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Emergency Planning and Community Right-To-Know Act Section 313 Reporting Guidance for the Presswood and Laminated Products Industry

DISCLAIMER

This guidance is intended to assist industry with EPCRA section313 reporting for the presswood and laminated products industry. In addition to providing an overview of aspects of the statutory and regulatory requirements of the EPCRA section 313 program, this document also provides recommendations and emission factors to assist industry with EPCRA reporting. These recommendations do not supercede any statutory or regulatory requirements, are subject to change, and are not independently binding on either EPA or covered facilities. Additionally, if a conflict exists between this guidance and the statutory or regulatory requirements, the conflict must be resolved in favor of the statute or regulation. Although EPA encourages industry to consider these recommendations and emission factors, in reviewing this document, industry should be aware that these recommendations and emission factors were developed to address common circumstances at typical facilities. The circumstances at a specific facility may significantly differ from those contemplated in the development of this document. Thus individual facilities may find that the recommendations and emission factors provided in this document are inapplicable to their processes or circumstances, and that alternative approaches or information are more accurate and/or more appropriate for meeting the statutory and regulatory requirements of EPCRA section 313. Facilities are encouraged to contact the Agency with any additional or clarifying questions about the recommendations and emission factors in this document, or if the facility believes that EPA has incorrectly characterized a particular process or recommendation. Additional guidance documents, including industry- and chemical-specific guidance documents, are available at the EPA TRI website: http://www.epa.gov/tri/.

TABLE OF CONTENTS

Page

TABLE OF CONTENTS (Continued)

Page

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGMENT

The U.S. EPA wishes to acknowledge the valuable contributions made by the staff and members of the Hardwood Plywood and Veneer Association (HPVA), the National Council of the Paper Industry for Air and Stream Improvement, Inc. (NCASI), APA - the Engineered Wood Association, and the American Hardboard Association (AHA). Without the insight provided by those in industry with actual experience in fulfilling the reporting requirements of EPCRA Section 313 we would not have been able to produce a document that we believe will be of great assistance to those who must prepare future EPCRA Section 313 reports.

OVERVIEW

This document supersedes the booklets entitled *Title III Section 313 Release Reporting Guidance, Estimating Chemical Releases from Presswood and Laminated Wood Products Manufacturing* (EPA-560/4-88-004i), dated March 1988. It is intended to assist establishments and facilities manufacturing presswood and laminated wood products in complying with the Emergency Planning and Community Right-To-Know Act (EPCRA) Section 313 and Pollution Prevention Act (PPA) Section 6607 reporting requirements, including the preparation of Form R or Form A certification statement. The EPCRA Section 313 program is commonly referred to as the Toxics Release Inventory (TRI).

The principal differences in this new document include:

- More detailed examples;
- New EPCRA Section 313 regulations and guidance developed since 1988;
- PPA Section 6607 reporting requirements;
- U.S. Environmental Protection Agency's (U.S. EPA's) interpretive guidance on various issues specific to presswood and laminated wood products operations; and
- EPCRA Section 313 issues regarding processes not discussed in the earlier documents.

This document is designed to be a supplement to the annual issue of the *Toxic Chemical Release Inventory Reporting Forms and Instructions,* (*TRI Forms and Instructions)*. It is organized to provide a step-by-step guide to compliance with EPCRA Section 313 and PPA Section 6607, starting with how to determine if your facility must report and ending with guidance for estimating release and other waste management activity quantities.

Presswood and laminated wood products include a variety of products used in many applications. Examples of the types of products that are covered in this document include particleboard, oriented strandboard, hardboard, medium density fiberboard, plywood, veneer, and engineered wood products. Other terms for these products include paneling and reconstituted wood products. Presswood and laminated wood products are used in everything from kitchen cabinets to building construction.

While the specific operations and raw materials used in these processes vary, environmental releases from the manufacture of presswood and laminated wood products originate in essentially three types of operations:

1. Drying;
2. Gluing/pressing; and
3. Finishing operations.

The majority of EPCRA Section 313 chemical or chemical category releases and other waste management activities from the manufacture of presswood and laminated wood products are formaldehyde and methanol air emissions. These originate primarily from wood dryers and hot presses. Finishing operations may also result in the release or management of smaller quantities of solvents used in filling, painting, laminating, and edge finishing operations.

It is recognized that not all presswood and laminated wood products manufacturing establishments will have all unit operations described in this document. However, each of the unit operations discussed are common operations found in presswood and laminated wood products manufacturing establishments covered by EPCRA Section 313 reporting requirements. To use this guidance, select the operation, or combination of operations, that most closely fits the activities at your establishment.

Chapter 1 introduces EPCRA Section 313 and PPA Section 6607 reporting and provides a brief background on Section 313 of EPCRA and Section 6607 of PPA.

Chapter 2 discusses reporting requirements and begins with how to determine whether your facility must report. This determination is based on your answers to a series of four questions:

- Is your facility's primary SIC Code on the EPCRA Section 313 list?
- Does your facility employ ten or more full-time employees or the equivalent?
- Does your facility manufacture, process, or otherwise use any EPCRA Section 313 chemicals or chemical categories?

- Does your facility exceed any of the activity thresholds for an EPCRA Section 313 chemical or chemical category?

If the answer to ANY ONE of the first three questions is "No" you are not required to submit an EPCRA Section 313 report for any chemicals. If you answer "Yes" to the first three questions and "No" to the fourth, you are not required to submit an EPCRA Section 313 report for that chemical or chemical category. If you answer "Yes" to ALL four questions, the next step is to determine what kind of report you must prepare, a Form R or Form A certification statement (40 CFR § 372.22) . Chapter 2 provides detailed information on the requirements for each kind of report. Chapter 2 concludes with a discussion on how to address trade secrets and the records that should be kept to support your reporting.

Chapter 3 discusses ways to calculate the activity thresholds (manufacture, process, and otherwise use) for the EPCRA Section 313 chemicals or chemical categories. Information is provided on how to determine which EPCRA Section 313 chemicals or chemical categories your facility manufactures, processes, or otherwise uses and how to calculate the quantities of each. Detailed information is also provided on the various exemptions:

- *De minimis* exemption;
- Article exemption;
- Facility-related exemption; and
- Activity-related exemptions.

Chapter 3 concludes with a discussion of how to determine which EPCRA Section 313 chemicals or chemical categories exceed a reporting threshold.

Chapter 4 discusses ways to estimate the release and other waste management activity amounts for those EPCRA Section 313 chemicals and chemical categories for which you must prepare a report. The first part of this chapter provides a step-by-step approach designed to minimize the risk of overlooking an activity involving an EPCRA Section 313 chemical or chemical category and any potential sources or types of release and other waste management activities. This procedure consists of:

- Preparation of a detailed **process flow diagram**;
- Identification of EPCRA Section 313 chemicals and chemical categories and potential **sources** of chemical release and other waste management activities;
- Identification of the potential **types** of release and other waste management activities from each source; and
- Determination of the most appropriate methods for **estimating the quantities** of EPCRA Section 313 chemical and chemical category release and other waste management activities.

The second part of Chapter 4 is organized by the three typical activities in presswood and laminated wood product manufacturing operations where EPCRA Section 313 chemicals and chemical categories are found: drying, pressing, and finishing. The commonly used EPCRA Section 313 chemicals and chemical categories, process descriptions, release and other waste management activity estimates, example calculations, and common problems are presented.

This document includes examples and common errors applicable to presswood and laminated wood products manufacturing operations. These examples are based on questions and information received from representatives of the Hardwood Plywood and Veneer Association (HPVA), the National Council of the Paper Industry for Air and Stream Improvement, Inc. (NCASI), APA - the Engineered Wood Association, and the American Hardboard Association (AHA), questions received by the EPCRA Hotline, and questions identified during voluntary site surveys of facilities that have filed EPCRA Section 313 reports in the past. Selected issues and guidance addressing these common problems are presented throughout this document as applicable.

CHAPTER 1 - INTRODUCTION

1.0 PURPOSE

The purpose of this guidance manual is two-fold. The primary purpose is to assist facilities manufacturing presswood and laminated wood products in complying with the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) and of Section 6607 of the Pollution Prevention Act of 1990 (PPA). This manual explains the EPCRA Section 313 reporting requirements and discusses specific release and other waste management activities encountered at many facilities that conduct these types of operations. Since each plant is unique, the recommendations presented may have to be modified for your particular facility. The secondary purpose is to provide information to other interested parties (such as management, legal professionals, inspectors, consultants, teachers, students, and the general public) about the processes and some of the toxic chemicals used in this industry.

This manual is intended solely for guidance and does not alter any statutory or regulatory requirements. The document should be used in conjunction with the appropriate statutes and regulations, but does not supersede them. Accordingly, the reader should consult other applicable documents (for example, the statute, the Code of Federal Regulations (CFR), relevant preamble language, and the current *Toxic Chemical Release Inventory Reporting Forms and Instructions* (*TRI Forms and Instructions*)(2000 version; EPA-745-B-01-001, February 2001)).

This document supersedes the 1988 document entitled *Title III Section 313 Release Reporting Guidance, Estimating Chemical Releases from Presswood and Laminated Wood Products Manufacturing (EPA-560/4-88-004i)*. This new document includes:

- More detailed examples;
- New EPCRA Section 313 regulations and guidance developed since 1988;
- PPA Section 6607 reporting requirements;

- U.S. Environmental Protection Agency's (U.S. EPA's) guidance on various issues specific to presswood and laminated wood products; and
- EPCRA Section 313 issues regarding processes not discussed in the earlier document.

This document supplements the *TRI Forms and Instructions* document that is updated and published annually by U.S. EPA. It is essential that you use the current version of the *TRI Forms and Instructions* to determine if (and how) you should report. Changes or modifications to EPCRA Section 313 reporting requirements are reflected in the annual *TRI Forms and Instructions* and should be reviewed before compiling information for the report.

The objectives of this manual are to:

- Reduce the level of effort expended by those facilities that prepare an EPCRA Section 313 report; and
- Increase the accuracy and completeness of the data being reported.

U.S. EPA cannot anticipate every potential issue or question that may apply to your facility. Therefore, this manual attempts to address those issues most prevalent or common for presswood and laminated wood products operations. Used in conjunction with the most current *TRI Forms and Instructions* and *Estimating Releases and Waste Treatment Efficiencies for the Toxic Chemical Release Inventory Form (2001 version)*, facilities should be able to provide complete and accurate information for EPCRA Section 313 reporting. Additional discussions on specific issues can be found in U.S. EPA's current edition of *EPCRA Section 313, Questions and Answers* (the 1998 edition is EPA 745-B-98-004), which is available on the U.S. EPA's TRI website (**http://www.epa.gov/tri**) or by contacting the **EPCRA Hotline at 1-800-424-9346**. In the Washington, DC metropolitan area, call 703-412-9810.

1.1 Background on EPCRA Section 313 and PPA Section 6607

The following overview of EPCRA Section 313 and Section 6607 of the PPA will provide you with a basic understanding of the objectives and requirements of this program, and will help you in completing your forms.

One of the primary goals of EPCRA is to increase the public's knowledge of, and access to, information on both the presence of toxic chemicals in their communities and on releases into the environment and other waste management activities of those chemicals. EPCRA Section 313 requires certain designated businesses (see SIC Code discussion, Chapter 2, Section 2.2) to submit annual reports (commonly referred to as Form R reports and Form A certification statements) on over 600 EPCRA Section 313 chemicals and chemical categories (40 CFR § 372.22). Covered facilities report the amounts released or otherwise managed as waste (40 CFR § 372.85). However, if a facility meets the reporting criteria for listed toxic chemicals, the facility must report even if there are no releases or other waste management quantities associated with these chemicals (40 CFR § 372.30(a));(40 CFR § 372.85(b)(15)). Throughout this document, whenever EPCRA Section 313 chemicals are discussed, the discussion includes toxic chemical categories, as appropriate. Toxic chemicals or chemical categories may be added or deleted from the list (EPCRA § 313 (d)(2)). Therefore, before completing your annual report, be sure to check the most current list included with the *TRI Forms and Instructions* when evaluating the toxic chemicals and chemical categories present at your facility. Copies of the reporting package can be requested from the EPCRA Hotline, 1-800-424-9346 or accessed through TRI website (http://www.epa.gov/tri/).

All facilities meeting the EPCRA Section 313 reporting criteria must report the annual release and other waste management activity quantities (routine and accidental) of EPCRA Section 313 chemicals and chemical categories to all environmental media. A separate report is required for each EPCRA Section 313 chemical or chemical category that is manufactured (including imported), processed, or otherwise used above the reporting threshold (40 CFR § 372.85). The reports must be submitted to U.S. EPA and State or Tribal governments, on or before July 1, for activities in the previous calendar year (40 CFR §

372.30(d)). On July 1, the owner/operator of the facility is primarily responsible for the report, even if the owner/operator did not own the facility during the reporting year (40 CFR § 372.5). However, property owners with no business interest in the operation of the facility, other than a lessor interest, are exempt from reporting requirements (40 CFR § 372.38(e)).

EPCRA also mandates U.S. EPA to establish and maintain a publicly available database system consisting of the information reported under Section 313 and under Section 6607 of the PPA. This database, known as the Toxics Release Inventory (TRI) database, can be accessed through the following sources:

- U.S. EPA Internet site, http://www.epa.gov/tri;
- TRI Explorer, http://www.epa.gov/triexplorer;
- Envirofacts Warehouse Internet site, http://www.epa.gov/enviro/; and
- Right-to-Know network, http://www.rtk.net/trisearch.html.

However, information qualifying as a trade secret, in accordance with the regulatory requirements, is protected from public release (40 CFR § 350). In addition to being a resource for the public, TRI data are also used in the research and development of regulations related to EPCRA Section 313 chemicals and chemical categories.

CHAPTER 2 - REPORTING REQUIREMENTS

2.0 PURPOSE

The purpose of this chapter is to help you determine if you must prepare an EPCRA Section 313 report(s) and, if so, what kind of a report(s) should be prepared (Form R or Form A certification statement). This chapter presents the EPCRA Section 313 reporting requirements to help you determine if these requirements apply to your facility. It also discusses the reporting of trade secrets and the records that must be kept.

To understand the following discussion you must first understand how EPCRA defines a facility. The term "facility" is defined as, "all buildings, equipment, structures, and other stationary items which are located on a single site or on contiguous or adjacent sites and which are owned or operated by the same person (or by any person which controls, is controlled by, or under common control with such person)" (40 CFR § 372.3). A facility may contain more than one establishment. An "establishment" is defined as, "an economic unit, generally at a single physical location, where business is conducted, or where services or industrial operations are performed" (40 CFR § 372.3).

U.S. EPA recognizes that for business reasons it may be easier and more appropriate for establishments at one facility to report separately. However, the combined quantities of EPCRA Section 313 chemicals and chemical categories manufactured, processed, or otherwise used in all establishments making up that facility must be considered for threshold determinations (40 CFR § 372.25(c); 40 CFR § 372.25(d)). Also, the combined release and other waste management activity quantities reported singly for each establishment must total those for the facility as a whole.

Note that if a facility is comprised of more than one establishment, once an activity threshold is met by the facility, providing the facility meets the SIC Code and employee threshold criteria, release and other waste management activities from all establishments at the facility must be reported (40 CFR § 372.25(c); 40 CFR § 372.25(d)). The preceding discussion

is particularly applicable to presswood and laminated wood products operations since they may be one of several industrial establishments using EPCRA Section 313 chemicals and chemical categories at a large wood processing facility.

Example - Multiple Establishments

Your facility has several different establishments, all with SIC Codes covered under EPCRA Section 313. One establishment used 7,000 pounds of toluene, an EPCRA Section 313 chemical, during the year to clean equipment. Another establishment purchased and used 4,000 pounds of toluene during the year as a solvent to separate a component from a mixture, with recovery of the toluene for reuse. Both activities constitute otherwise use of the EPCRA Section 313 chemical (as presented in Section 2.5 and described in detail in Chapter 3) and the total for the facility exceeded the 10,000-pound otherwise use threshold for the year. Thus, if your facility meets the employee threshold, you must file one Form R for the release and other waste management of toluene from your facility, or two Form Rs, one from each establishment. **Please note that you may be eligible to file one Form A certification statement for the facility but you cannot file a separate Form A certification statement for each establishment.**

2.1 Must You Report?

How do you determine if your facility must prepare an EPCRA Section 313 report? Your answers to the following four questions will help you decide (illustrated by Figure 2-1):

1) Is the primary SIC Code for your facility included in the list covered by EPCRA Section 313 reporting (see Section 2.2)?

2) Does your facility have 10 or more full-time employees or the equivalent (see Section 2.3)?

3) Does your facility manufacture (which includes importation), process, or otherwise use EPCRA Section 313 chemicals or chemical categories (see Section 2.4)?

4) Does your facility exceed any applicable thresholds of EPCRA Section 313 chemicals or chemical categories (for non-PBT chemicals; 25,000 pounds per year for manufacturing; 25,000 pounds per year for processing; or 10,000 pounds per year for otherwise use - see Section 2.5; for PBT chemicals - see Section 2.6 for applicable thresholds)?

If you answered "No" to any of the first three questions, you are not required to prepare any EPCRA Section 313 reports. If you answered "Yes" to ALL of the first three

questions, you must complete a threshold calculation for each EPCRA Section 313 chemical at the facility, and submit an EPCRA Section 313 report for each toxic chemical and chemical category exceeding the applicable threshold (40 CFR § 372.22).

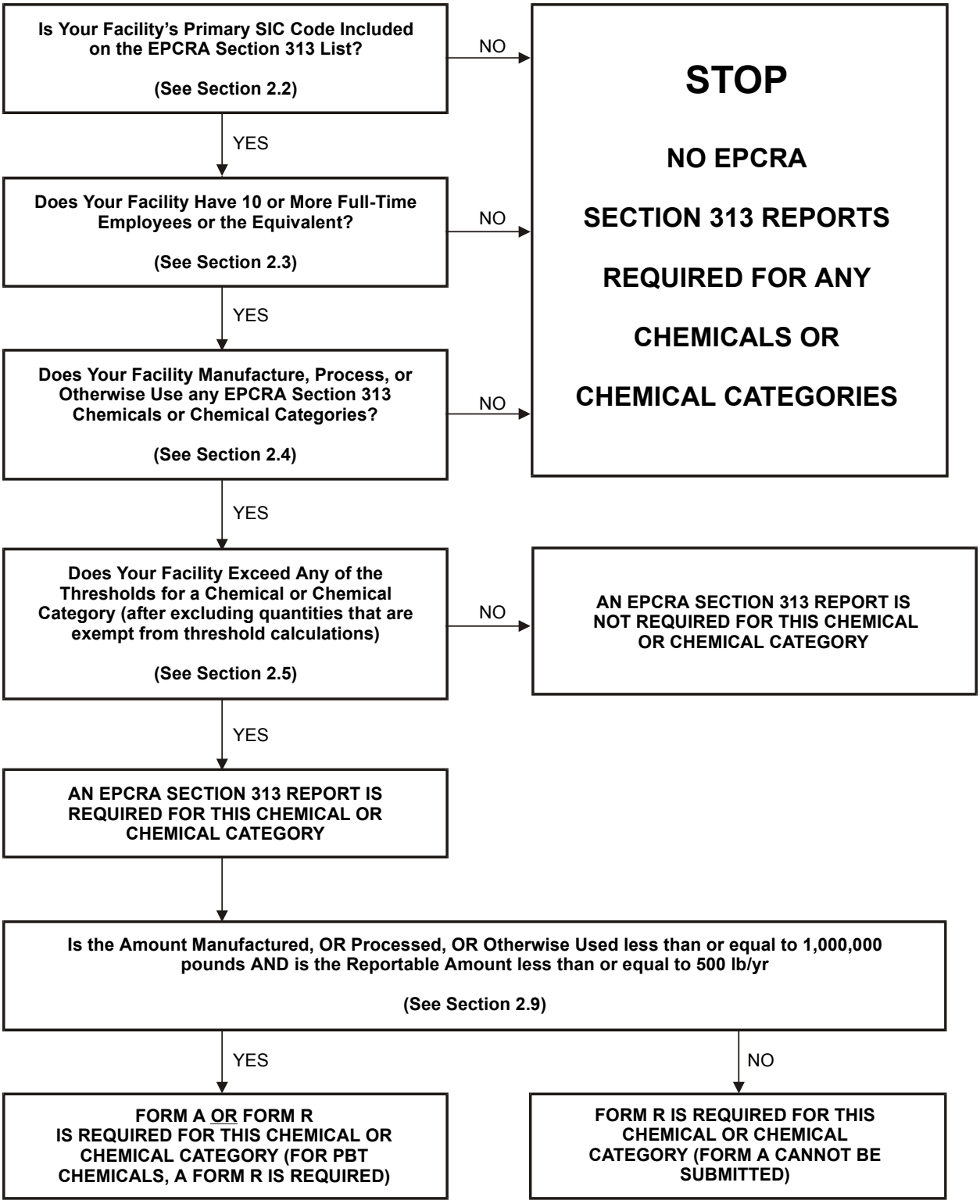

Figure 2-1. EPCRA Section 313 Reporting Decision Diagram

2.2 SIC Code Determination

Facilities with the SIC Codes presented in Table 2-1 are covered by the EPCRA Section 313 reporting requirements (40 CFR § 372.22(b)).

Table 2-1

SIC Codes Covered by EPCRA Section 313 Reporting

SIC Codes	Industry	Qualifiers
10	Metal Mining	Except SIC Codes 1011, 1081, and 1094
12	Coal Mining	Except SIC Code 1241
20 through 39	Manufacturing	None
4911, 4931, and 4939	Electric and Other Services and Combination Utilities	Limited to facilities that combust coal and/or oil for the purpose of generating electricity for distribution in commerce
4953	Refuse Systems	Limited to facilities regulated under RCRA Subtitle C
5169	Chemicals and Allied Products	None
5171	Petroleum Bulk Stations and Terminals	None
7389	Business Services	Limited to facilities primarily engaged in solvent recovery services on a contract or fee basis

Table 2-2 presents a listing of each SIC Code for facilities typically engaged in the manufacture of presswood and laminated wood products, with brief descriptions. You should determine the SIC Code(s) for your facility, based on the activities on site. For assistance in determining which SIC Code best suits your facility, refer to *Standard Industrial Classification Manual, 1987* published by the Office of Management and Budget or visit U.S. Census Bureau's web site at http://www.census.gov/epcd/www/sic.html.

Table 2-2

SIC Codes for Facilities That May Manufacture Presswood and Laminated Wood Products

SIC Code	SIC Description
2435	Hardwood (Veneer and/or Plywood)
2436	Softwood (Veneer and/or Plywood)
2439	Structural Wood Members, Not Elsewhere Classified
2493	Reconstituted Wood Products (Particleboard, Medium Density Fiberboard, Oriented Strandboard, etc.), Hardboard, and Fiberboard
2499	Wood Products, Not Elsewhere Classified

Note that auxiliary facilities can assume the SIC Code of another covered establishment if the primary function is to support the covered establishment's operations (40 CFR § 372.22). For the purpose of EPCRA Section 313, auxiliary facilities are defined as those that are primarily engaged in performing support services for another covered establishment or multiple establishments of a covered facility, and are in a different physical location from the primary facility (53 FR 4503; Standard Industrial Classification Manual, OMB,1987). In addition, auxiliary facilities perform an integral role in the primary facility's activities. In general, the auxiliary facility's basic administrative services (e.g., paperwork, payroll, employment) are performed by the primary facility. If an auxiliary facility's primary function is to support/service a facility with a covered SIC Code, the auxiliary facility assumes the covered SIC Code as its primary SIC Code and must consider the other reporting requirements ((40 CFR § 372.22; 53 FR 4503) to determine if it must comply with the EPCRA Section 313 reporting requirements. However, if the SIC Code for the primary facility is not covered by EPCRA Section 313, then neither the primary nor the auxiliary facility is required to submit a report.

If your facility has more than one SIC Code (i.e., several establishments with different SIC Codes are owned or operated by the same entity and are located at your facility), you are subject to reporting requirements if:

- All the establishments have SIC Codes covered by EPCRA Section 313; OR

- The total value of the products shipped or services provided at establishments with covered SIC Codes is greater than 50% of the value of the entire facility's products and services; OR

- Any one of the establishments with a covered SIC Code ships and/or produces products or provides services whose value exceeds the value of services provided, products produced and/or shipped by every other establishment within the facility (40 CFR § 372.22).

Example - Primary SIC Code

A facility has two establishments. The first, a retail wood dealer, is in SIC Code 5211. SIC Code 5211 is not a covered SIC Code. However, the second establishment, a wood products shop, is in SIC Code 2499, which is a covered SIC Code. The facility also determines the product is worth $500/unit as received from the establishment in the non-covered SIC Code and the value of the product is $1,500/unit after processing by the establishment in the covered SIC Code. The value added by the establishment in the covered SIC Code is more than 50% of the product value; therefore, the primary SIC Code is 2499, a covered SIC Code. Thus, the establishment is covered by EPCRA Section 313 reporting and the entire facility (i.e., both establishments) is subject to reporting.

A pilot plant within a covered SIC Code is considered a covered facility and is subject to reporting, provided it meets the employee and activity criteria (note that pilot plants are not eligible for the laboratory exemption, which is discussed in Chapter 3). Warehouses on the same site as facilities in a covered SIC Code are also subject to reporting. Likewise, warehouses that qualify as auxiliary facilities of covered facilities also must report, provided all applicable reporting requirements are met (53 FR 4503).

While you are currently required to determine your facility's reporting eligibility based on the SIC code system described above, it is important to be aware that the SIC code system will be replaced by a new system in the future. On April 9, 1997 (62 FR 17287), the Office of Management and Budget promulgated the North American Industrial Classification System (NAICS). NAICS is a new economic classification system that replaces the SIC code system as a means of classifying economic activities for economic forecasting and statistical purposes. The transition to the new NAICS may require regulatory actions. As a result, the SIC code system is still required to be used as the mechanism to determine your facility's reporting

eligibility. EPA will issue notice in the *Federal Register* to inform you and other EPCRA Section 313 facilities of its plans to adopt the NAICS and how facilities should make their NAICS code determination.

2.3 Number of Employees

If your facility meets SIC Code and activity threshold criteria, you are required to prepare an EPCRA Section 313 report if your facility has 10 or more full-time employees or the equivalent (40 CFR § 372.22(a)). A full-time employee equivalent is defined as a work year of 2,000 hours. If your facility's employees hours total 20,000 or more hours in a calendar year, you meet the 10 or more employee threshold criterion (40 CFR § 372.3).

The following information should be included in your employee calculations:

- Owners;
- Operations/manufacturing staff;
- Clerical staff;
- Temporary employees;
- Sales personnel;
- Truck drivers (employed by the facility);
- Other non-manufacturing or off-site facility employees directly supporting the facility;
- Paid vacation and sick leave; and
- Contractor employees (maintenance, construction, etc. but excluding contracted truck drivers and minor intermittent service vendors (e.g., trash handlers)).

In general, if an individual is employed or hired to work at the facility, all the hours worked by that individual for the facility (including paid leave and overtime) should be counted in determining if the 20,000-hour criterion has been met.

Example - Employee Equivalent Calculation

Your facility has six full-time employees working 2,000 hours/year. You also employ two full-time sales people and a delivery truck driver (employed by the facility) who are assigned to the plant, each working 2,000 hours/year but predominantly on the road or from their homes. The wastewater treatment system (on site and owned by the facility) is operated by a contractor who spends an average of two hours per day and five days per week at the plant. Finally, you built an addition to the plant warehouse during the year, using four contractor personnel who were on site full time for six months (working an average of 1,000 hours each). You would calculate the number of full-time employee equivalents as follows:

- Hours for your nine full-time employees (six plant personnel, two salespeople, and one delivery truck driver) are:
  (9 employees) × (2,000 hours/year) = 18,000 hours/year
- Hours for the wastewater treatment system operator are:
  (2 hours/day) × (5 days/week) × (52 weeks/year) = 520 hours/year; and
- Hours for the construction crew are:
  (4 contractors) × (1,000 hours) = 4,000 hours/year.

Your facility has a total of 22,520 hours for the year, which is above the 20,000 hours/year threshold; therefore, you meet the employee criterion.

2.4 Manufacturing, Processing, and Otherwise Use of EPCRA Section 313 Chemicals or Chemical Categories

If you are in a covered SIC Code and have 10 or more full-time employee equivalents, determine which EPCRA Section 313 chemicals and chemical categories are manufactured, processed, or otherwise used at your facility. One way to do this is to prepare a list which includes all toxic chemicals and chemical categories found in mixtures and trade name products at all establishments at the facility. This list should then be compared to the CURRENT list of EPCRA Section 313 chemicals and chemical categories found in the *TRI Forms and Instructions* document for that reporting year (also available from the EPCRA Hotline, 1-800-424-9346). Once you identify the EPCRA Section 313 chemicals and chemical categories at your facility, evaluate the activities involving each toxic chemical and chemical category and determine if any activity thresholds have been met.

The original list of chemicals and chemical categories subject to EPCRA Section 313 reporting was a combination of lists from New Jersey and Maryland. Refinements to the list have been made and changes are anticipated to continue. The list can be modified by U.S. EPA

initiatives, or industry or the public can petition U.S. EPA to modify the list (EPCRA § 313 (d) + (e)). When evaluating a chemical or chemical category for addition or deletion from the list, U.S. EPA must consider the chemical's potential acute human health effects, chronic human health effects, or its adverse environmental effects (EPCRA § 313(d)(2)). U.S. EPA reviews these petitions and initiates a rulemaking to add or delete the toxic chemical or chemical category from the list, or publishes an explanation why it denied the petition (EPCRA § 313(e)(1)).

Note that toxic chemicals and chemical categories are periodically added, delisted, or modified. Therefore, it is imperative that you refer to the appropriate reporting year's list. You can refer to the U.S. EPA's TRI website, http://www.epa.gov/tri, for updated guidance. Also, note that a list of synonyms for EPCRA Section 313 chemicals and chemical categories can be found in the U.S. EPA publication *Common Synonyms for Chemicals Listed Under Section 313 of the Emergency Planning and Community Right-To-Know Act*, (EPA 745-R-95-008). Table 2-3 lists the EPCRA Section 313 chemicals and chemical categories most frequently reported for presswood and laminated wood products manufacturing operations. This list is not intended to be all inclusive and should only be used as a guide.

Table 2-3

EPCRA Section 313 Chemicals and Chemical Categories Commonly Encountered in Presswood and Laminated Wood Products Manufacturing

Process	Section 313 Chemicals
Drying	Methanol, formaldehyde, acetaldehyde, acrolein, phenol, propionaldehyde
Pressing	Methanol, formaldehyde, diisocyanates, phenol, acetaldehyde, propionaldehyde
Finishing	Xylene, toluene, MEK, glycol ethers

2.5 Activity Categories

EPCRA Section 313 defines three activity categories for the listed toxic chemicals and chemical categories: manufacturing (which includes importing), processing, and otherwise use. For non-PBT chemicals, activity thresholds are 25,000 pounds per year for manufacturing, 25,000 pounds per year for processing, and 10,000 pounds per year for otherwise use[1] (40 CFR § 372.25). These thresholds apply to each toxic chemical or chemical category individually. The quantity of toxic chemicals or chemical categories stored on site or purchased is not relevant for threshold determinations. Rather, the determination is based solely on the annual quantity actually manufactured (including imported), processed, or otherwise used. Therefore, EPCRA Section 313 chemicals and chemical categories that are brought on site and stored, and are neither incorporated into a product for distribution in commerce nor otherwise used on site during the reporting year, are not considered towards any activity threshold (EPCRA § 313(a) & (b); EPCRA Section 313 Questions and Answers, Revised 1998 Version, Q&A 87 (1998), EPA 745-B-98-004, December 1998).

Expanded definitions, with examples, of each of the three activities are found in Chapter 3, Tables 3-2, 3-3, and 3-4. The terms are briefly defined in Table 2-4.

[1]These activity thresholds are for non-PBT chemicals. See Section 2.6 for the activity thresholds applicable to PBT chemicals.

