must be followed during review and storage of the documents, as discussed elsewhere.

The glossary [Appendix Q] and 40 CFR Parts 703 through 723 should be consulted for an explanation of TSCA terms and definitions. The following list summarizes the different objectives for inspections of the key TSCA Sections 5 and 8 components.

1. Premanufacture Notification (PMN)

   a. Verify that all commercially manufactured or imported chemicals are either on the TSCA Chemical Substances Inventory, are covered by an exemption, or are not subject to TSCA.

b. Verify that commercial manufacture or import of new chemicals did not begin prior to the end of 90-day review date [Appendix A, page A-24], and not more than 30 days before the Notice of Commencement (NOC) date. If commercial manufacture or import has not begun, verify that no NOC has been submitted .

c. Verify the accuracy and documentation of the contents of the PMN itself.

2. Research and Development (R&D) Exemption

a. Verify that the recor dkeeping and notification requirements are being met for all R&D chemicals.

b. Verify that "Prudent Laboratory Practices" and hazardous data searches are adequately documented.

3. Test Marketing Exemption (TME)

   a. Verify that the conditions spelled out in the TME application are being met, particularly with respect to dates of production, quantity manufactured or imported, number of customers and use(s).

   b. Verify that the TME recordkeeping requirements are being met.

4. Low Volume Exemption (LVE) and Polymer Exemption (PE)

   a. Verify that specific conditions of the exemption application are being met, and that all test data have been submitted.

   b. For an LVE, verify that the 1,000-kg limit per 12-month period has not been exceeded. For a PE, assure that the chemical structure and monomer composition(s) are accurate.

   c. Verify that recordkeeping requirements for both LVEs and PEs are being met.

5. 5(e)/5(f) Order, Rule, or Injunction

   a. Verify that all conditions of the order, rule, or injunction are being followed, including use of protective equipment, glove testing, training, and recordkeeping.

   b. If a testing trigger is specified, verify production volume and status of testing activity.

6. Significant New Use Rule (SNUR)

   a. Verify that no commercial production has occurred prior to the 90-day review date.

   b. Verify that SNUR notices have been submitted for all applicable manufactured, imported, or processed chemicals.

   c. Verify technical accuracy of SNUR submittal and completeness of required recordkeeping.

7. Bona Fide Submittals

   Determine the commercia l production (or import) status and R&D history of those bona fide chemicals not found on the confidentia l 8(b) inventory. Verify findings against applicable PMN, TME, or other exemption.

8. Section 8(a) Level A PAIR and CAIR Report

   a. Determine if Preliminary Assessment Information Rule (PAIR) and Comprehensive Assessment Information Rule (CAIR) reports have been submitted for all 8(a) Level A listed chemicals manufactured or imported by the facility.

   b. Verify the accuracy of submitted PAIR information, particularly the reported figures for total production volume and worker exposure levels.

   c. Verify the accuracy of submitted CAIR information and if the report meets the date specified in the regulation.

9. Section 8(b) Inventory Update Rule (IUR)

   a. Verify the accuracy of the information submitted in response to the IUR.

   b. Determine that required information was submitted by the prescribed deadline for all chemicals subject to IUR.

10. Section 8(c) Recordkeeping

   a. Determine if the facility has a Section 8(c) file and that allegations of significant health and environmental harm on record are properly filed and recorded.

   b. Determine that all applicable allegations have been recorded and filed.

   c. Determine if the facility has a written Section 8(c) policy and if the policy includes outreach to the employees.

11. Section 8(d) Reporting

   Determine if copies (or lists) of all unpublished health effects studies have been submitted by manufacturers, importers, and processors for any Section 8(d) listed chemical.

12. Section 8(e) Reporting

   a. Verify that all Section 8(e) substantial risk reports to the Agency were accurate and submitted within the required time frames.

   b. Verify that all substantial risk incidents and/or test results have been reported to EPA.

   c. Determine that the company has an adequate written policy addressing Section 8(e), and that it relieves employees of individual liability.

FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA)

Basic Program

Pesticides are regulated by FIFRA and regulations developed under delegated State programs. Under FIFRA, pesticide products must be registered by EPA before they are sold or distributed in commerce. EPA registers pesticides on the basis of data adequate to show that, when used according to label directions, they will not cause unreasonable adverse effects on human health or the environment.

To ensure that previously registered pesticides meet current scientific and regulatory standards, in 1972 Congress amended FIFRA to require the "reregistration" of all existing pesticides.

Evaluating Compliance

The following list is for use in conjunction with specific storage/ use/disposal requirements found on pesticide labels. FIFRA requires a written notice of inspection and written receipt for samples and documents collected.

- Determine types and registration status of all pesticides produced, sold, stored, and used at the facility, particularly if any are restricted or experimental use pesticides.

- Determine use(s) of each pesticide.

- Determine certification status of facility/handlers.

  - Verify who certifies facility/pesticide handlers [EPA, State, Department of Defense (DOD)].

  - Determine if commercial or private application.

  - If restricted-use pesticides are used, check if pesticide applicators are authorized to use these pesticides.

  - Check expiration dates on licenses/certificates.

- Review applicable records.

  - Check previous audit records and complaints.

  - Check application records.

  - Check restricted-use pesticides records (must b e kept at least 2 years). Document suspected violations accordingly.

  - Check inventory records.

  - Check training records.

  - Check equipment repair records.

- Inspect storage, mixing/loading, and container disposal areas.

  - Check bulk storage areas for compliance with Federal/ State rules.

  - Check location, ventilation, segregation, shelter, and housekeeping of pesticide storage/h andling areas. Check security, fire protection, and warning signs, as may be required by State regulations.

  - Check mixing equipment/procedures for reducing handlers' exposures to pesticides.

  - Check for safety equipment/procedures/use.

  - Check container cleanup and disposal procedures.

- Pesticide waste disposal

- Check to see that pesticides are disposed of in accordance with applicable label and RCRA requirements.

- Determine measures taken to ensure worker safety.

  - Check pesticide use records for re-entry time limit notation.

  - Check pesticide use records for record of informing farmer or warning workers and/or posting fields.

  - Provide farmer and/or applicator copy of current worker protection standards.

- Observe actual pesticide application.

  - Observe mixing/loading and check calculations for proper use dilution.

  - Observe when spray is turned on/off with respect to ends of field.

  - Watch for drift or pesticide mist dispersal pattern.

  - Note direction of spraying pattern and trimming techniques.

  - Record wind speed and direction, air temperature, and relative humidity.

  - Observe application with respect to field workers, houses, cars, power lines, and other obstacles.

  - Determine if applicator and assisting personnel are wearing safety gear required by the label.

EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT (EPCRA)

Basic Program

The Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 is a free-standing law contained within the Superfund Amendments and Reauthorization Act (SARA) of 1986. EPCRA is also commonly known as SARA Title III. EPCRA requires dissemination of information to State and community groups and health professionals on chemicals handled at regulated facilities.

An EPCRA audit verifies that the facility owner/operator has notified State and local agencies of regulated activities; has submitted information to specific State and local agencies; and has prepared and submitted all other required reports.

Evaluating Compliance

Emergency Planning (Sections 301 through 303)

EPA promulgated regulations which identify extremely hazardous substances and the levels to be regulated under EPCRA. The inspector should determine whether the facility is subject to EPCRA regulation. If the facility does meet the requirements, the inspector should verify whether the facility owner/operator:

- Notified the State emergency response agency and the local emergency planning committee that the facility is regulated under EPCRA

- Designated a facility emergency coordinator to assist the local emergency planning committee in the planning process

- Notified the local emergency planning committee of the emergency coordinator's identity

Emergency Notification (Section 304)

The owner/operator of a facility subject to EPCRA must immediately report releases of hazardous substances. Substances subject to this requirement are the extremely hazardous substances listed in 40 CFR Part 355 and substances subject to the emergency notification requirements under CERCLA Section 103(a) or (c). The inspector should verify whether an immediate notification was made to the:

- State emergency response commission
- Local emergency planning committee
- National Response Center for spills involving CERCLA reportable quantities

Community Right-to-Know Requirements (Sections 311 through 312)

Manufacturing facilities subject to the Occupational Safety and Health Act (OSHA) Hazardous Communication Regulation (29 CFR Part 1910) are required to prepare Material Safety Data Sheets (MSDS) for each hazardous chemical handled at the facility. Manufacturing facilities covered are contained within Standard Industrial Classification (SIC) Codes 20 through 39. OSHA revised its Hazardous Communication Regulation, effective September 23, 1987, to require that MSDSs be prepared by nonmanufacturing facilities. The inspector should verify that the facility owner/operator has sent

the following to the State emergency response commission, the local emergency planning committee and the local fire department:

- MSDS or a list of chemicals covered by MSDS found at the facility

- An annual inventory of hazardous chemicals found at the facility

Toxic Chemical Release Reporting (Section 313)

Covered facilities (40 CFR Part 372.22) that manufacture, import, process, or use certain chemicals must annually report releases to the environment. The inspector should determine whether the facility owner/ operator is required to submit a report (Form R) by July 1 for the preceding calendar year(s). All the following conditions must apply at the facility in order to meet the reporting requirements:

- The facility has 10 or more full-time employees

- An operation(s) identified in SIC Codes 20 through 39 is present

- The amount of chemical(s) handled exceeds the applicable threshold quantity

COMPREHENSIVE EME RGENCY RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA)

The Superfund law of 1980 (CERCLA) including the SARA amendments of 1986 authorizes EPA to clean up hazardous substances at closed and abandoned waste sites and to recover the cost of cleanup and associated damages from the responsible parties. EPA can also take enforcement action against responsible parties to compel them to clean up sites. Other provisions of CERCLA require releases of hazardous substances over a specified amount ("reportable quantities") to be reported.

CERCLA is mostly an "after-the-fact" cleanup program, and there are no routine compliance monitoring inspections as i n other programs. Sites are visited and environmental and other data are gathered for evaluation and assessment purposes, as well as to identify potential responsible parties. This information may ultimately be used in enforcement actions to recover the costs of cleanup or to compel cleanup by responsible parties.

Although CERCLA is not oriented to routine inspectio ns of active industrial facilities, inspectors should be alert to signs of potential abandoned dump sites, spills, potential release of hazardous waste s, or other Superfund-type situations while they are out in the field, such as:

- Rusting drums and containers, evidence of spills, discolored vegetation, discolored water, foul-smelling lagoons

- Statements by facility personnel about how they handle wastes

- Records of spills or other releases of hazardous substances, or potential releases of hazardous substances

- Records of non-RCRA sites where hazardous substances have been stored, treated, or disposed

The investigator should determine, through records review, interviews, etc., whether all RCRA and CERCLA sites have been reported to the proper authorities. The investigator should also evaluate assessment and response programs at a facility, if this objective is within the scope of the audit.

Additionally, the facility should be evaluated concerning State and local requirements controlling past and current disposal of municipal waste, nonhazardous industrial waste, and construction debris. The information concerning such past disposal activities may lead to unreported RCRA and CERCLA sites.

The initial step in evaluating compliance with solid/hazardous waste requirements is to identify all present and past waste streams generated at the facility and determine which are regulated by Federal,[13] State,[14] or local regulations, licenses, and approvals. Preferably, thi determination is initiated during background document review before the on-site facility audit and supplemented/modified using information obtained while on-site. All waste streams generated (even those that the generator claims are not regulated) must be evaluated for regulatory inclusion. This will allow the investigator to determine whether the generator has properly identified all regulated waste streams.

Once regulated waste is identified, the investigator can track the material from generation to final on-site disposition (on-site treatment/ disposal) or storage and transport for off-site disposal and determine compliance with applicable regulations. Throughout the investigation, the investigator must keep in mind that both past and present activities need to be evaluated for compliance with applicable regulations.

LABORATORY AND DATA QUALITY AUDITS

The purpose of laboratory evaluations and data quality assessment is to determine if all analytical and monitoring requirements have been met and to characterize data usability. The two approaches used are: (1) performance and (2) systems audits. This section discusses

13 *Definitions, identification, and listing of Federally regulated waste are given in 40 CFR 260 and 261 and CERCLA § 101.*

14 *Nonhazardous solid waste is usually regulated by the State and these regulations must be obtained to evaluate applicable facility activity.*

the approach to laboratory auditing under the CWA, RCRA waste handling, and RCRA groundwater regulations.

Performance audits are independent checks made to evaluate the quality of data produced by the total measurement system. This type of audit assesses the results and usually does not examine the intermediate steps to achieve these results. One example is the performance evaluation check sample which is used to validate calibration accuracy but usually not the overall effectiveness of the methodology. Another example is an audit of a particular measurement device using a reference device with known operational characteristics.

A systems audit typically involves an inspection of the components comprising the total measurement system. The Agency has certain expectations of the process used to sample, analyze, and report results. The systems audit is designed to objectively examine each important part of that process to determine deviations from required or recommended practice. The systems audit is more qualitative than the performance audit. A systems audit assesses such items as equipment, personnel, physical aspects, analytical and quality control procedures, quality assura nce procedures, and other laboratory or measurement procedures. From a regulatory perspectiv e, this type of audit may find noncompliance with equipment or procedural requirements, or even fraud.

Typically, a systems audit combined with performance audits will be conducted in order to extract the maximum amount of information.

A detailed list of items should be requested from the company and co ntract laboratory. This list should include:

- Standard Operating Procedures (SOPs)
- Quality Assurance Plan
- Personnel resumes
- Instrument maintenance and calibration records
- Monitoring data to be looked at

If performance evaluation samples are to be analyzed, these should be forwarded to the company at the earliest possible time. If preliminary data is available, it should be carefully examined for problems and if problems are found, a more careful examination of these areas can be made on-site.

During the on-site visit, every component of sample handling, sample analysis, and data reduction should be examined. The auditor starts with the laboratory supervisor and QA officer to verify that the information supplied on personnel training, quality assurance/quality control, and SOPs is correct. For each parameter determined, the individual or individuals who actually make that determination are interviewed. The analyst is asked to detail exactly what happens to each sample and demonstrate the use of equipment including instrument calibration. Checklists are prepared as an aid to the inspector. Bench data (initially recorded numbers, strip charts, etc.) is selected. Final results are calculated from the bench data by the inspector and compared with the results reported to the agency. On-site personnel will be asked to explain any discrepancies at this time. Other documents necessary to the case or as potential evidence are copied.

The final assessment and data quality determination is normally performed following the on-site audit. Critical data are re-examined for trends and anomolies. Where necessary, data is computerized and analyzed using statistical software packages. Techniques such as mass balance, solubility product determination, oxidation-reduction state consistency are used, where applicable, to indicate data problems. A propagation of error treatment may be used to establish data quality. Performance audit results are evaluated against reference database statistics. Tasks for common laboratory audits are:

<u>NPDES (Water)</u>

- Determine that the exact date, time, and person who takes each sample are recorded.

- Determine that the exact date, time, person, and method used for each type of determination are recorded.

- Inspect permit carefully to ensure that the permittee adheres to specified conditions.

- Ensure that methods used are in conformance with 40 CFR 136 unless alternate approval has been obtained.

- Ensure that proper chain-of-custody, accurate flow measurements, field preservation techniques, and instrument calibration procedures are practical.

RCRA Waste Handling

- Determine which parts of the regulations are applicable to the site.

- Determine which waste analysis plans (WAPs) were in effect during the time of records and evaluation.

- Determine that the WAPs meet the specifications of the regulation.

- Determine that each type of analysis specified in the WAPs is performed in accordance with the methodology specified and under the circumstances required.

- Determine that the methodology specified is adequate.

RCRA Groundwater

- Determine that the sampling and analysis plan (SAP) is adequate.

- Determine that the laboratory follows the methodology specified in the SAP.

- Determine that this methodology is adequate.

- Calculate detection limits to ensure that they are adequate for groundwater protection.

FIELD CITATIONS AND DOCUMENTATION

Field Citations

The use of field citations will be predicated on policies established by the individual program offices. They will be used if appropriate forms exist and the universe of violations for which they apply are well defined, unless specifically requested not to do so.

Other Facility Material

A serialized, document control system should be used to ensure that all facility documents are readily available when preparing the investigation report, and that all will be accounted for when the project is completed. All facility documents should be numbered, logged in for accounting purposes, provided to the appropriate investigation personnel, and ultimately filed or attached to the final investigation report, depending on the nature of the document. The team leader should have full responsibility for implementing this system for his/her particular investigation(s).

Documents received from a facility should be inventoried and a receipt for documents provided to the facility. EPA laws allow for the copying of documents. In some cases, facilities may not provide copies of requested documents so the investigators will have to provide their own document copying equipment (e.g., a rental portable copying machine). If the company provides copies, the investigator should offer and be prepared to pay a reasonable cost for each copy (see FOIA guidance/procedures for guidance on typical costs).

Project Logbook

The team leader should provide a bound logbook to every individual participating in the investigation. Each investigator should maintain his/her own investigation logbook, and they will form the basis for preparing the written investigation report. All logbooks issued by EPA are the property of EPA and should be turned over to the team leader for filing, after the final report is completed. In addition to documenting pertinent observations/ findings/comments, logbooks should also include any *in situ* measurements and descriptive information relative to all sampling operations. Any change in the logbook should be initialed and dated. It is important to remember that logbooks can end up in court, and therefore. must only contain facts, figures, and observations.

Chain-of-Custody

The team leader should be responsible for taking an adequate number of sample tags and chain-of-custody forms for the on-site investigation. If possible, these should be in serialized order. He/she should distribute them to the team members on an as needed basis. Each investigator that collects samples must prepare and be custodian of all chain-of-custody records for those samples until they are returned to the laboratory. When chain-of-custody records are no longer needed by the sampler, the original copies should be given to the team leader who will then file them for possible future use.

Photographs

All photographs should remain in the possession of the investigator that took them. That person will also be responsible for properly labeling the photographs so that they can be attached to the investigation report, and making a copy of each so they can be included in the master project file. Each photograph should be given a separate number for identification purposes, when it is taken. Corresponding entries should also be made in the logbook. For each numbered photograph, the photographer should include the following information in his/her logbook:

- Name of photographer
- Date
- Time
- Subject of photograph
- Direction of photograph

Additional information on photographs/microfilm is presented in Appendix J.

INVESTIGATION REPORT

After the on-site investigation is completed, information obtained is further evaluated and findings/conclusions are developed. An inspection report is then written to present the findings, conclusions, and supporting information in a logical organized manner. Reports should be prepared and peer-reviewed before they are published in final form. The procedure involves developing a draft for internal review, then a subsequent, revised draft for external (client) review. Upon receipt of comments on the external review draft, a final report is prepared. The final report is the basis for follow-up activities or enforcement actions that might be initiated.

Inspection reports are prepared by the appropriate individual or project team member(s) under the direction of the team leader. All participants in the report preparation process must assure that their individual contributions to the report are accurate, relevant, objective, clear, fully supportable, and commensurate with Agency policy. Supporting information and documents used or referred to in the report are implicitly endorsed, unless disclaimed. Report authors are responsible for determining where such disclaimers are needed. Although the overall responsibility for the preparation and content of the reports rests with the project coordinator, team members are responsible for the quality, accuracy, and admissibility of information in the final report.

Many different formats are possible for the multi-media inspection report. Generally, reports for the Categories C and D inspections are longer and require more effort to produce a cohesive, readable document. The potential audience for a multi-media inspection report may be diverse and includes not only technical peers but also managers, lawyers, judges, reporters, informed citizens, and other non-technical readers; the reports are written for this diverse audience.

Readability of the longer reports may be enhanced by organizing the report into two major sections: the Executive Summary and the Technical Report. The Executive Summary section clearly states inspection objectives, discusses relevant background information, summarizes inspection methods, and, as appropriate, presents conclusions regarding facility compliance which are supported by a brief summary of the findings. The Summary should include enough specifics to accurately determine whether a violation has occurred (e.g., "insufficient aisle space" is not all right; "aisle space less than 15 inches" is all right). The Technical Report section more comprehensively describes the inspection, giving specific details about the findings, including sample collection and analysis, and other pertinent aspects of the investigation. Findings in the Executive Summary must correlate to and be supported by discussion in the Technical Report.

Distribution of final reports is coordinated with the requesting office, program office, and Regional counsel. Reports containing confidential business information (CBI) may be subject to distribution restrictions. EPA reports containing material asserted to be CBI by the company may not be shared with non-Federal agencies without obtaining specific authorization from the company. [15]

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

The Secretary of Labor and Administrator of EPA signed a Memorandum of Understanding (MOU) on November 23, 1990 with the goal of establishing a program for improved environmental and workplace health and safety. Implementation of the program is to be coordinated primarily by

the Occupational Safety and Health Administration (OSHA) and EPA Office of Enforcement. Although the two agencies have worked cooperatively together in the past on a number of issues and investigations, no comprehensive structure existed to focus that cooperative effort nationally. Having such a comprehensive structure is particularly critical, given the need to assure the most effective use of limited Federal resources and potential overlapping EPA-OSHA responsibilities.

The MOU provides for coordinated and joint inspections of facilities believed to be in violation of Federal workplace or environmental standards, facilitates the exchange of technical information, computer data bases, and other information to allow for better targeting of inspections, and provides for cross-training programs.

The MOU requires that a number of specific actions be taken, including the development of a workplan for 1991 with subsequent annual workplans to be developed by the beginning of each succeeding fiscal year. Separate agreements and data exchange will also be developed in the future.

Furthermore, all Agency investigators should be aware of OSHA requirements and be alert for potential violations of OSHA requirements. Team leaders should be aware of appropriate procedures to refer potential violations to OSHA.

15 *Restrictions on distribution of CBI information are presented in 40 CFR Part 2.*

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APPENDICES

APPENDIX A

SUMMARY OF POLLUTION CONTROL LEGISLATION

Appendix A
SUMMARY OF POLLUTION CONTROL LEGISLATION

This appendix is a synopsis of the Federal approach to environmental regulation, EPA enforcement remedies and a summary of each of the major pollution control acts: the Clean Air Act (CAA), the Clean Water Act (CWA), the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA/Superfund), the Toxic Substances Control Act (TSCA), the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), the Safe Drinking Water Act (SDWA), and the Emergency Planning and Community Right-to-Know Act (EPCRA). Because these laws and the regulations promulgated thereunder typically are very complex and are continually being modified, the investigator should carefully review the specific provisions which apply to the operations of the facility before conducting an inspection.

GENERAL FEDERAL APPROACH TO ENVIRONMENTAL REGULATION

National standards are established to control the handling, emission, discharge, and disposal of harmful substances. Waste sources must comply with these national standards whether the programs are implemented directly by EPA or delegated to the States. In many cases, the national standards are applied to sources through permit programs which control the release of pollutants into the environment. EPA establishes the Federal standards and requirements and approves State programs for permit issuance.

The States can set stricter standards than those required by Federal law. Some of the larger programs which have been delegated by EPA to qualifying States are the National Emissions Standards for Hazardous Air Pollutants (NESHAP), and the Prevention of Significant Deterioration (PSD) permits under the CAA, the Water Quality Standards, and the National Pollution Discharge Elimination System (NPDES) programs under the CWA, the Hazardous Waste Program under RCRA, and the Drinking Water and Underground Injection Control (UIC) programs under the SDWA. Conversely, TSCA is administered entirely by the Federal government; although, States may have their own program regulating PCBs and asbestos.

EPA ENFORCEMENT OPTIONS

- Issuance of an Administrative Compliance Order, sometimes preceded by a Notice of Violation[1] - A Compliance Order will specify the nature of the violation and give a reasonable time for compliance. The order, if violated, can lead to enforcement action pursuant to the civil and/or criminal process of environmental laws.

- Issuance of an administrative complaint for civil penalties - Parties named in such complaints must be given notice and an opportunity for a hearing on the alleged violations before a penalty can be assessed by EPA.

- Under certain statutes (e.g., SDWA) EPA may take whatever action is necessary to protect the public health, in emergency situations, without first obtaining a judicial order.

- EPA generally may go directly to Federal court seeking injunctive relief or a civil penalty without using administrative procedures. EPA also may obtain

1 *A concise written statement with factual basis for alleging a violation and a specific reference to each regulation, act, provision, or permit term allegedly violated*

an emergency restraining order halting activity alleged to cause "an imminent and substantial endangerment" or " imminent hazard" to the health of persons.

- EPA may go directly to Federal court seeking criminal sanctions without using administrative procedures. Criminal penalties are available for "knowing" or for "willful" violations.

In addition, EPA may suspend and/or debar a company or party that fails to comply with the environmental statutes by preventing it from entering into Federal contracts, loans, and grants. In cases where the party has been convicted of certain criminal offenses under the CAA or CWA, Federal agencies are expressly prohibited from entering into contracts, etc., with that entity.

CLEAN AIR ACT

The Clean Air Act (CAA), as amended in 1990, is one of the most comprehensive and ambitious environmental statutes ever enacted. Through it's various programs, it is intended to protect human health and the environment by reducing emissions of specified pollutants at their sources, thus allowing the achievement and maintenance of maximum acceptable pollution levels in ambient air. The CAA also contains provisions which seek to prevent presently existing unpolluted areas from becoming significantly polluted in the future. Regulations implementing the multitude of amendments enacted in 1990 will be promulgated pursuant to statutory deadlines for many years to come. Where regulations under the amendments have not yet been promulgated, requirements which existed prior to the 1990 amendments will continue to be enforceable until amended or new requirements are promulgated.

National Ambient Air Quality Standards (NAAQS)

As in prior versions of the CAA, Section 109 continues to require that EPA establish NAAQS to protect public health and welfare from air pollutants. These standards will apply in all areas of the country. "Primary" NAAQS must be designed to protect human health while building in an adequate margin for safety, whereas "secondary" NAAQS protect public welfare, including wildlife, vegetation, soils, water, property, and personal comfort. EPA has promulgated NAAQS for six air pollutants (criteria pollutants): ozone, carbon monoxide (CO), particulate matter (PM-10), sulfur dioxide ($S0_2$) nitrogen dioxide and lead.

State Implementation Plans (SIPs)

The States, through adoption of plans known as SIPs, are required to establish procedures to achieve and maintain all NAAQS promulgated by EPA. EPA has designated 247 Air Quality Control Regions (AQCRs). Each AQCR has been evaluated to determine whether the NAAQS for each of the criteria pollutants has been met. AQCRs which do not meet the NAAQS for any of the criteria pollutants are designated as "non-attainment" for those pollutants. Thus, one AQCR may be attainment for some pollutants and non-attainment for others.

The SIP program dates back to the 1970 Clean Air Act, which required States to promulgate SIPs by 1972 to assure attainment of air quality standards by 1977. Having not met that goal, the 1977 amendments continued the program, requiring additional controls designed to achieve attainment by 1982, or at the latest 1987. While the goals of the SIP program were again not reached, the 1990 amendments have further continued the effort, adding several requirements which may increase the effectiveness of the program, including the use of modeling and other specified analytical techniques to demonstrate the ability to achieve attainment and a wide range of specified control requirements. An additional advantage of the new SIP program is that under the 1990 amendments it is no longer the primary mechanism for implementation of NAAQS. Instead, the comprehensive permit program under the 1990 amendments will assume a large part of that burden by detailing the specific requirements applicable to individual sources, thereby resolving any uncertainties as to what requirements are applicable.

A SIP must contain strategies designed to meet targets for attainment of any NAAQS for which an area is non-attainment by prescribed dates. SIPs must meet Federal requirements, but each State may choose its own mix of emissions for stationary and mobile sources to meet the NAAQS. The deadline for attainment of primary NAAQS is no more than five (5) years after the area was designated non-attainment, although EPA has the authority to extend the deadline for up to five (5) additional years. Attainment for secondary NAAQS must be achieved "as expeditiously as practicable."

In order to accomplish attainment, States must impose controls on existing sources to reduce emissions to the extent necessary to ensure achievement of the NAAQS. In attainment areas, new sources and those which are undertaking modifications which will increase emissions by more than a *de minimis* amount must obtain State construction permits after demonstrating that anticipated emissions will not exceed allowable limits. In non-attainment areas, emissions from new or modified sources must be offset by emissions reductions from existing sources.

Each State must submit a proposed SIP to EPA for approval within three (3) years of designation as non-attainment. Failure to submit a SIP, failure to submit an adequate SIP or failure to implement a SIP may subject a State to the imposition of sanctions such as increased offset ratios for stationary sources, prohibition of Federal highway grants or a ban on air quality grants. For ozone non-attainment areas, failure to attain the NAAQS will result in reclassification of the area, thus imposing more stringent control requirements and imposition of financial penalties on stationary sources in severe or extreme non-attainment areas. Where an acceptable SIP is not submitted by a State, EPA will be required to propose and enforce a Federal Implementation Plan for that State. EPA and the States have concurrent enforcement authority for SIPs.

Deadlines and control requirements imposed upon non-attainment areas vary depending upon the severity of the existing air pollution problem, with correspondingly more stringent control requirements and longer deadlines applying to more polluted areas. The CAA creates five (5) classes of ozone non-attainment and two (2) categories each for carbon monoxide and PM-10 non-attainment areas.

Prevention of Significant Deterioration (PSD)

The purpose of PSD, which remains largely unchanged by the 1990 amendments, is to avoid significant future degradation of the nation's clean air areas. A clean air area is one where the air quality is better than the ambient primary or secondary standard. Designation is pollutant specific so that an area can be non-attainment for one pollutant but clean for another. PSD applies only to new and modified sources in attainment areas. Clean air areas are divided into three categories: Class I includes wilderness areas and other pristine areas, where only minor air quality degradation is allowed; Class II includes all other attainment and non-classified areas where moderate degradation is permitted; and Class III includes selected areas that States designate for development where substantial degradation is permitted. In no case would PSD allow air quality to deteriorate below secondary NAAQS.

"Baseline" is the existing air quality for the area at the time the first PSD permit is applied for. "Increments" are the maximum amount of deterioration that can occur in a clean air area over baseline. Increments in Class I areas are smaller than those for Class II areas and Class II increments are smaller than those for Class III areas. For purposes of PSD, a major emitting source is one which falls within 28 designated categories and emits or has the potential to emit more than 100 tons per year of the designated air pollutant. A source that is not within the 28 designated categories is a major source if it emits more than 250 tons per year. Modifications to major sources that will result in a "significant net emissions increase" of any regulated pollutant are also subject to PSD. The amount of emissions which qualifies as significant varies for the regulated pollutants.

Under this program, new "major stationary sources" and "major modifications" to such sources located in attainment areas must obtain a permit before beginning construction. Permit requirements include installation of Best Available Control Technology (BACT) for each regulated pollutant emitted in significant amounts, assurance that the new emissions will not exceed NAAQS or any maximum allowable "increment" for the area, and assurance that the new emissions will not adversely impact any other air quality related values, such as visibility, vegetation or soils.

Hazardous Air Pollutants

Prior to the enactment of the 1990 amendments, Section 112 of the CAA required the establishment of National Emission Standards for Hazardous Air Pollutants (NESHAPs) to regulate exposure to dangerous air pollutants that are so localized that the establishment of NAAQS is not justified. NESHAP standards were to be based on health effects, with strong reliance on technological capabilities. They applied to both existing and new stationary sources. During the 20 years in which this program existed, effective regulations for only seven (7) substances were enacted: benzene, beryllium, asbestos, mercury, vinyl chloride, arsenic, and radionuclide emissions.

As rewritten in 1990, the goal of Section 112 remains the same - to protect public health and the environment from toxic air pollutants for which NAAQS will not be established. While the new program requires standards to be set for categories and subcategories of sources that emit hazardous air pollutants, rather than for the air pollutants themselves as under the NESHAP program, the seven (7) NESHAPs promulgated prior to the amendments will generally remain applicable until they are revised pursuant to the timetables established in the new Section 112.

Under the 1990 amendments, two types of sources have been identified for purposes of establishing emission standards - "major sources", which include stationary sources or a group of stationary sources within a contiguous area and under common control that emit or have the potential to emit 10 tons per year of a single listed hazardous air pollutant or 25 tons per year of any combination of listed hazardous air pollutants; and "area sources", which include numerous small sources that may cumulatively produce significant quantities of a pollutant resulting in a threat of adverse effects on human health or the environment. An initial list of 189 air pollutants requiring regulation was established by Congress and EPA has been tasked with the responsibility for establishing lists of categories and subcategories of major sources and area sources subject to emission standards.

Major Sources

EPA is required to set technology-based standards for sources of the listed pollutants which are designed to achieve "the maximum degree of reduction in emissions" (Maximum Achievable Control Technology - MACT) while taking into account costs and other health and environmental impacts. The standards for new sources "shall not be less stringent than the most stringent emissions level that is achieved in practice by the best controlled similar source" in the same category or subcategory. For existing sources, the standards may be less stringent than those for new sources, but in most circumstances must be no less stringent than the emissions control achieved by the best performing 12% of sources in the category or subcategory [or five (5) sources in a category with less than 30 sources]. Existing sources are given three (3) years following the promulgation of standards to achieve compliance, with the possibility of a one- (1)-year extension. Sources that voluntarily reduce emissions by 90% before an applicable MACT is proposed (95% for hazardous particulates) may be granted one (1) six- (6)-year extension from the MACT. Solid waste incinerators will be required to comply with both these hazardous air pollutant standards and the new source performance standards to be promulgated pursuant to Section 111 of the CAA.

The second provision of Section 112 relating to major sources sets health-based standards to address situations in which a significant residual risk of adverse health effects or a threat of adverse environmental effects remains after installation of MACT. Within six (6) years of enactment of the CAA, and after consultation with the Surgeon General and opportunity for public comment, EPA must report to Congress regarding the public health significance of the residual risks, technologically and commercially available methods and costs of reducing such risks and legislative recommendations to address such residual risks. If Congress does not act on the recommendations submitted by EPA, the EPA must issue residual risk standards for listed categories and subcategories of sources as necessary to protect public health with an ample margin of safety or to prevent adverse environmental effects.

Area Sources

The goal of the area source program is to reduce the incidence of cancer attributable to stationary area sources by at least 75% through a comprehensive national strategy for emissions control in urban areas. By November 15, 1995, EPA is required to identify the 30 hazardous air pollutants emitted from area sources that pose the most significant risks t0 public health in the largest number of urban areas and the source categories and subcategories of those pollutants. Area sources representing at least 90% of the emissions of the 30 identified pollutants will be subject to regulations to be promulgated by EPA by November 15, 2000.

Prevention of Sudden Catastrophic Releases

As added by the 1990 amendments, Section 112 of the CAA imposes a general duty on owners and operators of stationary sources which handle hazardous substances to: identify hazards which may result from releases, design and maintain safe facilities, take action to prevent releases, and minimize the consequences of accidental releases that do occur. It also requires EPA to promulgate a list of substances which, in the event of an accidental release, may reasonably be anticipated to cause death, injury, or serious adverse health and environmental effects, as well as threshold quantities for each of those regulated substances. Requirements for release prevention, detection and correction of regulated substances must be promulgated by EPA. Among the requirements will be preparation and implementation of risk management plans by owners and operators of facilities with regulated amounts greater than the threshold quantity.

Emergency policies and the opportunity to secure relief in the district courts is provided to EPA to protect against an imminent and substantial endangerment to health or the environment as a result of an actual or threatened release of a regulated substance. An independent, five-member Chemical Safety and Hazard Investigation Board to be appointed by the President will investigate any accidental release that results in a fatality, serious injury or substantial property damage, and will issue a report to EPA and OSHA recommending regulations for preparing risk management plans and general requirements for preventing and mitigating the potential adverse effects of accidental releases.

New Source Performance Standards (NSPS)

With the exception of the extension and establishment of deadlines for EPA's proposal of various regulations, the NSPS program remains largely unchanged by the 1990 amendments. NSPS establishes nationally uniform, technology-based standards for categories of new industrial facilities by providing maximum emission levels for new or extensively modified major stationary sources. The emission levels are determined by the best "adequately demonstrated" continuous control technology available, taking costs into account. Regulations for source categories listed prior to November 15, 1990, must be proposed in phases, beginning on November 15, 1992. Standards for new categories listed after November 15, 1990, must be proposed within one (1) year of listing and must be finalized within one (1) year after proposal.

The owner or operator of a new or extensively modified major source is required to demonstrate compliance with an applicable NSPS within 180 days of initial start-up of the facility and at other times required by EPA. Primary authority for enforcement of NSPS lies with EPA unless that authority is delegated to States, in which case EPA and the States have concurrent enforcement authority.

Emission Standards for Mobile Sources

Section 202 of the CAA directs EPA to regulate air pollutants emitted by motor vehicles which "cause, or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare." In response, the Agency has set standards governing motor vehicle emissions of carbon monoxide, hydrocarbons, oxides of nitrogen and particulates. These standards have given rise to the emission control systems that first appeared in automobiles in the early 1970s. The CAA generally prohibits the removal (or rendering inoperative) of any emission control device that was installed by the vehicle manufacturer in order to meet the applicable emission standards. Most States have enacted similar laws enforcing this prohibition and/or have incorporated such prohibitions as part of their SIP.

The CAA provides EPA with the authority to control or prohibit the use of fuels which pose a public health risk or which "impair to a significant degree the performance of any emission control device or system." The Agency's regulations are based upon both of these rationales. (The best example of this is the regulations governing the lead content of gasoline.) Enforcement of the fuel standards is achieved through a combination of Federal and State efforts, and is based, in part, upon SIP provisions and/or State laws.

The 1990 amendments tightened emission standards for both heavy duty and light duty vehicles. These standards take effect at different times for different types of vehicles, beginning in 1994.

Beginning in 1995, "reformulated" gasoline limiting emissions of air pollutants must be sold in the nine worst ozone non-attainment areas (Los Angeles, San Diego, Baltimore, Philadelphia, New York, Hartford, Chicago, and Milwaukee). Other ozone non-attainment areas may elect to use reformulated gasoline as it becomes more widely available.

Two "alternative fuel" programs are expected to reduce emissions in the most seriously polluted areas. California will develop a program requiring introduction of low emission vehicles and ultra low emission vehicles beginning in 1996. Additionally, in more than 20 metropolitan areas, fleets of 10 or more vehicles are required to phase in usage of "clean fuel vehicles" beginning in 1998.

Acid Rain Control

The acid rain program, added to the CAA by the 1990 amendments, primarily impacts emissions of sulfur dioxide (SO_2) and nitrogen oxides (NOx) from powerplants. It requires establishment of specific NOx emission rate limitations and implementation of a two-phase reduction of SO_2 emissions by the year 2000.

As determined by a formula based on 1985 SO_2 emissions and 1985 to 87 annual average fuel consumption for individual powerplants, marketable allowances are to be allocated to powerplants by EPA. As a general rule, only powerplants operating prior to November 15, 1990, will receive an allocation of allowances for SO_2 emissions. New units which begin operation after November 15, 1990, will be required to obtain offset allowances from existing facilities in order to continue operation after the year 2000. Allowances can be bought, sold, shared with other regulated units or banked for future use.

Facilities are not allowed to emit more SO_2 than the amount for which they hold allowances.

Penalties will be imposed at the rate of $2,000 per excess ton of SO_2 on any facility which does not have sufficient allowances to cover its SO_2 emissions. Additionally, any offending facility will be required to reduce its SO_2 emissions by one ton the following year for each ton of excess SO_2 emitted.

Stratospheric Ozone Protection Program

Another program added by the 1990 amendments is designed to protect the earth's stratospheric ozone layer by phasing out production and use of ozone-depleting substances, providing limited exemptions for uses such as medical, aviation, and fire-suppression. Production of Class I substances, those with the greatest depleting potential, will generally be prohibited after January 1, 2000. Production of Class II substances, those with less depleting potential, will be prohibited after January 1, 2030. EPA is required to promulgate rules governing issuance of production allowances for Class I and II substances and banning the production, after November 15, 1992, of non-essential products that release Class 1 substances.

Permitting

Under the Clean Air Act as it existed prior to the 1990 amendments, permits were required for only a limited number of facilities. While these requirements will continue to apply until new regulations are promulgated, the 1990 amendments have expanded the permit program to require most regulated stationary sources to have permits.

The new permitting program, patterned after the NPDES program, is designed to consolidate all operation and control requirements in one permit. However, unlike the NPDES program which focuses on individual sources within a facility, air permits are expected to be issued to a facility as a whole. As a result of this comprehensive program, greater consistency is expected and facilities will not be subjected to conflicting requirements.

Permits are required for any facility that qualifies as a "major source", which generally includes any source emitting more than 100 tons of pollutants per year, but extends to smaller sources in the more seriously polluted non-attainment areas. Permits are also required for major sources and area sources subject to regulation for emissions of hazardous air pollutants under Section 112 and all sources subject to NSPS.

Regulations establishing the numerous requirements for state permit programs must be promulgated by EPA by November 15, 1991. States must then develop and submit to EPA an operating permit program for approval by November 15, 1993. If all or any part of the program is disapproved by EPA, the States must correct the deficiencies and resubmit the program. A failure to timely submit a program or correct deficiencies will result in sanctions. If a program is not completely approved within 2 years after initial submission of the program to EPA or by November 15, 1995, whichever is earlier, EPA must promulgate and administer a permit program for the State.

Permit applications must be filed within 12 months after the permit program takes effect and must include a compliance plan for the facility. The permits, as issued, will contain enforceable emission limitations and standards, a schedule of compliance, and compliance certification, inspection, entry, monitoring and reporting requirements. Compliance with a permit will, to some extent, shield a source from enforcement actions. The extent of the protection provided by compliance will be governed by EPA's permitting regulations to be promulgated by November 15, 1991.

Enforcement

The 1990 Amendments greatly expanded enforcement options available under the CAA and impose heavy penalties, both civil and criminal, for violations of the Act.

Administrative penalties of up to $25,000 per day, to a maximum of $200,000, may be imposed by EPA for violations of any requirement, prohibition, permit, rule, or order without the initiation of a court proceeding. These penalties can be overturned only if, on judicial review, they are not supported by substantial evidence. Field investigators are also authorized to issue "field citations" imposing penalties of up to $5,000 per day per violation for minor violations observed while on site. Administrative orders requiring specific actions to comply with the CAA may be issued where compliance can be achieved within 1 year. Additionally, private citizens are now authorized to bring citizen suits seeking civil penalties for violations of the CAA where neither EPA nor the State is "diligently prosecuting a civil action" to require compliance, or seeking to compel EPA to discharge a non-discretionary duty, such as promulgating regulations by statutory deadlines.

Knowing violations of many provisions of the CAA qualify as felony crimes, punishable by fines for individuals of up to $250,000 and imprisonment up to 5 years, with each day counting as a separate violation. Fines for corporations may be up to $500,000 per day per violation. Penalties may be doubled for second convictions. The negligent release of a hazardous air pollutant or extremely hazardous substance under SARA that puts another person in imminent danger of death or serious bodily injury is punishable by fines and imprisonment for up to 1 year, while knowingly releasing such substances is punishable by up to $250,000 per day and 15 years imprisonment for individuals and up to $1 million per day for businesses.

EPA is also authorized to pay a "bounty" of up to $10,000 for information leading to a criminal conviction or a judicial or administrative civil penalty for violations of the CAA.

The CAA contains a presumption that once a violation which is likely to be of a continuing nature is proven, the violation is presumed to continue until full compliance is achieved unless the defendant can prove that the violation ceased.

CLEAN WATER ACT (FEDERAL WATER POLLUTION CONTROL ACT)

Through the 1950s and 1960s, emphasis was on the States setting ambient water quality standards and developing plans to achieve these standards. In 1972, the Federal Water Pollution Control Act was significantly amended. These changes emphasized a new approach, combining water quality standards and effluent limitations (i.e., technology-based standards). The amendments called for compliance by all point-source discharges with the technology-based standards. A strong Federal enforcement program was created and substantial monies were made available for construction of sewage treatment plants. The Federal Water Pollution Control Act was amended in 1977 to address toxic water pollutants and in 1987 to refine and strengthen priorities under the Act as well as enhance EPA's enforcement authority. Since the 1977 amendments, the Federal Water Pollution Control Act has been commonly referred to as the Clean Water Act (CWA).

State Water Quality Standards and Water Quality Management Plans

Section 303 of the CWA authorizes the States to establish ambient water quality standards and water quality management plans. If national technology standards are not sufficient to attain desired stream water quality, the State shall set maximum daily allowable pollutant loads (including toxic pollutants) for these waters and, accordingly, determine effluent limits and compliance schedules for point sources to meet the maximum daily allowable loads.

The National Pollutant Discharge Elimination (NPDES) Program

This program was established by Section 402 of the CWA and, under it, EPA and approved States have issued more than 50,000 NPDES permits. Permits are required for all point sources from which pollutants are discharged to navigable waters. An NPDES permit is required for any direct discharge from new or existing sources. Indirect discharges through POTWs are regulated under a separate program (see discussion of pretreatment standards below). In 1979 and 1980, the permit program was revised and one of the new features was the use of Best Management Practices (BMPs) on a case-by-case basis to minimize the introduction of toxic and hazardous substances into surface waters. BMPs are industry practices used to reduce secondary pollution (e.g., raw material storage piles shall be covered and protected

against rain and runoff). BMPs do not have numerical limits and, therefore, are different from effluent limits.

Section 304 of the CWA sets restrictions on the amount of pollutants discharged at industrial plant outfalls. Amounts are usually expressed as weight per unit of product (i.e., 0.5 lb/1,000 lb product manufactured). The standards are different for each industry. Effluent guidelines are applied to individual plants through the NPDES permit program.

There are three levels of technology for existing industrial sources: Best Practicable Control Technology (BPT), Best Conventional Technology (BCT), and Best Available Technology Economically Achievable (BAT). Under the 1972 Act, BPT was intended to be put in place by industry in 1977 and BAT in 1983. These timetables have been modified by subsequent amendments.

The 1987 CWA Amendments modified the compliance deadlines for the following:

- BPT limits requiring a substantially greater level of control based on a fundamentally different control technology
- BAT for priority toxic pollutants
- BAT for other toxic pollutants
- BAT for nonconventional pollutants
- BCT for conventional pollutants

For each technology the new deadline requires compliance "as expeditiously as practicable, but in no case later than 3 years after the date such limitations are promulgated. . .and in no case later than March 31, 1989."

New Source Performance Standards (NSPS) are closely related to BAT for existing sources but are not quite the same. NSPS are different for each industrial category. These standards must be achieved when the new industrial source begins to discharge. NSPS permits will be effective for a period of 10 years vs. 5 years or less for the BPT and BAT-type permits. This 10-year protection insulates against change in BCT or BAT requirements but does not hold against Section 307(a) toxic pollutant standards or against "surrogate" pollutants that are used to control hazardous or toxic pollutants.

A permit application must be made. Adequate information must be submitted including basic facility descriptions, SIC codes, regulated activities, lists of current environmental permits, descriptions of all outfalls, drawings, flows, treatment, production, compliance schedules, effluent characteristics, use of toxics, potential discharges, and bio-assay toxicity tests performed.

Applicants must conduct analytical testing for pollutants for BOD, COD, TOC, TSS, ammonia, temperature, and pH. The applicant, if included within any of the 34 "primary industry" categories, must sample for all toxic metals, cyanide, and phenols given in EPA Application Form 2C and for specified organic toxic pollutant fractions.

The applicant must list hazardous substances believed to be present at the industrial plant. Testing is not required but analytical results must be provided, if available.

NPDES Permit

The NPDES permit, issued by EPA or the State, enforces Federal effluent limitations promulgated for individual industrial categories; NSPS; toxic effluent standards; State water quality standards under Section 303 of the CWA, if any are applicable; and hazardous substances otherwise regulated under Section 311 of the CWA that may be incorporated under the NPDES permit instead. Permit elements include the amount of pollutants to be discharged expressed in terms of average monthly and maximum daily loads; compliance schedules, if applicable standards cannot be met now; and monitoring, testing, and reporting requirements.

Routine Noncompliance Reports - The Discharge Monitoring Form

The Discharge Monitoring Report (DMR) gives a summary of the discharger's records on a monthly or quarterly basis for flow measurement, sample collection, and laboratory analyses. Noncompliance reports must be submitted quarterly on the cause of noncomplying discharges, period of noncompliance, expected return to compliance and plans to minimize or eliminate recurrence of incident.

Emergency Reporting

- Health: EPA shall be notified within 24 hours of noncompliance involving discharge of toxic pollutants, threat to drinking water, or injury to human health.

- Bypass: Noncompliance due to intentional diversion of waste shall be reported promptly to the permitting agency and may be permissible if essential to prevent loss of life or serious property damage.

- Upset: Temporary noncompliance due to factors beyond the reasonable control of the permittee shall be promptly reported to the agency.

The 1987 CWA Amendments establish a schedule for the regulation of municipal and industrial stormwater discharges under NPDES permits. Initially, (before October 1, 1992), only major dischargers and those who are significant contributors of pollutants will be required to obtain permits.

Pretreatment Standards for Indirect Discharges to Publicly-Owned Treatment Works

Coverage

New and existing industrial users who discharge to POTWs are subject to general and categorical pretreatment standards. The categorical standards are primarily directed to control of toxic pollutants in specific industries. Note that localities with approved pretreatment programs may have imposed local limits, which are enforceable by EPA.

Requirements

- General Pretreatment Standards

  Prohibit fire or explosion hazards, corrosivity, solid or viscous obstructions, "slug" discharges, and heat sufficient to inhibit biological activity at POTWs.

- Categorical Standards

  - Standards to be expressed as concentration limits or mass weight per unit of production.
  - Source must be in compliance 3 years after promulgation of standards.
  - Variances can be obtained for fundamentally different factors or if industrial pollutants are consistently being removed by POTW.

- Reports

  Users must provide appropriate agency (EPA, State, or POTWs having approved pretreatment programs) with basic information; SIC code; average and maximum daily discharge; characteristics or pollutants, applicable standards and certification whether standards are being met and, if not, what pretreatment is necessary; and a compliance schedule.

- Monitoring, Sampling, and Analysis

  Users shall submit sampling data for each regulated pollutant in discharge.

- Progress Reports

  Reports and information shall be submitted at 6-month intervals.

Nonpoint Source Pollution Control

Section 208 of the CWA provides for control of nonpoint source pollution and directs States to establish planning bodies to formulate area-wide pollution control plans. NPDES permits cannot be issued where the permit may conflict with an approved Section 208 plan.

The 1987 CWA Amendments require States or EPA to develop nonpoint source management programs under Section 319.

Municipal and Industrial Stormwater Discharges

For some time there has been considerable debate over whether permits should be required for stormwater discharges from point sources, particularly those municipal or industrial discharges which may well contain toxic and other pollutants. The 1987

Amendments provide that five (5) types of stormwater discharges will be regulated under NPDES:

1. Discharges which have NPDES permits issued as of February 1987
2. Discharges "associated with industrial activity"
3. Discharges "from a municipal separate storm sewer system serving a population of 250,000 or more"
4. Discharges "from a municipal separate storm sewer system serving a population of 100,000 or more but less than 250,000"
5. Other discharges designated by the EPA administrator or the State if such discharge "contributes to a violation of a water quality standard or is a significant contributor of pollutants to waters of the United States"

Final regulations governing stormwater discharges were promulgated in November 1990.

Dredge or Fill Discharge Permit Program

Section 404 of the CWA regulates the discharge of dredged or fill material into waters of the United States. Dredged material is excavated or dredged from a water body. Fill material is that material used to replace water with dry land. The Section 404 permit program is administered by the U.S. Army Corps of Engineers. EPA provides guidelines for the issuance of permits by the Corps of Engineers. States may assume responsibility for portions of the program.

Discharge of Oil and Hazardous Substances

Section 311 of the CWA prohibits discharges of oil or hazardous substances in quantities that may be harmful to waters of the United States. The appropriate Federal agency must be immediately notified of any spill of a "reportable quantity." Section 311 provides for cleanup of spills and requires plans for preparation of Spill Prevention, Control, and Countermeasures (SPCC) plans.

Over 300 substances have been defined as hazardous under Section 311 and each of these substances has a "reportable quantity" (40 CFR, Parts 116 and 117, 1980).

A person or corporation who properly notifies the Agency of the discharge of a reportable quantity of oil or hazardous substance is immune from criminal prosecution but is liable for civil penalties. Additionally, those who cause the spill are liable for the costs of cleanup and removal. If the Federal government must clean up the spill, the discharger of the spill is liable for cleanup costs. There are maximum liability limits depending upon the type of facility and spill. These limits do not apply if the discharge resulted from willful negligence or willful misconduct of the owner.

Certain discharges of oil and hazardous material that flow from a point source may be excluded from Section 311 liability if, during preparation of the NPDES permit covering that facility, conditions are added to the permit to avoid the occurrence of a spill.

Enforcement

Section 309 of the CWA provides several enforcement options which can result in large penalties to violators.

Criminal violations can result in penalties for individuals of up to $250,000 and imprisonment for 15 years for "knowing endangerment", while penalties against organizations for similar violations can reach $1,000,000. "Knowing violations" result in fines of $5,000 to $50,000 per day and imprisonment of up to 3 years per day of violation. "Negligent violations" carry penalties of $2,500 to $25,000 and up to 1 year imprisonment per day of violation. Falsification of reports is punishable by a $10,000 fine and imprisonment of up to 2 years. All penalties may be doubled for second offenses.

Civil penalties may be assessed in an amount up to $25,000 per day of violation. Factors to be considered by the court in determining the amount of a civil penalty include the seriousness of the violation, the economic benefit to the defendant as a result of the violation, compliance history, good-faith efforts applied by the violator and the economic impact of the penalty on the violator.

Administrative penalties may also be imposed against violators through the initiation of an administrative penalty proceeding. Section 309(g) provide for two classes of penalties, Class I and Class II, which differ with respect to the limits on the penalties which can be imposed and the procedures which must be followed in order to impose those penalties.

