

**FINAL REPORT NUMBER: NCAP-TRC-13-005**

**NEW CAR ASSESSMENT PROGRAM (NCAP)  
FRONTAL BARRIER IMPACT TEST**

**Mazda Motor Corporation  
2013 Mazda CX-9 AWD 5-dr SUV  
NHTSA NUMBER: QD5400**

**PREPARED BY:  
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**Report Date: March 14, 2013**

**FINAL REPORT**

**Prepared For:  
U. S. DEPARTMENT OF TRANSPORTATION  
National Highway Traffic Safety Administration  
Office of Crashworthiness Standards  
1200 New Jersey Ave, SE Room W43-410  
Washington, DC 20590**

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Prepared By: Impact Laboratory Project Operations Group

Approved By: Jeffery W. Sankey

Approval Date: March 14, 2013

FINAL REPORT ACCEPTANCE BY OCWS:

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Division Chief, New Car Assessment Program  
NHTSA, Office of Crashworthiness Standards

Date \_\_\_\_\_

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COTR, New Car Assessment Program  
NHTSA, Office of Crashworthiness Standards

Date \_\_\_\_\_

| 1. Report No.<br>NCAP-TRC-13-005                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2. Government Accession No.                          | 3. Recipient's Catalog No. |        |                                                                                                                                                                                                                                                                                                                           |           |                  |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
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| 4. Title and Subtitle<br>Final Report of NEW CAR ASSESSMENT PROGRAM<br>Testing of a 2013 Mazda CX-9 AWD 5dr SUV<br>NHTSA No. QD5400                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                      |                            |        | 5. Report Date<br>March 14, 2013                                                                                                                                                                                                                                                                                          |           |                  |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
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| 7. Author(s)<br>Margaret Susan, Project Manager                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                      |                            |        | 8. Performing Organization Report No.<br>130228                                                                                                                                                                                                                                                                           |           |                  |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
| 9. Performing Organization Name and Address<br>Transportation Research Center Inc.<br>10820 State Route 347<br>East Liberty, OH 43319-0367                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                      |                            |        | 10. Work Unit No. (TRAIS)                                                                                                                                                                                                                                                                                                 |           |                  |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                      |                            |        | 11. Contract or Grant No.<br>DTNH22-12-D-00257                                                                                                                                                                                                                                                                            |           |                  |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
| 12. Sponsoring Agency Name and Address<br>U. S. Department of Transportation<br>National Highway Traffic Safety Administration<br>Office of Crashworthiness Standards<br>1200 New Jersey Ave SE<br>Room W43-410, Washington, DC 20590                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                      |                            |        | 13. Type of Report and Period Covered<br>Final Report<br>February 28 – March 14, 2013                                                                                                                                                                                                                                     |           |                  |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                      |                            |        | 14. Sponsoring Agency Code<br><br>NVS-111                                                                                                                                                                                                                                                                                 |           |                  |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
| 15. Supplemental Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                      |                            |        |                                                                                                                                                                                                                                                                                                                           |           |                  |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
| 16. Abstract<br><br>A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2013 Mazda CX-9 AWD 5dr SUV in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301 and foot well intrusion performance. This test was conducted at the Transportation Research Center Inc. in East Liberty, Ohio on February 28, 2013<br><br>The impact velocity was 56.54 km/h, and the ambient temperature at the barrier face at the time of impact was 21° C. The target vehicle post-test maximum crush was 625 millimeters at a point to the right of the vehicle centerline.<br>The test vehicle's performance is as follows:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                      |                            |        |                                                                                                                                                                                                                                                                                                                           |           |                  |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
| <table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th colspan="3">Driver ATD</th> <th colspan="3">Passenger ATD</th> </tr> <tr> <th>Units</th> <th>Threshold</th> <th>Result</th> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC<sub>15</sub>)</td> <td>NA</td> <td>700</td> <td>154</td> <td>NA</td> <td>700</td> <td>199<sup>1</sup></td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-23</td> <td>mm</td> <td>52</td> <td>-23</td> </tr> <tr> <td>3ms Chest Clip</td> <td>Gs</td> <td>60</td> <td>39.7</td> <td>Gs</td> <td>60</td> <td>45.9</td> </tr> <tr> <td>Nij</td> <td>NA</td> <td>1</td> <td>0.47</td> <td>NA</td> <td>1</td> <td>0.54</td> </tr> <tr> <td>Neck Tension</td> <td>Newtons</td> <td>4170</td> <td>1590</td> <td>Newtons</td> <td>2620</td> <td>798</td> </tr> <tr> <td>Neck Compression</td> <td>Newtons</td> <td>4000</td> <td>-241</td> <td>Newtons</td> <td>2520</td> <td>-518</td> </tr> <tr> <td>Left Femur Force</td> <td>Newtons</td> <td>10008</td> <td>-5928</td> <td>Newtons</td> <td>6805</td> <td>-1609</td> </tr> <tr> <td>Right Femur Force</td> <td>Newtons</td> <td>10008</td> <td>-2206</td> <td>Newtons</td> <td>6805</td> <td>-2790</td> </tr> </tbody> </table> |                                                      |                            |        |                                                                                                                                                                                                                                                                                                                           |           |                  | Measurement Description | Driver ATD |  |  | Passenger ATD |  |  | Units | Threshold | Result | Units | Threshold | Result | Head Injury Criteria (HIC <sub>15</sub> ) | NA | 700 | 154 | NA | 700 | 199 <sup>1</sup> | Maximum Chest Compression | mm | 63 | -23 | mm | 52 | -23 | 3ms Chest Clip | Gs | 60 | 39.7 | Gs | 60 | 45.9 | Nij | NA | 1 | 0.47 | NA | 1 | 0.54 | Neck Tension | Newtons | 4170 | 1590 | Newtons | 2620 | 798 | Neck Compression | Newtons | 4000 | -241 | Newtons | 2520 | -518 | Left Femur Force | Newtons | 10008 | -5928 | Newtons | 6805 | -1609 | Right Femur Force | Newtons | 10008 | -2206 | Newtons | 6805 | -2790 |
| Measurement Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Driver ATD                                           |                            |        | Passenger ATD                                                                                                                                                                                                                                                                                                             |           |                  |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Units                                                | Threshold                  | Result | Units                                                                                                                                                                                                                                                                                                                     | Threshold | Result           |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
| Head Injury Criteria (HIC <sub>15</sub> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | NA                                                   | 700                        | 154    | NA                                                                                                                                                                                                                                                                                                                        | 700       | 199 <sup>1</sup> |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
| Maximum Chest Compression                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | mm                                                   | 63                         | -23    | mm                                                                                                                                                                                                                                                                                                                        | 52        | -23              |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
| 3ms Chest Clip                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Gs                                                   | 60                         | 39.7   | Gs                                                                                                                                                                                                                                                                                                                        | 60        | 45.9             |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
| Nij                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | NA                                                   | 1                          | 0.47   | NA                                                                                                                                                                                                                                                                                                                        | 1         | 0.54             |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
| Neck Tension                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Newtons                                              | 4170                       | 1590   | Newtons                                                                                                                                                                                                                                                                                                                   | 2620      | 798              |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
| Neck Compression                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Newtons                                              | 4000                       | -241   | Newtons                                                                                                                                                                                                                                                                                                                   | 2520      | -518             |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
| Left Femur Force                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Newtons                                              | 10008                      | -5928  | Newtons                                                                                                                                                                                                                                                                                                                   | 6805      | -1609            |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
| Right Femur Force                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Newtons                                              | 10008                      | -2206  | Newtons                                                                                                                                                                                                                                                                                                                   | 6805      | -2790            |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
| <sup>1</sup> The Passenger Redundant Head X signal was used in the HIC calculation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                      |                            |        |                                                                                                                                                                                                                                                                                                                           |           |                  |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
| 17. Key Words<br>35 mph Frontal Barrier Impact Test<br>New Car Assessment Program (NCAP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                      |                            |        | 18. Distribution Statement<br>Copies of this report are available from:<br>National Highway Traffic Safety Administration<br>Technical Information Services Division, NPO-411<br>1200 New Jersey Ave, SE<br>Washington, DC 20590<br>e-mail: <a href="mailto:tis@nhtsa.dot.gov">tis@nhtsa.dot.gov</a><br>FAX: 202-493-2833 |           |                  |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |
| 19. Security Classif. (of this report)<br>Unclassified                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 20. Security Classif. (of this page)<br>Unclassified | 21. Number of Pages<br>167 |        | 22. Price                                                                                                                                                                                                                                                                                                                 |           |                  |                         |            |  |  |               |  |  |       |           |        |       |           |        |                                           |    |     |     |    |     |                  |                           |    |    |     |    |    |     |                |    |    |      |    |    |      |     |    |   |      |    |   |      |              |         |      |      |         |      |     |                  |         |      |      |         |      |      |                  |         |       |       |         |      |       |                   |         |       |       |         |      |       |

## Table of Contents

| <u>Section</u>    |                                                        | <u>Page</u> |
|-------------------|--------------------------------------------------------|-------------|
| 1                 | Purpose and Summary of the Test                        |             |
| 2                 | Occupant and Vehicle Information / Data Sheets         |             |
| <u>Data Sheet</u> |                                                        | <u>Page</u> |
| 1                 | General Test and Vehicle Parameter Data                | 1           |
| 2                 | Seat Adjustment, Fuel System, and Steering Wheel Data  | 8           |
| 3                 | Dummy Longitudinal Clearance Dimensions                | 10          |
| 4                 | Dummy Lateral Clearance Dimensions                     | 11          |
| 5                 | Seat Belt Positioning Data                             | 12          |
| 6                 | High-Speed Camera Locations and Data                   | 13          |
| 7                 | Vehicle Accelerometer Locations                        | 15          |
| 8                 | Photographic Reference Target Locations                | 16          |
| 9                 | Load Cell Locations on Fixed Barrier                   | 17          |
| 10                | Test Vehicle Summary of Results                        | 18          |
| 11                | Post-Test Observations                                 | 19          |
| 12                | Vehicle Profile Measurements                           | 20          |
| 13                | Accident Investigation Division Data                   | 22          |
| 14                | Vehicle Intrusion Measurements                         | 23          |
| 15                | Summary of FMVSS 212, 219 (Partial) Data, and 301 Data | 25          |
| 16                | FMVSS 301 Static Rollover Results                      | 27          |
| 17                | Dummy/Vehicle Temperature Stabilization Chart          | 28          |
| <u>Appendix</u>   |                                                        |             |
| A                 | Photographs                                            | A-1         |
| B                 | Dummy Response Data Traces                             | B-1         |
| C                 | Dummy Calibration and Performance Verification Data    | C-1         |



## **1: PURPOSE AND SUMMARY OF TEST**

### **PURPOSE**

This 56.3 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-12-D-00257. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

This 56.3 km/h frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure dated September, 2012.

### **SUMMARY**

A load cell barrier consisting of 36 load cells was impacted by a 2013 Mazda CX-9 AWD 5dr SUV at a velocity of 56.54 km/h. The test was performed at Transportation Research Center, Inc. on February 28, 2013. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

One real-time camera and 16 high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in this report.

One Part 572E 50<sup>th</sup> percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5<sup>th</sup> percentile female ATD was placed in the right-front passenger position according to dummy placement instructions specified in the Frontal NCAP Laboratory Test Procedure.

Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometers, upper neck transducers, right/left femur load cells, and lower leg instrumentation. Seat belt load cells were also on the drivers and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading.

The driver (position 1) ATD (Serial No. 037) and the right-front passenger (position 2) ATD (Serial No. 426) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 132 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

There was 100.0 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was no Stoddard solvent leakage after the event or during any phase of the static rollover.

The maximum static crush of the vehicle was 625 mm and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

The driver's visible contact points were as follows: front airbag, headrest, and knee bolster. The passenger's visible contact points were as follows: airbag, headrest, and glove box.

The occupant data is summarized below:

| <b>ATD Position</b>                   | <b>HIC<sub>15</sub></b> | <b>Nij</b> | <b>Neck<br/>Tension<br/>(N)</b> | <b>Neck<br/>Compression<br/>(N)</b> | <b>3 ms<br/>Chest<br/>Clip<br/>(Gs)</b> | <b>Chest<br/>Disp.<br/>(mm)</b> | <b>Left<br/>Femur<br/>(N)</b> | <b>Right<br/>Femur<br/>(N)</b> |
|---------------------------------------|-------------------------|------------|---------------------------------|-------------------------------------|-----------------------------------------|---------------------------------|-------------------------------|--------------------------------|
| Driver<br>(50 <sup>th</sup> Male)     | 154                     | 0.47       | 1590                            | -241                                | 39.7                                    | -23                             | -5928                         | -2206                          |
| Passenger<br>(5 <sup>th</sup> Female) | 199 <sup>1</sup>        | 0.54       | 798                             | -518                                | 45.9                                    | -23                             | -1609                         | -2790                          |

<sup>1</sup>The Passenger Redundant Head X signal was used in the HIC calculation.

## **2: OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS**

## DATA SHEET NO. 1

### GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV  
 Test Program: NCAP Frontal Impact

NHTSA No.: QD5400  
 Test Date: 02/28/13

#### TEST VEHICLE INFORMATION

|                             |                   |
|-----------------------------|-------------------|
| NHTSA No.                   | QD5400            |
| Model Year                  | 2013              |
| Make                        | Mazda             |
| Model                       | CX-9              |
| Body Style                  | MPV               |
| VIN                         | JM3TB3BA4D0407170 |
| Body Color                  | Meteor Gray       |
| Odometer Reading (km/mi)    | 173 mi            |
| Engine Displacement (L)     | 3.7               |
| Type/No. Cylinders          | 6                 |
| Engine Placement            | Front -Transverse |
| Transmission Type           | Auto              |
| Transmission Speeds         | 6                 |
| Overdrive                   | Yes               |
| Final Drive                 | AWD               |
| Roof Rack                   | No                |
| Sunroof/T-Top               | No                |
| Running Boards              | No                |
| Tilt Steering Wheel         | Yes               |
| Power Seats                 | No                |
| Anti-Lock Brakes (ABS)      | Yes               |
| Automatic Door Locks (ADLs) | Yes               |

#### TEST VEHICLE OPTIONS

|                                 |     |
|---------------------------------|-----|
| Traction Control System (TCS)   | Yes |
| Power Steering                  | Yes |
| Power Window Auto-Reverse       | Yes |
| Driver Frontal Airbag           | Yes |
| Driver Curtain Airbag           | Yes |
| Driver Head/Torso Airbag        | No  |
| Driver Torso Airbag             | Yes |
| Driver Torso/Pelvis Airbag      | No  |
| Driver Pelvis Airbag            | No  |
| Driver Knee Airbag              | No  |
| Front Pass. Frontal Airbag      | Yes |
| Front Pass. Curtain Airbag      | Yes |
| Front Pass. Head/Torso Airbag   | No  |
| Front Pass. Torso Airbag        | Yes |
| Front Pass. Torso/Pelvis Airbag | No  |
| Front Pass. Pelvis Airbag       | No  |
| Front Pass. Knee Airbag         | No  |
| Driver Pretensioner             | Yes |
| Driver Load Limiter             | Yes |
| Front Pass. Pretensioner        | Yes |
| Front Pass. Load Limiter        | Yes |
| Other                           | N/A |

Does owner's manual provide instructions to turn off automatic door locks?

Yes

#### DATA FROM CERTIFICATION LABEL

|                     |                         |
|---------------------|-------------------------|
| Manufactured by     | Mazda Motor Corporation |
| Date of Manufacture | 12/12                   |

|                 |      |
|-----------------|------|
| GVWR (kg)       | 2720 |
| GAWR Front (kg) | 1307 |
| GAWR Rear (kg)  | 1458 |

#### VEHICLE SEATING AND WEIGHT CAPACITY

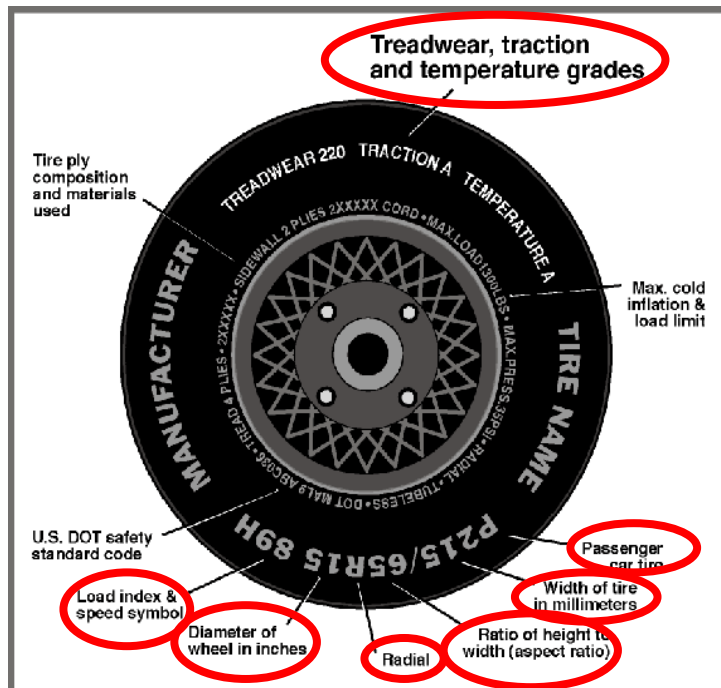
| Measured Parameter      | Front  | Rear        | Third       | Total |
|-------------------------|--------|-------------|-------------|-------|
| Type of Seats           | Bucket | Split bench | Split Bench |       |
| Number of Occupants     | 2      | 2           | 3           | 7     |
| Capacity Wt. (VCW) (kg) |        |             |             | 539.0 |
| Cargo Wt. (RCLW) (kg)   |        |             |             | 62.7  |

## DATA SHEET NO. 1 (CONTINUED)

### GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV  
 Test Program: NCAP Frontal Impact

NHTSA No.: QD5400  
 Test Date: 02/28/13



### DATA FROM TIRE PLACARD

| Measured Parameter          | Front                    | Rear                     |
|-----------------------------|--------------------------|--------------------------|
| Maximum Tire Pressure (kPa) | 300                      | 300                      |
| Cold / Test Pressure (kPa)  | 250                      | 250                      |
| Recommended Tire Size       | P245/60R18               | P245/60R18               |
| Tire Size on Vehicle        | P245/60R18               | P245/60R18               |
| Tire Manufacturer           | Bridgestone              | Bridgestone              |
| Tire Model                  | Dueler H/L 400           | Dueler H/L 400           |
| Treadwear                   | 300                      | 300                      |
| Traction Grade              | A                        | A                        |
| Temperature Grade           | A                        | A                        |
| Tire Plies Sidewall         | 2                        | 2                        |
| Tire Plies Body             | 5                        | 5                        |
| Load Index/Speed Symbol     | 104H                     | 104H                     |
| Tire Material               | Polyester, Steel & Nylon | Polyester, Steel & Nylon |
| DOT Safety Code Right       | H4L2 DEC4812             | H4L2 DEC4812             |
| DOT Safety Code Left        | H4L2 DEC4812             | H4L2 DEC4812             |

**DATA SHEET NO. 1 (CONTINUED)****GENERAL TEST AND VEHICLE PARAMETER DATA**Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUVNHTSA No.: QD5400Test Program: NCAP Frontal ImpactTest Date: 02/28/13**TEST VEHICLE WEIGHTS**

|        | Units | As Delivered (UVW) (Axle) |       |        | As Tested (ATW) (Axle) |        |        |
|--------|-------|---------------------------|-------|--------|------------------------|--------|--------|
|        |       | Front                     | Rear  | Total  | Front                  | Rear   | Total  |
| Left   | kg    | 570.8                     | 446.0 |        | 610.2                  | 506.8  |        |
| Right  | kg    | 558.4                     | 434.8 |        | 580.8                  | 507.4  |        |
| Ratio  | %     | 56.2                      | 43.8  |        | 54.0                   | 46.0   |        |
| Totals | kg    | 1129.2                    | 880.8 | 2010.0 | 1191.0                 | 1014.2 | 2205.2 |

**TARGET TEST WEIGHT CALCULATION**

| Measured Parameter                  | Units | Value  |
|-------------------------------------|-------|--------|
| Total Delivered Weight (UVW)        | kg    | 2010.0 |
| Weight of 1 P572E ATD & 1 P572O ATD | kg    | 139.3  |
| Rated Cargo/Luggage Weight (RCLW)   | kg    | 62.7   |
| Vehicle Target Weight (TVTW)        | kg    | 2212.0 |

**TEST VEHICLE ATTITUDES AND CG**

|              | Units | LF  | RF  | LR  | RR  | CG (aft of front axle) |
|--------------|-------|-----|-----|-----|-----|------------------------|
| As Delivered | mm    | 830 | 833 | 840 | 852 | 1258                   |
| As Tested    | mm    | 811 | 818 | 818 | 824 | 1320                   |
| Post Test    | mm    | 823 | 855 | 823 | 810 |                        |

**GENERAL TEST VEHICLE DATA**

| Measurement Description                 | Units  | Value |
|-----------------------------------------|--------|-------|
| Test Vehicle Wheel Base                 | mm     | 2870  |
| Total Vehicle Length at Left Side       | mm     | 4867  |
| Total Vehicle Length at Centerline      | mm     | 5077  |
| Total Vehicle Length at Right Side      | mm     | 4877  |
| Weight of Ballast in Cargo Area         | kg     | .45   |
| Weight of Vehicle Components Removed    | kg     | 0     |
| Amount of Stoddard Solvent in Fuel Tank | liters | 70.8  |

**LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:**

**DATA SHEET NO. 1 (CONTINUED)****GENERAL TEST AND VEHICLE PARAMETER DATA**Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUVNHTSA No.: QD5400Test Program: NCAP Frontal ImpactTest Date: 02/28/13**TARGET VEHICLE STRUCTURAL MEASUREMENT**

|    | Elements                              | Pre-Test<br>(mm) |
|----|---------------------------------------|------------------|
| 1  | Total Length                          | 5077             |
| 2  | Total Width                           | 1940             |
| 3  | Bumper Top Height                     | 633              |
| 4  | Bumper Bottom Height                  | 493              |
| 5  | Longitudinal Member Top Height        | 638              |
| 6  | Distance Between Longitudinal Members | 1080             |
| 7  | Longitudinal Member Width             | 80               |
| 8  | Engine Top Height                     | 935              |
| 9  | Engine Bottom Height                  | 238              |
| 10 | Engine and Gearbox Width              | 850              |
| 11 | Front Bumper-Engine Distance          | 585              |
| 12 | Front Shock Absorber Fixing Height    | 1055             |
| 13 | Bonnet Leading Edge Height            | 955              |
| 14 | Front Shock Absorber Fixing Width     | 1180             |
| 15 | Front Bumper – Front Axle Distance    | 1095             |
| 16 | Front Axle – A-Pillar Distance        | 565              |
| 17 | A-Pillar – B-Pillar Distance          | 1070             |
| 18 | B-Pillar – Rear Axle Distance         | 1225             |
| 19 | B-Pillar – C-Pillar Distance          | 1085             |
| 20 | Roof Sill Bottom Height               | 1525             |
| 21 | Roof Sill Top Height                  | 1590             |
| 22 | Floor Sill Bottom Height              | 410              |
| 23 | Floor Sill Top Height                 | 460              |

## DATA SHEET NO. 2

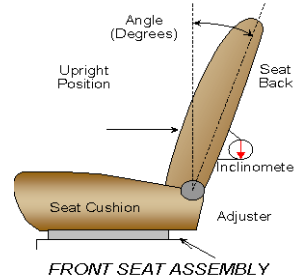
### SEAT ADJUSTMENT, FUEL SYSTEM AND STEERING WHEEL DATA

Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV  
 Test Program: NCAP Frontal Impact

NHTSA No.: QD5400  
 Test Date: 02/28/13

#### NORMAL DESIGN RIDING POSITION

For adjustable driver and passenger seat back. Please describe how to position the inclinometer to measure the seat back angle. Include description of the location of the adjustment latch detent, if applicable.



|                                   | Degree |
|-----------------------------------|--------|
| <b>Driver Seat back angle:</b>    | 15.7   |
| <b>Passenger Seat back angle:</b> | 16.6   |

#### SEAT FORE/AFT POSITIONS

Describe the method used of determining seat for/aft positions.

Driver: Mid position

Passenger: Full forward

|                       | Total Fore/Aft Travel | Placed in Position No. |
|-----------------------|-----------------------|------------------------|
| <b>Driver Seat</b>    | 320                   | 10                     |
| <b>Passenger Seat</b> | 260                   | 0                      |

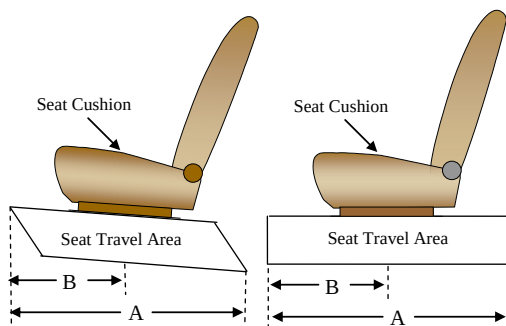
#### SEAT BELT UPPER ANCHORAGE

Describe the method of positioning seat belt upper anchorages.

Driver: Mid position

Passenger: Full forward

|                       | Total No. of Positions | Placed in Position No. |
|-----------------------|------------------------|------------------------|
| <b>Driver Seat</b>    | 4                      | 0                      |
| <b>Passenger Seat</b> | 4                      | 0                      |





## DATA SHEET NO. 2 (CONTINUED)

### SEAT ADJUSTMENT, FUEL SYSTEM AND STEERING WHEEL DATA

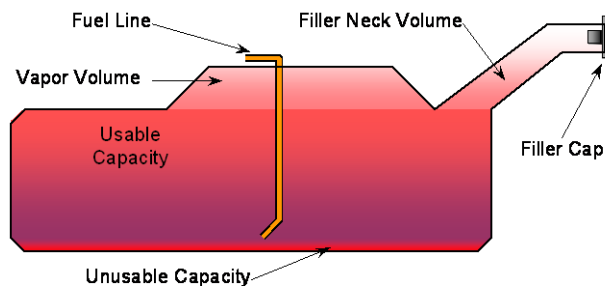
Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV  
 Test Program: NCAP Frontal Impact

NHTSA No.: QD5400  
 Test Date: 02/28/13

#### FUEL TANK CAPACITY

|                                    | Liters |
|------------------------------------|--------|
| Usable Capacity of "Standard Tank" | 76.0   |
| Usable Capacity of "Optional Tank" | N/A    |
| 92%-94% of Usable Capacity         | 70.8   |
| Actual Amount of Solvent Used      | 70.8   |
| 1/3 of Usable Capacity             | 25.3   |

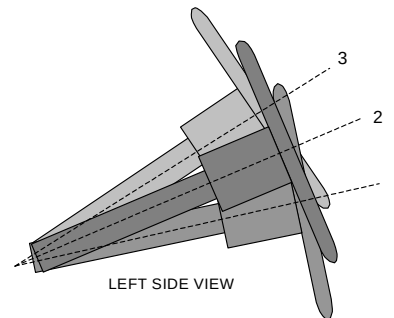
The test vehicle is equipped with an electric fuel pump. The fuel pump operates for approximately two seconds after the ignition is placed in the "ON" position, after which the fuel pump automatically shuts off. The fuel filler door is located on the left rear fender. The standard fuel tank occupies the area under the rear seat.



VEHICLE FUEL TANK ASSEMBLY

#### STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. An aluminum plate is placed across the rim of the steering wheel, an inclinometer is placed on the plate and the angle is measured.



STEERING COLUMN ASSEMBLY

#### STEERING COLUMN POSITIONS

|                                   | Degrees | Fore/Aft Position (mm) |
|-----------------------------------|---------|------------------------|
| Lowermost Position No. 1          | 26.8    | 25                     |
| Geometric Center Position No. 2   | 29.5    | 25                     |
| Uppermost Position No. 3          | 32.1    | 25                     |
| Telescoping Steering Wheel Travel | N/A     | 50                     |
| Test Position                     | 29.5    | 25                     |

### DATA SHEET NO. 3

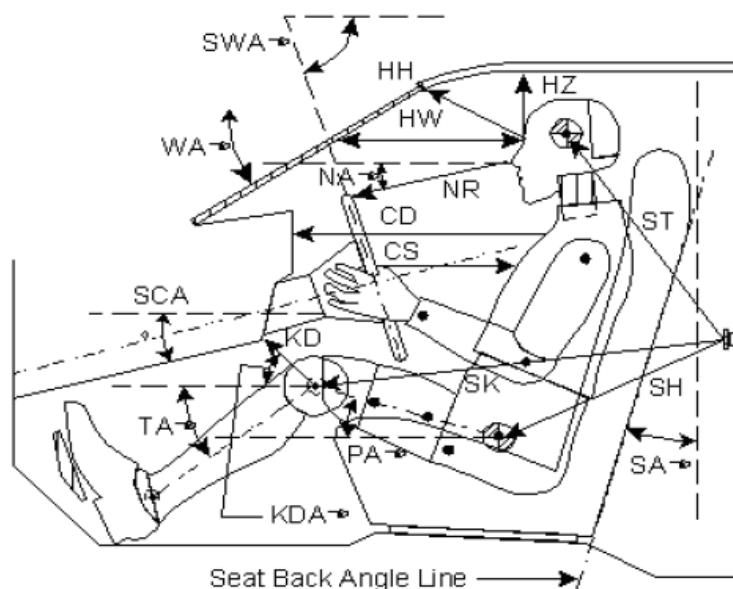
#### DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV

NHTSA No.: QD5400

Test Program: NCAP Frontal Impact

Test Date: 02/28/13



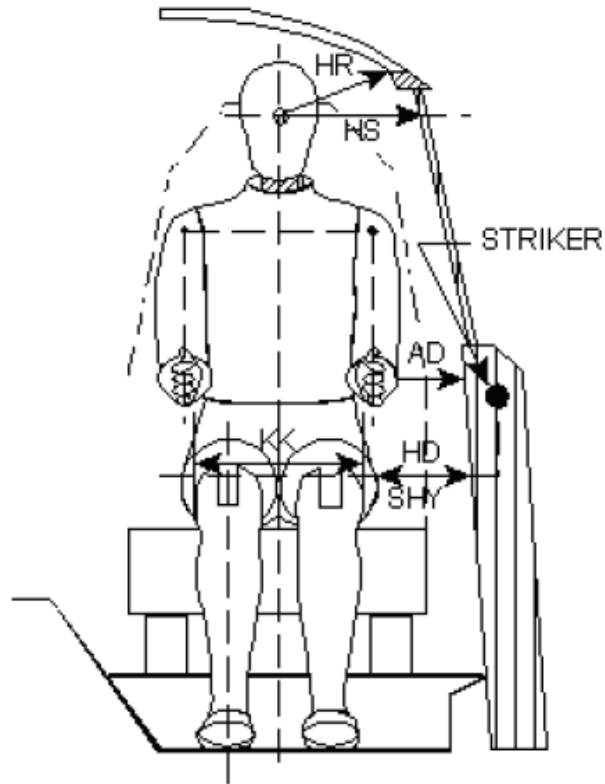
| Code        | Measurement Description            | Driver      |           | Passenger   |           |
|-------------|------------------------------------|-------------|-----------|-------------|-----------|
|             |                                    | Length (mm) | Angle (°) | Length (mm) | Angle (°) |
| <b>WA°</b>  | Windshield Angle                   |             | 28.5      |             |           |
| <b>SWA°</b> | Steering Wheel Angle               |             | 29.5      |             |           |
| <b>SCA°</b> | Steering Column Angle              |             | 60.5      |             |           |
| <b>SA°</b>  | Seat Back Angle (on headrest post) |             | 15.7      |             | 16.6      |
| <b>HZ</b>   | Head to Roof (Z)                   | 203         | 90.0      | 221         | 90.0      |
| <b>HH</b>   | Head to Header                     | 358         | 29.8      | 305         | 53.0      |
| <b>HW</b>   | Head to Windshield                 | 704         | 0.0       | 683         | 0.0       |
| <b>NR</b>   | Nose to Rim                        | 379         | 10.5      |             |           |
| <b>CD</b>   | Chest to Dash                      | 543         |           | 460         |           |
| <b>CS</b>   | Chest to Steering Hub              | 290         | 0.0       |             |           |
| <b>RA</b>   | Rim to Abdomen                     | 162         | 0.0       |             |           |
| <b>KDL</b>  | Left Knee to Dash                  | 154         | 25.0      | 59          | 41.0      |
| <b>KDR</b>  | Right Knee to Dash                 | 141         | 25.0      | 77          | 41.0      |
| <b>PA°</b>  | Pelvic Angle                       |             | 21.0      |             | 22.3      |
| <b>TA°</b>  | Tibia Angle                        |             | 49.3      |             | 61.0      |
| <b>SK</b>   | Striker to Knee                    | 665         | 2.5       | 763         | 6.5       |
| <b>ST</b>   | Striker to Head                    | 529         | 71.0      | 535         | 55.5      |
| <b>SH</b>   | Striker to H-Point                 | 323         | 28.5      | 452         | 12.7      |

## DATA SHEET NO. 4

### DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV  
Test Program: NCAP Frontal Impact

NHTSA No.: QD5400  
Test Date: 02/28/13



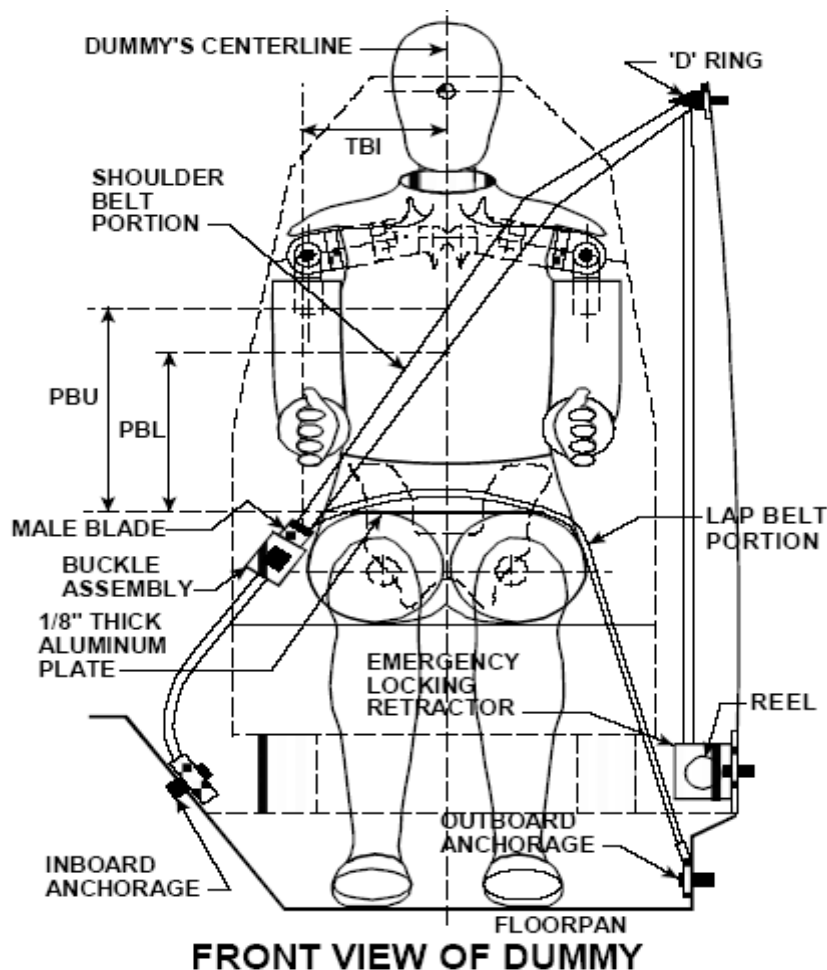
| Code       | Measurement Description          | Driver | Passenger |
|------------|----------------------------------|--------|-----------|
| <b>AD</b>  | Arm to Door                      | 153    | 99        |
| <b>HD</b>  | H-Point to Door                  | 194    | 190       |
| <b>HR</b>  | Head to Side Header              | 248    | 273       |
| <b>HS</b>  | Head to Side Window              | 380    | 388       |
| <b>KK</b>  | Knee to Knee                     | 300    | 165       |
| <b>SHY</b> | Striker to H-Point (Y Direction) | 190    | 178       |
| <b>AA</b>  | Ankle to Ankle                   | 287    | 158       |

## DATA SHEET NO. 5

### SEAT BELT POSITIONING DATA

Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV  
 Test Program: NCAP Frontal Impact

NHTSA No.: QD5400  
 Test Date: 02/28/13



### SEAT BELT POSITIONING MEASUREMENTS

| Measurement Description                                  | Units | Driver | Passenger |
|----------------------------------------------------------|-------|--------|-----------|
| <b>PBU</b> – Top surface of reference to belt upper edge | mm    | 375    | 334       |
| <b>PBL</b> – Top surface of reference to belt lower edge | mm    | 283    | 233       |

### BELT LENGTH DATA

| Measurement Description                          | Units | Driver | Passenger |
|--------------------------------------------------|-------|--------|-----------|
| Shoulder belt length as measured on ATD          | mm    | 927    | 1015      |
| Lap belt length as measured on ATD               | mm    | 743    | 540       |
| Remainder of belt on reel                        | mm    | 1164   | 1055      |
| Total belt length for continuous webbing systems | mm    | 2834   | 2610      |

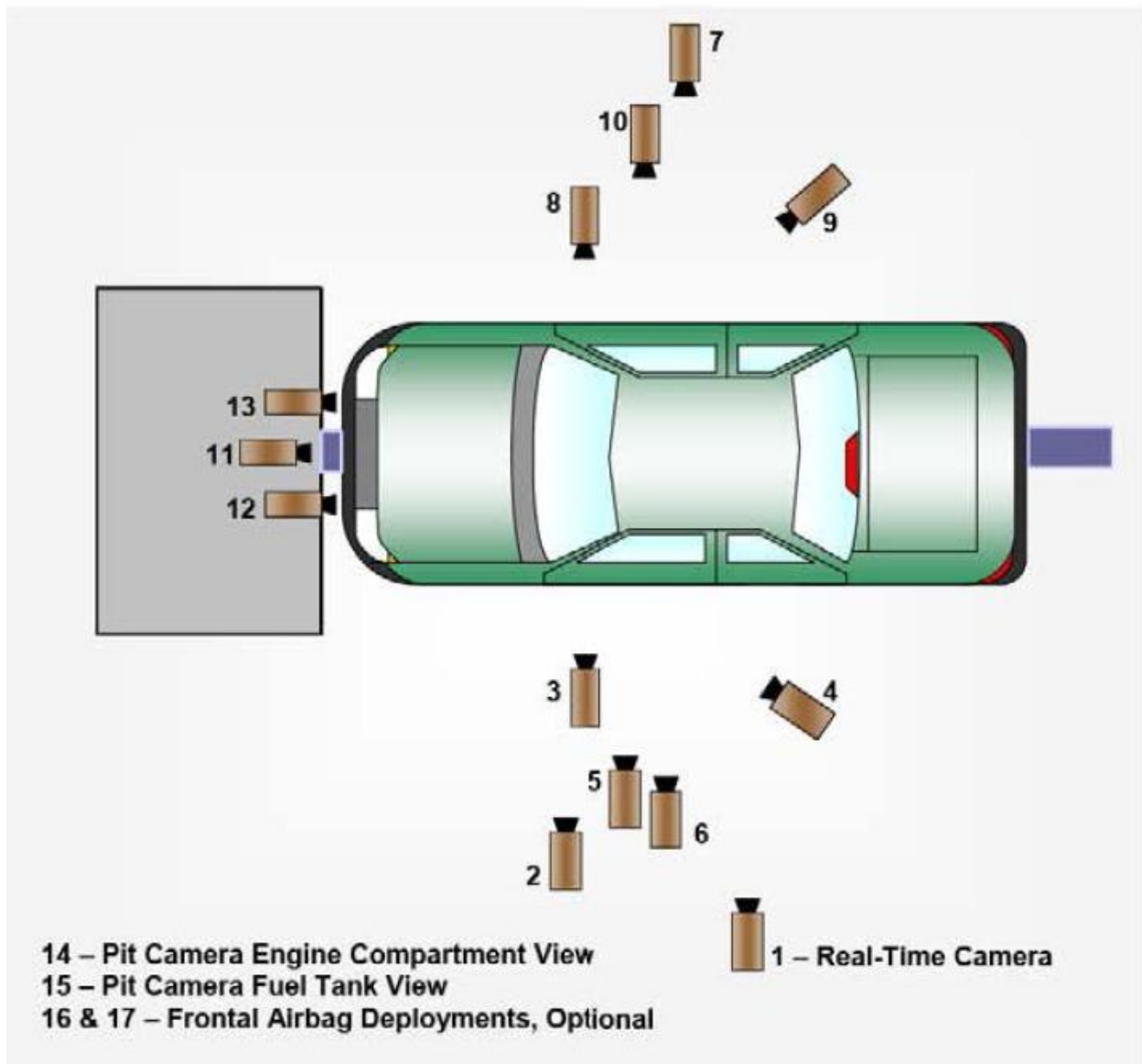
## DATA SHEET NO. 6

### HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV  
Test Program: NCAP Frontal Impact

NHTSA No.: QD5400  
Test Date: 02/28/13

### CAMERA POSITIONS FOR FRONTAL IMPACTS



**DATA SHEET NO. 6 (CONTINUED)****HIGH SPEED CAMERA LOCATIONS AND DATA**Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUVNHTSA No.: QD5400Test Program: NCAP Frontal ImpactTest Date: 02/28/13**CAMERA LOCATIONS**

| No. | Camera View                         | Location (mm) |       |       | Lens (mm) | Frame Speed (fps) |
|-----|-------------------------------------|---------------|-------|-------|-----------|-------------------|
|     |                                     | X             | Y     | Z     |           |                   |
| 1   | Real-Time Left Overall              | NA            | NA    | NA    | zoom      | 30                |
| 2   | Driver Close-Up                     | 1512          | -5548 | -1308 | 50        | 1000              |
| 3   | Left Front Half <sup>1</sup>        | 634           | -5286 | -1284 | 25        | 1000              |
| 4   | Left Angle                          | 4072          | -2429 | -1902 | 16        | 1000              |
| 5   | Steering Column - Top               | 1899          | -5088 | -2114 | 25        | 1000              |
| 6   | Steering Column – Bottom            | 1887          | -4697 | -1434 | 25        | 1000              |
| 7   | Right Overall                       | 2416          | 5626  | -1135 | 12.5      | 1000              |
| 8   | Passenger Close-Up                  | 1404          | 5796  | -1335 | 50        | 1000              |
| 9   | Right Front Half                    | 1267          | 5649  | -1105 | 25        | 1000              |
| 10  | Right Angle                         | 4221          | 2790  | -1954 | 25        | 1000              |
| 11  | Windshield                          | 73            | 0     | -2543 | 8.5       | 1000              |
| 12  | Driver Windshield                   | 108           | -323  | -2563 | 16        | 1000              |
| 13  | Passenger Windshield                | 86            | 375   | -2524 | 16        | 1000              |
| 14  | Pit Front                           | 540           | 0     | 3066  | 16        | 1000              |
| 15  | Pit Rear                            | 2476          | 0     | 2968  | 8.5       | 1000              |
| 16  | Onboard Driver Airbag (Optional)    | NA            | NA    | NA    | 8.5       | 1000              |
| 17  | Onboard Passenger Airbag (Optional) | NA            | NA    | NA    | 8.5       | 1000              |

Reference Points: +X – forward of impact plane  
+Y – right of monorail center  
+Z – into ground

<sup>1</sup> Camera malfunction view number 3.

## DATA SHEET NO. 7

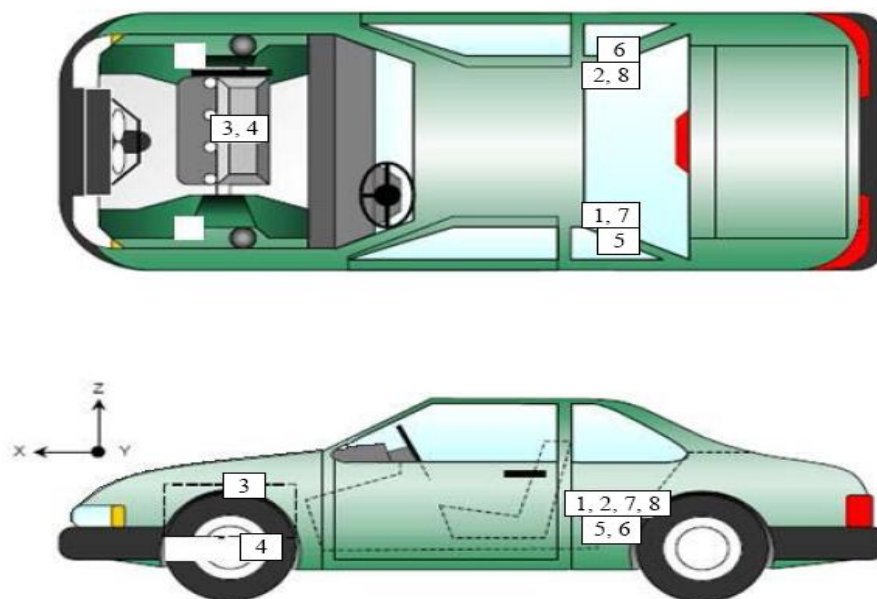
### VEHICLE ACCELEROMETER DATA

Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV

NHTSA No.: QD5400

Test Program: NCAP Frontal Impact

Test Date: 02/28/13



### VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

| No. | Camera View                            | Location (mm) |      |     |
|-----|----------------------------------------|---------------|------|-----|
|     |                                        | X             | Y    | Z   |
| 1   | Left Rear Accelerometer – X Direction  | 2730          | -618 | 480 |
| 2   | Right Rear Accelerometer – X Direction | 2737          | 610  | 480 |
| 3   | Engine Top X                           | 4775          | -10  | 890 |
| 4   | Engine Bottom X                        | 4940          | 310  | 275 |
| 5   | Left Rear Accelerometer – Z Direction  | 2700          | -625 | 480 |
| 6   | Right Rear Accelerometer – Z Direction | 2705          | 605  | 480 |

Reference Points: X – Rear Surface of Vehicle (+ forward)  
Y – Vehicle Centerline (+ to right)  
Z – Ground Plane (+ up)

## DATA SHEET NO. 8

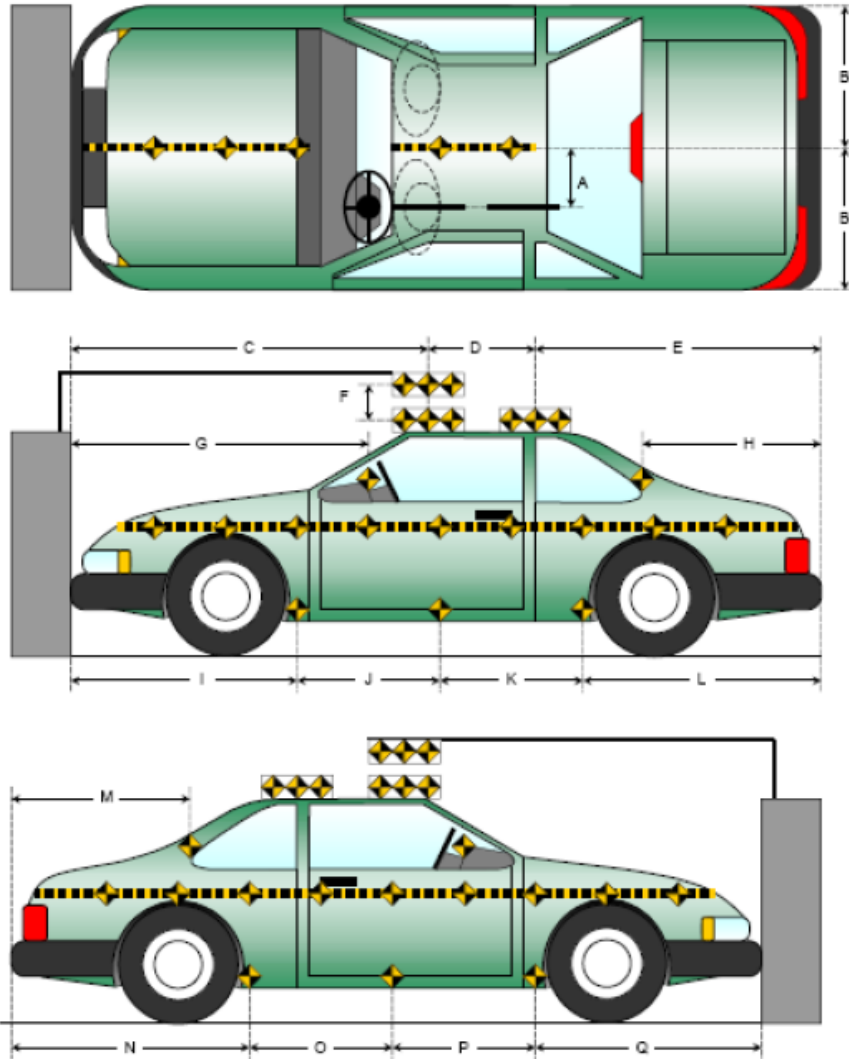
### PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV  
 Test Program: NCAP Frontal Impact

NHTSA No.: QD5400  
 Test Date: 02/28/13

| Item | Value |
|------|-------|
| A    | 410   |
| B    | 632   |
| C    | 2596  |
| D    | 610   |
| E    | 1901  |
| F    | ND    |
| G    | 1865  |
| H    | 1367  |
| I    | 1385  |
| J    | 915   |
| K    | 935   |
| L    | 1637  |
| M    | 1370  |
| N    | 1888  |
| O    | 922   |
| P    | 925   |
| Q    | 1395  |

All units in millimeters



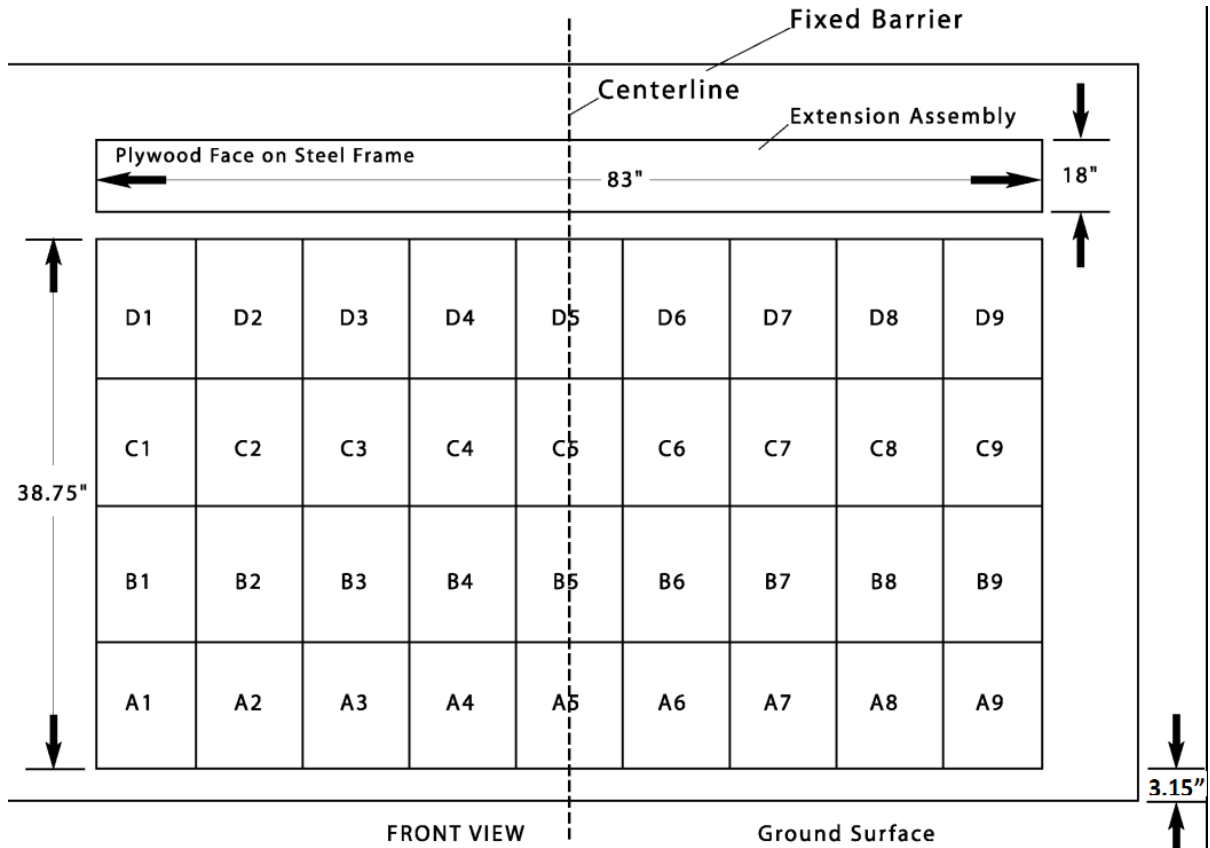


## DATA SHEET NO. 9

### LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV  
 Test Program: NCAP Frontal Impact

NHTSA No.: QD5400  
 Test Date: 02/28/13



## DATA SHEET NO. 10

### TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV NHTSA No.: QD5400  
Test Program: NCAP Frontal Impact Test Date: 02/28/13

### INSTRUMENTATION

| Instrumentation                  | Number of Channels Collected |
|----------------------------------|------------------------------|
| Driver Dummy Accelerometers      | 42                           |
| Passenger Dummy Accelerometers   | 42                           |
| Vehicle Structure Accelerometers | 8                            |
| <b>Total</b>                     | 92                           |

### CAMERA COVERAGE

| Type of Camera             | Number Used in this Test |
|----------------------------|--------------------------|
| High-Speed Vehicle Onboard | 2                        |
| High-Speed Offboard        | 14                       |
| Rear-Time Panning          | 2                        |
| <b>Total</b>               | 18                       |

**DATA SHEET NO. 11****POST-TEST OBSERVATIONS**Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUVNHTSA No.: QD5400Test Program: NCAP Frontal ImpactTest Date: 02/28/13**TEST DUMMY INFORMATION AND CONTACT LOCATIONS**

| Description             | Driver               | Passenger           |
|-------------------------|----------------------|---------------------|
| Dummy Type / Serial No. | Hybrid III 50th/ 037 | Hybrid III 5th/ 426 |
| Head Contact            | Airbag, headrest     | Airbag, headrest    |
| Upper Torso Contact     | Airbag               | Airbag              |
| Lower Torso Contact     | None                 | None                |
| Left Knee Contact       | Knee Bolster         | Glove box           |
| Right Knee Contact      | Knee Bolster         | Glove box           |

**DOOR OPENING AND SEAT TRACK INFORMATION**

| Description           | Front                  | Rear                   |
|-----------------------|------------------------|------------------------|
| Locked/Unlocked Doors | Unlocked               | Unlocked               |
| Front Door Opening    | Closed and operational | Closed and operational |
| Rear Door Opening     | Closed and operational | Closed and operational |
| Seat Track Shift (mm) | None                   | None                   |
| Seat Back Failure     | None                   | None                   |
| Glazing Damage        | None                   | None                   |

**VEHICLE REBOUND FROM BARRIER**

| Measured Parameters | Units | Value |
|---------------------|-------|-------|
| Left Side           | mm    | 1160  |
| Center              | mm    | 1235  |
| Right Side          | mm    | 1180  |
| Average             | mm    | 1192  |

**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

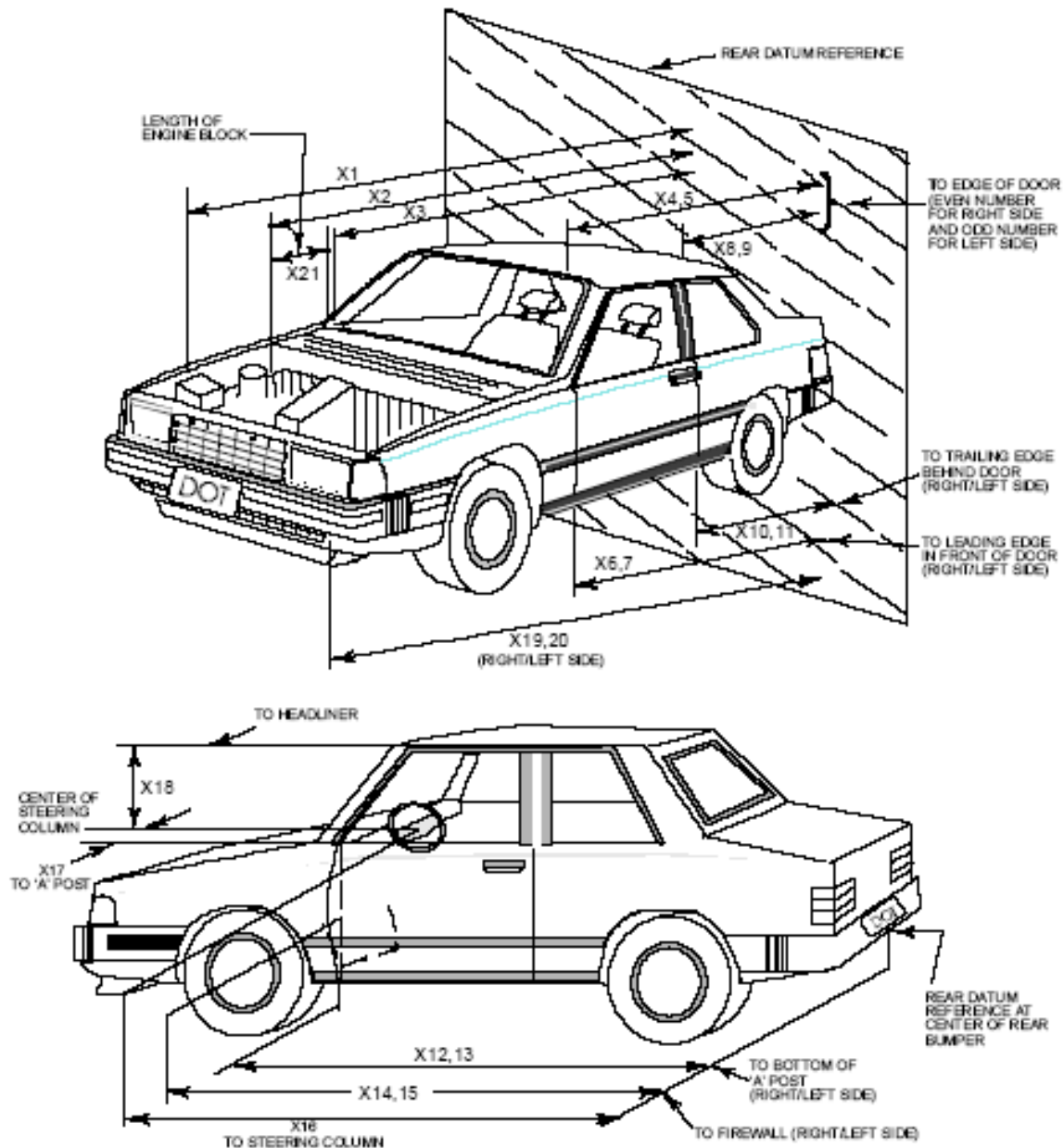
| Restraint Type         | Driver (Occupant 1) |          | Passenger (Occupant 2) |          |
|------------------------|---------------------|----------|------------------------|----------|
|                        | Installed           | Deployed | Installed              | Deployed |
| Front Airbag           | Yes                 | Yes      | Yes                    | Yes      |
| Curtain                | Yes                 | No       | Yes                    | No       |
| Torso Airbag           | Yes                 | No       | Yes                    | No       |
| Seat Belt Pretensioner | Yes                 | Yes      | Yes                    | Yes      |
| Seat Belt Load Limiter | No                  | NA       | No                     | NA       |
| Other                  | NA                  | NA       | NA                     | NA       |

## DATA SHEET NO. 12

### VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV  
Test Program: NCAP Frontal Impact

NHTSA No.: QD5400  
Test Date: 02/28/13



**DATA SHEET NO. 12 (CONTINUED)****VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV  
Test Program: NCAP Frontal Impact

NHTSA No.: QD5400  
Test Date: 02/28/13

| No. | Measurement Description                           | Pre-Test | Post-Test | Difference |
|-----|---------------------------------------------------|----------|-----------|------------|
| 1   | Total Length of Vehicle at Centerline             | 5077     | 4487      | 590        |
| 2   | Rear Surface of Vehicle (RSOV) to Front of Engine | 4477     | 4257      | 220        |
| 3   | RSOV to Firewall                                  | 3992     | 3947      | 45         |
| 4   | RSOV to Upper Leading Edge of Right Door          | 3442     | 3437      | 5          |
| 5   | RSOV to Upper Leading Edge of Left Door           | 3447     | 3442      | 5          |
| 6   | RSOV to Lower Leading Edge of Right Door          | 3440     | 3435      | 5          |
| 7   | RSOV to Lower Leading Edge of Left Door           | 3442     | 3442      | 0          |
| 8   | RSOV to Upper Trailing Edge of Right Door         | 2356     | 2352      | 4          |
| 9   | RSOV to Upper Trailing Edge of Left Door          | 2358     | 2352      | 6          |
| 10  | RSOV to Lower Trailing Edge of Right Door         | 2432     | 2427      | 5          |
| 11  | RSOV to Lower Trailing Edge of Left Door          | 2439     | 2439      | 0          |
| 12  | RSOV to Bottom of "A" Post-of Right Side          | 3422     | 3425      | -3         |
| 13  | RSOV to Bottom of "A" Post-of Left Side           | 3427     | 3425      | 2          |
| 14  | RSOV to Firewall, Right Side                      | 4047     | 3994      | 53         |
| 15  | RSOV to Firewall, Left Side                       | 4057     | 4009      | 48         |
| 16  | RSOV to Steering Column                           | 3007     | 3067      | -60        |
| 17  | Center of Steering Column to "A" Post             | 330      | 325       | 5          |
| 18  | Center of Steering Column to Headliner            | 425      | 410       | 15         |
| 19  | RSOV to Right Side of Front Bumper                | 4877     | 4387      | 490        |
| 20  | RSOV to Left Side of Front Bumper                 | 4867     | 4394      | 473        |
| 21  | Length of Engine Block                            | 540      | 540       | 0          |
| RD  | RSOV to Right Side of Dash Panel                  | 3397     | 3387      | 10         |
| CD  | RSOV to Center of Dash Panel                      | 3317     | 3312      | 5          |
| LD  | RSOV to Left Side of Dash Panel                   | 3382     | 3392      | -10        |

All Dimensions in mm

## DATA SHEET NO. 13

### ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV  
Test Program: NCAP Frontal Impact

NHTSA No.: QD5400  
Test Date: 02/28/13

### VEHICLE INFORMATION

VIN: JM3TB3BA4D0407170  
Vehicle Size Category: SUV

Wheelbase: 2870  
Test Weight (kg): 2205.2

### ACCELEROMETER DATA

Accelerometer Locations: As listed on Page 15 of this report.

Cal. Procedure/Interval: TRC procedure / 6 month interval

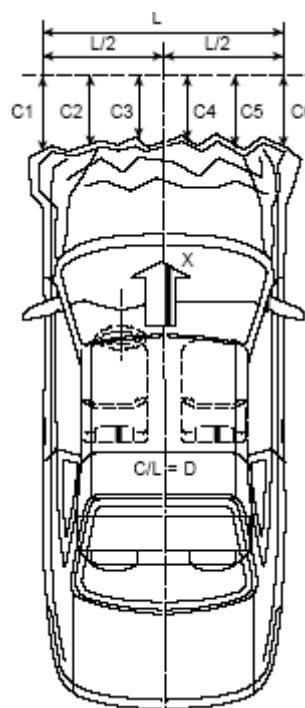
Integration Algorithm: Trapezoidal

Linearity: > 99%

Impact Velocity (km/h): 56.54

Velocity Change (km/h): 64.28

Time of Separation (ms): 117



### CRUSH PROFILE

Collision Deformation Classification: 12FDEW2

Midpoint of Damage: Centerline

Damage Region Length (mm): 1524

Impact Mode: Frontal

| No. | Measurement Description    | Units | Pre-Test | Post-Test | Difference |
|-----|----------------------------|-------|----------|-----------|------------|
| C1  | Crush zone 1 at left side  | mm    | 4867     | 4394      | 473        |
| C2  | Crush zone 1 at left side  | mm    | 4987     | 4462      | 525        |
| C3  | Crush zone 1 at left side  | mm    | 5062     | 4462      | 600        |
| C4  | Crush zone 1 at right side | mm    | 5067     | 4442      | 625        |
| C5  | Crush zone 1 at right side | mm    | 4987     | 4432      | 555        |
| C6  | Crush zone 1 at right side | mm    | 4877     | 4387      | 490        |
| L   | C1 to C6                   | mm    | 1524     |           |            |

## DATA SHEET NO. 14

### VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV  
Test Program: NCAP Frontal Impact

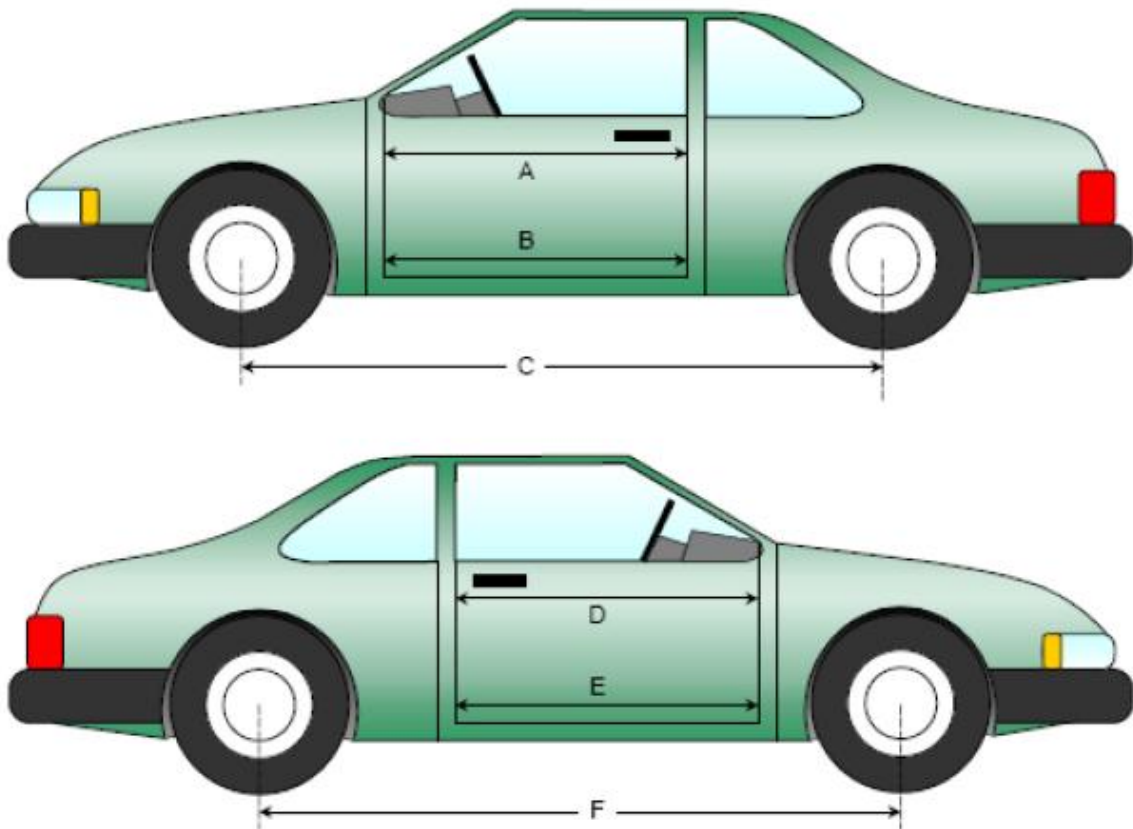
NHTSA No.: QD5400  
Test Date: 02/28/13

### DOOR OPENING WIDTH

| No. | Description      | Units | Pre-Test | Post-Test | Difference |
|-----|------------------|-------|----------|-----------|------------|
| A   | Left Side Upper  | mm    | 1027     | 1025      | 2          |
| B   | Left Side Lower  | mm    | 892      | 895       | -3         |
| D   | Right Side Upper | mm    | 1023     | 1022      | 1          |
| E   | Right Side Lower | mm    | 920      | 917       | 3          |

### WHEELBASE MEASUREMENTS

| No. | Description          | Units | Pre-Test | Post-Test | Difference |
|-----|----------------------|-------|----------|-----------|------------|
| C   | Left Side Wheelbase  | mm    | 2870     | 2855      | 15         |
| F   | Right Side Wheelbase | mm    | 2870     | 2850      | 20         |



## DATA SHEET NO. 14 (CONTINUED)

### VEHICLE INTRUSION MEASUREMENTS

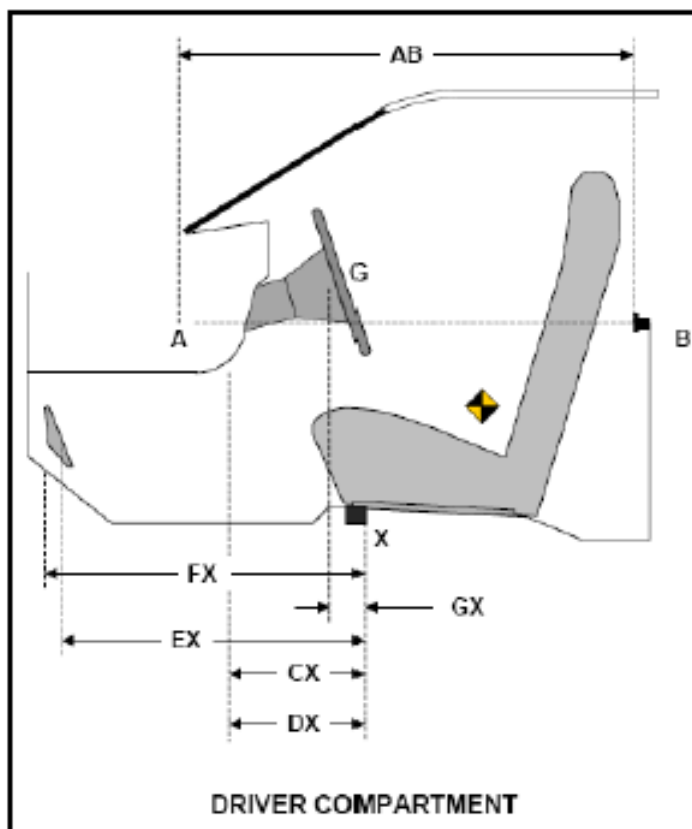
Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV  
 Test Program: NCAP Frontal Impact

NHTSA No.: QD5400  
 Test Date: 02/28/13

#### DRIVER COMPARTMENT INTRUSION

| Item | Description                              | Units | Pre-Test | Post-Test | Difference |
|------|------------------------------------------|-------|----------|-----------|------------|
| AB   | Door Opening (Inside Window Jam)         | mm    | 892      | 895       | -3         |
| CX   | Left Knee Bolster to X                   | mm    | 280      | 292       | -12        |
| DX   | Right Knee Bolster to X                  | mm    | 260      | 280       | -20        |
| EX   | Brake Pedal to X                         | mm    | 520      | 540       | -20        |
| FX   | Foot Rest to X                           | mm    | 535      | 533       | 2          |
| GX   | Center of Steering Column Wheel Hub to X | mm    | 53       | 105       | -52        |

X = Front of Seat Track (Stationary)





## DATA SHEET NO. 15

### SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV  
 Test Program: NCAP Frontal Impact

NHTSA No.: QD5400  
 Test Date: 02/28/13

Please provide windshield mounting details.

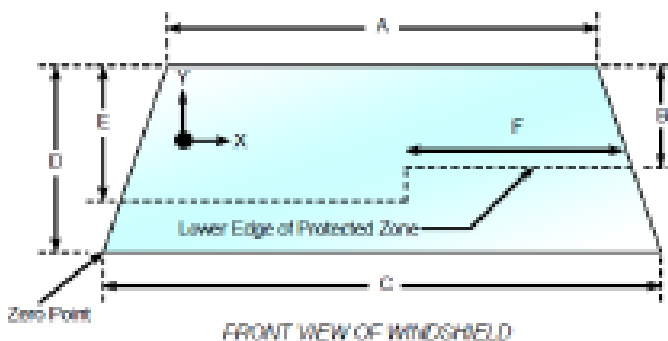
The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicle not equipped with occupant passive restraint and 50% for each side of the windshield for vehicle which are equipped with occupant passive restraints.

Temperature of windshield molding during test:

#### WINDSHIELD PERIPHERY MEASUREMENTS

| Measurement | Pre-Test (mm) | Post-Test (mm) | % Retention |
|-------------|---------------|----------------|-------------|
| Left Side   | 1865.0        | 1865.0         | 100         |
| Right Side  | 1915.0        | 1915.0         | 100         |
| Total       | 3780.0        | 3780.0         | 100         |

| Item | Units | Value |
|------|-------|-------|
| A    | mm    | 1300  |
| B    | mm    | 605   |
| C    | mm    | 1600  |
| D    | mm    | 930   |
| E    | mm    | 590   |
| F    | mm    | 520   |



#### AREAS OF PROTECTED ZONE FAILURES

A. Provide coordinates of the area that the protected zone was penetrated more than .25 inches by a vehicle component other than one that is normally in contact with the windshield.

| X  | Y  |
|----|----|
| NA | NA |
| NA | NA |
| NA | NA |
| NA | NA |

B. Provide coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component.

| X  | Y  |
|----|----|
| NA | NA |
| NA | NA |
| NA | NA |
| NA | NA |

**DATA SHEET NO. 15 (CONTINUED)**

**SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA**

Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV NHTSA No.: QD5400  
Test Program: NCAP Frontal Impact Test Date: 02/28/13

**FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA**

Temperature at Time of Impact: Test Time:

**Stoddard Solvent Spillage Measurements**

- A From impact until vehicle motion ceases: 0 oz.  
(maximum allowable – 1 oz.)
- B For the 5-minute period after motion ceases: 0 oz.  
(maximum allowable – 5 oz.)
- C For the following 25 minutes: 0 oz.  
(maximum allowable – 1 oz./minutes)
- D Spillage: 0

## DATA SHEET NO. 16

### FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV

NHTSA No.: QD5400

Test Program: NCAP Frontal Impact

Test Date: 02/28/13

1. The specified fixture rollover rate for each 90° of rotation is 50 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).

3. Details of Stoddard Solvent spillage:

None

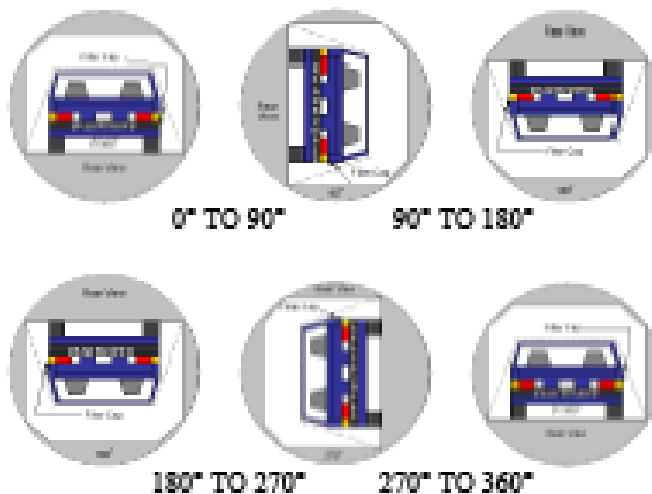
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### SOLVENT COLLECTION TIME TABLE IN SECONDS

| Test Phase   | Rotation Time | Hold Time | Total Time |
|--------------|---------------|-----------|------------|
| 0° to 90°    | 120           | 300       | 420        |
| 90° to 180°  | 120           | 300       | 420        |
| 180° to 270° | 120           | 300       | 420        |
| 270° to 360° | 120           | 300       | 420        |

### FMVSS 301 SPILLAGE TABLE

| Test Phase   | First 5 Minutes | Sixth Minute | Seventh Minute | Eighth Minute |
|--------------|-----------------|--------------|----------------|---------------|
| 0° to 90°    | 0               | 0            | 0              | NA            |
| 90° to 180°  | 0               | 0            | 0              | NA            |
| 180° to 270° | 0               | 0            | 0              | NA            |
| 270° to 360° | 0               | 0            | 0              | NA            |

### SOLVENT SPILLAGE LOCATION TABLE

| Test Phase   | Spillage Location |
|--------------|-------------------|
| 0° to 90°    | None              |
| 90° to 180°  | None              |
| 180° to 270° | None              |
| 270° to 360° | None              |

## DATA SHEET NO. 17

### DUMMY/VEHICLE TEMPERATURE STABILIZATION

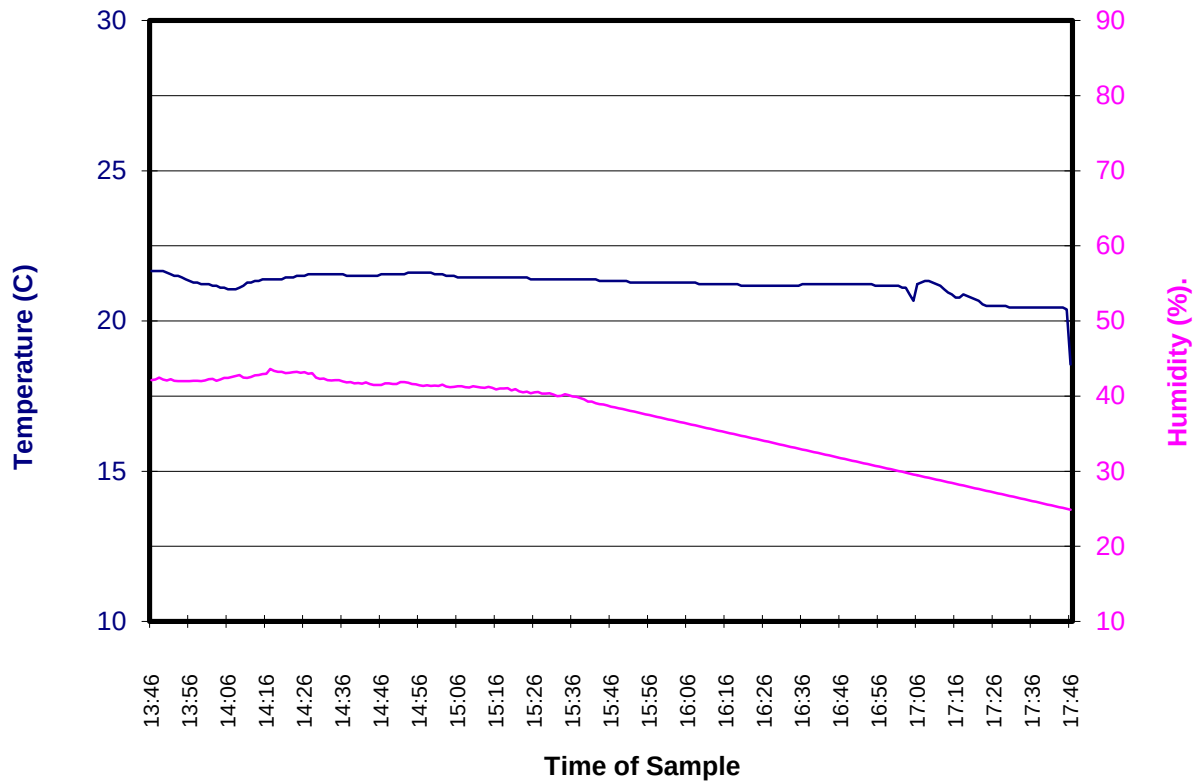
Test Vehicle: 2013 Mazda CX-9 AWD 5dr SUV

NHTSA No.: QD5400

Test Program: NCAP Frontal Impact

Test Date: 02/28/13

Frontal NCAP 130228: Test Time 17:46



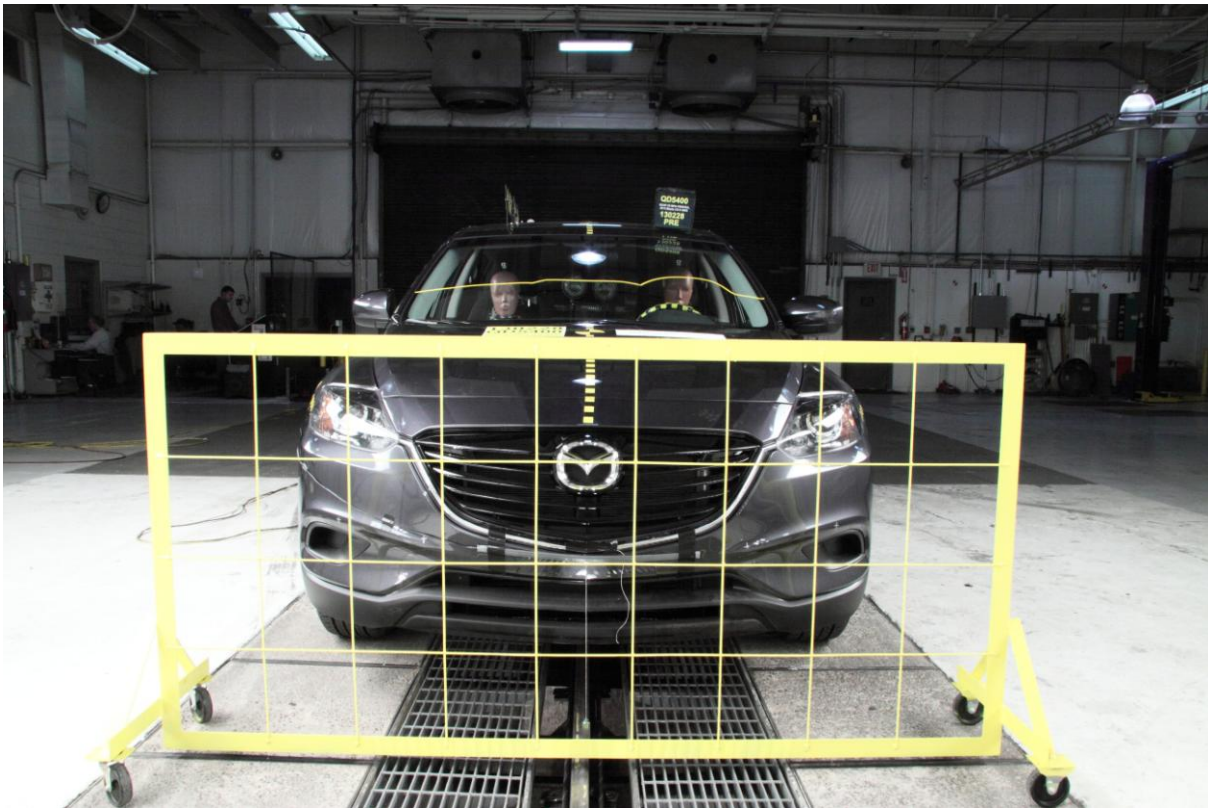
**APPENDIX A**  
**PHOTOGRAPHS**

## TABLE OF PHOTOGRAPHS

| No. | Description                                       | Page |
|-----|---------------------------------------------------|------|
| 1   | Load Cell Location                                | A-4  |
| 2   | Load Cell Wall                                    | A-4  |
| 3   | Manufacturer's Label                              | A-5  |
| 4   | Tire Placard                                      | A-5  |
| 5   | 2013 Mazda CX-9 AWD 5-dr SUV Frontal as Delivered | A-6  |
| 6   | Left Rear 3-4 View, as Received                   | A-6  |
| 7   | Pre-Test Front View of Test Vehicle               | A-7  |
| 8   | Post-Test Front View of Test Vehicle              | A-7  |
| 9   | Pre-Test Left View of Test Vehicle                | A-8  |
| 10  | Post-Test Left View of Test Vehicle               | A-8  |
| 11  | Pre-Test Right View of Test Vehicle               | A-9  |
| 12  | Post-Test Right View of Test Vehicle              | A-9  |
| 13  | Pre-Test Right Front 3-4 View                     | A-10 |
| 14  | Post-Test Right Front 3-4 View                    | A-10 |
| 15  | Pre-Test Left Rear 3-4 View                       | A-11 |
| 16  | Post-Test Left Rear 3-4 View                      | A-11 |
| 17  | Pre-Test Windshield View                          | A-12 |
| 18  | Pre-Test Windshield View                          | A-12 |
| 19  | Pre-Test Engine Compartment View                  | A-13 |
| 20  | Post-Test Engine Compartment View                 | A-13 |
| 21  | Pre-Test Fuel Filler Cap View                     | A-14 |
| 22  | Post-Test Fuel Filler Cap View                    | A-14 |
| 23  | Pre-Test Front Underbody View                     | A-15 |
| 24  | Post-Test Front Underbody View                    | A-15 |
| 24a | Pre-Test Mid Underbody View                       | A-16 |
| 24b | Post-Test Mid Underbody View                      | A-16 |
| 25  | Pre-Test Rear Underbody View                      | A-17 |
| 26  | Post-Test Rear Underbody View                     | A-17 |
| 27  | Pre-Test Dummy Cable Routing                      | A-18 |
| 28  | Post-Test Dummy Cable Routing                     | A-18 |
| 29  | Pre-Test Driver Dummy Front View                  | A-19 |
| 30  | Post-Test Driver Dummy Front View                 | A-19 |
| 31  | Pre-Test Driver Dummy Window View                 | A-20 |
| 32  | Post-Test Driver Dummy Window View                | A-20 |
| 33  | Pre-Test Driver Dummy and Vehicle Interior View   | A-21 |
| 34  | Post-Test Driver Dummy and Vehicle Interior View  | A-21 |
| 35  | Pre-Test Driver's Seat Fore-Aft Markings          | A-22 |
| 36  | Post-Test Driver's Seat Fore-Aft Markings         | A-22 |
| 37  | Pre-Test View of Belt Anchorage for Driver Dummy  | A-23 |
| 38  | Post-Test View of Belt Anchorage for Driver Dummy | A-23 |
| 39  | Pre-Test Driver Dummy Feet                        | A-24 |
| 40  | Post-Test Driver Dummy Feet                       | A-24 |
| 41  | Pre-Test Driver's Side Knee Bolster               | A-25 |

## TABLE OF PHOTOGRAPHS (CONTINUED)

| <b>No.</b> | <b>Description</b>                                             | <b>Page</b> |
|------------|----------------------------------------------------------------|-------------|
| <b>42</b>  | Post-Test Driver's Side Knee Bolster                           | <b>A-25</b> |
| <b>43</b>  | Pre-Test Driver's Side Floorpan                                | <b>A-26</b> |
| <b>44</b>  | Post-Test Driver's Side Floorpan                               | <b>A-26</b> |
| <b>45</b>  | Post-Test Driver Dummy Face                                    | <b>A-27</b> |
| <b>46</b>  | Post-Test Driver Dummy Contact with Airbag                     | <b>A-27</b> |
| <b>47</b>  | Post-Test Driver Dummy Contact with Headrest                   | <b>A-28</b> |
| <b>48</b>  | Pre-Test View of the Steering Wheel                            | <b>A-28</b> |
| <b>49</b>  | Post-Test View of the Steering Wheel                           | <b>A-29</b> |
| <b>50</b>  | Pre-Test Passenger Dummy Front View                            | <b>A-29</b> |
| <b>51</b>  | Post-Test Passenger Dummy Front View                           | <b>A-30</b> |
| <b>52</b>  | Pre-Test Passenger Dummy Window View                           | <b>A-30</b> |
| <b>53</b>  | Post-Test Passenger Dummy Window View                          | <b>A-31</b> |
| <b>54</b>  | Pre-Test Passenger Dummy and Vehicle Interior View             | <b>A-31</b> |
| <b>55</b>  | Post-Test Passenger Dummy and Vehicle Interior View            | <b>A-32</b> |
| <b>56</b>  | Pre-Test Passenger Seat Fore-Aft Markings                      | <b>A-32</b> |
| <b>57</b>  | Post-Test Passenger Seat Fore-Aft Markings                     | <b>A-33</b> |
| <b>58</b>  | Pre-Test View of Belt Anchorage for Passenger Dummy            | <b>A-33</b> |
| <b>59</b>  | Post-Test View of Belt Anchorage for Passenger Dummy           | <b>A-34</b> |
| <b>60</b>  | Pre-Test Passenger Dummy Feet                                  | <b>A-34</b> |
| <b>61</b>  | Post-Test Passenger Dummy Feet                                 | <b>A-35</b> |
| <b>62</b>  | Pre-Test Passenger Side Knee Bolster                           | <b>A-35</b> |
| <b>63</b>  | Post-Test Passenger Side Knee Bolster                          | <b>A-36</b> |
| <b>64</b>  | Pre-Test Passenger Side Floorpan                               | <b>A-36</b> |
| <b>65</b>  | Post-Test Passenger Side Floorpan                              | <b>A-37</b> |
| <b>66</b>  | Post-Test Passenger Dummy Contact With Headrest                | <b>A-37</b> |
| <b>66a</b> | Post-Test Passenger Dummy Contact With Airbag                  | <b>A-38</b> |
| <b>67</b>  | Photograph of Ballast Installed in Vehicle                     | <b>A-38</b> |
| <b>68</b>  | Post-Test Stoddard Solvent Spillage Location view, if required | <b>A-39</b> |
| <b>69</b>  | Post-Test Speed Trap Read-out                                  | <b>A-39</b> |
| <b>70</b>  | Vehicle at 0° on Static Rollover Device                        | <b>A-40</b> |
| <b>71</b>  | Vehicle at 90° on Static Rollover Device                       | <b>A-40</b> |
| <b>72</b>  | Vehicle at 180° on Static Rollover Device                      | <b>A-41</b> |
| <b>73</b>  | Vehicle at 270° on Static Rollover Device                      | <b>A-41</b> |
| <b>74</b>  | Vehicle at 360° on Static Rollover Device                      | <b>A-42</b> |
| <b>75</b>  | 2013 Mazda CX-9 AWD 5-dr SUV Frontal Impact Event              | <b>A-42</b> |
| <b>76</b>  | Monroney Label Photograph                                      | <b>A-43</b> |



