REPORT NUMBER: 221-MGA-2009-005

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

2009 TRANS TECH RONDAK BUS
NHTSA NO.: C90903

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

TEST DATES: DECEMBER 2, 2010 AND DECEMBER 17, 2010

FINAL REPORT DATE: FEBRUARY 25, 2011

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
MAIL CODE: NVS-220
1200 NEW JERSEY AVENUE, S.E.
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Prepared by: _____ Date: February 25, 2011
Eric Peschman, Project Engineer

Reviewed by: _____ Date: February 25, 2011
Michael Janovicz, Program manager

FINAL REPORT ACCEPTED BY:

Edward E. Chan

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_____
Date of Acceptance

Technical Report Documentation Page

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15. Supplementary Notes		

16. Abstract

Compliance tests were conducted on the subject 2009 Trans Tech Rondak Bus, NHTSA No.: C90903, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No.: TP-221-03 for the determination of Compliance with FMVSS 221 requirements.

Test Failures: All Test Samples

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Form DOT F1700.7 (8-72)

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SECTION 1
PURPOSE OF COMPLIANCE TEST

Tests were conducted on a 2009 Trans Tech Rondak Bus, NHTSA No.: C90903, in accordance with the specifications of the Office of Vehicle Safety Compliance (OVSC) Test Procedures TP-221-03 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.: DTNH22-08-D-00075.

SECTION 2
TEST PROCEDURE

The 2009 Trans Tech Rondak Bus, NHTSA No.: C90903 was subjected to FMVSS 221 testing.

The joint samples were selected in conjunction with the Contract Officer's Technical Representative (COTR). Three 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 three samples were tested for this vehicle. The samples were selected from the left side roof interior, the right side roof interior, and the right side roof exterior.

Joint Location	Joint Specimen I.D.	Maximum Load (N)	60% of Material Strength (N)	PASS/FAIL
Left Side Roof Interior	RSHLFI285BSH	10,709	18,816	**FAIL**
Right Side Roof Interior	RSHRMI385BSH	8,628	19,323	**FAIL**
Right Side Roof Exterior	RSRRFE186BBH	15,155	17,308	**FAIL**

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 2009 Trans Tech Rondak Bus, NHTSA No.: C90903.

DATA SHEET 1

ADMINISTRATIVE DATA SHEET

Test Vehicle:	**2009 Trans Tech Rondak Bus**	NHTSA No.:	**C90903**
Test Lab:	**MGA Research Corporation**	Test Dates:	**12/02/10 and 12/17/10**

INCOMPLETE VEHICLE (IF APPLICABLE)

Manufacturer:	Ford Motor Company
Model:	E-350 SRW
VIN:	1FD2E35L88DB33670
Certification Date:	05/08

COMPLETED VEHICLE (SCHOOL BUS)

Manufacturer:	Trans Tech Bus
Make/Model:	Trans Tech Rondak
VIN:	1FD2E35L88DB33670
NHTSA No.:	C90903
Color:	White
GVWR:	4,355 kg / 9,600 lb
Build Date:	08/09
Certification Date:	05/08

DATES

Vehicle Receipt:	10/01/09
Start of Compliance Test:	12/02/10
Completion of Compliance Test:	12/17/10

COMPLIANCE TEST:
All tests were performed in accordance with the references outlined in TP-221-03.

Recorded By:_____

Approved By:_____ Date: 12/17/10

DATA SHEET 2

SUMMARY OF DATA

Test Vehicle: **2009 Trans Tech Rondak Bus** NHTSA No.: **C90903**
Test Lab: **MGA Research Corporation** Test Dates: **12/02/10 and 12/17/10**

Joint Specimen I.D.	Joint Location	Joint Load Reqmt (60%) (N)	Max. Load at Joint Separation (N)	Calculated Material Strength (N)	PASS/ FAIL
RSHLFI285BSH	Left Side Roof Interior	18,816	10,709	31,360	**FAIL**
RSHRMI385BSH	Right Side Roof Interior	19,323	8,628	32,205	**FAIL**
RSRRFE186BBH	Right Side Roof Exterior	17,308	15,155	28,846	**FAIL**

Comments: None

Recorded By:_____

Approved By:_____ Date: 12/17/10

DATA SHEET 3

JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN

Test Vehicle: **2009 Trans Tech Rondak Bus** NHTSA No.: **C90903**
Test Lab: **MGA Research Corporation** Test Date: **12/02/10**

Specimen Description:	Left Side Roof Interior		
Joint Number:	RSHLFI285BSH	Test Number:	Q10534

	Weaker Member	Stronger Member
Material	P/N 579802	N/A
Tensile Strength (MPa)	172.4	N/A
Gage/Thickness (mm)	1.016	N/A
Fastener Holes (No./Diameter – mm.)	5 / 4.83	N/A
Net Area (Sq. mm.)	181.9	N/A
Material Strength (N)	31,360	N/A
60% of Material Strength (N)	18,816	N/A
Maximum Load From Tensile Test of Joint (N)	10,709	N/A
PASS/FAIL	**FAIL**	N/A

Comments: None

Recorded By:_____

Approved By:_____ Date: 12/02/10

DATA SHEET 3 (CONTINUED)

JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN

Test Vehicle: **2009 Trans Tech Rondak Bus** NHTSA No.: **C90903**
Test Lab: **MGA Research Corporation** Test Date: **12/17/10**

Specimen Description:	Right Side Roof Interior		
Joint Number:	RSHRMI385BSH	Test Number:	Q10567

	Weaker Member	Stronger Member
Material	P/N 579802	N/A
Tensile Strength (MPa)	172.4	N/A
Gage/Thickness (mm)	1.016	N/A
Fastener Holes (No./Diameter – mm.)	4 / 4.83	N/A
Net Area (Sq. mm.)	186.8	N/A
Material Strength (N)	32,205	N/A
60% of Material Strength (N)	19,323	N/A
Maximum Load From Tensile Test of Joint (N)	8,628	N/A
PASS/FAIL	**FAIL**	N/A

Comments: None

Recorded By:_____

Approved By:_____ Date: 12/17/10

DATA SHEET 3 (CONTINUED)

JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN

Test Vehicle: **2009 Trans Tech Rondak Bus** NHTSA No.: **C90903**
Test Lab: **MGA Research Corporation** Test Date: **12/17/10**

Specimen Description:	Right Side Roof Exterior		
Joint Number:	RSRRFE186BBH	Test Number:	Q10568

	Weaker Member	Stronger Member
Material	P/N 500270	P/N 579802
Tensile Strength (MPa)	358.5	172.4
Gage/Thickness (mm)	0.61	1.016
Fastener Holes (No./Diameter – mm.)	6 / 5.49	6 / 5.49
Net Area (Sq. mm.)	596.0	173.0
Material Strength (N)	28,846	29,821
60% of Material Strength (N)	17,308	17,893
Maximum Load From Tensile Test of Joint (N)	15,155	15,155
PASS/FAIL	**FAIL**	**FAIL**

Comments: None

Recorded By: _____

Approved By: _____ Date: 12/17/10

SECTION 5

INSTRUMENTATION AND EQUIPMENT LIST

Test Vehicle: **2009 Trans Tech Rondak Bus** NHTSA No.: **C90903**
Test Lab: **MGA Research Corporation** Test Dates: **12/02/10 and 12/17/10**

Equipment	Description	Model / Serial No.	Cal. Date	Next Cal. Date
Load Cell	Interface	1210AF-25K-B / 137778	06/21/10	12/21/10
Load Cell	Interface	1210AF-25K-B / 137781	12/16/10	06/16/11
Linear Potentiometer	Ametek	P-25A / 1102-19183	08/10/10	02/10/11
Steel Tape	Stanley	Powerlock / 184	09/23/10	03/23/11
Temp. Stickers	McMaster Carr	60° C / 5952K21	One Time Use	---

SECTION 6
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Test Vehicle:	**2009 Trans Tech Rondak Bus**	NHTSA No.:	**C90903**
Test Lab:	**MGA Research Corporation**	Test Dates:	**12/02/10 and 12/17/10**

Front View of School Bus

Test Vehicle: **2009 Trans Tech Rondak Bus** NHTSA No.: **C90903**
Test Lab: **MGA Research Corporation** Test Dates: **12/02/10 and 12/17/10**

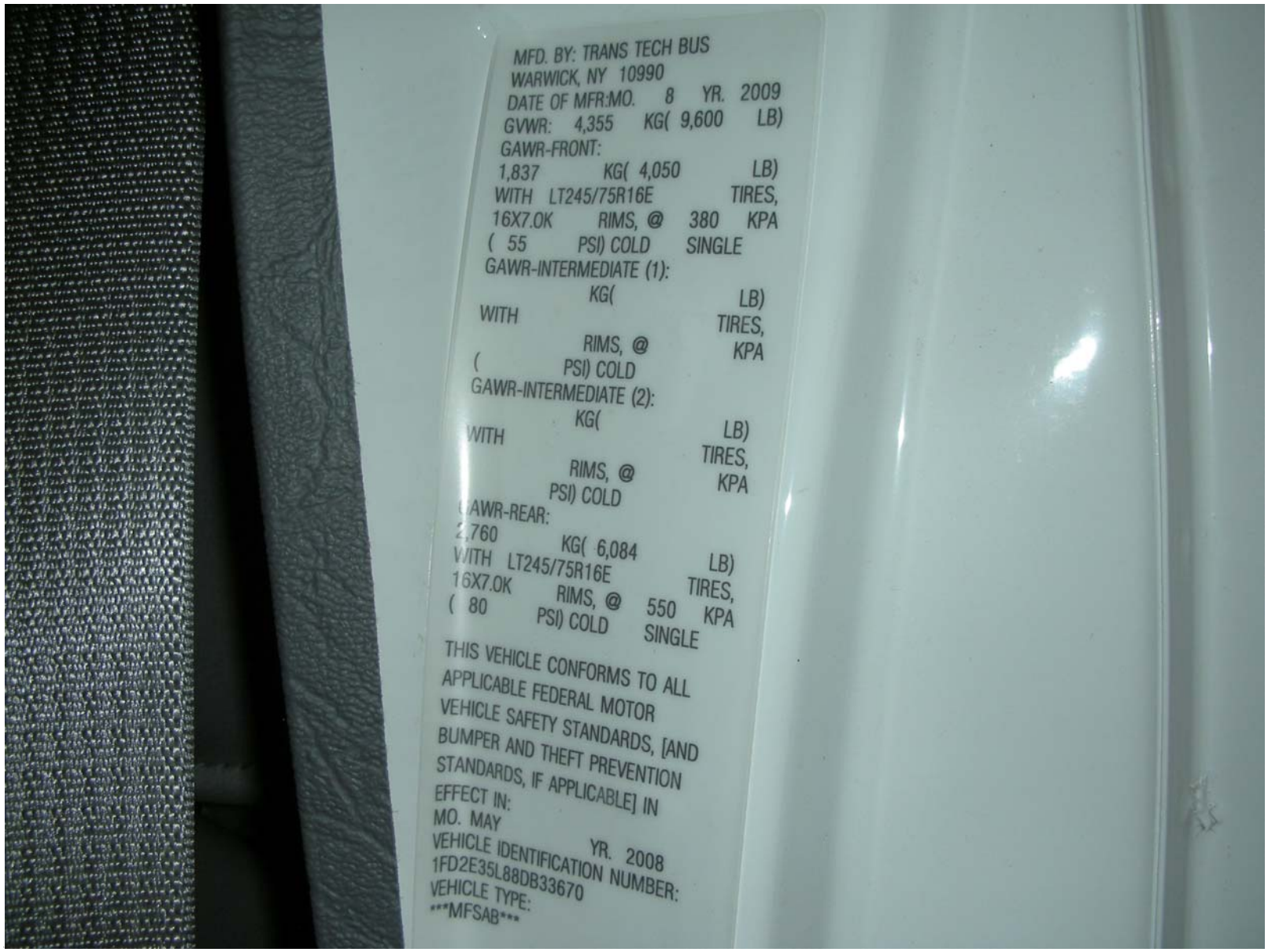
Rear View of School Bus

Test Vehicle: **2009 Trans Tech Rondak Bus** NHTSA No.: **C90903**
Test Lab: **MGA Research Corporation** Test Dates: **12/02/10 and 12/17/10**

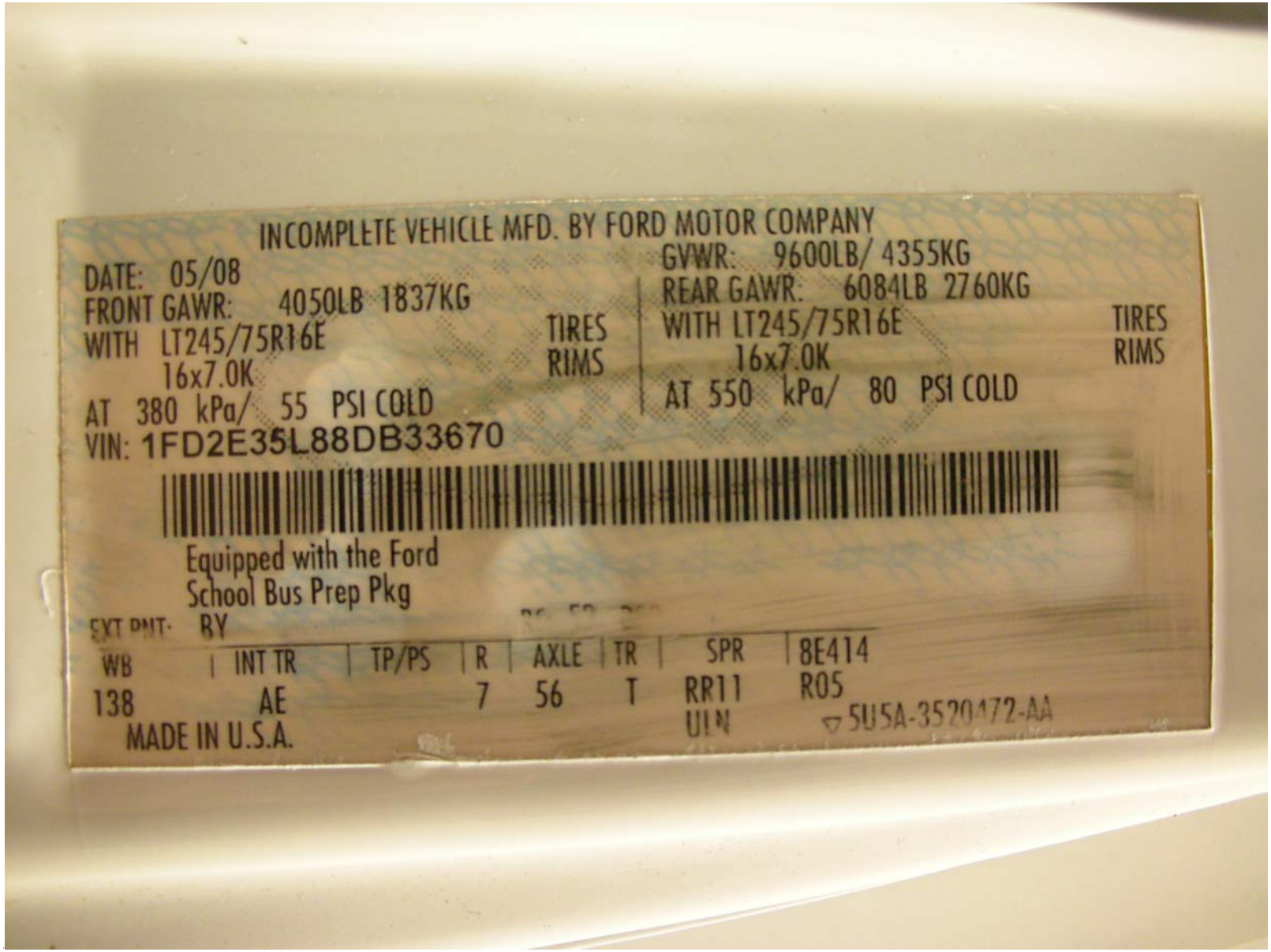
Left Side View of School Bus

Test Vehicle: **2009 Trans Tech Rondak Bus** NHTSA No.: **C90903**
Test Lab: **MGA Research Corporation** Test Dates: **12/02/10 and 12/17/10**

Right Side View of School Bus



Certification Label



Incomplete Certification Label

Test Vehicle: **2009 Trans Tech Rondak Bus** NHTSA No.: **C90903**
Test Lab: **MGA Research Corporation** Test Dates: **12/02/10 and 12/17/10**

Vehicle Interior View Front to Rear

Location of Joint ID Number RSHLFI285BSH

Location of Joint ID Number RSHRMI385BSH

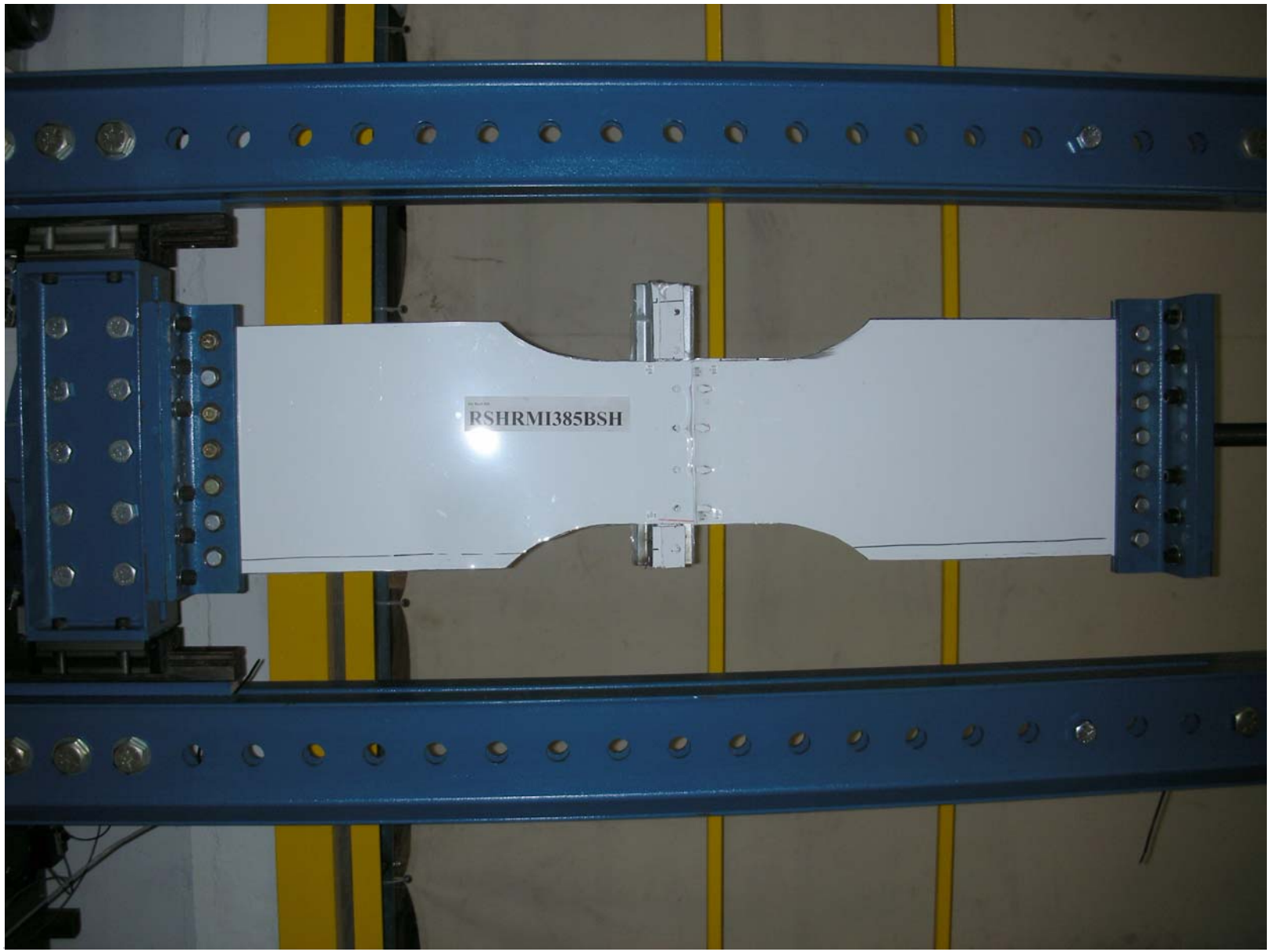
Location of Joint ID Number RSRRFE186BBH

Pre-Test of Joint ID Number RSHLFI285BSH

Post-Test of Joint ID Number RSHLFI285BSH

Post-Test of Joint ID Number RSHLFI285BSH, Close Up View

Pre-Test of Joint ID Number RSHRMI385BSH

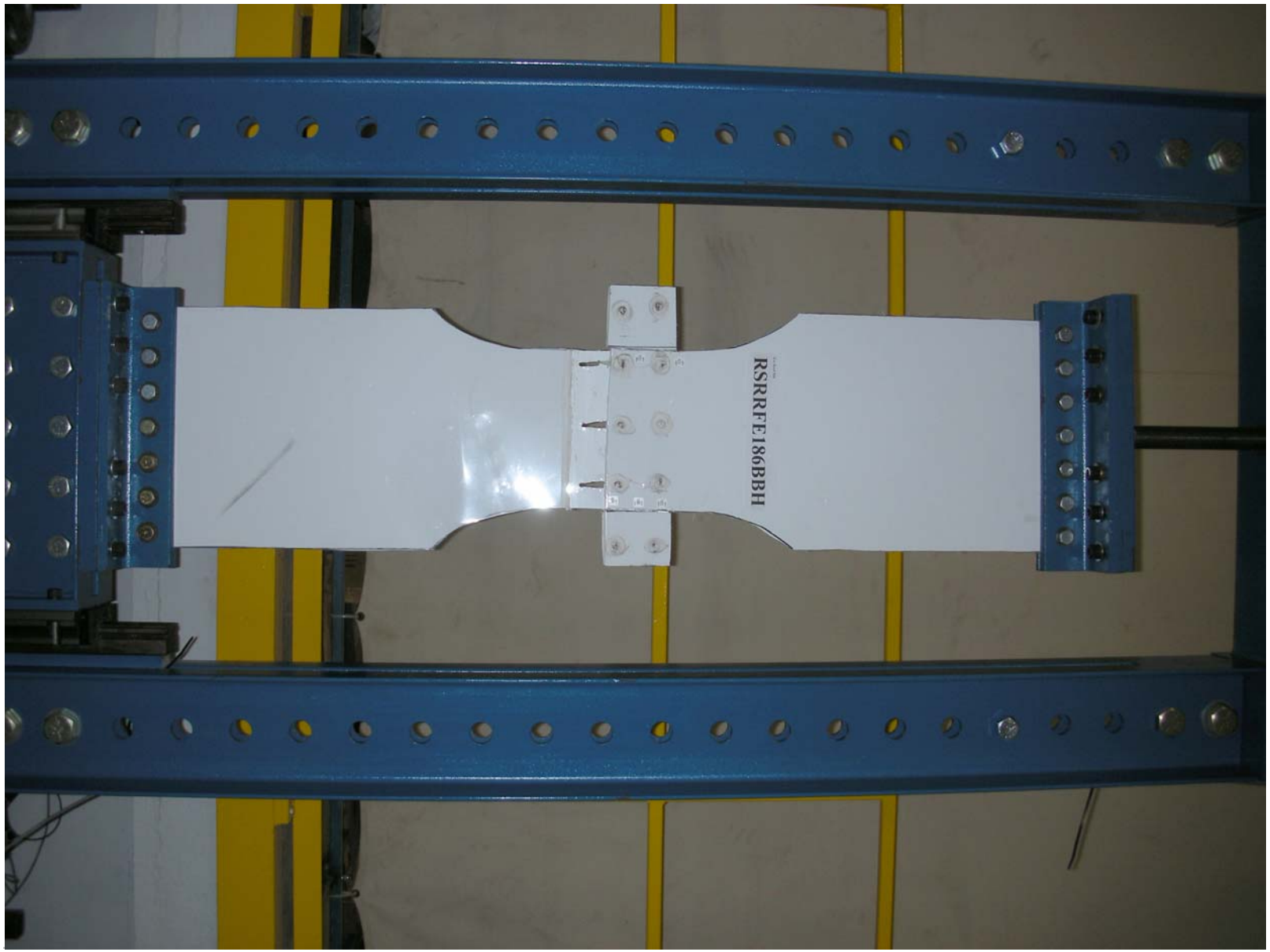


Post-Test of Joint ID Number RSHRMI385BSH

Post-Test of Joint ID Number RSHRMI385BSH, Close Up View

Pre-Test of Joint ID Number RSRRFE186BBH

Test Vehicle: **2009 Trans Tech Rondak Bus** NHTSA No.: **C90903**
Test Lab: **MGA Research Corporation** Test Dates: **12/02/10 and 12/17/10**



Post-Test of Joint ID Number RSRRFE186BBH

Post-Test of Joint ID Number RSRRFE186BBH, Close Up View

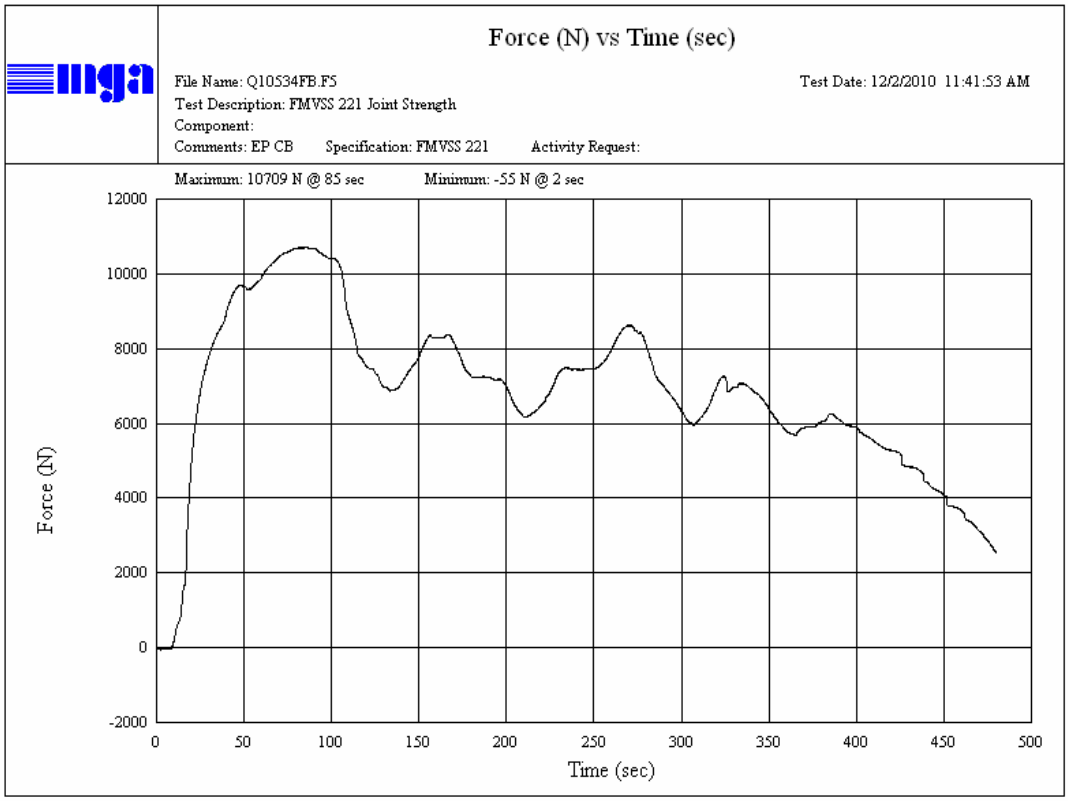
SECTION 7
TEST PLOTS

TABLE OF TEST PLOTS

SECTION 7

TEST PLOTS

Joint Strength, ID Number RSHLFI285BSH, Displacement vs. Time

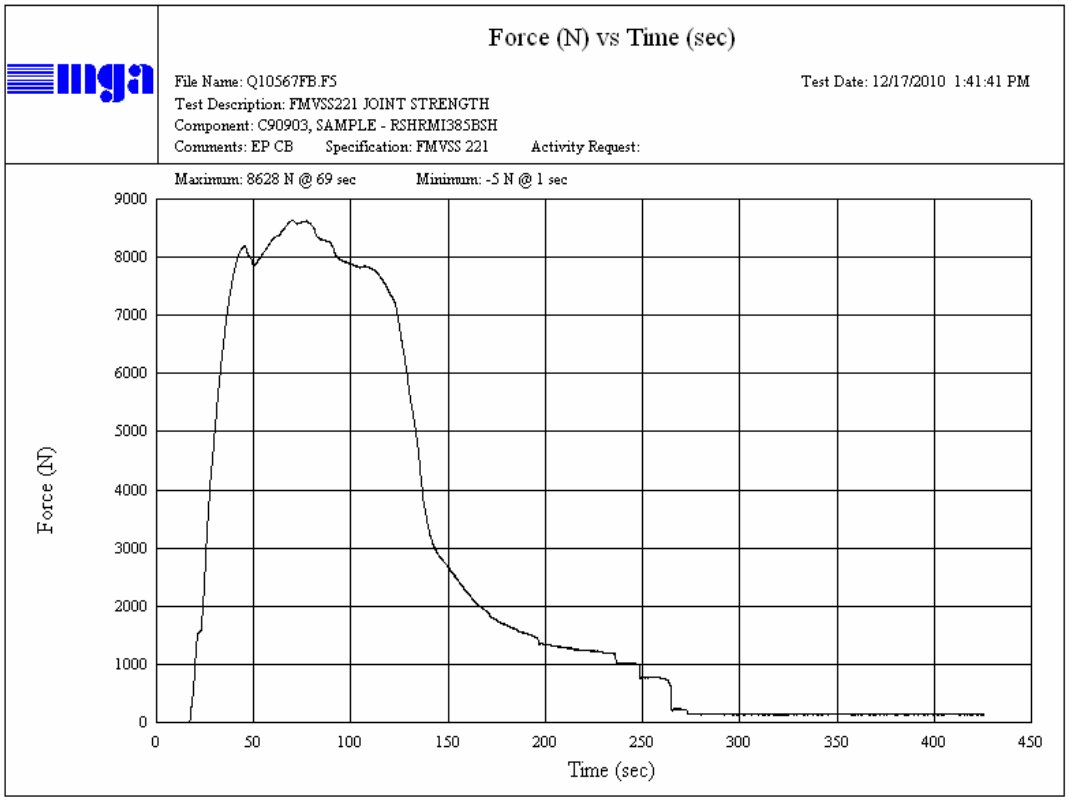


Joint Strength, ID Number RSHLFI285BSH, Force vs. Time

SECTION 7

TEST PLOTS

Joint Strength, ID Number RSHRMI385BSH, Displacement vs. Time

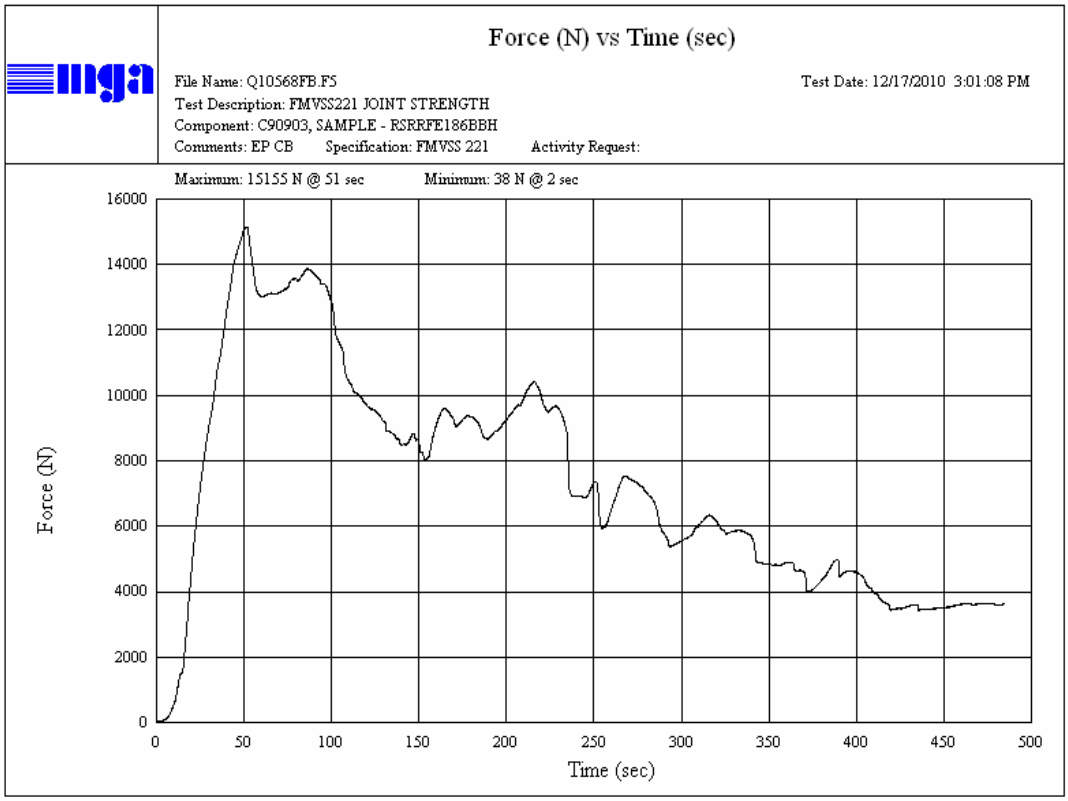


Joint Strength, ID Number RSHRMI385BSH, Force vs. Time

SECTION 7

TEST PLOTS

Joint Strength, ID Number RSRRFE186BBH, Displacement vs. Time

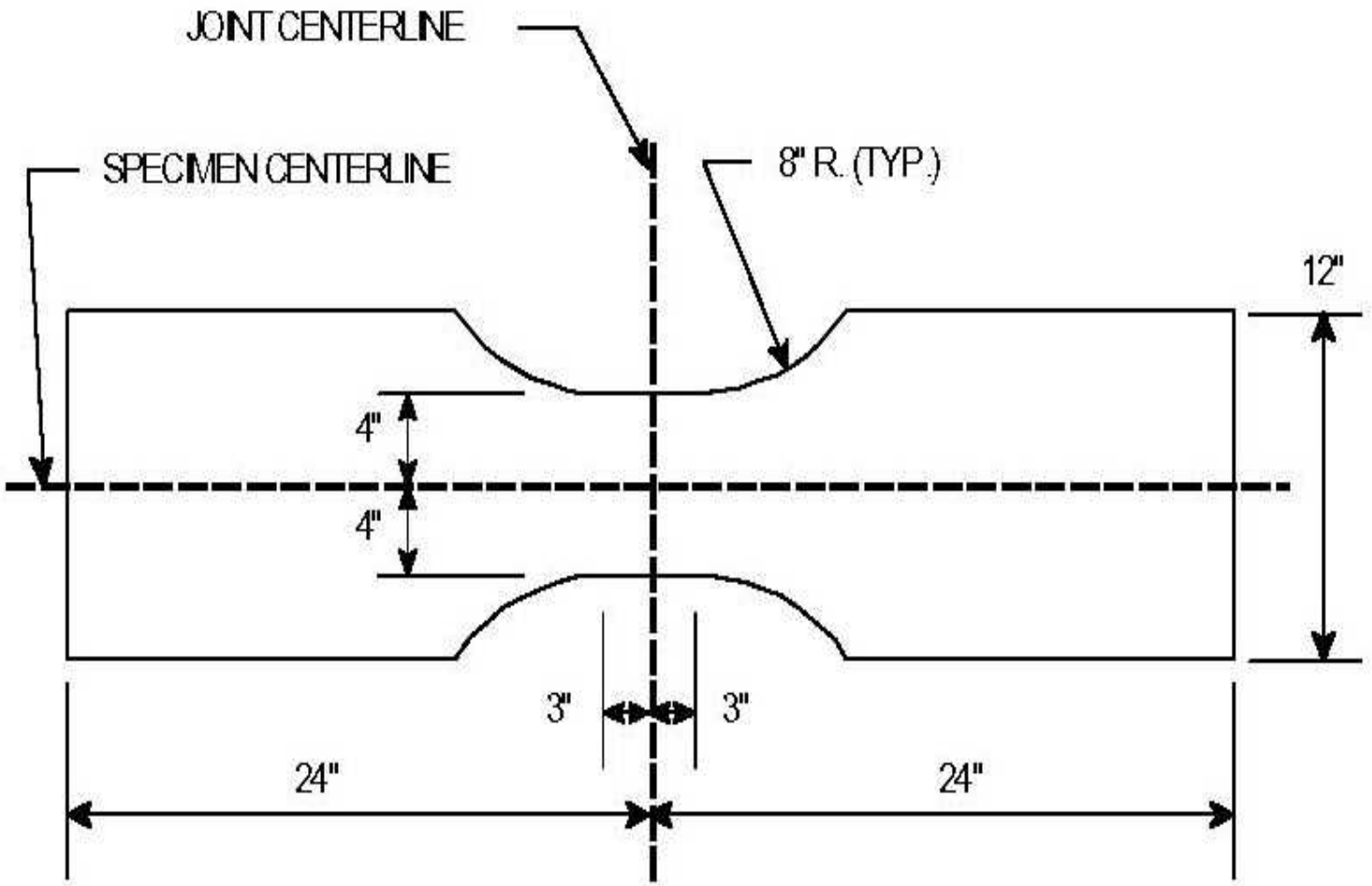


