

RULE 450 GRAPHIC ARTS OPERATIONS
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100 GENERAL

- 101 **PURPOSE:** To limit the emission of volatile organic compounds from materials as defined in Section 229 used by graphic arts operations.
- 102 **APPLICABILITY:** The provisions of this rule shall apply to graphic arts operations. This rule shall apply to any screen printing operation at any stationary source regardless of the substrate. The requirement of this rule, including the VOC limits in Section 301.1 for adhesives, shall also apply to adhesives used by graphic arts operations unless exempt pursuant to Sections 110.6 or 110.7. The cleaning and storage requirements in Section 302 shall apply to all graphic arts operations at any stationary source including those exempt pursuant to Section 110 of this rule. The requirements of Rule 441, ORGANIC SOLVENTS, shall not apply to operations subject to this rule.
- 103 **SEVERABILITY:** If a court of competent jurisdiction issues an order that any provision of this rule is invalid, it is the intent of the Board of Directors of the District that other provisions of this rule remain in full force and effect, to the extent allowed by law.
- 110 **EXEMPTIONS:**
- 110.1 **GENERAL**
- a. Until September 23, 2000, the requirements of this rule, with the exception of Sections 302 and 501.1(a) through (g), shall not apply to any graphic arts operation at a stationary source which emits less than 660 pounds of volatile organic compounds per calendar month from all graphic arts operations, including cleaning materials, and excluding operations addressed in Section 110.2.
 - b. After September 23, 2000, the requirements of this rule, with the exception of Sections 302 and 501.1(a) through (g), shall not apply to any graphic arts operation at a stationary source which either:
 1. has actual emissions of less than or equal to 60 pounds per calendar month of volatile organic compounds from all graphic arts operations and cleaning materials; or
 2. receives a permit that limits the potential to emit, as calculated pursuant to Rule 202, NEW SOURCE REVIEW, to less than or equal to 175 pounds of volatile organic compounds per calendar month from all graphic arts operations and cleaning materials.
- 110.2 **Proof Presses and/or Research and Development Operations:** Until September 23, 2000, this rule, with the exception of Sections 302 and 501, shall not apply to any graphic arts operations used exclusively for research, laboratory analysis or determination of product quality and commercial acceptance, such as proof presses or other proofing systems, provided that total VOC emissions from all such equipment do not exceed 300 pounds per calendar month per stationary source. This exemption shall expire after September 23, 2000.
- 110.3 **Gravure Printing Operations:** This rule shall not apply to gravure printing operations.
- 110.4 **Business and Personal Printers:** This rule shall not apply to business and personal printers such as ink jets, bubble jets, and laser jets.
- 110.5 **Prepress Operations:** This rule shall not apply to prepress operations associated with printing plate making including film photo processors and plate photo processors.
- 110.6 **Aerosol Adhesives – Screen Printing:** The requirements in Section 301 of this rule shall not apply to aerosol adhesives used by screen printing operations provided that the aerosol adhesives comply with the VOC limits for aerosol adhesives under Section 300 - STANDARDS in Rule 460 – ADHESIVES AND SEALANTS.
- 110.7 **Aerosol Adhesives – Graphic Arts Operations:** The requirements of this rule shall not apply to aerosol adhesives used by graphic arts operations provided that the VOC emissions from the facility are less than 660 pounds per month from all graphic arts operations.

