

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

Source Category

Source:	IC Engine – Compression Ignition, Stationary Prime; non-Agricultural	Revision:	6
		Document #:	96.1.4
Class:	> 50 BHP Output	Date:	04/13/2009

Determination

Pollutant	BACT 1. Technologically Feasible/ Cost Effective 2. Achieved in Practice	TYPICAL TECHNOLOGY
POC	<ol style="list-style-type: none"> 50% reduction of current tier^{a,b} standard for POC. Current tier^{a,b} standard for POC at applicable horsepower rating. 	<ol style="list-style-type: none"> Catalytic oxidation combined with current POC certified engine.^{a,b} Current POC certified engine.^{a,b}
NOx	<ol style="list-style-type: none"> 85% reduction of current tier^{a,b} standard for NOx. Current tier^{a,b} standard for NOx at applicable horsepower rating. 	<ol style="list-style-type: none"> Selective catalytic reduction (SCR) + current NOx certified engine.^{a,b} Current NOx certified engine.^{a,b}
SO₂	<ol style="list-style-type: none"> n/s Fuel sulfur content not to exceed 0.0015% (wt) or 15 ppm. 	<ol style="list-style-type: none"> n/s CARB Diesel Fuel (Ultra Low Sulfur Diesel).
CO	<ol style="list-style-type: none"> 50% reduction of current tier^{a,b} standard for CO. 2.75 g/bhp-hr [319 ppmvd @ 15% O₂]^d 	<ol style="list-style-type: none"> Catalytic oxidation combined with current CO certified engine.^{a,b} Any engine demonstrated or certified to meet 2.75 g/bhp-hr.
PM₁₀	<ol style="list-style-type: none"> n/s 0.01 g/bhp-hr or equiv^c technology.^c TBACT: 0.01 g/bhp-hr or equivalent^c technology.^c 	<ol style="list-style-type: none"> n/s Any engine/technology verified or certified to achieve 0.01 g/bhp-hr.^c (See 2., above)^c
NPOC	<ol style="list-style-type: none"> n/s n/s 	<ol style="list-style-type: none"> n/s n/s

References

<ol style="list-style-type: none"> <u>Current tier standard</u>: The current CARB or EPA off-road tier standard for the pollutant of concern within the appropriate horsepower range. Where NMHC + NOx is listed (with no individual standards for NOx or NMHC) as the standard, the portions may be considered 95% NOx and 5% NMHC. For the purposes of determining BACT NMHC = POC. Any engine which has been certified or demonstrated to meet the current year tier standard may be considered a current certified engine for that pollutant. An engine which does not meet the current EPA or CARB off-road tier standard may represent BACT2, providing 1) the engine met the most stringent EPA Tier Standard in effect prior to the Tier change for that horsepower rating, and 2) the permit application is submitted within 6 months of the effective date of the Tier change. [Source: California Health & Safety Code Section 93116.3(b)(7)] Compliance with 0.01 g/bhp-hr may be demonstrated by use of <i>Alternative Compliance Demonstration</i>, specified in California Health & Safety Code Section 93115.13(f) [Stationary CI Engine ATCM]. Previous BACT determination dated 01/11/02. Specified because not all BAAQMD-defined stationary engines are subject to the Stationary ATCM.
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Overview of Off-Road Compression Ignition Engine Certification Standards in g/bhp-hr (g/kW-hr)¹

