

RULE 1117

Graphic Arts and Paper, Film, Foil and Fabric Coatings

(A) General

(1) Purpose

- (a) To reduce emissions of Volatile Organic Compounds (VOC) from Graphic Arts Printing Operations, Digital Printing Operations, and Paper, Film, Foil or Fabric Coating Operations.

(2) Applicability

- (a) This rule is applicable to any Graphic Arts Printing Operations, Digital Printing Operations, and Paper, Film, Foil or Fabric Coating Operation and to the Solvent cleaning materials and processes associated with such Operations.
- (b) This rule is applicable to any person who manufactures any Ink, Coating, or Adhesive containing VOC which is sold, offered for sale, or supplied for use in Graphic Arts and Paper, Film, Foil and Fabric Coating Operations in the District.

(B) Definitions

The definitions contained in District Rule 102 – *Definition of Terms* shall apply unless the term is otherwise defined herein. Defined terms are capitalized for ease of recognition.

- (1) “Application Equipment” – A device, including, but not limited to, a spray gun, brush, roller, and a printing press, used to apply Adhesives, Coatings, or Inks.
- (2) “Blanket” – A synthetic rubber mat used to transfer or “offset” an image from a printing plate to paper or other substrate, commonly used in Offset Lithography.
- (3) “Blanket Repair Material” – The material used in Offset Lithographic Printing to correct low spots in the press Blanket.
- (4) “Blanket Wash” – A Solvent used to remove Ink from the Blanket of a press.
- (5) “Coating” – The application of a uniform layer of material across the entire width of a substrate. Those machines which have both Coating and printing units should be considered as performing a printing Operation. Coating applications that are not performed in association with a printing Operation are considered Coating Operations and are not Graphic Arts Printing Operations.

- (6) “Coating Line” –A series of Coating applicators, flash-off areas, and any associated curing/drying equipment between one or more unwind/feed stations and one or more rewind/cutting stations.
- (7) “Coldset” – A Lithographic Printing process where non-Heatset Inks are applied.
- (8) “Conductive Ink” – Screen Printing Inks which transmit electricity and are used in the production of Electronic Circuits.
- (9) “Conventional Printing Operations” – Those printing Operations that utilize physical masters, stencils, screens or plates during the printing process. Conventional Printing Operations use technologies including but not limited to Offset Lithographic, Flexographic, Gravure, Letterpress, and Screen Printing.
- (10) “Die Coater (or Slit Coater)” – A type of Application Equipment that coats an object by flowing Coatings through a slit directly onto the object moving past the slit.
- (11) “Digital Printer” – A printing device that uses a computer-driven machine to transfer an electronic image to a substrate through the use of Inks, toners, or other graphic materials. Digital printing technologies include, but are not limited to, various forms of Ink Jet, Thermography, Electrophotography, Ionography, and Magnetography.
- (12) “Digital Printing Operations” – Those Operations that do not use a physical master, stencils, or plates but use digital data to control the deposition of Ink, toner, or dye to create images.
- (13) “Doctor Blade” – A blade used to scrape excess Ink from a printing plate or inking cylinder.
- (14) “Dye Sublimation” – An imaging process that vaporizes colorant with heat and pressure, and deposits it onto a substrate in order to simulate a continuous tone image. Dye Sublimation is a digital printing technology.
- (15) “Electron Beam Ink” – Ink that, when exposed to electron energy, crosslinks or solidifies in milliseconds.
- (16) “Electron Charge Deposition Printing” – See Ionography
- (17) “Electronic Circuit” – A product which consists of a substrate and a circuitry created by Screen Printing a Conductive Ink on the substrate.
- (18) “Electrophotography” – A digital printing technology that works by recording an image on a drum in the form of an electrostatic charge, which is then transferred to the substrate. Electrophotography includes such technologies as laser printers, xerography, and Liquid Electrophotography.

- (19) “Fabric Coating” – Any decorative or protective Coating or reinforcing material applied or impregnated into textile fabric, vinyl coated textile fabric, or vinyl sheets.
- (20) “Film Coating” – A Coating applied in a Web Coating process on any film substrate other than paper or fabric, including but not limited to typewriter ribbons, photographic film, magnetic tape, and metal foil gift wrap, but excluding Coatings applied to packaging used exclusively for food and health care products for human or animal consumption.
- (21) “Fine Arts Painting” – Any unique visual representation, consisting of paint, Ink, or other media, hand applied to a substrate of canvas, wood, paper, metal, or other material.
- (22) “Flexible Packaging” – Any package or part of a package the shape of which can readily be changed. Flexible Packaging includes, but is not limited to, bags, pouches, liners, and wraps utilizing paper, plastic, film, aluminum foil, metalized or coated paper or film, or any combination of these materials.
- (23) “Flexographic Printing” – The application of words, designs, or pictures to a substrate by means of a roll printing technique in which the pattern is applied to an image carrier made of rubber or other elastomeric material. The image to be printed is raised above the carrier surface, while the non-image area is not raised.
- (24) “Foil Coating” – A Coating applied in a Web Coating process on any foil substrate other than paper or fabric, including but not limited to typewriter ribbons, photographic film, magnetic tape, and metal foil gift wrap, but excluding Coatings applied to packaging used exclusively for food and health care products for human and animal consumption.
- (25) “Fountain Solution” – Solution composed mainly of water and contains at least one of the following materials: etchants such as mineral salts; hydrophilic gums; or other additives, which is applied to the image plate to maintain the hydrophilic properties of the non-image areas.
- (26) “Fugitive Emissions” – Uncollected emissions of VOC from any portion of the printing, Coating or Laminating Operation other than from the Dryer.
- (27) “Grams of VOC per Liter of Ink, Coating, Adhesive, or Wash Primer Less Water and Less Exempt Compounds (VOC Content)” – The weight of VOCs emitted during use, Coating, curing or drying per combined volume of VOC and of Ink, Coating, Adhesive, or Wash Primer solids.
- (28) “Graphic Arts Coating” – The application of a uniform layer of material across the entire width of a substrate. Those machines which perform both Coating and printing should be considered as performing a printing Operation. For purposes of this rule, digital printing is not considered a Graphic Arts Coating Operation.