200 DEFINITIONS

- 201 **ADHESIVE:** Any substance used to bond one surface to another surface by attachment.
- 202 **AEROSOL ADHESIVE:** An adhesive consisting of a mixture of rubber, resins, liquid and /or gaseous solvents, and propellants packaged in a hand-held, pressurized, non-refillable container. The container expels the pressurized aerosol materials in a finely divided spray when a valve on the container is depressed.
- 203 **APPLICATION EQUIPMENT:** A device used to apply adhesive, coating, or ink materials.
- 204 **BLANKET AND ROLLER WASHES:** Cleaning materials, which are used to remove the printing inks, oils, and paper pieces from the blankets and rollers excluding metering rollers and plates.
- 205 **CLOSED CONTAINER:** A container which has a cover that meets with the main body of the container without any visible gaps between the cover and the main body of the container.
- 206 **COATING:** A layer of material, excluding adhesives, applied across the entire width of a substrate. For example, in printing, an emulsion, varnish or lacquer applied over a printed surface, and in platemaking, the light-sensitive polymer or mixture applied to a metal plate.
- 207 **COLD BENDING:** A process which subjects the printed color, design, alphabet, symbol, or numeral on a printed object to permanent bending through the application of force.
- 208 **CONTROL DEVICE:** Equipment such as an incinerator or adsorber used to prevent air pollutants from reaching the ambient air.
- 209 **CONVERTING OPERATION:** Coating, waxing, laminating, extrusion coating and printing, for fabrication of base materials. The base materials are then used to produce wraps, bags, and other preformed packages.
- 210 **DRYING OVEN:** An oven used to hasten the process of drying printed or coated material.
- 211 **ELECTRONIC CIRCUIT:** A product, which consists of a substrate and a circuitry, created by screen printing a conductive ink on the substrate.
- 212 **EMBOSSING:** A process performed after printing to stamp a raised or depressed image (artwork or type) into the surface of the paper, using engraved metal embossing dies, extreme pressure, and heat.
- 213 **EXEMPT COMPOUND:** An exempt compound has the same meaning as in Rule 101 - GENERAL PROVISIONS AND DEFINITIONS.
- 214 **EXTREME PERFORMANCE INK/COATING:** An ink or coating, used in screen printing on a non-porous substrate, that is designed to resist or withstand any of the following:
214.1 five or more years of outdoor exposure;
214.2 exposure to industrial-grade chemicals, solvents, acids, or detergents, oil products (including fuels), cosmetics, temperatures exceeding 76 °C (170 °F), vacuum-forming, embossing or molding.
- 215 **FLEXIBLE PACKAGING INDUSTRY:** Establishments that convert materials consisting of light gauge papers, plastic films, cellulosic films such as cellophane, thin gauge metal sheets such as aluminum foil or steel foil, and combinations thereof into a variety of product packages.
- 216 **FLEXOGRAPHIC PRINTING:** A printing operation utilizing a flexible rubber or other elastomeric plate in which the image area is raised relative to the nonimage area.

- 217 **FOUNTAIN SOLUTION:** The solution applied to the image plate to maintain the hydrophilic properties of the nonimage areas and to keep the nonimage area free from ink. Fountain solution is primarily water and contains at least one of the following materials:
217.1 etchants such as mineral salts;
217.2 hydrophilic gums; or
217.3 VOC additives to reduce the surface tension of the solution.
- 218 **GRAPHIC ARTS OPERATIONS:** Any gravure, screen printing, flexographic, lithographic, or letterpress printing operation, or any coating or laminating operation that manufactures flexible packaging material for the packaging industry. Equipment which has both coating and printing units are considered to be performing a graphic arts operation. Coating operations, which are performed by a machine having only coating units and no printing units, are not graphic arts operations except for flexographic printing operations.
- 219 **GRAVURE PRINTING:** An intaglio printing operation in which the image area is etched below the surface of the printing plate and is transferred directly to the substrate when the substrate is pressed against the plate by an impression roller.
- 220 **HEAT BENDING:** A process which subjects the printed color, design, alphabet, symbol, or numeral on a printed object to permanent bending through the application of heat and force.
- 221 **HEATSET INK:** A printing ink used on continuous web-feed printing presses that are equipped with dryers or ovens. The ink dries or sets by heat induced evaporation of the ink oils and subsequent chilling of the ink by chill rolls.
- 222 **INFLATING:** A process of filling a printed object with air or gas which results in the swelling of the printed area.
- 223 **LAMINATING OPERATIONS:** A process of composing two or more layers of material to form a single multiple-layer sheet by using adhesive as the bonding agent.
- 224 **LETTERPRESS PRINTING:** A printing operation in which the image area is raised relative to the nominate area and the ink is transferred to the paper directly from the image surface.
- 225 **LINE:** The minimum equipment which is required for the application and/or curing of inks and/or coatings on a substrate, including the ink and/or coating applicators and heating oven(s) and associated ink and coating mixing equipment.
- 226 **LITHOGRAPHIC PRINTING:** A printing operation in which the image and nonimage areas exist in the same plane. The nonimage area is treated chemically so that only the image areas will be printed onto the substrate.
- 227 **LITHOGRAPHIC AND LETTER PRESS PRINTING, OTHER CLEANING:** Cleaning of metering rollers and printing plates.
- 228 **MAINTENANCE CLEANING:** A solvent cleaning operation or activity carried out to keep tools, machinery, or general work areas in clean and good operational condition.
- 229 **MATERIAL:** Any material containing VOC including but not limited to coating, adhesive, inks (e.g., printing ink, metallic ink, ultraviolet ink), fountain solutions, thinners, reducers, catalysts, colorants, or solvents used in cleaning.
- 230 **MECHANICALLY FORMED PRODUCTS:** Screen printed products made of plastic substrates which are subjected to vacuum-forming, embossing, inflating, heat bending, or cold bending processes after the screen printing operation.