Table 2-4

Activity Categories

Activity Category	Definition	Threshold[1] (lb/yr)
Manufacture	To produce, prepare, import, or compound an EPCRA Section 313 chemical or chemical category. For example, methanol generated from wood dryers would be considered a manufacturing activity. Manufacture also applies to an EPCRA Section 313 chemical or chemical category that is produced coincidentally during the manufacture, processing, otherwise use, or disposal of another chemical or mixture of chemicals as a byproduct, and an EPCRA Section 313 chemical or chemical category that remains in that other chemical or mixture of chemicals as an impurity during the manufacturing, processing, or otherwise use or disposal of any other chemical substance or mixture (40 CFR § 372.3). An example of coincidental manufacturing could be the production of ammonia or nitrate compounds in a wastewater treatment system.	25,000
Process	To prepare an EPCRA Section 313 chemical or chemical category, or a mixture or trade name product containing an EPCRA Section 313 chemical or chemical category, for distribution in commerce (40 CFR § 372.3). For example, formaldehyde which remains with a wood product would be considered processed. Processing includes the preparation for sale to your customers (and transferring between facilities within your company) of a chemical or formulation that you manufacture. For example, if you manufacture an EPCRA Section 313 chemical or chemical category or product, package it, and then distribute it into commerce, this chemical has been manufactured AND processed by your facility.	25,000
Otherwise Use	Generally, use of an EPCRA Section 313 chemical or chemical category that does not fall under the manufacture or process definitions is classified as otherwise use (40 CFR § 372.3). An EPCRA Section 313 chemical or chemical category that is otherwise used does not function by being incorporated into a product that is distributed in commerce, but may be used instead as a manufacturing or processing aid (e.g., catalyst), in waste processing, or as a fuel (including waste fuel). For example, xylene used as a carrier solvent for wood stain is classified as otherwise used. On May 1, 1997 U.S. EPA revised the interpretation of otherwise use. The following new otherwise use definition became effective with the 1998 reporting year (62 FR 23834, May 1, 1997): Otherwise use means "any use of a toxic chemical, including a toxic chemical contained in a mixture or other trade name product or waste, that is not covered by the terms manufacture or process. Otherwise use of a toxic chemical does not include disposal, stabilization (without subsequent distribution in commerce), or treatment for destruction unless: (1) The toxic chemical that was disposed, stabilized, or treated for destruction was received from off site for the purposes of further waste management; OR (2) The toxic chemical that was disposed, stabilized, or treated for destruction was manufactured as a result of waste management activities on materials received from off site for the purposes of further waste management activities."	10,000

[1]These activity thresholds are for non-PBT chemicals. See Section 2.6 for the activity thresholds applicable to PBT chemicals.

COMMON ERROR - Formaldehyde in Waste Products

Facilities often overlook air emissions from other waste management activities. For example, formaldehyde that remains in wood products may be released to the air as fugitive emissions when the wood products are disposed on-site. Based on the disposal method, engineering calculations can be used to determine the amount of formaldehyde, if any, released to air.

Assuming the toxic chemical has not been imported, the relabeling or redistribution of an EPCRA Section 313 chemical or chemical category where no repackaging occurs does not constitute manufacturing, processing, or otherwise use of that chemical (EPCRA § 313(a) & (b); 40 CFR § 372.3). This type of activity should not be included in threshold determinations.

Example - Relabeling

You buy a mixture in small containers that contains an EPCRA Section 313 chemical or chemical category. When it arrives you put your own label on each container and put the containers in a larger box with several other items you manufacture, and sell the larger box as a kit. The quantity of the EPCRA Section 313 chemical or chemical category in the small containers should not be counted toward the processing threshold (because you did not repackage the chemical) or the otherwise use threshold, nor should it be counted toward the manufacturing activity threshold unless the small containers were imported. However, you must consider other EPCRA Section 313 chemicals and chemical categories that you manufactured in the kit toward manufacturing and processing threshold determinations.

Example - Treatment of Wastes from Off Site

A covered facility receives a waste containing 12,000 pounds of Chemical A, an EPCRA Section 313 chemical, from off site. The facility treats the waste, destroying Chemical A and in the treatment process manufactures 10,500 pounds of Chemical B, another EPCRA Section 313 chemical. Chemical B is disposed on site.

Since the waste was received from off site for the purpose of waste management, the amount of Chemical A must be included in the otherwise use threshold determination for Chemical A. The otherwise use threshold is 10,000 pounds and since the amount of Chemical A exceeds this threshold, all release and other waste management activities for Chemical A must be reported.

Chemical B was manufactured in the treatment of a waste received from off site. The quantity of chemical B should be counted towards the manufacturing threshold. However, the facility disposed of Chemical B on site and waste received from off site for treatment for destruction, disposal, or stabilization is considered to be otherwise used (40 CFR § 372.3). Therefore, the amount of Chemical B must also be considered in the otherwise use threshold determination. Thus, the reporting threshold for Chemical B has also been exceeded and all release and other waste management activities for Chemical B must be reported.

Also, note that the threshold determinations for the three activity categories (manufacturing, processing, and otherwise use) are mutually exclusive. That is, you must conduct a separate threshold determination for each activity category and if you exceed any threshold, all release and other waste management activities of that EPCRA Section 313 chemical or chemical category at the facility must be considered for reporting (40 CFR § 372.25(c) & (d)).

2.6 Persistent, Bioaccumulative, and Toxic (PBT) Chemicals

U.S. EPA promulgated the final rule for Persistent, Bioaccumulative, and Toxic (PBT) chemicals in the October 29, 1999 Federal Register (64 FR 58666). This rule applies for the reporting year beginning January 1, 2000 (for EPCRA Section 313 reports that must be filed by July 1, 2001).

In this rule, U.S. EPA has added seven chemicals and lowered the reporting thresholds for 18 chemicals and chemical categories that meet the EPCRA Section 313 criteria for persistence and bioaccumulation. The PBT chemicals and their thresholds are listed in Table 2-5.

Table 2-5

Reporting Thresholds for EPCRA Section 313 Listed PBT Chemicals

Section 313 Chemical Name or Chemical Category	CASRN	Section 313 Reporting Threshold (in pounds unless noted other-wise)
Aldrin	309-00-2	100
Benzo(g,h,i)perylene	191-24-2	10
Chlordane	57-74-9	10
Dioxin and dioxin-like compounds category (manufacturing; and the processing or otherwise use of dioxin and dioxin-like compounds if the dioxin and dioxin-like compounds are present as contaminants in a chemical and if they were created during the manufacturing of that chemical)	NA	0.1 grams
Heptachlor	76-44-8	10

Section 313 Chemical Name or Chemical Category	CASRN	Section 313 Reporting Threshold (in pounds unless noted other-wise)
Hexachlorobenzene	118-74-1	10
Isodrin	465-73-6	10
Methoxychlor	72-43-5	100
Octachlorostyrene	29082-74-4	10
Pendimethalin	40487-42-1	100
Pentachlorobenzene	608-93-5	10
Polycyclic aromatic compounds category	NA	100
Polychlorinated biphenyl (PCBs)	1336-36-3	10
Tetrabromobisphenol A	79-94-7	100
Toxaphene	8001-35-2	10
Trifluralin	1582-09-8	100
Mercury	7439-97-6	10
Mercury compounds	NA	10

U.S. EPA also added two toxic chemicals to the polycyclic aromatic compounds (PACs) category that is listed above:

- Benzo(j,k)fluorene (fluoranthene)
- 3-methylchloanthrene

(40 CFR § 372.65(c)) These two toxic chemicals are not to be reported individually; rather, they must be included within the PACs compound category (40 CFR § 372.25(h)).

U.S. EPA finalized two thresholds based on the toxic chemicals' potential to persist and bioaccumulate in the environment. The two levels include setting Section 313 manufacture, process, and otherwise use thresholds to 100 pounds for PBT chemicals and to 10 pounds for that subset of PBT chemicals that are highly persistent and highly bioaccumulative. One exception is the dioxin and dioxin-like compounds category. EPA set the threshold for the dioxin and dioxin-like compound category at 0.1 gram.

The *de minimis* exemption is inapplicable to the reporting of the PBT chemicals (40 CFR § 372.38(a)). However, this action does not affect the applicability of the *de minimis* exemption to the supplier notification requirements ((40 CFR § 372.45(d)(1)). U.S. EPA also

excluded all PBT chemicals from eligibility for the alternate threshold of 1 million pounds (see Section 2.9) (40 CFR § 372.27(e)) and eliminated range reporting of PBT chemicals and chemical categories for on-site releases and transfers off-site for further waste management (40 CFR § 372.85(b)(15) & (16)).

Note that U.S. EPA is currently developing four guidance documents for PBT chemicals modified by the PBT rule:

- Dioxins and dioxin-like compounds (EPA-745-B-00-021);
- Polycyclic aromatic compounds (PACs) category (EPA-260-B-01-003);
- Mercury and mercury compounds (EPA-260-B-01-004); and
- Pesticides and Other PBT chemicals (EPA-260-B-01-005).

Please refer to these guidance documents as appropriate if they are applicable to your facility.

2.7 How Do You Report?

You must submit an EPCRA Section 313 report for each EPCRA Section 313 chemical or chemical category that exceeds a threshold for manufacturing, OR processing, OR otherwise use (providing you meet the employee and SIC Code criteria) (40 CFR § 372.25). Provided you do not exceed certain alternate activity thresholds and total annual reportable amounts, you may prepare a Form A certification (See Section 2.9) rather than a Form R for non-PBT chemicals (40 CFR § 372.27). The *TRI Forms and Instructions* contain detailed directions for the preparation and submittal of EPCRA Section 313 reports for the reporting year. The *TRI Forms and Instructions* are sent to all facilities that submitted EPCRA Section 313 reports the preceding year. However, if you do not receive a courtesy copy, you may request copies of the *TRI Forms and Instructions* from the EPCRA Hotline (1-800-424-9346).

2.8 Form R

Form R is the report in which the information on the release or other waste management activities for toxic chemicals required by EPCRA Section 313 is reported. If you are submitting a Form R, it is essential that you use the *TRI Forms and Instructions* for the

appropriate reporting year. U.S. EPA encourages the electronic submittal of the Form R, via the Automated Toxics Release Inventory Reporting Software (ATRS) or TRI Made Easy (TRI-ME) Software. Use of the ATRS and TRI-ME will save preparation time in data entry and photocopying and reduce errors via on-line validation routines and use of pick lists. In addition, the TRI-ME Software will guide you through the process of determining your reporting requirements and assist you in completing the Form Rs.

The Form R consists of two parts:

Part I, Facility Identification Information. This part may be photocopied and re-used for each Form R you submit, except for the signature, which must be original for each submission.

Part II, Chemical Specific Information. You must complete this part separately for each EPCRA Section 313 chemical or chemical category; it cannot be reused year to year even if reporting has not changed.

Submission of incomplete EPCRA Section 313 reports may result in issuance of a Notice of Technical Error (NOTE), Notice of Significant Error (NOSE), or Notice of Non-compliance (NON). See the current *TRI Forms and Instructions* for more detailed information on completing the Form R and submitting the EPCRA Section 313 report.

2.9 Form A Certification

U.S. EPA developed the Form A Certification Statement to reduce the annual reporting burden for facilities with minimal amounts of EPCRA Section 313 chemicals or chemical categories released and otherwise managed as waste (59 FR 61488, November 1994; applicable beginning reporting year 1994 and beyond). On Form A certification you certify that you are not required to report the release and other waste management information required by EPCRA Section 313 and PPA Section 6607. A facility must meet the following two criteria to use a Form A certification:

- First, the total annual reportable amount of the EPCRA Section 313 chemical or chemical category cannot exceed 500 pounds per year. The

"reportable amount" is defined as the sum of the on-site amounts released (including disposal), treated, combusted for energy recovery, and recycled, combined with the sum of the amounts transferred off site for recycling, energy recovery, treatment, and/or release (including disposal). This total corresponds to the total of data elements 8.1 through 8.7 on the 2000 version of the Form R (40 CFR § 372.27).

- Second, the amount of the EPCRA Section 313 chemical or chemical category manufactured, processed, OR otherwise used cannot exceed one million pounds. It is important to note that the quantities for each activity are mutually exclusive and must be evaluated independently. If the quantity for any one of the activities exceeds 1,000,000 pounds a Form A certification cannot be used (40 CFR § 372.27).

Example - Form A Certification Threshold

If the combined annual reportable amounts from all activities do not exceed 500 pounds, a facility that manufactures 900,000 pounds of an EPCRA Section 313 chemical or chemical category and processes 150,000 pounds of the same chemical or chemical category is eligible to use the Form A certification because the facility did not exceed the one million pounds for either activity, even though the total usage exceeds one million pounds.

The Form A Certification Statement must be submitted for each eligible EPCRA Section 313 chemical or chemical category (40 CFR § 372.27). The information on the Form A certification will be included in the publicly accessible TRI database; however, these data are marked to indicate that they represent certification statements rather than Form Rs. Note that separate establishments at a facility cannot submit separate Form A certification statements for the same chemical or chemical category; rather, only one Form A certification statement per EPCRA Section 313 chemical or chemical category can be submitted per facility (40 CFR § 372.27).

While Form A certification requests facility identification and chemical identification information, no release and other waste management quantity estimations to any media are required. You simply certify that the total annual reportable amount did not exceed 500 pounds and that amounts manufactured, processed, or otherwise used did not exceed 1,000,000 pounds. Once the facility has completed estimates to justify the submission of a Form A certification, there is a considerable time savings in using the Form A certification, especially in subsequent years, providing activities involving the toxic chemical or chemical category did

not change significantly. U.S. EPA strongly recommends that you document your initial rationale and refer to it every year, to verify that you have not modified a part of the process that would invalidate the initial rationale supporting submission of Form A certification.

2.10 Trade Secrets

If you submit trade secret information, you must prepare two versions of the substantiation form as prescribed in 40 CFR Part 350 (see 53 FR 28801, July 29, 1988) as well as two versions of the EPCRA Section 313 report. One set of reports should be "sanitized" (i.e., it should provide a generic name for the EPCRA Section 313 chemical or chemical category identity). This version will be made available to the public. The second version, the "unsanitized" version, should provide the actual identity of the EPCRA Section 313 chemical or chemical category and have the trade secret claim clearly marked in Part I, Section 2.1 of the Form R or Form A certification. The trade secrets provision only applies to the EPCRA Section 313 chemical or chemical category identity. All other parts of the Form R or Form A certification must be filled out accordingly (40 CFR § 350.3).

Individual states may have additional criteria for confidential business information and the submittal of both sanitized and unsanitized reports for EPCRA Section 313 chemicals and chemical categories. Facilities may jeopardize the trade secret status of an EPCRA Section 313 chemical or chemical category by submitting an unsanitized version to a state agency or tribal government that does not require an unsanitized version.

More information on trade secret claims, including contacts for individual state's submission requirements, can be found in the *TRI Forms and Instructions*.

2.11 Recordkeeping

Complete and accurate records are absolutely essential to compliance with EPCRA Section 313 reporting requirements. Compiling and maintaining good records will help you to reduce the effort and cost in preparing future reports, and to document how you arrived at

the reported data in the event of U.S. EPA compliance audits. U.S. EPA requires you to maintain records substantiating each EPCRA Section 313 report submission for a minimum of three years (40 CFR § 372.10). Each facility must keep copies of every EPCRA Section 313 report along with all supporting documents, calculations, work sheets, and other forms that you used to prepare the EPCRA Section 313 report (40 CFR § 372.10). U.S. EPA may request this supporting documentation during a regulatory audit.

Violation of EPCRA Section 313 reporting provisions may result in federal civil penalties of up to $27,500 per day for each violation (40 CFR § 372.18; 40 CFR § 19.4). State enforcement provisions may also be applicable depending on the state's EPCRA Section 313 reporting regulations.

Specifically, U.S. EPA requires the following records be maintained for a period of three years from the date of the submission of a report (summarized from 40 CFR § 372.10):

1) A copy of each EPCRA Section 313 report that is submitted.

2) All supporting materials and documentation used to make the compliance determination that the facility or establishment is a covered facility.

3) Documentation supporting the report submitted, which may include some or all of the following:

   - Claimed allowable exemptions,
   - Threshold determinations,
   - Calculations for each quantity reported as being released, either on or off site, or otherwise managed as waste,
   - Activity determinations, including dates of manufacturing, processing, or use,
   - The basis of all estimates,
   - Receipts or manifests associated with transfers of each EPCRA Section 313 chemical or chemical category in waste to off-site locations, and
   - Waste treatment methods, treatment efficiencies, ranges of influent concentrations to treatment, sequential nature of treatment steps, and operating data to support efficiency claims.

4) For facilities submitting a Form A certification, all supporting materials used to make the compliance determination that the facility or

establishment is eligible to submit a Form A certification, which may include:

- Data supporting the determination that the alternate threshold applies,
- Calculations of the annual reportable amounts,
- Receipts or manifests associated with the transfer of each EPCRA Section 313 chemical or chemical category in waste to off-site locations, and
- Waste treatment methods, treatment efficiencies, ranges of influent concentrations to treatment, sequential nature of treatment steps, and operating data to support efficiency claims.

EPCRA Section 313 reporting does not require additional testing or monitoring. Rather, in order to report, facilities may use readily available data collected pursuant to other provisions of law, or where such data are not readily available, reasonable estimates of the amounts involved (EPCRA § 313(g)(2)). Some facilities may have detailed monitoring data and off-site transfer records that can be used for estimates while others may only have purchase and inventory records. Examples of records that you could use, if applicable, might include:

- Each EPCRA Section 313 report submitted;
- EPCRA Section 313 Reporting Threshold Worksheets (sample worksheets can be found in Chapter 3 of this document as well as in the *TRI Forms and Instructions)*;
- EPCRA Section 313 Reporting Release and Other Waste Management Quantity Estimation Worksheets (sample worksheets can be found in Chapter 4 of this document);
- Engineering calculations and other notes;
- Formulation sheets;
- Purchase records from suppliers;
- Inventory data;
- Material Safety Data Sheets (MSDSs);
- New Source Performance Standards (NSPS);
- National Pollutant Discharge Elimination System (NPDES)/State Pollutant Discharge Elimination System (SPDES) permits and monitoring reports;
- EPCRA Section 312, Tier II reports;
- Monitoring records;
- Air permits;
- Clean Air Act Title V permit data;
- Flow measurement data;
- Resource Conservation Recovery Act (RCRA) hazardous waste generator's reports;

- Pretreatment reports filed with local governments;
- Invoices from waste management firms;
- Manufacturer's estimates of treatment efficiencies;
- Comprehensive Environmental Response, Conservation, and Liability Act of 1980 (CERCLA) Reportable Quantity (RQ) reports;
- RCRA manifests; and
- Process flow diagrams (including emissions, releases, and other waste management activities).

CHAPTER 3 - EPCRA SECTION 313 CHEMICAL OR CHEMICAL CATEGORY ACTIVITY THRESHOLD DETERMINATIONS

3.0 PURPOSE

This chapter provides a step-by-step procedure for determining if any EPCRA Section 313 chemicals or chemical categories exceed a reporting threshold. Threshold determinations are essentially a three step process:

Step 1) Identify any EPCRA Section 313 chemicals and chemical categories you manufacture/import, process, or otherwise use.

Step 2) Identify the activity category and any exempt activities for each EPCRA Section 313 chemical or chemical category.

Step 3) Calculate the quantity of each EPCRA Section 313 chemical or chemical category and determine which ones exceed an activity threshold.

3.1 Step 1 - Identify Which EPCRA Section 313 Chemicals or Chemical Categories are Manufactured (Including Imported), Processed, or Otherwise Used

Compile lists of all chemicals, mixtures, and raw materials (e.g., wood) at your facility. For facilities with many different chemicals, mixtures, and raw materials it is often helpful to prepare two lists: one with the pure (single ingredient) chemicals (including chemical compounds) and one with the mixtures and trade name products (this list should include chemicals present in raw materials). On the second list, under the name of each mixture/trade name product, write the names of all chemicals in that product. Next, compare the chemicals and chemical categories on both lists to the current EPCRA Section 313 chemicals and chemical categories list found in the *TRI Forms and Instructions* (remember that toxic chemicals and chemical categories may be periodically added and deleted and you should use the current reporting year's instructions). Highlight the EPCRA Section 313 chemicals and chemical categories that are on your lists.

Review the lists to be sure each toxic chemical and chemical category is shown by its correct EPCRA Section 313 name. For example, a common EPCRA Section 313 chemical used as a solvent in finishing operations is toluene. Toluene (Chemical Abstracts Service (CAS) Registry No. 108-88-3) has several synonyms including: methylbenzene; methylbenzol; phenylmethane; and toluol. It should be reported on Form R (or Form A certification), Item 1.2, by its EPCRA Section 313 chemical name, toluene (40 CFR § 372.85(b)(10)). Synonyms can be found in the U.S. EPA document *Common Synonyms for Chemicals Listed Under Section 313 of the Emergency Planning and Community Right-to-Know Act* (EPA 745-R-95-008).

While you must consider every toxic chemical on the EPCRA Section 313 chemical and chemical category list, you should be aware of the toxic chemicals and chemical categories typically used in presswood and laminated product manufacturing operations (40 CFR § 372.25(h)). As a guide, the most frequently reported EPCRA Section 313 chemicals and chemical categories for reporting year 1995 by presswood and laminated product manufacturing facilities, and the processes they are typically used in, are listed in Table 2-3.

A computerized spreadsheet may be helpful in developing your facility's toxic chemical and chemical category list and performing threshold calculations. The spreadsheet could show the toxic chemical, chemical category or chemical mixture with corresponding component concentrations; the yearly quantity manufactured, processed, or otherwise used; and the CAS Registry number. The spreadsheet could also be designed to identify the total quantity by activity category (amounts manufactured, processed, and otherwise used) for each EPCRA Section 313 chemical or chemical category in every mixture, compound, and trade name product. You may want to use the TRI-ME Software as one easy way to perform your chemical threshold determinations.

An initial investment of time will be required to develop this spreadsheet; however, the time and effort saved in threshold calculations in subsequent years will be significant. Such a system will also reduce the potential of inadvertently overlooking EPCRA Section 313 chemicals or chemical categories present in mixtures purchased from off-site sources.

To develop the toxic chemical and chemical category list and the associated activity categories you may want to consult the following:

- Material Safety Data Sheets (MSDSs);
- Facility purchasing records;
- New Source Performance Standards (NSPS);
- Inventory records;
- Air and water discharge permits;
- Individual manufacturing/operating functions; and
- Receipts or manifests associated with the transfer of each EPCRA Section 313 chemical and chemical category in waste to off-site locations.

The following is suggested useful information needed to prepare your EPCRA Section 313 reports and should be included for each toxic chemical and chemical category on your spreadsheet:

- The mixture name and associated EPCRA Section 313 chemical and chemical category names;
- The associated Chemical Abstract Service (CAS) Registry numbers;
- The trade name for mixtures and compounds;
- The throughput quantities; and
- Whether the toxic chemical or chemical category is manufactured, processed, or otherwise used at the facility (be sure to include quantities that are coincidentally manufactured and imported, as appropriate).

MSDSs provide important information for the type and composition of chemicals and chemical categories in mixtures, and for determining whether you have purchased raw materials that contain EPCRA Section 313 chemicals and chemical categories. As of 1989, chemical suppliers to facilities in SIC Major Group Codes 20 through 39 are required to notify manufacturing customers of any EPCRA Section 313 chemicals and chemical categories present above the applicable *de minimis* concentration in mixtures or trade name products distributed to facilities (40 CFR § 372.45(a)). The notice must be provided to the receiving facility and may be attached or incorporated into that product's MSDS (40 CFR § 372.45(c)(5)). If no MSDS is required, the notification must be in a letter that accompanies the first shipment of the product to your facility each year (40 CFR § 372.45(c)). This letter must contain the chemical name, CAS Registry number, and the weight or volume percent (or a range) of the EPCRA Section 313 chemical or chemical category in mixtures or trade name products (40 CFR § 372.45(b)).

Carefully review the entire MSDS. Although new MSDSs must list whether EPCRA Section 313 chemicals and chemical categories are present (40 CFR § 372.45(b)), the language and location of this notification is not currently standardized. Depending on the supplier, this information could be found in different sections of the MSDS. The most likely sections of an MSDS to provide information on EPCRA Section 313 chemicals and chemical categories are:

- Physical properties/chemical composition section;
- Regulatory section;
- Hazardous components section;
- Labeling section; and
- Additional information section.

Also, many EPCRA Section 313 chemicals or chemical categories are present as impurities in mixtures. These quantities must also be considered in threshold determinations unless the concentration is below the *de minimis* value (see Section 3.2.2.1)(40 CFR § 372.3); (40 CFR § 372.38(a)).

COMMON ERROR - Mixture Components

Facilities often overlook EPCRA Section 313 chemicals and chemical categories that are present in small quantities of bulk solutions. For example, a common chemical used in finishing operations is xylene. Xylene is often purchased in large quantities for use as a solvent, among other things. Most facilities correctly report for xylene; however, ethyl benzene is typically present at up to 15% in solutions of xylene commercially available. Many facilities have historically overlooked the presence of ethyl benzene in their xylene mixture.

Qualifiers

Several toxic chemicals on the EPCRA Section 313 chemical and chemical category list include qualifiers related to use or form. Some toxic chemicals are reportable ONLY if manufactured by a specified process or classified in a specified activity category (40 CFR § 372.25(f)). For example, isopropyl alcohol is only reportable if it is manufactured using the strong acid process, and saccharin is reportable only if it is manufactured (40 CFR § 372.65). Some other chemicals are only reportable if present in certain forms (40 CFR § 372.25(g)). For

example, only yellow or white phosphorus is reportable, while black or red phosphorus is not reportable (40 CFR § 372.65).

The qualifiers and associated toxic chemicals and chemical categories listed in 40 CFR § 372.65 are presented below. Please make special note of the discussion pertaining to vanadium and vanadium compounds because effective as of December 31, 1999, U.S. EPA removed the fume or dust qualifier for vanadium and added to the EPCRA Section 313 list all forms of vanadium, with the exception of vanadium when contained in alloys, and vanadium compounds.

- **Aluminum oxide (fibrous)** - Aluminum oxide is only subject to threshold determination and release and other waste management calculations when it is handled in fibrous forms. U.S. EPA has characterized fibrous aluminum oxide for purposes of EPCRA Section 313 reporting as a man-made fiber commonly used in high-temperature insulation applications such as furnace linings, filtration, gaskets, joints, and seals (55 FR 5221 (February 14, 1990)).

- **Ammonia (includes anhydrous ammonia and aqueous ammonia from water dissociable ammonium salts and other sources)** - On June 26, 1995, U.S. EPA qualified the listing for ammonia (CAS Registry No. 7664-41-7) and deleted ammonium sulfate (solution) (CAS Registry No. 7783-20-2) from the EPCRA Section 313 chemical list. Both the qualification and the deletion were effective as of reporting year 1994. The qualifier for ammonia means that anhydrous forms of ammonia are 100% reportable while only 10% of the total aqueous ammonia is reportable. Any evaporation of ammonia from aqueous ammonia solutions is considered anhydrous ammonia. This qualifier applies to both activity threshold determinations and release and other waste management calculations. Note that while ammonium sulfate is no longer an EPCRA Section 313 chemical, 10% of the aqueous ammonia formed from the dissociation of ammonium sulfate (and all other ammonium salts) is reportable, and must be included in both activity threshold determinations and release and other waste management calculations. Additionally, any ammonium nitrate must also be included in the threshold determination and the nitrate portion included in the release and other waste management calculations, for the nitrate compounds category. U.S. EPA has published guidance on reporting for ammonia and ammonium salts in *Emergency Planning and Community Right-to-Know, EPCRA Section 313, Guidance for Reporting Aqueous Ammonia,* EPA 745-R-95-012.

- **Asbestos (friable)** - Asbestos only needs to be considered when it is handled in the friable form. Friable refers to the physical characteristics of being able to crumble, pulverize, or reduce to a powder with hand pressure.

- **Fume or dust** - Two metals (aluminum and zinc) are qualified with "fume or dust." This definition excludes "wet" forms such as solutions or slurries, but includes powder, particulate, or gaseous forms of these metals. There is no particle size limitation for particulates. For example, use of zinc metal as a paint component is not subject to reporting unless the zinc is in the form of a fume or dust. However, even though elemental zinc is reportable only in the fume or dust form, all forms of zinc compounds are reportable. Note that the entire weight of all zinc compounds should be included in the threshold determination for zinc compounds, while only the metal portion of metal compounds is reported in the release and other waste management amounts. Prior to reporting year 2000, vanadium was also qualified with "fume or dust." As of reporting year 2000, this qualifier has been removed for vanadium such that all physical forms are now reportable. Please see the discussion on vanadium and vanadium compounds below, if applicable.

- **Hydrochloric acid (acid aerosols)** - On July 25, 1996, U.S. EPA promulgated a final rule delisting non-aerosol forms of hydrochloric acid (CAS Registry No. 7647-01-0) from the EPCRA Section 313 chemical list (effective for the 1995 reporting year). Therefore, threshold determinations and release and other waste management estimates now apply only to the aerosol forms. Under EPCRA Section 313, the term aerosol covers any generation of airborne acid (including mists, vapors, gas, or fog) without any particle size limitation. Therefore, any process that sprays hydrochloric acid "manufactures" hydrochloric acid aerosol and you should include this quantity in the manufacturing threshold determination.

- **Manufacturing qualifiers** - Two toxic chemicals, saccharin and isopropyl alcohol, contain qualifiers relating to manufacture. The qualifier for saccharin means that only manufacturers of the chemical are subject to the reporting requirement. The qualifier for isopropyl alcohol means that only facilities that manufacture the chemical by the strong acid process are required to report. Facilities that only process or otherwise use these chemicals are not required to report. Thus, a facility that uses isopropyl alcohol in cleanup operations should not report for isopropyl alcohol.

- **Nitrate Compounds (water dissociable; reportable only in aqueous solution)** - A nitrate compound is covered by this listing only when in water and if water dissociable. Although the complete weight of the

nitrate compound must be used for threshold determinations for the nitrate compounds category, only the nitrate portion of the compound must be considered for release and other waste management calculations. One issue recently raised by industry is how to report nitrate compounds in wastewater and sludge that is applied to farms as a nitrogen source (either on site or off site). Although during such use nitrate compounds may be taken up by plants and cycled back into the ecosystem, U.S. EPA considers that the nitrate compounds in wastewaters/sludges are managed as waste. In this scenario, nitrate compounds should be reported as being disposed to land (either on site or off site as appropriate). U.S. EPA has published guidance for these chemicals in *List of Toxic Chemicals Within the Water Dissociable Nitrate Compounds Category and Guidance for Reporting*, EPA 745-R-96-004.

- **Phosphorus (yellow or white)** - Only manufacturing, processing, or otherwise use of phosphorus in the yellow or white chemical forms require reporting. Black and red phosphorus are not subject to EPCRA Section 313 reporting.

- **Sulfuric acid (acid aerosols)** - On June 26, 1995, U.S. EPA promulgated a final rule delisting non-aerosol forms of sulfuric acid (CAS Registry No. 7664-93-9) from the EPCRA Section 313 toxic chemical list (effective for the 1994 reporting year). Therefore, threshold determinations and release and other waste management estimates now apply only to the aerosol forms. Under EPCRA Section 313, the term aerosol covers any generation of airborne acid (including mists, vapors, gas, or fog) without any particle size limitation. Therefore, any process that sprays sulfuric acid "manufactures" sulfuric acid aerosol and you should include this quantity in the manufacturing threshold determination. U.S. EPA has published guidance for acid aerosols in *Guidance for Reporting Sulfuric Acid*, EPA 745-R-97-007.

- **Vanadium and vanadium compounds** - Note that prior to reporting year 2000 (effective December 31, 1999 for EPCRA Section 313 reports that must be filed by July 1, 2001), the fume or dust qualifier also applied to vanadium. Effective December 31, 1999, U.S. EPA removed the "fume or dust" qualifier for vanadium and added to the EPCRA Section 313 list all forms of vanadium and vanadium compounds, with the exception of vanadium when contained in alloys. Therefore, vanadium that is present in fumes, dusts, or any other physical forms of alloys should not be considered for EPCRA Section 313 reporting. However, if vanadium is separated from the alloy, all physical forms of the vanadium are considered to be manufactured and the quantity manufactured should be applied to the 25,000-pound manufacturing threshold. If the vanadium is subsequently processed or otherwise used, the applicable quantity should also be applied to the processing or otherwise use threshold(s). If a

threshold is exceeded, all quantities released or otherwise managed as waste must be reported as appropriate.

3.2 Step 2 - Identify the Activity Category and Any Exempt Activities for Each EPCRA Section 313 Chemical and Chemical Category

The next step is to identify the activity category (or categories) and any exempt activities for each EPCRA Section 313 chemical and chemical category on your list. Table 3-1 lists the reporting thresholds for each of these activity categories (Tables 3-2 through 3-4 provide detailed definitions of subcategories for each activity category). Each threshold must be individually calculated (40 CFR § 372.25); they are mutually exclusive and are not additive.

Table 3-1

Reporting Thresholds

Activity Category	Threshold[1]
Manufacture (including import)	25,000 pounds per year
Process	25,000 pounds per year
Otherwise use	10,000 pounds per year

[1]These reporting thresholds are for non-PBT chemicals. See Section 2.6 for reporting thresholds applicable to PBT chemicals.

Example -Threshold Determination

If your facility manufactures 22,000 pounds of an EPCRA Section 313 chemical or chemical category and you also otherwise use 8,000 pounds of the same chemical or chemical category, you have not exceeded either threshold and an EPCRA Section 313 report for that chemical or chemical category is not required. However, if your facility manufactures 28,000 pounds per year of an EPCRA Section 313 chemical or chemical category and otherwise uses 8,000 pounds of the same chemical or chemical category, you have exceeded the manufacturing threshold and ALL release and other waste management quantities (except those specifically exempted) of that chemical or chemical category must be reported on the Form R, including those from the otherwise use activity.

