

Appendix A, Figure 2

Calculation of Manufacturer X’s actual fuel economy value.

(Manufacturer’s Domestic Passenger Automobile Production for Applicable Model Year)

/ ((Group 1 Volume / Group 1 Fuel Economy) + ((Group 2 Volume / Group 2 Fuel

Economy) + ... + (Group 9 Volume / Group 9 Fuel Economy)) =

27500 / (1500/34.0 + 2000/34.6 + 2000/33.8 + 1000/34.4 + 3000/32.9 + 8000/32.2 +

2000/33.1 + 5000/30.6 + 3000/28.5) = 32.0

Manufacturer's Domestic Passenger Automobile Production for Applicable Model Year

Group1	Group2	Group3	Group4	Group5	Group6	Group7	Group8	Group9
Volume								
Group1	Group2	Group3	Group4	Group5	Group6	Group7	Group8	Group9
FuelEcon								

$$\frac{27,500}{\left[\frac{1500}{34.0} + \frac{2000}{34.6} + \frac{2000}{33.8} + \frac{1000}{34.4} + \frac{3000}{32.9} + \frac{8000}{32.2} + \frac{2000}{33.1} + \frac{5000}{30.6} + \frac{3000}{28.5} \right]}$$

Fleet’s actual fuel economy = 32.0 mpg

NOTE TO APPENDIX A, FIGURE 2. Since the actual average fuel economy of Manufacturer X’s fleet is 32.0 mpg, as compared to its required fuel economy level of 31.8 mpg, Manufacturer X complied with the CAFE standard for MY 2012 as set forth in §531.5(c).

[75 FR 25719, May 7, 2010]

533.6 Measurement and calculation procedures.

APPENDIX A TO PART 533—EXAMPLE OF CALCULATING COMPLIANCE UNDER §533.5 PARAGRAPH (g)

AUTHORITY: 49 U.S.C. 32902; delegation of authority at 49 CFR 1.50.

PART 533—LIGHT TRUCK FUEL ECONOMY STANDARDS

Sec.

- 533.1 Scope.
- 533.2 Purpose.
- 533.3 Applicability.
- 533.4 Definitions.
- 533.5 Requirements.

§533.1 Scope.

This part establishes average fuel economy standards pursuant to section 502(b) of the Motor Vehicle Information and Cost Savings Act, as amended, for light trucks.

[42 FR 13807, Mar. 14, 1977, as amended at 43 FR 12013, Mar. 23, 1978]

§ 533.2 Purpose.

The purpose of this part is to increase the fuel economy of light trucks by establishing minimum levels of average fuel economy for those vehicles.

[42 FR 13807, Mar. 14, 1977, as amended at 43 FR 12013, Mar. 23, 1978]

§ 533.3 Applicability.

This part applies to manufacturers of light trucks.

[42 FR 13807, Mar. 14, 1977, as amended at 43 FR 12013, Mar. 23, 1978]

§ 533.4 Definitions.

(a) *Statutory terms.* (1) The terms *average fuel economy*, *average fuel economy standard*, *fuel economy*, *import*, *manufacture*, *manufacturer*, and *model year* are used as defined in section 501 of the Act.

(2) The term *automobile* is used as defined in section 501 of the Act and in accordance with the determinations in part 523 of this chapter.

(3) The term *domestically manufactured* is used as defined in section 503(b)(2)(E) of the Act.

(b) *Other terms.* As used in this part, unless otherwise required by the context—

(1) *Act* means the Motor Vehicle Information Cost Savings Act, as amended by Pub. L. 94-163.

(2) *Light truck* is used in accordance with the determinations in part 523 of this chapter.

Captive import means with respect to a light truck, one which is not domestically manufactured but which is imported in the 1980 model year or thereafter by a manufacturer whose principal place of business is in the United States.

4-wheel drive, general utility vehicle means a 4-wheel drive, general purpose automobile capable of off-highway operation that has a wheelbase of not more than 280 centimeters, and that has a body shape similar to 1977 Jeep CJ-5 or CJ-7, or the 1977 Toyota Land Cruiser.

Basic engine means a unique combination of manufacturer, engine displacement, number of cylinders, fuel system (as distinguished by number of carburetor barrels or use of fuel injection), and catalyst usage.

Limited product line light truck means a light truck manufactured by a manufacturer whose light truck fleet is powered exclusively by basic engines which are not also used in passenger automobiles.

