

California Department of Pesticide Regulation  
Ventura County Department of Agriculture

Procedure for Growers and Applicators to Calculate Volatile Organic Compound  
Emissions from Field Fumigations in Ventura County

Regulations to reduce emissions of volatile organic compounds (VOCs) from fumigant pesticides went into effect in 2008. These regulations affect field fumigations within the Ventura nonattainment area (all of Ventura County) during May – October. To comply with these regulations, you submitted a request to obtain a fumigant VOC emission allowance to the county agricultural commissioner (CAC). Based on all requests forwarded by the commissioner, the Department of Pesticide Regulation (DPR) established a VOC emission allowance for each grower, and the CAC specified this emission allowance on your restricted materials permit. The emission allowance is likely less than you requested, so you will need to make these calculations to determine how to reduce your emissions and comply with the allowance.

If you have access to a computer and Microsoft Excel, a file is available to make these calculations automatically. This file is available from the CAC, or you can download it from DPR's web site, [www.cdpr.ca.gov](http://www.cdpr.ca.gov), go to "A-Z Index", click on "VOC regulations", click on "VOC emission targets and allowances". Use the following procedure if you do not have Excel.

**Simple calculation method: Reduce your acreage or application rate by the same percentage as your original request was reduced.** The CAC notified you of the specific pounds of VOC emissions included as a permit condition, as well as the percent reduction of your original request this represents. The simplest way to meet your allowance is to reduce your fumigated acreage or application rate by the same percentage as your request was reduced. For example, if DPR set your allowance by reducing the original request by 18%, you can meet the allowance by reducing the acreage or application rate by 18%. If your allowance includes multiple fields, you have the flexibility to divide acreage to be fumigated among the fields as you wish, as long as the total emissions do not exceed your allowance. If this single percentage reduction is not feasible, follow the instructions below.

**You will need the following information and materials to calculate VOC emissions:**

- 1) Product name and registration number
- 2) Product application rate in pounds or gallons per acre\*
- 3) Number of acres fumigated\*
- 4) Application method (must use low-emission method)
- 5) Product VOC Content Factor table (pages 4 – 8)
- 6) Application Method Emission Rating table (page 9)
- 7) Pen or pencil
- 8) Paper
- 9) A calculator would be very helpful

\* Both the application rate and the number of fumigated acres should be based on entire fields, or "broadcast" applications. For fields where only the bedded areas are treated and

furrows are untreated (or similar alternating treated-untreated areas), the fumigated acreage is the area of the treated beds plus untreated furrows. Similarly, the application rate is the total pounds of fumigant product applied divided by the sum of bedded and furrow acreage.

**General instructions:**

- When available, numbers for all calculations should include at least 3 digits after the decimal point. The final emission value should be rounded to the nearest pound.
- In order to meet your allowance, you will need to reduce the application rate, and/or reduce acreage, and/or change to a product-application method combination with a lower emission rate.

**Step 1: Look up the “VOC Content Factor(s)” for the fumigant product on the Product VOC Content Factor table (pages 4 – 8).** The products are in order by active ingredient(s) and name of the product. There is a VOC Content Factor for each active ingredient in a product. The VOC Content Factor represents the amount of VOCs in the product. For products with application rates in gallons/acre, the VOC Content Factor is the pounds (lbs) of VOCs per gallon of product. For products with application rates in lbs/acre, the VOC Content Factor is the proportion of the product weight that is VOCs. If you use more than one product, you will need to make separate calculations for each product.

Example: The Inline (62719-348) VOC Content Factors are

1,3-D	6.810 lbs VOCs/gallon
Chloropicrin	3.730 lbs VOCs/gallon

**Step 2: Multiply the VOC Content Factor(s) [Step 1] by the product application rate for each active ingredient to determine the VOC application rate(s).** Use the application rate of the product, not active ingredient. Use the same units for the product application rate as the product label, either gallons/acre or lbs/acre. If you use more than one application rate, you will need to make separate calculations.