- (29) “Graphic Arts Printing Operations” – Those Operations employing Conventional Printing Operations, or any Coating or Laminating process associated with Conventional Printing Operations to produce published products and packages. Solvent cleaning Operations performed in order to produce published products and packages are considered to be part of Graphic Arts Printing Operations.
- (30) “Gravure Printing” – An Intaglio Printing Operation in which the Ink is transferred from minute etched wells on a cylinder to the substrate, which is supported by an impression roller, with excess Ink removed from the cylinder by a Doctor Blade.
- (31) “Heatset Ink” – A quick-drying Ink in which the Solvents are vaporized by passing the printed surface through a Dryer.
- (32) “Ink” – A pigmented and/or dyed liquid or paste used in a graphic arts operation typically for printing, impressing, or transferring an image onto a substrate.
- (33) “Ink Jet” – A digital printing technology in which Ink is ejected through printheads onto a substrate to create an image.
- (34) “Intaglio Printing” – Printing done from a plate or cylinder in which the image is sunk below (etched or engraved into) the surface.
- (35) “Ion Deposition Printing” – See Ionography
- (36) “Ionography” – A Digital Printing technology that utilizes a directed array of ions to create a charge on a nonconductive surface to create an image. Ionography can also be known as ion deposition or electron charge deposition printing.
- (37) “Key System Operating Parameters” – Those parameters necessary to ensure compliance with subsection (C)(5), including, but not limited to, temperature, pressure drop, and air flow rate.
- (38) “Letterpress Printing” – A printing method where the image area is raised relative to the non-image area and the Ink is transferred to the paper directly from the image surface.
- (39) “Line” – The minimum equipment which is required for the application, drying, and/or curing of Inks, Ultraviolet Inks, and/or Coatings on a substrate, including the Ink and/or Coating applicators and drying systems, and associated Ink and Coating agitation and delivery systems.
- (40) “Liquid Electrophotography (LEP)” – A digital printing technology that records a latent electrostatic image on a photoconductive surface, such as a drum or belt. The image created by applying toner to the charged areas of the photoconductor is electrically transferred to an intermediate surface. In a second transfer process, the image is released from the Blanket surface to the final substrate, cooling rapidly as the substrate passes between the Blanket and an impression drum, causing the image to “peel off” the Blanket and be affixed to the substrate. This

Operation repeats itself on the one printing station for every color separation in the image.

- (41) “Liquid Leak” – A visible leak from a container at a rate of more than three drops per minute, or a visible liquid mist.
- (42) “Lithographic Printing” – Printing by a planographic method in which the image and non-image areas are on the same plane.
- (43) “Magnetography” – A digital printing technology whereby an image is printed using a magnetic toner, electromagnetic write heads, and magnetic fields on an imaging drum.
- (44) “Maintenance Cleaning” – A Solvent cleaning Operation or activity carried out to keep tools, machinery, equipment (excluding Ink, Coating, or Adhesive Application Equipment) or general work areas in clean and good operational condition.
- (45) “Matte Finish Ink” – A Specialty Ink which is applied on Non-Porous Substrates in Flexographic Printing Operations and contains at least five (5) percent by weight silicon dioxide flattening agent.
- (46) “Metallic Finish Ink” – A Ink which is applied on Non-Porous Substrates in Flexographic Printing Operations and contains at least 28 percent by weight elemental metal particles.
- (47) “Metallic Ink” – A Specialty Ink containing at least 50 grams of elemental metal particles per liter of Ink (0.4 lb/gal) as applied and which is not used in the manufacture of an electronic circuit.
- (48) “Non-Atomized Solvent Flow” – Solvents in the form of a liquid stream without the introduction of any Propellant.
- (49) “Non-Heatset Ink” – An Ink which dries by oxidation and/or absorption into the substrate and can be aided by exposure to infrared radiation or is cured via ultraviolet radiation without use of heat from Dryers or Ovens.
- (50) “Non-Leaking Container” – A container without Liquid Leak.
- (51) “Non-Porous” – Any substrate whose surface prevents penetration by water, including but not limited to foil, polyethylene, polypropylene, cellophane, metalized polyester, nylon, and polyethylene terephthalate (mylar), paper or paperboard coated with non-porous surface. 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 Non-Porous.

