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TITLE 250 – DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

CHAPTER 120 – AIR RESOURCES

SUBCHAPTER 05 – AIR POLLUTION CONTROL

PART 51 – Control of Volatile Organic Compound Emissions from Fiberglass Boat Manufacturing

51.1 Purpose and Authority

51.1.1 Purpose

The purpose of this regulation is to limit volatile organic compound emissions from fiberglass boat manufacturing.

51.1.2 Authority

These regulations are authorized pursuant to R.I. Gen. Laws § 42-17.1-2(19) and R.I. Gen. Laws Chapter 23-23, and have been promulgated pursuant to the procedures set forth in the Rhode Island Administrative Procedures Act, R.I. Gen. Laws Chapter 42-35.

51.2 Application

The terms and provisions of this regulation shall be liberally construed to permit the Department to effectuate the purposes of state laws, goals and policies.

51.3 Severability

If any provision of this regulation or the application thereof to any person or circumstance, is held invalid by a court of competent jurisdiction, the validity of the remainder of the regulation shall not be affected thereby.

51.4 Incorporated Materials

These regulations hereby adopt and incorporate South Coast Air Quality Management District Method (SCAQMD) 312-91(1996), by reference, not including any further editions or amendments thereof and only to the extent that the provisions therein are not inconsistent with these regulations.

51.5 Definitions

A. Unless otherwise expressly defined in this section, the terms used in this regulation shall be defined by reference to Part 0 of this Subchapter (General Definitions). As used in this regulation, the following terms shall, where the context permits, be construed as follows:

1. “Application equipment cleaning” means the process of flushing or removing resins and gel coats from the interior or exterior of equipment that is used to apply resin or gel coat in the manufacture of fiberglass parts.
2. “Assembly adhesives” means any chemical substance that is applied for the purpose of bonding two surfaces together other than by mechanical means.
3. “Atomized application method” means a resin application technology in which the resin leaves the application equipment and breaks into droplets or an aerosol as it travels from the application equipment to the surface of the part. Atomized application methods include, but are not limited to, resin spray guns and resin chopper spray guns.
4. “Boat” means any type of vessel, other than a seaplane, that can be used for transportation on the water.
5. “Clear gel coat” means gel coats that are clear or translucent so that underlying colors are visible. Clear gel coats are used to manufacture parts for sale.
 - a. Clear gel coats do not include tooling gel coats used to build or repair molds.
6. “Closed molding” means any molding process in which pressure is used to distribute the resin through the reinforcing fabric placed between two mold surfaces to either saturate the fabric or fill the mold cavity. The pressure may be clamping pressure, fluid pressure, atmospheric pressure, or vacuum pressure used either alone or in combination. The mold surfaces may be rigid or flexible. Closed molding includes, but is not limited to, compression molding with sheet molding compound, infusion molding, resin injection molding (RIM), vacuum-assisted resin transfer molding (VARTM), resin transfer molding (RTM), and vacuum-assisted compression molding.

- a. Processes in which a closed mold is used only to compact saturated fabric or remove air or excess resin from the fabric (such as in vacuum bagging), are not considered closed molding.
 - b. Open molding steps, such as application of a gel coat or skin coat layer by conventional open molding prior to a closed molding process, are not closed molding.
- 7. "Cured resin" or "cured gel coat" means resin or gel coat that has changed irreversibly from a liquid to a solid.
 - 8. "Fiberglass boat" means a vessel in which either the hull or deck is built from a composite material consisting of a thermosetting resin matrix reinforced with fibers of glass, carbon, aramid, or other material.
 - 9. "Filled resin" or "filled production resin" means a resin to which an inert material has been added to change viscosity, density, shrinkage, or other physical properties.
 - 10. "Flowcoater" means a nonatomizing application method of applying resins and gel coats to an open mold with a fluid nozzle in a fan pattern with no air supplied to the nozzle.
 - 11. "Gel coat" means a polyester resin surface coating, either pigmented or clear, that provides a cosmetic enhancement and improves resistance to degradation from exposure to the elements.
 - 12. "Mixing" means any operation in which resin or gel coat, including the mixing of putties or polyester resin putties, is combined with additives that include, but are not limited to, fillers, promoters, or catalysts.
 - 13. "Mold" means the cavity or surface into or on which gel coat, resin, and fibers are placed and from which finished fiberglass parts take their form.
 - 14. "Monomer VOC" means a relatively low-molecular-weight organic compound such as styrene that combines with itself, or other similar compounds, by a cross-linking reaction to become a cured thermosetting resin.
 - 15. "Monomer VOC content" means the weight of the monomer, divided by the weight of the polymer.
 - 16. "Non-atomized application method" means any application technology in which the resin is not broken into droplets or an aerosol as it travels from the application equipment to the surface of the part. Non-atomized

application methods include, but are not limited to, flowcoaters, chopper flowcoaters, pressure-fed resin rollers, resin impregnators, and hand application (for example, paint brush or paint roller).

17. “Open molding resin and gel coat operation” means any process in which the reinforcing fibers and resin are placed in the mold and are open to the surrounding air while the reinforcing fibers are saturated with resin. For the purposes of this regulation, open molding includes operations in which a vacuum bag or similar cover is used to compress an uncured laminate to remove air bubbles or excess resin, or to achieve a bond between a core material and a laminate.
18. “Pigmented gel coat” means opaque gel coats used to manufacture parts for sale.

 - a. Pigmented gel coats do not include tooling gel coats used to build or repair molds.
19. “Polyester resin materials” means unsaturated polyester resins, such as isophthalic, orthophthalic, halogenated, bisphenol A, vinyl ester, or furan resins; cross-linking agents; catalysts; gel coats; inhibitors; accelerators; promoters; and any other material containing VOC used in polyester resin operations.
20. “Polyester resin operations” means fabricate, rework, repair, or touchup products for commercial, military, or industrial use by mixing, pouring, hand laying-up, impregnating, injecting, forming, winding, spraying, and/or curing by using unsaturated polyester resin materials.
21. “Production resin” means any resin used to manufacture parts for sale.

 - a. Production resins do not include tooling resins used to build or repair molds, or assembly adhesives as defined in § 51.5(A)(2) of this Part.
22. “Repair” means that portion of the fabrication process that requires the addition of polyester resin materials to portions of a previously fabricated product in order to mend damage.
23. “Resin” means any thermosetting resin with or without pigment containing styrene or methyl methacrylate and used to encapsulate and bind together reinforcement fibers in the construction of fiberglass parts.

24. “Resin impregnator” means a mechanical non-atomizing composite materials application method in which fiber reinforcement is saturated with resins in a controlled ratio for each specific composite product.
25. “Roll-out” means the process of using rollers, squeegees, or similar tools to compact reinforcing materials saturated with resin to remove trapped air or excess resin.
26. “Skin coat” means a layer of resin and fibers applied over the gel coat to protect the gel coat from being deformed by the next laminate layers.
27. “Tooling gel coat” means the gel coat used to build or repair molds (also known as tools) or prototypes (also known as plugs) from which molds will be made.
28. “Tooling resin” means the resin used to build or repair molds (also known as tools) or prototypes (also known as plugs) from which molds will be made.
29. “Touch-up” means that portion of the process that is necessary to cover minor imperfections.
30. “Vacuum bagging” means any molding technique in which the reinforcing fabric is saturated with resin and then covered with a flexible sheet that is sealed to the edge of the mold and where a vacuum is applied under the sheet to compress the laminate, remove excess resin, or remove trapped air from the laminate during curing.
- a. Vacuum bagging does not include processes that meet the definition of closed molding.
31. “Vinylester resin” means a thermosetting resin containing esters of acrylic or methacrylic acids and having double-bond and ester linkage sites only at the ends of the resin molecules.

51.6 Applicability

- A. The provisions of this regulation apply to the owner or operator of any facility that manufactures fiberglass boat hulls or decks or related parts, builds molds to make fiberglass boat hulls or decks or related parts, or makes polyester resin putties for assembling fiberglass boats, whose total actual VOC emissions, before controls, are greater than or equal to fifteen (15) pounds per day from:
1. Open molding resin and gel coat operations, including pigmented gel coat, clear gel coat, production resin, tooling gel coat and tooling resin;

2. Resin and gel coat mixing operations; and

3. Resin and gel coat application cleaning operations.

B. This regulation shall not apply to:

1. Any facility that solely manufactures parts of boats, such as hatches, seats, or lockers, or boat trailers, and does not manufacture hulls or decks of boats from fiberglass or build molds to make fiberglass boat hulls or decks;

2. Surface coating applied to fiberglass boats and metal recreational boats or pleasure crafts;

3. Industrial adhesives used in the assembly of fiberglass boats, with the exception of polyester resin putties used to assemble fiberglass parts, which are not considered adhesives for the purpose of this regulation.

C. The monomer VOC content limits in § 51.7(B)(2) of the Part shall not apply to:

1. Production resins, including skin coat resins, that meet the specification for use in military vessels or are approved by the U.S. Coast Guard for use in the construction of lifeboats, rescue boats, and other life-saving appliances approved under 46 C.F.R. Chapter I Subpart Q, or the construction of small passenger vessels regulated by 46 C.F.R. Chapter I Subpart T, including but not limited to vessels of less than one hundred (100) tons carrying more than six (6) and less than one hundred fifty (150) passengers for hire. Production resins that meet these criteria must be applied with non-atomizing resin application equipment in order to qualify for exemption;

2. Pigmented, clear, and tooling gel coat used for part or mold repair and touch-up that are applied with non-atomizing resin application equipment. The total gel coat materials included in this exemption must not exceed one (1) percent by weight of all resin and gel coat used at a facility on a twelve (12) month rolling average basis;

3. Pure, one hundred percent (100%) vinylester resin used for skin coats that are applied with non-atomizing resin application equipment and with the total amount of the resin materials not exceeding five percent (5%) by weight of all resin used at a facility on a twelve (12) month rolling average basis; and

4. Closed molding operations.

51.7 Emissions Limitations

A. Except as provided in § 51.6(C) of this Part, the owner or operator of a fiberglass boat manufacturing facility subject to this regulation shall limit VOC emissions from molding operations, by use or one or more of the control options in §§ 51.7(B) through (E) of this Part;

B. Low monomer VOC content option

1. The monomer VOC content limits used for any open molding resin and gel coat operations subject to this regulation, shall not exceed the monomer VOC limits established in § 51.7(B)(2) of this Part.

2. Table 1 Monomer VOC Limits for Open Molding Resin and Gel Coat Operations

<u>Material</u>	<u>Application Method</u>	<u>Monomer VOC Content Limits (weight percent)</u>
<u>Production resin</u>	<u>Atomized (spray)</u>	<u>28</u>
<u>Production resin</u>	<u>Nonatomized</u>	<u>35</u>
<u>Pigmented gel coat</u>	<u>Any Method</u>	<u>33</u>
<u>Clear gel coat</u>	<u>Any method</u>	<u>48</u>
<u>Tooling resin</u>	<u>Atomized</u>	<u>30</u>
<u>Tooling resin</u>	<u>Nonatomized</u>	<u>39</u>
<u>Tooling gel coat</u>	<u>Any method</u>	<u>40</u>

3. Alternatively, the weighted average monomer VOC contents for a specific application method may be used to meet the monomer VOC content limits in § 51.7(B)(2) of this Part, on a twelve (12) month weighted average basis, as calculated using Equation 1:

Equation 1

$$E_{\text{voc}} = \frac{\sum_{i=1}^n (M_i \text{VOC}_i)}{\sum_{i=1}^n (M_i)}$$

Where:

E_{voc} = the weighted average monomer VOC content

M_i = mass of each open molding resin or gel coat used in the past twelve (12) months in an operation, in megagrams.

VOC_i = monomer VOC content, by weight percent, of each open molding resin or gel coat used in the past twelve (12) months in an operation.

n = number of different open molding resins or gel coats used in the past twelve (12) months in an operation.

4. In addition to complying with the monomer VOC limits in § 51.7(B)(2) of this Part, the non-monomer VOC content of each resin and gel coat shall not contain more than five percent (5%) by weight of the resin or gel coat. If the non-monomer VOC content of a resin or gel coat exceeds five percent (5%), then the excess non-monomer VOC over five percent (5%) would be counted toward the monomer VOC content.

C. Emissions averaging option

1. In lieu of complying with the monomer VOC content limits established in § 51.7(B)(2) of this Part, the owner or operator of a facility subject to this regulation may comply by using Equation 2 to establish a facility-specific monomer VOC mass emission limit on a twelve (12) month rolling average basis:

Equation 2

Monomer VOC Limit = 46(MR) + 159(MPG) + 291(MCG) + 54(MTR) + 214(MTG)

Where:

Monomer VOC Limit = total allowable monomer VOC that can be emitted from the open molding operations included in the average, in kilograms per twelve (12) month period.

MR = mass of production resin used in the past twelve (12) months, excluding any materials that are exempt, in megagrams.

MPG = mass of pigmented gel coat used in the past twelve (12) months, excluding any materials that are exempt, in megagrams.

MCG = mass of clear gel coat used in the past twelve (12) months, excluding any materials that are exempt, in megagrams.

MTR = mass of tooling resin used in the past twelve (12) months, excluding any materials that are exempt, in megagrams.

MTG = mass of tooling gel coat used in the past twelve (12) months, excluding any materials that are exempt, in megagrams.

Note: The numerical coefficients associated with each term on the right side of Equation 2 are the allowable monomer VOC emission rates for that materials in units of kilograms of monomer VOC per megagram of material used.

2. Equation 3 shall be used to demonstrate that that the monomer VOC mass emissions from the operations included in the average do not exceed the emission limit calculated using Equation 2 in § 51.7(C)(1) of this Part for the same period. This demonstration shall be conducted at the end of the first twelve (12) month averaging period and at the end of every subsequent month for only those operations and materials included in the average.

Equation 3

$$\text{Monomer VOC emissions} = (PV_R)(M_R) + (PV_{PG})(M_{PG}) + (PV_{CG})(M_{CG}) + (PV_{TR})(M_{TR}) + (PV_{TG})(M_{TG})$$

Where:

Monomer VOC emissions = monomer VOC emissions from open molding operations included in the average, in kilograms per twelve (12) month period.

PV_R = weighted-average monomer VOC emission rate for production resin used in the past twelve (12) months, in kilograms per megagram.

M_R = mass of production resin used in the past twelve (12) months,

excluding any materials that are exempt, in megagrams.

PV_{PG} = weighted-average monomer VOC emission rate for pigmented gel coat used in the past twelve (12) months, in kilograms per megagram.

M_{PG} = mass of pigmented gel coat used in the past twelve (12) months, excluding any material that are exempt, in megagrams.

PV_{CG} = weighted-average monomer VOC emission rate for clear gel coat used in the past twelve (12) months, in kilograms per megagram.

M_{CG} = mass of clear gel coat used in the past twelve (12) months, excluding any materials that are exempt, in megagrams.

PV_{TR} = weighted-average monomer VOC emission rate for tooling resin used in the past twelve (12) months, in kilograms per megagram.

M_{TR} = mass of tooling resin used in the past twelve (12) months, excluding any materials that are exempt, in megagrams.

PV_{TG} = weighted-average monomer VOC emission rate for tooling gel coat used in the past twelve (12) months, in kilograms per megagram.

M_{TG} = mass of tooling gel coat used in the past twelve (12) months, excluding any materials that are exempt, in megagrams.

3. Equation 4 shall be used to compute the weighted-average monomer VOC emission rate for the previous twelve (12) months for each open molding resin and gel coat operation included in the average for use in Equation 3 in § 51.7(C)(2) of this Part:

Equation 4

$$PV_{op} = \frac{\sum_{i=1}^n (M_i PV_i)}{\sum_{i=1}^n (M_i)}$$

Where:

PV_{OP} = weighted-average monomer VOC emission rate for each open molding operation (PV_R, PV_{PG}, PV_{CG}, PV_{TR}, and PV_{TG}) included in the average, in kilograms of monomer VOC per megagram of material

applied.

M_i = mass of resin or gel coat used within an operation in the past twelve (12) months, in megagrams.

PV_i = the monomer VOC emission rate for resin or gel coat used within an operation in the past twelve (12) months, in kilograms of monomer VOC per megagram of material applied. The quations in § 51.7(C)(4) of this Part shall be used to compute PV_i

4. Table 2: Monomer VOC Emission Rate Formulas for Open Molding Resin and Gel Coat

<u>Material</u>	<u>Application Method</u>	<u>Formula to Calculate the Monomer VOC Emission Rate or PV_i</u>
<u>Production resin, tooling resin</u>	<u>Atomized</u>	<u>$0.014 \times (\text{Resin VOC}\%)^{2.425}$</u>
	<u>Atomized, plus vacuum bagging with roll-out</u>	<u>$0.01185 \times (\text{Resin VOC}\%)^{2.425}$</u>
	<u>Atomized, plus vacuum bagging without roll-out</u>	<u>$0.00945 \times (\text{Resin VOC}\%)^{2.425}$</u>
	<u>Nonatomized</u>	<u>-</u>
	<u>Nonatomized, plus vacuum bagging with roll-out</u>	<u>$0.014 \times (\text{Resin VOC}\%)^{2.275}$</u>
	<u>Nonatomized, plus vacuum bagging without roll-out</u>	<u>$0.011 \times (\text{Resin VOC}\%)^{2.275}$</u>
<u>Pigmented gel coat, clear gel coat, tooling gel coat</u>	<u>All methods</u>	<u>$0.445 \times (\text{Gel Coat VOC}\%)^{1.675}$</u>

5. The monomer VOC content of each open molding resin or gel coat material included in the emissions averaging option includes the amount of non-monomer VOC content that exceeds five percent (5%) by weight of the resin or gel coat material.

D. The owner or operator of any facility with molding resin and gel coat operations choosing to use add-on emission controls instead of complying with the requirements of §§ 51.7(B) and (C) of this Part shall:

1. Install control equipment to meet the VOC emission limit determined by Equation 2 in § 51.7(C)(1) of this Part, except that instead of using the mass of each material used over the past consecutive twelve (12) month period, the facility shall use the mass of each material used during the air pollution control device performance test;
2. Use resin and gel coat with a non-monomer VOC content of no more than five percent (5%) by weight of the resin or gel coat. If the non-monomer VOC content of a resin or gel coat exceeds five percent (5%), then the excess non-monomer VOC over five percent (5%) would be counted toward the monomer VOC content.
3. Monitor and record relevant control device and capture system operating parameters during the control device performance test and use the recorded values to establish operating limits for those parameters; and
4. Monitor the operating parameters for the control device and emissions capture system and maintain the parameters within the established limits.

E. Requirements for filled resins

1. The owner or operator of a facility subject to this regulation that uses resins to which fillers are added shall use Equation 5 to adjust the emission rate for filled resins under all options specified in §§ 51.7(B) through (D) of this Part:

Equation 5

$$\text{PVF} = \text{PVU} \times (100 - \% \text{Filler}) / 100$$

Where:

PVF = The as-applied monomer VOC emission rate for the filled production resin or tooling resin, in kilograms monomer VOC per megagram of filled material.

PVU = The monomer VOC emission rate for the neat (unfilled) resin before filler is added, as calculated using the formulas in § 51.7(C)(4) of this Part.

%Filler = The weight-percent of filler in the as-applied filled resin.

system.

2. For filled resin used as a production resin the value of PV_F calculated by Equation 5 in § 51.7(E)(1) of this Part shall not exceed forty-six (46) kilograms of monomer VOC per megagram of filled resin applied;
3. For filled resin used as a tooling resin the value of PV_F calculated by Equation 5 in § 51.7(E)(1) of this Part shall not exceed fifty-four (54) kilograms of monomer VOC per megagram of filled resin applied;
4. For filled resin included in the emissions averaging procedure then the facility shall use the value of PV_F calculated by Equation 5 in § 51.7(E)(1) of this Part for the value of PV_i in Equation 4 in § 51.7(C)(3) of this Part.
5. The monomer VOC content of each, as applied, filled resin includes the amount of non-monomer VOC content that exceeds five percent (5%) by weight of the unfilled resin material.

51.8 Compliance Schedules

- A. The owner or operator of a facility that is subject to this regulation shall comply with the requirements of this regulation no later than the following dates:
 1. For any fiberglass boat manufacturing facility subject to this regulation for which construction commenced prior to January 1, 2019, the compliance date is either January 1, 2022 or the date of initial startup of the fiberglass boat manufacturing facility, whichever is later.
 2. For any fiberglass boat manufacturing facility subject to this [regulation](#) for which construction commenced on or after the January 1, 2019, compliance shall be achieved upon commencing operation.

51.9 Work Practice Standards

- A. All resin and gel coat containers with a capacity equal to or greater fifty-five (55) gallons, including those used for on-site mixing of putties and polyester resin putties, shall have a cover with no visible gaps in place at all times except when materials are being manually added to or removed from a container, or when mixing equipment is being placed or removed from a container.
- B. The volatile organic compound content of cleaning solvents employed for routine application equipment cleaning shall contain a maximum of five percent (5%) VOC by weight, or have a composite vapor pressure of no more than 0.50 mm Hg at sixty-eight degrees Fahrenheit (68° F), as determined by the cleaning

solvent manufacturer's Safety Data Sheet or other appropriate documentation acceptable to the Department and EPA.

- C. Only non-volatile organic compound solvents shall be used to remove cured resin and gel coat from application equipment.

51.10 Monitoring and Recordkeeping Requirements

- A. The owner or operator of a fiberglass boat manufacturing facility that is subject to the monomer and non-monomer VOC requirements of this regulation shall collect and record the following information for each operation subject to this regulation on a monthly basis:

1. The name and identification number of each resin and gel coat;
2. The total quantity of atomized molding production resin, non-atomized production resin, pigmented gel coat, clear gel coat, atomized tooling resin, non-atomized tooling resin and tooling gel coat used per month;
3. The monomer VOC content for each resin and gel coat;
4. The non-monomer VOC content for each resin and gel coat;
5. All calculations performed pursuant to § 51.7 of this Part.
6. For each cleaning solvent employed for routine application equipment cleaning, either the volatile organic compound content, by weight percent or the composite vapor pressure, in mmHg; whichever is the applicable requirement selected to comply with the cleaning solvent requirements of § 51.9(B) of this Part.

51.11 Testing

The monomer VOC content of resin and gel coat shall be determined by using SCAQMD Method 312-91, incorporated in § 51.4 of this Part, unless the facility maintains records from the manufacturer to document the monomer VOC content of resin and gel coat materials.

51.12 General Requirement

The owner or operator of a fiberglass boat manufacturing facility subject to this regulation shall comply with the provisions of Part 9 of this Subchapter ([Air Pollution Control Permits](#)) as applicable.