

SMAQMD BACT CLEARINGHOUSE

CATEGORY Type:

COATING - AUTO BODY

BACT Category: MINOR SOURCE

BACT Determination Number: 252	BACT Determination Date: 2/22/2021
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Equipment Information

Permit Number: N/A -- Generic BACT Determination
Equipment Description: PAINT SPRAY BOOTH EXPIRED
Unit Size/Rating/Capacity: ≤ 7,405 lbs VOC/year
Equipment Location:

BACT Determination Information

District Contact: Jeffrey Quok Phone No.: (279) 207-1145 email: jquok@airquality.org

ROCs	Standard:	
	Technology Description:	1.Compliance with SMAQMD Rule 459 2.For heaters, use of natural gas or LPG fired burner
	Basis:	Achieved in Practice
NOx	Standard:	30 ppmvd @ 3% O@ or 0.036 lb/MMBtu/hr
	Technology Description:	1.For heaters, low NOx burner, 30 ppmvd @ 3% O2 or 0.036 lb/MMBtu/hr 2.Natural gas or LPG fired burner
	Basis:	Achieved in Practice
SOx	Standard:	
	Technology Description:	For heaters, natural gas or LPG fired burner
	Basis:	Achieved in Practice
PM10	Standard:	
	Technology Description:	1.Spray booth with dry filters or waterwash, properly maintained, 98% PM control efficiency, 0.0015 gr/dcsf 2.HVLP spray or equivalent application equipment
	Basis:	Achieved in Practice
PM2.5	Standard:	
	Technology Description:	1.Spray booth with dry filters or waterwash, properly maintained, 98% PM control efficiency, 0.0015 gr/dcsf 2.HVLP spray or equivalent application equipment
	Basis:	Achieved in Practice
CO	Standard:	
	Technology Description:	For heaters, natural gas or LPG fired burner
	Basis:	Achieved in Practice
LEAD	Standard:	
	Technology Description:	
	Basis:	

Comments: T-BACT:
 1. Spray booth with filter system, 98% PM control efficiency, HVLP spray equipment or equivalent technology
 2. Coatings with VOC content compliant with BAAQMD Reg. 8, Rule 45 and transfer efficiency complying with Reg. 8, Rule 45
 3.VOC emission controlled to overall capture/destruction efficiency ≥ 90% by weight

SMAQMD BACT CLEARINGHOUSE

CATEGORY Type:

COATING - AUTO BODY

BACT Category: MINOR SOURCE

BACT Determination Number: 253	BACT Determination Date: 2/22/2021
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Equipment Information

Permit Number: N/A -- Generic BACT Determination
Equipment Description: PAINT SPRAY BOOTH
Unit Size/Rating/Capacity: > 7,405 lb VOC/year
Equipment Location:

EXPIRED

BACT Determination Information

District Contact: Jeffrey Quok Phone No.: (279) 207-1145 email: jquok@airquality.org

ROCs	Standard:	
	Technology Description:	1. Coatings with VOC content and transfer efficiency complying with Reg. 8, Rule 45, and emission controlled to overall capture/destruction efficiency ≥ 90% by weight 2. For heaters, use of natural gas or LPG fired burner
	Basis:	Cost Effective
NOx	Standard:	
	Technology Description:	1.For heaters, low NOx burner, 30 ppmvd @ 3% O2 or 0.036 lb/MMBtu/hr 2.Natural gas or LPG fired burner
	Basis:	Achieved in Practice
SOx	Standard:	
	Technology Description:	For heaters, natural gas or LPG fired burner
	Basis:	Achieved in Practice
PM10	Standard:	
	Technology Description:	1.Spray booth with dry filters or waterwash, properly maintained, 98% PM control efficiency, 0.0015 gr/dcsf 2.HVLP spray or equivalent application equipment
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CO	Standard:	
	Technology Description:	For heaters, natural gas or LPG fired burner
	Basis:	Achieved in Practice
LEAD	Standard:	
	Technology Description:	
	Basis:	

Comments: T-BACT:
 1. Spray booth with filter system, 98% PM control efficiency, HVLP spray equipment or equivalent technology
 2. Coatings with VOC content compliant with BAAQMD Reg. 8, Rule 45 and transfer efficiency complying with Reg. 8, Rule 45
 3. VOC emission controlled to overall capture/destruction efficiency ≥ 90% by weight



BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

EXPIRED

DETERMINATION NO.: 252 & 253
DATE: February 22, 2021
ENGINEER: Jeffrey Quok

Category/General Equip Description: Coating – Auto Body

Equipment Specific Description: Paint Spray Booth

Equipment Size/Rating: ≤ 7,405 lbs VOC/year, Minor Source (BACT #252)
> 7,405 lbs VOC/year, Minor Source (BACT #253)

Previous BACT Det. No.: #153 & #154

This BACT determination will update Determinations #153 & #154 for paint spray booths used for automotive coating. This BACT determination will also include stripping and solvent cleaning operations related to automotive coating operations.

BACT/T-BACT ANALYSIS

A: ACHIEVED IN PRACTICE (Rule 202, §205.1a)

The following control technologies are currently employed as BACT/T-BACT for paint spray booths used for automotive coating operations by the following air pollution control districts:

District/Agency	Best Available Control Technology (BACT)/Requirements												
US EPA	<p><u>BACT</u> Source: EPA RACT/BACT/LAER Clearinghouse RBLC ID: OH-0309 (5/03/2007)</p>												
	Automotive Refinishing												
	<table border="1"> <tr> <td>VOC</td> <td>< 14.5 tons VOC/year emission limit, 4.8 lb/gal coating – exempt lb/gal excluding water & exempt solvents</td> </tr> <tr> <td>NOx</td> <td>No standard</td> </tr> <tr> <td>SOx</td> <td>No standard</td> </tr> <tr> <td>PM10</td> <td>Dry Filtration, 98% efficiency, < 0.62 tons PM10/year emission limit, 0.0015 gr/dscf</td> </tr> <tr> <td>PM2.5</td> <td>No standard</td> </tr> <tr> <td>CO</td> <td>No standard</td> </tr> </table>	VOC	< 14.5 tons VOC/year emission limit, 4.8 lb/gal coating – exempt lb/gal excluding water & exempt solvents	NOx	No standard	SOx	No standard	PM10	Dry Filtration, 98% efficiency, < 0.62 tons PM10/year emission limit, 0.0015 gr/dscf	PM2.5	No standard	CO	No standard
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CO	No standard												

District/Agency	Best Available Control Technology (BACT)/Requirements
US EPA	<p><u>T-BACT</u> The EPA BACT Clearinghouse did not contain any T-BACT determinations.</p> <p><u>RULE REQUIREMENTS:</u> 40 CFR 63 Subpart HHHHHH – National Emission Standards for Hazardous Air Pollutants for Paint Stripping and Miscellaneous Surface Coating Operations at Area Sources</p> <p>This subpart applies to autobody refinishing operations, among other area sources, that include motor vehicles and mobile equipment spray-applied surface coating operations; and apply coatings that may potentially contain the target HAP compounds of chromium, lead, manganese, nickel, or cadmium. This subpart also applies to operations using methylene chloride (MeCl) for the removal of dried paint.</p> <p>General Requirements</p> <p>For paint stripping operations using MeCl:</p> <p>A. Implement management practice to minimize the evaporative emissions of MeCl. The management practices must address practices in paragraphs 1 through 5, as applicable.</p> <ol style="list-style-type: none"> 1. Evaluate each application to ensure there is a need for paint stripping. 2. Evaluate each application where a paint stripper containing MeCl is used to ensure that there is no alternative paint stripping technology that can be used. 3. Reduce exposure of all paint strippers containing MeCl to the air. 4. Optimize application conditions when using paint strippers containing MeCl to reduce MeCl evaporation. 5. Practice proper storage and disposal of paint strippers containing MeCl. <p>For coatings that may potentially contain the target HAP compounds of chromium, lead, manganese, nickel, or cadmium:</p> <ol style="list-style-type: none"> 1. All spray-applied coatings must be performed in a spray booth, preparation station, or mobile enclosures that are fully enclosed with a full roof with four walls or complete side curtains. The enclosure must be ventilated at a negative pressure and equipped with a filter system that can achieve at least 98% capture efficiency. 2. Coatings must be applied with HVLP spray equipment, electrostatic application, airless spray gun, air-assisted airless spray gun, or an equivalent technology for which written approval has been obtained from the U.S. EPA. 3. Spray gun cleaning must be conducted such that an atomized mist or spray of gun cleaning solvent and paint residue is not created outside of a container that collects used cleaning solvent. 4. All new and existing personnel who spray-apply surface coatings must be trained in the proper application of surface coatings. 5. For new affected sources, submit an initial notification to EPA no later than 180 days after initial startup or July 7, 2008, whichever is later. For an existing affected source, submit the initial notification no later than January 11, 2010.