[42 FR 13807, Mar. 14, 1977, as amended at 43 FR 12013, Mar. 23, 1978; 43 FR 46547, Oct. 10, 1978; 58 FR 18029, Apr. 7, 1993]

§ 533.5 Requirements.

(a) Each manufacturer of light trucks shall comply with the following average fuel economy standards, expressed in miles per gallon, in the model year specified as applicable:

TABLE I

Model year	2-wheel drive light trucks		4-wheel drive light trucks		Limited product line light trucks
	Captive imports	Other	Captive imports	Other	
1979	17.2	15.8
1980	16.0	16.0	14.0	14.0	14.0
1981	16.7	16.7	15.0	15.0	14.5

TABLE II

Model year	Combined standard		2-wheel drive light trucks		4-wheel drive light trucks	
	Captive imports	Others	Captive imports	Others	Captive imports	Others
1982	17.5	17.5	18.0	18.0	16.0	16.0
1983	19.0	19.0	19.5	19.5	17.5	17.5
1984	20.0	20.0	20.3	20.3	18.5	18.5
1985	19.5	19.5	19.7	19.7	18.9	18.9
1986	20.0	20.0	20.5	20.5	19.5	19.5
1987	20.5	20.5	21.0	21.0	19.5	19.5
1988	20.5	20.5	21.0	21.0	19.5	19.5
1989	20.5	20.5	21.5	21.5	19.0	19.0
1990	20.0	20.0	20.5	20.5	19.0	19.0
1991	20.2	20.2	20.7	20.7	19.1	19.1

TABLE III

Model Year	Combined standard	
	Captive imports	Other
1992	20.2	20.2
1993	20.4	20.4
1994	20.5	20.5
1995	20.6	20.6

TABLE IV

Model year	Standard
2001	20.7
2002	20.7

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TABLE IV—Continued

Model year	Standard
2003	20.7
2004	20.7
2005	21.0
2006	21.6

TABLE IV—Continued

Model year	Standard
2007	22.2
2008	22.5
2009	23.1
2010	23.5

FIGURE 1

$$\text{Required_Fuel_Economy_Level} = \frac{N}{\sum_i \frac{N_i}{T_i}}$$

Where:

N is the total number (sum) of light trucks produced by a manufacturer, N_i is the number (sum) of the ith light truck model type produced by the manufacturer, and

T_i is fuel economy target of the ith light truck model type, which is determined according to the following formula, rounded to the nearest hundredth:

$$T = \frac{1}{\frac{1}{a} + \left(\frac{1}{b} - \frac{1}{a} \right) \frac{e^{(x-c)/d}}{1 + e^{(x-c)/d}}}$$

Where:

Parameters a, b, c, and d are defined in § 533.3 Table V;

e = 2.718; and
x = footprint (in square feet, rounded to the nearest tenth) of the model type

TABLE V—PARAMETERS FOR THE LIGHT TRUCK FUEL ECONOMY TARGETS

Model year	Parameters			
	a	b	c	d
2008.....	28.56	19.99	49.30	5.58
2009.....	30.07	20.87	48.00	5.81
2010.....	29.96	21.20	48.49	5.50
2011.....	27.10	21.10	56.41	4.28

Figure 2:
$$CAFE_{required} = \frac{\sum_i Production_i}{\sum_i TARGET_i}$$

Where:
CAFE_{required} is the required level for a given fleet,
 Subscript *i* is a designation of multiple groups of light trucks, where each group's designation, *i.e.*, *i* = 1, 2, 3, etc., represents light trucks that share a unique model type and footprint within the applicable fleet.
Production_i is the number of units of light trucks produced for sale in the United States within each *i*th designation, *i.e.*,

which share the same model type and footprint.
TARGET_i is the fuel economy target in miles per gallon (mpg) applicable to the footprint of light trucks within each *i*th designation, *i.e.*, which shares the same model type and footprint, calculated according to Figure 3 and rounded to the nearest hundredth of a mpg, *i.e.*, 35.455 = 35.46 mpg, and the summations in the numerator and denominator are both performed over all models in the fleet in question.

Figure 3:
$$TARGET = \frac{1}{MIN \left[MAX \left(c \times FOOTPRINT + d, \frac{1}{a} \right), \frac{1}{b} \right]}$$

Where:
TARGET is the fuel economy target (in mpg) applicable to vehicles of a given footprint (*FOOTPRINT*, in square feet),

Parameters *a*, *b*, *c*, and *d* are defined in Table VI, and
 The *MIN* and *MAX* functions take the minimum and maximum, respectively of the included values.

