REPORT NUMBER: 217-MGA-2007-005

SAFETY COMPLIANCE TESTING FOR FMVSS NO. 217 SCHOOL BUS EMERGENCY EXITS AND WINDOW RETENTION AND RELEASE

US BUS CORPORATION
2006 US BUS SCHOOL BUS
NHTSA NO.: C60900

PREPARED BY:
MGA RESEARCH CORPORATION
5000 WARREN ROAD
BURLINGTON, WI 53105

Final Report Date: May 10, 2007

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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WASHINGTON, D.C. 20590

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Prepared by: _____ Date: May 10, 2007
James Hansen, Project Engineer

Reviewed by: _____ Date: May 10, 2007
Michael Janovicz, Program Manager

FINAL REPORT ACCEPTED BY:

_____
May 10, 2007

Technical Report Documentation Page

1. Report No. 217-MGA-2007-005	*2. Government Accession No.*	*3. Recipient's Catalog No.*	
4. Title and Subtitle Final Report of FMVSS 217 Compliance Testing of 2006 US BUS School Bus NHTSA No.:C60900		*5. Report Date* May 10, 2007 *6. Performing Organization Code* MGA	
7. Author(s) James Hansen, Project Engineer Michael Janovicz, Program Manager		*8. Performing Organization Report No.* 217-MGA-2007-005	
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		*10. Work Unit No.* *11. Contract or Grant No.* DTNH22-02-D-01057	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Enforcement Office of Vehicle Safety Compliance Mail Code: (NVS-220) 400 Seventh St., S.W. Room 6111 Washington, D.C. 20590		*13. Type of Report and Period Covered* Final Report 04/26/2007 - 05/10/2007 *14. Sponsoring Agency Code* NVS-220	
15. Supplementary Notes			
16. Abstract Compliance tests were conducted on the subject 2006 US BUS School Bus, NHTSA No. C60900 in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-217-06 for the determination of FMVSS 217 compliance. Test failures were as follows: None			
17. Key Words Compliance Testing Safety Engineering FMVSS 217		*18. Distribution Statement* Copies of this report are available from: NHTSA Technical Information Services (TIS), Room 2334 (NPO-411) 400 Seventh Street, S.W. Washington, D.C. 20590	
19. Security Classif. (of this report) Unclassified	*20. Security Classif. (of this page)* Unclassified	*21. No. of Pages* 41	22. Price

Form DOT F1700.7 (8-72)

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SECTION 1
PURPOSE OF COMPLIANCE TEST

Tests were conducted on a MY2006 US BUS School Bus, NHTSA No. C60900, in accordance with the specifications of the Office of Vehicle Safety Compliance (OVSC) Test Procedures TP-217-06 to determine compliance to the requirements of Federal Motor Vehicle Safety Standards (FMVSS) 217, “School Bus Emergency Exits and Window Retention and Release”.

This program is sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-02-D-01057.

SECTION 2
TEST DATA SUMMARY

Based on the tests performed, the MY2006 US BUS School Bus, NHTSA No. C60900 appeared to meet the requirements of FMVSS 217. See Data Sheet 1 for Test Summary on the following page.

DATA SHEET 1

TEST SUMMARY

GENERAL VEHICLE IDENTIFICATION

Model Year/Mfr. /Make/Model:	2006 US BUS GM/ US BUS	
NHTSA No.:	C60900	
GVWR:	4,536 kg / 10,000 lbs	
Build Date for Bus Chassis:	03/06	
VIN:	1GBHG31V561226021	
Chassis VIN:	1GBHG31V561226021	
Seating Capacity:	(1 Driver, 16 Passengers)	
Type of Bus:	School Bus	
Tire Pressure from tire placard (at capacity):	Front: 420 kPa	Rear: 420 kPa
Odometer Reading:	948 Miles	

	PASS/FAIL
S5.1 WINDOW RETENTION	**PASS**
S5.2 PROVISION OF EMERGENCY EXITS	**PASS**
Meets minimum exit provisions	**PASS**
Meets all other exit requirements	**PASS**
Meets requirements for additional exits	**PASS**
S5.2.3.1.A EMERGENCY EXIT DOOR OPERATIONAL REQUIREMENTS	**PASS**
S5.3 EMERGENCY EXIT RELEASE	**PASS**
Forces to unlatch the emergency exits	**PASS**
Forces to open the emergency exits	**PASS**
S5.4 EMERGENCY EXIT OPENING	**PASS**
S5.5 EMERGENCY EXIT LABELING AND IDENTIFICATION	**PASS**
S5.5 TAPE REFLECTIVITY (**49CFR 571.131)**	**NOT TESTED**

