SAFETY COMPLIANCE TESTING FOR
FMVSS NO. 222
SCHOOL BUS PASSENGER SEATING AND CRASH PROTECTION

THOMAS BUILT BUSES INC.
2007 THOMAS SAF-T-LINER C2
NHTSA No.: C70900

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

Final Report Date: April 23, 2007

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
MAILCODE: NVS-220
400 SEVENTH STREET, SW, ROOM 6111
WASHINGTON, D.C. 20590
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Prepared by: _____________________________ Date: April 23, 2007
James Hansen, Project Engineer

Reviewed by: _____________________________ Date: April 23, 2007
Michael Janovicz, Program Manager

FINAL REPORT ACCEPTED BY:

______________________________
April 23, 2007
Date of Acceptance
**Technical Report Documentation Page**

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<td>James Hansen, Project Engineer</td>
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<tr>
<td>Michael Janovicz, Program Manager</td>
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<td>Compliance tests were conducted on the subject 2007 Thomas SAF-T-LINER C2 School Bus, NHTSA No. C70900, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-222-03 for the determination of FMVSS 222 compliance.</td>
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<tr>
<td>NHTSA, Technical Information Services (TIS), Room 2334 (NPO-411)</td>
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<td>400 Seventh Street, S.W. Washington, D.C. 20590</td>
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<td>8</td>
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SECTION 1
PURPOSE OF COMPLIANCE TEST

Tests were conducted on a 2007 Thomas SAF-T-LINER C2 School Bus, NHTSA No. C70900, in accordance with the specifications of the Office of Vehicle Safety Compliance (OVSC) Test Procedures TP-222-03 to determine compliance to the requirements of Federal Motor Vehicle Safety Standards (FMVSS) 222, “School Bus Passenger Seating and Crash Protection”.

This program is sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-02-D-01057.
SECTION 2
TEST DATA SUMMARY

The passenger seating and crash protection tests were conducted during January through March 2007. All tests were conducted by MGA Research Corporation at the Wisconsin Operations. The test vehicle, 2007 Thomas SAF-T-LINER C2 School Bus, NHTSA No. C70900, appears to meet all the requirements of FMVSS 222.

LINEAR AND AREA MEASUREMENTS

Seat to seat/barrier spacing was checked on all seats and found to be 610 mm or less as shown on Data Sheet 1.

The seat back height and front surface area of Seat Nos. 1 and 16 were measured in accordance with Section 12.1 of OVSC TP-222-03. As shown in Data Sheet 2 for Seat Nos. 1 and 16, the seat back area is greater than ninety percent of the seat bench width multiplied by 508.

Restraining barriers positions and projected rear surface areas of Barrier Nos. 1 and 16 were measured in accordance with OVSC TP-222-03. As shown in Data Sheet 6 for Barrier Nos. 1 and 16, the projected perimeters of the seats fall completely within the perimeters of the restraining barriers.

SEAT CUSHION RETENTION

Seat Nos. 8 and 9 were tested in accordance with Section 12.3 of OVSC TP-222-03. Seat cushion weight was 4.7 kg for both S8 and S9. The maximum force reached for S8 was 231.0 N and 234.0 N for S9. For S8, the lower time limit boundary (t1) was approximately 3.5 seconds with an approximate load duration of 5.0 seconds. For S9, the lower time limit boundary (t1) was approximately 2.5 seconds with an approximate load duration of 5.0 seconds. As shown in Data Sheet 3, the seat cushions tested complied with all requirements.
SECTION 2 (CONTINUED)
TEST DATA SUMMARY

SEAT BACK FORCE/DEFLECTION TEST - FORWARD

Seat Nos. 2 and 15 were tested in accordance with Section 12.4 of OVSC TP-222-03. Seat bench width was determined to be 985 mm for S2 and 977 mm for S15. “W” was calculated to be 3 for both S2 and S15. The seating reference point (SRP) was 476 mm above the bus floor. The deflection of the seat back at conclusion of lower loading bar loading at 1557 W N load was 85.0 mm for S2 and 89.2 mm for S15. The allowable maximum deflection without moving the seat back to within 102 mm of another seat or restraining barrier was 356 mm. The stroke rate of the upper loading bar was determined by the test engineer to be 14.4 mm/sec. The location of the upper loading bar was 406 mm above the SRP. The tests were stopped when the maximum deflection of 356 mm was reached. The minimum required area under the force versus deflection curve of the upper loading bar was 1,356 joules for S2 and 1,356 joules for S15. As shown on Data Sheet No. 4, Seat Nos. 2 and 15 met the force deflection forward requirements. See Plots 3, 4, 5, and 6.

SEAT BACK FORCE/DEFLECTION TEST - REARWARD

Seat Nos. 11 and 12 were tested in accordance with Section 12.4 of OVSC TP-222-03. Seat bench width was determined to be 989 for S11 and 990 mm for S12. “W” was calculated to be 3 for both seats. The seating reference point (SRP) was 476 mm above the bus floor. The allowable maximum deflection without moving the seat back to within 102 mm of another seat or restraining barrier was 254 mm. The stroke rate of the upper loading bar was determined by the test engineer to be 14.4 mm/sec for both seats. The location of the loading bar was 343 mm above the SRP. The test was stopped when the maximum deflection of the seat back of 254 mm was achieved.

The area under the force versus deflection curve of the loading bar was 1,215 joules for S11 and 1,169 joules for S12. The minimum required area under the force versus deflection curve of the loading bar was 316 W or 948 joules for both seats. As shown on Data Sheet No. 5, Seat Nos. 11 and 12 met the force deflection rearward requirements. See Plots 7 and 8.
RESTRAINING BARRIER FORCE/DEFLECTION TEST - FORWARD

Both front restraining barriers (B1 and B16) were tested in accordance with Section 12.4 of OVSC TP-222-03. Seat bench width of the aft seats was determined to be 980 mm for B1 and 985 for B16. “W” was calculated to be 3 for B1 and B16. The SRP was 476 mm above the bus floor. The deflection of the restraining barrier at the conclusion of the lower loading bar loading at 1557W was 84.4 mm for B1 and 79.4 mm for B16. The allowable maximum deflection without moving the restraining barriers to within interference of a seat or door was 356 mm. The stroke rate of the upper loading bar was determined by the test engineer from test data to be 14.4 mm/sec. The location of the upper loading bar was 406 mm above the SRP. The tests were stopped when the maximum deflection of 356 mm was reached for B1 and B16. The area under the force versus deflection curve of the upper loading bar was 2,042 joules for B1 and 2,228 joules for B16. The minimum required area under the force versus deflection curve of the upper loading bar was 452 W or 1,356 joules for both barriers.
SECTION 2 (CONTINUED)
TEST DATA SUMMARY

KNEE FORM IMPACT ZONE TESTS

Seat No. S3 was tested in accordance with Section 12.7 of OVSC TP-222-03. The mass of the knee form was 4.53 kg. All knee form contact area criteria and impact energy criteria were met for the seat.

HEAD FORM IMPACT ZONE TESTS

Seat No. S3 was tested in accordance with Section 12.6 of OVSC TP-222-03. The mass of the head form was 5.21 kg. All head form contact area criteria was met for the seat. The impact energy criteria and head injury criteria for all impact locations were met.

WHEELCHAIR SECUREMENT ANCHORAGES AND DEVICES

Securement anchorage for wheelchair locations W8.5 was tested in accordance with Appendix 3 of OVSC TP-222-03. Wheelchair locations W8.5 is located as shown in the seating diagram in Section 8 and designed for forward facing occupants.

Anchorage attachments and webbing straps provided with the vehicle were used to conduct the tests. Type A and C anchorages were tested in location W8.5 at the LF and LR locations. A Type D anchorage was tested in location W8.5 at the upper torso location. All anchorages met the required minimum loads. See Data Sheet 10.
**ADMINISTRATIVE DATA SHEET**

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<tr>
<th>Test Vehicle:</th>
<th>2007 THOMAS SAF-T-LINER C2 SCHOOL BUS</th>
<th>NHTSA No.:</th>
<th>C70900</th>
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<tbody>
<tr>
<td>Test Lab:</td>
<td>MGA RESEARCH CORPORATION</td>
<td>Test Date:</td>
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**INCOMPLETE VEHICLE (IF APPLICABLE)**

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**COMPLETED VEHICLE (SCHOOL BUS)**

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<th>Thomas Built Buses Inc.</th>
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<td>Color:</td>
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<tr>
<td>GVWR:</td>
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<td>Completion of Compliance Test:</td>
<td>3/19/2007</td>
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**COMPLIANCE TEST:**
All tests were performed in accordance with the references outlined in TP-222-03.

