Automotive Testing Laboratories, Inc.

Final Report

TESTING OF 35 IN-USE DIESEL VEHICLES IN DENVER

Contract No. 68-03-2891
Task Order No. 3
Modification No. 1

prepared for:

U. S. Environmental Protection Agency
2565 Plymouth Road
Ann Arbor, MI 48105

May 22, 1981

651 chambers road, suite 200 303-343-8939 aurora, colorado 80011

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TABLE OF CONTENTS

LIST OF TABLES

1. INTRODUCTION

The United States Environmental Protection Agency (EPA) is designated under the provisions of the Clean Air Act as having responsibility for the control and prevention of air pollution. In order to fulfill these responsibilities, the EPA designs, conducts and promotes surveys and studies of air pollution sources.

National programs to characterize and reduce air pollution from mobile sources are developed and implemented through EPA's Emission Control Technology Division (ECTD). Mobile emission control strategies developed by the ECTD are based, in part, on projections of nationwide motor vehicle emissions. These projections are derived from surveys designed to obtain emission data from representative samples of in-use vehicles.

With the recent changes in standards relative to emissions and fuel economy there has been an increase in the population of diesel powered light duty vehicles. With this increase the effects of diesel-powered vehicles are of relatively greater importance. Accordingly, the EPA issued a Task Order contract to gather information regarding the effects of altitude on gaseous and particulate emissions from diesel light-duty trucks and passenger cars. This report describes the design and conduct of the project and presents test results.

2. TECHNICAL DISCUSSION

2.1 PROGRAM OBJECTIVES

This task order was performed to provide information on the various levels of emissions for thirty five (35) in-use 1978 and newer model-year diesel-powered vehicles operated in the Denver metropolitan area.

2.2 PROGRAM DESIGN

Testing was performed on a sample of thirty-five diesel vehicles recruited from the Denver metropolitan area. Actual vehicle selection was co-ordinated with and approved by the EPA project officer.

Vehicles selected for testing are detailed in Appendix A, Listing of Vehicles and *Test Parameters.*

Upon arrival at the laboratory, each vehicle was examined to insure that no extensive modifications had been performed and that the vehicle was safe to operate.

Each vehicle received a single test sequence conducted to determine the as-received level of emissions. The test sequence consisted of a basic engine status inspection, a twelve to thirty-six hour soak, a non-evaporative Federal Test Procedure with particulate sampling, a Highway Fuel Economy Test with particulate sampling, a Four Speed Idle Test, and a Loaded Two Mode Test.

2.3 TEST VEHICLE PROCUREMENT

2.3.1 Test Vehicle Selection

The thirty-five vehicles selected for this task were procured from the Denver metropolitan area. The test sample was comprised of fifteen light-duty pick-up trucks (any make) and twenty passenger cars, seven of which were General Motors vehicles, five of which were Mercedes Benz, three of which were Peugot and five of which were Volkswagen.

Candidate vehicles were acquired exclusively through registration mailings.

2.3.2 Incentives for Owner Participation

The incentives provided to owners of test vehicles to encourage participation in the program were

- Use of a late model, fully insured loan vehicle while testing was being conducted,
- A $100 U. S. Savings Bond, and
- Return of the owner's vehicle with a full tank of fuel.

2.3.3 Test Vehicle Selection and Screening Criteria

Those vehicle owners indicating a willingness to participate provided information by filling in a postage-paid vehicle information reply card for a preliminary comparison between the EPA approved vehicle list and their vehicle. If the vehicle was determined to meet testing criteria and the owner remained willing to participate in the program, the vehicle was scheduled for delivery to the laboratory for a physical inspection and screening procedure.

Prospective test vehicles were given an examination for test suitability upon their arrival at the laboratory and were accepted or rejected based upon this examination. Any questions regarding vehicle test suitability were resolved by the EPA project officer.

2.3.4 Test Vehicle Preconditioning Procedure

Following acceptance into the program, the test vehicles fuel tanks were drained and then refilled to forty per cent capacity with Diesel-type II test fuel.

2.4 VEHICLE TEST FACILITY AND EQUIPMENT

The ATL test facilities and associated equipment utilized in this Task Order are located at 19900 East Colfax Avenue, Aurora, Colorado. The laboratory is at an altitude of 5,480 feet above sea level. Prior to testing, a representative of the EPA visited the laboratory where facility and equipment procedures were checked. Typical emission testing equipment was used in the conduct of the program excepting the particulate measuring apparatus which is discussed on the following page.

2.4.1 Particulate Emission Test Equipment

The particulate emission sampling equipment consisted of a dilution air filtration system, a tunnel, and sample collection system. Except for the filters, which are of filter paper and charcoal construction, the filter housing is of stainless steel construction. The tunnel is also of stainless steel construction; the overall length of the tunnel section is twelve feet and it is ten inches in diameter. The sampling system is a dual pump design which allows collecting separate samples during each phase of the FTP. The sampling system operates as follows:

> Dilution air enters the assembly and is filtered. A particle, a charcoal and a final filter assembly is provided for this purpose. After filtration, the dilution air enters the tunnel where it is combined with exhaust from the vehicle. Vehicle exhaust enters the tunnel through a four inch diameter, ninety degree bend elbow. The point at which the exhaust is introduced to the dilution air stream is about one and one-half feet from the outlet of the dilution air filter box. At this introduction point a mixing orifice is installed. The mixing orifice, of seven inches in diameter, is situated in the plane described by the four inch, ninety degree exhaust introduction tube bend termination. This plane is perpendicular to the round wall of the tunnel. From this mixing plane the diluted exhaust flows to the plane at which it enters the transition piece which reduces stream diameter from the ten inches of the tunnel to the four inches of the CVS collection tube. This transition is made in about one and one-half feet. The only obstruction from the mixing point to the start of the transition piece is the sample probe. The CVS collector tube, also of stainless steel construction, carries the dilute exhaust into the CVS. During particulate testing, dilution air from the CVS filter box is closed off by means of a flapper valve that is pneumatically activated. Beyond the flapper valve, dilute exhaust flow within the CVS is normal. The tunnel and remote dilution box is merely an extension of normal flow paths within the CVS.
>
> The sample probes are one-half inch diameter stainless steel tubes. These tubes face upstream and originate about ten feet from the dilution air exhaust mixing point. From its point of origin the tube runs parallel to the tunnel for about five inches, makes a forty-five degree bend, continues another three inches, makes another forty-five degree bend and passes through the tunnel wall. Immediately outside the tunnel wall, the filter assembly, which holds a forty-seven millimeter diameter "Pallflex" filter (type 460A20), is situated. The particulate emissions are collected on this filter. From this point the filtered sample continues through an on-off valve, a pump, a flow control valve, a flowmeter and a dry gas meter. The on-off valve is used to start and stop sample flow at the beginning and end of the test phase. The pump moves sample through the filter. The flow control valve is used to regulate the sample stream flow. This valve is manually adjusted frequently and as necessary during the test. The dry gas meter is used to totalize sample flow during the test phase. A solenoid valve wired into the bag sample system directs the flow through one of two filter assemblies, allowing separate collection of particulate emissions during each of the three phases of the FTP and during the HFET.

2.5 VEHICLE TEST PLAN

The test sequence performed at the ATL facility was

- o A Federal Test Procedure (without evaporative test, with particulate sampling),
- o A Highway Fuel Economy Test (with particulate sampling)
- o A Four Speed Idle Test, and
- o *A Loaded Two Mode Test.*

Prior to this test sequence, the vehicles were soaked for twelve to thirty-six hours.

Following the test sequence, a procedural review was conducted to assure that exhaust emission tests had been performed as prescribed by the EPA. If any problems were determined, the vehicle was again soaked and tested.

After-test inspections were performed on the vehicles to determine the status of certain engine components.

Vehicles were returned to their owners upon completion of testing.

2.6 LABORATORY TEST PROCEDURES

Each vehicle received a prescribed sequence of test and inspection procedures during the course of the task. These procedures and others associated with the conduct of the program included the following:

Vehicle Preparation

Federal Test Procedure

Highway Fuel Economy Test

Particulate Test Procedure

Four Speed Idle Test

Loaded Two Mode test

After Test Procedures

Test Vehicle Depreparation

Details of these tests and procedures are presented in the following sections.

2.6.1 Test Vehicle Preparation Procedures

All vehicles selected for testing received a uniform series of preparation procedures to maintain standard testing conditions and to avoid possible vehicle malfunctions.

After acceptance of a vehicle into the program, as-received fuel was drained and the tank was then refilled to forty per cent capacity with Diesel-type II fuel. The pressures of the tires on the drive wheels were adjusted to thirty-five psi for all test vehicles.

Test preparation procedures were performed in the laboratory at a location separate from the soak and emission test areas.

2.6.2 Federal Test Procedure (Mass Exhaust Emission Test)

The Federal Test Procedure (FTP) was performed in accordance with procedures specified in 42 Federal Register 124. Preconditioning requirements for this test include a twelve to thirty-six hour soak period in an area with an ambient temperature between 20 and 30 degrees Centigrade (68 to 86 Fahrenheit). Each vehicle remained stationary while soaking with the ignition in the unlock position, the transmission in neutral and all accessories in the off position.

None of the vehicles acquired for this task received those segments of the FTP which deal with evaporative loss measurements. Consequently, following the soak period, test vehicles were moved to the dynamometer for the mass exhaust emission segment of the FTP.

Before the test vehicle was placed on the dynamometer and secured, the proper inertia weight and load adjustments were set. During those portions of the test with the engine operating, the vehicle hood was opened and a cooling fan was placed in front of the vehicle grille.

The Federal Test Procedure consists of three sequential segments: the cold transient stage, the cold stablized stage and the hot transient stage. Sampling for the initial cold transient portion was begun simultaneously with engine crank. This segment continued for 505 seconds at an average speed of 25.6 miles per hour over a cumulative

distance of 3.59 miles. At the 505 second point, the exhaust sample was diverted from the first sample bag of the Constant Volume Sampler (CVS) to the second bag. This marked the beginning of the cold stabilized portion of the test. This segment covers 3.91 miles at an average speed of 16.0 miles per hour. Its duration is 869 seconds. At the end of this phase the engine was stopped, sampling was terminated and the vehicle was soaked on the dynamometer for ten minutes. After soaking, the vehicle was restarted and sampling was switched to the third CVS bag for 505 seconds at an average speed of 25.6 miles per hour. CVS sample and background bags were analyzed within ten minutes after completion of each segment of the test.