- (52) “Offset Lithographic Printing” – A planographic method in which the image and non-image areas are on the same plane and where the Ink is transferred from an image plate on one cylinder to an image Blanket on a different cylinder. The Ink is finally transferred from the image Blanket to the surface to be printed.
- (53) “On-Press Component” – A part, component, or accessory of a press that is cleaned while still being physically attached to the press.
- (54) “Packaging Gravure” – Gravure Printing on paper, paperboard, foil, film or other substrates which are to be used to produce containers or packages.
- (55) “Pantone Ink” – An Ink created for color matching by combination of Process Inks.
- (56) “Paper Coating” – Any Coating applied on or impregnated into paper, including, but not limited to, Adhesive tapes and labels, book covers, post cards, office copier paper, drafting paper, and pressure sensitive tapes.
- (57) “Plastisizer” – A material used to keep plastic material soft and viscous.
- (58) “Plastisol” – A Coating that is a liquid dispersion of small particles of resins and Plastisizers that are fused to become a plastic.
- (59) “Porous” – A substrate whose surface does not prevent penetration by water, including but not limited to, paper, paperboard, and any paper product coated with a porous material.
- (60) “Process Ink” – The hues yellow, magenta, and cyan, plus black used in the four-color print process.
- (61) “Proof Press” – A press used only for printing a sample copy of a graphic art product to check the quality of print, color reproduction and editorial content.
- (62) “Publication Gravure” – Gravure Printing on a substrate which is subsequently formed into books, magazines, catalogues, brochures, directories, newspaper supplements or other types of printed material.
- (63) “Removable Press Component” – A part, component, or accessory of a press that is physically attached to the press but is disassembled and removed from the press prior to being cleaned. Rollers, Blankets, metering rollers, fountains, impression cylinders and plates shall not be considered as Removable Press Components.
- (64) “Resists” – Inks that are Screen Printed to form the required patterns, alphabets, numerals, designs, or symbols on the surface of the substrate; protect the Screen Printed or covered surface from the subsequent application of etching or plating solution; and are later removed from the substrate by a resist stripper. Resist applications include, but are not limited to, etched electronic circuits, display screens, chemical milling of parts, nameplates and signage.

- (65) “Roller Wash” – A Solvent used to remove Ink from the rollers of a press.
- (66) “Screen Printing” – A process where the 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.
- (67) “Screen Printing Metallic Ink” – An Ink used in Screen Printing that contains greater than 50 grams of elemental metal per liter (0.4 lb/gal) of Ink as applied.
- (68) “Sheet-fed” – A Lithographic Printing process where individual sheets of substrate are fed into the press sequentially.
- (69) “Solvent Flushing” – The use of a Solvent to remove uncured Adhesives, uncured Inks, uncured Coatings, or contaminants from the internal surfaces and passages of equipment by flushing Solvent, by a Non-Atomized Solvent Flow, through the equipment.
- (70) “Specialty Flexographic Printing” – A Flexographic Printing on polyethylene or polypropylene food packaging, fertilizer bags, or liquid-tight food containers.
- (71) “Specialty Gravure Printing” – Printing that uses the gravure process for production of wall and floor covering, decorated household paper products such as towels and tissues, cigarette filter tips, vinyl upholstery, woodgrains, and a wide variety of other products.
- (72) “Specialty Ink” – An Ink that is applied only on Non-Porous Substrates in Flexographic Printing Operations, and is either:
- (a) A Metallic Ink that contains at least 28 percent elemental metallic powder, by weight; or
 - (b) A Matte Finish Ink containing at least five (5) percent silicon dioxide flattening agent, by weight.
- (73) “Substrate Retention Factor” – A fraction, expressed in percent, of VOCs in lithographic Inks which is retained in the substrate when the Inks dry by adsorption or absorption.
- (74) “Thermography” – A digital printing technology that creates an image via a chemical reaction that occurs when portions of a thermal-coated substrate are subjected to heat. Thermographic technologies include but are not limited to thermal wax transfer, multi-bit thermal wax transfer, and Dye Sublimation.
- (75) “Thin Film UV Ink” – An Ultraviolet Ink for which <0.2 g will cover an area of ≥ 225 cm² (35 in²).

- (76) “Ultraviolet (UV) Ink” – An Ink which dries by polymerization reaction by ultraviolet or electron beam radiation.
- (77) “VOC Composite Partial Vapor Pressure” – The sum of the partial pressure of the compounds defined as VOCs.
- (78) “Wash Primer” – A material that contains no more than five (5) percent, by weight, solid materials, and that is used to clean and/or to activate surfaces of paper or fabric.
- (79) “Waste Solvent Material” – Any Solvent which may contain dirt, oil, metal particles, sludge, and/or waste products, or wiping material containing VOCs including, but not limited to, paper, cloth, sponge, rag, or cotton swab used in Solvent cleaning.
- (80) “Water Slide Decal” – A decal that is Screen Printed onto treated paper stock and is removable from the stock by the dissolution of an underlying water- soluble Adhesive or similar carrier.
- (81) “Web” – A continuous sheet of substrate.
- (82) “Web Feed” – An automatic system which supplies substrate from a Web.
- (83) “Web Splicing Adhesive” – An Adhesive used to join two continuous rolls of substrate materials.

(C) Requirements

- (1) Graphic Arts Printing Operation
 - (a) An Operator performing a Graphic Arts Operation, not subject to (C)(2), (C)(3), and (C)(4), shall not use graphic arts materials containing VOC in excess of the limits in Table 1 and Table 2.

Table 1

VOC Content Limits for Inks, Coatings and Adhesives	
Material	Grams of VOC per liter (lb/gal), less water and less Exempt Compounds, as applied
Flexographic Ink on Porous Substrates	225 (1.88)
All other Inks	300 (2.5)
Coatings	300 (2.5)
Adhesives	150 (1.25)
Web Splicing Adhesives	150 (1.25)

Table 2

Fountain Solution	VOC Content Percent by Weight of As-Applied Product
Heatset Web Offset Lithography	
Containing Alcohol	
Chilled Using Refrigerated Chiller	3
Non-Chilled	1.6
Containing No Alcohol	
Chilled or Non-Chilled	5
Coldset Web Offset Lithography	
Containing No Alcohol	
Chilled or Non-Chilled	5
Sheet-fed Offset Lithography with maximum sheet size greater than 11 x 17 inches or a total solution reservoir greater than 1 gallon	
Containing Alcohol	
Chilled Using Refrigerated Chiller	8.5
Non-Chilled	5
Containing No Alcohol	
Chilled or Non-Chilled	5
All Other Presses	
Chilled Using Refrigerated Chiller	10
Non-Chilled	8

- (b) If a Facility is using the chilled VOC options in subsection (C)(1)(a) Table 2, the refrigerated chiller shall be equipped with a temperature gauge. The temperature of the Fountain Solution shall be maintained below 60 °F at all times.
- (2) Flexographic Specialty Ink
- (a) An Operator using a Flexographic Printing Operation shall not use a Specialty Ink in excess of the VOC limit in Table 3, and shall not use more than two (2) gallons of Specialty Inks in a calendar day and 120 gallons of Specialty Inks in a calendar year.