Example - Xylene Isomers

Presswood and laminated wood products manufacturing operations use the EPCRA Section 313 chemical xylene, with the xylene (mixed isomers), CAS Registry No. 1330-20-7, being the most frequently reported type. Ortho-, meta-, and para-xylenes are listed on the EPCRA Section 313 chemicals and chemical categories list in addition to xylene (mixed isomers). The mixed isomers classification must be used when a mixture contains any combination of two or more of the isomers. The threshold determination for xylene must be calculated for each isomeric form individually unless the xylenes are manufactured, processed, or otherwise used as a mixture of xylene isomers. For example, a covered facility annually uses 8,000 pounds of para-xylene, 6,000 pounds of ortho-xylene, and 8,000 pounds of mixed isomers as carrier solvents in three separate processing lines. All three activities of xylene are classified as otherwise use as the carrier is intended to evaporate and not remain with the product. There are no other uses of any form of xylene in the facility. The otherwise use activity threshold of 10,000 pounds/year has not been reached for any of the xylenes and an EPCRA Section 313 report need not be prepared for xylene. However, should any two of the streams mix, the facility will exceed the otherwise use threshold for mixed isomers and an EPCRA Section 313 report must be prepared for the mixed isomer form of xylene.

COMMON ERROR - Threshold Determination for Recirculation

Facilities often incorrectly base threshold calculations on the amount of EPCRA Section 313 chemicals or chemical categories in a recirculation system rather than the amount actually used in the reporting year. The amount of the EPCRA Section 313 chemical or chemical category that is actually manufactured (including the quantity imported), processed, or otherwise used, not the amount in storage or in the system, should be the amount applied to the threshold determination. For example, a solvent containing an EPCRA Section 313 chemical or chemical category is used, recirculated on site, and reused as a solvent. The amount of EPCRA Section 313 chemical or chemical category recirculated in the on-site recycling process is not considered in the threshold determination because it is considered a "direct reuse" and is not reportable. Only the amount of new chemical added to the system should be included in the otherwise used threshold calculation. However, if you send a solvent containing an EPCRA Section 313 chemical or chemical category off site for distillation and subsequent recycling, it should be reported as a transfer to an off-site location for recycling (Part II, Sections 6.2 and 8.5 of the 1999 Form R) because the distillation is considered a waste management activity. The amount of solvent returned to you and subsequently used in the same reporting year must be included in the threshold determination. If the reporting threshold is exceeded, the total quantity recycled should be reported in Section 8.4, i.e., the amount recycled on site must be reported in Section 8.4 each time it is recycled.

Each of the activity categories is divided into subcategories. As discussed in the *TRI Forms and Instructions*, you are required to designate EACH category and subcategory that applies to your facility. Detailed definitions, including descriptions of subcategories for each activity and selected examples, are presented in Tables 3-2, 3-3, and 3-4.

Table 3-2

Description of Manufacturing Subcategories

Manufacturing Activity Subcategory	Description	Examples in Presswood/ Laminated Wood Products Manufacturing Operations*
Produced or imported for on-site use/processing	A toxic chemical or chemical category that is produced or imported and then further processed or otherwise used at the same facility.	
Produced or imported for sale/distribution	A toxic chemical or chemical category that is produced or imported specifically for sale or distribution outside the manufacturing facility.	
Produced as a byproduct	A toxic chemical or chemical category that is produced coincidentally during the production, processing, or otherwise use of another chemical substance or a mixture and is separated from that substance or mixture. EPCRA Section 313 chemicals or chemical categories produced and released as a result of waste treatment or disposal are also considered byproducts.	Methanol, formaldehyde, acetaldehyde
Produced as an impurity	A toxic chemical or chemical category that is produced coincidentally as a result of the manufacture, processing, or otherwise use of another chemical and remains primarily in the mixture or product with that other chemical.	Formaldehyde

* More complete discussions of the industry-specific examples can be found in Chapter 4 of this guidance manual.

Table 3-3

Description of Processing Subcategories

Processing Activity Subcategory	Description	Examples in Presswood/ Laminated Wood Products Manufacturing Operations*
Reactant	A natural or synthetic toxic chemical or chemical category used in chemical reactions for the manufacture of another chemical substance or product. Examples include feedstocks, raw materials, intermediates, and initiators.	Formaldehyde, phenol
Formulation component	A toxic chemical or chemical category that is added to a product or product mixture prior to further distribution of the product and acts as a performance enhancer during use of the product. Examples include additives, dyes, reaction diluents, initiators, solvents, inhibitors, emulsifiers, surfactants, lubricants, flame retardants, and rheological modifiers.	Inks, paints, synthetic patches
Article component	A toxic chemical or chemical category that becomes an integral component of an article distributed for industrial, trade, or consumer use.	
Repackaging only	A toxic chemical or chemical category that is processed or prepared for distribution in commerce in a different form, state, or quantity. May include, but is not limited to, the transfer of material from a bulk container, such as a tank truck, to smaller containers such as cans or bottles.	

* More complete discussions of the industry-specific examples can be found in Chapter 4 of this guidance manual.

Table 3-4

Description of Otherwise Use Subcategories

Otherwise Use Activity Subcategory	Description	Examples in Presswood/ Laminated Wood Products Manufacturing Operations*
Chemical processing aid	A toxic chemical or chemical category that is added to a reaction mixture to aid in the manufacture or synthesis of another chemical substance but is not intended to remain in or become part of the product or product mixture. Examples include process solvents, catalysts, inhibitors, initiators, reaction terminators, and solution buffers.	Diisocyanates, xylene, MEK, toluene, glycol ethers
Manufacturing aid	A toxic chemical or chemical category that aids the manufacturing process but does not become part of the resulting product and is not added to the reaction mixture during the manufacture or synthesis of another chemical substance. Examples include process lubricants, metalworking fluids, coolants, refrigerants, and hydraulic fluids.	Thermal oil
Ancillary or other use	A toxic chemical or chemical category that is used for purposes other than aiding chemical processing or manufacturing. Examples include cleaners, degreasers, lubricants, fuels (including waste fuels), and chemicals used for treating wastes.	Glycol ethers

* More complete discussions of the industry-specific examples can be found in Chapter 4 of this guidance manual.

3.2.1 Concentration Ranges for Threshold Determination

You should use the best, readily available information collected pursuant to other provisions of law or where such data are not available, reasonable estimates for all calculations in EPCRA Section 313 reporting. The concentration of an EPCRA Section 313 chemical or chemical category in a mixture or trade name product may be known as a specific concentration, as an average, as a range, or as an upper or lower bound concentration. If you know the specific concentration of an EPCRA Section 313 chemical or chemical category in a mixture or trade name product, you must use that value (40 CFR 372.30 (b)(i)). If only an average concentration is provided (e.g., by the supplier), you can use that value in the threshold determinations. If only the upper bound concentration is known, you must use this value in the threshold calculation (40

CFR 372.30(b)(3)(ii)). If only the lower bound concentration is provided or the concentration is given as a range or an upper and lower bound concentrations, EPA has developed the following guidance on the use of this type of information in threshold determinations.

If the concentration is given as a range or an upper and lower bound, EPA recommends that you use the mid-point in your calculations. For example, the MSDS for the trade name product states methanol is present in a concentration of not less than 20% and not more than 40%, or it may be stated as present at a concentration between 20 to 40%. EPA recommends you use the mid-point value of 30% methanol in your calculations for threshold determinations.

If only the lower bound concentration is given and the concentrations of the other components are given, EPA recommends that you subtract the other components total from 100% to calculate the upper bound concentration. EPA then recommends that you determine the midpoint for use in your calculations. For example, the MSDS states that a solvent contains at least 50% methyl ethyl ketone (MEK) and 20% non-hazardous surfactants. Subtracting the non-hazardous contents from 100% leaves 80% as the upper bound for MEK. The mid-point between upper (80%) and lower (50%) bounds is 65%, the value EPA recommends you use in your threshold calculations.

If only the lower bound concentration is given and the concentration of the other component(s) is not given, EPA recommends that you assume the upper bound for the EPCRA section 313 chemical or chemical category is 100% and use the mid-point. Alternatively, product quality requirements or information available from the most similar process stream may be used to determine the upper bound of the range.

Special guidance for concentration ranges that straddle the *de minimis* value is presented in Section 3.2.2.1.

3.2.2 Evaluation of Exemptions

When determining thresholds, you can exclude quantities of any EPCRA Section 313 chemicals and chemical categories that are manufactured, processed, or otherwise used in exempt activities. Exemptions are divided into four classes:

1. *De minimis* exemption;
2. Article exemption;
3. Facility-related exemption; and
4. Activity-related exemptions.

COMMON ERROR - Exempt Activities

If an EPCRA Section 313 chemical or chemical category is used in exempt activities, the quantity used in these activities does not need to be included in your threshold determinations or release and other waste management calculations, even if the chemical or chemical category is used in a reportable activity elsewhere in the facility (40 CFR § 372.38).

3.2.2.1 *De Minimis* Exemption

If the amount of EPCRA Section 313 chemical(s) or chemical categories present in a mixture or trade name product processed or otherwise used is below its *de minimis* concentration level, that amount is considered to be exempt from threshold determinations and release and other waste management calculations (40 CFR § 372.38(a)). Note that this exemption does not apply to manufacturing, except for importation or as an impurity as discussed below. Also note that the *de minimis* exemption does not apply to the manufacturing, processing, or otherwise use of the PBT chemicals (refer to Section 2.6) (40 CFR § 372.38(a)). The *de minimis* concentration for EPCRA Section 313 chemicals and chemical categories is 1%, except for Occupational Safety and Health Administration (OSHA)-defined carcinogens, which have a 0.1% *de minimis* concentration (40 CFR § 372.38(a)). Note that if a mixture contains more than one member of an EPCRA Section 313 chemical category, the weight percent of all members must be summed (40 CFR § 372.25(h)). If the total meets or exceeds the category's *de minimis* level, the *de minimis* exemption does not apply. U.S. EPA has published several detailed questions and answers and a directive in the current edition of *EPCRA Section 313 Questions and Answers* (1998 edition is EPA 745-B-98-004; see Appendix A, Directive #2) that

may be helpful if you have additional concerns about the *de minimis* exemption. The *TRI Forms and Instructions* list each EPCRA Section 313 chemical and chemical category with the associated *de minimis* value.

Once the *de minimis* level has been equaled or exceeded, the exemption no longer applies to that process stream, even if the EPCRA Section 313 chemical or chemical category later falls below the *de minimis* concentration. All release and other waste management activities that occur after the *de minimis* concentration has been equaled or exceeded are subject to reporting. The facility does not have to report release and other waste management activities that took place before the *de minimis* concentration was equaled or exceeded in the process stream.

Example - *De Minimis*

Your facility processes a mixture containing 1.1% nitric acid and 0.6% manganese. The *de minimis* exemption would apply to manganese because the concentration is below 1% which is the *de minimis* level for manganese; however, it would not apply to nitric acid. All of the nitric acid must be included in threshold determinations, and release and other waste management calculations.

The *de minimis* exemption also applies to EPCRA Section 313 chemicals and chemical categories that are coincidentally manufactured below the *de minimis* level only if that chemical is manufactured as an impurity in a mixture (53 FR 4504, February 16, 1988)). In addition, the exemption applies to EPCRA Section 313 chemicals and chemical categories below the *de minimis* concentration in an imported mixture or trade name product.

For some mixtures the concentration of EPCRA Section 313 chemicals and chemical categories may be available only as a range. U.S. EPA has developed guidance on how to determine quantities applicable to threshold determinations, and release and other waste management calculations when this range straddles the *de minimis* value. In general, only the quantity of the processed or otherwise used EPCRA Section 313 chemical or chemical category whose concentration exceeds the *de minimis* must be considered (40 CFR § 372.38(a)). Therefore, U.S. EPA allows facilities to estimate the quantity below the *de minimis* and exclude it from further consideration. The following examples illustrate this point.

Examples - *De Minimis* Concentration Ranges

Example 1:

A facility processes 8,000,000 pounds of a mixture containing 0.25 to 1.25% manganese. Manganese is subject to a 1% *de minimis* concentration exemption. The amount of mixture subject to reporting is the quantity containing manganese at or above the *de minimis* concentration:

8,000,000 × [(0.0125 - 0.0099) ÷ (0.0125 - 0.0025)]

The average concentration of manganese that is not exempt (at or above the *de minimis)* is:

(0.0125 + 0.01) ÷ 2

Therefore, the amount of manganese that is subject to threshold determination and release and other waste management estimates is:

$$\left[\frac{(8{,}000{,}000) \times (0.0125\&0.0099)}{(0.0125\&0.0025)}\right] \times \left[\frac{(0.0125\%0.01)}{(2)}\right] \text{ ' } 23{,}400 \text{ pounds}$$

= 23,400 pounds manganese (which is below the processing threshold)

In this example, because the facility's information pertaining to manganese was available to two decimal places, 0.99 was used to determine the amount below the *de minimis* concentrations. If the information was available to one decimal place, 0.9 should be used, as in Example 2 below.

Example 2:

As in Example 1, manganese is present in a mixture, of which 8,000,000 pounds is processed. The MSDS states the mixture contains 0.2% to 1.2% manganese. The amount of mixture subject to reporting (at or above *de minimis*) is:

(8,000,000) × (0.012 - 0.009) ÷ (0.012 - 0.002)

The average concentration of manganese that is not exempt (at or above *de minimis*) is:

(0.012 + 0.01) ÷ (2)

Therefore, the amount of manganese that is subject to threshold determinations and release and other waste management estimates is:

$$\left[\frac{(8{,}000{,}000) \times (0.012-0.009)}{(0.012-0.002)}\right] \times \left[\frac{(0.012+0.01)}{(2)}\right] = 26{,}400 \text{ pounds}$$

= 26,400 pounds manganese (which is above the processing threshold)

The exemption does not apply to EPCRA Section 313 chemicals and chemical categories coincidentally manufactured as byproducts and separated from the product, nor does it apply to EPCRA Section 313 chemicals and chemical categories coincidentally manufactured as a result of waste management activities, from either on site or off site. (Under EPCRA Section 313, U.S. EPA does not consider waste to be a mixture (see 53 FR 4501, 4504 (February 16, 1988); 62 FR 23,845-46 (May 1, 1997).) For example, many facilities treat waste solvents by

incinerating them. If coal is used as the primary fuel source to incinerate these waste solvents, combustion can result in the coincidental manufacture of sulfuric and hydrochloric acid aerosols and metal compounds. Since the *de minimis* exemption does not apply to the coincidental manufacture of EPCRA Section 313 chemicals or chemical categories as a byproduct or in a waste treatment process, the formation of these compounds must be considered for threshold determinations, and release and other waste management calculations.(40 CFR § 372.3)

3.2.2.2 Articles Exemption

An article is defined (40 CFR § 372.3) as a manufactured item that:

- Is formed to a specific shape or design during manufacture;
- Has end-use functions dependent in whole or in part upon its shape or design; and
- Does not release an EPCRA Section 313 chemical or chemical category under normal conditions of processing or otherwise use of the item at the facility.

If you receive a manufactured article from another facility or you produce the article in your facility and process or otherwise use it without changing the shape or design, and your processing or otherwise use does not result in the release of more than 0.5 pound of the EPCRA Section 313 chemical or chemical category in a reporting year from all like articles, then the EPCRA Section 313 chemical or chemical category in that article is exempt from threshold determinations and release and other waste management calculations (The 0.5 pound limit does not apply to each individual article, but applies to the sum of all releases from processing or use of all like articles) (40 CFR § 372.38(b)). Section 313 chemicals or chemical categories used to produce an article, however, do not qualify for the article exemption.

The shape and design can be changed somewhat during processing and otherwise use as long as part of the item retains the original dimensions. That is, as a result of processing or otherwise use, if an item retains its initial thickness or diameter, in whole or in part, then it still meets the article definition. If the item's original dimensional characteristics are totally altered during processing or otherwise use, the item would not meet the definition. As an example, items that do not meet the definition would be items that are cold extruded, such as lead ingots formed into wire or rods. However, cutting a manufactured item into pieces that are

recognizable as the article would not change the exemption status as long as the diameter and the thickness of the item remain unchanged (53 FR 4507 (February 16, 1988)). For instance, metal wire may be bent and sheet metal may be cut, punched, stamped, or pressed without losing the article status as long as no change is made in the diameter of the wire or tubing or the thickness of the sheet and no releases above 0.5 pound per year occur from all like articles.

Any processing or otherwise use of an article that results in a release above 0.5 pound per year for each EPCRA Section 313 chemical or chemical category for all like articles negates the exemption (40 CFR § 372.3, 372.38(b)). Cutting, grinding, melting, or other activities performed on a manufactured item could result in a release of an EPCRA Section 313 chemical or chemical category during normal conditions of processing or otherwise use and, therefore, could negate the article exemption if the total annual releases from all like articles exceed 0.5 pound in a calendar year. However, if all of the resulting waste is recycled or reused, either on site or off site, so that the release of the EPCRA Section 313 chemical or chemical category does not exceed 0.5 pound for the calendar year, then the article's exemption status may be maintained. If the processing or otherwise use of similar manufactured items results in a total release of less than or equal to 0.5 pound of any individual EPCRA Section 313 chemical or chemical category to any environmental media in a calendar year, U.S. EPA will allow this quantity to be rounded to zero and the manufactured items maintain their article status. The 0.5-pound limit does not apply to each individual article, but applies to the sum of all releases from processing or otherwise use of like articles for each EPCRA Section 313 chemical or chemical category. The current edition of *EPCRA Section 313 Questions and Answers* (1998 edition is EPA 745-B-98-004) presents several specific question and answers/discussions pertaining to the articles exemption.

Example - Articles Exemption

Your facility purchased plastic components that contain an EPCRA Section 313 chemical. The components, in their purchased form, are used in the manufacture of wood products at the facility. The plastic components are considered articles for Section 313 reporting purposes. However, if the releases from all like articles is greater than 0.5 pound per year the components will lose their article status.

3.2.2.3 Facility-Related Exemption – Laboratory Activity Exemption

EPCRA Section 313 chemicals and chemical categories that are manufactured, processed, or otherwise used in laboratories under the supervision of a technically qualified individual are exempted from the threshold determination (and subsequent release and other waste management calculations) (40 CFR § 372.38(d)). This exemption may be applicable in circumstances such as laboratory sampling and analysis, research and development, and quality assurance and quality control activities. It does not include pilot plant scale or specialty chemical production (40 CFR § 372.38(d)). It also does not include laboratory support activities. For example, chemicals used to maintain laboratory equipment are not eligible for the laboratory exemption.

Example - Laboratory Activity Exemption

An adhesives manufacturer has a research laboratory that uses various formulations of resins containing EPCRA Section 313 chemicals and chemical categories to test adhesive qualities for a particleboard manufacturer. The testing is under the supervision of a "technically qualified individual" in the laboratory. The EPCRA Section 313 chemicals and chemical categories used in this activity would be exempt from EPCRA Section 313 reporting and should not be included in any threshold determinations or release and other waste management calculations.

3.2.2.4 Activity-Related Exemptions (Otherwise Use Exemptions)

Some exemptions apply to the otherwise use of an EPCRA Section 313 chemical and chemical category. The specific quantities of EPCRA Section 313 chemicals and chemical categories used in these activities do not need to be included in facility threshold determinations (nor the associated release and other waste management calculations)(40 CFR § 372.38(c)). The following otherwise use activities are considered exempt:

- **EPCRA Section 313 chemicals and chemical categories used in routine janitorial or facility grounds maintenance**. Examples are bathroom cleaners, fertilizers, and garden pesticides similar in type or concentration to consumer products. Materials used to clean process equipment do not meet this exemption.

- **Personal use of items**. Examples are foods, drugs, cosmetics, and other personal items including those items within the facility such as in a facility operated cafeteria, store, or infirmary. Office supplies such as correction fluid are also exempt.

Example - Personal Use Exemption

Toluene in nail polish is exempt from threshold determinations and release and other waste management calculations.

- **Structural components of the facility**. Exemptions apply to EPCRA Section 313 chemicals and chemical categories present in materials used to construct, repair, or maintain structural components of a facility. An example common to all facilities would be the solvents and pigments used to paint buildings. Materials used to construct, repair, or maintain process equipment are not exempt.

- **EPCRA Section 313 chemicals and chemical categories used with facility motor vehicles**. This exemption includes the use of EPCRA Section 313 chemicals and chemical categories for the purpose of maintaining motor vehicles operated by the facility. Common examples include gasoline, radiator coolant, windshield wiper fluid, brake and transmission fluid, oils and lubricants, cleaning solutions, and solvents in paint used to touch up the vehicle. Motor vehicles include cars, trucks, forklifts, locomotives, and aircraft. Note that this exemption only applies to the OTHERWISE USE of EPCRA Section 313 chemicals and chemical categories. The coincidental manufacture of EPCRA Section 313 chemicals and chemical categories resulting from combustion of gasoline is not exempt and should be considered toward the manufacturing threshold.

Example - Motor Vehicle Exemption

Methanol is purchased for use as a processing aid and as a windshield washer anti-freeze in company vehicles. The amount used for the latter purpose would be subtracted from the facility total **BEFORE** the facility total is compared to the activity threshold. Even if the facility still exceeds the otherwise use threshold, the amount in the anti-freeze is exempt from release and other waste management calculations.

This exemption does NOT apply to stationary equipment. The use of lubricants and fuels for stationary process equipment (e.g., pumps and compressors) and stationary energy sources (e.g., furnaces, boilers, heaters), are NOT exempt.

Example - Process Equipment Chemical Use

Lubricants containing EPCRA Section 313 chemicals and chemical categories used on facility vehicles, or on-site structural maintenance activities that are not integral to the process, are exempt activities. However, lubricants used to maintain pumps and compressors that aid facility process operations are not exempt and the amount of the EPCRA Section 313 chemicals and chemical categories in the lubricant should be applied to the otherwise use threshold.

- **EPCRA Section 313 chemicals and chemical categories in certain air or water drawn from the environment or municipal sources**. Included are EPCRA Section 313 chemicals and chemical categories present in process water and non-contact cooling water drawn from the environment or a municipal source, or toxic chemicals and chemical categories present in air used either as compressed air or as an oxygen source for combustion.

> **Example - Toxic Chemicals in Process Water**
>
> A facility uses river water for one of its processes. This water contains approximately 100 pounds of an EPCRA Section 313 chemical or chemical category. The facility ultimately returns the water that contains the entire 100 pounds of the EPCRA Section 313 chemical or chemical category to the river. The EPCRA Section 313 chemical or chemical category in the water can be considered exempt because the EPCRA Section 313 chemical or chemical category was present as it was drawn from the environment. The facility does not need to consider the EPCRA Section 313 chemical or chemical category drawn with river water for threshold determinations or release and other waste management calculations.

3.2.3 Additional Guidance on Threshold Calculations for Certain Activities

This section covers three specific situations in which the threshold determination may vary from normal facility operations: reuse, remediation, and recycling activities of EPCRA Section 313 chemicals and chemical categories.

3.2.3.1 Reuse Activities

Threshold determinations of EPCRA Section 313 chemicals or chemical categories that are reused at the facility are based only on the amount of the EPCRA Section 313 chemical or chemical category that is added to the system during the year, not the total volume in the system. For example, a facility operates a refrigeration unit that contains 15,000 pounds of anhydrous ammonia at the beginning of the year. The system is charged with 2,000 pounds of anhydrous ammonia during the year. The facility has therefore otherwise used only 2,000 pounds of the EPCRA Section 313 chemical or chemical category and is not required to report (unless the facility has additional otherwise use activities of ammonia that, when taken together, exceed the reporting threshold). If, however, the whole refrigeration unit was recharged with 15,000 pounds of new or fresh anhydrous ammonia during the year, the facility would exceed the otherwise use threshold, and be required to report (40 CFR § 372.25(e)).

3.2.3.2 Remediation Activities

EPCRA Section 313 chemicals and chemical categories undergoing remediation are not being manufactured, processed, or otherwise used. Therefore, they are not included in the activity threshold determinations.

However, if you are conducting remediation of an EPCRA Section 313 chemical or chemical category that is also being manufactured, processed, or otherwise used by the facility above an activity threshold level, you must consider this activity for release and other waste management calculations. You must report any release or other waste management quantities of an EPCRA Section 313 chemical or chemical category due to remediation in Part II, Sections 5 through 8, accordingly, of the 1999 Form R. (40 CFR § 372.85(b)(15)+(16)) Those quantities would also be considered as part of the amount for determining Form A certification eligibility. EPCRA Section 313 chemicals and chemical categories used for remediation must be considered toward threshold determinations. (40 CFR § 372.3) If an EPCRA Section 313 chemical or chemical category exceeds one of the reporting thresholds elsewhere at the facility, all release and other waste management activity quantities of that chemical or chemical category must be reported, including release and other waste management activity quantities resulting from remediation.(40 CFR § 372.85(b)(15)+(16))

Excavation (that is considered part of the remedial action) of material already landfilled does not constitute a manufacturing, processing, or otherwise use activity. However, routine activities (e.g., dredging a lagoon), even if not performed every year, are not considered to be remedial actions and may be subject to reporting.

3.2.3.3 Recycling Activities

For on-site recycling and reuse systems, where the same EPCRA Section 313 chemical or chemical category is recycled and reused multiple times, only count the quantity recycled or reused once (at the time it is introduced into the system) for threshold calculations (40 CFR § 372.25(e)). (Please note that for reporting on-site waste management activities the

quantity of the EPCRA Section 313 chemical or chemical category should be counted every time it exits the recycling unit in Section 8 of Form R.) EPCRA Section 313 chemicals and chemical categories recycled off site and returned to the facility should be treated as newly purchased materials for purposes of EPCRA Section 313 threshold determinations.

3.3 Step 3 - Calculate the Quantity of Each EPCRA Section 313 Chemical and Chemical Category and Determine Which Ones Exceed an Activity Threshold

The final step is to determine the quantity and which EPCRA Section 313 chemicals and chemical categories exceed an activity threshold. At this point you should have:

1. Identified each EPCRA Section 313 chemical and chemical category at your facility.

2. Determined the activity category for each EPCRA Section 313 chemical and chemical category (manufactured, processed, or otherwise used).

Now, sum the amount for each EPCRA Section 313 chemical and chemical category by activity category, subtract all exempt quantities, and compare the totals to the applicable thresholds. Each EPCRA Section 313 chemical and chemical category exceeding **any one** of the activity thresholds requires the submission of an EPCRA Section 313 report. Provided you meet certain criteria, you may prepare a Form A certification rather than a Form R (see Section 2.9).

COMMON ERROR - Assuming a Threshold is Exceeded

U.S. EPA has published a report, *The 1994 and 1995 Toxic Release Inventory Data Quality Report*, EPA 745-R-98-002, with the site survey results of over 100 facilities to evaluate EPCRA Section 313 reporting quality. One of the findings of this survey was that facilities that simply assumed that chemical activity thresholds were exceeded were often in error. This resulted in many of these facilities filing EPCRA Section 313 reports when thresholds were actually not exceeded. Unless the facility has strong grounds to support such an assumption, the time spent in explicitly calculating the activity threshold is well spent.

COMMON ERROR - Zero Release and Other Waste Management Quantities

If you meet all reporting criteria and exceed any activity threshold for an EPCRA Section 313 chemical or chemical category, you must file an EPCRA Section 313 report for that chemical or chemical category, even if you have zero release and other waste management activity quantities. Exceeding the chemical activity threshold, not the quantity released or otherwise managed as waste, determines whether you report. Note that if the release and other waste management activity quantity is 500 pounds or less for each chemical or chemical category you may be eligible to use the alternate certification statement, Form A, rather than a Form R (see Section 2-9).

To determine if an EPCRA Section 313 chemical or chemical category exceeds a reporting threshold, calculate the annual activity amount of that chemical. Start with the amount of chemical or chemical category at the facility as of January 1, add any amounts brought on site during the year and the amount manufactured (including imported), and subtract the amount left in the inventory on December 31. If necessary, adjust the total to account for exempt activities (see Section 3.2.2 for a discussion of exemptions). You should then compare the result to the appropriate threshold to determine if you are required to submit an EPCRA Section 313 report for that chemical or chemical category. Keep in mind that the threshold calculations are independent for each activity category: manufactured, processed, and otherwise used. If more than one activity category applies, the amount associated with each category is determined separately.

Table 3-5 presents a work sheet that may be helpful when conducting your threshold determinations. Table 3-6 illustrates how the work sheet can be used for the following example:

Example - Threshold Worksheet

Assume your facility purchases, in the applicable reporting year, two mixtures that contain xylene (mixed isomers). You purchased 25,000 pounds of Mixture A (which is 50% xylene, by weight, according to the MSDS) and 110,000 pounds of Mixture B (which contains 20% xylene, by weight). Further, you determine that you process the entire quantity of Mixture A, while you process only half of Mixture B and otherwise use the other half. You do not qualify for any exempt activities.

In this example, you would have processed a total of 23,500 pounds of xylene (12,500 pounds from activities associated with Mixture A and 11,000 pounds from activities associated with Mixture B). You would also have otherwise used a total of 11,000 pounds (all from Mixture B). Therefore, you would not have exceeded the 25,000-pound threshold for processing; however, you would have exceeded the 10,000-pound threshold for otherwise use and would be required to submit an EPCRA Section 313 report that includes releases and other waste management quantities from all activities (including processing).

Table 3-5. EPCRA Section 313 Reporting Threshold Worksheet

Facility Name: _____ **Date Worksheet Prepared:** _____
EPCRA Section 313 Chemical or Chemical Category: _____ **Prepared By:** _____
CAS Registry Number: _____
Reporting Year: _____

Amounts of chemical or chemical category manufactured, processed, or otherwise used.

Mixture Name or Other Identifier	Information Source	Total Weight (lb)	Percent EPCRA Section 313 Chemical or Chemical Category by Weight	EPCRA Section 313 Chemical or Chemical Category Weight (lb)	Amount of the EPCRA Section 313 Chemical or Chemical Category by Activity (lb):		
					Manufactured	Processed	Otherwise Used
1.							
2.							
3.							
4.							
Subtotal:					(A)_____lb	(B)_____lb	(C)_____lb

Exempt quantity of chemical or chemical category that should be excluded.

Mixture Name as Listed Above	Applicable Exemption (de minimis, article, facility, activity)	Fraction or Percent Exempt (if Applicable)	Amount of the EPCRA Section 313 Chemical or Chemical Category Exempt from Above (lb):		
			Manufactured	Processed	Otherwise Used
1.					
2.					
3.					
4.					
Subtotal:			(A_1)_____lb	(B_1)_____lb	(C_1)_____lb
		Amount subject to threshold:	($A-A_1$)_____ lb	($B-B_1$)_____ lb	($C-C_1$)_____ lb
Compare to threshold for EPCRA Section 313 reporting.		Activity threshold quantities[1]:	25,000 lb	25,000 lb	10,000 lb

If any one of the thresholds is exceeded, reporting is required for all activities. [Do not submit this worksheet with Form R, retain it for your records.]

[1]These activity thresholds apply to non-PBT chemicals. See Section 2.6 for activity thresholds applicable to PBT chemicals; for dioxin and dioxin-like compounds, the activity threshold amount is 0.1 gram.

Table 3-6. Sample EPCRA Section 313 Reporting Threshold Worksheet

Facility Name: Plywood USA.
EPCRA Section 313 Chemical or Chemical Category: Xylene (mixed isomers)
CAS Registry Number: 1330-20-7
Reporting Year: 1999

Date Worksheet Prepared: May 1, 2000
Prepared By: A.B. Calloway

Amounts of chemical or chemical category manufactured, processed, or otherwise used.

Mixture Name or Other Identifier	Information Source	Total Weight (lb)	Percent EPCRA Section 313 Chemical or Chemical Category by Weight	EPCRA Section 313 Chemical or Chemical Category Weight (lb)	Amount of the EPCRA Section 313 Chemical or Chemical Category by Activity (lb):		
					Manufactured	Processed	Otherwise Used
1. Mixture A	MSDS	25,000	50%	12,500	---	12,500	---
2. Mixture B	MSDS	110,000	20%	22,000	---	11,000	11,000
3.							
4.							
Subtotal:					(A) 0 lb.	(B) 23,500 lb.	(C) 11,000 lb.

Exempt quantity of chemical or chemical category that should be excluded.

Mixture Name as Listed Above	Applicable Exemption (de minimis, article, facility, activity)	Fraction or Percent Exempt (if Applicable)	Amount of the EPCRA Section 313 Chemical or Chemical Category Exempt from Above (lb):		
			Manufactured	Processed	Otherwise Used
1. Mixture A	none				
2. Mixture B	none				
3.					
4.					
Subtotal:			(A_1) 0 lb.	(B_1) 0 lb.	(C_1) 0 lb.
		Amount subject to threshold:	(A-A_1) 0 lb.	(B-B_1) 23,500 lb.	(C-C_1) 11,000 lb.
Compare to threshold for EPCRA Section 313 reporting.		Activity threshold quantities[1]:	25,000 lb.	25,000 lb.	10,000 lb.