2.6.3 Highway Fuel Economy Test Procedure

The Highway Fuel Economy Test (HFET) consisted of vehicle operation on the dynamometer over a 10.2 mile, 765 second driving schedule with the vehicle in a warmed-up condition. Before testing was begun, each vehicle was driven at high cruise (50 mph) on the dynamometer for three minutes. Within one minute of the end of the cruise period, the vehicle was brought to idle and the test begun. During the entire driving schedule, CVS dilute exhaust was diverted into a sample bag. Sampling was terminated at the end of the schedule and the content of the sample bag was analyzed.

Load settings, inertia weights and vehicle speed tolerances for the HFET were identical to those used during the Federal Test Procedure.

2.6.4 Particulate Test Procedure

Samples of particulate exhaust emissions were collected for each of the three phases of the FTP and for the HFET using the equipment described in Section 2.4.1. For the FTP both sample systems were used. During the cold transient phase dilute exhaust sample was drawn through the filter in filter assembly #1, at the 505 second point the cold stablized phase began and sample was drawn through the filter in filter assembly #2. During the ten minute soak a new filter was placed in filter assembly #1 which was then

used during the Hot Transient phase. Filter assembly #1 was used during the HFET. The weights of particulates collected were determined by weighing the filter before the test and the combined particulate and filter after the test.

2.6.5 Four Speed Idle Test

The Four Speed Idle Test consisted of four operating modes (three modes for vehicles equipped with manual transmissions) and was preceded by a six (± 1) minute idle period with the cooling fan on and the engine compartment open. At the end of the six minutes, the vehicle was operated at curb idle in neutral, idle at approximately 2500 rpm in neutral, curb idle in neutral, and for vehicles equipped with automatic transmission, at curb idle in the drive position. Each of the operating modes was maintained for a maximum of three minutes. Raw tailpipe samples were analyzed at each speed after rpm and analyzer outputs had stabilized for a minimum of thirty seconds.

2.6.6 Loaded Two Mode Test

The Loaded Two Mode Test consisted of two steady state operating modes and was preceded by a six (± 1) minute idle period with the cooling fan on and the engine compartment open. At the end of the six minutes, the vehicle was operated at low cruise (thirty mph) for a maximum of three minutes. This operating mode was followed by vehicle operation at idle in neutral for a maximum of three minutes. For the cruise mode of this test a horsepower setting of 9.0 was used and dynamometer inertia weight was set to the minimum level. Raw tailpipe samples were analyzed for each operating mode after rpm and analyzer outputs had stabilized for a minimum of thirty seconds.

2.6.7 After Test Procedures

Vehicle engine equipment was checked after the test sequence to further document test conditions. The status of certain engine components such as air conditioning and turbo charging were noted and recorded.

2.6.8 Test Vehicle Depreparation

Before a vehicle was returned to its owner, the following procedures were

performed:

1. Tire pressures were adjusted to their original levels.

2. Test vehicle fuel tanks were refilled to full capacity.

3. Visual checks were performed to assure that the general condition of the vehicle was the same as when it was delivered to the laboratory.

2.7 DATA PROCESSING PROCEDURES

Accumulated raw test data and associated materials received a systematic review of each test point in the task from initial generation to final processing. These data accumulation and review procedures are described below.

2.7.1 Data Collection

Emission test procedures and laboratory conditions were monitored and controlled through the use of strip chart recorders. These units provided a constant read-out of data and also served to document test activities for later review. Test parameters registered on the recorders included emission analyzer outputs, wet and dry bulb temperatures of the air directed to the front of the test vehicle and dilute exhaust stream temperatures. Driver and vehicle performance traces were also documented on a strip chart recorder and included speed calibrations and calibration checks performed before and after each test.

Sample flow rates, gas meter temperatures and readings and other data pertinent to the particulate system were recorded on data forms.

A NOVA 2 minicomputer was utilized to collect and integrate CVS sample and background bag emission data. Speed/time profiles were generated for each test schedule by the computer and produced on the driver and vehicle performance trace. The computer also totalized and recorded CVS mass pump revolutions during each exhaust emission test segment.

Movement of each test vehicle through segments of the task was controlled through and documented on various data sheets. All data forms were collected in test

packets which were assigned to each vehicle prior to testing. As testing progressed, relevant sheets were completed, signed and returned to the packet by the appropriate technician. Included in the packet were: all data sheets used to identify the vehicle, data sheets used during tests, analyzer strip chart recordings, computer system sheets and magnetic tapes, and all applicable temperature strip chart recordings.

Laboratory personnel were also furnished a form indicating the daily test schedule including the order each vehicle was to be tested and the estimated duration of each test segment. Preconditioning personnel were also furnished with a similar schedule indicating the time each vehicle was to be placed in soak.

2.7.2 Data Review and Editing

Vehicle packets were reviewed for completeness, accuracy and compliance with temperature and speed tolerances on a test by test basis. This review was performed as soon as possible after each test to allow for a timely and appropriate solution to any problems. The test packet was again reviewed after all tests had been completed. After resolution of any discrepancies, the completed packet was forwarded to the data processing department.

Data processing procedures included an additional review of packet contents by personnel not directly involved in the original tests. Following this review, data from the on-site NOVA 2 minicomputer and from the manually prepared data sheets were combined into a single magnetic tape which was input to an offsite, time-share computer. When obvious data entry errors had been resolved and corrected, a computerized edit program was applied to the data. This program subjects each entry to a test of reasonableness. If recorded information failed to fall within a predetermined range, the computer indicated the presence of a possible error and identified the area requiring investigation. Any discrepancies found at this stage were resolved either through further clarifying information from test personnel, reference to test records or through a partial or complete retest of the vehicle.

When all problems were resolved, the data were reduced and printed for a final review before the test was declared valid. The completed data packets were then delivered to the EPA.

2.7.3 Calculation of Test Results

2.7.3.1 Federal Test Procedure Emission Data - Mass emission test results were calculated using equations specified in 42 Federal Register 124. Fuel economy data for this test were calculated using the carbon balance equation. Calculations were made using distance constants of 3.59 and 3.91 miles respectively for the transient and stabilized modes.

2.7.3.2 Highway Fuel Economy Test - Exhaust emission results for this test were calculated using Federal Register equations and a distance constant of 10.242 miles. Fuel economy was calculated using the mass emission results and the carbon balance equation.

2.7.3.3 Four Speed Idle Test - Emission results from this test were comprised of undiluted tailpipe concentrations and reported as measured.

2.7.3.4 Loaded Two Mode Test - Emission results from this test were comprised of undiluted tailpipe concentrations and reported as measured.

2.7.3.5 Particulate Test Data - Results for this test were calculated using the flow rates of the sampling system, filter weights, meter readings and other collected information using the equations presented in Appendix J.

The results presented here are of a quantitative nature. The filters have been sent to the EPA for qualitative analysis.

TABLE 1

TABLE 1

EXHAUST EMISSION TEST RESULTS BY MODEL YEAR

DENVER DIESELS

1975 FEDERAL TEST PROCEDURE

Vehicle Type & Model Year		# of Veh	Average Odom	HC	CO	CO2	NOxc	Fuel FTP	Economy HFET
CARS	1980	7	10,713	0.79	1.67	448.4	1.03	22.44	31.20
	1979	9	26,262	0.53	1.83	352.4	1.38	28.51	34.97
	1978	4	38,273	0.70	1.68	364.9	1.07	27.52	35.26
	ALL	20	23,222	0.66	1.74	388.5	1.20	25.87	33.60
TRUCKS	1980	2	11,092	1.48	2.34	538.8	1.43	18.60	24.33
	1979	6	16,866	1.27	2.51	547.8	1.38	18.31	22.86
	1978	7	43,855	1.33	3.92	522.3	1.52	19.10	23.70
	ALL	15	28,691	1.33	3.15	534.7	1.45	18.71	23.45

APPENDICES

APPENDIX A - LISTING OF VEHICLE AND TEST PARAMETERS

Legend

VEH. NO. - Vehicle number

YR - Model year

MAKE - Vehicle make

MODL - Vehicle model

CID - Engine displacement in cubic inches

CYL - Number of cylinders

BBL - Number of carburetor venturis (F: fuel injected)

T - Type of transmission (A: automatic; 2: semi-automatic; 3: 3-speed manual; 4: 4-speed manual; 5: 5-speed manual)

ENGINE FAMILY - Engine family

AC - Vehicle equipped with air conditioning (Y: yes; N: no)

FT - Fuel tank capacity in gallons

I.WT - Dynamometer inertia weight setting for Federal Test Procedure

A.HP - Actual road load horsepower setting for Federal Test Procedure

ACL - Was 10% AHP added to simulate air conditioner (M: manufacturer's certification AHP setting)

TEST NO. - Contractor run number

TEST DATE - Date of test (month/day/year)

DB - Dry bulb temperature (degrees Fahrenheit)

WB - Wet bulb temperature (degrees Fahrenheit)

BARO. - Barometric pressure (inches Hg)