Example: If you apply Inline at a product application rate of 35 gallons/acre, the VOC application rates are

1,3-D	$6.810 \text{ lbs VOC/gal} \times 35 \text{ gal/ac} = 238.350 \text{ lbs VOC applied/ac}$
Chloropicrin	$3.730 \text{ lbs VOC/gal} \times 35 \text{ gal/ac} = 130.550 \text{ lbs VOC applied/ac}$

**Step 3: Look up the “Emission Rating(s)” for the active ingredients and application method in the Application Method Emission Rating table (page 9).** The emission rating is the percent of the applied active ingredient that volatilizes to air, and varies with fumigant and application method. You will need to convert the percentage to a proportion by dividing by 100. You must use one of the methods shown in the table because the regulations require a low-emission method within the Ventura nonattainment area during May-October. See DPR’s web site described on the first page or contact the CAC for more information on application methods.

Example: If you apply Inline by drip chemigation (method 1209), the VOC emission ratings are

1,3-D	$19\% \text{ or } 19/100 = 0.19$
Chloropicrin	$12\% \text{ or } 12/100 = 0.12$

**Step 4: Multiply the VOC application rate [Step 2] by the emission rating [Step 3] to determine the VOC emission rate for each active ingredient.** If you use more than one application rate or method, you will need to make separate calculations.

Example:

$$\begin{array}{l} 1,3\text{-D} \quad 238.350 \text{ lbs VOC applied/ac} \times 0.19 = 45.286 \text{ lbs VOC emitted/ac} \\ \text{Chloropicrin} \quad 130.550 \text{ lbs VOC applied/ac} \times 0.12 = 15.666 \text{ lbs VOC emitted/ac} \end{array}$$

**Step 5: Multiply the emission rate [Step 4] by the number of acres fumigated to determine the total VOC emissions for each active ingredient.** If you make similar fumigations to multiple fields, the acreage is the sum of all fields combined. If you use more than one product, application rate, or method, assign acreage to each combination and calculate separately.

Example: If you fumigate 105 acres, the total VOC emissions are

$$\begin{array}{l} 1,3\text{-D} \quad 45.286 \text{ lbs VOC emitted/ac} \times 105 \text{ ac} = 4755.030 \text{ lbs VOC emitted} \\ \text{Chloropicrin} \quad 15.666 \text{ lbs VOC emitted/ac} \times 105 \text{ ac} = 1644.930 \text{ lbs VOC emitted} \end{array}$$

**Step 6: Add the VOC emissions for each active ingredient [Step 5] to determine the total VOC emissions for the combined active ingredients.** If you use more than one product, application rate, or application method, you will need to add the emissions for all combinations to determine the combined emissions. The final emission value should be rounded to the nearest pound. If the VOC emissions exceed your allowance, change the product, application rate, application method, or acres and repeat the calculations until you find a combination that meets your VOC emission allowance.

Example:

$$1,3\text{-D} + \text{Chloropicrin} \quad 4755.030 \text{ lbs} + 1644.930 \text{ lbs} = 6400 \text{ lbs VOC emitted}$$

**Shortcut: Multiply all four elements in a single operation.** Calculate the components separately and add together, if the product contains more than one active ingredient, or you use more than one combination of product, application rate, and application method.

$$\begin{array}{l} \text{Combination 1 (VOC Content Factor} \times \text{Application Rate} \times \text{Emission Rating} \times \text{Acres)} \\ + \text{Combination 2 (VOC Content Factor} \times \text{Application Rate} \times \text{Emission Rating} \times \text{Acres)} \\ + \text{Combinations 3, 4, etc.} = \text{combined VOC emissions} \end{array}$$

**For your information:**

These are the same steps DPR used to determine the VOC emissions associated with each request. DPR then reduced all requests by the same proportional amount to meet the fumigant limit for the nonattainment area, as specified in the regulations.