District/Agency	Best Available Control Technology (BACT)/Requirements														
ARB	<p><u>BACT</u> Source: ARB BACT Clearinghouse SMAQMD Permit #18402 (7/25/2005)</p> <table border="1"> <tr> <td colspan="2">Automotive Refinishing</td> </tr> <tr> <td>VOC</td> <td>≤ 4,700 lbs/year, low VOC coating</td> </tr> <tr> <td>NOx</td> <td>No standard</td> </tr> <tr> <td>SOx</td> <td>No standard</td> </tr> <tr> <td>PM10</td> <td>No standard</td> </tr> <tr> <td>PM2.5</td> <td>No standard</td> </tr> <tr> <td>CO</td> <td>No standard</td> </tr> </table> <p><u>T-BACT</u> The ARB BACT Clearinghouse did not contain any T-BACT determinations.</p> <p><u>RULE REQUIREMENTS:</u> Title 17, Cal. Code Regs. Section 93112 – Airborne Toxic Control Measure (ATCM) for Emissions of Hexavalent Chromium and Cadmium from Motor Vehicle and Mobile Equipment Coatings: This regulation prohibits the sale and supply of motor vehicle and/or mobile equipment coating manufactured on or after January 1, 2003 that contains hexavalent chromium or cadmium. Each motor vehicle and/or mobile equipment coating shall clearly display on its container or package, the day, month and year on which the coating was manufactured. Since this regulation is applicable to the sale and supply of coatings only, it will not be considered as T-BACT for the end user.</p>	Automotive Refinishing		VOC	≤ 4,700 lbs/year, low VOC coating	NOx	No standard	SOx	No standard	PM10	No standard	PM2.5	No standard	CO	No standard
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District/Agency	Best Available Control Technology (BACT)/Requirements		
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	<table border="1"> <tr> <td>NOx</td> <td>For heaters, Low NOx burner, 30 ppmvd @ 3% O₂, natural gas or LPG fired burner</td> </tr> </table>	NOx	For heaters, Low NOx burner, 30 ppmvd @ 3% O ₂ , natural gas or LPG fired burner
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	Paint Spray Booth ≤ 4,700 lbs VOC/year		
<table border="1"> <tr> <td>T-BACT</td> <td> <ol style="list-style-type: none"> 1. Spray booth with filter system, 98% PM10 control efficiency, HVLP spray equipment or equivalent technology 2. Coatings with VOC content and transfer efficiency complying with BAAQMD Reg. 8, Rule 45. 3. Overall capture/destruction efficiency ≥ 90% by weight. </td> </tr> </table>	T-BACT	<ol style="list-style-type: none"> 1. Spray booth with filter system, 98% PM10 control efficiency, HVLP spray equipment or equivalent technology 2. Coatings with VOC content and transfer efficiency complying with BAAQMD Reg. 8, Rule 45. 3. Overall capture/destruction efficiency ≥ 90% by weight. 	
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District/Agency	Best Available Control Technology (BACT)/Requirements																														
SMAQMD	<p><u>RULE REQUIREMENTS:</u></p> <p><u>Rule 459 Automotive, Mobile Equipment, and Associated Parts and Components Coating Operations (Last amended 8/25/2011)</u></p> <p>Vehicle Coating Limits: No person shall apply to any motor vehicle, mobile equipment, or associated parts and components, any coating with a VOC regulatory content, as calculated pursuant to Section 407, in excess of the following limits:</p> <table border="1"> <thead> <tr> <th>Coating Category (SMAQMD Rule 459 Definition)</th> <th>VOC Regulatory Limit as Applied g/l (lbs/gal)</th> </tr> </thead> <tbody> <tr> <td>Adhesion Promoter</td> <td>540 (4.5)</td> </tr> <tr> <td>Clear Coating</td> <td>250 (2.1)</td> </tr> <tr> <td>Color Coating</td> <td>420 (3.5)</td> </tr> <tr> <td>Multi-Color Coating: Mobile equipment driven or drawn on rails and its associated parts and components</td> <td>520 (4.3)</td> </tr> <tr> <td>Any other mobile equipment or motor vehicle and its associated parts and components</td> <td>680 (5.7)</td> </tr> <tr> <th>Coating Category (SMAQMD Rule 459 Definition)</th> <th>VOC Regulatory Limit as Applied g/l (lbs/gal)</th> </tr> <tr> <td>Pretreatment Coating</td> <td>660 (5.5)</td> </tr> <tr> <td>Primer/Primer Sealer</td> <td>250 (2.1)</td> </tr> <tr> <td>Single-Stage Coating</td> <td>340 (2.8)</td> </tr> <tr> <td>Temporary Protective Coating</td> <td>60 (0.5)</td> </tr> <tr> <td>Truck Bed Liner Coating</td> <td>200 (1.7)</td> </tr> <tr> <td>Underbody Coating</td> <td>430 (3.6)</td> </tr> <tr> <td>Uniform Finish Coating</td> <td>540 (4.5)</td> </tr> <tr> <td>Any Other Coating Type, Excluding Materials Listed In Section 302</td> <td>250 (2.1)</td> </tr> </tbody> </table>	Coating Category (SMAQMD Rule 459 Definition)	VOC Regulatory Limit as Applied g/l (lbs/gal)	Adhesion Promoter	540 (4.5)	Clear Coating	250 (2.1)	Color Coating	420 (3.5)	Multi-Color Coating: Mobile equipment driven or drawn on rails and its associated parts and components	520 (4.3)	Any other mobile equipment or motor vehicle and its associated parts and components	680 (5.7)	Coating Category (SMAQMD Rule 459 Definition)	VOC Regulatory Limit as Applied g/l (lbs/gal)	Pretreatment Coating	660 (5.5)	Primer/Primer Sealer	250 (2.1)	Single-Stage Coating	340 (2.8)	Temporary Protective Coating	60 (0.5)	Truck Bed Liner Coating	200 (1.7)	Underbody Coating	430 (3.6)	Uniform Finish Coating	540 (4.5)	Any Other Coating Type, Excluding Materials Listed In Section 302	250 (2.1)
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District/Agency	Best Available Control Technology (BACT)/Requirements										
SMAQMD	<p>Vehicle Material Limits: No person shall apply to any motor vehicle any of the following materials with a VOC regulatory content, as calculated pursuant to section 407, in excess of the following limits:</p> <table border="1"> <thead> <tr> <th>Material</th> <th>VOC Regulatory Limit as Applied g/l (lbs/gal)</th> </tr> </thead> <tbody> <tr> <td>Gasket/Gasket Sealing Material</td> <td>200 (1.7)</td> </tr> <tr> <td>Cavity Wax</td> <td>650 (5.4)</td> </tr> <tr> <td>Deadener</td> <td>650 (5.4)</td> </tr> <tr> <td>Lubricating Wax/Compound</td> <td>700 (5.8)</td> </tr> </tbody> </table> <p>If anywhere on the container of any automotive coating, or any label or sticker affixed to the container, or in any sales, advertising, or technical literature supplied by a person, any representation is made that indicates that the coating meets the definition of or is recommended for use for more than one of the coating categories listed in Section 301, then the lowest VOC content limit shall apply.</p> <p>Emission Control Equipment: As an alternative to the coating limits, as applicable, a person may use air pollution control equipment, subject to the approval to the Air Pollution Control Officer, that provides an overall system efficiency of not less than 85% as determined pursuant to Section 406. Any approved emission control equipment must be maintained and used at all times in proper working condition.</p> <p>Application Equipment Requirement: A person shall not apply any coating unless one of the following application methods is used:</p> <ol style="list-style-type: none"> a. Electrostatic application equipment. b. High-Volume Low-Pressure spray equipment. The spray gun shall meet one of the following: <ol style="list-style-type: none"> 1. The spray gun shall be permanently labeled as HVLP; or 2. If the spray gun is not permanently labeled as a HVLP, then the end user shall demonstrate that the spray gun meets the HVLP definition in Section 224 in design and use. A satisfactory demonstration shall be based on the manufacturer's published technical material on the design of the gun and by a demonstration of the operation of the gun using an air pressure tip gauge from the manufacturer of the gun. c. Low-Volume Low-Pressure spray equipment. d. Brush or roll coating, dip coat, or flow coat. e. Any other application method that achieves a transfer efficiency equivalent to, or higher than, the application methods listed in Sections 305.1 (a)-(d) as determined by the methods specified on Section 504.9. Written approval from the Air Pollution Control Officer shall be obtained for each alternative application method prior to use. <p>Solvent Cleaning Operations and Storage Requirements: Any person subject to this rule shall comply with the following requirements:</p> <ol style="list-style-type: none"> a. Closed containers shall be used for the disposal of cloth, sponges, or paper used for solvent cleaning operations and coating removal. b. Volatile organic compound-containing materials shall be stored in closed, vapor-tight containers, when not in use except while adding to or removing them from the containers. 	Material	VOC Regulatory Limit as Applied g/l (lbs/gal)	Gasket/Gasket Sealing Material	200 (1.7)	Cavity Wax	650 (5.4)	Deadener	650 (5.4)	Lubricating Wax/Compound	700 (5.8)
Material	VOC Regulatory Limit as Applied g/l (lbs/gal)										
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District/Agency	Best Available Control Technology (BACT)/Requirements																					
SMAQMD	<p>c. A person shall not perform cleaning operations using a solvent with a volatile organic compound content in excess of 25 grams per liter (0.21 pounds per gallon), as determined pursuant to Section 409.</p> <p>d. For bug and tar removal a person shall not use any solvent other than bug and tar remover regulated under the Consumer Products Regulation (California Code of Regulations Section 94507 et seq.) or a solvent with a volatile organic compound content of no more than 25 grams per liter.</p> <p>Coating remover (stripper requirements): A person shall not perform coating removal with a material containing volatile organic compounds in excess of 200 grams per liter (1.7 pounds per gallon).</p> <p>RULE REQUIREMENTS: Rule 419 – NOx from Miscellaneous Combustion Units (10/25/18) This Rule applies to any miscellaneous combustion unit or cooking unit with a total rated heat input capacity of 2 MMBtu/hr or greater that is located at a major stationary source of NOx and to any miscellaneous combustion unit or cooking unit with a total rated heat input capacity of 5 MMBtu/hr or greater that is not located at a major stationary source of NOx.</p> <p>The requirements of this rule do not apply to combustion equipment where its primary function is to operate as an air pollution control device including, but not limited to, afterburners, catalytic oxidizers, flares, thermal oxidizers, or vapor incinerators.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="4" style="text-align: center;">TABLE 1: Miscellaneous Combustion Units Emission Limits Expressed As PPMV, corrected to 3% O₂</th> </tr> <tr> <th rowspan="2" style="text-align: center;">Equipment Category</th> <th colspan="2" style="text-align: center;">NOx Limit ppmv, corrected to 3% O₂ (lb/MMBtu)</th> <th style="text-align: center;">CO Limit ppmv, corrected to 3% O₂ (lb/MMBtu)</th> </tr> <tr> <th colspan="3" style="text-align: center;">Effective (see Section 401)</th> </tr> <tr> <th rowspan="2" style="text-align: center;">Gaseous Fuel-Fired Equipment</th> <th colspan="2" style="text-align: center;">Process Temperature</th> <th rowspan="2" style="text-align: center;">All Temperatures</th> </tr> <tr> <th style="text-align: center;">< 1200°F</th> <th style="text-align: center;">≥ 1200 °F</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Oven, Dehydrator, Dryer, Heater, or Kiln</td> <td style="text-align: center;">30 (0.036)</td> <td style="text-align: center;">60 (0.073)</td> <td style="text-align: center;">400 (0.30)</td> </tr> </tbody> </table>	TABLE 1: Miscellaneous Combustion Units Emission Limits Expressed As PPMV, corrected to 3% O ₂				Equipment Category	NOx Limit ppmv, corrected to 3% O ₂ (lb/MMBtu)		CO Limit ppmv, corrected to 3% O ₂ (lb/MMBtu)	Effective (see Section 401)			Gaseous Fuel-Fired Equipment	Process Temperature		All Temperatures	< 1200°F	≥ 1200 °F	Oven, Dehydrator, Dryer, Heater, or Kiln	30 (0.036)	60 (0.073)	400 (0.30)
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District/Agency	Best Available Control Technology (BACT)/Requirements	
South Coast AQMD	<p>BACT Source: SCAQMD BACT Guidelines (Part D) for Non-Major Polluting Facilities, page 45 & 121 (Last Revised 2/1/19), Makeup Air Heater, A/N 413559 (11/24/04)</p>	
	<p>Spray Booths – Automotive, Down-Draft Type</p>	
	VOC	<p><u>For Automotive, down-draft booths with < 8,004 lbs/year (< 667 lbs/month) VOC Emissions</u> 1. Compliance with applicable AQMD Regulation XI Rules</p> <p><u>For Automotive, down-draft booths with ≥ 22 lbs/day VOC Emissions</u> 1. Compliance with applicable AQMD Regulation XI Rules, and VOC control system with ≥90% collection efficiency and ≥ 95% destruction efficiency; OR 2. Use of Super Compliant Materials (<5% VOC by weight); OR 3. Use of low-VOC materials resulting in an equivalent emission reduction</p>
	NOx	<p><u>For booths with heaters</u> 1. Low NOx burner not to exceed 30 ppmvd @ 3% O2</p>
	SOx	<p><u>For booths with heaters</u> 1. Natural Gas</p>
	PM10	<p><u>For Automotive, down-draft booths</u> 1. Dry filters or waterwash</p> <p><u>For booths with heaters</u> 1. Natural Gas</p>
	PM2.5	No standard
	CO	No standard
	<p>Spray Booths – Other Types</p>	
	VOC	<p><u>For booths with < 14,040 lbs/year (< 1,170 lbs/month) VOC Emissions</u> 1. Compliance with applicable AQMD Regulation XI Rules</p> <p><u>For booths with ≥ 14,040 (≥ 1,170 lbs/month) VOC Emissions</u> 1. Compliance with applicable AQMD Regulation XI Rules, and VOC control system with ≥90% collection efficiency and ≥ 95% destruction efficiency; OR 2. Use of Super Compliant Materials (<5% VOC by weight); OR 3. Use of low-VOC materials resulting in an equivalent emission reduction</p>