APPENDIX A

LISTING OF VEHICLE AND TEST PARAMETERS

DENVER DIESELS

VEH. NO.	YR	MAKE	MODL	CID	CYL	BBL	T	ENGINE FAMILY	AC	FT	I.WT	A.HP	ACL	TEST NO.	TEST DATE	DB	WB	BARO.
001	78	GMC	C150	350	8	F	A	832J9	Y	26	4500	19.5	M	D002	01/06/81	73	54	24.71
002	80	CHEV	STAW	350	8	F	A	03J9ZG	Y	22	4500	13.2	M	D028	01/09/81	76	55	24.78
003	78	GMC	C150	350	8	F	A	832J9	N	26	4500	19.5	M	D008	01/07/81	77	56	24.54
004	79	VOLK	RABB	090	4	F	4	D	N	11	2250	7.3	M	D005	01/06/81	74	51	24.67
005	80	OLDS	88	350	8	F	A	03J9ZG	Y	27	4000	12.2	M	D007	01/07/81	76	57	24.54
006	80	PONT	BONN	350	8	F	A	03J9ZG	Y	27	4000	12.2	M	D009	01/07/81	76	57	24.54
007	80	CHEV	C10	350	8	F	A	09J9Z	Y	20	4500	17.0	M	D010	01/07/81	77	56	24.54
008	79	MERB	240D	146	4	F	A	79/2/L4D/24	Y	21	3500	12.6	M	D006	01/07/81	77	53	24.53
009	80	OLDS	88	350	8	F	A	03J9ZG	Y	27	4000	12.2	M	DC12	01/07/81	77	54	24.58
010	78	IH	SCOU	198	6	F	4	SD331	N	20	4000	15.6	M	D042	01/13/81	76	57	24.78
011	78	CHEV	C10	350	8	F	A	832J9	N	26	4500	19.5	M	D011	01/07/81	76	53	24.56
012	78	OLDS	98	350	8	F	A	830J9	Y	27	4500	12.5	M	D015	01/08/81	77	56	24.58
013	78	VOLK	RABB	090	4	F	4	D	Y	11	2250	7.3	M	D014	01/08/81	76	54	24.58
014	79	OLDS	STAW	350	8	F	A	930J9	Y	27	4500	13.3	M	D017	01/08/81	75	55	24.57
015	80	PONT	BONN	350	8	F	A	03J9ZG	Y	27	4000	12.2	M	D018	01/08/81	76	54	24.50
016	79	GMC	C150	350	8	F	A	932J9	Y	26	4500	19.5	M	D021	01/09/81	78	53	24.74
017	78	MERB	240D	147	4	F	4	78/2/L4D/24	Y	21	3500	12.3	M	D030	01/12/81	77	50	24.83
018	79	VOLK	RABB	090	4	F	4	D	N	11	2250	7.3	M	D019	01/08/81	74	50	24.54
019	79	PEUG	504	141	4	F	A	XD	N	18	3500	11.8	M	D024	01/09/81	76	57	24.79
020	79	CHEV	C10	350	8	F	A	932J9	Y	20	4500	19.5	M	D026	01/09/81	77	59	24.75
021	80	CHEV	C10	350	8	F	A	09J9Z	Y	20	4500	17.0	M	D020	01/08/81	77	51	24.57
022	80	MERB	300D	183	5	F	A	80.21.35.30	Y	21	3500	12.6	M	D023	01/09/81	75	56	24.78
023	79	MERB	240D	146	4	F	A	79/2/L4D/24	Y	21	3500	12.6	M	D025	01/09/81	73	55	24.78
024	79	VOLK	RABB	090	4	F	4	D	N	11	2250	7.3	M	D035	01/13/81	75	51	24.70
025	78	CHEV	C10	350	8	F	A	832J9	N	26	4500	19.5	M	D027	01/09/81	76	53	24.78
026	79	MERB	300D	183	5	F	A	79/2/L5D/30	Y	21	4000	13.2	M	D032	01/12/81	74	55	24.74
027	79	GMC	C150	350	8	F	A	932J9	Y	26	4500	19.5	M	D031	01/12/81	75	55	24.82
028	79	GMC	C150	350	8	F	A	932J9	Y	26	4500	19.5	M	D033	01/12/81	77	54	24.70
029	78	CHEV	C10	350	8	F	A	832J9	Y	26	4500	19.5	M	D034	01/12/81	76	53	24.72
030	78	GMC	C150	350	8	F	A	832J9	N	26	4500	19.5	M	D038	01/13/81	78	55	24.73
031	79	GMC	C150	350	8	F	A	932J9	Y	26	4500	19.5	M	D041	01/13/81	74	56	24.77
032	78	PEUG	504	141	4	F	A	XD	Y	18	3500	12.3	M	D036	01/13/81	77	55	24.72
033	79	GMC	C150	350	8	F	A	932J9	Y	26	4500	19.5	M	D040	01/13/81	76	55	24.74
034	79	PEUG	504	141	4	F	A	XD	N	18	3500	11.8	M	D037	01/13/81	75	55	24.75
035	80	VOLK	RABB	090	4	F	4	D	N	11	2250	6.8	M	D039	01/13/81	76	52	24.72

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APPENDIX B - LISTING OF FEDERAL TEST PROCEDURE RESULTS ON INDIVIDUAL VEHICLES

Legend

VEH. NO. - Vehicle number

MODL YEAR - Model year

MAKE - Vehicle make

MODL - Vehicle model

CID - Engine displacement in cubic inches

TEST TYPE - Indicates the portion of the test or composite

BASE - Measured as-received from vehicle owner with indolene fuel

COLD TRANS - Cold transient portion of test
COLD STABI - Cold stabilized portion of test
HOT TRANS - Hot transient portion of test
75 FTP - 1975 Federal Test Procedure composite

EMISSION RESULTS (gm/mi) - Emission results measured in grams per mile

HC - Hydrocarbon emissions in grams per mile

CO - Carbon monoxide emissions in grams per mile

CO_2 - Carbon dioxide emissions in grams per mile

NO_{xc} - Oxides of nitrogen emission corrected for humidity in grams per mile

FUEL ECON MPG - Fuel economy calculated by the carbon balance method in miles per gallon

IHC - Hydrocarbon concentration with vehicle at normal idle, measured with garage-type instrumentation in parts per million hexane equivalent

ICO (act) - Carbon monoxide concentration with vehicle at normal idle, measured with garage-type instrumentation in mole per cent

ICO (spec) - Carbon monoxide concentration with vehicle at normal idle, as specified by the manufacturer (N/A: no specifications available).

OTHER TESTS - Lists other emission factor tests conducted on the vehicle

HFET - Vehicle was used in Highway Fuel Economy test
SHORT TESTS - Vehicle was used in the series of Short Tests

APPENDIX B

LISTING OF FEDERAL TEST PROCEDURE RESULTS ON INDIVIDUAL VEHICLES

DENVER DIESELS

VEH. NO.	MODL YEAR	MAKE	MODL	CID	TEST TYPE	--EMISSION RESULTS (gm/mi)- HC	CO	CO2	NOxc	FUEL ECON MPG
001	1978	GMC	C150	350	BASE COLD TRANS	2.03	3.24	601.3	1.54	16.61
	IHC: 28 ppm hexane				BASE COLD STABL	1.67	2.82	496.6	1.67	20.10
	ICO [act]: 0.0 %CO				BASE HOT TRANS	1.52	2.86	503.2	1.49	19.86
	ICO [spec]: N/A %CO				BASE 75 FTP	1.70	2.91	519.9	1.59	19.20
	OTHER TESTS: HFET, SHORT TESTS									
002	1980	CHEV	STAW	350	BASE COLD TRANS	0.75	2.10	550.6	0.97	18.29
	IHC: 14 ppm hexane				BASE COLD STABL	0.56	1.46	521.3	1.16	19.37
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.51	1.86	478.3	0.92	21.07
	ICO [spec]: N/A %CO				BASE 75 FTP	0.58	1.70	515.6	1.05	19.57
	OTHER TESTS: HFET, SHORT TESTS									
003	1978	GMC	C150	350	BASE COLD TRANS	1.67	2.79	592.9	1.30	16.89
	IHC: 17 ppm hexane				BASE COLD STABL	0.99	2.12	484.9	1.32	20.71
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.81	2.01	493.3	1.29	20.39
	ICO [spec]: N/A %CO				BASE 75 FTP	1.08	2.23	509.4	1.31	19.71
	OTHER TESTS: HFET, SHORT TESTS									
004	1979	VOLK	RABB	090	BASE COLD TRANS	0.54	1.58	251.8	0.83	39.75
	IHC: 46 ppm hexane				BASE COLD STABL	0.34	0.78	221.1	0.92	45.56
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.54	1.38	215.5	0.85	46.39
	ICO [spec]: N/A %CO				BASE 75 FTP	0.44	1.11	225.9	0.88	44.44
	OTHER TESTS: HFET, SHORT TESTS									
005	1980	OLDS	88	350	BASE COLD TRANS	0.85	2.29	533.0	0.93	18.87
	IHC: 6 ppm hexane				BASE COLD STABL	0.32	1.14	453.9	1.08	22.28
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.27	1.95	444.0	0.88	22.72
	ICO [spec]: N/A %CO				BASE 75 FTP	0.41	1.60	467.5	0.99	21.59
	OTHER TESTS: HFET, SHORT TESTS									
006	1980	PONT	BONN	350	BASE COLD TRANS	0.50	1.98	565.7	0.97	17.84
	IHC: 9 ppm hexane				BASE COLD STABL	0.31	1.17	488.7	1.19	20.70
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.28	1.82	455.8	0.92	22.15
	ICO [spec]: N/A %CO				BASE 75 FTP	0.34	1.51	495.6	1.07	20.39
	OTHER TESTS: HFET, SHORT TESTS									
007	1980	CHEV	C10	350	BASE COLD TRANS	1.84	2.50	584.4	1.38	17.13
	IHC: 14 ppm hexane				BASE COLD STABL	1.25	2.07	526.4	1.61	19.07
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.93	1.85	490.8	1.41	20.49
	ICO [spec]: N/A %CO				BASE 75 FTP	1.29	2.10	528.6	1.51	18.99
	OTHER TESTS: HFET, SHORT TESTS									

