San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 4.3.8

Emission Unit: Metal Product Coating - Large Steel Structures, < 64 lb. VOC/day, Outdoor Coating Operation

Industry Type: Metal Products Coating

Last Update: 5/28/26

Pollutant	Achieved in Practice or contained in SIP	Technologically Feasible	Alternate Basic Equipment
VOC	Use of 2.3 lb.-VOC/gal (Single component Air-Dried Coating), 2.5 lb.-VOC/gal (General Coating Air-Dried Coating)	1. Total enclosure (100% capture efficiency), served by a Thermal incineration, Catalytic incineration, or Carbon adsorption, or 2. Open paint booth (65% capture efficiency), served by a Thermal incineration, Catalytic incineration, or Carbon adsorption.	
PM10	Use of HVLP, flow, roll, dip, brush, Electrostatic or continuous coating application equipment.	1. Enclose painting operation with dry filters and the use of HVLP application equipment, or 2. Electrodeposition coating application.	

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 - Permit Specific BACT Determinations on Next Page(s)**

Top-Down Best Available Control Technology (BACT) Analysis for NOx and VOC Emissions from the Outdoor, Unconfined, Coating of Large Metal Structures

BACT is triggered for PM and VOC emissions from the unconfined outdoor coating operation associated with this project. The District's BACT clearinghouse does not currently contain a valid, non-rescinded guideline applicable to the outdoor, unconfined, coating of large metal structures. Therefore, a project specific BACT analysis for this source category will be performed as part of this project.

1. Step 1 - Identify all control technologies

The following BACT clearinghouse references were reviewed to determine whether any guidelines that could potential apply to unconfined large metal structures coating operation have been required to employ controls:

- EPA RACT/BACT/LAER clearinghouse
- South Coast AQMD (SCAQMD) BACT clearinghouse
- Bay Area AQMD (BAAQMD) BACT clearinghouse
- Sacramento Metro AQMD (SMAQMD) BACT clearinghouse
- San Diego APCD (SDAPCD) BACT clearinghouse
- San Joaquin Valley APCD (SJVAPCD) BACT clearinghouse
- Santa Barbara County APCD (SBCAPCD) BACT clearinghouse
- The CARB BACT clearinghouse does not include general guidelines, only individual determinations made by individual air districts.

Summary of BACT Guidelines:
Of the Air Districts reviewed only SJVAPCD has a guideline that could be applicable to the type of equipment used (outdoor unconfined coating of large metal structures). As mentioned in this evaluation, the BACT Guideline 4.3.8 (Metal Product Coating - Large Steel Structures, < 64 lb. VOC/day, Outdoor Coating Operation) has been rescinded, but was active at the time of installation. Therefore, BACT Guideline 4.3.8 will be included in the BACT analysis, even though the District does not consider the rescinded BACT guideline to be an adequate representation on BACT available at that time.

Guideline	Equipment	Control Technology
SJVAPCD BACT Guideline 4.3.8	(Metal Product Coating - Large Steel Structures, < 64 lb. VOC/day, Outdoor Coating Operation)	**Achieved in Practice (AIP)** PM10: • HVLP Gun VOC:

Guideline	Equipment	Control Technology
		Use of coatings with a VOC content (less water and exempt compounds) as indicated, or lower: • General Coating: 2.5 lb./gal, • General Coating, when the ambient temperature is at or below 60 F: 2.8 lb./gal, • Specialty Coatings - Extreme Performance or High-Gloss** 3.5 lb./gal and use of an HVLP spray gun or equivalent application method. **Technologically Feasible (TF)** PM10: • Enclose painting operation with dry filters and the use of HVLP application equipment. • Electrostatic application VOC: • Thermal incineration and total enclosure (100% capture efficiency), or equal. • Catalytic incineration and total enclosure (100% capture efficiency), or equal. • Carbon adsorption and total enclosure (100% capture efficiency), or equal. • Thermal incineration and open paint booth (65% capture efficiency), or equal. • Catalytic incineration and open paint booth (65% capture efficiency), or equal. • Carbon adsorption and open paint booth (65% capture efficiency), or equal.

Additionally, the rules and regulations from the following agencies were searched to identify if the agencies currently had any regulations that could be applied to unconfined metal structures coating operation, that contained any emission limits that could be considered more stringent than the BACT guidelines previously discussed:

- South Coast AQMD (SCAQMD)
- Bay Area AQMD (BAAQMD)
- Sacramento Metro AQMD (SMAQMD)
- San Diego APCD (SDAPCD)
- Colusa County APCD (CCAPCD)

- Yolo-Solano AQMD (YSAQMD)
- Antelope Valley APCD (AVAPCD)
- East Kern APCD (EKAPSD)
- Buttle County AQMD (BCAQMD)

Summary of Applicable Rules:

