



**Massachusetts Department of Environmental Protection (MassDEP)
Top Case BACT Guidelines
For
MECHANICAL AND MISCELLANEOUS SOURCES**

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

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

Category	Page
• <u>Ammonia Storage and Handling</u>	3
• <u>Asphalt Processing and Asphalt Roofing</u>	5
• <u>Bulk Cement Ship Unloading</u>	8
• <u>Concrete Batch Plants</u>	10
• <u>Dry Bulk Material Handling and Unloading</u>	13
• <u>Material and Coal Handling</u>	15
• <u>Rock Crushing</u>	17
• <u>Hot Mix Asphalt - Batch Plants and Drum Mix Plants</u>	18
• <u>Chrome Plating and Anodizing Operations Utilizing Chromic Acid</u>	20
• <u>Ethylene Oxide Sterilization</u>	23
• <u>Galvanizing Operations</u>	25

AMMONIA STORAGE AND HANDLING (June, 2011)			
Source Type	Air Contaminant	Minimum Requirements	BACT Determination
Anhydrous Ammonia Storage and Handling	NH ₃	<ul style="list-style-type: none"> • A mitigation plan describing the methods and procedures used to reduce the risk of a catastrophic release of ammonia • A contingency plan that describes the corrective actions utilized to notify persons in the immediate area of the release of ammonia • Audio, Visual and Olfactory (AVO) inspections twice per day to monitor potential ammonia leaks • During transfers of ammonia, all ammonia vapors are vented back to the host storage tank, UNCONTROLLED AMMONIA RELEASES TO ATMOSPHERE ARE PROHIBITED • Relieving pressures from hoses and connectors must be bled to adequate volume of water • All valves, connectors, and hoses must be maintained in a leak proof condition at all times • Upon detection of any leak, the facility must implement immediate leak repair, if not possible, the use of a leak collection/containment system must be utilized until a repair may be implemented (i.e. automated water spray set to operate upon detection of NH₃ fumes.) • Reinforced containment constructed around the ammonia storage tank for safety • Method of operation and interlocks to prevent unauthorized release and operation of the ammonia storage and transferring system • US EPA Level 2 Controls 	<ul style="list-style-type: none"> • US EPA Prevention Reference Manual: Chemical Specific, Volume 11, Control of Accidental Releases of Ammonia, EPA/600/8-87/034k

Aqueous Ammonia Storage and Handling	NH ₃	<ul style="list-style-type: none"> • Diked containment, release of spherical orbs to reduce surface area, etc. 	
--------------------------------------	-----------------	---	--

Key to Abbreviations

NH₃ = ammonia

ASPHALT PROCESSING AND ASPHALT ROOFING (June, 2011)			
Source Type	Air Contaminant	Minimum Requirements	BACT Determination
Saturator/Coater/Sealant Applicator	THC	<ul style="list-style-type: none"> • Reduce THC mass emissions by 95% or to a THC emission limit ≤ 20 ppmvd @ 3 volume percent O₂ • Control all THC emissions via a TO or RTO having a CE of 100% (PTE-Method 204)* having a DRE of $\geq 99.5\%$ • Natural gas firing 	40 CFR 60 Subpart UU 40 CFR 63 NESHAPS/MACT
	PM	<ul style="list-style-type: none"> • Control all PM emissions via a FF/BH having a RE of $\geq 99.9\%$ • ≤ 0.005 gr/dscf outlet emission limit • 0.04 kg/Mg of asphalt shingle or mineral-surfaces rolled roofing • 0.40 kg/Mg of saturated felt or smooth surfaced rolled roofing • Natural gas firing 	
	Opacity	<ul style="list-style-type: none"> • ≤ 5 percent opacity at all times • Natural gas firing 	
Storage Silo and Material Handling	PM	<ul style="list-style-type: none"> • Control all PM emissions via a FF/BH having a RE of $\geq 99.9\%$ • ≤ 0.005 gr/dscf outlet emission limit 	