Recorded By: [Signature]

Approved By: [Signature] DATE: 11/15/2006
## GENERAL TEST DATA SHEET

**Test Vehicle:** 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
**NHTSA No.:** C70900  
**Test Lab:** MGA RESEARCH CORPORATION  
**Test Date:** 1/12/2007

### SCHOOL BUS IDENTIFICATION

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<td>(1 Driver, 48 Passengers, 1 Wheelchair)</td>
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<td>C70900</td>
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<td>Conventional or Forward Control:</td>
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<td>GVWR (Certification Label) FRONT:</td>
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<td>GVWR (Certification Label) REAR:</td>
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### SEAT IDENTIFICATION

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<td>Model Name &amp; Number:</td>
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<td>Description of Seats:</td>
<td>Seat frames are constructed of 25.4 mm round welded tubing. The seat back has a 0.75 mm steel pan welded to the tubing and is covered with 20 mm foam on the front side and 11 mm foam on the rear side. In the knee impact areas, 45 mm Styrofoam is covered by 20 mm foam. The seat cushion is constructed of 10 mm plywood with 100 mm foam which tapers to 70 mm. The seat back and seat cushion are wrapped with 0.7 mm vinyl.</td>
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SECTION 3
COMPLIANCE TEST DATA

The following data sheets document the results of testing on the 2007 Thomas SAF-T-LINER C2 School Bus, NHTSA No. C70900.
### DATA SHEET 1

#### SEAT TO SEAT/BARRIER SPACING

**Test Vehicle:** 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
**NHTSA No.:** C70900  
**Test Lab:** MGA RESEARCH CORPORATION  
**Test Date:** 1/12/2007

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<th>SEAT NUMBER</th>
<th>MEASUREMENT OF SPACING FROM SRP FORWARD TO SEAT/BARRIER (mm)</th>
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**COMMENTS:** None

**Recorded By:** [Signature]

**Approved By:** [Signature]  
**DATE:** 1/12/2007
# DATA SHEET 2
## SEAT BACK HEIGHT & FRONT SURFACE AREA TEST

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<th>C70900</th>
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<td>MGA RESEARCH CORPORATION</td>
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### SEAT NUMBER: S1

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<td>1. Is the seat back height at least 508 mm vertically above the SRP? (S5.1.2)</td>
<td>PASS</td>
</tr>
<tr>
<td>2. Measure the seat back front projected area in a vertical plane bound by horizontal planes through the SRP and 508 mm above the SRP according to the following procedure: Width, a = 820 mm; width, b = 957 mm; radius = N/A Area = ½ (a+b) x 508 mm = 451,358 mm² – N/A mm² = 451,358 mm²</td>
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</tr>
<tr>
<td>3. Measure the seat cushion width - W1 = 978 mm</td>
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<tr>
<td>4. Calculate the following: 0.9 x W1 x 508 mm = 447,142 mm²</td>
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</tr>
<tr>
<td>5. Is item 2 greater than item 4? (S5.1.2)</td>
<td>PASS</td>
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</table>

**NOTE:** For a seat back or a seat cushion that has a nonsymmetrical shape or has a large radius at the corner, the above described measuring method must be modified as required to obtain accurate area measurements.

**Comments:** None

**Recorded By:**

**Approved By:** Michael Janczak

**DATE:** 2/14/2007
DATA SHEET 2 (CONTINUED)

SEAT BACK HEIGHT & FRONT SURFACE AREA TEST

Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
NHTSA No.: C70900

Test Lab: MGA RESEARCH CORPORATION  
Test Date: 2/14/2007

SEAT NUMBER: S16

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<td>1.</td>
<td>Is the seat back height at least 508 mm vertically above the SRP? (S5.1.2)</td>
<td>PASS</td>
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</table>

2. Measure the seat back front projected area in a vertical plane bound by horizontal planes through the SRP and 508 mm above the SRP according to the following procedure:
   - Width, a = 794 mm;  width, b = 956 mm;  radius = N/A
   - Area = \( \frac{1}{2} (a+b) \times 508 \text{ mm} = 444,500 \text{ mm}^2 - \text{N/A mm}^2 = 444,500 \text{ mm}^2 \)

3. Measure the seat cushion width - \( W_1 = 972 \text{ mm} \)

If the seat cushion is not rectangular, measure the cushion at the forward most edge and the rearward most edge, average the widths, and use the average width as \( W_1 \).

4. Calculate the following: \( 0.9 \times W_1 \times 508 \text{ mm} = 444,398 \text{ mm}^2 \)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>PASS/FAIL</th>
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<tbody>
<tr>
<td>5.</td>
<td>Is item 2 greater than item 4? (S5.1.2)</td>
<td>PASS</td>
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NOTE: For a seat back or a seat cushion that has a nonsymmetrical shape or has a large radius at the corner, the above described measuring method must be modified as required to obtain accurate area measurements.

Comments: None

Recorded By: ___________________________  
Approved By: ___________________________  DATE: 2/14/2007
DATA SHEET 3
SEAT CUSHION RETENTION TEST

Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS    NHTSA No.: C70900
Test Lab: MGA RESEARCH CORPORATION   Test Date: 1/12/2007

SEAT NUMBER: S8

1. Cushion Weight/Mass = 4.7 kg
2. Cushion Weight x 5 = F = 230.5 N (S5.1.5)
3. Complete the following force/time graph:

![Force-Time Graph]

F must be 5 x Cushion Weight; t1 and t2 must be according to the following expressions:
T1 => 1 sec., <5 sec., t2 = t1 + 5 sec., + 0 sec. and -0.10 sec.

4. Did seat cushion separate from the seat structure at any attachment point? (S5.1.5)   PASS

DESCRIBE SEAT CUSHION ATTACHMENTS: Two half shell clamps on front of seat and one pivoting latch on rear.

Comments: None

Recorded By: ____________________________

Approved By: ____________________________  DATE: 1/12/2007
SEAT NUMBER: S9

1. Cushion Weight/Mass = 4.7 kg
2. Cushion Weight x 5 = F = 230.5 N (S5.1.5)
3. Complete the following force/time graph:

\[
\begin{align*}
F &= 234.0 \text{ N} \\
T1 &= 2.5 \text{ sec.} \\
T2 &= 5.0 \text{ sec.}
\end{align*}
\]

F must be 5 x Cushion Weight; t1 and t2 must be according to the following expressions:
T1 => 1 sec., <5 sec., t2 = t1 + 5 sec., + 0 sec. and -0.10 sec.

| 4. Did seat cushion separate from the seat structure at any attachment point? (S5.1.5) | PASS |

DESCRIBE SEAT CUSHION ATTACHMENTS: Two half shell clamps on front of seat and one pivoting latch on rear.

Comments: None

Recorded By: 

Approved By: Michael January DATE: 1/12/2007
DATA SHEET 4
SEAT BACK FORCE DEFLECTION TEST - FORWARD

Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  NHTSA No.: C70900
Test Lab: MGA RESEARCH CORPORATION  Test Date: 2/23/2007

SEAT NUMBER: S2

1. Seat Bench Width = 985 mm
   \[ W = \frac{\text{Seat Bench Width}}{381} \text{ mm (round to nearest whole number)} = (3) \]
   Seat Reference Point (SRP) location is: (Description of location as supplied by the COTR): 476 mm Above Floor, 135 mm forward from the front of seat back.

2. Location of lower loading bar is 0 mm above the SRP.
   (Requirement: Between 102 mm above and 102 mm below the SRP) (S5.1.3.1)
   Length of lower loading bar = 850 mm
   Seat Back width at SRP = 954 mm

3. Include x-y plot of Force vs. Time for the lower loading bar.

4. Deflection of the seat back at conclusion of lower bar loading (1557 W Newtons position) = 85.0 mm, at start of upper bar loading 85.0 mm, at end of upper bar loading 85.0 mm.

5. Maximum deflection allowed without moving the seat back to within 102 mm of another seat or restraining barrier = 356 mm (must be 356 mm of less) (S5.1.3)

6. Seat back movement rate selected by the test engineer = 14.4 mm/sec

7. Location of upper loading bar is in a horizontal plane 406 mm above the SRP.
   (Requirement: 406 mm) (S5.1.3.3). Length of upper loading bar = 770 mm. Width of seat back at 406 mm above SRP = 870 mm.

8. Reason for stopping seat back deflection:
   ___ Reached deflection determined in Item 6 above (if less than 356 mm)
   \[ X \] Reached 356 mm maximum allowed deflection (Actual deflection was 362 mm)
   ___ Separation was about to occur

9. Include the x-y plot of force vs. deflection for the upper loading bar with boundaries of Figure 14 (OVSC TP-222-3) superimposed.
### DATA SHEET 4 (CONTINUED)

#### SEAT BACK FORCE DEFLECTION TEST – FORWARD

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.</td>
<td>Is the seat in its final deflected position within 102 mm of the next seat or barrier?</td>
<td>PASS</td>
</tr>
<tr>
<td>11.</td>
<td>Does the forward force vs. deflection trace of the seat back lie within the corridor? (S5.1.3)</td>
<td>PASS</td>
</tr>
<tr>
<td>12.</td>
<td>Include a deflection vs. time plot for the upper loading bar.</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>The area within the force vs. deflection curve = 1,688 joules</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>452W = 1,356 joules (S5.1.3.4)</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Is item 13 greater than or equal to item 14? (S5.1.3.4)</td>
<td>PASS</td>
</tr>
</tbody>
</table>

Comments: None

Recorded By: __________________________

Approved By: __________________________ DATE: 2/23/2007
SEAT BACK FORCE DEFLECTION TEST - FORWARD

SEAT NUMBER: S15

1. Seat Bench Width = 977 mm
   \[ W = \text{(Seat Bench Width)} / 381 \text{ mm (round to nearest whole number)} = (3) \]
   Seat Reference Point (SRP) location is: (Description of location as supplied by the COTR: 476 mm Above Floor, 135 mm forward from the front of seat back.

2. Location of lower loading bar is 0 mm above the SRP.
   (Requirement: Between 102 mm above and 102 mm below the SRP) (S5.1.3.1)
   Length of lower loading bar = 838 mm
   Seat Back width at SRP = 776 mm

3. Include x-y plot of Force vs. Time for the lower loading bar.

4. Deflection of the seat back at conclusion of lower bar loading (1557 W Newtons position) = 89.2 mm, at start of upper bar loading 89.2 mm, at end of upper bar loading 89.2 mm.

5. Maximum deflection allowed without moving the seat back to within 102 mm of another seat or restraining barrier = 356 mm (must be 356 mm of less) (S5.1.3)

6. Seat back movement rate selected by the test engineer = 14.4 mm/sec

7. Location of upper loading bar is in a horizontal plane 406 mm above the SRP.
   (Requirement: 406 mm) (S5.1.3.3). Length of upper loading bar = 760 mm. Width of seat back at 406 mm above SRP = 860 mm.