RESOURCE CONSERVATION AND RECOVERY ACT OF 1976 (RCRA) [2*]

RCRA, as enacted in 1976, was designed to establish "cradle-to-grave" control of hazardous wastes by imposing extensive requirements on those who generate and/or handle such wastes. RCRA applies primarily to current activities at active facilities, yet there is authority for addressing imminent hazards and for taking corrective actions based upon past

[*] *43 U.S.C. §§6901 et seq. and Solid Waste Disposal Act amendments of 1980, P.L. 96-482, 94 Stat. 2334.*

actions. Although RCRA ha s been amended several times, the most significant amendments are the Hazardous and Solid Waste Amendments (H SWA) of 1984. HSWA requires, among other things, that regulations be promulgated to address underground storage tanks, t o establish a schedule for restricting/prohibiting the land disposal of hazardous wastes, and to revamp the toxicity characteristic as a means for determining whether a waste is hazardous. (The process of prom ulgating implementing regulations in these areas is ongoing but almost is complete.)

Solid wastes, if land disposed, are regulated through State programs under Subtitle D of RCRA. Hazardous solid w astes are subject to regulation in their generation, transport, treatment, storage, and disposal under Subtitle C of RCRA. Subtitle C of the statut e authorizes a comprehensive Federal program to regulate hazardous wastes from generation to ultimate disp osal. A waste is hazardous under Subtitle C if it is listed by EPA a s hazardous, or it exhibits a hazardous characteristic (corrosivity, reactivity, ignitability, an d toxicity) and is not delisted or excluded from regulation. There are special managemen t provisions for hazardous wastes created by small quantity generators and hazardous wastes that are intended to be reused or recycled.

Solid waste includes garbage, refuse and sludge, other solid, liquid, semi-solid, o r contained gaseous material which is discarded, has se rved its intended purpose, or is a mining or manufacturing byproduct. Most industrial and commercial byproducts can qualify as a solid waste. Exclusions from solid waste include domestic sewage, irrigation return flows, materials defined by the Atomic Energy Ac t, *in situ* mining waste and NPDES point sources.

Solid wastes excluded from regulation as hazardous solid waste s are household waste; crop or animal waste; mining overburden and wastes from processi ng and benefication of ores and minerals; flyash, bottom ash waste, slag waste and flue gas emission control waste and drilling fluids from energy development. A waste can be "delisted" from the hazardous waste listing or excluded for other reasons. Some materials intended to be reused or recycled re not fully regulated as solid/hazardous wastes, while others, depending upon the type of waste generated and the recycling process used, are fully regulated.

List of Hazardous Wastes

Hazardous waste streams from specific major industry groups and some generic sources (40 CFR, Part 261, Subpart D, §261.31 and 261.32) and well over 200 toxic commercial chemical wastes (i.e., discarded commercial chemical products and chemical intermediates) are included on the list of hazardous waste (40 CFR §261.33). If a commercial chemical substance is on the list, its off-spec species is also considered hazardous when discarded, as are spill residues. Some of the listed wastes are acutely toxic and are more closely regulated than other hazardous wastes [see 40 CFR §§261.33(e), 261.5(e), and 261.7(b)(3)].

Special Management Provisions

- Small Quantity Generators

  Small quantity generators are those that generate less than 1,000 kg per month of hazardous waste. There are two classes of small quantity generators:

  1. Generators of between 100 and 1,000 kg per month that are subject to most of the requirements of 40 CFR Part 262 which apply to fully regulated generators, except that they are allowed to accumulate up

to 6,000 kg of hazardous waste and to store waste for up to 180 to 270 days.

2. Generators of less than 100 kg per month that are exempt from regulation under 40 CFR Part 262 so long as they do not accumulate greater than 1,000 kg of hazardous waste, properly identify their wastes, and comply with the less stringent waste treatment, storage and/or disposal requirements of 40 CFR §261.5.

Note that the classification of the generator is a function of the total wastes generated in a calendar month, not each waste stream. In addition, for acutely toxic wastes, if more than 1 kg per month of waste

or 100 kg per month of spill residues are generated, all quantities of that waste are fully regulated.

- Recycling or Reuse

The type of waste generated and/or the recycling process employed will determine whether recycled/reused materials are a solid/ hazardous waste. Some of these materials are not considered solid wastes, some are solid wastes but not hazardous wastes, while others are hazardous but are not subject to full regulation, and still other of these materials are both solid and hazardous wastes that are fully regulated. The circumstances surrounding the apparent recycling/ reuse of waste materials should be thoroughly documented during inspection.

- Land Disposal Restrictions

A major feature of HSWA is the schedule for prohibiting the land disposal of untreated hazardous wastes. The key dates and statutory/regulatory requirements are as follows:

- May 8, 1985 - Landfilling of bulk or noncontainerized liquid hazardous waste or free liquids in hazardous waste is prohibited.

- November 8, 1986 - Land disposal of certain solvents, as well as dioxin containing hazardous wastes (F-series wastes) is prohibited unless treatment standards are met.

- July 8, 1987 - Land disposal of hazardous wastes listed in Section 3004(d)(2) of RCRA (the "California list") is prohibited unless treatment standards are met.

- August 8, 1988 - Land disposal of 1st Third of listed hazardous wastes (primarily F and K wastes) is prohibited unless treatment standards are met.

- June 8, 1989 - Land disposal of 2nd Third of listed hazardous wastes (F, K, U, and P wastes) is prohibited unless treatment standards are met.

- May 8, 1990 - Land disposal of 3rd Third of listed hazardous wastes (the remaining listed wastes) as well as wastes exhibiting hazardous characteristics is prohibited unless treatment standards are met.

Requirements for Generators [3*]

- Identification - Hazardous wastes must be identified by list, testing, or experience and assigned waste identification numbers.

- Notification - No later than 90 days after a hazardous waste is identified or listed in 40 CFR, Part 261, a notification is to be filed with EPA or an authorized State. An EPA identification number must be received.

- Manifest System - Implement the manifest system and follow procedures for tracking and reporting shipments. Beginning September 1, 1985, a waste minimization statement is to be signed by the generator [see RCRA Section 3002(b)].

- Packing - Implement packaging, labeling, marking, and placarding requirements prescribed by DOT regulations (40 CFR, Parts 172, 173, 178, and 179).

- Annual Report - Submittal required March 1 using EPA Form 8700-13.

- Exception Reports - When generator does not receive signed copy of manifest from designated TSDF within 45 days, the generator sends Exception Report to EPA including copy of manifest and letter describing efforts made to locate waste and findings.

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[*] *40 CFR Part 262*

- Accumulation - When waste is accumulated for less than 90 days, generator shall comply with special requirements including contingency plan, prevention plan, and staff training (40 CFR, Part 265, Subparts C, D, J, and 265.16).

- Permit for Storage More Than 90 Days - If hazardous wastes are retained on-site more than 90 days, generator is subject to all requirements applicable to TSDFs and must obtain a RCRA permit.

Requirements for Transporters [4*]

- Notification - No later than 90 days after a hazardous waste is identified or listed in 40 CFR, Part 261, a notification is to be filed with EPA or an authorized State. Receive EPA identification number.

- Manifest System - The transporter must fully implement the manifest system. The transporter signs and dates manifest, returns one copy to generator, assures that manifest accompanies waste, obtains date and signature of TSDF or next receiver and retains one copy of the manifest for himself.

- Delivery to TSDF - The waste is delivered only to designated TSDF or alternate.

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[*] *40 CFR Part 263*

- Record Retention - Transporter retains copies of manifest signed by generator, himself, and accepting TSDF or receiver and keeps these records for a minimum of 3 years.

- Discharges - If discharges occur, notice shall be given to National Response Center. Appropriate immediate action shall be taken to protect health and the environment and a written report shall be made to the DOT.

Requirements for Treatment, Storage, or Disposal Facilities (TSDFs) [5*]

- Notification - No later than 90 days after a hazardous waste is identified or listed in 40 CFR, Part 261, a notification of hazardous waste management activities is to be filed with EPA or an authorized State by TSDFs, which manage newly identified or listed hazardous waste.

- Interim Status - These facilities include TSDFs; on-site hazardous waste disposal; on-site storage for more than 90 days; in-transit storage for greater than 10 days and the storage of hazardous sludges, listed wastes, or mixtures containing listed wastes intended for reuse. Interim status is achieved by:

  - Notification (see above)

  - Being in existence on November 19, 1980 or on the date of statutory or regulatory changes which require the facility to have a permit

[*] *40 CFR Parts 264 and 265*

- Filing a Part A by the date specified in the regulation covering the facility (40 CFR, Parts 261, 264, or 265)

- Interim Status Facility Standards - The following standards and requirements shall be met.

  - General information (Subpart B)
  - Waste analysis plan
  - Security
  - Inspection plan
  - Personnel training
  - Handling requirements
  - Preparedness and prevention
  - Contingency planning and emergency procedures (Subparts C and D)
  - Records and reports
  - Manifest system
  - Operating logs
  - Annual and other reports (Subpart E)
  - Groundwater Monitoring (Subpart F)
  - Closure and post-closure plans (Subpart G)
  - Financial requirements (Subpart H)
  - Containers, tanks, surface impoundments, piles (Subparts I, J, K, L)
  - Land treatment, landfills, incinerators, thermal treatment, chemical, physical and biological treatment (Subparts M, N, O, P, Q)
  - Underground injection (Subpart R)

- Permit - In order to obtain a permit:

- Facilities with interim status must file a Part B RCRA permit application when directed to do so by EPA or an authorized State and final facility standards must be met or the facility must be on an approved schedule to meet those standards.

- New facilities and facilities which do not qualify for interim status are to receive a RCRA permit before construction can begin or a hazardous waste can be handled.

State Hazardous Wastes Programs

Under RCRA, states can obtain approval from EPA to implement programs governing hazardous wastes "in lieu of" the federal program administered by EPA. State programs must be "equivalent" to the federal program to obtain approval, and include the ability to enforce program requirements. Once approved the state standards govern all regulated entities and any assessment of a facility's compliance must be based upon those state regulations. Thereafter, when federal standards change, each authorized state must submit a revised program for EPA approval. Until such approval is received, those new standards generally do not have any effect in those states. The major exception to this regulatory scheme is rule-making based upon the HSWA of 1984. HSWA provides that imple-menting regulations are to take effect at the same time in all states. Authorized states must still modify their programs to include HSWA requirements, but there is no gap in regulation between the time that the Agency promulgates a final HSWA-based rule and the time that the state receives final approval of the program revision which is equivalent to the federal HSWA rule. As a result, until a revised state program addressing all HSWA requirements is approved for an authorized state, the administration and enforcement of the overall hazardous waste program will involve both EPA and the authorized state.

Enforcement

EPA and authorized States may pursue enforcement actions based on administrative orders, as well as judicial actions seeking civil and criminal penalties for RCRA violations.

An administrative action involves issuance of an administrative order requiring compliance with the regulations. Injunctive relief may be sought in a civil action filed in the U.S. District Court. Civil penalties of up to $25,000 per day of violation may be imposed for violations of Subtitle C of RCRA. Failure to comply with an administrative order may result in suspension or revocation of a permit.

Criminal penalties of up to $50,000 and/or 2 years' imprisonment may be imposed for certain "knowing violations." "Knowing endangerment" that places another person in imminent danger of death or serious bodily injury can result in a fine of up to $250,000 and/or 15 years' imprisonment.

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (SUPERFUND)

The Superfund Act was enacted December 11, 1980. The Federal government is authorized to clean up toxic or hazardous contaminants at closed and abandoned hazardous waste dumps and the government is permitted to recover costs of this cleanup and associated damages by suing the responsible parties involved. Cleanup monies come out of a "superfund" created by taxes on chemicals and hazardous wastes.

The act provides that, when there is a release of hazardous substance, either real or threatened, the parties who operated the vessel or facility which created the release are liable for the containment, removal, remedial action, response, and injury damages to natural resources under Section 107(a). The act also establishes limitations on liability.

If claims are presented to the liable parties but are not satisfied, the act then allows claims to be reimbursed from the Superfund.

Regulatory provisions under Sections 102 and 103 of the act require that release of hazardous substances into the environment be reported unless the release is in accordance with an established permit. Spills of any "reportable quantity," established pursuant to regulations promulgated under the Act, must be reported.

All owners or operators of any facility handling and disposing of hazardous substances or that has handled hazardous substances in the past (including previous owners and operators) were required to inform the EPA Administrator by June 1981 of their facility activities unless they have a RCRA permit or have been accorded "interim status." Failure of notification is a crime and, if the party knowingly fails to provide these data, they are not entitled to the prescribed limits and defenses of liability.

On October 17, 1986, the Superfund Act was amended under the Superfund Amendments and Reauthorization Act (SARA). Those amendments provide mandatory schedules for the completion of various phases of remedial response activities, establish detailed cleanup standards, and generally strengthen existing authority to effect the cleanup of superfund sites.

Enforcement

Civil and criminal penalties and awards are available under CERCLA. Section 106 provides that failure or refusal to comply with an order directing immediate abatement of a release or threatened release of a hazardous substance which creates an imminent and substantial endangerment to the public health or welfare or the environment is punishable by a fine of up to $25,000 per day of violation. Section 109 also provides for penalties of up to $25,000 per day of violation, to be imposed by a U.S. District Court or in an administrative proceeding for failure or refusal to comply with other provisions of CERCLA.

Under Section 109(d), a "bounty" in the amount of up to $10,000 may be paid to any individual who provides information leading to the arrest and conviction of any person for a CERCLA violation.

Criminal penalties of up to $ 10,000 and imprisonment for 3 years are available under Section 103 for various violations, including failure to notify of a release and falsification of records. Second and subsequent violations may result in imprisonment of up to 5 years.

TOXIC SUBSTANCES CONTROL ACT (TSCA)

TSCA regulates existing and new chemical substances. TSCA applies primarily to manufacturers, distributors, processors, and importers of chemicals. TSCA can be divided into five parts as follows:

Inventory and Premanufacture Notification

EPA has published an inventory of existing chemicals. A substance that is not on this list is considered "new" and requires Premanufacture Notification (PMN) to EPA at least 90 days before the chemical can be manufactured, shipped, or sold (TSCA, Section 5). If EPA does not make a declaration within 90 days to restrict the product, then full marketing can begin and the chemical is added to the inventory. In addition, a manufacturer may obtain a test marketing exemption and distribute the chemical before the 90-day period has expired.

Conversely, EPA, in response, may reject PMN for insufficient data; negotiate for suitable data, prohibit manufacture or distribution until risk data are available; or, pending development of a Section 6 rule, completely ban the product from the market or review the product data for an additional 90 days.

Testing

Under TSCA, Section 4, EPA can require product testing of any substance which "may present an unreasonable risk of injury to health or to the environment." Some testing standards are proposed, but no test requirements for specific chemicals are yet in effect.

Reporting and Recordkeeping

TSCA, Section 8(a) deals with general reporting. The "first tier" rule (PAIR) now in effect is a short form seeking production and exposure data on over 2,300 existing chemicals. A "second tier" rule is expected to obtain more detailed data on a relatively small group of chemicals that may become priority candidates for regulation.

Section 8(c) calls for records of significant adverse effects of toxic substances on human health and the environment. It requires that records of alleged adverse reaction be kept for a minimum of 5 years.

Section 8(d) allows EPA to require that manufacturers, processors, and distributors of certain listed chemicals (designated under 40 CFR 716.13) submit to EPA lists of health and safety studies conducted by, known to, or ascertainable by them. Studies include individual files, medical records, daily monitoring reports, etc.

Section 8(e) requires action upon discovery of certain data. Any person who manufactures, processes, or distributes a chemical substance or mixture, or who obtains data which reasonably supports the conclusion that their chemical presents a substantial risk of injury to health or to the environment, is required to notify EPA immediately. Personal liability can only be limited if the company has a response plan in effect.

Regulation Under Section 6

EPA can impose a Section 6 rule if there is reason to believe that the manufacture, processing, distribution or use, or disposal of a chemical substance or mixture causes, or may cause, an unreasonable risk of injury to health or to the environment. Regulatory action can range from labeling requirements to complete prohibition of the product. Section 6 rules are currently in effect for several chemicals including PCBs. A Section 6 rule requires informal rulemaking, a hearing, and a cost-benefit analysis.

Imminent Hazard

This is defined as a chemical substance or mixture causing an imminent and unreasonable risk of serious or widespread injury to health or the environment. When such a condition prevails, EPA is authorized by TSCA, Section 7, to bring action in U.S. District Court. Remedies include seizure of the chemical or other relief including notice of risk to the affected population or recall, replacement, or repurchase of the substance.

Enforcement

Civil penalties may be assessed through administrative proceedings in an amount not to exceed $25,000 per day of violation. Appeals relating to civil penalties are reviewed in the U.S. Court of Appeals.

Criminal penalties for knowing and willful violations of TSCA may be imposed in amounts of not more than $25,000 per day of violation and/or imprisonment for up to 1 year.

Actions to restrain violations, compel compliance, or seize and condemn any substance, mixture, or article may be brought in the U.S. District Courts.

FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA)

A pesticide is defined as any substance intended to prevent, destroy, repel, or mitigate pests. FIFRA requires registration of all pesticides, restricts use of certain pesticides, authorizes experimental use permits and recommends standards for pesticide applicators and the disposal and transportation of pesticides.

Pesticides are registered for 5 years and classified for either general or restricted usage. Restricted use means that they are to be applied either by or under the direct supervision of a certified applicator. Pesticides must be labeled and specify ingredients, uses, warnings, registration number, and any special use restrictions. Regulations also specify tolerance levels for certain pesticide chemicals in or on agricultural commodities. These limits apply to 310 different compounds and residue tolerances range from 0 to 100 ppm. A few pesticides are also regulated as toxic pollutants under Section 307(a) of the CWA and by Primary Drinking Water Standards under the SDWA.

Enforcement

FIFRA provides for relatively low penalties when compared with many of the other environmental statutes. Civil penalties range from as little as $500 for private applicators on a first offense, to not more than $5,000 per violation for registrants, commercial applicators, wholesalers, dealers, retailers, and distributors. Criminal penalties against private applicators are misdemeanors punishable by fines of not more than $1,000 and/or imprisonment for up to 30 days. Commercial applicators who knowingly violate FIFRA may be fined up to $25,000 and/or imprisoned for up to 1 year. Registrants, applicants for a registration and producers who knowingly violate this statute are subject to fines of up to $50,000 and/or imprisonment for up to 1 year.

Any person who, with intent to defraud, uses or reveals information relating to product formulas acquired pursuant to FIFRA's registration provisions may be fined up to $10,000 and/or imprisoned for up to 3 years.

SAFE DRINKING WATER ACT

The SDWA of 1974 was established to provide safe drinking water to the public. Both primary and secondary drinking water standards have been set by EPA regulations which apply to water after treatment by public drinking water systems. National Interim Primary Drinking Water Regulations were adopted in 1975 to protect public health (40 CFR, Part 141). Regulations covering radionuclides were added in 1976. Regulations for trihalomethanes were promulgated in 1979. Secondary regulations were established in 1979 as guidelines to States to protect the nonhealth-related qualities of drinking water. The 1986 amendments to the SDWA: (1) establish a mandatory schedule, requiring the promulgation of primary drinking water regulations for 83 contaminants, (2) prohibit the use of lead in public water systems, (3) provide civil and criminal penalties for persons who tamper with public water systems, and (4) require closer scrutiny of State programs, including the direct enforcement of drinking water standards, if necessary.

The SDWA also provides for protection of underground sources of drinking water. Final regulations have been issued whereby States are to establish Underground Injection Control (UIC) waste disposal programs to ensure that contaminants in water supplies do not exceed National Drinking Water Standards and to prevent endangerment of any underground source of drinking water. Injection wells are divided into five classes for regulatory handling. Construction and disposal standards are established for the permitting of Class I to III wells. Class I and IV wells are subject to RCRA requirements. Class IV wells are those used by generators of hazardous or radioactive wastes to dispose of hazardous wastes into formations within one-quarter mile of an underground source of drinking water. New Class IV wells are prohibited and existing Class IV wells must be phased out within 6 months after approval or promulgation of a UIC program in the State. There are numerous State regulatory requirements affecting groundwater which should be consulted by multi-media compliance inspectors. In addition, the 1986 amendments to SDWA strengthen EPA's enforcement authority for UIC programs.

Enforcement

Civil penalties of not more than $25,000 per day of violation may be assessed for failure to comply with national primary drinking water regulations [Section 300g - 3(b)], failure of an owner or operator of a public water system to give notice to persons served by it of failure or inability to meet maximum containment level requirements [Section 300(g) - 3(c)], failure to comply with an administrative order requiring compliance [Section 300g -

3(g)], or failure to comply with requirements of an applicable underground injection control program [Section 300h - 2(b)].

Any person who fails or refuses to comply with an administrative order issued where a contaminant is contaminating or is likely to contaminate an underground source of drinking water and may present an imminent and substantial endangerment to human health, is subject to civil penalties of up to $5,000 per day of violation (Section 300i). Administrative orders relating to violations of underground injection regulations may impose penalties of up to $5,000 per day of violation up to a maximum administrative penalty of $125,000.

Tampering with a public water system may result in a criminal fine and/or imprisonment for up to 5 years. Threats to tamper carry fines and/or imprisonment of up to 3 years. Civil penalties may also be imposed against persons who tamper, attempt to tamper, or make threats to tamper with a public water system. The maximum fine is $50,000 for tampering and $20,000 for an attempt or threat to tamper.

EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT (EPCRA)

EPCRA was enacted as a part of the Superfund Amendments and Reauthorization Act of 1986, as a freestanding provision to address the handling of "extremely hazardous substances" and to establish an extensive information collection system to assist in responding to releases of those substances. EPCRA is comprised of three subtitles: (1) Subtitle A, which establishes the framework for emergency response planning and release notification; (2) Subtitle B, which contains reporting requirements; and (3) Subtitle C, which contains general provisions, including enforcement, penalties, and trade secrets.

Subtitle A - Emergency Planning and Notification

The goal of Subtitle A is to provide States and local communities with the information necessary to adequately respond to unplanned releases of certain hazardous materials. Through the establishment of State Emergency Response Commissions (SERC) and Local Emergency Planning Committees (LEPC), Subtitle A mandated the development and implementation of emergency response plans. Subtitle A also requires facilities at which certain "extremely hazardous substances" are present in excess of established threshold planning quantities to notify the State Commission of the presence of the substances and to report releases of those substances in excess of specified reportable quantities.

Subtitle B - Reporting Requirements

Sections 311 - 313 of EPCRA (Subtitle B) contain reporting requirements for facilities at which "hazardous chemicals" are present in excess of specified thresholds or which experience environmental releases of "toxic chemicals" in excess of the established threshold quantities.

Section 311 requires facilities at which "hazardous chemicals" are present in amounts exceeding threshold levels, to submit material safety data sheets (MSDSs) or lists of substances for which they maintain MSDSs to the SERC, LEPC, and local fire departments in order to give notice to those authorities of the types of potential hazards present at each facility.

Section 312 requires submission of annual and daily inventory information on the quantities and locations of the hazardous chemicals. "Tier I" reports provide the required general information. "Tier II" reports providing chemical-specific information must be submitted in place of Tier I reports upon request of the SERC, LEPC, or local fire department.

Section 313 requires annual reporting to EPA and the State of any environmental releases of listed "toxic chemicals" in excess of specified threshold quantities. A facility is required to submit a "Form R" Toxic Chemical Release Inventory Report in the event of a release if it has 10 or more full-time employees; is grouped in SIC codes 20 through 39; and manufactures, processes, or otherwise uses a toxic chemical in excess of the established reporting thresholds.

Enforcement

Section 325 of EPCRA sets forth the civil, criminal, and administrative penalties which may be assessed for violations of that Act. Violation of an administrative order may result in civil penalties of up to $25,000 per day. Penalties for violations of the emergency notification provisions of Section 304 may be assessed through administrative or judicial proceedings, with potential penalties ranging from $25,000 per violation to $25,000 per day of violation. Any person who knowingly or willfully fails to provide emergency notification may be assessed a criminal penalty of up to $25,000 and/or 2 years' imprisonment, ($50,000 and/or 5 years for second and subsequent convictions).

Violations of reporting requirements carry civil penalties of up to $25,000 per violation. Frivolous trade secret claims may result in penalties of up to $25,000 per claim, whereas the knowing and willful disclosure of actual trade secret information may be punishable by a fine of up to $20,000 and/or imprisonment up to 1 year.

APPENDIX B

MULTI-MEDIA INSPECTIONS
DEFINITIONS AND TRAINING

MULTIMEDIA INSPECTIONS - DEFINITIONS AND TRAINING

06/05/91

To describe a proposed program for multimedia inspections and inspector training, we must first establish some definitions:

1. Compliance Programs - These are administrative, civil, and criminal enforcement programs as authorized to EPA.

2. Inspection categories - All inspections, for purposes of this program description, can be grouped into four categories.

Category A - An inspection for a single program. A program may have one or more types of inspections.

Category B - A simplified screening multimedia inspection is conducted in addition to the single program (Category A) inspection. The screening inspection is intended to identify the more obvious and readily detectable instances of non-compliance or indicators of possible non-compliance in other compliance program areas with only minimal additional resources required. Information obtained would be referred to the appropriate compliance program office(s) for follow-up. Follow-up action could include a full inspection for one or more programs or in some instances immediate enforcement action. The inspector would use a simplified checklist as a guide and to record observations and pertinent information. As an example, observations of potential compliance issues could include inoperable control systems, unusual emissions/discharges, evidence of spillage or leaks, breached dikes, new emission/discharge sources, lack of permits or SPCC plan, abandoned drums, etc.

Category C - A multi-program inspection is an inspection of a facility for two or more (Category A inspections) compliance programs but not compliance with all applicable requirements. The inspection may be conducted by either one or a team of inspectors. The team which is headed by a team leader, conducts a detailed inspection for each of the targeted programs represented. The inspection may include screening for the more obvious and readily detectable indicators of possible non-compliance in other compliance program areas.

Category D - A multimedia inspection is a comprehensive inspection which addresses relevant program compliance requirements operative for a single facility at a specific point in time that can be used in subsequent enforcement actions. The inspection is usually conducted by a team of inspectors lead by a team leader. Team members may be comprised of ESD, program, contractors, state, NEIC, or local agency inspectors. The inspection may focus on facility processes to identify activities and wastes potentially subject to regulations and to identify potential cross-program issues.

3. Inspector Training - For purpose of this program description, inspector training will be described in terms of four inspector training levels.

Level 1 - The Level 1 (single program) inspector is a person who has been trained to be a lead inspector per EPA Order 3500.1 (Basic Health & Safety, Fundamentals curriculum, and program specific minimum) for a single compliance program.

Level 2 - The Level 2 (screening) inspector is a person who has received training beyond Level 1 to screen for and report on the more obvious or key indicators of non-compliance in all environmental program areas relevant to a particular facility or site (Category B inspection). The additional training requires a minimum of time (1 to 2 days) is keyed to a simplified checklist, and is designed to enable the inspector to ask key questions and readily recognize the more obvious environmental problems or key indicators of non-compliance. Additionally, the training will enable the inspector to readily recognize and report the more obvious violations of OSHA regulations and as a minimum disseminate pollution prevention information. The training could be heavily aided by extensive use of videos to demonstrate critical observations.

Level 3 - The Level 3 (multi-program) inspector is a person who has been trained to be a lead inspector per EPA Order 3500.1 for two or more compliance programs and has started the leadership project management and team building training required for Level 4 inspector training. Level 3 inspector training is a prerequisite for Level 4.

Level 4 - The Level 4 (multimedia) inspector is a senior, experienced person who has received training beyond Levels 2 or 3 to lead a team of inspectors to conduct either a multimedia (Category D) inspection which addresses all relevant compliance program requirements or a multi-program (Category C) inspection which addresses the requirements of two or more compliance programs. The inspector in addition to having significant experience in leading inspections, should complete the following:

* leadership project management and team building training
* training to recognize cross-media impacts and integrate cross media evaluations

* training and experience to merge diverse written reports into a coherent whole.

A summary in matrix form, of multimedia inspection and inspector training definitions are shown in Figure 1.

PROGRAM GOALS

The overall goal of each region would be a multimedia compliance program with inspectors in each region equipped to perform all four categories of inspections. The specific goals of the FBCs is:

1. To have all inspectors trained per EPA Order 3500.1 (Level 1) to as a minimum, be able to conduct inspections for a single compliance program (Category A).

2. To have all inspectors trained to be Level 2 inspectors and conduct screening (Category B) inspections during all compliance inspections by the end of FY 1993.

3. To have teams of dedicated multi-program (Level 3) and multimedia (Level 4) inspectors trained to conduct or lead multi-program (Category C) or multimedia inspections (Category D) as required by the end of FY 1993.

4. To have inspectors progress on a career ladder from Level 1 to Level 4 inspectors.

5. To build into the inspections and inspector training program as appropriate the reporting of environmental results.

These goals require a dedicated effort to develop and improve upon the skills that would be required for a single program inspector. Regional compliance programs can be aggressive in targeting multi-program and multimedia inspections to achieve environmental results using TRI data, comparative risk, geographic, and other enforcement initiatives. Similarly, the FBCs can take the initiative to identify overlapping routine program inspection requests and flag potential multi-program enforcement opportunities. Achievements of these goals would provide enhanced capability for responding to special requests from the RA/DRA and providing support to the office of criminal investigations.

Appendix C
TEAM LEADER RESPONSIBILITIES AND AUTHORITIES

INTRODUCTION

The team leader is the lead person for a given project. The team leader for each project is selected by the Branch Chiefs, based on factors such as project needs, employee development opportunities, and personnel availability. In general, the team leader is a work group leader, the central focal point for a particular project, responsible for ensuring that project objectives are met in a timely manner. The team leader is given certain responsibilities and authorities, as outlined below, and is expected to fulfill the responsibilities and exercise authority to successfully plan, coordinate, conduct, and complete the project.

The extent of input and involvement by the supervisor in these team leader responsibilities is dependent on the team leader's grade and experience. GS-12 and GS-13 team leaders should be able to perform most, if not all, required tasks. Team leaders of other grades will require more assistance from their supervisor or mentor.

Team leader responsibilities and authorities may vary somewhat with unique requirements of each project. However, general responsibilities and authorities for conducting a complete and timely project are common for most projects. The following discussion of team leader responsibilities is presented in two sections: responsibilities and authorities. The discussion of responsibilities is presented by project phases (most projects will involve some form of each project phase). The discussion of authorities follows. Because the team leader has similar authorities for most project phases, the authorities are not discussed in terms of project phases.

TEAM LEADER RESPONSIBILITIES

Phase 1 - Project Request/Project Objectives

As stated previously, the team leader is the central focal point for a given project responsible for assuring that project objectives are met in a professional and timely fashion. The team leader uses the media specific and Multi-Media Investigation manuals as guidance for conducting environmental compliance investigations. General project phases and associated team leader responsibilities follow. Phase 1 of any project begins with a request for assistance. Depending on the specifics of the request, work is required to develop that request into a project plan that addresses the requestor's needs.

The team leader, in conjunction with his/her supervisor, project requestor and, often times, members of the project team, is responsible for:

- Defining project objectives
- Defining specific tasks required to fulfill project objectives
- Identifying resource needs (both equipment and personnel)
- Identifying potential on-the-job training (OJT) opportunities associated with the various project phases and, in conjunction with supervisors (and, in some cases, staff), develop OJT objectives for other personnel
- Scheduling project tasks
- Coordinating with supervisors to ensure availability of project members for project tasks
- Developing and assigning work tasks to team members (this should include identifying any OJT opportunities)

- Ensuring that a comprehensive Project Plan is prepared (this task may be a separate project phase - project phase 3 - depending on the extent of information available during the project request)

- Maintaining communication with project requestor and appropriate personnel (team members, team member supervisors, counterparts in other agencies, etc.)

Phase 2 - Background Information Retrieval and Review

This project phase involves identifying, collecting and reviewing background information applicable to a specific project. The team leader, often in conjunction with project team members, is responsible for:

- Identifying necessary background information (including applicable laws and regulations, facility description, past compliance status, safety considerations, etc.)

- Arranging for access to background information

- Arranging for receipt of background information (such as file review and document retrieval, phone requests, phone conversations, etc.)

- Ensuring that background information is properly organized and filed

- Ensuring that background information is provided to appropriate project personnel

- Conducting reconnaissance inspection, if appropriate

- Providing guidance to project me mbers and ensuring that any associated OJT objectives are met

- Maintaining lines of communication with appropriate NEIC personnel (team members, team member supervisors, etc.)

Phase 3 - Project Plan

The project plan is a written document completed at some point prior to the fiel d work on most projects. The plan identifies work to be conducted to address projec t objectives and includes a site safety plan. The team leader is responsible for:

- Overall completion of a final project plan (including site safety plan, if sit e work is required)

- Ensuring that the project plan is peer reviewed

- Obtaining concurrence from the project requestor

- Providing all project team members with copies of the project plan

- Ensuring that all project members are familiar with the contents of the plan, including individual project responsibilities, project schedules, and safet y requirements

- Ensuring that the project reques tor receives the final project plan prior to any on-site work

- Providing guidance to project members and ensuring that any associated OJT objectives are met

Phase 4 - On-site Investigation

This project phase involves the on-site field work and necessary logistics/personnel actions to ensure that the field investigation is carried out in a complete, efficient, and timely manner. During this project phase, the team leader is responsible for:

- Ensuring that all personnel actions (overtime/compensatory time, work schedule changes, etc. are addressed)

- Ensuring that logistical issues are addressed (transportation of personnel and equipment to the site, lodging arrangements, etc.)

- Developing and maintaining a working relationship between all parties involved (including investigation target and contractors)

- Coordinating all on-site activities, including scheduling

- Ensuring that all project objectives are addressed during the on-site investigation

- Ensuring that the site safety plan is followed (or more stringent facility requirements, if appropriate)

- Maintaining communication with appropriate personnel (team members, team member supervisors, etc.) and with other appropriate personnel (such as project requestor, contractors, Department of Justice, FBI)

- Providing guidance to team members and ensuring that any associated OJT objectives are met

- Ensuring that contaminated equipment is properly disposed of or cleaned

- Directing public inquiries to proper authorities

Phase 5 - Information Evaluation/Report Preparation

A report of project activities, information evaluation, and findings is prepared for most projects. The project report is usually the major conduit for presenting project findings to the project requestor. In general, the coordinator is responsible for ensuring that the project report addresses all the project objectives, is accurate, and is reviewed and completed in a timely fashion.

- Preparing a report outline (or otherwise identifying report structure and contents to project members)

- Identifying and assigning preparation of project report sections to individual project members

- Identifying and communicating report writing schedules to project members

- Coordinating with supervisors to ensure availability of project members for report preparation

- Maintaining communication with project requestor and appropriate personnel (team members, team member supervisors, etc.)

- Providing guidance to project members and ensuring that all associated OJT objectives are met

- Coordinating all portions of report preparation with other groups (Graphics, Report Services, etc.)

- Assembling draft reports

- Ensuring that report is properly reviewed and revised (including transmittal of drafts for external review, tracking of copies, and return of external draft copies)

- Assembling and transmitting final report

Phase 6 - Project Follow-up

Project follow-up includes project activities that follow transmittal of the final report. This normally includes providing input into legal action such as case preparation, court testimony, settlement negotiations, and depositions. During project follow-up, the team leader is responsible for:

- Maintaining post-project report contact with project requestor or other designated project contact to remain informed of legal or other activities

- Coordinating any requests for additional assistance

- Advising supervisors and appropriate staff of additional or potential additional project support

- Preparing project file for turn-in to central files

- Providing the supervisor of each project member a critique of the project member's activities, including a discussion of the OJT objectives as identified by project coordinator and project member's supervisor during project request phase

- Provide each team member with an individual, verbal critique of his/her performance

TEAM LEADER AUTHORITIES

As the central focal point and leader of a team of employees, the team leader has some "first-line" supervisor authorities for most project phases. Once project members are selected and general responsibilities of each member are agreed upon (agreement between team leader and project member's supervisor and often times the project member), the team leader has the authority to:

- Set and/or modify project schedules

- Identify and modify, as necessary, specific project staff tasks (including activities in all project phases such as project plan preparation, field work, and report preparation).

- Direct field operations

- Enforce project safety plan requirements (including barring personnel without the proper equipment and/or training from the identified "hot" zone)

- Set working hours for team members during field work

- Approve/verify OT/CT hours worked

- Negotiate terms of inspection with company (e.g., taking of photographs, requesting/copying documents, advance notification of areas to be inspected, personnel to be interviewed, handling of CBI materials, etc.) so long as no statutory or regulatory authorizations are compromised

- Arrange for inspection of off-site facilities related to project objective (e.g., off-site contractor laboratory, waste transfer station, etc.)

- Request/arrange for assistance from other groups (e.g., Laboratory Services, ORD, EPIC, etc.)

- Procure project-specific equipment/services

- Require project team members to follow established protocols for conduct, investigation, preparing reports, and participation in follow-up actions, and enforce ground rules identified for specific investigations

- Ensure security of project files report, etc. and investigation findings

Appendix D
TYPES OF INFORMATION

TECHNICAL INFORMATION

Facility Background

- Maps showing facility location and environmental and geographic features (stacks, discharge pipes, and solid waste disposal sites)
- Geology/hydrogeology of the area
- Aerial photographs
- Names, titles, phone numbers of responsible facility officials
- Process description, process flow charts, and major production areas
- Records reflecting changes in facility conditions since previous audit/permit application
- Production levels - past, present, and future

Audit Reports, Records, and Files

- Federal and State compliance files
- Correspondence between the facility and the local, State, and Federal agencies
- Citizens' complaints and reports, follow-up studies, findings

- Audit records, reports, correspondence on past incidents or violations
- Emissions inventory
- Self-monitoring data and reports
- EPA, State, and consultant studies and reports
- Annual reports by the facility (e.g., PCB annual documents and inventories, Securities Exchange Commission §10K reports)
- Records, applications, reports, manifest files, etc. (e.g., RCRA reports, CERCLA submittals)
- Laboratory audit reports, QA/QC activities
- Records of previous hazardous substances spills and malfunctions

Pollutant and Waste Generation, Control, Treatment, and Disposal Systems

- Description and design data for pollution control systems and process operations
- Sources and characterization of wastewater discharges, hazardous wastes, emissions, types of treatment, and disposal operations
- Type and amount of waste generated which is discharged, emitted, stored, treated, and disposed
- Waste storage, treatment, and disposal areas

- Waste/spill contingency plans
- Available bypasses, diversions, and spill containment facilities
- Industrial process, pollution control, treatment and disposal methods, monitoring systems

Legal Information

Requirements, Regulations, and Limitations

- Permit applications, draft or existing permits, registrations, approvals, and applicable Federal, State, and local regulations and requirements
- Application certificates, EPA identification numbers
- Information on draft permits which is different from current conditions
- Exemptions and waivers
- Receiving stream water quality standards, ambient air standards, State Implementation Plans, protected uses
- RCRA notification and Part A and Part B applications
- Pesticide labels
- Grant applications for publicly owned treatment works, research and development demonstration projects and progress reports on these projects

- Federal and State classification of facility (e.g., Interim Status, Small Quantity Generator)

Enforcement History

- Status of current and pending litigation against the facility [6*]

- Deficiency notices issued to facility and responses by the facility

- Status of administrative orders, consent decrees, and other regulatory corrective actions, if any, and compliance by the facility

- Penalties imposed against the company

Information Sources

Laws and Regulations - Federal laws and regulations establish procedures, controls, and other requirements applicable to a facility [Table 1] (Missing). In addition, State laws and regulations and sometimes even local ordinances may be applicable, or take precedence.

* *Coordination should occur prior to the audit (in conjunction with the EPA Regional Office) with the local Assistant United States Attorney or Justice Department attorney responsible for the civil or criminal case and any consent decree.*

Permits and Permit Applications - Permits provide information on the limitations, requirements, and restrictions applicable to discharges, emissions and disposal practices; compliance schedules; and monitoring, analytical, and reporting requirements. Applications provide technical information on facility size, layout, and location of pollution sources; waste and pollutant generation, treatment, control and disposal practices; contingency plans and emergency procedures; and pollutant characterization - types, amounts, and locations of discharge, emissions, or disposal.

Regional and State Files - These files often contain grant records, applications, facility self-monitoring data, and audit reports, as well as permits and permit applications pertaining to individual facilities. These information sources can provide compliance, enforcement, and litigation history; special exemptions and waivers applied for and granted or denied; citizen complaints and action taken; process operating problems/solutions; pollution problems/solutions; and laboratory capabilities. Consultant reports can provide design and operating data and recommendations for processes; pollutant sources; treatment, control, and disposal systems; and remedial measures.

Technical Reports, Documents, and References - These sources provide information on industrial process operations, data on available treatment, control and disposal techniques, such as their advantages or drawbacks, limits of application, etc. Such sources include Effluent Guideline and New Source Performance Standard development documents and EPA's Treatability Manual. Similar guidance documents on hazardous waste generation, treatment/ disposal are also available.

The background information sources for overall program areas and those that apply specifically to the water, air, solid waste, pesticides, and toxic substances programs are listed in Table 2 (Missing).

APPENDIX E

SOURCES OF INFORMATION

APPENDIX E

SOURCES OF INFORMATION

I. General References:

A. NEIC Policies and Procedures Manual - Covers chain-of-custody, shipping, document handling, report preparation, and in general, how to conduct an investigation [EPA 33019-78-001-R, August 1991].

B. RCRA Orientation Manual, 1990 Edition. USEPA, Office of Solid Waste/Permits and State Programs Division and the Association of State and Territorial Solid Waste Management Officials. GPO 1990-261-069/24136H

C. Standard Operating Safety guides. USEPA Office of Emergency and Remedial Response, Emergency Response Division. July 1988. GPO 1988-548-158/87012.

D. EPA Publications Bibliography. Quarterly listing of all EPA publications distributed through the National Technical Information Service, indexed alphabetically, numerically, and by key word. NTIS, U.S. Department of Commerce, Springfield, VA 22161 (703) 487-4650.

E. Access EPA: Libraries and Information Services. NTIS, U.S. Department of Commerce, Springfield, VA 22161 (703) 487-4650.

F. Computer Data Systems - A description of the automated data systems accessed by NEIC. Indexes 41 sources accessing over 1,000 data bases.

II. Technical References:

A. Kirk-Othmer Encyclopedia of Chemical Technology. Wiley, 3rd ed., 1981; 4th ed. in publication process.

B. Merck Index: Encyclopedia of chemicals, drugs, and biological compounds. Good source for chemical properties and safety plan details.

C. Directory of Chemical Producers: Lists major chemical producers and the products they make. SRI, International: Menlo Park, California. Annual.

III. Legal/Regulatory References:

A. Statutes at Large: The official publication of a public and private laws and resolutions enacted during a session of Congress.

B. United States Code: A codification of the general and permanent laws of the United States. New editions appear approximately every 6 years with cumulative annual supplements.

C. Regulations

1. Federal Register. Daily publication of proposed and final rules.

2. Code of Federal Regulations: Annual compilation of regulations.

3. LSA (Lists of CFR Sections Affected): Monthly updates of CFR by section.

IV. Computer Data Systems - A description of the automated data systems accessed by NEIC follows:

CONTENTS

AGENCY INTERNAL INFORMATION SYSTEMS CURRENTLY ACCESSIBLE BY NEIC

CONTENTS (cont.)

AGENCY INTERNAL INFORMATION SYSTEMS
NOT CURRENTLY ACCESSIBLE BY NEIC

System	Description	Application
Aerometric Information Retrieval System (AIRS)	A national system in ADABAS maintained by the National Air Data Branch which incorporates information from many of the Agency's air databases. Emissions data (formerly in NEDS) is now available in AIRS.	Data currently available from AIRS consists of the ambient air quality data collected by States, utilized for trends analysis and pollution control strategies and emissions and compliance data collected by EPA and State agencies.
Chemicals in Commerce Information System (CICIS)	A national system containing the results of the 1977 TSCA inventory and later cumulative supplement of approximately 60,000 unique chemical substances (7,000 claim confidentiality) used commercially in the United States.	NEIC can access the system by company name and geographical area, generate listings by company name, CAS registry number or geographical area.
AIRS Facility Subsystem (AFS)	A national system containing compliance information including compliance status, agency actions (e.g., inspections), etc. for major sources of the five primary air pollutants. Recently converted from the Compliance Data System (CDS), AFS is one of five AIRS subsystems.	NEIC can acquire the Significant Violators list and compliance event data for individual sources, whole facilities, sources within a certain geographical area and sources of a specific industrial classification.
Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS)	A national system containing names and locations of uncontrolled hazardous waste sites in the U.S., summary response event status information, alias names and site characteristic data. Recent modifications include provisions for tracking enforcement activities, and technical and chemical information at CERCLA sites. Superfund Comprehensive Accomplish Plan (SCAP) data is also available through CERCLIS.	NEIC can generate site inventory listings for geographical area, the National Priorities List, technical event status reports, and enforcement history for any uncontrolled hazardous waste site and cleanup expenditure reports.
Consent Decree Tracking System	A national system containing a computerized inventory of consent decrees to which EPA is a party, and computerized summaries of the contents of decrees by facility. NEIC maintains a hardcopy library of all consent decrees within the system. This repository has been converted to a full-text database on JURIS.	NEIC can produce hard copies of all decrees in the inventory, and produce computer reports of the inventory, the entire contents of decrees, the milestones to be met in specific decrees or for decrees within a Region and the contents of all decrees for a specific issue (e.g., groundwater monitoring).
Docket System	A national system containing all pertinent information regarding a civil or administrative enforcement action taken by EPA or designated States against violators of all Federal environmental statutes.	NEIC can access the entire system to produce reports of enforcement actions in a geographical area, for a specific statute or media or for a specific source classification.
DUNS Market Identifiers (DMI)	Leased by the Agency from Dun and Bradstreet, DMI contains basic business information for privately- and publicly-owned companies in the United States.	NEIC can generate reports with business information such as number of employees, amount of sales, telephone number, principal officer title, and line of business.

AGENCY INTERNAL INFORMATION SYSTEMS
CURRENTLY ACCESSIBLE BY NEIC

System	Description	Application
Emergency Response Notification System (ERNS)	A national system containing information on reported releases of oil and hazardous substances and responses by EPA, the U.S. Coast Guard and others to the reported releases.	Reports can be generated to identify specific releases and to aggregate data on the number and types of releases throughout the country and in specific states and regions.
Enforcement Document Retrieval System (EDRS)	EDRS is a full-text national database of EPA enforcement documents including the General Enforcement Policy Compendium and the Policy Compendiums for FIFRA, TSCA, RCRA, CERCLA/SARA, and CWA/FWPCA.	EDRS can be used to retrieve all enforcement documents containing a word like "landfill" or relevant to an issue, law, or regulation.
Facility and Company Tracking System (FACTS)	A national database which provides basic business information for privately- and publicly-owned companies in the United States, and facility information for EPA-regulated facilities. FACTS is comprised of the DMI and FINDS subsystems.	NEIC can generate facility listings for any geographical area, type of business, and/or corporation. DMI locates business information such as number of employees, amount of sales, telephone number, and principal officer. FINDS provides facility information for EPA-regulated databases.
Facility Index System (FINDS)	A national database which serves as a cross-reference index on a facility basis to point to media-specific EPA databases to acquire additional data. This is the link with other EPA data systems.	NEIC can generate facility listings for any geographical area, as well as tabulated listing of whether other databases contain information about that facility.
Federal Reporting Data System (FRDS)	A national system containing an inventory of public water supplies in support of the Safe Drinking Water Act. It contains identification and statistical summary information for each public water supply including type of data collected or monitored, and analytical procedures.	NEIC can acquire source information and location, service areas, geographic areas, and historical information. Information on noncompliance and enforcement actions can also be obtained.
NPDES Industrial Permit Ranking System	An NEIC-operated and maintained system which contains criteria, ranking factors and calculation mechanisms to rate (1) a facility's effluent discharge pollution otential, including toxics; (2) health impact potential; and (3) water quality impact potential which is then used in PCS for major/minor differentiation.	NEIC can access the specific data for any of 12 criteria, ranking factors, and resultant ratings for each of the 12, as well as the total ranking for any or all of the three potentials. NEIC can access the data by Effluent Guideline subcategory, as well as by Standard Industrial Classification Code.
Permit Compliance System (PCS)	A national computerized management information system containing an inventory of NPDES permits, milestone forecasts, inspection events, effluent measurement data, effluent and compliance violations and enforcement actions.	NEIC can acquire limit/measurement data for individual discharges or whole facilities, facilities within a geographic area, sources of a specific industrial classification and the Quarterly Noncompliance Report (QNCR) by Region by State. Information on effluent and compliance schedule violations and enforcement actions/tracking can be obtained.

AGENCY INTERNAL INFORMATION SYSTEMS
NOT CURRENTLY ACCESSIBLE BY NEIC

System	Description	Application
Pollution Prevention Information Exchange System (PIES)	A national computerized information network providing access to technical, programmetric, and legislative pollution prevention information. Includes a calendar of events, case studies, directory of contacts, an interactive message center, and document ordering capability.	NEIC can use the system to stay abreast of policy and program activities at HQ and the regions as well as industry specific technical information. Case studies of enforcement settlements incorporating pollution prevention projects can be obtained.
Potentially Responsible Parties System	An NEIC-automated system, which links PRPs from SETS, SFFAS, and Techlaw files.	This system is used as an inventory of specific generators or parent corporations identified at and among hazardous waste sites.
Records of Decision System (RODS)	A full-text national database of over 2,000 Superfund Records of Decision	NEIC can retrieve a specific ROD by searching onsite name or ID number or can identify all RODS having selected media, contaminants, or remedies.
Resource Conservation and Recovery Information System (RCRIS)	Conversion to RCRIS from HWDMS is currently underway on a per state basis. RCRIS is scheduled to be operating as the official automated source of information on RCRA program activities by January 1992.	NEIC is planning to use the RCRIS National Oversight Database, which is derived from the 10 regional RCRIS databases. Information available will include handler identification, permitting/closure/post-closure, compliance monitoring and enforcement, and corrective action and program management data.
Site Enforcement Tracking System (SETS)	A centralized national database tracking notice letters which have been sent to potentially responsible parties.	NEIC uses this database to supplement currently available responsible party information.
STORET	A national database containing water quality data for some 1,800 unique parameters from over 200,000 collection points including lakes, streams, wells, and other waterways. New STORET software provides an interface between STORET and PCS data.	NEIC can access and produce reports of water quality, including groundwater quality, for specific geographical areas, for specific parameters (e.g., organics), and for a specific station.
Superfund Financial Assessment System (SFFAS)	Nationally available computer application designed to calculate the remedial costs a responsible party can theoretically afford to pay for cleanup of a site. Three common financial ratios are used to make this determination: (1) Cash flow to total debt, (2) total debt to equity, and (3) the interest coverage ratio.	NEIC has used the SFFAS too provide financial assessments for potentially responsible parties in response to HQ/Regional requests for several sites including the following: Seymour Recycling (several hundred responsible parties), Re-Solve (more than 200 responsible parties), and MIDCO I and II (approximately 100 responsible parties).

System	Description	Application
TECHLAW Evidence Audit System	Under contract to NEIC, TECHLAW provides document inventories, evidence profiles and generator transaction databases. TECHLAW has produced, for about 30 cases, document inventories containing key word searching capability of all related records contained in Regional office, Headquarters, Department of Justice and/or office files. For sample related activities, including those of the contractor laboratories, TECHLAW produces sample tracking profiles. For hazardous waste sites, TECHLAW has produced document inventories of available records dealing with the generators, volume and type of water, etc.	NEIC can access the document inventories to substantiate the universe of information on which a case is based, to demonstrate the efficacy and utility of an evidence audit system in enforcement case preparation and to provide demonstrative examples of actual applications to establish protocols and implementation procedures.
Toxic Release Inventory System (TRIS)	A national database containing information directly related to the Toxic Chemical Release Inventory Report Form "R." Two types of submissions will be present: Partial (facility and chemical information) and Complete (offsite transfers, emission and releases, waste treatment, waste minimization, activities and uses, and maximum amount stored onsite).	NEIC can generate reports for facilities, geographic areas, and chemical compounds listing facility and chemical information with emissions, releases, activities, etc., for complete submissions.

AGENCY INTERNAL INFORMATION SYSTEMS
NOT CURRENTLY ACCESSIBLE BY NEIC

System	Description	Application
FIFRA/TSCA Tracking System (FTTS)	A PC-based regional system that tracks FIFRA and TSCA inspections, samples, case reviews, enfrocement actions, referrals, and State grants. A national database is planned for FY89.	NEIC has limited access through Headquarters. The national database is used to produce facility listings showing inspections, enforcement data, and product lists.

System	Description	Application
Bibliographic Retrieval System (BRS)	The BRS system contains more than 100 databases with unique files in the chemical technology and standards and specification areas.	BRS is used mainly as a backup when the DIALOG system is unavailable but is also used to obtain chemical manufacturing and production information for specific compounds.
Chemical Information System (CIS)	The CIS is a collection of scientific and regulatory databases containing numeric, textual and some bibliographic information in the areas of toxicology, environment, regulations, spectroscopy, and chemical and physical properties.	NEIC uses the CIS to locate mass spectral information environmental fate information, formulation ingredients for commercially available products such as pesticides and waste disposal methods for hazardous substances.
Colorado Alliance of Research Libraries (CARL)	The CARL system includes the catalogs of the member libraries, an index of over 10,000 periodicals, a full text encyclopedia, Choice book reviews, and a bibliography of GPO publications.	CARL is searched by NEIC staff for general reference, to locate books, and to identify articles and documents.
DataTimes	DataTimes provides online access to numerous full-text databases, including newspapers, wire services, and Dow Jones News/Retrieval.	DataTimes is a source of national environmental news. Newspaper databases from all regions are updated daily.
DIALOG Information Services, Inc.	The DIALOG system contains more than 330 databases covering a variety of disciplines: Science, technology, engineering, social sciences, business, and economics. The databases contain more than 120,000,000 records and are regularly updated to provide the most recent information.	NEIC uses the DIALOG databases to obtain: (1) expert witness information, including biographies, publications authored, congressional testimony; (2) up-to-date pollution control technology for hazardous waste, air and water; and (3) business information such as corporate officers, subsidiaries, and line of business.
Dun and Bradstreet	Dun and Bradstreet, a credit-reporting firm, provides business information reports for privately- and publicly-owned companies and government activity reports which list Federal contracts, grants, fines, and debarments for specific companies.	NEIC uses the Dun and Bradstreet system to locate corporate information such as business done by the company, company history, financial condition, subsidiaries, and corporate officers for privately-held companies.
Groundwater On-Line (GWOL)	The National Groundwater Information Center Database is a bibliographic database containing references to materials on hydrogeology and water well technology with emphasis on reports or projects sponsored by EPA.	NEIC accesses GWOL to locate publications on groundwater topics and to verify or locate groundwater experts.