Rule	Agency	Emissions Requirement
Rule 1107 - *Coating Of Metal Parts And Products*	AVAPCD	VOC: • 2.8 lb.-VOC/gal (General Air-Dried Coating) PM10: • Use of a HVLP gun, electrostatic, electrodeposition, flow, roll, dip, brush or other rule complaint application method.
Rule 4 - *General Solvent and Surface Coating Operations*	BAAQMD	VOC: • 3.5 lb. - VOC/gal (General Air-Dried Coating) PM10: • Use of a HVLP gun, electrostatic, electrodeposition, flow, roll, dip, brush or other rule complaint application method.
Rule 19 - *Surface Preparation and Coating of Miscellaneous Metal Parts and Products*		VOC: • 2.8 lb.-VOC/gal (General Air-Dried Coating) PM10: • Use of a HVLP gun, electrostatic, electrodeposition, flow, roll, dip, brush or other rule complaint application method.
Rule 1107 - *Coating of Metal Parts and Products*	SCAQMD	VOC: • 2.8 lb.-VOC/gal (Multiple component Air-Dried Coating) • 2.3 lb.-VOC/gal (Single component Air-Dried Coating) PM10: • Use of a HVLP gun, electrostatic, electrodeposition, flow, roll, dip, brush or other rule complaint application method.
Rule 451 - *Surface Coating of Miscellaneous Metal Parts and Products*	SMAQMD	VOC: • 2.8 lb.-VOC/gal (General Air-Dried Coating) PM10: • Use of a HVLP gun, electrostatic, electrodeposition, flow, roll, dip, brush or other rule complaint application method.

Rule 67.3 - *Metal Parts and Products Coating Operations*	SDAPCD	VOC: • 2.8 lb.-VOC/gal (General Air-Dried Coating) PM10: • Use of a HVLP gun, electrostatic, electrodeposition, flow, roll, dip, brush or other rule complaint application method.
Rule 410.4 - *Metal, Plastic, and Pleasure Craft Parts and Products Coating Operations*	EKAPCD	VOC: • 2.8 lb.-VOC/gal (Multiple component Air-Dried Coating) • 2.3 lb.-VOC/gal (Single component Air-Dried Coating) PM10: • Use of a HVLP gun, electrostatic, electrodeposition, flow, roll, dip, brush or other rule complaint application method.
Rule 2.25 - *Metal Parts and Products Coating Operations*	YSAQMD	VOC: • 2.8 lb.-VOC/gal (General Air-Dried Coating) PM10: • Use of a HVLP gun, electrostatic, electrodeposition, flow, roll, dip, brush or other rule complaint application method.
Rule 241 - *Metal Parts and Products Surface Coating*	BCAQMD	VOC: • 2.8 lb.-VOC/gal (General Air-Dried Coating) PM10: • Use of a HVLP gun, electrostatic, electrodeposition, flow, roll, dip, brush or other rule complaint application method.
Rule 236 - *Miscellaneous Metal Parts and Products Surface Coatings*	CCAPCD	VOC: • 2.8 lb.-VOC/gal (General Air-Dried Coating) PM10: • Use of a HVLP gun, electrostatic, electrodeposition, flow, roll, dip, brush or other rule complaint application method.

Survey of Permit Requirements for Outdoor Unconfined Coating of Large Metal Structures.

In order to evaluate what VOC and PM controls are currently being achieved by outdoor unconfined coating operations of large metal structures, permitted in the SJVAPCD, all permitted sources within the District were searched. The District has issued multiple outdoor unconfined coating of large metal structures, and as seen below, the permitted VOC and PM controls are more stringent, than what is being proposed in the present project. However, none of the more stringent operations permitted within the SJVAPCD were specifically for outdoor unconfined coating operations for metal structures of the same size as proposed (36 ft. x 90 ft. x6 ft.) The following permits were the most stringent comparable operation.

N-3780-1-1: OUTDOOR METAL PARTS COATING OPERATION

- This permit limits PM10 through the use of a HVLP, electrostatic, electrodeposition, flow, roll, dip, brush or continuous coating application equipment. The VOC emissions are controlled, by restricting the maximum VOC content of air-dried coatings (primers) as applied (excluding water and exempt compounds) to less than 2.8 lbs. VOC/gallon. However, this unit is used for the coating of metal parts and products. Therefore, the emissions produced do not represent the expected emissions from the unconfirmed coating of a large metal structure.

C-711-1-1: OUTDOOR METAL PARTS AND PRODUCTS COATING OPERATION WITH AIR PRESSURE REGULATOR LIMITED TO 10 PSI MAX AI

- This permit limits PM10 through the use of a HVLP, electrostatic, electrodeposition, flow, roll, dip, brush or continuous coating application equipment. The VOC emissions are controlled, by restricting the maximum VOC content of air-dried coatings (primers) as applied (excluding water and exempt compounds) to less than 2.8 lbs. VOC/gallon. However, this unit is used for the coating of metal parts and products. Therefore, the emissions produced do not represent the expected emissions from the unconfirmed coating of a large metal structure.