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<p><u>Reg XI, Rule 1151 – Motor Vehicle and Mobile Equipment Non-Assembly Line Coating Operations (Last amended 9/5/2014)</u></p>																						
<p>A person shall not apply any automotive coating to a motor vehicle, mobile equipment, or associated parts or components of a motor vehicle or mobile equipment that contains VOC in excess of the limits specified in Table of Standards below. Compliance with the applicable VOC content limits shall be based on VOC content, including any material added to the original automotive coating supplied by the manufacturer, as applied, less water and exempt compounds.</p>																						
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<p>Most Restrictive VOC Limit If any representation or information on the container of any automotive coating, or any label or sticker affixed to the container, or in any sales, advertising, or technical literature that indicates that the automotive coating meets the definition of or is recommended for use for more than one of the automotive coating categories listed in VOC Content Limit table, then the lowest VOC content shall apply.</p>							
<p>Alternative Compliance A person may comply with the provisions of the VOC content Limit table, by using an approved emission control system, consisting of collection and control devices provided such emission control system is approved pursuant to Rule 203 – Permit to Operate, in writing, by the Executive Officer for reducing emissions of VOC. The Executive Officer shall approve such emission control system only if the VOC emissions resulting from the use of non-compliant automotive coatings will be reduced to a level equivalent to or lower than that which would have been achieved by compliance with the terms of the VOC Content Limit table. The required efficiency of an emission control system at which an equivalent or greater level of VOC emission reduction will be achieved shall be calculated by the following equation,</p>							
$C.E. = \left[1 - \left\{ \frac{(VOC_{L,Wc})}{(VOC_{L,Wn,Max})} \times \frac{1 - (VOC_{L,Wn,Max}/D_{n,Max})}{1 - (VOC_{L,Wc}/D_c)} \right\} \right] \times 100$ <p>Where:</p> <p>C.E. = Control Efficiency, percent</p> <p>VOC_{L,Wc} = VOC Limit of Rule 1151, less water and less exempt compounds, pursuant to paragraph (d)(1).</p> <p>VOC_{L,Wn,Max} = Maximum VOC content of non-compliant automotive coating used in conjunction with a control device, less water and exempt compounds.</p> <p>D_{n,Max} = Density of VOC solvent, reducer, or thinner contained in the non-compliant automotive coating containing the maximum VOC.</p> <p>D_c = Density of corresponding VOC solvent, reducer, or thinner used in the compliant automotive coating system = 880 g/L.</p>							

District/Agency	Best Available Control Technology (BACT)/Requirements																		
South Coast AQMD	<p>Transfer Efficiency A person shall not apply automotive coatings to any motor vehicle, mobile equipment or any associated parts or components to a motor vehicle or mobile equipment except by the use of one of the following methods:</p> <ul style="list-style-type: none"> A. Electrostatic application, or B. High-volume, low-pressure (HVLV) spray, or C. Brush, dip, or roller, or D. Spray gun application, provided the owner or operator demonstrate that the spray gun meets the HVLV definition in paragraph (c)(17) in design and use. A satisfactory demonstration must be based on the manufacturer's published technical material on the design of the spray gun and by a demonstration of the operation of the spray gun using an air pressure tip gauge from the manufacturer of the spray gun. E. Any such other automotive coating application methods as demonstrated, in accordance with the provisions of subparagraph (h)(1)(F), to be capable of achieving equivalent or better transfer efficiency than the automotive coating application method listed in clause (d)(6)(A)(ii), provided written approval is obtained from the Executive Officer Prior to use. <p><u>Reg XI, Rule 1171 – Solvent Cleaning Operations (Last amended 5/1/2009)</u> This rule applies to all persons who use solvent materials in solvent cleaning operations during the production, repair, maintenance, or servicing of parts, products, tools, machinery, equipment, or general work areas; all persons who store and dispose of these materials used in solvent cleaning operations; and all solvent suppliers who supply, sell, or offer for sale solvent cleaning materials for use in solvent cleaning operations.</p>																		
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<p>South Coast AQMD</p>	<p>Reg XI, Rule 1147 – NOx Reductions from Miscellaneous Sources (Last amended 7/7/2017) This rule applies to ovens, dryers, dehydrators, heaters, kilns, calciners, furnaces, crematories, incinerators, heated pots, cookers, roasters, fryers, closed and open heated tanks and evaporators, distillation units, afterburners, degassing units, vapor incinerators, catalytic or thermal oxidizers, soil and water remediation units and other combustion equipment with nitrogen oxide emissions that require a District permit and are not specifically required to comply with a nitrogen oxide emission limit by other District Regulation XI rules.</p> <table border="1"> <thead> <tr> <th rowspan="3">Equipment Category</th> <th colspan="3">NOx Emission Limit PPM @ 3% O2, dry or pound/MMBtu heat input ≥ 325,000 Btu/hr</th> </tr> <tr> <th colspan="3">Process Temperature</th> </tr> <tr> <th>≤800° F</th> <th>>800° F and <1200° F</th> <th>≥1200 ° F</th> </tr> </thead> <tbody> <tr> <td>Make-Up air heater or other air heater located outside of building with temperature controlled zone inside building</td> <td>30 ppm or 0.036 lb/MMBtu/hr</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Equipment Category	NOx Emission Limit PPM @ 3% O2, dry or pound/MMBtu heat input ≥ 325,000 Btu/hr			Process Temperature			≤800° F	>800° F and <1200° F	≥1200 ° F	Make-Up air heater or other air heater located outside of building with temperature controlled zone inside building	30 ppm or 0.036 lb/MMBtu/hr	-	-
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<p>Most Restrictive VOC Content Limit If anywhere on the automotive coating container, or any label or sticker affixed to the container, or in any sales, advertising, or technical literature, any representation is made that indicates that the coating meets the definition of or is recommended for use for more than one of the coating categories listed in the VOC Content Limit table, then the lowest VOC content limit shall apply.</p> <p>No coatings shall be applied unless one of the following coating application methods is used:</p> <ol style="list-style-type: none"> 1. Electrostatic spray application 2. Flow coat application 3. Dip coat application 4. High-volume low-pressure (HVLP) spray application 5. Roll coat 6. Hand application methods 7. Other coating application methods that are demonstrated to have a transfer efficiency a least equal to one of the above application methods, and which are used in such a manner that the parameters under which they were tested are permanent features of the method. Such coating application methods shall be features in writing prior to use by the Air Pollution Control Officer. <p>Coating Application Equipment A person shall conduct motor vehicle and mobile equipment coating operations by using only the following coating application methods:</p> <ol style="list-style-type: none"> 1. Electrostatic spray application; or 2. Flow coat application; or 3. Dip coat application; or 4. Roll coat; or 5. Hand application methods; or 6. High-volume low-pressure spray. Facilities using an HVLP spray gun shall have available on site pressure gauges in proper operating condition to measure the air cap pressure or have available manufacturer's technical information regarding the correlation option is used to demonstrate 																			

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San Diego County APCD	<p>compliance, a handle air inlet pressure gauge will be required on site in proper operating condition to measure the handle air inlet pressure; or</p> <ol style="list-style-type: none"> 7. Other coating application methods that are demonstrated to have transfer efficiency at least equal to one of the above application methods, and which are used in such a manner that the operating parameters under which they were demonstrated to achieve such transfer efficiency are permanent features of the method. Such coating application methods shall be approved in writing by the Air Pollution Control Officer prior to use. <p>Cleaning of Coating Application Equipment A person shall not clean coating application equipment used in motor vehicle and mobile equipment coating operations unless:</p> <ol style="list-style-type: none"> 1. The VOC content of cleaning material does not exceed 25 grams per liter (0.21 lbs/gal), as applied; and 2. The cleaning material is flushed or rinsed through the application equipment, including paint lines, without exposure to air, into a container which has in place a lid that completely covers the container and has no visible holes, breaks or openings; and either 3. The application equipment or equipment parts are cleaned in a container which is open only when being accessed for adding, cleaning, or removing application equipment or when cleaning material is being added, provided the cleaned equipment or equipment parts are drained to the container until dripping ceases; or 4. A system is used that totally encloses the component parts being cleaned during the washing, rinsing, and draining process. <p>Surface Preparation and Other Cleaning Operations A person shall not use any material for surface preparation or any other surface cleaning unless its VOC content is 25 grams or less per liter of material (0.21 lbs/gal), as applied.</p> <p>Waste Disposal A person shall not use coating application equipment or any other means to dispose of waste coatings, coating components, surface preparation materials, or cleaning materials by spraying into the air, except when momentarily purging coating material from a spray applicator cap immediately before or after applying the coating material.</p> <p>Control Equipment In lieu of complying with the provisions of the VOC Content Limits, Most Restrictive VOC Content Limit, Coating Application Equipment, Cleaning of Coating Application Equipment, and Surface Preparation and Other Cleaning Operations requirements, a person may elect to use an air pollution control system which:</p> <ol style="list-style-type: none"> 1. Has been installed in accordance with an Authority to Construct; and 2. Includes an emission collection system which captures emissions generated from coating, surface preparation, and/or application equipment cleaning and transports the captured emissions to an air pollution control device; and 3. Has an overall control efficiency of at least 85% by weight.

District/Agency	Best Available Control Technology (BACT)/Requirements														
<p>Bay Area AQMD</p>	<p>BACT Source: BAAQMD BACT Guideline Document # 161.3.1 for < 40 lb/day (uncontrolled) (12/16/91) Document # 161.3.2 for ≥ 40 lb/day (uncontrolled) (05/05/95)</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Spray Booths – Coating of Motor Vehicle and Mobile Equipment, Rework or Bodyshop</p> </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">POC</td> <td> <p><u>For < 14,600 lb/year (< 40 lb/day) VOC emissions</u></p> <ol style="list-style-type: none"> 1. Coatings with VOC content less than and transfer efficiency greater than that required by Reg. 8, Rule 45, and emissions controlled to overall capture/destruction efficiency ≥ 90% by weight (Technologically Feasible); or 2. Compliance with Reg. 8, Rule 45 (Achieved in Practice) <p><u>For ≥ 14,600 lb/year (≥ 40 lb/day) VOC emissions</u></p> <ol style="list-style-type: none"> 1. Coatings with VOC content less than and transfer efficiency greater than that required by Reg. 8, Rule 45, and emissions controlled to overall capture/destruction efficiency ≥ 90% by weight (Technologically Feasible); or 2. Coatings with VOC content and transfer efficiency complying with Reg. 8, Rule 45, and emission controlled to overall capture/destruction efficiency ≥ 90% by weight (Achieved in Practice) <p>Note: The 40 lb/day threshold listed in the BAAQMD BACT standard was derived from their cost-effectiveness level, which is an annualized cost. Therefore, this would be equivalent to an uncontrolled emissions rate of 14,600 lbs/year.</p> </td> </tr> <tr> <td>NOx</td> <td>No standard</td> </tr> <tr> <td>SOx</td> <td>No standard</td> </tr> <tr> <td>PM10</td> <td>Dry filters or waterwash, properly maintained</td> </tr> <tr> <td>PM2.5</td> <td>No standard</td> </tr> <tr> <td>CO</td> <td>No standard</td> </tr> <tr> <td>NPOC</td> <td> <p><u>For < 14,600 lb/year (< 40 lb/day) VOC emissions</u></p> <ol style="list-style-type: none"> 1. Coatings with VOC content less than and transfer efficiency greater than that required by Reg. 8, Rule 45, and emissions controlled to overall capture/destruction efficiency ≥ 90% by weight (Technologically Feasible); or 2. Compliance with Reg. 8, Rule 45 (Achieved in Practice) <p><u>For ≥ 14,600 lb/year (≥ 40 lb/day) VOC emissions</u></p> <ol style="list-style-type: none"> 1. Coatings with VOC content less than and transfer efficiency greater than that required by Reg. 8, Rule 45, and emissions controlled to overall capture/destruction efficiency ≥ 90% by weight (Technologically Feasible) </td> </tr> </table>	POC	<p><u>For < 14,600 lb/year (< 40 lb/day) VOC emissions</u></p> <ol style="list-style-type: none"> 1. Coatings with VOC content less than and transfer efficiency greater than that required by Reg. 8, Rule 45, and emissions controlled to overall capture/destruction efficiency ≥ 90% by weight (Technologically Feasible); or 2. Compliance with Reg. 8, Rule 45 (Achieved in Practice) <p><u>For ≥ 14,600 lb/year (≥ 40 lb/day) VOC emissions</u></p> <ol style="list-style-type: none"> 1. Coatings with VOC content less than and transfer efficiency greater than that required by Reg. 8, Rule 45, and emissions controlled to overall capture/destruction efficiency ≥ 90% by weight (Technologically Feasible); or 2. Coatings with VOC content and transfer efficiency complying with Reg. 8, Rule 45, and emission controlled to overall capture/destruction efficiency ≥ 90% by weight (Achieved in Practice) <p>Note: The 40 lb/day threshold listed in the BAAQMD BACT standard was derived from their cost-effectiveness level, which is an annualized cost. Therefore, this would be equivalent to an uncontrolled emissions rate of 14,600 lbs/year.</p>	NOx	No standard	SOx	No standard	PM10	Dry filters or waterwash, properly maintained	PM2.5	No standard	CO	No standard	NPOC	<p><u>For < 14,600 lb/year (< 40 lb/day) VOC emissions</u></p> <ol style="list-style-type: none"> 1. Coatings with VOC content less than and transfer efficiency greater than that required by Reg. 8, Rule 45, and emissions controlled to overall capture/destruction efficiency ≥ 90% by weight (Technologically Feasible); or 2. Compliance with Reg. 8, Rule 45 (Achieved in Practice) <p><u>For ≥ 14,600 lb/year (≥ 40 lb/day) VOC emissions</u></p> <ol style="list-style-type: none"> 1. Coatings with VOC content less than and transfer efficiency greater than that required by Reg. 8, Rule 45, and emissions controlled to overall capture/destruction efficiency ≥ 90% by weight (Technologically Feasible)
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	<p><u>RULE REQUIREMENTS:</u> Reg 8, Rule 45 – Motor Vehicle and Mobile Equipment Coating Operations (12/03/2008)</p> <p>Coating Limits No person shall finish or refinish any vehicles, mobile equipment or their parts and components using any coating with a VOC content in excess of the following limits, expressed as grams of VOC per liter (or pounds per gallon) of coating applied, excluding water and exempt solvents, in excess of the following limits unless emissions to the atmosphere are controlled to an equivalent level by air pollution abatement equipment with an overall control efficiency of at least 85% and which meets the requirements of Regulation 2, Rule 1:</p>				