System	Description	Application
Justice Retrieval and Inquiry System (JURIS)	The Justice Retrieval and Inquiry System (JURIS) is a legal information system developed by the Department of Justice. It contains the complete text of Federal cases, statutes, and regulations in addition to selected DOJ Appellate Court Briefs, trial briefs, and the full text of the U.S. Attorneys' Manual. The full-text of the NEIC Consent Decree repository has been added to JURIS. JURIS also contains comuterized legislative histories of the environmental statutes, model pleadings, and other work products of DOJ attorneys, and EPA General Counsel opinions from 1970 to the present.	JURIS is used to identify relevant caselaw and current statutory and regulatory environmental information.
NEXIS/LEXIS	NEXIS/LEXIS contains the full text of more than 600 business and general news files, including the Washington Post and New York Times. Statutory and case law are provided for computer-aided legal research.	NEIC uses NEXIS/LEXIS to keep informed of the latest Agency and environmental news stories and to track corporate and financial status of U.S. businesses involved in environmental litigation.
National Library of Medicine (NLM)	The National Library of Medicine system contains more than 5,000,000 references to journal articles and books in the health sciences published since 1965.	NEIC uses the NLM system to obtain: (1) toxicity and environmental health effects information for individual chemicals or groups of chemicals, (2) physical and chemical properties of specific compounds, (3) analytical methodology references, and (4) National Cancer Institute carcinogenic bioassay information.
Scientific and Technical Information Network (STN)	The STN system contains databases covering chemistry, science, and engineering that are regularly updated to provide the most recent information. STN has strong coverage of European and Japanese scientific databases.	NEIC uses the STN databases to obtain: (1) chemical structures and synonyms for a chemical compound, (2) analytical methods and techniques, and (3) toxicity of a chemical compound.
		NEIC can acquire source information and location, service areas, geographic areas, and historical information. Information on noncompliance and enforcement actions can also be obtained.
VU/TEXT	VU/TEXT contains the full text of 30 daily newspapers, including nationally recognized papers such as the Boston Globe, Chicago Tribune, Detroit Free Press, Philadelphia Inquirer, and regional papers such as the Orlando Sentinel, the Sacramento Bee and the San Jose Mercury News.	NEIC uses VU/TEXT to keep informed of the latest Agency and environmental news stories and to track corporate and financial status of U.S. businesses involved in environmental litigation.

System	Description	Application
WESTLAW	The WESTLAW system contains legal information, including the full text of cases from the Supreme Court, U.S. Court of Appeals, U.S. District Courts, and State Courts. It contains Shepards' Citations, regulatory information froom the Code of Federal Regulations, Federal Register, U.S. Code and the expert witness information from Forensic Services Directory.	NEIC uses WESTLAW toidentify precedent cases, to locate all cases decided by a certain judge or all cases represented by a certain attorney and to locate possible expert witnesses.

PROJECT PLAN *
MULTI-MEDIA COMPLIANCE INVESTIGATION
XYZ COMPANY, MIDTOWN, ANYSTATE

INTRODUCTION

The XYZ Company operates a plant at 1234 Anywhere Road in the middle part of Midtown, Anystate [Figure 1]. EPA Region XX requested that NEIC conduct a multi-media compliance investigation of the XYZ plant. The specific objectives of the investigation are to determine compliance with:

- Water pollution control regulations under the Clean Water Act (CWA), including wastewater pretreatment requirements and Spill Prevention and Control Countermeasures (SPCC) regulations
- Hazardous waste management regulations, under the Resource Conservation and Recovery Act (RCRA) and the Anystate Administrative Code (AAC)
- Underground Storage Tank (UST) regulations
- Air pollution control regulations under the Clean Air Act (CAA), Federal Implementation Plan (FIP), and the Federally approved portions of the State Implementation Plan (SIP)
- Toxic Substances Control Act (TSCA) PCB regulations
- Superfund Amendments Reauthorization Act, Title III, Emergency Planning and Community Right-To-Know Act (EPCRA) regulations

Compliance with other applicable environmental regulations may be determined by the NEIC. Region XX personnel will evaluate compliance with TSCA Sections 5, 8, 12, and 13 during the NEIC inspection, and report their findings separately.

BACKGROUND

XYZ began operating the plant in 1492. Compounds A, B, and C; chemicals D, E, and F; pesticides G and H, and special containers for these materials have been manufactured on site. In 1942, some operations (formerly under the Middle Division) were acquired by a company known as "Newage, Inc." The remaining XYZ plant currently manufactures water soluble specialty items, and conducts research and development.

The XYZ plant employs a total of about 1,300 people, in a Primary Division, a Secondary Division, a Tertiary Division, and R and D Laboratory. The Primary Division manufactures compounds A, B , and C (240 tons in 1990). Raw materials for the compounds are purchased from

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* *Subject to revision*

an outside source. The Secondary Division makes chemicals and pesticides under numerous brand names (180 tons in 1990), and the Tertiary Division makes special containers for these materials (3 million containers in 1990). Research and development are conducted by R and D Laboratory.

The EPA Region XX Environmental Compliance Division, Midtown District Office (MDO), conducted a multi-media inspection of the XYZ plant during the first quarter of 1991. The MDO inspection report identified concerns with wastewater control, hazardous waste management, documentation, and spill prevention control.

Approximately 1.2 million gallons of wastewater per day are discharged to the Midtown Wastewater Treatment Plant (MWTP) of Midtown, Anystate. There are two direct National Pollutant Discharge Elimination System discharges (001 and 002) to the Midtown River at this facility. Additionally, sewered plant effluent discharge is regulated by the MWTP pretreatment standards, and the Federal effluent limitations and standards for the Compounds, Chemicals, Pesticides and Containers point source category. The R and D Laboratory conducts the Company's effluent analyses.

Violations of the MWTP pretreatment ordinance effluent limitations have occurred for solids, and the toxic standards. MWTP is concerned with data indicating the discharge of solids and toxics J, K, and L from the plant. XYZ also may have modified their pretreatment plant without obtaining a construction permit required by the Anystate Environmental Resources Department (AERD).

XYZ submitted the original RCRA Part A permit application on November 15, 1980. The application listed 19 hazardous waste management units, including 4 container storage areas, 10 storage tanks, and 5 storage surface impoundments. AERD is responsible for monitoring hazardous waste activities.

The facility's June 1990 contingency plan lists 14 above ground and 22 underground tanks on site. The tanks range in size from 2,000 to 50,000 gallons, with the majority between 5,000 and 20,000 gallons. These tanks are located in a tank farm area and near production areas.

The plant emits both volatile organics and particulates. There is no volatile organic constituent emission control equipment. Particulate emissions are controlled by three dust collectors. Five wet scrubbers are used to control fugitive particulate emissions when mixing bags of dry raw materials in reaction vessels. Air emissions are regulated by "Anystate Permits and Air Pollution regulations including AERD Operating Permits. EPA also promulgated a FIP on February 14, 1991.

On August 31, 1983, EPA Region XX conducted a PCB sampling inspection at the plant. XYZ was fined for violations, including cracks in the floor of the PCB storage area, not conducting monthly inspections, no annual document, and not properly marking PCB transformers.

The Toxic Release Inventory (TRI) for this plant lists emissions of A, B, C, and D. The TRI also lists various inorganics, including E, F, G, and H.

INVESTIGATIVE METHODS

Investigation objectives will be addressed by:

- Compilation and review of EPA, AERD, and MWTP database and file information
- Meetings with EPA Region XX personnel to discu ss investigation specifics including: objectives, logistics, and potential sampling locations
- An on-site inspection

Meetings with Region XX personnel took place (date). The on-site inspection, scheduled to begin (date), will include:

- Discussing plant operations with facility personnel
- Reviewing and copying, as appropriate, facility documents including operating plans and records
- Visually inspecting plant facilities including processing, material storage, and waste handling facilities
- Sampling and analysis of appropriate waste streams and/or any un known/unauthorized discharges to assist in compliance determination, as follows:

  (a) MWTP will collect and analyze wastewater samples for organic constituents during the week of (date). All QA/QC will be the responsibility of MWTP.

  (b) NEIC will collect wastewater samples for v olatile organic constituent analysis during the on-site inspection. NEIC will conduct the associated analysis.

After completing the on-site inspection, NEIC investigators will br ief appropriate EPA Region XX Program and Office of Regional Counsel per-sonnel regarding preliminar y findings.

A draft report, including any analytical data, will be written by NEIC personnel and transmitted to EPA Region XX personnel for review and comment. A final report will be completed about two weeks after Region V comments are received. If analytical data are not available by (date), they will be presented in an addendum to the report.

NEIC personnel will be available for any additional support required (negotiations , litigation, etc.) until noncompliance issues are resolved.

<u>DOCUMENT CONTROL PROCEDURES</u>

NEIC document control procedures * will be followed during the inv estigation. TSCA "Notice of Inspection" and "Confidentiality" forms will be completed during the openin g conference. Documents and r ecords obtained from the Company will be uniquely numbered

* *NEIC Policies and Procedures Manual, revised August 1991*

and listed on docu-ment logs. Photograph logs will also be maintained. A copy of the document and photograph logs, with a Receipt For Samples/Document form, will be offered to the Company prior to completion of the on-site inspection. Any documents declared to be confidential business information pursuant to 40 CFR Part 2 will be so noted on the log and secured appropriately.

SAFETY PROCEDURES

Safety procedures to be followed during the on-site inspection will comply with those described in the attached safety plan [Appendix A], and established NEIC safety procedures. These procedures are contained in EPA 1440 - Occupational Health and Safety Manual (1986 edition), Agency orders and applicable provisions of the NIOSH/OSHA/USCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. The Company's safety policies will also be reviewed and followed.

TENTATIVE SCHEDULE

(date) Region XX will notify facility of inspection (verbally and in writing)
(date) Initiate on-site inspection
(date) Brief Region V regarding preliminary findings
(date) Draft report to Region V

APPENDIX

NEIC
SAFETY PLAN
FOR
HAZARDOUS SUBSTANCES RESPONSES AND FIELD INVESTIGATIONS

The OSHA Hazardous Waste Site Worker Standards (29 CFR 1910.120) and EPA protocols require certain safety planning efforts prior to field activities. The following format is aligned with these requirements. Extensive training and certifications are required in addition to this plan.

PROJECT: ____________________________________ NEIC Reporting Code: _________

Project Coordinator: ___________________________________ Date: ________________
Branch Chief: _______________________________________ Date: __________________
On Scene Coordinator or Supervisor:

____

Health and Safety Manager:

Approval: ____ Date: _____________

DESCRIPTION OF ACTIVITY

If any of the following information is unavailable, mark "UA"; if covered in project plan, mark "PP".

Site Name: ____
Location and approximate size: ____
Description of the response activity and/or the job tasks to be performed:
____
____

Duration of the Planned Employee Activity: ____
____

Proposed Date of Beginning the Investigation: _______________________________________
Site Topography: ____

Site Accessibility by Air and Roads: ____

HAZARDOUS SUBSTANCES AND HEALTH HAZARDS INVOLVED OR SUSPECTED AT THE SITE

Fill in any information that is known or suspected

Areas of Concern	Chemical and Physical Properties	Identity of Substance and Precautions
Explosivity:	______________	______________ ______________ ______________
Radioactivity:	______________	______________ ______________ ______________
Oxygen Deficiency: (e.g., Confined Spaces)	______________	______________ ______________ ______________
Toxic Gases:	______________	______________ ______________ ______________
Skin/Eye Contact Hazards:	______________	______________ ______________ ______________
Heat Stress:	______________	______________ ______________ ______________

Pathways from site for hazardous substance dispersion: ______________________________
____
____

WORK PLAN INSTRUCTIONS

A. Recommended Level of Protection: A _____ B _____ C _____ D _____

Cartridge Type, if Level C: ______________________________

Additional Safety Clothing/Equipment: ______________________________
____
____
____
____

Monitoring Equipment to be Used: ____________________

CONTRACTOR PERSONNEL:

Number and Skills ____________________

CONTRACTOR SAFETY CLOTHING/EQUIPMENT REQUIRED: ____________________

Have contractors received OSHA required training and certification?
(29 CFR 1910.120)
Yes ______ Not Required ______

(If "yes", copy of training certificate(s) must be obtained from contractor)

B. Field Investigation and Decontamination Procedures:

Decontamination Procedures (contaminated protective clothing, instruments, equipment, etc.): __

Disposal Procedures (contaminated equipment, supplies, disposal items, washwater, etc.): ______

IV. EMERGENCY CONTACTS

Hospital Phone No.: ____

Hospital Location: ____ ______
____
____

EMT/Ambulance Phone No.: ____
Fire Assistance Phone No.: ____

NEIC Health and Safety Manager: Steve Fletcher - 303/236-5111
FTS 776-5111

Radiation Assistance: Wayne Bliss, Director
Office of Radiation Programs
Las Vegas Facility (ORP-LVF)
702/798-2476
FTS 545-2476

Appendix G

MULTI-MEDIA INVESTIGATION EQUIPMENT CHECKLIST

DHL/Federal Express forms

Packing/shipping labels

Packing tape/fiber tape

Custody tape/evidence tape

Coolers with TSCA locks

Cartridges for respirators (14 organic vapor)

Extra vehicle keys

TSCA lock and bar on rear closet doors of van

Accordian folders

Yellow Post-It notes

Box paper clips

Staplers

Boxes of staples

Xerox machine

Related plugs for xerox machine to connect to trailer outlets

Alter 220 extension plug-in to adapt to SCA hookup

Boxes rubber bands

Xerox paper

Writing paper

Box of pens

Box of pencils

Pencil sharpener

Large eraser

Calculators

Lap top/notebook computer

Desk lamps, preferably flat bases

TSCA/PCB forms (CBI green sheets, Confidentiality Notice, Declaration of CBI, Notice of Inspection)

Cameras, Polaroid and Nikon 35mm

Boxes film for each (Ecktachrome slides for 35mm)

300-Foot tape

Brunton compass

Two way radios and chargers

Flashlights

Tyvex suits, disposable gloves

Rulers

Desk blotters

Chain-of-custody forms

Ice chests for sample shipping (environmental)

Packing material

NEIC Procedures manual for shipping of samples and TSCA material

Sample receipt forms

Sample tags

Microfilm copier

Microfilm copier film

Tool box

Steel sounding tape

SS weight for tape and SS wire

Boxes Kimwipes

Clipboards

Carpenter's chalk

Sonic sounder

12-Foot tape measure

Garbage bags

Pair NUKs boots

Folding 6-foot ruler

Colored pens/pencils/markers

8-oz. jars

Quart size jars

Plastic Ziplocks

Glass thieves

Plastic/metal scoops

Shovel

pH paper/meter

HNu meter

Bacon bombs

Sampling gear

Media-specific sampling gear

Appendix H
SUGGESTED RECORDS/DOCUMENTS REQUEST

GENERAL PROCEDURE

The records evaluation generally will proceed in two stages. First, various records to be reviewed will be identified. Generally, these records will date back 3years from the present, but some of the records will be for specific time periods. Second, according to a schedule to be developed onsite, the records will be reviewed and copies requested, as needed. Alternately, document copies will be requested for later review after the investigation.

GENERAL

1. Facility map and plot plan
2. Organizational chart
3. Description of facility and operations

CLEAN AIR ACT (CAA)

1. Plot plan of the facility showing location and identification of all major process area and stacks

2. Brief descriptions for all process areas to include:

    (a) Simplified process flow diagrams
    (b) Pollution control equipment

3. Permits and/or variances for air emission sources and related correspondence

4. Consent Decrees/Orders/Agreements still in effect

5. Sulfur in fuel records for boiler/space heater fuel

6. Stack tests (most recent) and stack and ambient monitoring data (last 2 quarters)

7. Performance specification tests for continuous emission monitors

8. 1989 state emissions inventory report

9. Procedures/manuals for the operation and inspection of pollution control equipment

10. Required notices for asbestos demolition/renovation projects in progress or completed within the last three years

11. Hours of operation and process weight rates for the automated multi-base propellant (AMB) manufacturing facility (last 2 years)

12. Annual volatile organic compounds (VOC) emissions from the AMB facility including associated VOC storage tanks (last 2 years). Describe the method(s) used to determine emissions. If estimates have been made show calculations and assumptions.

13. Annual AMB facility inspections reports (last 2 years)

14. Annual AMB facility VOC emissions control reports (last 5 years)

15. Non-compliance AMB reports (last 2 years)

16. List air pollution sources, not covered in items 1 - 8, such as combustions units larger than 2.5 million BTUs/hr heat inputs and incinerators (other than the RCRA incinerators)

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

1. List of description of all hazardous waste storage areas, including above and below ground tanks, temporary tanks, drum storage areas, pits, ponds, lagoons, waste piles, etc., that have been operated at any time since November 1980.

2. RCRA Part A Permit Application

3. Manifests for all offsite shipments of hazardous waste, including notifications and certifications for Land Disposal Restricted (LDR) hazardous waste.

4. Determinations, data, documents, etc., supporting the Base's decision that wastes are hazardous, non-hazardous or LDR hazardous wastes for all solid wastes, as defined under RCRA. Also provide information used in the determination of the EPA hazardous waste codes applied to all hazardous wastes.

5. Notices to the owner or operator of the disposal facility receiving waste subject to land disposal restrictions

6. Schedule and inspection logs for inspection of safety and emergency equipment, security devices, monitoring equipment, and operating and structural equipment

7. Satellite accumulation area inspection records

8. Employee training records for hazardous waste handlers, including job title and description, name of each employee and documentation of the type and amount of training each has received.

9. Current Contingency Plan

10. Current Closure Plan

11. Copy of the Waste Analysis Plan (WAP) currently in use and effective date of the plan. If the current WAP was not effective on January 1, 1986 provide copies of all WAPs and revisions.

12. Narrative of procedures used to store hazardous wastes prior to shipment offsite for treatment, recycle, reclamation and/or disposal. Include a list of all storage and satellite storage areas and the quantity of waste stored at each area.

13. Summary reports and documentation of all incidents that required implementation of the contingency plan for the past 3 years

14. The Generator Biennial and Exception Reports

15. Reports and analytical results of any groundwater quality and groundwater contamination surveys

16. Closure plan for units undergoing closure

17. Inspection schedule(s) for all hazardous waste management units, such as storage areas and tank systems, and all inspection logs, remediations document, etc, for the last three years.

18. Description of the Facility's hazardous waste minimization plan

19. Copy of the annual report for the last three years

20. Copy of notification to EPA of hazardous waste activity to secure generator ID number

21. Copy of Clean Closure Demonstration, if any.

22. List of all identified or suspected Solid Waste Management Units on the Base's property

23. List of all locations where hazardous wastes are generated including types, quantity, and EPA hazardous waste codes of wastes

24. Notification of any releases to the environment and follow-up reports

25. Notifications for underground storage tanks

26. Copy of written tank integrity assessment certified by a professional engineer

27. Agreements with local emergency response authorities or documentation of refusal by the emergency response authorities to enter into such agreements.

28. Design specifications for any underground storage tanks installed after May 1985

29. Characteristics of materials removed from facility septic systems, including analytical results

30. Wastes burned in the RCRA incinerators, including waste analysis

31. Instruments used to monitor incinerator combustions and emissions

32. Incinerator inspection records (last year)

TOXIC SUBSTANCES CONTROL ACT - PCB WASTE MANAGEMENT

1. Copies of the "Annual Document" required by 40 CFR 761.180(a) for the last 3 years

2. Records of monthly inspections of storage areas subject to 40 CFR 761.65

3. The SPCC plan prepared for storage areas subject to 40 CFR 761.65

4. All spill reports

5. Records of inspection and maintenance for PCB transformers for the last 3 years

6. Transformer inventory and PCB analyses

7. Reports or other documentation identifying the extent of any PCB spills and any remediation plans

8. Certifications of Destruction for PCB Transformer disposal

9. Manifests for PCB items shipped offsite

CLEAN WATER ACT (CWA)

1. All NPDES permit(s) applications

2. NPDES permit effective for last 3 years

3. Discharge monitoring reports (DMRs) for last 3 years

4. Any correspondence regarding exceedences of discharge limitations

5. Spill Prevention Control and Countermeasure (S PCC) plan and Prevention Preparedness and Contingency (PPC) plan

6. Description or lies of all sewer system monitoring stations and analyse s conducted on samples collected (include monitoring frequency).

7. Written calibration procedures for flow measuring and recordin g equipment; includes industrial sewers, storm sewers, sanitary sewers o r any other sewers on the Plant's property.

8. Description of waste water treatment pla nt, sewer system and storm water by-pass system

9. Consent decrees/agreements still in effect

COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT (CERCLA)

1. Specific CERCLA questions will be provided during the inspection.

EMERGENCY PLANNING COMMUNITY RIGHT-TO-KNOW ACT (EPCRA)

1. Notification to the State Emergency Response Commission

2. Designated facility emergency coordinator

3. Written follow-up emergency release notifications

4. Material Safety Data S heet report to the Commission and fire department

5. Tier I/Tier II submittal to the Commission and fire department

6. EPA Form R submittals for the past 3 years

7. Documentation supporting the Form R submittals for the past 3 years

FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA)

1. Restricted pesticide use and application records

2. Pesticide handlers training and certification records

3. Pesticide inventory and storage area inspection records

SAFE DRINKING WATER ACT

1. Description of water supply system including supply, storage capacity, distribution, and monitoring system

Appendix I
MULTI-MEDIA CHECKLISTS

TITLE	DATE	SOURCE
Multi-Media		
Facility Multi-Media Survey		Region I
Inspector's Multi-Media Checklist		Region II
RCRA		
Pre-Inspection Worksheet	October 1993	RCRA Inspection Manual
Land Ban Checklist Questions	October 1993	RCRA Inspection Manual
General Site Inspections Information	October 1993	RCRA Inspection Manual For m
General Facility Checklist	October 1993	RCRA Inspection Manual
Land Disposal Restrictions List	October 1993	RCRA Inspection Manual
RCRA Hazardous Wste Tank Inspection	October 1993	RCRA Inspection Manual
Transporter's Checklist	October 1993	RCRA Inspection Manual
Containers Checklist	October 1993	RCRA Inspection Manual
Surface Impoundments List	October 1993	RCRA Inspection Manual
Waste Piles Checklist	October 1993	RCRA Inspection Manual
Land Treatment Checklist	October 1993	RCRA Inspection Manual
Landfills Checklist	October 1993	RCRA Inspection Manual
Incinerators Checklist	October 1993	RCRA Inspection Manual
Thermal Treat. List (part 264)	October 1993	RCRA Inspection Manual
Groundwater Monitoring Checklist	October 1993	RCRA Inspection Manual
Waste Information Worksheet	October 1993	RCRA Inspection Manual
Comprehensive GW Monitoring Evaluation	March 1988	RCRA GW Monitoring Systems Manual
Comparison of Permit & Oper. Condition	April 1989	RCRA Incinerator Inspection Manual
Visual Assess. & Audit Activities	April 1989	RCRA Incinerator Inspection Manual
List-Inspection New RCRA Incinerators	April 1989	RCRA Incinerator Inspection Manual
Landfill and Dump Site Analysis	April 1989	RCRA Incinerator Inspection Manual
Chemical Facility Analysis	June 1988	RCRA Incinerator Inspection Manual
RCRA Land Disposal Rest. Gen. List	Feb. 1989	RCRA Incinerator Inspection Manual
Transporter Checklist	Feb. 1989	RCRA Incinerator Inspection Manual

Appendix I (cont.)
MULTI-MEDIA CHECKLISTS

TITLE	DATE	SOURCE
RCRA Land Restrictions-T, S, & D Req.	Feb. 1989	RCRA Incinerator Inspection Manual
Solvent Identification Checklist	Feb. 1989	RCRA LDR Inspection Manual T a n k
Systems-Inspection Checklist	Sept. 1988	RCRA Tank Inspection Manual
Tank Systems-Small Quantity Gen.	Sept. 1988	RCRA Tank Inspection Manual
Tank-Document of General Inspection Requirements	Sept. 1988	RCRA Tank Inspection Manual
Tank System-Existing Tank System	Sept. 1988	RCRA Tank Inspection Manual
Tank System-New Tank System	Sept. 1988	RCRA Tank Inspection Manual
Tank Systems and Ignitable Waste	Sept. 1988	RCRA Tank Inspection Manual
Tank System-Release Response	Sept. 1988	RCRA Tank Inspection Manual
Tank System-Visual Tank Inspection	Sept. 1988	RCRA Tank Inspection Manual
Tank-Closure, Post-Closure Call	Sept. 1988	RCRA Tank Inspection Manual
Landfill & Dump Site Analysis	June 1988	RCRA Tank Inspection Manual
Chemical Facility Analysis	June 1988	RCRA Tech. Case Devel Guidance
RCRA LDR Inspections	Sept. 1990	Prepared by Region V
Health & Safety Inspection Form	Feb. 1991	OWPE
TSCA		
TSCA Screening Inspection Checklist		Region VI
Established Inspections Narrative Report	Jan. 1989	Pesticides Inspection Manual
CWA		
Record, Report, & Schedule List	1985	CWA Compliance/Enforcement Guidance
Sample Evaluations List Section 309	1985	CWA Compliance/Enforcement Guidance

Appendix I (cont.)
MULTI-MEDIA CHECKLISTS

TITLE	DATE	SOURCE
NPDES		
NPDES Compliance Inspection Report		NPDES Compliance Monitoring - Overview
Mobile Bioassay Equipment List		NPDES Compliance Monitoring - Biomonitoring
Records, Reports, & Schedule List	June 1984	NPDES Compliance Inspection Manual
Facility Site Review Checklist	June 1984	NPDES Compliance Inspection Manual
Permittee Sampling Inspection	June 1984	NPDES Compliance Inspection Manual
Flow Measurement Inspection List	June 1984	NPDES Compliance Inspection Manual NPDES
Biomonitoring Evaluation Form	June 1984	NPDES Compliance Inspection Manual
Laboratory Quality Assurance List	June 1984	NPDES Compliance Inspection Manual
UIC		
Inspections Checklist (UIC)	Feb. 1988	UIC Inspection Manual for U.S. EPA
Pressure Gauge Inspection List	Feb. 1988	UIC Inspection Manual for U.S. EPA
Flow Measurement Inspection List	Feb. 1988	UIC Inspection Manual for U.S. EPA
Inspections Checklist (UIC)	Feb. 1988	UIC Inspection Manual for U.S. EPA
Pressure Gauge Inspection List	Feb. 1988	UIC Inspection Manual for U.S. EPA
Flow Measurement Inspection List	Feb. 1988	UIC Inspection Manual for U.S. EPA
Air		
Electric Arc Furnaces (I) List	May 1977	Steel Producing Electric Arc Furnaces
Opacity Observations (II) List	May 1977	Steel Producing Electric Arc Furnaces
Performance Test Observation (III)	May 1977	Steel Producing Electric Arc Furnaces
Operation of Electric Arc Furnace (IV)	May 1977	Steel Producing Electric Arc Furnaces
Fume Collection System (V) Checklist	May 1977	Steel Producing Electric Arc Furnaces

Appendix I (cont.)
MULTI-MEDIA CHECKLISTS

TITLE	DATE	SOURCE
Fabric Filter Collectors (VI) Checklist	May 1977	Steel Producing Electric Arc Furnaces
Scrubbers (VI) Checklist	May 1977	Steel Producing Electric Arc Furnaces
Electrostatic Precipitators (VIII) List	May 1977	Steel Producing Electric Arc Furnaces
Tank Inspection Checklist	April 1977	Volatile Hydrocarbon Storage Tanks
Sewage Sludge Incinerators - During Performance Test	Feb. 1975	Sewage Sludge Incinerators
Sewage Sludge Incinerators - After Performance Test	Feb. 1975	Sewage Sludge Incinerators
Municipal Incinerators - During Performance Test	Feb. 1975	Municipal Incinerators
Municipal Incinerators - After Performance Test	Feb. 1975	Municipal Incinerators
Secondary Brass & Bronze Smelters - During Performance Test	Jan. 1977	Secondary Brass & Bronze Ingot Production Plants
Secondary Lead Smelters - During Performance Test	Jan. 1977	Secondary Lead Smelters
Basic Oxygen Process Furnace - During Performance Test	Jan. 1977	Basic Oxygen Process Furnaces
Performance Test of Portland Cement Plants	Sept. 1975	Portland Cement Plants
Periodic Check of Portland Cement Plant	Sept. 1975	Portland Cement Plants
Steam-Electric Generators - During Performance Test	Feb. 1975	Fossil-Fuel Fired Steam Generators
Steam-Electric Generation - After Performance Test	Feb. 1975	Fossil-Fuel Fired Steam Generators
Municipal Incinerators Checklist	June 1973	Combustion & Incineration Sources

APPENDIX I

MULTI-MEDIA CHECKLISTS

TITLE	DATE	SOURCE

Table 1

INVESTIGATION AUTHORITY UNDER THE MAJOR ENVIRONMENTAL ACTS

CAA - § 114(a)(2)

". . .the Administrator or hi s authorized representative, upon presentation of his credentials - shall have a right of entry to, upon, or through any pre mises of such person or in which any records required to be maintained. . .are located, and may at reasonable ti mes have access to and copy any records, inspect any monitoring equipment and method. . .and sample any emissions. . .."

CWA - § 308(a)(4)(B)

". . .the Administrato r or his authorized representative. . .upon presentation of his credentials - (i) shall have a right of entry to, upon, or through any premises in w hich an effluent source is located or in which any records required to be maintained. . .are located, and (ii) may at reasonable times have access to and copy any records, inspect any monitoring equipment or method. . .any sample any effluents which the owner or operator of such source is required to sample. . .."

RCRA - § 3007(a)

". . .any such person who generates, stores, treats, transports, disposes of or otherwise handles or has handled hazardous wastes shall upon request of any. . .employee or representative of the Environmental Protection Agency. . .furnish information relating to such wastes and permit such person at all reasonable times to have access to, and to copy all records relating to such wastes."

". . .such employees or representatives are authorized. . .to enter at reasonable times any establishment or other place where hazardous wastes are or have been generated, stored, treated, or disposed of or transported from; to inspect and obtain sam ples from any person of any such wastes and samples of any containers or labeling for such wastes."

- § 9005(a)(1)

". . .representatives are authorized. . .to enter. . .inspect and obtain samples. . .

TSCA - § 11(a)(b)

". . .any duly designated re presentative of the Administrator, may inspect any establishment. . .in which chemical substances or mixtures are manufactured, processed, stored, or held before or after thei r distribution in commerce and any conveya nce being used to transport chemical substances, mixtures, or such articles in connection with distribution in commerce. Such an inspection may only be made upon the presentation of appropriate credentials and of a written notice to the owner, co-operator, or agent in charge of the premises or conveyance to be inspected."

FIFRA - § 8 and 9

". . .any person who sells or offers for sale, delivers, or offers for delivery any pesticide. . .shall, upon request of any officer or employee of the Environmental Protection Agency. . .furnish or permit such person at all reasonable times to have access to, and to copy: (1) all records showing the delivery, movement, or holding of such pesticide or device, including the quantity, the date of shipment and receipt, and the name of the consignor and consignee. . .."

". . .officers or employees duly designated by the Administrator are authorized to enter at reasonable times, any establishment or other place where pesticides or devices are held for distribution or sale for the purpose of inspecting and obtaining samples of any pesticides or devices, packaged, labeled, and released for shipment and samples of any containers or labeling for such pesticides or devices."

"Before undertaking such inspection, the officers or employees must present to the owner, operator, or agent in charge of the establishment. . .appropriate credentials and a written statement as to the reason for the inspection, including a statement as to whether a violation of the law is suspected."

". . .employees duly designated by the Administrator are empowered to obtain and too execute warrants authorizing entry. . .inspection and reproduction of all records. . .and the seizure of any pesticide or device which is in violation of this Act."

SDWA - § 1445

". . .the Administrator, or representatives of the Administrator. . .upon presenting appropriate credentials and a written notice to any. . .person subject to. . .any requirement. . .is authorized to enter any establishment, facility, or other property. . .in order to determine. . .compliance with this title, including for this purpose, inspection, at reasonable times, of records, files, papers, processes, controls, and facilities or in order to test any feature of a public water system, including its raw water source."

CERCLA (Superfund) - § 104(e)

"Any officer, employee, or representative of the President. . .is authorized to . . .

require any person.. .to furnish. . .information or documents relating to. . .identification, nature, and quantity of material. . .generated, treated, stored, or disposed. . .or transported. . .nature or extent of a release. . .ability of a person to pay. . ."

". . .access. . .to inspect and copy all documents or records. . ."

Appendix I (cont.)
MULTI-MEDIA CHECKLISTS

TITLE	DATE	SOURCE

". . .to enter. . .place or property wh ere any hazardous substance or pollutant or contaminant may be or has been generated, stored, treated, disposed of, or transported from. . .needed to determine the need for response. . ."

". . .to inspect and obtain samples. . ."

Table 2

SUMMARY OF FEDERAL ENVIRONMENTAL ACTS REGARDING RIGHT OF ENTRY, INSPECTIONS, SAMPLING, TESTING, ETC.

Act/Section	Designated Representative	Presentation of Credentials	Notice of Inspection	Sampling Permitted	Inspection of Records	Sample Splits	Receipt for Agency's Samples	Return of Analytical Results
Clean Water Act - § 308(a)	Yes, auth. by Administrator	Required	Not required	Yes (effluents which the owner is required to sample)	Yes	Not required	Not required	Not required
FIFRA - § 8(b) (Books and Records)	Yes, designated by Administrator	Required	Written notice required with reason and suspected violation note	Access and copy records	Yes	N/A	N/A	N/A
FIFRA - § 9(a) (Inspections of Establishments)	Yes, designated by Administrator	Required	Written notice required with reasons for inspection	Yes	See § 8	Required, if requested	Required	Required, promptly
Clean Air Act - § 114(a)	Yes, auth. by Administrator	Required	Not required except notify State for SIP sources	Yes	Yes	Not required	Not required	Not required
RCRA - § 3007(a) § 9005(a)	Yes, designated by Administrator	Not required	Not required	Yes	Yes	Required, if requested	Required	Required, promptly
SDWA - § 1445(b)	Yes, designated by Administrator	Required	Written notice required, must also notify State with reasons for entry if State has primary enforcement responsibility	Yes	Yes	Not required	Not required	Not required
TSCA - § 11(a, b)	Yes, designated by Administrator	Required	Written notice required	(The Act does not mention samples or sampling in this section. It does state an inspection shall extend to all things within the premise of conveyance.)	Yes	N/A		N/A
CERCLA - § 104(e)	Yes, designated by President	Not required	Upon reasonable notice for information	Yes	Yes	Required, if request	Required	Required, promptly

(03/92)

Appendix K

PHOTOGRAPHS

When movies, slides, or photographs are taken which visually show the effluent or emission source and/or any monitoring locations, they are numbered to correspond to logbook entries. The name of the photographer, date, time, site location, and site description are entered sequentially in the logbook as photos are taken. A series entry may be used for rapid the aperture settings and shutter speeds for photographs taken within the normal automatic exposure range. Special lenses, films, filters, or other image enhancement techniques must be noted in the logbook. Chain-of-custody procedures depend upon the subject matter, type of film, and the processing it requires. Film used for aerial photography, confidential information, or criminal investigations require chain-of-custody procedures. Adequate logbook notations and receipts may be used to account for routine film processing. Once developed, the slides or photographic prints shall be serially numbered corresponding to the logbook descriptions and labeled.

MICROFILM

Microfilm is often used to copy documents that are or may later become TSCA Confidential Business Information (CBI). This microfilm must be handled in accordance with the TSCA CBI procedures (see Appendix I for additional information and forms). Table C-1 is the NEIC procedure for processing microfilm containing TSCA CBI documents.

Table K-1

NEIC PROCEDURE FOR MICROFILM
PROCESSING OF TSCA CBI DOCUMENTS

1. Kodak Infocapture AHU 1454 microfilm shall be used for filming all TSCA CBI documents.

2. Obtain packaging materials and instructions from the NEIC Document Control Officer or Assistant, including:

   - Preprinted shipping labels
   - Chain-of-custody records
   - Custody seals
   - Double envelopes
   - Green TSCA cover sheets
   - TSCA loan receipt

3. Prepare each roll of microfilm for shipment to the processor.

   - Enclose the film in double-wrapped packages
   - Place a green TSCA cover sheet in the inner package
   - Place a TSCA loan receipt in the inner package
   - Complete a Chain-of-Custody Record, place the white copy in the inner package and keep the pink copy for the field files
   - Seal inner package with a custody seal and sign and date it
   - Mark the inner package:

   "TO BE OPENED BY ADDRESSEE ONLY
   TSCA CONFIDENTIAL BUSINESS INFORMATION"

4. Ship the film via Federal Express to the Springfield, Virginia Federal Express office and instruct that it is to be held for pickup. USE SIGNATURE SECURITY SERVICE ONLY.

   This practice requires the courier to sign, the station personnel to sign, and the delivery courier to sign.

   Instruct the Springfield Federal Express office to hold the shipment for pickup and to notify:

   Mr. Vern Webb
   U.S. EPA/EPIC
   Vint Hill Farms Station
   Warrenton, Virginia 22186
   (730)557-3110

5. Telephone Mr. Webb and inform him of the date shipped, the number of rolls of film, the air bill number, and your phone number.

6. Telephone the NEIC Document Control Officer or Assistant and inform them.

7. Telephone Mr. Webb the following day and verify film quality to determine if repeat microfilming is necessary.

8. The pink copy of the Federal Express form, with the shipment cost and project number indicated, must be turned in to the Assistant Director, Planning and Management. If you are in the field for an extended period of time (3 weeks or more), the pink copies must be mailed to NEIC.

KEY PRINCIPLES AND TECHNIQUES FOR INTERVIEWING

The list of principles and techniques presented below is intended to highlight methods which can be used by auditors to conduct effective interviews.

Planning the Interview

- Iron out logistics
- Define the desired outcome(s)
- Organize thoughts and establish a general sequence for questioning

Opening the Interview

- Introduce yourself and the purpose of the interview
- Ensure appropriateness of time
- Explain how information will be used

Conducting the Interview

- Request a brief overview of the interviewee's responsibilities with respect to the audit topic(s)
- Ask open-ended questions (e.g., "what" or "how"), not obvious yes/no questions (e.g., "do you", etc.)
- Follow-up on issues which are unclear
- Avoid making assumptions
- Avoid leading questions
- Provide feedback to interviewee questions, as appropriate, to ensure a level of responsiveness to the interviewee.
- Tolerate silences in order to allow the interviewee to formulate thoughts and responses

Closing the Interview

- Do not exceed the agreed-upon time limit without getting concurrence for an extension
- End on a positive note
- Summarize your understanding of key points discussed to ensure accuracy

Documenting Interview Results

- Establish the context of the interview (time, name of interviewee, protocol step)
- Take notes of key points during the interview (do not attempt a verbatum transcript)
- Summarize the outcome and overall conclusions at the end of the audit

Interpersonal Considerations

- Use appropriate voice tone and inflection
- Do not jump to conclusions

Interview Setting

- Make sure the interviewee feels that there is sufficient privacy
- When appropriate, conduct the discussion in the interviewee's work area
- Try to keep it "one-on-one"
- Minimize distractions

Non-Verbal Communication

- Shake hands
- Maintain eye contact
- Keep the right distance
- Mirror the interviewee

Appendix M
SAMPLING GUIDELINES

The value of samples as evidence to document/support a violation is contingent upon many factors including: (1) the method by which samples are collected; (2) the selection of sample containers, preserving samples after they are collected, and ensuring that proper holding times are adhered to between sample collection and analysis; (3) the accuracy or validity of field measurements that are taken in conjunction with that sampling; (4) the adequate decontamination of field sampling equipment; (5) the degree to which appropriate notes or other documentation pertaining to sampling operations are logged in a notebook; and (6) the labeling of samples and employing a suitable chain-of-custody system. Most of these topics will be discussed in a relatively brief fashion in this section of the document. For additional details, the reader should refer to any of the SOPs currently being used by the Regions or NEIC. Other useful documents are program specific sampling/analytical protocols, such as 40 CFR Part 136 (NPDES), SW 846 (RCRA), and the Technical Enforcement Guidance Document (RCRA).

SAMPLE COLLECTION

Samples can generally be divided into two separate and distinct categories: (1) environmental samples and (2) source or waste samples. The collection of both will probably be necessary during most multi-media inspections. Environmental samples can include surface/runoff water, groundwater, sediment, surface wipes, soil, etc. Source or waste samples can include discharges from permitted outfalls, PCB oil from electrical equipment, RCRA regulated "hazardous waste", treatment residues, leachate, etc. In the case of any toxic/hazardous materials, the inspectors should make every effort to have the facility collet the sample for them. Sampling of either category can be accomplished by collecting grab samples, composite samples, or both. The type of sample ultimately obtained will be predicated on satisfying a legal requirement such as a permit which specifies a type of sample, laboratory requirements, or ensuring that representativeness is achieved. A time-based composite sample will usually require the use of an automatic sampler set to collect a series of discrete samples, over the time period of interest. A spatially-based composite sample (actually a series of grab samples blended together) and grab samples are collected by more conventional means and during a much shorter time. Some type of dipper, scoop, auger, pump, corers, etc. can be used to collect a grab sample.

Perhaps the two most important points, the investigators should keep in mind whenever sampling, are identifying precisely where the sample will be collected and selecting the appropriate equipment to collet the sample. From a collection standpoint, a sample must often be obtained such that it is representative of the entire media. If the media is well mixed and homogenous, a single sample will probably be adequate to ensure representativeness. If it is not well mixed, the investigator will have to collect several samples at different locations, and composite them on an equally weighted or some other basis or have each of the discrete samples analyzed. The total number of samples required will largely depend upon the area/volume of the material and the degree of nonhomogeneity. Normally in this case, the investigator will have to use a statistically random process to determine where the samples should be collected. Laying out some type of imaginary grid to encompass the media to be sampled and randomly selecting specific elements for sampling is one common method of ensuring that bias is not introduced and that no other important statistic is compromised. In other cases, the inspector must rely on a judgmental sampling approach, particularly in situations where a worst case result is desired. In that situation, the inspector should look for signs of discoloration, wetness, waste plumes or residue, dead vegetation, odor, or some other physical attribute or apply knowledge of the situation (i.e., judgment) in an attempt too identify exactly where constituent concentrations are likely to be highest. Other items that must be considered when selecting sampling sites are safety, convenience, and accessibility. The investigators should not collect samples until they have adequate knowledge of the site, through touring/observing, interviewing, etc. too make prudent decisions regarding selection of sampling sites.

The second important point the investigator should remember is to use the proper equipment to physically collect the sample. The equipment should either be unused or decontaminated to an extent that it cannot impart any contamination to the sample itself. Moreover, it is important to select sampling equipment made of the proper material. Wherever possible, the material should be inert (i.e., teflon or stainless steel) and not contain, as its principal constituents, any of the same constituents for which the samples will be analyzed. Lastly, the element of safety should not be overlooked. One key example would be where the investigators need to sample a potentially hazardous waste from a 55-gallon drum. Opening the drum must be carefully performed prior to sampling.

SAMPLE CONTAINERS, PRESERVATION METHODS, HOLDING TIMES, BLANKS

In order for the samples to be properly analyzed in the laboratory, the field investigators must follow certain accepted procedures relative to the containers they use, the preservation of the samples at time of collection, the holding time limits which dictate the quickness in which the samples must be transported to the laboratory, and the use of field blanks for QA purposes. Each of these procedures can vary from matrix to matrix, parameter to parameter, and in some cases, from program to program. All of this information pertaining to sample collection/handling is summarized in the following two tables. One table corresponds to liquid samples and the other to nonliquid samples.

FIELD MEASUREMENTS

The acquisition of field data is customarily required whenever sampling is performed. A number of *in situ* monitoring devices/meters are used for this purpose, each of which have certain applications and limitations. These instruments are designed to withstand some rough handling without affecting their stability or reliability. Parameters normally measured in the field include but, are not limited to, dissolved oxygen, pH, temperature, and chlorine residual.

SAMPLE COLLECTION\HANDLING REQUIREMENTS - LIQUID SAMPLES

Parameter	Sample Type	Container Size/Type	Minimum Volume	Preservation	Holding Times	Blanks
Bacteriological						
Coliform, Fecal & T	Grab	250 ml P,G sterilized	3/4 full	Cool, 4°C - 0.2 ml, 10% $Na_2S_2O_3$ added in lab	6-hr.	Field (A)
Inorganic						
BOD		1000 ml P,G	400 ml	Cool, 4°C	48-hr.	None
COD		1000 ml P,G	200 ml	Cool, 4°C - H_2SO_4 to pH<2	28-day	Acid
TSS		1000 ml P,G	100 ml	Cool, 4°C	7-day	None
TKN		1000 ml P,G	200 ml	Cool, 4°C - H_2SO_4 to pH<2	28-day	Acid
Ammonia				Cool, 4°C - H_2SO_4 to pH<2	28-day	Acid
Nitrite		1000 ml P,G	400 ml	Cool, 4°C	48-hr.	None
Nitrate				Cool, 4°C	48-hr.	None
NO_2 MO_3		1000 ml P,G	200 ml	Cool, 4°C - H_2SO_4 to pH<2	28-day	Acid
Ortho Phosphorus		1000 ml P,G	200 ml	Cool, 4°C	48-hr.	None
Total Phosphorus		1000 ml P,G	200 ml	Cool, 4°C - H_2SO_4 to pH<2	28-day	Acid
Oil & Grease	Grab	1000 ml G only	1000 ml	Cool, 4°C - H_2SO_4 to pH<2	28-day	Acid
Sulfide	Grab	300 ml G		Cool, 4°C - Zinc Acetate; NaOH to pH<9	7-day	Field
Cyanide T & Amen	Grab	1000 ml P	500 ml	Cool, 4°C - NaOH to pH<12 [3]	14-day	NaOH
Hex Chrome	Grab	1000 ml P	300 ml	Cool, 4°C	24-hr.	Field
Mercury		1000 ml P	500 ml	HNO_3 to pH<2	28-day	Acid
Other Heavy Metals		1000 ml P	500 ml	HNO_3 to pH<2	6-mo.	Acid
Organic						
Volatiles	Grab	3-40 ml G vials [1]	40 ml	Cool, 4°C-HCI to pH<2, Dechlor w/25 mg/40 ml Ascorbic Acid	7 day-Unpres. 14 day-Pres.	Field (3)
Extract, P.P.s		2-1/2 gl G(ambr) [1]	1000 ml	Cool, 4°C-Dechlor w/1.0 ml $Na_2S_2O_3$	7 day[2]	
Extract Pest/Herb		2-1/2 gl G(ambr) [1]	1000 ml	Cool, 4°C-Dechlor w/1.0 ml $Na_2S_2O_3$	7 day[2]	Field (1)
Phenols		1-qt. G[1]	1000 ml	Cool, 4°C - H_2SO_4 to pH<2	28 day	Acid
PCB		1-40 ml G-vial[4]	2 ml[4]	Cool, 4°C	7 day[2]	None
TOC		1000 ml P	200 ml	Cool, 4°C - H_2SO_4 to pH<2	28 day	Acid
TCLP						
Volatiles	Grab	3-40 ml G vials [1]	40 ml	Cool, 4°C	14 day[2]	None
Semi-Volatiles		Qt. Mason Jar [1]	500 ml	Cool, 4°C	14 day[2]	None
Mercury		1000 ml P	500 ml	Cool, 4°C	28 day[2]	None
Other Metals		1000 ml P	500 ml	Cool, 4°C	180 day[2]	None

1 Teflon Lid Liners
2 To Etraction
3 Check for $C1_2$ Residual and Sulfides (lead acetate paper). If $C1_2$ is present, add ascorbic acid. If sulfide is present, remove with cadmium nitrate powder, filter and pH - 12 with NaOH.
4 For oil samples only. Water samples require 1000 ml and can be collected in a qt. mason jar with teflon lid liner.

SAMPLE COLLECTION\HANDLING REQUIREMENTS - NON-LIQUID SAMPLES

Parameter	Sample Type	Container Size/Type	Minimum Volume	Preservation	Holding Times	Blanks
Inorganic						
COD		8 oz. glass jar[1]	5 gr.	Cool, 4°C	28-days	None
TKN		8 oz. glass jar[1]	5 gr.	Cool, 4°C	28 days	None
Total Phosphorus		8 oz. glass jar[1]	5 gr.	Cool, 4°C	28 days	None
Cyanide	Grab	8 oz. glass jar[1]	5 gr.	Cool, 4°C	14 days	None
Mercury		8 oz. glass jar[1]	0.2 gr.	Cool, 4°C	28 days	None
Other Heavy Metals		8 oz. glass jar[1]	0.2 gr.	Cool, 4°C	6 mos.	None
Organic						
Volatiles	Grab	2-40 ml G vials[1]	40 ml[3]	Cool, 4°C	7 days	Field (3)
Extract, P.P.s		8 oz. glass jar[1]	100 gr.	Cool, 4°C	10 days[2]	None
Extract Pest/Herb		8 oz. glass jar[1]	100 gr.	Cool, 4°C	10 days[2]	None
Phenols		8 oz. glass jar[1]	100 gr.	Cool, 4°C	28 days	None
PCB		8 oz. glass jar[1]	10 gr.	Cool, 4°C	10 days[2]	None
TCLP						
Volatiles	Grab	2-40 ml G vials[1]	40 ml[3]	Cool, 4°C	14 days[2]	None
Semi-Volatiles		8 oz. glass jar[1]	200 gr.-wet	Cool, 4°C	14 days[2]	None
Mercury		8 oz. glass jar[1]	200 gr.-wet	Cool, 4°C	28 days[2]	None
Other Metals		8 oz. glass jar[1]	combined	Cool, 4°C	180 days[2]	None

1 Teflon Lid Liners
2 To Etraction
3 Pack Tightly

M-6

The instruments most often utilized in the field are listed below:

HNU PI-101
Foxboro OVA-108
Foxboro OVA-128
Sampler, Discrete
  Manning
Sampler, Discrete
  Microprocessor
  Manning
Meter, pH
  Ioananalyzer,
  Portable, Beckman
Meter, pH and Temp.
  Recording Analytical
  Measurements
Meter, pH Recording
  Remote Sampling
  Analytical
  Measurements
Meter, Conductivity
  Geonics
Apparatus, Breathing
  SCBA, MSA
Apparatus, Breathing
  Umbilical, MSA
Apparatus, Breathing
  Umbilical, Survivar
Apparatus, Breathing
  60 min/Biopack
Ultrasonic Level/
  Flow, Manning
Analyzer, Engine
  Exhaust, Chrysler
  Corporation
Fluorometer, High
  Volume, Turner
Flowmeter, Dipper
  Manning
Sampler, Source,
  Stack, Misco
Sampler, Source,
  Stack, Misco
  Glass
Meter, Water Current
  Marsh, McBirney
Fishing Equipment
  Shocker, Coffelt
  Electronics
Locator, Cable
  Magnetic, Brunson
  Instruments
Calibrator, Digital
  0-20 OSL, Kurtz
Calibrator, Digital
  0-15 SLPM, Kurtz
FIT Testing Apparatus,
  Portacount
Calibrator, High
  Volume, Kurtz
Sampler, Discrete
Microprocessor, ISCO
Flow Meter, ISCO
Flow Metering Inserts,
  ISCO
Geiger Counter Ludlum
Gas Detector, HCN
  Bayer Diagnostic
Gastech, Personal
  Model 6X91
Gastech Personal
  Model 6X86
Photoionization
  Detector, Micro
  Tip, HL-200
High Volume Air
  Sampler
Low Volume Air
  Sampler
Portable Generator
  EMS4000, Honda
Well Sampler
  Pneumatic Pump
Recorder, Sound
  Ultrasounic, Level
Well Depth Sounder
Conductivity Meter
ORSAT Analyzer
  Stack Gas

Although the above parameter-specific instruments, or their equivalent, should be used almost exclusive, field personnel may occasionally utilize a multi-parameter instrument for the measurement of all the above mentioned parameters with the exception of chlorine residual. The instrument is manufactured by the Hydrolab Corporation and is designed specifically for use in the "field."

Proper calibration of these instruments is considered an essential ingredient of the measurement process to ensure the collection of valid "field" data, In general, these instruments are calibrated according to the manufacturer's recommended procedures. The pH meter, dissolved oxygen meters, and the colorimeters are normally calibrated daily in the field, just prior to use. Calibration of these instruments, according to the manufacturer's specifications, is normally sufficient to ensure the collection of valid data eve when taking a number of measurements. However, if in the field inspector's judgment, a drastic change in the field conditions occurs or if an instrument is subjected to other than normal handling, the instrument should be recalibrated. The only exception to the above procedures is that the multi-parameter instrument (Hydrolab) should only be calibrated in a laboratory environment, just prior to being utilized in the "field."

EQUIPMENT DECONTAMINATION

When possible, the investigators should use new disposable sampling utensils such as plastic scoops, stainless steel spatulas, glass colowassas or laboratory cleaned glass jars, since no additional decontamination is needed for this equipment. Nonexpendable equipment must be decontaminated before and after each use. This equipment includes, but is not limited to, shovels, teflon bailers, soil augers (powered and hand operated), soil probes, buckets, automatic samplers, etc. The portion of these sampling devices that come in direct contact with the sample must be washed with a soapy water solution, using a non-phosphate laboratory cleaner and vigorous scrubbing (scrub brush). The equipment may require disassembly to ensure that contamination is removed from all surfaces. Two tap water rinses follow. A third and final rinse should consist of laboratory deionized organic free water. In order to reduce the likelihood of cross-contamination due to equipment, sampling should proceed from cleanest areas first to dirtiest areas last, whenever possible. Between sampling stations, the equipment is decontaminated, as described above. At some point during the sampling effort, deionized organic free lab water should be passed through or over the newly decontaminated sampling equipment and then sampled to ensure that the decontamination procedure was effective. This so-called equipment blank should be preserved, return to the laboratory using appropriate chain-of-custody procedures, and analyzed for the same parameters as the actual samples. The above decontamination procedure can be modified for specific parameters and condition, if deemed necessary by the team leader.