If any one of three thresholds is exceeded, reporting is required for all activities. [Do not submit this worksheet with Form R, retain it for your records.]

[1]These activity thresholds apply to non-PBT chemicals. See Section 2.6 for activity thresholds applicable to PBT chemicals; for dioxin and dioxin-like compounds, the activity threshold amount is 0.1 gram.

CHAPTER 4 - ESTIMATING RELEASE AND OTHER WASTE MANAGEMENT QUANTITIES

4.0 PURPOSE

This chapter is intended to guide the user in developing a systematic approach for estimating release and other waste management quantities of EPCRA Section 313 chemicals and chemical categories from presswood and laminated wood products manufacturing operations. Figure 4-1 diagrams a recommended approach for estimating quantities of reportable EPCRA Section 313 chemicals or chemical categories.

This chapter also includes common EPCRA Section 313 reporting and compliance issues as they apply to presswood and laminated wood products manufacturing. The general discussion (Section 4.1) is followed by a presentation of specific examples and issues (Section 4.2). The basic calculation techniques and examples provided in Appendix B may be used to estimate the release and other waste management quantities of toxic chemicals and chemical categories.

4.1 General Steps for Determining Release and Other Waste Management Activity Quantities

Release and other waste management activity quantities can be determined by completing the following four steps, described in detail in the following sections.

Step 1) Prepare a **process flow diagram**.
Step 2) Identify EPCRA Section 313 chemicals and chemical categories and potential **sources** of chemical release and other waste management activities.
Step 3) Identify release and other waste management activity **types**.
Step 4) Determine the most appropriate method(s) and **calculate the estimates** for release and other waste management activity quantities.

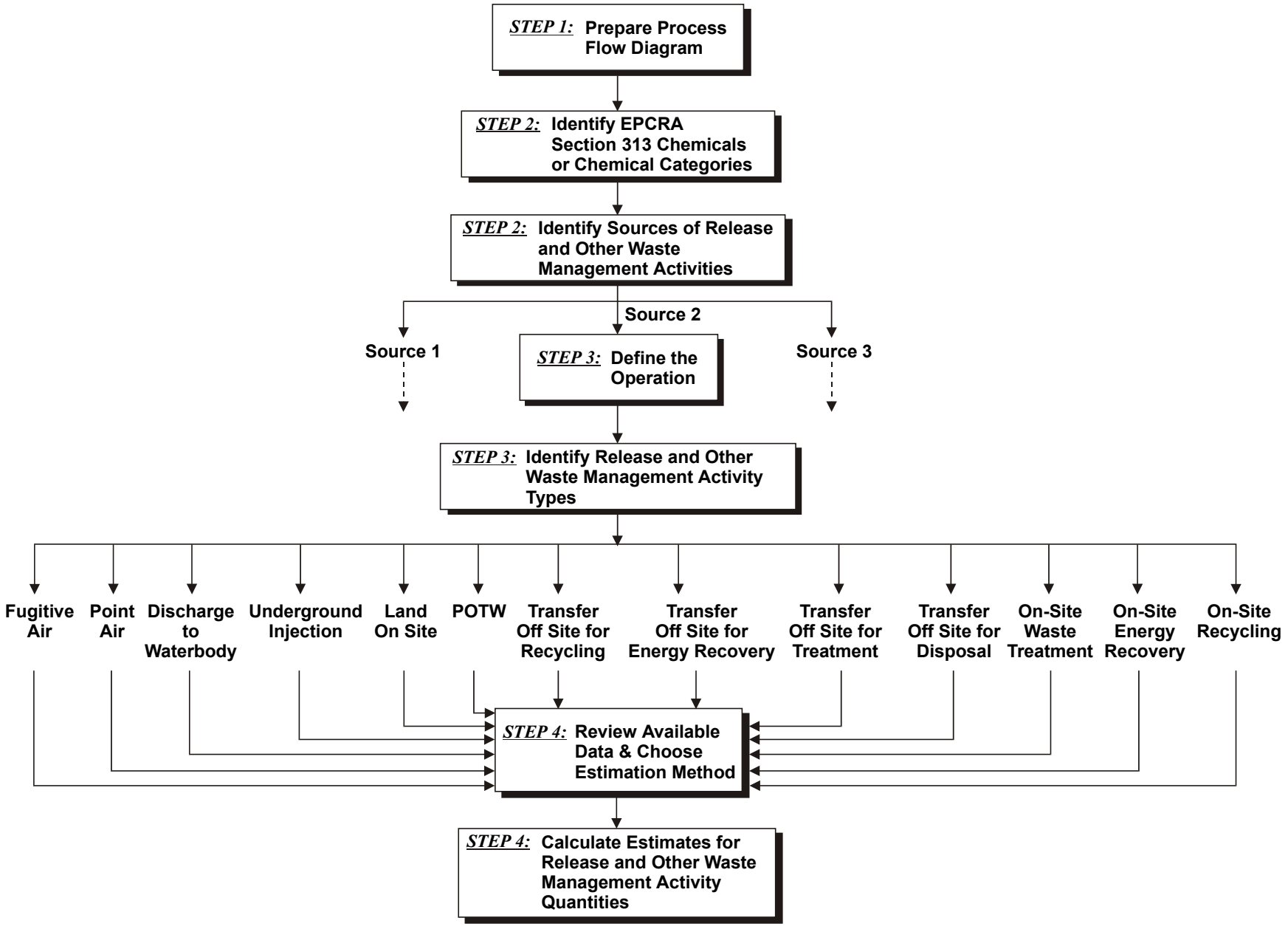

Figure 4-1. Release and Other Waste Management Activity Calculation Approach

For EPCRA Section 313 reporting purposes, "sources" means the streams or units that generate the release and other waste management activity (such as process vents, container residue, or spills) and "types" means the environmental media corresponding to elements in Sections 5 through 8 of the 2000 Form R (for example, releases to fugitive air, releases to stack air, discharges to receiving streams or POTWs, or releases to land).

4.1.1 Step 1: Prepare a Process Flow Diagram

Preparing a process flow diagram will help you to identify potential sources and types of EPCRA Section 313 chemicals and chemical categories released and otherwise managed as waste at your facility. Depending on the complexity of your facility, you may want to diagram individual processes or operations rather than the entire facility. The diagram should show how materials flow through the processes and identify material input, generation, and output points. Looking at each operation separately, you can determine where EPCRA Section 313 chemicals and chemical categories are used and the medium to which they may be released or otherwise managed as waste.

4.1.2 Step 2: Identify EPCRA Section 313 Chemicals and Chemical Categories and Potential Sources of Chemical Release and Other Waste Management Activities

Once a process flow diagram has been developed, determine the potential sources and the EPCRA Section 313 chemicals and chemical categories that may be released and otherwise managed as waste from each unit operation and process. Remember to include upsets and routine maintenance activities. Potential sources include:

- Accidental spills and releases;
- Air pollution control devices (e.g., baghouses, electrostatic precipitators, and scrubbers);
- Clean up and housekeeping practices;
- Combustion byproducts;
- Container residues;
- Fittings;
- Flanges;
- Process discharge stream;
- Process vents;
- Pumps;
- Recycling and energy recovery byproducts;
- Relief valves;
- Stock pile losses;

- Storage tanks;
- Storm water runoff;
- Tower stacks;
- Transfer operations;
- Treatment sludge;
- Volatilization from process or treatment; and
- Waste treatment discharges.

Next, identify the EPCRA Section 313 chemicals and chemical categories that may be released or otherwise managed as waste from each source. A thorough knowledge of the facility operations and processes is required for this determination. You should also consider whether any of the EPCRA Section 313 chemicals or chemical categories are coincidentally manufactured at your facility. Table 2-3 identifies EPCRA Section 313 chemicals and chemical categories typically used in the operations common to presswood and laminated wood products manufacturing. This table can be used as an aid in identifying which chemicals and chemical categories are found in your process. The list may not include all the EPCRA Section 313 chemicals and chemical categories your facility uses, and it may include many chemicals and chemical categories that you do not use.

4.1.3 Step 3: Identify Release and Other Waste Management Activity Types

For each identified source of an EPCRA Section 313 chemical or chemical category, examine all possible release and other waste management activity types. Figure 4-2 schematically represents the possible release and other waste management activity types as they correspond to individual data elements of the Form R. Remember to include both routine operations and accidents when identifying types. This diagram along with the following descriptions can be used as a checklist to make sure all possible types of release and other waste management activities have been considered.

a. Fugitive or Non-Point Air Emissions (Part II, Section 5.1 of Form R) - Includes all emissions to the air that are not released through stacks, vents, ducts, pipes, or any confined air stream. Examples include:

- Equipment leaks from valves, pump seals, flanges, compressors, sampling connections, open-ended lines, etc.;

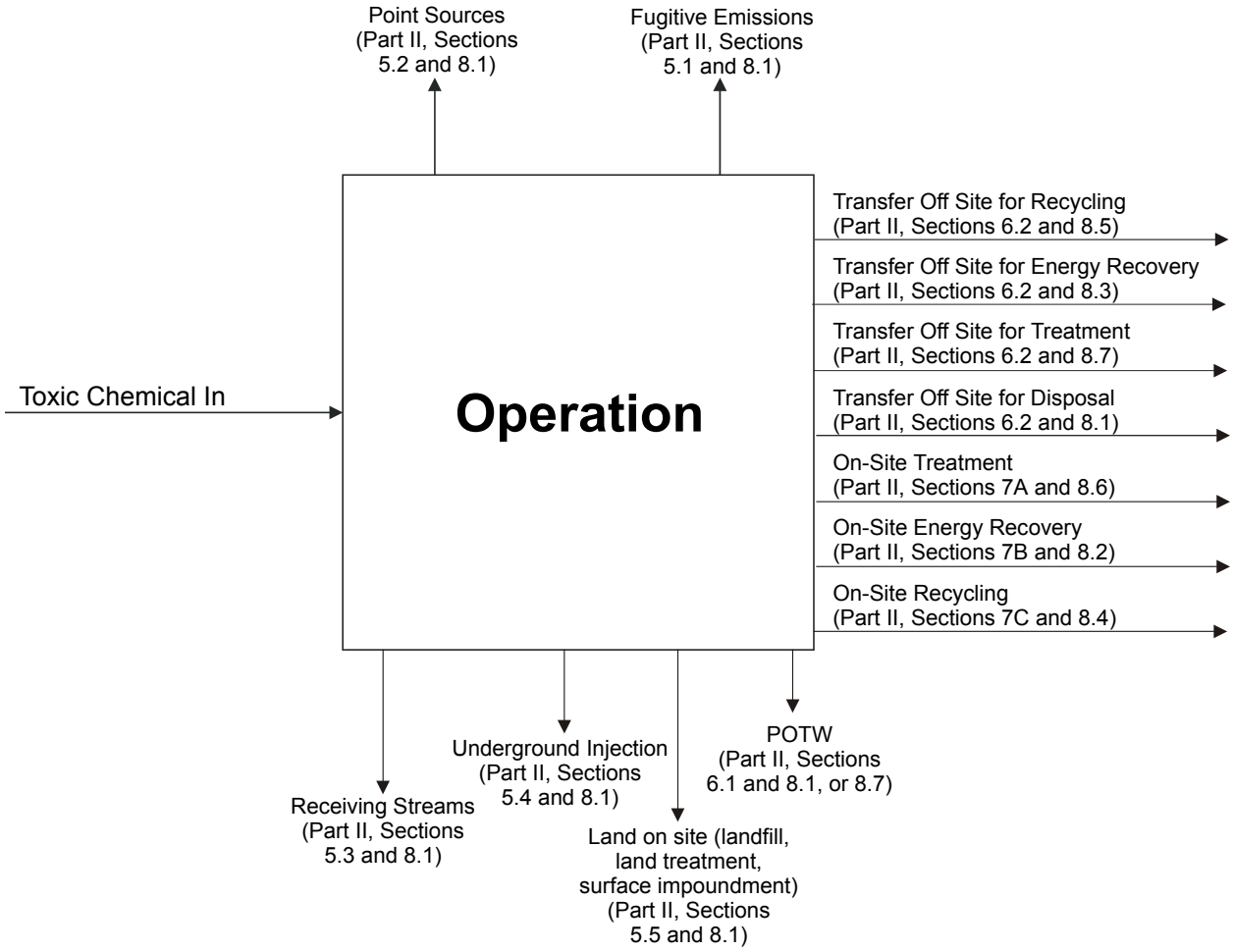

Figure 4-2. Possible Release and Other Waste Management Activity Types[1] for EPCRA Section 313 Chemicals and Chemical Categories

- Releases from building ventilation systems, such as a roof fan in an open room (e.g., fan above an uncontrolled press);

- Evaporative losses from solvent cleaning tanks, surface impoundments, and spills; and

- Emissions from any other fugitive or non-point source.

b. Stack or Point Air Emissions (Part II, Section 5.2 of Form R) - Includes all emissions to the air that occur through stacks, vents, ducts, pipes, or any confined air stream, including the emissions from storage tanks and air pollution control equipment. Air emissions from presses

[1]Sections refer to 1999 Form R. Quantities released to the environment as a result of remedial actions, catastrophic events, or one-time events should be reported in Part II, Section 8 as Subsection 8.8.

may be channeled through air pollution control devices. These are considered stack emissions. Note that emissions released from general room air through a ventilation system are not considered stack or point releases for the purpose of EPCRA Section 313 reporting unless they are channeled through an air pollution control device. Instead, they are considered fugitive releases. However, certain state air quality reporting requirements, not associated with EPCRA Section 313 reporting, consider ventilation systems to be a stack or point source.

c. Discharges to Receiving Streams or Water Bodies (Part II, Section 5.3 of Form R) - Includes direct wastewater discharges to a receiving stream or surface water body. Discharges usually occur under a NPDES or SPDES permit.

d. Underground Injection On-Site to Class I Wells (Part II, Section 5.4.1 of Form R) and to Class II through V Wells (Part II, Section 5.4.2 of Form R) - Includes releases into an underground well at the facility. These wells may be monitored under an Underground Injection Control (UIC) Program permit. RCRA Hazardous Waste Generator Reports may be a good source of information for wastes injected into a Class I well. Injection rate meters may provide information for all the well classes.

e. Disposal to Land On-Site (Part II, Section 5.5 of Form R) - Includes all releases to land on-site, both planned (i.e., disposal) and unplanned (i.e., accidental release or spill). The four predefined subcategories for reporting quantities released to land within the boundaries of the facility are:

(1) **Landfill** - The landfill may be either a RCRA permitted (Part II, Section 5.5.1A) or a non-hazardous waste landfill (Part II, Section 5.5.1B). Both types are included if they are located on site. Leaks from landfills in the years subsequent to the disposal of the EPCRA Section 313 chemicals or chemical categories in the landfill do not need to be reported as a release.

(2) **Land treatment/application farming** - Land treatment is a disposal method in which a waste containing an EPCRA Section 313 chemical or chemical category is applied to or incorporated into soil. Volatilization of an EPCRA Section 313 chemical or chemical category because of the disposal operation must be included in the total fugitive air releases and should be excluded from land treatment/application farming to avoid double counting.

Sludge and/or aqueous solutions that contain biomass and other organic materials are often collected and applied to farm land. This procedure supplies a nitrogen source for plants and supplies metabolites for microorganisms. U.S. EPA considers this

operation to be land treatment/farming if it occurs on site. If a facility sends this material off site for the same purpose, it is considered to be a "transfer to an off-site location, disposal" and should be reported under Sections 6.2 and 8.1 of the Form R.

The ultimate disposition of the toxic chemical or chemical category after application to the land does not change the required reporting. For example, even if the toxic chemical or chemical category is eventually biodegraded by microorganisms or plants, it is not considered recycled, reused, or treated.

(3) **Surface impoundment** - A surface impoundment is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials that is designed to hold an accumulation of wastes containing free liquids. Examples include: holding, settling, storage, and elevation pits; ponds; and lagoons. Quantities of the toxic chemical released to surface impoundments that are used merely as part of a wastewater treatment process generally must not be reported in this section. However, if the sludge from the surface impoundment contains the EPCRA Section 313 chemical or chemical category, then the EPCRA Section 313 chemicals or chemical categories in the sludge should be reported in this section unless the sludge is removed and subjected to another waste management activity.

(4) **Other disposal** - Releases to land that do not fit the categories of landfills, land treatment, or surface impoundment are classified as other disposal. This disposal may include any spills or leaks of the EPCRA Section 313 chemical or chemical category to land.

f. Discharges to Publicly Owned Treatment Works (POTW) (Part II, Section 6.1 of Form R) - Includes the amount of EPCRA Section 313 chemical or chemical category in water transferred to an off-site POTW. Note that metals and metal compounds transferred to a POTW must also be reported in Section 8.1 (40 CFR § 372.85(b)(16)(i)).

g. Transfers to Other Off-Site Locations (Part II, Section 6.2 of Form R) - Includes all off-site transfers containing the EPCRA Section 313 chemical or chemical category for the purposes of disposal, treatment, energy recovery, or recycling. Off-site transfer for disposal includes underground injection, landfill/surface impoundment, other land disposal and transfer to a waste broker for disposal. The amount transferred off site for disposal must also be reported in Section 8.1 (40 CFR § 372.85(b)(16)(ii)).

Also reported in Section 6.2 would be any residual EPCRA Section 313 chemicals or chemical categories in "empty" containers transferred off

site. U.S. EPA expects that all containers (bags, totes, drums, tank trucks, etc.) will have a small amount of residual solids and/or liquid. On-site cleaning of containers must be considered for EPCRA Section 313 reporting. If the cleaning occurs with a solvent (organic or aqueous), you must report the disposition of the waste solvent as appropriate. If the containers are sent off site for disposal or reclamation, you should report the EPCRA Section 313 chemical or chemical category in this section (40 CFR § 372.85(b)(16)(ii)).

COMMON ERROR - Shipping Container Residue

Do not overlook residual toxic chemicals or chemical categories in containers. U.S. EPA has published *The 1994 and 1995 Toxic Release Inventory Data Quality Report*, EPA 745-R-98-002, presenting the site survey results of over 100 facilities to evaluate EPCRA Section 313 reporting quality. This survey found the largest source of overlooked release and other waste management activities was from container residue. So-called "empty" drums may contain an inch or more of liquid after draining and similarly "empty" bags may contain residues of dust and powder. Even though each individual drum or bag may only contain a small amount of an EPCRA Section 313 chemical or chemical category, for facilities that receive hundreds or thousands of drums or bags each year the annual cumulative amount of an EPCRA Section 313 chemical or chemical category can be substantial. The quantities should typically be reported in Section 6.2 (see Table 4-1 for estimates of liquid drum residual and the text of this section for estimates of residual from solids). Please note that unlike RCRA, EPCRA Section 313 does not define what constitutes an "empty" container.

Actual data and a knowledge of the unloading methods at your facility can be used to estimate the quantity of residual EPCRA Section 313 chemicals or chemical categories in containers. However, U.S. EPA has developed guidance to assist facilities if no site-specific information is available. Table 4-1 provides results from a study of liquid residue quantities left in drums and tanks when emptied. These results are presented as the mass percent of the vessel capacity, and are categorized based on unloading method, vessel material, and bulk fluid material properties such as viscosity and surface tension. No testing was conducted for residual solids in this study. If data or site-specific knowledge is available to estimate the quantity of solid residual in containers, it should be considered. If no data are available, U.S. EPA believes an estimate of 1% residual solid is reasonable.

Table 4-1

Summary of Liquid Residue Quantities From Pilot-Scale Experimental Study[a,b] (weight percent of drum capacity)

Unloading Method	Vessel Type	Value	Material			
			Kerosene[c]	Water[d]	Motor Oil[e]	Surfactant Solution[f]
Pumping	Steel drum	Range Mean	1.93 - 3.08 2.48	1.84 - 2.61 2.29	1.97 - 2.23 2.06	3.06 3.06
Pumping	Plastic drum	Range Mean	1.69 - 4.08 2.61	2.54 - 4.67 3.28	1.70 - 3.48 2.30	Not Available
Pouring	Bung-top steel drum	Range Mean	0.244 - 0.472 0.404	0.266 - 0.458 0.403	0.677 - 0.787 0.737	0.485 0.485
Pouring	Open-top steel drum	Range Mean	0.032 - 0.080 0.054	0.026 - 0.039 0.034	0.328 - 0.368 0.350	0.089 0.089
Gravity Drain	Slope-bottom steel tank	Range Mean	0.020 - 0.039 0.033	0.016 - 0.024 0.019	0.100 - 0.121 0.111	0.048 0.048
Gravity Drain	Dish-bottom steel tank	Range Mean	0.031 - 0.042 0.038	0.033 - 0.034 0.034	0.133 - 0.191 0.161	0.058 0.058
Gravity Drain	Dish-bottom glass-lined tank	Range Mean	0.024 - 0.049 0.040	0.020 - 0.040 0.033	0.112 - 0.134 0.127	0.040 0.040

[a]From "Releases During Cleaning of Equipment." Prepared by PEI Associates, Inc., for the U.S. Environmental Protection Agency, Office of Pesticides and Toxic Substances, Washington DC Contract No. 68-02-4248. June 30, 1986.

[b]The values listed in this table should only be applied to similar vessel types, unloading methods, and bulk fluid materials. At viscosities greater than 200 centipoise, the residue quantities can rise dramatically and the information on this table is not applicable.

[c]For kerosene, viscosity = 5 centipoise, surface tension = 29.3 dynes/cm^2

[d]For water, viscosity = 4 centipoise, surface tension = 77.3 dynes/cm^2

[e]For motor oil, viscosity = 97 centipoise, surface tension = 34.5 dynes/cm^2

[f]For surfactant solution viscosity = 3 centipoise, surface tension = 31.4 dynes/cm^2

The following example describes how the information in the table can be used to estimate the quantity of an EPCRA Section 313 chemical or chemical category in water that was used to clean drums on site.

Example - Container Residue

You have determined that a Form R for an EPCRA Section 313 chemical must be submitted. The facility purchases and uses one thousand 55-gallon steel drums that contain a 10% aqueous solution of the chemical. Further, it is assumed that the physical properties of the solution are similar to water. The solution is pumped from the drums directly into a mixing vessel and the "empty" drums are triple-rinsed with water. The rinse water is indirectly discharged to a POTW and the cleaned drums are sent to a drum reclaimer.

From Table 4-1, the average drum residue quantity for this scenario is 2.29%. In this example, it can be assumed that all of the residual solution in the drums was transferred to the rinse water. Therefore, the quantity of the EPCRA Section 313 chemical transferred to the drum reclaimer should be reported as "zero."

The annual quantity of residual solution that is transferred to the rinse water can be estimated by multiplying the mean weight percent of residual solution remaining in a pumped steel drum by the total annual weight of solution in the drums. If the density is not known, it may be appropriate to use the density of water (8.34 pounds per gallon):

$$(0.0229) \times (55 \text{ gal/drum}) \times (1{,}000 \text{ drums}) \times (8.34 \text{ lb/gal}) = 10{,}504 \text{ pounds solution}$$

The concentration of the EPCRA Section 313 chemical in the solution is only 10%.

$$(10{,}504 \text{ lb solution}) \times (0.1) = 1{,}050 \text{ pounds of the EPCRA Section 313 chemical}$$

Therefore, 1,050 pounds of the EPCRA Section 313 chemical are transferred to the POTW, and should be reported in Part II, Sections 6.1 and 8.7 of the 1999 Form R. Because they cannot be destroyed, metals cannot be reported as being treated, and metals and metal portions of metal compounds should be reported in Part II, Section 6.1 and 8.1 of the 1999 Form R.

Example - Container Residue in Tank Trucks

Many wood products facilities purchase resin in tank trucks for processing operations. The tank trucks are typically returned to the supplier without washing on site, or are sent off site for cleaning at a transportation equipment cleaning facility. Any EPCRA Section 313 chemicals in the residue in the empty trucks should be considered as a possible off-site transfer for EPCRA Section 313 reports. If the tank truck is returned to the supplier and refilled without cleaning, the residue does not need to be reported. However, if the tank truck is sent off-site for cleaning the quantity must be reported as an off-site transfer for disposal (or recycle, treatment, or energy recovery if appropriate) (40 CFR § 372.85(b)(16) & (17)).

For example, your site receives one tank truck every two days of a liquid phenol-formaldehyde resin for processing plywood. After the trucks are emptied, they are sent to an off-site facility for cleaning. You have determined that the trucks contains 5,000 gallons resin when full, the resin density is 10 lb/gal, and approximately 0.2% of the resin remains in the trucks as a residual quantity after they have been emptied. Further, based on material analysis, the resin contains (by weight) 0.5% formaldehyde, 0.22% methanol, and 0.75% phenol.

[continued on next page]

Phenol and methanol are both below their *de minimis* concentrations (1%). Therefore, they do not need to be considered in this off-site transfer estimate. However, formaldehyde is not below its *de minimis* concentration (0.1%) and this activity must be included in threshold determinations and the off-site transfer estimate as follows:

Threshold Calculation:

Amount of formaldehyde brought on site:

= (5,000 gal/truck) x (10 lb/gal) x (1 truck/2 days) x (365 days/yr) x (0.5% formaldehyde)
= 45,625 lb formaldehyde/yr

Since the reporting threshold for processing has been exceeded, all releases and other waste management quantities of formaldehyde must be reported.

Off-Site Transfer Calculation:

Amount of formaldehyde sent off-site for disposal as residue in the empty trucks:

= [quantity resin received in trucks] x [percent residue remaining after emptying trucks] x [concentration formaldehyde in residue]
= [(5,000 gal/truck) x (10 lb/gal) x (1 truck/2 days) x (365 days/yr)] x [0.2% residue] x [0.5% formaldehyde]
= 91 lb formaldehyde

This quantity must be reported in Part II, Section 6.2 and included in Part II, Section 8.1 of the Form R.

h. On-Site Waste Treatment (Part II, Section 7A of Form R) - Includes all on-site waste treatment of EPCRA Section 313 chemicals or chemical categories. The information reported in Section 7A focuses on the treatment of the entire waste stream, not the specific EPCRA Section 313 chemical or chemical category. The information includes type of waste stream (gaseous, aqueous or non-aqueous liquid, or solid); treatment methods or sequence; influent concentrations of the EPCRA Section 313 chemical or chemical category; treatment efficiency (combined removal and destruction) of the entire method or sequence; and whether efficiency data are based on actual operating data. Metals and metal portions of metal compounds treated in a combustion process are not destroyed but should still be reported as going through the treatment process, with a treatment efficiency of zero. Note that only the metal portion of metal compounds should be reported in the Form R. The following example illustrates how Section 7A could be completed for on-site treatment of a wastewater stream containing three EPCRA Section 313 chemicals or chemical categories.

Example - On-Site Waste Treatment

A process at your facility generates a wastewater stream containing an EPCRA Section 313 chemical (chemical A). A second process generates a wastewater stream containing two EPCRA Section 313 chemicals, a metal (chemical B) and a mineral acid (chemical C). Thresholds for all three chemicals have been exceeded and you are in the process of completing separate Form Rs for each chemical.

The two wastewater streams are combined and sent to an on-site wastewater treatment system before being released to a POTW. This system consists of an oil/water separator that removes 99% of chemical A; a neutralization tank in which the pH is adjusted to 7.5, thereby destroying 100% of the mineral acid (chemical C); and a settling tank where 95% of the metal (chemical B) is removed from the water (and eventually land filled off site).

Section 7A would be completed slightly differently when you file the Form R for each of the chemicals or chemical categories. The table accompanying this example shows how Section 7A would be completed for each chemical or chemical category. First, on each Form R you identify the type of waste stream in Section 7A.1a as wastewater (aqueous waste, code W). Next, on each Form R list the code for each of the treatment steps that is applied to the entire waste stream, regardless of whether the operation affects the chemical or chemical category for which you are completing the Form R (for instance, the first four blocks of Section 7A.1b of all three Form Rs should show: P19 (liquid phase separation), C11 (neutralization), P11 (settling/clarification), and N/A (to signify the end of the treatment system). Note that Section 7A.1b is the only section of the Form R that is not chemical or chemical category specific. It applies to the entire waste stream being treated. Section 7A.1c of each Form R should show the concentration of the specific chemical or chemical category in the influent to the first step of the process (oil/water separation). For this example, assume chemicals or chemical categories A, B, and C are all present at concentrations greater than 1%. Therefore, code "1" should be entered. Section 7A.1d is also chemical specific. It applies to the efficiency of the entire system in destroying and/or removing the chemical or chemical category for which you are preparing the Form R. You should enter 99% when filing for chemical A, 95% for chemical B, and 100% for chemical C. Finally, you should report whether the influent concentration and efficiency estimates are based on operating data for each chemical or chemical category, as appropriate (40 CFR § 372.85(b)(17)).

Chemical A

7A.1a	7A.1b			7A.1c	7A.1d	7A.1e
W	1. P19	2. C11		1	99 %	Yes No
	3. P11	4. N/A	5.			X
	6.	7.	8.			

Chemical B

7A.1a	7A.1b			7A.1c	7A.1d	7A.1e
W	1. P19	2. C11		1	95 %	Yes No
	3. P11	4. N/A	5.			X
	6.	7.	8.			

Chemical C

7A.1a	7A.1b			7A.1c	7A.1d	7A.1e
W	1. P19	2. C11		1	100 %	Yes No
	3. P11	4. N/A	5.			X
	6.	7.	8.			

[continued on next page]

Note that the quantity removed and/or destroyed is not reported in Section 7 and that the efficiency reported in Section 7A.1d refers to the amount of EPCRA Section 313 chemical or chemical category destroyed and/or removed from the applicable waste stream. The amount actually destroyed would be reported in Section 8.6 (quantity treated on site). For example, when completing the Form R for chemical B you would report "0" pounds in Section 8.6 because the metal has been removed from the wastewater stream, but not actually destroyed. The quantity of chemical B that is ultimately land filled off site would be reported in Section 6.2 and 8.1. However, when completing the Form R for chemical C you would report the entire quantity in Section 8.6 because raising the pH to 7.5 will completely destroy the mineral acid.

i. On-Site Energy Recovery (Part II, Section 7B of Form R) - Includes all on-site energy recovery of reported EPCRA Section 313 chemicals and chemical categories. U.S. EPA's view is that EPCRA Section 313 chemicals or chemical categories that do not contribute significant heat energy during combustion processes can not be considered for energy recovery. Therefore, only EPCRA Section 313 chemicals or chemical categories with a significant heating value that are combusted in an energy recovery unit, such as an industrial furnace, kiln, or boiler can be reported for energy recovery. If an EPCRA Section 313 chemical or chemical category is incinerated on site but does not significantly contribute energy to the process, (e.g., chlorofluorocarbons (CFCs)) it must be considered on-site waste treatment (see 4.1.3, h. above) (see PPA § 6607; 63 FR 52,184). Metals and metal portions of metal compounds will never be combusted for energy recovery.

j. On-Site Recycling (Part II, Section 7C of Form R) - Includes all on-site recycling methods used on EPCRA Section 313 chemicals or chemical categories.

k. Source Reduction and Recycling Activities (Part II, Section 8 of Form R)[2] - Provide information about source reduction and recycling activities related to the EPCRA Section 313 chemical or chemical category for which release and other waste management activities are being reported. Section 8 uses some data collected to complete Part II, Sections 5 through 7. For this reason, Section 8 should be completed last. The relationship between Sections 5, 6, and 8.8 to Sections 8.1, 8.3, 8.5, and 8.7 are provided in equation forms below.

(1) **Quantity Released (Part II, Section 8.1 of Form R)** - The quantity reported in Section 8.1 is the quantity reported in all of Section 5 plus the quantity of metals and metal compounds reported as discharged off site to POTWs in Section 6.1 plus the quantity reported as sent off site for disposal in Section 6.2 minus

[2]The Subsection 8.1 through 8.8 designations are for the 1999 Form R. Please refer to the current reporting year *TRI Forms and Instructions* for any changes.

the quantity reported in Section 8.8 that was released on site or sent off site for disposal:

§8.1 = §5 + §6.1 (metals and metal compounds) + §6.2 (disposal) - §8.8 (on-site release or off-site disposal only)

(2) **Quantity Used for Energy Recovery On-Site (Part II, Section 8.2 of Form R)** - Estimate the quantity of the EPCRA Section 313 chemical or chemical category in wastes combusted for energy recovery on site. This estimate should be the quantity of the toxic chemical or chemical category combusted in the process for which codes were reported in Section 7B. Test data from trial burns or other monitoring data may be used to estimate the quantity of the EPCRA Section 313 chemical or chemical category combusted for energy recovery purposes. If monitoring data are not available, vendor specifications regarding combustion efficiency may be used as they relate to the EPCRA Section 313 chemical or chemical category. There should be quantities reported in Section 8.2 when a method of on-site energy recovery is reported in Section 7B and vice versa.

