

## Summary of EPA Non-Road Regulations

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Information in the following tables was gleaned from EPA fact sheets, Federal Register notices, and regulatory impact analyses available on the OTAQ website. These documents were not thoroughly studied or compared, so if (for example) the tables below do not mention an in-use testing program for a particular rule or engine category, that does not necessarily mean it does not exist. Emission reductions are shown for some pollutants that are not necessarily regulated, but expected as secondary benefits. Likewise, some pollutants may be regulated but are not expected to decrease, either because of growth or to the possibility that the standard is intended to prevent backsliding. In fact, NOx is expected to increase in some instances. This is due to a tradeoff between HC and NOx emissions in the design of the engines. Hence, several regulations set a single standard for HC+NOx. The tables below, however, shows their individual changes when available.

CI = Compression-ignition (i.e., diesel) engines and vehicles. Some CI engines may use non-diesel fuel.

SI = Spark-ignition engines and vehicles. Some SI engines may use non-gasoline fuel.

ABT = Averaging, banking, and trading.

### Nonroad Land-Based Diesel Engines and Vehicles (excluding locomotives and including some marine)

Regulation	Status	Affected Sources	Effective Dates (MY)	Emission Reductions	Comments / Key Features
Tier 1 CI > 50 hp	Final: 06-17-94	Cranes, bulldozers, tractors, surface mining equipment, etc.	176-756 hp: 1996 101-175 hp: 1997 50-100 hp: 1998 > 756 hp: 2000	NOx – 27% by 2010, 37% by 2025 on a per unit basis Smoke – ? PM – ? HC – ? CO – ?	Emphasis on NOx and smoke. Standards for PM, HC and CO were not proposed, but adopted for harmonization with CA and European standards.
Tier 1 CI < 50 hp Tier 2 CI All sizes Tier 3 CI 50 – 750 hp	Final: 10-23-98	Same as Tier 1, plus smaller engines such as lawn tractors and marine CI < 50 hp.	Tier 1: 1999-2000 Tier 2: 2001-2006 Tier 3: 2006-2008	NOx – 50% over Tier 1 by 2020 PM – 45% over Tier 1 by 2020 HC – 57% over Tier 1 by 2020 CO – Significant ambient impact not expected	Engines certified to these standards must meet EPA requirements for maintenance and rebuilding (e.g., no tampering, use of specified parts, use of engine for originally-intended purpose).
Tier 4 CI > 25 hp < 25 hp maybe	Proposal expected circa April.	Same as Tier 2-3, plus train and ship fuel.	Approx 2008-10	NOx – Significant decrease PM – Approx 90%	Fuel sulfur limited to 15 ppm. Fuel sulfur limited to 300 ppm in trains and ships. New emissions model and new transient test cycle for PM. May allow purchase of credits from retrofits and rebuild of on/off-road sources.

### Nonroad Land-Based Spark-Ignition Engines and Vehicles

Regulation	Status	Affected Sources	Effective Dates (MY)	Emission Reductions	Comments / Key Features
Phase 1 SI < 25 hp	Final: 08-02-95	Principally lawn and garden equipment, but also chainsaws, snow-blowers, pumps, compressors, and farm and construction equipment.	1997	NO <sub>x</sub> – 154% by 2020 (increase) HC – 32% by 2020 CO – 7% by 2020	Previously unregulated.
Phase 2 SI Nonhandheld < 25 hp	Final: 03-30-99	Phase 1 engines that are not handheld.	> 225 cc: 2001-05 < 225 cc: 2007*	HC+NO <sub>x</sub> – 59% over Phase 1 by 2027 CO – Marginal	Includes an ABT certification program.
Phase 2 SI Handheld < 25 hp	Final: 05-25-00	Phase I engines that are handheld.	2002-07	HC+NO <sub>x</sub> – 71% over Phase 1 by 2027 CO – Marginal	Includes an ABT certification program.
Large SI > 25 hp	Final: 11-08-02	Includes forklifts, generators, and a variety of farm, construction, and airport equipment.	Tier 1: 2004 Tier 2: 2007	NO <sub>x</sub> – 91% by 2020 PM – 0% by 2020 HC – 89% by 2020 CO – 88% by 2020	Previously unregulated. Tier 2 includes evaporative standards, transient tests, OBD, and trading between HC+NO <sub>x</sub> and CO.
Recreational Vehicles	Final: 11-08-02	Snowmobiles	2006-12	NO <sub>x</sub> – 100% by 2020 (increase) PM – 42% by 2020 HC – 58% by 2020 CO – 46% by 2020	Previously unregulated.
		Off-Road motorcycles	2006-07	NO <sub>x</sub> – 19% by 2020 (increase) PM – 50% by 2020 HC – 50% by 2020 CO – 26% by 2020	
		All-terrain vehicles	2006-07	NO <sub>x</sub> – 25% by 2020 PM – 86% by 2020 HC – 86% by 2020 CO – 13% by 2020	