TABLE VI—PARAMETERS FOR THE LIGHT TRUCK FUEL ECONOMY TARGETS

Model year	Parameters			
	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>
2012	29.82	22.27	0.0004546	0.014900
2013	30.67	22.74	0.0004546	0.013968
2014	31.38	23.13	0.0004546	0.013225
2015	32.72	23.85	0.0004546	0.011920
2016	34.42	24.74	0.0004546	0.010413

(b)(1) For model year 1979, each manufacturer may:

(i) Combine its 2- and 4-wheel drive light trucks and comply with the average fuel economy standard in paragraph (a) of this section for 2-wheel drive light trucks; or

(ii) Comply separately with the two standards specified in paragraph (a) of this section.

(2) For model year 1979, the standard specified in paragraph (a) of this section for 4-wheel drive light trucks applies only to 4-wheel drive general utility vehicles. All other 4-wheel drive light trucks in that model year shall be included in the 2-wheel drive category for compliance purposes.

(c) For model years 1980 and 1981, manufacturers of limited product line light trucks may:

(1) Comply with the separate standard for limited product line light trucks, or

(2) Comply with the other standards specified in § 533.5(a), as applicable.

(d) For model years 1982–91, each manufacturer may:

(1) Combine its 2- and 4-wheel drive light trucks (segregating captive import and other light trucks) and comply with the combined average fuel economy standard specified in paragraph (a) of this section; or

(2) Comply separately with the 2-wheel drive standards and the 4-wheel drive standards (segregating captive import and other light trucks) specified in paragraph (a) of this section.

(e) For model year 1992, each manufacturer shall comply with the average fuel economy standard specified in paragraph (a) of this section (segregating captive import and other light trucks).

(f) For model year 1996 and thereafter, each manufacturer shall combine its captive imports with its other light

trucks and comply with the average fuel economy standard in paragraph (a) of this section.

(g) For model years 2008–2010, at a manufacturer's option, a manufacturer's light truck fleet may comply with the fuel economy level calculated according to Figure I and the appropriate values in Table V, with said option being irrevocably chosen for that model year and reported as specified in § 537.8.

(h) For model year 2011, a manufacturer's light truck fleet shall comply with the fuel economy level calculated for that model year according to Figure 1 and the appropriate values in Table V.

(i) For model years 2012–2016, a manufacturer's light truck fleet shall comply with the fuel economy level calculated for that model year according to Figures 2 and 3 and the appropriate values in Table VI.

[43 FR 12014, Mar. 23, 1978]

EDITORIAL NOTE: For FEDERAL REGISTER citations affecting § 533.5 see the List of CFR Sections Affected which appears in the Finding Aids section of the printed volume and on GPO Access.

§ 533.6 Measurement and calculation procedures.

(a) Any reference to a class of light trucks manufactured by a manufacturer shall be deemed—

(1) To include all light trucks in that class manufactured by persons who control, are controlled by, or are under common control with, such manufacturer; and

(2) To exclude all light trucks in that class manufactured (within the meaning of paragraph (a)(1) of this section) during a model year by such manufacturer which are exported prior to the expiration of 30 days following the end of such model year.

(b) The average fuel economy of all nonpassenger automobiles that are manufactured by a manufacturer and are subject to §533.5(b) or to §533.5(c) shall be determined in accordance with procedures established by the Administrator of the Environmental Protection Agency under section 503(a)(2) of the Act.

[42 FR 13807, Mar. 14, 1977, as amended at 43 FR 12013, Mar. 23, 1978]

APPENDIX A TO PART 533—EXAMPLE OF CALCULATING COMPLIANCE UNDER § 533.5 PARAGRAPH (g)

Assume a hypothetical manufacturer (Manufacturer X) produces a fleet of light trucks in MY 2012 as follows:

APPENDIX A, TABLE 1

Model type				Description	Actual measured fuel economy (mpg)	Volume
Group	Carline name	Basic engine (L)	Transmission class			
1	Pickup A 2WD	4	A5	Reg cab, MB	27.1	800
2	Pickup B 2WD	4	M5	Reg cab, MB	27.6	200
3	Pickup C 2WD	4.5	A5	Reg cab, LB	23.9	300
4	Pickup C 2WD	4	M5	Ext cab, MB	23.7	400
5	Pickup C 4WD	4.5	A5	Crew cab, SB	23.5	400
6	Pickup D 2WD	4.5	A6	Crew cab, SB	23.6	400
7	Pickup E 2WD	5	A6	Ext cab, LB	22.7	500
8	Pickup E 2WD	5	A6	Crew cab, MB	22.5	500
9	Pickup F 2WD	4.5	A5	Reg cab, LB	22.5	1,600
10	Pickup F 4WD	4.5	A5	Ext cab, MB	22.3	800
11	Pickup F 4WD	4.5	A5	Crew cab, SB	22.2	800
Total						6,700