Solvents should only be used if proper decontamination cannot be obtained with soapy water (e.g., heavy petroleum products) or if specifically requested. If a solvent is used, the laboratory analyzing the samples should be consult to ensure the solvent of choice will not interfere with the analytical procedure or mask the results.

SAMPLE LOGGING

A sample log should be maintained in a bound log book which documents all samples that are collected. This log should include a unique sample number (if needed), date, time, sample medium (soil, liquid, etc.), preservative (if any), parameters, and location. Included with the log are any observations made by the sampler that would otherwise identify the sample or conditions at the time of sampling. If photographs are taken, that should also be noted in the field log book.

SAMPLE SPLITTING

Often, it will be necessary to collect duplicate samples or to split a sample in order to provide the facility with a separate sample it can analyze on its own. In these situations, every effort should be made to ensure that both samples are as identical as possible and should theoretically yield the same results. Bulk samples (liquid) for parameters such as extractable organics, cyanide, nutrients, PCB, metals, etc. may be collected in a larger container and alternately poured into the appropriate sample containers. However, the liquid should be well mixed during the transfer. EPA normally provides the sample containers.

Certain parameters may not be split using the above method (e.g., volatile organics, semi-volatiles, and oil and grease) since these samples must be collected and analyzed in their original container. This type of sample should not be distributed by splitting since it may cause air stripping of the volatiles or, in the case of the oil and grease, a residue may adhere to the sample container and cause an erroneous measurement. These parameters will necessitate collecting duplicate samples, virtually at the same time and at the same place to assure homogeneity.

Samples of solid matrices such as sludge, soil, or sediment may be placed into a sufficiently large container and either hand agitated and/or mechanically mixed with a blender, etc. to achieve a homogeneous consistency, except for volatile or semi-volatile analyses. Individual samples may then be placed in the appropriate containers.

Wipe samples (PCB), due to their nature, must be collected immediately adjacent to each other with each party receiving a separate sample.

CHAIN-OF-CUSTODY

Since there are legal implications when sampling data is used as evidence, EPA must be able to demonstrate that the samples were protected from tampering from the time of collection to the time they are introduced as evidence. This demonstration is based on samples being in the possession or custody of an EPA employee at all times, and it is documented by means of a chain-of-custody record. Custody implies both physical possession as well as controlled access by locking in a secured area. The chain-of-custody record indicates who had possessio at any given point in time and how and when transfer of custody from one individual to another occurred.

Each sample container should be affixed with a sample tag to ensure chain-of-custody from the sample location to the laboratory (see next section for further details). The tag contains the sample location, the sampler's signature, preserved (Y or N), parameter(s), and sample type (composite or grab) and it must be completely filled out using waterproof ink.

Pressure sensitive tape affixed to the container may also be used under certain circumstances to identify the sample. Ink used to write on the container must be waterproof. At a minimum, the label must contain the following information: location, date, time, sample number (if needed), and preservative used. The sampler should be certain that the label is securely affixed to the outside of the container and will not peel off during shipment.

The chain-of-custody record is comprised of sample tags and the record form itself. Both of these are shown on the following pages. A sample tag should be completed for each sample by the field sampler using waterproof ink, if possible. It should be affixed to the sample container in a secure manner. The field sampler should also complete the chain-of-custody record form, appropriately describing all samples that he/she was responsible for collecting. The same wording must be used on both the tag and form, and care must be exercised to make sure that all the information in the chain-of-custody record corresponds properly without discrepancies. While the samples are in his/her custody, all necessary precautions should be taken by the field sampler to ensure that they are adequately safeguarded. Whenever the possession of samples is transferred, the individuals relinquishing and receiving will sign, date, and note the time on the record. The record will continue to accompany the samples. At the completion of the process, a copy of all of the chain-of-custody records will be provided to the team leader for filing.

TRANSPORTATION

All samples will be properly packed in suitable ice chests and transported back to the Regional Laboratory via vehicle or private transport. Chain-of-Custody record forms should also be affixed to the ice chests. The inspectors should always lock the vehicles in which samples are being transported. There may be times when DOT regulations will have to be followed. At least one member of the inspection team should review the DOT requirements prior to an inspection, and make certain that they are complied with in cases where samples are unusually hazardous or travel through tunnels or if confined/special areas are encountered.

Appendix N

LAND DISPOSAL RESTRICTIONS PROGRAM

BASIC PROGRAM

Land Disposal Restrictions (LDR), 40 CFR 268, are phased regulations prohibiting land disposal of hazardous waste unless that waste meets the applicable treatment standards. * Land disposal includes but is not limited to placement in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, underground mine or cave, or placement in a concrete vault or bunker intended for disposal purposes. The applicable treatment standards are expressed as either concentrations of contaminants in the extract or total waste and as specified technologies.

The schedule for the different groups of waste is:

- Solvents and Dioxins: banned from land disposal (unless treated) effective November 8, 1986 and November 8, 1988, respectively

- "California List" Waste: This group includes liquid wastes containing metals, free cyanides, polychlorinated biphenyls, corrosives (pH less than 2.0) and certain wastes containing halogenated organic compounds. Solid hazardous waste containing halogenated organic compounds are also included. These wastes were banned effective July 8, 1987

- "First, Second, and Third Third" Wastes: The remaining listed and characteristic wastes** were divided into thirds (see 40 CFR 268 for specific waste groupings). The

* *40 CFR 268.40, 41, 42, and 43 contain the treatment standards.*

** *40 CFR 261 defines listed and characteristic wastes.*

first third wastes were banned effective August 8, 1988, second third June 8, 1989 and the third third May 8, 1990.

- Newly Listed Wastes: New wastes that become listed after November 8, 1984 will be banned on a case-by-case basis. There is no statutory deadline for determining treatment standards.

The effective dates for banning these wastes from land disposal can be modified by several kinds of variances. 40 CFR 268, Appendix VII includes all of the different effective dates for each type of waste. Effective dates can be modified by any of the following:

- National capacity variance
- Case-by-case extension
- Treatability variance
- Equivalent method variance
- No-migration petition
- Surface impoundment exemption

Generators of restricted waste are required to:

- Determine whether they generate restricted wastes
- Determine waste treatment standards
- Determine whether waste exceeds treatment standards

- Provide for appropriate treatment and/or disposal
- Satisfy documentation, recordkeeping, notification, certification, packaging, and manifesting requirements
- Meet applicable requirements if the generator is or becomes a TSDF

Treatment, storage, and disposal facilities are required to:

- Ensure compliance with generator recordkeeping requirements when residues generated from treating restricted wastes are manifested off-site

- Certify that treatment standards have been achieved for particular wastes prior to disposal

To become familiar with all of the requirements of LDR, refer to 40 CFR 268 and the Land Disposal Restrictions - Summary of Requirements, OSWER 9934.0-1A, February 1991 for a complete discussion.

EVALUATING COMPLIANCE

LDR requires substantial documentation certifying waste types, required treatment, and notifying waste handlers of the regulatory requirements. Interviews and field observations also may be helpful.

Interview may cover:

- Who fills out the LDR notifications and certifications
- Frequency of sampling and methods used for sampling and analysis

Documentation required to be kept by a generator include:

- LDR notifications and certifications
- Waste analysis plan if treating a prohibited waste in tanks or containers

Documentation required for TSDFs include:

- Storage
  - Waste analyses and results
  - Waste analysis plan (provision for determining whether a waste is prohibited)

- Treatment
  - Waste analysis plan

- Land Disposal Facility
  - Generator and treatment facility notifications and certifications
  - Waste analysis plan

Field/visual observations related to LDR requirements can be incorporated into a general storage facility inspection. LDR requirements can be incorporated into a general storage facility inspection. LDR wastes cannot be stored longer than 1 year unless the facility can show that the storage is solely for the purpose of accumulation of sufficient quantities of hazardous waste necessary to facilitate proper recovery, treatment, or disposal. Wastes that are placed in storage prior to the effective date of the restrictions for that waste are not subject to the LDR restrictions on storage. A quick check of accumulation dates on labels will determine how long a drum has been in storage. Be sure to note the hazardous waste number.

Refer to the Land Disposal Restrictions - Inspection Manual, OSWER 9938.1A, February 1989, for a complete discussion on how to conduct an LDR inspection. Keep in mind that this document has yet to be updated with information regarding the Third Third wastes.

Table 1

SOURCE SUBPART (40 CFR Part 60)
EFFECTIVE DATE OF STANDARD AND POLLUTANTS SUBJECT TO NSPS

Source	Subpart	Effective Date	Pollutant
Fossil-fuel-fired steam generators constructed after August 17, 1971	D	August 17, 1971	Particulate matter, sulfur dioxide, nitrogen oxides
Fossil-fuel-fired-steam generator constructed after September 18, 1978	Da	September 18, 1978	Particulate matter, sulfur dioxide, nitrogen dioxide
Industrial-Commercial-Institutional steam generating units constructed after June 19, 1984	Db	June 19, 1984	Particulate matter, sulfur dioxide, nitrogen oxides
Municipal incinerators	E	August 17, 1971	Particulate matter
Portland cement plants	F	August 17, 1971	Particulate matter
Nitric acid plants	G	August 17, 1971	
Sulfuric acid plants	H	August 17, 1971	Sulfur dioxide, acid mist (sulfuric acid)
Asphalt concrete plants	I	June 11, 1973	Particulate matter
Petroleum refineries	J	June 11, 1973	Particulate matter, carbon monoxide, sulfur dioxide
Storage vessels for petroleum liquids	K	June 11, 1973	VOC
	Ka	May 18, 1978	VOC
Volatile organic liquid storage vessels	Kb	July 23, 1984	VOC
Secondary lead smelters	L	June 11, 1973	Particulate matter
Secondary brass and bronze ingot production plants	M	June 11, 1973	Particulate matter
Iron and steel plants (basic oxygen furnace)	N	June 11, 1973	Particulate matter
Iron and steel plants (secondary emissions from oxygen furnaces)	Na	Januray 20, 1983	Particulate matter
Sewage treatment plants (incinerators)	O	June 11, 1973	Particulate matter
Primary cooper smelters	P	October 16, 1974	Particulate matter, sulfur dioxide
Primary zinc smelters	Q	October 16, 1974	Particulate matter, sulfur dioxide
Primary lead smelters	R	October 16, 1974	Particulate matter, sulfur dioxide
Primary aluminum reduction plants	S	October 23, 1974	Fluorides
Phosphate fertilizer industry (listed as five separate categories)	TUV WX	October 22, 1974	Fluorides
Coal preparation plants	Y	October 24, 1974	Particulate matter
Ferro-alloy production facilities	Z	October 21, 1974	Particulate matter, carbon monoxide
Steel plants (electric arc furnaces)	AA	October 21, 1974	Particulate matter
Steel plants, electric arc furnaces and argon-oxygen decarburization vessels	AAa	August 17, 1983	Particulate matter
Kraft pulp mills BB	September 24, 1976		Particulate matter, TRS
Glass plants	CC	June 15, 1979	Particulate matter
Grain elevators DD	August 3, 1978		Particulate matter
Metal furniture surface coating	EE	November 28, 1980	VOC
Stationary gas turbines	GG	September 24, 1976	Nitrogen oxides, sulfur dioxides
Lime plants	HH	May 3, 1977	Particulate matter
Lead acid battery plants	KK	January 14, 1980	Lead
Metallic mineral processing plants	LL	August 24, 1982	Particulate matter
Auto and light-duty truck, surface coating operation	MM	October 5, 1979	VOC
Phosphate rock plants	NN	September 21, 1979	Particulate matter
Ammonium sulfate plants	PP	February 4, 1980	Particulate matter
Graphic arts industry	QQ	October 28, 1980	VOC
Pressure sensitive tape manufacturing	RR	December 30, 1980	VOC
Appliance surface coating	SS	December 24, 1980	VOC
Metal coal surface coating	TT	January 5, 1981	VOC

Table 1 (cont.)

SOURCE SUBPART (40 CFR Part 60)
EFFECTIVE DATE OF STANDARD AND POLLUTANTS SUBJECT TO NSPS

Source	Subpart	Effective Date	Pollutant
Asphalt roofing plants	UU	November 18, 1980; May 26, 1981	Particulate matter
Synthetic organic chemicals	VV	January 5, 1981	Performance standards
Beverage can surface coating	WW	November 26, 1980	VOC
Bulk gasoline terminal	XX	December 17, 1980	VOC
New residual wood heaters	AAA	July 1, 1988	Particulate matter
Rubber tire manufacturing industry	BBB	January 20, 1983	VOC
Vinyl/urethane coating	FFF	January 18, 1983	VOC
Petroleum refineries	GGG	January 4, 1983	Performance standards
Synthetic fiber plants	HHH	November 23, 1982	VOC
Synthetic organic chemicals (air oxidation unit processes)	III	October 21, 1983	VOC
Petroleum dry cleaners	JJJ	September 21, 1984	VOC
Onshore natural gas processing plants	KKK	June 24, 1985	VOC
Onshore natural gas processing plants	LLL	October 1985	SO_2
Synthetic organic chemicals (distillation operations)	NNN	December 30, 1983	VOC
Nonmetallic mineral processing plants	OOO	August 1, 1985	Particulate matter
Wool fiberglass insulation manufacturing plants	PPP	February 25, 1985	Particulate matter
Petroleum refineries (wastewater systems)	QQQ	May 4, 1987	VOC
Magnetic tape coating	SSS	January 22, 1986	VOC
Industrial surface coating, plastic parts for business machines	TTT	January 8, 1986	VOC
Polymeric coating of supporting substrates facilities	VVV	April 30, 1987	VOC

Table 2

NSPS SOURCES REQUIRING CEM

Source	Subpart	Effective Date	Monitor
Fossil-fuel-fired steam generator	D	08/17/71	opacity, SO_2, NO_x, O_2, or CO_2
Fossil-fuel-fired electric utilities	Da	09/18/71	opacity, SO_2, NO_x, O_2, or CO_2
Nitric acid plants	G	08/17/71	NO_x
Sulfuric acid plants	H	08/17/71	SO_2
Petroleum refineries (FBCCU)	J	06/11/73	opacity, CO, SO_2, H_2S
Claus sulfur recovery unit	J	10/04/76	opacity, CO, SO_2, H_2S
Primary copper smelters	P	10/16/74	opacity, SO_2
Primary zinc smelters	Q	10/16/74	opacity, SO_2
Primary lead smelters	R	10/16/74	opacity, SO_2
Ferroalloy production facilities	Z	10/21/74	opacity
Electric arc furnaces	AA	10/21/74	opacity
Kraft pulp mills	BB	09/24/76	opacity, TRS
Lime manufacturing plants	HH	05/03/77	opacity
Phosphate rock plants	NN	09/21/79	opacity
Flexible vinyl and urethane coating and printing	FFF	01/18/83	VOC
Onshore natural gas processing plants	LLL	10/01/85	SO_2/T/TRS

Table 3

SOURCE SUBJECT TO TITLE 40 CFR Part 61)
NATIONAL EMISSIONS STANDARDS FOR HAZARDOUS AIR POLLUTANTS

Pollutant	Subpart	Source
Radon-222	B	Underground uranium mines
Beryllium	C	Extaction plants Ceramic plants Foundries Incinerators Machine shops
Beryllium	D	Rock motor firing
Mercury	E	Ore processing plants Chlor-alkali plants Sludge incinerators Sludge drying plants
Vinyl chloride	F	Ethylene dichloride plants Vinyl chloride plants Polyvinyl chloride plants
Radionuclides	H	DOE facilities
Radionuclides	I	Facilities licensed by the Nuclear Regulatory Comission and Federal facilitie s not covered by Subpart H
Benzene (leaks)	J	Equipment in benzene service (plants designed to produce more than 1,000 megagrams of benzene per year)
Radionuclides	K	Elemental phosphorus plants
Benzene	L	Coke by-product recovery plants
Asbestos	M	Asbestos mills Manufacturing Demolition and renovation Spraying Fabrication Waste disposal

Table 3 (cont.)

SOURCE SUBJECT TO TITLE 40 CFR Part 61)
NATIONAL EMISSIONS STANDARDS FOR HAZARDOUS AIR POLLUTANTS

Pollutant	Subpart	Source
Inorganic arsenic	N	Glass manufacturing plants
Inorganic arsenic	O	Primary copper smelters
Inorganic arsenic facilities	P	Arsenic trioxide and metallic arsenic productio n
Radon-222	Q	DOE facilities
Radon-222	R	Phosphogypsum stacks
Radon-222	T	Disposal sites of uranium mill tailings
Volatile hazardous air	V	Equipment leaks (fugitive pollutants (VHAP) * emission sources)
Radon-222	W	Licensed uranium mill tailings
Benzene	Y	Benzene storage vessels
Benzene	BB	Benzene transfer operations
Benzene	FF	Benzene waste operations

* *Volatile hazardous air pollutant (VHAP) means a substance regulated under this part for which a standard for equipment leaks has been proposed and promulgated. As of February 1, 1989, benzene and vinyl chloride are VHAPs.*

Table 4

LIST OF HAZARDOUS AIR POLLUTANTS TO BE REGULATED UNDER AIR TOXICS PROGRAM

CAS Number	Chemical Name	CAS Number	Chemical Name
75070	Acetaldehyde	67663	Chloroform
60355	Acetamide	107301	Chloromethyl methyl ether
75058	Acetonitrile	126998	Chloroprene
98862	Acetophenone	1319773	Cresols/cresylic acid (isomers and mixture)
53963	2-Acetylaminofluorene	95487	o-Cresol
107028	Acrolein	108394	m-Cresol
79061	Acrylamide	106445	p-Cresol
79107	Acrylic acid	98828	Cumene
107131	Acrylonitrile	93747	2,4-D, salts and esters
107051	Allyl chloride	3547044	DDE
92671	4-Aminobiphenyl	334883	Diazomethane
62533	Analine	132649	Dibenzofurans
90040	o-Anisidine	96128	1,2-Dibromo-3-chloropropane
1332214	Asbestos	84742	Dibutylphthalate
71432	Benzene (including benzene from gasoline)	106467	1,4-Dibhlorobenzene(p)
92875	Benzidine	91941	3,3-Dichlorobenzidene
98077	Benzotrichloride	111444	Dichloroethyl ether [Bis(2-chloroethyl) ether]
100447	Benzyl chloride	542756	1,3-Dichloropropene
92524	Biphenyl	62737	Dichlorvos
117817	Bis(2-ethylhexyl)phthalate (DEHP)	111422	Diethanolamine
542881	Bis(chloromethyl)ether	121697	N,N-Diethyl aniline (N,N-Dimethylaniline)
75252	Bromoform	64675	Diethyl sulfate
106990	1,3-Butadiene	119904	3,3-Dimethoxybenzidine
156627	Calcium cyanamide	60117	Dimethyl aminoazobenzene
105602	Caprolactam	119937	3,3'-Dimethyl benzidine
133062	Captan	79447	Dimethyl carbamoyl chloride
63252	Carbaryl	68122	Dimethyl formamide
75150	Carbon disulfide	57147	1,1-Dimethyl hydrazine

Table 4 (cont.)

LIST OF HAZARDOUS AIR POLLUTANTS TO BE REGULATED UNDER AIR TOXICS PROGRAM

CAS Number	Chemical Name	CAS Number	Chemical Name
56235	Carbon tetrachloride	13113	Dimethyl phthalate
463581	Carbonyl sulfide	77781	Dimethyl sulfate
120809	Catechol	534521	4,6-Dinitro-o-cresol
133904	Chloramben	51285	2,4-Dinitrophenol
57749	Chlordane	121142	2,4-Dinitrotoluene
7782505	Chlorine	123911	1,4-Dioxane(1,4-Diethyleneoxide)
79118	Chloroacetic acid	122667	1,2-Diphenyl hydrazine
532274	2-Chloroacetophenone	106898	Epichlorohydrin(1-Chloro-2,3-epoxypropane)
108907	Chlorobenzene	106887	1,2-Epoxybutane
510156	Chlorobenzilate	140885	Ethyl acrylate
100414	Ethyl benzene	80626	Methyl methacrylate
51796	Ethyl carbamate (Urethane)	101144	4,4-Methylene bis(2-chloroaniline)
75003	Ethy chloride (Chloroethane)	75092	Methylene chloride (Dichloromethane)
106934	Ethylene dibromide (Dibromoethane)	101688	Methylene diphenyl diisocyanate (MDI)
107062	Ethylene dichloride (1,2-Dichloroethane)	101779	4,4'-Methylenedianiline
107211	Ethylene glycol	1634044	Methyl tert-butyl ether
15164	Ethylene iminie (Aziridine)	91203	Naphthalene
75218	Ethylene oxide	98953	Nitrobenzene
96457	Ethylene thiourea	92933	4-Nitrobiphenyl
75343	Ethylidene dichloride (1,1-Dichloroethane)	100027	4-Nitrophenol
50000	Formaldehyde	79469	2-Nitropropane
76448	Heptachlor	684935	N-Nitroso-N-methylurea
118741	Hexachlorobenzene	62759	N-Nitrosodimethylamine
87683	Hexachlorobutadiene	59892	N-Nitrosomorpholine
77474	Hexachlorocyclopentadiene	56382	Parathion
67721	Hexachloroethane	82688	Pentachloronitrobenzene (Quintobenzene)

Table 4 (cont.)

LIST OF HAZARDOUS AIR POLLUTANTS TO BE REGULATED UNDER AIR TOXICS PROGRAM

CAS Number	Chemical Name	CAS Number	Chemical Name
822060	Hexamethylene-1,6-diisocyanate	87865	Pentachlorophenol
680319	Hexamethylphosphoramide	108952	Phenol
110543	Hexane	106503	p-Phenylenediamine
302012	Hydrazine	75445	Phosgene
7647010	Hydrochloric acid	7803512	Phosphine
7664393	Hydrogen fluoride (Hydrofluoric acid)	7723140	Phosphorus
7783064	Hydrogen sulfide [6]	85449	Phthalic anhydride
123319	Hydroquinone	1336363	Polychlorinated biphenyls (Aroclors)
78591	Isophorone	1120714	1,3-Propane sultone
58899	Lindane (all isomers)	57578	beta-Propiolactone
108316	Maleic anhydride	123386	Propionaldehyde
67561	Methanol	114261	Propoxur (Baygon)
72435	Methoxychlor	78875	Propylene dichloride (1,2-Dichloropropane)
74839	Methyl bromide (Bromomethane)	75569	Propylene oxide
74873	Methyl chloride (Chloromethane)	75558	1,2-Propylenimine (2-Methyl aziridine)
71556	Methyl chloroform (1,1,1-Trichloroethane)		Quinoline
78933	Methyl ethyl ketone (2-Butanone)	106514	Quinone
60344	Methyl hydrazine	100425	Styrene
74884	Methyl iodide (Iodomethane)	96093	Styrene oxide
108101	Methyl isobutyl ketone (Hexone)	1746016	2,3,7,8-Tetrachlorodibenzo-p-dioxin
624839	Methyl isocyanate	79345	1,1,2,2-Tetrachloroethane
127184	Tetrachloroethylene (Perchloroethylene)		Antimony compounds [*]
7550450	Titanium tetrachloride		Arsenic Compounds (inorganic including arsine)[*]
108883	Toluene		Beryllium compounds [*]
95807	2,4-Toluene diamine		Cadmium compounds [*]
584849	2,4-Toluene diisocyanate		Chromium compounds [*]
95534	o-Toluidine		Cobalt compounds [*]

Table 4 (cont.)

LIST OF HAZARDOUS AIR POLLUTANTS TO BE REGULATED UNDER AIR TOXICS PROGRAM

CAS Number	Chemical Name	CAS Number	Chemical Name
8001352	Toxaphene (Chlorinated camphene)		Coke oven emissions
120821	1,2,4-Trichlorobenzene		Cyanide compounds [*1]
79005	1,1,2-Trichloroethane		Glycol ethers [*2]
79016	Trichloroethylene		Lead compounds [*]
95954	2,4,5-Trichlorophenol		Manganese compounds [*]
88062	2,4,6-Trichlorophenol		Mercury compounds [*]
121448	Triethylamine		Fine mineral fibers [3]
1582098	Trifluralin		Nickel compounds [*]
540841	2,2,4-Trimethylpentane		Polycrylic Organic Matter [4]
108054	Vinyl acetate		Radionuclides (including radon) [5]
593602	Vinyl bromide		Selenium Compounds [*]
75014	Vinyl chloride		
75354	Vinylidene chloride (1,1-Dichloroethylene)		
1330207	Xylenes (isomers and mixtures)		
95476	o-Xylenes		
108383	m-Xylenes		
106423	p-Xylenes		

* *Unless otherwise specified, these listings are defined as including any unique chemical substance that contains the named chemical (i.e., antimony, arsenic, etc.) as part of the chemical's infrastructure.*

Appendix P
CONFIDENTIALITY NOTES AND DISCUSSIONS

The TSCA Notice of Inspection [Figure L-1] and Inspection Confidentiality Notice [Figure L-2] are presented to the facility owner or agent in charge during the opening conference. These notices inform facility officials of their right to claim as confidential business information, any information (documents, physical samples, or other material) collected by the inspector.

Authority to Make Confidentiality Claims

The inspector must ascertain whether the facility official, to whom the notices were given, has the authority to make business confidentiality claims for the company. The facility official's signature must be obtained at the appropriate places on the notices certifying that he does or does not have such authority.

- The facility owner is assumed too always have the authority to make business confidentiality claims. In most cases, it is expected that the agent in charge will also have such authority. It is possible that the officials will want to consult with their attorneys (or superiors in the case of agents in charge) regarding this issue.

- If no one at the site has the authority to make business confidentiality claims, a copy of the TSCA Inspection Confidentiality Notice and Notice and Declaration of Confidential Business Information form [Figure L-3] are to be sent to the chief executive officer of the firm within 2 days of the inspection. He will then have 7 calendar days in which to make confidentiality claims.

Notice of Inspection (Missing)

TSCA Inspection Confidentiality Notice (Missing)

Declaration of Confidential Business Information (Missing)

Appendix P (cont.)

- The facility official may designate a company official, in addition to the chief executive officer, who should also receive a copy of the notices and any accompanying forms.

Confidentiality Discussion

Officials should be informed of the procedures and requirements that EPA must follow in handling TSCA confidential business information. The inspector should explain that these procedures were established to protect the companies subject to TSCA and cover the following points during the discussion.

- Data may be claimed confidential business information during the closing conference if a person authorized to make such claims is on-site at the facility.

- It is suggested that a company official accompany the inspector during the inspection to facilitate designation (or avoidance, if possible) of confidential business data.

- A detailed receipt for all documents, photographs, physical samples, and other materials [Figure L-4] collected during the inspection will be issued at the closing conference.

- An authorized person may make immediate declarations that some or all the information is confidential business information. This is done by completing the Declaration of Confidential Business Information form. Each item claimed must meet all four of the criteria shown on the TSCA Inspection Confidentiality Notice.

Receipt for Samples and Documents (Missing)

Appendix P (cont.)

- If no authorized person is available on-site, a copy of the notices, along with the Receipt for Samples and Documents, will be sent by certified, return-receipt-requested mail to the Chief Executive Officer of the firm and to another company official, if one has been designated.

Four copies are made of the Declaration of Confidential Information form and distributed to:

- Facility owner or agent in charge
- Other company official (if designated)
- Document Control Officer
- Inspection report

Appendix Q

GLOSSARY OF TERMS AND ACRONYMS: TOXIC SUBSTANCES CONTROL ACT SECTIONS 5 AND 8

SECTION 5. New Chemicals

(Note: TSCA does not regulate chemicals such as pesticides, drugs, cosmetics, explosives, etc., which are regulated under separate acts.)

PMN	Premanufacture Notification required for all "new" TSCA chemicals (i.e., those not listed as TSCA Chemical Substances Inventory).
SNURs	Significant New Use Rules require subsequent notification to EPA when usage/exposure of existing chemical changes.
NOC	Notice of Commencement to Agency is required before manufacture begins (after PMN review period has expired).
TME	Test Marketing Exemption from PMN requirement can be obtained on application to and approval by EPA - usually subject to specific restrictions.
LVE	Low Volume Exemption from PMN requirement
PE	Polymer Exemption from PMN requirement, a modified PMN
R & D	Research and Development Exemption - automatic exemption, does not require Agency review or approval.
Section 5(e)	An administrative order limiting the manufacture, Order processing, distribution, use and/or disposal of a chemical for which a PMN is required because there is insufficient information to permit full evaluation.
Bona fide	Inquiry to Agency to determine whether a chemical is on the confidential portion of the Inventory. A *Bona fide* should indicate an interest or intent to commercially manufacture the subject chemical.
Section 5(f)	An administrative order or rule prohibiting/ limiting the Order/Rule manufacture, etc., of a chemical for which a PMN is required because there is a reasonable basis to conclude that such activities present an unreasonable risk to health/environment.

Section 8 Existing Chemicals

PAIR	Preliminary Assessment Information Rules are promulgated under Section 8(a) Level A and require reporting to Agency of production, uses and exposure of specific chemicals or classes of chemicals.
ITC	Interagency Testing Committee designates chemicals to be listed in PAIR rules, as well as some of the chemicals in Section 8(d) rules. ITC is established under Section 4(e) of TSCA. It also recommends chemicals for inclusion in testing rules under Section 4(a).
CHEMICAL SUBSTANCES INVENTORY	A listing compiled under Section 8(b) of TSCA of all chemicals manufactured/ processed in U.S. that were manufactured, imported, or processed in the period 1975-77. Chemicals for which PMN is submitted are added to inventory when manufacturing/processing commences (i.e., upon receipt of NOC). A major updating of the inventory was undertaken in 1986, and will be repeated every 4 years thereafter.
CAIR	Comprehensive Assessment Information Rule, a more detailed reporting rule under Section 8(A) Level A (see PAIR

EPA/310-R-97-008

EPA Office of Compliance Sector Notebook Project:

PROFILE OF THE SHIPBUILDING AND REPAIR INDUSTRY

November 1997

Office of Compliance
Office of Enforcement and Compliance Assurance
U.S. Environmental Protection Agency
401 M St., SW (MC 2221-A)
Washington, DC 20460

This report is one in a series of volumes published by the U.S. Environmental Protection Agency (EPA) to provide information of general interest regarding environmental issues associated with specific industrial sectors. The documents were developed under contract by Abt Associates (Cambridge, MA), Science Applications International Corporation (McLean, VA), and Booz-Allen & Hamilton, Inc. (McLean, VA). This publication may be purchased from the Superintendent of Documents, U.S. Government Printing Office. A listing of available Sector Notebooks and document numbers is included at the end of this document.

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AIRS -	Aerometric Information Retrieval System (CAA database)
BIFs -	Boilers and Industrial Furnaces (RCRA)
BOD -	Biochemical Oxygen Demand
CAA -	Clean Air Act
CAAA -	Clean Air Act Amendments of 1990
CERCLA -	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS -	CERCLA Information System
CFCs -	Chlorofluorocarbons
CO -	Carbon Monoxide
COD -	Chemical Oxygen Demand
CSI -	Common Sense Initiative
CWA -	Clean Water Act
D&B -	Dun and Bradstreet Marketing Index
ELP -	Environmental Leadership Program
EPA -	United States Environmental Protection Agency
EPCRA -	Emergency Planning and Community Right-to-Know Act
FIFRA -	Federal Insecticide, Fungicide, and Rodenticide Act
FINDS -	Facility Indexing System
HAPs -	Hazardous Air Pollutants (CAA)
HSDB -	Hazardous Substances Data Bank
IDEA -	Integrated Data for Enforcement Analysis
LDR -	Land Disposal Restrictions (RCRA)
LEPCs -	Local Emergency Planning Committees
MACT -	Maximum Achievable Control Technology (CAA)
MCLGs -	Maximum Contaminant Level Goals
MCLs -	Maximum Contaminant Levels
MEK -	Methyl Ethyl Ketone
MSDSs -	Material Safety Data Sheets
NAAQS -	National Ambient Air Quality Standards (CAA)
NAFTA -	North American Free Trade Agreement
NCDB -	National Compliance Database (for TSCA, FIFRA, EPCRA)
NCP -	National Oil and Hazardous Substances Pollution Contingency Plan
NEIC -	National Enforcement Investigation Center
NESHAP -	National Emission Standards for Hazardous Air Pollutants
NO_2 -	Nitrogen Dioxide
NOV -	Notice of Violation
NO_X -	Nitrogen Oxides
NPDES -	National Pollution Discharge Elimination System (CWA)
NPL -	National Priorities List
NRC -	National Response Center

NSPS -	New Source Performance Standards (CAA)
OAR -	Office of Air and Radiation
OECA -	Office of Enforcement and Compliance Assurance
OPA -	Oil Pollution Act
OPPTS -	Office of Prevention, Pesticides, and Toxic Substances
OSHA -	Occupational Safety and Health Administration
OSW -	Office of Solid Waste
OSWER -	Office of Solid Waste and Emergency Response
OW -	Office of Water
P2 -	Pollution Prevention
PCS -	Permit Compliance System (CWA Database)
POTW -	Publicly Owned Treatments Works
RCRA -	Resource Conservation and Recovery Act
RCRIS -	RCRA Information System
SARA -	Superfund Amendments and Reauthorization Act
SDWA -	Safe Drinking Water Act
SEPs -	Supplementary Environmental Projects
SERCs -	State Emergency Response Commissions
SIC -	Standard Industrial Classification
SO_2 -	Sulfur Dioxide
SO_X -	Sulfur Oxides
TOC -	Total Organic Carbon
TRI -	Toxic Release Inventory
TRIS -	Toxic Release Inventory System
TCRIS -	Toxic Chemical Release Inventory System
TSCA -	Toxic Substances Control Act
TSS -	Total Suspended Solids
UIC -	Underground Injection Control (SDWA)
UST -	Underground Storage Tanks (RCRA)
VOCs -	Volatile Organic Compounds

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SHIPBUILDING AND REPAIR INDUSTRY
(SIC 3731)

I. INTRODUCTION TO THE SECTOR NOTEBOOK PROJECT

I.A. Summary of the Sector Notebook Project

Integrated environmental policies based upon comprehensive analysis of air, water, and land pollution are a logical supplement to traditional single-media approaches to environmental protection. Environmental regulatory agencies are beginning to embrace comprehensive, multi-statute solutions to facility permitting, enforcement and compliance assurance, education/ outreach, research, and regulatory development issues. The central concepts driving the new policy direction are that pollutant releases to each environmental medium (air, water, and land) affect each other, and that environmental strategies must actively identify and address these inter-relationships by designing policies for the "whole" facility. One way to achieve a whole facility focus is to design environmental policies for similar industrial facilities. By doing so, environmental concerns that are common to the manufacturing of similar products can be addressed in a comprehensive manner. Recognition of the need to develop the industrial "sector-based" approach within the EPA Office of Compliance led to the creation of this document.

The Sector Notebook Project was originally initiated by the Office of Compliance within the Office of Enforcement and Compliance Assurance (OECA) to provide its staff and managers with summary information for eighteen specific industrial sectors. As other EPA offices, states, the regulated community, environmental groups, and the public became interested in this project, the scope of the original project was expanded to its current form. The ability to design comprehensive, common sense environmental protection measures for specific industries is dependent on knowledge of several inter-related topics. For the purposes of this project, the key elements chosen for inclusion are: general industry information (economic and geographic); a description of industrial processes; pollution outputs; pollution prevention opportunities; Federal statutory and regulatory framework; compliance history; and a description of partnerships that have been formed between regulatory agencies, the regulated community, and the public.

For any given industry, each topic listed above could alone be the subject of a lengthy volume. However, in order to produce a manageable document, this project focuses on providing summary information for each topic. This format provides the reader with a synopsis of each issue, and references where more in-depth information is available. Text within each profile was researched from a variety of sources, and was usually condensed from more detailed sources pertaining to specific topics. This approach allows for a wide coverage of activities that can be further explored based upon the citations and references listed at the end of this profile. As a check on the information included, each notebook went through an external review process. The Office of Compliance appreciates the efforts of all those that participated in this process and enabled us to develop more complete, accurate and up-to-date summaries. Many of those who reviewed this notebook are listed as contacts in Section IX and may be sources of additional information. The individuals and groups on this list do not necessarily concur with all statements within this notebook.

I.B. Additional Information

Providing Comments

OECA's Office of Compliance plans to periodically review and update the notebooks and will make these updates available both in hard copy and electronically. If you have any comments on the existing notebook, or if you would like to provide additional information, please send a hard copy and computer disk to the EPA Office of Compliance, Sector Notebook Project, 401 M St., SW (2223-A), Washington, DC 20460. Comments can also be uploaded to the Enviroene World Wide Web for general access to all users of the system. Follow instructions in Appendix A for accessing this system. Once you have logged in, procedures for uploading text are available from the on-line Enviroene Help System.

Adapting Notebooks to Particular Needs

The scope of the industry sector described in this notebook approximates the national occurrence of facility types within the sector. In many instances, industries within specific geographic regions or states may have unique characteristics that are not fully captured in these profiles. The Office of Compliance encourages state and local environmental agencies and other groups to supplement or re-package the information included in this notebook to include more specific industrial and regulatory information that may be available. Additionally, interested states may want to supplement the "Summary of Applicable Federal Statutes and Regulations" section with state and local requirements. Compliance or technical assistance providers may also want to develop the "Pollution Prevention" section in more detail. Please contact the appropriate specialist listed on the opening page of this notebook if your office is interested in assisting us in the further development of the information or policies addressed within this volume. If you are interested in assisting in the development of new notebooks for sectors not covered in the original eighteen, please contact the Office of Compliance at 202-564-2395.

II. INTRODUCTION TO THE SHIPBUILDING AND REPAIR INDUSTRY

This section provides background information on the size, geographic distribution, employment, production, sales, and economic condition of the ship building and repair industry. Facilities described within this document are described in terms of their Standard Industrial Classification (SIC) codes.

II.A. Introduction, Background, and Scope of the Notebook

The shipbuilding and repair industry builds and repairs ships, barges, and other large vessels, whether self-propelled or towed by other craft. The industry also includes the conversion and alteration of ships and the manufacture of offshore oil and gas well drilling and production platforms. The shipbuilding and repair industry described in this notebook is categorized by the Office of Management and Budget (OMB) under the Standard Industrial Classification (SIC) code 3731. This notebook does not cover the related sector SIC 3732 Boat Building and Repairing. The boat building and repair industry is engaged in the manufacturing and repairing of smaller non-ocean going vessels primarily used for recreation, fishing, and personnel transport. OMB is in the process of changing the SIC code system to a system based on similar production processes called the North American Industrial Classification System (NAICS). (In the NAIC system, shipbuilding and repair facilities are all classified as NAIC 336611.)

II.B. Characterization of the Shipbuilding and Repair Industry

Shipyards, or facilities that build and/or repair ships, operate on a job basis. With the exception of about nine U.S. Navy owned shipyards (which are not included in SIC 3731), the U.S. shipbuilding and repair industry is privately owned. Unlike most other industries, each year only a small number of valuable orders are received that often take years to fill. Orders for ships and ship repairs are primarily placed by companies or the federal government. Companies that place orders often include commercial shipping companies, passenger and cruise companies, ferry companies, petrochemical companies, commercial fishing companies, and towing and tugboat companies. The principal federal government agencies placing shipbuilding and repair orders include the Naval Sea Systems Command, the Military Sealift Command, the Army Corps of Engineers, the U.S. Coast Guard, the National Oceanic and Atmospheric Administration, the National Science Foundation, and the Maritime Administration.

II.B.1. Product Characterization

Shipyards are often categorized into a few basic subdivisions either by type of operations (shipbuilding or ship repairing), by type of ship (commercial or military), and shipbuilding or repairing capacity (first-tier or second-tier).

Ships themselves are often classified by their basic dimensions, weight (displacement), load-carrying capacity (deadweight), or their intended service. In the U.S., there are considerable differences between shipyard operations when constructing ships for commercial purposes and when constructing ships for the military.

Commercial Ships

An important difference between commercial ships and military ships is that the commercial ship market is much more cost competitive. Unlike the military market, the commercial ship market must also compete internationally. The cost of building and maintaining a ship must be low enough such that the owners can make a reasonable profit. This has a significant impact on the manner in which commercial ships are built and repaired. The intense global competition in this industry is the main reason that since World War II, U.S. shipyards have produced relatively few commercial ships. In this regard, since 1981 the U.S. shipyards received less than one percent of all commercial orders for large ocean going vessels in the world, and no commercial orders for large ocean going cruise ships (ASA, 1997).

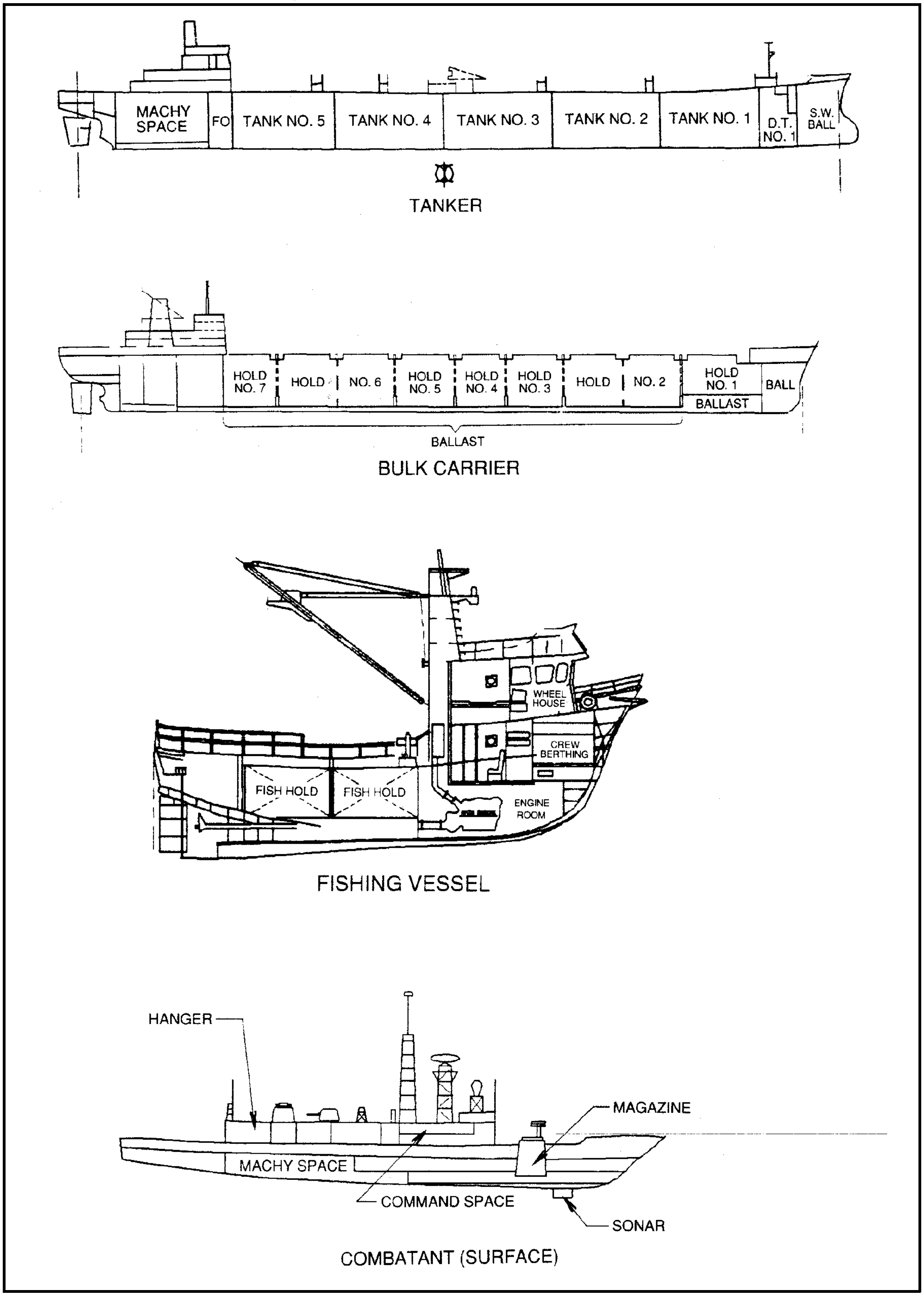
Commercial ships can be subdivided into a number of classes based on their intended use. Commercial ship classes include dry cargo ships, tankers, bulk carriers, passenger ships, fishing vessels, industrial vessels, and others (Storch et al., 1995). Dry cargo ships include break bulk, container, and roll-on/roll-off types. Profiles of a number of ship types are shown in Figure 1.

Military Ships

Military ship orders have been the mainstay of the industry for many years. The military ship market differs from the commercial market in that the major market drivers are agency budgets as set by government policy.

The military ship market can be divided into combatant ships and ships that are ordered by the government, but are built and maintained to commercial standards rather than military standards. (Storch et al., 1995) Combatant ships are primarily ordered by the U.S. Navy and include surface combatants, submarines, aircraft carriers, and auxiliaries. Government owned non-combatant ships are mainly purchased by the Maritime Administration's National Defense Reserve Fleet (NDRF) and the Navy's Military Sealift Command (MSC). Other government agencies that purchase non-combatant ships are the Army Corp of Engineers, National Oceanic and Atmospheric Administration, and the National Science Foundation. Such ships often include cargo ships, transport ships, roll on/roll off ships, crane ships, tankers, patrol ships, and ice breakers.

Figure 1: Profiles of Ship Types



Source: Adapted from *Ship Production* , Storch, et. al., 1995.

Ship Repairing

Ship repair operations include repainting, overhauls, ship conversions, and alterations. Almost all shipyards that construct new ships also do major ship repairs. In addition, about 200 shipyards concentrate solely on ship repairing and do not have the necessary facilities to construct ships (Storch et. al., 1995). Only about 31 shipyards have "major dry-docking facilities" capable of removing ships over 122 meters in length from the water (MARAD, 1995). Dry-docking facilities, or "full service" repair yards, allow repairs and maintenance below a ship's water line. The remaining repair yards can either dry-dock vessels under 122 meters or have no dry-docking facilities. Shipyards with no dry-docking facilities, called topside yards, perform above-water ship and barge repairs. Such facilities generally employ fewer than 100 people and are often capable of transporting workers and materials to the ship (Storch et al., 1995).

First and Second-Tier Shipyards

U.S. shipyards are also classified by MARAD as either first-tier shipyards or second-tier shipyards. First-tier shipyards make up the "U.S. major shipbuilding base" (MSB). As defined by MARAD and the Department of Transportation in "Report on Survey of U.S. Shipbuilding and Repair Facilities," 1995, the MSB is comprised of privately owned shipyards that are open and have at least one shipbuilding position capable of accommodating a vessel of 122 meters (383 feet) or more. With few exceptions, these shipyards are also major repair facilities with drydocking capabilities (U.S. Industrial Outlook, 1994). In 1996 there were 16 of these major shipbuilding facilities in the U.S.

Second-tier shipyards are comprised of the many small and medium-size shipyards that construct and repair smaller vessels (under 122 meters) such as military and non-military patrol boats, fire and rescue vessels, casino boats, water taxis, tug and towboats, off-shore crew and supply boats, ferries, fishing boats, and shallow draft barges (MARAD, 1996). A number of second-tier shipyards are also able to make topside repairs to ships over 122 meters in length.

II.B.2. Industry Size and Geographic Distribution

According to the *1992 Census of Manufacturers* data (the most recent Census data available), there were approximately 598 shipbuilding and repairing yards under SIC code 3731. The payroll for this year totaled $3.6 billion for a workforce of 118,000 employees, and value of shipments totaled $10.6 billion. Based on the Census of Manufacturers data, the industry is very labor intensive. The value of shipments per employee (a measure of labor intensiveness) is $90,000, which is about one third that of the steel manufacturing industry ($245,000 per employee) and only five percent that of the petroleum refining industry ($1.8 million per employee).

According to the *Census of Manufacturers*, most shipyards are small. About 72 percent of the shipyards employ fewer than 50 people in 1992 (see Table 1). It is the relatively few (but large) shipyards, however, that account for the majority of the industry's employment and sales. Less than five percent of the shipyards account for almost 80 percent of the industry's employment and sales.

Table 1: Facility Size Distribution for the Shipbuilding and Repair Industry

Employees per Facility	**Facilities**		**Employees**	
	Number of Facilities	Percentage of Facilities	Number of Employees	Percentage of Employees
1-9	230	38%	900	1%
10-49	203	34%	4,600	4%
50-249	113	19%	12,900	11%
250-499	25	4%	8,200	7%
500-2499	21	4%	17,100	14%
2500 or more	6	1%	74,600	63%
Total	598	100%	118,300	100%

Source: U.S. Department of Commerce, Census of Manufacturers, 1992.

Geographic Distribution

The geographic distribution of the shipbuilding and repair industry is concentrated on the coasts. Other important areas are the southern Mississippi River and Great Lakes regions. According to the *1992 U.S. Census of Manufacturers*, there are shipyards in 24 states. The top states in order are: Florida, California, Louisiana, Texas, Washington, and Virginia. Together, these states account for about 56 percent of U.S. shipyards. Figure 2 shows the U.S. distribution of facilities based on data from the Census of Manufacturers.

Figure 2: Geographic Distribution of Shipyards

Source: U.S. Census of Manufacturers, 1992.

Dun & Bradstreet's *Million Dollar Directory*, compiles financial data on U.S. companies including those operating within the shipbuilding and repair industry. Dun & Bradstreet ranks U.S. companies, whether they are a parent company, subsidiary or division, by sales volume within their assigned 4-digit SIC code. Readers should note that: (1) companies are assigned a 4-digit SIC that resembles their principal industry most closely; and (2) sales figures include total company sales, including subsidiaries and operations (possibly not related to shipbuilding and repair). Additional sources of company specific financial information include Standard & Poor's *Stock Report Services*, *Ward's Business Directory of U.S. Private and Public Companies*, Moody's Manuals, and annual reports.

Table 2: Top U.S. Companies with Shipbuilding and Repair Operations

Rank[a]	Company[b]	1996 Sales (millions of dollars)
1	Newport News Shipbuilding and Dry Dock Co. Newport News, VA	1,756
2	Ingalls Shipbuilding Inc. - Pascagoula, MS	1,125
3	General Dynamics Corp. (Electric Boat) - Groton, CT	980
4	Bath Iron Works Corp. - Bath, ME	850
5	Avondale Industries Inc., Shipyards Division New Orleans, LA	576
6	National Steel and Shipbuilding Co. (NASSCO) San Diego, CA	500
7	Trinity Marine Group - Gulfport, MS	400
8	Norfolk Shipbuilding and Drydock Corp. - Norfolk, VA	212
9	American Commercial Marine Service Co. - Jeffersonville, IN	166
10	Atlantic Marine - Jacksonville, FL	121

Note: [a]Not all sales can be attributed to the companies' shipbuilding and repair operations.
[b] Companies shown listed SIC 3731.

Source: *Dunn & Bradstreet's Million Dollar Directory - 1996.*

II.B.3. Economic Trends

General Economic Health

In general, the U.S. shipbuilding and repair industry is in a depressed state. At its height in the mid-1970s, the industry held a significant portion of the international commercial market while maintaining its ability to supply all military orders. Since then, new ship construction, the number of shipbuilding and repair yards, and overall industry employment have decreased sharply. The decline has been especially severe in the construction of commercial vessels at first tier shipyards which fell from about 77 ships (1,000 gross tons or more) per year in the mid-1970s to only about eight ships total through the late 1980s and early 1990s. In the 1980s, the industry's loss of the commercial market share was somewhat offset by a substantial increase in military ship orders. Following the naval expansion, however, the industry entered the 1990s with a much smaller military market and a negligible share of the commercial market.

The second tier shipyards and the ship repairing segment of the industry has also suffered in recent decades; however, its decline has not been as drastic. The second tier shipyards, comprised of small and medium size facilities, were able to keep much of their mainly commercial market share. These shipyards build vessels used on the inland and coastal waterways which by law must be built in the U.S.

The U.S. shipbuilding and repairing industry's loss of the commercial shipbuilding market has been attributed to a number of factors. First, a world wide shipbuilding boom in the 1970s created a large quantity of surplus tonnage which suppressed demand for years. Another significant factor reducing U.S. shipbuilding and repair industry's ability to compete internationally are the substantial subsidies that many nations provide to their domestic shipbuilding and repair industries. Also, until 1980, over 40 percent of U.S.-built merchant ships received Construction Differential Subsidies (CDS) based on the difference between foreign and domestic shipbuilding costs. The program was eliminated in 1981, further reducing the industry's competitiveness.

Another trend in the industry has been a movement toward consolidation. In recent years many shipyards have been closed or purchased by larger ship building and repair companies.

Government Influences

The U.S. shipbuilding and repair industry is highly dependent on the Federal Government, its primary market, for its continued existence. Direct purchases of military ships and military ship repair services by the Federal Government account for about 80 percent of the industry's sales (Census of Manufacturers, 1992). In addition, the industry receives a small amount of support through a few federal tax incentives and financing assistance programs.

MARAD provides assistance to U.S. ship owners through the Federal Ship Mortgage Insurance (Title XI) and Capital Construction Fund programs. Under Title XI, the Federal Government guarantees repayment of private sector mortgage obligations for operators that purchase ships from U.S. shipyards. Although the Capital Construction Fund has not been funded in recent years, in the past it has allowed operators to establish tax-deferred funds for procuring new or reconstructed vessels from U.S. shipyards (U.S. Industrial Outlook, 1994). Another program, MARITECH, is jointly funded by the Federal Government and industry and is administered by the Department of Defense's Advanced Research Projects Agency (ARPA), in collaboration with MARAD. MARITECH provides matching Government funds to encourage the shipbuilding industry to direct and lead in the development and application of advanced technology to improve its competitiveness and to preserve its industrial base. (For more information on MARITECH, see Section VIII.A.)