001 Load Cell Location



002 Load Cell Wall





003 Manufacturer's Label



004 Tire Placard



**005 2013 Mazda CX-9 AWD Frontal As Delivered**



**006 Left Rear 3-4 View, as Received**





**007 Pre-test Front View of Test Vehicle**



**008 Post-test Front View of Test Vehicle**



**009 Pre-test Left View of Test Vehicle**



**010 Post-test Left View of Test Vehicle**





**011 Pre-test Right View of Test Vehicle**



**012 Post-test Right View of Test Vehicle**



**013 Pre-test Right Front 3-4 View**



**014 Post-test Right Front 3-4 View**





**015 Pre-test Left Rear 3-4 View**



**016 Post-test Left Rear 3-4 View**





017 Pre-test Windshield View



018 Post-test Windshield View





**019 Pre-test Engine Compartment View**



**020 Post-test Engine Compartment View**



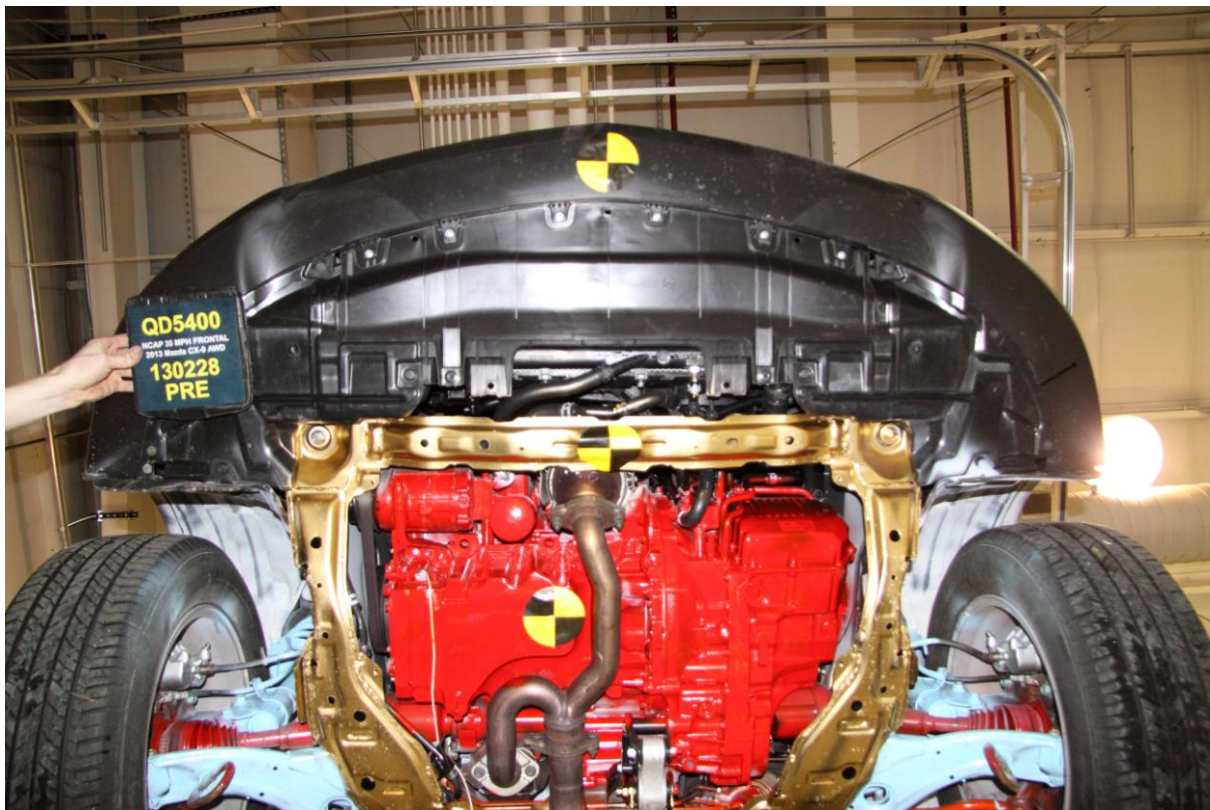


021 Pre-test Fuel Filler Cap View



022 Post-test Fuel Filler Cap View



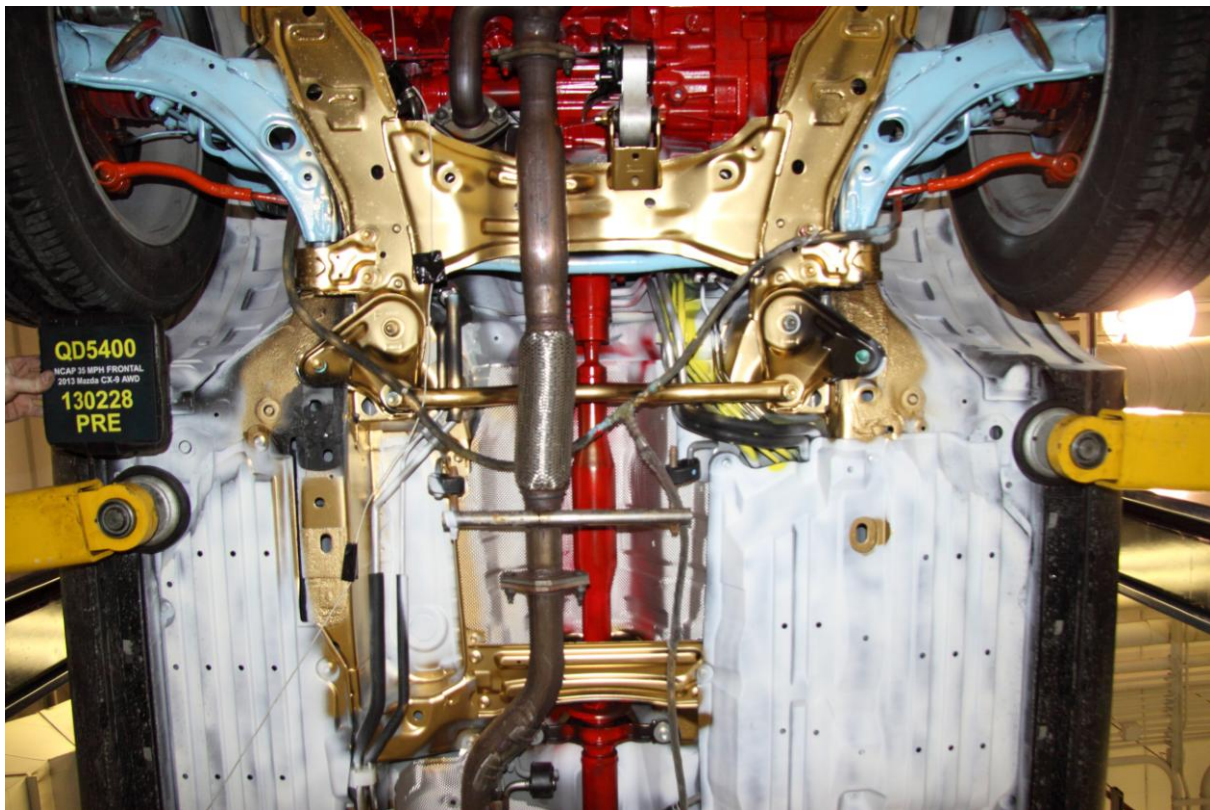


023 Pre-test Front Underbody View

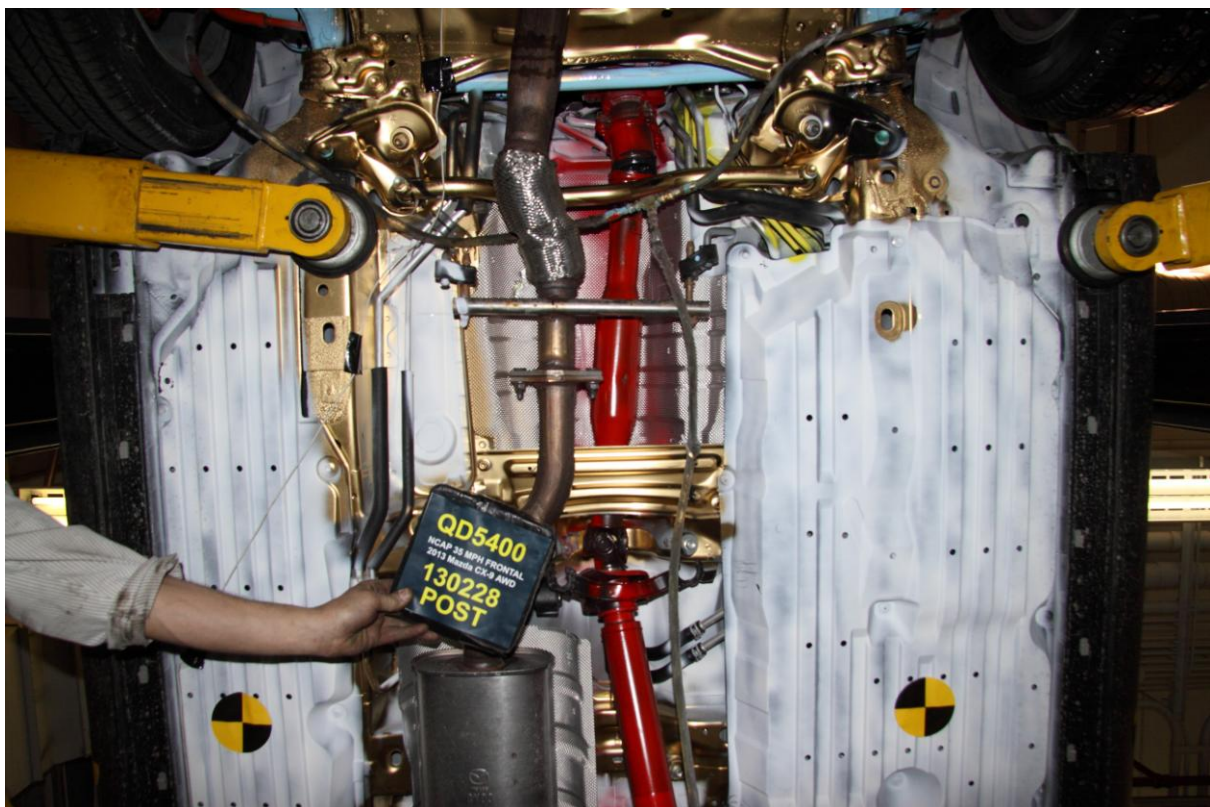


024 Post-test Front Underbody View



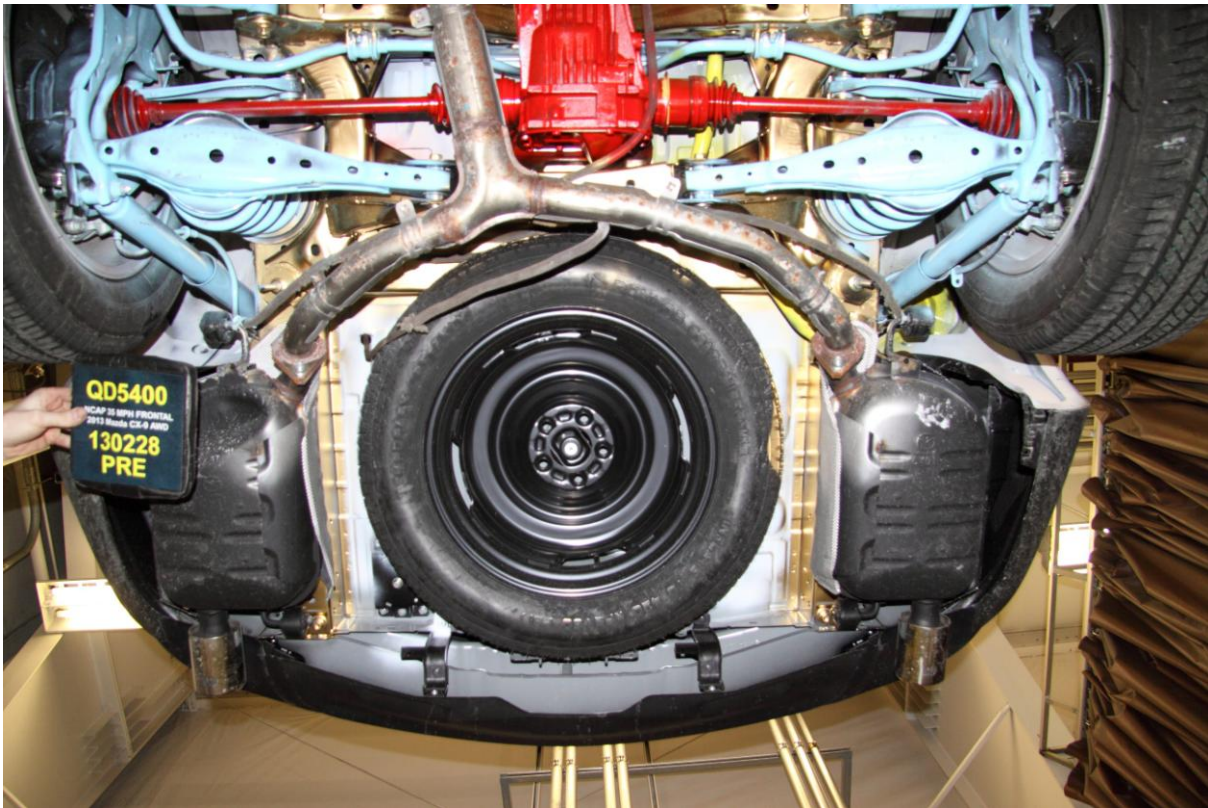


024a Pre-test Mid Underbody View

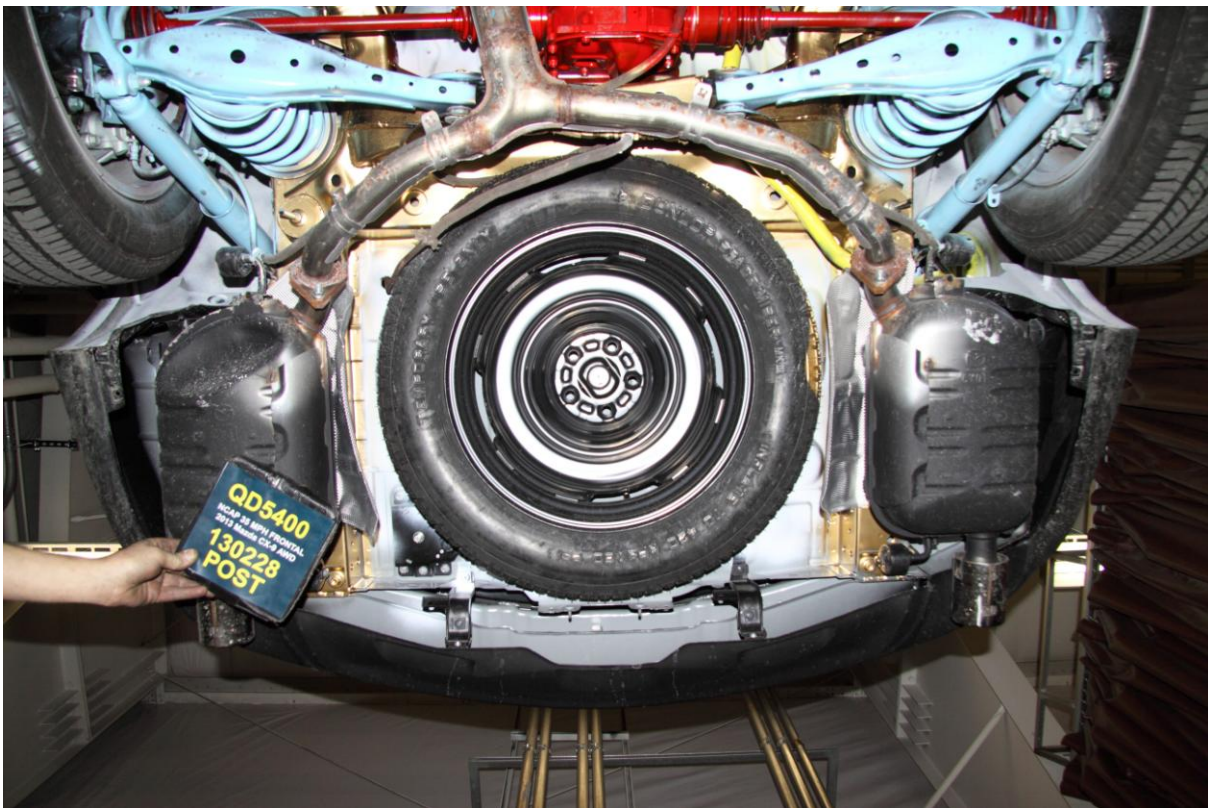


024b Post-test Mid Underbody View





025 Pre-test Rear Underbody View



026 Post-test Rear Underbody View





**027 Pre-test Dummy Cable Routing**

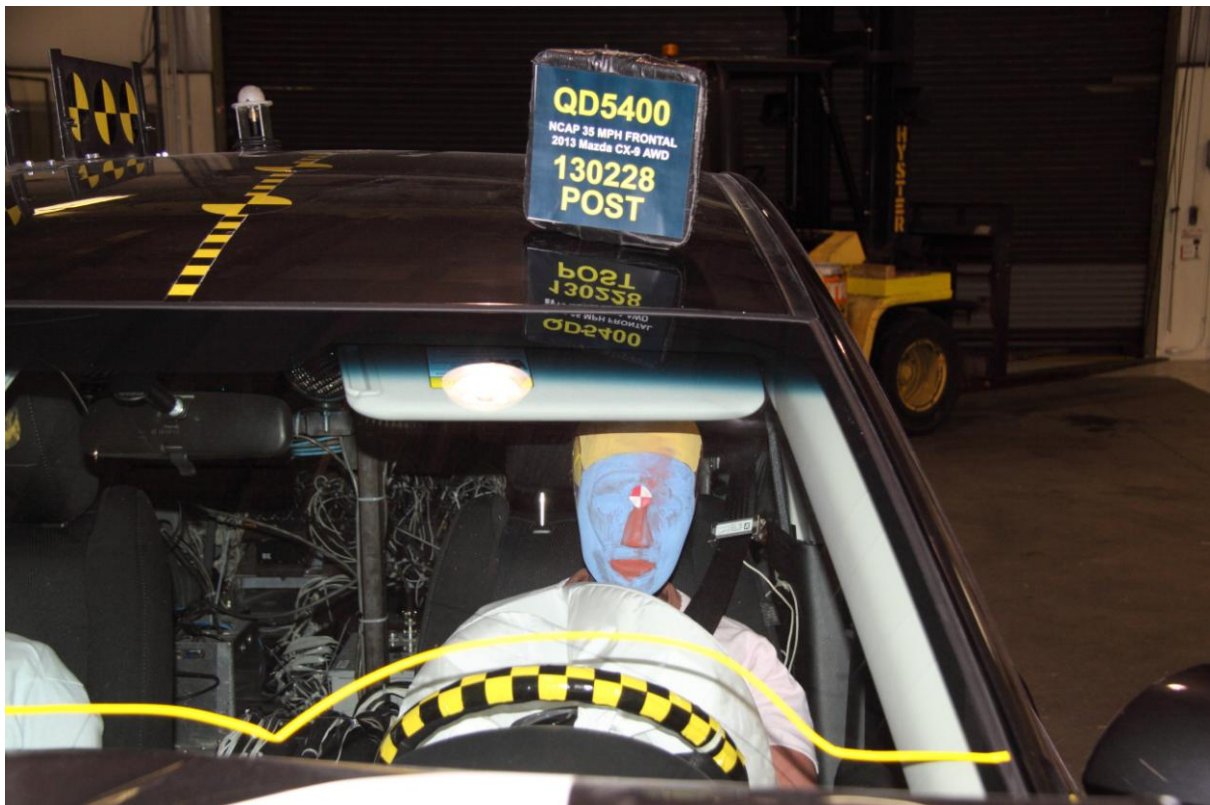


**028 Post-test Dummy Cable Routing**





029 Pre-test Driver Dummy Front View



030 Post-test Driver Dummy Front View



031 Pre-test Driver Dummy Window View



032 Post-test Driver Dummy Window View





033 Pre-test Driver Dummy and Vehicle Interior View

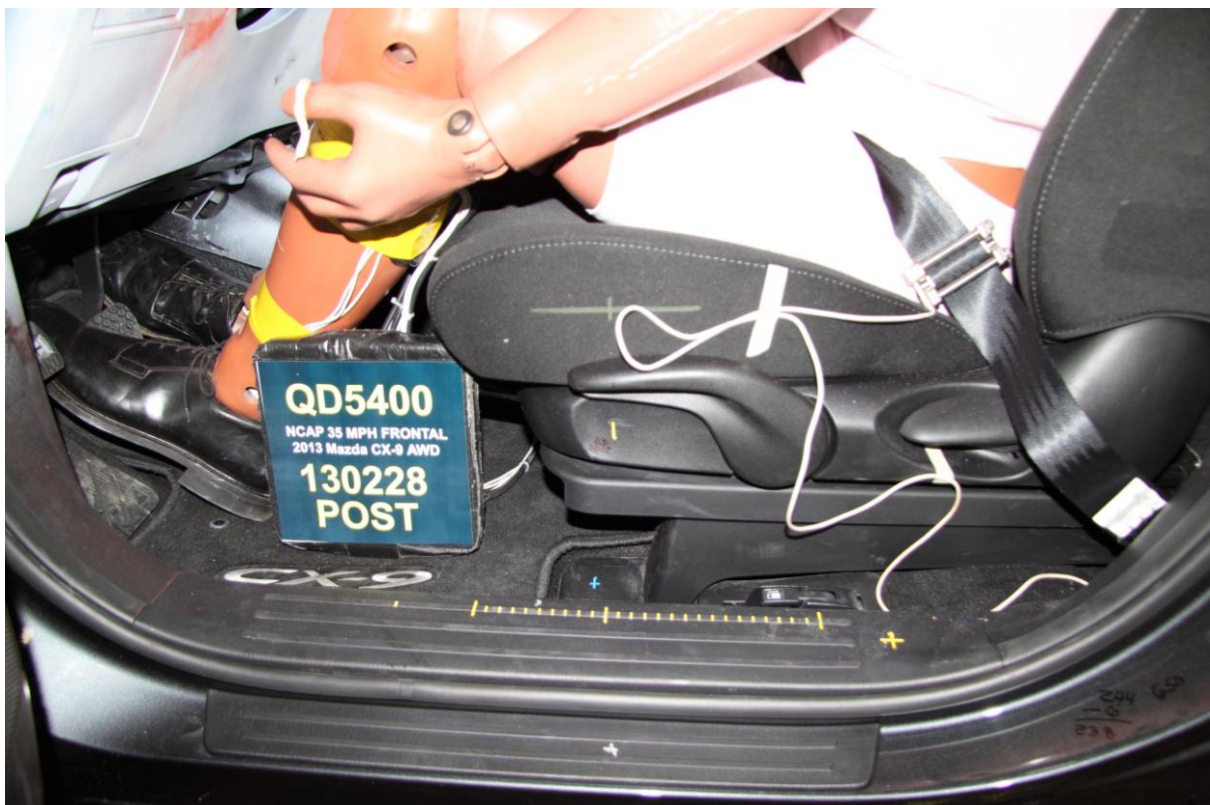


034 Post-test Driver Dummy and Vehicle Interior View





035 Pre-test Driver's Seat Fore-Aft Markings



036 Post-test Driver's Seat Fore-Aft Markings





037 Pre-Test View of Belt Anchorage for Driver Dummy



038 Post-Test View of Belt Anchorage for Driver Dummy



039 Pre-test Driver Dummy Feet



040 Post-test Driver Dummy Feet





**041 Pre-test Driver's Side Knee Bolster**



**042 Post-test Driver's Side Knee Bolster**

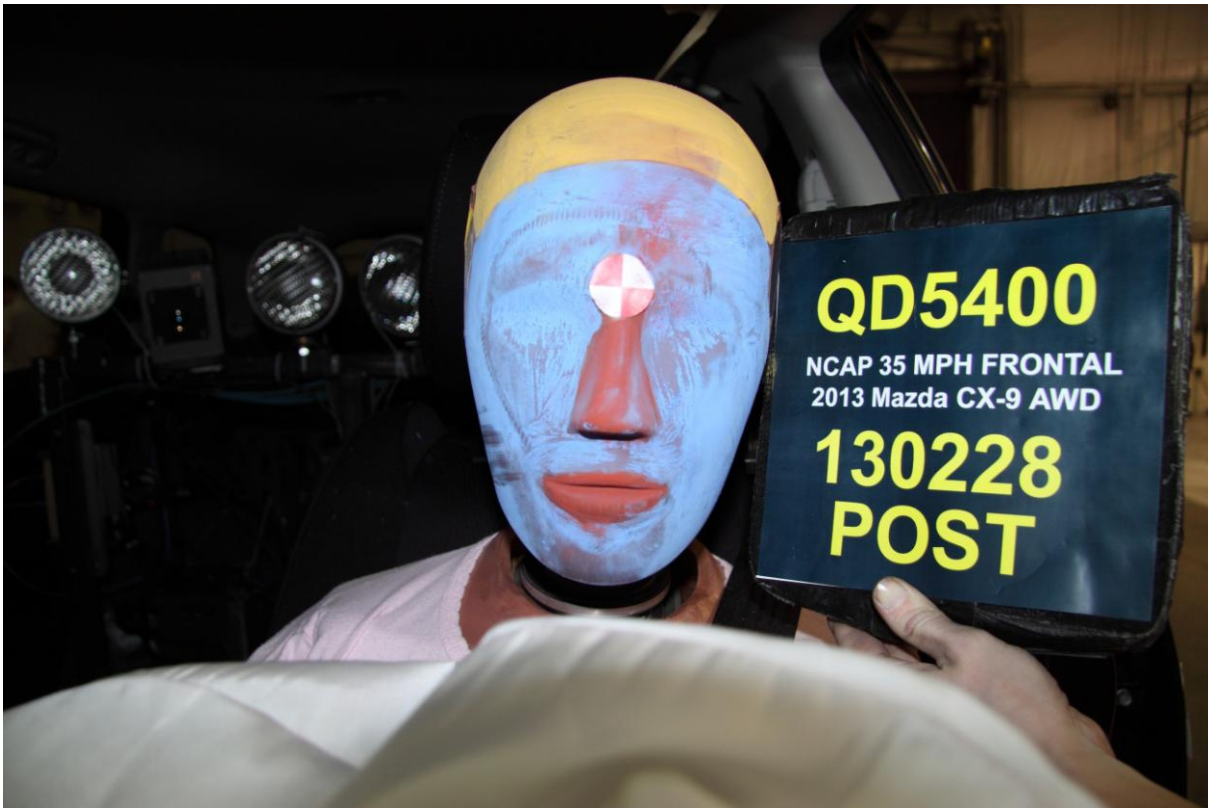


**043 Pre-test Driver's Side Floorpan**



**044 Post-test Driver's Side Floorpan**





045 Post-Test Driver Dummy Face



046 Post-test Driver Dummy Contact With Airbag



047 Post-test Driver Dummy Contact With Headrest



048 Pre-test View of the Steering Wheel





049 Post-test View of the Steering Wheel



050 Pre-test Passenger Dummy Front View



051 Post-test Passenger Dummy Front View



052 Pre-test Passenger Dummy Window View





053 Post-test Passenger Dummy Window View



054 Pre-test Passenger Dummy and Vehicle Interior View



055 Post-test Passenger Dummy and Vehicle Interior View

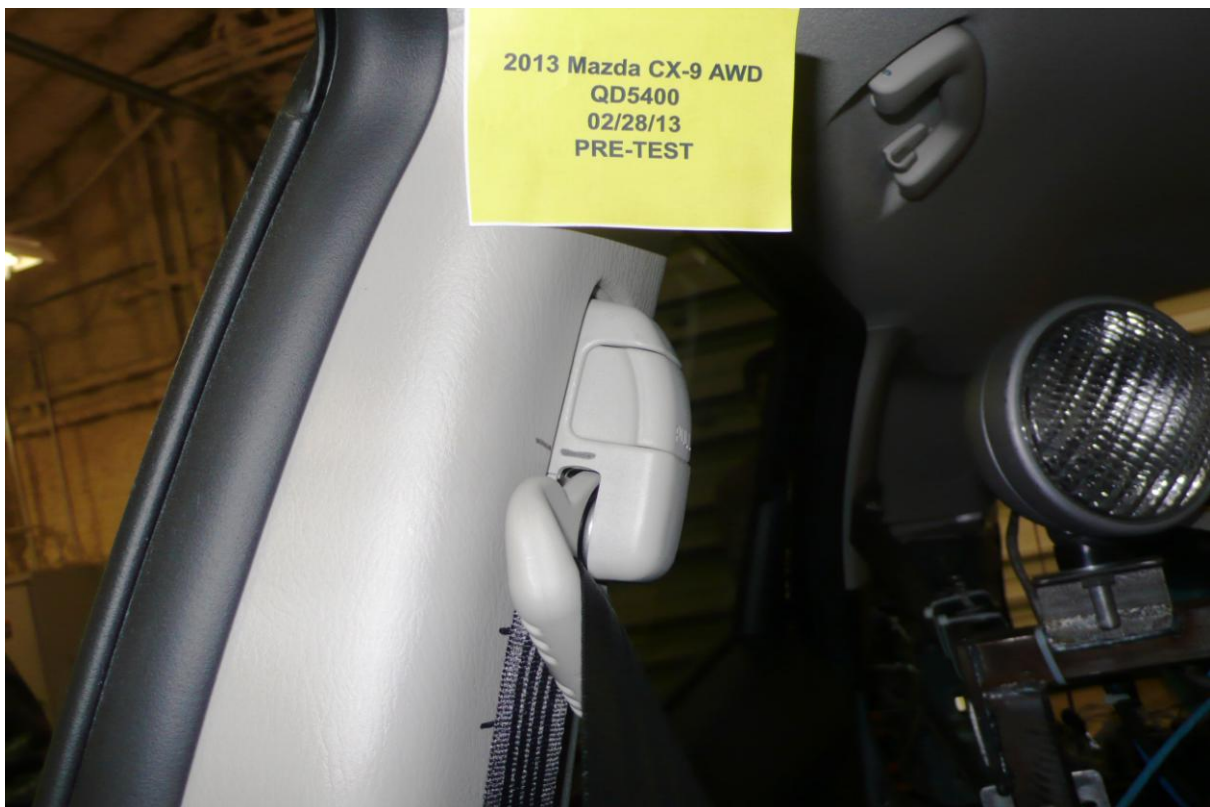


056 Pre-test Passenger's Seat Fore-Aft Markings





057 Post-test Passenger's Seat Fore-Aft Markings



058 Pre-Test View of Belt Anchorage for Passenger Dummy





059 Post-Test View of Belt Anchorage for Passenger Dummy



060 Pre-test Passenger Dummy Feet



061 Post-test Passenger Dummy Feet



062 Pre-test Passenger's Side Knee Bolster





**063 Post-test Passenger's Side Knee Bolster**



**064 Pre-test Passenger's Side Floorpan**





**065 Post-test Passenger's Side Floorpan**



**066 Post-test Passenger Dummy Contact With Headrest**

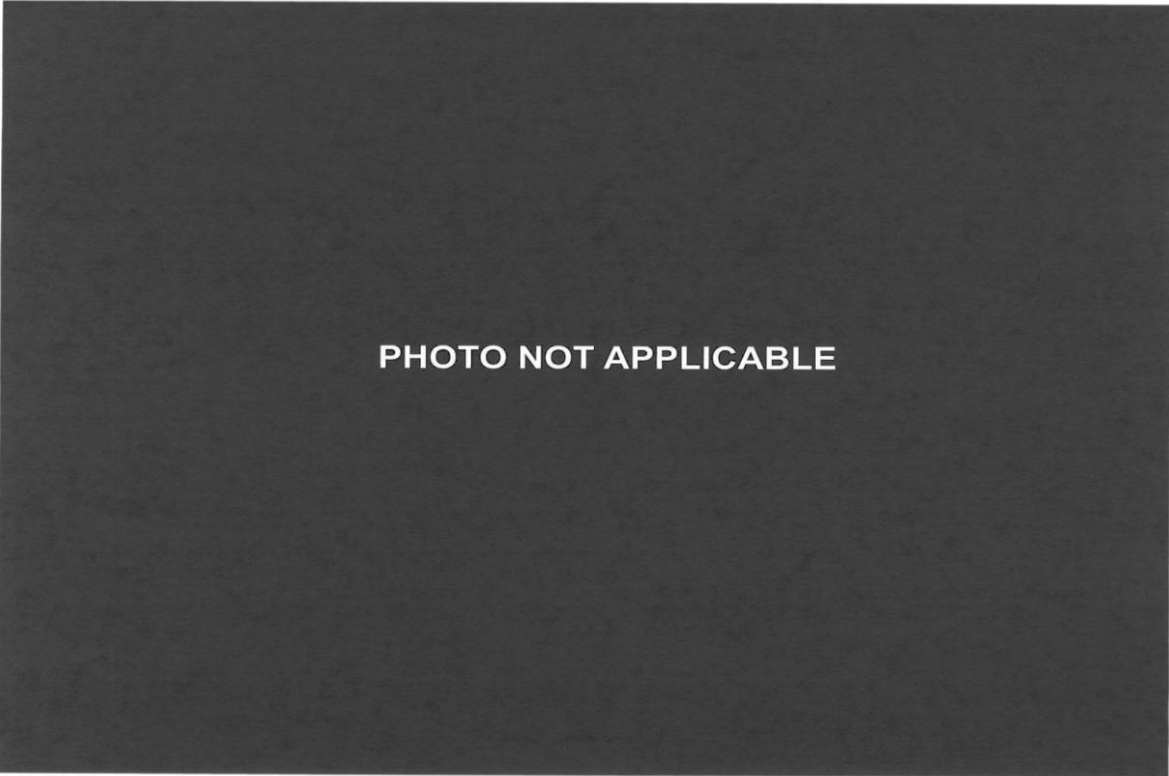


PHOTO NOT APPLICABLE

**066a Post-test Passenger Dummy Contact With Airbag**

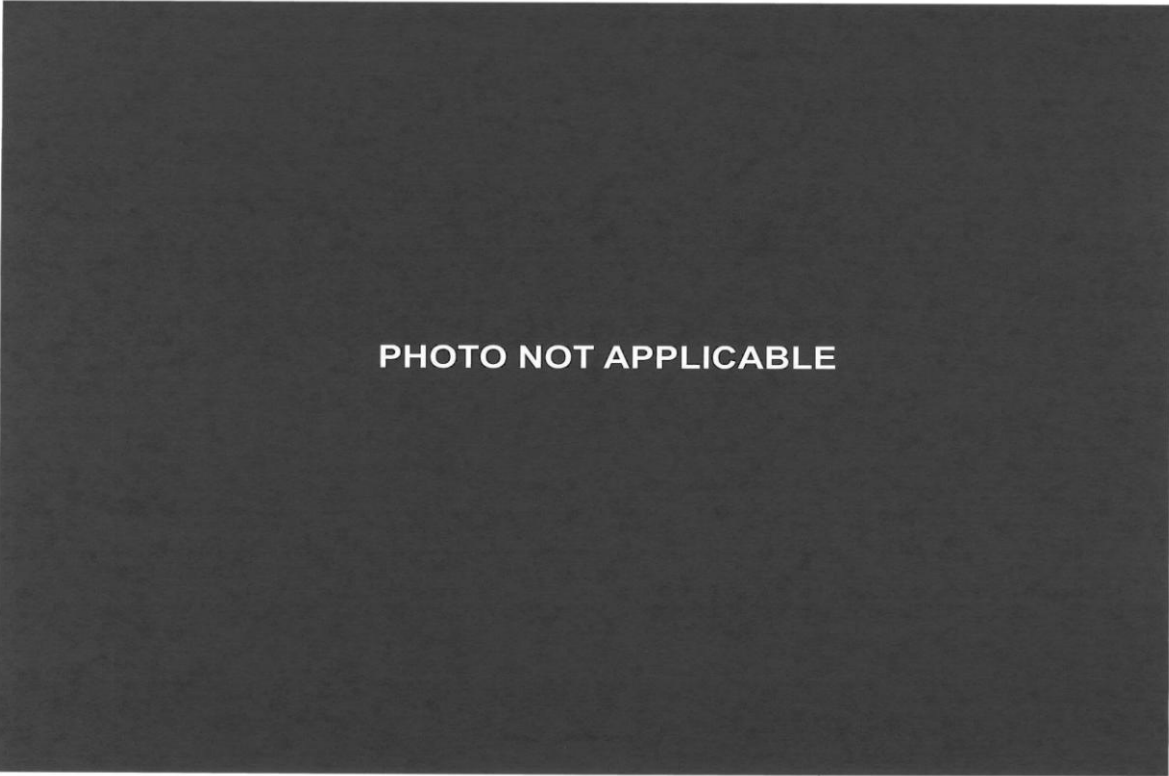


PHOTO NOT APPLICABLE

**067 Photograph of Ballast Installed in Vehicle**

PHOTO NOT APPLICABLE

068 Post-test Stoddard Solvent Spillage Location View, if required



069 Post-test Speed Trap Read-out





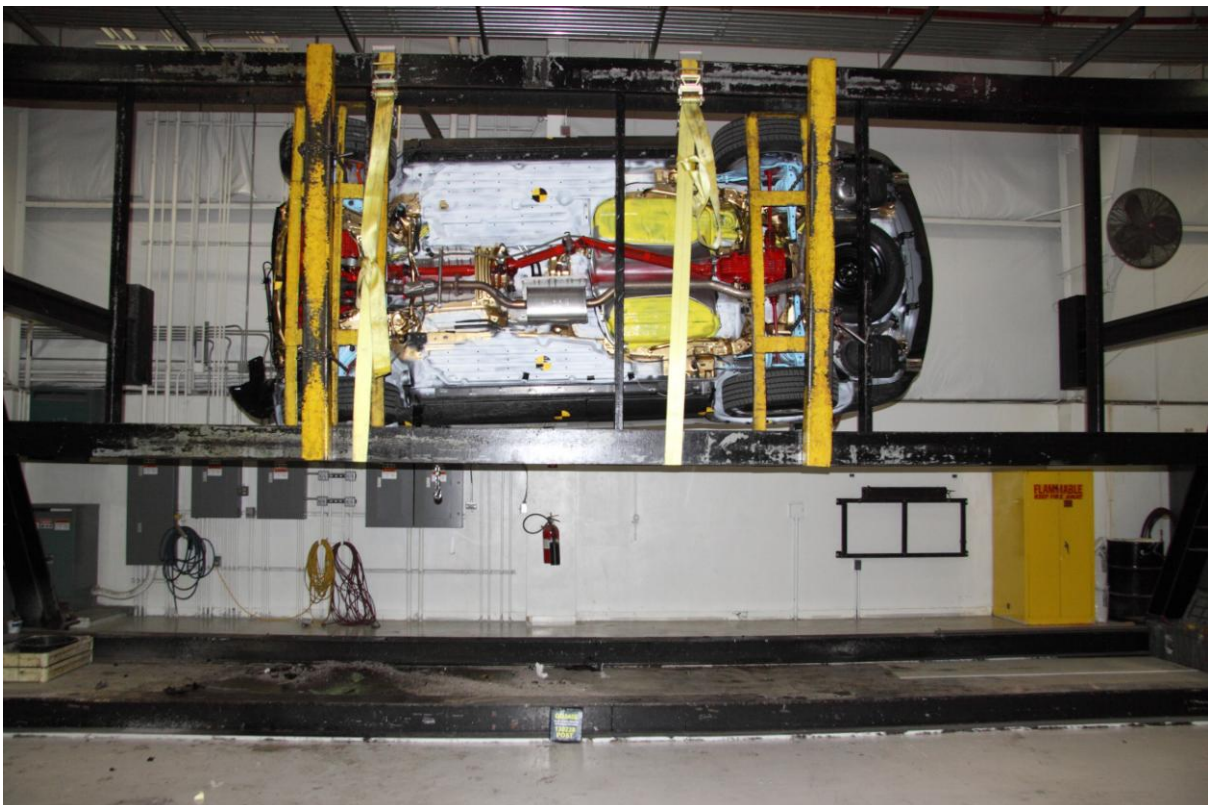
**070 Vehicle at 0° on Static Rollover Device**



**071 Vehicle at 90° on Static Rollover Device**



**072 Vehicle at 180° on Static Rollover Device**



**073 Vehicle at 270° on Static Rollover Device**





**074 Vehicle at 360° on Static Rollover Device**



**075 2013 Mazda CX-9 AWD Frontal Impact Event**



**mazda**

Scan for  
Vehicle  
Info and offers

**2013 CX-9**  
Model: 2013 CX-9 SPORT ALL WHEEL DRIVE  
Exterior Color: METEOR GRAY  
Interior Color: BLACK

**Fuel Economy and Environment**  
Gasoline Vehicle  
**Fuel Economy**  
**You spend \$3,150 more in fuel costs over 5 years compared to the average new vehicle.**  
**Annual fuel Cost \$2,950**  
**Fuel Economy & Greenhouse Gas Rating** (better only) **Smog Rating** (better only)

**PARTS CONTENT INFORMATION:**  
FOR VEHICLES IN THIS CARLINE:  
U.S./CANADIAN PARTS CONTENT: 10%  
MAJOR SOURCES OF FOREIGN PARTS CONTENT: JAPAN 85%  
NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.  
FOR THIS VEHICLE:  
FINAL ASSEMBLY POINT: HIROCHIMA, JAPAN  
COUNTRY OF ORIGIN: JAPAN  
TRANSMISSION: JAPAN  
This label is affixed pursuant to the Federal Automotive Disclosure Act. Gasoline, License and Title fees, State and Local taxes, and Dealer-installed options are not included.

**STANDARD EQUIPMENT**  
**ENGINE/MECHANICAL FEATURES**  
• 3.7L V6 DOHC 24-VALVE ENGINE  
• 273 HP, 270 LB-FT TORQUE  
• 6-SPEED SPORT AT  
• ACTIVE TORQUE SPLIT AWD  
**EXTERIOR FEATURES**  
• 18-SPoke ALUMINUM ALLOY WHEELS  
• P245/60R18 TIRES  
• POWER MIRRORS  
• REAR BUMPER GUARD  
**INTERIOR FEATURES**  
• 3-SPoke, TILT/TELESCOPIC STEERING WHEEL W/AUDIO AND CRUISE CONTROLS  
• SPEED SENSING AUTO DOOR LOCKS  
• POWER FR. WINDOWS W/AUTO UP/DOWN WITH REMOTE OPEN  
• LEATHER WRAPPED SHIFT KNOB AND STEERING WHEEL  
• CLOTH TRIMMED UPHOLSTERY  
**SAFETY AND SECURITY FEATURES**  
• 30 MONTH / 50,000 MILE "BUMPER-TO-BUMPER" WARRANTY  
• 60 MONTH / 60,000 MILE POWERTRAIN WARRANTY  
• 24 HOUR ROADSIDE ASSISTANCE  
• ABS WITH EBD AND BRAKE ASSIST  
• TIRE PRESSURE MONITORING SYSTEM  
• 3-ROW SIDE AIR CURTAINS  
• W/ROLL-OVER PROTECTION  
• ROLL STABILITY CONTROL  
• VENTILATED 4-WHEEL DISC BRAKES  
• INDEPENDENT FRONT MACPHERSON STRUT/REAR MULTI-LINK SUSPENSION  
• HALOGEN HEADLIGHTS  
• ROOF SPOILER  
• REAR SIDE WINDOW AND LIFT GATE PRIVACY GLASS  
• 60/40 SPLIT FOLD DOWN 2ND ROW  
• 50/50 SPLIT FOLD DOWN 3RD ROW  
• USB AUDIO INPUT  
• BLUETOOTH HANDS FREE PHONE/AUDIO  
• 6-SPEAKER AUDIO W/6 SPEAKERS  
• 3-ZONE AUTOMATIC CLIMATE CONTROL AIR CONDITIONING  
• REMOTE KEYLESS ENTRY  
• DYNAMIC STABILITY CONTROL AND TRACTION CONTROL SYSTEM  
• ADVANCED DUAL FRONT AND SIDE IMPACT AIR BAGS  
• TRIPLE-IF BODY CONSTRUCTION  
• ANTI-THEFT ENGINE IMMobilIZER  
• SIDE-IMPACT DOOR BEAMS  
• FRONT & REAR CRUMPLE ZONES  
• LATCH REAR CHILD SAFETY SEAT ANCHORS AND TETHERS

**GOVERNMENT 5-STAR SAFETY RATINGS**  
**Overall Vehicle Score Not Rated**  
Based on the combined ratings of frontal, side and rollover.  
Should ONLY be compared to other vehicles of similar size and weight.  
**Frontal Crash** Driver Not Rated  
Passenger Not Rated  
Based on the risk of injury in a frontal impact.  
**Side Crash** Front seat Not Rated  
Rear seat Not Rated  
Based on the risk of injury in a side impact.  
**Rollover** ★★★★★  
Based on the risk of rollover in a single vehicle crash.  
Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest.  
Source: National Highway Traffic Safety Administration (NHTSA)  
www.safercar.gov or 1-888-327-4236

**OPTIONAL EQUIPMENT**  
CGN CARGO NET \$80  
WLK WHEEL LOCKS \$55  
Total Vehicle and Options \$31,480  
Delivery, Processing and Handling Fee \$795  
**Total MSRP \$32,275**

**MSRP \$31,375**

**fueleconomy.gov**  
Calculate personalized estimates and compare vehicles.

**SOLD TO: 61602**  
EASTSIDE MAZDA  
28400 CHARDON ROAD  
WILLOUGHBY HILLS, OH 44092

**SHIP TO: 61602 LP**  
EASTSIDE MAZDA  
28400 CHARDON ROAD  
WILLOUGHBY HILLS, OH 44092

**JM3TB3BA4D0407170**  
CX9-BP-XA-1K27NJA1A-1A-20130108  
**MazdaUSA.COM**

076 Monroney Label Photograph

**APPENDIX B**  
**VEHICLE AND DUMMY RESPONSE DATA PLOTS**

## TABLE OF DATA PLOTS

| <b>No.</b> | <b>List of Data Plots Provided in the Test Report</b>   | <b>Page</b> |
|------------|---------------------------------------------------------|-------------|
| <b>1</b>   | Driver Head X Acceleration vs. Time Primary             | <b>B-6</b>  |
| <b>2</b>   | Driver Head Y Acceleration vs. Time Primary             | <b>B-6</b>  |
| <b>3</b>   | Driver Head Z Acceleration vs. Time Primary             | <b>B-6</b>  |
| <b>4</b>   | Driver Head Resultant Acceleration vs. Time Primary     | <b>B-6</b>  |
| <b>5</b>   | Driver Chest X Deflection vs. Time                      | <b>B-7</b>  |
| <b>6</b>   | Driver Chest X Acceleration vs. Time Primary            | <b>B-8</b>  |
| <b>7</b>   | Driver Chest Y Acceleration vs. Time Primary            | <b>B-8</b>  |
| <b>8</b>   | Driver Chest Z Acceleration vs. Time Primary            | <b>B-8</b>  |
| <b>9</b>   | Driver Chest Resultant Acceleration vs. Time Primary    | <b>B-8</b>  |
| <b>10</b>  | Driver Upper Neck Force X vs. Time                      | <b>B-9</b>  |
| <b>11</b>  | Driver Upper Neck Force Z vs. Time                      | <b>B-9</b>  |
| <b>12</b>  | Driver Upper Neck Moment Y vs. Time Primary             | <b>B-9</b>  |
| <b>13</b>  | Driver Nij vs. Time Primary                             | <b>B-10</b> |
| <b>14</b>  | Driver Left Femur Force vs. Time                        | <b>B-11</b> |
| <b>15</b>  | Driver Right Femur Force vs. Time                       | <b>B-11</b> |
| <b>16</b>  | Passenger Head X Acceleration vs. Time Redundant        | <b>B-12</b> |
| <b>17</b>  | Passenger Head Y Acceleration vs. Time Primary          | <b>B-12</b> |
| <b>18</b>  | Passenger Head Z Acceleration vs. Time Primary          | <b>B-12</b> |
| <b>19</b>  | Passenger Head Resultant Acceleration vs. Time          | <b>B-12</b> |
| <b>20</b>  | Passenger Chest X Deflection vs. Time                   | <b>B-13</b> |
| <b>21</b>  | Passenger Chest X Acceleration vs. Time Primary         | <b>B-14</b> |
| <b>22</b>  | Passenger Chest Y Acceleration vs. Time Primary         | <b>B-14</b> |
| <b>23</b>  | Passenger Chest Z Acceleration vs. Time Primary         | <b>B-14</b> |
| <b>24</b>  | Passenger Chest Resultant Acceleration vs. Time Primary | <b>B-14</b> |
| <b>25</b>  | Passenger Upper Neck Force X vs. Time                   | <b>B-15</b> |
| <b>26</b>  | Passenger Upper Neck Force Z vs. Time                   | <b>B-15</b> |
| <b>27</b>  | Passenger Upper Neck Moment Y vs. Time Primary          | <b>B-15</b> |
| <b>28</b>  | Passenger Nij vs. Time Primary                          | <b>B-16</b> |
| <b>29</b>  | Passenger Left Femur Force vs. Time                     | <b>B-17</b> |
| <b>30</b>  | Passenger Right Femur Force vs. Time                    | <b>B-17</b> |

The following additional dummy and vehicle response data can be found in the R & D section of the NHTSA website at: [www.nhtsa.dot.gov](http://www.nhtsa.dot.gov).

Driver Head Acceleration X Redundant  
Driver Head Acceleration Y Redundant  
Driver Head Acceleration Z Redundant  
Driver Upper Neck Force Y



Driver Upper Neck Moment X  
Driver Upper Neck Moment Z  
Driver Chest X Acceleration Redundant  
Driver Chest Y Acceleration Redundant  
Driver Chest Z Acceleration Redundant  
Driver Pelvis X  
Driver Pelvis Y  
Driver Pelvis Z  
Driver Left Upper Tibia Moment X  
Driver Left Upper Tibia Moment Y  
Driver Left Upper Tibia Force Z  
Driver Left Lower Tibia Moment X  
Driver Left Lower Tibia Moment Y  
Driver Left Lower Tibia Force Z  
Driver Right Upper Tibia Moment X  
Driver Right Upper Tibia Moment Y  
Driver Right Upper Tibia Force Z  
Driver Right Lower Tibia Moment X  
Driver Right Lower Tibia Moment Y  
Driver Right Lower Tibia Force Z  
Driver Left Foot Fore Z  
Driver Left Foot Aft X  
Driver Left Foot Aft Z  
Driver Right Foot Fore Z  
Driver Right Foot Aft X  
Driver Right Foot Aft Z  
Driver Shoulder Belt Force  
Driver Lap Belt Force  
Passenger Head Acceleration X Redundant  
Passenger Head Acceleration Y Redundant  
Passenger Head Acceleration Z Redundant  
Passenger Upper Neck Force Y  
Passenger Upper Neck Moment X  
Passenger Upper Neck Moment Z  
Passenger Chest X Acceleration Redundant  
Passenger Chest Y Acceleration Redundant  
Passenger Chest Z Acceleration Redundant  
Passenger Pelvis X  
Passenger Pelvis Y  
Passenger Pelvis Z  
Passenger Left Upper Tibia Moment X

Passenger Left Upper Tibia Moment Y  
Passenger Left Upper Tibia Force Z  
Passenger Left Lower Tibia Moment X  
Passenger Left Lower Tibia Moment Y  
Passenger Left Lower Tibia Force Z  
Passenger Right Upper Tibia Moment X  
Passenger Right Upper Tibia Moment Y  
Passenger Right Upper Tibia Force Z  
Passenger Right Lower Tibia Moment X  
Passenger Right Lower Tibia Moment Y  
Passenger Right Lower Tibia Force Z  
Passenger Left Foot Fore Z  
Passenger Left Foot Aft X  
Passenger Left Foot Aft Z  
Passenger Right Foot Fore Z  
Passenger Right Foot Aft X  
Passenger Right Foot Aft Z  
Passenger Shoulder Belt Force  
Passenger Lap Belt Force  
Left Rear Seat Crossmember X  
Left Rear Seat Crossmember Z  
Right Rear Seat Crossmember X  
Right Rear Seat Crossmember Z  
Left Rear Seat Crossmember X Redundant  
Right Rear Seat Crossmember X Redundant  
Vehicle Engine Top X  
Vehicle Engine Bottom X  
BARRIER LOAD A1  
BARRIER LOAD A2  
BARRIER LOAD A3  
BARRIER LOAD A4  
BARRIER LOAD A5  
BARRIER LOAD A6  
BARRIER LOAD A7  
BARRIER LOAD A8  
BARRIER LOAD A9  
BARRIER LOAD B1  
BARRIER LOAD B2  
BARRIER LOAD B3  
BARRIER LOAD B4  
BARRIER LOAD B5

BARRIER LOAD B6  
BARRIER LOAD B7  
BARRIER LOAD B8  
BARRIER LOAD B9  
BARRIER LOAD C1  
BARRIER LOAD C2  
BARRIER LOAD C3  
BARRIER LOAD C4  
BARRIER LOAD C5  
BARRIER LOAD C6  
BARRIER LOAD C7  
BARRIER LOAD C8  
BARRIER LOAD C9  
BARRIER LOAD D1  
BARRIER LOAD D2  
BARRIER LOAD D3  
BARRIER LOAD D4  
BARRIER LOAD D5  
BARRIER LOAD D6  
BARRIER LOAD D7  
BARRIER LOAD D8  
BARRIER LOAD D9



# NHTSA

Test Lab: CTF

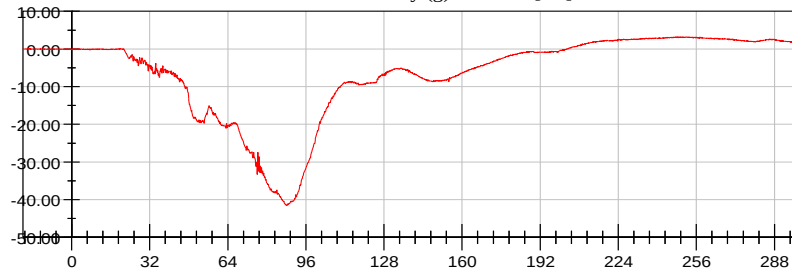
Test Number: 130228 (QD5400)

Test Date: 02/28/2013

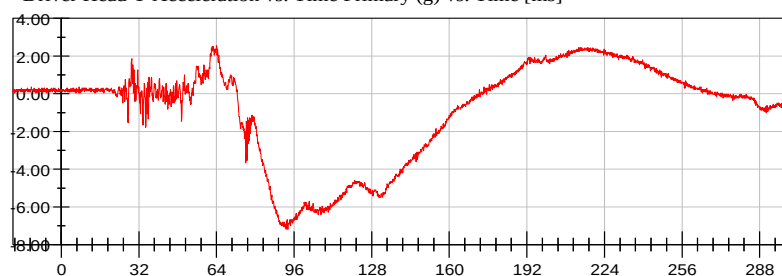
Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)

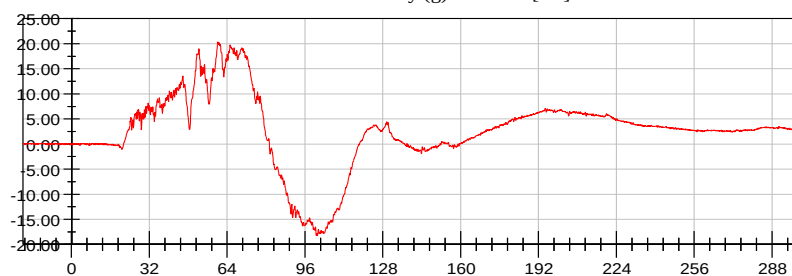
Driver Head X Acceleration vs. Time Primary (g) vs. Time [ms]



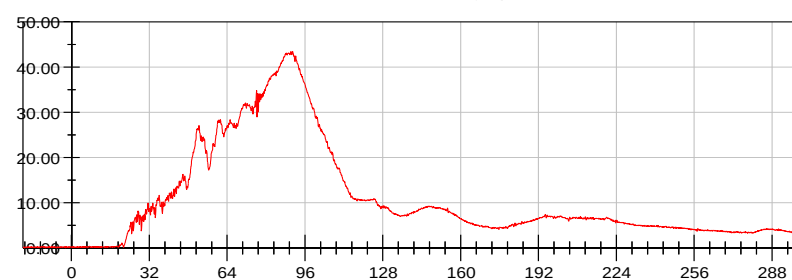
Driver Head Y Acceleration vs. Time Primary (g) vs. Time [ms]



Driver Head Z Acceleration vs. Time Primary (g) vs. Time [ms]



Driver Head Resultant Acceleration vs. Time Primary (g) vs. Time [ms]



# NHTSA

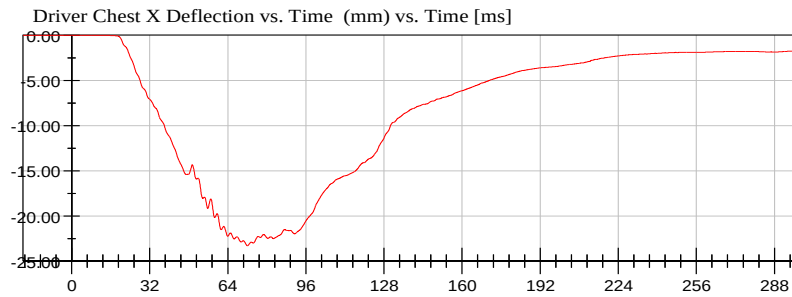
Test Lab: CTF

Test Number: 130228 (QD5400)

Test Date: 02/28/2013

Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)



<Max>

0.00 mm at -9.60 ms

<Min>

-23.30 mm at 72.08 ms

CFC\_600



# NHTSA

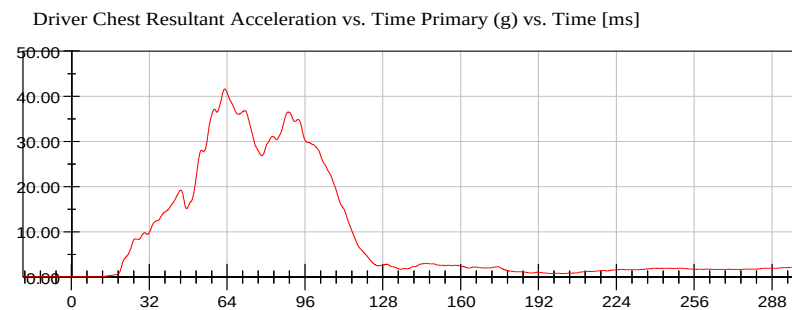
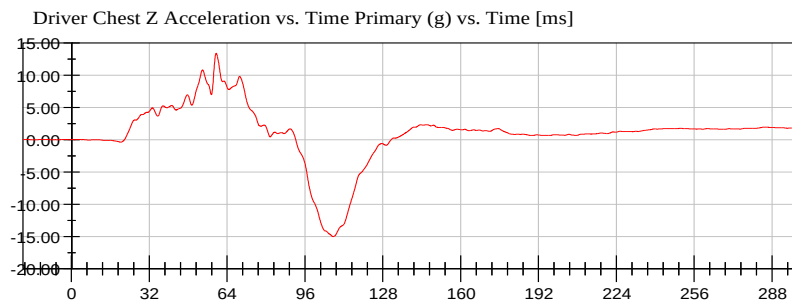
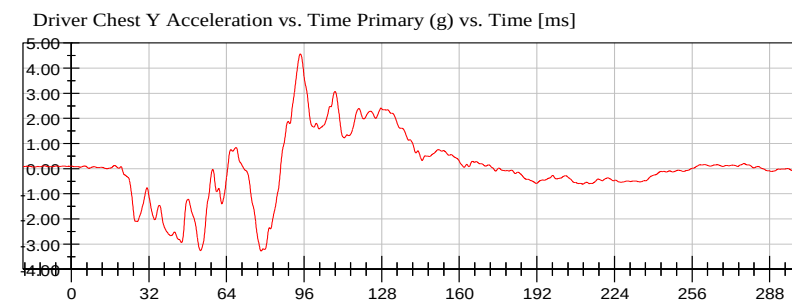
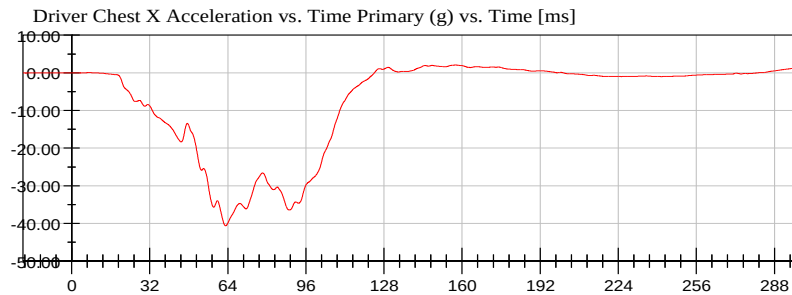
Test Lab: CTF

Test Number: 130228 (QD5400)

Test Date: 02/28/2013

Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)





# NHTSA

Test Lab: CTF

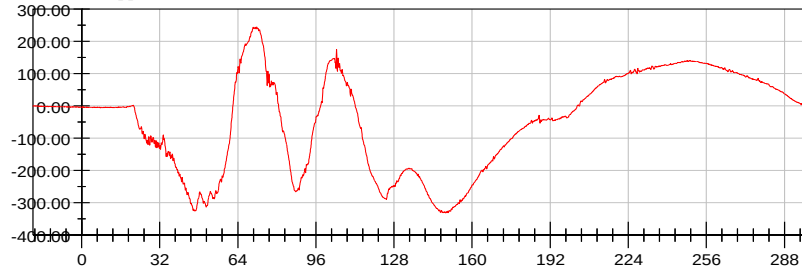
Test Number: 130228 (QD5400)

Test Date: 02/28/2013

Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)

Driver Upper Neck Force X vs. Time (N) vs. Time [ms]



<Max>

244.61 N at 71.76 ms

<Min>

-331.05 N at 149.20 ms

CFC\_1000

Driver Upper Neck Force Z vs. Time (N) vs. Time [ms]



<Max>

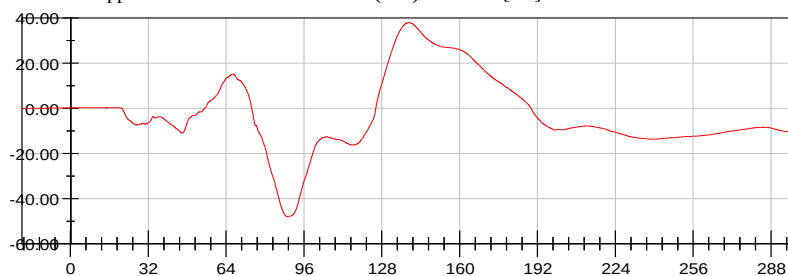
1,590.14 N at 72.56 ms

<Min>

-241.44 N at 110.88 ms

CFC\_1000

Driver Upper Neck Moment Y vs. Time (Nm) vs. Time [ms]



<Max>

38.00 Nm at 139.28 ms

<Min>

-47.95 Nm at 89.12 ms

CFC\_600





# 2013 Mazda CX-9 AWD 5-Dr SUV into Load Cell Barrier

Date: 02/28/2013  
Time: 17:54

## Neck Injury Predictor (NIJ)

Customer: NHTSA

Test Number: QD5400

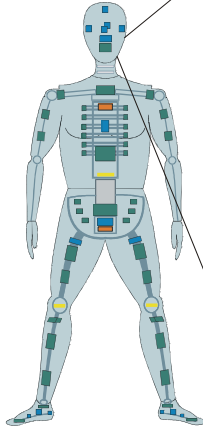
Test Orientation = Frontal

Fzc(Tension) = 6806

Fzc(Compression) = 6160

Myc(Extension) = 135

Myc(Flexion) = 310

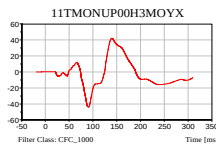


Dummy: HIII 50th Male  
Seating Position:

Driver

NIJ Source Code: (Fz/Fzc)+(My/Myc)

My (Nm)

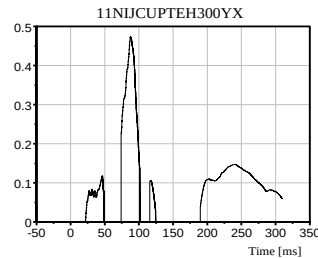


Fzc (N)

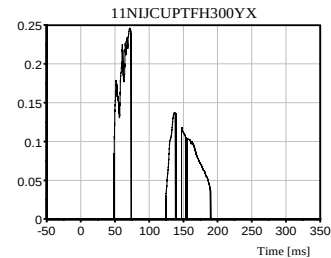


TRC Inc. Test Lab: CTF

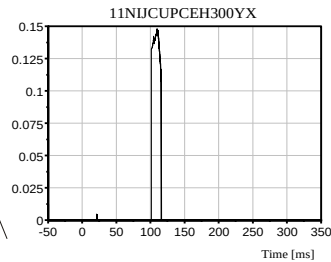
Test Number: 130228



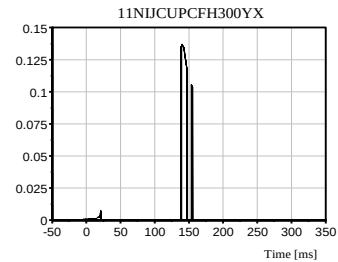
Max [NTE] 0.4740 at 87.44 ms



Max [NTE] 0.2461 at 71.52 ms



Max [NCE] 0.1479 at 109.60 ms



Max [NCF] 0.1370 at 139.92 ms

# NHTSA

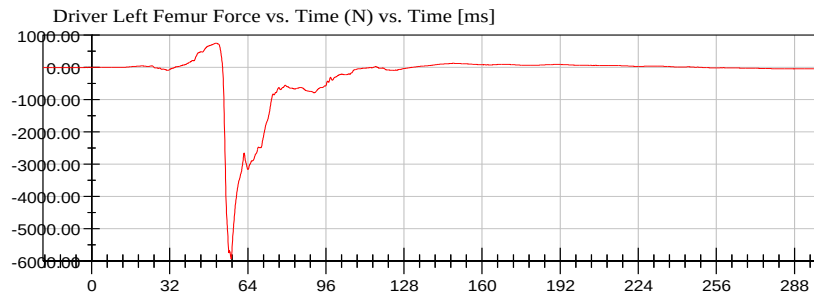
Test Lab: CTF

Test Number: 130228 (QD5400)

Test Date: 02/28/2013

Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)



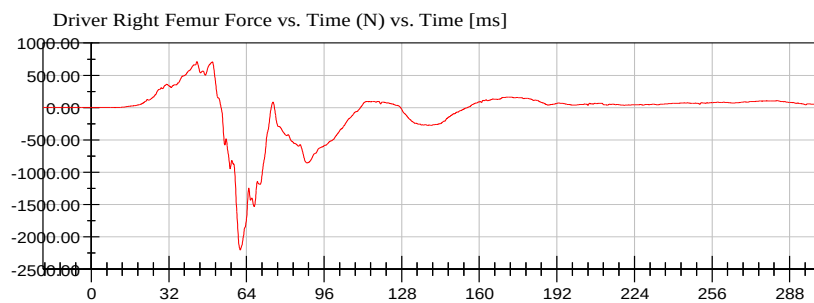
<Max>

753.66 N at 51.12 ms

<Min>

-5,927.83 N at 57.20 ms

CFC\_600



<Max>

713.45 N at 43.52 ms

<Min>

-2,205.74 N at 61.44 ms

CFC\_600





# NHTSA

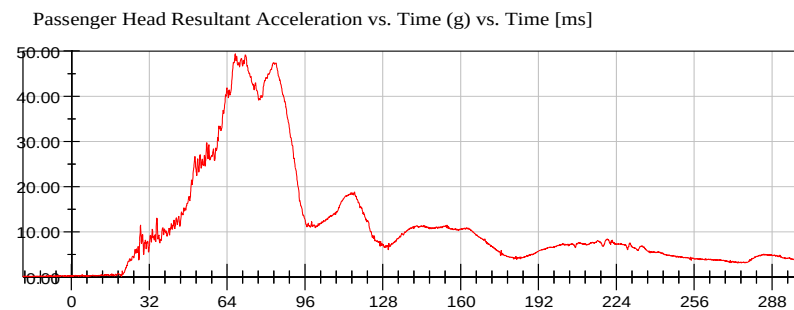
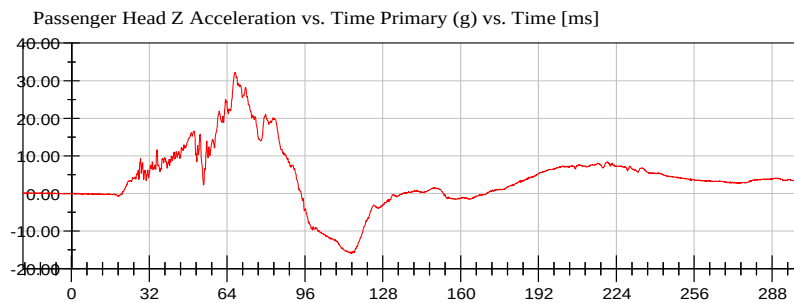
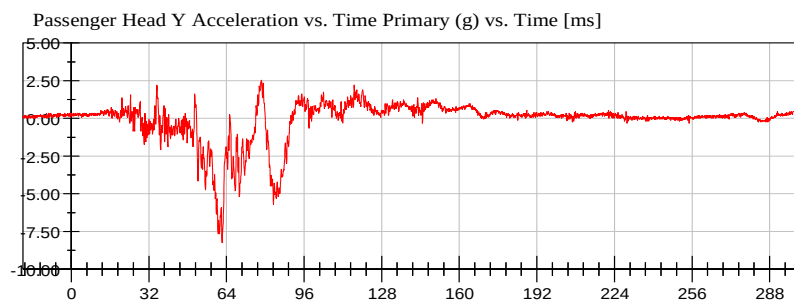
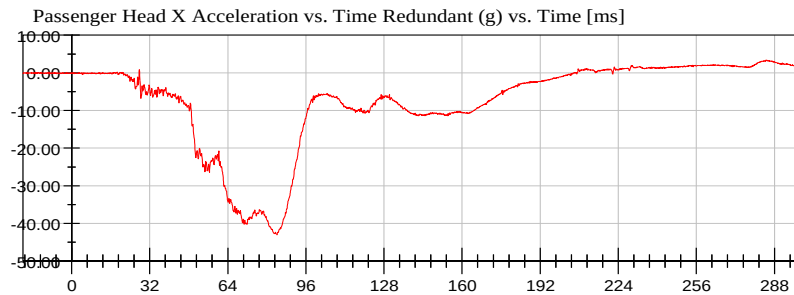
Test Lab: CTF

Test Number: 130228 (QD5400)

Test Date: 02/28/2013

Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)



# NHTSA

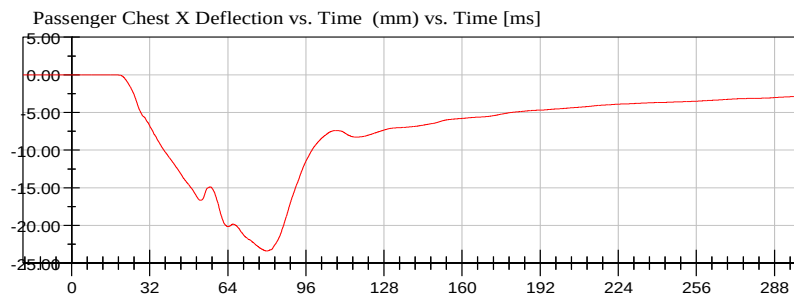
Test Lab: CTF

Test Number: 130228 (QD5400)

Test Date: 02/28/2013

Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)



<Max>

0.01 mm at -16.72 ms

<Min>

-23.40 mm at 80.00 ms

CFC\_600



# NHTSA

Test Lab: CTF

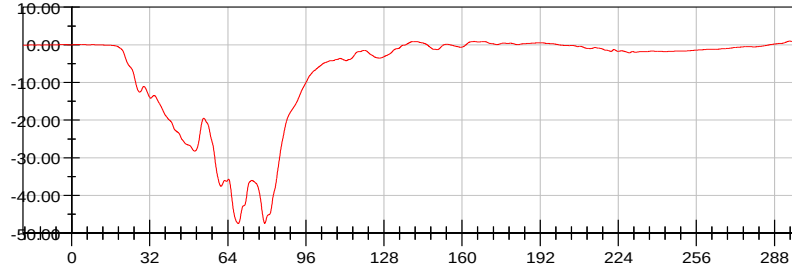
Test Number: 130228 (QD5400)

Test Date: 02/28/2013

Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)

Passenger Chest X Acceleration vs. Time Primary (g) vs. Time [ms]



<Max>

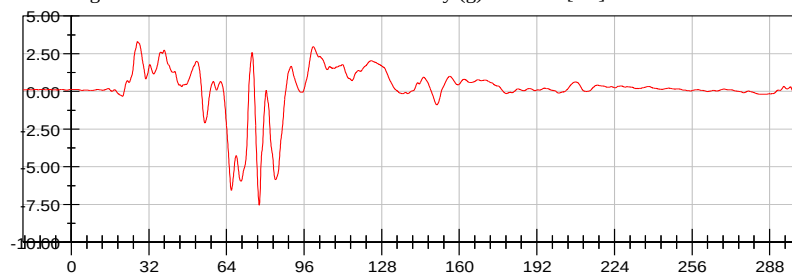
1.00 g at 294.24 ms

<Min>

-47.44 g at 68.24 ms

CFC\_180

Passenger Chest Y Acceleration vs. Time Primary (g) vs. Time [ms]



<Max>

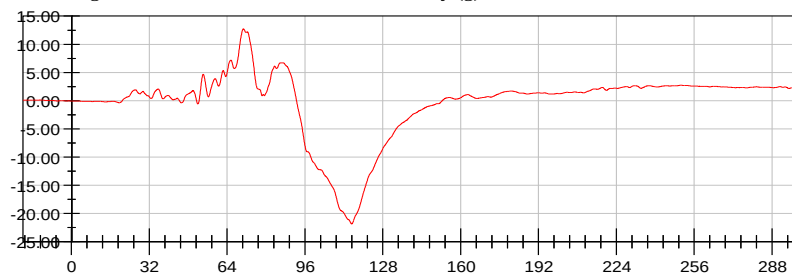
3.30 g at 27.28 ms

<Min>

-7.56 g at 77.52 ms

CFC\_180

Passenger Chest Z Acceleration vs. Time Primary (g) vs. Time [ms]



<Max>

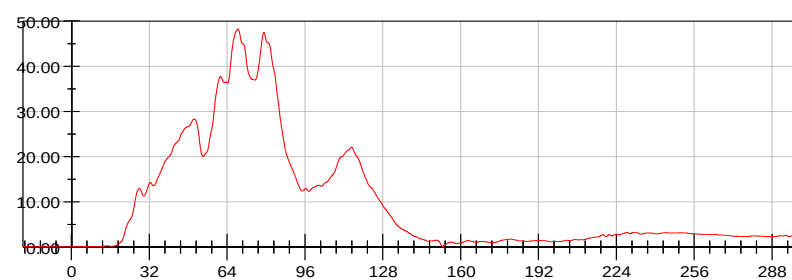
12.73 g at 70.72 ms

<Min>

-21.85 g at 115.20 ms

CFC\_180

Passenger Chest Resultant Acceleration vs. Time Primary (g) vs. Time [ms]



<Max>

48.20 g at 68.40 ms

<Min>

0.07 g at 152.56 ms

CFC\_180



# NHTSA

Test Lab: CTF

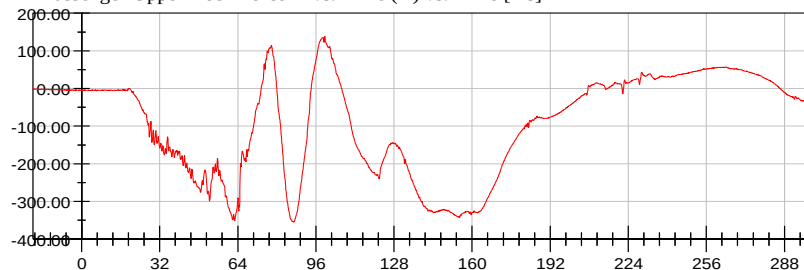
Test Number: 130228 (QD5400)

Test Date: 02/28/2013

Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)

Passenger Upper Neck Force X vs. Time (N) vs. Time [ms]



<Max>

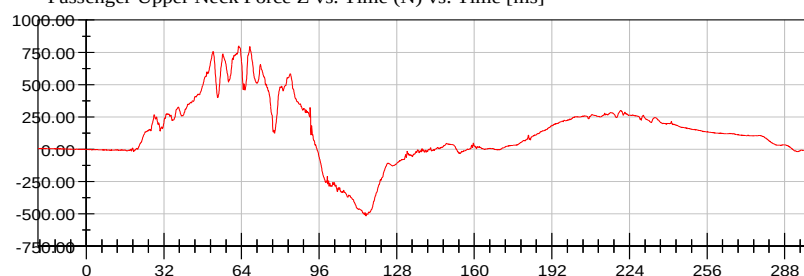
138.14 N at 99.60 ms

<Min>

-354.76 N at 86.80 ms

CFC\_1000

Passenger Upper Neck Force Z vs. Time (N) vs. Time [ms]



<Max>

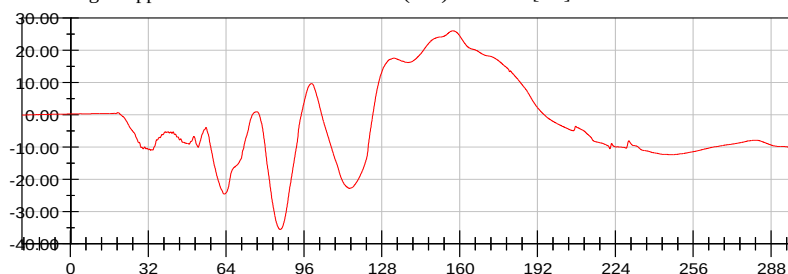
798.42 N at 62.88 ms

<Min>

-517.59 N at 115.36 ms

CFC\_1000

Passenger Upper Neck Moment Y vs. Time (Nm) vs. Time [ms]



<Max>

26.04 Nm at 157.20 ms

<Min>

-35.57 Nm at 86.16 ms

CFC\_600







# 2013 Mazda CX-9 AWD 5-Dr SUV into Load Cell Barrier

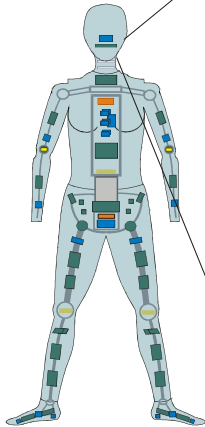
Date: 02/28/2013  
Time: 17:54

## Neck Injury Predictor (NIJ)

Customer: NHTSA

Test Number: QD5400

Test Orientation = Frontal  
Fzc(Tension) = 4287  
Fzc(Compression) = 3880  
Myc(Extension) = 67  
Myc(Flexion) = 155



Dummy: HIII 5th Female  
Seating Position:

Right Front Passenger

NIJ Source Code: (Fz/Fzc)+(My/Myc)

Moment [Nm]

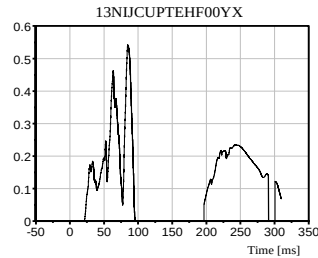


Force [N]

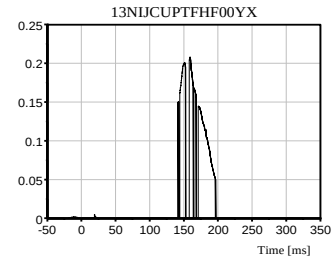


TRC Inc. Test Lab: CTF

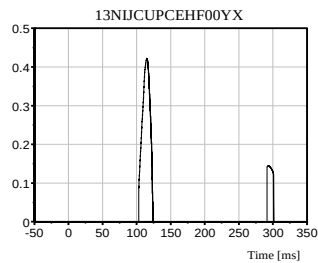
Test Number: 130228



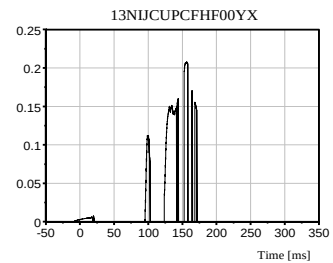
Max [NTE] 0.5421 at 84.72 ms



Max [NTF] 0.2078 at 159.60 ms



Max [NCE] 0.4224 at 114.64 ms



Max [NCF] 0.2079 at 156.24 ms

# NHTSA

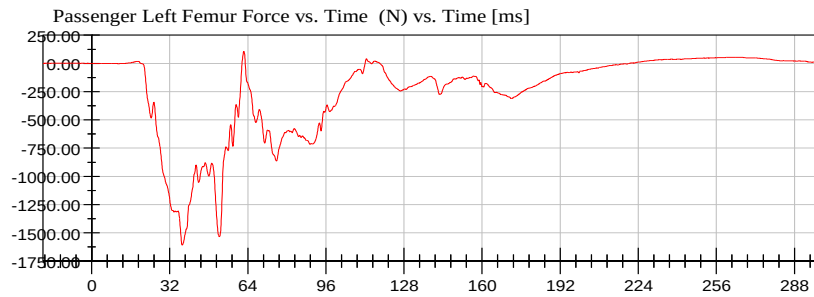
Test Lab: CTF

Test Number: 130228 (QD5400)

Test Date: 02/28/2013

Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)



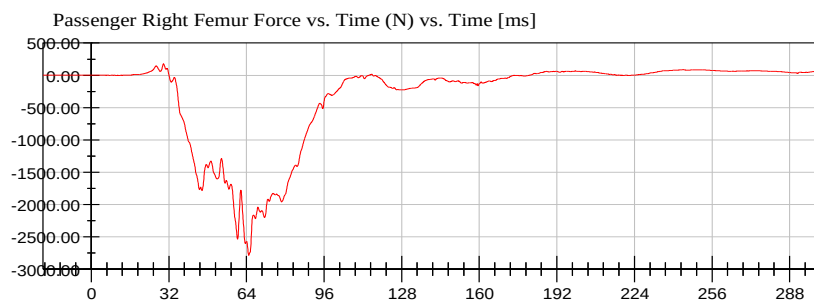
<Max>

106.56 N at 62.40 ms

<Min>

-1,608.52 N at 37.12 ms

CFC\_600



<Max>

177.67 N at 29.76 ms

<Min>

-2,790.08 N at 64.96 ms

CFC\_600



**APPENDIX C**  
**DUMMY CALIBRATION AND PERFORMANCE VERIFICATION**

**Pre-Test Calibration Sheets**  
**Driver S/N 037**



## Transportation Research Center Inc.

Front Head Drop

HIII 50th Serial No. 037 Certification No. 14-1

Test Date: 1/17/2013

| Test Parameter                                        | Specification  | Test Results | Pass |
|-------------------------------------------------------|----------------|--------------|------|
| Temperature                                           | 18.9 - 25.5 °C | 21.8 °C      | Yes  |
| Relative Humidity                                     | 10 - 70 %      | 29 %         | Yes  |
| Peak Head Resultant Acceleration                      | 225 - 275 g    | 259.1 g      | Yes  |
| Peak Head Lateral Acceleration                        | (-15) - 15 g   | -5.9 g       | Yes  |
| Is Acceleration Curve Unimodal<br>within 10% of Peak? | Yes            | Yes          | Yes  |

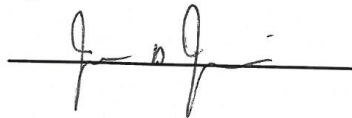
**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

01.17.2013 08:33:27 581

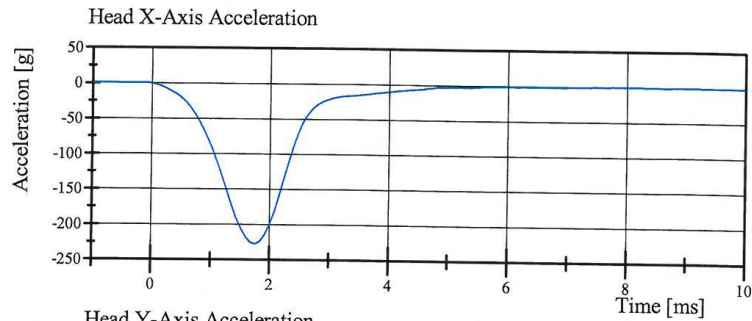


## Transportation Research Center Inc.

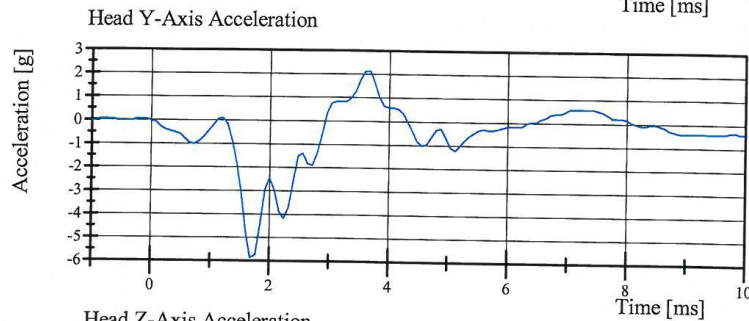
Front Head Drop

HIII 50th Serial No. 037 Certification No. 14-1

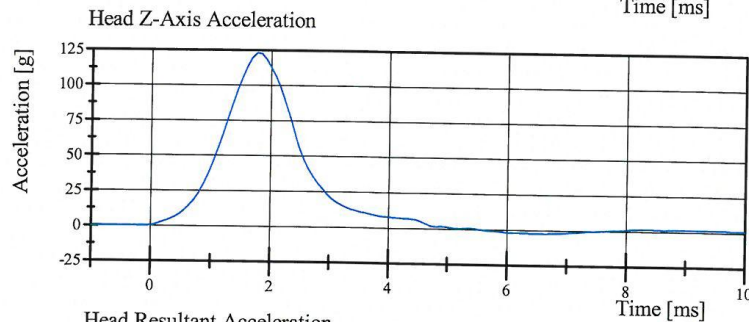
Test Date: 1/17/2013



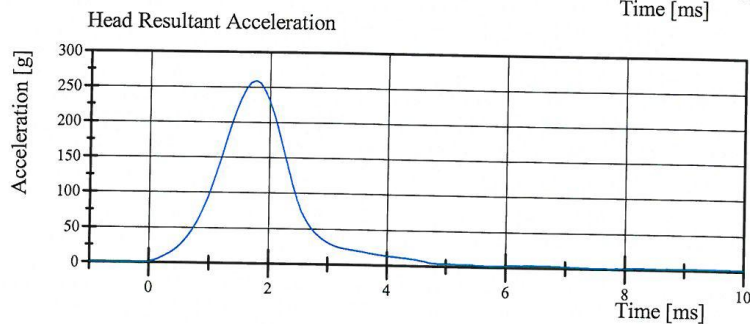
Filter Class: CFC\_1000  
Max: 0.1 gn at 7.9 ms  
Min: -228.0 gn at 1.8 ms



Filter Class: CFC\_1000  
Max: 2.1 gn at 3.6 ms  
Min: -5.9 gn at 1.7 ms



Filter Class: CFC\_1000  
Max: 122.9 gn at 1.8 ms  
Min: -2.3 gn at 6.4 ms



Filter Class: CFC\_1000  
Max: 259.1 gn at 1.8 ms  
Min: 0.0 gn at -0.9 ms

Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

01.17.2013 08:33:44 581



## Transportation Research Center Inc.

Neck Flexion

HIII 50th Serial No. 037 Certification No. 14-3

Test Date: 1/17/2013

| Test Parameter                                      | Specification       | Test Results | Pass |
|-----------------------------------------------------|---------------------|--------------|------|
| Temperature                                         | 20.6 - 22.2 °C      | 21.8 °C      | Yes  |
| Relative Humidity                                   | 10 - 70 %           | 34 %         | Yes  |
| Pendulum Velocity                                   | 6.89 - 7.13 m/s     | 6.970 m/s    | Yes  |
| Pendulum Acceleration Decay Crossing -5g            | 34 - 42 ms          | 37.5 ms      | Yes  |
| Pendulum Acceleration at 10ms                       | (-22.5) - (-27.5) g | -23.82 g     | Yes  |
| Pendulum Acceleration at 20ms                       | (-17.6) - (-22.6) g | -20.21 g     | Yes  |
| Pendulum Acceleration at 30ms                       | (-12.5) - (-18.5) g | -16.06 g     | Yes  |
| Pendulum Acceleration > 30ms                        | >= (-29.0) g        | -16.06 g     | Yes  |
| Total Head D-Plane Rotation                         |                     |              |      |
| Peak                                                | (-64) - (-78) °     | -74.2 °      | Yes  |
| Time of Peak                                        | 57 - 64 ms          | 59.0 ms      | Yes  |
| Total Head D-Plane Rotation Decay to 0°             | 113 - 128 ms        | 116.2 ms     | Yes  |
| Total Neck Occipital Condyles Moment                |                     |              |      |
| Peak                                                | 88 - 108 N·m        | 106.1 N·m    | Yes  |
| Time of Peak                                        | 47 - 58 ms          | 50.3 ms      | Yes  |
| Total Neck Occipital Condyles Moment Decay to 0 N·m | 97 - 107 ms         | 98.1 ms      | Yes  |

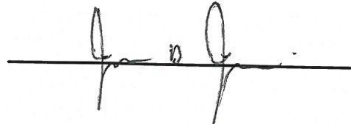
**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

01.17.2013 11:40:52 2913

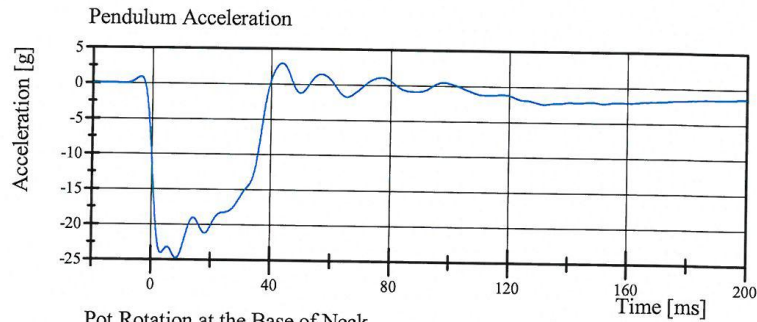


# Transportation Research Center Inc.

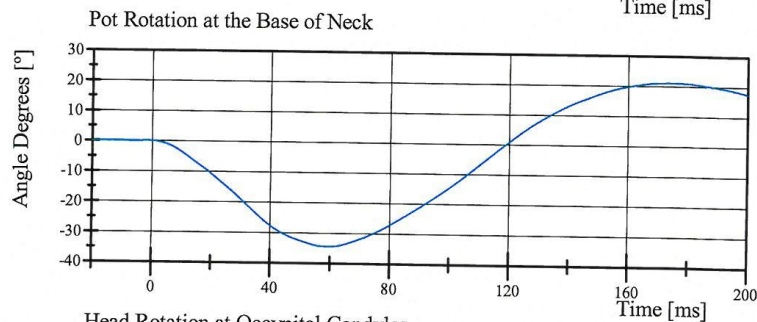
## Neck Flexion

HIH 50th Serial No. 037 Certification No. 14-3

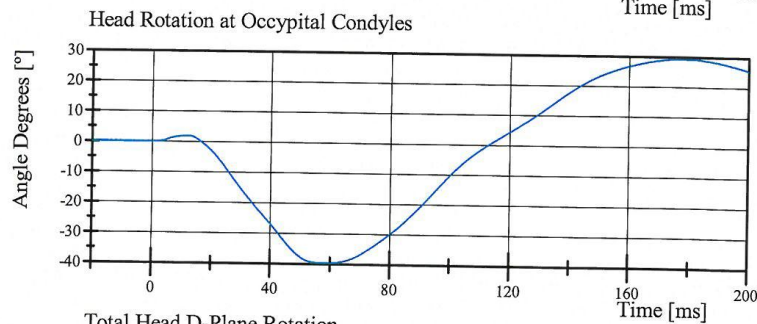
Test Date: 1/17/2013



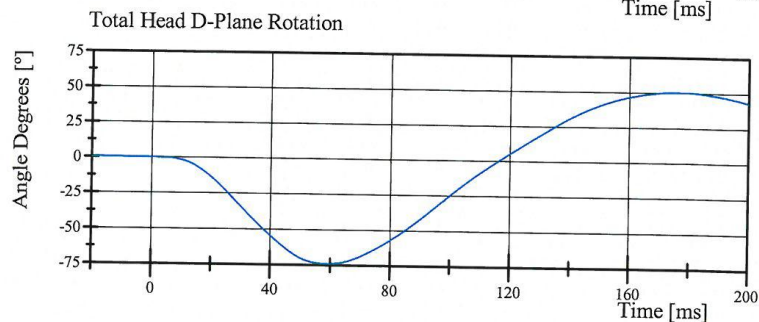
Filter Class: CFC\_60  
Max: 2.9 gn at 43.6 ms  
Min: -24.8 gn at 8.5 ms



Filter Class: CFC\_60  
Max: 21.1 ° at 174.0 ms  
Min: -34.4 ° at 59.1 ms



Filter Class: CFC\_60  
Max: 29.3 ° at 178.2 ms  
Min: -39.8 ° at 59.0 ms



Filter Class: CFC\_60  
Max: 50.4 ° at 176.3 ms  
Min: -74.2 ° at 59.0 ms

Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

01.17.2013 11:41:04 2913



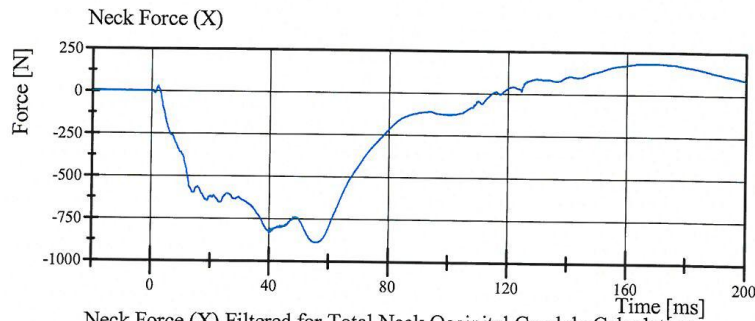


# Transportation Research Center Inc.

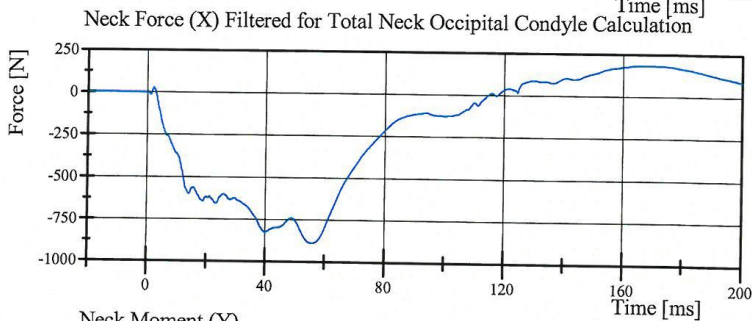
Neck Flexion

HIII 50th Serial No. 037 Certification No. 14-3

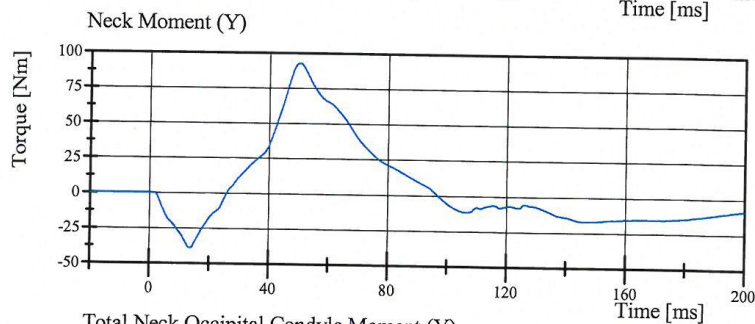
Test Date: 1/17/2013



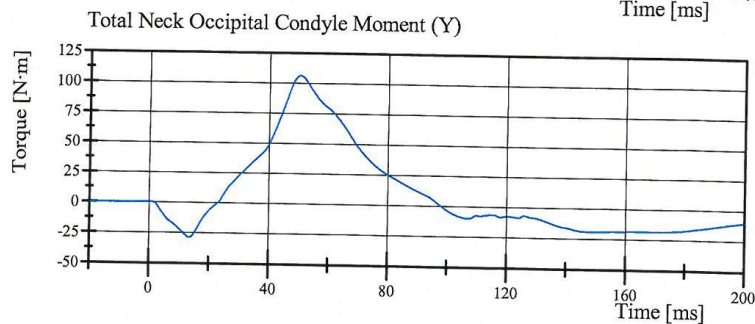
Filter Class: CFC\_1000  
Max: 183.9 N at 168.0 ms  
Min: -889.2 N at 55.9 ms



Filter Class: CFC\_600  
Max: 183.8 N at 168.1 ms  
Min: -888.9 N at 55.9 ms



Filter Class: CFC\_600  
Max: 92.8 Nm at 50.1 ms  
Min: -39.2 Nm at 13.8 ms



Filter Class: Without\_(Consta  
Max: 106.1 N·m at 50.3 ms  
Min: -28.8 N·m at 13.4 ms

Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

01.17.2013 11:41:05 2913



## Transportation Research Center Inc.

Neck Extension

HIII 50th Serial No. 037 Certification No. 14-1

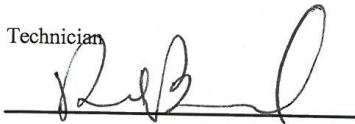
Test Date: 1/17/2013

| Test Parameter                                         | Specification         | Test Results | Pass |
|--------------------------------------------------------|-----------------------|--------------|------|
| Temperature                                            | 20.6 - 22.2 °C        | 21.5 °C      | Yes  |
| Relative Humidity                                      | 10 - 70 %             | 30 %         | Yes  |
| Pendulum Velocity                                      | (-5.95) - (-6.18) m/s | -5.963 m/s   | Yes  |
| Pendulum Acceleration Decay<br>Crossing 5g             | 38 - 46 ms            | 41.0 ms      | Yes  |
| Pendulum Acceleration at 10ms                          | 17.2 - 21.2 g         | 19.34 g      | Yes  |
| Pendulum Acceleration at 20ms                          | 14.0 - 19.0 g         | 16.04 g      | Yes  |
| Pendulum Acceleration at 30ms                          | 11.0 - 16.0 g         | 13.04 g      | Yes  |
| Pendulum Acceleration > 30ms                           | <= 22.0 g             | 13.04 g      | Yes  |
| Total Head D-Plane Rotation<br>Peak                    | 81 - 106 °            | 96.1 °       | Yes  |
| Time of Peak                                           | 72 - 82 ms            | 75.8 ms      | Yes  |
| Total Head D-Plane Rotation<br>Decay to 0°             | 147 - 174 ms          | 156.9 ms     | Yes  |
| Total Neck Occipital Condyles Moment<br>Peak           | (-53) - (-80) N·m     | -69.2 N·m    | Yes  |
| Time of Peak                                           | 65 - 79 ms            | 70.8 ms      | Yes  |
| Total Neck Occipital Condyles Moment<br>Decay to 0 N·m | 120 - 148 ms          | 143.2 ms     | Yes  |

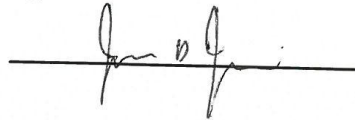
**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

01.17.2013 12:26:34 2995

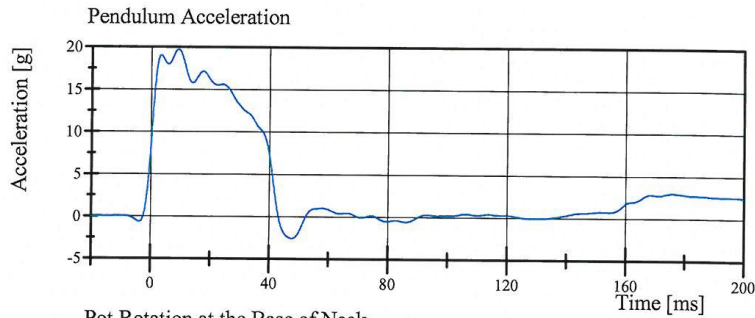


## Transportation Research Center Inc.

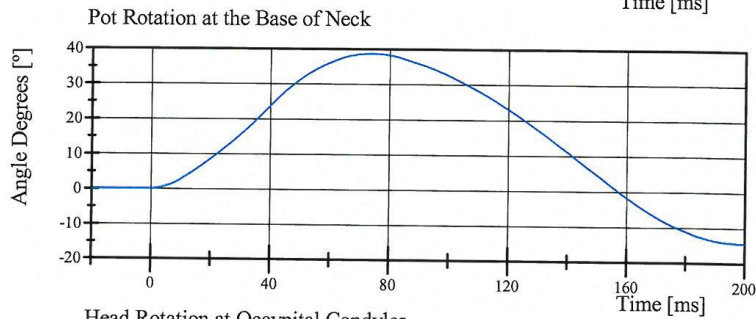
Neck Extension

HIII 50th Serial No. 037 Certification No. 14-1

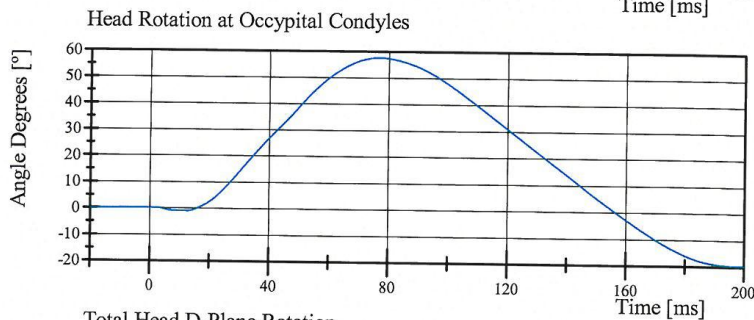
Test Date: 1/17/2013



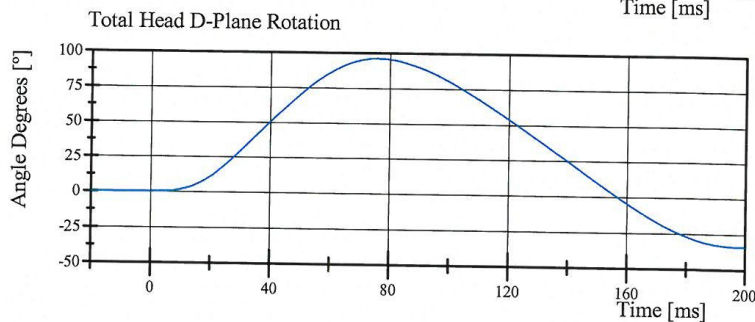
Filter Class: CFC\_60  
Max: 19.7 gn at 9.0 ms  
Min: -2.6 gn at 47.6 ms



Filter Class: CFC\_60  
Max: 38.7 ° at 74.1 ms  
Min: -14.4 ° at 199.3 ms



Filter Class: CFC\_60  
Max: 57.5 ° at 76.8 ms  
Min: -19.8 ° at 198.1 ms



Filter Class: CFC\_60  
Max: 96.1 ° at 75.8 ms  
Min: -34.1 ° at 198.6 ms

Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

01.17.2013 12:26:51 2995

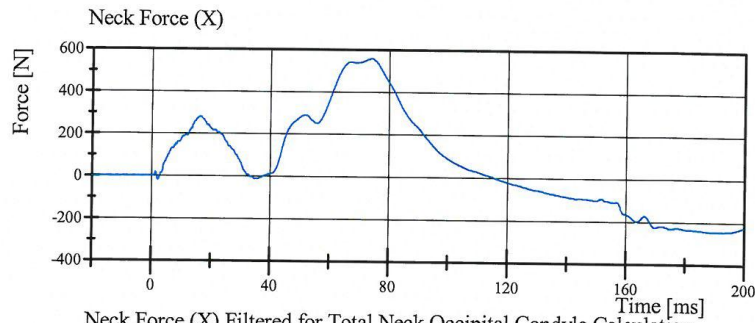


# Transportation Research Center Inc.

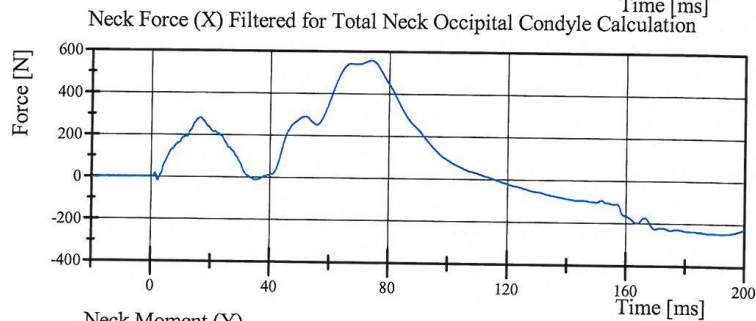
Neck Extension

HIII 50th Serial No. 037 Certification No. 14-1

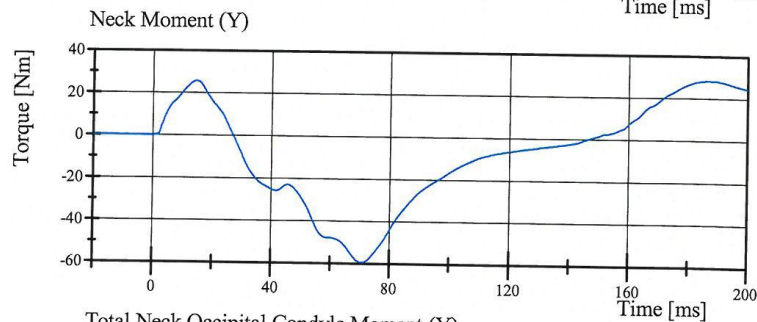
Test Date: 1/17/2013



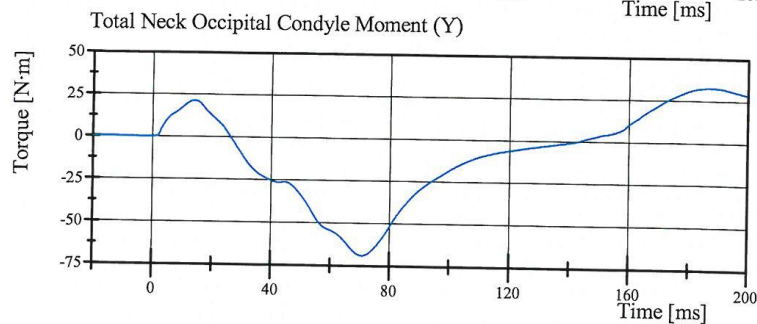
Filter Class: CFC\_1000  
Max: 558.9 N at 74.2 ms  
Min: -245.5 N at 189.0 ms



Filter Class: CFC\_600  
Max: 558.6 N at 74.1 ms  
Min: -245.3 N at 189.1 ms



Filter Class: CFC\_600  
Max: 28.3 Nm at 186.8 ms  
Min: -59.6 Nm at 70.7 ms



Filter Class: Without\_Constant  
Max: 32.6 N·m at 187.2 ms  
Min: -69.2 N·m at 70.8 ms

Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

01.17.2013 12:26:52 2995





## Transportation Research Center Inc.

Front Thorax

HIII 50th Serial No. 037 Certification No. 14-2

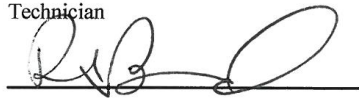
Test Date: 1/17/2013

| Test Parameter            | Specification         | Test Results | Pass |
|---------------------------|-----------------------|--------------|------|
| Temperature               | 20.6 - 22.2 °C        | 21.8 °C      | Yes  |
| Relative Humidity         | 10 - 70 %             | 31 %         | Yes  |
| Probe Velocity            | 6.59 - 6.83 m/s       | 6.654 m/s    | Yes  |
| Probe Force Peak          | (-5,160) - (-5,893) N | -5,690.1 N   | Yes  |
| Maximum Chest Compression | (-63.5) - (-72.6) mm  | -68.34 mm    | Yes  |
| Internal Hysteresis       | 65 - 85 %             | 73.9 %       | Yes  |

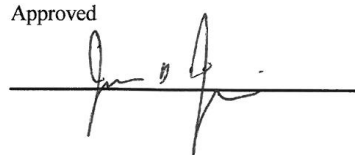
**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: CFR49 Part 572 Subpart P  
with Polarity in accordance with J211

01.17.2013 13:37:33 394

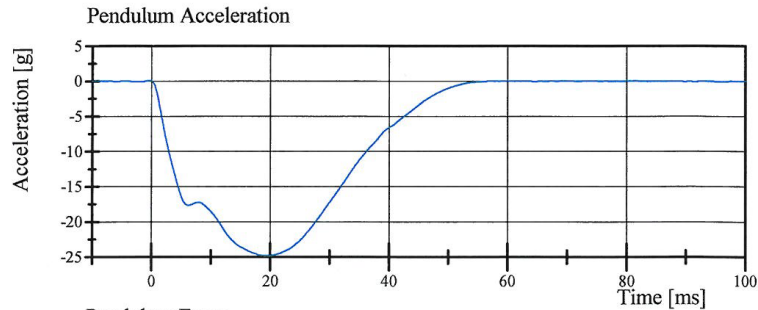


## Transportation Research Center Inc.

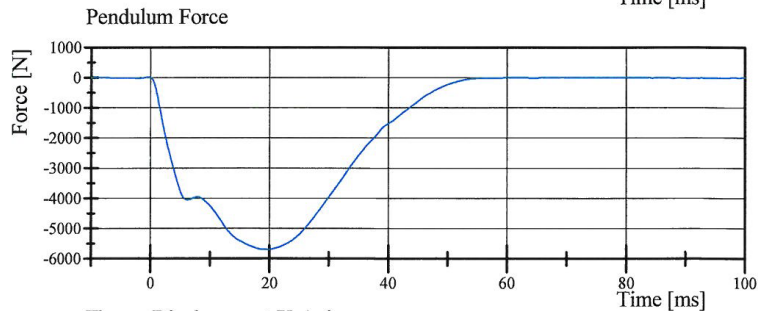
Front Thorax

HIII 50th Serial No. 037 Certification No. 14-2

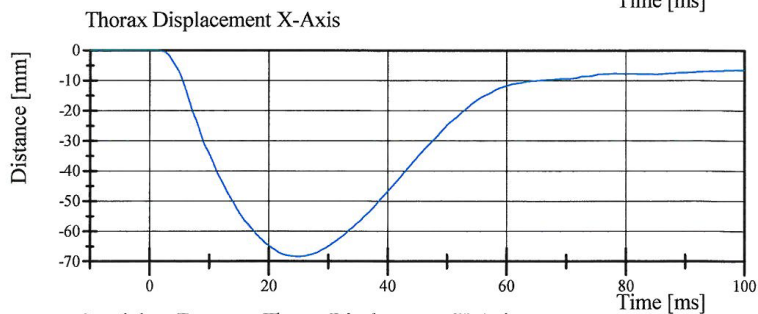
Test Date: 1/17/2013



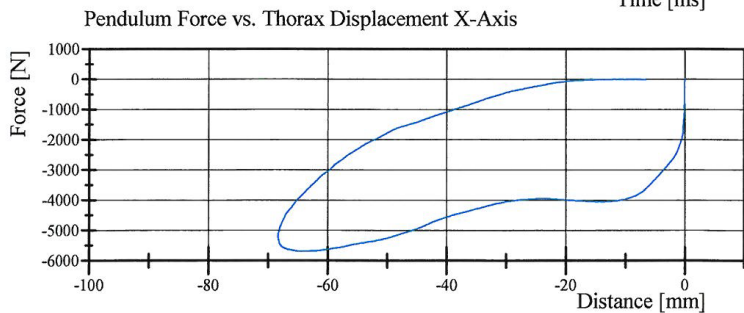
Filter Class: CFC\_180  
Max: 0.1 gn at -0.3 ms  
Min: -24.8 gn at 19.8 ms



Filter Class: CFC\_180  
Max: 22.3 N at -0.3 ms  
Min: -5,690.1 N at 19.8 ms



Filter Class: CFC\_600  
Max: 0.0 mm at -9.1 ms  
Min: -68.3 mm at 25.0 ms



Filter Class: CFC\_180  
Max: 22.3 N at -0.0 mm  
Min: -5,690.1 N at -64.4 mm

Specification Source: CFR49 Part 572 Subpart P  
with Polarity in accordance with J211

01.17.2013 13:37:48 394



# Transportation Research Center Inc

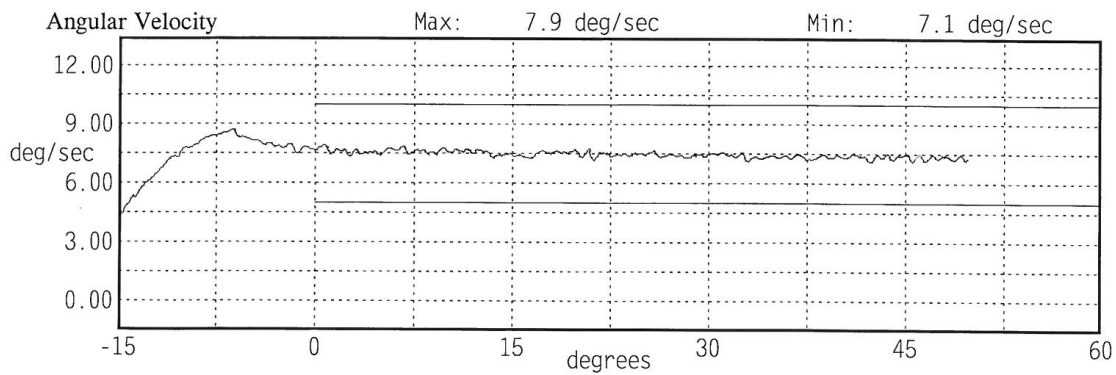
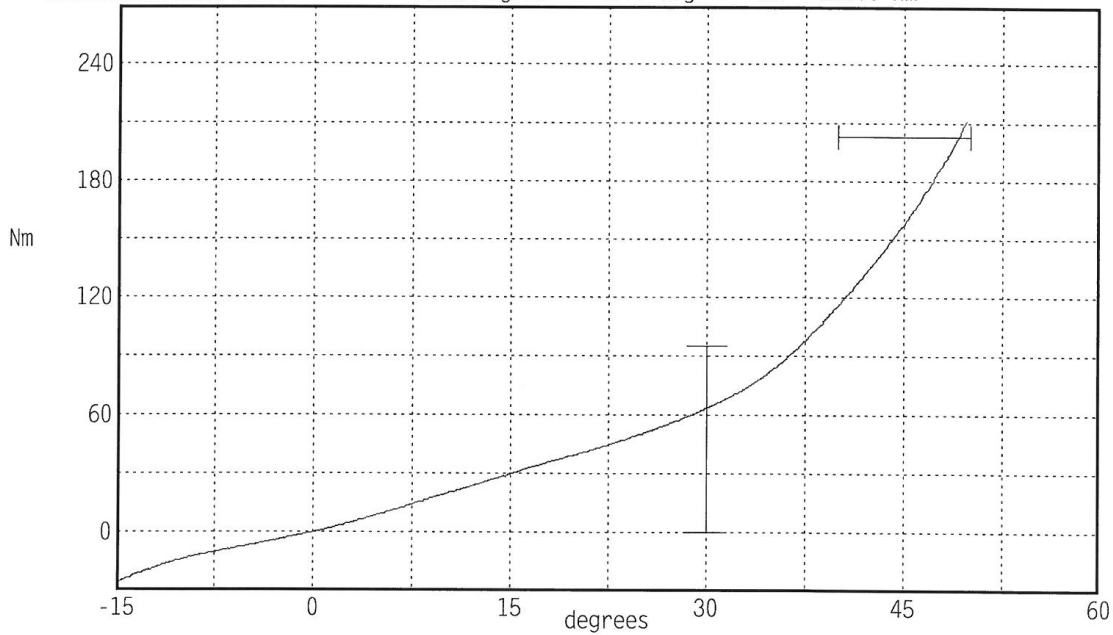
Hybrid III Hip Range of Motion

Serial Number: 037L  
 Test Number: 037C14  
 Comments:

Date: 17.01.2013  
 Time: 07:41

| TEST PARAMETER   | SPECIFICATION | TEST RESULTS     |
|------------------|---------------|------------------|
| Temperature      | 18.9 - 25.6   | 21.6 °C Pass     |
| Humidity         | 10 - 70       | 29 % Pass        |
| Moment at 30 deg | <= 94.9       | 63.8 Nm Pass     |
| Angle at 203 Nm  | 40.0 - 50.0   | 49.2 deg Pass    |
| Average Velocity | 5.0 - 10.0    | 7.4 deg/sec Pass |

Moment About H-Point  
 Peak Moment: 211.0 Nm at 49.7 deg  
 Peak Angle: 49.7 deg at 211.0 Nm



# Transportation Research Center Inc

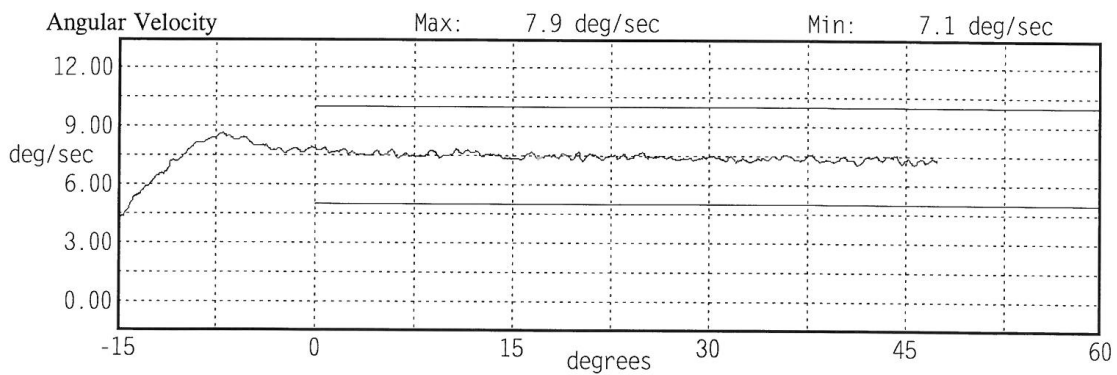
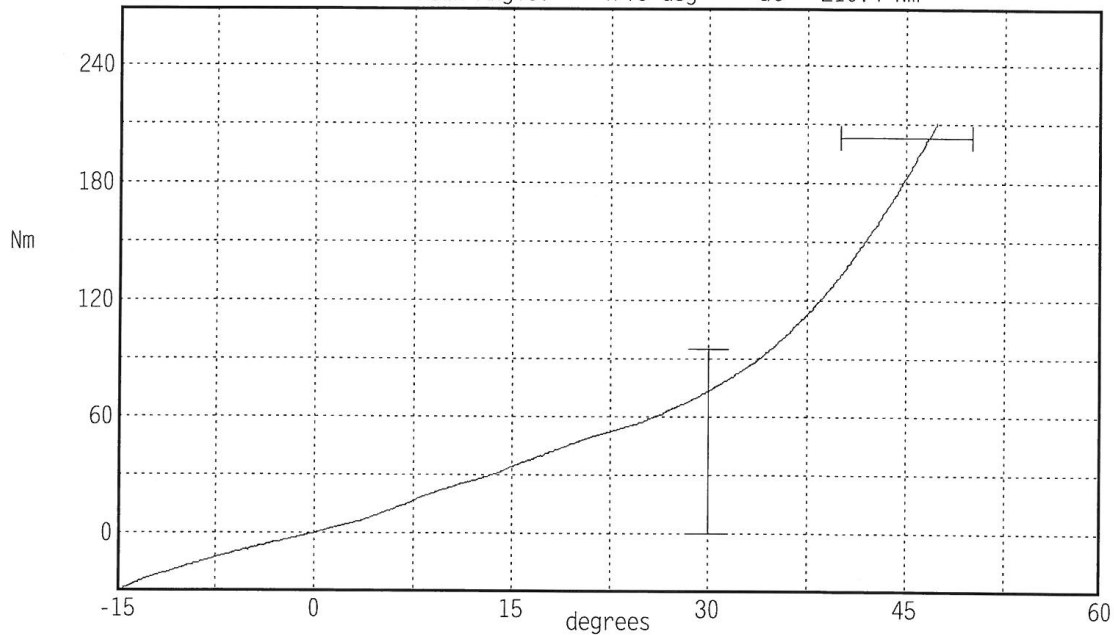
Hybrid III Hip Range of Motion

Serial Number: 037R  
 Test Number: 037C14  
 Comments:

Date: 17.01.2013  
 Time: 08:43

| TEST PARAMETER   | SPECIFICATION | TEST RESULTS     |
|------------------|---------------|------------------|
| Temperature      | 18.9 - 25.6   | 21.8 °C Pass     |
| Humidity         | 10 - 70       | 23 % Pass        |
| Moment at 30 deg | <= 94.9       | 73.5 Nm Pass     |
| Angle at 203 Nm  | 40.0 - 50.0   | 46.7 deg Pass    |
| Average Velocity | 5.0 - 10.0    | 7.4 deg/sec Pass |

Moment About H-Point  
 Peak Moment: 210.4 Nm at 47.3 deg  
 Peak Angle: 47.3 deg at 210.4 Nm





## Transportation Research Center Inc.

Left Knee Femur Response Test  
HIII 50th Serial No. 037 Certification No. 14-1  
Test Date: 1/17/2013

| Test Parameter    | Specification             | Test Results | Pass |
|-------------------|---------------------------|--------------|------|
| Temperature       | 18.9 - 25.5 °C            | 21.6 °C      | Yes  |
| Relative Humidity | 10 - 70 %                 | 34 %         | Yes  |
| Probe Velocity    | 2.08 - 2.13 m/s           | 2.100 m/s    | Yes  |
| Peak Femur Force  | (-4,715.2) - (-5,782.6) N | -5,554.28 N  | Yes  |

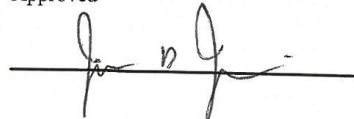
Test meets specifications.

Comments:

Technician



Approved



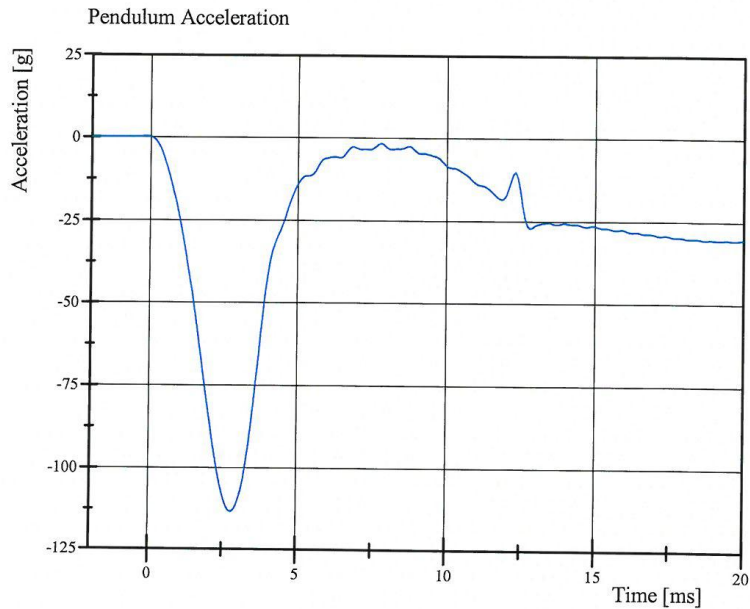
Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

01.17.2013 09:22:18 1705

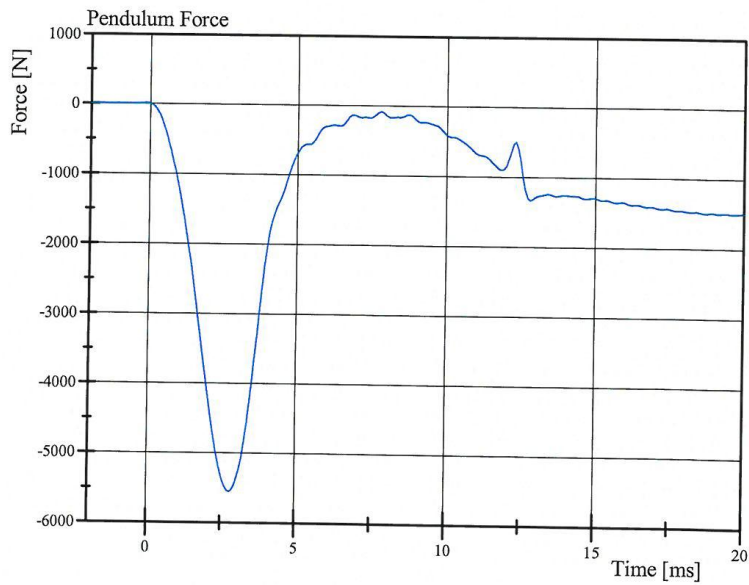


## Transportation Research Center Inc.

Left Knee Femur Response Test  
HIII 50th Serial No. 037 Certification No. 14-1  
Test Date: 1/17/2013



Filter Class: CFC\_600  
Max: 0.2 gn at -0.1 ms  
Min: -113.5 gn at 2.8 ms



Filter Class: CFC\_600  
Max: 9.8 N at -0.1 ms  
Min: -5,554.3 N at 2.8 ms

Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

01.17.2013 09:22:31 1705



## Transportation Research Center Inc.

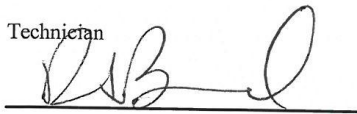
Right Knee Femur Response Test  
HIII 50th Serial No. 037 Certification No. 14-1  
Test Date: 1/17/2013

| Test Parameter    | Specification             | Test Results | Pass |
|-------------------|---------------------------|--------------|------|
| Temperature       | 18.9 - 25.5 °C            | 21.6 °C      | Yes  |
| Relative Humidity | 10 - 70 %                 | 33 %         | Yes  |
| Probe Velocity    | 2.08 - 2.13 m/s           | 2.097 m/s    | Yes  |
| Peak Femur Force  | (-4,715.2) - (-5,782.6) N | -5,673.37 N  | Yes  |

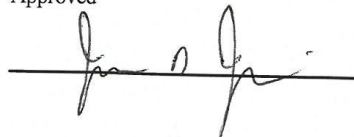
Test meets specifications.

Comments:

Technician



Approved



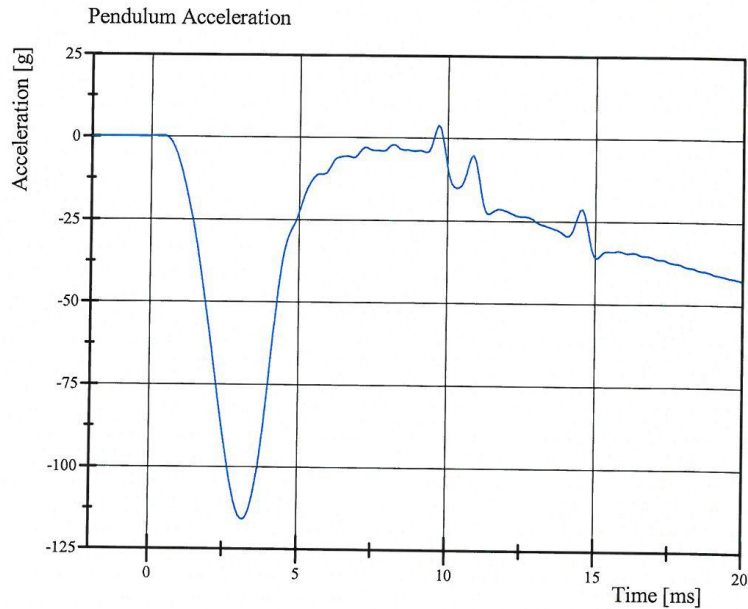
Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

01.17.2013 09:25:27 1701

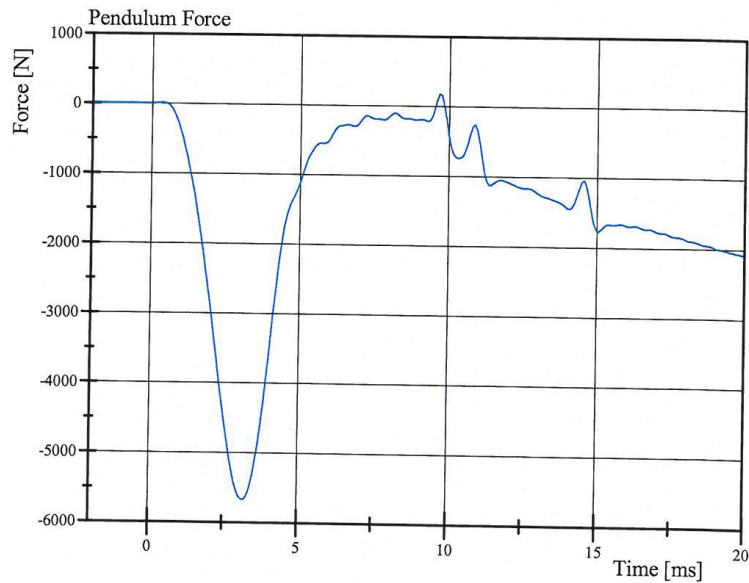


## Transportation Research Center Inc.

Right Knee Femur Response Test  
HIII 50th Serial No. 037 Certification No. 14-1  
Test Date: 1/17/2013



Filter Class: CFC\_600  
Max: 3.8 gn at 9.7 ms  
Min: -115.9 gn at 3.2 ms



Filter Class: CFC\_600  
Max: 185.3 N at 9.7 ms  
Min: -5,673.4 N at 3.2 ms

Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

01.17.2013 09:25:35 1701



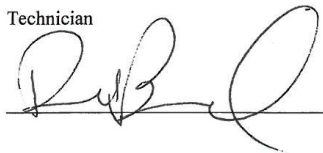


**Transportation Research Center Inc.**  
**572E HIII 50th Male Dummy**  
**External Dimensions**  
**Serial No. 037**  
**Calibration No. 14**

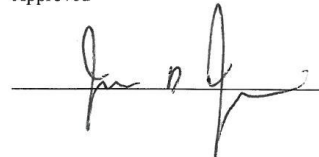
| Symbol | Description                      | Specification  | Results | Pass |
|--------|----------------------------------|----------------|---------|------|
|        |                                  | mm             | mm      |      |
| A      | Total Sitting Height             | 878.8 - 889.0  | 880     | Yes  |
| B      | Shoulder Pivot Height            | 505.5 - 520.7  | 520     | Yes  |
| C      | H-Point Height                   | 83.8 - 88.9    | 85      | Yes  |
| D      | H-Point From Seatback            | 134.6 - 139.7  | 138     | Yes  |
| E      | Shoulder Pivot From Backline     | 83.8 - 94.0    | 92      | Yes  |
| F      | Thigh Clearance                  | 139.7 - 154.9  | 150     | Yes  |
| G      | Back Of Elbow To Wrist Pivot     | 289.6 - 304.8  | 294     | Yes  |
| H      | Skull Cap To Backline            | 40.6 - 45.7    | 45      | Yes  |
| I      | Shoulder-Elbow Length            | 330.2 - 345.4  | 339     | Yes  |
| J      | Elbow Rest Height                | 190.5 - 210.8  | 198     | Yes  |
| K      | Buttock Knee Length              | 579.1 - 604.5  | 600     | Yes  |
| L      | Popliteal Height                 | 429.3 - 454.7  | 441     | Yes  |
| M      | Knee Pivot Height                | 485.1 - 500.4  | 495     | Yes  |
| N      | Buttock Popliteal Length         | 452.1 - 477.5  | 470     | Yes  |
| O      | Chest Depth                      | 213.4 - 228.6  | 225     | Yes  |
| P      | Foot Length                      | 251.5 - 266.7  | 264     | Yes  |
| V      | Shoulder Breadth                 | 421.6 - 436.9  | 427     | Yes  |
| W      | Foot Breadth                     | 91.4 - 106.7   | 97      | Yes  |
| Y      | Chest Circumference              | 970.3 - 1000.8 | 985     | Yes  |
| Z      | Waist Circumference              | 835.7 - 866.1  | 865     | Yes  |
| AA     | Location For Chest Circumference | 429.3 - 434.3  | 430     | Yes  |
| BB     | Location For Waist Circumference | 226.1 - 231.1  | 230     | Yes  |

Comments:

Technician



Approved




Revised 3/13/3003

**Driver S/N 037**

**Post-Test Calibration Sheets**

## Transportation Research Center Inc.

Front Head Drop

HIII 50th Serial No. 037 Certification No. 15-1

Test Date: 3/1/2013

| Test Parameter                                        | Specification  | Test Results | Pass |
|-------------------------------------------------------|----------------|--------------|------|
| Temperature                                           | 18.9 - 25.5 °C | 21.5 °C      | Yes  |
| Relative Humidity                                     | 10 - 70 %      | 29 %         | Yes  |
| Peak Head Resultant Acceleration                      | 225 - 275 g    | 246.4 g      | Yes  |
| Peak Head Lateral Acceleration                        | (-15) - 15 g   | -4.3 g       | Yes  |
| Is Acceleration Curve Unimodal<br>within 10% of Peak? | Yes            | Yes          | Yes  |

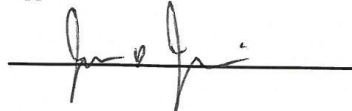
Test meets specifications.

Comments:

Technician



Approved



Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

03.01.2013 07:24:45 612

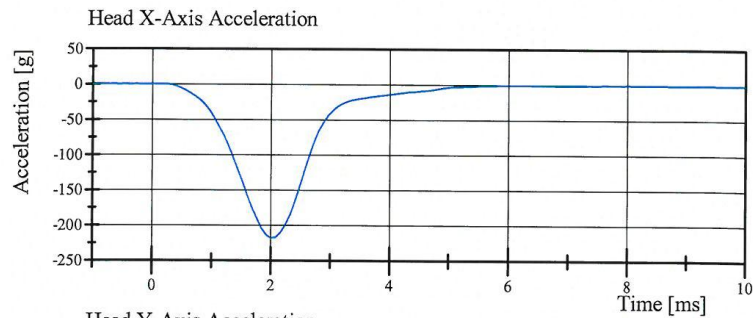


## Transportation Research Center Inc.

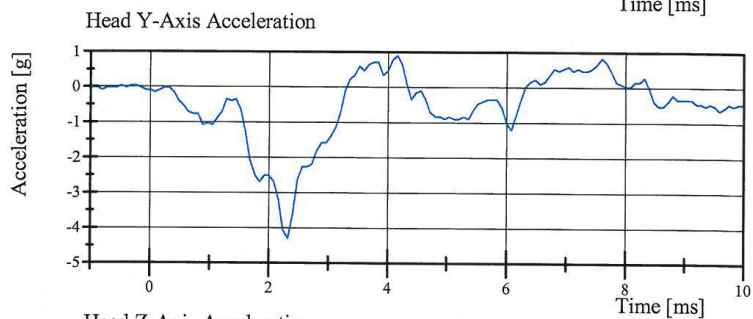
Front Head Drop

HIII 50th Serial No. 037 Certification No. 15-1

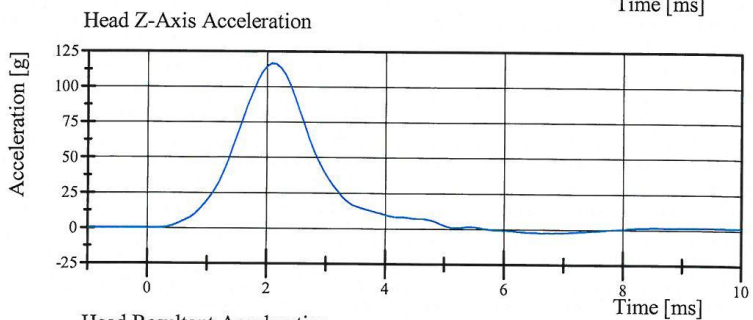
Test Date: 3/1/2013



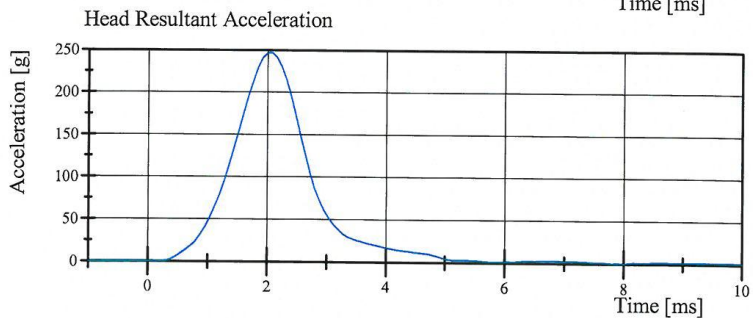
Filter Class: CFC\_1000  
Max: 0.1 gn at 0.0 ms  
Min: -218.1 gn at 2.0 ms



Filter Class: CFC\_1000  
Max: 0.9 gn at 4.2 ms  
Min: -4.3 gn at 2.3 ms



Filter Class: CFC\_1000  
Max: 116.5 gn at 2.1 ms  
Min: -2.6 gn at 6.6 ms



Filter Class: CFC\_1000  
Max: 246.4 gn at 2.1 ms  
Min: 0.0 gn at -0.2 ms

Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

03.01.2013 07:24:52 612





## Transportation Research Center Inc.

Neck Flexion

HIII 50th Serial No. 037 Certification No. 15-1

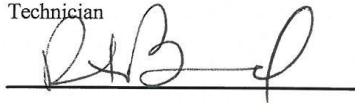
Test Date: 3/1/2013

| Test Parameter                                      | Specification       | Test Results | Pass |
|-----------------------------------------------------|---------------------|--------------|------|
| Temperature                                         | 20.6 - 22.2 °C      | 21.6 °C      | Yes  |
| Relative Humidity                                   | 10 - 70 %           | 29 %         | Yes  |
| Pendulum Velocity                                   | 6.89 - 7.13 m/s     | 6.970 m/s    | Yes  |
| Pendulum Acceleration Decay Crossing -5g            | 34 - 42 ms          | 36.2 ms      | Yes  |
| Pendulum Acceleration at 10ms                       | (-22.5) - (-27.5) g | -24.89 g     | Yes  |
| Pendulum Acceleration at 20ms                       | (-17.6) - (-22.6) g | -21.72 g     | Yes  |
| Pendulum Acceleration at 30ms                       | (-12.5) - (-18.5) g | -16.66 g     | Yes  |
| Pendulum Acceleration > 30ms                        | >= (-29.0) g        | -16.66 g     | Yes  |
| Total Head D-Plane Rotation                         |                     |              |      |
| Peak                                                | (-64) - (-78) °     | -72.3 °      | Yes  |
| Time of Peak                                        | 57 - 64 ms          | 59.4 ms      | Yes  |
| Total Head D-Plane Rotation Decay to 0°             | 113 - 128 ms        | 118.6 ms     | Yes  |
| Total Neck Occipital Condyles Moment                |                     |              |      |
| Peak                                                | 88 - 108 N·m        | 105.9 N·m    | Yes  |
| Time of Peak                                        | 47 - 58 ms          | 49.2 ms      | Yes  |
| Total Neck Occipital Condyles Moment Decay to 0 N·m | 97 - 107 ms         | 97.4 ms      | Yes  |

**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

03.01.2013 07:53:30 2942

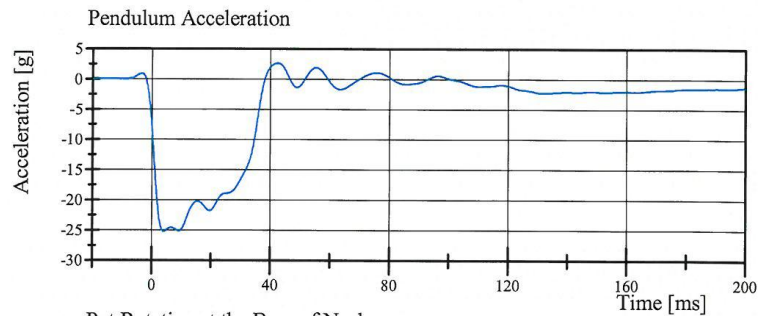


## Transportation Research Center Inc.

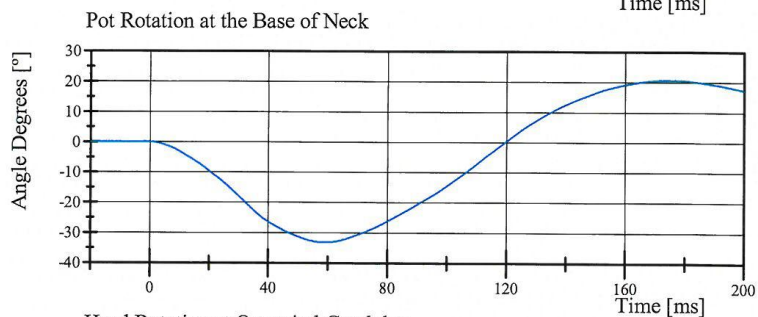
### Neck Flexion

HIII 50th Serial No. 037 Certification No. 15-1

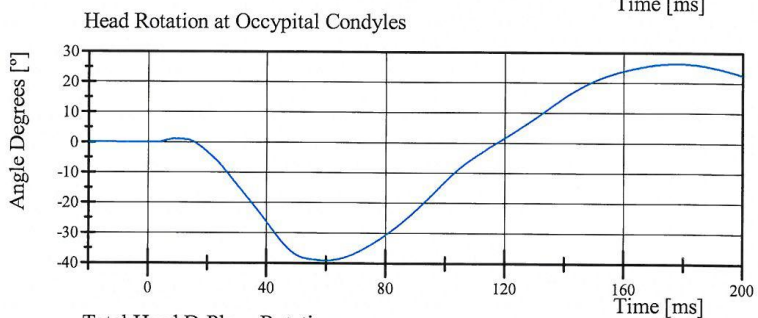
Test Date: 3/1/2013



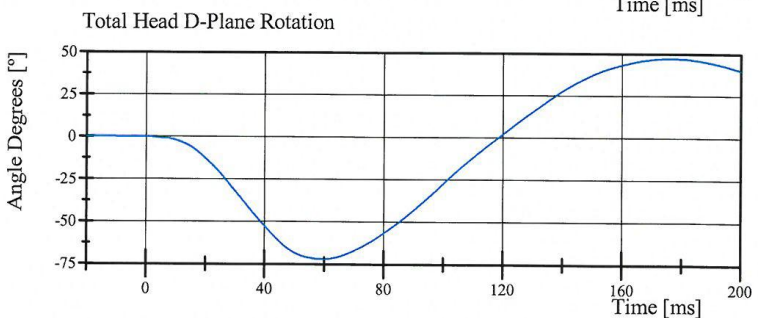
Filter Class: CFC\_60  
Max: 2.6 gn at 42.4 ms  
Min: -25.2 gn at 4.0 ms



Filter Class: CFC\_60  
Max: 20.8 ° at 174.1 ms  
Min: -33.2 ° at 59.0 ms



Filter Class: CFC\_60  
Max: 26.4 ° at 177.6 ms  
Min: -39.1 ° at 59.9 ms



Filter Class: CFC\_60  
Max: 47.1 ° at 175.9 ms  
Min: -72.3 ° at 59.4 ms

Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

03.01.2013 07:53:38 2942

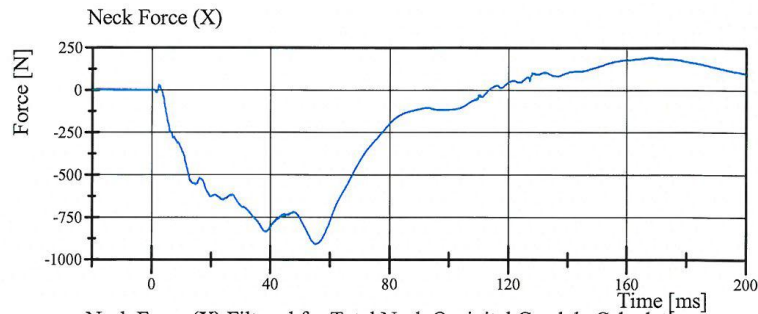


## Transportation Research Center Inc.

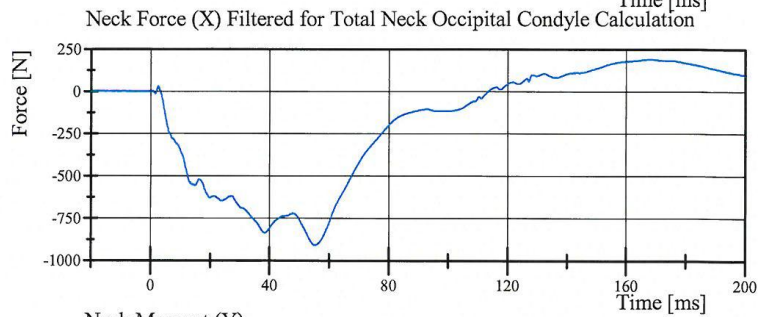
Neck Flexion

HIII 50th Serial No. 037 Certification No. 15-1

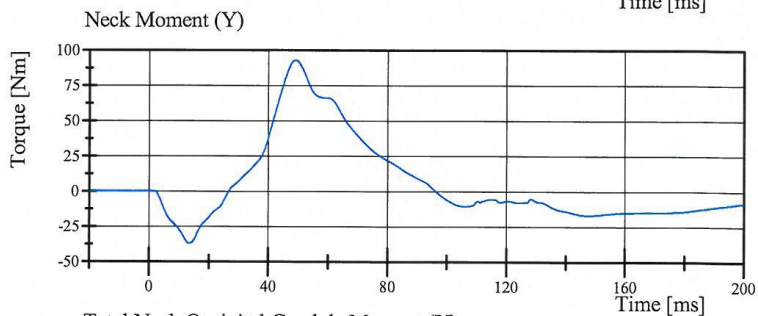
Test Date: 3/1/2013



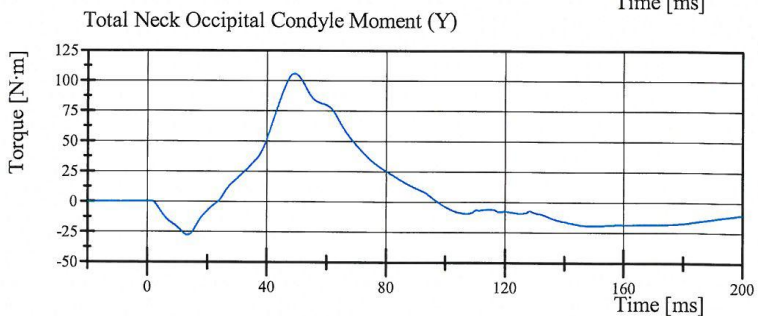
Filter Class: CFC\_1000  
Max: 190.4 N at 168.0 ms  
Min: -909.2 N at 55.0 ms



Filter Class: CFC\_600  
Max: 189.9 N at 168.1 ms  
Min: -909.3 N at 55.1 ms



Filter Class: CFC\_600  
Max: 92.9 Nm at 49.1 ms  
Min: -37.2 Nm at 13.4 ms



Filter Class: Without\_(Consta  
Max: 105.9 N·m at 49.2 ms  
Min: -27.6 N·m at 13.3 ms

Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

03.01.2013 07:53:39 2942



## Transportation Research Center Inc.

Neck Extension

HIII 50th Serial No. 037 Certification No. 15-1

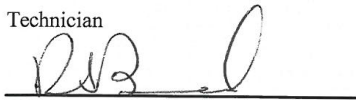
Test Date: 3/1/2013

| Test Parameter                                      | Specification         | Test Results | Pass |
|-----------------------------------------------------|-----------------------|--------------|------|
| Temperature                                         | 20.6 - 22.2 °C        | 21.3 °C      | Yes  |
| Relative Humidity                                   | 10 - 70 %             | 35 %         | Yes  |
| Pendulum Velocity                                   | (-5.95) - (-6.18) m/s | -5.969 m/s   | Yes  |
| Pendulum Acceleration Decay Crossing 5g             | 38 - 46 ms            | 42.7 ms      | Yes  |
| Pendulum Acceleration at 10ms                       | 17.2 - 21.2 g         | 17.48 g      | Yes  |
| Pendulum Acceleration at 20ms                       | 14.0 - 19.0 g         | 15.47 g      | Yes  |
| Pendulum Acceleration at 30ms                       | 11.0 - 16.0 g         | 13.36 g      | Yes  |
| Pendulum Acceleration > 30ms                        | <= 22.0 g             | 13.36 g      | Yes  |
| Total Head D-Plane Rotation                         |                       |              |      |
| Peak                                                | 81 - 106 °            | 93.4 °       | Yes  |
| Time of Peak                                        | 72 - 82 ms            | 77.8 ms      | Yes  |
| Total Head D-Plane Rotation Decay to 0°             | 147 - 174 ms          | 159.7 ms     | Yes  |
| Total Neck Occipital Condyles Moment                |                       |              |      |
| Peak                                                | (-53) - (-80) N·m     | -65.3 N·m    | Yes  |
| Time of Peak                                        | 65 - 79 ms            | 72.6 ms      | Yes  |
| Total Neck Occipital Condyles Moment Decay to 0 N·m | 120 - 148 ms          | 144.7 ms     | Yes  |

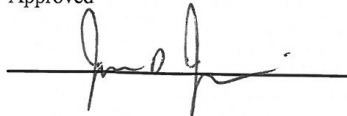
**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

03.01.2013 08:30:20 3029



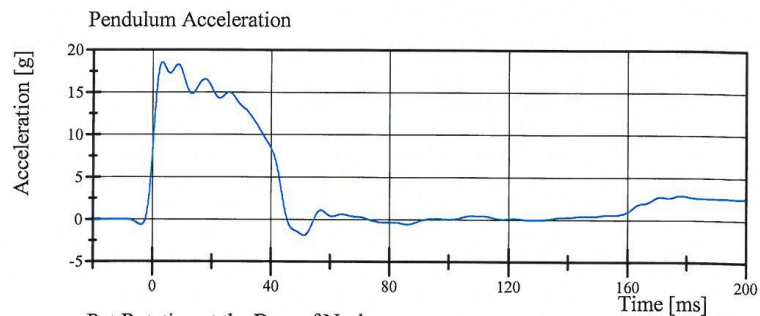


## Transportation Research Center Inc.

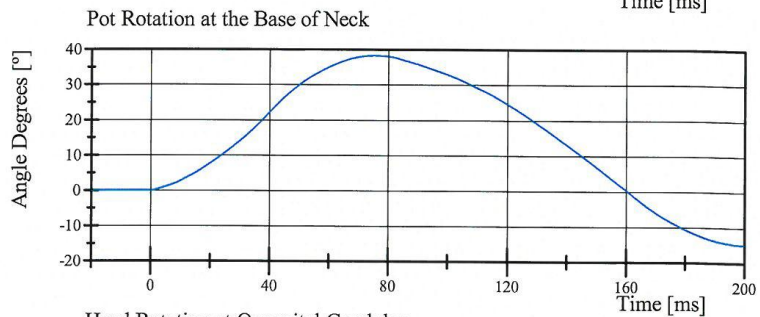
### Neck Extension

HIII 50th Serial No. 037 Certification No. 15-1

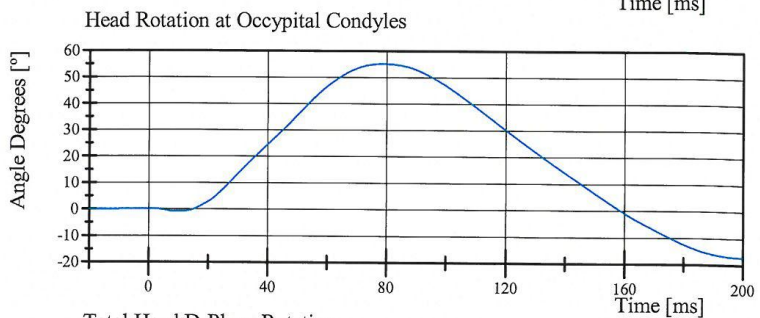
Test Date: 3/1/2013



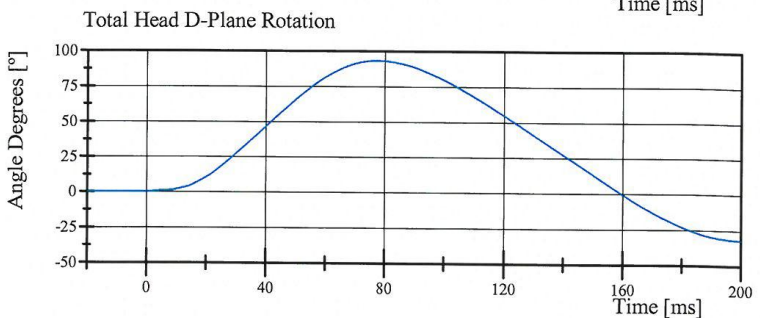
Filter Class: CFC\_60  
Max: 18.5 gn at 3.2 ms  
Min: -1.9 gn at 51.1 ms



Filter Class: CFC\_60  
Max: 38.3 ° at 75.8 ms  
Min: -14.9 ° at 200.0 ms



Filter Class: CFC\_60  
Max: 55.1 ° at 78.8 ms  
Min: -17.2 ° at 200.0 ms



Filter Class: CFC\_60  
Max: 93.4 ° at 77.8 ms  
Min: -32.1 ° at 200.0 ms

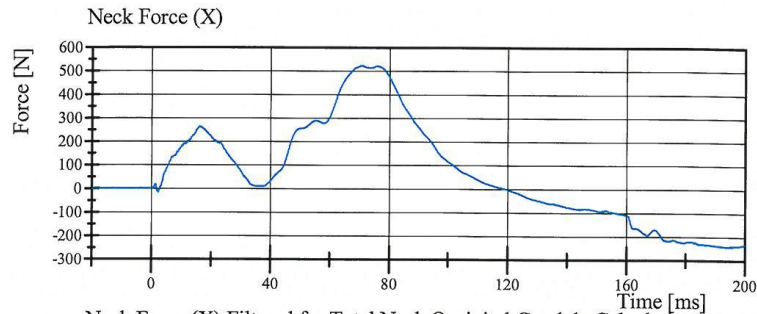
Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

03.01.2013 08:30:27 3029

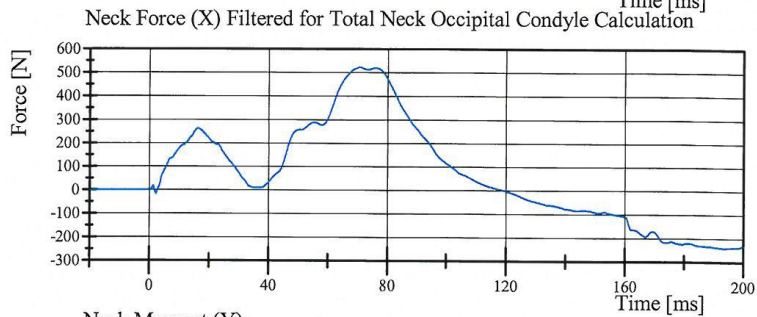


# Transportation Research Center Inc.

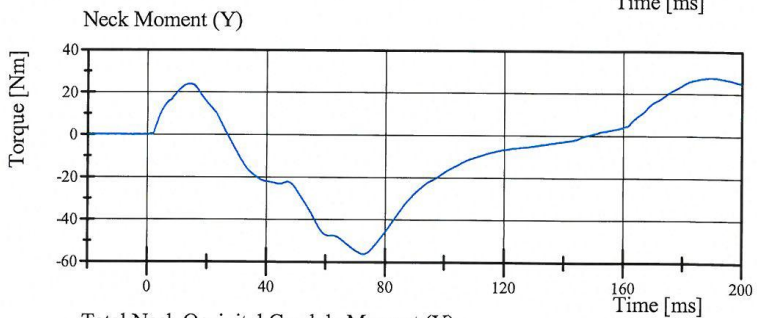
Neck Extension  
 HIII 50th Serial No. 037 Certification No. 15-1  
 Test Date: 3/1/2013



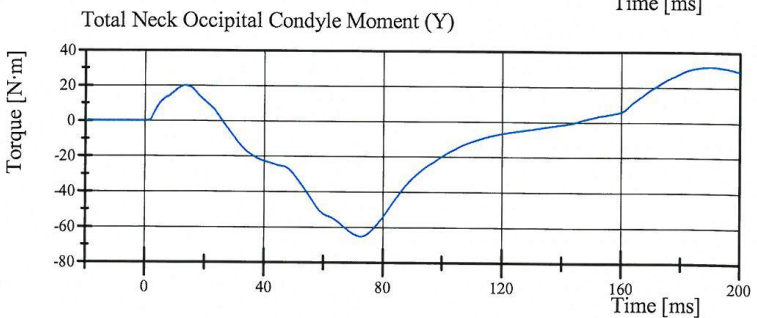
Filter Class: CFC\_1000  
 Max: 522.2 N at 70.3 ms  
 Min: -241.9 N at 194.0 ms



Filter Class: CFC\_600  
 Max: 522.0 N at 70.4 ms  
 Min: -241.5 N at 193.9 ms



Filter Class: CFC\_600  
 Max: 27.6 Nm at 189.9 ms  
 Min: -56.2 Nm at 72.6 ms



Filter Class: Without\_(Consta  
 Max: 31.8 N·m at 190.5 ms  
 Min: -65.3 N·m at 72.6 ms

Specification Source: CFR49 Part 572 Subpart E  
 with Polarity in accordance with J211

03.01.2013 08:30:28 3029



## Transportation Research Center Inc.

Front Thorax

HIII 50th Serial No. 037 Certification No. 15-2

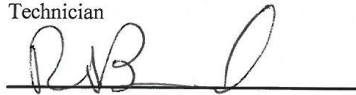
Test Date: 3/4/2013

| Test Parameter            | Specification         | Test Results | Pass |
|---------------------------|-----------------------|--------------|------|
| Temperature               | 20.6 - 22.2 °C        | 21.1 °C      | Yes  |
| Relative Humidity         | 10 - 70 %             | 29 %         | Yes  |
| Probe Velocity            | 6.59 - 6.83 m/s       | 6.633 m/s    | Yes  |
| Probe Force Peak          | (-5,160) - (-5,893) N | -5,733.3 N   | Yes  |
| Maximum Chest Compression | (-63.5) - (-72.6) mm  | -66.74 mm    | Yes  |
| Internal Hysteresis       | 65 - 85 %             | 73.9 %       | Yes  |

Test meets specifications.

Comments:

Technician



Approved



Specification Source: CFR49 Part 572 Subpart P  
with Polarity in accordance with J211

03.04.2013 09:20:20 392

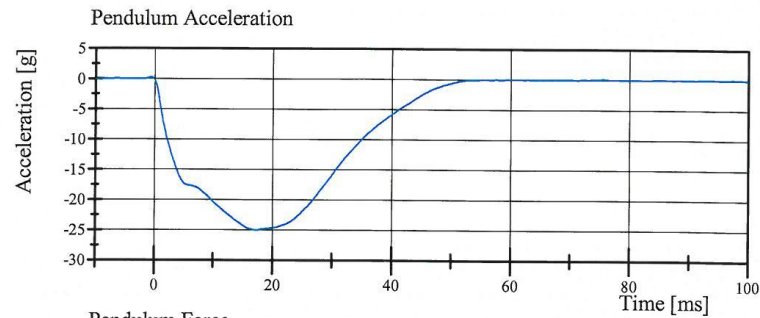


## Transportation Research Center Inc.

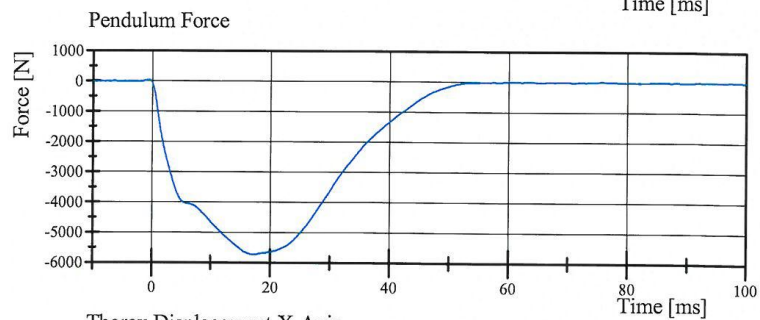
Front Thorax

HIII 50th Serial No. 037 Certification No. 15-2

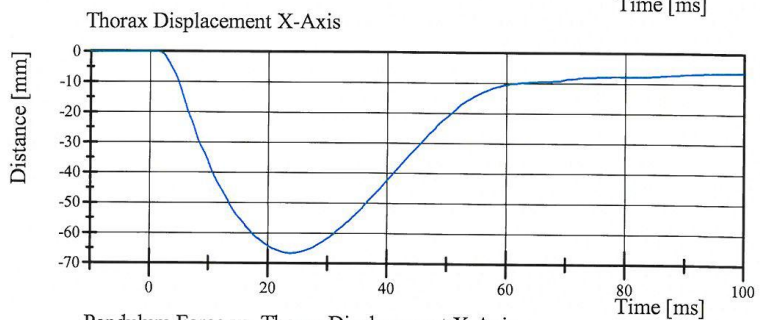
Test Date: 3/4/2013



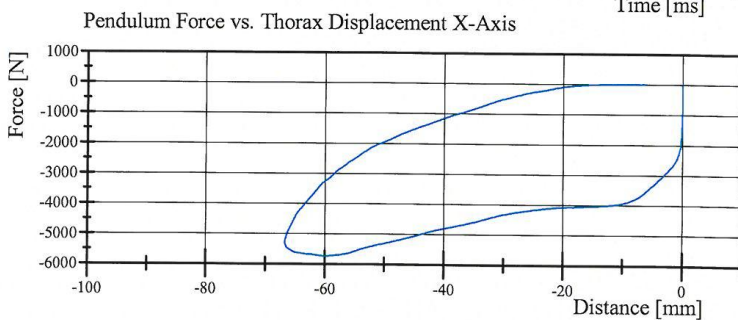
Filter Class: CFC\_180  
Max: 0.2 gn at -0.6 ms  
Min: -25.0 gn at 17.3 ms



Filter Class: CFC\_180  
Max: 38.6 N at -0.6 ms  
Min: -5,733.3 N at 17.3 ms



Filter Class: CFC\_600  
Max: 0.0 mm at -8.2 ms  
Min: -66.7 mm at 23.8 ms



Filter Class: CFC\_180  
Max: 38.6 N at -0.0 mm  
Min: -5,733.3 N at -60.0 mm

Specification Source: CFR49 Part 572 Subpart P  
with Polarity in accordance with J211

03.04.2013 09:20:29 392





# Transportation Research Center Inc.

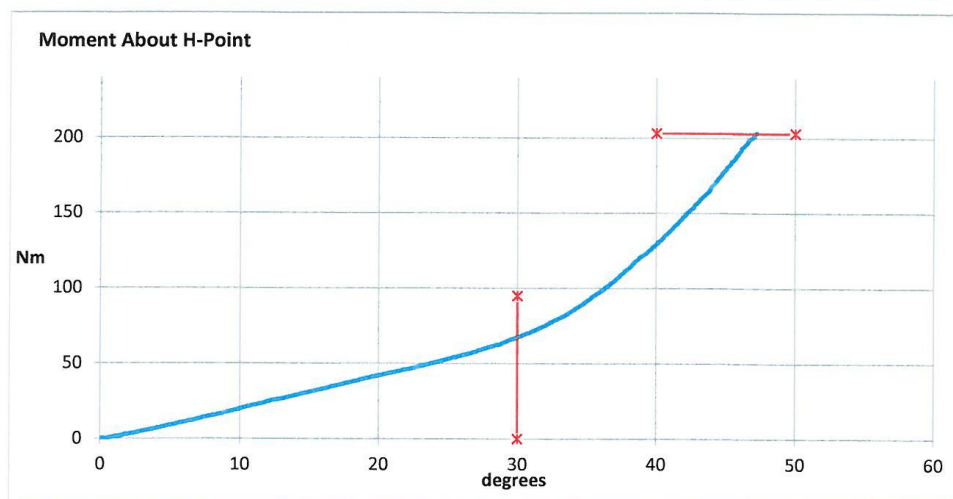
Hybrid III 50th Male Hip Range of Motion



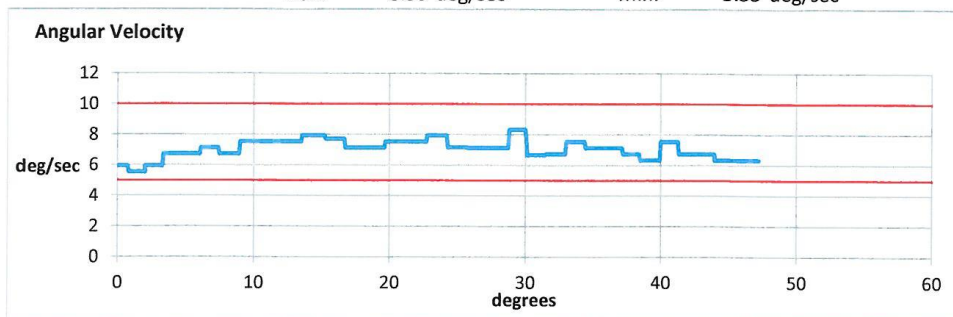
Serial Number: 37  
Test Number: 1  
Comments: Left

Date: 01-Mar-2013  
Time: 8:16

| TEST PARAMETER   | SPECIFICATION | TEST RESULTS      |
|------------------|---------------|-------------------|
| Temperature      | 18.9 - 25.6   | 21.2 °C Pass      |
| Humidity         | 10 - 70       | 33 % Pass         |
| Moment at 30°    | 0 ≤ 94.9      | 67.99 Nm Pass     |
| Angle at 203 Nm  | 40 - 50       | 47.21 deg Pass    |
| Average Velocity | 5 - 10        | 7.03 deg/sec Pass |



Max: 8.33 deg/sec Min: 5.55 deg/sec



Technician

*[Signature]*

Approved

*[Signature]*

# Transportation Research Center Inc.

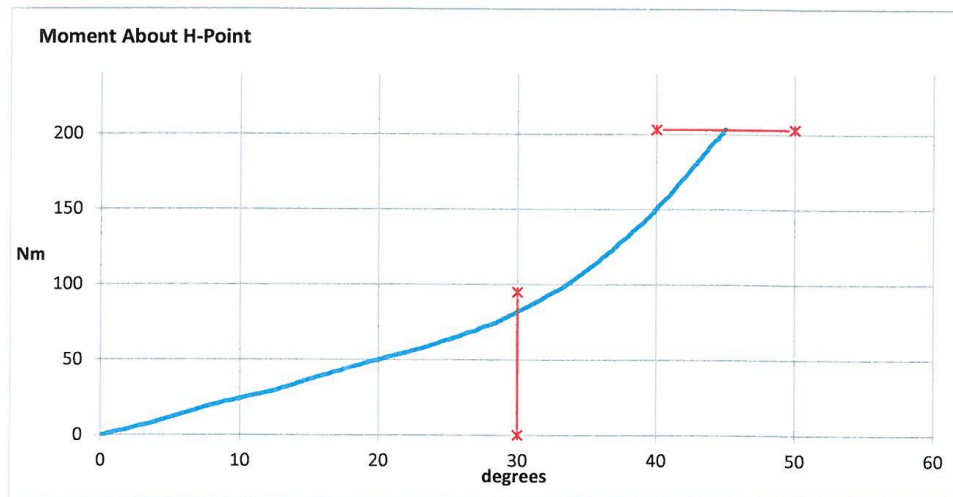
Hybrid III 50th Male Hip Range of Motion



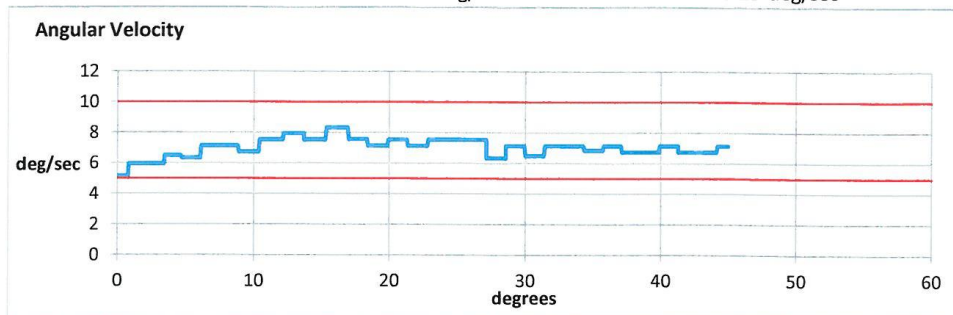
Serial Number: 37  
Test Number: 1  
Comments: Right

Date: 01-Mar-2013  
Time: 8:49

| TEST PARAMETER   | SPECIFICATION |        | TEST RESULTS |         |      |
|------------------|---------------|--------|--------------|---------|------|
| Temperature      | 18.9          | - 25.6 | 21.4         | °C      | Pass |
| Humidity         | 10            | - 70   | 33           | %       | Pass |
| Moment at 30°    | 0             | ≤ 94.9 | 82.58        | Nm      | Pass |
| Angle at 203 Nm  | 40            | - 50   | 44.99        | deg     | Pass |
| Average Velocity | 5             | - 10   | 7            | deg/sec | Pass |



Max: 8.33 deg/sec Min: 5.15 deg/sec



Technician

Approved

## Transportation Research Center Inc.

Left Knee Femur Response Test

HIII 50th Serial No. 037 Certification No. 15-1

Test Date: 3/1/2013

| Test Parameter    | Specification             | Test Results | Pass |
|-------------------|---------------------------|--------------|------|
| Temperature       | 18.9 - 25.5 °C            | 21.4 °C      | Yes  |
| Relative Humidity | 10 - 70 %                 | 29 %         | Yes  |
| Probe Velocity    | 2.08 - 2.13 m/s           | 2.110 m/s    | Yes  |
| Peak Femur Force  | (-4,715.2) - (-5,782.6) N | -5,756.75 N  | Yes  |

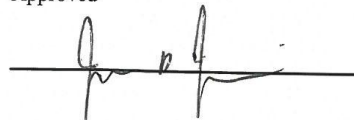
Test meets specifications.

Comments:

Technician



Approved



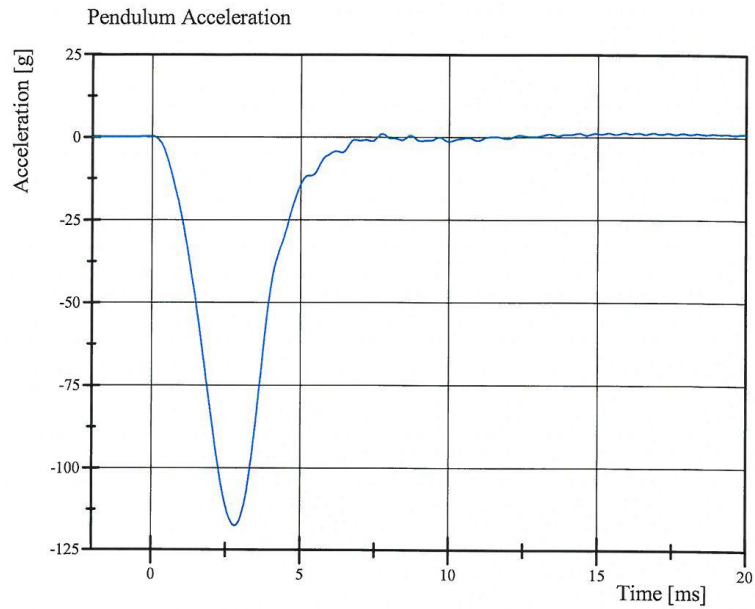
Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

03.01.2013 07:03:56 1895

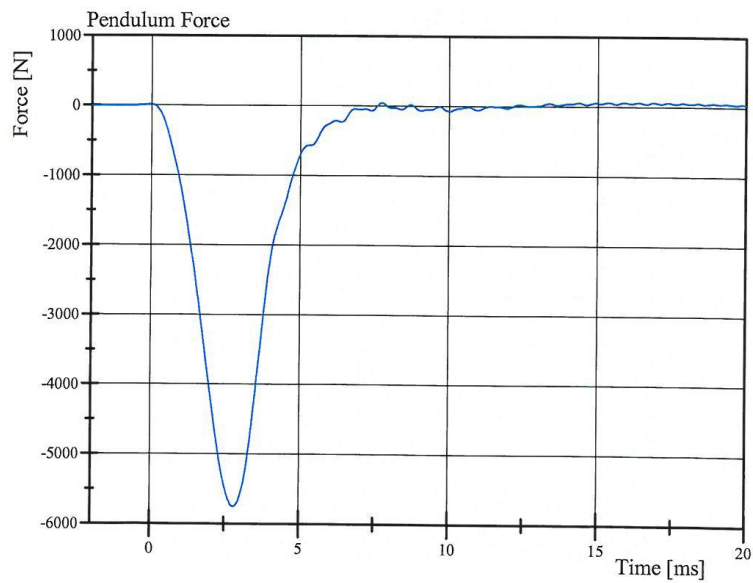


## Transportation Research Center Inc.

Left Knee Femur Response Test  
HIII 50th Serial No. 037 Certification No. 15-1  
Test Date: 3/1/2013



Filter Class: CFC\_600  
Max: 1.3 gn at 16.9 ms  
Min: -117.7 gn at 2.8 ms



Filter Class: CFC\_600  
Max: 64.8 N at 16.9 ms  
Min: -5,756.7 N at 2.8 ms

Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

03.01.2013 07:04:03 1895





## Transportation Research Center Inc.

Right Knee Femur Response Test  
HIII 50th Serial No. 037 Certification No. 15-1  
Test Date: 3/1/2013

| Test Parameter    | Specification             | Test Results | Pass |
|-------------------|---------------------------|--------------|------|
| Temperature       | 18.9 - 25.5 °C            | 21.5 °C      | Yes  |
| Relative Humidity | 10 - 70 %                 | 29 %         | Yes  |
| Probe Velocity    | 2.08 - 2.13 m/s           | 2.112 m/s    | Yes  |
| Peak Femur Force  | (-4,715.2) - (-5,782.6) N | -5,576.11 N  | Yes  |

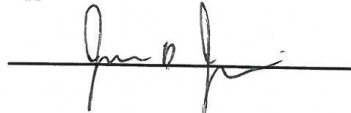
Test meets specifications.

Comments:

Technician



Approved



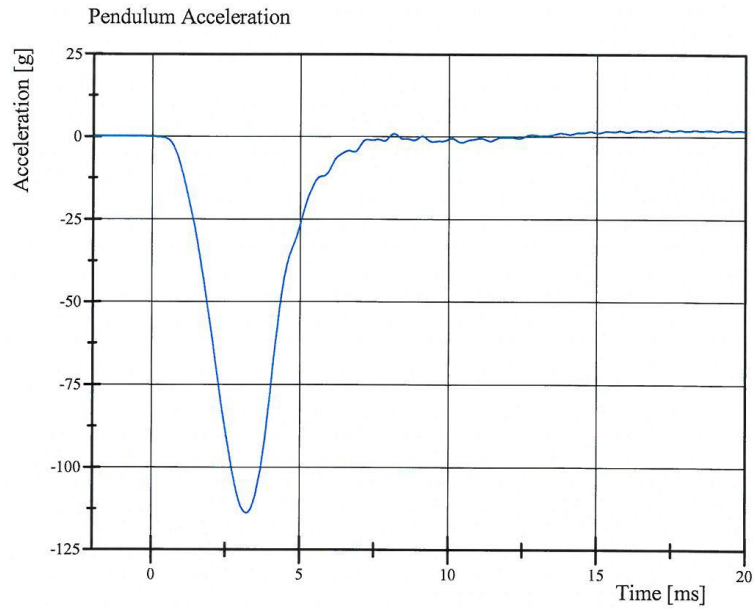
Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

03.01.2013 07:09:53 1888

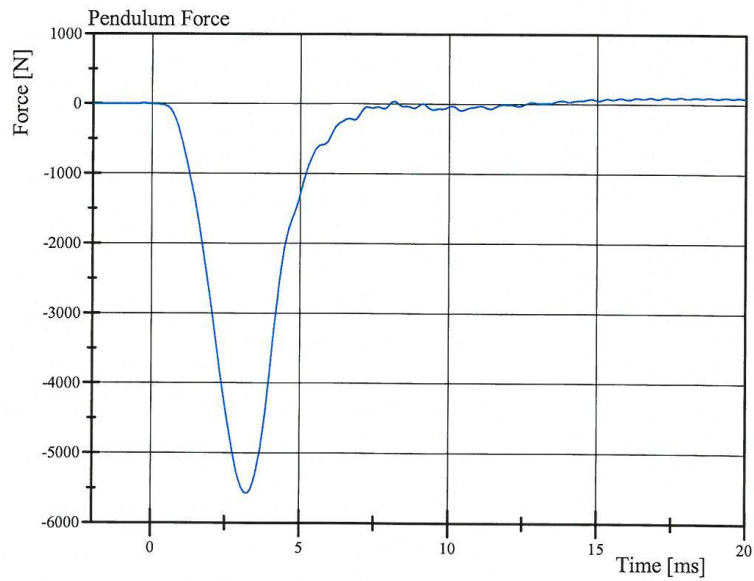


## Transportation Research Center Inc.

Right Knee Femur Response Test  
HIII 50th Serial No. 037 Certification No. 15-1  
Test Date: 3/1/2013



Filter Class: CFC\_600  
Max: 2.0 gn at 17.3 ms  
Min: -114.0 gn at 3.2 ms



Filter Class: CFC\_600  
Max: 99.1 N at 17.3 ms  
Min: -5,576.1 N at 3.2 ms

Specification Source: CFR49 Part 572 Subpart E  
with Polarity in accordance with J211

03.01.2013 07:09:59 1888

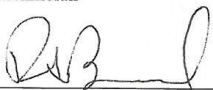


**Transportation Research Center Inc.**  
**572E HIII 50th Male Dummy**  
**External Dimensions**  
**Serial No. 037**  
**Calibration No. 15**

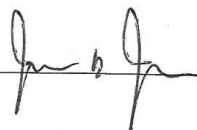
| Symbol | Description                      | Specification  | Results | Pass |
|--------|----------------------------------|----------------|---------|------|
|        |                                  | mm             | mm      |      |
| A      | Total Sitting Height             | 878.8 - 889.0  | 882     | Yes  |
| B      | Shoulder Pivot Height            | 505.5 - 520.7  | 520     | Yes  |
| C      | H-Point Height                   | 83.8 - 88.9    | 85      | Yes  |
| D      | H-Point From Seatback            | 134.6 - 139.7  | 138     | Yes  |
| E      | Shoulder Pivot From Backline     | 83.8 - 94.0    | 92      | Yes  |
| F      | Thigh Clearance                  | 139.7 - 154.9  | 151     | Yes  |
| G      | Back Of Elbow To Wrist Pivot     | 289.6 - 304.8  | 294     | Yes  |
| H      | Skull Cap To Backline            | 40.6 - 45.7    | 45      | Yes  |
| I      | Shoulder-Elbow Length            | 330.2 - 345.4  | 339     | Yes  |
| J      | Elbow Rest Height                | 190.5 - 210.8  | 198     | Yes  |
| K      | Buttock Knee Length              | 579.1 - 604.5  | 600     | Yes  |
| L      | Popliteal Height                 | 429.3 - 454.7  | 441     | Yes  |
| M      | Knee Pivot Height                | 485.1 - 500.4  | 495     | Yes  |
| N      | Buttock Popliteal Length         | 452.1 - 477.5  | 470     | Yes  |
| O      | Chest Depth                      | 213.4 - 228.6  | 225     | Yes  |
| P      | Foot Length                      | 251.5 - 266.7  | 264     | Yes  |
| V      | Shoulder Breadth                 | 421.6 - 436.9  | 427     | Yes  |
| W      | Foot Breadth                     | 91.4 - 106.7   | 97      | Yes  |
| Y      | Chest Circumference              | 970.3 - 1000.8 | 986     | Yes  |
| Z      | Waist Circumference              | 835.7 - 866.1  | 865     | Yes  |
| AA     | Location For Chest Circumference | 429.3 - 434.3  | 430     | Yes  |
| BB     | Location For Waist Circumference | 226.1 - 231.1  | 230     | Yes  |

Comments:

Technician



Approved



Revised 3/13/3003



**Pre-Test Calibration Sheets**  
**Front Passenger S/N 426**



## Transportation Research Center Inc.

Front Head Drop

HIII 5th Serial No. 426 Certification No. 16-2

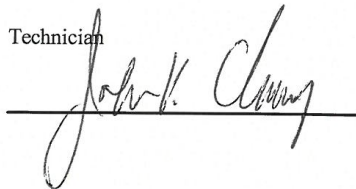
Test Date: 1/17/2013

| Test Parameter                                        | Specification  | Test Results | Pass |
|-------------------------------------------------------|----------------|--------------|------|
| Temperature                                           | 18.9 - 25.5 °C | 21.7 °C      | Yes  |
| Relative Humidity                                     | 10 - 70 %      | 29 %         | Yes  |
| Peak Head Resultant Acceleration                      | 250 - 300 g    | 269.4 g      | Yes  |
| Peak Head Lateral Acceleration                        | (-15) - 15 g   | -6.0 g       | Yes  |
| Is Acceleration Curve Unimodal<br>within 10% of Peak? | Yes            | Yes          | Yes  |

**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

01.17.2013 15:50:16 573

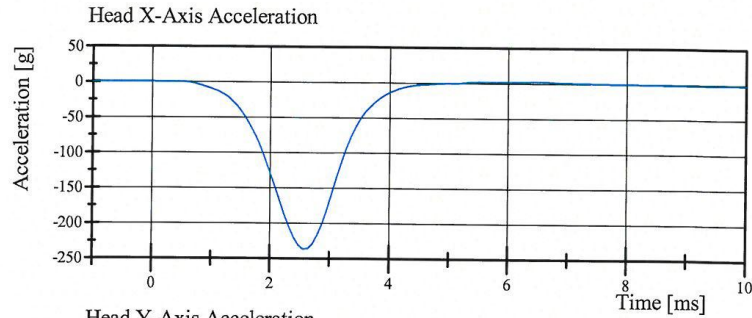


## Transportation Research Center Inc.

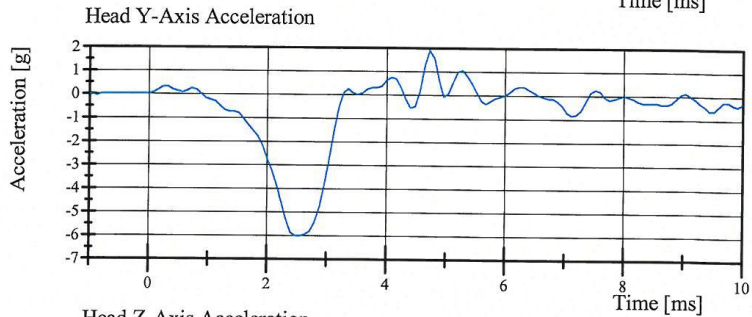
Front Head Drop

HIII 5th Serial No. 426 Certification No. 16-2

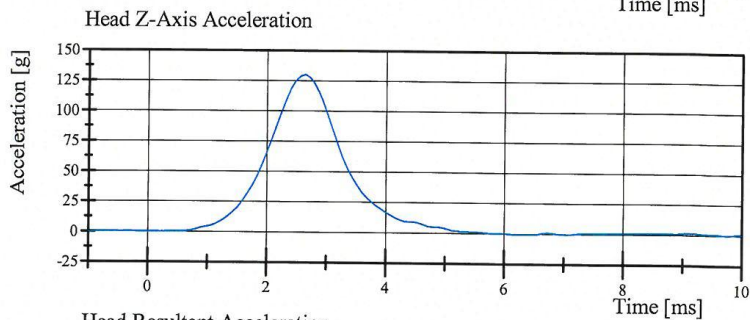
Test Date: 1/17/2013



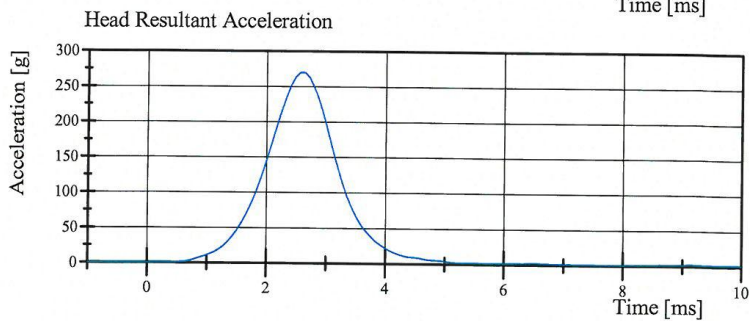
Filter Class: CFC\_1000  
Max: 2.3 gn at 6.6 ms  
Min: -236.5 gn at 2.6 ms



Filter Class: CFC\_1000  
Max: 1.9 gn at 4.7 ms  
Min: -6.0 gn at 2.5 ms



Filter Class: CFC\_1000  
Max: 130.1 gn at 2.6 ms  
Min: -0.7 gn at 6.5 ms



Filter Class: CFC\_1000  
Max: 269.4 gn at 2.6 ms  
Min: 0.0 gn at -0.3 ms

Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

01.17.2013 15:50:32 573



## Transportation Research Center Inc.

Neck Flexion

HIII 5th Serial No. 426 Certification No. 16-2

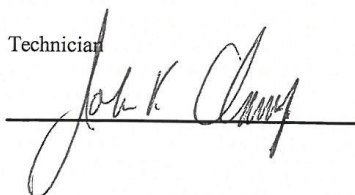
Test Date: 1/17/2013

| Test Parameter                                                         | Specification       | Test Results | Pass |
|------------------------------------------------------------------------|---------------------|--------------|------|
| Temperature                                                            | 20.6 - 22.2 °C      | 21.6 °C      | Yes  |
| Relative Humidity                                                      | 10 - 70 %           | 31 %         | Yes  |
| Pendulum Velocity                                                      | 6.89 - 7.13 m/s     | 7.035 m/s    | Yes  |
| Pendulum Integrated Velocity<br>Change at 10ms                         | (-2.1) - (-2.5) m/s | -2.44 m/s    | Yes  |
| Pendulum Integrated Velocity<br>Change at 20ms                         | (-4.0) - (-5.0) m/s | -4.83 m/s    | Yes  |
| Pendulum Integrated Velocity<br>Change at 30ms                         | (-5.8) - (-7.0) m/s | -6.92 m/s    | Yes  |
| Total Head D-Plane Rotation                                            | (-77) - (-91) °     | -80.0 °      | Yes  |
| Total Neck Occipital Condyles Moment<br>Between -77° and -91° Rotation | 69 - 83 N·m         | 77.9 N·m     | Yes  |
| Total Neck Occipital Condyles Moment<br>Decay to 10 N·m                | 80 - 100 ms         | 84.7 ms      | Yes  |

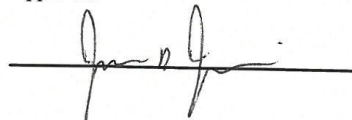
**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

01.17.2013 14:50:54 1671

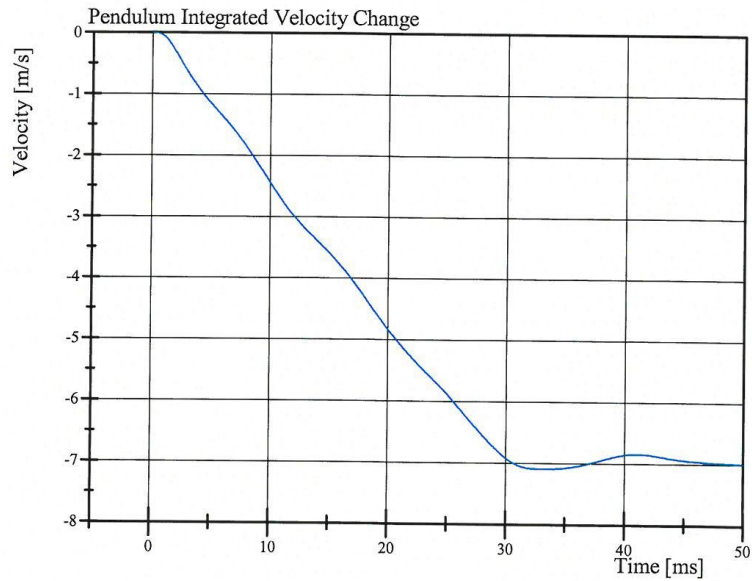
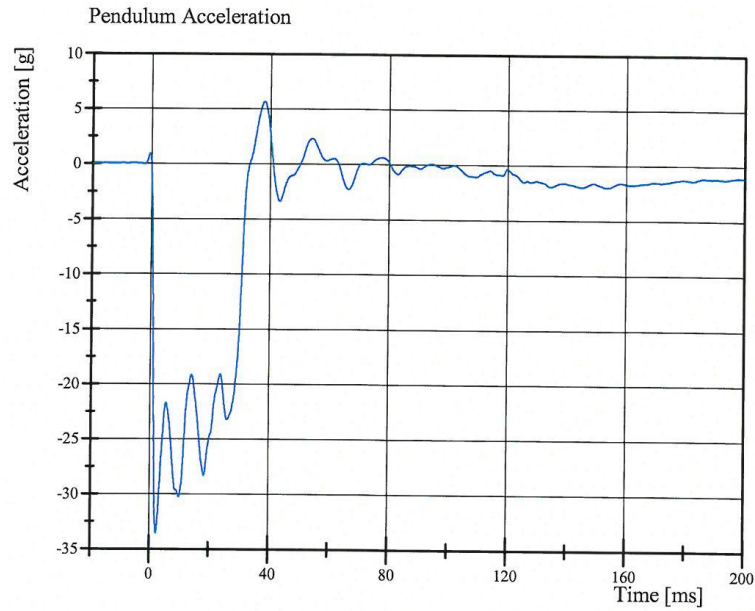


# Transportation Research Center Inc.

Neck Flexion

HIII 5th Serial No. 426 Certification No. 16-2

Test Date: 1/17/2013



Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

01.17.2013 14:51:01 1671





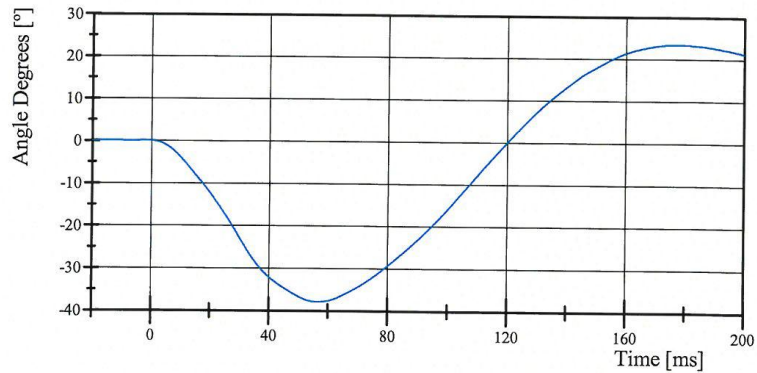
## Transportation Research Center Inc.

Neck Flexion

HIII 5th Serial No. 426 Certification No. 16-2

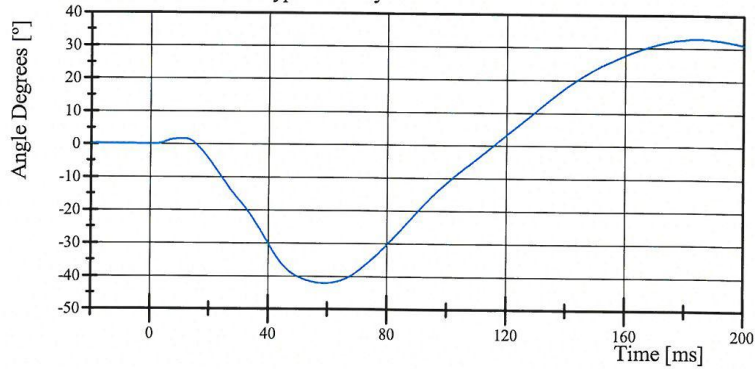
Test Date: 1/17/2013

Pot Rotation at the Base of Neck



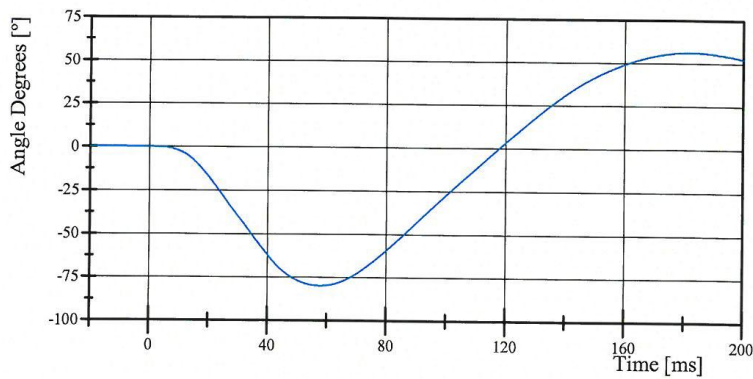
Filter Class: CFC\_60  
Max: 23.4 ° at 177.0 ms  
Min: -37.9 ° at 56.6 ms

Head Rotation at Occipital Condyles



Filter Class: CFC\_60  
Max: 32.9 ° at 184.8 ms  
Min: -42.1 ° at 59.2 ms

Total Head D-Plane Rotation



Filter Class: CFC\_60  
Max: 56.1 ° at 182.8 ms  
Min: -80.0 ° at 58.0 ms

Specification Source: CFR49 Part 572, Subpart O  
with Polarity in accordance with J211

01.17.2013 14:51:01 1671

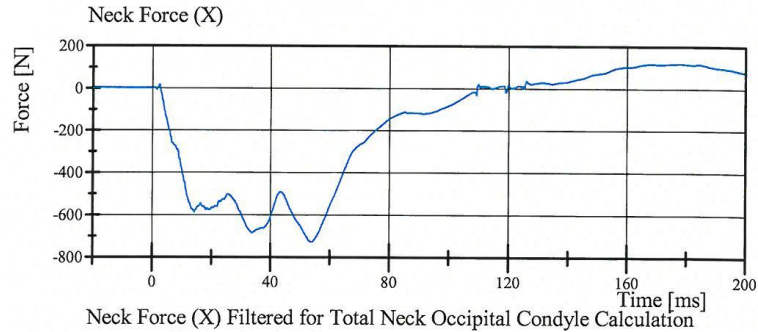


## Transportation Research Center Inc.

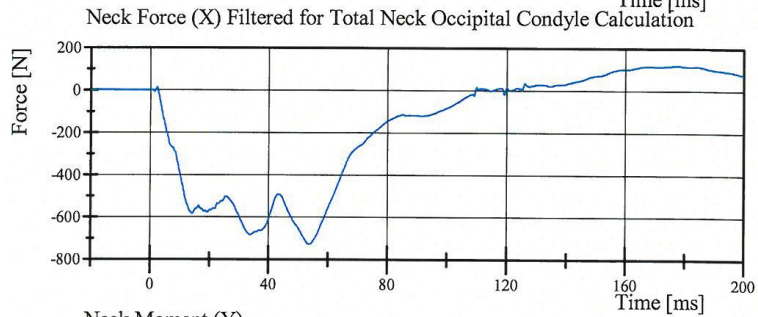
Neck Flexion

HIII 5th Serial No. 426 Certification No. 16-2

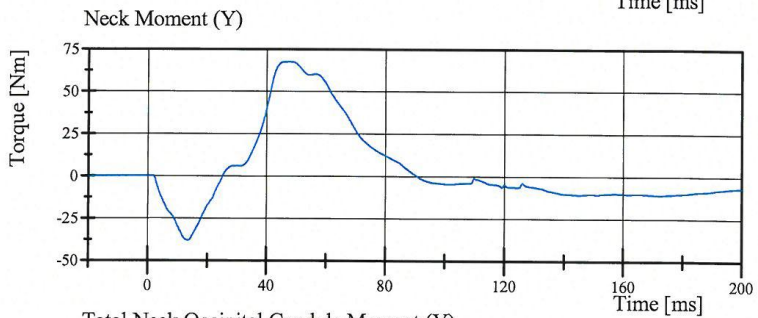
Test Date: 1/17/2013



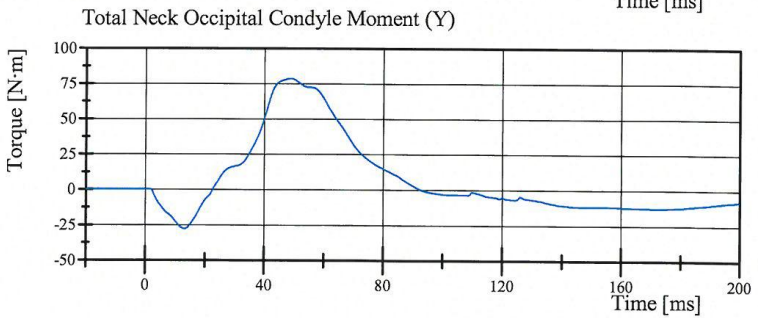
Filter Class: CFC\_1000  
Max: 119.8 N at 177.8 ms  
Min: -728.5 N at 53.7 ms



Filter Class: CFC\_600  
Max: 119.7 N at 177.9 ms  
Min: -728.3 N at 53.8 ms



Filter Class: CFC\_600  
Max: 67.6 Nm at 47.8 ms  
Min: -38.2 Nm at 13.4 ms



Filter Class: Without\_(Consta  
Max: 78.5 N·m at 48.8 ms  
Min: -28.0 N·m at 13.3 ms

Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

01.17.2013 14:51:02 1671



## Transportation Research Center Inc.

Neck Extension

HIII 5th Serial No. 426 Certification No. 16-1

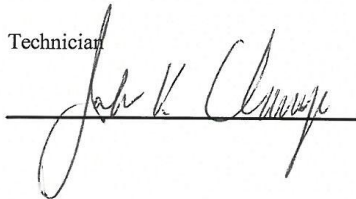
Test Date: 1/17/2013

| Test Parameter                                                        | Specification         | Test Results | Pass |
|-----------------------------------------------------------------------|-----------------------|--------------|------|
| Temperature                                                           | 20.6 - 22.2 °C        | 21.7 °C      | Yes  |
| Relative Humidity                                                     | 10 - 70 %             | 28 %         | Yes  |
| Pendulum Velocity                                                     | (-5.95) - (-6.19) m/s | -6.059 m/s   | Yes  |
| Pendulum Integrated Velocity<br>Change at 10ms                        | 1.5 - 1.9 m/s         | 1.80 m/s     | Yes  |
| Pendulum Integrated Velocity<br>Change at 20ms                        | 3.1 - 3.9 m/s         | 3.55 m/s     | Yes  |
| Pendulum Integrated Velocity<br>Change at 30ms                        | 4.6 - 5.6 m/s         | 5.13 m/s     | Yes  |
| Total Head D-Plane Rotation                                           | 99 - 114 °            | 106.6 °      | Yes  |
| Total Neck Occipital Condyles Moment<br>Between 99° and 114° Rotation | (-53) - (-65) N·m     | -55.8 N·m    | Yes  |
| Total Neck Occipital Condyles Moment<br>Decay to -10 N·m              | 94 - 114 ms           | 104.5 ms     | Yes  |

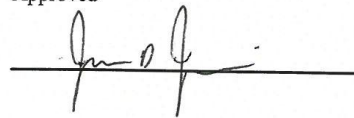
**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

01.17.2013 15:14:38 1803

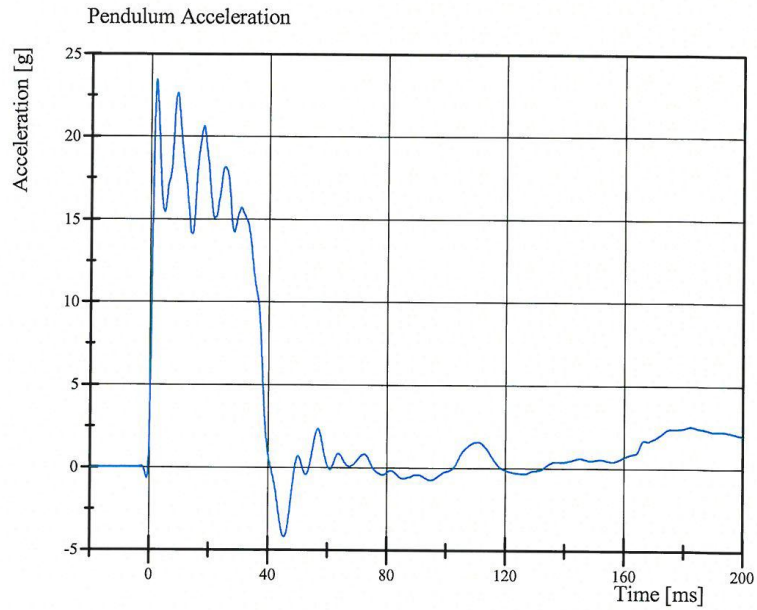


# Transportation Research Center Inc.

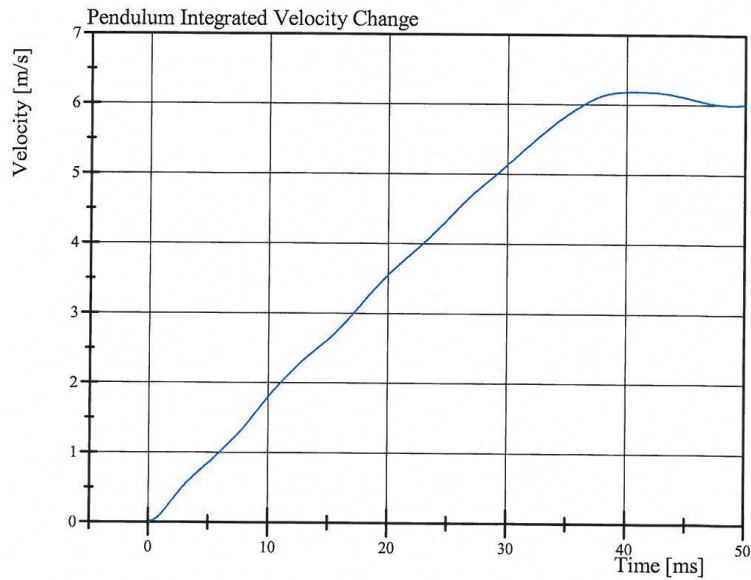
Neck Extension

HIII 5th Serial No. 426 Certification No. 16-1

Test Date: 1/17/2013



Filter Class: CFC\_180  
Max: 23.4 gn at 1.9 ms  
Min: -4.2 gn at 45.4 ms



Filter Class: CFC\_180  
Max: 6.2 m/s at 40.9 ms  
Min: 0.0 m/s at 0.0 ms

Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

01.17.2013 15:14:45 1803



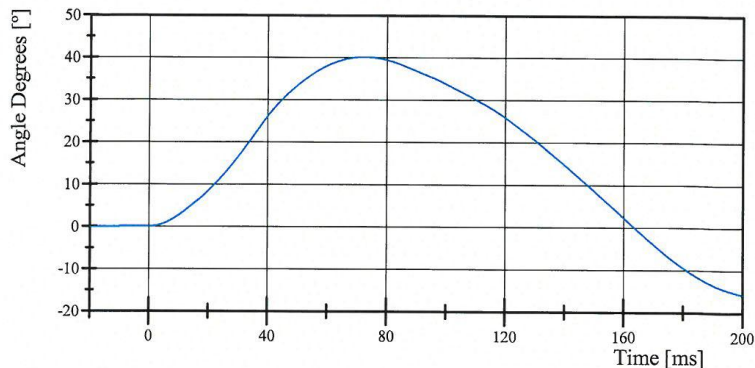
# Transportation Research Center Inc.

Neck Extension

HIII 5th Serial No. 426 Certification No. 16-1

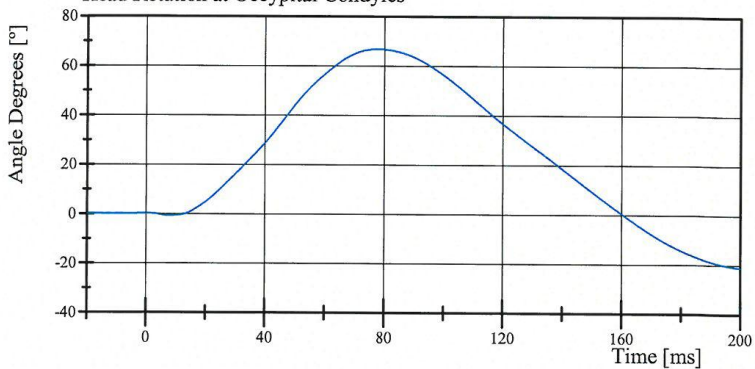
Test Date: 1/17/2013

Pot Rotation at the Base of Neck



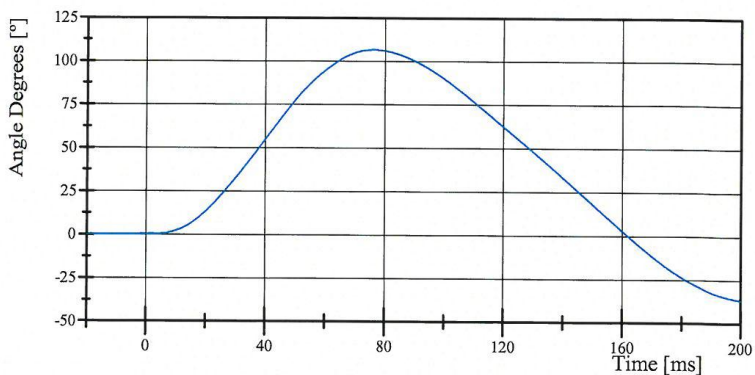
Filter Class: CFC\_60  
Max: 40.1 ° at 72.1 ms  
Min: -15.7 ° at 200.0 ms

Head Rotation at Occipital Condyles



Filter Class: CFC\_60  
Max: 66.7 ° at 77.6 ms  
Min: -21.1 ° at 200.0 ms

Total Head D-Plane Rotation



Filter Class: CFC\_60  
Max: 106.6 ° at 76.5 ms  
Min: -36.9 ° at 200.0 ms

Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

01.17.2013 15:14:46 1803



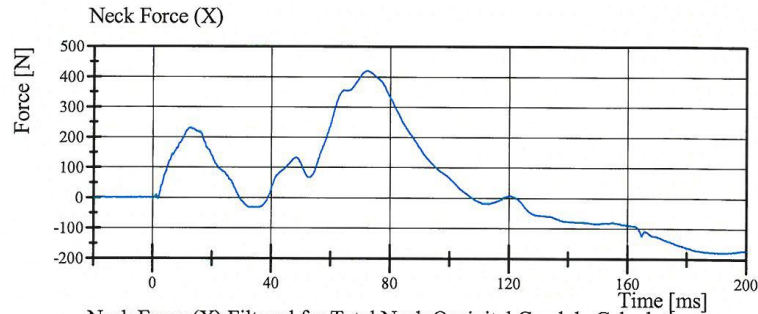


## Transportation Research Center Inc.

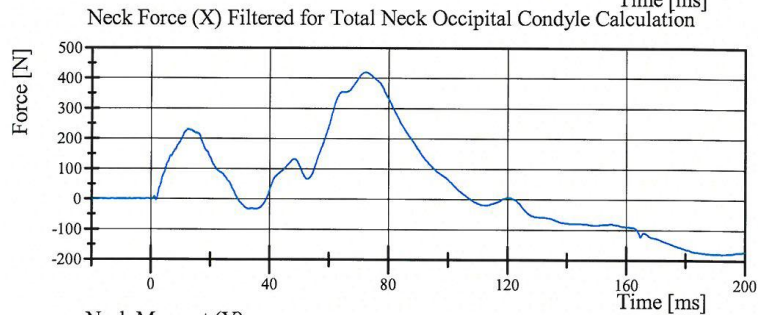
Neck Extension

HIII 5th Serial No. 426 Certification No. 16-1

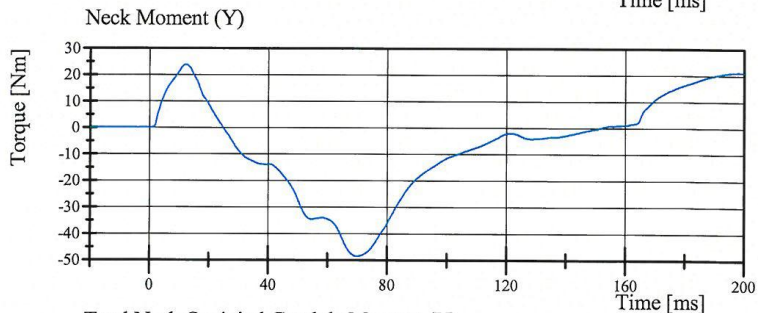
Test Date: 1/17/2013



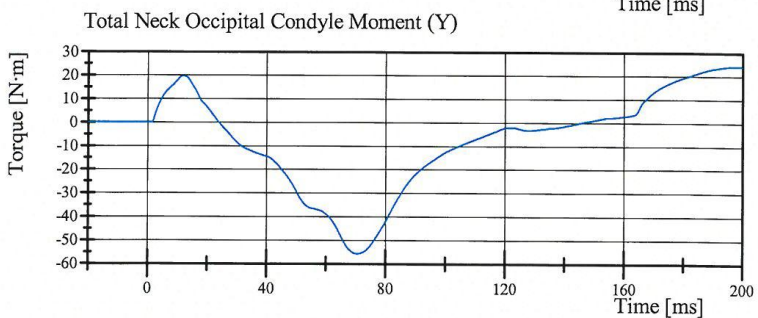
Filter Class: CFC\_1000  
Max: 420.4 N at 72.5 ms  
Min: -179.5 N at 192.4 ms



Filter Class: CFC\_600  
Max: 420.0 N at 72.4 ms  
Min: -179.2 N at 192.4 ms



Filter Class: CFC\_600  
Max: 23.8 Nm at 12.3 ms  
Min: -48.6 Nm at 70.0 ms



Filter Class: Without\_(Consta  
Max: 24.2 N·m at 197.8 ms  
Min: -55.8 N·m at 70.6 ms

Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

01.17.2013 15:14:47 1803



## Transportation Research Center Inc.

Front Thorax

HIII 5th Serial No. 426 Certification No. 16-3

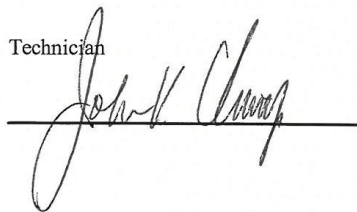
Test Date: 1/18/2013

| Test Parameter                                                   | Specification         | Test Results | Pass |
|------------------------------------------------------------------|-----------------------|--------------|------|
| Temperature                                                      | 20.6 - 22.2 °C        | 21.4 °C      | Yes  |
| Relative Humidity                                                | 10 - 70 %             | 26 %         | Yes  |
| Probe Velocity                                                   | 6.59 - 6.83 m/s       | 6.798 m/s    | Yes  |
| Probe Force Peak Between 50.0 mm<br>and 58.0 mm Chest Deflection | (-3,900) - (-4,400) N | -4,357.4 N   | Yes  |
| Probe Force Peak Between 18.0 mm<br>and 50.0 mm Chest Deflection | $\geq$ (-4,600) N     | -4,478.1 N   | Yes  |
| Maximum Chest Compression                                        | (-50) - (-58) mm      | -50.6 mm     | Yes  |
| Internal Hysteresis                                              | 69 - 85 %             | 76.2 %       | Yes  |

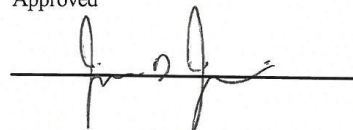
**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

01.18.2013 11:05:35 350

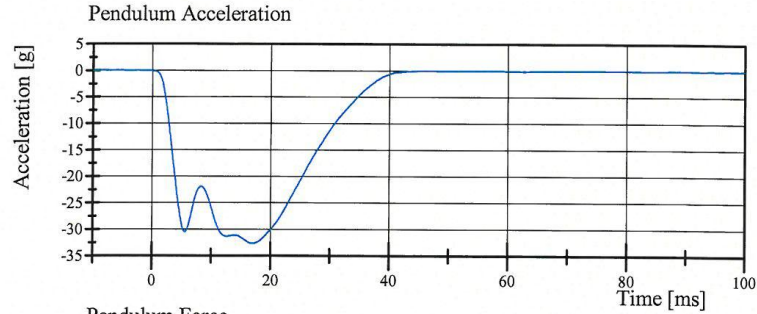


## Transportation Research Center Inc.

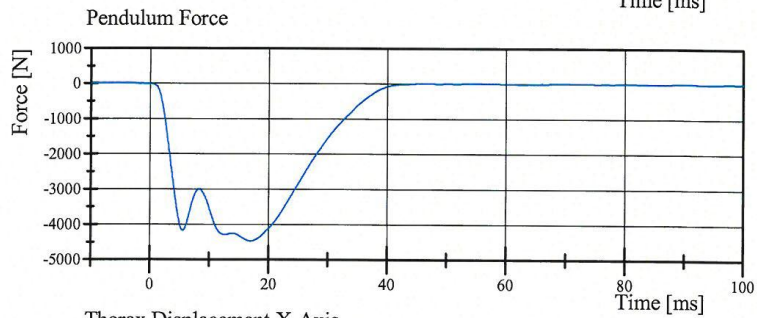
Front Thorax

HIII 5th Serial No. 426 Certification No. 16-3

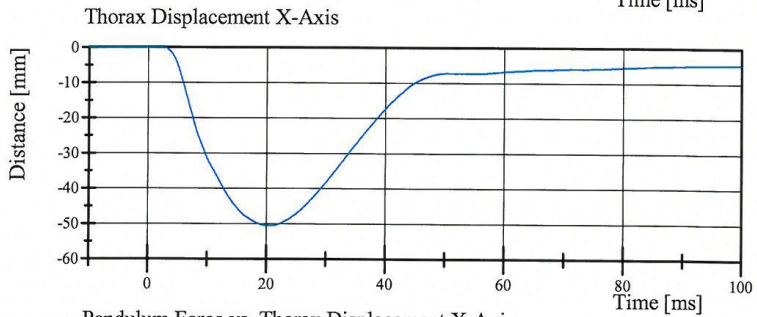
Test Date: 1/18/2013



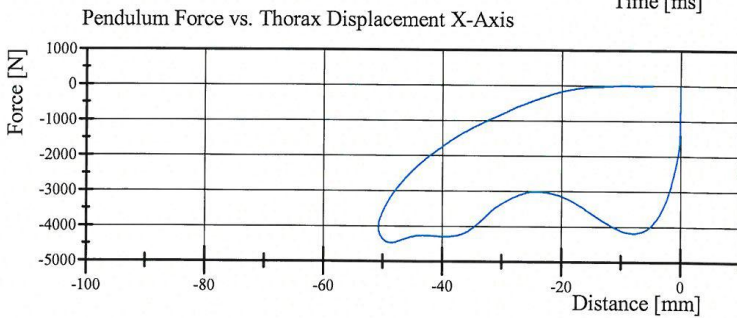
Filter Class: CFC\_180  
Max: 0.0 gn at 53.4 ms  
Min: -32.7 gn at 17.0 ms



Filter Class: CFC\_180  
Max: 3.5 N at 53.4 ms  
Min: -4,478.1 N at 17.0 ms



Filter Class: CFC\_600  
Max: 0.0 mm at -4.2 ms  
Min: -50.6 mm at 20.2 ms



Filter Class: CFC\_180  
Max: 3.5 N at -7.2 mm  
Min: -4,478.1 N at -48.5 mm

Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

01.18.2013 11:05:43 350



TRANSPORTATION RESEARCH CENTER INC.

TORSO FLEXION TEST

HYBRID III SMALL FEMALE

CAL DATE: 17-Jan-13

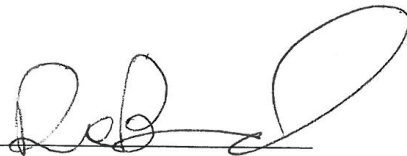
TRC, INC. TEST NO: TOFL-01 572 O SN426 TORSO FLEX CAL 16

| TEST PARAMETER                                                  | SPECIFICATION                               | TEST RESULTS |
|-----------------------------------------------------------------|---------------------------------------------|--------------|
| TIME                                                            |                                             | 1030         |
| TEMPERATURE                                                     | 20.6 – 22.2° C                              | 21.7 ° C     |
| RELATIVE HUMIDITY                                               | 10 – 70 %                                   | 29 %         |
| INITIAL ANGLE OF<br>UNSUPPORTRED DUMMY<br><u>START ANGLE</u>    | <= 20°<br><br>REFERENCED<br><br>TO VERTICAL | 16.2 °       |
| DIFFERENCE BETWEEN <u>RETURN</u><br><u>ANGLE</u> & INTIAL ANGLE | +/- 8 ° OF<br><br>INTIAL ANGLE              | 6.3 °        |
| MAXIMUM FORCE AT 45 DEG.<br><br>DURING 10 SECOND PERIOD         | 320 – 390 N                                 | 347.6 N      |
| RATE                                                            | 0.5° - 1.5 °/sec                            | 0.97°/sec    |

TEST MEETS SPECIFICATIONS

Comments:

TECHNICIAN



## Transportation Research Center Inc.

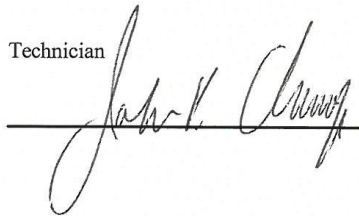
Left Knee Femur Response Test  
HIII 5th Serial No. 426 Certification No. 16-2  
Test Date: 1/17/2013

| Test Parameter    | Specification         | Test Results | Pass |
|-------------------|-----------------------|--------------|------|
| Temperature       | 18.9 - 25.6 °C        | 21.2 °C      | Yes  |
| Relative Humidity | 10 - 70 %             | 35 %         | Yes  |
| Probe Velocity    | 2.08 - 2.13 m/s       | 2.104 m/s    | Yes  |
| Peak Femur Force  | (-3,450) - (-4,060) N | -3,779.0 N   | Yes  |

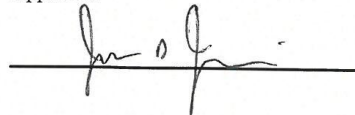
Test meets specifications.

Comments:

Technician



Approved



Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

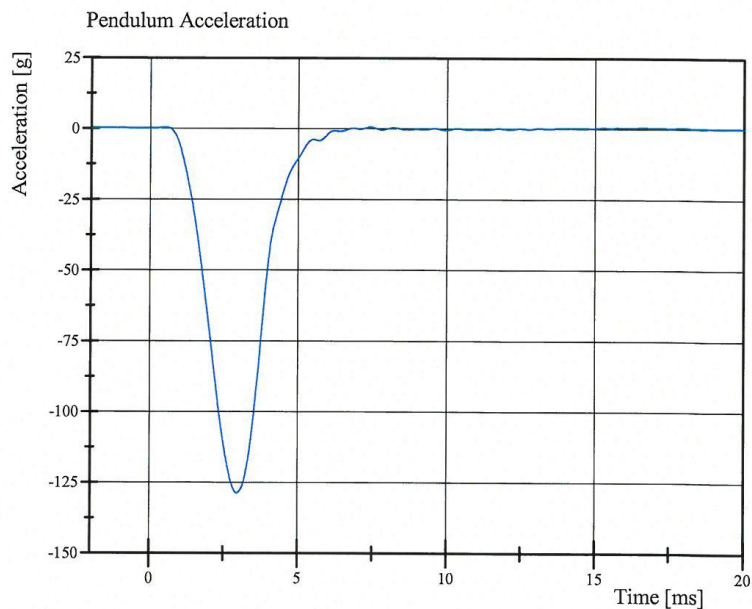
01.17.2013 09:07:36 1812



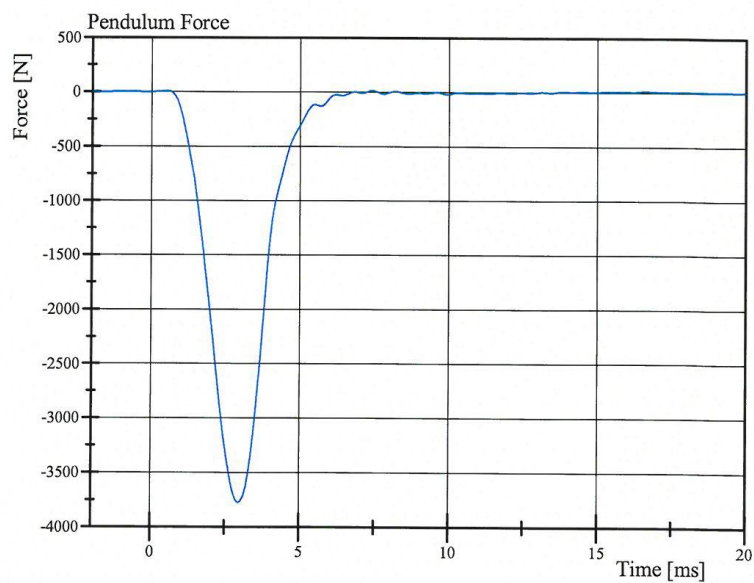


## Transportation Research Center Inc.

Left Knee Femur Response Test  
HIII 5th Serial No. 426 Certification No. 16-2  
Test Date: 1/17/2013



Filter Class: CFC\_600  
Max: 0.5 gn at 7.4 ms  
Min: -128.9 gn at 3.0 ms



Filter Class: CFC\_600  
Max: 14.6 N at 7.4 ms  
Min: -3,779.0 N at 3.0 ms

Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

01.17.2013 09:07:43 1812



## Transportation Research Center Inc.

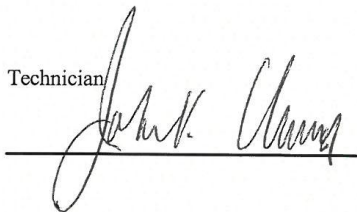
Right Knee Femur Response Test  
HIII 5th Serial No. 426 Certification No. 16-1  
Test Date: 1/17/2013

| Test Parameter    | Specification         | Test Results | Pass |
|-------------------|-----------------------|--------------|------|
| Temperature       | 18.9 - 25.6 °C        | 21.8 °C      | Yes  |
| Relative Humidity | 10 - 70 %             | 29 %         | Yes  |
| Probe Velocity    | 2.08 - 2.13 m/s       | 2.083 m/s    | Yes  |
| Peak Femur Force  | (-3,450) - (-4,060) N | -3,821.1 N   | Yes  |

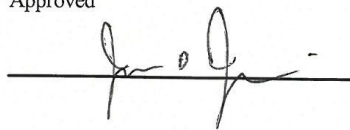
Test meets specifications.

Comments:

Technician



Approved



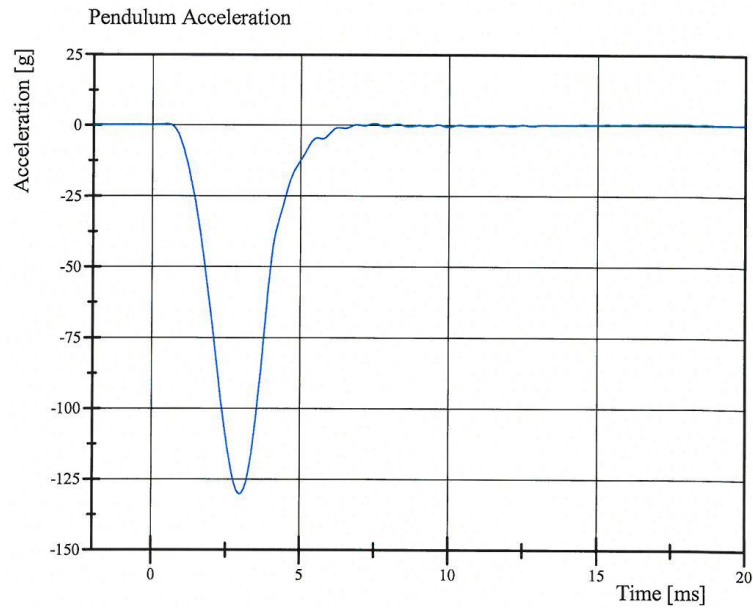
Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

01.17.2013 08:28:47 2077

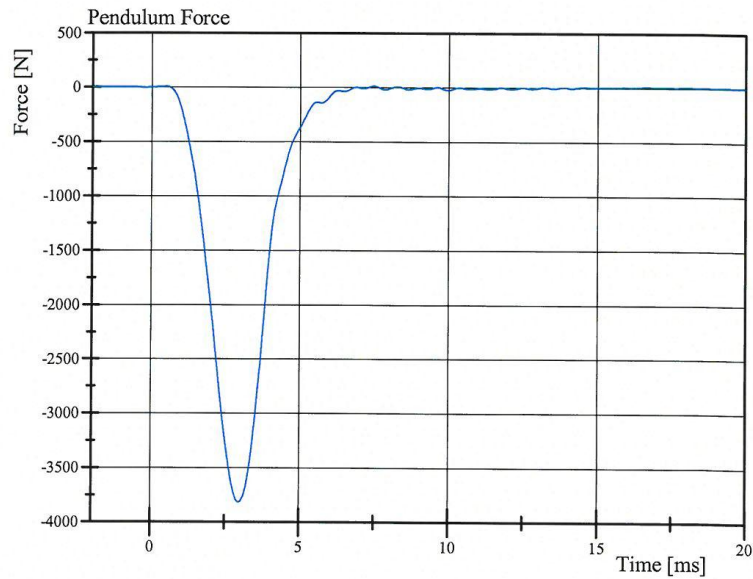


## Transportation Research Center Inc.

Right Knee Femur Response Test  
HIII 5th Serial No. 426 Certification No. 16-1  
Test Date: 1/17/2013



Filter Class: CFC\_600  
Max: 0.5 gn at 7.4 ms  
Min: -130.3 gn at 3.0 ms



Filter Class: CFC\_600  
Max: 15.3 N at 7.4 ms  
Min: -3,821.1 N at 3.0 ms

Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

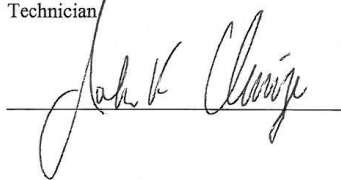
01.17.2013 08:28:55 2077



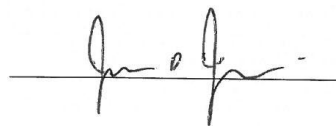
**Transportation Research Center Inc.**  
**5720 HIII 5th Dummy**  
**External Dimensions**  
**Serial No. 426 Calibration No. 16**

| Symbol | Description                                | Specification | Results | Pass |
|--------|--------------------------------------------|---------------|---------|------|
|        |                                            | mm            | mm      |      |
| A      | Total Sitting Height                       | 774.7 - 800.1 | 780     | Yes  |
| B      | Shoulder Pivot Height                      | 431.8 - 457.2 | 445     | Yes  |
| C      | Hip Pivot Height                           | 81.3 - 86.3   | 85      | Yes  |
| D      | Hip Pivot from Backline                    | 144.8 - 149.8 | 147     | Yes  |
| E      | Shoulder Pivot from Backline               | 68.6 - 83.8   | 80      | Yes  |
| F      | Thigh Clearance                            | 119.4 - 134.6 | 129     | Yes  |
| G      | Back of Elbow to Wrist Pivot               | 243.9 - 259.1 | 249     | Yes  |
| H      | Head Back to Backline                      | 43.2 - 48.2   | 45      | Yes  |
| I      | Shoulder to Elbow Length                   | 276.8 - 297.2 | 283     | Yes  |
| J      | Elbow Rest Height                          | 182.8 - 203.2 | 195     | Yes  |
| K      | Buttock Knee Length                        | 520.7 - 546.1 | 535     | Yes  |
| L      | Popliteal Height                           | 355.6 - 376.0 | 369     | Yes  |
| M      | Knee Pivot Height                          | 393.7 - 419.1 | 413     | Yes  |
| N      | Buttock Popliteal Length                   | 414.0 - 439.4 | 436     | Yes  |
| O      | Chest Depth without Jacket                 | 175.3 - 190.5 | 185     | Yes  |
| P      | Foot Length                                | 218.5 - 233.7 | 222     | Yes  |
| R      | Buttock to Knee Pivot Length               | 457.2 - 482.6 | 475     | Yes  |
| S      | Head Breadth                               | 137.1 - 147.3 | 140     | Yes  |
| T      | Head Depth                                 | 177.8 - 188.0 | 182     | Yes  |
| U      | Hip Breadth                                | 299.7 - 314.9 | 307     | Yes  |
| V      | Shoulder Breadth                           | 350.5 - 365.7 | 358     | Yes  |
| W      | Foot Breadth                               | 78.8 - 94.0   | 83      | Yes  |
| X      | Head Circumference                         | 528.3 - 548.7 | 539     | Yes  |
| Y      | Chest Circumference with Jacket            | 850.9 - 881.3 | 866     | Yes  |
| Z      | Waist Circumference                        | 759.5 - 789.9 | 772     | Yes  |
| AA     | Reference Location for Chest Circumference | 332.7 - 358.1 | 345     | Yes  |
| BB     | Reference Location for Waist Circumference | 160.0 - 170.2 | 165     | Yes  |

Technician/



Approved



Revised 3/19/3003



Passenger **S/N 426**

**Post-Test Calibration Sheets**



## Transportation Research Center Inc.

Front Head Drop

HIII 5th Serial No. 426 Certification No. 17-1

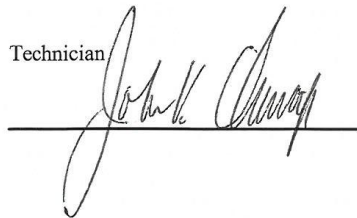
Test Date: 3/4/2013

| Test Parameter                                        | Specification  | Test Results | Pass |
|-------------------------------------------------------|----------------|--------------|------|
| Temperature                                           | 18.9 - 25.5 °C | 21.6 °C      | Yes  |
| Relative Humidity                                     | 10 - 70 %      | 34 %         | Yes  |
| Peak Head Resultant Acceleration                      | 250 - 300 g    | 251.2 g      | Yes  |
| Peak Head Lateral Acceleration                        | (-15) - 15 g   | -3.5 g       | Yes  |
| Is Acceleration Curve Unimodal<br>within 10% of Peak? | Yes            | Yes          | Yes  |

Test meets specifications.

Comments:

Technician



Approved



Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

03.04.2013 15:26:28 610

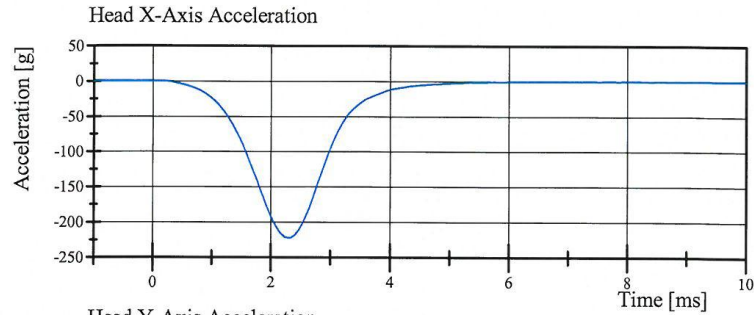


## Transportation Research Center Inc.

Front Head Drop

HIII 5th Serial No. 426 Certification No. 17-1

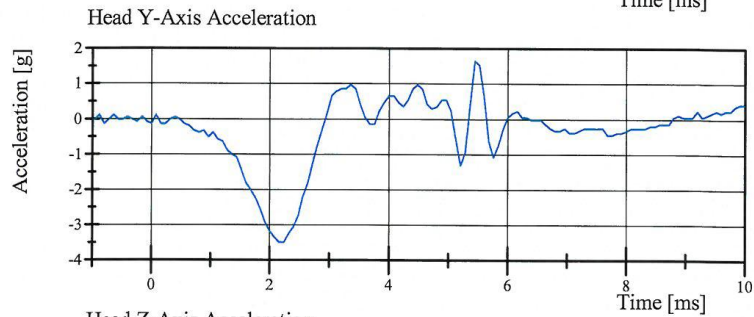
Test Date: 3/4/2013



Filter Class: CFC\_1000

Max: 0.1 gn at 9.8 ms

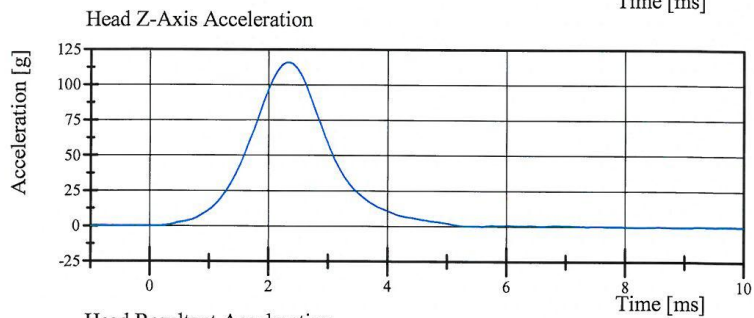
Min: -222.7 gn at 2.3 ms



Filter Class: CFC\_1000

Max: 1.7 gn at 5.4 ms

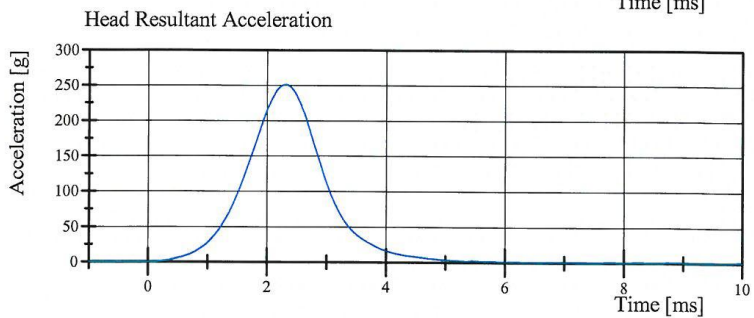
Min: -3.5 gn at 2.2 ms



Filter Class: CFC\_1000

Max: 116.1 gn at 2.3 ms

Min: -0.4 gn at 8.8 ms



Filter Class: CFC\_1000

Max: 251.2 gn at 2.3 ms

Min: 0.0 gn at -0.4 ms

Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

03.04.2013 15:26:37 610



## Transportation Research Center Inc.

Neck Flexion

HIII 5th Serial No. 426 Certification No. 17-7

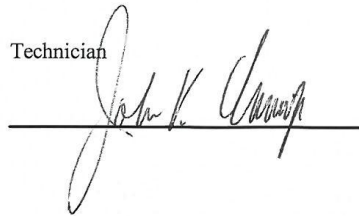
Test Date: 3/4/2013

| Test Parameter                                                         | Specification       | Test Results | Pass |
|------------------------------------------------------------------------|---------------------|--------------|------|
| Temperature                                                            | 20.6 - 22.2 °C      | 21.6 °C      | Yes  |
| Relative Humidity                                                      | 10 - 70 %           | 27 %         | Yes  |
| Pendulum Velocity                                                      | 6.89 - 7.13 m/s     | 6.975 m/s    | Yes  |
| Pendulum Integrated Velocity<br>Change at 10ms                         | (-2.1) - (-2.5) m/s | -2.47 m/s    | Yes  |
| Pendulum Integrated Velocity<br>Change at 20ms                         | (-4.0) - (-5.0) m/s | -4.78 m/s    | Yes  |
| Pendulum Integrated Velocity<br>Change at 30ms                         | (-5.8) - (-7.0) m/s | -6.82 m/s    | Yes  |
| Total Head D-Plane Rotation                                            | (-77) - (-91) °     | -78.8 °      | Yes  |
| Total Neck Occipital Condyles Moment<br>Between -77° and -91° Rotation | 69 - 83 N·m         | 69.3 N·m     | Yes  |
| Total Neck Occipital Condyles Moment<br>Decay to 10 N·m                | 80 - 100 ms         | 86.8 ms      | Yes  |

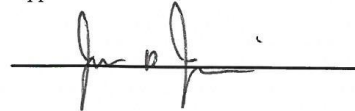
**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

03.04.2013 14:31:33 1709

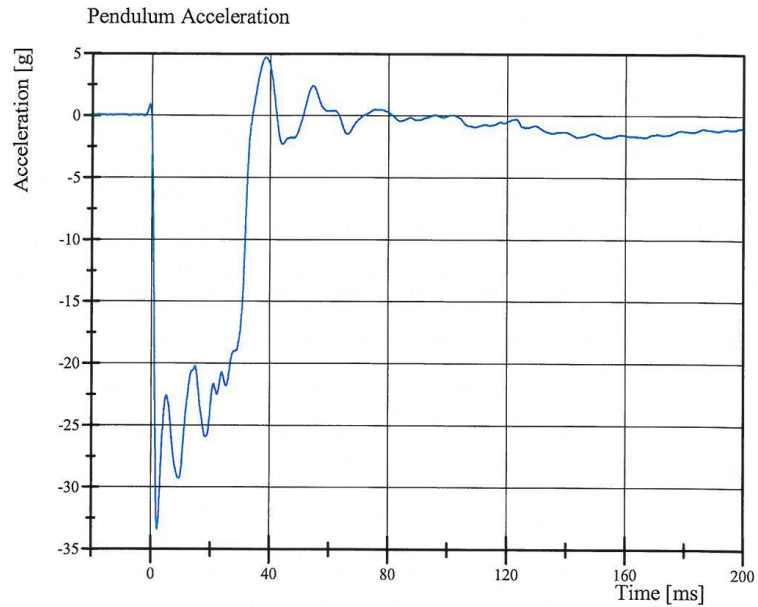


## Transportation Research Center Inc.

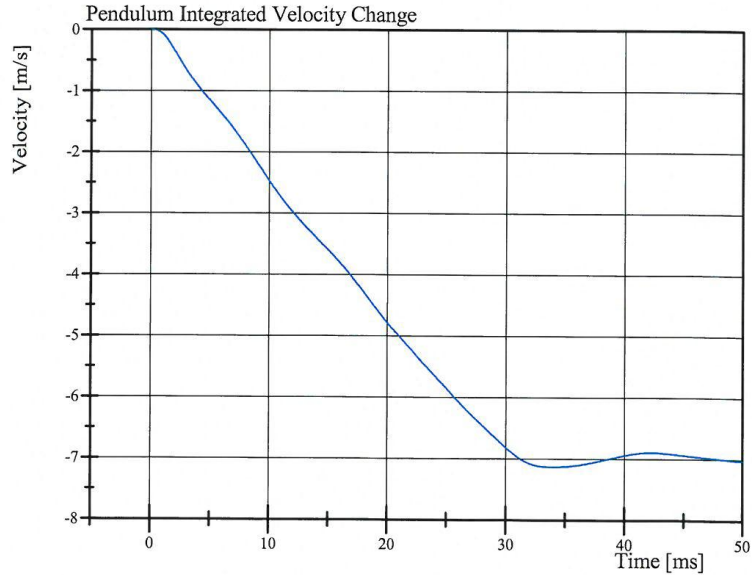
Neck Flexion

HIII 5th Serial No. 426 Certification No. 17-7

Test Date: 3/4/2013



Filter Class: CFC\_180  
Max: 4.7 gn at 38.5 ms  
Min: -33.4 gn at 2.2 ms



Filter Class: CFC\_180  
Max: 0.0 m/s at 0.0 ms  
Min: -7.1 m/s at 34.0 ms

Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

03.04.2013 14:31:53 1709



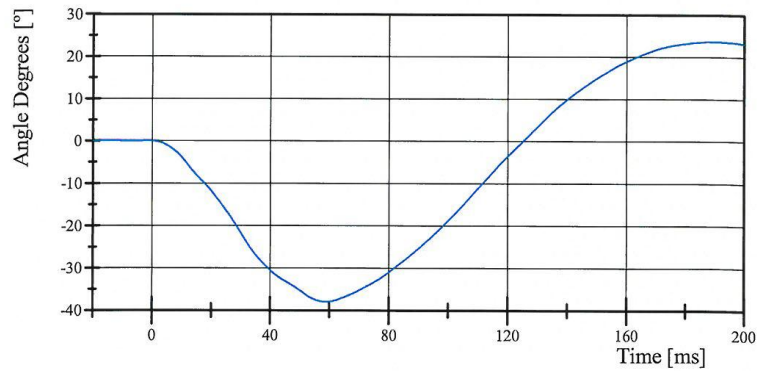
## Transportation Research Center Inc.

Neck Flexion

HIII 5th Serial No. 426 Certification No. 17-7

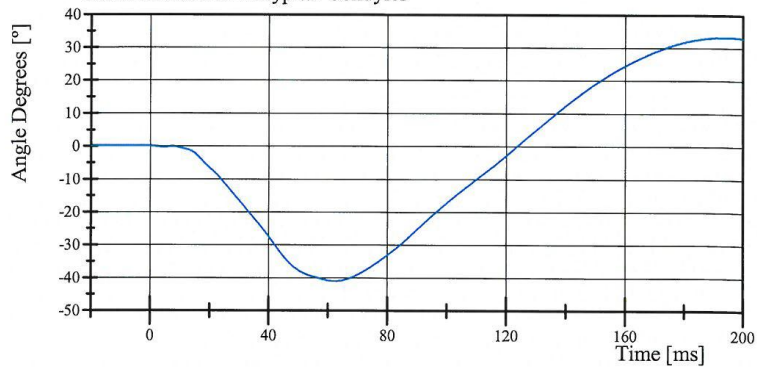
Test Date: 3/4/2013

Pot Rotation at the Base of Neck



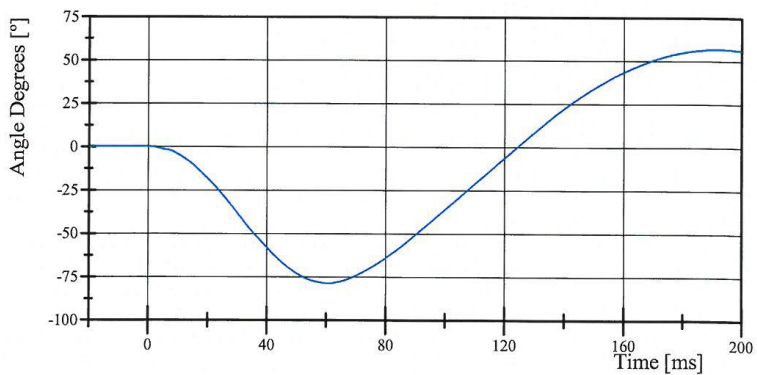
Filter Class: CFC\_60  
Max: 23.6 ° at 189.5 ms  
Min: -38.0 ° at 58.9 ms

Head Rotation at Occypital Condyles



Filter Class: CFC\_60  
Max: 33.2 ° at 193.9 ms  
Min: -41.1 ° at 62.3 ms

Total Head D-Plane Rotation



Filter Class: CFC\_60  
Max: 56.7 ° at 191.9 ms  
Min: -78.8 ° at 60.7 ms

Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

03.04.2013 14:31:54 1709



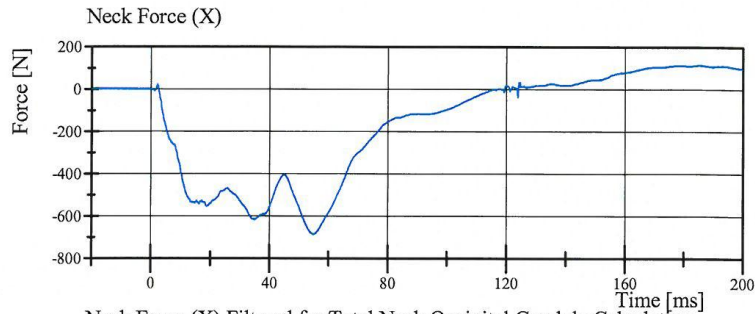


## Transportation Research Center Inc.

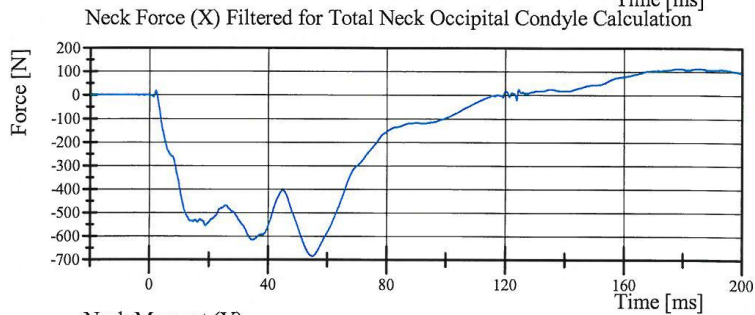
Neck Flexion

HIII 5th Serial No. 426 Certification No. 17-7

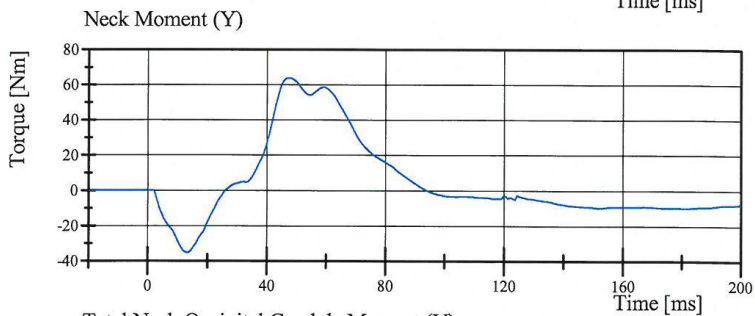
Test Date: 3/4/2013



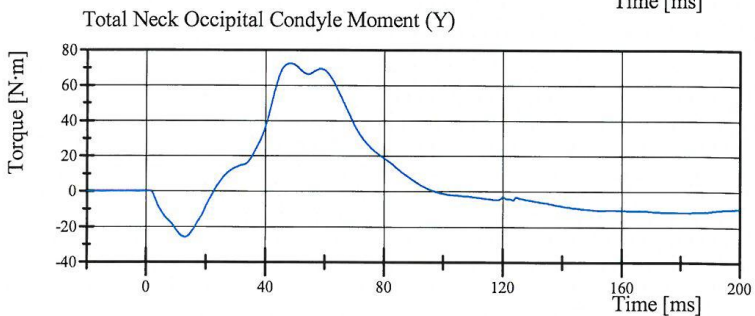
Filter Class: CFC\_1000  
Max: 114.2 N at 185.5 ms  
Min: -686.0 N at 54.8 ms



Filter Class: CFC\_600  
Max: 113.7 N at 185.5 ms  
Min: -685.5 N at 54.9 ms



Filter Class: CFC\_600  
Max: 63.7 Nm at 47.2 ms  
Min: -35.4 Nm at 13.4 ms



Filter Class: Without\_Constai  
Max: 72.3 N·m at 48.4 ms  
Min: -26.0 N·m at 13.1 ms

Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

03.04.2013 14:31:55 1709



## Transportation Research Center Inc.

Neck Extension

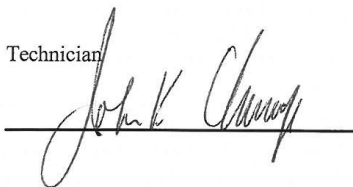
HIII 5th Serial No. 426 Certification No. 17-1

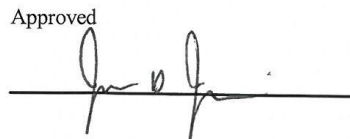
Test Date: 3/4/2013

| Test Parameter                                                        | Specification         | Test Results | Pass |
|-----------------------------------------------------------------------|-----------------------|--------------|------|
| Temperature                                                           | 20.6 - 22.2 °C        | 21.0 °C      | Yes  |
| Relative Humidity                                                     | 10 - 70 %             | 32 %         | Yes  |
| Pendulum Velocity                                                     | (-5.95) - (-6.19) m/s | -6.049 m/s   | Yes  |
| Pendulum Integrated Velocity<br>Change at 10ms                        | 1.5 - 1.9 m/s         | 1.89 m/s     | Yes  |
| Pendulum Integrated Velocity<br>Change at 20ms                        | 3.1 - 3.9 m/s         | 3.66 m/s     | Yes  |
| Pendulum Integrated Velocity<br>Change at 30ms                        | 4.6 - 5.6 m/s         | 5.28 m/s     | Yes  |
| Total Head D-Plane Rotation                                           | 99 - 114 °            | 108.9 °      | Yes  |
| Total Neck Occipital Condyles Moment<br>Between 99° and 114° Rotation | (-53) - (-65) N·m     | -57.6 N·m    | Yes  |
| Total Neck Occipital Condyles Moment<br>Decay to -10 N·m              | 94 - 114 ms           | 103.8 ms     | Yes  |

**Test meets specifications.**

**Comments:**

Technician  


Approved  


Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

03.04.2013 15:00:52 1837

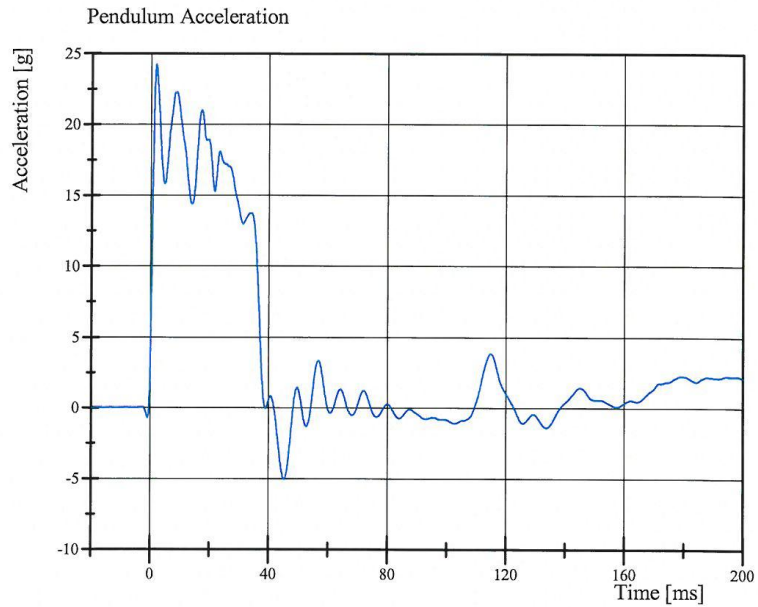


## Transportation Research Center Inc.

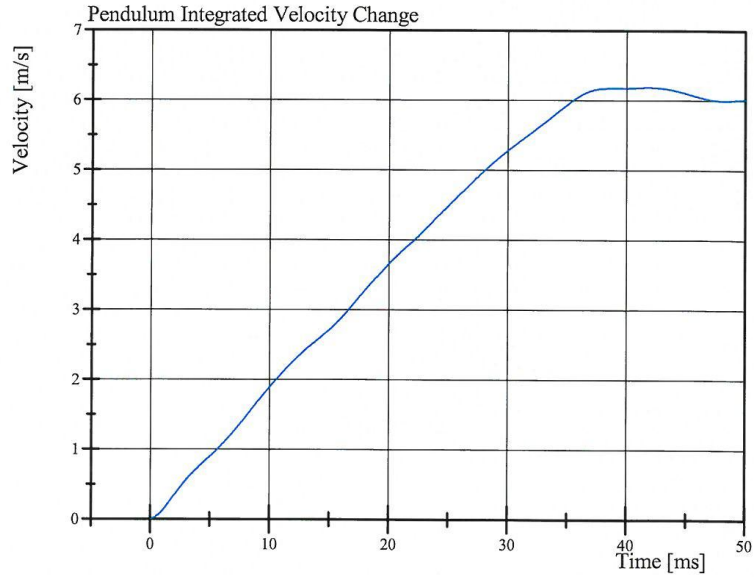
Neck Extension

HIII 5th Serial No. 426 Certification No. 17-1

Test Date: 3/4/2013



Filter Class: CFC\_180  
Max: 24.2 gn at 1.8 ms  
Min: -5.1 gn at 45.3 ms



Filter Class: CFC\_180  
Max: 6.2 m/s at 41.8 ms  
Min: 0.0 m/s at 0.0 ms

Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

03.04.2013 15:01:07 1837



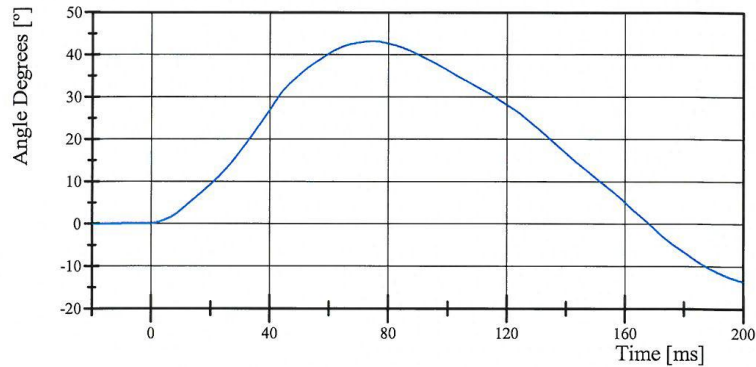
# Transportation Research Center Inc.

Neck Extension

HIII 5th Serial No. 426 Certification No. 17-1

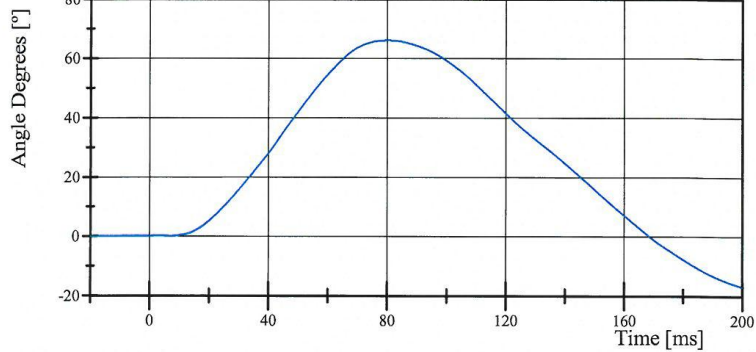
Test Date: 3/4/2013

Pot Rotation at the Base of Neck



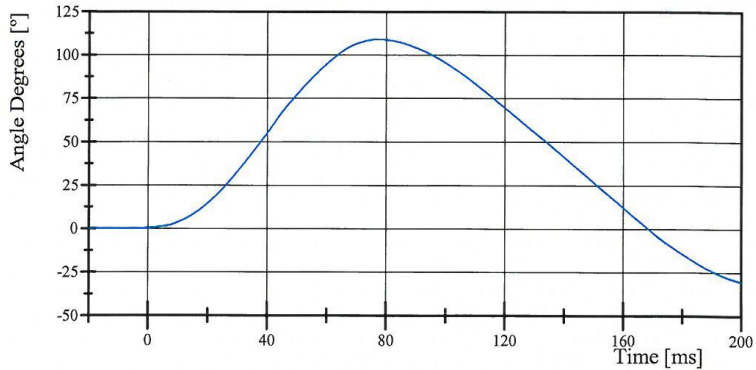
Filter Class: CFC\_60  
Max: 43.1 ° at 74.9 ms  
Min: -13.6 ° at 200.0 ms

Head Rotation at Occypital Condyles



Filter Class: CFC\_60  
Max: 66.1 ° at 80.2 ms  
Min: -16.9 ° at 200.0 ms

Total Head D-Plane Rotation



Filter Class: CFC\_60  
Max: 108.9 ° at 77.4 ms  
Min: -30.5 ° at 200.0 ms

Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

03.04.2013 15:01:07 1837

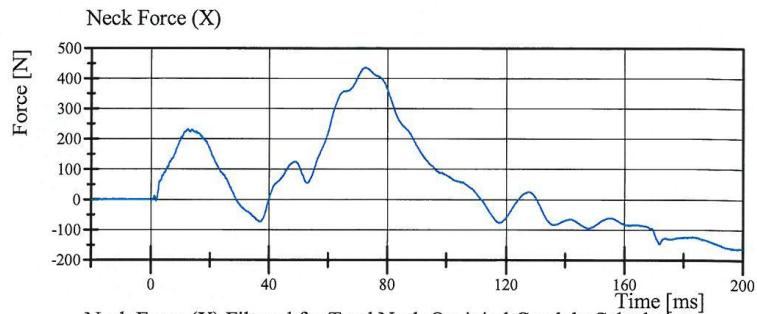


# Transportation Research Center Inc.

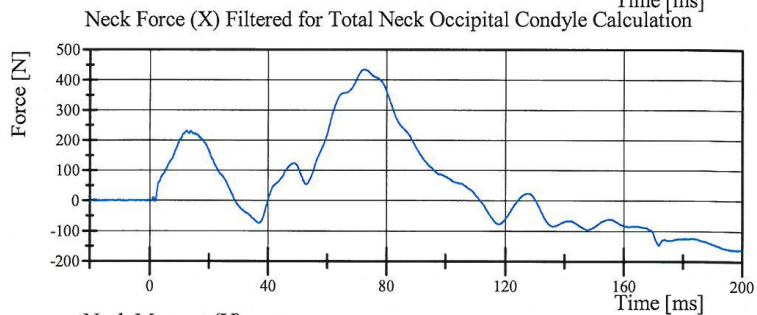
Neck Extension

HIII 5th Serial No. 426 Certification No. 17-1

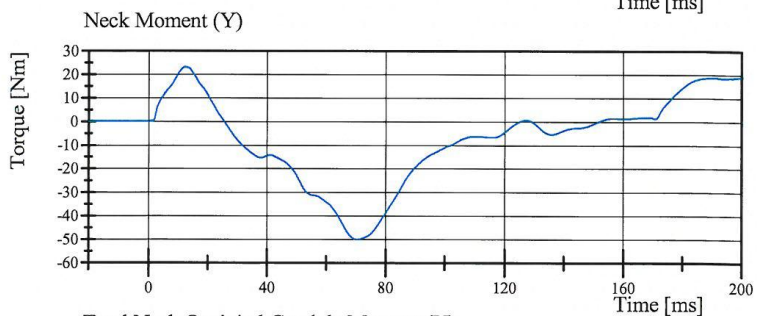
Test Date: 3/4/2013



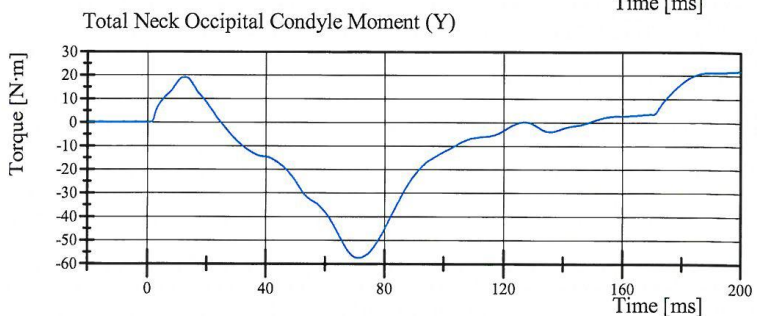
Filter Class: CFC\_1000  
Max: 435.7 N at 72.6 ms  
Min: -163.4 N at 198.5 ms



Filter Class: CFC\_600  
Max: 435.0 N at 72.5 ms  
Min: -163.0 N at 198.4 ms



Filter Class: CFC\_600  
Max: 23.2 Nm at 12.4 ms  
Min: -50.1 Nm at 70.5 ms



Filter Class: Without\_(Consta  
Max: 21.8 N·m at 200.0 ms  
Min: -57.6 N·m at 71.3 ms

Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

03.04.2013 15:01:08 1837





## Transportation Research Center Inc.

Front Thorax

HIII 5th Serial No. 426 Certification No. 17-5

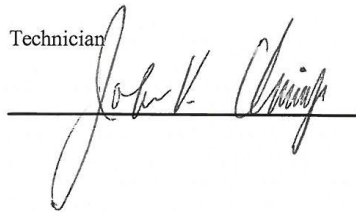
Test Date: 3/5/2013

| Test Parameter                                                   | Specification         | Test Results | Pass |
|------------------------------------------------------------------|-----------------------|--------------|------|
| Temperature                                                      | 20.6 - 22.2 °C        | 21.4 °C      | Yes  |
| Relative Humidity                                                | 10 - 70 %             | 29 %         | Yes  |
| Probe Velocity                                                   | 6.59 - 6.83 m/s       | 6.761 m/s    | Yes  |
| Probe Force Peak Between 50.0 mm<br>and 58.0 mm Chest Deflection | (-3,900) - (-4,400) N | -4,293.9 N   | Yes  |
| Probe Force Peak Between 18.0 mm<br>and 50.0 mm Chest Deflection | $\geq$ (-4,600) N     | -4,056.4 N   | Yes  |
| Maximum Chest Compression                                        | (-50) - (-58) mm      | -55.6 mm     | Yes  |
| Internal Hysteresis                                              | 69 - 85 %             | 73.3 %       | Yes  |

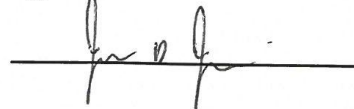
**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

03.05.2013 09:09:08 370

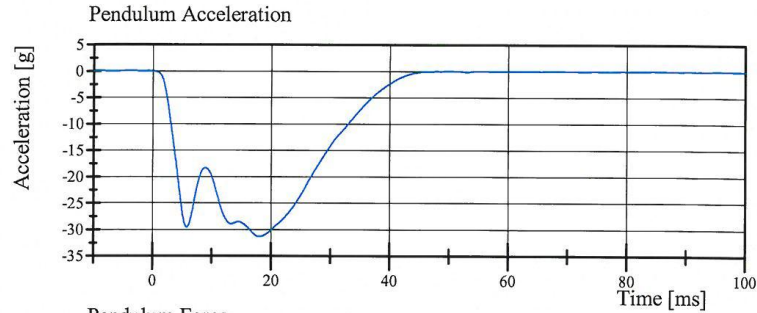


## Transportation Research Center Inc.

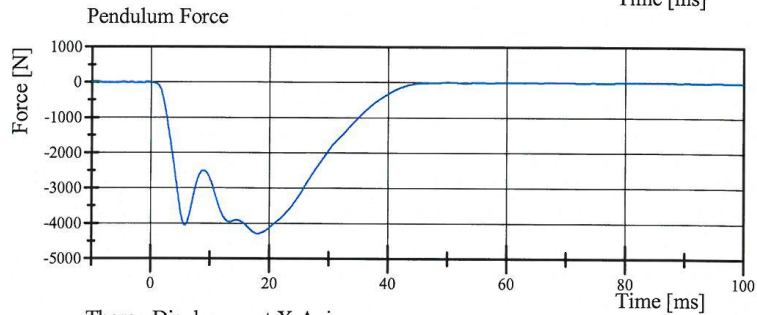
Front Thorax

HIII 5th Serial No. 426 Certification No. 17-5

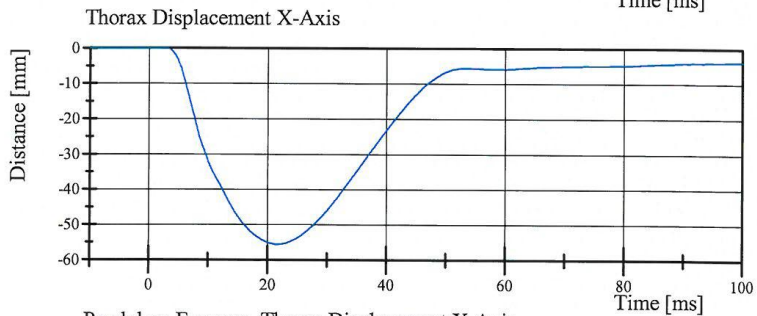
Test Date: 3/5/2013



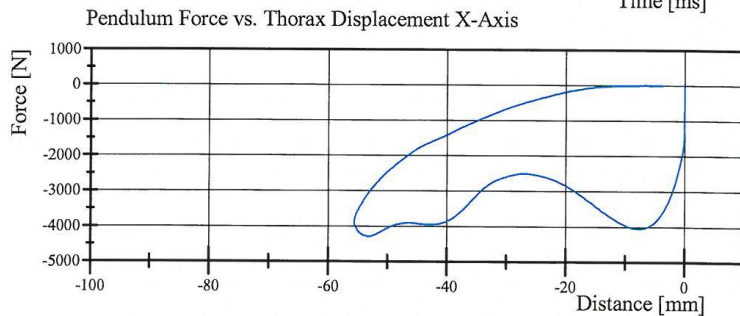
Filter Class: CFC\_180  
Max: 0.1 gn at 50.0 ms  
Min: -31.3 gn at 18.0 ms



Filter Class: CFC\_180  
Max: 7.2 N at 50.0 ms  
Min: -4,293.9 N at 18.0 ms



Filter Class: CFC\_600  
Max: 0.0 mm at -9.2 ms  
Min: -55.6 mm at 21.5 ms



Filter Class: CFC\_180  
Max: 7.2 N at -6.6 mm  
Min: -4,293.9 N at -53.1 mm

Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

03.05.2013 09:09:16 370



TRANSPORTATION RESEARCH CENTER INC.

TORSO FLEXION TEST

HYBRID III SMALL FEMALE

CAL DATE: 01-Mar-13

TRC, INC. TEST NO: TOFL-01 572 O SN426 TORSO FLEX CAL 17

| TEST PARAMETER                                                  | SPECIFICATION                               | TEST RESULTS |
|-----------------------------------------------------------------|---------------------------------------------|--------------|
| TIME                                                            |                                             | 1000         |
| TEMPERATURE                                                     | 20.6 – 22.2° C                              | 21.6 ° C     |
| RELATIVE HUMIDITY                                               | 10 – 70 %                                   | 30 %         |
| INITIAL ANGLE OF<br>UNSUPPORTED DUMMY<br><u>START ANGLE</u>     | <= 20°<br><br>REFERENCED<br><br>TO VERTICAL | 15.0 °       |
| DIFFERENCE BETWEEN <u>RETURN</u><br><u>ANGLE</u> & INTIAL ANGLE | +/- 8 ° OF<br><br>INTIAL ANGLE              | 5.5 °        |
| MAXIMUM FORCE AT 45 DEG.<br><br>DURING 10 SECOND PERIOD         | 320 – 390 N                                 | 377.9 N      |
| RATE                                                            | 0.5° - 1.5 °/sec                            | 0.98°/sec    |

TEST MEETS SPECIFICATIONS

Comments:

TECHNICIAN



## Transportation Research Center Inc.

Left Knee Femur Response Test

HIII 5th Serial No. 426 Certification No. 17-2

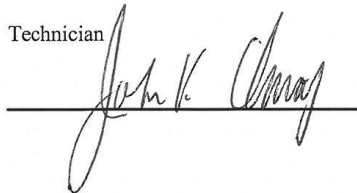
Test Date: 3/1/2013

| Test Parameter    | Specification         | Test Results | Pass |
|-------------------|-----------------------|--------------|------|
| Temperature       | 18.9 - 25.6 °C        | 21.4 °C      | Yes  |
| Relative Humidity | 10 - 70 %             | 29 %         | Yes  |
| Probe Velocity    | 2.08 - 2.13 m/s       | 2.119 m/s    | Yes  |
| Peak Femur Force  | (-3,450) - (-4,060) N | -3,536.6 N   | Yes  |

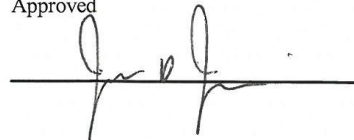
Test meets specifications.

Comments:

Technician



Approved



Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

03.01.2013 16:38:15 1691

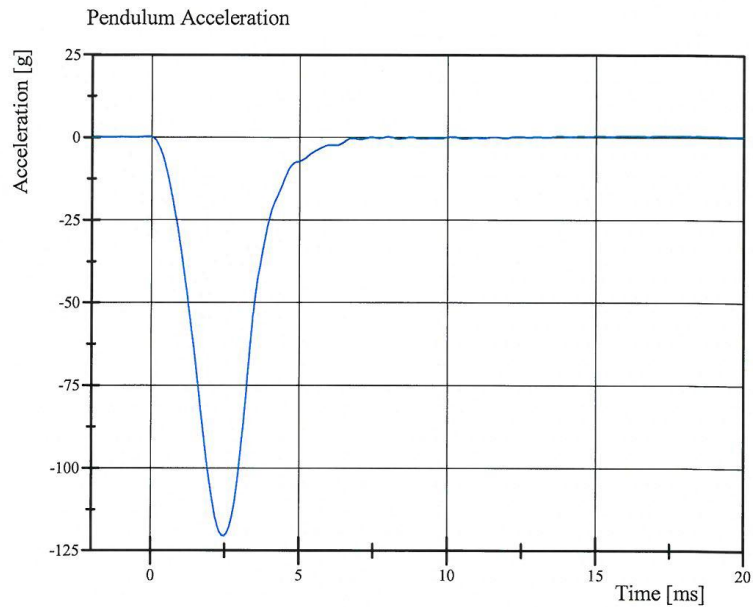


## Transportation Research Center Inc.

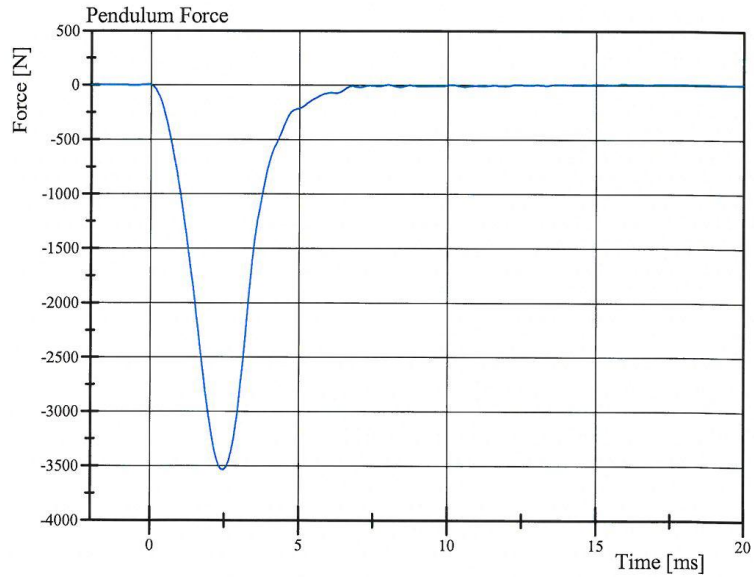
Left Knee Femur Response Test

HIII 5th Serial No. 426 Certification No. 17-2

Test Date: 3/1/2013



Filter Class: CFC\_600  
Max: 0.4 gn at 15.9 ms  
Min: -120.6 gn at 2.5 ms



Filter Class: CFC\_600  
Max: 10.8 N at 15.9 ms  
Min: -3,536.6 N at 2.5 ms

Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

03.01.2013 16:38:27 1691





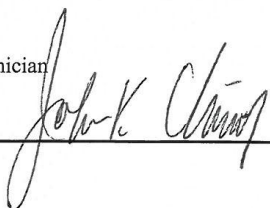
## Transportation Research Center Inc.

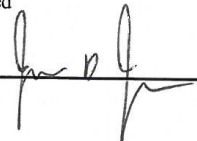
Right Knee Femur Response Test  
HIII 5th Serial No. 426 Certification No. 17-2  
Test Date: 3/4/2013

| Test Parameter    | Specification         | Test Results | Pass |
|-------------------|-----------------------|--------------|------|
| Temperature       | 18.9 - 25.6 °C        | 21.0 °C      | Yes  |
| Relative Humidity | 10 - 70 %             | 27 %         | Yes  |
| Probe Velocity    | 2.08 - 2.13 m/s       | 2.127 m/s    | Yes  |
| Peak Femur Force  | (-3,450) - (-4,060) N | -3,681.2 N   | Yes  |

Test meets specifications.

Comments:

Technician 

Approved 

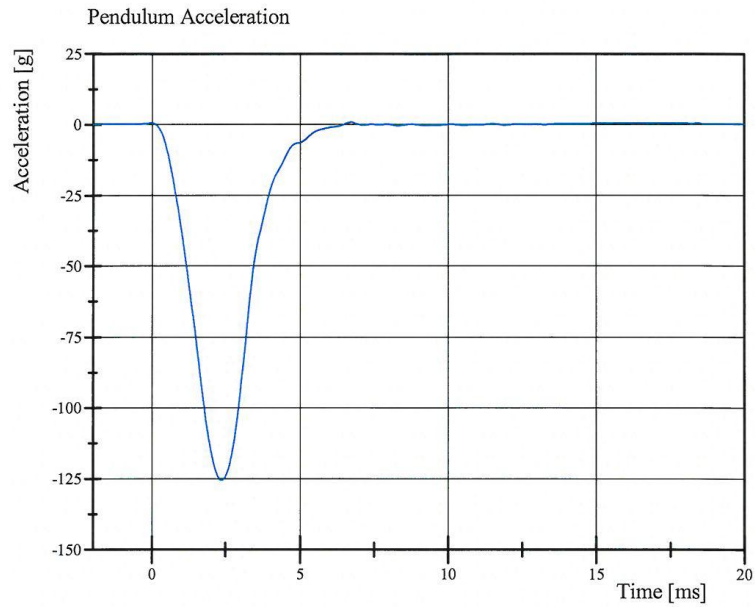
Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

03.04.2013 08:12:06 1679

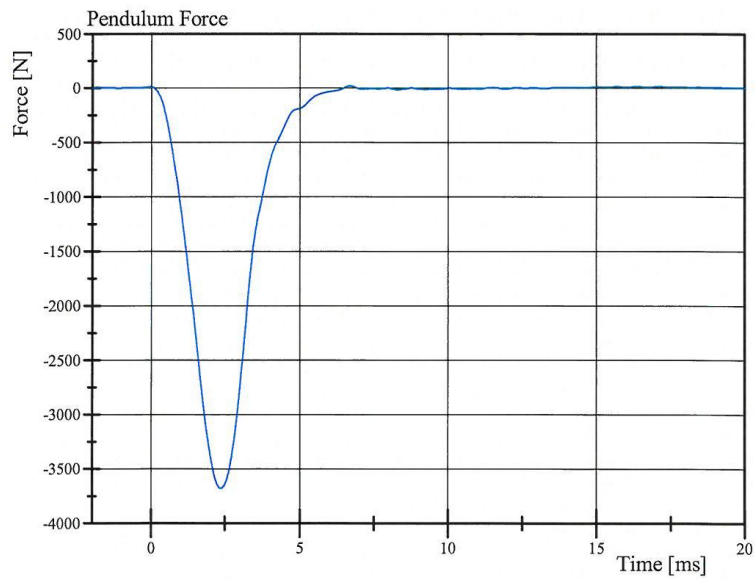


## Transportation Research Center Inc.

Right Knee Femur Response Test  
HIII 5th Serial No. 426 Certification No. 17-2  
Test Date: 3/4/2013



Filter Class: CFC\_600  
Max: 0.7 gn at 6.7 ms  
Min: -125.5 gn at 2.4 ms



Filter Class: CFC\_600  
Max: 19.9 N at 6.7 ms  
Min: -3,681.2 N at 2.4 ms

Specification Source: CFR49 Part 572 Subpart O  
with Polarity in accordance with J211

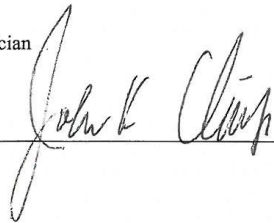
03.04.2013 08:12:14 1679



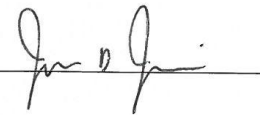
**Transportation Research Center Inc.**  
**5720 HIII 5th Dummy**  
**External Dimensions**  
**Serial No. 426 Calibration No. 16**

| Symbol | Description                                | Specification | Results | Pass |
|--------|--------------------------------------------|---------------|---------|------|
|        |                                            | mm            | mm      |      |
| A      | Total Sitting Height                       | 774.7 - 800.1 | 780     | Yes  |
| B      | Shoulder Pivot Height                      | 431.8 - 457.2 | 445     | Yes  |
| C      | Hip Pivot Height                           | 81.3 - 86.3   | 85      | Yes  |
| D      | Hip Pivot from Backline                    | 144.8 - 149.8 | 147     | Yes  |
| E      | Shoulder Pivot from Backline               | 68.6 - 83.8   | 79      | Yes  |
| F      | Thigh Clearance                            | 119.4 - 134.6 | 128     | Yes  |
| G      | Back of Elbow to Wrist Pivot               | 243.9 - 259.1 | 249     | Yes  |
| H      | Head Back to Backline                      | 43.2 - 48.2   | 45      | Yes  |
| I      | Shoulder to Elbow Length                   | 276.8 - 297.2 | 283     | Yes  |
| J      | Elbow Rest Height                          | 182.8 - 203.2 | 195     | Yes  |
| K      | Buttock Knee Length                        | 520.7 - 546.1 | 535     | Yes  |
| L      | Popliteal Height                           | 355.6 - 376.0 | 369     | Yes  |
| M      | Knee Pivot Height                          | 393.7 - 419.1 | 413     | Yes  |
| N      | Buttock Popliteal Length                   | 414.0 - 439.4 | 436     | Yes  |
| O      | Chest Depth without Jacket                 | 175.3 - 190.5 | 184     | Yes  |
| P      | Foot Length                                | 218.5 - 233.7 | 222     | Yes  |
| R      | Buttock to Knee Pivot Length               | 457.2 - 482.6 | 475     | Yes  |
| S      | Head Breadth                               | 137.1 - 147.3 | 140     | Yes  |
| T      | Head Depth                                 | 177.8 - 188.0 | 182     | Yes  |
| U      | Hip Breadth                                | 299.7 - 314.9 | 306     | Yes  |
| V      | Shoulder Breadth                           | 350.5 - 365.7 | 358     | Yes  |
| W      | Foot Breadth                               | 78.8 - 94.0   | 83      | Yes  |
| X      | Head Circumference                         | 528.3 - 548.7 | 538     | Yes  |
| Y      | Chest Circumference with Jacket            | 850.9 - 881.3 | 867     | Yes  |
| Z      | Waist Circumference                        | 759.5 - 789.9 | 773     | Yes  |
| AA     | Reference Location for Chest Circumference | 332.7 - 358.1 | 345     | Yes  |
| BB     | Reference Location for Waist Circumference | 160.0 - 170.2 | 165     | Yes  |

Technician



Approved



Revised 3/19/3003