NOTE TO APPENDIX A, TABLE 1. Manufacturer X's required corporate average fuel economy level under §533.5(i) would first be calculated by determining the fuel economy targets applicable to each unique model type and footprint combination for model type groups (1-11) illustrated in Appendix A, Table 2:

APPENDIX A, TABLE 2

Manufacturer X calculates a fuel economy target standard value for each unique model type and footprint combination.

Group	Model type			Description	Base tire size	Wheel-base (inches)	Track width F&R average (inches)	Footprint (ft²)	Volume	Fuel economy target standard (mpg)
	Catline name	Basic engine (L)	Transmission class							
1	Pickup A 2WD	4	A5	Reg cab, MB	235/75R15	100.0	68.8	47.8	800	27.30
2a	Pickup B 2WD	4	M5	Reg cab, MB	235/75R15	100.0	68.2	47.4	100	27.44
2b	Pickup B 2WD	4	M5	Reg cab, MB	235/70R16	100.0	68.4	47.5	100	27.40
3	Pickup C 2WD	4.5	A5	Reg cab, LB	255/70R17	125.0	68.8	59.7	300	23.79
4	Pickup C 2WD	4	M5	Ext cab, MB	255/70R17	125.0	68.8	59.7	400	23.79
5	Pickup C 4WD	4.5	A5	Crew cab, SB	275/70R17	150.0	69.0	71.9	400	22.27
6a	Pickup D 2WD	4.5	A6	Crew cab, SB	255/70R17	125.0	68.8	59.7	200	23.79
6b	Pickup D 2WD	4.5	A6	Crew cab, SB	285/70R17	125.0	69.2	60.1	200	23.68
7	Pickup E 2WD	5	A6	Ext cab, LB	255/70R17	125.0	68.8	59.7	500	23.79
8	Pickup E 2WD	5	A6	Crew cab, MB	285/70R17	125.0	69.2	60.1	500	23.68
9	Pickup F 2WD	4.5	A5	Reg cab, LB	255/70R17	125.0	68.9	59.8	1,600	23.76
10	Pickup F 4WD	4.5	A5	Ext cab, MB	275/70R17	150.0	69.0	71.9	800	22.27
11	Pickup F 4WD	4.5	A5	Crew cab, SB	285/70R17	150.0	69.2	72.1	800	22.27
Total										6,700

NOTE TO APPENDIX A, TABLE 2. With the appropriate fuel economy targets determined for each unique model type and footprint combination, Manufacturer X's required fuel economy target standard would be calculated as illustrated in Appendix A, Figure 1.

Appendix A, Figure 1

Calculation of Manufacturer X's target fuel economy standard value.

$$\begin{aligned}
 & \text{(Manufacturer's Light Truck Production for Applicable Model Year) / ((Group 1 Volume} \\
 & \text{/ Group 1 Target) + ((Group 2a Volume / Group 2a Target) + ... + (Group 11 Volume /} \\
 & \text{Group 11 Target)) =} \\
 & 6700 / (800/27.30 + 100/27.44 + 100/27.40 + 300/23.79 + 400/23.79 + 400/22.27 + \\
 & 200/23.79 + 200/23.68 + 500/23.79 + 500/23.68 + 1600/23.76 + 800/22.27 + 800/22.27) \\
 & = 23.7
 \end{aligned}$$

Manufacturer's Light Truck Production for Applicable Model Year												
Group1	Group2a	Group2b	Group3	...	Group9	Group10	Group11					
Volume	Volume	Volume	Volume	...	Volume	Volume	Volume					
Group1	Group2a	Group2b	Group3	...	Group9	Group10	Group11					
Target	Target	Target	Target	...	Target	Target	Target					
6,700												
800	100	100	300	400	400	200	200	500	500	1600	800	800
26.99	27.13	27.08	23.54	23.54	22.06	23.54	23.45	23.54	23.45	23.52	22.06	22.06

Fleet's target fuel economy standard = 23.7 mpg

Appendix A, Figure 2

Calculation of Manufacturer X’s actual fuel economy value.