ASPHALT PROCESSING AND ASPHALT ROOFING (June, 2011)			
Source Type	Air Contaminant	Minimum Requirements	BACT Determination
	Opacity	<ul style="list-style-type: none"> Zero percent opacity – no visible emissions 	
Blow Still	PM	<ul style="list-style-type: none"> 0.67 kg/Mg from blow still when catalyst used 0.60 kg/Mg from blow still when catalyst not used Fuel oils are prohibited – natural gas firing only 	
	HAPs/THC/VOC	<ul style="list-style-type: none"> Reduce THC mass emissions by 95% or to a THC emission limit ≤ 20 ppmvd @ 3% O₂ Control all THC emissions via a TO or RTO having a CE of 100% (PTE-Method 204)* DRE of $\geq 99.5\%$ Natural gas firing 	

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

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

Key to Abbreviations

VOC = volatile organic compounds

HAPs = hazardous air pollutants

THC = total hydrocarbons

PM = particulate matter

CE = capture efficiency

DRE = destruction/removal efficiency

RE = removal efficiency

≤ = less than or equal to

≥ = greater than or equal to

TO = thermal oxidizer

RTO = regenerative thermal oxidizer

% = weight percent

ppmvd = parts per million volume dry

@ = at

kg/Mg = kilograms per Megagram

gr/dscf = grains per dry standard cubic foot

FF/BH = fabric filter/baghouse

NESHAPS = National Emissions Standards for Hazardous Air Pollutants

MACT = maximum achievable control technology

BULK CEMENT SHIP UNLOADING (June, 2011)			
Source Type	Air Contaminant	Minimum Requirements	BACT Determination
Power Source to Pneumatic Unloading system	NO _x	<ul style="list-style-type: none"> • Shore Utility Power – Electric Power [emergency power must comply with Engine & Turbine ERP Regulation at 310 CMR 7.26(42)] 	
	SO ₂		
	CO		
	PM		
Material Handling	PM	<ul style="list-style-type: none"> • Enclosed, self-unloading ship with pneumatic conveyor system; receiving shore silos/containers/domes • Enclosed processing equipment vented to FF/BH having a PM collection efficiency of 99.99%. • Emission Limits range between 0.001 and 0.003 gr/acf, process equipment specific • System must be equipped with process flow interlocks, high level sensor interlocks in silos, containers, domes to ensure that over-loading of storage vessels and over-pressurization of delivery lines do not occur • Continuous process monitoring must occur during any loading or transferring events, the system shall record all system excursions and be equipped with audible and visual alarms. 	310 CMR 7.02 Plan Approvals, Transmittal Number W154933, Transmittal Number W158294

Key to Abbreviations

PM = particulate matter

NO_x = nitrogen oxides

SO₂ = sulfur dioxide

CO = carbon monoxide

gr/acf = grains per actual cubic foot

% = weight percent

FF/BH = fabric filter/baghouse

CMR = Code of Massachusetts Regulations

CONCRETE BATCH PLANTS (June, 2011)			
Source Type	Air Contaminant	Minimum Requirements	BACT Determination
Permanent Concrete Batch Plants	PM	<ul style="list-style-type: none"> • Emission Limit ≤ 0.0002 gr/dscf • Dry material storage controlled with FF/BH $\geq 99.99\%$ collection efficiency • All aggregate material handling prewashed achieving $\geq 70\%$ reduction • Aggregate stockpiles controlled by continuous water spray systems to achieve $\geq 70\%$ reduction, aggregate storage piles must be maintained at a minimum moisture content of 4% by weight • Central mixer and/or truck drop point emissions controlled to $\geq 99\%$ or emission limit of ≤ 0.008 gr/dscf – use of suction shroud with minimum 5000 acfm flow rate • Visible emissions ≤ 5 percent opacity except up to 10 percent opacity for no more than 2 minutes during any one hour, not to exceed 10 percent opacity from any process point, internal roads, work areas, material storage areas or stockpiles 	310 CMR 7.02 Plan Approval, Transmittal Number 002964