8. Reason for stopping seat back deflection:
   ____ Reached deflection determined in Item 6 above (if less than 356 mm)
   ____ Reached 356 mm maximum allowed deflection (Actual deflection was 361 mm)
   ____ Separation was about to occur

9. Include the x-y plot of force vs. deflection for the upper loading bar with boundaries of Figure 14 (OVSC TP-222-3) superimposed.
### DATA SHEET 4 (CONTINUED)

#### SEAT BACK FORCE DEFLECTION TEST – FORWARD

**Test Vehicle:** 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
**NHTSA No.:** C70900  
**Test Lab:** MGA RESEARCH CORPORATION  
**Test Date:** 2/16/2007

<table>
<thead>
<tr>
<th>Test Item</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.</td>
<td>Is the seat in its final deflected position within 102 mm of the next seat or barrier?</td>
<td>PASS</td>
</tr>
<tr>
<td>11.</td>
<td>Does the forward force vs. deflection trace of the seat back lie within the corridor? (S5.1.3)</td>
<td>PASS</td>
</tr>
<tr>
<td>12.</td>
<td>Include a deflection vs. time plot for the upper loading bar.</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>The area within the force vs. deflection curve = 1,576 joules</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>$452W = 1,356$ joules (S5.1.3.4)</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Is item 13 greater than or equal to item 14? (S5.1.3.4)</td>
<td>PASS</td>
</tr>
</tbody>
</table>

**Comments:** None

**Recorded By:**

**Approved By:** Michael Janco  
**DATE:** 2/16/2007
DATA SHEET 5
SEAT BACK FORCE DEFLECTION TEST – REARWARD

Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  NHTSA No.: C70900
Test Lab: MGA RESEARCH CORPORATION  Test Date: 2/26/2007

SEAT NUMBER: S11

1. Seat Bench Width = 989 mm
   \[ W = \frac{\text{Seat Bench Width}}{381 \text{ mm}} \text{ (round to nearest whole number)} = (3) \]
2. Location of the loading bar is in a horizontal plane 343 mm above the SRP of the test seat. (Requirement: 343 mm above the SRP) (S5.1.4.1)
   Length of loading bar = 800 mm
   Width of seat back at 343 mm above SRP = 904 mm
3. Deflection of seat back at 222 N preload = 15.0 mm
4. Maximum deflection allowed without moving the seat back to within 102 mm of another seat = 254 mm (maximum allowed = 254 mm) (S5.1.4)
5. Seat back movement rate selected by the test engineer = 14.4 mm/sec
6. Reason for stopping deflection:
   ___ Reached deflection determined in Item 4 above (if less than 254 mm)
   _X_ Reached 254 mm maximum allowed deflection (Actual deflection was 256 mm)
   ___ Separation was about to occur
7. Include the x-y plot of force vs. deflection for the loading bar with boundaries of Figure 18 (OVSC TP-222-3) superimposed.

<table>
<thead>
<tr>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.</td>
<td>Does the force vs. deflection plot lie within the boundaries of Figure 18 (OVSC TP-222-03)?</td>
</tr>
</tbody>
</table>

9. Include a deflection vs. time plot for the upper loading bar.
10. 316W = 948 joules
11. The area within the force vs. deflection curve = 1,215 joules
<table>
<thead>
<tr>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Is item 11 greater than or equal to item 10? (S5.1.4.2)</td>
<td>PASS</td>
</tr>
</tbody>
</table>

Comments: None

Recorded By: ________________________________

Approved By: ________________________________  DATE: 2/26/2007
DATA SHEET 5 (CONTINUED)
SEAT BACK FORCE DEFLECTION TEST – REARWARD

Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
NHTSA No.: C70900
Test Lab: MGA RESEARCH CORPORATION  
Test Date: 2/16/2007

SEAT NUMBER: S12

1. Seat Bench Width = 990 mm
   \[ W = \frac{\text{Seat Bench Width}}{381 \text{ mm}} \] (round to nearest whole number) = (3)

2. Location of the loading bar is in a horizontal plane 343 mm above the SRP of the test seat. (Requirement: 343 mm above the SRP) (S5.1.4.1)
   - Length of loading bar = 798 mm
   - Width of seat back at 343 mm above SRP = 900 mm

3. Deflection of seat back at 222 N preload = 10 mm

4. Maximum deflection allowed without moving the seat back to within 102 mm of another seat = 254 mm (maximum allowed = 254 mm) (S5.1.4)

5. Seat back movement rate selected by the test engineer = 14.4 mm/sec

6. Reason for stopping deflection:
   - ___ Reached deflection determined in Item 4 above (if less than 254 mm)
   - _X_ Reached 254 mm maximum allowed deflection (Actual deflection was 256 mm)
   - ___ Separation was about to occur

7. Include the x-y plot of force vs. deflection for the loading bar with boundaries of Figure 18 (OVSC TP-222-3) superimposed.

<table>
<thead>
<tr>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.</td>
<td>Does the force vs. deflection plot lie within the boundaries of Figure 18 (OVSC TP-222-03)?</td>
</tr>
</tbody>
</table>

9. Include a deflection vs. time plot for the upper loading bar.

10. 316W = 948 joules

11. The area within the force vs. deflection curve = 1,169 joules
DATA SHEET 5 (CONTINUED)
SEAT BACK FORCE DEFLECTION TEST – REARWARD

Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  NHTSA No.: C70900
Test Lab: MGA RESEARCH CORPORATION  Test Date: 2/16/2007

| 12. Is item 11 greater than or equal to item 10? (S5.1.4.2) | PASS |

Comments: None

Recorded By: ____________________________

Approved By: ___________________________  DATE: 2/16/2007
DATA SHEET 6
RESTRAINING BARRIER POSITION AND PROJECTED REAR SURFACE AREA

Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
NHTSA No.: C70900
Test Lab: MGA RESEARCH CORPORATION  
Test Date: 2/15/2007

SEAT NUMBER: B1

1. Measure distance T from SRP of seat immediately aft of barrier in a horizontal longitudinal line forward to barrier. T = 539 mm.

<table>
<thead>
<tr>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Is distance T equal to or less than 610 mm? (S5.2)</td>
</tr>
</tbody>
</table>

3. Measure distance D at top (t) and bottom (b) of barrier.
   \[ D_t = 78 \text{ mm} \quad D_b = 0 \text{ mm} \]

4. Measure distance C at top (t) and bottom (b) of barrier.
   \[ C_t = 84 \text{ mm} \quad C_b = 0 \text{ mm} \]

<table>
<thead>
<tr>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>Is ( D_t ) equal to or less than ( C_t )?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.</td>
<td>Is ( D_b ) equal to or less than ( C_b )?</td>
</tr>
</tbody>
</table>

7. Measure distance E at top of barrier and bottom of barrier.
   \[ E_t = 768 \text{ mm} \quad E_b = 969 \text{ mm} \]

8. Measure distance A at top of seat back and bottom of seat.
   \[ A_t = 751 \text{ mm} \quad A_b = 969 \text{ mm} \]

<table>
<thead>
<tr>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.</td>
<td>Is distance ( E_t + D_t ) equal to or greater than distance ( A_t + C_t )?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.</td>
<td>Is distance ( E_b + D_b ) equal to or greater than distance ( A_b + C_b )</td>
</tr>
</tbody>
</table>

11. Measure distance U at inboard (i) and outboard (o) side of barrier.
   \[ U_i = 297 \text{ mm} \quad U_o = 291 \text{ mm} \]

12. Measure distance V at inboard (i) and outboard (o) sides of seat.
   \[ V_i = 307 \text{ mm} \quad V_o = 307 \text{ mm} \]
#### DATA SHEET 6 (CONTINUED)

**RESTRAINING BARRIER POSITION AND PROJECTED REAR SURFACE AREA**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.</td>
<td>Is $U_i$ equal to or less than $V_i$?</td>
<td><strong>PASS</strong></td>
</tr>
<tr>
<td>14.</td>
<td>Is $U_o$ equal to or less than $V_o$?</td>
<td><strong>PASS</strong></td>
</tr>
</tbody>
</table>

15. Measure distance $S$ at inboard (I) and outboard (o) side of barrier.  
   $S_i = 745$ mm  
   $S_o = 735$ mm  

16. Measure distance $W$ at inboard (i) and outboard (o) sides of seat.  
   $W_i = 710$ mm  
   $W_o = 717$ mm  

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.</td>
<td>Is $S_i + U_i$ equal to or greater than $W_i + V_i$?</td>
<td><strong>PASS</strong></td>
</tr>
<tr>
<td>18.</td>
<td>Is $S_o + U_o$ equal to or greater than $W_o + V_o$?</td>
<td><strong>PASS</strong></td>
</tr>
</tbody>
</table>

19. Compute area $(W \times A) = 613,610$ mm²  
20. Compute area $(E \times S) = 642,690$ mm²  

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.</td>
<td>Is $(W \times A)$ equal to or less than $(E \times S)$?</td>
<td><strong>PASS</strong></td>
</tr>
</tbody>
</table>

**Comments:** None

**Recorded By:** ________________________________  
**Approved By:** ________________________________  
**DATE:** 2/15/2007
SEAT NUMBER: B16

1. Measure distance $T$ from SRP of seat immediately aft of barrier in a horizontal longitudinal line forward to barrier. $T = 443$ mm.

