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TEST REPORT

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REPORT NO. 301-MSE-88-03-TR8001-03 KIA MOTORS COMPANY R8001-03

SAFETY COMPLIANCE TEST FOR
301-75
REAR IMPACT

1988 FORD FESTIVA

NHTSA NO. CJ0201

MOBILITY SYSTEMS AND EQUIPMENT COMPANY
9920 LA CIENGA BOULEVARD SUITE 708
INGLEWOOD, CALIFORNIA 90301



NOVEMBER 1988

FINAL REPORT

Prepared Under Contract No. DTNH22-88-D-01039

For

U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Vehicle Safety Compliance
400 Seventh Street, S.W.
Washington, DC 20590

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PREPARED BY: S. D. Pruitt

APPROVED BY: *Anil V. Khadlikar*

Dr. Anil V. Khadlikar

DATE: 11/17/88

FINAL REPORT ACCEPTED BY:

R. Shannon
Contracting Officer Technical Representative
Office of Vehicle Safety Compliance

11/17/89
Date

Technical Report Documentation Page

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SECTION 1

INTRODUCTION

This report presents information on tests conducted on a 1988 Ford Festiva NHTSA No. CJO201 to determine compliance with the requirements of FMVSS 301-75 Rear Impact testing. All tests were conducted in accordance with the National Highway Traffic Safety Administration (NHTSA) Office of Vehicle Safety Compliance (OVSC) Laboratory Procedure TP-301-75-02 (Rear) and the corresponding Mobility Systems and Equipment Company Test Procedure MSE-TP-301-75-02 dated August 1988, which is approved by NHTSA officials.

Section 2 of the report describes the test procedure and presents the summary data. Section 3 of the report shows all the test results.

No test failures related to FMVSS 301-75 (Rear) were identified for the 1988 Ford Festiva.

SECTION 2

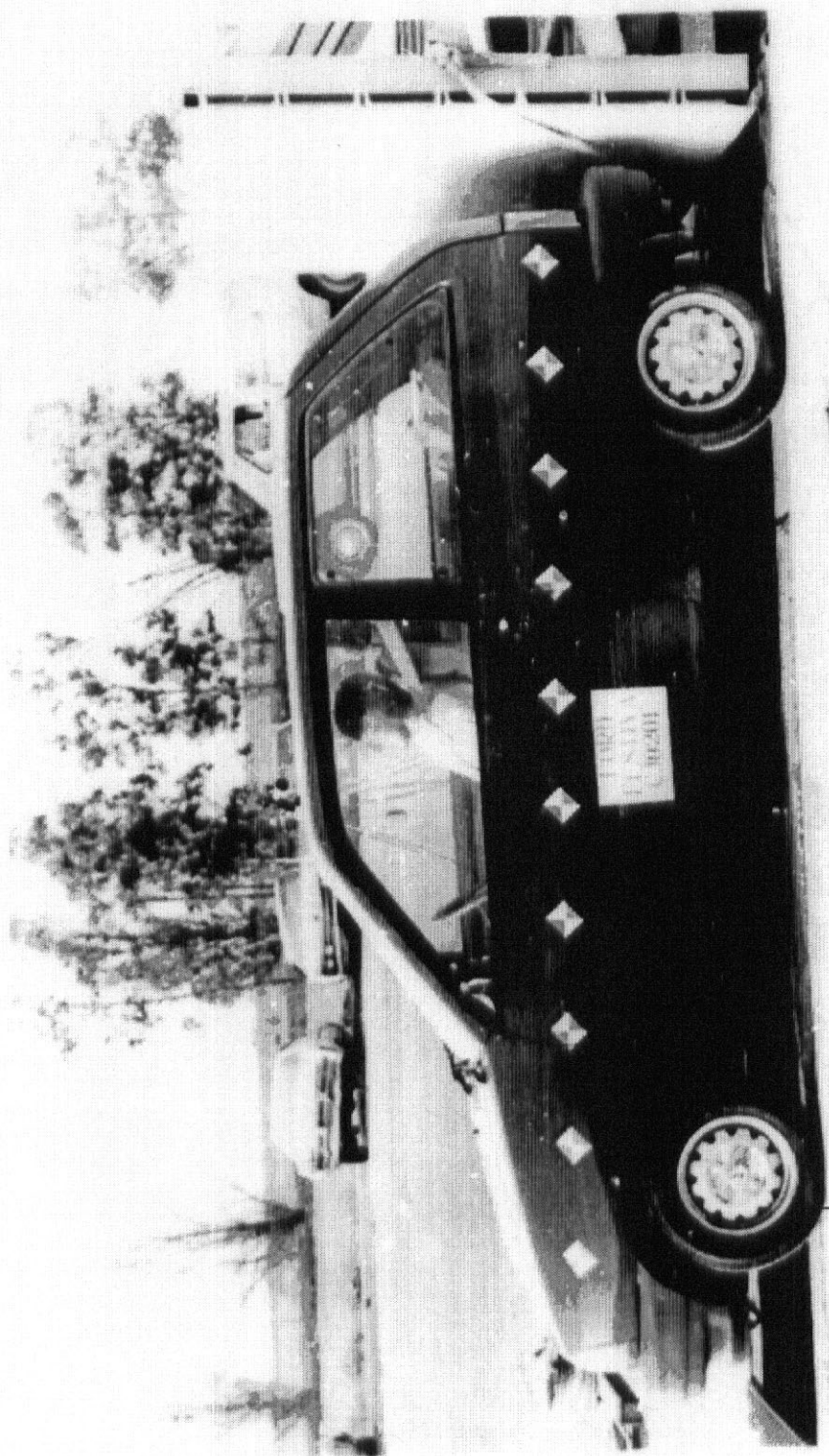
TEST PROCEDURE AND SUMMARY DATA

The 1988 Ford Festiva NHTSA No. CJ0201 was subjected to FMVSS 301-75 Rear testing on 06 October 1988. The vehicle is shown in pretest condition in Figures 2-1 to 2-4. Manufacturer's and tire placard labels are shown in Figures 2-5 and 2-6.

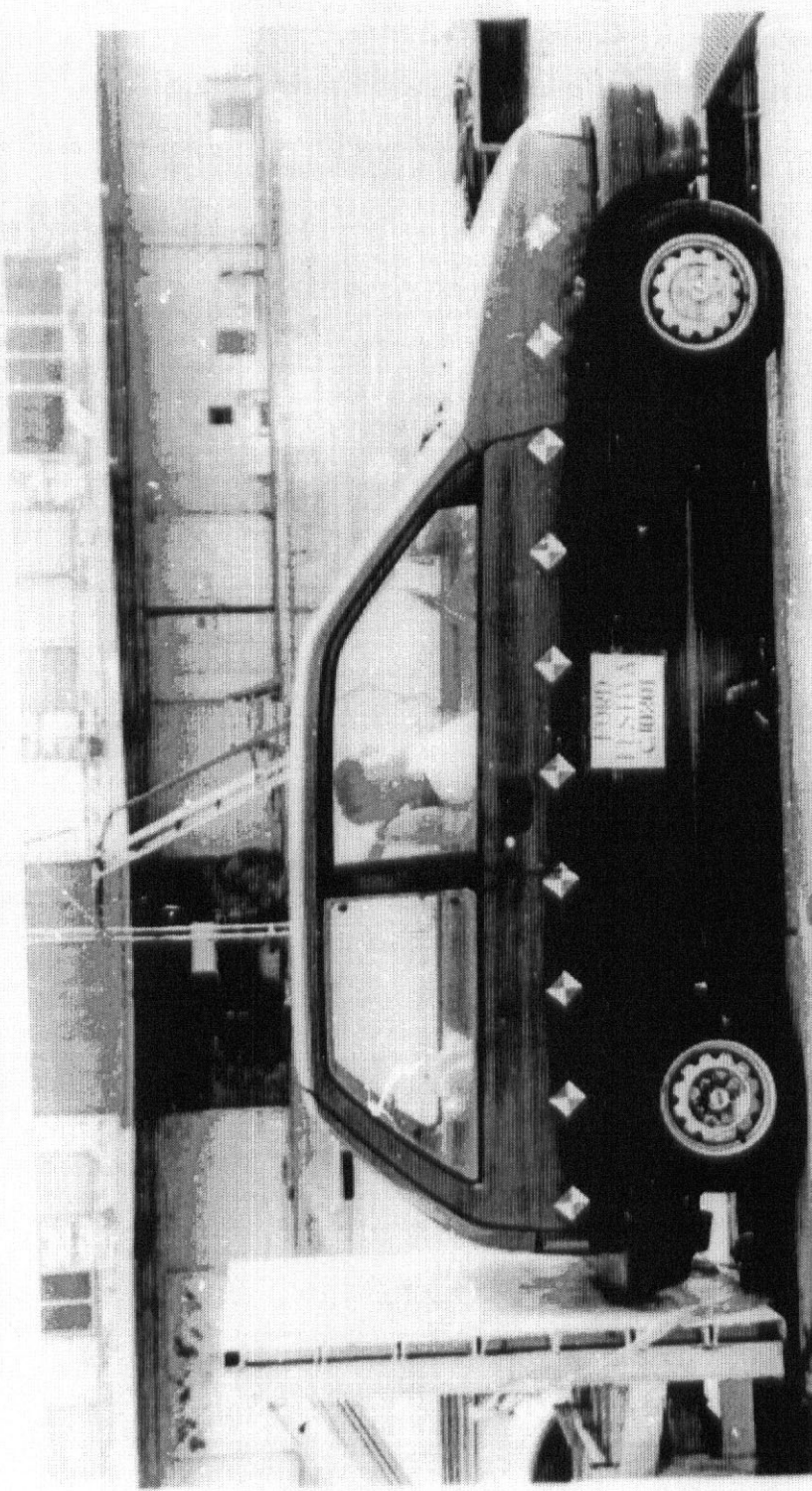
The vehicle was inspected, measured, weighed, marked, photographed and tested in accordance with the procedure requirements. A triaxial accelerometer was mounted at the vehicle c.g. to measure the acceleration characteristics of the vehicle during impact. The triaxial accelerometer is shown in Figure 2-7 mounted in the test vehicle. Two part 572 dummies were installed in the vehicle in the driver and right front passenger positions.

High speed cameras were setup as required in the test procedure. The camera positions for the FMVSS 301-75 Rear test are as shown in Figure 2-8. Position descriptions are presented in Table 2-1. All high speed cameras were set to run at a minimum of 500 frames per second, the test vehicle was checked for fuel system leaks for a twenty-five minute period after the initial impact and for successive 5 to 8 minutes periods afterwards at 90°, 180°, 270°, and 360° roll-over attitudes.

The test velocity of the impact sled was 29.89 mph. The 1988 Ford Festiva NHTSA No. CJ0201 had no fuel system leaks and appears to have passed all requirements of the FMVSS 301-75 Rear.







FORD MUSTANG CHEROKEE

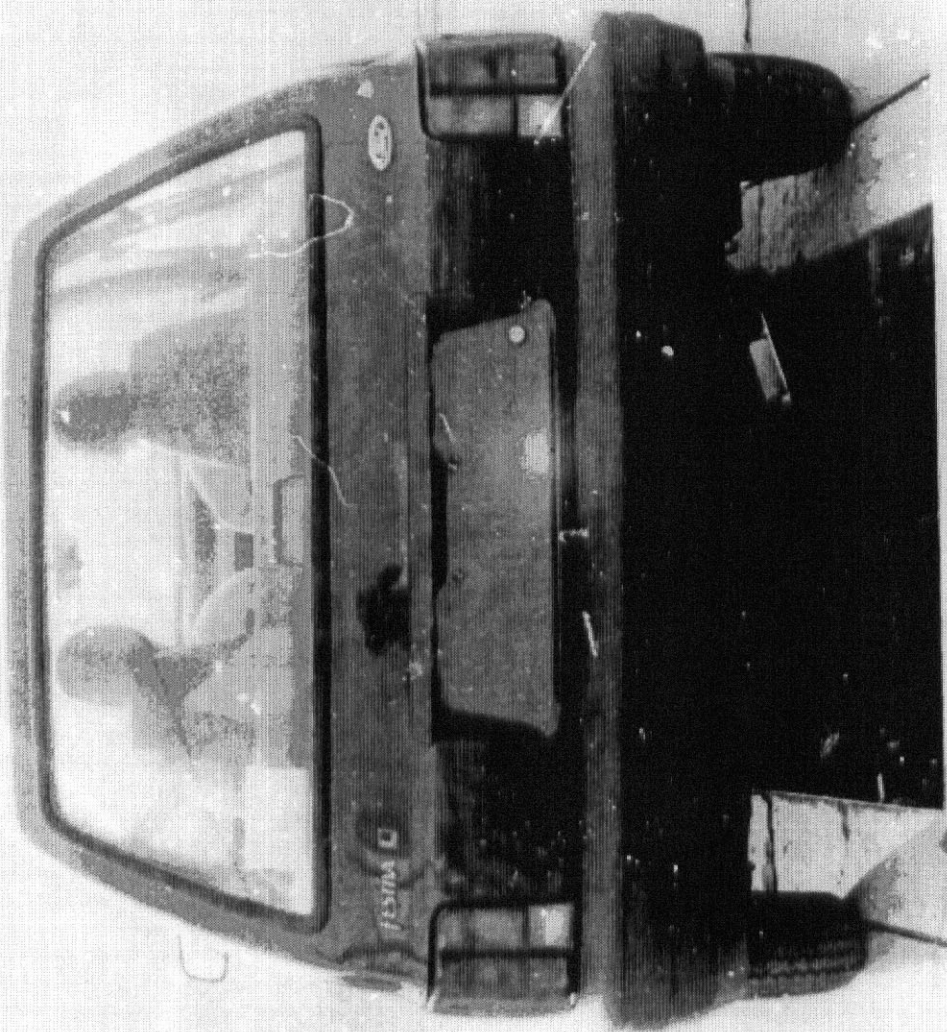
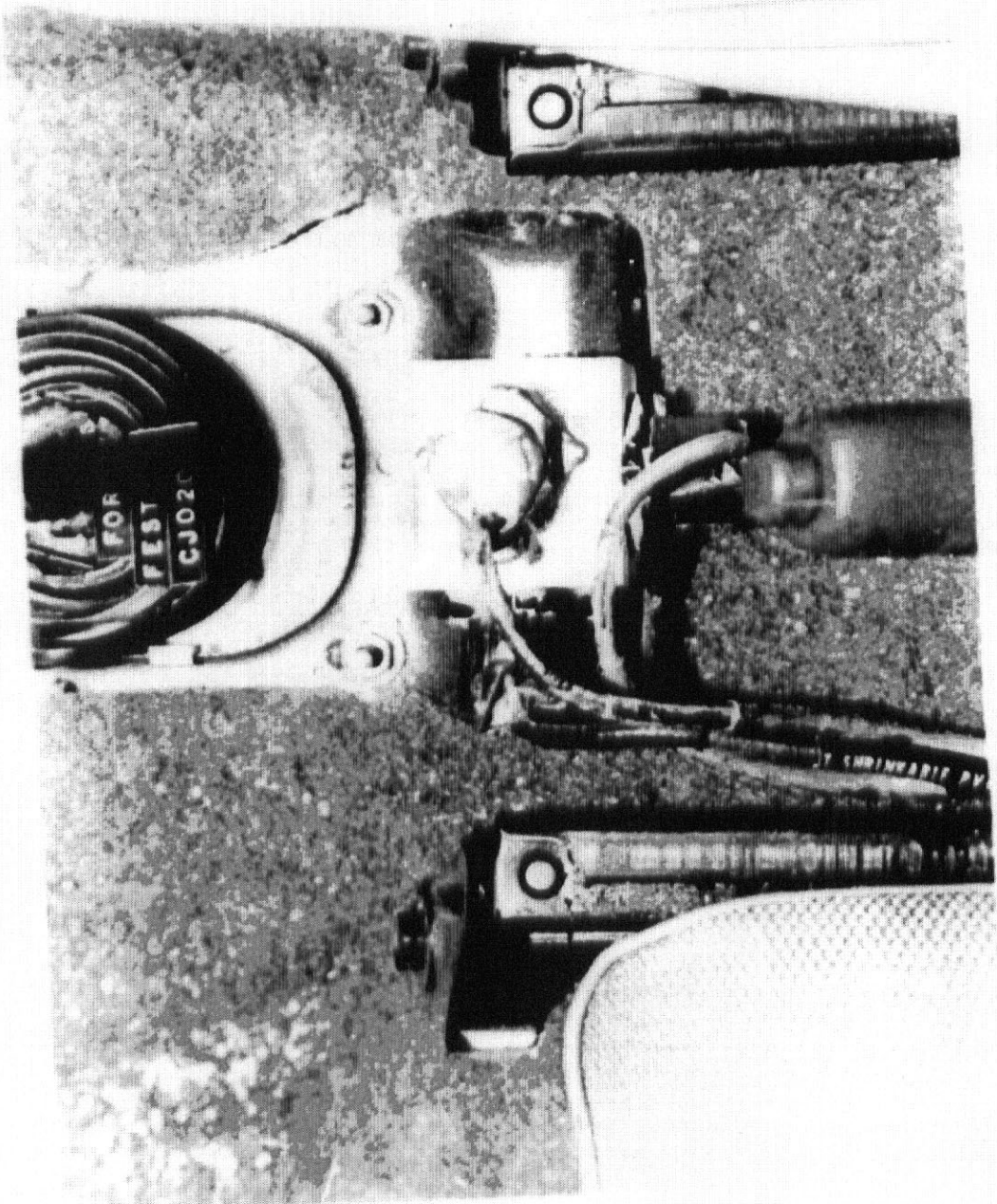


FIGURE 2-4 FULL REAR VIEW - PRESENT



NOTE: The concrete surface upon which the vehicle is tested is level, rigid and of uniform construction. **DO NOT PLACE VEHICLE ON PIT STEEL GRATING.**

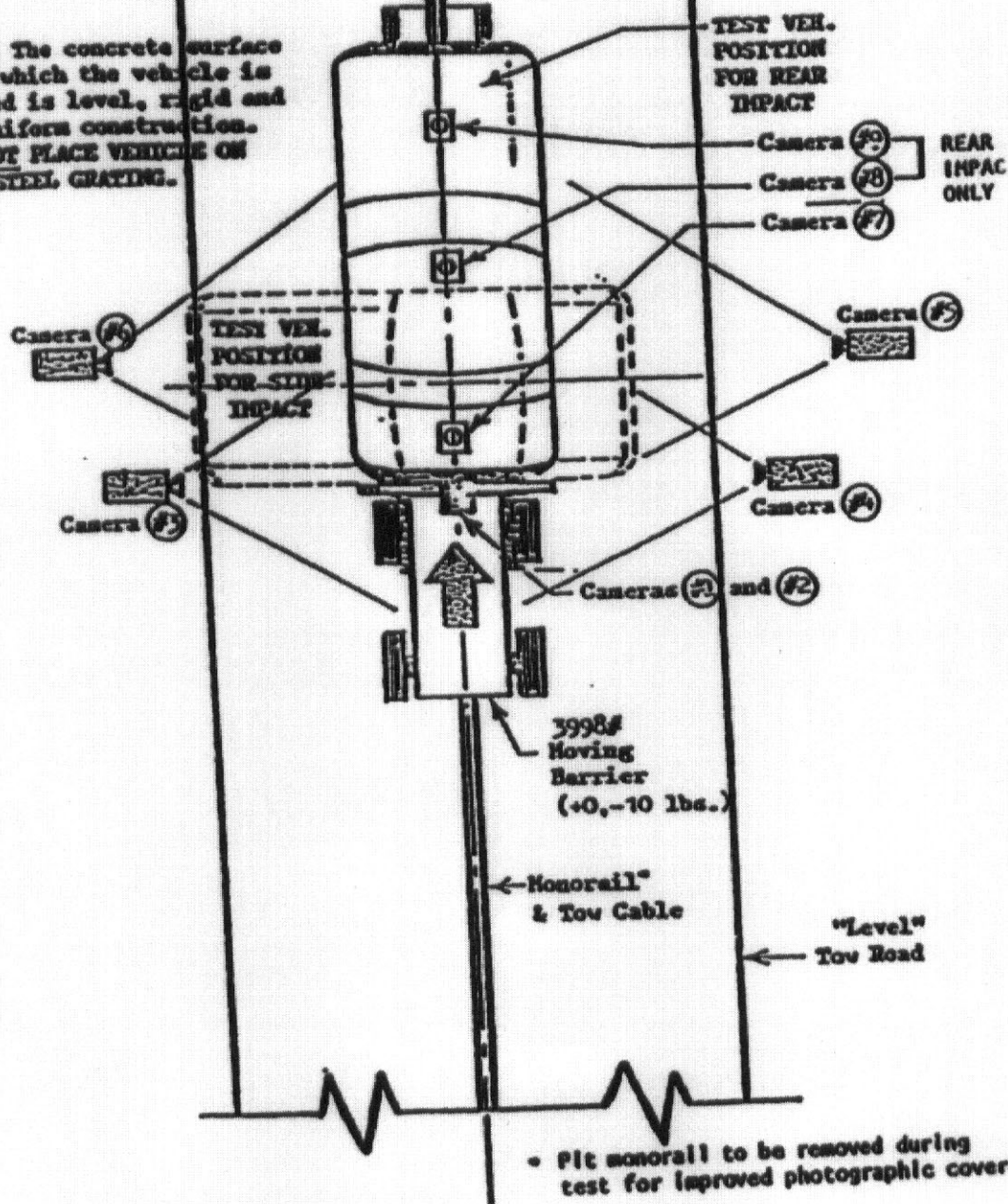


FIGURE 2-8 CAMERA POSITIONS FOR 301-75 (REAR)