Two conditions need to be met to report the combustion of an EPCRA Section 313 chemical or chemical category in waste as energy recovery: the toxic chemical or chemical category (1) must have a significant heating value and (2) must be combusted in an energy recovery unit, such as a waste heat boiler, an industrial furnace, or a kiln (63 FR 52,184). If an EPCRA Section 313 chemical or chemical category that does not have a significant heating value (except metals and metal compounds) is combusted for energy recovery on site, it must be considered on-site waste treatment (see 4.1.3.h). Metals and metal compounds in a waste that are combusted on site will never be combusted for energy recovery and are considered to be disposed. Note that "NA" should be reported for EPCRA Section 313 chemicals or chemical categories that do not have a significant heating value. This includes metals, metal portions of metal compounds, halogens, hydrochlorofluorocarbons (HCFCs), and CFCs.

(3) **Quantity Used for Energy Recovery Off-Site (Part II, Section 8.3 of Form R)** - The quantity reported in Section 8.3 is the quantity reported in Section 6.2 for which energy recovery codes are reported. If a quantity is reported in Section 8.8, subtract any associated off-site transfers for energy recovery:

§8.3 = §6.2 (energy recovery) - §8.8 (off-site energy recovery)

Two conditions need to be met to report the combustion of an EPCRA Section 313 chemical or chemical category in waste as energy recovery: the toxic chemical or chemical category (1) must have a significant heating value and (2) must be combusted in an energy recovery unit, such as a waste heat boiler, an industrial furnace, or a kiln. If an EPCRA Section 313 chemical or chemical category that does not have a significant heating value (except metals and metal compounds) is sent off site for energy recovery, it must be considered off-site waste treatment (see 4.1.3.g). However, this does not apply to metals and metal compounds. Metals and metal compounds sent off site for combustion in energy recovery units must be considered as sent off site for disposal because typically they will ultimately be disposed. Metals and metal portions of metal compounds will never be treated or combusted for energy recovery. Note that only the metal portion of metal compounds should be reported in the Form R. Also note that "NA" should be reported for EPCRA Section 313 chemicals or chemical categories that do not have a significant heating value. This includes metals, metal portions of metal compounds, halogens, HCFCs, and CFCs.

(4) **Quantity Recycled On-Site (Part II, Section 8.4 of Form R)** - Estimate the quantity of the EPCRA Section 313 chemical or chemical category recycled in wastes on site. This estimate should be the quantity of the toxic chemical or chemical category recycled in the process for which codes were reported in Section 7C. A quantity should be reported in Section 8.4 when a method of on-site recycling is reported in Section 7C and vice versa. To estimate this quantity, determine if operating data exist that indicate a recovery efficiency and use that efficiency value combined with throughput data to calculate an estimate. If operating data are unavailable, available vendor specifications may be appropriate.

(5) **Quantity Recycled Off-Site (Part II, Section 8.5 of Form R)** - The quantity reported in Section 8.5 would be the same as the quantity reported in Section 6.2 for which recycling codes are reported. If a quantity is reported in Section 8.8, subtract any associated off-site transfers for recycling.

If the facility has knowledge about metals being recovered, this quantity should be reported in Section 8.5. (PPA § 6607)

§8.5 = §6.2 (recycling) - §8.8 (off-site recycling)

COMMON ERROR - Direct Reuse vs. Recycling

The direct reuse of an EPCRA Section 313 chemical does not need to be included in the amount reported in Part II, Section 8 of Form R (40 CFR § 372.25(e)). However, recycling of the chemical should be included.

(6) **Quantity Treated On-Site (Part II, Section 8.6 of Form R)** - Waste treatment in Section 8 is limited to the destruction or chemical conversion of the EPCRA Section 313 chemical or chemical category in wastes. The quantities reported in Section 8.6 will be those that have undergone processes that are a subset of the processes for which codes were reported in Section 7A, where treatment includes physical removal from a waste stream. To estimate the quantity treated, determine if operating data exist that indicate a treatment efficiency (e.g., destruction or chemical conversion of the EPCRA Section 313 chemical or chemical category) and use that efficiency value combined with throughput data to calculate an estimate. Because metals cannot be destroyed or chemically converted into something other than the metal or metal compound, metals cannot be reported as treated in Section 8.6. Note that conversion of a metal from one oxidation state to another (e.g., Cr(VI) to Cr(III)) is not considered treatment for Section 8.6. If operating data are unavailable, available vendor specifications may be appropriate. Section 7A must be completed if a quantity is entered in Section 8.6 (40 CFR § 372.85(b)(17)).

(7) **Quantity Treated Off-Site (Part II, Section 8.7 of Form R)** - The quantity reported in Section 8.7 would be the same as the quantity reported in Section 6.2 for which treatment codes are reported plus quantities sent to a POTW as reported in Section 6.1 except for metals and metal compounds. If a quantity is reported in Section 8.8, subtract any associated off-site transfers for treatment:

§8.7 = §6.1 (except metals and metal compounds) + §6.2 (treatment) - §8.8 (off-site treatment)

Because metals cannot be destroyed or chemically converted into something other than the metal or metal compound, metals cannot be reported as treated in Section 8.7. Quantities of metals reported in Section 6.1 and 6.2 should be reported in Section 8.1 (Quantity Released) unless the facility has knowledge that the metal is being recovered.

(8) **Quantity Released to the Environment as a Result of Remedial Actions, Catastrophic Events, or One-Time Events Not Associated with Production Processes (Part II, Section 8.8 of**

Form R) - The purpose of this section is to separate quantities recycled off site, used for energy recovery off site, treated off site, or released (including disposed) that are associated with normal or routine production from those quantities that are not. The quantity reported in Section 8.8 is the quantity of the EPCRA Section 313 chemical or chemical category released directly into the environment or sent off site for recycling, energy recovery, treatment, or disposal during the reporting year because of any of the following events:

- Remedial actions;
- Catastrophic events such as earthquakes, fires, or floods; or
- One-time events not associated with normal or routine production processes.

The quantity reported in Section 8.8 should not be included with quantities reported in Part II, Sections 8.1 through 8.7 of Form R, but should be included in Part II, Sections 5 and 6 of Form R as appropriate.

Spills that occur as a routine part of production operations and could be reduced or eliminated by improved handling, loading, or unloading procedures are included in the quantities reported in Section 8.1 through 8.7 as appropriate. This includes small drippings and spills that often occur during transfer operations and loading/unloading operations associated with many coating processes.

On-site releases and off-site transfers for further waste management from remediation of an EPCRA Section 313 chemical or chemical category or an unpreventable accident unrelated to production (such as a hurricane) are reportable in Section 8.8.

On-site treatment, energy recovery, or recycling of EPCRA Section 313 chemicals or chemical categories in wastes generated as a result of remedial actions, catastrophic events, or one-time events not associated with production processes are not reported in Part II, Section 8.8, nor in Sections 8.1 through 8.7 of Form R.

COMMON ERROR - Double Counting

Release and other waste management activities should not be "double counted." A single wastewater discharge should not be listed as both a release to water (on site) and a discharge to POTW (off site). Similarly, a release to land should not be listed as both a release to land (on site) and a transfer to an off-site landfill. Estimates of release and other waste management activities should be prepared for Sections 5 through 7 of the Form R. For the most part, Section 8 relies on the data collected to complete these previous sections. Therefore, U.S. EPA recommends section 8 should be completed last. However, the data elements of Section 8 (8.1 through 8.7) are mutually exclusive and care should be taken to avoid double counting.

4.1.4 Step 4: Determine the Most Appropriate Method(s) and Calculate the Estimates for Release and Other Waste Management Activity Quantities

After you have identified all of the potential sources for release and other waste management activity types, estimate the quantities of each EPCRA Section 313 chemical and chemical category released and otherwise managed as waste. U.S. EPA has identified four basic methods that may be used to develop estimates (each method has been assigned a code that must be included when reporting). The methods and corresponding codes are:

- Monitoring Data or Direct Measurement (M);
- Mass Balance (C);
- Emission Factors (E); and,
- Engineering Calculations (O).

Descriptions of these techniques are provided in the U.S. EPA publication, *Estimating Releases and Waste Treatment Efficiencies for the Toxic Chemical Release Inventory Forms* (2000 edition). They are also briefly described below. A more detailed discussion including examples of selected calculation techniques is presented in Appendix B. EPCRA does not require you to conduct additional sampling or testing for EPCRA Section 313 reporting. Rather, facilities may use readily available data collected pursuant to other provisions of law, or where such data are not readily available, reasonable estimates of the amounts involved (EPCRA § 313(g)(2)). For example, it may not be appropriate to use emission factors or engineering calculations if more accurate data, such as stack testing results, are available. You are required to identify the primary method used for each estimation (40 CFR § 372.85(b)(15)(i)).

Many potential sources of data exist for these (and other) methods of developing estimates. Table 4-2 presents potential data sources and the estimation methodology in which they are most likely to be used. Based on site-specific knowledge and potential data sources available, you should be able to determine the best method for calculating each release and other waste management activity quantity.

Once all potential release and other waste management activity sources, types, and estimation methods have been determined, an estimate for each EPCRA Section 313 chemical and chemical category can be developed corresponding to the elements on Form R.

Table 4-2

Potential Data Sources for Release and Other Waste Management Calculations

DATA SOURCES	
Monitoring Data	**Mass Balance**
C Air permits C Continuous emission monitoring C Effluent limitations C Hazardous waste analysis C Industrial hygiene monitoring data C NPDES permits C Outfall monitoring data C pH for acids and bases C POTW pretreatment standards C RCRA permit C Stack monitoring data C New Source Performance Standards C Title V permit data	C Air emissions inventory C Hazardous material inventory C Hazardous waste manifests C MSDSs C Pollution prevention reports C Spill event records C Supply and purchasing records
Emission Factors	**Engineering Calculations**
C AP-42 chemical specific emission factors C Facility or trade association derived chemical-specific emission factors	C Facility non-chemical specific emission factors. C Henry's Law C Raoult's Law C SOCMI* or trade association non-chemical specific emission factors C Solubilities C Volatilization rates

*Synthetic Organic Chemicals Manufacturing Industry.

4.1.4.1 Monitoring Data or Direct Measurement (code M)

Using monitoring data or direct measurements is usually the best method for developing toxic chemical release and other waste management activity quantity estimates. Your facility may be required to perform monitoring under provisions of the Clean Air Act (CAA), Clean Water Act (CWA), RCRA, or other regulations. If so, data should be available for developing estimates. Data may have also been collected for your facility through an occupational health and safety assessment. If only a small amount of direct measurement data is available or if you believe the monitoring data are not representative, you must decide if another estimation method would give a more accurate result.

Example - Monitoring Data

Data from the on-site wastewater treatment facility indicate that the annual average concentration of copper in the discharge is 2 mg/L. The wastewater treatment facility processed 1.5 million gallons of water. The treated wastewater is discharged to an off-site POTW. The amount of copper transferred off site to the POTW (for Sections 6.1 and 8.1 of the Form R) is estimated as follows:

Amount of copper transferred

$$= (2\ \text{mg/L}) \times \left(\frac{\text{g}}{1{,}000\ \text{mg}}\right) \times \left(\frac{\text{lb}}{453.59\ \text{g}}\right) \times \left(\frac{\text{L}}{0.2642\ \text{gal}}\right) \times (1{,}500{,}000\ \text{gal/yr})$$

$$= 25\ \text{lb/yr}$$

COMMON ERROR - Treatment Efficiencies

Vendor data on treatment efficiencies often represent ideal operating conditions. You may adjust such data to account for downtime and process upsets during the year that would result in lower efficiencies. Remember that efficiencies reported by vendors are often general and may not apply to specific chemicals. For example, an incinerator or flare may be 99.99% efficient in destroying certain organic chemicals, but will have a 0% efficiency in destroying metals.

4.1.4.2 Mass Balance (code C)

A mass balance involves determining the amount of an EPCRA Section 313 chemical or chemical category entering and leaving an operation. The mass balance is written as follows:

Input + Generation = Output + Consumption

where:

- Input refers to the materials (toxic chemicals) entering an operation. For example, chlorine added to process water as a disinfectant would be considered an input to the water treatment operation or EPCRA Section 313 chemical contained in a resin or added to the wood material.

- Generation identifies those toxic chemicals created during an operation (manufactured, including coincidental manufacturing). For example, when nitrogen sources are used in biological wastewater treatment systems, nitrate compounds and additional ammonia may be coincidentally manufactured.

- Output refers to the materials (toxic chemicals) leaving an operation by various avenues. Output (avenues) may include on-site release and other on-site waste management activities; transfers off site for recycling, energy recovery, treatment, storage, or disposal; or the amount of toxic chemical that leaves with the final product. For example, free formaldehyde remaining in a presswood product should be considered an output, or EPCRA Section 313 chemical emissions from a wood dryer.

- Consumption refers to the amount of toxic chemical converted to another substance during the operation (i.e., reacted). For example, in the phosphating process, accelerators may be added to enhance reaction speed, eliminate hydrogen production, or sludge formation control. Several materials can be used for this purpose, including nitrite or nitrate compounds, which would be consumed in the process. Also, a urea scavenger is used to react with any excess formaldehyde in a urea-formaldehyde resin.

The mass balance technique may be applied toward manufactured, processed, or otherwise used toxic chemicals and chemical categories. It is typically most useful for otherwise used toxic chemicals or chemical categories that do not become part of the final product, such as catalysts. For large inputs and outputs, a mass balance may not be the best estimation method, because slight uncertainties in mass calculations can yield significant errors in the release and other waste management estimates.

Example - Mass Balance

A facility otherwise uses a volatile EPCRA Section 313 chemical as a refrigerant and adds 20,000 pounds to the refrigeration system (to make up for system losses). The chemical is released to the air from relief vents, during system filling operations and from leaks in valves and fittings. During system maintenance, the lines are bled directly into water and the system is vented to the air. Monitoring data of the wastewater, including chemical concentrations and wastewater throughput, indicate that 1,200 pounds of the chemical were discharged to the wastewater. The remaining losses are assumed to be fugitive air releases and are estimated as follows:

Fugitive air releases of the EPCRA Section 313 chemical:

= Amount input (lb/yr) - Amount released to wastewater (lb/yr)

= 20,000 lb/yr - 1,200 lb/yr

= 18,800 lb/yr

This quantity would be reported in Sections 5.1 and 8.1 of Form R.

COMMON ERROR - Mass Balances for Otherwise Used Toxic Chemicals

Facilities often do not account for the entire quantity of EPCRA Section 313 chemicals or chemical categories that are otherwise used. Many EPCRA Section 313 chemicals and chemical categories are used as carrier solvents and are classified as otherwise used. Such chemicals and chemical categories may or may not leave the facility with the product. For those instances where the EPCRA Section 313 chemical or chemical category does not leave the facility in the product, all throughput may be lost during processing through on-site releases to air, water, or land, or it may be shipped off site for further waste management activities. Thus, the entire throughput is often reportable on Form R as release and other waste management activities to various media. Be sure to consider the entire throughput in these circumstances and partition it as appropriate. A mass balance may be the best starting point to estimate the release and other waste management quantities.

4.1.4.3 Emission Factors (code E)

An emission factor is a representative value that attempts to relate the quantity of a chemical or chemical category released with an associated activity. These factors are usually expressed as the weight of chemical or chemical category released divided by a unit weight, volume, distance, or duration of the activity releasing the toxic chemical (e.g., pounds of chemical released per pounds of product produced). Emission factors, commonly used to estimate air emissions, have been developed for many different industries and activities. You should carefully evaluate the source of the emission factor and the conditions for its use to determine if it is applicable to the situation at your facility. If there are more than one EPA

published emission factors, determine which is the most appropriate for your operation and document your rationale.

The most widely known and used source for emission factors is U.S. EPA's publication *Compilation of Air Pollutant Emission Factors (AP-42)*. Volume I of AP-42 contains information on over 200 stationary source categories, including process descriptions and potential sources of air emissions from these processes. Methodologies for estimating the quantity of air pollutant emissions from these sources are presented as Emission Factors. For EPCRA Section 313 purposes only CHEMICAL-SPECIFIC emission factors can be reported as Code "E" - Emission Factor in Part II, Section 5, Column B, Basis for estimate, of the Form R. AP-42 contains emission factors for individual chemicals and for the chemical group Volatile Organic Compounds (VOCs). The VOC emission factors are NOT chemical specific and when used must be reported in Column B as Code "O" - Engineering Calculations. Each chapter in Volume I covers a major industry or source category. Of special interest to presswood and laminated wood products manufacturing operations would be Chapter 10: Wood Products Industry, in particular Sections 10.5, Plywood Manufacturing; and 10.6, Reconstituted Wood Products.

AP-42 can be accessed at the following Internet site:

- **http://www.epa.gov/ttn/chief/ap42.html**

Note that U.S. EPA is currently developing additional emission factors and associated guidance for presswood operations. You should periodically review AP-42 for this updated guidance.

In an effort to provide current emissions data in an easy-to-access format, U.S. EPA has prepared a CD-ROM entitled Air CHIEF (Air ClearingHouse for Inventories and Emission Factors). The Air CHIEF CD-ROM is updated annually and is available from the Government Printing Office and can be ordered from their Web site. In addition to AP-42, the Air CHIEF CD-ROM contains the Factor Information Retrieval (FIRE) data system, a database

management system containing U.S. EPA's recommended emission estimation factors for criteria and hazardous air pollutants. The CD-ROM also contains installable copies of software programs for air emission estimation models such as "TANKS" for VOC emission from storage tanks; "WATER8" for air emissions from wastewater systems; and "CHEMDAT8" for VOC emissions from Treatment, Storage, and Disposal Facility (TSDF) processes. Additional information on Air CHIEF and the CD-ROM is available at:

- **http://www.epa.gov/ttn/chief/airchief.html**

Your facility may have developed non-chemical-specific emission factors for fugitive or stack emissions from dryers or presses based on stack tests for various air permits. Be sure to consider these emission factors if appropriate. However, if such factors are used, they are considered "engineering calculations" for the purposes of EPCRA Section 313 reporting.

Example - Emission Factors

Emission factors have been developed for air releases of fuel constituents and combustion products from boiler operations. AP-42 lists a following emission factor for formaldehyde when No. 6 fuel oil is consumed by electricity generating facilities (EGFs):

0.033 lb formaldehyde generated/10^3 gal No. 6 fuel oil fired.

Assuming a facility met reporting requirements for formaldehyde, the EGF operating a boiler using No. 6 fuel oil could use the above emission factor to determine the amount of formaldehyde generated and subsequently released to the air. If 1,000,000 gallons of No. 6 fuel oil is used during a reporting year, the amount of formaldehyde generated would be:

(0.033 lb/10^3 gal) × (1,000,000 gal)

= 33 lb of formaldehyde generated

If there are no engineering controls or air pollution control devices that would destroy or remove the formaldehyde, this quantity would be reported in Part II, Sections 5.2 and 8.1 of the 2000 Form R.

NOTE: No. 6 fuel oil contains other EPCRA Section 313 chemicals and chemical categories and EPCRA Section 313 chemicals and chemical categories may also be coincidentally manufactured during combustion. All should be considered for EPCRA Section 313 reporting.

4.1.4.4 Engineering Calculations (code O)

Engineering calculations are assumptions and/or judgments used to estimate quantities of EPCRA Section 313 chemicals and chemical categories released or otherwise managed as waste. The quantities are estimated by using physical and chemical properties and relationships (e.g., Ideal Gas law, Raoult's law) or by modifying an emission factor to reflect the chemical properties of the chemical in question. Engineering calculations rely on the process parameters; you must have a thorough knowledge of your facility operations to complete these calculations.

Engineering calculations can also include computer models. Several computer models are available for estimating emissions from landfills, wastewater treatment, water treatment, and other processes.

Non-chemical-specific emission factors, Synthetic Organic Chemicals Manufacturing Industry (SOCMI) emission factors, industry-determined emission factors for processes or equipment, and site-specific emission factors also can be used, but should be classified as "Engineering Calculations" for EPCRA Section 313 reporting.

Examples - Engineering Calculations

Example 1:

Stack monitoring data are available for xylene but you are required to report for toluene. Toluene is used in the same application as xylene at your facility and the concentrations of the chemicals in the liquid feedstock are approximately the same. You can estimate the emissions of toluene by adjusting the monitoring data of xylene by a ratio of the vapor pressure for xylene to toluene. This example is an engineering calculation based on physical properties and process operation information:

From facility stack monitoring data, you determine that an estimated 200 lb of xylene are released as air emissions during the reporting year. Toluene is also present in the air emissions, but not monitored. The stack operates at approximately 20°C. Based on literature data, the vapor pressure at 20°C for toluene is 22 millimeters of mercury (mmHg) and for xylene is 6 mmHg. Using a ratio of the vapor pressures, the amount of toluene released as air emissions from the stack can be calculated:

$$\frac{\text{X lb/yr toluene}}{\text{200 lb/yr xylene}} = \frac{\text{22 mmHg (vapor pressure of toluene)}}{\text{6 mmHg (vapor pressure of xylene)}}$$

$$\text{X lb/yr toluene} = \frac{\text{(200 lb/yr xylene) (22 mmHg toluene)}}{\text{(6 mmHg xylene)}}$$

Completing the calculation, you determine that 730 lbs of toluene were released as stack air emissions during the reporting year. The quantity of toluene released would be reported in Section 5.2 of the 1999 Form R.

Example 2:

A finishing process uses 10,000 gallons per year of a coating that is 3% xylene by volume. All of the xylene in the coating is assumed to evaporate during the operation. The process is equipped with a fume collection hood that captures 80% of the solvent vapors. The remaining 20% of the vapors are assumed to be released as fugitive air emissions. The collection hood routes the vapors to an incinerator that is vented to the atmosphere and has a destruction efficiency of 99% for xylene. The specific gravity of xylene is 0.86 and the density of water is 8.34 lb/gal. Fugitive air emissions and stack air emissions may be estimated as follows:

1. The total amount of xylene volatilized to air (assumed to be the total amount of xylene in the coating)

   = (10,000 gal/yr coating) × (0.03, three percent xylene) × (0.86 xylene specific gravity) × (8.34 lb/gal, density of water)

   = 2,152 lb/yr xylene evaporated from finishing operations

2. The amount of xylene released as fugitive air emissions

   = (2,152 lb/yr) × (0.2; twenty percent released as fugitive air emissions)
   = 430 lb/yr

   This would be reported in Part II, Sections 5.1 and 8.1 of the 1999 Form R.

3. The amount of xylene released as stack air emissions

   = (2,152 lb/yr) × (0.8, eighty percent capture efficiency) × (1-0.99, percent not incinerated)
   = 17 lb/yr

   This would be reported in Part II, Sections 5.2 and 8.1 of the 1999 Form R.

4.1.4.5 Estimating Release and Other Waste Management Quantities

Once all sources, types, and appropriate estimation methodologies have been identified, you can estimate the release and other waste management activity quantities of EPCRA Section 313 chemicals or chemical categories for each element of the Form R. The recommended approach is that you estimate amounts from all sources at your facility to each type as identified by the elements of Form R. Table 4-3 presents a work sheet that may be helpful in compiling this information.

If you prepare a Form R, you must also enter on-site treatment information in Section 7A, including the code for each treatment method used, the destruction and removal efficiency for the EPCRA Section 313 chemical or chemical category in the treated waste stream, and the concentration of the EPCRA Section 313 chemical or chemical category in the influent to treatment (40 CFR § 372.85(b)(17)). You should report treatment methods that do not actually destroy or remove the toxic chemical or chemical category by entering "zero (0)" for removal efficiency (53 FR 4517). Similarly, on-site energy recovery methods and on-site recycling methods must be reported in Sections 7B and 7C, respectively.

Table 4-3

Release and Other Waste Management Quantity Estimation Worksheet

Facility Name: _____ Date Worksheet Prepared: _____

EPCRA Section 313 Chemical or Chemical Category: _____ Prepared by: _____

CAS Registry Number: _____

Reporting Year: _____

ON SITE			
Release or Other Waste Management Activity Type	**Amount (lb)**	**Basis of Estimate**	**Form R Element* (2000 version)**
FUGITIVE AIR			
Equipment Leaks			5.1 and 8.1 or 8.8
Process Areas			5.1 and 8.1 or 8.8
Evaporative Losses, Spills, Surface Impoundments			5.1 and 8.1 or 8.8
Total =			5.1 and 8.1 or 8.8
STACK AIR			
Process Vents			5.2 and 8.1 or 8.8
Storage Tanks			5.2 and 8.1 or 8.8
Control Device Stacks			5.2 and 8.1 or 8.8
Other			5.2 and 8.1 or 8.8
Total =			5.2 and 8.1 or 8.8
RECEIVING STREAM/WATER BODY DISCHARGE			
Stormwater Discharge			5.3 and 8.1 or 8.8
On-Site Treatment Plant Discharge			5.3 and 8.1 or 8.8
Total =			5.3 and 8.1 or 8.8
ON-SITE UNDERGROUND INJECTION			
Underground Injection to Class I Wells			5.4 and 8.1 or 8.8
Underground Injection to Class II - V Wells			5.4 and 8.1 or 8.8
Total =			5.4 and 8.1 or 8.8

*Entries for Section 8.8 only if release is result of remedial action, catastrophic event, or one-time event not associated with production process.

Table 4-3 (Continued)

ON SITE			
Release or Other Waste Management Activity Type	**Amount (lb)**	**Basis of Estimate**	**Form R Element* (2000 version)**
ON-SITE LAND			
RCRA Subtitle C Landfill			5.5 and 8.1 or 8.8
Other Landfill			5.5 and 8.1 or 8.8
Land Treatment/Application Farming			5.5 and 8.1, or 8.8
Surface Impoundment			5.5 and 8.1 or 8.8
Other Disposal			5.5 and 8.1 or 8.8
Total =			5.5 and 8.1 or 8.8
ON-SITE ENERGY RECOVERY			
Industrial Kiln			8.2
Industrial Furnace			8.2
Industrial Boiler			8.2
Other Energy Recovery Methods			8.2
Total =			8.2
ON-SITE RECYCLING			
Solvents/Organics Recovery			8.4
Metals Recovery			8.4
Acid Regeneration			8.4
Other Reuse or Recovery			8.4
Total =			8.4
ON-SITE TREATMENT			
Air Emissions Treatment			8.6
Biological Treatment			8.6
Chemical Treatment			8.6
Incineration/Thermal Treatment			8.6
Physical Treatment			8.6
Solidification/Stabilization			8.6
Total =			8.6

*Entries for Section 8.8 only if release is result of remedial action, catastrophic event, or one-time event not associated with production process.

Table 4-3 (Continued)

OFF SITE				
Release or Other Waste Management Activity Type	**Amount (lb)**	**Basis of Estimate**	**Form R Element* (2000 version)**	**Off-Site Location (name)**
OFF-SITE DISPOSAL				
Solidification/Stabilization (metals and metal compounds only)			6.2 and 8.1 or 8.8	
Amount of metal and metal compounds to POTW			6.1 and 8.1 or 8.8	
Wastewater Treatment (excluding POTWs) metals and metal compounds only			6.2 and 8.1 or 8.8	
Underground Injection			6.2 and 8.1 or 8.8	
Landfill/Surface Impoundment			6.2 and 8.1 or 8.8	
Land Treatment			6.2 and 8.1 or 8.8	
Other Land Disposal			6.2 and 8.1 or 8.8	
Other Off-Site Management			6.2 and 8.1 or 8.8	
Total =			6.2 and 8.1 or 8.8	
OTHER AMOUNTS SENT OFF SITE				
Amounts sent for storage			6.2 and 8.1 or 8.8	
Amounts sent for unknown waste management practice			6.2 and 8.1 or 8.8	
Total =			6.2 and 8.1 or 8.8	
OFF-SITE TREATMENT				
Solidification/Stabilization			6.2 and 8.7 or 8.8	
Incineration/Thermal Treatment			6.2 and 8.7 or 8.8	
Incineration/Insignificant Fuel Value			6.2 and 8.7 or 8.8	
Wastewater Treatment (to POTW excluding metals and metal compounds)			6.1 and 8.7 or 8.8	
Wastewater Treatment (excluding POTW and metal and metal compounds)			6.2 and 8.7 or 8.8	
Sent to Waste Treatment Broker			6.2 and 8.7 or 8.8	
Total =			6.2 and 8.7 or 8.8	

*Entries for Section 8.8 only if release is result of remedial action, catastrophic event, or one-time event not associated with production process.

Table 4-3 (Continued)

OFF SITE				
Release or Other Waste Management Activity Type	**Amount (lb)**	**Basis of Estimate**	**Form R Element* (2000 version)**	**Off-Site Location (name)**
OFF-SITE ENERGY RECOVERY				
Off-Site Energy Recovery			6.2 and 8.3 or 8.8	
Sent to Energy Recovery Broker			6.2 and 8.3 or 8.8	
Total =			6.2 and 8.3 or 8.8	
OFF-SITE RECYCLING				
Solvents/Organics Recovery			6.2 and 8.5 or 8.8	
Metals Recovery			6.2 and 8.5 or 8.8	
Other Reuse or Recovery			6.2 and 8.5 or 8.8	
Acid Regeneration			6.2 and 8.5 or 8.8	
Sent to Recycling Waste Broker			6.2 and 8.5 or 8.8	
Total =			6.2 and 8.5 or 8.8	

*Entries for Section 8.8 only if release is result of remedial action, catastrophic event, or one-time event not associated with production process.

4.2 Determination of Release and Other Waste Management Activity Quantities from the Presswood and Laminated Wood Products Industry

Presswood and laminated wood products include a variety of products such as plywood, veneer, waferboard, oriented strandboard, particleboard, medium density fiberboard, hardboard, and engineered lumber. Essentially, all of these products are manufactured using wood as a raw product, refining the wood to thin sheets, chips, strands, or fibers, and re-combining the wood using some type of adhesive or resin, usually under pressure and/or heat. EPCRA Section 313 chemicals or chemical categories may be found in the adhesives and resins. They may also be generated as a by-product from refining the wood or from the combustion of wood in dryers.

While the specific processes involved with the manufacture of each type of presswood and laminated product are unique, the basic processes are similar. In general, the manufacture of each type of product consists of a four-step process that involves similar unit operations and corresponding release and waste management of EPCRA Section 313 chemicals and chemical categories. For the purposes of this document, these general steps are defined as:

- Drying (see Section 4.2.2);
- Pressing (see Section 4.2.3);
- Finishing (see Section 4.2.4); and
- Combustion (see Section 4.2.5).

Figure 4-3 presents an overall process flow diagram for these general steps. Detailed diagrams for drying, pressing, and finishing can be found in Sections 4.2.1, 4.2.2, and 4.2.3, respectively.

It is recognized that not all presswood and laminated wood products manufacturing establishments will have all unit operations described in this document. For example, softwood plywood manufacturers may not have finishing operations. However, each of the unit operations discussed are common operations found in presswood and laminated wood products manufacturing establishments covered by EPCRA Section 313 reporting requirements.

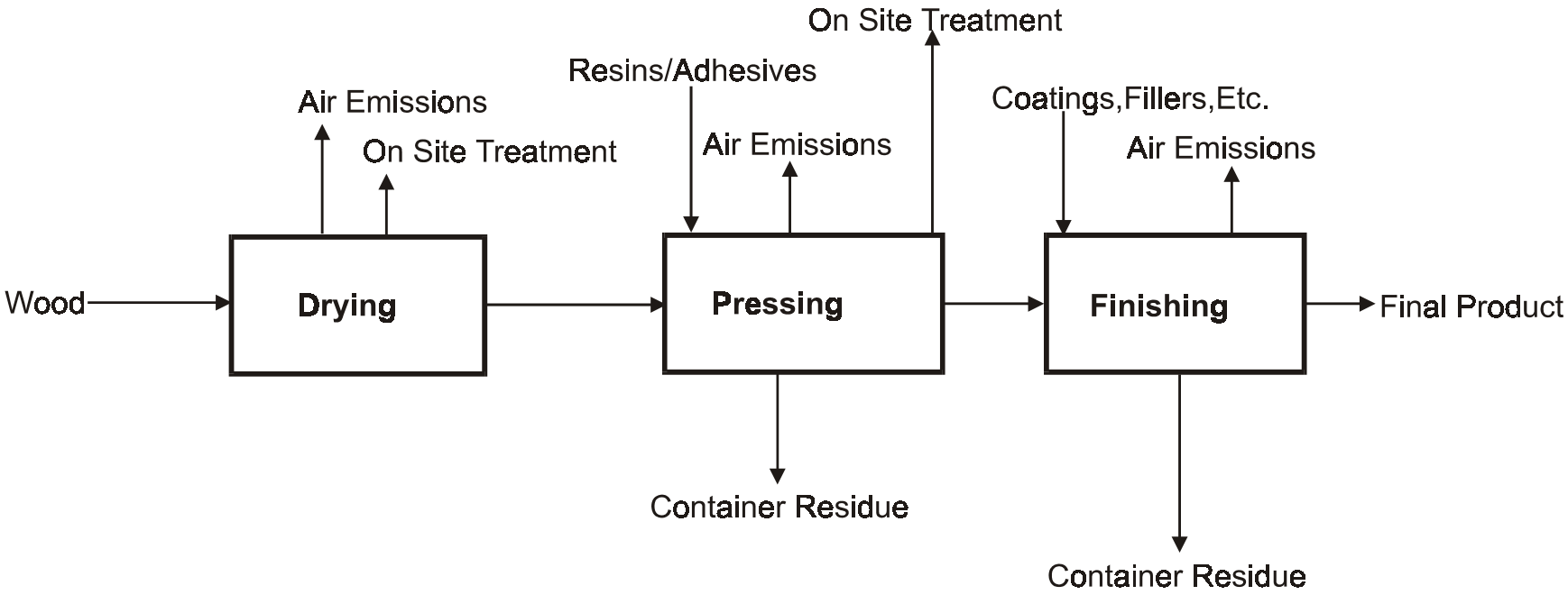

Figure 4-3. Overall Process Flow Diagram - Application of Organic Coatings

You should select the operation, or combination of operations, that most closely fits the activities at your establishment.

A brief discussion of the individual processes involved with manufacture of presswood and laminated products listed above is provided in Section 4.2.1. Sections 4.2.2 through 4.2.5 discuss each of the general steps in the manufacture of presswood and laminated wood products and the corresponding estimation of releases and other waste management quantities.

4.2.1 Process Description

Plywood/Veneer

Plywood is a building material consisting of veneers (thin wood layers or plies) bonded with an adhesive. The outer layers (face and back) surround a core that is usually lumber, veneer, or particleboard. The manufacture of plywood consists of seven main processes: log debarking and bucking, heating the logs, peeling the logs into veneers, drying the veneers, gluing the veneers together, pressing the veneers in a hot press, and finishing processes such as sanding and trimming.

The initial step in plywood manufacturing is feeding logs through debarking machines. After the bark is removed, the logs are cut to appropriate lengths (bucking). The logs (now referred to as blocks) are then heated to improve the cutting action of the veneer lathe or slicer, resulting in better surface finish. Blocks are heated to around 93EC (200EF) using a variety of methods -- hot water baths, steam heat, hot water spray, or a combination of the three.

After heating, the logs are processed to generate veneer. For most applications, a veneer lathe is used, but some decorative, high quality veneer is generated with a veneer slicer. The veneer lathe or slicer compress the wood with a nosebar while cutting the blocks into veneers, typically 1/8 inch thick. These pieces are then clipped to a useable width.

The veneers are then dried in a veneer dryer until the target moisture content is reached. Target moisture content, ranging from <1% to 15%, depends on the type of resin used in subsequent gluing steps. After drying, the veneers are glued together with a thermosetting resin. The two main types of resins are phenol-formaldehyde, which is used for softwood and exterior grades of hardwood, and urea-formaldehyde, which is used to glue interior grades of hardwood. The resins are applied by glue spreaders, curtain coaters, or spray systems.

At the hot press, the laid-up assembly of veneers is consolidated under heat and pressure. Hot pressing has two main objectives: (1) to press the glue into a thin layer over each sheet of veneer; and (2) to activate the thermosetting resins. The press time and temperature vary depending on the wood species used, the resin used, and the press design. Press times range from 2 to 7 minutes and press temperature ranges for softwood and hardwood plywood are 270E-330EF and 225E to 275EF, respectively. Following the hot press, the plywood may undergo trimming and sanding operations.

Waferboard/Oriented Strandboard

Waferboard (WB) and oriented strandboard (OSB) belong to the subset of reconstituted wood panel products called flakeboards. They are structural panels made from wood wafers specially produced from logs at the plant. The relatively long and narrow flakes (strands) are blended with resin and formed into a 3- or 5-layered mat. Aligning the strands in each layer perpendicular to adjacent layers gives OSB flexural properties superior to those of randomly oriented waferboard.

WB/OSB manufacturing begins with whole logs, which are cut to 100-inch lengths by a slasher saw. The logs are then debarked and carried to stationary slasher saws, where they are cut into bolts (33-inches long), in preparation for the waferizer. The waferizer slices the logs into wafers with approximate dimensions of 1.5 in. × 3 in. × 0.028 in.

Triple-pass rotary drum dryers are typical in WB/OSB plants. The dryers are normally fired with wood residue from the plant, but occasionally oil or natural gas are also used

as fuels. The wafers are dried to a low moisture content (generally 4% to 10%, dry basis) to compensate for moisture gained by adding resins and other additives.

After drying, the wafers are conveyed pneumatically from the dryer, separated from the gas stream at the primary cyclone, and screened to remove fines and separate the wafers by surface area and weight. The gas stream continues through an air pollution control device and is vented to the atmosphere. The screened wafers are stored in dry bins.

The dried wafers are blended with resin, wax, and other additives. The most commonly used binders are thermosetting urea-formaldehyde (WB production only), phenol-formaldehyde, and isocyanate resins, all of which require the application of heat for curing.

At the mat forming process the wafers are metered out on a continuously moving screen system. This process is the only step where there is any significant difference between WB and OSB production. In WB production, the wafers are allowed to fall randomly to the moving screen below to form a mat of the required thickness. In OSB production, the wafers are oriented electrostatically or mechanically in one direction. Subsequent forming heads create distinct layers in which the wafers are oriented perpendicular to those in the previous layer.

In the mat trimming section, a traveling saw cuts the formed mat into desired lengths. The trimmed mat proceeds to the accumulating press loader and the hot press. The press applies heat and pressure to activate the resin and bond the wafers into a solid reconstituted product. In most hot presses, boilers generate the steam heat by burning plant residuals. Hot oil and hot water also can be used to heat the press. After cooling, the bonded panel is trimmed to final dimensions, finished (if necessary), and packaged for shipment.

Particleboard

Particleboard is defined as a panel product manufactured from lignocellulosic materials, primarily in the form of discrete particles, combined with a synthetic resin or other suitable binder and bonded together under heat and pressure. The primary difference between

particleboard and other reconstituted wood products is the material or particles used in its production. The major types of particles used to manufacture particleboard include wood shavings, flakes, wafers, chips, sawdust, strands, slivers, and wood wool.

The general steps used to produce particleboard include raw material procurement or generation, classifying by size, drying, blending with resin and sometimes wax, forming the resinated material into a mat, hot pressing, and finishing.

The furnish or raw material for particleboard normally consists of wood particles, primarily wood chips, sawdust, and planer shavings. This material may be shipped to the facility or generated onsite. In facilities where chips are generated on site, logs are debarked, cut, and chipped. After receipt or generation, the furnish may be reduced in size by means of hammermills, flakers, or refiners. The material is then screened using vibrating or gyrator screens, or the particles are air-classified. The purpose of this step is to remove the fines and to separate the core material from the surface material. The screened or classified material is stored until conveyed to dryers. Rotary dryers (single and triple-pass) are the most commonly used dryer type in the particleboard industry. In addition, some facilities use tube dryers to dry the furnish. Wood-fired dryers are used at most facilities, however, gas- and oil-fired dryers are also used.

After drying, the particles pass through a primary cyclone for product recovery and are stored in holding bins until transferred to the blenders. At the blenders, the core and surface materials are mixed with resin, wax, and other additives by means of spray nozzles, tubes, or atomizers. The most commonly used resins are phenol-formaldehyde and urea-formaldehyde.

The blended material is conveyed to the forming machine, which deposits the resinated material into a continuous mat. Formers use air to convey the material, which is dropped or thrown into an air chamber above a moving caul, belt, or screen and floats down into position. To produce multilayer particleboard, several forming heads can be used in series, or air currents can produce a gradation of particle sizes from face to core.

The mat may be prepressed prior to trimming. Following trimming, the press applies heat and pressure to activate the resin and bond the fibers into a solid panel. Presses generally are steam-heated using steam generated by a boiler that burns wood residue. However, hot oil and hot water are also used to heat the press.

Once the particleboard panels are sanded and trimmed to final dimensions, any other finishing operations (e.g., edge painting, laminate or veneer application) are done, and the finished product is packaged for shipment.

Medium Density Fiberboard

Medium density fiberboard (MDF) is a dry-formed panel product manufactured from lignocellulosic fibers with an interfiber bond formed by a synthetic resin or other suitable organic binder. The general steps used to produce MDF include mechanical pulping of wood chips to fibers (refining), drying, blending fibers with resin and sometimes wax, forming the resinated material into a mat, and hot pressing.

The furnish for MDF normally consists of wood chips. Clean chips are softened by steam and then sent to atmospheric or pressurized disk refiners, also known as attrition mills. The refiners use single or double revolving disks to mechanically pulp the chips to obtain fibers in a suitable form for making the board.

From the refiners, the fibers move to the drying and blending area. Heat for the dryers is usually provided by the direct firing of propane, natural gas, or distillate oil. The sequence of the drying and blending operations depends on the method by which resins and other additives are blended with the fibers. Some plants inject resins into a short-retention blender, while others inject resin formulations into a blowline system. If resin is added in a separate blender, the fibers are first dried and separated from the gas stream by a primary cyclone, then conveyed to the blender. The fibers then are blended with resin, wax, and any other additives and conveyed to a dry fiber storage bin. Urea-formaldehyde (UF) resins are the

most common resins used. Phenolic resins and melamine resins may also be used, however MDF plants generally do not use phenolic resins.

Air conveys the resinated fibers from storage to the forming machine, where they are deposited on a continuously moving screen system. The continuously formed mat must be prepressed before being loaded into the hot press. After prepressing, some pretrimming is done. The prepressed and trimmed mats then are transferred to the hot press. The press applies heat and pressure to activate the resin and bond the fibers into a solid panel. Radio-frequency (RF) heating and steam heating of the press platens are common in domestic MDF plants. After pressing, the boards are cooled, sanded, trimmed to final dimensions, finished if required, and packaged for shipment.

Hardboard/Fiberboard

Hardboard and fiberboard are similar to MDF in some respects. Hardboard is a higher-density version of MDF, while fiberboard has a lower density than MDF. Hardboard is used for housing (e.g., exterior siding, garage doors, and interior door facings), furniture, store fixtures, automotive interiors, and toys. Fiberboard is used for housing, roofing, and office furnishings. Like MDF, hardboard and fiberboard are manufactured from wood chips which are softened and refined into wood fibers. However, the processes and resins used to manufacture hardboard and fiberboard differ from those used to manufacture MDF.

One of three processes may be used to manufacture hardboard: dry process, wet process, or wet/dry processes. Dry processing involves dry mat forming and pressing, while wet processing involves wet forming and wet pressing. Wet/dry processing involves wet forming followed by dry pressing. Fiberboard is manufactured by wet forming, however the fiberboard is not pressed.

Dry process hardboard manufacturing is similar to MDF manufacturing, except for the resin used and operations following pressing. The hardboard wood furnish is dried using tube dryers. Blowline blending is used to blend PF resin with the hardboard fibers. If a blowline

system is used, the fibers are blended with resin, wax, and other additives in a blowpipe that discharges the resinated fibers to the dryer. The resinated, dried fibers are formed into a mat and pressed. Following pressing, the boards are coated with a drying oil and further dried in a tempering oven. Tempering of the hardboard improves its water resistance. Once tempered, the boards are re-humidified to improve their dimensional stability. Following humidification, the boards are finished and packaged for shipment.

Wet hardboard, wet/dry hardboard, and fiberboard mats are formed using a wet process in which fibers are mixed with water and adhesive and then metered onto a wire screen. Water is drained away with the aid of suction applied to the underside of the screen. The fiber mat, along with the supporting wire, is moved to a prepress where excess water is squeezed out. A PF adhesive is used for wet process hardboard. Linseed oil, asphalt, and/or starch is used as the binder in wet/dry process hardboard and fiberboard manufacturing.

Once formed, wet process hardboard is pressed and further dried in a bake oven. The wet process boards are then passed through a humidifier and finished. Wet/dry process hardboard is dried in a conveyor-type dryer before being hot pressed. Once pressed, the wet/dry hardboard is tempered and re-humidified. Fiberboard is also dried in a conveyor-type dryer following forming. The fiberboard is ready for finishing once it is dried.

Engineered Wood Products

Engineered wood products are made from lumber, veneers, strands of wood, or from other small wood elements that are bound together with structural adhesives to form lumber-like structural products. They are designed for use as girders, beams, headers, joists, studs, columns, and other end uses. The engineered wood products discussed in this document include laminated veneer lumber (LVL), laminated strand lumber (LSL), parallel strand lumber (PSL), I-joists, and glue-laminated beams (glu-lam).

Laminated Veneer Lumber - Laminated veneer lumber consists of layers of wood veneers laminated together into a billet with PF resin. Laminated veneer lumber is used

for headers, beams, rafters, and I-joist flanges. Veneers used in LVL manufacture are either purchased pre-dried, purchased green and dried on site, or peeled and dried on site. Softwood or hardwood veneers may be used to manufacture LVL. The veneer dryers used at LVL plants are the same types of dryers in use at plywood plants. The dried veneers are graded and passed under a curtain or roll coater where phenol-formaldehyde (PF) resin is applied. Some plants that manufacture LVL from hardwood species may use urea-formaldehyde (UF) resin rather than PF resin. Next, the veneers are manually laid up into a long stack that is several inches thick. The veneer stack is fed to a hot press where the veneers are pressed into a solid billet under heat and pressure. Batch or continuous presses heated by electricity, microwaves, hot oil, steam, or radio frequency (RF) waves are used for LVL. Billets exiting the press are several inches thick, and may be made even thicker in a secondary gluing operation. The billets are sawed into strips based on customer specifications. Trademarks or grade stamps may be applied in ink to the LVL before it is shipped from the plant.

Laminated Strand Lumber - Laminated strand lumber is made up of hardwood strands glued together with the grain of each strand oriented parallel to the length of the finished product. Whole logs are received at the plant, debarked, cut to length, and conditioned in heated log vats. The conditioned logs are cut into long strands. The strands are screened and dried in either a conveyor or rotary drum dryer. The dried strands are re-screened and blended with MDI resin in a rotating blender. From the blender, the resinated strands are formed into mats. The mats are pressed in a single-opening, batch, steam-injection press. The press compacts the loose mat of strands into a billet that is several inches thick. The pressed billets are sanded, cut to dimensions, and packaged for shipment.

Parallel Strand Lumber - Parallel strand lumber is made of hardwood or softwood veneer strands glued together with PF resin. Logs are peeled into veneers and dried onsite in veneer dryers. The dried veneer is clipped into strands. The veneer strands are coated with PF resin, aligned, and fed into a continuous press. The press uses microwaves to cure the PF resin. A variety of billet dimensions may be produced in the continuous press. Following pressing, the billets are sawn according to customer specifications and packaged for shipment.

I-Joists - Wood I-joists are a family of engineered wood products consisting of a web made from a structural panel such as plywood or OSB which is glued between two flanges made from sawn lumber or LVL. They are used in residential and commercial buildings as floor joists, roof joists, headers, and for other structural applications. The processes for manufacturing wood I-joists range from continuously operated automated production lines to custom hand lay-up processes. Regardless of the process, the general steps used to fabricate I-joists include: flange preparation, web preparation, I-joist assembly, and I-joist curing. Web preparation involves ripping of the web into sections of desired length and machining (tapering) the edges of the web. Flange preparation involves ripping of sawn lumber, LVL, or other engineered wood material to the desired width. If required, the flanges may be finger-jointed end-to-end to form a continuous flange. During the finger-jointing process, grooves are cut into the end of each flange, a phenol-resorcinol-formaldehyde (PRF) finger-jointing resin is applied between the grooves, the flanges are fitted together end-to-end, and the finger-jointing resin is cured in a radio-frequency (RF) tunnel. Next a groove is routed into one face of the flange along its length. Resin (PRF or MDI) is applied in the flange groove and to the short edges of the web material. The webs are fitted together into the resinated grooves between two flanges. The I-joists then pass through an oven or curing chamber to cure the adhesive. Once cured, the finished I-joists are inspected and bundled for shipment.

Glu-Laminated Beams - Glu-laminated beams are manufactured by glueing lumber faces together to form larger structural members for applications such as ridge beams, garage door headers, floor beams, and arches. The glu-lam manufacturing process consists of four phases: (1) drying and grading the lumber; (2) finger-jointing the lumber into longer laminations; (3) face gluing the laminations; and (4) finishing and fabrication. Lumber used to manufacture glu-lam may be dried on site in a lumber kiln or purchased pre-dried from suppliers. The dried lumber is graded and sorted. To manufacture glu-lam in long lengths, the lumber must be finger-jointed at its ends in a process similar to that described above for I-joist flanges. Next, the lumber is planed and adhesive is spread onto the lumber face. Phenol-resorcinol-formaldehyde is the most commonly used adhesive for face gluing. Other adhesives used for face gluing include PF resin or melamine-urea-formaldehyde (MUF) resin. The resinated lumber is assembled into a specified lay-up pattern and is clamped in a clamping bed where a

mechanical or hydraulic system brings the lumber into close contact. Curved beams are clamped in a curved form. The beams are cured at room temperature for several hours before the pressure is released. After the glu-lam beams are removed from the clamping system, the sides are planed or sanded to remove beads of adhesive. The top and bottom of the beams may be lightly planed or sanded depending on appearance requirements. Corners are often rounded as well. The specified appearance of the member dictates whether additional finishing is required at this point in the manufacturing process. Knot holes may be filled with putty patches and the beams may be further sanded. End sealers, surface sealers, finishes, or primer coats may also be applied.

4.2.2 Drying

Drying of the wood prior to subsequent manufacturing steps is needed to obtain a consistent raw product (for reconstituted wood products), as well as to prevent further warping or cracking once the wood has been combined into the finished product (for plywood and veneer). Dryer types include veneer and rotary dryers for particles and flakes (particleboard and OSB), tube dryers for wood fibers (MDF and dry process hardboard), and other conveyor-type dryers for wood slurries (wet/dry hardboard and fiberboard) and flakes (OSB). Hardboard plants also operate bake and/or tempering ovens. Dryers may be direct-fired (the exhaust gases from the combustion process directly contact the wood) or indirect-fired (through the use of steam). Wood may be the only fuel, or supplemental fuels, such as fuel oil or natural gas, may be used.

EPCRA Section 313 chemicals and chemical categories are generated from both the combustion process as well as from the wood itself. Air emissions from dryers include wood dust and other solid particulate matter (PM), formaldehyde, methanol, and other combustion products (such as acetaldehyde). Additional toxic chemicals emitted from dryers may include acrolein, propionaldehyde, and phenol. Furthermore, small amounts of benzene cumene, M&K, MIBK, styrene, toluene, and xylenes may also be emitted from some dryers.

Exhaust gases from wood dryers may be controlled for filterable and condensable particulate matter (PM) as well as for VOC's. VOC control devices used on dryers are typically incineration devices, including regenerative thermal oxidizers, regenerative catalytic oxidizers, thermal oxidizers, and thermal catalytic oxidizers.

Step 1: Prepare Process Flow Diagram

A site-specific process flow diagram can be prepared to help identify all potential sources and types of toxic chemical and chemical category release and other waste management activities. A typical flow diagram is presented in Figure 4-4.

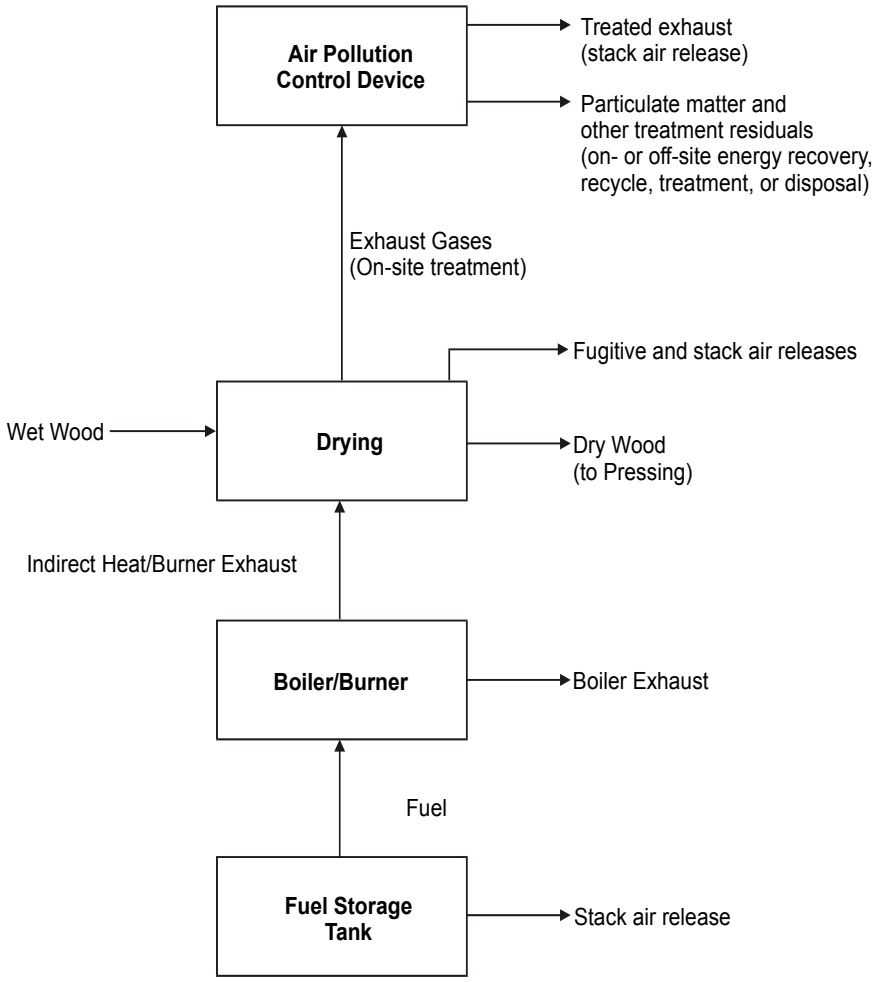

Figure 4-4. Process Flow Diagram - Drying

Step 2: Identify EPCRA Section 313 Chemicals and Chemical Categories and Potential Sources of Chemical Release and Other Waste Management Activities

The most common potential source of EPCRA Section 313 chemicals and chemical categories from dryers are exhaust gases from the dryer vents (if uncontrolled) and control device stacks. EPCRA Section 313 chemicals and chemical categories from dryers include organic chemicals generated from heating the wood and chemicals, and chemicals coincidentally manufactured from the combustion of dryer fuel (typically wood, fuel oil, or natural gas) in direct-fired dryers. If fuel is stored in on-site storage vessels, the daily loading and breathing losses from pressure release valves will result in stack air releases.

The two most predominant EPCRA Section 313 chemicals and chemical categories which would be expected from wood dryers are formaldehyde and methanol. These are generated directly from the heating of the wood. Formaldehyde and other EPCRA Section 313 chemicals (such as acetaldehyde) and chemical categories may also be generated as a product of incomplete combustion of the fuel (particularly if fuel oil is used). Quantities of these chemicals emitted from these sources are dependent on many variables, including wood species, dryer temperature, dryer heating method, fuel used, season of the year, time between logging and processing, wood storage time, and wood moisture content.

Step 3: Identify Release and Other Waste Management Activity Types

The primary sources of release are the drying units and corresponding boilers. Release types include fugitive emissions to the air from uncontrolled vents and leaks from the dryer, and stack emissions directly from the dryer (if uncontrolled) and from the control device stack.

If the exhaust gases from the dryer are controlled, on-site treatment quantities would also be estimated. Note that any EPCRA Section 313 chemical or chemical category sent through an air pollution control device is considered to have been treated for destruction if it is converted to another chemical or it is HC1 or H_2SO_4 acid aerosols. The treatment efficiency of

the unit should be reported in Section 7A and the quantity treated for destruction should be reported in Section 8.6 (for example, the formaldehyde destruction efficiency of a thermal oxidizer should be reported in Section 7A, and the amount (lb/yr) of formaldehyde destroyed should be reported in Section 8.6). Also, note that any EPCRA Section 313 chemical or chemical category sent through an air pollution control device is considered to have been captured for further waste management activities if it is not converted to another chemical or it is not HC1 or H_2SO_4 acid aerosols. The capture efficiency of the unit should be reported in Section 7A and the quantity captured should be reported in Sections 6 and/or 8 depending on the final disposition of the toxic chemical or chemical category. If fuel oil storage tanks are present at your facility, the expected release from breathing and loading operations should be considered a stack release (53 FR 4515).

Typical release and other waste management activities and associated EPCRA Section 313 chemicals and chemical categories are:

Typical Type of Release/Waste Management Activity	Typical EPCRA Section 313 Chemicals and Chemical Categories
Fugitive Air	Methanol, Formaldehyde
Stack Air	Methanol, Formaldehyde, Acetaldehyde
On-Site Treatment	Methanol, Formaldehyde

It should be noted that if fossil fuels are used in dryers or in other applications at a facility, they may contain EPCRA Section 313 chemicals or chemical categories above the *de minimis* level. Please refer to Section 4.2.5 for a discussion of how to determine if these operations are subject to reporting.

Step 4: Determine the Most Appropriate Method(s) and Calculate the Estimates for Release and Other Waste Management Activity Quantities

Stack testing and the use of emission factors are the most viable options for estimating releases and other waste management activity quantities from dryers. This is because emissions associated with dryers are usually generated during the drying process (either evolved

from the raw materials or coincidentally manufactured from combustion of the fuel) and a mass balance approach is typically not practical. If controlled emission rates are unknown, the quantity of EPCRA Section 313 chemicals and chemical categories treated on-site may be calculated using published or vendor provided control efficiency information.

Please refer to Appendix C for a summary of currently available emission factors for presswood and laminated wood products processes. The following example presents the steps to estimate stack emissions of formaldehyde from the drying of poplar veneer.

Example - Dryers (Stack Emissions of Formaldehyde)

Your facility manufactures plywood using poplar veneer. In 1999, your facility processed 12,900 square feet per hour of 3/8 inch veneer through a veneer dryer (indirect heat) and the dryer was in operation 40 hours per week during 50 weeks. The formaldehyde emissions can be calculated using AP-42 emission factors. The AP-42 emission factor for this operation is 0.0023 pounds formaldehyde per thousand square feet veneer.

Step 1. Calculate the total hours of operation over the course of the year.

Total hours of operation = (50 weeks/year) × (40 hours/week)
= 2,000 hours per year

Step 2. Calculate the total quantity of veneer dried in the dryer.

Quantity of veneer = (12,900 square feet/hr) × (2,000 hours per year)
= 25,800,000 square feet/year

Step 3. Estimate formaldehyde emissions.

Formaldehyde emissions = (25,800,000 square feet/year) × (0.0023 pounds formaldehyde/1,000 square feet)
= 59.34 pounds formaldehyde/year

This quantity would be reported in Part II, Section 5.2 (stack or point air emissions) and included in Section 8.1 (quantity released) of the Form R.

Please note that if the emission factors used to estimate releases are developed from on-site testing data, they should be coded as "engineering judgement" on the Form R.

As discussed under Step 3, if an air pollution control device is used, you are required to report the quantity of the EPCRA Section 313 chemical or chemical category that is destroyed and/or removed from the waste stream in Sections 6, 7, and 8 as appropriate. A detailed example for estimating and reporting quantities sent to on-site treatment have been presented in Section 4.1.3.h.

4.2.3 Presses

Presses are used to compress wood products to the desired density, and to provide sufficient contact time and pressure to allow resins and adhesives to fix. Typical adhesives (or glues) used in this industry include thermosetting urea-formaldehyde (UF), phenol-formaldehyde (PF), and isocyanate resins. UF resins are typically used in hardwood plywood, MDF, and particleboard manufacture. PF resins are typically used in softwood plywood and wet/dry process hardboard. A combination of PF and isocyanate resins are typically used in oriented strandboard and waferboard. PF and UF resins are also used in the manufacture of particleboard. Hardboard and engineered lumber plants primarily use PF, phenol-resorcinol-formaldehyde (PRF), or MDI resin. Fiberboard and wet/dry hardboard plants use starch, asphalt, or linseed oil as a binder.

These resins may be combined with a variety of additives prior to application to the wood. The additives include extenders, fillers, catalysts, and caustic solutions. Most additives, however, do not contain EPCRA Section 313 chemicals or chemical categories.

Step 1: Prepare Process Flow Diagram

U.S. EPA recommends you prepare a site-specific process flow diagram to help identify all potential sources and types of chemical and chemical category release and other waste management activities. A typical flow diagram is presented in Figure 4-5.

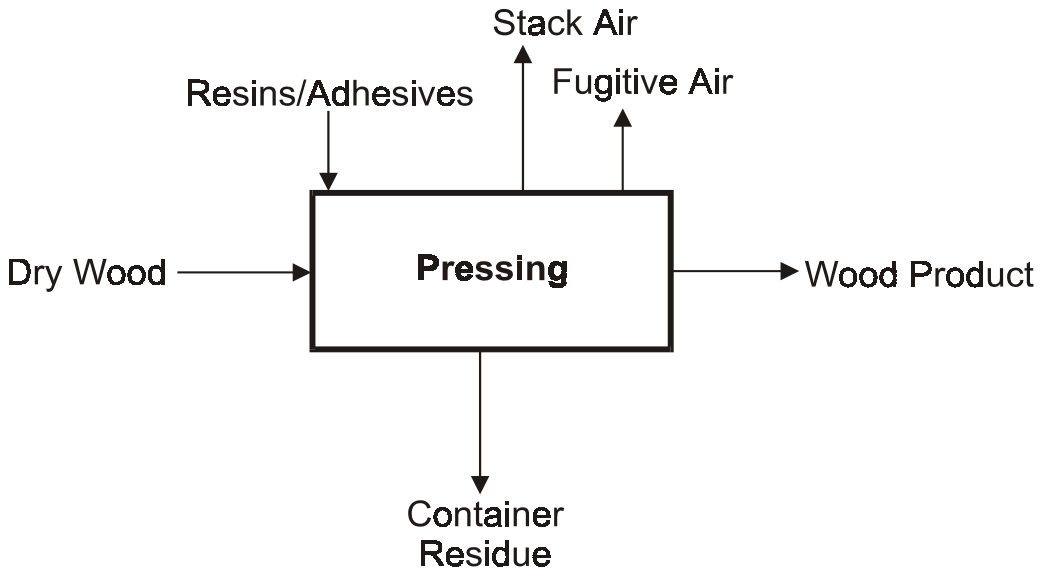

Figure 4-5. Process Flow Diagram - Pressing

Step 2: Identify EPCRA Section 313 Chemicals and Chemical Categories and Potential Sources of Chemical Release and Other Waste Management Activities

Potential sources of EPCRA Section 313 chemicals and chemical categories from press operations include building vents (if uncontrolled), control device stacks, and "empty" containers of resins, adhesives, and additives that may contain residual EPCRA Section 313 chemicals or chemical categories.

Factors that affect press emissions include resin composition, wood species, press temperature, and press cycle time. When the press opens, vapors that may include resin ingredients such as formaldehyde, phenol, methyl diisocyanate (MDI), and other EPCRA Section 313 chemicals and chemical categories are released to the atmosphere through roof vents above the press. Board coolers (where the wood product may be sent following the press operations) may also be a source of releases.

Formaldehyde emitted through press vents during pressing and board cooling operations is dependent upon the amount of excess (free) formaldehyde in the resin as well as

press temperature and cycle time. Small quantities of excess formaldehyde are often present in resin mixtures to ensure adequate resin strength.

Step 3: Identify Release and Other Waste Management Activity Types

Common release and other waste management activity types from press operations include fugitive emissions from board coolers and stack emissions from control devices and press vents, on-site treatment from control devices, and off-site transfer of "empty" containers of resins, adhesives, and additives. Typical release and other waste management activities and associated EPCRA Section 313 chemicals and chemical categories are:

Typical Type of Release/Waste Management Activity	Typical EPCRA Section 313 Chemicals and Chemical Categories
Stack Air	Methanol, Formaldehyde, Phenol, Diisocyanates
Fugitive Air	Methanol, Formaldehyde, Phenol, Diisocyanates
On-Site Treatment (control devices)	Methanol, Formaldehyde, Phenol, Diisocyanates
Off-Site Transfer (residual in empty containers)	Formaldehyde, Phenol, Diisocyanates

Step 4: Determine the Most Appropriate Method(s) and Calculate the Estimates for Release and Other Waste Management Activity Quantities

Mass balances, stack tests, control device efficiencies, and emission factors may be used to estimate release and other waste management activity quantities from press operations (including board coolers if used). Mass balances may be appropriate for estimating formaldehyde releases if the amount of formaldehyde in the resin is known, as well as for estimating releases of solvents used as additives. It should be noted that the mass balance approach is most suitable if all the different fates of the chemical being estimated are known.

Quantities of EPCRA Section 313 chemicals and chemical categories in "empty" containers can be estimated using established residue factors based on the method of cleaning or

draining of the container (see the discussion in Section 4.1.3.g including the common error, Table 4-1, and the corresponding container residue example).

The following example illustrates the use of AP-42 emission factors to estimate formaldehyde releases from a batch press and board cooler.

Example - Presses

Your facility manufactured 30,000,000 square feet of 3/4 inch particleboard in 1999. The process used is a batch hot press followed by a board cooler. The formaldehyde emissions can be calculated from these operations using AP-42 emission factors. The current AP-42 emission factors for formaldehyde from batch hot presses and board coolers are 0.26 and 0.027 pounds per thousand square feet (3/4-inch basis), respectively. (Note: these emission factors assume urea-formaldehyde resins are used.)

Annual emissions from the batch press	= (30,000,000 square feet per year) × (0.26 pounds formaldehyde per 1,000 square feet) = 7,800 pounds formaldehyde per year
Annual emissions from the board cooler	= (30,000,000 square feet per year) × (0.027 pounds per 1,000 square feet) = 810 pounds formaldehyde per year
Total Annual formaldehyde emissions	= 7,800 (lbs/year) + 810 (lbs/year) = 8,610 lbs/year

This quantity would be reported in Part II, Section 5.2 (stack or point air emissions) and included in Section 8.1 (quantity released) as appropriate. If an air pollution control device is used to reduce emissions, you should recalculate the quantity released based on the device's efficiency and complete Part II, Sections 7 and 8.6 as appropriate (see Section 4.1.3.h for a detailed example of on-site treatment).

4.2.4 Finishing Operations

Finishing operations include any processes performed on the wood products subsequent to the pressing and cooling operations described above. Finishing operations may include sanding, cutting, trimming, painting, filling, and coating. Wood residue from these operations is typically collected for energy recovery via combustion in on-site boilers to heat dryers or presses.

Step 1: Prepare Process Flow Diagram

U.S. EPA recommends you prepare a site-specific process flow diagram to help identify all potential sources and types of toxic chemical and chemical category release and other waste management activities. Your diagram would include all of the applicable finishing operations discussed above. A typical flow diagram is presented in Figure 4-6.

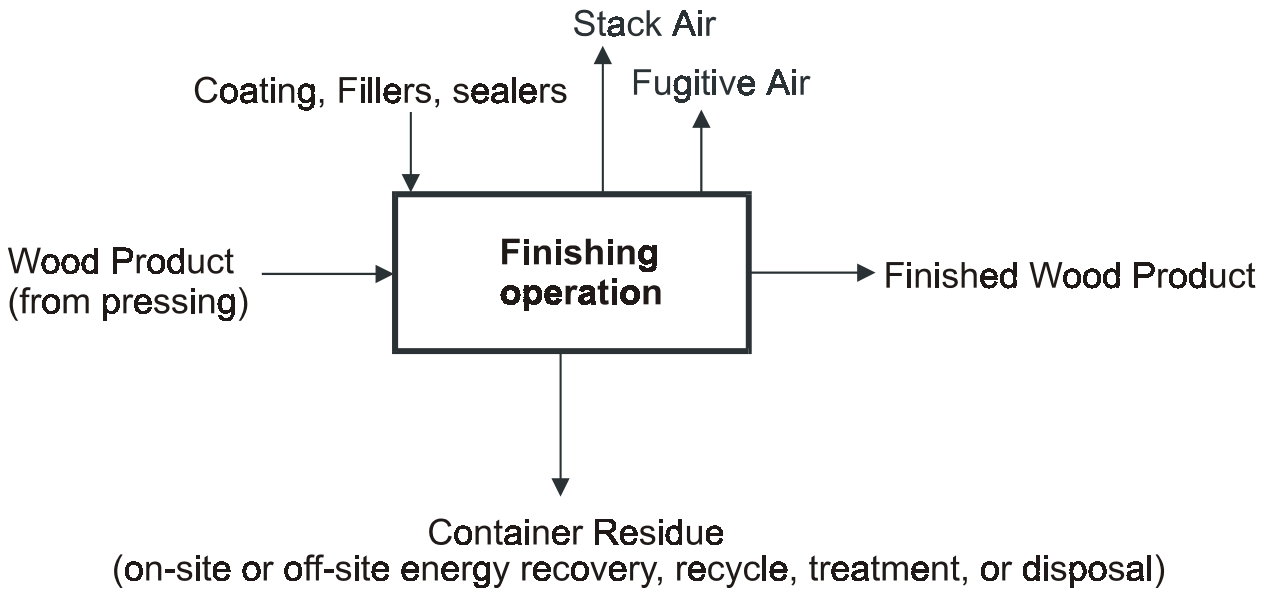

Figure 4-6. Process Flow Diagram - Finishing Operations

Step 2: Identify EPCRA Section 313 Chemicals and Chemical Categories and Potential Sources of Chemical Release and Other Waste Management Activities

The most common potential source of EPCRA Section 313 chemicals and chemical categories from finishing operations are trimming and sawdust residue, evaporation of solvents used in coatings and other surface protectants, and container residues (from "empty" containers of finishing additives).

Step 3: Identify Release and Other Waste Management Activity Types

Release and other waste management activity types from finishing operations include fugitive and stack emissions from the evaporation of volatile coating solvents and cleaning compounds, and off-site transfer of drum residues (to energy recovery, recycle, treatment, or disposal). If wood residue is collected and burned on-site for heat recovery (such as for heating of direct-fired dryers), then EPCRA Section 313 chemicals and chemical categories in the residue should be considered for on-site energy recovery. If this residue is transferred off-site it should be reported as a waste that is managed to energy recovery, recycle, treatment, or disposal as appropriate (40 CFR § 372.85(b)(16)(ii)(B)). Typical release and other waste management activities and corresponding EPCRA Section 313 chemicals and chemical categories are:

Typical Type of Release/Waste Management Activity	Typical EPCRA Section 313 Chemicals and Chemical Categories
Stack Air	Xylene, Toluene, methyl ethyl ketone (MEK), Glycol Ethers
Fugitive Air	Xylene, Toluene, MEK, Glycol Ethers
On-Site Energy Recovery	Xylene, Toluene, MEK, Glycol Ethers
Off-Site Transfer (wood residue and residual chemicals in empty containers)	Xylene, Toluene, MEK, Glycol Ethers

Step 4: Determine the Most Appropriate Method(s) and Calculate the Estimates for Release and Other Waste Management Activity Quantities

Emission factors, mass balances, and source testing may be used to estimate releases and other waste management quantities from finishing operations.

Quantities of EPCRA Section 313 chemicals and chemical categories in "empty" containers can be estimated using established residue factors based on the method of cleaning or draining of the container (see the discussion in Section 4.1.3.g including the Common Error, Table 4-1, and the corresponding container residue example).

The following example illustrates the use of emission factors to estimate the uncontrolled emissions from sanding operations.

Example - Finishing Operations (Fugitive Methanol Emissions from Sanding)

Your facility manufactured 121,000,000 square feet of medium density fiberboard in 1999. As part of the finishing process, both the top and bottom of each board is sanded to produce a uniform surface. Methanol emissions from the sanding operations can be calculated using the site-calculated emission factor of 0.003 pounds per thousand square feet of fiberboard (see Table C-13, Appendix C).

Annual Methanol emissions = (121,000,000 square feet/year) × (0.003 pounds methanol per 1,000 square feet)

= 363 pounds methanol per year

4.2.5 Combustion

If the fuel that is used for your boiler or dryer contains EPCRA Section 313 chemicals or chemical categories, or if these toxic chemicals are coincidentally manufactured during the combustion of the fuel, you must conduct the appropriate threshold and release calculations (40 CFR § 372.3). Natural gas is not expected to contain or generate EPCRA Section 313 chemicals or chemical categories and coal is not typically used. However, if fuel oil or wood is used you should consider it as a potential source of EPCRA Section 313 chemicals or chemical categories and calculate the amount of each chemical manufactured and/or released.

U.S. EPA has analyzed various fuels used for boilers in *Section 313 Emergency Planning and Community Right-to-Know-Act Guidance for Electricity Generating Facilities* (EPA 745-B-99-003). A summary of that analysis is presented here. Please refer to the detailed discussion in the above referenced document for further information.

In general, coal and fuel oils typically contain many organic chemicals along with metals and metal compounds. Combustion of these fuels results in the coincidental manufacture of metal compounds. Formaldehyde is also coincidentally manufactured if fuel oil is used. Wood combustion may also result in the coincidental manufacture of EPCRA Section 313 chemicals and chemical categories (refer to Section 1.6 of AP-42).

To estimate the total quantity of all metal compounds that are coincidentally manufactured, U.S. EPA assumes the metal in the fuel is converted to the metal oxide. A balanced stoichiometric equation from the metal to the metal oxide is then used to determine the mass of oxide generated. This quantity can be used for threshold determinations.

Based on the typical concentration of metal found in fuel oil and the stoichiometric conversion to the appropriate metal oxide, the approximate quantity of fuel oil required to exceed the manufacturing threshold can be calculated. This information has been reproduced in Table 4-4.

Table 4-4

Concentrations of Section 313 Constituents and Their Compounds Found in No. 6 Fuel Oil and Tons of Oil Needed to Manufacture 25,000 lbs.

Fuel Oil Constituents	Concentration (micrograms/gram)	Compound Concentration (micrograms/gram)	Approximate Tons of Fuel Oil Required to Manufacture 25,000 lbs. of Metal Compound (assuming 8 lbs./gallon as the density for No. 6 Fuel Oil)
Manganese/MnO_2	50.0	79.1	158,000
Nickel/NiO	37.5	47.7	262,000
Lead/PbO_2	1.0	1.2	10,831,000
Cadmium/CdO	0.3	0.3	36,500,000
Copper/CuO	0.3	0.4	33,291,000
Cobalt/CoO	0.15	0.19	65,790,000
Selenium/SeO_2	0.09	0.13	98,870,000
Beryllium	0.08	0.22	56,277,000
Antimony	0.01	0.01	944,149,000
Arsenic/As_2O_5	0.058	0.088	140,503,000
Mercury/HgO	0.005	0.005	2,301,136,000
Chromium/CrO_3	0.0045	0.009	1,444,539,000
Silver/AgO	0.0002	0.0002	53,571,429,000

Source: *Economic Analysis of the Final Rule to Add Certain Industry Groups to EPCRA Section 313*, Appendix E, Table E-6.

If a threshold is exceeded you must estimate the quantity of metal that is released from the boiler (40 CFR § 372.30(a)). Table 4-5 presents emission factors for each metal from combustion of number 6 fuel oil. Note that while the entire mass of metal compound applies to threshold calculations, only the mass of the parent metal must be reported for release and other waste management estimates (40 CFR § 372.25(h)).

Table 4-5

Section 313 Metal Emission Factors for Fuel Combustion

No. 6 Fuel Oil Combustion[a]	
Metal	**Average Emission Factor[b] (lb/10^3 Gal)**
Antimony	5.25E-03
Arsenic	1.32E-03
Barium	2.57E-03
Beryllium	2.78E-05
Cadmium	3.98E-04
Chromium	8.45E-04
Chromium (VI)	2.48E-04
Cobalt	6.02E-03
Copper	1.76E-03
Lead	1.51E-03
Manganese	3.00E-03
Mercury	1.13E-04
Nickel	8.45E-02
Selenium	6.83E-04

[a]Data are for residual oil fired boilers, Source Classification Codes (SCCs) 1-01-004-01/04.
[b]To convert from lb/10^3 gal to kg/10^3 L, multiply by 0.12.

Table 4-6 presents the approximate quantity of fuel oil required to exceed the manufacturing threshold for formaldehyde and an emission factor is provided for industrial boilers and furnaces.

Table 4-6

Emission Factor and Tons of No. 6 Fuel Oil Needed to Manufacture 25,000 Pounds of Formaldehyde

Section 313 Chemical	Emission Factor (lbs./ton)	Approx. Tons of Fuel Oil Needed to Manufacture 25,000 lbs. Of Formaldehyde
Formaldehyde	0.00075[a]	33,333,000

Source: *Economic Analysis of the Final Rule to Add Certain Industry Groups to EPCRA Section 313*, Appendix E, Table E-10.

[a]Emission factor is an average range of data for industrial oil-fired boilers and furnaces. Note that the document cautions that "Since formaldehyde is a product of incomplete combustion, it is likely that modern units, particularly for utilities, would have lower emissions than those in these tests which date to the mid-1960s. Additional emissions testing is clearly needed to establish reliable boiler emission factors for formaldehyde."

INDEX

The pages listed in bold text in the index correspond to the primary uses or definitions of the associated term. Additionally, this index includes a list of primary purposes for examples and common errors that are presented throughout the document.

INDEX (Continued)

INDEX (Continued)

INDEX (Continued)

INDEX (Continued)

Appendix A

TRI GUIDANCE RESOURCES

Appendix A

TRI GUIDANCE RESOURCES

A.1 EPCRA Section 313 RELATED REFERENCES

40 CFR 372, Toxic Chemical Release Reporting; Community Right-to-Know; Final Rule
See 53 FR 4500, February 16, 1988.

Toxic Chemical Release Inventory Reporting Forms and Instructions for the Current Reporting Year - See also Automated Toxics Release Inventory Reporting Software (ATRS) under Section A.2, Internet Sites.
U.S. EPA publishes this document each year to provide current guidance for preparing the Form R reports and Form A certification statements. This document contains the most up-to-date list of chemicals for which reports are required. It includes a blank Form R and Form A certification and provides step-by-step instructions for completing each report. It also has a list of U.S. EPA regional and state contacts for EPCRA Section 313 reporting. The current version of this document should always be consulted in preparing the EPCRA Section 313 report.

Common Synonyms for Chemicals Listed Under EPCRA Section 313 of the Emergency Planning and Community Right-to-Know Act (EPA 745-R-95-008)
This glossary contains chemical names and their synonyms for substances covered by the reporting requirements of EPCRA Section 313. The glossary was developed to aid in determining whether a facility manufactures, processes, or uses a chemical subject to EPCRA Section 313 reporting.

Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 112(r) of the Clean Air Act (as amended) (EPA 740-R-95-001)
List of chemicals covered by EPCRA Sections 302 and 313, CERCLA Hazardous Substances, and CAA 112(r). The list contains the chemical name, CAS Registry Number, and reporting requirement(s) to which the chemical is subject.

The Emergency Planning and Community Right-to-Know Act: EPCRA Section 313 Release Reporting Requirements, August, 1995 (EPA 745/K-95-052)
This brochure alerts businesses to their reporting obligations under EPCRA Section 313 and assists in determining whether their facility is required to report. The brochure contains U.S. EPA Regional contacts, the list of EPCRA Section 313 toxic chemicals and a description of the Standard Industrial Classification (SIC) codes subject to EPCRA Section 313.

EPCRA Section 313 Questions and Answers: 1998 Version, (EPA 745-B-98-004).

Executive Order 12856 - Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements: Questions and Answers (EPA 745-R-95-011)
This document assists federal facilities in complying with Executive Order 12856. This information has been compiled by U.S. EPA from questions received from federal facilities. This document is intended for the exclusive use of federal facilities in complying with Sections 302,

303, 304, 311, 312, and 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 and the Pollution Prevention Act of 1990, as directed by the Executive Order.

Supplier Notification Requirements (EPA 560/4-91-006)
This pamphlet assists chemical suppliers who may be subject to the supplier notification requirements under EPCRA Section 313. The pamphlet explains the supplier notification requirements, gives examples of situations which require notification, describes the trade secret provision, and contains a sample notification.

Toxic Chemical Release Inventory - Data Quality Checks to Prevent Common Reporting Errors on Form R/Form A Certification (EPA 745-R-98-012)
This is a compilation of Notices of Data Change, Significant Error, Noncompliance, or Technical Error. It provides a listing of common errors found on the Form R reports submitted to U.S. EPA. It also provides a discussion of the types of errors which result in each of the above Notices as well as a list of Notice of Technical Error codes and descriptions.

Trade Secrets Rule and Form
See 53 FR 28772, July 29, 1988. This rule implements the trade secrets provision of the EPCRA (Section 322) and includes a copy of the trade secret substantiation form.

A.2 INFORMATION SOURCES

Most of the materials included as reference in this manual are available from the following sources:

National Center for Environmental Publications and Information (NCEPI)
P.O. Box 42419
Cincinnati, OH 45242-2419
(800) 490-9198
Fax: (513)489-8695
Internet: *http://www.epa.gov/ncepihom/index.html*

Emergency Planning and Community Right-to-Know (EPCRA) Information Hotline
U.S. Environmental Protection Agency
(800) 424-9346 or (703) 412-9810 (for the Washington, D.C. metropolitan area)
TDD: (800) 553-7672

Internet Sites

- TRI homepage: *http://www.epa.gov/tri*
  This site contains information on the Toxic Release Inventory and provides links to a variety of data and documents related to the TRI program.

- Automated Toxics Release Inventory Reporting Software (ATRS): *http://www.epa.gov/atrs*
  This site provides access to the automated EPCRA Section 313 reporting forms for electronic submittal of required data to U.S. EPA.

- Air CHIEF CD-ROM
  http://www.epa.gov/ttn/chief/airchief.html
  This site provides information on the Air CHIEF CD-ROM, contents, ordering information, system requirements, and sources for additional information.

- Clearinghouse for Inventories and Emission Factors (CHIEF):
  http://www.epa.gov/ttn/chief/
  This site provides access to the latest information and tools for estimating emissions of air pollutants and performing emission inventories.

- Code of Federal Regulations, 40 CFR: *http://www.epa.gov/epacfr40*
  This site was created by U.S. EPA to expand access to Title 40 - Environmental Protections of the Code of Federal Regulations.

- Compilation of Air Pollutant Emission Factors (AP-42):
  http://www.epa.gov/ttn/chief/ap42etc.html
  This site provides access to files containing guidance for estimating emissions from specific sources and emission factors.

- Federal Register Notice: *http://www.epa.gov/EPA-TRI*
  This site provides access to all Federal Register notices related to the TRI program from 1994 to current.

- Material Safety Data Sheets (MSDSs):
  http://msds.pdc.cornell.edu/issearch/msdssrch.htm
  A key word searchable database of 325,000 MSDSs.

- TANKS: *http://www.epa.gov/ttn/chief/tanks.html*
  This site contains information on TANKS, a DOS-based computer software program that computes estimates of VOC emissions from fixed and floating-roof storage tanks.

- WATER8/CHEMDAT8: *http://www.epa.gov/ttn/chief/software.html#water8*
  WATER8 is an analytical model for estimating compound-specific air emissions from wastewater collection and treatment systems. CHEMDAT8 is a Lotus 1-2-3 spreadsheet for estimating VOC emissions from TSDF processes.

A.3 INDUSTRY-SPECIFIC TECHNICAL GUIDANCE DOCUMENTS

In 1988 and 1990, U.S. EPA developed a group of individual guidance documents for industries or activities in industries who primarily manufacture, process, or otherwise use EPCRA Section 313 chemicals. See list of industries/activities below. U.S. EPA is currently revising some of these documents and preparing additional documents. The newer versions will be available beginning in the Fall of 2001.

Chemical Distribution Facilities, January 1999 (EPA 745-B-99-005)

Coal Mining Facilities, January 1999 (EPA 745-B-99-002)

Coincidental Manufacture/By-Products (EPA 260-B-01-012)

Electricity Generating Facilities, January 1999 (EPA 745-B-99-003)

Estimating Releases and Waste Treatment Efficiencies (EPA260-F-01-004)

Federal Facilities, May 2000 (EPA-745-R-00-003)

Food Processors, September 1998 (EPA 745-R-98-011)

Formulation of Aqueous Solutions, March 1988 (EPA 560-4-88-004F)

Foundry Operations (EPA 260-B-01-009)

Leather Tanning and Finishing Industry, April 2000 (EPA 745-B-00-012)

Metal Mining Facilities, January 1999 (EPA 745-B-99-001)

Metal Working and Electroplating Operations, (EPA 260-B-01-010)

Monofilament Fiber Manufacture (EPA 260-B-01-014)

Pulp, Paper, and Paperboard Production (EPA 260-B-01-015)

Petroleum Terminals and Bulk Storage Facilities, January 1999 (EPA 745-B-99-006)

Presswood & Laminated Wood Products Manufacturing (EPA 260-B-01-013)

Printing, Publishing and Packaging Industry, April 2000 (EPA 745-B-00-005)

RCRA Subtitle C TSD Facilities and Solvent Recovery Facilities, January 1999 (EPA 745-B-99-004)

Rubber and Plastics Manufacturing, April 2000 (EPA 745-B-00-017)

Semiconductor Manufacture, July 1999 (EPA 745-R-99-007)

Smelting Operations (EPA 260-B-01-011)

Spray Application and Electrodeposition of Organic Coatings, December 1998 (EPA 745-B-99-014)

Textile Processing Industry, April 200 (EPA 745-B-00-008)

Welding Operations (EPA 260-B-01-007)

Wood Preserving Operations (EPA 260-B-01-008)

U.S. EPA, Office of Compliance, published a series of documents in 1995 called Sector Notebooks. These documents provide information of general interest regarding environmental issues associated with specific industrial sectors. The Document Control Numbers (DCN) range from EPA/310-R-95-001 through EPA/310-R-95-018.

A.4 CHEMICAL-SPECIFIC GUIDANCE DOCUMENTS

U.S. EPA has also developed a group of guidance documents specific to individual chemicals and chemical categories. These are presented below.

Emergency Planning and Community Right-to-Know EPCRA Section 313: Guidance for Reporting Aqueous Ammonia, December 2000 (EPA 745-R-00-005)

Emergency Planning and Community Right-to-Know EPCRA Section 313: List of Toxic Chemicals within the Chlorophenols Category, June 1999 (EPA 745-B-99-013)

Emergency Planning and Community Right-to-Know EPCRA Section 313: Guidance for Reporting Toxic Chemicals within Dioxin and Dioxin-like Compounds Category, December 2000 (EPA 745-B-00-021)

Estimating Releases for Mineral Acid Discharges Using pH Measurements, U.S. Environmental Protection Agency, June 1991

Guidance for Reporting Sulfuric Acid (acid aerosols including mists, vapors, gas, fog, and other airborne forms of any particle size), March 1998 (EPA-745-R-97-007)

Guidance for Reporting Hydrochloric Acid (acid aerosols including mists, vapors, gas, fog, and other airborne forms of any particle size), December 1999 (EPA-745-B-99-014)

Toxic Release Inventory List of Toxic Chemicals within the Glycol Ethers Category and Guidance for Reporting, December 2000 (EPA 745-R-00-004)

Toxic Release Inventory: List of Toxic Chemicals within the Nicotine and Salts Category, June 1999 (EPA 745-R-99-010)

Toxic Release Inventory: List of Toxic Chemicals within the Polychlorinated Alkanes Category and Guidance for Reporting, June 1999 (EPA 745-B-99-023)

Toxic Release Inventory: List of Toxic Chemicals within the Strychnine and Salts Category, June 1999 (EPA 745-R-99-011)

Toxic Release Inventory List of Toxic of Chemicals within the Water Dissociable Nitrate Compounds Category and Guidance for Reporting, December 2000 (EPA 745-R-00-006)

Toxics Release Inventory - List of Toxic Chemicals Within Ethylenebisdithiocarbamic Acid, Salts and Esters Category and List of Mixtures that Contain the Individually Listed Chemicals Maneb, Metiram, Nabam and Zineb, December 2000 (EPA 745-B-00-018)

Toxics Release Inventory - Copper Phthalocyanine Compounds Excluded for the Reporting Requirements Under the Copper Compounds Category on the EPCRA Section 313 List, April 1995, EPA 745-R-95-007

Emergency Planning and Community Right-to-Know EPCRA Section 313: Guidance for Reporting: Mercury and Mercury Compounds Category, June 2001 (EPA 745-B-01-00X)

Emergency Planning and Community Right-to-Know EPCRA Section 313: Guidance for Reporting: Pesticides and Other Persistent Bioaccumulative Toxic (PBT) Chemicals, June 2001 (EPA 745-B-01-00X)

Emergency Planning and Community Right-to-Know EPCRA Section 313: Guidance for Reporting: Polycyclic Aromatic Compounds Category, June 2001 (EPA 745-B-01-00X)

Toxics Release Inventory - List of Toxic Chemicals Within Warfarin Category, June 1999 (EPA 745-B-99-011)

A.5 OTHER USEFUL REFERENCES

Burgess, W.A. Recognition of Health Hazards in Industry. Harvard School of Public Health. Boston, Massachusetts, John-Wiley & Sons.

CRC Handbook of Chemistry and Physics. Latest Edition, Robert C. Weast, Editor, CRC Press, Inc., Florida.

Kirk Othmer - Encyclopedia of Chemical Technology. Latest Edition, John Wiley & Sons, New York.

Locating and Estimating Air Emissions from Various Sources. Available from: National Technical Information Services (NTIS), (703) 487-4650.

The Merck Index. Latest Edition, Merck & Co., Inc., New Jersey.

Perry, R.H. and C.H. Chilton, Chemical Engineer's Handbook. Latest Edition, McGraw-Hill Book Company, New York.

Sax, N.I. and R.J. Lewis, Sr., Hawley's Condensed Chemical Dictionary. Latest Edition, Van Nostrand Reinhold Company, New York.

Appendix B

BASIC CALCULATION TECHNIQUES

Appendix B

BASIC CALCULATION TECHNIQUES

This section will provide the basic techniques needed to use specific types of data or engineering calculations. Examples are provided for:

(1) Stack monitoring data;

(2) Industrial hygiene data;

(3) Raoult's Law;

(4) Air emission factors;

(5) RCRA hazardous waste analysis data;

(6) NPDES monitoring data.

(1) Stack Monitoring Data

The following is an example of a release calculation using monitoring data.

Example: Stack monitoring data are available for a paint booth. The measured average concentration of toluene is 0.1 ppmv (dry gas basis). The moisture content in the stack is typically 10%, and stack conditions are maintained at 80ºC and atmospheric pressure. The stack gas velocity is 8 m/s. The diameter of the stack is 0.3 m. Calculate the point air release of toluene.

Step 1. Calculate volumetric flow of stack gas stream.

Volumetric flow = (gas velocity) × [(π) × (internal stack diameter)^2/4)]

Volumetric flow = (8.0 m/s) × [(π) × (0.3 m)^2/4] = 0.6 m^3/s

Step 2. Correct for moisture content in stack gas stream.

Stack exhausts may contain large amounts of water vapor. The concentration of the chemical in the exhaust is often presented on a dry basis. For an accurate release rate, correct the vent gas flow rate for the moisture content by multiplying by the term (1 - fraction water vapor). The dry gas rate can then by multiplied by the chemical concentration.

(Note: If the toluene concentration is on a wet gas basis, no correction is necessary for moisture content.)

Dry volumetric flow = (Volumetric flow) × (1-fraction water vapor)

Dry volumetric flow = (0.6 m^3/s) × (1-0.10) = 0.5 m^3/s

Step 3. Convert ppmv to mg/m^3.

- ppmv is defined as one part of a chemical in 10^6 parts of gas (1.0 $m^3/10^6$ m^3).
- Use the molar volume of a gas, corrected for stack temperature and pressure conditions, calculated by the ideal gas law (PV = nRT). Note that the molar volume of an ideal gas at 237 K and 1 atm is 22.4 L/mole.
- Molecular weight of toluene (MW) = 92.14 g/mole.
- R = the Ideal Gas Constant (0.082057 L - atm per mole-Kelvin)

To calculate the molar volume of stack gas, use the ideal gas equation.

$$\text{Molar volume} = \frac{V}{n} = \frac{RT}{P}$$

For the example, the stack conditions are 80° C (353 K) and atmospheric pressure (1 atm).

$$\text{Molar volume} = \left(0.082057\ \frac{\text{L-atm}}{\text{mole-K}}\right) \times (353\ \text{K})/(1\text{atm})$$

= 29.0 L/mole

The conversion of ppmv to mg/m^3 can now be calculated.

$$\left(\frac{\text{mg}}{\text{m}^3}\right) = (\text{concentration of chemical, ppmv}) \times \left(\frac{1}{\text{molar volume of gas}}\right) \times (\text{MW})$$

Using the example, the concentration of toluene is calculated as follows:

$$\left(\frac{0.1\ m^3}{10^6\ m^3}\right) \times \left(\frac{mole}{29.0\ L}\right) \times \left(\frac{92.14\ g}{mole}\right) \times \left(\frac{L}{10^{-3}\ m^3}\right) \times \left(\frac{1{,}000\ mg}{1\ g}\right) = 0.3\ mg/m^3$$

Step 4. Calculate air releases.

Air releases are calculated as follows:

Air Release=(volumetric flow, m^3/s) × (concentration, mg/m^3) × (operating time, s/yr)

The paint booth is used 8 hours per day, 5 days per week, 52 weeks per year.

$$\text{Operating time} = \left(8\ \frac{hr}{day}\right) \times \left(5\ \frac{day}{week}\right) \times \left(52\ \frac{week}{yr}\right) = 2{,}080\ hr/yr$$

$$\text{Air Release} = (0.5\ m^3/s) \times (0.3\ mg/m^3) \times \left(\frac{3{,}600\ s}{hr}\right) \times \left(\frac{2{,}080\ hr}{yr}\right) \times \left(\frac{lb}{454\ g}\right) \times \left(\frac{g}{1{,}000\ mg}\right)$$

' 2.5 lb/yr of toluene

It is important to note that this calculation assumes the measured emissions are representative of actual emissions at all times; however, this is not always the case. Ideally, a continuous emissions monitor provides the most representative data.

Also note that monitoring and stack data may have units that are different than those used in the example. Modify conversion factors and constants to reflect your data when calculating air releases.

(2) Industrial Hygiene Data

The following is an example of a release calculation using industrial hygiene data.

Example: Occupational industrial hygiene data shows that workers are exposed to an average of 0.1 ppmv benzene (wet gas basis). The density of benzene vapor is 0.2 lb/ft^3. The ventilation system exhausts 20,000 acfm of room air at 70EF. The plant operates 24 hours per day, 330 days per year.

The benzene concentration is on a wet gas basis, therefore a moisture correction of the ventilation flow rate is not necessary. The industrial hygiene data is collected at the same ambient conditions as the ventilation system, therefore no

adjustment for temperature or pressure needs to be performed. A conservative estimation of benzene fugitive releases could be calculated as follows:

Air Release	=	(ventilation flow rate, ft^3/min) × (operating time, min/yr) × (concentration of chemical, ppmv) × (vapor density of chemical, lb/ft^3)

Benzene releases per year would be calculated as follows:

$$\left(\frac{20{,}000\ ft^3}{min}\right) \times \left(\frac{60\ min}{hr}\right) \times \left(\frac{24\ hr}{day}\right) \times \left(\frac{330\ day}{yr}\right) \times \left(\frac{0.1\ ft^3\ benzene}{10^6\ ft^3\ air}\right) \times \left(\frac{0.2\ lb}{ft^3}\right)$$

$$\approx 190\ lb/yr\ of\ benzene$$

(3) <u>Raoult's Law</u>

The following is an example of a release calculation using Raoult's Law. Raoult's Law states that the partial pressure of a compound in the vapor phase over a solution may be estimated by multiplying its mole fraction in the liquid solution by the vapor pressure of the pure chemical.

$$P_A = X_{A,L}P^o = X_{A,G}P_T$$

where:

PE	=	Vapor pressure of pure liquid chemical A;
$X_{A,L}$	=	Mole fraction of chemical A in solution;
$X_{A,G}$	=	Mole fraction of chemical A in the gas phase;
P_A	=	Partial pressure of chemical A in the gas phase; and
P_T	=	Total pressure.

Example: A wash tank holds a solution containing 10% by weight of o-xylene (A) and 90% by weight of toluene (B). The tank is vented to the atmosphere; the process vent flow rate is estimated as 100 acfm (2.83m^3/min) based on a minimum fresh air ventilation rate. The molecular weight of o-xylene is 106.17 g/mole and toluene is 92.14 g/mole. The vapor pressure of o-xylene is 10 mm of Hg (0.19 psia). The total pressure of the system is 14.7 psia (atmospheric conditions). The process tank is in service 250 days/yr. Calculate the air release of o-xylene.

Step 1: Calculate the mole fraction of o-xylene in the liquid solution.

$$X_{A,L} = \frac{\frac{\text{wt fraction A}}{MW_A}}{\frac{\text{wt fraction A}}{MW_A} + \frac{\text{wt fraction B}}{MW_B}}$$

Where:

$X_{A,L}$	=	Mole fraction of chemical A in liquid solution;
MW	=	Molecular weight of chemical, g/mole; and
wt fraction	=	Weight fraction of chemical in material.

$$X_{A,L} = \frac{\left[\frac{0.1}{106.17}\right]}{\left[\frac{0.1}{106.17} + \frac{0.9}{92.14}\right]}$$

$$X_{A,L} = 0.09$$

Step 2: Calculate the mole fraction of o-xylene in the gas phase.

$$X_{A,G} = \frac{X_{A,L} PE}{P_T}$$

where:

$X_{A,G}$	=	Mole fraction of chemical A in gas phase;
$X_{A,L}$	=	Mole fraction of chemical A in liquid solution;
PE	=	Vapor pressure of pure liquid chemical A, psia; and
P_T	=	Total pressure of system, psia.

$$X_{A,G} = [0.09] \times \left[\frac{0.19 \text{ psia}}{14.7 \text{ psia}}\right] = 0.001$$

Step 3: Calculate releases using Raoult's Law.

$$\text{Emissions} = (X_{A,G}) \times (\text{AFR}) \times (t) \times (MW_A) \times \left(\frac{1}{MV}\right)$$

where:

Emissions	=	Air release of pollutant A, g-A/yr;
$X_{A,G}$	=	Mole fraction of chemical A in gas phase;
AFR	=	Air flow rate of room, m^3/min;
t	=	Operating time of wash tank, min/yr;
MW	=	Molecular weight of chemical, g/g-mole; and
MV	=	Gas molar volume (22.4 L/mole at standard temperature and pressure).

