

# TOTAL VOC EMISSIONS CALCULATIONS (MASS BALANCE METHOD)

## Instructions for Form D1-4

Form D1-4 should be used to calculate the total VOC emissions from materials (coatings, inks, solvents, etc) used at VOC emission sources. This form uses the mass balance method. If emission factors are used, use Form D2-1. Make as many copies of the form as necessary.

**NAME OF MATERIALS USED OR APPLIED** - Enter the name of the material (coating, ink, thinner, solvent) as it appears on the Material Safety Data Sheet (MSDS) and as it appears on Form D1-1.

**ACTUAL ANNUAL USAGE (a)** - Enter the actual annual usage under normal operation or the projected actual usage of the material in either pounds or gallons. The number entered here should correspond to the VOC content unit. Attach documentation on how actual usages were determined.

**POTENTIAL ANNUAL USAGE (b)** - Enter the amount of the material in either pounds or gallons that would be used if the facility were operating 24 hours per day, 7 days per week, and 52 weeks per year. Physical limitations can be taken into consideration when determining potential usages (e.g. Drying must occur in the paint booth prior to removal of the object painted and positioning of a new object to paint). The number entered here should correspond to the VOC content unit. Attach documentation on how potential usages were determined.

**UNIT** - Enter the unit of measure in which the actual and potential usages are reported on the form. The unit entered here should correspond to the VOC content unit (e.g. gallons if the VOC content unit is lbs/gallon).

**VOC CONTENT (c) & UNIT** - Enter the VOC content and the unit in which the VOC content is reported. A facility may select the unit of measure that is more convenient for emission calculations (e.g. lbs/gal or % by wt). If lbs/gal is selected, enter the lbs of VOC per gallon of the material in the "VOC Content" column and "lbs/gal" in the "Unit" column. If % by weight is selected, enter the percentage of VOC content of the material in the "VOC Content" column and "% by wt" in the "Unit" column. This information can be obtained from the MSDS or the vendor.

**UNCONTROLLED ACTUAL EMISSIONS (Equation d (lb/yr) and Equation e (tpy))** - Calculate and enter the uncontrolled actual emissions.

$$\begin{aligned} \text{Equation:} \quad d &= a \times c \text{ for lb/gal or } d = a \times c/100 \text{ for \% by wt} \\ e &= d/2000 \end{aligned}$$

**UNCONTROLLED POTENTIAL EMISSIONS (Equation f (lb/yr) and Equation g (tpy))** - Calculate and enter the uncontrolled potential emissions.

$$\begin{aligned} \text{Equation:} \quad f &= b \times c \text{ for lb/gal or } f = b \times c/100 \text{ for \% by wt} \\ g &= f/2000 \end{aligned}$$

**CONTROL EFFICIENCY** - Enter the control efficiency if there is a control device for VOC's. Provide documentation of the control efficiency determination in the proper Form C. If there is no control device enter "NA" and proceed to "Total VOC".

**CONTROLLED ACTUAL EMISSIONS (Equation i (lb/yr) and Equation j (tpy))** - Calculate and enter the controlled actual emissions.

$$\begin{aligned} \text{Equation:} \quad i &= d - (d \times (h/100)) \\ j &= i/2000 \end{aligned}$$

**CONTROLLED POTENTIAL EMISSIONS (Equation k (lb/yr) and Equation l (tpy))** - Calculate and enter the controlled potential emissions.

$$\begin{aligned} \text{Equation:} \quad k &= f - (f \times (h/100)) \\ l &= k/2000 \end{aligned}$$

**TOTAL VOC (sum of emissions)** - Add the following columns and enter the total (d,e,f,g,i,j,k, and l).

SECTION D  
**TOTAL VOC EMISSIONS CALCULATIONS**  
 Mass Balance Method

D1-4

Name of Material Used or Applied	Annual Usage			VOC Content	Unit (wt.% or lb/gal)	Uncontrolled Emissions				Control Efficiency (%)	Controlled Emissions				
	Actual (Unit/yr)	Potential (Unit/yr)	Unit (lb or gal)			Actual		Potential			Actual		Potential		
						lb/yr	tons/yr	lb/yr	tons/yr		lb/yr	tons/yr	lb/yr	tons/yr	
<b>Reference for Equation &amp; Notes:</b>	<b>a, (1)</b>	<b>b, (1)</b>	<b>(2)</b>	<b>c</b>	<b>(2)</b>	<b>d</b>	<b>e</b>	<b>f</b>	<b>g</b>	<b>h, (3)</b>	<b>i</b>	<b>j</b>	<b>k</b>	<b>l</b>	
<i>Example:</i>	<i>Material X</i>	5,000	10,000	gal	2.8	lb/gal	14,000	7.00	28,000	14.00	95	700	0.35	1400	0.70
	<i>Material Y</i>	3,000	7,000	lb	50	%	1,500	0.75	3,500	1.75	80	300	0.15	700	0.35
	<b>Total VOC</b>						<b>15,500</b>	<b>7.75</b>	<b>31,500</b>	<b>15.75</b>		<b>1000</b>	<b>0.50</b>	<b>2100</b>	<b>1.05</b>
<b>Total VOC (sum of emission):</b>															

**EQUATIONS:**

**Notes:**

<p><b>d</b> = a x c      for lb/gal</p> <p><b>d</b> = a x c / 100      for wt.%</p> <p><b>e</b> = d / 2000</p> <p><b>f</b> = b x c      for lb/gal</p> <p><b>f</b> = b x c / 100      for wt.%</p>	<p><b>g</b> = f / 2000</p> <p><b>i</b> = d - (d x (h/100))</p> <p><b>j</b> = i / 2000</p> <p><b>k</b> = f - (f x (h/100))</p> <p><b>l</b> = k / 2000</p>
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- (1) Please provide documentation for how actual usage & potential usage values were calculated
- (2) If usage is reported in pounds, VOC content must be provided in % by weight. If usage is reported in gallons, VOC content must be reported in lb / gallon.
- (3) Please provide information about capture efficiency and documentation for how control efficiency was determined. Attach information about retention factors and/or any assumptions made where applicable.