C-736-2-0: OUTDOOR METAL PARTS AND PRODUCTS AND MOTOR VEHICLE AND MOBILE EQUIPMENT COATING OPERATION

- This permit limits PM10 emissions through the use of a HVLP, electrostatic, electrodeposition, flow, roll, dip, brush or continuous coating application equipment. The VOC emissions are controlled by restricting the maximum VOC content of air-dried coatings (primers) as applied (excluding water and exempt compounds) to less than 2.8 lbs. VOC/gallon. However, this unit is used for the coating of metal parts and products in addition to motor vehicle and mobile equipment. Therefore, the emissions produced do not represent the expected emissions from the unconfirmed coating of a large metal structure.

C-1239-2-0: TRAILER COATING OPERATION

- This permit limits PM10 through the use of a HVLP, electrostatic, electrodeposition, flow, roll, dip, brush or continuous coating application equipment. The VOC emissions are controlled, by restricting the maximum VOC content of air-dried coatings (primers) as applied (excluding water and exempt compounds) to less than 2.8 lbs. VOC/gallon. However, this unit is used for the coating of mobile equipment. Therefore, the emissions produced do not represent the expected emissions from the unconfirmed coating of a large metal structure.

C-2064-4-0: OUTDOOR LARGE STEEL STRUCTURES COATING OPERATION

- This permit limits PM10 through the use of a HVLP, electrostatic, electrodeposition, flow, roll, dip, brush or continuous coating application equipment. The VOC emissions are controlled, by restricting the maximum VOC content of air-dried coatings (primers) as applied (excluding water and exempt compounds) to less than 2.8 lbs. VOC/gallon. The control associated with this project meet or exceed the stringency on this permit.

C-2183-3-0: OUTDOORS MOTOR VEHICLE AND MOBILE EQUIPMENT COATING OPERATION

- This permit limits PM10 through the use of a HVLP, electrostatic, electrodeposition, flow, roll, dip, brush or continuous coating application equipment. The VOC emissions are controlled, by restricting the maximum VOC content of air-dried coatings (primers) as applied (excluding water and exempt compounds) to less than 2.8 lbs. VOC/gallon. However, this unit is used for the coating of motor vehicle and mobile equipment. Therefore, the emissions produced do not represent the expected emissions from the unconfirmed coating of a large metal structure.

C-4028-2-1: METAL PARTS AND PRODUCTS COATING OPERATION INCLUDING HVLP SPRAY EQUIPMENT

- This permit limits PM10 through the use of a HVLP, electrostatic, electrodeposition, flow, roll, dip, brush or continuous coating application equipment. The VOC emissions are controlled, by restricting the maximum VOC content of air-dried coatings (primers) as applied (excluding water and exempt compounds) to less than 2.8 lbs. VOC/gallon. However, this unit is used for the coating of metal parts and products. Therefore, the emissions produced do not represent the expected emissions from the unconfirmed coating of a large metal structure.

C-5830-1-1: LARGE STEEL STRUCTURE METAL PARTS AND PRODUCTS COATING OPERATION

- This permit limits PM10 through the use of a HVLP, electrostatic, electrodeposition, flow, roll, dip, brush or continuous coating application equipment. The VOC emissions are controlled, by restricting the maximum VOC content of air-dried coatings (primers) as applied (excluding water and exempt compounds) to less than 2.8 lbs. VOC/gallon, or 2.5 lb./gal when the ambient temperature is above 60 degrees F. The control associated with this project meet or exceed the stringency on this permit.

C-7565-1-0: INDOOR AND OUTDOOR METAL PARTS AND PRODUCTS COATING OPERATION WITH HVLP, BRUSH AND ROLLER APPLICATION

- This permit limits PM10 through the use of a HVLP, electrostatic, electrodeposition, flow, roll, dip, brush or continuous coating application equipment. The VOC emissions are controlled, by restricting the maximum VOC content of air-dried coatings (primers) as applied (excluding water and exempt compounds) to less than 2.8 lbs. VOC/gallon. However, this unit is used for the coating of metal parts and products. Therefore, the emissions produced do not represent the expected emissions from the unconfirmed coating of a large metal structure.

C-8902-1-0: METAL PARTS AND PRODUCTS COATING OPERATION WITH HVLP SPRAY GUNS

- This permit limits PM10 through the use of a HVLP, electrostatic, electrodeposition, flow, roll, dip, brush or continuous coating application equipment. The VOC emissions are controlled, by restricting the maximum VOC content of air-dried coatings (primers) as applied (excluding water and exempt compounds) to less than 2.8 lbs. VOC/gallon. However, this unit is used for the coating of metal parts and products. Therefore, the emissions produced do not represent the expected emissions from the unconfirmed coating of a large metal structure.

C-9398-1-0: INDOOR/OUTDOOR WOOD AND METAL PARTS COATING OPERATION FOR MODULAR BUILDINGS

- This permit limits PM10 through the use of a HVLP, electrostatic, electrodeposition, flow, roll, dip, brush or continuous coating application equipment. The VOC emissions are controlled, by restricting the maximum VOC content of air-dried coatings (primers) as applied (excluding water and exempt compounds) to less than 2.8 lbs. VOC/gallon. The control associated with this project meet or exceed the stringency on this permit.

