REPORT NUMBER: 222-MGA-2009-006

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

TRANS TECH BUS
2009 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 29, 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: _____ Date: September 29, 2010
Eric Peschman, Project Engineer

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FINAL REPORT ACCEPTED BY:

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15. Supplementary Notes			
16. Abstract Compliance tests were conducted on the subject 2009 Trans Tech Rondak Bus, NHTSA No.: C90903, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-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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SECTION 1
PURPOSE OF COMPLIANCE TEST

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

SECTION 2 (CONTINUED)
TEST DATA SUMMARY

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.

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 were unable to be achieved and maintained the required load of 21,780 N for each designated seating position. Data from these tests are presented on Data Sheet No. 11.

ADMINISTRATIVE DATA SHEET

Test Vehicle: **2009 TRANS TECH RONDAK BUS** NHTSA No.: **C90903**
Test Lab: **MGA RESEARCH CORPORATION** Test Dates: **12/21/09 – 05/25/10**

INCOMPLETE VEHICLE (IF APPLICABLE)

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

COMPLETED VEHICLE (SCHOOL BUS)

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

DATES

Vehicle Receipt:	10/01/09
Start of Compliance Test:	12/21/09
Completion of Compliance Test:	05/25/10

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

Recorded By: _____

Approved By: _____ Date: 05/25/10

GENERAL TEST DATA SHEET

Test Vehicle: **2009 TRANS TECH RONDAK BUS** NHTSA No.: **C90903**
Test Lab: **MGA RESEARCH CORPORATION** Test Dates: **12/21/09 – 05/25/10**

SCHOOL BUS IDENTIFICATION

Model Year/Mfr./Make/Model:	2009 Trans Tech Rondak
Passenger Capacity:	(1 Driver, 14 Passengers)
NHTSA No.:	C90903
VIN:	1FD2E35L88DB33670
Conventional or Forward Control:	Conventional
GAWR (Certification Label) FRONT:	1,837 kg / 4,050 lb
GAWR (Certification Label) REAR:	2,760 kg / 6,084 lb
GVWR (Certification Label) TOTAL:	4,355 kg / 9,600 lb

TEST CONDITIONS

Date(s) of Test:	12/21/09 – 05/25/10
Ambient Temperature (°C):	21°C
Required Temperature Range (°C):	0°C to 32°C

SEAT IDENTIFICATION

Seat Manufacturer:	FREEDMAN SEATING COMPANY
Model Name & Number:	
Description of Seats:	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.

SECTION 3
COMPLIANCE TEST DATA

The following data sheets document the results of testing on the 2009 Trans Tech Rondak Bus, NHTSA No.: C90903.

DATA SHEET 1

SEAT TO SEAT/BARRIER SPACING

Test Vehicle: **2009 TRANS TECH RONDAK BUS** NHTSA No.: **C90903**
Test Lab: **MGA RESEARCH CORPORATION** Test Dates: **12/21/09 – 05/25/10**

Seat Number	Measurement of Spacing From SRP Forward to Seat/Barrier (mm)	Requirement ≤ 610 mm (≤ 24") Class 1 Buses Only PASS/FAIL
S1	**515**	**PASS**
S2	**580**	**PASS**
S3	**585**	**PASS**
S4	**550**	**PASS**
S5	**500**	**PASS**
S6	**498**	**PASS**
S7	**500**	**PASS**

Comments: None

Recorded By: _____

Approved By: _____ Date: 12/21/09

DATA SHEET 2

SEAT BACK HEIGHT & FRONT SURFACE AREA TEST

Test Vehicle: **2009 TRANS TECH RONDAK BUS** NHTSA No.: **C90903**
Test Lab: **MGA RESEARCH CORPORATION** Test Dates: **12/21/09 – 05/25/10**

SEAT NUMBER: S1

		PASS/FAIL
1.	Is the seat back height at least 508 mm vertically above the SRP? (S5.1.2) Yes – Pass; No – Fail	**PASS**

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 mm^2

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

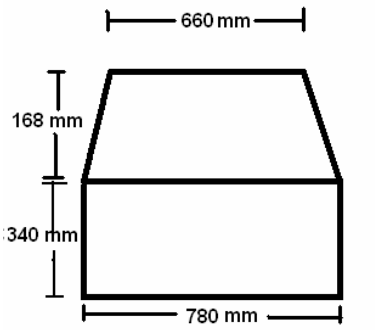
   If the seat cushion is not rectangular, measure the cushion at the forward most edge and the rearward most edge, average the widths, and use the average width as W1.

4. Calculate the following: 0.9 x W1 x 508 mm = 374,904 mm^2

		PASS/FAIL
5.	Is item 2 greater than item 4? (S5.1.2) Yes – Pass; No – Fail	**PASS**

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 mm^2



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

Recorded By: _____

Approved By: _____ Date: 12/22/09

DATA SHEET 2

SEAT BACK HEIGHT & FRONT SURFACE AREA TEST

Test Vehicle: **2009 TRANS TECH RONDAK BUS** NHTSA No.: **C90903**
Test Lab: **MGA RESEARCH CORPORATION** Test Dates: **12/21/09 – 05/25/10**

SEAT NUMBER: S7

		PASS/FAIL
1.	Is the seat back height at least 508 mm vertically above the SRP? (S5.1.2) Yes – Pass; No – Fail	**PASS**

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 mm^2

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

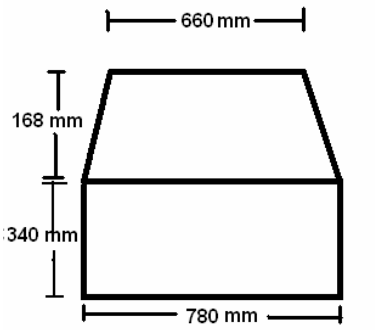
   If the seat cushion is not rectangular, measure the cushion at the forward most edge and the rearward most edge, average the widths, and use the average width as W1.

4. Calculate the following: 0.9 x W1 x 508 mm = 374,904 mm^2

		PASS/FAIL
5.	Is item 2 greater than item 4? (S5.1.2) Yes – Pass; No – Fail	**PASS**

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 mm^2



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

Recorded By: _____

Approved By: _____ Date: 12/22/09

DATA SHEET 4

SEAT BACK FORCE DEFLECTION TEST - FORWARD

Test Vehicle: **2009 TRANS TECH RONDAK BUS** NHTSA No.: **C90903**
Test Lab: **MGA RESEARCH CORPORATION** Test Dates: **12/21/09 – 05/25/10**

SEAT NUMBER: S2

1. Seat Bench Width = 820 mm
   W = (Seat Bench Width)/381 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, 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.

DATA SHEET 4 (CONTINUED)

SEAT BACK FORCE DEFLECTION TEST – FORWARD

		PASS/FAIL
10.	Is the seat in its final deflected position within 102 mm of the next seat or barrier? Yes – Fail; No – Pass	**PASS**

		PASS/FAIL
11.	Does the forward force vs. deflection trace of the seat back lie within the corridor? (S5.1.3) Yes – Pass; No – Fail	**PASS**

12. Include a deflection vs. time plot for the upper loading bar.
13. The area within the force vs. deflection curve = 1,801 joules
14. 452W = 904 joules (S5.1.3.4)

		PASS/FAIL
15.	Is item 13 greater than or equal to item 14? (S5.1.3.4) Yes – Pass; No – Fail	**PASS**

Comments: None

Recorded By: 

Approved By:  Date: 01/04/10

DATA SHEET 4

SEAT BACK FORCE DEFLECTION TEST – FORWARD

Test Vehicle: **2009 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 = (Seat Bench Width)/381 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)
   _X_ 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.

DATA SHEET 4 (CONTINUED)

SEAT BACK FORCE DEFLECTION TEST – FORWARD

		PASS/FAIL
10.	Is the seat in its final deflected position within 102 mm of the next seat or barrier? Yes – Fail; No – Pass	**PASS**

		PASS/FAIL
11.	Does the forward force vs. deflection trace of the seat back lie within the corridor? (S5.1.3) Yes – Pass; No – Fail	**PASS**

12. Include a deflection vs. time plot for the upper loading bar.
13. The area within the force vs. deflection curve = 1,757 joules
14. 452W = 904 joules (S5.1.3.4)

		PASS/FAIL
15.	Is item 13 greater than or equal to item 14? (S5.1.3.4) Yes – Pass; No – Fail	**PASS**

Comments: None

Recorded By: 

Approved By:  Date: 01/04/10

DATA SHEET 5

SEAT BACK FORCE DEFLECTION TEST – REARWARD

Test Vehicle: **2009 TRANS TECH RONDAK BUS** NHTSA No.: **C90903**
Test Lab: **MGA RESEARCH CORPORATION** Test Dates: **12/21/09 – 05/25/10**

SEAT NUMBER: S5

1. Seat Bench Width = 820 mm
   W = (Seat Bench Width)/381 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)
   _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.

		PASS/FAIL
8.	Does the force vs. deflection plot lie within the boundaries of Figure 18? (OVSC TP-222-04) Yes – Pass; No – Fail	**PASS**

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

		PASS/FAIL
12.	Is item 11 greater than or equal to item 10? (S5.1.4.2) Yes – Pass; No – Fail	**PASS**

Comments: None

Recorded By: Eric Lundberg

Approved By: Michael Jarosz Date: 04/09/10

DATA SHEET 6

RESTRAINING BARRIER POSITION AND PROJECTED REAR SURFACE AREA

Test Vehicle: **2009 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.

		PASS/FAIL
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 = 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

		PASS/FAIL
5.	Is D_t equal to or less than C_t? Yes – Pass; No – Fail	**PASS**

		PASS/FAIL
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 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

		PASS/FAIL
9.	Is distance $E_t + D_t$ equal to or greater than distance $A_t + C_t$? Yes – Pass; No – Fail	**PASS**

		PASS/FAIL
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 = 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

		PASS/FAIL
13.	Is U_i equal to or less than V_i? Yes – Pass; No – Fail	**PASS**

		PASS/FAIL
14.	Is U_o equal to or less than V_o? Yes – Pass; No – Fail	**PASS**

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

		PASS/FAIL
17.	Is $S_i + U_i$ equal to or greater than $W_i + V_i$? Yes – Pass; No – Fail	**PASS**

		PASS/FAIL
18.	Is $S_o + U_o$ equal to or greater than $W_o + V_o$? Yes – Pass; No – Fail	**PASS**

19. Compute area (W x A) = 580,178 mm^2

20. Compute area (E x S) = 754,585 mm^2

		PASS/FAIL
21.	Is (W x A) equal to or less than (E x S)? Yes – Pass; No – Fail	**PASS**

Comments: None

Recorded By: _____

Approved By: _____ Date: 12/22/09

DATA SHEET 6

RESTRAINING BARRIER POSITION AND PROJECTED REAR SURFACE AREA

Test Vehicle: **2009 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.

		PASS/FAIL
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 mm D_b = 6 mm

4. Measure distance C at top (t) and bottom (b) of seat back.

   C_t = 78 mm C_b = 30 mm

		PASS/FAIL
5.	Is D_t equal to or less than C_t? Yes – Pass; No – Fail	**PASS**

		PASS/FAIL
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 mm E_b = 850 mm

8. Measure distance A at top of seat back and bottom of seat.

   A_t = 700 mm A_b = 820 mm

		PASS/FAIL
9.	Is distance $E_t + D_t$ equal to or greater than distance $A_t + C_t$? Yes – Pass; No – Fail	**PASS**

		PASS/FAIL
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 mm U_o = 288 mm

12. Measure distance V at inboard (i) and outboard (o) sides of seat.

    V_i = 328 mm V_o = 328 mm

DATA SHEET 6 (CONTINUED)

RESTRAINING BARRIER POSITION AND PROJECTED REAR SURFACE AREA

		PASS/FAIL
13.	Is U_i equal to or less than V_i? Yes – Pass; No – Fail	**PASS**

		PASS/FAIL
14.	Is U_o equal to or less than V_o? Yes – Pass; No – Fail	**PASS**

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

		PASS/FAIL
17.	Is $S_i + U_i$ equal to or greater than $W_i + V_i$? Yes – Pass; No – Fail	**PASS**

		PASS/FAIL
18.	Is $S_o + U_o$ equal to or greater than $W_o + V_o$? Yes – Pass; No – Fail	**PASS**

19. Compute area (W x A) = 593,560 mm^2

20. Compute area (E x S) = 752,050 mm^2

		PASS/FAIL
21.	Is (W x A) equal to or less than (E x S)? Yes – Pass; No – Fail	**PASS**

Comments: None

Recorded By: _____

Approved By: _____ Date: 12/22/09

DATA SHEET 8

HEAD FORM IMPACT CONTACT AREA REQUIREMENT

Test Vehicle: **2009 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 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

DATA SHEET 8 (CONTINUED)

HEAD FORM IMPACT CONTACT AREA REQUIREMENT

4. Complete the following table:

(1)	(2)			(3)	(4)*	(5)	(6)	(7)
Head Impact & Test #	Location (a)			Speed Trap Impact Velocity** mps	Derived Velocity mps	Contact Area (CA) mm^2	CA ≥ 1935 mm^2	
	X	Y	Angle				Yes-PASS	No-FAIL
H1	-225	506	0	1.60	1.68	6,200	PASS	
H2	-123	504	0	1.56	1.44	5,180	PASS	
H3	-515	431	0	1.55	1.47	5,760	PASS	
H4	-182	406	0	1.58	1.48	4,920	PASS	
H5	-256	337	0	1.57	1.44	6,470	PASS	

* 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: _____

Approved By: _____ Date: 01/06/10

DATA SHEET 8

HEAD FORM IMPACT CONTACT AREA REQUIREMENT

Test Vehicle: **2009 TRANS TECH RONDAK BUS** NHTSA No.: **C90903**
Test Lab: **MGA RESEARCH CORPORATION** Test Dates: **12/21/09 – 05/25/10**

BARRIER NUMBER: B1

REAR 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° = 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:

(1)	(2)			(3)	(4)*	(5)	(6)	(7)
Head Impact & Test #	Location (a)			Speed Trap Impact Velocity** mps	Derived Velocity mps	Contact Area (CA) mm^2	CA ≥ 1935 mm^2	
	X	Y	Angle				Yes-PASS	No-FAIL
H1	-613	554	0	1.52	1.36	4,690	PASS	
H2	-512	556	0	1.60	1.70	3,790	PASS	
H3	-410	554	0	1.60	1.62	3,810	PASS	
H4	-362	456	0	1.55	1.33	3,850	PASS	
H5	-310	364	0	1.59	1.41	3,550	PASS	
H6	-209	362	0	1.54	1.03	4,070	PASS	
H7	-107	362	0	1.56	1.31	5,260	PASS	

* 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:  Date: 1/12/2010

DATA SHEET 9

HEAD FORM IMPACT ENERGY REQUIREMENT

Test Vehicle: **2009 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 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

DATA SHEET 9 (CONTINUED)

HEAD FORM IMPACT ENERGY REQUIREMENT

4. Complete the following table:

(1)	(2)			(3)	(4)*	(5)	(6)	(7)		(8)	
Head impact & Test #	Location (a)			Speed Trap Impact Velocity ** mps	Derived Velocity ** mps	Max HIC	Energy Req'd Joules	Column 5 < 1000		Column 6 > 4.5 joules	
	X	Y	Angle					Yes-PASS	No-FAIL	Yes-PASS	No-FAIL
H8	-593	500	0	6.63	6.81	96	10.57	PASS		PASS	
H9	-300	429	0	6.62	6.63	170	5.75	PASS		PASS	
H10	-580	338	0	6.66	6.57	132	16.82	PASS		PASS	
H11	-477	339	0	6.69	6.57	164	8.48	PASS		PASS	
H12	-103	340	0	6.69	6.52	211	5.34	PASS		PASS	

* 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: _____

Approved By: _____ Date: 01/06/10

DATA SHEET 10

KNEE FORM IMPACT TEST

Test Vehicle: **2009 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

DATA SHEET 10 (CONTINUED)

KNEE FORM IMPACT TEST

4. Complete the following table:

(1)	(2)			(3)	(4)*	(5)	(6)	(7)		(8)	
Knee impact & Test #	Location (a)			Speed Trap Impact Velocity ** mps	Derived Velocity ** mps	Cont. Area mm^2	Resist Force (N)	Column 5 > 1935 mm^2		Column 6 < 2669N	
	X	Y	Angle					Yes-PASS	No-FAIL	Yes-PASS	No-FAIL
K1	-528	259	0	4.92	4.80	4,880	1,156	PASS			
K2	-336	260	0	4.93	4.97	2,970	2,604	PASS			
K3	-155	146	0	4.94	4.89	5,470	1,104	PASS			
K4	-53	148	0	4.88	4.65	4,140	1,677	PASS			
K5	-590	151	0	4.84	4.60		1,099			PASS	
K6	-488	151	0	4.86	4.26		1,660			PASS	
K7	-210	259	0	4.85	3.92		1,900			PASS	
K8	-70	257	0	4.81	4.45		2,621			PASS	

* 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: 

Approved By:  Date: 01/06/10

DATA SHEET 10

KNEE FORM IMPACT TEST

Test Vehicle: **2009 TRANS TECH RONDAK BUS** NHTSA No.: **C90903**
Test Lab: **MGA RESEARCH CORPORATION** Test Dates: **12/21/09 – 05/25/10**

BARRIER NUMBER: B1

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:

(1)	(2)			(3)	(4)*	(5)	(6)	(7)		(8)	
Knee impact & Test #	Location (a)			Speed Trap Impact Velocity ** mps	Derived Velocity ** mps	Cont. Area mm^2	Resist Force (N)	Column 5 > 1935 mm^2		Column 6 < 2669N	
	X	Y	Angle					Yes-PASS	No-FAIL	Yes-PASS	No-FAIL
K2	-399	263	0	4.89	4.74	2,640		PASS			
K5	-398	160	0	4.84	4.50		2,846				FAIL
K6	-382	12	0	4.80	4.96		2,432			PASS	
K7	-222	263	0	4.80	4.35		1,261			PASS	
K8	-46	261	0	4.83	4.16		1,119			PASS	

* 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: _____

Approved By: _____ Date: 01/13/10

DATA SHEET 11

SEAT BELT ASSEMBLY ANCHORAGES

Test Vehicle: **2009 TRANS TECH RONDAK BUS** NHTSA No.: **C90903**
Test Lab: **MGA RESEARCH CORPORATION** Test Dates: **12/21/09 – 05/25/10**

SEAT LOCATION: S6

		PASS/FAIL
1.	Are all seat belt assembly anchorages designed for forward facing occupant position?	**PASS**

Seat Location	Seating Location	Anchor Type	Measured Spacing (mm) *	Measured Angle **	Load Application Angle (degrees)	
					Side View Horizontal Load Angle	Plan View From Vehicle Center Line
S6	Left	1	275	46.7°	9.7°	0.0°
	Right	1	200	46.7°	9.9°	0.0°

*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°.

Seat Location	Seating Location	Required Load (Newtons)	Actual Max. Test Load (Newtons)	PASS/FAIL	Comment
S6	Left	21,780 – 21,956	21,476	**FAIL**	Washers securing seat frame to floor failed.
	Right	21,780 – 21,956	21,392	**FAIL**	Washers securing seat frame to floor failed.

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

Equipment	Description	Model / Serial No.	Cal. Date	Cal. Due Date
Load Cell	Interface	1210AF-5K / 62736	07/01/09	01/01/10
Load Cell	Interface	1210AF-5K / 62736	01/18/10	07/18/10
Load Cell	Interface	1210AF-25K-B / 137778	12/08/09	06/08/10
Load Cell	PCB	1315-101-01A / 664	09/24/09	03/24/10
Load Cell	PCB	1315-101-01A / 664	03/24/10	09/24/10
Load Cell	PCB	1315-101-01A / 703	10/01/09	04/01/10
String Pot.	Ametek	P-25A / 1202-19365	12/08/09	06/08/10
String Pot.	Ametek	P-40A / 0504-21782	09/23/09	03/23/10
String Pot.	Ametek	P-40A / 9904-8664	12/23/09	06/23/10
String Pot.	Ametek	P-40A / 0108-27167	09/23/09	03/23/10
String Pot.	Ametek	P-40A / 0108-27167	03/11/10	09/11/10
Inclinometer	Digital Protractor	Pro 360 / 001	Daily	Daily
Steel Tape	Stanley	Powerlock / 184	12/09/09	12/09/10
Impact Fixture	MGA	IF2003A	---	---
Camera	Sony	DSC-575	---	---
Planimeter	Sokkia Corp.	Planix5 007319	Daily	Daily
Accelerometer	Entran	EGE-73B6Q-500JF / G30-N08	01/04/10	07/04/10
Accelerometer	Entran	EGCS-S425-2000 / W04807	11/24/09	05/24/10

SECTION 5

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Left Side View of School Bus

Test Vehicle: **2009 TRANS TECH RONDAK BUS** NHTSA No.: **C90903**
Procedure: **FMVSS 222** Test Dates: **12/21/09 – 05/25/10**

Right Side View of School Bus

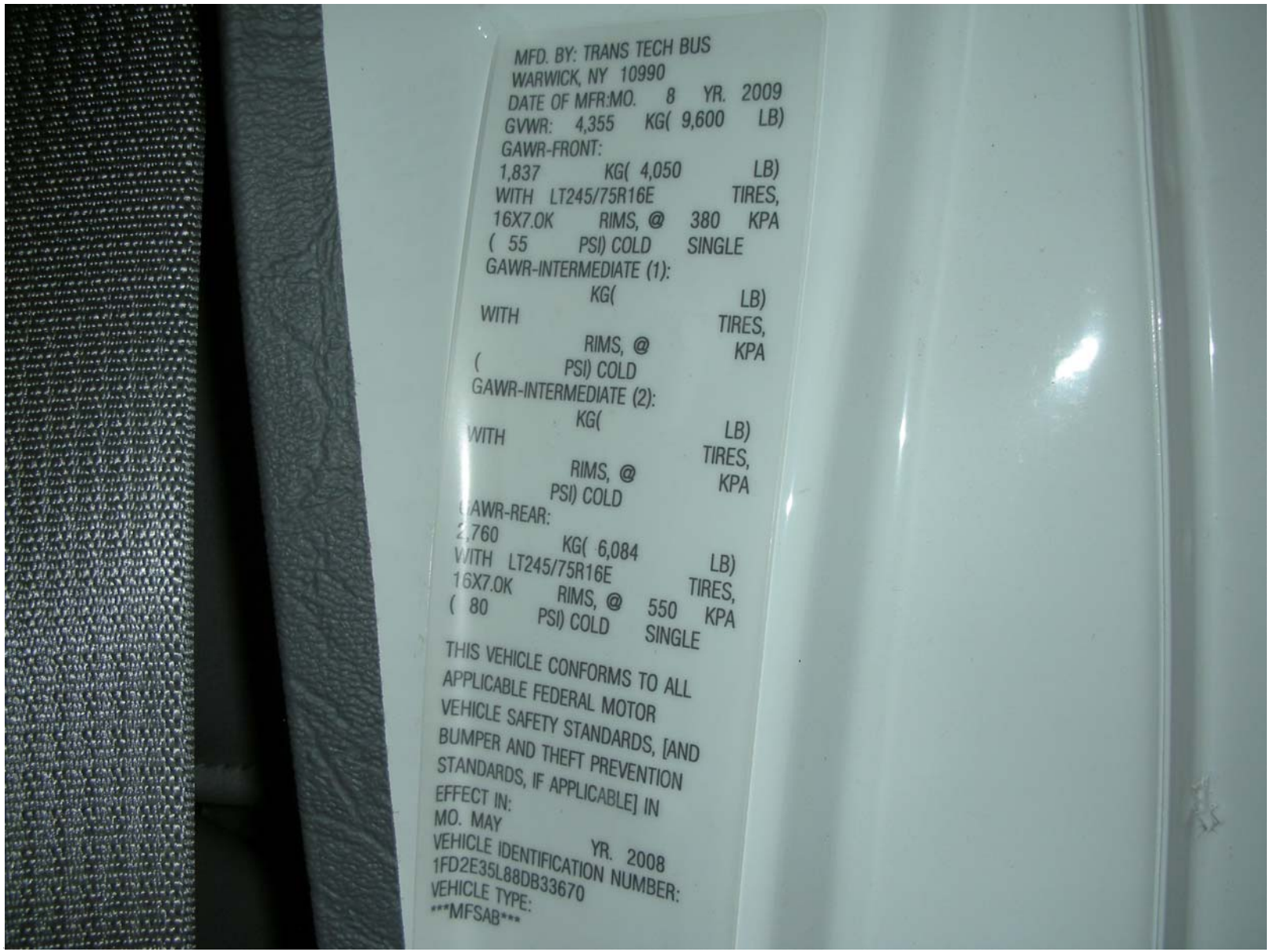
Test Vehicle:	**2009 TRANS TECH RONDAK BUS**	NHTSA No.:	**C90903**
Procedure:	**FMVSS 222**	Test Dates:	**12/21/09 – 05/25/10**

¾ Front View From Left Side of School Bus

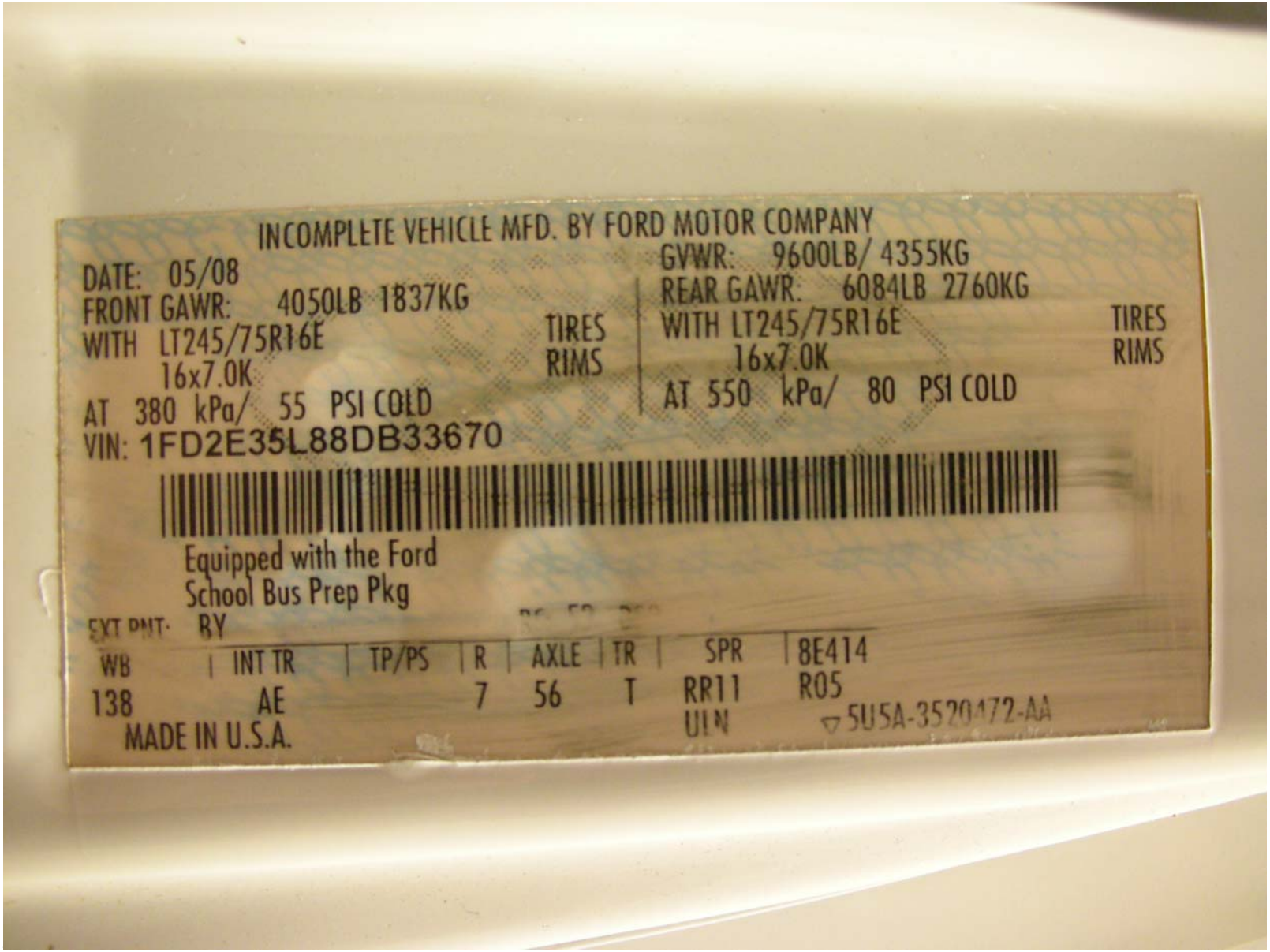
Test Vehicle:	**2009 TRANS TECH RONDAK BUS**	NHTSA No.:	**C90903**
Procedure:	**FMVSS 222**	Test Dates:	**12/21/09 – 05/25/10**

¾ Front View From Right Side of School Bus

¾ Rear View From Right Side of School Bus



Certification Label & Tire Placard



Incomplete Vehicle Label

Test Vehicle: **2009 TRANS TECH RONDAK BUS** NHTSA No.: **C90903**
Procedure: **FMVSS 222** Test Dates: **12/21/09 – 05/25/10**

Vehicle Interior View From Front to Rear

Pre-Test of Seat Back S2 Force Deflection Forward Test

Test Vehicle:	**2009 TRANS TECH RONDAK BUS**	NHTSA No.:	**C90903**
Procedure:	**FMVSS 222**	Test Dates:	**12/21/09 – 05/25/10**

Post-Test of Seat Back S2 Force Deflection Forward Test

Test Vehicle: **2009 TRANS TECH RONDAK BUS** NHTSA No.: **C90903**
Procedure: **FMVSS 222** Test Dates: **12/21/09 – 05/25/10**

Pre-Test of Seat Back S7 Force Deflection Forward Test

Post-Test of Seat Back S7 Force Deflection Forward Test

Test Vehicle: **2009 TRANS TECH RONDAK BUS** NHTSA No.: **C90903**
Procedure: **FMVSS 222** Test Dates: **12/21/09 – 05/25/10**

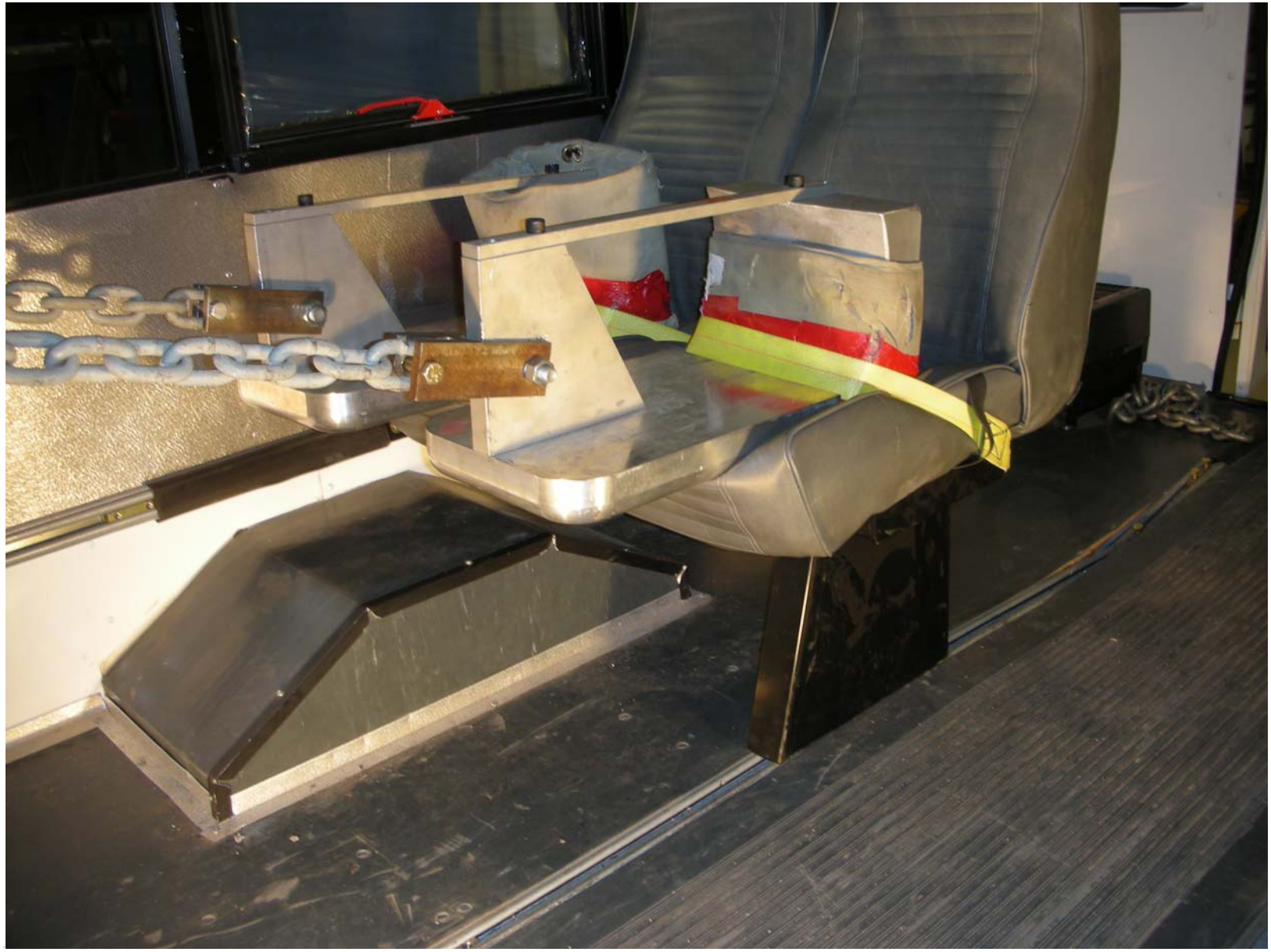
Pre-Test of Seat Back S5 Force Deflection Rearward Test

Post-Test of Seat Back S5 Force Deflection Rearward Test

Test Vehicle:	**2009 TRANS TECH RONDAK BUS**	NHTSA No.:	**C90903**
Procedure:	**FMVSS 222**	Test Dates:	**12/21/09 – 05/25/10**

