

Annex VIII

LIMIT VALUES FOR FUELS AND NEW MOBILE SOURCES

Introduction

1. Section A applies to Parties other than Canada and the United States of America, section B applies to Canada and section C applies to the United States of America.
2. The annex contains limit values for NO_x, expressed as nitrogen dioxide (NO₂) equivalents, and for hydrocarbons, most of which are volatile organic compounds, as well as environmental specifications for marketed fuels for vehicles.
3. The timescales for applying the limit values in this annex are laid down in annex VII.

A. Parties other than Canada and the United States of America

Passenger cars and light-duty vehicles

4. Limit values for power-driven vehicles with at least four wheels and used for the carriage of passengers (category M) and goods (category N) are given in table 1.

Heavy-duty vehicles

5. Limit values for engines for heavy-duty vehicles are given in tables 2 and 3 depending on the applicable test procedures.

Motorcycles and mopeds

6. Limit values for motorcycles and mopeds are given in table 6 and table 7.

Non-road vehicles and machines

7. Limit values for agricultural and forestry tractors and other non-road vehicle/machine engines are listed in tables 4 and 5. Stage I (table 4) is based on ECE regulation 96, "Uniform provisions concerning the approval of compression-ignition (C.I.) engines to be installed in agricultural and forestry tractors with regard to the emissions of pollutants by the engine".

Fuel quality

8. Environmental quality specifications for petrol and diesel are given in tables 8 to 11.

Table 1. Limit values for passenger cars and light-duty vehicles

Category	Class	To be applied from ^{b/}	Reference mass(RW)(kg)	Limit values									
				Carbon monoxide		Hydrocarbons		Nitrogen oxides		Hydrocarbons and nitrogen oxides combined		Particulates ^{d/}	
				L1 (g/km)		L2 (g/km)		L3 (g/km)		L2+L3 (g/km)		L4 (g/km)	
				Petrol	Diesel	Petrol	Diesel	Petrol	Diesel	Petrol	Diesel	Diesel	
A	M ^{e/}	1.1.2001	All ^{e/}	2.3	0.64	0.20	-	0.15	0.50	-	0.56	0.05	
	N ₁ ^{d/}	I	1.1.2001 ^{e/}	RW ≤ 1305	2.3	0.64	0.20	-	0.15	0.50	-	0.56	0.05
		II	1.1.2002	1305 < RW ≤ 1760	4.17	0.80	0.25	-	0.18	0.65	-	0.72	0.07
		III	1.1.2002	1760 < RW	5.22	0.95	0.29	-	0.21	0.78	-	0.86	0.10
B	M ^{e/}	1.1.2006	All	1.0	0.50	0.10	-	0.08	0.25	-	0.30	0.025	
	N ₁ ^{d/}	I	1.1.2006 ^{f/}	RW ≤ 1305	1.0	0.50	0.10	-	0.08	0.25	-	0.30	0.025
		II	1.1.2007	1305 < RW ≤ 1760	1.81	0.63	0.13	-	0.10	0.33	-	0.39	0.04
		III	1.1.2007	1760 < RW	2.27	0.74	0.16	-	0.11	0.39	-	0.46	0.06

a/ For compression-ignition engines.

b/ The registration, sale or entry into service of new vehicles that fail to comply with the respective limit values shall be refused as from the dates given in this column and type approval may no longer be granted with effect from 12 months prior to these dates.

c/ Except vehicles whose maximum mass exceeds 2,500 kg.

d/ And those category M vehicles specified in note c.

e/ 1.1.2002 for those category M vehicles specified in note c.

f/ 1.1.2007 for those category M vehicles specified in note c.

g/ Until 1 January 2003 vehicles in this category fitted with compression-ignition engines that are non-road vehicles and vehicles with a maximum mass of more than 2,000 kg which are designed to carry more than six occupants, including the driver, shall be considered as vehicles in category N1, class III, in row A.