CONCRETE BATCH PLANTS (June, 2011)			
Source Type	Air Contaminant	Minimum Requirements	BACT Determination
Temporary Concrete Batch Plants	PM	<ul style="list-style-type: none"> • Emission Limit ≤ 0.008[should this also be 0.0002?] gr/dscf • Dry material storage controlled with FF/BH $\geq 99.99\%$ collection efficiency • All aggregate material handling prewashed achieving $> 70\%$ reduction • Aggregate stockpiles controlled by continuous water spray systems to achieve $\geq 70\%$ reduction, aggregate storage piles must be maintained at a minimum moisture content of 4% by weight • Central mixer and/or truck drop point emissions controlled to $\geq 99\%$ or emission limit of ≤ 0.008 gr/dscf – use of suction shroud with minimum 5000 acfm flow rate • Visible emissions ≤ 5 percent at any time from any process point, internal roads, work areas, material storage areas or stockpiles 	

Key to Abbreviations

PM = particulate matter

gr/dscf = grains per dry standard cubic foot

% = weight percent

FF/BH = fabric filter/baghouse

> = greater than

≥ = greater than or equal to

< = less than

≤ = less than or equal to

acfm = actual cubic feet per minute

DRY BULK MATERIAL HANDLING AND UNLOADING (June, 2011)			
Source Type	Air Contaminant	Minimum Requirements	BACT Determination
Dry Bulk Material Handling and Unloading Activities	PM	<ul style="list-style-type: none"> • Pertains to dry, enclosed and open activities. • Dry and/or enclosed activities to include dry commodities such as gypsum, lime, soda ash, salt cake, etc. • Enclosed systems vented to a FF/BH having a collection efficiency of 99.99% or an emission limit of 0.001 to 0.003 gr/dscf activity specific. • Material handling by use of pneumatic transfer, bag unload, box unload, small container unload to achieve total enclosure (100% capture efficiency) • Open systems of stockpiles must achieve $\geq 70\%$ control of emissions, utilizing, water sprays, fogging, chemical suppressants and/or foam. • Zero Percent Opacity • Comply with MassDEP Noise Policy 	310 CMR 7.02 Plan Approval, Transmittal Number W158294

Key to Abbreviations

PM = particulate matter

FF/BH = fabric filter/baghouse

gr/dscf = grains per dry standard cubic foot

% = weight percent

MATERIAL AND COAL HANDLING (June, 2011)			
Source Type	Air Contaminant	Minimum Requirements	BACT Determination
Material Handling	PM	<ul style="list-style-type: none"> • Pertains to dry, enclosed and open activities. • Dry and/or enclosed activities to include dry commodities such as gypsum, lime, soda ash, salt cake, etc. • Enclosed systems vented to a FF/BH having a collection efficiency of $\geq 99.99\%$ or an emission limit of 0.001 to 0.003 gr/dscf activity specific. • Open systems of stockpiles must achieve $\geq 70\%$ control of emissions, utilizing, water sprays, fogging, chemical suppressants and/or foam. 	

MATERIAL AND COAL HANDLING (June, 2011)			
Source Type	Air Contaminant	Minimum Requirements	BACT Determination
Coal Handling	PM	<ul style="list-style-type: none"> • Enclosed systems, such as domes. • In cases where domes or enclosures are not permissible by local ordinances, or equivalent: stockpiles and internal roads must be treated with water sprays; stockpiles must also be treated with encrusting agents. • Transfer points must be treated with foam and/or surfactants. • Receiving and unloading must be conducted within enclosures and/or shrouding. Foaming sprays during receiving and unloading activities is required. • Conveying of coal must be fully enclosed. • Crushing of coal must be fully enclosed. • Screening of coal must be fully enclosed. 	