C-9640-1-0: OUTDOOR METAL PARTS AND PRODUCTS COATING OPERATION UTILIZING HVLP APPLICATION EQUIPMENT

- This permit limits PM10 through the use of a HVLP, electrostatic, electrodeposition, flow, roll, dip, brush or continuous coating application equipment. The VOC emissions are controlled, by restricting the maximum VOC content of air-dried coatings (primers) as applied (excluding water and exempt compounds) to less than 2.8 lbs. VOC/gallon However this unit is used for the coating of metal parts and products, therefore, the emissions produced do not represent the expected emissions from the unconfirmed coating of a large metal structure.

S-1810-8-8: TANK COATING OPERATION WITH HVLP GUNS, ENCLOSED GUN CLEANER AND WATER WASH CONTROL SYSTEM

- This permit limits PM10 through the use of a HVLP, electrostatic, electrodeposition, flow, roll, dip, brush or continuous coating application equipment. All coating is done inside an enclosed coating booth. The VOC emissions are controlled, by restricting the maximum VOC content of air-dried coatings (primers) as applied (excluding water and exempt compounds) to less than 2.8 lbs. VOC/gallon. However this unit is used for the coating of metal structures substantially smaller than the proposed transportation bridge sections, therefore, the emissions produced do not represent the expected emissions from the unconfirmed coating of a large metal structure.

S-1810-9-8: TANK COATING OPERATION WITH HVLP GUNS, ENCLOSED GUN CLEANER AND WATER WASH CONTROL SYSTEM

- This permit limits PM10 through the use of a HVLP, electrostatic, electrodeposition, flow, roll, dip, brush or continuous coating application equipment. All coating is done inside an enclosed coating booth. The VOC emissions are controlled, by restricting the maximum VOC content of air-dried coatings (primers) as applied (excluding water and exempt compounds) to less than 2.8 lbs. VOC/gallon. However this unit is used for the coating of metal structures substantially smaller than the proposed transportation bridge sections, therefore, the emissions produced do not represent the expected emissions from the unconfirmed coating of a large metal structure.

S-9242-1-0: INDOOR/OUTDOOR WOOD AND METAL PARTS COATING OPERATION FOR MODULAR BUILDINGS

- This permit limits PM10 through the use of a HVLP, electrostatic, electrodeposition, flow, roll, dip, brush or continuous coating application equipment. All coating is done inside an enclosed coating booth. The VOC emissions are controlled, by restricting the maximum VOC content of air-dried coatings (primers) as applied (excluding water and exempt compounds) to less than 2.8 lbs. VOC/gallon. However, this unit is used for the coating of metal structures substantially smaller than the proposed transportation bridge sections, therefore, the emissions produced do not represent the expected emissions from the unconfirmed coating of a large metal structure.

Alternative Technologies

The District has determined that there are no alternative Technologies that can potentially be used in place of the proposed application methods.

Conclusion:

There are multiple permitted outdoor unconfined coating operations for metal structures that can be used to establish BACT for the outdoor, unconfined coating of large metal structures. In addition the requirements of the rescinded BACT guild line 4.3.8, and applicable air district rules from other air districts apply specifically to the coating of unconfined coating of large metal structures. Therefore the District will rely on a combination of Air District Rule, BACT guild line requirements and previously issued permits to establish the applicable BACT requirements. The following are the identified control technologies for reducing the PM10, and VOC emissions from the unconfined coating of large metal structures.

PM10 emission control technologies:

1. Use of HVLP, flow, roll, dip, brush, Electrostatic or continuous coating application equipment. (AIP).
2. Enclose painting operation with dry filters and the use of HVLP application equipment. (TF SJVAPCD rescinded BACT Guideline 4.3.8)
3. Electrodeposition coating application (TF - SJVAPCD rescinded BACT Guideline 4.3.8)

VOC emission control technologies:

1. 2.3 lb.-VOC/gal (Single component Air-Dried Coating), 2.5 lb.-VOC/gal (General Coating Air-Dried Coating)(AIP SCAQMD Rule 1107 - Coating of Metal Parts and Products)
2. Total enclosure (100% capture efficiency), served by a Thermal incineration, Catalytic incineration, or Carbon adsorption. (TF - SJVAPCD rescinded BACT Guideline 4.3.8)
3. Open paint booth (65% capture efficiency), served by a Thermal incineration, Catalytic incineration, or Carbon adsorption. (TF - SJVAPCD rescinded BACT Guideline 4.3.8)

Step 2 - Eliminate Technologically Infeasible Options

Option 3 for PM Emission Control

The use of an Electrodeposition coating application method is not technologically feasible. Since the process is a wet, dip/immersion process, the size of the bridge section and components make this method infeasible.

Option 3 for VOC Emission Control

The use of an Open paint booth (65% capture efficiency), served by a Thermal incineration, Catalytic incineration, or Carbon adsorption is not technologically feasible. The open unenclosed area would prevent the booth from producing the negative pressure needed to collect and control the VOC emissions.

The remaining listed control options are technologically feasible.

Step 3 - Rank Remaining Control Technologies by Control Effectiveness

PM10 emission control technologies:

1. Enclose painting operation with dry filters and the use of HVLP application equipment. (TF SJVAPCD rescinded BACT Guideline 4.3.8)
2. Use of HVLP, flow, roll, dip, brush, Electrostatic or continuous coating application equipment. (AIP)

VOC emission control technologies:

1. Total enclosure (100% capture efficiency), served by a Thermal incineration, Catalytic incineration, or Carbon adsorption. (TF - SJVAPCD rescinded BACT Guideline 4.3.8)
2. 2.3 lb.-VOC/gal (Single component Air-Dried Coating), 2.5 lb.-VOC/gal (General Coating Air-Dried Coating)(AIP SCAQMD Rule 1107 - Coating of Metal Parts and Products)

Step 4 - Cost Effectiveness Analysis

PM10 Control Option 2 - *Use of HVLP, flow, roll, dip, brush, Electrostatic or continuous coating*, is Achieved in Practice. Per District BACT Policy, a cost effectiveness analysis is not required for Achieved in Practice controls.

VOC Control Option 2 – *Limiting the VOC content to 2.3 lb.-VOC/gal,* is Achieved in Practice. Per District BACT Policy, a cost effectiveness analysis is not required for Achieved in Practice controls.

The cost Effectiveness Analysis for PM10 Control Option 1 - Enclose painting operation with dry filters is as follows:

Particulate Filters Capital Cost Estimation

The following table is taken from the EPA Air Pollution Control Cost Manual for estimating capital costs of PM emission control technologies. Capital Cost Factors for Fabric Filters

Cost Item		**Factor**
Direct Costs		
Purchased Equipment Costs		
	Fabric filter (EC) + bags + auxiliary equipment	As estimated, A
	Instrumentation	0.10 x A
	Sales taxes	0.03 x A
	Freight	0.05 x A
	Purchased Equipment Cost, PEC	**B = 1.18 x A**
Direct Installation Costs		
	Foundations & supports	0.04 x B
	Handling & erection	0.50 x B
	Electrical	0.08 x B
	Piping	0.01 x B
	Insulation for ductwork	0.07 x B
	Painting	0.04 x B
	Direct installation cost	0.74 x B
	Building	**As required, Bldg.**
	Total Direct Cost	**1.74 x B + Bldg.**
Indirect Costs (installation)		
	Engineering	0.10 x B
	Construction and field expense	0.20 x B
	Contractor fees	0.10 x B
	Start-up	0.01 x B
	Performance test	0.01 x B
	Contingencies	0.03 x B
	Total Indirect Cost, IC	**0.45 x B**
TOTAL CAPITAL INVESTMENT = DC + IC		**2.19 x B + Bldg.**

Particulate Matter Capture Costs

The exiting gas flowrate (Q_o) used to determine the appropriate cloth surface area was derived from equation 3.6 in EPA's Control Cost Manual. Assuming the EPA's required minimum facial velocity (FV) of 200 fpm and applying a safety factor (SF) of 3, inflow volume into the enclosure (Q_i) assumed zero due to no forced makeup air provided, and a minimum 1 square foot area for any opening normally open during operation (A_{NDO}).

$$Q = FV * SF * A_{NDO} + Q_i = 200\ fpm * 3 * 1\ ft^2 + 0 = 600\ \text{scfm}$$

A gas-to-cloth ratio of 2.5 (actual ft^3/min)/(ft^2 of net cloth area) for paint pigments was determined from Table 1.1 in the EPA Control Cost Manual for an expected shaker style baghouse. Applying the ratio to the gas flowrate yields a net cloth area of 240 ft^2. Referencing Table 1.2, the net cloth area can be converted into 480 ft^2 of gross cloth area.

A pulse-jet baghouse with cartridge filters was chosen for cost estimation due to ease of design and affordability. Using Figure No. 1.10 equation for determining cost without bags for a pulsejet baghouse accommodating cartridge filters.

$$Cost\ without\ bags = 3{,}285 + 0.8686\ (GCA) = 3{,}285 + 0.8686\ (480\ ft^2)$$
$$= \$3{,}702\ (1998\ \$)$$

The resulting cost is based on 1998 dollars. Adjusting the cost to 2026 dollars using the calculator from the Federal Bureau of Labor Statistics, (consumer price index for 1998 (163.0) and 2026 (330.2)) yields a value of $7,499. in 2026 dollars.[1]

Replacement Parts

Replacement parts consist of filter bags, which have a typical operating life of about 2 to 4 years. The following formula is used for computing the bag replacement cost:

$$CRC_B = (C_B + C_L) * CRF_B$$

Where

CRC_B = $bag\ capital\ recovery\ cost$ ($/year)
C_B = $initial\ bag\ cost\ including\ taxes\ and\ freight$ ($)
C_L = $bag\ replacement\ labor$ ($)
CRF_B = $capital\ recovery\ factor$

The EPA Control Cost Manual's Bag Prices table (Table 1.8) lists a 16-oz polyester cartridges for pulse-jet cleaning type at $2.95/$ft^2$ in 1998 dollars. The Manual's average replacement labor cost for pulse jets of $0.28/$ft^2$ in 1998 dollars was used, and a capital recovery factor of 0.5531 (7% interest rate, 2-year life).

[1] https://data.bls.gov/timeseries/CUUR0000SA0?amp%253bdata_tool=XGtable&output_view=data&include_graphs=true

$$CRC_B = (480\ ft^2)(\$2.95/ft^2 + \$0.28/ft^2)(0.5331)$$
$$= \$858 \text{ in } 1998$$

The resulting cost is based on 1998 dollars. Adjusting the cost to 2026 dollars using the calculator from the Federal Bureau of Labor Statistics, (consumer price index for 1998 (163.0) and 2026 (330.2)) yields a value of **$1,738** in 2026 dollars.

Compressed Air

Pulse-jet filters use compressed air to clear the baghouse cartridges, reducing blockage and increasing the life span of the filters. The EPA Control Cost Manual's typical consumption is about 2 scfm/1,000 cfm of gas filtered and the cost for compressed air is $0.25/1,000 scf in 1998 dollars. Considering a maximum hour of operation of 8,760 hr./yr. and 600 scf/min of gas filtered the maximum annual gas flow rate is determined to be 315 MMscf/yr.

Cost of Compressed Air = Consumption x Compressed Air Cost x Gas Filtered Volume
= 2 scfm/1,000 cfm x $0.25/1,000 scf x 315 MMscf = $158/yr.

The resulting cost is based on 1998 dollars. Adjusting the cost to 2026 dollars using the calculator from the Federal Bureau of Labor Statistics, (consumer price index for 1998 (163.0) and 2026 (330.2)) yields a value of **$320** in 2026 dollars.

Direct Annual Costs (Labor Only, EPA Cost Manual, PM Control)

Operating labor:

Operator (4 hr./shift; 2 shifts/day; 365 days/yr.; $24.92/hr.) = $72,766/yr.
Supervisor (15% operator) = $10,915

Maintenance:

Labor (2 hr./shift; 2 shifts/day; 365 days/yr.; $24.75/hr.) = $36,135
Repair Materials (100% of labor cost) = $36,135

Total Direct Annual Costs = $72,766 + $10,915 + (2 x $36,135) = $155,951

Direct Annual Costs (Utilities)

Electricity is required to operate system fans and cleaning equipment. Primary gas fan power can be calculated as described in Chapter 2 of Section 2 and assuming a combined fan-motor efficiency of 0.65 and a specific gravity of 1.000. We obtain:

$$Power_{fan} = 0.000181\ Q(\Delta P)\theta$$

Where

$Power_{fan}$ = $fan\ power\ requirement\ (kWh/yr.)$
Q = $system\ flow\ rate\ (acfm)$
ΔP = $system\ pressure\ drop\ (in.\ H2O)$
θ = $operating\ time\ (h/yr.)$

The system flow rate (Q) was calculated above; system pressure drop was taken from the EPA Control Cost Manual average of 6.5 in. H_2O and an operating time of 8,760 hr./yr.

$$Power_{\text{fan}} = (0.000181)(600\ acfm)(6.5\ in.\ H2O)(8{,}760\ \text{hr./}yr.)$$
$$= 6{,}184\ kWh/yr.$$

Electricity cost is $Power_{\text{fan}}$ multiplied by the annual operating hours and the cost of electricity.

Annual cost Electricity = $Power_{\text{fan}}$ (kW) x Operating Schedule (hr./yr.) x Power Cost ($/kW-hr.)

"Average" power cost for single phase, flat rate commercial is $0.26205/kW-hr plus $0.32854 per day meter charge, per PG&E's tariff rates for class A-1 commercial customers.

Annual Utility Cost = 6,184 kW-hr./yr. x $0.26205/kW-hr. + $0.32854 x 365
= **$1,740/yr.**

Total Annual Cost (PM Control)

Total Annual Cost = Direct Labor Costs + Direct Utilities Cost (electricity & compressed air) + Replacement Parts Cost
= $155,951 + $253 + $1,740 = **$157,944/yr.**

Permanent Total Enclosure Capital Cost Estimation

The following table is created from the EPA's cost estimation guidance for permanent total enclosures (PTE). Enclosure size is based on the largest bridge sections that will be required to be coated.

An enclosure footprint of 110' L x 50' W x 40' H has been estimated to be the required size. Based on the estimated largest bridge sections, an opening of 50' x 40' will be required, thus resulting in a straight-run curtain of similar size. The cost of the curtain was determined from an online supplier [2]. Modular panels were chosen for ease of adjustability and economical cost of installation. With the straight-run curtain enclosing the main opening side, the enclosure will require 3 walls and one roof panel, giving a total panel area of 10,800 ft^2. A specially designed workstation crane will be required to replace the operation of the currently used crane in order to maintain use inside new enclosure.

Capital Cost Factors for Permanent Total Enclosure			
Wall Material	Purchased cost (1997	(1997 $)	2026 $
Modular panels	$9.76/sq ft	$9.76 x 10,800 ft^2 =	$213,532
Doors	(1997 $/door)		
Straight-Run Curtain, 40 x 50 ft [3]	493	$493	$999

[2] https://www.strip-curtains.com/proCat/warehouseCurtains.php

[3] https://www.strip-curtains.com/proCat/warehouseCurtains.php

Personnel door, steel, 3 x 7 ft	575	$575 x 4 = $2,300	$4,659
LFL Monitor	(1997 $ each)		
% LFL monitor using catalytic bead	3,325	$3,325	$6,736
Safety Equipment	(1997 $ each)		
Smoke detector (ceiling type)	75	$75	$152
Ductwork	(1997 $)		
Straight duct cost	33.49/ft	$33.48 x 90 ft^2 = $3,013	$6,104
Elbow cost	269	$269 x 5 = $1,345	$2,725
Damper cost	210	$210	$425
Crane			
Workstation crane [4]	--	--	
Taxes & Freight			
Taxes	7.25% of equip. cost	--	$0
Freight	3% of equip. cost	--	$0
Installation	(1997 $)		
Modular wall installation	7.97/sq ft	$7.97 x 10,800 ft^2 = $86,076	$174,370
Straight-Run Curtain Installation	500	$500	$1,013
Personnel door installation	415/each	$415 x 4 = $1,660	$3,363
LFL monitor installation	1000	$1,000	$2,026
Duct installation	37.5% of material ($7,445)	--	$88,249
		Direct Total Cost	**$504,532**
Professional Services	(1997 $)		
Engineering	5,000	$5,000	$10,129
Contractors	15,000	$15,000	$30,387
Compliance Test	2,500	$2,500	$5,064
TOTAL CAPITAL INVESTMENT IN 2026			**$549,932**

The resulting capital investment cost is based on 1997 and 1998 dollars. Adjusting the costs to 2026 dollars using the calculator from the Federal Bureau of Labor Statistics, (consumer price index for 1997 (160.5), 1998 (163), and 2026 (330.2)) yields a values of **$549,932** in 2026 dollars.

[4] https://www.mazzellacompanies.com/Resources/Blog/what-is-the-cost-of-an-overhead-crane

Capital Cost Factors for Fabric Filters w/ Building Cost		
Cost Item		**Factor**
Direct Costs		
Purchased Equipment Costs		
	Fabric filter (EC) + bags + auxiliary equipment	As estimated, A = $7,499+$1,738 = $9,237
	Instrumentation	0.10 x A
	Sales taxes	0.03 x A
	Freight	0.05 x A
	Purchased Equipment Cost, PEC	B = 1.18 x A = $10,900
Direct installation costs		
	Foundations & supports	0.04 x B
	Handling & erection	0.50 x B
	Electrical	0.08 x B
	Piping	0.01 x B
	Insulation for ductwork	0.07 x B
	Painting	0.04 x B
	Direct installation cost	0.74 x B
	Building	As required, Bldg. = $549,932 see above
	Total Direct Cost	**1.74 x B + Bldg. = 1.74($10,900) + $549,932 = $568,897**
Indirect Costs (installation)		
	Engineering	0.10 x B
	Construction and field expense	0.20 x B
	Contractor fees	0.10 x B
	Start-up	0.01 x B
	Performance test	0.01 x B
	Contingencies	0.03 x B
	Total Indirect Cost, IC	**0.45 x B**
	TOTAL CAPITAL INVESTMENT = DC + IC	**2.19 x B + Bldg. = 2.19($10,500) + $549,932 = $573,802**

The indirect annual cost is calculated using standard factors from the EPA Control Cost Manual and total capital investment (TCI) below:

Item	**Factor**
Property taxes	1% of TCI
Insurance	1% of TCI
General & administrative	2% of TCI
Capital Recovery	Capital Recovery Factor x TCI

Overhead is not considered because it is based on the sum of the operating, supervisory, and maintenance labor and materials costs, which are negligible for a PTE. The cost for the first three items is:

Property taxes	= 0.01 x $573,802	=	$5,738
Insurance	= 0.01 x $573,802	=	$5,738
+ General & admin	= 0.02 x $573,802	=	$11,476
Total		=	$22,952

An economic life of 10 years and an interest rate of 6 percent yields a CRF of 0.1359.

Capital recovery	= 0.1359 x TCI		
	= 0.1359 x **$573,802**	=	$77,961
Total annualized cost	= $22,952 + $77,961	=	$100,913

Total Annual Cost (PTE and PM Control)

Total Annual Cost = Annualized Total PM Control Capital Cost + Direct Annual Cost
= $100,913 + $157,944
= **$258,857/yr.**

Emission Reductions and Cost Effectiveness

District Standard Emissions:
Pursuant to District Policy 1305 - *Best Available Control Technology (BACT),* the District Standard Emissions (DSE) value for the unit, being a new emissions units, is equal to the emissions level allowed by the applicable SJVAPCD rules once the final compliance date for the rule has passed. Therefore, the DSE is calculated as follows:

District Standard PM10 Emissions (DSE_{PM}):

DSE_{PM} = (45 gal/yr.) x (District Standard EF $_{Primer}$ ((lb.-PM/gal) + (45 gal/yr.) x (District Standard EF $_{Top\ Coat}$ (lb.-PM/gal)) x (1- Transfer efficiency (Decimal))

DSE_{PM} Assumptions:

- PM10 Transfer efficiency = 75% (0.75) (District Practice)
- PM10 content of Coating = 5.5 lb. PM/gal (District Practice)

- PM10 content of Primer = 5.5 lb. PM/gal (District Practice)

DSE_{PM} Calculations:
DSE_{PM} = ((45 gal/yr.) x (5.5 lb. -PM10/gal) + (45 gal/yr.) x (5.5 lb. -PM10/gal)) x (1 - 0.75)
= (495 lb. -PM10/yr.) x (0.25)
= 123.8 lb. -PM10/yr.
= 0.06 tons-PM10/yr.
= 0.1 tons-PM10/yr.

District Standard VOC Emissions (DSE_{VOC}):

DSE_{VOC} = (45 gal/yr.) x (District Standard EF $_{Primer}$ ((lb.-VOC/gal) + (45 gal/yr.) x (District Standard EF $_{Top\ Coat}$ (lb.-VOC/gal))

<u>DSE_{VOC} Assumptions:</u>
- VOC content of Coating = 2.8 lb.-VOC/gal *(District Rule 4603 - Surface Coating of Metal Parts and Products, Plastic Parts and Products, and Pleasure Crafts (4/16/20))*

- VOC content of Primer = 2.1 lb.-VOC/gal (*District Rule 4603 - Surface Coating of Metal Parts and Products, Plastic Parts and Products, and Pleasure Crafts (4/16/20))*

<u>DSE_{VOC} Calculations:</u>
DSE_{VOC} = ((45-gals. primer /yr.) x (2.1 lb.-VOC/gal) + (45-gals. coating /yr.) x (2.8 lb.-VOC/gal coating))
= 220.5 lb.-VOC/yr.
= 0.1 ton-VOC/yr.

<u>Emission Reductions:</u>
PM10 emissions:
The Enclosed Structure with PM10 filters vented to a baghouse is considered to provide 95% control. The emission reduction is calculated by taking the DSE values minus the same DSE values with the tech feasible BACT applied. This is shown below as follows:

Emission Reduction = *DSE – DSE w/ Tech Feasible BACT*
= 0.1 ton-PM/yr. – ((0.1 ton-PM/yr.) x (1- 0.95))
= 0.095-ton PM/yr.

VOC Emissions:
The Enclosed Structure vented to destruction device is considered to provide 95% control. The emission reduction is calculated by taking the DSE values minus the same DSE values with the tech feasible BACT applied. This is shown below as follows:

Emission Reduction = *DSE – DSE w/ Tech Feasible BACT*
= 0.1 ton-PM/yr. – ((0.1 ton-PM/yr.) x (1- 0.95))
= 0.095-ton VOC/yr.

The Cost Efficiency:
The Cost efficiency per control measures is calculated as follows:

Cost efficiency ($/ton) = Total Annual Cost $_{2026}$ ($/yr.)/ Amount Emission Reductions (ton/yr.)

The Cost efficiency per 110' L x 50' W x 40' H enclose painting operation with dry filters and the use of HVLP application equipment for PM Control:

Cost efficiency ($/ton-PM) = Total Annual Cost ($/yr.) / Emissions Reductions (tons/yr.)
= $258,857/ 0.095 ton-PM10/yr.
= $2,588,570/ton-PM10

Per District policy APR 1305 - Current BACT Cost Effectiveness Thresholds and Interest Rate for District Policy APR 1305 (BACT) (amended 6/1/25), the cost effectiveness threshold for PM10 is $13,700/ton-PM10. The cost effectiveness calculated above is greater than the District's threshold of $13,700/ton-PM10; therefore, capture and filtration is not cost effective for this project.

The Cost efficiency per 110' L x 50' W x 40' H enclose painting operation alone for VOC Control is as follows:

Cost efficiency ($/ton-VOC) = Direct Annual Cost ($/yr.) / Emissions Reductions (tons/yr.)
= $157,944/ 0.095 ton-VOC/yr.
= $1,662,568.0 /ton-VOC

Per District policy on BACT APR 1305 - Current BACT Cost Effectiveness Thresholds and Interest Rate for District Policy APR 1305 (BACT) (amended 6/1/25), the cost effectiveness threshold for VOC is $27,100/ton-VOC. The cost effectiveness calculated above for the enclosed structure alone without the added cost of a capture and filtration system, or thermal destruction device is greater than the District's threshold of $27,100/ton-VOC; therefore, capture and filtration is not cost effective for this project.

Step 5 – Select BACT

BACT for this operation is the use of coatings containing less than 2.8 lb.-VOC (less water and exempt compounds) and the use of HVLP or equivalent spray equipment. The applicant has proposed these items; therefore, BACT is satisfied for VOC and PM10.