Table 2. Limit values for heavy-duty vehicles - European steady-state cycle (ESC) and European load-response (ELR) tests

Row	To be applied from ^{a/}	Carbon monoxide (g/kWh)	Hydrocarbons (g/kWh)	Nitrogen oxides (g/kWh)	Particulates (g/kWh)	Smoke (m ⁻¹)
A	1.10.2001	2.1	0.66	5.0	0.10 / 0.13 ^{b/}	0.8
B1	1.10.2006	1.5	0.46	3.5	0.02	0.5
B2	1.10.2009	1.5	0.46	2.0	0.02	0.5

a/ With effect from the given dates and except for vehicles and engines intended for export to countries that are not parties to the present Protocol and for replacement engines for vehicles in use, Parties shall prohibit the registration, sale, entry into service or use of new vehicles propelled by a compression-ignition or gas engine and the sale and use of new compression-ignition or gas engines if their emissions do not comply with the respective limit values. With effect from twelve months prior to these dates, type approval may be refused if the limit values are not complied with.

b/ For engines with a swept volume below 0.75 dm³ per cylinder and a rated power speed above 3000 revolutions per minute.

Table 3. Limit values for heavy-duty vehicles - European transient cycle (ETC) test^{a/}

Row	To be applied from ^{b/}	Carbon monoxide (g/kWh)	Non-methane hydrocarbons (g/kWh)	Methane ^{c/} (g/kWh)	Nitrogen oxides (g/kWh)	Particulates ^{d/}
A (2000)	1.10.2001	5.45	0.78	1.6	5.0	0.16 / 0.21 ^{e/}
B1 (2005)	1.10.2006	4.0	0.55	1.1	3.5	0.03
B2 (2008)	1.10.2009	4.0	0.55	1.1	2.0	0.03

a/ The conditions for verifying the acceptability of the ETC tests when measuring the emissions of gas-fuelled engines against the limit values applicable in row A shall be re-examined and, where necessary, modified in accordance with the procedure laid down in article 13 of Directive 70/156/EEC.

b/ With effect from the given dates and except for vehicles and engines intended for export to countries that are not parties to the present Protocol and for replacement engines for vehicles in use, Parties shall prohibit the registration, sale, entry into service or use of new vehicles propelled by a compression-ignition or gas engine and the sale and use of new compression-ignition or gas engines if their emissions do not comply with the respective limit values. With effect from twelve months prior to these dates, type approval may be refused if the limit values are not complied with.

c/ For natural gas engines only.

d/ Not applicable to gas-fuelled engines at stage A and stages B1 and B2.

e/ For engines with a swept volume below 0.75 dm³ per cylinder and a rated power speed above 3000 revolutions per minute.

Table 4. Limit values (stage I) for diesel engines for non-road mobile machines (measurement procedure ISO 8178)

Net power (P) (kW)	To be applied from ^{a/}	Carbon monoxide (g/kWh)	Hydrocarbons (g/kWh)	Nitrogen oxides (g/kWh)	Particulate matter (g/kWh)
130 ≤ P < 560	31.12.1998	5.0	1.3	9.2	0.54
75 ≤ P < 130	31.12.1998	5.0	1.3	9.2	0.70
37 ≤ P < 75	31.03.1998	6.5	1.3	9.2	0.85

a/ With effect from the given date and with the exception of machinery and engines intended for export to countries that are not parties to the present Protocol, Parties shall permit the registration, where applicable, and placing on the market of new engines, whether or not installed in machinery, only if they meet the limit values set out in the table. Type approval for an engine type or family shall be refused with effect from 30 June 1998 if it fails to meet the limit values.

Note: These limits are engine-out limits and shall be achieved before any exhaust after-treatment service.

