Massachusetts Department of Environmental Protection (MassDEP)
Top Case Best Available Control Technology (BACT) Guidelines
For
VOC EMITTING SOURCES

This information is maintained by the MassDEP, Bureau of Waste Prevention, Air Quality Permitting Section, and is subject to change. These requirements represent Top Case BACT guidelines for Major and Non-major air contaminants emitting sources, and are published for informational purposes only, to enhance program transparency and facilitate our goal of "permitting at the speed of business". Use of the applicable, Top Case BACT emissions limitations contained herein may preclude the need for applicants to prepare and submit a "top-down BACT analysis" for MassDEP's review, and will streamline the Air Quality permitting process for both the applicants and MassDEP. Applicants should note that BACT requirements for any new or modified air contaminants source are subject to change through the MassDEP 310 CMR 7.02 Air Quality Plan Approval (permitting) procedures. Please contact the MassDEP Regional Office that regulates your facility should you have any questions related to these Top Case BACT guidelines.

Please be aware that, in addition to BACT requirements, federal NSPS, MACT and/or GACT requirements may also apply pursuant to 40 CFR Parts 60, 61 and 63.

Category	Page

PRINTING* (June, 2011)				
Source Type	**Air Contaminant**	**Minimum Requirements**	**Control Technology**	**BACT Determination**
Non-heatset Lithographic Printing	VOC	• Fountain solutions: 1. Web-fed - No Alcohol allowed 2. Sheet-fed - unrefrigerated ≤ 5% VOC refrigerated (< 60 °F) and ≤ 8% VOC (by weight, including alcohol) • Cleanup Solution 1. ≤ 30% VOC by weight, or VOC composite partial pressure of 10 mmHg at 20 °C or less • Adhesive Standard (Midsize and large printers) - ≤300 g VOC per liter of product, less water, as applied • Record keeping in accordance with 310 CMR 7.26(28)	• Fountain solution tanks covered • Clean-up Solution in covered containers • Shop towels with solvent kept in covered containers	310 CMR 7.26(24) IPS Regulation

Graphic Arts Printing Gravure, Letterpress and Flexographic	VOC	• Standards – Midsize and Large Printers 1. Ink – ≤300 g VOC per liter of product, less water, as applied 2. Coating – ≤300 g VOC per liter of product less water, as applied 3. Adhesive – ≤150 g VOC per liter of product, less water, as applied • Clean-up solution standard – VOC composite partial pressure of ≤ 25 mm Hg (at 20 °C) • Record keeping in accordance with 310 CMR 7.26(28)	• Clean-up solution in covered containers • Shop towels with solvent kept in covered containers	310 CMR 7.26(25) IPS Regulation

Screen Printing		• Standards – Midsize and Large Printers 1. Ink – ≤400 g VOC per liter of product, less water, as applied 2. Coating – ≤400 g VOC per liter of product less water, as applied 3. Adhesive –≤ 400 g VOC per liter of product, less water, as applied 4. Extreme Performance Ink/Coating – ≤800 g VOC per liter of product, less water, as applied 5. Metallic Ink - ≤400 g VOC per liter of product, less water, as applied 6. Conductive Ink - ≤850 g VOC per liter of product, less water, as applied • Clean-up solution standard – VOC composite partial pressure of ≤ 5 mm Hg (at 20 °C) • Record keeping in accordance with 310 CMR 7.26(28)	• Clean-up Solution in covered containers • Shop towels with solvent kept in covered containers	310 CMR 7.26(26) IPS Regulation
Printers with: Heatset Presses or Non-conforming Operations	VOC	See Regulation 310 CMR 7.26(27) for minimum BACT Requirements		310 CMR 7.26(27) IPS Regulation
All Printers	HAPs	Facilities may obtain a federally enforceable approval to cap HAPs below MACT major source thresholds to < 25 tons of total HAPs per rolling 12 month period and to < 10 tons of any individual HAPs per rolling 12 month period		

*Printers that **exceed** the facility emissions/usage thresholds contained in Regulation 310 CMR 7.26 are subject to Best Available Control Technology (BACT), The BACT determinations require the installation of PTE and VOC destruction/removal efficiency of 98-99% utilizing regenerative thermal oxidation, thermal oxidation, catalytic oxidation, etc. **See Miscellaneous VOC Source BACT.**

