

**REPORT NUMBER: 221-MGA-2009-004**

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

**2008 COLLINS GRAND BANTAM SCHOOL BUS  
NHTSA NO.: C80900**

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




**TEST DATE: DECEMBER 22, 2010**

**FINAL REPORT DATE: JANUARY 31, 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  
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WASHINGTON, D.C. 20590**

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Date of Acceptance

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### Technical Report Documentation Page

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		<p>14. <i>Sponsoring Agency Code:</i> NVS-220</p>	
<p>15. <i>Supplementary Notes</i></p>			
<p>16. <i>Abstract</i> Compliance tests were conducted on the subject 2008 Collins Grand Bantam School Bus, NHTSA No.: C80900, 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.</p> <p>Test Failures: None</p>			
<p>17. <i>Key Words</i>  Compliance Testing Safety Engineering FMVSS 221</p>		<p>18. <i>Distribution Statement</i> Copies of this report are available from: NHTSA, Technical Information Services (TIS) Mail Code: NPO-411 1200 New Jersey Avenue, S.E. Washington, D.C. 20590 FAX No.: (202) 493-2833 E-mail: <a href="mailto:tis@dot.gov">tis@dot.gov</a></p>	
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## TABLE OF CONTENTS

<u>Section</u>		<u>Page No</u>
1	Purpose of Compliance Test	1
2	Test Procedure	2
3	Test Data Summary	3
4	Compliance Test Data	4
	Data Sheet 1 – Administrative Data Sheet	5
	Data Sheet 2 – Summary of Data	6
	Data Sheet 3 – Joint Strength When ASTM Material Properties Are Known	7
5	Instrumentation and Equipment List	10
6	Photographs	11
7	Test Plots	32
8	Joint Configurations	36

**SECTION 1**  
**PURPOSE OF COMPLIANCE TEST**

Tests were conducted on a 2008 Collins Grand Bantam School Bus, NHTSA No.: C80900, 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 2008 Collins Grand Bantam School Bus, NHTSA No.: C80900 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 exterior centerline seam and the interior headliner.

Joint Location	Joint Specimen I.D.	Maximum Load (N)	60% of Material Strength (N)	PASS/FAIL
Exterior Centerline Seam	CLRCFE181BBH	52,013	32,419	<b>PASS</b>
Interior Headliner #1	CLHRMI182BBH	43,568	25,292	<b>PASS</b>
Interior Headliner #2	CLHLMI282BAH	50,703	25,292	<b>PASS</b>

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 2008 Collins Grand Bantam School Bus, NHTSA No.: C80900.



**DATA SHEET 1**  
**ADMINISTRATIVE DATA SHEET**

Test Vehicle: **2008 Collins Grand Bantam School Bus**  
Test Lab: **MGA Research Corporation**

NHTSA No.: **C80900**  
Test Date: **12/22/10**

INCOMPLETE VEHICLE (IF APPLICABLE)

Manufacturer:	General Motors Corporation
Model:	G33803
VIN:	1GDJG31K981197124
Certification Date:	03/08

COMPLETED VEHICLE (SCHOOL BUS)


Manufacturer:	Collins Bus Corporation
Make/Model:	Collins Grand Bantam
VIN:	1GDJG31K981197124
NHTSA No.:	C80900
Color:	Yellow
GVWR:	5,579 kg / 12,300 lbs
Build Date:	06/08
Certification Date:	06/08

DATES

Vehicle Receipt:	12/04/08
Start of Compliance Test:	12/22/10
Completion of Compliance Test:	12/22/10

COMPLIANCE TEST:

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

Recorded By: 

Approved By: 

Date: 12/22/10


**DATA SHEET 2**  
**SUMMARY OF DATA**


Test Vehicle: **2008 Collins Grand Bantam School Bus**  
Test Lab: **MGA Research Corporation**

NHTSA No.: **C80900**  
Test Date: **12/22/10**

Joint Specimen I.D.	Joint Location	Joint Load Reqmt (60%) (N)	Max. Load at Joint Separation (N)	Calculated Material Strength (N)	PASS/ FAIL
CLRCFE181BBH	Exterior Centerline Seam	32,419	52,013	54,032	<b>PASS</b>
CLHRM182BBH	Interior Headliner #1	25,292	43,568	42,153	<b>PASS</b>
CLHLM1282BAH	Interior Headliner #2	25,292	50,703	42,153	<b>PASS</b>

Comments: None

Recorded By: 

Approved By: 

Date: 12/22/10

**DATA SHEET 3**

**JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN**


Test Vehicle: **2008 Collins Grand Bantam School Bus**  
 Test Lab: **MGA Research Corporation**

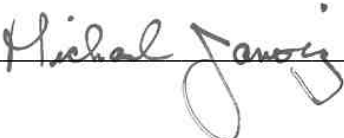
NHTSA No.: **C80900**  
 Test Date: **12/22/10**

Specimen Description:	Exterior Centerline Seam		
Joint Number:	CLRCFE181BBH	Test Number:	Q10571

	Weaker Member	Stronger Member
Material	ASTM 569 Steel	N/A
Tensile Strength (MPa)	358.5	N/A
Gage/Thickness (mm)	0.76	N/A
Fastener Holes (No./Diameter – mm.)	1 / 4.93	N/A
Net Area (Sq. mm.)	150.7	N/A
Material Strength (N)	54,032	N/A
60% of Material Strength (N)	32,419	N/A
Maximum Load From Tensile Test of Joint (N)	52,013	N/A
PASS/FAIL	<b>PASS</b>	N/A