TABLE 2-1 CAMERA LOCATION FOR FIGURE 1 (REAR) FOR STANDARD FMVSS 301-75

LOCATION	CAMERA NUMBER	DESCRIPTION
Overhead	1	A high speed camera will be moving barrier showing the front face of the barrier contacting the test vehicle.
	2	A second high speed camera will be suspended over the impact area to record the entire impact event.
Surface	3 & 4	Side views of event using high speed cameras. The view should concentrate on recording fuel system leakage.
	5	A "real time" (24 fps) camera will follow the moving barrier down the track and through the impact.
	6	A handled "real time" camera will be available to photograph any fuel system fluid leakage and its collection.
Pit	7	A high speed camera will be placed beneath the fuel tank area to record the entire impact event.
	8	A second high speed camera will be placed approximately six feet from Camera 7 to record barrier/vehicle interaction.
	9	A third high speed camera may be placed six feet from Camera 8 for continued coverage of the impact event.

SECTION 3

COMPLIANCE TEST RESULTS

The results of the FMVSS 301-75 Rear compliance tests on the 1988 Ford Festiva, NHTSA No. CJ0201 are presented in this section.

The test vehicle was inspected on receipt. Vehicle pretest information, delivered and test weights and attitudes, fitted tires and pressures, and fuel system capacities were recorded and are presented in Table 3-1. The location of the triaxial accelerometer mounted in the test vehicle is given in Table 3-2.

The test velocity of the rear impact sled was 29.89 mph. Test velocity information and posttest crush details are given in Table 3-3. Posttest left side, front, right side, and rear views of the test vehicle are given in Figure 3-1 to 3-4.

No solvent leaked from any part of the vehicle's fuel system during impact or for approximately 30 minutes after the impact event. The vehicle was then placed on the static rollover machine and rotated to the 90°, 180°, 270° and 360° positions successively at the required time intervals. No fuel system leaks were detected at any of the rollover positions. The details of the rollover test sequence and fuel spillage details are presented in Table 3-4. Pre and posttest views of the underbody fuel system components are shown in Figures 3-5 to 3-7.

The acceleration of the test vehicle due to the impact was measured by a triaxial accelerometer placed at the approximate vehicle c.g. Plots of acceleration versus time for the x, y, and z vehicle axes and resultant acceleration shown in Figures 3-8 to 3-11.

TABLE 3-1 TEST VEHICLE INFORMATION

Vehicle Manufacturer: KIA MOTORS CO.
 Make/Model: FORD/FESTIVA
 Body Style: 2-DOOR HATCHBACK Model Year: 1988
 VIN: KNJBTO6K4J6118749 Build Date: 06/87
 NHTSA No.: CJ0201 Colors: RED
 Engine Data: 4 Cylinders: 79.3 in³ / cc Displacement
 Transmission Data: 4 Speed (X) Manual / () Automatic
 Date Vehicle Received by Laboratory: 07/28/88

DATA FROM CERTIFICATION LABEL ON LEFT DOOR REAR FACE OR 'B' POST

Vehicle Manufactured By: KIA MOTORS COMPANY
 Date of Manufacturer: 06/87 VIN: KNJBTO6K4J6118749
 GVWR: 2505 lbs. GAWR: Front = 1390 lbs. Rear = 1170

DATA FROM "RECOMMENDED TIRE PRESSURE" LABEL ON DOOR, POST, GLOVE BOX ETC.

Vehicle Load: FRONT REAR RECOMMENDED TIRE SIZE: LOAD RANGE
 Up to Capacity 32 psi 32 psi 145/SR12 B C D

Vehicle Capacity:

Type of Seats - X Bench
X Bucket
 Split Bench
 CARGO LOAD = 80 lbs
 TOTAL = 680 lbs

Number of Occupants = 2 Front
 (Designated Seating 2 Rear
 Capacity) 4 Total

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (with max. fluids):

Right Front = 545 lbs Right Rear = 287 lbs
 Left Front = 548 lbs Left Rear = 313 lbs
 TOTAL FRONT WEIGHT = 1093 lbs (64.6% of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 600 lbs (35.4% of Total Vehicle Weight)
 TOTAL DELV. WEIGHT = 1693 lbs

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 80 lbs. CARGO:

Right Front = 652 lbs Right Rear = 410 lbs
 Left Front = 658 lbs Left Rear = 381 lbs
 TOTAL FRONT WEIGHT = 1310 lbs (62.4% of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 791 lbs (37.6% of Total Vehicle Weight)
 TOTAL TEST. WEIGHT = 2101 lbs
 Weight of ballast secured in vehicle trunk area = 80 lbs

TOTAL CONDITIONS:

Date of Test: 10/06/88 Time of Test: 10:30 (am) / pm
 Ambient Temperature: 70 °F at impact area.
 Temp. in Occ. Comp.: 70 °F; W/Shld. Mldg. Temp.: 70 °F.

TABLE 3-1 TEST VEHICLE INFORMATION (Cont'd)

VEHICLE ATTITUDE (all dimensions in inches)

Delivered Attitudes: RF 24.4 LF 24.2 RR 25.5 LR 25.0
 Test Attitudes: RF 22.8 LF 22.8 RR 22.3 LR 22.5

VEHICLE TIRE DATA

Recommended Cold Tire Pressures: Front = 32 psi
 Rear = 32 psi
 Recommended Tire Size: 145/SR12
 Load Range: B
 Tire on Vehicle: MICHELAN P185/70R14
 Is Spare Tire a "Space Saver": YES (yes/no)
 Is Spare Tire Standard Equipment: YES (yes/no)

TEST FLUID DATA

Test Fluid Type: Red Stoddard Solvent Spec Grav.: 0.764
 Test Volume: 8.75 Gallons (92 to 94% of Man. Cap.)
 Fuel System Capacity (data from Owner's Manual): 9.46 gal.
 Details of Fuel System: Fuel tank is mounted forward of the spare tire compartment. There is a frame rail separating the tire compartment and fuel tank. The filler neck is on driver's side and it feeds directly down to the tank.
 Electric Fuel Pump X Yes No; Fuel Injection: X Yes No
 Does electric fuel pump operate with ignition switch "on" and the engine not operating: X Yes No

VEHICLE REBOUND AND CRUSH

Overall Length of Test Vehicle: Pretest = R 177.2 in
 Crush = R 12.4 Posttest = R 164.8 in
 FOR FRONTAL IMPACTS, distance from front of test vehicle to the barrier after impact = N/A inches

* With entire fuel system filled from fuel tank through carburetor bowl.

TEST ENGINEER: S.D. PRUITT

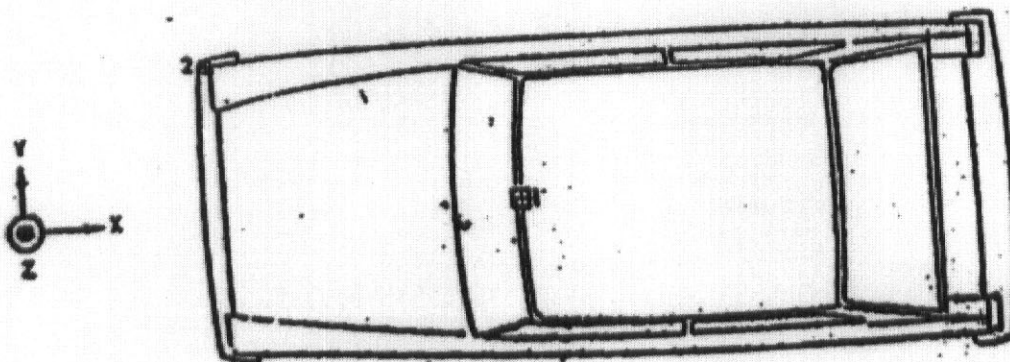
TECHNICIAN: P. PUZZUTO/T. KIPPEN

amh
 Signature of Approving Laboratory Official

11/17/88
 Date

TABLE 3-2 ACCELEROMETER LOCATIONS

Vehicle: 1988 FORD FESTIVA **Test Date:** 10/06/88

[illegible]

① - Single Axis
② - Triaxial

TEST VEHICLE MAKE FORD FESTIVA
NHTSA NO.: CJ0201
VIN: KNJBTO6K4J6118749
TEST ENGINEER: S. D. PRUITT TECHNICIAN: P. PUZZUTO

Signature of Laboratory Approving Official

11/17/84
Date

TABLE 3-3 POST IMPACT DATA STANDARD 3-1-75 REAR IMPACT

TYPE OF TEST: Frontal (90°) Impact
Oblique ()° Impact on Left (Driver's) Side
Right Side
Lateral or Side Impact on Left (Driver's) Side
Right Side
X Rear Impact

DATE OF TEST: 10/06/88 TIME: 10:30 AM TEMP.: 70 °F

VEH. NHTSA NO.: CJ0201 VIN: KNJBT06K4J6118749

REQUIRED VEH. VELOCITY RANGE: 28.9 to 29.9 MPH

IMPACT VELOCITY: (traps within 5 feet of impact event)

Trap #1 = 29.89 mph; Trap #2 = 29.85 mph

Distance from the vehicle's front bumper to the barrier face
entering the vehicle velocity measurement device = 6.0 ft
exiting the vehicle velocity measurement device = 2.0 ft

VEHICLE STATIC CRUSH:

Driver's Side = 12.4 in Passenger's Side = 10.1 in
Average = 11.1 inches

Crush Details:

Hatchback lid and rear tire carrier area are badly deformed.
Back and rear side windows are all shattered. Rear seats
were pushed rearwards and broken off the adjustment tracks.
Fuel tank and filler neck appear to be undamaged in any way.