AUTOMOTIVE TESTING LABORATORIES,INC.
651 CHAMBERS ROAD, SUITE # 200
AURORA, COLORADO 80011

APPENDIX B

LISTING OF FEDERAL TEST PROCEDURE RESULTS ON INDIVIDUAL VEHICLES

DENVER DIESELS

VEH. NO.	MODL YEAR	MAKE	MODL	CID	TEST TYPE	--EMISSION RESULTS (gm/mi)- HC	CO	CO2	NOxc	FUEL ECON MPG
008	1979	MERB	240D	146	BASE COLD TRANS	0.58	2.12	456.0	1.85	22.06
	IHC: 24 ppm hexane				BASE COLD STABL	0.24	1.32	347.5	1.54	29.05
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.35	1.66	378.5	1.73	26.62
	ICO [spec]: N/A %CO				BASE 75 FTP	0.34	1.58	378.3	1.66	26.65
	OTHER TESTS: HFET, SHORT TESTS									
009	1980	OLDS	88	350	BASE COLD TRANS	0.83	1.79	558.4	0.98	18.05
	IHC: 12 ppm hexane				BASE COLD STABL	0.43	1.19	486.6	1.19	20.77
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.30	1.07	455.2	0.96	22.23
	ICO [spec]: N/A %CO				BASE 75 FTP	0.48	1.28	492.8	1.08	20.50
	OTHER TESTS: HFET, SHORT TESTS									
010	1978	IH	SCOU	198	BASE COLD TRANS	1.91	21.53	563.1	1.93	16.88
	IHC: 10 ppm hexane				BASE COLD STABL	0.98	5.11	532.0	2.04	18.73
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.79	17.29	495.8	1.78	19.37
	ICO [spec]: N/A %CO				BASE 75 FTP	1.12	11.81	528.5	1.94	18.48
	OTHER TESTS: HFET, SHORT TESTS									
011	1978	CHEV	C10	350	BASE COLD TRANS	1.31	2.33	589.5	1.15	17.04
	IHC: 21 ppm hexane				BASE COLD STABL	1.18	2.13	501.3	1.16	20.02
	ICO [act]: 0.1 %CO				BASE HOT TRANS	0.81	1.68	483.9	1.11	20.80
	ICO [spec]: N/A %CO				BASE 75 FTP	1.10	2.05	514.7	1.14	19.52
	OTHER TESTS: HFET, SHORT TESTS									
012	1978	OLDS	98	350	BASE COLD TRANS	1.64	2.61	528.5	1.11	18.92
	IHC: 20 ppm hexane				BASE COLD STABL	1.17	2.29	485.8	1.19	20.64
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.90	1.95	450.4	1.19	22.30
	ICO [spec]: N/A %CO				BASE 75 FTP	1.19	2.26	484.9	1.17	20.67
	OTHER TESTS: HFET, SHORT TESTS									
013	1978	VOLK	RABB	090	BASE COLD TRANS	0.64	2.16	244.7	0.77	40.68
	IHC: 17 ppm hexane				BASE COLD STABL	0.38	1.13	213.2	0.82	47.07
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.46	2.01	210.3	0.80	47.34
	ICO [spec]: N/A %CO				BASE 75 FTP	0.45	1.58	218.9	0.80	45.67
014	1979	OLDS	STAW	350	BASE COLD TRANS	1.80	3.33	598.6	1.80	16.70
	IHC: 18 ppm hexane				BASE COLD STABL	1.23	2.40	514.4	2.11	19.49
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.91	2.58	492.6	1.73	20.37
	ICO [spec]: N/A %CO				BASE 75 FTP	1.26	2.64	525.8	1.94	19.06
	OTHER TESTS: HFET, SHORT TESTS									

APPENDIX B

LISTING OF FEDERAL TEST PROCEDURE RESULTS ON INDIVIDUAL VEHICLES

DENVER DIESELS

VEH. NO.	MODL YEAR	MAKE	MODL	CID	TEST TYPE	--EMISSION RESULTS (gm/mi)- HC	CO	CO2	NOxc	FUEL ECON MPG
015	1980	PONT	BONN	350	BASE COLD TRANS	4.05	4.46	570.9	0.75	17.22
	IHC: 39	ppm hexane			BASE COLD STABL	2.78	2.74	501.4	0.90	19.78
	ICO [act]:	0.1 %CO			BASE HOT TRANS	2.44	3.03	485.2	0.73	20.45
	ICO [spec]:	N/A %CO			BASE 75 FTP	2.95	3.18	511.3	0.82	19.36
	OTHER TESTS: HFET, SHORT TESTS									
016	1979	GMC	C150	350	BASE COLD TRANS	2.45	3.56	574.0	1.36	17.32
	IHC: 19	ppm hexane			BASE COLD STABL	1.39	2.58	489.4	1.40	20.44
	ICO [act]:	0.0 %CO			BASE HOT TRANS	1.10	2.32	489.9	1.51	20.47
	ICO [spec]:	N/A %CO			BASE 75 FTP	1.53	2.71	507.0	1.42	19.72
	OTHER TESTS: HFET, SHORT TESTS									
017	1978	MERB	240D	147	BASE COLD TRANS	0.30	1.17	394.1	1.29	25.64
	IHC: 12	ppm hexane			BASE COLD STABL	0.28	1.14	345.6	1.26	29.22
	ICO [act]:	0.0 %CO			BASE HOT TRANS	0.13	0.81	331.9	1.22	30.50
	ICO [spec]:	N/A %CO			BASE 75 FTP	0.25	1.06	351.8	1.26	28.72
	OTHER TESTS: HFET, SHORT TESTS									
018	1979	VOLK	RABB	090	BASE COLD TRANS	1.07	2.01	246.8	0.88	40.17
	IHC: 28	ppm hexane			BASE COLD STABL	0.64	1.25	223.2	0.91	44.79
	ICO [act]:	0.1 %CO			BASE HOT TRANS	0.65	2.36	224.3	1.01	44.23
	ICO [spec]:	N/A %CO			BASE 75 FTP	0.73	1.71	228.3	0.93	43.61
	OTHER TESTS: HFET, SHORT TESTS									
019	1979	PEUG	504	141	BASE COLD TRANS	0.33	3.63	440.1	1.12	22.77
	IHC: 22	ppm hexane			BASE COLD STABL	0.16	0.95	346.0	1.18	29.25
	ICO [act]:	0.1 %CO			BASE HOT TRANS	0.26	2.64	373.1	1.02	26.92
	ICO [spec]:	N/A %CO			BASE 75 FTP	0.22	1.96	372.7	1.12	27.03
	OTHER TESTS: HFET, SHORT TESTS									
020	1979	CHEV	C10	350	BASE COLD TRANS	0.96	2.81	660.3	1.40	15.24
	IHC: 16	ppm hexane			BASE COLD STABL	0.92	2.11	530.8	1.51	18.95
	ICO [act]:	0.0 %CO			BASE HOT TRANS	0.82	2.27	549.7	1.40	18.31
	ICO [spec]:	N/A %CO			BASE 75 FTP	0.90	2.30	562.6	1.46	17.88
	OTHER TESTS: HFET, SHORT TESTS									
021	1980	CHEV	C10	350	BASE COLD TRANS	2.12	3.18	607.2	1.30	16.44
	IHC: 21	ppm hexane			BASE COLD STABL	1.66	2.54	540.3	1.38	18.52
	ICO [act]:	0.0 %CO			BASE HOT TRANS	1.34	2.20	521.6	1.33	19.23
	ICO [spec]:	N/A %CO			BASE 75 FTP	1.67	2.58	549.0	1.35	18.23
	OTHER TESTS: HFET, SHORT TESTS									

APPENDIX B

LISTING OF FEDERAL TEST PROCEDURE RESULTS ON INDIVIDUAL VEHICLES

DENVER DIESELS

VEH. NO.	MODL YEAR	MAKE	MODL	CID	TEST TYPE	--EMISSION RESULTS (gm/mi)- HC	CO	CO2	NOxc	FUEL ECON MPG
022	1980	MERB	300D	183	BASE COLD TRANS	0.46	1.20	507.6	1.34	19.92
	IHC: 12 ppm hexane				BASE COLD STABL	0.47	1.06	374.8	1.19	26.93
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.36	1.03	399.2	1.20	25.31
	ICO [spec]: N/A %CO				BASE 75 FTP	0.44	1.08	408.8	1.22	24.71
023	1979	MERB	240D	146	BASE COLD TRANS	0.44	2.58	460.5	2.27	21.84
	IHC: 10 ppm hexane				BASE COLD STABL	0.31	2.05	355.6	1.84	28.28
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.29	1.66	378.6	2.13	26.63
	ICO [spec]: N/A %CO				BASE 75 FTP	0.33	2.05	383.4	2.01	26.25
	OTHER TESTS: HFET, SHORT TESTS									
024	1979	VOLK	RABB	090	BASE COLD TRANS	1.01	3.75	265.2	0.94	37.09
	IHC: 14 ppm hexane				BASE COLD STABL	0.49	1.35	227.6	1.03	44.00
	ICO [act]: 0.1 %CO				BASE HOT TRANS	0.80	3.65	225.4	1.01	43.54
	ICO [spec]: N/A %CO				BASE 75 FTP	0.68	2.47	234.7	1.01	42.26
025	1978	CHEV	C10	350	BASE COLD TRANS	1.48	3.16	618.8	1.70	16.19
	IHC: 12 ppm hexane				BASE COLD STABL	0.96	2.61	508.6	1.69	19.73
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.81	2.33	509.6	1.59	19.73
	ICO [spec]: N/A %CO				BASE 75 FTP	1.02	2.65	531.5	1.66	18.88
	OTHER TESTS: HFET, SHORT TESTS									
026	1979	MERB	300D	183	BASE COLD TRANS	0.52	2.17	543.3	1.57	18.56
	IHC: 21 ppm hexane				BASE COLD STABL	0.58	2.02	438.2	1.47	22.96
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.32	1.55	413.0	1.42	24.43
	ICO [spec]: N/A %CO				BASE 75 FTP	0.50	1.92	453.0	1.48	22.24
	OTHER TESTS: HFET, SHORT TESTS									
027	1979	GMC	C150	350	BASE COLD TRANS	1.59	2.76	612.1	1.50	16.37
	IHC: 19 ppm hexane				BASE COLD STABL	1.54	2.53	549.4	1.52	18.23
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.90	1.97	523.4	1.45	19.22
	ICO [spec]: N/A %CO				BASE 75 FTP	1.37	2.43	555.2	1.50	18.06
	OTHER TESTS: HFET, SHORT TESTS									
028	1979	GMC	C150	350	BASE COLD TRANS	1.63	2.79	654.2	1.30	15.33
	IHC: 25 ppm hexane				BASE COLD STABL	1.38	2.56	569.0	1.25	17.62
	ICO [act]: 0.1 %CO				BASE HOT TRANS	0.87	1.96	546.0	1.24	18.44
	ICO [spec]: N/A %CO				BASE 75 FTP	1.29	2.44	580.2	1.26	17.30
	OTHER TESTS: HFET, SHORT TESTS									