Comments: None

Recorded By: 

Approved By: 

Date: 12/22/10

**DATA SHEET 3 (CONTINUED)**

**JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN**


Test Vehicle: **2008 Collins Grand Bantam School Bus**  
 Test Lab: **MGA Research Corporation**

NHTSA No.: **C80900**  
 Test Date: **12/22/10**

Specimen Description:	Interior Headliner #1		
Joint Number:	CLHRMI182BBH	Test Number:	Q10572

	Weaker Member	Stronger Member
Material	ASTM 569 Steel	N/A
Tensile Strength (MPa)	358.5	N/A
Gage/Thickness (mm)	0.61	N/A
Fastener Holes (No./Diameter – mm.)	2 / 4.93	N/A
Net Area (Sq. mm.)	117.6	N/A
Material Strength (N)	42,153	N/A
60% of Material Strength (N)	25,292	N/A
Maximum Load From Tensile Test of Joint (N)	43,568	N/A
PASS/FAIL	<b>PASS</b>	N/A

Comments: None

Recorded By: 

Approved By: 

Date: 12/22/10

**DATA SHEET 3 (CONTINUED)**

**JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN**


Test Vehicle: **2008 Collins Grand Bantam School Bus**  
 Test Lab: **MGA Research Corporation**

NHTSA No.: **C80900**  
 Test Date: **12/22/10**

Specimen Description:	Interior Headliner #2		
Joint Number:	CLHLMI282BAH	Test Number:	Q10573

	Weaker Member	Stronger Member
Material	ASTM 569 Steel	N/A
Tensile Strength (MPa)	358.5	N/A
Gage/Thickness (mm)	0.61	N/A
Fastener Holes (No./Diameter – mm.)	2 / 4.93	N/A
Net Area (Sq. mm.)	117.6	N/A
Material Strength (N)	42,153	N/A
60% of Material Strength (N)	25,292	N/A
Maximum Load From Tensile Test of Joint (N)	50,703	N/A
PASS/FAIL	<b>PASS</b>	N/A

Comments: None

Recorded By: 

Approved By: 

Date: 12/22/10

**SECTION 5  
INSTRUMENTATION AND EQUIPMENT LIST**

Test Vehicle: **2008 Collins Grand Bantam School Bus**  
 Test Lab: **MGA Research Corporation**

NHTSA No.: **C80900**  
 Test Date: **12/22/10**

<b>Equipment</b>	<b>Description</b>	<b>Model / Serial No.</b>	<b>Cal. Date</b>	<b>Next Cal. Date</b>
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**

<u>No.</u>		<u>Page No.</u>
1	Front View of School Bus	12
2	Rear View of School Bus	13
3	Right Side View of School Bus	14
4	Left Side View of School Bus	15
5	Certification Label	16
6	Incomplete Certification Label	17
7	Vehicle Interior View Front to Rear	18
8	Vehicle Interior View Rear to Front	19
9	Location of Joint ID Number CLRCFE181BBH	20
10	Location of Joint ID Number CLHRMI182BBH	21
11	Location of Joint ID Number CLHLM1282BAH	22
12	Pre-Test of Joint ID Number CLRCFE181BBH	23
13	Post-Test of Joint ID Number CLRCFE181BBH	24
14	Post-Test of Joint ID Number CLRCFE181BBH, Close Up View	25
15	Pre-Test of Joint ID Number CLHRMI182BBH	26
16	Post-Test of Joint ID Number CLHRMI182BBH	27
17	Post-Test of Joint ID Number CLHRMI182BBH, Close Up View	28
18	Pre-Test of Joint ID Number CLHLM1282BAH	29
19	Post-Test of Joint ID Number CLHLM1282BAH	30
20	Post-Test of Joint ID Number CLHLM1282BAH, Close Up View	31

Test Vehicle: 2008 Collins Grand Bantam School Bus  
Test Lab: MGA Research Corporation  
NHTSA No.: C80900  
Test Date: 12/22/10



Front View of School Bus



Test Vehicle: 2008 Collins Grand Bantam School Bus  
Test Lab: MGA Research Corporation  
NHTSA No.: C80900  
Test Date: 12/22/10



Rear View of School Bus

Test Vehicle: 2008 Collins Grand Bantam School Bus      NHTSA No.: C80900  
Test Lab: MGA Research Corporation                      Test Date: 12/22/10



Right Side View of School Bus

Test Vehicle: 2008 Collins Grand Bantam School Bus      NHTSA No.: C80900  
Test Lab: MGA Research Corporation                      Test Date: 12/22/10



Left Side View of School Bus

Test Vehicle: 2008 Collins Grand Bantam School Bus NHTSA No.: C80900  
 Test Lab: MGA Research Corporation Test Date: 12/22/10

**TIRE AND LOADING INFORMATION**

SEATING CAPACITY	TOTAL 23	FRONT 1	REAR 22
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The combined weight of occupants and cargo should never exceed **1,369** kg or **3,018** lbs.