- 231 **METALLIC INK:** An ink that contains greater than 50 grams of metal per liter (0.4 lb/gal) of ink.
- 232 **METERING ROLLER:** A roller to transfer and meter water to maintain hydrophilic properties.
- 233 **NONCOMPLIANT MATERIAL:** A material that:
- 233.1 exceeds the VOC content limits specified in Section 301, and is not exempt pursuant to Section 110, and does not use an alternative compliance option pursuant to Rule 107, ALTERNATIVE COMPLIANCE, and does not use emission control equipment pursuant to Section 303; or
- 233.2 exceeds the VOC content limit and/or composite vapor pressure limit, as applicable, in Section 302.1, and does not use an alternative compliance option pursuant to Rule 107, ALTERNATIVE COMPLIANCE, and does not use emission control equipment pursuant to Section 303.
- 234 **NON-HEATSET INK:** An ink that sets and dries by absorption into the substrates, and hardens by ambient air oxidation that may be accelerated by the use of infrared light sources. For purpose of this definition ultraviolet and electron-beam curable inks are examples of non-heatset inks.
- 235 **NON-POROUS SUBSTRATE:** Any substrate whose surface prevents penetration by water, including but not limited to foil, polyethylene, polypropylene, cellophane, paper or paperboard coated with a non-porous surface, metallized polyester, nylon and polyethylene terephthalate (mylar). Clay-coated printing paper as defined by the American Paper Institute Classification System and paperboard coated with clay to prevent water penetration shall be considered a non-porous substrate.
- 236 **OFFSET PRINTING:** A lithographic printing operation in which the image area is transferred, or offset, to another surface, and then printed onto the substrate.
- 237 **OVERLAY:** A screen printed product made of polycarbonate, polyester, or clear vinyl plastic substrate which activates the circuitry on an electronic circuit underneath it when pressed against the electronic circuit. Overlays and electronic circuits are used in membrane switches of products such as computer keyboards, calculators, control panels, and home appliances.
- 238 **PREPRESS OPERATIONS:** Operations associated with printing plate making using film photo processors and plate photo processors.
- 239 **PRINTING:** Any graphic arts operation that imparts color, design, alphabet, or numerals on a substrate.
- 240 **PRINTING INK:** A pigmented fluid or viscous material used in printing.
- 241 **PROOF PRESS:** A press used exclusively to check the quality of print, color reproduction, and editorial content.
- 242 **REFRIGERATED CHILLER:** A device that continuously maintains and supplies fountain solution to a holding tray at a temperature of 55 degrees Fahrenheit or less measured at the supply tank, thereby reducing evaporative emissions of VOCs in fountain solution.
- 243 **REPAIR CLEANING:** Cleaning of equipment parts as part of a repair operation or as part of a scheduled maintenance procedure during which the parts are not removed from the equipment and power to the printing equipment has been turned off and secured.
- 244 **SCREEN PRINTING:** A printing operation in which the printing ink passes through a web or a fabric to which a refined form of stencil has been applied. The stencil openings determine the form and dimensions of the imprint.