\* New engine families introduced in the < 25 hp nonhandheld category after 8/1/03 must meet the standards upon production.

**Marine Engines and Vehicles (includes commercial, recreational, and ocean-going vessels)**

<b>Regulation</b>	<b>Status</b>	<b>Affected Sources</b>	<b>Effective Dates (MY)</b>	<b>Emission Reductions</b>	<b>Comments / Key Features</b>
Marine CI Comm > 50 hp	Final: 12-29-99	Includes fishing boats, tugboats, dredgers, coastal and Great Lakes cargo vessels, and ocean-going vessels.	2004-07	NOx – 32% by 2030 PM – 26% by 2030 HC – 13% by 2030 CO – ?	Includes an ABT certification program and requirements for off-cycle testing and rebuilt engines.
Marine CI Rec > 50 hp	Final: 11-08-02	Recreational boats such as yachts and cruisers.	2006-09	NOx – 21% by 2020 PM – 18% by 2020 HC – 28% by 2020 CO – 0% by 2020	Previously unregulated.
Marine CI Large > 30 liters/cyl	Prop: 05-29-02	US-flagged ocean-going vessels	Tier 1: 2004	Would make internationally-negotiated NOx stds mandatory. These stds already being met, so no further NOx reductions expected from this rule.	Requesting comment on applicability to non-US vessels.
			Tier 2: 2007	Considering stricter NOx stds and HC and CO stds to prevent backsliding. Requesting comment on fuel-S limits.	
Marine SI	Final: 10-04-96	Includes outboard engines, personal watercraft, and jet boats, but not sterndrive or inboard engines.	1998-2006	NOx – Slight increase HC – 73% by 2020	Includes an ABT certification program and in-use testing. CO standard proposed but not adopted.
Marine SI Evap	Prop: 08-14-02	Yachts, sport boats, fishing boats, jet boats, and other types of pleasure craft with outboard engines.	2008	HC – 80% reduction in evaporative / permeation emissions	

### Aircraft and Locomotive Engines and Vehicles

Regulation	Status	Affected Sources	Effective Dates (MY)	Emission Reductions	Comments / Key Features
Aircraft	Final: 1984	All commercial jets		Smoke and fuel venting limits HC limits on some classes	
Aircraft	Final: 05-08-97	Commercial aircraft gas turbine engines	NOx: 1995, 1999 CO: 1997	Makes mandatory the NOx and CO limits adopted by the UN Civil Aviation Organization.	Only a few models would need minor reductions to meet NOx standard.
Locomotive	Final: 04-16-98	Locomotives and locomotive engines	Tier 0: 1973-2001 Tier 1: 2002-2004 Tier 2: 2005	NOx – 40% by 2010, 60% by 2040 PM – 45% by 2040 HC – 45% by 2040 CO – Nominal Opacity of 20% at steady state	Previously unregulated. First-time regs on remanufacturing of pre-reg engines (Tier 0). Provisions for in-use compliance and ABT.