1893

REPORT NUMBERS: 208-CAL-93-14
212-CAL-93-14
301-CAL-93-14

VEHICLE SAFETY COMPLIANCE TESTING FOR OCCUPANT CRASH PROTECTION, WINDSHIELD MOUNTING, WINDSHIELD ZONE INTRUSION (PARTIAL) AND FUEL SYSTEM INTEGRITY

SANTA FE VANS, INC.
1993 GMC VANDURA
7-PASSENGER CONVERSION VAN

NHTSA NUMBER: CP1302

CALSPAN TEST NUMBER: 8056-15

MARCH 25, 1993

CALSPAN CORPORATION
ADVANCED TECHNOLOGY CENTER
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BUFFALO, NEW YORK 14225

FINAL REPORT

PREPARED FOR:

U. S. Department of Transportation
National Highway Traffic Safety Administration
ENFORCEMENT
Office of Vehicle Safety Compliance
400 Seventh Street, S.W.
Room No. 6115 (NEF-30)
Washington, DC 20590

Rec'd 5/10/93

This Final Test Report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-90-C-01003. This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

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6/25/93
Date of Report Acceptance

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
208-CAL-93-14 212-CAL-93-14 301-CAL-93-14		

4. Title and Subtitle	5. Report Date
Final Report of FMVSS 208, 212, 219 (Partial), and 301 Compliance Testing of a 1993 Santa Fe Vandura Conversion Van	March 25, 1993
	6. Performing Organization Code: CAL
7. Author(s): David J. Travale, Project Engineer Walter E. Levan, Program Manager	8. Performing Organization Report No.: 8056-15
9. Performing Organization Name and Address: Calspan Advanced Technology Center P.O. Box 400 Buffalo, New York 14225	10. Work Unit No.: 256-15-1268
	11. Contract or Grant No.: DTNH22-90-C-01003
12. Sponsoring Agency Name and Address: U.S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Compliance (NEF-30) 400 Seventh St., S.W., Rm. 6115, Washington, DC 20590	13. Type of Report and Period Covered: Final Report March-April 1993
	14. Sponsoring Agency Code: DOT/NHTSA/NEF/OVSC

15. Supplementary Notes

16. Abstract

A 30 mph vehicle safety compliance test was conducted on a 1993 Santa Fe Conversion Van.

This test was performed at the Calspan Advanced Technology Center in Buffalo, New York on March 25, 1993. The purpose of this test was to determine compliance with the performance requirements of the following Federal Motor Vehicle Safety Standards:

1. FMVSS No. 208, "Occupant Crash Protection"
2. FMVSS No. 212, "Windshield Mounting"
3. FMVSS No. 219 (partial), "Windshield Zone Intrusion"
4. FMVSS No. 301, "Fuel System Integrity"

The test mode was perpendicular (0°) and the impact velocity was 29.4 mph. The ambient temperature at the impact face was 50°F.

The subject test vehicle appears to comply with the requirements of FMVSS Nos. 208, 212, 219 (partial) and 301.

Type of Restraint System: The test vehicle was equipped with driver and right front passenger 3-point continuous loop manual seat belt restraints.

17. Key Words	18. Distribution Statement
30 mph Vehicle Safety Compliance Testing FMVSS 208, "Occupant Crash Protection" FMVSS 212, "Windshield Mounting" FMVSS 219, "Windshield Zone Intrusion" FMVSS 301, "Fuel System Integrity" Frontal Impact	Copies of this report are available from: Technical Reference Division National Highway Traffic Safety Admin. Nassif Building, Room 5108 (NAD-52) 400 Seventh St., S.W., Washington, DC 20590

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
UNCLASSIFIED	UNCLASSIFIED		

Form DOT F1700.7 (8-69)

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Section 1

PURPOSE AND TEST PROCEDURE

This 30 mph frontal barrier impact test is part of the Federal Motor Vehicle Safety Standard (FMVSS) 208, 212, 219 (partial) and 301 compliance test program conducted for the National Highway Traffic Safety Administration (NHTSA) by Calspan Advanced Technology Center under Contract No. DTNH22-90-C-01003. The purpose of this test was to determine if the subject vehicle, a 1993 Santa Fe Vandura Conversion Van, meets the performance requirements of FMVSS 208, "Occupant Crash Protection"; FMVSS No. 212, "Windshield Mounting"; FMVSS No. 219 (partial), "Windshield Zone Intrusion"; and FMVSS No. 301, "Fuel System Integrity". This compliance test was conducted using the requirements found in the OVSC Laboratory Test Procedure No. TP-208-08, dated September 8, 1989.

Section 2

SUMMARY OF TEST NUMBER CP1302

A frontal barrier was impacted by a 1993 Santa Fe Vandura Conversion Van at a velocity of 29.4 mph. The test was performed at the Calspan Corporation Advanced Technology Center on March 25, 1993. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

The frontal barrier impact event was documented by one real-time camera and 14 high-speed cameras. Camera locations and other pertinent camera information can be found in this report.

Two Part 572B, 50th percentile male anthropomorphic test devices (ATDs), were placed in the driver and right front passenger seating positions according to dummy placement instructions specified in the OVSC Laboratory Test Procedure.

Both ATDs were fully instrumented with head and chest triaxial accelerometers, and left/right femur load cells. These ATDs had been certified prior to the test.

The 23 channels of data were recorded on PC based data acquisition system. Appendix B contains the vehicle and dummy response data traces.

The driver's HIC was 761. The maximum chest deceleration over 3 milliseconds was 50.7 g's. The maximum force on the driver's left femur was 881 pounds and 1023 pounds on the right femur.

The right front passenger's HIC was 568. The maximum chest deceleration over 3 milliseconds was 45.9 g's. Loads of 558 and 249 pounds were recorded on the left and right femurs respectively.

Table 1

CRASH TEST SUMMARY

Vehicle NHTSA No.: CP1302 Test Mode: 30 mph Frontal Barrier

Test Date: March 25, 1993 Time: 13:45 Temperature: 50 °F

Vehicle Make/Model/Body Style: 1993 Santa Fe Vandura Conversion Van

Vehicle Test Weight: 5780 lbs.

Vehicle/Barrier Impact Angle: 0°

Impact Velocity: 29.4 mph

Maximum Static Crush: 16.5 inches

Vehicle Rebound: 7.2 inches

DUMMIES:	DRIVER	PASSENGER
Type:	Part 572B	Part 572B
Restraint System:	3-Point Continuous Belt	3-Point Continuous Belt

Number of Data Channels: 23

Number of Cameras: 1 Real Time

14 High Speed

DOOR OPENING DATA: Closed - Left Front

Closed - Right Front

Front Seat(s) Data:	DRIVER	PASSENGER
Seat Track Failure:	0.0" inches of shift	0.0"
Seat Back Failure:	None	None

VISIBLE DUMMY CONTACT POINTS:	DRIVER	PASSENGER
Head:	• Face with horn pad • Top of head grazed inner top of steering wheel rim • Rear of head with seat	Chin with chest
Abdomen:	No contact	No contact
Chest:	Lower steering wheel rim	No contact
Knees:	Lower dash	Lower dash

Table 2

GENERAL TEST AND VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 1993 GMC Santa Fe Vandura Van

NHTSA No.: CP1302 ; VIN: 1GDEG25K7PF501798 ; Color: White

Engine Data: 8 cylinders; 350 CID; 5.7 Liters; - cc

Placement: ✓ Longitudinal or In-Line; - Transverse or Lateral

Transmission Data: 4 speeds; - Manual; ✓ Automatic; - Overdrive

Final Drive: ✓ Rear Wheel Drive; - Front Wheel Drive; - Four Wheel Drive

Major Options: ✓ A/C; ✓ Pwr.Strg.; ✓ Pwr.Brakes

✓ Pwr.Windows; ✓ Pwr.Door Locks; ✓ Tilt Wheel

Date Received: 3/4/93 ; Odometer Reading 116 miles

Selling Dealer: James Mathews Inc.

& Address 1101 Baldwin Avenue, Marion, IN

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by: Santa Fe Vans, Inc./General Motors Corp.

Date of Manufacture: 12/92

GVWR: 6600 lbs.; GAWR: 3400 lbs. FRONT; 3406 lbs. REAR

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load: - psi FRONT

- psi REAR

Recommended Tire Size: P225/75R15

* Recommended Cold Tire Pressure: 35 psi FRONT; 35 psi REAR

Size of Tires on Test Vehicle: P225/75R15 ; Manufacturer: Goodyear

Vehicle Capacity Data:

Type of Front Seats: - Bench; ✓ Bucket; - Split Bench

Number of Occupants: 2 Front; 5 Rear; 7 Total

Vehicle Capacity Weight (VCW) = - lbs.

No. of Occupants x 150 lbs. = - lbs.

Rated Cargo/Luggage Weight (RCLW) = 300** lbs. (Difference)

*Tire pressure used for test

**Maximum of 300 lbs RCLW used for light trucks, vans, and utility vehicles.

Table 2

GENERAL TEST AND VEHICLE PARAMETER DATA (cont.)

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (WITH MAXIMUM FLUIDS) = UDW:

Right Front = 1300 lbs. Right Rear = 1290 lbs.

Left Front = 1350 lbs. Left Rear = 1230 lbs.

TOTAL FRONT = 2650 lbs. TOTAL REAR = 2520 lbs.

% of Total Vehicle Weight = 51.3 % of Total Weight = 48.7 %

TOTAL DELIVERED WEIGHT = 5170 lbs.

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight = 5170 lbs.

Rated Cargo/Luggage Weight (RCLW) = 300 lbs.

Weight of 2 P.572 Dummies @ 164 ea. = 328 lbs.

TARGET TEST WEIGHT = 5798 lbs. (sum)

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 0 POUNDS OF CARGO WEIGHT:

Right Front = 1400 lbs. Right Rear = 1490 lbs.

Left Front = 1420 lbs. Left Rear = 1470 lbs.

TOTAL FRONT = 2820 lbs. TOTAL REAR = 2960 lbs.

% of Total Weight = 48.8 % % of Total Weight = 51.2 %

TOTAL TEST WEIGHT = 5780 lbs.

Weight of Ballast Secured in Vehicle Trunk Area = 300 lbs.

Vehicle Components Removed for Weight Reduction: None

VEHICLE ATTITUDE (all dimensions in inches):

AS DELIVERED:	RF 29.5	LF 29.3	RR 28.8	LR 28.5
FULLY LOADED:	RF 28.4	LF 28.5	RR 27.2	LR 27.7
AS TESTED:	RF 28.9	LF 29.0	RR 27.9	LR 28.0

Vehicle's Wheel Base: 125.4 in.

Location of Vehicle's C.G.: 64.2 inches rearward of front wheel center

FUEL SYSTEM DATA:

Fuel System Capacity From Owner's Manual = 33 gallons

Usable Capacity Figure Furnished by COTR = 33 gallons

Test Volume Range (92 to 94% of Usable Capacity) = 30.4 to 31.0 gallons

ACTUAL TEST VOLUME = 30.7 gallons (with entire fuel system filled)

Table 3

POST IMPACT DATA

TYPE OF TEST:

Type of Test: Frontal Barrier Impact Angle: 0°

Test Date: March 25, 1993 Time: 13:45 Temperature: 50°F

Vehicle NHTSA No.: CP1302

Required Impact Velocity Range: 28.9 to 29.9 mph

BARRIER IMPACT VELOCITY: (Speed traps within 5 feet of impact plane.)

Trap No. 1 = 29.4 mph; Trap No. 2 = 29.4 mph

Distance from vehicle to barrier: (1) entering trap = 52 inches

(2) exiting trap = 12 inches

VEHICLE STATIC CRUSH: (For frontal and rear impacts only.)

Vehicle Length:

Pre-Test	Right = 201.5 ;	C/L = 202.5 ;	Left = 201.5
Post-Test	Right = 186.4 ;	C/L = 186.0 ;	Left = 186.6
Crush	Right = 15.1 ;	C/L = 16.5 ;	Left = 14.9

AVERAGE = 15.5 inches

VEHICLE REBOUND: (From rigid barrier only.)

Distance from front of test vehicle to impact point:

Right = 6.6 ; C/L = 7.7 ; Left = 7.3

AVERAGE = 7.2 inches

DOOR OPENING:	Left	Right
Front	Closed	Closed
Rear	N/A	Closed

SEAT MOVEMENT:	Seat Back Failure	Seat Shift
Front	None	0.0"
Rear	None	0.0"

Table 3

POST IMPACT DATA (cont.)

GLAZING DAMAGE: Windshield cracked throughout

OTHER NOTABLE IMPACT FEATURES: Right front tire deflated during impact event

Section 3

OCCUPANT AND VEHICLE DATA

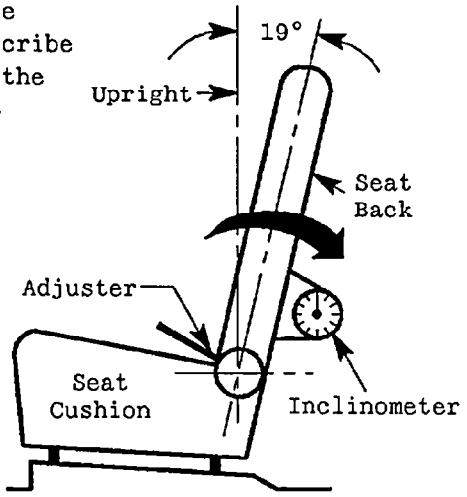
Figure 1

TEST VEHICLE INFORMATION

VEHICLE IDENTIFICATION:

Model Year: 1993 Vehicle Model: Santa Fe GMC Vandura Body Style: Conversion Van

1. Nominal Design Riding Position for adjustable driver and passenger seat backs. Please describe how to position the inclinometer to measure the seat back angle. Include description of the location of the adjustment latch detent, if applicable.



Left Side View

Seat back angle for driver's seat: 19°

Measurement instructions: Place seat back in 5th detent from first locking detent. (First locking detent = 0)

Seat back angle for passenger's seat: 19°

Measurement instructions: Same as driver

2. Seat Fore and Aft Positioning

Positioning of the driver's seat: Place seat in 6th detent (mid-position) from a total of 11 detents

Positioning of the passenger's seat (if applicable): Same as driver

3. Fuel Tank Capacity Data

A. "Usable Capacity" of the standard equipment fuel tank is 22 gallons

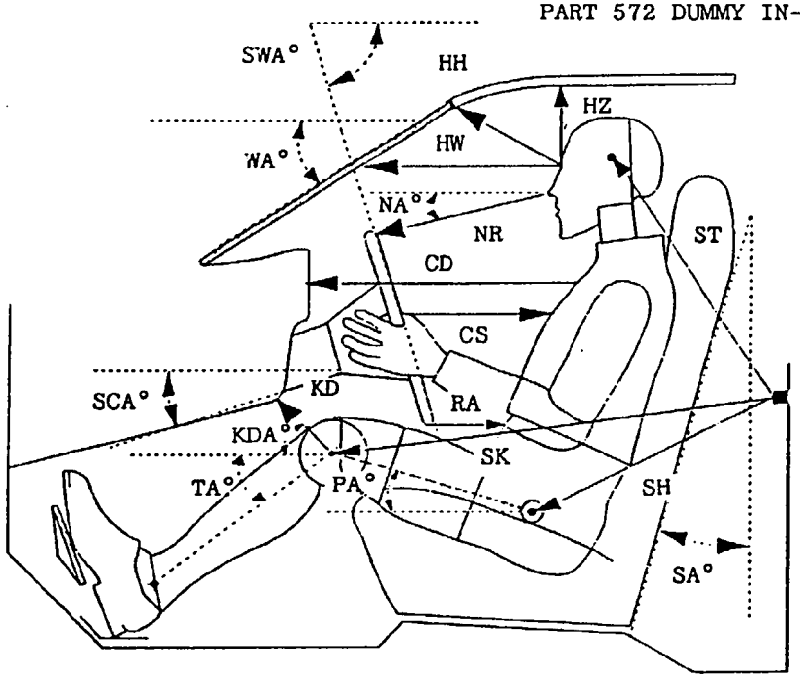
B. "Usable Capacity" of the optional equipment fuel tank is 33 gallons

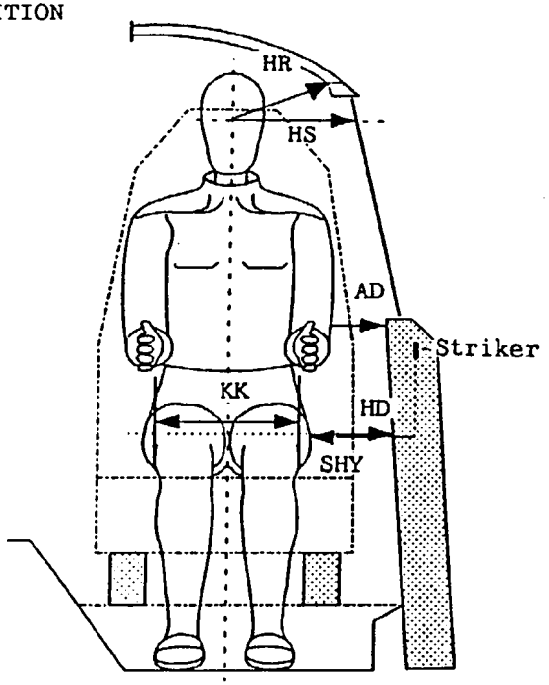
4. Steering Column Position: Mid Position

5. Other: Vehicle equipped with optional (33 gal.) fuel tank

Figure 2

PART 572 DUMMY IN-VEHICLE POSITION



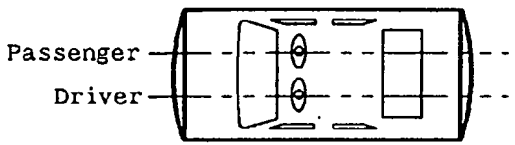


HH - Head to Header
HW - Head to Windshield
HZ - Head to Roof
NR - Nose to Rim
CS - Steering Wheel to Chest
CD - Chest to Dash
RA - Rime to Abdomen
KDL/KDR - Knee to Dash
KDA - Knee to Dash Angle
SH - Striker to H-Point

SK - Striker to Knee
ST - Striker to Head
NA - Nose to Rim Angle
TA - Tibial Angle
PA - Pelvic Angle
SA - Seat Back Angle
SCA - Steering Column Angle
SWA - Steering Wheel Angle
WA - Windshield Angle

HR - Head to Side Header
HS - Head to Side Window
AD - Arm to Door
HD - H-Point to Door
SHY - Striker to H-Point (Y Dir.)
KK - Knee to Knee

Vertical Longitudinal Planes



Vertical Transverse Plane

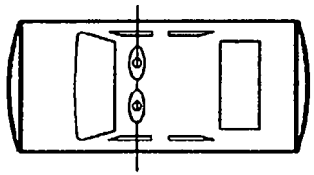


Table 4

FRONT SEAT OCCUPANT MEASUREMENTS

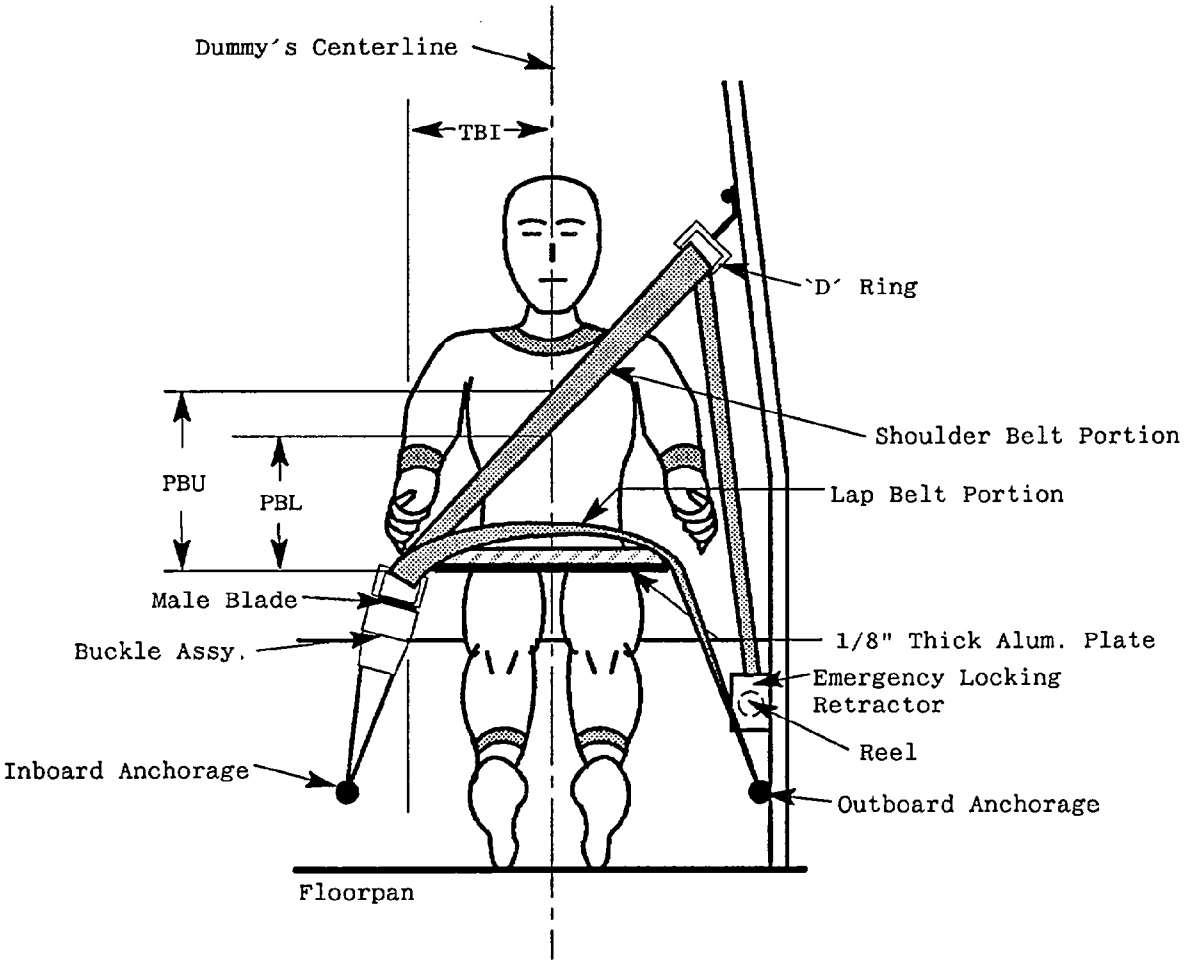
(all dimensions in inches unless otherwise specified)

	DRIVER (Serial #1020)	PASS (Serial #1021)
WA°	45°	-
SWA°	63°	-
SCA°	27°	-
SA°	See Note	See Note
HZ	7.1	7.5
HH	22.6	26.1
HW	26.4	29.9
HR	9.7	9.1
NR	18.4 Angle (NA) 20°	-
CD	25.4	31.4
CS	12.2	-
RA	7.2	-
KDL	10.8 Angle (KDA) 24°	13.6
KDR	10.1	13.3 Angle (KDA) 10°
FA°	16°	16°
TA°	41°	43°
KK	11.2	10.3
ST	23.8 Angle 3°	24.3 Angle -7°
SK	21.2 Angle 93°	20.0 Angle 96°
SH	6.0 Angle 129°	5.2 Angle 127°
SHY	8.7	8.8
HS	9.3	8.8
HD	6.2	6.4
AD	2.3 to door handle	3.7

Note: Seats were positioned as specified by manufacturer.

Figure 3

SEAT BELT POSITIONING DATA

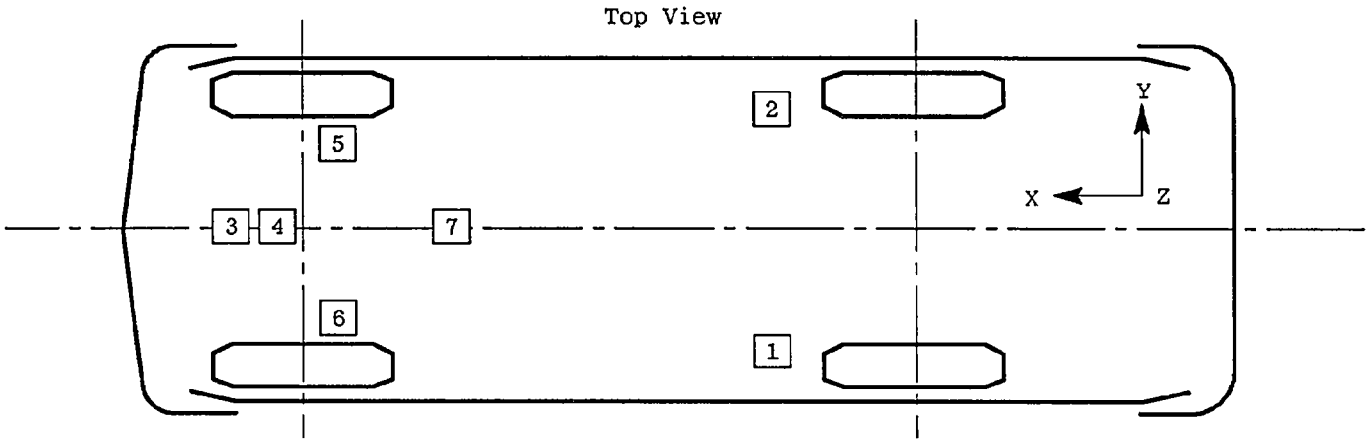


Front View of Driver Dummy

	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
PBU -- Top surface of alum. plate to upper edge	14.3	14.7
PBL -- Top surface of alum. plate to belt lower edge	10.6	11.5
TBI -- Distance from torso centerline to buckle	8.6	9.3

Figure 4

VEHICLE ACCELEROMETER LOCATIONS



ACCELEROMETER NUMBER*	ACCELEROMETER LOCATION	DIRECTION		
		X	Y	Z
1	Left Rear Seat Crossmember	X		
2	Right Rear Seat Crossmember	X		
3	Top of Engine	X		
4	Bottom of Engine	X		
5	Right Disc Brake Caliper	X		
6	Left Disc Brake Caliper	X		
7	Instrument Panel	X		

*The accelerometer pack number can be correlated with the vehicle response data traces found in Appendix B.

Table 5

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

NO.	LOCATION		X*	Y*	Z*	POSITIVE DIRECTION** MAX (g)	POSITIVE DIRECTION** TIME (msec)	NEGATIVE DIRECTION** MAX (g)	NEGATIVE DIRECTION** TIME (msec)
1	REAR SEAT X-MEMBER AT LEFT SIDE	PRE:	100.0	23.7	24.7				
		POST:	100.0	23.7	24.2				
	LONGITUDINAL ACCELERATION					4	113	-30	30
2	REAR SEAT X-MEMBER AT RIGHT SIDE	PRE:	100.0	-23.7	24.1				
		POST:	100.0	-23.7	21.8				
	LONGITUDINAL ACCELERATION					3	107	-28	44
3	TOP OF ENGINE BLOCK	PRE:	163.2	-10.1	35.3				
		POST:	160.2	-10.8	32.0				
	LONGITUDINAL ACCELERATION					52	51	-74	40
4	BOTTOM OF ENGINE	PRE:	161.7	-1.5	12.7				
		POST:	159.0	-1.8	8.1				
	LONGITUDINAL ACCELERATION					45	53	-96	42
5	BRAKE CALIPER AT RIGHT SIDE	PRE:	167.4	-25.8	9.7				
		POST:	165.9	-25.8	7.5				
	LONGITUDINAL ACCELERATION					24	66	-71	51
6	BRAKE CALIPER AT LEFT SIDE	PRE:	167.4	25.8	9.7				
		POST:	165.4	25.8	9.6				
	LONGITUDINAL ACCELERATION					43	60	-109	43
7	DASH PANEL	PRE:	165.0	6.0	55.7				
		POST:	163.4	6.0	56.5				
	LONGITUDINAL ACCELERATION					25	68	-53	27

		**	POSITIVE	NEGATIVE
*X	+ Forward from rear bumper	LONGITUDINAL:	FORWARD	REARWARD
Y	+ Left from vehicle centerline	LATERAL:	LEFTWARD	RIGHTWARD
Z	+ Up from ground	VERTICAL:	UPWARD	DOWNWARD

DISTANCE MEASUREMENTS IN INCHES

Figure 5

CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 5.

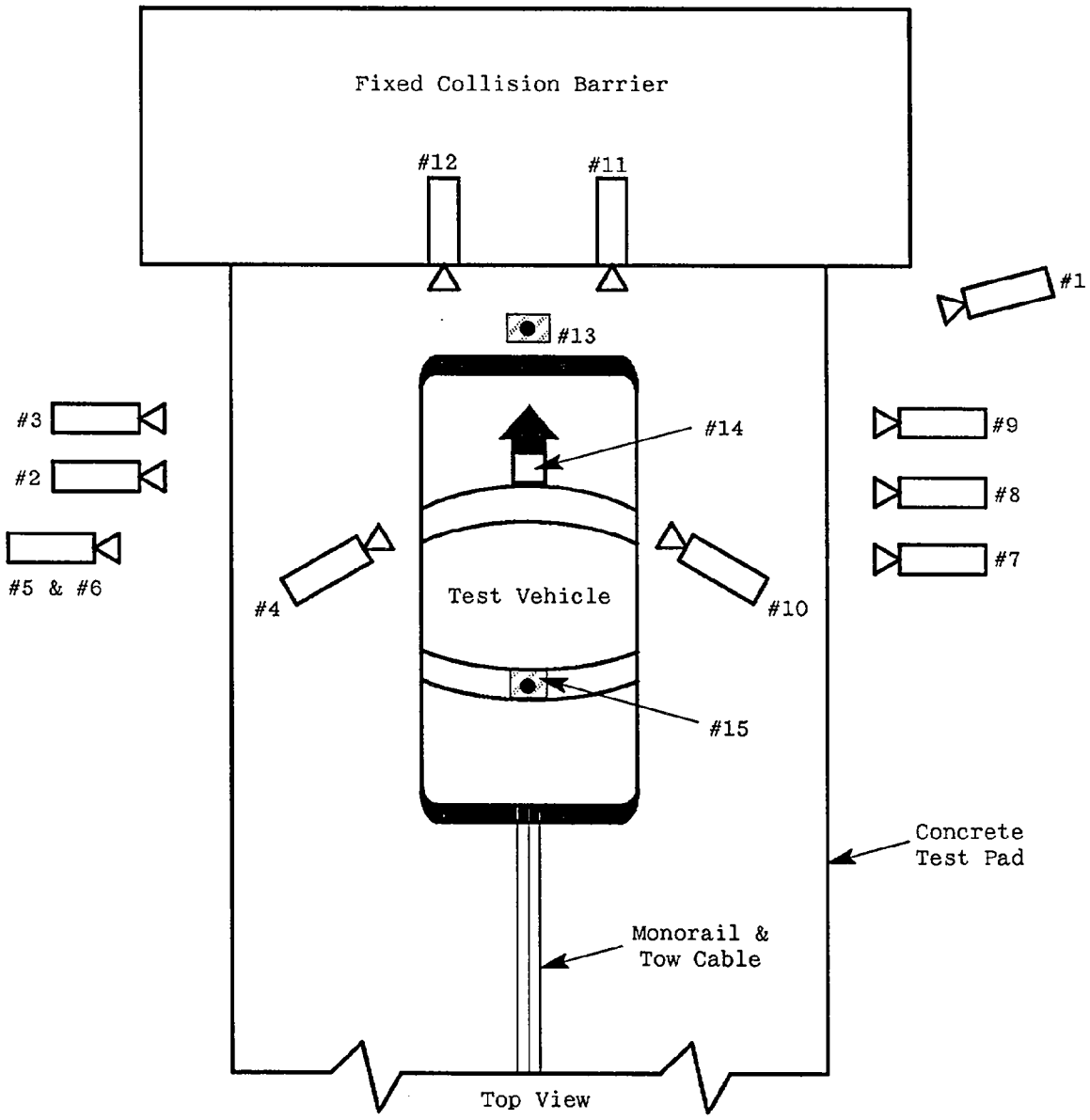


Table 6

HIGH-SPEED CAMERA LOCATIONS

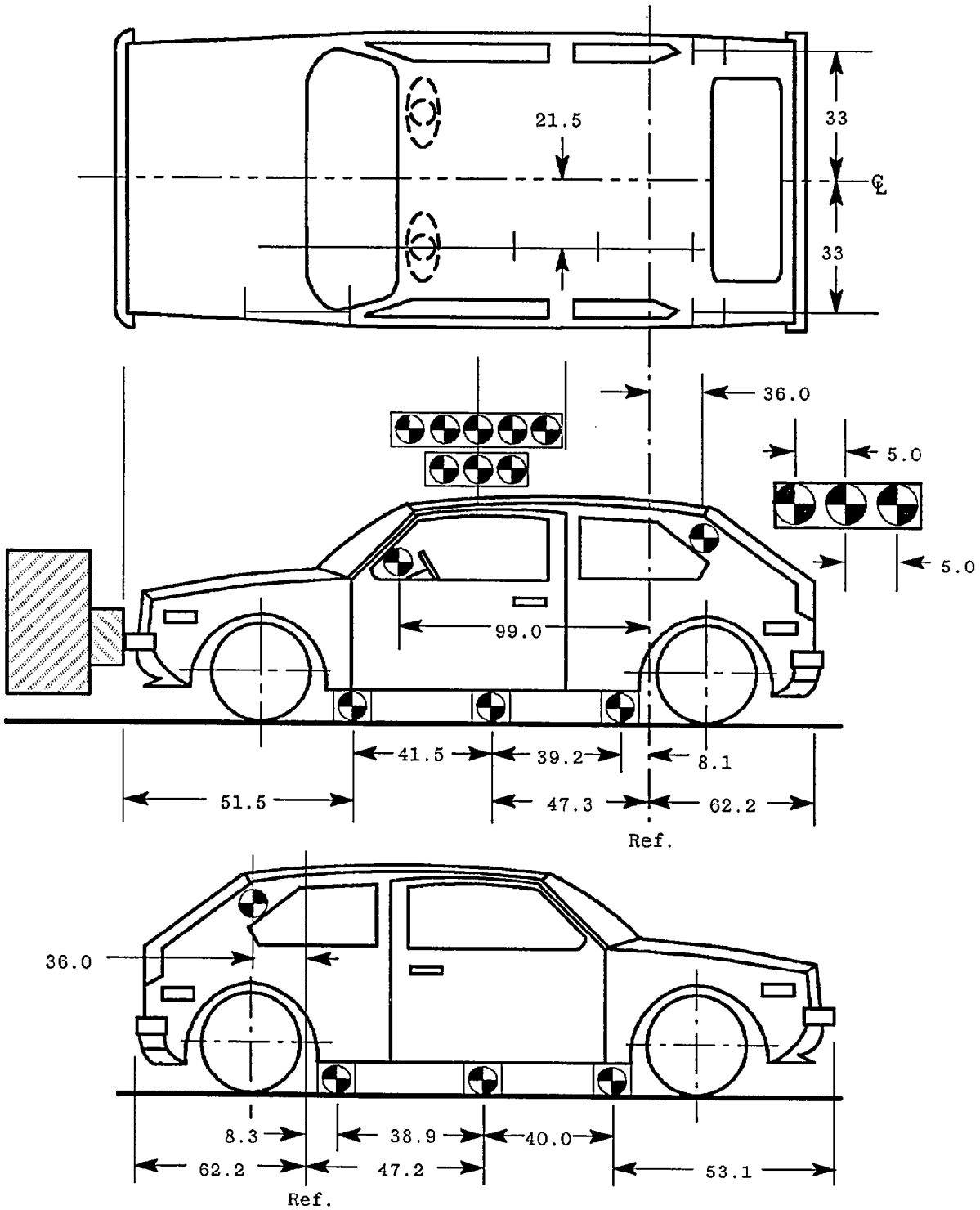
Test No. CP1302 Vehicle: 1993 Santa Fe Vandura Conversion Van

CAMERA NO.	VIEW	CAMERA POSITIONS (in)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Camera	-	-	-	-	-	-	24
2	Overall Left Side	257	65	42	-2	232.5	13	550
3	Left Side View	332	39	41	-1	307.5	25	620
4	Driver and Interior View	118	78	72	-10	-	13	570
5	Steering Column (Bottom)	316	50	46	-2	291.5	25	840
6	Steering Column (Top)	316	50	70	-6	291.5	25	765
7	Overall Right Side	270	76	42	-2	245.5	13	540
8	Right Side View	319	50	41	-1	294.5	25	560
9	Right Passenger View	327	63	57	-2	302.5	35	585
10	Passenger and Interior View	111	77	71	-10	-	13	570
11	Passenger Front View	16	0	135	-66	-	13	625
12	Driver Front View	16	0	135	-64	-	13	595
13	Windshield View	0	0	125	-66	-	13	600
14	Pit View of Engine	0	30	-86	90	-	13	650
15	Pit View of Fuel Tank	0	130	-86	90	-	13	845

*X = film plane to monorail centerline
Y = film plane to impact location
Z = film plane to ground
** = referenced to horizontal plane

Figure 6

VEHICLE TARGET LOCATIONS



(Dimensions in inches)

