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

TRANS TECH BUS
2008 TRANS TECH RONDAK BUS
NHTSA NO.: C90903

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

TEST DATES:  DECEMBER 21, 2009 – MAY 25, 2010
FINAL REPORT DATE:  SEPTEMBER 27, 2010

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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Prepared by: Eric Peschman, Project Engineer  Date: September 27, 2010

Reviewed by: Michael Janovicz, Program Manager  Date: September 27, 2010

FINAL REPORT ACCEPTED BY:

Edward E. Chan

Date of Acceptance
Compliance tests were conducted on the subject 2008 Trans Tech Rondak Bus, NHTSA No.: C90903, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-222-04 for the determination of FMVSS 222 compliance.

Data Sheet 3 has been omitted from this report at the request of the COTR. This test was skipped to retain the seat for FMVSS 210 testing.

Data Sheet 7 has been omitted from this report as this test is not applicable to class 2 (GVWR < 10,000 lb) vehicles.

Test Failure: See Section 2, Test Data Summary. See Section 9, Laboratory Notice of Test Failure.

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<table>
<thead>
<tr>
<th>Section</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1   Purpose of Compliance Test</td>
<td>1</td>
</tr>
<tr>
<td>2   Test Data Summary</td>
<td>2</td>
</tr>
<tr>
<td>3   Compliance Test Data</td>
<td>7</td>
</tr>
<tr>
<td>Data Sheet 1 – Seat to Seat/Barrier Spacing</td>
<td>8</td>
</tr>
<tr>
<td>Data Sheet 2 – Seat Back Height &amp; Front Surface Area Test</td>
<td>9</td>
</tr>
<tr>
<td>Data Sheet 4 – Seat Back Force Deflection Test - Forward</td>
<td>11</td>
</tr>
<tr>
<td>Data Sheet 5 – Seat Back Force Deflection Test - Rearward</td>
<td>15</td>
</tr>
<tr>
<td>Data Sheet 6 – Restraining Barrier Position and Projected Rear Surface Area</td>
<td>16</td>
</tr>
<tr>
<td>Data Sheet 8 – Head Form Impact Contact Area</td>
<td>20</td>
</tr>
<tr>
<td>Data Sheet 9 – Head Form Impact Energy Requirement</td>
<td>24</td>
</tr>
<tr>
<td>Data Sheet 10 – Knee Form Impact Test</td>
<td>26</td>
</tr>
<tr>
<td>Data Sheet 11 – Seat Belt Assembly Anchorages</td>
<td>30</td>
</tr>
<tr>
<td>4   Instrumentation and Equipment List</td>
<td>31</td>
</tr>
<tr>
<td>5   Photographs</td>
<td>32</td>
</tr>
<tr>
<td>6   Test Plots</td>
<td>51</td>
</tr>
<tr>
<td>7   Welt Contact Points</td>
<td>91</td>
</tr>
<tr>
<td>8   Bus Floor Plan</td>
<td>108</td>
</tr>
<tr>
<td>9   Laboratory Notice of Test Failure</td>
<td>109</td>
</tr>
</tbody>
</table>
SECTION 1
PURPOSE OF COMPLIANCE TEST

Tests were conducted on a 2008 Trans Tech Rondak Bus, NHTSA No.: C90903, in accordance with the specifications of the Office of Vehicle Safety Compliance (OVSC) Test Procedures TP-222-04 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.: DTNH22-08-D-00075.
SECTION 2
TEST DATA SUMMARY

The passenger seating and crash protection tests were conducted from December 21, 2009 through May 25, 2010. All tests were conducted by MGA Research Corporation at the Wisconsin Operations. The test vehicle, 2008 Trans Tech Rondak Bus NHTSA No.: C90903, does not appear to meet all the requirements of FMVSS 222. The test failures are listed below.

FAILURE 1
During the knee form impact test for Barrier No. B1, the resistance force (2,846 N) for K5 exceeded the limit of 2,669 N.

FAILURE 2
During the seat belt assembly anchorage test, the target load of 21,780 N was unable to be achieved and maintained for 10 seconds, as the seat slipped in the seat mounting track.
LINEAR AND AREA MEASUREMENTS

Seat to seat/barrier spacing was checked on all seats and found to be 585 mm or less as shown on Data Sheet No. 1.

The seat back height and front surface area of Seat Nos. S2 and S7 were measured in accordance with Section 12.1 of OVSC TP-222-04. As shown in Data Sheet No. 2 for S2 and S7, the seat back area was greater than ninety percent of the seat bench width multiplied by 508.

The restraining barrier positions and projected rear surface areas of Barrier Nos. B1 and B7 were measured in accordance with OVSC TP-222-04. As shown in Data Sheet No. 6 for B1 and B7, the projected perimeters of the seats fall completely within the perimeters of the restraining barriers.

SEAT BACK FORCE/DEFLECTION TEST - FORWARD

Seat Nos. S2 and S7 were tested in accordance with Section 12.4 of OVSC TP-222-04. Seat bench width was determined to be 820 mm for S2 and S7. “W” was calculated to be 2 for S2 and S7. The seating reference point (SRP) was 482 mm above the bus floor. The deflection of the seat back at conclusion of lower loading bar loading at 1557 W N load was 61 mm for S2, and 58 mm for S7. The allowable maximum deflection without moving the seat back to within 102 mm of another seat or restraining barrier was 356 mm for both seats. The stroke rate of the upper loading bar was determined by the test engineer to be 14.4 mm/sec for S2 and 12.3 mm/sec for S7. 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 452 W or 904 joules for S2 and S7. As shown on Data Sheet No. 4, S2 and S7 met the force deflection forward requirements.

SEAT BACK FORCE/DEFLECTION TEST - REARWARD

Seat No. S5 was tested in accordance with Section 12.4 of OVSC TP-222-04. Seat bench width was determined to be 820 mm. “W” was calculated to be 2. The seating reference point (SRP) was 482 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 9.1 mm/sec. 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 1,181 joules. The minimum required area under the force versus deflection curve of the loading bar was 316 W or 632 joules. As shown in Data Sheet No. 5, S5 met the force deflection rearward requirements.
SECTION 2 (CONTINUED)
TEST DATA SUMMARY

HEAD FORM IMPACT ZONE TESTS
Seat No. S1 was tested in accordance with Section 12.6 of OVSC TP-222-04. The mass of the head form was 5.21 kg. All head form contact area, impact energy, and head injury criteria were met for S1. Data from these tests are presented in Data Sheet Nos. 8 and 9.

Barrier No. B1 was tested in accordance with Section 12.6 of OVSC TP-222-04. The mass of the head form was 5.21 kg. All head form contact area, impact energy, and head injury criteria were met for B1. Data from these tests are presented in Data Sheet Nos. 8 and 9.

KNEE FORM IMPACT ZONE TESTS
Seat No. S1 was tested in accordance with Section 12.7 of OVSC TP-222-04. The mass of the knee form was 4.53 kg. All knee form contact area criteria and impact energy criteria were met for the S1. Data from these tests are presented on Data Sheet No. 10.

Barrier No. B1 was tested in accordance with Section 12.7 of OVSC TP-222-04. The mass of the knee form was 4.53 kg. All knee form contact area criteria and impact energy criteria were not met for the B1. Data from these tests are presented on Data Sheet No. 10.

SEAT BELT ANCHORAGES
Seat belt anchorages for Seat No. S6 were tested in accordance with Appendix A of OVSC TP-222-04. Seat belt anchorages and specially made high strength webbing straps were used to conduct the test. The seat belt anchor points did not meet the required load of 21,780 N for each. Data from these tests are presented on Data Sheet No. 11.
ADMINISTRATIVE DATA SHEET

Test Vehicle: 2008 TRANS TECH RONDAK BUS  NHTSA No.: C90903
Test Lab: MGA RESEARCH CORPORATION  Test Dates: 12/21/09 – 05/25/10

INCOMPLETE VEHICLE (IF APPLICABLE)

<table>
<thead>
<tr>
<th>Manufacturer:</th>
<th>Ford Motor Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model:</td>
<td>E-350 SRW</td>
</tr>
<tr>
<td>VIN:</td>
<td>1FD2E35L88DB33670</td>
</tr>
<tr>
<td>Certification Date:</td>
<td>05/08</td>
</tr>
</tbody>
</table>

COMPLETED VEHICLE (SCHOOL BUS)

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

DATES

<table>
<thead>
<tr>
<th>Vehicle Receipt:</th>
<th>10/01/09</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start of Compliance Test:</td>
<td>12/21/09</td>
</tr>
<tr>
<td>Completion of Compliance Test:</td>
<td>05/25/10</td>
</tr>
</tbody>
</table>

Compliance Test: All tests were performed in accordance with the references outlined in TP-222-04.