Such outside support is not unique to the U.S. Worldwide, many nations provide substantial subsidies to their shipbuilding and repair industries. The governments of most trading nations support their domestic industries because they believe that it is in their best interest economically and militarily. Maintaining a shipbuilding industrial base helps to safeguard a nation's control over getting its products to foreign markets, and ensures that it will have the means to replace its merchant or naval fleets in a time of national emergency. As a result of these external influences, the industry does not behave according to the simple economic supply and demand model. Rather, the policies of national governments in conjunction with economic forces dictate economic activity in this sector.

Like many other nations, the U.S. has a policy of maintaining a shipbuilding and repair industrial base that can be expanded in time of war (Storch, et al., 1995). National policy, therefore, will continue to be the primary factor influencing the industry's economic trends in the U.S.

Domestic Market

The military still is, and will continue to be, the primary source of work for the industry. However, the Navy's new ship procurement has sharply declined since the accelerated Navy ship construction in the 1980s. This work is expected to continue to decline at least through the remainder of the 1990s. Some industry analysts predict that a number of the first tier shipyards, which fill most of the military orders, will close in coming years.

While military shipbuilding is on the decline, the forecast for the commercial sector is more promising. Domestic demand for commercial shipbuilding and repair has increased dramatically in recent years and is expected to continue to increase throughout the 1990s. There have been significant increases in barge construction in recent years. In 1996, 1,070 hopper barges were delivered by U.S. shipyards, more than double the number delivered in 1995. This number is expected to grow to over 1,500 in 1997. Demand is also expected to be particularly high for tankers; especially for new double-hull tankers in response to the 1990 Oil Pollution Act requirements.

International Market

Currently, the U.S. holds less than one half of one percent of the world market share of commercial shipbuilding and repair. South Korea and Japan currently dominate the world market. Each holds about 30 percent of the gross tonnage of merchant ships on order. Germany, Poland, Italy, and China each hold between four and five percent of the commercial market. However, a number of major commercial ship orders were received by first and second tier shipyards in 1995 and 1996. The chief driving forces for this increase in U.S. commercial ship production is a general increase in worldwide demand stemming from an aging merchant fleet and an improving global economy. The elevated demand is expected to continue over the next three to five years.

Through the OECD in December 1994, an agreement was reached by the Commission of the European Communities, and the Governments of Finland, Japan, South Korea, Norway, Sweden and the United States to establish more normal competitive conditions in the shipbuilding industry. The agreement is expected to remove government support and unfair pricing practices in the industry. If and when this agreement is implemented, it is expected to have a positive impact on the world market by discouraging "ship dumping" practices that are believed to have been damaging shipbuilders. It is hoped that the agreement will also bring to light the actual economic advantage and competitiveness of the various countries and individual ship builders. In addition, the shipowners will no longer be able to buy ships at subsidized or dumped prices reducing the likelihood of speculative buying.

Recognizing the unique need for the Administration, Congress and the shipbuilding industry to work together in order for the U.S. to become competitive once again in the international shipbuilding market, President Clinton submitted a Report to Congress entitled "Strengthening America's Shipyards: A Plan for Competing in the International Market." In that report, the President outlined a number of steps to be taken "to ensure a successful transition to a competitive industry in a truly competitive marketplace." The Administration's five step plan included:

- Ensuring Fair International Competition
- Improving Competitiveness
- Eliminating Unnecessary Government Regulation
- Financing Ship Sales Through Title XI Loan Guarantees, and
- Assisting International Marketing.

III. INDUSTRIAL PROCESS DESCRIPTION

This section describes the major industrial processes within the shipbuilding and repair industry, including the materials and equipment used and the processes employed. The section is designed for those interested in gaining a general understanding of the industry, and for those interested in the inter-relationship between the industrial process and the topics described in subsequent sections of this profile -- pollutant outputs, pollution prevention opportunities, and Federal regulations. This section does not attempt to replicate published engineering information that is available for this industry. Refer to Section IX for a list of resource materials and contacts that are available.

This section specifically contains a description of commonly used production processes, associated raw materials, the by-products produced or released, and the materials either recycled or transferred off-site. This discussion, coupled with schematic drawings of the identified processes, provide a concise description of where wastes may be produced in the process. This section also describes the potential fate (via air, water, and soil pathways) of these waste products.

III.A. Industrial Processes in the Shipbuilding and Repair Industry

The shipbuilding and repair industry has characteristics of both a manufacturing industry and the construction industry. The industry uses and produces a wide variety of manufactured components in addition to basic construction materials. As with the construction industry, shipbuilding and repair requires many workers with many different skills all working in an established organization structure.

New ship construction and ship repairing have many industrial processes in common. They both apply of essentially the same manufacturing practices, processes, facilities, and support shops. Both ship repair and new construction work require highly skilled labor because many of the operations (especially in ship repair) have limited potential for automation. Both require excellent planning, engineering, and interdepartmental communications. New ship construction, however, generally requires a greater amount of organization because of the size of the workforce, size of the workload, number of parts, and the complexity of the communications (e.g., production plans and schedules) surrounding the shipbuilding work-flow (NSRP, 1993).

III.A.1. Shipyard Layout

Shipbuilding and repair facilities are generally made up of several specific facilities laid out to facilitate the flow of materials and assemblies. Most shipyards were built prior to the Second World War. Changes in shipyard layout were made piecemeal, responding to advances in technology, demands for different types of ships, and availability of land and waterfront. As a result, there is no typical shipyard layout. There are, however, a number of specific facilities that are common to most large shipyards. These facilities include: drydocks, shipbuilding positions, piers and berthing positions, workshops (e.g., machine, electrical, pipe, assembly, paint and blast, carpenter, and sheet metal shops), work areas (steel storage, platen lines, and construction areas), warehouses, and offices. A shipyard layout containing many of these facilities is shown in Figure 3.

III.A.2. Docking and Launching Facilities

There are few shipyards that have the capability to construct or repair vessels under cover; in most cases shipbuilding and repair are done largely out of doors. Much of this work is done over, in, under, or around water, which can inadvertently receive a portion of shipyard pollutant outputs. The docking facilities, or the mechanisms used to remove ships from the water for repair or to construct and launch ships, can affect waste generation and management.

Ships can be either wet-docked or drydocked. A wet-dock or berth is a pier or a wet slip position that a ship can dock next to and tie up. A ship that has its entire hull exposed to the atmosphere is said to be drydocked. A number of different drydocking and launching facilities exist including building ways, floating drydocks, graving docks, and marine railways.

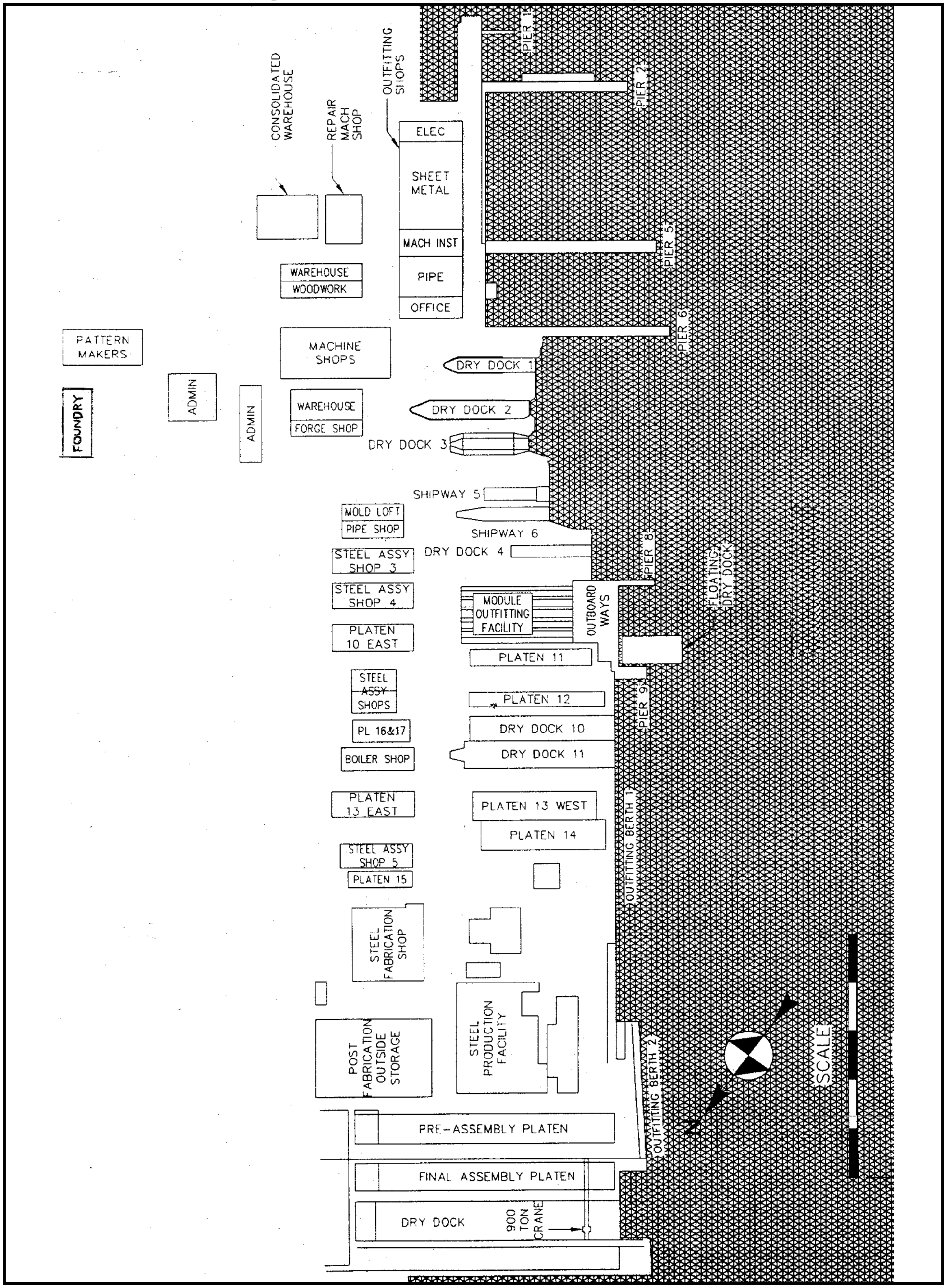
Building Ways

Building ways are used only for building ships and releasing them into the adjacent waters. New ships are constructed and launched from one of two main types of building ways: longitudinal end launch ways and side launch ways (NSRP, 1993).

Floating Drydocks

Floating drydocks are floating vessels secured to land that have the ability to be lowered under the water's surface in order to raise ships above the water surface. Floating drydocks are generally used for ship repair, but in some cases ship construction is performed. When the drydock is submerged by filling ballast tanks with water, ships are positioned over bilge and keel blocks located on the deck of the drydock. The ship's position over the drydock is maintained while the ballast tanks are pumped out, which raises the dock and the ship above the water surface (NSRP, 1993).

Figure 3: Example Shipyard Layout



Source: Maritime Administration, *Report on Survey of U.S. Shipbuilding and Repair Facilities*, 1995.

Graving Docks

Graving docks are man-made rectangular bays where water can be let in and pumped out. Ships are floated into the dock area when the dock is full of water. Water-tight gates are closed behind the ship and the water is pumped from inside the dock area to the outside adjacent waters. Large pumping systems are typically used to remove all but a few inches of the water. Graving docks usually have a sloping dock floor which directs the water to channels leading to smaller pumps which empty the final few inches of water as well as any rain or water runoff which enters the dock (NSRP, 1993).

Marine Railways

Marine railways have the ability to retrieve and launch ships. They are similar to end-launch building ways, but usually much smaller. Marine railways essentially consist of a rail-car platform and a set of railroad tracks. The rails are secured to an inclined cement slab that runs the full length of the way and into the water to a depth necessary for docking ships. Motor and pulley systems are located at the head of marine railways to pull the rail-car platform and ship from the water (NSRP, 1993).

III.A.3. Ship Construction Processes

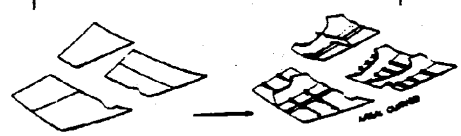
Most new ship construction projects are carried out using zone-oriented methods, such as the hull block construction method (HBCM). In HBCM, the ship structure is physically divided into a number of blocks. The definition of hull blocks has an enormous impact on the efficiency of the ship construction. Therefore, blocks are carefully designed to minimize work and to avoid scheduling problems. Blocks are constructed and pieced together in five general manufacturing levels. Figure 4 summarizes the various manufacturing levels.

The first level involves the purchasing and handling of raw materials and fabricating these materials into the most basic parts. The primary raw materials include steel plates, bars, and structural members. Parts fabrication or pre-assembling operations often involve cutting, shaping, bending, machining, blasting, and painting of these materials. Fabricated parts include steel plates and steel members used as structural parts, machined parts, piping, ventilation ducts, electrical components (motors, lights, transformers, gauges, etc.), and a wide variety of other miscellaneous parts. Parts fabrication is carried out throughout the shipyard in a number of different shops and work areas depending on the specific raw materials being handled (see Section III.A.7 for a description of typical operations conducted in shipyard shops).

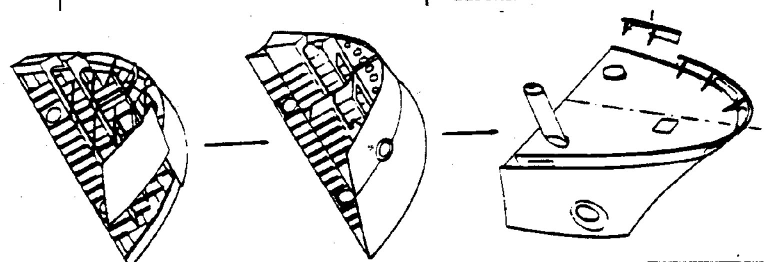
Level 2 of new ship construction involves the joining of different fabricated parts from Level 1 into assembled parts. In the third level of manufacturing the fabricated and/or assembled parts are fitted together into a sub-block assembly which are in turn fitted together in Level 4 to form blocks. Blocks are three dimensional sections of the ship and are the largest sections of the ship to be assembled away from the erection site. Blocks are designed to be stable configurations that do not require temporary support or reinforcement. Often, at least one side of a block forms part of the outside hull of the ship. Blocks are built and transported through the shipyard and welded together at a building position where the ship is erected. The size of the blocks that a shipyard can build is dependent on the shipyard capacity to assemble, transport, and lift the blocks and units onto the ship under construction. In Level 5 the ship is erected from the blocks (Storch, 1995).

Figure 4: General Ship Manufacturing Levels

LEVEL # 1	PURCHASING AND PRE-ASSEMBLY	A) PURCHASING OF RAW MATERIALS, B) TRANSFORMING THE MATERIALS INTO PARTS. (I.e., PLATE STEEL INTO SHAPES AND PIPE INTO PIPE SPOOLS)
LEVEL #s 2 & 3	SUB-ASSEMBLY	JOINING THOSE PARTS PRODUCED AT LEVEL #1 INTO LARGER SUB-ASSEMBLIES.



LEVEL # 4	ASSEMBLY AND OUTFITTING	JOINING PARTS AND SUB-ASSEMBLIES TOGETHER TO FORM LARGE SECTION OF THE SHIP CALLED HULL BLOCKS.



LEVEL # 5	ERECTION	INSTALLATION OF THE HULL BLOCK ONTO THE SHIP UNDER CONSTRUCTION, THUS THE SHIP IN BEING ERECTED.
LEVEL # 6	SYSTEM COMPLETION AND TEST AND TRIAL	SYSTEMS ON THE SHIP (I.e., ELECTRICAL, HEATING AND VENTILATION, PLUMBING, ETC.) ARE CONNECTED TOGETHER, TESTED, AND TESTED BEFORE DELIVERY TO THE CUSTOMER.

Source: Adapted from NSRP, *Introduction to Production Processes and Facilities in the Steel Shipbuilding and Repair Industry*, 1993.

Another important aspect of ship construction is outfitting. Outfitting, which involves the fabrication and installation of all the parts of a ship that are not structural in nature, is carried out concurrently with the hull construction. Outfit is comprised of the ship's plumbing, derricks, masts, engines, pumps, ventilation ducts, electrical cable, stairs, doors, ladders, and other equipment. The basic raw materials include pipes, sheet metal, electrical components, and machinery. A zone-oriented method is typically used to assemble the parts that form major machinery spaces onboard the ship including engine rooms, pump rooms, and auxiliary machinery spaces. Parts or fittings can be assembled onboard the ship during hull erection, on the blocks or subblocks, or independent of the hull structure in units of similar parts (NSRP, 1993).

III.A.4. Major Production Facilities

Most shipbuilding yards have in common the following major facilities, work areas, or specialized equipment.

Prime Line

The prime line is a large machine that blasts and primes (paints) raw steel sheets, preparing them for production. Steel sheets, parts, and shapes enter one end of the prime line, go through a blasting section, then through a priming section. The primer is referred to as construction primer, and is used to prevent corrosion during the production process. Section III.A.9 discusses surface preparation and coating operations in more detail (NSRP, 1993).

Panel Lines

Panel lines typically consist of motor driven conveyors and rollers used to move large steel plates together for joining. The use of panel lines introduced manufacturing production line techniques into the steel shipbuilding industry. Joining of plates involves the welding of the seams either on one side or two sides. Two sided welding requires the panel line to be capable of turning the steel plates over after one-side is welded. Vertical stiffeners are also welded on the panel line often using automated welding machines. After welding, excess steel is cut off using gas cutting equipment. Panel assemblies are typically moved through the line with the aid of magnetic cranes (NSRP, 1993).

Platen Lines

The platen lines (or platens) are the area in the shipyard where blocks are assembled. Therefore, platens form assembly lines where the steel structures of construction blocks are fabricated. Sub-assemblies from the panel line and plate shop are brought together at the platen and assembled into blocks. The platen mainly provides locations for sub-assembly construction, block layout, tack-welding, and final weld out. The platen lines are serviced by welding and steel cutting equipment and cranes for materials movement (NSRP, 1993).

Rolls

Rolls are large facilities that bend and shape steel plates into curved surface plates for the curved portion of the hull. Rolls consist of large cylindrical steel shafts and a motor drive. Rolls vary greatly in size and technology from shipyard to shipyard. Some of the newer rolls are computer controlled, while the older machines are manually operated (NSRP, 1993).

Pin Jigs

Pin jigs are platen lines used to assemble the curved blocks that form the outside of the hull's curved surface. The pin jig is simply a series of vertical screw jacks that support curved blocks during construction. A pin jig is set up specifically for the curved block under construction. The jig heights are determined from the ship's engineering drawings and plans (NSRP, 1993).

Rotary Tables

Rotary tables are facilities that hull blocks are set into and which mechanically rotate the block. The ability to easily rotate an entire block in a single location reduces the number of time-consuming crane lifts that would otherwise be needed. Rotary tables also exploit the increased efficiencies experienced when workers are able to weld on a vertical line (down hand). Down hand welding provides a higher quality weld with higher efficiency rates. Turn tables are also used for outfitting materials on the block because of easier access to outfitting locations (NSRP, 1993).

Materials Handling

Materials handling is an important aspect of efficient shipbuilding. Considerable coordination is needed between materials delivery and the production schedule. Materials need to be delivered to the proper location in the shipyard at the proper time to be installed on the construction block. Typical materials handling equipment includes conveyors, cranes, industrial vehicles (e.g., forklifts, flatbeds, carts, special lift vehicles, etc.), and containers (NSRP, 1993).

III.A.5. Welding

The structural framework of most ships is constructed of various grades of mild and high strength steel. Aluminum and other nonferrous materials are used for some superstructures (deck-houses) and other areas requiring specific corrosion resistance and structural requirements. However, other common materials such as stainless steel, galvanized steel, and copper nickel alloys, are used in far less quantities than steel (ILO, 1996).

The primary raw material for ship construction is steel plate. Steel plates are typically cut to the desired size by automatic burners before being welded together to form the structural components of the vessel.

Shipyard welding processes are performed at nearly every location in the shipyard. The process involves joining metals by bringing the adjoining surfaces to extremely high temperatures to be fused together with a molten filler material. An electric arc or gas flame are used to heat the edges of the joint, permitting them to fuse with molten weld fill metal in the form of an electrode, wire, or rod. There are many different welding techniques used by the industry. Most welding techniques can be classified as either electric arc or gas welding, with electric arc being the most common (ILO, 1996).

An important factor impacting the strength of welds is arc shielding, isolating the molten metal weld pool from the atmosphere. At the extremely high temperatures used in welding, the molten metal reacts rapidly with oxygen and nitrogen in the atmosphere which decreases the weld strength. To protect against this weld impurity and ensure weld quality, shielding from the atmosphere is required. In most welding processes, shielding is accomplished by addition of a flux, a gas, or a combination of the two. Where a flux material is used, gases generated by vaporization and chemical reaction at the electrode tip result in a combination of flux and gas shielding that protect the weld from the atmosphere. The various types of electric arc welding (shielded metal arc, submerged arc, gas metal arc, gas tungsten arc, flux core arc, and plasma-arc) all use different methods to accomplish arc shielding (ILO, 1996).

III.A.6. Ship Repairing Processes

Ship repair generally includes all ship conversions, overhauls, maintenance programs, major damage repairs, and minor equipment repairs. Although specific repair methods vary from job to job, many of the operations are identical to new ship construction operations. Repair operations, however, are typically on a smaller scale and are performed at a faster pace. Jobs can last anywhere from one day to over a year. Repair jobs often have severe time constraints requiring work to be completed as quickly as possible in order to get the ships back in service. In many cases, piping, ventilation, electrical, and other machinery are prefabricated prior to the ship's arrival. Often, repair jobs are an emergency situation with very little warning, which makes ship repair a fast moving and unpredictable environment. Typical maintenance and repair operations include:

- Blasting and repainting the ship's hull, freeboard, superstructure, and interior tanks and work areas
- Major rebuilding and installation of machinery such as diesel engines, turbines, generators, pump stations, etc.

- Systems overhauls, maintenance, and installation (e.g., piping system flushing, testing, and installation)

- System replacement and new installation of systems such as navigational systems, combat systems, communication systems, updated piping systems, etc.

- Propeller and rudder repairs, modification, and alignment

- Creation of new machinery spaces through cut outs of the existing steel structure and the addition of new walls, stiffeners, vertical, webbing, etc.

In addition, some larger shipyards are capable of large repair and conversion projects that could include: converting supply ships to hospital ships, cutting a ship in half and installing a new section to lengthen the ship, replacing segments of a ship that has run aground, completing rip-out, structural reconfiguration and outfitting of combat systems, major remodeling of ships' interiors or exteriors (NSRP, 1993).

III.A.7. Support Shops and Services

Shipyards typically have a number of support shops that either process specific raw materials (e.g., pipes, electric, sheet metal, machinery, plates, paint, etc.) or provide specialty services (e.g., carpentry, maintenance, materials transporting, warehousing, etc.). In many ways, support shops are small manufacturers producing goods to support the production effort (NSRP, 1993). Common shipbuilding and repair yard support shops and services are described below.

Pipe Shop

The pipe shop is responsible for manufacturing and assembling piping systems. Piping systems are the largest outfitting task in shipbuilding. Small pipe sections known as "pipe spools" are assembled in the pipe shop and transported to the stages of construction (i.e., assembly, on-block, on-unit, and on-board). Pipe spools are shaped and manufactured per engineering design, are scheduled for construction, and sent to the various stages for installation. Many pipe shops will tag the spools to identify the location for installation on the block and ship. A typical ship may have anywhere from 10,000 to 25,000 pipe spools. Some of the processes in the pipe shop include: pipe welding, pipe bending, flux removal, grit-blast, pickling, painting, galvanizing, and pressure testing. Some of the equipment used by the pipe shop are as follows: pipe welders, lathes, pipe cutting saws, shears, grinders, chippers, hole cutters, pipe benders, pickling tanks, and transportation equipment (NSRP, 1993).

Machine Shop

The machine shop serves the entire shipyard's machining needs though the exact functions of the shipyard machine shops vary throughout the shipbuilding industry. Shipyard machine shops perform functions ranging from rebuilding pumps to turning 25 foot long propeller drive shafts on lathes. Equipment in the machine shop consists of: end mills, lathes, drill presses, milling machines, band saws, large presses, work tables, and cleaning tanks (NSRP, 1993).

Sheet Metal Shop

The sheet metal shop is generally responsible for fabricating and installing ventilation ducting and vent spools. Using engineering drawings and special sheet metal tools this shop produces ventilation systems for new construction, as well as repair work. The shop cuts, shapes, bends, welds, stamps, paints, and performs a variety of manufacturing operations for ship ventilation systems. Many sheet metal shops are also responsible for assembling large ducting fans and heating and air conditioning components. Sheet metal workers perform the installation of the ducting in various stages of construction such as on-block, on-unit, onboard (NSRP, 1993).

Electrical Shop

Electrical shops in the shipyard perform a variety of functions throughout the industry. In many cases, the electrical shop installs, rebuilds, builds, and tests electrical components (e.g., motors, lights, transformers, gauges, etc.). The electrical shop electricians also install the electrical equipment on the ship either on-block or onboard. On-block is where the electrical parts are installed and onboard is where cables are routed throughout the ship connecting the electrical systems together. Electric shops generally have plating tanks, dip tanks for lacquer coatings, electrical testing equipment, and other specialized equipment (NSRP, 1993).

Foundry/Blacksmith Shop

The blacksmith shop is an older term used for the shipyard shop that performs forging or castings. Forging and casting at shipyards are somewhat rare. Over the years, forging and casting functions have been shifted to subcontractors off-site. The subcontractors are usually foundries whose primary function is forging and casting. Shipyards that have blacksmith shops maintain large furnaces and other foundry equipment (NSRP, 1993).

Plate Shop

The plate shop is a generic term used for the area and process in the shipyard that provides steel parts cutting, bending, and sub-assembly. The plate shop uses information from engineering drawings to produce plate shapes. The shapes are cut and formed as needed. Most plate shops have manual and computer controlled machinery. The types of machinery commonly found in the plate shop are cutting machines, steel bending machines and plate bending rolls, shearing machines, presses, hole punching equipment, and furnaces for heat treatment. The plate shop sends the parts and sub-assemblies that they manufacture to the stages of construction, or the platen area for installation (NSRP, 1993).

Production Services

Services provided by this department include: carpentry, scaffolding erection, crane operations, rigging, facility and equipment maintenance, and other production support activities. The production services may be grouped into one department or divided into unique shops for each service provided (NSRP, 1993).

III.A.8. Solvent Cleaning and Degreasing

Solvent cleaning and degreasing are common in the shipbuilding and repair industry (although many facilities are replacing solvent cleaning and degreasing with aqueous and alkaline cleaning and degreasing). Solvent cleaning and degreasing are typically accomplished by either cold cleaning or vapor degreasing. Cold cleaning refers to operations in which the solvent is used at room temperature. The surfaces or parts are soaked in a tank of solvent, or sprayed, brushed, wiped, or flushed with solvent. Diphase cleaning is sometimes used to combine a water rinse before and after the solvent cleaning into a single step. In diphase cleaning, water insoluble halogenated solvents and water are placed in a single tank where they separate with the solvent on the bottom. Parts are lowered through the water bath before reaching the solvent and then are rinsed through the water level as they are removed from the tank.

In vapor degreasing, parts and surfaces are cleaned with a hot solvent vapor. Solvent in a specially designed tank is boiled creating a solvent vapor in the upper portion of the tank. The parts are held in the vapor zone where solvent vapor condenses on the surface removing dirt and oil as it drips back into the liquid solvent. In this way, only clean solvent vapors come in contact with the part. A condensing coils at the top of the tank reduces the amounts of solvents escaping to the atmosphere (NSRP, 1993).

III.A.9. Surface Preparation

To a large extent, the effectiveness of the surface coating relies on the quality of surface preparation. All paints will fail eventually, but the majority of premature failures are due to loss of adhesion caused by improper surface preparation. Surface preparation is also typically one of the most significant sources of shipyard wastes and pollutant outputs. Section III.B.1 discusses waste generation and pollution outputs from these operations.

Surface preparation techniques are used to remove surface contaminants such as mill scale, rust, dirt, dust, salts, old paint, grease, and flux. Contaminants that remain on the surface are the primary causes of premature failure of coating systems. Depending on the surface location, contaminants, and materials, a number of different surface preparation techniques are used in the shipbuilding and repair industry:

- Solvent, Detergent, and Steam Cleaning
- Blasting
- Hand Tool Preparation
- Wet Abrasive Blasting and Hydroblasting
- Chemical Preparation

Solvent, Detergent, and Steam Cleaning

The process of removing grease, oil and other contaminants with the aid of solvents, emulsions, detergents, and other cleaning compounds is frequently used for surface preparation in the shipbuilding industry. Solvent cleaning involves wiping, scrubbing, immersion in solvent, spraying, vapor degreasing, and emulsion cleaning the surface with rags or brushes until the surface is cleaned. The final wipe down must be performed with a clean rag or brush, and solvent. Inorganic compounds such as chlorides, sulfates, weld flux, rust and mill scale cannot be removed with organic solvents.

In many cases steam cleaning is a better alternative to solvent wipe down. Steam cleaning or high pressure washing is used to remove dirt and grime that is present on top of existing paint and bare steel. Many hot steam cleaners with detergents will remove most petroleum products and sometimes, old chipping paint. After steam cleaning the part should be rinsed with fresh water and allowed to dry. Often the surface is ready to prime, although many surfaces will require further preparation before painting.

Blasting

Abrasive blasting is the most common method for paint removal and surface preparation. Copper slag, coal slag, steel grit, and steel shot are common blasting abrasives. Copper and steel grit consist of small angular particles, while steel shot is made up of small round balls. Copper slag can generally be used only once or twice before it becomes too small to be effective. Steel grit and shot can typically be used between 50 and 5,000 times before becoming ineffective. Metallic grit and shot are available in varying ranges of hardness and size.

Centrifugal blasting machines, also called roto-blasting or automatic blasting, are one of the more popular methods of blasting steel surfaces. In centrifugal blasting, metallic shot or grit is propelled to the surface to be prepared by a spinning wheel. Centrifugal blasting machines tend to be large and not easily mobilized. Therefore, they are not applicable to all shipyard blasting needs. Parts to be prepared must be brought to the machine and passed through on a conveyor or rotary table. On flat surfaces, centrifugal blasting machines can produce uniform blasting results at high production rates. More time is required to prepare surfaces that are hard to reach. The process allows easy recovery of abrasive materials for reuse and recycling which can result in significant savings in materials and disposal costs. Large centrifugal blasting machines are often found in the prime line for preparing raw steel sheets before priming. Other centrifugal blasting machines are smaller and can be used to prepare small parts, pipe spools, and steel subassemblies prior to painting.

Air nozzle blasting (or dry abrasive blasting) is one of the most common types of blasting in the shipbuilding and repair industry. In air nozzle blasting, abrasive is conveyed to the surface to be prepared in a medium of high pressure air (approximately 100 pounds per square inch) through a nozzle at velocities approaching 450 feet per second. Abrasives are copper slag, coal slag and other metallic grit. Typically copper slag is used on the west coast and coal slag is used on the east coast. Traditionally sand was used, but metallic grit has replaced it due to the adverse health and environmental effects of silica dust associated with sand. Air nozzle blasting is generally carried out manually by shipyard workers either within a building or in the open air, depending on the application. If the application allows, blast booths can be used for containing abrasives.

Hand Tool Preparation

Hand tools such as grinders, wire brushes, sanders, chipping hammers, needle guns, rotary peening tools, and other impact tools are commonly used in the shipyard for surface preparation. The hand tools are ideal for small jobs, hard to reach areas, and areas where blasting grit would be too difficult to contain. Cleaning surfaces with hand tools seems comparatively slow although, when removing heavy paint formulations and heavy rust, they are effective and economical. Impact tools like chipping and needle guns are best for removing heavy deposits of brittle substances (e.g., rust and old paint). Hand tools are generally less effective when removing tight surface mill scale or surface rusting, because they can damage the metal surface. Surface preparation hand tools are generally pneumatic instead of electric because they are lighter, easy to handle, do not overheat, and there is no risk of electric shock.

Wet Abrasive Blasting and Hydroblasting

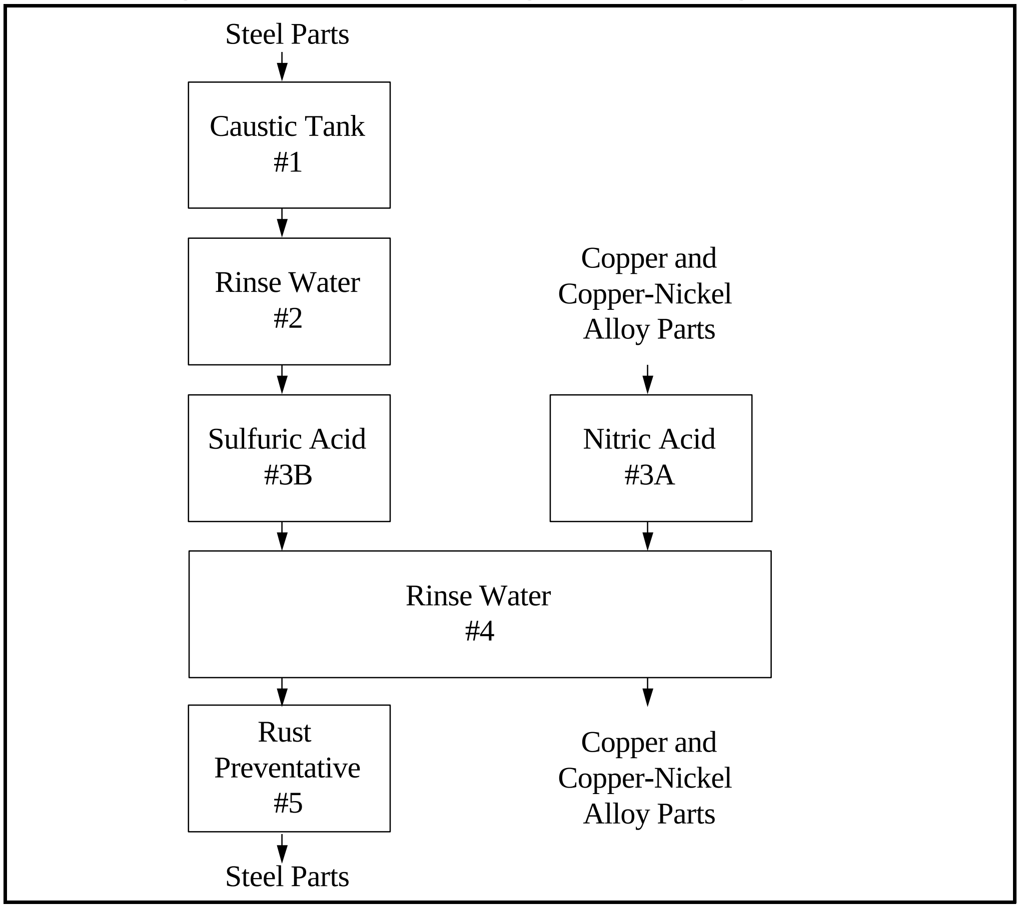
Wet abrasive blasting and hydroblasting are generally performed on ships being repaired in a floating drydock, graving dock, or other building or repair position. Wet abrasive blasting involves blasting with a mixture of water, air and solid abrasives. Wet abrasive blasting does not occur throughout the shipyard like dry abrasive blasting because of the problem of water blast containment. In part due to lack of customer acceptance, wet abrasive blasting is not common in the shipbuilding and repair industry at this time. Instead, hydroblasting is a widely used wet blasting technique which uses only high pressure water to remove chipping paint, marine growth, mud, and salt water from the ship's hull. A small amount of rust inhibitor may be used in the water to prevent flash rusting. Hydro basting is often followed by air nozzle blasting for final surface preparation.

Chemical Preparation

Chemical surface preparations consist of paint removers, alkaline cleaning solutions, chlorinated solvents, and pickling. Alkaline cleaning solutions come in a variety of forms and are used in a variety of manners. Alkaline cleaners can be brushed on, sprayed on, and applied in a dip tank. Alkaline dip tanks of caustic soda solution are frequently used for cleaning parts and preparing them for painting. After the surface is cleaned, it is thoroughly rinsed before a coating system is applied. Many solvents and alkaline cleaners cannot be used for nonferrous materials, such as bronze, aluminum, and galvanized steel which are frequently found on ships.

Pickling is a process of chemical abrasion/etching which prepares surfaces for good paint adhesion. The pickling process is used in shipyards mainly for preparing pipe systems and small parts for paint. However, the process and qualities will vary from shipyard to shipyard. The process involves a system of dip tanks. Figure 5 displays how the tanks can be arranged. In pickling steel parts and piping systems, Tank #1 is used to remove any oil, grease, flux, and other contaminants on the surface being pickled. The content in tank #1 are generally a 5-8% caustic soda and water mixture maintained at temperatures of between 180°-200°F. The part is then immersed into tank #2, which is the caustic soda rinse tank (pH 8-13). Next, the steel is dipped into tank #3B, which is a 6-10% sulfuric acid/water mixture maintained between 140°-160°F. Tank #4 is the acid rinse tank that is maintained at a pH of 5-7. Finally the steel pipe or part is immersed in a rust preventative 5% phosphoric mixture in tank #5. The part is allowed to fully dry prior to paint application.

Figure 5: Typical Pickling Tank Arrangement



Some ships have large piping systems that are predominantly copper-nickel alloy or copper. Pickling of copper is generally only a two-step process. The first step is to dip the pipe into tank #3A, a 3-6% nitric acid solution maintained at 140 °-160°F. The nitric acid removes any flux and greases that are present on the surface and prepares the surface for paint. Next, the pipe is dipped into the acid rinse tank (#4), after which it is considered to be treated. Once the part is dry, the final coating can be applied.

Metal Plating and Surface Treatment

Metal plating and surface treatment are used in shipyards to alter the surface properties of the metal in order to increase corrosion or abrasion resistance, and to improve electrical conductivity (Kura, 1996). Metal plating and surface treatment includes chemical and electrochemical conversion, case hardening, metallic coating, and electroplating. Thorough descriptions of these processes and their associated wastes are contained in the *Fabricated Metal Products Industry Sector Notebook*.

III.A.10. Painting Processes

Proper surface coating system application is essential in the shipbuilding and repair industry. The corrosion and deterioration associated with the marine environment has detrimental effects on ships and shipboard components. Maintaining ships' structural integrity and the proper functioning of their components are the main purposes of shipboard coating systems.

Painting is performed at almost every location within shipyards. This is due to the wide variety of work performed throughout shipyards. The nature of shipbuilding and repair requires several types of paints to be used for a variety of applications. Paint types range from water-based coatings to high performance epoxy coatings. The type of paint needed for a certain application depends on the environment that the coating will be exposed. In general there are six areas where shipboard paint requirements exist:

- Underwater (Hull Bottom)
- Waterline
- Topside Superstructures
- Internal Spaces and Tanks
- Weather Decks
- Loose Equipment

Because paint systems are often specified by the customer or are supplied by the ship owner, shipyards often may not be able to choose or recommend a particular system. Navy ships may require a specific type of paint for every application through a military specification (Mil-spec). Many factors are considered when choosing a particular application. Among the factors are environmental conditions, severity of environmental exposure, drying and curing times, application equipment and procedures, etc.

Paint Coating Systems

Paints are made up of three main ingredients: pigment, binder, and a solvent vehicle. Pigments are small particles that generally determine the color as well as many other properties associated with the coating. Examples of pigments include: zinc oxide, talc, carbon, coal tar, lead, mica, aluminum, and zinc dust. The binder can be thought of as the glue that holds the paint pigments together. Many paints are referred to by their binder type (e.g., epoxy, alkyd, urethane, vinyl, phenolic, etc.). The binder is also very important for determining a coating's performance characteristics (e.g., flexibility, chemical resistance, durability, finish, etc.). The solvent is added to thin the paints so that it will flow to the surface and then dry. The solvent portion of the paint evaporates when the paint dries. Some typical solvents include acetone, mineral spirits, xylene, methyl ethyl ketone, and water.

Anticorrosive and antifouling paints are typically used on ship's hulls and are the main two types of paint used in the shipbuilding industry. Antifouling paints are used to prevent the growth of marine organisms on the hull of vessels. Copper-based and tributyl-tin-based paints are widely used as antifouling paints. These paints release small quantities of toxics which discourage marine life from growing on the hull. Anticorrosive paints are either vinyl, lacquer, urethane, or newer epoxy-based coating systems (ILO, 1996).

The first coating system applied to raw steel sheets and parts is generally pre-construction primer. This pre-construction primer is sometimes referred to as shop primer. This coat of primer is important for maintaining the condition of the part throughout the construction process. Pre-construction priming is performed on steel plates, shapes, sections of piping, and ventilation ducting. Most pre-construction primers are zinc-rich with organic or inorganic binders. Zinc silicates are predominant among the inorganic zinc primers. Zinc coating systems protect coatings in much the same manner as galvanizing. If zinc is coated on steel, oxygen will react with the zinc to form zinc oxide, which forms a tight layer that does not allow water or air to come into contact with the steel (ILO, 1996).

Paint Application Equipment

There are many types of paint application equipment used in the shipbuilding industry. Two main methods used are compressed air and airless sprayers. Compressed air sprayers are being phased out in the industry because of the low transfer ability of the system. Air assisted paint systems spray both air and paint, which causes some paint to atomize and dry quickly prior to reaching the intended surface. The transfer efficiency of air assisted spray systems can vary from 65% to 80%. This low transfer efficiency is due mainly to overspray, drift, and the air sprayer's inefficiencies (ILO, 1996).

The most widely used form of paint application in the shipbuilding industry is the airless sprayer. The airless sprayer is a system that simply compresses paint in a hydraulic line and has a spray nozzle at the end. Airless sprayers use hydrostatic pressure instead of air to convey the paint. They are much cleaner to operate and have fewer leaking problems because the system requires less pressure. Airless sprayers can have up to 90% transfer efficiency. A new technology that can be added to the airless sprayer is called High Volume Low Pressure (HVLP). HVLP offers an even higher transfer efficiency, in certain conditions (ILO, 1996).

Thermal spray is the application of aluminum or zinc coatings to steel for long term corrosion protection. Thermal spray can also be referred to as metal spray or flame spray. Thermal spray is significantly different than conventional coating practices due to its specialized equipment and relatively slow production rates. The initial cost of thermal spray is usually high compared to painting, although when the life-cycle is taken into account, thermal spray becomes more economically attractive. Many shipyards have their own thermal spray machines and other shipyards will subcontract their thermal coating work. Thermal spray can occur in a shop or onboard the ship. There are two basic types of thermal coating machines: combustion wire and arc spray. The combustion wire type consists of combustible gasses and flame system with a wire feed controller. The combustible gasses melt the material to be sprayed onto the parts. The electric arc spray machine instead uses a power supply arc to melt the flame sprayed material (ILO, 1996).

Painting Practices and Methods

Painting is performed in nearly every area in the shipyard from the initial priming of the steel to the final paint detailing of the ship. Methods for painting vary greatly from process to process. Mixing of paint is performed both manually and mechanically and should be done in an area contained by berms, tarps, secondary containment pallets. Outdoor as well as indoor painting occurs in the shipyard. Shrouding fences, made of steel, plastic, or fabric, are frequently used to help contain paint overspray by blocking the wind and catching paint particles (NSRP, 1996).

Hull painting occurs on both repair ships and new construction ships. Hull surface preparation and painting on repair ships is normally performed when the ship is fully drydocked (i.e., graving-dock or floating drydock). For new construction, the hull is prepared and painted at a building position using one of the techniques discussed in the previous sections. Paint systems are sprayed onto the hull using airless sprayers and high reach equipment such as man-lifts, scissor lifts, or portable scaffolding (ILO, 1996).

The superstructure of the ship consists of the exposed decks, deck houses, and structures above the main deck. In many cases, scaffolding is used onboard the ship to reach antennas, houses, and other superstructures. Shrouding is usually put into place if it is likely that paint or blast material will fall into adjacent waters. On repair ships, the ship's superstructure is painted mostly while berthed. The painters access the superstructures with existing scaffolding, ladders, and various lifting equipment that was used during surface preparation. The shrouding system (if applicable) that was used for blast containment will stay in place to help contain any paint overspray (ILO, 1996).

Tanks and compartments onboard ships must be coated and re-coated to maintain the longevity of the ship. Re-coating of repair ship tanks requires a large amount of surface preparation prior to painting. The majority of the tanks are at the bottom of the ship (e.g., ballast tanks, bilges, fuel, etc.). The tanks are prepared for paint by using solvents and detergents to remove grease and oil build-up. The associated waste-water developed during tank cleaning must be properly treated and disposed of. After the tanks are dried, they are blasted with a mineral slag. Once the surface is blasted and the grit is removed, painting can begin. Adequate ventilation and respirators are a strict requirement for all tank and compartment surface preparation and painting (ILO, 1996).

Painting is also carried out after the assembly of hull blocks. Once the blocks leave the assembly area, they are frequently transported to a blast area where the entire block is prepared for paint. At this point, the block is usually blasted back down to bare metal (i.e., the construction primer is removed). However, many shipyards are now moving towards implementing a preconstruction primer that does not need to be removed. The most frequent method for block surface preparation is air nozzle blasting. The paint system is applied by painters generally using airless spray equipment on access platforms. Once the block's coating system has been applied, the block is transported to the on-block stage where outfitting materials are installed (ILO, 1996).

Many parts need to have a coating system applied prior to installation. For example, piping spools, vent ducting, foundations, and doors are painted before they are installed on-block. Some small parts painting occurs in the various shops while others are painted in a standard location operated by the paint department (ILO, 1996). Indoor painting of this type usually occurs in a spray booth. Spray booths capture overspray, control the introduction of contaminants to the workplace environment, and reduce the likelihood of explosions and fires. Paint booths are categorized by the method used for collecting the overspray (EPA, 1995).

The two primary types of paint booths are dry filter and water wash booths. Dry filter booths use filter media (usually paper or cloth filters) to screen out the paint solids by pulling prefiltered air through the booth, past the spraying operation, and through the filter media. Water wash booths use a "water curtain" to capture paint overspray by pulling air containing entrained paint overspray through a circulated water stream which "scrubs" the overspray from the air. Water is periodically added to the paint booth reservoir to compensate for evaporative losses, and chemicals are periodically added to improve paint sludge formation. The sump is periodically discharged, usually during general system cleaning or maintenance (EPA, 1995).

III.A.11. Fiberglass Reinforced Construction Operations

Many of the medium and small shipyards manufacture and repair fiberglass ships and boats or construct fiberglass parts for steel ships. The process involves combining polymerizing resin with fiberglass reinforcing material. The resin is polymerized with a catalyst or curing agent. Once cured, the hard resin cannot be softened or reshaped and is stronger than composite plastics without the reinforcing. Fiberglass material consists of a woven mat of glass-like fibers. The fiberglass content of the reinforced product ranges from 25 to 60 percent.

A number of different processes are used, but the mold-based process is the most common for this industry. Mold-based fiberglass reinforced construction typically involves either the hand application or spray application of fiberglass reinforcing. In the hand application method, the reinforcing material is manually applied to a mold wetted with catalyzed resin mix or gelcoat and then sprayed or brushed with more resin or gelcoat. In the sprayup method, catalyzed resin and fiberglass reinforcement are mechanically sprayed onto the mold surface.

Molds are used to give structure and support to the shape of the structure being built. Most molds are made of wood with a plastic finish. Typical resins used include: polyesters, epoxies, polyamides, and phenolics. The type of resin to be used in a particular process depends on the specific properties required for the end product. The resin is supplied in liquid form and may contain a solvent. Resin preparation involves mixing with solvents, catalysts, pigments, and other additives. Solvents are typically acetone, methanol, methyl ethyl ketone, and styrene. Catalysts are typically amines, anydrides, aldehyde condensation products, and Lewis acid products. Gelcoat is a pigmented polyester resin or a polyester resin-based paint containing approximately 35 percent styrene that is applied to the mold or surface with an air atomizer or airless spray gun. A catalyst is injected into the resin in a separate line or by hand mixing in order to thermoset the polyester resin.

III.B. Raw Material Inputs and Pollutant Outputs

Raw material inputs to the shipbuilding and repair industry are primarily steel and other metals, paints and solvents, blasting abrasives, and machine and cutting oils. In addition, a wide variety of chemicals are used for surface preparation and finishing such as solvent degreasers, acid and alkaline cleaners, and cyanide and metal bearing plating solutions. Pollutants and wastes generated typically include VOCs, particulates, waste solvents, oils and resins, metal bearing sludges and wastewater, waste paint, waste paint chips, and spent abrasives. The major shipyard activities that generate wastes and pollutant outputs are discussed below and are summarized in Table 3.

III.B.1. Surface Preparation

The materials used and wastes generated during surface preparation depend on the specific methods used. The surface preparation method is chosen based on the condition of the metal surface (e.g., coated with paint, rust, scale, dirt, grease, etc.), the type of coating to be applied, the size, shape, and location of the surface, and the type of metal. Material inputs used for preparing surfaces include: abrasive materials such as steel shot or grit, garnet, and copper or coal slag; and cleaning water, detergents, and chemical paint strippers (e.g., methylene chloride-based solutions, caustic solutions, and solvents). In the case of hydroblasting, only water and occasionally rust inhibitor are required (NSRP, 1996).

Air Emissions

Air emissions from surface preparation operations include particulate emissions of blasting abrasives, and paint chips. Particulates emissions can also contain toxic metals which are a concern both in the immediate area surrounding the work and if they are blown off-site or into surrounding surface waters. Particulate emissions are typically controlled by preparing surfaces indoors when possible or by surrounding the work area with shrouding fences made of steel, plastic, or fabric. Other air emissions that could potentially arise during surface preparation operations are VOCs and hazardous air pollutants (HAPs) arising from the use of solvent cleaners, paint strippers, and degreasers.

Residual Wastes

The primary residual waste generated is a mixture of paint chips and used abrasives. Paint chips containing lead or antifouling agents may be hazardous, but often in practice the concentration of toxic compounds is reduced due to the presence of considerable amounts of spent blasting medium. The resulting mixed waste may be nonhazardous (Kura, 1996). Waste sludge containing paint chips and surface contaminants may also be generated in the case of hydroblasting or wet abrasive blasting. Blasting abrasives and paint chips that collect in tank vessels, ship decks, or drydocks should be thoroughly cleaned up and collected after work is completed or before the drydock is flooded or submerged. Particular attention should be paid to the cleanup of paint chips containing the antifouling tributyl-tin (TBT) compounds which have been shown to be highly toxic to oysters and other marine life (Levy, 1996).

Wastewater

Significant quantities of wastewater can be generated when cleaning ship cargo tanks, ballast tanks, and bilges prior to surface preparation and painting. Such wastewater is often contaminated with cleaning solvents, and oil and fuel from bilges and cargo tanks. Wastewater contaminated with paint chips and surface contaminants is generated when hydroblasting and wet abrasive blasting methods are used (EPA, 1991).

III.B.2. Painting

Material inputs for painting are primarily paints and solvents. Solvents are used in the paints to carry the pigment and binder to the surface, and for cleaning the painting equipment. VOCs and HAPs from painting solvents are one of the most important sources of pollutant outputs for the industry. Paints also may contain toxic pigments such as chromium, titanium dioxide, lead, copper, and tributyl-tin compounds. Water is also used for equipment cleaning when water-based paints are used.

Air Emissions

Painting can produce significant emissions of VOCs and HAPs when the solvents in the paint volatilize as the paint dries. Other sources of VOCs and HAPs may arise when solvents are used to clean painting equipment such as spray guns, brushes, containers, and rags. Sprayed paint that does not reach the surface being coated, or overspray, is another source of painting air emissions. The solvents in the overspray rapidly volatilize and the remaining dry paint particles can drift off-site or into nearby surface waters.

Residual Wastes

Solid wastes associated with painting are believed to be the largest category of hazardous waste produced in shipyards (Kura, 1996). Typical wastes associated with painting include leftover paint, waste paint containers, spent equipment, rags and other materials contaminated with paint, spent solvents, still bottoms from recycled cleaning solvents, and sludges from the sumps of water wash paint spray booths. Wastes associated with antifouling bottom paints are sometimes collected separately from the typically less toxic topside and interior paints. Antifouling paints contain toxic metal or organometallic biocides such as cuprous oxide, lead oxide, and tributyl-tin compounds. (Kura, 1996)

Wastewater

Wastewater contaminated with paints and solvents may be generated during equipment cleaning operations; however, water is typically only used in cleaning water-based paints. Wastewater is also generated when water curtains (water wash spray booths) are used during painting. Wastewater from painting water curtains commonly contains organic pollutants as well as certain metals. The wastewater can be treated at the source using filtration, activated carbon adsorption, or centrifugation and then reused instead of being discharged (EPA, 1995).

III.B.3. Metal Plating and Surface Finishing

Material inputs for metal plating and finishing include the solutions of plating metals such as chromium, aluminum, brass, bronze, cadmium, copper, iron, lead, nickel, zinc, gold, platinum, and silver. In addition, cyanide solutions, solvents, rinse water, and rust inhibitors are used. Many of the wastes generated from metal plating and surface finishing operations are considered hazardous resulting from their toxicity. Thorough descriptions of these processes and their associated wastes are contained in the *Fabricated Metal Products Industry Sector Notebook*.

Air Emissions

Air emissions arise from metal mists, fumes, and gas bubbles from the surface of the liquid baths and the volatilization of solvents used to clean surfaces prior to plating or surface finishing.

Residual Wastes

Solid wastes include wastewater treatment sludges, still bottoms, spent metal plating solutions, spent cyanide solutions, and residues from tank cleaning. Often, the solid waste generated contains significant concentrations of toxic metals, cyanides, acids, and alkalies.

