

# Emission standards in the United States for non-road vehicles

**Table 1:** Tier 4 emission standards for non-road Diesel engines up to 560 kW, g/kWh (g/bhp-hr)

Engine power	Model years	CO	NMHC	NMHC + NO <sub>x</sub>	NO <sub>x</sub>	PM
kW < 8 (hp < 11)	2008 – 2014	8.0 (6.0)	–	7.5 (5.6)	–	0.40 <sup>a</sup> (0.3)
8 ≤ kW < 19 (11 ≤ hp < 25)	2008 – 2014	6.6 (4.9)	–	7.5 (5.6)	–	0.40 (0.3)
19 ≤ kW < 37 (25 ≤ hp < 50)	2008 – 2012	5.5 (4.1)	–	7.5 (5.6)	–	0.30 (0.22)
	2013 – 2014	5.5 (4.1)	–	4.7 (3.5)	–	0.03 (0.022)
37 ≤ kW < 56 (50 ≤ hp < 75)	2008 – 2012	5.0 (3.7)	–	4.7 (3.5)	–	0.30 <sup>b</sup> (0.22)
	2013 – 2014	5.0 (3.7)	–	4.7 (3.5)	–	0.03 (0.022)
56 ≤ kW < 130 (75 ≤ hp < 175)	2012 – 2014 <sup>c</sup>	5.0 (3.7)	0.19 (0.14)	–	0.4 (0.3)	0.02 (0.015)
130 ≤ kW ≤ 560 (175 ≤ hp ≤ 750)	2011 – 2014 <sup>d</sup>	3.5 (2.6)	0.19 (0.14)	–	0.4 (0.3)	0.02 (0.015)

a - hand-startable, air-cooled, DI engines may be certified to Tier 2 standards through 2009 and to an optional PM standard of 0.6 g/kWh starting in 2010

b - 0.4 g/kWh (Tier 2) if manufacturer complies with the 0.03 g/kWh standard from 2012

c - PM/CO: full compliance from 2012; NO<sub>x</sub>/HC: Option 1 (if banked Tier 2 credits used)—50% engines must comply in 2012-2013; Option 2 (if no Tier 2 credits claimed)—25% engines must comply in 2012-2014, with full compliance from 12/31/2014

d - PM/CO: full compliance from 2011; NO<sub>x</sub>/HC: 50% engines must comply in 2011-2013

**Table 2:** Tier 4 emission standards for non-road Diesel engines above 560 kW, g/kWh (g/bhp-hr)

Year	Category	CO	NMHC	NO <sub>x</sub>	PM
2011 - 2014	Generator sets > 900 kW	3.5 (2.6)	0.40 (0.30)	0.67 (0.5)	0.10 (0.07)
	All engines except gensets > 900 kW	3.5 (2.6)	0.40 (0.30)	3.50 (2.6)	0.10 (0.07)
2015	Generator sets	3.5 (2.6)	0.19 (0.14)	0.67 (0.5)	0.03 (0.022)
	All engines except gensets	3.5 (2.6)	0.19 (0.14)	3.50 (2.6)	0.04 (0.03)

Equipment for agricultural, construction, marine, generating sets, material handling and railway.

- **Tier 1** became effected 1996 through 2000, depending on the engine power
- **Tier 2** became effected 2002 through 2006, depending on the engine power
- **Tier 3** became effected 2006 through 2008, depending on the engine power
- **Tier 4i** and **final Tier 4** becomes effected 2008 through 2015, depending on the engine power
  - **Tier 4i** reduces PM emissions by 90% compared to **Tier 2** and **Tier 3** and further NO<sub>x</sub> reduction by 50%, depending on engine power
  - **Final Tier 4** reduces NO<sub>x</sub> emissions by further 80% compared to **Tier 4i**, depending on engine power