Recorded By: 

Approved By: Michael 
Date: 05/25/10
GENERAL TEST DATA SHEET

Test Vehicle: 2008 TRANS TECH RONDAK BUS  NHTSA No.: C90903
Test Lab: MGA RESEARCH CORPORATION  Test Dates: 12/21/09 – 05/25/10

SCHOOL BUS IDENTIFICATION

<table>
<thead>
<tr>
<th>Model Year/Mfr./Make/Model:</th>
<th>2008 / Trans Tech Rondak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Capacity:</td>
<td>(1 Driver, 14 Passengers)</td>
</tr>
<tr>
<td>NHTSA No.:</td>
<td>C90903</td>
</tr>
<tr>
<td>VIN:</td>
<td>1FD2E35L88DB33670</td>
</tr>
<tr>
<td>Conventional or Forward Control:</td>
<td>Conventional</td>
</tr>
<tr>
<td>GAWR (Certification Label) FRONT:</td>
<td>1,837 kg / 4,050 lb</td>
</tr>
<tr>
<td>GAWR (Certification Label) REAR:</td>
<td>2,760 kg / 6,084 lb</td>
</tr>
<tr>
<td>GVWR (Certification Label) TOTAL:</td>
<td>4,355 kg / 9,600 lb</td>
</tr>
</tbody>
</table>

TEST CONDITIONS

<table>
<thead>
<tr>
<th>Date(s) of Test:</th>
<th>12/21/09 – 05/25/10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Temperature (°C):</td>
<td>21°C</td>
</tr>
<tr>
<td>Required Temperature Range (°C):</td>
<td>0°C to 32°C</td>
</tr>
</tbody>
</table>

SEAT IDENTIFICATION

<table>
<thead>
<tr>
<th>Seat Manufacturer:</th>
<th>FREEDMAN SEATING COMPANY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Name &amp; Number:</td>
<td></td>
</tr>
<tr>
<td>Description of Seats:</td>
<td>Seat frames are constructed of 1 inch square welded steel tubing. The seat back has a 22 gauge (0.03 inches) steel pan in the form of spot welded straps in a grid pattern and is covered with 25 mm of soft foam. The outer main uprights of the seat back frame are covered by 45 mm Styrofoam and 10 mm of thick soft foam. The seat cushion is constructed of a 10 mm metal frame and foam pad. The seat back and cushion are wrapped with 0.5 mm of vinyl.</td>
</tr>
</tbody>
</table>
SECTION 3
COMPLIANCE TEST DATA

The following data sheets document the results of testing on the 2008 Trans Tech Rondak Bus, NHTSA No.: C90903.
# DATA SHEET 1

## SEAT TO SEAT/BARRIER SPACING

**Test Vehicle:** 2008 TRANS TECH RONDAK BUS  
**NHTSA No.:** C90903  
**Test Lab:** MGA RESEARCH CORPORATION  
**Test Dates:** 12/21/09 – 05/25/10

### Requirement

<table>
<thead>
<tr>
<th>Seat Number</th>
<th>Measurement of Spacing From SRP Forward to Seat/Barrier (mm)</th>
<th>Requirement ≤ 610 mm (≤ 24&quot;) Class 1 Buses Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>515</td>
<td><strong>PASS</strong></td>
</tr>
<tr>
<td>S2</td>
<td>580</td>
<td><strong>PASS</strong></td>
</tr>
<tr>
<td>S3</td>
<td>585</td>
<td><strong>PASS</strong></td>
</tr>
<tr>
<td>S4</td>
<td>550</td>
<td><strong>PASS</strong></td>
</tr>
<tr>
<td>S5</td>
<td>500</td>
<td><strong>PASS</strong></td>
</tr>
<tr>
<td>S6</td>
<td>498</td>
<td><strong>PASS</strong></td>
</tr>
<tr>
<td>S7</td>
<td>500</td>
<td><strong>PASS</strong></td>
</tr>
</tbody>
</table>

**Comments:** None

**Recorded By:**  
**Approved By:** Michael James  
**Date:** 12/21/09
DATA SHEET 2

SEAT BACK HEIGHT & FRONT SURFACE AREA TEST

Test Vehicle: 2008 TRANS TECH RONDAK BUS  NHTSA No.: C90903
Test Lab: MGA RESEARCH CORPORATION  Test Dates: 12/21/09 – 05/25/10

SEAT NUMBER: S1

<table>
<thead>
<tr>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is the seat back height at least 508 mm vertically above the SRP? (S5.1.2) Yes – Pass; No – Fail</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 1 = 660 mm; Width 2 = 780 mm; Area = 386,160 mm²</td>
<td></td>
</tr>
<tr>
<td>3. Measure the seat cushion width - W1 = 820 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 W1.</td>
<td></td>
</tr>
<tr>
<td>4. Calculate the following: 0.9 x W1 x 508 mm = 374,904 mm²</td>
<td></td>
</tr>
<tr>
<td>5. Is item 2 greater than item 4? (S5.1.2) Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
</tbody>
</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.

Total Area = [(660 + 780)/2]*168 + (340*780) = 386,160 mm²

Comments: * Denotes area of the trapezoid outside of radius.

Recorded By: [Signature]

Approved By: [Signature]  Date: 12/22/09
DATA SHEET 2
SEAT BACK HEIGHT & FRONT SURFACE AREA TEST

Test Vehicle: 2008 TRANS TECH RONDAK BUS
Test Lab: MGA RESEARCH CORPORATION
NHTSA No.: C90903
Test Dates: 12/21/09 – 05/25/10

SEAT NUMBER: S7

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Is the seat back height at least 508 mm vertically above the SRP? (S5.1.2) Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
</tbody>
</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 1 = 660 mm; Width 2 = 780 mm;
   - Area = 386,160 mm²

3. Measure the seat cushion width - W1 = 820 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 W1.

4. Calculate the following: 0.9 x W1 x 508 mm = 374,904 mm²

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>Is item 2 greater than item 4? (S5.1.2) Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
</tbody>
</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.

Total Area = [(660 + 780)/2]*168 + (340*780) = 386,160 mm²

Comments: * Denotes area of the trapezoid outside of radius.

Recorded By: [Signature]

Approved By: [Signature] Date: 12/22/09
DATA SHEET 4
SEAT BACK FORCE DEFLECTION TEST - FORWARD

Test Vehicle: 2008 TRANS TECH RONDAK BUS
Test Lab: MGA RESEARCH CORPORATION
NHTSA No.: C90903
Test Dates: 12/21/09 – 05/25/10

SEAT NUMBER: S2

1. Seat Bench Width = 820 mm
   \[ W = \frac{\text{Seat Bench Width}}{381 \text{ mm}} \text{ (round to nearest whole number)} = (2) \]
   Seat Reference Point (SRP) location is: (Description of location as supplied by the COTR):
   482 mm Above Floor, 0mm from center.
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 = 711 mm
   Seat Back width at SRP = 810 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) = 61 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 = 636 mm. Width of seat back at 406 mm above SRP = 735 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 360 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.
### SEAT BACK FORCE DEFLECTION TEST – FORWARD

<table>
<thead>
<tr>
<th>10.</th>
<th>Is the seat in its final deflected position within 102 mm of the next seat or barrier? Yes – Fail; No – Pass</th>
<th>PASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.</td>
<td>Does the forward force vs. deflection trace of the seat back lie within the corridor? (S5.1.3) Yes – Pass; No – Fail</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 = 1,801 joules</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>452W = 904 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) Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
</tbody>
</table>

Comments: None

Recorded By: [Signature]

Approved By: [Signature] Date: 01/04/10
DATA SHEET 4
SEAT BACK FORCE DEFLECTION TEST – FORWARD

Test Vehicle: 2008 TRANS TECH RONDAK BUS  NHTSA No.: C90903
Test Lab: MGA RESEARCH CORPORATION  Test Dates: 12/21/09 – 05/25/10

SEAT NUMBER: S7

1. Seat Bench Width = 820 mm
   \[ W = \frac{\text{Seat Bench Width}}{381} \text{ mm (round to nearest whole number)} = (2) \]
   Seat Reference Point (SRP) location is: (Description of location as supplied by the COTR):
   482 mm Above Floor, 0 mm center.