TEST ENGINEER: S. D. PRUITT TECHNICIAN: P. PUZZUTO/T. KIPPEN

and 11/17/88

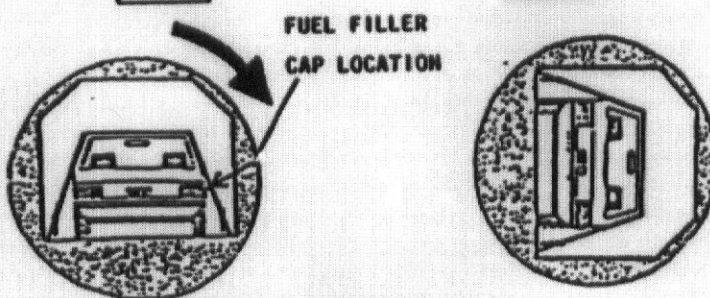
TABLE 3-4 FMVSS 301-75 STATIC ROLLOVER DATA SHEET

TEST VEHICLE NHTSA NO. CJ0201 TEST DATE 10/06/88
 VEH. MFR/MAKE/MODEL 1988/FORD/PESTIVA/2-DOOR HATCHBACK

TEST PHASE:

0

90



FUEL FILLER
CAP LOCATION

NOTE: IF SIDE
FILL ROTATE SO
FILLER CAP IS DOWN

I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time -- = 1 minutes 20 seconds
 (Spec. Range = 1 to 3 minutes)

FMVSS 301-75 Position Hold Time -- = 5 minutes 00 seconds

TOTAL ----- = 6 minutes 20 seconds

Next Whole Minute Interval ----- = 7 minutes

II. FMVSS 301-75 REQUIREMENTS:
 (1) Time Period--

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

(2) Maximum Allowable Solvent Spillage --

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE

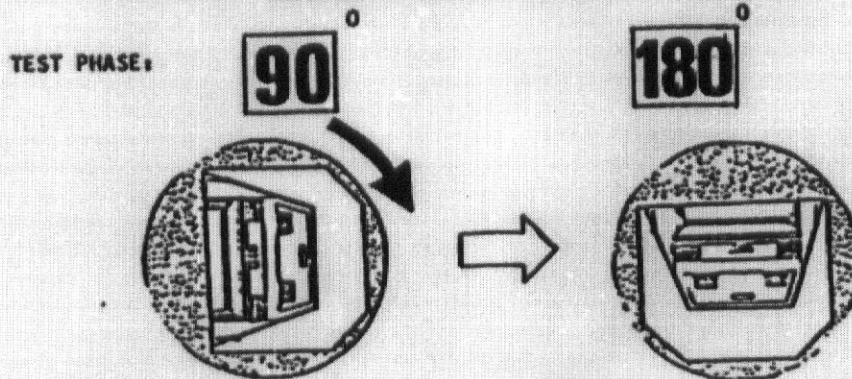
0 ounces	0 ounces	0 ounces	N/A
----------	----------	----------	-----

NOTE: Record spillage
for whole minute
intervals only as
determine above.

IV. SOLVENT SPILLAGE LOCATION(S):
 NONE.

TABLE 3-4 FMVSS 301-75 STATIC ROLLOVER DATA SHEET (Cont'd)

TEST VEHICLE NHTSA NO. CJ0201 TEST DATE 10/06/88
 VEH. MFR/MAKE/MODEL 1988/FORD/FESTIVA/2-DOOR HATCHBACK



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time --- minutes seconds
 (Spec. Range = 1 to 3 minutes) 1 20

FMVSS 301-75 Position Hold Time --- minutes seconds
5 00

TOTAL --- minutes seconds
6 20

Next Whole Minute Interval --- minutes
7

II. FMVSS 301-75 REQUIREMENTS:

(1) Time Period—

First 5 min. FROM onset of rotation	6th min.	7 min.	8th min. If red.
-------------------------------------	----------	--------	---------------------

(2) Maximum Allowable Solvent Spillage ---

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE

0 ounces	0 ounces	0 ounces	N/A
----------	----------	----------	-----

NOTE: Record spillage for whole minute intervals only as determine above.

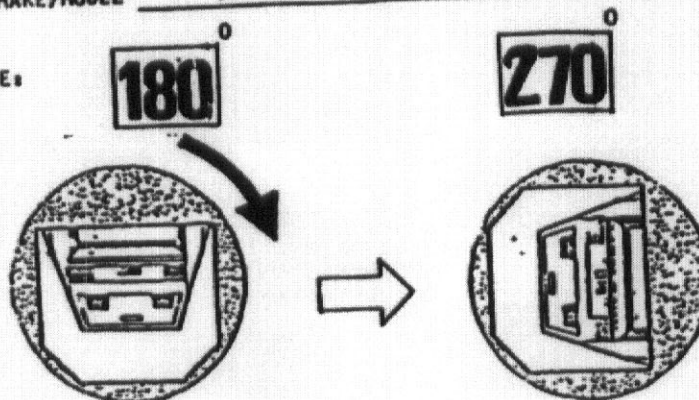
IV. SOLVENT SPILLAGE LOCATION(S):

NONE.

TABLE 3-4 FMVSS 301-75 STATIC ROLLOVER DATA SHEET (Cont'd)

TEST VEHICLE NHTSA NO. CJ0201 TEST DATE 10/06/88
 VEH. MFR/MAKE/MODEL 1988/FORD/FESTIVA/2-DOOR HATCHBACK

TEST PHASE:



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time -- = 3 minutes 20 seconds
 (Spec. Range = 1 to 3 minutes)

FMVSS 301-75 Position Hold Time -- = 5 minutes 00 seconds

TOTAL ----- = 6 minutes 20 seconds

Next Whole Minute Interval ----- = 7 minutes

II. FMVSS 301-75 REQUIREMENTS:

(1) Time Period--

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

(2) Maximum Allowable Solvent Spillage --

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE

0 ounces	0 ounces	0 ounces	N/A
----------	----------	----------	-----

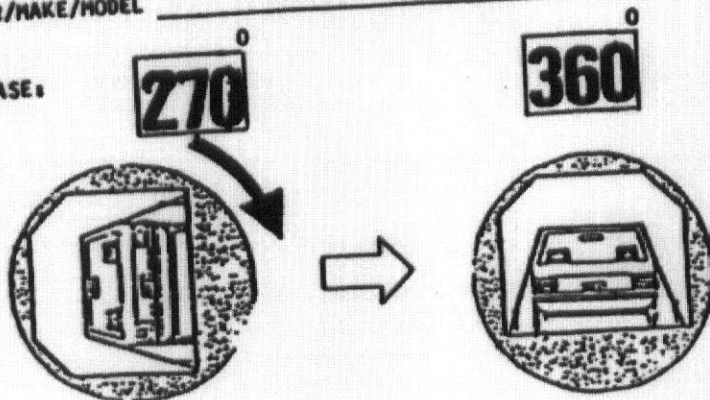
NOTE: Record spillage for whole minute intervals only as determine above.

IV. SOLVENT SPILLAGE LOCATION(S):

NONE.

TABLE 3-4 FMVSS 301-75 STATIC ROLLOVER DATA SHEET (Cont'd)
 TEST VEHICLE NHTSA NO. CJO201 TEST DATE 10/06/88
 VEH. MFR/MAKE/MODEL 1988/FORD/FESTIVA/2-DOOR HATCHBACK

TEST PHASE:



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time --- = 1 minutes 20 seconds
 (Spec. Range = 1 to 3 minutes)

FMVSS 301-75 Position Hold Time --- = 5 minutes 00 seconds

TOTAL --- = 6 minutes 20 seconds

Next Whole Minute Interval --- = 7 minutes

II. FMVSS 301-75 REQUIREMENTS:
 (1) Time Period—

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

(2) Maximum Allowable Solvent Spillage —

5 ounces	1 ounce	1 ounce	1 ounce

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE

0 ounces	0 ounces	0 ounces	N/A

NOTE: Record spillage for whole minute intervals only as determine above.

IV. SOLVENT SPILLAGE LOCATION(S):
 NONE.

TABLE 3-4 FMVSS 301-75 STATIC ROLLOVER DATA SHEET

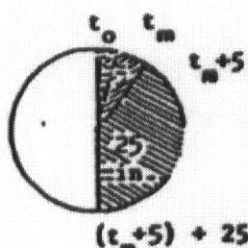
TEST VEHICLE NHTSA NO. CJ0201 TEST DATE 10/06/88
 VEH. MFR/MAKE/MODEL 1988/FORD/FESTIVA/2-DOOR HATCHBACK

Test vehicle fuel tank filled to 92 to 94% capacity with Stoddard Solvent and with electric fuel pump operating (if it will operate without engine operation. Part 572 test dummies located at each front designated seating position.

A. TEST VEHICLE IMPACT TYPE

- ☐ Frontal (35 mph)
☐ Oblique (35) with ☐° barrier face
 first contacting ☐ (driver/passenger) side
☒ Rear Moving Barrier (30 mph)
☐ Lateral Moving Barrier (20 mph)

FUEL SPILLAGE MEASUREMENT - - -



1. From impact until vehicle motion ceases - - - - -
2. For 5 minute period after veh. motion ceases - - -
3. For next 25 minutes - - -

ACTUAL	MAX. ALLOW.
0 oz.	1 oz.
0 oz.	5 oz.
0 oz.	1 oz./1 min.

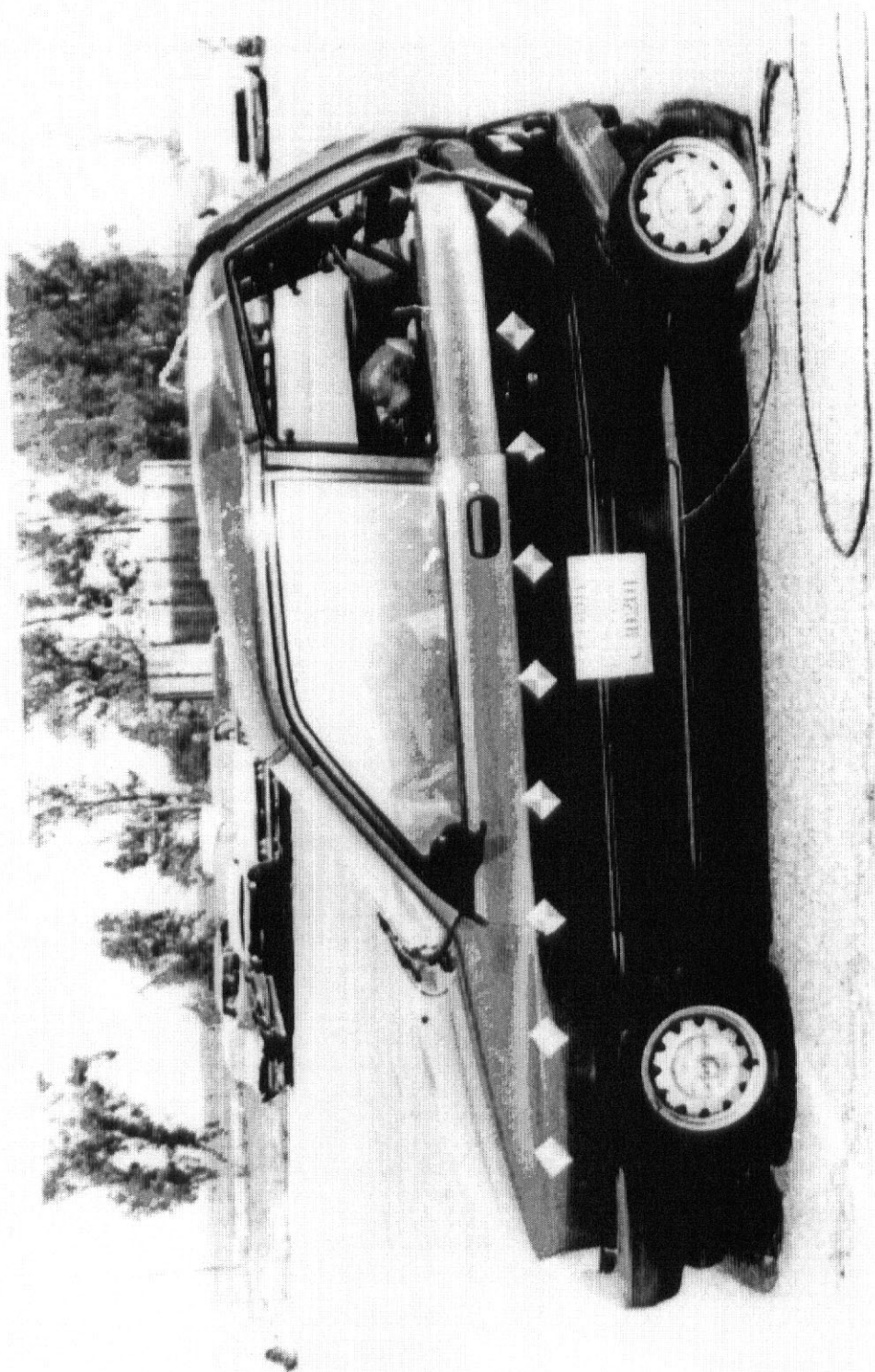
B. TEST VEHICLE STATIC ROLLOVER

DETAILED TEST RESULTS ARE RECORDED ON THE FOLLOWING DATA SHEETS:

- (1) Rollover data for 0° to 90° test phase.
- (2) Rollover data for 90° to 180° test phase.
- (3) Rollover data for 180° to 270° test phase.
- (4) Rollover data for 270° to 360° test phase.