- 245 **SIGN INK/COATING:** A printing ink or coating used in screen printing indoor and outdoor signs (excluding structural components) and murals, including lettering enamels, poster colors, copy blockers, and bulletin enamels.
- 246 **SOLVENT CLEANING:** The removal of loosely held uncured adhesives, uncured inks, uncured coatings, and contaminants including, but not limited to, dirt, soil, and grease from equipment, substrate, and general work areas.
- 247 **SPECIALTY FLEXOGRAPHIC PRINTING:** Flexographic printing on polyethylene, polyester and foil substrates for food packaging, health care products, fertilizer bags, or liquid-tight containers.
- 248 **STATIONARY SOURCE:** Any building, structure, facility, or emissions unit which emits or may emit any affected pollutant directly or as a fugitive emission.
- 248.1 Building, structure, facility, or emissions unit includes all pollutant emitting activities which:
- a. Belong to the same industrial grouping, and
 - b. Are located on one property, or two or more contiguous properties, and
 - c. Are under the same or common ownership, operation, or control, or which are owned or operated by entities which are under common control.
- 248.2 Pollutant emitting activities shall be considered as part of the same industrial grouping if:
- a. They belong to the same two-digit Standard Industrial Classification (SIC) code, or
 - b. They are part of a common production process, which includes industrial processes, manufacturing processes and any connected processes involving a common material.
- 249 **SUBSTRATE:** The surface to which a printed image is applied. Substrates include, but are not limited to, paper, plastic, metal, wood, ceramic, and fabric.
- 250 **ULTRAVIOLET INK:** Ink which dries by polymerization reaction induced by ultraviolet energy.
- 251 **VACUUM-FORMING:** A process which imparts a desired shape to a printed object by subjecting the screen printed area of the object to a vacuum.
- 252 **VOC COMPOSITE PARTIAL PRESSURE:** The sum of the partial pressures of the compounds defined as VOCs. VOC composite partial pressure is calculated pursuant to Section 403.
- 253 **VOLATILE ORGANIC COMPOUND (VOC):** A volatile organic compound has the same meaning as in Rule 101—GENERAL PROVISIONS AND DEFINITIONS.
- 254 **VOLATILE ORGANIC COMPOUND (VOC) AS APPLIED:** A VOC as applied means the VOC content of the material as applied including thinners, reducers, hardeners, retarders, catalysts and additives calculated pursuant to Section 502.1.
- 255 **VOLATILE ORGANIC COMPOUND (VOC) AS SUPPLIED:** A VOC as supplied means the VOC content of the original material as supplied by the manufacturer calculated pursuant to Section 502.1.
- 256 **WATER SLIDE DECALS:** Decals which are screen printed onto treated paper stock, and are removable from the stock by the dissolution of an underlying, water-soluble adhesive or a similar carrier.
- 257 **WEB:** A continuous sheet of substrate that is printed on web-fed printing presses.

258 **WEB-FED:** An automatic system on a printing press which supplies a web substrate for printing from a continuous roll or web or from an extrusion conversion process.

259 **WIPE CLEANING:** The method of cleaning a surface by physically rubbing the surface with a material such as a rag, paper, or a sponge moistened with a solvent.

300 STANDARDS

301 **VOC CONTENT LIMITS FOR MATERIALS USED IN GRAPHIC ARTS OPERATIONS:** Except for graphic arts operations exempt pursuant to Section 110, no person shall apply any material with a VOC content in excess of the limits specified below. The VOC content of the material as applied shall be determined pursuant to Section 502.1.

301.1 VOC Content for Inks, Coatings, and Adhesives:

MATERIAL TYPE	VOC CONTENT g/l (lb/gal) Less water and exempt compounds		
		Effective Date	Effective Date
	2/23/93	9/23/2000	3/23/2001
General			
Printing Ink	300 (2.5)	300 (2.5)	300 (2.5)
Adhesive	300 (2.5)	150 (1.25)	150 (1.25)
Coating	300 (2.5)	300 (2.5)	300 (2.5)
Screen Printing			
Printing Ink	-	-	400 (3.3)
Adhesive	-	-	150 (1.25)
Coating	-	-	400 (3.3)
Electronic Circuit	-	-	800 (6.7)
Extreme Performance Ink/Coating	-	-	800 (6.7)
Metallic Ink	-	-	400 (3.3)
Sign Ink/Coating	-	-	500 (4.1)
Mechanically Formed Products	-	-	800 (6.7)
Overlays	-	-	800 (6.7)
Web-Fed Wallpaper	-	-	300 (2.5)
Water Slide Decals	-	-	800 (6.7)

301.2 VOC Content for Fountain Solution Materials:

MATERIAL TYPE	VOC CONTENT g/l (lb/gal) Including water and exempt compounds	
	Effective Date	Effective Date
	2/23/93	9/23/2000
Fountain Solutions – Chilled Using Refrigerated Chiller	116(0.97)	100 (0.83)
Fountain Solutions – Non-Chilled	116(0.97)	80 (0.67)

301.3 **Temperature Gauge Requirements Refrigerated Chiller.** The refrigerated chiller shall be equipped with a temperature gauge. The temperature of the fountain solution shall be maintained at 55 °F or less.

302 **CLEANING AND STORAGE REQUIREMENTS:** Any person owning or operating a graphic arts operation shall comply with the following requirements:

302.1 Materials used for solvent cleaning shall not exceed the VOC and/or composite vapor pressure limits specified in the table below. The VOC content of the material as applied shall be determined pursuant to Section 502.1. The composite partial pressure shall be determined using Section 502.6.

Material Type	VOC Content g/l (lb/gal) Including Water and Exempt Compounds		VOC Composite Partial Pressure Millimeters of Mercury at 20 °C (68 °F)
General (e.g., maintenance, repair, solvent, wipe) Cleaning	72 (0.60)		
Application Equipment Cleaning			
1. General (not specifically listed below)	100 (0.83)	AND	3
2. Lithographic and Letter Press Printing, Blanket and Roller Washes	300 (2.5)	OR	10
3. Lithographic and Letter Press Printing, Other Cleaning	300 (2.5)	OR	25
4. Screen Printing	300 (2.5)	OR	10
5. Flexographic Printing	100 (0.83)	AND	3
6. Specialty Flexographic Printing	810 (6.8)	AND	21
7. Ultraviolet Inks (Except Screen Printing)	800 (6.7)	AND	33

302.2 **Lithographic and Letter Press Printing, Other Cleaning:** The total usage for this cleaning category shall not exceed 15 percent (by volume) of the total monthly usage of the Lithographic and Letter Press Printing, Blanket and Roller Washes category. The percentage of the solvents used for Lithographic and Letter Press Printing, Other Cleaning shall be calculated as follows:

$$\% \text{ Usage} = \frac{G}{Y} * 100\%$$

Where: G = Total usage for Lithographic and Letter Press, Other Cleaning materials (gal/month)
Y = Total material usage for Lithographic and Letter Press, Blanket and Roller Washes (gal/month)

302.3 Closed containers shall be used for the disposal of all VOC-containing cloth, sponges, papers, or other materials used for solvent cleaning.

302.4 All VOC-materials shall be stored in closed containers when not in use.

303 **EMISSIONS CONTROL EQUIPMENT:** As an alternative to Sections 301 and 302.1, a person may use air pollution control equipment provided it satisfies the following:

- 303.1 The air pollution control equipment is approved by the Air Pollution Control Officer pursuant to Rule 201, GENERAL PERMIT REQUIREMENTS, and
- 303.2 The air pollution control equipment is designed and operated with:
- A control device efficiency of at least 95 percent on a mass basis, as determined pursuant to Sections 406 and 502.4, and
 - An emission collection efficiency of at least 70 percent on a mass basis, as determined pursuant to Section 502.5.
- 304 **PROHIBITION OF SALE:** A person shall not supply, sell, solicit, or offer for sale, any noncompliant material as defined in Section 233 for use in graphic arts operations. The prohibition in this section shall apply to any graphic arts material which will be applied at any physical location within the District.

400 ADMINISTRATIVE REQUIREMENTS

- 401 **OPERATION AND MAINTENANCE PLAN:** Any person using an approved emission control device pursuant to Section 303 as a means of complying with this rule (as provided in Section 301) must submit an Operation and Maintenance Plan for the emission control device to the Air Pollution Control Officer for approval, along with the application for Authority to Construct, required by Rule 201, General Permit Requirements. The Plan shall specify key system operating parameters, such as temperatures, pressures, and/or flow rates, necessary to determine compliance with this rule and shall describe in detail procedures to maintain the approved emission control device. The Plan shall also specify which records must be kept to document these operations and maintenance procedures. These records shall comply with the requirements of Sections 501.4 and 501.5. The Plan shall be implemented upon approval of the Air Pollution Control Officer.
- 402 **PRODUCT INFORMATION REQUIREMENTS FOR SELLERS:** Any person who sells any material subject to this rule shall make available to the purchaser at the time of sale the following information:
- 402.1 The material type by name/code/manufacturer;
- 402.2 **For materials subject to Section 301.1:** The maximum VOC content of the material (adhesive, ink, and coating), as supplied. The VOC content shall be displayed as grams of VOC per liter of material (or pounds of VOC per gallon), excluding water and exempt compounds;
- 402.3 **For materials subject to Section 301.2:** The maximum VOC content of the fountain solution, as supplied. The VOC content shall be displayed as grams per liter of material (or pounds of VOC per gallon), including water and exempt compounds as determined pursuant to Section 502.1;
- 402.4 **For materials subject to Section 302.1:** The maximum VOC content and the total VOC composite partial pressure of the material as supplied. The VOC content shall be displayed as grams of VOC per liter of material (or pounds of VOC per gallon), including water and exempt compounds as determined pursuant to Section 502.1. The composite vapor pressure shall be displayed in millimeters of mercury at 20 °C (68 °F) as determined pursuant to Section 502.6; and
- 402.5 **For all materials subject to Sections 301 and 302.1:** Recommendations regarding thinning, reducing, or mixing with any material.
- 403 **CALCULATION FOR DETERMINING VOC COMPOSITE PARTIAL PRESSURE:** VOC composite partial pressure shall be calculated by the following equation:

$$PP_c = \frac{\sum_{i=1}^n \frac{(W_i)(VP_i)}{MW_i}}{\frac{W_w}{MW_w} + \sum_{e=1}^n \frac{W_e}{MW_e} + \sum_{i=1}^n \frac{W_i}{MW_i}}$$

Where: PP_c = VOC composite partial pressure at 20 °C, in mm Hg.

W_i	=	Weight of the "i"th VOC compound/, in grams, as determined by ASTM E 260-96.
W_w	=	Weight of water, in grams as determined by ASTM D 3792-99.
W_e	=	Weight of the "e"th exempt compound, in grams, as determined by ASTM E 260-96.
MW_i	=	Molecular weight of the "i"th VOC compound, in grams per g-mole, as given in chemical reference literature.
MW_w	=	Molecular weight of water, 18 grams per g-mole.
MW_e	=	Molecular weight of the "e"th exempt compound, in grams per g-mole, as given in chemical reference literature.
VP_i	=	Vapor pressure of the "i"th VOC compound at 20°C, in mm Hg, as determined by Section 502.7 of this rule.

- 404 **CALCULATION FOR DETERMINING VOC CONTENT OF MATERIAL EXCLUDING WATER AND EXEMPT COMPOUNDS:** For the VOC content as applied, the volume of material is defined as the volume of the original material plus any material (e.g., thinners, reducers, or catalysts) added to the original material. For the VOC content as supplied, the volume of material is defined as the volume of the original material. The weight of VOC per combined volume of VOC and material solids shall be calculated by the following equation:

$$G_1 = \frac{W_v - W_w - W_{ec}}{V_m - V_w - V_{ec}}$$

Where: G_1	=	Weight of VOC per volume of material, less water and exempt compounds, in grams per liter
W_v	=	Weight of all volatile compounds, including any volatile materials added to the original material supplied by the manufacturer when calculating the VOC content as applied, in grams
W_w	=	Weight of water, in grams
W_{ec}	=	Weight of exempt compounds, in grams
V_m	=	Volume of material, in liters
V_w	=	Volume of water, in liters
V_{ec}	=	Volume of exempt compounds, in liters

- 405 **CALCULATION FOR DETERMINING VOC CONTENT OF MATERIAL INCLUDING WATER AND EXEMPT COMPOUNDS:** For the VOC content as applied, the volume of material is defined as the volume of the original material, plus any material added to the original material (e.g., thinners or reducers). For the VOC content as supplied, the volume of material is defined as the volume of the original material. The weight of VOC per total volume of material shall be calculated by the following equation:

$$G_2 = \frac{W_v - W_w - W_{ec}}{V_m}$$

Where: G_2	=	Weight of VOC per total volume of material, in grams per liter
W_v	=	Weight of all volatile compounds, in grams
W_w	=	Weight of water, in grams
W_{ec}	=	Weight of exempt compounds, in grams
V_m	=	Volume of material, in liters

- 406 **CALCULATION FOR DETERMINING PERCENT CONTROL EFFICIENCY AND VOC MASS EMISSION RATE:** The VOC mass emission rate shall be calculated both upstream and downstream of the emissions control device based on the VOC mass concentration and volumetric flowrate, pursuant to Section 502.4 and the following equations:

406.1 **VOC Mass Emission Rate:**

$$M = (Q) * (C) * (60 \frac{m}{hr}) \text{ (calculated upstream and downstream)}$$

Where: M = VOC mass emission rate (upstream/downstream), in lb/hr.
 Q = the volumetric flowrate at the inlet (upstream) or exhaust stack outlet (downstream), in standard cubic feet per minute as determined by Section 502.4.
 C = the VOC mass concentration at the inlet (upstream) or outlet (downstream), in pounds per standard cubic feet, as determined pursuant to Section 502.4.

406.2 **The percent control efficiency is calculated as follows:**

$$\%CE = \left(\frac{M_u - M_d}{M_u} \right) * 100$$

Where: CE = control efficiency.
 M_u = the upstream VOC mass emission rate, in lb/hr.
 M_d = the downstream VOC mass emission rate, in lb/hr.

407 **CALCULATION FOR DETERMINING VOC EMISSIONS FOR STATIONARY SOURCES INCLUDING THOSE EXEMPT PURSUANT TO SECTIONS 110.1 AND 110.2:**

407.1 The total VOC emissions from materials shall be determined as follows:

$$E = \sum (E_1 + E_2)$$

407.2 **VOC Emissions from Ink Usage:**

$$E_1 = U_1 * P_1 * (1 - R)$$

Where: E₁ = VOC emissions from ink usage (lbs-VOCs/month)
 U₁ = ink usage as applied (gallons/month). This equals the ink usage in pounds per month divided by the density of the ink.
 P₁ = VOC content (lbs-VOC/gallon), applied as, determined pursuant to Section 502.1
 R = ink retention factor (20% for heat-set lithographic printing, 95% for non-heat set lithographic printing, and 0% for all other printing operations)

407.3 **VOC Emissions from Materials (Except Inks) Usages:**

$$E_2 = \sum_{i=1}^n (U_i) * (V_i)$$

Where E₂ = VOC emissions from materials (except inks) used (lbs-VOCs/month)
 U_i = material usage, as applied, (gallons/month)
 V_i = VOC content in the material (lbs-VOC/gal), as applied, as determined pursuant to Section 502.1

500 **MONITORING AND RECORDS**

501 **RECORDKEEPING:** In addition to any existing permit conditions issued pursuant to Rule 201, GENERAL PERMIT REQUIREMENTS, any person subject to this rule, including operations claiming exemption under Section 110.1 and 110.2, shall comply with the following requirements:

- 501.1 **LIST OF MATERIALS:** A list shall be maintained of all materials currently used and/or stored at the site. The list shall include the following information:
- a. Material type (e.g., adhesive, coating, ink, fountain solution, extreme performance ink/coating, or cleanup solvent) by name/code/manufacturer and the appropriate material type category as designated in Sections 301 and 302.1 as applicable.
 - b. The actual VOC content of the materials (e.g., adhesive, coating, or ink) listed in Section 301.1, as applied excluding water and exempt compounds.
 - c. The actual VOC content of the fountain solution listed in Section 301.2 as applied including water and exempt compounds in grams per liter or pounds per gallon. The VOC content as provided by the manufacturer may be acceptable if the fountain solution is used as supplied.
 - d. The actual VOC content of the cleaning materials listed in Section 302.1, as applied including water and exempt compounds in grams per liter or pounds per gallon.
 - e. The VOC composite partial pressure for materials listed in Section 302.1 if applicable. The composite partial pressure shall be calculated pursuant to Sections 403 and 502.6.
 - f. The actual mixing ratio used for the material, as applied.
 - g. For inks, the density of the ink in lbs/gallon.
 - h. For aerosol adhesives exempt pursuant to Section 110.6, records of VOC content in the aerosol adhesive. The VOC content shall be recorded as percent by weight. The record shall also include the type of operation (i.e., substrate, purpose) for which the aerosol adhesive is used.
 - i. For screen printing, the substrate to which the material is applied.
 - j. For extreme performance ink/coating indicate what the material is intended to resist or withstand and what substrate it is intended to be applied to.
 - k. Identification of each material type exceeding the VOC limits specified in Sections 301 and 302.1 or the composite vapor pressure specified in Section 302.1.
- 501.2 **PRODUCT INFORMATION:** The information listed under Section 402.1 through 402.5 shall be maintained on-site and made available to the Air Pollution Control Officer upon request.
- 501.3 **Usage Records:** Any person within the District using materials regulated by this rule shall update and maintain the records as required by this rule as follows:
- a. **Daily:**
 1. **For noncompliant materials:** Records regarding the use, including the lack of use, of each material type by name/code/ and the total applied volume in gallons or weight in pounds (weight allowed for ink only) of each material.
 - b. **Monthly:**
 1. Records of total applied volume in gallons or weight in pounds (weight allowed for ink only) for each material (including thinners, reducers, hardeners, retarders, catalysts, fountain solutions and cleaning materials), specified by material type as listed in Sections 301 and 302.1.
 2. For graphic arts operations exempt pursuant to Sections 110.1(a), 110.1(b), or 110.7, records of total VOC emissions from all materials (including thinners, reducers, hardeners, retarders, and catalysts) used for each calendar month in pounds. The records shall be determined using emission calculations specified in Section 407.
 3. Records of total applied volume for each material exceeding the VOC limits specified in Sections 301 and 302.1 by name/code/manufacturer and material type.
 4. Records showing the percentage of Lithographic and Letter Press, Other Cleaning materials (i.e., metering rollers and plates) as calculated pursuant to Section 302.2.