2. Is distance $T$ equal to or less than 610 mm? (S5.2) **PASS**

3. Measure distance $D_t$ at top (t) and bottom (b) of barrier.
   $D_t = 96$ mm  $D_b = 11$ mm

4. Measure distance $C_t$ at top (t) and bottom (b) of barrier.
   $C_t = 105$ mm  $C_b = 16$ mm

5. Is $D_t$ equal to or less than $C_t$? **PASS**

6. Is $D_b$ equal to or less than $C_b$? **PASS**

7. Measure distance $E_t$ at top of barrier and bottom of barrier.
   $E_t = 758$ mm  $E_b = 963$ mm

8. Measure distance $A_t$ at top of seat back and bottom of seat.
   $A_t = 724$ mm  $A_b = 940$ mm

9. Is distance $E_t + D_t$ equal to or greater than distance $A_t + C_t$? **PASS**

10. Is distance $E_b + D_b$ equal to or greater than distance $A_b + C_b$? **PASS**

11. Measure distance $U$ at inboard (i) and outboard (o) side of barrier.
    $U_i = 294$ mm  $U_o = 290$ mm

12. Measure distance $V$ at inboard (i) and outboard (o) sides of seat.
    $V_i = 320$ mm  $V_o = 298$ mm
### DATA SHEET 6 (CONTINUED)

**RESTRAINING BARRIER POSITION AND PROJECTED REAR SURFACE AREA**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.</td>
<td>Is $U_i$ equal to or less than $V_i$?</td>
<td>PASS</td>
</tr>
<tr>
<td>14.</td>
<td>Is $U_o$ equal to or less than $V_o$?</td>
<td>PASS</td>
</tr>
<tr>
<td>15.</td>
<td>Measure distance $S$ at inboard (I) and outboard (O) side of barrier.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$S_i = 735$ mm</td>
<td>$S_o = 740$ mm</td>
</tr>
<tr>
<td>16.</td>
<td>Measure distance $W$ at inboard (I) and outboard (O) sides of seat.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$W_i = 695$ mm</td>
<td>$W_o = 727$ mm</td>
</tr>
<tr>
<td>17.</td>
<td>Is $S_i + U_i$ equal to or greater than $W_i + V_i$?</td>
<td>PASS</td>
</tr>
<tr>
<td>18.</td>
<td>Is $S_o + U_o$ equal to or greater than $W_o + V_o$?</td>
<td>PASS</td>
</tr>
<tr>
<td>19.</td>
<td>Compute area $(W \times A) = 591,552$ mm$^2$</td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>Compute area $(E \times S) = 634,619$ mm$^2$</td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>Is $(W \times A)$ equal to or less than $(E \times S)$?</td>
<td>PASS</td>
</tr>
</tbody>
</table>

**Comments:** None

**Recorded By:**

**Approved By:** Michael Janoff  
**DATE:** 2/15/2007
BARRIER IDENTIFICATION: B1

1. Seat cushion width of seat immediately rearward of restraining barrier = 980 mm
   \[ W = \frac{\text{Seat Cushion Width}}{381 \text{ mm}} \] (round to nearest whole number) = (3)

2. Location of SRP of seat rearward of restraining barrier is: (Description of location as supplied by the manufacturer): 476 mm Above Floor, 135 mm forward from the front of seat back.

3. Location of lower loading bar is 0 mm above/below the SRP.
   (Requirement: between 102 mm above and 102 mm below the SRP) (S5.1.3.1)
   Length of loading bar = 850 mm
   Width of barrier at SRP = 950 mm

4. Include the x-y plot of force vs. time for the lower loading bar.

5. Deflection of the barrier at the conclusion of lower bar loading (1557W position) = 84.4 mm.

6. Maximum deflection allowed without moving the restraining barrier to within interference of door operation = 356 mm (must be 356 mm or less).

7. Barrier movement rate selected by the test engineer = 14.4 mm/sec

8. Location of upper loading bar is in a horizontal plane 406 mm above the SRP.
   (Requirement: 406 mm) (S5.1.3.3)
   Length of loading bar = 770 mm
   Width of Barrier at 406 mm above the SRP = 870 mm

9. Reason for stopping restraining barrier deflection:
   \[ \checkmark \text{ Reached 356 mm maximum } \]
   \[ \_\_\_ \text{ Separation was about to occur } \]
   \[ \_\_\_ \text{ Interference with door operation } \]
   \[ \_\_\_ \text{ Exceeded maximum load of 10675 } \]

10. Maximum deflection of barrier back 361 mm.
    (Requirement: maximum allowed is 356 mm) (S5.2.3(b))
DATA SHEET 7 (CONTINUED)
RESTRAINING BARRIER FORCE/DEFLECTION TEST

11. Does the restraining barrier interfere with the normal operation of the door. (S5.2.3 (c))  
   PASS

12. Did any separation of barrier component or the separation of the barrier from the vehicle occur? (S5.1.3 (d) & (e))  
   PASS

13. Include the x-y plot of force vs. deflection for the upper loading bar with boundaries of Figure 14 (OVSC TP-222-3) superimposed.

14. Does the forward force vs. deflection trace of the barrier back lie within the unshaded area? (S5.2.3(a))  
   PASS

15. Include a deflection vs. time plot for the upper loading bar.
16. The area within the force vs. deflection curve = 2,042 joules
17. 452W = 1,356 joules (S5.2.3) (S5.1.3.4)

18. Is item 16 greater than item 17?  
   PASS

Comments: None

Recorded By: ________________________________

Approved By: ________________________________  DATE: 2/23/2007
BARRIER IDENTIFICATION: B16

1. Seat cushion width of seat immediately rearward of restraining barrier = 985 mm
   \[ W = \frac{\text{Seat Cushion Width}}{381 \text{ mm}} \text{ (round to nearest whole number)} = (3) \]
2. Location of SRP of seat rearward of restraining barrier is: (Description of location as supplied by the manufacturer): 476 mm Above Floor, 135 mm forward from the front of seat back.
3. Location of lower loading bar is 0 mm above/below the SRP.
   (Requirement: between 102 mm above and 102 mm below the SRP) (S5.1.3.1)
   Length of lower loading bar = 880 mm
   Width of barrier at SRP = 980 mm
4. Include the x-y plot of force vs. time for the lower loading bar.
5. Deflection of the barrier at the conclusion of lower bar loading (1557W position) = 79.4 mm.
6. Maximum deflection allowed without moving the restraining barrier to within interference of door operation = 356 mm (must be 356 mm or less).
7. Barrier movement rate selected by the test engineer = 14.4 mm/sec
8. Location of upper loading bar is in a horizontal plane 406 mm above the SRP.
   (Requirement: 406 mm) (S5.1.3.3)
   Length of loading bar = 770 mm
   Width of Barrier at 406 mm above the SRP = 870 mm
9. Reason for stopping restraining barrier deflection:
   \[ \times \] Reached 356 mm maximum
   ___ Separation was about to occur
   ___ Interference with door operation
   ___ Exceeded maximum load of 10675
10. Maximum deflection of barrier back 362 mm.
    (Requirement: maximum allowed is 356 mm) (S5.2.3(b))
### DATA SHEET 7 (CONTINUED)
#### RESTRAINING BARRIER FORCE/DEFLECTION TEST

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.</td>
<td>Does the restraining barrier interfere with the normal operation of the door. (S5.2.3 (c))</td>
<td>PASS</td>
</tr>
<tr>
<td>12.</td>
<td>Did any separation of barrier component or the separation of the barrier from the vehicle occur? (S5.1.3 (d) &amp; (e))</td>
<td>PASS (1)</td>
</tr>
</tbody>
</table>

13. Include the x-y plot of force vs. deflection for the upper loading bar with boundaries of Figure 14 (OVSC TP-222-3) superimposed.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.</td>
<td>Does the forward force vs. deflection trace of the barrier back lie within the unshaded area? (S5.2.3(a))</td>
<td>PASS (2)</td>
</tr>
</tbody>
</table>

15. Include a deflection vs. time plot for the upper loading bar.
16. The area within the force vs. deflection curve = 2,228 joules
17. 452W = 1,356 joules (S5.2.3) (S5.1.3.4)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.</td>
<td>Is item 16 greater than item 17?</td>
<td>PASS</td>
</tr>
</tbody>
</table>

**Comments:**

1. The bolts anchoring the restraining barrier to the floor broke at 11,490 N. However, it would appear that the required energy was already absorbed by this point.

2. The Force vs. Deflection trace did exceed the upper force limit at 279 mm displacement. However, it would appear that the required energy was already absorbed by this point.

**Recorded By:**

**Approved By:** Michael Jankowski  DATE: 2/26/2007
SEAT NUMBER: S3

NOTE: SHADED AREA IS NONCONTACTABLE SURFACE

1. Locate x-y reference point on sketch above for head form impact locations. (Label the positive and negative directions, if applicable)

2. Identify head form impact location on sketch by placing H1, H2, H3, H4, H5, H6, and H7 in the appropriate location.

3. Define and mark on graphic above, the plane of reference for head form impact angle:
   - $0^\circ$ = Parallel With Floor, (+) is Up, (-) is Down
   - X = From Inboard Edge of Seat
   - Y = Measured Vertically from the SRP
4. Complete the following table:

<table>
<thead>
<tr>
<th>Head Impact &amp; Test #</th>
<th>Location (a)</th>
<th>Speed Trap Impact Velocity** mps</th>
<th>Derived Velocity mps</th>
<th>Contact Area (CA) mm²</th>
<th>CA ≥ 1935 mm²</th>
<th>Yes-Pass</th>
<th>No-Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>Y</td>
<td>Angle</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1</td>
<td>780</td>
<td>440</td>
<td>0</td>
<td>1.55</td>
<td>1.84</td>
<td>4,410</td>
<td>PASS</td>
</tr>
<tr>
<td>H2</td>
<td>670</td>
<td>440</td>
<td>0</td>
<td>1.55</td>
<td>1.55</td>
<td>3,070</td>
<td>PASS</td>
</tr>
<tr>
<td>H3</td>
<td>560</td>
<td>440</td>
<td>0</td>
<td>1.53</td>
<td>1.36</td>
<td>3,680</td>
<td>PASS</td>
</tr>
<tr>
<td>H4</td>
<td>780</td>
<td>320</td>
<td>0</td>
<td>1.54</td>
<td>1.79</td>
<td>3,820</td>
<td>PASS</td>
</tr>
<tr>
<td>H5</td>
<td>670</td>
<td>320</td>
<td>0</td>
<td>1.55</td>
<td>1.75</td>
<td>3,620</td>
<td>PASS</td>
</tr>
<tr>
<td>H6</td>
<td>560</td>
<td>320</td>
<td>0</td>
<td>1.54</td>
<td>1.61</td>
<td>3,950</td>
<td>PASS</td>
</tr>
<tr>
<td>H7</td>
<td>450</td>
<td>320</td>
<td>0</td>
<td>1.55</td>
<td>1.52</td>
<td>3,450</td>
<td>PASS</td>
</tr>
</tbody>
</table>

* Contact Velocity from Item 7 below
** Velocity Range = 1.52 mps, +0.08, -0 mps

5. Attach Contact Area Prints.
6. Attach acceleration versus time plots for each impact.
7. Integrate the acceleration versus time plots and attach plots of the results that show velocity versus time.