Key to Abbreviations

VOC = volatile organic compounds
HAPs = Hazardous Air Pollutants
PTE = Permanent Total Enclosure
IPS = Industrial Performance Standards
% = weight percent
@ = at
kPa = kilopascal
< = less than
≤ = less than or equal to
> = greater than
≥ = greater than or equal to
CMR = Code of Massachusetts Regulations
CFR = Code of Federal Regulations
ft^2 = square feet

m^3/min = cubic meters per minute
m/min = meters per minute
g = grams
°F = degrees Fahrenheit
°C = degrees Celsius
mm Hg = millimeters of mercury

Painting – Enclosed Painting (June, 2011)				
Source Type	**Air Contaminant**	**Minimum Requirements**	**Control Technology**	**BACT Determination**
Enclosed Painting < 670 gallons materials containing VOC per month or < 2.5 tons of VOC per month and < 2,000 gallons material containing VOC per 12 month rolling period or <18 tons VOC per 12 month rolling period • Sources having VOC emissions or coating usage greater than the thresholds listed above, must capture and control VOC emissions	VOC	• Painting must be conducted in spray booth • Coatings must comply with 310 CMR 7.18 source specific requirements • Exempt (See 310 CMR 7.18 source specific requirements) coating cannot exceed 55 gallons per 12 month rolling period • Spray guns must be either: electrostatic, high volume low pressure (HVLP), or other having equal or better transfer efficiency than electrostatic or HVLP and approved by MassDEP in writing. • Spray gun cleaning activities to minimize evaporation, maximize solvent re-use, collect spent solvent into air tight containers	• Coating formulations • Maximized transfer efficiency • TO, RTO, CA or other air pollution control technology to achieve collection/destruction efficiency $\geq$ 98% for sources $\geq$ 18 tons of VOC per rolling 12 month period • Project proponent must evaluate all P2 opportunities before resorting to “end of pipe” control of VOC	310 CMR 7.03(16)

	HAPs	• See 40 CFR Part 63 • Facilities may obtain a federally enforceable approval to cap HAPs below MACT major source thresholds to < 25 tons of total HAPs per rolling 12 month period and to < 10 tons of any individual HAPs per rolling 12 month period	• See 40 CFR Part 63 • Facilities may obtain a federally enforceable approval to cap HAPs below MACT major source thresholds to < 25 tons of total HAPs per rolling 12 month period and to < 10 tons of any individual HAPs per rolling 12 month period	40 CFR Part 63
	PM	• Particulate control efficiency ≥99% • Face velocity ≤200 ft/min	• Dry filter media ≥97% collection efficiency	310 CMR 7.03(16)
	Opacity	• no visible emissions (zero percent opacity)		
	All Pollutants	• stack must discharge vertically • stack rain protection which impedes vertical discharge is NOT allowed • stack velocity > 40 ft/s • minimum stack exit height: 35 ft above ground or 10 ft above roof level • No nuisance odors		

Key to Abbreviations
VOC = volatile organic compounds
HAPs = hazardous air pollutants
PM = particulate matter
TO = thermal oxidizer
RTO = regenerative thermal oxidizer
CA = carbon adsorption
% = weight percent
> = greater than
≥ = greater than or equal to
< = less than
≤ = less than or equal to
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
m/hr = meters per hour
ft = feet
ft/min = feet per minute
ft/s = feet per second
P2 = pollution prevention

Painting – Outdoor Painting (June, 2011)				
Source Type	**Air Contaminant**	**Minimum Requirements**	**Control Technology**	**BACT Determination**
Outdoor Painting Ship Painting VOC $\geq$ 18 tons per 12 month rolling period	VOC	• Painting must be conducted in an enclosed/shrouded area, 99% capture efficiency (i.e. APACTS or similar) • Coatings must comply with 310 CMR 7.18 source specific requirements • Exempt (See 310 CMR 7.18 source specific requirements) coating cannot exceed 55 gallons per 12 month rolling period • Spray guns must be either: electrostatic, high volume low pressure (HVLP), or other having equal or better transfer efficiency than electrostatic or HVLP • Spray gun cleaning activities to minimize evaporation, maximize solvent re-use, collect spent solvent into air tight containers	• Coating formulations • Maximized transfer efficiency • VOC collection (99% capture efficiency) and control system (98+% control efficiency), i.e. APACTS, or similar • Project proponent must evaluate all P2 opportunities before resorting to “end of pipe” control of VOC	310 CMR 7.02 Plan Approval Transmittal Number W210062