TIRE	SIZE	COLD TIRE PRESSURE	SEE OWNER'S MANUAL FOR ADDITIONAL INFORMATION
FRONT	LT225/75R16D	448 KPA, 65 PSI	
REAR	LT225/75R16D	448 KPA, 65 PSI	
SPARE	N/A	N/A	

41175



**COLLINS**  
 MANUFACTURED BY:  
 COLLINS BUS CORPORATION  
 P.O. BOX 2946  
 HUTCHINSON, KS 67504-2946  
 620-662-9000

THIS VEHICLE HAS BEEN COMPLETED IN ACCORDANCE WITH THE PRIOR MANUFACTURER'S IVD WHERE APPLICABLE. THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE: **06/2008**

VEHICLE TYPE: SCHOOL BUS  
 INCOMPLETE VEHICLE MANUFACTURER: GENERAL MOTORS CORPORATION  
 INCOMPLETE VEHICLE DATE OF MANUFACTURE: 03/2008

GVWR: 5,579 KG ( 12,300 LBS)  
 FRONT: 1,950 KG ( 4,300 LBS) GAWR: 3,901 KG ( 8,600 LBS)  
 WITH: LT225/75R16D TIRES WITH: 16 X 6.5J RIMS  
 AT: 448 KPA ( 65 PSI) COLD AT: 448 KPA ( 65 PSI) COLD  
 UNIT NUMBER: 41175 CGB6WR-13G  
 VIN: **1GDJG31K981197124**

Certification Label

Test Vehicle: 2008 Collins Grand Bantam School Bus NHTSA No.: C80900  
 Test Lab: MGA Research Corporation Test Date: 12/22/10



Incomplete Certification Label

Test Vehicle: 2008 Collins Grand Bantam School Bus      NHTSA No.: C80900  
Test Lab: MGA Research Corporation                      Test Date: 12/22/10



Vehicle Interior View Front to Rear

Test Vehicle: 2008 Collins Grand Bantam School Bus  
Test Lab: MGA Research Corporation  
NHTSA No.: C80900  
Test Date: 12/22/10



Vehicle Interior View Rear to Front

Test Vehicle: 2008 Collins Grand Bantam School Bus  
Test Lab: MGA Research Corporation  
NHTSA No.: C80900  
Test Date: 12/22/10



Location of Joint ID Number CLRCFE181BBH



Test Vehicle: **2008 Collins Grand Bantam School Bus**      NHTSA No.: **C80900**  
Test Lab: **MGA Research Corporation**                      Test Date: **12/22/10**



Location of Joint ID Number CLHRMI182BBH

Test Vehicle: **2008 Collins Grand Bantam School Bus**      NHTSA No.: **C80900**  
Test Lab: **MGA Research Corporation**                      Test Date: **12/22/10**



Location of Joint ID Number CLHLM1282BAH

Test Vehicle: 2008 Collins Grand Bantam School Bus      NHTSA No.: C80900  
Test Lab: MGA Research Corporation                      Test Date: 12/22/10



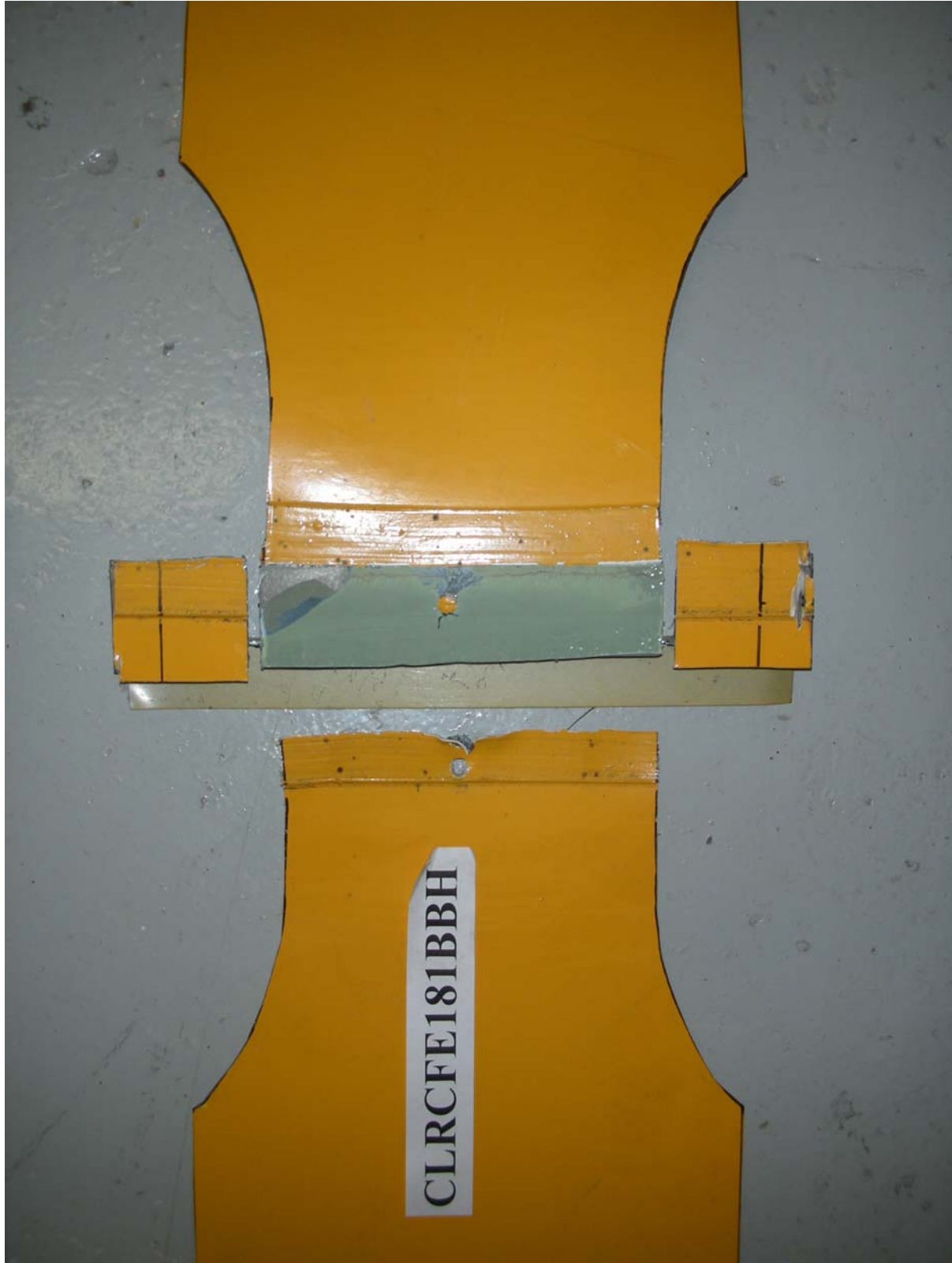
Pre-Test of Joint ID Number CLRCFE181BBH