Post-Test of Head and Knee Impact Locations on Seat S1

Post-Test of Head and Knee Impact Locations on Seat B1



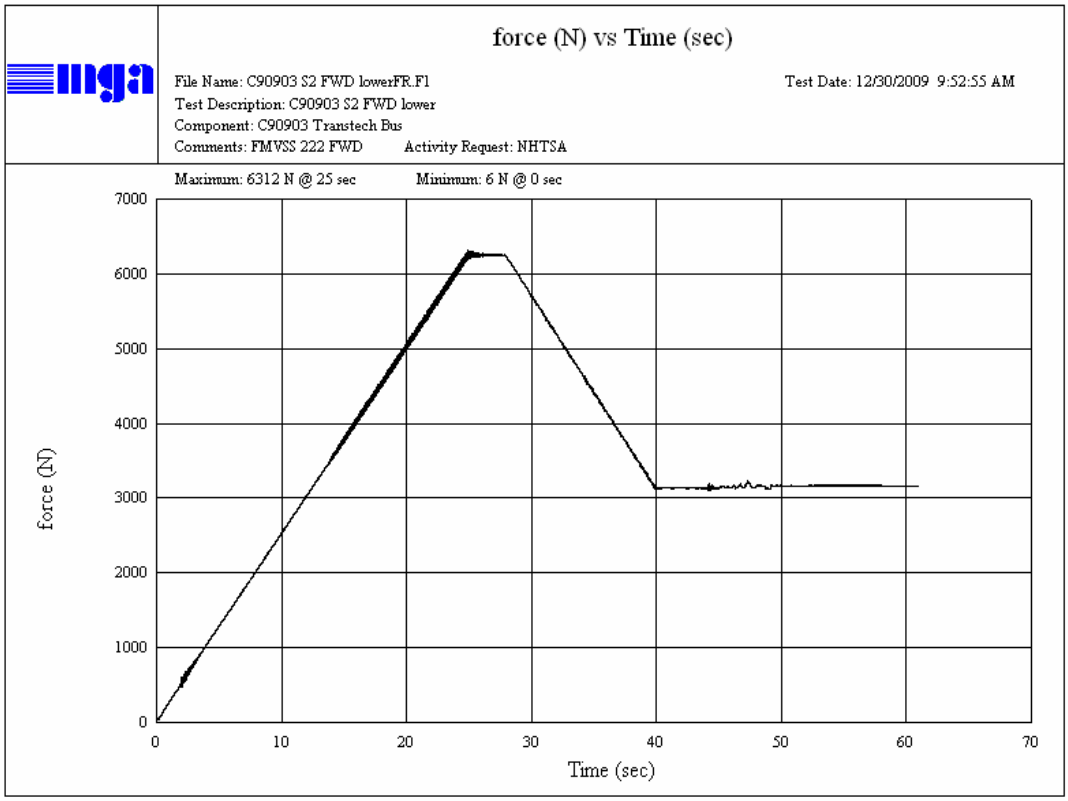
Pre-Test of Seat S6 210 Test

Post-Test of Seat S6 210 Test

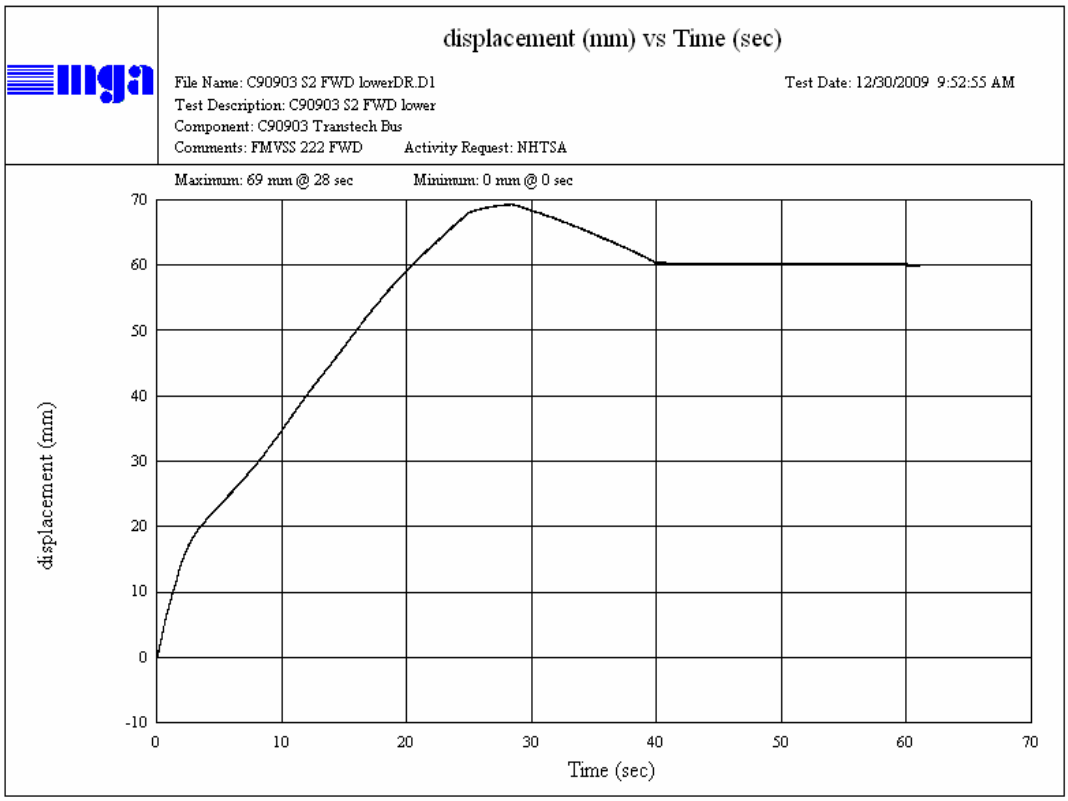
SECTION 6

TEST PLOTS

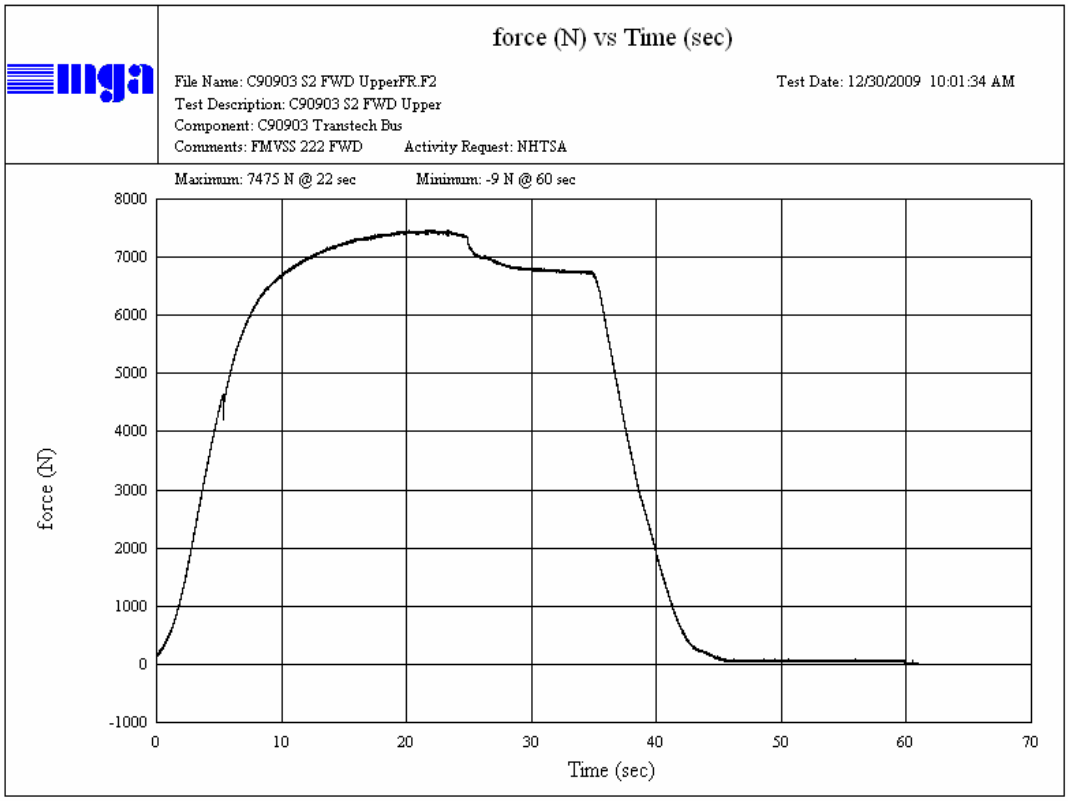
TABLE OF TEST PLOTS



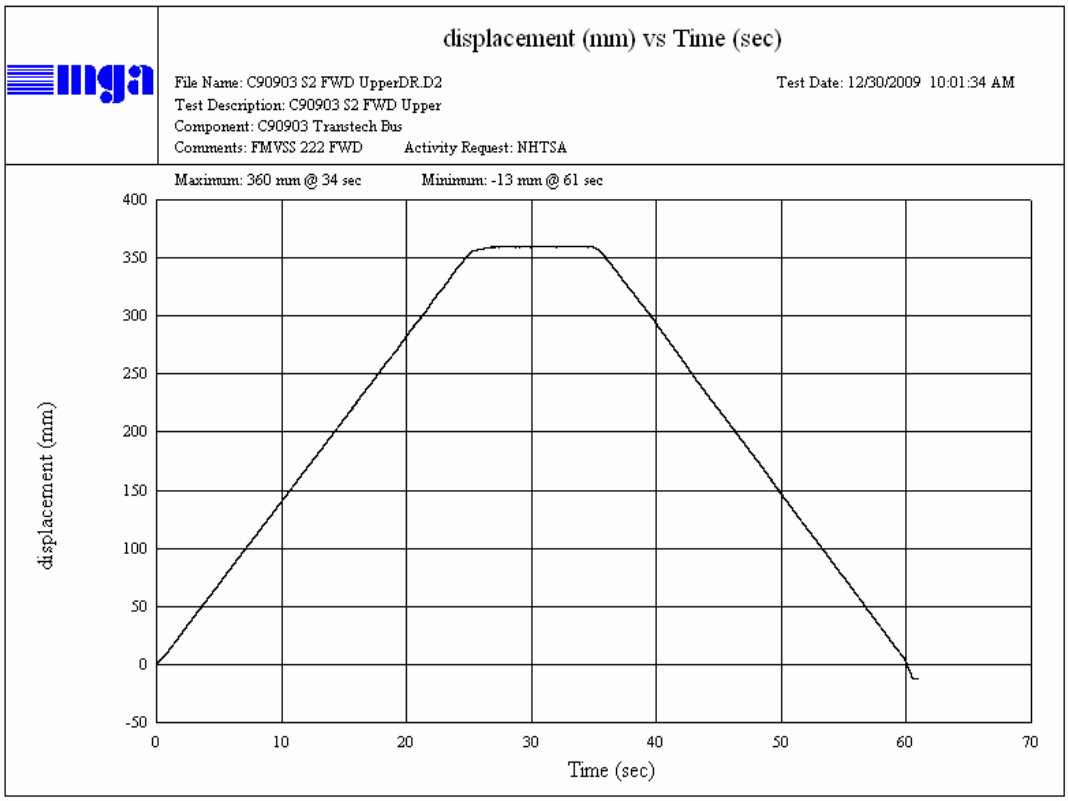
S2 Forward Deflection Lower Cylinder



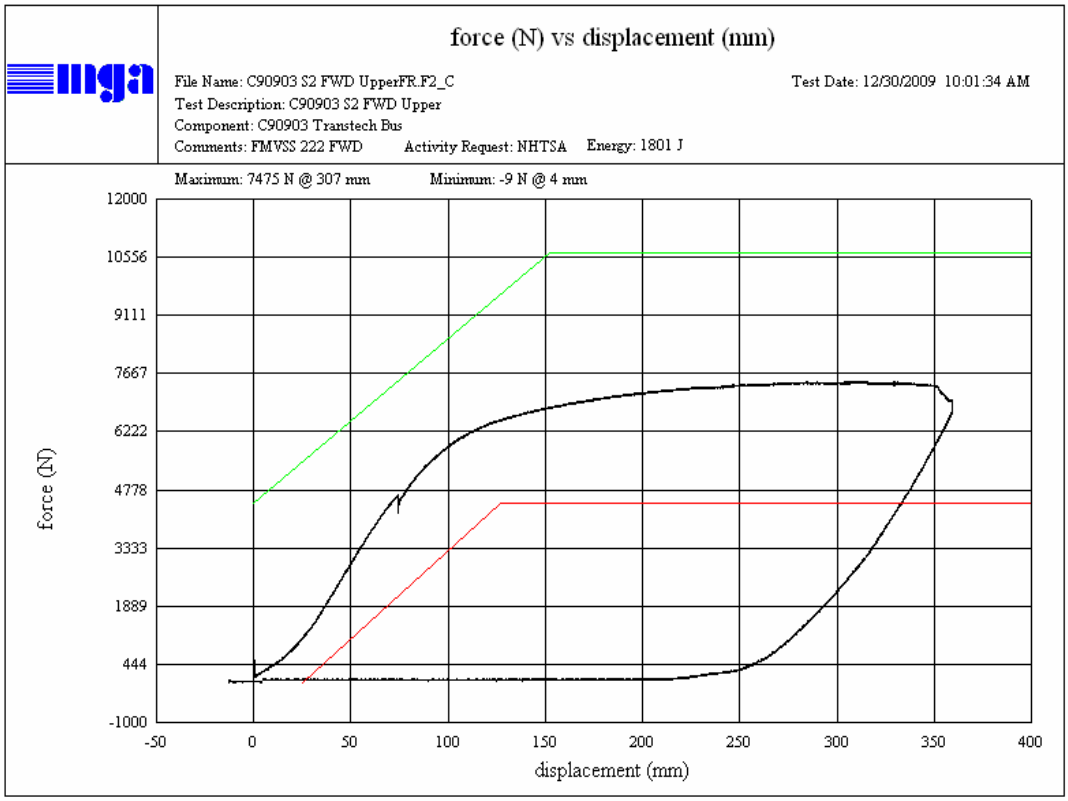
S2 Forward Deflection Lower Cylinder



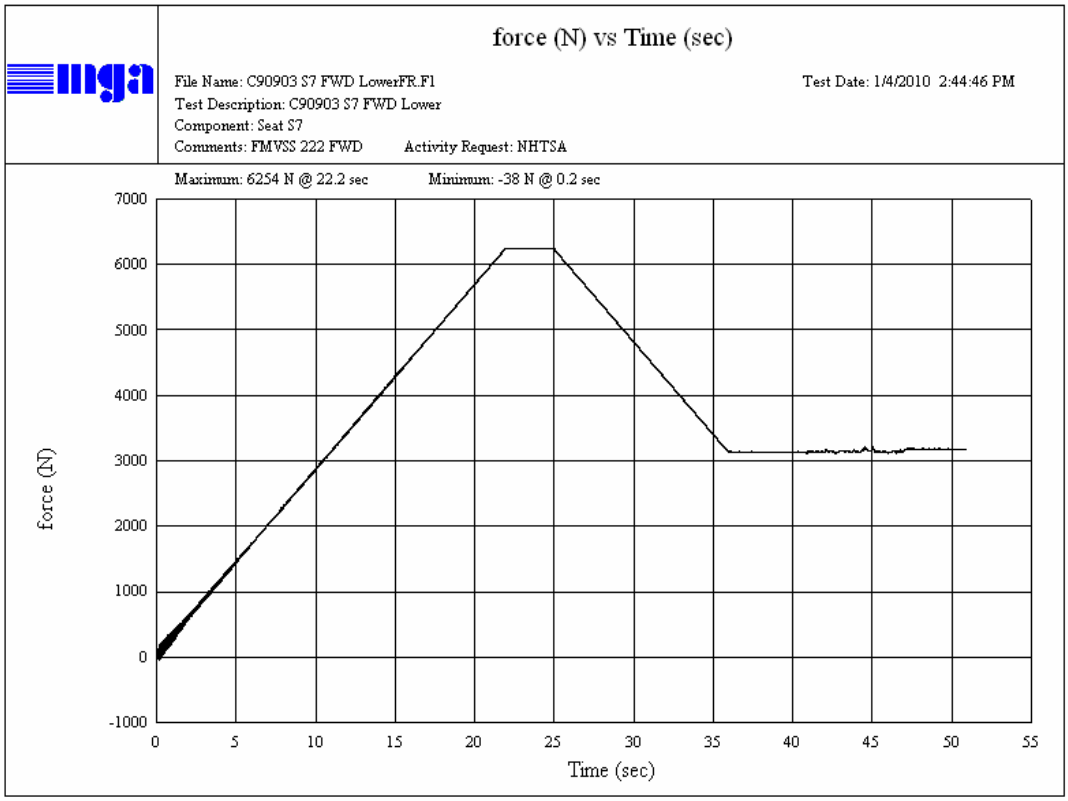
S2 Forward Deflection Upper Cylinder



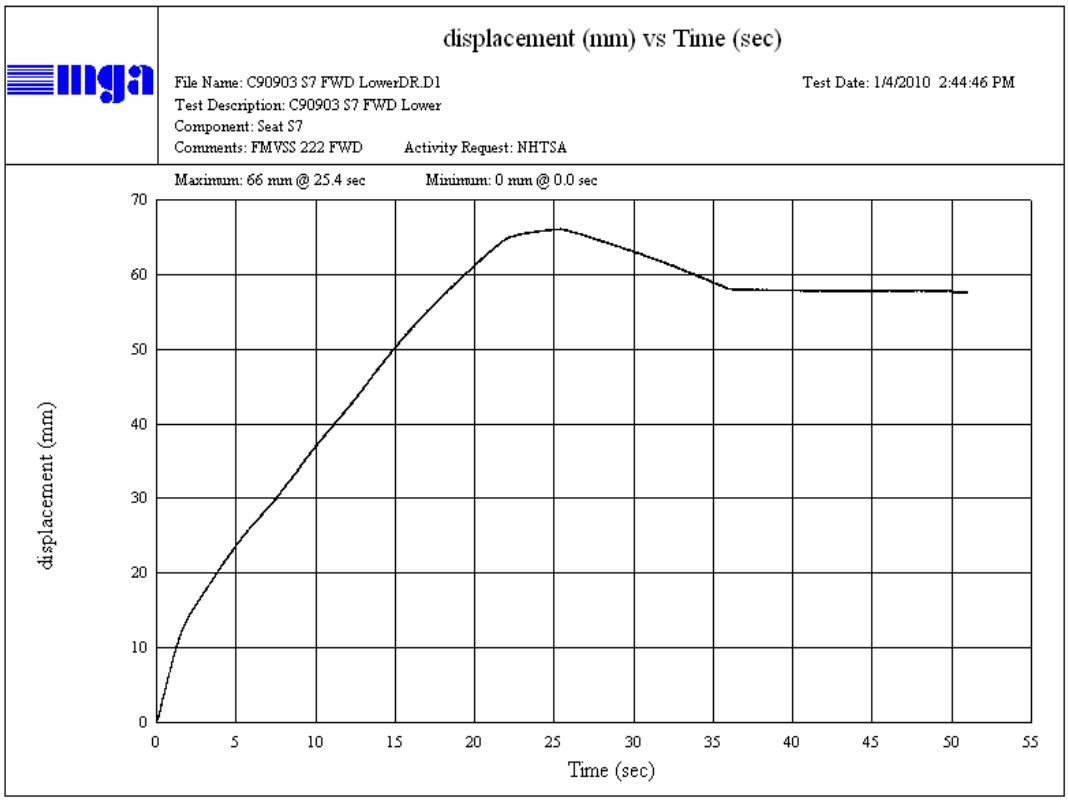
S2 Forward Deflection Upper Cylinder



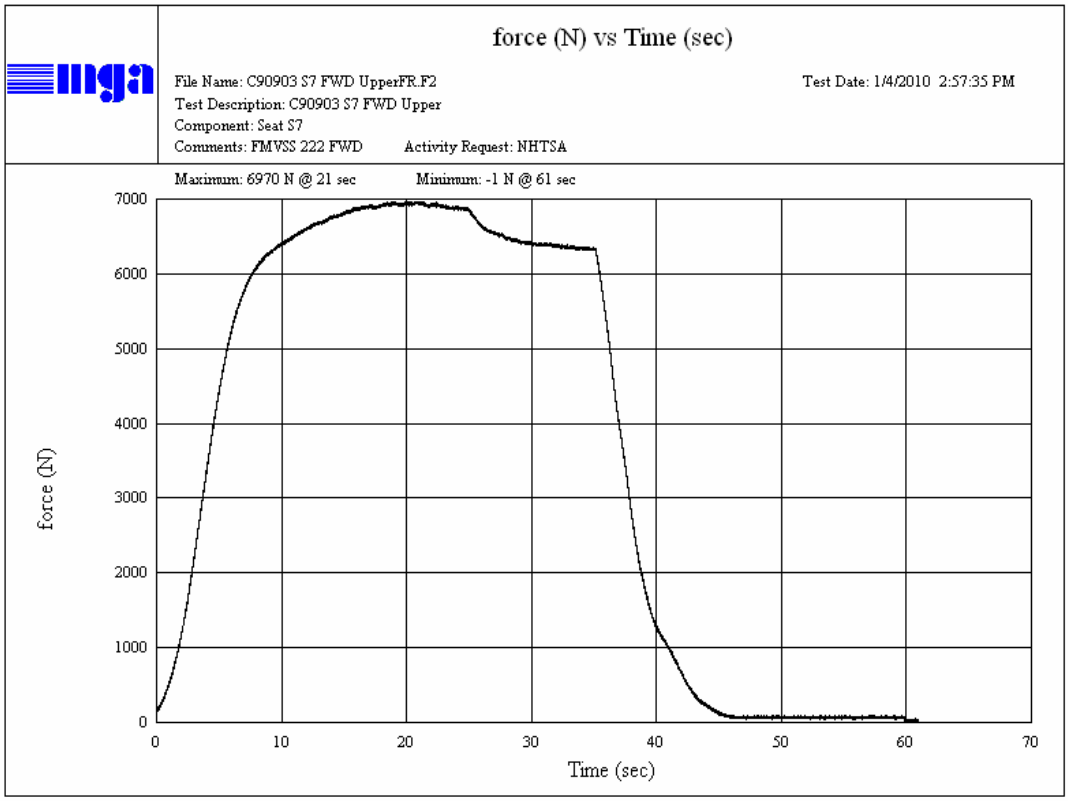
S2 Forward Deflection Upper Cylinder



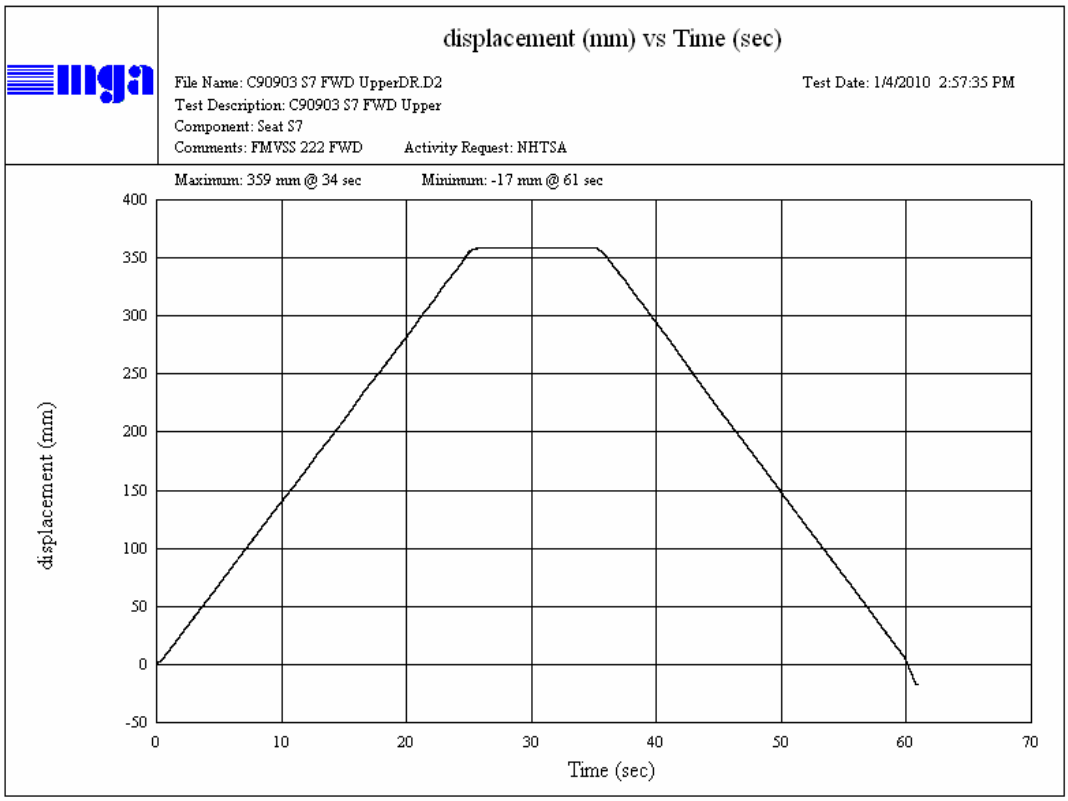
S7 Forward Deflection Lower Cylinder



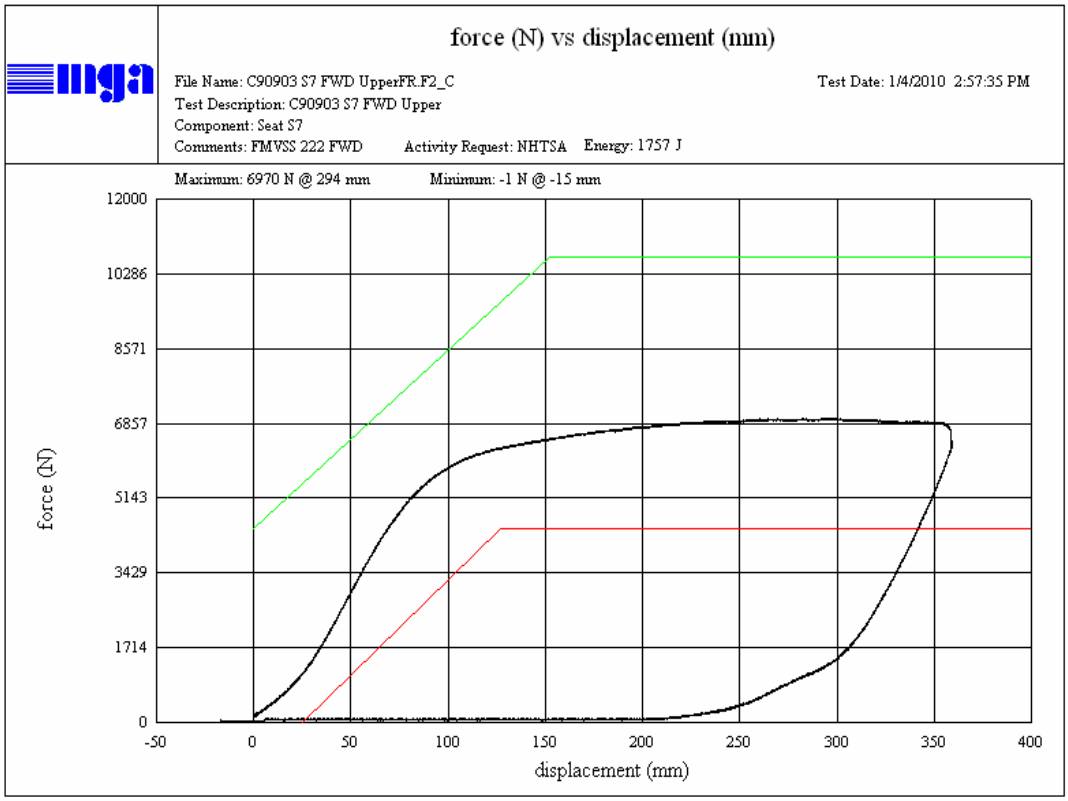
S7 Forward Deflection Lower Cylinder



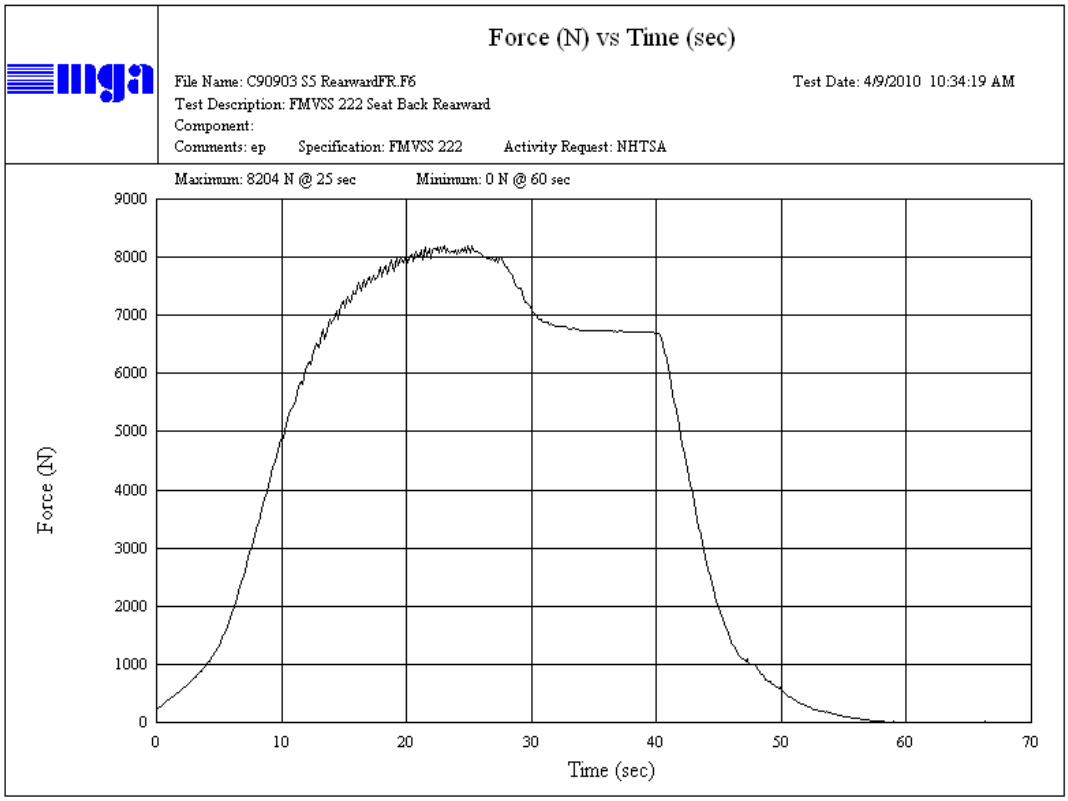
S7 Forward Deflection Upper Cylinder



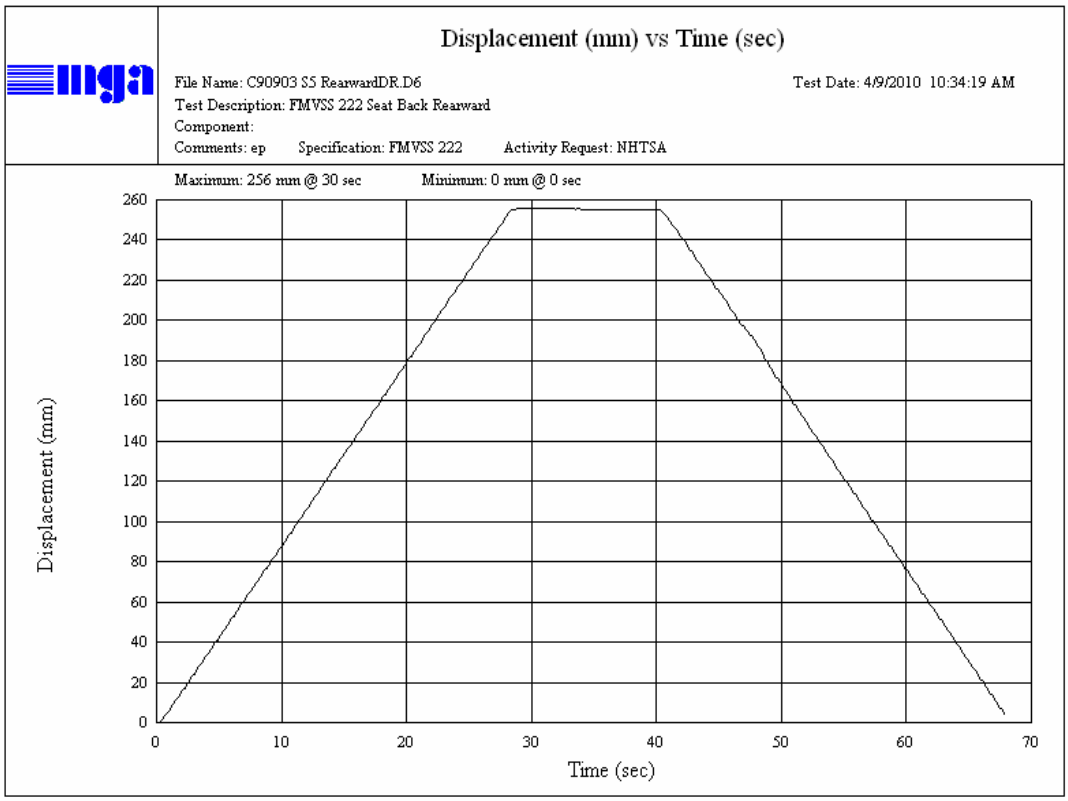
S7 Forward Deflection Upper Cylinder



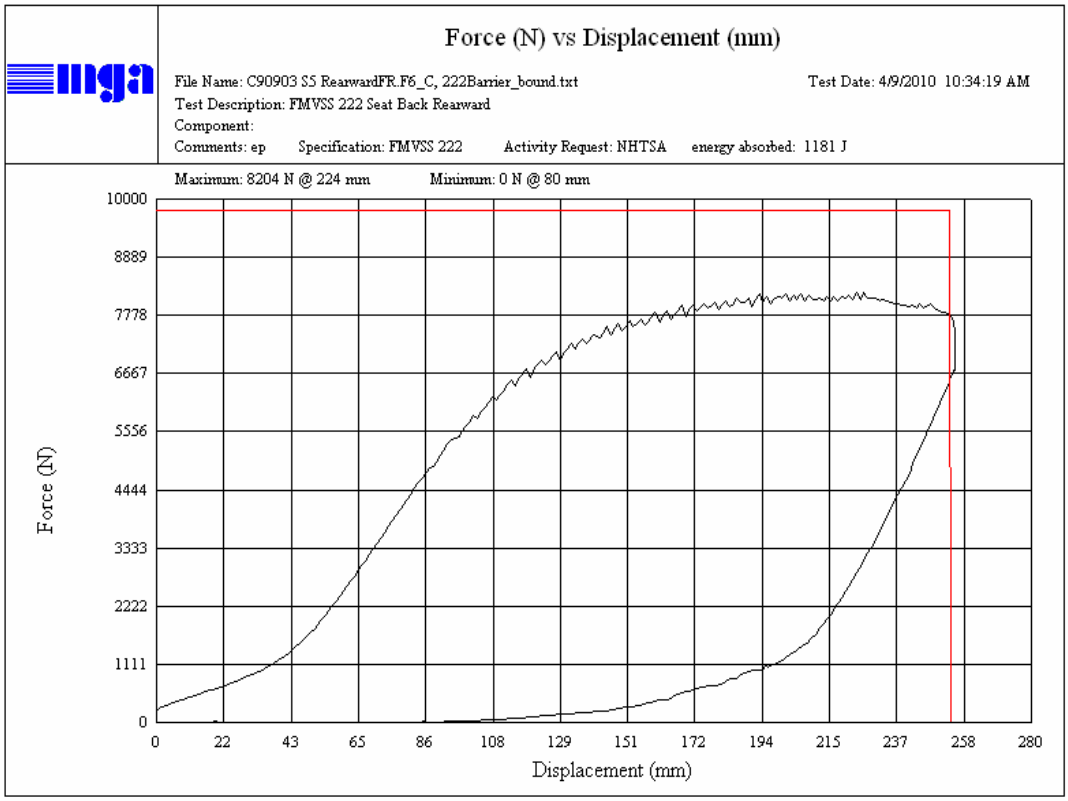
S7 Forward Deflection Upper Cylinder



Seat Back Rearward Deflection Seat S5



Seat Back Rearward Deflection Seat S5

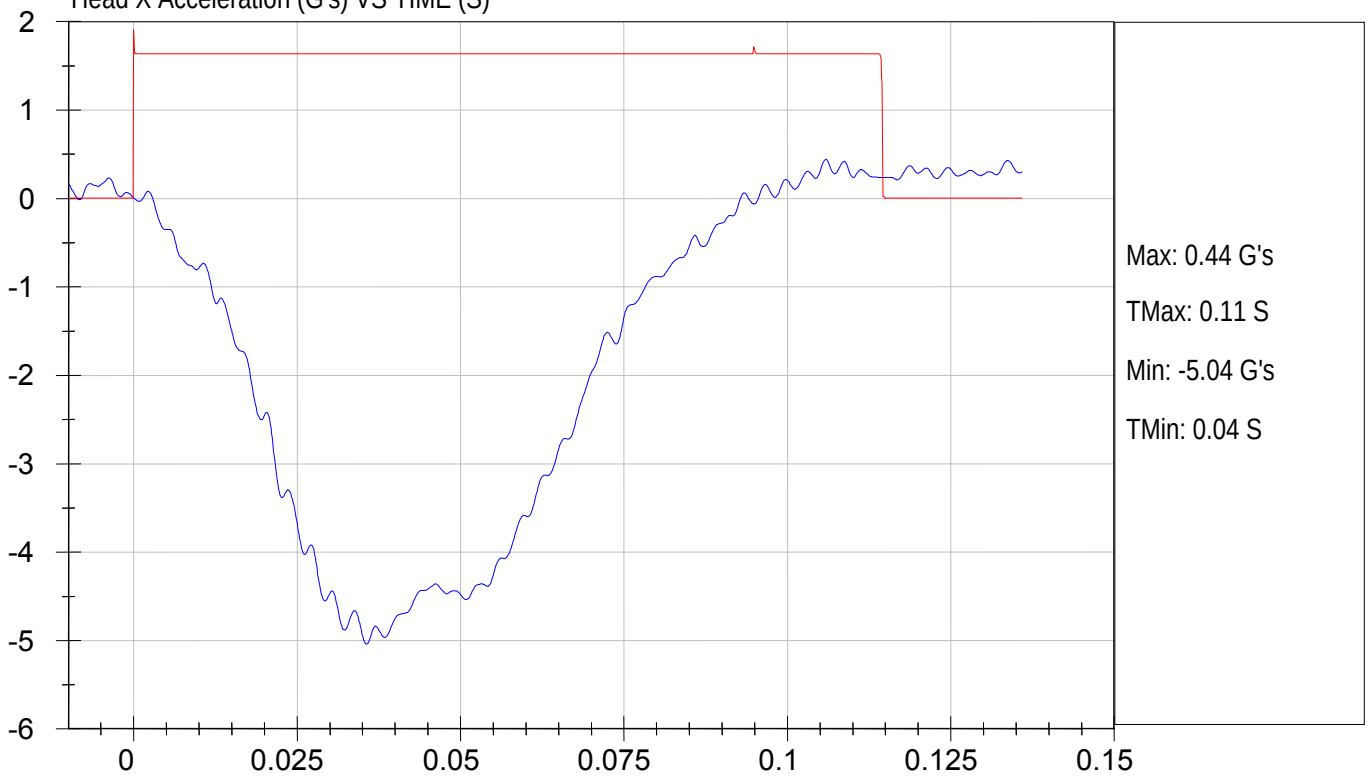


Seat Back Rearward Deflection Seat S5

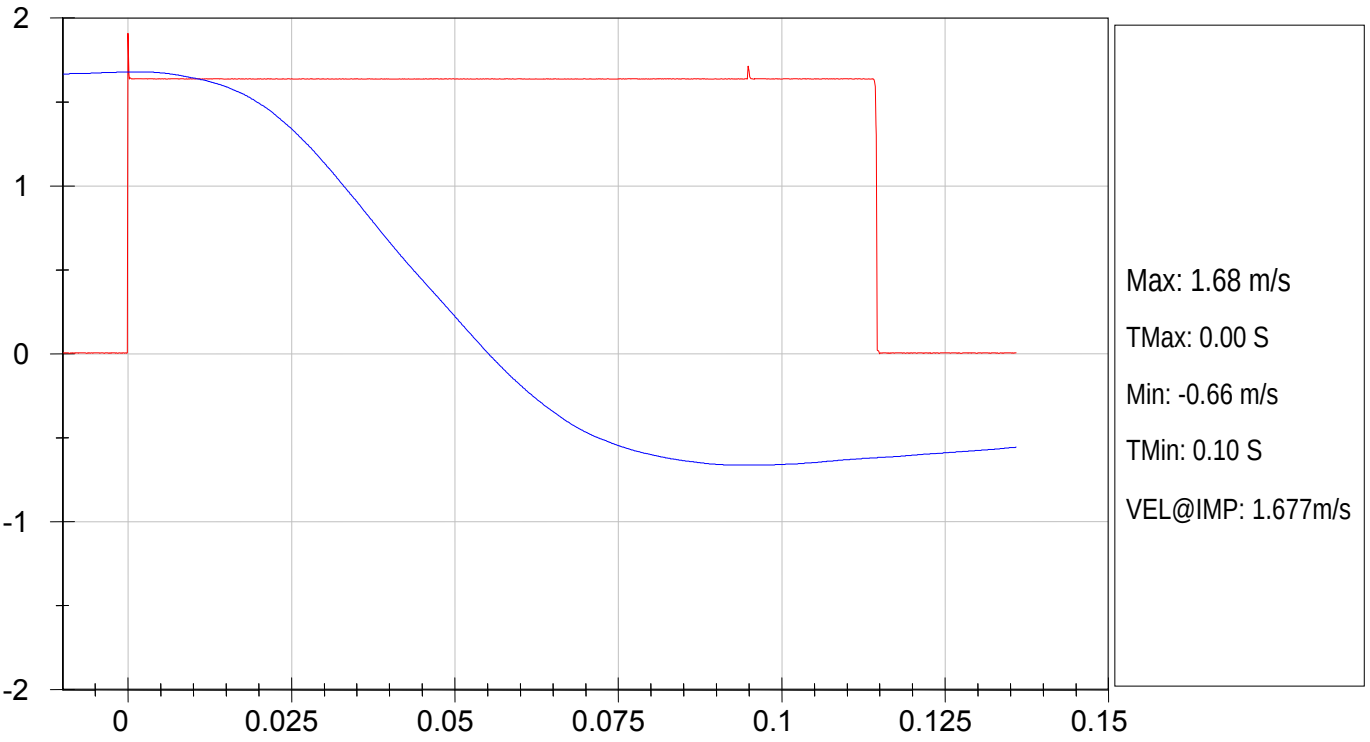
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s) Test Date: 1-6-2010
Component ID: Trans Tech Rondak - Trap: 1.597 m/s Location: S1 H1
NHTSA #: C90903