APPENDIX B

LISTING OF FEDERAL TEST PROCEDURE RESULTS ON INDIVIDUAL VEHICLES

DENVER DIESELS

VEH. NO.	MODL YEAR	MAKE	MODL	CID	TEST TYPE	--EMISSION RESULTS (gm/mi)- HC	CO	CO2	NOxc	FUEL ECON MPG
029	1978	CHEV	C10	350	BASE COLD TRANS	2.57	3.60	628.4	1.20	15.85
	IHC: 24 ppm hexane				BASE COLD STABL	1.95	2.94	490.3	1.06	20.31
	ICO [act]: 0.1 %CO				BASE HOT TRANS	1.58	2.58	517.5	1.17	19.32
	ICO [spec]: N/A %CO				BASE 75 FTP	1.98	2.98	526.2	1.12	18.95
	OTHER TESTS: HFET, SHORT TESTS									
030	1978	GMC	C150	350	BASE COLD TRANS	1.24	3.53	613.4	1.90	16.34
	IHC: 14 ppm hexane				BASE COLD STABL	1.46	2.77	503.5	1.90	19.86
	ICO [act]: 0.0 %CO				BASE HOT TRANS	1.09	2.34	503.9	1.80	19.91
	ICO [spec]: N/A %CO				BASE 75 FTP	1.32	2.81	526.2	1.87	19.03
	OTHER TESTS: HFET, SHORT TESTS									
031	1979	GMC	C150	350	BASE COLD TRANS	1.52	3.27	602.7	1.30	16.61
	IHC: 11 ppm hexane				BASE COLD STABL	1.06	2.40	522.2	1.29	19.22
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.91	2.46	519.9	1.30	19.32
	ICO [spec]: N/A %CO				BASE 75 FTP	1.12	2.60	538.1	1.29	18.65
	OTHER TESTS: HFET, SHORT TESTS									
032	1978	PEUG	504	141	BASE COLD TRANS	1.42	2.72	482.4	1.07	20.72
	IHC: 57 ppm hexane				BASE COLD STABL	0.80	1.38	377.0	1.06	26.66
	ICO [act]: 0.1 %CO				BASE HOT TRANS	0.73	1.91	395.7	0.96	25.38
	ICO [spec]: N/A %CO				BASE 75 FTP	0.91	1.80	403.8	1.03	24.85
	OTHER TESTS: HFET, SHORT TESTS									
033	1979	GMC	C150	350	BASE COLD TRANS	1.79	3.12	623.2	1.33	16.06
	IHC: 14 ppm hexane				BASE COLD STABL	1.44	2.63	522.2	1.38	19.17
	ICO [act]: 0.0 %CO				BASE HOT TRANS	1.08	2.09	525.5	1.38	19.12
	ICO [spec]: N/A %CO				BASE 75 FTP	1.41	2.58	543.9	1.37	18.42
	OTHER TESTS: HFET, SHORT TESTS									
034	1979	PEUG	504	141	BASE COLD TRANS	0.49	1.78	434.9	1.35	23.17
	IHC: 16 ppm hexane				BASE COLD STABL	0.28	0.79	344.4	1.46	29.36
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.19	0.84	367.4	1.27	27.55
	ICO [spec]: N/A %CO				BASE 75 FTP	0.30	1.01	369.3	1.39	27.37
	OTHER TESTS: HFET, SHORT TESTS									
035	1980	VOLK	RABB	090	BASE COLD TRANS	0.41	1.00	263.5	0.89	37.97
	IHC: 09 ppm hexane				BASE COLD STABL	0.25	0.90	250.7	1.09	40.23
	ICO [act]: 0.0 %CO				BASE HOT TRANS	0.30	1.70	228.3	0.87	43.89
	ICO [spec]: N/A %CO				BASE 75 FTP	0.30	1.34	247.2	0.99	40.66
	OTHER TESTS: HFET, SHORT TESTS									

APPENDIX C - LISTING OF FTP PARTICULATE TEST RESULTS ON INDIVIDUAL VEHICLES

Legend

VEH. NO. - Vehicle number

MODL YEAR - Model year

MAKE - Vehicle make

MODL - Vehicle model

CID - Engine displacement in cubic inches

DATE - Date of test (month/day/year)

TEST - Contractor Run Number

SEGMENTS - Indicates the cumulative sample of Cold Transient, Cold Stabilized and Hot Transient portions of the related Federal Test Procedure.

CT - Cold transient
CS - Cold stabilized
HT - Hot transient

MILLIGRAMS - Filter weight gain measured in milligrams

CUBIC FEET - Vehicle exhaust volume measured in cubic feet

GRAMS - Particulates, in the vehicle exhaust, calculated in grams

GRAMS/MILE - Particulates calculated to grams per mile

APPENDIX C

LISTING OF FTP PARTICULATE TEST RESULTS ON INDIVIDUAL VEHICLES

DENVER DIESELS

VEH. NO.	MODL YEAR	MAKE	MODL	CID	DATE	TEST	SEGMENTS	MILLI GRAMS	CUBIC FEET	GRAMS	GRAMS/ MILES
001	1978	GMC	C150	350	01/06/81	D002	CT	6.900	2.46	5.737	1.598
							CS	7.000	4.32	5.690	1.455
							HT	6.850	2.53	5.516	1.537
002	1980	CHEV	STAW	350	01/09/81	D028	CT	3.710	2.50	3.041	0.847
							CS	2.310	4.47	1.821	0.466
							HT	4.340	2.46	3.597	1.002
003	1978	GMC	C150	350	01/07/81	D008	CT	3.720	2.48	3.053	0.850
							CS	2.700	4.32	2.174	0.556
							HT	2.970	2.48	2.411	0.672
004	1979	VOLK	RABB	090	01/06/81	D005	CT	1.310	2.60	1.027	0.286
							CS	0.650	4.45	0.513	0.131
							HT	0.940	2.55	0.753	0.210
005	1980	OLDS	88	350	01/07/81	D007	CT	3.350	2.44	2.786	0.776
							CS	1.230	4.22	1.018	0.260
							HT	2.260	2.45	1.859	0.518
006	1980	PONT	BONN	350	01/07/81	D009	CT	3.810	2.44	3.156	0.879
							CS	1.420	4.25	1.161	0.297
							HT	2.060	2.46	1.679	0.468
007	1980	CHEV	C10	350	01/07/81	D010	CT	3.510	2.51	2.815	0.784
							CS	2.940	4.23	2.413	0.617
							HT	2.510	2.49	2.036	0.567
008	1979	MERB	240D	146	01/07/81	D006	CT	3.300	2.51	2.693	0.750
							CS	2.960	4.37	2.379	0.609
							HT	2.610	2.43	2.184	0.608
009	1980	OLDS	88	350	01/07/81	D012	CT	3.070	2.48	2.492	0.694
							CS	1.480	4.24	1.207	0.309
							HT	1.650	2.45	1.364	0.380
010	1978	IH	SCOU	198	01/13/81	D042	CT	9.160	2.45	7.671	2.137
							CS	3.120	4.24	2.575	0.659
							HT	7.650	2.43	6.396	1.782
011	1978	CHEV	C10	350	01/07/81	D011	CT	2.700	2.49	2.181	0.608
							CS	2.690	4.37	2.144	0.548
							HT	5.900	2.49	4.796	1.336

APPENDIX C

LISTING OF FTP PARTICULATE TEST RESULTS ON INDIVIDUAL VEHICLES

DENVER DIESELS

VEH. NO.	MODL YEAR	MAKE	MODL	CID	DATE	TEST	SEGMENTS	MILLI GRAMS	CUBIC FEET	GRAMS	GRAMS/ MILES
012	1978	OLDS	98	350	01/08/81	D015	CT	4.100	2.44	3.420	0.953
							CS	3.710	4.24	3.050	0.780
							HT	3.970	2.45	3.293	0.917
013	1978	VOLK	RABB	090	01/08/81	D014	CT	1.540	2.46	1.278	0.356
							CS	0.860	4.36	0.693	0.177
							HT	1.580	2.43	1.326	0.369
014	1979	OLDS	STAW	350	01/08/81	D017	CT	7.380	2.52	5.942	1.655
							CS	5.270	4.29	4.272	1.093
							HT	5.900	2.35	5.070	1.412
015	1980	PONT	BONN	350	01/08/81	D018	CT	9.800	2.49	7.979	2.222
							CS	3.120	4.28	2.543	0.650
							HT	5.220	2.45	4.302	1.198
016	1979	GMC	C150	350	01/09/81	D021	CT	8.040	2.44	6.779	1.888
							CS	6.020	4.33	4.908	1.255
							HT	5.810	2.43	4.910	1.368
017	1978	MERB	240D	147	01/12/81	D030	CT	1.490	2.48	1.230	0.343
							CS	1.540	4.33	1.253	0.320
							HT	1.210	2.49	1.000	0.278
018	1979	VOLK	RABB	090	01/08/81	D019	CT	2.470	2.55	1.980	0.552
							CS	1.050	4.36	0.845	0.216
							HT	2.270	2.50	1.845	0.514
019	1979	PEUG	504	141	01/09/81	D024	CT	2.990	2.50	2.449	0.682
							CS	0.820	4.34	0.661	0.169
							HT	2.040	2.43	1.707	0.476
020	1979	CHEV	C10	350	01/09/81	D026	CT	4.560	2.48	3.758	1.047
							CS	2.810	4.28	2.298	0.588
							HT	3.490	2.48	2.843	0.792
021	1980	CHEV	C10	350	01/08/81	D020	CT	4.170	2.50	3.387	0.943
							CS	3.930	4.33	3.179	0.813
							HT	3.660	2.50	2.980	0.830
022	1980	MERB	300D	183	01/09/81	D023	CT	1.600	2.41	1.363	0.380
							CS	1.140	4.35	0.923	0.236
							HT	1.260	2.47	1.044	0.291

