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Report No. 217-NVS-03-01

OFFICE OF VEHICLE SAFETY COMPLIANCE

FMVSS No. 217
"BUS EMERGENCY EXITS AND WINDOW RETENTION AND RELEASE"

Compliance Test Report
for a
2002 Orion 5, 34 Passenger Bus
NHTSA No. C20803

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF VEHICLE SAFETY COMPLIANCE
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Technical Report Documentation Page

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9. Performing Organization Name and Address U.S. DEPARTMENT OF TRANSPORTATION NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION OFFICE OF VEHICLE SAFETY COMPLIANCE 400 SEVENTH STREET, S.W., ROOM 6111 WASHINGTON, D.C. 20590		10. Work Unit No N/A 11. Contract or Grant No. N/A	
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SECTION 1.0 – PURPOSE OF COMPLIANCE TEST

Tests were conducted on a model year 2002 Orion 5, 34-passenger transit bus, NHTSA No. C20803, in accordance with the Office of Vehicle Safety Compliance (OVSC) Test Procedure TP-217TB-00 to determine compliance to the requirements of Federal Motor Vehicle Safety Standards (FMVSS) 217, "Bus Emergency Exits and Window Retention and Release".

SECTION 2.0 – TEST SUMMARY

DATA SHEET No. 1
TEST SUMMARY

A 34-passenger, 2002 Orion 5 bus (VIN:1VHAE3N2826501904) was tested to the requirements of Federal Motor Vehicle Safety Standard No. 217, "Bus Emergency Exits and Window Retention and Release" on February 20, 2003. The testing was performed by OVSC engineers. The bus was tested in accordance with the OVSC test procedure TP-217TB-00, dated June 25, 2002. The bus is equipped with four (4) emergency exit windows on the right side of the bus, three (3) emergency exit windows on the left side of the bus and two (2) emergency roof exits located at the front and rear half of the bus. A summary of results is provided in the table below.

Table 1 – Test Summary

Section	Description	Pass/Fail	Reason
S5.2	Provision of Emergency Exits	Pass	
S5.3	Emergency Exit Release	Pass	Windows 2 and 3 were not recorded because they would not extend.
S5.4	Emergency Exit Opening	Fail	Windows 2 and 3 could not be extended.
S5.5	Emergency Exit Identification	Pass	
S5.1	Window Retention	Not Tested	

SECTION 3.0 – COMPLIANCE TEST DATA

DATA SHEET No. 2
PROVISION OF EMERGENCY EXITS

Schematic of Bus Floor Plan

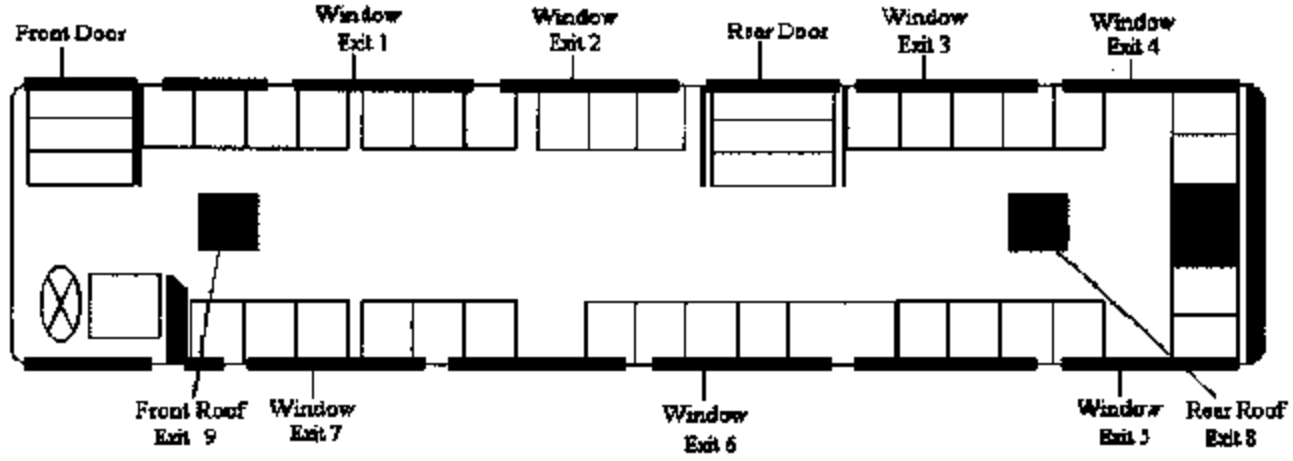


Table 2 - Provision of Emergency Exits

	Emergency Exit Type & Location	Size of Exit Opening (cm)	Actual Exit Area Measured (cm^2)	Maximum Credit Area Allowed (cm^2) (not to exceed 3,458)
1	Window, Right-Front	140 x 82.5	11,550	3,458
2	Window, Right-Mid-Front	140 x 82.5	11,550	3,458
3	Window, Right-Mid-Rear	140 x 82.5	11,550	3,458
4	Window, Right-Rear	140 x 82.5	11,550	3,458
5	Window, Left-Rear	140 x 82.5	11,550	3,458
6	Window, Left-Mid	140 x 82.5	11,550	3,458
7	Window, Left-Front	140 x 82.5	11,550	3,458
8	Roof Hatch, Rear	54 x 54	2,916	2,916
9	Roof Hatch, Front	54 x 54	2,916	2,916
				30,038