	HAPs	• See 40 CFR Part 63 • Facilities may obtain a federally enforceable approval to cap HAPs below MACT major source thresholds to < 25 tons of total HAPs per rolling 12 month period and to < 10 tons of any individual HAP per rolling 12 month period	• See 40 CFR Part 63 • Facilities may obtain a federally enforceable approval to cap HAPs below MACT major source thresholds to < 25 tons of total HAPs per rolling 12 month period and to < 10 tons of any individual HAP per rolling 12 month period	
	PM	• Particulate control efficiency >99% • Face velocity ≤200 ft/min or APACTS	• Dry filter media >99% collection efficiency (may also utilize an APACTS for PM control)	
	Opacity	• No visible emissions (zero percent opacity)		
	All Air Contaminant	• No nuisance odors		

Key to Abbreviations

VOC = volatile organic compounds
PM = particulate matter
HAPs = hazardous air pollutants
% = weight percent
> = greater than
≥ = greater than or equal to
< = less than
≤ = less thanor equal to
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
m/hr = meters per hour
ft/min = feet per minute
ft/s = feet per second
P2 = pollution prevention
APACTS = automated paint application, containment and treatment system

VOC COATING SOURCES (June, 2011)				
Source Type	**Air Contaminant**	**Minimum Control Efficiency**	**Control Technology**	**BACT Determination**
VOC Coating Sources VOC emissions ≥ 18 tons per 12 month rolling period	VOC	• 100% Capture Efficiency (PTE-Method 204)* • 99% Destruction Efficiency	• Regenerative Thermal Oxidizer (RTO)	In general, MassDEP considers proposed VOC coating operations which propose to meet the requirements of this Table as complying with Top Case BACT as required by 310 CMR 7.02(8)
		• 100% Capture Efficiency (PTE-Method 204)* • 99% Destruction Efficiency	• Thermal Oxidizer (TO)/Afterburner (AB)	
		• 100% Capture Efficiency (PTE-Method 204)* • 98% Destruction Efficiency	• Catalytic Oxidizer (CatOx)) – may be utilized only if the effluent exhaust stream contains no substituents which could cause catalyst poisoning	
		• 100% Capture Efficiency (PTE-Method 204)* • 98% Collection Efficiency	• Adsorption Technology or equivalent (including nitrogen blanketing and condensation strategies) • Project proponent must evaluate all P2 opportunities before resorting to “end of pipe” control of VOC	

	HAPs	• As above, in addition to requirements specified by 40 CFR 63 if facility is a major source for HAPs	• As above, in addition to requirements specified by 40 CFR 63 if facility is a major source for HAPs	40 CFR 63

*****Capture efficiency determined by US EPA Method 204 for Permanent Total Enclosures (PTE). PTE criteria:

- any natural draft opening (NDO) is at least four equivalent opening diameters from each VOC emitting point;
- the total area of all NDO's shall not exceed 5 percent of the surface area of the enclosure's four walls, floor, and ceiling;
- the average face velocity (FV) of air through all NDOs shall be at least 3600 m/hr (200 fpm). The direction of air flow through all NDOs shall be into the enclosure;
- all access doors and windows whose areas are not included in the method and are not included in the calculation are closed at all times during routine operation of the process;
- all VOC and/or HAPs emissions are captured and contained for discharge through a control device.

Key to Abbreviations
VOC = volatile organic compounds
PTE = Permanent Total Enclosure
% = weight percent
> = greater than or equal to
NDO = Natural Draft Opening
m/hr = meters per hour
fpm = feet per minute
P2 = pollution prevention
CFR = Code of Federal Regulations
HAPs = hazardous air pollutants

MISCELLANEOUS VOC EMITTING SOURCES				
Source Type	**Air Contaminant**	**Minimum Control Efficiency**	**Control Technology**	**BACT Determination**
Miscellaneous VOC emitting Sources VOC emissions $\geq$ 18 tons per 12 month rolling period	VOC	• 100% Capture Efficiency (PTE-Method 204)* • 99% Destruction Efficiency	• Regenerative Thermal Oxidizer (RTO)	In general, MassDEP considers proposed miscellaneous VOC operations which propose to meet the requirements of this Table as complying with Top Case BACT as required by 310 CMR 7.02(8)
		• 100% Capture Efficiency (PTE-Method 204)* • 99% Destruction Efficiency	• Thermal Oxidizer (TO)/Afterburner (AB)	
		• 100% Capture Efficiency (PTE-Method 204)* • 98% Destruction Efficiency	• Catalytic Oxidizer (CatOx)	
		• 100% Capture Efficiency (PTE-Method 204)* • 98% Collection Efficiency	• Adsorption Technology (AT) or equivalent (may also include nitrogen blanketing and condensation strategies) • Project proponent must evaluate all P2 opportunities before resorting to “end of pipe” control of VOC	

	HAPs	• < 10 tons per year, single HAP • < 18 tons per year, total HAPs	• RTO or TO/AB or CatOx or AT or equivalent (may also include nitrogen blanketing and condensation strategies) • Project proponent must evaluate all P2 opportunities before resorting to "end of pipe" control of VOC	

*****Capture efficiency determined by US EPA Method 204 for Permanent Total Enclosures (PTE). PTE criteria:

- any natural draft opening (NDO) is at least four equivalent opening diameters from each VOC emitting point;
- the total area of all NDO's shall not exceed 5 percent of the surface area of the enclosure's four walls, floor, and ceiling;
- the average face velocity (FV) of air through all NDOs shall be at least 3600 m/hr (200 fpm). The direction of air flow through all NDOs shall be into the enclosure;
- all access doors and windows whose areas are not included in the method and are not included in the calculation are closed at all times during routine operation of the process;
- all VOC and/or HAPs emissions are captured and contained for discharge through a control device.

Key to Abbreviations
VOC = volatile organic compounds
HAPs = Hazardous Air Pollutants
HAP = Hazardous Air Pollutant
PTE = Permanent Total Enclosure
% = weight percent
< = less than
> = greater than or equal to

NDO = Natural Draft Opening
m/hr = meters per hour
fpm = feet per minute
P2 = pollution prevention

Cleaning and Degreasing Operations (June, 2011)				
Source Type	**Air Contaminant**	**Minimum Requirements**	**Control Technology**	**BACT Determination**
Hand Wipe Solvent Cleaning Operations	VOC	• Use of low vapor pressure solvents (i.e. <15 mm Hg) • Minimize use of solvents to employees • Use of controlled flow solvent dispensers (squeeze bottles) • Use of closed containers for non-active solvent and papers/cloths • Cleaning performed in hood, booth or room vented to air pollution control device (if possible) having a capture efficiency >90%	• Carbon adsorption technology, condensation technology, or thermal oxidation at >95% destruction/collection efficiency for facilities ≥ 10 tons per year • Good Housekeeping to address spills and routine operation	310 CMR 7.18(8) Solvent Metal Degreasing 310 CMR 7.03(8) Plan Approval Exemptions - Degreasers
	HAPs*	• See 40 CFR Part 63	• See 40 CFR Part 63	

Cold Solvent Cleaning Operations	VOC	• Be equipped with a cover • Be equipped with an internal drain • Cleaned parts are enclosed for 15 seconds or until dripping ceases • Designed with a freeboard ratio of ≥0.75 • Designed with a water blanket (if solvent insoluble with water and is heavier than water) • Covers are closed when parts are not being handled or when unit is not in use • Open area drafts are <40 m/min • Leaks must be immediately addressed and degreaser shutdown • Solvent v.p. ≤4.3 kPa @ 38 degrees Celsius • Sink-like work area < 100 cm^2	• Carbon adsorption technology or condensation technology at >95% collection efficiency for facilities ≥ 10 tons per year • Good housekeeping to address spills and routine operation (see 310 CMR 7.18(8)(a))	
	HAPs*	• See 40 CFR Part 63, Subpart T	• See 40 CFR Part 63, Subpart T	