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

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



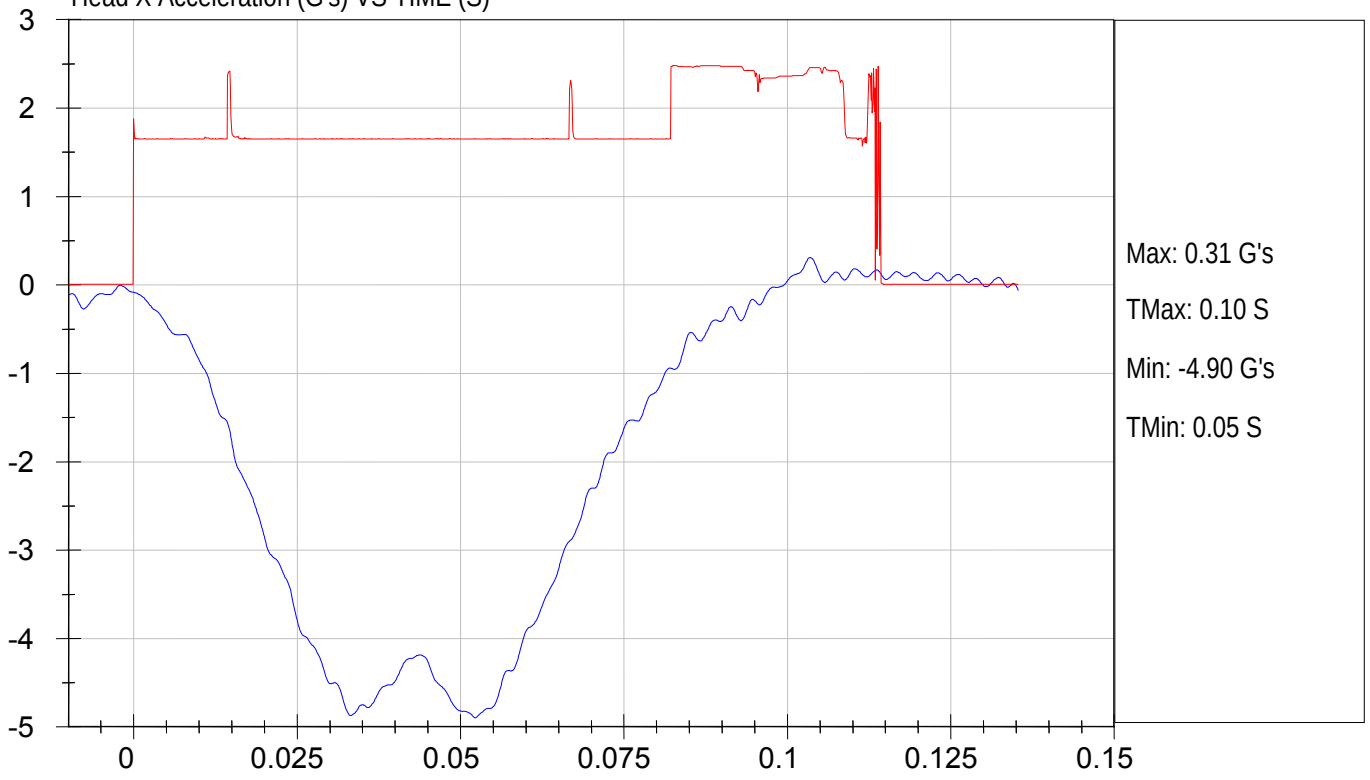
VELOCITY X (m/s) VS TIME (S)



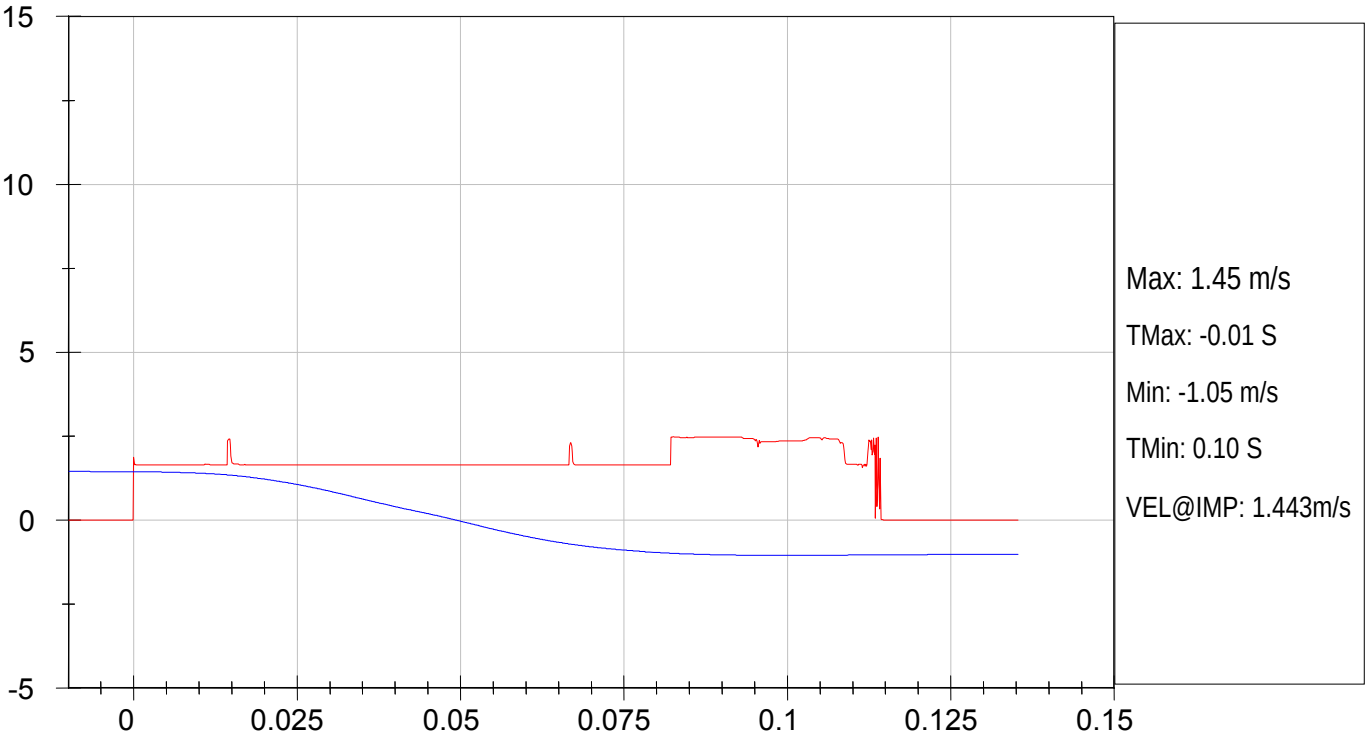
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s) Test Date: 1-6-2010
Component ID: Trans Tech Rondak - Trap: 1.562 m/s Location: S1 H2
NHTSA #: C90903

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

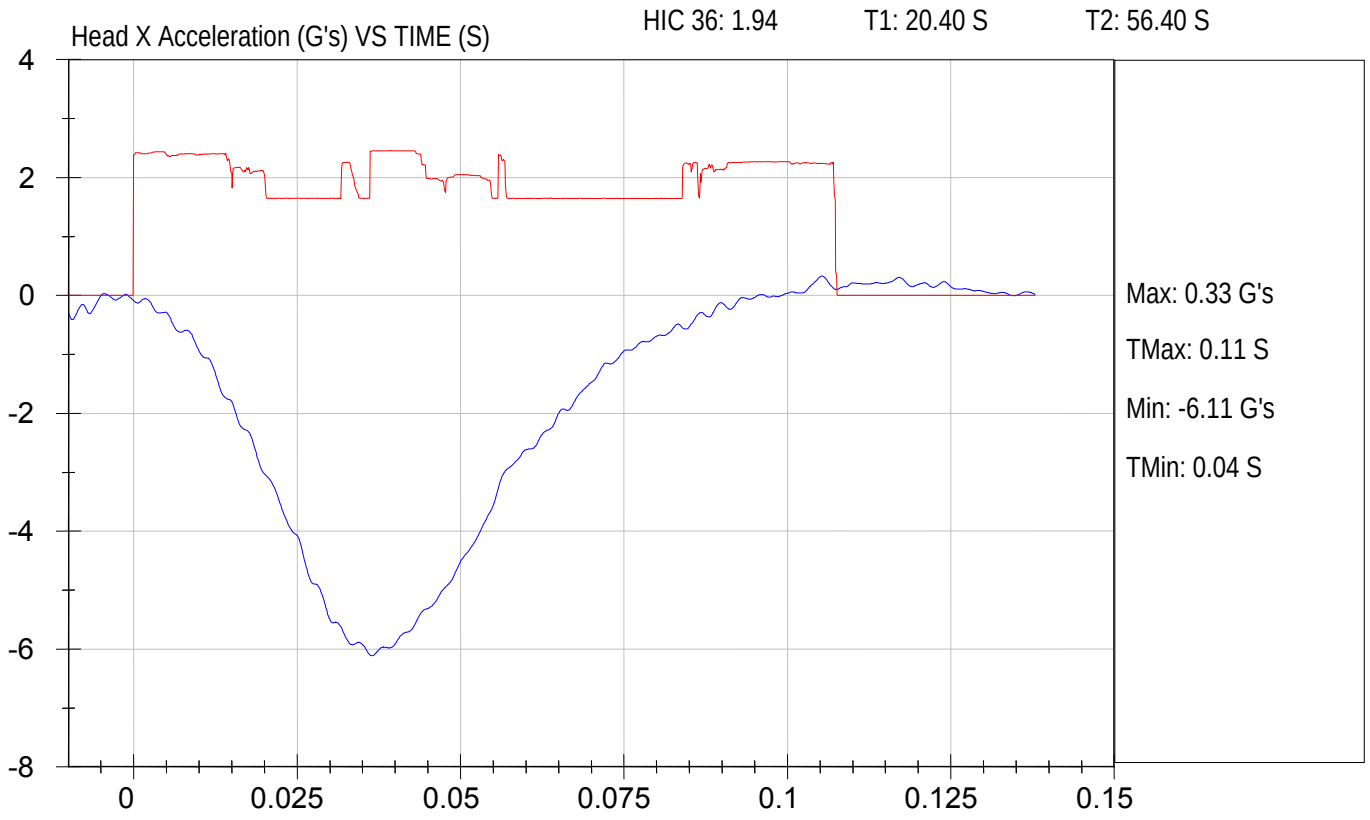
HIC 36: 1.53 T1: 25.20 S T2: 61.20 S

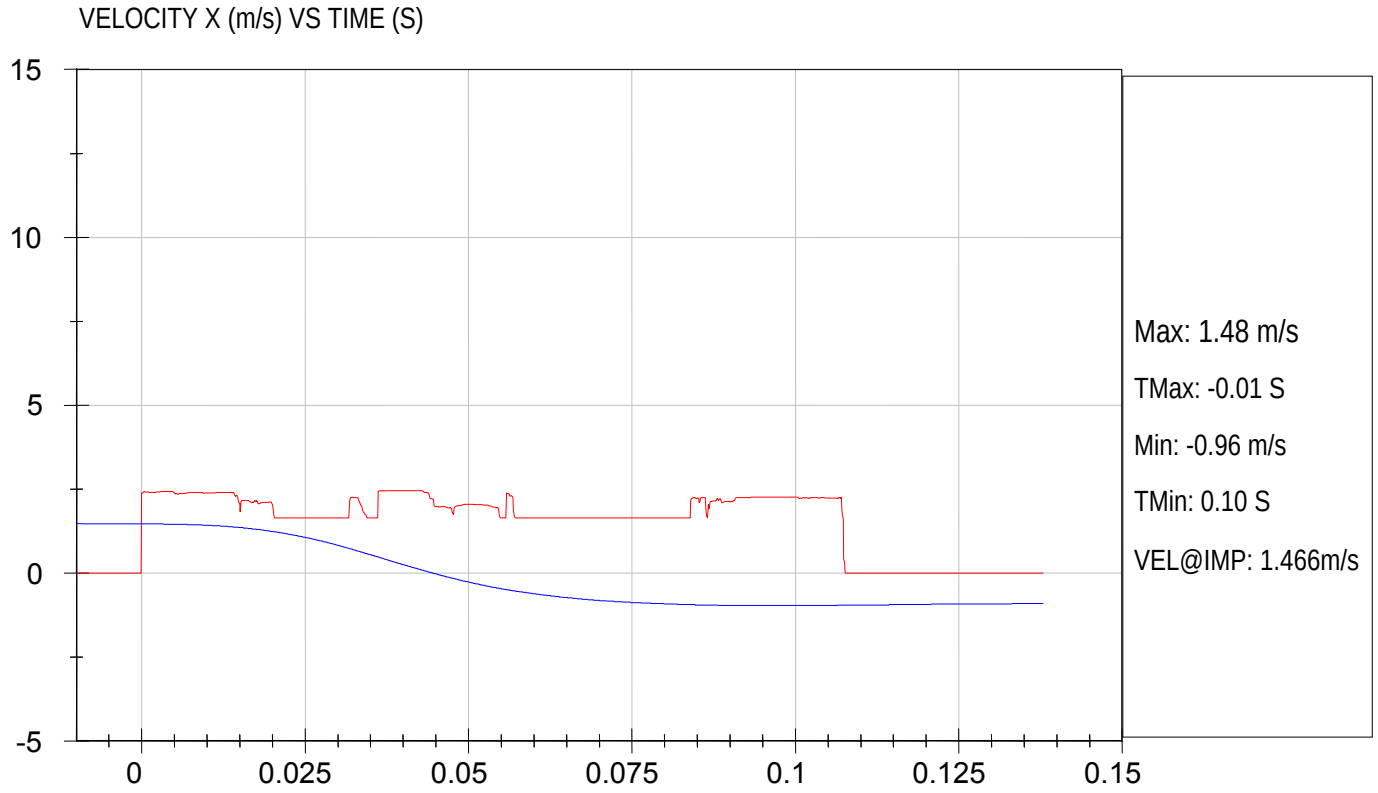


VELOCITY X (m/s) VS TIME (S)



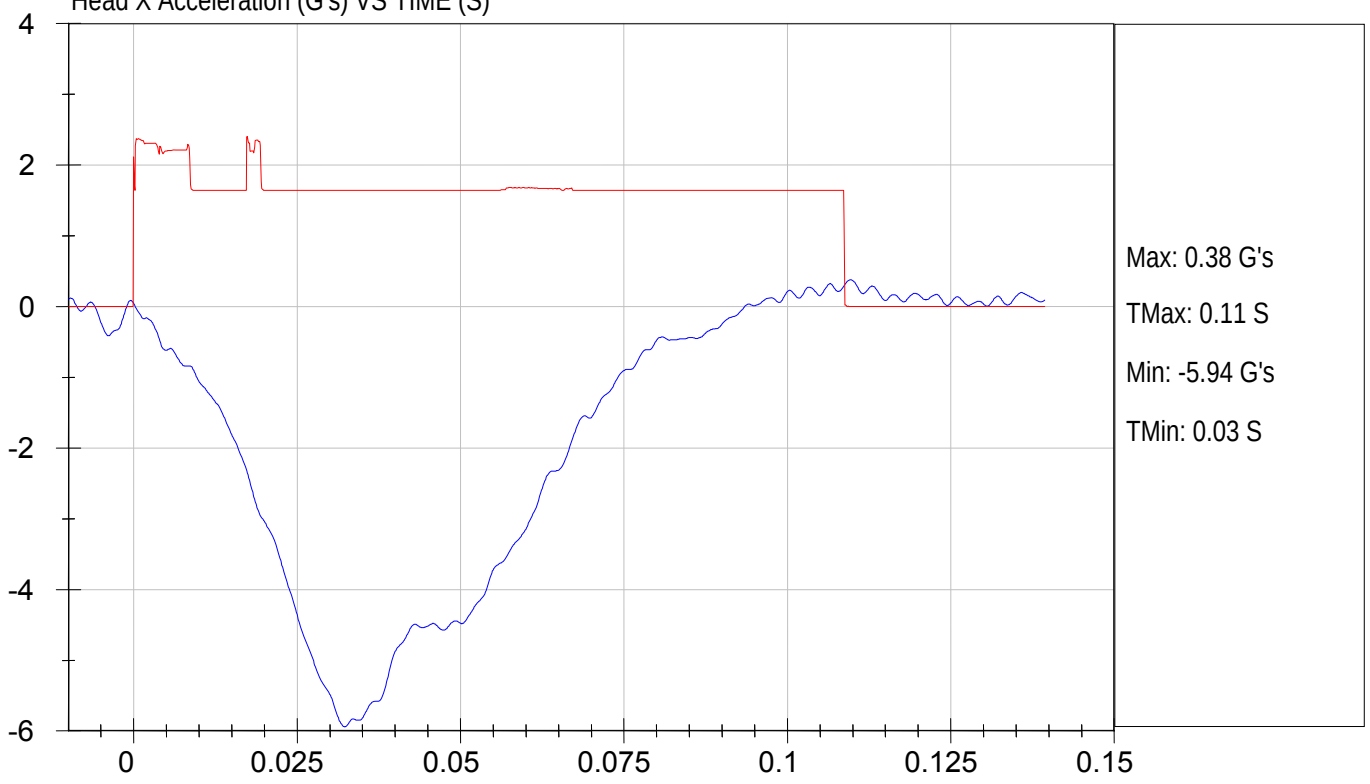
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s) Test Date: 1-6-2010
Component ID: Trans Tech Rondak - Trap: 1.554 m/s Location: S1 H3
NHTSA #: C90903

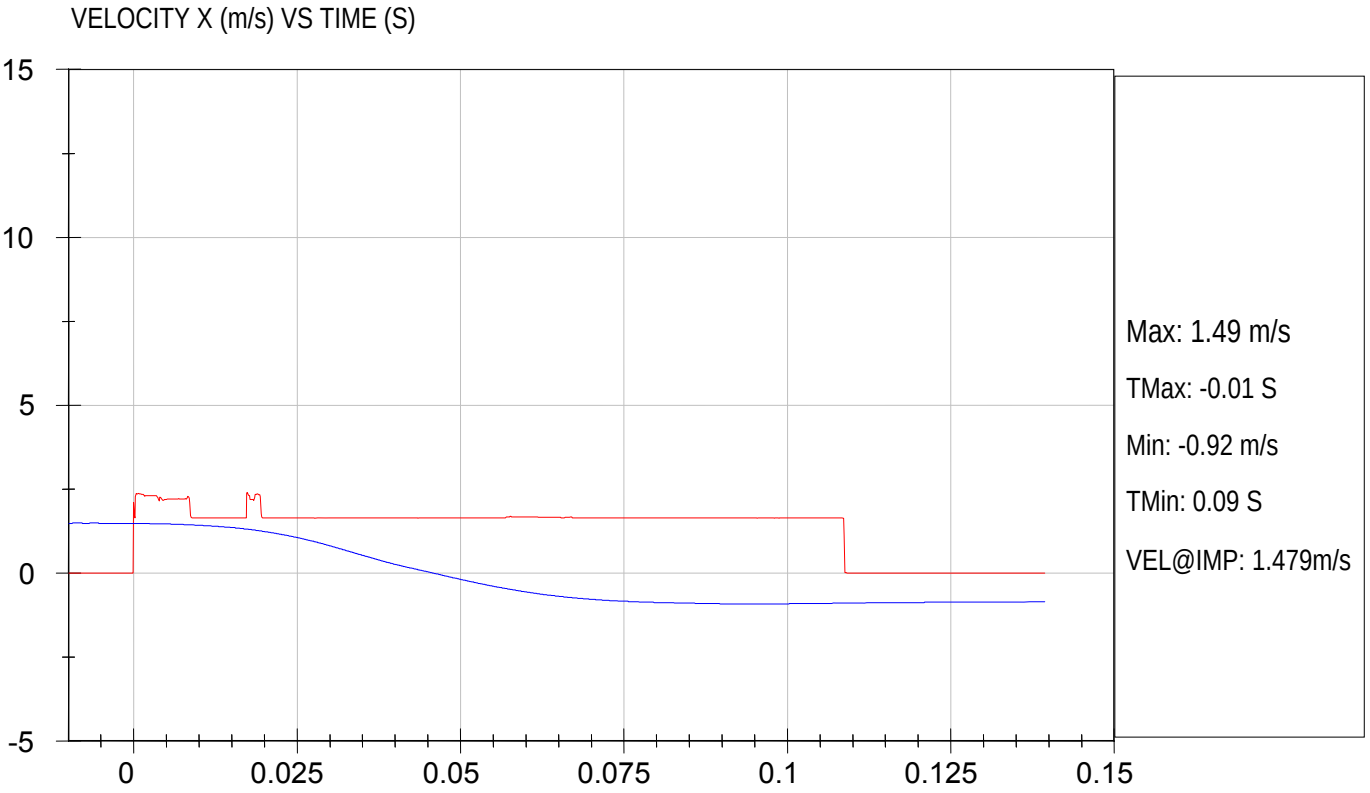




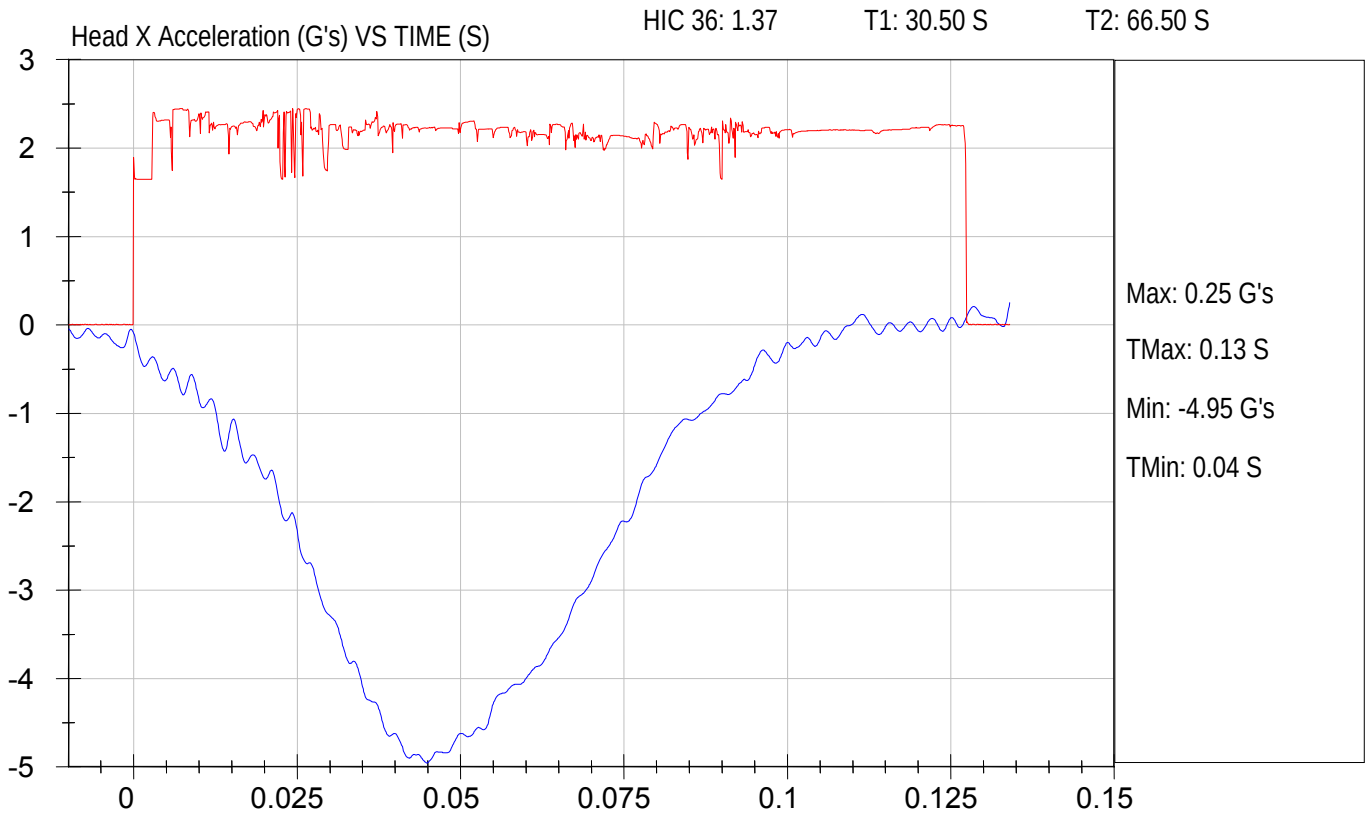
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s) Test Date: 1-6-2010
Component ID: Trans Tech Rondak - Trap: 1.579 m/s Location: S1 H4
NHTSA #: C90903

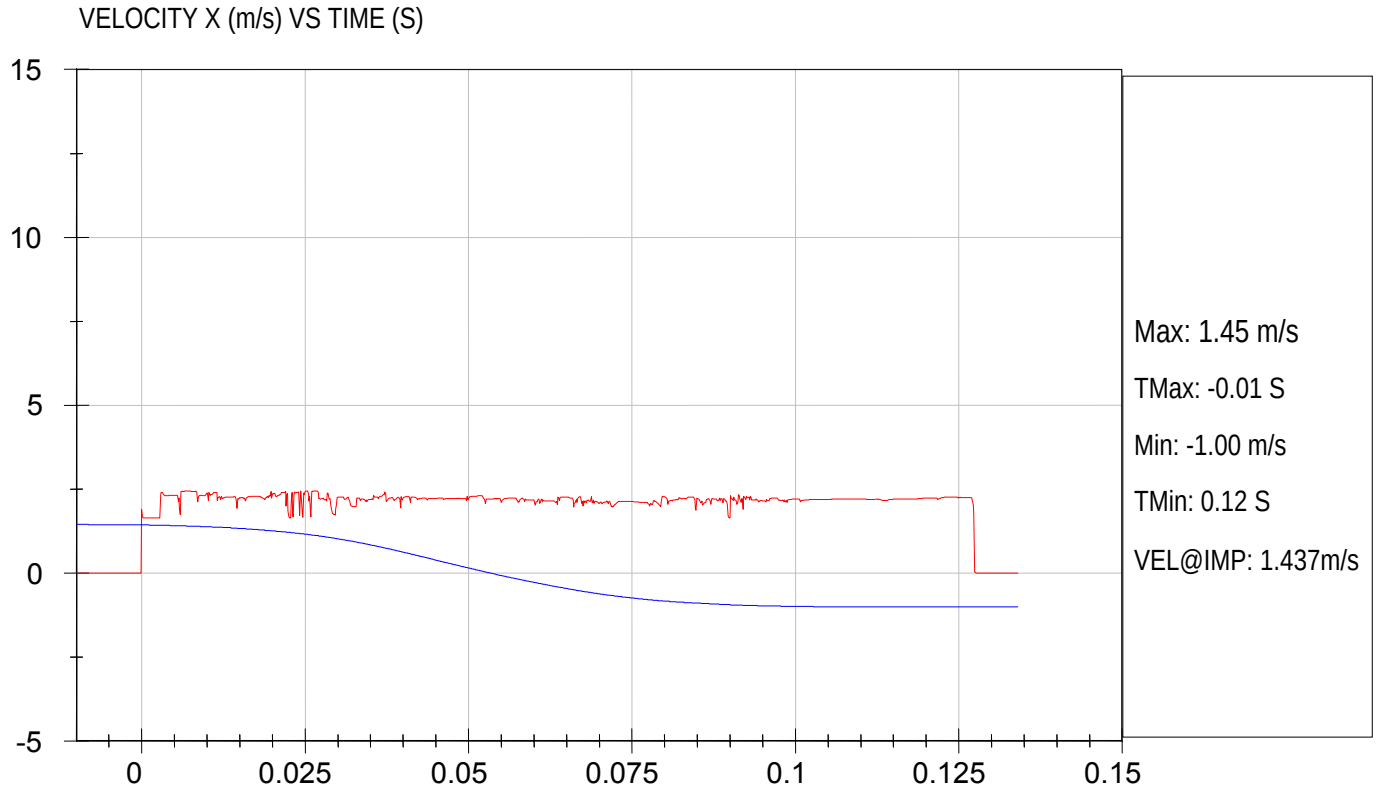
HIC 36: 1.75 T1: 21.90 S T2: 57.90 S





FMVSS 222 HEAD FORM IMPACTS (1.5 m/s) Test Date: 1-6-2010
Component ID: Trans Tech Rondak - Trap: 1.568 m/s Location: S1 H5
NHTSA #: C90903

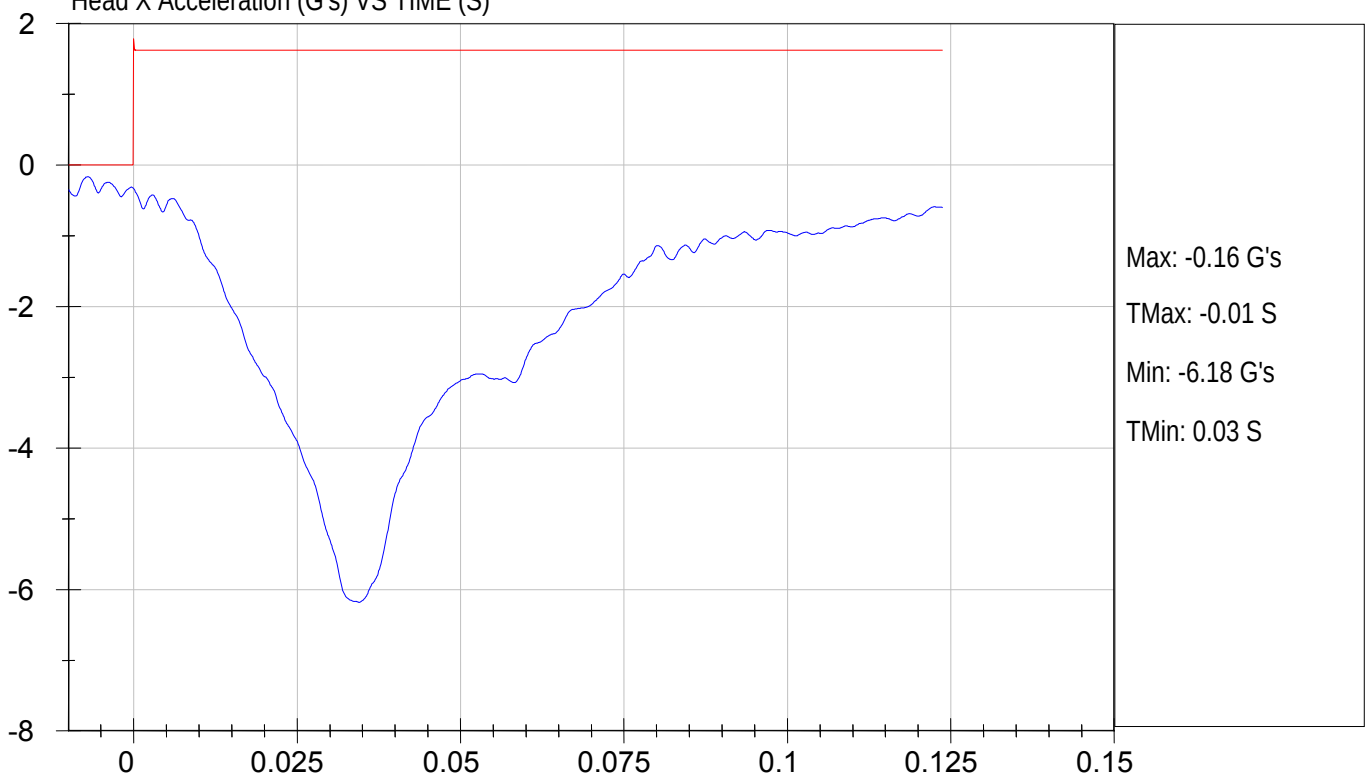


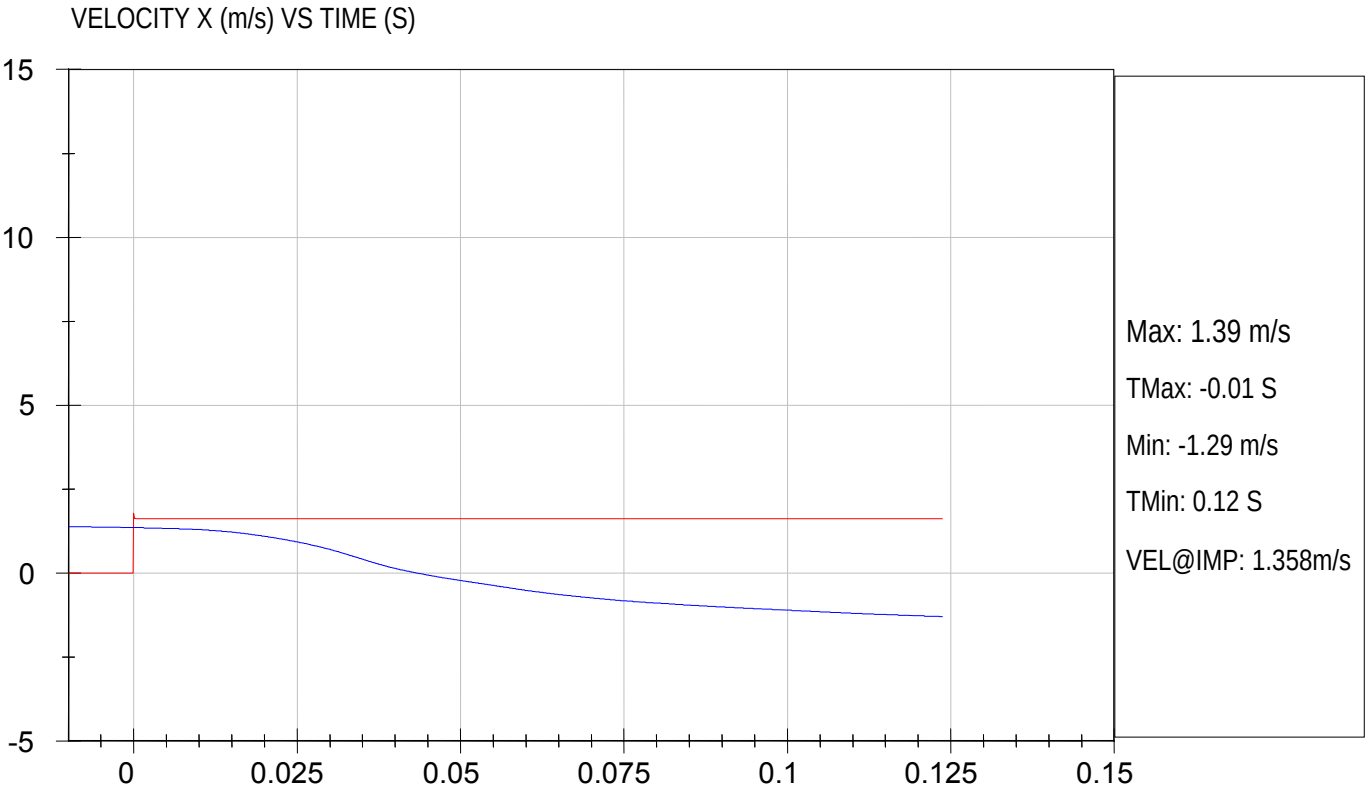


FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)
Component ID: Trans Tech Rondak - Trap: 1.519
NHTSA #: C90903

