CHINA: NONROAD: EMISSIONS

History

China has established emissions standards for multiple categories of non-highway vehicles and engines. These include standards for three-wheeled and low-speed vehicles (primarily used in agricultural and rural applications) as well as nonroad mobile machinery.

Chinese emissions standards for nonroad mobile machinery are generally based on the European emission standards. However, the Chinese standards also include small diesel engines which are not included in the European standards. Emissions limits for the smallest engines are consistent with the US Tier 1/2 nonroad standards.

In June 2013, China's Ministry of Environmental Protection (MEP) issued draft Stage III emission limits for nonroad diesel engines, with reference to European Stage III. In May 2014, MEP announced the official standards for Stage III and IV. China Stage III and IV are comparable to European Stage III A and III B, respectively.

Compared to the EU standard (2004/26/EC), China Stage III and IV standards have the following main changes (GB 20981-2014).

- Applicable to a broader range of power categories - regulating engine power less than 19 kW or above 560 kW
- Excluding the technical requirements for European Stage IV
- G2 test cycle as described in ISO8178 is required for specific engines
- Additional requirement for characterization of catalytic converters
- Revised fuel properties requirement of reference diesel fuel for testing (e.g. maximum sulfur content 300 ppm for European Stage III A vs. 350 ppm for China III
- Simplified criteria for consistency check

The new national standard sets the limits for China Stage IV. While the mandatory implementation date for Stage IV is unknown, early implementation is encouraged for regions that can meet the regulation (GB 20981-2014).

Implementation dates for Chinese nonroad emissions standards are as follows:

Three-wheeled and low-speed vehicles			
Stage	**Standard**	**Implementation Date (type approval)**	**Implementation Date (all sales and registrations)**
Stage I (smoke only)	GB 18322-2002	1 Oct 2002	1 Jul 2003
Stage II (smoke only)		1 Jan 2004	1 Jul 2004
Stage I (emissions)	GB 19756-2005	1 Oct 2006	1 Oct 2007
Stage II (emissions)		1 Oct 2007	1 Oct 2008
Nonroad mobile machinery			

Fuel	Stage	Standard	Implementation Date (type approval)	Implementation Date (all sales and registrations)
Diesel	Stage I	GB 20891-2007	1 October 2007	
	Stage II		1 October 2009	
	Stage III	GB 20981-2014	1 October 2014	1 April 2016
	Stage IV		TBD	TBD
Gasoline	Stage I	GB 26133-2010	1 Mar 2011	1 Mar 2012
	Stage II		1 Jan 2013(1) 1 Jan 2015(2)	1 Jan 2014(1) 1 Jan 2016(2)
(1) Non-handheld; (2) Handheld				

Definitions and Applicability

a. Three-wheeled and low-speed vehicles

As defined in GB 19756-2005:

- Three-wheeled vehicles: three-wheeled goods vehicles with maximum design speed less than or equal to 50 km/h.
- Low-speed vehicles: four-wheeled goods vehicles vehicles with maximum design speed less than or equal to 70 km/h.

b. Nonroad mobile machinery

- Diesel: nonroad mobile machinery with power less than or equal to 560 kW (as defined in GB 20981-2014).
- Gasoline: nonroad mobile machinery with power less than or equal to 19kW (as defined in GB 26133-2010).

Technical Standards

a. Three-wheeled and low-speed vehicles

Emission Standards for Three-wheeled and Low-speed Vehicles [g/kWh]				
Stage	**CO**	**HC**	**NOx**	**PM**
I	11.2/12.3	2.4/2.6	14.4/15.8	-
II	4.5/4.9	1.1/1.23	8.0/9.0	0.61/0.68
Note: The first number listed is the Type Approval limit value while the second number is Conformity of Production limit value.				

Limit values given in GB 19756-2005.

b. Nonroad Diesel Engines

Emission Limits for Nonroad Diesel Engines [g/kWh]						
Stage	**Max Power (P), kW**	**CO**	**HC**	**NO_x**	**HC+NO_x**	**PM**
I [i]	130 ≤ P ≤ 560	5.0	1.3	9.2	–	0.54
	75 ≤ P < 130	5.0	1.3	9.2	–	0.7
	37 ≤ P < 75	6.5	1.3	9.2	–	0.85
	18 ≤ P < 37	8.4	2.1	10.8	–	1.0
	8 ≤ P < 18	8.4	–	–	12.9	–
	0 < P < 8	12.3	–	–	18.4	–
II	130 ≤ P ≤ 560	3.5	1.0	6.0	–	0.2
	75 ≤ P < 130	5.0	1.0	6.0	–	0.3
	37 ≤ P < 75	5.0	1.3	7.0	–	0.4
	18 ≤ P < 37	5.5	1.5	8.0	–	0.8
	8 ≤ P < 18	6.6	–	–	9.5	0.8
	0 < P < 8	8.0	–	–	10.5	1.0
III	P > 560	3.5	–	–	6.4	0.20
	130 ≤ P ≤ 560	3.5	–	–	4.0	0.20
	75 ≤ P < 130	5.0	–	–	4.0	0.30

	37 ≤ P < 75	5.0	–	–	4.7	0.40
	P < 37	5.5	–	–	7.5	0.60
IV	P > 560	3.5	0.4	3.5, 0.67 [ii]	–	0.10
	130 ≤ P ≤ 560	3.5	0.19	2.0	–	0.025
	75 ≤ P < 130	5.0	0.19	3.3	–	0.025
	56 ≤ P < 75	5.0	0.19	3.3	–	0.025
	37 ≤ P < 56	5.0	–	–	4.7	0.025
	P < 37	5.5	–	–	7.5	0.60
Notes: [i] Stage I limits shall be achieved before any exhaust aftertreatment device. [ii] Applicable to mobile power generator with diesel engine P_{max} > 900 kW						

Emissions are measured over a steady-state test cycle that is equivalent to the ISO 8178 C1, 8-mode test. Other ISO 8178 test cycles can be used for selected applications.

c. Nonroad Gasoline Engines

Limit values given in GB 26133-2010.

d. Additional Notes

Compared to previous standards, the non-road transient cycle (NRTC) will be required to test non-constant speed diesel engines with power below 560 kW in State IV. For Stage III, manufacturers have the option to choose NRTC to test non-constant speed diesel engines with power below 560 kW. The NRTC includes cold-start and hot-start tests. The weights of cold-start and hot-start test results are 10% and 90%, respectively.

Additionally, unlike Stage I and II, durability testing is required in Stage III and IV. The test time requirements are provided in the table below. Durability testing is conducted to establish deterioration factors for diesel engines with after-treatment systems or deterioration corrections for diesel engines without after-treatment systems. The test results from Stage III and IV need to be multiplied by deterioration factors or added to deterioration corrections and then compared to the limits.

Durability requirements			
Max Power (P), kW	**Speed (rpm)**	**Useful Life (h)**	**Allowed Minimum Test Time (h)**
$P \geq 37$	Any speed	8000	2000
$19 \leq P < 37$	Non-constant speed	5000	1250
	Constant speed < 3000		
	Constant speed > 3000		
$P < 19$	Any speed	3000	750

Source: http://transportpolicy.net/index.php?title=China:_Nonroad:_Emissions