IPA Cleaning and Degreasing	VOC	• Be equipped with a cover • Be equipped with an internal drain • Cleaned parts are enclosed for 15 seconds or until dripping ceases • Designed with a freeboard ratio of ≥0.75 • Covers are closed when parts are not being handled or when unit is not in use • Open area drafts are ≤40 m/min • Leaks must be immediately addressed and degreaser shutdown	• Carbon adsorption technology or condensation technology at >95% collection efficiency for facilities ≥ 10 tons per year • Good housekeeping to address spills and routine operation (see 310 CMR 7.18(8)(a))	
Vapor Degreasing Operations	VOC	• Equipped with cover that will not disturb vapor zone • Degreaser covered at all times except: loading, unloading and degreasing • Equipped with safety switches (see 310 CMR 7.18 (8)(b)3) • Freeboard ration ≥0.75 if open area >10ft^2 or refrigerated chiller, or enclosed system vented to carbon adsorption system with outlet VOC concentration <6ppmv • Solvent carry-out minimized • Open air drafts ≤40 m/min	• Carbon adsorption or condensation technology at ≥95% collection efficiency • Good Housekeeping Practices (see 310 CMR 7.18(8)(b)) • Best Management and Operating Practices (see 310 CMR 7.18(8)(b))	

	HAPs*	• See 40 CFR Part 63	• See 40 CFR Part 63	
Conveyorized Vapor Degreasing Operations	VOC	• Conveyorized degreaser >21.5 ft^2 must be equipped with either: refrigerated chiller, or vented at a rate $\geq$15 m^3/min to an adsorption system with VOC outlet $\leq$ 6 ppm • Eliminate solvent carry-out • Equipped with safety switches (310 CMR 7.18(8)(c)3 • Open areas are minimized	• Carbon adsorption or condensation technology at $\geq$95% collection efficiency • Good Housekeeping Practices (see 310 CMR 7.18(8)(c)) • Best Management and Operating Practices (see 310 CMR 7.18(8)(c))	
	HAPs*	• See 40 CFR Part 63	• See 40 CFR Part 63	
Aqueous Cleaning Operations	VOC	• All organic solvent in cleaning fluid is water soluble • Cleaning fluid is $\leq$ 5% by weight organic material	• Good Housekeeping Practices • Best Management and Operating Practices	

* Facilities may obtain a federally enforceable approval to cap HAPs below MACT major source thresholds to < 25 tons of total HAPs per rolling 12 month period and to < 10 tons of any individual HAPs per rolling 12 month period.

Key to Abbreviations

VOC = volatile organic compounds
HAPs = Hazardous Air Pollutants
PTE = Permanent Total Enclosure
% = weight percent
@ = at
v.p. = vapor pressure
kPa = kilopascal
< = less than
≤ = less than or equal to
> = greater than
≥ = greater than or equal to
CMR = Code of Massachusetts Regulations
CFR = Code of Federal Regulations
ft^2 = square feet
mm Hg = millimeters of mercury
ppmv = parts per million volume
m^3/min = cubic meters per minute
m/min = meters per minute
IPA = Isopropyl Alcohol

EXPANDABLE POLYSTYRENE FOAM (June, 2011)

Source Type	Air Contaminant	Minimum Control Requirements	Control Technology	BACT Determination
Expandable Polystyrene Foam Manufacturers	VOC (Pentane)	Pre-expanding activities (including steam expansion and curing/drying/aging with transfer to storage "bags") with off-gassing: • 100% capture efficiency* for the curing/drying/aging activities to control device • 95% capture efficiency for the pre-expanders emissions sent to control device • 100% capture efficiency* for "aging bag" storage emissions collected by general ventilation and/or floor sweeps to control device • Rotary expanders are prohibited as BACT • New vertical batch expanders with 100% capture efficiency may utilize an existing boiler, having a VOC control efficiency of 97%, as a control device if ALL emission points are controlled (specifically targeting the product storage room), including off-gassing during final storage. Best Management Practices (BMP) to include at minimum no wrapping of product, and storing product for long duration to maximize off-gassing to be collected (100%) and controlled (97%-99%).	Thermal Oxidation or Regenerative Thermal Oxidation Technology at 99 % destruction efficiency Boilers may be utilized as an air pollution control device for VOC emissions at a 97 % destruction/removal efficiency (DRE), for new vertical batch expanders	310 CMR 7.02 Plan Approval Transmittal Number W093075 Transmittal Number W052874 Transmittal Number W028295