Table 5. Limit values (stage II) for diesel engines for non-road mobile machines (measurement procedure ISO 8178)

Net power (P) (kW)	To be applied from ^{a/}	Carbon monoxide (g/kWh)	Hydrocarbons (g/kWh)	Nitrogen oxides (g/kWh)	Particulate matter (g/kWh)
130 ≤ P < 560	31.12.2001	3.5	1.0	6.0	0.2
75 ≤ P < 130	31.12.2002	5.0	1.0	6.0	0.3
37 ≤ P < 75	31.12.2003	5.0	1.3	7.0	0.4
18 ≤ P < 37	31.12.2000	5.5	1.5	8.0	0.8

a/ With effect from the given dates and with the exception of machinery and engines intended for export to countries that are not parties to the present Protocol, Parties shall permit the registration, where applicable, and placing on the market of new engines, whether or not installed in machinery, only if they meet the limit values set out in the table. Type approval for an engine type or family shall be refused with effect from twelve months prior to these dates if it fails to meet the limit values.

Table 6. Limit values for motorcycles and 3- and 4-wheelers (> 50 cm³; > 45 km/h) to be applied from 17 June 1999 ^{a/}

Engine type	Limit values
2-stroke	CO = 8 g/km HC = 4 g/km NO _x = 0.1 g/km
4-stroke	CO = 13 g/km HC = 3 g/km NO _x = 0.3 g/km

a/ Type approval shall be refused as from the given date if the vehicle's emissions do not meet the limit values.

Note: For 3- and 4-wheelers, the limit values have to be multiplied by 1.5.

Table 7. Limit values for mopeds (50 cm³; < 45 km/h)

Stage	To be applied from ^{a/}	Limit values	
		CO (g/km)	HC + NO _x (g/km)
I	17.6.1999	6.0 ^{b/}	3.0 ^{b/}
II	17.6.2002	1.0 ^{c/}	1.2

^{a/} Type approval shall be refused as from the given dates if the vehicle's emissions do not meet the limit values.

^{b/} For 3- and 4-wheelers, multiply by 2.

^{c/} For 3- and 4-wheelers, 3.5 g/km.

Table 8. Environmental specifications for marketed fuels to be used for vehicles equipped with positive-ignition engines

Type: Petrol

Parameter	Unit	Limits ^{a/}		Test	
		Minimum	Maximum	Method ^{b/}	Date of publication
Research octane number		95	-	EN 25164	1993
Motor octane number		85	-	EN 25163	1993
Reid vapour pressure, summer period ^{c/}	kPa	-	60	EN 12	1993
Distillation:					
evaporated at 100 °C	% v/v	46	-	EN-ISO 3405	1988
evaporated at 150 °C	% v/v	75	-		
Hydrocarbon analysis:					
- olefins	% v/v	-	18.0 ^{d/}	ASTM D1319	1995
- aromatics		-	42	ASTM D1319	1995
- benzene		-	1	project EN 12177	1995
Oxygen content	% m/m	-	2.7	EN 1601	1996
Oxygenates:					
- Methanol, stabilizing agents must be added	% v/v	-	3	EN 1601	1996
- Ethanol, stabilizing agents may be necessary	% v/v	-	5	EN 1601	1996
- Iso-propyl alcohol	% v/v	-	10	EN 1601	1996
- Tert-butyl alcohol	% v/v	-	7	EN 1601	1996
- Iso-butyl alcohol	% v/v	-	10	EN 1601	1996
- Ethers containing 5 or more carbon atoms per molecule	% v/v	-	15	EN 1601	1996
Other oxygenates ^{e/}	% v/v	-	10	EN 1601	1996
Sulphur content	mg/kg	-	150	project EN-ISO/DIS 14596	1996

^{a/} The values quoted in the specification are 'true values'. In the establishment of their limit values, the terms of ISO 4259, "Petroleum products - Determination and application of precision data in relation to methods of test", have been applied and, in fixing a minimum value, a minimum difference of 2R above zero has been taken into account (R = reproducibility). The results of individual measurements shall be interpreted on the basis of the criteria described in ISO 4259 (published in 1995).

^{b/} EN - European standard; ASTM - American Society for Testing and Materials; DIS - Draft international standard.