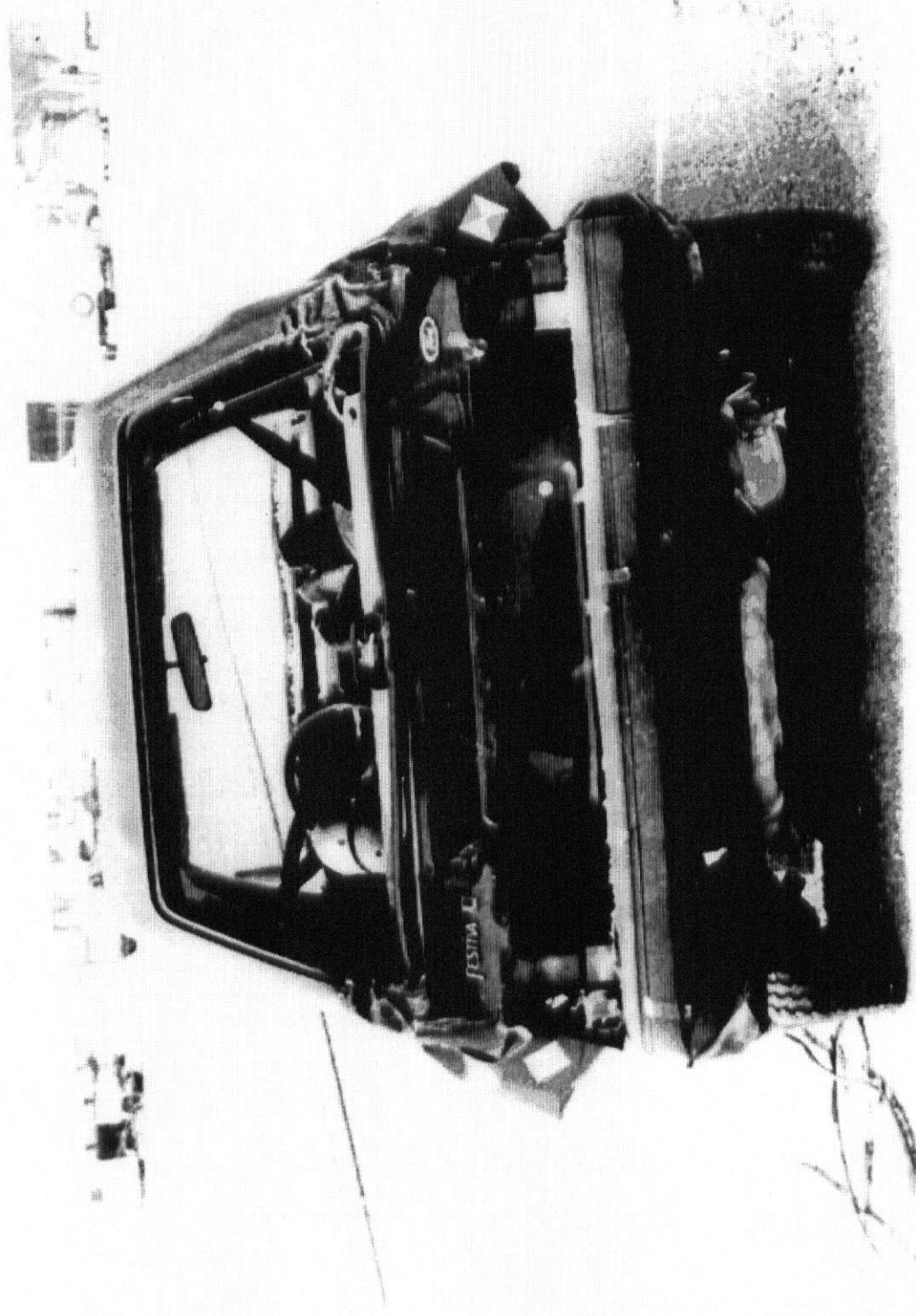
C. SOLVENT SPILLAGE DETAILS

No Spillage









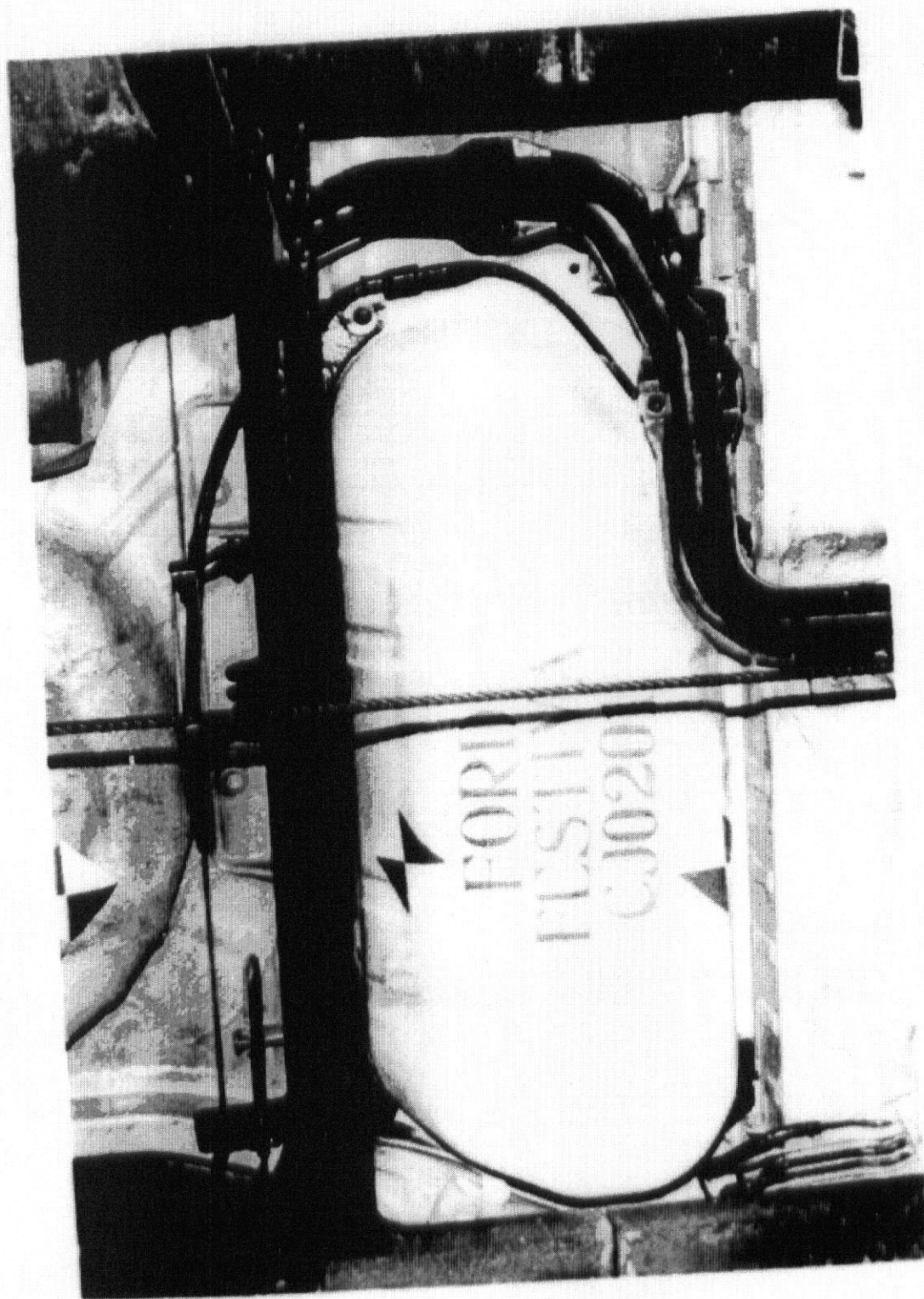


FIGURE 1. FORN - FCS11 - CJ020

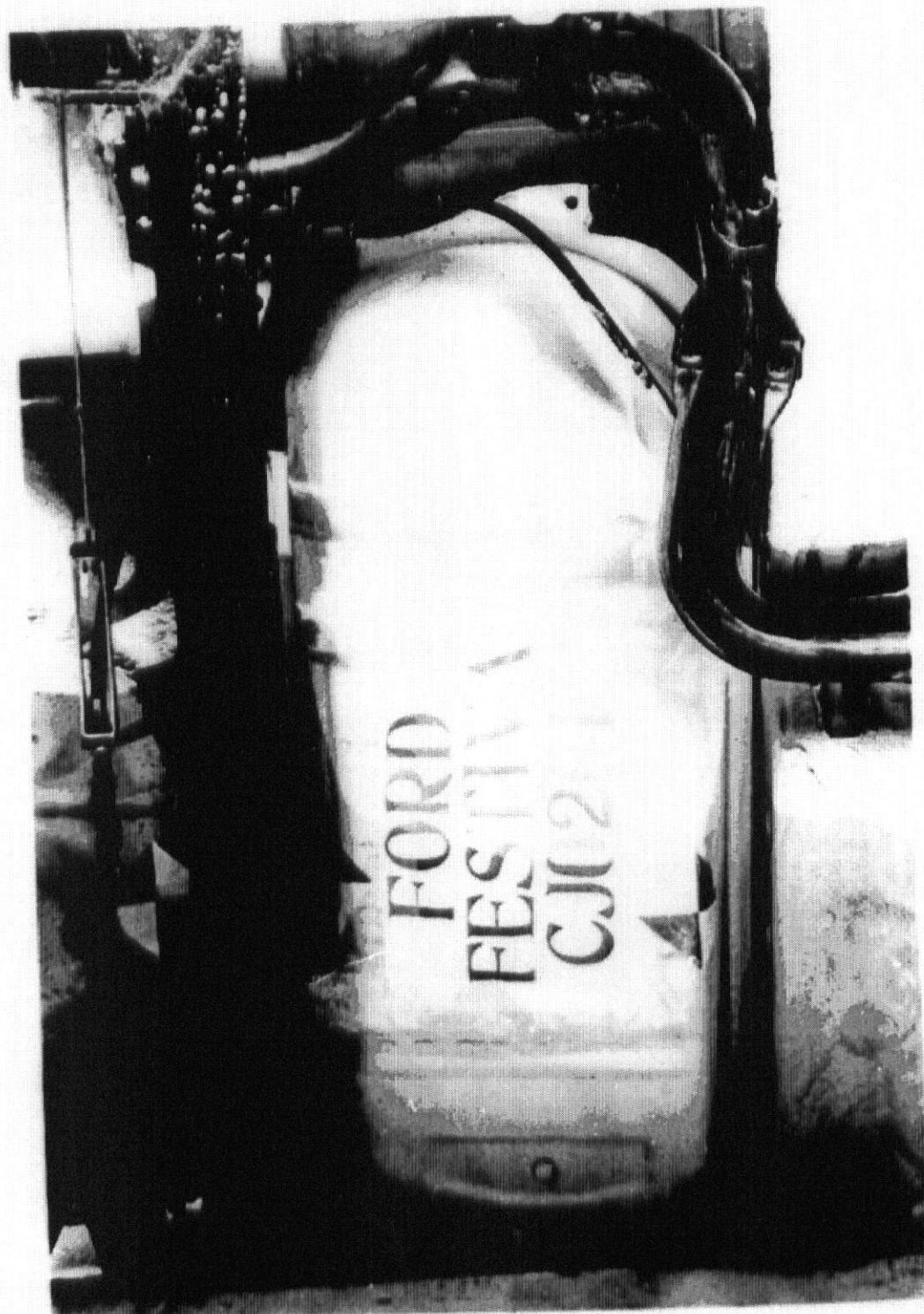
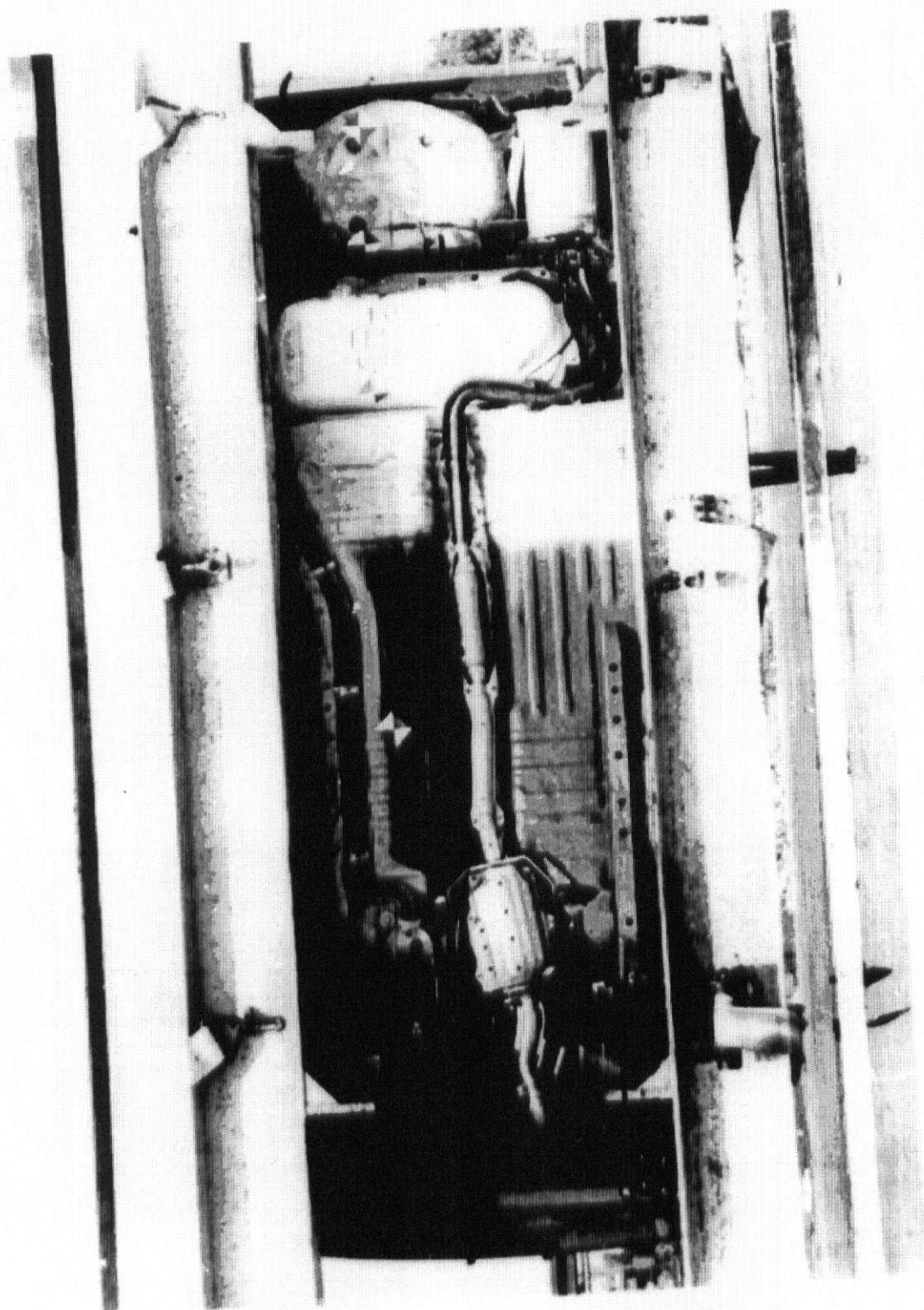
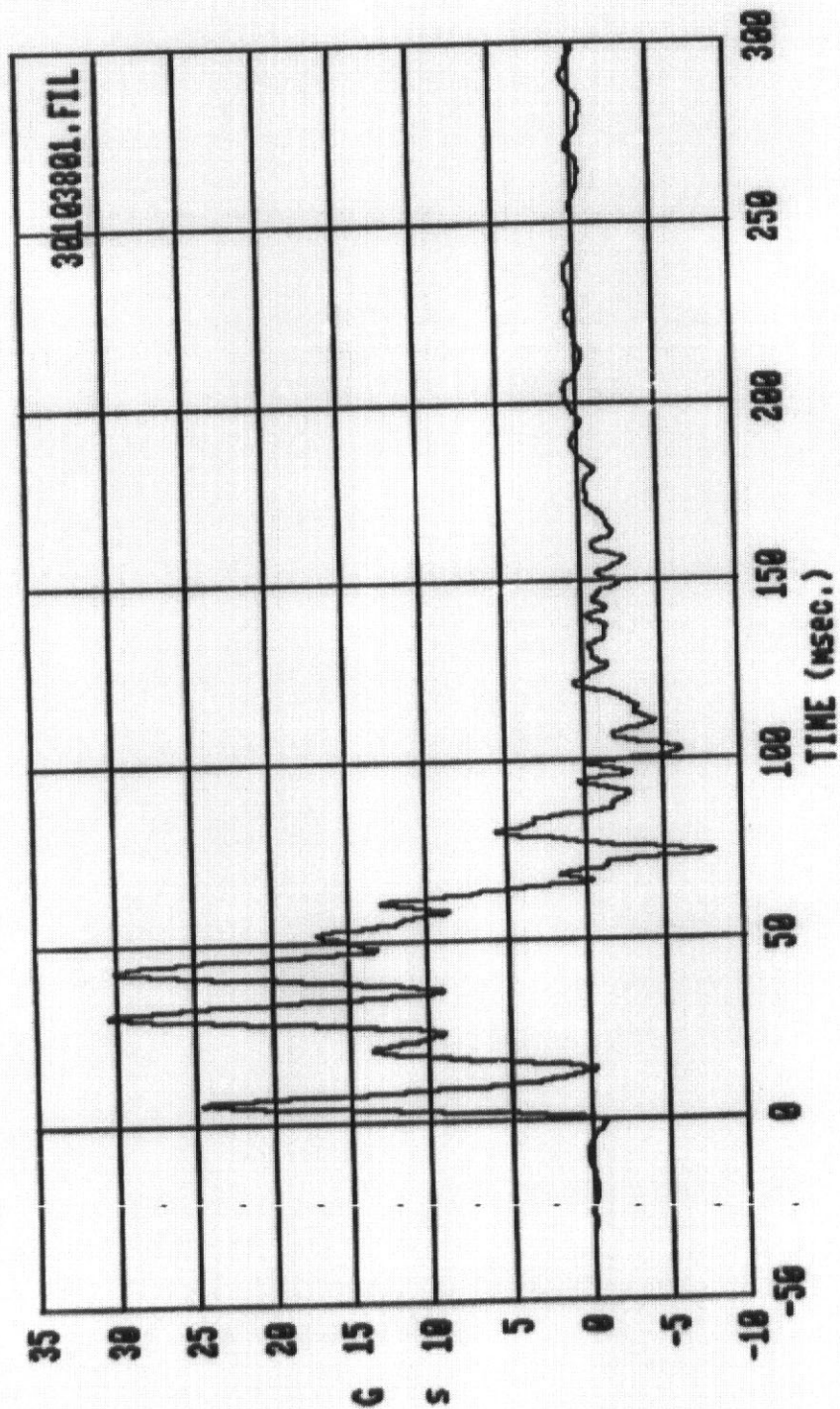


FIGURE 14. TANK FOR FORD FESTIVAL

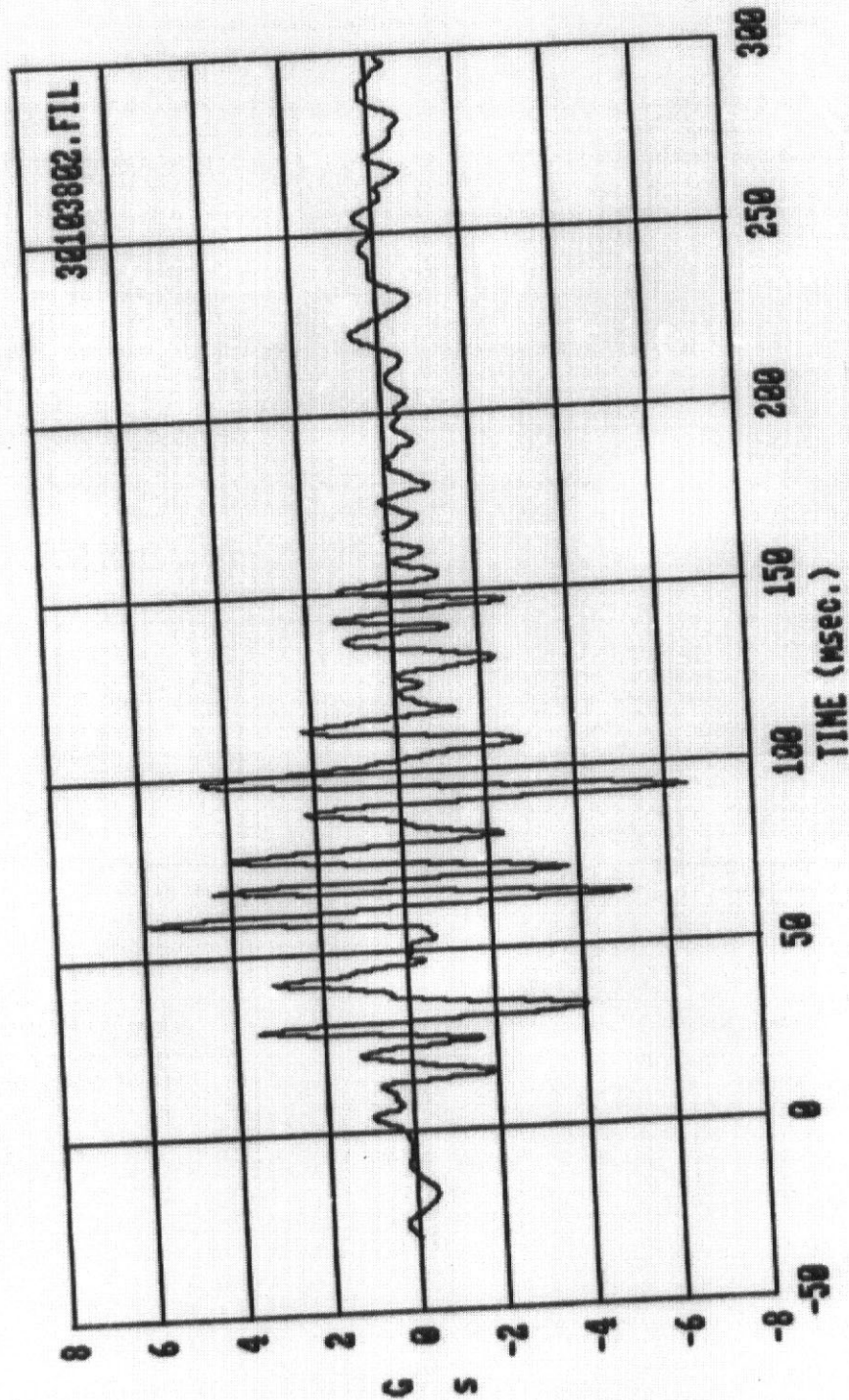




Max = 30.712 Min = -8.1737

MSE 10/06/86 -- 1988 Ford Festiva : C/G acceleration, X-axis (SAE CLASS 60)

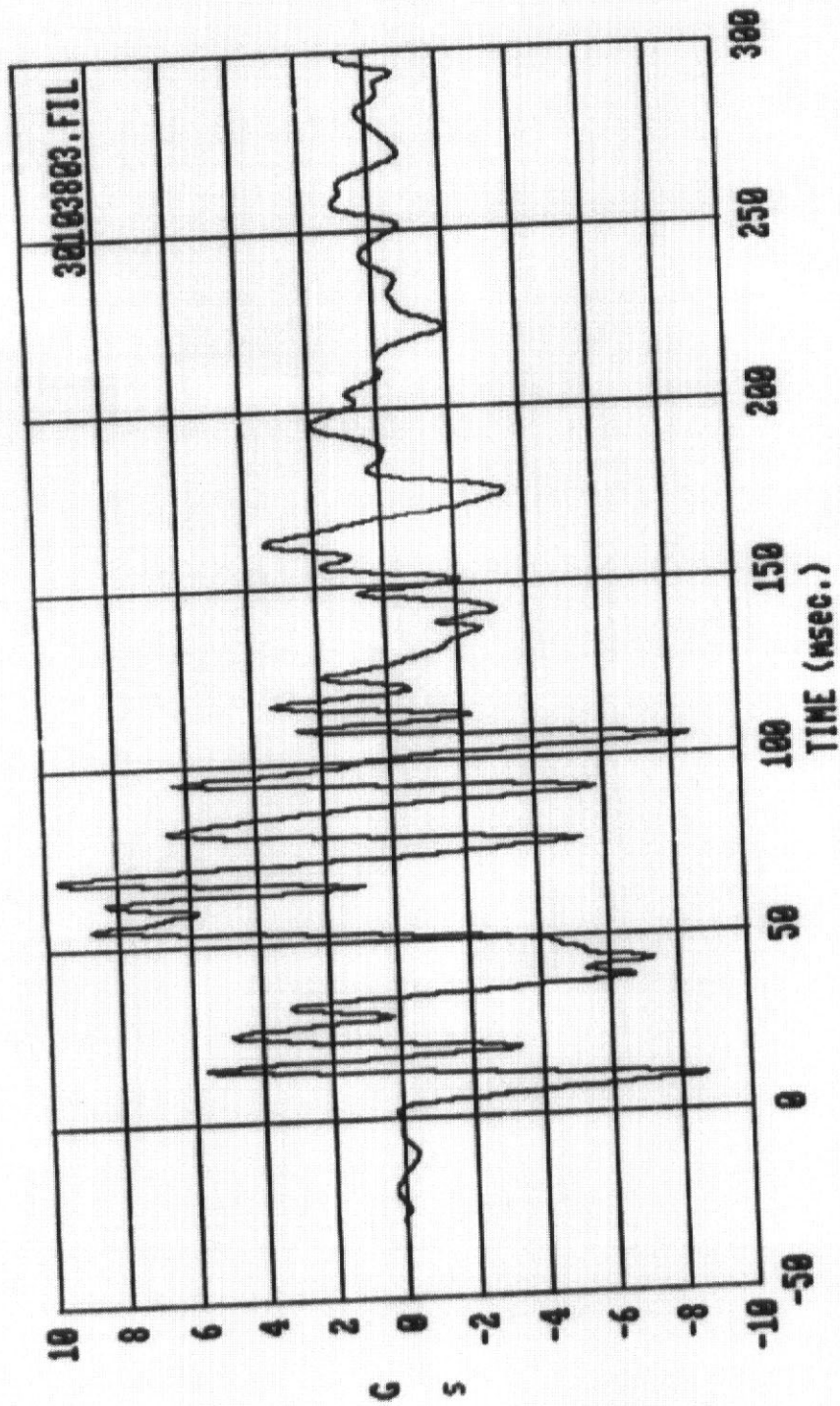
FIGURE 3-8



Max = 6.8541 Min = -6.5416

MSF .10/06/88 - 1988 Ford Festiva : C/G acceleration, Y-axis (SAE CLASS 60)

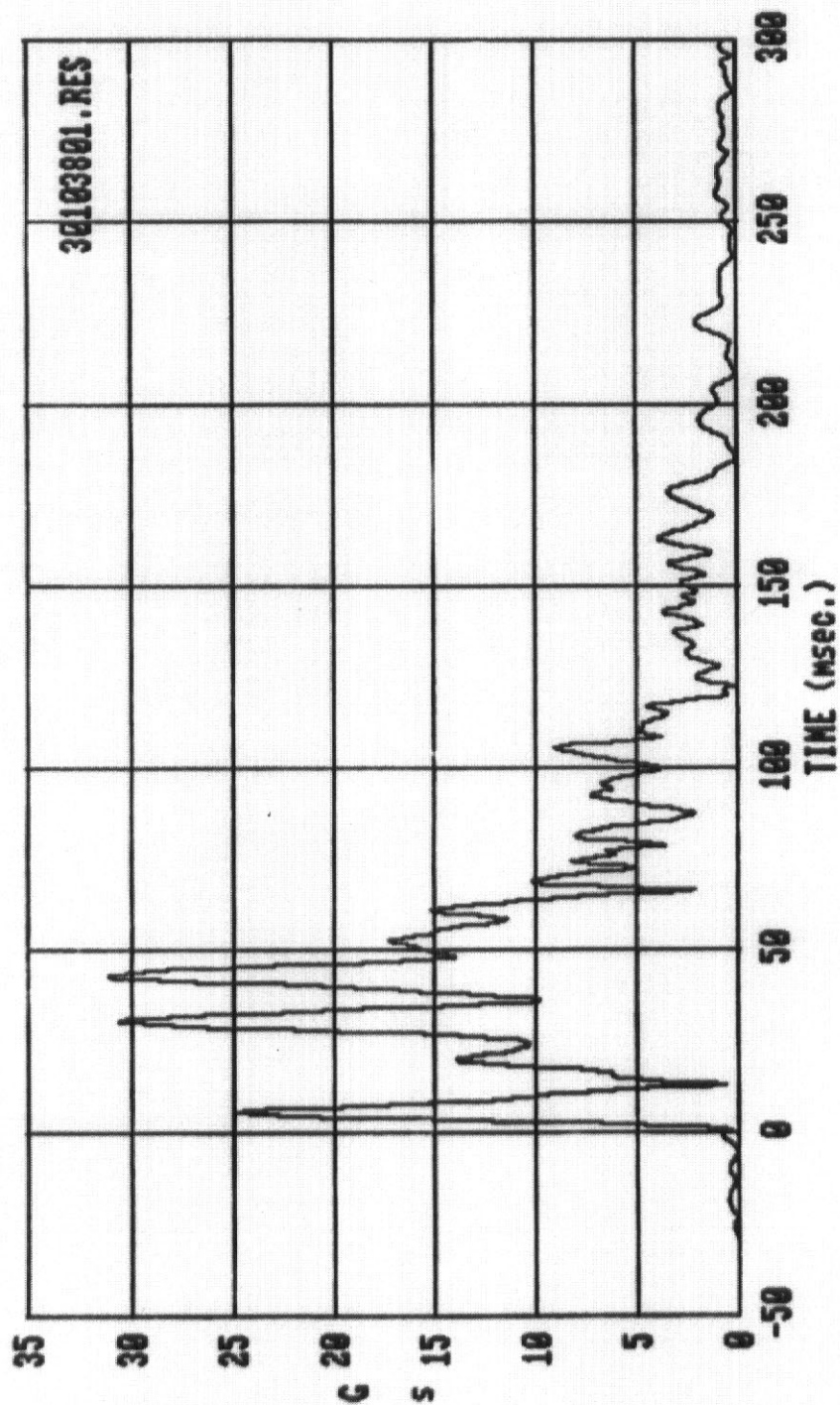
FIGURE 3-9



Max = 9.6748 Min = -8.7381

MSE 10/06/88 -- 1988 Ford Festiva : C/G acceleration, Z-axis (SAE CLASS 60)

FIGURE 3-10



MSE 10/06/88 -- 1988 Ford Festiva : C/G resultant acceleration (SAE CLASS 60)

FIGURE 3-11

Detailed pre and posttest measurements of the test vehicle dimensions are presented in Table 3-5. Detailed posttest rear end crush measurements are given in Table 3-6.

No test failures relative to FMVSS 301-75 (Rear) were identified for 1988 Ford Festiva.

TABLE 3-5 TEST VEHICLE MEASUREMENTS

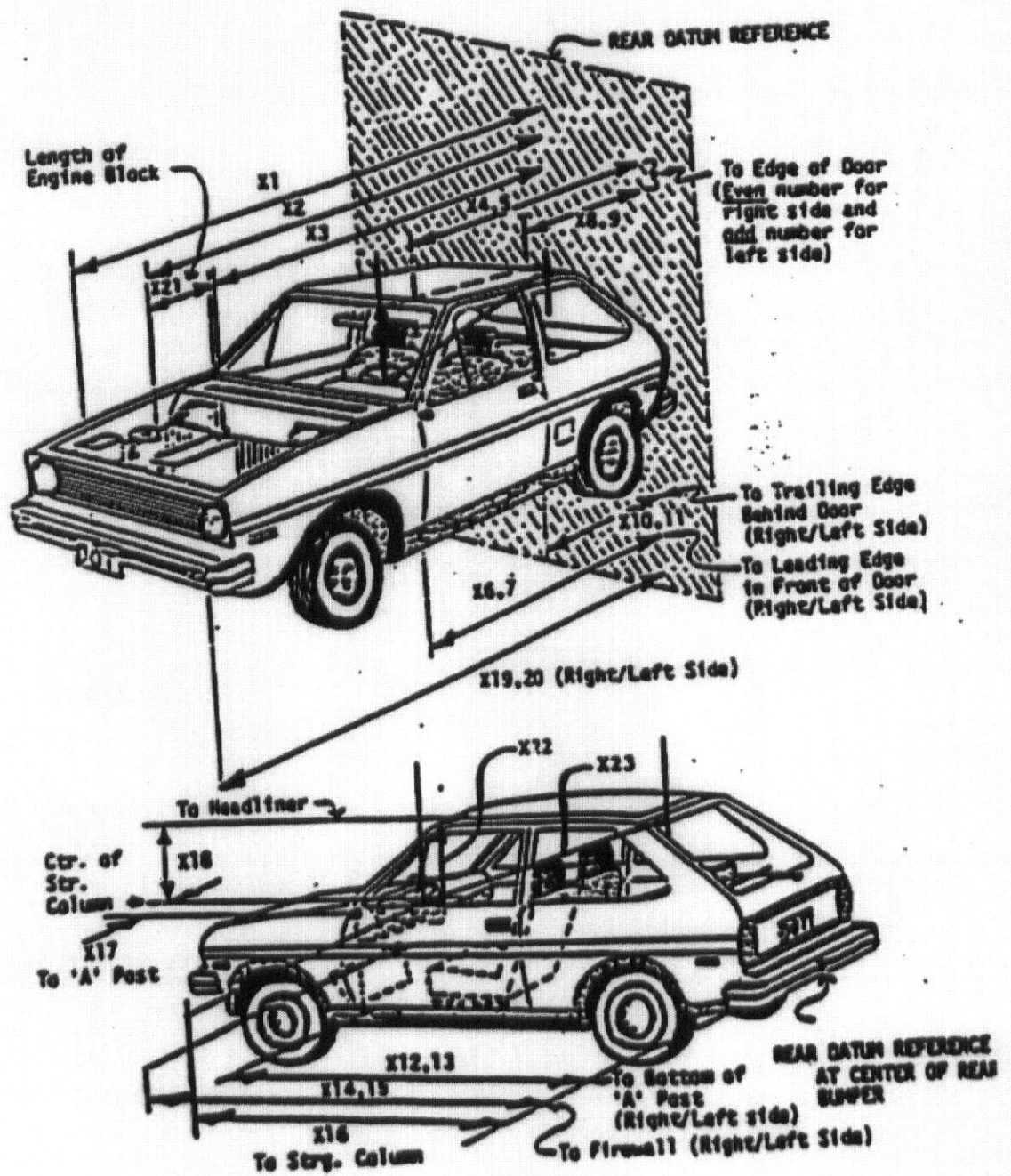


TABLE 3-5 TEST VEHICLE MEASUREMENTS (Cont'd)

NO.	MEASUREMENT DESCRIPTION	Pre-Test (in.)	Post-Test (in.)	Diff. (in.)
X1	Total Length of Test Vehicle at Centerline	139.5	129.0	9.5
X2	Rear Surface of Vehicle to Front of Engine	123.2	112.2	11.0
X3	Rear Surface of Vehicle to Firewall	106.8	96.5	10.3
X4	Rear Surface to Upr. Leading Edge of Right Door	97.0	86.7	10.3
X5	Rear Surface to Upr. Leading Edge of Left Door	96.5	86.7	9.8
X6	Rear Surface to Lwr. Leading Edge of Right Door	96.5	85.5	11.0
X7	Rear Surface to Lwr. Leading Edge of Left Door	96.5	85.0	10.5
X8	Rear Surface to Upr. Trailing Edge of Right Door	48.5	39.0	9.5
X9	Rear Surface to Upr. Trailing Edge of Left Door	48.5	39.0	9.5
X10	Rear Surface to Lwr. Trailing Edge of Right Door	48.5	38.0	10.5
X11	Rear Surface to Lwr. Trailing Edge of Left Door	49.3	38.5	10.8
X12	Rear Surface to Bottom 'A' Post on Right Side	94.0	83.5	10.5
X13	Rear Surface to Bottom 'A' Post on Left Side	94.5	83.8	10.7
X14	Rear Surface to Firewall on Right Side	106.0	96.0	10.0
X15	Rear Surface to Firewall on Left Side	106.0	95.7	10.3
X16	Rear Surface to Steering Column	81.8	71.3	10.5
X17	Center of Steering Column to 'A' Post	15.7	15.7	0.0
X18	Center Steering Column to Headlining	19.5	19.5	0.0
X19	Rear Surface to Right Side of Front Bumper	137.6	127.5	10.1
X20	Rear Surface to Left Side of Front Bumper	137.6	127.5	10.1
X21	Length of Engine Block	21.5	21.5	0.0
X22	Strg. Whl. Hub C/L to W/Shld Head Int. Trim Moulding	17.5	17.5	0.0
X23	Strg. Whl. Hub C/L to Rr. Wdo. Upper Int. Trim Moulding	62.0	61.0	1.0

TABLE 3-6 REAR CRUSH DETAILS

VEHICLE MAKE/MODEL/BODY STYLE: FORD/FESTIVA/2-DOOR HATCHBACK

VEH. NHTSA NO.: CJ0201 ; VIN: KNJBTO6K4J6118749

MODEL YEAR: 1988 BUILD DATE: 06/87 ; TEST DATE: 10/06/88

COLLISION DEFORMATION CLASSIFICATION (CDC) CODE:

(Rear)

CRUSH DEPTH	C1 = 10.8 inches
DIMENSIONS:	C2 = 10.8 inches
	C3 = 10.8 inches
	C4 = 10.7 inches
	C5 = 11.0 inches
	C6 = 12.0 inches

MIDPOINT OF DAMAGE: D = Vehicle Centerline (Longitud.)

LENGTH OF DAMAGED

REGION: L = 63.0 inches