Joint Strength, ID Number RSRRFE186BBH, Force vs. Time

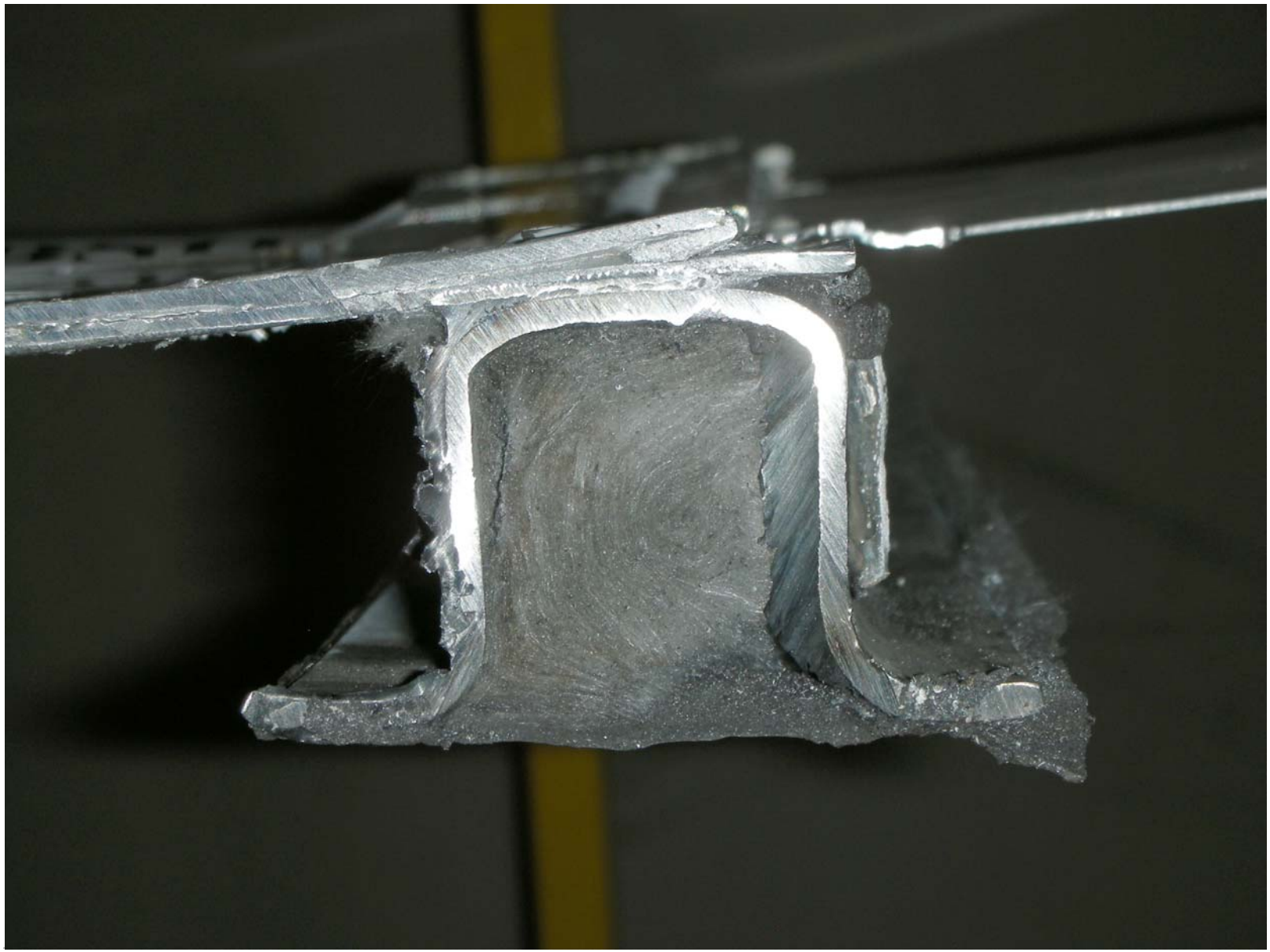
SECTION 8
JOINT CONFIGURATIONS

TABLE OF PHOTOGRAPHS

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



Typical Test Sample Configuration



View of Joint ID Number RSHLFI285BSH

View of Joint ID Number RSHRMI385BSH

View of Joint ID Number RSRRFE186BBH

mga research corporation

LABORATORY NOTICE OF TEST FAILURE TO OVSC

Test Procedure:	FMVSS 221	Test Date:	12/2-12/17/2010
Test Vehicle:	2009 Trans Tech Rondak Bus	Test Lab:	MGA Research Corp.
NHTSA No.:	C90903	Project Engineer:	Eric Peschman
Contract No.:	DTNH22-08-D-00075	Delivery Order No.:	1
MFR.:	Trans Tech	VIN:	1FD2E35L88DB33670
Build Date:	08/09		

TEST FAILURE DESCRIPTION

The following body joint panels were tested and failed to meet the minimum load requirements of FMVSS 221:

Sample #	ID #	Required Load (N)	Actual Load (N)
1	RSHLFI285BSH	18,816	10,709
2	RSHRMI385BSH	19,323	8,628
3	RSRRFE186BBH	17,308	15,155

FMVSS REQUIREMENTS DESCRIPTION

Paragraph S5.1.2:
"When tested in accordance with the procedure of S6, each body panel joint shall hold each body panel to the component to which it is joined when subjected to a force that equates to 60 percent of the tensile strength of the weakest joined body panel, determined pursuant to S6.2."

Remarks: No remarks.

Notification to NHTSA (COTR): Ed Chan

Date: December 17, 2010

By: