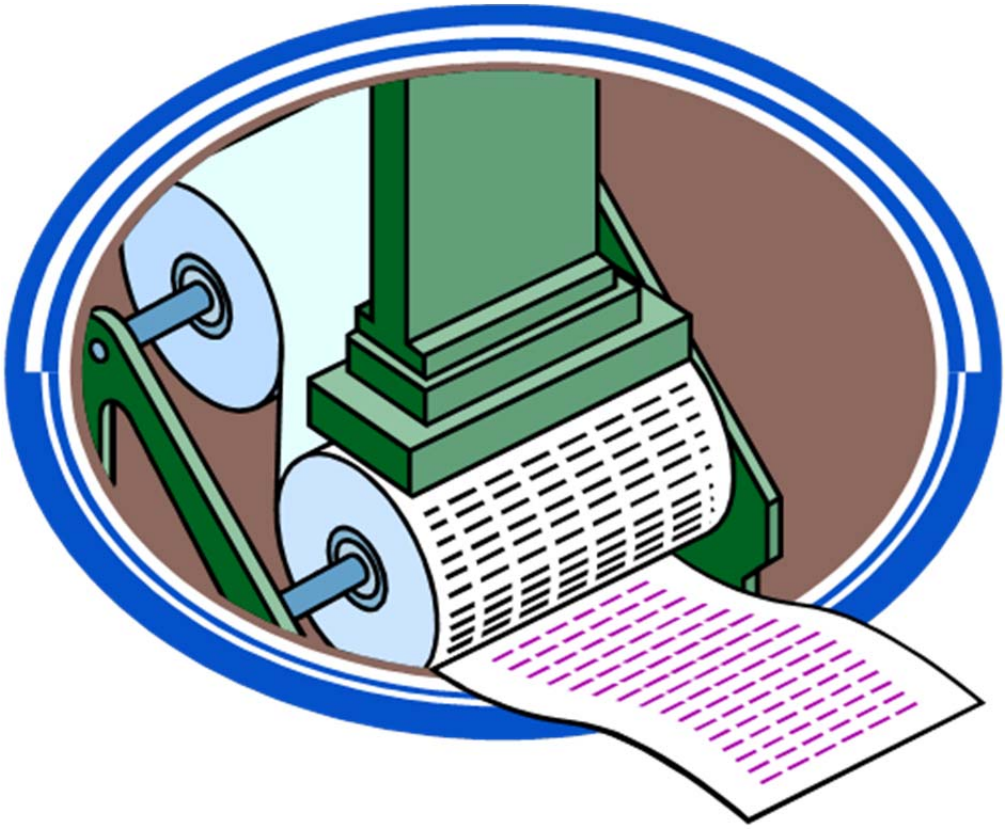
Wisconsin Printers

Environmental Compliance Assistance Workbook



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Wisconsin Department of Natural Resource's
Environmental Results Program for Printers

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Introduction

Environmental laws and regulations are complex and can be difficult to understand. Most regulations are not written for one particular industry, but rather, they apply to a diverse group of industries. In addition, small businesses must understand and comply with the same rules as large corporations. Yet many large corporations have staff trained specifically to work on environmental matters, while most small businesses, including printing operations, do not have the same staff resources.

This workbook is intended to help Wisconsin's smaller printing facility owners and operators understand and comply with regulatory obligations. The workbook mainly focuses on environmental requirements, but it also contains information about related topics, such as health and safety standards, emergency planning and hazard communication, and pollution prevention tips. Using this workbook helps make regulations simple to understand and easy to implement.

This workbook is Part 1 of a two-part compliance assistance package, described below, designed under the Environmental Results Program (ERP). The purpose of the ERP is to help printers in Wisconsin improve their environmental performance. The ERP is a result of collaboration between the Department of Natural Resources (DNR) Small Business Environmental Assistance Program (SBEAP) and several printing trade associations, including the Great Lakes Graphic Association, the Specialty Graphics Imaging Association, the Flexographic Technical Association, and the Printing Industries of America.

Environmental Results Program (ERP) Two-Part Compliance Assistance Package

Part 1 – ***Wisconsin Printers Environmental Compliance Assistance Workbook -*** The workbook explains the environmental standards that apply to your facility, and how to make sure you are complying with these standards. The workbook is designed to be used in conjunction with the accompanying self-evaluation checklist and can also be used as a reference for day-to-day operations. The workbook also provides information regarding best management practices and pollution prevention techniques that can help your facility minimize health risks and environmental impacts while saving money. Finally, the workbook explains how to certify your compliance with environmental regulations.

Part 2 – ***Wisconsin Printers Environmental Compliance Self-Evaluation Checklist -*** The checklist contains a series of compliance questions, which generally require "yes" or "no" answers about whether your facility is following the applicable environmental requirements. After completing the checklist, you will know your facility's compliance status.

The workbook and checklist will serve as an important foundation for small printing operations to understand how to achieve compliance with state and federal requirements. In addition to the information previously mentioned, the workbook also includes information on an Air Pollution Registration Operation Permit (ROP) written specifically for printers – the Type C ROP, or ROP-C. Compliance with the ROP-C is addressed in Chapter 1 of the workbook.

What types of printers can utilize the ERP?

ALL printers with printing operations with a primary Standard Industrial Classification (SIC) Code of 23, 26 or 27 or a primary North American Industry Classification System (NAICS) code of 323xxx or 5111x are subject to the standards included in the Compliance Assistance Workbook. There are two exceptions:

- Manufacturers or other businesses where printing is an ancillary operation.
- Facilities with actual emissions of air pollution greater than any one of the following levels:
  - 25 tons per year of any criteria air pollutant (Volatile Organic Compounds (VOCs), Nitrogen Oxides, Carbon Monoxide, Sulfur Dioxide, Particulate Matter), or
  - 5 tons per year of any single Hazardous Air Pollutant (HAP), or
  - 12.5 tons per year for any combination of HAPs.

If your facility falls into either or both of these categories, this workbook does not cover all requirements that may apply to your facility.

How do I use the workbook and checklist?

The ERP Compliance Assistance Package contains:

- Environmental Compliance Assistance Workbook
  - Resources in the Appendices (Cyan, Yellow, Magenta, and Black Ink Room sections)
- Environmental Compliance Self-Evaluation Checklist

It is best if you read through the workbook, generally in the order that it is presented, and follow along with the checklist, answering the questions as you review the workbook. If you feel comfortable with your understanding of the environmental standards and believe you are in compliance, you may prefer to start with the checklist and refer back to the workbook only if there is a question you cannot answer with certainty.

The checklist may serve as part of an environmental audit process available to printers. Some printers may discover areas where their facility is not in compliance. Actions needed to achieve compliance should be taken as soon as possible. If a compliance issue is discovered by the DNR before compliance is achieved, the DNR may need to take enforcement action. To help printers with noncompliance issues, a program called the Wisconsin Compliance Audit Program is available. The Audit Program offers limited liability for certain requirements and situations to printers that complete an environmental audit. Reviewing the workbook and completing the checklist is an option for performing an internal environmental audit. To use the Audit Program, a printer would need to do the following:

- Notify the DNR of the intent to complete an audit of the environmental requirements, submitted at least 30 days prior to completing the audit.
- Complete the audit using the Compliance Assistance Workbook and Self-Evaluation Checklist. Summarize areas where the checklist indicates the facility is not in compliance in an audit report.
- Report any findings to the DNR within 45 days of completing the audit report, and prepare a compliance plan. Provide a schedule for any requirements that will require time to implement a compliance plan. Follow the compliance plan timelines described in the Audit Program. For more information, visit: http://dnr.wi.gov/business/audit.html.

In order to ensure that compliance is achieved on an annual basis, a suggested course of action could include the following three steps.

1. Complete an internal audit using the Self-Evaluation Checklist and prepare an audit report.
2. Submit the audit report to the DNR under the Audit Program.
3. Submit the checklist to the DNR's Air Program to satisfy the ROP-C annual permit certification requirement.

Is there anything I should do before using this workbook?

Yes, there are a few things you should do up front, some of which will potentially save you time later in the process.

Consider reviewing and implementing the recommended actions in **Chapter 8: Pollution Prevention and Waste Reduction** (Part III of the workbook) before addressing the regulatory requirements in Parts I and II of the workbook. Adopting pollution prevention and waste reduction practices can be a means of complying with environmental regulations. These practices also improve overall environmental performance and cost competitiveness.

Next, gather production related information prior to reviewing the workbook. You will need to know how much ink, coating, fountain solution, cleaning solutions, adhesives, and other materials that contain volatile organic compounds were purchased for your facility. You will also need the Safety Data Sheets for each of the chemicals used at your facility. Finally, you will need to know the amount of waste ink, cleaning solvents, and other chemicals at your facility, as well as how much is generated on a monthly and annual basis.

Finally, review Section A of this Introduction – *Who is this workbook designed to help?* Complete the evaluation of your ink and solvent usage or calculate your emissions as indicated to determine if your facility's air emissions are within the ranges covered by the workbook. Larger printers with emissions greater than the listed thresholds may have requirements that are not addressed within this workbook and are advised against solely using this workbook for determining compliance.

Section A: Who is this workbook designed to help?

The intent of this workbook is to address regulatory issues for those with emissions low enough to either be exempt from needing air permits or qualify for an Air Pollution Permit called the Registration Operation Permit Type C, or ROP-C.

Are the emissions from my printing facility low enough to qualify for ROP-C?

This workbook is designed for those with actual emissions less than:

- 5.0 tons per year of any one federal HAP
- 12.5 tons per year of all federal HAPs, and
- 25 tons per year of VOCs and each of the criteria pollutants

Actual Emissions: the amount of a pollutant emitted from the facility under normal operations. Calculation examples for actual emissions begin in Section A2.

What if my facility's emissions are greater than the thresholds for ERP, what do I do next?

If your facility has emissions over those thresholds:

- do not continue to complete the checklist in this workbook
- contact the Small Business Environmental Assistance Program (SBEAP) at either 1-855-889-3021 or DNRsmallbusiness@wisconsin.gov for assistance with DNR's permit process

How do I determine whether my facility's emissions are below the thresholds?

There are three groups of pollutant emissions to calculate: VOCs, HAPs and criteria pollutants. To determine your facility's emissions, there are two approaches for determining emissions. You can either:

- determine total product/material usage on an annual basis, or
- calculate actual emissions for a full calendar year (See Section A2 below)

If you use a control device, such as an oxidizer, you must calculate your actual emissions. You are not allowed to use the product/material usage approach.

Section A1: Thresholds Based on Material Usage

VOC Emissions

Your printing facility qualifies if:

- total VOC-containing materials used at your facility in a year are less than the thresholds shown in the table on the following page called Facility VOC Thresholds, or
- your actual VOC emissions are less than 25 tons per year

How do I determine my usage of VOC-containing materials?

1. Using records from the previous calendar year, add the total amount of solvent-containing materials used for the year. These include:
   a. inks (depending upon the process type)
   b. cleaning materials used at the press, on rags, in cold cleaning machines, etc.
   c. alcohol or other additives used in fountain solution
   d. coatings and adhesives used on presses or other equipment
2. Compare your usage totals with the Facility VOC Thresholds table to determine whether your facility qualifies. Note that the thresholds vary by the type of printing process.

Be aware that when using purchase records for actual usage accounting, it is usually helpful to complete and apply a year-end inventory of VOC containing products to the purchase record. This step will translate into a more accurate accounting of actual "usage" of each product for that calendar year.

If my facility operates more than one printing process, can I meet the thresholds?

If you operate more than one printing process (e.g., litho and flexo, screen and litho, flexo and screen, etc.) in your facility, you can use one of the following options to determine where you fit under the Facility VOC Thresholds:

1. calculate actual emissions, or
2. use the press type at your facility with the lowest consumption threshold listed in the Facility VOC Thresholds table below.

For example, to use the second option a printer operating both digital and screen printing would:

1. Add the amounts of ink and clean-up solvents used by the facility in the previous calendar year.
2. Refer to the Facility VOC Thresholds table below.
3. Find the press type with the lowest threshold. In this scenario, the process with the lowest threshold is digital printing, with a threshold of 6,000 gallons.
4. If the total ink and clean-up solvent used at the facility is less than 6,000 gallons, the facility qualifies to use this workbook.

Facility VOC Thresholds	
Press Type	**Gallons of Solvent Containing Materials**
Sheetfed/Non-heatset Lithographic	**7,100** gallons of cleaning solvent and fountain solution additives
Heatset Web Offset Lithographic	**50,000** lbs of ink, cleaning solvent and fountain solution additives
Digital Printing	**6,000** gallons of solvent from inks, clean up solutions

Facility VOC Thresholds	
Press Type	**Gallons of Solvent Containing Materials**
Screen Printing	**7,100** gallons of solvent from inks, clean up solutions
Flexographic (Water-based and UV)	**200,000** pounds of water-based and/or UV inks, coatings and adhesives
Flexographic (Solvent)	**50,000** pounds of solvent from inks, dilution solvents, coatings and adhesives

HAP Emissions

Your printing facility qualifies if:

1. during the previous calendar year, your facility used fewer than 1,333 gallons of total materials containing any one HAP as defined by federal standards, AND
2. during the previous calendar year your facility used fewer than 3,333 total gallons of all materials containing HAPs as defined by federal standards

Refer to the ***Cyan Ink Room*** for the list of HAPs.

Materials contain different percentages of HAPs. Does this affect the way I determine the amount used?

Yes. Even if materials contain a very small percentage of HAPs, you must include the amount for all HAPs when determining usage totals. If the amount used exceeds the threshold, your facility might still qualify, but you will have to calculate the actual emissions. For calculations of actual emissions go to Section A2.

How do I determine my usage of HAP-containing materials?

1. Identify which products contain at least one federal HAP.
2. List every product used or purchased during the previous calendar year containing the same HAP. Add together the amount used or purchased for each of these products. This will produce totals for each individual HAP. Usage of each individual HAP must be less than 1,333 gallons per year.
3. List every product used or purchased during the previous calendar year containing one or more HAP. Add together the amount used or purchased for all of these products. The total usage of all products with at least one HAP must be less than 3,333 gallons per year.

If product usage at your facility meets the levels in numbers 2 and 3 above, keep reading to determine if you meet the thresholds for other criteria pollutants.

Additional Criteria Pollutant Emissions

The criteria pollutants nitrogen oxides, sulfur dioxide, carbon monoxide and particulate matter, are all emitted at printing facilities that have certain operations. The main sources of these other criteria pollutants include:

- burning fuels for building heat, dryers, oxidizers, process steam, or generators
- heatset web offset press emissions due to ink oil, which is a condensable organic compound classified as particulate matter
- cutting and trimming operations or from paper or other scrap collection systems

- spray powder ducted from sheetfed offset lithographic presses

What are the fuel usage thresholds?

When fossil fuels, such as natural gas, fuel oil, or coal, are burned, all criteria pollutants as well as hazardous air pollutants are emitted. When emissions of nitrogen oxides (NO_x) or sulfur dioxide (SO_2) from fuels are capped at the ERP eligibility threshold of 25 tons per year, all other criteria pollutant emissions will be far below the thresholds for the respective pollutants. Refer to the Fuel Usage Thresholds table below. If your facility does not exceed the listed fuel consumption levels, NO_x and SO_2 emissions will be less than 25 tons per year.

Fuel Usage Thresholds

Fuel (Unit Size)	Fuel Usage
Natural Gas* (<10 million Btu/hr)	**500** million cubic feet/yr
Natural Gas (10-100 million Btu/hr)	**350** million cubic feet/yr
Distillate Fuel Oil (sulfur = 0.05%)	**2,500,000** gallons/yr

*Includes Propane

What operations at a printer might emit particulate matter?

Another criteria pollutant common to printing operations is particulate matter, or PM. Particulate Matter: any airborne solid or liquid material of a size measured in microns (or micrometers). Total particulate is anything less than 100 microns. EPA regulates categories of PM_{10} and $PM_{2.5}$ or particulates smaller than 10 and 2.5 microns respectively. The primary source of PM is ink oils from heatset web offset presses. PM emissions from trimming operations or spray powder from sheetfed presses are usually insignificant.

How do I keep heatset web offset press emissions below thresholds?

The threshold for VOC eligibility is 50,000 pounds of ink used from lithographic printing. If this threshold is not exceeded, it is assured that less than 10 TPY of PM will be produced from ink oils from uncontrolled heatset web offset presses.

Control devices like thermal or catalytic oxidizers will reduce particulate matter from ink oils by the same amount that the VOCs are reduced. Calculations show that so long as total controlled VOCs are below 25 TPY, then PM due to ink oils will be around 10 TPY.

Are my particulate matter emissions below the thresholds?

We can assume that PM emissions from facilities with heatset web offset presses qualify if:

1. the facility is below the VOC thresholds, and
2. fuel usage is below thresholds

Section A2: Determining you meet the Thresholds Based on Actual Emissions

The total materials used in my facility last year are above the thresholds. Can I calculate actual emissions instead?

Yes. If your facility used more material (inks, solvents, fuels, etc.) than allowed by the thresholds to qualify based on the product usage option, you may still qualify when actual emissions are calculated.

How do I determine VOC actual emissions?

The following equations show how to calculate VOC actual emissions for different materials used on presses.

VOC emissions = Total material used (pounds or gallons) x VOC content (pounds per gallon or percent by weight) x Emission factor

The amount of material used is defined as the total amount purchased minus the amount in inventory and waste.

The emission factor in the equation above refers to the rules allowing printers to account for materials that are not emitted. The basis for allowed emission factors is:

- a factor of 0.05 for inks and varnishes used on sheetfed or non-heatset lithographic presses, which reflects that 95% of ink oils are retained on the substrate
- a factor of 0.80 for inks on used heatset lithographic presses, which reflects that 20% of ink oils are retained on the substrate
- a factor of 0.50 on cleaning solvent, which is ONLY to be used when the VOC composite vapor pressure is less than 10 mmHg at 20°C and ONLY if the solvent is used in conjunction with shop towels and those shop towels are stored in closed containers

How do I calculate VOCs when using an add-on control device to reduce emissions?

For each portion of your operations directed to a control device, include the overall control efficiency (i.e. capture efficiency x destruction/removal) for that device when calculating emissions. For example, the VOC calculation when a control device is used would look like this:

VOCs Emitted = Total VOC emissions from materials used x [1-(capture efficiency x destruction/removal efficiency)]

1. For the control efficiency, use either the results of the latest destruction efficiency test conducted or mass balance for recovery systems on your control device or 90%, the default destruction/removal efficiency.
2. The capture efficiency must be determined by testing, except as explained below for heatset web offset presses.
3. Multiply the capture efficiency and destruction efficiency, as fractions rather than percent.
4. Subtract the answer from 1.
5. Multiply the result by the Total VOC emissions from the materials.
6. To calculate the amount in tons per year, divide pounds of emissions by 2,000.
7. The result is the actual emissions of VOCs from your facility.

How do I determine the capture efficiency for Heatset Web Offset Lithographic Presses?

To determine capture efficiency, for heatset web offset lithographic presses:

- check that the air pressure flow to the dryer is negative relative to the surrounding pressroom
- check that no visible smoke is emitted at the exit slot of the dryer

If these two requirements are met, then calculate VOC emissions for heatset web offset lithographic presses in your facility using the capture efficiencies in the table below for each material indicated.

To calculate, change the percentage to a fraction (i.e., 40% = 40/100 or 0.40). In the case of emissions captured by a control device, there are also fugitive emissions (the fraction not captured or 1-%capture efficiency) to include in the calculation.

Press Section	Capture efficiencies
Ink	100%
Fountain Solution	70% for alcohol substitutes
Automatic Blanket or Roller Washes, where VOC composite partial vapor pressure is less than 10 mmHg at 20°C	40%

For example, the VOC emissions from a heatset web offset lithographic press with an oxidizer achieving 90% destruction would be as follows. Note that the weight percent VOC content and the capture and destruction efficiencies have been converted into a fraction for each item. The emissions in the fugitive groups for fountain solution and blanket wash are the fraction not captured as shown in the "Overall Control" column.

Emissions Calculations for Heatset Web Offset Press

Product	Usage (pounds)	x	VOC Content (%wt)	x	Emission Factor	x	Overall Control	=	VOC Emissions
Ink	100,000	x	40.0	x	0.8	x	1-(1x0.9)	=	3,200
Fountain Solution (overall)	10,000	x	4.0	x	1	x	1-(0.7x 0.9)	=	148
Fountain Solution (controlled)	10,000	x	4.0	x	1	x	0.7 x (1- 0.9)	=	28
Fountain Solution (fugitive)	10,000	x	4.0	x	1	x	1-0.7	=	120
Auto Blanket Wash (overall)	5,000	x	100.0	x	1	x	(1-0.4x 0.9)	=	3,200
Auto Blanket Wash (controlled)	5,000	x	100.0	x	1	x	0.4 x (1- 0.9)	=	200
Auto Blanket Wash (fugitive)	5,000	x	100.0	x	1	x	1-0.4	=	3,000
Manual Blanket Wash	5,000	x	100.0	x	0.5	x	N/A	=	2,500
		Total Pounds VOC							**9,048**
		Total TONS VOC (total pounds / 2000)							**4.52**

After completing calculations for VOC emissions, if the amount for total VOCs is less than 50,000 pounds or 25 tons in a calendar year, your printing facility is eligible for the ERP.

For other emission calculation examples, go to the Cyan Ink Room section CI-8 or the example spreadsheet at: http://dnr.wi.gov/topic/smallbusiness/documents/ERP/printing/ExamplePrinterEmissionCalculationSheets2017.xlsx.

How do I determine HAP emissions?

The method for calculating HAP emissions is similar to that used to calculate VOC emissions. Refer to the calculation table on page A-6 for standard emissions equations for printing facilities and replace the VOC content with the HAP content. When using these equations, it is important to note that HAP quantities in pounds per gallon (lb/gal) are rarely provided on Safety Data Sheets (SDS). It will be necessary to perform additional calculations to obtain the HAP content in lb/gal.

To determine the value for HAP in lb/gal, do the following calculation for each HAP in your materials, referring to the material MSDS for the values indicated:

1. determine total usage of each HAP-containing material in pounds (lbs) or gallons (gal)
2. find the density (lb/gal) of each material (ink, solvent, etc.)
3. find the percent by weight of each HAP
4. if the percent by weight is not provided on the SDS, contact the material supplier to provide the data needed to calculate HAPs in lb/gal
5. if the percent by weight for each HAP is provided, multiply it by the density of the material to determine the HAP content in lb/gal
6. if the density is not provided, multiply the specific gravity by 8.34, which is the density of water
7. add together all individual HAP contents to determine total HAP content

Sometimes VOC or HAP content is only provided as a percent BY VOLUME. This number cannot be used. The content "by volume", if not spelled out as such, may be abbreviated as "v/v" or "bv" on the SDS. If only the "by volume" content is provided, you can contact the supplier to get the content value in "by weight" or the SBEAP may be able to help with calculating emissions.

Then, use the following formula to calculate HAP content:

$$\textit{HAP Content (in lb/gal) = HAP content (\% by weight) x Density of material (in lb/gal)}$$

Finally, determine the HAP emissions using the following formula:

$$\textit{HAPs (in lbs) = Total material used x HAP content x Emission factor}$$

Once you've completed your calculations, you are under the threshold if:

- your emissions of each federal HAP are less than 10,000 pounds per year, and
- your emissions of total federal HAPs combined are less than 25,000 pounds per year

My facility uses an add-on control device to minimize emissions. How does that affect HAP calculations?

Similar to the calculations for VOCs, for each portion of your operations directed to a control device you can include the overall control efficiency (i.e. capture efficiency x destruction/removal) for that device when calculating emissions. For example, the HAP calculation when a control device is used would look like this:

$$\textit{HAPs Emitted = Total HAP emissions from materials used x [1-(capture efficiency x destruction/removal efficiency)]}$$

1. For the control efficiency, use either the results of the latest destruction/removal efficiency test or mass balance for recovery systems conducted on your control device or 90%, the default destruction/removal efficiency.
2. The capture efficiency must be determined by testing, except as explained previously for

heatset web offset presses for VOC emissions (the HAP emissions would be calculated similarly).
3. Multiply the capture efficiency and destruction efficiency.
4. Subtract the answer from 1.
5. Multiply the result by the Total HAP emissions from the materials.
6. To calculate the amount in tons per year, divide pounds of emissions by 2,000.
7. The result is the actual emissions of HAPs from your facility.

Do I need to calculate actual emissions of criteria pollutants?

You do not need to calculate actual emissions of criteria pollutants if:

- you use less than the levels in the Fuel Usage Thresholds table on page v
- you have heatset web offset presses using less than the amounts shown in the Facility VOC Thresholds table on page iii

Emissions Checklist: Do I meet all thresholds to utilize this workbook?

- HAPs:
  - Is your total usage of materials containing any one federal HAP less than 1,333 gallons per year and total usage of materials containing all federal HAPs combined less than 3,333 gallons per year? OR
  - Are your actual emissions less than 10,000 pounds per year of each federal HAP and less than 25,000 pounds per year of all federal HAPs combined?
- VOCs:
  - Is your usage of materials less than the thresholds in the Facility VOC Thresholds table on page iii-iv? OR
  - Are your actual emissions less than 50,000 pounds per year of total VOCs?
- Criteria Pollutants:
  - Is your fuel usage below the amounts in the Fuel Usage Thresholds table on page v?

Question I.1	Do you fall within the thresholds established to indicate the types of printers intended to use this workbook?	❑ Yes. Go to Chapter 1. ❑ No. STOP using this workbook. Contact the SBEAP for help with compliance and permit questions.