Comments: (a) All measurements are referenced to the point where the horizontal plane through the SRP intersects the vertical line tangent to the inboard edge at the seat.
DATA SHEET 8 (CONTINUED)
HEAD FORM IMPACT CONTACT AREA AND ENERGY REQUIREMENTS

Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
Test Lab: MGA RESEARCH CORPORATION  
NHTSA No.: C70900  
Test Date: 2/19/2007

SEAT NUMBER: S3

SEAT BACK REAR SURFACE

NOTE: SHADED AREA IS NONCONTACTABLE SURFACE

1. Locate x-y reference point on sketch above for head form impact locations. (Label the positive and negative directions, if applicable)
2. Identify head form impact location on sketch by placing H8, H9, H10, H11, H12, H13 and H14 in the appropriate location.
3. Define and mark on graphic above, the plane of reference for head form impact angle:
   0° = Parallel With Floor, (+) is Up, (-) is Down
   X = From Inboard Edge of Seat
   Y = Measured Vertically from the SRP
4. Complete the following table:

<table>
<thead>
<tr>
<th>Head impact &amp; Test #</th>
<th>Location (a)</th>
<th>Speed Trap Impact Velocity ** mps</th>
<th>Derived Velocity ** mps</th>
<th>Max HIC</th>
<th>Enrgy Reqd Joules</th>
<th>Column 5 &lt; 1000</th>
<th>Column 6 &gt; 4.5 joules</th>
<th>Yes- Pass</th>
<th>No- Fail</th>
<th>Yes- Pass</th>
<th>No- Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>Y</td>
<td>Angle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>H8</td>
<td>450</td>
<td>440</td>
<td>0</td>
<td>6.63</td>
<td>6.48</td>
<td>129</td>
<td>4.73</td>
<td>PASS</td>
<td>PASS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H9</td>
<td>340</td>
<td>440</td>
<td>0</td>
<td>6.66</td>
<td>6.54</td>
<td>127</td>
<td>4.97</td>
<td>PASS</td>
<td>PASS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H10</td>
<td>230</td>
<td>440</td>
<td>0</td>
<td>6.63</td>
<td>6.72</td>
<td>130</td>
<td>5.07</td>
<td>PASS</td>
<td>PASS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H11</td>
<td>120</td>
<td>440</td>
<td>0</td>
<td>6.62</td>
<td>6.30</td>
<td>112</td>
<td>6.48</td>
<td>PASS</td>
<td>PASS</td>
<td></td>
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<tr>
<td>H12</td>
<td>340</td>
<td>320</td>
<td>0</td>
<td>6.63</td>
<td>6.60</td>
<td>117</td>
<td>14.30</td>
<td>PASS</td>
<td>PASS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H13</td>
<td>230</td>
<td>320</td>
<td>0</td>
<td>6.65</td>
<td>6.74</td>
<td>117</td>
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<td>H14</td>
<td>120</td>
<td>320</td>
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<td>6.65</td>
<td>6.32</td>
<td>172</td>
<td>6.41</td>
<td>PASS</td>
<td>PASS</td>
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<td></td>
</tr>
</tbody>
</table>

* Impact velocity from item No. 6 below
** Impact velocity range = 6.69 mps, +0, -0.08 mps

5. Attach acceleration versus time plots for each impact.
6. Integrate the acceleration versus time plots and attach plots of the results that show velocity versus time.

Comments: (a) All measurements are referenced to the point where the horizontal plane through the SRP intersects the vertical line tangent to the inboard edge at the seat.

Recorded By: __________________________

Approved By: __________________________ DATE: 2/19/2007
DATA SHEET 9
KNEE FORM IMPACT TEST

Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  NHTSA No.: C70900
Test Lab: MGA RESEARCH CORPORATION  Test Date: 2/21/2007

SEAT NUMBER: S3

1. Locate x-y reference point on sketch above for knee form impact locations. (Label the positive and negative directions, if applicable)

2. Identify knee form impact location on sketch by placing K1, K2, K3, K4, K5, K6, K7, and K8 in the appropriate location.

3. Define the plane of reference for knee form impact angle:
   0° = Parallel With Floor, (+) is Up, (-) is Down
   X = From Inboard Edge of the Seat
   Y = Measured Vertically from the SRP
### DATA SHEET 9 (CONTINUED)

#### KNEE FORM IMPACT TEST

4. Complete the following table:

<table>
<thead>
<tr>
<th>Knee impact &amp; Test #</th>
<th>Location (a)</th>
<th>Speed Trap Impact Velocity ** mps</th>
<th>Derived Velocity ** mps</th>
<th>Cont. Area mm²</th>
<th>Resist Force (N)</th>
<th>Column 5 &gt; 1935 mm²</th>
<th>Column 6 &lt; 2669N</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>Y</td>
<td>Angle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K1</td>
<td>365</td>
<td>220</td>
<td>0</td>
<td>4.88</td>
<td>4.90</td>
<td>3,720</td>
<td>1,814</td>
</tr>
<tr>
<td>K2</td>
<td>225</td>
<td>220</td>
<td>0</td>
<td>4.87</td>
<td>4.89</td>
<td>4,040</td>
<td>1,435</td>
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<tr>
<td>K3</td>
<td>85</td>
<td>220</td>
<td>0</td>
<td>4.89</td>
<td>4.71</td>
<td>3,660</td>
<td>1,675</td>
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<tr>
<td>K4</td>
<td>365</td>
<td>80</td>
<td>0</td>
<td>4.87</td>
<td>4.80</td>
<td>2,970</td>
<td>2,014</td>
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<tr>
<td>K5</td>
<td>225</td>
<td>80</td>
<td>0</td>
<td>4.86</td>
<td>4.54</td>
<td>1,810</td>
<td></td>
</tr>
<tr>
<td>K6</td>
<td>85</td>
<td>80</td>
<td>0</td>
<td>4.80</td>
<td>4.60</td>
<td>1,571</td>
<td></td>
</tr>
<tr>
<td>K7</td>
<td>225</td>
<td>-60</td>
<td>0</td>
<td>4.85</td>
<td>5.07</td>
<td>1,678</td>
<td></td>
</tr>
<tr>
<td>K8</td>
<td>85</td>
<td>-60</td>
<td>0</td>
<td>4.83</td>
<td>5.00</td>
<td>1,688</td>
<td></td>
</tr>
</tbody>
</table>

* Impact velocity from item No. 7 below

** Impact velocity range = 4.86 mps, +0.08, -0 mps for contact area, +0, -0.08 mps for force

5. Attach Contact Area Prints for K1, K2, K3 and K4.

6. Attach acceleration versus time plots for each impact.

7. Integrate the acceleration versus time plots and attach plots of the results that show velocity versus time for each impact K1 through K8.

8. Attach force vs. time plots for K5, K6, K7 and K8.

Comments: (a) All measurements are referenced to the point where the horizontal plane through the SRP intersects the vertical line tangent to the inboard edge at the seat.

Recorded By: ____________________________

Approved By: ___________________________ DATE: 2/21/2007
**DATA SHEET 10**  
**WHEELCHAIR SECUREMENT ANCHORAGES AND DEVICES**  
**WHEELCHAIR OCCUPANT RESTRAINT ANCHORAGES AND RESTRAINTS**

Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
NHTSA No.: C70900  
Test Lab: MGA RESEARCH CORPORATION  
Test Date: 3/15/2007

**WHEELCHAIR LOCATIONS: W8.5**

<table>
<thead>
<tr>
<th>#</th>
<th>Question</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Are all wheelchair securement and occupant restraint anchorages designed for forward wheelchair position?</td>
<td>PASS</td>
</tr>
<tr>
<td>2</td>
<td>Each wheelchair location shall have not less than four wheelchair securement anchorages (Type A or C) – two located in front of the wheelchair and two in the rear. Type C anchorage may be used in rear of the wheelchair only. Number of Type A anchorages in front of the wheelchair (&gt;2 Pass;&lt;2 Fail)</td>
<td>PASS</td>
</tr>
<tr>
<td>3</td>
<td>Number of anchorages behind the wheelchair (&gt;2 Pass;&lt;2 Fail): Type A 0; Type C 2; Total: 2</td>
<td>PASS</td>
</tr>
<tr>
<td>4</td>
<td>Each wheelchair location shall have not less than two wheelchair occupant pelvis and upper torso restraint anchorage (Type B, C, or combination). The pelvic belt must not terminate at the wheelchair. Number of anchorages (&gt;2 Pass;&lt;2 Fail): Type B 0; Type C 2; Total: 2</td>
<td>PASS</td>
</tr>
<tr>
<td>5</td>
<td>The wheelchair location has at least one Type D anchorage:</td>
<td>PASS</td>
</tr>
<tr>
<td>6</td>
<td>The wheelchair securement device has means to limit movement of the wheelchair.</td>
<td>PASS</td>
</tr>
</tbody>
</table>
### DATA SHEET 10 (CONTINUED)

**WHEELCHAIR SECUREMENT ANCHORAGES AND DEVICES**

**WHEELCHAIR OCCUPANT RESTRAINT ANCHORAGES AND RESTRAINTS**

<table>
<thead>
<tr>
<th>Wheelchair Location</th>
<th>Anchorage Location</th>
<th>Anchorage Type</th>
<th>Required Load (Newtons)</th>
<th>Actual Max. Test Load (Newtons)</th>
<th>Pass/Fail</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>W8.5</td>
<td>LF</td>
<td>A</td>
<td>13,344</td>
<td>13,287</td>
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<tr>
<td></td>
<td>RF</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LR</td>
<td>C</td>
<td>26,688</td>
<td>26,737</td>
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</tr>
<tr>
<td></td>
<td>RR</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Upper Torso</td>
<td>D</td>
<td>6,672</td>
<td>6,852</td>
<td>PASS</td>
<td></td>
</tr>
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Comments: None

Recorded By: ____________________________

Approved By: ____________________________  DATE: 3/15/2007
## SECTION 4
### INSTRUMENTATION AND EQUIPMENT LIST

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Description</th>
<th>Model/Serial No.</th>
<th>Cal. Date</th>
<th>Next Cal. Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer</td>
<td>HP</td>
<td>Vectra / US03263612</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Test Fixture</td>
<td>MGA</td>
<td>TF2003</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>A/D Interface</td>
<td>Met Abyte</td>
<td>DAS-1802</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Load Cell</td>
<td>Interface</td>
<td>1210AF-SK / 62736</td>
<td>1/29/07</td>
<td>7/24/07</td>
</tr>
<tr>
<td>Load Cell</td>
<td>Interface</td>
<td>1210AF / 137778</td>
<td>11/3/06</td>
<td>5/3/07</td>
</tr>
<tr>
<td>Inclinometer</td>
<td>Digital Protractor</td>
<td>Pro 360 / Comp Lab</td>
<td>10/4/06</td>
<td>4/4/07</td>
</tr>
<tr>
<td>Steel Tape</td>
<td>Stanley</td>
<td>Powerlock / 278</td>
<td>9/26/06</td>
<td>3/26/07</td>
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<tr>
<td>Impact Fixture</td>
<td>MGA</td>
<td>IF2003A</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Camera</td>
<td>Sony</td>
<td>DSC-S75</td>
<td>---</td>
<td>---</td>
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<tr>
<td>Planimeter</td>
<td>Sokkia Corp.</td>
<td>Planix5 007319</td>
<td>11/22/06</td>
<td>5/22/07</td>
</tr>
<tr>
<td>Accelerometer</td>
<td>Endevco</td>
<td>7264-2000 / W04807</td>
<td>10/4/06</td>
<td>4/4/07</td>
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<tr>
<td>Linear Motion Transducer</td>
<td>Ametek</td>
<td>P-25A / 1202-19366</td>
<td>10/30/06</td>
<td>4/30/07</td>
</tr>
<tr>
<td>Linear Motion Transducer</td>
<td>Ametek</td>
<td>P25A / 21954</td>
<td>10/30/06</td>
<td>4/30/07</td>
</tr>
</tbody>
</table>
### TABLE OF PHOTOGRAPHS

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Left Side View of School Bus</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>Right Side View of School Bus</td>
<td>41</td>
</tr>
<tr>
<td>3</td>
<td>¾ Front View From Left Side of School Bus</td>
<td>42</td>
</tr>
<tr>
<td>4</td>
<td>¾ Rear View From Right Side of School Bus</td>
<td>43</td>
</tr>
<tr>
<td>5</td>
<td>Certification Label and Tire Placard</td>
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</tr>
<tr>
<td>6</td>
<td>Vehicle Interior View From Front to Rear</td>
<td>45</td>
</tr>
<tr>
<td>7</td>
<td>Vehicle Interior View From Rear to Front</td>
<td>46</td>
</tr>
<tr>
<td>8</td>
<td>Pre-Test of Seat Cushion S8</td>
<td>47</td>
</tr>
<tr>
<td>9</td>
<td>Post-Test of Seat Cushion S8</td>
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<tr>
<td>11</td>
<td>Post-Test of Seat Cushion S9</td>
<td>50</td>
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<tr>
<td>12</td>
<td>Pre-Test of Seat Back S2 Force Deflection Forward Test</td>
<td>51</td>
</tr>
<tr>
<td>13</td>
<td>Test (In Progress) of Seat Back S2 Force Deflection Forward Test</td>
<td>52</td>
</tr>
<tr>
<td>14</td>
<td>Pre-Test of Seat Back S15 Force Deflection Forward Test</td>
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<tr>
<td>15</td>
<td>Post-Test of Seat Back S15 Force Deflection Forward Test</td>
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<td>16</td>
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<td>Post-Test of Seat Back S11 Force Deflection Rearward Test</td>
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<td>18</td>
<td>Pre-Test of Seat Back S12 Force Deflection Rearward Test</td>
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</tr>
<tr>
<td>19</td>
<td>Post-Test of Seat Back S12 Force Deflection Rearward Test</td>
<td>58</td>
</tr>
<tr>
<td>20</td>
<td>Post-Test of Head and Knee Impact Locations on Seat S3</td>
<td>59</td>
</tr>
<tr>
<td>21</td>
<td>Pre-Test of Barrier B1 Force Deflection Forward Test</td>
<td>60</td>
</tr>
<tr>
<td>22</td>
<td>Post-Test of Barrier B1 Force Deflection Forward Test</td>
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<td>23</td>
<td>Pre-Test of Barrier B16 Force Deflection Forward Test</td>
<td>62</td>
</tr>
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<td>24</td>
<td>Post-Test of Barrier B16 Force Deflection Forward Test</td>
<td>63</td>
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<tr>
<td>25</td>
<td>Pre-Test of Wheelchair Anchorage W8.5 Left Front Type A Load Test</td>
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<tr>
<td>26</td>
<td>Post-Test of Wheelchair Anchorage W8.5 Left Front Type A Load Test</td>
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<td>27</td>
<td>Pre-Test of Wheelchair Anchorage W8.5 Left Rear Type C Load Test</td>
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<tr>
<td>29</td>
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Procedure: FMVSS 222
NHTSA No.: C70900
Test Date: 01/12/2007

Left Side View of School Bus
Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
Procedure: FMVSS 222  
NHTSA No.: C70900  
Test Date: 01/12/2007

Right Side View of School Bus
Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
Procedure: FMVSS 222  
NHTSA No.: C70900  
Test Date: 01/12/2007

¾ Front View From Left Side of School Bus
Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
NHTSA No.: C70900  
Procedure: FMVSS 222  
Test Date: 01/12/2007

¾ Rear View From Right Side of School Bus
Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS
NHTSA No.: C70900

Procedure: FMVSS 222
Test Date: 01/12/2007
Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
NHTSA No.: C70900  
Procedure: FMVSS 222  
Test Date: 01/12/2007

Vehicle Interior View From Front to Rear
Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS   NHTSA No.: C70900
Procedure: FMVSS 222   Test Date: 01/12/2007

Vehicle Interior View From Rear to Front
Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS
Procedure: FMVSS 222
NHTSA No.: C70900
Test Date: 01/12/2007

Pre-Test of Seat Cushion S8
Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
NHTSA No.: C70900  
Procedure: FMVSS 222  
Test Date: 01/12/2007
Pre-Test of Seat Cushion S9
Post-Test of Seat Cushion S9
Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS
Procedure: FMVSS 222
NHTSA No.: C70900
Test Date: 01/12/2007

Pre-Test of Seat Back S2 Force Deflection Forward Test
Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
NHTSA No.: C70900  
Procedure: FMVSS 222  
Test Date: 01/12/2007  

Test (In Progress) of Seat Back S2 Force Deflection Forward Test
Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
Procedure: FMVSS 222  
NHTSA No.: C70900  
Test Date: 01/12/2007

Pre-Test of Seat Back S15 Force Deflection Forward Test
Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS
Procedure: FMVSS 222
NHTSA No.: C70900
Test Date: 01/12/2007

Post-Test of Seat Back S15 Force Deflection Forward Test
Pre-Test of Seat Back S11 Force Deflection Rearward Test
Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  NHTSA No.: C70900
Procedure: FMVSS 222  Test Date: 01/12/2007

Post-Test of Seat Back S11 Force Deflection Rearward Test
Pre-Test of Seat Back S12 Force Deflection Rearward Test
Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS
Procedure: FMVSS 222
NHTSA No.: C70900
Test Date: 01/12/2007

Post-Test of Seat Back S12 Force Deflection Rearward Test
Post-Test of Head and Knee Impact Locations on Seat S3
Pre-Test of Barrier B1 Force Deflection Forward Test
Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
NHTSA No.: C70900  
Procedure: FMVSS 222  
Test Date: 01/12/2007

Post-Test of Barrier B1 Force Deflection Forward Test
Pre-Test of Barrier B16 Force Deflection Forward Test
Post-Test of Barrier B16 Force Deflection Forward Test
Pre-Test of Wheelchair Anchorage W8.5 Left Front Type A Load Test
Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS
Procedure: FMVSS 222
NHTSA No.: C70900
Test Date: 01/12/2007

Post-Test of Wheelchair Anchorage W8.5 Left Front Type A Load Test
Pre-Test of Wheelchair Anchorage W8.5 Left Rear Type C Load Test
Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS
Procedure: FMVSS 222
NHTSA No.: C70900
Test Date: 01/12/2007

Post-Test of Wheelchair Anchorage W8.5 Left Rear Type C Load Test
Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS
Procedure: FMVSS 222
NHTSA No.: C70900
Test Date: 01/12/2007

Pre-Test of Wheelchair Anchorage W8.5 Upper Torso Type D Load Test
Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS
Procedure: FMVSS 222
NHTSA No.: C70900
Test Date: 01/12/2007

Post-Test of Wheelchair Anchorage W8.5 Upper Torso Type D Load Test
## SECTION 6
### TEST PLOTS
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Test Desc: Seat Cushion Retention
Component ID: Thomas Saf-T-Liner C2 S8
Test Date: 1/12/2007
NHTSA #: C70900

FORCE (N) VS TIME (SEC)
Test Desc: Seat Cushion Retention.
Test Date: 1/12/2007
Component ID: Thomas Saf-T-Liner C2 S9
NHTSA #: C70900
Test Desc: Seat Back Forward Deflection (Upper)
Component ID: Thomas Saf-T-Liner C2 S2
NHTSA #: C70900

Test Date: 2/23/2007

Total Energy: 1,688 J

Force Max: 6,600.1 N
Time Max: 13.2

Disp Max: 361.5 mm
Time Max: 26.9

 FORCE (N) VS DISPLACEMENT (mm)

 DISPLACEMENT (mm) VS TIME (SEC)

 FORCE (N) VS TIME (SEC)
Test Desc: Seat Back Forward Deflection (Lower)  Test Date: 2/23/2007
Component ID: Thomas Saf-T-Liner C2 S2  NHTSA #: C70900

FORCE (N) VS DISPLACEMENT (mm)

DISPLACEMENT (mm) VS TIME (SEC)

FORCE (N) VS TIME (SEC)
Test Desc: Seat Back Forward Deflection (Upper)  
Test Date: 2/16/2007  
Component ID: Thomas Saf-T-Liner C2 S15  
NHTSA #: C70900

Total Energy: 1,576 J

Disp Max : 360.8 mm  
Time Max : 31.4

Force Max : 6,384.9 N  
Time Max : 14.2
Test Desc: Seat Back Forward Deflection (Lower)  
Component ID: Thomas Saf-T-Liner C2 S15  
NHTSA #: C70900  
Test Date: 2/16/2007

FORCE (N) VS DISPLACEMENT (mm)

FORCE (N) VS TIME (SEC)

DISPLACEMENT (mm) VS TIME (SEC)

Disp. Max : 98.0 mm
Disp. End : 89.2 mm

Force Max : 9,241.2 N
Time Max : 27.6
Force @ 60 sec : 4,540.3 N
Test Desc: Seat Back Rearward Deflection
Component ID: Thomas Saf-T-Liner C2 S11
Test Date: 2/26/2007
NHTSA #: C70900

Total Energy: 1,214.6 J
Disp Max : 256.1 mm
Time Max : 23.9
Force Max : 7,539.5 N
Time Max : 13.2

FORCE (N) VS DISPLACEMENT (mm)
DISPLACEMENT (mm) VS TIME (SEC)
FORCE (N) VS TIME (SEC)
Test Desc: Seat Back Rearward Deflection
Component ID: Thomas Saf-T-Liner C2 S12
NHTSA #: C70900

Test Date: 2/16/2007

Total Energy: 1,169.3 J

Disp Max : 255.9 mm
Time Max : 21.7

Force Max : 7,364.7 N
Time Max : 13.0
Test Desc: Barrier Forward Deflection (Upper)  Test Date: 2/27/2007
Component ID: Thomas Saf-T-Liner C2 B1  NHTSA #: C70900

Total Energy: 2,042 J

Force Max: 10,220.5 N  Time Max: 25.3

Disp Max: 361.4 mm  Time Max: 32.4
Test Desc: Barrier Forward Deflection (Lower)  
Test Date: 2/27/2007  
Component ID: Thomas Saf-T-Liner C2 B1  
NHTSA #: C70900

**FORCE (N) VS DISPLACEMENT (mm)**

Disp. Max : 95.3 mm  
Disp. End : 84.4 mm

**DISPLACEMENT (mm) VS TIME (SEC)**

**FORCE (N) VS TIME (SEC)**

Force Max : 9,290.2 N  
Time Max : 28.7  
Force @ 60 sec : 4,603.5 N
Test Desc: Barrier Forward Deflection (Upper)  
Test Date: 2/26/2007  
Component ID: Thomas Saf-T-Liner C2 B16  
NHTSA #: C70900

FORCE (N) VS DISPLACEMENT (mm)
- Total Energy: 2,228 J
- Force Max: 11,490.3 N
- Time Max: 24.5

DISPLACEMENT (mm) VS TIME (SEC)
- Disp Max: 362.2 mm
- Time Max: 31.0

FORCE (N) VS TIME (SEC)
- Force Max: 11,490.3 N
- Time Max: 24.5
Test Desc: Barrier Force Deflection (Lower)  Test Date: 2/26/2007
Component ID: Thomas Saf-T-Liner C2 B16  NHTSA #: C70900

FORCE (N) VS DISPLACEMENT (mm)

DISPLACEMENT (mm) VS TIME (SEC)
Disp. Max : 89.4 mm
Disp. End : 79.4 mm

FORCE (N) VS TIME (SEC)
Force Max : 9,314.4 N
Time Max : 28.4
Force @ 60 sec : 4,648.1 N
Test Desc: Head Form Impact (1.5 m/s)  
Component ID: Thomas Saf-T-Liner C2 S3, Location H1  
NHTSA #: C70900  

**HEAD X Acceleration (G's) VS TIME (S)**

- Max: 5.94 G's  
- Tmax: 0.17 S  
- Min: -7.08 G's  
- Tmin: 0.03 S

**VELOCITY X (m/s) VS TIME (S)**

- Max: 1.97 m/s  
- Tmax: 0.29 S  
- Min: -0.48 m/s  
- Tmin: 0.07 S  
- Vel@Imp: 1.841 m/s
Test Desc: Head Form Impact (1.5 m/s)  
Test Date: 2/21/2007  
Component ID: Thomas Saf-T-Liner C2 S3, Location H2  
NHTSA #: C70900

HEAD X Acceleration (G's) VS TIME (S)

Max: 5.22 G's  
TMax: 0.17 S  
Min: -7.36 G's  
TMin: 0.02 S

VELOCITY X (m/s) VS TIME (S)

Max: 1.55 m/s  
TMax: -0.00 S  
Min: -1.01 m/s  
TMin: 0.07 S  
VEL@IMP: 1.545m/s
Test Desc: Head Form Impact (1.5 m/s)  
Component ID: Thomas Saf-T-Liner C2 S3, Location H4  
NHTSA #: C70900  

HEAD X Acceleration (G's) VS TIME (S)

Max: 4.40 G's  
TMax: 0.20 S  
Min: -8.50 G's  
TMin: 0.03 S

VELOCITY X (m/s) VS TIME (S)

Max: 1.79 m/s  
TMax: 0.00 S  
Min: -0.47 m/s  
TMin: 0.06 S  
VEL@IMP: 1.79 m/s
Test Desc: Head Form Impact (1.5 m/s)  
Test Date: 2/21/2007  
Component ID: Thomas Saf-T-Liner C2 S3, Location H5  
NHTSA #: C70900

**HEAD X Acceleration (G's) VS TIME (S)**

- Max: 4.58 G's  
- Tmax: 0.26 S  
- Min: -5.93 G's  
- Tmin: 0.05 S

**VELOCITY X (m/s) VS TIME (S)**

- Max: 1.75 m/s  
- Tmax: -0.00 S  
- Min: -0.42 m/s  
- Tmin: 0.09 S  
- Vel@IMP: 1.745 m/s
Test Desc: Head Form Impact (1.5 m/s)  
Component ID: Thomas Saf-T-Liner C2 S3, Location H6  
NHTSA #: C70900  

HEAD X Acceleration (G's) VS TIME (S)

Max: 4.42 G's  
TMax: 0.25 S  
Min: -5.61 G's  
TMin: 0.05 S

VELOCITY X (m/s) VS TIME (S)

Max: 1.61 m/s  
TMax: 0.00 S  
Min: -0.72 m/s  
TMin: 0.11 S  
VEL@IMP: 1.605m/s
Test Desc: Head Form Impact (6.69 m/s)
Test Date: 2/16/2007
Component ID: Thomas Saf-T-Liner C2 S3, Location H8
NHTSA #: C70900

**HEAD X ACCELERATION (G's) VS TIME (S)**

- Hic: 128.90 T1: 3.70 ms T2: 35.20 ms
- Max: 47.57 G's TMax: 0.07 S
- Min: -55.93 G's Tmin: 0.01 S

**VELOCITY X (m/s) VS TIME (S)**

- Max: 6.50 m/s TMax: -0.00 S
- Min: -17.47 m/s Tmin: 5.00 S
- VEL@IMP: 6.476 m/s

**FORCE X (N) VS TIME (S)**

- Max: 2,431.34 N TMax: 0.07 S
- Min: -2,858.70 N Tmin: 0.01 S

**FORCE (N) VS TIME (SEC)**

- Energy: 4.73 J
Test Desc: Head Form Impact (6.69 m/s)  
Test Date: 2/19/2007  
Component ID: Thomas Saf-T-Liner C2 S3, Location H10  
NHTSA #: C70900

- **Max**: 46.03 G's  
  **TMax**: 0.08 S  
  **Min**: -47.14 G's  
  **TMin**: 0.01 S

- **Max**: 6.73 m/s  
  **TMax**: -0.00 S  
  **Min**: -3.43 m/s  
  **TMin**: 0.06 S  
  **VEL@IMP**: 6.722 m/s

- **Max**: 2,352.47 N  
  **TMax**: 0.08 S  
  **Min**: -2,409.20 N  
  **TMin**: 0.01 S

- **Energy**: 5.07 J
Test Desc: Head Form Impact (6.69 m/s)  Test Date: 2/19/2007
Component ID: Thomas Saf-T-Liner C2 S3, Location H11  NHTSA #: C70900

HEAD X ACCELERATION (G's) VS TIME (S)

Max: 38.89 G's  Tmax: 0.07 S  Min: -40.70 G's  Tmin: 0.01 S
Hic: 112.23  T1: 4.80 ms  T2: 29.40 ms

VELOCITY X (m/s) VS TIME (S)

Max: 6.34 m/s  Tmax: -0.00 S  Min: -2.97 m/s  Tmin: 0.06 S
VEL@IMP: 6.304 m/s

FORCE X (N) VS TIME (S)

Max: 1,987.67 N  Tmax: 0.07 S  Min: -2,080.14 N  Tmin: 0.01 S

Energy: 6.48 J
Test Desc: Head Form Impact (6.69 m/s)  
Test Date: 2/19/2007  
Component ID: Thomas Saf-T-Liner C2 S3, Location H12  
NHTSA #: C70900

**HEAD X ACCELERATION (G's) VS TIME (S)**

- Max: 41.48 G's  
- Tmax: 0.09 S  
- Min: -47.57 G's  
- Tmin: 0.02 S  
- Hic: 116.73  
- T1: 11.80 ms  
- T2: 25.80 ms

**VELOCITY X (m/s) VS TIME (S)**

- Max: 6.63 m/s  
- Tmax: -0.00 S  
- Min: -3.27 m/s  
- Tmin: 0.06 S  
- VEL@IMP: 6.602 m/s

**FORCE X (N) VS TIME (S)**

- Max: 2,120.25 N  
- Tmax: 0.09 S  
- Min: -2,431.30 N  
- Tmin: 0.02 S

**FORCE (N) VS TIME (SEC)**

- Energy: 14.30 J
Test Desc: Head Form Impact (6.69 m/s)  Test Date: 2/19/2007
Component ID: Thomas Saf-T-Liner C2 S3, Location H13  NHTSA #: C70900

Max: 34.50 G's  Tmax: 0.08 S  Min: -44.24 G's  Tmin: 0.02 S

Max: 6.77 m/s  Tmax: -0.00 S  Min: -2.98 m/s  Tmin: 0.06 S  VEL@IMP: 6.742 m/s

Max: 1,763.10 N  Tmax: 0.08 S  Min: -2,261.36 N  Tmin: 0.02 S

Energy: 10.63 J
Test Desc: Head Form Impact (6.69 m/s)  
Test Date: 2/19/2007  
Component ID: Thomas Saf-T-Liner C2 S3, Location H14  
NHTSA #: C70900

**HEAD X ACCELERATION (G's) VS TIME (S)**
- Max: 38.09 G's
- Tmax: 0.07 S
- Min: -52.41 G's
- Tmin: 0.01 S

**VELOCITY X (m/s) VS TIME (S)**
- Max: 6.36 m/s
- Tmax: -0.00 S
- Min: -3.46 m/s
- Tmin: 0.06 S
- VEL@IMP: 6.319 m/s

**FORCE X (N) VS TIME (S)**
- Max: 1,946.70 N
- Tmax: 0.07 S
- Min: -2,678.80 N
- Tmin: 0.01 S

**ENERGY**
- Energy: 6.41 J

**HIC**
- Hic: 171.76
- T1: 5.70 ms
- T2: 25.50 ms
Test Desc: Knee Form Impact  
Component ID: Thomas Saf-T-Liner C2 S3, Location K1  
NHTSA #: C70900  

Test Date: 2/21/2007

KNEE X Acceleration (G's) VS TIME (S)
- Max: 26.90 G's
- Tmax: 0.22 s
- Min: -40.82 G's
- Tmin: 0.11 s

VELOCITY X (m/s) VS TIME (S)
- Max: 4.92 m/s
- Tmax: 0.07 s
- Min: -1.86 m/s
- Tmin: 0.15 s
- VEL@IMP: 4.9 m/s

FORCE X (N) VS TIME (S)
- Max: 1,195.54 N
- Tmax: 0.22 s
- Min: -1,813.92 N
- Tmin: 0.11 s
Test Desc: Knee Form Impact
Component ID: Thomas Saf-T-Liner C2 S3, Location K2
NHTSA #: C70900

Test Date: 2/21/2007

KNEE X Acceleration (G's) VS TIME (S)
Max: 22.28 G's
TMax: 0.04 s
Min: -32.29 G's
TMin: 0.10 s

VELOCITY X (m/s) VS TIME (S)
Max: 4.90 m/s
TMax: 0.07 s
Min: -1.90 m/s
TMin: 0.15 s
VEL@IMP: 4.89 m/s

FORCE X (N) VS TIME (S)
Max: 990.31 N
TMax: 0.04 s
Min: -1,434.77 N
TMin: 0.10 s
Test Desc: Knee Form Impact
Component ID: Thomas Saf-T-Liner C2 S3, Location K3
NHTSA #: C70900

Test Date: 2/21/2007

KNEE X Acceleration (G's) VS TIME (S)
Max: 28.49 G's
TMax: 0.15 s
Min: -37.68 G's
TMin: 0.09 s

VELOCITY X (m/s) VS TIME (S)
Max: 4.75 m/s
TMax: 0.07 s
Min: -2.26 m/s
TMin: 0.15 s
VEL@IMP: 4.71 m/s

FORCE X (N) VS TIME (S)
Max: 1,266.15 N
TMax: 0.15 s
Min: -1,674.55 N
TMin: 0.09 s
Test Desc: Knee Form Impact
Component ID: Thomas Saf-T-Liner C2 S3, Location K4
NHTSA #: C70900

Test Date: 2/21/2007

KNEE X Acceleration (G's) VS TIME (S)
Max: 26.66 G's
TMax: 0.22 s
Min: -45.32 G's
TMin: 0.10 s

VELOCITY X (m/s) VS TIME (S)
Max: 4.84 m/s
TMax: 0.07 s
Min: -1.65 m/s
TMin: 0.14 s
VEL@IMP: 4.8 m/s

FORCE X (N) VS TIME (S)
Max: 1,184.60 N
TMax: 0.22 s
Min: -2,013.99 N
TMin: 0.10 s
Test Desc: Knee Form Impact
Component ID: Thomas Saf-T-Liner C2 S3, Location K5

Test Date: 2/21/2007
NHTSA #: C70900

KNEE X Acceleration (G's) VS TIME (S)
Max: 26.73 G's
TMax: 0.21 s
Min: -40.72 G's
TMin: 0.10 s

VELOCITY X (m/s) VS TIME (S)
Max: 4.58 m/s
TMax: 0.06 s
Min: -2.61 m/s
TMin: 0.21 s
VEL@IMP: 4.54 m/s

FORCE X (N) VS TIME (S)
Max: 1,187.74 N
TMax: 0.21 s
Min: -1,809.52 N
TMin: 0.10 s
Test Desc: Knee Form Impact
Component ID: Thomas Saf-T-Liner C2 S3, Location K6
NHTSA #: C70900

Test Date: 2/21/2007

KNEE X Acceleration (G's) VS TIME (S)
- Max: 27.54 G's
- Tmax: 0.15 s
- Min: -35.35 G's
- Tmin: 0.09 s

VELOCITY X (m/s) VS TIME (S)
- Max: 4.64 m/s
- Tmax: 0.07 s
- Min: -2.31 m/s
- Tmin: 0.12 s
- Vel@Imp: 4.6 m/s

FORCE X (N) VS TIME (S)
- Max: 1,223.97 N
- Tmax: 0.15 s
- Min: -1,571.12 N
- Tmin: 0.09 s
Test Desc: Knee Form Impact
Component ID: Thomas Saf-T-Liner C2 S3, Location K8
NHTSA #: C70900

Test Date: 2/21/2007

- **Max:** 29.88 G's
- **TMax:** 0.15 s
- **Min:** -37.98 G's
- **TMin:** 0.09 s

**KNEE X Acceleration (G's) VS TIME (S)**

Max: 5.01 m/s
TMax: 0.07 s
Min: -1.66 m/s
TMin: 0.11 s
VEL@IMP: 5 m/s

**VELOCITY X (m/s) VS TIME (S)**

Max: 1,327.71 N
TMax: 0.15 s
Min: -1,687.62 N
TMin: 0.09 s

**FORCE X (N) VS TIME (S)**

Max: 1,327.71 N
TMax: 0.15 s
Min: -1,687.62 N
TMin: 0.09 s
Test Desc: Left Front Type A Anchorage
Component ID: Thomas Saf-T-Liner C2 W8.5
Test Date: 3/14/2007
NHTSA No: C70900

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SECTION 7
WELT CONTACT POINTS

Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS
Test Lab: MGA RESEARCH CORPORATION
NHTSA No.: C70900
Test Date: 2/21/2007

H1 / SEAT S3

H1  THOMAS SAF-T-LINER C2  44.1 cm²
H2 / SEAT S3

H2  THOMAS SAF-T-LINER C2  30.7 cm²
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
NHTSA No.: C70900
Test Lab: MGA RESEARCH CORPORATION  
Test Date: 2/21/2007

H3 / SEAT S3

H3  THOMAS SAF-T-LINER C2  36.8 cm²
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
NHTSA No.: C70900
Test Lab: MGA RESEARCH CORPORATION  
Test Date: 2/21/2007

H4 / SEAT S3

H4  THOMAS SAF-T-LINER C2  38.2 cm²
H5 / SEAT S3

H5   THOMAS SAF-T-LINER C2   36.2 cm²
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS
NHTSA No.: C70900
Test Lab: MGA RESEARCH CORPORATION
Test Date: 2/21/2007

H6 / SEAT S3

H6  THOMAS SAF-T-LINER C2  39.5 cm²
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS
Test Lab: MGA RESEARCH CORPORATION
NHTSA No.: C70900
Test Date: 2/21/2007

H7 / SEAT S3

H7   THOMAS SAF-T-LINER C2   34.5 cm²
K1 / SEAT S3

K1 THOMAS SAF-T-LINER C2  37.2 cm²
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
NHTSA No.: C70900
Test Lab: MGA RESEARCH CORPORATION  
Test Date: 2/21/2007

K2 / SEAT S3

K2  THOMAS SAF-T-LINER C2  40.4 cm²
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

Test Vehicle: 2007 THOMAS SAF-T-LINER C2 SCHOOL BUS  
NHTSA No.: C70900
Test Lab: MGA RESEARCH CORPORATION  
Test Date: 2/21/2007

K3 / SEAT S3

K3 THOMAS SAF-T-LINER C2 36.6 cm²
K4 / SEAT S3

K4   THOMAS SAF-T-LINER C2   29.7 cm²