District/Agency	Best Available Control Technology (BACT)/Requirements	
Bay Area AQMD	Coating Category (BAAQMD Rule 45 Definition)	VOC Content Limit as Applied g/l (lbs/gal)
	Adhesion Promoter	540 (4.5)
	Clear Coating	250 (2.1)
	Color Coating	420 (3.5)
	Multi-Color Coating	680 (5.7)
	Pretreatment Coating	660 (5.5)
	Primer	250 (2.1)
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	Single-Stage Coating	340 (2.8)
	Temporary Protective Coating	60 (0.5)
	Truck Bed Liner Coating	310 (2.6)
	Underbody Coating	430 (3.6)
	Uniform Finish Coating	540 (4.5)
	Any Other Coating Type	250 (2.1)
<p>Transfer Efficiency: A person shall not apply any coating to any motor vehicles or mobile equipment or their parts and components with spray application equipment unless one of the following methods is used:</p> <ol style="list-style-type: none"> 1. Electrostatic application equipment, operated in accordance with the manufacturer's recommendations; or 2. High-Volume Low-Pressure (HVLP) spray equipment, operated in accordance with the manufacturer's recommendations; or 3. Any alternative coating application method that achieves a transfer efficiency equivalent to, or higher than, the application methods listed above. Prior written approval from the APCO shall be obtained for each alternative method used. <p>Surface Preparation and Solvent Loss Minimization: Any person using an organic solvent for surface preparation and cleanup or mixing, using or disposing of coating or stripper containing organic solvent:</p> <ol style="list-style-type: none"> 1. Shall close containers used for the storage or disposal of cloth or paper used for solvent surface preparation and cleanup. 2. Shall close containers of fresh or spent solvent, coating, catalyst, thinner, or reducer when not in use. 3. Shall not use organic compounds for the cleanup of spray equipment, including paint lines, unless equipment for collecting the organic compounds and minimizing their evaporation to the atmosphere is used. 4. The VOC content of surface preparation solvent shall not exceed 25 g/l (0.2 lb/gal). This limit shall not apply to surface preparation solvent used as bug and tar remover provided that the VOC content of such solvent does not 		

District/Agency	Best Available Control Technology (BACT)/Requirements														
<p>Bay Area AQMD</p>	<p>exceed 350 g/l (2.9 lb/gal). Usage of solvent used as bug and tar remover is limited as follows:</p> <ul style="list-style-type: none"> i. 20 gallons in any consecutive 12-month period for facilities and operations with 400 gallons or more of coating usage per year; ii. 15 gallons in any consecutive 12-month period for facilities and operations with 150 gallons or more of coating usage per year; and iii. 10 gallons in any consecutive 12-month period for facilities and operations with less than 150 gallons of coating usage per year. <p>Specialty Coatings The volume of adhesion promoter, uniform finish coating and multi-color coating combined shall not exceed 5.0% of all topcoats applied, on a monthly basis.</p> <p>Filtration: A person shall not apply single or multi-stage topcoats subject to the coating limits to any vehicle except when exhausted through properly maintained particulate filtration media. A person shall not apply clear coating, color coating, multi-color coating, single-stage coating or uniform finish coating to any vehicle except when exhausted through properly maintained particulate filtration media. This requirement applies to all persons applying coating subject to this rule at stationary and mobile locations. The filter system shall meet the requirements of Regulation 2, Rule 1, as applicable.</p> <p>Most Restrictive VOC Limit: If anywhere on the container or any automotive coating, or any label or sticker affixed to the container, or in any sales, advertising, or technical literature supplied by a person, any representation is made that indicates that the coating meets the definition of or is recommended for use for more than one of the coating categories listed in Coating Limits table, then the lowest VOC content limit shall apply.</p>														
<p>San Joaquin Valley APCD</p>	<p>BACT Source: SJVUAPCD BACT Guideline Guideline 4.2.1 Automotive Spray Painting Operation, <5.0 MMBtu/hr (1/27/2010)</p> <table border="1"> <tr> <td colspan="2">Automotive Spray Painting Operation, < 5.0 MMBtu/hr (also applies to operations without a heat source)</td> </tr> <tr> <td>VOC</td> <td>1. HVLP spray guns, coatings, cleaning materials, and solvents compliant with District Rule 4612 (Achieved in Practice) 2. VOC capture and control system (Technologically Feasible)</td> </tr> <tr> <td>NOx</td> <td>Natural gas or LPG fired burner</td> </tr> <tr> <td>SOx</td> <td>No standard</td> </tr> <tr> <td>PM10</td> <td>Spray booth with exhaust filters; 95% control efficiency</td> </tr> <tr> <td>PM2.5</td> <td>No standard</td> </tr> <tr> <td>CO</td> <td>No standard</td> </tr> </table> <p>T-BACT There are no T-BACT standards published in the clearinghouse for this category.</p>	Automotive Spray Painting Operation, < 5.0 MMBtu/hr (also applies to operations without a heat source)		VOC	1. HVLP spray guns, coatings, cleaning materials, and solvents compliant with District Rule 4612 (Achieved in Practice) 2. VOC capture and control system (Technologically Feasible)	NOx	Natural gas or LPG fired burner	SOx	No standard	PM10	Spray booth with exhaust filters; 95% control efficiency	PM2.5	No standard	CO	No standard
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District/Agency	Best Available Control Technology (BACT)/Requirements																												
San Joaquin Valley APCD	<p>RULE REQUIREMENTS: <u>Rule 4612 – Motor Vehicle and Mobile Equipment Coating Operations</u> (Amended 10/21/2010)</p> <p>Coating Limits No person shall apply to any motor vehicle, mobile equipment, or associated parts and components, any coating with a VOC regulatory content, as calculated pursuant to Section 3.45.1, in excess of the applicable limits in Table 1, except as provided in Section 5.3.</p> <table border="1"> <thead> <tr> <th>Coating Category (SJVAPCD Rule 4612 Definition)</th> <th>VOC Regulatory Limit as Applied g/l (lbs/gal)</th> </tr> </thead> <tbody> <tr> <td>Adhesion Promoter</td> <td>540 (4.5)</td> </tr> <tr> <td>Clear Coating</td> <td>250 (2.1)</td> </tr> <tr> <td>Color Coating</td> <td>420 (3.5)</td> </tr> <tr> <td>Multi-Color Coating</td> <td>680 (5.7)</td> </tr> <tr> <td>Pretreatment Coating</td> <td>660 (5.5)</td> </tr> <tr> <td>Primer</td> <td>250 (2.1)</td> </tr> <tr> <td>Primer Sealer</td> <td>250 (2.1)</td> </tr> <tr> <td>Single-Stage Coating</td> <td>340 (2.8)</td> </tr> <tr> <td>Temporary Protective Coating</td> <td>60 (0.5)</td> </tr> <tr> <td>Truck Bed Liner Coating</td> <td>310 (2.6)</td> </tr> <tr> <td>Underbody Coating</td> <td>430 (3.6)</td> </tr> <tr> <td>Uniform Finish Coating</td> <td>540 (4.5)</td> </tr> <tr> <td>Any Other Coating Type</td> <td>250 (2.1)</td> </tr> </tbody> </table> <p>Most Restrictive VOC Limit If anywhere on the container of any automotive coating, or any label or sticker affixed to the container, or in any sales, advertising, or technical literature, any representation is made that indicates that the coating meets the definition of or is recommended for use for more than one of the coating categories listed in Coating Limits table, then the lowest applicable VOC content limit in the Coating Limits Table shall apply.</p> <p>VOC Emission Control System In lieu of complying with the applicable requirements of Section 5.1, 5.7, or 5.8, a person may use a VOC emission control system that meets all of the following requirements:</p> <ol style="list-style-type: none"> <li>1. The VOC emission control system shall be approved, in writing, by the APCO. <li>2. The VOC emission control system shall achieve an overall capture and control efficiency of at least 85% by weight. 	Coating Category (SJVAPCD Rule 4612 Definition)	VOC Regulatory Limit as Applied g/l (lbs/gal)	Adhesion Promoter	540 (4.5)	Clear Coating	250 (2.1)	Color Coating	420 (3.5)	Multi-Color Coating	680 (5.7)	Pretreatment Coating	660 (5.5)	Primer	250 (2.1)	Primer Sealer	250 (2.1)	Single-Stage Coating	340 (2.8)	Temporary Protective Coating	60 (0.5)	Truck Bed Liner Coating	310 (2.6)	Underbody Coating	430 (3.6)	Uniform Finish Coating	540 (4.5)	Any Other Coating Type	250 (2.1)
	Coating Category (SJVAPCD Rule 4612 Definition)	VOC Regulatory Limit as Applied g/l (lbs/gal)																											
	Adhesion Promoter	540 (4.5)																											
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	Any Other Coating Type	250 (2.1)																											

District/Agency	Best Available Control Technology (BACT)/Requirements
San Joaquin Valley APCD	<p>3. In no case shall compliance through the use of a VOC emission control system result in a VOC emissions in excess of the VOC emissions which would result from compliance with applicable requirements of Section 5.1, 5.7, or 5.8.</p> <p>Coating Application Methods Except for underbody coatings, graphic arts operations, truck bed liner coatings, or any coating use of less than one (1.0) fluid ounce (29.6 milliliters), no person shall apply any coating to any motor vehicle, mobile equipment, or associated parts and components unless one of the following application methods is used:</p> <ol style="list-style-type: none"> 1. Brush, dip, or roller; 2. Electrostatic spray 3. High-volume low-pressure (HVLP) spray equipment <ol style="list-style-type: none"> A. HVLP spray equipment shall be operated in accordance with the manufacturer's recommendations B. A person shall not sell or offer for sale for use within the SJVAB any HVLP spray gun without a permanent marking denoting the maximum inlet air pressure in psig at which the gun will operate within the parameters specified in Section 3.0. 4. Use of a spray gun not permanently marked HVLP. If a spray gun is used, the operator must demonstrate that the gun meets the HVLP definition in Section 3.21 in design and use. A satisfactory demonstration must be based on the manufacturer's published technical material on the design of the gun and by a demonstration of the operation of the gun using an air pressure tip gauge designed specifically for the gun in use. 5. Any other coating application method that is capable of achieving at least 65 percent transfer efficiency, as determined per Section 6.8.8. Written approval from the APCO shall be obtained for each alternative method prior to use. 6. In lieu of complying with the applicable provisions of Sections 5.7.1 through 5.7.5, an operator may control VOC emissions from coating application with a VOC emission control system that meets the requirements of Section 5.3 around the coating operation. <p>Organic Solvent Cleaning Requirements For solvent cleaning operations other than for bug and tar removal, a person shall not use solvents that have VOC content greater than 25 grams VOC per liter of cleaning material, as calculated using the equation listed in Section 3.45.3.</p> <p>For bug and tar removal, a person shall not use any material other than bug and tar remover regulated under Consumer Products Regulation (California Code of Regulations Section 94507 et seq.).</p> <p>In lieu of complying with Sections 5.8.1 and 5.8.2, a person may control VOC emissions from solvent cleaning with an APCO-approved VOC emission control system for the solvent cleaning operation that meets the requirements of Section 5.3.</p>

The following control technologies have been identified and are ranked based on stringency. The VOC emissions from use of coatings and solvents were split into two categories, with-out add-on controls and with add-on controls. For the add-on controls category, the annual usage trigger levels were left off due to the variability in different districts cost effectiveness threshold levels for which the add-on control devices were required. In this case, the overall capture and control efficiency of the add-on control devices was compared for stringency.

