

REPORT NUMBER: 221-MGA-2007-003

**SAFETY COMPLIANCE TESTING FOR
FMVSS NO. 221
SCHOOL BUS BODY JOINT STRENGTH**

**IC CORPORATION
2007 IC BE 200 SCHOOL BUS
NHTSA NO.: C70901**

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



FINAL REPORT DATE: NOVEMBER 1, 2007

FINAL REPORT

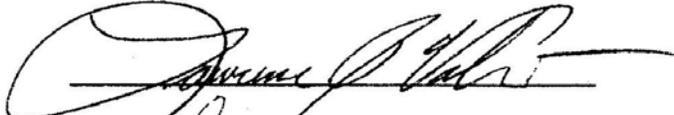
**PREPARED FOR:
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NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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Prepared by: 
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November 01, 2007

Technical Report Documentation Page

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SECTION 1
PURPOSE OF COMPLIANCE TEST

Tests were conducted on a MY 2007 IC BE 200 School Bus, NHTSA No. C70901, in accordance with the specifications of the Office of Vehicle Safety Compliance (OVSC) Test Procedures TP-221-02 to determine compliance with the requirements of Federal Motor Vehicle Safety Standards (FMVSS) 221, "School Bus Body Joint Strength".

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

SECTION 2

TEST PROCEDURE

The MY 2007 IC BE 200 School Bus, NHTSA No. C70901 was subjected to FMVSS 221 testing.

The joint samples were selected in conjunction with the Contract Officer's Technical Representative (COTR). Six 12 x 48 inch samples were selected. They were removed from the bus using a metal shear and/or SawzAll type of cutter.

After each sample area had been removed from the bus, the sample was cut to the specific selected dimensions. Each specimen was carefully shaped to the final size using supports as specified in FMVSS 221. Additionally, temperature monitoring stickers were placed at the specified locations of each sample to ensure the sample temperature did not exceed 140°F during the shaping operation.

The samples were tested using the MGA 50,000 pound tensile tester. The force applied was measured directly at the upper clamp. The upper clamp was attached to the load cell and the lower clamp was attached to the load frame.

The gripping devices were fabricated from 3" x 3" angle iron. Slots were milled on the face that mounted to the machine, in order to allow for fore and aft movement of the clamps. This allowed the specimens to be fixtured so that the axis of the test specimen coincided with the centerline axis of the tensile tester heads.

The test specimen was inserted in between the grips, and the grips were then bolted together using 7 size ½" bolts. The bolts were inserted through one grip, through the test specimen, and then through the other grip. This prevented any slipping of the test sample in the grips, while fully distributing the clamping force across the entire end width of the test sample. Post test examination of the specimens indicated that no loads were applied to the clamp mounting holes.

The rate of load application was ¼ inch per minute. The force and displacement were recorded and displacement vs. time was plotted to monitor the displacement rate.

SECTION 3
TEST DATA SUMMARY

A total of six samples were tested for this vehicle. The samples were selected from the right side exterior, right side interior, mid roof exterior, mid roof interior, rear roof exterior, and rear roof interior.

	Maximum Load (N)	60% of Material Strength (N)	PASS/FAIL
Right Side Exterior	68195.2	47251.0	PASS
Right Side Interior	26546.7	25259.4	PASS
Mid Roof Exterior	42232.1	28366.4	PASS
Mid Roof Interior	27315.2	25837.6	PASS
Rear Roof Exterior	37741.3	29241.7	PASS
Rear Roof Interior	28546.0	25259.4	PASS

The maximum forces measured, and the displacement rate used, are provided in Section 7.
The photographs taken from the samples are provided in Section 6 and Section 8.

SECTION 4
COMPLIANCE TEST DATA

The following data sheets document the results of FMVSS 221 testing on the MY 2007 IC BE 200 School Bus, NHTSA No. C70901.

DATA SHEET 1
ADMINISTRATIVE DATA SHEET

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**

INCOMPLETE VEHICLE (IF APPLICABLE)

Manufacturer:	
Model:	
VIN:	
Build Date:	
Certification Date:	

COMPLETED VEHICLE (SCHOOL BUS)

Manufacturer:	IC CORPORATION
Make/Model:	IC BE 200 SCHOOL BUS
VIN:	4DRAPAFK07A407251
NHTSA No.:	C70901
Color:	Yellow
GVWR:	7,938 kg / 17,500 lbs
Build Date:	04/06
Certification Date:	04/06

DATES

Vehicle Receipt:	10/06/06
Start of Compliance Test:	01/15/06
Completion of Compliance Test:	03/14/07

COMPLIANCE TEST:

All tests were performed in accordance with the references outlined in TP-221-02.

Recorded By: 

Approved By: 

Date: 10/12/07

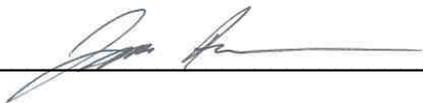
DATA SHEET 2
SUMMARY OF DATA

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**

Joint Specimen I.D.	Joint Location	Joint Load Reqmt (60%) (N)	Max. Load at Joint Separation (N)	Calculated Material Strength (N)	PASS/ FAIL
ILSRRE187BAV	Right Side Exterior	47251.0	68195.2	78751.7	PASS
ILSRFI286BAV	Right Side Interior	25259.4	26546.7	42099.1	PASS
ILRCME387BAH	Mid Roof Exterior	28366.4	42232.1	47277.3	PASS
ILRRMI485BAH	Mid Roof Interior	25837.6	27315.2	43062.7	PASS
ILRRRE586BAH	Rear Roof Exterior	29241.7	37741.3	48736.1	PASS
ILRCRI686BAH	Rear Roof Interior	25259.4	28546.0	42099.1	PASS

Comments: NONE

Recorded By: 

Approved By: 

Date: 10/12/07

DATA SHEET 3

JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
 Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
 Test Date: **10/12/07**

Specimen Description:	Right Side Exterior		
Joint Number:	ILSRRE187BAV	Test Number:	1

	Weaker Member	Stronger Member
Material	ASTM 653, Grade 1008	N/A
Tensile Strength (MPa)	310.3	N/A
Gage/Thickness (mm)	16 / 1.519	N/A
Fastener Holes (No./Diameter – mm.)	7 / 5.16	N/A
Net Area (Sq. mm.)	253.8	N/A
Material Strength (N)	78751.7	N/A
60% of Material Strength (N)	47251.0	N/A
Maximum Load From Tensile Test of Joint (N)	68195.2	N/A
PASS/FAIL	PASS	N/A

Comments: NONE

Recorded By: 

Approved By: 

Date: 10/12/07

DATA SHEET 3... (Continued)

JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
 Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
 Test Date: **10/12/07**

Specimen Description:	Right Side Interior		
Joint Number:	ILSRF1286BAV	Test Number:	2

	Weaker Member	Stronger Member
Material	ASTM 653, Grade 1008	N/A
Tensile Strength (MPa)	310.3	N/A
Gage/Thickness (mm)	22 / 0.759	N/A
Fastener Holes (No./Diameter – mm.)	6 / 4.09	N/A
Net Area (Sq. mm.)	135.7	N/A
Material Strength (N)	42099.1	N/A
60% of Material Strength (N)	25259.4	N/A
Maximum Load From Tensile Test of Joint (N)	26546.7	N/A
PASS/FAIL	PASS	N/A

Comments: NONE

Recorded By: 

Approved By: 

Date: 10/12/07

DATA SHEET 3... (Continued)

JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN

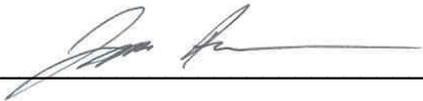
Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
 Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
 Test Date: **10/12/07**

Specimen Description:	Mid Roof Exterior		
Joint Number:	ILRCME387BAH	Test Number:	3

	Weaker Member	Stronger Member
Material	ASTM 653, Grade 1008	N/A
Tensile Strength (MPa)	310.3	N/A
Gage/Thickness (mm)	20 / .0912	N/A
Fastener Holes (No./Diameter – mm.)	7 / 5.16	N/A
Net Area (Sq. mm.)	152.4	N/A
Material Strength (N)	47277.3	N/A
60% of Material Strength (N)	28366.4	N/A
Maximum Load From Tensile Test of Joint (N)	42232.1	N/A
PASS/FAIL	PASS	N/A

Comments: NONE

Recorded By: 

Approved By: 

Date: 10/12/07

DATA SHEET 3... (Continued)

JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN

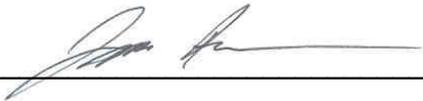
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 Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
 Test Date: **10/12/07**

Specimen Description:	Mid Roof Interior		
Joint Number:	ILRRMI485BAH	Test Number:	4

	Weaker Member	Stronger Member
Material	ASTM 653, Grade 1008	N/A
Tensile Strength (MPa)	310.3	N/A
Gage/Thickness (mm)	22 / 0.759	N/A
Fastener Holes (No./Diameter – mm.)	5 / 4.09	N/A
Net Area (Sq. mm.)	138.8	N/A
Material Strength (N)	43062.7	N/A
60% of Material Strength (N)	25837.6	N/A
Maximum Load From Tensile Test of Joint (N)	27315.2	N/A
PASS/FAIL	PASS	N/A

Comments: NONE

Recorded By: 

Approved By: 

Date: 10/12/07

DATA SHEET 3... (Continued)

JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN

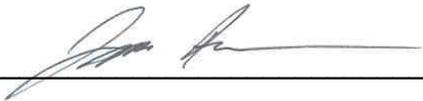
Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
 Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
 Test Date: **10/12/07**

Specimen Description:	Rear Roof Exterior		
Joint Number:	ILRRRE586BAH	Test Number:	5