COMMENTS: NONE

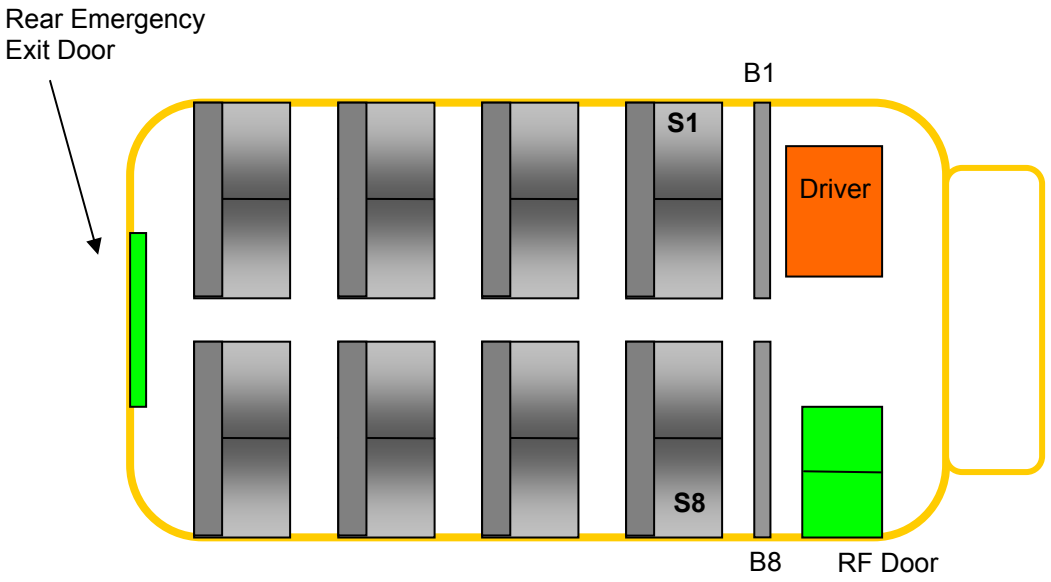
SECTION 3
COMPLIANCE TEST DATA

The following data sheets document the results of testing on the 2006 US BUS School Bus, NHTSA No. C60900.

DATA SHEET 2

PROVISION OF EMERGENCY EXITS

Test Vehicle: **2006 US BUS SCHOOL BUS** NHTSA No.: **C60900**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **04/26/2007**



		Height (mm)	Width (mm)
1	Rear Exit Door	1530	913

Seating Capacity: 17 (Including Driver)

	PASS/FAIL
Bus meets minimum emergency exit provision, based upon Table 1	**PASS**

COMMENTS: NONE

DATA SHEET 2 (CONTINUED)

PROVISION OF EMERGENCY EXITS

		PASS/FAIL
1	Rear Emergency Door – opens outward and is hinged on the right side (either side, if the bus has a GVWR of 10,000 pounds or less)	**PASS**
2	Side Emergency Door – hinged on its forward side. No more than one side emergency exit door is located, in whole or in part, within the same post and roof bow panel space.	**N/A**
3	Rear Push Out Window – provides a minimum opening clearance 41 cm high and 122 cm wide (16" x 48")	**N/A**
4	Roof Exit – is hinged on its forward side, and operable from both the inside and outside the vehicle	**N/A**
5	There is an even number of side emergency exit windows on each side of bus.	**N/A**
6	The bus is not equipped with both sliding and push-out windows, (except for buses equipped with rear push out emergency exit windows).	**N/A**
7	A right side emergency exit door, if any, is located as near as practicable to the midpoint of the passenger compartment.	**N/A**

COMMENTS: NONE

Recorded By:_____

Approved By:_____ DATE: 04/26/2007

DATA SHEET 3

EMERGENCY EXIT DOOR OPERATIONAL REQUIREMENTS

Test Vehicle: **2006 US BUS SCHOOL BUS** NHTSA No.: **C60900**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **04/26/2007**

		PASS/FAIL
1	The engine starting system does NOT operate if any Emergency Exit is LOCKED	**N/A**
2	All Emergency Door and Roof Exits can be released by one person (from inside and outside of bus)	**PASS**
3	When the Release Mechanism is NOT in the closed position and the vehicle ignition is in the "ON" position, there is a continuous warning sound audible at the Driver's DSP and in the vicinity of the Emergency Door(s) having the unclosed mechanism.	**PASS**
4	Emergency exit release mechanism does not use remote controls or central power systems	**PASS**

COMMENTS: NONE

Recorded By:_____

Approved By:_____ DATE: 04/26/2007

DATA SHEET 4A

EMERGENCY EXIT IDENTIFICATION AND LABELING

Test Vehicle: **2006 US BUS SCHOOL BUS** NHTSA No.: **C60900**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **04/26/2007**

EMERGENCY EXIT LABELING - INTERIOR

Exit Location	Rear Door
Exit Description	Emergency Door
Letter Height (cm)	5.2
Background Color	White
Location Inside	Upper Mid Section of Door
Pass/Fail	**PASS**

OPERATING INSTRUCTIONS - INTERIOR

Exit Location	Rear Door
Instructions	To Open (Arrow)
Letter Height (cm)	2.5
Letter Color	Black
Background Color	White
Distance From Release (cm)	4
Reflective Tape Color	N/A
Reflective Tape Width (cm)	N/A
Pass/Fail	**PASS**

COMMENTS: NONE

Recorded By:_____

Approved By:_____ DATE: 04/26/2007

DATA SHEET 4B

EMERGENCY EXIT IDENTIFICATION AND LABELING

Test Vehicle: **2006 US BUS SCHOOL BUS** NHTSA No.: **C60900**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **04/26/2007**

EMERGENCY EXIT LABELING - EXTERIOR

Exit Location	Rear Door
Exit Description	Emergency Door
Letter Height (cm)	5.0
Background Color	Yellow
Location Outside	Above Door
Pass/Fail	**PASS**

OPERATING INSTRUCTIONS - EXTERIOR

Exit Location	Rear Door
Instructions	To Open (Arrow)
Letter Height (cm)	2.5
Letter Color	Black
Background Color	Yellow
Distance From Release (cm)	1.5
Reflective Tape Color	Yellow
Reflective Tape Width (cm)	2.5 cm
Pass/Fail	**PASS**

COMMENTS: NONE

Recorded By:_____

Approved By:_____ DATE: 04/26/2007

DATA SHEET 4 (CONTINUED)

EMERGENCY EXIT IDENTIFICATION AND LABELING

Test Vehicle: **2006 US BUS SCHOOL BUS** NHTSA No.: **C60900**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **04/26/2007**

		PASS/FAIL
1	Each required Emergency Exit is labeled with the words “Emergency Exit” or “Emergency Door” as appropriate in letters at least 5 cm high (2”) of a color that contrasts with its background.	**PASS**
2	Emergency Doors – The designation “Emergency Exit” or “Emergency Door” is located at the top of, or directly above the exit door on both inside and outside surfaces of the bus.	**PASS**
3	Roof Exits – The designation for roof exits is located on an inside surface of the exit, or within 30 cm (11.8”) of the roof exit opening.	**N/A**
4	Emergency Window Exits – The designation is located at the top of, or directly above, or at the bottom of the emergency window exit on both the inside and outside surfaces of the bus.	**N/A**
5	Exit Operating Instructions indicate all motions required to unlatch and open the exit, in letters at least 1 cm (.39”) high and of a color that contrast with its background and shall be located within 15 cm (5.9”) of the release mechanism on the inside surface of the bus.	**PASS**
6	Each required Emergency Exit opening is outlined around its perimeter with a 2.5 cm (1”) wide retroreflective tape of red, white, or yellow color.	**PASS**

COMMENTS: NONE

Recorded By:_____

Approved By:_____ DATE: 04/26/2007

DATA SHEET 5

TAPE RELECTIVITY TEST

Test Vehicle: **2006 US BUS SCHOOL BUS** NHTSA No.: **C60900**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **04/26/2007**

_____ Color of retroreflective tape (white, red, or yellow)

_____ Glass bead retroreflective element material – Fill in Part A

_____ Prismatic retroreflective element material – Fill in Part B

SPECIFIC INTENSITY PER UNIT AREA
(Candela Per Foot Candle Per Square Foot)

Observation Angle	Entrance Angle	Min. Reqd. Intensity	Recorded Intensity	Pass/Fail
Part A – Glass Bead				
Part B - Prismatic				

This section of tape passes the REFLECTIVITY requirement. Yes___ No___

COMMENTS: NOT TESTED

Recorded By:_____

Approved By:_____ Date:

DATA SHEET 6A

FORCE TESTS TO UNLATCH THE EMERGENCY EXITS - INTERIOR

Test Vehicle: **2006 US BUS SCHOOL BUS** NHTSA No.: **C60900**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **04/26/2007**

Exit Location	Exit Description	High/Low Force Area	Maximum Force Requirement Newtons	Actual Force Measured (N)	Motion(s) required to Release Exit	Actual Motion(s) to Release Exit	PASS/FAIL
Rear Door	Emergency Door	High	178	1. 30.8 2. 31.4 3. 26.7 Average: 29.6	Straight	Upward Pull	**PASS**

COMMENTS: NONE

Recorded By:_____

Approved By:_____ DATE: 04/26/2007

DATA SHEET 6B

FORCE TESTS TO UNLATCH THE EMERGENCY EXITS - EXTERIOR

Test Vehicle: **2006 US BUS SCHOOL BUS** NHTSA No.: **C60900**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **04/26/2007**

Exit Location	Exit Description	High/Low Force Area	Maximum Force Requirement Newtons	Actual Force Measured (N)	Motion(s) required to Release Exit	Actual Motion(s) to Release Exit	PASS/FAIL
Rear Door	Emergency Door	High	178	1. 136.4 2. 141.7 3. 146.8 Average: 141.6	Rotary	Rotate Handle Counter Clockwise	**PASS**