Test Date: 1-12-2010
Location: B1 H1

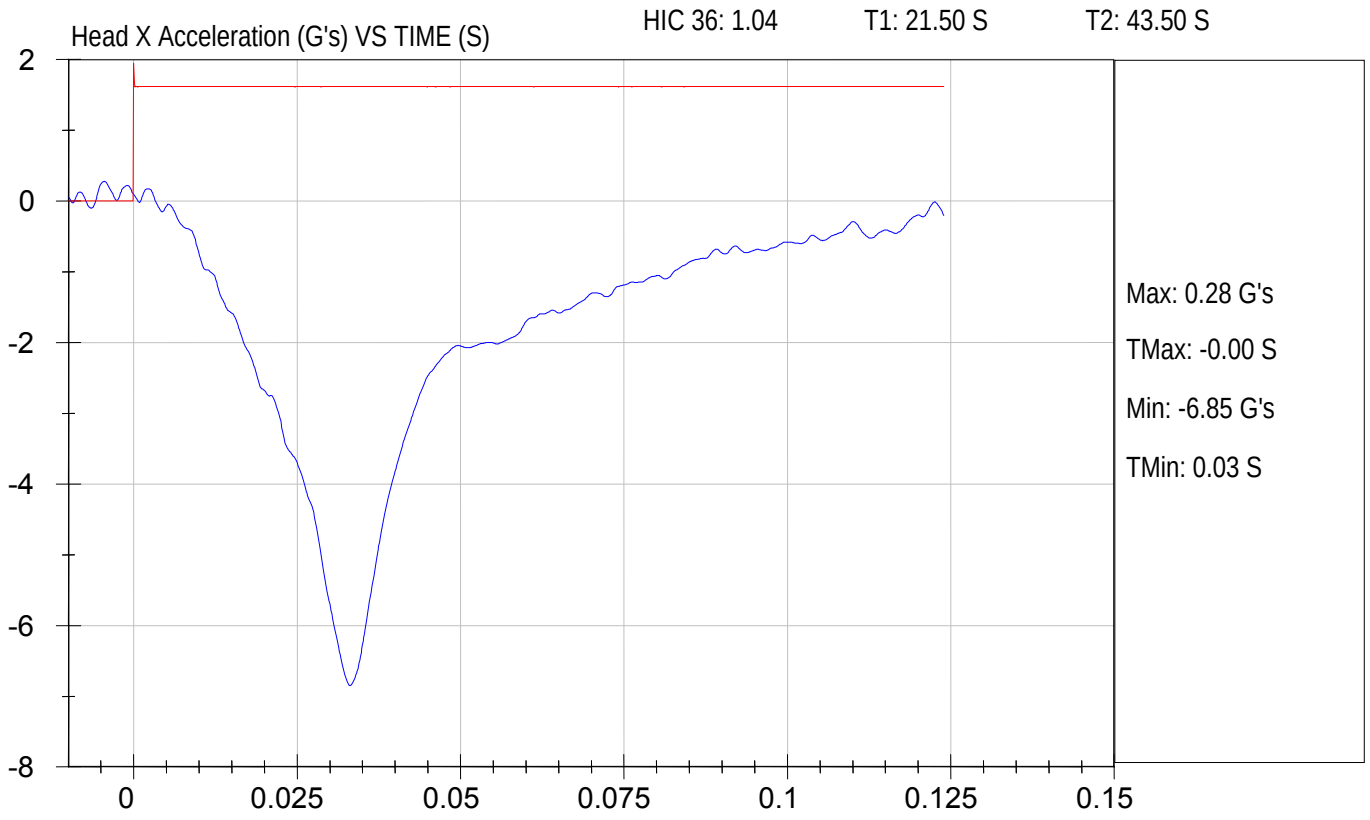
HIC 36: 1.32 T1: 20.40 S T2: 56.40 S

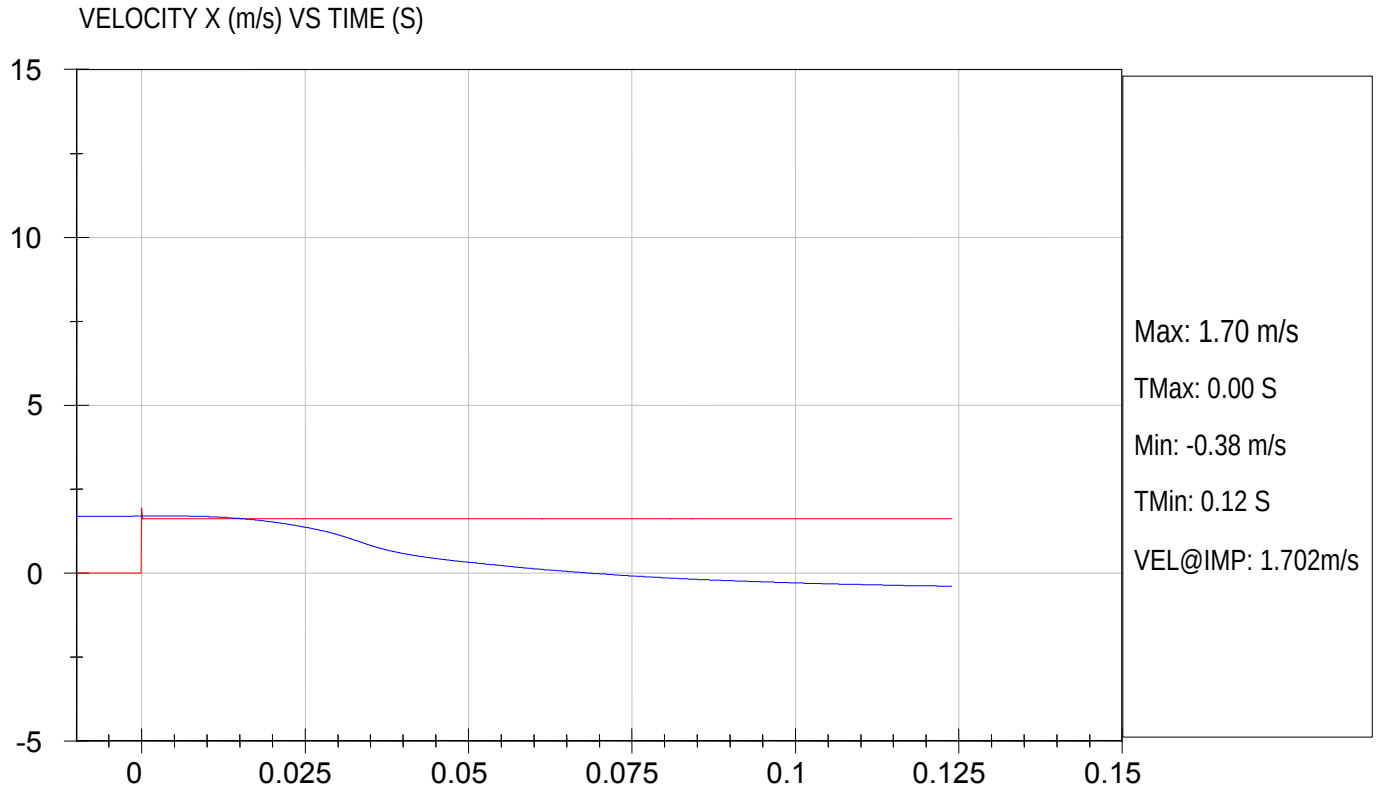




FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)
Component ID: Trans Tech Rondak - Trap: 1.603
NHTSA #: C90903

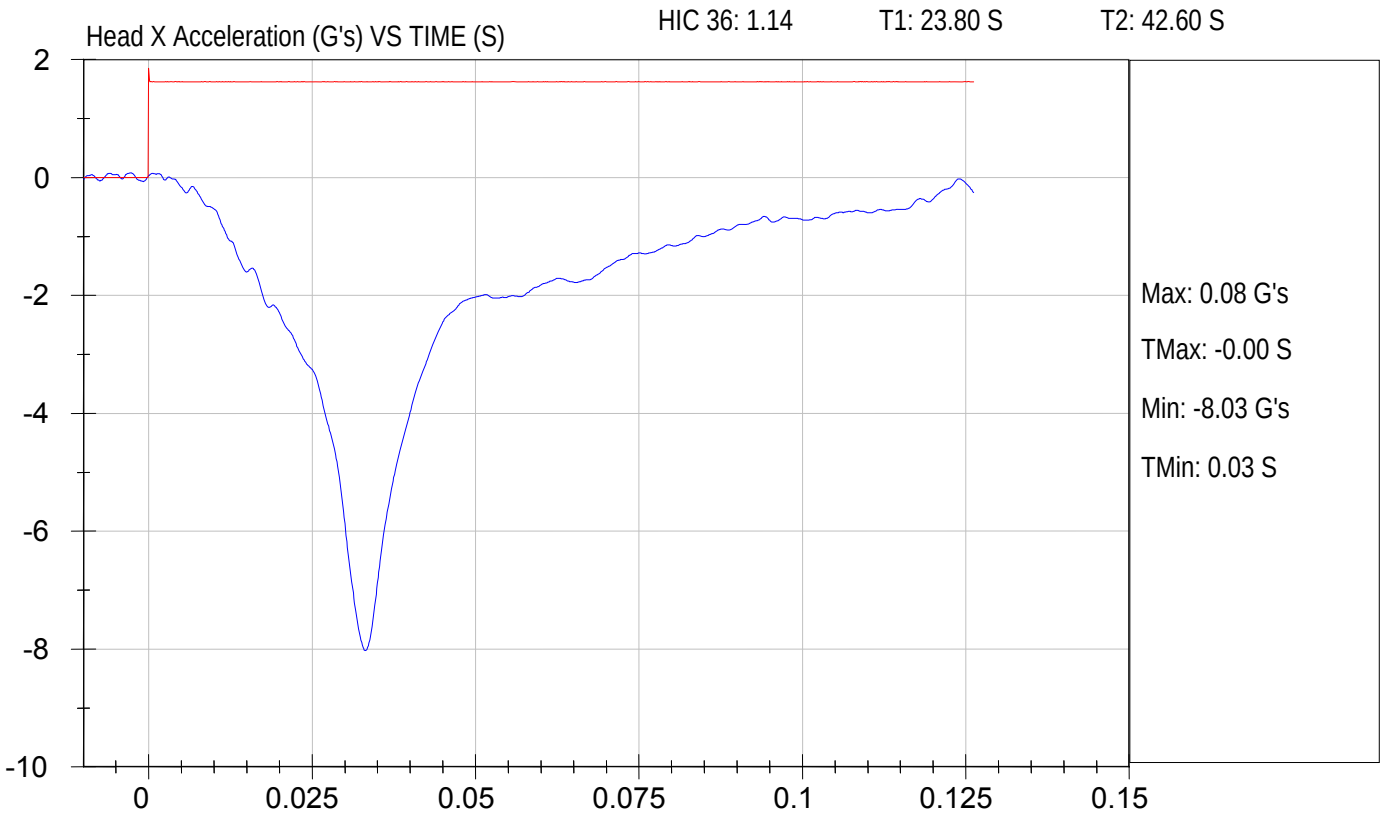
Test Date: 1-12-2010
Location: B1 H2

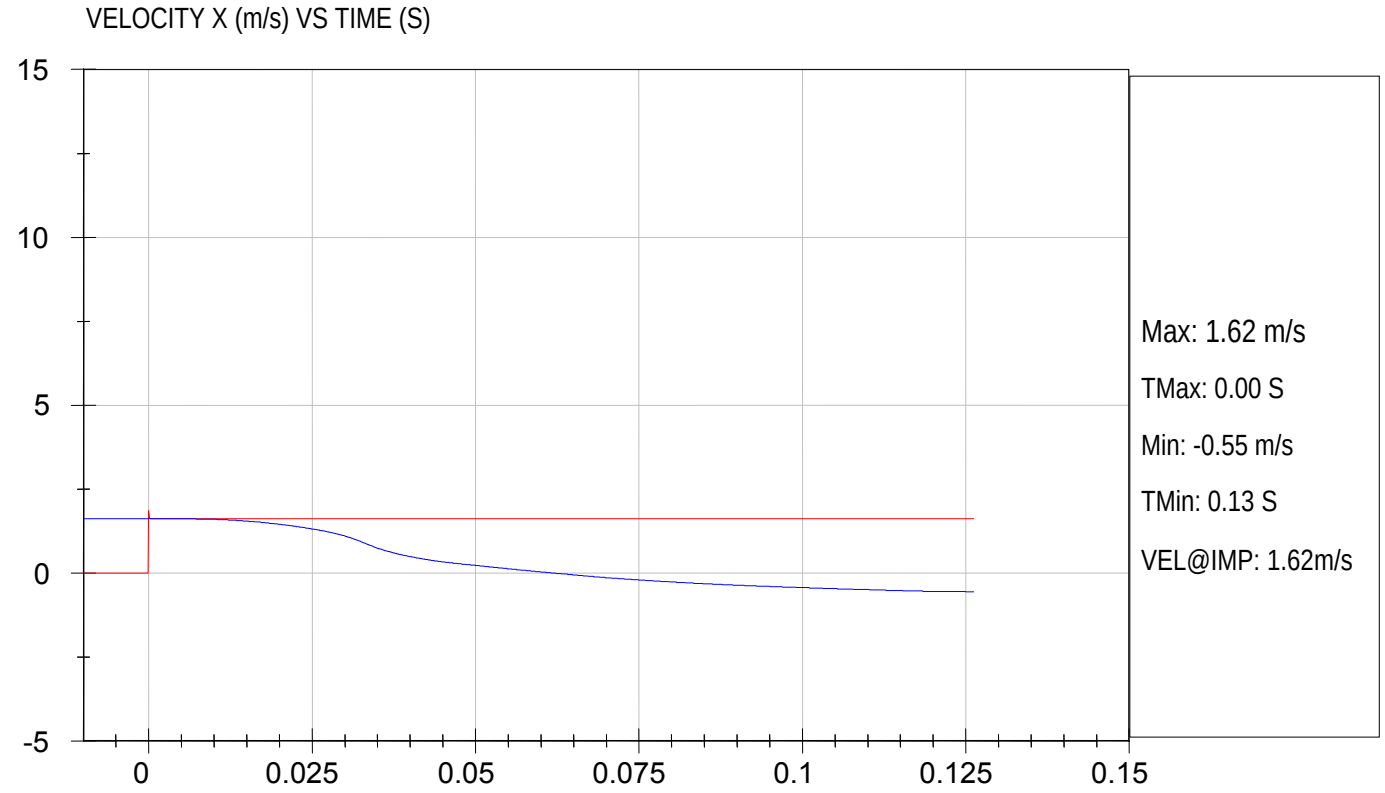




FMVSS 222 HEAD FORM IMPACTS (1.5 m/s)
Component ID: Trans Tech Rondak - Trap: 1.601
NHTSA #: C90903

Test Date: 1-12-2010
Location: B1 H3

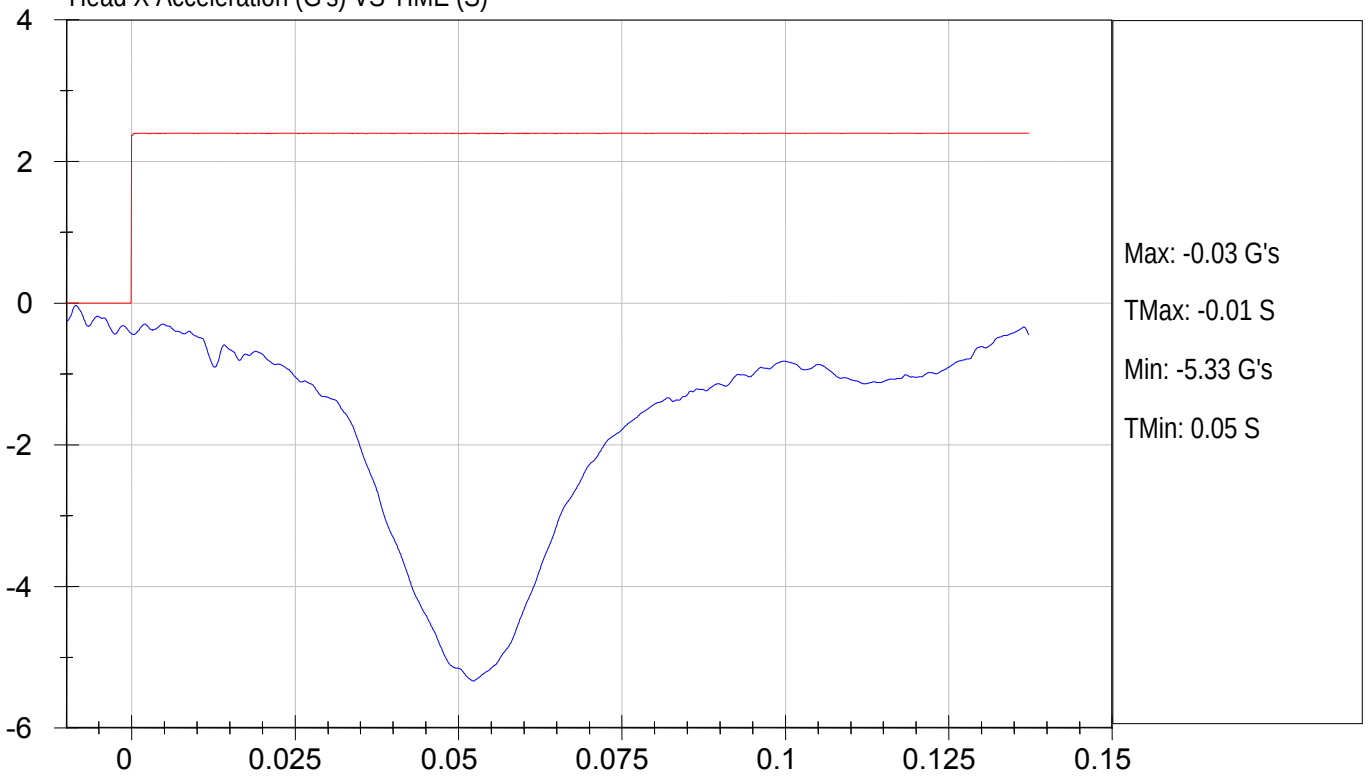




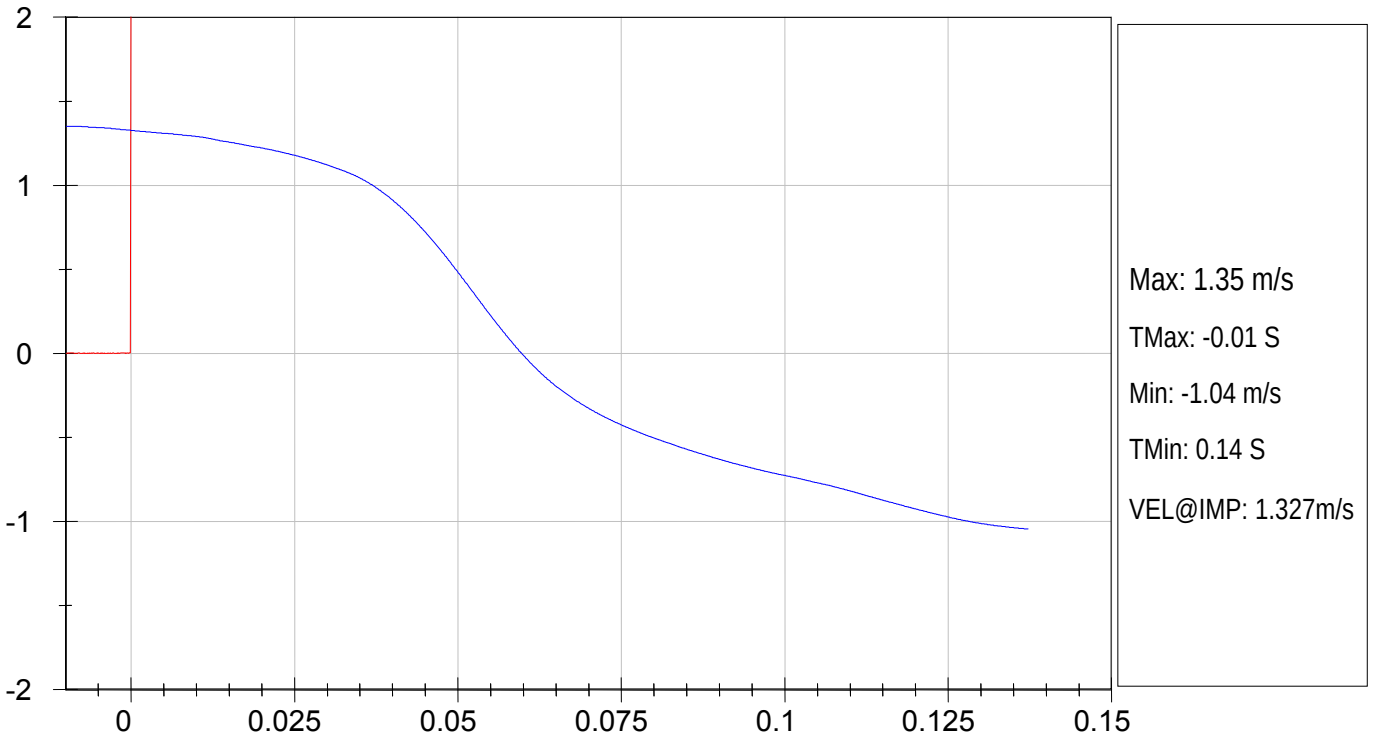
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s) Test Date: 1-12-2010
Component ID: Trans Tech Rondak - Trap: 1.554 m/s Location: B1 H4
NHTSA #: C90903

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

HIC 36: 1.12 T1: 36.90 S T2: 68.70 S



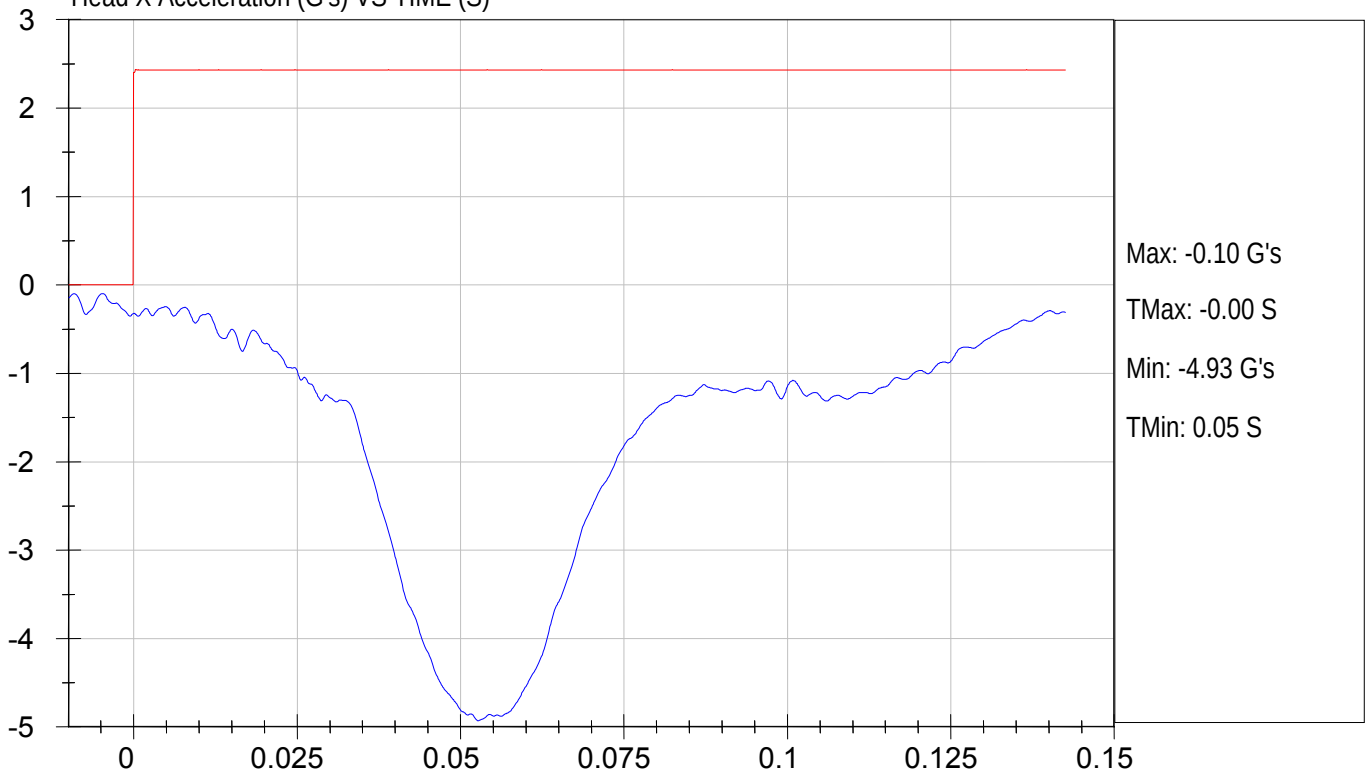
VELOCITY X (m/s) VS TIME (S)



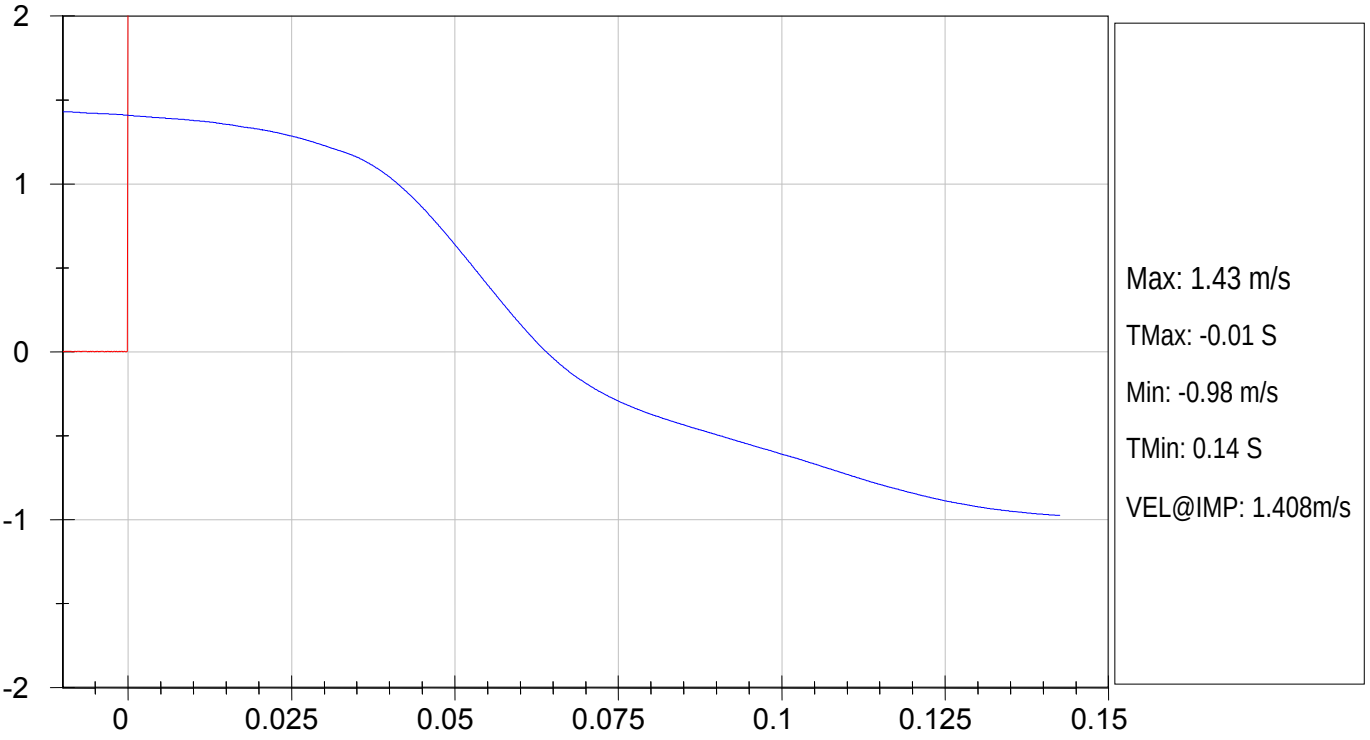
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s) Test Date: 1-12-2010
Component ID: Trans Tech Rondak – Trap: 1.587 m/s Location: B1 H5
NHTSA #: C90903

HIC 36: 1.08 T1: 37.40 S T2: 70.70 S

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

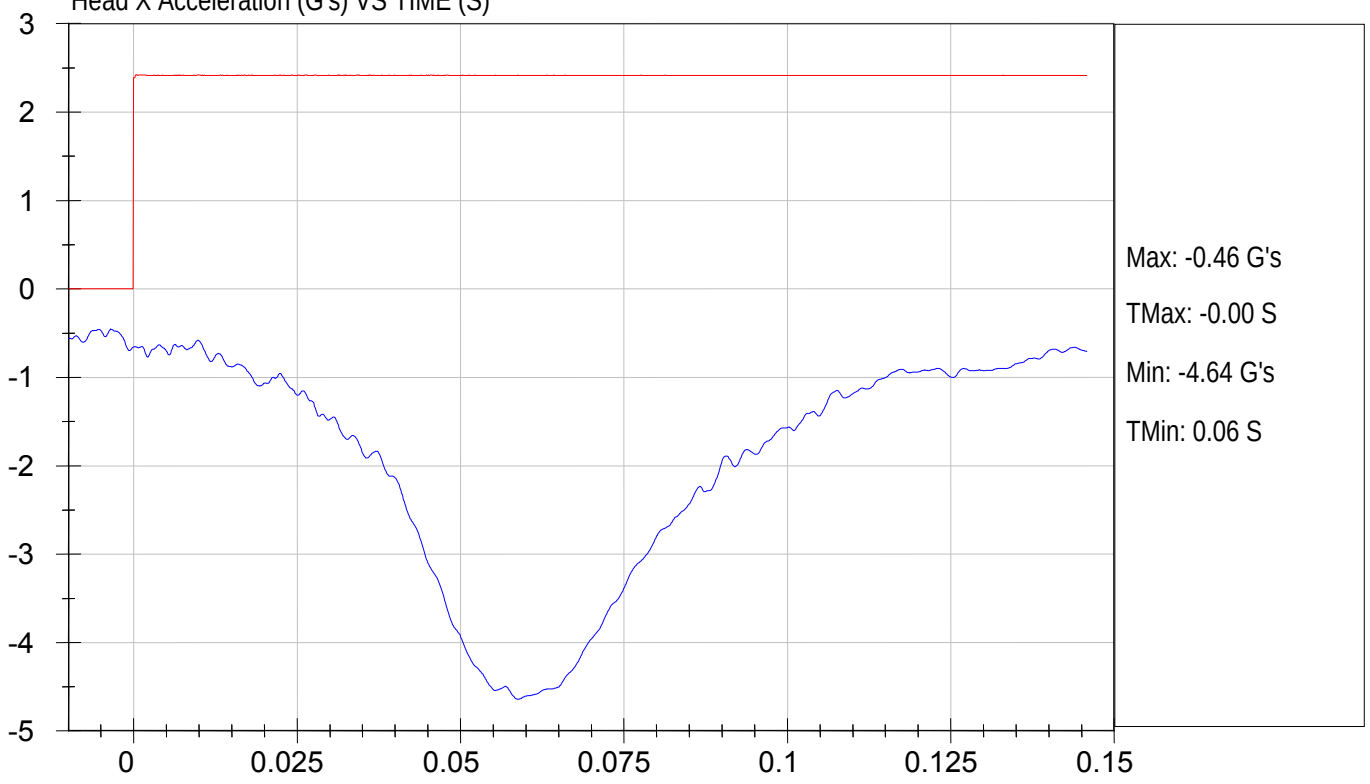


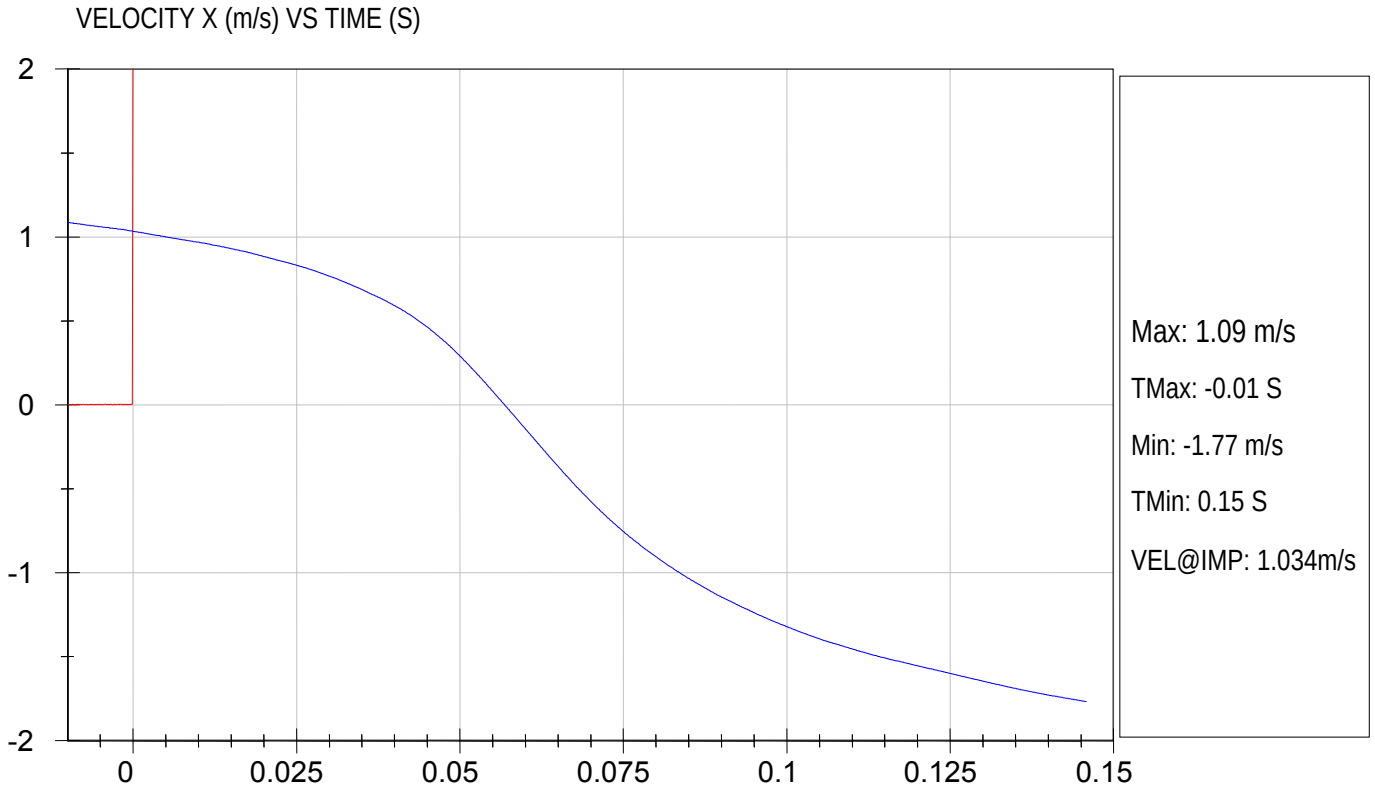
VELOCITY X (m/s) VS TIME (S)