Wastewater

Wastewaters are primarily rinse waters, quench water, and waste tank cleaning water contaminated with metals, cyanides, acids, alkalies, organics, and solvents. Wastewaters are typically either sent off-site for treatment or disposal or are treated onsite by neutralization and conventional hydroxide precipitation prior to discharging either to a POTW or surface waters under an NPDES permit.

III.B.4. Fiberglass Reinforced Construction

Material inputs for fiberglassing operations include fiberglass, mold or reinforcing materials (wood and plastic), resins, solvents, and curing catalysts. Unsaturated polyester resins, such as orthophthalic polyester, isophthalic polyester, and bisphenol polyester are the most commonly used resins. Other resins include epoxies, polyamides and phenolic compounds. Resins typically are not hazardous; however, the solvent in which the resin is dissolved may be hazardous. In addition, some catalysts may be hazardous. Catalysts include amines (e.g., diethylenetriamine and triethylenetetramone), anhydrides, aldehyde condensation products, and Lewis acid catalysts.

Typical hazardous wastes include containers contaminated with residual chemicals, wash-down wastewater, spent cleaning solvents from equipment cleanup, scrap solvated resin left over in mix tanks, diluted resin and partially cured resin. For a detailed description of fiberglassing operations and associated wastes, refer to EPA's *Pollution Prevention Guide for the Fiberglass-Reinforced and Composite Plastics Industry, October 1991.*

Air Emissions

Organic vapors consisting of VOCs are emitted from fresh resin surfaces during the fabrication process and from the use of solvents for cleanup. The polyester resins used in gelcoating operations have a styrene content of approximately 35 percent. Emissions of styrene and other solvent VOCs during spraying, mixing, brushing, and curing can be significant. In addition, emissions of solvent vapors arise when acetone and methylene chloride are used to clean fiber glassing equipment (Kura, 1996).

Residual Wastes

Residual wastes generated from fiberglass operations include, gelcoat and resin overspray, unused resins that have exceeded their shelf life, fiberglass boxes, gelcoat drums, waste solvents, and cleanup rags (Kura, 1996).

III.B.5. Machining and Metalworking

Machining and metal working operations such as cutting, pressing, boring, milling, and grinding, typically involve the use of a high speed cutting tool. Friction at the cutting edge of the blade creates heat that could permanently deform the metal being machined or the cutting tool. Coolants, such as cutting oils and lube oils are, therefore, supplied to the leading edge of the tool to remove excessive heat (Kura, 1996). Solvents are frequently used to clean parts and tools prior to and after machining.

Air Emissions

Fugitive air emissions arise from the use of solvents for cleaning and degreasing.

Residual Wastes

Waste cutting oils, lube oils, and degreasing solvents are the major residual wastes generated. Metal shavings and chips are also generated. Typically these are separated from coolants, if necessary, and recycled along with scrap metal (Kura, 1996).

Wastewater

Wastewaters containing cleaning solvents and emulsified lubricants, coolants, and cutting oils may produced if parts are cleaned or rinsed with water. In addition, some modern lubricating oils and grease are being formulated with limited or no mineral oil content. These lubricants are known as high water content fluids. When spent they can result in wastewater comprised of a maximum of 15 percent mineral oil emulsified in water (Water Environment Federation, 1994).

III.B.6. Solvent Cleaning and Degreasing

The type of solvent used in parts and surface cleaning and degreasing depends on the type of contaminants to be removed, degree of cleaning needed, properties of the surfaces to be cleaned, and properties of the various solvents (stability, toxicity, flammability, and cost). Both halogenated and nonhalogenated solvents are used and mixtures of different solvents are common. Typical cleaning and degreasing solvents include mineral spirits, aromatic hydrocarbons (e.g., xylenes, toluene, etc.), aliphatic hydrocarbons, ketones, esters, alcohols, glycol ethers, phenols, turpentine, and various halogenated solvents (e.g., trichloroethylene, 1,1,1-trichloroethane, perchloroethylene, etc.).

Air Emissions

Solvent vapors comprised of VOCs and HAPs are a significant pollutant output of cleaning and degreasing operations. Fugitive emissions arise from vapor degreasers, solvent tanks and containers, solvent stills, solvent soaked rags, and residual solvents on parts and surfaces.

Residual Wastes

Residual wastes may include contaminated or spent solvents, solvents that have become contaminated or deteriorated due to improper storage or handling, solvent residues and sludges from tank bottoms and still bottoms, solvent contaminated rags and filter cartridges, and solvent contaminated soil from solvent spills.

Wastewater

Wastewater containing solvents are generated when cleaning or rinsing parts or surfaces, and when cleaning equipment, tanks, and process lines with water. Wastewater contaminated with solvents is also generated when water from diphase parts cleaning operations is replaced.

Table 3: Material Inputs and Potential Pollutant Outputs for the Shipbuilding and Repair Industry

Industrial Process	Material Inputs	Air Emissions	Wastewater	Residual Wastes
Surface Preparation	Abrasives (steel shot, lead shot, steel grit, garnet, copper slag, and coal slag), detergents, solvent paint strippers and cleaners, and caustic solutions.	Particulates (metal, paint, and abrasives) and VOCs from solvent cleaners and paint strippers.	Wastewater contaminated with paint chips, cleaning and paint stripping solvents, surface contaminants, and oil residues from bilges and cargo tanks.	Paint chips (potentially containing metals, tributyl-tin), spent abrasives, surface contaminants, and cargo tank residues.
Metal Plating and Surface Finishing	Plating metals, cyanide solutions, cleaning solvents, rinse water, acid and caustic solutions and rust inhibitors.	Metal mists and fumes, and VOCs from solvents.	Rinse and quench water contaminated with metals, cyanides, acids, alkalies, organics, and solvents.	Sludge from wastewater treatment, spent plating solutions and cyanide solutions, bath cleaning residues.
Painting	Paints, solvents, and water.	VOCs from paint solvents and equipment cleaning solvents, and overspray.	Waste equipment cleaning water and water wash spray paint booth sump water contaminated with paints and solvents.	Leftover paint and solvents, waste paint and solvent containers, spent paint booth filters, and spent equipment.
Fiberglass Reinforced Construction	Fiberglass, resin, solvents, curing catalysts, and wood and plastic reinforcing materials.	VOC emissions released during construction operations and curing (e.g., styrene) and during cleaning with solvents (e.g., acetone and methylene chloride).	Little or no wastewater generated.	Waste fiberglass, gelcoat, resin, unused resin that has exceeded its shelf life, spent solvents, and used containers.
Machining and Metal Working	Cutting oils, lube oils, and solvents.	VOC emissions from the use of cleaning and degreasing solvents.	Wastewater containing solvents, emulsified lubricating and cutting oils and coolants.	Waste cutting oils, lube oils, and metal chips and shavings.

Sources: Kura, Bhaskar, *Typical Waste Streams in a Shipbuilding Facility*, and U.S. EPA, Office of Research and Development, *Guides to Pollution Prevention, The Marine Maintenance and Repair Industry.*

III.C. Management of Chemicals in Wastestream

The Pollution Prevention Act of 1990 (PPA) requires facilities to report information about the management of Toxics Release Inventory (TRI) chemicals in waste and efforts made to eliminate or reduce those quantities. These data have been collected annually in Section 8 of the TRI reporting Form R beginning with the 1991 reporting year. The data summarized below cover the years 1993-1996 and is meant to provide a basic understanding of the quantities of waste handled by the industry, the methods typically used to manage this waste, and recent trends in these methods. TRI waste management data can be used to assess trends in source reduction within individual industries and facilities, and for specific TRI chemicals. This information could then be used as a tool in identifying opportunities for pollution prevention compliance assistance activities.

While the quantities reported for 1994 and 1995 are estimates of quantities already managed, the quantities listed by facilities for 1996 and 1997 are projections only. The PPA requires these projections to encourage facilities to consider future waste generation and source reduction of those quantities as well as movement up the waste management hierarchy. Future-year estimates are not commitments that facilities reporting under TRI are required to meet.

Table 4 shows that the TRI reporting shipyards managed about six million pounds of production related wastes (total quantity of TRI chemicals in the waste from routine production operations in column B) in 1995. From the yearly data presented in column B, the total quantities of production related TRI wastes increased between 1994 and 1995. This is likely in part because the number of chemicals on the TRI list nearly doubled between those years. Production related wastes were projected to decrease between 1996 and 1997.

Values in column C are intended to reveal the percentage of production related wastes that are either transferred off-site or released to the environment. Column C is calculated by dividing the total TRI transfers and releases (reported in Sections 5 and 6 of the TRI Form R) by the total quantity of production-related waste (reported in Section 8). Since the TRI releases and transfers from Sections 5 and 6 of the TRI Form R should all be accounted for in Section 8 of Form R, the percentages shown in column C should always be less than 100 percent. For the shipbuilding and repair industry, the TRI data shows that erroneous reporting in Form R by a number of shipyards in both 1994 and 1995 has undermined the data resulting in unusually high values in Column C.

If it is assumed that the proportions of production related wastes managed onsite and off-site using the methods shown in columns D-I were reported correctly, the data would indicate that about 60 percent of the TRI wastes are managed off-site through recycling, energy recovery, or treatment (columns G, H, and I, respectively) in 1995. Only about one percent of the wastes were managed on-site. The remaining portion of TRI chemical wastes (about 44 percent), shown in column J, were released to the environment through direct discharges to air, land, water, and underground injection, or was disposed off-site.

Table 4: Source Reduction and Recycling Activity for Shipyards (SIC 3731) as Reported within TRI

A	B	C	On-Site			Off-Site			J
			D	E	F	G	H	I	
Year	Quantity of Production-Related Waste (10^6 lbs.)[a]	% Released and Transferred[b]	% Recycled	% Energy Recovery	% Treated	% Recycled	% Energy Recovery	% Treated	% Released and Disposed[c] Off-site
1994	5.32	113%	1.1%	0.0%	0.7%	36.1%	12.6%	3.6%	46%
1995	6.45	100%	0.5%	0.0%	0.7%	45.7%	11.2%	2.2%	44%
1996	5.62	---	0.7%	0.0%	0.7%	40.1%	11.3%	3.1%	44%
1997	5.59	---	0.8%	0.0%	0.7%	40.6%	11.1%	3.1%	44%

Source: *1995 Toxics Release Inventory Database.*

[a] Within this industry sector, non-production related waste < 1% of production related wastes for 1995.

[b] Total TRI transfers and releases as reported in Section 5 and 6 of Form R as a percentage of production related wastes.

[c] Percentage of production related waste released to the environment and transferred off-site for disposal.

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IV. CHEMICAL RELEASE AND TRANSFER PROFILE

This section is designed to provide background information on the pollutant releases that are reported by this industry. The best source of comparative pollutant release information is the Toxic Release Inventory (TRI). Pursuant to the Emergency Planning and Community Right-to-Know Act, TRI includes self-reported facility release and transfer data for over 600 toxic chemicals. Facilities within SIC Codes 20 through 39 (manufacturing industries) that have more than 10 employees, and that are above weight-based reporting thresholds are required to report TRI on-site releases and off-site transfers. The information presented within the sector notebooks is derived from the most recently available (1995) TRI reporting year (which includes over 600 chemicals), and focuses primarily on the on-site releases reported by each sector. Because TRI requires consistent reporting regardless of sector, it is an excellent tool for drawing comparisons across industries. TRI data provide the type, amount and media receptor of each chemical released or transferred.

Although this sector notebook does not present historical information regarding TRI chemical releases over time, please note that in general, toxic chemical releases have been declining. In fact, according to the 1995 Toxic Release Inventory Public Data Release, reported onsite releases of toxic chemicals to the environment decreased by 5 percent (85.4 million pounds) between 1994 and 1995 (not including chemicals added and removed from the TRI chemical list during this period). Reported releases dropped by 46 percent between 1988 and 1995. Reported transfers of TRI chemicals to off-site locations increased by 0.4 percent (11.6 million pounds) between 1994 and 1995. More detailed information can be obtained from EPA's annual Toxics Release Inventory Public Data Release book (which is available through the EPCRA Hotline at 800-535-0202), or directly from the Toxic Release Inventory System database (for user support call 202-260-1531).

Wherever possible, the sector notebooks present TRI data as the primary indicator of chemical release within each industrial category. TRI data provide the type, amount and media receptor of each chemical released or transferred. When other sources of pollutant release data have been obtained, these data have been included to augment the TRI information.

TRI Data Limitations

Certain limitations exist regarding TRI data. Release and transfer reporting are limited to the approximately 600 chemicals on the TRI list. Therefore, a large portion of the emissions from industrial facilities are not captured by TRI. Within some sectors, (e.g. dry cleaning, printing and transportation equipment cleaning) the majority of facilities are not subject to TRI reporting because they are not considered manufacturing industries, or because they are below TRI reporting thresholds. For these sectors, release information from other sources has been included. In addition, many facilities report more than one SIC code reflecting the multiple operations carried out onsite. Therefore, reported releases and transfers may or may not all be associated with the industrial operations described in this notebook.

The reader should also be aware that TRI "pounds released" data presented within the notebooks is not equivalent to a "risk" ranking for each industry. Weighting each pound of release equally does not factor in the relative toxicity of each chemical that is released. The Agency is in the process of developing an approach to assign toxicological weightings to each chemical released so that one can differentiate between pollutants with significant differences in toxicity. As a preliminary indicator of the environmental impact of the industry's most commonly released chemicals, the notebook briefly summarizes the toxicological properties of the top five chemicals (by weight) reported by each industry.

Definitions Associated With Section IV Data Tables

General Definitions

SIC Code -- the Standard Industrial Classification (SIC) is a statistical classification standard used for all establishment-based Federal economic statistics. The SIC codes facilitate comparisons between facility and industry data.

TRI Facilities -- are manufacturing facilities that have 10 or more full-time employees and are above established chemical throughput thresholds. Manufacturing facilities are defined as facilities in Standard Industrial Classification primary codes 20-39. Facilities must submit estimates for all chemicals that are on the EPA's defined list and are above throughput thresholds.

Data Table Column Heading Definitions

The following definitions are based upon standard definitions developed by EPA's Toxic Release Inventory Program. The categories below represent the possible pollutant destinations that can be reported.

RELEASES -- are an on-site discharge of a toxic chemical to the environment. This includes emissions to the air, discharges to bodies of water, releases at the facility to land, as well as contained disposal into underground injection wells.

Releases to Air (Point and Fugitive Air Emissions) -- Include all air emissions from industry activity. Point emissions occur through confined air streams as found in stacks, vents, ducts, or pipes. Fugitive emissions include equipment leaks, evaporative losses from surface impoundments and spills, and releases from building ventilation systems.

Releases to Water (Surface Water Discharges) -- encompass any releases going directly to streams, rivers, lakes, oceans, or other bodies of water. Releases due to runoff, including storm water runoff, are also reportable to TRI.

Releases to Land -- occur within the boundaries of the reporting facility. Releases to land include disposal of toxic chemicals in landfills, land treatment/application farming, surface impoundments, and other land disposal methods (such as spills, leaks, or waste piles).

Underground Injection -- is a contained release of a fluid into a subsurface well for the purpose of waste disposal. Wastes containing TRI chemicals are injected into either Class I wells or Class V wells. Class I wells are used to inject liquid hazardous wastes or dispose of industrial and municipal wastewaters beneath the lowermost underground source of drinking water. Class V wells are generally used to inject non-hazardous fluid into or above an underground source of drinking water. TRI reporting does not currently distinguish between these two types of wells, although there are important differences in environmental impact between these two methods of injection.

TRANSFERS -- is a transfer of toxic chemicals in wastes to a facility that is geographically or physically separate from the facility reporting under TRI. Chemicals reported to TRI as transferred are sent to off-site facilities for the purpose of recycling, energy recovery, treatment, or disposal. The quantities reported represent a movement of the chemical away from the reporting facility. Except for off-site transfers for disposal, the reported quantities do not necessarily represent entry of the chemical into the environment.

Transfers to POTWs -- are wastewater transferred through pipes or sewers to a publicly owned treatments works (POTW). Treatment or removal of a chemical from the wastewater depend on the nature of the chemical, as well as the treatment methods present at the POTW. Not all TRI chemicals can be treated or removed by a POTW. Some chemicals, such as metals, may be removed, but are not destroyed and may be disposed of in landfills or discharged to receiving waters.

Transfers to Recycling -- are sent off-site for the purposes of regenerating or recovery by a variety of recycling methods, including solvent recovery, metals recovery, and acid regeneration. Once these chemicals have been recycled, they may be returned to the originating facility or sold commercially.

Transfers to Energy Recovery -- are wastes combusted off-site in industrial furnaces for energy recovery. Treatment of a chemical by incineration is not considered to be energy recovery.

Transfers to Treatment -- are wastes moved off-site to be treated through a variety of methods, including neutralization, incineration, biological destruction, or physical separation. In some cases, the chemicals are not destroyed but prepared for further waste management.

Transfers to Disposal -- are wastes taken to another facility for disposal generally as a release to land or as an injection underground.

IV.A. EPA Toxic Release Inventory for the Shipbuilding and Repair Industry

This section summarizes TRI data of shipbuilding and repair facilities reporting operations under SIC code 3731. Of the 598 shipbuilding and repair establishments reported by the *1992 Census of Manufacturers*, 43 reported to TRI in 1995.

According to the 1995 TRI data, the reporting shipbuilding and repair facilities released and transferred 39 different TRI chemicals for a total of approximately 6.5 million pounds of pollutants during calendar year 1995. These releases and transfers are dominated by volatile organic compounds (VOCs) and metal-bearing wastes which make up 52 percent and 48 percent, respectively, of total releases and transfers.

Transfers of TRI chemicals account for 58 percent of shipbuilding and repair facilities' total TRI-reportable chemicals (3.5 million pounds) while *releases* make up 42 percent (2.5 million pounds).

Releases

Releases to the air, water, and land accounted for 37 percent (2.4 million pounds) of shipyard's total reportable chemicals (see Table 5). Of these releases, over 98 percent are released to the air from fugitive (75 percent) or point (24 percent) sources. VOCs accounted for about 86 percent of the shipbuilding and repair industry's reported TRI releases. The remainder of the releases were primarily metal-bearing wastes. Xylenes, n-butyl alcohol, toluene, methyl ethyl ketone, and methyl isobutyl ketone account for about 65 percent of the industry's reported releases. These organic compounds are typically found in solvents which are used extensively by the industry in thinning paints and for cleaning and degreasing metal parts and equipment. Styrene, reported by eight facilities, accounts for about 4 percent of the industry's releases. Styrene comprises a substantial portion of the resin mixtures and gelcoat used in fiberglass reinforced construction. Finally, copper-, zinc-, and nickel-bearing wastes account for about 14 percent of the industry's reported releases. They are released primarily as fugitive emissions during metal plating operations and as overspray in painting operations and can also be released as fugitive dust emissions during blasting operations.

Transfers

Off-site transfers of TRI chemicals account for 63 percent of shipyard's total TRI reportable chemicals (4.1 million pounds). Over 72 percent of the shipbuilding and repair industry's TRI transfers are sent off-site for recycling followed by about 18 percent sent off-site for energy recovery (see Table 6). Metals accounted for about 67 percent of the industry's reported transfers. VOCs made up almost all of the remainder of transferred TRI chemicals.

About 60 percent of the metals transferred were recycled, and almost all of the remainder were either treated or disposed off-site. Copper, zinc, and chromium made up about 70 percent of the metals transferred off-site. Most of these are in the form of scrap metal, metal shavings and dust, spent plating baths, wastewater treatment sludges, and in paint chips and spent blasting abrasives. About 53 percent of the VOCs transferred were sent off-site for energy recovery with the remainder primarily going to off-site recycling and treatment. Waste solvents containing xylene, n-butyl alcohol, methanol, carbon tetrachloride, and methyl ethyl ketone make up almost 70 percent of the VOCs transferred off-site. These wastes were primarily transferred for energy recovery.

Table 5: 1995 TRI Releases for Shipbuilding and Repair Facilities (SIC 3731), by Number of Facilities Reporting (Releases reported in pounds/year)

CHEMICAL NAME	# REPORTING CHEMICAL	FUGITIVE AIR	POINT AIR	WATER DISCHARGES	UNDERGROUND INJECTION	LAND DISPOSAL	TOTAL RELEASES	AVG. RELEASES PER FACILITY
XYLENE (MIXED ISOMERS)	30	853,863	99,379	9,292	0	0	962,534	32,084
N-BUTYL ALCOHOL	15	278,218	60,802	2,691	0	0	341,711	22,781
COPPER COMPOUNDS	8	91,410	0	3,968	0	250	95,628	11,954
STYRENE	8	7,209	87,069	250	0	0	94,528	11,816
ZINC COMPOUNDS	6	75,417	27,278	2,920	0	250	105,865	17,644
ZINC (FUME OR DUST)	5	81,088	0	8,260	0	0	89,348	17,870
CHROMIUM COMPOUNDS	4	631	7,250	256	0	0	8,137	2,034
METHYL ETHYL KETONE	4	77,928	0	0	0	0	77,928	19,482
TOLUENE	4	25,806	30,239	0	0	0	56,045	14,011
PROPYLENE	4	755	250	0	0	0	1,005	251
NICKEL	4	20	0	16	0	0	36	9
COPPER	4	20	0	261	0	0	281	70
NICKEL COMPOUNDS	3	30,592	0	294	0	250	31,136	10,379
METHANOL	3	2,172	13,222	250	0	0	15,644	5,215
1,2,4-TRIMETHYLBENZENE	3	42,399	18,100	0	0	0	60,499	20,166
METHYL ISOBUTYL KETONE	3	55,979	0	0	0	0	55,979	18,660
MANGANESE	3	3,884	0	0	0	0	3,884	1,295
CHROMIUM	3	260	0	10	0	0	270	90
LEAD COMPOUNDS	2	546	0	261	0	250	1,057	529
MANGANESE COMPOUNDS	2	620	0	250	0	250	1,120	560
FREON 113	2	14,672	0	0	0	0	14,672	7,336
ETHYLBENZENE	2	16,993	1,159	0	0	0	18,152	9,076
ETHYLENE GLYCOL	2	256	26	0	0	0	282	141
METHYL TERT-BUTYL ETHER	2	425	99,555	250	0	0	100,230	50,115
BARIUM COMPOUNDS	1	3,600	0	0	0	0	3,600	3,600
CERTAIN GLYCOL ETHERS	1	22,000	5,000	0	0	0	27,000	27,000
BENZENE	1	426	84,999	0	0	0	85,425	85,425
1,1,1-TRICHLOROETHANE	1	67,000	0	0	0	0	67,000	67,000
DICHLOROMETHANE	1	8,400	0	0	0	0	8,400	8,400
DICHLOROTETRAFLUOROETHANE (CFC-114)	1	250	0	0	0	0	250	250
DICYCLOPENTADIENE	1	18	6,072	0	0	0	6,090	6,090
TRICHLOROETHYLENE	1	15,600	0	0	0	0	15,600	15,600
CUMENE	1	7	2,611	0	0	0	2,618	2,618
1,2-DICHLOROETHANE	1	31	2,634	0	0	0	2,665	2,665
ACRYLONITRILE	1	250	5	250	0	0	505	505
N-HEXANE	1	57	11,608	0	0	0	11,665	11,665
2-ETHOXYETHANOL	1	0	12,975	0	0	0	12,975	12,975
CYCLOHEXANE	1	16	3,864	0	0	0	3,880	3,880
LEAD	1	0	0	0	0	0	0	0
	43	1,778,818	574,097	29,479	0	1,250	2,383,644	55,434

Table 6: 1995 TRI Transfers for Shipbuilding and Repair Facilities (SIC 3731), by Number of Facilities Reporting (Transfers reported in pounds/year)

CHEMICAL NAME	# REPORTING CHEMICAL	POTW TRANSFERS	DISPOSAL TRANSFERS	RECYCLING TRANSFERS	TREATMENT TRANSFERS	ENERGY RECOVERY TRANSFERS	TOTAL TRANSFERS	AVG TRANSFER PER FACILITY
XYLENE (MIXED ISOMERS)	30	250	35	223,254	14,020	407,986	645,545	21,518
N-BUTYL ALCOHOL	15	250	255	24,500	3,620	116,929	145,554	9,704
COPPER COMPOUNDS	8	1,525	3,878	647,200	44,700	.	697,303	87,163
STYRENE	8	0	2,835	118,127	2,420	30,837	154,219	19,277
ZINC COMPOUNDS	6	1,950	2,828	.	36,028	.	40,806	6,801
ZINC (FUME OR DUST)	5	14	229,950	12,240	28,382	1,837	272,423	54,485
CHROMIUM COMPOUNDS	4	261	250	647,200	2,650	.	650,361	162,590
METHYL ETHYL KETONE	4	0	.	.	.	45,705	45,705	11,426
TOLUENE	4	0	15	.	20	15,745	15,780	3,945
PROPYLENE	4	0	.	.	.	.	0	0
NICKEL	4	5	2,286	232,848	.	.	235,139	58,785
COPPER	4	5	3,678	251,005	.	.	254,688	63,672
NICKEL COMPOUNDS	3	251	.	.	7,000	.	7,251	2,417
METHANOL	3	0	5	73,286	20	2,045	75,356	25,119
1,2,4-TRIMETHYLBENZENE	3	0	.	.	.	33,883	33,883	11,294
METHYL ISOBUTYL KETONE	3	0	.	.	.	3,615	3,615	1,205
MANGANESE	3	0	.	431,480	.	.	431,480	143,827
CHROMIUM	3	5	1,000	126,008	.	.	127,013	42,338
LEAD COMPOUNDS	2	251	900	1,064	3,244	.	5,459	2,730
MANGANESE COMPOUNDS	2	0	.	.	.	.	0	0
FREON 113	2	0	.	55,438	.	.	55,438	27,719
ETHYLBENZENE	2	0	15	.	20	7,214	7,249	3,625
ETHYLENE GLYCOL	2	250	5	.	20	.	275	138
METHYL TERT-BUTYL ETHER	2	0	15	32,736	20	.	32,771	16,386
BARIUM COMPOUNDS	1	0	.	.	100	.	100	100
CERTAIN GLYCOL ETHERS	1	0	.	.	.	22,000	22,000	22,000
BENZENE	1	0	15	.	20	.	35	35
1,1,1-TRICHLOROETHANE	1	250	.	.	.	.	250	250
DICHLOROMETHANE	1	0	.	.	.	21,500	21,500	21,500
DICHLOROTETRAFLUOROETHANE (CFC-114)	1	0	.	.	.	.	0	0
DICYCLOPENTADIENE	1	0	15	.	20	.	35	35
TRICHLOROETHYLENE	1	250	.	1,200	250	.	1,700	1,700
CUMENE	1	0	5	.	20	.	25	25
1,2-DICHLOROETHANE	1	0	5	.	20	.	25	25
ACRYLONITRILE	1	0	.	69,716	.	.	69,716	69,716
N-HEXANE	1	0	15	.	20	.	35	35
2-ETHOXYETHANOL	1	0	.	.	.	200	200	200
CYCLOHEXANE	1	0	5	.	20	.	25	25
LEAD	1	0	250	.	.	.	250	250
	43	5,517	248,260	2,947,302	142,634	709,496	4,053,209	94,260

The TRI database contains a detailed compilation of self-reported, facility-specific chemical releases. The top reporting facilities for the shipbuilding and repair industry are listed below in Tables 7 and 8. Facilities that have reported only the primary SIC codes covered under this notebook appear on Table 7. Table 8 contains additional facilities that have reported the SIC codes covered within this notebook, or SIC codes covered within this notebook and one or more SIC codes that are not within the scope of this notebook. Therefore, the second list may include facilities that conduct multiple operations -- some that are under the scope of this notebook, and some that are not. Currently, the facility-level data do not allow pollutant releases to be broken apart by industrial process.

Table 7:Top 10 TRI Releasing Shipbuilding and Repair Facilities Reporting Only SIC 3731 [1]

Rank	Facility	Total TRI Releases in Pounds
1	Newport News Shipbuilding - Newport News, VA	309,000
2	Atlantic Marine Inc. - Mobile, AL	268,670
3	Platzer Shipyard Inc. - Houston, TX	268,442
4	Norshipco - Norfolk, VA	229,000
5	Bethlehem Steel Corp.-Port Arthur, TX	133,020
6	Cascade General, Inc. - Portland, OR	116,929
7	Trinity Industries-Gulfport, MS	90,983
8	Todd Pacific Shipyards - Seattle, WA	85,081
9	Avondale Industries Inc. - Avondale, LA	84,650
10	Jeffboat - Jeffersonville, IN	82,108

Source: *US Toxics Release Inventory Database, 1995.*

[1] Being included on this list does not mean that the release is associated with non-compliance with environmental laws.

Table 8: Top 10 TRI Releasing Facilities Reporting Only SIC 3731 or SIC 3731 and Other SIC codes [2]			
Rank	**SIC Codes Reported in TRI**	**Facility**	**Total TRI Releases in Pounds**
1	3731, 3441, 3443	Ingalls Shipbuilding Inc.-Pascagoula, MS	723,560
2	3731	Newport News Shipbuilding - Newport News, VA	309,000
3	3731	Atlantic Marine Inc. - Mobile, AL	268,670
4	3731	Platzer Shipyard Inc. - Houston, TX	268,442
5	3731	Norshipco - Norfolk, VA	229,000
6	3731	Bethlehem Steel Corp.-Port Arthur, TX	133,020
7	3731	Cascade General, Inc. - Portland, OR	116,929
8	3731	Trinity Industries-Gulfport, MS	90,983
9	3731	Todd Pacific Shipyards - Seattle, WA	85,081
10	3731	Avondale Industries Inc. - Avondale, LA	84,650

Source: *US Toxics Release Inventory Database, 1995.*

IV.B. Summary of Selected Chemicals Released

The following is a synopsis of current scientific toxicity and fate information for the top chemicals (by weight) that facilities within this sector self-reported as released to the environment based upon 1995 TRI data. Because this section is based upon self-reported release data, it does not attempt to provide information on management practices employed by the sector to reduce the release of these chemicals. Information regarding pollutant release reduction over time may be available from EPA's TRI and 33/50 programs, or directly from the industrial trade associations that are listed in Section IX of this document. Since these descriptions are cursory, please consult the sources referenced below for a more detailed description of both the chemicals described in this section, and the chemicals that appear on the full list of TRI chemicals appearing in Section IV.A.

The brief descriptions provided below were taken from the Hazardous Substances Data Bank (HSDB) and the Integrated Risk Information System (IRIS). The discussions of toxicity describe the range of possible adverse health effects that have been found to be associated with exposure to these chemicals. These adverse effects may or may not occur at the levels released to the environment. Individuals interested in a more detailed picture of the chemical concentrations associated with these adverse effects should consult

[2] Being included on this list does not mean that the release is associated with non-compliance with enviromental laws.

a toxicologist or the toxicity literature for the chemical to obtain more information. The effects listed below must be taken in context of these exposure assumptions that are more fully explained within the full chemical profiles in HSDB. For more information on TOXNET[3], contact the TOXNET help line at 1-800-231-3766.

Xylenes (Mixed Isomers) (CAS: 1330-20-7)

Sources. Xylenes are used extensively as cleaning solvents and in thinning paints.

Toxicity. Xylenes are rapidly absorbed into the body after inhalation, ingestion, or skin contact. Short-term exposure of humans to high levels of xylene can cause irritation of the skin, eyes, nose, and throat, difficulty in breathing, impaired lung function, impaired memory, and possible changes in the liver and kidneys. Both short- and long-term exposure to high concentrations can cause effects such as headaches, dizziness, confusion, and lack of muscle coordination. Reactions of xylene (see environmental fate) in the atmosphere contribute to the formation of ozone in the lower atmosphere. Ozone can affect the respiratory system, especially in sensitive individuals such as asthma or allergy sufferers.

Carcinogenicity. There is currently no evidence to suggest that this chemical is carcinogenic.

Environmental Fate. A portion of releases to land and water will quickly evaporate, although some degradation by microorganisms will occur. Xylenes are moderately mobile in soils and may leach into groundwater, where they may persist for several years. Xylenes are volatile organic chemicals. As such, xylene in the lower atmosphere will react with other atmospheric components, contributing to the formation of ground-level ozone and other air pollutants.

[3] TOXNET is a computer system run by the National Library of Medicine that includes a number of toxicological databases managed by EPA, National Cancer Institute, and the National Institute for Occupational Safety and Health. For more information on TOXNET, contact the TOXNET help line at 800-231-3766. Databases included in TOXNET are: CCRIS (Chemical Carcinogenesis Research Information System), DART (Developmental and Reproductive Toxicity Database), DBIR (Directory of Biotechnology Information Resources), EMICBACK (Environmental Mutagen Information Center Backfile), GENE-TOX (Genetic Toxicology), HSDB (Hazardous Substances Data Bank), IRIS (Integrated Risk Information System), RTECS (Registry of Toxic Effects of Chemical Substances), and TRI (Toxic Chemical Release Inventory). HSDB contains chemical-specific information on manufacturing and use, chemical and physical properties, safety and handling, toxicity and biomedical effects, pharmacology, environmental fate and exposure potential, exposure standards and regulations, monitoring and analysis methods, and additional references.

Zinc and Zinc Compounds (CAS: 7440-66-6; 20-19-9)

Sources. To protect metal from oxidizing, it is often coated with a material that will protect it from moisture and air. In the galvanizing process, steel is coated with zinc.

Toxicity. Zinc is a nutritional trace element; toxicity from ingestion is low. Severe exposure to zinc might give rise to gastritis with vomiting due to swallowing of zinc dusts. Short-term exposure to very high levels of zinc is linked to lethargy, dizziness, nausea, fever, diarrhea, and reversible pancreatic and neurological damage. Long-term zinc poisoning causes irritability, muscular stiffness and pain, loss of appetite, and nausea.

Zinc chloride fumes cause injury to mucous membranes and to the skin. Ingestion of soluble zinc salts may cause nausea, vomiting, and purging.

Carcinogenicity. There is currently no evidence to suggest that this chemical is carcinogenic.

Environmental Fate. Significant zinc contamination of soil is only seen in the vicinity of industrial point sources. Zinc is a relatively stable soft metal, though burns in air. Zinc bioconcentrates in aquatic organisms.

n-Butanol (n-Butyl Alcohol) (CAS: 71-36-3)

Sources. n-Butanol is used extensively for thinning paints and equipment cleaning.

Toxicity. Short-term exposure usually results in depression of the central nervous system, hypotension, nausea, vomiting, and diarrhea. Butanols may cause gastrointestinal hemorrhaging. Eye contact may cause burning and blurred vision. Hypotension and cardiac arrhythmias may occur. Inhaling n-butanol may cause pulmonary edema. Headache, dizziness, and giddiness may occur. Liver injury may occur but is probably rare. Dermatitis and hypoglycemia may result from exposure to this chemical. Chronic exposure may result in dry, cracked skin, and eye inflammation. Workers have exhibited systemic effects of the auditory nerve as well as vestibular injury.

Carcinogenicity. There are currently no long-term studies in humans or animals to suggest that this chemical is carcinogenic. Based on this evidence, U.S. EPA has indicated that this chemical cannot be classified as to its human carcinogenicity. There is some evidence of chromosomal abnormalities in short-term tests in bacteria and hamster cells, which may suggest potential carcinogenicity.

Environmental Fate. This chemical may volatilize from soil surface. In addition, the chemical may biodegrade from the soil, and leach to groundwater. n-Butanol released to water is expected to biodegrade and volatilize from the water surface, and is not expected to bioconcentrate in fish. People are exposed primarily from contact with products containing n-butanol.

Copper and Copper Compounds (CAS: 7440-50-8)

Sources. Copper and copper compounds are commonly used as biocides in anti-fouling paints. Many ship parts requiring anti-corrosive characteristics (e.g., piping) are fabricated or plated with copper and copper alloys.

Toxicity. Metallic copper probably has little or no toxicity, although copper salts are more toxic. Inhalation of copper oxide fumes and dust has been shown to cause metal fume fever, irritation of the upper respiratory tract, nausea, sneezing, coughing, chills, aching muscles, gastric pain, and diarrhea. However, the respiratory symptoms may be due to a non-specific reaction to the inhaled dust as a foreign body in the lung, and the gastrointestinal symptoms may be attributed to the conversion of copper to copper salts in the body.

It is unclear whether long-term copper poisoning exists in humans. Some have related certain central nervous system disorders, such as giddiness, loss of appetite, excessive perspiration, and drowsiness to copper poisoning. Long-term exposure to copper may also cause hair, skin, and teeth discoloration, apparently without other adverse effects.

People at special risk from exposure to copper include those with impaired pulmonary function, especially those with obstructive airway diseases, since the breathing of copper fumes might cause exacerbation of pre-existing symptoms due to its irritant properties.

Ecologically, copper is a trace element essential to many plants and animals. However, high levels of copper in soil can be directly toxic to certain soil microorganisms and can disrupt important microbial processes in soil, such as nitrogen and phosphorus cycling.

Carcinogenicity. There is currently no evidence to suggest that this chemical is carcinogenic.

Environmental Fate. Copper is typically found in the environment as a solid metal in soils and soil sediment in surface water. There is no evidence that biotransformation processes have a significant bearing on the fate and transport of copper in water.

Styrene (CAS: 100-42-5)

Sources. Styrene is a major constituent of fiberglass resins and gelcoats.

Toxicity. Short-term exposure may cause irritation to eyes, lungs, stomach, and skin. Problems may occur in the central nervous system as a result of serious exposure and may also occur in the peripheral nervous system. Short-term exposure from inhalation is commonly associated with "styrene sickness", which includes vomiting, loss of appetite, and a drunken feeling. Short-term exposure also irritates the respiratory tract, and is associated with asthma and pulmonary edema.

Long-term exposure in those working with styrene has been associated with impaired nervous system functions including memory, learning, and motor skills and impaired psychiatric functioning. Styrene may also cause gene mutations and birth defects. Styrene has been shown to cause liver damage.

Carcinogenicity. The International Agency for Research on Cancer notes that evidence of carcinogenicity in experimental animals indicates that styrene is a possible carcinogen in humans. However, U.S. EPA is currently reviewing the evidence for carcinogenicity of styrene, and may arrive at a different decision.

Environmental Fate and Potential for Human Exposure. If styrene is released to air, it will quickly react with hydroxyl radicals and ozone. At night, air concentrations of styrene will degrade by reacting with nitrate radicals. Styrene released to water volatilizes and biodegrades, but does not hydrolyze. In soil, styrene biodegrades and is fairly immobile in soil. Styrene has been found in drinking water, but not in 945 groundwater supplies. The chemical has been found in industrial effluents and in air surrounding industrial sources and in urban areas. The chemical has been found in some food packaged in polystyrene containers.

IV.C. Other Data Sources

The toxic chemical release data obtained from TRI captures only about seven percent of the facilities in the shipbuilding and repair industry. However, it allows for a comparison across years and industry sectors. Reported chemicals are limited to the approximately 600 TRI chemicals. A large portion of the emissions from shipbuilding and repair facilities, therefore, are not captured by TRI. The EPA Office of Air Quality Planning and Standards has compiled air pollutant emission factors for determining the total air emissions of priority pollutants (e.g., total hydrocarbons, SOx, NOx, CO, particulates, etc.) from many shipbuilding and repair sources.

The Aerometric Information Retrieval System (AIRS) contains a wide range of information related to stationary sources of air pollution, including the emissions of a number of air pollutants which may be of concern within a particular industry. With the exception of volatile organic compounds (VOCs), there is little overlap with the TRI chemicals reported above. Table 9 summarizes annual releases (from the industries for which a Sector Notebook Profile was prepared) of carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter of 10 microns or less (PM10), total particulate matter (PT), sulfur dioxide (SO_2), and volatile organic compounds (VOCs).

Table 9: Air Pollutant Releases (tons/year)						
Industry Sector	CO	NO_2	PM_{10}	PT	SO_2	VOC
Metal Mining	4,670	39,849	63,541	173,566	17,690	915
Nonmetal Mining	25,922	22,881	40,199	128,661	18,000	4,002
Lumber and Wood Production	122,061	38,042	20,456	64,650	9,401	55,983
Furniture and Fixtures	2,754	1,872	2,502	4,827	1,538	67,604
Pulp and Paper	566,883	358,675	35,030	111,210	493,313	127,809
Printing	8,755	3,542	405	1,198	1,684	103,018
Inorganic Chemicals	153,294	106,522	6,703	34,664	194,153	65,427
Organic Chemicals	112,410	187,400	14,596	16,053	176,115	180,350
Petroleum Refining	734,630	355,852	27,497	36,141	619,775	313,982
Rubber and Misc. Plastics	2,200	9,955	2,618	5,182	21,720	132,945
Stone, Clay and Concrete	105,059	340,639	192,962	662,233	308,534	34,337
Iron and Steel	1,386,461	153,607	83,938	87,939	232,347	83,882
Nonferrous Metals	214,243	31,136	10,403	24,654	253,538	11,058
Fabricated Metals	4,925	11,104	1,019	2,790	3,169	86,472
Electronics and Computers	356	1,501	224	385	741	4,866
Motor Vehicles, Bodies, Parts and Accessories	15,109	27,355	1,048	3,699	20,378	96,338
Dry Cleaning	102	184	3	27	155	7,441
Ground Transportation	128,625	550,551	2,569	5,489	8,417	104,824
Metal Casting	116,538	11,911	10,995	20,973	6,513	19,031
Pharmaceuticals	6,586	19,088	1,576	4,425	21,311	37,214
Plastic Resins and Manmade Fibers	16,388	41,771	2,218	7,546	67,546	74,138
Textiles	8,177	34,523	2,028	9,479	43,050	27,768
Power Generation	366,208	5,986,757	140,760	464,542	13,827,511	57,384
Shipbuilding and Repair	**105**	**862**	**638**	**943**	**3,051**	**3,967**

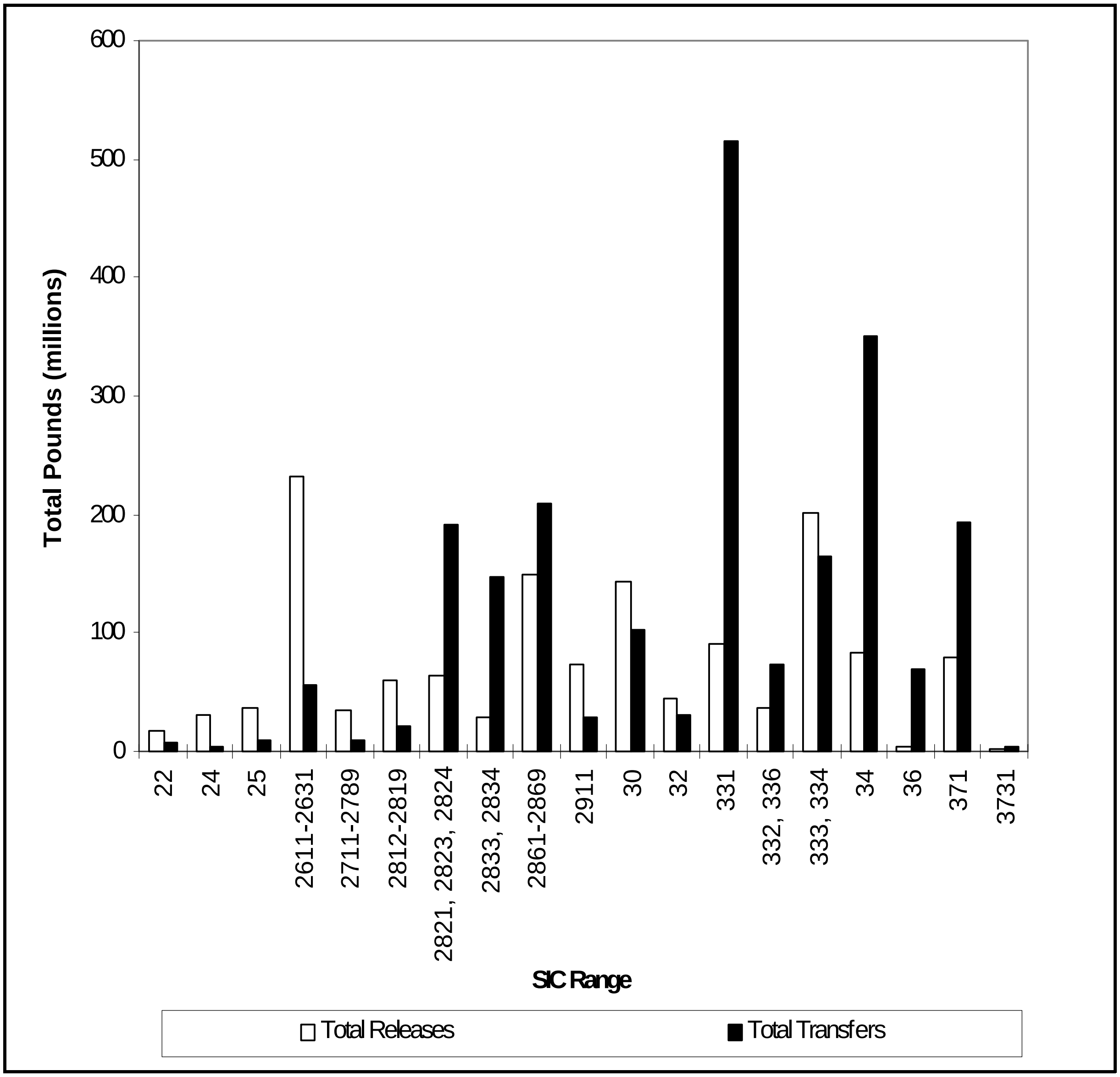
Source: U.S. EPA Office of Air and Radiation, AIRS Database, 1997.

IV.D. Comparison of Toxic Release Inventory Between Selected Industries

The following information is presented as a comparison of pollutant release and transfer data across industrial categories. It is provided to give a general sense as to the relative scale of TRI releases and transfers within each sector profiled under this project. Please note that the following figure and table do not contain releases and transfers for industrial categories that are not included in this project, and thus cannot be used to draw conclusions regarding the total release and transfer amounts that are reported to TRI. Similar information is available within the annual TRI Public Data Release Book.

Figure 10 is a graphical representation of a summary of the 1995 TRI data for the shipbuilding and repair industry and the other sectors profiled in separate notebooks. The bar graph presents the total TRI releases and total transfers on the vertical axis. The graph is based on the data shown in Table 10 and is meant to facilitate comparisons between the relative amounts of releases, transfers, and releases per facility both within and between these sectors. The reader should note, however, that differences in the proportion of facilities captured by TRI exist between industry sectors. This can be a factor of poor SIC matching and relative differences in the number of facilities reporting to TRI from the various sectors. In the case of the shipbuilding and repair industry, the 1995 TRI data presented here covers 43 facilities. These facilities listed SIC 3731 (Shipbuilding and Repair) as primary SIC codes.

Figure 6: Summary of TRI Releases and Transfers by Industry



Source: US EPA 1995 Toxics Release Inventory Database.

SIC Range	Industry Sector	SIC Range	Industry Sector	SIC Range	Industry Sector
22	Textiles	2833, 2834	Pharmaceuticals	333, 334	Nonferrous Metals
24	Lumber and Wood Products	2861-2869	Organic Chem. Mfg.	34	Fabricated Metals
25	Furniture and Fixtures	2911	Petroleum Refining	36	Electronic Equip. and Comp.
2611-2631	Pulp and Paper	30	Rubber and Misc. Plastics	371	Motor Vehicles, Bodies, Parts, and Accessories
2711-2789	Printing	32	Stone, Clay, and Concrete	**3731**	**Shipbuilding and Repair**
2812-2819	Inorganic Chemical Manufacturing	331	Iron and Steel		
2821, 2823, 2824	Plastic Resins and Manmade Fibers	332, 336	Metal Casting		

Table 10: Toxics Release Inventory Data for Selected Industries

Industry Sector	SIC Range	# TRI Facilities	TRI Releases		TRI Transfers		Total Releases +Transfers (million lbs)	Average Releases + Transfers per Facility (pounds)
			Total Releases (million lbs.)	Ave. Releases per Facility (pounds)	Total Transfers (million lbs.)	Ave. Trans. per Facility (pounds)		
Textiles	22	339	17.8	53,000	7.0	21,000	24.8	74,000
Lumber and Wood Products	24	397	30.0	76,000	4.1	10,000	34.1	86,000
Furniture and Fixtures	25	336	37.6	112,000	9.9	29,000	47.5	141,000
Pulp and Paper	2611-2631	305	232.6	763,000	56.5	185,000	289.1	948,000
Printing	2711-2789	262	33.9	129,000	10.4	40,000	44.3	169,000
Inorganic Chem. Mfg.	2812-2819	413	60.7	468,000	21.7	191,000	438.5	659,000
Plastic Resins and Manmade Fibers	2821,2823, 2824	410	64.1	156,000	192.4	469,000	256.5	625,000
Pharmaceuticals	2833, 2834	200	29.9	150,000	147.2	736,000	177.1	886,000
Organic Chemical Mfg.	2861-2869	402	148.3	598,000	208.6	631,000	946.8	1,229,000
Petroleum Refining	2911	180	73.8	410,000	29.2	162,000	103.0	572,000
Rubber and Misc. Plastics	30	1,947	143.1	73,000	102.6	53,000	245.7	126,000
Stone, Clay, and Concrete	32	623	43.9	70,000	31.8	51,000	75.7	121,000
Iron and Steel	331	423	90.7	214,000	513.9	1,215,000	604.6	1,429,000
Metal Casting	332, 336	654	36.0	55,000	73.9	113,000	109.9	168,000
Nonferrous Metals	333, 334	282	201.7	715,000	164	582,000	365.7	1,297,000
Fabricated Metals	34	2,676	83.5	31,000	350.5	131,000	434.0	162,000
Electronics and Computers	36	407	4.3	11,000	68.8	169,000	73.1	180,000
Motor Vehicles, Bodies, Parts, and Accessories	371	754	79.3	105,000	194	257,000	273.3	362,000
Shipbuilding and Repair	**3731**	**43**	**2.4**	**55,000**	**4.1**	**94,000**	**6.5**	**149,000**

Source: *US EPA Toxics Release Inventory Database, 1995.*

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V. POLLUTION PREVENTION OPPORTUNITIES

The best way to reduce pollution is to prevent it in the first place. Some companies have creatively implemented pollution prevention techniques that improve efficiency and increase profits while at the same time minimizing environmental impacts. This can be done in many ways such as reducing material inputs, re-engineering processes to reuse by-products, improving management practices, and employing substitution of toxic chemicals. Some smaller facilities are able to actually get below regulatory thresholds just by reducing pollutant releases through aggressive pollution prevention policies.

The Pollution Prevention Act of 1990 established a national policy of managing waste through source reduction, which means preventing the generation of waste. The Pollution Prevention Act also established as national policy a hierarchy of waste management options for situations in which source reduction cannot be implemented feasibly. In the waste management hierarchy, if source reduction is not feasible the next alternative is recycling of wastes, followed by energy recovery, and waste treatment as a last alternative.

In order to encourage these approaches, this section provides both general and company-specific descriptions of some pollution prevention advances that have been implemented within the shipbuilding and repair industry. While the list is not exhaustive, it does provide core information that can be used as the starting point for facilities interested in beginning their own pollution prevention projects. This section provides summary information from activities that may be, or are being implemented by this sector. When possible, information is provided that gives the context in which the technique can be used effectively. Please note that the activities described in this section do not necessarily apply to all facilities that fall within this sector. Facility-specific conditions must be carefully considered when pollution prevention options are evaluated, and the full impacts of the change must examine how each option affects air, land and water pollutant releases.

Much of the information contained in this Section was obtained from *Hazardous Waste Minimization Guide for Shipyards*, produced by the National Shipbuilding Research Program (NSRP) in cooperation with the U.S. Navy and National Steel and Shipbuilding Company (NASSCO). The Guide provides and extensive discussion of pollution prevention opportunities available to shipyards which could not all be reproduced in this document. For further details on pollution prevention opportunities for shipyards, readers are encouraged to consult the Guide and the additional references listed in Section IX of this sector notebook. In addition, many of the pollution prevention opportunities listed in the *Profile of the Fabricated Metal Products Industry Sector Notebook* can also be applied to the shipbuilding and repair industry.

V.A. Surface Preparation

The majority of wastes generated during surface preparation are spent abrasives mixed with paint chips. One way the volume of waste generated can be reduced is by using blast media that is relatively easy to reuse. Some abrasives, such as mineral abrasives, are not easily reused. Copper slag has a very low reuse factor and in general, can be used no more than twice before breaking down.

Steel Shot and Grit

One of the most widely used reusable abrasives is steel grit, which is a crushed form of steel shot. While slags and sands can only be used a couple of times, steel abrasives can be used 50 times or more. With reused steel abrasive, care must be taken to watch that the abrasive does not become rounded. The abrasive works best if it has a sharp angular shape. Steel shot and grit require a high initial outlay of capital, but they can be used repeatedly to the point that they are more cost effective than copper slag. This medium is only deemed hazardous when it is contaminated with a sufficient amount of paint chips.

Improving Recyclability of Abrasive Blasting Media

In order to realize the maximum usage of reusable grit, measures must be taken to ensure it can be reused. Some media, such as steel shot, can be reused hundreds of times. It is important that the used grit is recovered as much as possible. With wheelabrator type equipment, this is done automatically. The used abrasive may be vacuumed up or mechanically fed to the blasting equipment. Containment of the abrasive allows it to be recovered, where otherwise it could suffer from loss to overspray. Protection from the weather, such as rain, will also prolong the life of the grit. It is very important that waste streams, especially hazardous waste, are not mixed with used blasting media. Outside debris and other waste could render the grit unfit for reuse.

Often, air powered cleaning equipment is used to screen abrasive to separate it from large paint particles. These systems may also remove lighter dust from the heavy abrasive. This media separation can be especially important when the paint being removed contains heavy metals. An alternative to on-site reclamation is to send it for processing off-site.

Plastic Media Blasting

As a substitute for other blast media, the military has experimented extensively with plastic media stripping. This process is particularly good for stripping coatings from parts with fragile substrates such as zinc, aluminum, and fiberglass. It can be a lengthy process because it strips paint layer by layer.

The same types and quantities of waste are generated as with grit blasting, but the plastic medium is more recyclable with the use of pneumatic media classifiers that are part of the stripping equipment. The only waste requiring disposal is the paint waste itself. However, the use of plastic media is fairly limited in shipyards. Plastic blasting media do not work well on epoxy paints. In addition, the blasting equipment is expensive and requires trained operators.

Water Jet Stripping (Hydroblasting)

Hydroblasting is a cavitating high pressure water jet stripping system that can remove most paints. These system may use pressures as high as 50,000 psig. Hydroblasting is an excellent method for removing even hard coatings from metal substrates. The process can be used for stripping hulls, removing scales and deposits from heat exchangers, and removing rubber liners. Some systems automatically remove the paint chips or stripped material from the water and reuse the water for further blasting. By recirculating the water in this manner, the amount of waste is greatly reduced. Wastewater from this process is usually suitable for sewer disposal after the paint particles are removed. Although this process produces very little waste, it is not always as efficient as abrasive grit blasting and has relatively high capital and maintenance costs.

V.B. Painting and Coating

Painting and coating operations are typically the largest single source of VOC emissions from shipyards. In addition, paint waste can account for more than half of the total hazardous waste generated at shipyards. Paint waste at a shipyard may include leftover paint in containers, overspray, paint that is no longer usable (Non-spec paint), and rags and other materials contaminated with paint. In many cases, the amount of paint waste generated can be reduced through the use of improved equipment, alternative coatings, and good operating practices.

Regulations under the CAA aimed at reducing VOC emissions by limiting VOC content in paints were finalized in 1996. Shipyards required to comply with these rules and wishing to implement the pollution prevention options discussed below, should consult the regulations to determine the practical and legal implications of these options.

V.B.1. Application Equipment

In order to effectively reduce paint waste and produce a quality coating, proper application techniques should be supplemented with efficient application equipment. Through the use of equipment with high transfer efficiencies, the amount of paint lost to overspray is minimized.

High Volume Low Pressure (HVLP) Spray Guns

The HVLP spray gun is basically a conventional air spray gun with modifications and special nozzles that atomize the paint at very low air pressures. The atomizing pressure of HVLP systems is often below 10 psi. The design of this gun allows better transfer efficiency and reduced overspray than that of conventional air guns. The low application pressure decreases excessive bounceback and allows better adhesion of the coating to the substrate.

Although improvements are consistently being made to overcome its limitations, most HVLP systems have some definite drawbacks, including difficulty atomizing viscous coatings, sensitivity to variations in incoming pressure, sensitivity to wind, and slow application rates.

Airless Spray Guns

Instead of air passing through the spray gun, an airless system applies static pressure to the liquid paint. As the paint passes through the nozzle, the sudden drop in pressure atomizes the paint and it is carried to the substrate by its own momentum. Pressure is applied to the paint by a pump located at a remote supply. These systems have become favorable over conventional air-spray systems for three main reasons: 1) reduced overspray and rebound, 2) high application rates and transfer efficiency, and 3) permits the use of high-build coatings with the result that fewer coats are required to achieve specific film thickness.

One major disadvantage of some airless spray systems is the difficulty applying very thin coats. If coatings with less than a mil in thickness are required, such as primers applied to objects that require weld ability, it may be difficult to use an airless system.

Electrostatic Spray

Electrostatic spray system utilize paint droplets that are given a negative charge in the vicinity of a positively charged substrate. The droplets are attracted to the substrate and a uniform coating is formed. This system works well on cylindrical and rounded objects due to its "wrap-around" effect that nearly allows the object to be coated from one side. Very little paint is lost to overspray, and it has been noted to have a transfer efficiency of over 95%.

In order for an electrostatic system to operate properly, the correct solvent balance is needed. The evaporation rate must be slow enough for the charged droplets to reach the substrate in a fluid condition to flow out into a smooth film, but fast enough to avoid sagging. The resistivity of the paint must also be low enough to enable the paint droplets to acquire the maximum charge.

Although the operating costs of electrostatic spray systems are relatively low, the initial capital investment can be high. This system has been found to work extremely well in small parts painting applications. Sometimes the installation of an electrostatic powder coating system can replace a water curtain spray paint booth.

Heated Spray

When paint is heated, its viscosity is reduced allowing it to be applied with a higher solids content, thus requiring less solvent. When the paint is heated in a special container and supplied to the gun at 140 ° to 160 °F, coatings of 2 to 4 mils dry-film thickness can be applied in one operation, resulting in considerable savings in labor cost. In addition, much of the associated solvent emissions are eliminated.

Heating the coating prior to application can be used with both conventional and airless spray applications. An in-line heater is used to heat the coating before it reaches the gun. As the coating is propelled through the air, it cools rapidly and increases viscosity after it hits the surface, allowing for better adhesion to the substrate.

Plural Component Systems

A common problem that shipyards face when working with two-part coatings is overmixing. Once the component parts of a catalyst coating are mixed, the coating must be applied. Otherwise, the excess unused coating will cure and require disposal. Additionally, the coating equipment must be cleaned immediately after use.

One large advantage of plural component technology is the elimination of paint waste generated by mixing an excess amount of a two part coating. This is achieved through the use of a special mixing chamber that mixes the pigment and catalyst seconds before the coating is applied. Each component is pumped through a device that controls the mixing ratio and then is combined in a mixing chamber. From the mixing chamber, the mixed coating travels directly to the spray guns. The only cleaning that is required is the mixing chamber, gun, and the length of supply hose connecting them.

Recycle Paint Booth Water

Various methods and equipment are used to reduce or eliminate the discharge of the water used in water-wash booths (water curtain). These methods and equipment prevent the continuous discharge of booth waters by conditioning (i.e., adding detacifiers and paint-dispersing polymers) and removing paint solids. The most basic form of water maintenance is the removal of paint solids by manual skimming and/or raking. This can be performed without water conditioning since some portion of solvent-based paints usually float and/or sink. With the use of detacifiers and paint-dispersing polymer treatments, more advanced methods of solids removal can be implemented. Some common methods are discussed below.

<u>Wet-Vacuum Filtration.</u> Wet-vacuum filtration units consist of an industrial wet-vacuum head on a steel drum containing a filter bag. The unit is used to vacuum paint sludge from the booth. The solids are filtered by the bag and the water is returned to the booth. Large vacuum units are also commercially available that can be moved from booth to booth by forklift or permanently installed near a large booth.

<u>Tank-Side Weir.</u> A weir can be attached to the side of a side-draft booth tank, allowing floating material to overflow from the booth and be pumped to a filtering tank for dewatering.

<u>Consolidator.</u> A consolidator is a separate tank into which booth water is pumped. The water is then conditioned by the introduction of chemicals. Detacified paint floats to the surface of the tank, where it is skimmed by a continuously moving blade. The clean water is recycled to the booth.

<u>Filtration.</u> Various types of filtration units are used to remove paint solids from booth water. This is accomplished by pumping the booth water to the unit where the solids are separated and returning the water to the booth. The simplest filtration unit consists of a gravity filter bed utilizing paper or cloth media. Vacuum filters are also employed, some of which require precoating with diatomaceous earth.

<u>Centrifuge Methods.</u> Two common types of centrifugal separators are the hydrocyclone and the centrifuge. The hydrocyclone is used to concentrate solids. The paint booth water enters a cone-shaped unit under pressure and spins around the inside surface. The spinning imparts an increased force of gravity, which causes most of the solid particles to be pulled outward to the walls of the cone. Treated water exits the top of the unit and the solids exit from the bottom. Some systems have secondary filtration devices to further process the solids. The centrifuge works in a similar manner, except that the booth water enters a spinning drum, which imparts the centrifugal force needed for separating the water and solids. Efficient centrifugation requires close control of the booth water chemistry to ensure a uniform feed. Also, auxiliary equipment such as booth water agitation equipment may be needed (EPA, 1995).

Convert Wash-Water Booths to Dry Filter Booths

Water-wash booths can be converted to or replaced by dry filter booths. The dry filter booths have the potential to eliminate the discharge of wastewater, but they create a solid waste stream. The choice between using a water-wash booth or a dry filter booth is primarily based on the quantity of overspray. It is usually cost effective to use a dry filter booth when paint usage does not exceed 20 gallons/8 hour shift/10 feet of chamber width.

A 1989 Navy study concluded that conversion from wet to dry booths can be cost effectively performed over a range of operational scenarios. The Navy work included a survey of military and industrial facilities that have successfully made the conversion and an economic analysis based on typical Navy painting operational parameters (EPA, 1995).

V.B.2. Alternative Coatings

The use of solvent-based coatings can lead to high costs to meet air and water quality regulations. In efforts to reduce the quantity and toxicity of waste paint disposal, alternative coatings have been developed that do not require the use of solvents and thinners.

Powder Coatings

Metal substrates can be coated with certain resins by applying the powdered resin to the surface, followed by application of heat. The heat melts the resin, causing it to flow and form a uniform coating. The three main methods in use for applying the powder coating are fluidized bed, electrostatic spray, and flame spraying.

Flame spraying is the most applicable method for shipyards. The resin powder is blown through the gun by compressed air. The particles are melted in a high temperature flame and propelled against the substrate. This process is used widely with epoxy powders for aluminum surfaces.

The electrostatic application method uses the same principles as the electrostatic spray. The resin powder is applied to the surface electrostatically. Heat is applied to the covered surface and the powder melts to form the coating. The transfer efficiency and recyclability of this method is very high.

The elimination of environmental problems associated with many liquid based systems is one of the major advantages of powder coatings. The use of powder coatings eliminates the need for solvents and thereby emits negligible volatile organic compounds (VOCs). Powder coatings also reduce the waste associated with unused two-part coatings that have already been mixed. Since powder overspray can be recycled, material utilization is high and solid waste generation is low. Recent case studies demonstrate that powder coating systems can be cleaner, more efficient, and more environmentally acceptable, while producing a higher quality finish than many other coating systems.

Water-Based Paints

Water-based coatings are paints containing a substantial amount of water instead of volatile solvents. Alkyd, polyester, acrylic, and epoxy polymers can be dissolved and dispersed by water. In addition to reduction in environmental hazards due to substantially lower air emissions, a decrease in the amount of hazardous paint sludge generated can reduce disposal cost.

The application for water-based coatings in the shipyard are limited. Some of the areas of use may include the inside of the superstructure of a vessel, and other surfaces that are protected from extreme conditions.

V.B.3. Good Operating Practices

In many cases, simply altering a painting process can reduce wastes through better management.

Coating Application

A good manual coating application technique is very important in reducing waste. Most shipyards rely primarily on spraying methods for coating application. If not properly executed, spraying techniques have a high potential for creating waste; therefore, proper application techniques are very important.

<u>Reducing Overspray</u> One of the most common means of producing paint waste at shipyards is overspray. Overspray not only wastes some of the coating, it also presents environmental and health hazards. It is important that shipyards try to reduce the amount of overspray as much as possible. Techniques for reducing overspray include: 1) triggering the paint gun at the end of each pass instead of carrying the gun past the edge of the surface before reversing directions, 2) avoiding excessive air pressure, and 3) keeping the gun perpendicular to the surface being coated.

<u>Uniform Finish</u> Application of a good uniform finish provides the surface with quality coating with a higher performance than an uneven finish. An uneven coating does not dry evenly and commonly results in using excess paint.

<u>Overlap</u> An overlap of 50 percent can reduce the amount of waste by increasing the production rate and overall application efficiency. Overlap of 50 percent means that for every pass that the operator makes with the spray gun, 50 percent of the area covered by the previous pass is also sprayed. If less than a 50 percent overlap is used, the coated surface may appear streaked. If more than a 50 percent overlap is used, the coating is wasted and more passes are required to coat the surface.

General Housekeeping

Small quantities of paint and solvents are frequently lost due to poor housekeeping techniques. There are a variety of ways that can be implemented to control and minimize spills and leaks. Specific approaches to product transfer methods and container handling can effectively reduce product loss.

The potential for accidents and spills is at the highest point when thinners and paints are being transferred from bulk drum storage to the process equipment. Spigots, pumps, and funnels should be used whenever possible.

Evaporation can be controlled by using tight fitting lids, spigots, and other equipment. The reduction in evaporation will increase the amount of available material and result in lower solvent purchase cost.

Paint Containers

A significant portion of paint waste is the paint that remains inside a container after the container is emptied, and paint that is placed in storage, not used, and becomes outdated or non-spec. Shipyards should try to consolidate paint use to facilitate the purchase of paint in bulk. Since large bulk containers have less surface area than an equivalent volume of small cans, the amount of drag-on paint waste is reduced. Large bulk containers can sometimes be returned to the paint supplier to be cleaned for reuse.

If the purchase of paint in bulk containers is not practical, the paint should be purchased in the smallest amount required to minimize outdated or non-spec paint waste. Workers should not have to open a gallon can when only a quart is required. Usually, any paint that is left in the can will require disposal as hazardous waste.

V.C. Metal Plating and Surface Finishing

Pollution prevention opportunities in metal plating and surface finishing operations are discussed in detail in NSRP's *Hazardous Waste Minimization Guide for Shipyards* and in the *Profile of the Fabricated Metal Products Industry Sector Notebook*. Readers are encouraged to consult these documents for pollution prevention information relating to metal plating and surface finishing.

V.D. Fiberglass Reinforced Construction

Material Application

Major waste reduction is available by optimizing material application processes. These processes include spray delivery systems and non-spray resin application methods. Non-spray application methods include closed mold systems, vacuum bag mold systems, resin roller dispensers, prespray fiber reinforcing, and in-house resin impregnation. These no-spray techniques reduce material waste and energy costs during application. The lower application pressures reduce the cost and maintenance of pressure lines, pumps, controls, and fittings. Routine cleanups of work areas are also reduced.

Spray Delivery Systems

The fabrication process for fiberglass construction and the wastes produced are highly dependent on the equipment and procedures used. The current system of resin and gelcoat delivery systems include high-pressure air, medium-pressure airless, and low-pressure air-assisted airless spray guns.

- The high-pressure air system is used less due to the large amount of expensive high-pressure compressed air required and significant air emissions generated.

- The airless method produces a pressurized resin stream electrostatically atomized through a nozzle. The nozzle orifice and spray angle can be varied by using different tips. The size of the orifice affects the delivery efficiency, with larger orifices resulting in greater raw material loss. Airless spray guns are considered to be very efficient in the delivery of resin to the work surface.

- The air-assisted airless technology modifies the airless gun by introducing pressurized air on the outer edge of the resin stream as it exits the pressure nozzle. The air stream forms an envelope which focuses the resin to follow a controllable spray pattern. Since more resin ends up on the mold with this technology, the amount of spraying is reduced leading to a reduction in air emissions. It is estimated that a savings of 5 to 20 percent in net loss of resin spray waste for the air-assisted airless gun is achieved compared to the airless gun.

Resin Roller Application

This application uses pumped resin and catalyst from drums or bulk containers. The resin and catalyst are precisely metered in a gun-type line much like the paint plural component systems. A resin roller dispenser transfers the catalyzed resin to the mold surface. This eliminates the material lost due to overspray and bounceback of the resin. Air emissions are also greatly reduced with this type of delivery system.

Thermoplastic Resins

Thermoplastic resins have the advantage of being easily recycled by applying heat which returns the resin to a liquid state. In its liquid state, the resin can be reused in the manufacture of other fiberglass components in shipbuilding. The use of thermoplastics offers faster curing cycles, lower emission during processing, lower costs per pound of raw material used, ease of recycling material, and, in some cases, lower labor costs. With the recent advances in the processing technologies and thermoplastic resin systems, the shipbuilding industries are reexamining the application of thermoplastics versus thermosets material systems.

V.E. Solvent Cleaning and Degreasing

Shipyards often use large quantities of solvents in a variety of cleaning and degreasing operations including parts cleaning, process equipment cleaning, and surface preparation for coating applications. The final cost of solvent used for various cleanup operations is nearly twice the original purchase price of the virgin solvent. The additional cost is primarily due to the fact that for each drum purchased, extra disposal cost, hazardous materials transportation cost, and manifesting time and expense are incurred. With the rising cost of solvents and waste disposal services, combined with continuously developing regulation, reducing the quantities of solvents used and solvent wastes generated can be extremely cost effective.

Eliminating the Use of Solvents

Eliminating the use of solvents avoids any waste generation associated with spent solvent. Elimination can be achieved by utilization of non-solvent cleaning agents or eliminating the need for cleaning altogether. Solvent elimination applications include the use of water-soluble cutting fluids, protective peel coatings, aqueous cleaners, and mechanical cleaning systems.

<u>Water-soluble Cutting Fluids</u>. Water-soluble cutting fluids can often be used in place of oil-based fluids. The cutting oils usually consist of an oil-in-water emulsion used to reduce friction and dissipate heat. If these fluids need to be removed after the machining process is complete, solvents may be needed.

In efforts to eliminate solvent degreasing and its subsequent waste, special water-soluble cutting fluids have been developed. Systems are available that can clean the cutting fluid and recycle the material back to the cutting operation. Obstacles to implementing this method are: cost (water-soluble fluids are generally more expensive), procurement (there are only a few suppliers available), and the inability to quickly switch between fluid types without thoroughly cleaning the equipment.

Aqueous Cleaners Aqueous cleaners, such as alkali, citric, and caustic base, are often useful substitutes for solvents. There are many formulations that are suited for a variety of cleaning requirements. Many aqueous cleaners have been found to be as effective as the halogenated solvents that are commonly employed.

The advantages of substituting aqueous cleaners include minimizing worker's exposure to solvent vapors, reducing liability and disposal problems associated with solvent use, and cost. Aqueous cleaners do not volatilize as quickly as other solvents, thereby reducing losses due to evaporation. Since most aqueous cleaners are biodegradable, disposal is not a problem once the organic or inorganic contaminants are removed.

The use of aqueous cleaners can also result in cost savings. Although some aqueous cleaners may cost less than an equivalent amount of solvent, the purchase price of each is about the same. The cost of disposal, loss due to evaporation, and associated liabilities, however, favor aqueous cleaners.

The disadvantages of aqueous cleaners in place of solvents may include: possible inability of the aqueous cleaners to provide the degree of cleaning required, incompatibility between the parts being cleaned and the cleaning solution, need to modify or replace existing equipment, and problems associated with moisture left on parts being cleaned. Oils removed from the parts during cleaning may float on the surface of the cleaning solution and may interfere with subsequent cleaning. Oil skimming is usually required.

Mechanical Cleaning Systems Utilizing mechanical cleaning systems can also replace solvents in degreasing and cleaning operations. In many cases, a high pressure steam gun or high pressure parts washer can clean parts and surfaces quicker and to the same degree of cleanliness as that of the solvents they replace. Light detergents can be added to the water supply for improved cleaning. The waste produced by these systems is usually oily wastewater. This wastewater can be sent through an oil/water separator, the removed water discharged to the sewer, and the oil residue sent to a petroleum recycler. Some hot water wash and steam systems can be supplemented by emulsifying solutions to speed the process. Although these additives speed the cleaning process, they can make separation of the oil from the water very difficult and create problems with disposal of the waste.

Non-Solvent Based Paint Stripping Non-solvent based paint stripping methods are viable substitutes for solvent stripping. Paint stripping is normally performed by soaking, spraying, or brushing surfaces with a stripping agent such as methylene chloride, chromates, phenols, or strong acids. After the agent has remained on the parts for a period, the surface is rinsed with water and the loosened paint is sprayed or brushed off. The alternatives to solvent stripping agents include aqueous striping agents, use of abrasives, cryogenic stripping, and thermal stripping.

Aqueous stripping agents, such as caustic soda (NaOH), are often employed in place of methylene chloride based strippers. Caustic solutions have the advantage of eliminating solvent vapor emissions. A typical caustic bath consists of about 40 percent caustic solution heated to about 200 degrees Fahrenheit. Caustic stripping is generally effective on alkyl resins and oil paints.

Cryogenic stripping utilizes liquid nitrogen and non-abrasive plastic beads as blasting shot. This method relies on the freezing effect of the liquid nitrogen and the impact of the plastic shot. Subjecting the surface to extremely low temperatures creates stress between the coating and the substrate causing the coating to become brittle. When the plastic shot hits the brittle coating, debonding occurs. The process is non-abrasive, and will not damage the substrate, but effects of the metal shrinkage, due to extremely low temperatures, should be monitored. The process does not produce liquid wastes, and nitrogen, chemically inert, is already present in the atmosphere (U.S. EPA, March 1997).

The most common form of non-solvent paint stripping in shipyards is the use of abrasive blasting. The use of various metallic grit propelled at high pressure against the surface is very effective to remove marine coatings.

Thermal stripping methods can be useful for objects that cannot be immersed. In this process, superheated air is directed against the surface of the object. The high temperatures cause some paints to flake off. The removal results from the drying effects of the air and the uneven expansion of the paint and the substrate. Some paints will melt at high temperatures, allowing the paint to be scraped off. Hand-held units are available that produce a jet of hot air. Electric units and open flame or torch units are also used. While this system is easy to implement, it is limited to items that are not heat sensitive and to coatings that are affected by the heat.

Reducing the Use of Solvent

By eliminating the use or need for solvent cleaning, the problems associated with disposal of spent solvent are also eliminated. In cases where the elimination of solvent use is not possible or practical, utilization of various solvent waste reduction techniques can lead to a substantial savings in solvent waste.

Methods of reducing solvent usage can be divided into three categories: source control of air emissions, efficient use of solvent and equipment, and maintaining solvent quality. Source control of air emissions addresses ways in which more of the solvent can be kept inside a container or cleaning tank by reducing the chances for evaporation loss. Efficient use of solvent and equipment through better operating procedures can reduce the amount of solvent required for cleaning. Maintaining the quality of solvent will extend the lifecycle effectiveness of the solvent.

<u>Source Control of Air Emissions</u> Source control of air emissions can be achieved through equipment modification and proper operation of equipment. Some simple control measures include installation and use of lids, an increase of freeboard height of cleaning tanks, installation of freeboard chillers, and taking steps to reduce solvent drag-out.

All cleaning units, including cold cleaning tanks and dip tanks, should have some type of lid installed. When viewed from the standpoint of reducing air emissions, the roll-type cover is preferable to the hinge type. Lids that swing down can cause a piston effect and force the escape of solvent vapor. In operations such as vapor degreasing, use of lids can reduce solvent loss from 24 percent to 50 percent. For tanks that are continuously in use, covers have been designed that allow the work pieces to enter and leave the tank while the lid remains closed.

In an open top vapor degreaser, freeboard is defined as the distance from the top of the vapor zone to the top of the tank. Increasing the freeboard will substantially reduce the amount of solvent loss. A freeboard chiller may also be installed above the primary condenser coil. This refrigerated coil, much like the cooling jacket, chills the air above the vapor zone and creates a secondary barrier to vapor loss. Reduction in solvent usage, by use of freeboard chillers, can be as high as 60 percent. The major drawback with a freeboard chiller is that it can introduce water (due to condensation from air) into the tank.

In addition to measures that reduce air emissions through equipment modification, it is also possible to reduce emissions through proper equipment layout, operation, and maintenance. Cleaning tanks should be located in areas where air turbulence and temperature do not promote vapor loss.

<u>Maximize the Dedication of the Process Equipment</u> In addition to reduction in vapor loss, reducing the amount of solvent used can be achieved through better operating practices that increase the efficiency of solvent cleaning operations. Maximizing the dedication of the process equipment reduces the

need for frequent cleaning. By using a mix tank consistently for the same formulation, the need to clean equipment between batches is eliminated.

Avoid Unnecessary Cleaning Avoiding unnecessary cleaning also offers potential for waste reduction. For example, paint mixing tanks for two-part paints are often cleaned between batches of the same product. The effect of cross-contamination between batches should be examined from a product quality control viewpoint to see if the cleaning step is always necessary.

Process pipelines are often flushed with some type of solvent to remove deposits on the pipe walls. Cleaning the pipelines can be achieved by using an inert gas propellant to remove deposits. This method can only be used if the pipelines do not have many bends or sharp turns.

Proper Production Scheduling Proper production scheduling can reduce cleaning frequency by eliminating the need for cleaning between the conclusion of one task and the start of the next. A simple example of this procedure is to have a small overlap between shifts that perform the same operation with the same equipment. This allows the equipment that would normally be cleaned and put away at the end of each shift, such as painting equipment, to be taken over directly by the relief.

Clean Equipment Immediately Cleaning equipment immediately after use prevents deposits from hardening and avoids the need for consuming extra solvent. Letting dirty equipment accumulate and be cleaned later can also increase the time required for cleaning.

Better Operating Procedures Better operating procedures can minimize equipment clean-up waste. Some of the methods already discussed are examples of better operating procedures. Better operator training, education, closer supervision, improved equipment maintenance, and increasing the use of automation are very effective in waste minimization.

Reuse Solvent Waste Reuse of solvent waste can reduce or eliminate waste and result in a cost savings associated with a decrease in raw material consumption. The solvent from cleaning operations can be reused in other cleaning processes in which the degree of cleanliness required is much less. This will be discussed in more detail in the next section.

Solvent Recycling

Although not a preferable as source reduction, solvent recycling may be a viable alternative for some shipyards. The goal of recycling is to recover from the waste solvent, a solvent of a similar purity to that of the virgin solvent for eventual reuse in the same operation, or of a sufficient purity to be used in another application. Recycling can also include the direct use of solvent waste from one waste stream in another operation. There are a number of techniques that shipyards can use onsite to separate solvents from contaminants including distillation, evaporation, sedimentation, decanting, centrifugation, filtering, and membrane separation.

V.F. Machining and Metalworking

Coolant fluids account for the largest waste stream generated by machining operations. Waste metalworking fluids are created when the fluids are no longer usable due to contamination by oils or chemical additives. If the contamination rate of the metalworking fluids is reduced, the need to replace them will be less frequent. This will reduce the waste generated.

Preventing Fluid Contamination

Fluid can become hazardous waste if it is contaminated. Although it is not possible to eliminate contamination, it is possible to reduce the rate of contamination and thereby prolong its use.

The primary contaminant in these waste fluids is tramp oil. One way to postpone contamination is to promote better maintenance of the wipers and seals. A preventative maintenance program should be installed and enforced in the machine shop. Scheduled sump and machine cleaning as well as periodic inspections of the wipers and oil seals should be carried out. The responsibility for this should be assigned to some person or group in a position of authority to ensure its success.

Synthetic Fluids

Synthetic fluids have many advantages over the non-synthetic counterparts. Usually the synthetic varieties do not lubricate as effectively, but they are less susceptible to contamination and highly resistant to biological breakdown. Most synthetic fluids have superior longevity and can operate over a large temperature range without adverse side effects. Straight oils should be replaced with synthetic ones when possible.

Recycling Fluids

Once all of the source reduction options have been considered, it is time to explore the possibilities of reuse. It should be noted that in many cases, after the majority of the contaminants have been removed, further treatment with chemicals or concentrated fluid is necessary before the fluids can be recirculated through the machines.

<u>Filtration</u>. Filtration is a common way to remove particles from the fluid as well as tramp oils or other contaminants. Many different types of filters can

be used depending on the medium to be filtered and the amount of filtration desired. Contaminated cutting fluids can be passed through a bag, disc, or cartridge filter or separated in a centrifuge.

Skimming and Flotation. Although it is a slow process, skimming of contaminants is inexpensive and can be very effective. The principle is to let the fluid sit motionless in a sump or a tank, and after a predetermined amount of time, the unwanted oils are skimmed off the surface and the heavier particulate matter is collected off the bottom. A similar technique, flotation, injects high pressure air into contaminated cutting fluid. As the air comes out of solution and bubbles to the surface, it attaches itself to suspended contaminants and carries them up to the surface. The resulting sludge is skimmed off the surface and the clean fluid is reused.

Centrifugation. Centrifugation uses the same settling principles as flotation, but the effects of gravity are multiplied thousands of times due to the spinning action of the centrifuge. This will increase the volume of fluids which can be cleaned in a given amount of time.

Pasteurization. Pasteurization uses heat treatment to kill microorganisms in the fluid and reduce the rate at which rancidity (biological breakdown) will occur. Unfortunately, heat can alter the properties of the fluid and render it less effective. Properties lost in this way are usually impossible to recover.

Downgrading. Sometimes it is possible to use high quality hydraulic oils as cutting fluids. After the oils have reached their normal usable life, they no longer meet the high standards necessary for hydraulic components. At this time they are still good enough to be used for the less demanding jobs. It may be necessary to treat the fluid before it can be reused, but changing fluid's functions in this manner has proven successful in the past.

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VI. SUMMARY OF FEDERAL STATUTES AND REGULATIONS

This section discusses the Federal regulations that may apply to this sector. The purpose of this section is to highlight and briefly describe the applicable Federal requirements, and to provide citations for more detailed information. The three following sections are included:

- Section VI.A. contains a general overview of major statutes
- Section VI.B. contains a list of regulations specific to this industry
- Section VI.C. contains a list of pending and proposed regulations

The descriptions within Section VI are intended solely for general information. Depending upon the nature or scope of the activities at a particular facility, these summaries may or may not necessarily describe all applicable environmental requirements. Moreover, they do not constitute formal interpretations or clarifications of the statutes and regulations. For further information, readers should consult the Code of Federal Regulations and other state or local regulatory agencies. EPA Hotline contacts are also provided for each major statute.

VI.A. General Description of Major Statutes

Resource Conservation and Recovery Act

The Resource Conservation And Recovery Act (RCRA) of 1976, which amended the Solid Waste Disposal Act, addresses solid (Subtitle D) and hazardous (Subtitle C) waste management activities. The Hazardous and Solid Waste Amendments (HSWA) of 1984 strengthened RCRA's waste management provisions and added Subtitle I, which governs underground storage tanks (USTs).

Regulations promulgated pursuant to Subtitle C of RCRA (40 CFR Parts 260-299) establish a "cradle-to-grave" system governing hazardous waste from the point of generation to disposal. RCRA hazardous wastes include the specific materials listed in the regulations (commercial chemical products, designated with the code "P" or "U"; hazardous wastes from specific industries/sources, designated with the code "K"; or hazardous wastes from non-specific sources, designated with the code "F") or materials which exhibit a hazardous waste characteristic (ignitability, corrosivity, reactivity, or toxicity and designated with the code "D").

Regulated entities that generate hazardous waste are subject to waste accumulation, manifesting, and record keeping standards. Facilities must obtain a permit either from EPA or from a State agency which EPA has authorized to implement the permitting program if they store hazardous wastes for more than 90 days (or 180 days depending on the amount of waste generated) before treatment or disposal. Facilities may treat hazardous wastes stored in less-than-ninety-day tanks or containers without a permit provided the procedure is approved by a state agency having RCRA delegation authority. Subtitle C permits contain general facility standards such as contingency plans, emergency procedures, record keeping and reporting requirements, financial assurance mechanisms, and unit-specific standards. RCRA also contains provisions (40 CFR Part 264 Subpart S and §264.10) for conducting corrective actions which govern the cleanup of releases of hazardous waste or constituents from solid waste management units at RCRA-regulated facilities.

Although RCRA is a Federal statute, many States implement the RCRA program. Currently, EPA has delegated its authority to implement various provisions of RCRA to 47 of the 50 States and two U.S. territories. Delegation has not been given to Alaska, Hawaii, or Iowa.

Most RCRA requirements are not industry specific but apply to any company that generates, transports, treats, stores, or disposes of hazardous waste. Here are some important RCRA regulatory requirements:

- **Identification of Solid and Hazardous Wastes** (40 CFR Part 261) lays out the procedure every generator must follow to determine whether the material in question is considered a hazardous waste, solid waste, or is exempted from regulation.

- **Standards for Generators of Hazardous Waste** (40 CFR Part 262) establishes the responsibilities of hazardous waste generators including obtaining an EPA ID number, preparing a manifest, ensuring proper packaging and labeling, meeting standards for waste accumulation units, and recordkeeping and reporting requirements. Generators can accumulate hazardous waste for up to 90 days (or 180 days depending on the amount of waste generated) without obtaining a permit.

- **Land Disposal Restrictions** (LDRs) (40 CFR Part 268) are regulations prohibiting the disposal of hazardous waste on land without prior treatment. Under the LDRs program, materials must meet LDR treatment standards prior to placement in a RCRA land disposal unit (landfill, land treatment unit, waste pile, or surface impoundment). Generators of waste subject to the LDRs must provide notification of such to the designated TSD facility to ensure proper treatment prior to disposal.

- **Used Oil Management Standards** (40 CFR Part 279) impose management requirements affecting the storage, transportation, burning, processing, and re-refining of the used oil. For parties that merely generate used oil, regulations establish storage standards. For a party considered a used oil processor, re-refiner, burner, or marketer (one who generates and sells off-specification used oil), additional tracking and paperwork requirements must be satisfied.

- RCRA contains unit-specific standards for all units used to store, treat, or dispose of hazardous waste, including **Tanks and Containers**. Tanks and containers used to store hazardous waste with a high volatile organic concentration must meet emission standards under RCRA. Regulations (40 CFR Part 264-265, Subpart CC) require generators to test the waste to determine the concentration of the waste, to satisfy tank and container emissions standards, and to inspect and monitor regulated units. These regulations apply to all facilities that store such waste, including large quantity generators accumulating waste prior to shipment off-site.

- **Underground Storage Tanks** (USTs) containing petroleum and hazardous substances are regulated under Subtitle I of RCRA. Subtitle I regulations (40 CFR Part 280) contain tank design and release detection requirements, as well as financial responsibility and corrective action standards for USTs. The UST program also includes upgrade requirements for existing tanks that must be met by December 22, 1998.

- **Boilers and Industrial Furnaces** (BIFs) that use or burn fuel containing hazardous waste must comply with design and operating standards. BIF regulations (40 CFR Part 266, Subpart H) address unit design, provide performance standards, require emissions monitoring, and restrict the type of waste that may be burned.

EPA's RCRA, Superfund and EPCRA Hotline, *at (800) 424-9346, responds to questions and distributes guidance regarding all RCRA regulations. The RCRA Hotline operates weekdays from 9:00 a.m. to 6:00 p.m., ET, excluding Federal holidays.*

Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), a 1980 law known commonly as Superfund, authorizes EPA to respond to releases, or threatened releases, of hazardous substances that may endanger public health, welfare, or the environment. CERCLA also enables EPA to force parties responsible for environmental contamination to clean it up or to reimburse the Superfund for response costs incurred by EPA. The Superfund Amendments and Reauthorization Act (SARA) of 1986 revised various sections of CERCLA, extended the taxing authority for the

Superfund, and created a free-standing law, SARA Title III, also known as the Emergency Planning and Community Right-to-Know Act (EPCRA).

The CERCLA hazardous substance release reporting regulations (40 CFR Part 302) direct the person in charge of a facility to report to the National Response Center (NRC) any environmental release of a hazardous substance which equals or exceeds a reportable quantity. Reportable quantities are listed in 40 CFR §302.4. A release report may trigger a response by EPA, or by one or more Federal or State emergency response authorities.

EPA implements hazardous substance responses according to procedures outlined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR Part 300). The NCP includes provisions for permanent cleanups, known as remedial actions, and other cleanups referred to as removals. EPA generally takes remedial actions only at sites on the National Priorities List (NPL), which currently includes approximately 1300 sites. Both EPA and states can act at sites; however, EPA provides responsible parties the opportunity to conduct removal and remedial actions and encourages community involvement throughout the Superfund response process.

EPA's RCRA, Superfund and EPCRA Hotline, at (800) 424-9346, answers questions and references guidance pertaining to the Superfund program. This Hotline, which addresses CERCLA issues, operates weekdays from 9:00 a.m. to 6:00 p.m., ET, excluding Federal holidays.

Emergency Planning And Community Right-To-Know Act

The Superfund Amendments and Reauthorization Act (SARA) of 1986 created the Emergency Planning and Community Right-to-Know Act (EPCRA, also known as SARA Title III), a statute designed to improve community access to information about chemical hazards and to facilitate the development of chemical emergency response plans by State and local governments. EPCRA required the establishment of State emergency response commissions (SERCs), responsible for coordinating certain emergency response activities and for appointing local emergency planning committees (LEPCs).

EPCRA and the EPCRA regulations (40 CFR Parts 350-372) establish four types of reporting obligations for facilities which store or manage specified chemicals:

- **EPCRA §302** requires facilities to notify the SERC and LEPC of the presence of any extremely hazardous substance (the list of such substances is in 40 CFR Part 355, Appendices A and B) if it has such substance in excess of the substance's threshold planning quantity, and directs the facility to appoint an emergency response coordinator.

- **EPCRA §304** requires the facility to notify the SERC and the LEPC in the event of a release equaling or exceeding the reportable quantity of a CERCLA hazardous substance or an EPCRA extremely hazardous substance.

- **EPCRA §311 and §312** require a facility at which a hazardous chemical, as defined by the Occupational Safety and Health Act, is present in an amount exceeding a specified threshold to submit to the SERC, LEPC and local fire department material safety data sheets (MSDSs) or lists of MSDSs and hazardous chemical inventory forms (also known as Tier I and II forms). This information helps the local government respond in the event of a spill or release of the chemical.

- **EPCRA §313** requires manufacturing facilities included in SIC codes 20 through 39, which have ten or more employees, and which manufacture, process, or use specified chemicals in amounts greater than threshold quantities, to submit an annual toxic chemical release report. This report, known commonly as the Form R, covers releases and transfers of toxic chemicals to various facilities and environmental media, and allows EPA to compile the national Toxic Release Inventory (TRI) database.

All information submitted pursuant to EPCRA regulations is publicly accessible, unless protected by a trade secret claim.

EPA's RCRA, Superfund and EPCRA Hotline, at (800) 424-9346, answers questions and distributes guidance regarding the emergency planning and community right-to-know regulations. The EPCRA Hotline operates weekdays from 9:00 a.m. to 6:00 p.m., ET, excluding Federal holidays.

Clean Water Act

The primary objective of the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act (CWA), is to restore and maintain the chemical, physical, and biological integrity of the nation's surface waters. Pollutants regulated under the CWA include "priority" pollutants, including various toxic pollutants; "conventional" pollutants, such as biochemical oxygen demand (BOD), total suspended solids (TSS), fecal coliform, oil and grease, and pH; and "non-conventional" pollutants, including any pollutant not identified as either conventional or priority.

The CWA regulates both direct and indirect discharges. The National Pollutant Discharge Elimination System (NPDES) program (CWA §502) controls direct discharges into navigable waters. NPDES permits, issued by either EPA or an authorized State (EPA has authorized 42 States to administer the NPDES program), contain industry-specific, technology-based and/or water quality-based limits, and establish pollutant monitoring requirements. A facility that intends to discharge into the nation's waters must obtain a permit prior to initiating its discharge. A permit applicant must provide quantitative analytical data identifying the types of pollutants present in the facility's effluent. The permit will then set the conditions and effluent limitations on the facility discharges.

A NPDES permit may also include discharge limits based on Federal or State water quality criteria or standards, that were designed to protect designated uses of surface waters, such as supporting aquatic life or recreation. These standards, unlike the technological standards, generally do not take into account technological feasibility or costs. Water quality criteria and standards vary from State to State, and site to site, depending on the use classification of the receiving body of water. Most States follow EPA guidelines which propose aquatic life and human health criteria for many of the 126 priority pollutants.

Storm Water Discharges

In 1987 the CWA was amended to require EPA to establish a program to address storm water discharges. In response, EPA promulgated the NPDES storm water permit application regulations. These regulations require that facilities with the following storm water discharges apply for an NPDES permit: (1) a discharge associated with industrial activity; (2) a discharge from a large or medium municipal storm sewer system; or (3) a discharge which EPA or the State determines to contribute to a violation of a water quality standard or is a significant contributor of pollutants to waters of the United States.

The term "storm water discharge associated with industrial activity" means a storm water discharge from one of 11 categories of industrial activity defined at 40 CFR 122.26. Six of the categories are defined by SIC codes while the other five are identified through narrative descriptions of the regulated industrial activity. If the primary SIC code of the facility is one of those identified in the regulations, the facility is subject to the storm water permit application requirements. If any activity at a facility is covered by one of the five narrative categories, storm water discharges from those areas where the activities occur are subject to storm water discharge permit application requirements.

Those facilities/activities that are subject to storm water discharge permit application requirements are identified below. To determine whether a particular facility falls within one of these categories, consult the regulation.

Category i: Facilities subject to storm water effluent guidelines, new source performance standards, or toxic pollutant effluent standards.

Category ii: Facilities classified as SIC 24-lumber and wood products (except wood kitchen cabinets); SIC 26-paper and allied products (except paperboard containers and products); SIC 28-chemicals and allied products (except drugs and paints); SIC 291-petroleum refining; and SIC 311-leather tanning and finishing, 32 (except 323)-stone, clay, glass, and concrete, 33-primary metals, 3441-fabricated structural metal, and 373-ship and boat building and repairing.

Category iii: Facilities classified as SIC 10-metal mining; SIC 12-coal mining; SIC 13-oil and gas extraction; and SIC 14-nonmetallic mineral mining.

Category iv: Hazardous waste treatment, storage, or disposal facilities.

Category v: Landfills, land application sites, and open dumps that receive or have received industrial wastes.

Category vi: Facilities classified as SIC 5015-used motor vehicle parts; and SIC 5093-automotive scrap and waste material recycling facilities.

Category vii: Steam electric power generating facilities.

Category viii: Facilities classified as SIC 40-railroad transportation; SIC 41-local passenger transportation; SIC 42-trucking and warehousing (except public warehousing and storage); SIC 43-U.S. Postal Service; SIC 44-water transportation; SIC 45-transportation by air; and SIC 5171-petroleum bulk storage stations and terminals.

Category ix: Sewage treatment works.

Category x: Construction activities except operations that result in the disturbance of less than five acres of total land area.

Category xi: Facilities classified as SIC 20-food and kindred products; SIC 21-tobacco products; SIC 22-textile mill products; SIC 23-apparel related products; SIC 2434-wood kitchen cabinets manufacturing; SIC 25-furniture and fixtures; SIC 265-paperboard containers and boxes; SIC 267-converted paper and paperboard products; SIC 27-printing, publishing, and allied industries; SIC 283-drugs; SIC 285-paints, varnishes, lacquer, enamels, and allied products; SIC 30-rubber and plastics; SIC 31-leather and leather products (except leather tanning and finishing); SIC 323-glass products; SIC 34-fabricated metal products (except fabricated structural metal); SIC 35-

industrial and commercial machinery and computer equipment; SIC 36 - electronic and other electrical equipment and components; SIC 37 - transportation equipment (except ship and boat building and repair); SIC 38- measuring, analyzing, and controlling instruments; SIC 39-miscellaneous manufacturing industries; and SIC 4221-4225-public warehousing and storage.

Pretreatment Program

Another type of discharge that is regulated by the CWA is one that goes to a publicly-owned treatment works (POTW). The national pretreatment program (CWA §307(b)) controls the indirect discharge of pollutants to POTWs by "industrial users." Facilities regulated under §307(b) must meet certain pretreatment standards. The goal of the pretreatment program is to protect municipal wastewater treatment plants from damage that may occur when hazardous, toxic, or other wastes are discharged into a sewer system and to protect the quality of sludge generated by these plants. Discharges to a POTW are regulated primarily by the POTW, rather than the State or EPA.

EPA has developed technology-based standards for industrial users of POTWs. Different standards apply to existing and new sources within each category. "Categorical" pretreatment standards applicable to an industry on a nationwide basis are developed by EPA. In addition, another kind of pretreatment standard, "local limits," are developed by the POTW in order to assist the POTW in achieving the effluent limitations in its NPDES permit.

Regardless of whether a State is authorized to implement either the NPDES or the pretreatment program, if it develops its own program, it may enforce requirements more stringent than Federal standards.

Spill Prevention, Control and Countermeasure Plans

The 1990 Oil Pollution Act requires that facilities that could reasonably be expected to discharge oil in harmful quantities prepare and implement more rigorous Spill Prevention Control and Countermeasure (SPCC) Plan required under the CWA (40 CFR §112.7). There are also criminal and civil penalties for deliberate or negligent spills of oil. Regulations covering response to oil discharges and contingency plans (40 CFR Part 300), and Facility Response Plans to oil discharges (40 CFR §112.20) and for PCB transformers and PCB-containing items were revised and finalized in 1995.

EPA's Office of Water, at (202) 260-5700, will direct callers with questions about the CWA to the appropriate EPA office. EPA also maintains a bibliographic database of Office of Water publications which can be accessed through the Ground Water and Drinking Water resource center, at (202) 260-7786.

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) mandates that EPA establish regulations to protect human health from contaminants in drinking water. The law authorizes EPA to develop national drinking water standards and to create a joint Federal-State system to ensure compliance with these standards. The SDWA also directs EPA to protect underground sources of drinking water through the control of underground injection of liquid wastes.

EPA has developed primary and secondary drinking water standards under its SDWA authority. EPA and authorized States enforce the primary drinking water standards, which are, contaminant-specific concentration limits that apply to certain public drinking water supplies. Primary drinking water standards consist of maximum contaminant level goals (MCLGs), which are non-enforceable health-based goals, and maximum contaminant levels (MCLs), which are enforceable limits set as close to MCLGs as possible, considering cost and feasibility of attainment.

The SDWA Underground Injection Control (UIC) program (40 CFR Parts 144-148) is a permit program which protects underground sources of drinking water by regulating five classes of injection wells. UIC permits include design, operating, inspection, and monitoring requirements. Wells used to inject hazardous wastes must also comply with RCRA corrective action standards in order to be granted a RCRA permit, and must meet applicable RCRA land disposal restrictions standards. The UIC permit program is primarily State-enforced, since EPA has authorized all but a few States to administer the program.

The SDWA also provides for a Federally-implemented Sole Source Aquifer program, which prohibits Federal funds from being expended on projects that may contaminate the sole or principal source of drinking water for a given area, and for a State-implemented Wellhead Protection program, designed to protect drinking water wells and drinking water recharge areas.

EPA's Safe Drinking Water Hotline, at (800) 426-4791, answers questions and distributes guidance pertaining to SDWA standards. The Hotline operates from 9:00 a.m. through 5:30 p.m., ET, excluding Federal holidays.

Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) granted EPA authority to create a regulatory framework to collect data on chemicals in order to evaluate, assess, mitigate, and control risks which may be posed by their manufacture, processing, and use. TSCA provides a variety of control methods to prevent chemicals from posing unreasonable risk.

TSCA standards may apply at any point during a chemical's life cycle. Under TSCA §5, EPA has established an inventory of chemical substances. If a chemical is not already on the inventory, and has not been excluded by TSCA, a premanufacture notice (PMN) must be submitted to EPA prior to manufacture or import. The PMN must identify the chemical and provide available information on health and environmental effects. If available data are not sufficient to evaluate the chemicals effects, EPA can impose restrictions pending the development of information on its health and environmental effects. EPA can also restrict significant new uses of chemicals based upon factors such as the projected volume and use of the chemical.

Under TSCA §6, EPA can ban the manufacture or distribution in commerce, limit the use, require labeling, or place other restrictions on chemicals that pose unreasonable risks. Among the chemicals EPA regulates under §6 authority are asbestos, chlorofluorocarbons (CFCs), and polychlorinated biphenyls (PCBs).

Under TSCA §8, EPA requires the producers and importers of chemicals to report information on chemicals' production, use, exposure, and risks. Companies producing and importing chemicals can be required to report unpublished health and safety studies on listed chemicals and to collect and record any allegations of adverse reactions or any information indicating that a substance may pose a significant risk to humans or the environment.

EPA's TSCA Assistance Information Service, at (202) 554-1404, answers questions and distributes guidance pertaining to Toxic Substances Control Act standards. The Service operates from 8:30 a.m. through 4:30 p.m., ET, excluding Federal holidays.

Clean Air Act

The Clean Air Act (CAA) and its amendments, including the Clean Air Act Amendments (CAAA) of 1990, are designed to "protect and enhance the nation's air resources so as to promote the public health and welfare and the productive capacity of the population." The CAA consists of six sections, known as Titles, which direct EPA to establish national standards for ambient air quality and for EPA and the States to implement, maintain, and enforce these standards through a variety of mechanisms. Under the CAAA, many facilities will be required to obtain permits for the first time. State and local governments oversee, manage, and enforce many of the requirements of the CAAA. CAA regulations appear at 40 CFR Parts 50-99.

Pursuant to Title I of the CAA, EPA has established national ambient air quality standards (NAAQSs) to limit levels of "criteria pollutants," including carbon monoxide, lead, nitrogen dioxide, particulate matter, volatile organic compounds (VOCs), ozone, and sulfur dioxide. Geographic areas that meet

NAAQSs for a given pollutant are classified as attainment areas; those that do not meet NAAQSs are classified as non-attainment areas. Under section 110 of the CAA, each State must develop a State Implementation Plan (SIP) to identify sources of air pollution and to determine what reductions are required to meet Federal air quality standards. Revised NAAQSs for particulates and ozone were proposed in 1996 and may go into effect as early as 1997.

Title I also authorizes EPA to establish New Source Performance Standards (NSPSs), which are nationally uniform emission standards for new stationary sources falling within particular industrial categories. NSPSs are based on the pollution control technology available to that category of industrial source.

Under Title I, EPA establishes and enforces National Emission Standards for Hazardous Air Pollutants (NESHAPs), nationally uniform standards oriented towards controlling particular hazardous air pollutants (HAPs). Title I, section 112(c) of the CAA further directed EPA to develop a list of sources that emit any of 189 HAPs, and to develop regulations for these categories of sources. To date EPA has listed 174 categories and developed a schedule for the establishment of emission standards. The emission standards will be developed for both new and existing sources based on "maximum achievable control technology" (MACT). The MACT is defined as the control technology achieving the maximum degree of reduction in the emission of the HAPs, taking into account cost and other factors. Title I, section 112(r) directed EPA to develop a list of hazardous chemicals and regulations to control and prevent accidental releases of these chemicals. Owners and operators of facilities at which such substances are present in more than a threshold quantity will have to prepare risk management plans for each substance used at the facility. EPA may also require annual audits and safety inspections to prevent leaks and other episodic releases.

Title II of the CAA pertains to mobile sources, such as cars, trucks, buses, and planes. Reformulated gasoline, automobile pollution control devices, and vapor recovery nozzles on gas pumps are a few of the mechanisms EPA uses to regulate mobile air emission sources.

Title IV of the CAA establishes a sulfur dioxide and nitrogen oxides emissions program designed to reduce the formation of acid rain. Reduction of sulfur dioxide releases will be obtained by granting to certain sources limited emissions allowances, which, beginning in 1995, will be set below previous levels of sulfur dioxide releases.

Title V of the CAA of 1990 created a permit program for all "major sources" (and certain other sources) regulated under the CAA. One purpose of the operating permit is to include in a single document all air emissions requirements that apply to a given facility. States are developing the permit programs in accordance with guidance and regulations from EPA. Once a

State program is approved by EPA, permits will be issued and monitored by that State.

Title VI of the CAA is intended to protect stratospheric ozone by phasing out the manufacture of ozone-depleting chemicals and restrict their use and distribution. Production of Class I substances, including 15 kinds of chlorofluorocarbons (CFCs) and chloroform, were phased out (except for essential uses) in 1996.

EPA's Clean Air Technology Center, at (919) 541-0800, provides general assistance and information on CAA standards. The Stratospheric Ozone Information Hotline, at (800) 296-1996, provides general information about regulations promulgated under Title VI of the CAA, and EPA's EPCRA Hotline, at (800) 535-0202, answers questions about accidental release prevention under CAA §112(r). In addition, the Clean Air Technology Center's website includes recent CAA rules, EPA guidance documents, and updates of EPA activities (www.epa.gov/ttn then select Directory and then CATC).

VI.B. Industry Specific Requirements

Resource Conservation and Recovery Act (RCRA)

A material is classified under RCRA as a hazardous waste if the material meets the definition of solid waste (40 CFR 261.2), and that solid waste material exhibits one of the characteristics of a hazardous waste (40 CFR 261.20-40) or is specifically listed as a hazardous waste (40 CFR 261.31-33). A material defined as a hazardous waste may then be subject to Subtitle C generator (40 CFR 262), transporter (40 CFR 263), and treatment, storage, and disposal facility (40 CFR 264 and 265) requirements. The shipbuilding and repair industry must be concerned with the regulations addressing all of these.

Several common shipyard operations have the potential to generate RCRA hazardous wastes. Some of these wastes are identified below by process.

Machining and Other Metalworking

- Metalworking fluids contaminated with oils, phenols, creosol, alkalies, phosphorus compounds, and chlorine

Cleaning and Degreasing

- Solvents (F001, F002, F003, F004, F005)
- Alkaline and Acid Cleaning Solutions (D002)
- Cleaning filter sludges with toxic metal concentrations

Metal Plating and Surface Finishing and Preparation

- Wastewater treatment sludges from electroplating operations (F006)
- Spent cyanide plating bath solutions (F007)
- Plating bath residues from the bottom of cyanide plating baths (F008)
- Spent stripping and cleaning bath solutions from cyanide plating operations (F009)

Surface Preparation, Painting and Coating

- Paint and paint containers containing paint sludges with solvents or toxic metals concentrations
- Solvents (F002, F003)
- Paint chips with toxic metal concentrations
- Blasting media contaminated with paint chips

Vessel Cleaning

- Vessel sludges
- Vessel cleaning wastewater
- Vessel cleaning wastewater sludges

Fiberglass Reinforced Construction

- Solvents (F001, F002, F003, F004, F005)
- Chemical additives and catalysts

Shipbuilding and repair facilities may also generate used lubricating oils which are regulated under RCRA but may or may not be considered a hazardous waste (40 CFR 266).

United States Code, Title 10, Section 7311

Title 10, Section 7311 of the U.S. Code applies specifically to the handling of hazardous waste (as defined by RCRA) during the repair and maintenance of naval vessels. The Code requires the navy to identify the types and amounts of hazardous wastes that will be generated or removed by a contractor working on a naval vessel and that the navy compensate the contractor for the removal, handling, storage, transportation, or disposal of the hazardous waste. The Code also requires that waste generated solely by the navy and handled by the contractor bears a generator identification number issued to the navy; wastes generated and handled solely by the contractor bears a generator identification number issued to the contractor; and waste generated by both the navy and the contractor and handled by the contractor bears a generator identification number issued to the contractor and a generator identification number issued to the navy.