If conditions vary from standard temperature and pressure the gas molar volume can be calculated using the ideal gas law and tank conditions as presented in Example 1.

Emissions = (0.001) ×

$$\left(\frac{2.83\,m^3}{min}\right)\times\left(\frac{250\ day}{yr}\right)\times\left(\frac{24\ hr}{day}\right)\times\left(\frac{60\ min}{hr}\right)\times\left(\frac{mole}{22.4\,L}\right)\times\left(\frac{106.17\,g}{mole}\right)\times\left(\frac{L}{10^{\&3}\,m^3}\right)$$

$= 4.8 \times 10^6$ g/yr

The emission of o-xylene is calculated as shown below.

$$\text{Emissions} = (4.8 \times 10^6\ \text{g/yr}) \times \left(\frac{\text{lb}}{454\ \text{g}}\right) = 10{,}570\ \text{lb/yr of o\&xylene}$$

Air releases for toluene can be calculated in a similar manner.

(4) Air Emission Factor

The following is an example of a release calculation using air emission factors.

Example: An industrial boiler uses 300 gallons per hour of No. 2 fuel oil. The boiler operates 2,000 hours per year. Calculate emissions of formaldehyde using the AP-42 emission factors.

$$AE = (EF) \times (AU) \times (OT)$$

where:

AE	=	Annual emissions of pollutant, lb/yr
EF	=	Emission factor of pollutant, lb/10^3 gallon of fuel. EF for formaldehyde for an industrial boiler burning No. 2 fuel oil is 0.035 to 0.061 lb/10^3 gallons.
AU	=	Quantity of fuel used, gal/yr.
OT	=	Operating time, hr/yr.

Using an emission factor of 0.061 pounds of formaldehyde per gallon of fuel, the air releases are calculated as follows:

$$AE = \left(\frac{0.061\ lb}{10^3\ gal}\right) \times \left(\frac{300\ gal}{hr}\right) \times \left(\frac{2{,}000\ hr}{yr}\right) = 36.6\ lb/yr\ of\ formaldehyde$$

(5) RCRA Waste Analysis

The following is an example of a calculation using RCRA waste analysis data.

Example: Spent paint wastes were disposed at an off-site waste treatment facility. The quantity of paint waste shipped was five 55-gallon drums per year. Analysis of the waste showed 5% cadmium by weight. Estimating the density of the paint waste to be 9.5 lb/gallon, the amount of cadmium to off-site disposal is calculated as follows:

Amount of cadmium = (amount of paint waste disposed, gal/yr) × (concentration of cadmium, lb/lb) × (density of paint waste, lb/gal)

$$\left(\frac{5\ drums}{yr}\right) \times \left(\frac{55\ gal}{drum}\right) \times \left(\frac{9.5\ lb}{gal}\right) \times \left(\frac{5\,lb\ Cd}{100\,lb\ waste}\right) = 131\ lb/yr\ of\ cadmium$$

(6) NPDES Data

The following is an example of a calculation using NPDES data.

NPDES permits require periodic monitoring of the effluent stream. In this example, quarterly samples were taken to be analyzed for silver content. Each sample was an hourly, flow rate-based composite taken for one day to be representative of the discharge for that day. The total effluent volume for that day was also recorded. The following data were collected on each sample day.

Yearly Quarter Sample Number	Discharge Flow Rate (10^6 gal/day)	Total Silver (µg/L)
1	0.5	10
2	0.6	10
3	0.4	6
4	0.2	<3

To calculate the amount of silver in pounds discharged on each sample day, the concentration of silver in the discharge is multiplied by the discharge flow rate for that day, as shown below for the first quarter sample.

Amount of silver = (daily flow rate) × (silver concentration)

$$\text{First Quarter: } \left(\frac{10\,\mu g}{L}\right) \times \left(\frac{1\,g}{10^6\,\mu g}\right) \times \left(\frac{1\,lb}{454\,g}\right) \times \left(\frac{3.785\,L}{gal}\right) \left(\frac{0.5 \times 10^6\,gal}{day}\right)$$

= 0.04 lb/day of silver

The amount of silver discharged during each of the other three monitoring events was similarly determined to be:

0.05 lb/day; 0.02 lb/day, and 0.005 lb/day.

For the last data point the concentration of silver was reported by the laboratory to be less than the detection limit of 3 µg/L. For this calculation the detection limit was used to calculate the daily discharge, a conservative assumption.

The average daily discharge was calculated to be:

$$\left(\frac{0.04 \% 0.05 \% 0.02 \% 0.005}{4}\right) \text{lb/day} \quad ' \quad 0.03\,\text{lb/day}$$

The plant operates 350 days/year (plant shuts down for two weeks in July).

The estimated annual discharge of silver is calculated as follows:

Annual discharge = (350 day/yr) (0.03 lb/day) = 10.5 lb of silver/yr

Appendix C

PRESSWOOD/LAMINATED WOOD PRODUCTS EMISSION FACTORS

Table C-1

Emission Factors for Plywood Veneer Dryers[a]

Source	Emission Control	Formaldehyde	Emission Factor Rating
Poplar (SCC 3-07-007-69)	None	0.0023	E

[a]Reference = AP-42.
Factors represent uncontrolled emissions unless noted. SCC = Source Classification Code. All emission factors in units of pounds per thousand square feet of 3/8-inch thick veneer (lb/MSF 3/8). One lb/MSF 3/8 = 0.5 kg/m^3.

Table C-2

Emission Factors for Plywood Presses - Formaldehyde[a]

Source	Formaldehyde	Emission Factor Rating
Plywood press		
UF resin (SCC 3-07-007-81)	0.0042	E
UF resin, wet scrubber (SCC 3-07-007-81)	0.0025	E

[a]Reference = AP-42.
SCC = Source Classification Code. Emission factors units are pounds per thousand square feet of 3/8-inch thick panel (lb/MSF 3/8). One lb/MSF 3/8 = 0.5 kg/m^3. UF = urea-formaldehyde.

Table C-3

Emission Factors for OSB Dryers[a]

Source	Emission Control Device[b]	CASRN[c]	Pollutant	Emission Factor	Emission Factor Rating
Rotary dryer, direct wood-fired					
Unspecified pines (SCC 3-07-010-01)	None	50-00-0	Formaldehyde	0.067	D
	RTO	50-00-0	Formaldehyde	0.034	E
Aspen (SCC 3-07-010-08)	None	50-00-0	Formaldehyde	0.11	E
Hardwoods (SCC 3-07-010-10)	None	50-00-0	Formaldehyde	0.084	D
		71-43-2	Benzene	0.0016	E
		50-32-8	Benzo-a-pyrene	0.0000030	E
		108-95-2	Phenol	0.0050	E
	RTO	50-00-0	Formaldehyde	0.017	E
Rotary dryer, direct natural gas-fired					
Hardwoods (SCC 3-07-010-20)	None	50-00-0	Formaldehyde	0.036	E

[a]Reference = AP-42.
Emission factor units are pounds of pollutant per oven-dried ton of wood material out of dryer (lb/ODT). One lb/ODT = 0.5 kg/Mg (oven-dried). Factors represent uncontrolled emissions unless otherwise noted. SCC = Source Classification Code.

Table C-4

Emission Factors for OSB Presses[a]

Source[b]	Emission Control Device[c]	CASRN[d]	Pollutant	Emission Factor	Emission Factor Rating
Hot press, PF resin	None				
(SCC 3-07-010-53)		50-00-0	Formaldehyde	0.043	E
		91-20-3	Naphthalene	0.0030	E
		108-95-2	Phenol	0.053	E
Hot press, MDI resin	None				
(SCC 3-07-010-55)		50-00-0	Formaldehyde	0.064	E
		101-68-8	MDI	0.0017	E
Hot press, PF/MDI resins	None				
(SCC 3-07-010-57)		50-00-0	Formaldehyde	0.063	D
		101-68-8	MDI	0.0021	D
		108-95-2	Phenol	0.019	D
	RTO				
		50-00-0	Formaldehyde	0.0043	E
		101-68-8	MDI	0.000078	E
		108-95-2	Phenol	0.0026	E

[a]Reference = AP-42.
Emission factors units are pounds of pollutant per thousand square feet of 3/8-inch thick panel (lb/MSF 3/8). One lb/MSF 3/8 = 0.5 kg/m^3. Factors represent uncontrolled emissions unless otherwise noted. SCC = Source Classification Code.
[b]PF = phenol formaldehyde; MDI - methylene diphenyl diisocyanate; PF/MDI - PF resin in surface layers, MDI resin in core layers.
[c]Emission control device: RTO = regenerative thermal oxidizer.
[d]CASRN = Chemistry Abstracts Service Registry Number.

Table C-5

Emission Factors for Particleboard Dryers[a]

Source	CASRN[b]	Pollutant	Emission Factor	Emission Factor Rating
Rotary dryer, direct wood-fired Southern yellow pine (SCC 3-07-006-06)	50-00-0	Formaldehyde	0.021	E
Rotary dryer, direct wood-fired, unspecified pines[c], 730EF inlet air (SCC 3-07-006-02)	77-55-6	1,1,1-Trichloroethane	1.2E-05	E
	95-63-6	1,2,4-Trimethyl benzene	9.0E-05	E
	5779-94-2	2,5-Dimethyl benzaldehyde	3.3E-05	E
	108-10-1	4-Methyl-2-pentanone	8.1E-05	E
	101-77-9	4,4-Methylene dianiline	3.3E-05	E
	80-56-8	Alpha pinene	0.46	E
	10482-56-1	Alpha terpeneol	0.066	E
	75-07-0	Acetaldehyde	0.010	E
	67-64-1	Acetone	0.0079	E
	98-86-2	Acetophenone	6.4E-05	E
	107-02-8	Acrolein	0.0033	E
	107-13-1	Acrylonitrile	8.9E-05	E
	127-91-3	Beta pinene	0.16	E
	100-52-7	Benzaldehyde	0.0026	E
	71-43-2	Benzene	0.00022	E
	92-52-4	Biphenyl	3.9E-05	E
	117-81-7	Bis-(2-ethylhexyl phthalate)	0.00032	E
	74-83-9	Bromomethane	2.8E-05	E
		Butylbenzyl phthalate	1.4E-05	E
		Butyladehyde	0.0031	E
	75-15-0	Carbon disulfide	1.8E-05	E
	56-23-5	Carbon tetrachloride	1.2E-05	E
	74-87-3	Chloromethane	0.00011	E
	98-82-8	Cumene	6.9E-05	E
	84-74-2	Di-n-butyl phthalate	2.3E-05	E
		Dimethyl sulfide	1.4E-05	E
	100-41-4	Ethyl benzene	3.8E-06	E
	50-00-0	Formaldehyde	0.030	E
	66-25-1	Hexaldehyde	0.016	E
	123-31-9	Hydroquinone	6.0E-05	E
	590-86-3	Isovaleraldehyde	0.00052	E
	108-38-3, 106-42-3	m,p-Xylene	0.00011	E
		m-Tolualdehyde	0.00035	E
	78-93-3	Methyl ethyl ketone	0.0013	E
	75-09-2	Methylene chloride	0.00066	E
	110-54-3	n-Hexane	2.6E.05	E
	98-95-3	Nitrobenzen	1.7E-05	E
	95-47-6	o-Xylene	1.4E-05	E
	99-87-6	p-Cymene	0.0062	E
	100-42-5	Styrene	0.00012	E
		Trans 1,4-dichlorobutene	2.4E-05	E

Table C-5 (Continued)

Source	CASRN[b]	Pollutant	Emission Factor	Emission Factor Rating
Rotary dryer, direct wood-fired, unspecified pines[c], 730EF inlet air (SCC 3-07-006-02) (cont.)	108-88-3	Toluene	0.0017	E
	110-64-3	Valeraldehyde	0.0045	E
	108-05-4	Vinyl acetate	2.9E-05	E
Rotary dryer, direct wood-fired, unspecified pines[c], 900EF inlet air (SCC 3-07-006-04)	5779-94-2	2,5 Dimethyl benzaldehyde	0.0053	E
	80-56-8	Alpha pinene	1.9	E
	10482-56-1	Alpha terpeneol	0.17	E
	75-07-0	Acetaldehyde	0.072	E
	67-64-1	Acetone	0.16	E
	107-02-8	Acrolein	0.023	E
	127-91-3	Beta pinene	0.82	E
	100-52-7	Benzaldehyde	0.12	E
		Butyl aldehyde	0.029	E
	67-66-3	Chloroform	0.00010	E
	123-73-9	Crotonaldehyde	0.010	E
	98-82-8	Cumene	0.0020	E
	50-00-0	Formaldehyde	0.17	E
	66-25-1	Hexaldehyde	0.022	E
	590-86-3	Isovaleraldehyde	0.018	E
	108-38-3, 106-42-3	m-, p-Xylene	0.0076	E
	78-93-3	Methyl ethyl ketone	0.0092	E
	75-09-2	Methylene chloride	0.0022	E
		n-Butyraldehyde	0.030	E
	529-20-4	o-Tolualdehyde	0.011	E
	95-47-6	o-Xylene	0.00045	E
	99-87-6	p-Cymene	0.011	E
	104-87-0	p-Tolualdehyde	0.026	E
	123-38-6	Propionaldehyde	0.011	E
	100-42-5	Styrene	0.00036	E
	108-88-3	Toluene	0.021	E
	110-64-3	Valderaldehyde	0.014	E

[a]Reference = AP-42.
Factors represent uncontrolled emissions. Emission factor units are pounds of pollutant per oven-dried ton of wood material out of dryer (lb/ODT). One lb/ODT = 0.5 kg/Mg (oven-dried). SCC = Source Classification Code.
[b]CASRN = Chemistry Abstracts Service Registry Number.
[c]Unspecified pines = mixed pine species or the specific pine species processed were not reported.

Table C-6

Emission Factors for Particleboard Presses and Board Coolers[a]

Source	CASRN[b]	Pollutant	Emission Factor	Emission Factor Rating
Batch hot press, UF resin				
(SCC 3-07-006-51)	5779-94-2	2,5 Dimethyl benzaldehyde	0.00032	E
	75-07-0	Acetaldehyde	0.014	E
	67-64-1	Acetone	0.013	E
	107-02-8	Acrolein	0.0019	E
	100-52-7	Benzaldehyde	0.0018	E
		Butylaldehyde	0.0018	E
	123-73-9	Crotonaldehyde	0.00050	E
	50-00-0	Formaldehyde	0.26	D
	66-25-1	Hexaldehyde	0.045	E
	590-86-3	Isovaleraldehyde	0.0011	E
	78-93-3	Methyl ethyl ketone	0.0014	E
	80-56-8	a-Pinene	0.00054	E
	127-91-3	b-Pinene	0.00011	E
	123-38-6	Propionaldehyde	7.2E-05	E
	108-88-3	Toluene	0.00047	E
	110-64-3	Valderaldehyde	0.0039	E
Veneer hot press, UF resin				
(SCC 3-07-020-21)	71-55-6	1,1,1-Trichloroethane	0.00022	E
	75-07-0	Acetaldehyde	9.9E-05	E
		Butylaldehyde	0.00014	E
	50-00-0	Formaldehyde	0.0062	E
	66-25-1	Hexaldehyde	0.11	E
	78-93-3	Methyl ethyl ketone	0.00028	E
Board Cooler, UF resin				
(SCC 3-07-006-61)	50-00-0	Formaldehyde	0.027	D
	75-07-0	Acetaldehyde	0.0013	E
	67-64-1	Acetone	0.0020	E
	107-02-8	Acrolein	0.00036	E
	100-52-7	Benzaldehyde	0.00042	E
		Butylaldehyde	0.00060	E
	123-73-9	Crotonaldehyde	0.00029	E
	66-25-1	Hexaldehyde	0.0011	E
	590-86-3	Isolvaleraldehyde	0.00040	E
	78-93-3	Methyl ethyl ketone	0.00011	
	110-62-3	Valeraldehyde	0.0015	

[a]Reference = AP-42.
Emission factors units are pounds of pollutant per thousand square feet of 3/4-inch thick panel (lb/MSF 3/4. One lb/MSF 3/4= 0.26 kg/m^3. Factors represent uncontrolled emissions. SCC = Source Classification Code. All data for mills using urea-formaldehyde resins.
[b]CASRN = Chemistry Abstracts Service Registry Number.

Table C-7

Emission Factors for Laminated Veneer Lumber (LVL) Press Emissions[a]

Pollutant	Emission Factor lb/MCF
Acetaldehyde	5.1E-2
Formaldehyde	5.0E-2
Methanol	3.1E+0
Propionaldehyde	2.2E-2

[a]Reference - NCASI Technical Bulletin No. 769.
MCF = 1,000 cubic feet.

Table C-8

Emission Factors for Wood I-Joist Line Emissions[a]

Pollutant	I-Beam Line lb/MLF
Formaldehyde	1.8E-4
Methanol	1.7E-2

[a]Reference - NCASI Technical Bulletin No. 769.
MLF = 1,000 cubic feet.

Table C-9

Emission Factors for MDF Dryers[a]

Source	CASRN[b]	Pollutant	Emission Factor	Emission Factor Rating
Tube dryer, direct wood-fired				
Hardwoods (SCC 3-07-009-25)	50-00-0	Formaldehyde	0.86	E
Tube dryer, indirect heat				
Hardwoods (SCC 3-07-009-35)	50-00-0 75-07-0	Formaldehyde Acetaldehyde	0.20 0.013	E E

Source	CASRN[b]	Pollutant	Emission Factor	Emission Factor Rating
Mixed species[c]	50-00-0	Formaldehyde	1.4	E
(SCC 3-07-009-39)	5779-94-2	2,5-Dimethyl benzaldehyde	3.8×10^{-4}	E
	75-07-0	Acetaldehyde	0.013	E
	67-64-1	Acetone	0.0025	E
	98-86-2	Acetophenone	2.4×10^{-4}	E
	107-02-8	Acrolein	0.0022	E
	80-56-8	Alpha pinene	0.0062	E
	10482-56-1	Alpha terpeneol	0.0022	E
	100-52-7	Benzaldehyde	0.0026	E
	117-81-7	Bis-(2-ethylhexyl phthalate)	2.7×10^{-4}	E
		Butylbenzyl phthalate	2.4×10^{-4}	E
		Butylaldehyde	0.0028	E
	127-91-3	Beta pinene	0.0064	E
	74-87-3	Chloromethane	0.0015	E
	123-73-9	Crotonaldehyde	0.0019	E
	84-74-2	Di-n-butyl phthalate	1.8×10^{-4}	E
	66-25-1	Hexaldehyde	0.0026	E
	540-84-1	Isooctane	6.2×10^{-4}	E
	590-86-3	Isovaleraldehyde	0.0019	E
	78-93-3	Methyl ethyl ketone	0.0063	E
	75-09-2	Methylene chloride	0.0029	E
	91-20-3	Napthalene	6.6×10^{-4}	E
	110-54-3	n-Hexane	0.0014	E
	529-20-4	o-Tolualdehyde	7.4×10^{-4}	E
	108-95-2	Phenol	2.0×10^{-4}	E
	123-38-6	Propionaldehyde	0.0011	E
	99-87-6	p-Cymene	1.9×10^{-4}	E
	104-87-0	p-Tolualdehyde	0.0036	E
	75-69-4	Trichlorofluoromethane	0.0014	E
	110-62-3	Valeraldehyde	0.0021	E

[a]Reference = AP-42.
Factors represent uncontrolled emissions. SCC = Source Classification Code. All emission factors in units of pounds per oven-dried ton of wood material out of dryer (lb/ODT). One lb/ODT = 0.5 kg/Mg (oven-dried).
[b]CASRN = Chemistry Abstracts Service Registry Number.
[c]Mixed species = 50 percent hardwood and 50 percent softwood.

Table C-10

Emission Factors for MDF Tube Dryer Emissions[a]

Pollutant	Emission Factor for Non-Blowline Blend Dryers lb/ODT	Emission Factor for Blowline Blend Dryers lb/ODT
Methanol	9.8E-1	9.3E-1

[a]Reference = NCASI Technical Bulletin No. 770.
ODT = Oven Dried Tons.

Table C-11

Emission Factors for MDF Presses and Board Coolers[a]

Source	CASRN[b]	Pollutant	Emission Factor	Emission Factor Rating
Batch hot press, UF resin (SCC 3-07-009-60)	5779-94-2	2,5-Dimethyl benzaldehyde	0.0025	E
	75-07-0	Acetaldehyde	0.0051	E
	67-64-1	Acetone	0.0031	E
	107-02-8	Acrolein	0.0012	E
	100-52-7	Benzaldehyde	0.00055	E
		Butylaldehyde	0.0024	E
	123-73-9	Crotonaldehyde	0.0011	E
	50-00-0	Formaldehyde	0.30	D
	66-25-1	Hexaldehyde	0.0029	E
	590-86-3	Isovaleraldehyde	0.0014	E
	78-93-3	Methyl ethyl ketone	0.00059	E
	529-20-4	o-Tolualdehyde	0.00070	E
	123-38-6	Propionaldehyde	0.00054	E
	104-87-0	p-Tolualdehyde	0.0010	E
	110-62-3	Valeraldehyde	0.0024	E
Continuous hot press, UF resin (SCC 3-07-009-50)				
Uncontrolled	50-00-0	Formaldehyde	1.1	E
RTO-controlled	50-00-0	Formaldehyde	0.0091	E

Table C-11 (Continued)

Source	CASRN[b]	Pollutant	Emission Factor	Emission Factor Rating
MDF board cooler, UF resin (SCC 3-07-009-71)				
	5779-94-2	2,5-Dimethyl benzaldehyde	0.00019	E
	75-07-0	Acetaldehyde	0.0010	E
	67-64-1	Acetone	0.0021	E
	107-02-8	Acrolein	0.00022	E
	100-52-7	Benzaldehyde	9.9×10^{-5}	E
		Butylaldehyde	0.0014	E
	123-73-9	Crotonaldehyde	0.00026	E
	50-00-0	Formaldehyde	0.11	E
	66-25-1	Hexaldehyde	0.00065	E
	590-86-3	Isovaleraldehyde	0.00025	E
	78-93-3	Methyl ethyl ketone	0.00011	E
MDF board cooler, UF resin (cont.)	529-20-4	o-Tolualdehyde	6.5×10^{-5}	E
	104-87-0	p-Tolualdehyde	0.00017	E
	110-62-3	Valeraldehyde	0.00048	E

[a]Reference = AP-42.
Emission factors units are pounds of pollutant per thousand square feet of 3/4-inch thick panel (lb/MSF 3/4. One lb/MSF 3/4= 0.26kg/m^3. Factors represent uncontrolled emissions unless otherwise noted. SCC = Source Classification Code. All data for mills using urea-formaldehyde resins.
[b]CASRN = Chemistry Abstracts Service Registry Number.

Table C-12

Emission Factors for MDF Press Emissions[a]

Pollutant	Emission Factor lb/MSF 3/4"
Methanol	3.7E-1
Methyl isobutyl ketone	3.0E-3
Phenol	7.7E-3

[a]Reference = NCASI Technical Bulletin No. 770.
MSF = 1,000 square feet.

Table C-13

Emission Factors for MDF Sanders[a]

Pollutant	Emission Factor lb/MSF
Formaldehyde	2.5E-3
Methanol	2.7E-3
Phenol	3.2E-3
Styrene	2.4E-4

[a]Reference = NCASI Technical Bulletin No. 770.
MSF = 1,000 square feet.

Table C-14

Emission Factors for OSB Press Emissions[a]

Pollutant	Hardwood Press lb/MSF 3/8"	Softwood Press lb/MSF 3/8"
Acetaldehyde	6.5E-3	9.9E-3
Methanol	2.7E-1	3.5E-1

[a]Reference = NCASI Technical Bulletin No. 772.
MSF = 1,000 square feet.

Table C-15

Emission Factors for OSB Dryer Emissions (Southern Pine)[a]

Analyte	Emission Factor lb/ODT
Acetaldehyde	1.1E-1
Acrolein	6.0E-2
Benzene	6.6E-3
Formaldehyde	2.3E-1
Methanol	1.0E-1
Methyl ethyl ketone (MEK)	1.3E-3
Phenol	1.5E-2
Propionaldehyde	6.9E-3
Toluene	1.5E-2

[a]Reference = NCASI Technical Bulletin No. 772.
ODT = oven dried tons.

Table C-16

Emission Factors for Particleboard Mill (Board Coolers)[a]

Analyte	Emission Factor lb/MSF 3/4"
Formaldehyde	1.4E-2
Methanol	8.5E-2
Methyl isobutyl ketone	9.2E-4

[a]Reference = NCASI Technical Bulletin No. 771.
MSF = 1,000 square feet.

Table C-17

Emission Factors for Uncontrolled Particleboard Batch Press[a]

Analyte	Emission Factor lb/MSF 3/4"
Benzene	1.5E-3
Methanol	5.7E-1
Methyl isobutyl ketone	5.5E-3
Phenol	6.3E-3

[a]Reference = NCASI Technical Bulletin No. 771.
MSF = 1,000 square feet.

Table C-18

Emission Factors for Particleboard Rotary Dryer[a]

Analyte	Southern Pine Emission Factors for "Dry" Furnish lb/ODT	Mixed Western Softwood Emission Factors lb/ODT	Mixed Northern Hardwood and Northern Pine Emission Factors lb/ODT
Acetaldehyde	6.3E-3	2.8E-2	1.1E-1
Acrolein	1.9E-3	6.6E-3	2.3E-2
Benzene		2.8E-3	7.5E-3
Formaldehyde		1.2E-1	1.9E-1
Methanol	1.0E-2	4.3E-2	7.3E-2
Methyl ethyl ketone (MEK)	9.6E-3		
Methyl isobutyl ketone	1.4E-3		
Phenol	2.3E-3	1.0E-2	1.6E-2
Propionaldehyde		1.8E-3	4.0E-3
Toluene		6.0E-3	1.4E-2
m,p-xylene		7.7E-4	1.0E-2

[a]Reference = NCASI Technical Bulletin No. 771.
ODT = oven dried tons.

Table C-19

Emission Factors for Particleboard Refiner/Hammermill and Flaker[a]

Analyte	Emission Factor lb/ODT
Methanol	6.9E-3
Phenol	1.1E-3

[a]Reference = NCASI Technical Bulletin No. 771.
ODT = oven dried tons.

Appendix D

UNIT CONVERSION FACTORS

(From U.S. Coast Guard Commandant Instruction M.16465.12A)

CONVERSION FACTORS

To Convert	To	Multiply By
Length		
inches	millimeters	25.4
inches	feet	0.0833
feet	inches	12
feet	meters	0.3048
feet	yards	0.3333
feet	miles (U.S. statute)	0.0001894
yards	feet	3
yards	miles (U.S. statute)	0.0005682
miles (U.S. statute)	feet	5280
miles (U.S. statute)	yards	1760
miles (U.S. statute)	meters	1609
miles (U.S. statute)	nautical miles	0.868
meters	feet	3.271
meters	yards	1.094
meters	miles (U.S. statute)	0.0006214
nautical miles	miles (U.S. statute)	1.152
Area		
square inches	square centimeters	6.452
square inches	square feet	0.006944
square feet	square inches	144
square feet	square meters	0.09290
square meters	square feet	10.76
square miles	square yards	3,097,600
square yards	square feet	9
Volume		
cubic inches	cubic centimeters	16.39
cubic inches	cubic feet	0.0005787
cubic feet	cubic inches	1728
cubic feet	cubic meters	0.02832
cubic feet	U.S. gallons	7.481
cubic meters	cubic feet	35.31
liters	quarts (U.S. liquid)	1.057
quarts (U.S. liquid)	liters	0.9463
U.S. gallons	barrels (petroleum)	0.02381
U.S. gallons	cubic feet	0.1337
U.S. gallons	Imperial gallons	0.8327
barrels (petroleum)	U.S. gallons	42
Imperial gallons	U.S. gallons	1.201
milliliters	cubic centimeters	1

CONVERSION FACTORS (Continued)

To Convert	To	Multiply By
Time		
seconds	minutes	0.01667
seconds	hours	0.0002778
seconds	days	0.00001157
minutes	seconds	60
minutes	hours	0.01667
minutes	days	0.0006944
hours	seconds	3600
hours	minutes	60
hours	days	0.04167
Mass or Weight		
pounds	kilograms	0.4536
pounds	short tons	0.0005
pounds	long tons	0.000464
pounds	metric tons	0.0004536
tons (short)	pounds	2000
tons (metric)	pounds	2205
tons (long)	pounds	2240
kilograms	pounds	2.205
tonnes (metric tons)	kilograms	1000
Energy		
calories	Btu	0.003968
calories	joules	4.187
Btu (British thermal units)	calories	252.0
Btu	joules	1055
joules	calories	0.2388
joules	Btu	0.0009479
Velocity		
feet per second	meters per second	0.3048
feet per second	miles per hour	0.6818
feet per second	knots	0.5921
meters per second	feet per second	3.281
meters per second	miles per hour	2.237
miles per hour	meters per second	0.4470
miles per hour	feet per second	1.467
knots	meters per second	0.5148
knots	miles per hour	1.151
knots	feet per second	1.689
pounds per cubic foot	grams per cubic centimeter	0.01602
grams per cubic centimeter	pounds per cubic foot	62.42
grams er cubic centimeter	kilograms per cubic meter	1000
kilograms per cubic meter	grams per cubic centimeter	0.001

CONVERSION FACTORS (Continued)

To Convert	To	Multiply By
Pressure		
ponds per square inch (absolute) (psia)	kilonewtons per square meter (kN/m^2)	6.895
psia	atmospheres	0.0680
psia	inches of water	27.67
psia	millimeters of mercury (torr)	51.72
pounds per square inch (gauge) (psig)	psia	add 14.70
millimeters of mercury (torr)	psia	0.01934
millimeters of mercury (torr)	kN/m^2	0.1333
inches of water	psia	0.03614
kilograms per square centimeter	millimeters of mercury (torr)	735.6
inches of water	kN/m^2	0.2491
kilograms per square centimeter	atmospheres	0.9678
atmospheres	kN/m^2	101.3
kilograms per square centimeter	psia	14.22
atmospheres	psia	14.70
bars	kN/m^2	100
kilonewtons per square meter (kN/m^2)	psia	0.1450
bars	atmospheres	0.9869
kilonewtons per square meter (kN/m^2)	atmospheres	0.009869
bars	kilograms per square centimeter	1.020
Viscosity		
centipoises	pounds per foot per second	0.0006720
pounds per foot per second	centipoises	1488
centipoises	poises	0.01
centipoises	Newton seconds per square meter	0.001
poises	grams per centimeter per second	1
grams per centimeter per second	poises	1
Newton seconds per square meter	centipoises	1000
Thermal Conductivity		
Btu per hour per foot per EF	watts per meter-kelvin	1.731
Btu per hour per foot per EF	kilocalories per hour per meter per EC	1.488
watts per meter-kelvin	Btu per hour per foot per EF	0.5778
kilocalories per hour per meter per EC	watts per meter-kelvin	1.163
kilocalories per hour per meter per EC	Btu per hour per foot per EF	0.6720
Heat Capacity		
Btu per pound per EF	calories per gram per EC	1
Btu per pound per EF	joules per kilogram-kelvin	4187
joules per kilogram-kelvin	Btu per pound per EF	0.0002388
calories per gram per EC	Btu per pound per EF	1

CONVERSION FACTORS (Continued)

To Convert	To	Multiply By
Concentration (in water solution)		
parts per million (ppm)	milligrams per liter	1
milligrams per liter	ppm	1
milligrams per cubic meter	grams per cubic centimeter	1×10^{-9}
grams per cubic centimeter	milligrams per cubic meter	1×10^{9}
grams per cubic centimeter	pounds per cubic foot	62.42
pounds per cubic foot	grams per cubic centimeter	0.01602
Temperature		
degrees Kelvin (EK)	degrees Rankine (ER)	1.8
degrees Rankine (ER)	degrees Kelvin (EK)	0.5556
degrees centigrade (EC)	degrees Fahrenheit (EF)	first multiply by 1.8, then add 32
degrees Fahrenheit (EF)	degrees centigrade (EC)	first subtract 32, then multiply by 0.5556
degrees centigrade (EC)	degrees Kelvin (EK)	add 273.2
degrees Fahrenheit (EF)	degrees Kelvin (EK)	add 459.7
Flow		
cubic feet per second	U.S. gallons per minute	448.9
U.S. gallons per minute	cubic feet per second	0.002228

Universal Gas Constant (R)

8.314 joules per gram mole-kelvin
1.987 calories per gram mole-kelvin
1.987 Btu per pound mole per EF
10.73 psia-cubic feet per pound mole per EF
82.057 atm-cubic centimeters per gram mole-kelvin
62.361 millimeters mercury liter per gram mole-kelvin