APPENDIX C

LISTING OF FTP PARTICULATE TEST RESULTS ON INDIVIDUAL VEHICLES

DENVER DIESELS

VEH. NO.	MODL YEAR	MAKE	MODL	CID	DATE	TEST	SEGMENTS	MILLI GRAMS	CUBIC FEET	GRAMS	GRAMS/ MILES
023	1979	MERB	240D	146	01/09/81	D025	CT	5.210	2.49	4.285	1.194
							CS	4.420	4.37	3.552	0.909
							HT	2.330	2.43	1.952	0.544
024	1979	VOLK	RABB	090	01/13/81	D035	CT	3.770	2.46	3.129	0.872
							CS	1.450	4.18	1.217	0.311
							HT	3.340	2.41	2.834	0.790
025	1978	CHEV	C10	350	01/09/81	D027	CT	8.000	2.45	6.630	1.847
							CS	6.140	4.31	4.986	1.275
							HT	6.090	2.50	4.973	1.385
026	1979	MERB	300D	183	01/12/81	D032	CT	2.900	2.44	2.418	0.674
							CS	2.540	4.35	2.043	0.523
							HT	2.020	2.55	1.618	0.451
027	1979	GMC	C150	350	01/12/81	D031	CT	7.720	2.53	6.287	1.751
							CS	3.270	4.32	2.662	0.681
							HT	3.830	2.46	3.192	0.889
028	1979	GMC	C150	350	01/12/81	D033	CT	3.270	2.52	2.653	0.739
							CS	3.150	4.46	2.470	0.632
							HT	2.640	2.49	2.158	0.601
029	1978	CHEV	C10	350	01/12/81	D034	CT	5.830	2.47	4.812	1.340
							CS	3.000	4.25	2.468	0.631
							HT	3.700	2.52	3.005	0.837
030	1978	GMC	C150	350	01/13/81	D038	CT	6.980	2.48	5.991	1.669
							CS	5.160	4.33	4.183	1.070
							HT	5.400	2.41	4.572	1.273
031	1979	GMC	C150	350	01/13/81	D041	CT	5.490	2.48	4.508	1.256
							CS	4.060	4.28	3.335	0.853
							HT	4.650	2.57	3.708	1.033
032	1978	PEUG	504	141	01/13/81	D036	CT	2.590	2.45	2.144	0.597
							CS	0.950	4.32	0.768	0.197
							HT	1.450	2.46	1.201	0.335
033	1979	GMC	C150	350	01/13/81	D040	CT	5.130	2.55	4.151	1.156
							CS	3.580	4.28	2.934	0.750
							HT	3.430	2.53	2.777	0.774

APPENDIX C

LISTING OF FTP PARTICULATE TEST RESULTS ON INDIVIDUAL VEHICLES

DENVER DIESELS

VEH. NO.	MODL YEAR	MAKE	MODL	CID	DATE	TEST	SEGMENTS	MILLI GRAMS	CUBIC FEET	GRAMS	GRAMS/ MILES
034	1979	PEUG	504	141	01/13/81	D037	CT	2.250	2.53	1.827	0.509
							CS	0.700	4.42	0.555	0.142
							HT	1.180	2.42	0.996	0.278
035	1980	VOLK	RABB	090	01/13/81	D039	CT	2.360	2.54	1.894	0.528
							CS	1.200	4.21	1.002	0.256
							HT	1.930	2.53	1.559	0.434

Supplement to Appendix C

Overall Federal Test Procedure Results
of Particulate Testing

Vehicle Number	FTP Results (gm/mi)
1	1.511
2	0.680
3	0.660
4	0.190
5	0.454
6	0.491
7	0.652
8	0.647
9	0.429
10	1.293
11	0.727
12	0.855
13	0.266
14	1.312
15	1.192
16	1.451
17	0.318
18	0.369
19	0.372
20	0.755
21	0.852
22	0.287
23	0.911
24	0.563
25	1.454
26	0.549
27	1.016
28	0.655
29	0.867
30	1.275
31	1.000
32	0.334
33	0.866
34	0.270
35	0.367
Average	0.739

APPENDIX D - LISTING OF HIGHWAY FUEL ECONOMY AND EMISSION RESULTS ON INDIVIDUAL VEHICLES

Legend

VEH. NO. - Vehicle number

MODL YEAR - Model year

MAKE - Vehicle make

MODL - Vehicle model

CID - Engine displacement in cubic inches

EMISSION RESULTS (gm/mi) - Emission results measured in grams per mile

HC - Hydrocarbon emissions in grams per mile

CO - Carbon monoxide emissions in grams per mile

CO_2 - Carbon dioxide emissions in grams per mile

NO_{xc} - Oxides of nitrogen emission corrected for humidity in grams per mile

FUEL ECON MPG - Fuel economy calculated by the carbon balance method in miles per gallon

APPENDIX D

LISTING OF HIGHWAY FUEL ECONOMY AND EMISSION RESULTS ON INDIVIDUAL VEHICLES

DENVER DIESELS

VEH. NO.	MODL YEAR	MAKE	MODL	CID	- EMISSION RESULTS (gm/mi)- HC	CO	CO2	NOxc	FUEL ECON MPG
001	1978	GMC	C150	350	0.96	1.6	445.9	1.49	22.54
002	1980	CHEV	STAW	350	0.26	0.9	356.1	0.75	28.40
003	1978	GMC	C150	350	0.67	1.3	423.2	1.25	23.81
004	1979	VOLK	RABB	090	0.68	1.1	181.0	0.84	55.05
005	1980	OLDS	88	350	0.14	0.7	344.3	0.77	29.43
006	1980	PONT	BONN	350	0.20	0.8	329.4	0.71	30.72
007	1980	CHEV	C10	350	0.74	1.2	395.1	1.27	25.49
008	1979	MERB	240D	146	0.45	1.6	321.2	1.81	31.30
009	1980	OLDS	88	350	0.20	0.6	344.7	0.78	29.40
010	1978	IH	SCOU	198	0.40	2.2	424.1	1.76	23.73
011	1978	CHEV	C10	350	0.60	1.1	400.5	1.06	25.18
012	1978	OLDS	98	350	0.62	1.3	338.7	1.05	29.69
013	1978	VOLK	RABB	090	0.34	1.1	177.4	0.81	56.47
014	1979	OLDS	STAW	350	0.47	1.4	394.4	1.52	25.57
015	1980	PONT	BONN	350	1.70	1.6	332.4	0.54	29.91
016	1979	GMC	C150	350	0.91	1.8	414.1	1.69	24.24
017	1978	MERB	240D	147	0.08	0.6	277.7	1.22	36.50
018	1979	VOLK	RABB	090	0.48	1.3	181.6	1.02	54.95
019	1979	PEUG	504	141	0.23	0.7	330.8	0.95	30.60
020	1979	CHEV	C10	350	0.70	1.5	477.0	1.27	21.13
021	1980	CHEV	C10	350	1.17	1.5	430.8	1.27	23.29
022	1980	MERB	300D	183	0.33	0.7	355.3	1.19	28.47
023	1979	MERB	240D	146	0.23	1.0	323.1	2.43	31.27
024	1979	VOLK	RABB	090	0.76	2.1	191.6	0.96	51.59
025	1978	CHEV	C10	350	0.50	1.4	421.2	1.55	23.95
026	1979	MERB	300D	183	0.22	1.2	343.4	1.39	29.41
027	1979	GMC	C150	350	0.54	1.2	429.6	1.42	23.49
028	1979	GMC	C150	350	1.09	1.4	447.4	1.19	22.46
029	1978	CHEV	C10	350	1.38	1.8	441.1	1.22	22.70
030	1978	GMC	C150	350	0.80	1.6	414.9	1.70	24.24
031	1979	GMC	C150	350	0.62	1.3	416.2	1.23	24.21
032	1978	PEUG	504	141	0.58	1.0	348.8	0.90	28.89
033	1979	GMC	C150	350	1.09	1.5	456.1	1.35	22.03
034	1979	PEUG	504	141	0.22	0.5	323.5	1.23	31.31
035	1980	VOLK	RABB	090	0.32	1.0	201.1	0.83	49.96

AUTOMOTIVE TESTING LABORATORIES, INC.
651 CHAMBERS ROAD, SUITE # 200
AURORA, COLORADO 80011

APPENDIX E - LISTING OF HFET PARTICULATE TEST RESULTS ON INDIVIDUAL VEHICLES

Legend

VEH. NO. - Vehicle number

MODL YEAR - Model year

MAKE - Vehicle make

MODL - Vehicle model

CID - Engine displacement in cubic inches

DATE - Date of test (month/day/year)

TEST - Contractor Run Number

MILLIGRAMS - Filter weight gain measured in milligrams

CUBIC FEET - Vehicle exhaust volume measured in cubic feet

GRAMS - Particulates, in the vehicle exhaust, calculated in grams

GRAMS/MILE - Particulates calculated to grams per mile

APPENDIX E

LISTING OF HFET PARTICULATE TEST RESULTS ON INDIVIDUAL VEHICLES

DENVER DIESELS

VEH. NO.	MODL YEAR	MAKE	MODL	CID	DATE	TEST	MILLI GRAMS	CUBIC FEET	GRAMS	GRAMS/ MILE
001	1978	GMC	C150	350	01/06/81	D002	12.730	3.68	10.655	1.040
002	1980	CHEV	STAW	350	01/09/81	D028	3.680	3.72	3.038	0.297
003	1978	GMC	C150	350	01/07/81	D008	6.310	3.68	5.215	0.509
004	1979	VOLK	RABB	090	01/06/81	D005	2.240	3.76	1.843	0.180
005	1980	OLDS	88	350	01/07/81	D007	2.750	3.72	2.260	0.221
006	1980	PONT	BONN	350	01/07/81	D009	3.060	3.73	2.494	0.244
007	1980	CHEV	C10	350	01/07/81	D010	4.330	3.69	3.583	0.350
008	1979	MERB	240D	146	01/07/81	D006	6.460	3.65	5.428	0.530
009	1980	OLDS	88	350	01/07/81	D012	2.790	3.76	2.261	0.221
010	1978	IH	SCOU	198	01/13/81	D042	7.280	3.66	6.108	0.596
011	1978	CHEV	C10	350	01/07/81	D011	0.410	3.64	0.344	0.034
012	1978	OLDS	98	350	01/08/81	D015	7.750	3.62	6.555	0.640
013	1978	VOLK	RABB	090	01/08/81	D014	4.090	3.75	3.359	0.328
014	1979	OLDS	STAW	350	01/08/81	D017	10.620	3.70	8.745	0.854
015	1980	PONT	BONN	350	01/08/81	D018	5.550	3.72	4.541	0.443
016	1979	GMC	C150	350	01/09/81	D021	12.190	3.67	10.266	1.002
017	1978	MERB	240D	147	01/12/81	D030	2.970	3.77	2.432	0.238
018	1979	VOLK	RABB	090	01/08/81	D019	5.650	11.81	1.477	0.144
019	1979	PEUG	504	141	01/09/81	D024	2.410	3.76	1.972	0.193
020	1979	CHEV	C10	350	01/09/81	D026	5.530	3.74	4.551	0.444
021	1980	CHEV	C10	350	01/08/81	D020	6.570	3.72	5.404	0.528
022	1980	MERB	300D	183	01/09/81	D023	3.300	3.72	2.740	0.268
023	1979	MERB	240D	146	01/09/81	D025	6.010	3.71	5.031	0.491
024	1979	VOLK	RABB	090	01/13/81	D035	7.060	3.57	6.096	0.595
025	1978	CHEV	C10	350	01/09/81	D027	10.550	3.70	8.803	0.860
026	1979	MERB	300D	183	01/12/81	D032	3.890	3.68	3.247	0.317
027	1979	GMC	C150	350	01/12/81	D031	5.760	3.75	4.749	0.464
028	1979	GMC	C150	350	01/12/81	D033	5.760	3.70	4.787	0.467
029	1978	CHEV	C10	350	01/12/81	D034	6.870	3.36	6.282	0.613
030	1978	GMC	C150	350	01/13/81	D038	11.400	3.69	9.505	0.928
031	1979	GMC	C150	350	01/13/81	D041	7.110	3.68	5.952	0.582
032	1978	PEUG	504	141	01/13/81	D036	2.840	3.66	0.005	0.000
033	1979	GMC	C150	350	01/13/81	D040	6.500	3.41	5.877	0.574
034	1979	PEUG	504	141	01/13/81	D037	2.480	3.69	2.067	0.202
035	1980	VOLK	RABB	090	01/13/81	D039	4.250	3.72	3.535	0.345

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APPENDIX F - LISTING OF FOUR SPEED IDLE EMISSION RESULTS ON INDIVIDUAL VEHICLES

Legend

VEH. NO. - Vehicle number

MODL YEAR - Model year

MAKE - Vehicle make

MODL - Vehicle model

CID - Engine displacement in cubic inches

TYPE - Test speed

IDLE (N) - measured with vehicle in neutral, at normal idle
2500 RPM - measured with vehicle at 2500 RPM (estimated RPM)
IDLE (N) - measured with vehicle in neutral, at normal idle
IDLE (D) - measured with vehicle in drive, at normal idle

HC ppmh - Exhaust hydrocarbon concentration in ppm hexane

CO % - Exhaust carbon monoxide concentration in mole per cent

NO ppm - Exhaust oxides of nitrogen concentration in ppm

APPENDIX F

LISTING OF FOUR SPEED IDLE EMISSION RESULTS ON INDIVIDUAL VEHICLES

DENVER DIESELS

VEH. NO.	MODL YEAR	MAKE	MODL	CID	TYPE	HC ppmh	CO %	NO ppm
001	1978	GMC	C150	350	IDLE (N)	28	0.05	54
					2500 RPM	25	0.03	63
					IDLE (N)	28	0.05	56
					IDLE (D)	36	0.06	89
002	1980	CHEV	STAW	350	IDLE (N)	12	0.04	41
					2500 RPM	13	0.04	28
					IDLE (N)	14	0.04	38
					IDLE (D)	13	0.04	93
003	1978	GMC	C150	350	IDLE (N)	14	0.05	33
					2500 RPM	12	0.02	63
					IDLE (N)	17	0.05	35
					IDLE (D)	22	0.06	57
004	1979	VOLK	RABB	090	IDLE (N)	43	0.04	85
					2500 RPM	37	0.02	121
					IDLE (N)	46	0.04	81
005	1980	OLDS	88	350	IDLE (N)	9	0.02	63
					2500 RPM	8	0.03	45
					IDLE (N)	6	0.02	70
					IDLE (D)	6	0.03	114
006	1980	PONT	BONN	350	IDLE (N)	9	0.02	63
					2500 RPM	12	0.04	29
					IDLE (N)	9	0.02	75
					IDLE (D)	8	0.03	115
007	1980	CHEV	C10	350	IDLE (N)	11	0.03	49
					2500 RPM	16	0.04	33
					IDLE (N)	14	0.03	50
					IDLE (D)	18	0.05	90
008	1979	MERB	240D	146	IDLE (N)	20	0.01	133
					2500 RPM	27	0.08	181
					IDLE (N)	24	0.01	150
					IDLE (D)	26	0.04	174
009	1980	OLDS	88	350	IDLE (N)	10	0.02	67
					2500 RPM	12	0.02	47
					IDLE (N)	12	0.02	69
					IDLE (D)	12	0.03	124

APPENDIX F

LISTING OF FOUR SPEED IDLE EMISSION RESULTS ON INDIVIDUAL VEHICLES

DENVER DIESELS

VEH. NO.	MODL YEAR	MAKE	MODL	CID	TYPE	HC ppmh	CO %	NO ppm
010	1978	IH	SCOU	198	IDLE (N)	9	0.04	78
					2500 RPM	11	0.07	108
					IDLE (N)	10	0.03	83
011	1978	CHEV	C10	350	IDLE (N)	19	0.06	29
					2500 RPM	18	0.03	33
					IDLE (N)	21	0.05	28
					IDLE (D)	24	0.05	52
012	1978	OLDS	98	350	IDLE (N)	17	0.05	30
					2500 RPM	17	0.03	47
					IDLE (N)	20	0.05	35
					IDLE (D)	24	0.05	59
013	1978	VOLK	RABB	090	IDLE (N)	15	0.05	55
					2500 RPM	12	0.03	79
					IDLE (N)	17	0.04	54
014	1979	OLDS	SCAR	350	IDLE (N)	16	0.04	79
					2500 RPM	15	0.02	82
					IDLE (N)	18	0.04	77
					IDLE (D)	22	0.05	135
015	1980	PONT	BONN	350	IDLE (N)	28	0.07	24
					2500 RPM	44	0.07	19
					IDLE (N)	39	0.06	35
					IDLE (D)	35	0.06	61
016	1979	GMC	C150	350	IDLE (N)	17	0.05	59
					2500 RPM	18	0.03	55
					IDLE (N)	19	0.04	67
					IDLE (D)	21	0.05	85
017	1978	MERB	240D	147	IDLE (N)	12	0.02	84
					2500 RPM	12	0.04	63
					IDLE (N)	12	0.02	81
018	1979	VOLK	RABB	090	IDLE (N)	27	0.07	64
					2500 RPM	24	0.03	112
					IDLE (N)	28	0.06	61

APPENDIX F

LISTING OF FOUR SPEED IDLE EMISSION RESULTS ON INDIVIDUAL VEHICLES

DENVER DIESELS

VEH. NO.	MODL YEAR	MAKE	MODL	CID	TYPE	HC ppmh	CO %	NO ppm
019	1979	PEUG	504	141	IDLE (N)	18	0.07	43
					2500 RPM	16	0.04	43
					IDLE (N)	22	0.06	40
					IDLE (D)	16	0.02	134
020	1979	CHEV	C10	350	IDLE (N)	15	0.04	46
					2500 RPM	14	0.03	41
					IDLE (N)	16	0.04	42
					IDLE (D)	17	0.05	86
021	1980	CHEV	C10	350	IDLE (N)	16	0.05	33
					2500 RPM	23	0.06	25
					IDLE (N)	21	0.05	35
					IDLE (D)	24	0.05	69
022	1980	MERB	300D	183	IDLE (N)	12	0.02	74
					2500 RPM	12	0.03	42
					IDLE (N)	12	0.02	75
					IDLE (D)	12	0.02	142
023	1979	MERB	240D	146	IDLE (N)	10	0.03	144
					2500 RPM	10	0.03	150
					IDLE (N)	10	0.03	165
					IDLE (D)	11	0.08	157
024	1979	VOLK	RABB	090	IDLE (N)	13	0.06	84
					2500 RPM	10	0.03	105
					IDLE (N)	14	0.06	78
025	1978	CHEV	C10	350	IDLE (N)	12	0.04	54
					2500 RPM	12	0.02	77
					IDLE (N)	12	0.04	57
					IDLE (D)	14	0.05	82
026	1979	MERB	300D	183	IDLE (N)	14	0.03	90
					2500 RPM	33	0.05	110
					IDLE (N)	21	0.02	104
					IDLE (D)	19	0.05	166
027	1979	GMC	C150	350	IDLE (N)	17	0.05	32
					2500 RPM	13	0.02	52
					IDLE (N)	19	0.05	33
					IDLE (D)	22	0.05	78

APPENDIX F

LISTING OF FOUR SPEED IDLE EMISSION RESULTS ON INDIVIDUAL VEHICLES

DENVER DIESELS

VEH. NO.	MODL YEAR	MAKE	MODL	CID	TYPE	HC ppmh	CO %	NO ppm
028	1979	GMC	C150	350	IDLE (N)	14	0.05	30
					2500 RPM	30	0.11	16
					IDLE (N)	25	0.06	29
					IDLE (D)	27	0.06	65
029	1978	CHEV	C10	350	IDLE (N)	22	0.07	26
					2500 RPM	21	0.05	34
					IDLE (N)	24	0.06	33
					IDLE (D)	24	0.06	58
030	1978	GMC	C150	350	IDLE (N)	12	0.03	57
					2500 RPM	13	0.02	56
					IDLE (N)	14	0.03	57
					IDLE (D)	17	0.04	93
031	1979	GMC	C150	350	IDLE (N)	9	0.03	51
					2500 RPM	11	0.03	43
					IDLE (N)	11	0.03	51
					IDLE (D)	14	0.05	90
032	1978	PEUG	504	141	IDLE (N)	42	0.09	34
					2500 RPM	66	0.07	16
					IDLE (N)	57	0.08	34
					IDLE (D)	26	0.03	113
033	1979	GMC	C150	350	IDLE (N)	12	0.05	32
					2500 RPM	13	0.04	32
					IDLE (N)	14	0.05	29
					IDLE (D)	18	0.06	81
034	1979	PEUG	504	141	IDLE (N)	15	0.04	113
					2500 RPM	15	0.04	57
					IDLE (N)	16	0.04	110
					IDLE (D)	14	0.02	224
035	1980	VOLK	RABB	090	IDLE (N)	8	0.02	228
					2500 RPM	8	0.02	126
					IDLE (N)	9	0.02	222