Example: If DPR reduced all requests by 27%, the emission allowance is 73% of the request (100 – 27%).

$$6400 \text{ lbs VOC emitted} \times 73/100 = 4672 \text{ lbs VOC allowance}$$

Growers are expected to accurately calculate the VOC emissions and plan for all the fumigations that will be conducted. The CAC will check the calculations and track VOC emissions as you submit Notices of Intent (NOIs). The CAC will deny any NOIs that exceed your emission allowance.

## Product VOC Content Factors

The VOC Content Factor is pounds VOCs per gallon for products with application rates in gallons/acre. The VOC Content Factor is the proportion of the product weight that is VOCs for products with application rates in pounds/acre.

### 1,3-dichloropropene only products

Product Name	Registration Number	1,3-D
TELONE EC	62719-321	9.170
TELONE II	62719-32	9.911
TELONE II CA	62719-32	9.848
TELONE II SOIL FUMIGANT	62719-32	9.485
TELONE TECHNICAL	62719-341	9.848
TRI-CAL TELONE II SOIL FUMIGANT	11220-1	9.466
TRI-CAL TRILONE II	11220-1	9.477

### 1,3-dichloropropene and chloropicrin mixture products

Product Name	Registration Number	1,3-D	Chloropicrin
INLINE	62719-348	6.810	3.730
INLINE	62719-55044-EX	6.573	3.729
PIC-CLOR 15	8536-21	8.378	1.573
PIC-CLOR 30	8536-22	7.237	3.299
PIC-CLOR-60	8536-8	4.506	7.190
PIC-CLOR-60	8536-43	4.382	6.696
TELONE C-15	11220-20	8.703	1.554
TELONE C-17	62719-12	8.286	1.746
TELONE C-17 CA	62719-12	8.300	1.749
TELONE C-17 SOIL FUNGICIDE AND NEMATICIDE	464-379	8.226	1.742
TELONE C-17 SOIL FUNGICIDE AND NEMATICIDE	62719-12	8.243	1.746
TELONE C-35	62719-302	6.822	3.874
TELONE C-35 CA	62719-302	6.843	3.886
TRI-FORM 30	11220-21	7.501	3.266
TRI-FORM 35	11220-22	7.079	3.863
TRI-FORM 40/60	11220-15	4.679	7.127

### Chloropicrin only products

Product Name	Registration Number	Chloropicrin
CHLOR-O-PIC	5785-17	0.990
CHLOROPICRIN	5785-58	0.990
CHLOROPICRIN	7747-1	0.990
CHLOROPICRIN 100 FUMIGANT	8536-2	0.990
CHLOROPICRIN FROM ARVESTA CORPORATION	66330-47	0.995
METAPICRIN	8622-43	1.000
NUTRAPIC	66330-47	0.995
PIC PLUS FUMIGANT	8853-6-11220	0.855
TECHNICAL CHLOROPICRIN	62341-15	0.994
TRI-CLOR	11220-5	0.990
TRI-CLOR	58266-2	0.990
TRI-CLOR	58266-2-11220	0.990
TRI-CLOR EC FUMIGANT	58266-5	0.940
TRI-CLOR EC FUMIGANT	58266-5-11220	0.940

## Product VOC Content Factors

### Dazomet (Tetrahydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thione) products

Product Name	Registration Number	Dazomet
AMA-224	9386-3	0.240
AMA-24	9386-3	0.240
AMA-35D-P	9386-13	0.980
AMA-420	9386-28	0.200
AMA-424	9386-3	0.240
B.I.O. BLAST 100S	9386-13-3635	0.980
BASAMID – GRANULAR SOIL FUMIGANT	7969-99	0.990
BASAMID G	70051-101	0.990
BASAMID GRANULAR	7969-99-51036	0.990
BASAMID PELLETS	7969-162	0.990
BUSAN 1058	1448-103	0.240
BUSAN 1059	1448-104	0.980
DURAFUME	1448-104-75341	0.980
HOPKINS BASAMID GRANULAR	2393-460	0.990
N521 DISPERSION	67869-25	0.198
N521 PAC 24	67869-20	0.240
NALCON D3T-A	1706-193	0.212
NUOSEPT S PRESERVATIVE	9386-13-1529	0.980
SUPER-FUME	1448-104-54471	0.980
ULTRAFUME	7969-162-10465	0.990

### Metam-potassium (potassium N-methyl dithiocarbamate) products

Product Name	Registration Number	Metam-Potassium
BUSAN 1180	1448-362	2.761
BUSAN 40	1448-52	1.700
BUSAN 52	1448-47	1.373
BUSAN 881	1448-53	1.037
EMS ALGAECIDE #311	1448-180-3682	0.475
FIDELIS	1448-180-40208	0.468
FORMULA 410 ALGAECIDE	1448-180-70799	0.472
K-PAM HL	5481-483	2.879
MC-305	1448-115-44323	0.223
NM-175-1	1448-180	0.472
NM-35-1	1448-128	1.038
NM-875-11	1448-115	0.225
SECTAGON-K54	61842-7	2.942
SKASOL MB-X	1448-180-9743	0.472

## Product VOC Content Factors

### Metam-sodium products

Product Name	Registration Number	Metam-Sodium
AMVAC METAM	5481-420	1.792
BUSAN 1020	1448-85	1.779
BUSAN 1236	1448-361	2.606
BUSAN 1236W	1448-361	2.425
CLEAN CROP METAM SODIUM	5481-350-34704	1.804
METAM 426	5481-423	2.395
METAM CLR 42%	45728-16	2.416
METAM FLUID MANUFACTURER'S CONCENTRATE	61842-4	2.405
METAM SODIUM	5481-350	1.784
METAM SODIUM LAWN AND GARDEN SOIL FUMIGANT	5481-420-34704	1.804
METAM SODIUM MANUFACTURER'S CONCENTRATE	5481-416	2.395
NEMASOL 426	5481-423-34704	2.395
POL FUME	1022-562-71581	1.789
RID-A-VEC II	5481-423	2.401
ROUT	64898-4	1.350
SANAFOAM VAPOROOTER II	1015-70	1.642
SECTAGON 42	52251-43	2.420
SECTAGON 42	61842-6	2.420
SECTAGON 42	70166-6	2.420
SEWEROUT	64898-4	1.350
SMDC-FUME	1448-85-54471	1.793
SOIL-PREP	1448-85-2935	1.821
UCB METAM 42% (SOIL FUMIGANT)	45728-16	2.024
VAPAM	10182-150-5481	1.789
VAPAM	5481-466	1.789
VAPAM HL SOIL FUMIGANT	10182-392	2.397
VAPAM HL SOIL FUMIGANT	10182-392-5481	2.377
VAPAM HL SOIL FUMIGANT	5481-468	2.397
VAPAM MANUFACTURING CONCENTRATE	5481-469	2.490
VAPAM SOIL FUMIGANT	10182-150	1.804
VAPAM SOIL FUMIGANT SOLUTION FOR ALL CROPS	10182-150	1.804
WOODFUME	75341-2	1.805

## Product VOC Content Factors

### Methyl bromide only products (chloropicrin as a warning agent)

Product Name	Registration Number	Methyl Bromide
98-2	5785-56	0.980
98-2 CONTAINS 2% CHLOROPICRIN	8622-12	0.980
BROM-O-GAS (LIQUID)	5785-4	0.980
BROM-O-GAS 0.5%	5785-8	0.995
BROM-O-GAS 2%	5785-42	0.980
BROM-O-GAS 2%	5785-42	0.980
MBC CONCENTRATE SOIL FUMIGANT	8853-2-11220	0.980
M-B-R 98 TECHNICAL	3377-27	0.980
METABROM 100	8622-16	0.997
METABROM 99	8622-17	0.990
METABROM Q	8622-55	1.000
METH-O-GAS	5785-41	1.000
METH-O-GAS (CAN)	5785-11	1.000
METH-O-GAS 100	5785-11	1.000
METH-O-GAS Q	5785-41	1.000
METHYL BROMIDE	11198-50002	0.996
METHYL BROMIDE	5785-51	1.000
METHYL BROMIDE 100	15298-4	1.000
METHYL BROMIDE 100	8536-15	1.000
METHYL BROMIDE 89.5%	11220-17	0.895
METHYL BROMIDE 98%	8536-19	0.980
METHYL BROMIDE 98%	8536-19	0.980
METHYL BROMIDE 98%	8536-19-11220	0.980
METHYL BROMIDE 99.5%	5785-109	0.995
METHYL BROMIDE 99.5%	8536-12	0.995
METHYL BROMIDE 99.5%	8536-12	0.995
METHYL BROMIDE 99.75%	5785-55-8536	0.998
METHYL BROMIDE 99.75%	8536-17	0.998
METHYL BROMIDE 99.75%	8536-50020	0.998
METHYL BROMIDE QUARANTINE FUMIGANT	8536-29	1.000
METHYL BROMIDE RODENT FUMIGANT	10965-50045	1.000
METHYL BROMIDE TECHNICAL	3377-9	0.998
TRI-BROM	11220-16	0.990
TRICAL METHYL BROMIDE 99.5%	58266-3	0.995

### Methyl bromide and 1,3-dichloropropene mixture products

Product Name	Registration Number	Methyl Bromide	1,3-D
BROM 70/30	8536-10	0.700	0.300

## Product VOC Content Factors

### Methyl bromide and chloropicrin mixture products

Product Name	Registration Number	Methyl Bromide	Chloropicrin
50-50	8622-39	0.500	0.500
57-43	8622-40	0.570	0.430
67-33	5785-52	0.670	0.330
67-33 PREPLANT SOIL FUMIGANT	8622-13	0.670	0.330
75-25	8622-15	0.750	0.250
80-20	8622-44	0.800	0.200
BROM-76	8536-1	0.750	0.010
MBC-33 SOIL FUMIGANT	8853-3-11220	0.670	0.330
METHYL BROMIDE 98%	8536-50013	0.980	0.020
METHYL BROMIDE 99.5%	8536-12-11220	0.995	0.005
NAMCO NAMFUME	550-131	0.995	0.005
PIC-BROM 25	8536-11	0.750	0.250
PIC-BROM 25	8536-11	0.750	0.250
PIC-BROM 33	8536-5	0.670	0.330
PIC-BROM 33	8536-5	0.670	0.330
PIC-BROM 43	8536-7	0.430	0.570
PIC-BROM 50	8536-9	0.500	0.500
PIC-BROM 55	8536-6	0.450	0.550
PIC-BROM 55	8536-6	0.450	0.550
PIC-BROM 67	8536-20	0.330	0.670
TERR-O-GAS 57	5785-28	0.570	0.415
TERR-O-GAS 67	5785-24	0.670	0.330
TERR-O-GAS 75	5785-40	0.750	0.250
TERR-O-GAS 80	5785-47	0.800	0.200
TERR-O-GAS 98	5785-22	0.980	0.020
TRI-CON 45/55	11220-11	0.450	0.550
TRI-CON 50/50	11220-10	0.500	0.500
TRI-CON 57/43	11220-4	0.570	0.426
TRI-CON 67/33	11220-7	0.670	0.327
TRI-CON 75/25	11220-8	0.750	0.248
TRI-CON 80/20	58266-1	0.800	0.198
TRI-CON 80/20	58266-1-11220	0.800	0.198
TRI-PAN 76/24	11220-6	0.750	0.010

### Sodium tetrathiocarbonate products

Product Name	Registration Number	Sodium Tetrathio carbonate
ENZONE	612-5	1.299
ENZONE	66330-69	1.378
ENZONE	68891-2	1.299
ETK-1101	68891-9	2.743



## Application Method Emission Ratings

These are all low-emission methods.

Method Code	Emission Rating (%)	Regulation Section and Field Fumigation Method
<b>1100 series</b>		<b>6447.3. Methyl Bromide Fumigation Methods (with or without chloropicrin)</b>
1103	48	6447.3(a)(3) Tarpaulin/Shallow/Broadcast – Nobel Plow
1107	48	6447.3(a)(5) Tarpaulin/Deep/Broadcast
-	-	-
<b>1200 series</b>		<b>6448.1. 1,3-Dichloropropene Fumigation Methods (with or without chloropicrin)</b>
1204	44	6448.1(c)(3) Nontarpaulin/Shallow/Broadcast /Three Water Treatments
1205	44	6448.1(c)(4) Tarpaulin/Shallow/Bed/Three Water Treatment
1206	26	6448.1(c)(5) Nontarpaulin/Deep/Broadcast or Bed
1207	26	6448.1(c)(6) Tarpaulin/Deep/Broadcast
1208	26	Tarpaulin/Deep/Bed
1209	19	6448.1(c)(7) Chemigation (Drip System)/Tarpaulin
<b>1100-1200 series</b>		<b>Chloropicrin Fumigation Methods</b>
1103	44	6447.3(a)(3) Tarpaulin/Shallow/Broadcast – Nobel Plow
1107	44	6447.3(a)(5) Tarpaulin/Deep/Broadcast
1202	44	6448.1(c)(2) Tarpaulin/Shallow/Broadcast
1204	43	6448.1(c)(3) Nontarpaulin/Shallow/Broadcast /Three Water Treatments
1205	43	6448.1(c)(4) Tarpaulin/Shallow/Bed/Three Water Treatment
1206	64	
1207	44	6448.1(c)(6) Tarpaulin/Deep/Broadcast
1208	44	Tarpaulin/Deep/Bed
1209	12	6448.1(c)(7) Chemigation (Drip System)/Tarpaulin
<b>1400 series</b>		<b>6450.1. Metam-Sodium and Metam-Potassium Fumigation Methods</b>
1402	28	6450.1(d)(2) Day Sprinkler/Broadcast or Bed/Two Water Treatments
1403	21	6450.1(d)(3) Day Sprinkler/Broadcast or Bed/Three Water Treatments
1405	28	6450.1(d)(5) Day Nontarpaulin/Shallow/Broadcast or Bed /Two Water Treatments
1406	21	6450.1(d)(6) Day Nontarpaulin/Shallow/Broadcast or Bed/Three Water Treatments
1407	9	6450.1(d)(7) Day Chemigation (Drip System) Tarpaulin
1408	9	Day Chemigation (Drip System) Nontarpaulin
1409	14	6450.1(d)(8) Day Rotary Tiller
1410	14	Day Power Mulcher
1411	14	Day Soil Capping
1413	100	6452 Day Drench
1455	28	6452 Night 1AM Start/Nontarpaulin/Shallow/Broadcast or Bed/Two Water Treatments
1472	35	6452 Night 4AM Start/Sprinkler/ Broadcast or Bed/Two Water Treatments
<b>1500 series</b>		<b>6450.2. Dazomet Fumigation Methods</b>
1501	17	Soil incorporation
1502	17	Surface application – water incorporation
<b>1600 series</b>		<b>6451.1 Sodium Tetrathiocarbonate Fumigation Methods</b>
1601	10	Chemigation (Drip)
1602	10	Chemigation (mini-sprinkler)
1603	10	Chemigation (flood, basin)
1604	10	Chemigation (furrow, border)
1605	10	Chemigation (foggers, jets, misters, other)