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 = 711 mm
   Seat Back width at SRP = 810 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) = 58 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 = 12.3 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 = 636 mm. Width of seat back at 406 mm above SRP = 735 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 359 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.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th>PASS/FAIL</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? Yes – Fail; No – Pass</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) Yes – Pass; No – Fail</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 = 1,757 joules</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>452W = 904 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) Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
</tbody>
</table>

Comments: None

Recorded By: [Signature]

Approved By: [Signature]  Date: 01/04/10
DATA SHEET 5
SEAT BACK FORCE DEFLECTION TEST – REARWARD

Test Vehicle: 2008 TRANS TECH RONDAK BUS
Test Lab: MGA RESEARCH CORPORATION
NHTSA No.: C90903
Test Dates: 12/21/09 – 05/25/10

SEAT NUMBER: S5

1. Seat Bench Width = 820 mm
   \[ W = \frac{\text{Seat Bench Width}}{381} \text{ mm (round to nearest whole number)} = (2) \]

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 = 708 mm
   Width of seat back at 343 mm above SRP = 921 mm

3. Deflection of seat back at 222 N preload = 4 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 = 9.1 mm/sec

6. Reason for stopping deflection:
   ___ Reached deflection determined in Item 4 above (if less than 254 mm)
   ___ 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>Item</th>
<th>Description</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-222-04) Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
</tbody>
</table>

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

10. 316W = 632 joules

11. The area within the force vs. deflection curve = 1,181 joules

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.</td>
<td>Is item 11 greater than or equal to item 10? (S5.1.4.2) Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
</tbody>
</table>

Comments: None

Recorded By: [Signature]

Approved By: [Signature] Date: 04/09/10
### DATA SHEET 6
RESTRAINING BARRIER POSITION AND PROJECTED REAR SURFACE AREA

Test Vehicle: **2008 TRANS TECH RONDAK BUS**  
NHTSA No.: **C90903**  
Test Lab: **MGA RESEARCH CORPORATION**  
Test Dates: **12/21/09 – 05/25/10**

**BARRIER NUMBER: B1**

1. Measure distance T from SRP of seat immediately aft of barrier in a horizontal longitudinal line forward to barrier. T = 510 mm.

<table>
<thead>
<tr>
<th></th>
<th>Measure Distance T from SRP of seat immediately aft of barrier in a horizontal longitudinal line forward to barrier. T = 510 mm.</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) Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
</tbody>
</table>

3. Measure distance D at top (t) and bottom (b) of barrier.  
   - D_t = 8 mm  
   - D_b = 0 mm

4. Measure distance C at top (t) and bottom (b) of seat back.  
   - C_t = 108 mm  
   - C_b = 29 mm

<table>
<thead>
<tr>
<th></th>
<th>Measure Distance D and C at Top (t) and Bottom (b) of Barrier and Seat Back.</th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>Is D_t equal to or less than C_t? Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
<tr>
<td>6.</td>
<td>Is D_b equal to or less than C_b? Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
</tbody>
</table>

7. Measure distance E at top of barrier and bottom of barrier.  
   - E_t = 840 mm  
   - E_b = 850 mm

8. Measure distance A at top of seat back and bottom of seat.  
   - A_t = 695 mm  
   - A_b = 810 mm

<table>
<thead>
<tr>
<th></th>
<th>Measure Distance E and A at Top (t) and Bottom (b) of Barrier and Seat.</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? Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
</tbody>
</table>

10. Is distance E_b + D_b equal to or greater than distance A_b + C_b? Yes – Pass; No – Fail  

<table>
<thead>
<tr>
<th></th>
<th>Measure Distance E and A at Top (t) and Bottom (b) of Barrier and Seat.</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? Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
</tbody>
</table>

11. Measure distance U at inboard (i) and outboard (o) side of barrier.  
   - U_i = 289 mm  
   - U_o = 292 mm

12. Measure distance V at inboard (i) and outboard (o) sides of seat.  
   - V_i = 322 mm  
   - V_o = 322 mm
DATA SHEET 6 (CONTINUED)
RESTRAINING BARRIER POSITION AND PROJECTED REAR SURFACE AREA

<table>
<thead>
<tr>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.</td>
<td>Is $U_i$ equal to or less than $V_i$? Yes – Pass; No – Fail</td>
</tr>
<tr>
<td>14.</td>
<td>Is $U_o$ equal to or less than $V_o$? Yes – Pass; No – Fail</td>
</tr>
</tbody>
</table>

15. Measure distance $S$ at inboard (I) and outboard (O) side of barrier.
   - $S_i = 896$ mm
   - $S_o = 890$ mm

16. Measure distance $W$ at inboard (I) and outboard (O) sides of seat.
   - $W_i = 772$ mm
   - $W_o = 770$ mm

<table>
<thead>
<tr>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.</td>
<td>Is $S_i + U_i$ equal to or greater than $W_i + V_i$? Yes – Pass; No – Fail</td>
</tr>
<tr>
<td>18.</td>
<td>Is $S_o + U_o$ equal to or greater than $W_o + V_o$? Yes – Pass; No – Fail</td>
</tr>
</tbody>
</table>

19. Compute area $(W \times A) = 580,178$ mm$^2$

20. Compute area $(E \times S) = 754,585$ mm$^2$

<table>
<thead>
<tr>
<th></th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.</td>
<td>Is $(W \times A)$ equal to or less than $(E \times S)$? Yes – Pass; No – Fail</td>
</tr>
</tbody>
</table>

Comments: None

Recorded By: [Signature]

Approved By: [Signature] Date: 12/22/09
DATA SHEET 6
RESTRAINING BARRIER POSITION AND PROJECTED REAR SURFACE AREA

Test Vehicle: 2008 TRANS TECH RONDAK BUS  NHTSA No.: C90903
Test Lab: MGA RESEARCH CORPORATION  Test Dates: 12/21/09 – 05/25/10

BARRIER NUMBER: B7

1. Measure distance T from SRP of seat immediately aft of barrier in a horizontal longitudinal line forward to barrier. T = 500 mm.

2. Is distance T equal to or less than 610 mm? (S5.2) Yes – Pass; No – Fail
   PASS

3. Measure distance D at top (t) and bottom (b) of barrier.
   \( D_t = 0 \text{ mm} \quad D_b = 6 \text{ mm} \)

4. Measure distance C at top (t) and bottom (b) of seat back.
   \( C_t = 78 \text{ mm} \quad C_b = 30 \text{ mm} \)

5. Is \( D_t \) equal to or less than \( C_t \)? Yes – Pass; No – Fail
   PASS

6. Is \( D_b \) equal to or less than \( C_b \)? Yes – Pass; No – Fail
   PASS

7. Measure distance E at top of barrier and bottom of barrier.
   \( E_t = 840 \text{ mm} \quad E_b = 850 \text{ mm} \)

8. Measure distance A at top of seat back and bottom of seat.
   \( A_t = 700 \text{ mm} \quad A_b = 820 \text{ mm} \)

9. Is distance \( E_t + D_t \) equal to or greater than distance \( A_t + C_t \)?
   Yes – Pass; No – Fail
   PASS

10. Is distance \( E_b + D_b \) equal to or greater than distance \( A_b + C_b \)?
    Yes – Pass; No – Fail
    PASS

11. Measure distance U at inboard (i) and outboard (o) side of barrier.
    \( U_i = 288 \text{ mm} \quad U_o = 288 \text{ mm} \)

12. Measure distance V at inboard (i) and outboard (o) sides of seat.
    \( V_i = 328 \text{ mm} \quad V_o = 328 \text{ mm} \)
<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 $V_i$? Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
<tr>
<td>14.</td>
<td>Is $U_o$ equal to or less than $V_o$? Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
</tbody>
</table>

15. Measure distance $S$ at inboard (i) and outboard (o) side of barrier.
   $S_i = 890$ mm  $S_o = 890$ mm

16. Measure distance $W$ at inboard (i) and outboard (o) sides of seat.
   $W_i = 780$ mm  $W_o = 782$ 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 $W_i + V_i$? Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
<tr>
<td>18.</td>
<td>Is $S_o + U_o$ equal to or greater than $W_o + V_o$? Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
</tbody>
</table>

19. Compute area $(W \times A) = 593,560$ mm$^2$

20. Compute area $(E \times S) = 752,050$ mm$^2$

<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 $(E \times S)$? Yes – Pass; No – Fail</td>
<td>PASS</td>
</tr>
</tbody>
</table>

Comments: None

Recorded By: [Signature]

Approved By: [Signature]  Date: 12/22/09
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, and H5 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>Contact Area (CA) mm²</th>
<th>CA ≥ 1935 mm²</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>
</tr>
<tr>
<td>H1</td>
<td>-225</td>
<td>506</td>
<td>0</td>
<td>1.60</td>
<td>1.68</td>
<td>6,200</td>
<td>PASS</td>
</tr>
<tr>
<td>H2</td>
<td>-123</td>
<td>504</td>
<td>0</td>
<td>1.56</td>
<td>1.44</td>
<td>5,180</td>
<td>PASS</td>
</tr>
<tr>
<td>H3</td>
<td>-515</td>
<td>431</td>
<td>0</td>
<td>1.55</td>
<td>1.47</td>
<td>5,760</td>
<td>PASS</td>
</tr>
<tr>
<td>H4</td>
<td>-182</td>
<td>406</td>
<td>0</td>
<td>1.58</td>
<td>1.48</td>
<td>4,920</td>
<td>PASS</td>
</tr>
<tr>
<td>H5</td>
<td>-256</td>
<td>337</td>
<td>0</td>
<td>1.57</td>
<td>1.44</td>
<td>6,470</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: 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. In the case of Seat No. S1, the inboard edge of the seat is on the right hand side of the seat as viewed from the rear.