^{c/} The summer period shall begin no later than 1 May and shall not end before 30 September. For member States with arctic conditions the summer period shall begin no later than 1 June and not end before 31 August and the RVP is limited to 70 kPa.

^{d/} Except for regular unleaded petrol (minimum motor octane number (MON) of 81 and minimum research octane number (RON) of 91), for which the maximum olefin content shall be 21% v/v. These limits shall not preclude the introduction on the market of a member State of another unleaded petrol with lower octane numbers than set out here.

^{e/} Other mono-alcohols with a final distillation point no higher than the final distillation point laid down in national specifications or, where these do not exist, in industrial specifications for motor fuels.

Note: Parties shall ensure that, no later than 1 January 2000, petrol can be marketed within their territory only if it complies with the environmental specifications set out in table 8. Where a Party determines that banning petrol with a sulphur content which does not comply with the specifications for sulphur content in table 8, but does not exceed the current content, would raise severe difficulties for its industries in making the necessary changes in their manufacturing facilities by 1 January 2000, it may extend the time period of marketing within its territory until 1 January 2003 at the latest. In such a case the Party shall specify, in a declaration to be deposited together with its instrument of ratification, acceptance, approval or accession, that it intends to extend the time period and present written information on the reason for this to the Executive Body.

Table 9. Environmental specifications for marketed fuels to be used for vehicles equipped with compression-ignition engines

Type: Diesel fuel

Parameter	Unit	Limits ^{a/}		Test	
		Minimum	Maximum	Method ^{b/}	Date of publication
Cetane number		51	-	EN-ISO 5165	1992
Density at 15 °C	kg/m ³	-	845	EN-ISO 3675	1995
Distillation point: 95%	°C	-	360	EN-ISO 3405	1988
Polycyclic aromatic hydrocarbons	% m/m	-	11	IP 391	1995
Sulphur content	mg/kg	-	350	project EN-ISO/DIS 14596	1996

^{a/} The values quoted in the specification are 'true values'. In the establishment of their limit values, the terms of ISO 4259, "Petroleum products - Determination and application of precision data in relation to methods of test", have been applied and, in fixing a minimum value, a minimum difference of 2R above zero has been taken into account (R = reproducibility). The results of individual measurements shall be interpreted on the basis of the criteria described in ISO 4259 (published in 1995).

^{b/} EN - European standard; IP - The Institute of Petroleum; DIS - Draft international standard.

Note: Parties shall ensure that, no later than 1 January 2000, diesel fuel can be marketed within their territory only if it complies with the environmental specifications set out in table 9. Where a Party determines that banning diesel fuel with a sulphur content which does not comply with the specifications for sulphur content in table 9, but does not exceed the current content, would raise severe difficulties for its industries in making the necessary changes in their manufacturing facilities by 1 January 2000, it may extend the time period of marketing within its territory until 1 January 2003 at the latest. In such a case the Party shall specify, in a declaration to be deposited together with its instrument of ratification, acceptance, approval or accession, that it intends to extend the time period and present written information on the reason for this to the Executive Body.

Table 10. Environmental specifications for marketed fuels to be used for vehicles equipped with positive-ignition engines

Type: Petrol

Parameter	Unit	Limits ^{a/}		Test	
		Minimum	Maximum	Method ^{b/}	Date of publication
Research octane number		95		EN 25164	1993
Motor octane number		85		EN 5163	1993
Reid vapour pressure, summer period	kPa	-			
Distillation:					
evaporated at 100 °C	% v/v	-	-		
evaporated at 150 °C		-	-		
Hydrocarbon analysis:					
- olefins	% v/v	-			
- aromatics	% v/v	-	35	ASTM D1319	1995
- benzene	% v/v	-			
Oxygen content	% m/m	-			
Sulphur content	mg/kg	-	50	project EN-ISO/DIS 14596	1996

^{a/} The values quoted in the specification are 'true values'. In the establishment of their limit values, the terms of ISO 4259, "Petroleum products - Determination and application of precision data in relation to methods of test", have been applied and, in fixing a minimum value, a minimum difference of 2R above zero has been taken into account (R = reproducibility). The results of individual measurements shall be interpreted on the basis of the criteria described in ISO 4259 (published in 1995).

b/ EN - European standard; ASTM - American Society for Testing and Materials; DIS - Draft international standard.