Test Vehicle: 2008 Collins Grand Bantam School Bus  
Test Lab: MGA Research Corporation  
NHTSA No.: C80900  
Test Date: 12/22/10



Post-Test of Joint ID Number CLRCFE181BBH

Test Vehicle: 2008 Collins Grand Bantam School Bus  
Test Lab: MGA Research Corporation  
NHTSA No.: C80900  
Test Date: 12/22/10



Post-Test of Joint ID Number CLRCFE181BBH, Close Up View

Test Vehicle: 2008 Collins Grand Bantam School Bus  
Test Lab: MGA Research Corporation  
NHTSA No.: C80900  
Test Date: 12/22/10



Pre-Test of Joint ID Number CLHRMI182BBH

Test Vehicle: 2008 Collins Grand Bantam School Bus  
Test Lab: MGA Research Corporation  
NHTSA No.: C80900  
Test Date: 12/22/10



Post-Test of Joint ID Number CLHRM1182BBH

Test Vehicle: 2008 Collins Grand Bantam School Bus  
Test Lab: MGA Research Corporation  
NHTSA No.: C80900  
Test Date: 12/22/10



Post-Test of Joint ID Number CLHRM182BBH, Close Up View



Test Vehicle: 2008 Collins Grand Bantam School Bus  
Test Lab: MGA Research Corporation  
NHTSA No.: C80900  
Test Date: 12/22/10



Pre-Test of Joint ID Number CLHLM1282BAH

Test Vehicle: 2008 Collins Grand Bantam School Bus  
Test Lab: MGA Research Corporation  
NHTSA No.: C80900  
Test Date: 12/22/10



Post-Test of Joint ID Number CLHLM1282BAH

Test Vehicle: 2008 Collins Grand Bantam School Bus  
Test Lab: MGA Research Corporation  
NHTSA No.: C80900  
Test Date: 12/22/10



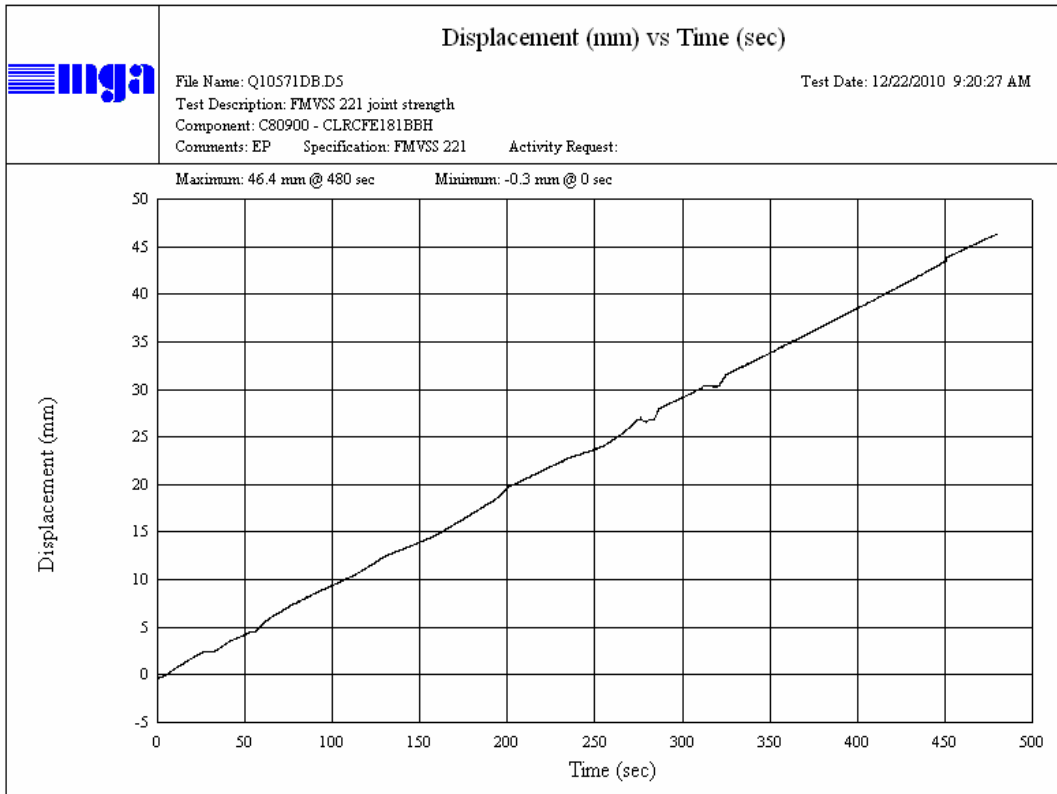
Post-Test of Joint ID Number CLHLM1282BAH, Close Up View

**SECTION 7**  
**TEST PLOTS**

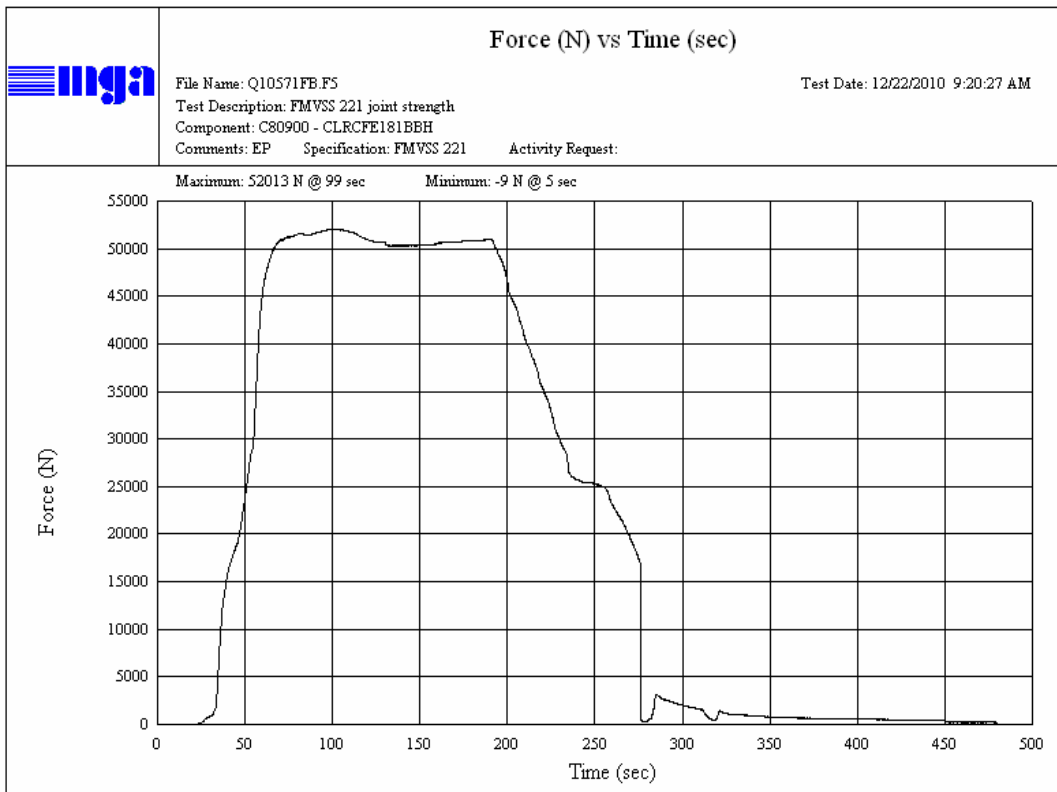
**TABLE OF TEST PLOTS**

	<u>Page No.</u>
Joint Strength, ID Number CLRCFE181BBH, Displacement vs. Time	33
Joint Strength, ID Number CLRCFE181BBH, Force vs. Time	33
Joint Strength, ID Number CLHRMI182BBH, Displacement vs. Time	34
Joint Strength ID Number CLHRMI182BBH, Force vs. Time	34
Joint Strength, ID Number CLHLM1282BAH, Displacement vs. Time	35
Joint Strength, ID Number CLHLM1282BAH, Force vs. Time	35

## SECTION 7 TEST PLOTS

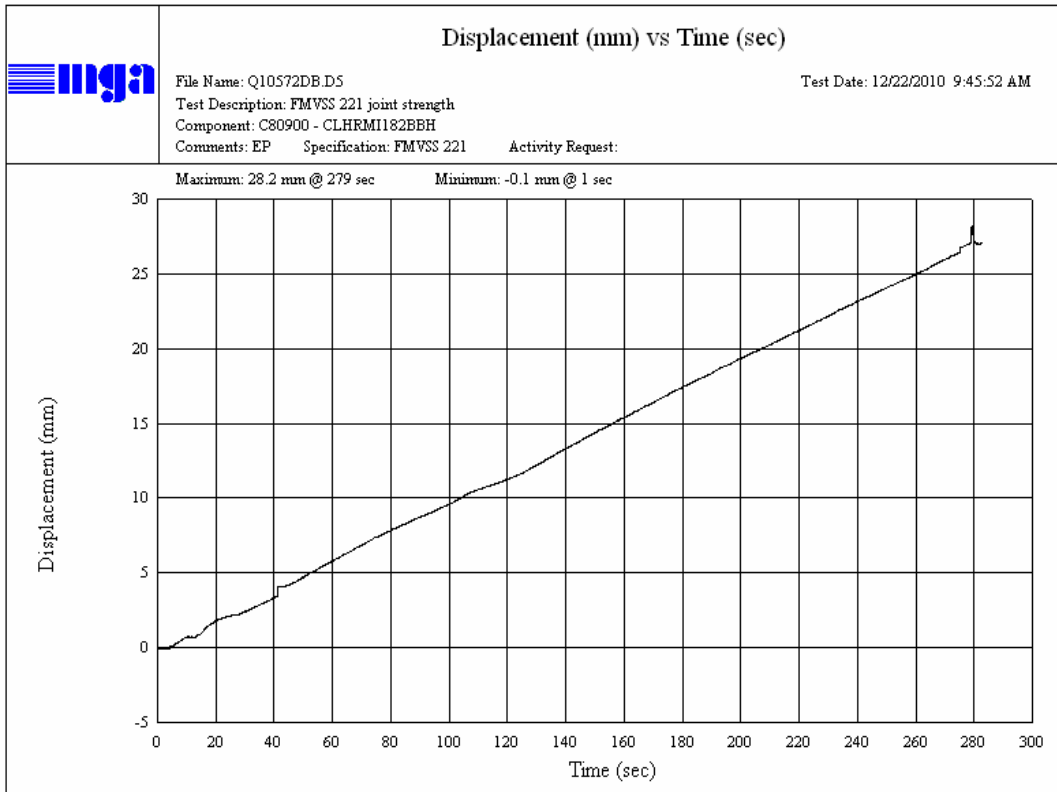


Joint Strength, ID Number CLRCFE181BBH, Displacement vs. Time

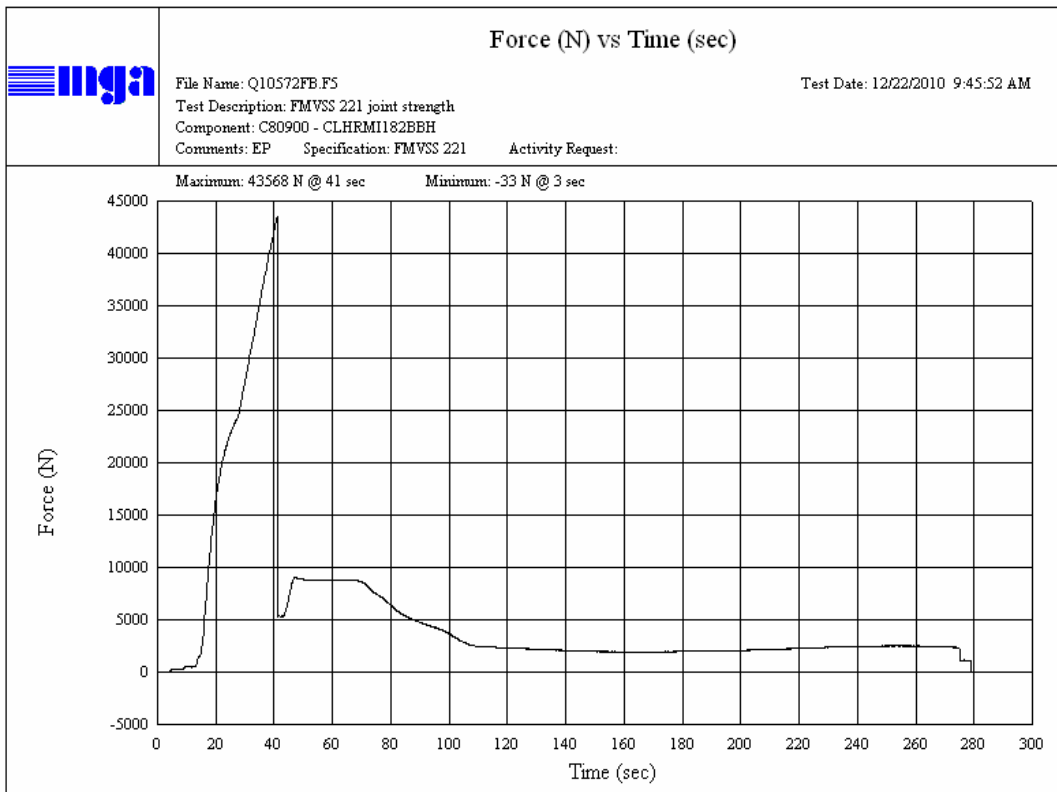


Joint Strength, ID Number CLRCFE181BBH, Force vs. Time

## SECTION 7 TEST PLOTS

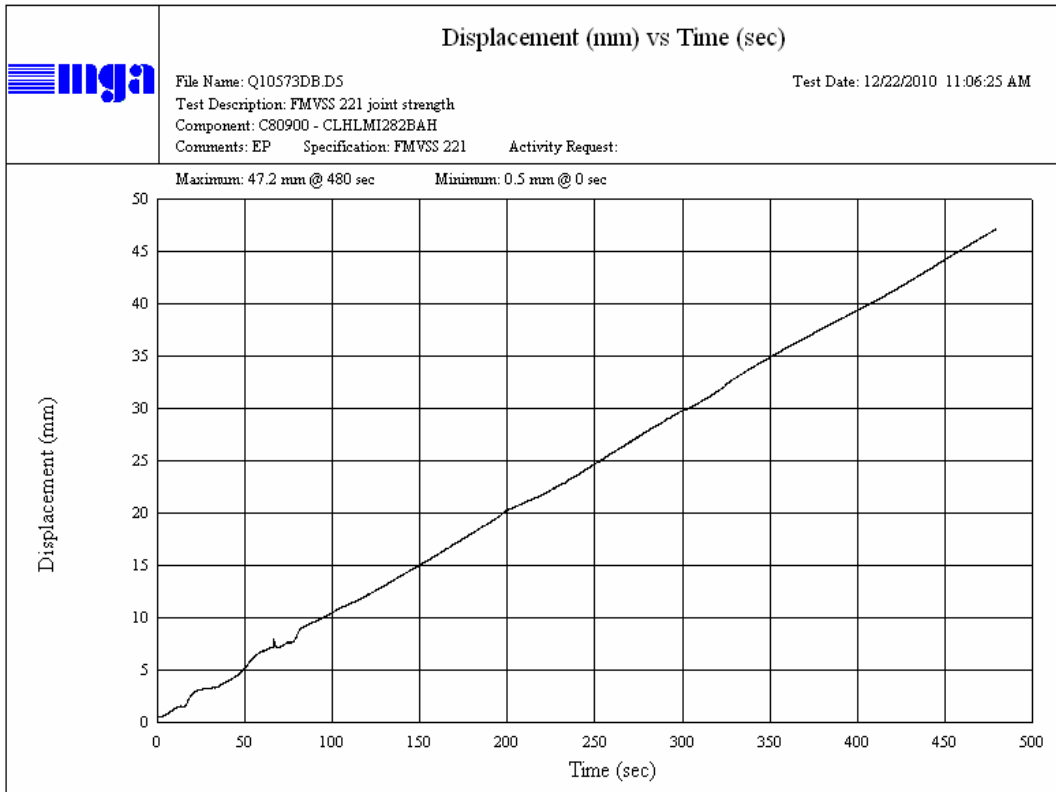


Joint Strength, ID Number CLHRMI182BBH, Displacement vs. Time

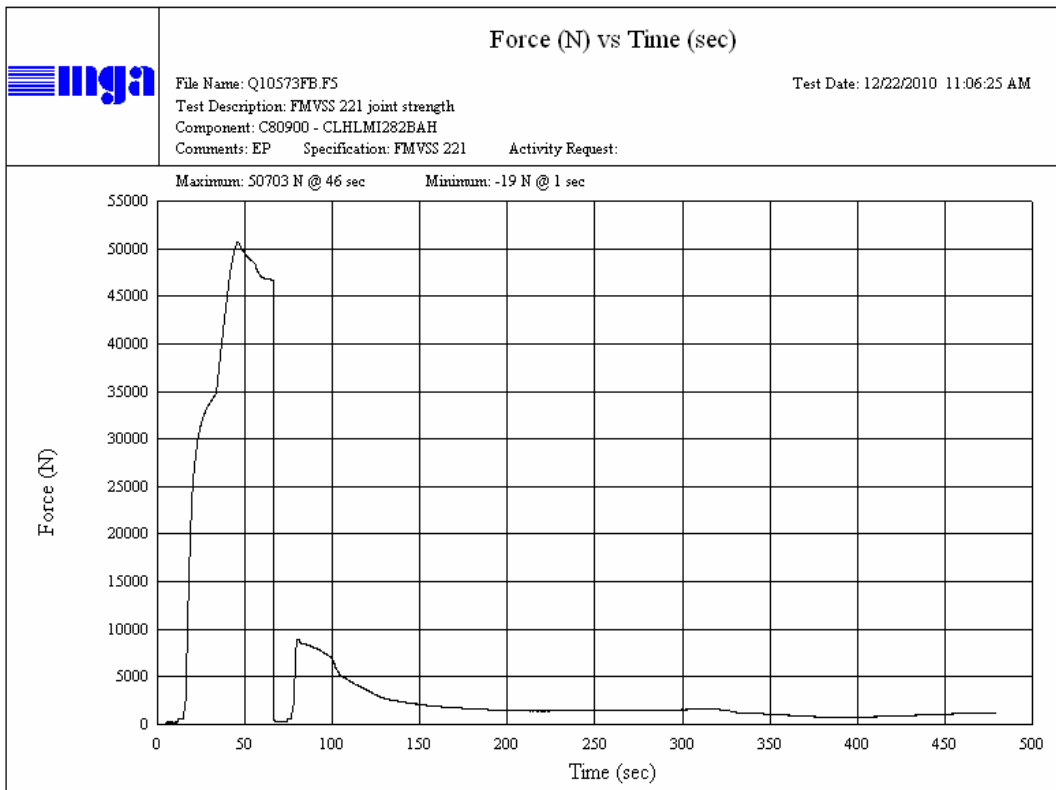


Joint Strength, ID Number CLHRMI182BBH, Force vs. Time

## SECTION 7 TEST PLOTS



Joint Strength, ID Number CLHLM1282BAH, Displacement vs. Time



Joint Strength, ID Number CLHLM1282BAH, Force vs. Time

**SECTION 8  
JOINT CONFIGURATIONS**

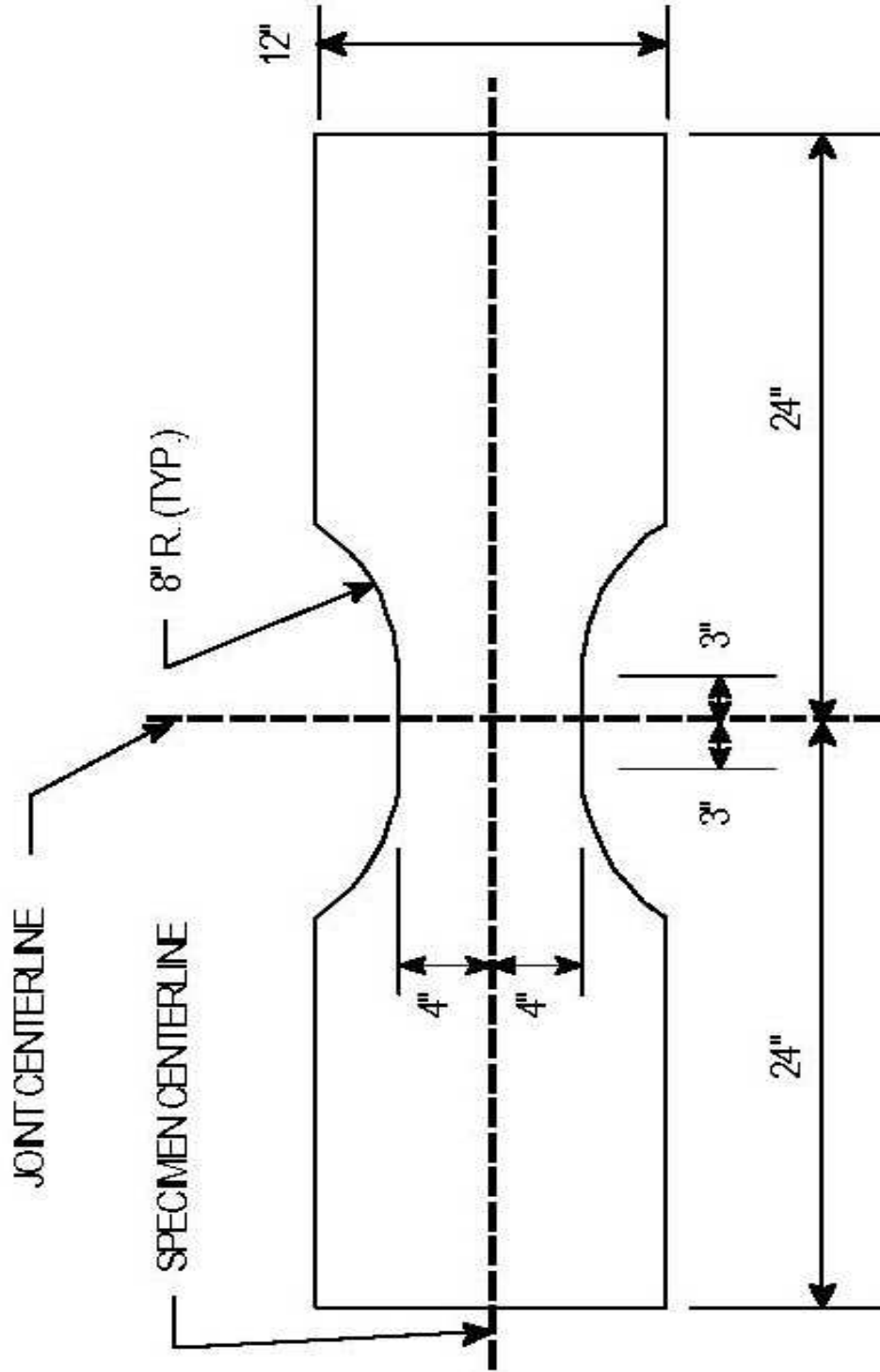
**TABLE OF PHOTOGRAPHS**

<u>No.</u>		<u>Page No.</u>
1	Typical Test Sample Configuration	37
2	View of Joint ID Number CLRCFE181BBH	38
3	View of Joint ID Number CLHRMI182BBH	39
4	View of Joint ID Number CLHLM1282BAH	40



Test Vehicle: 2008 Collins Grand Bantam School Bus NHTSA No.: C80900  
Test Lab: MGA Research Corporation Test Date: 12/22/10

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



Test Vehicle: 2008 Collins Grand Bantam School Bus NHTSA No.: C80900  
Test Lab: MGA Research Corporation Test Date: 12/22/10



View of Joint ID Number CLRCFE181BBH

Test Vehicle: 2008 Collins Grand Bantam School Bus  
Test Lab: MGA Research Corporation  
NHTSA No.: C80900  
Test Date: 12/22/10



View of Joint ID Number CLHRM182BBH

Test Vehicle: 2008 Collins Grand Bantam School Bus  
Test Lab: MGA Research Corporation  
NHTSA No.: C80900  
Test Date: 12/22/10



View of Joint ID Number CLHLM1282BAH