Key to Abbreviations
 PM = particulate matter
 FF/BH = fabric filter/baghouse
 gr/dscf = grains per dry standard cubic foot
 =greater than or equal to
 % = weight percent

ROCK CRUSHING			
Source Type	Air Contaminant	Minimum Requirements	BACT Determination
Rock Crushers	PM-10/PM-2.5	<ul style="list-style-type: none"> • ≤ 0.014 gr/dscf (emission limit) • use of charges “water fog” sprays of transfer points, conveyors • water spray with chemical suppressants for material storage piles • enclosure of jaw/cone crushers, screens, and associated material transfer points and vent to baghouse(s) having a PM removal efficiency of $\geq 99.99\%$ or proper application of water sprays to achieve an equivalent $\geq 99.99\%$ overall PM control efficiency • water sprays for road surfaces • visible emissions not to exceed seven percent opacity 	40 CFR 60 Subpart OOO

Key to Abbreviations

PM-10 = particulate matter 10 microns or less

PM-2.5 = particulate matter 2.5 microns or less

\leq = less than or equal to

\geq = greater than or equal to

Gr/dscf = grains per dry standard cubic foot

% = weight percent

HOT MIX ASPHALT - BATCH PLANTS AND DRUM MIX PLANTS (June, 2011)					
Source Type	Fuel	Air Contaminant	Minimum Requirements	BACT Determination	
Batch Plants And Drum Mix Plants	Reserved			310 CMR 7.02 Plan Approval, Transmittal Number X227251	
	Ultra Low Sulfur Distillate Fuel Oil (0.0015 % S)	PM(filterable)	<ul style="list-style-type: none"> • ≤ 0.01 gr/dscf • 0.0194 lbs/ton 		
		PM(condensable)			
		NOx	• ≤ 0.113 lb/MMBtu		
		CO	• ≤ 0.39 lb/MMBtu		
		VOC	• ≤ 0.032 lbs/ton product produced		
	Natural Gas	PM	• ≤ 0.01 gr/dscf		
		NOx	• ≤ 0.044 lb/MMBtu		
		CO	• ≤ 0.30 lb/MMBtu		
		VOC	• ≤ 0.032 lbs/ton product produced		
	All Fuels	Opacity	• ≤ 5 percent, except $\leq 20\%$ for ≤ 2 minutes during any one hour period		

HOT MIX ASPHALT - BATCH PLANTS AND DRUM MIX PLANTS (June, 2011)				
Source Type	Fuel	Air Contaminant	Minimum Requirements	BACT Determination
	All Fuels	Other	<ul style="list-style-type: none"> • Emissions Testing for new facilities • Visilite testing of FF/BH – once at start-up of “season”, and once per month thereafter during the operating season • Ultra Low-NOx Burner(s), FGR as necessary • 80% PM reduction – All aggregate must be prewashed • Baghouse outlet temperature and pressure differential monitoring system, with instantaneous readings in control room; audible and visual alarms to alert operator to need for corrective actions • Top of silo controls to collect and control 90 percent minimum of exhaust gases displaced from filling of silos 	