Figure 7

TEST VEHICLE MEASUREMENTS

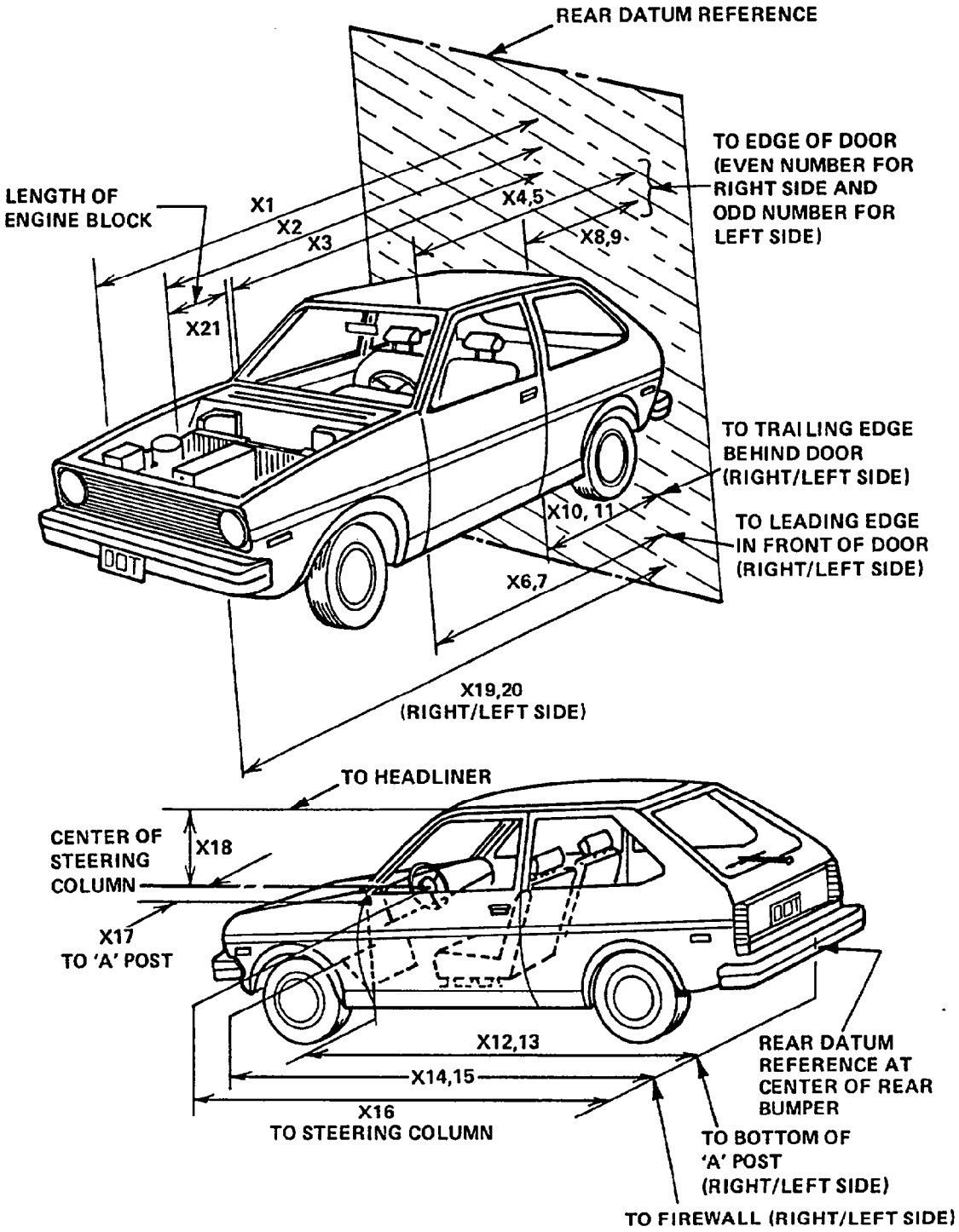


Table 7

VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	202.5	186.0	16.5
X2	Rear Surface of Vehicle to Front of Engine	180.0	175.0	5.0
X3	Rear Surface of Vehicle to Firewall	185.4	181.0	4.4
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	170.9	169.0	1.9
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	171.2	167.4	3.8
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	171.4	169.9	1.5
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	171.8	166.9	4.9
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	132.5	131.9	0.6
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	132.5	132.0	0.5
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	132.4	132.2	0.2
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	132.6	132.8	-0.2
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	153.0	154.0	-1.0
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	154.3	153.9	0.4
X14	Rear Surface of Vehicle to Firewall, Right Side	184.5	181.5	3.0
X15	Rear Surface of Vehicle to Firewall, Left Side	184.4	179.2	5.2
X16	Rear Surface of Vehicle to Steering Column	152.5	152.0	0.5
X17	Center of Steering Column to "A" Post	13.5	13.6	-0.1
X18	Center of Steering Column to Headliner	19.2	19.2	0.0
X19	Rear Surface of Vehicle to Right Side of Front Bumper	201.5	186.4	15.1
X20	Rear Surface of Vehicle to Left Side of Front Bumper	201.5	186.6	14.9
X21	Length of Engine Block	23.0	23.0	0.0

Section 4

SUMMARY OF RESULTS OF FMVSS NOS. 208, 212, 219 AND 301-75

- "Occupant Crash Protection," FMVSS No. 208 Data
- "Windshield Mounting," FMVSS No. 212 Data
- "Windshield Zone Intrusion," FMVSS No. 219 (Partial) Data
- "Fuel System Integrity," FMVSS No. 301-75

Table 8

DUMMY INJURY CRITERIA VALUES

NHTSA No.: CP1302 Vehicle: 1993 Santa Fe Vandura Conversion Van

	MAXIMUM ACCELERATION (g's)								
	HEAD				CHEST				
	X	Y	Z	R	X	Y	Z	R*	Displace-ment
Dummy (1)	-68	-26	93	116	-59	-14	25	50.7	N/A
Dummy (2)	-37	9	58	61	-50	-18	-16	45.9	N/A

	MAXIMUM FORCE - FEMUR LOAD (lbs.)	
	LEFT FEMUR	RIGHT FEMUR
Dummy (1)	881	1023
Dummy (2)	558	249

	HEAD INJURY CRITERIA**			
		36 millisecond Maximum		Avg. Acc. (g)
	HIC	t_1 (msec)	t_2 (msec)	t_1 TO t_2
Dummy (1)	761.2	57.600	90.960	55.37
Dummy (2)	568.2	72.360	108.240	47.85

* Defined as exceeding 0.003 sec. duration
**As defined in FMVSS No. 208

Table 9

FMVSS NO. 208 - SEAT BELT WARNING SYSTEM CHECK

With occupant in driver's position, the lap belt in stowed position, and ignition switch placed in "Start/On" position:

Log time duration of audible warning signal = 6.0 sec.

Log time duration of reminder light operation = 6.0 sec.

With occupant in driver's position, lap belt in use, and the ignition switch placed in "Start/On" position:

Log time duration of audible warning signal = 0 sec.
(audible warning should not operate)

Log time duration of reminder light operation = 0 sec.

Note wording of visual warning:

Fasten Seat Belt -

Fasten Belt -

Symbol 101-80 X

Table 10

FMVSS NO. 208 - LABELING AND DRIVER'S MANUAL INFORMATION

Locate label which describes manufacturers maintenance or replacement schedule for crash-deployed occupant protection system.

Describe location: Vehicle does not contain a crash-deployed occupant protection system.

The manufacturers recommended schedule is to replace ___-___ or repair ___-___ this system:

a. by ___-___ month, ___-___ year

b. by ___--___ miles

c. or after a time interval of _____ months or ___-___years.

Were appropriate instructions concerning maintenance and/or replacement of this system provided?

YES ___N/A___ NO ___N/A___

Was a description of the functional operation of the system provided?

YES ___N/A___ NO ___N/A___

Is there a reference to the instructions and description of the system on the label?

YES ___N/A___ NO ___N/A___

Was an owner's manual provided? YES ___N/A___ NO ___N/A___

Did the owner's manual contain appropriate information concerning maintenance and/or replacement and a description of the functional operation of the systems?

YES ___N/A___ NO ___N/A___

Table 11

FMVSS NO. 208 - READINESS INDICATOR

An occupant restraint system that deploys in the event of a crash shall have a monitoring system with a readiness indicator. A totally mechanical system is exempt from this requirement.

Is the system totally mechanical? YES ___X___ NO ___-___

Describe the location of the readiness indicator: --

Is the readiness indicator clearly visible to the driver?
YES ___N/A___ NO ___N/A___

Is a list of the elements in the occupant restraint system, being monitored by the readiness indicator, provided?
YES ___N/A___ NO ___N/A___

Table 12

FMVSS NO. 208 – COMFORT AND CONVENIENCE TEST SUMMARY

Test Vehicle NHTSA No.:	CP1302
Make/Model:	1993 Santa Fe Vandura Conversion Van
Date of Comfort/Convenience Check:	3/24/93
Technician Performing Check:	VMP
GVWR:	6600 lbs

Seat belt comfort and convenience requirements cover vehicles manufactured on or after September 1, 1986, which have a gross vehicle weight rating of 10,000 pounds or less. Exemptions to this rule are belts installed in a walk-in, van-type vehicle and manual Type 2 belt systems installed in the front outboard seating positions of passenger automobiles. On or after September 1, 1989, the exemption of the type 2 manual seat belts installed in the front outboard seating positions of passenger automobiles will change depending on the states' enactment of mandatory usage laws.

Was vehicle built after or on September 1, 1986, and is it equipped with:

1. Automatic seat belts YES - NO X

If yes, go to requirements D1, D2 and D3

2. Manual seat belts* YES X NO -

a. The seat belts, other than Type 2 lap/shoulder belts, are located in the front outboard seating positions of a passenger automobile.

YES - NO X

(Go to requirements D3, D4, D5, and D6)

b. The seat belt system is Type 2 lap/shoulder belt in the front outboard seating positions or the seat belts are located in a walk-in van.

STOP

*If the seat belts are voluntarily installed by the manufacturer they do not have to comply.

Table 12 (cont.)

D1

CONVENIENCE HOOKS

A convenience hook or other device is provided to stow seat belt webbing to facilitate entering or exiting the vehicle.

YES X* NO -

* - on driver seat only

Check the option which applies to this test vehicle:

1. A convenience hook or other device automatically releases the webbing when the automatic belt system is operational and remains in the released mode as long as the vehicle's ignition switch is moved to the "on" or "start" position and the vehicle's drivetrain is engaged.

   YES N/A NO N/A

2. A convenience hook or other device automatically releases the webbing when the automatic belt system is operational and remains in the released mode as long as the vehicle's ignition switch is moved to the "on" or "start" position and the vehicle's parking brake is in the released mode (nonengaged).

   YES N/A NO N/A

D2

WEBBING TENSION - RELIEVING DEVICE

The seat belt assembly installed in the outboard designated seating position has either manual or automatic tension relieving devices permitting the introduction of slack in the webbing of the shoulder belt ("comfort clips" or "window shade" devices).

YES - NO X

Check the owner's manual and determine the maximum amount of slack recommended by the manufacturer in inches. The recommended slack is - inches. Introduce this slack into the shoulder belt before testing the vehicle to comply with the requirements of FMVSS 208 S5.1. A warning is included in the owner's manual that introducing slack beyond the amount specified can significantly reduce the effectiveness of the shoulder belt.

YES N/A NO N/A

(If NO, provide explanation.)

Check the option which applies to this test vehicle:

1. This vehicle is equipped with automatic seat belts and the tension relieving device is canceled each time the adjacent door is opened.

   YES N/A NO N/A

(If NO, provide explanation.)

Table 12 (cont.)

2. This vehicle is equipped with manual belts, required to meet FMVSS 208 S4.6, and the tension relieving device is canceled each time one of the following options occurs:

   a. The adjacent door is opened. YES N/A NO N/A

   b. The latch plate is released from the buckle. YES N/A NO N/A

3. This is an open-body vehicle, without doors. Does the manual mean to cancel any shoulder belt slack introduced by a tension relieving device to operate properly?

   YES N/A NO N/A

(If NO, provide explanation.)

D3

BELT CONTACT FORCE

1. Do not measure the belt contact force if the manual or automatic seat belt assemblies in this vehicle incorporate a webbing tension relieving device. Does the vehicle incorporate a tension relieving device?

   YES - NO X

2. Seats are adjusted according to instructions in Appendix B.

   YES X NO -

3. The test dummies are positioned according to dummy position placement instructions in Appendix B and Appendix C.

   YES X NO -

4. Close the vehicle's adjacent door, pull either 12 inches of belt webbing or the maximum available amount of belt webbing, whichever is less, from the retractor and then release it, allowing the belt webbing to return to the dummy's chest, then fasten the latch. Locate the point where the centerline of the upper torso belt webbing crosses the midsagittal line on the dummy's chest. At that point, pull the belt webbing out 3 inches from the dummy's chest and release until it is within one inch from the dummy's chest. Measure the contact force exerted by the belt webbing on the dummy's chest. The contact force is 0.3 pounds. Contact the COTR if the contact force exceeds 0.7 pounds.

Table 12 (cont.)

D4

LATCHPLATE ACCESSIBILITY

1. Position the test dummy in the driver's seat or passenger's seat in its forward most adjustment position.

   YES X NO -

2. Attach the inboard and outboard reach string. YES X NO -

3. Extend each line backward and outboard to generate arcs of the reach envelope of the test dummy's arms. With the latchplate in the normal stowed position, check to assure that the latchplates are within the reach envelope.

   YES X NO -

4. Using the clearance test block, determine if there is sufficient clearance between the vehicle seat and the side of vehicle interior to allow the test block to move unhindered to the latchplate or buckle.

   YES X NO -

D5

RETRACTION

1. Seats and seat backs are adjusted according to instructions in Appendix B "General Test Conditions" in TP-208-8.

   YES X NO -

2. Use anthropomorphic test dummies whose arms have been removed and position the dummies in the front outboard designated seating positions according to instructions in Appendix B and restrain the dummies, using the belt systems for the positions being tested.

   YES X NO -

3. Outboard armrests which are capable of being stowed on vehicle seats shall be placed in their stowed positions.

   YES N/A NO N/A

4. Check the option which applies to this test vehicle:

   a. The torso and lap belt webbing of the seat belt system automatically retract to a stowed position when the adjacent vehicle door is in an open position and the seat belt latch plate is released.

      YES X NO -

Table 12 (cont.)

b. The torso and lap belt webbing of the seat belt system automatically retract when the seat belt latch plate is released.

YES ___X___ NO ___-___

5. With the webbing and hardware in the stowed position, close the door to assure that the webbing and hardware are prevented from being pinched.

YES ___X___ NO ___-___

6. If this test vehicle has an open body (without doors) and has a belt system with a tension-relieving device, check to assure that the belt system fully retracts when the tension-relief device is manually deactivated.

YES ___N/A___ NO ___N/A___

D6

ACCESSIBILITY

The requirements for accessibility do not apply to:

1. Seats whose seat cushions are removable so that the seat back serves a function other than seating;

2. Seats which are removable;

3. Seats which are movable so that the space formerly occupied by the seat can be used for a secondary function.

If the seats in this vehicle are different than the criteria above, then determine if:

1. Each manual seat belt assembly whose webbing is designed to pass through the seat cushion or between the seat cushion and seat back has one of the following three parts (the seat belt latchplate, the buckle, or the seat belt webbing) on top of or above the seat cushion under normal conditions (i.e., conditions other than when belt hardware is intentionally pushed behind the seat by a vehicle occupant).

YES ___X___ NO ___-___

2. The remaining two seat belt parts are accessible under normal conditions.

YES ___X___ NO ___-___

Table 12 (cont.)

3. The buckle and latchplate pass through the guides or conduits provided and do not fall behind the seat when the following events occur in order:

   a. The belt is completely retracted or, if the belt is nonretractable, the belt is unattached.

   YES ___X___ NO ___-___

   b. The seat is moved to any position to which it is designed to be adjusted.

   YES ___X___ NO ___-___

   c. The seat back, if foldable, is folded forward as far as possible and then moved backward into positions.

   YES ___X___ NO ___-___

4. Is the inboard receptacle end of the seat belt assembly which is installed in the outboard designated seating position accessible with the center arm rest in any position to which it can be adjusted without moving the armrest?

   YES ___X___ NO ___-___

D7

LATCH MECHANISM

A seat belt assembly installed in a passenger car, except an automatic belt assembly, shall have a latch mechanism: Vehicle equipped with automatic belts.

1. Whose components are accessible to a seated occupant in both the stowed and operational positions.

   YES ___X___ NO ___-___

2. That releases both the upper torso restraint and the lap belt simultaneously, if the assembly has a lap belt and an upper torso restraint that require unlatching for release of the occupant.

   YES ___X___ NO ___-___

3. That releases at a single point by a push button action.

   YES ___X___ NO ___-___

Figure 8

FMVSS NO. 212 – "WINDSHIELD MOUNTING" DATA SHEET

DETAILS OF WINDSHIELD MOUNTING SUCH AS RETENTION METHOD, TRIM TYPE, ETC.:

Windshield is bonded in place with 1.2" plastic trim covering entire periphery.

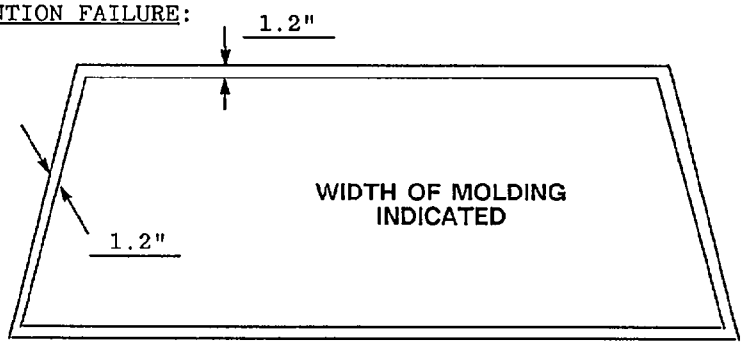
FMVSS 212 REQUIREMENTS:

The Post-Test periphery retention amount must be at least 75% of the Pre-Test periphery measurement for vehicles NOT equipped with automatic restraints, and 50% for each side of windshield for vehicles equipped with automatic restraint systems for front occupants.

FMVSS 212 TEST DATA:

	WINDSHIELD PERIPHERY		
	PRE-TEST (in.)	POST-TEST (in.)	PERCENT RETENTION
RIGHT SIDE	95.5	95.5	100
LEFT SIDE	95.5	95.5	100
TOTAL	191.0	191.0	100

AREA OF RETENTION FAILURE:



FRONT VIEW

FAILURE DETAILS:

None

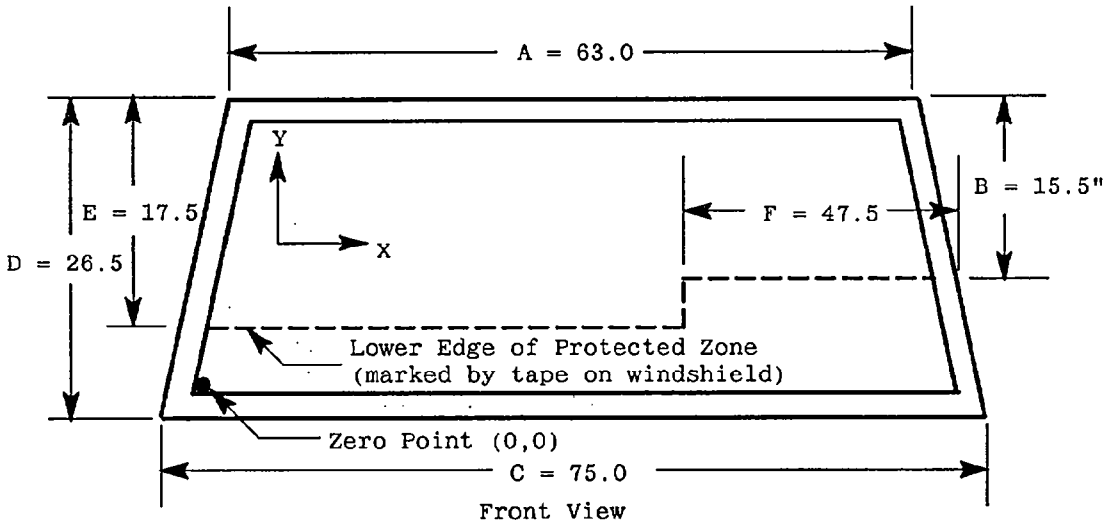
Figure 9

FMVSS NO. 219 (PARTIAL) – "WINDSHIELD ZONE INTRUSION" DATA SHEET

PROTECTED ZONE LOWER EDGE REQUIREMENT:

The lower edge of the protected zone is determined by placing a 6.5″ dia. rigid sphere weighing 15 pounds in a position such that it simultaneously contacts the inner surface of the windshield and the top surface of the instrument panel including padding. The locus of points is drawn on the inner surface of the windshield contacted by the sphere across the width of the instrument panel. From the outermost contactable points, extend the locus line horizontally to the edges of the windshield, and then draw a line on the inner surface of the windshield below and 1/2″ distant from the locus line. The LOWER EDGE OF THE PROTECTED ZONE is the longitudinal projection of this line onto the outer surface of the windshield.

FMVSS 219 TEST DATA: (Dimensions in inches.)



DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 1/4″:

(Show location of penetration on above sketch)

None

	COORDINATES	
	X	Y
1.		
2.		
3.		
4.		

Table 13

FUEL SYSTEM INTEGRITY POST IMPACT TEST DATA

FMVSS NO. 301

TEST VEHICLE NHTSA NO.: | C | P | 1 | 3 | 0 | 2 | TEST DATE: March 25, 1993

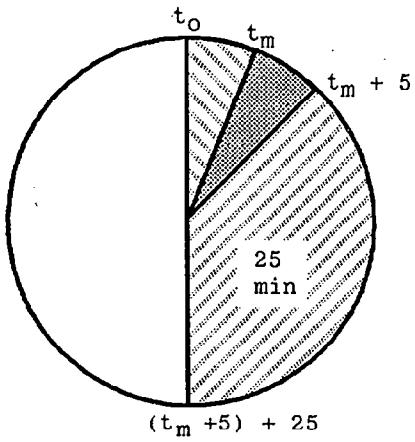
Vehicle Mfgr./Make/Model: 1993 Santa Fe Vans Inc./General Motors Corp. Vandura Conversion Van

Test vehicle fuel tank filled to 92% to 94% of manufacturer's "usable" capacity and with electric fuel pump operating (if it will operate without engine operation). Part 572 test dummies located at each front designated seating position.

TEST VEHICLE IMPACT TYPE:

- X Frontal (30 mph)
- _ Oblique (30 mph) with ____° barrier face first contacting _____ (driver/passenger) side
- _ Rear Moving Barrier (30 mph)
- _ Lateral Moving Barrier (20 mph)

FUEL SPILLAGE MEASUREMENT:



	ACTUAL	MAX ALLOWED
1. From impact until vehicle motion ceases	0	1 oz.
2. For 5 minute period after vehicle motion ceases	0	5 oz.
3. For next 25 minutes	0	1 oz./1 min.

SOLVENT SPILLAGE DETAILS:

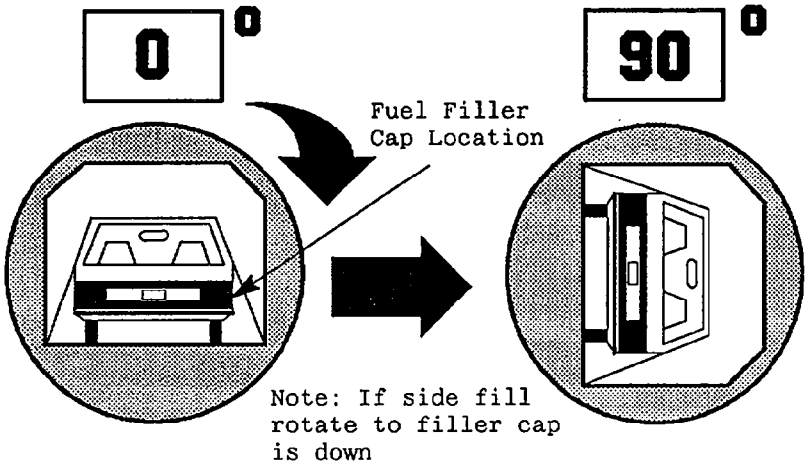
NONE

Table 14

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE:

Vehicle NHTSA ID No.: CP1302



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	1	minutes	30	seconds
FMVSS 301 Position Hold Time +	5	minutes	00	seconds
TOTAL	6	minutes	30	seconds
Next whole minute interval	7	minutes		

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min FROM onset of rotation	6th min.	7th min.	8th min. if reqd.

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	N/A

Note: Record spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATION(S):

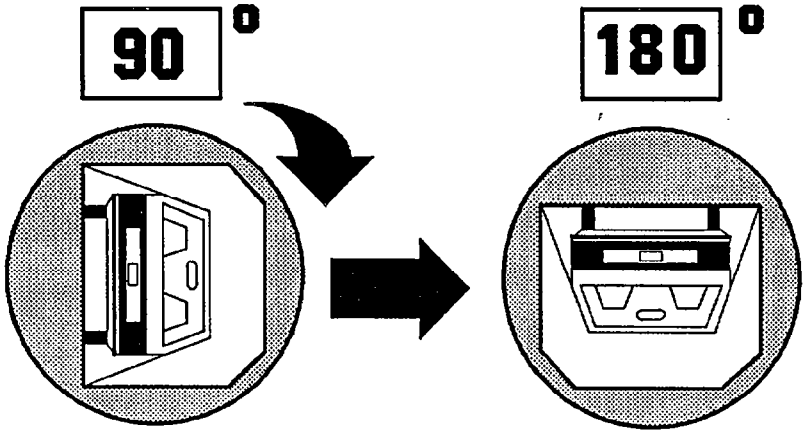
NONE

Table 13

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (cont.)

TEST PHASE:

Vehicle NHTSA ID No.: CP1302



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	2	minutes	08	seconds
FMVSS 301 Position Hold Time +	5	minutes	00	seconds
TOTAL	7	minutes	08	seconds
Next whole minute interval	8	minutes		

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min FROM onset of rotation	6th min.	7th min.	8th min. if reqd.

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	0

Note: Record spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATION(S):

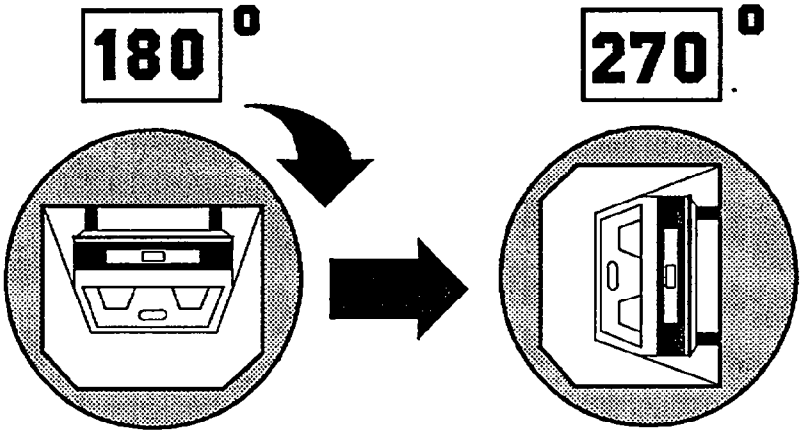
NONE

Table 13

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (cont.)

TEST PHASE:

Vehicle NHTSA ID No.: CP1302



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	2	minutes	00	seconds
FMVSS 301 Position Hold Time +	5	minutes	00	seconds
TOTAL	7	minutes	00	seconds
Next whole minute interval	7	minutes		

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min FROM onset of rotation	6th min.	7th min.	8th min. if reqd.

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	N/A

Note: Record spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATION(S):

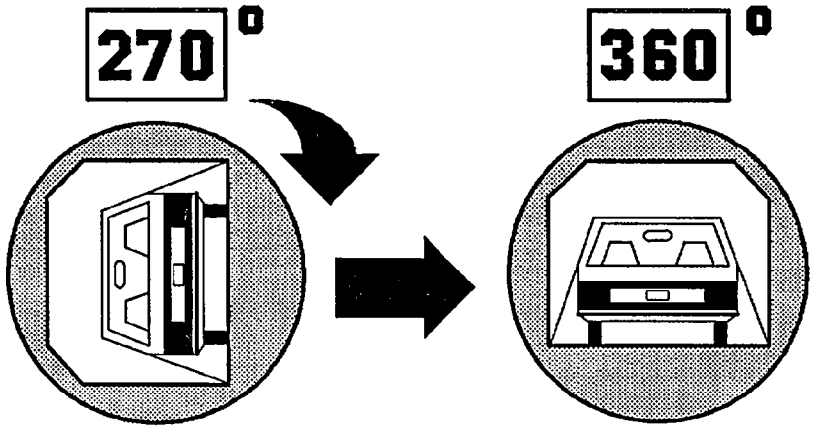
NONE

Table 13

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (cont.)

TEST PHASE:

Vehicle NHTSA ID No.: CP1302



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	1 minutes	48 seconds
FMVSS 301 Position Hold Time +	5 minutes	00 seconds
TOTAL	6 minutes	48 seconds
Next whole minute interval	7 minutes	

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min FROM onset of rotation	6th min.	7th min.	8th min. if reqd.

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	N/A

Note: Record spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATION(S):

NONE

Table 15

TEST VEHICLE NONCOMPLIANCE NOTICE

NHTSA Contract Lab: Calspan Advanced Technology Center

Lab Project Manager & Telephone No.: Walter E. Levan (716) 632-7500

Date of Test: March 25, 1993 Vehicle NHTSA No.: CP1302

Vehicle Manufacturer: Santa Fe Vans, Inc./General Motors Corp.

Model Year: 1993 VIN: 1GDEG25K7PF501798

Model: Santa Fe Vandura Body Style: Conversion van Build Date: 12/92

Dummy Stabilized Temperature at Time of Test: 70 °F (Spec. = 66-78°F)

Impact Velocity: 29.4 mph Time of Test: 13:45

Type of Automatic Restraint System: Driver and right front passenger manual 3-point continuous loop seat belt restraint system.

Failure Details:

The vehicle as tested appears to comply with the requirements of FMVSS Nos. 208, 212, 219 (partial), and 301.

Appendix A

PHOTOGRAPHS

LIST OF PHOTOGRAPHS

A-3

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Figure A-1 PRE-TEST FRONT VIEW

Figure A-2 POST-TEST FRONT VIEW

8056-15

Figure A-3 PRE-TEST LEFT SIDE VIEW.

Figure A-4 POST-TEST LEFT SIDE VIEW

Figure A-5 PRE-TEST RIGHT SIDE VIEW

Figure A-6 POST-TEST RIGHT SIDE VIEW

Figure A-7 PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

Figure A-8 POST-TEST RIGHT FRONT THREE-QUARTER VIEW

Figure A-9 PRE-TEST LEFT REAR THREE-QUARTER VIEW

Figure A-10 POST-TEST LEFT REAR THREE-QUARTER VIEW

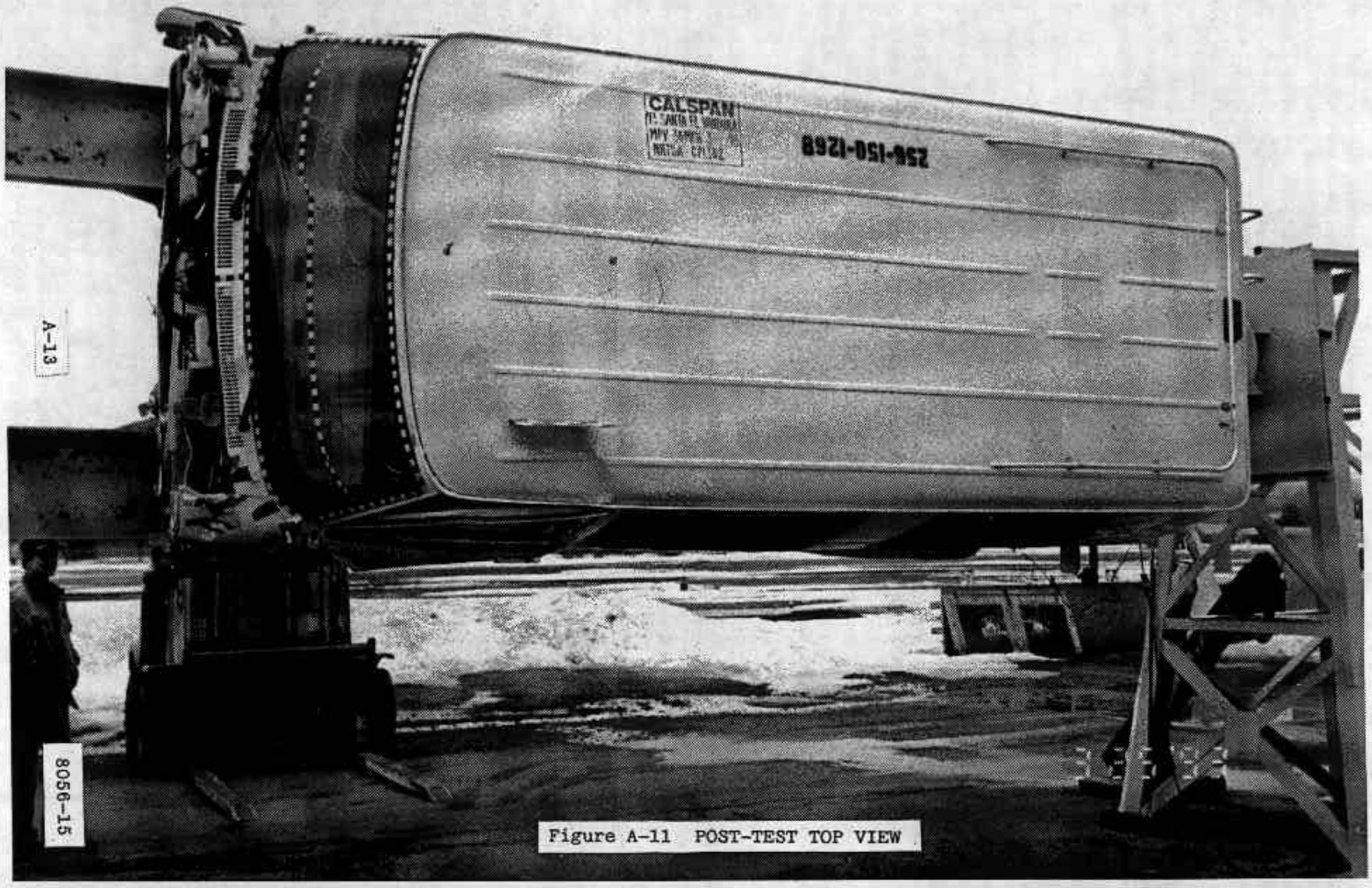


Figure A-11 POST-TEST TOP VIEW

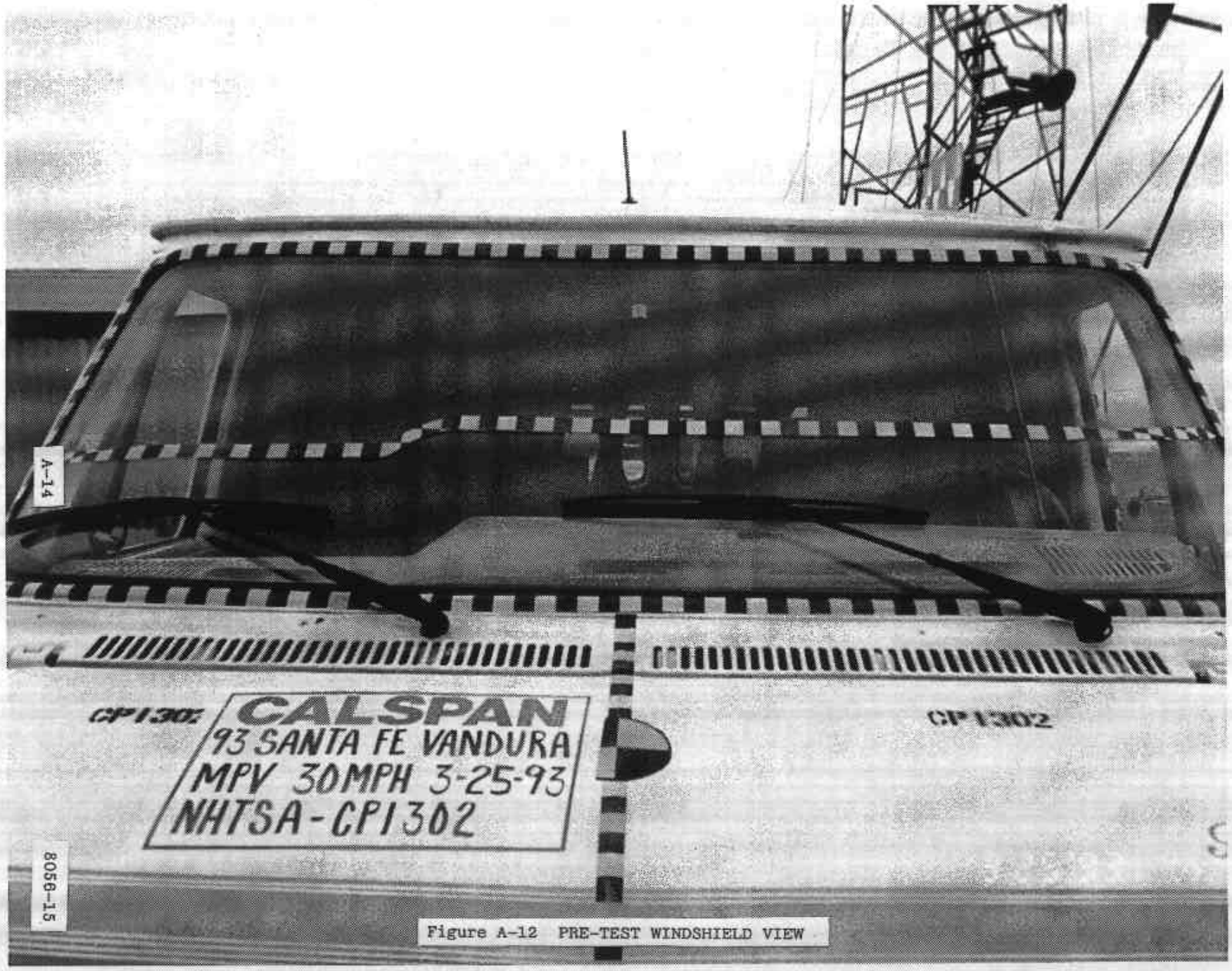


Figure A-12 PRE-TEST WINDSHIELD VIEW

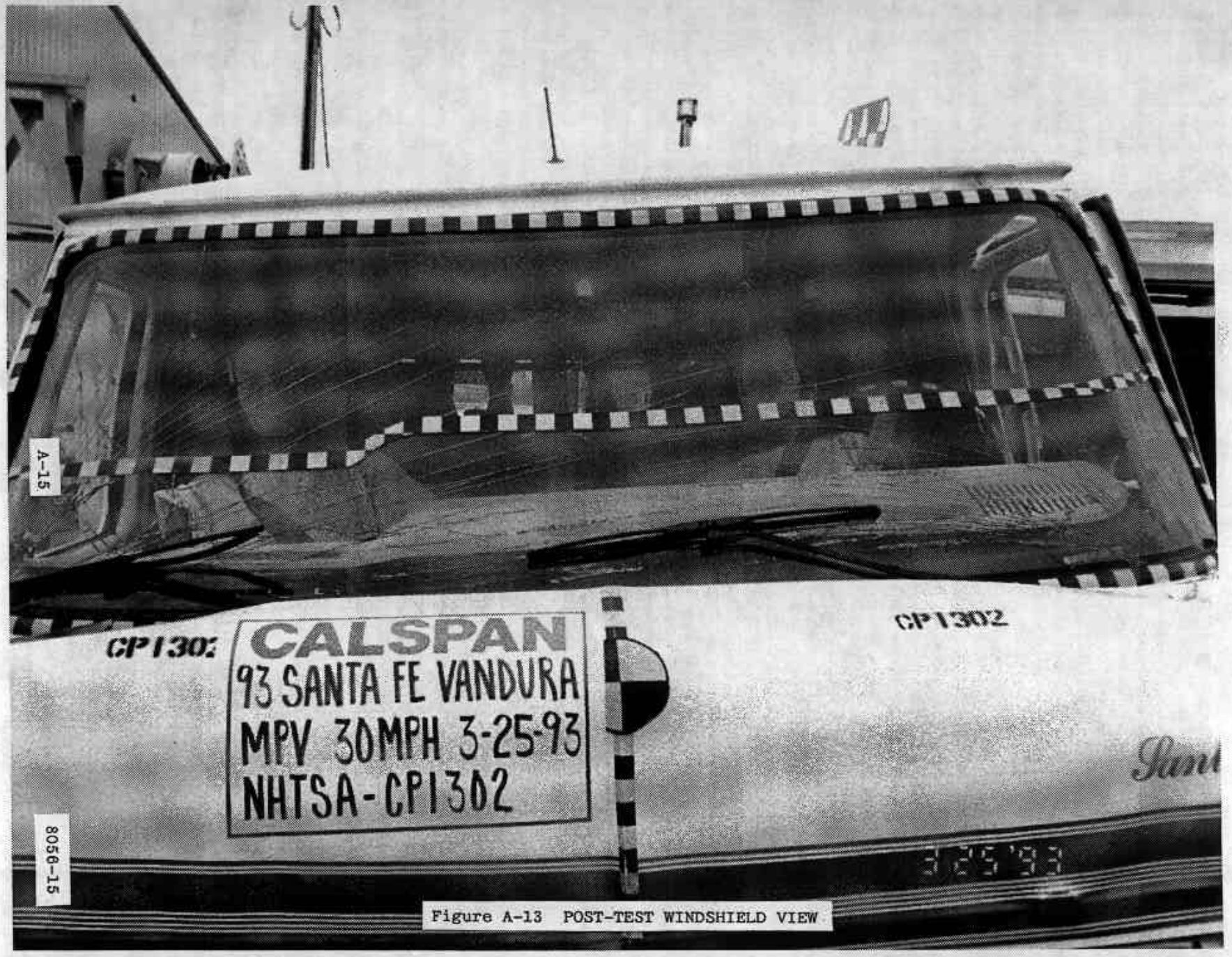


Figure A-13 POST-TEST WINDSHIELD VIEW

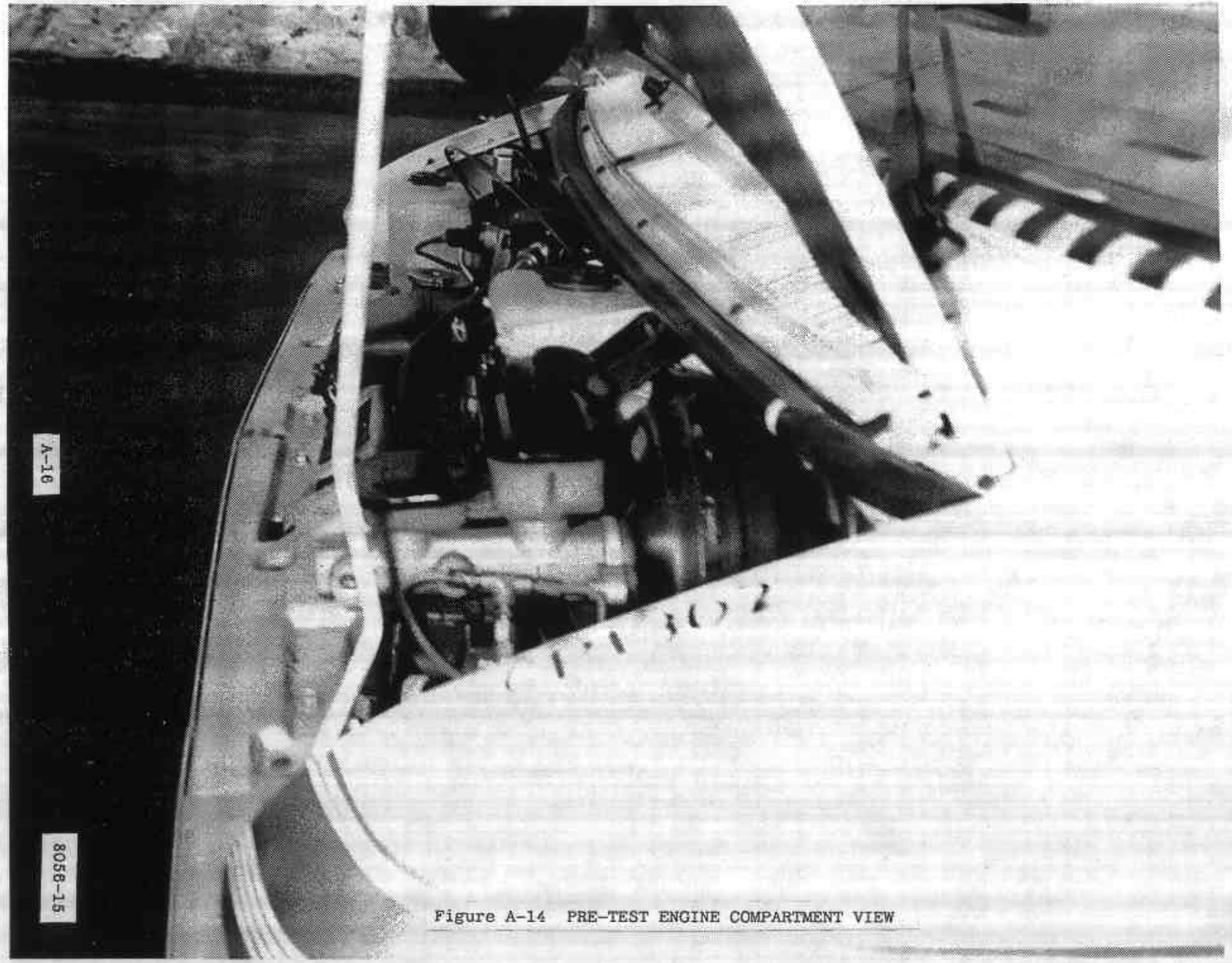


Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW

Figure A-15 POST-TEST ENGINE COMPARTMENT VIEW

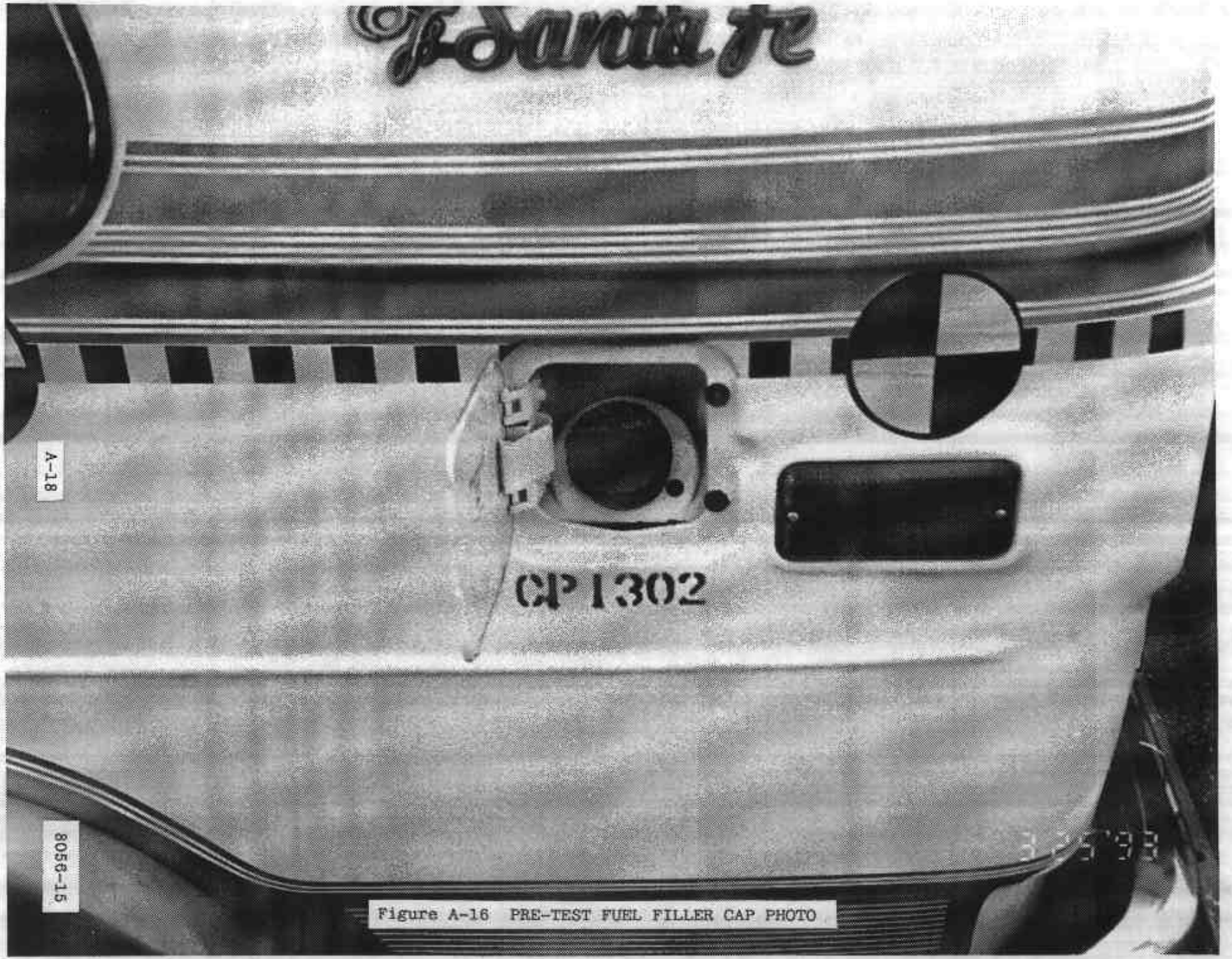


Figure A-16 PRE-TEST FUEL FILLER CAP PHOTO

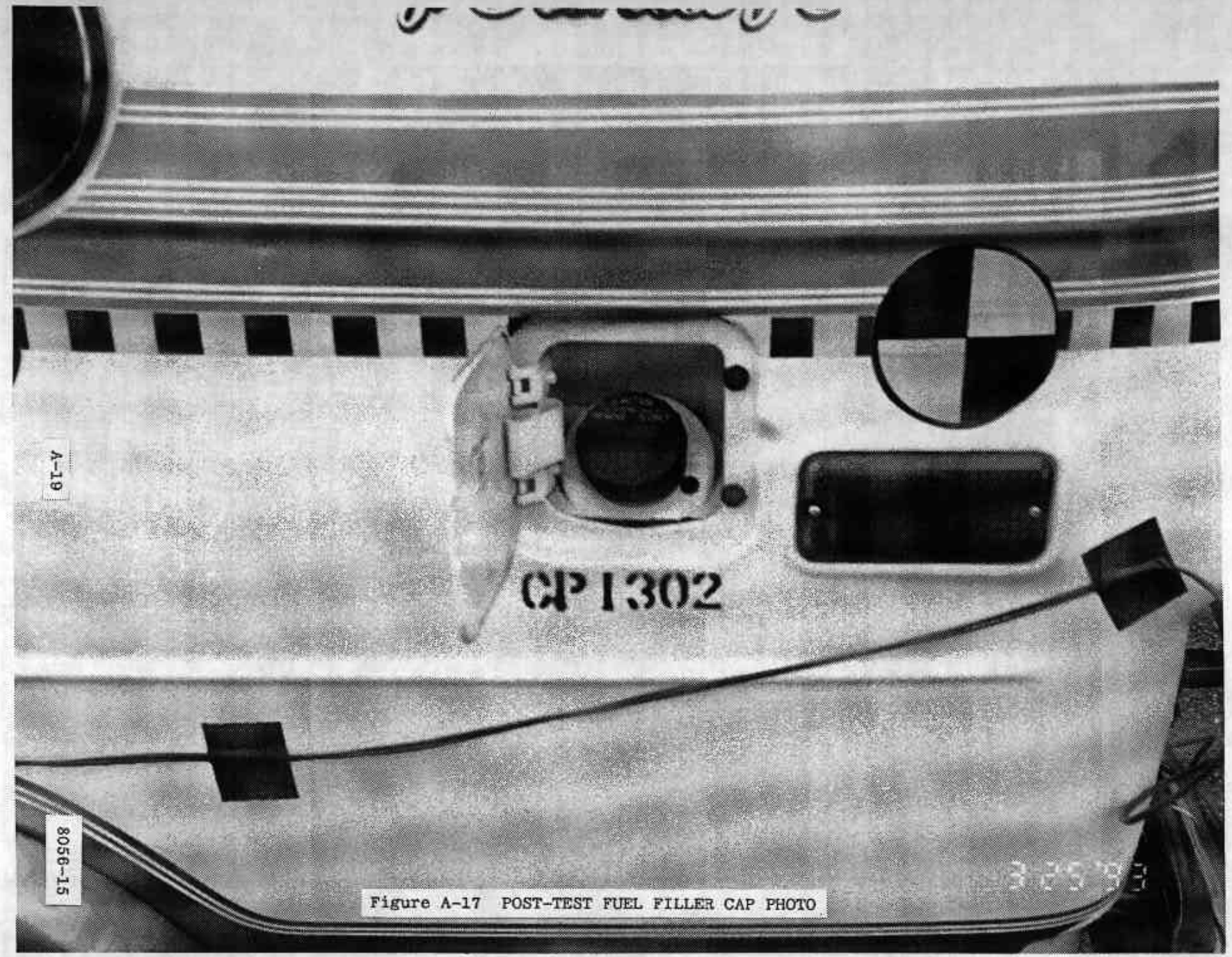


Figure A-17 POST-TEST FUEL FILLER CAP PHOTO

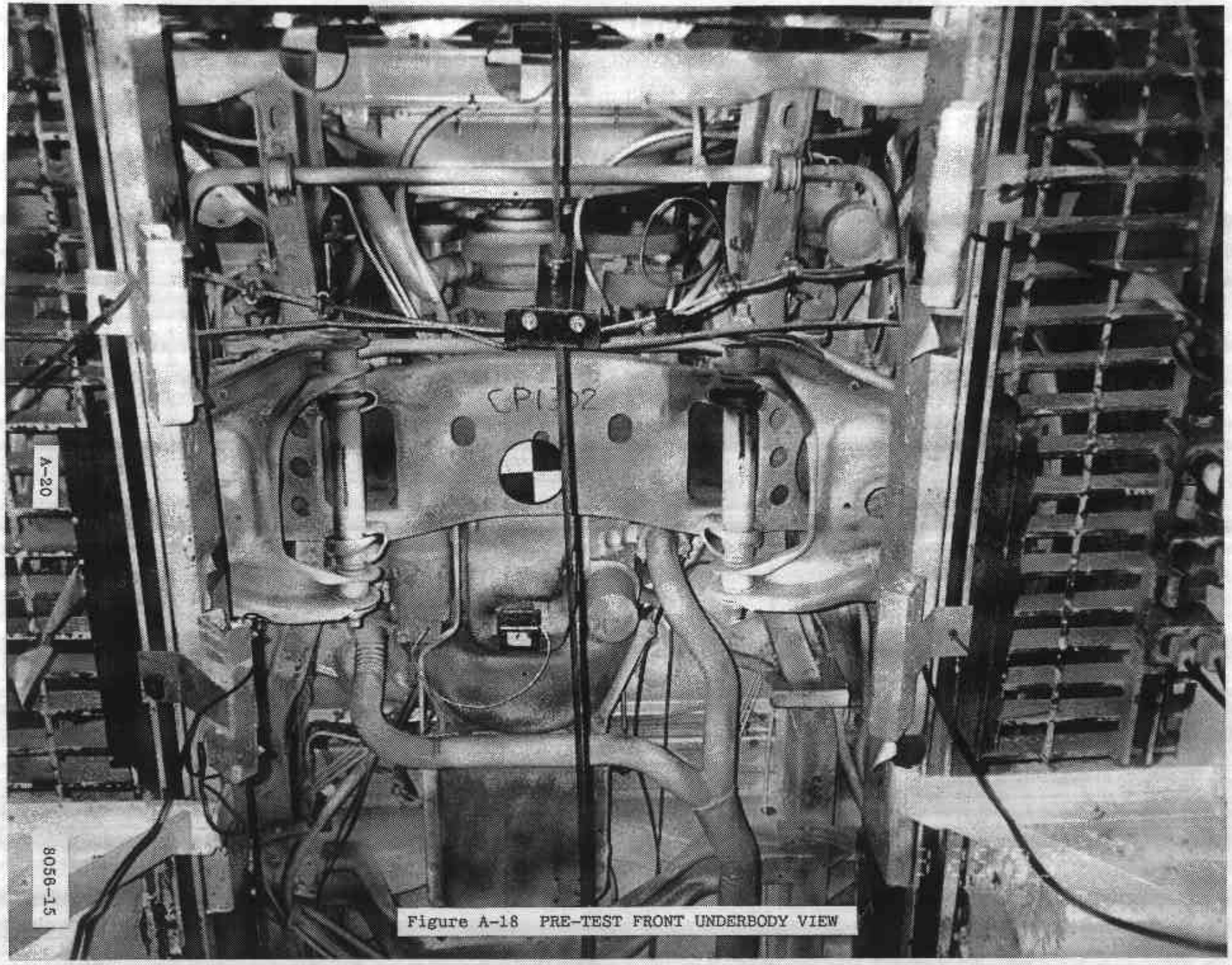


Figure A-18 PRE-TEST FRONT UNDERBODY VIEW

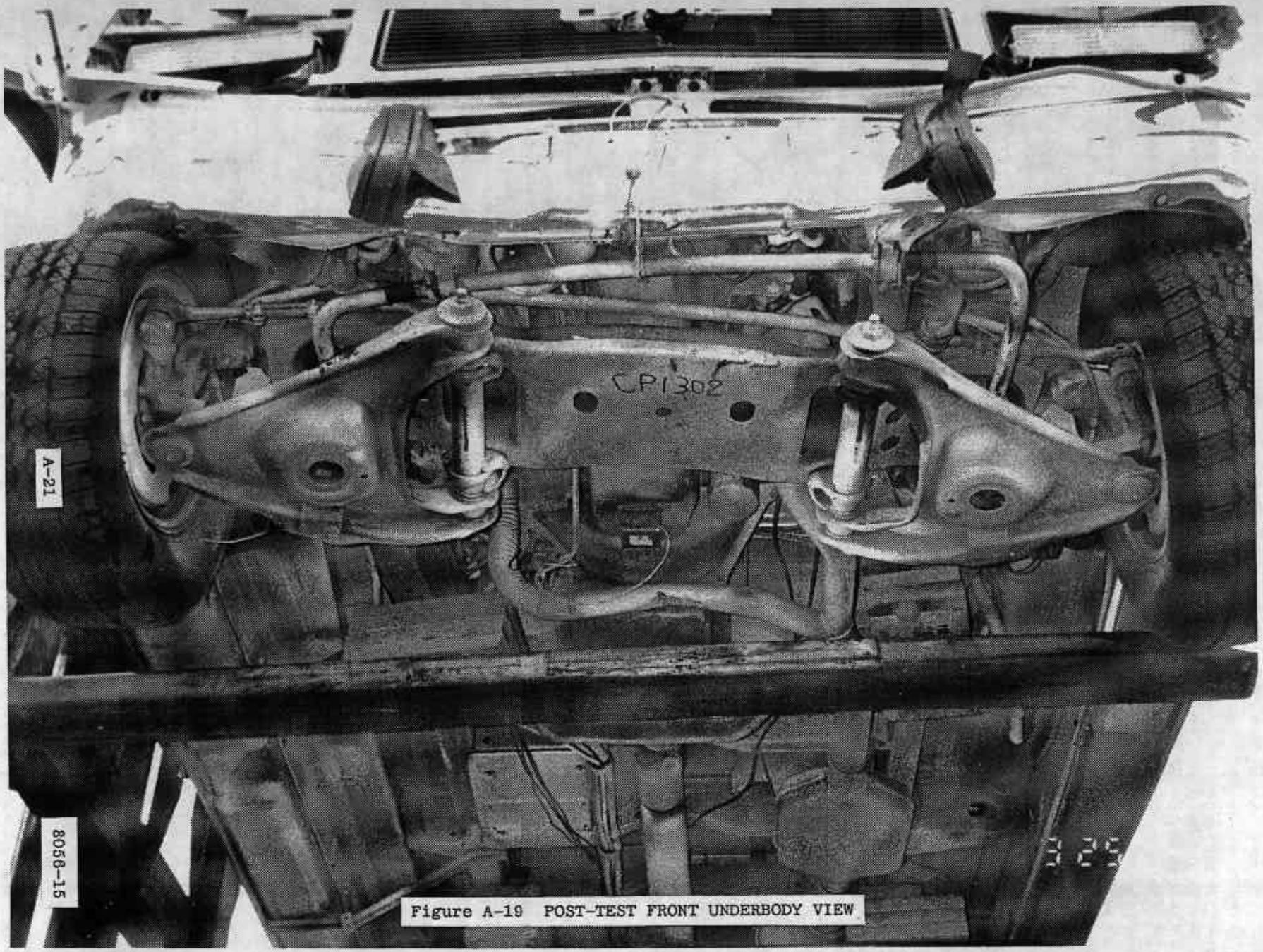


Figure A-19 POST-TEST FRONT UNDERBODY VIEW

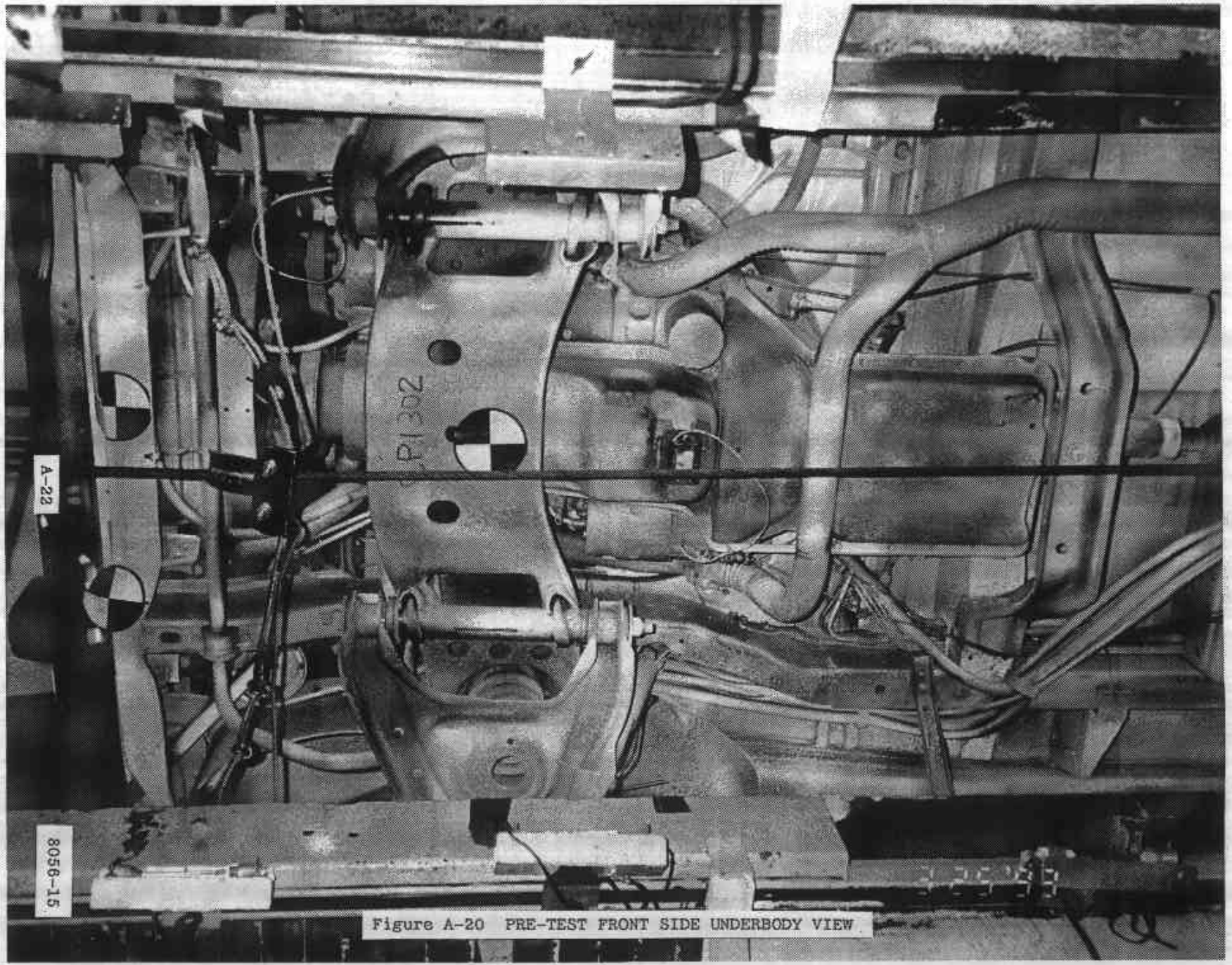


Figure A-20 PRE-TEST FRONT SIDE UNDERBODY VIEW

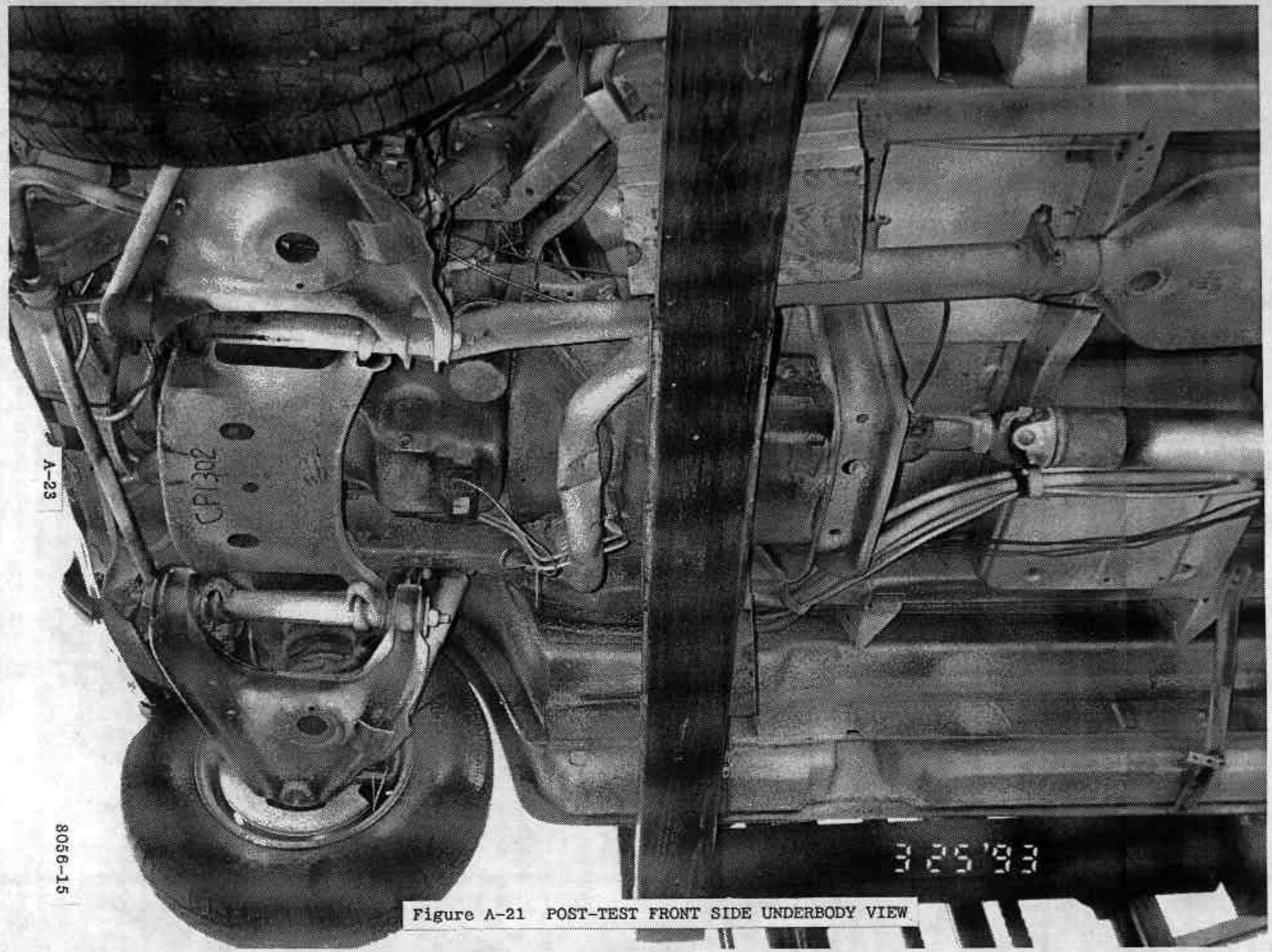


Figure A-21 POST-TEST FRONT SIDE UNDERBODY VIEW

8056-15

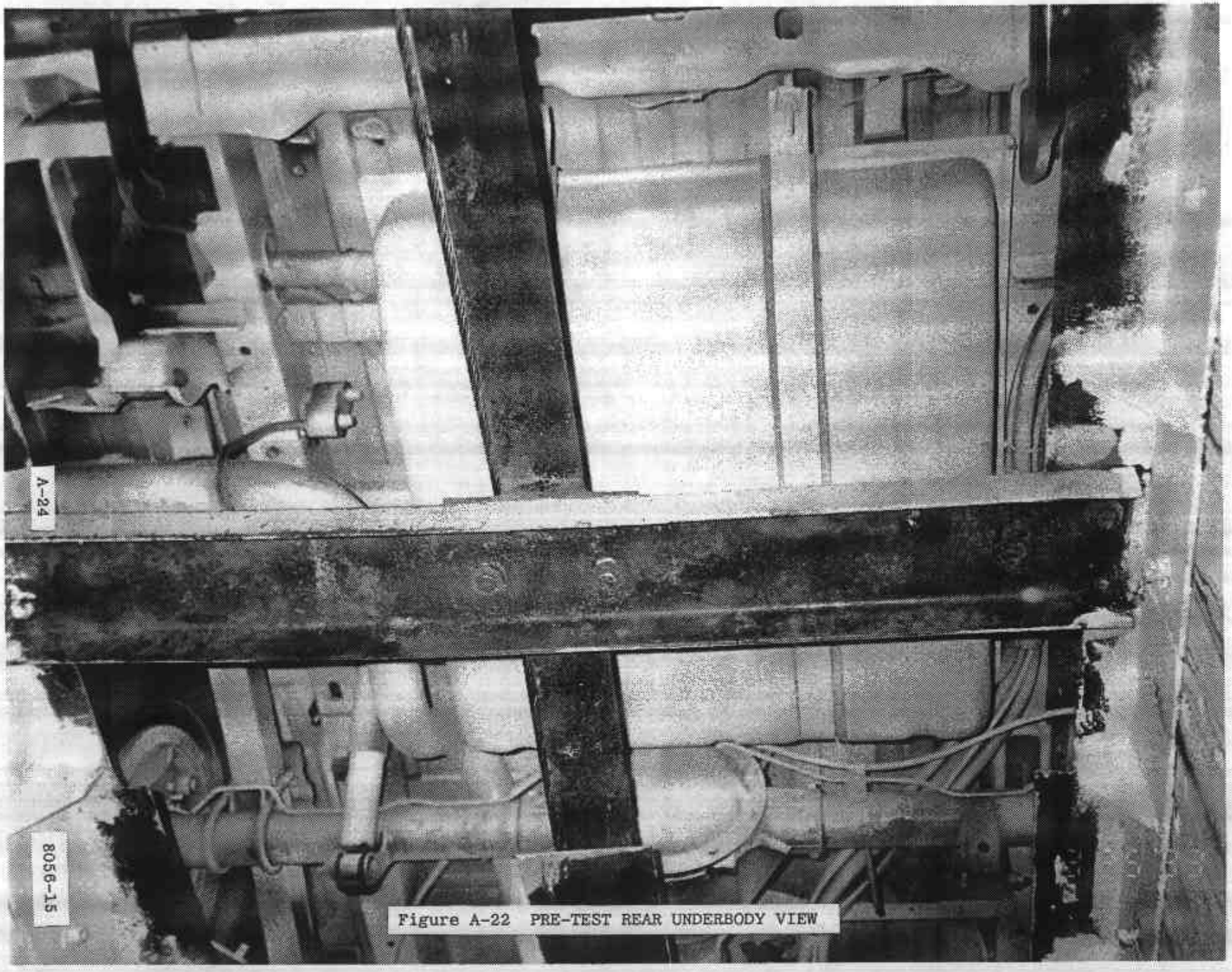


Figure A-22 PRE-TEST REAR UNDERBODY VIEW

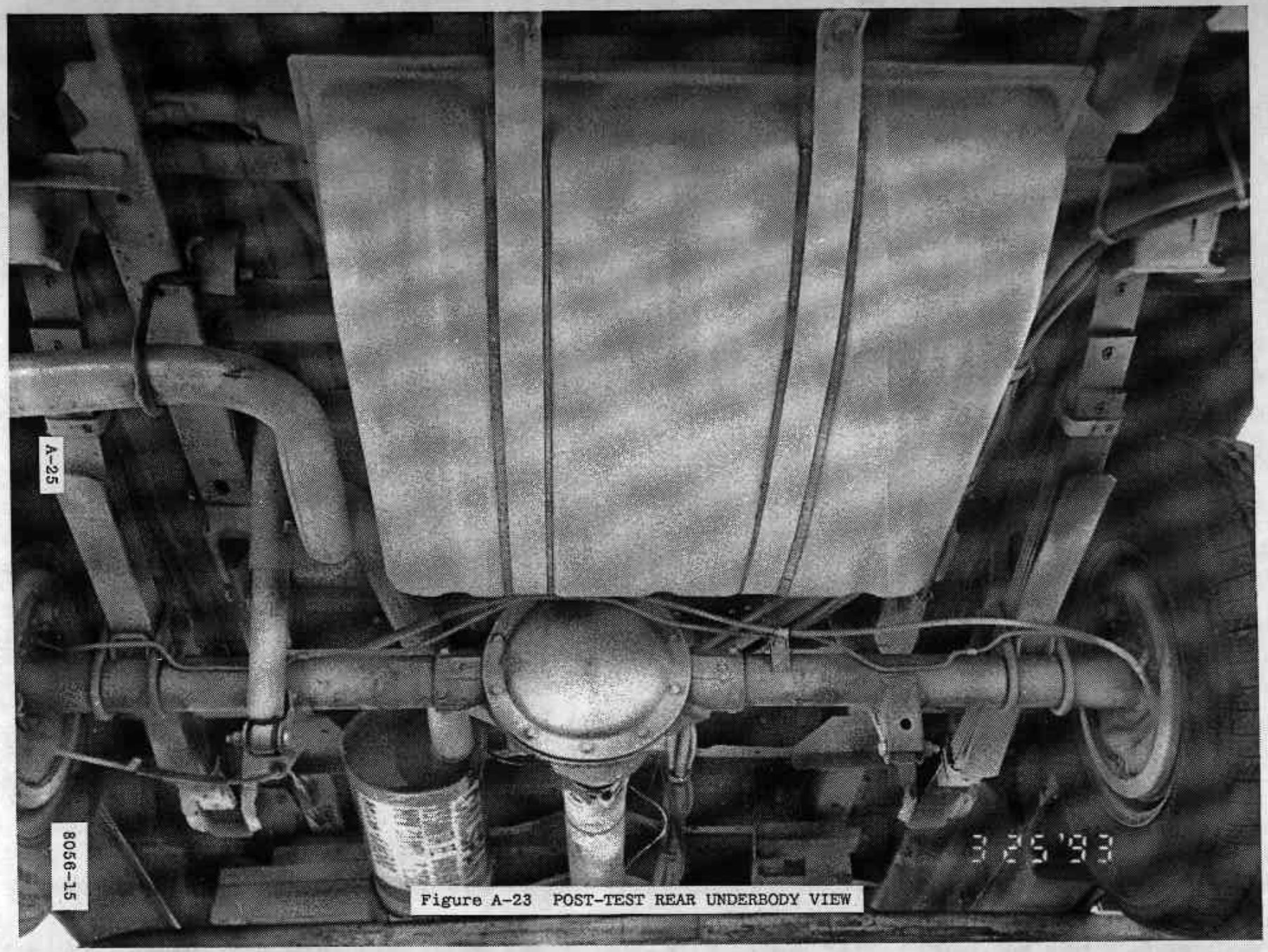


Figure A-23 POST-TEST REAR UNDERBODY VIEW

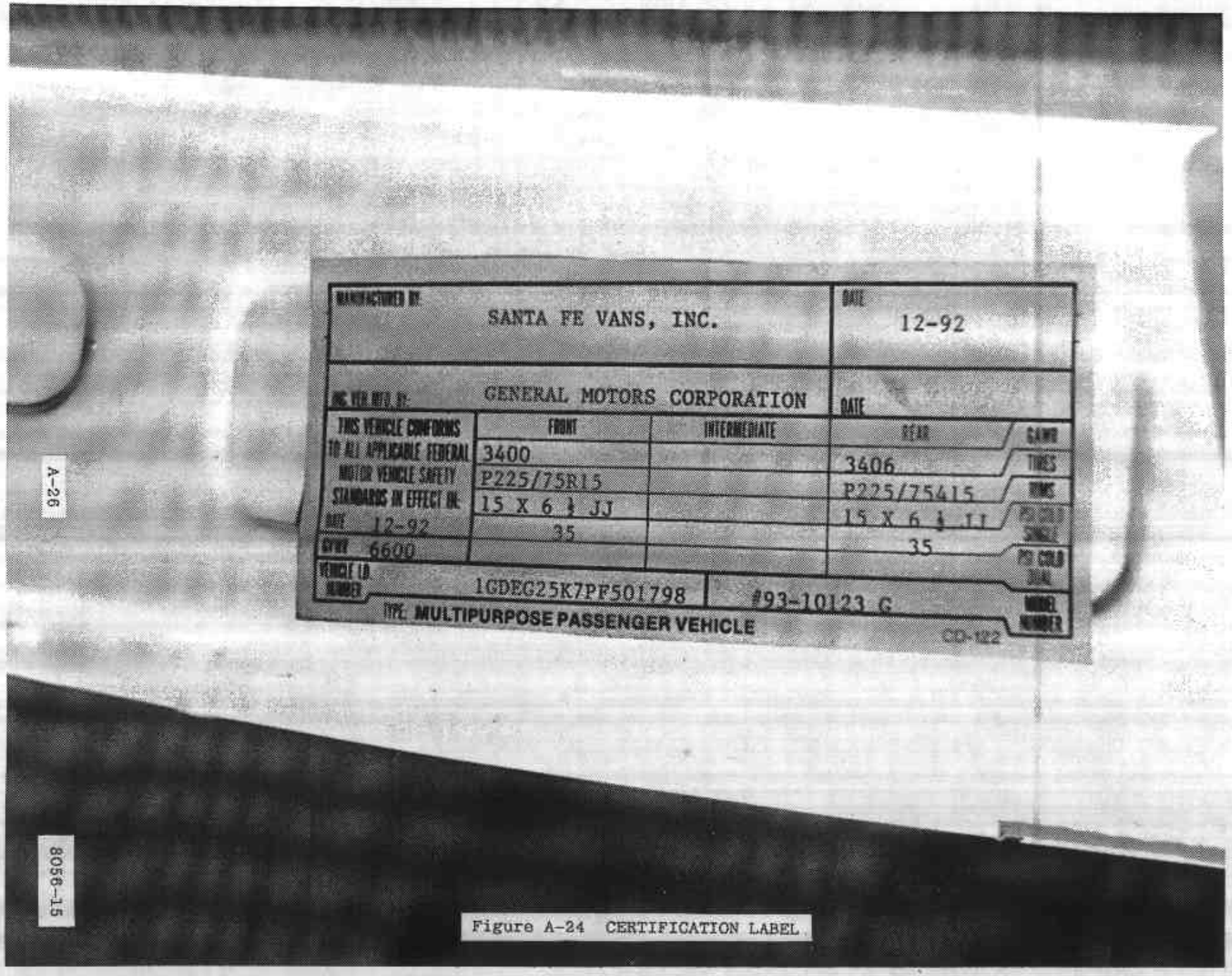


Figure A-24 CERTIFICATION LABEL

Figure A-25 PRE-TEST DRIVER DUMMY POSITION

Figure A-26 POST-TEST DRIVER DUMMY POSITION

Figure A-27 PRE-TEST PASSENGER DUMMY POSITION

Figure A-28 POST-TEST PASSENGER DUMMY POSITION

Figure A-29 PRE-TEST DRIVER DUMMY AND INTERIOR VIEW

8056-15

Figure A-30 POST-TEST DRIVER DUMMY AND INTERIOR VIEW

8056-15

Figure A-31 PRE-TEST PASSENGER DUMMY AND INTERIOR VIEW

8056-15

Figure A-32 POST-TEST PASSENGER DUMMY AND INTERIOR VIEW

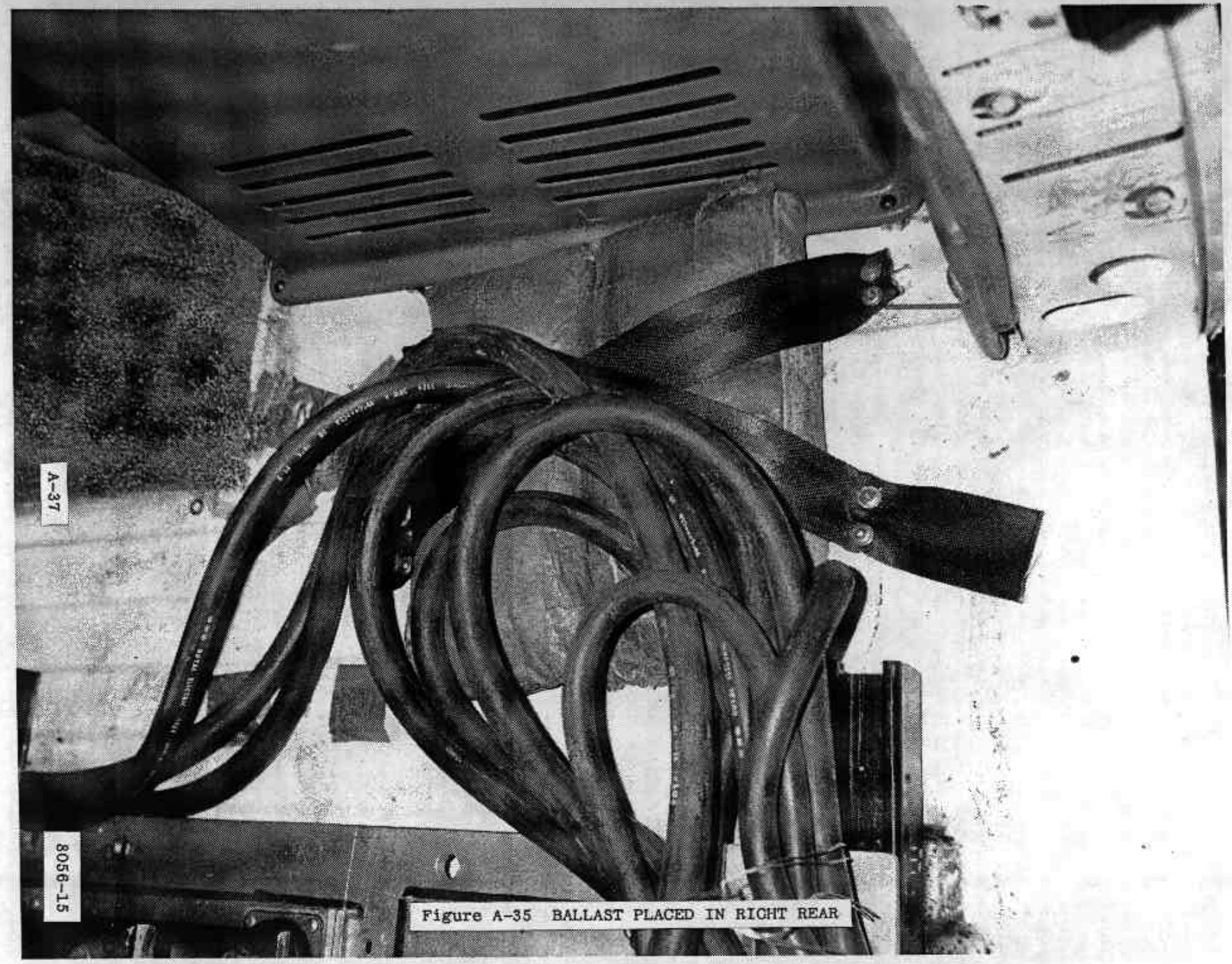
8056-15

Figure A-33 VEHICLE IMPACT

A-36

8056-15

Figure A-34 BALLAST PLACED IN LEFT REAR



A-37

8056-15

Figure A-35 BALLAST PLACED IN RIGHT REAR

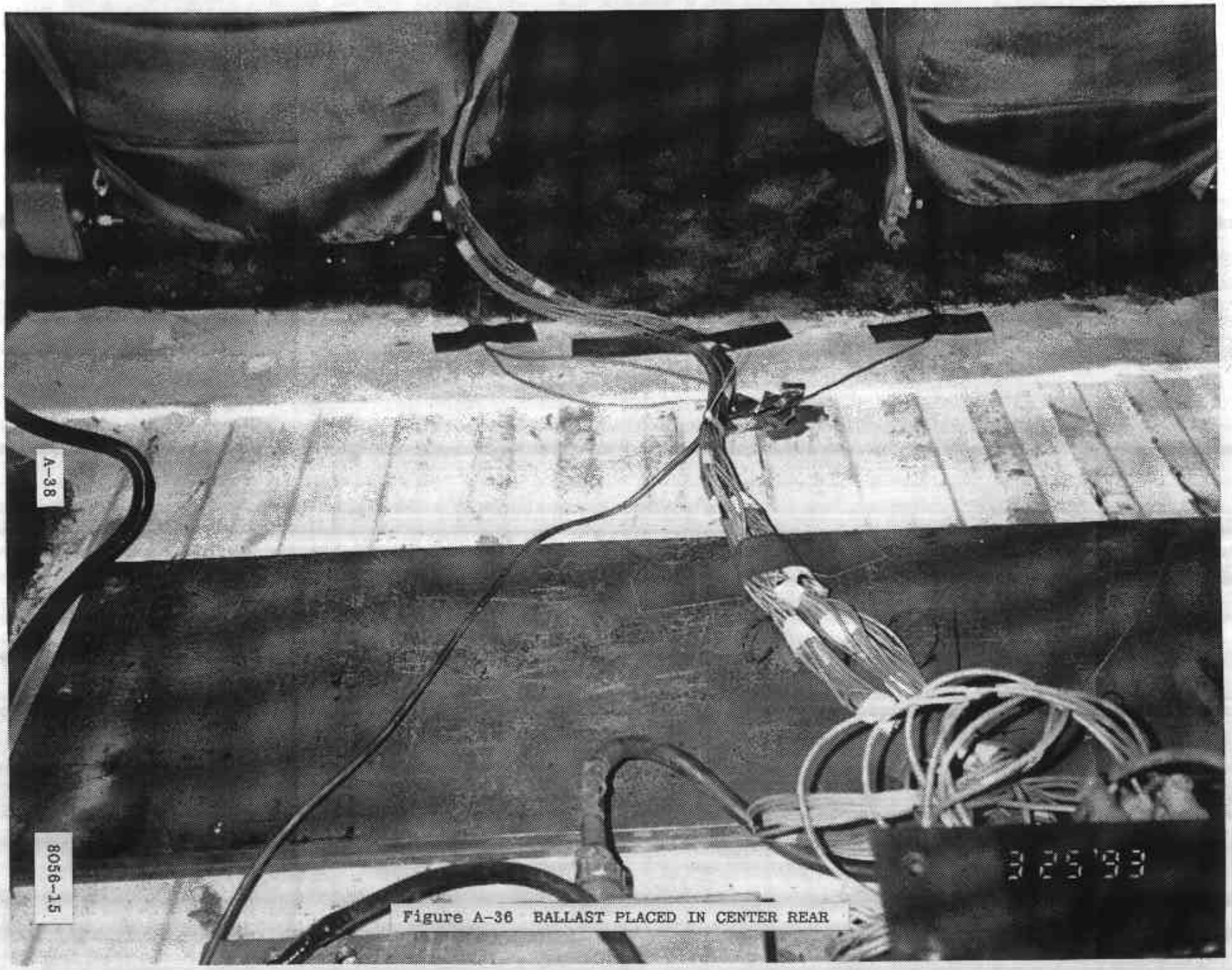


Figure A-36 BALLAST PLACED IN CENTER REAR

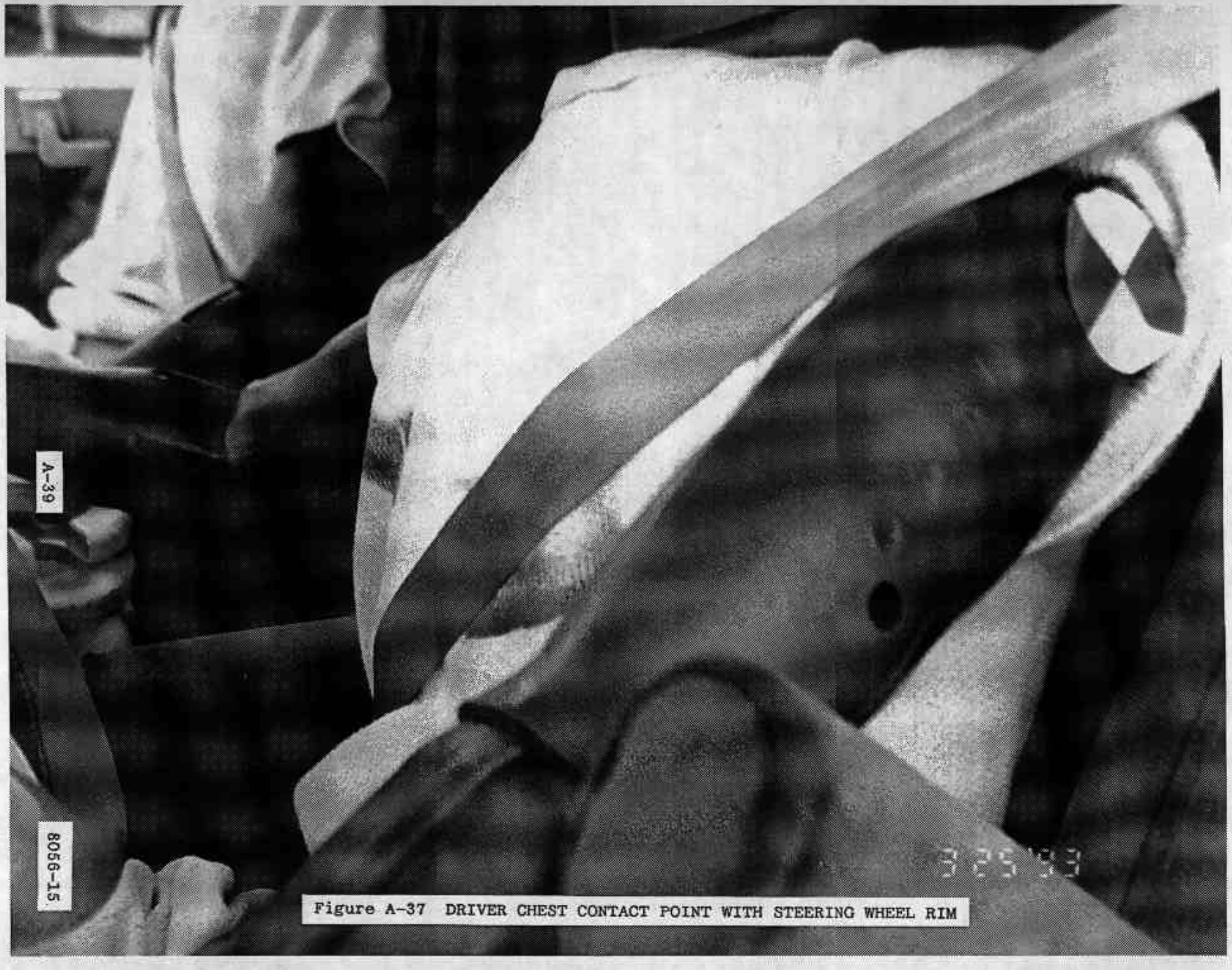


Figure A-37 DRIVER CHEST CONTACT POINT WITH STEERING WHEEL RIM

Appendix B

VEHICLE AND DUMMY RESPONSE DATA

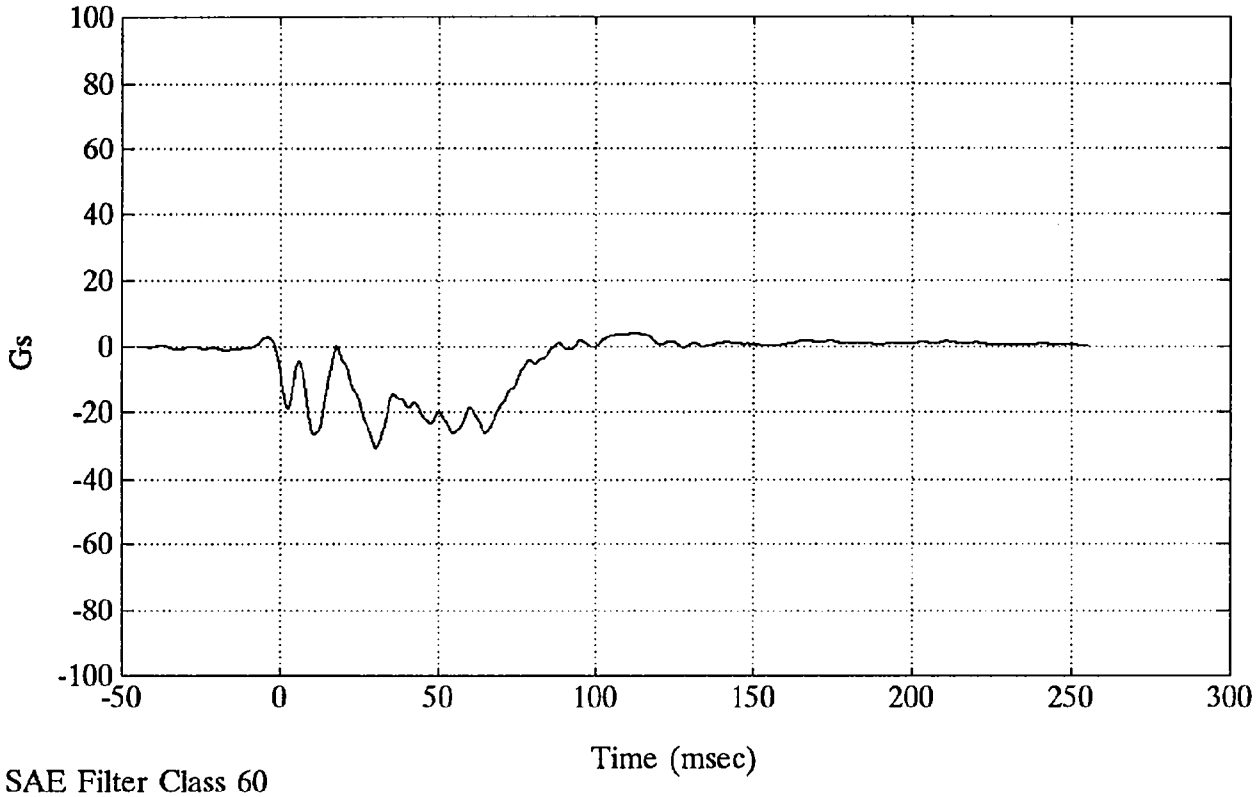
TEST NO. CP1302

VEHICLE DATA

SAE FILTER CHANNEL CLASS

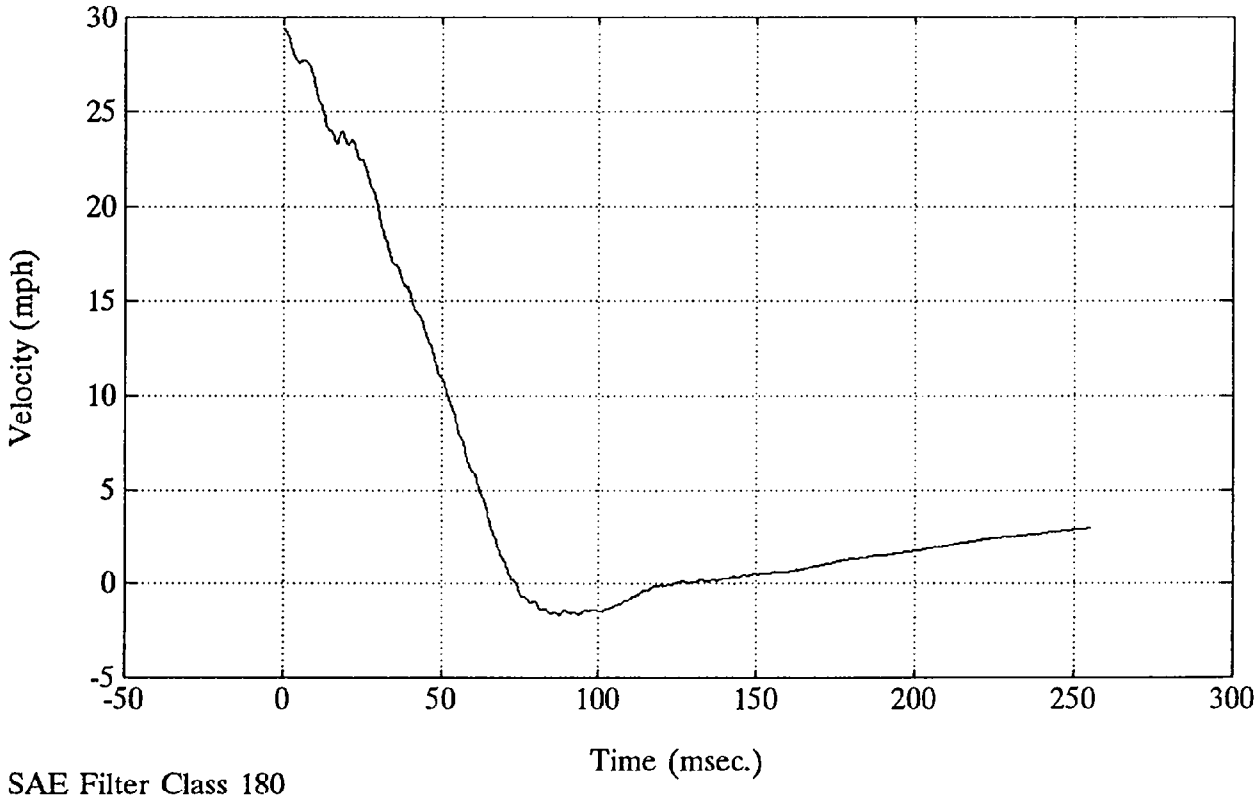
60

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
L. Rear Crossmember X (#1)
Max = 4.26 Gs @ 112.80 msec
Min = -30.42 Gs @ 30.36 msec



SAE Filter Class 60

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
L. Rear Crossmember X (#1)
Max = 29.40 mph @ -0.00 msec
Min = -1.64 mph @ 93.84 msec



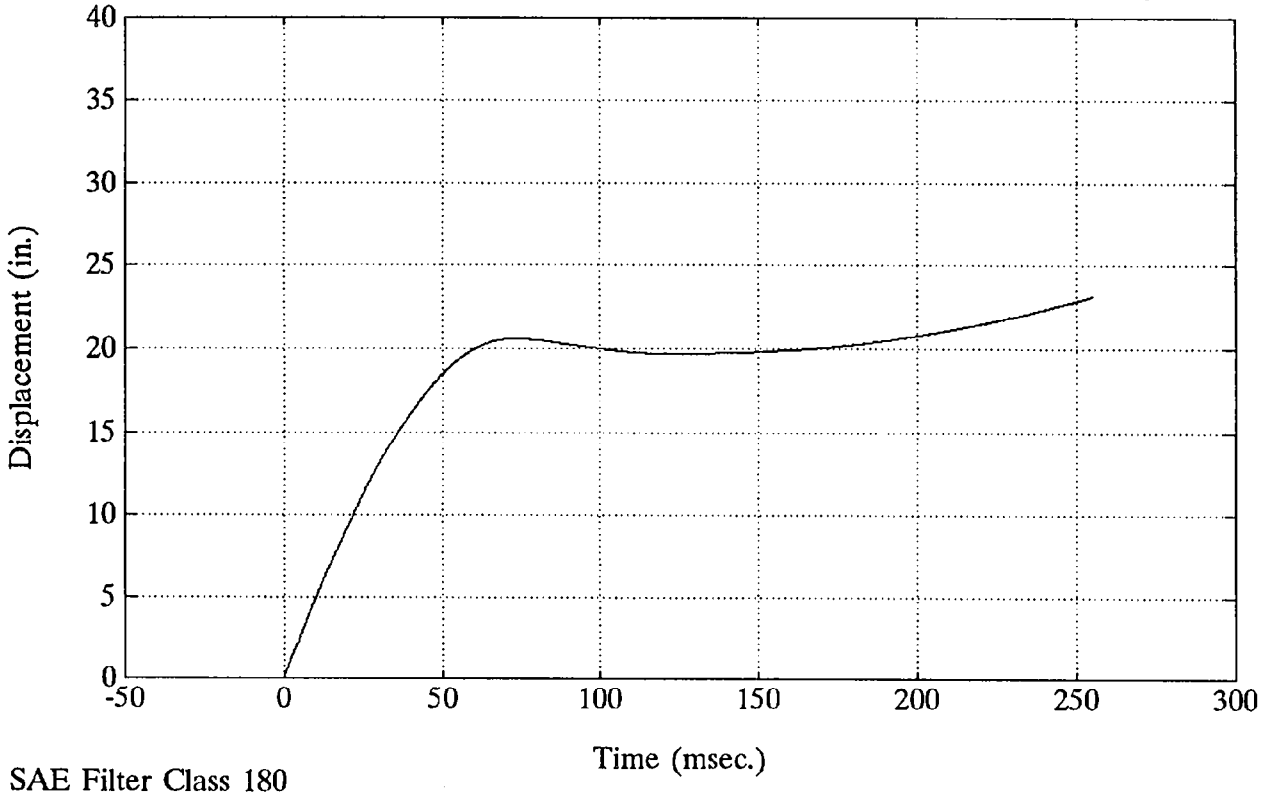
SAE Filter Class 180

8056-15

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

L. Rear Crossmember X (#1)

Max = 23.16 in. @ 254.88 msec
Min = 0.00 in. @ -0.00 msec

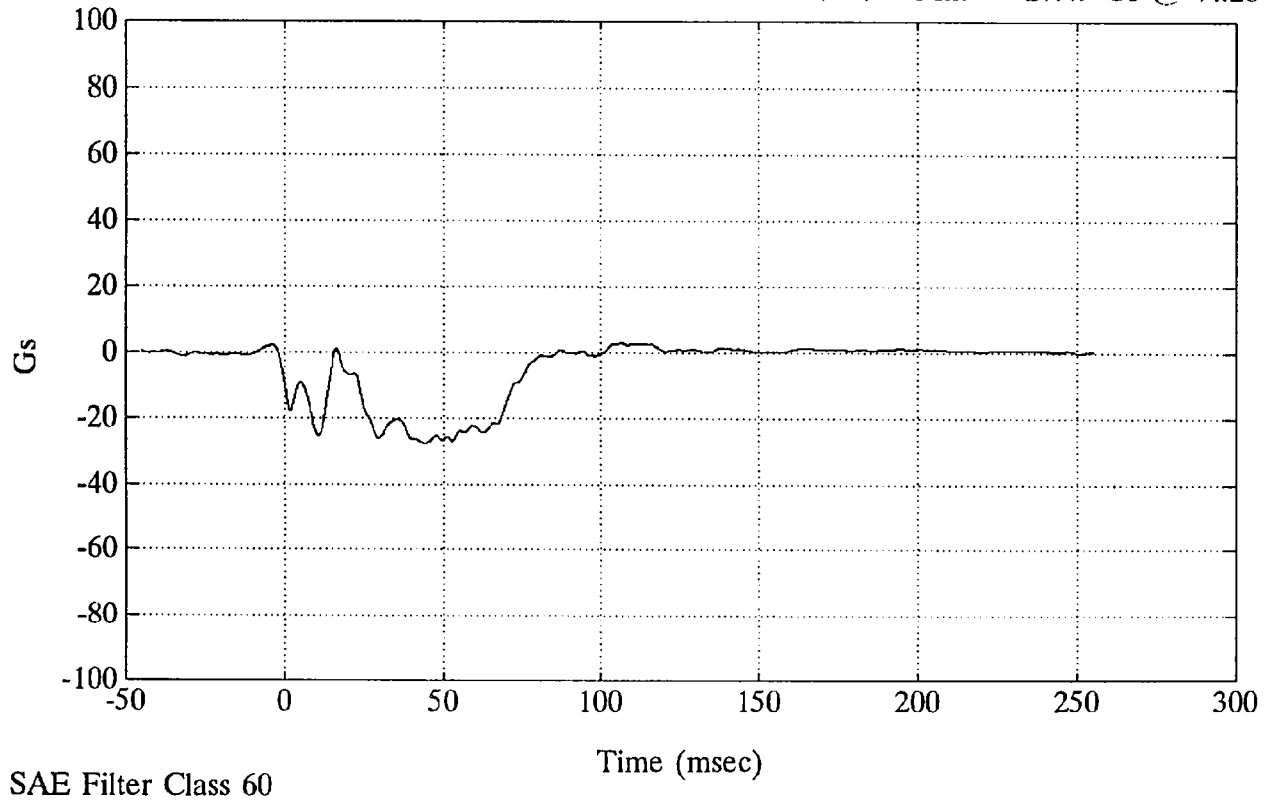


SAE Filter Class 180

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

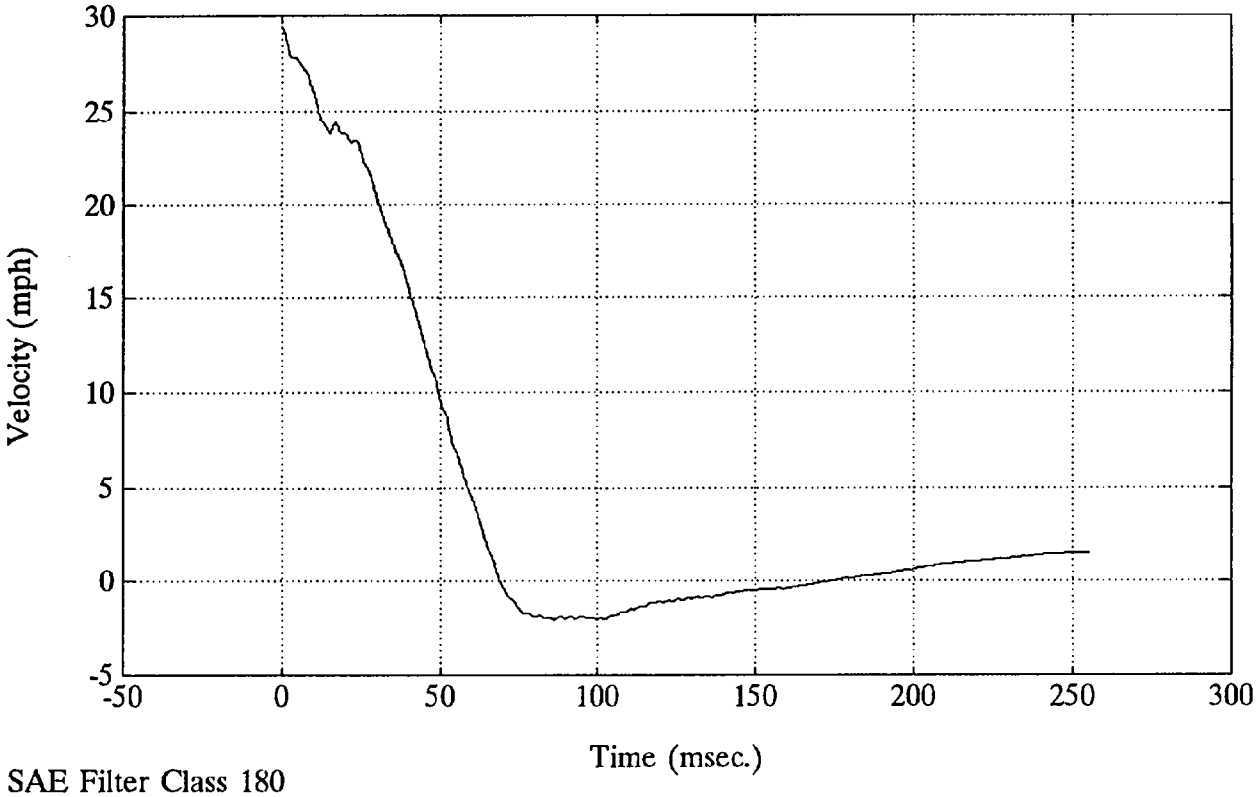
R. Rear Crossmember X (#2)

Max = 2.97 Gs @ 106.56 msec
Min = -27.49 Gs @ 44.28 msec



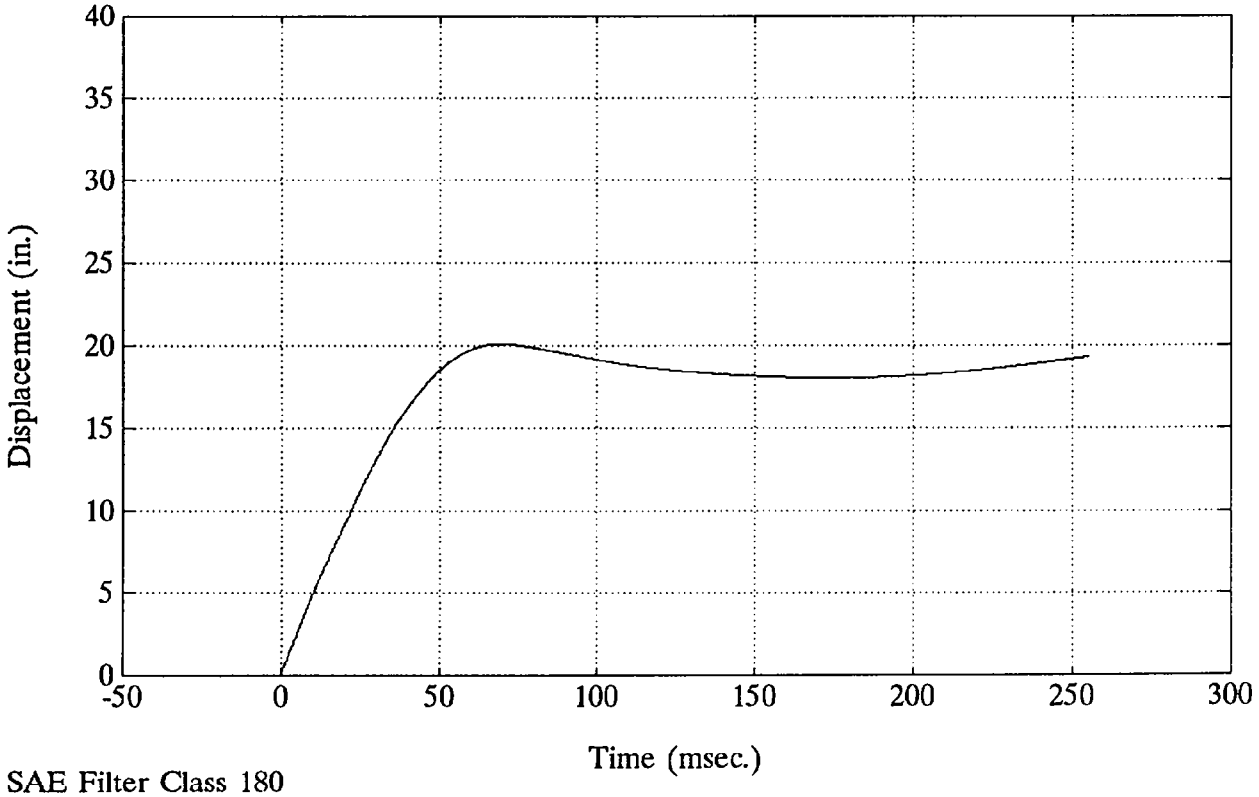
SAE Filter Class 60

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
R. Rear Crossmember X (#2)
Max = 29.40 mph @ -0.00 msec
Min = -2.08 mph @ 86.16 msec



SAE Filter Class 180

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
R. Rear Crossmember X (#2)
Max = 20.11 in. @ 70.56 msec
Min = 0.00 in. @ -0.00 msec

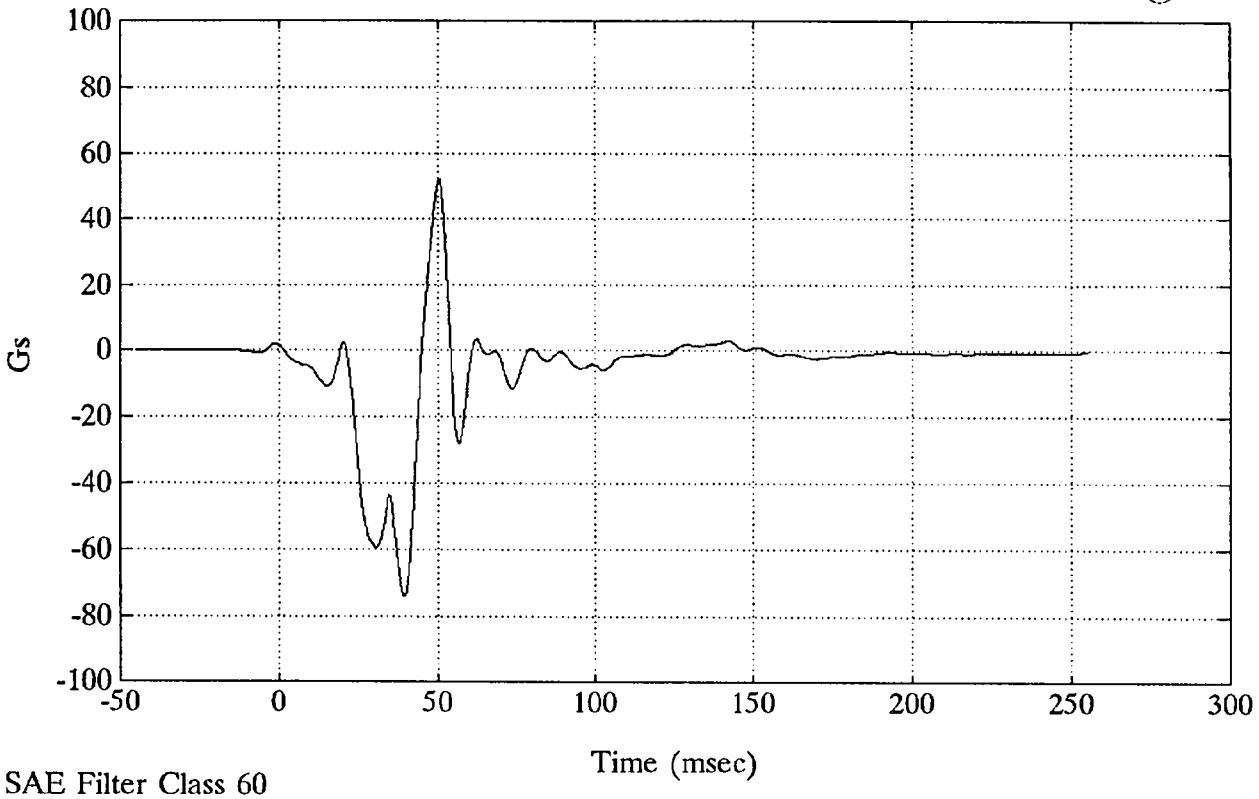


SAE Filter Class 180

8056-15

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
Engine Top X (#3)

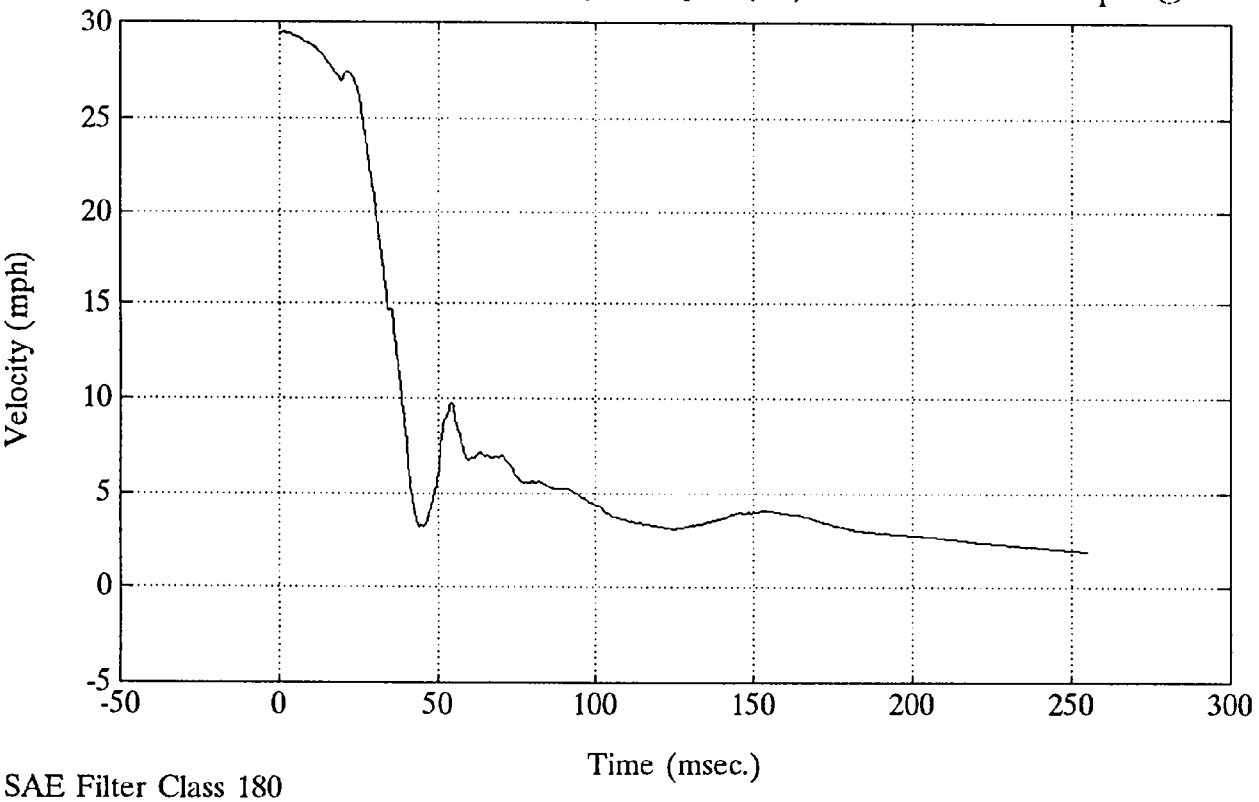
Max = 52.30 Gs @ 50.52 msec
Min = -74.08 Gs @ 39.60 msec



SAE Filter Class 60

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
Engine Top X (#3)

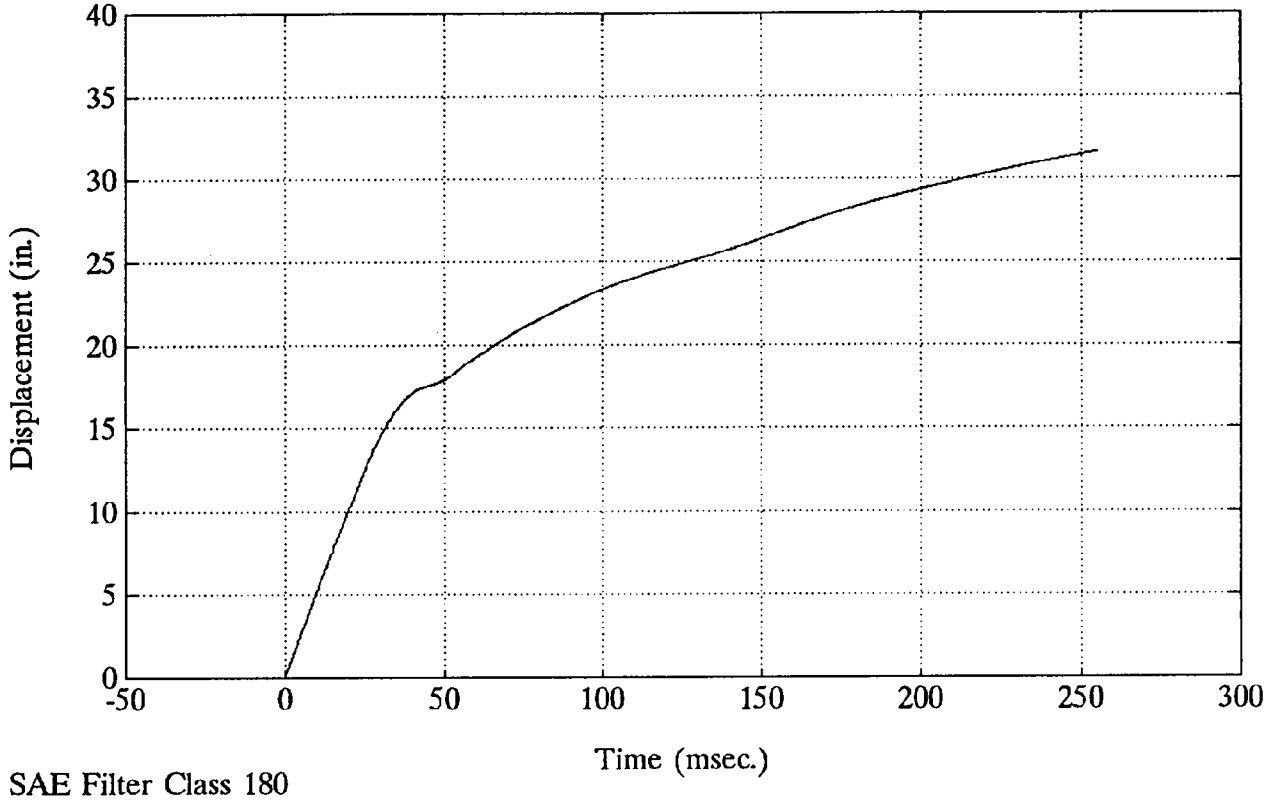
Max = 29.50 mph @ 1.44 msec
Min = 1.89 mph @ 254.88 msec



SAE Filter Class 180

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
Engine Top X (#3)

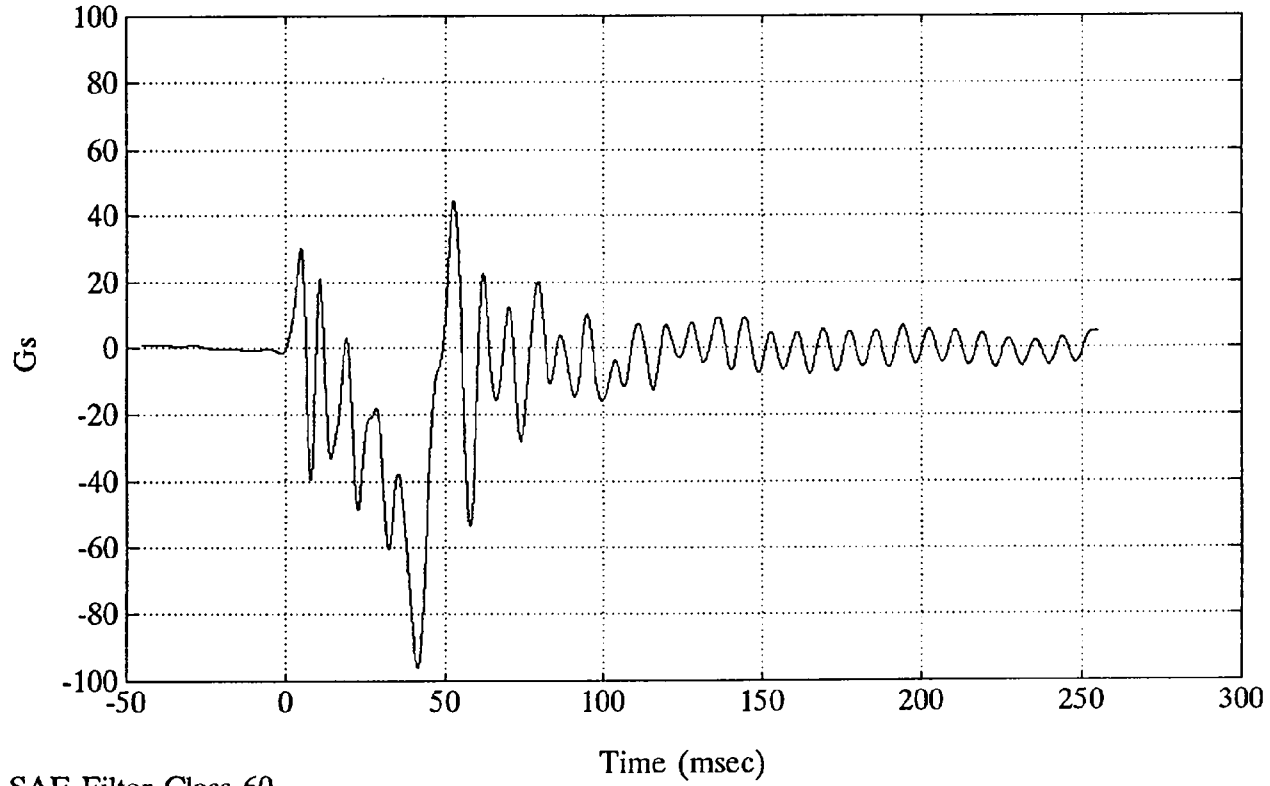
Max = 31.58 in. @ 254.88 msec
Min = 0.00 in. @ -0.00 msec



SAE Filter Class 180

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
Engine Bottom X (#4)

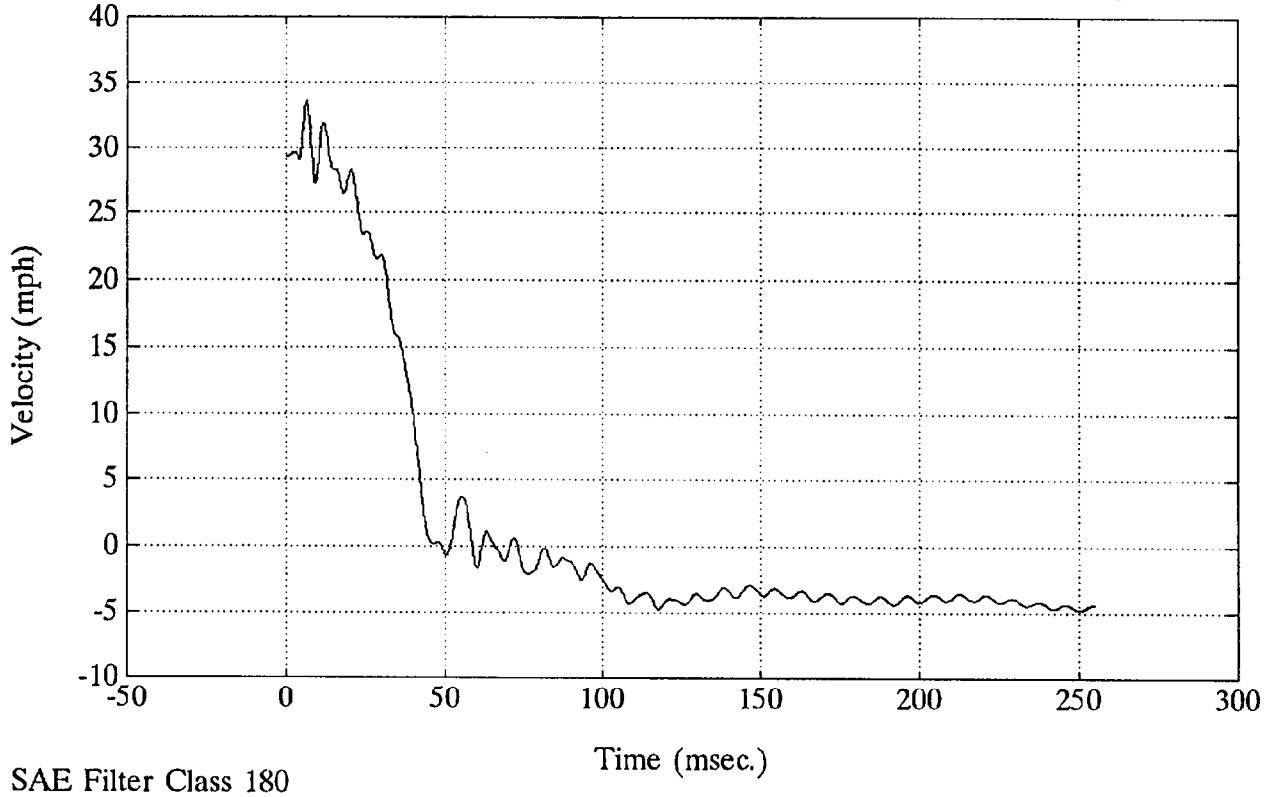
Max = 44.67 Gs @ 52.80 msec
Min = -96.09 Gs @ 41.52 msec



SAE Filter Class 60

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
Engine Bottom X (#4)

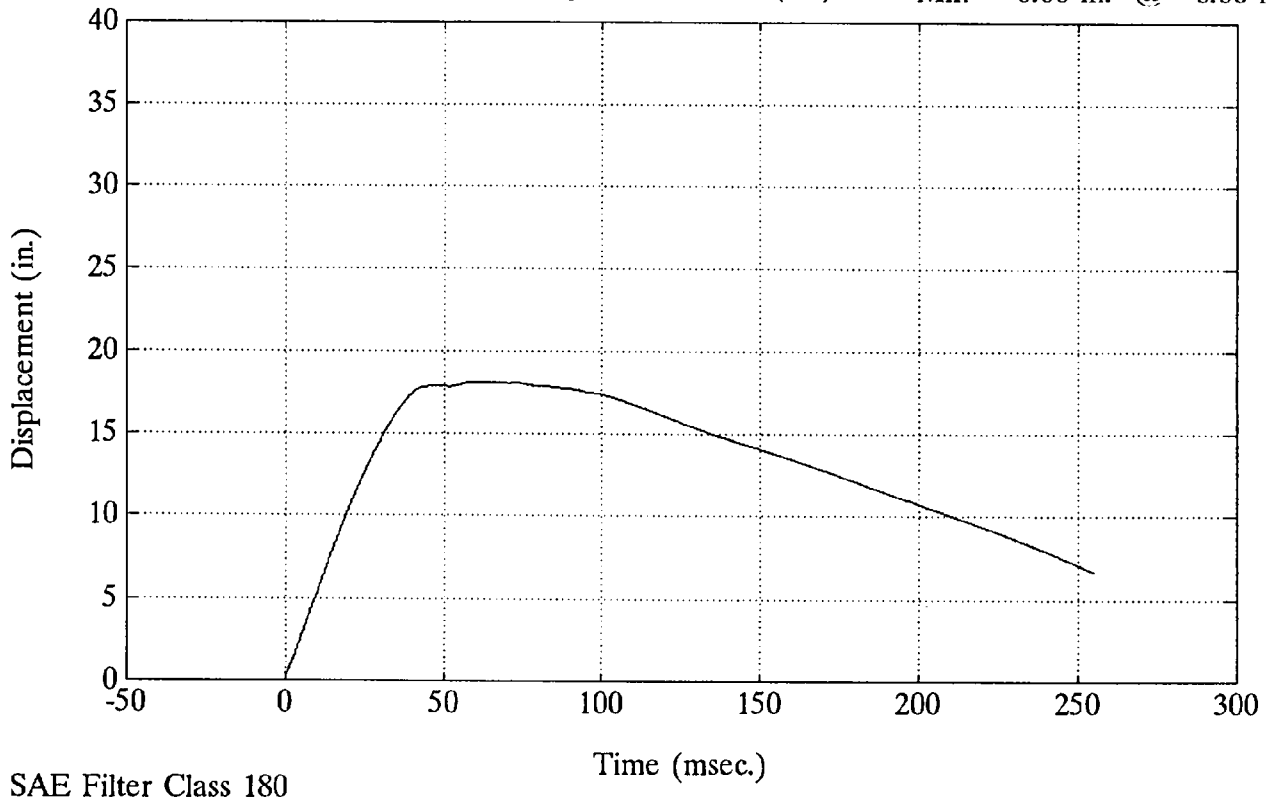
Max = 33.56 mph @ 6.48 msec
Min = -4.81 mph @ 250.08 msec



SAE Filter Class 180

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
Engine Bottom X (#4)

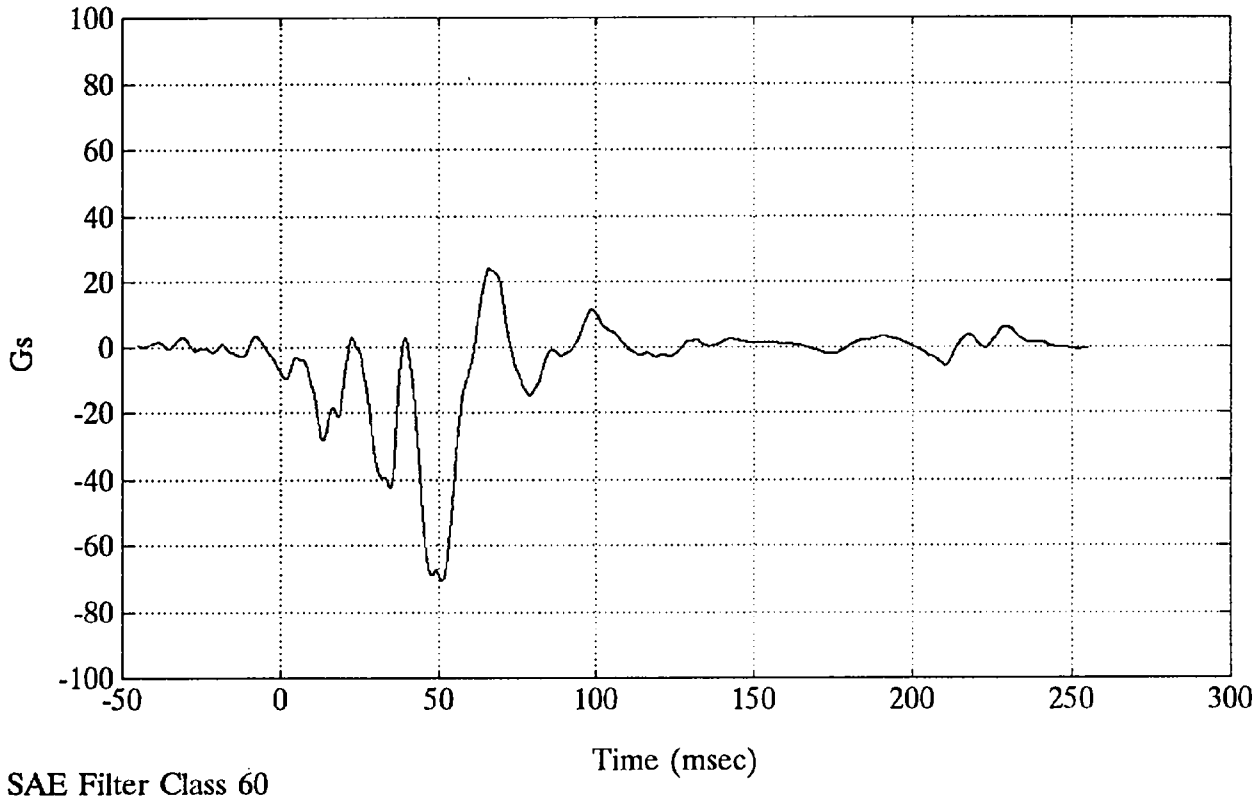
Max = 18.12 in. @ 58.80 msec
Min = 0.00 in. @ -0.00 msec



SAE Filter Class 180

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
R. Brake Caliper X (#5)

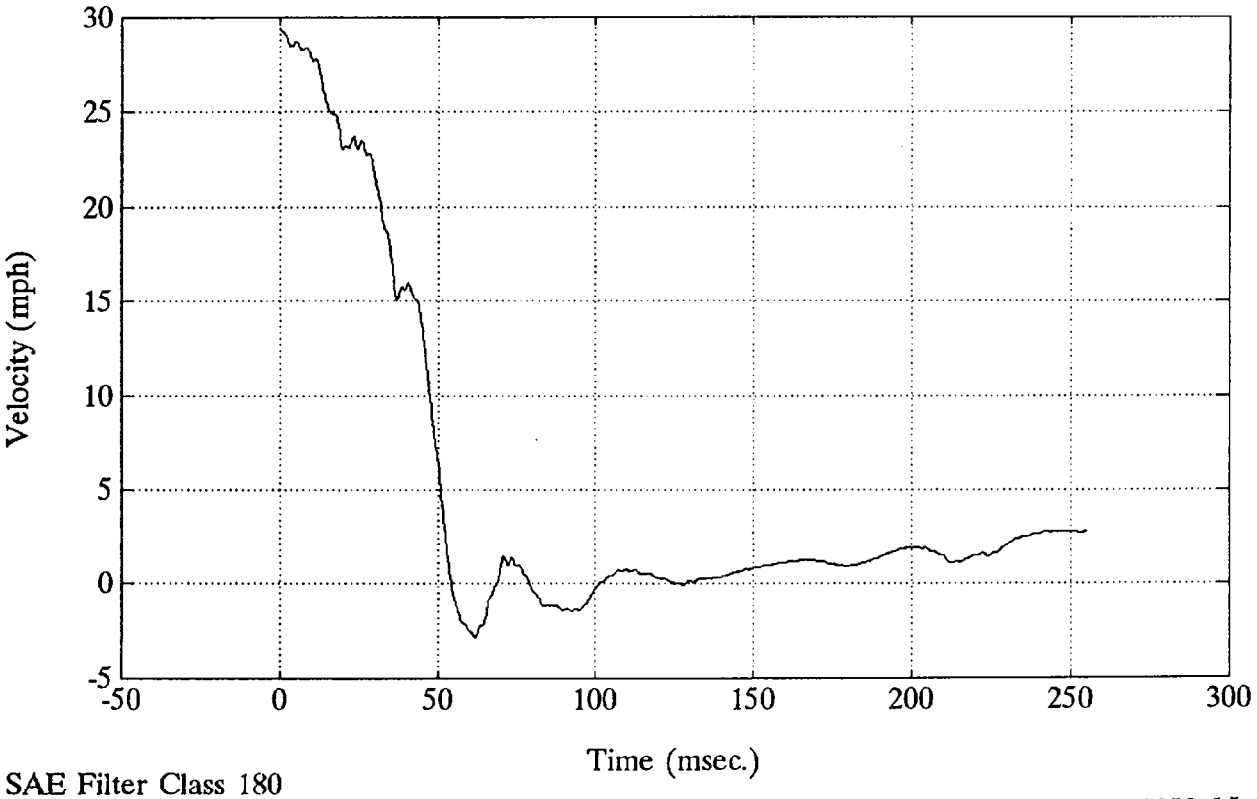
Max = 23.97 Gs @ 65.88 msec
Min = -70.51 Gs @ 51.00 msec



SAE Filter Class 60

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
R. Brake Caliper X (#5)

Max = 29.40 mph @ -0.00 msec
Min = -2.82 mph @ 61.92 msec

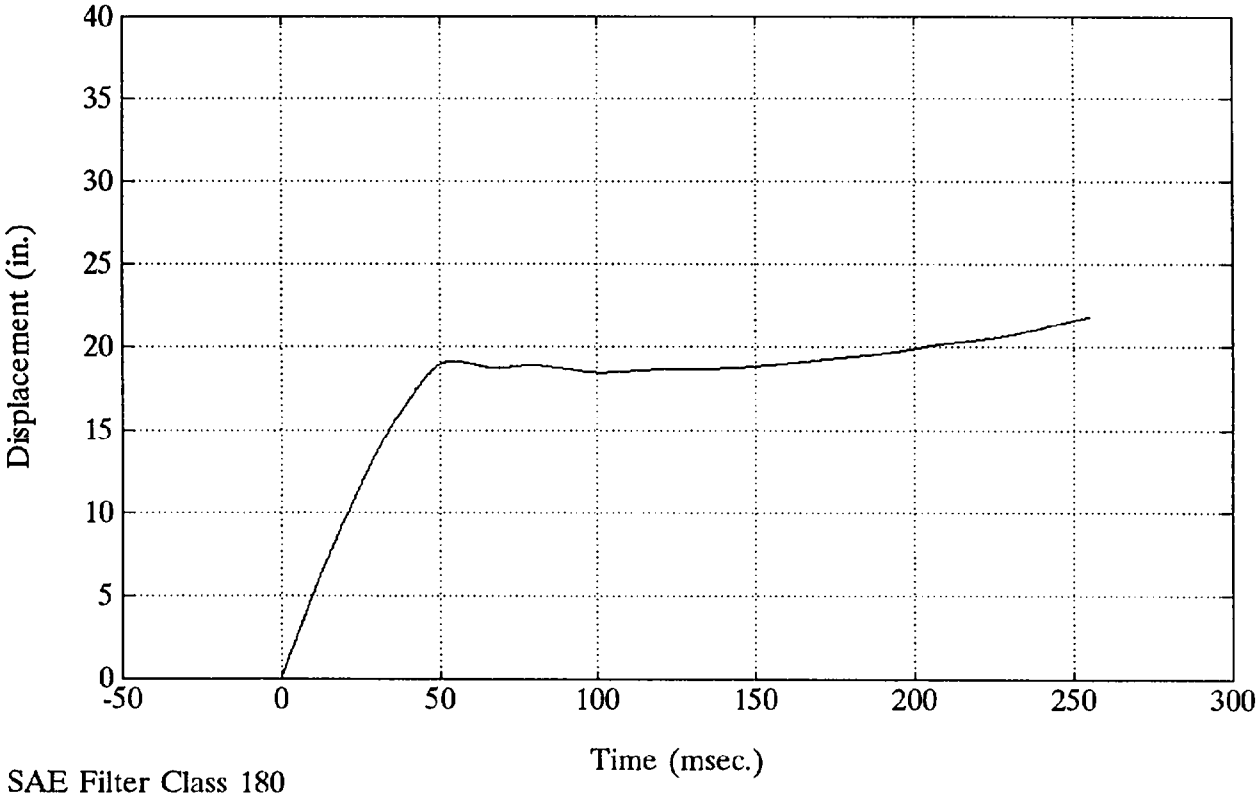


SAE Filter Class 180

8056-15

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
R. Brake Caliper X (#5)

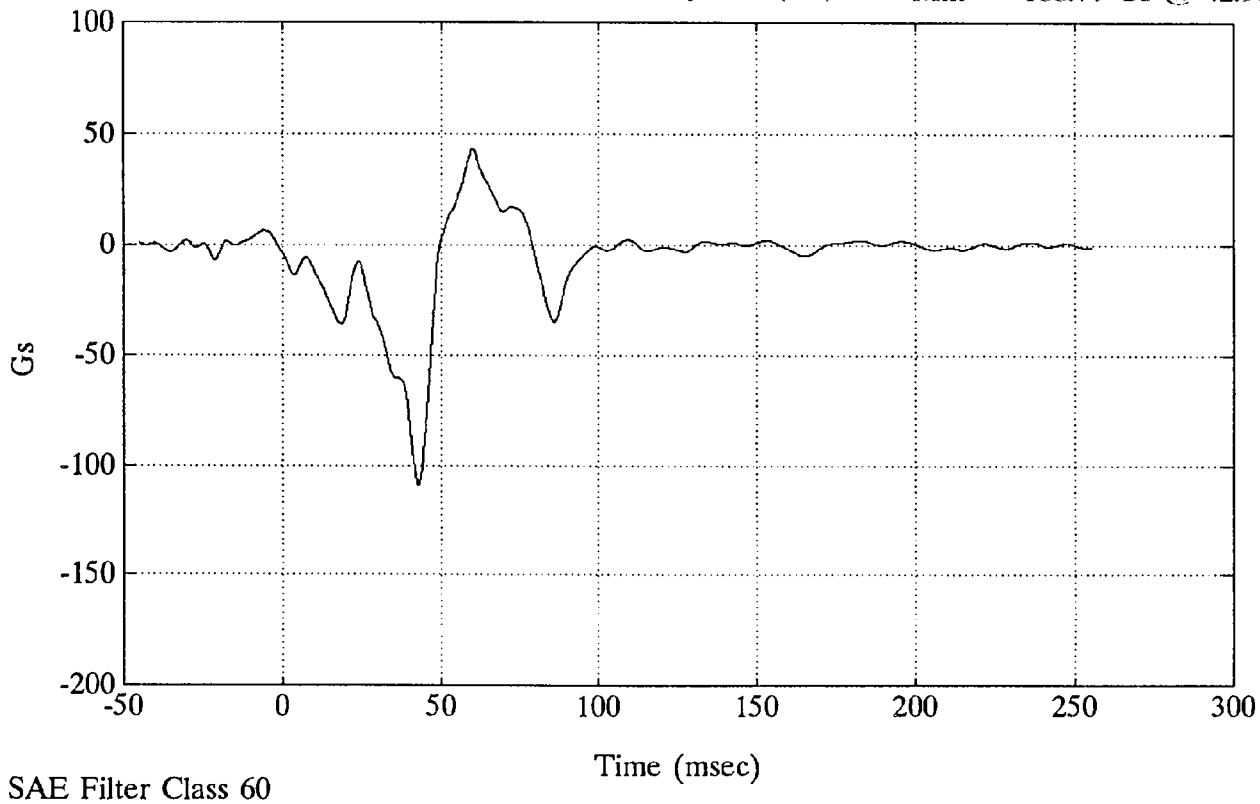
Max = 21.88 in. @ 254.88 msec
Min = 0.00 in. @ -0.00 msec



SAE Filter Class 180

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
L. Brake Caliper X (#6)

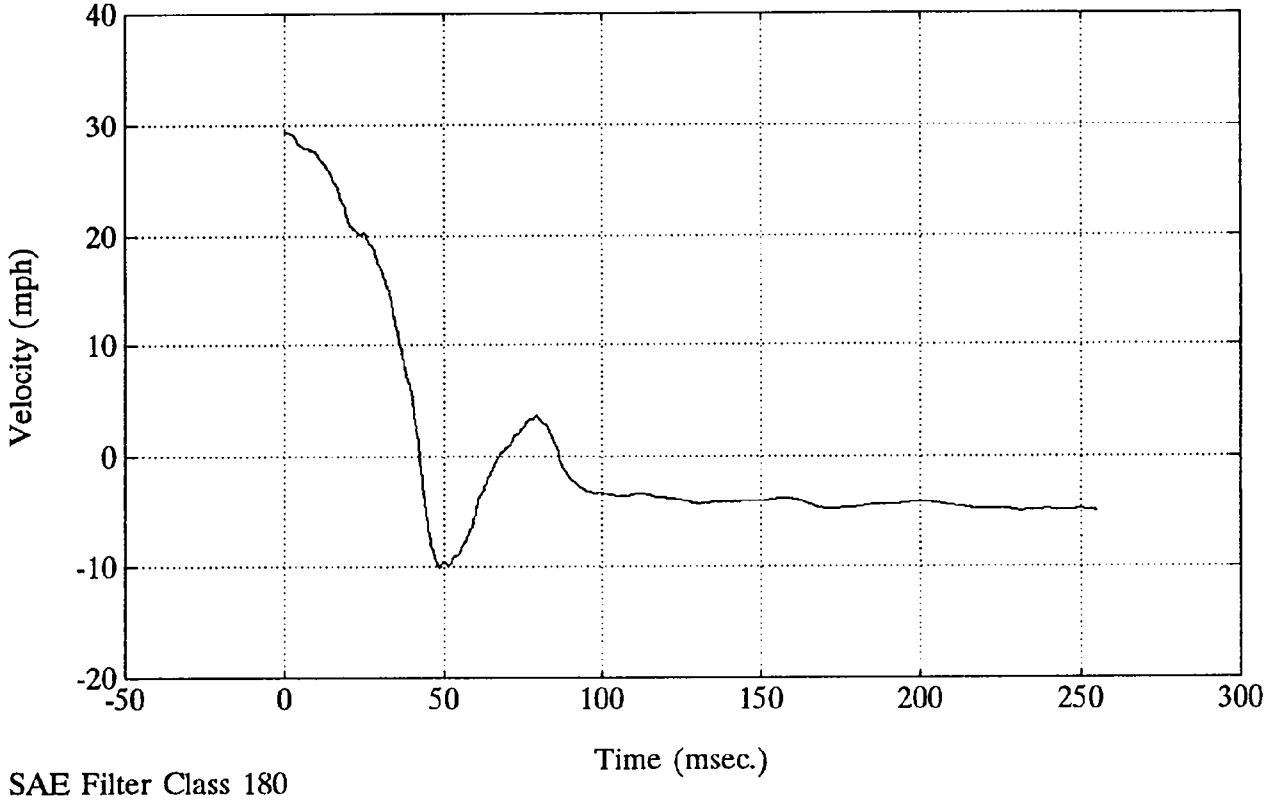
Max = 43.31 Gs @ 60.12 msec
Min = -108.77 Gs @ 42.96 msec



SAE Filter Class 60

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
L. Brake Caliper X (#6)

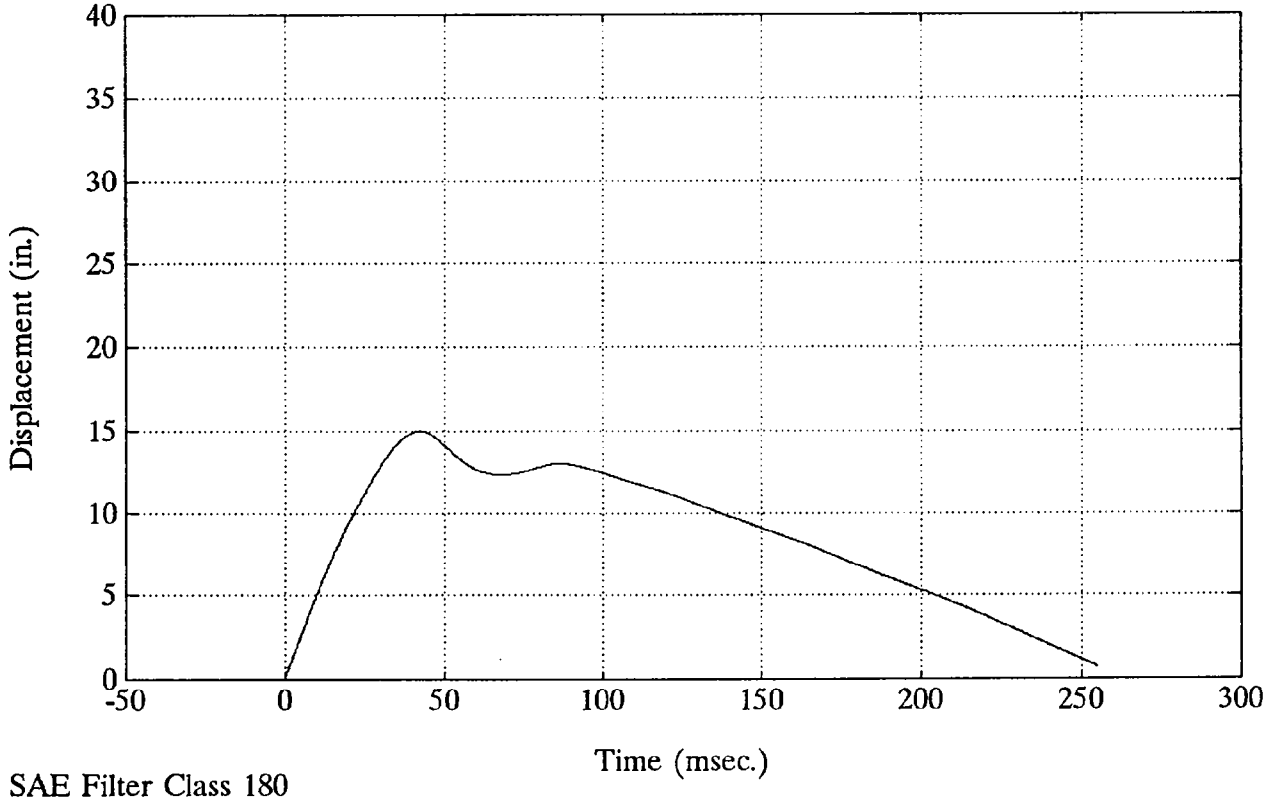
Max = 29.40 mph @ -0.00 msec
Min = -10.03 mph @ 48.72 msec



SAE Filter Class 180

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
L. Brake Caliper X (#6)

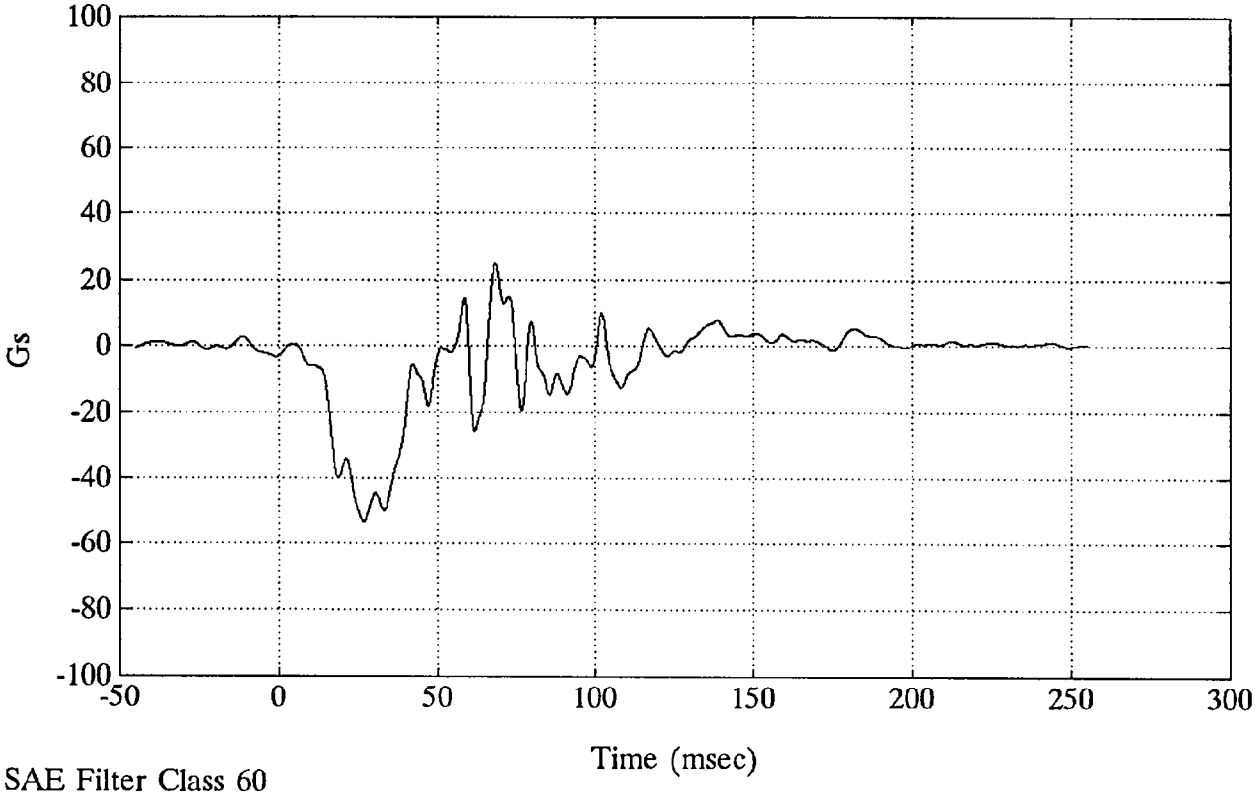
Max = 15.04 in. @ 42.96 msec
Min = 0.00 in. @ -0.00 msec



SAE Filter Class 180

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
Instrument Panel X (#7)

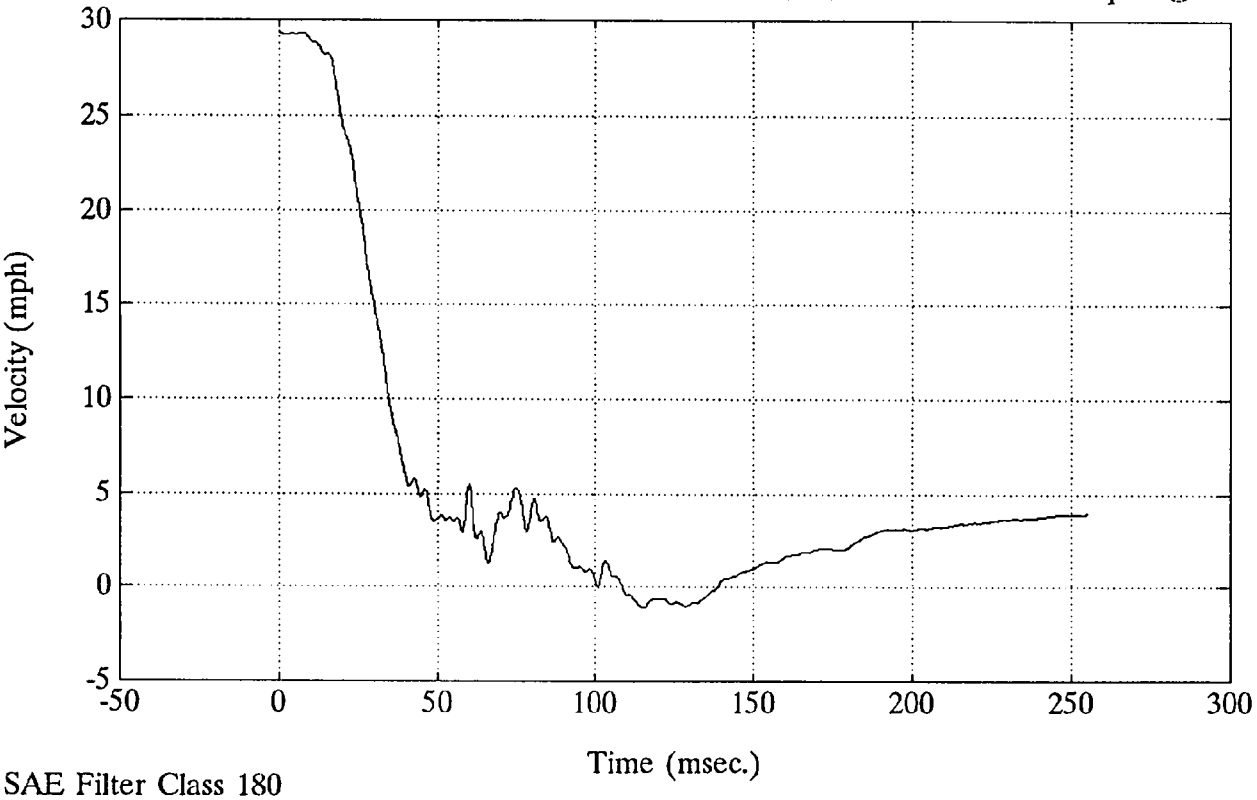
Max = 25.07 Gs @ 68.28 msec
Min = -53.38 Gs @ 27.00 msec



SAE Filter Class 60

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
Instrument Panel X (#7)

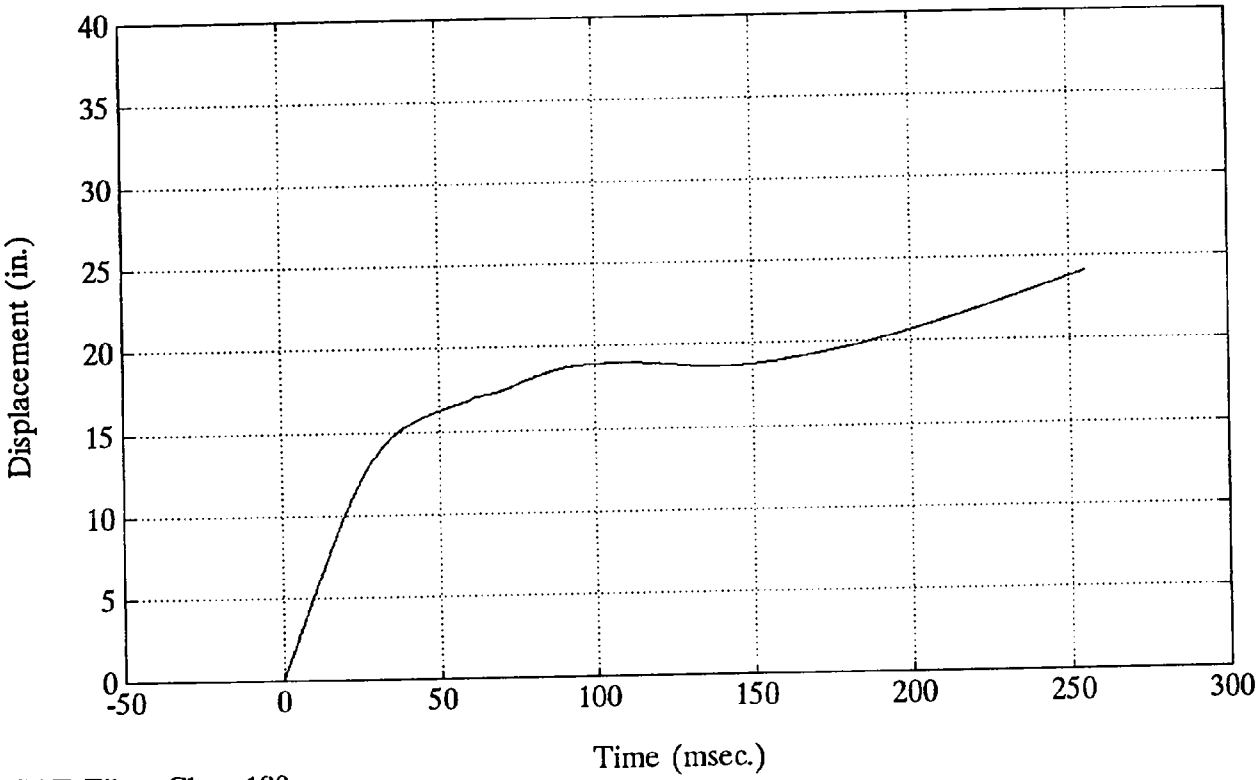
Max = 29.40 mph @ -0.00 msec
Min = -1.11 mph @ 115.44 msec



SAE Filter Class 180

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
Instrument Panel X (#7)

Max = 24.14 in. @ 254.88 msec
Min = 0.00 in. @ -0.00 msec



SAE Filter Class 180

TEST NO. CP1302

DUMMY DATA	SAE FILTER CHANNEL CLASS
Head Accelerations	1000
Chest Accelerations	180
Femur Forces	600

FACILITY: TRACK TEST DATE: 25 Mar 1993
RUN #: 1268
SERIES #: 15

TITLE: NHTSA "208" TEST #15 - 1993 SANTA FE CONVERSION VAN

36 ms Fixed Duration HIC SUMMARY: Pos. 1 Head Resultant

hic: 761.20
t1 = 57.600 msec
t2 = 90.960 msec
Average G's Over Hic Duration = 55.37

CLIP SUMMARY: Pos. 1 Chest Resultant

Peak Resultant (3 ms CLIPPED DURATION) = 50.670 G's
Tstart = 55.2000 ms
Tend = 58.3200 ms
CSI = 463.182

36 ms Fixed Duration HIC SUMMARY: Pos. 2 Head Resultant

hic: 568.20
t1 = 72.360 msec
t2 = 108.240 msec
Average G's Over Hic Duration = 47.85

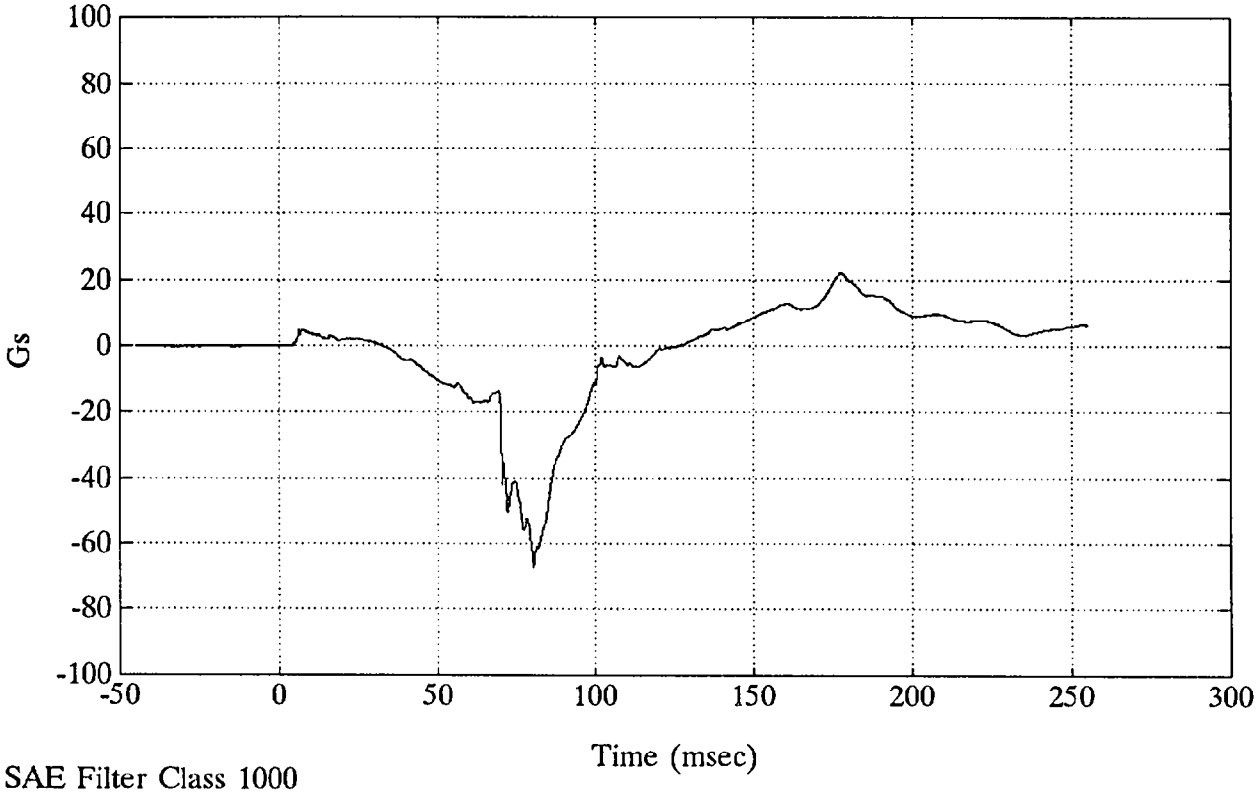
CLIP SUMMARY: Pos. 2 Chest Resultant

Peak Resultant (3 ms CLIPPED DURATION) = 45.862 G's
Tstart = 69.2400 ms
Tend = 72.3600 ms
CSI = 418.184