Recorded By: [Signature]
Approved By: [Signature] Date: 01/06/10
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° = Parallel with Floor, (+) is Up, (-) is Down
   - X = From Inboard Edge of Barrier
   - Y = Measured Vertically from the SRP
DATA SHEET 8 (CONTINUED)
HEAD FORM IMPACT CONTACT AREA REQUIREMENT

4. Complete the following table:

<table>
<thead>
<tr>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)*</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head Impact &amp; Test #</td>
<td>Location (a)</td>
<td>Speed Trap Impact Velocity** mps</td>
<td>Derived Velocity mps</td>
<td>Contact Area (CA) mm²</td>
<td>CA ≥ 1935 mm²</td>
<td>Yes-</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Y</td>
<td>Angle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1</td>
<td>-613</td>
<td>554</td>
<td>0</td>
<td>1.52</td>
<td>1.36</td>
<td>4,690</td>
</tr>
<tr>
<td>H2</td>
<td>-512</td>
<td>556</td>
<td>0</td>
<td>1.60</td>
<td>1.70</td>
<td>3,790</td>
</tr>
<tr>
<td>H3</td>
<td>-410</td>
<td>554</td>
<td>0</td>
<td>1.60</td>
<td>1.62</td>
<td>3,810</td>
</tr>
<tr>
<td>H4</td>
<td>-362</td>
<td>456</td>
<td>0</td>
<td>1.55</td>
<td>1.33</td>
<td>3,850</td>
</tr>
<tr>
<td>H5</td>
<td>-310</td>
<td>364</td>
<td>0</td>
<td>1.59</td>
<td>1.41</td>
<td>3,550</td>
</tr>
<tr>
<td>H6</td>
<td>-209</td>
<td>362</td>
<td>0</td>
<td>1.54</td>
<td>1.03</td>
<td>4,070</td>
</tr>
<tr>
<td>H7</td>
<td>-107</td>
<td>362</td>
<td>0</td>
<td>1.56</td>
<td>1.31</td>
<td>5,260</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: 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 barrier. In the case of Barrier No. B1, the inboard edge of the barrier is on the right hand side of the barrier as viewed from the rear.

Recorded By: 

Approved By: Michael January Date: 1/12/2010
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, and H12 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
### HEAD FORM IMPACT ENERGY REQUIREMENT

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>Energy Req'd Joules</th>
<th>Column 5 &lt; 1000</th>
<th>Column 6 &gt; 4.5 joules</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X    Y   Angle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes-PASS</td>
<td>No-FAIL</td>
</tr>
<tr>
<td>H8</td>
<td>-593</td>
<td>500  0</td>
<td>6.63</td>
<td>6.81</td>
<td>96</td>
<td>10.57</td>
<td>PASS</td>
</tr>
<tr>
<td>H9</td>
<td>-300</td>
<td>429  0</td>
<td>6.62</td>
<td>6.63</td>
<td>170</td>
<td>5.75</td>
<td>PASS</td>
</tr>
<tr>
<td>H10</td>
<td>-580</td>
<td>338  0</td>
<td>6.66</td>
<td>6.57</td>
<td>132</td>
<td>16.82</td>
<td>PASS</td>
</tr>
<tr>
<td>H11</td>
<td>-477</td>
<td>339  0</td>
<td>6.69</td>
<td>6.57</td>
<td>164</td>
<td>8.48</td>
<td>PASS</td>
</tr>
<tr>
<td>H12</td>
<td>-103</td>
<td>340  0</td>
<td>6.69</td>
<td>6.52</td>
<td>211</td>
<td>5.34</td>
<td>PASS</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: 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. In the case of Seat No. S1, the inboard edge of the seat is on the right hand side of the seat as viewed from the rear.

Recorded By: [Signature]

Approved By: [Signature] Date: 01/06/10
DATA SHEET 10
KNEE FORM IMPACT TEST

Test Vehicle: 2008 TRANS TECH RONDAK BUS  NHTSA No.: C90903
Test Lab: MGA RESEARCH CORPORATION  Test Dates: 12/21/09 – 05/25/10
SEAT NUMBER: S1

REAR SURFACE

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
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>Yes-PASS</td>
<td>No-FAIL</td>
</tr>
<tr>
<td>K1</td>
<td>-528</td>
<td>259</td>
<td>0</td>
<td>4.92</td>
<td>4.80</td>
<td>4,880</td>
<td>1,156</td>
</tr>
<tr>
<td>K2</td>
<td>-336</td>
<td>260</td>
<td>0</td>
<td>4.93</td>
<td>4.97</td>
<td>2,970</td>
<td>2,604</td>
</tr>
<tr>
<td>K3</td>
<td>-155</td>
<td>146</td>
<td>0</td>
<td>4.94</td>
<td>4.89</td>
<td>5,470</td>
<td>1,104</td>
</tr>
<tr>
<td>K4</td>
<td>-53</td>
<td>148</td>
<td>0</td>
<td>4.88</td>
<td>4.65</td>
<td>4,140</td>
<td>1,677</td>
</tr>
<tr>
<td>K5</td>
<td>-590</td>
<td>151</td>
<td>0</td>
<td>4.84</td>
<td>4.60</td>
<td>1,099</td>
<td>PASS</td>
</tr>
<tr>
<td>K6</td>
<td>-488</td>
<td>151</td>
<td>0</td>
<td>4.86</td>
<td>4.26</td>
<td>1,660</td>
<td>PASS</td>
</tr>
<tr>
<td>K7</td>
<td>-210</td>
<td>259</td>
<td>0</td>
<td>4.83</td>
<td>3.92</td>
<td>1,900</td>
<td>PASS</td>
</tr>
<tr>
<td>K8</td>
<td>-70</td>
<td>257</td>
<td>0</td>
<td>4.83</td>
<td>4.45</td>
<td>2,621</td>
<td>PASS</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: 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. In the case of Seat No. S1, the inboard edge of the seat is on the right hand side of the seat as viewed from the rear.

Recorded By: [Signature]
Approved By: [Signature] Date: 01/06/10
REAR SURFACE

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 K2, 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 Barrier
   Y = Measured Vertically from the SRP
DATA SHEET 10 (CONTINUED)
KNEE FORM IMPACT TEST

4. Complete the following table:

<table>
<thead>
<tr>
<th>Knee impact &amp; Test #</th>
<th>Location (a)</th>
<th>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></td>
<td>X    Y  Angle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes-PASS</td>
<td>No-FAIL</td>
</tr>
<tr>
<td>K2</td>
<td>-399</td>
<td>263 0</td>
<td>4.89</td>
<td>4.74</td>
<td>2,640</td>
<td>PASS</td>
<td></td>
</tr>
<tr>
<td>K5</td>
<td>-398</td>
<td>160 0</td>
<td>4.84</td>
<td>4.50</td>
<td>2,846</td>
<td>FAIL</td>
<td></td>
</tr>
<tr>
<td>K6</td>
<td>-382</td>
<td>12 0</td>
<td>4.80</td>
<td>4.96</td>
<td>2,432</td>
<td>PASS</td>
<td></td>
</tr>
<tr>
<td>K7</td>
<td>-222</td>
<td>263 0</td>
<td>4.80</td>
<td>4.35</td>
<td>1,261</td>
<td>PASS</td>
<td></td>
</tr>
<tr>
<td>K8</td>
<td>-46</td>
<td>261 0</td>
<td>4.83</td>
<td>4.16</td>
<td>1,119</td>
<td>PASS</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 Print for K2.
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 K2, K5, K6, K7, and 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 barrier. In the case of Barrier No. B1, the inboard edge of the barrier is on the right hand side of the barrier as viewed from the rear.

Recorded By: [Signature]
Approved By: [Signature] Date: 01/13/10
## DATA SHEET 11
### SEAT BELT ASSEMBLY ANCHORAGES

**Test Vehicle:** 2008 TRANS TECH RONDAK BUS  
**NHTSA No.:** C90903  
**Test Lab:** MGA RESEARCH CORPORATION  
**Test Dates:** 12/21/09 – 05/25/10

**SEAT LOCATION: S6**

<table>
<thead>
<tr>
<th>Seat Location</th>
<th>Seating Location</th>
<th>Anchor Type</th>
<th>Measured Spacing (mm) *</th>
<th>Measured Angle **</th>
<th>Load Application Angle (degrees)</th>
<th>PASS/FAIL</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>S6 Left</td>
<td>1</td>
<td>275</td>
<td>46.7°</td>
<td>9.7°</td>
<td>0.0°</td>
<td>PASS</td>
<td></td>
</tr>
<tr>
<td>S6 Right</td>
<td>1</td>
<td>200</td>
<td>46.7°</td>
<td>9.9°</td>
<td>0.0°</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* The spacing for an individual seat belt assembly anchorage shall be at least 165mm apart as measured between the vertical center lines of the bolt holes.  
** Specified angle range above horizontal to be 20° to 75°.

<table>
<thead>
<tr>
<th>Seat Location</th>
<th>Seating Location</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>S6 Left</td>
<td>21,780 – 21,956</td>
<td>21,476</td>
<td>FAIL</td>
<td>Washers securing seat frame to floor failed.</td>
<td></td>
</tr>
<tr>
<td>S6 Right</td>
<td>21,780 – 21,956</td>
<td>21,392</td>
<td>FAIL</td>
<td>Washers securing seat frame to floor failed.</td>
<td></td>
</tr>
</tbody>
</table>

Comments: Seat slipped in seat mounting track and could not achieve and hold the target load.

Recorded By:  
Approved By:  
Date: 05/25/10
## 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>Cal. Due Date</th>
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<tr>
<td>Load Cell</td>
<td>Interface</td>
<td>1210AF-5K / 62736</td>
<td>07/01/09</td>
<td>01/01/10</td>
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<tr>
<td>Load Cell</td>
<td>Interface</td>
<td>1210AF-5K / 62736</td>
<td>01/18/10</td>
<td>07/18/10</td>
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<tr>
<td>Load Cell</td>
<td>Interface</td>
<td>1210AF-25K-B / 137778</td>
<td>12/08/09</td>
<td>06/08/10</td>
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<tr>
<td>Load Cell</td>
<td>PCB</td>
<td>1315-101-01A / 664</td>
<td>09/24/09</td>
<td>03/24/10</td>
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<tr>
<td>Load Cell</td>
<td>PCB</td>
<td>1315-101-01A / 664</td>
<td>03/24/10</td>
<td>09/24/10</td>
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<td>1315-101-01A / 703</td>
<td>10/01/09</td>
<td>04/01/10</td>
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<tr>
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<td>P-25A / 1202-19365</td>
<td>12/08/09</td>
<td>06/08/10</td>
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<td>P-40A / 0504-21782</td>
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<td>03/23/10</td>
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<td>03/23/10</td>
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<td>09/11/10</td>
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<td>Digital Protractor</td>
<td>Pro 360 / 001</td>
<td>Daily</td>
<td>Daily</td>
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<tr>
<td>Steel Tape</td>
<td>Stanley</td>
<td>Powerlock / 184</td>
<td>12/09/09</td>
<td>12/09/10</td>
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<td>Impact Fixture</td>
<td>MGA</td>
<td>IF2003A</td>
<td>---</td>
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<td>Camera</td>
<td>Sony</td>
<td>DSC-575</td>
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<tr>
<td>Planimeter</td>
<td>Sokkia Corp.</td>
<td>Planix5 007319</td>
<td>Daily</td>
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<tr>
<td>Accelerometer</td>
<td>Entran</td>
<td>EGE-73B6Q-500JF / G30-N08</td>
<td>01/04/10</td>
<td>07/04/10</td>
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<td>EGCS-S425-2000 / W04807</td>
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<td>05/24/10</td>
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# TABLE OF PHOTOGRAPHS

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Page No.</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Left Side View of School Bus</td>
<td>33</td>
</tr>
<tr>
<td>2</td>
<td>Right Side View of School Bus</td>
<td>34</td>
</tr>
<tr>
<td>3</td>
<td>¾ Front View From Left Side of School Bus</td>
<td>35</td>
</tr>
<tr>
<td>4</td>
<td>¾ Front View From Right Side of School Bus</td>
<td>36</td>
</tr>
<tr>
<td>5</td>
<td>¾ Rear View From Right Side of School Bus</td>
<td>37</td>
</tr>
<tr>
<td>6</td>
<td>Certification Label &amp; Tire Placard</td>
<td>38</td>
</tr>
<tr>
<td>7</td>
<td>Incomplete Vehicle Label</td>
<td>39</td>
</tr>
<tr>
<td>8</td>
<td>Vehicle Interior View From Front to Rear</td>
<td>40</td>
</tr>
<tr>
<td>9</td>
<td>Pre-Test of Seat Back S2 Force Deflection Forward Test</td>
<td>41</td>
</tr>
<tr>
<td>10</td>
<td>Post-Test of Seat Back S2 Force Deflection Forward Test</td>
<td>42</td>
</tr>
<tr>
<td>11</td>
<td>Pre-Test of Seat Back S7 Force Deflection Forward Test</td>
<td>43</td>
</tr>
<tr>
<td>12</td>
<td>Post-Test of Seat Back S7 Force Deflection Forward Test</td>
<td>44</td>
</tr>
<tr>
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<td>Pre-Test of Seat Back S5 Force Deflection Rearward Test</td>
<td>45</td>
</tr>
<tr>
<td>14</td>
<td>Post-Test of Seat Back S5 Force Deflection Rearward Test</td>
<td>46</td>
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<tr>
<td>15</td>
<td>Post-Test of Head and Knee Impact Locations on Seat S1</td>
<td>47</td>
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<tr>
<td>16</td>
<td>Post-Test of Head and Knee Impact Locations on Seat B1</td>
<td>48</td>
</tr>
<tr>
<td>17</td>
<td>Pre-Test of Seat S6 210 Test</td>
<td>49</td>
</tr>
<tr>
<td>18</td>
<td>Post-Test of Seat S6 210 Test</td>
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Test Vehicle: 2008 Transtech Rondak Bus
Procedure: FMVSS 222
NHTSA No.: C90903
Test Dates: 12/21/09 – 05/25/10
Test Vehicle: 2008 Transtech Rondak Bus
Procedure: FMVSS 222
NHTSA No.: C90903
Test Dates: 12/21/09 – 05/25/10

Right Side View of School Bus
Test Vehicle:
2008 Transtech Rondak Bus

FMVSS 222

NHTSA No.:
C90903

Test Dates:
12/21/09 – 05/25/10

¾ Front View From Left Side of School Bus
Test Vehicle: 2008 Transtech Rondak Bus  
Procedure: FMVSS 222  
NHTSA No.: C90903  
Test Dates: 12/21/09 – 05/25/10
Test Vehicle:
2008 Transtech Rondak Bus

NHTSA No.:
C90903

Procedure:
FMVSS 222

Test Dates:
12/21/09 – 05/25/10

¾ Rear View From Right Side of School Bus
Test Vehicle: 2008 Transtech Rondak Bus
Procedure: FMVSS 222
NHTSA No.: C90903
Test Dates: 12/21/09 – 05/25/10

Certification Label & Tire Placard
Test Vehicle: 2008 Transtech Rondak Bus
NHTSA No.: C90903
Procedure: FMVSS 222
Test Dates: 12/21/09 – 05/25/10
Test Vehicle: 2008 Transtech Rondak Bus
NHTSA No.: C90903
Procedure: FMVSS 222
Test Dates: 12/21/09 – 05/25/10

Vehicle Interior View From Front to Rear
Test Vehicle:
2008 Transteck Rondak Bus

NHTSA No.:
C90903

Test Dates:
12/21/09 – 05/25/10

Procedure:
FMVSS 222

Pre-Test of Seat Back S2 Force Deflection Forward Test
Test Vehicle:
2008 Transtech Rondak Bus

NHTSA No.:
C90903

Test Dates:
12/21/09 – 05/25/10

Procedure:
FMVSS 222

Post-Test of Seat Back S2 Force Deflection Forward Test
Test Vehicle:
2008 Transtech Rondak Bus

Procedure:
FMVSS 222

Pre-Test of Seat Back S7 Force Deflection Forward Test
Test Vehicle: 2008 Transtech Rondak Bus
Procedure: FMVSS 222
NHTSA No.: C90903
Test Dates: 12/21/09 – 05/25/10

Post-Test of Seat Back S7 Force Deflection Forward Test
2008 Transteck Rondak Bus

FMVSS 222

Test Vehicle:

Procedure:

Pre-Test of Seat Back S5 Force Deflection Rearward Test

NHTSA No.:

C90903

Test Dates:

12/21/09 – 05/25/10
Test Vehicle: 2008 Transtech Rondak Bus

NHTSA No.: C90903

Test Dates: 12/21/09 – 05/25/10

Procedure: FMVSS 222

Post-Test of Seat Back S5 Force Deflection Rearward Test
Post-Test of Head and Knee Impact Locations on Seat S1
<table>
<thead>
<tr>
<th>Test Vehicle:</th>
<th>2008 Transtech Rondak Bus</th>
<th>NHTSA No.:</th>
<th>C90903</th>
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<td>FMVSS 222</td>
<td>Test Dates:</td>
<td>12/21/09 – 05/25/10</td>
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Post-Test of Head and Knee Impact Locations on Seat B1
Test Vehicle:
2008 TransTech Rondak Bus

FMVSS No.:
222

NHTSA No.:
C90903

Test Dates:
12/21/09 – 05/25/10

Pre-Test of Seat S6 210 Test
Test Vehicle: 2008 Transtech Rondak Bus
Procedure: FMVSS 222
NHTSA No.: C90903
Test Dates: 12/21/09 – 09/20/10

Post-Test of Seat S6 210 Test
## TABLE OF TEST PLOTS

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<th>Description</th>
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<tbody>
<tr>
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<td>Seat Back Forward Deflection Seat S2 (Lower)</td>
<td>52</td>
</tr>
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<td>2</td>
<td>Seat Back Forward Deflection Seat S2 (Upper)</td>
<td>53</td>
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<td>Seat Back Rearward Deflection Seat S5</td>
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<td>H1 Head Form Impact (1.5 m/s) S1</td>
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<td>H2 Head Form Impact (1.5 m/s) S1</td>
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<td>H3 Head Form Impact (1.5 m/s) S1</td>
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<td>H4 Head Form Impact (1.5 m/s) S1</td>
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<td>H2 Head Form Impact (1.5 m/s) B1</td>
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<td>K8 Knee Form Impact B1</td>
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<td>36</td>
<td>Seat S6 Anchorage Type 1 FMVSS 210</td>
<td>90</td>
</tr>
</tbody>
</table>
S2 Forward Deflection Lower Cylinder

**force (N) vs Time (sec)**

Maximum: 6312 N @ 25 sec  
Minimum: 6 N @ 0 sec

**displacement (mm) vs Time (sec)**

Maximum: 69 mm @ 26 sec  
Minimum: 0 mm @ 0 sec

S2 Forward Deflection Lower Cylinder
**force (N) vs Time (sec)**

Maximum: 7475 N @ 32 sec  
Minimum: 0 N @ 60 sec

**displacement (mm) vs Time (sec)**

Maximum: 360 mm @ 34 sec  
Minimum: -13 mm @ 61 sec

S2 Forward Deflection Upper Cylinder
S2 Forward Deflection Upper Cylinder

force (N) vs displacement (mm)

Maximum: 7475 N @ 337 mm
Minimum: -8 N @ 4 mm
**S7 Forward Deflection Upper Cylinder**

**force (N) vs Time (sec)**

Maximum: 6930 N @ 21 sec  
Minimum: -13 N @ 61 sec

**displacement (mm) vs Time (sec)**

Maximum: 359 mm @ 34 sec  
Minimum: -17 mm @ 61 sec

S7 Forward Deflection Upper Cylinder
force (N) vs displacement (mm)

Maximum: 6670 N @ 294 mm  Minimum: -1.3 N @ -15 mm

S7 Forward Deflection Upper Cylinder
Seat Back Rearward Deflection Seat S5

Force (N) vs Time (sec)

Seat Back Rearward Deflection Seat S5

Displacement (mm) vs Time (sec)

Seat Back Rearward Deflection Seat S5
Seat Back Rearward Deflection Seat S5

Force (N) vs Displacement (mm)

Maximum: 2204 N @ 224 mm
Minimum: 0 N @ 80 mm

File Name: 00000 S5 RearwardFRPFR_C_222Fbndk_bound.txt
Test Date: 4/9/2010 10:24:19 AM
Test Description: FMVSS 222 Seat Back Rearward
Component: 
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)  Test Date: 1-6-2010
Component ID: Transtech Rondak - Trap:  1.597 m/s  Location: S1 H1
NHTSA #: C90903

Head X Acceleration (G's) VS TIME (S)
Max: 0.44 G's
TMax: 0.11 S
Min: -5.04 G's
TMin: 0.04 S

HIC 36: 1.48  T1: 24.80 S  T2: 60.80 S

VELOCITY X (m/s) VS TIME (S)
Max: 1.68 m/s
TMax: 0.00 S
Min: -0.66 m/s
TMin: 0.10 S
VEL@IMP: 1.677 m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)
Component ID: Transtech Rondak - Trap: 1.562 m/s
NHTSA #: C90903
Test Date: 1-6-2010
Location: S1 H2

Head X Acceleration (G's) VS TIME (S)
- Max: 0.31 G's
- Tmax: 0.10 S
- Min: -4.90 G's
- Tmin: 0.05 S
- HIC: 1.53
- T1: 25.20 S
- T2: 61.20 S

VELOCITY X (m/s) VS TIME (S)
- Max: 1.45 m/s
- Tmax: -0.01 S
- Min: -1.05 m/s
- Tmin: 0.10 S
- Vel@Imp: 1.443 m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)  
Component ID: Transtech Rondak - Trap: 1.554 m/s  
NHTSA #: C90903  
Test Date: 1-6-2010  
Location: S1 H3

- Head X Acceleration (G's) VS TIME (S)
  - Max: 0.33 G's
  - Tmax: 0.11 S
  - Min: -6.11 G's
  - Tmin: 0.04 S
  - HIC 36: 1.94
  - T1: 20.40 S
  - T2: 56.40 S

- VELOCITY X (m/s) VS TIME (S)
  - Max: 1.48 m/s
  - Tmax: -0.01 S
  - Min: -0.96 m/s
  - Tmin: 0.10 S
  - VEL@IMP: 1.466 m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)  Test Date: 1-6-2010
Component ID: Transtech Rondak - Trap: 1.579 m/s  Location: S1 H4
NHTSA #: C90903

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

-6 0 2 4
0 0.025 0.05 0.075 0.1 0.125 0.15
Max: 0.38 G's
TMax: 0.11 S
Min: -5.94 G's
TMin: 0.03 S

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

-5 0 5 10 15
0 0.025 0.05 0.075 0.1 0.125 0.15
Max: 1.49 m/s
TMax: -0.01 S
Min: -0.92 m/s
TMin: 0.09 S
VEL@IMP: 1.479 m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)  
Component ID: Transtech Rondak - Trap: 1.568 m/s 
NHTSA #: C90903

Test Date: 1-6-2010  
Location: S1 H5

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

HIC 36: 1.37  
T1: 30.50 S  
T2: 66.50 S

Max: 0.25 G's  
TMax: 0.13 S  
Min: -4.95 G's  
TMin: 0.04 S

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

Max: 1.45 m/s  
TMax: -0.01 S  
Min: -1.00 m/s  
TMin: 0.12 S  
VEL@IMP: 1.437 m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)
Component ID: Transtech Rondak - Trap: 1.519
NHTSA #: C90903
Test Date: 1-12-2010
Location: B1 H1

Head X Acceleration (G's) VS TIME (S)
Max: -0.16 G's
TMax: -0.01 S
Min: -6.18 G's
TMin: 0.03 S
HIC 36: 1.32
T1: 20.40 S
T2: 56.40 S

VELOCITY X (m/s) VS TIME (S)
Max: 1.39 m/s
TMax: -0.01 S
Min: -1.29 m/s
TMin: 0.12 S
VEL@IMP: 1.358 m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)
Component ID: Transtech Rondak - Trap: 1.603
NHTSA #: C90903

Test Date: 1-12-2010
Location: B1 H2

Head X Acceleration (G's) VS TIME (S)
Max: 0.28 G's
TMax: -0.00 S
Min: -6.85 G's
TMin: 0.03 S

VELOCITY X (m/s) VS TIME (S)
Max: 1.70 m/s
TMax: 0.00 S
Min: -0.38 m/s
TMin: 0.12 S
VEL@IMP: 1.702m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)  
Component ID: Transtech Rondak - Trap: 1.601  
NHTSA #: C90903  
Location: B1 H3  
Test Date: 1-12-2010  

Head X Acceleration (G's) VS TIME (S)  
- Max: 0.08 G's  
- Tmax: -0.00 S  
- Min: -8.03 G's  
- Tmin: 0.03 S  

HIC 36: 1.14  
T1: 23.80 S  
T2: 42.60 S  
VEL@IMP: 1.62 m/s  

VELOCITY X (m/s) VS TIME (S)  
- Max: 1.62 m/s  
- Tmax: 0.00 S  
- Min: -0.55 m/s  
- Tmin: 0.13 S  

VEL@IMP: 1.62 m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)  
Component ID: Transtech Rondak - Trap: 1.554 m/s  
NHTSA #: C90903  
Test Date: 1-12-2010  
Location: B1 H4

Head X Acceleration (G's) VS TIME (S)  
HIC 36: 1.12  
T1: 36.90 S  
T2: 68.70 S

Max: -0.03 G's  
TMax: -0.01 S  
Min: -5.33 G's  
TMin: 0.05 S

VELOCITY X (m/s) VS TIME (S)  
Max: 1.35 m/s  
TMax: -0.01 S  
Min: -1.04 m/s  
TMin: 0.14 S  
VEL@IMP: 1.327m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)
Component ID: Transtech Rondak – Trap: 1.587 m/s
Location: B1 H5
NHTSA #: C90903

Test Date: 1-12-2010

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

VELocity X (m/s) VS TIME (S)
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)  
Component ID: Transtech Rondak - Trap: 1.535 m/s  
Location: B1 H6  
NHTSA #: C90903  

Test Date: 1-12-2010

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

HIC 36: 1.12  
T1: 43.80 S  
T2: 79.80 S  

Max: -0.46 G's  
TMax: -0.00 S  
Min: -4.64 G's  
TMin: 0.06 S

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

Max: 1.09 m/s  
TMax: -0.01 S  
Min: -1.77 m/s  
TMin: 0.15 S  
VEL@IMP: 1.034m/s
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)  
Component ID: Transtech Rondak – Trap:  1.559 m/s  
NHTSA #: C90903  
Test Date: 1-12-2010  
Location: B1 H7  

Head X Acceleration (G's) VS TIME (S)  
HIC 36: 1.25  
TMax: 0.14 S  
Min: -5.10 G's  
TMin: 0.04 S  

VELOCITY X (m/s) VS TIME (S)  
Max: 1.34 m/s  
TMax: -0.01 S  
Min: -0.98 m/s  
TMin: 0.14 S  
VEL@IMP: 1.314m/s
HEAD FORM IMPACT (6.69 m/s) Test Date: 1-8-2010
Component ID: Transtech Rondak - Trap: 6.628 m/s
NHTSA#: C90903 Location: S1 H8

Max: 6.95 G's
TMax: -0.01 S
Min: -32.32 G's
TMin: 0.02 S

Max: 6.89 m/s
TMax: -0.01 S
Min: -2.91 m/s
TMin: 0.05 S
VEL@IMP: 6.81 m/s

Max: 355.27 N
TMax: -0.01 S
Min: -1,651.74 N
TMin: 0.02 S

Energy: 10.57 J
HEAD FORM IMPACT (6.69 m/s)  
Test Date: 1-8-2010  
Component ID: Transtech Rondak - Trap: 6.659 m/s  
NHTSA#: C90903  
Location: S1 H10  

Max: 8.49 G's  
TMax: -0.01 S  
Min: -42.59 G's  
TMin: 0.01 S  

Max: 6.68 m/s  
TMax: -0.01 S  
Min: -2.23 m/s  
TMin: 0.05 S  
VEL@IMP: 6.568 m/s  

Max: 434.18 N  
TMax: -0.01 S  
Min: -2,176.76 N  
TMin: 0.01 S  

Energy: 16.82 J
HEAD FORM IMPACT (6.69 m/s)  
Test Date: 1-11-2010  
Component ID: Transtech Rondak - Trap: 6.691 m/s  
NHTSA#: C90903  
Location: S1 H11

Max: 8.32 G's  
TMax: -0.01 S  
Min: -58.42 G's  
TMin: 0.01 S

Max: 6.65 m/s  
TMax: -0.00 S  
Min: -2.22 m/s  
TMin: 0.05 S  
VEL@IMP: 6.569 m/s

Max: 425.44 N  
TMax: -0.01 S  
Min: -2,985.79 N  
TMin: 0.01 S

Energy: 8.48 J
HEAD FORM IMPACT (6.69 m/s)  
Component ID: Transtech Rondak - Trap: 6.690 m/s  
NHTSA#: C90903  
Location: S1 H12  

Test Date: 1-11-2010  
Max: 8.12 G's  
TMax: -0.01 S  
Min: -62.85 G's  
TMin: 0.01 S  

Max: 6.63 m/s  
TMax: -0.01 S  
Min: -2.32 m/s  
TMin: 0.04 S  
VEL@IMP: 6.522 m/s

Max: 415.25 N  
TMax: -0.01 S  
Min: -3,212.28 N  
TMin: 0.01 S

Energy: 5.34 J
**FMVSS 222 KNEE FORM IMPACTS**
Component ID: Transtech Rondak - Trap: 4.933 m/s
NHTSA #: C90903

Test Date: 1-6-2010  
Location: S1 K2

### Knee X Acceleration (G's) VS TIME (S)

- Max: 23.80 G's  
- Tmax: 0.04 s  
- Min: -58.61 G's  
- Tmin: 0.08 s

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

- Max: 4.98 m/s  
- Tmax: 0.07 s  
- Min: -1.54 m/s  
- Tmin: 0.11 s  
- VEL@IMP: 4.97 m/s

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

- Max: 1,057.73 N  
- Tmax: 0.04 s  
- Min: -2,604.37 N  
- Tmin: 0.08 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: Transtech Rondak - Trap: 4.881 m/s
NHTSA #: C90903
Test Date: 1-6-2010
Location: S1 K4

Knee X Acceleration (G's) VS TIME (S)
Max: 24.31 G's
TMax: 0.04 s
Min: -37.74 G's
TMin: 0.09 s

VELOCITY X (m/s) VS TIME (S)
Max: 4.66 m/s
TMax: 0.07 s
Min: -1.93 m/s
TMin: 0.13 s
VEL@IMP: 4.65 m/s

FORCE X (N) VS TIME (S)
Max: 1,080.19 N
TMax: 0.04 s
Min: -1,677.23 N
TMin: 0.09 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: Transtech Rondak - Trap: 4.858 m/s
NHTSA #: C90903

Test Date: 1-7-2010
Location: S1 K6

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

Max: 24.44 G's
TMax: 0.04 s
Min: -37.36 G's
TMin: 0.09 s

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

Max: 4.33 m/s
TMax: 0.07 s
Min: -2.48 m/s
TMin: 0.14 s
VEL@IMP: 4.26 m/s

FORCE X (N) VS TIME (S)

Max: 1,086.27 N
TMax: 0.04 s
Min: -1,660.17 N
TMin: 0.09 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: Transtech Rondak - Trap: 4.849 m/s
NHTSA #: C90903
Test Date: 1-7-2010
Location: S1 K7

Knee X Acceleration (G's) VS TIME (S)
Max: 22.25 G's
TMax: 0.03 s
Min: -42.75 G's
TMin: 0.10 s

VELOCITY X (m/s) VS TIME (S)
Max: 4.05 m/s
TMax: 0.06 s
Min: -3.61 m/s
TMin: 0.17 s
VEL@IMP: 3.92 m/s

FORCE X (N) VS TIME (S)
Max: 988.71 N
TMax: 0.03 s
Min: -1,899.75 N
TMin: 0.10 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: Transtech Rondak - Trap: 4.814 m/s
NHTSA#: C90903
Test Date: 1-7-2010
Location: S1 K8

Knee X Acceleration (G's) VS TIME (S)
Max: 22.55 G's
TMax: 0.04 s
Min: -58.98 G's
TMin: 0.09 s

VELOCITY X (m/s) VS TIME (S)
Max: 4.51 m/s
TMax: 0.07 s
Min: -2.19 m/s
TMin: 0.11 s
VEL@IMP: 4.45 m/s

FORCE X (N) VS TIME (S)
Max: 1,002.32 N
TMax: 0.04 s
Min: -2,620.99 N
TMin: 0.09 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: Transtech Rondak - Trap: 4.887 m/s
NHTSA #: C90903

Test Date: 1-13-2010
Location: B1 K2

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

Max: 23.84 G's
TMax: 0.04 s
Min: -62.38 G's
TMin: 0.09 s

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

Max: 4.75 m/s
TMax: 0.07 s
Min: -1.51 m/s
TMin: 0.18 s
VEL@IMP: 4.74 m/s

FORCE X (N) VS TIME (S)

Max: 1,059.45 N
TMax: 0.04 s
Min: -2,771.99 N
TMin: 0.09 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: Transtech Rondak - Trap: 4.835 m/s
NHTSA #: C90903

Test Date: 1-14-2010
Location: B1 K5

Knee X Acceleration (G's) VS TIME (S)
Max: 24.30 G's
TMax: 0.04 s
Min: -64.04 G's
TMin: 0.09 s

VELOCITY X (m/s) VS TIME (S)
Max: 4.52 m/s
TMax: 0.07 s
Min: -1.57 m/s
TMin: 0.18 s
VEL@IMP: 4.5 m/s

FORCE X (N) VS TIME (S)
Max: 1,079.89 N
TMax: 0.04 s
Min: -2,845.86 N
TMin: 0.09 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: Transtech Rondak - Trap: 4.803 m/s
NHTSA #: C90903

Test Date: 1-13-2010
Location: B1 K6

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<tr>
<th>Parameter</th>
<th>Max</th>
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<th>Min</th>
<th>Tmin</th>
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<tr>
<td>Knee X Acceleration (G's) VS TIME (S)</td>
<td>23.79 G's</td>
<td>0.04 s</td>
<td>-54.72 G's</td>
<td>0.09 s</td>
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<td>VELOCITY X (m/s) VS TIME (S)</td>
<td>4.96 m/s</td>
<td>0.07 s</td>
<td>-0.94 m/s</td>
<td>0.12 s</td>
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<tr>
<td>FORCE X (N) VS TIME (S)</td>
<td>1,057.09 N</td>
<td>0.04 s</td>
<td>-2,431.76 N</td>
<td>0.09 s</td>
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FMVSS 222 KNEE FORM IMPACTS
Component ID: Transtech Rondak - Trap: 4.801 m/s
NHTSA #: C90903
Test Date: 1-13-2010
Location: B1 K7

Knee X Acceleration (G's) VS TIME (S)
- Max: 22.73 G's
- Tmax: 0.04 s
- Min: -28.38 G's
- Tmin: 0.10 s

Velocity X (m/s) VS TIME (S)
- Max: 4.39 m/s
- Tmax: 0.07 s
- Min: -2.15 m/s
- Tmin: 0.17 s
- VEL@IMP: 4.35 m/s

Force X (N) VS TIME (S)
- Max: 1,010.10 N
- Tmax: 0.04 s
- Min: -1,261.05 N
- Tmin: 0.10 s
FMVSS 222 KNEE FORM IMPACTS
Component ID: Transtech Rondak - Trap: 4.828 m/s
NHTSA #: C90903
Test Date: 1-13-2010
Location: B1 K8

Knee X Acceleration (G's) VS TIME (S)
Max: 23.14 G's
TMax: 0.04 s
Min: -25.17 G's
TMin: 0.09 s

VELOCITY X (m/s) VS TIME (S)
Max: 4.24 m/s
TMax: 0.07 s
Min: -2.72 m/s
TMin: 0.17 s
VEL@IMP: 4.16 m/s

FORCE X (N) VS TIME (S)
Max: 1,028.37 N
TMax: 0.04 s
Min: -1,118.76 N
TMin: 0.09 s
SECTION 7
WELT CONTACT POINTS

H1 / SEAT S1

H1 Trans Tech Rondak 62.0 cm²
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

H2 / SEAT S1

H2 Trans Tech Rondak 51.8 cm²
H3 / SEAT S1

H3 Trans Tech Rondak 57.6 cm²
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

H4 / SEAT S1

H4 Trans Tech Rondak 49.2 cm²
H5 / SEAT S1

H5 Trans Tech Rondak 64.7 cm²
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

H1 / BARRIER B1

H1 Trans Tech Rondak 46.9 cm$^2$
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

H2 / BARRIER B1

H2 Trans Tech Rondak 37.9 cm²
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

H3 / BARRIER B1

H3 Trans Tech Rondak 38.1 cm²
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

H4 / BARRIER B1

H4 Trans Tech Rondak 38.5 cm²
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

H5 / BARRIER B1

H5 Trans Tech Rondak 35.5 cm$^2$
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

H6 / BARRIER B1

H6 Trans Tech Rondak 40.7 cm²
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

H7 / BARRIER B1

H7 Trans Tech Rondak 52.6 cm$^2$
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

K1 / SEAT S1

K1 Trans Tech Rondak 48.8 cm²
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

K2 / SEAT S1

K2 Trans Tech Rondak 29.7 cm²
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

K3 / SEAT S1

K3 Trans Tech Rondak 54.7 cm²
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

K4 / SEAT S1

K4 Trans Tech Rondak 41.4 cm²
SECTION 7 (CONTINUED)
WELT CONTACT POINTS

K2 / BARRIER B1

K2 Trans Tech Rondak 26.4 cm$^2$
LABORATORY NOTICE OF TEST FAILURE TO OVSC

Test Procedure: FMVSS 222
Test Vehicle: Trans Tech Rondak
NHTSA No.: C90903
Contract No.: DTNH22-08-D-00075
Manufacturer: Trans Tech Bus
Manufacture Date: 08/09
Test Date: 01/13/10
Test Lab: MGA Research Corp.
Project Engineer: Eric Peschman
Delivery Order No.: 1
VIN: 1FD2E35L88DB33670

TEST FAILURE DESCRIPTION
During the knee form impact test for Barrier No. B1, the resistance force (2,846 N) for K5 exceeded the limit of 2,669 N.

FMVSS REQUIREMENTS DESCRIPTION
Paragraph S5.2.3: Barrier performance forward. When force is applied to the restraining barrier in the same manner as specified in S5.1.3.1 through S5.1.3.4 for seating performance tests:

(a) The restraining barrier force/deflection curve shall fall within the zone specified in Figure 1;
(b) Restraining barrier deflection shall not exceed 356 mm; (for computation of (a) and (b) the force/deflection curve describes only the force applied through the upper loading bar, and only the forward travel of the pivot attachment point of the loading bar, measured from the point at which the initial application of 44 N of force is attained.)

Remarks: No remarks.

Notification to NHTSA (COTR): Ed Chan

Date: 01/13/10

By: [Signature]
LABORATORY NOTICE OF TEST FAILURE TO OVSC

<table>
<thead>
<tr>
<th>Test Procedure:</th>
<th>FMVSS 222</th>
</tr>
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<tbody>
<tr>
<td>Test Vehicle:</td>
<td>Trans Tech Rondak</td>
</tr>
<tr>
<td>NHTSA No.:</td>
<td>C90903</td>
</tr>
<tr>
<td>Contract No.:</td>
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<td>Manufacturer:</td>
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<td>08/09</td>
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<td>Test Lab:</td>
<td>MGA Research Corp.</td>
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<td>Project Engineer:</td>
<td>Eric Peschman</td>
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<td>Delivery Order No.:</td>
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<tr>
<td>VIN:</td>
<td>1FD2E35L88DB33670</td>
</tr>
</tbody>
</table>

TEST FAILURE DESCRIPTION
During the seat belt assembly anchorage test, the target load of 21,780 N was unable to be achieved and maintained for 10 seconds, as the seat slipped in the seat mounting track.

FMVSS REQUIREMENTS DESCRIPTION

Paragraph S210): The load shall be increased to 100% of target load and held for a minimum of 10 seconds, not to exceed 30 seconds.

Remarks: No remarks.

Notification to NHTSA (COTR): Ed Chan

Date: 05/25/10

By: [Signature]