	Weaker Member	Stronger Member
Material	ASTM 653, Grade 1008	N/A
Tensile Strength (MPa)	310.3	N/A
Gage/Thickness (mm)	20 / 0.912	N/A
Fastener Holes (No./Diameter – mm.)	6 / 5.16	N/A
Net Area (Sq. mm.)	157.1	N/A
Material Strength (N)	48736.1	N/A
60% of Material Strength (N)	29241.7	N/A
Maximum Load From Tensile Test of Joint (N)	37741.3	N/A
PASS/FAIL	PASS	N/A

Comments: NONE

Recorded By: 

Approved By: 

Date: 10/12/07

DATA SHEET 3... (Continued)

JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN

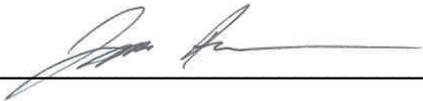
Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
 Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
 Test Date: **10/12/07**

Specimen Description:	Rear Roof Interior		
Joint Number:	ILRCRI686BAH	Test Number:	6

	Weaker Member	Stronger Member
Material	ASTM 653, Grade 1008	N/A
Tensile Strength (MPa)	310.3	N/A
Gage/Thickness (mm)	22 / 0.759	N/A
Fastener Holes (No./Diameter – mm.)	6 / 4.09	N/A
Net Area (Sq. mm.)	135.7	N/A
Material Strength (N)	42099.1	N/A
60% of Material Strength (N)	25259.4	N/A
Maximum Load From Tensile Test of Joint (N)	28546.0	N/A
PASS/FAIL	PASS	N/A

Comments: NONE

Recorded By: 

Approved By: 

Date: 10/12/07

SECTION 5
INSTRUMENTATION AND EQUIPMENT LIST

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**

Equipment	Description	Model/Serial No.	Cal. Date	Next Cal. Date
Load Cell	Interface	1220AF / 137778A	09/28/07	03/28/08
Linear Potentiometer	Patriot	P40A / 21783	05/08/07	11/08/07
Steel Tape	Stanley	Powerlock / 281	06/29/07	12/2907
Temp. Stickers	McMaster Carr	60° C / 5952K21	One Time Use	---

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Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Front View of School Bus

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Rear View of School Bus

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Left Side View of School Bus

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

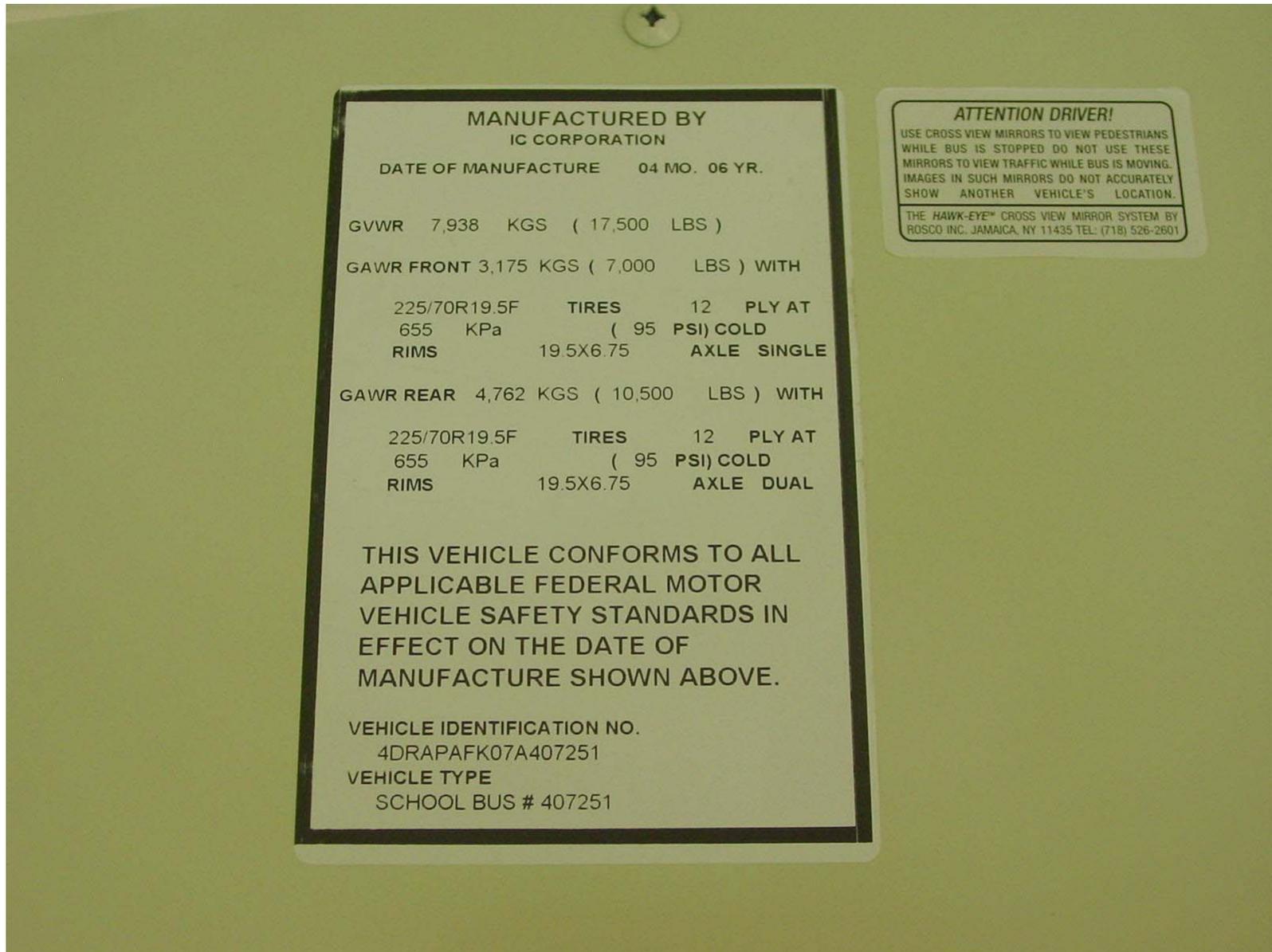
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Test Date: **10/12/07**



Right Side View of School Bus

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Close up View of Certification Label

Test Vehicle: 2007 IC BE 200 SCHOOL BUS
Test Lab: MGA RESEARCH CORPORATION

NHTSA No.: C70901
Test Date: 10/12/07



Vehicle Interior View Front to Rear

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Vehicle Interior View Rear to Front