5. **Extreme Performance Ink/Coating:** Records of applied volume in gallon or by weight in pounds (weight allowed for ink only), what the material is used to resist or withstand, and what substrate it was applied to.
- 501.4 **Control Equipment:** Any person using an emission control device pursuant to Section 303 as a means of complying with this rule shall maintain:
- a. On a daily basis:
 1. Such records as required by the Operation and Maintenance Plan in Section 401; and
 2. Records of applied volume in gallon or by weight in pounds (weight allowed for ink only); and
 - b. Records of test reports conducted pursuant to Section 502.
- 501.5 **Duration of Records:** Such records shall be maintained on-site for five years and made available for review by the Air Pollution Control Officer upon request.

502 TEST METHODS

- 502.1 **DETERMINATION OF VOC CONTENT:** VOC content of the material (except as provided for in Section 502.2), as applied, shall be determined in accordance with EPA Method 24, Section 404, and Section 502.3 if less water and exempt compounds or with EPA Method 24 and Section 405 if including water and exempt compounds.
- 502.2 **ANALYSIS OF SAMPLES, NON-HEATSET POLYMERIZING LITHOGRAPHIC OR LETTERPRESS INKS:** Measurement of the volatile content shall be made in accordance with EPA Method 24. All components of the sample must be weighed in the proper proportion into the analysis container and mixed together, with the mixture then being allowed to stand for at least one hour, but no more than 24 hours, prior to being oven-dried at 110 degrees C for 1 hour.
- 502.3 **DETERMINATION OF COMPOUNDS EXEMPT FROM VOC DEFINITION:** Compounds exempt pursuant to Section 213, shall be determined in accordance with ASTM D4457-91 or ARB Method 432. If any of the perfluorocarbons are being claimed as exempt compounds, the person making the claim must state in advance which compounds are present, and the EPA-approved test method used to make the determination of these compounds.
- 502.4 **DETERMINATION OF CONTROL EFFICIENCY:** Control efficiency of control equipment shall be determined in accordance with applicable EPA Methods 18, 25, 25A, EPA Method 2 or 2C; and Section 406.
- 502.5 **DETERMINATION OF COLLECTION EFFICIENCY:** Collection efficiency shall be determined in accordance with U.S. EPA technical guideline Document, "Guidelines for Determining Capture Efficiency dated January 9, 1995". Individual capture efficiency test runs subject to U.S. EPA technical guidelines shall be determined by:
- a. Applicable EPA Methods 204, 204A, 204B, 204C, 204D, 204E, and/or 204F; or
 - b. Any other method approved by U.S. EPA, the California Air Resources Board, and the Air Pollution Control Officer.
- 502.6 **DETERMINATION OF VOC COMPOSITE PARTIAL PRESSURE:** VOC composite partial pressure shall be determined in accordance with Section 403 and Section 502.7.
- 502.7 **DETERMINATION OF VAPOR PRESSURE:** Vapor pressure of a VOC shall be determined in accordance with ASTM Method D2879-97, or may be obtained from the most current edition of a published source, including, but not limited to:
- a. *The Vapor Pressure of Pure Substances*, Boublik, Fried, and Hala; Elsevier Scientific Publishing Company, New York.
 - b. *Perry's Chemical Engineer's Handbook*, McGraw-Hill Book Company.
 - c. *CRC Handbook of Chemistry and Physics*, Chemical Rubber Publishing Company.
 - d. *Lange's Handbook of Chemistry*, John Dean, editor, McGraw-Hill Book Company.

Notwithstanding the provisions of this section, the Air Pollution Control Officer may require the use of a vapor pressure determined in accordance with ASTM Method D2879-97 for determining compliance with this rule.

- 502.8 **DETERMINATION OF METAL CONTENT IN INKS:** The metal content of metallic inks shall be determined in accordance with the South Coast Air Quality Management District's Method 318, "Determination of Weight Percent Elemental Metals in Coatings by X-ray Diffraction". Use of this method for determining the content of metals other than aluminum in metallic inks shall be subject to approval by the U.S. EPA, the California Air Resources Board, and the Air Pollution Control Officer.

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