Table 3

VOC Content Limits for Flexographic Specialty Ink	
Material	Grams of VOC per liter (lb/gal), less water and less exempt compounds, as applied
Metallic Ink	460 (3.8)
Matte Finish Ink	535 (4.5)
Metallic Ink and Matte Finish Ink on Flexible Package Printing	383 (3.2)

- (b) Facilities with the potential to emit or with actual emissions of at least 10 tons VOC in any calendar year shall not use Specialty Inks with VOC content greater than 300 grams VOC per liter, less water and Exempt Compounds, as applied.
- (3) Screen Printing Operation
- (a) An Operator using a Screen Printing Operation shall not use graphic arts materials in excess of the VOC content limits, as applied, in Table 4.

Table 4

VOC Content Limits for Screen Printing Inks, Coatings, and Adhesives	
Material	Grams of VOC per liter (lb/gal), less water and less Exempt Compounds
Inks and Coatings	400 (3.3)
Adhesives	150 (1.25)
Resists	600 (5.0)
Conductive Inks	850 (7.1)

- (4) Paper, Film, Foil, or Fabric Coating Operations
- (a) An Operator using a Paper, Film, Foil, or Fabric Coating Operation shall not use any Coating or Wash Primer in excess of the VOC content limits, as applied, in Table 5.

Table 5

VOC Content Limits of Paper, Film, Foil, or Fabric Coating and Wash Primer	
Material	VOC Content Limit
Coating	265 gm/liter (2.2 lb/gal) of Coating, less water and less Exempt Compounds
Wash Primer	265 gm/liter (2.2 lb/gal) of Coating, less water and less Exempt Compounds
Plastisols	20 gm/liter (0.16 lb/gal)

- (b) An Operator performing pressure sensitive tape and label surface Coating Operations shall not use any VOC content materials or combinations of materials that exceed a VOC content of either 0.20 kg of VOC/kg of solids (0.20 lb VOC/lb of solids), as applied, or an additional limit of 0.067 kg VOC/kg of Coating (0.067 lb of VOC/lb of Coating), as applied.
- (5) Approved VOC Emission Control System
- (a) Heatset Web Offset Lithographic or Letterpress

An Operator performing Heatset Web Offset Lithographic or Letterpress Printing that has greater than 25 tpy potential to emit prior to controls shall use an add-on Control Device on the Dryers, as follows:

- (i) Heatset Web offset lithographic or letterpress printer Control Device installed on or prior to July 31, 2010 shall have an overall capture and control efficiency of 90 percent.
 - (ii) Heatset Web offset lithographic or letterpress printer Control Device installed on or after August 1, 2010 shall have an overall capture and control efficiency of 95 percent.
- (b) In lieu of the requirements of subsection (C)(1), (C)(2), (C)(3), and (C)(4), emissions of VOC may be controlled by an emission capture and control system, which reduces VOC emissions to the atmosphere, provided that:
- (i) The VOC emission control system is approved, in writing, by the Air Pollution Control Officer (APCO).
 - (ii) During continuous operation, not to exceed 24 hours, the VOC emission control system shall have a minimum overall VOC capture and control efficiency as specified in Table 6.

Table 6

VOC Emission Control System Overall Capture and Control Efficiency	
Process	Overall VOC capture and control efficiency %, by weight
Flexible Package Printing (All Technologies)	80%
Publication Gravure	85%
Flexographic Printing Operations	80%
Other Printing Operations, excluding Heatset Web Offset Lithographic Printing Press	75%
Paper, Film, Foil, or Fabric Coating Operations	90%

- (c) The collection system shall vent all drying Oven exhaust to the Control Device and shall have one or more inlets for collection of Fugitive Emissions; and,
- (d) During any period of operation of a recuperative thermal oxidizer, combustion temperature shall be continuously monitored and recorded at least once every 15 minutes or for a regenerative thermal oxidizer, the minimum operational or set point temperature shall be continuously monitored and recorded at least once every 15 minutes, be maintained at a 3-hour average temperature no less than 50 °F below the minimum required operational temperature; and,

- (e) During any period of operation of a catalytic oxidizer, inlet gas temperature shall be continuously monitored and recorded at least once every 15 minutes and shall be maintained at a 3-hour average temperature no less than 50 °F below the minimum required operational temperature; and,
 - (f) Appropriate permit(s) for the emission capture and control system are obtained pursuant to District regulations.
 - (g) The VOC emission control system shall reduce VOC emissions, at all times, to a level that is not greater than the emissions which would have been achieved through the use of compliant materials, compliant equipment or compliant work practices in subsections (C)(1), (C)(2), (C)(3), (C)(4), and (C)(7).
- (6) Coating Application Equipment

No Operator shall apply Coatings unless Coatings are applied with equipment operated according to manufacturer's specifications, and only by the use of one of the following types of Coating Application Equipment:

- (a) Flow Coater;
- (b) Roll Coater;
- (c) Dip Coater;
- (d) Foam Coater;
- (e) Die Coater;
- (f) Hand Application Methods; or
- (g) High-volume, low-pressure (HVLP) spray for air dried Coatings.
 - (i) For HVLP spray guns manufactured prior to January 1, 1996, the end user shall demonstrate that the gun meets HVLP spray equipment standards. Satisfactory proof will be either in the form of manufacturer's published technical material or by a demonstration using a certified air pressure tip gauge, measuring the air atomizing pressure dynamically at the center of the air cap and at the air horns.
 - (ii) A person shall not sell or offer for sale for use within the District any HVLP spray gun without a permanent marking denoting the maximum inlet air pressure in psig at which the gun will operate.
- (h) For Coatings with a Viscosity of 200 centipoise or greater, as applied, airless spray, air-assisted airless spray, and air-atomized spray may also be used.

- (i) Other Coating application methods which are demonstrated to the APCO to be capable of achieving at least 65 percent transfer efficiency as determined in accordance with Section (F). Prior written approval from the APCO shall be obtained for each alternative method used.
 - (j) In lieu of complying with subsection (C)(6)(a) through (C)(6)(i), an Operator may control emissions from the Coating Application Equipment with a VOC emission control system that meets the requirements of subsection (C)(5).
- (7) Solvent Cleaning
- (a) An Operator shall not use Solvents for cleaning Operations that exceed the VOC content limits specified in Table 7.

Table 7

VOC Content Limits for Solvent Cleaning	
Type of Solvent Cleaning Operation	VOC Content Limit grams of VOC/liter of material (lb/gal)
A. Product Cleaning During Manufacturing Process; or Surface Preparation for Coating, Ink, or Adhesive Application	25 (0.21)
B. Repair and Maintenance Cleaning	25 (0.21)
C. Cleaning of Coating or Adhesive Application Equipment	25 (0.21)
D. Cleaning of Ink Application Equipment	
1. General	25 (0.21)
2. Flexographic Printing	25 (0.21)
3. Specialty Flexographic Printing	100 (0.83)
4. Gravure Printing	
a. Publication	100 (0.83)
b. Packaging	25 (0.21)
5. Lithographic (Offset) or Letterpress Printing	
a. Roller Wash - Step 1	100 (0.83)
b. Roller Wash - Step 2; Roller Wash - not specified; Blanket Wash, and On-Press Components	100 (0.83)
c. Removable Press Components	25 (0.21)
6. Screen Printing	100 (0.83)
7. Ultraviolet Ink/Electron Beam Ink Application Equipment (except Screen Printing)	100 (0.83)

- (b) The following cleaning Operations may be performed outside of an APCO-approved VOC emission control system and using Solvent with VOC content greater than 25 g/L:
 - (i) Wipe Cleaning;
 - (ii) Application of Solvent from hand-held spray bottles from which Solvents are dispensed without a Propellant induced force;
 - (iii) Non-Atomized Solvent Flow method in which the cleaning Solvent is collected in a container or a collection system which is closed except for Solvent collection openings and, if necessary, openings to avoid excessive pressure build-up inside the container; or
 - (iv) Solvent Flushing method in which the cleaning Solvent is discharged into a container that is closed except for Solvent collection openings and, if necessary, openings to avoid excessive pressure build-up inside the container. The discharged Solvent from the equipment must be collected into containers without atomizing into the open air. The Solvent may be flushed through the system by air or hydraulic pressure, or by pumping.
- (c) Solvent shall not be atomized into the open air unless it is vented to a VOC emission control system that complies with subsection (C)(5). This provision shall not apply to printing Operations where the roller or Blanket Wash is applied automatically and the cleaning of nozzle tips of automated spray equipment systems, except for robotic systems, and cleaning with spray bottles or containers described in subsection (C)(7)(b)(ii).
- (d) An Operator shall not use VOC-containing materials to clean spray equipment used for the application of Coatings, Adhesives, or Ink, unless an enclosed system or equipment that is proven to be equally effective at controlling emissions is used for cleaning. If an enclosed system is used, it must totally enclose spray guns, cups, nozzles, bowls, and other parts during washing, rinsing and draining procedures, and it must be used according to the manufacturer's recommendations and must be closed when not in use.
- (e) In lieu of complying with the provisions of subsections (C)(7)(a) through (C)(7)(d), an Operator may control emissions from cleaning Operations with an APCO-approved VOC emission control system that meets the requirements of subsection (C)(5).
- (8) An Operator shall store or dispose of fresh or spent Solvents, Waste Solvent Materials, Coatings, Adhesives, catalysts, Thinners, and Ink in Non-Absorbent, Non-Leaking Containers, which shall be kept closed except when adding or removing material, during cleaning Operations, or when the container is empty.

- (9) VOC material wastes (including but not limited to liquid wastes, rags, and packaging) shall be disposed of in a manner consistent with Federal, State, and local hazardous waste regulations.
- (10) The manufacturer of any Ink, Coating, or Adhesive, except Thin Film UV Ink, which is sold, offered for sale, or supplied for use in Packaging Gravure, Publication Gravure, or Flexographic Printing Operations in the District shall include the following information on the product container or Safety Data Sheet (SDS) supplied with the product:
 - (a) Material name, manufacturer identification, specific mixing instructions, density, and VOC Content, as applied.
 - (b) The VOC Content of Inks (except Thin Film UV Ink), Coatings, and Adhesives expressed as defined in subsection (B)(27).
- (11) Work Practices
 - (a) An Operator shall properly use and properly operate all graphic arts printing technologies as directed and/or specified by the manufacturer of the printer or graphic arts material.
 - (b) Solvent containers and mixing tanks must be kept closed or covered except when filling, draining, or conducting cleaning operations.
 - (c) Used shop towels, rags and wipes shall be kept in closed containers.
 - (d) Spray guns shall be cleaned in an enclosed system.
 - (e) Recycled solvents shall be used for cleaning if available and practical.
 - (f) Cleaning materials shall be conveyed from one location to another in closed containers or pipes.