Test Vehicle: 2007 IC BE 200 SCHOOL BUS
Test Lab: MGA RESEARCH CORPORATION

NHTSA No.: C70901
Test Date: 10/12/07



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Location of Joint #1

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



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Location of Joint #2

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**

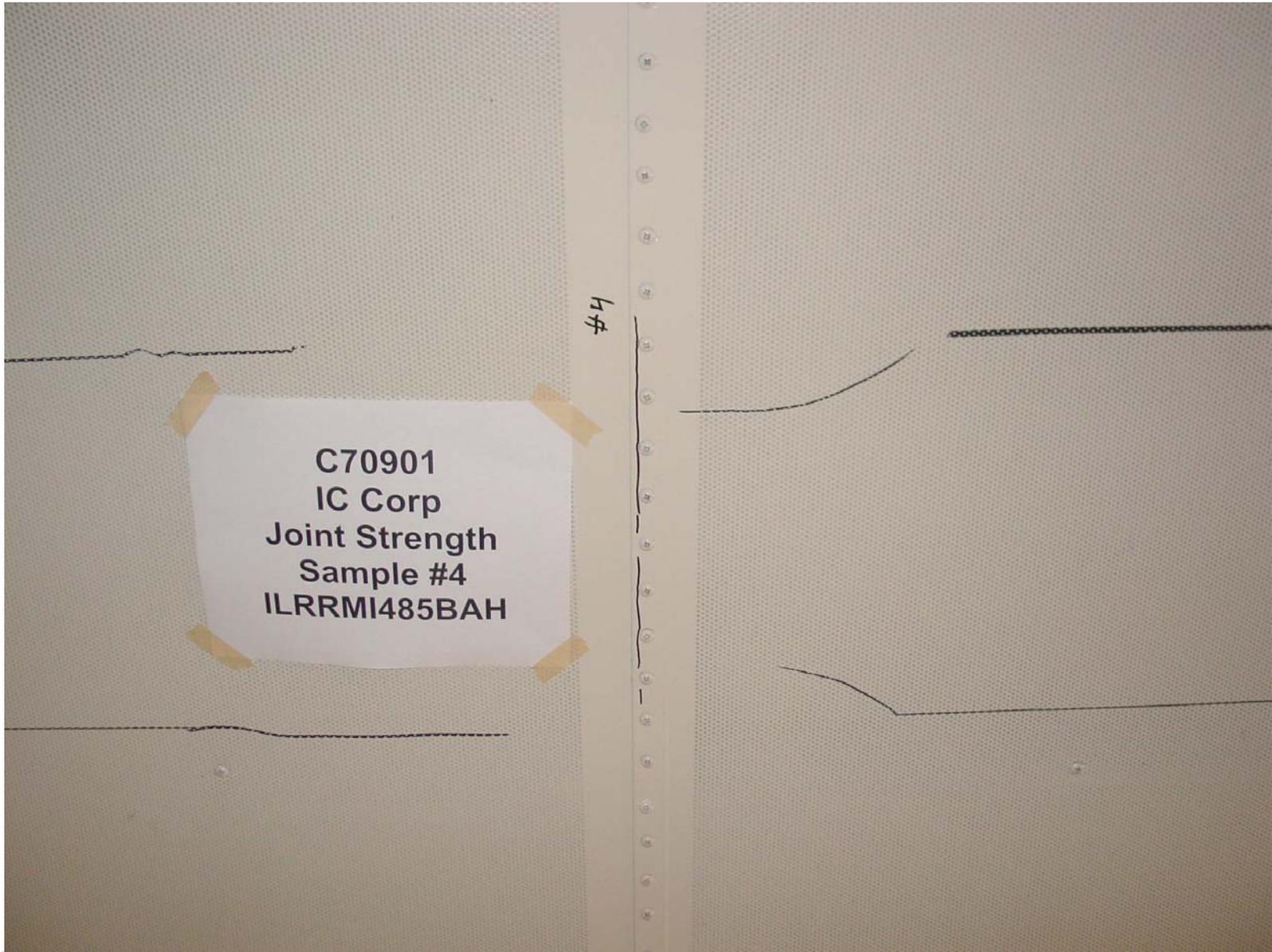


Location of Joint #3

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**

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Location of Joint #4

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

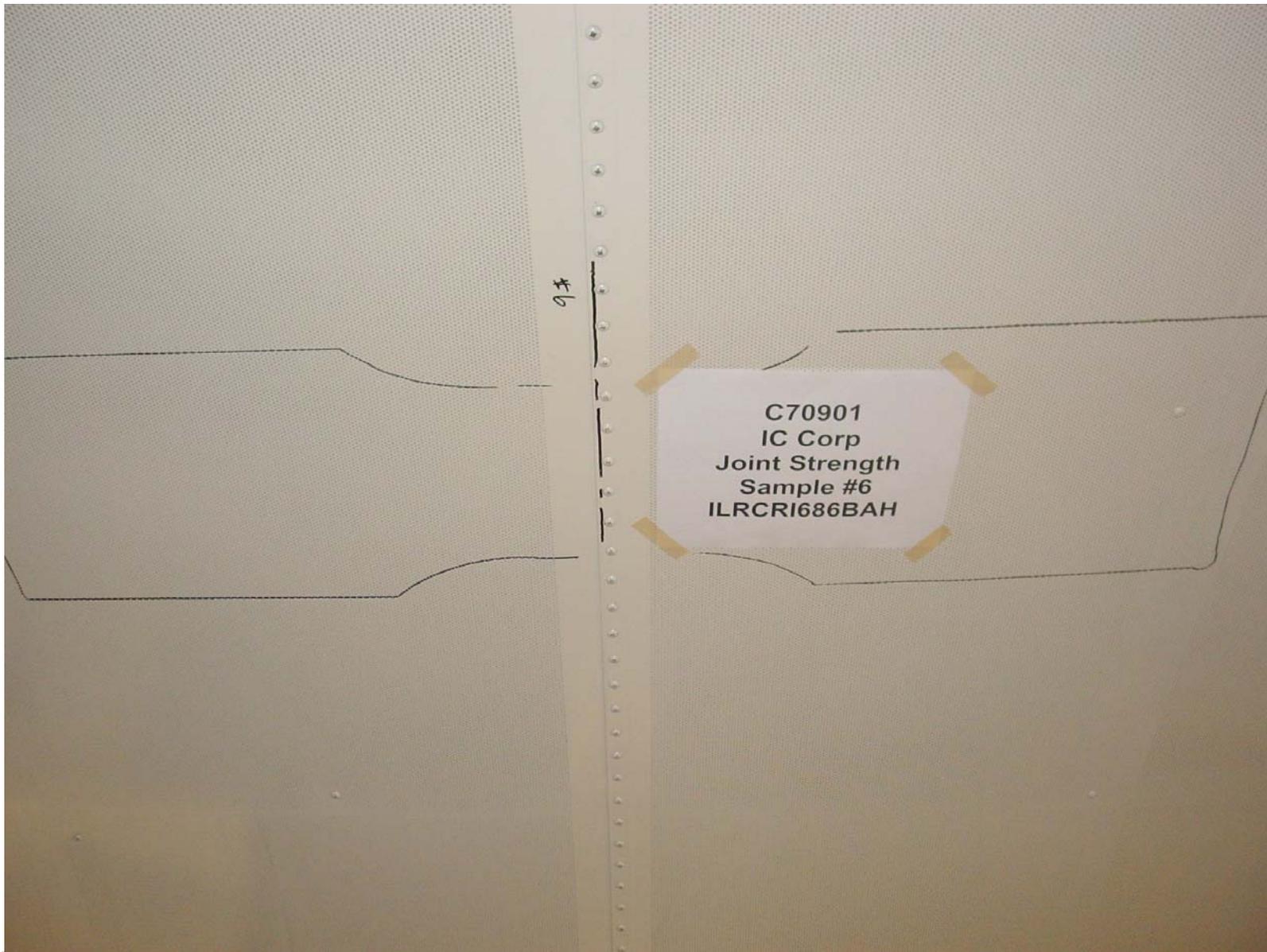
NHTSA No.: **C70901**
Test Date: **10/12/07**



Location of Joint #5

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Location of Joint #6

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Post-Test of Joint #1

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



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Post-Test of Joint #1 view 2

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Post-Test of Joint #2

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**

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Post-Test of Joint #2 view 2

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Post-Test of Joint #3

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Post-Test of Joint #3 view 2

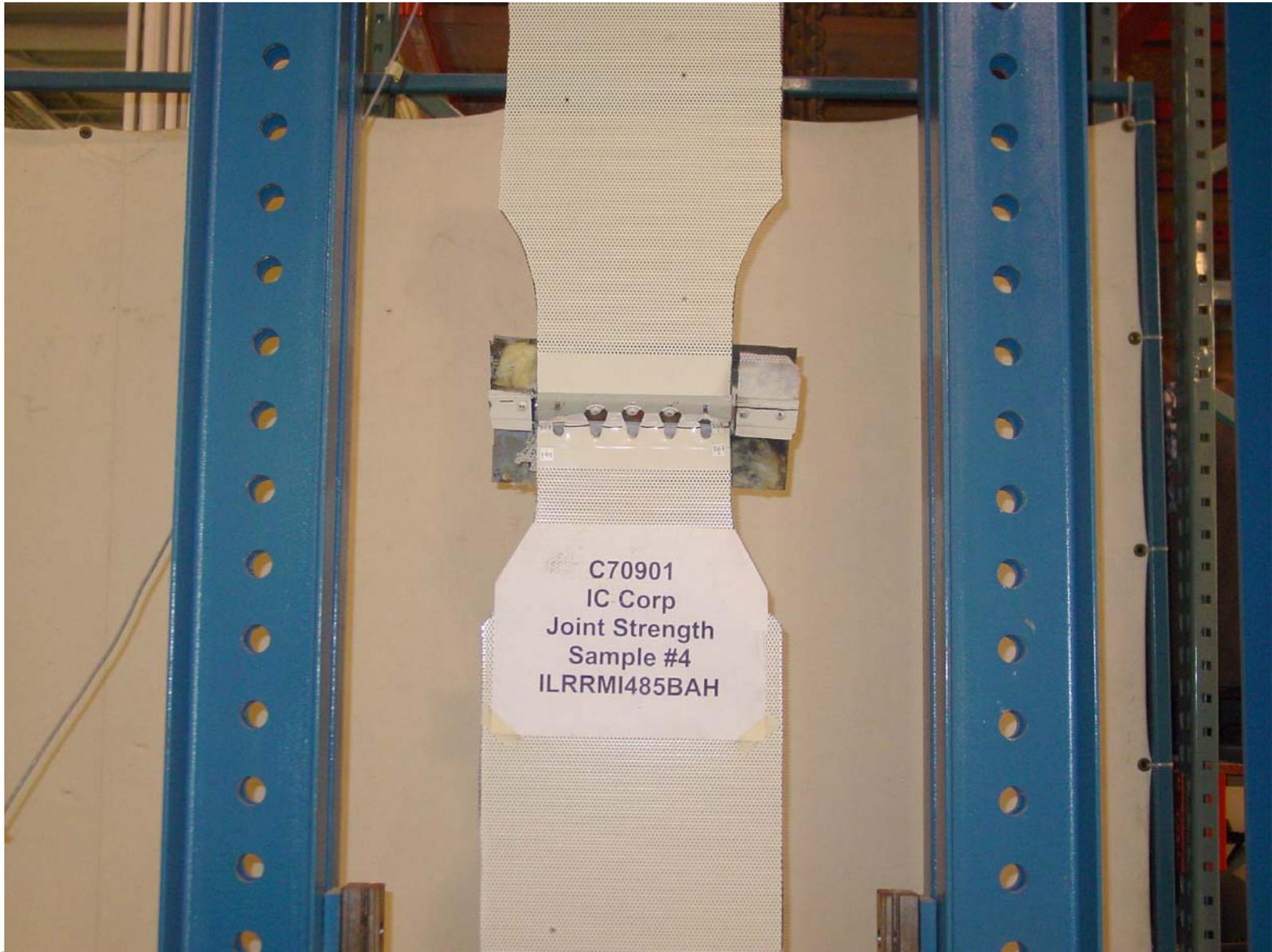
Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Post-Test of Joint #4

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Post-Test of Joint #4 view 2

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Post-Test of Joint #5

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Post-Test of Joint #5 view 2

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



Post-Test of Joint #6

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



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Post-Test of Joint #6 view 2

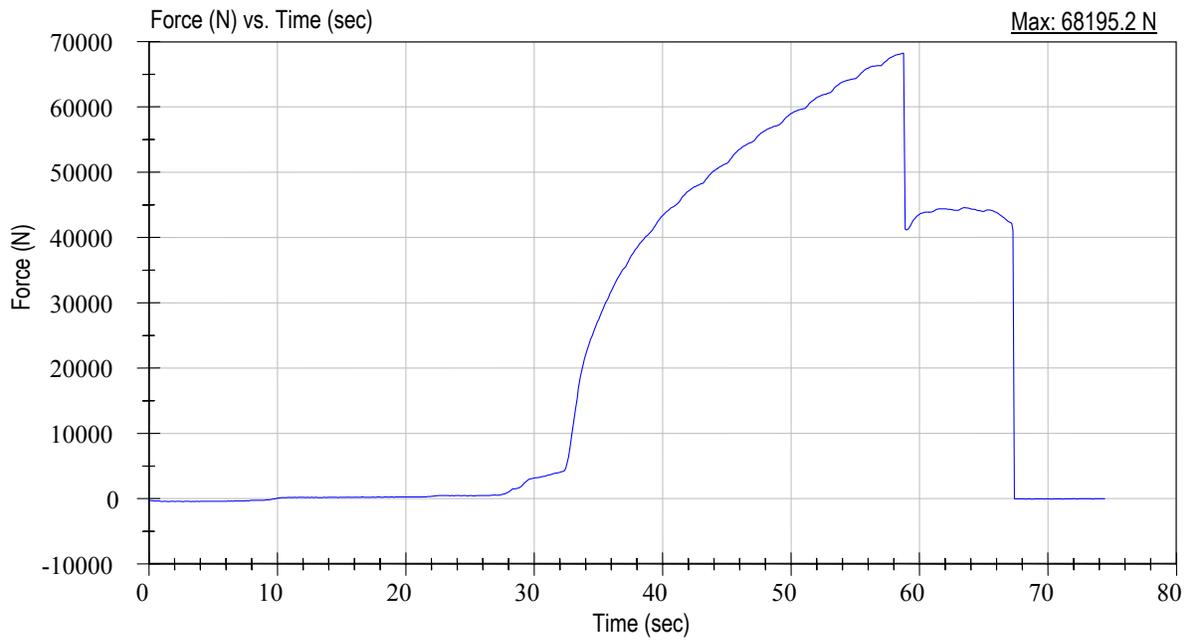
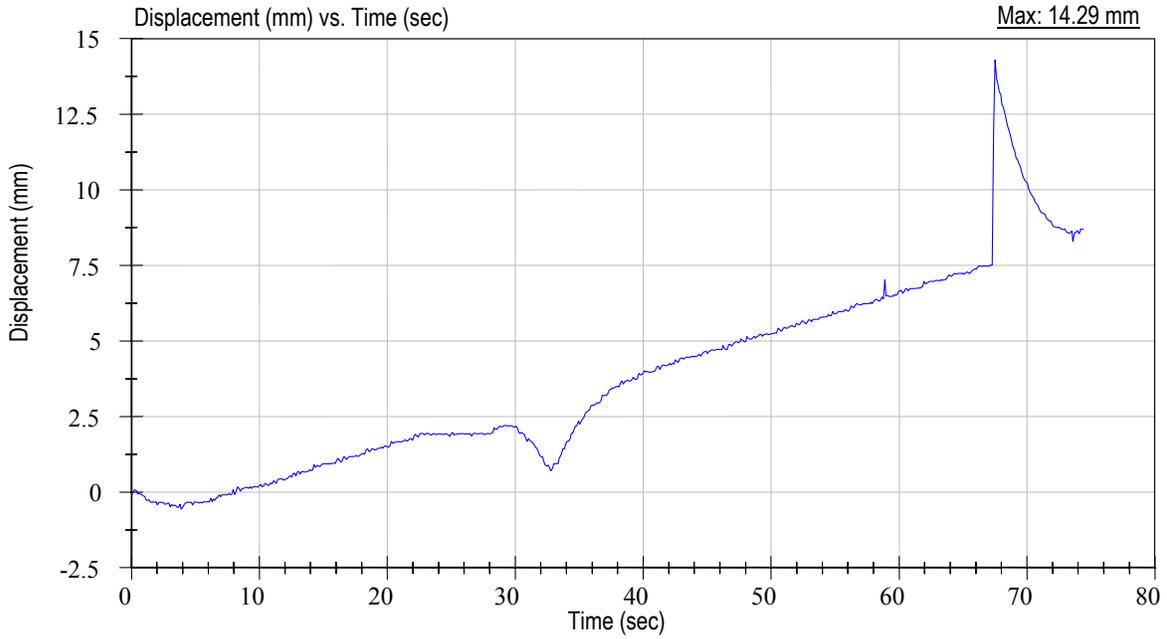
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Test Desc: FMVSS 221 (Required Load: 47251N)
Sample: 1

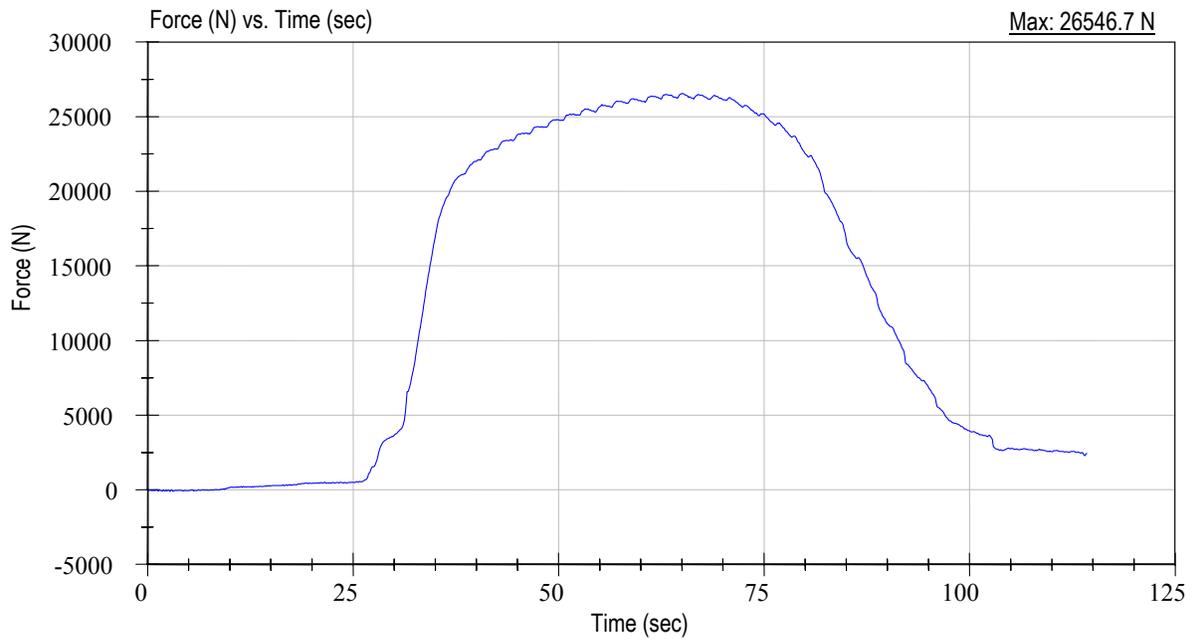
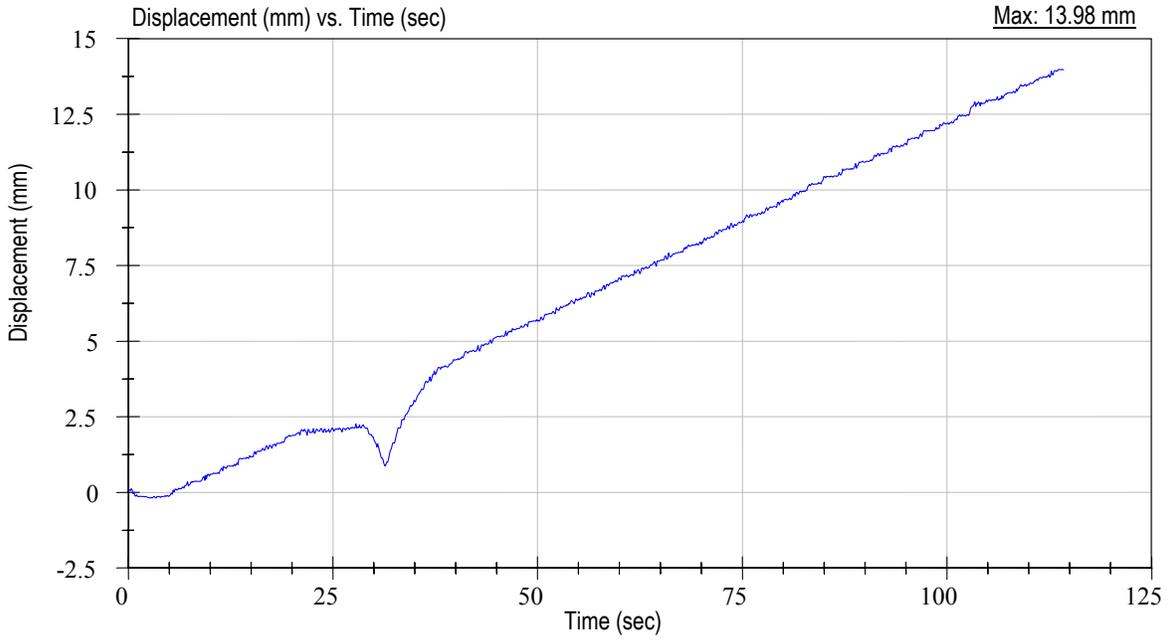
Test Date: 10-12-07
NHTSA No: C70901





Test Desc: FMVSS 221 (Required Load: 25259.4N)
Sample: 2

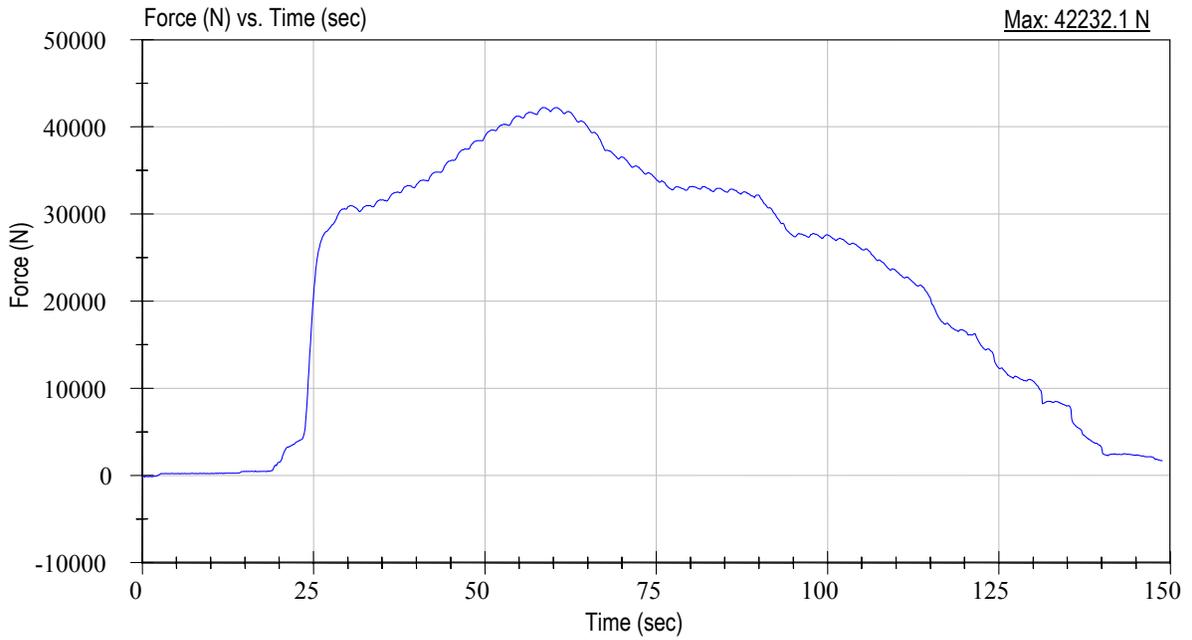
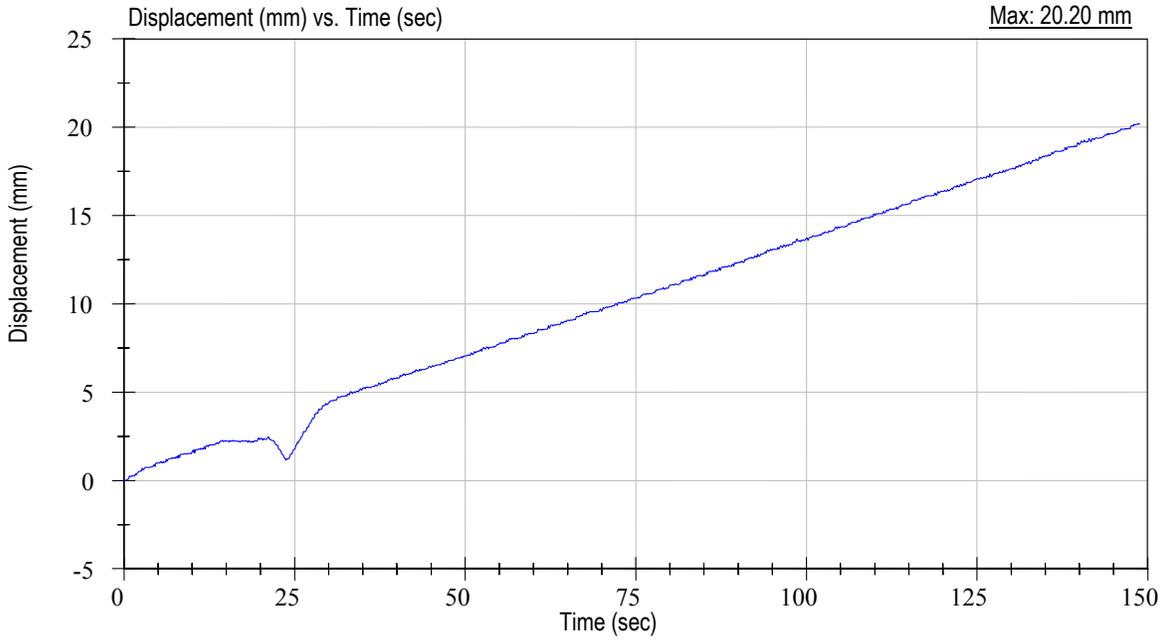
Test Date: 10-12-07
NHTSA No: C70901





Test Desc: FMVSS 221 (Required Load: 28366.4N)
Sample: 3

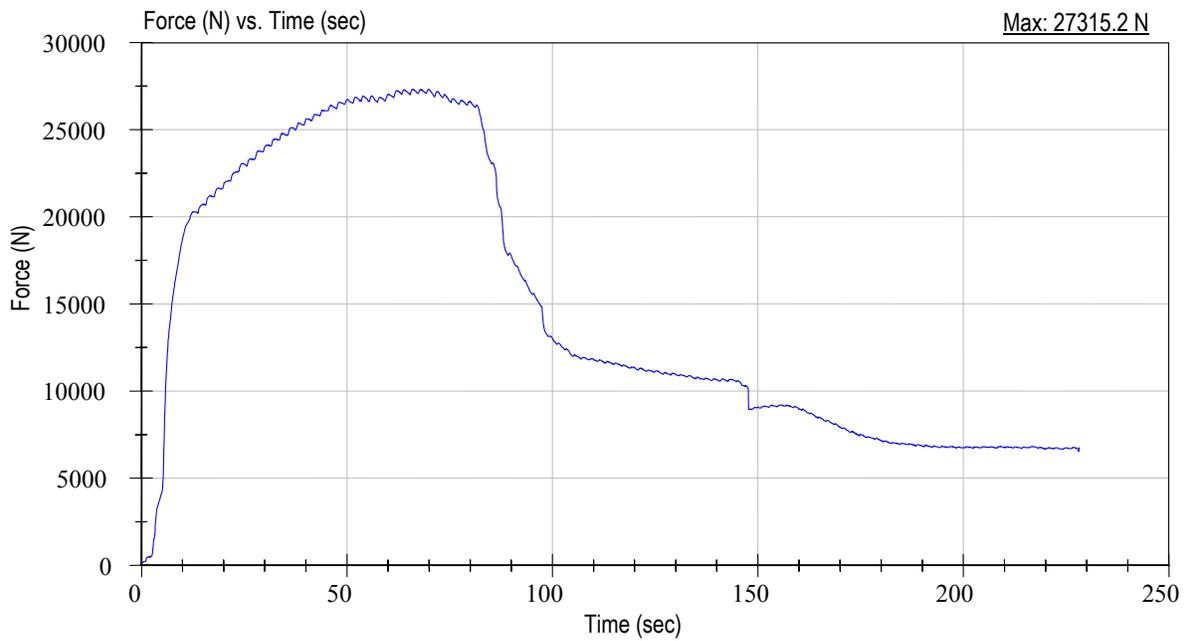
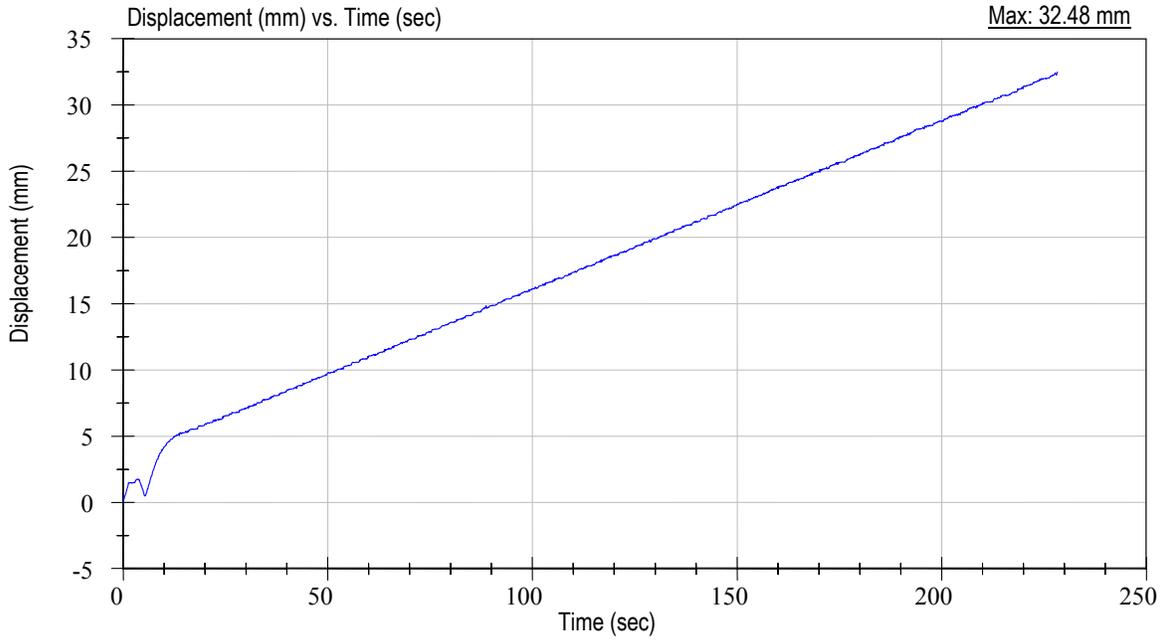
Test Date: 10-12-07
NHTSA No: C70901





Test Desc: FMVSS 221 (Required Load: 25837.6N)
Sample: 4

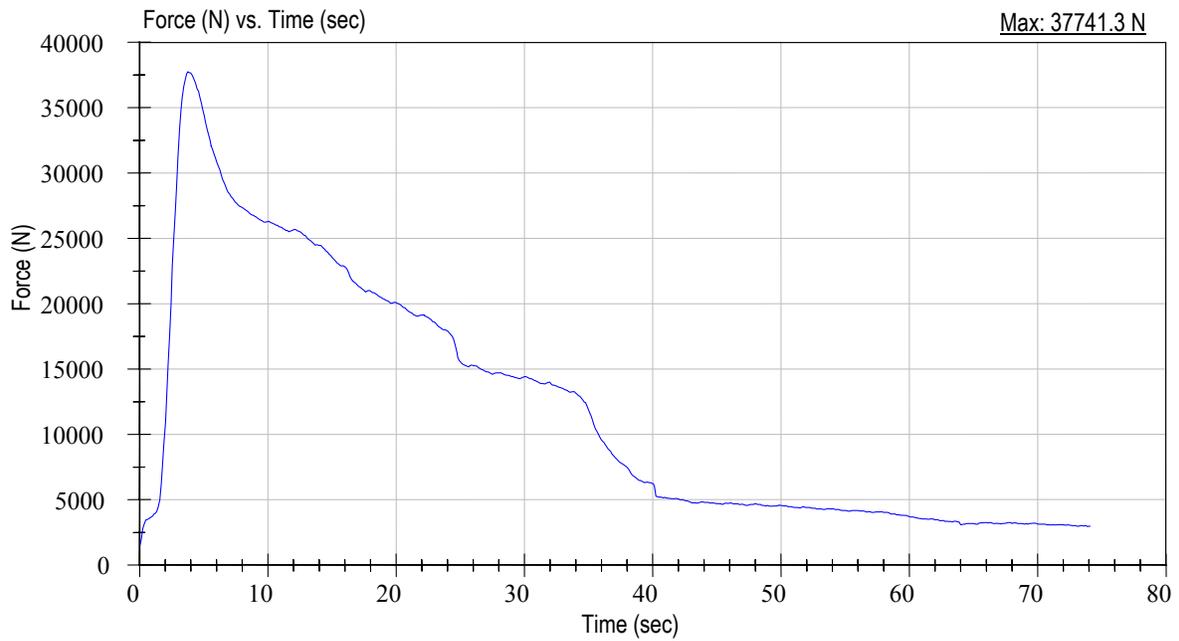
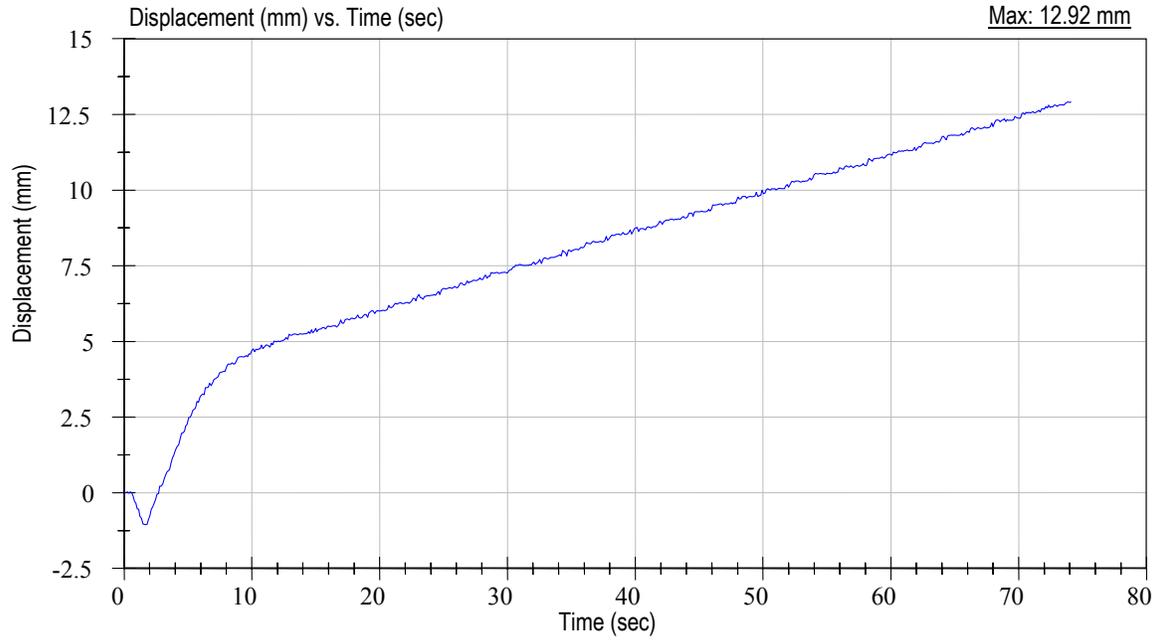
Test Date: 10-12-07
NHTSA No: C70901





Test Desc: FMVSS 221 (Required Load: 29241.7N)
Sample: 5

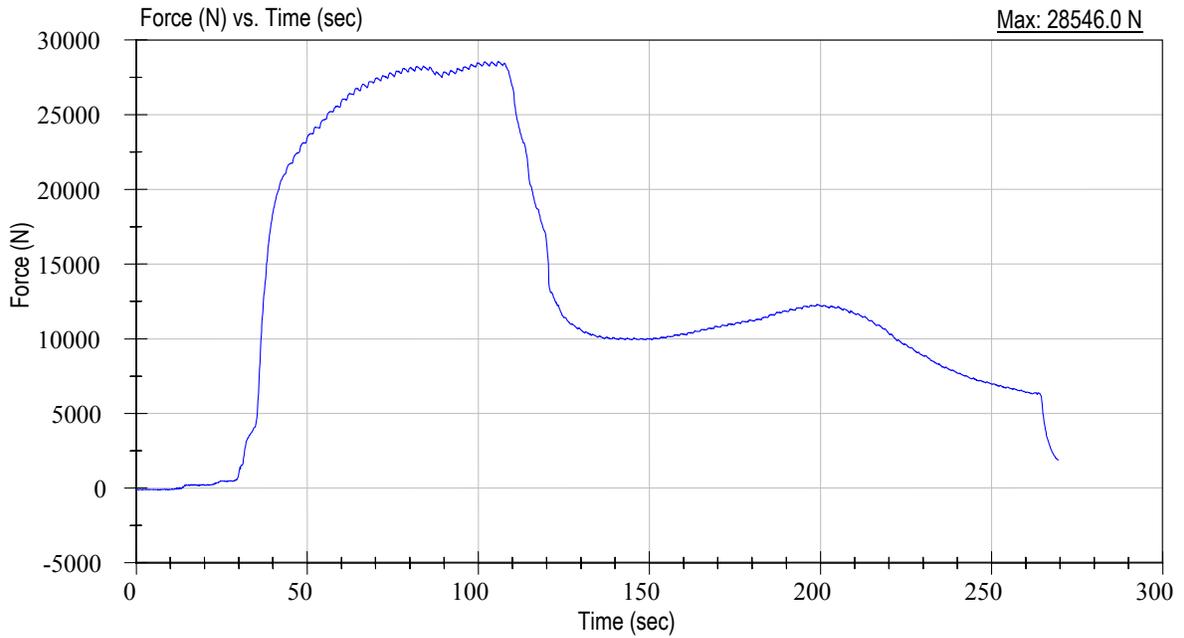
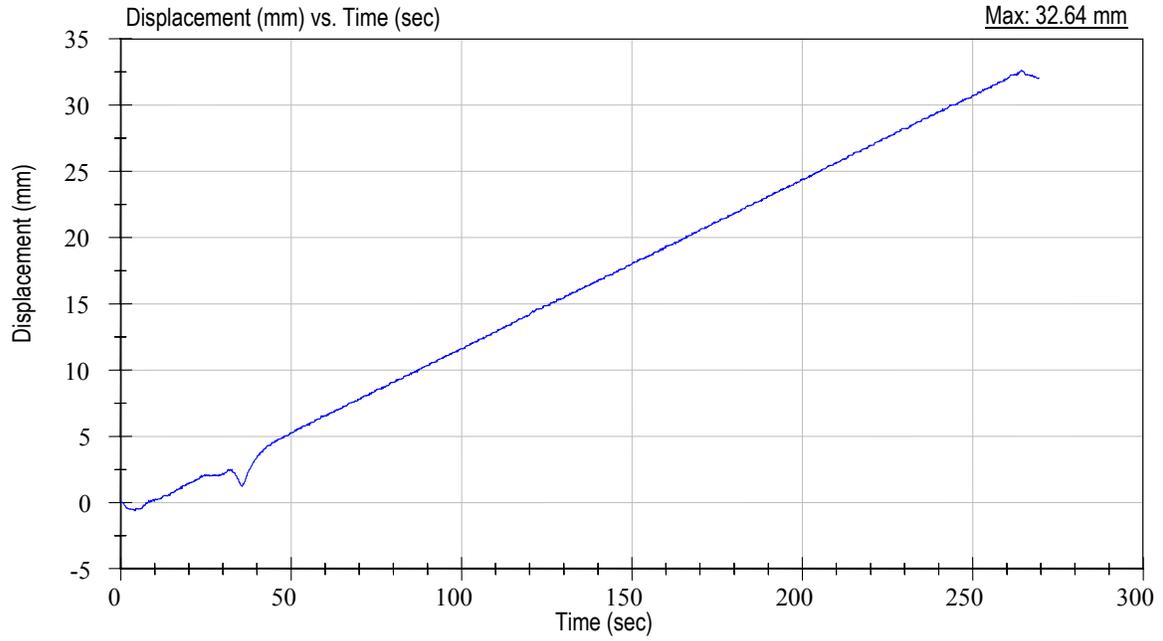
Test Date: 10-12-07
NHTSA No: C70901





Test Desc: FMVSS 221 (Required Load: 25259.4N)
Sample: 6

Test Date: 10-12-07
NHTSA No: C70901



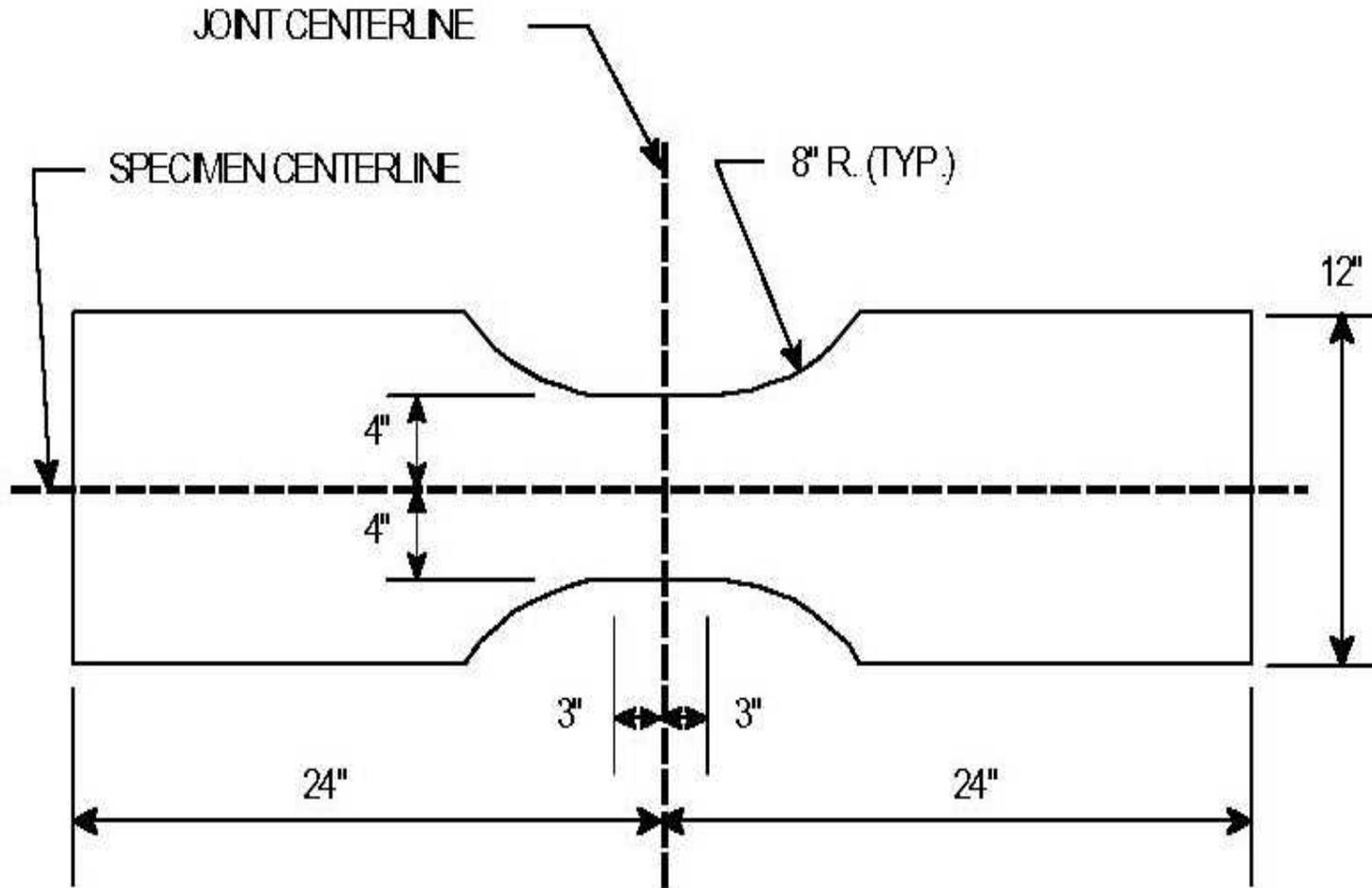
SECTION 8
JOINT CONFIGURATIONS
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Test Vehicle: 2007 IC BE 200 SCHOOL BUS
Test Lab: MGA RESEARCH CORPORATION

NHTSA No.: C70901
Test Date: 10/12/07

DIMENSION REQUIREMENTS OF BODY PANEL SPECIMEN WHOSE JOINT SEGMENT IS 8 INCHES LONG

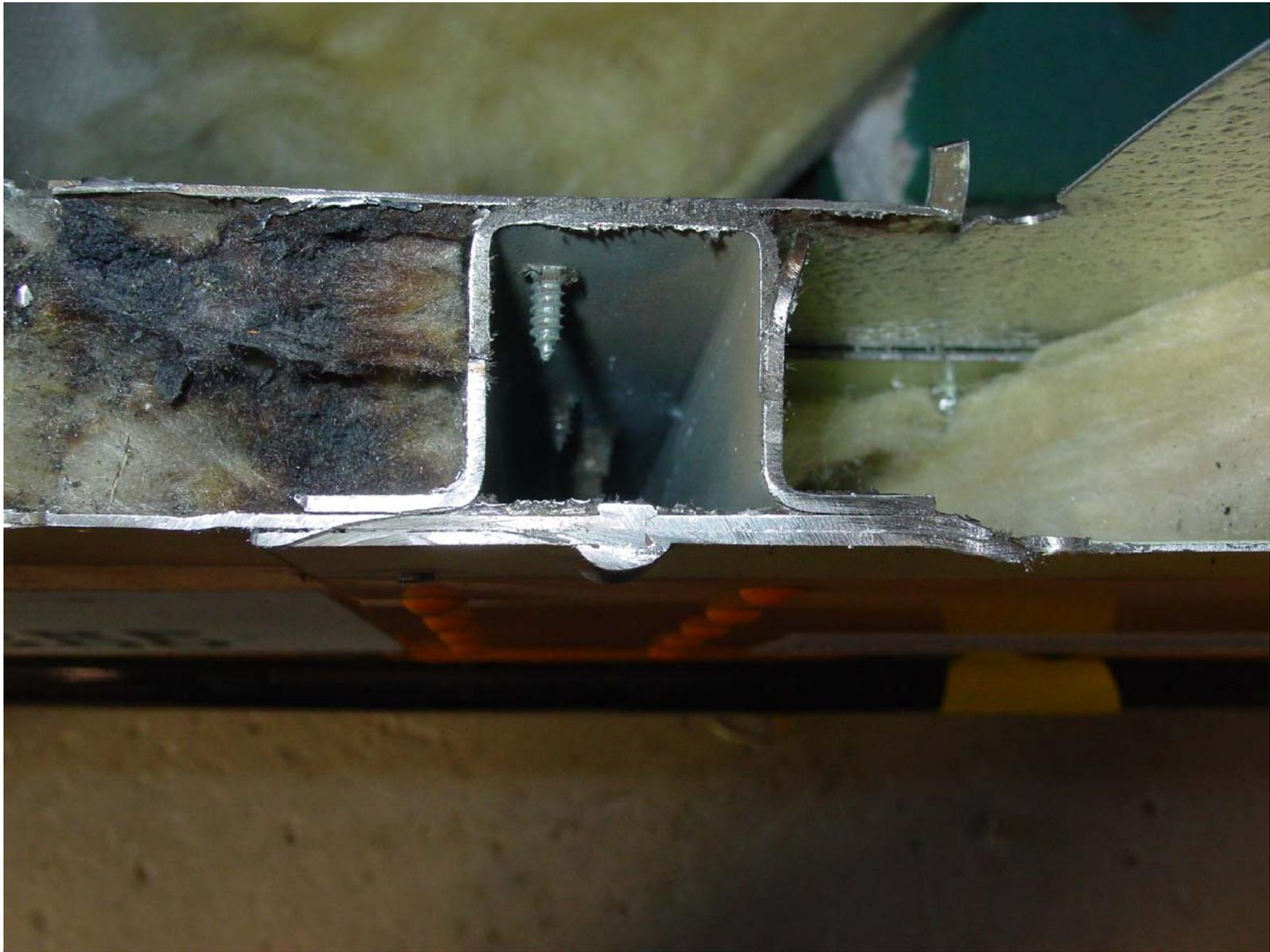


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Typical Test Sample Configuration

Test Vehicle: 2007 IC BE 200 SCHOOL BUS
Test Lab: MGA RESEARCH CORPORATION

NHTSA No.: C70901
Test Date: 10/12/07



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View of Joint #1

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**

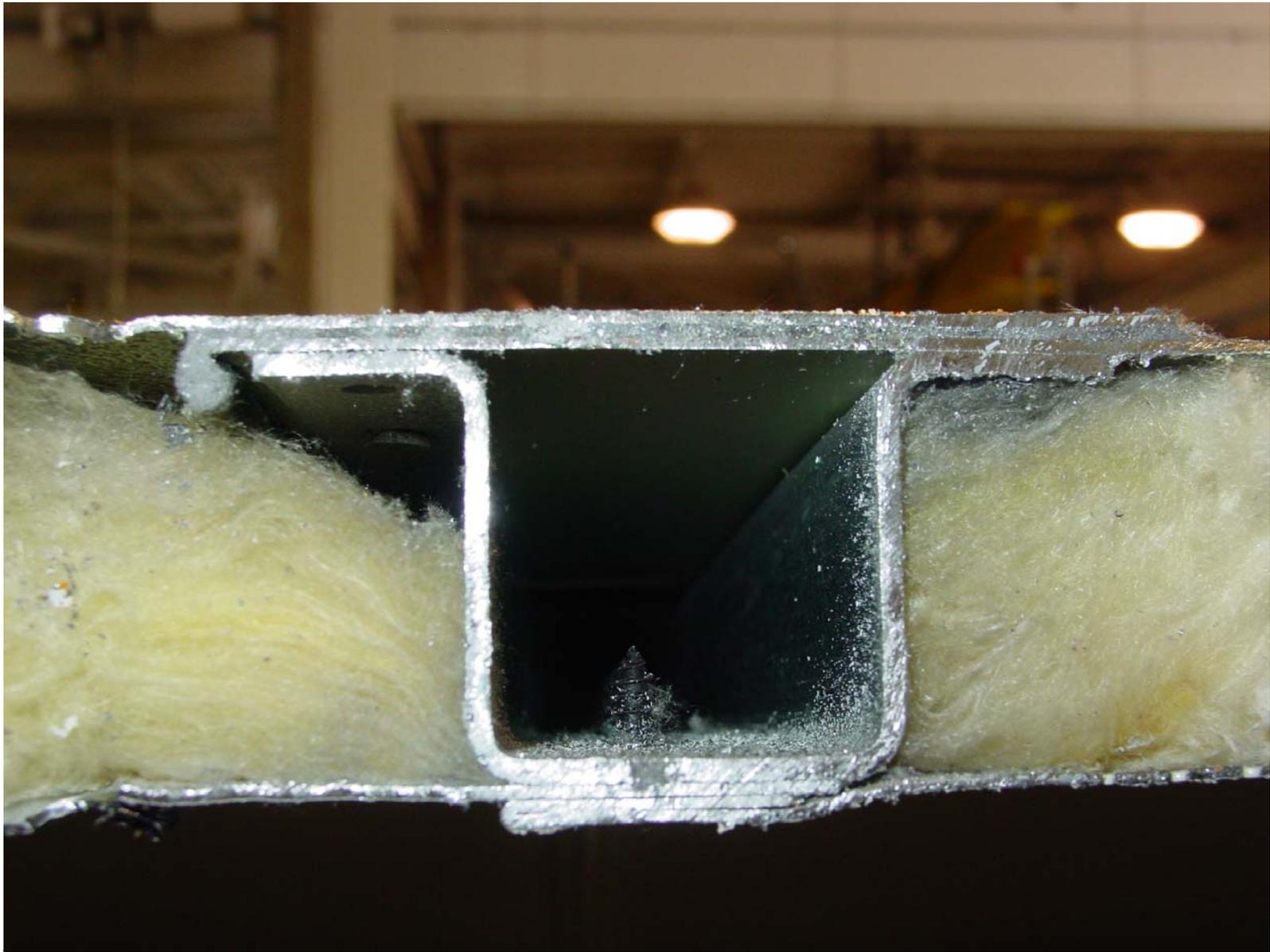


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View of Joint #2

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**

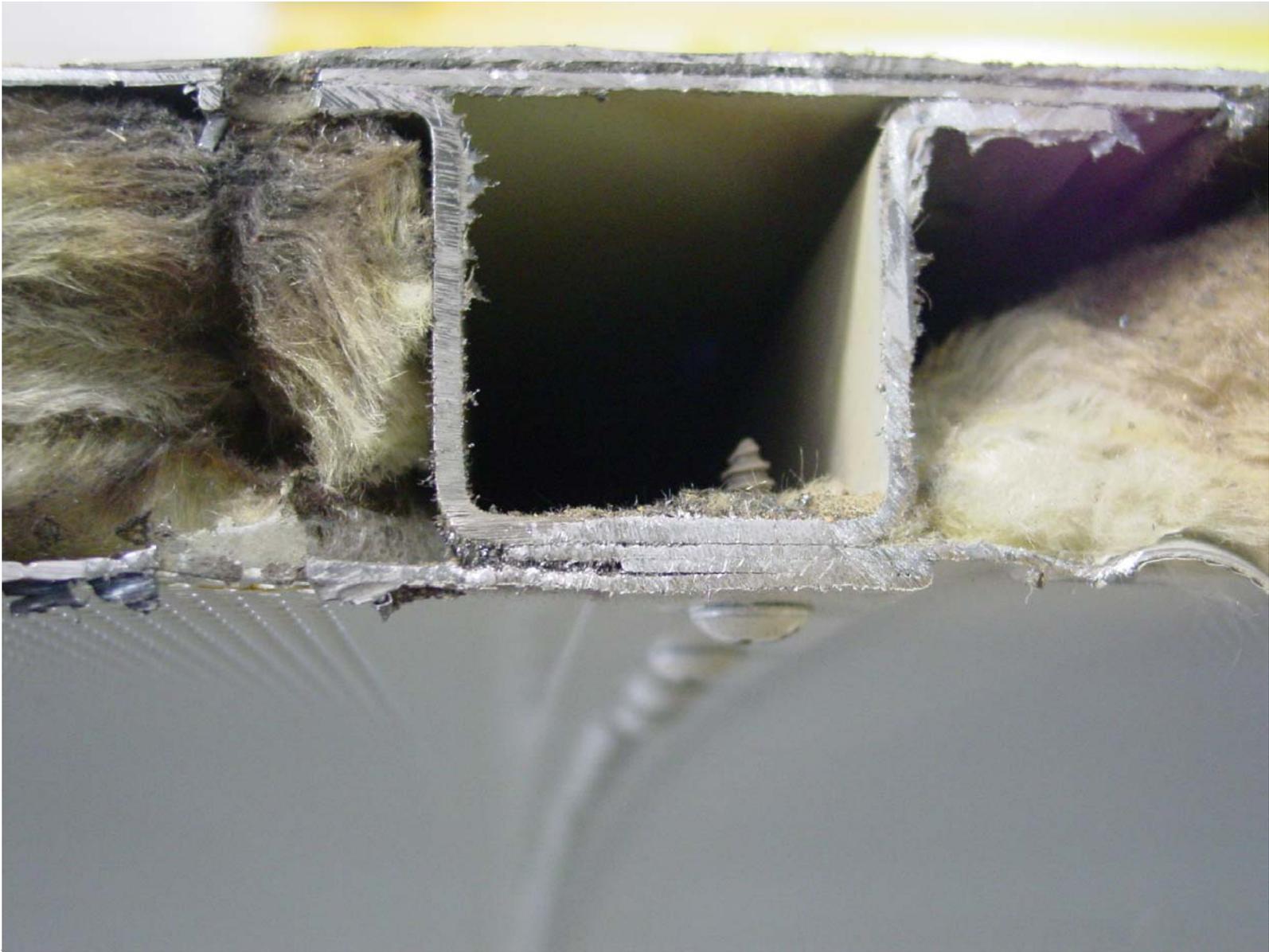


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View of Joint #3

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**

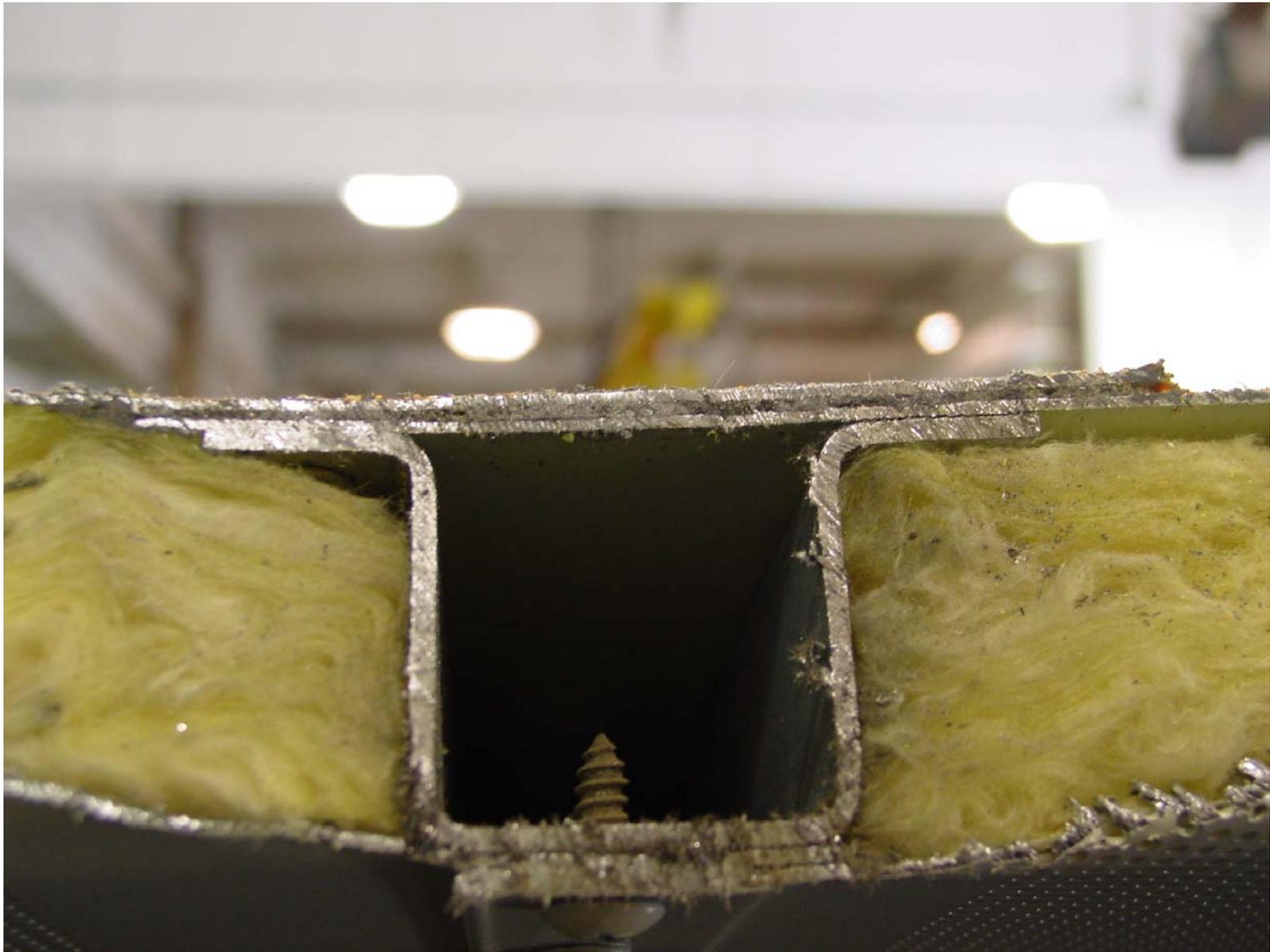


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View of Joint #4

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



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View of Joint #5

Test Vehicle: **2007 IC BE 200 SCHOOL BUS**
Test Lab: **MGA RESEARCH CORPORATION**

NHTSA No.: **C70901**
Test Date: **10/12/07**



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View of Joint #6