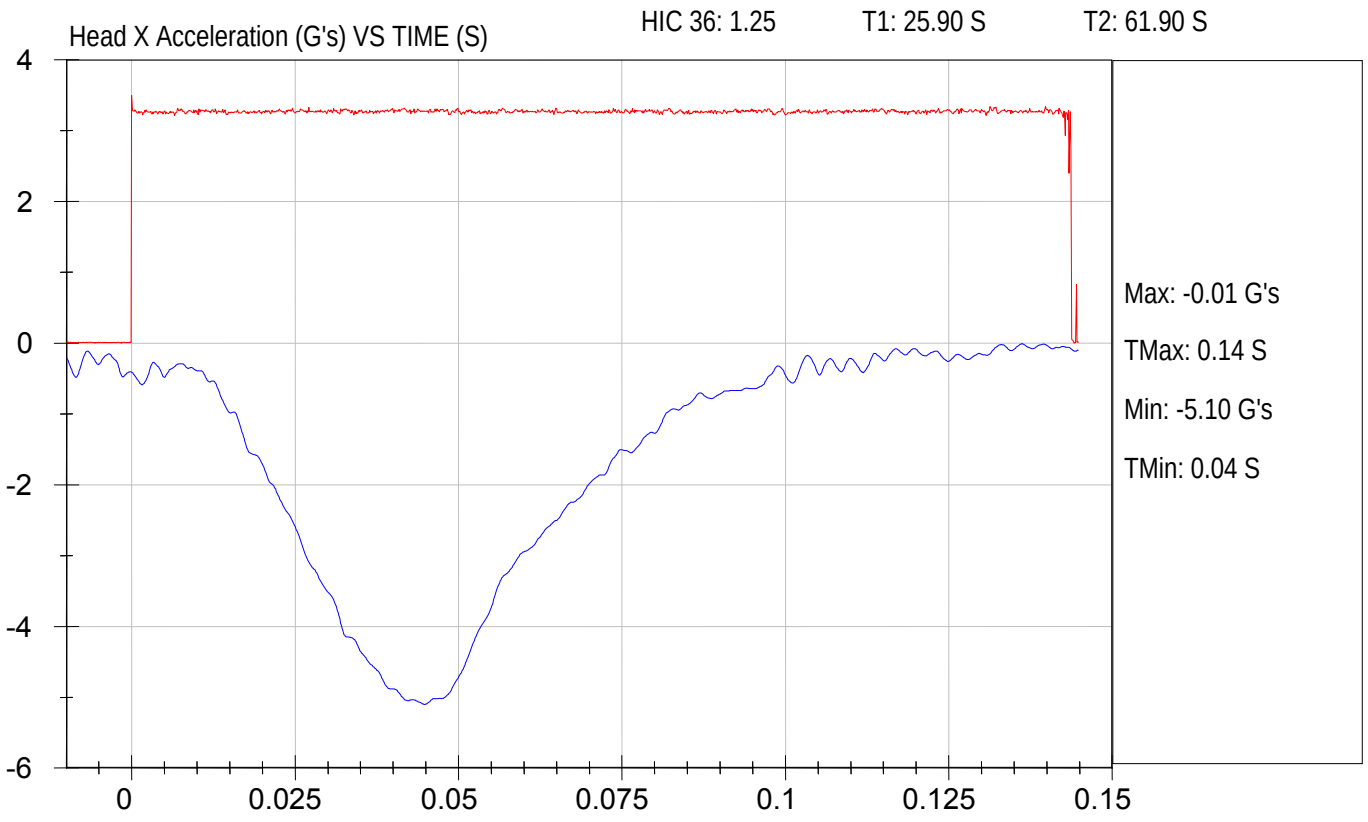
FMVSS 222 HEAD FORM IMPACTS (1.5 m/s) Test Date: 1-12-2010
Component ID: Trans Tech Rondak - Trap: 1.535 m/s Location: B1 H6
NHTSA #: C90903

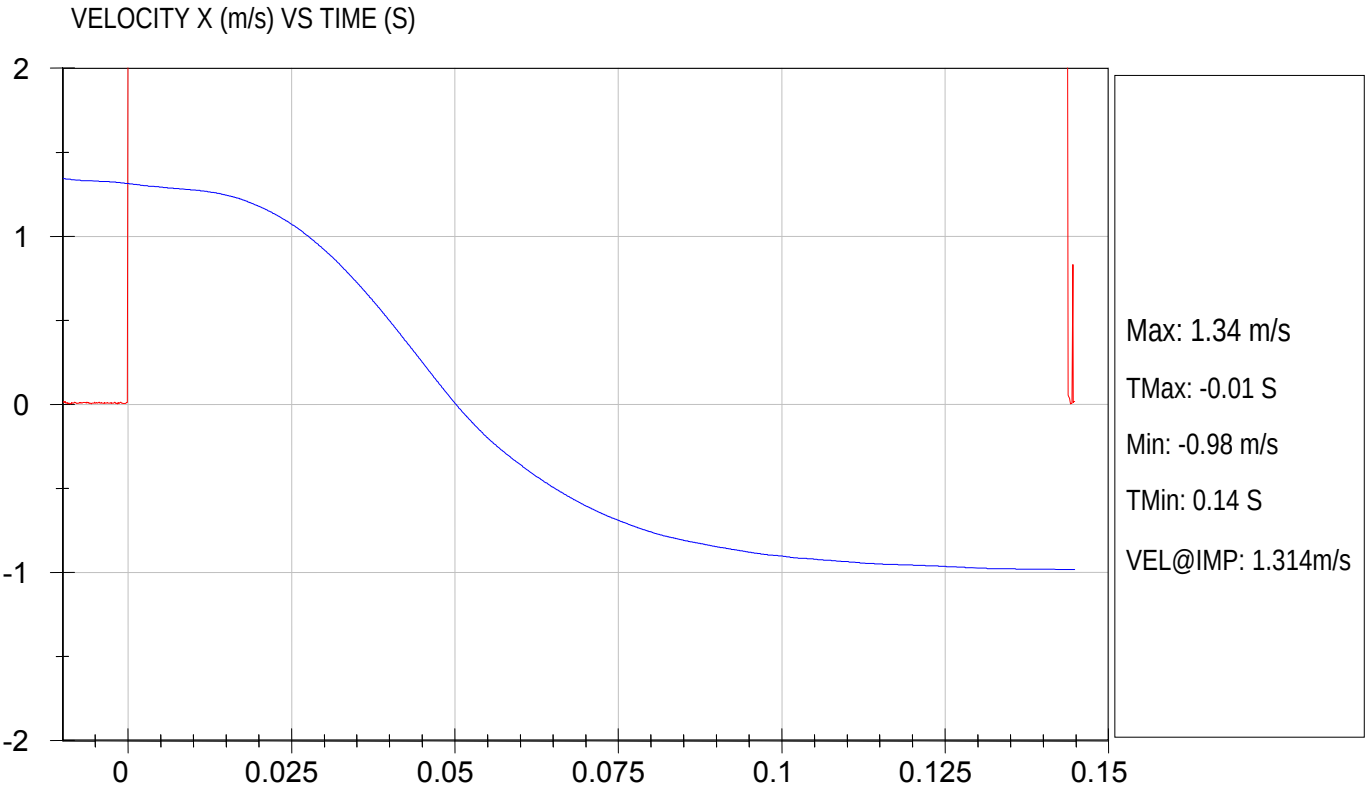
HIC 36: 1.12 T1: 43.80 S T2: 79.80 S





FMVSS 222 HEAD FORM IMPACTS (1.5 m/s) Test Date: 1-12-2010
Component ID: Trans Tech Rondak – Trap: 1.559 m/s Location: B1 H7
NHTSA #: C90903





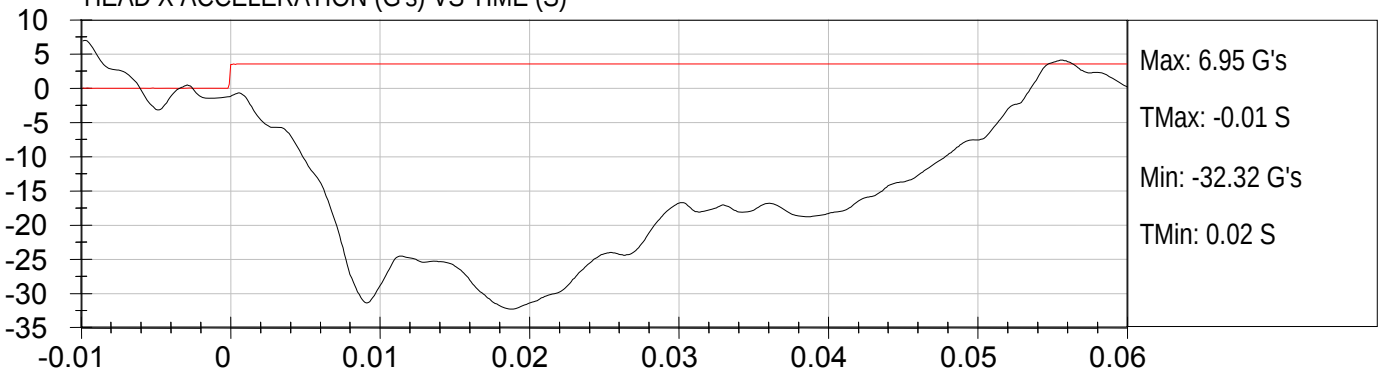
HEAD FORM IMPACT (6.69 m/s) Test Date: 1-8-2010

Component ID: Trans Tech Rondak - Trap: 6.628 m/s Location: S1 H8

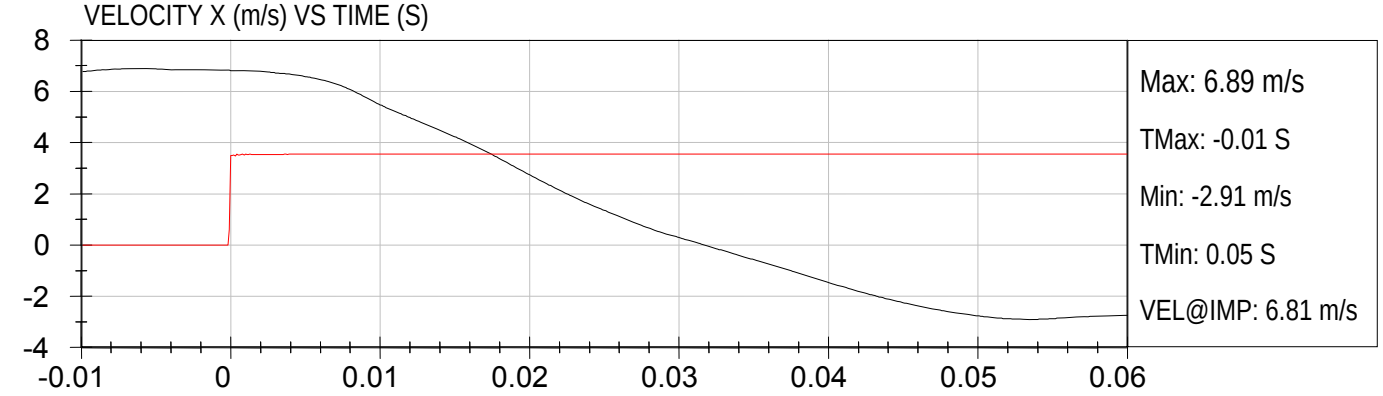
NHTSA#: C90903

Hic: 96.26 T1: 6.00 ms T2: 45.20 ms

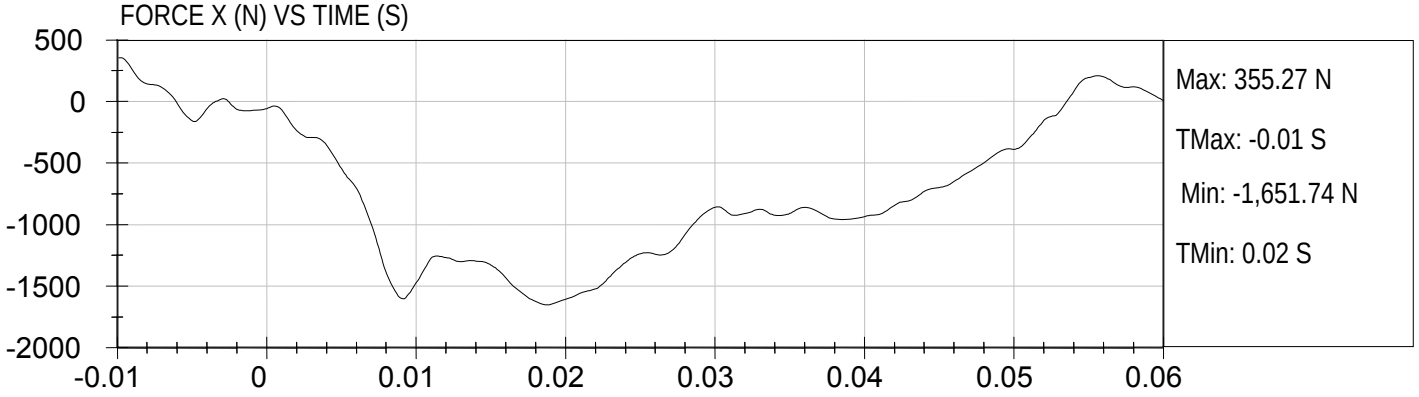
HEAD X ACCELERATION (G's) VS TIME (S)



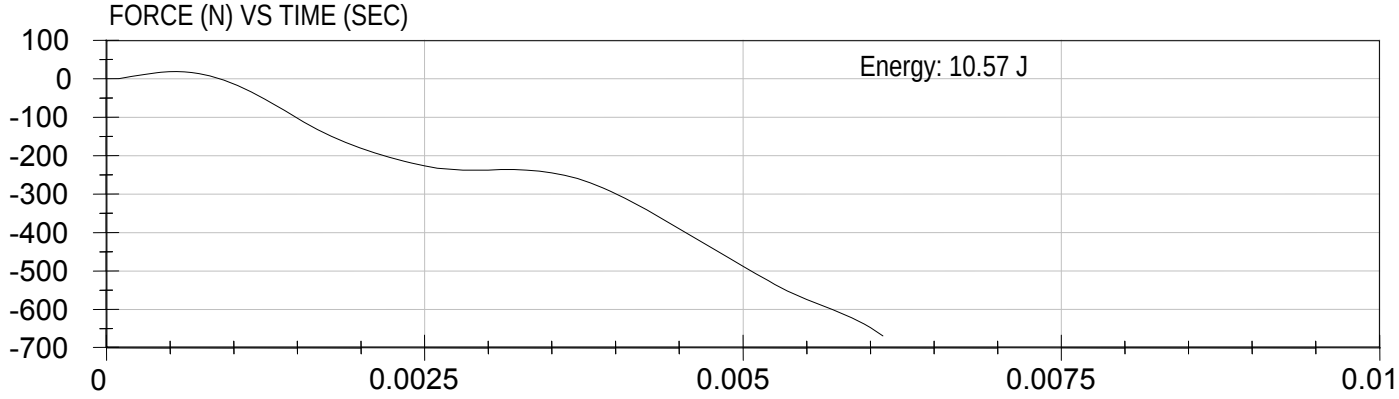
VELOCITY X (m/s) VS TIME (S)



FORCE X (N) VS TIME (S)



FORCE (N) VS TIME (SEC)



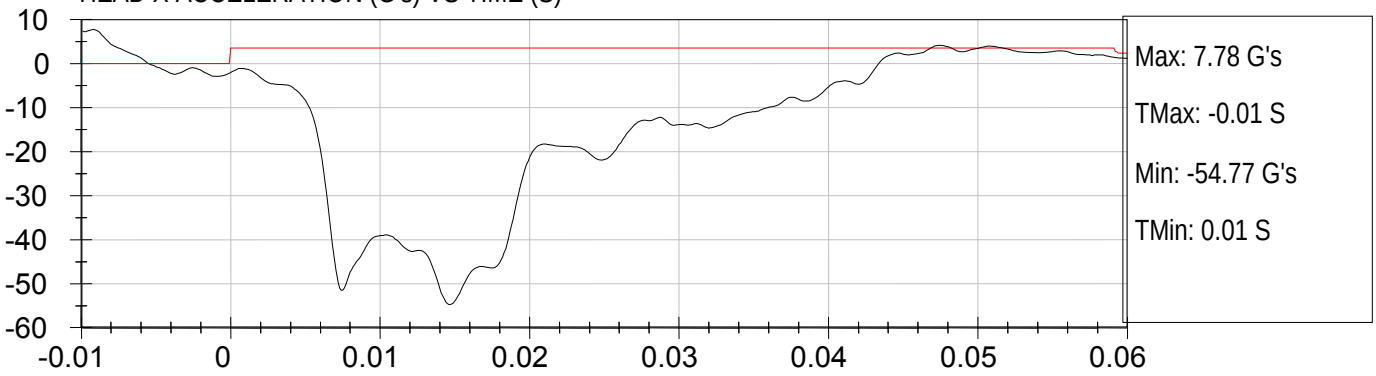
HEAD FORM IMPACT (6.69 m/s) Test Date: 1-8-2010

Component ID: Trans Tech Rondak - Trap: 6.619 m/s Location: S1 H9

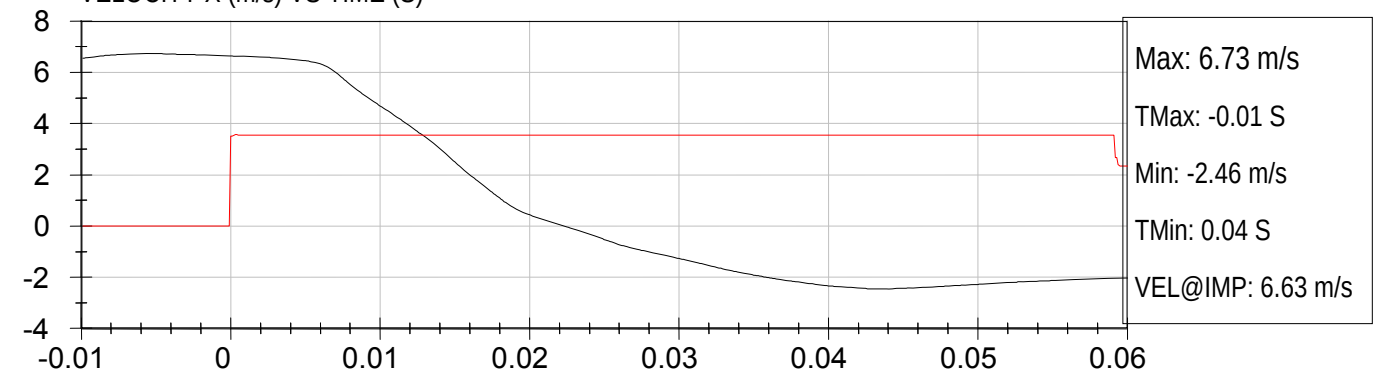
NHTSA #: C90903

Hic: 170.40 T1: 6.30 ms T2: 19.50 ms

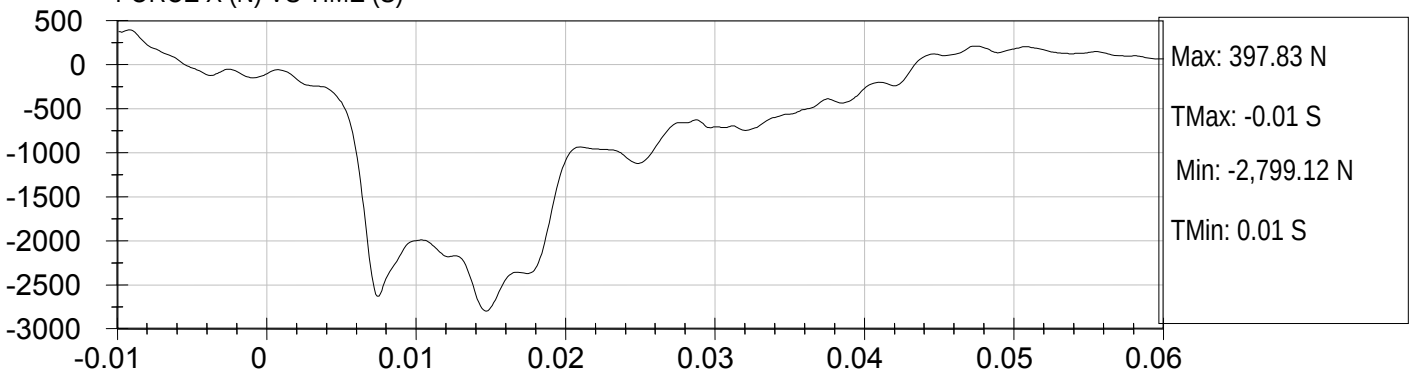
HEAD X ACCELERATION (G's) VS TIME (S)



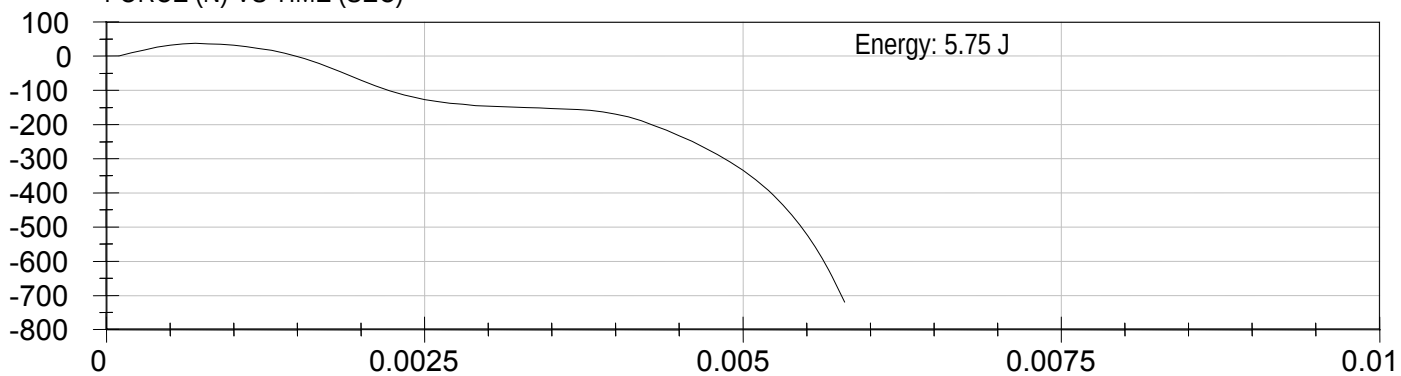
VELOCITY X (m/s) VS TIME (S)



FORCE X (N) VS TIME (S)



FORCE (N) VS TIME (SEC)



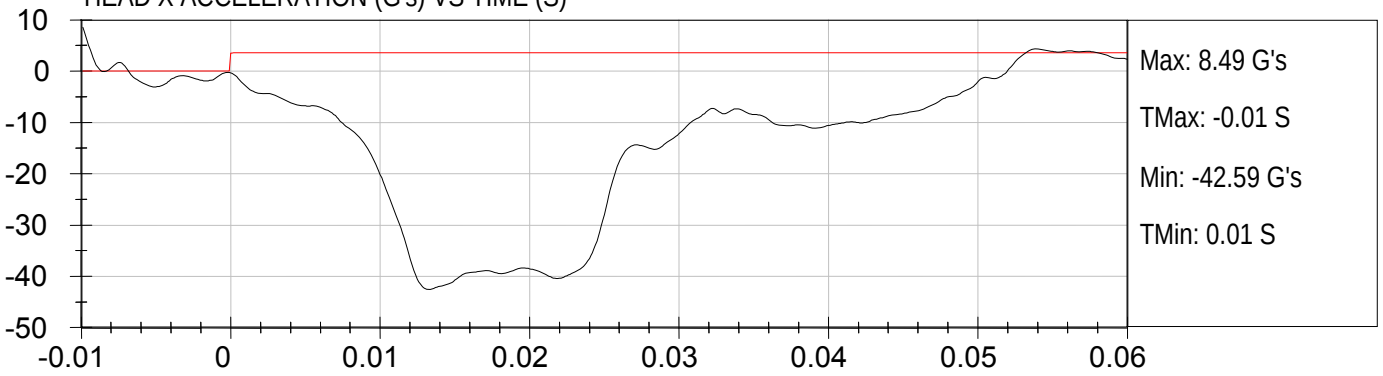
HEAD FORM IMPACT (6.69 m/s) Test Date: 1-8-2010

Component ID: Trans Tech Rondak - Trap: 6.659 m/s Location: S1 H10

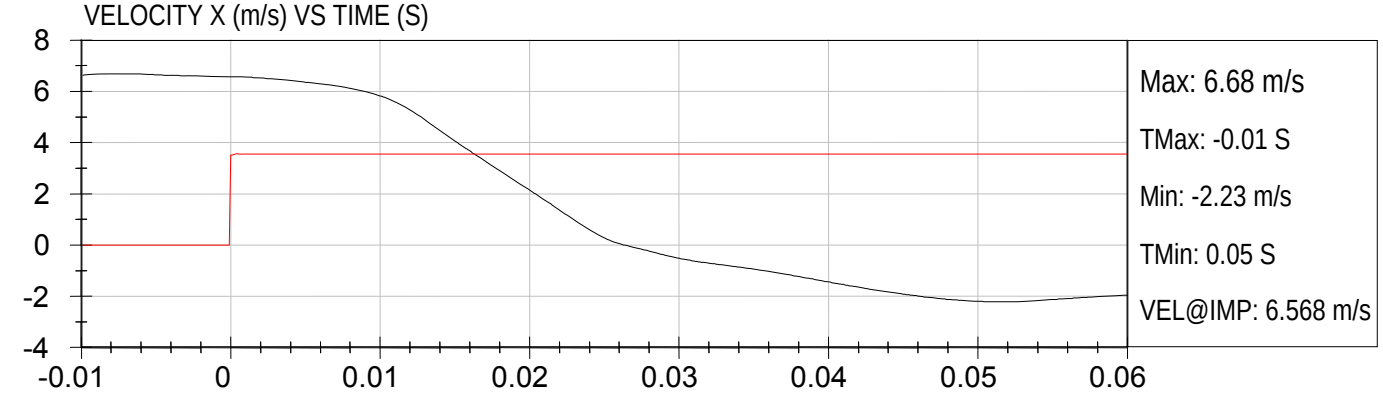
NHTSA#: C90903

Hic: 131.71 T1: 10.30 ms T2: 25.50 ms

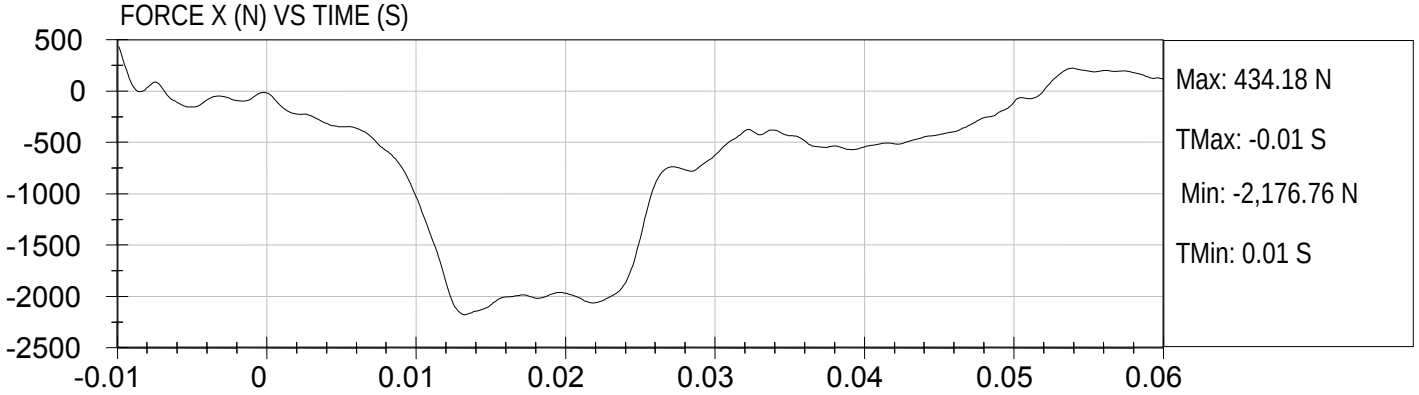
HEAD X ACCELERATION (G's) VS TIME (S)



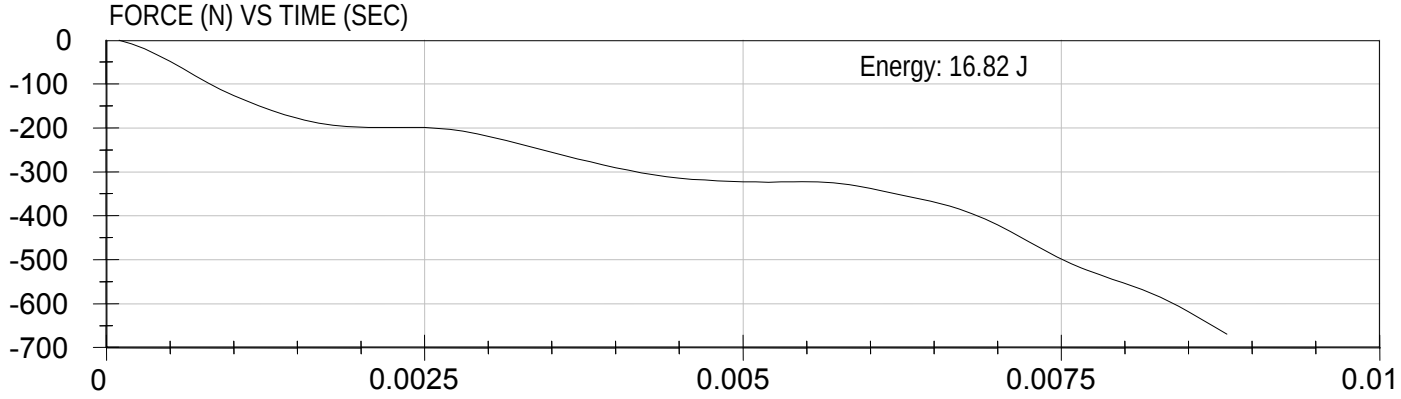
VELOCITY X (m/s) VS TIME (S)



FORCE X (N) VS TIME (S)



FORCE (N) VS TIME (SEC)



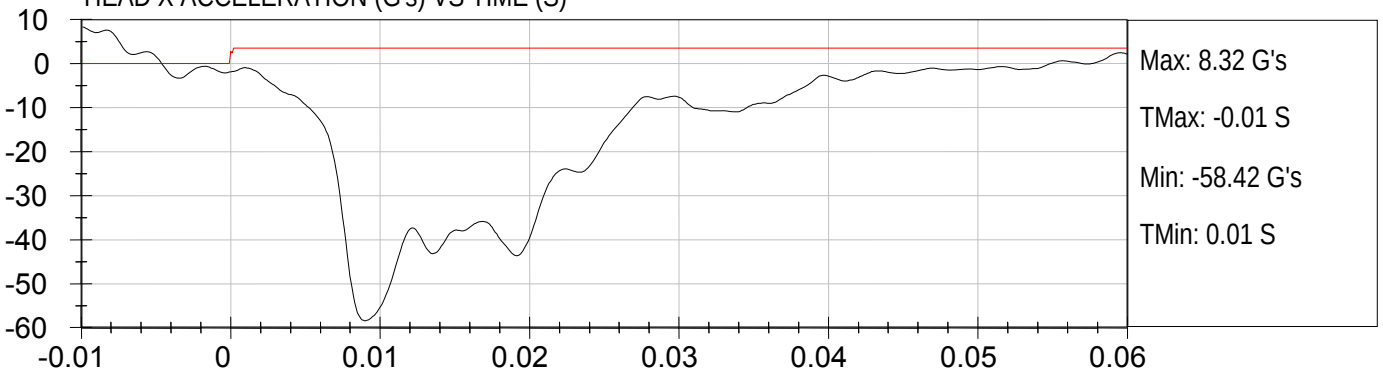
HEAD FORM IMPACT (6.69 m/s) Test Date: 1-11-2010

Component ID: Trans Tech Rondak - Trap: 6.691 m/s Location: S1 H11

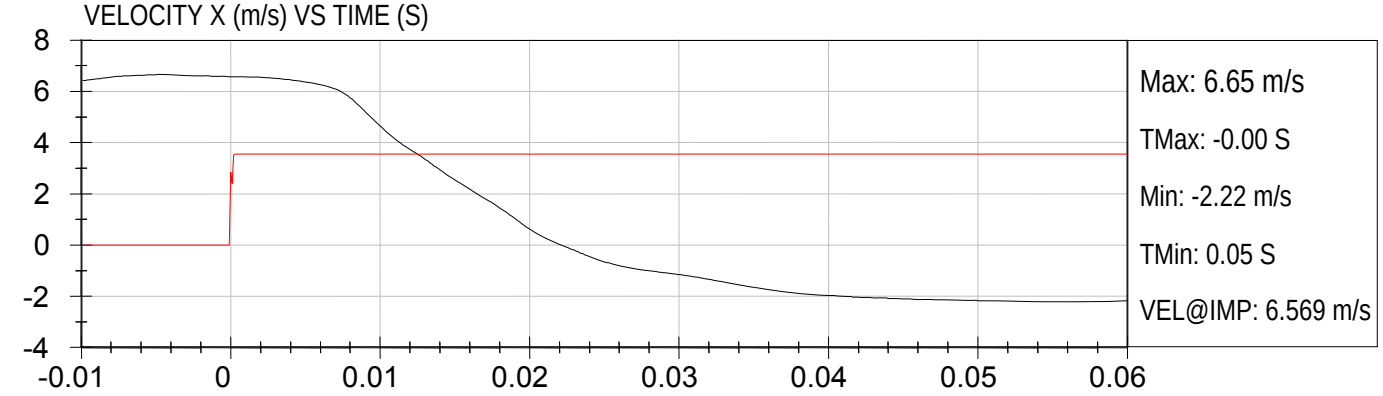
NHTSA#: C90903

Hic: 163.85 T1: 7.00 ms T2: 23.90 ms

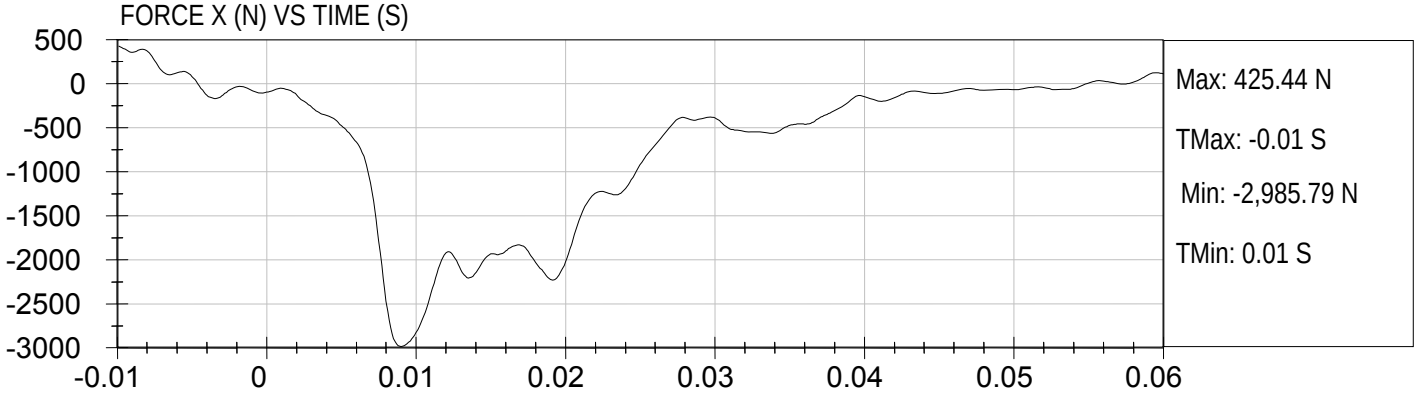
HEAD X ACCELERATION (G's) VS TIME (S)



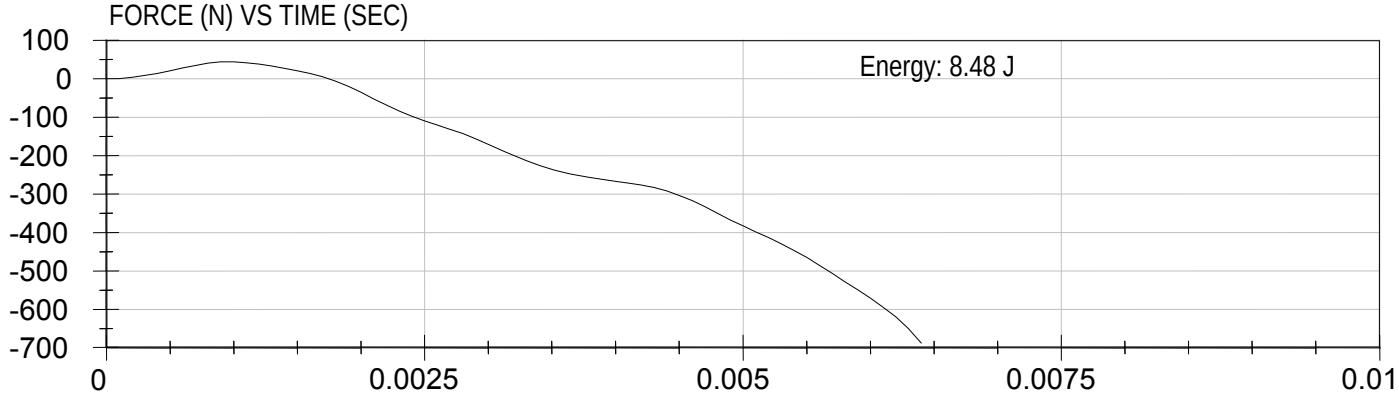
VELOCITY X (m/s) VS TIME (S)



FORCE X (N) VS TIME (S)



FORCE (N) VS TIME (SEC)