Clean Air Act

Under Title III of the 1990 Clean Air Act Amendments (CAAA), EPA is required to develop national emission standards for 189 hazardous air pollutants (NESHAP). EPA is developing maximum achievable control technology (MACT) standards for all new and existing sources. The National Emission Standards for Shipbuilding and Repair Operations (Surface Coating) (40 CFR Part 63 Subpart II) were finalized in 1995 and apply to major source shipbuilding and ship repairing facilities that carry out surface coating operations. Shipyards that emit ten or more tons of any one HAP or 25 or more tons of two or more HAPs combined are subject to the MACT requirements. The MACT requirements set VOC limits for different types of marine coatings and performance standards to reduce spills, leaks, and fugitive emissions. EPA estimates that there are approximately 35 major source shipyards affected by this regulation. Shipbuilding and repair facilities may also be subject to National Emissions Standards for Asbestos (40 CFR Part 61 Subpart M). Both NESHAPs require emission limits, work practice standards, record keeping, and reporting.

Under Title V of the CAAA 1990 (40 CFR Parts 70-72) all of the applicable requirements of the Amendments are integrated into one federal renewable operating permit. Facilities defined as "major sources" under the Act must apply for permits within one year from when EPA approves the state permit programs. Since most state programs were not approved until after November 1994, Title V permit applications, for the most part, began to be due in late 1995. Due dates for filing complete applications vary significantly from state to state, based on the status of review and approval of the state's Title V program by EPA.

A facility is designated as a major source for Title V if it releases a certain amount of any one of the CAAA regulated pollutants (SO_x, NO_x, CO, VOC, PM_{10}, hazardous air pollutants, extremely hazardous substances, ozone depleting substances, and pollutants covered by NSPSs) depending on the region's air quality category. Title V permits may set limits on the amounts of pollutant emissions; require emissions monitoring, and record keeping and reporting. Facilities are required to pay an annual fee based on the magnitude of the facility's potential emissions. It is estimated that approximately 35 shipyards will be designated as major sources and therefore must apply for a Title V permit.

Clean Water Act

Shipbuilding and repair facility wastewater released to surface waters is regulated under the CWA. National Pollutant Discharge Elimination System (NPDES) permits must be obtained to discharge wastewater into navigable waters (40 Part 122). Facilities that discharge to a POTW may be required to meet National Pretreatment Standards for some contaminants. General pretreatment standards applying to most industries discharging to a POTW are described in 40 CFR Part 403. In addition, effluent limitation guidelines, new source performance standards, pretreatment standards for new sources, and pretreatment standards for existing sources may apply to some shipbuilding and repair facilities that carryout electroplating or metal finishing operations. Requirements for the Electroplating Point Source Category and the Metal Finishing Point Source Category are listed under 40 CFR Part 413 and 40 CFR Part 433, respectively.

Storm water rules require certain facilities with storm water discharge from any one of 11 categories of industrial activity defined in 40 CFR 122.26 be subject to the storm water permit application requirements (see Section VI.A). Many shipbuilding and repair facilities fall within these categories. To determine whether a particular facility falls within one of these categories, the regulation should be consulted. Required treatment of storm water flows are expected to remove a large fraction of both conventional pollutants, such as suspended solids and biochemical oxygen demand (BOD), as well as toxic pollutants, such as certain metals and organic compounds.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA) provide the basic legal framework for the federal "Superfund" program to clean up abandoned hazardous waste sites (40 CFR Part 305). Metals and metal compounds often found in shipyards' air emissions, water discharges, or waste shipments for off-site disposal include chromium, manganese, aluminum, nickel, copper, zinc, and lead. Metals are frequently found at CERCLA's problem sites. When Congress ordered EPA and the Public Health Service's Agency for Toxic Substances and Disease Registry (ATSDR) to list the hazardous substances most commonly found at problem sites and that pose the greatest threat to human health, lead, nickel, and aluminum all made the list.

VI.C. Pending and Proposed Regulatory Requirements

Clean Water Act

Effluent limitation guidelines for wastewater discharges from metal products and machinery (MP&M) industries are being developed. MP&M industries have been divided into two groups that originally were to be covered under two separate phases of the rulemaking. Effluent guidelines for Phase I industries and Phase II industries (which includes the shipbuilding and repair industry) will now be covered under a single regulation to be proposed in October 2000 and finalized in December 2002. (Steven Geil, U.S. EPA, Office of Water, Engineering and Analysis Division, (202) 260-9817, email: geil.steve@epamail.epa.gov)

Clean Air Act

In August 1996, EPA published Control Technique Guidelines (CTG) for the control of VOC emissions from surface coating operations in the shipbuilding and ship repair industry. The CTG was issued to assist states in analyzing and determining reasonably available control technology (RACT) standards for major sources of VOCs in the shipbuilding and repair operations located within ozone NAAQS nonattainment areas. EPA estimates that there are approximately 100 facilities that will fall within this category in addition to the approximately 35 major sources identified for the NESHAP MACT standards. Within one year of the publication of the CTG, states must adopt a RACT regulation at least as stringent as the limits recommended in the CTG. Under Section 183(b)(4) of the Clean Air Act, EPA is required to issue the CTG for the shipbuilding and repair industry based on "best available control measures" (BACM) for emissions of VOCs and particulates. In developing the CTG, EPA determined that the MACT standard of the 1995 NESHAP for Shipbuilding and Repair Operations (Surface Coating) is the only technologically and economically feasible level of control for these sources. Therefore, for ship building and repair operations, EPA considers the RACT, BACM, and MACT standards to be identical. For particulate emissions, EPA determined the BACM to be no control. (Mohamed Serageldin, U.S. EPA, Office of Air Quality Planning and Standards, (919) 541-2379)

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VII. COMPLIANCE AND ENFORCEMENT HISTORY

Background

Until recently, EPA has focused much of its attention on measuring compliance with specific environmental statutes. This approach allows the Agency to track compliance with the Clean Air Act, the Resource Conservation and Recovery Act, the Clean Water Act, and other environmental statutes. Within the last several years, the Agency has begun to supplement single-media compliance indicators with facility-specific, multimedia indicators of compliance. In doing so, EPA is in a better position to track compliance with all statutes at the facility level, and within specific industrial sectors.

A major step in building the capacity to compile multimedia data for industrial sectors was the creation of EPA's Integrated Data for Enforcement Analysis (IDEA) system. IDEA has the capacity to "read into" the Agency's single-media databases, extract compliance records, and match the records to individual facilities. The IDEA system can match Air, Water, Waste, Toxics/Pesticides/EPCRA, TRI, and Enforcement Docket records for a given facility, and generate a list of historical permit, inspection, and enforcement activity. IDEA also has the capability to analyze data by geographic area and corporate holder. As the capacity to generate multimedia compliance data improves, EPA will make available more in-depth compliance and enforcement information. Additionally, sector-specific measures of success for compliance assistance efforts are under development.

Compliance and Enforcement Profile Description

Using inspection, violation and enforcement data from the IDEA system, this section provides information regarding the historical compliance and enforcement activity of this sector. In order to mirror the facility universe reported in the Toxic Chemical Profile, the data reported within this section consists of records only from the TRI reporting universe. With this decision, the selection criteria are consistent across sectors with certain exceptions. For the sectors that do not normally report to the TRI program, data have been provided from EPA's Facility Indexing System (FINDS) which tracks facilities in all media databases. Please note, in this section, EPA does not attempt to define the actual number of facilities that fall within each sector. Instead, the section portrays the records of a subset of facilities within the sector that are well defined within EPA databases.

As a check on the relative size of the full sector universe, most notebooks contain an estimated number of facilities within the sector according to the Bureau of Census (See Section II). With sectors dominated by small businesses, such as metal finishers and printers, the reporting universe within the EPA databases may be small in comparison to Census data. However, the group selected for inclusion in this data analysis section should be consistent with this sector's general make-up.

Following this introduction is a list defining each data column presented within this section. These values represent a retrospective summary of inspections and enforcement actions, and reflect solely EPA, State, and local compliance assurance activities that have been entered into EPA databases. To identify any changes in trends, the EPA ran two data queries, one for the past five calendar years (April 1, 1992 to March 31, 1997) and the other for the most recent twelve-month period (April 1, 1996 to March 31, 1997). The five-year analysis gives an average level of activity for that period for comparison to the more recent activity.

Because most inspections focus on single-media requirements, the data queries presented in this section are taken from single media databases. These databases do not provide data on whether inspections are state/local or EPA-led. However, the table breaking down the universe of violations does give the reader a crude measurement of the EPA's and states' efforts within each media program. The presented data illustrate the variations across EPA Regions for certain sectors.[4] This variation may be attributable to state/local data entry variations, specific geographic concentrations, proximity to population centers, sensitive ecosystems, highly toxic chemicals used in production, or historical noncompliance. Hence, the exhibited data do not rank regional performance or necessarily reflect which regions may have the most compliance problems.

Compliance and Enforcement Data Definitions

General Definitions

Facility Indexing System (FINDS) -- this system assigns a common facility number to EPA single-media permit records. The FINDS identification number allows EPA to compile and review all permit, compliance, enforcement and pollutant release data for any given regulated facility.

Integrated Data for Enforcement Analysis (IDEA) -- is a data integration system that can retrieve information from the major EPA program office databases. IDEA uses the FINDS identification number to link separate data records from EPA's databases. This allows retrieval of records from across media or statutes for any given facility, thus creating a "master list" of

[4] EPA Regions include the following states: I (CT, MA, ME, RI, NH, VT); II (NJ, NY, PR, VI); III (DC, DE, MD, PA, VA, WV); IV (AL, FL, GA, KY, MS, NC, SC, TN); V (IL, IN, MI, MN, OH, WI); VI (AR, LA, NM, OK, TX); VII (IA, KS, MO, NE); VIII (CO, MT, ND, SD, UT, WY); IX (AZ, CA, HI, NV, Pacific Trust Territories); X (AK, ID, OR, WA).

records for that facility. Some of the data systems accessible through IDEA are: AIRS (Air Facility Indexing and Retrieval System, Office of Air and Radiation), PCS (Permit Compliance System, Office of Water), RCRIS (Resource Conservation and Recovery Information System, Office of Solid Waste), NCDB (National Compliance Data Base, Office of Prevention, Pesticides, and Toxic Substances), CERCLIS (Comprehensive Environmental and Liability Information System, Superfund), and TRIS (Toxic Release Inventory System). IDEA also contains information from outside sources such as Dun and Bradstreet and the Occupational Safety and Health Administration (OSHA). Most data queries displayed in notebook sections IV and VII were conducted using IDEA.

Data Table Column Heading Definitions

Facilities in Search -- are based on the universe of TRI reporters within the listed SIC code range. For industries not covered under TRI reporting requirements (metal mining, nonmetallic mineral mining, electric power generation, ground transportation, water transportation, and dry cleaning), or industries in which only a very small fraction of facilities report to TRI (e.g., printing), the notebook uses the FINDS universe for executing data queries. The SIC code range selected for each search is defined by each notebook's selected SIC code coverage described in Section II.

Facilities Inspected --- indicates the level of EPA and state agency inspections for the facilities in this data search. These values show what percentage of the facility universe is inspected in a one-year or five-year period.

Number of Inspections -- measures the total number of inspections conducted in this sector. An inspection event is counted each time it is entered into a single media database.

Average Time Between Inspections -- provides an average length of time, expressed in months, between compliance inspections at a facility within the defined universe.

Facilities with One or More Enforcement Actions -- expresses the number of facilities that were the subject of at least one enforcement action within the defined time period. This category is broken down further into federal and state actions. Data are obtained for administrative, civil/judicial, and criminal enforcement actions. Administrative actions include Notices of Violation (NOVs). A facility with multiple enforcement actions is only counted once in this column, e.g., a facility with 3 enforcement actions counts as 1 facility.

Total Enforcement Actions -- describes the total number of enforcement actions identified for an industrial sector across all environmental statutes. A facility with multiple enforcement actions is counted multiple times, e.g., a facility with 3 enforcement actions counts as 3.

State Lead Actions -- shows what percentage of the total enforcement actions are taken by state and local environmental agencies. Varying levels of use by states of EPA data systems may limit the volume of actions recorded as state enforcement activity. Some states extensively report enforcement activities into EPA data systems, while other states may use their own data systems.

Federal Lead Actions -- shows what percentage of the total enforcement actions are taken by the United States Environmental Protection Agency. This value includes referrals from state agencies. Many of these actions result from coordinated or joint state/federal efforts.

Enforcement to Inspection Rate -- is a ratio of enforcement actions to inspections, and is presented for comparative purposes only. This ratio is a rough indicator of the relationship between inspections and enforcement. It relates the number of enforcement actions and the number of inspections that occurred within the one-year or five-year period. This ratio includes the inspections and enforcement actions reported under the Clean Water Act (CWA), the Clean Air Act (CAA) and the Resource Conservation and Recovery Act (RCRA). Inspections and actions from the TSCA/FIFRA/EPCRA database are not factored into this ratio because most of the actions taken under these programs are not the result of facility inspections. Also, this ratio does not account for enforcement actions arising from non-inspection compliance monitoring activities (e.g., self-reported water discharges) that can result in enforcement action within the CAA, CWA, and RCRA.

Facilities with One or More Violations Identified -- indicates the percentage of inspected facilities having a violation identified in one of the following data categories: In Violation or Significant Violation Status (CAA); Reportable Noncompliance, Current Year Noncompliance, Significant Noncompliance (CWA); Noncompliance and Significant Noncompliance (FIFRA, TSCA, and EPCRA); Unresolved Violation and Unresolved High Priority Violation (RCRA). The values presented for this column reflect the extent of noncompliance within the measured time frame, but do not distinguish between the severity of the noncompliance. Violation status may be a precursor to an enforcement action, but does not necessarily indicate that an enforcement action will occur.

Media Breakdown of Enforcement Actions and Inspections -- four columns identify the proportion of total inspections and enforcement actions within EPA Air, Water, Waste, and TSCA/FIFRA/EPCRA databases. Each column is a percentage of either the "Total Inspections," or the "Total Actions" column.

VII.A. Shipbuilding and Repair Industry Compliance History

Table 11 provides an overview of the reported compliance and enforcement data for the shipbuilding and repair industry over the past five years (April 1992 to April 1997). These data are also broken out by EPA Region thereby permitting geographical comparisons. A few points evident from the data are listed below.

- About half of shipbuilding and repair facility inspections and almost 70 percent of enforcement actions occurred in Regions IV and VI, where most facilities in the database search (60 percent) were located.

- In Region III, a relatively large number of inspections (66) were carried out in relation to the number of facilities (6) found in this Region. This is reflected in the relatively low average time between inspections (5 months). However, the Region had the lowest rate of enforcement actions to inspections (0.02).

- Region X showed three facilities in the database search and only eight inspections over the past five years, giving the Region the highest average time between inspections (23 months). However, enforcement actions were brought against all three facilities in this time period, resulting in the highest enforcement to inspection rate (0.38).

Table 11: Five-Year Enforcement and Compliance Summary for the Shipbuilding and Repair Industry

A	B	C	D	E	F	G	H	I	J
Region	**Facilities in Search**	**Facilities Inspected**	**Number of Inspections**	**Average Months Between Inspections**	**Facilities with 1 or More Enforcement Actions**	**Total Enforcement Actions**	**Percent State Lead Actions**	**Percent Federal Lead Actions**	**Enforcement to Inspection Rate**
I	6	6	34	11	4	6	83%	17%	0.18
II	0	0	0	--	0	0	0%	0%	--
III	6	5	66	5	1	1	100%	0%	0.02
IV	13	9	49	16	5	8	100%	0%	0.16
V	1	1	8	8	0	0	0%	0%	--
VI	13	12	72	11	8	14	79%	21%	0.19
VII	0	0	0	--	0	0	0%	0%	--
VIII	0	0	0	--	0	0	0%	0%	--
IX	2	1	6	20	0	0	0%	0%	--
X	3	3	8	23	2	3	67%	33%	0.38
TOTAL	44	37	243	9	20	32	84%	16%	0.13

VII.B. Comparison of Enforcement and Compliance Activity Between Selected Industries

Tables 12 and 13 allow the compliance history of the shipbuilding and repair sector to be compared to the other industries covered by the industry sector notebook project. Comparisons between Tables 12 and 13 permit the identification of trends in compliance and enforcement records of the industry by comparing data covering the last five years (April 1992 to April 1997) to that of the past year (April 1996 to April 1997). Some points evident from the data are listed below.

- Of the sectors shown, the shipbuilding and repair industry had, by far, the smallest number of facilities (44) in the database search. (The facilities presented only include those facilities that report to TRI.)

- The shipbuilding and repair industry had one of the highest enforcement to inspection rates over the past five years (0.13). However, this rate decreased significantly over the past year (0.08).

- Compared to the other sectors shown, the industry was about average in terms of the percent of facilities with violations (86 percent) and enforcement actions (14 percent) in the past year, and in the average time between inspections over the past five years (9 months).

Tables 14 and 15 provide a more in-depth comparison between the shipbuilding and repair industry and other sectors by breaking out the compliance and enforcement data by environmental statute. As in the previous Tables (Tables 12 and 13), the data cover the last five years (Table 14) and the last one year (Table 15) to facilitate the identification of recent trends. A few points evident from the data are listed below.

- Inspections carried out under CAA and RCRA accounted for 81 percent and 89 percent of inspections over the past five years and one year, respectively. RCRA inspections made up only 14 percent of inspections in the past five years, but accounted for 25 percent of enforcement actions.

- Over the past year, a larger percentage of inspections were carried out under CAA (54 percent) compared to the past five years (39 percent).

- Meaningful comparisons of enforcement actions taken under each statute over the past year are not possible since only four enforcement actions (two under RCRA and two under CWA) were taken in this period.

Table 12: Five-Year Enforcement and Compliance Summary for Selected Industries

A	B	C	D	E	F	G	H	I	J
Industry Sector	**Facilities in Search**	**Facilities Inspected**	**Number of Inspections**	**Average Months Between Inspections**	**Facilities with 1 or More Enforcement Actions**	**Total Enforcement Actions**	**Percent State Lead Actions**	**Percent Federal Lead Actions**	**Enforcement to Inspection Rate**
Metal Mining	1,232	378	1,600	46	63	111	53%	47%	0.07
Coal Mining	3,256	741	3,748	52	88	132	89%	11%	0.04
Oil and Gas Extraction	4,676	1,902	6,071	46	149	309	79%	21%	0.05
Non-Metallic Mineral Mining	5,256	2,803	12,826	25	385	622	77%	23%	0.05
Textiles	355	267	1,465	15	53	83	90%	10%	0.06
Lumber and Wood	712	473	2,767	15	134	265	70%	30%	0.10
Furniture	499	386	2,379	13	65	91	81%	19%	0.04
Pulp and Paper	484	430	4,630	6	150	478	80%	20%	0.10
Printing	5,862	2,092	7,691	46	238	428	88%	12%	0.06
Inorganic Chemicals	441	286	3,087	9	89	235	74%	26%	0.08
Resins and Manmade Fibers	329	263	2,430	8	93	219	76%	24%	0.09
Pharmaceuticals	164	129	1,201	8	35	122	80%	20%	0.10
Organic Chemicals	425	355	4,294	6	153	468	65%	35%	0.11
Petroleum Refining	156	148	3,081	3	124	763	68%	32%	0.25
Rubber and Plastic	1,818	981	4,383	25	178	276	82%	18%	0.06
Stone, Clay, Glass and Concrete	615	388	3,474	11	97	277	75%	25%	0.08
Iron and Steel	349	275	4,476	5	121	305	71%	29%	0.07
Metal Castings	669	424	2,535	16	113	191	71%	29%	0.08
Nonferrous Metals	203	161	1,640	7	68	174	78%	22%	0.11
Fabricated Metal Products	2,906	1,858	7,914	22	365	600	75%	25%	0.08
Electronics	1,250	863	4,500	17	150	251	80%	20%	0.06
Automobile Assembly	1,260	927	5,912	13	253	413	82%	18%	0.07
Shipbuilding and Repair	**44**	**37**	**243**	**9**	**20**	**32**	**84%**	**16%**	**0.13**
Ground Transportation	7,786	3,263	12,904	36	375	774	84%	16%	0.06
Water Transportation	514	192	816	38	36	70	61%	39%	0.09
Air Transportation	444	231	973	27	48	97	88%	12%	0.10
Fossil Fuel Electric Power	3,270	2,166	14,210	14	403	789	76%	24%	0.06
Dry Cleaning	6,063	2,360	3,813	95	55	66	95%	5%	0.02

Table 13: One-Year Enforcement and Compliance Summary for Selected Industries

A	B	C	D	E		F		G	H
				Facilities with 1 or More Violations		Facilities with 1 or more Enforcement Actions			
Industry Sector	Facilities in Search	Facilities Inspected	Number of Inspections	Number	Percent*	Number	Percent*	Total Enforcement Actions	Enforcement to Inspection Rate
Metal Mining	1,232	142	211	102	72%	9	6%	10	0.05
Coal Mining	3,256	362	765	90	25%	20	6%	22	0.03
Oil and Gas Extraction	4,676	874	1,173	127	15%	26	3%	34	0.03
Non-Metallic Mineral Mining	5,256	1,481	2,451	384	26%	73	5%	91	0.04
Textiles	355	172	295	96	56%	10	6%	12	0.04
Lumber and Wood	712	279	507	192	69%	44	16%	52	0.10
Furniture	499	254	459	136	54%	9	4%	11	0.02
Pulp and Paper	484	317	788	248	78%	43	14%	74	0.09
Printing	5,862	892	1,363	577	65%	28	3%	53	0.04
Inorganic Chemicals	441	200	548	155	78%	19	10%	31	0.06
Resins and Manmade Fibers	329	173	419	152	88%	26	15%	36	0.09
Pharmaceuticals	164	80	209	84	105%	8	10%	14	0.07
Organic Chemicals	425	259	837	243	94%	42	16%	56	0.07
Petroleum Refining	156	132	565	129	98%	58	44%	132	0.23
Rubber and Plastic	1,818	466	791	389	83%	33	7%	41	0.05
Stone, Clay, Glass and Concrete	615	255	678	151	59%	19	7%	27	0.04
Iron and Steel	349	197	866	174	88%	22	11%	34	0.04
Metal Castings	669	234	433	240	103%	24	10%	26	0.06
Nonferrous Metals	203	108	310	98	91%	17	16%	28	0.09
Fabricated Metal	2,906	849	1,377	796	94%	63	7%	83	0.06
Electronics	1,250	420	780	402	96%	27	6%	43	0.06
Automobile Assembly	1,260	507	1,058	431	85%	35	7%	47	0.04
Shipbuilding and Repair	**44**	**22**	**51**	**19**	**86%**	**3**	**14%**	**4**	**0.08**
Ground Transportation	7,786	1,585	2,499	681	43%	85	5%	103	0.04
Water Transportation	514	84	141	53	63%	10	12%	11	0.08
Air Transportation	444	96	151	69	72%	8	8%	12	0.08
Fossil Fuel Electric Power	3,270	1,318	2,430	804	61%	100	8%	135	0.06
Dry Cleaning	6,063	1,234	1,436	314	25%	12	1%	16	0.01

**Percentages in Columns E and F are based on the number of facilities inspected (Column C). Percentages can exceed 100% because violations and actions can occur without a facility inspection.*

Table 14: Five-Year Inspection and Enforcement Summary by Statute for Selected Industries

Industry Sector	Facilities Inspected	Total Inspections	Total Enforcement Actions	Clean Air Act		Clean Water Act		RCRA		FIFRA/TSCA/ EPCRA/Other	
				% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions
Metal Mining	378	1,600	111	39%	19%	52%	52%	8%	12%	1%	17%
Coal Mining	741	3,748	132	57%	64%	38%	28%	4%	8%	1%	1%
Oil and Gas Extraction	1,902	6,071	309	75%	65%	16%	14%	8%	18%	0%	3%
Non-Metallic Mineral Mining	2,803	12,826	622	83%	81%	14%	13%	3%	4%	0%	3%
Textiles	267	1,465	83	58%	54%	22%	25%	18%	14%	2%	6%
Lumber and Wood	473	2,767	265	49%	47%	6%	6%	44%	31%	1%	16%
Furniture	386	2,379	91	62%	42%	3%	0%	34%	43%	1%	14%
Pulp and Paper	430	4,630	478	51%	59%	32%	28%	15%	10%	2%	4%
Printing	2,092	7,691	428	60%	64%	5%	3%	35%	29%	1%	4%
Inorganic Chemicals	286	3,087	235	38%	44%	27%	21%	34%	30%	1%	5%
Resins and Manmade Fibers	263	2,430	219	35%	43%	23%	28%	38%	23%	4%	6%
Pharmaceuticals	129	1,201	122	35%	49%	15%	25%	45%	20%	5%	5%
Organic Chemicals	355	4,294	468	37%	42%	16%	25%	44%	28%	4%	6%
Petroleum Refining	148	3,081	763	42%	59%	20%	13%	36%	21%	2%	7%
Rubber and Plastic	981	4,383	276	51%	44%	12%	11%	35%	34%	2%	11%
Stone, Clay, Glass and Concrete	388	3,474	277	56%	57%	13%	9%	31%	30%	1%	4%
Iron and Steel	275	4,476	305	45%	35%	26%	26%	28%	31%	1%	8%
Metal Castings	424	2,535	191	55%	44%	11%	10%	32%	31%	2%	14%
Nonferrous Metals	161	1,640	174	48%	43%	18%	17%	33%	31%	1%	10%
Fabricated Metal	1,858	7,914	600	40%	33%	12%	11%	45%	43%	2%	13%
Electronics	863	4,500	251	38%	32%	13%	11%	47%	50%	2%	7%
Automobile Assembly	927	5,912	413	47%	39%	8%	9%	43%	43%	2%	9%
Shipbuilding and Repair	**37**	**243**	**32**	**39%**	**25%**	**14%**	**25%**	**42%**	**47%**	**5%**	**3%**
Ground Transportation	3,263	12,904	774	59%	41%	12%	11%	29%	45%	1%	3%
Water Transportation	192	816	70	39%	29%	23%	34%	37%	33%	1%	4%
Air Transportation	231	973	97	25%	32%	27%	20%	48%	48%	0%	0%
Fossil Fuel Electric Power	2,166	14,210	789	57%	59%	32%	26%	11%	10%	1%	5%
Dry Cleaning	2,360	3,813	66	56%	23%	3%	6%	41%	71%	0%	0%

Table 15: One-Year Inspection and Enforcement Summary by Statute for Selected Industries

Industry Sector	Facilities Inspected	Total Inspections	Total Enforcement Actions	Clean Air Act		Clean Water Act		RCRA		FIFRA/TSCA/ EPCRA/Other	
				% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions
Metal Mining	142	211	10	52%	0%	40%	40%	8%	30%	0%	30%
Coal Mining	362	765	22	56%	82%	40%	14%	4%	5%	0%	0%
Oil and Gas Extraction	874	1,173	34	82%	68%	10%	9%	9%	24%	0%	0%
Non-Metallic Mineral Mining	1,481	2,451	91	87%	89%	10%	9%	3%	2%	0%	0%
Textiles	172	295	12	66%	75%	17%	17%	17%	8%	0%	0%
Lumber and Wood	279	507	52	51%	30%	6%	5%	44%	25%	0%	40%
Furniture	254	459	11	66%	45%	2%	0%	32%	45%	0%	9%
Pulp and Paper	317	788	74	54%	73%	32%	19%	14%	7%	0%	1%
Printing	892	1,363	53	63%	77%	4%	0%	33%	23%	0%	0%
Inorganic Chemicals	200	548	31	35%	59%	26%	9%	39%	25%	0%	6%
Resins and Manmade Fibers	173	419	36	38%	51%	24%	38%	38%	5%	0%	5%
Pharmaceuticals	80	209	14	43%	71%	11%	14%	45%	14%	0%	0%
Organic Chemicals	259	837	56	40%	54%	13%	13%	47%	34%	0%	0%
Petroleum Refining	132	565	132	49%	67%	17%	8%	34%	15%	0%	10%
Rubber and Plastic	466	791	41	55%	64%	10%	13%	35%	23%	0%	0%
Stone, Clay, Glass and Concrete	255	678	27	62%	63%	10%	7%	28%	30%	0%	0%
Iron and Steel	197	866	34	52%	47%	23%	29%	26%	24%	0%	0%
Metal Castings	234	433	26	60%	58%	10%	8%	30%	35%	0%	0%
Nonferrous Metals	108	310	28	44%	43%	15%	20%	41%	30%	0%	7%
Fabricated Metal	849	1,377	83	46%	41%	11%	2%	43%	57%	0%	0%
Electronics	420	780	43	44%	37%	14%	5%	43%	53%	0%	5%
Automobile Assembly	507	1,058	47	53%	47%	7%	6%	41%	47%	0%	0%
Shipbuilding and Repair	**22**	**51**	**4**	**54%**	**0%**	**11%**	**50%**	**35%**	**50%**	**0%**	**0%**
Ground Transportation	1,585	2,499	103	64%	46%	11%	10%	26%	44%	0%	1%
Water Transportation	84	141	11	38%	9%	24%	36%	38%	45%	0%	9%
Air Transportation	96	151	12	28%	33%	15%	42%	57%	25%	0%	0%
Fossil Fuel Electric Power	1,318	2,430	135	59%	73%	32%	21%	9%	5%	0%	0%
Dry Cleaning	1,234	1,436	16	69%	56%	1%	6%	30%	38%	0%	0%

VII.C. Review of Major Legal Actions

Major Cases/Supplemental Environmental Projects

This section provides summary information about major cases that have affected this sector, and a list of Supplemental Environmental Projects (SEPs).

VII.C.1. Review of Major Cases

As indicated in EPA's *Enforcement Accomplishments Report, FY1995 and FY1996* publications, two significant enforcement actions were resolved between 1995 and 1996 for the shipbuilding industry.

U.S. v. First Marine Shipyard Inc., et al. (E.D.NY): On September 30, 1996 the U.S. filed a complaint for CERCLA cost recovery and penalties related to Region II's cleanup of the barge *Nathan Berman*. The complaint seeks recovery of approximately $1,8 million from First Marine Shipyard, Marine Facilities Inc., Marine Movements, Inc., and Peter Frank and Jane Frank Kresch individually. It also includes a second cause of action against First Marine Shipyard for failure to comply with an administrative CERCLA §106 order issued to it in March of 1993.

Cascade General: Cascade General, a ship repair facility in Portland, Oregon, agreed to a penalty of $78,568 for alleged EPCRA violations. The company agreed to pay $39,284 in cash and install air filtration dust collector and solvent recovery systems and to switch to water-based paint to remediate the balance of the penalty. The SEPs will cost about $117,000 to implement. The dust collector will improve air quality in the facility by reducing dust in work areas. The solvent recovery system will reduce by 90% the amount of solvents discharged to the air by recovering batch solvents for reuse in the facility. For TRI reporting years 1988-1993, total releases were reported at 253,000 pounds.

VII.C.2. Supplementary Environmental Projects (SEPs)

Supplemental environmental projects (SEPs) are enforcement options that require the non-compliant facility to complete specific projects. Information on SEP cases can be accessed via the internet at EPA's Enviroene website: http://es.inel.gov/sep.

VIII. COMPLIANCE ASSURANCE ACTIVITIES AND INITIATIVES

This section highlights the activities undertaken by this industry sector and public agencies to voluntarily improve the sector's environmental performance. These activities include those independently initiated by industrial trade associations. In this section, the notebook also contains a listing and description of national and regional trade associations.

VIII.A. Sector-related Environmental Programs and Activities

National Shipbuilding Research Program Panel SP-1

The National Shipbuilding Research Program (NSRP) is a joint industry/government program aimed at improving the global competitiveness of American shipyards. NSRP's mission is to assist the shipbuilding and ship repair industry in achieving and maintaining global competitiveness with respect to quality, time, cost, and customer satisfaction. The program is also expected to significantly reduce the costs and delivery times of ships ordered by the U.S. Navy. NSRP's objectives are reached through individual projects which form the content of the shipbuilding technology program. Joint Government and industry meetings are held to identify final project descriptions. NSRP utilizes a panel structure to develop project proposals and implement projects. The Panel SP-1 focuses on shipbuilding and repair facilities and environmental effects.

The mission of Panel SP-1, Facilities and Environmental Effects, is to support the NSRP by providing leadership and expertise to the shipbuilding and repair industry, with respect to facilities and environmental issues. The following goals have been established by SP-1:

- increase participation of shipyards and other Maritime Associations by 100 percent;
- improve communication and visibility between NSRP Panels, with the Executive Control Board, within NSRP participating shipyards and beyond NSRP;
- be proactive in representing industry views regarding regulatory matters;
- identify, develop and implement cost-effective technologies in facilities and environmental areas;
- educate and assist the shipbuilding and repair industry and its customers in meeting environmental and regulatory requirements; and

- maintain and continue to improve SP-1 expertise.

Panel SP-1 has a number of active and proposed projects. The following is a list of active projects:

- Environmental Studies and Testing
- Environmental Training Modules
- Feasibility and Economic Study of the Treatment, Recycling & Disposal of Spent Abrasives
- Solid Waste Segregation & Recycling
- Title V Permit for Shipyards Strategy Guide for Development of Generated Permit
- Wastewater Treatment Technology Survey
- Impact on Shipyards from the Reauthorization of the Federal Clean Water Act
- Development of Guidance for Selecting Legitimate Recycling Products and Processes
- Developing a Shipyard Program for NPDES Compliance

More information on Panel SP-1 activities can be obtained from the Environmental Resources and Information Center (ERIC), a division of the Gulf Coast Region Maritime Technology Center at the University of New Orleans at (504) 286-6053.

National Defense Center for Environmental Excellence

The National Defense Center for Environmental Excellence (NDCEE) was established by the Department of Defense to provide the military and private sector industrial base clients with environmentally compliant technologies. NDCEE conducts environmental technology research and disseminates information on environmental technologies and regulations. At the Army's Armament Research, Development and Engineering Center at Picatinny Arsenal, NJ, NDCEE has established an industrial-scale facility for the demonstration of nonpolluting surface coatings. The NDCEE demonstration facility is used to validate cost, schedules and performance parameters of new coating technologies. NDCEE also provides assistance in the form of equipment, site engineers, economic analyses, training, and troubleshooting for those clients implementing demonstrated coating technologies at their industrial facility. In its powder coating demonstration line, industrial parts are cleaned, pretreated, sprayed with nonpolluting organic powders, then cured in a process than nearly eliminates volatile organic compounds and hazardous wastes. Contact: Dr. Dale A. Denny, Executive Director, NDCEE, (814) 269-2432.

MARITECH

MARITECH is a five-year jointly funded by the Federal Government and industry and is administered by the Department of Defense's Advanced Research Projects Agency (ARPA), in collaboration with MARAD. MARITECH provides matching Government funds to encourage the shipbuilding industry to direct and lead in the development and application of advanced technology to improve its competitiveness and to preserve its industrial base. In the near-term MARITECH aims to assist industry in penetrating the international marketplace with competitive ship designs, market strategies, and modern shipbuilding processes and procedures. In the long-term, the program is meant to encourage advanced ship and shipbuilding technology projects for promoting continuous product and process improvement in order to maintain and enlarge the U.S. share of the commercial and international market. MARITECH funded $30 million in FY94, $40 million in FY95, $50 million in FY96, and $50 million in FY97 for vessel design and shipyard technology projects.

VIII.B. EPA Voluntary Programs

33/50 Program

The "33/50 Program" is EPA's voluntary program to reduce toxic chemical releases and transfers of seventeen chemicals from manufacturing facilities. Participating companies pledge to reduce their toxic chemical releases and transfers by 33% as of 1992 and by 50% as of 1995 from the 1988 baseline year. Certificates of Appreciation have been given out to participants meeting their 1992 goals. The list of chemicals includes seventeen high-use chemicals reported in the Toxics Release Inventory. Table 16 lists those companies participating in the 33/50 program that reported the four-digit SIC code 3731 to TRI. Some of the companies shown also listed facilities that are not building or repairing ships. The number of facilities within each company that are participating in the 33/50 program and that report the shipbuilding and repair SIC code is shown. Where available and quantifiable against 1988 releases and transfers, each company's 33/50 goals for 1995 and the actual total releases and transfers and percent reduction between 1988 and 1994 are presented. TRI 33/50 data for 1995 was not available at the time of publication.

Twelve of the seventeen target chemicals were reported to TRI by shipbuilding and repair facilities in 1994. Of all TRI chemicals released and transferred by the shipbuilding and repair industry, xylenes (a 33/50 target chemical), was released and transferred most frequently (32 facilities), and was the top chemical by volume released and transferred. Toluene, the next most frequently reported 33/50 chemical, was reported by six facilities. The remaining 33/50 chemicals were each reported by four or fewer facilities.

Table 16 shows that 7 companies comprised of 15 facilities reporting SIC 3731 are participating in the 33/50 program. For those companies shown with more than one shipyard, all shipyards may not be participating in 33/50. The 33/50 goals shown for companies with multiple shipyards are company-wide, potentially aggregating more than one shipyard and facilities not carrying out shipbuilding and repair operations. In addition to company-wide goals, individual facilities within a company may have their own 33/50 goals or may be specifically listed as not participating in the 33/50 program. Since the actual percent reductions shown in the last column apply to all of the companies' shipbuilding and repair facilities and only shipbuilding and repair facilities, direct comparisons to those company goals incorporating non-shipbuilding and repair facilities or excluding certain facilities may not be possible. For information on specific facilities participating in 33/50, contact David Sarokin (202-260-6907) at the 33/50 Program Office.

Table 16: Shipbuilding and Repair Industry Participation in the 33/50 Program

Parent Company (Headquarters Location)	Company-Owned Shipyards Reporting 33/50 Chemicals	Company-Wide % Reduction Goal[1] (1988 to 1995)	1988 TRI Releases and Transfers of 33/50 Chemicals (pounds)	1994 TRI Releases and Transfers of 33/50 Chemicals (pounds)	Actual % Reduction for Shipyards (1988-1994)
Avondale Industries Inc. Avondale, LA	3	54	1,558,614	20,285	99
Bethlehem Steel Corp. Bethlehem, PA	2	50	92,000	129,020	-40
Fulcrum II Limited Partner. (Bath Iron Works) New York, NY	4	24	116,500	15,331	87
General Dynamics Corp. Falls Church, VA	2	84	316,777	8,182	97
Tenneco Inc. (Newport News) Houston, TX	1	8	896,292	268,950	70
U.S. Air Force Washington, DC	1	***	0	108,835	-
Unimar International Inc. Seattle, WA	1	*	0	0	-
TOTAL	15	--	2,980,183	550,603	86

Source: U.S. EPA 33/50 Program Office, 1996.

[1] Company-Wide Reduction Goals aggregate all company-owned facilities which may include facilities not building and repairing ships.

* = Reduction goal not quantifiable against 1988 TRI data.
** = Use reduction goal only.
*** = No numeric reduction goal.

Environmental Leadership Program

The Environmental Leadership Program (ELP) is a national initiative developed by EPA that focuses on improving environmental performance, encouraging voluntary compliance, and building working relationships with stakeholders. EPA initiated a one year pilot program in 1995 by selecting 12 projects at industrial facilities and federal installations which would demonstrate the principles of the ELP program. These principles include: environmental management systems, multimedia compliance assurance, third-party verification of compliance, public measures of accountability, pollution prevention, community involvement, and mentor programs. In return for participating, pilot participants received public recognition and were given a period of time to correct any violations discovered during these experimental projects.

EPA is making plans to launch its full-scale Environmental Leadership Program in 1997. The full-scale program will be facility-based with a 6-year participation cycle. Facilities that meet certain requirements will be eligible to participate, such as having a community outreach/employee involvement programs and an environmental management system (EMS) in place for 2 years. (Contact: http://es.inel.gov/elp or Debby Thomas, ELP Deputy Director, at 202-564-5041)

Project XL

Project XL was initiated in March 1995 as a part of President Clinton's *Reinventing Environmental Regulation* initiative. The projects seek to achieve cost effective environmental benefits by providing participants regulatory flexibility on the condition that they produce greater environmental benefits. EPA and program participants will negotiate and sign a Final Project Agreement, detailing specific environmental objectives that the regulated entity shall satisfy. EPA will provide regulatory flexibility as an incentive for the participants' superior environmental performance. Participants are encouraged to seek stakeholder support from local governments, businesses, and environmental groups. EPA hopes to implement fifty pilot projects in four categories, including industrial facilities, communities, and government facilities regulated by EPA. Applications will be accepted on a rolling basis. For additional information regarding XL projects, including application procedures and criteria, see the May 23, 1995 Federal Register Notice. (Contact: Fax-on-Demand Hotline 202-260-8590, Web: http://www.epa.gov/ProjectXL, or Christopher Knopes at EPA's Office of Policy, Planning and Evaluation 202-260-9298)

Climate Wise Program

Climate Wise is helping US industries turn energy efficiency and pollution prevention into a corporate asset. Supported by the technical assistance, financing information and public recognition that Climate Wise offers, participating companies are developing and launching comprehensive industrial energy efficiency and pollution prevention action plans that save money and protect the environment. The nearly 300 Climate Wise companies expect to save more than $300 million and reduce greenhouse gas emissions by 18 million metric tons of carbon dioxide equivalent by the year 2000. Some of the actions companies are undertaking to achieve these results include: process improvements, boiler and steam system optimization, air compressor system improvements, fuel switching, and waste heat recovery measures including cogeneration. Created as part of the President's Climate Change Action Plan, Climate Wise is jointly operated by the Department of Energy and EPA. Under the Plan many other programs were also launched or upgraded including Green Lights, Waste Wi$e and DoE's Motor Challenge Program. Climate Wise provides an umbrella for these programs which encourage company participation by providing information on the range of partnership opportunities available. (Contact: Pamela Herman, EPA, 202-260-4407 or Jan Vernet, DoE, 202-586-4755)

Energy Star Buildings Program

EPA's ENERGY STAR Buildings Program is a voluntary, profit-based program designed to improve the energy-efficiency in commercial and industrial buildings. Expanding the successful Green Lights Program, ENERGY STAR Buildings was launched in 1995. This program relies on a 5-stage strategy designed to maximize energy savings thereby lowering energy bills, improving occupant comfort, and preventing pollution -- all at the same time. If implemented in every commercial and industrial building in the United States, ENERGY STAR Buildings could cut the nation's energy bill by up to $25 billion and prevent up to 35% of carbon dioxide emissions. (This is equivalent to taking 60 million cars of the road). ENERGY STAR Buildings participants include corporations; small and medium sized businesses; local, federal and state governments; non-profit groups; schools; universities; and health care facilities. EPA provides technical and non-technical support including software, workshops, manuals, communication tools, and an information hotline. EPA's Office of Air and Radiation manages the operation of the ENERGY STAR Buildings Program. (Contact: Green Light/Energy Star Hotline at 1-888-STAR-YES or Maria Tikoff Vargas, EPA Program Director at 202-233-9178 or visit the ENERGY STAR Buildings Program website at http://www.epa.gov/appdstar/buildings/)

Green Lights Program

EPA's Green Lights program was initiated in 1991 and has the goal of preventing pollution by encouraging U.S. institutions to use energy-efficient lighting technologies. The program saves money for businesses and organizations and creates a cleaner environment by reducing pollutants released into the atmosphere. The program has over 2,345 participants which include major corporations, small and medium sized businesses, federal, state and local governments, non-profit groups, schools, universities, and health care facilities. Each participant is required to survey their facilities and upgrade lighting wherever it is profitable. As of March 1997, participants had lowered their electric bills by $289 million annually. EPA provides technical assistance to the participants through a decision support software package, workshops and manuals, and an information hotline. EPA's Office of Air and Radiation is responsible for operating the Green Lights Program. (Contact: Green Light/Energy Star Hotline at 1-888-STARYES or Maria Tikoff Vargar, EPA Program Director, at 202-233-9178 the)

WasteWi$e Program

The WasteWi$e Program was started in 1994 by EPA's Office of Solid Waste and Emergency Response. The program is aimed at reducing municipal solid wastes by promoting waste prevention, recycling collection and the manufacturing and purchase of recycled products. As of 1997, the program had about 500 companies as members, one third of whom are Fortune 1000 corporations. Members agree to identify and implement actions to reduce their solid wastes setting waste reduction goals and providing EPA with yearly progress reports. To member companies, EPA, in turn, provides technical assistance, publications, networking opportunities, and national and regional recognition. (Contact: WasteWi$e Hotline at 1-800-372-9473 or Joanne Oxley, EPA Program Manager, 703-308-0199)

NICE^3

The U.S. Department of Energy is administering a grant program called The National Industrial Competitiveness through Energy, Environment, and Economics (NICE^3). By providing grants of up to 45 percent of the total project cost, the program encourages industry to reduce industrial waste at its source and become more energy-efficient and cost-competitive through waste minimization efforts. Grants are used by industry to design, test, and demonstrate new processes and/or equipment with the potential to reduce pollution and increase energy efficiency. The program is open to all industries; however, priority is given to proposals from participants in the forest products, chemicals, petroleum refining, steel, aluminum, metal casting and glass manufacturing sectors. (Contact: http//www.oit.doe.gov/access/nice3, Chris Sifri, DOE, 303-275-4723 or Eric Hass, DOE, 303-275-4728.)

Design for the Environment (DfE)

DfE is working with several industries to identify cost-effective pollution prevention strategies that reduce risks to workers and the environment. DfE helps businesses compare and evaluate the performance, cost, pollution prevention benefits, and human health and environmental risks associated with existing and alternative technologies. The goal of these projects is to encourage businesses to consider and use cleaner products, processes, and technologies. For more information about the DfE Program, call (202) 260-1678. To obtain copies of DfE materials or for general information about DfE, contact EPA's Pollution Prevention Information Clearinghouse at (202) 260-1023 or visit the DfE Website at http://es.inel.gov/dfe.

VIII.C. Trade Associations

American Shipbuilding Association
600 Pennsylvania Ave. Suite 305
Washington, DC 20003
Phone: (202)-544-8170
Fax: (202)-544-9618

Members: 6
Contact: Frank Losey
(202)-544-9614

The American Shipbuilding Association (ASA) is a private, non-profit trade association comprising America's six largest private sector shipyards. The shipyards are: Avondale Industries, Bath Iron Works, Electric Boat, Ingalls Shipbuilding, National Steel & Shipbuilding Company, and Newport News Shipbuilding. These six shipyards employ the large majority of shipbuilding employees in the U.S. More than 98 percent of the Navy's shipbuilding budget is spent on ships constructed in ASA shipyards. The goals of ASA are to preserve and promote the U.S. naval shipbuilding industrial base as well as to educate the U.S. public and government to the importance of shipbuilding to the country. ASA publishes *American Shipbuilder Newsletter* monthly.

National Shipyard Association
1600 Wilson Blvd.
Arlington, VA 22209
Phone: (703) 351-6734
Fax: (703) 351-6736

Members: 44 companies
Staff: 6

The National Shipyard Association (NSA) is a national trade association representing the commercial shipbuilding, repair, and cleaning industry. NSA represents 44 shipyard companies that own and operate over 90 shipyards in 17 states along the Gulf, Pacific, and Atlantic coasts of the U.S. NSA also has among its membership 16 companies that supply services and products to the shipbuilding and repair industry. NSA aims to promote high standards of health, safety, and environmental awareness throughout the industry. NSA publishes a monthly newsletter, *NSA Newsline*.

Shipyard Association for
Environmental Responsibility
Post Office Box 250
Lockport, LA 70374
Phone: (504)-532-7272
Fax: (202)-532-7295

Members: 67
Staff: 5
Contact: Scott Theriot

The Shipyard Association for Environmental Responsibility (SAFER) was formed by 67 shipbuilding and repair facilities in the states of Alabama, Louisiana, Mississippi, and Texas. The goal of SAFER is to work cooperatively with the federal and state agencies to ensure that environmental standards truly reflect the environmental concerns of the vastly different sizes and capabilities of the Gulf Coast shipyards.

Shipbuilders Council of America	Members: 10
901 No. Washington St. Suite 204	Staff: 10
Arlington, VA 22314	Contact: Penny Eastman
Phone: (703) 548-7447	

The Shipbuilders Council of America (SCA) was founded in 1921 and is made up of companies engaged in the construction and repair of vessels and other marine craft; manufacturers of all types of propelling machinery, boilers, marine auxiliaries, marine equipment and supplies; and drydock operators. SCA promotes and maintains sound private shipbuilding and ship repairing industries and adequate mobilization potential of shipbuilding and repairing facilities, organizations, and skilled personnel in times of national emergencies. A newsletter, *Shipyard Chronicle*, is published weekly.

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IX. CONTACTS/ACKNOWLEDGMENTS/RESOURCE MATERIALS

For further information on selected topics within the shipbuilding and repair industry a list of contacts and publications are provided below.

Contacts[5]

Name	Organization	Telephone	Subject
Anthony Raia	U.S. EPA - Office of Compliance	(202) 564-6045	Multimedia Compliance
Mohamed Serageldin	U.S. EPA - Office of Air Quality Planning and Standards	(919) 541-2379	Regulatory Requirements (Air)
Steve Guile	U.S. EPA - Office of Water	(202) 260-9817	MP&M water regulations
Bhaskar Kura	University of New Orleans	(504) 280-6572	Multimedia pollutant outputs and pollution prevention

Section II: Introduction to the Shipbuilding and Repair Industry

U.S. Department of Commerce, International Trade Administration, *1994 U.S. Industrial Outlook*, 1995.

U.S. Department of Commerce, Bureau of the Census, *1992 Census of Manufacturers Industry Series: Ship and Boat Building, Railroad and Miscellaneous Transportation Equipment*, 1996.

U.S. Department of Transportation, Maritime Administration, *Outlook for the U.S. Shipbuilding and Repair Industry 1996*, April 1996.

U.S. Department of Transportation, Maritime Administration, *Report on Survey of U.S. Shipbuilding and Repair Facilities 1995*, December 1995.

ICAF Publications, *Shipbuilding Industry Study Report*, 1996, http://198.80.36.91/ndu/icaf/isshp.html, March 1997.

OECD, Overview of the Agreement Respecting Normal Competitive Conditions in the Commercial Shipbuilding and Repair Industry, http://www.oecd.org/dsti/sid/wp7.html, March 1997.

National Shipbuilding Research Program, Panel SP-4), *US Shipbuilding International Market Study 1996-2005*, June 1995. SPFA:0001.

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[5] Many of the contacts listed above have provided valuable information and comments during the development of this document. EPA appreciates this support and acknowledges that the individuals listed do not necessarily endorse all statements made within this notebook.

Section III: Industrial Process Description

Kura, Bhaskur (University of New Orleans) and Lacoste, Steve (Avondale Industries, Avondale, LA), *Typical Waste Streams in a Shipbuilding Facility*, 1996.

Storch, R.L., Hammon, C.P. , Bunch, H.M., & Moore, R.C., *Ship Production*, 2nd ed., The Society of Naval Architects and Marine Engineers, Jersey City, New Jersey, 1995.

Thornton, James R., *Ship and Boat Building and Repair, ILO Encyclopaedia of Occupational Health and Safety* 4th ed., International Labour Office, Geneva, Switzerland, 1996.

Development Document for the Proposed Effluent Limitations Guidelines and Standards for the Metal Products and Machinery Phase 1 Point Source Category, 1995, U.S. EPA, Office of Water, (EPA-821-R-95-021).

Water Environment Federation, *Pretreatment of Industrial Wastes, Manual of Practice No. FD-3*, Alexandria, Virginia, 1994.

National Shipbuilding Research Program, *Hazardous Waste Minimization Guide for Shipyards*, U.S. Navy and National Steel and Shipbuilding Company (NASSCO), January 1994.

National Shipbuilding Research Program, *Introduction to Production Processes and Facilities in the Steel Shipbuilding and Repair Industry*, U.S. Navy and National Steel and Shipbuilding Company (NASSCO), February 1993.

Levy, Doug, *Boat Paint Tied to Dolphin Deaths*, USA Today, December 31, 1996.

Section IV: Chemical Release and Transfer Profile

1994 Toxics Release Inventory Public Data Release, U.S. EPA Office of Pollution Prevention and Toxics, June 1996. (EPA 745-R-96-002)

Section V: Pollution Prevention Opportunities

National Shipbuilding Research Program, *Hazardous Waste Minimization Guide for Shipyards*, U.S. Navy and National Steel and Shipbuilding Company (NASSCO), January 1994.

Guides to Pollution Prevention, The Marine Maintenance and Repair Industry, U.S. EPA, Office of Research and Development, Cincinnati, OH, October 1991. (EPA/625/7-91/015)

Development Document for the Proposed Effluent Limitations Guidelines and Standards for the Metal Products and Machinery Phase 1 Point Source Category, 1995, U.S. EPA, Office of Water, (EPA-821-R-95-021).

Natan, Thomas E., Jr., *Examples of Successful Pollution Prevention Programs*, from Industrial Pollution Prevention Handbook, ed. Freeman, Harry M., McGraw-Hill, Inc., New York, 1995. pp. 142-144.

Identification of Pollution for Possible Inclusion in Enforcement Agreements Using Supplemental Environmental Projects (SEPs) and Injunctive Relief, Final Report, March 1997. U.S. EPA, Office of Enforcement and Compliance Assurance, (EPA-300-R-97-001).

Section VI: Summary of Applicable Federal Statutes and Regulations

Personal Correspondence with Mohamed Serageldin, U.S. EPA, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina, March 1997.

Personal Correspondence with Steve Guile, U.S. EPA, Office of Water, Engineering and Analysis Division, Washington, DC, April 1997.

Section VIII: Compliance Activities and Initiatives

National Shipbuilding Research Program, *SNAME Panel SP-1 Newsletter*, Volume 1, Number 1, Summer 1996.

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