SUMMARY OF ACHIEVED IN PRACTICE CONTROL TECHNOLOGIES	
VOC	<p><u>VOCs from Coating Operation and booths without add-on controls</u></p> <ol style="list-style-type: none"> 1. <u>4,700 lb VOC/year limit</u>, compliance with SMAQMD Rule 459 limits for all booth types. [SMAQMD] 2. <u>< 8,004 lb VOC/year</u> and compliance with SCAQMD Regulation XI, Rule 1151 and 1171 for Down-Draft Booths [SCAQMD] 3. <u>< 10,403 lb VOC/year</u> and compliance with Rule 67.20.1, Motor Vehicle and Mobile Equipment Refinishing Operations [SDAPCD] 4. <u>< 14,040 lb VOC/year</u> and compliance with SCAQMD Regulation XI, Rule 1151 and 1171 for Non-Down-Draft Booths [SCAQMD] 5. <u>< 14,600 lb VOC/year</u> and compliance with Reg. 8, Rule 45 [BAAQMD] 6. High-volume low-pressure (HVLP) spray guns, coatings, cleaning materials, and solvents compliant with District Rule 4612 [SJVAPCD] 7. <u>< 29,000 lb VOC/year (14.5 tons/year)</u> and max coating VOC content of 4.8 lb/gal coating [US EPA, RBLC ID: OH-0309] <p><u>VOCs from Coating Operation and booths with add-on controls</u></p> <ol style="list-style-type: none"> 1. Coatings with VOC content and transfer efficiency complying with Reg. 8, Rule 45, and emission controlled to overall capture/destruction efficiency $\geq 90\%$ by weight [BAAQMD, SMAQMD] 2a. Compliance with applicable AQMD Regulation XI Rules, and VOC control system with $\geq 90\%$ collection efficiency and $\geq 95\%$ destruction efficiency; OR [SCAQMD] 2b. Use of Super Compliant Materials (<5% VOC by weight); OR [SCAQMD] 2c. Use of low-VOC materials resulting in an equivalent emission reduction [SCAQMD] 3. High-volume low-pressure (HVLP) spray guns, coatings, cleaning materials, and solvents compliant with District Rule 4612 [SJVAPCD] 4. Compliance with Rule 67.20.1, Motor Vehicle and Mobile Equipment Refinishing Operations [SDAPCD] 5. 14.5 tons/year, 4.8 lb/gal coating [US EPA, RBLC ID: OH-0309] <p><u>VOCs from fuel combustion in Heaters</u></p> <ol style="list-style-type: none"> 1. Natural gas or LPG fired burner [SMAQMD] 2. No Standard – [SCAQMD, SDCAPCD, BAAQMD, SJVAPCD]
NOx	<ol style="list-style-type: none"> 1. For heaters, low NOx burner, 30 ppmvd @ 3% O₂ or 0.036 lb/MMBtu/hr, natural gas or LPG fired burner [SMAQMD, SCAQMD Rule 1147] 2. Natural gas or LPG fired burner [SJVAPCD] 3. No Standard – [SDCAPCD, BAAQMD]
SOx	<ol style="list-style-type: none"> 1. For heaters, natural gas or LPG fired burner [SMAQMD, SCAQMD] 2. No Standard – [SDCAPCD, BAAQMD, SJVAPCD]
PM10	<p><u>PM10 from Coating Operations</u></p> <ol style="list-style-type: none"> 1. 98% control efficiency, 0.0015 gr/dcsf. HVLP spray equipment or equivalent application equipment. [SMAQMD] 2. Dry filtration, 98% efficiency, 0.62 tons/year, 0.0015 gr/dcsf [US EPA, RBLC ID: OH-0309] 3. Spray booth with exhaust filters; 95% control efficiency [SJVAPCD] 4. Dry filters or waterwash, properly maintained [BAAQMD] 5. Dry filters or waterwash [SCAQMD] 6. Spray booth equipped with overspray filters [SDAPCD] <p><u>PM10 from fuel combustion in Heaters</u></p> <ol style="list-style-type: none"> 1. Natural gas or LPG fired burner [SMAQMD, SCAQMD] 2. No Standard – [SDCAPCD, BAAQMD, SJVAPCD]

SUMMARY OF ACHIEVED IN PRACTICE CONTROL TECHNOLOGIES	
PM2.5	<p><u>PM10 from Coating Operations</u></p> <ol style="list-style-type: none"> 98% control efficiency, 0.0015 gr/dcsf. HVLP spray equipment or equivalent application equipment. [SMAQMD] Spray booth equipped with overspray filters [SDAPCD] No Standard – [SCAQMD, BAAQMD, SJVAPCD] <p><u>PM2.5 from fuel combustion in Heaters</u></p> <ol style="list-style-type: none"> For heaters, natural gas or LPG fired burner [SMAQMD, SCAQMD] No Standard – [SDCAPCD, BAAQMD, SJVAPCD]
CO	<ol style="list-style-type: none"> For heaters, natural gas or LPG fired burner [SMAQMD] No Standard – [SCAQMD, SDCAPCD, BAAQMD, SJVAPCD]
NPOC	<p><u>For booths with < 14,600 lbs/year (average of <40 lbs/day VOC emissions [BAAQMD]</u></p> <ol style="list-style-type: none"> Compliance with Reg. 8, Rule 45 [BAAQMD] <p><u>For booths with ≥ 14,600 lbs/year (average of ≥ 40 lb/day) VOC emissions [BAAQMD]</u></p> <ol style="list-style-type: none"> Coatings with VOC content and transfer efficiency complying with Reg. 8, Rule 45, and emission controlled to overall capture/destruction efficiency ≥ 90% by weight [BAAQMD]
HAP/VHAP (T-BACT) (A)	<p><u>For booths with < 14,600 lbs/year (average of < 40 lbs/day VOC emissions [BAAQMD]</u></p> <ol style="list-style-type: none"> Spray booth with filter system, 98% PM10 control efficiency, HVLP spray equipment or equivalent technology, coatings with VOC content and transfer efficiency complying with BAAQMD Reg. 8, Rule 45. Overall capture/destruction efficiency ≥ 90% by weight. [SMAQMD] Compliance with Reg. 8, Rule 45 [BAAQMD] Spray booth with filter system, 98% capture efficiency, HVLVP spray equipment or equivalent technology [US EPA, 40 CFR 63 Subpart HHHHH] <p><u>For booths with ≥ 14,600 lbs/year (average of ≥ 40 lbs/day VOC emissions [BAAQMD]</u></p> <ol style="list-style-type: none"> Spray booth with filter system, 98% PM10 control efficiency, HVLP spray equipment or equivalent technology, coatings with VOC content and transfer efficiency complying with BAAQMD Reg. 8, Rule 45. Overall capture/destruction efficiency ≥ 90% by weight. [SMAQMD] Coatings with VOC content and transfer efficiency complying with Reg. 8, Rule 45, and emission controlled to overall capture/destruction efficiency ≥ 90% by weight [BAAQMD] Spray booth with filter system, 98% capture efficiency, HVLVP Spray equipment or equivalent technology [US EPA, 40 CFR 63 Subpart HHHHH]

(A) Since toxics are in the form of VOCs, T-BACT includes BACT requirements for VOCs.

The following control technologies have been identified as the most stringent, achieved in practice control technologies:

BEST CONTROL TECHNOLOGIES ACHIEVED		
Pollutant	Standard	Source
VOC	<u>For booths with ≤ 4,700 lbs/year VOC Emissions</u> 1. 4,700 lb VOC/year limit 2. Compliance with SMAQMD Rule 459. 3. For heaters, use of natural gas or LPG fired burner	SMAQMD
	<u>For booths with > 4,700 lbs/year VOC Emissions</u> 1. Coatings with VOC content and transfer efficiency complying with Reg. 8, Rule 45, and emission controlled to overall capture/destruction efficiency ≥ 90% by weight 2. For heaters, use of natural gas or LPG fired burner	BAAQMD SMAQMD
NOx	1. For heaters, low NOx burner, 30 ppmvd @ 3% O2 or 0.036 lb/MMBtu/hr 2. Natural gas or LPG fired burner	SMAQMD SCAQMD SJVAPCD
SOx	For heaters, natural gas or LPG fired burner	SMAQMD SCAQMD
PM10	1. Spray booth with dry filters or waterwash, properly maintained, 98% PM control efficiency, 0.0015 gr/dcsf 2. HVLP spray or equivalent application equipment 3. For heaters, natural gas or LPG fired burner	US EPA, RBLC ID: OH-0309 SMAQMD SCAQMD SDAPCD BAAQMD SJVAPCD
PM2.5	1. Spray booth dry filters or waterwash, properly maintained, 98% PM control efficiency, 0.0015 gr/dcsf 2. HVLP spray or equivalent application equipment 3. For heaters, natural gas or LPG fired burner	US EPA, RBLC ID: OH-0309 SMAQMD SCAQMD SDAPCD BAAQMD SJVAPCD
CO	For heaters, natural gas or LPG fired burner	SMAQMD
HAP/VHAP (T-BACT) (A)	1. Spray booth with filter system, 98% PM control efficiency for PM, HVLP spray equipment or equivalent technology 2. Coatings with VOC content compliant with BAAQMD Reg. 8, Rule 45 and transfer efficiency complying with Reg. 8, Rule 45 3. VOC emission controlled to overall capture/destruction efficiency ≥ 90% by weight	US EPA (40 CFR 63 Subpart HHHHH) BAAQMD SMAQMD

(A) Since toxics are in the form of VOCs, T-BACT includes BACT requirements for VOCs.

B. TECHNOLOGICALLY FEASIBLE AND COST EFFECTIVE (Rule 202, §205.1.b.):

Technologically Feasible Alternatives:

Any alternative basic equipment, fuel, process, emission control device or technique, singly or in combination, determined to be technologically feasible by the Air Pollution Control Officer.

The table below shows the technologically feasible alternatives identified as capable of reducing emissions beyond the levels determined to be “Achieved in Practice” as per Rule 202, §205.1.a.

Pollutant	Technologically Feasible Alternative
VOC	1. Carbon Adsorber 2. Thermal Oxidizer
NOx	No other technologically feasible option identified
SOx	No other technologically feasible option identified
PM10	No other technologically feasible option identified
PM2.5	No other technologically feasible option identified
CO	No other technologically feasible option identified

Cost Effective Determination:

After identifying the technologically feasible control options, a cost analysis is performed to take into consideration economic impacts for all technologically feasible controls identified.

Maximum Cost per Ton of Air Pollutants Controlled

1. A control technology is considered to be cost-effective if the cost of controlling one ton of that air pollutant is less than the limits specified below:

<u>Pollutant</u>	<u>Maximum Cost (\$/ton)</u>
VOC	17,500
NO _x	24,500
PM10	11,400
SO _x	18,300
CO	TBD if BACT triggered

Cost Effectiveness Analysis Summary

A previous cost effectiveness analysis determined that 4,700 lb VOC/year was the highest allowable uncontrolled emission rate that did not require any add-on control devices. The EPA has updated the cost manual for incinerators/oxidizers in 11/2017 and carbon adsorbers in 10/2018. Therefore, this BACT determination will revisit this limit in accordance with the updated EPA OAQPS Air Pollution Control Cost Manual. The electricity (13.80 cents/kWh) and natural gas (8.04 dollars/1,000 cubic feet) rates were based on a commercial application as approved by the District. The life of the equipment was based on the EPA cost manual recommendation. The interest rate was based on the previous 6-month average interest rate on United States Treasury Securities (based on the life of the equipment) and addition of two percentage points and rounding up to the next higher integer rate. The district has adopted a minimum 4% interest

rate due to the depression of the United States Treasury Securities caused by COVID-19. The labor (Occupation Code 51-8099: Plant and System Operators - Other) and maintenance (Occupation Code 49-2094: electrical and electronics commercial and industrial equipment repairers) rates were based on data from the Bureau of Labor Statistics.