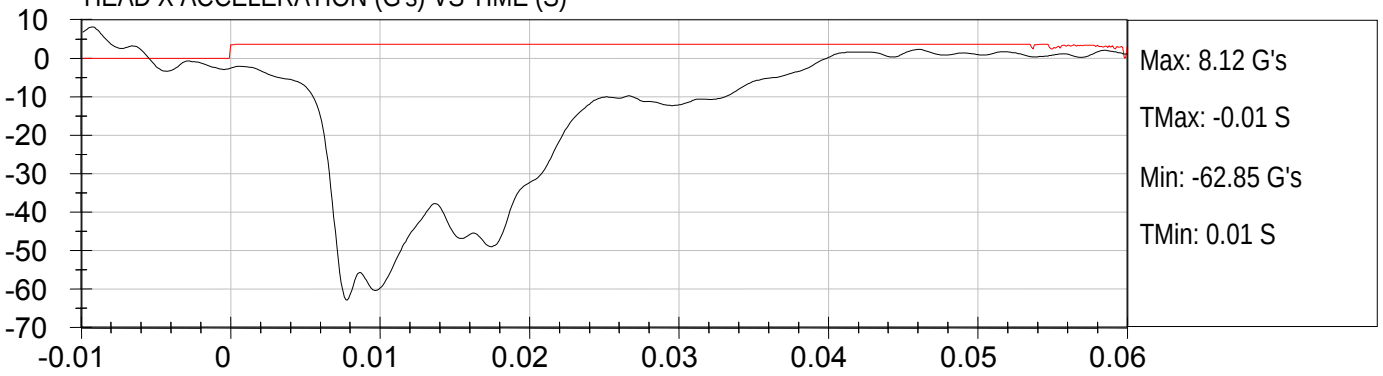
HEAD FORM IMPACT (6.69 m/s) Test Date: 1-11-2010

Component ID: Trans Tech Rondak - Trap: 6.690 m/s Location: S1 H12

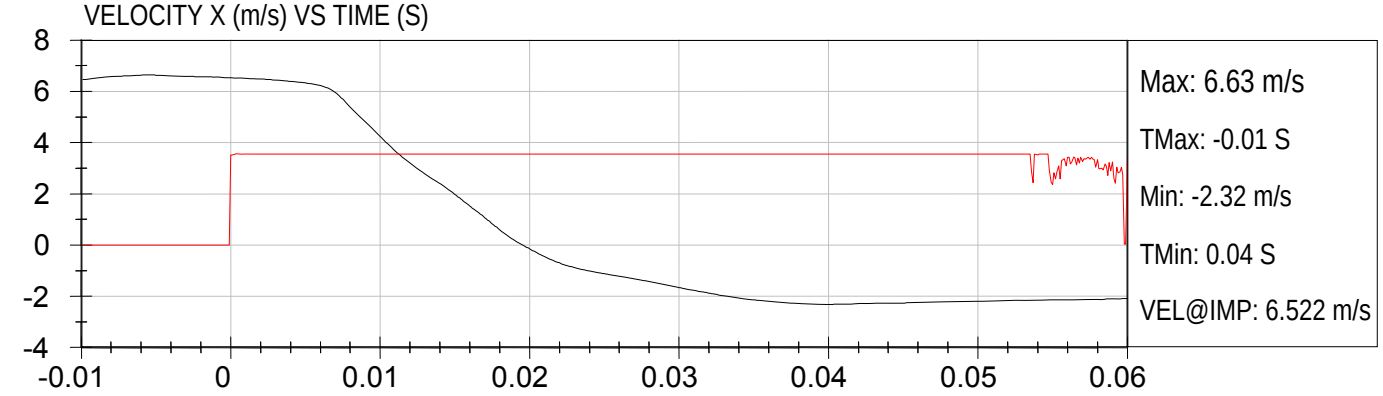
NHTSA#: C90903

Hic: 211.00 T1: 6.50 ms T2: 21.20 ms

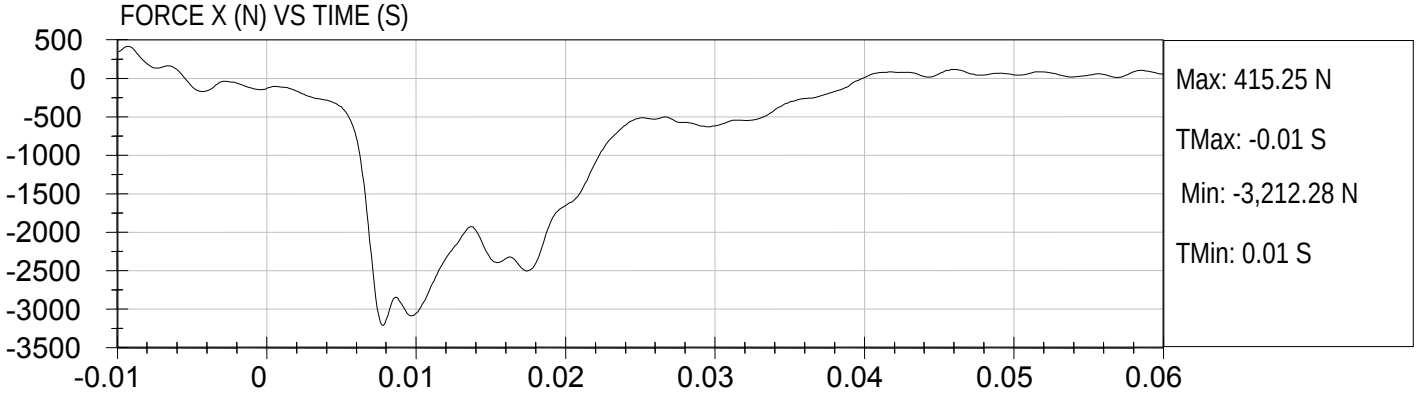
HEAD X ACCELERATION (G's) VS TIME (S)



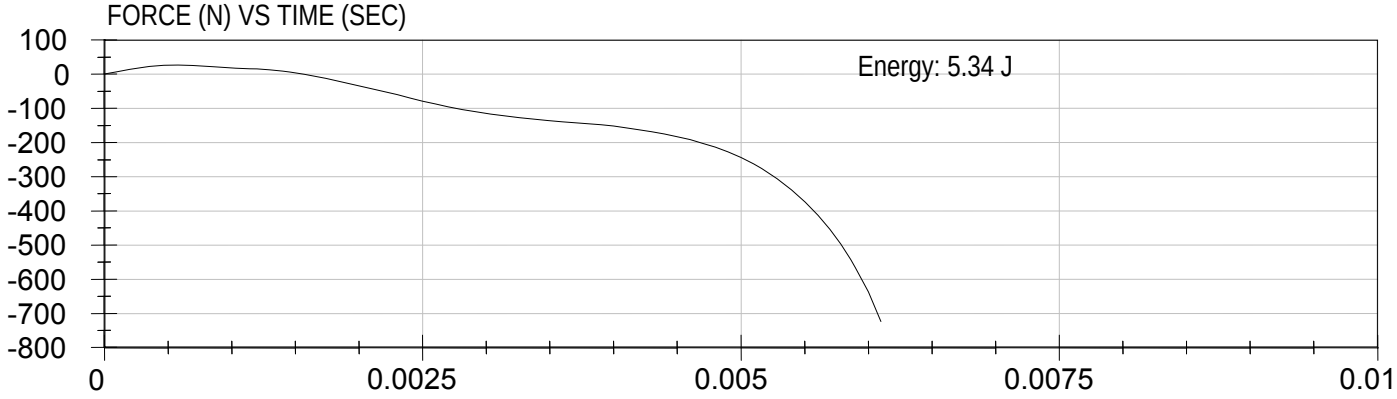
VELOCITY X (m/s) VS TIME (S)



FORCE X (N) VS TIME (S)



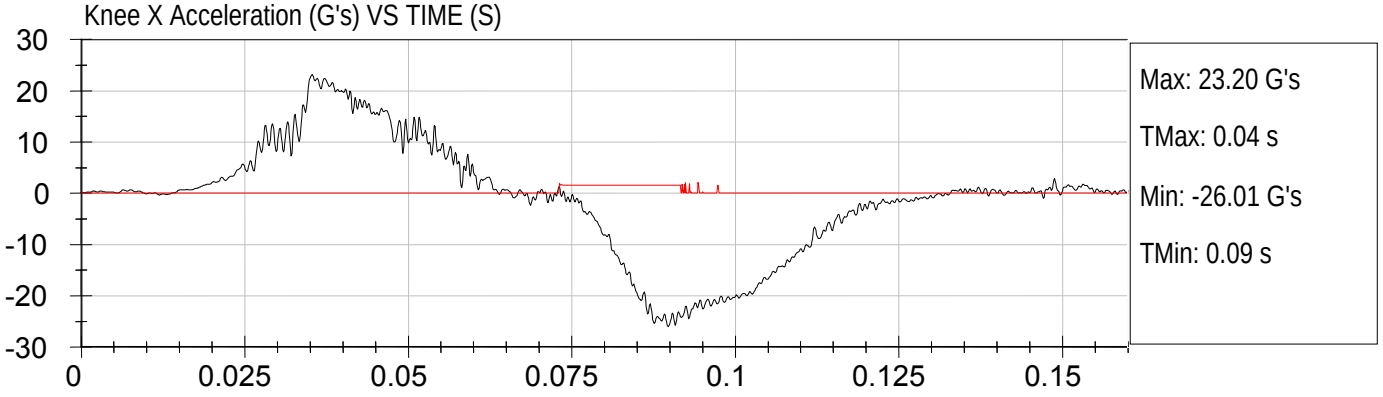
FORCE (N) VS TIME (SEC)



FMVSS 222 KNEE FORM IMPACTS
Component ID: Trans Tech Rondak - Trap: 4.924 m/s
NHTSA #: C909003

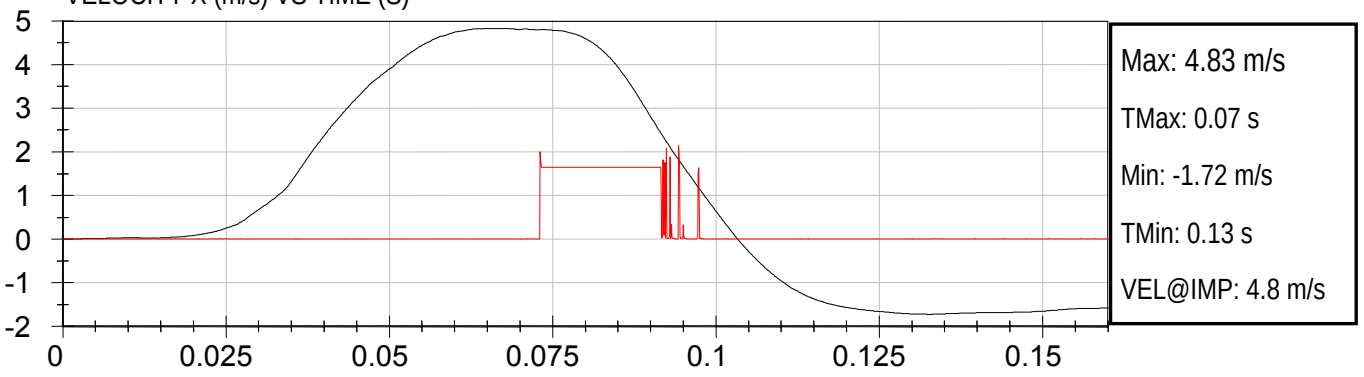
Test Date: 1-6-2010
Location: S1 K1

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



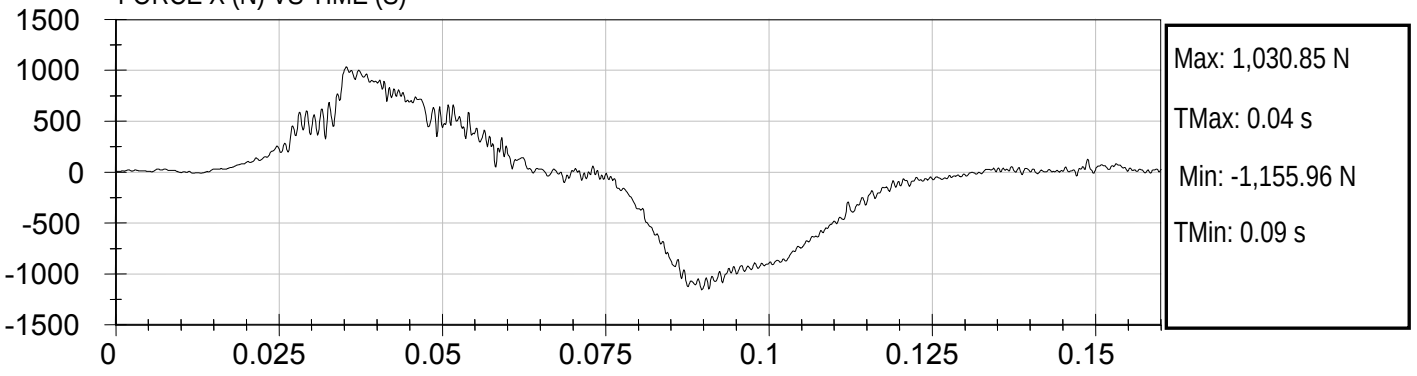
Max: 23.20 G's
TMax: 0.04 s
Min: -26.01 G's
TMin: 0.09 s

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



Max: 4.83 m/s
TMax: 0.07 s
Min: -1.72 m/s
TMin: 0.13 s
VEL@IMP: 4.8 m/s

FORCE X (N) VS TIME (S)

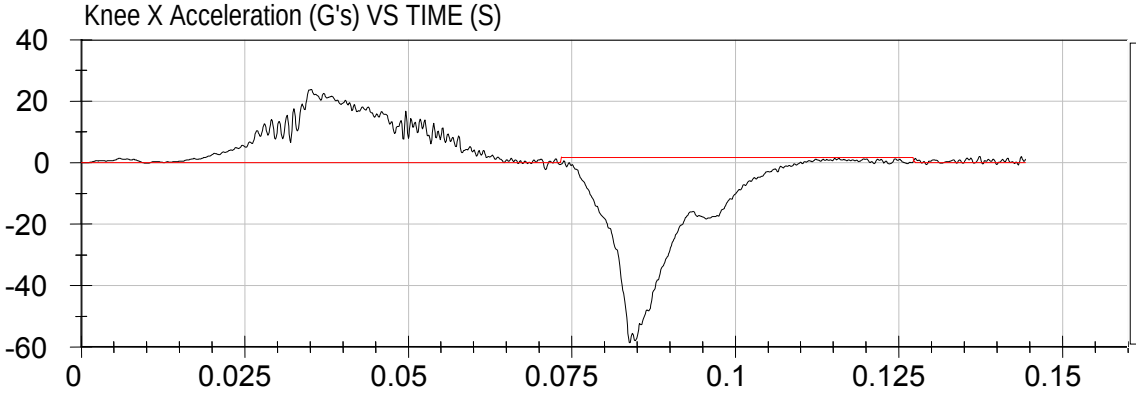


Max: 1,030.85 N
TMax: 0.04 s
Min: -1,155.96 N
TMin: 0.09 s

FMVSS 222 KNEE FORM IMPACTS
Component ID: Trans Tech Rondak - Trap: 4.933 m/s
NHTSA #: C90903

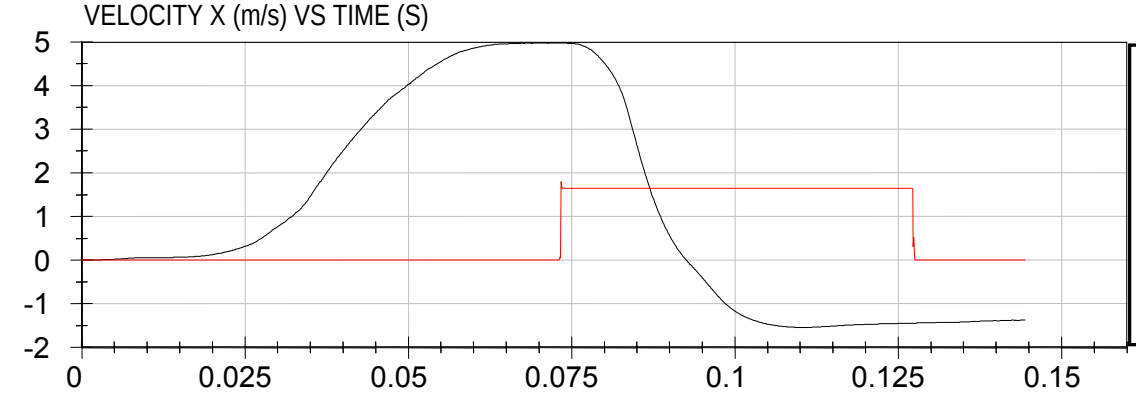
Test Date: 1-6-2010
Location: S1 K2

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



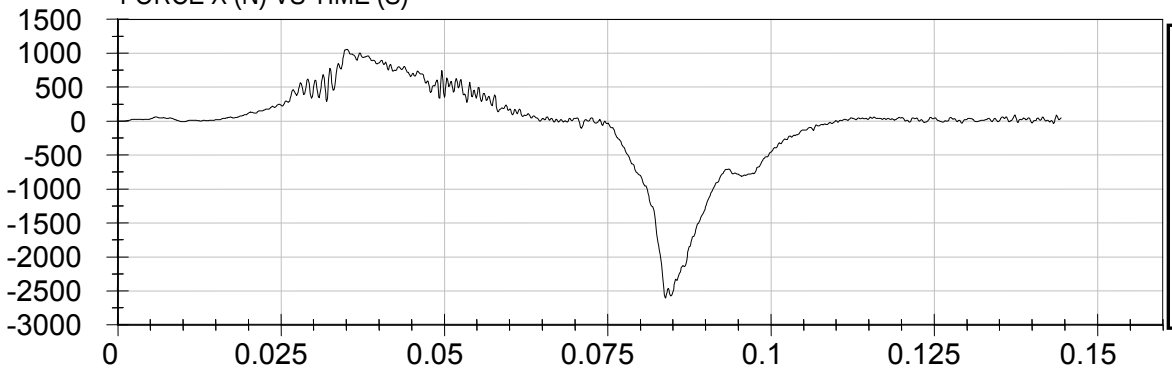
Max: 23.80 G's
TMax: 0.04 s
Min: -58.61 G's
TMin: 0.08 s

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)

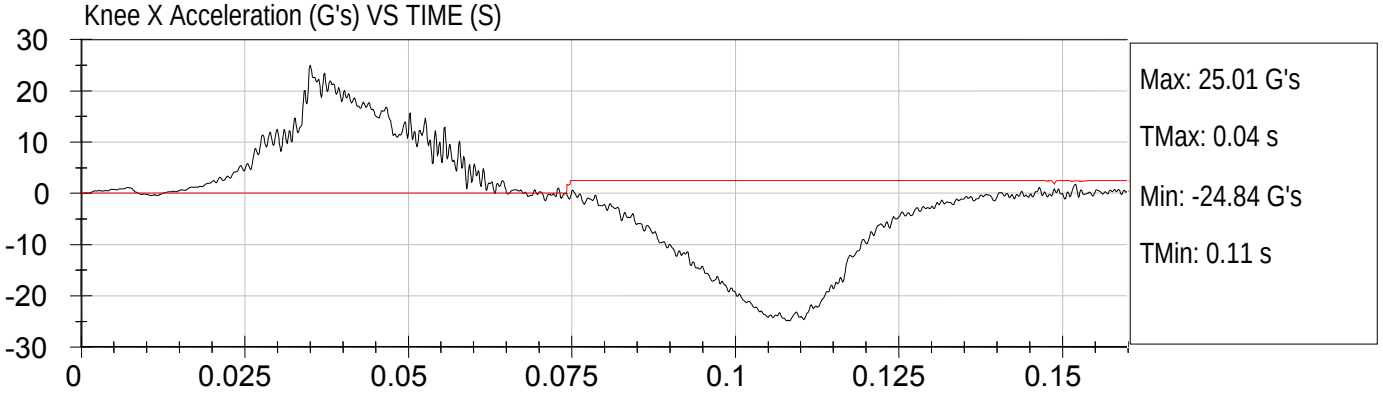


Max: 1,057.73 N
TMax: 0.04 s
Min: -2,604.37 N
TMin: 0.08 s

FMVSS 222 KNEE FORM IMPACTS
Component ID: Trans Tech Rondak - Trap: 4.94 m/s
NHTSA #: C90903

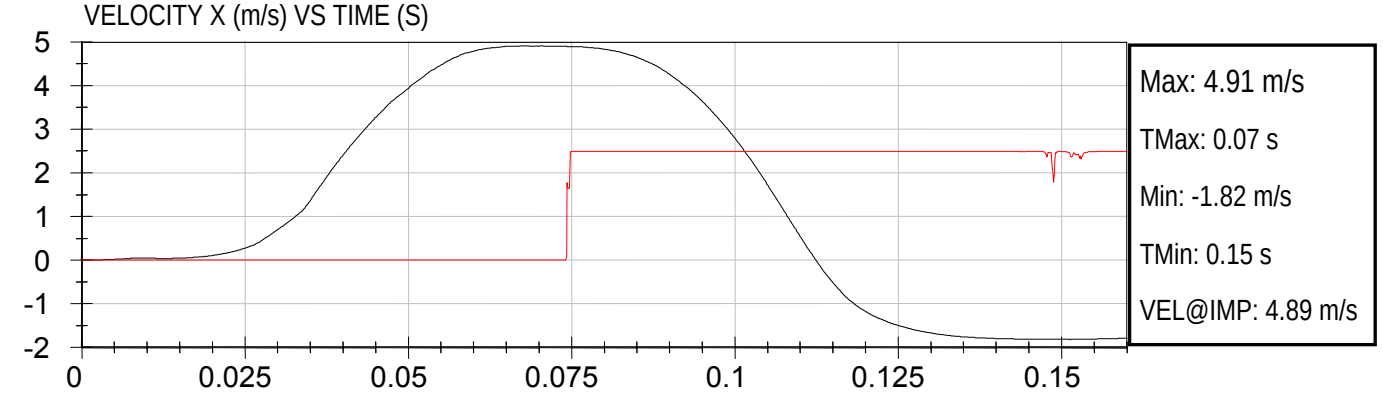
Test Date: 1-6-2010
Location: S1 K3

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



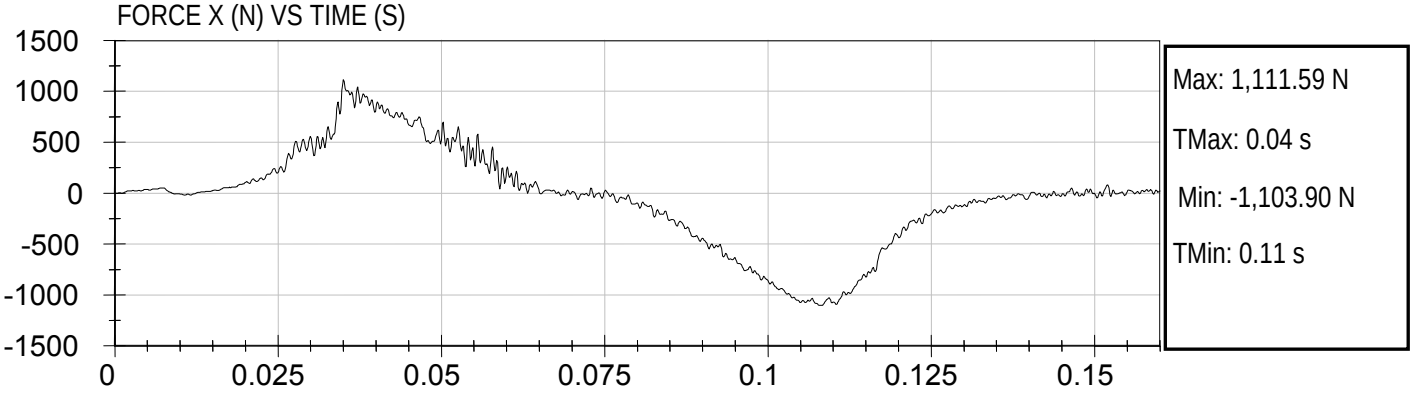
Max: 25.01 G's
TMax: 0.04 s
Min: -24.84 G's
TMin: 0.11 s

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



Max: 4.91 m/s
TMax: 0.07 s
Min: -1.82 m/s
TMin: 0.15 s
VEL@IMP: 4.89 m/s

FORCE X (N) VS TIME (S)

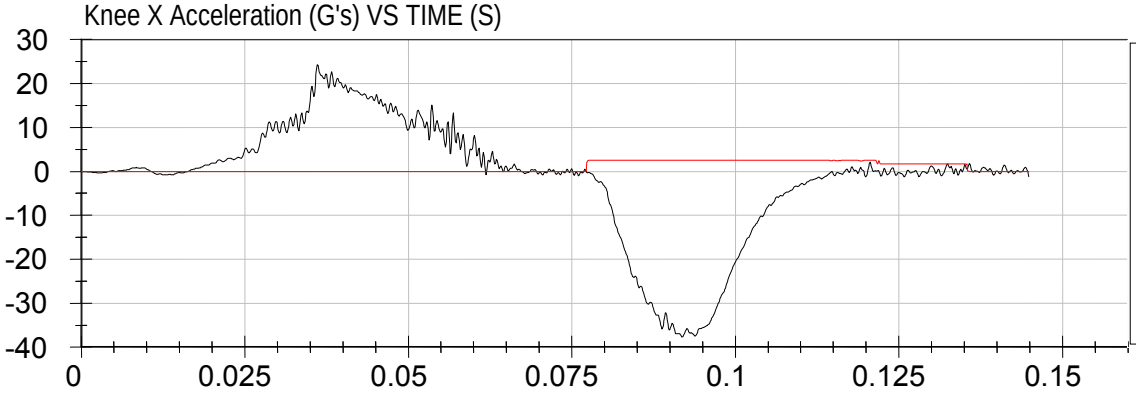


Max: 1,111.59 N
TMax: 0.04 s
Min: -1,103.90 N
TMin: 0.11 s

FMVSS 222 KNEE FORM IMPACTS
Component ID: Trans Tech Rondak - Trap: 4.881 m/s
NHTSA #: C90903

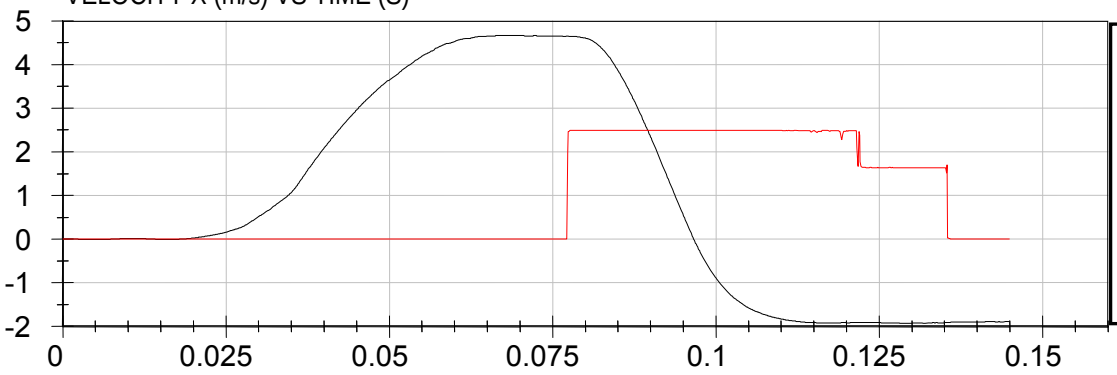
Test Date: 1-6-2010
Location: S1 K4

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



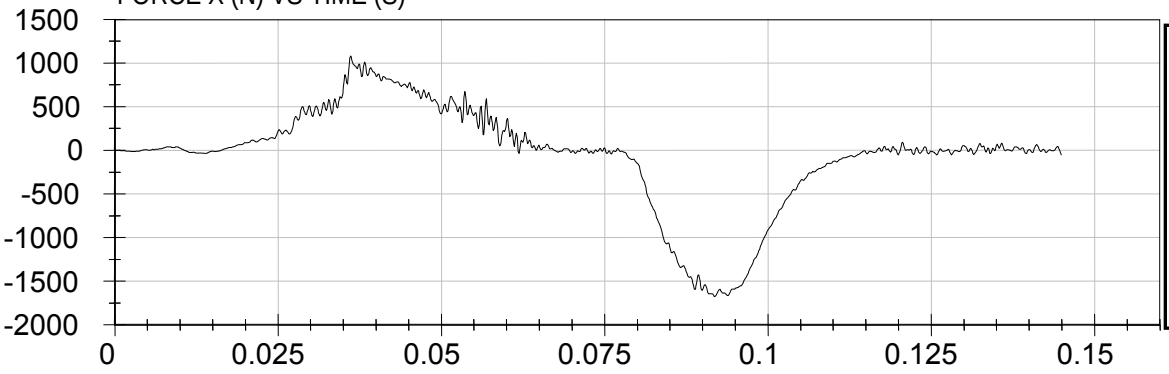
Max: 24.31 G's
TMax: 0.04 s
Min: -37.74 G's
TMin: 0.09 s

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)

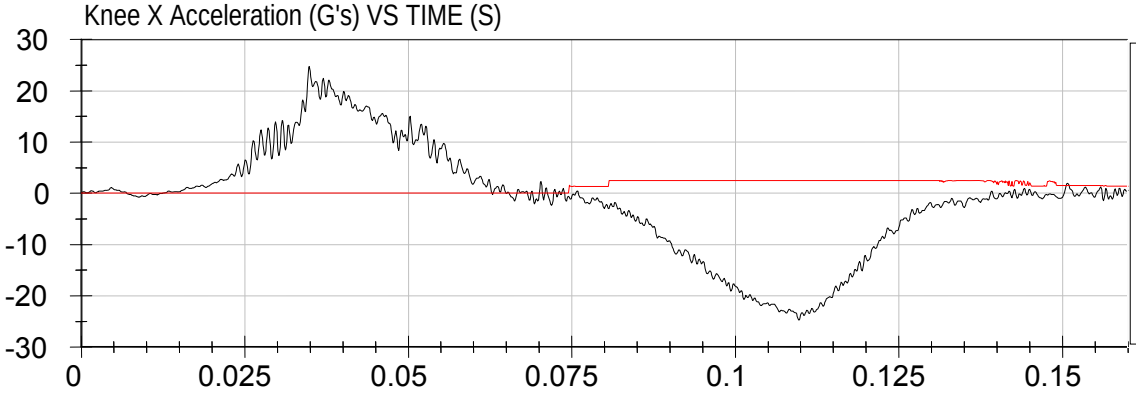


Max: 1,080.19 N
TMax: 0.04 s
Min: -1,677.23 N
TMin: 0.09 s

FMVSS 222 KNEE FORM IMPACTS
Component ID: Trans Tech Rondak - Trap: 4.838 m/s
NHTSA #: C90903

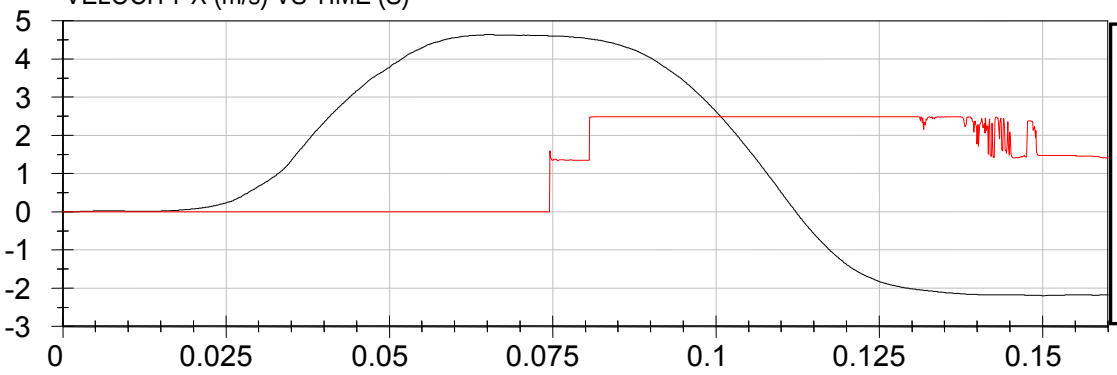
Test Date: 1-7-2010
Location: S1 K5

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



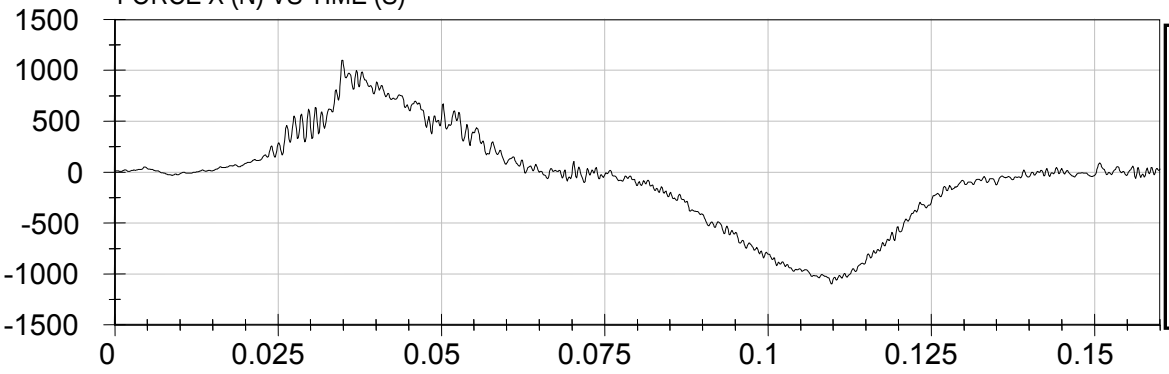
Max: 24.71 G's
TMax: 0.03 s
Min: -24.74 G's
TMin: 0.11 s

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



Max: 4.64 m/s
TMax: 0.07 s
Min: -2.19 m/s
TMin: 0.15 s
VEL@IMP: 4.6 m/s

FORCE X (N) VS TIME (S)

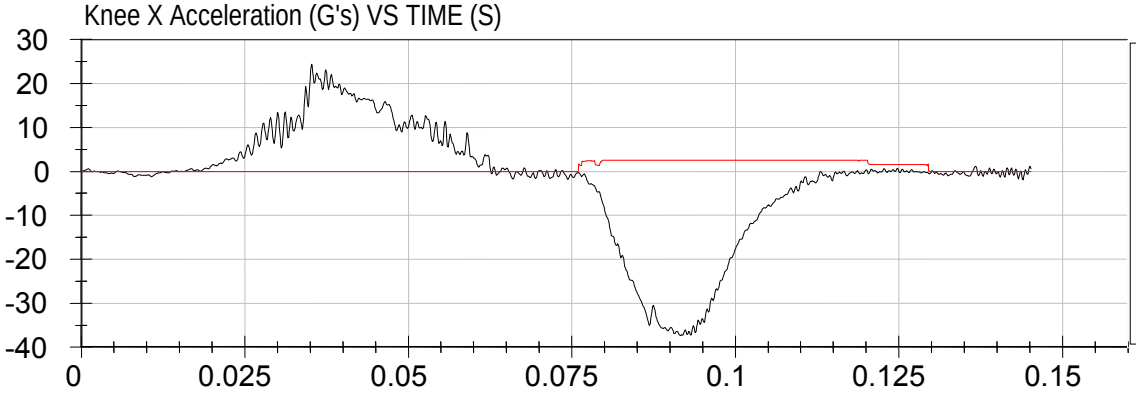


Max: 1,097.90 N
TMax: 0.03 s
Min: -1,099.28 N
TMin: 0.11 s

FMVSS 222 KNEE FORM IMPACTS
Component ID: Trans Tech Rondak - Trap: 4.858 m/s
NHTSA #: C90903

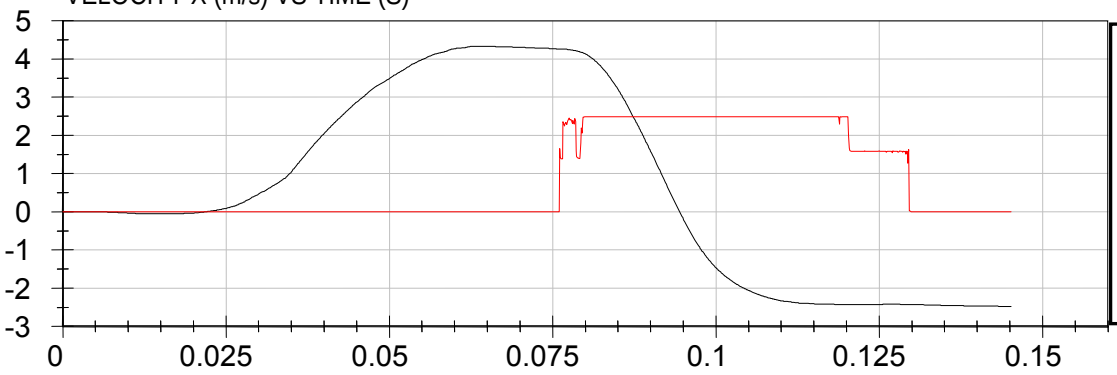
Test Date: 1-7-2010
Location: S1 K6

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



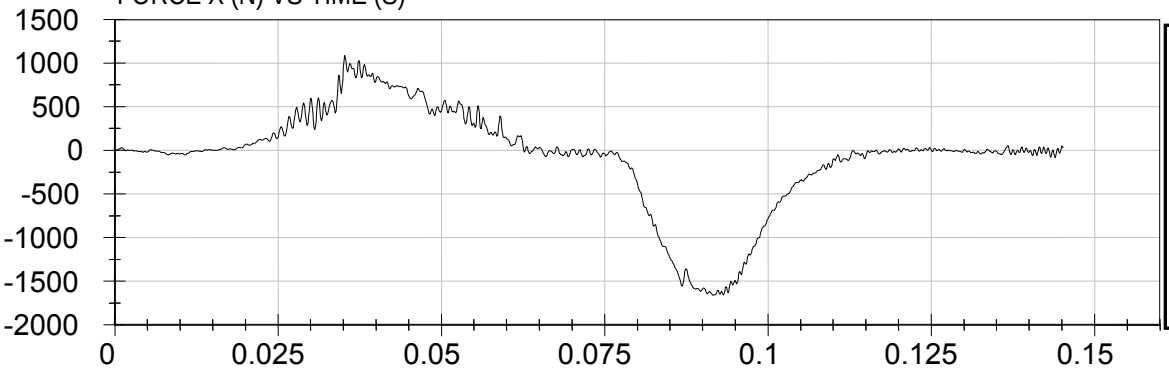
Max: 24.44 G's
TMax: 0.04 s
Min: -37.36 G's
TMin: 0.09 s

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)

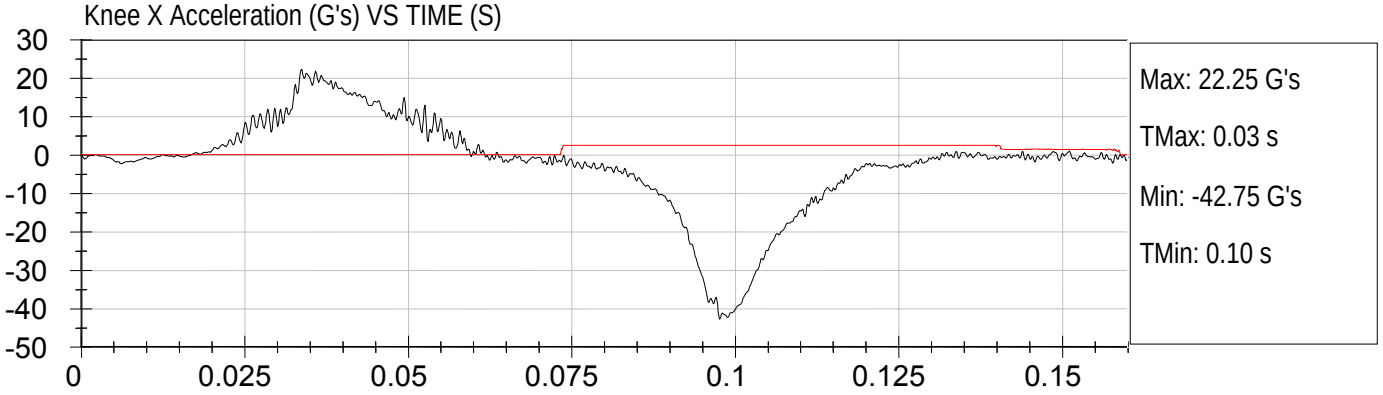


Max: 1,086.27 N
TMax: 0.04 s
Min: -1,660.17 N
TMin: 0.09 s

FMVSS 222 KNEE FORM IMPACTS
Component ID: Trans Tech Rondak - Trap: 4.849 m/s
NHTSA #: C90903

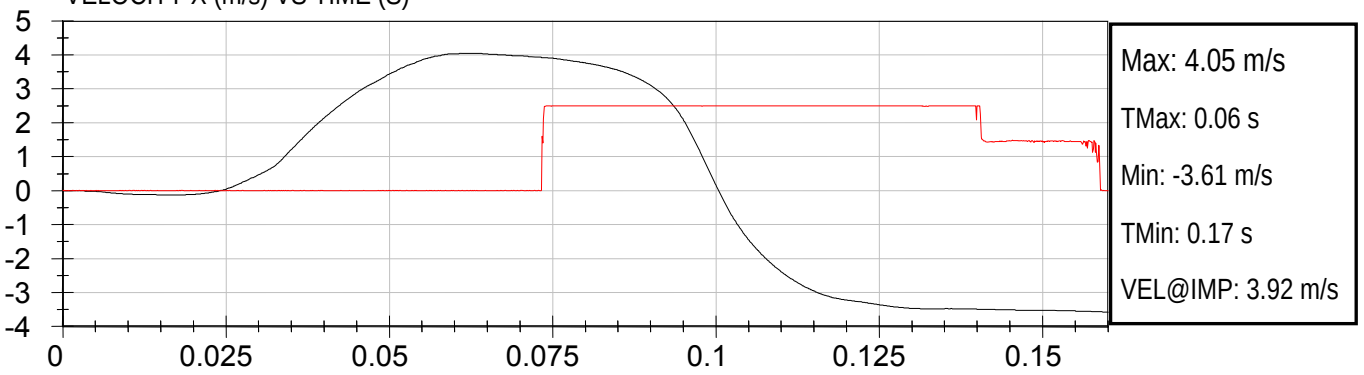
Test Date: 1-7-2010
Location: S1 K7

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



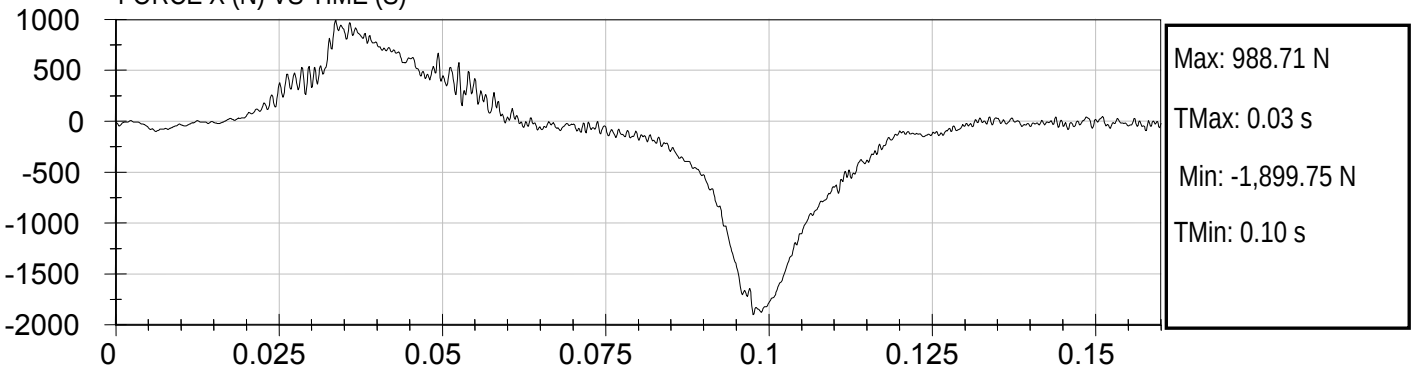
Max: 22.25 G's
TMax: 0.03 s
Min: -42.75 G's
TMin: 0.10 s

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)

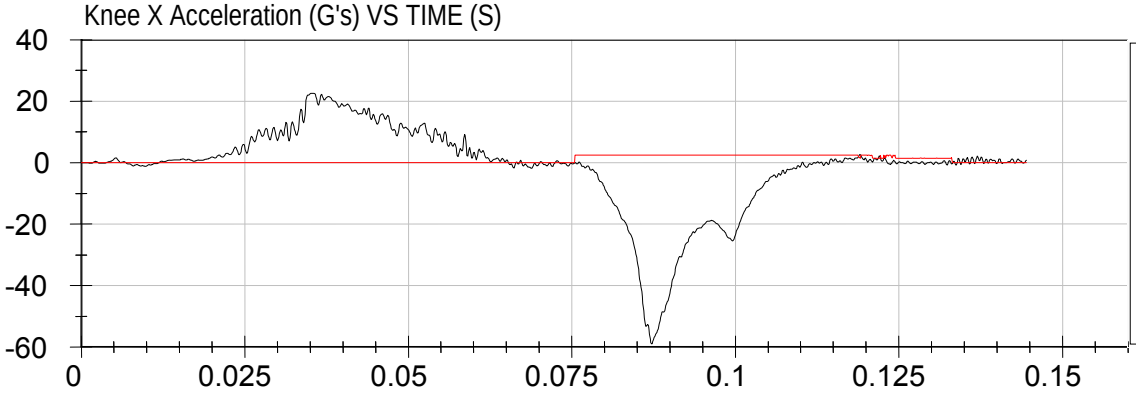


Max: 988.71 N
TMax: 0.03 s
Min: -1,899.75 N
TMin: 0.10 s

FMVSS 222 KNEE FORM IMPACTS
Component ID: Trans Tech Rondak - Trap: 4.814 m/s
NHTSA#: C90903

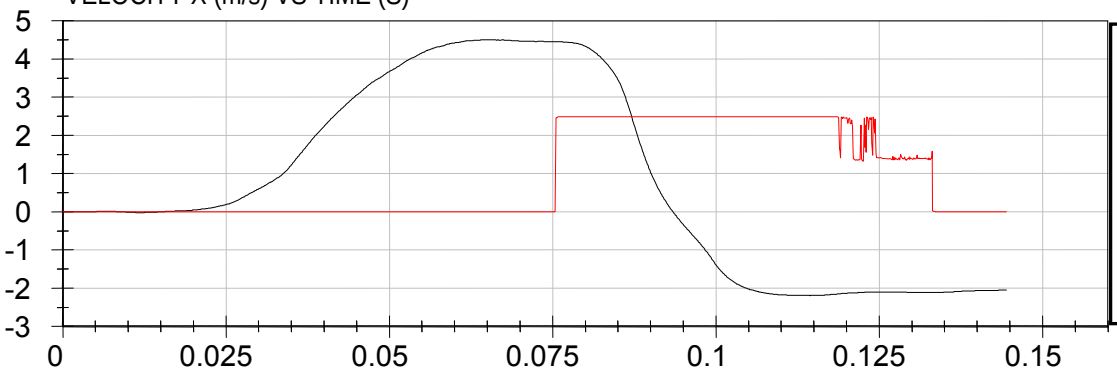
Test Date: 1-7-2010
Location: S1 K8

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



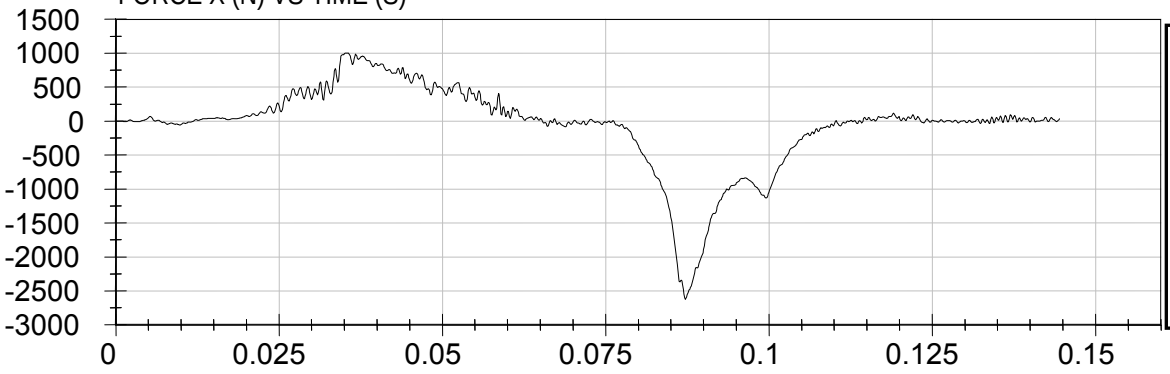
Max: 22.55 G's
TMax: 0.04 s
Min: -58.98 G's
TMin: 0.09 s

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)

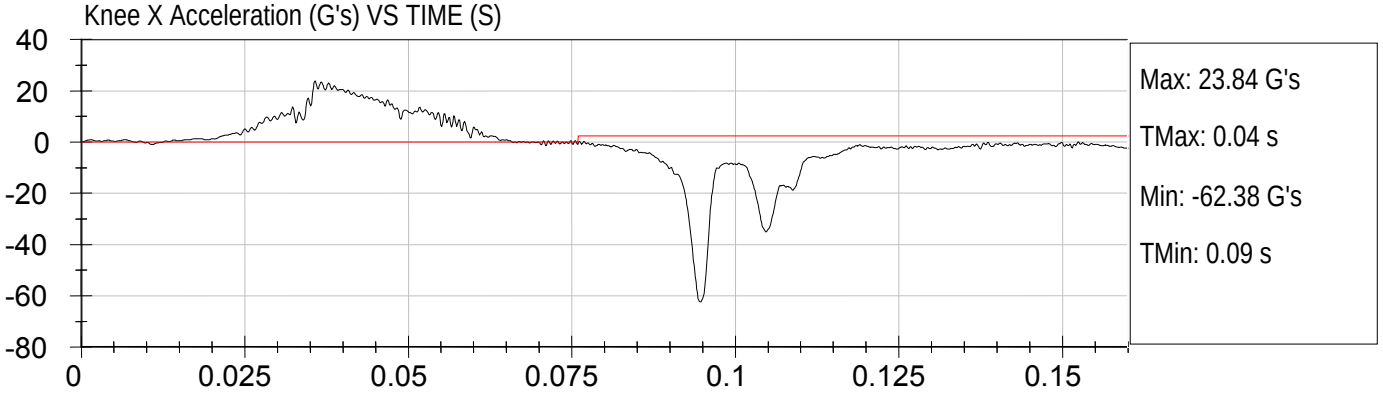


Max: 1,002.32 N
TMax: 0.04 s
Min: -2,620.99 N
TMin: 0.09 s

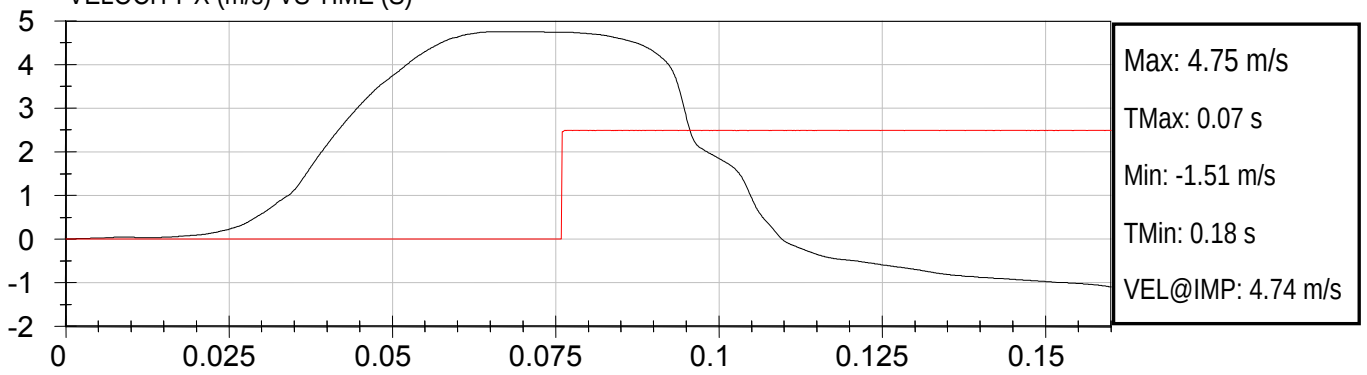
FMVSS 222 KNEE FORM IMPACTS
Component ID: Trans Tech Rondak - Trap: 4.887 m/s
NHTSA #: C90903

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

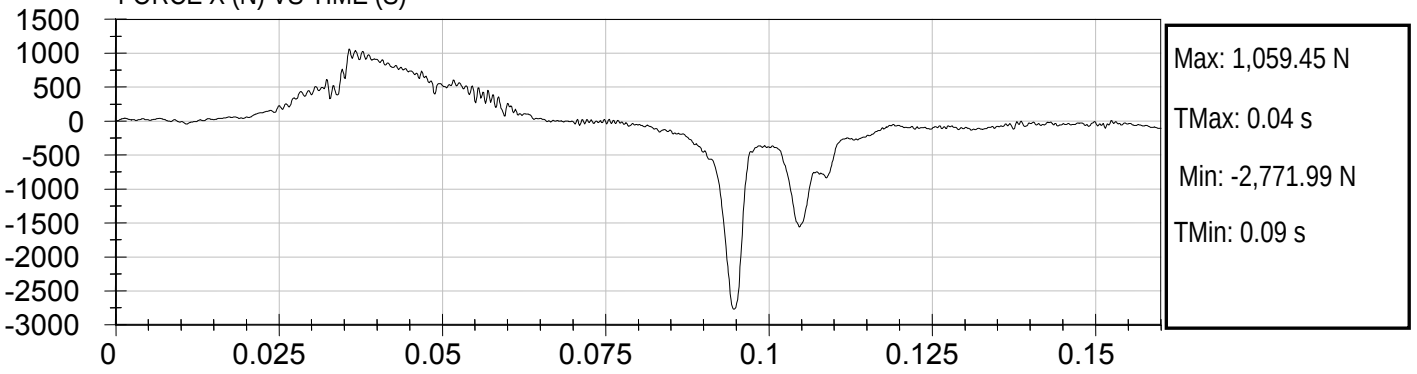
Knee X Acceleration (G's) VS TIME (S)



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

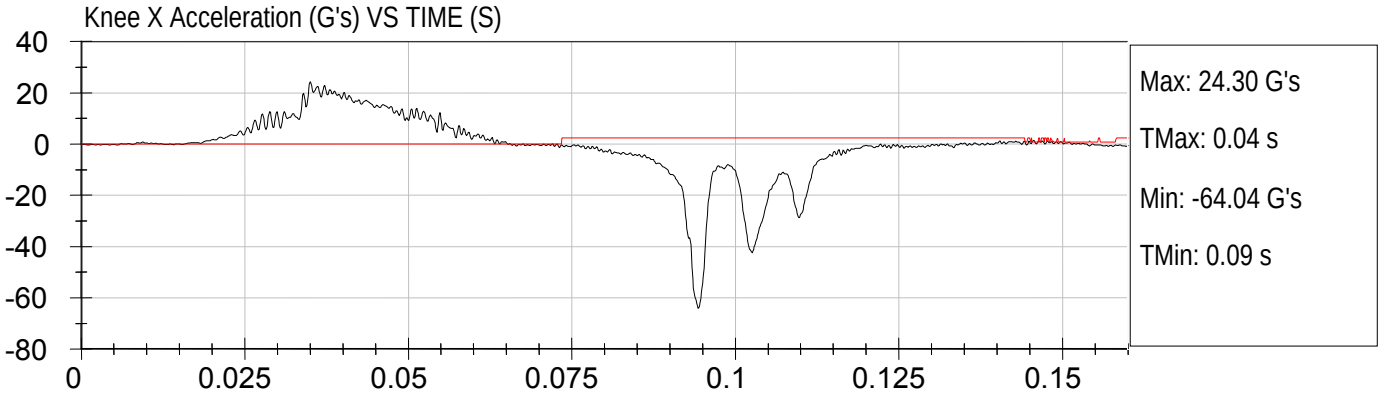


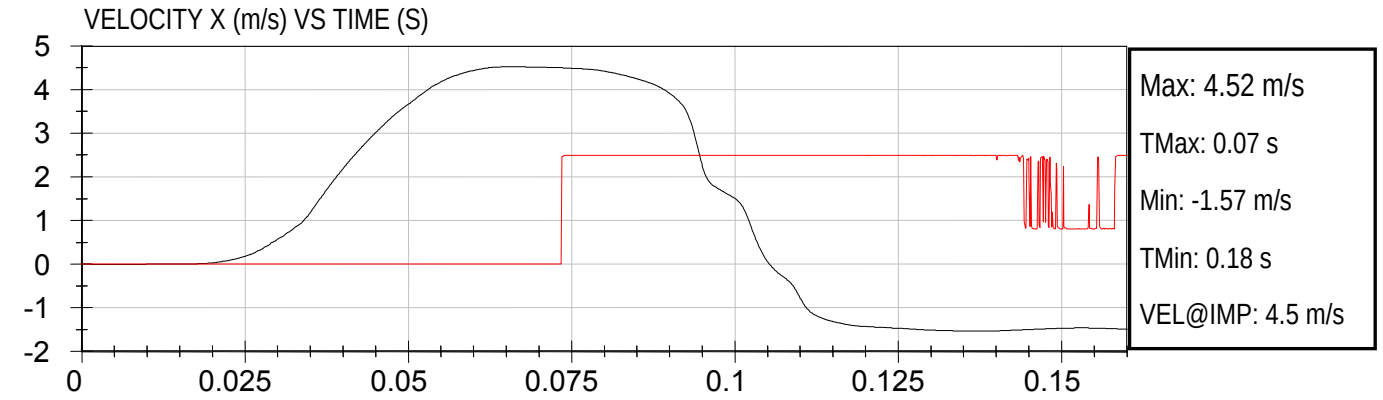
FORCE X (N) VS TIME (S)

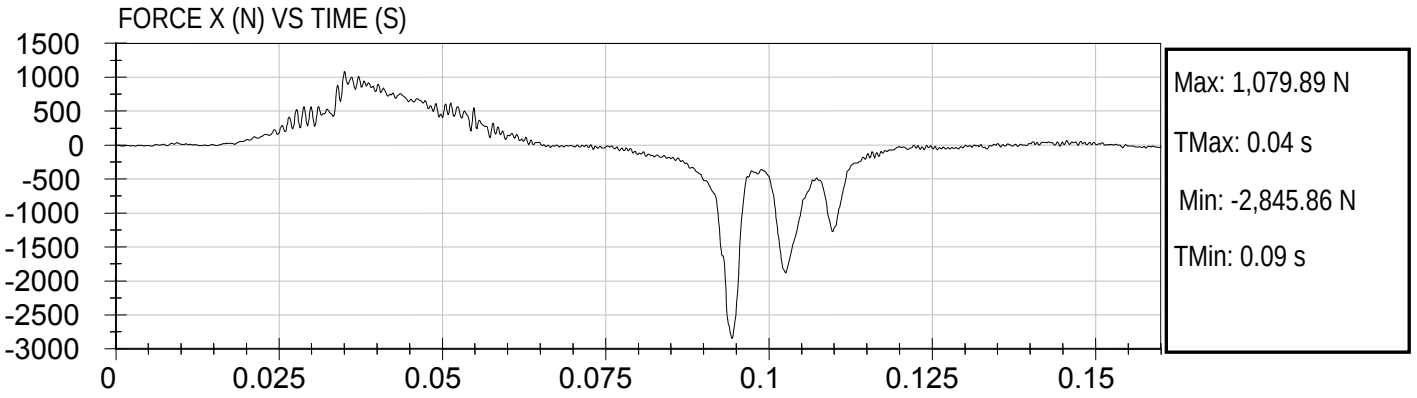


FMVSS 222 KNEE FORM IMPACTS
Component ID: Trans Tech Rondak - Trap: 4.835 m/s
NHTSA #: C90903

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

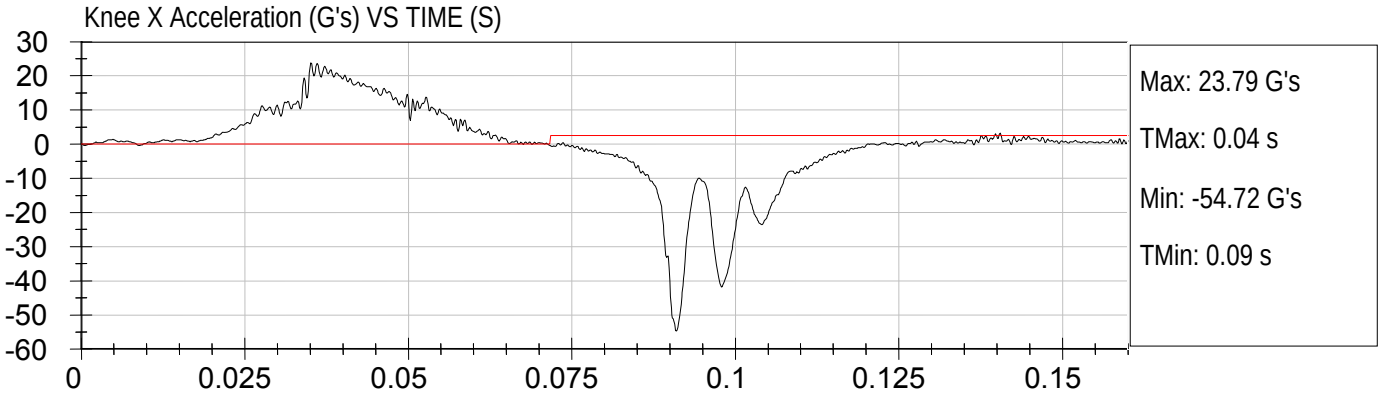


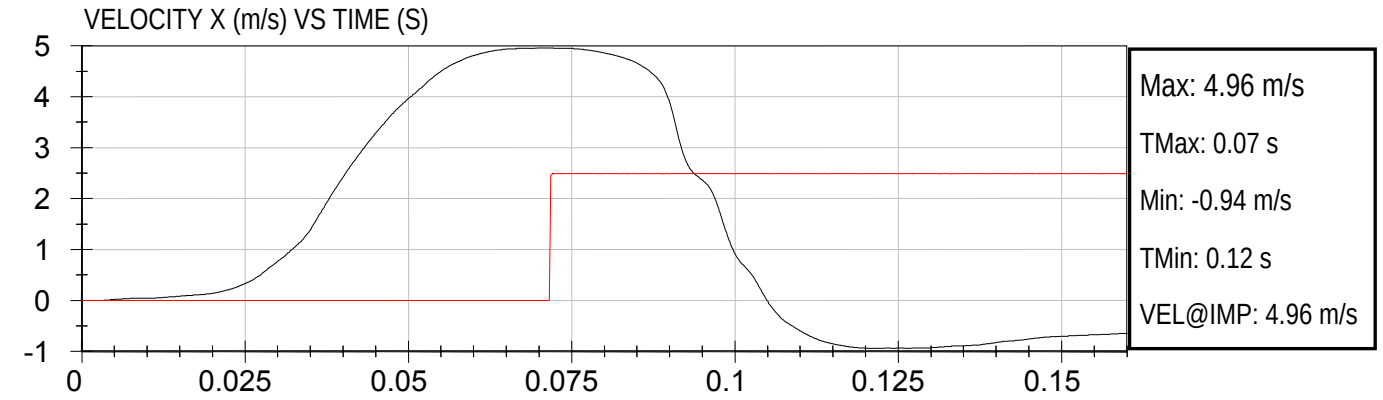


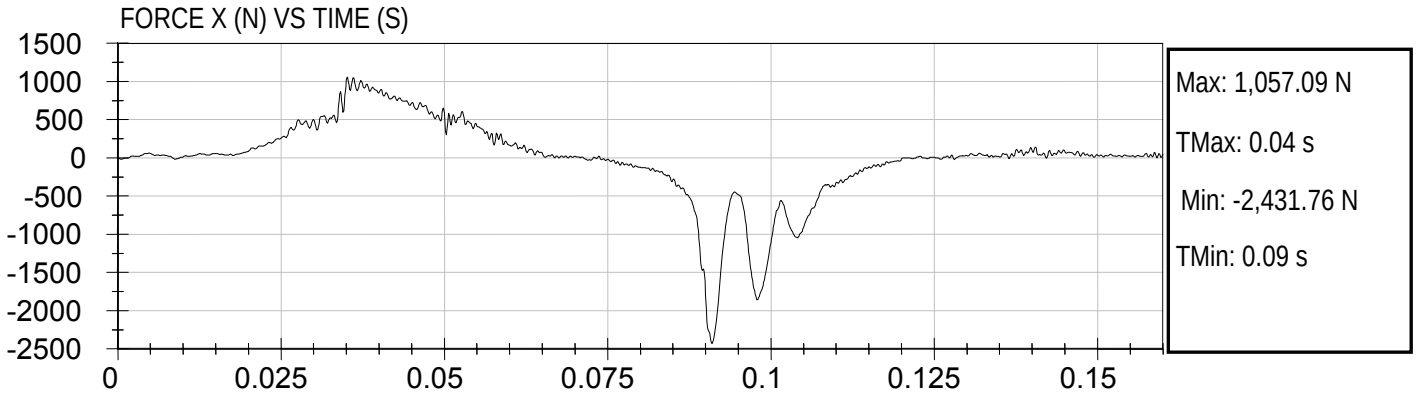


FMVSS 222 KNEE FORM IMPACTS
Component ID: Trans Tech Rondak - Trap: 4.803 m/s
NHTSA #: C90903

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

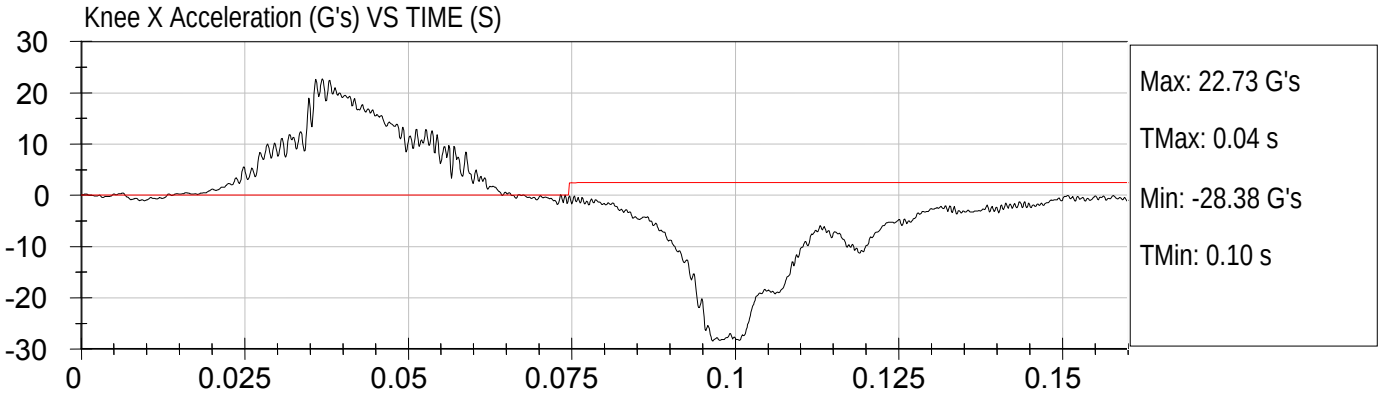


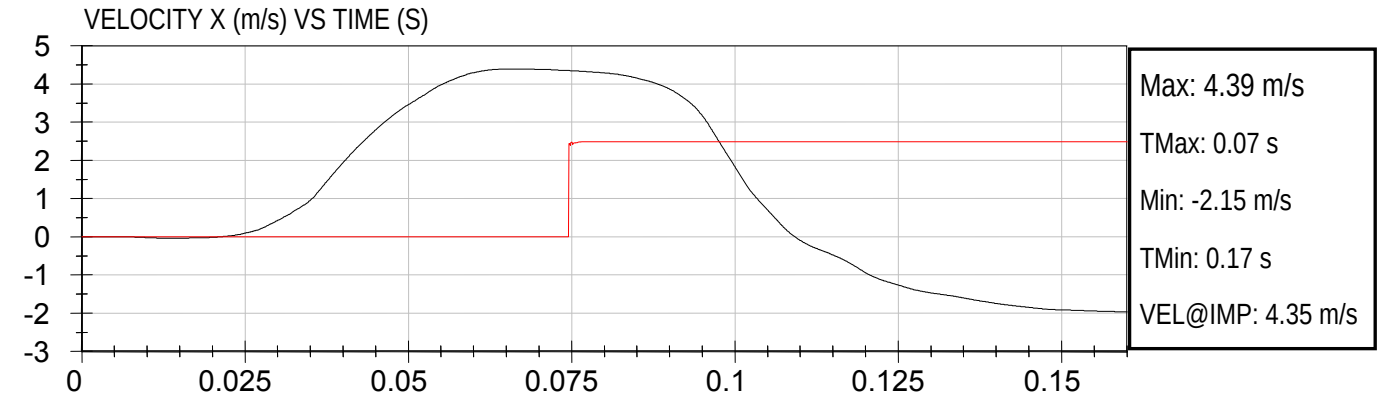


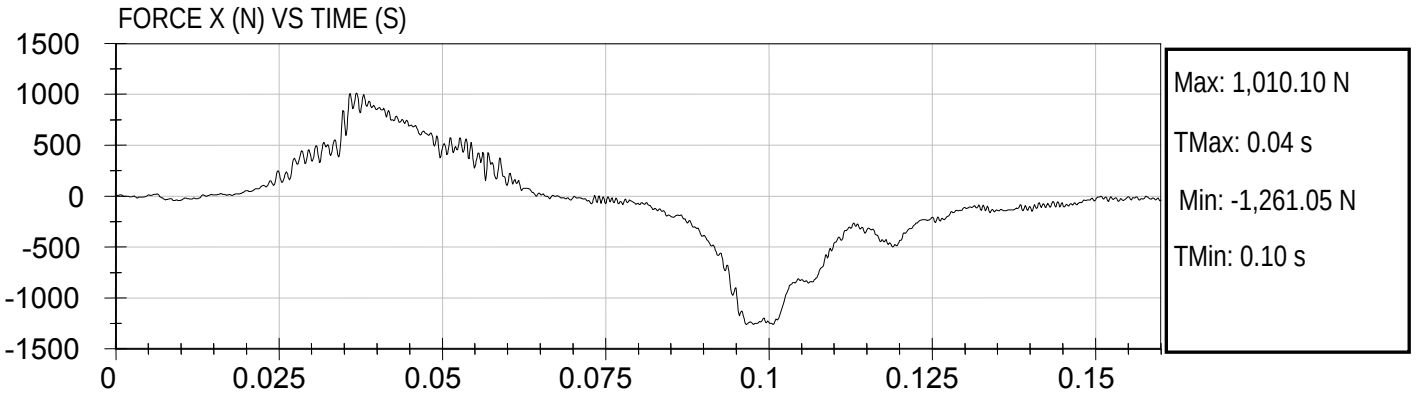


FMVSS 222 KNEE FORM IMPACTS
Component ID: Trans Tech Rondak - Trap: 4.801 m/s
NHTSA #: C90903

Test Date: 1-13-2010
Location: B1 K7

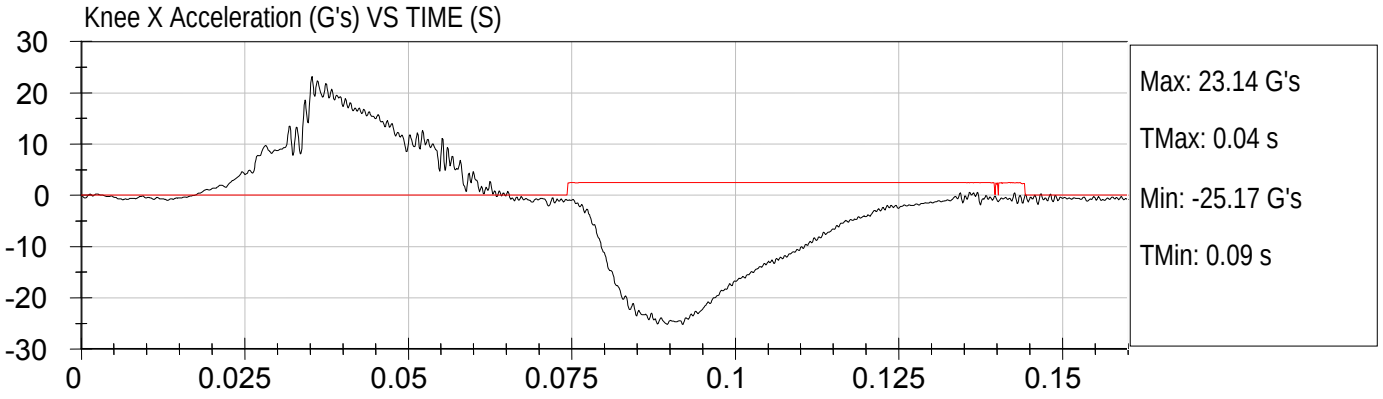


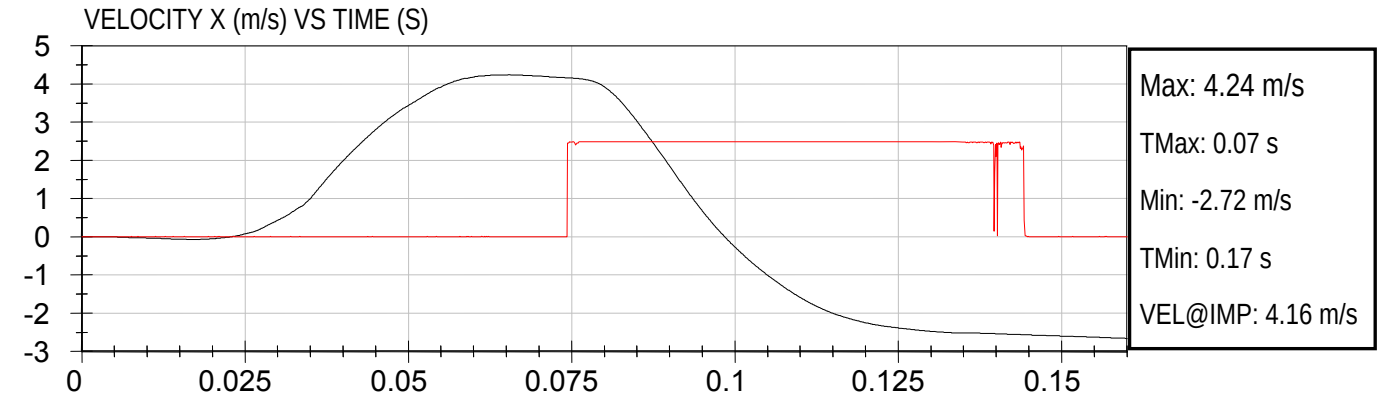


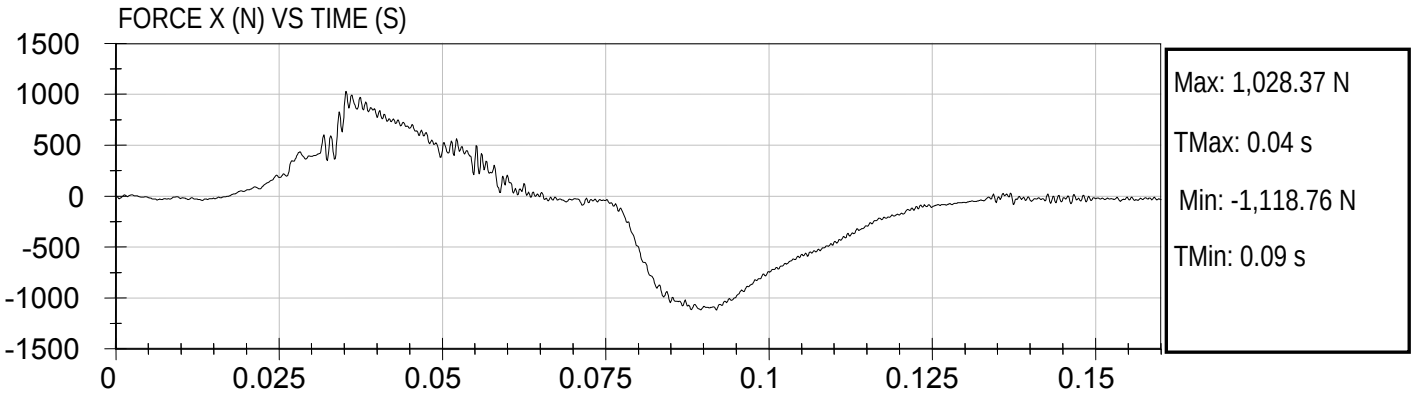


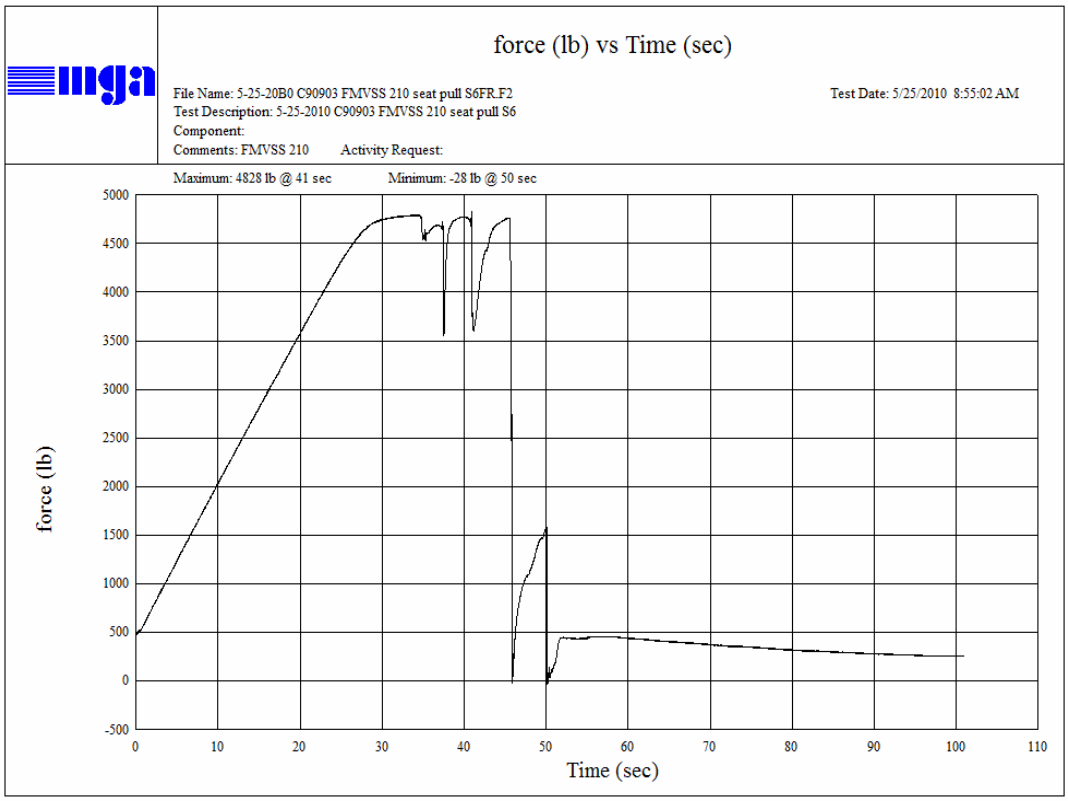
FMVSS 222 KNEE FORM IMPACTS
Component ID: Trans Tech Rondak - Trap: 4.828 m/s
NHTSA #: C90903

Test Date: 1-13-2010
Location: B1 K8

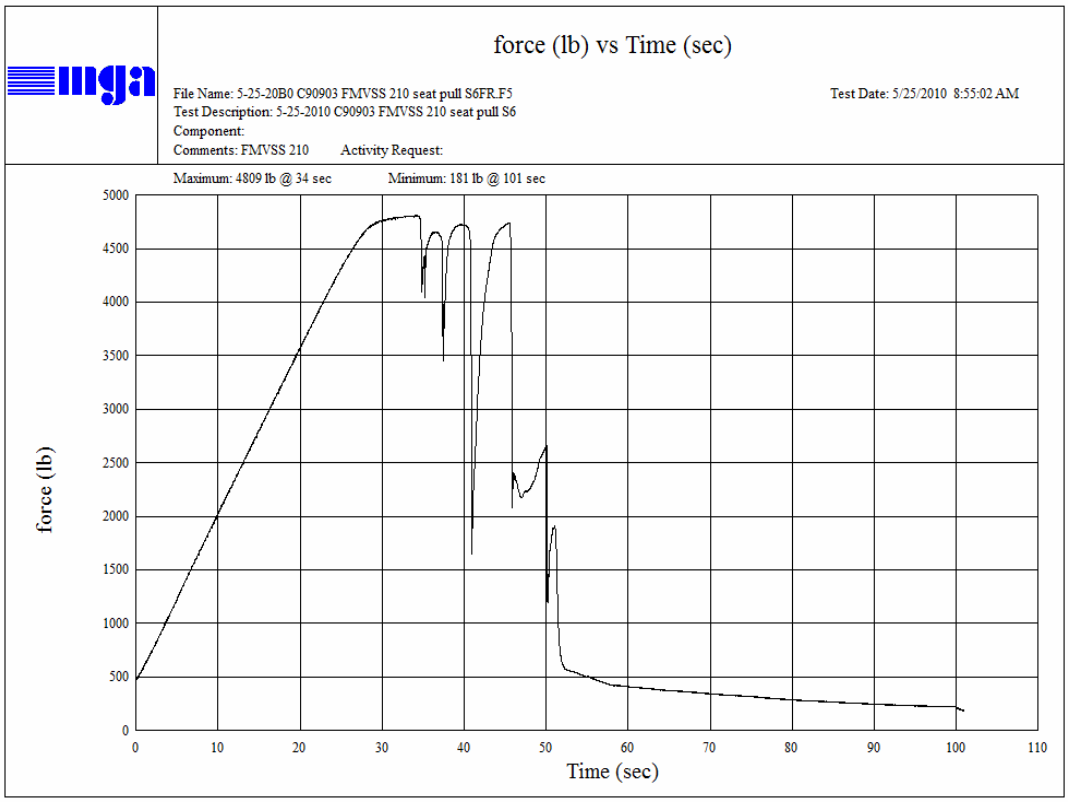








Seat S6 Anchorage Type 1 FMVSS 210

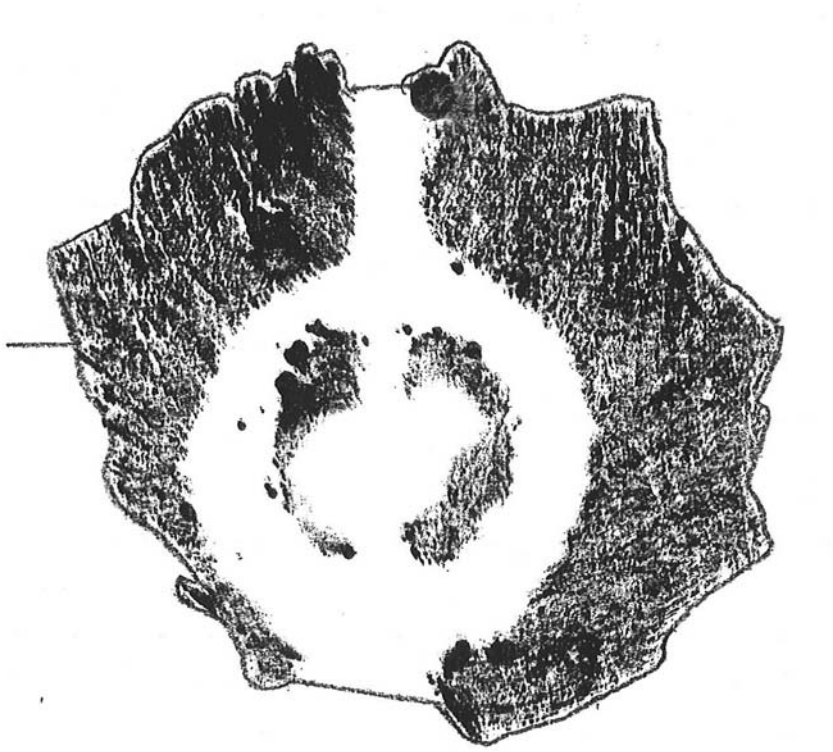


Seat S6 Anchorage Type 1 FMVSS 210

SECTION 7

WELT CONTACT POINTS

H1 / SEAT S1

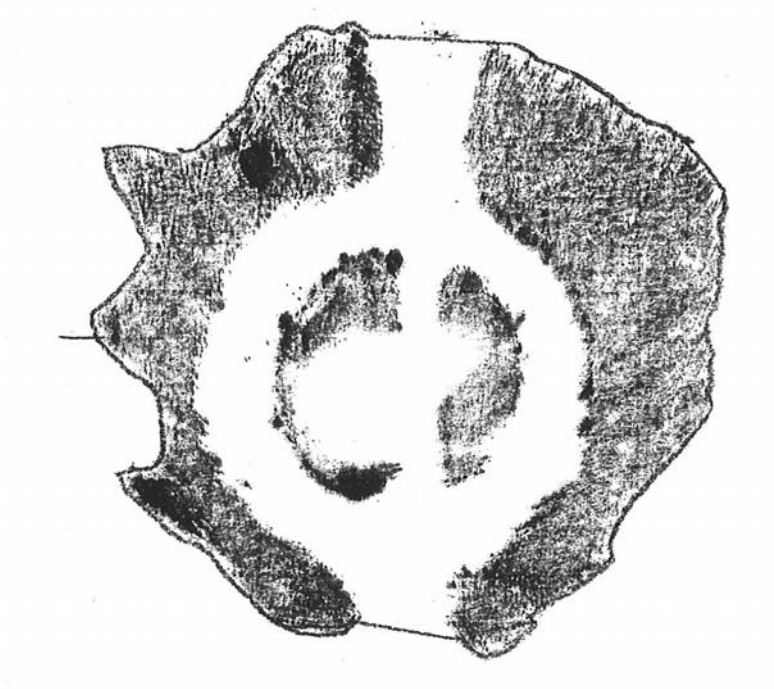


H1 Trans Tech Rondak 62.0 cm^2

SECTION 7 (CONTINUED)

WELT CONTACT POINTS

H2 / SEAT S1

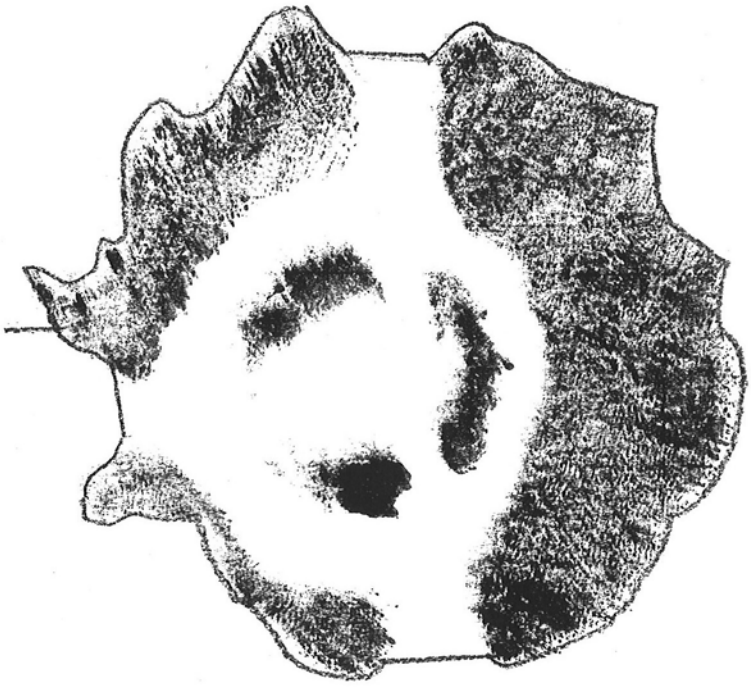


H2 Trans Tech Rondak 51.8 cm^2

SECTION 7 (CONTINUED)

WELT CONTACT POINTS

H3 / SEAT S1

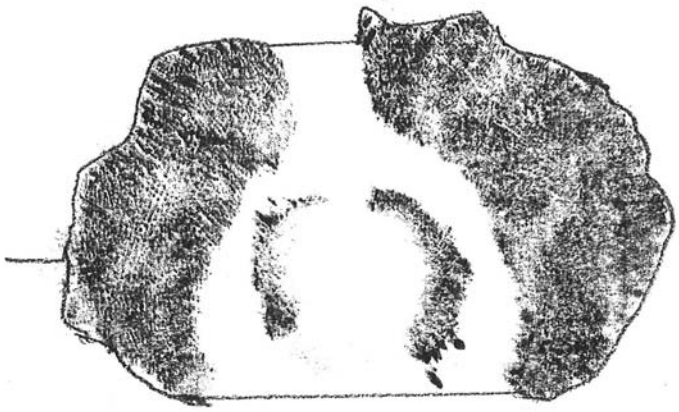


H3 Trans Tech Rondak 57.6 cm^2

SECTION 7 (CONTINUED)

WELT CONTACT POINTS

H4 / SEAT S1

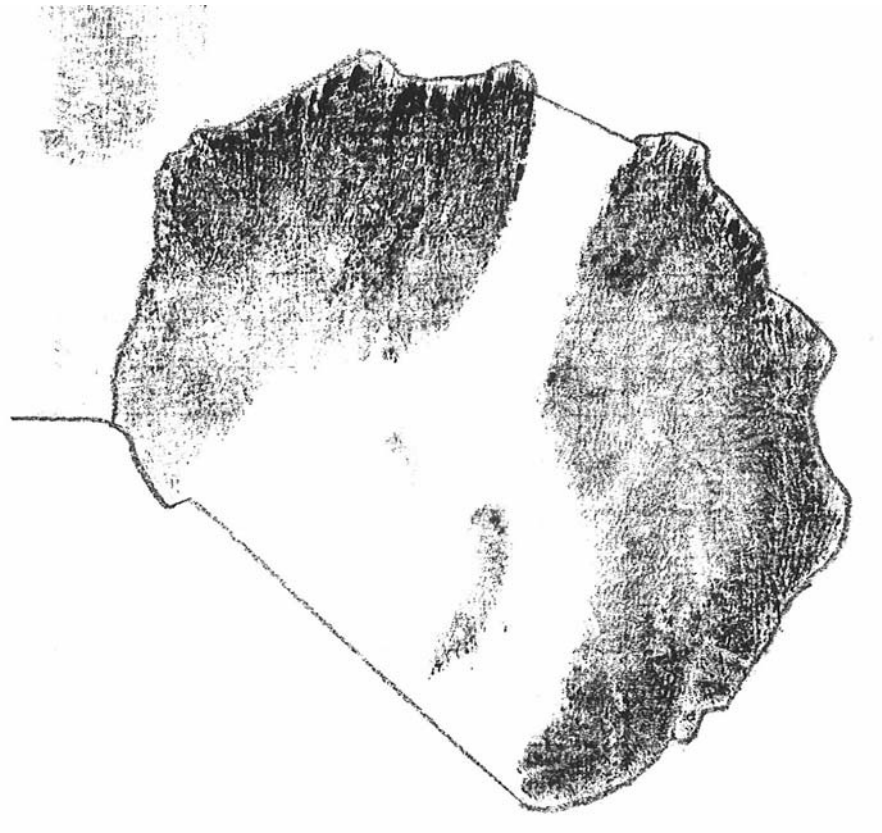


H4 Trans Tech Rondak 49.2 cm^2

SECTION 7 (CONTINUED)

WELT CONTACT POINTS

H5 / SEAT S1

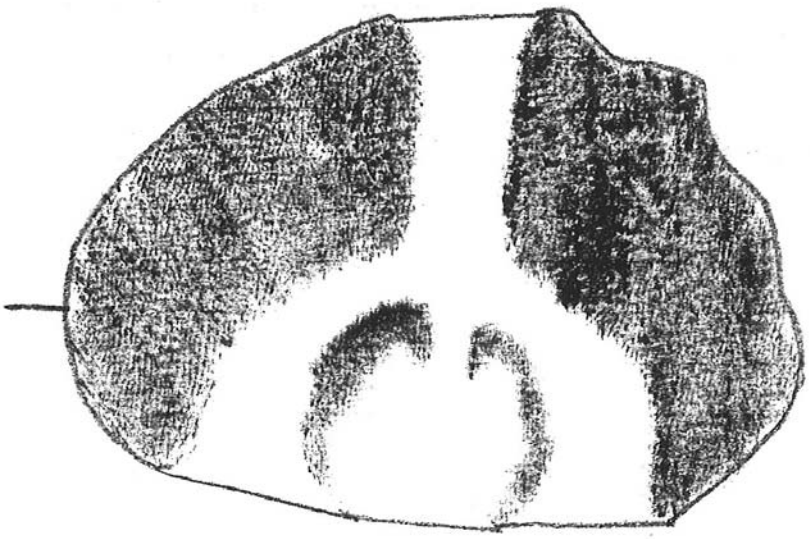


H5 Trans Tech Rondak 64.7 cm^2

SECTION 7 (CONTINUED)

WELT CONTACT POINTS

H1 / BARRIER B1

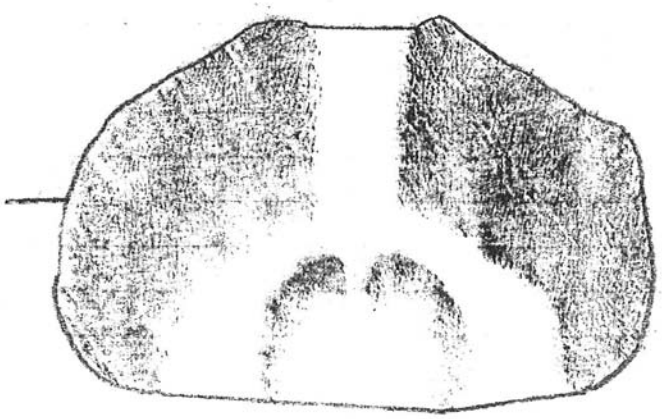


H1 Trans Tech Rondak 46.9 cm^2

SECTION 7 (CONTINUED)

WELT CONTACT POINTS

H2 / BARRIER B1

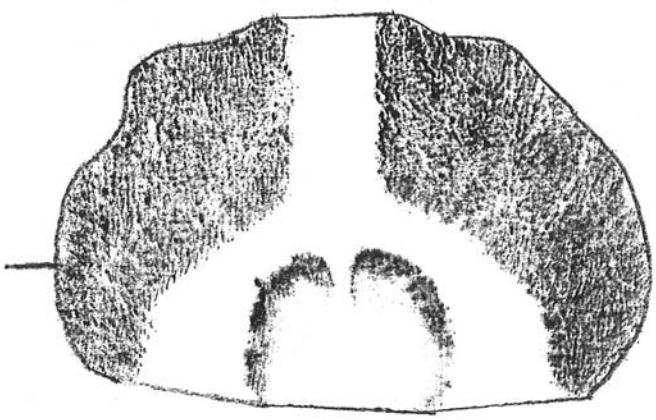


H2 Trans Tech Rondak 37.9 cm^2

SECTION 7 (CONTINUED)

WELT CONTACT POINTS

H3 / BARRIER B1

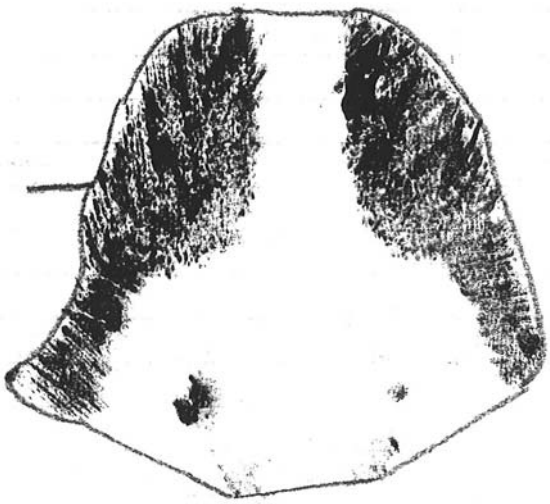


H3 Trans Tech Rondak 38.1 cm^2

SECTION 7 (CONTINUED)

WELT CONTACT POINTS

H4 / BARRIER B1

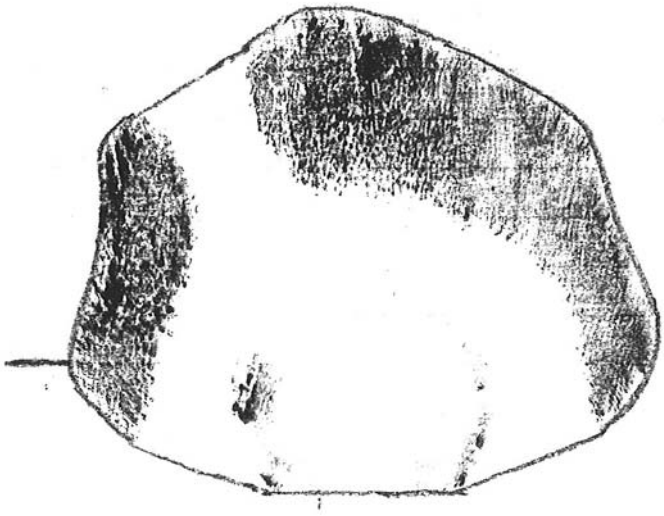


H4 Trans Tech Rondak 38.5 cm^2

SECTION 7 (CONTINUED)

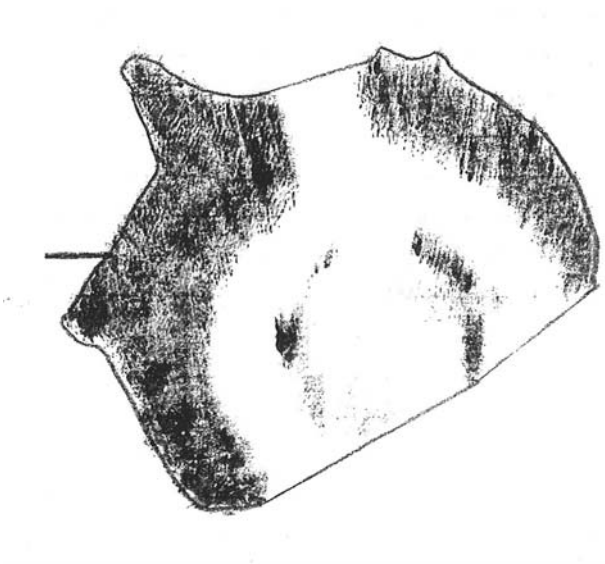
WELT CONTACT POINTS

H5 / BARRIER B1



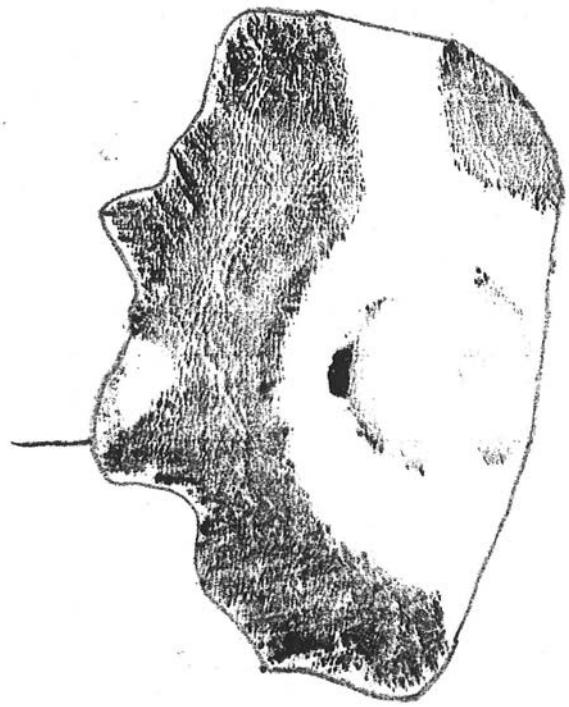
H5 Trans Tech Rondak 35.5 cm^2

H6 / BARRIER B1



H6 Trans Tech Rondak 40.7 cm^2

H7 / BARRIER B1

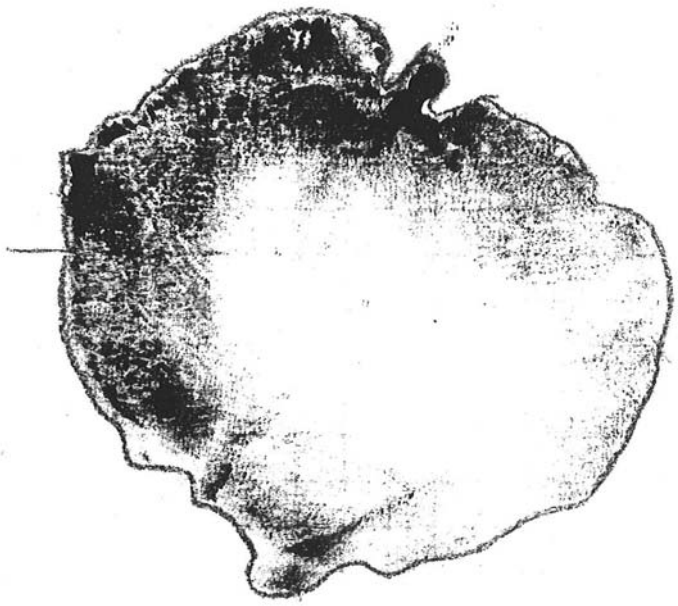


H7 Trans Tech Rondak 52.6 cm^2

SECTION 7 (CONTINUED)

WELT CONTACT POINTS

K1 / SEAT S1

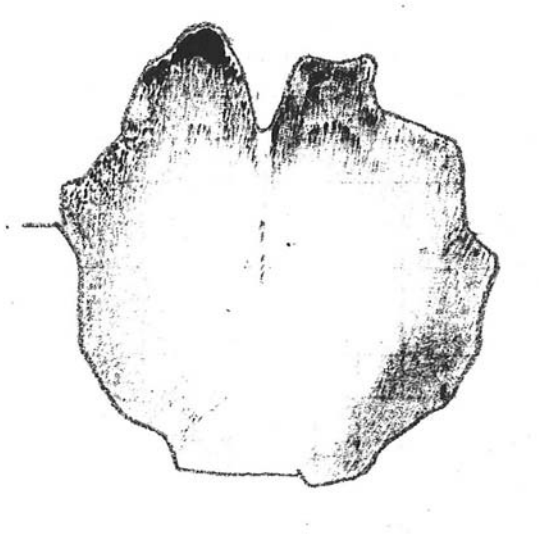


K1 Trans Tech Rondak 48.8 cm^2

SECTION 7 (CONTINUED)

WELT CONTACT POINTS

K2 / SEAT S1

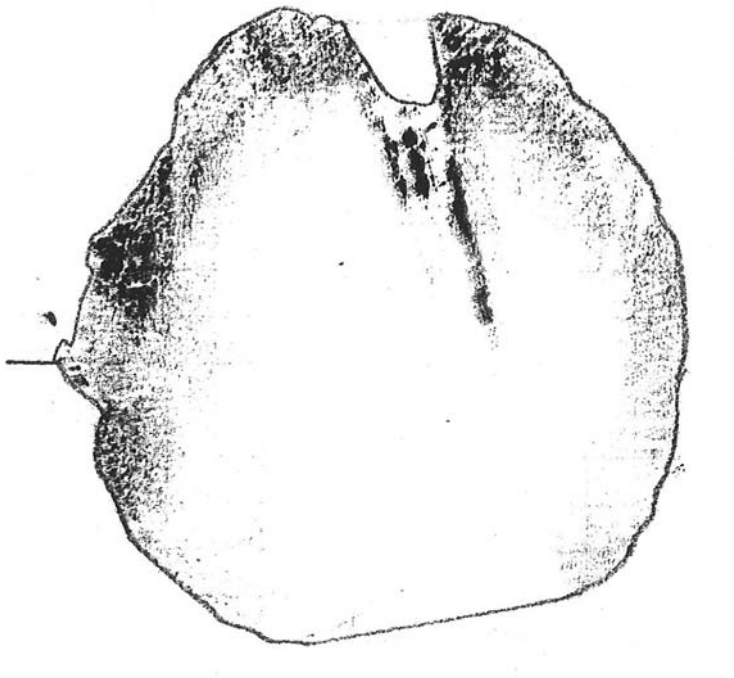


K2 Trans Tech Rondak 29.7 cm^2

SECTION 7 (CONTINUED)

WELT CONTACT POINTS

K3 / SEAT S1

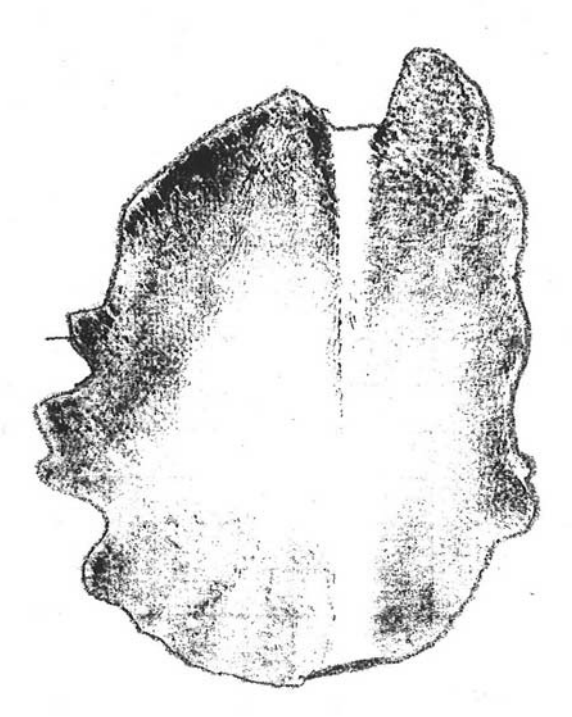


K3 Trans Tech Rondak 54.7 cm^2

SECTION 7 (CONTINUED)

WELT CONTACT POINTS

K4 / SEAT S1

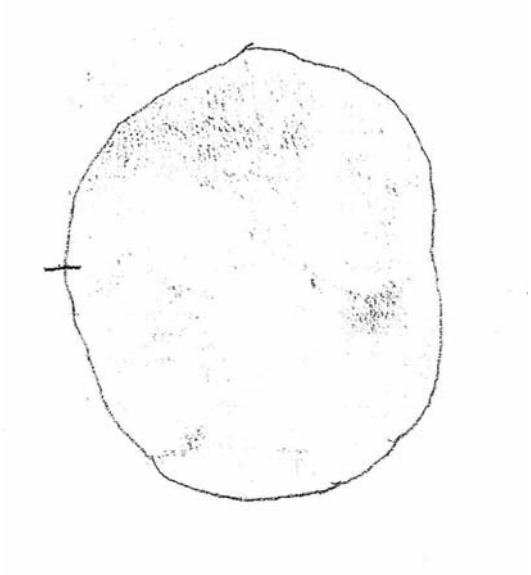


K4 Trans Tech Rondak 41.4 cm^2

SECTION 7 (CONTINUED)

WELT CONTACT POINTS

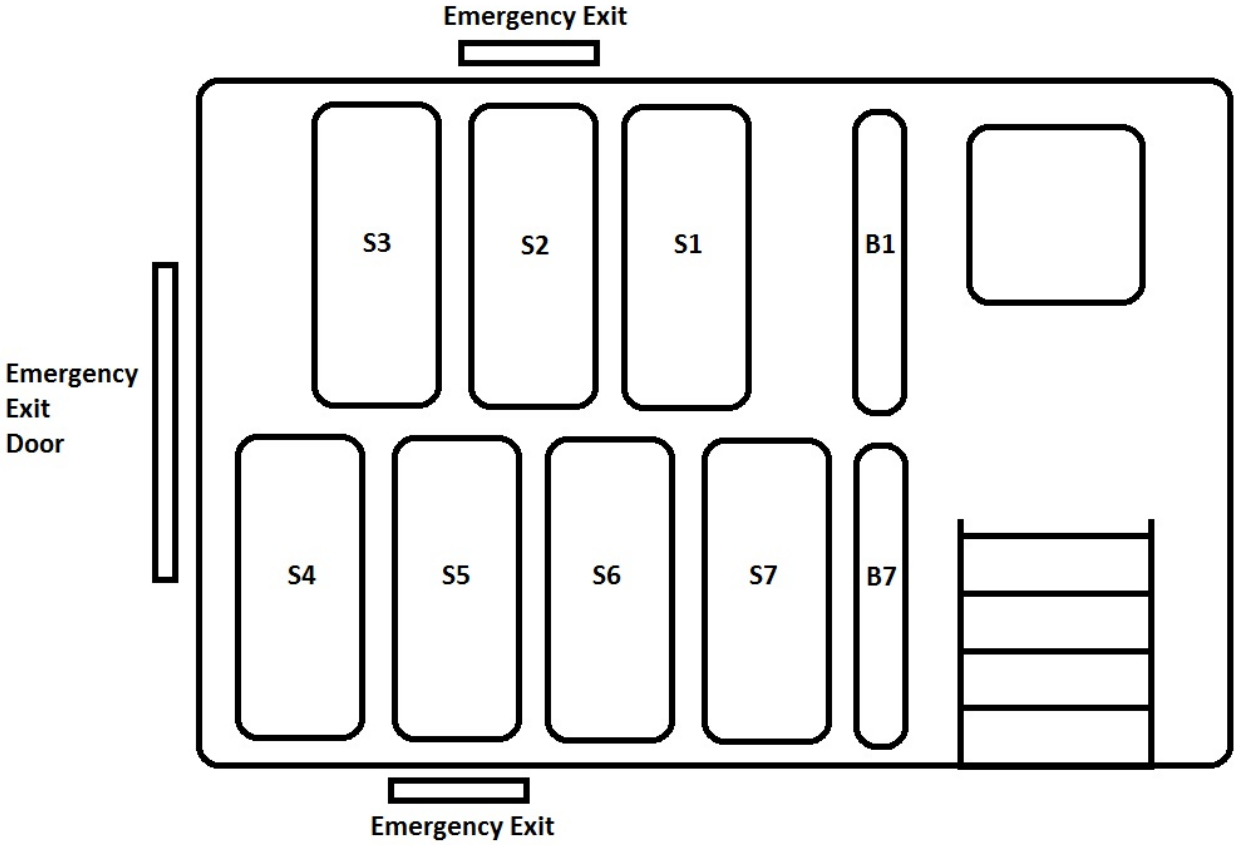
K2 / BARRIER B1



K2 Trans Tech Rondak 26.4 cm^2

SECTION 8

BUS FLOOR PLAN



SECTION 9

LABORATORY NOTICE OF TEST FAILURE

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: 

LABORATORY NOTICE OF TEST FAILURE

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:	05/25/10
Test Lab:	MGA Research Corp.
Project Engineer:	Eric Peschman
Delivery Order No.:	1
VIN:	1FD2E35L88DB33670

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: