2.111 Major Stationary Sources of VOC

2.111.1 Applicability and Designation of Affected Facility

The affected facility to which the provisions of this source category apply is any operation in which volatile organic compounds are emitted to the atmosphere and are subject to the Georgia Rules and Regulations for Air Quality Control Chapter 391-3-1-.02(2)(tt), (aaa), (ddd), ~~(eee),~~ or as otherwise specified by the Director.

2.111.2 Definitions and Symbols

All symbols used in this source category not defined below are given the meaning in the Clean Air Act of 1970 (as amended) or the Georgia Air Quality Act (as amended) or in published regulations pertaining thereto.

B_w = the proportion of the VOC containing material (VCM) which is water (fraction by volume)

C_a = the VOC concentration in each gas stream leaving the control device and entering the atmosphere (parts per million by volume, as carbon)

C_b = the VOC concentration in each gas stream entering the control device (parts per million by volume, as carbon)

C_f = the VOC concentration in each gas stream emitted directly to the atmosphere (parts per million by volume, as carbon)

D_c = density of each VOC containing material, as received (kilograms per liter)

D_d = density of each diluent VOC-solvent (kilograms per liter)

D_r = density of VOC-solvent recovered by an emission control device (kilograms per liter)

E = VOC destruction efficiency of the control device (fraction)

F = the proportion of total VOCs emitted by an affected facility that enters the control device (fraction)

G = the volume-weighted average mass of VOCs in VOC containing materials consumed in an averaging period per unit volume of coating solids applied (kilograms per liter)

G_{c-w} = the volume-weighted average mass of VOC's consumed per unit volume of coating excluding water (kilograms per liter)

G_m = the mass of VOCs in VOC containing material consumed in an averaging period per mass of solids processed (kilograms)

L_c = the volume of each VOC containing material consumed, as received (liters)

L_{c-w} = the volume of each VOC containing material consumed less water (liters)

L_d = the volume of VOC-solvent added to VOC containing material (liters)

L_m = the mass of VOC containing material processed (kilograms)

L_r = the volume of VOC-solvent recovered by an emission control device (liters)

L_s = the volume of material solids consumed (liters)

M_d = the mass of diluent VOC-solvent consumed (kilograms)

M_o = the mass of VOCs in VOC containing material consumed, as received (kilograms)

M_r = the mass of VOCs recovered by an emission control device (kilograms)

M_{ret} = the mass of VOCs retained in the final product at the end of the average cure time for the facility (kilograms)

N = the volume-weighted average mass of VOC emissions to the atmosphere per unit volume of solids applied (kilograms per liter)

N_{c-w} = the volume-weighted average mass of VOC emissions to the atmosphere per unit volume of VOC containing material less water (kilograms per liter)

N_m = the mass of VOC emissions to the atmosphere per unit mass of VOC containing material processed (kilograms per kilograms)

Q_a = the volumetric flow rate of each gas stream leaving the control device and entering the atmosphere (dry standard cubic meters per hour)

Q_b = the volumetric flow rate of each gas stream entering the control device (dry standard cubic meters per hour)

Q_f = the volumetric flow rate of each gas stream emitted directly to the atmosphere (dry standard cubic meters per hour)

R = the overall VOC emission reduction achieved for an affected facility (fraction)

T = the transfer efficiency (fraction)

V_s = the proportion of solids in each VOC containing material (or input stream), as received (fraction by volume)

W_o = the proportion of VOCs in each VOC containing material (or input stream), as received (fraction by weight)

For the purpose of this source category, a VOC containing material (VCM) is any coating, ink, resin, adhesive, sealant or other material which contains volatile organic compounds.

2.111.3 Performance Tests and Compliance Provisions

(a) The provisions of paragraph 6 of Section 1.2 of this text do not apply to the required performance tests and the provisions of paragraph 8 of Section 1.2 of this text do not apply.

(b) The owner or operator of an affected facility shall conduct the initial performance test as required under Section 1.2 according to procedures in this section; and, thereafter, procedures in this section shall be used to conduct any required periodic performance tests to demonstrate compliance with the applicable Georgia Regulations for Air Quality Control.

(c) The owner or operator shall use the following procedures for determining volume-weighted average emissions of VOCs in kilograms per liter of VOC containing material solids applied (G).

(1) An owner or operator shall use the following procedures for any affected facility which does not use a capture system and control device to comply with the applicable emission limit. The owner or operator shall determine the composition of the VCMs by formulation data supplied by the manufacturer of the VCM or by an analysis of each VCM, as received, using Method 24. The Director may require the owner or operator who uses formulation data supplied by the manufacturer of the VCM to determine the VOC content of VCM using Method 24. The owner or operator shall determine the volume of VCM and the mass of VOC-solvent used for thinning purposes from company records on the same basis as the averaging period. If a common VCM distribution system serves more than one affected facility, the owner or operator shall estimate the volume of VCM used at each facility by using the average dry weight of VCM and the surface area coated by each affected facility or by other procedures acceptable to the Director.

(i) Calculate the volume-weighted average of the total mass of VOCs consumed per unit volume of VCM solids applied (G) during each averaging period specified by the Director* for each affected facility, except as provided under paragraphs (c)(2) and (c)(3). Each calculation is considered a performance test. The volume-weighted average of the total mass of VOCs consumed per unit volume of VCM solids applied (G) each averaging period will be determined by the following procedures.

(A) Calculate the mass of VOCs used (M_o+M_d) during each averaging period for each affected facility by the following equation:

$$M_o + M_d = \sum_{i=1}^{n} L_{ci} D_{ci} W_{oi} + \sum_{j=1}^{m} L_{dj} D_{dj}$$

($L_{dj}D_{dj}$ will be **0** if no VOC solvent is added to the VCMs, as received.)

Where: **n** is the number of different VCMs used during the

averaging period and **m** is the number of different diluent VOC-solvents used during the averaging period.

(B) Calculate the total volume of VCM solids used (L_s) in each averaging period for each affected facility by the following equation:

$$L_S = \sum_{i=1}^{n} L_{ci} V_{si}$$

Where: **n** is the number of different VCMs used during the averaging period.

Determine an appropriate transfer efficiency. Transfer efficiency values shall be determined by the Director on a case-by-case basis. An owner or operator must submit sufficient data for the Director to judge the accuracy of the transfer efficiency claims.

Where more than one application method is used within a single operation, the owner or operator shall determine the composition and volume of each VCM applied by each method through a means acceptable to the Director and compute the weighted average transfer efficiency by the following equation:

$$T = \frac{\sum_{i=1}^{n} \sum_{k=1}^{p} L_{cik} V_{sik} T_k}{L_S}$$

Where **n** is the number of VCMs used and **p** is the number of application methods used.

(C) Calculate the volume-weighted average mass of VOCs consumed per unit volume of solids applied (G) during the averaging period for each affected facility by the following equation:

$$G = \frac{M_o + M_d}{L_s T}$$

(ii) Calculate the volume-weighted average of VOC emissions to the atmosphere (N) during the averaging period for each affected facility by the following equation:

$$N = G$$

(2) An owner or operator shall use the following procedures for any affected facility that uses a capture system and a control device that destroys VOCs (e.g., incinerator) to comply with the applicable emission limit.

(i) Determine the overall reduction efficiency (R) for the capture system and control device. For the initial performance test the overall reduction efficiency (R) shall be determined as prescribed in (c)(2)(i) (A), (B), and (C) of this section. In subsequent averaging periods, the owner or operator may use the most recently determined overall reduction efficiency (R) for the performance test providing control device and capture system operating conditions have not changed. The procedure in, (c)(2)(i) (A), (B), and (C), of this section, shall be repeated when directed by the Director or when the owner or operator elects to operate the control device or capture system at conditions different from the initial performance test.

(A) Determine the fraction (F) of total VOCs emitted by an affected facility that enters the control device using the following equation or as provided in Appendix G of this text:

$$F = \frac{\sum_{i=1}^{n} C_{bi} Q_{bi}}{\sum_{i=1}^{n} C_{bi} Q_{bi} + \sum_{j=1}^{m} C_{fj} Q_{fj}}$$

Where: **n** is the number of gas streams entering the control device and **m** is the number of gas streams emitted directly to the atmosphere.

(B) Determine the destruction efficiency of the control device (E) using values of the volumetric flow rate of each of the gas streams and the VOC content (as carbon) of each of the gas streams in and out of the device by the following equation:
Where:

$$E = \frac{\sum_{i=1}^{n} Q_{bi} C_{bi} - \sum_{j=1}^{m} Q_{aj} C_{aj}}{\sum_{i=1}^{n} Q_{bi} C_{bi}}$$

n is the number of gas streams entering the control device, and

m is the number of gas streams leaving the control device and entering the atmosphere.

(C) Determine the overall reduction efficiency (R) using the following equation:

$$R = EF$$

(ii) Calculate the volume-weighted average of the total mass of VOCs per unit volume of VCM solids (G) during each averaging period for each affected facility using equations in paragraphs (c)(1)(i) (A), (B), and (C) of this section.

(iii) Calculate the volume-weighted average of VOC emissions to the atmosphere (N) during each averaging period by the following equation:

$$N = G(1-R)$$

(3) An owner or operator shall use the following procedure for any affected facility which uses a control device that recovers the VOCs (e.g., carbon adsorption) to comply with the applicable emission limit. **Note:** If the owner or operator can demonstrate to the satisfaction of the Director that the procedures of paragraph (c)(3)(i), (ii), (iii) are impractical due to the length of the averaging period, then the procedure of paragraph (c)(2) may be used.

(i) Calculate the total mass of VOCs consumed (M_o+M_d) and the volume-weighted average of the total mass of VOCs per unit volume of solids applied (G) during each averaging period for each affected facility using equations in paragraph (c)(1)(i) (A), (B), and (C) of this section.

(ii) Calculate the total mass of VOCs recovered (M_r) during each averaging period using the following equation:

$$M_r = L_r D_r$$

(iii) Calculate overall reduction efficiency of the control device (R) for each averaging period for each affected facility using the following equation:

$$R = \frac{M_r}{M_o + M_d}$$

(iv) Calculate the volume-weighted average mass of VOCs emitted to the atmosphere (N) for each averaging period for each affected facility using equation in paragraph (c)(2)(iii) of this section.

(d) The owner or operator shall use the following procedures for determining volume-weighted average emissions of VOCs in units of pounds VOC per gallon of VCM excluding water.

(1) An owner or operator shall use the following procedures for any affected facility which does not use a capture system and control device to comply with the applicable emission limit. The owner or operator shall determine the composition of the VCMs by formulation data supplied by the

manufacturer of the VCM or by an analysis of each VCM, as received, using Method 24. The Director may require the owner or operator who uses formulation data supplied by the manufacturer of the material used to determine the VOC content of the VCM using Method 24. The owner or operator shall determine the volume of VCM and the mass of VOC-solvent used for thinning purposes from appropriate records on the same basis as the averaging period. If a common VCM distribution system serves more than one affected facility, the owner or operator shall estimate the volume of VCM used at each facility by using the average dry weight of VCM and the surface area coated by each affected facility or by other procedures acceptable to the Director.

(i) Calculate the volume-weighted average of the total mass of VOCs consumed per unit volume of VCM excluding water during each averaging period for each affected facility, except as provided under paragraph (d)(2). Each calculation is considered a performance test. The volume-weighted average of the total mass of VOCs consumed per unit volume of VCM excluding water for each averaging period will be determined by the following procedures.

(A) Calculate the mass of VOCs used (M_o+M_d) during each calendar day for each affected facility by the following equation:

$$M_o + M_d = \sum_{i=1}^{n} L_{ci} D_{ci} W_{oi} + \sum_{j=1}^{m} L_{dj} D_{dj}$$

($L_{dj}D_{dj}$ will be **0** if no VOC is added to the materials, as received.)

Where **n** is the number of different VCMs used during the averaging period and **m** is the number of different diluent VOC-solvents used during the averaging period.

(B) Calculate the total volume of VCM used excluding water, L_{c-w}, in each averaging period for each affected facility by the following equation:

$$L_{c-w} = \sum_{i=1}^{n} L_{ci} (1 - B_{wi})$$

(C) Calculate the volume-weighted average emissions of VOCs per volume of material as follows:

Metric Units--

$$G_{c-w} = \frac{M_o + M_d}{L_{c-w}}$$

English Units--

$$G_{c\text{-}w}\,(english) = G_{c\text{-}w}\,(metric)\,x\,1.717$$

(2) Follow the procedure of paragraph (c)(2) and (c)(3) of this section for any affected facility which uses a control device which either destroys (e.g., incinerator) or recovers (e.g., carbon adsorption) the VOC to comply with the applicable emission limit, except substitute $G_{c\text{-}w}$ as calculated in paragraph (d)(1) for G wherever it occurs.

(e) The owner or operator shall use the following procedures for determining mass emissions of VOCs in units of pounds VOC per mass of VOC containing raw material.

(1) An owner or operator shall determine the composition of the VCMs by formulation data supplied by the manufacturer of the VCM or analysis of each VCM by gas chromatography, or another method acceptable to the Director which provides equivalent results. The Director may require the owner or operator who uses formulation data supplied by the manufacturer of the material used to determine the VOC content of the VCM using gas chromatography, or another method acceptable to the Director which provides equivalent results. The owner or operator shall determine the mass of VCM from appropriate records on the same basis as the averaging period. If a common VCM distribution system serves more than one affected facility, the owner or operator shall estimate the volume of VCM used at each facility by using the average weight of VCM and the amount processed by each affected facility or by other procedures acceptable to the Director.

(i) Calculate the total mass of VOCs consumed per unit mass of VCM raw material processed (G_m) during each averaging period specified by the Director* for each affected facility, except as provided under paragraphs (c)(2) and (c)(3). Each calculation is considered a performance test. The total mass of VOCs consumed per unit mass of VCM solids processed (G_m) each averaging period will be determined by the following procedures:

(A) Determine the mass of VOCs used (M_o) and the mass of VOCs retained in the final product (M_{ret}) during each averaging period for each affected facility.

(B) Determine the total mass of VCM solids processed (L_m) in each averaging period for each affected facility.

(C) Calculate the mass of VOCs consumed per unit mass of VOC containing raw material (G_m) by the following equation:

$$G_m = \frac{(M_o - M_{ret})}{L_m}$$

(ii) Calculate the mass of VOC emissions to the atmosphere (N_m) during the averaging period for each affected facility by the following equation:

$$N_m = G_m$$

(2) Follow the procedure of paragraph (c)(2) and (c)(3) of this section for any affected facility which uses a control device which either destroys (e.g., incinerator) or recovers (e.g., carbon adsorption) the VOC to comply with the applicable emission limit, except substitute the phrase "volume-weighted average of the total mass of VOCs" wherever it occurs with the phrase "total mass" and substitute G_m as calculated in paragraph (e)(1) for G wherever it occurs.

2.111.4 Monitoring of Emissions and Operations

(a) The owner or operator of an affected facility which uses a capture system and an incinerator to comply with the emission limits shall install, calibrate, maintain, and operate temperature measurement devices according to the following procedures:

(1) Where thermal incineration is used, a temperature measurement device shall be installed in the firebox. Where catalytic incineration is used, a temperature measurement device shall be installed in the gas stream immediately before and after the catalyst bed.

(2) Each temperature measurement device shall be installed, calibrated, and maintained according to the manufacturer's specifications. The device shall have an accuracy of the greater of 0.75 percent of the temperature being measured expressed in degrees Celsius or ±2.5°C.

(3) Each temperature measurement device shall be equipped with a recording device so that a permanent continuous record is produced.

(b) The owner or operator of an affected facility which uses a capture system and a solvent recovery system to comply with the emission limits shall install the equipment necessary to determine the total volume of VOC-solvent recovered for each averaging period.

2.111.5 Test Methods and Procedures

(a) The test methods in Appendix A to this part, except as provided under Section 1.2, shall be used to determine compliance with the applicable standards as follows:

(1) Method 24, or manufacturer's formulations data, for use in the determination of VOC content of each batch of VOC containing material, except that for facilities using Section 2.111.3(e), the procedures of Method 311 shall apply for determination of VOC content in the VOC containing material. In case of an inconsistency between the analytical results and the formulation data, the analytical results will govern.

(2) Method 25, 25A, or 18, as applicable, for the measurement of VOC concentration.

(3) Method 1 for sample and velocity traverses.

(4) Method 2 for velocity and volumetric flow rate.

(5) Method 3 for gas analysis.

(6) Method 4 for stack gas moisture.

(7) Method 204 and Methods 204A – 204F for the criteria and verification of a permanent or temporary total enclosure.

(b) For Method 24, the VCM sample must be at least a 1 liter sample in a 1 liter container taken at a point where the sample will be representative of the material as applied.

(c) For Method 25, the minimum sampling time for each of the 3 runs is 60 minutes and the minimum sample volume is 0.003 dry standard cubic meters, except that shorter sampling times or smaller volumes, when necessitated by process variables or other factors, may be approved by the Director.

(d) The Director will approve testing of representative stacks on a case-by-case basis if the owner or operator can demonstrate to the satisfaction of the Director that testing of representative stacks yields results comparable to those that would be obtained by testing all stacks.

(e) The protocols and methods of Appendix G shall be used to determine the capture efficiency and the amount of VOC retained in the final product.

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*Each day or fraction of a day in which an affected facility is operated is considered the averaging period unless otherwise specified or approved by the Director.