		Molding activities emissions controlled under vacuum. 95% of polystyrene molding emissions are collected and delivered to the control device.		
		Molded polystyrene product storage emissions cannot exceed 8-10% of the pentane contained in the original polystyrene beads.		
		Halogenated blowing agents are prohibited.		
		Pentane content of styrene beads is limited to ≤5% by weight (based on a monthly average)		

*****Capture efficiency determined by US EPA Method 204 for Permanent Total Enclosures (PTE). PTE criteria:

- any natural draft opening (NDO) is at least four equivalent opening diameters from each VOC emitting point;
- the total area of all NDO's shall not exceed 5 percent of the surface area of the enclosure's four walls, floor, and ceiling;
- the average face velocity (FV) of air through all NDOs shall be at least 3600 m/hr (200 fpm). The direction of air flow through all NDOs shall be into the enclosure;
- all access doors and windows whose areas are not included in the method and are not included in the calculation are closed at all times during routine operation of the process;
- all VOC emissions are captured and contained for discharge through a control device.

Key to Abbreviations

VOC = volatile organic compounds
PTE = Permanent Total Enclosure
% = weight percent
NDO = Natural Draft Opening
m/hr = meters per hour
fpm = feet per minute

BULK GASOLINE TERMINALS (June, 2011)					
Source Type	**Air Contaminant**	**Emission Limit**	**Minimum Control Requirements**	**Control Technology**	**BACT Determination**
Bulk Gasoline Terminals	VOC	2 mg/l of gasoline loaded	Vacuum Assist, negative pressure (VANP) vapor collection system – 100% collection efficiency. Switch loading to occur only under VANP.	• Activated Carbon Adsorption Technology • Combustion Technology is prohibited, since the Department Regulations at 310 CMR 7.24 require vapor "recovery", not vapor destruction technology.	310 CMR 7.02 Plan Approval, Transmittal Number W080267
			Continuously monitor and record system vacuum for the vapor collection system (at each loading lane).		
			Submerged filling.		
			Semi-annual tank truck leak testing per 40 CFR 60 Subpart XX – US EPA Method 27		

			Installation and operation of electronic interlocks and visible and audible alarms to prevent non-vapor-tight gasoline loading and fugitive emissions at the tank truck loading rack. Interlocks shall be maintained to ensure that vapor collection system under negative pressure continuously and vapor collection hose is connected properly between tank truck and facility during loading operations..		
			Installation and operation of CEMS to monitor inlet and outlet of ACAT.		
			Subject to 40 CFR 60 Subpart XX		
	HAPs	As above, in addition to requirements specified by 40 CFR 63 Subpart R if facility is a major source for HAPs	As above, in addition to requirements specified by 40 CFR 63 Subpart R if facility is a major source for HAPs	40 CFR 63 Subpart R	
		If facility is not major for HAPs, the facility may be subject to 40 CFR 63 Subpart BBBBBB.			

Key to Abbreviations

VOC = volatile organic compounds
HAPs = Hazardous Air Pollutants
mg/l = milligrams per liter
% = weight percent
CEMS = continuous emissions monitoring system

BULK GASOLINE STORAGE TANKS (June, 2011)				
Source Type	**Air Contaminant**	**Minimum Requirements**	**Control Technology**	**BACT Determination**
Bulk Gasoline Storage Tanks	VOC	• In addition to requirements specified in Regulations 310 CMR 7.24 and 40 CFR 60 Subpart Kb • All tanks shall be equipped with cable suspended full contact floating roofs (leg-supported floating roofs shall not be allowed) • Tanks designed such that there will be no standing liquid when emptied • Tanks must include a connection for a control device (98% VOC/HAPs control efficiency or 5000 ppmv VOC/HAPs tank concentration) that will control vapors when roofs are not floating (when tanks are emptied, cleaned, during seasonal fuel switching/tank landings, etc.) • Utilize 98% overall efficiency VOC/HAPs control device when seasonal fuel switching/tank landing event would cause potential VOC/HAPs emission of one or more tons	• Cable suspended full contact floating roof • Drain dry tank bottom • Vapor control device	• In addition to requirements specified in Regulations 310 CMR 7.24 and 40 CFR 60 Subpart Kb 310 CMR 7.02 Plan Approval, Transmittal Number W152661
	HAPs*	• As above, in addition to requirements specified by 40 CFR 63 Subpart R if facility is a major source for HAPs	• As above, in addition to requirements specified by 40 CFR 63 Subpart R if facility is a major source for HAPs	• As above, in addition to requirements specified by 40 CFR 63 Subpart R if facility is a major source for HAPs

Key to Abbreviations
VOC = volatile organic compounds
HAPs = hazardous air pollutants
% = weight percent
ppmv = parts per million volume
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations

*If not major for HAPs, the facility may be subject to 40 CFR 63 Subpart BBBBBB.

BIOTECHNOLOGY SURFACE DISINFECTION PROCESSES (June, 2011)				
Source Type	**Air Contaminant**	**Minimum Requirements**	**Control Technology**	**BACT Determination**
Surface disinfection processes used in drug, medical device, and biologic product production having: ≤ 15 tons per 12 month rolling period VOC or total/combined HAPs	VOC	• ≤ 15 tons of VOC per rolling 12 month period • ≤ 2.5 tons of VOC per month	• Good housekeeping • Best Management Practices	310 CMR 7.03(25)
	HAPs	• ≤ 15 tons of total/combined HAPs per rolling 12 month period • ≤ 3 tons of total/combined HAPs per month • ≤ 2 tons of individual HAP per month • ≤ 9 tons of individual HAPs per rolling 12 month period		
	VOC/HAPs	• VOC containing solutions kept in tightly closed containers • Spent cleaning cloths/wipes kept in tightly closed containers		
>15 tons per 12 month rolling period VOC and/or total/combined	VOC/HAPs	• 100% Capture Efficiency (PTE-Method 204)* • 99% Destruction Efficiency	• Regenerative Thermal Oxidizer (RTO)	See MISCELLANEOUS VOC EMITTING SOURCES

HAPs**		• 100% Capture Efficiency (PTE-Method 204)* • 99% Destruction Efficiency	• Thermal Oxidizer (TO)	
		• 100% Capture Efficiency (PTE-Method 204)* • 98% Destruction Efficiency	• Catalytic Oxidizer (CatOx) – may be utilized only if the effluent exhaust stream contains no substituents which could cause catalyst poisoning	
		• 100% Capture Efficiency (PTE-Method 204)* • 98% Removal Efficiency	• Adsorption Technology or equivalent (including nitrogen blanketing and condensation strategies)	

*****Capture efficiency determined by US EPA Method 204 for Permanent Total Enclosures (PTE). PTE criteria:

- any natural draft opening (NDO) is at least four equivalent opening diameters from each VOC emitting point;
- the total area of all NDOs shall not exceed 5 percent of the surface area of the enclosure's four walls, floor, and ceiling;
- the average face velocity (FV) of air through all NDOs shall be at least 3600 m/hr (200 fpm). The direction of air flow through all NDOs shall be into the enclosure;
- all access doors and windows whose areas are not included in the method and are not included in the calculation are closed at all times during routine operation of the process;
- all VOC emissions are captured and contained for discharge through a control device.

******To avoid MACT, a facility may request a federally enforceable cap of < 25 tons per rolling 12 month period for total HAPs and < 10 tons per 12 month rolling period for individual HAP.

Key to Abbreviations

VOC = volatile organic compounds
HAPs = Hazardous Air Pollutants
PTE = Permanent Total Enclosure
% = weight percent
< = less than
≤ = less than or equal to
> = greater than
≥ = greater than or equal to
CMR = Code of Massachusetts Regulations
CFR = Code of Federal Regulations

<table>
<tr><th colspan="5">CHEMICAL AND COATING MANUFACTURING SOURCES* (June, 2011)</th></tr>
<tr><th>Source Type</th><th>Air Contaminant</th><th>Minimum Requirements</th><th>Control Technology</th><th>BACT Determination</th></tr>
<tr><td>Storage Tanks</td><td>VOC</td><td>• Submerged fill pipes
• Vapor collection system to a control device*</td><td rowspan="6">• Vapor collection system must be at all times under negative pressure (100 % capture efficiency)*
• VOC control device must achieve a control efficiency of ≥ 98 % (flares are Prohibited)*
• Good housekeeping for cleaning and spill prevention
• Waste coatings and cleaning solvents kept in closed containers when not in use
• All covers, ports, hatches, etc. must be kept clean and in a tight fitting manner
• All material and product loading must be done utilizing submerged fill pipes
• NOTE: Malodorous compounds may need to install technology that exceeds BACT to eliminate any nuisance odors generated from the process.</td><td rowspan="6">In general, MassDEP considers proposed chemical and coating manufacturing sources which propose to emit VOC and which propose to meet the requirements of this Table as complying with Top Case BACT as required by 310 CMR 7.02(8)</td></tr>
<tr><td></td><td>HAPs</td><td>• Compliance with 40 CFR 63 Subpart HHHHH (for major source of HAPs)</td></tr>
<tr><td>Process Piping</td><td>VOC</td><td>• All material transfers to be accomplished by hard piping, not by manual transfers</td></tr>
<tr><td></td><td>HAPs</td><td>• Compliance with 40 CFR 63 Subpart HHHHH (for major source of HAPs)</td></tr>
<tr><td>Mixers, Dispensers</td><td>VOC</td><td>• All units equipped with permanent, tightly fitted covers, minimum shaft clearance, and shaft boot
• All tanks shall be equipped with a vapor collection system to a control device*
• All cleaning activities will occur with emissions collected via the vapor collection system</td></tr>
<tr><td></td><td>HAPs</td><td>• Compliance with 40 CFR 63 Subpart HHHHH (for major source of HAPs)</td></tr>
</table>

Letdown Tanks	VOC	• Tanks must have tightly fitting: covers, hatches and ports kept closed except for sampling and addition of materials • Tanks controlled by a vapor collection system to a control device		
	HAPs	• Compliance with 40 CFR 63 Subpart HHHHH (for major source of HAPs)		
Product Packaging	VOC	• Packaging must occur in a PTE** equipped with a vapor collection system to a control device		
	HAPs	• Compliance with 40 CFR 63 Subpart HHHHH (for major source of HAPs)		

***For Chemical and Coating Manufacturing Sources ≥ 18 tons per twelve month rolling period, these sources must comply with the BACT Guidelines found in the above Table, for Minimum Requirements including add-on air pollution control technology. While sources < 18 tons per twelve month rolling period may apply for a facility wide VOC emissions cap, these sources must still comply with the Minimum Requirements including Control Technology, however add-on air pollution control technology is not required.**

**Capture efficiency determined by US EPA Method 204 for Permanent Total Enclosures (PTE). PTE criteria:

- any natural draft opening (NDO) is at least four equivalent opening diameters from each VOC emitting point;
- the total area of all NDO's shall not exceed 5 percent of the surface area of the enclosure's four walls, floor, and ceiling;
- the average face velocity (FV) of air through all NDOs shall be at least 3600 m/hr (200 fpm). The direction of air flow through all NDOs shall be into the enclosure;

- all access doors and windows whose areas are not included in the method and are not included in the calculation are closed at all times during routine operation of the process;
- all VOC and/or HAPs emissions are captured and contained for discharge through a control device.

Key to Abbreviations

VOC = volatile organic compounds
HAPs = Hazardous Air Pollutants
PTE = Permanent Total Enclosure
% = weight percent
NDO = Natural Draft Opening
m/hr = meters per hour
fpm = feet per minute
P2 = pollution prevention
CFR = Code of Federal Regulations
≥ = greater than or equal to
< = less than