APPENDIX G - LISTING OF LOADED TWO MODE EMISSION RESULTS ON INDIVIDUAL VEHICLES

Legend

VEH. NO. - Vehicle number

MODL YEAR - Model year

MAKE - Vehicle make

MODL - Vehicle model

CID - Engine displacement in cubic inches

MODE - Identifies the mode of the Loaded Two Mode Test
30 MPH - Vehicle at 30 miles per hour
IDLE (N) - Vehicle at idle, transmission in neutral

RLHP - Dynamometer load used in test

HC - Exhaust hydrocarbon concentration in ppm hexane

CO - Exhaust carbon monoxide concentration in mole per cent

NO - Exhaust oxides of nitrogen concentrations in ppm

APPENDIX G

LISTING OF LOADED TWO MODE EMISSION RESULTS ON INDIVIDUAL VEHICLES

DENVER DIESELS

VEH. NO.	MODL YEAR	MAKE	MODL	CID	MODE	KLHP	HC ppmh	CO %	NO ppm
001	78	GMC	C150	350	30 MPH	9.0	26	0.04	147
					IDLE (N)		28	0.04	65
002	80	CHEV	STAW	350	30 MPH	9.0	11	0.03	101
					IDLE (N)		14	0.03	50
003	78	GMC	C150	350	30 MPH	9.0	12	0.03	124
					IDLE (N)		16	0.04	35
004	79	VOLK	RABB	090	30 MPH	9.0	39	0.03	331
					IDLE (N)		50	0.04	99
005	80	OLDS	88	350	30 MPH	9.0	8	0.02	101
					IDLE (N)		8	0.02	68
006	80	PONT	BONN	350	30 MPH	9.0	7	0.03	99
					IDLE (N)		7	0.02	76
007	80	CHEV	C10	350	30 MPH	9.0	12	0.03	144
					IDLE (N)		11	0.02	57
008	79	MERB	240D	146	30 MPH	9.0	17	0.04	281
					IDLE (N)		19	0.01	147
009	80	OLDS	88	350	30 MPH	9.0	9	0.03	104
					IDLE (N)		10	0.02	87
010	78	IH	SCOU	198	30 MPH	9.0	9	0.04	202
					IDLE (N)		10	0.03	83
011	78	CHEV	C10	350	30 MPH	9.0	16	0.03	91
					IDLE (N)		22	0.05	28
012	78	OLDS	98	350	30 MPH	9.0	22	0.03	111
					IDLE (N)		26	0.04	36
013	78	VOLK	RABB	090	30 MPH	9.0	21	0.04	222
					IDLE (N)		25	0.04	75
014	79	OLDS	STAW	350	30 MPH	9.0	20	0.05	180
					IDLE (N)		18	0.03	94

APPENDIX G

LISTING OF LOADED TWO MODE EMISSION RESULTS ON INDIVIDUAL VEHICLES

DENVER DIESELS

VEH. NO.	MODL YEAR	MAKE	MODL	CID	MODE	RLHP	HC ppmh	CO %	NO ppm
015	80	PONT	BONN	350	30 MPH	9.0	33	0.05	64
					IDLE (N)		37	0.06	35
016	79	GMC	C150	350	30 MPH	9.0	19	0.04	169
					IDLE (N)		18	0.03	64
017	78	MERB	240D	147	30 MPH	9.0	10	0.02	206
					IDLE (N)		12	0.02	82
018	79	VOLK	RABB	090	30 MPH	9.0	22	0.05	284
					IDLE (N)		24	0.05	93
019	79	PEUG	504	141	30 MPH	9.0	20	0.02	170
					IDLE (N)		28	0.06	50
020	79	CHEV	C10	350	30 MPH	9.0	14	0.03	114
					IDLE (N)		16	0.04	49
021	80	CHEV	C10	350	30 MPH	9.0	17	0.04	128
					IDLE (N)		20	0.04	37
022	80	MERB	300D	183	30 MPH	9.0	11	0.02	173
					IDLE (N)		12	0.02	75
023	79	MERB	240D	146	30 MPH	9.0	9	0.04	321
					IDLE (N)		9	0.03	172
024	79	VOLK	RABB	090	30 MPH	9.0	23	0.08	285
					IDLE (N)		20	0.05	90
025	78	CHEV	C10	350	30 MPH	9.0	11	0.04	164
					IDLE (N)		10	0.04	66
026	79	MERB	300D	183	30 MPH	9.0	11	0.03	176
					IDLE (N)		10	0.02	101
027	79	GMC	C150	350	30 MPH	9.0	20	0.04	142
					IDLE (N)		24	0.05	36
028	79	GMC	C150	350	30 MPH	9.0	18	0.04	109
					IDLE (N)		21	0.04	32

APPENDIX G

LISTING OF LOADED TWO MODE EMISSION RESULTS ON INDIVIDUAL VEHICLES

DENVER DIESELS

VEH. NO.	MODL YEAR	MAKE	MODL	CID	MODE	RLHP	HC ppmh	CO %	NO ppm
029	78	CHEV	C10	350	30 MPH	9.0	19	0.04	96
					IDLE (N)		23	0.06	37
030	78	GMC	C150	350	30 MPH	9.0	16	0.03	191
					IDLE (N)		14	0.02	59
031	79	GMC	C150	350	30 MPH	9.0	11	0.04	119
					IDLE (N)		10	0.03	55
032	78	PEUG	504	141	30 MPH	9.0	24	0.03	154
					IDLE (N)		42	0.07	52
033	79	GMC	C150	350	30 MPH	9.0	11	0.03	124
					IDLE (N)		13	0.04	33
034	79	PEUG	504	141	30 MPH	9.0	11	0.02	211
					IDLE (N)		15	0.04	116
035	80	VOLK	RABB	090	30 MPH	9.0	8	0.04	282
					IDLE (N)		8	0.02	263

APPENDIX H - LISTING OF SELECTED VEHICLE INFORMATION

Legend

VEH. NO. - Vehicle number

YR - Model year

MAKE - Vehicle make

MODL - Vehicle model

CID - Engine displacement in cubic inches

ODOMETER - Odometer reading as-received from vehicle owner

A/C - Is vehicle equipped with air conditioning

AP - Is vehicle equipped with air pump

CATALYST - Catalyst identification

None - Vehicle not equipped with catalyst

PB - Lead content of fuel as-received from vehicle owner

N/A - Not applicable

APPENDIX H

LISTING OF SELECTED VEHICLE INFORMATION

DENVER DIESELS

VEH. NO.	YR	MAKE	MODL	CID	ODOMETER	A/C	AP	CATALYST	PB
001	78	GMC	C150	350	36458	YES	NO	NONE	N/A
002	80	CHEV	STAW	350	16153	YES	NO	NONE	N/A
003	78	GMC	C150	350	46367	NO	NO	NONE	N/A
004	79	VOLK	RABB	090	27431	NO	NO	NONE	N/A
005	80	OLDS	88	350	9336	YES	NO	NONE	N/A
006	80	PONT	BONN	350	3922	YES	NO	NONE	N/A
007	80	CHEV	C10	350	809	YES	NO	NONE	N/A
008	79	MERB	240D	146	17377	YES	NO	NONE	N/A
009	80	OLDS	88	350	12567	YES	NO	NONE	N/A
010	78	IH	SCOU	198	30196	NO	NO	NONE	N/A
011	78	CHEV	C10	350	72699	NO	NO	NONE	N/A
012	78	OLDS	98	350	60786	YES	NO	NONE	N/A
013	78	VOLK	RABB	090	25657	YES	NO	NONE	N/A
014	79	OLDS	STAW	350	21319	YES	NO	NONE	N/A
015	80	PONT	BONN	350	9633	YES	NO	NONE	N/A
016	79	GMC	C150	350	29523	YES	NO	NONE	N/A
017	78	MERB	240D	147	39522	YES	NO	NONE	N/A
018	79	VOLK	RABB	090	23743	NO	NO	NONE	N/A
019	79	PEUG	504	141	24324	NO	NO	NONE	N/A
020	79	CHEV	C10	350	9178	YES	NO	NONE	N/A
021	80	CHEV	C10	350	21374	YES	NO	NONE	N/A
022	80	MERB	300D	183	7884	YES	NO	NONE	N/A
023	79	MERB	240D	146	17128	YES	NO	NONE	N/A
024	79	VOLK	RABB	090	45903	NO	NO	NONE	N/A
025	78	CHEV	C10	350	41763	NO	NO	NONE	N/A
026	79	MERB	300D	183	37820	YES	NO	NONE	N/A
027	79	GMC	C150	350	700	YES	NO	NONE	N/A
028	79	GMC	C150	350	15986	YES	NO	NONE	N/A
029	78	CHEV	C10	350	37895	YES	NO	NONE	N/A
030	78	GMC	C150	350	41605	NO	NO	NONE	N/A
031	79	GMC	C150	350	25830	YES	NO	NONE	N/A
032	78	PEUG	504	141	27128	YES	NO	NONE	N/A
033	79	GMC	C150	350	19978	YES	NO	NONE	N/A
034	79	PEUG	504	141	21316	NO	NO	NONE	N/A
035	80	VOLK	RABB	090	15493	NO	NO	NONE	N/A

APPENDIX J

PARTICULATE EMISSIONS CALCULATIONS

The total particulate emissions in grams for a given test phase are calculated as follows:

$$\text{Total Particulates} = \frac{Vmix}{GMV} \times (FW_A - FW_B)$$

Where: Vmix is the total dilute exhaust volume in cubic feet per test phase corrected to standard conditions.

GMV is the total particulate system sample volume in cubic feet per test phase corrected to standard conditons.

FW_A is the weight of the filter and particulates in grams collected during the test phase.

FW_B is the weight of the filter in grams before the test.

Vmix is calculated as specified in the Federal Register.

GMV is calculated as follows:

$$GMV = (MR_E - MR_I) \times \frac{BAR}{29.92} \times \frac{530}{460+T_G} \times MCF$$

Where: MR_E is the dry gas meter reading in cubic feet at the completion of the test phase.

MR_I is the dry gas meter reading in cubic feet at the beginning of the test phase.

BAR is the ambient barometric pressure in inches Hg.

T_G is the temperature of the gas flowing through the dry gas meter in degrees Fahrenheit.

MCF is the dry gas meter correction factor obtained through laminar flow element calibration.

The particulate emissions in grams per mile are found per test phase by dividing the total grams per phase by the standard distance constant. The weighted emission results are found by applying the standard distance constants and using the weighting factors and equations given in the Federal Register.