Note: Parties shall ensure that, no later than 1 January 2005, petrol can be marketed within their territory only if it complies with the environmental specifications set out in table 10. Where a Party determines that banning petrol with a sulphur content which does not comply with the specifications for sulphur content in table 10, but does comply with table 8, would raise severe difficulties for its industries in making the necessary changes in their manufacturing facilities by 1 January 2005, it may extend the time period of marketing within its territory until 1 January 2007 at the latest. In such a case the Party shall specify, in a declaration to be deposited together with its instrument of ratification, acceptance, approval or accession, that it intends to extend the time period and present written information on the reason for this to the Executive Body.

Table 11. Environmental specifications for marketed fuels to be used for vehicles equipped with compression-ignition engines

Type: Diesel fuel

Parameter	Unit	Limits ^{a/}		Test	
		Minimum	Maximum	Method ^{b/}	Date of publication
Cetane number			-		
Density at 15 ≤ C	kg/m ³		-		
Distillation point: 95%	°C	-			
Polycyclic aromatic hydrocarbons	% m/m	-			
Sulphur content	mg/kg	-	50	project EN-ISO/DIS 14596	1996

a/ The values quoted in the specification are 'true values'. In the establishment of their limit values, the terms of ISO 4259, "Petroleum products - Determination and application of precision data in relation to methods of test", have been applied and, in fixing a minimum value, a minimum difference of 2R above zero has been taken into account (R =reproducibility). The results of individual measurements shall be interpreted on the basis of the criteria described in ISO 4259.

b/ EN - European standard; DIS - Draft international standard.

Note: Parties shall ensure that, no later than 1 January 2005, diesel fuel can be marketed within their territory only if it complies with the environmental specifications set out in table 11. Where a Party determines that banning diesel fuel with a sulphur content which does not comply with the specifications for sulphur content in table 11, but does comply with table 9, would raise severe difficulties for its industries in making the necessary changes in their manufacturing facilities by 1 January 2005, it may extend the time period of marketing within its territory until 1 January 2007 at the latest. In such a case the Party shall specify, in a declaration to be deposited together with its instrument of ratification, acceptance, approval or accession, that it intends to extend the time period and present written information on the reason for this to the Executive Body.

B. Canada

9. New vehicle emission standards for light-duty vehicles, light-duty trucks, heavy-duty vehicles, heavy-duty engines and motorcycles: Motor Vehicle Safety Act (and successor legislation), Schedule V of the Motor Vehicle Safety Regulations: Vehicle Emissions (Standard 1100), SOR/97-376, (28 July, 1997), as amended from time to time.

10. Canadian Environmental Protection Act, Diesel Fuel Regulations, SOR/97-110 (4 February, 1997, sulphur in diesel fuel), as amended from time to time.

11. Canadian Environmental Protection Act, Benzene in Gasoline Regulations, SOR/97-493 (6 November, 1997), as amended from time to time.

12. Canadian Environmental Protection Act, Sulphur in Gasoline Regulations, Canada Gazette, Part II, June 4, 1999, as amended from time to time.

C. United States of America

13. Implementation of a mobile source emission control programme for light-duty vehicles, light-duty trucks, heavy-duty trucks and fuels to the extent required by sections 202 (a), 202 (g) and 202 (h) of the Clean Air Act, as implemented through:

- (a) 40 Code of Federal Regulations (C.F.R.) Part 80, Subpart D - Reformulated Gasoline;
- (b) 40 C.F.R. Part 86, Subpart A - General Provisions for Emission Regulations;
- (c) 40 C.F.R. Part 80, section 80.29 -- Controls and Prohibitions on Diesel Fuel Quality.