(D) Exemptions

- (1) The requirements of this rule, except for the recordkeeping requirements of subsection (E)(6), shall not apply to the following Operations except for Paper, Film, Foil, or Fabric Coating Operations that emit less than 200 pounds of VOC per 12 rolling consecutive calendar months.

- (2) The requirements of this rule shall not apply to:
 - (a) Proof Presses;
 - (b) The application of Coatings and use of cleaning Solvents in creating Fine Art Paintings;
 - (c) Stripping of Cured Coatings, Cured Adhesives, and Cured Inks, except the Stripping of such materials from spray Application Equipment;
 - (d) Cleaning Operations in printing pre-press or graphic arts pre-press areas, including the cleaning of film processors, color scanners, plate processors, films, and plates.
 - (e) Blanket Repair Materials used in containers of four (4) fluid ounces or less.
 - (f) Digital Printers and Digital Printing Operations except for recordkeeping requirements in subsection (E)(5).
 - (g) Screen Printing of Waterslide Decals.
 - (h) Cleaning of plastic-based or vinyl-based substrates for use in the Screen Printing process when using UV curable Ink and Coating systems.
 - (i) 110 gallons per year of cleaning materials which meet neither the limits in subsection (C)(7)(a) Table 7, subsection (D)(6), or work practices.
- (3) The provisions of Section (C) shall not apply to the application of Adhesives and Coatings via Aerosol Products.
- (4) This rule shall not apply to laboratory tests or analyses, Bench Scale, or Research and Development Projects.
- (5) This rule shall not limit the VOC content of Thin Film UV Inks.
- (6) Cleaning materials with a VOC Composite Partial Vapor Pressure less than 8 mm Hg at 20 °C are exempt from subsection (C)(7)(a) of this rule.
- (7) The provisions of subsection (C)(1)(a) Table 2 do not apply to any Sheet-fed Lithographic presses with maximum sheet size 11x17 inches or smaller or to any press with total Fountain Solution reservoir of less than one (1) gallon.
- (8) The provisions of subsection(C)(5)(a) do not apply to any Heatset press used for book printing or that has a maximum Web width of 22.0 inches or less.

(E) Monitoring and Records

Unless otherwise noted, all VOC content and density values recorded pursuant to the requirements of this rule shall be for the material as applied. Graphic Arts and Paper, Film, Foil and Fabric Coating Operations subject to this rule shall maintain the following records and information:

- (1) For each Ink, Coating, and Adhesive, Fountain Solution, Wash Primer, and Solvent in use and in storage:
 - (a) A SDS or product data sheet giving material name, manufacturer identification, specific mixing instructions, and density; and
 - (b) VOC Content as applied.
- (2) Compliant Materials Records

If only Inks, Coatings, and Adhesives meeting the specification found in Section (C) are used:

- (a) Records on a monthly basis showing the amount of Ink used. Ink use records shall be maintained using one of the following options:
 - (i) Group the quantity of all Inks used and identify the maximum VOC content figure and use the minimum density of 1,010 gm/liter (8.44 lb/gal);
 - (ii) Itemize Process Inks and Pantone Inks separately and use the specific VOC content and density value for each Process Ink, and the highest VOC content and the maximum density of 1,010 gm/liter (8.44 lb/gal) for Pantone Inks;
 - (iii) Report Process Inks and Pantone Inks separately and use the maximum VOC content and minimum density value for both process and Pantone Inks, or use the density of 1,010 gm/liter (8.44 lb/gal) for Pantone Inks; or
 - (iv) Itemize each Ink and Pantone Ink and use the specific VOC content and density value for each.
- (b) Records on a monthly basis showing the amount of Coating, Adhesive, Wash Primer, and Solvent (including cleaning Solvent) used. Itemize each Coating, Adhesive, Wash Primer, and Solvent and use the specific VOC content and density value for each.
- (c) Record, on a monthly basis, the type, amount, and percent VOC by volume of Fountain Solution used.

(3) Non-Compliant Materials Records

If Inks, Coatings, Adhesives, Fountain Solutions, Wash Primers, and Solvents (including non-compliant cleaning Solvent) which do not meet the specifications found in Section (C) are used and compliance is achieved through the use of add-on emission control equipment pursuant to subsection (C)(5):

- (a) Records on a daily basis showing the type and amount of Inks, Coatings, Adhesives, Fountain Solutions, Wash Primers, and Solvents (including non-compliant cleaning Solvent) used and itemized using the specific VOC content and density value for each.
- (b) Daily records of Key System Operating Parameters which will demonstrate continuous Operation and compliance of the emission Control Device during periods of emission producing activities. Key System Operating Parameters are those necessary to ensure compliance with VOC capture and control requirements pursuant to subsection (C)(5) (including but not limited to temperatures, pressures, and flow rates). Such records shall be kept in the form and manner as prescribed by the APCO.

(4) Records for Flexographic Specialty Inks

If flexographic Specialty Inks are used pursuant to subsection (C)(2), record, on a monthly basis, the type and amount of each Specialty Ink used.

(5) Digital Printing Records

- (a) Digital Printing Operations shall keep records in accordance with (E)(5)(b) for each Digital Printer that:
 - (i) Uses Solvent-based Inks and has a print capacity of 1,000 ft²/hr or more; or
 - (ii) Uses water-based Inks, or UV Inks and has a print capacity of 10,000 ft²/hr or more,
- (b) Operators with printers subject to subsection (E)(5)(a) shall keep the following records:
 - (i) A current file of Inks, Coatings, Adhesives, and Solvents in use and in storage. The file shall include a SDS or product data sheet showing the material name, manufacturer's name, VOC content as applied, specific mixing instructions, and density.
 - (ii) Monthly records of the type, and amount of each Ink, Coating, and/or Adhesive used.
 - (iii) Monthly records of the type, and amount of Solvent used for thinning the Ink, Coating, or Adhesive, and for cleaning.

- (6) If the facility is claiming exempt status pursuant to Section (D), the facility shall maintain adequate records on a monthly basis to demonstrate the exempt status. The Operator who becomes subject to the emission limits/standards of this rule through loss of exemption in Section (D) shall not operate the subject equipment, except as required for obtaining a new or modified Permit-to-Operate, until the Operator demonstrates that the Operation is in full compliance with the requirements of this rule.
- (7) Any record required or produced pursuant to this rule shall be retained on site for a minimum of five (5) years and shall be made available to the APCO, CARB, or USEPA upon request.
- (8) Retention Factors and Capture Efficiencies

For the purposes of determining compliance with emissions limits from Offset Lithographic Printing Operations, and determining eligibility for exemption under subsection (D)(1) of this rule, the following Substrate Retention Factors and Capture Efficiencies shall be used:

- (a) The following Substrate Retention Factors shall be used to determine the portion of VOC contained in Inks and cleaning solution retained in the printed Web or shop towels used for cleaning:
 - (i) 20 percent Substrate Retention Factor for Heatset Inks printed on absorptive substrates (80 percent of the VOC in the ink emitted during the printing process is available for Capture and Control by an Add-on Air Pollution Control Device).
 - (ii) 95 percent Substrate Retention Factor for Non-Heatset Inks (5 percent of the VOC in the ink emitted during the printing process is available for Capture and Control by an Add-on Air Pollution Control Device).
 - (iii) 50 percent VOC retention factor for low VOC composite vapor pressure cleaning materials in shop towels where:
 - a. VOC Composite Partial Vapor Pressure of the cleaning material is less than 10 mm Hg at 20 °C; and
 - b. Cleaning material and shop towels are kept in closed containers.
- (b) The following Capture Efficiencies shall be used to determine the portion of VOC contained in Inks, Fountain Solutions, and Automatic Blanket Washes captured in the press Dryer for control by Add-on Air Pollution Control Device:
 - (i) 40 percent VOC carryover (capture) factor for Automatic Blanket wash solutions with a VOC Composite Partial Vapor Pressure of the cleaning material is less than 10 mm Hg at 20 °C.

- (ii) 70 percent VOC carryover (capture) factor for alcohol substitutes in Fountain Solution.
- (iii) A 100 percent VOC Capture Efficiency shall be used for Inks. All the VOC in the Ink that is not retained is assumed to be volatilized in the press Dryer. Capture efficiency testing for Heatset dryers is not required if it is demonstrated that pressure in the Dryer is negative relative to the surrounding press room and the airflow is into the Dryer.

These Substrate Retention Factors shall not be used when determining compliance of Inks with applicable VOC content limits specified in this rule, and Heatset and Non-Heatset lithographic Inks shall meet the VOC content limits specified in subsection (C)(1), Table 1.

(F) Test Methods

The VOC content of materials subject to the provisions of this rule and overall capture and control efficiency of VOC emission control systems shall be determined by the following test methods specified in subsections (F)(1) through (F)(9), or alternative test methods approved by the APCO, USEPA, and CARB.

- (1) Except for UV Inks, the VOC content of Inks, Adhesives, Fountain Solutions, Solvents and Coatings shall be determined by using EPA Method 24 or 24A as applicable. The VOC content of UV Inks, except for Thin Film UV Inks, shall be determined by using American Society of Testing and Materials (ASTM) D5403-93 (2007) (Test Methods for Volatile Content of Radiation Curable Materials).
- (2) Exempt Compound Content: Exempt compound content shall be determined by using ARB Method 432, "Determination of Dichloromethane and 1,1,1-Trichloroethane in Paints and Coatings," September 12, 1989; ARB Method 422 "Determination of Volatile Organic Compounds in Emission from Stationary Sources," December 13, 1991; or, South Coast Air Quality Management District (SCAQMD) Method 303-91 "Determination of Exempt Compounds," February 1993.
- (3) The content of silicon dioxide as a flattening agent in a Matte Finish Ink shall be determined by using the latest EPA approved revision of ASTM D717-86 (Standard Test Methods for Analysis of Magnesium Silicate Pigment).
- (4) The metal content of Metallic Inks shall be determined by SCAQMD Test Method 318-95, July 1996, (Determination of Weight Percent Elemental Metal in Coatings by X-Ray Diffraction).
- (5) Determination of emissions of VOC from spray gun cleaning systems shall be made using SCAQMD method "General Test Method for Determining Solvent Losses from Spray Gun Cleaning Systems," October 3, 1989.