COMMENTS: NONE

Recorded By:_____

Approved By:_____ DATE: 04/26/2007

DATA SHEET 7A

FORCE TESTS TO OPEN THE EMERGENCY EXITS - INTERIOR

Test Vehicle: **2006 US BUS SCHOOL BUS** NHTSA No.: **C60900**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **04/26/2007**

Exit Location	Exit Description	High/Low Force Area	Maximum Force Requirement Newtons	Actual Force Measured (N)	Motion(s) required to Open Exit	Actual Motion(s) to Open Exit	Passage of Ellipsoid or Parallelepiped	PASS/ FAIL
Rear Door	Emergency Door	High	178	1. 21.4 2. 26.7 3. 27.3 Average: 25.1	Straight	Outward Push	114x55x15 Parallelepiped	**PASS**

Describe in the comments section if more than one force and motion are required to unlatch the exit.

COMMENTS: NONE

Recorded By:_____

Approved By:_____ DATE: 04/26/2007

DATA SHEET 7B

FORCE TESTS TO OPEN THE EMERGENCY EXITS - EXTERIOR

Test Vehicle: **2006 US BUS SCHOOL BUS** NHTSA No.: **C60900**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **04/26/2007**

Exit Location	Exit Description	High/Low Force Area	Maximum Force Requirement Newtons	Actual Force Measured (N)	Motion(s) required to Open Exit	Actual Motion(s) to Open Exit	Passage of Ellipsoid or Parallelepiped	PASS/ FAIL
Rear Door	Emergency Door	High	178	1. 17.7 2. 20.8 3. 15.6 Average: 18.0	Straight	Pull Outwards	114x55x15 Parallelepiped	**PASS**

Describe in the comments section if more than one force and motion are required to unlatch the exit.

COMMENTS: NONE

Recorded By:_____

Approved By:_____ DATE: 04/26/2007

DATA SHEET 8

EMERGENCY EXIT EXTENSION

Test Vehicle: **2006 US BUS SCHOOL BUS** NHTSA No.: **C60900**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **04/26/2007**

		PASS/FAIL
1	Exit(s) can be extended by a single person.	**PASS**
2	Each emergency exit door is equipped with a positive door opening device that meets the requirements (outlined in Section S5.4.1 (3) of FMVSS 217).	**PASS**
3	There is a 30 cm (11.81”) wide clear aisle space for each side emergency door exit.	**N/A**
4	For flip-up seat adjacent to the side emergency door exit it automatically assumes and retain a vertical position when not in use, so that no portion of the seat bottom is within the 30 cm (11.81”) aisle clearance space	**N/A**
5	There is no seat or barrier which extend past the side door opening	**N/A**
6	There is no obstruction of door latch mechanism for the rear emergency door.	**PASS**

COMMENTS: NONE

Recorded By:_____

Approved By:_____ DATE: 04/26/2007

DATA SHEET 9

WINDOW RETENTION TEST

Test Vehicle: **2006 US BUS SCHOOL BUS** NHTSA No.: **C60900**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **04/26/2007**

1	Test Window Identification:	Rear Door Upper Window		
2	Provide a detailed description of the window such as fixed, push out, single or double glazed, horizontal or vertical sliding, etc.	Fixed		
3	Provide the horizontal and vertical glazing dimensions for each panel.	610 mm x 444 mm		
4	Did the window pass the retention requirements? Describe how the window structure and glazing withstood the force per the PASS/FAIL criteria:	Glazing shattered at 1109 N. **PASS**		
5	Did the window pass the force tests to unlatch and open the exit after the completion of the retention test?	Unlatch Force Measured (N)	Open Force Measured (N)	Pass/ Fail
		1. 32.6	1. 17.2	**PASS**
		2. 30.1	2. 19.1	**PASS**
		3. 30.4	3. 18.9	**PASS**

COMMENTS: NONE

Recorded By:_____

Approved By:_____ DATE: 04/26/2007

DATA SHEET 9 (CONTINUED)

WINDOW RETENTION TEST

Test Vehicle: **2006 US BUS SCHOOL BUS** NHTSA No.: **C60900**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **04/26/2007**

1	Test Window Identification:	Left Window 4		
2	Provide a detailed description of the window such as fixed, push out, single or double glazed, horizontal or vertical sliding, etc.	Vertical Sliding Not Emergency Exit		
3	Provide the horizontal and vertical glazing dimensions for each panel.	606 mm X 296 mm		
4	Did the window pass the retention requirements? Describe how the window structure and glazing withstood the force per the PASS/FAIL criteria:	Glazing shattered at 1149 N. **PASS**		
5	Did the window pass the force tests to unlatch and open the exit after the completion of the retention test?	Unlatch Force Measured (N)	Open Force Measured (N)	Pass/ Fail
		NA	NA	NA
		NA	NA	NA
		NA	NA	NA

COMMENTS: NONE

Recorded By:_____

Approved By:_____ DATE: 04/26/2007

SECTION 4

INSTRUMENTATION AND EQUIPMENT LIST

Test Vehicle: **2006 US BUS SCHOOL BUS** NHTSA No.: **C60900**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **04/26/2007**

Equipment	Description	Model/Serial No.	Cal. Date	Next Cal. Date
Head Form	MGA	217	When Used	When Used
A/D Interface	Metrabyte	DAS-1802	---	---
Sphere	MGA	Sphere – 1A	When Used	When Used
Load Cell	Interface	1210AF-62736	01/29/07	07/29/07
Inclinometer	Digital Protractor	Pro 360 / Comp Lab	04/19/07	10/19/07
Linear Potentiometer	Ametek	P40A/0504-21782	10/30/06	04/30/07
Digital Calipers	Mitutoyo	CD-6” cs/ 0441288	09/11/06	09/11/07
Steel Tape	Stanley	Powerlock / 282	02/27/07	08/27/07
Camera	Sony	DSC-S75	---	---
Ellipsoid	MGA	ELLIP – 1A	When Used	When Used
Parallelepiped	MGA	PARA – 1A	When Used	When Used
Force Gauge	Dillon	AFG/DMLC	04/19/07	10/19/07

SECTION 5
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Test Vehicle: **2006 US BUS SCHOOL BUS** NHTSA No.: **C60900**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **04/26/2007**

Exterior Left Side View of School Bus

Test Vehicle:	**2006 US BUS SCHOOL BUS**	NHTSA No.:	**C60900**
Test Lab:	**MGA RESEARCH CORPORATION**	Test Date:	**04/26/2007**

Exterior Right Front ¾ View of School Bus

Test Vehicle:	**2006 US BUS SCHOOL BUS**	NHTSA No.:	**C60900**
Test Lab:	**MGA RESEARCH CORPORATION**	Test Date:	**04/26/2007**

Exterior Left Rear ¾ View of School Bus

Certification Label

Test Vehicle: **2006 US BUS SCHOOL BUS** NHTSA No.: **C60900**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **04/26/2007**

Interior Front to Rear View Depicting Seating Arrangement

Test Vehicle:	**2006 US BUS SCHOOL BUS**	NHTSA No.:	**C60900**
Test Lab:	**MGA RESEARCH CORPORATION**	Test Date:	**04/26/2007**

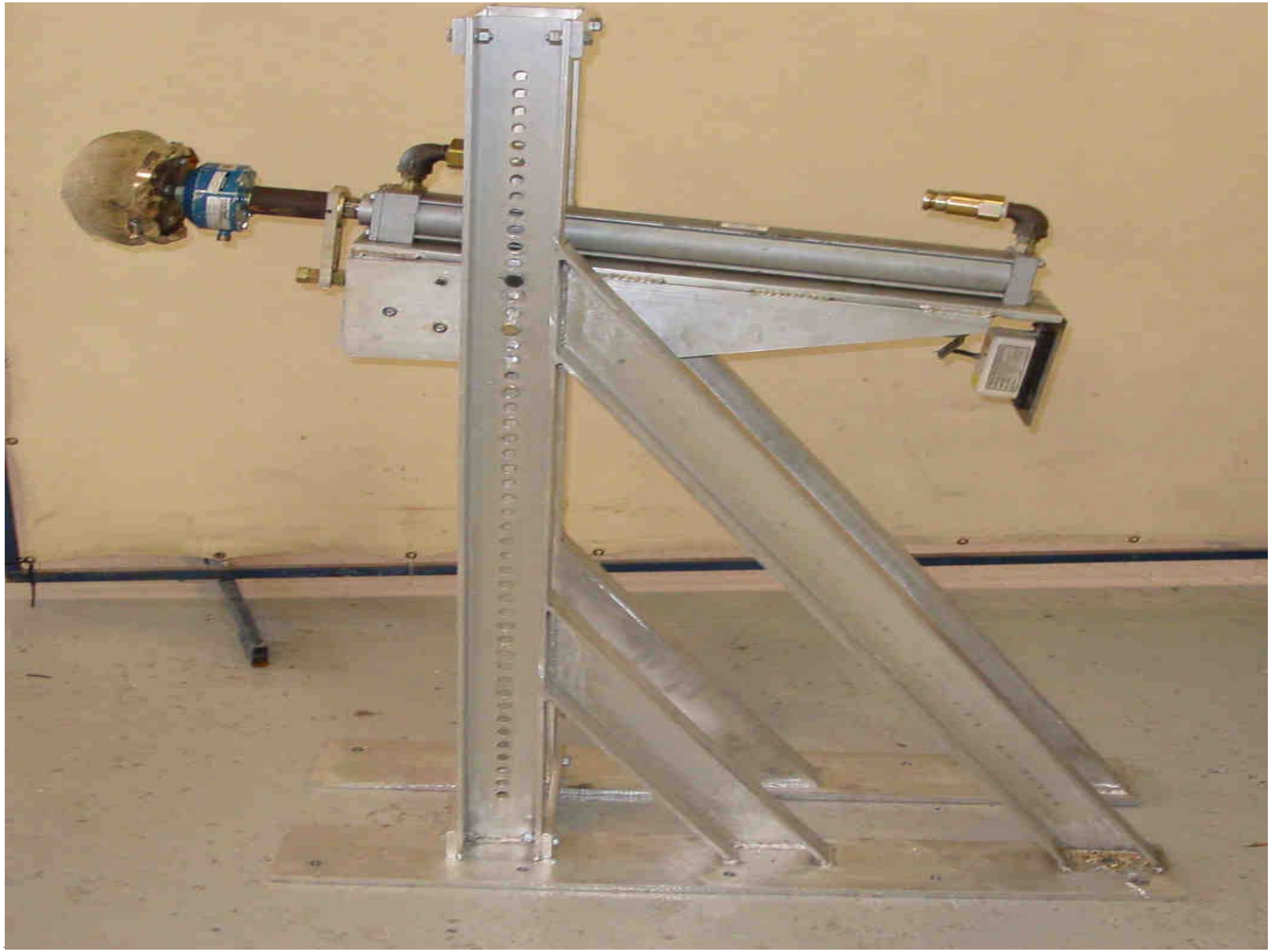
Interior Rear to Front View Depicting Seating Arrangement

