

**SMAQMD BACT CLEARINGHOUSE**

CATEGORY:

**IC ENGINE COMPRESSION-PRIME**

BACT Size: Minor Source BACT

**IC ENGINE NON-ROAD/PORTABLE**

<b>BACT Determination Number:</b> 150	<b>BACT Determination Date:</b> 4/13/2017
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**Equipment Information**

**Permit Number:** N/A -- Generic BACT Determination  
**Equipment Description:** IC ENGINE NON-ROAD/PORTABLE  
**Unit Size/Rating/Capacity:** All Horsepower  
**Equipment Location:**

**BACT Determination Information**

<b>ROCs</b>	<b>Standard:</b>	See Comments Below
	<b>Technology Description:</b>	< 50 hp: Comply w/ EPA nonroad regulations & use CARB diesel fuel, >= 50 hp: Comply with the ATCM for portable CI engines
	<b>Basis:</b>	Achieved in Practice
<b>NOx</b>	<b>Standard:</b>	See Comments Below
	<b>Technology Description:</b>	< 50 hp: Comply w/ EPA nonroad regulations & use CARB diesel fuel, >= 50 hp: Comply with the ATCM for portable CI engines
	<b>Basis:</b>	Achieved in Practice
<b>SOx</b>	<b>Standard:</b>	See Comments Below
	<b>Technology Description:</b>	< 50 hp: Comply w/ EPA nonroad regulations & use CARB diesel fuel, >= 50 hp: Comply with the ATCM for portable CI engines
	<b>Basis:</b>	Achieved in Practice
<b>PM10</b>	<b>Standard:</b>	See Comments Below
	<b>Technology Description:</b>	< 50 hp: Comply w/ EPA nonroad regulations & use CARB diesel fuel, >= 50 hp: Comply with the ATCM for portable CI engines
	<b>Basis:</b>	Achieved in Practice
<b>PM2.5</b>	<b>Standard:</b>	See Comments Below
	<b>Technology Description:</b>	< 50 hp: Comply w/ EPA nonroad regulations & use CARB diesel fuel, >= 50 hp: Comply with the ATCM for portable CI engines
	<b>Basis:</b>	Achieved in Practice
<b>CO</b>	<b>Standard:</b>	See Comments Below
	<b>Technology Description:</b>	< 50 hp: Comply w/ EPA nonroad regulations & use CARB diesel fuel, >= 50 hp: Comply with the ATCM for portable CI engines
	<b>Basis:</b>	Achieved in Practice
<b>LEAD</b>	<b>Standard:</b>	
	<b>Technology Description:</b>	
	<b>Basis:</b>	

**Comments:** For all criteria pollutants : < 50 hp: Comply w/ EPA nonroad regulations & use CARB diesel fuel, >= 50 hp: Comply with the ATCM for portable CI engines

**District Contact:** Joe Carle      Phone No.: (916) 874 - 4838      email: jcarle@airquality.org



## BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

**DETERMINATION NO.:** 150  
**DATE:** 3/13/2017  
**ENGINEER:** Joe Carle

**Category/General Equipment Description:** IC Engine Compression - Prime  
**Equipment Specific Description:** Nonroad, Compression-Ignited, IC Engine  
**Equipment Size/Rating:** Minor Source BACT, All Horsepower  
**Previous BACT Det. No.:** None

This Best Available Control Technology (BACT) determination for nonroad, compression-ignited, IC engines is new. There was previously no BACT determination for this category.

This determination includes T-BACT for the Toxic Air Contaminants (TAC) – diesel particulate matter is associated with compression-ignited engines.

The Clean Air Act (CAA) Section 209(e) states that no State or any political subdivision thereof shall adopt or attempt to enforce any standard or other requirement relating to the control of emissions from new or in-use nonroad engines. This section does allow the EPA to grant the state of California a waiver to this preemption allowing California to set standards and requirements for certain new and in-use nonroad engines. Because of this preemption, this BACT determination will not include a review of BACT determinations or rules from local air districts.

### **BACT/T-BACT ANALYSIS**

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

The following control technologies are currently employed for compression-ignited engines as discussed below:

#### **US EPA**

##### **RULE REQUIREMENTS:**

#### **[40 CFR 89 – Control of Emissions from New and In-Use Nonroad Compression-Ignition Engines](#)**

The Federal Clean Air Act allows California to seek an authorization of the federal preemption that prohibits states and local jurisdictions from enacting emission standards and other emission-related requirements for new and in-use nonroad engines that are not conclusively preempted by section 209(e)(1) new engines less than 175 hp used in farm and construction equipment and vehicles and new engines used in new locomotives and

locomotive engines. (CAA section 209(e)(2)). The ARB serves as the representative of California in filing authorization requests with U.S. EPA. California filed a written request for an authorization to enforce its own rule, the *Airborne Toxic Control Measures (ATCM) for Diesel Particulate Matter from Portable Engines Rated at 50 Horsepower and Greater (Title 17, CCR Sections 93116-93116.5)*, in lieu EPA's nonroad standards, arguing that California's rule is, in the aggregate, at least as protective of public health and welfare as the applicable federal standards and it is necessary to meet compelling and extraordinary conditions. EPA approved California's rule.

Since California obtained a waiver from EPA, the requirements of 40 CFR 89 are not applicable for engines greater than or equal to 50 hp (37 KW).

The following table shows the emission standards for nonroad compression-ignited engines under 50 hp (37 Kw) based on their specified model year and maximum engine power (40 CFR 89.112)

EPA Tier 1-3 Nonroad Diesel Engine Emission Standards (40 CFR §89.112), g/kWh (g/bhp·hr)							
Engine Power	Tier	Year	CO	HC	NMHC+NO <sub>x</sub>	NO <sub>x</sub>	PM
kW < 8 (hp < 11)	Tier 1	2000	8.0 (6.0)	-	10.5 (7.8)	-	1.0 (0.75)
	Tier 2	2005	8.0 (6.0)	-	7.5 (5.6)	-	0.8 (0.6)
8 ≤ kW < 19 (11 ≤ hp < 25)	Tier 1	2000	6.6 (4.9)	-	9.5 (7.1)	-	0.8 (0.6)
	Tier 2	2005	6.6 (4.9)	-	7.5 (5.6)	-	0.8 (0.6)
19 ≤ kW < 37 (25 ≤ hp < 50)	Tier 1	1999	5.5 (4.1)	-	9.5 (7.1)	-	0.8 (0.6)
	Tier 2	2004	5.5 (4.1)	-	7.5 (5.6)	-	0.6 (0.45)

40 CFR 1039 – Control of Emissions from New and In-Use Nonroad Compression-Ignition Engines:

The following table shows the emission standards for nonroad compression-ignited engines under 50 hp (37 KW) based on their specified model year and maximum engine power (40 CFR 1039.101 and 1039.102).

Tier 4 Nonroad Diesel Engine Emission Standards (40 CFR §1039.101 & 102), g/kWh (g/bhp-hr)						
Engine Power	Year	CO	NMHC	NMHC+NO <sub>x</sub>	NO <sub>x</sub>	PM
kW < 8 (hp < 11)	2008	8.0 (6.0)	-	7.5 (5.6)	-	0.4 <sup>a</sup> (0.3)
8 ≤ kW < 19 (11 ≤ hp < 25)	2008	6.6 (4.9)	-	7.5 (5.6)	-	0.4 (0.3)
19 ≤ kW < 37 (25 ≤ hp < 50)	2008	5.5 (4.1)	-	7.5 (5.6)	-	0.3 (0.22)
	2013	5.5 (4.1)	-	4.7 (3.5)	-	0.03 (0.022)

**CALIFORNIA AIR RESOURCES BOARD**

**RULE REQUIREMENTS:**

13 CCR Section 2423 Exhaust Emission Standards and Test Procedures – Off-Road Compression Ignition Engines

New off-road compression ignition engines must meet the following exhaust emission standards according to its model year and maximum rated power.

Maximum Engine Power	Model Year	Type	PM	NMHC + NOx	NMHC	NOx	CO
			grams per kilowatt-hour				
kW<8	2008 and later	Final	0.40	7.5	-	-	8.0
8≤kW<19							6.6
19≤kW<37	2008-2012	Interim	0.30	7.5	-	-	5.5
	2013 and later	Final	0.03	4.7			
37≤kW<56	2008-2012	Interim	0.30	4.7	-	-	5.0
	2013 and later	Final	0.03				
56≤kW<75	2012-2014	Phase-In	0.02	-	0.19	0.40	5.0
		Phase-Out		4.7	-	-	
		or/ Alt NOx		-	0.19	3.4	
	2015 and later	Final		-	0.19	0.40	
75≤kW<130	2012-2014	Phase-In	0.02	-	0.19	0.40	5.0
		Phase-Out		4.0	-	-	
		or/ Alt NOx		-	0.19	3.4	
	2015 and later	Final		-	0.19	0.40	
130≤kW≤560	2011-2013	Phase-In	0.02	-	0.19	0.40	5.0
		Phase-Out		4.0	-	-	
		or/ Alt NOx		-	0.19	2.0	
	2014 and later	Final		-	0.19	0.40	
Generators: 560<kW≤900	2011-2014	Interim	0.10	-	0.40	3.5	3.5
	2015 and later	Final	0.03		0.19	0.67	
Generators: kW>900	2011-2014	Interim	0.01	-	0.40	0.67	3.5
	2015 and later	Final	0.03		0.19		
Other engines: kW>560	2011-2014	Interim	0.10	-	0.40	3.5	3.5
	2015 and later	Final	0.04		0.19		

Title 17, CCR Sections 93116-93116.5 - ARB Airborne Toxic Control Measures (ATCM) for Diesel Particulate Matter from Portable Engines Rated at 50 Horsepower and Greater:

This ATCM applies to portable diesel-fueled engines greater than 50 hp. Since California obtained a waiver to implement the ATCM in lieu of the federal requirements, the ATCM applies to engines 50 hp and greater and the federal nonroad requirements apply to engines under 50 hp.

This regulation is very complex and will not be discussed in detail in this analysis. The main requirements of the regulation are:

- Does not apply to engines propelling mobile equipment or motor vehicles.
- Requires the use of CARB diesel fuel; or verified alternative diesel fuel or CARB diesel fuel utilizing verified fuel additives.
- Imposes emission standards on portable engines based on a series of predefined criteria.

**Discussion on Achieved in Practice Control Technologies:**

It is shown above that the EPA and California have certification standards for engines based on their model year and horsepower rating. The CARB ATCM for portable engines goes further by requiring change-out of older in-use engines to higher tiered engines by particular dates. It also sets a fleet standard for PM emissions. Engines less than 50 hp are not subject to the ATCM. As mentioned before, the district is preempted from setting emission standards although can still require the use of a specific fuel type (Appendix A to Subpart A of Part 89—State Regulation of Nonroad Internal Combustion Engines). Therefore, the following control technologies have been identified as the most stringent, achieved in practice control technologies:

<b>BEST CONTROL TECHNOLOGIES ACHIEVED – NONROAD COMPRESSION-IGNITED IC ENGINE RATED LESS THAN 50 HP</b>		
<b>Pollutant</b>	<b>Standard</b>	<b>Source</b>
<b>VOC</b>	Compliance with applicable EPA non-road regulations (40 CFR part 89 and/or 1039) and use of CARB-approved diesel fuel or a fuel that meets the CARB requirements in 17 CCR Section 93115.5.	US EPA/ CARB
<b>NOx</b>	Compliance with applicable EPA non-road regulations (40 CFR part 89 and/or 1039) and use of CARB-approved diesel fuel or a fuel that meets the CARB requirements in 17 CCR Section 93115.5.	US EPA/ CARB
<b>SOx</b>	Compliance with applicable EPA non-road regulations (40 CFR part 89 and/or 1039) and use of CARB-approved diesel fuel or a fuel that meets the CARB requirements in 17 CCR Section 93115.5.	US EPA/ CARB
<b>PM10</b>	Compliance with applicable EPA non-road regulations (40 CFR part 89 and/or 1039) and use of CARB-approved diesel fuel or a fuel that meets the CARB requirements in 17 CCR Section 93115.5.	US EPA/ CARB
<b>PM2.5</b>	Compliance with applicable EPA non-road regulations (40 CFR part 89 and/or 1039) and use of CARB-approved diesel fuel or a fuel that meets the CARB requirements in 17 CCR Section 93115.5.	US EPA/ CARB

<b>BEST CONTROL TECHNOLOGIES ACHIEVED – NONROAD COMPRESSION-IGNITED IC ENGINE RATED LESS THAN 50 HP</b>		
<b>Pollutant</b>	<b>Standard</b>	<b>Source</b>
<b>CO</b>	Compliance with applicable EPA non-road regulations (40 CFR part 89 and/or 1039) and use of CARB-approved diesel fuel or a fuel that meets the CARB requirements in 17 CCR Section 93115.5.	US EPA/ CARB

<b>BEST CONTROL TECHNOLOGIES ACHIEVED – NONROAD COMPRESSION-IGNITED IC ENGINE RATED AT 50 HP OR GREATER</b>		
<b>Pollutant</b>	<b>Standard</b>	<b>Source</b>
<b>VOC</b>	Compliance with the CARB ATCM for Diesel Particulate Matter from Portable Engines Rated at 50 Horsepower and Greater	CARB
<b>NOx</b>	Compliance with the CARB ATCM for Diesel Particulate Matter from Portable Engines Rated at 50 Horsepower and Greater	CARB
<b>SOx</b>	Compliance with the CARB ATCM for Diesel Particulate Matter from Portable Engines Rated at 50 Horsepower and Greater	CARB
<b>PM10</b>	Compliance with the CARB ATCM for Diesel Particulate Matter from Portable Engines Rated at 50 Horsepower and Greater	CARB
<b>PM2.5</b>	Compliance with the CARB ATCM for Diesel Particulate Matter from Portable Engines Rated at 50 Horsepower and Greater	CARB
<b>CO</b>	Compliance with the CARB ATCM for Diesel Particulate Matter from Portable Engines Rated at 50 Horsepower and Greater	CARB

**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.

Staff was unable to identify any technologically feasible alternatives, beyond what is achieved in practice that did not conflict with CAA Section 209(e), which restricts air districts from adopting emission standards or other requirements relating to the control of emissions for nonroad engines.

**C. SELECTION OF BACT:**

Based on the above analysis, BACT for VOC, NOx, SOx, PM, and CO will be considered at what is currently achieved in practice.

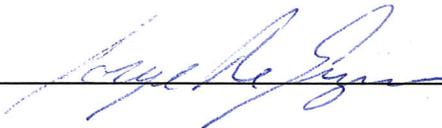
<b>BEST CONTROL TECHNOLOGIES ACHIEVED – NONROAD COMPRESSION-IGNITED IC ENGINE RATED LESS THAN 50 HP</b>		
<b>Pollutant</b>	<b>Standard</b>	<b>Source</b>
<b>VOC</b>	Compliance with applicable EPA non-road regulations (40 CFR part 89 and/or 1039) and use of CARB-approved diesel fuel or a fuel that meets the CARB requirements in 17 CCR Section 93115.5.	US EPA/ CARB
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<b>PM10</b>	Compliance with applicable EPA non-road regulations (40 CFR part 89 and/or 1039) and use of CARB-approved diesel fuel or a fuel that meets the CARB requirements in 17 CCR Section 93115.5.	US EPA/ CARB
<b>PM2.5</b>	Compliance with applicable EPA non-road regulations (40 CFR part 89 and/or 1039) and use of CARB-approved diesel fuel or a fuel that meets the CARB requirements in 17 CCR Section 93115.5.	US EPA/ CARB
<b>CO</b>	Compliance with applicable EPA non-road regulations (40 CFR part 89 and/or 1039) and use of CARB-approved diesel fuel or a fuel that meets the CARB requirements in 17 CCR Section 93115.5.	US EPA/ CARB

<b>BEST CONTROL TECHNOLOGIES ACHIEVED – NONROAD COMPRESSION-IGNITED IC ENGINE RATED AT 50 HP OR GREATER</b>		
<b>Pollutant</b>	<b>Standard</b>	<b>Source</b>
<b>VOC</b>	Compliance with the CARB ATCM for Diesel Particulate Matter from Portable Engines Rated at 50 Horsepower and Greater	CARB
<b>NOx</b>	Compliance with the CARB ATCM for Diesel Particulate Matter from Portable Engines Rated at 50 Horsepower and Greater	CARB
<b>SOx</b>	Compliance with the CARB ATCM for Diesel Particulate Matter from Portable Engines Rated at 50 Horsepower and Greater	CARB
<b>PM10</b>	Compliance with the CARB ATCM for Diesel Particulate Matter from Portable Engines Rated at 50 Horsepower and Greater	CARB
<b>PM2.5</b>	Compliance with the CARB ATCM for Diesel Particulate Matter from Portable Engines Rated at 50 Horsepower and Greater	CARB
<b>CO</b>	Compliance with the CARB ATCM for Diesel Particulate Matter from Portable Engines Rated at 50 Horsepower and Greater	CARB

**D. SELECTION OF T-BACT:**

The toxic pollutant at issue with this technology is diesel particulate matter. The BACT standard will also control diesel particulate matter. Therefore, BACT controls are also the T-BACT controls.

REVIEWED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

APPROVED BY:  DATE: 3/13/17