Key to Abbreviations

VOC = volatile organic compounds

S = sulfur

PM = particulate matter

NOx = oxides of nitrogen

< = less than

≤ = less than or equal to

≥ = greater than or equal to

% = weight percent

@ = at

FGR = flue gas recirculation

lbs/ton = pounds per ton

lb/MMBtu = pounds per million British thermal units

gr/dscf = grains per dry standard cubic foot

FF/BH = fabric filter/baghouse

CMR = Code of Massachusetts Regulations

CHROME PLATING AND ANODIZING OPERATIONS USING CHROMIC ACID (June, 2011)			
Source Type	Air Contaminant	Minimum Requirements	BACT Determination
Hard Chrome Plating Tank	PM and Chrome	<p>Small Existing Tanks:</p> <ol style="list-style-type: none"> 100% capture efficiency (PTE-Method 204)* Emission Limit ≤ 0.03 mg/dscm or Wetting agent fume suppressant in plating tank with plating solution surface tension not exceeding 45 dynes/cm (stalagmometer) or 35 dynes/cm (tensiometer), and good housekeeping for spills. <p>All Other Hard Chromium Tanks:</p> <ol style="list-style-type: none"> 100% capture efficiency (PTE-Method 204)* Emission Limit ≤ 0.015 mg/dscm or Wetting agent fume suppressant in plating tank with plating solution surface tension not exceeding 45 dynes/cm (stalagmometer) or 35 dynes/cm (tensiometer), and good housekeeping for spills. 	40 CFR 63 Subpart N MACT/NESHAPS
Decorative Chrome Plating Tank	PM and Chrome	<ol style="list-style-type: none"> 100% capture efficiency (PTE-Method 204)* Emission Limit ≤ 0.01 mg/dscm or Wetting agent fume suppressant in plating tank with plating solution surface tension not exceeding 45 dynes/cm (stalagmometer) or 35 dynes/cm (tensiometer), and good housekeeping for spills. 	

CHROME PLATING AND ANODIZING OPERATIONS USING CHROMIC ACID (June, 2011)			
Source Type	Air Contaminant	Minimum Requirements	BACT Determination
Chromic Acid Anodizing	PM and Chrome	1. 100% capture efficiency (PTE-Method 204)* 2. Emission Limit ≤ 0.01 mg/dscm or 3. Wetting agent fume suppressant in plating tank with plating solution surface tension not exceeding 45 dynes/cm (stalagmometer) or 35 dynes/cm (tensiometer), and good housekeeping for spills.	

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

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

Key to Abbreviations

PM = particulate matter
 gr/dscf = grains per dry standard cubic foot
 % = weight percent
 m/hr = meters per hour
 ft/min = feet per minute
 FF/BH = fabric filter/baghouse

\leq = less than or equal to

mg/dscm = milligrams per dry standard cubic meter

dynes/cm = dynes per centimeter

CFR = Code of Federal Regulations

MACT = Maximum Achievable Control Technology

NESHAPS = National Emission Standards for Hazardous Air Pollutants

ETHYLENE OXIDE STERILIZATION (June, 2011)			
Source Type	Air Contaminant	Minimum Requirements	BACT Determination
Sterilizers and Aerators	ETO (VOC/HAPs)	<ul style="list-style-type: none"> • Sterilization and/or aeration process vessels or rooms must be constructed to achieve and maintain 100% Capture Efficiency at minimum, per Method 204* • All ETO exhaust emissions from the sterilizer and/or aerator must be ducted to a control device (Thermal Oxidizer, Catalytic Oxidizer, or Wet Chemical Scrubber) achieving and maintaining a Destruction Efficiency of \geq 99.9% or ETO emissions, post control, of \leq than 0.2 ppm. • No by-pass stacks are permitted. 	310 CMR 7.02 Plan Approval Transmittal Number W058285 MACT - 40 CFR 63, Subpart O

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

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

Key to Abbreviations

VOC = volatile organic compounds

HAPs = hazardous air pollutants

ETO = ethylene oxide

≥ = greater than or equal to

≤ = less than or equal to

ppm = part per million

% = weight percent

CMR = Code of Massachusetts Regulations

CFR = Code of Federal Regulations

MACT = Maximum Achievable Control Technology

GALVANIZING OPERATIONS (June, 2011)			
Source Type	Air Contaminant	Minimum Requirements	BACT Determination
Zinc Kettle	PM	<ul style="list-style-type: none"> • 95% Capture Efficiency (PTE-Method 204)* • 99.99% collection efficiency, achieved with a FF/BH equipped with lime pre-coated bags. • Emission Limit ≤ 0.003 gr/dscf • No Opacity from stack exhaust (0 percent) • Separate ammonia chloride preflux tank. 	MACT 40 CFR 63 Subpart CCC
HCl Tanks	HCl	<ul style="list-style-type: none"> • 98% control efficiency utilizing fume suppressant or equivalent 	

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

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

Key to Abbreviations

PM = particulate matter

HCl = hydrochloric acid

gr/dscf = grains per dry standard cubic foot

% = weight percent

m/hr = meters per hour

fpm = feet per minute

FF/BH = fabric filter/baghouse