Carbon Adsorber:

As shown in Attachment D, the cost effectiveness for the add on carbon adsorber system to control VOC was calculated to be **\$17,509.23/ton** (see attached Paint Spray Booth for Automotive Coating Cost Effectiveness Analysis). The following basic parameters were used in the analysis.

Equipment Life = 15 years

Total Capital Investment = \$307,618

Direct Annual Cost = \$13,549 per year

Indirect Annual Cost = \$46,994 per year

Total Annual Cost = \$58,344 per year

VOC Removed = 3 tons per year

Cost of VOC Removal = \$17,509.23 per ton reduced

A detailed calculation of the cost effectiveness for VOC removal with a carbon absorber is shown in Attachment D. Uncontrolled VOC emissions of 7,405 lb/year or greater is the cost-effective threshold for control equipment using carbon absorption control technology.

Thermal Oxidizer:

Equipment Life = 20 years

Direct Cost = \$193,478

Direct Annual Cost = \$72,648 per year

Indirect Annual Cost = \$133,973 per year

Total Annual Cost = \$206,621 per year

VOC Removed = 10.9 tons per year

Cost of VOC Removal = \$18,961 per ton reduced

A detailed calculation of the cost effectiveness for VOC removal with a thermal oxidizer is shown in Attachment D. Uncontrolled VOC emissions of 22,014 lb/year or greater is the cost-effective threshold for control equipment using thermal oxidation control technology.

Conclusion: In this analysis, different emission operating levels are presented with the corresponding total cost per ton of VOC controlled using either a carbon adsorption control or a

thermal oxidizer. Uncontrolled VOC emission level of 7,405 lb per year or greater must be reached in order for the carbon adsorption control option to be cost effective. Uncontrolled VOC emission level of 22,014 lb per year or greater must be reached in order for a thermal oxidizer to be cost effective. The emissions levels for the cost effectiveness of controls is based on the District cost effective limit for VOC of \$17,500 per ton controlled.

With EPA's new cost data, the highest allowable uncontrolled emission rate to not require add-on control devices will be updated to 7,405 lb/year based on the cost of carbon adsorption.

C. SELECTION OF BACT:

Based on the review of SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD, CARB, and EPA BACT Clearinghouses and cost effectiveness determinations, BACT for VOC, NOx, SOx, PM10, PM2.5, and CO will be the following:

BACT For Paint Spray Booths for Automotive Refinishing (#252) ≤ 7,405 lbs VOC/year		
Pollutant	Standard	Source
VOC	1. Compliance with SMAQMD Rule 459 2. For heaters, use of natural gas or LPG fired burner	SMAQMD SCAQMD
NOx	1. For heaters, low NOx burner, 30 ppmvd @ 3% O2 or 0.036 lb/MMBtu/hr 2. Natural gas or LPG fired burner	SMAQMD SCAQMD SJVAPCD
SOx	For heaters, natural gas or LPG fired burner	SMAQMD
PM10	1. Spray booth with dry filters or waterwash, properly maintained, 98% PM control efficiency, 0.0015 gr/dcsf 2. HVLP spray or equivalent application equipment 3. For heaters, natural gas or LPG fired burner	US EPA, RBLC ID: OH-0309 SMAQMD SCAQMD SDAPCD BAAQMD SJVAPCD
PM2.5	1. Spray booth dry filters or waterwash, properly maintained, 98% PM control efficiency, 0.0015 gr/dcsf 2. HVLP spray or equivalent application equipment 3. For heaters, natural gas or LPG fired burner	US EPA, RBLC ID: OH-0309 SMAQMD SCAQMD SDAPCD BAAQMD SJVAPCD
CO	For heaters, natural gas or LPG fired burner	SMAQMD

T-BACT Paint Spray Booths for Automotive Refinishing (#252) ≤ 7,405 lbs VOC/year		
Pollutant	Standard	Source
Organic HAP (T-BACT)	<ol style="list-style-type: none"> 1. Spray booth with filter system, 98% PM control efficiency, HVLP spray equipment or equivalent technology 2. Coatings with VOC content compliant with BAAQMD Reg. 8, Rule 45 and transfer efficiency complying with Reg. 8, Rule 45 3. VOC emission controlled to overall capture/destruction efficiency ≥ 90% by weight 	US EPA (40 CFR 63 Subpart HHHHH) BAAQMD SMAQMD

BACT For Paint Spray Booths for Automotive Refinishing (#253) > 7,405 lb VOC/year		
Pollutant	Standard	Source
VOC	<ol style="list-style-type: none"> 1. Coatings with VOC content and transfer efficiency complying with Reg. 8, Rule 45, and emission controlled to overall capture/destruction efficiency ≥ 90% by weight 2. For heaters, use of natural gas or LPG fired burner 	SMAQMD BAAQMD
NOx	<ol style="list-style-type: none"> 1. For heaters, low NOx burner, 30 ppmvd @ 3% O2 or 0.036 lb/MMBtu/hr 2. Natural gas or LPG fired burner 	SMAQMD SCAQMD SJVAPCD
SOx	For heaters, natural gas or LPG fired burner	SMAQMD
PM10	<ol style="list-style-type: none"> 1. Spray booth with dry filters or waterwash, properly maintained, 98% PM control efficiency, 0.0015 gr/dcsf 2. HVLP spray or equivalent application equipment 3. For heaters, natural gas or LPG fired burner 	US EPA, RBLC ID: OH-0309 SMAQMD SCAQMD SDAPCD BAAQMD SJVAPCD
PM2.5	<ol style="list-style-type: none"> 1. Spray booth with dry filters or waterwash, properly maintained, 98% PM control efficiency, 0.0015 gr/dcsf 2. HVLP spray or equivalent application equipment 3. For heaters, natural gas or LPG fired burner 	US EPA, RBLC ID: OH-0309 SMAQMD SCAQMD SDAPCD BAAQMD SJVAPCD
CO	For heaters, natural gas or LPG fired burner	SMAQMD

T-BACT For Paint Spray Booths for Automotive Refinishing (#253) > 7,405 lb VOC/year		
Pollutant	Standard	Source
Organic HAP (T-BACT)	1. Spray booth with filter system, 98% PM control efficiency, HVLP spray equipment or equivalent technology 2. Coatings with VOC content compliant with BAAQMD Reg. 8, Rule 45 and transfer efficiency complying with Reg. 8, Rule 45 3. VOC emission controlled to overall capture/destruction efficiency $\geq 90\%$ by weight	US EPA (40 CFR 63 Subpart HHHHH) BAAQMD

APPROVED BY: *Brian F Krebs* DATE: 04-07-2021

Attachment A

Review of BACT Determinations published by EPA

List of BACT determinations published in EPA's RACT/BACT/LAER Clearinghouse (RBLC) for Automotive Refinishing:

RBLC	Permit Date	Process Code ^(A)	Process/Equipment	Pollutant	Standard	Control Technology	Case-By-Case Basis
OH-0309	05/03/2007	41.003	Automotive Off-Line Repair Booth with Dry Filtration and Indirect Fired 5 MMBtu/hr Natural Gas Fired Infrared Oven	PM10 (filterable)	0.62 tons/year per rolling month, 0.0015 gr/dscf	Dry Filtration, 98% efficiency	BACT-PSD
				PM	2.4 tons/year, 0.5510 lb/hr	Dry Filtration, 98% efficiency	BACT-PSD
				Visible Emissions (VE)	5% Opacity as a 6-minute average	Dry Filtration	BACT-PSD
				VOC	14.5 tons/year, 4.8 lb/gal coat - Exempt lb/gal coat excluding 2ater & exempt solvents	VOC content shall be maintained as a monthly maximum for all coating repair operations or as a daily volume weighted average of the materials used	LAER/MACT

(A) Process Code 41.003 includes automotive refinishing.

= Selected as the most stringent BACT determination achieved in practice.

Attachment B

Review of BACT Determinations published by ARB

List of BACT determinations published in ARB's BACT Clearinghouse for spray booths that were used for automotive coatings:

Capacity	Source	Date	NOx	VOC	CO	PM10
16' x 30' x 17'	SMAQMD	7/25/2005		4,700 lb/year, low VOC coatings		
16'4"W x 12'2"L x 10'8"H	SCAQMD	07/01/1999		15 lb VOC/day, dry filters		

= Selected as the most stringent BACT determination achieved in practice.

Attachment C

BACT Determinations from Air Districts

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guidelines for Non-Major Polluting Facilities*

10-20-2000 Rev. 0
 2-2-2018 Rev. 1
 2-1-2019 Rev 2

Equipment or Process: Dryer or Oven

Subcategory/ Rating/Size	Criteria Pollutants					Inorganic
	VOC	NOx	SOx	CO	PM ₁₀	
Carpet Oven		30 ppm Compliance with Rule 1147 (2-1-2019)	Natural Gas (1990)		Natural Gas (1990)	
Rotary, Spray and Flash Dryers ¹⁾		Compliance with Rule 1147 (2-1-2019)	Natural Gas (1990)		Natural Gas with Baghouse (1990)	
Tray, Agitated Pan, and Rotary Vacuum Dryers		Compliance with Rule 1147 (2-1-2019)	Natural Gas (1990)		Natural Gas (1990)	
Tenter Frame Fabric Dryer		30 ppm Compliance with Rule 1147 (2-1-2019)	Natural Gas (10-20-2000)		Natural Gas (10-20-2000)	
Other Dryers and Ovens – Direct and Indirect		30 ppmvd corrected to 3% O ₂ (04-10-98)	Natural Gas (10-20-2000)		Natural Gas (10-20-2000)	

* Means those facilities that are not major polluting facilities as defined by Rule 1302 - Definitions

**SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guidelines for Non-Major Polluting Facilities***

10-20-2000 Rev. 0
2-1-2019 Rev 1

Equipment or Process: Spray Booth

Subcategory/ Rating/Size	Criteria Pollutants					Inorganic
	VOC	NOx	SOx	CO	PM ₁₀	
Automotive, Down-Draft Type, < 667 Lbs/Month of VOC Emissions (2-1-2019)	Compliance with Applicable SCAQMD Regulation XI Rules (10-20-2000)				Dry Filters or Waterwash (1990)	
Other Types, < 1170 Lbs/Month of VOC Emissions	Compliance with Applicable SCAQMD Regulation XI Rules (10-20-2000)				Same as Above (1990)	
Automotive, Down-Draft Type, ≥ 22 Lbs/Day of VOC Emissions	- Compliance with Applicable SCAQMD Regulation XI Rules, and VOC Control System with ≥ 90% Collection Efficiency and ≥ 95% Destruction Efficiency, or - Use of Super Compliant Materials (< 5% VOC by weight); or - Use of Low-VOC Materials Resulting in an Equivalent Emission Reduction (10-20-2000)				Same as Above (1990)	
Other Types, ≥ 1170 Lbs/Month of VOC Emissions	Same as Above (10-20-2000)				Same as Above (1990)	

Note: The sum of all VOC emissions from all spray booths within the same subcategory applied for in the previous two years at the same facility are considered toward the emission threshold.

* Means those facilities that are not major polluting facilities as defined by Rule 1302 - Definitions

AUTOMOTIVE REFINISHING OPERATIONS (<5 gal/day)

Fee Schedule 27R

Review the BACT Control Option listed below. The applicant must propose the Control Option listed or perform a Top-down BACT Analysis as described in Section 4 to justify the selection of another Control Option. The applicant will be required to provide documentation that the Control Option selected meets the requirements listed in the table.

	VOC	NO_x	SO_x	PM
BACT Emission Rate Limit	Not Determined	(N/A)	(N/A)	Not Determined
BACT Control Option	Compliance with Rule 67.20.1, Motor Vehicle and Mobile Equipment Refinishing Operations (A/P)	(N/A)	(N/A)	Spray booth equipped with overspray filters. (A/P)

The applicant may choose to limit the Potential to Emit (PTE) from the equipment to less than 10 pounds per day for each pollutant in lieu of meeting the stated BACT requirement.

(This table does not apply to operations applying, on average, 5 or more gallons of coating per day.)

AUTOMOTIVE REFINISHING OPERATIONS

Fee Schedule 27S

The BACT Control Options which have been determined to be technologically feasible (T/F - demonstrated but not necessarily proven in field application) or have achieved the BACT emission rate limits in practice (A/P - demonstrated in use for the specific equipment category) are listed below. The BACT Control Options are listed in descending order of control stringency. If the top-listed T/F control option is proposed, no further analysis is required. If the first T/F control option is not chosen, then the applicant must review and determine the cost-effectiveness of each T/F control option in the order listed. The first control option determined to be cost-effective must be installed to meet the BACT requirement. A control option is considered cost-effective if the annualized cost of implementing that control option is equal to or less than the reference cost-effectiveness value for the same pollutant shown in Table 2-4. If none of the T/F control options are determined to be cost-effective, the applicant must propose the A/P control option, propose an alternative technology that meets the BACT emission rate limit or perform a full Top-down BACT Analysis as described in Section 4. The applicant is responsible for ensuring that the installed equipment meets the specified BACT Emission Rate Limit. (See Section 2 for further guidance.)

	VOC	NOx	SOx	PM
BACT Control Option	Collection System Vented to Carbon Adsorber or Afterburner with coatings complying with Rule 67.20.1, Motor Vehicle and Mobile Equipment Refinishing Operations (T/F) BACT Emission Rate Limit - emissions controlled to overall capture/ destruction efficiency $\geq 90\%$ by weight	(N/A)	(N/A)	Spray booth equipped with overspray filters. (A/P)
BACT Control Option	Compliance with Rule 67.20.1, Motor Vehicle and Mobile Equipment Refinishing Operations (A/P)	(N/A)	(N/A)	Spray booth equipped with overspray filters. (A/P)

The applicant may choose to limit the Potential to Emit (PTE) from the equipment to less than 10 pounds per day for each pollutant in lieu of meeting the stated BACT requirement.
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BAY AREA AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guideline

Source Category

Source:	<i>Spray Booth - Coating of Motor Vehicle and Mobile Equipment, Rework or Bodyshop</i>	Revision:	2
		Document #:	161.3.1
Class:	<i><40 lb/day Emissions (Uncontrolled)</i>	Date:	12/16/91

Determination

POLLUTANT	BACT	TYPICAL TECHNOLOGY
	<ol style="list-style-type: none"> 1. Technologically Feasible/ Cost Effective 2. Achieved in Practice 	
POC	<ol style="list-style-type: none"> 1. Coating w/ VOC content and transfer efficiency complying w/ Reg. 8, Rule 45, and emissions controlled to overall capture/ destruction efficiency $\geq 90\%$^{a,b,T} 2. Compliance w/ Reg. 8, Rule 45^{a,T} 	<ol style="list-style-type: none"> 1. Collection System Vented to Carbon Adsorber System or thermal Oxidizer^{a,b,T} 2. Complying Coatings and Coating Equipment (HVLP or Electrostatic or other BAAQMD approved applicator)^{a,T}
NOx	<ol style="list-style-type: none"> 1. n/a 2. n/a 	<ol style="list-style-type: none"> 1. n/a 2. n/a
SO₂	<ol style="list-style-type: none"> 1. n/a 2. n/a 	<ol style="list-style-type: none"> 1. n/a 2. n/a
CO	<ol style="list-style-type: none"> 1. n/a 2. n/a 	<ol style="list-style-type: none"> 1. n/a 2. n/a
PM₁₀	<ol style="list-style-type: none"> 1. n/d 2. n/s 	<ol style="list-style-type: none"> 1. n/d 2. Dry Filters or Waterwash, Properly Maintained^a
NPOC	<ol style="list-style-type: none"> 1. Coating w/ solvent content and transfer efficiency complying w/ Reg. 8, Rule 45, and emissions controlled to overall capture/ destruction efficiency $\geq 90\%$^{a,b,T} 2. Compliance w/ Reg. 8, Rule 45^{a,T} 	<ol style="list-style-type: none"> 1. Collection System Vented to Carbon Adsorber System^{a,T} 2. Complying Coatings and Coating Equipment (HVLP or Electrostatic or other BAAQMD approved applicator)^{a,T}

References

a. BAAQMD
b. Generally considered to be cost-effective if uncontrolled emissions ≥ 40 lb/day
T. TBACT

**BAY AREA AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guideline**

Source Category

Source:	<i>Spray Booth - Coating of Motor Vehicle and Mobile Equipment, Rework or Bodyshop</i>	Revision:	2
		Document #:	161.3.2
Class:	<i>≥40 lb/day Emissions (Uncontrolled)</i>	Date:	05/05/95

Determination

POLLUTANT	BACT 1. Technologically Feasible/ Cost Effective 2. Achieved in Practice	TYPICAL TECHNOLOGY
POC	1. Coating w/ VOC content less than and transfer efficiency greater than that required by Reg. 8, Rule 45, and emissions controlled to overall capture/destruction efficiency $\geq 90\%$ ^{a,T} 2. Coating w/ VOC content and transfer efficiency complying w/ Reg. 8, Rule 45, and emission controlled to overall capture/destruction efficiency $\geq 90\%$ ^{a,b,T}	1. Collection System Vented to Carbon Adsorption System or thermal Oxidizer ^{a,T} 2. Collection System Vented to Carbon Adsorption System or thermal Oxidizer ^{a,T}
NOx	1. n/a 2. n/a	1. n/a 2. n/a
SO ₂	1. n/a 2. n/a	1. n/a 2. n/a
CO	1. n/a 2. n/a	1. n/a 2. n/a
PM ₁₀	1. n/d 2. n/s	1. n/d 2. Dry Filters or Waterwash, Properly Maintained ^a
NPOC	1. Coating w/ VOC content and transfer efficiency complying w/ Reg. 8, Rule 45, and emissions controlled to overall capture/destruction efficiency $\geq 90\%$ ^{a,T} 2. n/d	1. Collection System Vented to Carbon Adsorption System ^{a,T} 2. n/d

References

a. BAAQMD

b. A/N 3856 (Note: POC BACT2 control is achieved in practice for auto coating, not for bus coating, 7/9/02 memo from B. Young to B. deBoisblanc).

SJVAPCD

[Back](#)

Best Available Control Technology (BACT) Guideline 4.2.1 Last Update: 3/23/2010

Automotive Spray Painting Operation, < 5.0 MMBtu/hr**

Pollutant	Achieved in Practice or in the SIP	Technologically Feasible	Alternate Basic Equipment
NOx	Natural gas or LPG fired burner		
PM10	Spray Booth with Exhaust Filters; 95% control efficiency		Other compliant coating methods as stated in Rule 4612
VOC	HVLP spray guns, coatings, cleaning materials, and solvents compliant with District Rule 4612	VOC capture and control system	Other compliant coating methods as stated in Rule 4612

*** This Determination is also applicable to automotive spray painting operations without a heat source*

BACT is the most stringent control technique for the emissions unit and class of source. Control techniques that are not achieved in practice or contained in a state implementation plan must be cost effective as well as feasible. Economic analysis to demonstrate cost effectiveness is required for all determinations that are not achieved in practice or contained in an EPA approved State Implementation Plan.

This is a Summary Page for this Class of Source. For background information, see Permit Specific BACT Determinations on [Details Page](#).

Attachment D

**Cost Effectiveness Determination for Carbon
Adsorption and Thermal Oxidizers**

COST EFFECTIVENESS ANALYSIS FOR CARBON ADSORPTION

Data Inputs

Select the type of carbon adsorber system:

Fixed-Bed Carbon Adsorber with Steam Regeneration

For fixed-bed carbon adsorbers, provide the following information:

Select the type of operation:

Continuous Operation

Select the type of material used to fabricate the carbon adsorber vessels:

Stainless Steel, 304

Select the orientation for the adsorber vessels:

Horizontal

Enter the design data for the proposed Fixed-Bed Carbon Adsorber with Steam Regeneration

Number of operating hours per year (Θ_s)	2,080 hours/year
Waste Gas Flow Rate (Q)	10,000 acfm (at atmospheric pressure and 77°F)
VOC Emission Rate (m_{voc})	3.560 lbs/hour
Required VOC removal efficiency (E)	90 percent
Superficial Bed Velocity (v_b)	75.00 ft/min
Estimated equipment life of adsorber vessels and auxiliary Equipment (n)	15 Years*
Estimated Carbon life (n)	5 Years
Total Number of carbon beds (N_{total})	3 Beds*
Number of carbon beds adsorbing VOC when system is operating (N_d)	2 Beds*
Total time for adsorption (Θ_A)	12 hours*
Total time for desorption (Θ_D)	5 hours*
Estimated Carbon Replacement Rate (CRR)	379 lbs./hour*

* 15 years is a default equipment life. User should enter actual value, if known.

* 3 beds is the default. User should enter actual number of beds, if known.

* 2 beds is the default. User should enter actual number of beds, if known.

* 12 hours is a default value. User should enter actual value, if known.

* 5 hours is a default value. User should enter actual value, if known.

* 379 lbs./hour is a default value. User should enter actual value, if known.

Enter the Characteristics of the VOC/HAP:

Name of VOC/HAP	Toluene
Partial Pressure of Toluene in waste gas stream	0.0104 psia
Parameter "k" for Toluene	0.551 Note:
Parameter "m" for Toluene	0.110

Typical values of "k" and "m" for some common VOCs are shown in Table A.

Enter the cost data for the carbon adsorber:

Desired dollar-year	2020
CEPCI* for 2020	567.5 CEPCI value for 2020
Annual Interest Rate (i)	4 percent (Current bank prime rate)

* CEPCI is the Chemical Engineering Plant Cost Index. The use of CEPCI in this spreadsheet is not an endorsement of the index for purpose of cost escalation or de-escalation, but is there merely to allow for availability of a well-known cost index to spreadsheet users. Use of other well-known cost indexes (e.g., M&S) is acceptable.

Electricity (P_{elec})	\$0.1380 per kWh	
Steam (P_s)	\$5.00 per 1,000 lbs*	* \$5.00/1,000 lbs is a default value. User should enter actual value, if known.
Cooling Water (P_{cw})	\$3.55 per 1,000 gallons of water*	* \$3.55/1,000 gallons is a default value. User should enter actual value, if known.
Operator Labor Rate	\$27.48 per hour*	* \$27.48/hour is a default value. User should enter actual value, if known.
Maintenance Labor Rate	\$30.23 per hour*	* \$30.23/hour is a default value. User should enter actual value, if known. If the rate is not known, use 1.10 x operator labor rate.
Carbon Cost (CC)	\$4.20 per lb	* \$4.20/lb is a default value based on 2018 market price. User should enter actual value, if known.
Re-Sale Value of Recovered VOC (P_{voc})	\$0.33 per lb*	* \$0.33/lb is a default value for recovered toluene based on 2018 data. User should enter actual value of
Disposal/Treatment Cost for Recovered VOC (D_{voc})	\$0.00 per lb*	* \$0/lb is a default value for disposal and/or treatment of recovered VOC/HAP. User should enter actual value,

If known, enter any additional costs for site preparation and building construction/modification:

Site Preparation (SP) =	\$0	* Default value. User should enter actual value, if known.
Buildings (Bldg) =	\$0	* Default value. User should enter actual value, if known.
Equipment Costs for auxiliary equipment (e.g., ductwork, dampers, and stack) (EC_{aux}) =	\$32,000	* Default value. User should enter actual value, if known.
Contingency Factor (CF)	10.0 percent*	* 10 percent is a default value. The contingency factor should be between 5 and 15 percent.

Cost Estimate

Capital Costs

Estimated capital costs for a Fixed-Bed Carbon Adsorber with Steam Regeneration with the following characteristics:

VOC Controlled/Recovered = Toluene

Adsorber Vessel Orientation = Horizontal

Operating Schedule = Continuous Operation

Total Capital Investment (TCI) (in 2020 dollars)

Parameter	Equation	Cost
Costs for Each Carbon Adsorber Vessel (C_v) =	$271 \times F_m \times S^{0.778} =$	\$25,175
Total Cost for All Carbon Adsorber Vessels and Carbon (EC_{Adsorb}) =	$5.82 \times Q^{-0.133} \times [C_c + (N_A + N_D) \times C_v] =$	\$131,885
Auxiliary Equipment (EC_{aux}) =	(Based on design costs or estimated using methods provided in Section 2)	\$32,000
Total Purchased Equipment Costs for Carbon Adsorber (A) =	$= EC_{Adsorb} + EC_{aux} =$	\$163,885
Instrumentation =	$0.10 \times A =$	Included in A
Sales taxes =	$0.03 \times A =$	\$4,917
Freight =	$0.05 \times A =$	\$8,194
Total Purchased Equipment Costs (B) =		\$176,995

Direct Installation Costs (in 2020 dollars)

Parameter	Equation	Cost
Foundations and Supports =	$0.08 \times B =$	\$14,160
Handling and Erection =	$0.14 \times B =$	\$24,779
Electrical =	$0.04 \times B =$	\$7,080
Piping =	$0.02 \times B =$	\$3,540
Insulation =	$0.01 \times B =$	\$1,770
Painting =	$0.01 \times B =$	\$1,770
Site Preparation (SP) =		\$0
Buildings (Bldg) =		\$0
Total Direct Costs (DC) = $B + (0.3 \times B) + SP + Bldg =$		\$230,094

Total Indirect Installation Costs (in 2020 dollars)

Parameter	Equation	Cost
Engineering =	$0.10 \times B =$	\$17,700
Construction and field expenses =	$0.05 \times B =$	\$8,850
Contractor fees =	$0.10 \times B =$	\$17,700
Start-up =	$0.02 \times B =$	\$3,540
Performance test =	$0.01 \times B =$	\$1,770
Total Indirect Costs (IC) =		\$49,559
Contingency Cost (C) =	$CF(IC+DC)=$	\$27,965

Total Capital Investment (TCI) = $DC + IC + C = (1.28 \times B) + SP + Bldg. + C =$ **\$307,618** in 2020 dollars

Annual Costs

Direct Annual Costs

Parameter	Equation	Cost
Annual Electricity Cost =	$Q_{Elec} \times P_{elec} =$	\$738
Annual Steam Cost (C_s) =	$3.50 \times m_{voc} \times \Theta_s \times P_s =$	\$130
Annual Cooling Water Cost (C_{cs}) =	$3.43 \times C_s/P_s \times P_{wc} =$	\$316
Operating Labor Costs:	Operator = 0.5 hours/shift \times Labor Rate \times (Operating hours/8 hours/shift) Supervisor = 15% of Operator	\$3,572 \$536
Maintenance Costs:	Labor = 0.5 hours/shift \times Labor Rate \times (Operating Hours/8 hours/shift) Materials = 100% of maintenance labor	\$3,930 \$3,930
Carbon Replacement Costs:	Labor = $CRF_{carbon} \times (Labor Rate \times M_c)/CRR =$ Carbon = $CRF_{carbon} \times CC \times M_c \times 1.08 =$	\$7 \$392

Direct Annual Costs (DAC) = **\$13,549** in 2020 dollars

Indirect Annual Costs

Parameter	Equation	Cost
Overhead	= 60% of sum of operator, supervisor, maintenance labor Plus maintenance materials	\$7,181
Administrative Charges	= 2% of TCI	\$6,152
Property Taxes	= 1% of TCI	\$3,076
Insurance	= 1% of TCI	\$3,076
Capital Recovery	= $CRF_{Adsorber} \times (TCI - [(1.08 \times CC \times M_c) + (LR \times M_c / CRR)]) =$	\$27,508

Indirect Annual Costs (IAC) = **\$46,994** in 2020 dollars

Recovered Solvent Credit/Disposal Costs

Parameter	Equation	Cost
VOC Disposal/Treatment Costs ($Disposal_{cost}$)	= $m_{VOC} \times \theta_s \times D_{VOC} \times E =$	\$0

VOC Recovery Credit

Parameter	Equation	Cost
Annual Recovery Credit for Condensate (RC)	= $m_{VOC} \times \theta_s \times P_{VOC} \times E =$	\$2,199

Total Annual Cost (TAC) = **\$58,344** in 2020 dollars

Cost Effectiveness

Parameter	Equation	Cost
Total Annual Cost =	TAC =	\$58,344 per year in 2020 dollars
Annual Quantity of VOC Removed/Recovered =	$W_{VOC} = m_{VOC} \times \theta_s \times E =$	3 tons/year
Cost Effectiveness =	Total Annual Cost (TAC) / Annual Quantity of VOC Removed/Recovered =	\$17,509.23 per ton of pollutants removed/recovered in 2020 dollars

COST EFFECTIVENESS ANALYSIS FOR THERMAL INCINERATION

Data Inputs

Select the type of oxidizer

Regenerative Thermal Oxidizer ▼

RESET

Enter the following information for your emission source:

Composition of Inlet Gas Stream				
Pollutant Name	Concentration (ppmv)	Lower Explosive Limit (LEL) (ppmv)*	Heat of Combustion (Btu/scf)	Molecular Weight
Toluene	37	11,000	4,274	92.13

Note: The lower explosion limit (LEL), heat of combustion and molecular weight for some commonly used VOC/HAP are provided in the table below.

Enter the design data for the proposed oxidizer:

Number of operating hours/year

2,080 hours/year

Inlet volumetric flow rate (Q_{in}) at 77°F and 1 atm.

20,000 scfm*

Inlet volumetric flow rate (Q_{in}) (actual conditions)

20,900 acfm*

Pressure drop (ΔP)

19 inches of water

Motor/Fan Efficiency (ϵ)

60 percent*

Inlet Waste Gas Temperature (T_w)

77 °F

Operating Temperature (T_{ri})

1,900 °F

Destruction and Removal Efficiency (DRE)

99 percent*

Estimated Equipment Life

20 Years*

Heat Loss (η)

1 percent*

Percent Energy Recovery (HR) =

70 percent ▼

* 20,000 scfm is a default volumetric flow rate. User should enter actual value, if known.

* 20,900 acfm is a default volumetric flow rate. User should enter actual value, if known.

* 23 inches of water is the default pressure drop for thermal oxidizers; 19 inches of water is the default pressure drop for catalytic oxidizers. Enter actual value, if known.

* 60% is a default fan efficiency. User should enter actual value, if known.

* Note: Default value for T_{ri} is 2000°F for thermal regenerative oxidizers. Use actual value if known. T_{ri} for regenerative oxidizers typically between 1800 and 2000°F.

* 99 percent is a default control efficiency. User should enter actual value, if known.

* 20 years is the typical equipment life. User should enter actual value, if known.

* 1 percent is a default value for the heat loss. User should enter actual value, if known. Heat loss is typically between 0.2 and 1.5%.

Enter the cost data:

Desired dollar-year
 CEPCI* for 2020
 Annual Interest Rate (i)
 Electricity (Cost_{elect})
 Natural Gas Fuel Cost (Cost_{fuel})
 Operator Labor Rate
 Maintenance Labor rate
 Contingency Factor (CF)

2020			
541.7	Enter the CEPCI value for 2020	541.7	2016 CEPCI
4	Percent		
0.138	\$/kWh		
0.00804	\$/scf		
\$26.61	per hour		
\$27.40	per hour		
10.0	Percent		

* \$26.61 per hour is a default labor rate. User should enter actual value, if known.

* \$27.40 per hour is a default labor rate. User should enter actual value, if known.

* 10 percent is a default value for construction contingencies. User may enter values between 5 and 15 percent.

* CEPCI is the Chemical Engineering Plant Cost Escalation/De-escalation Index. The use of CEPCI in this spreadsheet is not an endorsement of the index for purposes of cost escalation or de-escalation, but is there merely to allow for availability of a well-known cost index to spreadsheet users. Use of other well-known cost indexes (e.g., M&S) is acceptable.

Cost Estimate

Direct Costs

Total Purchased equipment costs (in 2020 dollars)

Incinerator + auxiliary equipment ^a (A) =		
Equipment Costs (EC) for Regenerative Oxidizer	= $[2.664 \times 100,000 + (13.98 \times Q_{tot})] \times (2020 \text{ CEPI}/2016 \text{ CEPCI}) =$	\$546,548 in 2020 dollars
Instrumentation ^b =	$0.10 \times A =$	\$54,655
Sales taxes =	$0.03 \times A =$	\$16,396
Freight =	$0.05 \times A =$	\$27,327
Total Purchased equipment costs (B) =		\$644,926 in 2020 dollars

Footnotes

a - Auxiliary equipment includes equipment (e.g., duct work) normally not included with unit furnished by incinerator vendor.

b - Includes the instrumentation and controls furnished by the incinerator vendor.

Direct Installation Costs (in 2020 dollars)

Foundations and Supports =	$0.08 \times B =$	\$51,594
Handlong and Errection =	$0.14 \times B =$	\$90,290
Electrical =	$0.04 \times B =$	\$25,797
Piping =	$0.02 \times B =$	\$12,899
Insulation for Ductwork =	$0.01 \times B =$	\$6,449
Painting =	$0.01 \times B =$	\$6,449
Site Preparation (SP) =		\$0
Buildings (Bldg) =		\$0
Total Direct Installaton Costs =		\$193,478
Total Direct Costs (DC) =	Total Purchase Equipment Costs (B) + Total Direct Installation Costs =	\$838,404 in 2020 dollars

Total Indirect Installation Costs (in 2020 dollars)

Engineering =	$0.10 \times B =$	\$64,493
Construction and field expenses =	$0.05 \times B =$	\$32,246
Contractor fees =	$0.10 \times B =$	\$64,493
Start-up =	$0.02 \times B =$	\$12,899
Performance test =	$0.01 \times B =$	\$6,449
Total Indirect Costs (IC) =		\$180,579

Contingency Cost (C) =	$CF(IC+DC) =$	\$101,898
Total Capital Investment =	DC + IC + C =	\$1,120,882 in 2020 dollars

Direct Annual Costs

Annual Electricity Cost	= Fan Power Consumption × Operating Hours/year × Electricity Price =	\$22,227
Annual Fuel Costs for Natural Gas	= Cost _{fuel} × Fuel Usage Rate × 60 min/hr × Operating hours/year	\$39,319
Operating Labor	Operator = 0.5hours/shift × Labor Rate × (Operating hours/8 hours/shift)	\$3,459
	Supervisor = 15% of Operator	\$519
Maintenance Costs	Labor = 0.5 hours/shift × Labor Rate × (Operating Hours/8 hours/shift)	\$3,562
	Materials = 100% of maintenance labor	\$3,562

Direct Annual Costs (DC) = \$72,648 in 2020 dollars

Indirect Annual Costs

Overhead	= 60% of sum of operating, supervisor, maintenance labor and maintenance materials	\$6,661
Administrative Charges	= 2% of TCI	\$22,418
Property Taxes	= 1% of TCI	\$11,209
Insurance	= 1% of TCI	\$11,209
Capital Recovery	= CRF[TCI-1.08(cat. Cost)]	\$82,476

Indirect Annual Costs (IC) = \$133,973 in 2020 dollars

Total Annual Cost = DC + IC = \$206,621 in 2020 dollars

Cost Effectiveness

$$\text{Cost Effectiveness} = (\text{Total Annual Cost}) / (\text{Annual Quantity of VOC/HAP Pollutants Destroyed})$$

Total Annual Cost (TAC) =	\$206,621 per year in 2020 dollars
VOC/HAP Pollutants Destroyed =	10.9 tons/year
Cost Effectiveness =	\$18,961 per ton of pollutants removed in 2020 dollars