Engine HP (KW)	Tier 1 ₂					Tier 2				Tier 3				Tier 4					
	HC	NOx	CO	PM	Years	NMHC + NOx	CO	PM	Years	NMHC + NOx	CO	PM	Years	NMHC + NOx	NMHC	NOx ₃	CO	PM	Years
50 <75 (37<56)		6.9 (9.2)			1998 - 2003	5.6 (7.5)	3.7 (5.0)	0.30 (0.40)	2004 - 2007	3.5 (4.7)	3.7 (5.0)	0.22 (0.30)	2008 - 2012	3.5 (4.7)			3.7 (5.0)	0.02 (0.03)	2013+
75<100 (56<75)		6.9 (9.2)			1998 - 2003	5.6 (7.5)	3.7 (5.0)	0.30 (0.40)	2004 - 2007	3.5 (4.7)	3.7 (5.0)	0.30 (0.40)	2008 - 2011	3.5 (4.7)	0.14 (0.19)	0.30-2.5 (0.40-3.4)	3.7 (5.0)	0.01 (0.02)	2012 - 2013
															0.14 (0.19)	0.30 (0.40)	3.7 (5.0)	0.01 (0.02)	2014+
100<175 (75<130)		6.9 (9.2)			1997 - 2002	4.9 (6.6)	3.7 (5.0)	0.22 (0.30)	2003 - 2006	3.0 (4.0)	3.7 (5.0)	0.22 (0.30)	2007 - 2011	3.0 (4.0)	0.14 (0.19)	0.30-2.5 (0.40-3.4)	3.7 (5.0)	0.01 (0.02)	2012 - 2013
															0.14 (0.19)	0.30 (0.40)	3.7 (5.0)	0.01 (0.02)	2014+
175<300 (>130<225)	0.97 (1.3)	6.9 (9.2)	8.5 (11.4)	0.40 (0.54)	1996 - 2002	4.9 (6.6)	2.6 (3.5)	0.15 (0.20)	2003 - 2005	3.0 (4.0)	2.6 (3.5)	0.15 (0.20)	2006 - 2010	3.0 (4.0)	0.14 (0.19)	0.30-1.5 (0.40-2.0)	2.6 (3.5)	0.01 (0.02)	2011 - 2013
															0.14 (0.19)	0.30 (0.40)	2.6 (3.5)	0.01 (0.02)	2014+
300<600 (225<450)	0.97 (1.3)	6.9 (9.2)	8.5 (11.4)	0.40 (0.54)	1996 - 2000	4.8 (6.4)	2.6 (3.5)	0.15 (0.20)	2001 - 2005	3.0 (4.0)	2.6 (3.5)	0.15 (0.20)	2006 - 2010	3.0 (4.0)	0.14 (0.19)	0.30-1.5 (0.40-2.0)	2.6 (3.5)	0.01 (0.02)	2011 - 2013
															0.14 (0.19)	0.3.0 (0.40)	2.6 (3.5)	0.01 (0.02)	2014+
600<750 (450<560)	0.97 (1.3)	6.9 (9.2)	8.5 (11.4)	0.40 (0.54)	1996 - 2001	4.8 (6.4)	2.6 (3.5)	0.15 (0.20)	2002 - 2005	3.0 (4.0)	2.6 (3.5)	0.15 (0.20)	2006 - 2010	3.0 (4.0)	0.14 (0.19)	0.30-1.5 (0.40-0.20)	2.6 (3.5)	0.01 (0.02)	2011 - 2013
															0.14 (0.19)	0.30 (0.40)	2.6 (3.5)	0.01 (0.02)	2014+
≥750 (≥560)	0.97 (1.3)	6.9 (9.2)	8.5 (11.4)	0.40 (0.54)	2000 - 2005	4.8 (6.4)	2.6 (3.5)	0.15 (0.20)	2006 - 2010						0.30 (0.40)	2.6 (3.5)	2.6 (3.5)	0.075 (0.10)	2011 - 2014
															0.14 (0.19)	2.6 (3.5)	2.6 (3.5)	0.03 (0.04)	2015+
>750≤1200 ⁴ (560≤900) Gen. Only	0.97 (1.3)	6.9 (9.2)	8.5 (11.4)	0.40 (0.54)	2000 - 2005	4.8 (6.4)	2.6 (3.5)	0.15 (0.20)	2006 - 2010						0.30 (0.40)	2.6 (3.5)	2.6 (3.5)	0.075 (0.10)	2011 - 2014
															0.14 (0.19)	0.50 (0.67)	2.6 (3.5)	0.02 (0.03)	2015+
>1200 ⁴ (>900) Gen. Only	0.97 (1.3)	6.9 (9.2)	8.5 (11.4)	0.40 (0.54)	2000 - 2005	4.8 (6.4)	2.6 (3.5)	0.15 (0.20)	2006 - 2010						0.30 (0.40)	0.50 (0.67)	2.6 (3.5)	0.075 (0.10)	2011 - 2014
															0.14 (0.19)	0.5 (0.67)	2.6 (3.5)	0.02 (0.03)	2015+

¹ This table is intended as an overview. For California Exhaust Emission Standards and Test Procedures -Off-Road Compression-Ignition Engines, consult title 13, California Code of Regulations, section 2423. For federal Nonroad Compression Ignition Engine Certification Standards, consult title 40, United States Code of Federal Regulations, Chapter 1, Part 89, subpart B and Part 1039, Subpart B.

² Engine manufacturers have several options for complying with NOx during the transitional implementation years of Tier 4, including a "phase-in--phase-out" or alternative NOx level approach.