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

Pos. 1 Head X

Max = 22.14 Gs @ 177.84 msec
Min = -67.64 Gs @ 80.40 msec

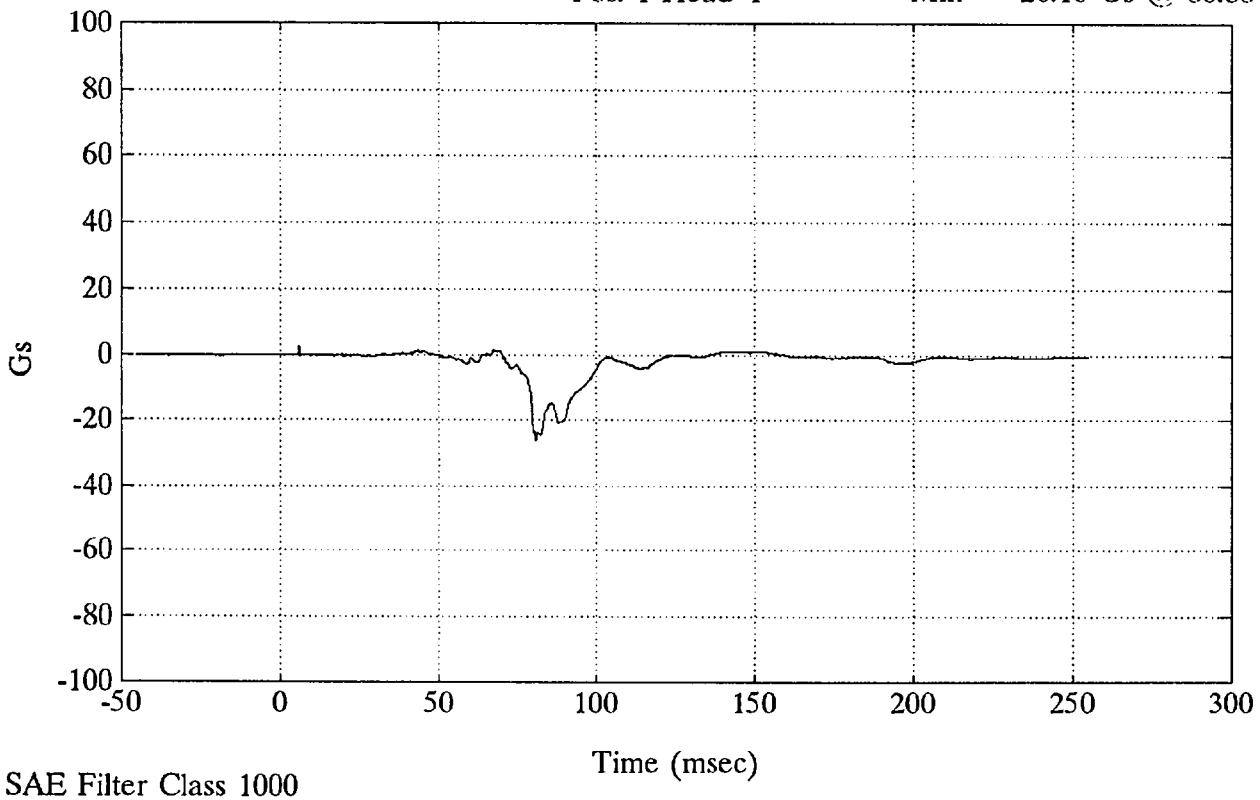


SAE Filter Class 1000

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

Pos. 1 Head Y

Max = 2.53 Gs @ 6.00 msec
Min = -26.10 Gs @ 80.88 msec



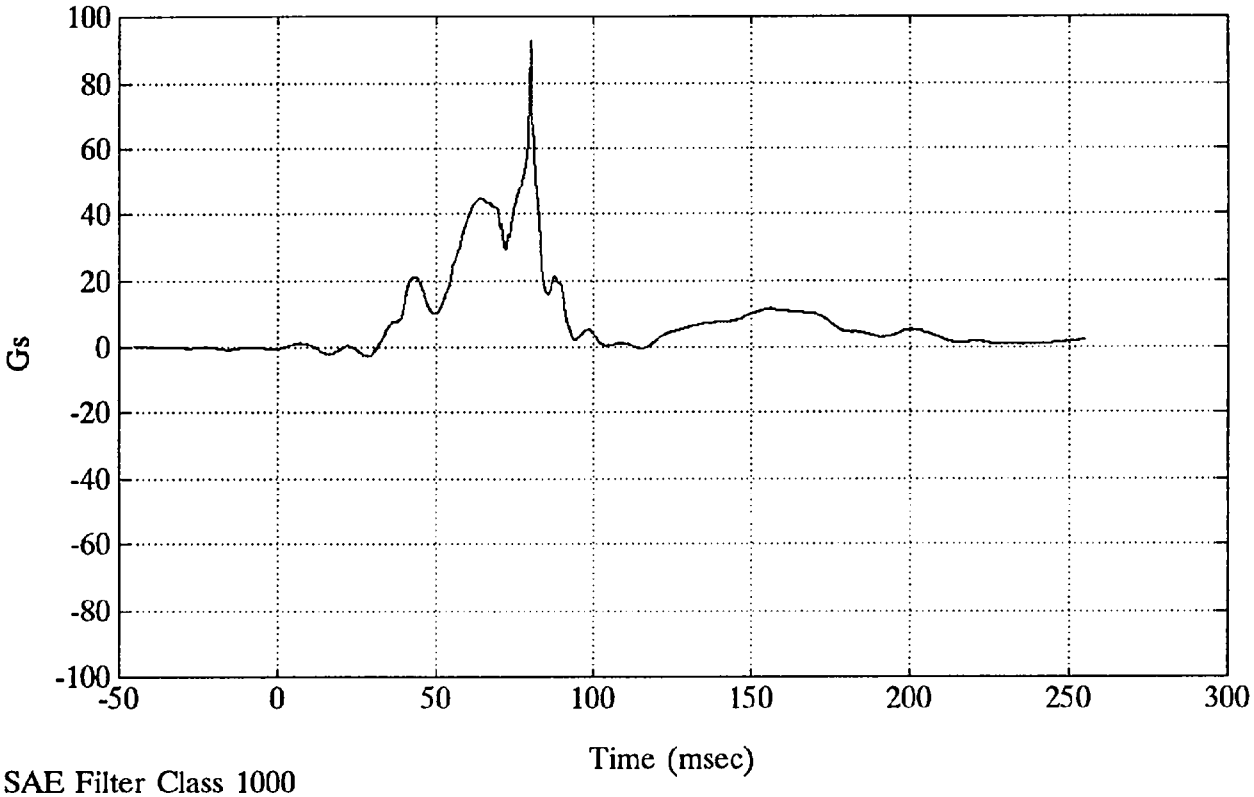
SAE Filter Class 1000

8056-15

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

Pos. 1 Head Z

Max = 92.93 Gs @ 80.04 msec
Min = -2.37 Gs @ 29.28 msec

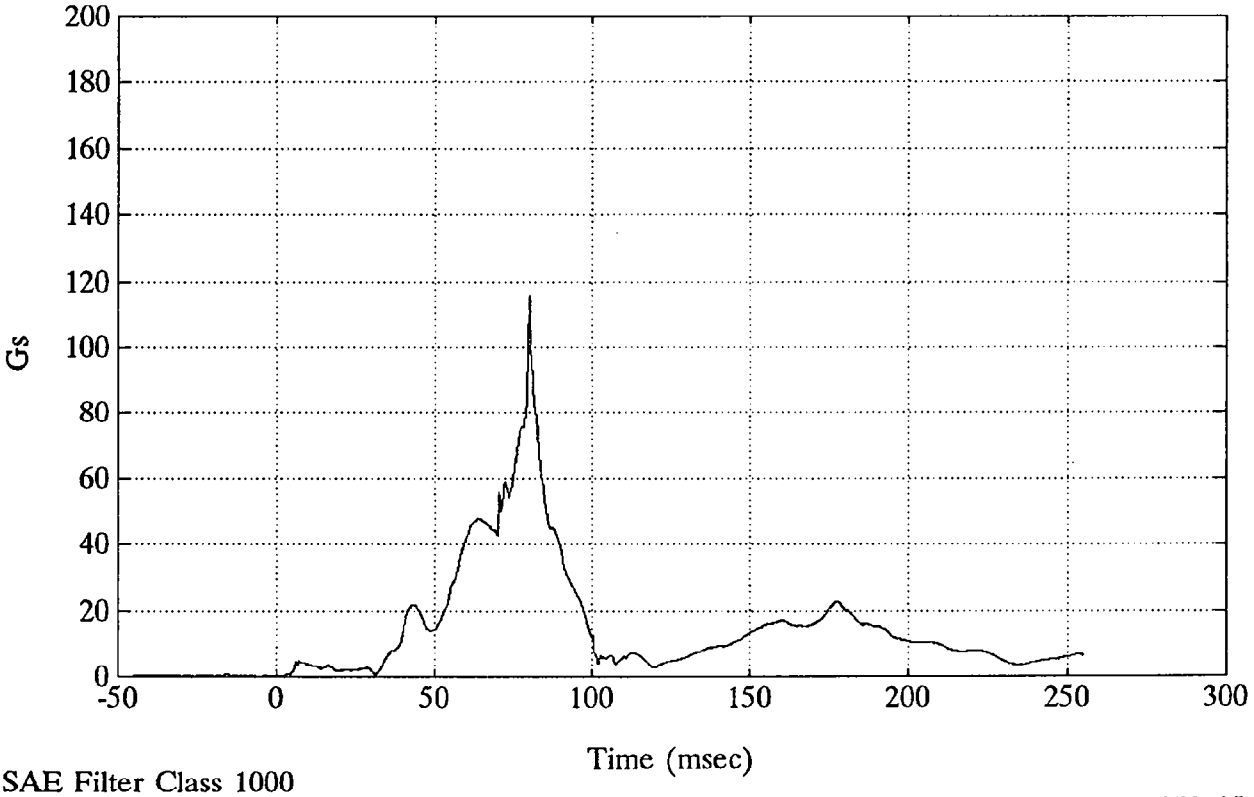


SAE Filter Class 1000

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

Pos. 1 Head Resultant

Max = 116.01 Gs @ 80.04 msec
Min = 0.06 Gs @ -11.04 msec



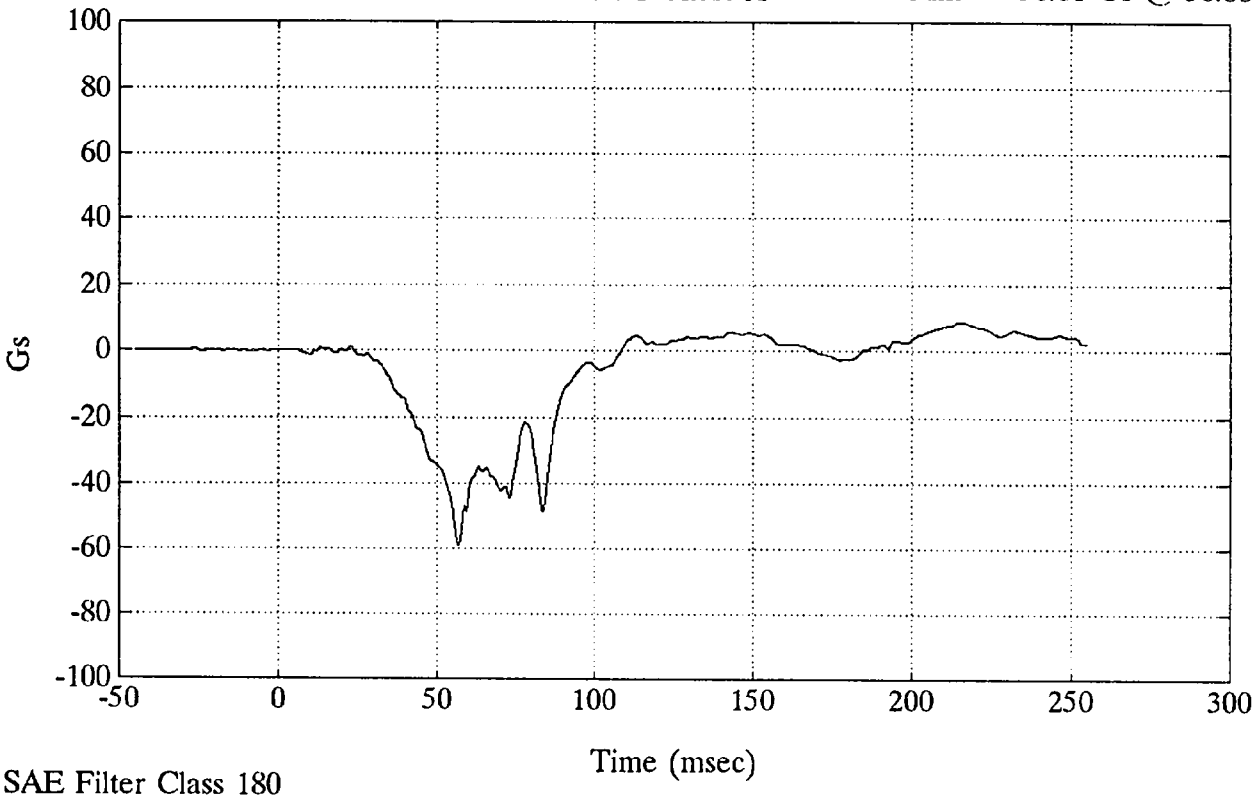
SAE Filter Class 1000

8056-15

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

Pos. 1 Chest X

Max = 9.03 Gs @ 215.28 msec
Min = -58.81 Gs @ 56.88 msec

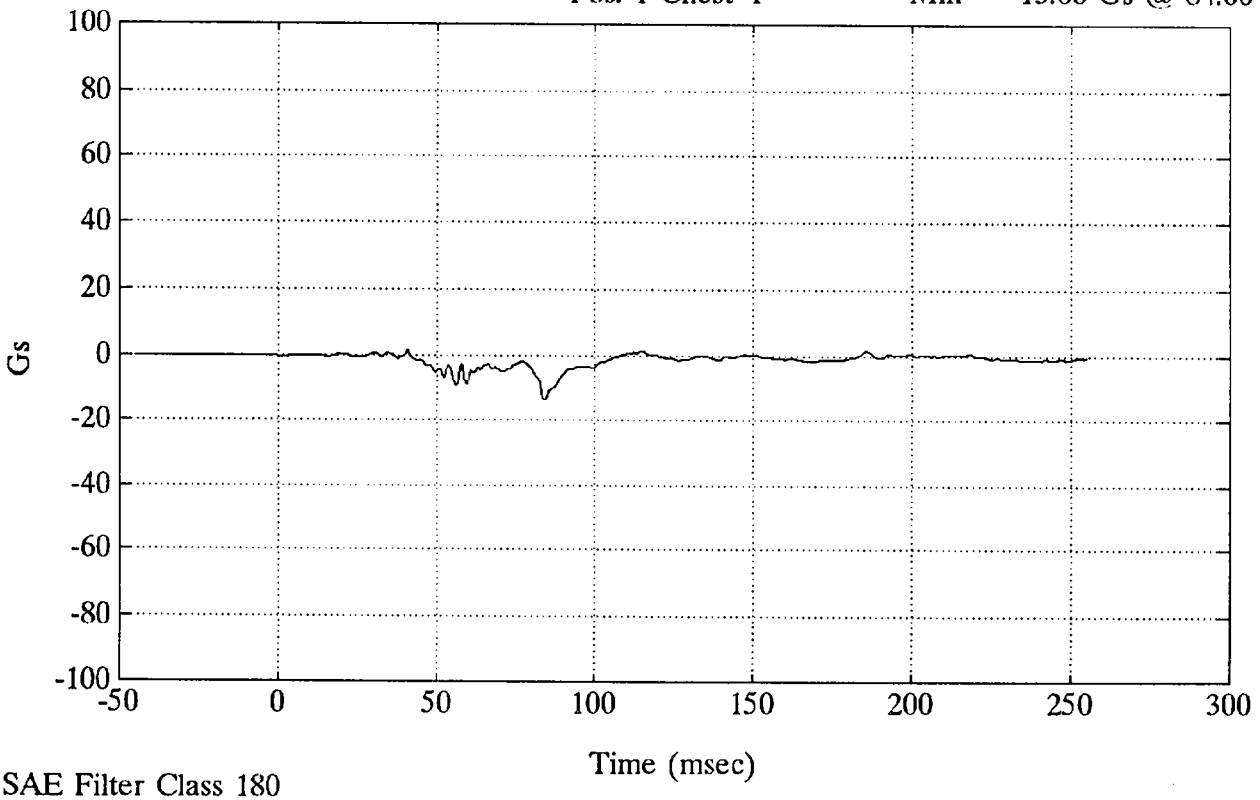


SAE Filter Class 180

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

Pos. 1 Chest Y

Max = 1.77 Gs @ 185.52 msec
Min = -13.66 Gs @ 84.00 msec

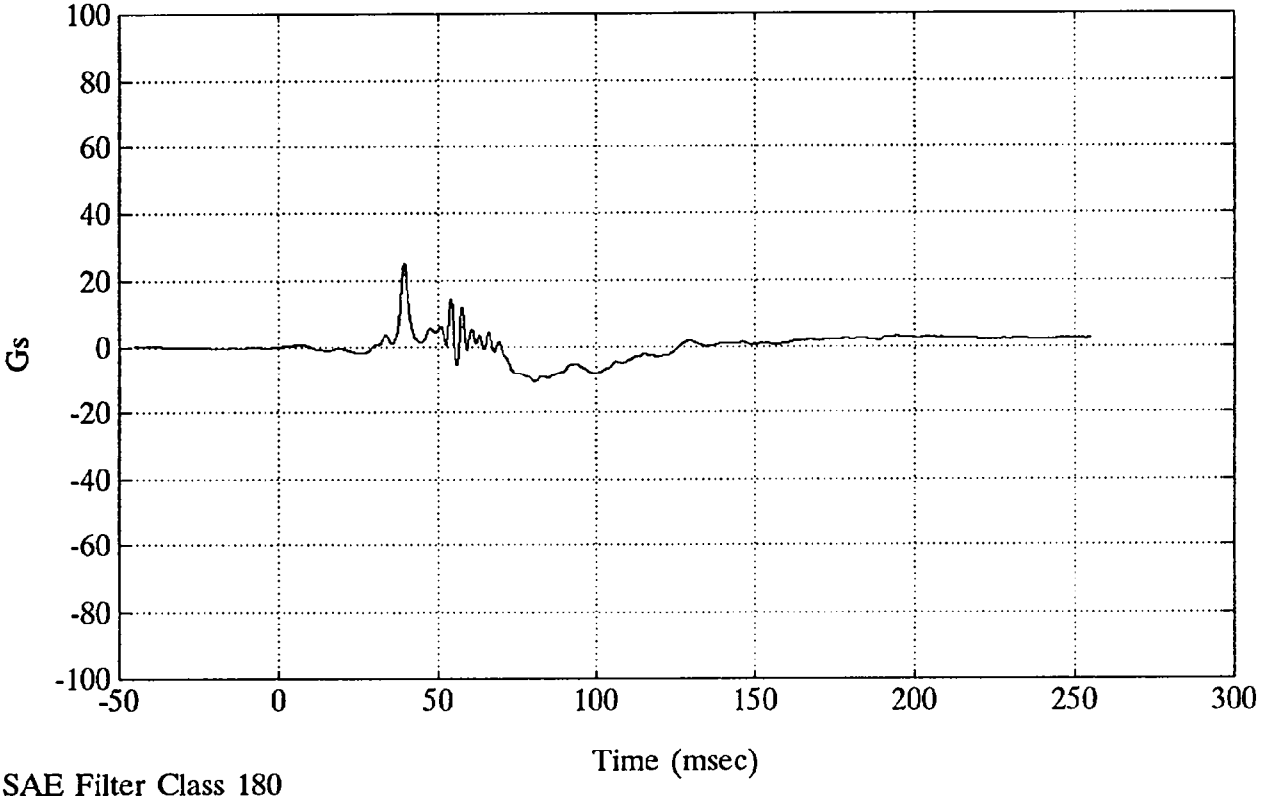


SAE Filter Class 180

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

Pos. 1 Chest Z

Max = 25.19 Gs @ 39.60 msec
Min = -10.47 Gs @ 80.52 msec

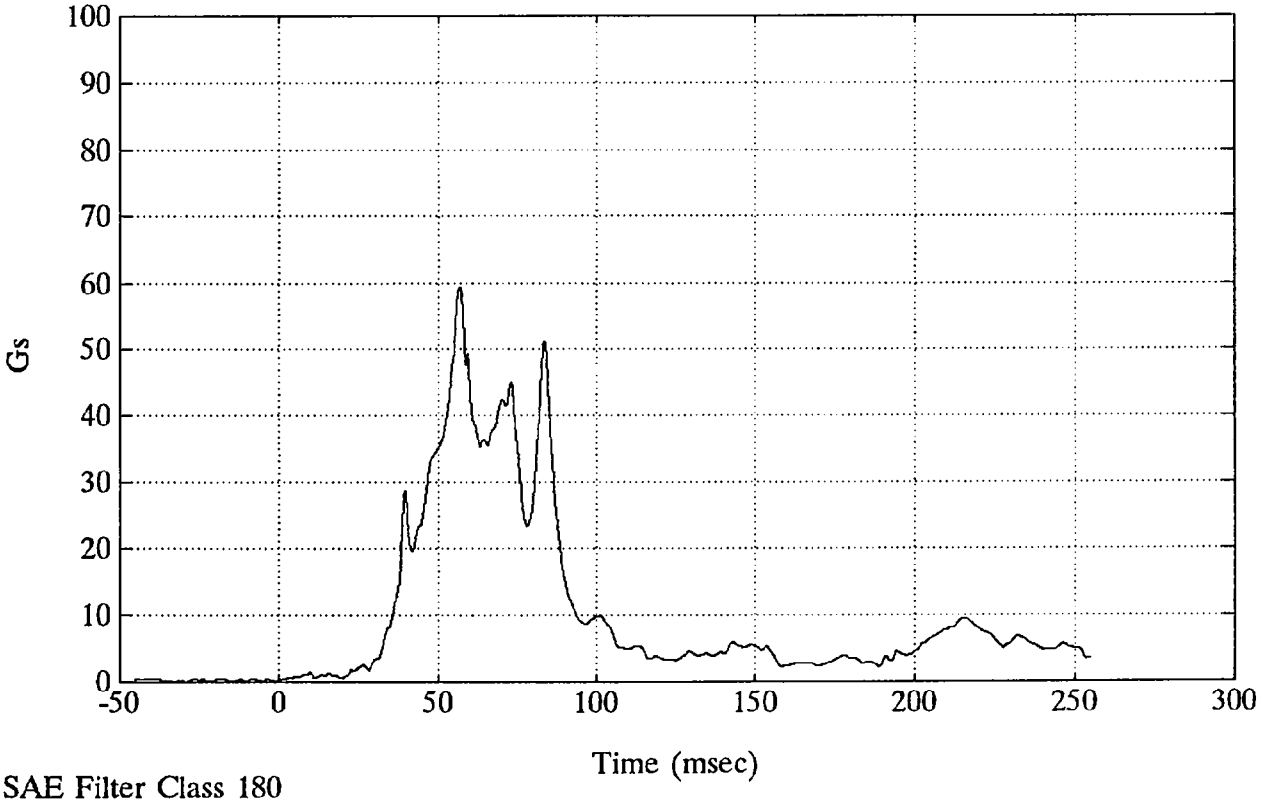


SAE Filter Class 180

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

Pos. 1 Chest Resultant

Max = 59.35 Gs @ 56.88 msec
Min = 0.02 Gs @ -32.40 msec

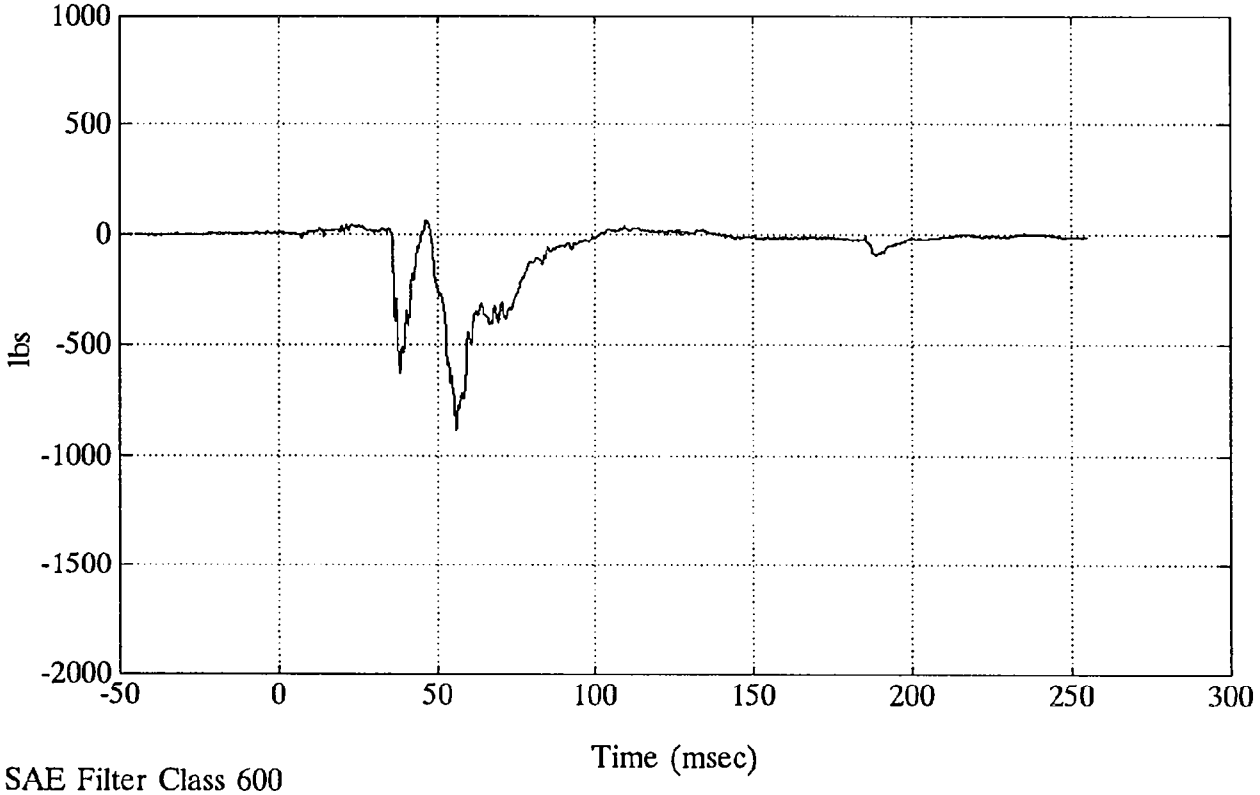


SAE Filter Class 180

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

Pos. 1 Left Femur

Max = 58.93 lbs @ 46.56 msec
Min = -881.19 lbs @ 56.04 msec

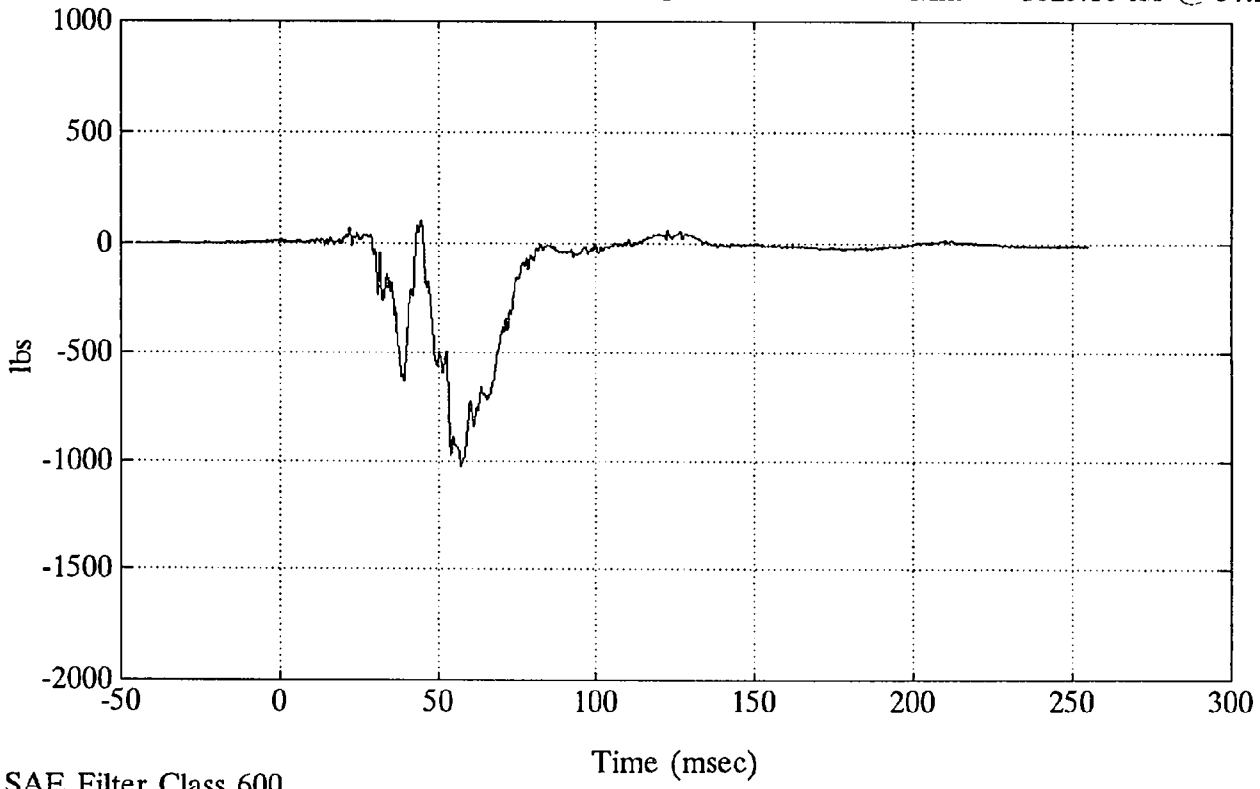


SAE Filter Class 600

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

Pos. 1 Right Femur

Max = 102.16 lbs @ 44.76 msec
Min = -1023.10 lbs @ 57.24 msec

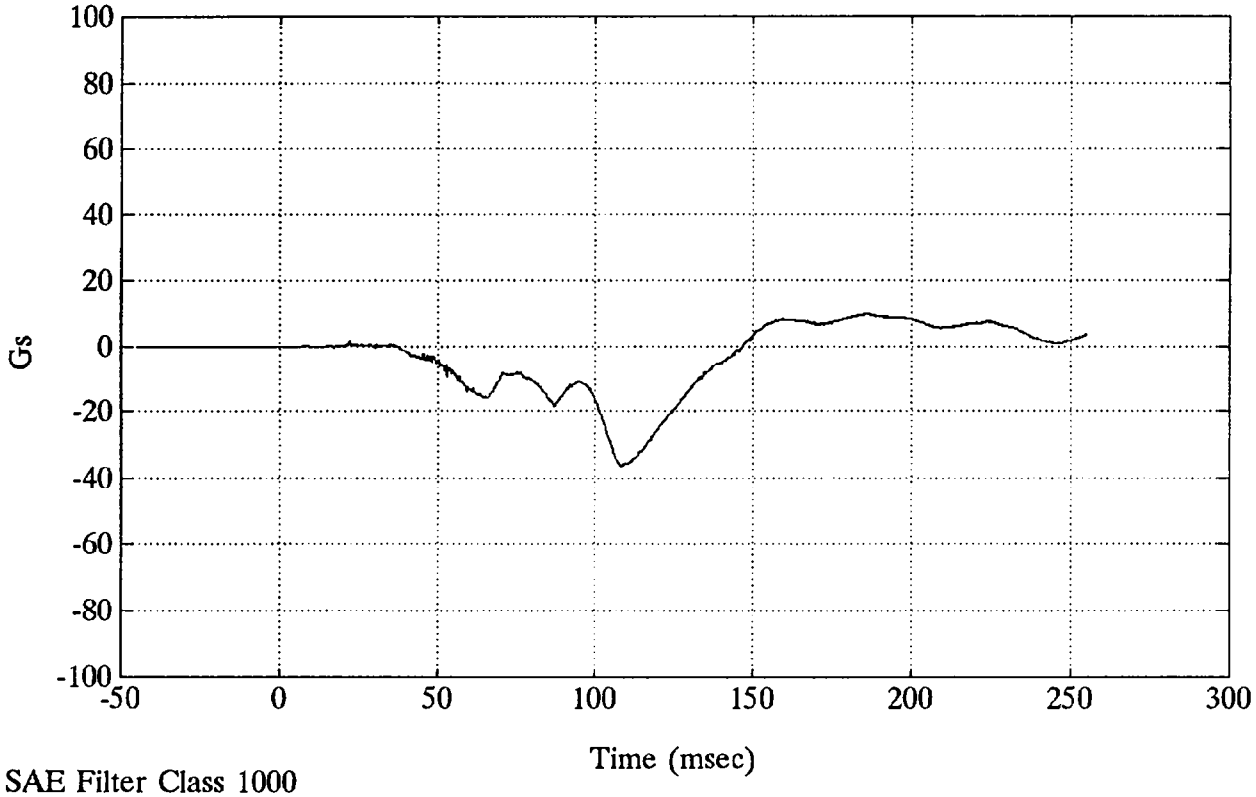


SAE Filter Class 600

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

Pos. 2 Head X

Max = 9.90 Gs @ 186.12 msec
Min = -36.48 Gs @ 108.48 msec

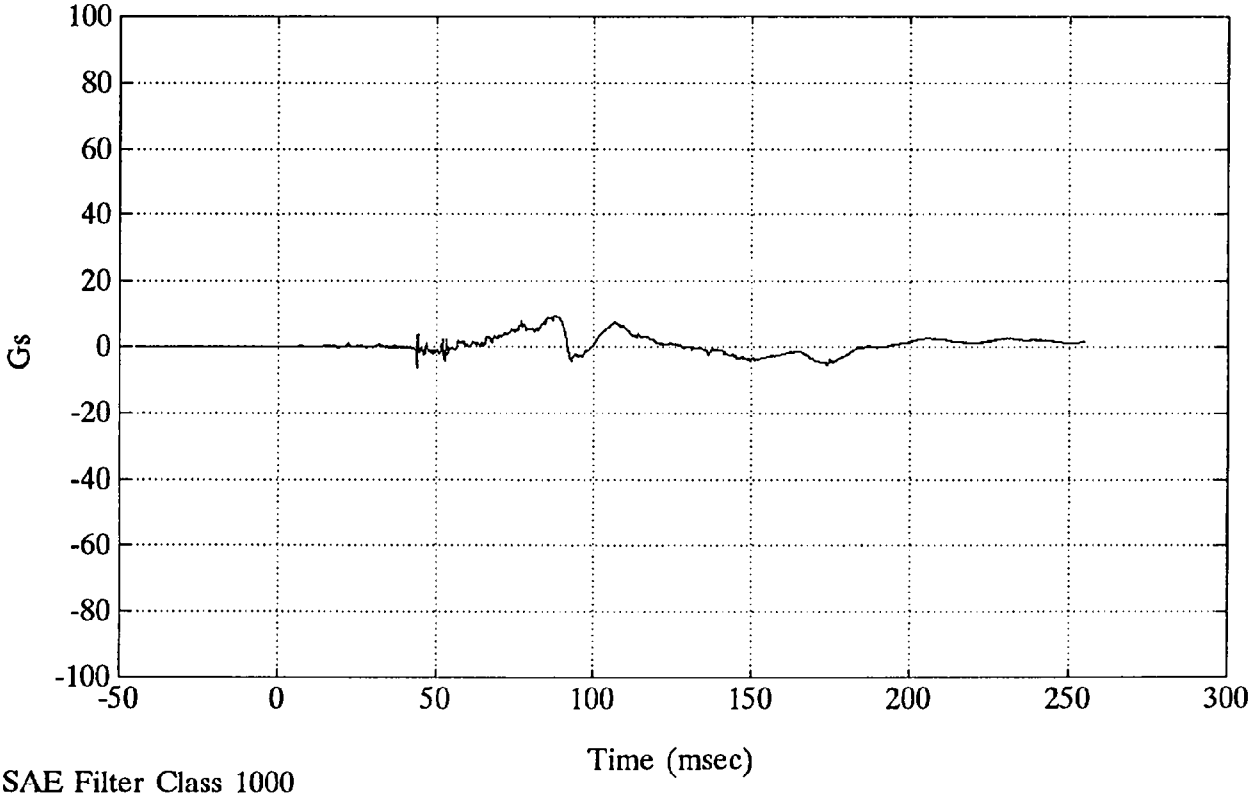


SAE Filter Class 1000

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

Pos. 2 Head Y

Max = 9.35 Gs @ 87.60 msec
Min = -6.21 Gs @ 43.92 msec

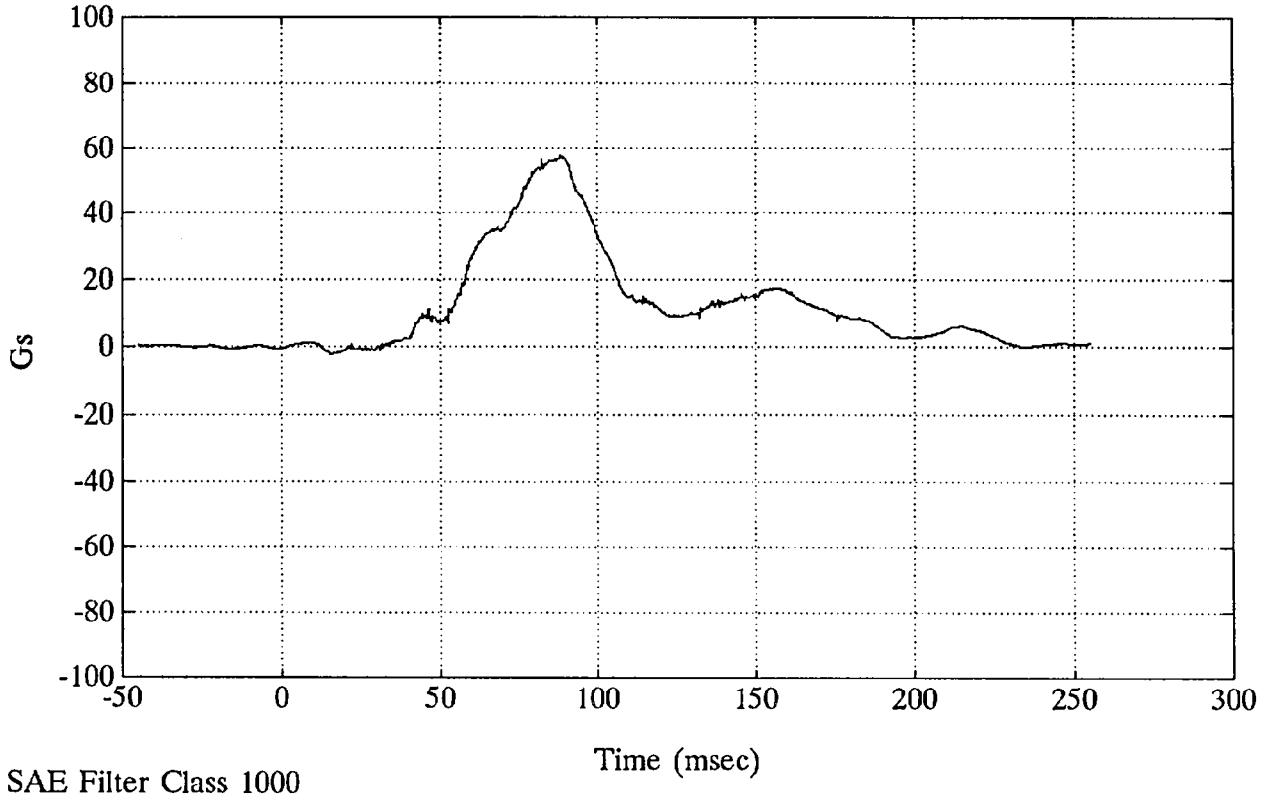


SAE Filter Class 1000

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

Pos. 2 Head Z

Max = 57.73 Gs @ 88.08 msec
Min = -2.11 Gs @ 16.20 msec

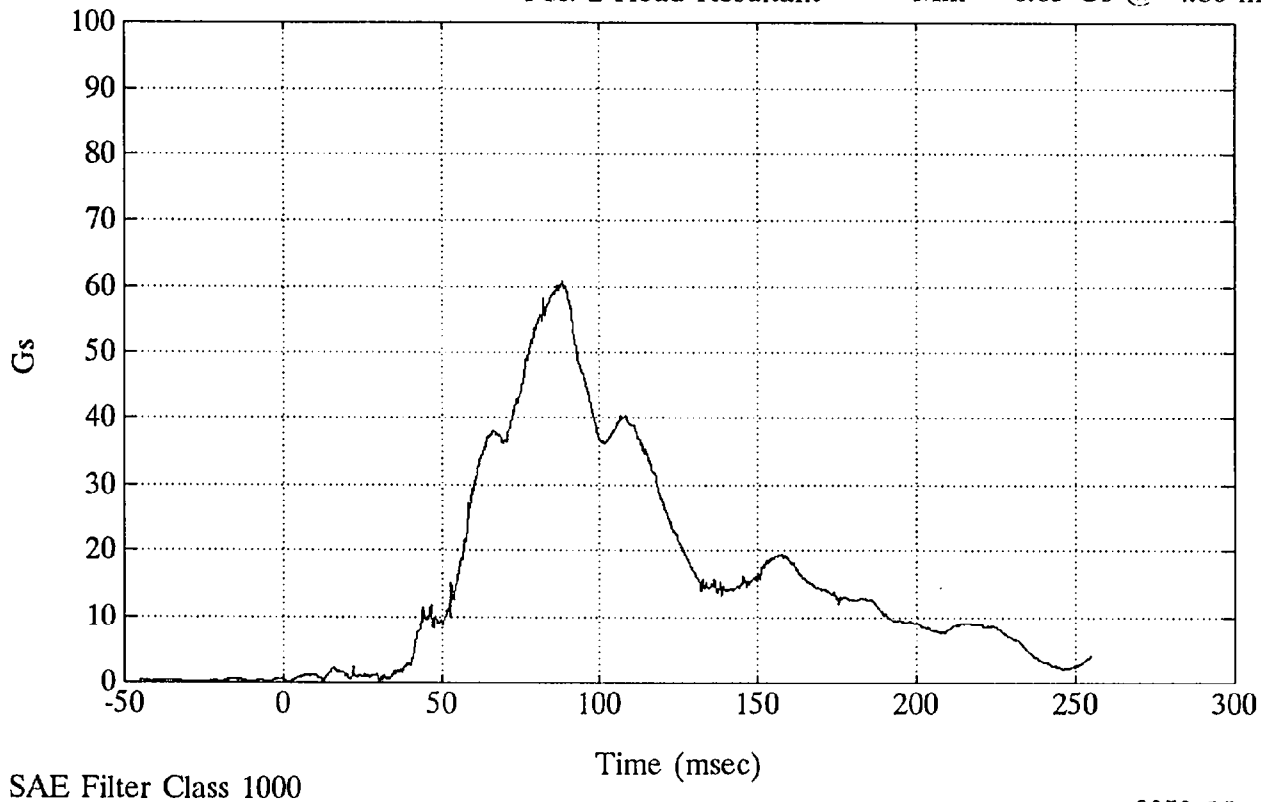


SAE Filter Class 1000

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

Pos. 2 Head Resultant

Max = 60.84 Gs @ 88.08 msec
Min = 0.03 Gs @ -4.80 msec



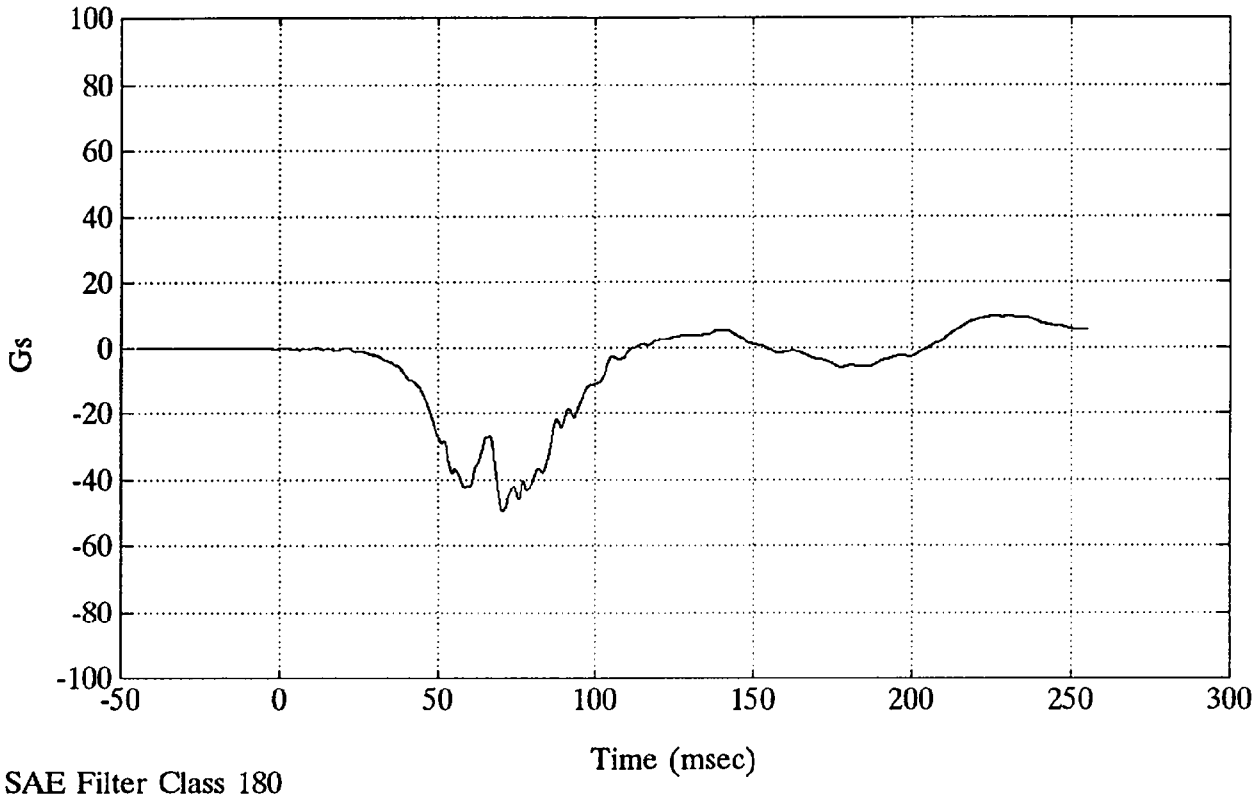
SAE Filter Class 1000

8056-15

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

Pos. 2 Chest X

Max = 9.47 Gs @ 226.92 msec
Min = -49.50 Gs @ 70.56 msec

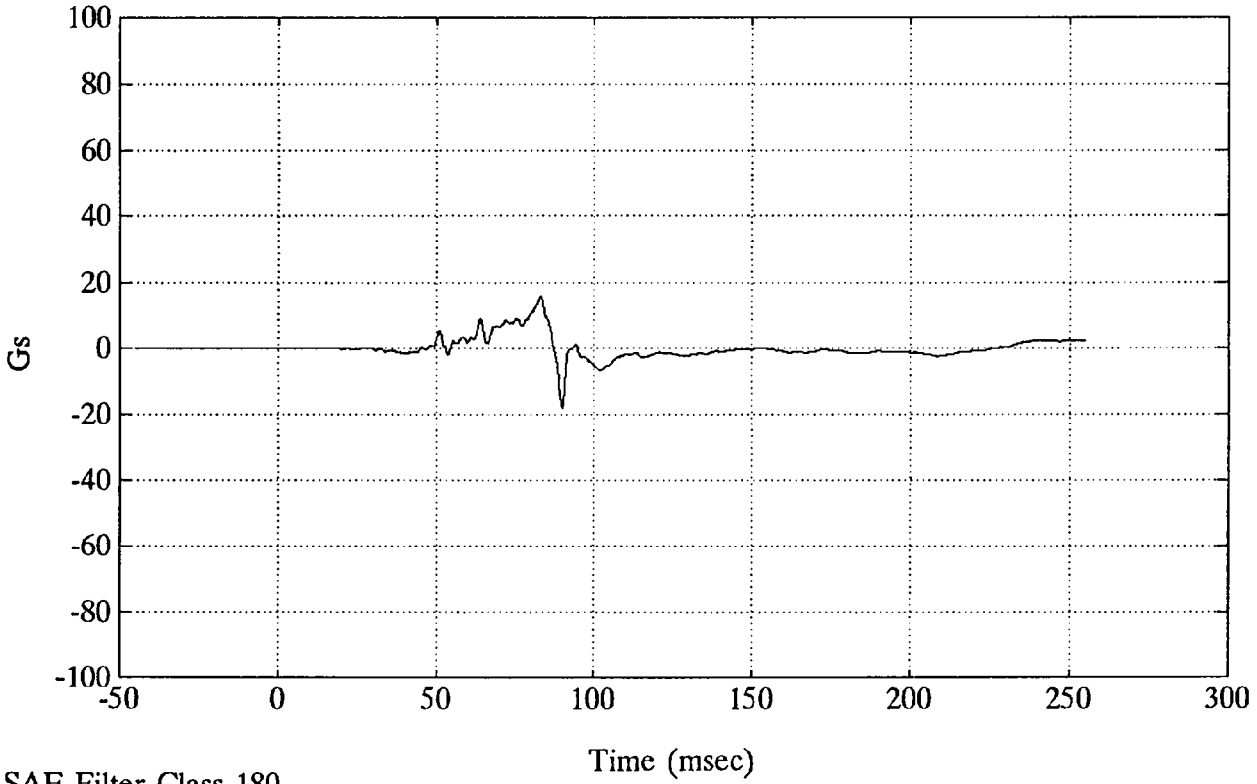


SAE Filter Class 180

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

Pos. 2 Chest Y

Max = 15.72 Gs @ 83.04 msec
Min = -17.99 Gs @ 89.88 msec



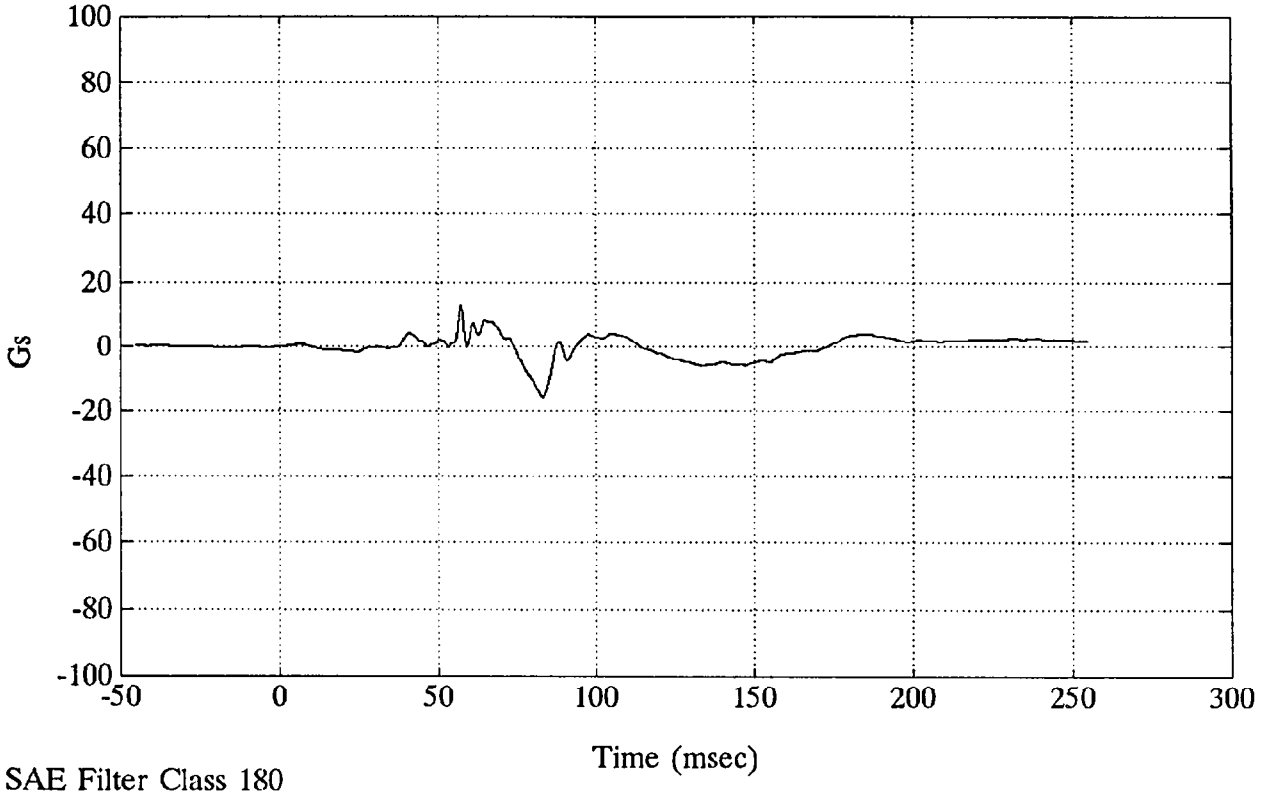
SAE Filter Class 180

8056-15

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

Pos. 2 Chest Z

Max = 12.94 Gs @ 57.24 msec
Min = -15.75 Gs @ 83.04 msec

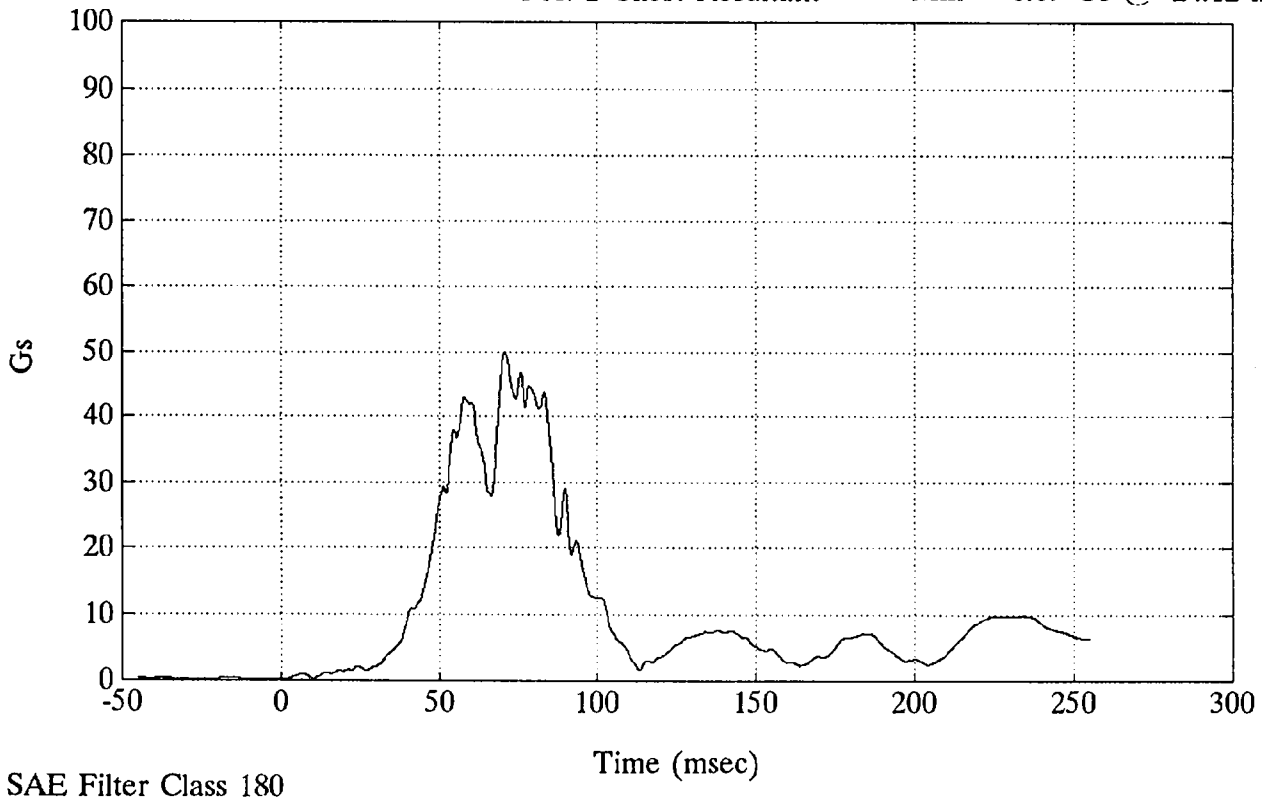


SAE Filter Class 180

FMVSS 208 - 1993 SANTA FE CONVERSION VAN

Pos. 2 Chest Resultant

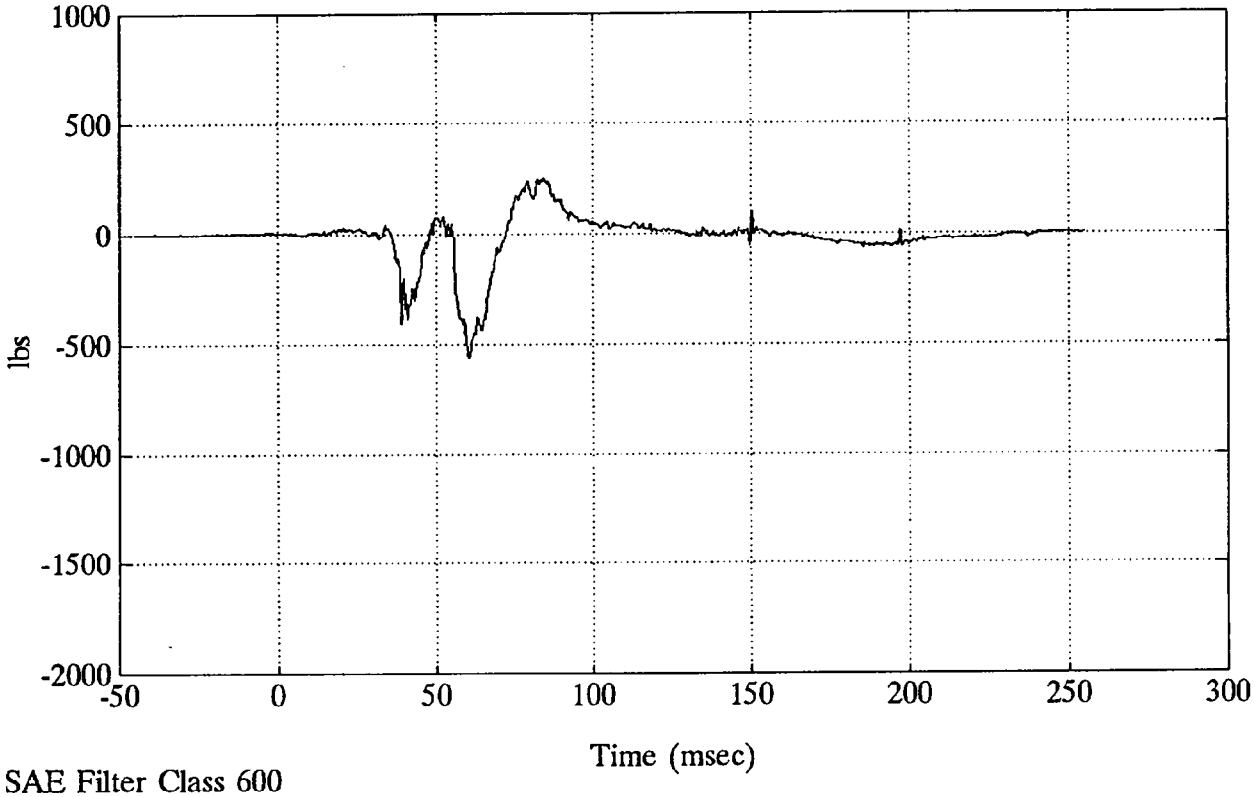
Max = 50.03 Gs @ 70.56 msec
Min = 0.09 Gs @ -24.12 msec