$$\begin{aligned}
 & \text{(Manufacturer’s Light Truck Production for Applicable Model Year) / ((Group 1 Volume} \\
 & \text{/ Group 1 Fuel Economy) + ((Group 2 Volume / Group 2 Fuel Economy) + ... + (Group} \\
 & \text{11 Volume / Group 11 Fuel Economy)) =} \\
 & 6700 / (800/27.1 + 200/27.6 + 300/23.9 + 400/23.7 + 400/23.5 + 400/23.6 + 500/22.7 + \\
 & 500/22.5 + 1600/22.5 + 800/22.3 + 800/22.2) = 23.3
 \end{aligned}$$

Manufacturer's Light Truck Production for Applicable Model Year										
Group1	Group2	Group3	Group4	Group5	Group6	Group7	Group8	Group9	Group10	Group11
Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume
Group1	Group2	Group3	Group4	Group5	Group6	Group7	Group8	Group9	Group10	Group11
FuelEcon	FuelEcon	FuelEcon	FuelEcon	FuelEcon	FuelEcon	FuelEcon	FuelEcon	FuelEcon	FuelEcon	FuelEcon

6,700										
800	200	300	400	400	400	500	500	1600	800	800
27.1	27.6	23.9	23.7	23.5	23.6	22.7	22.5	22.5	22.3	22.2

Fleet’s actual fuel economy value = 23.3 mpg

NOTE TO APPENDIX A, FIGURE 2. Since the actual average fuel economy of Manufacturer X’s fleet is 23.3 mpg, as compared to its required fuel economy level of 23.5 mpg,

Manufacturer X did not comply with the CAFE standard for MY 2012 as set forth in section 533.5(i).

Appendix A Figure 3

Manufacturer's Light Truck Production for Applicable Model Year											
Model A Volume Model A Fuel Econ.	+	Model B Volume Model B Fuel Econ.	+	Model C Volume Model C Fuel Econ.	+	Model D Volume Model D Fuel Econ.	+	Model E Volume Model E Fuel Econ.	+	Model F Volume Model F Fuel Econ.	
					9,500						
=											
<u>1,000</u> 27.0	+	<u>1,500</u> 25.6	+	<u>1,000</u> 25.4	+	<u>2,000</u> 22.1	+	<u>3,000</u> 22.4	+	<u>1,000</u> 20.2	
=											
23.2 mpg											

NOTE TO APPENDIX A FIGURE 3. Since the actual average fuel economy of Manufacturer X's fleet is 23.2 mpg, as compared to its required fuel economy level of 23.1 mpg, Manufacturer X complies with the Reformed CAFE standard for MY 2008 as set forth in § 533.7(g).

[71 FR 17677, Apr. 6, 2006; 71 FR 19451, Apr. 14, 2006, as amended at 75 FR 25724, May 7, 2010]

PART 534—RIGHTS AND RESPONSIBILITIES OF MANUFACTURERS IN THE CONTEXT OF CHANGES IN CORPORATE RELATIONSHIPS

- Sec.
- 534.1 Scope.
- 534.2 Applicability.
- 534.3 Definitions.
- 534.4 Successors and predecessors.
- 534.5 Manufacturers within control relationships.
- 534.6 Reporting corporate transactions.
- 535.7 Situations not directly addressed by this part.

AUTHORITY: 49 U.S.C. 32901; delegation of authority at 49 CFR 1.50.

SOURCE: 69 FR 77671, Dec. 28, 2004, unless otherwise noted.

§ 534.1 Scope.

This part defines the rights and responsibilities of manufacturers in the context of changes in corporate relationships for purposes of the automotive fuel economy program established by 49 U.S.C. Chapter 329.

§ 534.2 Applicability.

This part applies to manufacturers of passenger automobiles and non-passenger automobiles.

§ 534.3 Definitions.

(a) *Statutory definitions and terms.* All terms used in 49 U.S.C. Chapter 329 are used according to their statutory meaning.

(b) As used in this part—
 “Control relationship” means the relationship that exists between manufacturers that control, are controlled by, or are under common control with, one or more other manufacturers.

“Predecessor” means a manufacturer whose rights have been vested in and whose burdens have been assumed by another manufacturer.

“Successor” means a manufacturer that has become vested with the rights and assumed the burdens of another manufacturer.

§ 534.4 Successors and predecessors.

For purposes of the automotive fuel economy program, “manufacturer” includes “predecessors” and “successors” to the extent specified in paragraphs (a) through (d) of this section.

(a) Successors are responsible for any civil penalties that arise out of fuel economy shortfalls incurred and not satisfied by predecessors.

(b) If one manufacturer has become the successor of another manufacturer during a model year, all of the vehicles