Total Required Area = 34 Designated Seating Positions (DSPs) X 432 cm^2 = **14,688 cm^2**
Total Credit Area = **30,038 cm^2** (PASS)

Each side of the bus must contain 40% of the Total Required Area
(.40 X 14,688 cm^2) = 5,875 cm^2
Total Credit Area-Left Side (3 windows)= (3 X 3,458 cm^2) = 10,374 cm^2 (PASS)
Total Credit Area-Right Side (4 windows)= (4 X 3,458 cm^2) = 13,832 cm^2 (PASS)
The bus has a rear roof exit and the configuration of the bus appears to preclude the installation of an accessible rear exit.

DATA SHEET No. 3

Table 3 - Access Regions and Forces Test to Release Exits

	Emergency Exit Type & Location	No. of Release Mechanisms	HIGH or LOW Access Region	Motions Required to Release Exit	Actual Motions to Release Exit	Peak Force Measured to Release Exit (N)	Max. Force Allowable (N)	Pass	Fail
1	Window, Right-Front – Exit 1	1	High + Low	Rotary or Straight	Rotary	1. 73.5 2. 73.5 3. 78.4 Avg. = 75.1	89	X	
2	Window, Right-Mid-Front – Exit 2	1	High + Low	Rotary or Straight	Rotary	1. Unable to open window 2. 3. Avg. =	89		
3	Window, Right- Mid-Rear – Exit 3	1	High + Low	Rotary or Straight	Rotary	1. Unable to open window 2. 3. Avg. =	89		
4	Window, Right- Rear – Exit 4	1	High + Low	Rotary or Straight	Rotary	1. 34.3 2. 29.4 3. 24.5 Avg. = 29.4	89	X	
5	Window, Left-Rear – Exit 5	1	High + Low	Rotary or Straight	Rotary	1. 44.1 2. 44.1 3. 24.5 Avg. = 37.6	89	X	

DATA SHEET No. 3 (Cont'd)

Table 3 - Access Regions and Forces Test to Release Exits

	Emergency Exit Type & Location	No. of Release Mechanisms	HIGH or LOW Access Region	Motions Required to Release Exit	Actual Motions to Release Exit	Peak Force Measured to Release Exit (N)	Max. Force Allowable (N)	Pass	Fail
6	Window, Left-Mid – Exit 6	1	High + Low	Rotary or Straight	Rotary	1. 44.1 2. 44.1 3. 73.5 Avg. = 53.9	89	X	
7	Window, Left-Front – Exit 7	1	High + Low	Rotary or Straight	Rotary	1. 24.5 2. 73.5 3. 34.3 Avg. = 44.1	89	X	

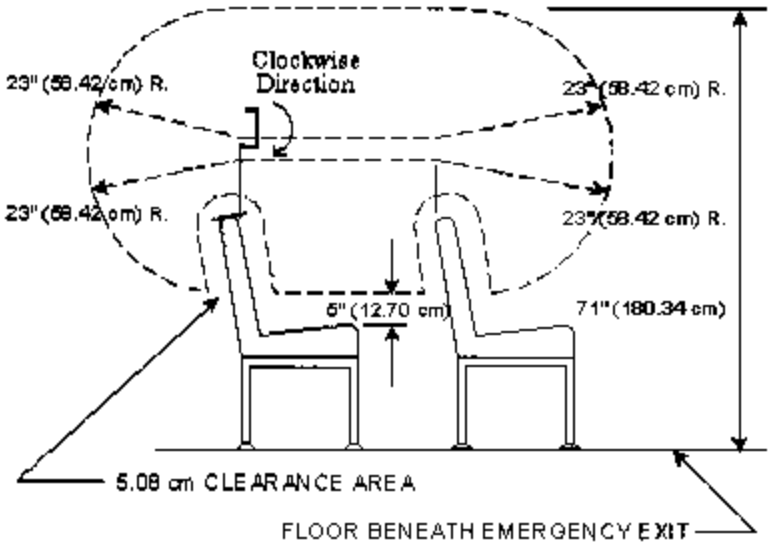
Note:

Windows 2 and 3 would not extend. The handle force was low but the windows would not open. Window 3 opened once when attempting to exercise.

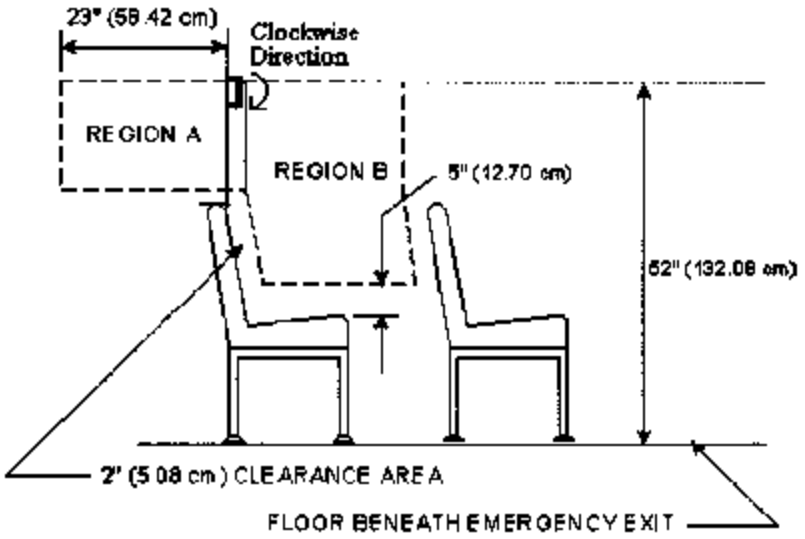
Each release mechanism tested was exercised three times prior to measuring the release force. The term exercised is used to describe the action whereby the release mechanism is released and the window opened and then returned to its original unreleased location.

The forces were measured using a Shimpo MF handheld force gauge. The force gauge has a hook at one end that allows for the attachment of the gauge onto the release mechanism. After the gauge is attached an engineer applies a force to the gauge which is transferred to the release mechanism. The engineer applies increasingly greater force until the release mechanism is released. The force measured is recorded and the gauge is zeroed for the next test.

Access Regions for Low Force



Access Regions for High Force



DATA SHEET No. 4

Table 4 - Access Regions and Forces Test to Open Exits

	Emergency Exit Type & Location	HIGH or LOW Access Region	Motions Required to Open Exit	Actual Motions to Open Exit	Direction of Motion differs 90-180° from Release motion (Yes or No)	Peak Force Measured to Open Exit (N)	Max. Force Allowable (N)	Pass	Fail
1	Window, Right-Front – Exit 1	High + Low	Rotary Or Straight	Straight, Perpendicular to undisturbed surface	Yes	1. 122.5 2. 98 3. 122.5 Avg. = 114.3	267	X	
2	Window, Right-Mid-Front – Exit 2	High + Low	Rotary Or Straight	Straight, Perpendicular to undisturbed surface	Yes	1. Unable to open window 2. 3. Avg. =	267		Window would not extend
3	Window, Right-Mid-Rear – Exit 3	High + Low	Rotary Or Straight	Straight, Perpendicular to undisturbed surface	Yes	1. Unable to open window 2. 3. Avg. =	267		Window opened once, while being exercised, pretest
4	Window, Right-Rear – Exit 4	High + Low	Rotary Or Straight	Straight, Perpendicular to undisturbed surface	Yes	1. 142.1 2. 147 3. 122.5 Avg. = 137.2	267	X	
5	Window, Left-Rear – Exit 5	High + Low	Rotary Or Straight	Straight, Perpendicular to undisturbed surface	Yes	1. 117.6 2. 117.6 3. 117.6 Avg. = 117.6	267	X	

DATA SHEET No. 4 (Cont'd)

Table 4 - Access Regions and Forces Test to Open Exits

	Emergency Exit Type & Location	HIGH or LOW Access Region	Motions Required to Open Exit	Actual Motions to Open Exit	Direction of Motion differs 90-180° from Release motion (Yes or No)	Peak Force Measured to Open Exit (N)	Max. Force Allowable (N)	Pass	Fail
6	Window, Left-Mid – Exit 6	High + Low	Rotary Or Straight	Straight, Perpendicular to undisturbed surface	Yes	1. 88.2 2. 98 3. 78.4 Avg. = 88.2	267	X	
7	Window, Left-Front – Exit 7	High + Low	Rotary Or Straight	Straight, Perpendicular to undisturbed surface	Yes	1. 117.6 2. 107.8 3. 107.8 Avg. = 111	267	X	

A Shimpo MF handheld force gauge is used to measure the force to open the exit. The force gauge has a flat attachment on one end that provides a surface to place against the exit. The exit is released prior to measuring the force to open the exit. An engineer then applies an increasing force to the force gauge until the exit is opened allowing passage of the 33cm by 50cm ellipsoid. The force is recorded and the gauge is zeroed for the next test.

Data Sheet No. 5

Table 5 - Emergency Exit Identification

	Emergency Exit Type & Location	Description of Designation Label or Placard	Description of Operating Instructions Label or Placard	(For Buses w/ adjacent seats) Description of labels to indicate location of nearest release mechanism
1	Window, Right-Front	"Emergency Exit"	"Pull red handle down and hold while pushing window out at bottom"	N/A – aisle facing seats
2	Window, Right-Mid-F	"Emergency Exit"	"Pull red handle down and hold while pushing window out at bottom"	
3	Window, Right-Mid-R	"Emergency Exit"	"Pull red handle down and hold while pushing window out at bottom"	
4	Window, Right-Rear	"Emergency Exit"	"Pull red handle down and hold while pushing window out at bottom"	
5	Window, Left-Rear	"Emergency Exit"	"Pull red handle down and hold while pushing window out at bottom"	
6	Window, Left-Middle	"Emergency Exit"	"Pull red handle down and hold while pushing window out at bottom"	
7	Window, Left-Front	"Emergency Exit"	"Pull red handle down and hold while pushing window out at bottom"	
8	Roof Exit, Rear	31.5 cm Long X 6.5 cm Wide, Lettering- 5 cm High	"1 Push Tab, 2 Push Handle Out"	N/A
9	Roof Exit, Front	31.5 cm Long X 6.5 cm Wide, Lettering- 5 cm High	"1 Push Tab, 2 Push Handle Out"	N/A

	PASS	FAIL
1. Each emergency exit has a permanently affixed, legible label or placard with the designation "Emergency Door" or "Emergency Exit."	X	
2. Each emergency exit has a permanently affixed, legible label or placard describing the motion necessary to release (unlatch) and open the exit.	X	
3. The label is within 16 cm of the nearest release mechanism.	X	
4. For buses equipped with adjacent seats, a permanently affixed, legible label or placard has been placed with the occupant space to indicate the location of the nearest release mechanism.	N/A	

SECTION 4.0 – INSTRUMENTATION AND EQUIPMENT LIST

INSTRUMENTATION AND EQUIPMENT LIST

EQUIPMENT	DESCRIPTION	SERIAL NO.
Ellipsoid	Minor Axis = 33 cm Major Axis = 50 cm	N/A
Force gauge	Shimpo MF	505110
Craftsman 8m Tape Measure	Tape Measure	N/A

SECTION 5.0 – DISCUSSION OF FINDINGS

- Window 2 would not open. The handle rotated and it was possible to hear a sliding noise. However the window could not be extended. The handle was operated several times and the window still could not be opened.

- Window 3 opened once. Window 3 opened on the first exercise attempt. The window was closed and then the window would not open, despite repeated attempts. The test procedure requires each window to be exercised three times prior to the commencement of the test.

SECTION 6.0

PHOTOGRAPHS LIST

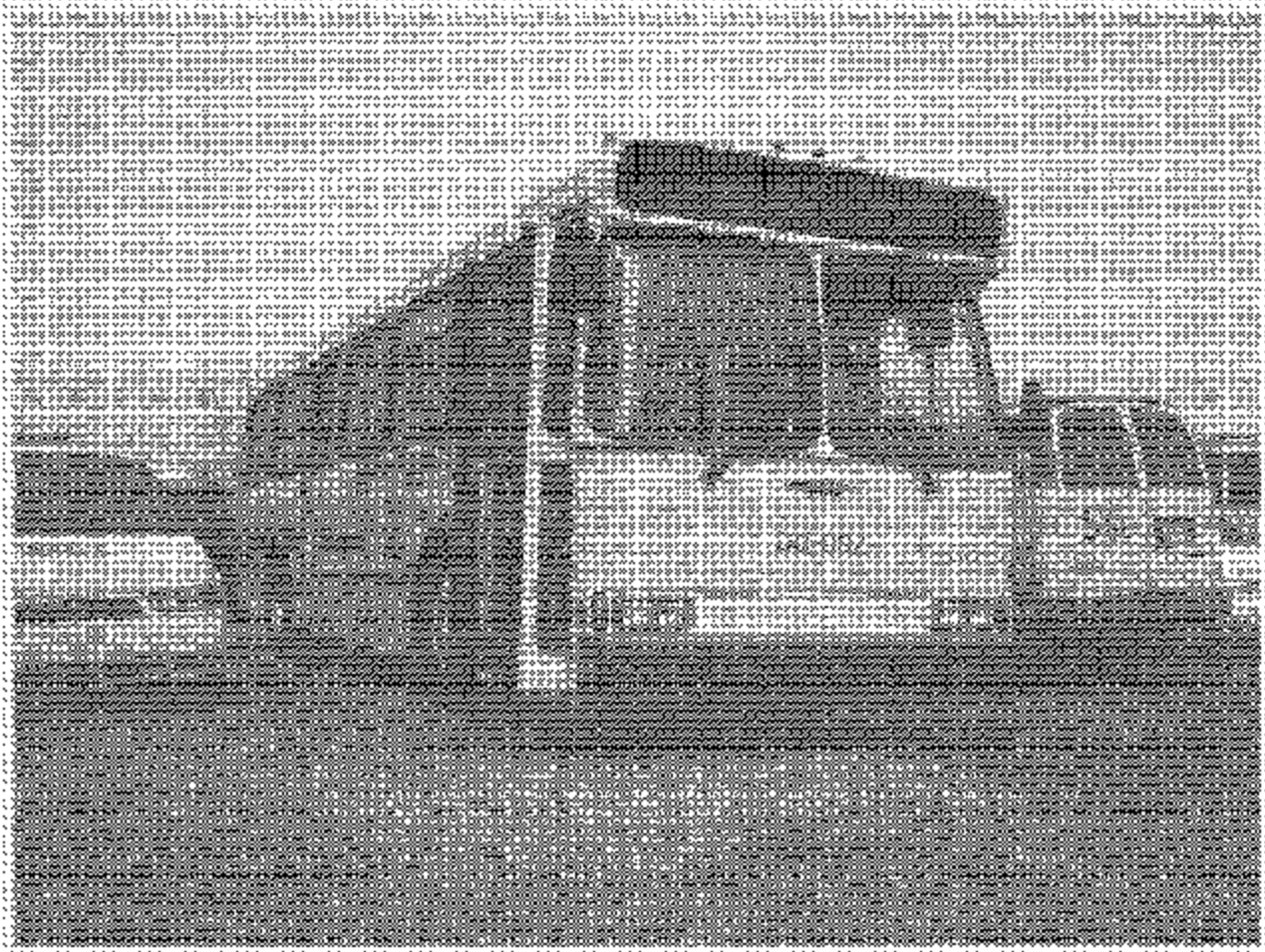


Photo 1 - Exterior Front View

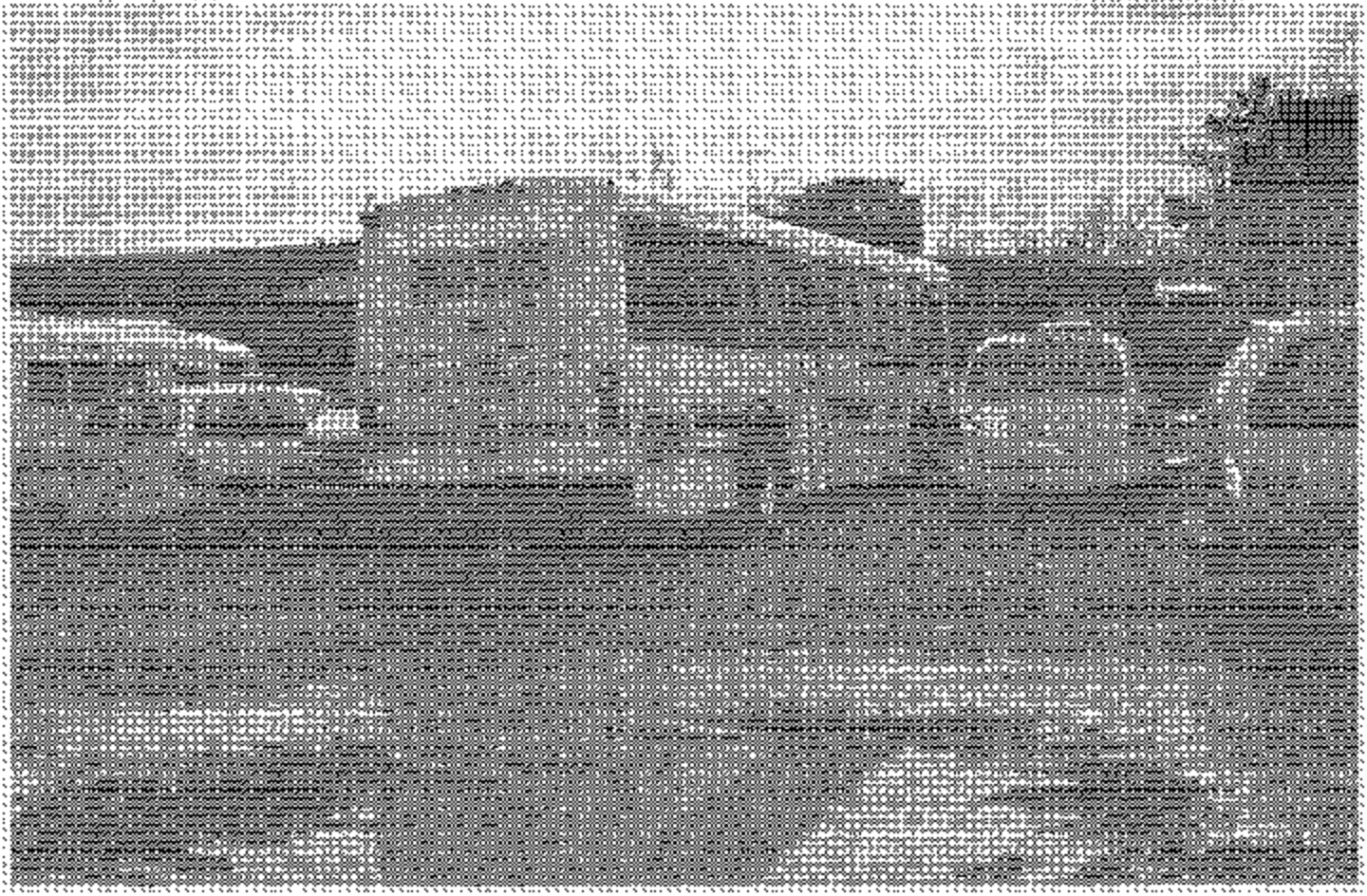


Photo 2 - Exterior Rear View

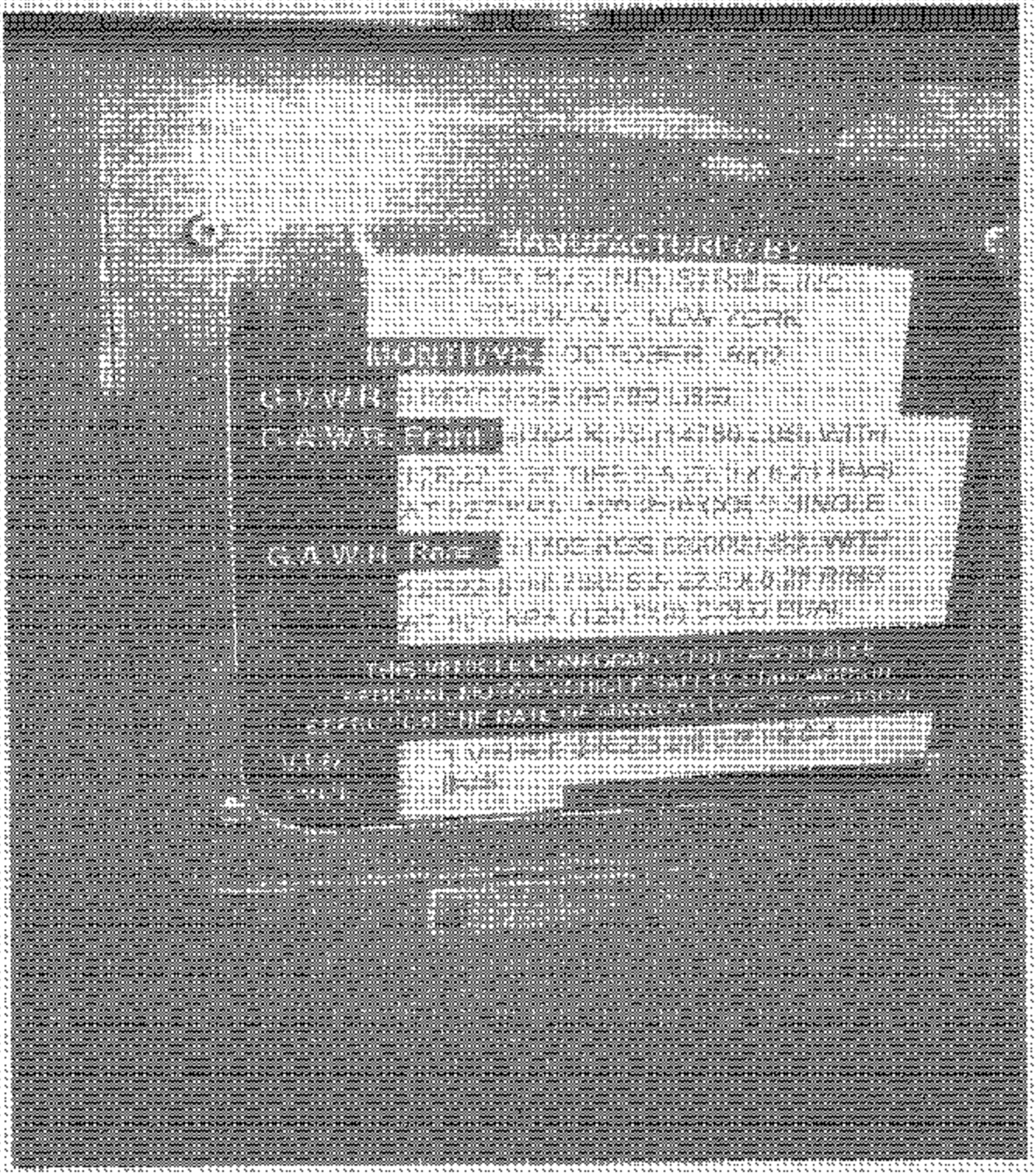


Photo 3 – Certification Label

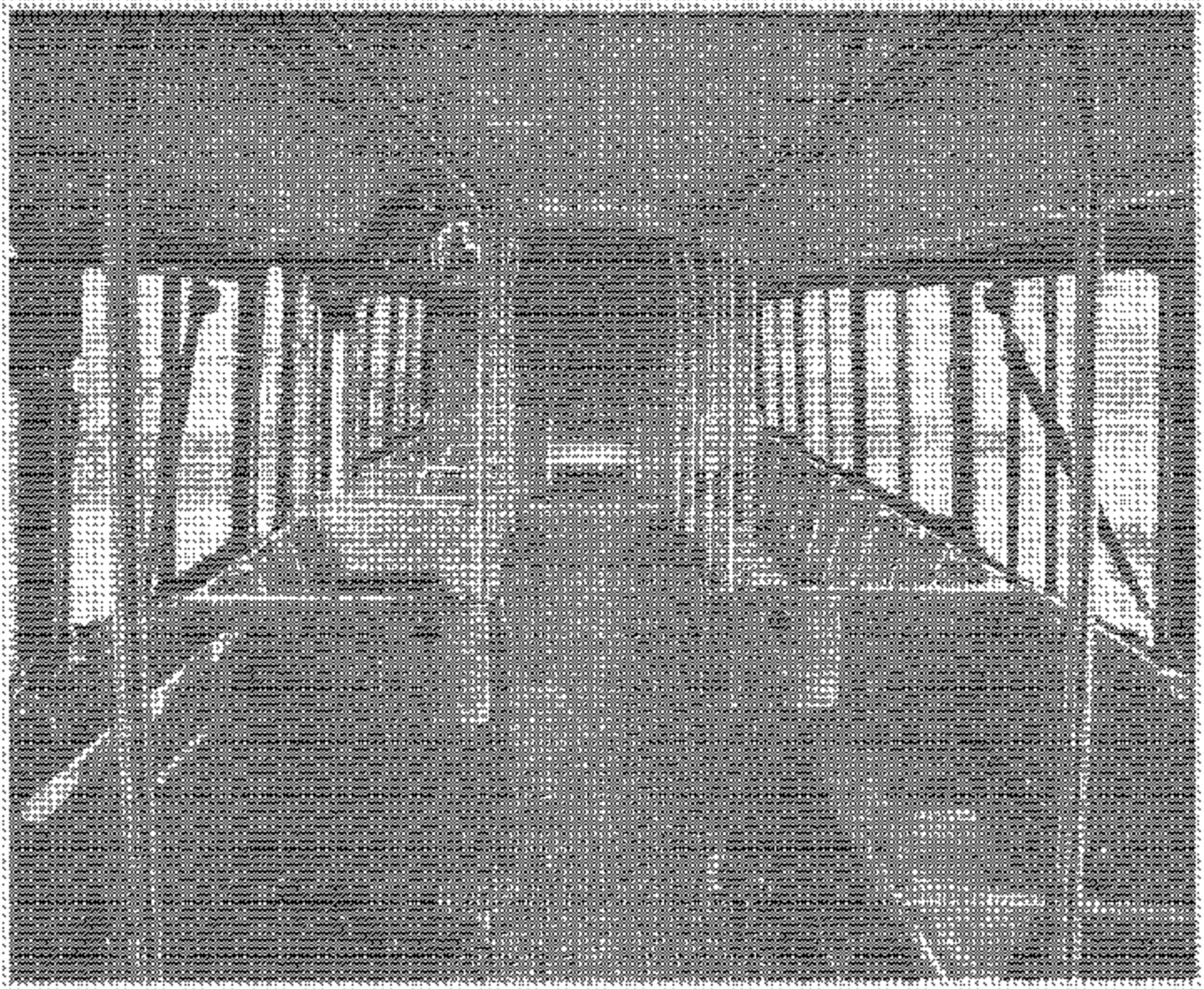


Photo 4 – Interior Rear View

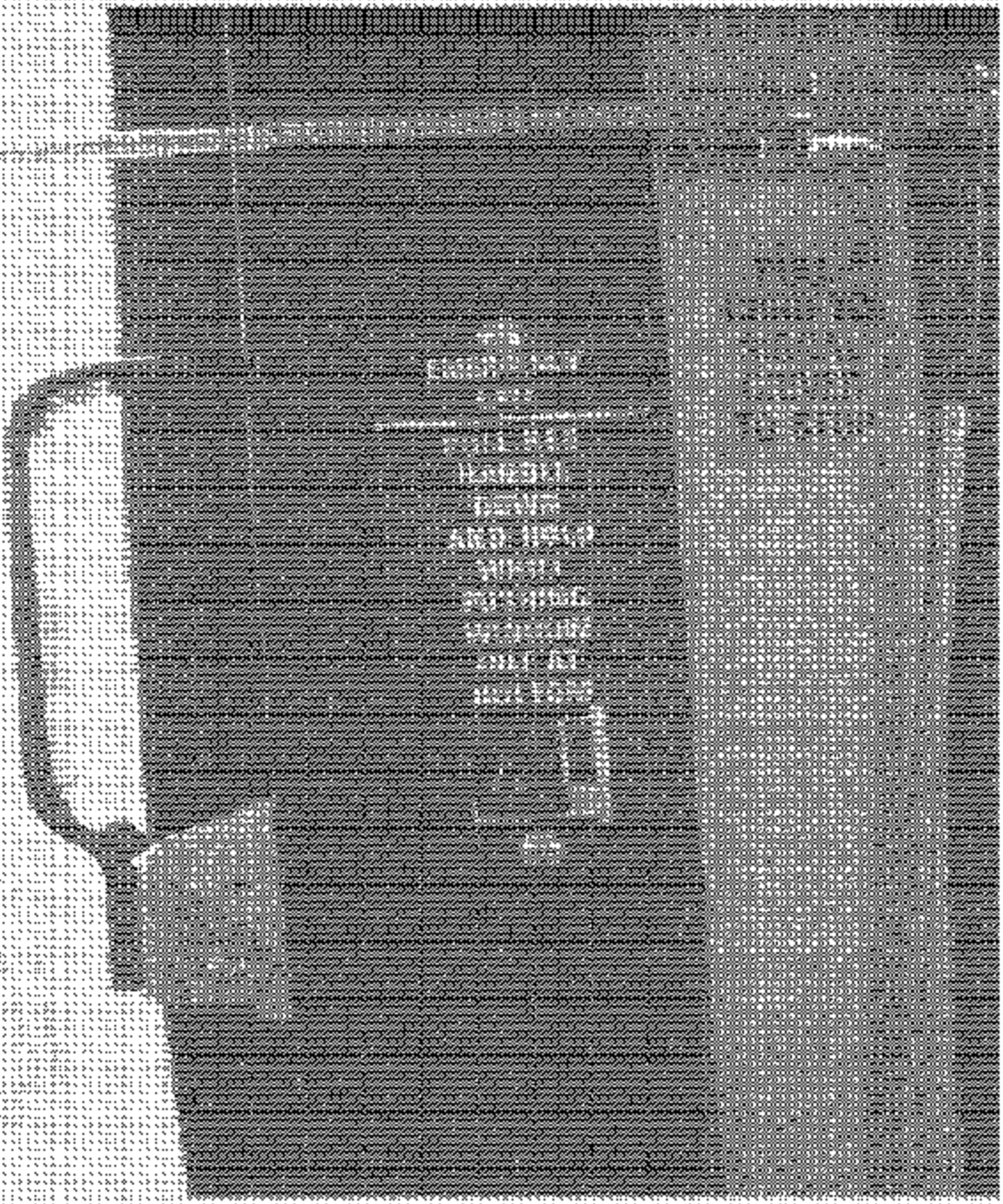


Photo 5 – Emergency Exit Label and Release Mechanism

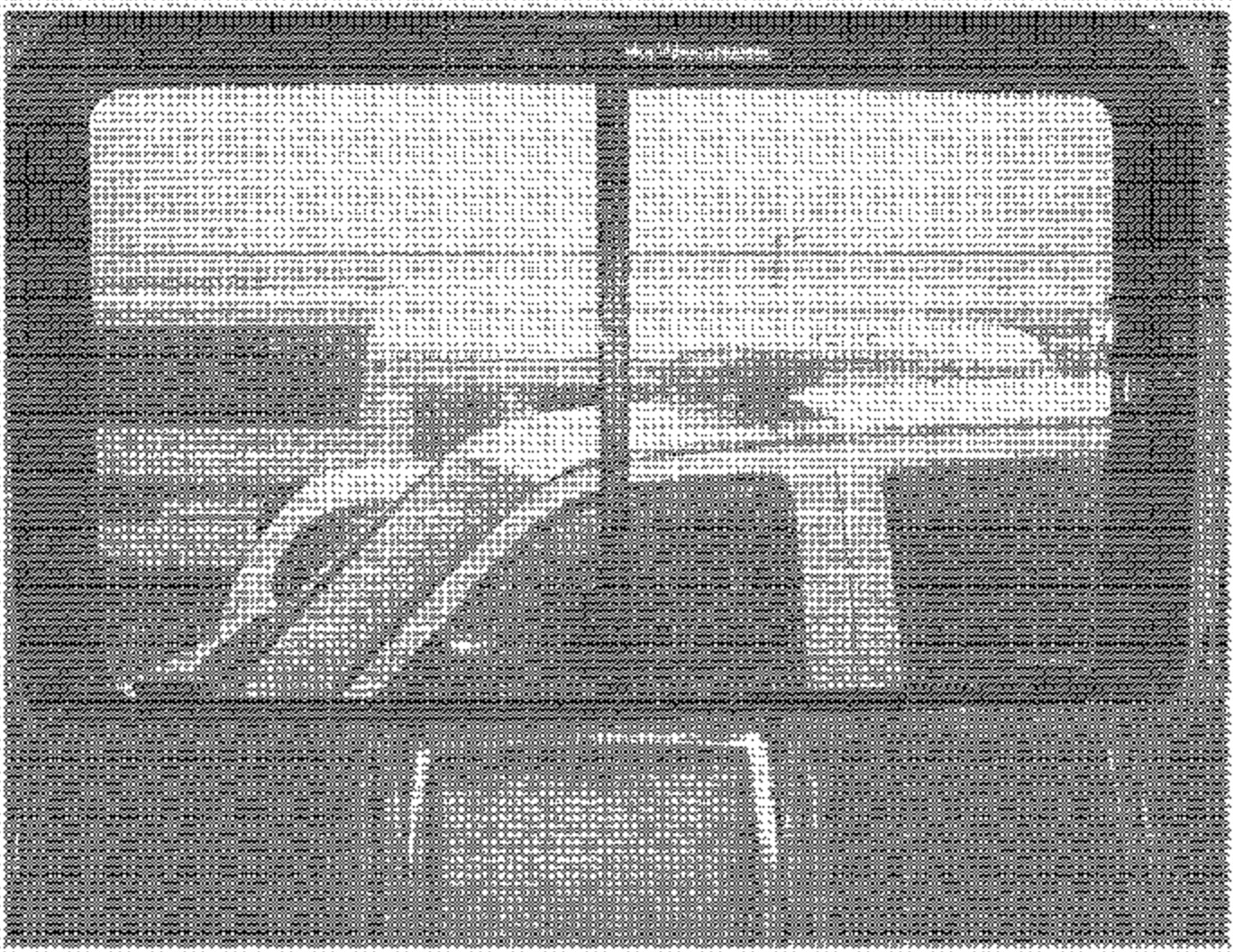


Photo 6 – Release Mechanism, Exit Identification, Exit Instructions