SAE Filter Class 180

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
Pos. 2 Left Femur

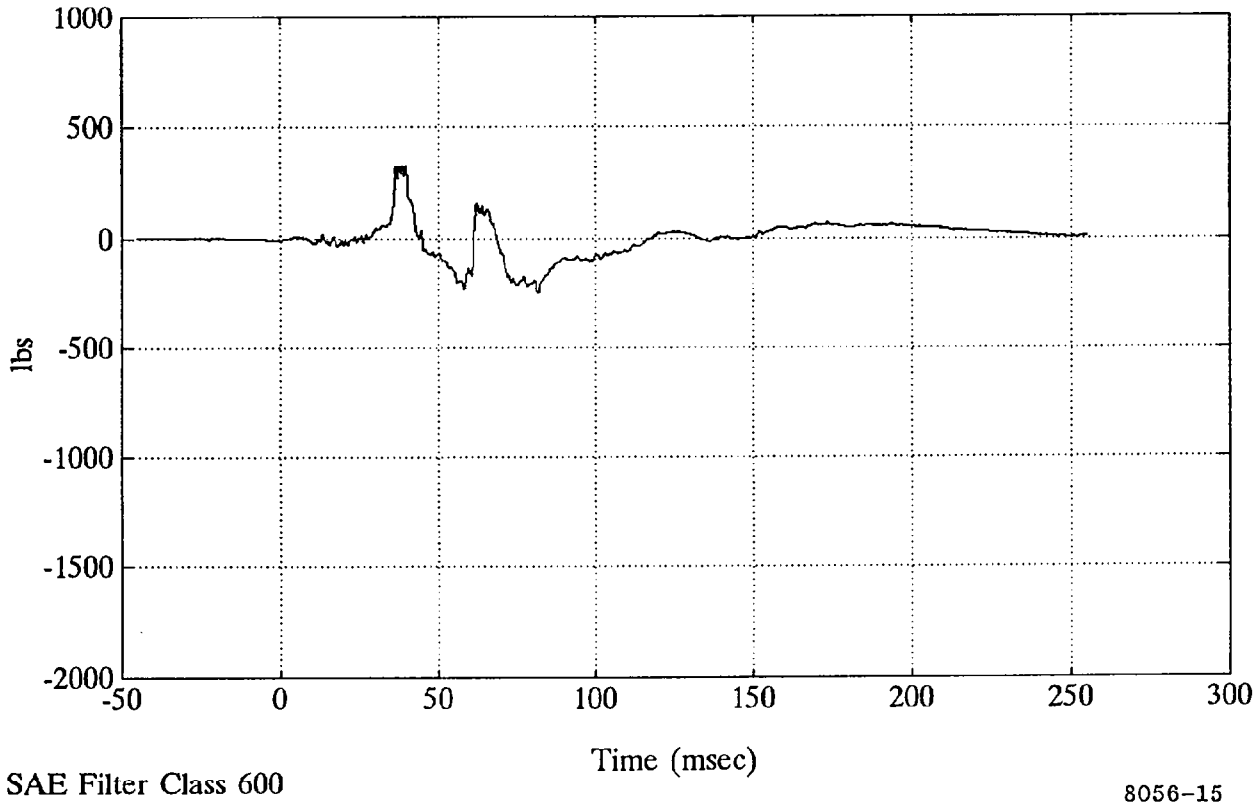
Max = 249.86 lbs @ 84.00 msec
Min = -557.66 lbs @ 60.60 msec



SAE Filter Class 600

FMVSS 208 - 1993 SANTA FE CONVERSION VAN
Pos. 2 Right Femur

Max = 329.08 lbs @ 39.72 msec
Min = -249.29 lbs @ 81.48 msec



SAE Filter Class 600

8056-15

Appendix C

VEHICLE OWNERS MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

Seats and Safety Belts

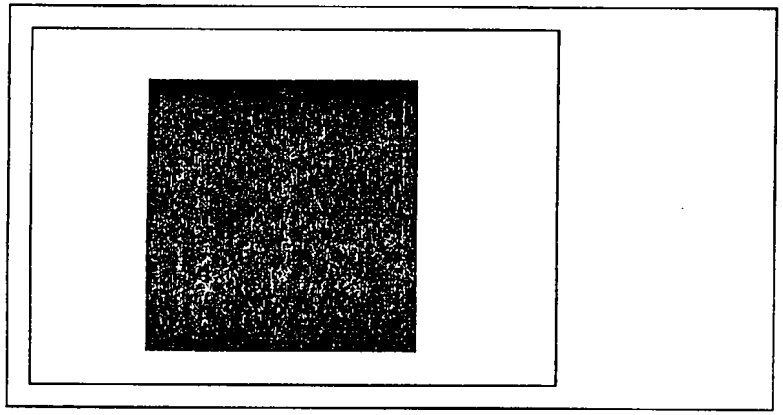
Safety Belts: They're For Everyone

This part of the manual tells you how to use safety belts properly. It also tells you some things you should not do with safety belts.

CAUTION

⚠ Don't let anyone ride where they can't wear a safety belt properly. If you are in a crash and you're not wearing a safety belt, your injuries can be **much** worse. You can hit things inside the vehicle or be ejected from it. You can be seriously injured or killed. In the same crash, you might not be if you are buckled up. Always fasten your safety belt, and check that your passengers' belts are fastened properly too.

This figure, located in the instrument cluster, lights up when you turn the key to **RUN** or **START** when your safety belt isn't buckled, and you'll hear a tone, too. It's the reminder to buckle up. In many states and Canadian provinces, the law says to wear safety belts. Here's why: **They work.**



K4163

You never know if you'll be in a crash. If you do have a crash, you don't know if it will be a bad one.

A few crashes are very mild. In them, you won't get hurt even if you're not buckled up. And some crashes can be so serious, like being hit by a train, that even buckled up a person wouldn't survive. But most crashes are in between. In many of them, people who buckle up can survive and sometimes walk away. Without belts they could be badly hurt or killed.

After 25 years of safety belts in vehicles, the facts are clear. In most crashes buckling up does matter . . . a lot!

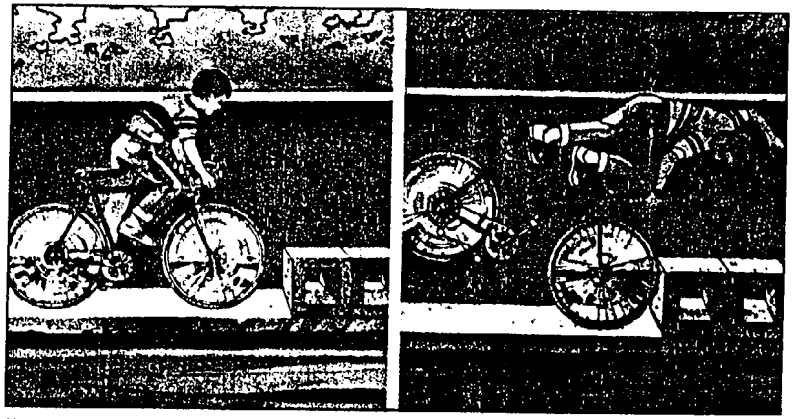
AP110017

Why Safety Belts Work

When you ride in or on anything, you go as fast as it goes.

For example, if the bike is going 10 mph (16 km/h), so is the child.

When the bike hits the block, it stops. But the child keeps going!



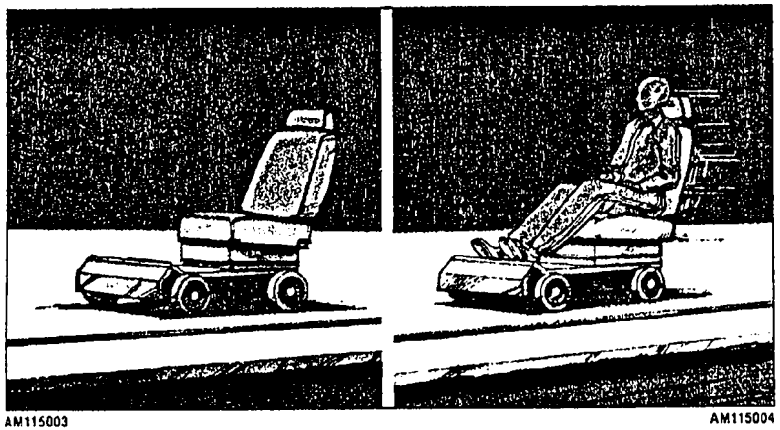
AM115001

AM115002

Seats and Safety Belts

Take the simplest vehicle. Suppose it's just a seat on wheels.

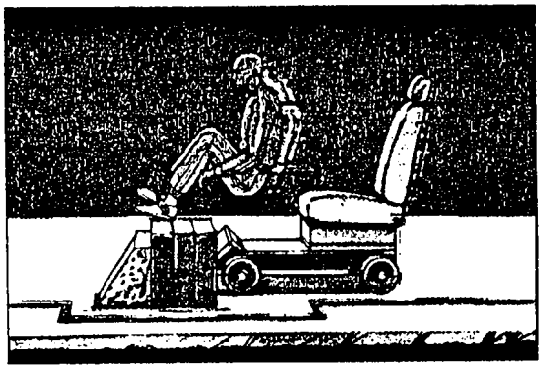
Put someone on it.



AM115003

AM115004

Get it up to speed. Then stop the vehicle. The rider doesn't stop.



AM115005

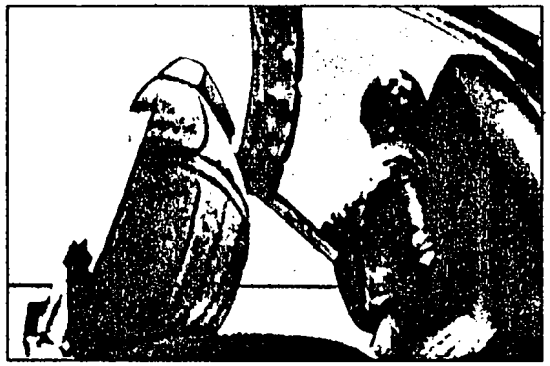
C-3

8056-15

The person keeps going until stopped by something. In a real vehicle, it could be the windshield . . .

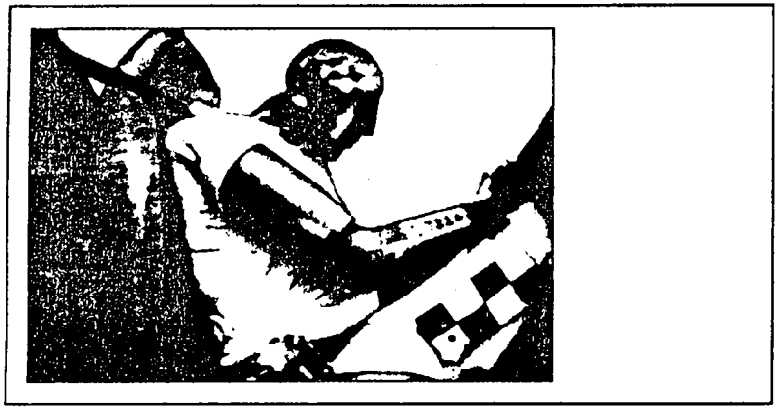
AM115006

or the instrument panel . . .



AM115007

or the safety belts!



AM115008

With safety belts, you slow down as the vehicle does. You get more time to stop. You stop over more distance, and your strongest bones take the forces. That's why safety belts make such good sense.

Here Are Questions Many People Ask About Safety Belts—and the Answers

Q: Won't I be trapped in the vehicle after an accident if I'm wearing a safety belt?

A: You **could** be—whether you're wearing a safety belt or not. But you can easily unbuckle a safety belt, even if you're upside down. And your chance of being conscious during and after an accident, so you **can** unbuckle and get out, is **much** greater if you are belted.

Q: Why don't they just put in air bags so people won't have to wear safety belts?

A: "Air bags," or Supplemental Inflatable Restraint systems, are in some vehicles today and will be in more of them in the future. But they are supplemental systems only—so they work **with** safety belts, not instead of them. Every "air bag" system ever offered for sale has required the use of safety belts. Even if you're in a vehicle that has "air bags," you still have to buckle up to get the most protection. That's true not only in frontal collisions, but especially in side and other collisions.

C–4

8056–15

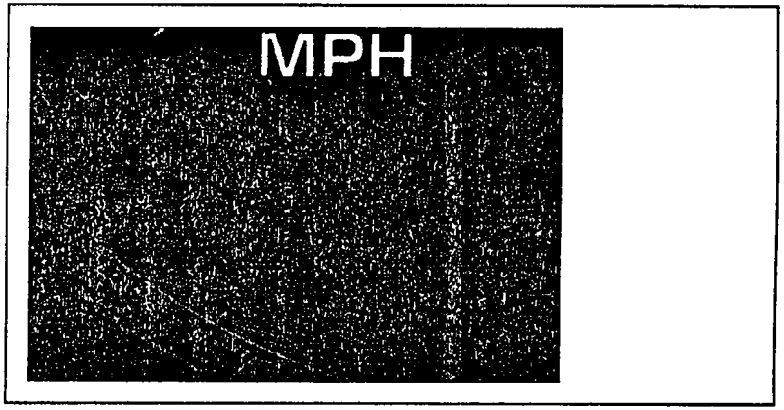
Q: If I'm a good driver, and I never drive far from home, why should I wear safety belts?

A: You may be an excellent driver, but if you're in an accident—even one that isn't your fault—you and your passengers can be hurt. Being a good driver doesn't protect you from things beyond your control, such as bad drivers.

Most accidents occur within 25 miles (40 km) of home. And the greatest number of serious injuries and deaths occur at speeds of less than 40 mph (65 km/h).

Safety belts are for everyone.

Safety Belt Reminder Light



K4257

When the key is turned to **RUN** or **START** a light, located in the instrument cluster, will come on for about eight seconds to remind people to fasten their safety belts. Unless the driver's safety belt is buckled, a tone will also sound.

Seats and Safety Belts

How To Wear Safety Belts Properly

Adults

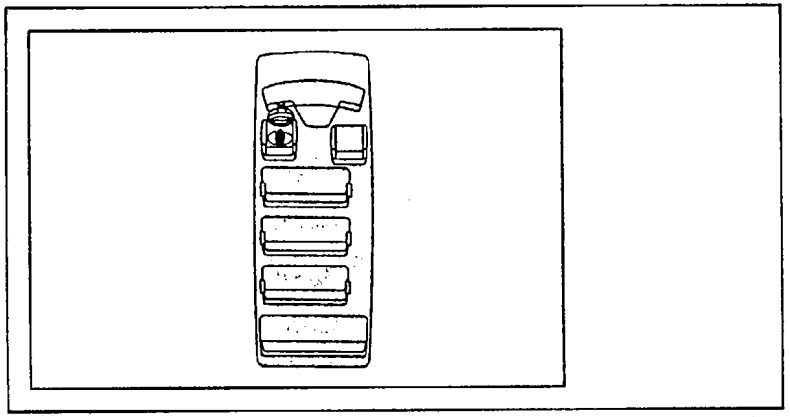
This part is only for people of adult size.

CAUTION

There are special things to know about safety belts and children. And there are different rules for babies and smaller children. If a child will be riding in your vehicle see the part after this one, called "Children." Follow those rules for everyone's protection.

First, you'll want to know which restraint systems your vehicle has. We'll start with the driver position.

Driver Position



K4121

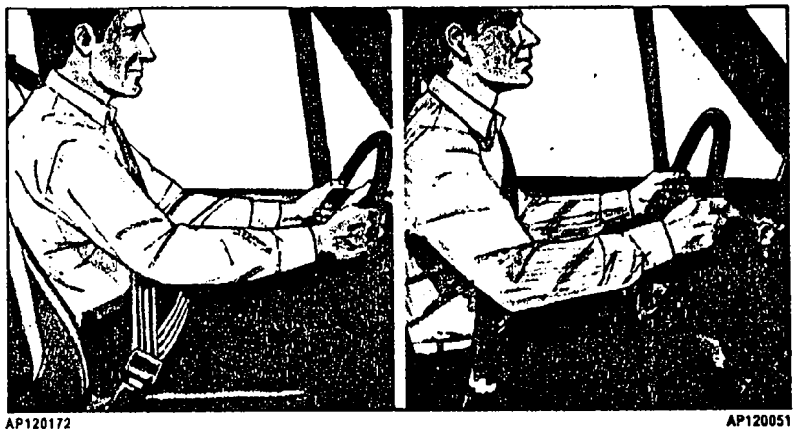
This part describes the driver's restraint system.

C-5

8056-15

Lap-Shoulder Belt

Van *Cab and Chassis*

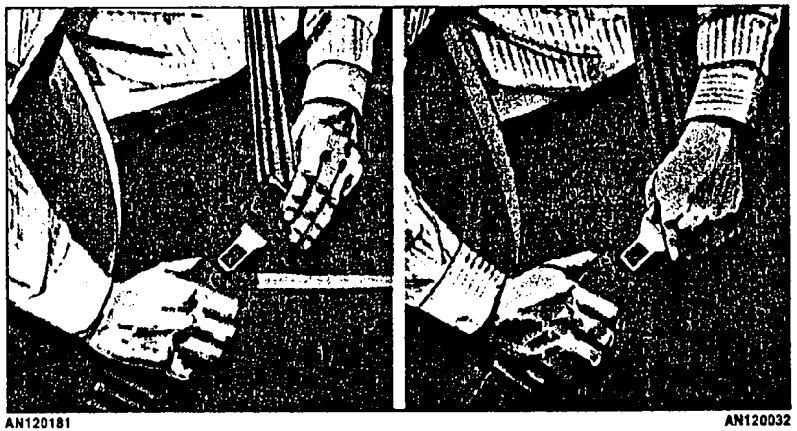


AP120172 AP120051

This driver has a lap-shoulder belt. Here's how to wear it properly.

1. Close and lock the door.
2. Adjust the seat (to see how, see "Seats and Seat Controls in the Index") so you can sit up straight.
3. Pick up the latch plate and pull the belt across you. Don't let it get twisted.

Van *Cab and Chassis*



AN120181 AN120032

4. Push the latch plate into the buckle until it clicks.

Seats and Safety Belts

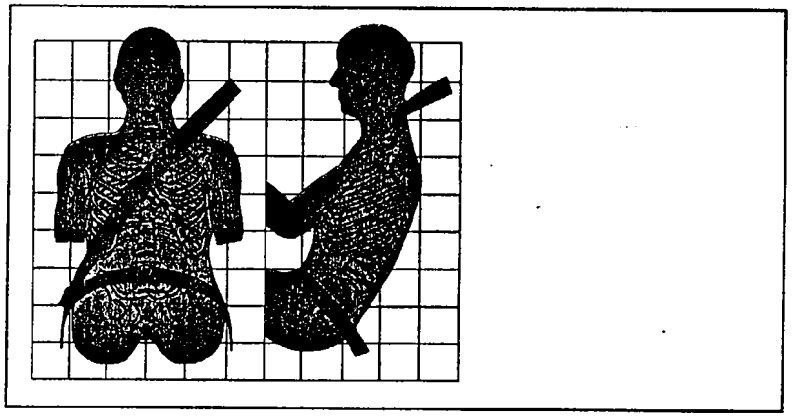
For all models except the Cab and Chassis, if the belt stops before it reaches the buckle, tilt the latch plate and keep pulling until you can buckle the belt.

If the belt isn't long enough, see "Safety Belt Extender" at the end of this section.

Make sure the release button on the buckle faces upward or outward so you would be able to unbuckle it quickly if you ever had to.

AN120171 AN120175

5. For all models except the Cab and Chassis, to make the lap belt tight, pull down on the buckle end of the belt as you pull up on the shoulder belt.

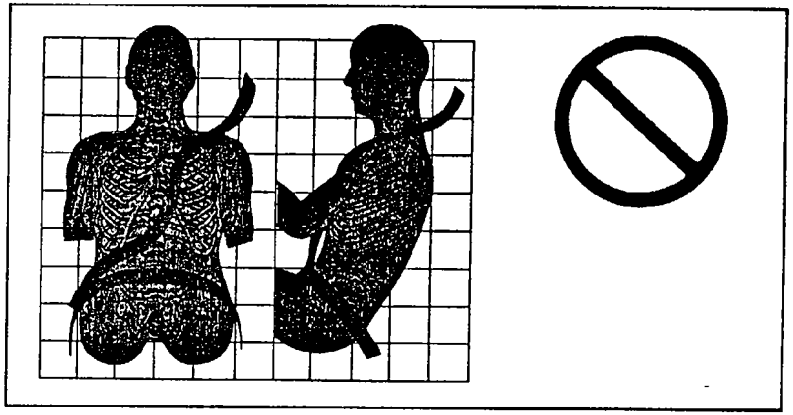


AM120007

The lap part of the belt should be worn low and snug on the hips, just touching the thighs. In a crash, this applies force to the strong pelvic bones. And you'd be less likely to slide under the lap belt. If you slid under it, the belt would apply force at your abdomen. This could cause serious or even fatal injuries. The shoulder belt should go over the shoulder and across the chest. These parts of the body are best able to take belt restraining forces.

The safety belt locks if there's a sudden stop or a crash.

Q: What's wrong with this?



AM120015

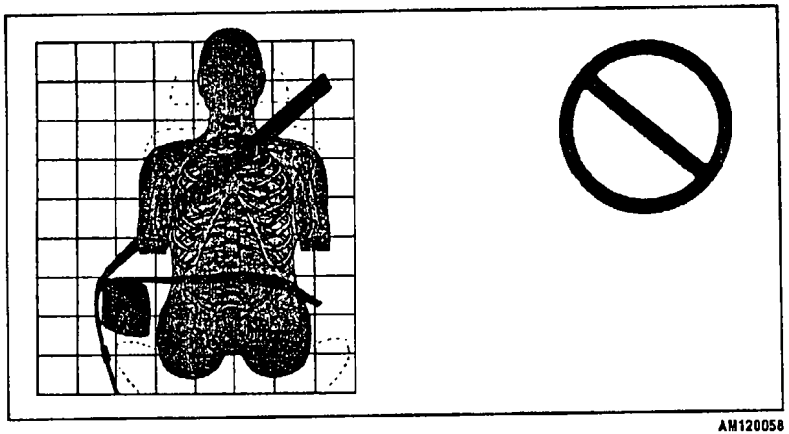
A: The shoulder belt is too loose. It won't give nearly as much protection this way.

Seats and Safety Belts

CAUTION

You can be seriously hurt if your shoulder belt is too loose. In a crash you would move forward too much, which could increase injury. The shoulder belt should fit against your body.

Q: What's wrong with this?



AM120058

A: The belt is over an armrest.

CAUTION

You can be seriously injured if your belt goes over an armrest like this. The belt would be much too high. In a crash, you can slide under the belt. The belt force would then be applied at the abdomen, not at the pelvic bones, and that could cause serious or fatal injuries. Be sure the belt goes under the armrests.

C-7

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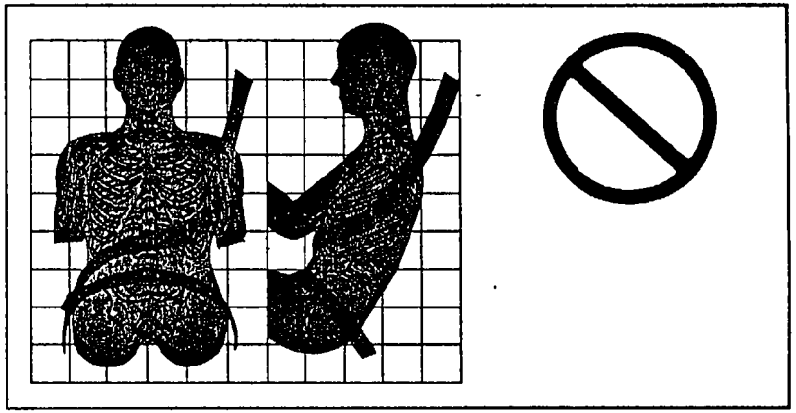
Q: What's wrong with this?



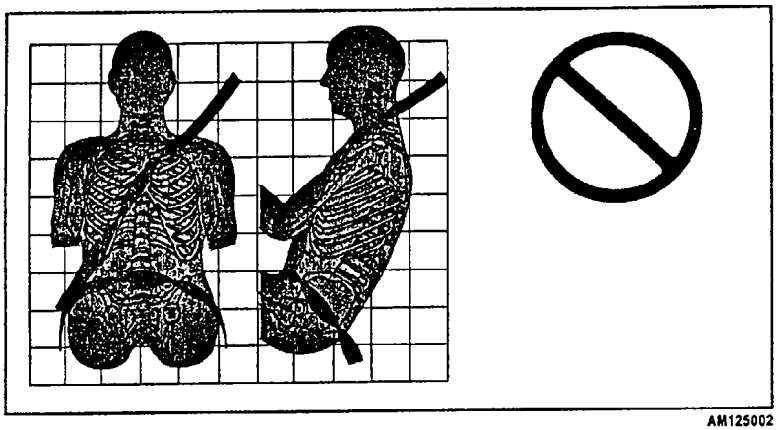
AM125001

A: The shoulder belt is worn under the arm. It should be worn over the shoulder at all times.

CAUTION

You can be seriously injured if you wear the shoulder belt under your arm. In a crash, your body would move too far forward, which would increase the chance of head and neck injury. Also, the belt would apply too much force to the ribs, which aren't as strong as shoulder bones. You could also severely injure internal organs like your liver or spleen.

Q: What's wrong with this?



AM125002

A: The belt is twisted across the body.

CAUTION

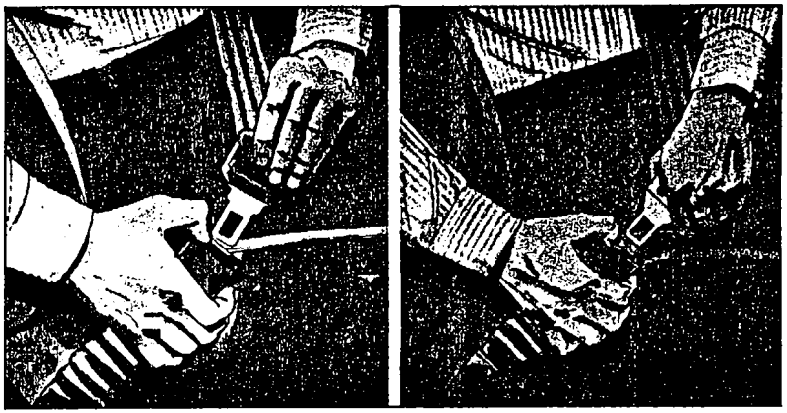
⚠ You can be seriously injured by a twisted belt. In a crash, you wouldn't have the full width of the belt to take impact forces. If a belt is twisted, make it straight so it can work properly, or ask your dealer to fix it.

To unlatch the belt, just push the button on the buckle. The belt should go back out of the way.

C-8

8056-15

Van *Cab and Chassis*

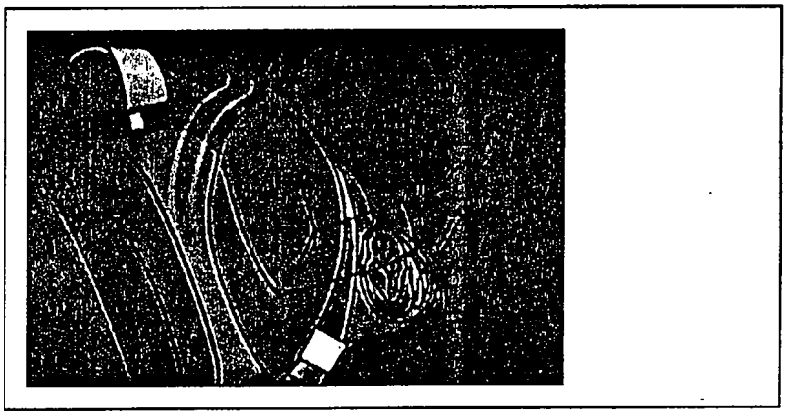


AN120177 AN120055

Before you close the door, be sure the belt is out of the way. If you slam the door on it, you can damage both the belt and your vehicle.

Safety Belt Use During Pregnancy

Safety belts work for everyone, including pregnant women. Like all occupants, they are more likely to be seriously injured if they don't wear safety belts. A pregnant woman should wear a lap-shoulder belt and the lap portion should be worn as low as possible throughout the pregnancy.

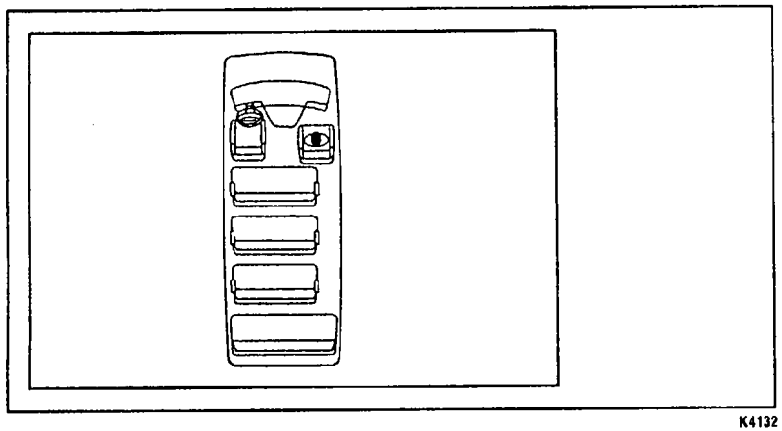


AM135001

The best way to protect the fetus is to protect the mother. When a safety belt is worn properly, it's more likely that the fetus won't be hurt in a crash. For pregnant women, as for anyone, the key to making safety belts effective is wearing them properly.

Seats and Safety Belts

Right Front Passenger Position

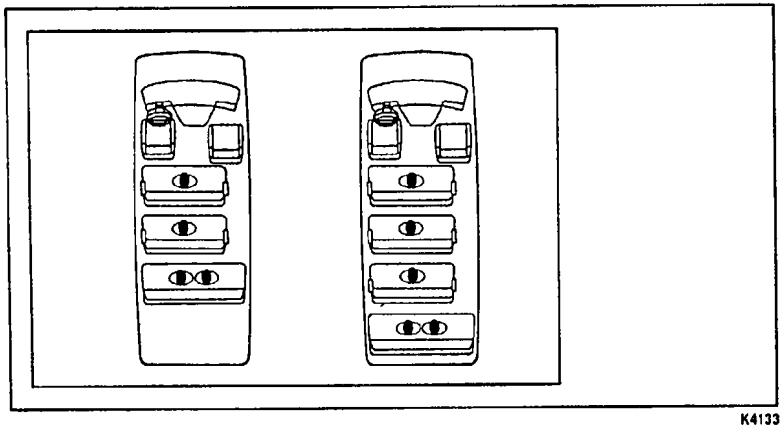


K4132

The right front passenger's safety belt works the same way as the driver's safety belt. See "Driver Position," earlier in this section.

If you have the Cab and Chassis, when the lap portion of the belt is pulled out all the way, it will lock. If it does, let it go back all the way and start again.

Center Passenger Position (Bench Seat)

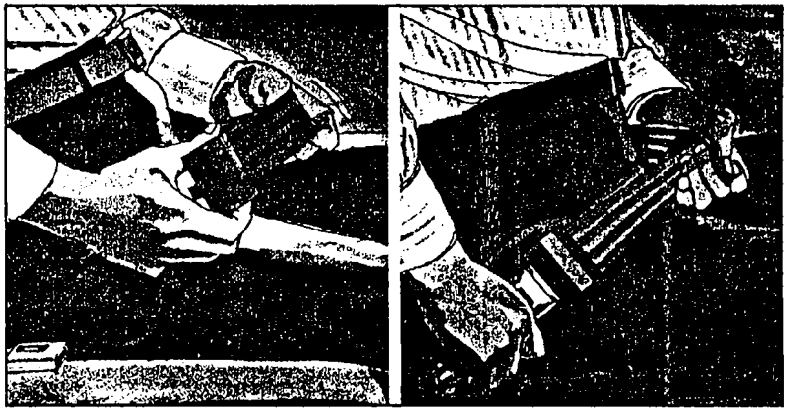


K4133

If your vehicle has rear bench seats, someone can sit in the center positions.

C-9

8056-15



AM145017 AM145027

When you sit in a center seating position, you have a lap safety belt, which has no retractor. To make the belt longer, tilt the latch plate and pull it along the belt.

To make the belt shorter, pull its free end as shown until the belt is snug. Buckle, position and release it the same way as the lap part of a lap-shoulder belt. If the belt isn't long enough, see "Safety Belt Extender" at the end of this section. Make sure the release button on the buckle faces upward or outward so you would be able to unbuckle it quickly if you ever had to.

Rear Seat Passengers

It's very important for rear seat passengers to buckle up! Accident statistics show that unbelted people in the rear seat are hurt more often in crashes than those who are wearing safety belts.

Rear passengers who aren't safety belted can be thrown out of the vehicle in a crash. And they can strike others in the vehicle who are wearing safety belts.