Rear Exit Door Identification (Outside View)

Rear Exit Door Identification (Inside View)

Test Vehicle: **2006 US BUS SCHOOL BUS** NHTSA No.: **C60900**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **04/26/2007**

Rear Door Emergency Exit Parallelepiped Clearance



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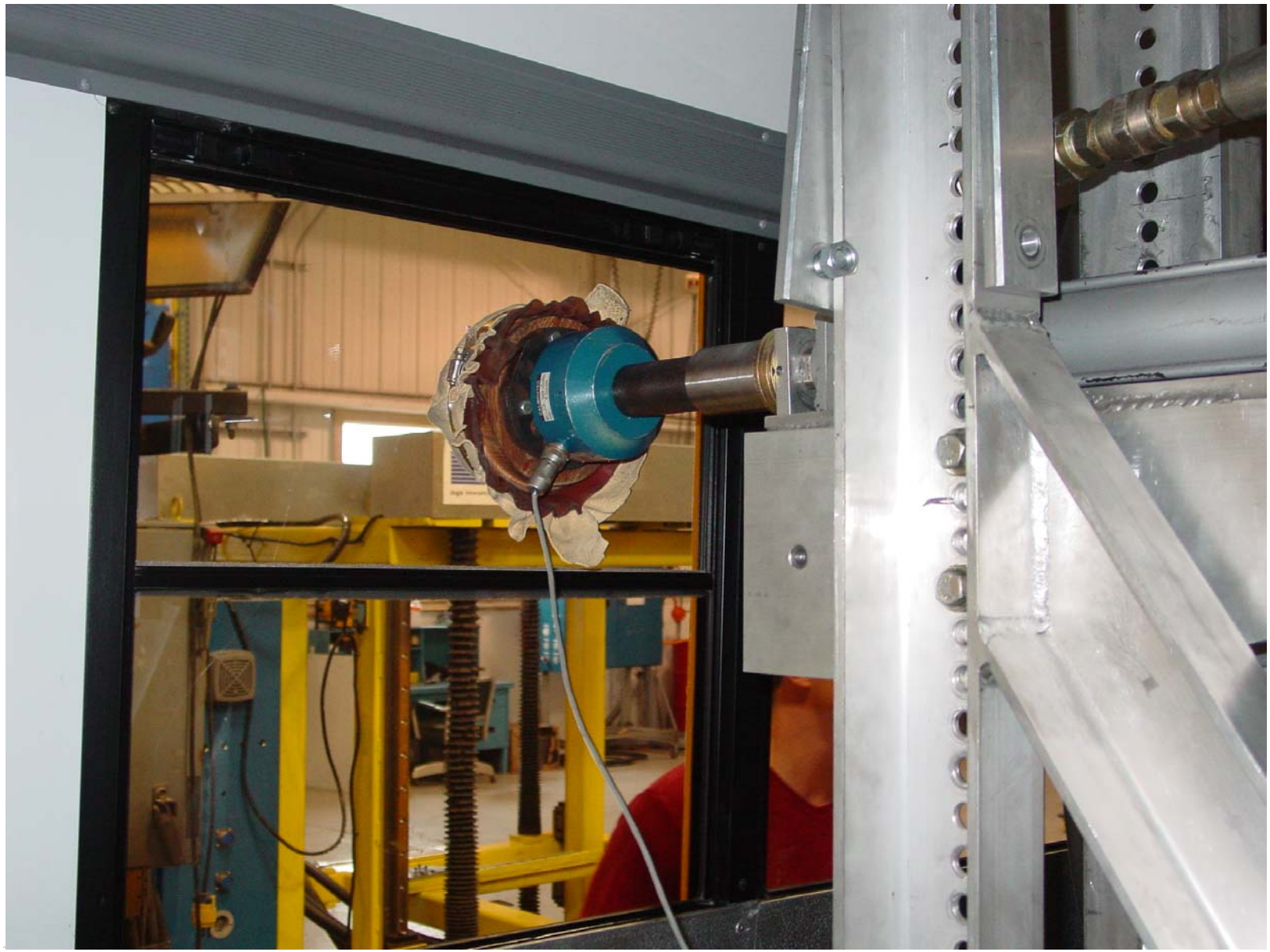
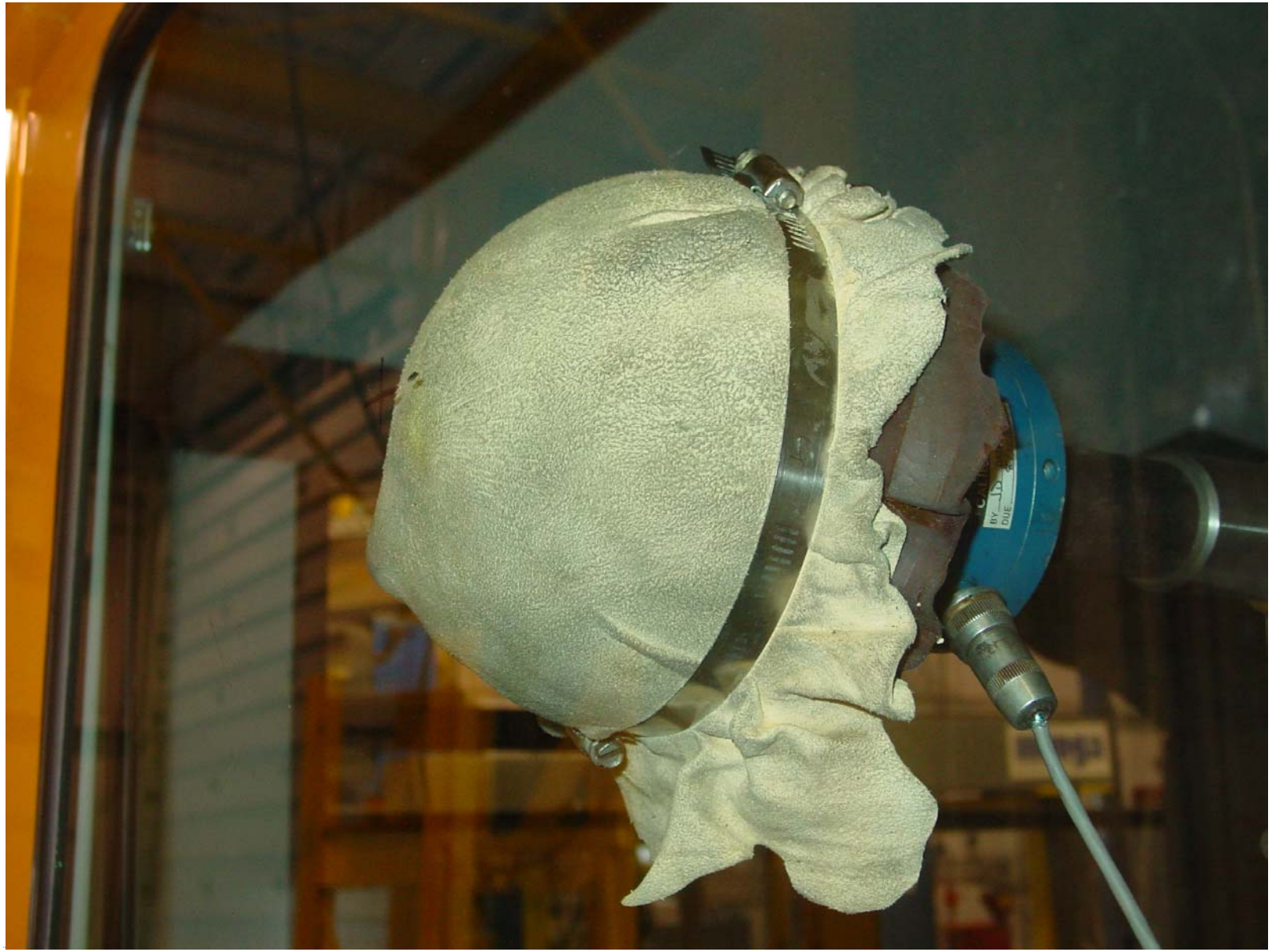


Retention Test of Left Side Window (Pre-Test)

Retention Test of Left Side Window (Post-Test)



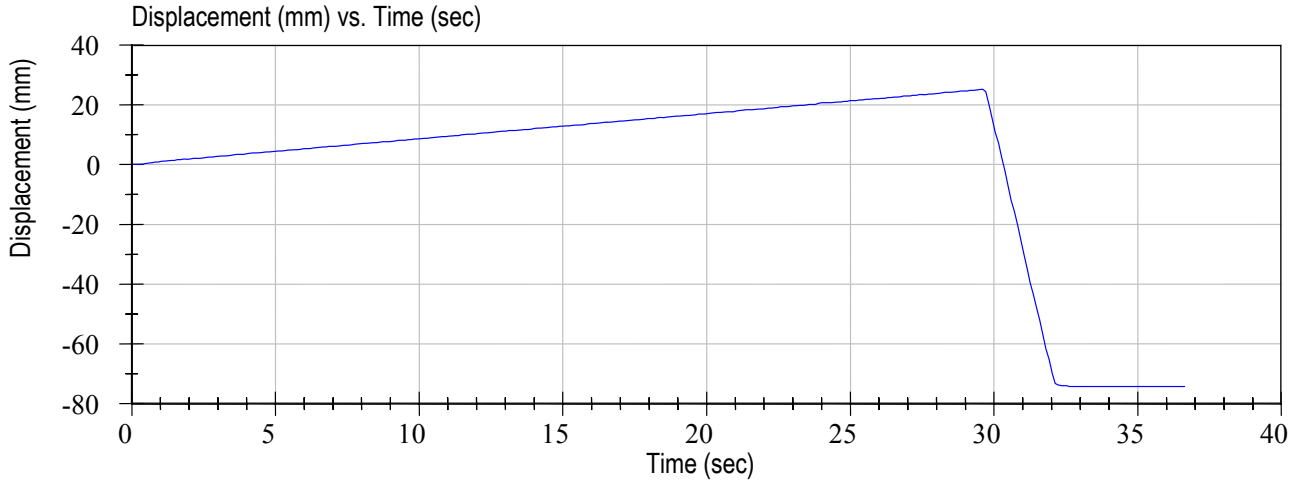
Retention Test of Rear Door Window (Pre-Test)

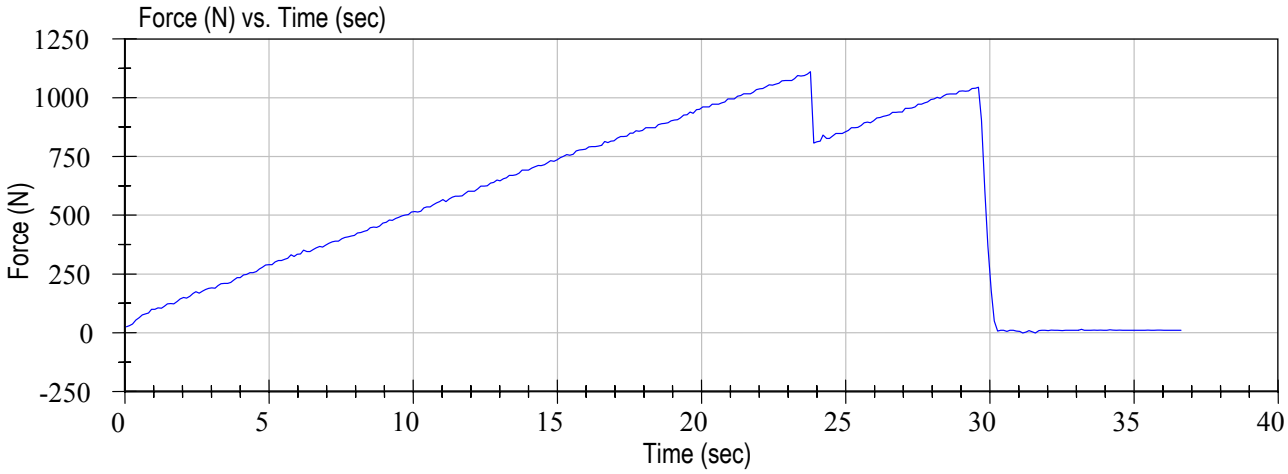
Retention Test of Rear Door Window (Post-Test)

SECTION 6

TEST PLOTS

Test Desc: FMVSS 217 Window Retention
Component ID: US Bus Rear Door Upper Window
Test Date: 04/26/2007
NHTSA No: C60900





Test Desc: FMVSS 217 Window Retention
Component ID: US Bus Left Window 4

Test Date: 04/26/2007
NHTSA No: C60900