Table 1. *Continued*

Model Year	Federal HC (g/bhp-hr)	Federal CO (g/bhp-hr)	Federal NO_x (g/bhp-hr)	Federal Evap (g/test)	Federal Particulates (g/bhp-hr)	Federal HC+NO_x	California HC (g/bhp-hr)	California CO (g/bhp-hr)	California NO_x (g/bhp-hr)	California Evap (g/test)	California Particulates (g/bhp-hr)	California HC+NO_x
					Emission Rates							
					Heavy-Duty Truck and Bus Engines[f]							
1969							[u]	[u]				
1972							[v]	[v]				
1973								40.0[v]				16.0
1974		40.0				16.0		40.0				16.0
1975		40.0				16.0		30.0				10.0
1977		40.0				16.0	1.0	25.0	7.5			5.0[w]
1978		40.0				16.0	1.0	25.0	7.5	6		5.0[w]
1979		25.0				10.0	1.5	25.0	7.5	6		5.0[w]
1980	1.5	25.0				10.0	1.0	25.0	7.5	2		6.0[w]
1984	1.5	25.0				10.0	0.5	25.0	7.5	2		4.5[w]
1985	1.9[x]	37.1[y]	10.6[z]	3[aa]			0.5	25.0	7.5	2		4.5[w,bb]
1987	1.1	14.4[y]	10.6	3			0.5	25.0	7.5	2		4.5[w]
1988[cc]	1.1	14.4	6.0	3	0.6		0.5	25.0	7.5	2		4.5[w]
1991	1.1	14.4	5.0	3	0.25[dd]		0.5[ee]	25.0[ee]	7.5[ee]	2		4.5[w]

NOTE: Evap = evaporative HC.
[p] 1.5 for >6,000 lb.
[q] Full useful life requirement = 11 yr/120,000 mi (was 5 yr/50,000 mi).
[r] NO_x federal standard = 1.2 g/mi under 3,751-lb loaded vehicle weight (LVW), 1.7 g/mi for ≥3,751 lb LVW, and 2.3 g/mi for ≥6,000 lb LVW.
[s] 1.2 for <3,751 lb.
[t] Various test methods, values are not strictly comparable.
[u] 275 ppm HC, 1.5% CO.
[v] 180 ppm HC, 1.0% CO.
[w] A combined standard is optional in lieu of separate HC and NO_x standards (for example, 1 g HC + 7.5 g NO_x or 5 g [HC+NO_x]).
[x] 1.3 for diesel.
[y] 15.5 for diesel.
[z] 10.7 for diesel.
[aa] 4.0 for >20,000 lb.
[bb] Gasoline only and in following years.
[cc] 1988 federal standards for NO_x have been postponed until 1990.
[dd] Separate standard of 0.1 for all 1991 urban buses and all 1994 engines.
[ee] 1.3 HC, 16.5 CO, 5.1 NO_x for diesel.
SOURCE: Adapted with permission from General Motors Corp. 1986.

are classified as heavy-duty vehicles. The driving-cycle philosophies for the light commercial vehicles follow those for passenger cars. For heavy commercial vehicles, engine dynamometers are used, not chassis dynamometers; that is, the engine rather than the vehicle is certified. The new (effective 1985) U.S. transient test procedure for heavy-duty vehicles combines the two philosophies just described in that the cycle is made up in a random way from actual driving cycle data. The use of this cycle replaces the 13-mode steady-state cycle in use since 1973 in California and since 1974 nationally (U.S. Environmental Protection Agency 1972).

Emission Standards

United States. Emissions standards and test procedures in the United States have changed significantly since the first automobile emission standards were imposed in California in 1966 (see table 1) (General

Table 1. *Continued*

Model Year	Emission Rates: Federal HC (g/bhp-hr)	CO (g/bhp-hr)	NO_x (g/bhp-hr)	Evap (g/test)	Particulates (g/bhp-hr)	HC+NO_x	California HC (g/bhp-hr)	CO (g/bhp-hr)	NO_x (g/bhp-hr)	Evap (g/test)	Particulates (g/bhp-hr)	HC+NO_x
					Heavy-Duty Truck and Bus Engines[r]							
1969							[u]	[u]				
1972							[v]	[v]				
1973								40.0[v]				16.0
1974		40.0				16.0		40.0				16.0
1975		40.0				16.0		30.0				10.0
1977		40.0				16.0	1.0	25.0	7.5			5.0[w]
1978		40.0				16.0	1.0	25.0	7.5	6		5.0[w]
1979		25.0				10.0	1.5	25.0	7.5	6		5.0[w]
1980	1.5	25.0				10.0	1.0	25.0	7.5	2		6.0[w]
1984	1.5	25.0				10.0	0.5	25.0	7.5	2		4.5[w]
1985	1.9[x]	37.1[y]	10.6[z]	3[aa]			0.5	25.0	7.5	2		4.5[w,bb]
1987	1.1	14.4[y]	10.6	3			0.5	25.0	7.5	2		4.5[w]
1988[cc]	1.1	14.4	6.0	3	0.6		0.5	25.0	7.5	2		4.5[w]
1991	1.1	14.4	5.0	3	0.25[dd]		0.5[ee]	25.0[ee]	7.5[ee]	2		4.5[w]

NOTE: Evap = evaporative HC.
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Emission Standards

United States. Emissions standards and test procedures in the United States have changed significantly since the first automobile emission standards were imposed in California in 1966 (see table 1) (General

Table 1. *Continued*

Model Year	Federal HC (g/bhp-hr)	Federal CO (g/bhp-hr)	Federal NO_x (g/bhp-hr)	Federal Evap (g/test)	Federal Particulates (g/bhp-hr)	Federal HC+NO_x	California HC (g/bhp-hr)	California CO (g/bhp-hr)	California NO_x (g/bhp-hr)	California Evap (g/test)	California Particulates (g/bhp-hr)	California HC+NO_x
	Emission Rates											
	Heavy-Duty Truck and Bus Engines[f]											
1969							[u]	[u]				
1972							[v]	[v]				
1973								40.0[v]				16.0
1974		40.0				16.0		40.0				16.0
1975		40.0				16.0		30.0				10.0
1977		40.0				16.0	1.0	25.0	7.5			5.0[w]
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1980	1.5	25.0				10.0	1.0	25.0	7.5	2		6.0[w]
1984	1.5	25.0				10.0	0.5	25.0	7.5	2		4.5[w]
1985	1.9[x]	37.1[y]	10.6[z]	3[aa]			0.5	25.0	7.5	2		4.5[w,bb]
1987	1.1	14.4[y]	10.6	3			0.5	25.0	7.5	2		4.5[w]
1988[cc]	1.1	14.4	6.0	3	0.6		0.5	25.0	7.5	2		4.5[w]
1991	1.1	14.4	5.0	3	0.25[dd]		0.5[ee]	25.0[ee]	7.5[ee]	2		4.5[w]

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