- (6) The transfer efficiency of alternative Coating application methods shall be determined in accordance with the SCAQMD method “Spray Equipment Transfer Efficiency Test Procedure for Equipment User,” May 24, 1989.
- (7) Determination of Overall Capture and Control Efficiency of VOC Emission Control Systems
- (a) The Capture Efficiency of a VOC emission control system’s collection device(s) shall be determined according to EPA’s “Guidelines for Determining Capture Efficiency,” January 9, 1995 and 40 CFR 51, Appendix M, Test Methods 204-204F, as applicable.
- (i) Method 204 shall not be used for Heatset Web Offset Lithographic presses and Heatset Web Letterpress presses, where the negative Dryer pressure is established during the initial test using an airflow direction indicator, such as a smoke stick or aluminum ribbons, or differential pressure gauge.
- (b) The control efficiency of a VOC emission control system’s VOC Control Device(s) shall be determined using EPA Test Methods 2, 2A, or 2D for measuring flow rates and EPA Test Methods 25, 25A, or 25B for measuring total gaseous organic concentrations at the inlet and outlet of the Control Device(s). EPA Method 18 or ARB Method 422 “Determination of Volatile Organic Compounds in Emission from Stationary Sources,” December 13, 1991 shall be used to determine the emissions of Exempt Compounds.
- (c) Capture Efficiency shall be calculated using the following equation:

$$\text{Capture Efficiency} = \left[W_c / W_e \right] \times 100$$

Where:

W_c = Weight of VOC entering Control Device
 W_e = Weight of VOC emitted from the Operation

- (d) Control Device Efficiency shall be calculated using the following equation:

$$\text{Control Device Efficiency} = \left[(W_c - W_d) / W_c \right] \times 100$$

Where:

W_c = Weight of VOC entering Control Device
 W_d = Weight of VOC discharged from the Control Device

- (e) For VOC emission control systems that consist of a single VOC emission collection device connected to a single VOC emission Control Device, the overall capture and control efficiency shall be calculated by using the following equation:

$$CE_{\text{Capture,Control}} = (CE_{\text{capture}} \times CE_{\text{control}})/100$$

Where:

- $CE_{\text{Capture,Control}}$ = Overall Capture and Control Efficiency, in percent
- CE_{Capture} = Capture Efficiency of the collection device, in percent, as determined in subsection (F)(7)(a)
- CE_{Control} = Control Efficiency of the Control Device, in percent, as determined in subsection (F)(7)(b).

- (f) The following equation shall be used to determine if the minimum required overall capture and control efficiency of an emission control system is at an equivalent or greater level of VOC reduction as would be achieved using compliant materials, equipment, or work practices, as stated in subsection (C)(5)(g).

$$CE = \left[1 - \left(\frac{VOC_{LWc}}{VOC_{LWn,Max}} \times \frac{1 - (VOC_{LWn,Max}/D_{n,Max})}{1 - (VOC_{LWc}/D_c)} \right) \right] \times 100$$

Where:

- CE = Minimum Required Overall Capture and Control Efficiency, percent
- VOC_{LWc} = VOC Limit, less water and less Exempt Compounds
- $VOC_{LWn,Max}$ = Maximum VOC content of noncompliant Ink (or Coating or Adhesive) used in conjunction with a Control Device, less water and less Exempt Compounds
- $D_{n,Max}$ = Density of Solvent, reducer, or Thinner contained in the noncompliant Ink (or Coating or Adhesive), containing the maximum VOC content of the multi-component Ink (or Coating, or Adhesive) printing Line
- D_c = Density of corresponding Solvent, reducer, or Thinner used in the compliant Ink (or Coating, or Adhesive) system = 880 gm/liter.

- (g) The weight of VOCs emitted during use, Coating, curing or drying per combined volume of VOC and of Ink, Coating, Adhesive, or Wash Primer solids and can be calculated by the following equation:

$$\frac{\text{Grams } VOC_{LWC}}{\text{Liter of Coating}} = \frac{(W_s - W_w - W_{es})}{(V_m - V_w - V_{es})}$$

Where:

- W_s = Weight of volatile compounds, in grams
- W_w = Weight of water, in grams
- W_{es} = Weight of Exempt Compounds, in grams
- V_m = Volume of material, in liters
- V_w = Volume of water, in liters
- V_{es} = Volume of Exempt Compounds, in liters

- (h) Grams of VOC per Liter of Material:

$$\frac{\text{Grams of } VOC}{\text{Liter of Material}} = \left[\frac{(W_s - W_w - W_{es})}{V_m} \right]$$

Where:

- W_s = Weight of volatile compounds, in grams
- W_w = Weight of water, in grams
- W_e = Weight of Exempt Compounds, in grams
- V_m = Volume of materials, in liters

- (8) Thin Film UV Ink coverage shall be calculated using the following equation:

$$C = F \times A \times D_c$$

Where:

- C = Amount of Ink added to the substrate in grams
- F = Manufacturer's recommended film thickness in cm (or in)
- A = Area of substrate in cm^2 (or in^2)
- D_c = Density of Ink in g/cm^3 (or g/in^3)

- (9) VOC Composite Partial Vapor Pressure shall be calculated using the following equation:

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

Where:

- W_i = Weight of the “i”th VOC compound, in grams.
 W_w = Weight of water, in grams.
 W_e = Weight of Exempt Compound, in grams
 MW_i = Molecular weight of the “i”th VOC compound, in grams per gram-mole.
 MW_e = Molecular weight of Exempt Compound, in grams per gram-mole.
 PP_c = VOC composite partial pressure at 20°C, in mm Hg.
 VP_i = Vapor pressure of the “i”th VOC compound at 20°C, in mm Hg.

- (10) When one or more test method or set of test methods are specified for any testing, a violation of any requirement of this rule established by any one of the specified test methods or set of test methods shall constitute a violation of the rule.

See SIP Table at <https://www.mdaqmd.ca.gov/rules/overview>