

How to Research Stiffness Data and Calculate Stiffness Values

- Stiffness values through Calculation By Hand

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How to Research Stiffness Data

Researching the Data

Objective - Obtain Frontal, Side and Rear Stiffness Data for a 2018 Toyota Corolla.

First Step - determine the year range for the 2018 Toyota Corolla where the vehicle is essentially the “same”.

How to Research Stiffness Data

Researching the Data

To determine the appropriate year range in which to search, the most common tool is the Vehicle Interchange List which is maintained by Greg Anderson.

This list is more commonly referred to as the “Sister-Clone List”. The list for 1974-2012 vehicles is still available for download from a variety of web sites. For more current models, you need to go to Greg Anderson’s web site. See -

<http://www.scaliaanderson.com/clones/>

How to Research Stiffness Data

Researching the Data

Other possible tools are the N.S.D.C. (No Significant Dimensional Change) range in Expert AutoStats for those who have that program, or web sites like Car and Driver.

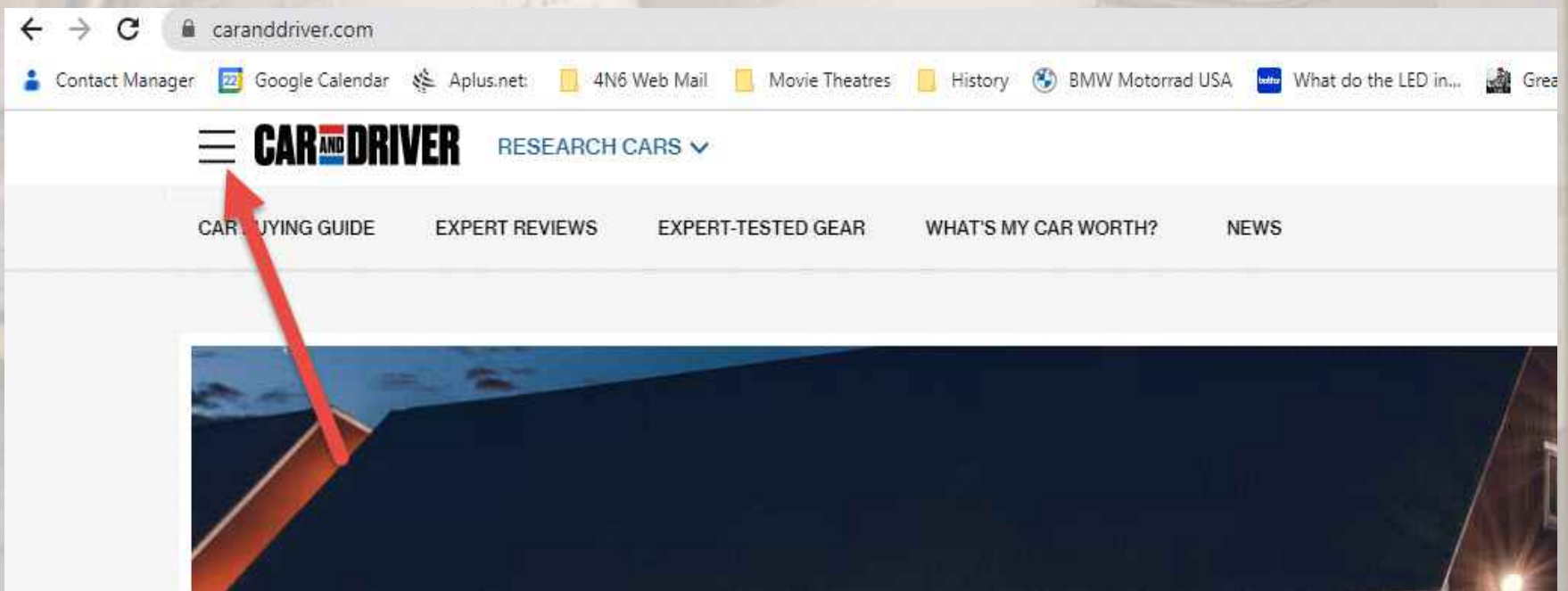
Keeping this presentation to a totally “no out of pocket cost” work flow, we will look at the Car & Driver web site.

<https://www.caranddriver.com/>

How to Research Stiffness Data

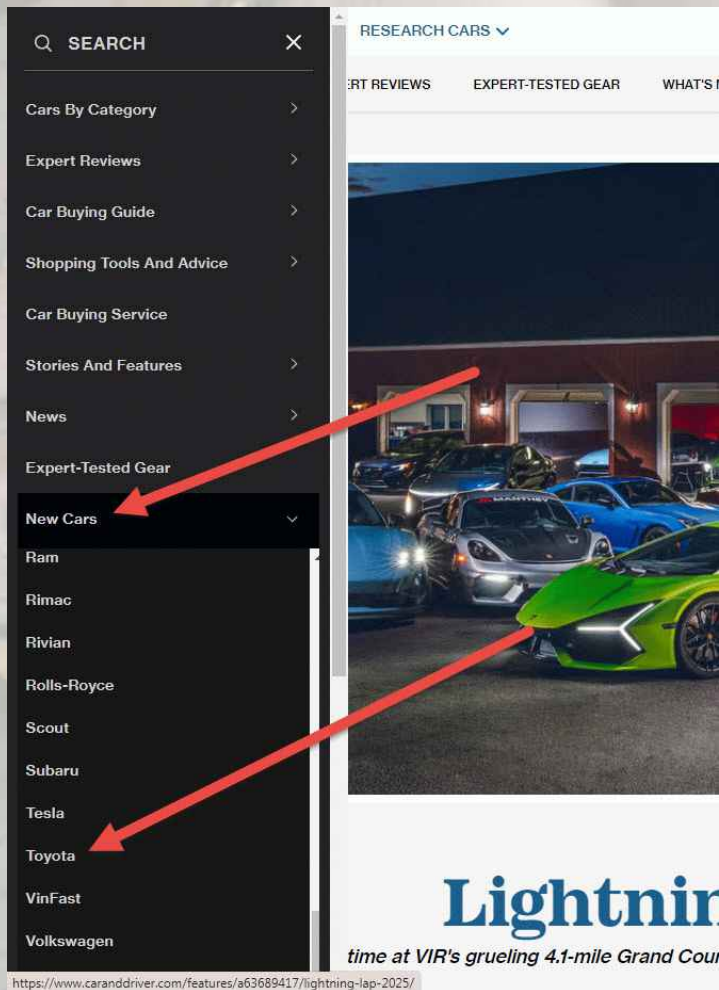
Researching the Data

Upon researching the Home Page, click on the menu to get to the New Cars area



How to Research Stiffness Data

Researching the Data



After Clicking on NEW CARS
Scroll down to TOYOTA
Click on it.

How to Research Stiffness Data

Researching the Data

Either scroll down to the model of interest, or search using the drop down menus.

We will use the drop down menus for this exercise.

The screenshot shows the Car and Driver website's search interface. At the top, there are navigation links: CAR BUYING GUIDE, EXPERT REVIEWS, EXPERT-TESTED GEAR, WHAT'S MY CAR WORTH?, and NEWS. Below this is a 'Research Cars' section with the text 'Explore Car and Driver's trusted reviews with exclusive test data and expert insights:'. A search bar contains 'Toyota' in the first dropdown, 'Select Model' in the second, and 'Select Year' in the third, with a 'GO' button. Below the search bar is a 'Car and Driver Rating and Accolades' section with icons for 10Best, EV of the Year, Editors' Choice (EC), and C/D Rating (10/10). Further down is an ACURA section with links for Features, Offers, Build & Price, Find a Dealer, and Learn More. The 'Cars' section is titled 'Sedans, coupes, convertibles, and wagons' and displays two car listings: '2025 Toyota Camry' with a 9/10 C/D Rating and '2025 Toyota Corolla' with a 7.5/10 C/D Rating. A red arrow points to the '2025 Toyota Corolla' listing.

How to Research Stiffness Data

Researching the Data

CAR AND DRIVER RESEARCH CARS

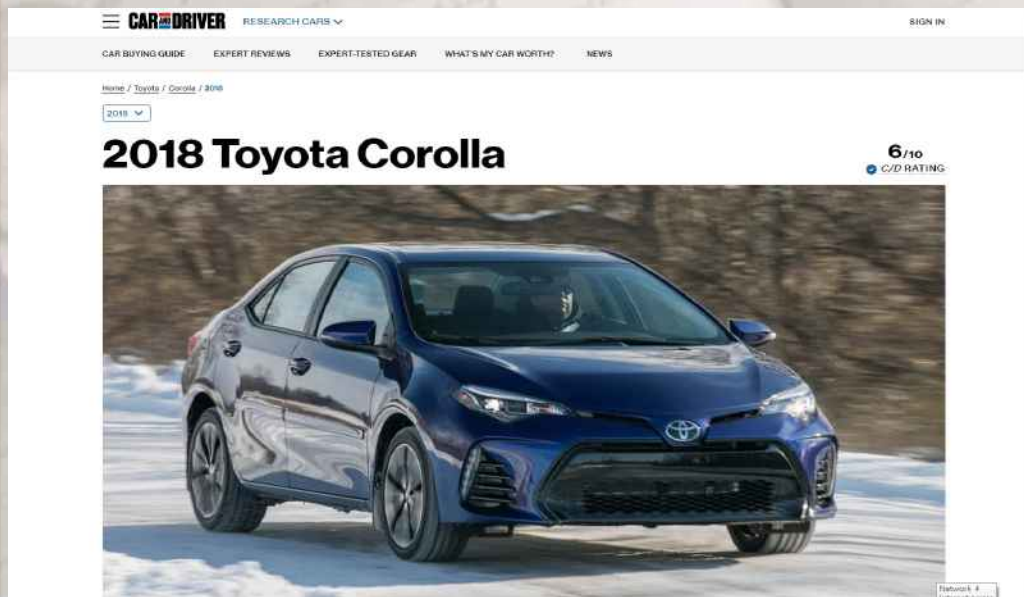
CAR BUYING GUIDE EXPERT REVIEWS EXPERT-TESTED GEAR WHAT'S MY CAR WORTH? NEWS

Research Cars

Explore Car and Driver's trusted reviews with exclusive test data and expert insights

Toyota Corolla 2018 GO

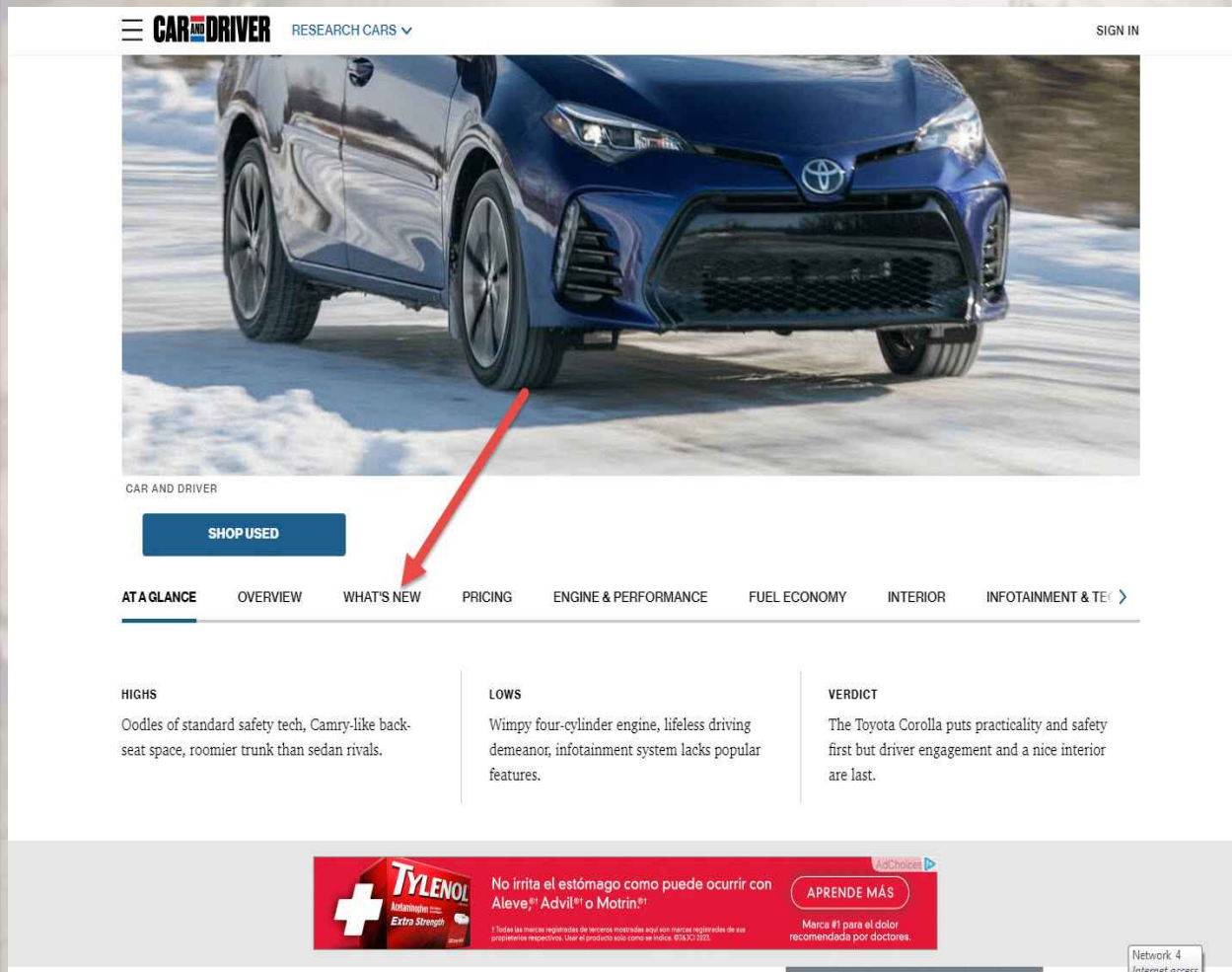
After entering the information in the appropriate drop down boxes, click GO.



You will then get to the model of interest.

How to Research Stiffness Data

Researching the Data



The screenshot shows the Car and Driver website interface. At the top, there is a navigation bar with the Car and Driver logo, a "RESEARCH CARS" dropdown menu, and a "SIGN IN" link. Below the navigation bar is a large image of a blue Toyota Corolla. Underneath the image, there is a "SHOP USED" button. Below the button is a horizontal navigation menu with tabs: "AT A GLANCE", "OVERVIEW", "WHAT'S NEW", "PRICING", "ENGINE & PERFORMANCE", "FUEL ECONOMY", "INTERIOR", and "INFOTAINMENT & TECH". A red arrow points to the "WHAT'S NEW" tab. Below the navigation menu, there are three columns of text: "HIGHS", "LOWS", and "VERDICT".

HIGHS
Oodles of standard safety tech, Camry-like back-seat space, roomier trunk than sedan rivals.

LOWS
Wimpy four-cylinder engine, lifeless driving demeanor, infotainment system lacks popular features.

VERDICT
The Toyota Corolla puts practicality and safety first but driver engagement and a nice interior are last.

Scroll down and click on the **WHAT'S NEW** tab, or continue to scroll down until you get to that area.

How to Research Stiffness Data

Researching the Data



WHAT'S NEW

PRICING

ENGINE & PERFORMANCE

FUEL ECONOMY

INTERIOR

What's New for 2018?

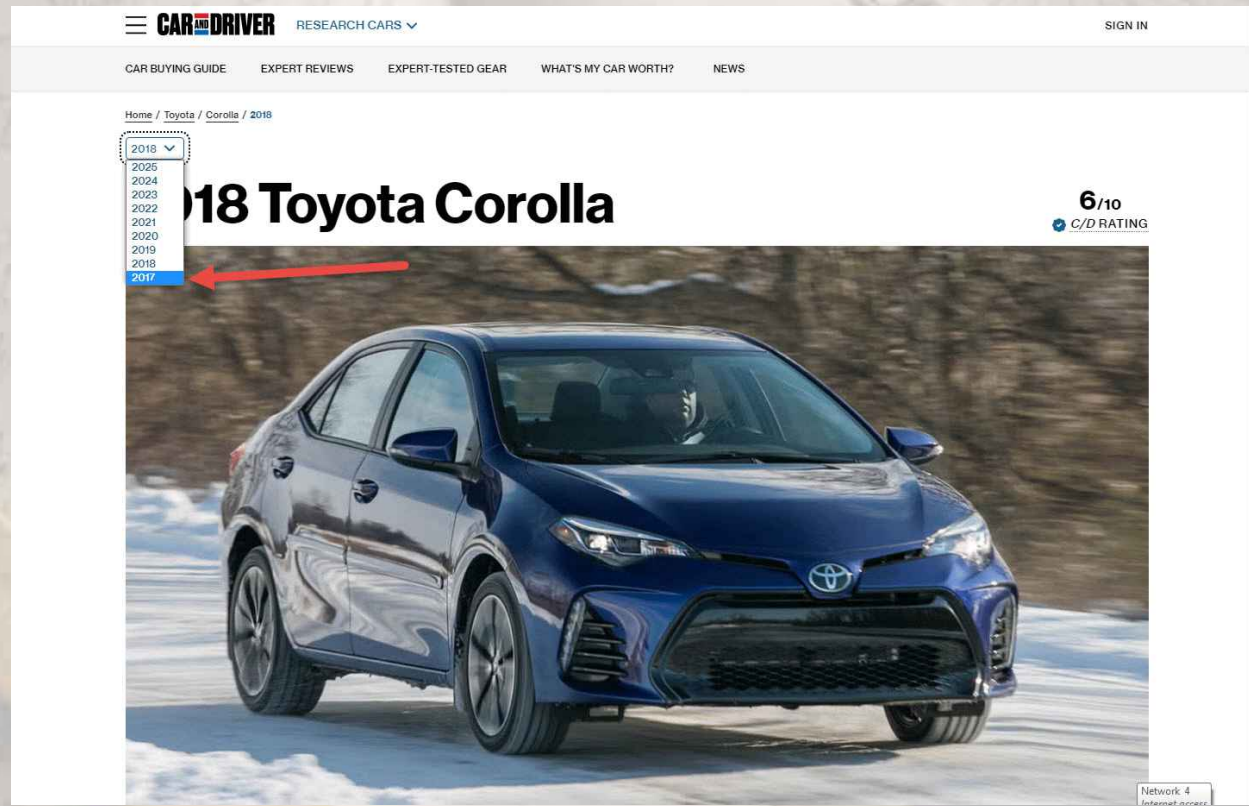
The Corolla enters 2018 with the most minimal of changes. The front-seat sun visors now feature illuminated vanity mirrors, and XLE and stick-shift SE models receive a leather-trimmed steering wheel. The upgraded helms have controls for the driver information display, audio adjustments, Bluetooth operation, and active safety settings.

For our purposes, no significant changes in 2018. We will now look for what the first year is that there were significant changes.

How to Research Stiffness Data

Researching the Data

Scroll to the top of the page, change the year to 2017 by using the drop down box and clicking on the year.



How to Research Stiffness Data

Researching the Data

CAR AND DRIVER 2017 Toyota Corolla

< **OVERVIEW** WHAT'S NEW PRICING ENGINE & PERFORMANCE FUEL ECONOMY

Consider the Toyota Corolla as mere transportation, and its impressive features at an affordable price outweigh its dull demeanor. A bundle of standard collision-avoidance technologies and excellent safety ratings make this Toyota one of the safest cars in its class. Class-leading back-seat legroom benefits passengers, but driving dynamics and fuel economy are disappointing.

What's New for 2017?

For 2017, the Corolla's front end is redesigned, and the interior has a revised instrument panel and climate controls. The special 50th Anniversary Edition wears special Black Cherry Pearl paint and unique badging. Every Corolla has the Toyota Safety Sense system, which includes adaptive cruise control, automatic high-beams, lane-departure warning, lane-keeping assist, forward-collision warning, and automated emergency braking.

For Sale Near You

Repeat the process to get down to the 2017 WHATS NEW area.

It can be seen that the front end was redesigned for 2017.

How to Research Stiffness Data

Researching the Data

2019 Corolla is a segment staple that will satisfy those who just want to get to their destination. Thankfully, the completely redesigned 2019 Corolla [hatchback](#) is based on an all-new platform that kicks off the next-generation models.

What's New for 2019?

The 2019 Corolla has no changes whatsoever. This current generation has been around for several years, but Toyota lightly refreshed its exterior and interior styling for 2017. Every Corolla also added the company's suite of driver assists that year. While the sedan stays the same for now, an [all-new Corolla hatchback was released for 2019](#), which rides on a separate platform. An [all-new 2020 Corolla sedan](#) is also now on sale, but we have yet to test one at the track.

Pricing and Which One to Buy

Repeating the process for year change to get to the 2019 model, then looking at WHATS NEW, the Corolla Hatchback was ALL NEW for 2019, and the SEDAN was ALL NEW for 2020. Therefore, our year range is 2017-2019 as a SAME SIMILAR vehicle.

How to Research Stiffness Data

Researching the Data

Now go to the NHTSA basic search page -

<https://www.nhtsa.gov/research-data/research-testing-databases#/vehicle>

Vehicle Crash Test Database

Download Test Reference Guide

Test Number: To:

Performer:

Contract/Study Title:

Reference Number:

Test Date Range: 01/01/1970 To 02/22/2025

Vehicle Information

Make:

Model:

Year: To:

Test Parameters

Test Type:

Configuration:

Impact Angle: To:

Closing Speed: To: (mph)

Offset Distance: To: (mm)

Occupant Type:

RESET SEARCH

10 Newest Results

PREVIOUS 1 NEXT

| TEST # | YEAR/MAKE/MODEL | TEST TYPE | CLOSING SPEED (mph) | IMPACT ANGLE (°) | OFFSET DISTANCE (mm) | PERFORMER | CONTRACT/STUDY TITLE | REF # | CRUSH DIS. | TEST CONTENT |
|--------|------------------------|----------------------------------|---------------------|------------------|----------------------|-------------------|---|-----------|------------|--------------|
| 15314 | 2024 TESLA CYBERTRUCK | OPTIONAL NEW CAR ASSESSMENT TEST | 61.42 | 270 | 0 | KARCO ENGINEERING | NCAP SIDE IMPACT 2024 TESLA CYBERTRUCK BEAST 4-DOOR TRUCK | 020244502 | 93 | |
| 15313 | 2024 TESLA FORTY EIGHT | OPTIONAL NEW CAR | 32.05 | 270 | 0 | KARCO ENGINEERING | NCAP SIDE IMPACT POLE BEAST 4-DOOR TRUCK | 020244501 | 188 | |

How to Research Stiffness Data

Researching the Data

Upon reaching the Basic Search page, scroll down and enter the **MAKE**, **MODEL**, and **YEAR RANGE** in the appropriate boxes, then click **SEARCH**

The screenshot shows the NHTSA Vehicle Crash Test Database search interface. The page header includes the NHTSA logo and navigation links for Ratings, Recalls, Risky Driving, Road Safety, Vehicle Safety, and More. The main content area is titled 'Vehicle Crash Test Database' and features a search form with the following fields:

- Test Number: [] To: []
- Performer: []
- Contract/Study Title: []
- Reference Number: []
- Test Date Range: [] 01/01/1070 To [] 02/22/2025
- Vehicle Information** (highlighted with a red box):
 - Make: TOYOTA
 - Model: COROLLA
 - Year: 2017 To 2019
- Test Parameters:
 - Test Type: []
 - Configuration: []
 - Impact Angle: [] To []
 - Closing Speed: [] To [] (mph)
 - Offset Distance: [] To [] (mm)
 - Occupant Type: []

At the bottom right of the search form, there are 'RESET' and 'SEARCH' buttons. A red arrow points to the 'SEARCH' button. Below the search form, there is a section for '10 Newest Results' with a table header and a 'PREVIOUS 1 NEXT' navigation bar.

How to Research Stiffness Data

Researching the Data

Reference Number:

Test Date Range: To

Vehicle Information

Make:

Model:

Year: To

Home Vehicle Biomechanics Component Crash Avoidance

Impact Angle: To

Closing Speed: To (kph)

Offset Distance: To (mm)

Occupant Type:

RESET SEARCH

11 Results

PREVIOUS **1** NEXT

| TEST ↑ | YEAR/MAKE/MODEL | TEST TYPE | CLOSING SPEED (kph) | IMPACT ANGLE (°) | OFFSET DISTANCE (mm) | PERFORMER | CONTRACT/STUDY TITLE | REF # | CRUSH DIS. | TEST CONTENT |
|--------|---------------------|--|---------------------|------------------|----------------------|-------------|--|---------------|------------|--------------|
| 9984 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 56.65 | 0 | 0 | TRC OF OHIO | NEW CAR ASSESSMENT PROGRAM FRONTAL IMPACT TESTING | 161114 | 738 | |
| 9985 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 32.18 | 270 | 0 | TRC OF OHIO | 75 DEGREE OBLIQUE RIGID POLE SIDE NCAP IMPACT | 161115 | 330 | |
| 9986 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 62.55 | 270 | 0 | TRC OF OHIO | MOVING BARRIER INTO LEFT SIDE OF 2017 TOYOTA COROLLA | 161116 | 205 | |
| 10078 | 2017 TOYOTA COROLLA | OUT OF POSITION (TWG) SIDE AIRBAG DEPLOYMENT TESTS | 0 | 0 | 0 | TRC OF OHIO | 2017 TOYOTA COROLLA STATIC SAB OOP TEST | M20175106TWG2 | 0 | |
| 10125 | 2017 TOYOTA COROLLA | FMVSS 301 FUEL SYSTEM | 0 | 180 | 0 | CALSPAN | FMVSS 301 TEST REPORTS/PHOTOS/VIDEO | | 0 | |

Search Results for Toyota Corolla between 2017-2019.

How to Research Stiffness Data

Researching the Data

Sort based on Impact Angle to see the available tests.

| Home Vehicle Biomechanics Component Crash Avoidance | | | | | | | | | | |
|---|---------------------|--|---------------------|--------------------|----------------------|--------------|--|---------------|------------|--------------|
| TEST | YEAR/MAKE/MODEL | TEST TYPE | CLOSING SPEED (kph) | IMPACT ANGLE (°) ↑ | OFFSET DISTANCE (mm) | PERFORMER | CONTRACT/STUDY TITLE | REF # | CRUSH DIS. | TEST CONTENT |
| 9984 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 56.65 | 0 | 0 | TRC OF OHIO | NEW CAR ASSESSMENT PROGRAM FRONTAL IMPACT TESTING | 161114 | 738 | |
| 10078 | 2017 TOYOTA COROLLA | OUT OF POSITION (TWG) SIDE AIRBAG DEPLOYMENT TESTS | 0 | 0 | 0 | TRC OF OHIO | 2017 TOYOTA COROLLA STATIC SAB OOB TEST | M20175106TWG2 | 0 | |
| 10651 | 2019 TOYOTA COROLLA | OPTIONAL NEW CAR ASSESSMENT TEST | 56.41 | 0 | 0 | MGA RESEARCH | OPTIONAL NCAP - 2019 TOYOTA COROLLA HATCHBACK SE 5-DR HATCHBACK | BT19011131 | 506 | |
| 10125 | 2017 TOYOTA COROLLA | FMVSS 301 FUEL SYSTEM INTEGRITY | 0 | 180 | 0 | CALSPAN | FMVSS 301 TEST REPORTS/PHOTOS/VIDEO | | 0 | |
| 9985 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 32.18 | 270 | 0 | TRC OF OHIO | 75 DEGREE OBLIQUE RIGID POLE SIDE NCAP IMPACT | 161115 | 330 | |
| 9986 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 62.55 | 270 | 0 | TRC OF OHIO | MOVING BARRIER INTO LEFT SIDE OF 2017 TOYOTA COROLLA | 161116 | 205 | |
| 10646 | 2019 TOYOTA COROLLA | OPTIONAL NEW CAR ASSESSMENT TEST | 62.14 | 270 | 0 | MGA RESEARCH | OPTIONAL NCAP SIDE - 2019 TOYOTA COROLLA HATCHBACK SE 5-DOOR HATCHBACK | BT19011021 | 169 | |
| 10650 | 2019 TOYOTA COROLLA | OPTIONAL NEW CAR ASSESSMENT TEST | 32.25 | 270 | 0 | MGA RESEARCH | OPTIONAL NCAP SIDE POLE - 2019 TOYOTA COROLLA HATCHBACK 5-DR HATCHBACK | BT19011141 | 305 | |
| 10133 | 2017 TOYOTA COROLLA | RMDB INTO FRONT 15 DEGREE STATIONARY | 90.75 | 345 | 0 | CALSPAN | RESEARCH AND DEVELOPMENT LEFT OBLIQUE OFFSET FRONTAL IMPACT | CV1702.0001 | 602 | |

How to Research Stiffness Data

Researching the Data

An angle of "0" is in theory a Frontal Test

| TEST | YEAR/MAKE/MODEL | TEST TYPE | CLOSING SPEED (kph) | IMPACT ANGLE (°) ↑ | OFFSET DISTANCE (mm) | PERFORMER | CONTRACT/STUDY TITLE | REF # | CRUSH DIS. | TEST CONTENT |
|-------|---------------------|--|---------------------|--------------------|----------------------|--------------|--|---------------|------------|--------------|
| 9984 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 56.65 | 0 | 0 | TRC OF OHIO | NEW CAR ASSESSMENT PROGRAM FRONTAL IMPACT TESTING | 161114 | 738 | |
| 10078 | 2017 TOYOTA COROLLA | OUT OF POSITION (TWG) SIDE AIRBAG DEPLOYMENT TESTS | 0 | 0 | 0 | TRC OF OHIO | 2017 TOYOTA COROLLA STATIC SAB OOP TEST | M20175106TWG2 | 0 | |
| 10651 | 2019 TOYOTA COROLLA | OPTIONAL NEW CAR ASSESSMENT TEST | 56.41 | 0 | 0 | MGA RESEARCH | OPTIONAL NCAP -2019 TOYOTA COROLLA HATCHBACK SE 5-DR HATCHBACK | BT19011131 | 506 | |
| 10125 | 2017 TOYOTA COROLLA | FMVSS 301 FUEL SYSTEM INTEGRITY | 0 | 180 | 0 | CALSPAN | FMVSS 301 TEST REPORTS/PHOTOS/VIDEO | | 0 | |
| 9985 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 32.18 | 270 | 0 | TRC OF OHIO | 75 DEGREE OBLIQUE RIGID POLE SIDE NCAP IMPACT | 161115 | 330 | |
| 9986 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 62.55 | 270 | 0 | TRC OF OHIO | MOVING BARRIER INTO LEFT SIDE OF 2017 TOYOTA COROLLA | 161116 | 205 | |
| 10646 | 2019 TOYOTA COROLLA | OPTIONAL NEW CAR ASSESSMENT TEST | 62.14 | 270 | 0 | MGA RESEARCH | OPTIONAL NCAP SIDE -2019 TOYOTA COROLLA HATCHBACK SE 5-DOOR HATCHBACK | BT19011021 | 169 | |
| 10650 | 2019 TOYOTA COROLLA | OPTIONAL NEW CAR ASSESSMENT TEST | 32.25 | 270 | 0 | MGA RESEARCH | OPTIONAL NCAP SIDE POLE - 2019 TOYOTA COROLLA HATCHBACK 5-DR HATCHBACK | BT19011141 | 305 | |
| 10133 | 2017 TOYOTA COROLLA | RMDB INTO FRONT 15 DEGREE STATIONARY | 90.75 | 345 | 0 | CALSPAN | RESEARCH AND DEVELOPMENT LEFT OBLIQUE OFFSET FRONTAL IMPACT | CV1702.0001 | 602 | |

How to Research Stiffness Data

Researching the Data

Impact angles of 180 can be either a FRONT or a REAR test. More on this later in the exercise.

| TEST | YEAR/MAKE/MODEL | TEST TYPE | CLOSING SPEED (kph) | IMPACT ANGLE (°) ↑ | OFFSET DISTANCE (mm) | PERFORMER | CONTRACT/STUDY TITLE | REF # | CRUSH DIS. | TEST CONTENT |
|-------|---------------------|--|---------------------|--------------------|----------------------|--------------|--|---------------|------------|--------------|
| 9984 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 56.65 | 0 | 0 | TRC OF OHIO | NEW CAR ASSESSMENT PROGRAM FRONTAL IMPACT TESTING | 161114 | 738 | |
| 10078 | 2017 TOYOTA COROLLA | OUT OF POSITION (TWG) SIDE AIRBAG DEPLOYMENT TESTS | 0 | 0 | 0 | TRC OF OHIO | 2017 TOYOTA COROLLA STATIC SAB OOP TEST | M20175106TWG2 | 0 | |
| 10651 | 2019 TOYOTA COROLLA | OPTIONAL NEW CAR ASSESSMENT TEST | 56.41 | 0 | 0 | MGA RESEARCH | OPTIONAL NCAP - 2019 TOYOTA COROLLA HATCHBACK SE 5-DR HATCHBACK | BT19011131 | 506 | |
| 10125 | 2017 TOYOTA COROLLA | FMVSS 301 FUEL SYSTEM INTEGRITY | 0 | 180 | 0 | CALSPAN | FMVSS 301 TEST REPORTS/PHOTOS/VIDEO | | 0 | |
| 9985 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 32.18 | 270 | 0 | TRC OF OHIO | 75 DEGREE OBLIQUE RIGID POLE SIDE NCAP IMPACT | 161115 | 330 | |
| 9986 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 62.55 | 270 | 0 | TRC OF OHIO | MOVING BARRIER INTO LEFT SIDE OF 2017 TOYOTA COROLLA | 161116 | 205 | |
| 10646 | 2019 TOYOTA COROLLA | OPTIONAL NEW CAR ASSESSMENT TEST | 62.14 | 270 | 0 | MGA RESEARCH | OPTIONAL NCAP SIDE - 2019 TOYOTA COROLLA HATCHBACK SE 5-DOOR HATCHBACK | BT19011021 | 169 | |
| 10650 | 2019 TOYOTA COROLLA | OPTIONAL NEW CAR ASSESSMENT TEST | 32.25 | 270 | 0 | MGA RESEARCH | OPTIONAL NCAP SIDE POLE - 2019 TOYOTA COROLLA HATCHBACK 5-DR HATCHBACK | BT19011141 | 305 | |
| 10133 | 2017 TOYOTA COROLLA | RMDB INTO FRONT 15 DEGREE STATIONARY | 90.75 | 345 | 0 | CALSPAN | RESEARCH AND DEVELOPMENT LEFT OBLIQUE OFFSET FRONTAL IMPACT | CV1702.0001 | 602 | |

How to Research Stiffness Data

Researching the Data

Angles of 270 or 90 are almost certainly Side Impacts

| | | | | | | Home | Vehicle | Biomechanics | Component | Crash Avoidance |
|-------|---------------------|--|-------|-----|---|-------------------|---|-------------------------------------|-----------|-----------------|
| 10125 | 2017 TOYOTA COROLLA | FMVSS 301 FUEL SYSTEM INTEGRITY | 0 | 180 | 0 | CALSPAN | HATCHBACK SE 5-DR HATCHBACK | FMVSS 301 TEST REPORTS/PHOTOS/VIDEO | 0 | |
| 9985 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 32.18 | 270 | 0 | TRC OF OHIO | 75 DEGREE OBLIQUE RIGID POLE SIDE NCAP IMPACT | 161115 | 330 | |
| 9986 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 62.55 | 270 | 0 | TRC OF OHIO | MOVING BARRIER INTO LEFT SIDE OF 2017 TOYOTA COROLLA | 161116 | 205 | |
| 10646 | 2019 TOYOTA COROLLA | OPTIONAL NEW CAR ASSESSMENT TEST | 62.14 | 270 | 0 | MGA RESEARCH | OPTIONAL NCAP SIDE - 2019 TOYOTA COROLLA HATCHBACK SE 5-DOOR HATCHBACK | BT19011021 | 169 | |
| 10650 | 2019 TOYOTA COROLLA | OPTIONAL NEW CAR ASSESSMENT TEST | 32.25 | 270 | 0 | MGA RESEARCH | OPTIONAL NCAP SIDE POLE - 2019 TOYOTA COROLLA HATCHBACK SE 5-DR HATCHBACK | BT19011141 | 305 | |
| 10133 | 2017 TOYOTA COROLLA | RMDB INTO FRONT 15 DEGREE STATIONARY VEHICLE, OVERLAP=35 PERCENT | 90.75 | 345 | 0 | CALSPAN | RESEARCH AND DEVELOPMENT LEFT OBLIQUE OFFSET FRONTAL IMPACT | CV1702.0001 | 602 | |
| 10134 | 2017 TOYOTA COROLLA | RMDB INTO FRONT 15 DEGREE STATIONARY VEHICLE, OVERLAP=35 PERCENT | 90.72 | 345 | 0 | CALSPAN | RESEARCH AND DEVELOPMENT LEFT OBLIQUE OFFSET FRONTAL IMPACT | CV1702.0002 | 538 | |
| 10824 | 2017 TOYOTA COROLLA | RMDB INTO FRONT 15 DEGREE STATIONARY VEHICLE, OVERLAP=35 PERCENT | 89.62 | 345 | 0 | KARCO ENGINEERING | RESEARCH AND DEVELOPMENT LEFT OBLIQUE OFFSET FRONTAL IMPACT | R20175149 | 593 | |

How to Research Stiffness Data

Researching the Data

Angles of 345-15 can be classified as a Frontal Test if no better tests are available.

| | | | | | | Home | Vehicle | Biomechanics | Component | Crash Avoidance |
|-------|---------------------|--|-------|-----|---|-------------------|--|--------------|-----------|-----------------|
| 10125 | 2017 TOYOTA COROLLA | FMVSS 301 FUEL SYSTEM INTEGRITY TEST | 0 | 180 | 0 | CALSPAN | FMVSS 301 TEST REPORTS/PHOTOS/VIDEO | 0 | | |
| 9985 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 32.18 | 270 | 0 | TRC OF OHIO | 75 DEGREE OBLIQUE RIGID POLE SIDE NCAP IMPACT | 161115 | 330 | |
| 9986 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 62.55 | 270 | 0 | TRC OF OHIO | MOVING BARRIER INTO LEFT SIDE OF 2017 TOYOTA COROLLA | 161116 | 205 | |
| 10646 | 2019 TOYOTA COROLLA | OPTIONAL NEW CAR ASSESSMENT TEST | 62.14 | 270 | 0 | MGA RESEARCH | OPTIONAL NCAP SIDE - 2019 TOYOTA COROLLA HATCHBACK SE 5-DOOR HATCHBACK | BT19011021 | 169 | |
| 10650 | 2019 TOYOTA COROLLA | OPTIONAL NEW CAR ASSESSMENT TEST | 32.25 | 270 | 0 | MGA RESEARCH | OPTIONAL NCAP SIDE POLE - 2019 TOYOTA COROLLA HATCHBACK 5-DR HATCHBACK | BT19011141 | 305 | |
| 10133 | 2017 TOYOTA COROLLA | RMDB INTO FRONT 15 DEGREE STATIONARY VEHICLE, OVERLAP=35 PERCENT | 90.75 | 345 | 0 | CALSPAN | RESEARCH AND DEVELOPMENT LEFT OBLIQUE OFFSET FRONTAL IMPACT | CV1702.0001 | 602 | |
| 10134 | 2017 TOYOTA COROLLA | RMDB INTO FRONT 15 DEGREE STATIONARY VEHICLE, OVERLAP=35 PERCENT | 90.72 | 345 | 0 | CALSPAN | RESEARCH AND DEVELOPMENT LEFT OBLIQUE OFFSET FRONTAL IMPACT | CV1702.0002 | 538 | |
| 10824 | 2017 TOYOTA COROLLA | RMDB INTO FRONT 15 DEGREE | 89.62 | 345 | 0 | KARCO ENGINEERING | RESEARCH AND DEVELOPMENT LEFT OBLIQUE OFFSET FRONTAL | R20175149 | 593 | |

How to Research Stiffness Data

Stiffness Calculations - Summary

Front Stiffness

How to Research Stiffness Data

Researching the Data - Frontal

For the Frontal Test we will pick test 9984. Some data can be gleaned from the results page. On the top half you can get Year/Make/Model, Impact Angle, and Speed. You can also view the photographs for this test.

The screenshot shows the NHTSA website interface for a specific crash test. The header includes the NHTSA logo and navigation links for Ratings, Recalls, Risky Driving, Road Safety, Vehicle Safety, and More. The main content area is titled "Vehicle Crash Test Database: Test Number 9984" and includes a "Back to Results" button. The test details are as follows:

- Test Type:** NEW CAR ASSESSMENT TEST
- Configuration:** VEHICLE INTO BARRIER
- Make:** TOYOTA
- Model:** COROLLA
- Year:** 2017
- Impact Angle:** 0°
- Closing Speed:** 56 (kph)
- Offset Distance:** 0 (mm)
- Performer:** TRC OF OHIO
- Contract/Study Title:** NEW CAR ASSESSMENT PROGRAM FRONTAL IMPACT TESTING
- Reference Number:** 161114
- Test Objectives:** REDUCE THE RISK OF SERIOUS & FATAL INJURY IN FRONTAL IMPACT

A large photograph shows a red Toyota Corolla in a frontal impact test, positioned behind a yellow safety cage. Below this main image is a gallery of smaller images, with a "View All 88 Images" link. The date "NOVEMBER 14, 2016" is displayed in the top right corner of the page content.

How to Research Stiffness Data

Researching the Data - Frontal

From the bottom half of the screen we can see the videos for download, the contractor report for download, some summary data, and in the far bottom left, the number 1. Click this to get detailed data for the vehicle.

Back to Results Home Vehicle Biomechanics Component Crash Avoidance

Vehicle Crash Test Database: Test Number 9984 NOVEMBER 14, 2016

Performer
TRC OF OHIO

Contract/Study Title
NEW CAR ASSESSMENT PROGRAM FRONTAL IMPACT TESTING

Reference Number
161114

Test Objectives
REDUCE THE RISK OF SERIOUS & FATAL INJURY IN FRONTAL IMPACT CRASHES

Contract Number
DTNH22-12-D-00257

Test Track Surface
CONCRETE

Test Track Surface Condition
DRY

Reports
M20165104 2017 Toyota Corolla 4DR Sedan NCAP Final Report.pdf

Download Instrumentation Data
NHTSA LDS-1992
NHTSA EV5 ASCII X-Y
Altair Binary Format (ABF)
NHTSA ISO_MME
DIAdem TDMS

Download Metadata

Video Downloads

| | | |
|----|---|-------------|
| 1 | 01 REAL-TIME LEFT OVERALL.wmv | (2.57 MB) |
| 2 | 02 DRIVER CLOSE-UP.wmv | (46.25 MB) |
| 3 | 03 LEFT FRONT HALF.wmv | (75.32 MB) |
| 4 | 04 LEFT ANGLE.wmv | (65.08 MB) |
| 5 | 05 STEERING COLUMN - TOP.wmv | (72.26 MB) |
| 6 | 06 STEERING COLUMN - BOTTOM.wmv | (61.39 MB) |
| 7 | 07 RIGHT OVERALL.wmv | (56.84 MB) |
| 8 | 08 PASSENGER CLOSE-UP.wmv | (64.33 MB) |
| 9 | 09 RIGHT ANGLE.wmv | (52.69 MB) |
| 10 | 10 RIGHT FRONT HALF.wmv | (44.32 MB) |
| 11 | 11 WINDSHIELD.wmv | (46.8 MB) |
| 12 | 12 DRIVER WINDSHIELD.wmv | (43.74 MB) |
| 13 | 13 PASSENGER WINDSHIELD.wmv | (62.43 MB) |
| 14 | 14 PIT FRONT.wmv | (41.36 MB) |
| 15 | 15 PIT REAR.wmv | (53.75 MB) |
| 16 | 16 DRIVER ONBOARD.wmv | (40.94 MB) |
| 17 | 17 PASSENGER ONBOARD.wmv | (32.67 MB) |
| 18 | REAL-TIME DOCUMENTARY.wmv | (102.64 MB) |
| 19 | M20165104 2017 Toyota Corolla 4DR Sedan NCAP Frontal Impact for Web.wmv | (340.93 KB) |

| VEHICLE | | BARRIER | INSTRUMENTATION | | | OCCUPANT | |
|---------|---------------------|-----------------------------|-----------------|------------|------------|-----------|----------------|
| # | YEAR/MAKE/MODEL | ENGINE | WEIGHT(Kgrams) | SPEED(kph) | LENGTH(mm) | WIDTH(mm) | CRUSH DIS.(mm) |
| 1 | 2017 TOYOTA COROLLA | 4 CYLINDER TRANSVERSE FRONT | 1488 | 56.65 | 4650 | 1765 | 738 |

Network 4
Internet access

How to Research Stiffness Data

Researching the Data - Frontal

Vehicle Crash Test Database: Test Number 9984

NOVEMBER

| Vehicle Detail Information | |
|-------------------------------------|----------------------------------|
| Vehicle | TOYOTA COROLLA 2017 |
| Body Type | FOUR DOOR SEDAN |
| Engine | 1.8L 4 CYLINDER TRANSVERSE FRONT |
| Weight Tested | 1488(kg) |
| Vehicle Size w x l | 1765 x 4650 (mm) |
| NHTSA # | M20175104 |
| Commentary | MAX CRUSH @ CRUSH CENTERLINE |
| VIN | 2T1BURHE9HC747230 |
| Modification Indicator | PRODUCTION VEHICLE |
| Description of Vehicle Modification | UNMODIFIED |
| Maximum Crush Distance | 738 |

After Clicking on the “1”, you get details that are important for the calculations. Working down -
Year/Make/Model/Body Style - Test Weight (kg)
- Width (mm) - Maximum Crush (mm)

How to Research Stiffness Data

Researching the Data - Frontal

Vehicle Crash Test Database: Test Number 9984

NOVEMBER

| | |
|---|--------------------|
| Vehicle Center of Gravity Distance Behind Front Axle | 1139 |
| Steering Column Shear Capsule Separation | NOT APPLICABLE (N) |
| Steering Column Collapse Mechanism | NOT APPLICABLE (N) |
| Vehicle Speed | 56.65 |
| Crabbed Angle | 0 |
| Principal Direction of Force | 0 |
| Bumper Engagement | DE |
| Sill Engagement | NOT APPLICABLE |
| A-Pillar Engagement | NOT APPLICABLE |
| Vehicle Damage Index (Collision Deformation Classification) | 12FDEW2 |
| Angle of Moving Test Cart | 0 |
| Vehicle Orientation of Moving Cart | 0 |
| Total Length of Indentation | 1524 |
| Distance between center of Damaged area and C.G. Axis | 0 |

Vehicle Closing Speed (kph)

Vehicle Damage Index - Confirms impact is a frontal

Indentation Length (mm)

How to Research Stiffness Data

Researching the Data - Frontal

Vehicle Crash Test Database: Test Number 9984

NOVEMBER

| | |
|---|------|
| Distance between center of Damaged area and C.G. Axis | 0 |
| Damage Profile Distances One | 417 |
| Damage Profile Distances Two | 588 |
| Damage Profile Distances Three | 686 |
| Damage Profile Distances Four | 675 |
| Damage Profile Distances Five | 592 |
| Damage Profile Distances Six | 402 |
| Pre-test - Total Length of Vehicle at centerline: | 4650 |
| Pre-test - Rear Surface of Vehicle to Front of Engine: | 4135 |
| Pre-test - Rear Surface of Vehicle to Firewall: | 3707 |
| Pre-test - Rear Surface of Vehicle to Upper Leading Edge of Right Door: | 3232 |
| Pre-test - Rear Surface of Vehicle to Upper Leading Edge of Left Door: | 3231 |
| Pre-test - Rear Surface of Vehicle to Lower Leading Edge of Right Door: | 3165 |
| Pre-test - Rear Surface of Vehicle to Lower Leading Edge of Left Door: | 3167 |

Damage Profile Distance Measurements 1-6 (mm)
Pre-Test Centerline measurement (mm)

How to Research Stiffness Data

Researching the Data - Frontal

Vehicle Crash Test Database: Test Number 9984

NOVEMBER

| | |
|---|------|
| Pre-test - center of Steering Column to Headliner: | 407 |
| Pre-test - Rear Surface of Vehicle to Right Side of Front Bumper: | 4366 |
| Pre-test - Rear Surface of Vehicle to Left Side of Front Bumper: | 4367 |
| Pre-test - Length of Engine Block: | 550 |
| Post-test Total Length of Vehicle at centerline: | 3912 |
| Post-test - Rear Surface of Vehicle to Front of Engine: | 3861 |
| Post-test - Rear Surface of Vehicle to Firewall: | |
| Post-test - Rear Surface of Vehicle to Upper Leading Edge of Right Door: | 3231 |
| Post-test - Rear Surface of Vehicle to Upper Leading Edge of Left Door: | 3223 |
| Post-test - Rear Surface of Vehicle to Lower Leading Edge of Right Door: | 3166 |
| Post-test - Rear Surface of Vehicle to Lower Leading Edge of Left Door: | 3158 |
| Post-test - Rear Surface of Vehicle to Upper Trailing Edge of Right Door: | 2167 |
| Post-test - Rear Surface of Vehicle to Upper Trailing Edge of Left Door: | 2159 |
| Post-test - Rear Surface of Vehicle to Lower Trailing Edge of Right Door: | 2162 |

Pre-Test Right and Left Corner measurement (mm)

Post-Test Centerline measurement (mm)

How to Research Stiffness Data

Researching the Data - Frontal

Vehicle Crash Test Database: Test Number 9984

NOVEMBER

| | |
|---|------|
| Post-test - Rear Surface of Vehicle to Upper Trailing Edge of Left Door: | 2160 |
| Post-test - Rear Surface of Vehicle to Lower Trailing Edge of Right Door: | 2162 |
| Post-test - Rear Surface of Vehicle to Lower Trailing Edge of Left Door: | 2160 |
| Post-test - Rear Surface of Vehicle to Bottom of A Post of Right Side: | 3223 |
| Post-test - Rear Surface of Vehicle to Bottom of A Post of Left Side: | 3215 |
| Post-test - Rear Surface of Vehicle to Firewall Right Side: | 3730 |
| Post-test - Rear Surface of Vehicle to Firewall Left Side: | 3715 |
| Post-test - Rear Surface of Vehicle to Steering Column: | 2780 |
| Post-test - center of Steering Column to A Post: | 300 |
| Post-test - center of Steering Column to Headliner: | 400 |
| Post-test - Rear Surface of Vehicle to Right Side of Front Bumper: | 3964 |
| Post-test - Rear Surface of Vehicle to Left Side of Front Bumper: | 3950 |
| Post-test - Length of Engine Block: | 550 |

Post-Test Right and Left Corner measurement (mm)

How to Calculate Stiffness Values

Calculating Frontal Stiffness

◆ Conversion Factors - Metric to Imperial

- ★ 1 inch = 25.4 millimeters
 - ★ 1 mile = 1.609344 kilometers
 - ★ 1 pound = 0.4535924 kilograms
- or
- ★ 1 kilogram = 2.20462 pounds

◆ Constants

- ★ 1 mph = 17.6 inch/sec
- ★ $g = 32.2 \text{ feet/sec}^2 = 386.4 \text{ inch/sec}^2$

How to Calculate Stiffness Values

Calculating Frontal Stiffness (Damage Profile Distances)

When working with essentially equally spaced crush measurements, the **AVERAGE CRUSH** formula can be calculated as:

$$\text{Crush}_{\text{avg}} = (c_1 + \dots + 2*c_{n-1} + c_n) / (2*[number of zones])$$

Where:

n = the number of crush measurements

[number of zones] = (the number of crush measurements) - 1

How to Research Stiffness Data

Researching the Data - Frontal Stiffness

The Distance Profile Distances are:

$$\text{DPD1} = 417 \text{ mm} / 25.4 = 16.4 \text{ in}$$

$$\text{DPD2} = 588 \text{ mm} / 25.4 = 23.1 \text{ in}$$

$$\text{DPD3} = 686 \text{ mm} / 25.4 = 27.0 \text{ in}$$

$$\text{DPD4} = 675 \text{ mm} / 25.4 = 26.6 \text{ in}$$

$$\text{DPD5} = 592 \text{ mm} / 25.4 = 23.3 \text{ in}$$

$$\text{DPD6} = 402 \text{ mm} / 25.4 = 15.8 \text{ in}$$

How to Calculate Stiffness Values

Calculating Frontal Stiffness (Damage Profile Distances)

When working with essentially equally spaced crush measurements, the **AVERAGE CRUSH** based upon the six Damage Profile Distance measurements can be calculated as follows:

$$\text{Crush}_{\text{avg}} = (c_1 + 2*c_2 + 2*c_3 + 2*c_4 + 2*c_5 + c_6) / (2*5)$$

Which, feeding in values, equates to:

$$\text{Crush}_{\text{avg}} = (16.4 + 2*23.1 + 2*27.0 + 2*26.6 + 2*23.3 + 15.8) / (2*5)$$

$$\text{Crush}_{\text{avg}} = 232.3 / 10 = \mathbf{23.2 \text{ inches}}$$

How to Calculate Stiffness Values

Calculating Frontal Stiffness (Damage Profile Distances)

Variables:

$$\Delta v_{\text{test}} = \text{Closing Speed} * 17.6 = \text{in/sec}$$

$$c_{\text{avg}} = \text{calculated average crush} = \text{inches}$$

$$W = \text{vehicle weight} = \text{pounds}$$

$$g = \text{acceleration due to gravity} = 386.4 \text{ inch/sec}^2$$

b_0 = No Damage Speed (Damage Threshold). If no specific knowledge of the vehicle is available, the beginning frontal NO DAMAGE SPEED is assumed to be ~4.5-5.0 mph. For calculations we will use 5.0 mph = 88 in/sec

$$L_{\text{test}} = \text{Damage Width} = \text{inches}$$

How to Calculate Stiffness Values

Calculating Frontal Stiffness

(Damage Profile Distances)

$$\Delta v_{\text{test}} = 56.65 \text{ kph} / 1.609 = 35.2 \text{ mph}$$

Calculations:

$$b_1 = \text{slope} = \text{inches} / [\text{inch} \cdot \text{sec}]$$

Note - depending upon the author the unit notation could also appear as [inch/sec]/inch or as 1/in

$$b_1 = (\Delta v_{\text{test}} - b_0) / c_{\text{avg}}$$

$$b_1 = ([35.2 * 17.6] - 88) / 23.2$$

$$b_1 = 22.9$$

How to Calculate Stiffness Values

Calculating Frontal Stiffness

(Damage Profile Distances)

$$W = 1488 \text{ kg} * 2.205 = 3280.5 \text{ lbs}$$

$$L_{\text{test}} \text{ Width} = 1765 \text{ mm} * 25.4 = 69.5 \text{ inches}$$

$$L_{\text{test}} \text{ Indentation Length} = 1524 \text{ mm} * 25.4 = 60.0 \text{ inches}$$

Calculations:

A coefficient = pound/inch

$$A = (W * b_0 * b_1) / (g * L_{\text{test}})$$

If you choose a $L_{\text{test}} = \underline{\text{vehicle width}}$

$$A = (3280.5 * 88 * 22.9) / (386.4 * 69.5)$$

$$\mathbf{A = 246.0}$$

If you choose a $L_{\text{test}} = \underline{\text{indentation length}}$

$$A = (3280.5 * 88 * 22.9) / (386.4 * 60)$$

$$\mathbf{A = 284.9}$$

How to Calculate Stiffness Values

Calculating Frontal Stiffness (Damage Profile Distances)

Calculations:

B coefficient = pound/inch²

$$B = (W * b_1 * b_1) / (g * L_{\text{test}})$$

If you choose a $L_{\text{test}} = \text{vehicle width}$

$$B = (3280.5 * 22.9 * 22.9) / (386.4 * 69.5)$$

$$\mathbf{B = 64.0}$$

If you choose a $L_{\text{test}} = \text{indentation length}$

$$B = (3280.5 * 22.9 * 22.9) / (386.4 * 60.0)$$

$$\mathbf{B = 74.1}$$

How to Calculate Stiffness Values

Calculating Frontal Stiffness (Damage Profile Distances)

Calculations:

G coefficient = pound

$$G = (A * A) / (2 * B)$$

If you choose a $L_{test} = \underline{\text{vehicle width}}$

$$G = (246.0 * 246.0) / (2 * 64.0)$$

$$\mathbf{G = 473.1}$$

If you choose a $L_{test} = \underline{\text{indentation length}}$

$$G = (284.9 * 284.9) / (2 * 74.1)$$

$$\mathbf{G = 547.9}$$

How to Calculate Stiffness Values

Calculating Frontal Stiffness ([Pre Test] - [Post Test] Distances)

Sometimes, the Damage Profile Distance measurements are not taken/reported/available.

In that case, in Frontal and Rear tests the
[Pre Test] - [Post Test]

measurements might be available, and if so, used.

Left = $4367 - 3950 = 417 \text{ mm} / 25.4 = 16.4 \text{ inches}$

Centerline = $4650 - 3912 = 738 \text{ mm} / 25.4 = 29.1 \text{ inches}$

Right = $4366 - 3964 = 402 \text{ mm} / 25.4 = 15.8 \text{ inches}$

How to Calculate Stiffness Values

Calculating Frontal Stiffness ([Pre Test] - [Post Test] Distances)

When working with essentially equally spaced crush measurements, the **AVERAGE CRUSH** based upon the three [Pre Test] -[Post Test] measurements can be calculated as follows:

$$\text{Crush}_{\text{avg}} = (\text{LeftBumper} + 2 * \text{Centerline} + \text{RightBumper}) / (2 * 2)$$

Which, feeding in values, equates to:

$$\text{Crush}_{\text{avg}} = (16.4 + 2 * 29.1 + 15.8) / (2 * 2)$$

$$\text{Crush}_{\text{avg}} = 90.3 / 4 = \mathbf{22.6 \text{ inches}}$$

How to Calculate Stiffness Values

Calculating Frontal Stiffness ([Pre Test] - [Post Test] Distances)

Calculations:

$$b_1 = \text{slope} = \text{inches} / [\text{inch} * \text{sec}]$$

*Note - depending upon the author the unit notation could also appear as
[inch/sec]/inch or as l/in*

$$b_1 = (\Delta v_{\text{test}} - b_0) / c_{\text{avg}}$$

$$b_1 = ([35.2 * 17.6] - 88) / 22.6$$

$$b_1 = 23.5$$

How to Calculate Stiffness Values

Calculating Frontal Stiffness ([Pre Test] - [Post Test] Distances)

Calculations:

A coefficient = pound/inch

$$A = (W * b_0 * b_1) / (g * L_{\text{test}})$$

If you choose a $L_{\text{test}} = \text{vehicle width}$

$$A = (3280.5 * 88 * 23.5) / (386.4 * 69.5)$$

$$A = 253.0$$

If you choose a $L_{\text{test}} = \text{indentation length}$

$$A = (3280.5 * 88 * 23.5) / (386.4 * 60.0)$$

$$A = 293.0$$

How to Calculate Stiffness Values

Calculating Frontal Stiffness ([Pre Test] - [Post Test] Distances)

Calculations:

B coefficient = pound/inch²

$$B = (W * b_1 * b_1) / (g * L_{\text{test}})$$

If you choose a $L_{\text{test}} = \text{vehicle width}$

$$B = (3280.5 * 23.5 * 23.5) / (386.4 * 69.5)$$

$$\mathbf{B = 67.7}$$

If you choose a $L_{\text{test}} = \text{indentation length}$

$$B = (3280.5 * 23.5 * 23.5) / (386.4 * 60.0)$$

$$\mathbf{B = 78.3}$$

How to Calculate Stiffness Values

Calculating Frontal Stiffness ([Pre Test] - [Post Test] Distances)

Calculations:

G coefficient = pound

$$G = (A * A) / (2 * B)$$

If you choose a $L_{\text{test}} = \text{vehicle width}$

$$G = (253.0 * 253.0) / (2 * 67.7)$$

$$\mathbf{G = 473.1}$$

If you choose a $L_{\text{test}} = \text{indentation length}$

$$G = (293.0 * 293.0) / (2 * 78.3)$$

$$\mathbf{G = 547.9}$$

How to Calculate Stiffness Values

Calculating Frontal Stiffness (Maximum Crush Distance)

When working with the following equations, one should note that only ONE crush measurement is used to calculate the A & B Stiffness values. This is important, because at times, the only crush depth recorded is the MAXIMUM CRUSH. However, some people are concerned that because the equations call for a “Crush_{avg}” measurement, use of only one crush measurement is not permitted. For those people, the AVERAGE CRUSH based upon the Maximum Crush Distance measurement can be calculated as follows:

$$\text{Crush}_{\text{avg}} = (c_{\text{Max}}) / (l)$$

Which, feeding in values, equates to:

$$\text{Maximum Crush} = 738 \text{ mm} / 25.4 = 29.1 \text{ inches}$$

$$\text{Crush}_{\text{avg}} = (29.1) / (l)$$

$$\text{Crush}_{\text{avg}} = \mathbf{29.1 \text{ inches}}$$

How to Calculate Stiffness Values

Calculating Frontal Stiffness (Maximum Crush Distance)

Calculations:

$$b_1 = \text{slope} = \text{inches} / [\text{inch} * \text{sec}]$$

*Note - depending upon the author the unit notation could also appear as
[inch/sec]/inch or as 1/in*

$$b_1 = (\Delta v_{\text{test}} - b_0) / c_{\text{avg}}$$

$$b_1 = ([35.2 * 17.6] - 88) / 29.1$$

$$b_1 = 18.3$$

How to Calculate Stiffness Values

Calculating Frontal Stiffness (Maximum Crush Distance)

Calculations:

A coefficient = pound/inch

$$A = (W * b_0 * b_1) / (g * L_{\text{test}})$$

If you choose a $L_{\text{test}} = \underline{\text{vehicle width}}$

$$A = (3280.5 * 88 * 18.3) / (386.4 * 69.5)$$

$$\mathbf{A = 196.7}$$

If you choose a $L_{\text{test}} = \underline{\text{indentation length}}$

$$A = (3280.5 * 88 * 18.3) / (386.4 * 60.0)$$

$$\mathbf{A = 227.8}$$

How to Calculate Stiffness Values

Calculating Frontal Stiffness (Maximum Crush Distance)

Calculations:

B coefficient = pound/inch²

$$B = (W * b_1 * b_1) / (g * L_{\text{test}})$$

If you choose a $L_{\text{test}} = \underline{\text{vehicle width}}$

$$B = (3280.5 * 18.3 * 18.3) / (386.4 * 69.5)$$

$$\mathbf{B = 40.9}$$

If you choose a $L_{\text{test}} = \underline{\text{indentation length}}$

$$B = (3280.5 * 18.3 * 18.3) / (386.4 * 60.0)$$

$$\mathbf{B = 47.4}$$

How to Calculate Stiffness Values

Calculating Frontal Stiffness (Maximum Crush Distance)

Calculations:

G coefficient = pound

$$G = (A * A) / (2 * B)$$

If you choose a $L_{test} = \underline{\text{vehicle width}}$

$$G = (196.7 * 196.7) / (2 * 40.9)$$

$$\mathbf{G = 473.1}$$

If you choose a $L_{test} = \underline{\text{indentation length}}$

$$G = (227.8 * 227.8) / (2 * 47.4)$$

$$\mathbf{G = 547.9}$$

| | | | |
|--------------------|---------------------|--------|------------------|
| NHTSA Crash Test # | 9984 | | |
| Vehicle | 2017 Toyota Corolla | | |
| Indentation Length | mm | inches | |
| Width | 1524 | 60.0 | |
| | 1765 | 69.5 | |
| Vehicle Weight | kilograms | pounds | |
| Barrier Weight | 1488 | 3280.5 | |
| | | 0.0 | |
| Closing Speed | kph | mph | in/sec |
| | 56.65 | 35.2 | 619.5 |
| No Damage Speed | | 5 | 88.0 |
| Gravity - ft/s/s | | 32.2 | 386.4 <-- in/s/s |

b0 = 88.0

| | Crush Depth (mm) | Crush depth (in) | 6 measurement avg | Trapezoidal Avg |
|-------|------------------|------------------|-------------------|-----------------|
| DPD 1 | 417 | 16.4 | 16.4 | |
| DPD 2 | 588 | 23.1 | 46.3 | 19.8 |
| DPD 3 | 686 | 27.0 | 54.0 | 25.1 |
| DPD 4 | 675 | 26.6 | 53.1 | 26.8 |
| DPD 5 | 592 | 23.3 | 46.6 | 24.9 |
| DPD 6 | 402 | 15.8 | 15.8 | 19.6 |

crush depth = 23.2 23.2 b1= 22.9

| | Pre Test (mm) | Post Test (mm) | Crush Depth (mm) | Crush depth (in) | | |
|--------------|---------------|----------------|------------------|------------------|------|------|
| Left corner | 4367 | 3950 | 417 | 16.4 | 16.4 | |
| Center Line | 4650 | 3912 | 738 | 29.1 | 58.1 | 22.7 |
| Right Corner | 4366 | 3964 | 402 | 15.8 | 15.8 | 22.4 |

crush depth = 22.6 22.6 b1= 23.5

| | Crush Depth (mm) | Crush depth (in) | | |
|---------|------------------|------------------|----------------------|---------------------------|
| Maximum | 738 | 29.1 | crush depth = | 29.1 b1= 18.3 |

Front Stiffness

| | A | B | G |
|----------------------|-------|------|-------|
| DPD Width | 246.0 | 64.0 | 473.1 |
| DPD Indentation | 284.9 | 74.1 | 547.9 |
| Pre-Post Width | 253.0 | 67.7 | 473.1 |
| Pre-Post Indentation | 293.0 | 78.3 | 547.9 |
| Max Width | 196.7 | 40.9 | 473.1 |
| Max Indentation | 227.8 | 47.4 | 547.9 |

How to Research Stiffness Data

Stiffness Calculations - Summary

Side Stiffness

How to Research Stiffness Data

Researching the Side Data

Now that we have obtained Frontal Stiffness values for the Toyota, lets look for the Side and Rear Stiffness data for the 2017 Toyota Corolla. The first thing we will look for are Side tests from which to calculate Side Stiffness values.

So, back to NHTSA and the tests for the 2017-2019 Toyota Corolla -

<https://www.nhtsa.gov/research-data/research-testing-databases#/vehicle>

How to Research Stiffness Data

Researching the Data - Side Data

| | | | | Home | Vehicle | Biomechanics | Component | Crash Avoidance |
|-------|---------------------|----------------------------------|-------|------|---------|--------------|---------------|---|
| | | TEST | | | | | | HATCHBACK |
| 10125 | 2017 TOYOTA COROLLA | FMVSS 301 FUEL SYSTEM INTEGRITY | 0 | 180 | | | | FMVSS 301 TEST REPORTS/PHOTOS/VIDEO |
| 9985 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 32.18 | 270 | 0 | | TRC OF OHIO | 75 DEGREE OBLIQUE RIGID POLE SIDE NCAP IMPACT 1611 |
| 9986 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 62.55 | 270 | 0 | | TRC OF OHIO | MOVING BARRIER INTO LEFT SIDE OF 2017 TOYOTA COROLLA 1611 |
| 10646 | 2019 TOYOTA COROLLA | OPTIONAL NEW CAR ASSESSMENT TEST | 62.14 | 270 | | | ARCH | OPTIONAL NCAP SIDE - 2019 TOYOTA COROLLA HATCHBACK SE 5-DOOR HATCHBACK BT19 |
| 10650 | 2019 TOYOTA COROLLA | OPTIONAL NEW CAR ASSESSMENT TEST | 32.25 | 270 | | | INGA RESEARCH | OPTIONAL NCAP SIDE POLE - 2019 TOYOTA COROLLA HATCHBACK 5-DR HATCHBACK BT19 |
| 10133 | 2017 TOYOTA | RMDB INTO | 90.75 | 345 | | | CALSPAN | RESEARCH AND CV17 |

Pole Test

Barrier ("car") Test

Hatchback Tests - Different Front End, but 4 door, so similar to Sedan on the Side

Test 9986 is the test of choice for this exercise. If you have a pole impact, 9985 would perhaps be preferred. 10646 and 10650 could be used for side and rear tests, but could also open the user to “smoke screen” issues.

How to Research Stiffness Data - Side Data

Researching the Data - Side Data

Home Vehicle Biomechanics Component Crash Avoidance

[Back to Results](#)

Vehicle Crash Test Database: Test Number 9986 NOVEMBER 16, 2016

Test Type
NEW CAR ASSESSMENT TEST

Configuration
IMPACTOR INTO VEHICLE

Make
TOYOTA

Model
COROLLA

Year
2017

Impact Angle
270°

Closing Speed
62 (kph)

Offset Distance
0 (mm)

Performer
TRC OF OHIO

Contract/Study Title
MOVING BARRIER INTO LEFT SIDE OF 2017 TOYOTA COROLLA

Reference Number
161116

Test Objective

Test Type - General

Vehicle Confirmation

Impact Angle

Test Type - General

Test Type - "Specific"

Photos

View All 106 Images

How to Research Stiffness Data

Researching the Data - Side Data

Back to Results Home Vehicle Biomechanics Component Crash Avoidance

Vehicle Crash Test Database: Test Number 9986 NOVEMBER 16, 2016

161116 View All 106 Images

Test Objectives
REDUCE RISK OF SERIOUS & FATAL INJURY TO OCCUPANT OF PASSENGER CARS

Contract Number
DTNH2214D00354

Test Track Surface
CONCRETE

Test Track Surface Condition
DRY

Reports
M20175106 2017 Toyota Corolla 4DR Sedan SINCAP Final Report.pdf

Download Instrumentation Data
NHTSA UDS-1992
NHTSA EV5 ASCII X-Y
Altair Binary Format (ABF)
NHTSA ISO_MME
DIAdem TDMS

Download Metadata

Contractor Report for Download

Video Downloads

| ID | Description | Size |
|----|--|-------------|
| 1 | 01 Overhead Wide View.wmv | (21.48 MB) |
| 2 | 02 Overhead Close-Up View.wmv | (20.84 MB) |
| 3 | 03 Impact Point.wmv | (66.59 MB) |
| 4 | 04 Struck-Side View at Impact.wmv | (75.25 MB) |
| 5 | 05 Rear Impact View of Struck Side.wmv | (75.37 MB) |
| 6 | 06 Front Oblique Impact View of Struck Side.wmv | (64.24 MB) |
| 7 | 07 Driver Dummy Front View (Onboard).wmv | (51.13 MB) |
| 8 | 08 Driver Dummy Side View (Onboard).wmv | (50.66 MB) |
| 9 | 09 Rear Passenger Dummy Side View (Onboard).wmv | (38.18 MB) |
| 10 | 10 Real-Time Rear View of Impact.wmv | (1.65 MB) |
| 11 | 11 Real-Time Pan View of Impact.wmv | (3.78 MB) |
| 12 | Real-Time Documentary.wmv | (149.96 MB) |
| 13 | M20175106 2017 Toyota Corolla 4DR Sedan MDB Impact for Web.wmv | (380 KB) |

Videos for download

Details for vehicle and Barrier

| # | VEHICLE | ENGINE | WEIGHT(Kgrams) | SPEED(kph) | LENGTH(mm) | WIDTH(mm) | CRUSH DIS.(mm) |
|---|---------------------------|-----------------------------|----------------|------------|------------|-----------|----------------|
| 1 | NHTSA DEFORMABLE IMPACTOR | NOT APPLICABLE | 1363 | 62.55 | 4115 | 1252 | 373 |
| 2 | 2017 TOYOTA COROLLA | 4 CYLINDER TRANSVERSE FRONT | 1474 | 0.00 | 4650 | 1768 | 205 |

Summary data - Weight, Speed, Crush

Click on the 1 and 2 to get the detail information for Barrier and Vehicle.

How to Research Stiffness Data

Researching the Data - Side Data - Barrier

Vehicle Crash Test Database: Test Number 9986

NOVEMBER

161116

Test Objectives

REDUCE RISK OF SERIOUS

Contract Number

DTNH2214D00354

Test Track Surface

CONCRETE

Test Track Surface Co

DRY

Reports

M20175106 2017 Te

Download Instrument

NHTSA UDS-1992

NHTSA EV5 ASCII X-1

Altair Binary Format

NHTSA ISO_MME

DIAdem TDMS

Download Metadata

YEAR/MAKE

1 NHTSA DEFC

Vehicle Detail Information

| | |
|--|---|
| Vehicle | NHTSA DEFORMABLE IMPACTOR |
| Body Type | NOT APPLICABLE |
| Engine | 0.0L NOT APPLICABLE |
| Weight Tested | 1363(kg) |
| Vehicle Size w x l | 1252 x 4115 (mm) |
| NHTSA # | |
| Commentary | MAX CRUSH 200 MM LEFT AND RIGHT OF CENTER |
| VIN | |
| Modification Indicator | RESEARCH VEHICLE |
| Description of Vehicle Modification | VEHICLE WAS A 214 CART WITH DEFORMABLE BARRIER FACE |
| Maximum Crush Distance | 373 |
| Transmission | NOT APPLICABLE |
| Vehicle Center of Gravity Distance Behind Front Axle | 1109 |
| Steering Column Shear Capsule Separation | NOT APPLICABLE (N) |

Vehicle Weight = 1363 kg * 2.205 = 3004.9 pounds

How to Research Stiffness Data

Researching the Data - Side Data - Barrier

Vehicle Crash Test Database: Test Number 9986

NOVEMBER

| | | |
|-----------------------|---|--------------------|
| 161116 | Steering Column Shear Capsule Separation | NOT APPLICABLE (N) |
| Test Objectives | Steering Column Collapse Mechanism | NOT APPLICABLE (N) |
| REDUCE RISK OF SERI | Vehicle Speed | 62.55 |
| Contract Number | Crabbed Angle | 27 |
| DTNH2214D00354 | Principal Direction of Force | 0 |
| Test Track Surface | Bumper Engagement | NA |
| CONCRETE | Sill Engagement | NOT APPLICABLE |
| Test Track Surface Co | A-Pillar Engagement | NOT APPLICABLE |
| DRY | Vehicle Damage Index (Collision Deformation Classification) | |
| Reports | Angle of Moving Test Cart | 0 |
| M20175106 2017 To | Vehicle Orientation of Moving Cart | 0 |
| Download Instrument | Total Length of Indentation | 1600 |
| NHTSA UDS-1992 | Distance between center of Damaged area and C.G. Axis | 0 |
| NHTSA EV5 ASCII X- | Damage Profile Distances One | 149 |
| Altair Binary Format | Damage Profile Distances Two | 140 |
| NHTSA ISO_MME | Damage Profile Distances Three | 373 |
| DIadem TDMS | Damage Profile Distances Four | 373 |
| Download Metadata | | |
| # YEAR/MAKE | | |
| 1 NHTSA DEFO | | |

Barrier Closing Speed = $62.55 \text{ kph} / 1.609 = 38.9 \text{ mph}$

How to Research Stiffness Data

Researching the Data - Side Data - Barrier

Vehicle Crash Test Database: Test Number 9986 NOVEMBER

| | |
|---|----------------|
| Sill Engagement | NOT APPLICABLE |
| A-Pillar Engagement | NOT APPLICABLE |
| Vehicle Damage Index (Collision Deformation Classification) | |
| Angle of Moving Test Cart | 0 |
| Vehicle Orientation of Moving Cart | 0 |
| Total Length of Indentation | 1600 |
| Distance between center of Damaged area and C.G. Axis | 0 |
| Damage Profile Distances One | 149 |
| Damage Profile Distances Two | 140 |
| Damage Profile Distances Three | 373 |
| Damage Profile Distances Four | 373 |
| Damage Profile Distances Five | 212 |
| Damage Profile Distances Six | 236 |
| Pre-test - Total Length of Vehicle at centerline: | 0 |
| Pre-test - Rear Surface of Vehicle to Front of Engine: | 0 |
| Pre-test - Rear Surface of Vehicle to Firewall: | 0 |
| Pre-test - Rear Surface of Vehicle to Upper Leading Edge of Right Door: | 0 |

Many tests do not contain this data for the barrier. Even with it ... what are the barrier Stiffness Values??

For that reason, I ignore them. Result? Slightly higher than actual stiffness values for the vehicle.

Barrier crush is included in this test, however, often times it is not included, especially in the earlier years of the NHTSA Crash Testing.

How to Research Stiffness Data

Researching the Data - Side Data - Vehicle

Vehicle Crash Test Database: Test Number 9986 NOVEMBER

| Vehicle Detail Information | |
|--|----------------------------------|
| Vehicle | TOYOTA COROLLA 2017 |
| Body Type | FOUR DOOR SEDAN |
| Engine | 1.8L 4 CYLINDER TRANSVERSE FRONT |
| Weight Tested | 1474(kg) |
| Vehicle Size w x l | 1768 x 4650 (mm) |
| NHTSA # | M20175106 |
| Commentary | MAX CRUSH AT H-POINT |
| VIN | 2T1BURHEXHC750301 |
| Modification Indicator | PRODUCTION VEHICLE |
| Maximum Crush Distance | 205 |
| Transmission | AUTOMATIC - FRONT WHEEL DRIVE |
| Vehicle Center of Gravity Distance Behind Front Axle | 1121 |
| Steering Column Shear Capsule Separation | NOT APPLICABLE (N) |
| Steering Column Collapse Mechanism | NOT APPLICABLE (N) |

Vehicle Test Weight = 1474 kg * 2.205 = 3249.6 pounds

Max Crush = 205 mm / 25.4 = 8.1 inches

How to Research Stiffness Data

Researching the Data - Side Data - Vehicle

Vehicle Crash Test Database: Test Number 9986 NOVEMBER

| | |
|---|----------------------|
| Steering Column Collapse Mechanism | NOT APPLICABLE (N) |
| Vehicle Speed | 0.00 |
| Crabbed Angle | 0 |
| Principal Direction of Force | 270 |
| Bumper Engagement | NA |
| Sill Engagement | DIRECT ENGAGEMENT |
| A-Pillar Engagement | NO DIRECT ENGAGEMENT |
| Vehicle Damage Index (Collision Deformation Classification) | 09LPEW2 |
| Angle of Moving Test Cart | 0 |
| Vehicle Orientation of Moving Cart | 0 |
| Total Length of Indentation | 2700 |
| Distance between center of Damaged area and C.G. Axis | -341 |
| Damage Profile Distances One | 2 |
| Damage Profile Distances Two | 156 |
| Damage Profile Distances Three | 159 |
| Damage Profile Distances Four | 201 |
| Damage Profile Distances Five | 182 |

Vehicle Speed = 0

PDOF and VDI confirm side impact

How to Research Stiffness Data

Researching the Data - Side Data - Vehicle

Vehicle Crash Test Database: Test Number 9986 NOVEMBER

| | | |
|--|--|------|
| 161116 | Vehicle Orientation of Moving Cart: | 0 |
| Test Objectives REDUCE RISK OF SERI | Total Length of Indentation | 2700 |
| Contract Number DTNH2214D00354 | Distance between center of Damaged area and C.G. Axis | -341 |
| Test Track Surface CONCRETE | Damage Profile Distances One | 2 |
| Test Track Surface Co DRY | Damage Profile Distances Two | 156 |
| Reports M20175106 2017 To | Damage Profile Distances Three | 159 |
| Download Instrument NHTSA UDS-1992 NHTSA EV5 ASCII X-3 Altair Binary Format NHTSA ISO_MME DIAdem TDMS | Damage Profile Distances Four | 201 |
| Download Metadata | Damage Profile Distances Five | 182 |
| # YEAR/MAKE | Damage Profile Distances Six | 4 |
| 1 NHTSA DEFE | Pre-test - Total Length of Vehicle at centerline: | 0 |
| | Pre-test - Rear Surface of Vehicle to Front of Engine: | 0 |
| | Pre-test - Rear Surface of Vehicle to Firewall: | 0 |
| | Pre-test - Rear Surface of Vehicle to Upper Leading Edge of Right Door: | 0 |
| | Pre-test - Rear Surface of Vehicle to Upper Leading Edge of Left Door: | 0 |
| | Pre-test - Rear Surface of Vehicle to Lower Leading Edge of Right Door: | 0 |
| | Pre-test - Rear Surface of Vehicle to Lower Leading Edge of Left Door: | 0 |
| | Pre-test - Rear Surface of Vehicle to Upper Trailing Edge of Right Door: | 0 |

"0's" for the rest of data fields

Indentation length = $2700 \text{ mm} / 25.4 = 106.3 \text{ inches}$

DPD1 = $2 \text{ mm} / 25.4 = 0.1 \text{ in}$ DPD4 = $201 \text{ mm} / 25.4 = 7.9 \text{ in}$

DPD2 = $156 \text{ mm} / 25.4 = 6.1 \text{ in}$ DPD5 = $182 \text{ mm} / 25.4 = 7.2 \text{ in}$

DPD3 = $159 \text{ mm} / 25.4 = 6.3 \text{ in}$ DPD6 = $4 \text{ mm} / 25.4 = 0.2 \text{ in}$

How to Calculate Stiffness Values

Calculating Side Stiffness (Damage Profile Distances)

Complication - Calculations:

The speed to be used in the stiffness calculations IS NOT the closing speed, rather an estimation of the **KEES** speed needs to be calculated. For further discussion of why, see Mr. Vomhof's paper on why the **KE Equivalent Speed (KEES) [500K]** needs to be calculated for side and rear impact tests in the NHTSA Crash Test database which can be downloaded from the 4N6XPRT Systems web site at: <http://www.4n6xpert.com/papers.htm>.

How to Calculate Stiffness Values

Calculating Side Stiffness

(Damage Profile Distances)

Complication - Calculations (cont.):

The KEES speed can be calculated as follows:

$$\text{KEES} = \text{SQR}([W_{\text{barrier}} * \text{Speed}_{\text{Closing}}^2] / [W_{\text{barrier}} + W_{\text{vehicle}}])$$

With data becomes -

$$\text{KEES} = \text{SQR}([3004.9 * 38.9^2] / [3004.9 + 3249.6])$$

$$\text{KEES} = \text{SQR}([4547045] / [6254.5])$$

$$\text{KEES} = \text{SQR}(727.0)$$

$$\text{KEES} = 26.9 \text{ mph}$$

How to Calculate Stiffness Values

Calculating Side Stiffness (Damage Profile Distances)

When working with essentially equally spaced crush measurements, the **AVERAGE CRUSH** based upon the six Damage Profile Distance measurements can be calculated as follows:

$$\text{Crush}_{\text{avg}} = (c_1 + 2*c_2 + 2*c_3 + 2*c_4 + 2*c_4 + 2*c_5 + c_6) / (2*5)$$

Which, feeding in values, equates to:

$$\text{Crush}_{\text{avg}} = (0.1 + 2*6.1 + 2*6.3 + 2*7.9 + 2*7.2 + 0.2) / (2*5)$$

$$\text{Crush}_{\text{avg}} = 55.2 / 10 = \mathbf{5.5 \text{ inches}}$$

How to Calculate Stiffness Values

Calculating Side Stiffness (Damage Profile Distances)

Variables:

$$\Delta v_{\text{test}} = \text{KEES Speed} * 17.6 = \text{in/sec}$$

$$c_{\text{avg}} = \text{calculated average crush} = \text{inches}$$

$$W = \text{Target Vehicle weight} = \text{pounds}$$

$$g = \text{acceleration due to gravity} = 386.4 \text{ inch/sec}^2$$

b_0 = No Damage Speed (Damage Threshold). If no specific knowledge of the vehicle is available, the beginning frontal NO DAMAGE SPEED is assumed to be ~2.0 mph. For calculations we will use 2.0 mph = 35.2 in/sec

$$L_{\text{test}} = \text{Damage Length} = \text{inches}$$

How to Calculate Stiffness Values

Calculating Side Stiffness (Damage Profile Distances)

Calculations:

$$b_1 = \text{slope} = \text{inches} / [\text{inch} * \text{sec}]$$

Note - depending upon the author the unit notation could also appear as [inch/sec]/inch or as 1/in

$$b_1 = (\Delta v_{\text{test}} - b_0) / c_{\text{avg}}$$

$$b_1 = ([26.9 * 17.6] - 35.2) / 5.5$$

$$b_1 = 79.5$$

How to Calculate Stiffness Values

Calculating Side Stiffness (Damage Profile Distances)

Calculations:

A coefficient = pound/inch

$$A = (W * b_0 * b_1) / (g * L_{\text{test}})$$

L_{test} = indentation length

$$A = (3249.6 * 35.2 * 79.5) / (386.4 * 106.3)$$

$$A = 221.5$$

How to Calculate Stiffness Values

Calculating Side Stiffness (Damage Profile Distances)

Calculations:

B coefficient = pound/inch²

$$B = (W * b_1 * b_1) / (g * L_{\text{test}})$$

L_{test} = indentation length

$$B = (3249.6 * 79.5 * 79.5) / (386.4 * 106.3)$$

$$\mathbf{B = 500.3}$$

How to Calculate Stiffness Values

Calculating Side Stiffness (Damage Profile Distances)

Calculations:

G coefficient = pound

$$G = (A * A) / (2 * B)$$

L_{test} = indentation length

$$G = (221.5 * 221.5) / (2 * 500.3)$$

$$\mathbf{G = 49.0}$$

How to Calculate Stiffness Values

Calculating Side Stiffness (Maximum Crush Distance)

When working with the following equations, one should note that only ONE crush measurement is used to calculate the A & B Stiffness values. This is important, because at times, the only crush depth recorded is the MAXIMUM CRUSH. However, some people are concerned that because the equations call for a “Crush_{avg}” measurement, use of only one crush measurement is not permitted. For those people, the AVERAGE CRUSH based upon the Maximum Crush Distance measurement can be calculated as follows:

$$\text{Crush}_{\text{avg}} = (c_{\text{Max}}) / (l)$$

Which, feeding in values, equates to:

$$\text{Crush}_{\text{avg}} = (8.1) / (1)$$

$$\text{Crush}_{\text{avg}} = \mathbf{8.1 \text{ inches}}$$

How to Calculate Stiffness Values

Calculating Side Stiffness (Maximum Crush Distance)

Calculations:

$$b_1 = \text{slope} = \text{inches} / [\text{inch} * \text{sec}]$$

*Note - depending upon the author the unit notation could also appear as
[inch/sec]/inch or as 1/in*

$$b_1 = (\Delta v_{\text{test}} - b_0) / c_{\text{avg}}$$

$$b_1 = ([26.9 * 17.6] - 35.2) / 8.1$$

$$b_1 = 54.4$$

How to Calculate Stiffness Values

Calculating Side Stiffness (Maximum Crush Distance)

Calculations:

A coefficient = pound/inch

$$A = (W * b_0 * b_1) / (g * L_{\text{test}})$$

L_{test} = indentation length

$$A = (3249.6 * 35.2 * 54.4) / (386.4 * 106.3)$$

$$A = 151.5$$

How to Calculate Stiffness Values

Calculating Side Stiffness (Maximum Crush Distance)

Calculations:

B coefficient = pound/inch²

$$B = (W * b_1 * b_1) / (g * L_{\text{test}})$$

L_{test} = indentation length

$$B = (3249.6 * 54.4 * 54.4) / (386.4 * 106.3)$$

$$\mathbf{B = 234.0}$$

How to Calculate Stiffness Values

Calculating Side Stiffness (Maximum Crush Distance)

Calculations:

G coefficient = pound

$$G = (A * A) / (2 * B)$$

L_{test} = indentation length

$$G = (151.5 * 151.5) / (2 * 234.0)$$

$$\mathbf{G = 49.0}$$

| | | | | | | | |
|--------------------|---------------------|--------|-------------|------------------|-------------|-------|-------------|
| NHTSA Crash Test # | 9986 | | | | | | |
| Vehicle | 2017 Toyota Corolla | | | | | | |
| | mm | inches | | | | | |
| Indentation Length | 2700 | | 106.3 | | | | |
| Width | 1768 | | 69.6 | | | | |
| | kilograms | pounds | | | | | |
| Vehicle Weight | 1474 | | 3249.6 | | | | |
| Barrier Weight | 1363 | | 3004.9 | | | | |
| | kph | mph | in/sec | | | | |
| Closing Speed | 0 | | 0.0 | 0.0 | | mph | in/sec |
| Barrier Speed | 62.55 | | 38.9 | 684.1 | KEES = | 26.94 | 474.1 |
| No Damage Speed | | 2 | | 35.2 | b0 = | | 35.2 |
| Gravity - ft/s/s | | | 32.2 | 386.4 <-- in/s/s | | | |

| | Crush Depth (mm) | Crush depth (in) | 6 measurement avg | Trapezoidal Avg | | |
|-------|------------------|------------------|-------------------|-----------------|----------------------|-------------|
| DPD 1 | 2 | 0.1 | 0.1 | | | |
| DPD 2 | 156 | 6.1 | 12.3 | 3.1 | | |
| DPD 3 | 159 | 6.3 | 12.5 | 6.2 | | |
| DPD 4 | 201 | 7.9 | 15.8 | 7.1 | | |
| DPD 5 | 182 | 7.2 | 14.3 | 7.5 | | |
| DPD 6 | 4 | 0.2 | 0.2 | 3.7 | | |
| | 1363 | 53.7 | | | crush depth = | 5.5 |
| | | | | | | 5.5 |
| | | | | | b1= | 79.5 |

| | Crush Depth (mm) | Crush depth (in) | | | | |
|---------|------------------|------------------|--|--|----------------------|-------------|
| Maximum | 205 | 8.1 | | | crush depth = | 8.1 |
| | | | | | b1= | 54.4 |

Side Stiffness

| | A | B | G |
|-----------------|-------|-------|------|
| DPD Indentation | 221.5 | 500.3 | 49.0 |
| Max Indentation | 151.5 | 234.0 | 49.0 |

How to Research Stiffness Data

Stiffness Calculations - Summary

Rear Stiffness

How to Research Stiffness Data

Researching the Data - Rear Data

Now lets look for the Rear Stiffness data for the 2017 Toyota Corolla. An important thing to be aware of is that post 1998 there are very few Rear Tests, and even fewer that have sufficient data to calculate Stiffness Values

To look for any Rear tests, we go back to NHTSA and the tests for the 2017-2019 Toyota Corolla -

<https://www.nhtsa.gov/research-data/research-testing-databases#/vehicle>

How to Research Stiffness Data

Researching the Data - Rear Data

Home Vehicle Biomechanics Component Crash Avoidance

PREVIOUS 1 NEXT

| TEST | YEAR/MAKE/MODEL | TEST TYPE | CLOSING SPEED (kph) | IMPACT ANGLE (°) ↑ | OFFSET DISTANCE (mm) | PERFORMER | CONTRACT/STUDY TITLE | REF # | CRUSH DIS. | TEST CONTEN |
|-------|---------------------|--|---------------------|--------------------|----------------------|--------------|---|---------------|------------|-------------|
| 9984 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 56.65 | 0 | 0 | TRC OF OHIO | NEW CAR ASSESSMENT PROGRAM FRONTAL IMPACT TESTING | 161114 | 738 | |
| 10078 | 2017 TOYOTA COROLLA | OUT OF POSITION (TWG) SIDE AIRBAG DEPLOYMENT TESTS | 0 | 0 | 0 | TRC OF OHIO | 2017 TOYOTA COROLLA STATIC SAB OOP TEST | M20175106TWG2 | 0 | |
| 10651 | 2019 TOYOTA COROLLA | OPTIONAL NEW CAR ASSESSMENT TEST | 56.41 | 0 | 0 | MGA RESEARCH | OPTIONAL NCAP - 2019 TOYOTA COROLLA HATCHBACK SE 5-DR HATCHBACK | BT19011131 | 506 | |
| 10125 | 2017 TOYOTA COROLLA | FMVSS 301 FUEL SYSTEM INTEGRITY | 0 | 180 | 0 | CALSPAN | FMVSS 301 TEST REPORTS/PHOTOS/VIDEO | | 0 | |
| 9985 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 32.18 | 270 | 0 | TRC OF OHIO | 75 DEGREE OBLIQUE RIGID POLE SIDE NCAP IMPACT | 161115 | 330 | |
| 9986 | 2017 TOYOTA COROLLA | NEW CAR ASSESSMENT TEST | 62.55 | 270 | 0 | TRC OF OHIO | MOVING BARRIER INTO LEFT SIDE OF 2017 TOYOTA COROLLA | 161116 | 205 | |

Impact angle = 180, so a possible Rear Test, but 180 is also used/entered for frontal tests by the test contractors.

How to Research Stiffness Data

Researching the Data - Rear Data

Back to Results Home Vehicle Biomechanics Component Crash Avoidance

Vehicle Crash Test Database: Test Number 10125

Test Type
FMVSS 301 FUEL SYSTEM INTEGRITY

Configuration
IMPACTOR INTO VEHICLE

Make
TOYOTA

Model
COROLLA

Year
2017

Impact Angle
180°



Closing Speed
0 (kph)

Offset Distance
0 (mm)

Performer
CALSPAN

Contract/Study Title
FMVSS 301 TEST REPORTS/PHOTOS/VIDEO

Reference Number



View All 126 Images

When looking at test 10125, the Test Type and Impact Angle are consistent with a Rear Test.

How to Research Stiffness Data

Researching the Data - Rear Data

Back to Results Home Vehicle Biomechanics Component Crash Avoidance

Vehicle Crash Test Database: Test Number 10125

Contract/Study Title
FMVSS 301 TEST REPORTS/PHOTOS/VIDEO

Reference Number

Test Objectives
NO INSTRUMENTATION OR OCCUPANT DATA

Contract Number
XXXX

Test Track Surface
CONCRETE

Test Track Surface Condition
DRY

Reports
C20175102-2017 Toyota Corolla- 301R Final Report.pdf

Download Instrumentation Data

Download Metadata

Video Downloads

| | | |
|---|---|------------|
| 1 | C20175102 - Impact Point.avi | (8 MB) |
| 2 | C20175102 - Left Side View.avi | (17.48 MB) |
| 3 | C20175102 - Overhead View.avi | (42.22 MB) |
| 4 | C20175102 - Right Side View.avi | (19.61 MB) |
| 5 | C20175102 - 2017 Toyota Corolla Real-Time.avi | (10.73 MB) |

| VEHICLE | | BARRIER | INSTRUMENTATION | | | OCCUPANT | |
|---------|---------------------------|----------------|-----------------|------------|------------|-----------|----------------|
| # | YEAR/MAKE/MODEL | ENGINE | WEIGHT(Kgrams) | SPEED(kph) | LENGTH(mm) | WIDTH(mm) | CRUSH DIS.(mm) |
| 1 | NHTSA DEFORMABLE IMPACTOR | NOT APPLICABLE | 0 | 0.00 | 0 | 0 | 0 |
| 2 | 2017 TOYOTA COROLLA | NOT APPLICABLE | 0 | 0.00 | 0 | 0 | 0 |

Click on the 1 & 2 in the bottom left corner to get detail info on the barrier and the vehicle. However, the lack of data in the barrier and Vehicle rows is not promising. The contractor Report can also be downloaded.

How to Research Stiffness Data

Researching the Data - Rear Data - Barrier

Back to Results Home Vehicle Biomechanics Component Crash

Vehicle Crash Test Database: Test Number 10125

Contract/Study Title: FMVSS 301 TEST...
Reference Number:
Test Objectives: NO INSTRUMENTA...
Contract Number: XXXX
Test Track Surface: CONCRETE
Test Track Surface: DRY
Reports: C20175102-2017
Download Instrum...
Download Metada...

YEAR/MA

| Vehicle Detail Information | |
|--|---------------------------|
| Vehicle | NHTSA DEFORMABLE IMPACTOR |
| Body Type | NOT APPLICABLE |
| Engine | 0.0L NOT APPLICABLE |
| Weight Tested | 0(kg) |
| Vehicle Size w x l | 0 x 0 (mm) |
| NHTSA # | |
| Commentary | NHTSA REAR MDB |
| VIN | |
| Modification Indicator | RESEARCH VEHICLE |
| Maximum Crush Distance | 0 |
| Transmission | NOT APPLICABLE |
| Vehicle Center of Gravity Distance Behind Front Axle | 0 |

All Calc Data are 0

All Barrier Data needed for calculating stiffness data is "0".

How to Research Stiffness Data

Researching the Data - Rear Data

Vehicle Crash Test Database: Test Number 10125

| Vehicle Detail Information | |
|--|--------------------------------------|
| Vehicle | TOYOTA COROLLA 2017 |
| Body Type | NOT APPLICABLE |
| Engine | 0.0L NOT APPLICABLE |
| Weight Tested | 0(kg) |
| Vehicle Size w x l | 0 x 0 (mm) |
| NHTSA # | C20175102 |
| Commentary | 2017 TOYOTA COROLLA C20175102 645100 |
| VIN | |
| Modification Indicator | PRODUCTION VEHICLE |
| Maximum Crush Distance | 0 |
| Transmission | NOT APPLICABLE |
| Vehicle Center of Gravity Distance Behind Front Axle | 0 |

All data for Calcs
are 0

As with the barrier, all data for calculating stiffness data is "0".

How to Research Stiffness Data

Researching the Data - Rear Data

REPORT NUMBER: 301R-CAL-17-004

SAFETY COMPLIANCE TESTING FOR FMVSS 301R
FUEL SYSTEM INTEGRITY – REAR IMPACT

Toyota Motor Manufacturing, Canada, Inc.
2017 Toyota Corolla

NHTSA NUMBER: C20175102

PREPARED BY:
CALSPAN CORPORATION
TRANSPORTATION TEST OPERATIONS
P.O. BOX 400
BUFFALO, NEW YORK 14225



Given the lack of data in the online database, lets look at the Contractor Report.

How to Research Stiffness Data

Researching the Data - Rear Data

SECTION 2

COMPLIANCE TEST RESULTS SUMMARY

A 1,510 kg 2017 Toyota Corolla four door sedan was impacted from the rear by a 1357.0 kg moving barrier at a velocity of 79.24 kph (49.23 mph). The test was performed by Calspan Corporation on June 2, 2017

The test vehicle was equipped with a 50.3 liter fuel tank which was filled to 93 percent capacity with stoddard fluid prior to impact. Additional ballast (37 kg) was secured in the vehicle's rear passenger foot well. Two ballast Part 572E 50th percentile male Anthropomorphic Test Devices (ATD) were placed in the front occupant seating positions.

The crash event was recorded by three high-speed cameras and one real-time camera. High-speed camera locations and other pertinent camera information can be found on page 3-7 of this report. Pre- and post-test photographs of the vehicle can be found in Appendix A.

There was no fuel system fluid spillage following the impact and including all portions of the static rollover test. The maximum vehicle longitudinal crush was 740 millimeters of which the average was 588 millimeters. The vehicle appeared to comply with all the requirements of FMVSS No. 301 "Fuel System Integrity."

Summary contains weights for the barrier, the Toyota Corolla, and the barrier Closing Speed. Also Maximum and Average Crush to the Toyota.

How to Research Stiffness Data

Researching the Data - Rear Data

| | | | | | | | |
|--------|----|-----|-----|------|-----|-----|------|
| Totals | kg | 801 | 511 | 1312 | 904 | 606 | 1510 |
|--------|----|-----|-----|------|-----|-----|------|

TARGET TEST WEIGHT CALCULATION (TTW)

| Measured Parameter | Units | Value | |
|--------------------------------------|-------|--------|---------|
| Total Unloaded Vehicle Weight (UVW) | kg | 1312 | (A) |
| Rated Cargo/Luggage Weight (RCLW) | kg | 49.8 | (B) |
| Weight of two P572E ATDS @ 74kg each | kg | 155.4 | (C) |
| Target Vehicle Test Weight (TVTW) | kg | 1517.2 | (A+B+C) |

*As tested Weight = (TVTW -10kg) <=ATW < (TVTW -5kg); TVTW = Weight of Test Vehicle with 2 dummies and 49.8kg of Cargo Weight

MDB WEIGHTS

| | Units | Front | Rear | Total |
|--------|-------|-------|-------|--------|
| Left | kg | 358.0 | 322.0 | 680.0 |
| Right | kg | 404.0 | 273.0 | 677.0 |
| Ratio | % | 56.2% | 43.8% | 100.0% |
| Totals | kg | 762.0 | 595.0 | 1357.0 |

Weights for the Toyota and the Barrier

Toyota = 1517.2 kg * 2.205 = 3344.8 pounds

Barrier = 1357.0 kg * 2.205 = 2991.7 pounds

How to Research Stiffness Data

Researching the Data - Rear Data

GENERAL TEST VEHICLE DATA

| Measured Parameter | Units | Value |
|--|-------|----------------|
| Vehicle Wheelbase | mm | 2701 |
| Vehicle Length (at Centerline) | mm | 4646 |
| Vehicle Width | mm | 1761 |
| Weight of Ballast Secured in Cargo Area ¹ | kg | 37 |
| Type of Ballast | | Lead Shot |
| Method of Securing Ballast | | Rear Foot Well |
| Components Removed for Weight Reduction | | 0 |
| Vehicle Width at Widest Point | mm | 1775 |
| Vehicle Width at Widest Point Location | | C-Pillar |
| Centerline offset for impact line | mm | 355 |
| Filler neck side (left/right) | | Left |

¹ Ballast weight does not include the weight of instrumentation, on-board cameras and data acquisition system

Vehicle Width = $1761 \text{ mm} / 25.4 = 69.3 \text{ in}$

There is no recorded Indentation length, so the full vehicle width will be used.

How to Research Stiffness Data

Researching the Data - Rear Data

VEHICLE CRUSH MEASUREMENTS: LENGTH

| Measurement | Left Side | Centerline | Right Side |
|-------------|-----------|------------|------------|
| Pre-Test | 4543 | 4646 | 4546 |
| Post-Test | 3803 | 4013 | 4156 |
| Crush | -740 | -633 | -390 |

Vehicle Crush Depths - Pre-Test - Post-Test

Left Side: $4543 - 3803 = 740 \text{ mm} / 25.4 = 29.1 \text{ in}$

Centerline: $4646 - 4013 = 633 \text{ mm} / 25.4 = 24.9 \text{ in}$

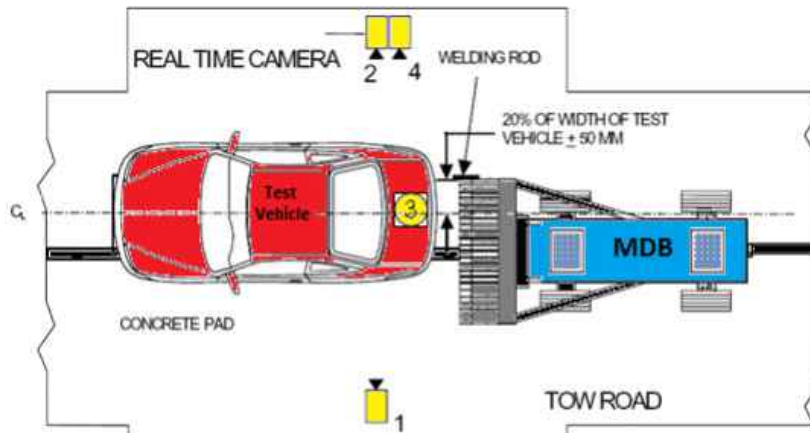
Right Side: $4546 - 4156 = 390 \text{ mm} / 25.4 = 15.4 \text{ in}$

How to Research Stiffness Data

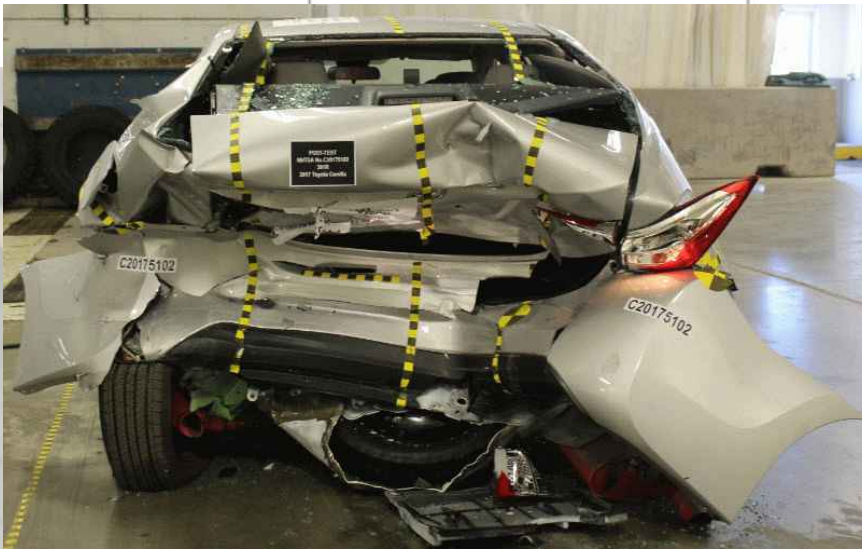
Researching the Data - Rear Data

Test Vehicle: 2017 Toyota Corolla four door sedan
Test Program: FMVSS 301R Compliance Rear Impact Test

NHTSA No.: C20175102
Test Date: 6/2/2017



Test configuration
And damage



How to Research Stiffness Data

Researching the Data - Rear Data

DATA SHEET NO. 5 POST-TEST DATA

Test Vehicle: 2017 Toyota Corolla four door sedan
Test Program: FMVSS 301R Compliance Rear Impact Test

NHTSA No.: C20175102
Test Date: 6/2/2017

VIN: 2T1BURHE8HC754623

REQUIRED IMPACT VELOCITY RANGE: 78.5 to 80.1 km/h

ACTUAL IMPACT VELOCITY (WITHIN 1.5 M OF IMPACT PLANE)

| Measurement Description | Units | Speed |
|-------------------------|-------|-------|
| Trap No. 1 | km/h | 79.24 |
| Trap No. 2 | km/h | 79.14 |

The barrier impact speed is recorded as 79.24 and 79.14 kph. 79.24 will be used for this exercise since that is what is in the summary

$$\text{Barrier speed} = 79.24 \text{ kph} / 1.609 = 49.2 \text{ mph}$$

How to Calculate Stiffness Values

Calculating Rear Stiffness

Calculations:

The speed to be used in the stiffness calculations IS NOT the closing speed, rather an estimation of the **KEES** speed needs to be calculated. For further discussion of why, see Mr. Vomhof's paper on why the **KE Equivalent Speed (KEES) [500K]** needs to be calculated for side and rear impact tests in the NHTSA Crash Test database which can be downloaded from the 4N6XPRT Systems web site at: <http://www.4n6xpert.com/papers.htm>.

How to Calculate Stiffness Values

Calculating Rear Stiffness

Calculations (cont.):

The KEES speed can be calculated as follows:

$$\text{KEES} = \text{SQR}([W_{\text{barrier}} * \text{Speed}_{\text{Closing}}^2] / [W_{\text{barrier}} + W_{\text{vehicle}}])$$

With data becomes -

$$\text{KEES} = \text{SQR}([2991.7 * 49.2^2] / [2991.7 + 3344.8])$$

$$\text{KEES} = \text{SQR}([7241828.7] / [6336.5])$$

$$\text{KEES} = \text{SQR}(1142.9)$$

$$\text{KEES} = 33.8 \text{ mph}$$

How to Calculate Stiffness Values

Calculating Rear Stiffness (Damage Profile Distances)

Variables:

$$\Delta v_{\text{test}} = \text{KEES Speed} * 17.6 = \text{in/sec}$$

$$c_{\text{avg}} = \text{calculated average crush} = \text{inches}$$

$$W = \text{Target Vehicle weight} = \text{pounds}$$

$$g = \text{acceleration due to gravity} = 386.4 \text{ inch/sec}^2$$

b_0 = No Damage Speed (Damage Threshold). If no specific knowledge of the vehicle is available, the beginning frontal NO DAMAGE SPEED is assumed to be ~4.7-5.0 mph. For calculations we will use 5.0 mph = 88 in/sec

$$L_{\text{test}} = \text{Damage Width} = \text{inches}$$

How to Calculate Stiffness Values

Calculating Rear Stiffness

([Pre Test] - [Post Test] Distances)

When working with essentially equally spaced crush measurements, the **AVERAGE CRUSH** based upon the three [Pre Test] -[Post Test] measurements can be calculated as follows:

$$\text{Crush}_{\text{avg}} = (\text{LeftBumper} + 2 * \text{Centerline} + \text{RightBumper}) / (2 * 2)$$

Which, feeding in values, equates to:

$$\text{Crush}_{\text{avg}} = (29.1 + 2 * 24.9 + 15.4) / (2 * 2)$$

$$\text{Crush}_{\text{avg}} = 94.3 / 4 = \mathbf{23.6 \text{ inches}}$$

How to Calculate Stiffness Values

Calculating Rear Stiffness ([Pre Test] - [Post Test] Distances)

Calculations:

$$b_1 = \text{slope} = \text{inches} / [\text{inch} * \text{sec}]$$

*Note - depending upon the author the unit notation could also appear as
[inch/sec]/inch or as 1/in*

$$b_1 = (\Delta v_{\text{test}} - b_0) / c_{\text{avg}}$$

$$b_1 = ([33.83 * 17.6] - 88) / 23.6$$

$$b_1 = 21.5$$

How to Calculate Stiffness Values

Calculating Rear Stiffness
([Pre Test] - [Post Test] Distances)

Calculations:

A coefficient = pound/inch

$$A = (W * b_0 * b_1) / (g * L_{\text{test}})$$

If you choose a $L_{\text{test}} = \underline{\text{vehicle width}}$

$$A = (3344.8 * 88 * 21.5) / (386.4 * 69.3)$$

$$A = 236.4$$

How to Calculate Stiffness Values

Calculating Rear Stiffness
([Pre Test] - [Post Test] Distances)

Calculations:

B coefficient = pound/inch²

$$B = (W * b_1 * b_1) / (g * L_{\text{test}})$$

If you choose a $L_{\text{test}} = \text{vehicle width}$

$$B = (3344.8 * 21.5 * 21.5) / (386.4 * 69.3)$$

$$\mathbf{B = 57.8}$$

How to Calculate Stiffness Values

Calculating Rear Stiffness
([Pre Test] - [Post Test] Distances)

Calculations:

G coefficient = pound

$$G = (A * A) / (2 * B)$$

If you choose a $L_{test} = \underline{\text{vehicle width}}$

$$G = (236.4 * 236.4) / (2 * 57.8)$$

$$\mathbf{G = 483.4}$$

How to Calculate Stiffness Values

Calculating Rear Stiffness (Maximum Crush Distance)

When working with the following equations, one should note that only ONE crush measurement is used to calculate the A & B Stiffness values. This is important, because at times, the only crush depth recorded is the MAXIMUM CRUSH. However, some people are concerned that because the equations call for a “Crush_{avg}” measurement, use of only one crush measurement is not permitted. For those people, the AVERAGE CRUSH based upon the Maximum Crush Distance measurement can be calculated as follows:

$$\text{Crush}_{\text{avg}} = (c_{\text{Max}}) / (l)$$

Which, feeding in values, equates to:

$$\text{Crush}_{\text{avg}} = (29.1) / (1)$$

$$\text{Crush}_{\text{avg}} = \mathbf{29.1 \text{ inches}}$$

How to Calculate Stiffness Values

Calculating Rear Stiffness (Maximum Crush Distance)

Calculations:

$$b_1 = \text{slope} = \text{inches} / [\text{inch} * \text{sec}]$$

*Note - depending upon the author the unit notation could also appear as
[inch/sec]/inch or as 1/in*

$$b_1 = (\Delta v_{\text{test}} - b_0) / c_{\text{avg}}$$

$$b_1 = ([33.8 * 17.6] - 88) / 29.1$$

$$b_1 = 17.4$$

How to Calculate Stiffness Values

Calculating Rear Stiffness (Maximum Crush Distance)

Calculations:

A coefficient = pound/inch

$$A = (W * b_0 * b_1) / (g * L_{\text{test}})$$

If you choose a $L_{\text{test}} = \underline{\text{vehicle width}}$

$$A = (3344.8 * 88 * 17.4) / (386.4 * 69.3)$$

$$\mathbf{A = 191.4}$$

How to Calculate Stiffness Values

Calculating Rear Stiffness (Maximum Crush Distance)

Calculations:

B coefficient = pound/inch²

$$B = (W * b_1 * b_1) / (g * L_{\text{test}})$$

If you choose a $L_{\text{test}} = \text{vehicle width}$

$$B = (3344.8 * 17.4 * 17.4) / (386.4 * 69.3)$$

$$\mathbf{B = 37.9}$$

How to Calculate Stiffness Values

Calculating Rear Stiffness (Maximum Crush Distance)

Calculations:

G coefficient = pound

$$G = (A * A) / (2 * B)$$

If you choose a $L_{test} = \underline{\text{vehicle width}}$

$$G = (191.4 * 191.4) / (2 * 37.9)$$

$$\mathbf{G = 483.4}$$

| | | | | | | | | |
|--------------------|---------------------|--------|------------------|--------|-------|-------|-----|--------|
| NHTSA Crash Test # | 10125 | | | | | | | |
| Vehicle | 2017 Toyota Corolla | | | | | | | |
| | mm | inches | | | | | | |
| Indentation Length | 1761 | 69.3 | | | | | | |
| Width | 0 | 0.0 | | | | | | |
| | kilograms | pounds | | | | | | |
| Vehicle Weight | 1517.2 | 3344.8 | | | | | | |
| Barrier Weight | 1357 | 2991.7 | | | | | | |
| | kph | mph | in/sec | | | | | |
| Closing Speed | 0 | 0.0 | 0.0 | | | | mph | in/sec |
| Barrier Speed | 79.24 | 49.2 | 866.6 | KEES = | 33.83 | 595.4 | | |
| No Damage Speed | | 5 | 88.0 | b0 = | | 88.0 | | |
| Gravity - ft/s/s | | 32.2 | 386.4 <-- in/s/s | | | | | |

| | Crush Depth (mm) | Crush depth (in) | 6 measurement avg | Trapezoidal Avg | |
|-------|------------------|------------------|----------------------|-----------------|-----------------------|
| DPD 1 | | 0.0 | 0.0 | | |
| DPD 2 | | 0.0 | 0.0 | 0.0 | |
| DPD 3 | | 0.0 | 0.0 | 0.0 | |
| DPD 4 | | 0.0 | 0.0 | 0.0 | |
| DPD 5 | | 0.0 | 0.0 | 0.0 | |
| DPD 6 | | 0.0 | 0.0 | 0.0 | |
| | | | crush depth = | 0.0 | 0.0 b1= |

| | Pre Test (mm) | Post Test (mm) | Crush Depth (mm) | Crush depth (in) | | | |
|--------------|---------------|----------------|----------------------|------------------|-------------|------------|-------------|
| Left corner | 4543 | 3803 | 740 | 29.1 | 29.1 | | |
| Center Line | 4646 | 4013 | 633 | 24.9 | 49.8 | 27.0 | |
| Right Corner | 4546 | 4156 | 390 | 15.4 | 15.4 | 20.1 | |
| | | | crush depth = | 23.6 | 23.6 | b1= | 21.5 |

| | Crush Depth (mm) | Crush depth (in) | | | |
|---------|------------------|------------------|----------------------|-------------|-----------------|
| Maximum | 740 | 29.1 | crush depth = | 29.1 | b1= 17.4 |

Rear Stiffness

| | A | B | G |
|-----------------------------|-------|------|-------|
| DPD Width | | | |
| DPD Indentation | | | |
| Pre-Post Width | | | |
| Pre-Post Indentation | 236.4 | 57.8 | 483.4 |
| Max Width | | | |
| Max Indentation | 191.4 | 37.9 | 483.4 |

How to Research Stiffness Data

Stiffness Calculations - Summary

Stiffness Calculation Summary

How to Research Stiffness Data

Stiffness Calculations - Summary

| Front Stiffness | | | |
|---------------------|-------|------|-------|
| | A | B | G |
| DPD Width | 246.0 | 64.0 | 473.1 |
| DPD Indentation | 284.9 | 74.1 | 547.9 |
| Pre-Post Width | 253.0 | 67.7 | 473.1 |
| Pre-Post Indentatio | 293.0 | 78.3 | 547.9 |
| Max Width | 196.7 | 40.9 | 473.1 |
| Max Indentation | 227.8 | 47.4 | 547.9 |

As can be seen from the Frontal Values, the data available potentially allows for up to 6 sets of Stiffness values in a given test.

Potentially 2 different crush lengths for Front and Rear Tests, 1 crush length for Side.

Potentially 3 sets of crush measurements for Front and Rear Tests, 2 sets for Side.

How to Calculate Stiffness Values

Stiffness Calculations - Summary

When examining the previous comparison table, some general trends should be noted:

- The wider the Crush Length that is used, the lower the A-B values will be
- The deeper the Crush_{avg} depth is, the lower the A-B values will be

And

- The lower (or softer) the A-B values are, the more conservative your final speed from crush estimates will be in your reconstruction.

How to Research Stiffness Data

Stiffness Calculations - Summary

I have downloaded and provided the Contractor Reports for the 3 selected tests. Feel free to review to see the similarities and differences between the reports and the online database values.

To try and lessen “the pain” of doing these calculations by hand, a spreadsheet which does these calculations has also been provided with the PDF’s. Feel free to modify it as you see fit.

You can also find this presentation and the spreadsheet on my web site at -

https://www.4n6xpert.com/NAPARS_3-2025.htm

How to Research Stiffness Data

Stiffness Calculations - Summary

The “easy” way to get to the page is -

The screenshot displays the 4N6XPRT website interface. On the left, there is a sidebar with a blue textured background. The main content area contains several paragraphs of text. On the right, there is a vertical navigation menu with dark blue buttons. A red callout box with white text is positioned in the center, pointing to the 'Conference Presentation Material' link in the navigation menu. Below the navigation menu, there is a 'Recent Posts' section with three article titles. At the bottom of the page, there is a dark blue footer with a cookie notice and a 'Got it!' button.

cessible. 4N6XPRT Systems' accident reconstruction software helps you to reliably evaluate and analyze accident information with some of the easiest, most trusted, and most cost-efficient software you can find in the industry today.

Vehicle accident investigation software involves a multitude of studies and comprehensive reports that can be confusing to someone who isn't properly trained. Our system breaks down the information so you can digest it quickly. Learn about vehicle data, crush data, ABG stiffness values, and more with these programs.

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- What Every Motorist Should Know About Defensive Driving
- How You Can Prepare for Safe Travel This

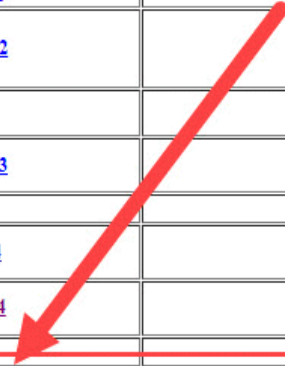
Site uses cookies to ensure you get the best experience on our website. [Learn more](#) **Got it!**

How to Research Stiffness Data

Stiffness Calculations - Summary

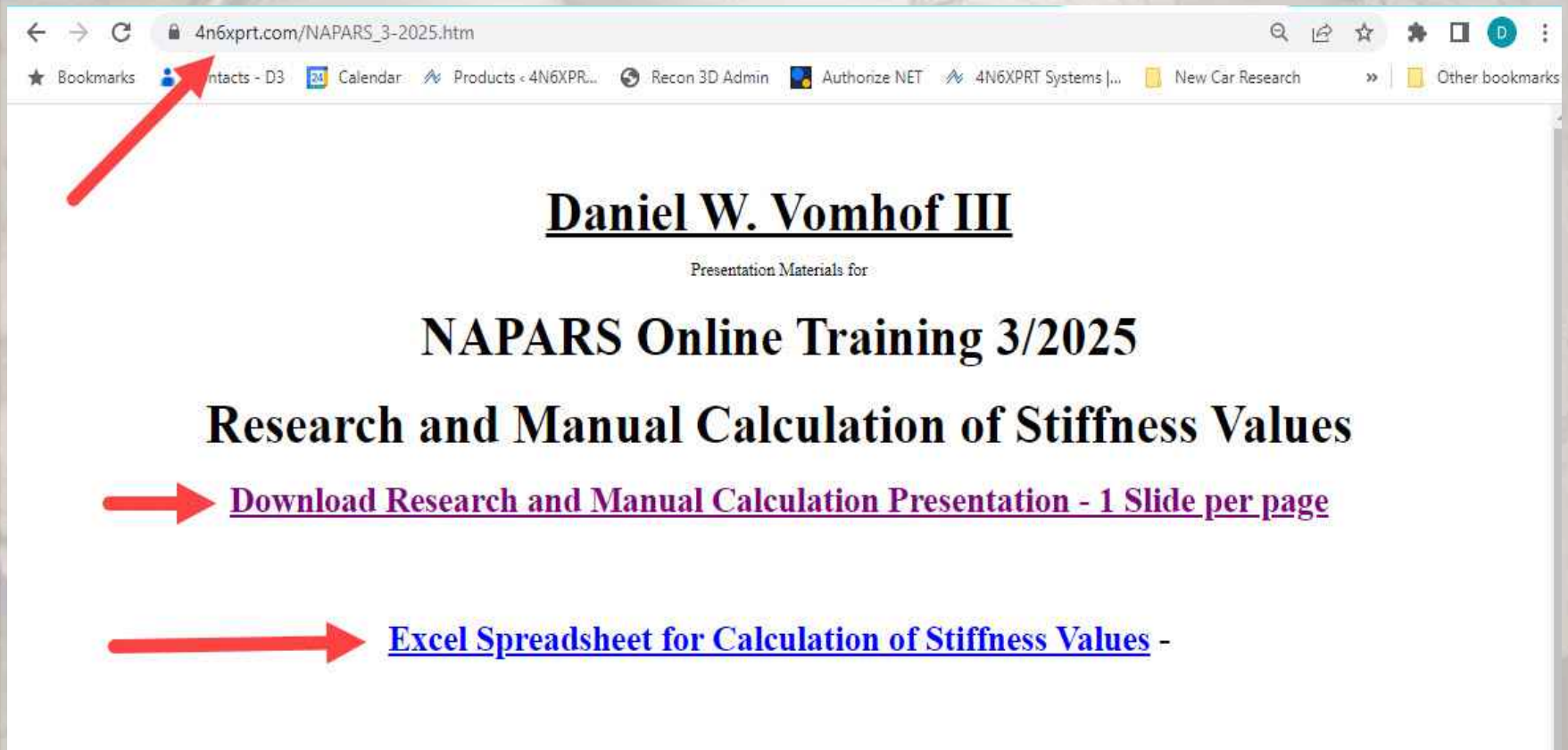
and Presentations

| Conference | Conference Material Page | Material on Page |
|---|-----------------------------|---|
| Illinois Association of Technical Accident Investigators - September 2022 | IATAI-2022 | Speed from Crush Considerations |
| Midwest Association of Technical Accident Investigators - September 2022 | MATAI-2022 | Conference Video Force-Balance Analysis of Crush 4N6XPRT Systems vehicle Data |
| South Carolina Accident Reconstruction Specialists/Southeastern Collision Reconstruction Conference - July 2023 | SCARS-2023 | Recon-3D and Cloud Compare Speed from Crush Considerations |
| IPTM Symposium - June 2024 | IPTM-2024 | Conference Video 4N6XPRT Systems vehicle Data |
| SATAI 2024 Fall Conference - October 2024 | SATAI_2024 | Recon-3D and Cloud Compare Speed from Crush Considerations |
| NAPARS Online Trasing - March 2025 | NAPARS 2025 | Research and Calculation of Stiffness Values Manually |



How to Research Stiffness Data

Stiffness Calculations - Summary



4n6xpert.com/NAPARS_3-2025.htm

Bookmarks contacts - D3 Calendar Products < 4N6XPR... Recon 3D Admin Authorize NET 4N6XPRT Systems |... New Car Research Other bookmarks

Daniel W. Vomhof III

Presentation Materials for

NAPARS Online Training 3/2025

Research and Manual Calculation of Stiffness Values

➔ [Download Research and Manual Calculation Presentation - 1 Slide per page](#)

➔ [Excel Spreadsheet for Calculation of Stiffness Values](#) -

How to Research Stiffness Data

Stiffness Calculations - Summary

Some notes on the Spreadsheet -

- ◆ The boxes for data entry are in **green**
- ◆ IF you have a frontal test where the vehicle was impacted by a moving barrier, it is suggested that you use the REAR test tab and change the title where appropriate to FRONT before printing out so that you use the appropriate speed for your calculations.
- ◆ In the same way, if you have a Side or Rear test where the vehicle impacts a solid barrier, use the FRONT test and change the title to SIDE or REAR where appropriate

How to Calculate Stiffness Values

Calculating Stiffness - Constants & Conversions

◆ Conversion Factors - Metric to Imperial

- ★ 1 inch = 25.4 millimeters
 - ★ 1 mile = 1.609344 kilometers
 - ★ 1 pound = 0.4535924 kilograms
- or
- ★ 1 kilogram = 2.20462 pounds

◆ Constants

- ★ 1 mph = 17.6 inch/sec
- ★ $g = 32.2 \text{ feet/sec}^2 = 386.4 \text{ inch/sec}^2$

How to Calculate Stiffness Values

Calculating Stiffness - Variables

Variables:

Δv_{test} = On Side and Rear tests generally the speed to be used is the KEES speed. On Frontal Tests generally the speed to be used is Closing speed = in/sec

c_{avg} = calculated average crush = inches

W = Vehicle weight = pounds

g = acceleration due to gravity = 386.4 inch/sec²

b_0 = No Damage Speed (Damage Threshold). If no specific knowledge of the vehicle is available, the beginning frontal NO DAMAGE SPEED is assumed to be ~4.7-5.0 mph. For calculations generally 5.0 mph = 88 in/sec is used for Front and Rear tests, and 2.0 mph = 35.2 in/sec is used for Side tests.

L_{test} = Damage Width = inches

How to Research Stiffness Data

Stiffness Calculations - Formulas

$$KEES = \text{SQR}([W_{\text{barrier}} * \text{Speed}_{\text{Closing}}^2] / [W_{\text{barrier}} + W_{\text{vehicle}}])$$

$$b_1 = (\Delta v_{\text{test}} - b_0) / c_{\text{avg}}$$

$$A = (W * b_0 * b_1) / (g * L_{\text{test}})$$

$$B = (W * b_1 * b_1) / (g * L_{\text{test}})$$

$$G = (A * A) / (2 * B)$$

How to Research Stiffness Data

Stiffness Calculations - Terms & Units

C = crush measurement

Crush zone = area between two crush measurements

$Crush_{avg}$ = inches

W = weight of vehicle or barrier = pounds

g = acceleration due to gravity = 386.4 inch/sec^2

L_{test} = Damage Length (*Also called WIDTH for front and rear tests*) = inches

ΔV_{test} = On Side and Rear tests generally the speed to be used is the KEES speed. On Frontal Tests generally the speed to be used is Closing speed = in/sec

How to Research Stiffness Data

Stiffness Calculations- Terms & Units (cont)

b_0 = No Damage Speed (Damage Threshold). If no specific knowledge of the vehicle is available, the beginning frontal NO DAMAGE SPEED is assumed to be ~4.7-5.0 mph. For calculations generally 5.0 mph = 88 in/sec is used for Front and Rear tests, and 2.0 mph = 35.2 in/sec is used for Side tests.

b_1 = slope (*increase in speed per inch of crush*)
= inches / [inch*sec]

Note - depending upon the author the unit notation could also appear as [inch/sec]/inch or as I/in

A coefficient = pound/inch

B coefficient = pound/inch²

G coefficient = pound

How to Research Stiffness Data

Stiffness Calculations - Contractor Report

Contractor Report

NHTSA Test

9984

Final Report Number: NCAP-TRC-17-003

**New Car Assessment Program (NCAP)
Frontal Barrier Impact Test**

**Toyota Motor Manufacturing
2017 Toyota Corolla 4DR Sedan
NHTSA Number: M20175104**

**PREPARED BY:
Transportation Research Center Inc.
10820 State Route 347
P. O. Box B-67
East Liberty, OH 43319**



Report Date: December 15, 2016

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**

Notice

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Prepared By: ILO Project Operations Group

Approved By: John Shultz

Approval Date: December 15, 2016

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date _____

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

Date _____

| 1. Report No. NCAP-TRC-17-003 | 2. Government Accession No. | 3. Recipient's Catalog No. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|----------------------------|---|---------------|-----------|-------------------------|------------|--|--|---------------|--|--|-------|-----------|--------|-------|-----------|--------|---|----|-----|-----|----|-----|-----|---------------------------|----|----|-------|----|----|-------|----------------|----|----|------|----|----|------|-----|----|---|------|----|---|------|--------------|---------|------|--------|---------|------|-------|------------------|---------|------|--------|---------|------|--------|------------------|---------|-------|---------|---------|------|---------|-------------------|---------|-------|---------|---------|------|--------|
| 4. Title and Subtitle Final Report of NEW CAR ASSESSMENT PROGRAM Frontal Impact Testing of a 2017 Toyota Corolla 4DR Sedan NHTSA No. M20175104 | | | 5. Report Date December 15, 2016 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 6. Performing Organization Code TRC Inc. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7. Author(s) John Shultz, Project Manager | | | 8. Performing Organization Report No. 161114 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9. Performing Organization Name and Address Transportation Research Center Inc. 10820 State Route 347 East Liberty, OH 43319-0367 | | | 10. Work Unit No. (TR AIS) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 11. Contract or Grant No. DTNH22-12-D-00257 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12. Sponsoring Agency Name and Address 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 | | | 13. Type of Report and Period Covered Final Report November 14, 2016– December 15, 2016 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 14. Sponsoring Agency Code NRM-110 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15. Supplemental Notes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16. Abstract A 56.0 km/h NCAP Frontal Impact Test was conducted on a 2017 Toyota Corolla 4DR Sedan, 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 November 14, 2016. The impact velocity was 56.65 km/h, and the ambient temperature at the barrier face at the time of impact was 21.7° C. The target vehicle post-test maximum crush was 738 millimeters at crush centerline. 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 (HIC₁₅)</td> <td>NA</td> <td>700</td> <td>210</td> <td>NA</td> <td>700</td> <td>201</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-24.6</td> <td>mm</td> <td>52</td> <td>-20.4</td> </tr> <tr> <td>3ms Chest Clip</td> <td>Gs</td> <td>60</td> <td>45.5</td> <td>Gs</td> <td>60</td> <td>46.5</td> </tr> <tr> <td>Nij</td> <td>NA</td> <td>1</td> <td>0.26</td> <td>NA</td> <td>1</td> <td>0.54</td> </tr> <tr> <td>Neck Tension</td> <td>Newtons</td> <td>4170</td> <td>1379.3</td> <td>Newtons</td> <td>2620</td> <td>730.1</td> </tr> <tr> <td>Neck Compression</td> <td>Newtons</td> <td>4000</td> <td>-145.7</td> <td>Newtons</td> <td>2520</td> <td>-167.8</td> </tr> <tr> <td>Left Femur Force</td> <td>Newtons</td> <td>10000</td> <td>-1459.3</td> <td>Newtons</td> <td>6800</td> <td>-1086.7</td> </tr> <tr> <td>Right Femur Force</td> <td>Newtons</td> <td>10000</td> <td>-2358.2</td> <td>Newtons</td> <td>6800</td> <td>-194.5</td> </tr> </tbody> </table> | | | | | | Measurement Description | Driver ATD | | | Passenger ATD | | | Units | Threshold | Result | Units | Threshold | Result | Head Injury Criteria (HIC ₁₅) | NA | 700 | 210 | NA | 700 | 201 | Maximum Chest Compression | mm | 63 | -24.6 | mm | 52 | -20.4 | 3ms Chest Clip | Gs | 60 | 45.5 | Gs | 60 | 46.5 | Nij | NA | 1 | 0.26 | NA | 1 | 0.54 | Neck Tension | Newtons | 4170 | 1379.3 | Newtons | 2620 | 730.1 | Neck Compression | Newtons | 4000 | -145.7 | Newtons | 2520 | -167.8 | Left Femur Force | Newtons | 10000 | -1459.3 | Newtons | 6800 | -1086.7 | Right Femur Force | Newtons | 10000 | -2358.2 | Newtons | 6800 | -194.5 |
| Measurement Description | Driver ATD | | | Passenger ATD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Units | Threshold | Result | Units | Threshold | Result | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Head Injury Criteria (HIC ₁₅) | NA | 700 | 210 | NA | 700 | 201 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maximum Chest Compression | mm | 63 | -24.6 | mm | 52 | -20.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3ms Chest Clip | Gs | 60 | 45.5 | Gs | 60 | 46.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nij | NA | 1 | 0.26 | NA | 1 | 0.54 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Neck Tension | Newtons | 4170 | 1379.3 | Newtons | 2620 | 730.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Neck Compression | Newtons | 4000 | -145.7 | Newtons | 2520 | -167.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Left Femur Force | Newtons | 10000 | -1459.3 | Newtons | 6800 | -1086.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Right Femur Force | Newtons | 10000 | -2358.2 | Newtons | 6800 | -194.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17. Key Words 35 mph Frontal Barrier Impact Test New Car Assessment Program (NCAP) | | | 18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, NPO-411 1200 New Jersey Ave, SE Washington, DC 20590 e-mail: tis@nhtsa.dot.gov FAX: 202-493-2833 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19. Security Classif. (of this report) Unclassified | 20. Security Classif. (of this page) Unclassified | 21. Number of Pages 170 | 22. Price | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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1: PURPOSE AND SUMMARY OF THE TEST

PURPOSE

This 56 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 km/h frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Front NCAP Laboratory Test Procedure dated October 2015.

SUMMARY

A 2017 Toyota Corolla 4DR Sedan impacted the barrier wall at a velocity of 56.65 km/h. The test was performed at Transportation Research Center, Inc. on November 14, 2016. 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 50th percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5th 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 load cells, right/left femur load cells, and lower leg instrumentation. Seat belt load cells were also on the driver's and the passenger's lap belts to measure dummy 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 100 channels of data were recorded on an on-board data acquisition system. The 288 barrier channels of data were recorded on an off-board high resolution barrier 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 738 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, side curtain airbag, headrest, and knee airbag. The passenger's visible contact points were as follows: front airbag, side curtain airbag and headrest.

The occupant data is summarized below:

| ATD Position | HIC₁₅ | Nij | Neck Tension (N) | Neck Compression (N) | 3 ms Chest Clip (Gs) | Chest Disp. (mm) | Left Femur (N) | Right Femur (N) |
|---------------------------------------|-------------------------|------------|-------------------------|-----------------------------|-----------------------------|-------------------------|-----------------------|------------------------|
| Driver (50 th Male) | 210 | 0.26 | 1379.3 | -145.7 | 45.5 | -24.6 | -1459.3 | -2358.2 |
| Passenger (5 th Female) | 201 | 0.54 | 730.1 | -167.8 | 46.5 | -20.4 | -1086.7 | -194.5 |

2: OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
 Test Date: 11/14/16

TEST VEHICLE INFORMATION

| | |
|-----------------------------|-------------------|
| NHTSA No. | M20175104 |
| Model Year | 2017 |
| Make | Toyota |
| Model | Corolla |
| Body Style | Sedan |
| VIN | 2T1BURHE9HC747230 |
| Body Color | Barcelona Red |
| Odometer Reading (km/mi) | 9 mi. |
| Engine Displacement (L) | 1.8 |
| Type/No. Cylinders | Inline/4 |
| Engine Placement | Front/Transverse |
| Transmission Type | Automatic |
| Transmission Speeds | CVT |
| Overdrive | Yes |
| Final Drive | FWD |
| 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 | No |
| Driver Torso/Pelvis Airbag | Yes |
| Driver Pelvis Airbag | No |
| Driver Knee Airbag | Yes |
| Front Pass. Frontal Airbag | Yes |
| Front Pass. Curtain Airbag | Yes |
| Front Pass. Head/Torso Airbag | No |
| Front Pass. Torso Airbag | No |
| Front Pass. Torso/Pelvis Airbag | Yes |
| 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: Pass. Seat Cushion Airbag | Yes |

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

Yes

DATA FROM CERTIFICATION LABEL

| | | | |
|---------------------|----------------------------|------------------|------|
| Manufactured by | Toyota Motor Manufacturing | GVWR (lbs) | 3820 |
| Date of Manufacture | 08/16 | GAWR Front (lbs) | 2070 |
| | | GAWR Rear (lbs) | 1850 |

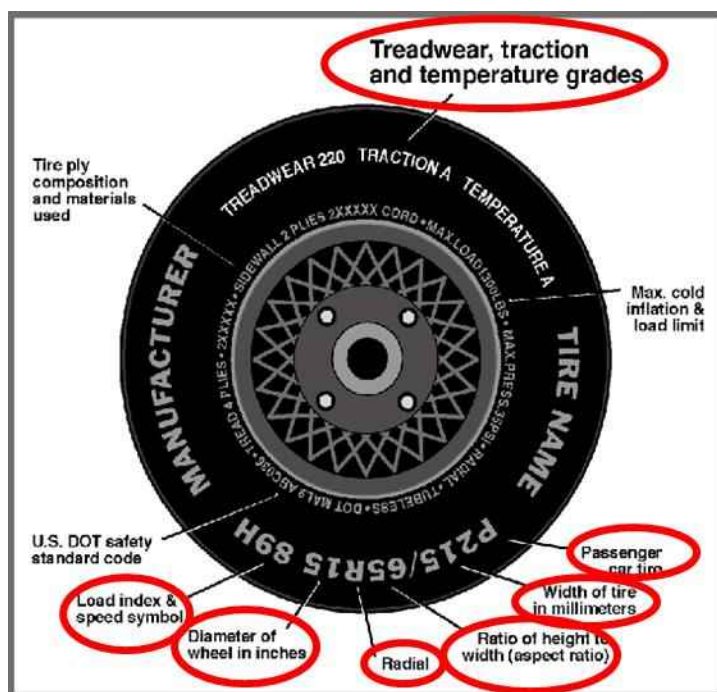
VEHICLE SEATING AND WEIGHT CAPACITY

| Measured Parameter | Front | Rear | Third | Total |
|-------------------------|--------|-------------|-------|-------|
| Type of Seats | Bucket | Split Bench | N/A | |
| Number of Occupants | 2 | 3 | N/A | 5 |
| Capacity Wt. (VCW) (kg) | | | | 381 |
| Cargo Wt. (RCLW) (kg) | | | | 40.8 |

DATA SHEET NO. 1 (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
 Test Date: 11/14/16



DATA FROM TIRE PLACARD

| Measured Parameter | Front | Rear |
|-----------------------------|------------------------------|------------------------------|
| Maximum Tire Pressure (kPa) | 350 | 350 |
| Cold / Test Pressure (kPa) | 220 | 220 |
| Recommended Tire Size | P205/55R16 | P205/55R16 |
| Tire Size on Vehicle | P205/55R16 | P205/55R16 |
| Tire Manufacturer | Michelin | Michelin |
| Tire Model | Primacy MXV4 | Primacy MXV4 |
| Treadwear | 620 | 620 |
| Traction Grade | A | A |
| Temperature Grade | A | A |
| Tire Plies Sidewall | 1 | 1 |
| Tire Plies Body | 4 | 4 |
| Load Index/Speed Symbol | 89H | 89H |
| Tire Material | Polyester, Polyamide & Steel | Polyester, Polyamide & Steel |
| DOT Safety Code Right | B3WC 02NX 2716 | B3WC 02NX 2716 |
| DOT Safety Code Left | B3WC 02NX 2716 | B3WC 02NX 2716 |

DATA SHEET NO. 1 (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
 Test Date: 11/14/16

TEST VEHICLE WEIGHTS

| | Units | As Delivered (UVW) (Axle) | | | As Tested (ATW) (Axle) | | |
|--------|-------|---------------------------|-------|--------|------------------------|-------|--------|
| | | Front | Rear | Total | Front | Rear | Total |
| Left | kg | 415.0 | 267.8 | | 446.4 | 320.0 | |
| Right | kg | 387.4 | 245.2 | | 414.0 | 307.4 | |
| Ratio | % | 61.0 | 39.0 | | 57.8 | 42.2 | |
| Totals | kg | 802.4 | 513.0 | 1315.4 | 860.4 | 627.4 | 1487.8 |

TARGET TEST WEIGHT CALCULATION

| Measured Parameter | Units | Value |
|-------------------------------------|-------|--------|
| Total Delivered Weight (UVW) | kg | 1315.4 |
| Weight of 1 P572E ATD & 1 P572O ATD | kg | 139.3 |
| Rated Cargo/Luggage Weight (RCLW) | kg | 40.8 |
| Vehicle Target Weight (TVTW) | kg | 1495.5 |

TEST VEHICLE ATTITUDES AND CG

| | Units | LF | RF | LR | RR | CG (aft of front) |
|--------------|-------|-----|-----|-----|-----|-------------------|
| As Delivered | mm | 690 | 693 | 715 | 712 | 1053 |
| As Tested | mm | 675 | 683 | 679 | 683 | 1139 |
| Post Test | mm | 713 | 679 | 712 | 709 | |

GENERAL TEST VEHICLE DATA

| Measurement Description | Units | Value |
|---|--------|-------|
| Test Vehicle Wheel Base | mm | 2700 |
| Total Vehicle Length at Left Side | mm | 4367 |
| Total Vehicle Length at Centerline | mm | 4650 |
| Total Vehicle Length at Right Side | mm | 4366 |
| Weight of Ballast in Cargo Area | kg | 0.0 |
| Weight of Vehicle Components Removed | kg | 62.0 |
| Amount of Stoddard Solvent in Fuel Tank | liters | 45.4 |

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT: Rear bumper beam and fascia, rear door windows, panels and speakers, tail lights, hubcaps, rear shelf panel and speakers, C-pillar trim, rear seat belts, exterior mirrors, rear brake drums and rear deck lid.

DATA SHEET NO. 1 (CONTINUED)**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
Test Date: 11/14/16

TARGET VEHICLE STRUCTURAL MEASUREMENT

| | Elements | Pre-Test (mm) |
|----|---------------------------------------|--------------------------|
| 1 | Total Length | 4650 |
| 2 | Total Width | 1765 |
| 3 | Bumper Top Height | 541 |
| 4 | Bumper Bottom Height | 429 |
| 5 | Longitudinal Member Top Height | 541 |
| 6 | Distance Between Longitudinal Members | 915 |
| 7 | Longitudinal Member Width | 100 |
| 8 | Engine Top Height | 870 |
| 9 | Engine Bottom Height | 200 |
| 10 | Engine and Gearbox Width | 760 |
| 11 | Front Bumper-Engine Distance | 510 |
| 12 | Front Shock Absorber Fixing Height | 865 |
| 13 | Bonnet Leading Edge Height | 710 |
| 14 | Front Shock Absorber Fixing Width | 1140 |
| 15 | Front Bumper – Front Axle Distance | 470 |
| 16 | Front Axle – A-Pillar Distance | 445 |
| 17 | A-Pillar – B-Pillar Distance | 1070 |
| 18 | B-Pillar – Rear Axle Distance | 1185 |
| 19 | B-Pillar – C-Pillar Distance | 1040 |
| 20 | Roof Sill Bottom Height | 1308 |
| 21 | Roof Sill Top Height | 1382 |
| 22 | Floor Sill Bottom Height | 327 |
| 23 | Floor Sill Top Height | 375 |

DATA SHEET NO. 2

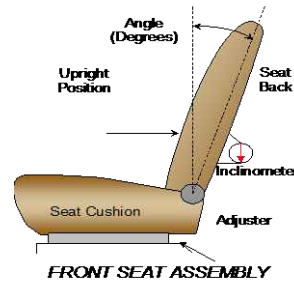
SEAT ADJUSTMENT, FUEL SYSTEM AND STEERING WHEEL DATA

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
 Test Date: 11/14/16

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. Inclinometer measurement at the top of the backrest at the seat centerline, according to Form 1 attachment.



| | Degree |
|----------------------------|--------|
| Driver Seat back angle: | 3.1 |
| Passenger Seat back angle: | 1.4 |

SEAT FORE/AFT POSITIONS

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

Driver: Mid position, Positioned according to Form 1

Passenger: Full forward, Positioned according to Form 1

| | Total Fore/Aft Travel | Placed in Position No. |
|----------------|-----------------------|------------------------|
| Driver Seat | 240 | 10 |
| Passenger Seat | 240 | 0 |

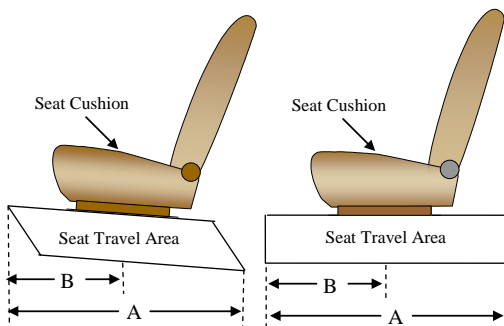
SEAT BELT UPPER ANCHORAGE

Describe the method of positioning seat belt upper anchorages.

Driver: Uppermost, Positioned according to Form 1

Passenger: Uppermost, Positioned according to Form 1.

| | Total No. of Positions | Placed in Position No. |
|----------------|-------------------------|------------------------|
| Driver Seat | 4, numbered from 0 to 3 | 3, Uppermost |
| Passenger Seat | 4, numbered from 0 to 3 | 3, Uppermost |



DATA SHEET NO. 2 (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEM AND STEERING WHEEL DATA

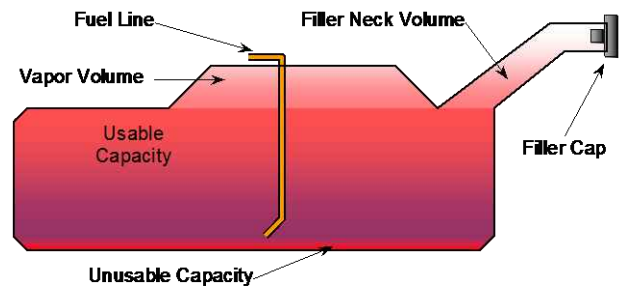
Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
 Test Date: 11/14/16

FUEL TANK CAPACITY

| | Liters |
|------------------------------------|---------------|
| Usable Capacity of "Standard Tank" | 48.8 |
| Usable Capacity of "Optional Tank" | N/A |
| 92%-94% of Usable Capacity | 45.4 |
| Actual Amount of Solvent Used | 45.4 |
| 1/3 of Usable Capacity | 16.3 |

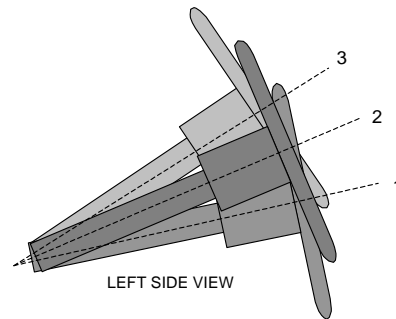
The vehicle is equipped with an electric fuel pump. The fuel pump is activated when the ignition is turned to "on".



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. Steel square was placed across the rim of the steering wheel, an inclinometer was placed on the plate and the angle was measured. Telescope travel was measured full in and full out and set at the midpoint.



STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONS

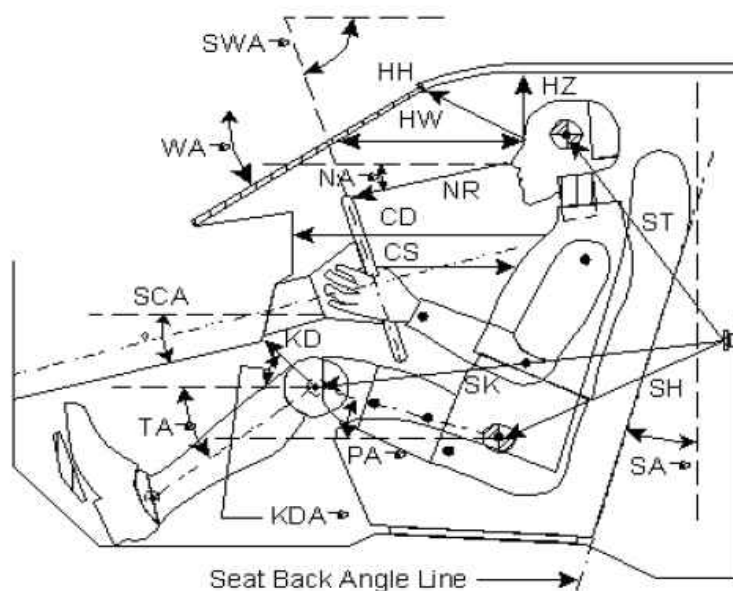
| | Degrees | Fore/Aft Position (mm) |
|-----------------------------------|----------------|-------------------------------|
| Lowermost Position No. 1 | 20.4 | |
| Geometric Center Position No. 2 | 22.2 | |
| Uppermost Position No. 3 | 23.9 | |
| Telescoping Steering Wheel Travel | | 70 |
| Test Position | 22.2 | 35 |

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
 Test Date: 11/14/16



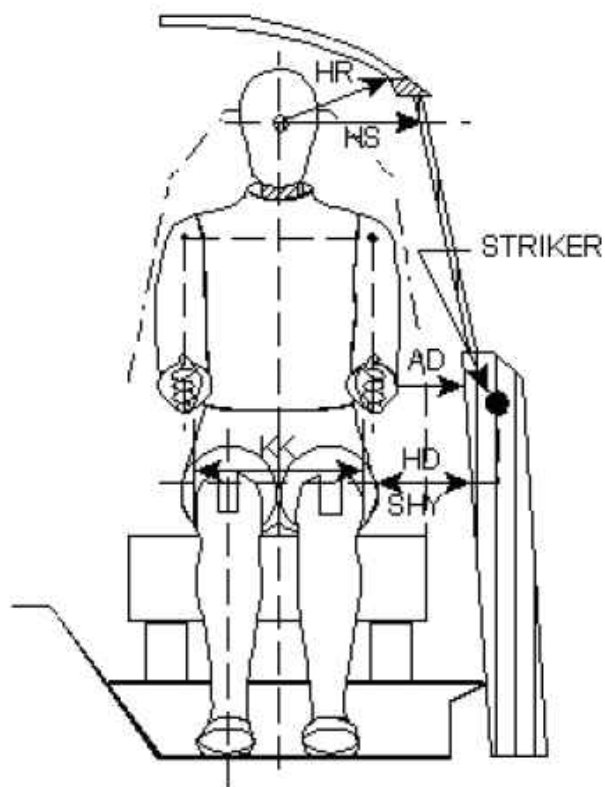
| Code | Measurement Description | Driver | | Passenger | |
|------|------------------------------------|-------------|-----------|-------------|-----------|
| | | Length (mm) | Angle (°) | Length (mm) | Angle (°) |
| WA° | Windshield Angle | | 24.9 | | |
| SWA° | Steering Wheel Angle | | 22.2 | | |
| SCA° | Steering Column Angle | | 67.8 | | |
| SA° | Seat Back Angle (on headrest post) | | 3.1 | | 1.4 |
| HZ | Head to Roof (Z) | 201 | | 220 | |
| HH | Head to Header | 351 | | 276 | |
| HW | Head to Windshield | 696 | | 723 | |
| NR | Nose to Rim | 370 | 9.6 | | |
| CD | Chest to Dash | 496 | | 388 | |
| CS | Chest to Steering Hub | 280 | | | |
| RA | Rim to Abdomen | 188 | | | |
| KDL | Left Knee to Dash | 137 | 24.4 | 104 | 38.5 |
| KDR | Right Knee to Dash | 129 | 24.3 | 114 | 38.5 |
| PA° | Pelvic Angle | | 23.5 | | 19.9 |
| TA° | Tibia Angle | | 50.1 | | 53.1 |
| SK | Striker to Knee | 585 | 9.6 | 710 | 15.1 |
| ST | Striker to Head | 407 | -73.5 | 397 | -59.1 |
| SH | Striker to H-Point | 340 | 50.1 | 412 | 32.5 |

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
 Test Date: 11/14/16



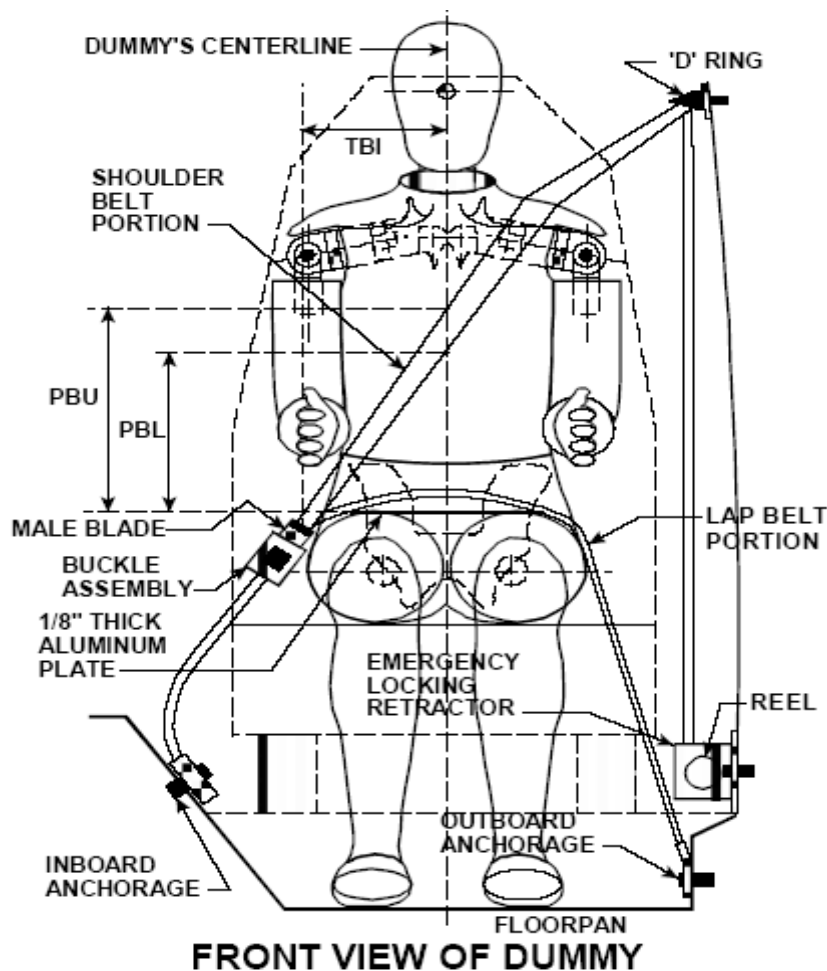
| Code | Measurement Description | Driver | Passenger |
|------|----------------------------------|--------|-----------|
| AD | Arm to Door | 151 | 102 |
| HD | H-Point to Door | 145 | 178 |
| HR | Head to Side Header | 215 | 240 |
| HS | Head to Side Window | 327 | 326 |
| KK | Knee to Knee | 360 | 170 |
| SHY | Striker to H-Point (Y Direction) | 240 | 300 |
| AA | Ankle to Ankle | 360 | 182 |

DATA SHEET NO. 5

SEAT BELT POSITIONING DATA

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
 Test Date: 11/14/16



SEAT BELT POSITIONING MEASUREMENTS

| Measurement Description | Units | Driver | Passenger |
|--|-------|--------|-----------|
| PBU – Top surface of reference to belt upper edge | mm | 298 | 310 |
| PBL – Top surface of reference to belt lower edge | mm | 214 | 205 |

BELT LENGTH DATA

| Measurement Description | Units | Driver | Passenger |
|--|-------|--------|-----------|
| Shoulder belt length as measured on ATD | mm | 870 | 964 |
| Lap belt length as measured on ATD | mm | 802 | 908 |
| Remainder of belt on reel | mm | 968 | 718 |
| Total belt length for continuous webbing systems | mm | 2640 | 2590 |

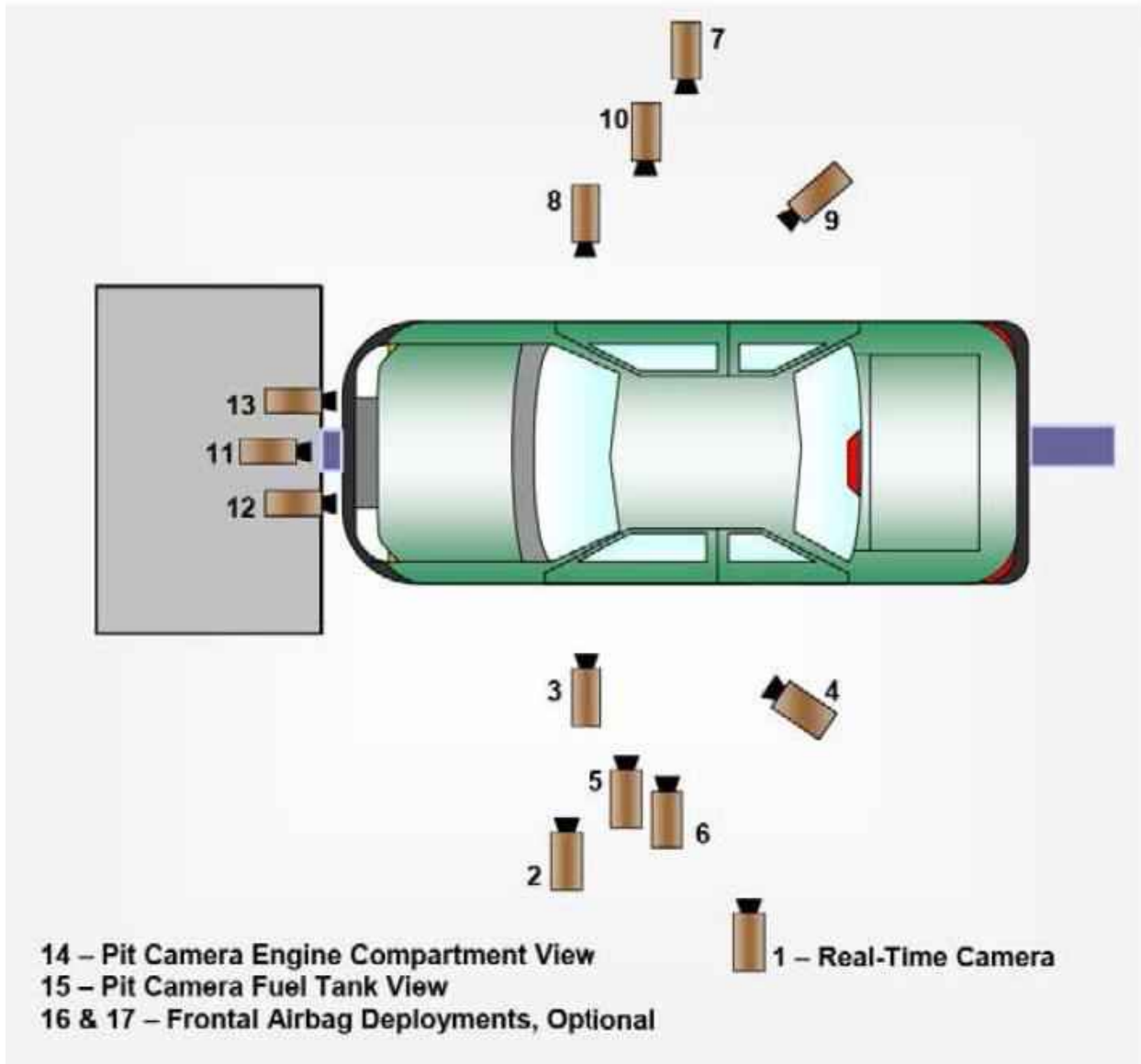
DATA SHEET NO. 6

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
Test Date: 11/14/16

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 (CONTINUED)

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
 Test Date: 11/14/16

CAMERA LOCATIONS

| No. | Camera View | Location (mm) | | | Lens (mm) | Frame Speed (fps) |
|-----|-------------------------------------|---------------|-------|------|-----------|-------------------|
| | | X | Y | Z | | |
| 1 | Real-Time Left Overall | 2376 | 5612 | 1410 | Zoom | 30 |
| 2 | Driver Close-Up | 1578 | -4902 | 1200 | 50 | 1000 |
| 3 | Left Front Half | 1289 | -4769 | 1200 | 28 | 1000 |
| 4 | Left Angle | 4017 | 2176 | 1950 | 35 | 1000 |
| 5 | Steering Column - Top | 1858 | -5364 | 2380 | 50 | 1000 |
| 6 | Steering Column – Bottom | 1839 | -5044 | 1220 | 50 | 1000 |
| 7 | Right Overall | 2135 | 5549 | 1210 | 20 | 1000 |
| 8 | Passenger Close-Up | 1657 | 4891 | 1090 | 50 | 1000 |
| 9 | Right Front Half | 4187 | 2201 | 1930 | 35 | 1000 |
| 10 | Right Angle | 1548 | 5235 | 990 | 28 | 1000 |
| 11 | Windshield | 0 | 0 | 2680 | 20 | 1000 |
| 12 | Driver Windshield | 0 | -310 | 2680 | 25 | 1000 |
| 13 | Passenger Windshield | 0 | 470 | 2680 | 25 | 1000 |
| 14 | Pit Front | 1240 | 0 | 3077 | 25 | 1000 |
| 15 | Pit Rear | 3043 | 0 | 3228 | 12.5 | 1000 |
| 16 | Onboard Driver Airbag (Optional) | | | | 12.5 | 1000 |
| 17 | Onboard Passenger Airbag (Optional) | | | | 12.5 | 1000 |

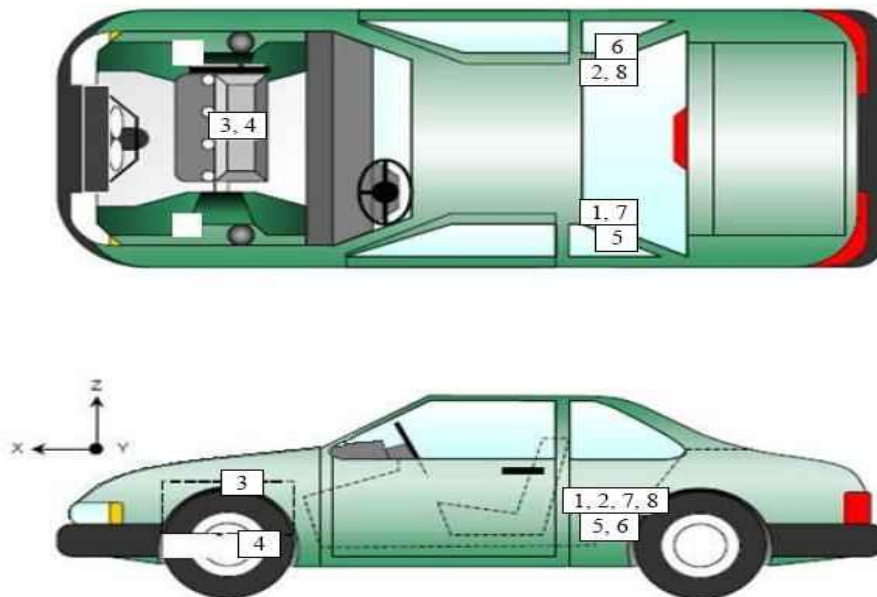
Reference Points: +X – forward of impact plane
 +Y – right of monorail center
 +Z – into ground

DATA SHEET NO. 7

VEHICLE ACCELEROMETER DATA

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
 Test Date: 11/14/16



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

| No. | Accelerometer Location | Location (mm) | | |
|-----|---|---------------|------|------|
| | | X | Y | Z |
| 1 | Left Rear Accelerometer – X Direction | 1782 | -222 | -424 |
| 2 | Right Rear Accelerometer – X Direction | 1782 | 215 | -427 |
| 3 | Engine Top X | 3882 | 25 | -820 |
| 4 | Engine Bottom X | 3810 | 175 | -233 |
| 5 | Left Rear Accelerometer – Z Direction | 1782 | -222 | -424 |
| 6 | Right Rear Accelerometer – Z Direction | 1782 | 215 | -427 |
| 7 | Left Rear Accelerometer – X Direction Redundant | 1782 | -165 | -424 |
| 8 | Right Rear Accelerometer- X Direction Redundant | 1782 | 157 | -427 |

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

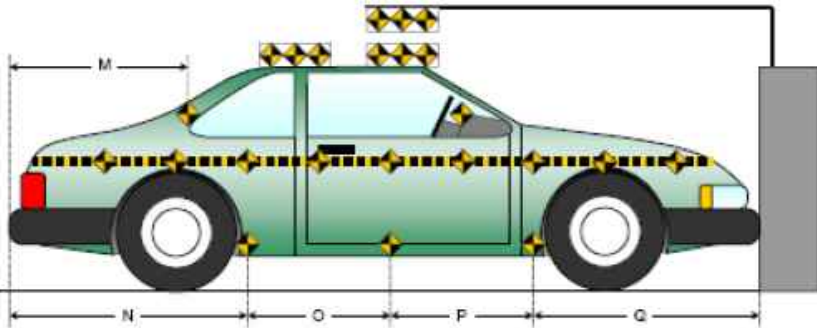
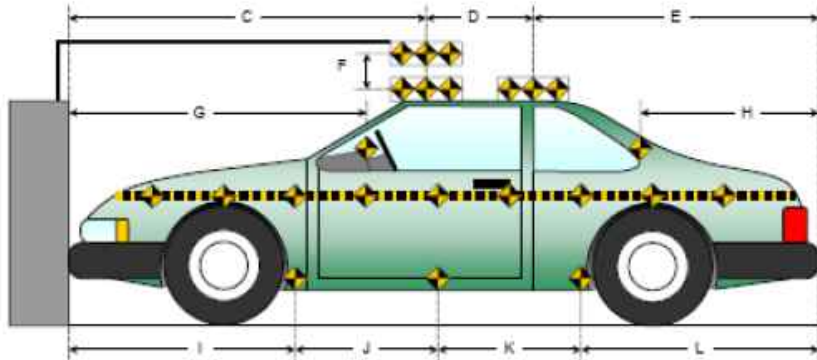
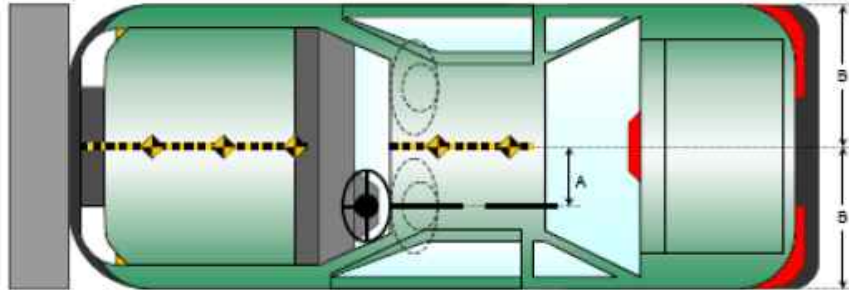
DATA SHEET NO. 8

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
 Test Date: 11/14/16

| Item | Value |
|------|-------|
| A | 350 |
| B | 883 |
| C | 2300 |
| D | 625 |
| E | 1716 |
| F | 213 |
| G | 1719 |
| H | 1227 |
| I | 1441 |
| J | 884 |
| K | 923 |
| L | 1402 |
| M | 1226 |
| N | 1395 |
| O | 923 |
| P | 883 |
| Q | 1449 |



All units in millimeters

DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
 Test Date: 11/14/16

| | | | | | | | | Centerline | | | | | | | |
|------|------|------|------|------|------|------|------|------------|------|------|------|------|------|------|------|
| A-16 | A-15 | A-14 | A-13 | A-12 | A-11 | A-10 | A-09 | A-08 | A-07 | A-06 | A-05 | A-04 | A-03 | A-02 | A-01 |
| B-16 | B-15 | B-14 | B-13 | B-12 | B-11 | B-10 | B-09 | B-08 | B-07 | B-06 | B-05 | B-04 | B-03 | B-02 | B-01 |
| C-16 | C-15 | C-14 | C-13 | C-12 | C-11 | C-10 | C-09 | C-08 | C-07 | C-06 | C-05 | C-04 | C-03 | C-02 | C-01 |
| D-16 | D-15 | D-14 | D-13 | D-12 | D-11 | D-10 | D-09 | D-08 | D-07 | D-06 | D-05 | D-04 | D-03 | D-02 | D-01 |
| E-16 | E-15 | E-14 | E-13 | E-12 | E-11 | E-10 | E-09 | E-08 | E-07 | E-06 | E-05 | E-04 | E-03 | E-02 | E-01 |
| F-16 | F-15 | F-14 | F-13 | F-12 | F-11 | F-10 | F-09 | F-08 | F-07 | F-06 | F-05 | F-04 | F-03 | F-02 | F-01 |
| G-16 | G-15 | G-14 | G-13 | G-12 | G-11 | G-10 | G-09 | G-08 | G-07 | G-06 | G-05 | G-04 | G-03 | G-02 | G-01 |
| H-16 | H-15 | H-14 | H-13 | H-12 | H-11 | H-10 | H-09 | H-08 | H-07 | H-06 | H-05 | H-04 | H-03 | H-02 | H-01 |
| I-16 | I-15 | I-14 | I-13 | I-12 | I-11 | I-10 | I-09 | I-08 | I-07 | I-06 | I-05 | I-04 | I-03 | I-02 | I-01 |
| J-16 | J-15 | J-14 | J-13 | J-12 | J-11 | J-10 | J-09 | J-08 | J-07 | J-06 | J-05 | J-04 | J-03 | J-02 | J-01 |
| K-16 | K-15 | K-14 | K-13 | K-12 | K-11 | K-10 | K-09 | K-08 | K-07 | K-06 | K-05 | K-04 | K-03 | K-02 | K-01 |

DATA SHEET NO. 10

TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
Test Date: 11/14/16

INSTRUMENTATION

| Instrumentation | Number of Channels Collected |
|----------------------------------|-------------------------------------|
| Driver Dummy Accelerometers | 44 |
| Passenger Dummy Accelerometers | 44 |
| Vehicle Structure Accelerometers | 8 |
| Total | 96 |

CAMERA COVERAGE

| Type of Camera | Number Used in this Test |
|----------------------------|---------------------------------|
| High-Speed Vehicle Onboard | 2 |
| High-Speed Offboard | 14 |
| Real-Time Panning | 1 |
| Total | 17 |

DATA SHEET NO. 11

POST-TEST OBSERVATIONS

Test Vehicle: 2017 Toyota Corolla 4DR Sedan

NHTSA No.: M20175104

Test Program: NCAP Frontal Impact

Test Date: 11/14/16

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

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

DOOR OPENING AND SEAT TRACK INFORMATION

| Description | Front | Rear |
|-----------------------|--|--|
| Locked/Unlocked Doors | Unlocked | Unlocked |
| Front Door Opening | Remained closed & latched, operational | Remained closed & latched, operational |
| Rear Door Opening | Remained closed & latched, operational | Remained closed & latched, operational |
| Seat Track Shift (mm) | 0 | 0 |
| Seat Back Failure | None | None |

POST-TEST STRUCTURAL OBSERVATIONS

| Critical Areas of Performance | Observations and Conclusions |
|-------------------------------|------------------------------|
| Windshield Damage | Lower right side at cowl |
| Window Damage | None |
| Other Notable Effects | None |

VEHICLE REBOUND FROM BARRIER

| Measured Parameter | Units | Value |
|--------------------|-------|-------|
| Left Side | mm | 1917 |
| Center | mm | 1848 |
| Right Side | mm | 1944 |
| Average | mm | 1903 |

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

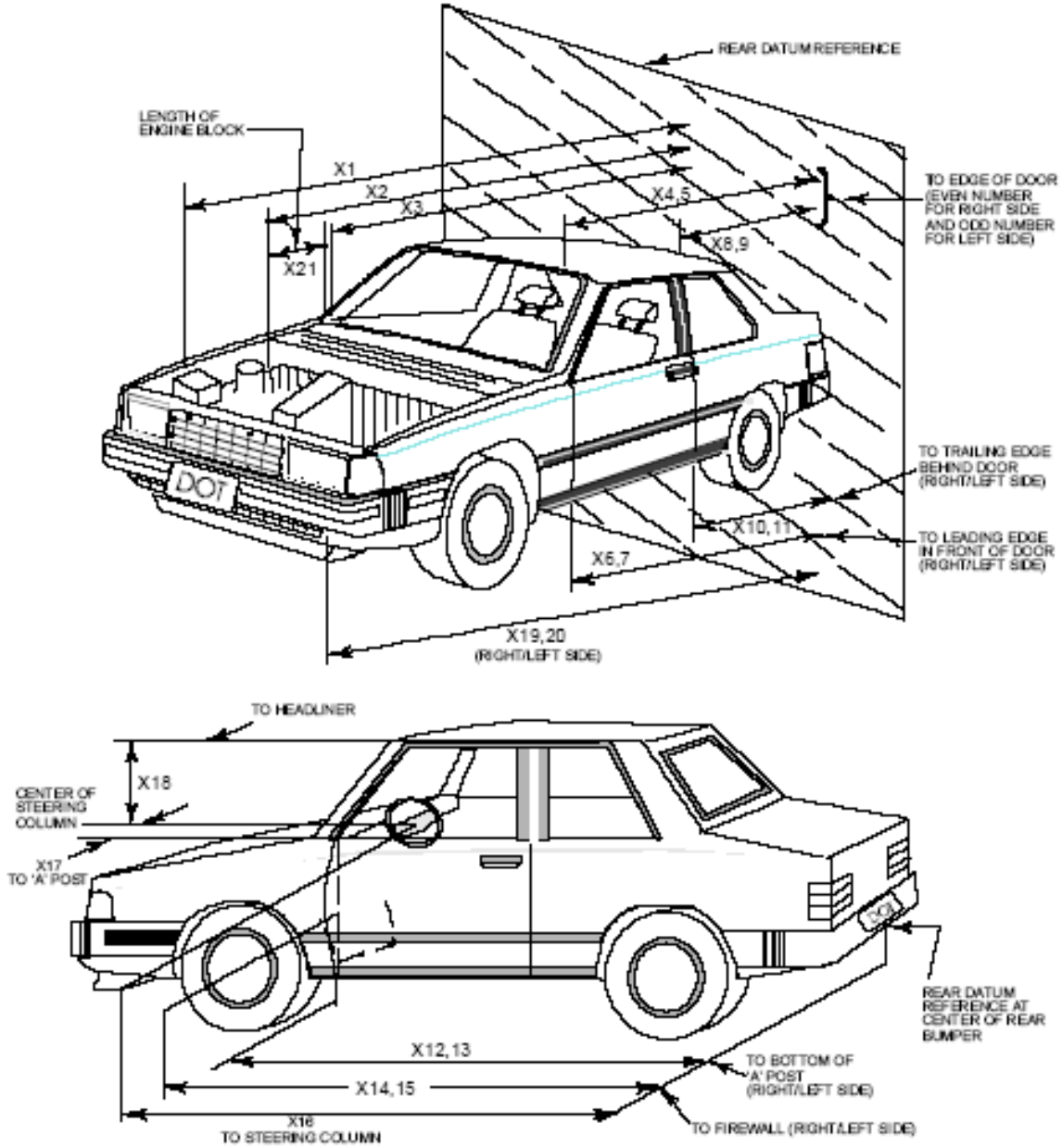
| Restraint Type | Driver (Occupant 1) | | Passenger (Occupant 2) | |
|------------------------|---------------------|----------|------------------------|----------|
| | Installed | Deployed | Installed | Deployed |
| Front Airbag | Yes | Yes | Yes | Yes |
| Side Curtain Airbag | Yes | Yes | Yes | Yes |
| Torso/Pelvis Airbag | Yes | Yes | Yes | Yes |
| Pelvis Airbag | No | N/A | No | N/A |
| Knee Airbag | Yes | Yes | No | N/A |
| Seat Belt Pretensioner | Yes | Yes | Yes | Yes |
| Seat Belt Load Limiter | Yes | Unknown | Yes | Unknown |
| Seat Cushion Airbag | No | N/A | Yes | Yes |

DATA SHEET NO. 12

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
Test Date: 11/14/16



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
 Test Date: 11/14/16

| No. | Measurement Description | Pre-Test | Post-Test | Difference |
|-----|---|----------|-----------|------------|
| 1 | Total Length of Vehicle at Centerline | 4650 | 3912 | 738 |
| 2 | Rear Surface of Vehicle (RSOV) to Front of Engine | 4135 | 3861 | 274 |
| 3 | RSOV to Firewall | 3707 | 3650 | 57 |
| 4 | RSOV to Upper Leading Edge of Right Door | 3232 | 3231 | 1 |
| 5 | RSOV to Upper Leading Edge of Left Door | 3231 | 3223 | 8 |
| 6 | RSOV to Lower Leading Edge of Right Door | 3165 | 3166 | -1 |
| 7 | RSOV to Lower Leading Edge of Left Door | 3167 | 3158 | 9 |
| 8 | RSOV to Upper Trailing Edge of Right Door | 2168 | 2167 | 1 |
| 9 | RSOV to Upper Trailing Edge of Left Door | 2166 | 2159 | 7 |
| 10 | RSOV to Lower Trailing Edge of Right Door | 2160 | 2162 | -2 |
| 11 | RSOV to Lower Trailing Edge of Left Door | 2168 | 2160 | 8 |
| 12 | RSOV to Bottom of "A" Post-of Right Side | 3225 | 3223 | 2 |
| 13 | RSOV to Bottom of "A" Post-of Left Side | 3224 | 3215 | 9 |
| 14 | RSOV to Firewall, Right Side | 3586 | 3730 | -144 |
| 15 | RSOV to Firewall, Left Side | 3587 | 3715 | -128 |
| 16 | RSOV to Steering Column | 2749 | 2780 | -31 |
| 17 | Center of Steering Column to "A" Post | 283 | 300 | -17 |
| 18 | Center of Steering Column to Headliner | 407 | 400 | 7 |
| 19 | RSOV to Right Side of Front Bumper | 4366 | 3964 | 402 |
| 20 | RSOV to Left Side of Front Bumper | 4367 | 3950 | 417 |
| 21 | Length of Engine Block | 550 | 550 | 0 |
| RD | RSOV to Right Side of Dash Panel | 3006 | 3010 | -4 |
| CD | RSOV to Center of Dash Panel | 2943 | 2950 | -7 |
| LD | RSOV to Left Side of Dash Panel | 3010 | 3000 | 10 |

All Dimensions in mm

DATA SHEET NO. 13

ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
 Test Date: 11/14/16

VEHICLE INFORMATION

VIN: 2T1BURHE9HC747230
 Vehicle Size Category: Passenger Car

Wheelbase: 2700
 Test Weight (kg): 1487.8

ACCELEROMETER DATA

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

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

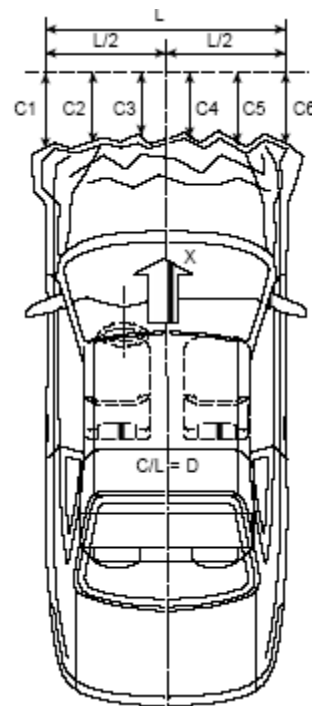
Integration Algorithm: Trapezoidal

Linearity: > 99%

Impact Velocity (km/h): 56.65

Velocity Change (km/h): 69.59

Time of Separation (ms): 120



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 | 4367 | 3950 | 417 |
| C2 | Crush zone 2 at left side | mm | 4548 | 3960 | 588 |
| C3 | Crush zone 3 at left side | mm | 4611 | 3925 | 686 |
| C4 | Crush zone 4 at right side | mm | 4610 | 3935 | 675 |
| C5 | Crush zone 5 at right side | mm | 4548 | 3956 | 592 |
| C6 | Crush zone 6 at right side | mm | 4366 | 3964 | 402 |
| L | C1 to C6 | mm | 1524 | 1080 | 444 |

DATA SHEET NO. 14

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: NCAP Frontal Impact

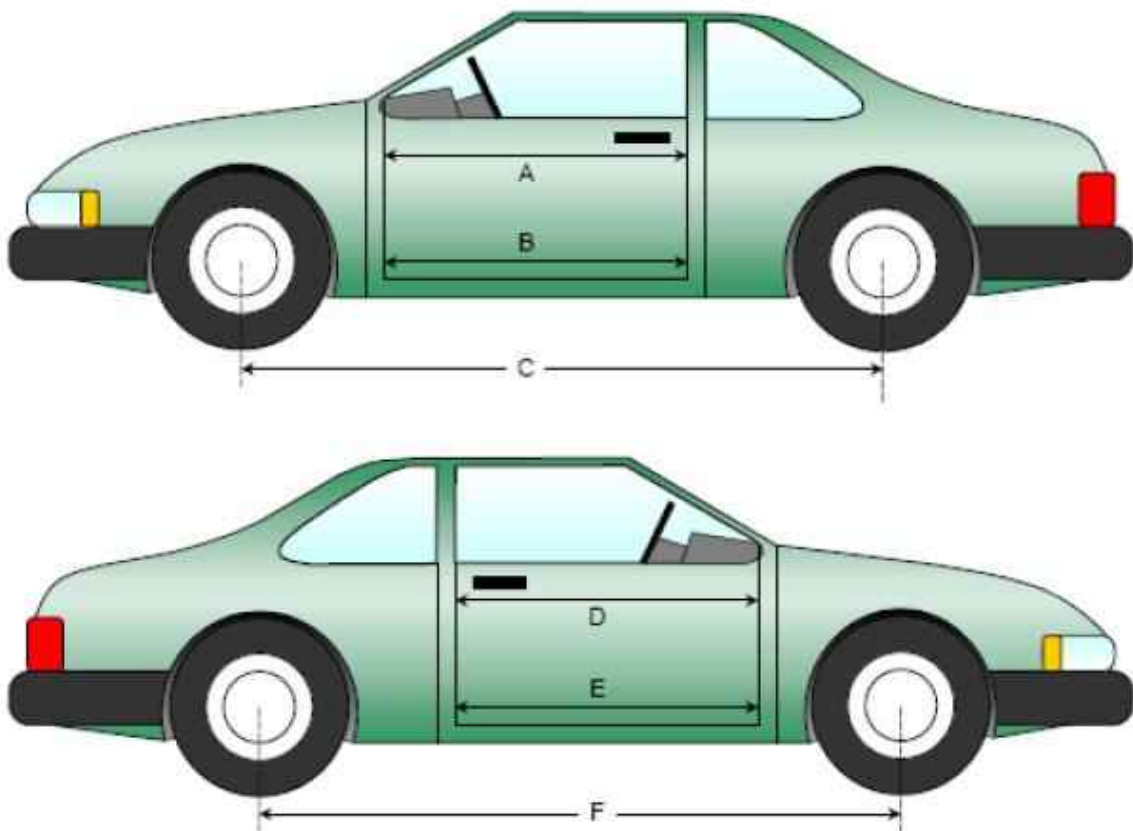
NHTSA No.: M20175104
 Test Date: 11/14/16

DOOR OPENING WIDTH

| No. | Description | Units | Pre-Test | Post-Test | Difference |
|-----|------------------|-------|----------|-----------|------------|
| A | Left Side Upper | mm | 1033 | 1032 | 1 |
| B | Left Side Lower | mm | 852 | 852 | 0 |
| C | Right Side Upper | mm | 1033 | 1033 | 0 |
| D | Right Side Lower | mm | 852 | 852 | 0 |

WHEELBASE MEASUREMENTS

| No. | Description | Units | Pre-Test | Post-Test | Difference |
|-----|----------------------|-------|----------|-----------|------------|
| C | Left Side Wheelbase | mm | 2700 | 2635 | 65 |
| F | Right Side Wheelbase | mm | 2700 | 2662 | 38 |



DATA SHEET NO. 14 (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

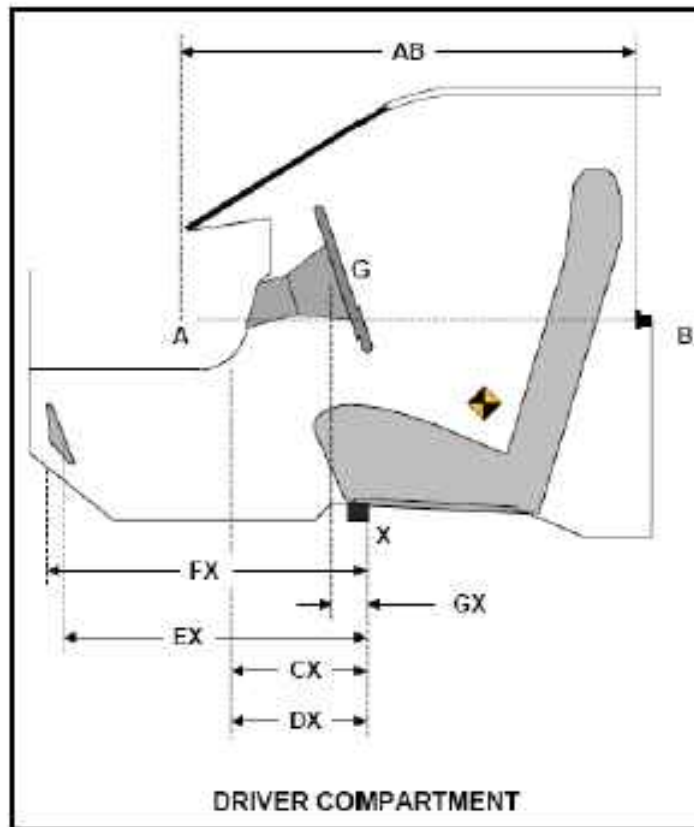
Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
 Test Date: 11/14/16

DRIVER COMPARTMENT INTRUSION

| Item | Description | Units | Pre-Test | Post-Test | Difference |
|------|--|-------|----------|-----------|------------|
| AB | Door Opening (Inside Window Jam) | mm | 1020 | 1020 | 0 |
| CX | Left Knee Bolster to X | mm | 308 | 318 | -10 |
| DX | Right Knee Bolster to X | mm | 305 | 340 | -35 |
| EX | Brake Pedal to X | mm | 545 | 545 | 0 |
| FX | Foot Rest to X | mm | 530 | 515 | 15 |
| GX | Center of Steering Column Wheel Hub to X | mm | 55 | 115 | -60 |

X = Front of Seat Track (Stationary)



DATA SHEET NO. 15

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

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
 Test Date: 11/14/16

Please provide windshield mounting details.

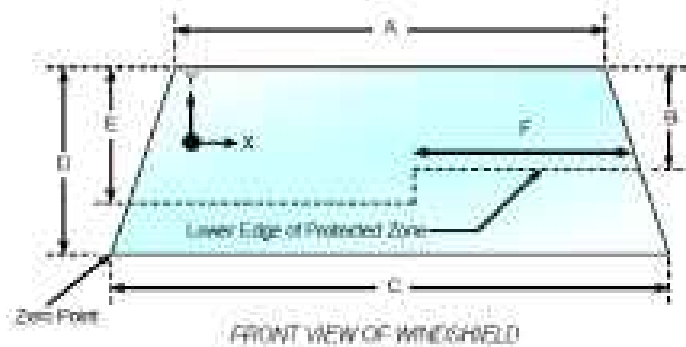
The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicle not equipped with occupant passive restraint and 50% for each side of the windshield for vehicle which are equipped with occupant passive restraints.

Temperature of windshield molding during test: 21.7° C

WINDSHIELD PERIPHERY MEASUREMENTS

| Measurement | Pre-Test (mm) | Post-Test (mm) | % Retention |
|-------------|---------------|----------------|-------------|
| Left Side | 2094 | 2094 | 100.0 |
| Right Side | 2117 | 2117 | 100.0 |
| Total | 4211 | 4211 | 100.0 |

| Item | Units | Value |
|------|-------|-------|
| A | mm | 1100 |
| B | mm | 473 |
| C | mm | 1440 |
| D | mm | 840 |
| E | mm | 489 |
| F | mm | 415 |



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. The inner surface of the windshield was penetrated by the hood support beneath the protected zone.

| 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: 2017 Toyota Corolla 4DR Sedan
Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
Test Date: 11/14/16

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21.1°C

Test Time: 17:03

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: None

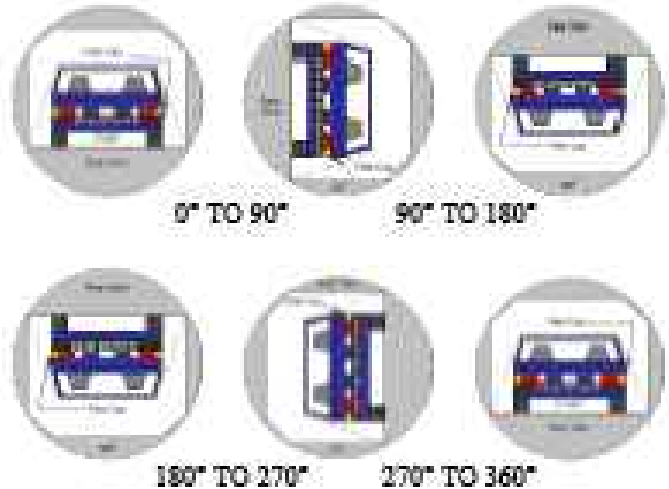
DATA SHEET NO. 16

FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
 Test Date: 11/14/16

1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard Solvent spillage:
 None



SOLVENT COLLECTION TIME TABLE IN SECONDS

| Test Phase | Rotation Time | Hold Time | Total Time |
|--------------|---------------|-----------|------------|
| 0° to 90° | 90 | 330 | 420 |
| 90° to 180° | 90 | 330 | 840 |
| 180° to 270° | 90 | 330 | 1260 |
| 270° to 360° | 90 | 330 | 1480 |

FMVSS 301 SPILLAGE TABLE

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

SOLVENT SPILLAGE LOCATION TABLE

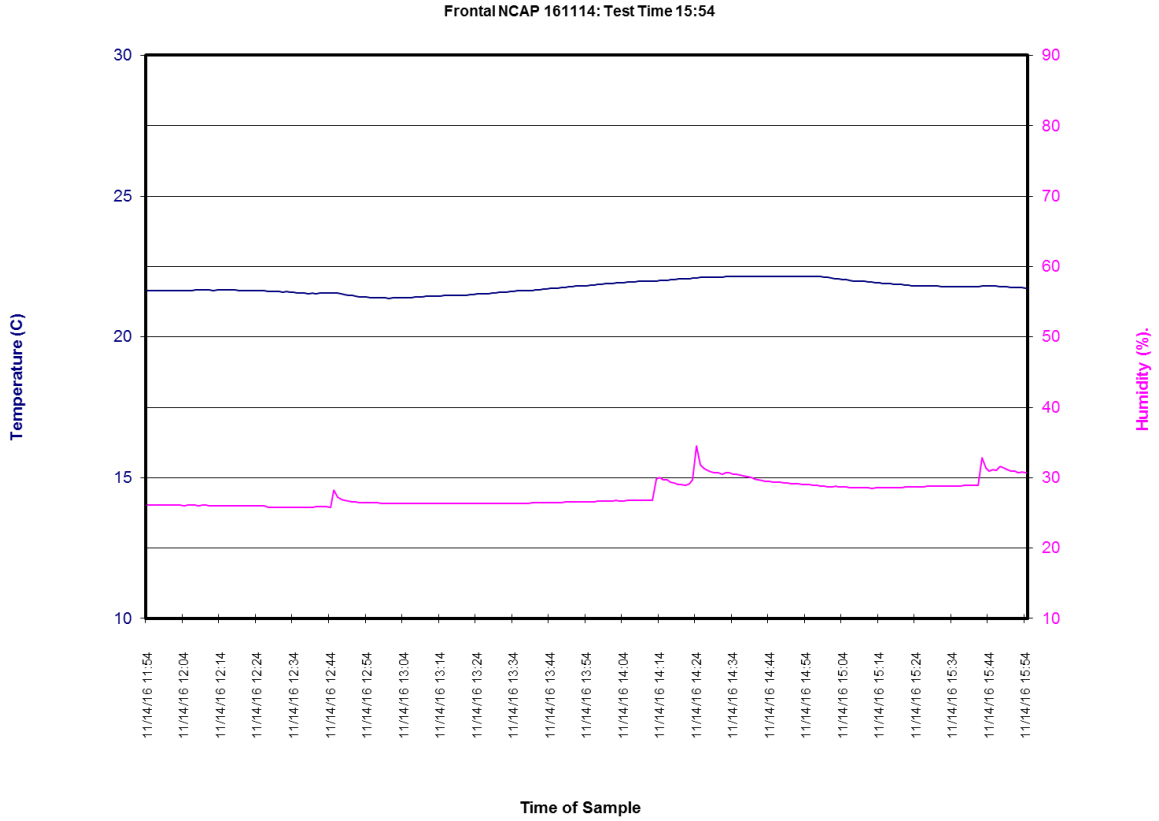
| Test Phase | Spillage Location |
|--------------|-------------------|
| 0° to 90° | None |
| 90° to 180° | None |
| 180° to 270° | None |
| 270° to 360° | None |

DATA SHEET NO. 17

DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
Test Program: NCAP Frontal Impact

NHTSA No.: M20175104
Test Date: 11/14/16



APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

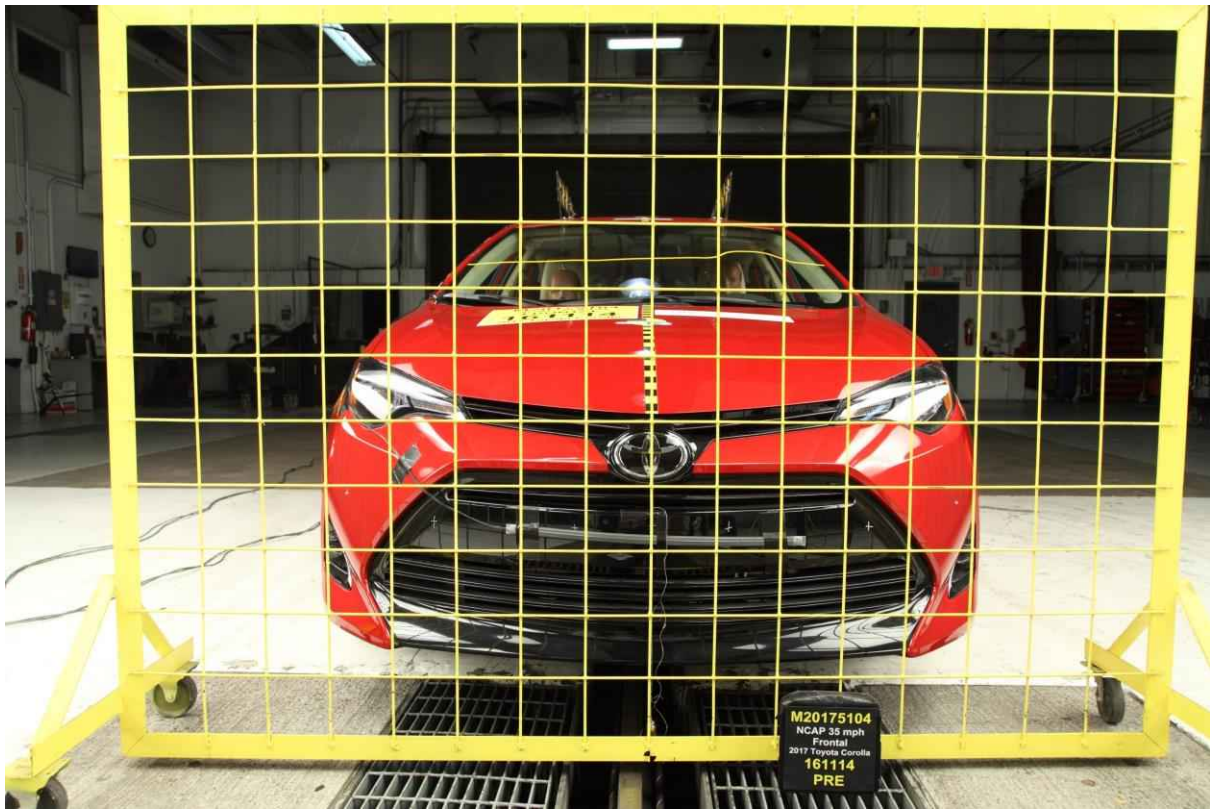
| No. | Description | Page |
|------------|--|-------------|
| 1 | Load Cell Location | A-5 |
| 2 | Pre-Test Load Cell Wall | A-5 |
| 3 | Post-Test Load Cell Wall | A-6 |
| 4 | Manufacturer's Label | A-6 |
| 4a | Reduced Load Carrying Capacity Label | A-7 |
| 5 | Tire Placard | A-7 |
| 6 | 2017 Toyota Corolla 4DR Sedan Frontal as Delivered | A-8 |
| 7 | Right Rear 3-4 View, as Received | A-8 |
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| 12 | Pre-Test Right View of Test Vehicle | A-11 |
| 13 | Post-Test Right View of Test Vehicle | A-11 |
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| 23 | Post-Test Fuel Filler Cap View | A-16 |
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| 25a | Pre-Test Mid Underbody View | A-18 |
| 25b | Post-Test Mid Underbody View | A-18 |
| 25c | Pre-Test Mid Rear Underbody View | A-19 |
| 25d | Post-Test Mid Rear Underbody View | A-19 |
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| 27 | Post-Test Rear Underbody View | A-20 |
| 28 | Pre-Test Dummy Cable Routing | A-21 |
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| 30 | Pre-Test Driver Dummy Front View | A-22 |
| 31 | Post-Test Driver Dummy Front View | A-22 |

TABLE OF PHOTOGRAPHS (CONTINUED)

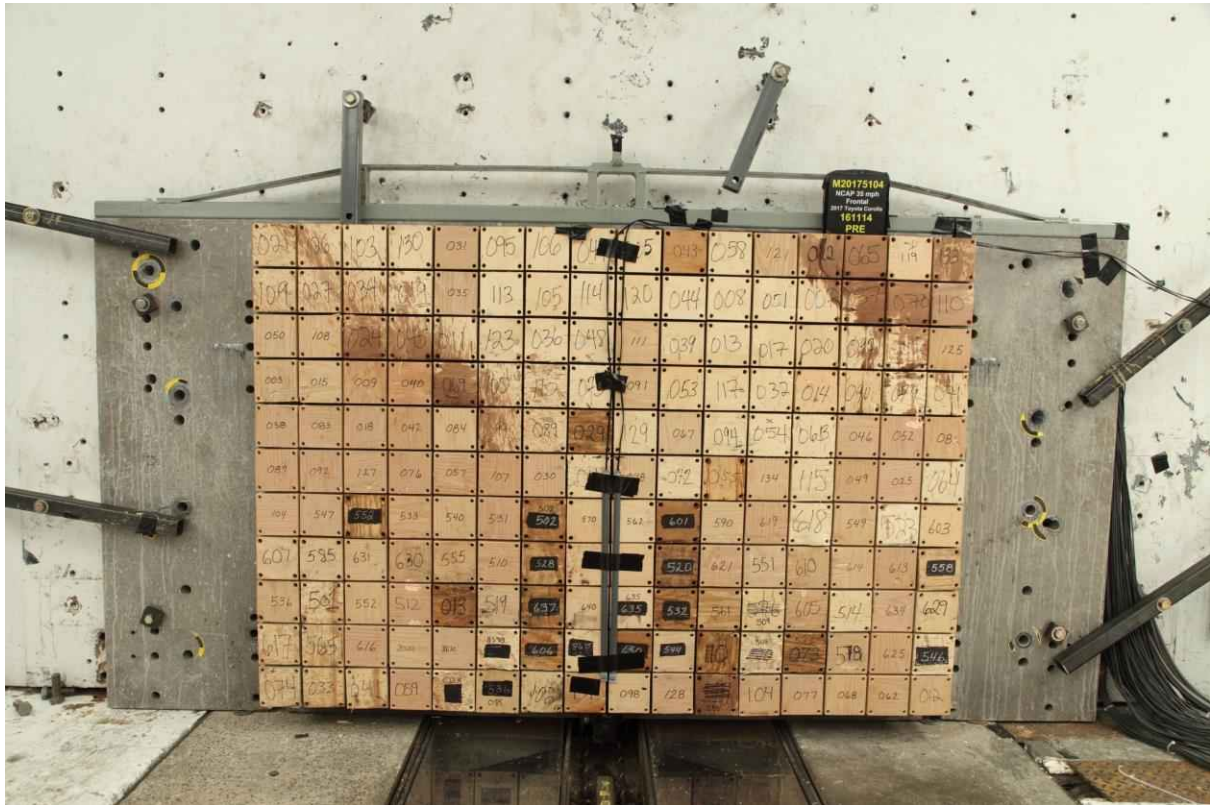
| No. | Description | Page |
|------------|---|-------------|
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001 Load Cell Location



002 Pre-Test Load Cell Wall



003 Post-Test Load Cell Wall



004 Manufacturer's Label



004a Reduced Load Carrying Capacity Label



005 Tire Placard



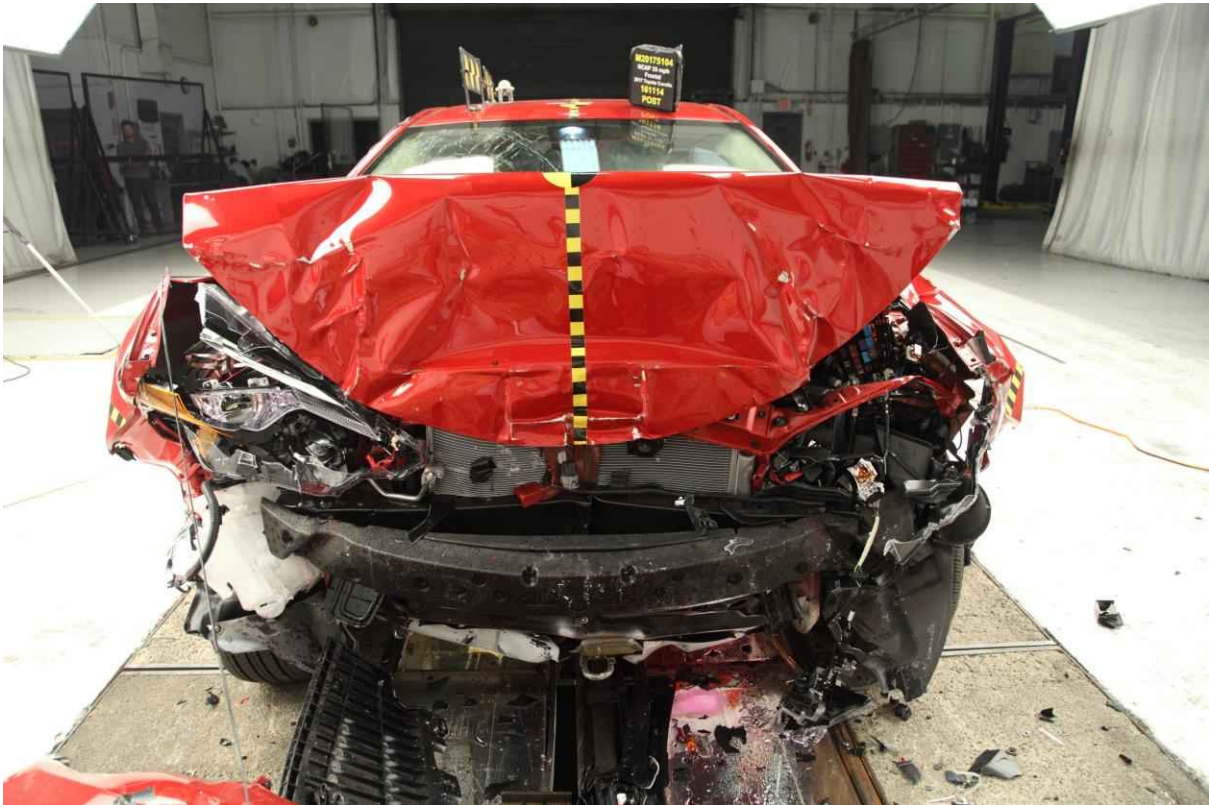
006 2017 Toyota Corolla 4DR Sedan Frontal as Delivered



007 Right Rear 3-4 View, as Received



008 Pre-Test Front View of Test Vehicle



009 Post-Test Front View of Test Vehicle



010 Pre-Test Left View of Test Vehicle



011 Post-Test Left View of Test Vehicle



012 Pre-Test Right View of Test Vehicle



013 Post-Test Right View of Test Vehicle



014 Pre-Test Right Front 3-4 View



015 Post-Test Right Front 3-4 View



016 Pre-Test Left Rear 3-4 View



017 Post-Test Left Rear 3-4 View



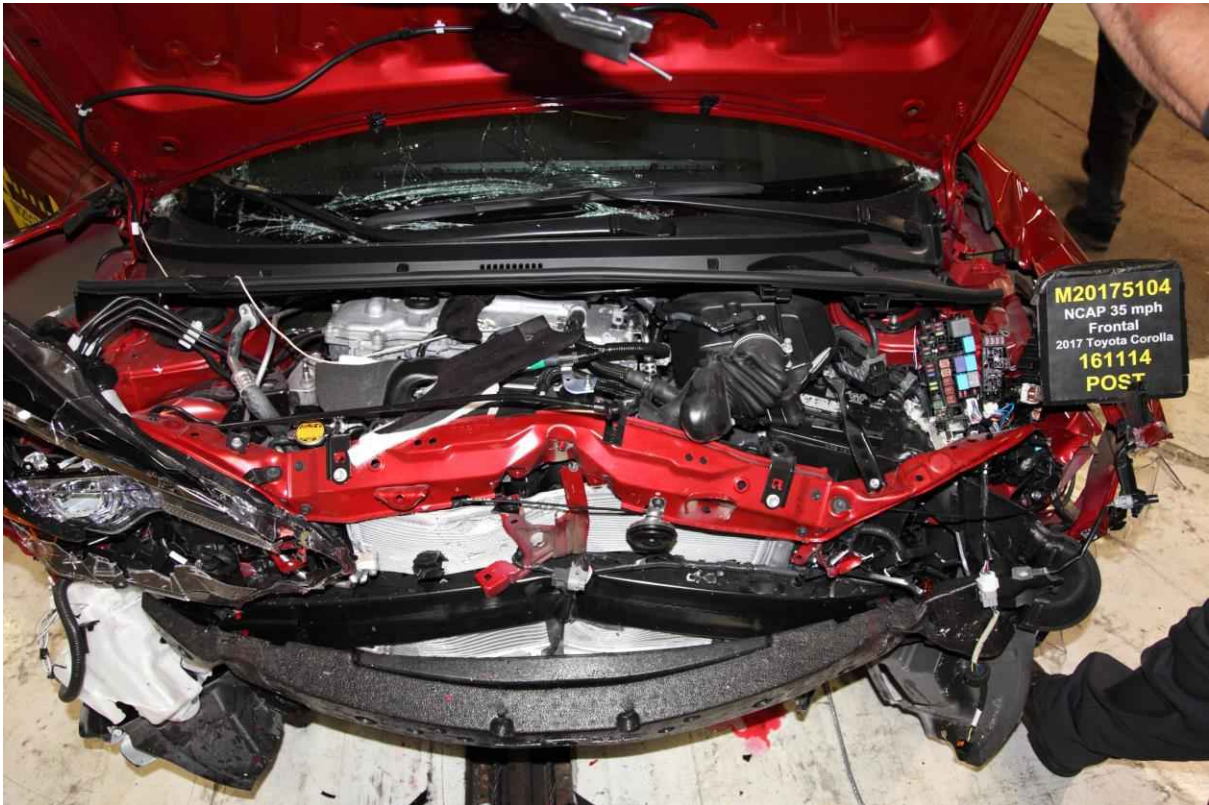
018 Pre-Test Windshield View



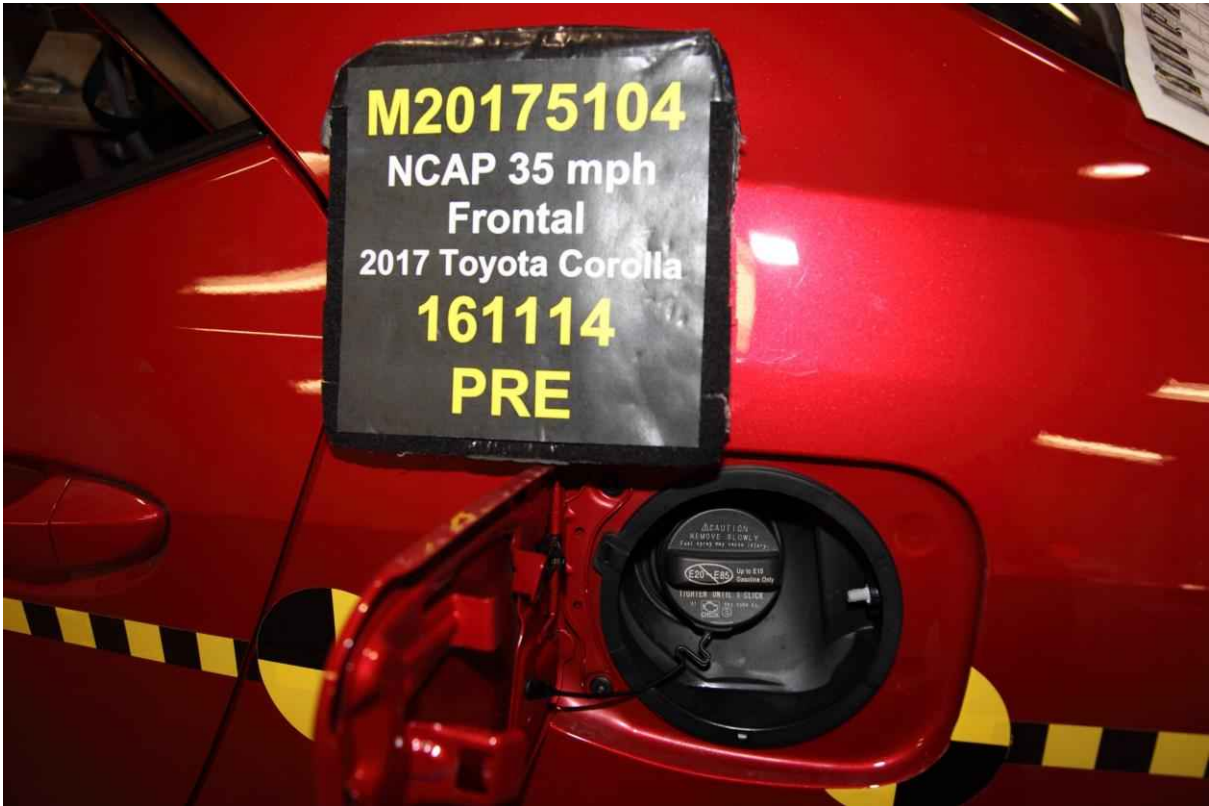
019 Post-Test Windshield View



020 Pre-Test Engine Compartment View



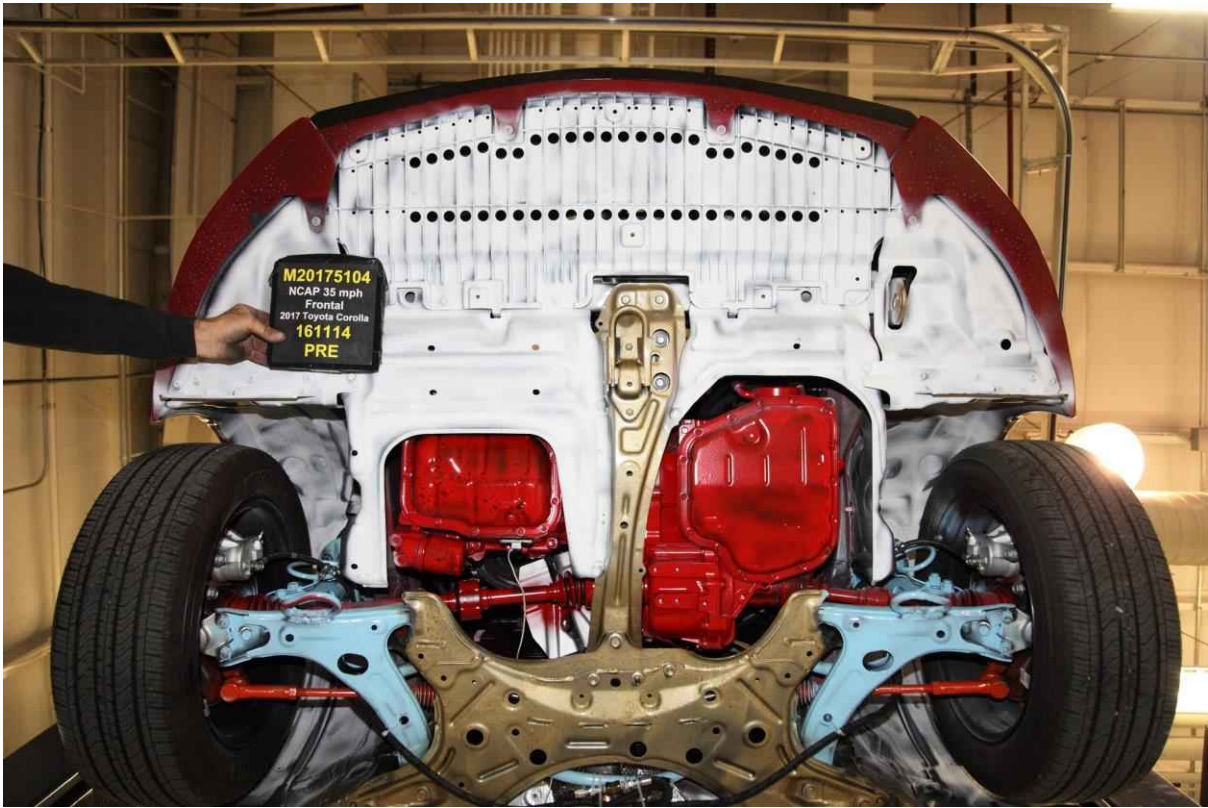
021 Post-Test Engine Compartment View



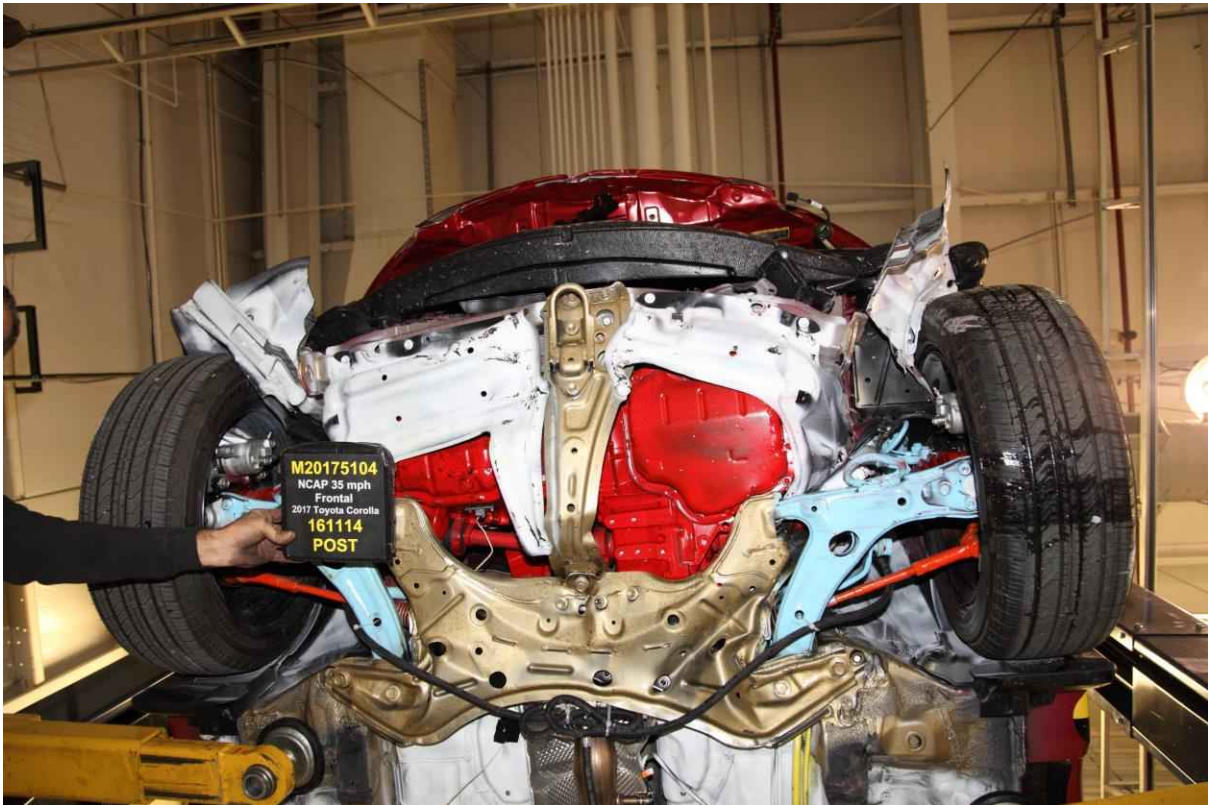
022 Pre-Test Fuel Filler Cap View



023 Post-Test Fuel Filler Cap View



024 Pre-Test Front Underbody View



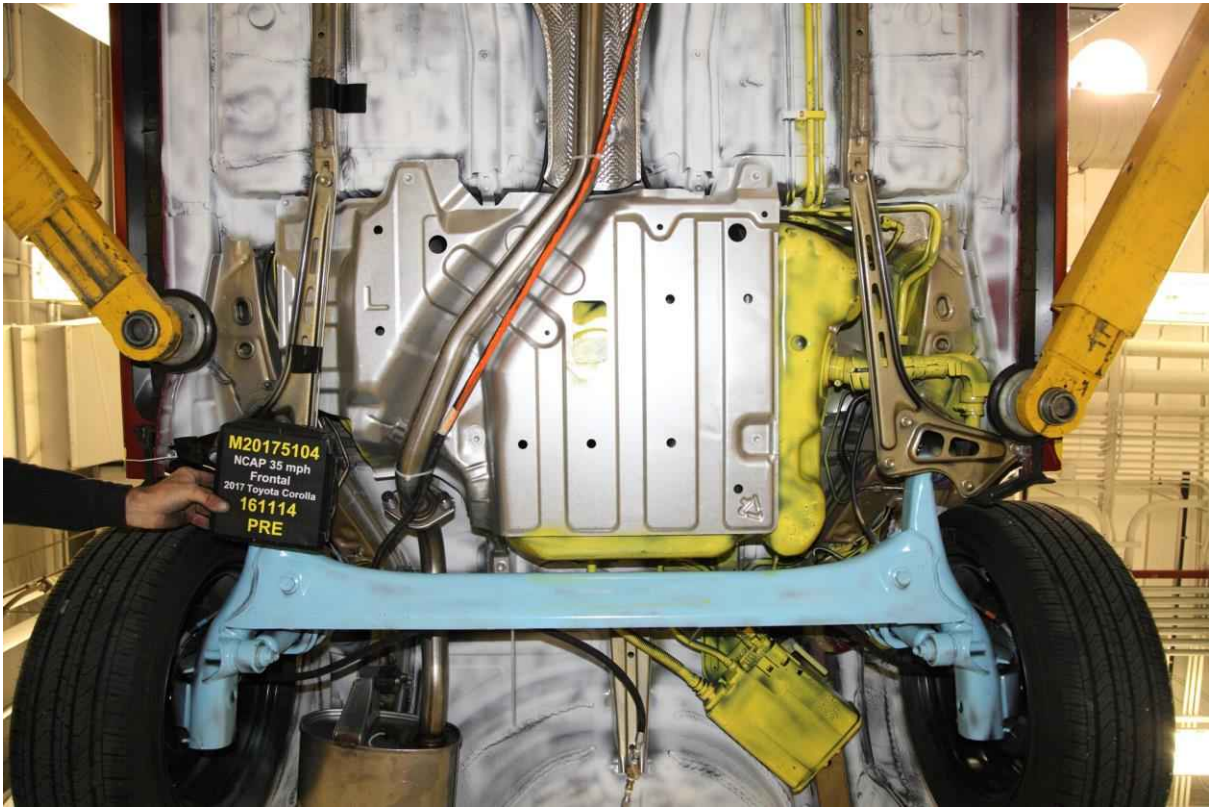
025 Post-Test Front Underbody View



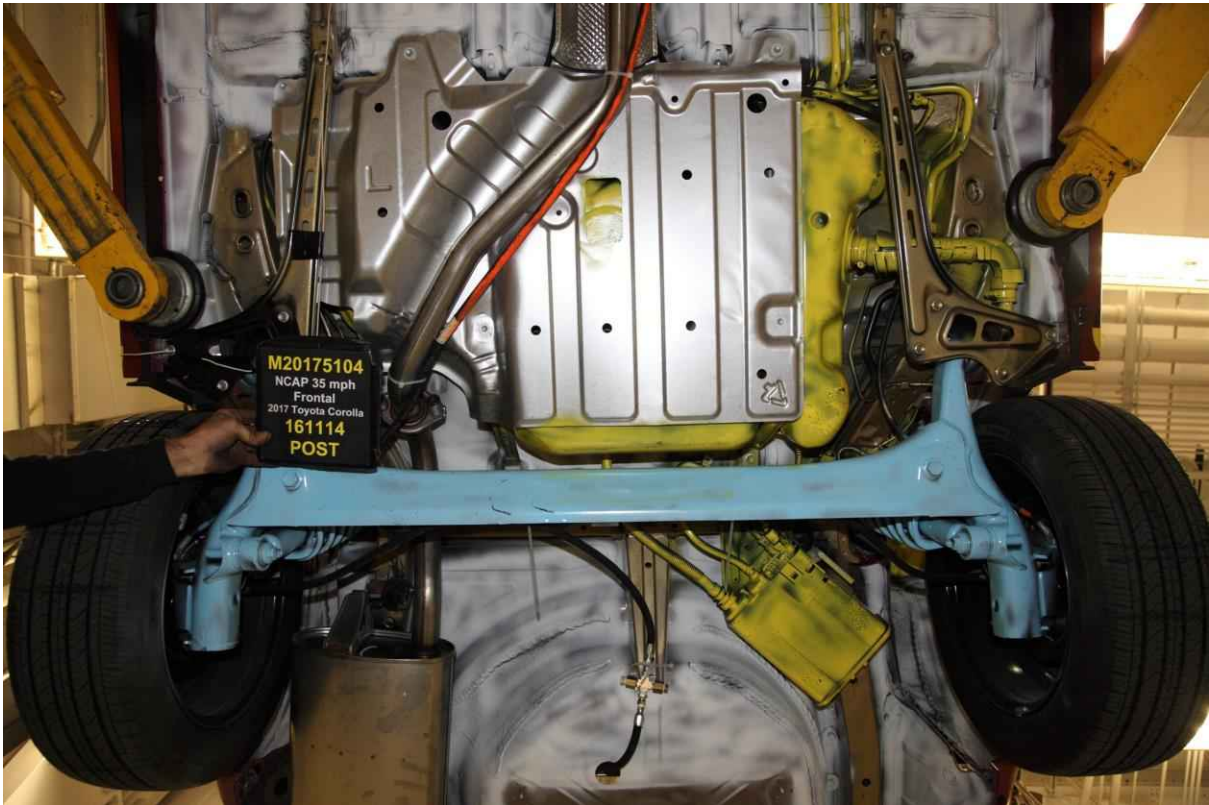
025a Pre-Test Mid Front Underbody View



025b Post-Test Mid Front Underbody View



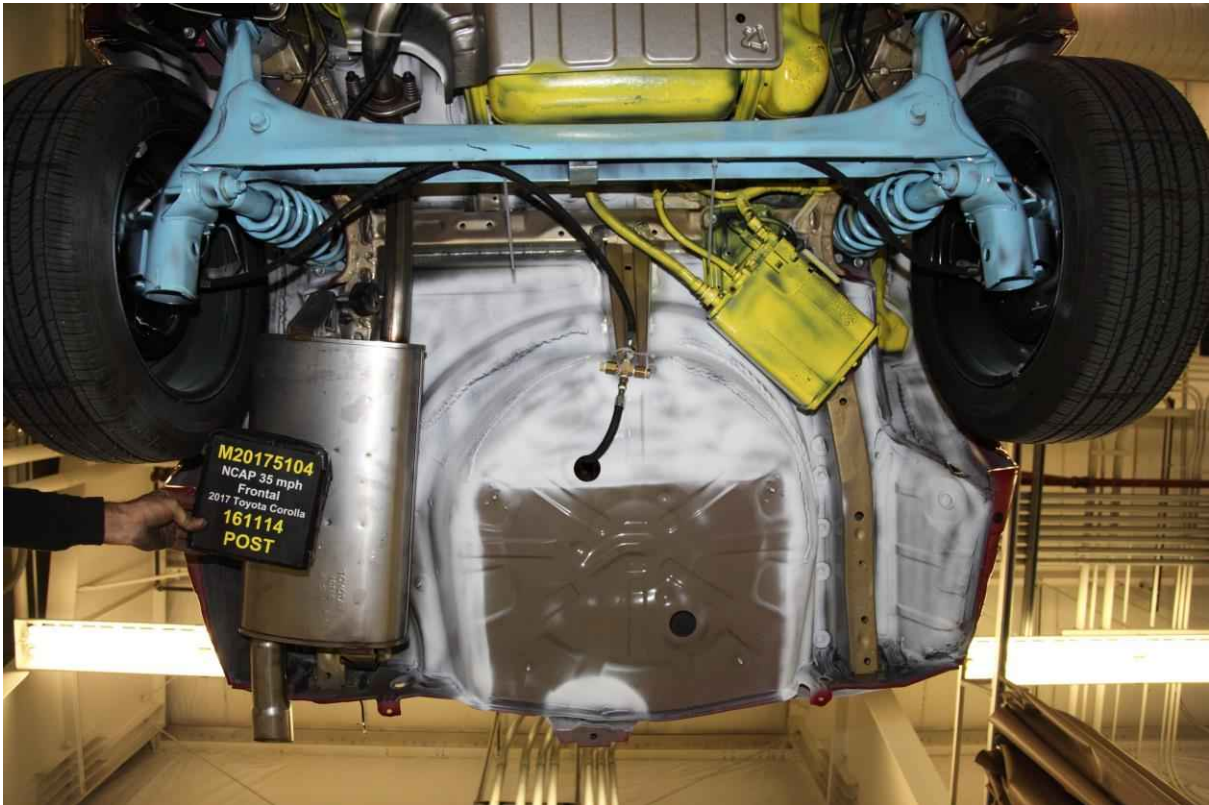
025c Pre-Test Mid Rear Underbody View



025d Post-Test Mid Rear Underbody View



026 Pre-Test Rear Underbody View



027 Post-Test Rear Underbody View



028 Pre-Test Dummy Cable Routing



029 Post-Test Dummy Cable Routing



030 Pre-Test Driver Dummy Front View



031 Post-Test Driver Dummy Front View



032 Pre-Test Driver Dummy Window View



033 Post-Test Driver Dummy Window View



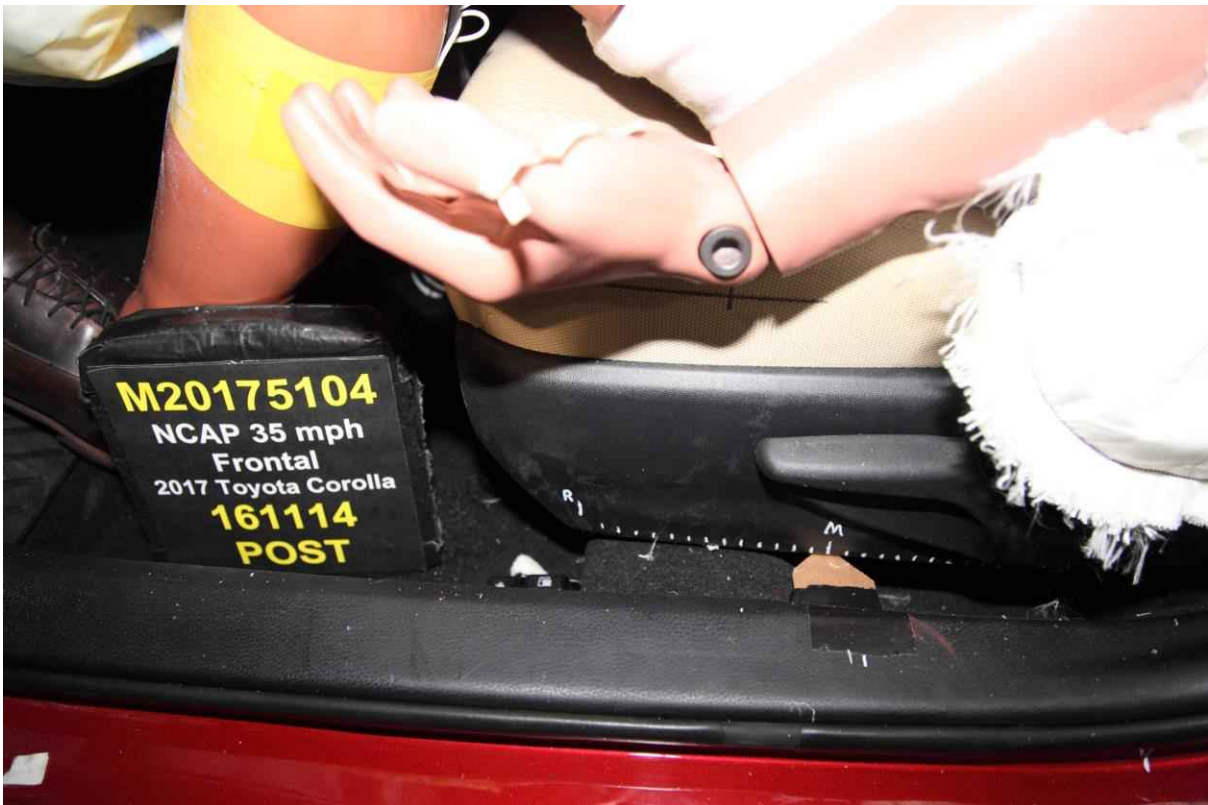
034 Pre-Test Driver Dummy and Vehicle Interior View



035 Post-Test Driver Dummy and Vehicle Interior View



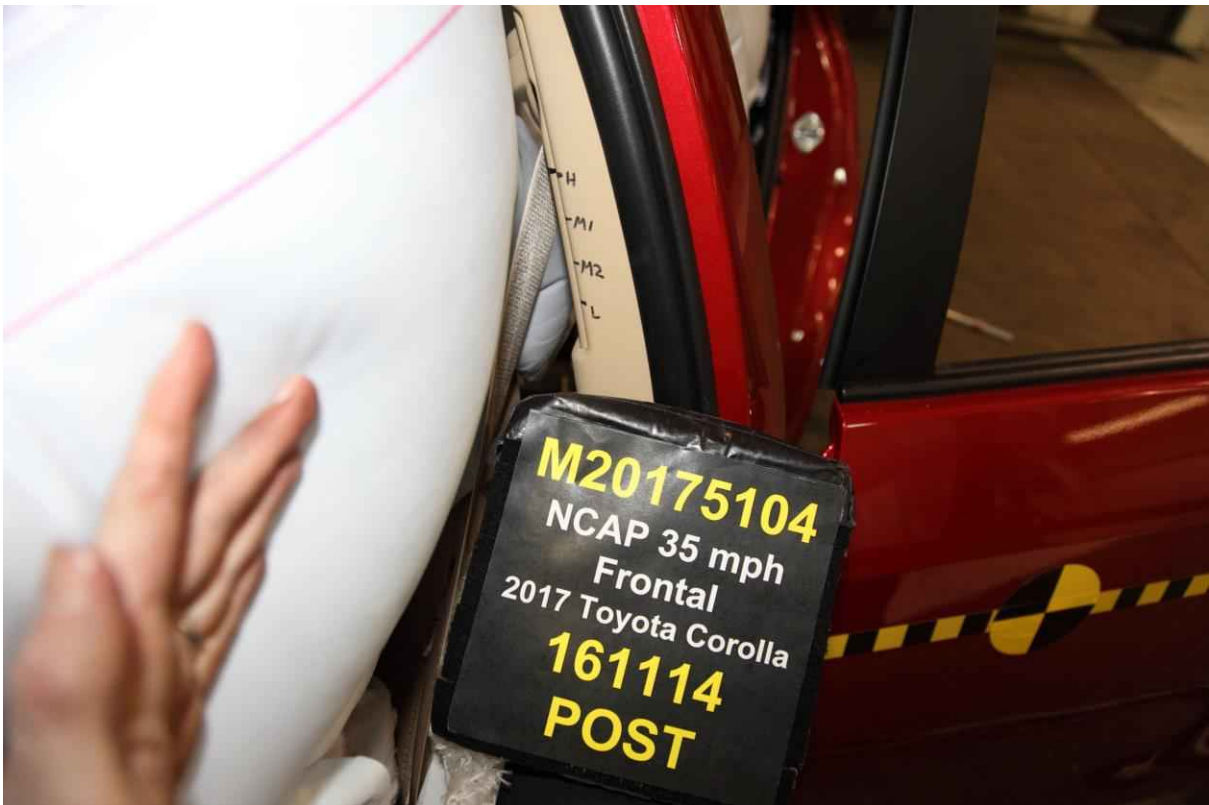
036 Pre-Test Driver's Seat Fore-Aft Markings



037 Post-Test Driver's Seat Fore-Aft Markings



038 Pre-Test View of Belt Anchorage for Driver Dummy



039 Post-Test View of Belt Anchorage for Driver Dummy



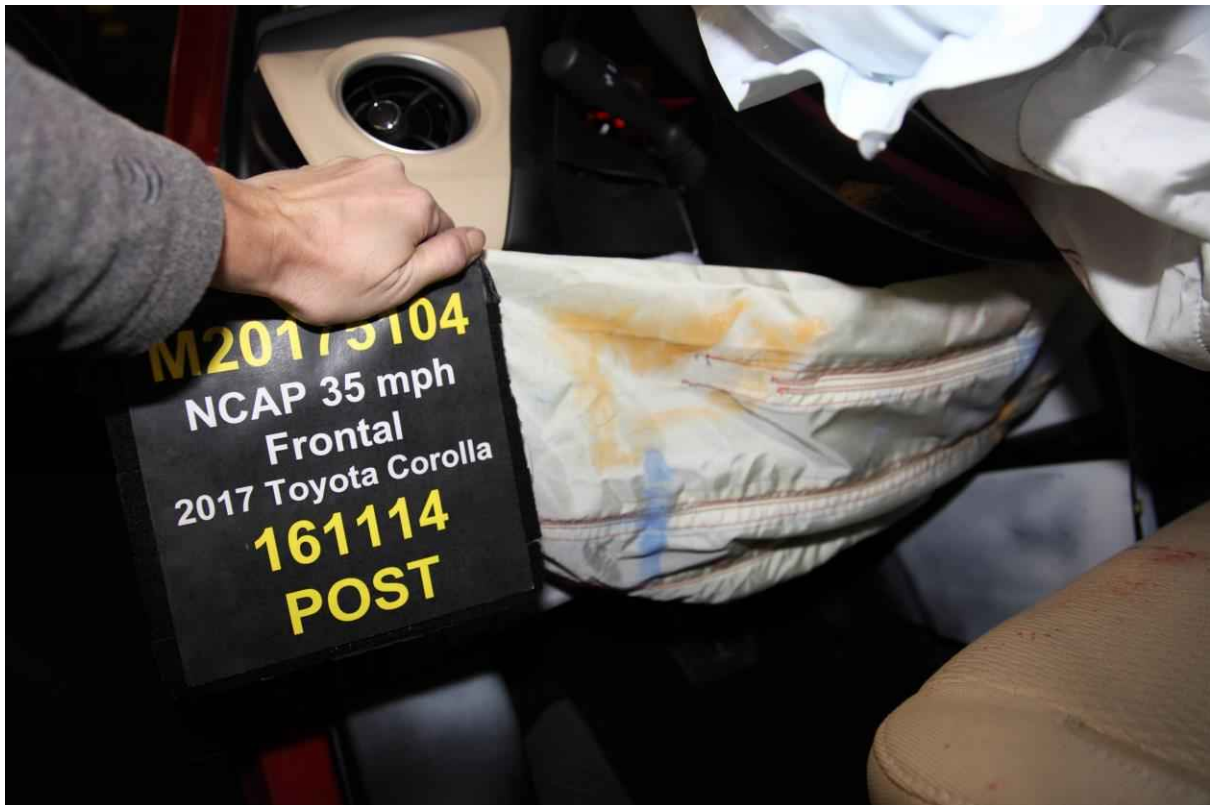
040 Pre-Test Driver Dummy Feet



041 Post-Test Driver Dummy Feet



042 Pre-Test Driver's Side Knee Bolster



043 Post-Test Driver's Side Knee Bolster



044 Pre-Test Driver's Side Floorpan



045 Post-Test Driver's Side Floorpan



046 Post-Test Driver Dummy Face



047 Post-Test Driver Dummy Contact with Airbag



048 Post-Test Driver Dummy Contact with Headrest



048a Post-Test Driver Dummy Contact with Side Curtain Airbag



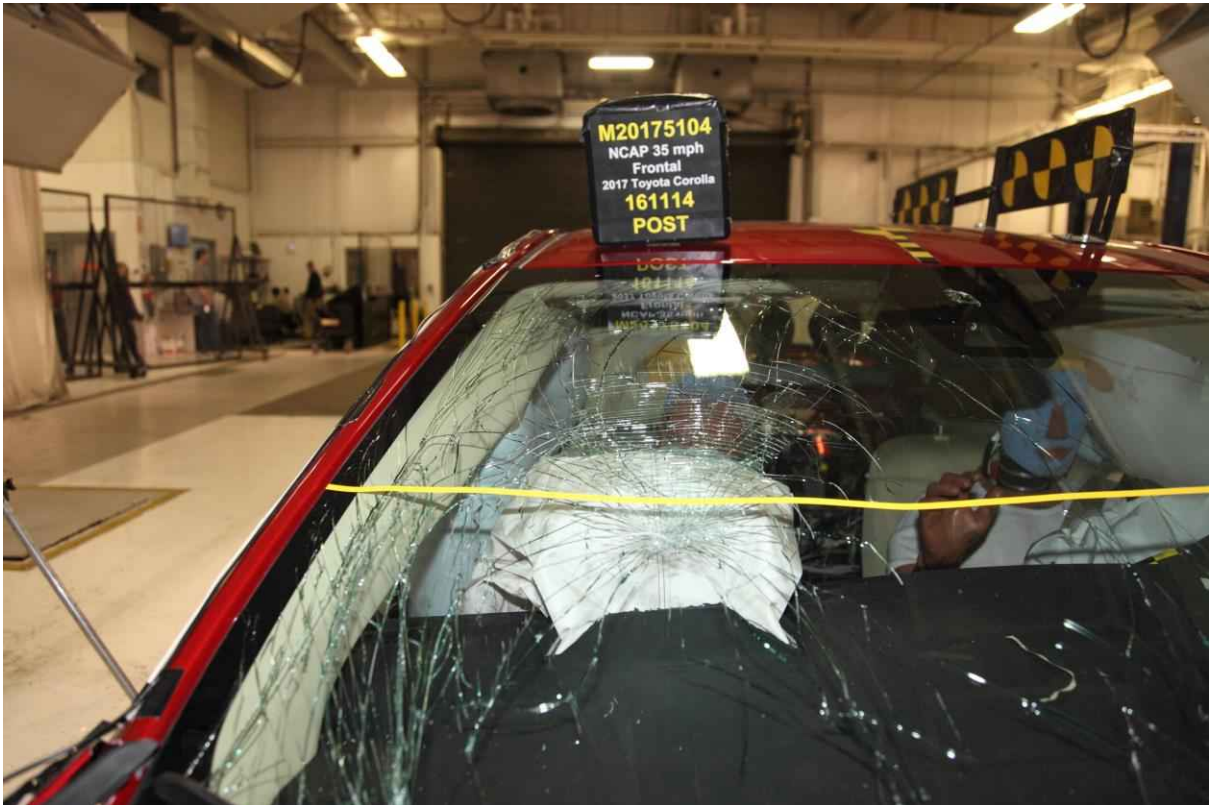
049 Pre-Test View of the Steering Wheel



050 Post-Test View of the Steering Wheel



051 Pre-Test Passenger Dummy Front View



052 Post-Test Passenger Dummy Front View



053 Pre-Test Passenger Dummy Window View



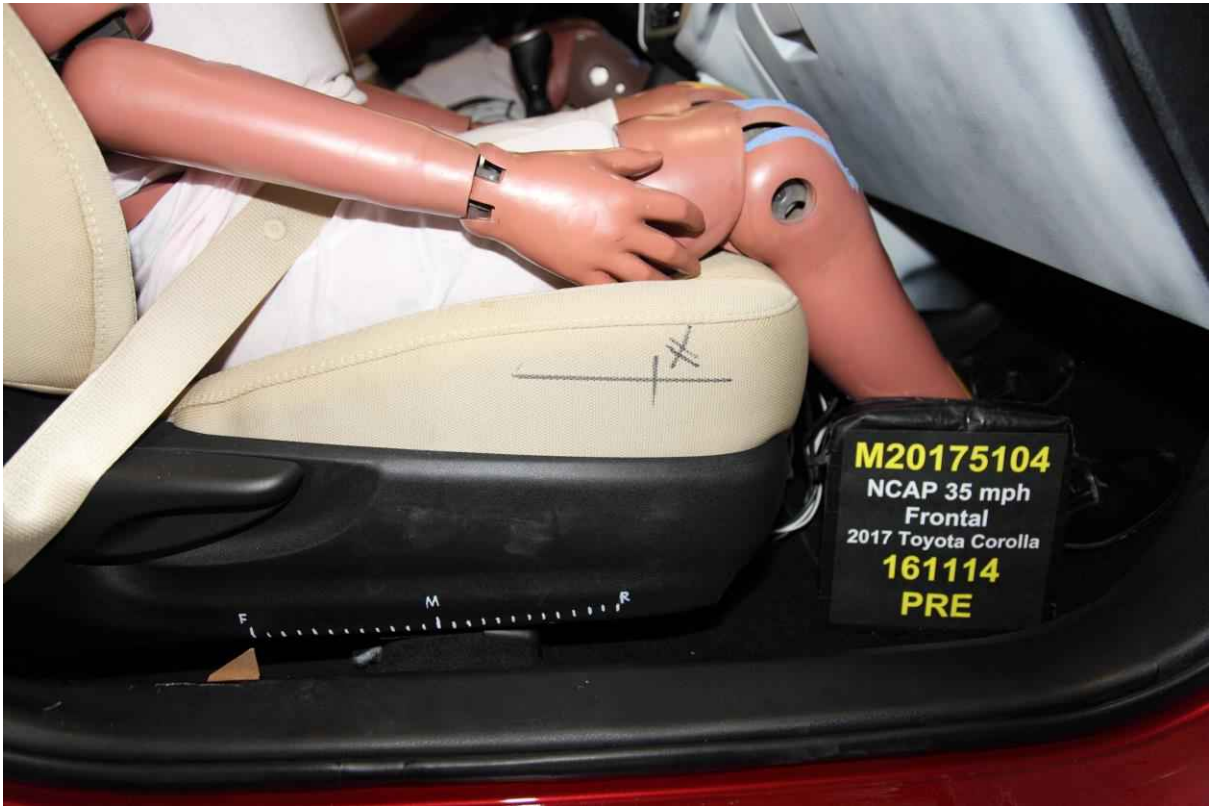
054 Post-Test Passenger Dummy Window View



055 Pre-Test Passenger Dummy and Vehicle Interior View



056 Post-Test Passenger Dummy and Vehicle Interior View



057 Pre-Test Passenger's Seat Fore-Aft Markings



058 Post-Test Passenger's Seat Fore-Aft Markings



059 Pre-Test View of Belt Anchorage for Passenger Dummy



060 Post-Test View of Belt Anchorage for Passenger Dummy



061 Pre-Test Passenger Dummy Feet



062 Post-Test Passenger Dummy Feet



063 Pre-Test Passenger's Side Knee Bolster



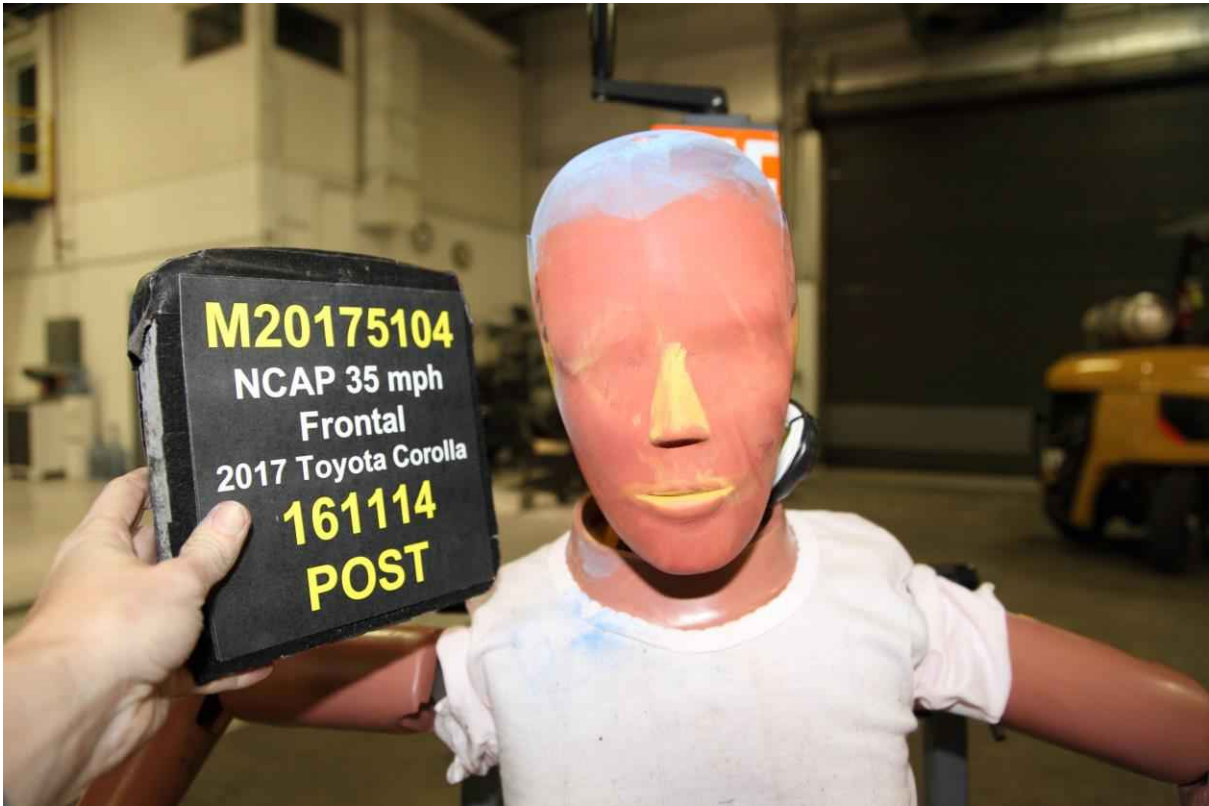
064 Post-Test Passenger's Side Knee Bolster



065 Pre-Test Passenger's Side Floorpan



066 Post-Test Passenger's Side Floorpan



067 Post-Test Passenger Dummy Face



068 Post-Test Passenger Dummy Contact with Airbag



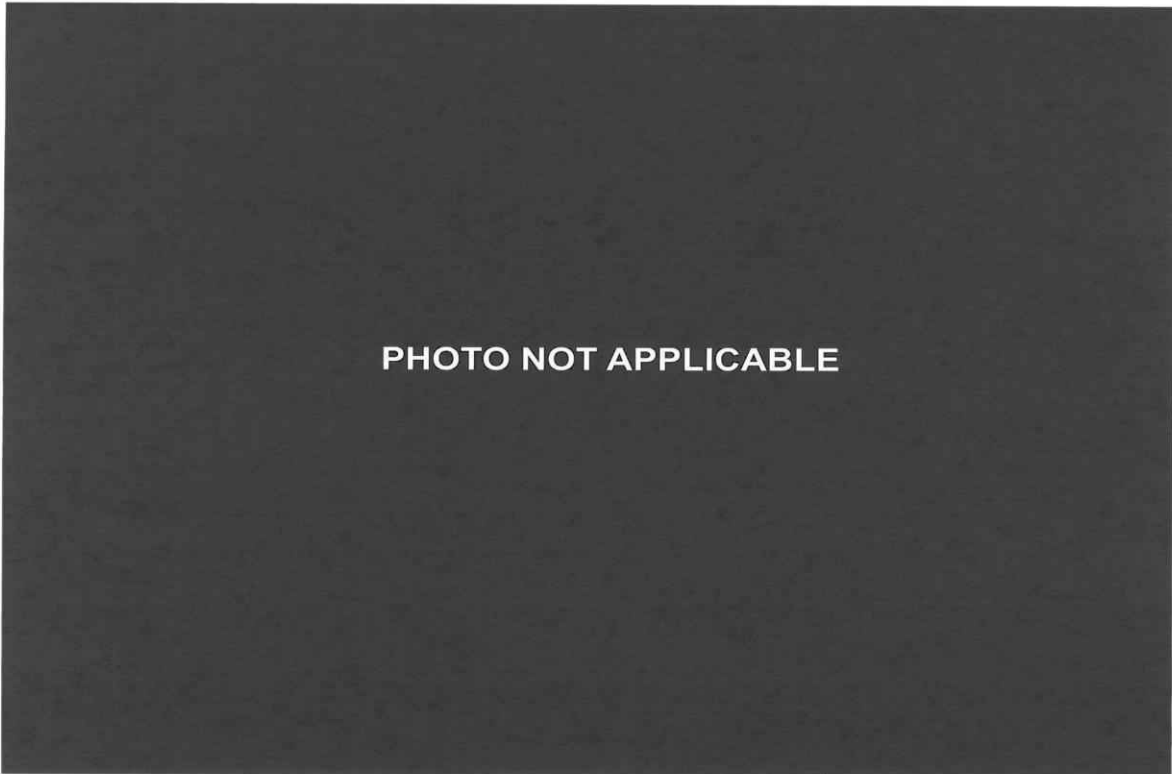
069 Post Test Passenger Dummy Contact with Headrest



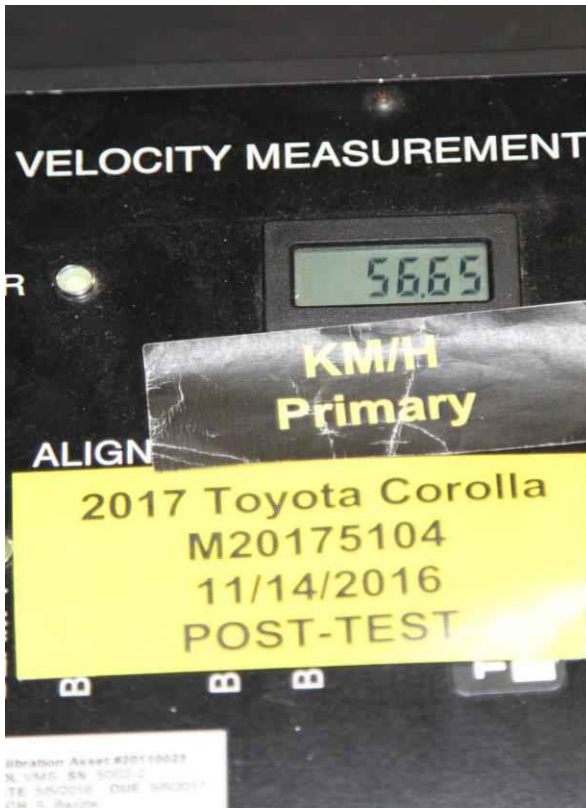
069a Post Test Passenger Dummy Contact with Side Curtain Airbag



070 Photograph of Ballast Installed in Vehicle View



071 Post-Test Stoddard Solvent Spillage Location View



072 Post-Test Speed Trap Readout



073 Vehicle at 0° on Static Rollover Device



074 Vehicle at 90° on Static Rollover Device



075 Vehicle at 180° on Static Rollover Device



076 Vehicle at 270° on Static Rollover Device



077 Vehicle at 360° on Static Rollover Device



078 2017 Toyota Corolla 4DR Sedan Frontal Impact Event

| | | | | | | | | | | | | | | |
|--|-------------------------------------|--|------------------|--|---|-----------|--------------------|--|----|-------------------------------------|--------|----|-----------|--------|
| <p>TOYOTA Let's Go Places</p> | | <p>STANDARD EQUIPMENT</p> <p>MECHANICAL & PERFORMANCE</p> <ul style="list-style-type: none"> - 1.8L 4-cyl DOHC 16-Valve Dual VVT-i - Continuously Variable Transmission - 16-in Wide-Vent Steel Wheels - And P205/55R16 Tires | | <p>MANUFACTURER'S SUGGESTED RETAIL PRICE \$18,935.00</p> <p>OPTIONAL EQUIPMENT</p> <table border="1"> <tr> <td>FE</td> <td>50 State Emissions</td> <td></td> </tr> <tr> <td>ZT</td> <td>All Weather Floor Liners/Cargo Tray</td> <td>265.00</td> </tr> <tr> <td>MF</td> <td>Mudguards</td> <td>129.00</td> </tr> </table> | | FE | 50 State Emissions | | ZT | All Weather Floor Liners/Cargo Tray | 265.00 | MF | Mudguards | 129.00 |
| FE | 50 State Emissions | | | | | | | | | | | | | |
| ZT | All Weather Floor Liners/Cargo Tray | 265.00 | | | | | | | | | | | | |
| MF | Mudguards | 129.00 | | | | | | | | | | | | |
| <p>DESC: COROLLA LE</p> <p>VIN: 2T1BURHE9HC747230</p> <p>YR/MDL: 2017/1852A</p> <p>CLR: BARCELONA RED MET./IVORY (03R3/01)</p> <p>FINAL ASSEMBLY POINT: CAMBRIDGE, ONTARIO, CANADA</p> | | <p>SAFETY & CONVENIENCE</p> <ul style="list-style-type: none"> - Toyota Safety Sense-P: Pre-Collision Sys w/ Pedestrian Detection, Dynamic Radar Cruise Control, Lane Departure Alert w/ Steering Assist, Automatic High Beams - Star Safety System Includes: VSC, TRAC, Anti-lock Brake System, ABS, Smart Assist & Smart Stop Technology - 8 Airbags: Dr & Fr Pass Airbag, Side, Dr & Fr Pass Seat-Mounted Side Airbags, Dr Knee Airbag, Pass Seat Cushion Airbag, Front & Rear Side Curtain Airbags - LATCH (Lar Anchors & Tethers for Children) for Outboard Rear Seating Positions Only - Whiplash-Injury Lessening Front Seats | | | | | | | | | | | | |
| <p>GOVERNMENT 5-STAR SAFETY RATINGS</p> <p>Overall Vehicle Score Not Rated</p> <p>Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.</p> | | <p>EXTERIOR</p> <ul style="list-style-type: none"> - Bi-LED Headlights - LED Daytime Running Lights in Headlight - Color-Keyed Heated Power Outside Mirrors | | | | | | | | | | | | |
| <table border="1"> <tr> <td>Frontal Crash</td> <td>Driver Passenger</td> <td>Not Rated</td> </tr> </table> <p>Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.</p> | | Frontal Crash | Driver Passenger | Not Rated | <p>INTERIOR</p> <ul style="list-style-type: none"> - Premium Fabric-Trimmed 6-Way Adj Dr Seat - 6-Way Adj Fr Pass Seat w/Seatback Pocket - Entune Audio w/5.1-in Touch-screen Incl Entune Multimedia Bundle (AUX/USB/BT/Adv Voice Recognition), Siri Eyes Free - 3.5-in Monochrome TFT Multi-Info Display - Integrated Backup Camera w/Projected Path - Steering Wheel w/ Audio & Bluetooth - Hands-Free Phone Voice Command Controls - Auto Climate Control w/ Pollen Filter - And Push Button Controls - Remote Keyless Entry System - Power Door Locks and Windows - **Full Tank of Gas** | | | | | | | | | |
| Frontal Crash | Driver Passenger | Not Rated | | | | | | | | | | | | |
| <table border="1"> <tr> <td>Side Crash</td> <td>Front seat</td> <td>Not Rated</td> </tr> <tr> <td></td> <td>Rear seat</td> <td>Not Rated</td> </tr> </table> <p>Based on the risk of injury in a side impact.</p> | | Side Crash | Front seat | Not Rated | | Rear seat | Not Rated | | | | | | | |
| Side Crash | Front seat | Not Rated | | | | | | | | | | | | |
| | Rear seat | Not Rated | | | | | | | | | | | | |
| <p>Rollover</p> <p>Based on the risk of rollover in a single-vehicle crash. ★★★★★</p> <p>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</p> | | | | | | | | | | | | | | |
| <p>EPA DOT Fuel Economy and Environment</p> <p>Gasoline Vehicle</p> <p>Fuel Economy</p> <p>32 MPG <small>Miles per gallon - range from 13 to 114 MPG. The best vehicle rate: 113 MPG.</small></p> <p>28 36 combined city/hwy city highway</p> <p>3.1 gallons per 100 miles</p> | | <p>You save \$1,250</p> <p>in fuel costs over 5 years compared to the average new vehicle.</p> | | <p>DELIVERY PROCESSING AND HANDLING FEE 865.00</p> | | | | | | | | | | |
| <p>Annual fuel cost \$1,150</p> <p>Fuel Economy & Greenhouse Gas Rating <small>(mpg/eqt)</small></p> <p>Smog Rating <small>(mpg/eqt)</small></p> <p>1 7 10 1 6 10 Best</p> <p><small>The vehicle with 2017 green 520 per mile. The best with 0 grams per mile (below 50). Producing and</small></p> | | <p>TOTAL \$20,178.00</p> | | <p>The New Vehicle Limited Warranty provides 3-year/50,000-mile basic coverage, 5-year/100,000-mile powertrain coverage, plus 8-year/unlimited-mile corrosion perforation coverage. See Warranty and Maintenance Guide for details. An extended service contract may be available for this vehicle.</p> <p>Manufacturer's suggested retail price includes manufacturer's recommended pre-delivery service. Certain, dealer-installed items, specified features, model and stock items and dealer and distributor handling expense. Dealer price may vary. ©2017 Toyota Motor Sales, U.S.A., Inc.</p> <p>ToyotaCare, which covers normal factory scheduled maintenance for two years or 25,000 miles. Excludes certain vehicles. See dealer for details. ©2017 Toyota Motor Sales, U.S.A., Inc.</p> | | | | | | | | | | |
| <p>fuelconomy.gov</p> <p>Calculate personalized estimates and compare vehicles</p> | | <p>Smartphone QR Code</p> | | <p>Delivered by Truck to: 31175 WEST HERR TOWN/WILLIAMSVILLE 8129 MAIN STREET WILLIAMSVILLE NY 14221</p> | | | | | | | | | | |

079 Monroney Label Photograph

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS

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| 2 | Driver Head Y Acceleration vs. Time Primary | B-5 |
| 3 | Driver Head Z Acceleration vs. Time Primary | B-5 |
| 4 | Driver Head Resultant Acceleration vs. Time Primary | B-5 |
| 5 | Driver Chest X Deflection vs. Time | B-6 |
| 6 | Driver Chest X Acceleration vs. Time Primary | B-7 |
| 7 | Driver Chest Y Acceleration vs. Time Primary | B-7 |
| 8 | Driver Chest Z Acceleration vs. Time Primary | B-7 |
| 9 | Driver Chest Resultant Acceleration vs. Time Primary | B-7 |
| 10 | Driver Upper Neck Force X vs. Time | B-8 |
| 11 | Driver Upper Neck Force Z vs. Time | B-8 |
| 12 | Driver Upper Neck Moment Y vs. Time | B-8 |
| 13 | Driver Nij vs. Time | B-9 |
| 14 | Driver Left Femur Force vs. Time | B-10 |
| 15 | Driver Right Femur Force vs. Time | B-10 |
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| 17 | Passenger Head Y Acceleration vs. Time Primary | B-11 |
| 18 | Passenger Head Z Acceleration vs. Time Primary | B-11 |
| 19 | Passenger Head Resultant Acceleration vs. Time Primary | B-11 |
| 20 | Passenger Chest X Deflection vs. Time | B-12 |
| 21 | Passenger Chest X Acceleration vs. Time Primary | B-13 |
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| 23 | Passenger Chest Z Acceleration vs. Time Primary | B-13 |
| 24 | Passenger Chest Resultant Acceleration vs. Time Primary | B-13 |
| 25 | Passenger Upper Neck Force X vs. Time | B-14 |
| 26 | Passenger Upper Neck Force Z vs. Time | B-14 |
| 27 | Passenger Upper Neck Moment Y vs. Time | B-14 |
| 28 | Passenger Nij vs. Time | B-15 |
| 29 | Passenger Left Femur Force vs. Time | B-16 |
| 30 | Passenger Right Femur Force vs. Time | B-16 |

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.

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 Acceleration
Driver Pelvis Y Acceleration
Driver Pelvis Z Acceleration
Driver Left Femur Force Redundant
Driver Right Femur Force Redundant
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 Femur Force Redundant
Passenger Right Femur Force Redundant
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
Load Cell Barrier Forces and Moments

NHTSA

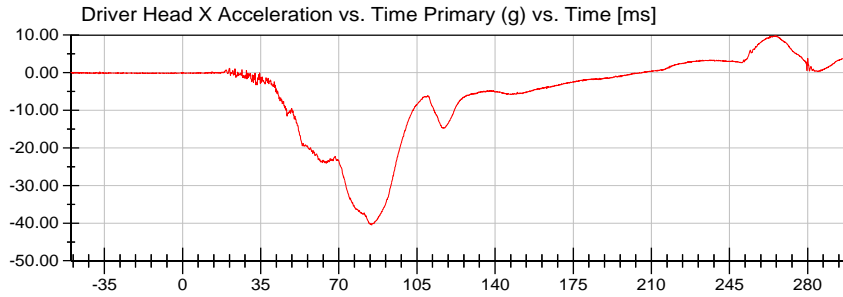
Test Lab: CTF

Test Number: 161114 (M20175104)

Test Date: 11/14/2016

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Position #2 Hybrid III Small Adult Female (426)



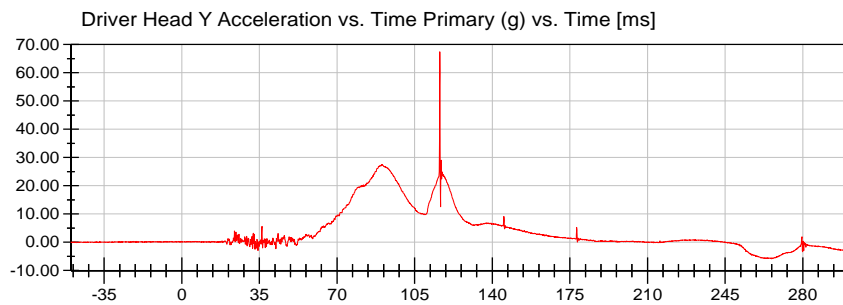
<Max>

9.75 g at 265.04 ms

<Min>

-40.49 g at 84.72 ms

CFC_1000



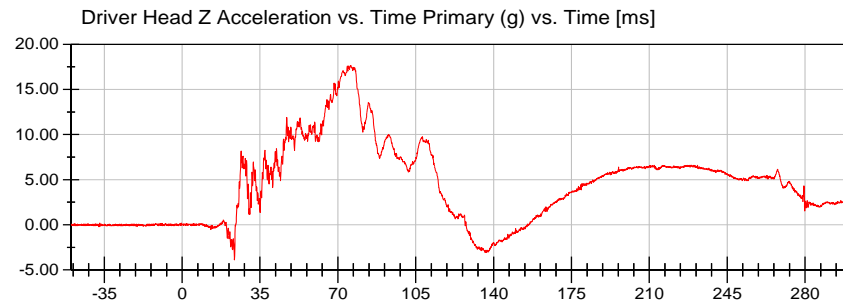
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67.45 g at 116.32 ms

<Min>

-5.89 g at 266.00 ms

CFC_1000



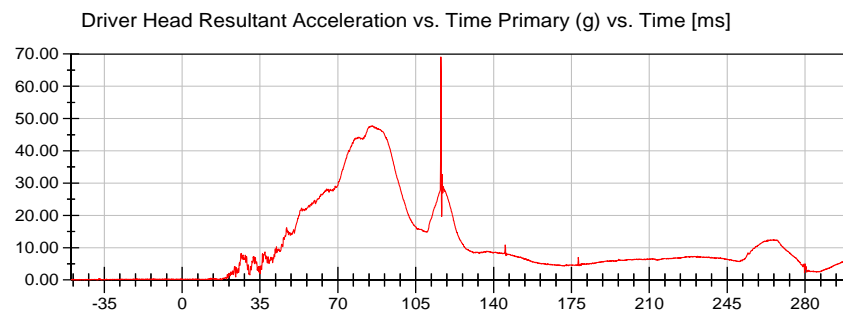
<Max>

17.65 g at 75.84 ms

<Min>

-3.89 g at 23.52 ms

CFC_1000



<Max>

69.12 g at 116.32 ms

<Min>

0.03 g at -48.48 ms

CFC_1000



NHTSA

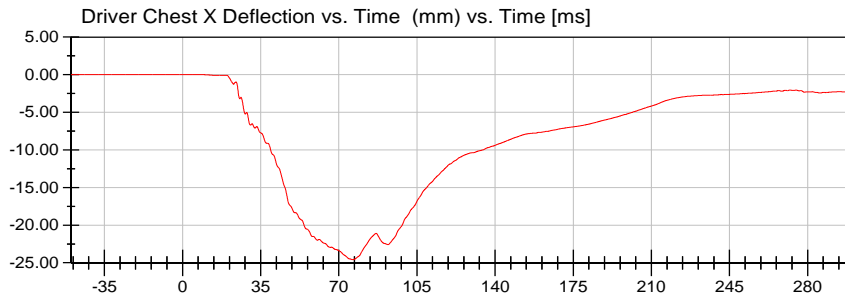
Test Lab: CTF

Test Number: 161114 (M20175104)

Test Date: 11/14/2016

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Position #2 Hybrid III Small Adult Female (426)



<Max>

0.01 mm at -20.00 ms

<Min>

-24.57 mm at 76.16 ms

CFC_600



NHTSA

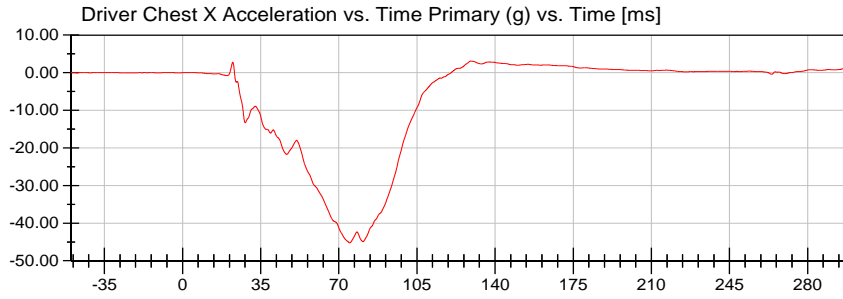
Test Lab: CTF

Test Number: 161114 (M20175104)

Test Date: 11/14/2016

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Position #2 Hybrid III Small Adult Female (426)



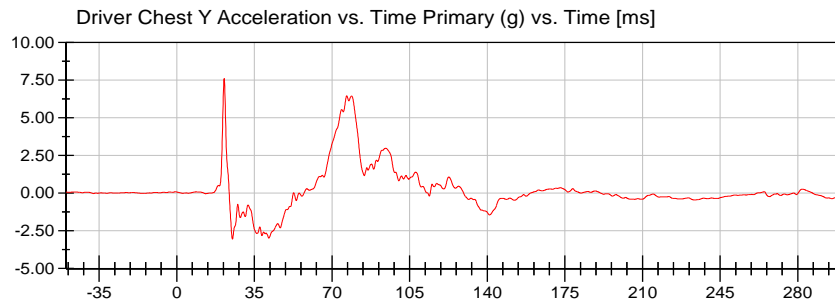
<Max>

3.08 g at 129.12 ms

<Min>

-45.25 g at 74.88 ms

CFC_180



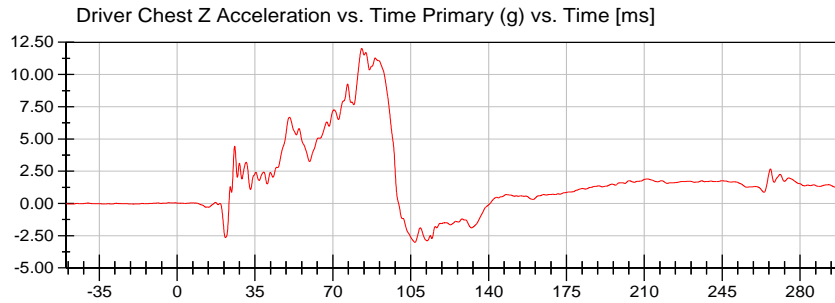
<Max>

7.60 g at 21.36 ms

<Min>

-3.05 g at 25.12 ms

CFC_180



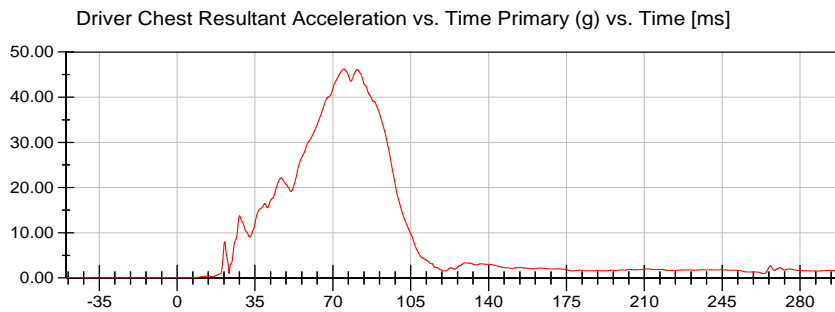
<Max>

12.02 g at 82.96 ms

<Min>

-3.02 g at 106.88 ms

CFC_180



<Max>

46.27 g at 74.88 ms

<Min>

0.01 g at -15.52 ms

CFC_180



NHTSA

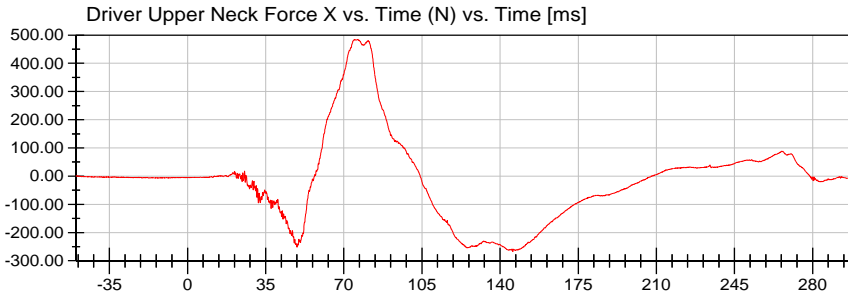
Test Lab: CTF

Test Number: 161114 (M20175104)

Test Date: 11/14/2016

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Position #2 Hybrid III Small Adult Female (426)



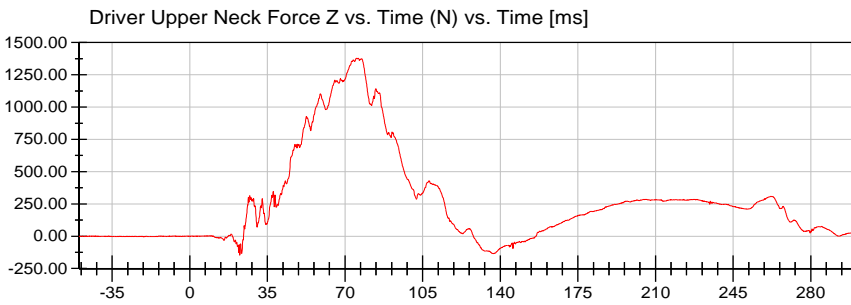
<Max>

484.24 N at 76.08 ms

<Min>

-267.44 N at 145.68 ms

CFC_1000



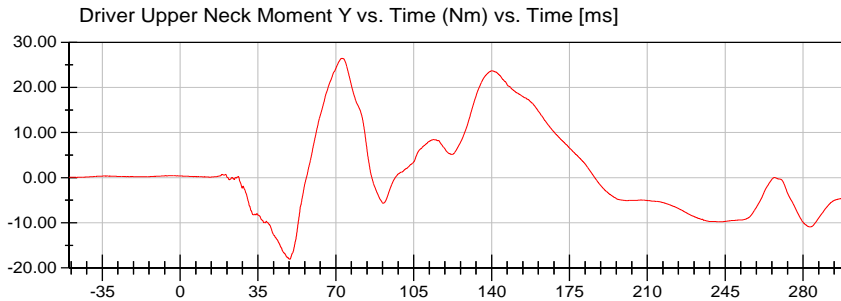
<Max>

1,379.28 N at 75.12 ms

<Min>

-145.73 N at 22.56 ms

CFC_1000



<Max>

26.43 Nm at 72.72 ms

<Min>

-18.08 Nm at 49.20 ms

CFC_600





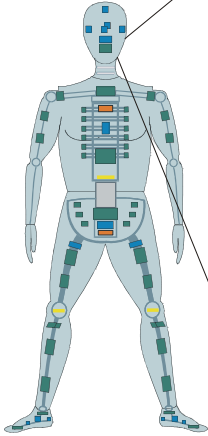
2017 Toyota Corolla NCAP 35 mph Frontal Impact Neck Injury Predictor (NIJ)

Date: 11/14/2016
Time: 15:54

Customer: NHTSA
Test Number: M20175104

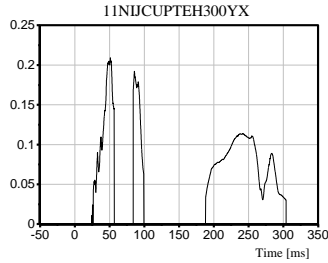
Test Orientation = Frontal
Fzc(Tension) = 6806
Fzc(Compression) = 6160
Myc(Extension) = 135
Myc(Flexion) = 310

TRC Inc. Test Lab: CTF
Test Number: 161114

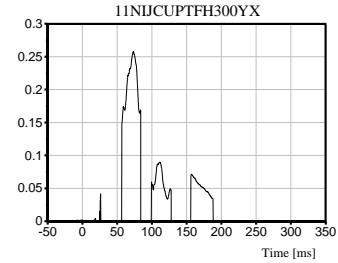


Dummy: HIII 50th Male
Seating Position:
Driver

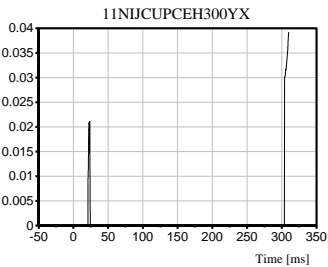
NIJ Source Code: (Fz/Fzc)+(Myc/Myc)



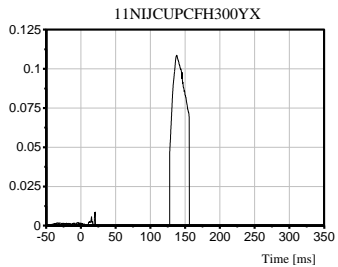
Max [NTE] 0.2090 at 51.20 ms



Max [NTF] 0.2583 at 73.60 ms



Max [NCE] 0.0393 at 310.00 ms



Max [NCF] 0.1086 at 137.92 ms

NHTSA

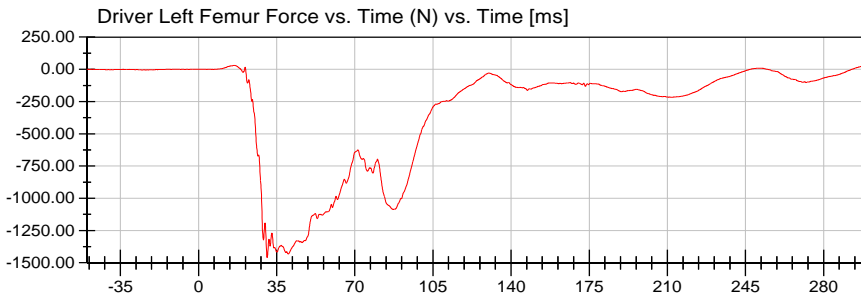
Test Lab: CTF

Test Number: 161114 (M20175104)

Test Date: 11/14/2016

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Position #2 Hybrid III Small Adult Female (426)



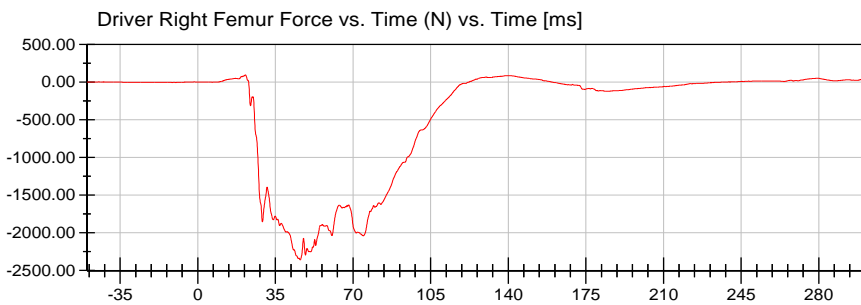
<Max>

34.44 N at 300.00 ms

<Min>

-1,459.27 N at 30.72 ms

CFC_600



<Max>

97.97 N at 21.44 ms

<Min>

-2,358.16 N at 46.16 ms

CFC_600



NHTSA

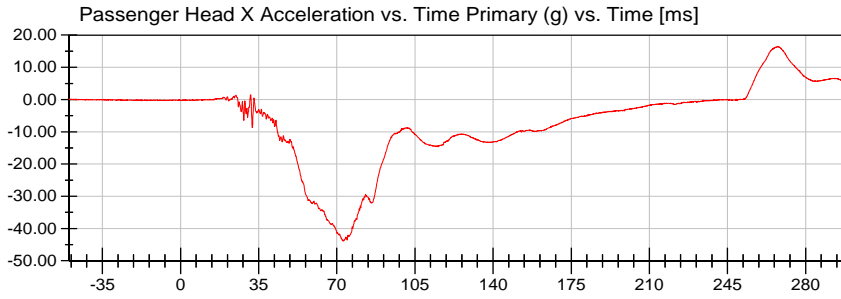
Test Lab: CTF

Test Number: 161114 (M20175104)

Test Date: 11/14/2016

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Position #2 Hybrid III Small Adult Female (426)



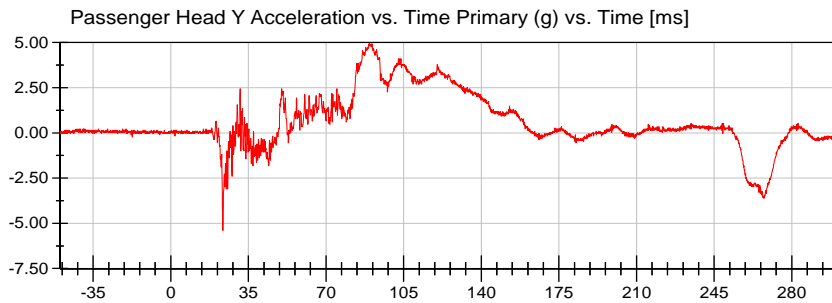
<Max>

16.42 g at 267.20 ms

<Min>

-43.90 g at 72.88 ms

CFC_1000



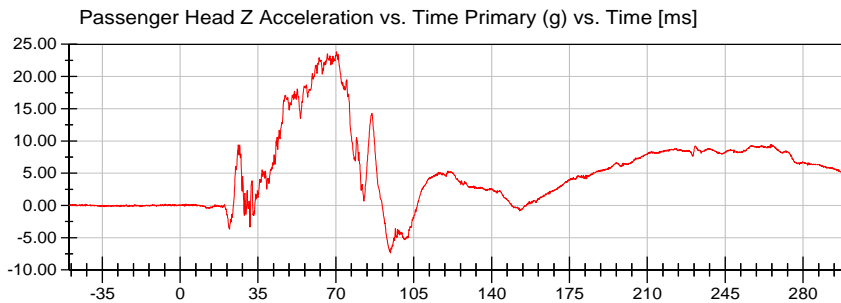
<Max>

4.94 g at 89.44 ms

<Min>

-5.40 g at 23.44 ms

CFC_1000



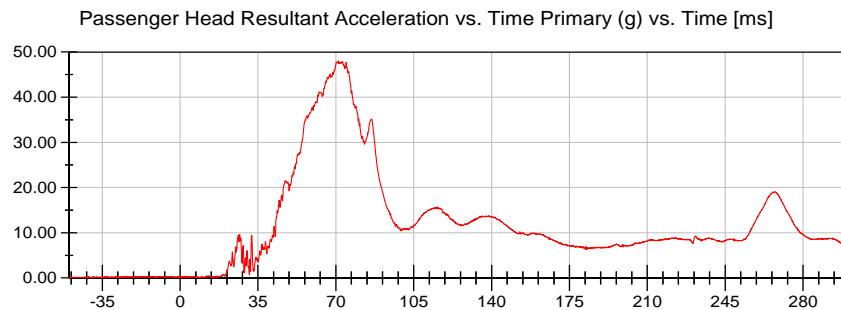
<Max>

23.84 g at 70.24 ms

<Min>

-7.37 g at 94.56 ms

CFC_1000



<Max>

48.07 g at 71.12 ms

<Min>

0.03 g at -48.48 ms

CFC_1000



NHTSA

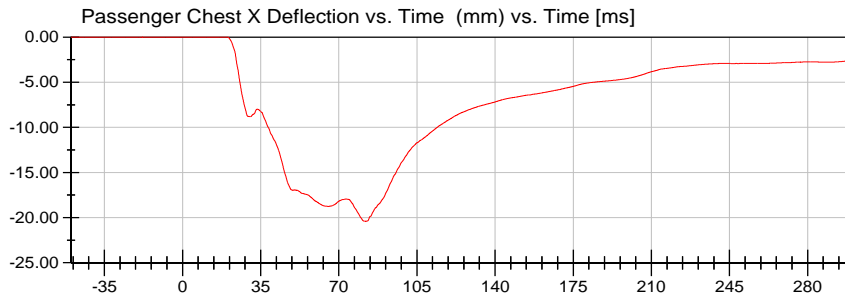
Test Lab: CTF

Test Number: 161114 (M20175104)

Test Date: 11/14/2016

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Position #2 Hybrid III Small Adult Female (426)



<Max>

0.00 mm at -17.92 ms

<Min>

-20.41 mm at 82.00 ms

CFC_600



NHTSA

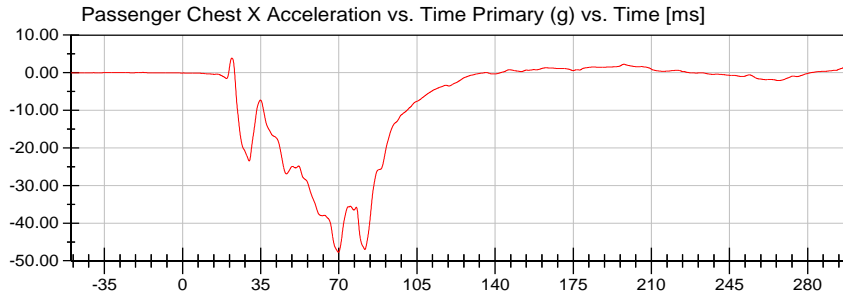
Test Lab: CTF

Test Number: 161114 (M20175104)

Test Date: 11/14/2016

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Position #2 Hybrid III Small Adult Female (426)



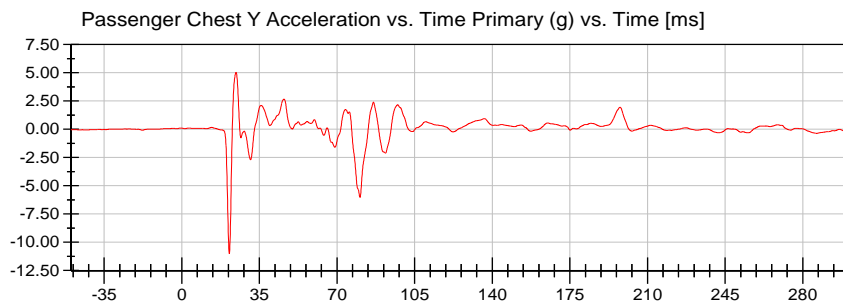
<Max>

3.86 g at 22.08 ms

<Min>

-47.75 g at 69.84 ms

CFC_180



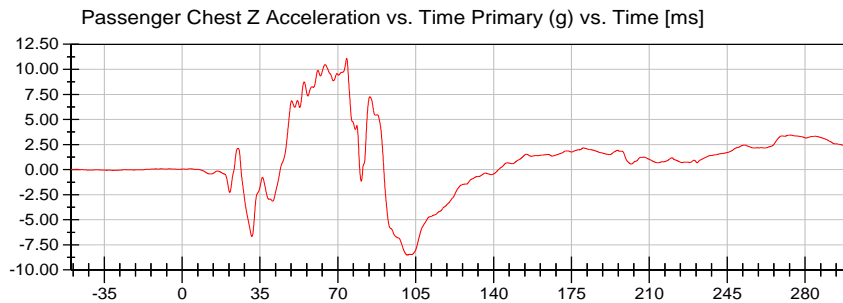
<Max>

5.04 g at 24.48 ms

<Min>

-11.00 g at 21.44 ms

CFC_180



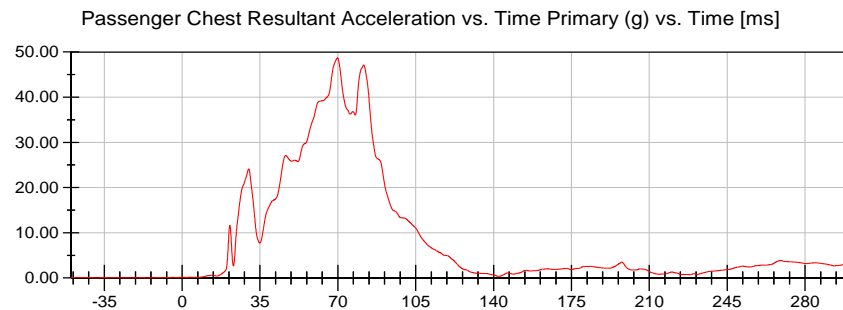
<Max>

11.08 g at 74.00 ms

<Min>

-8.51 g at 101.28 ms

CFC_180



<Max>

48.71 g at 69.84 ms

<Min>

0.01 g at -20.48 ms

CFC_180



NHTSA

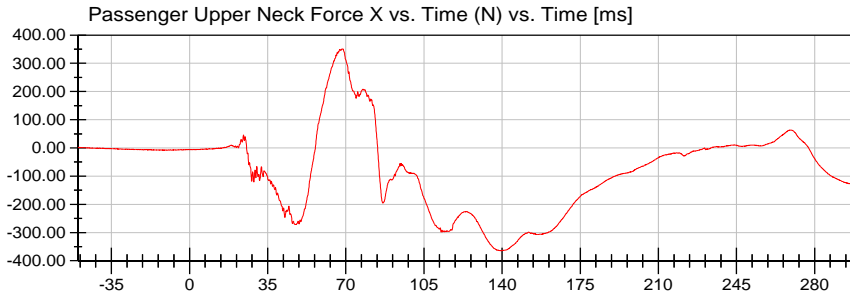
Test Lab: CTF

Test Number: 161114 (M20175104)

Test Date: 11/14/2016

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Position #2 Hybrid III Small Adult Female (426)



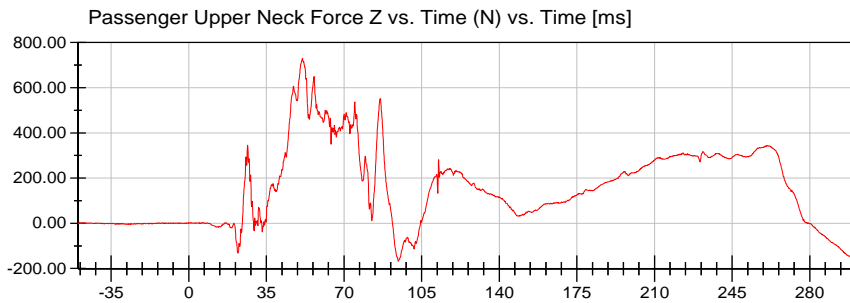
<Max>

351.28 N at 68.24 ms

<Min>

-364.98 N at 139.68 ms

CFC_1000



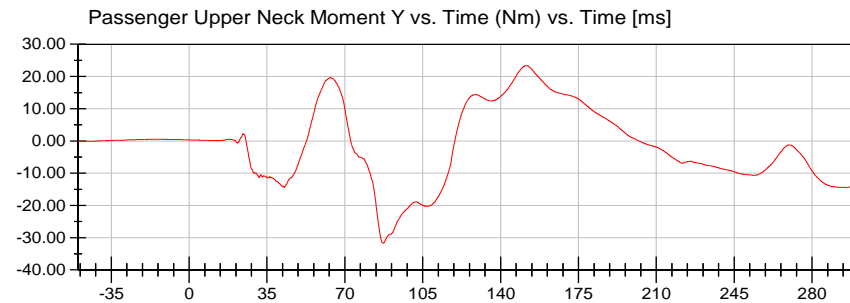
<Max>

730.08 N at 51.20 ms

<Min>

-167.84 N at 94.40 ms

CFC_1000



<Max>

23.35 Nm at 151.60 ms

<Min>

-31.71 Nm at 87.28 ms

CFC_600





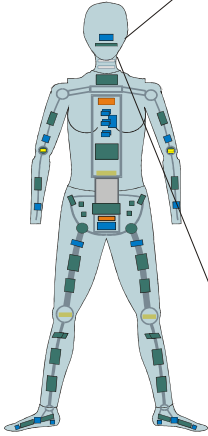
2017 Toyota Corolla NCAP 35 mph Frontal Impact Neck Injury Predictor (NIJ)

Date: 11/14/2016
Time: 15:54

Customer: NHTSA
Test Number: M20175104

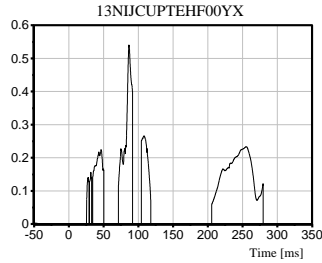
Test Orientation = Frontal
Fzc(Tension) = 4287
Fzc(Compression) = 3880
Myc(Extension) = 67
Myc(Flexion) = 155

TRC Inc. Test Lab: CTF
Test Number: 161114

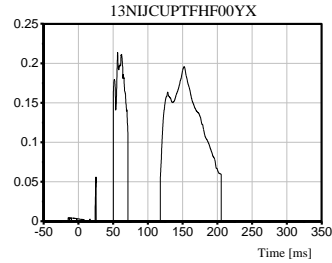


Dummy: HIII 5th Female
Seating Position:
Right Front Passenger

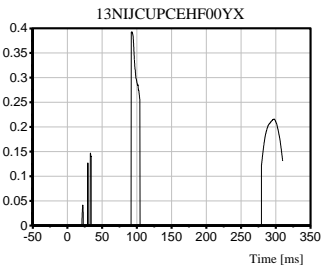
NIJ Source Code: (Fz/Fzc)+(Myc/Myc)



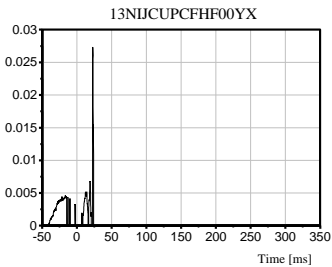
Max [NTE] 0.5399 at 86.48 ms



Max [NTF] 0.2135 at 56.48 ms



Max [NCE] 0.3934 at 92.80 ms



Max [NCF] 0.0273 at 22.96 ms

NHTSA

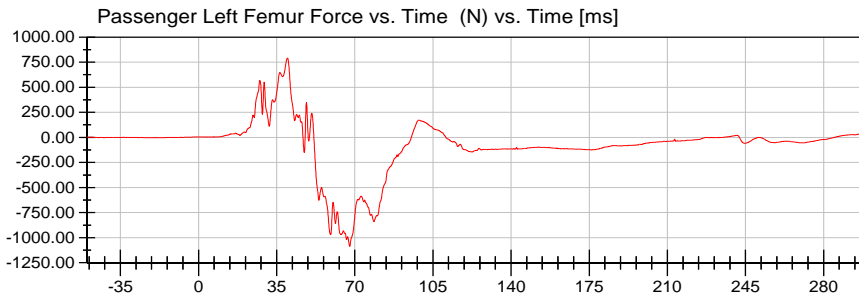
Test Lab: CTF

Test Number: 161114 (M20175104)

Test Date: 11/14/2016

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Position #2 Hybrid III Small Adult Female (426)



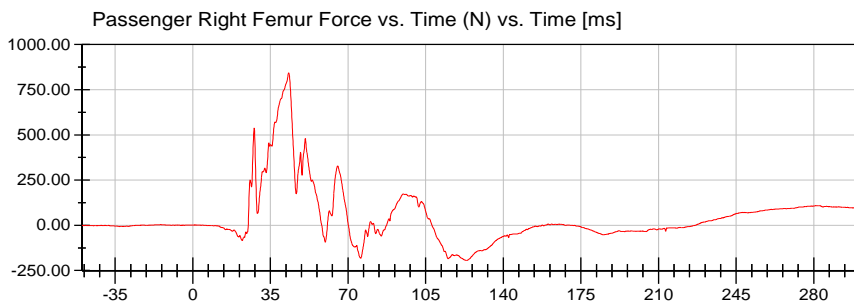
<Max>

790.45 N at 39.84 ms

<Min>

-1,086.67 N at 67.68 ms

CFC_600



<Max>

843.10 N at 43.20 ms

<Min>

-194.51 N at 123.36 ms

CFC_600



APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION

Pre-Test Calibration Sheets

Driver S/N 037

Transportation Research Center Inc.
572E HIII 50th Male Dummy
External Dimensions
Serial No. 037
Calibration No. 40

| 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 | 514 | Yes |
| C | H-Point Height | 83.8 - 88.9 | 87 | 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 | 295 | Yes |
| H | Skull Cap To Backline | 40.6 - 45.7 | 45 | Yes |
| I | Shoulder-Elbow Length | 330.2 - 345.4 | 340 | Yes |
| J | Elbow Rest Height | 190.5 - 210.8 | 198 | Yes |
| K | Buttock Knee Length | 579.1 - 604.5 | 599 | Yes |
| L | Popliteal Height | 429.3 - 454.7 | 440 | 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 | 429 | Yes |
| W | Foot Breadth | 91.4 - 106.7 | 97 | Yes |
| Y | Chest Circumference | 970.3 - 1000.8 | 990 | 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:



Transportation Research Center Inc.

Front Head Drop

HIII 50th Serial No. 037 Certification No. 40-1

Test Date: 10/11/2016

| Test Parameter | Specification | Test Results | Pass |
|--|----------------|--------------|------|
| Temperature | 18.9 - 25.5 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 35 % | Yes |
| Peak Head Resultant Acceleration | 225 - 275 g | 265.0 g | Yes |
| Peak Head Lateral Acceleration | (-15) - 15 g | 5.7 g | Yes |
| Is Acceleration Curve Unimodal within 10% of Peak? | Yes | Yes | Yes |

Test meets specifications.

Comments:

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

10.11.2016 08:14:30 614

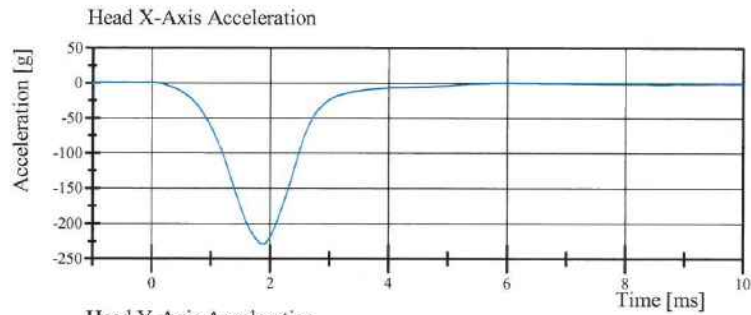


Transportation Research Center Inc.

Front Head Drop

HIII 50th Serial No. 037 Certification No. 40-1

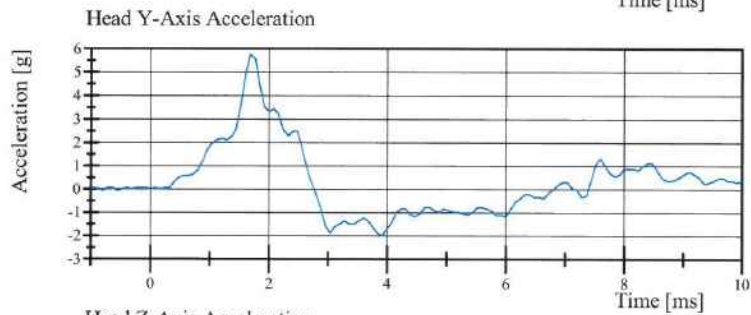
Test Date: 10/11/2016



Filter Class: CFC_1000

Max: 0.1 g at -1.0 ms

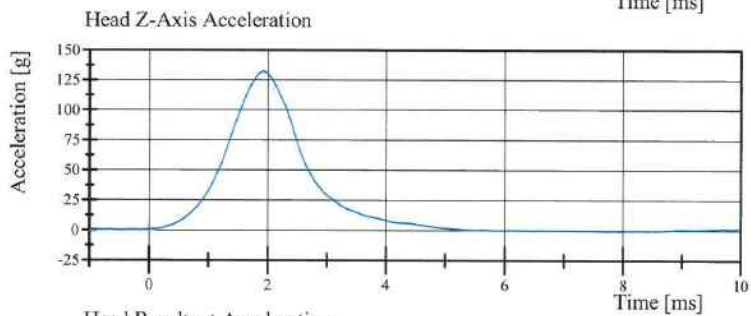
Min: -229.8 g at 1.8 ms



Filter Class: CFC_1000

Max: 5.7 g at 1.7 ms

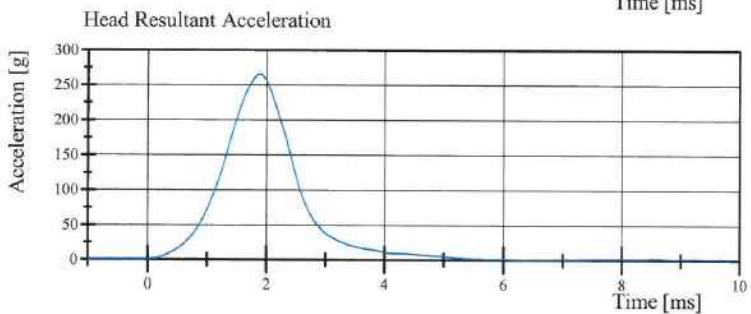
Min: -2.0 g at 3.9 ms



Filter Class: CFC_1000

Max: 132.5 g at 1.9 ms

Min: -0.8 g at 7.9 ms



Filter Class: CFC_1000

Max: 265.0 g at 1.9 ms

Min: 0.0 g at -0.4 ms

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

10.11.2016 08:14:39 614



Transportation Research Center Inc.

Neck Flexion

HIII 50th Serial No. 037 Certification No. 40-3

Test Date: 10/11/2016

| Test Parameter | Specification | Test Results | Pass |
|--|---------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 35 % | Yes |
| Pendulum Velocity | 6.89 - 7.13 m/s | 6.941 m/s | Yes |
| Pendulum Acceleration Decay Crossing -5g | 34 - 42 ms | 38.9 ms | Yes |
| Pendulum Acceleration at 10ms | (-22.5) - (-27.5) g | -23.47 g | Yes |
| Pendulum Acceleration at 20ms | (-17.6) - (-22.6) g | -19.84 g | Yes |
| Pendulum Acceleration at 30ms | (-12.5) - (-18.5) g | -15.74 g | Yes |
| Pendulum Acceleration > 30ms | >= (-29.0) g | -15.74 g | Yes |
| Total Head D-Plane Rotation | | | |
| Peak | (-64) - (-78) ° | -67.7 ° | Yes |
| Time of Peak | 57 - 64 ms | 60.4 ms | Yes |
| Total Head D-Plane Rotation | | | |
| Decay to 0° | 113 - 128 ms | 121.0 ms | Yes |
| Total Neck Occipital Condyles Moment | | | |
| Peak | 88 - 108 N-m | 101.6 N-m | Yes |
| Time of Peak | 47 - 58 ms | 51.6 ms | Yes |
| Total Neck Occipital Condyles Moment | | | |
| Decay to 0 N-m | 97 - 107 ms | 101.6 ms | Yes |

Test meets specifications.

Comments:

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

10.11.2016 12:43:24 3039

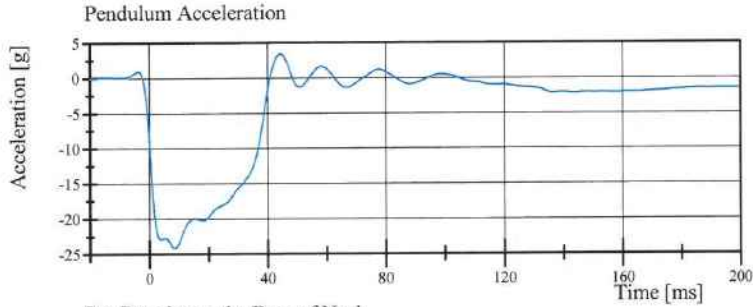


Transportation Research Center Inc.

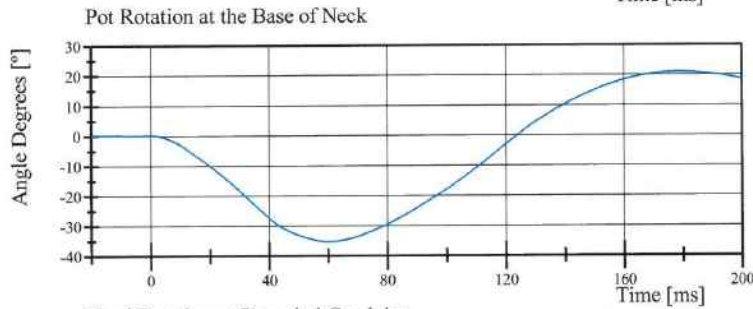
Neck Flexion

HIII 50th Serial No. 037 Certification No. 40-3

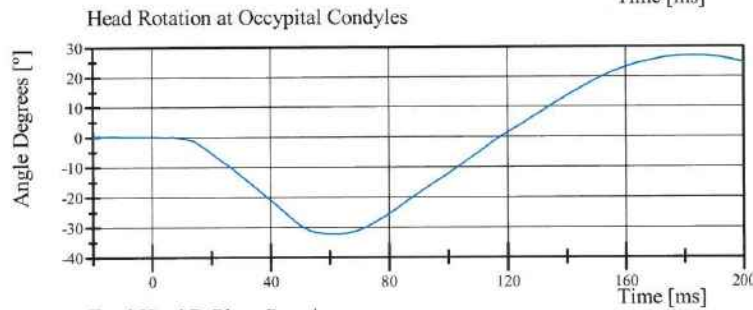
Test Date: 10/11/2016



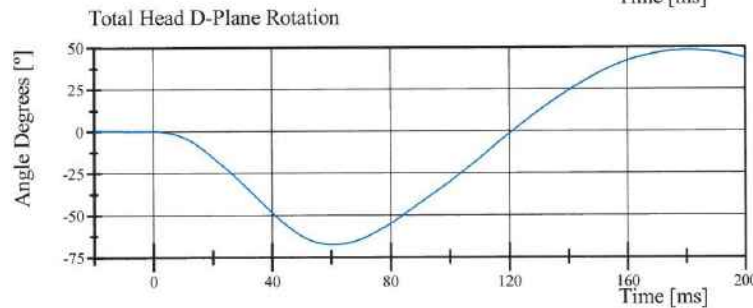
Filter Class: CFC_60
Max: 3.4 g at 44.4 ms
Min: -24.2 g at 8.6 ms



Filter Class: CFC_60
Max: 21.0 ° at 178.7 ms
Min: -35.4 ° at 59.8 ms



Filter Class: CFC_60
Max: 27.0 ° at 183.0 ms
Min: -32.4 ° at 61.4 ms



Filter Class: CFC_60
Max: 48.0 ° at 180.6 ms
Min: -67.7 ° at 60.4 ms

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

10.11.2016 12:43:50 3039

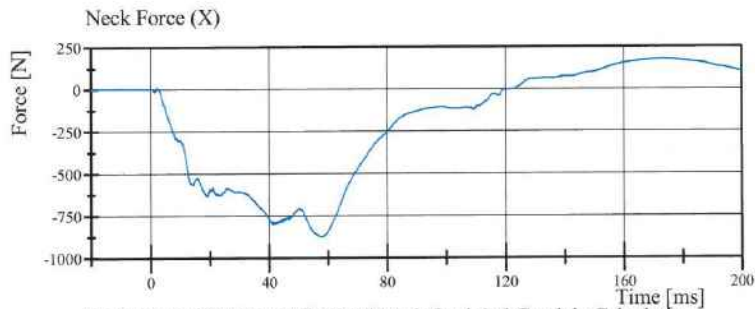


Transportation Research Center Inc.

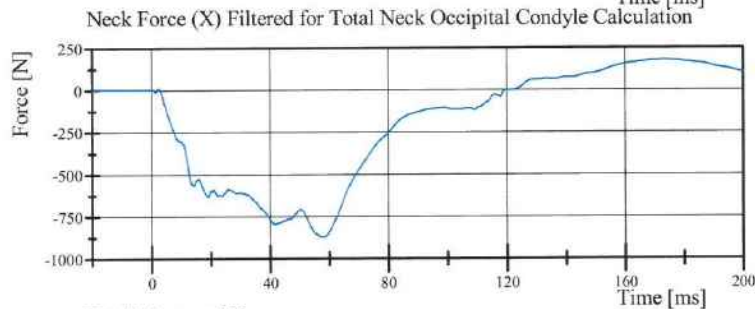
Neck Flexion

HIII 50th Serial No. 037 Certification No. 40-3

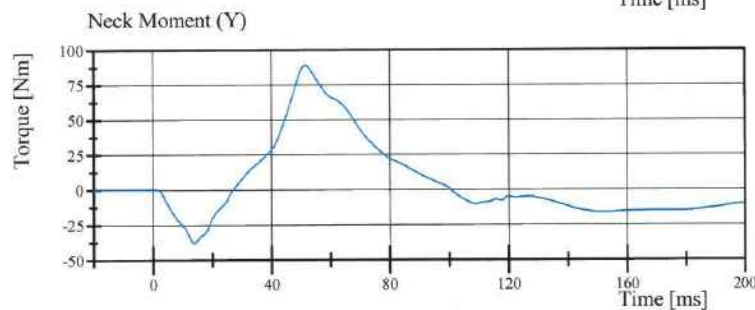
Test Date: 10/11/2016



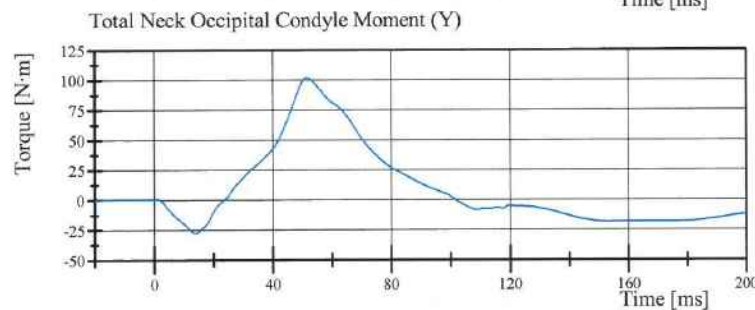
Filter Class: CFC_1000
Max: 177.5 N at 173.5 ms
Min: -874.7 N at 57.9 ms



Filter Class: CFC_600
Max: 177.2 N at 173.6 ms
Min: -874.2 N at 57.8 ms



Filter Class: CFC_600
Max: 88.8 Nm at 51.4 ms
Min: -38.2 Nm at 13.9 ms



Filter Class: Without_(Consta
Max: 101.6 N.m at 51.6 ms
Min: -28.2 N.m at 13.8 ms

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

10.11.2016 12:43:51 3039



Transportation Research Center Inc.

Neck Extension

HIII 50th Serial No. 037 Certification No. 40-1

Test Date: 10/11/2016

| Test Parameter | Specification | Test Results | Pass |
|--|-----------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 36 % | Yes |
| Pendulum Velocity | (-5.95) - (-6.18) m/s | -6.005 m/s | Yes |
| Pendulum Acceleration Decay Crossing 5g | 38 - 46 ms | 42.1 ms | Yes |
| Pendulum Acceleration at 10ms | 17.2 - 21.2 g | 18.35 g | Yes |
| Pendulum Acceleration at 20ms | 14.0 - 19.0 g | 16.97 g | Yes |
| Pendulum Acceleration at 30ms | 11.0 - 16.0 g | 13.25 g | Yes |
| Pendulum Acceleration > 30ms | <= 22.0 g | 13.25 g | Yes |
| Total Head D-Plane Rotation Peak | 81 - 106 ° | 93.0 ° | Yes |
| Time of Peak | 72 - 82 ms | 78.2 ms | Yes |
| Total Head D-Plane Rotation Decay to 0° | 147 - 174 ms | 159.8 ms | Yes |
| Total Neck Occipital Condyles Moment Peak | (-53) - (-80) N·m | -67.6 N·m | Yes |
| Time of Peak | 65 - 79 ms | 72.0 ms | Yes |
| Total Neck Occipital Condyles Moment Decay to 0 N·m | 120 - 148 ms | 145.6 ms | Yes |

Test meets specifications.

Comments:

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

10.11.2016 13:13:24 3126

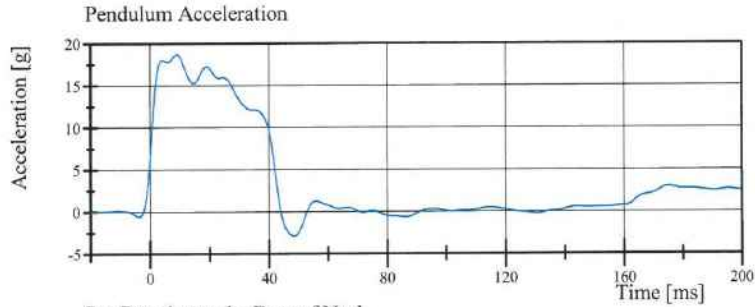


Transportation Research Center Inc.

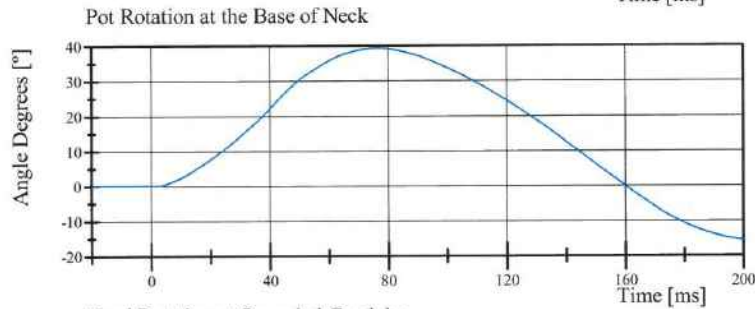
Neck Extension

HIII 50th Serial No. 037 Certification No. 40-1

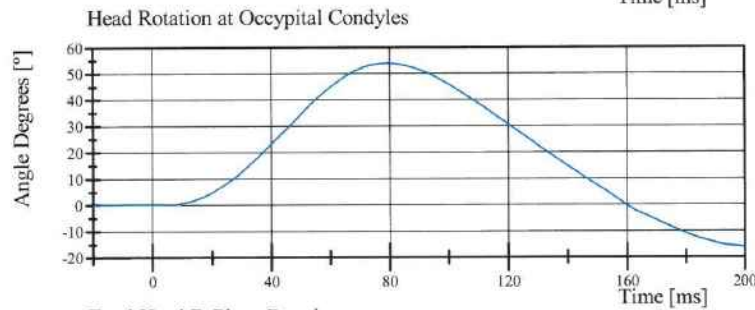
Test Date: 10/11/2016



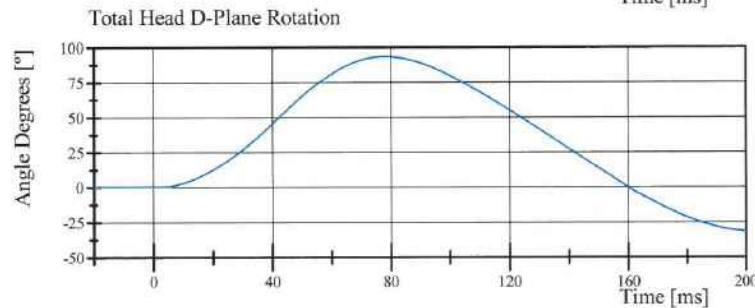
Filter Class: CFC_60
Max: 18.6 g at 9.0 ms
Min: -2.9 g at 48.4 ms



Filter Class: CFC_60
Max: 39.3 ° at 76.3 ms
Min: -15.6 ° at 200.0 ms



Filter Class: CFC_60
Max: 53.8 ° at 79.2 ms
Min: -16.0 ° at 200.0 ms



Filter Class: CFC_60
Max: 93.0 ° at 78.2 ms
Min: -31.6 ° at 200.0 ms

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

10.11.2016 13:13:35 3126

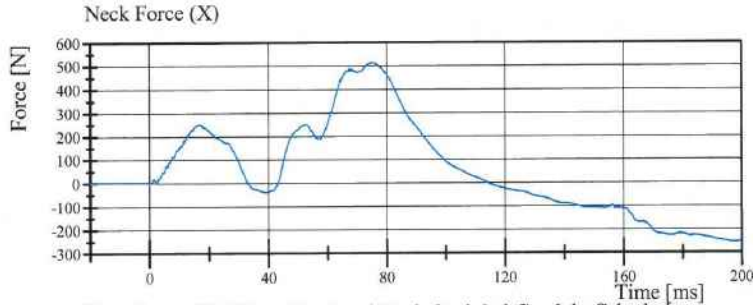


Transportation Research Center Inc.

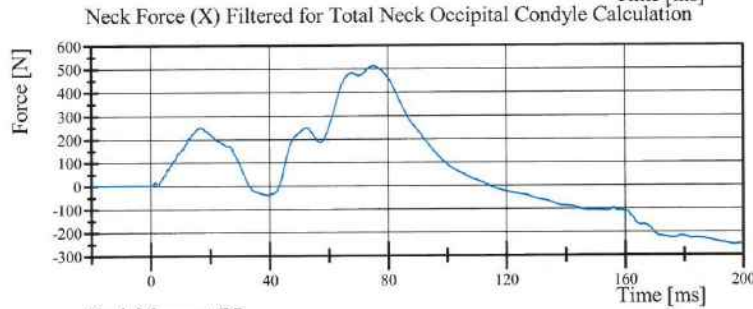
Neck Extension

HIII 50th Serial No. 037 Certification No. 40-1

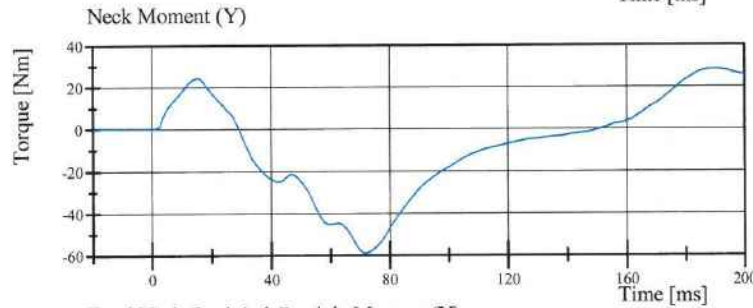
Test Date: 10/11/2016



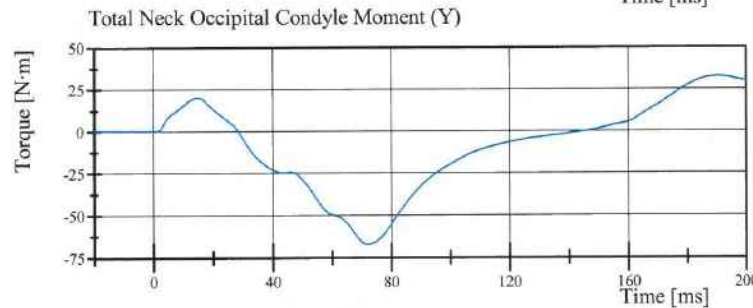
Filter Class: CFC_1000
Max: 511.7 N at 75.0 ms
Min: -253.6 N at 196.8 ms



Filter Class: CFC_600
Max: 511.3 N at 75.1 ms
Min: -253.2 N at 196.9 ms



Filter Class: CFC_600
Max: 28.3 Nm at 189.8 ms
Min: -59.1 Nm at 71.8 ms



Filter Class: Without_(Consta
Max: 32.6 N·m at 190.7 ms
Min: -67.6 N·m at 72.0 ms

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

10.11.2016 13:13:35 3126



Transportation Research Center Inc.

Front Thorax

HIII 50th Serial No. 037 Certification No. 40-1

Test Date: 10/11/2016

| Test Parameter | Specification | Test Results | Pass |
|---------------------------|-----------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.1 °C | Yes |
| Relative Humidity | 10 - 70 % | 37 % | Yes |
| Probe Velocity | 6.59 - 6.83 m/s | 6.644 m/s | Yes |
| Probe Force Peak | (-5,160) - (-5,893) N | -5,460.8 N | Yes |
| Maximum Chest Compression | (-63.5) - (-72.6) mm | -71.07 mm | Yes |
| Internal Hysteresis | 65 - 85 % | 72.8 % | Yes |

Test meets specifications.

Comments:

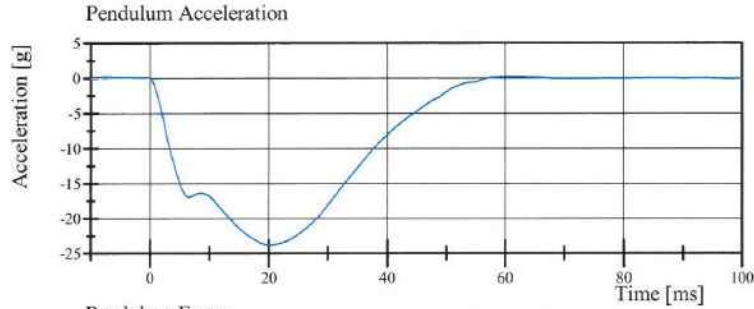


Transportation Research Center Inc.

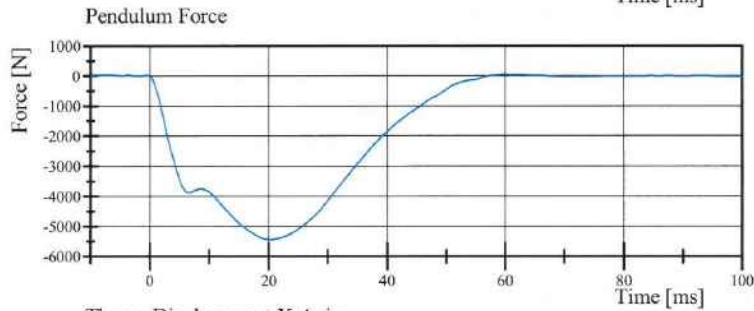
Front Thorax

HIII 50th Serial No. 037 Certification No. 40-1

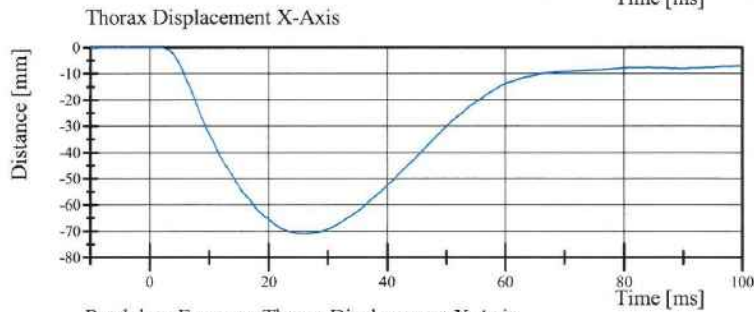
Test Date: 10/11/2016



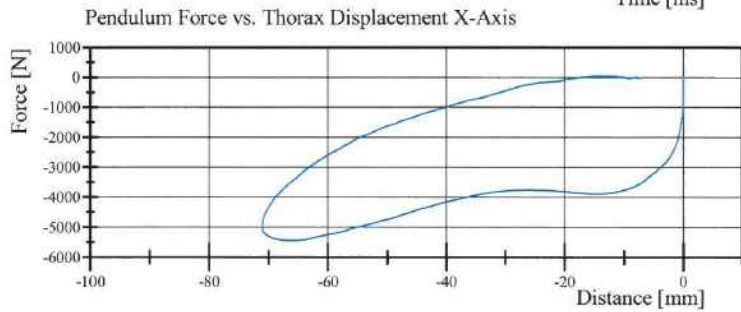
Filter Class: CFC_180
Max: 0.2 g at 59.8 ms
Min: -23.8 g at 20.2 ms



Filter Class: CFC_180
Max: 41.2 N at 59.8 ms
Min: -5,460.8 N at 20.2 ms



Filter Class: CFC_600
Max: 0.0 mm at -9.8 ms
Min: -71.1 mm at 25.8 ms



Filter Class: CFC_180
Max: 41.2 N at -14.1 mm
Min: -5,460.8 N at -66.0 mm

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

10.11.2016 09:43:22 437



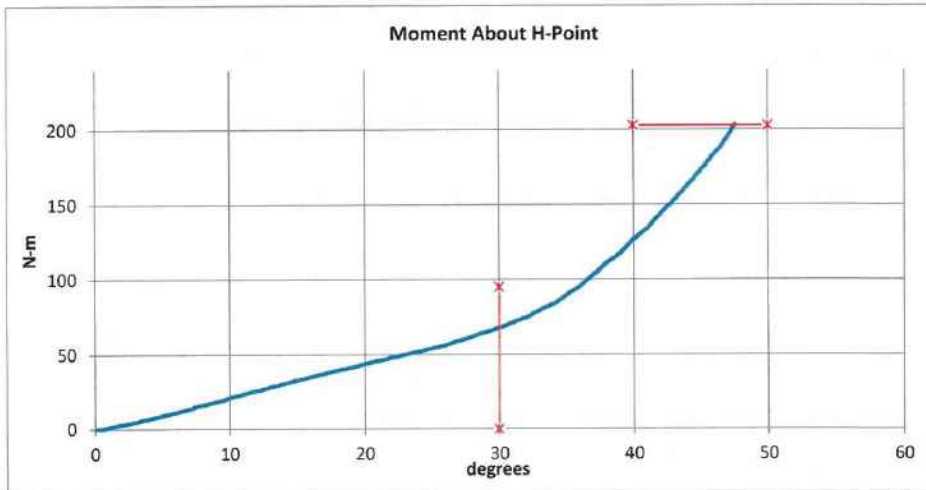
Transportation Research Center Inc.

Hybrid III 50th Male Hip Range of Motion

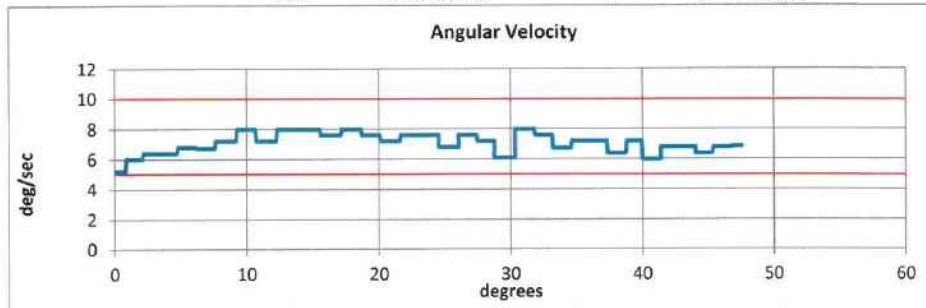


Serial Number: 037 Date: 10-Oct-2016
 Side Tested: Left Hip Time: 15:39
 Test Number: 1 Comments:

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|------------------|---------------|-------------------|
| Temperature | 18.9 - 25.6 | 21.7 °C Pass |
| Humidity | 10 - 70 | 38 % Pass |
| Moment at 30° | 0 ≤ 94.9 | 67.86 N-m Pass |
| Angle at 203 Nm | 40 - 50 | 47.56 deg Pass |
| Average Velocity | 5 - 10 | 7.04 deg/sec Pass |



Max: 7.99 deg/sec Min: 5.19 deg/sec



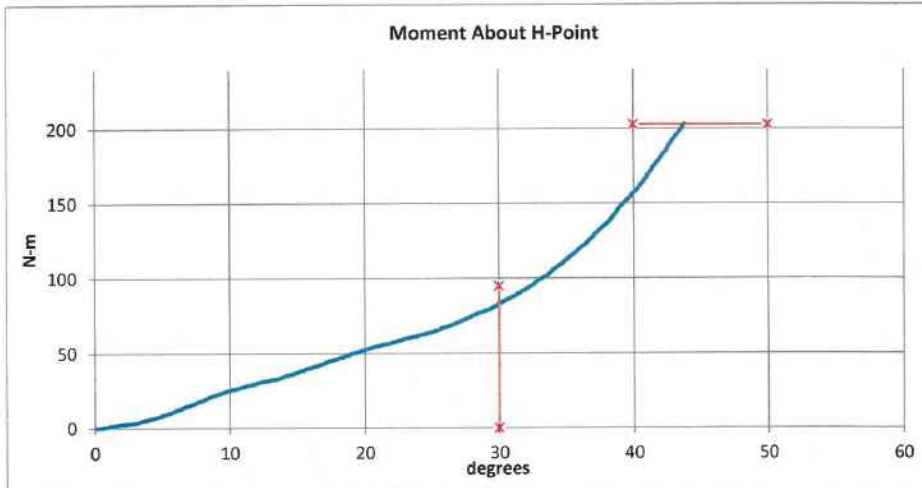
Transportation Research Center Inc.

Hybrid III 50th Male Hip Range of Motion

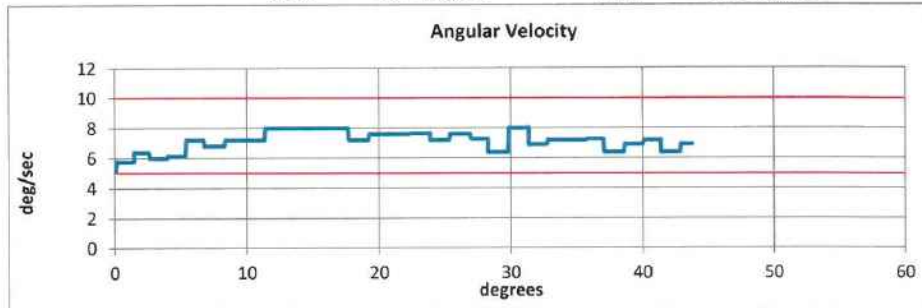


Serial Number: 037 Date: 11-Oct-2016
 Side Tested: Right Hip Time: 6:49
 Test Number: 1 Comments:

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|------------------|---------------|------------------|
| Temperature | 18.9 - 25.6 | 21.7 °C Pass |
| Humidity | 10 - 70 | 35 % Pass |
| Moment at 30° | 0 ≤ 94.9 | 83.27 N-m Pass |
| Angle at 203 Nm | 40 - 50 | 43.8 deg Pass |
| Average Velocity | 5 - 10 | 7.1 deg/sec Pass |



Max: 7.99 deg/sec Min: 5.19 deg/sec



Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 40-1
Test Date: 10/11/2016

| Test Parameter | Specification | Test Results | Pass |
|-------------------|---------------------------|--------------|------|
| Temperature | 18.9 - 25.5 °C | 21.3 °C | Yes |
| Relative Humidity | 10 - 70 % | 36 % | Yes |
| Probe Velocity | 2.08 - 2.13 m/s | 2.117 m/s | Yes |
| Peak Femur Force | (-4,715.2) - (-5,782.6) N | -5,718.16 N | Yes |

Test meets specifications.

Comments:

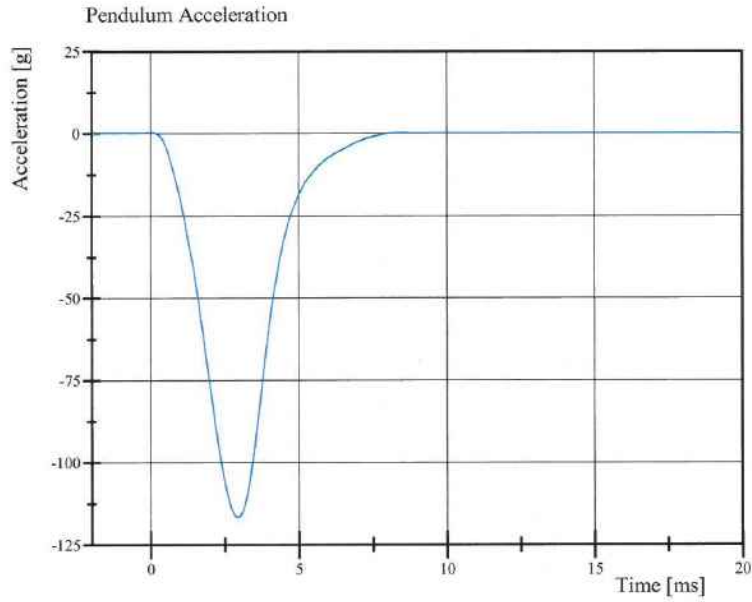
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

10.11.2016 07:26:54 1746

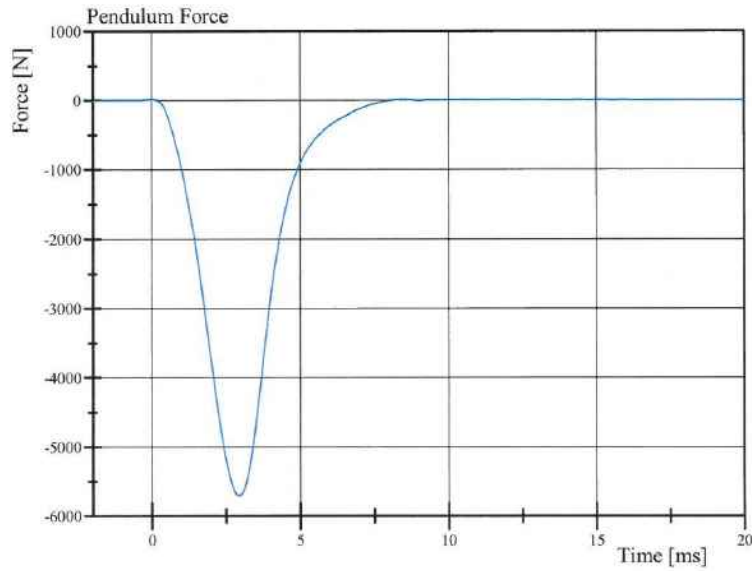


Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 40-1
Test Date: 10/11/2016



Filter Class: CFC_600
Max: 0.2 g at 8.5 ms
Min: -116.9 g at 3.0 ms



Filter Class: CFC_600
Max: 10.2 N at 8.5 ms
Min: -5,718.2 N at 3.0 ms

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

10.11.2016 07:27:07 1746



Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 40-1
Test Date: 10/11/2016

| Test Parameter | Specification | Test Results | Pass |
|-------------------|---------------------------|--------------|------|
| Temperature | 18.9 - 25.5 °C | 21.7 °C | Yes |
| Relative Humidity | 10 - 70 % | 36 % | Yes |
| Probe Velocity | 2.08 - 2.13 m/s | 2.118 m/s | Yes |
| Peak Femur Force | (-4,715.2) - (-5,782.6) N | -5,573.60 N | Yes |

Test meets specifications.

Comments:

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

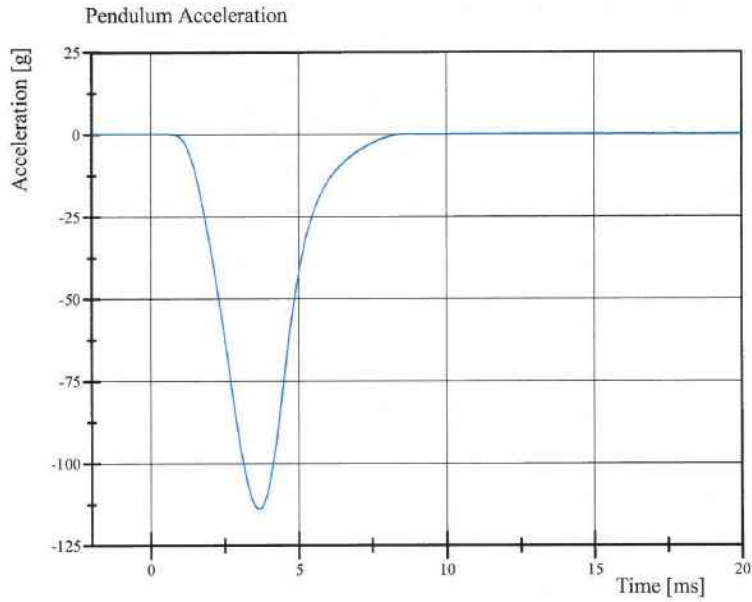
10.11.2016 07:30:02 1735



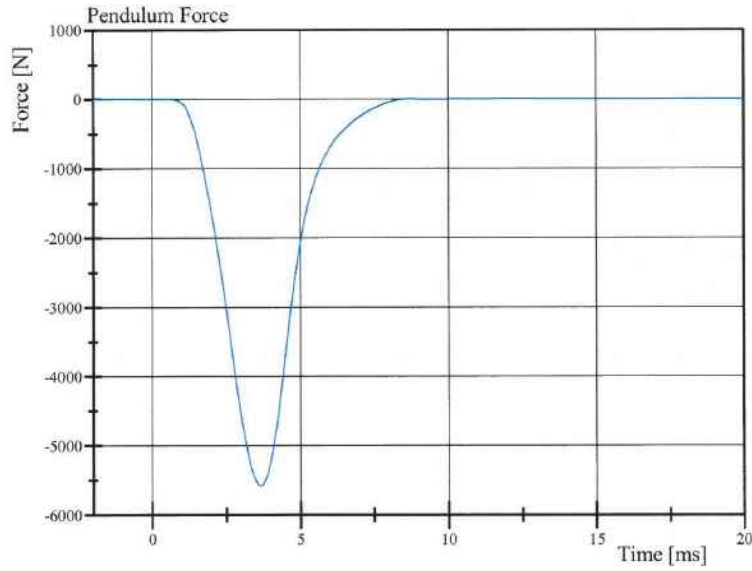
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Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 40-1
Test Date: 10/11/2016



Filter Class: CFC_600
Max: 0.1 g at 12.7 ms
Min: -113.9 g at 3.7 ms



Filter Class: CFC_600
Max: 4.8 N at 12.7 ms
Min: -5,573.6 N at 3.7 ms

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

10.11.2016 07:30:12 1735



Post-Test Calibration Sheets

Driver S/N 037

Transportation Research Center Inc.
572E HIII 50th Male Dummy
External Dimensions
Serial No. 037
Calibration No. 41

| 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 | 514 | Yes |
| C | H-Point Height | 83.8 - 88.9 | 87 | 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 | 295 | Yes |
| H | Skull Cap To Backline | 40.6 - 45.7 | 45 | Yes |
| I | Shoulder-Elbow Length | 330.2 - 345.4 | 340 | Yes |
| J | Elbow Rest Height | 190.5 - 210.8 | 198 | Yes |
| K | Buttock Knee Length | 579.1 - 604.5 | 599 | Yes |
| L | Popliteal Height | 429.3 - 454.7 | 440 | 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 | 429 | Yes |
| W | Foot Breadth | 91.4 - 106.7 | 97 | Yes |
| Y | Chest Circumference | 970.3 - 1000.8 | 990 | 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:



Transportation Research Center Inc.

Front Head Drop

HIII 50th Serial No. 037 Certification No. 41-1

Test Date: 11/15/2016

| Test Parameter | Specification | Test Results | Pass |
|--|----------------|--------------|------|
| Temperature | 18.9 - 25.5 °C | 21.7 °C | Yes |
| Relative Humidity | 10 - 70 % | 28 % | Yes |
| Peak Head Resultant Acceleration | 225 - 275 g | 249.1 g | Yes |
| Peak Head Lateral Acceleration | (-15) - 15 g | -8.7 g | Yes |
| Is Acceleration Curve Unimodal within 10% of Peak? | Yes | Yes | Yes |

Test meets specifications.

Comments:

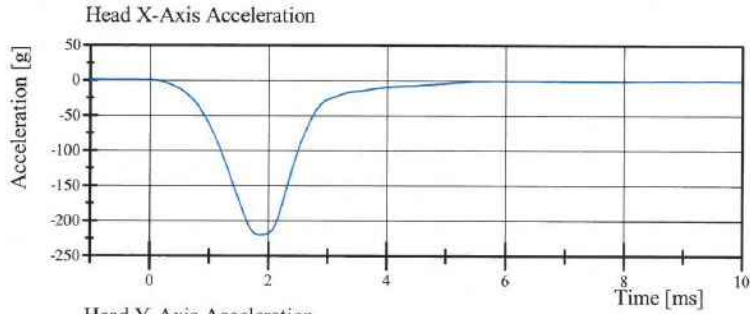


Transportation Research Center Inc.

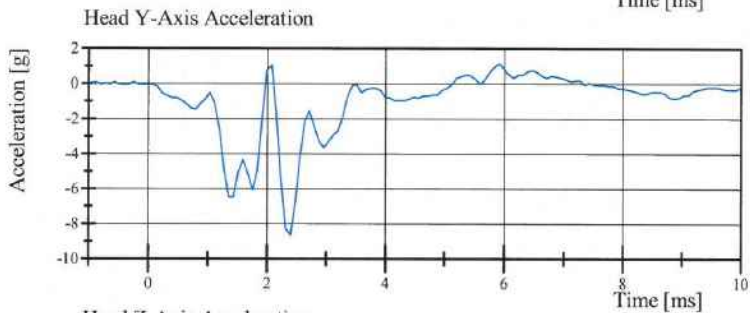
Front Head Drop

HIII 50th Serial No. 037 Certification No. 41-1

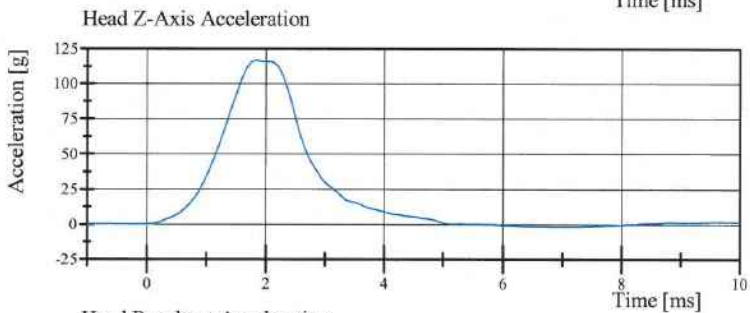
Test Date: 11/15/2016



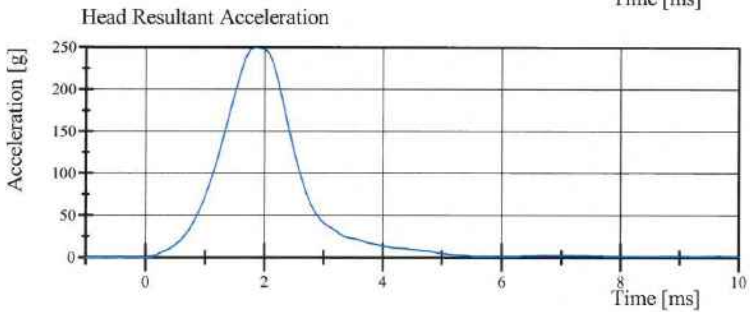
Filter Class: CFC_1000
Max: 0.1 g at -0.2 ms
Min: -220.0 g at 1.8 ms



Filter Class: CFC_1000
Max: 1.1 g at 5.9 ms
Min: -8.7 g at 2.4 ms



Filter Class: CFC_1000
Max: 116.7 g at 1.8 ms
Min: -1.8 g at 7.0 ms



Filter Class: CFC_1000
Max: 249.1 g at 1.8 ms
Min: 0.1 g at -0.6 ms

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

11.15.2016 13:26:06 614



Transportation Research Center Inc.

Neck Flexion

HIII 50th Serial No. 037 Certification No. 41-2

Test Date: 11/15/2016

| Test Parameter | Specification | Test Results | Pass |
|--|---------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 28 % | Yes |
| Pendulum Velocity | 6.89 - 7.13 m/s | 6.941 m/s | Yes |
| Pendulum Acceleration Decay Crossing -5g | 34 - 42 ms | 37.6 ms | Yes |
| Pendulum Acceleration at 10ms | (-22.5) - (-27.5) g | -24.70 g | Yes |
| Pendulum Acceleration at 20ms | (-17.6) - (-22.6) g | -19.83 g | Yes |
| Pendulum Acceleration at 30ms | (-12.5) - (-18.5) g | -14.38 g | Yes |
| Pendulum Acceleration > 30ms | >= (-29.0) g | -14.38 g | Yes |
| Total Head D-Plane Rotation | | | |
| Peak | (-64) - (-78) ° | -76.3 ° | Yes |
| Time of Peak | 57 - 64 ms | 59.5 ms | Yes |
| Total Head D-Plane Rotation | | | |
| Decay to 0° | 113 - 128 ms | 119.0 ms | Yes |
| Total Neck Occipital Condyles Moment | | | |
| Peak | 88 - 108 N·m | 102.5 N·m | Yes |
| Time of Peak | 47 - 58 ms | 50.7 ms | Yes |
| Total Neck Occipital Condyles Moment | | | |
| Decay to 0 N·m | 97 - 107 ms | 99.9 ms | Yes |

Test meets specifications.

Comments:

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

11.15.2016 14:23:30 3039

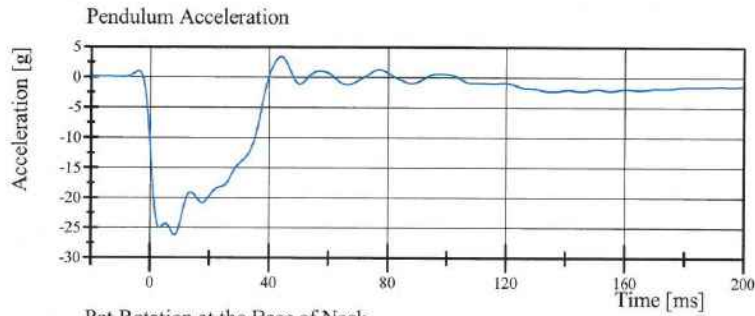


Transportation Research Center Inc.

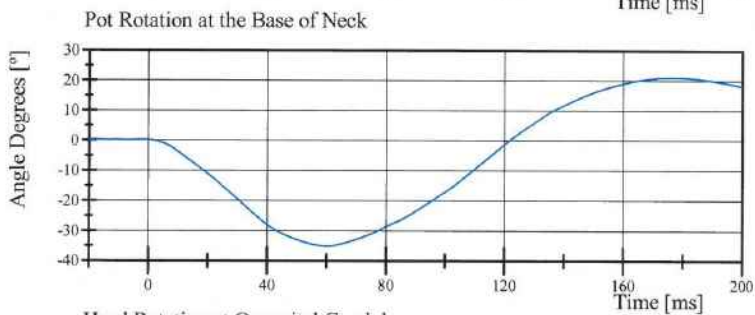
Neck Flexion

HIII 50th Serial No. 037 Certification No. 41-2

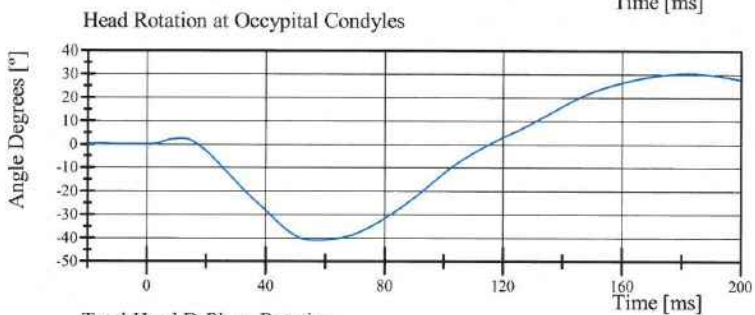
Test Date: 11/15/2016



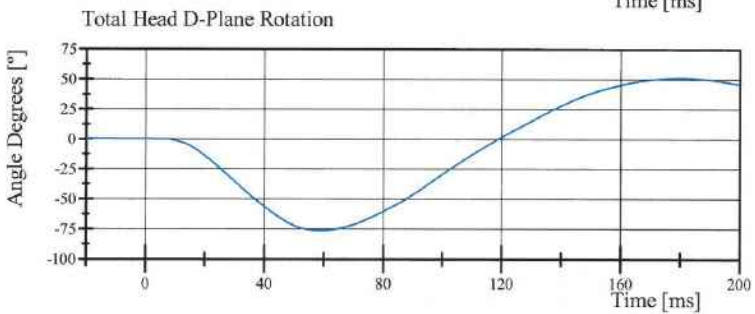
Filter Class: CFC_60
Max: 3.3 g at 44.1 ms
Min: -26.3 g at 8.4 ms



Filter Class: CFC_60
Max: 21.0 ° at 176.3 ms
Min: -35.3 ° at 60.4 ms



Filter Class: CFC_60
Max: 30.5 ° at 182.2 ms
Min: -41.2 ° at 56.5 ms



Filter Class: CFC_60
Max: 51.4 ° at 180.2 ms
Min: -76.3 ° at 59.5 ms

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

11.15.2016 14:23:55 3039

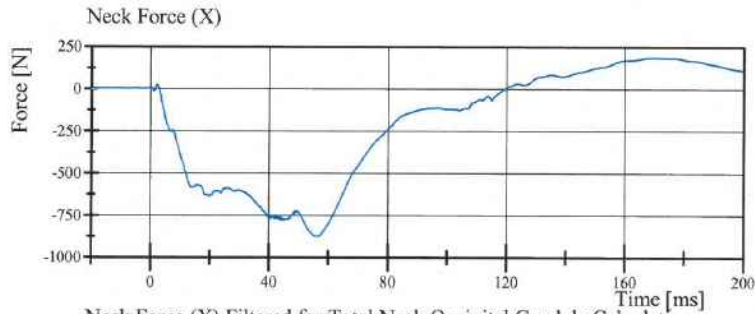


Transportation Research Center Inc.

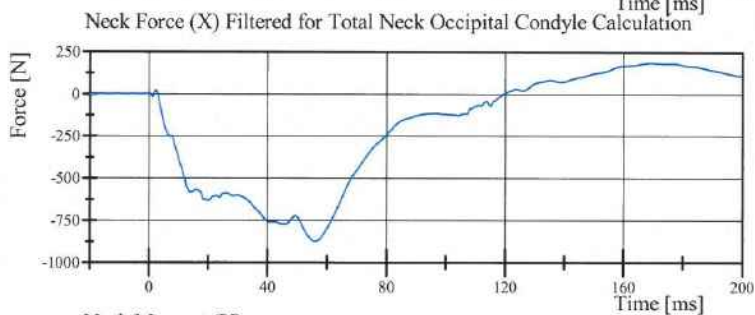
Neck Flexion

HIII 50th Serial No. 037 Certification No. 41-2

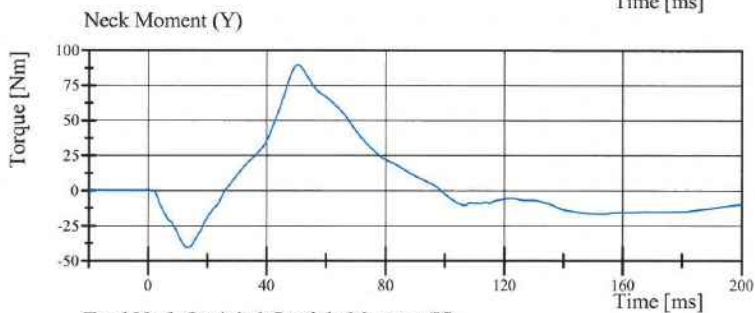
Test Date: 11/15/2016



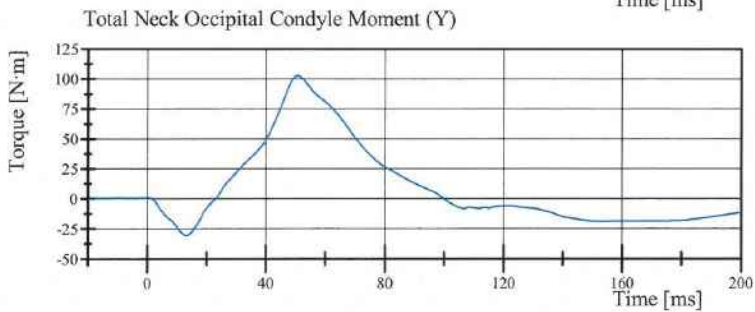
Filter Class: CFC_1000
Max: 187.3 N at 170.0 ms
Min: -876.3 N at 56.6 ms



Filter Class: CFC_600
Max: 186.6 N at 169.9 ms
Min: -875.8 N at 56.6 ms



Filter Class: CFC_600
Max: 89.4 Nm at 50.5 ms
Min: -41.1 Nm at 13.7 ms



Filter Class: Without_Constai
Max: 102.5 N·m at 50.7 ms
Min: -30.9 N·m at 13.2 ms

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

11.15.2016 14:23:56 3039



Transportation Research Center Inc.

Neck Extension

HIII 50th Serial No. 037 Certification No. 41-2

Test Date: 11/15/2016

| Test Parameter | Specification | Test Results | Pass |
|---|-----------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.6 °C | Yes |
| Relative Humidity | 10 - 70 % | 29 % | Yes |
| Pendulum Velocity | (-5.95) - (-6.18) m/s | -5.984 m/s | Yes |
| Pendulum Acceleration Decay Crossing 5g | 38 - 46 ms | 41.0 ms | Yes |
| Pendulum Acceleration at 10ms | 17.2 - 21.2 g | 19.11 g | Yes |
| Pendulum Acceleration at 20ms | 14.0 - 19.0 g | 16.00 g | Yes |
| Pendulum Acceleration at 30ms | 11.0 - 16.0 g | 13.01 g | Yes |
| Pendulum Acceleration > 30ms | <= 22.0 g | 13.01 g | Yes |
| Total Head D-Plane Rotation | | | |
| Peak | 81 - 106 ° | 98.6 ° | Yes |
| Time of Peak | 72 - 82 ms | 77.4 ms | Yes |
| Total Head D-Plane Rotation | | | |
| Decay to 0° | 147 - 174 ms | 159.2 ms | Yes |
| Total Neck Occipital Condyles Moment | | | |
| Peak | (-53) - (-80) N·m | -72.0 N·m | Yes |
| Time of Peak | 65 - 79 ms | 71.9 ms | Yes |
| Total Neck Occipital Condyles Moment | | | |
| Decay to 0 N·m | 120 - 148 ms | 145.6 ms | Yes |

Test meets specifications.

Comments:

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

11.15.2016 15:26:04 3128

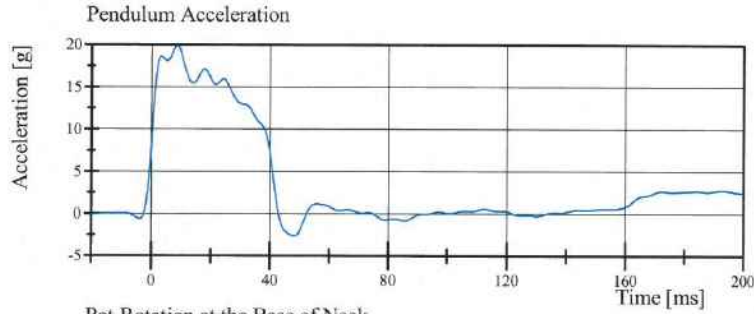


Transportation Research Center Inc.

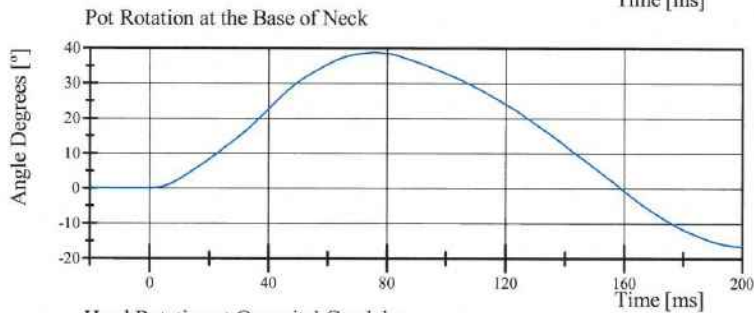
Neck Extension

HIII 50th Serial No. 037 Certification No. 41-2

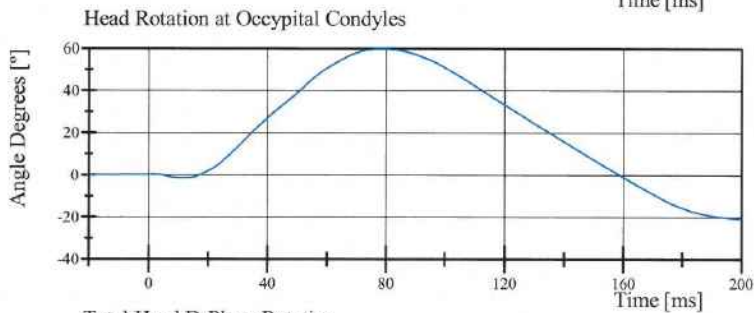
Test Date: 11/15/2016



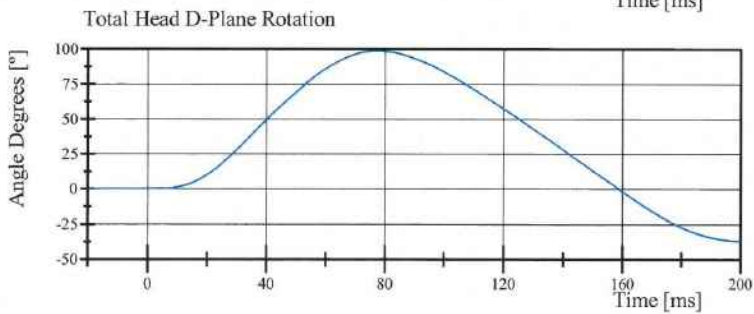
Filter Class: CFC_60
Max: 19.9 g at 8.7 ms
Min: -2.7 g at 48.2 ms



Filter Class: CFC_60
Max: 38.8 ° at 75.8 ms
Min: -16.5 ° at 200.0 ms



Filter Class: CFC_60
Max: 59.9 ° at 78.4 ms
Min: -20.5 ° at 200.0 ms



Filter Class: CFC_60
Max: 98.6 ° at 77.4 ms
Min: -37.0 ° at 200.0 ms

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

11.15.2016 15:26:15 3128

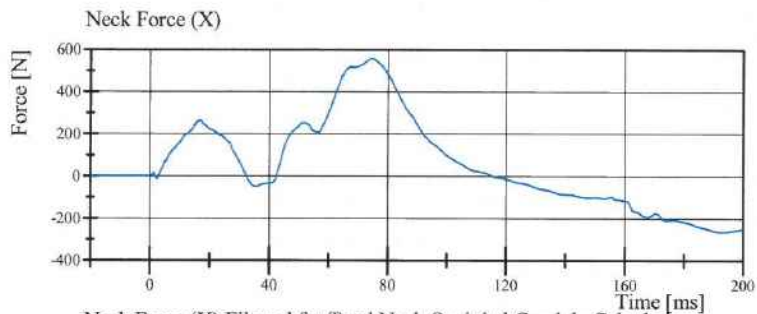


Transportation Research Center Inc.

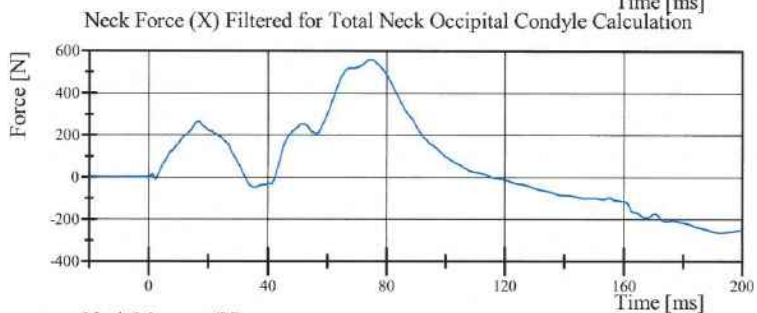
Neck Extension

HIII 50th Serial No. 037 Certification No. 41-2

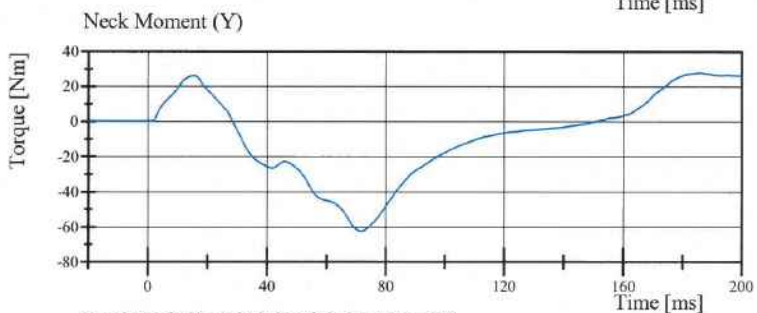
Test Date: 11/15/2016



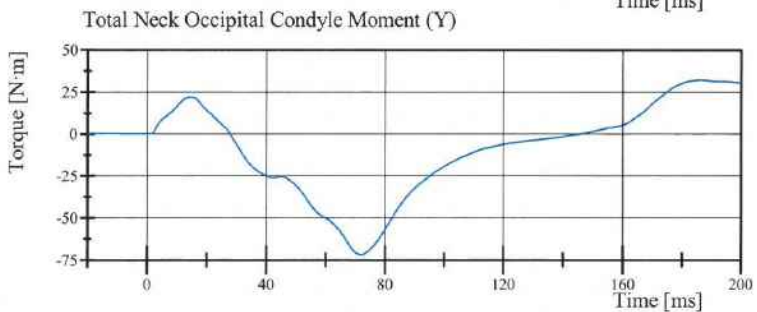
Filter Class: CFC_1000
Max: 558.9 N at 74.4 ms
Min: -263.7 N at 193.0 ms



Filter Class: CFC_600
Max: 558.6 N at 74.5 ms
Min: -263.4 N at 193.0 ms



Filter Class: CFC_600
Max: 27.9 Nm at 186.1 ms
Min: -62.5 Nm at 71.7 ms



Filter Class: Without (Consta
Max: 32.2 N·m at 186.1 ms
Min: -72.0 N·m at 71.9 ms

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

11.15.2016 15:26:16 3128



Transportation Research Center Inc.

Front Thorax

HIII 50th Serial No. 037 Certification No. 41-3

Test Date: 11/15/2016

| Test Parameter | Specification | Test Results | Pass |
|---------------------------|-----------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 30 % | Yes |
| Probe Velocity | 6.59 - 6.83 m/s | 6.680 m/s | Yes |
| Probe Force Peak | (-5,160) - (-5,893) N | -5,550.3 N | Yes |
| Maximum Chest Compression | (-63.5) - (-72.6) mm | -71.96 mm | Yes |
| Internal Hysteresis | 65 - 85 % | 72.7 % | Yes |

Test meets specifications.

Comments:

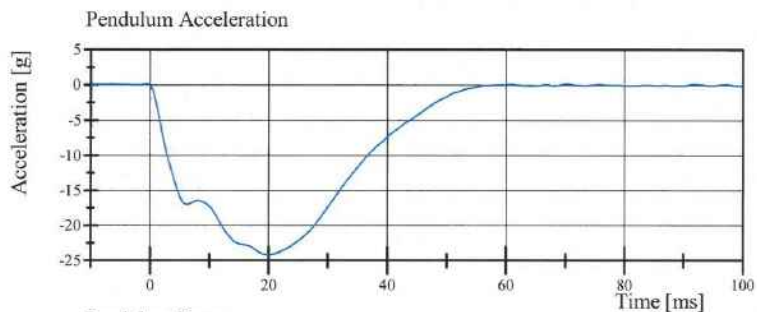


Transportation Research Center Inc.

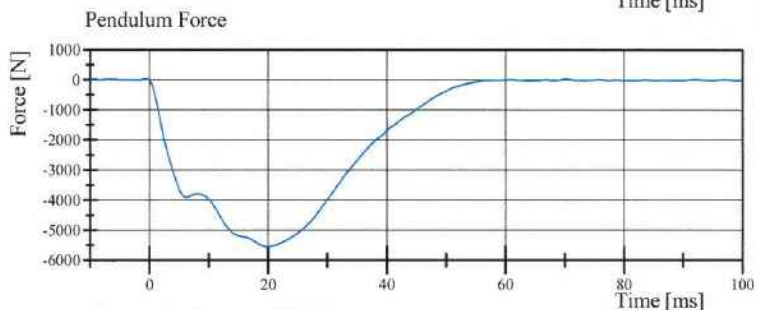
Front Thorax

HIII 50th Serial No. 037 Certification No. 41-3

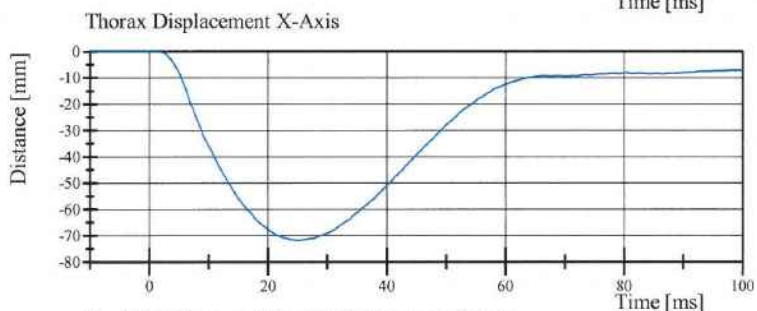
Test Date: 11/15/2016



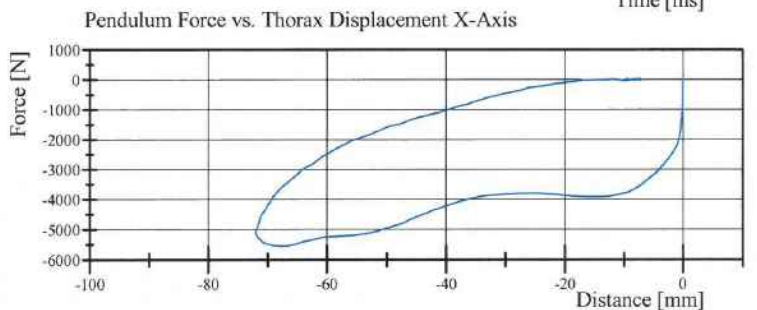
Filter Class: CFC_180
Max: 0.2 g at 70.3 ms
Min: -24.2 g at 19.9 ms



Filter Class: CFC_180
Max: 37.8 N at 70.3 ms
Min: -5,550.3 N at 19.9 ms



Filter Class: CFC_600
Max: 0.0 mm at -9.8 ms
Min: -72.0 mm at 25.1 ms



Filter Class: CFC_180
Max: 37.8 N at -9.4 mm
Min: -5,550.3 N at -67.6 mm

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

11.15.2016 16:15:09 381



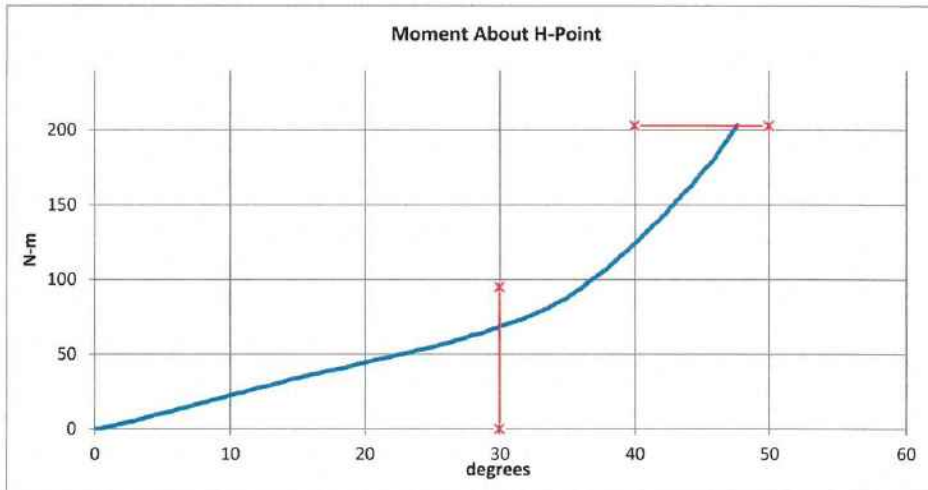
Transportation Research Center Inc.

Hybrid III 50th Male Hip Range of Motion

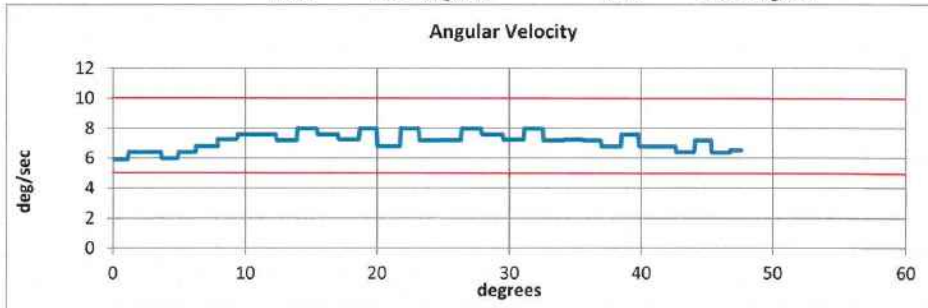


Serial Number: 037 Date: 15-Nov-2016
 Side Tested: Left Hip Time: 11:27
 Test Number: 1 Comments:

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|------------------|---------------|-------------------|
| Temperature | 18.9 - 25.6 | 21.8 °C Pass |
| Humidity | 10 - 70 | 25 % Pass |
| Moment at 30° | 0 ≤ 94.9 | 68.75 N-m Pass |
| Angle at 203 Nm | 40 - 50 | 47.64 deg Pass |
| Average Velocity | 5 - 10 | 7.11 deg/sec Pass |



Max: 7.99 deg/sec Min: 5.93 deg/sec



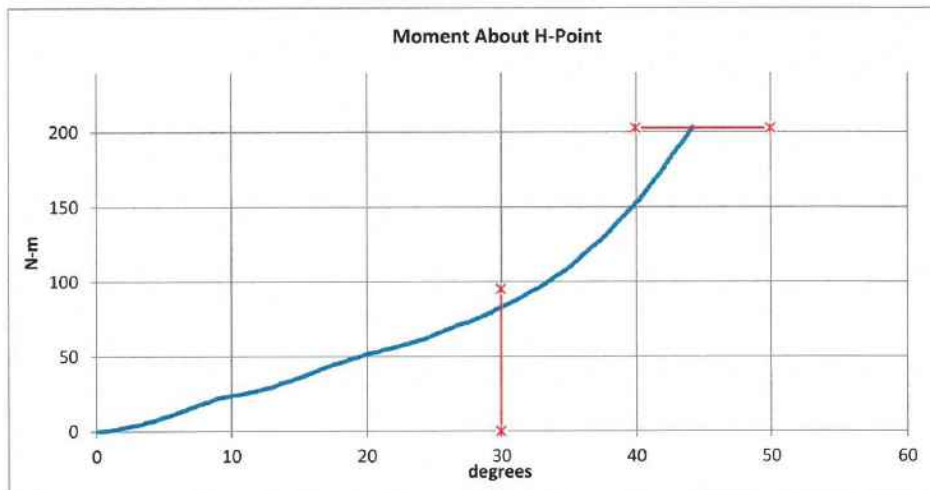
Transportation Research Center Inc.

Hybrid III 50th Male Hip Range of Motion

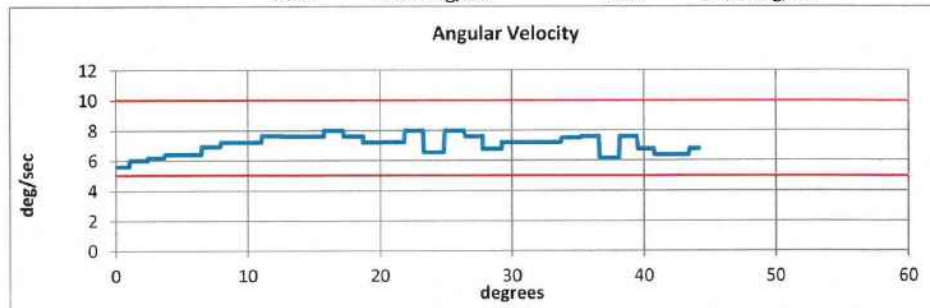


Serial Number: 037 Date: 15-Nov-2016
 Side Tested: Right Hip Time: 12:29
 Test Number: 1 Comments:

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|------------------|---------------|-------------------|
| Temperature | 18.9 - 25.6 | 21.8 °C Pass |
| Humidity | 10 - 70 | 26 % Pass |
| Moment at 30° | 0 ≤ 94.9 | 83.27 N-m Pass |
| Angle at 203 Nm | 40 - 50 | 44.2 deg Pass |
| Average Velocity | 5 - 10 | 7.05 deg/sec Pass |



Max: 7.99 deg/sec Min: 5.59 deg/sec



Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 41-2
Test Date: 11/15/2016

| Test Parameter | Specification | Test Results | Pass |
|-------------------|---------------------------|--------------|------|
| Temperature | 18.9 - 25.5 °C | 21.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 23 % | Yes |
| Probe Velocity | 2.08 - 2.13 m/s | 2.098 m/s | Yes |
| Peak Femur Force | (-4,715.2) - (-5,782.6) N | -5,472.02 N | Yes |

Test meets specifications.

Comments:

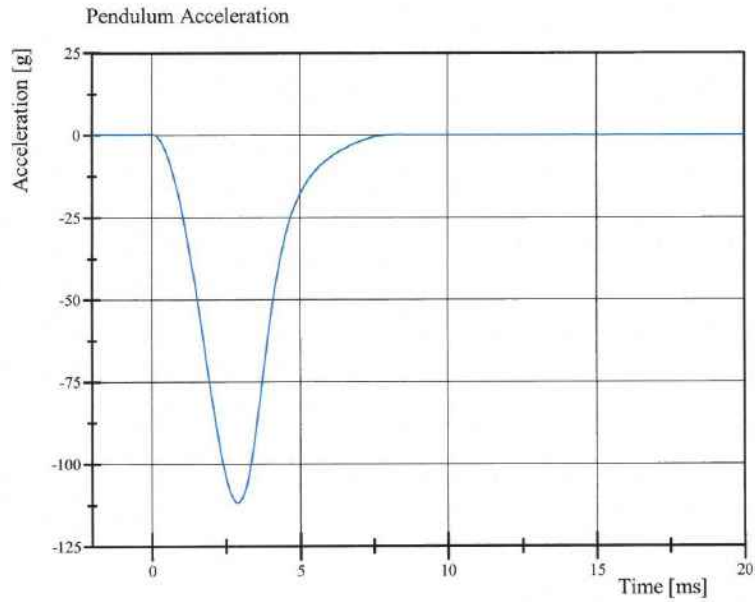
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

11.15.2016 09:49:58 1780

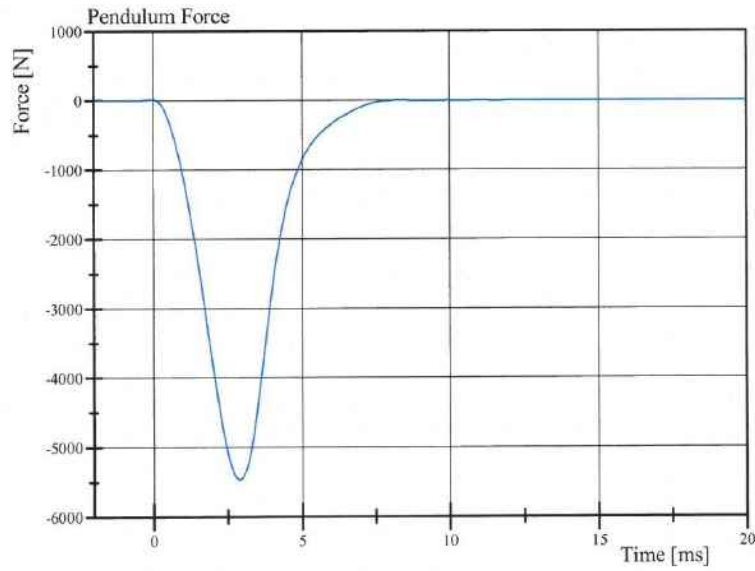


Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 41-2
Test Date: 11/15/2016



Filter Class: CFC_600
Max: 0.2 g at -0.1 ms
Min: -111.8 g at 2.9 ms



Filter Class: CFC_600
Max: 7.4 N at -0.1 ms
Min: -5,472.0 N at 2.9 ms

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

11.15.2016 09:50:35 1780



Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 41-1
Test Date: 11/15/2016

| Test Parameter | Specification | Test Results | Pass |
|-------------------|---------------------------|--------------|------|
| Temperature | 18.9 - 25.5 °C | 21.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 22 % | Yes |
| Probe Velocity | 2.08 - 2.13 m/s | 2.084 m/s | Yes |
| Peak Femur Force | (-4,715.2) - (-5,782.6) N | -5,468.86 N | Yes |

Test meets specifications.

Comments:

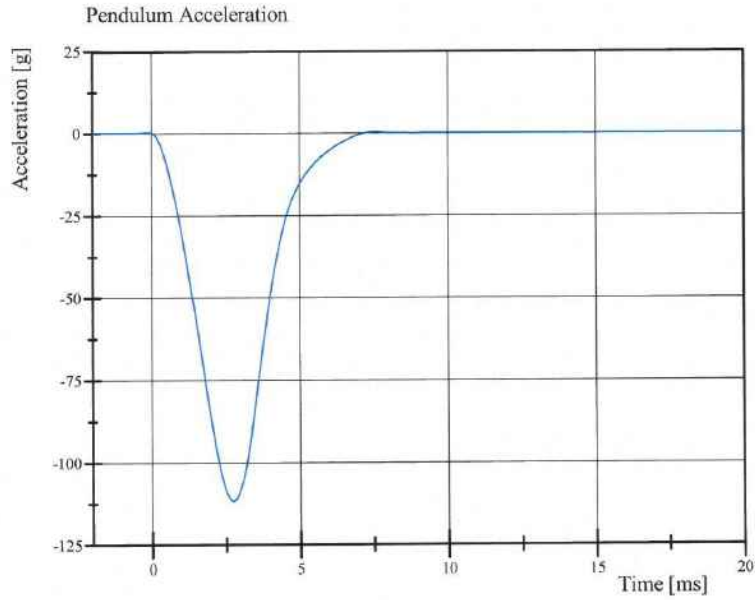
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

11.15.2016 09:31:22 1789

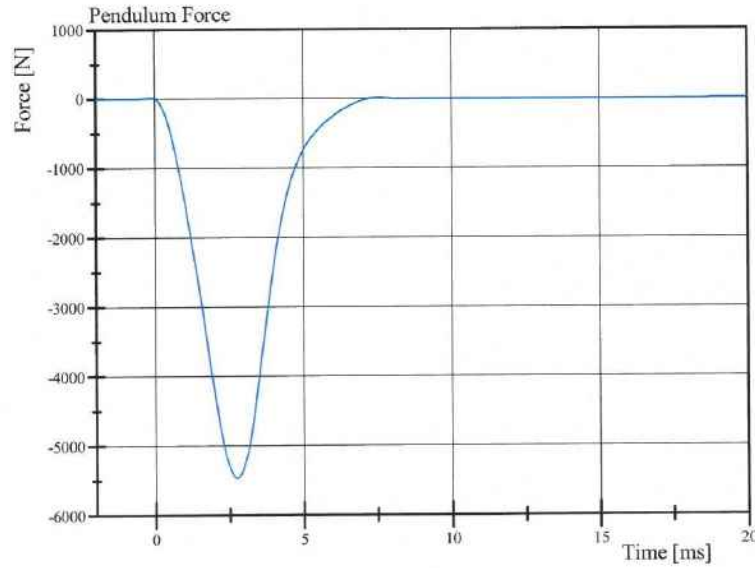


Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 41-1
Test Date: 11/15/2016



Filter Class: CFC_600
Max: 0.3 g at 7.6 ms
Min: -111.8 g at 2.7 ms



Filter Class: CFC_600
Max: 14.9 N at 7.6 ms
Min: -5,468.9 N at 2.7 ms

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

11.15.2016 09:32:20 1789



Pre-Test Calibration Sheets

Front Passenger S/N 426

Transportation Research Center Inc.
5720 HIII 5th Dummy
External Dimensions
Serial No. 426 Calibration No. 38

| Symbol | Description | Specification | Results | Pass |
|--------|--|---------------|---------|------|
| | | mm | mm | |
| A | Total Sitting Height | 774.7 - 800.1 | 781 | 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 | 78 | Yes |
| F | Thigh Clearance | 119.4 - 134.6 | 129 | Yes |
| G | Back of Elbow to Wrist Pivot | 243.9 - 259.1 | 250 | Yes |
| H | Head Back to Backline | 43.2 - 48.2 | 45 | Yes |
| I | Shoulder to Elbow Length | 276.8 - 297.2 | 286 | Yes |
| J | Elbow Rest Height | 182.8 - 203.2 | 196 | Yes |
| K | Buttock Knee Length | 520.7 - 546.1 | 535 | Yes |
| L | Popliteal Height | 355.6 - 376.0 | 367 | Yes |
| M | Knee Pivot Height | 393.7 - 419.1 | 409 | Yes |
| N | Buttock Popliteal Length | 414.0 - 439.4 | 431 | Yes |
| O | Chest Depth without Jacket | 175.3 - 190.5 | 182 | Yes |
| P | Foot Length | 218.5 - 233.7 | 224 | Yes |
| R | Buttock to Knee Pivot Length | 457.2 - 482.6 | 473 | Yes |
| S | Head Breadth | 137.1 - 147.3 | 141 | 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 | 357 | 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 | 870 | Yes |
| Z | Waist Circumference | 759.5 - 789.9 | 775 | 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 |

Transportation Research Center Inc.

Front Head Drop

HIII 5th Serial No. 426 Certification No. 38-1

Test Date: 10/10/2016

| Test Parameter | Specification | Test Results | Pass |
|--|----------------|--------------|------|
| Temperature | 18.9 - 25.5 °C | 21.5 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| Peak Head Resultant Acceleration | 250 - 300 g | 282.2 g | Yes |
| Peak Head Lateral Acceleration | (-15) - 15 g | -1.2 g | Yes |
| Is Acceleration Curve Unimodal within 10% of Peak? | Yes | Yes | Yes |

Test meets specifications.

Comments:

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

10.10.2016 15:09:40 609

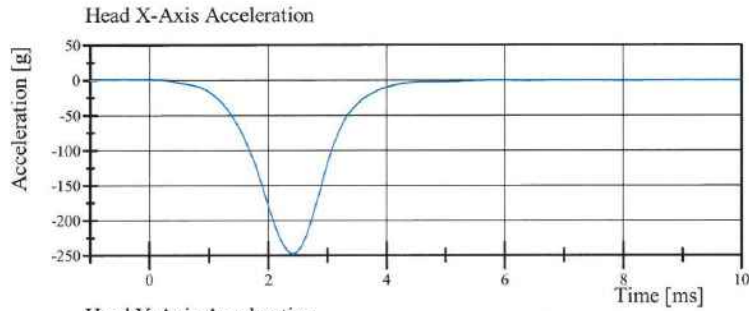


Transportation Research Center Inc.

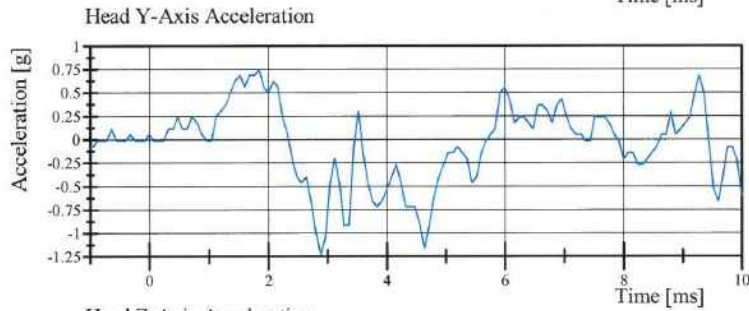
Front Head Drop

HIII 5th Serial No. 426 Certification No. 38-1

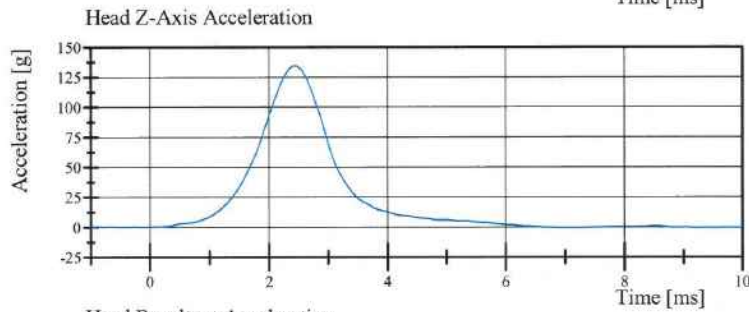
Test Date: 10/10/2016



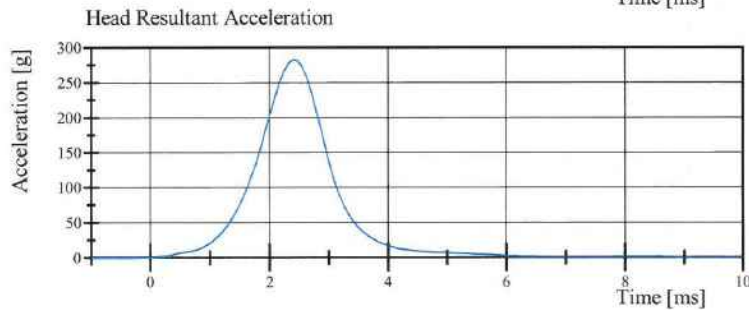
Filter Class: CFC_1000
Max: 0.1 g at -0.2 ms
Min: -248.3 g at 2.4 ms



Filter Class: CFC_1000
Max: 0.8 g at 1.8 ms
Min: -1.2 g at 2.9 ms



Filter Class: CFC_1000
Max: 134.1 g at 2.4 ms
Min: -0.5 g at 6.9 ms



Filter Class: CFC_1000
Max: 282.2 g at 2.4 ms
Min: 0.0 g at -0.8 ms

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

10.10.2016 15:09:53 609



Transportation Research Center Inc.

Neck Flexion

HIII 5th Serial No. 426 Certification No. 38-1

Test Date: 10/11/2016

| Test Parameter | Specification | Test Results | Pass |
|--|---------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.1 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| Pendulum Velocity | 6.89 - 7.13 m/s | 7.089 m/s | Yes |
| Pendulum Integrated Velocity Change at 10ms | (-2.1) - (-2.5) m/s | -2.45 m/s | Yes |
| Pendulum Integrated Velocity Change at 20ms | (-4.0) - (-5.0) m/s | -4.67 m/s | Yes |
| Pendulum Integrated Velocity Change at 30ms | (-5.8) - (-7.0) m/s | -6.48 m/s | Yes |
| Total Head D-Plane Rotation | (-77) - (-91) ° | -79.5 ° | Yes |
| Total Neck Occipital Condyles Moment Between -77° and -91° Rotation | 69 - 83 N·m | 72.9 N·m | Yes |
| Total Neck Occipital Condyles Moment Decay to 10 N·m | 80 - 100 ms | 87.2 ms | Yes |

Test meets specifications.

Comments:

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

10.11.2016 13:34:28 1848

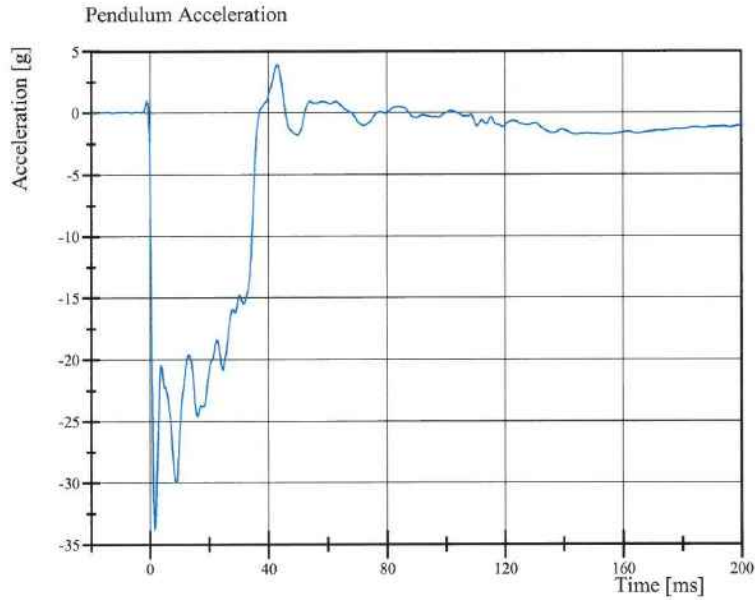


Transportation Research Center Inc.

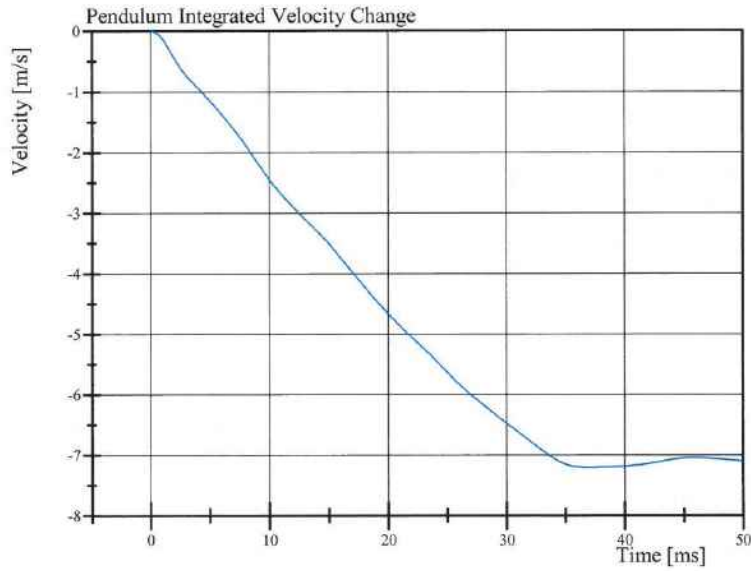
Neck Flexion

HIII 5th Serial No. 426 Certification No. 38-1

Test Date: 10/11/2016



Filter Class: CFC_180
Max: 3.8 g at 43.1 ms
Min: -33.8 g at 1.8 ms



Filter Class: CFC_180
Max: 0.0 m/s at 0.0 ms
Min: -7.2 m/s at 37.0 ms

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

10.11.2016 13:34:46 1848



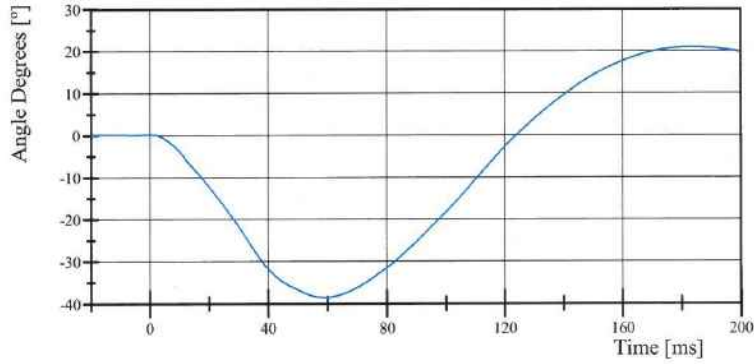
Transportation Research Center Inc.

Neck Flexion

HIII 5th Serial No. 426 Certification No. 38-1

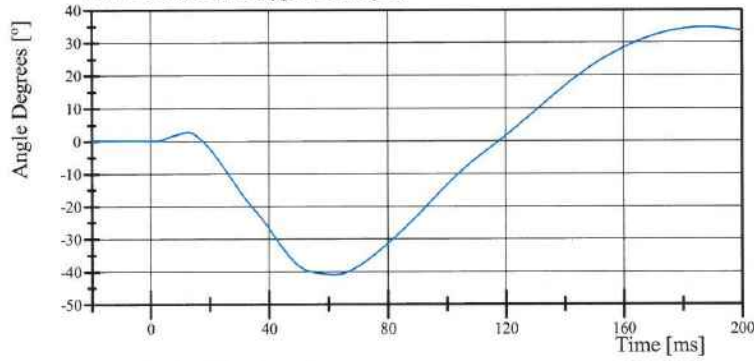
Test Date: 10/11/2016

Pot Rotation at the Base of Neck



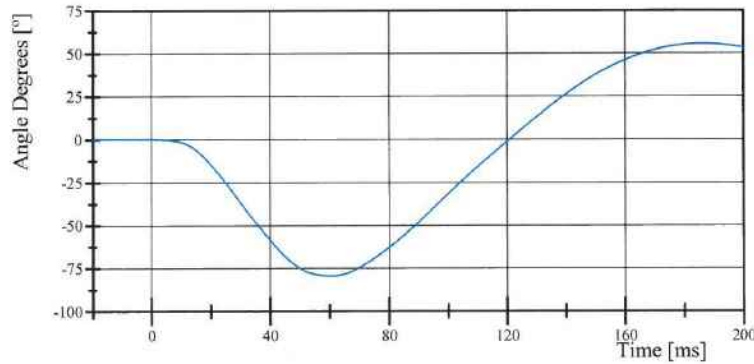
Filter Class: CFC_60
Max: 20.9 ° at 183.3 ms
Min: -38.6 ° at 59.1 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 34.8 ° at 187.3 ms
Min: -41.0 ° at 62.0 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 55.6 ° at 186.0 ms
Min: -79.5 ° at 60.3 ms

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

10.11.2016 13:34:47 1848

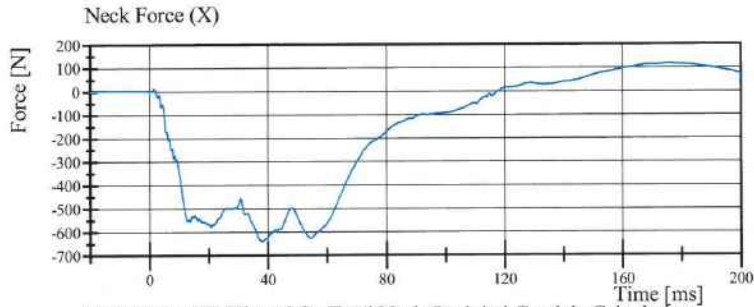


Transportation Research Center Inc.

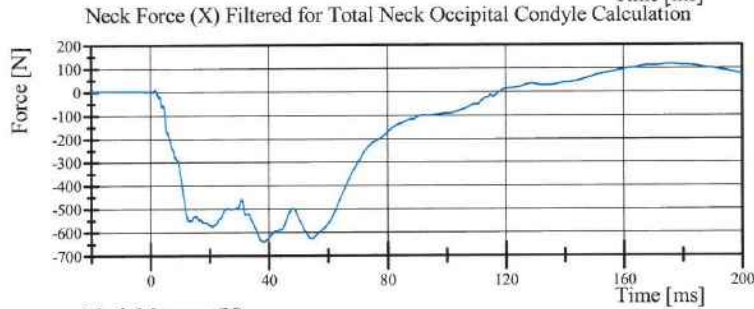
Neck Flexion

HIII 5th Serial No. 426 Certification No. 38-1

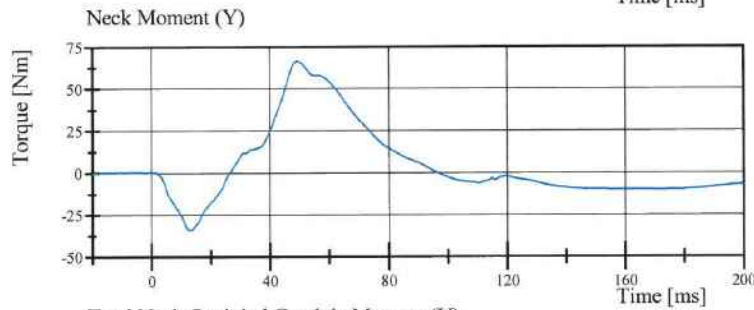
Test Date: 10/11/2016



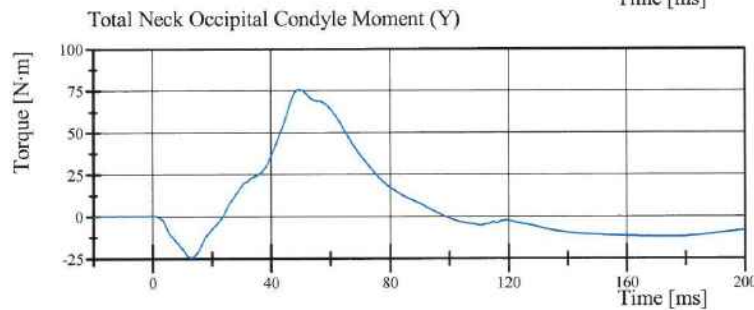
Filter Class: CFC_1000
Max: 117.9 N at 176.2 ms
Min: -642.5 N at 38.1 ms



Filter Class: CFC_600
Max: 117.4 N at 176.1 ms
Min: -641.8 N at 38.1 ms



Filter Class: CFC_600
Max: 66.3 Nm at 49.3 ms
Min: -34.5 Nm at 12.9 ms



Filter Class: Without_(Consta
Max: 75.6 N·m at 49.7 ms
Min: -24.6 N·m at 12.9 ms

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

10.11.2016 13:34:48 1848



Transportation Research Center Inc.

Neck Extension

HIII 5th Serial No. 426 Certification No. 38-3

Test Date: 10/11/2016

| Test Parameter | Specification | Test Results | Pass |
|---|-----------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.2 °C | Yes |
| Relative Humidity | 10 - 70 % | 36 % | Yes |
| Pendulum Velocity | (-5.95) - (-6.19) m/s | -6.140 m/s | Yes |
| Pendulum Integrated Velocity Change at 10ms | 1.5 - 1.9 m/s | 1.86 m/s | Yes |
| Pendulum Integrated Velocity Change at 20ms | 3.1 - 3.9 m/s | 3.75 m/s | Yes |
| Pendulum Integrated Velocity Change at 30ms | 4.6 - 5.6 m/s | 5.40 m/s | Yes |
| Total Head D-Plane Rotation | 99 - 114 ° | 109.2 ° | Yes |
| Total Neck Occipital Condyles Moment Between 99° and 114° Rotation | (-53) - (-65) N·m | -59.4 N·m | Yes |
| Total Neck Occipital Condyles Moment Decay to -10 N·m | 94 - 114 ms | 100.6 ms | Yes |

Test meets specifications.

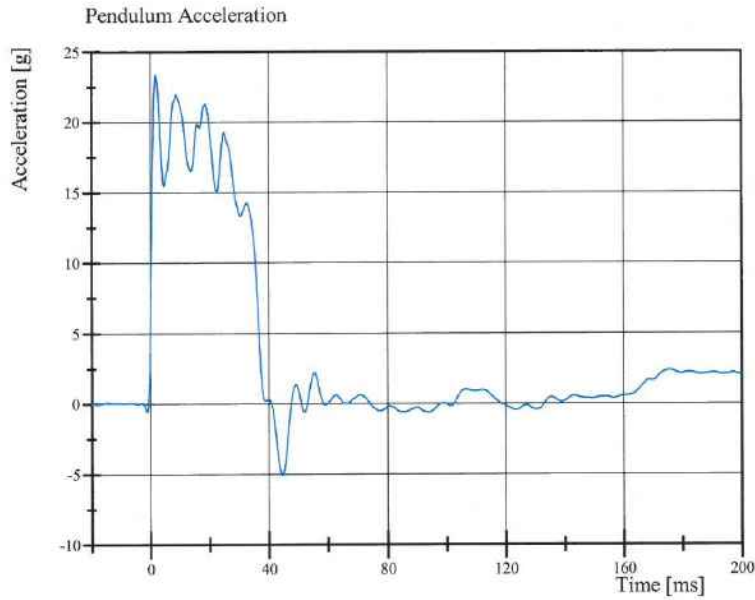
Comments:

Transportation Research Center Inc.

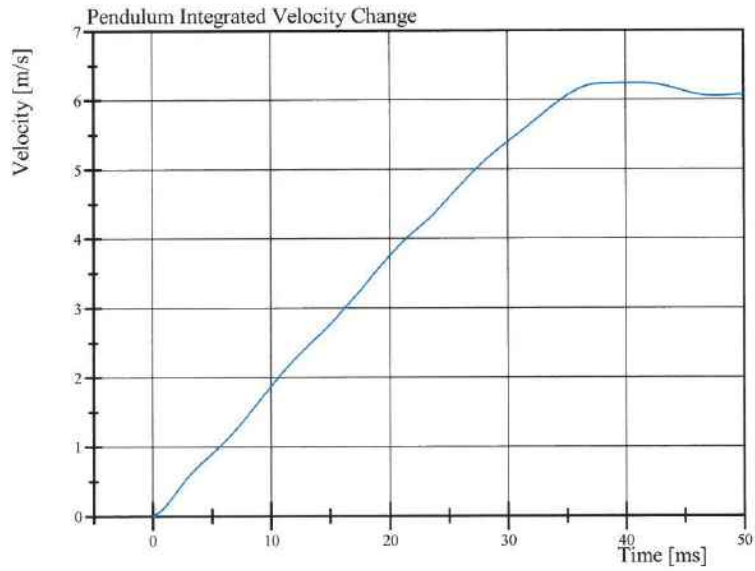
Neck Extension

HIII 5th Serial No. 426 Certification No. 38-3

Test Date: 10/11/2016



Filter Class: CFC_180
Max: 23.3 g at 1.8 ms
Min: -5.1 g at 44.6 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

10.11.2016 15:30:58 3116



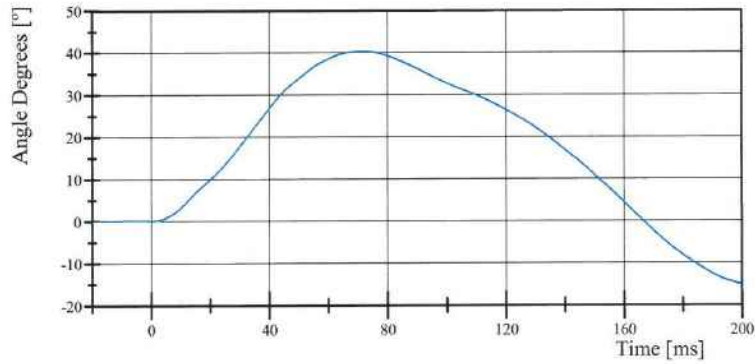
Transportation Research Center Inc.

Neck Extension

HIII 5th Serial No. 426 Certification No. 38-3

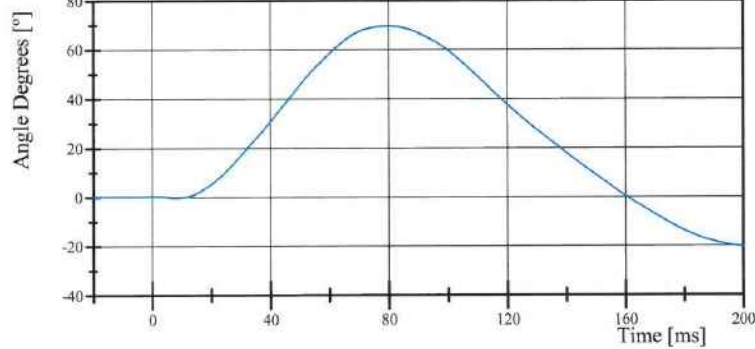
Test Date: 10/11/2016

Pot Rotation at the Base of Neck



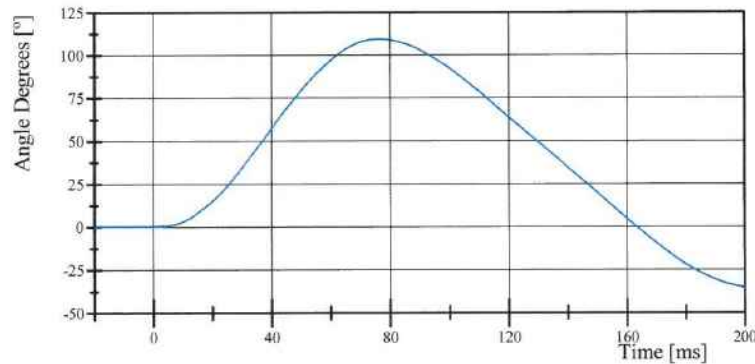
Filter Class: CFC_60
Max: 40.2 ° at 71.4 ms
Min: -15.1 ° at 200.0 ms

Head Rotation at Occipital Condyles



Filter Class: CFC_60
Max: 69.5 ° at 79.9 ms
Min: -20.3 ° at 200.0 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 109.2 ° at 76.2 ms
Min: -35.4 ° at 200.0 ms

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

10.11.2016 15:30:59 3116

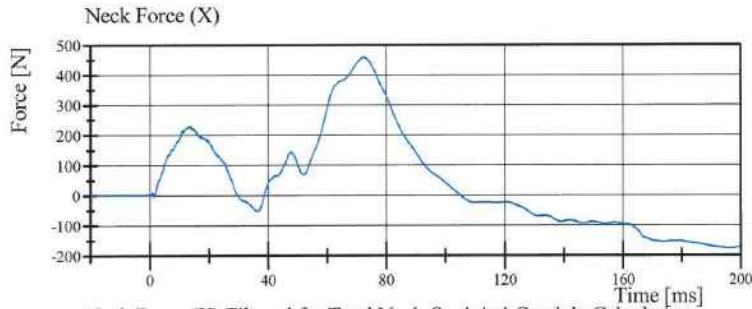


Transportation Research Center Inc.

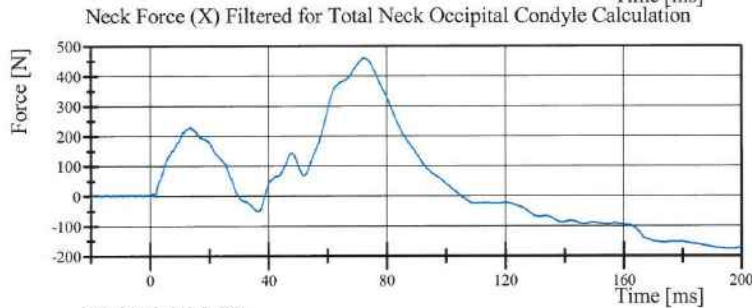
Neck Extension

HIII 5th Serial No. 426 Certification No. 38-3

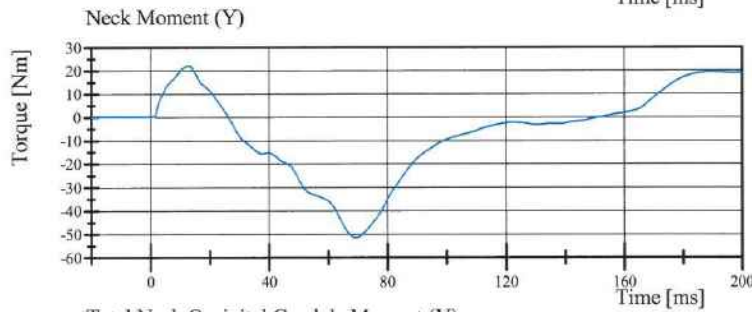
Test Date: 10/11/2016



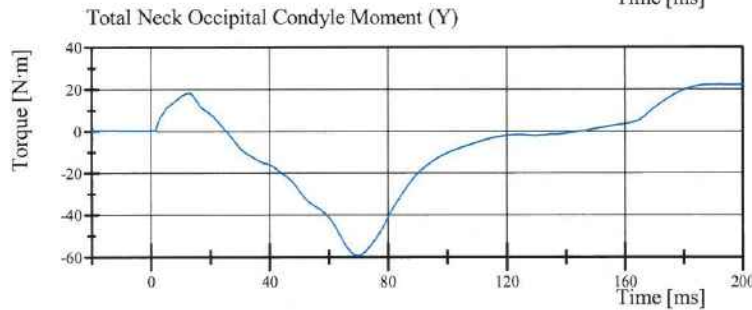
Filter Class: CFC_1000
Max: 458.7 N at 72.6 ms
Min: -175.9 N at 195.0 ms



Filter Class: CFC_600
Max: 458.3 N at 72.2 ms
Min: -175.8 N at 196.6 ms



Filter Class: CFC_600
Max: 21.9 Nm at 12.5 ms
Min: -51.7 Nm at 69.4 ms



Filter Class: Without_(Consta
Max: 22.3 N·m at 192.1 ms
Min: -59.4 N·m at 69.8 ms

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

10.11.2016 15:31:00 3116



Transportation Research Center Inc.

Front Thorax

HIII 5th Serial No. 426 Certification No. 38-1

Test Date: 10/11/2016

| Test Parameter | Specification | Test Results | Pass |
|--|-----------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.1 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| Probe Velocity | 6.59 - 6.83 m/s | 6.616 m/s | Yes |
| Probe Force Peak Between 50.0 mm and 58.0 mm Chest Deflection | (-3,900) - (-4,400) N | -4,273.7 N | Yes |
| Probe Force Peak Between 18.0 mm and 50.0 mm Chest Deflection | \geq (-4,600) N | -4,301.2 N | Yes |
| Maximum Chest Compression | (-50) - (-58) mm | -51.4 mm | Yes |
| Internal Hysteresis | 69 - 85 % | 75.2 % | Yes |

Test meets specifications.

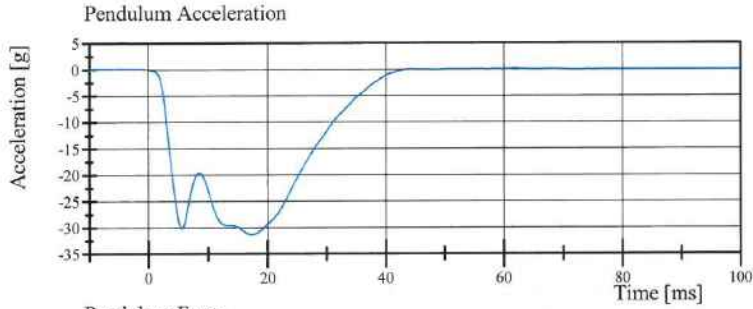
Comments:

Transportation Research Center Inc.

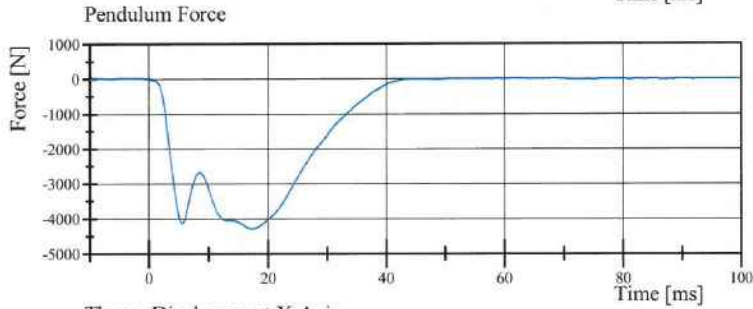
Front Thorax

HIII 5th Serial No. 426 Certification No. 38-1

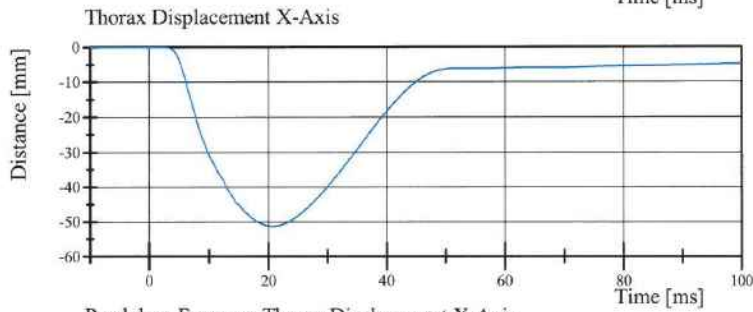
Test Date: 10/11/2016



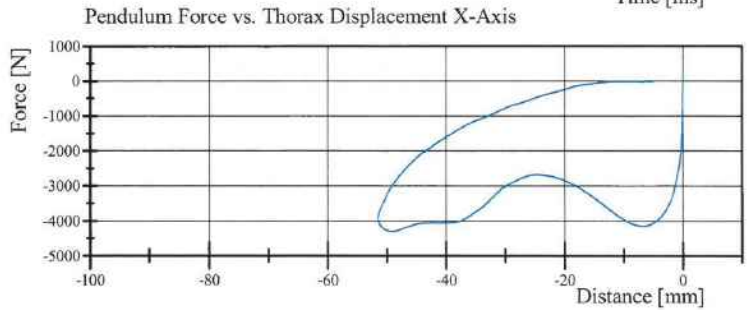
Filter Class: CFC_180
Max: 0.1 g at 61.8 ms
Min: -31.4 g at 17.3 ms



Filter Class: CFC_180
Max: 14.2 N at 61.8 ms
Min: -4,301.2 N at 17.3 ms



Filter Class: CFC_600
Max: 0.0 mm at -5.2 ms
Min: -51.4 mm at 20.6 ms



Filter Class: CFC_180
Max: 14.2 N at -6.1 mm
Min: -4,301.2 N at -49.1 mm

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

10.11.2016 13:35:58 420



Transportation Research Center Inc.

Hybrid III Small Female Torso Flexion



NHTSA

Serial Number: 426

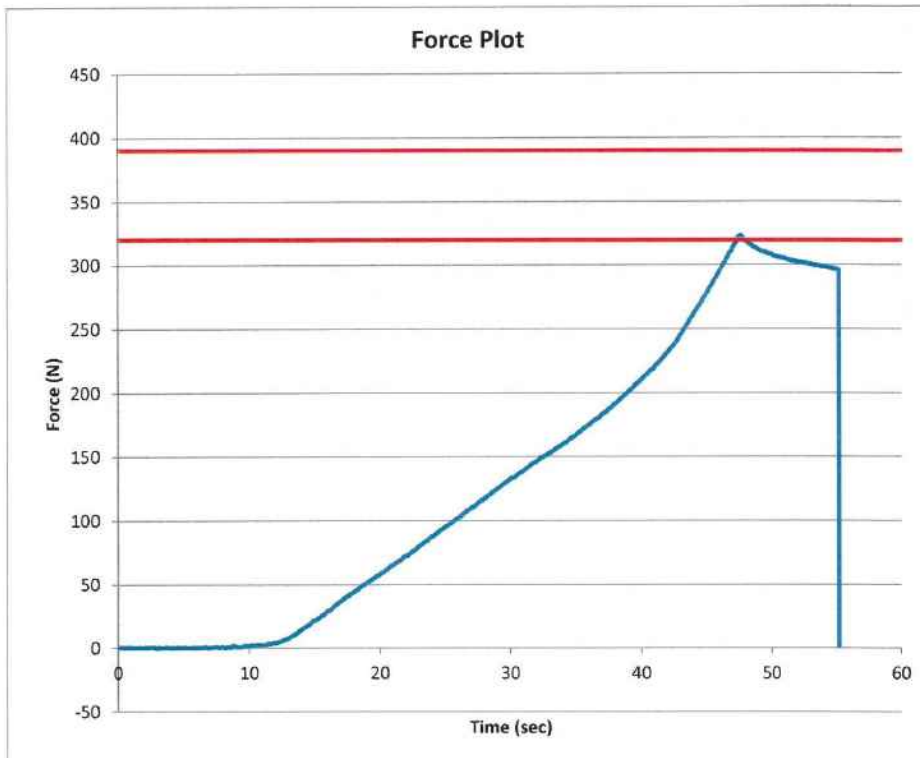
Date: 10/12/2016

Test Number: 01

Time: 7:39

Comments:

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|--------------------------|---------------|-------------------|
| Temperature | 18.9 - 25.6 | 21.6 °C Pass |
| Humidity | 10 - 70 | 41 % Pass |
| Average Angular Velocity | 0.5 - 1.5 | 0.82 deg/sec Pass |
| Initial Angle | 0 - 20 | 15.76 deg Pass |
| Peak Force at 45.12° | 320 - 390 | 323.15 N Pass |
| Final Angle | -8 - 8 | 4.94 deg Pass |



Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 38-4
Test Date: 10/11/2016

| Test Parameter | Specification | Test Results | Pass |
|-------------------|-----------------------|--------------|------|
| Temperature | 18.9 - 25.6 °C | 22.0 °C | Yes |
| Relative Humidity | 10 - 70 % | 36 % | Yes |
| Probe Velocity | 2.08 - 2.13 m/s | 2.114 m/s | Yes |
| Peak Femur Force | (-3,450) - (-4,060) N | -3,788.0 N | Yes |

Test meets specifications.

Comments:

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

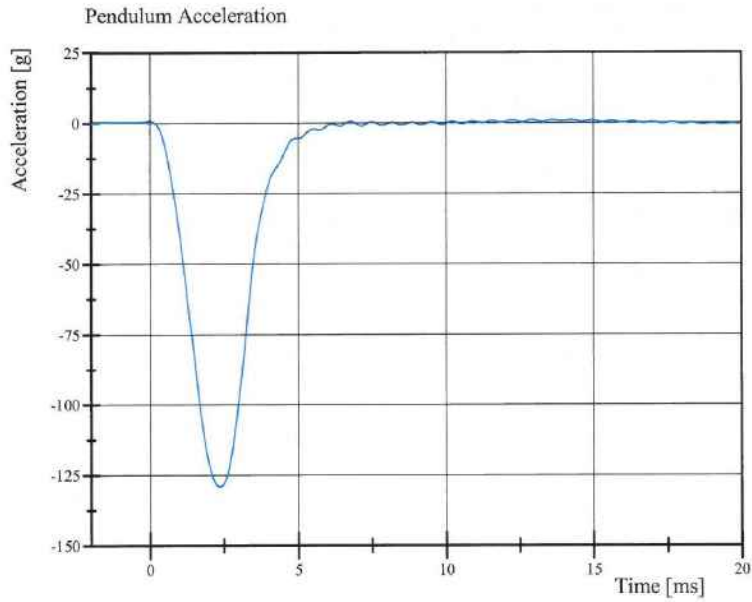
10.11.2016 11:45:16 1766



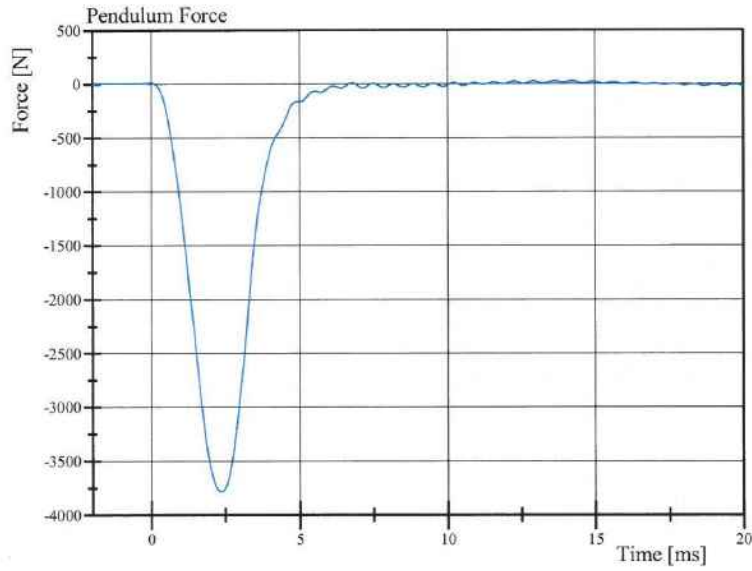
Page 16 of 20

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 38-4
Test Date: 10/11/2016



Filter Class: CFC_600
Max: 0.9 g at 13.6 ms
Min: -129.2 g at 2.4 ms



Filter Class: CFC_600
Max: 26.8 N at 13.6 ms
Min: -3,788.0 N at 2.4 ms

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

10.11.2016 11:45:26 1766



Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 38-1
Test Date: 10/11/2016

| Test Parameter | Specification | Test Results | Pass |
|-------------------|-----------------------|--------------|------|
| Temperature | 18.9 - 25.6 °C | 21.2 °C | Yes |
| Relative Humidity | 10 - 70 % | 37 % | Yes |
| Probe Velocity | 2.08 - 2.13 m/s | 2.114 m/s | Yes |
| Peak Femur Force | (-3,450) - (-4,060) N | -3,785.1 N | Yes |

Test meets specifications.

Comments:

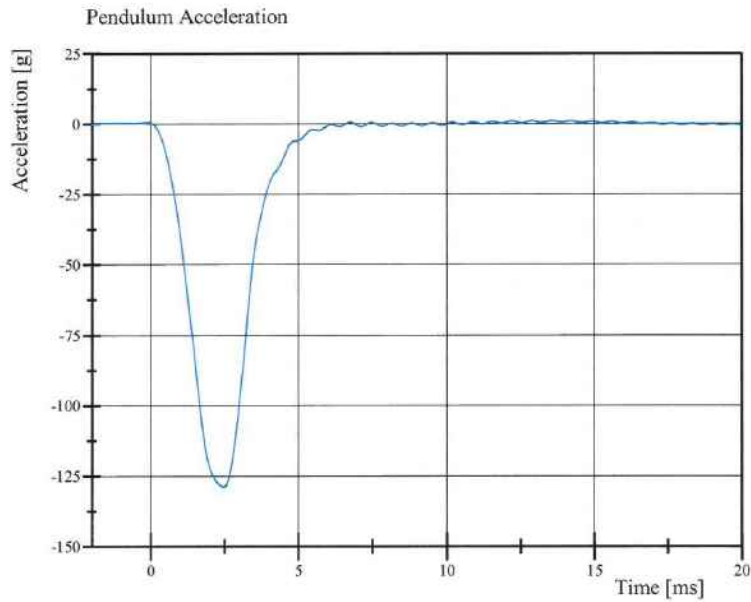
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.11.2016 10:20:01 1768

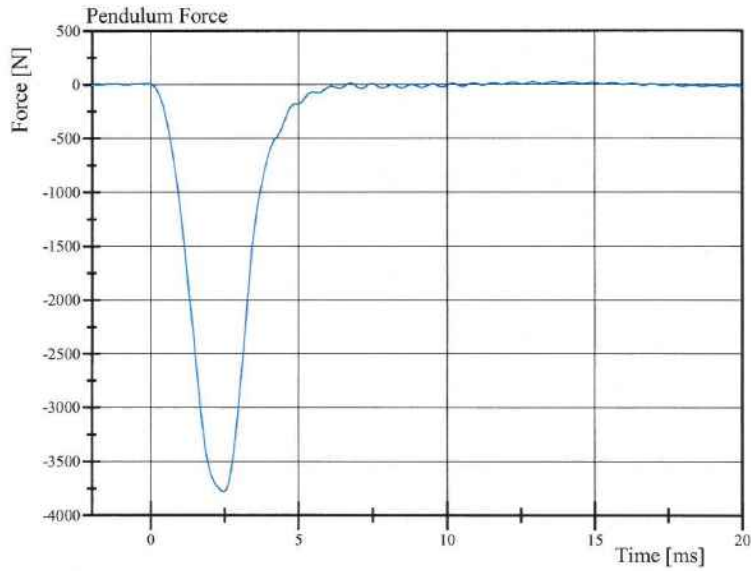


Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 38-1
Test Date: 10/11/2016



Filter Class: CFC_600
Max: 0.9 g at 13.6 ms
Min: -129.1 g at 2.5 ms



Filter Class: CFC_600
Max: 27.2 N at 13.6 ms
Min: -3,785.1 N at 2.5 ms

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

10.11.2016 10:20:12 1768



Post-Test Calibration Sheets

Front Passenger S/N 426

Transportation Research Center Inc.
5720 HHH 5th Dummy
External Dimensions
Serial No. 426 Calibration No. 39

| 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 | 444 | 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 | 78 | Yes |
| F | Thigh Clearance | 119.4 - 134.6 | 130 | Yes |
| G | Back of Elbow to Wrist Pivot | 243.9 - 259.1 | 250 | Yes |
| H | Head Back to Backline | 43.2 - 48.2 | 45 | Yes |
| I | Shoulder to Elbow Length | 276.8 - 297.2 | 286 | Yes |
| J | Elbow Rest Height | 182.8 - 203.2 | 196 | Yes |
| K | Buttock Knee Length | 520.7 - 546.1 | 535 | Yes |
| L | Popliteal Height | 355.6 - 376.0 | 367 | Yes |
| M | Knee Pivot Height | 393.7 - 419.1 | 409 | Yes |
| N | Buttock Popliteal Length | 414.0 - 439.4 | 431 | Yes |
| O | Chest Depth without Jacket | 175.3 - 190.5 | 182 | Yes |
| P | Foot Length | 218.5 - 233.7 | 224 | Yes |
| R | Buttock to Knee Pivot Length | 457.2 - 482.6 | 473 | Yes |
| S | Head Breadth | 137.1 - 147.3 | 141 | 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 | 357 | 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 | 870 | Yes |
| Z | Waist Circumference | 759.5 - 789.9 | 775 | 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 |



Transportation Research Center Inc.

Front Head Drop

HIII 5th Serial No. 426 Certification No. 39-1

Test Date: 11/15/2016

| Test Parameter | Specification | Test Results | Pass |
|---|----------------|--------------|------|
| Temperature | 18.9 - 25.5 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 27 % | Yes |
| Peak Head Resultant Acceleration | 250 - 300 g | 284.9 g | Yes |
| Peak Head Lateral Acceleration | (-15) - 15 g | 4.0 g | Yes |
| Is Acceleration Curve Unimodal within 10% of Peak? | Yes | Yes | Yes |

Test meets specifications.

Comments:

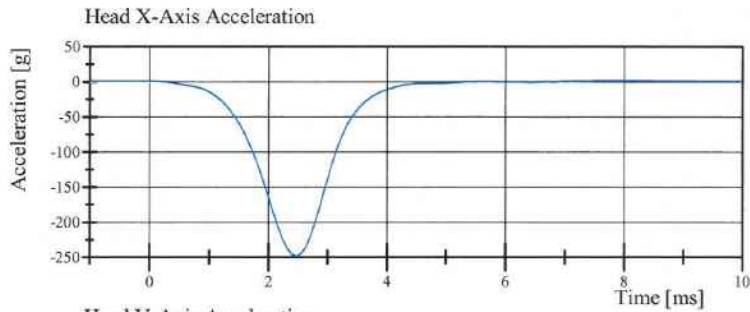


Transportation Research Center Inc.

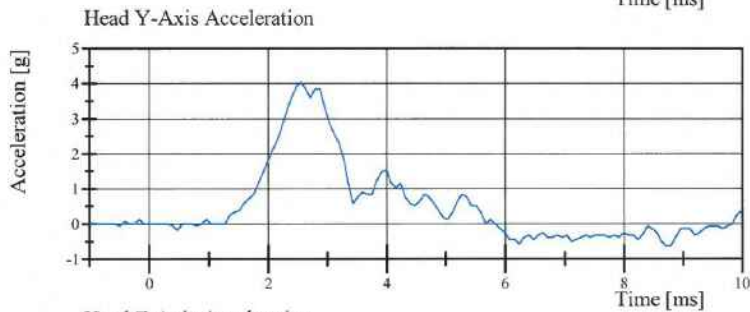
Front Head Drop

HIII 5th Serial No. 426 Certification No. 39-1

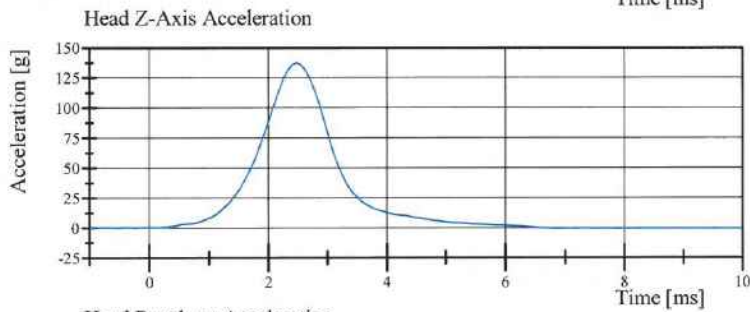
Test Date: 11/15/2016



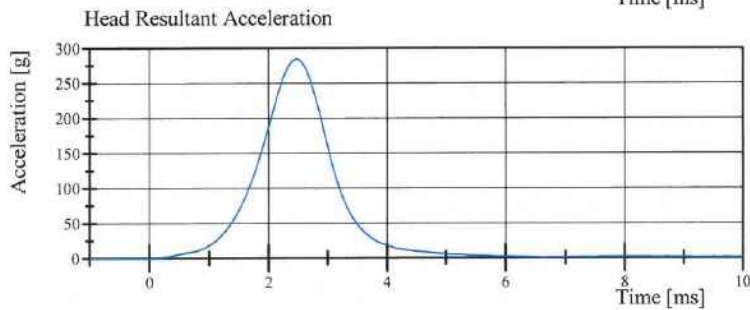
Filter Class: CFC_1000
Max: 1.5 g at 7.8 ms
Min: -249.5 g at 2.5 ms



Filter Class: CFC_1000
Max: 4.0 g at 2.6 ms
Min: -0.6 g at 8.7 ms



Filter Class: CFC_1000
Max: 137.5 g at 2.5 ms
Min: -0.7 g at 6.9 ms



Filter Class: CFC_1000
Max: 284.9 g at 2.5 ms
Min: 0.0 g at -1.0 ms

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

11.15.2016 13:58:04 608



Transportation Research Center Inc.

Neck Flexion

HIII 5th Serial No. 426 Certification No. 39-2

Test Date: 11/15/2016

| Test Parameter | Specification | Test Results | Pass |
|--|---------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 30 % | Yes |
| Pendulum Velocity | 6.89 - 7.13 m/s | 7.092 m/s | Yes |
| Pendulum Integrated Velocity Change at 10ms | (-2.1) - (-2.5) m/s | -2.39 m/s | Yes |
| Pendulum Integrated Velocity Change at 20ms | (-4.0) - (-5.0) m/s | -4.68 m/s | Yes |
| Pendulum Integrated Velocity Change at 30ms | (-5.8) - (-7.0) m/s | -6.73 m/s | Yes |
| Total Head D-Plane Rotation | (-77) - (-91) ° | -82.6 ° | Yes |
| Total Neck Occipital Condyles Moment Between -77° and -91° Rotation | 69 - 83 N·m | 75.7 N·m | Yes |
| Total Neck Occipital Condyles Moment Decay to 10 N·m | 80 - 100 ms | 87.0 ms | Yes |

Test meets specifications.

Comments:

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

11.15.2016 16:48:02 1845

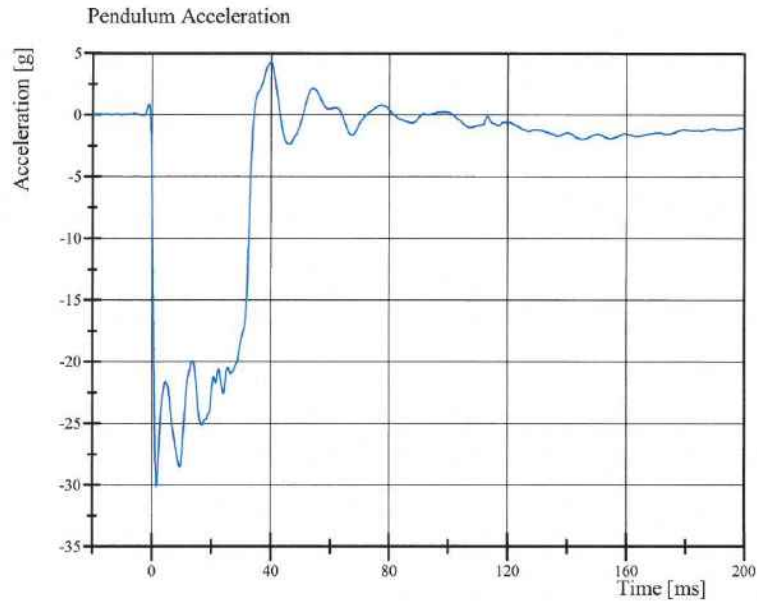


Transportation Research Center Inc.

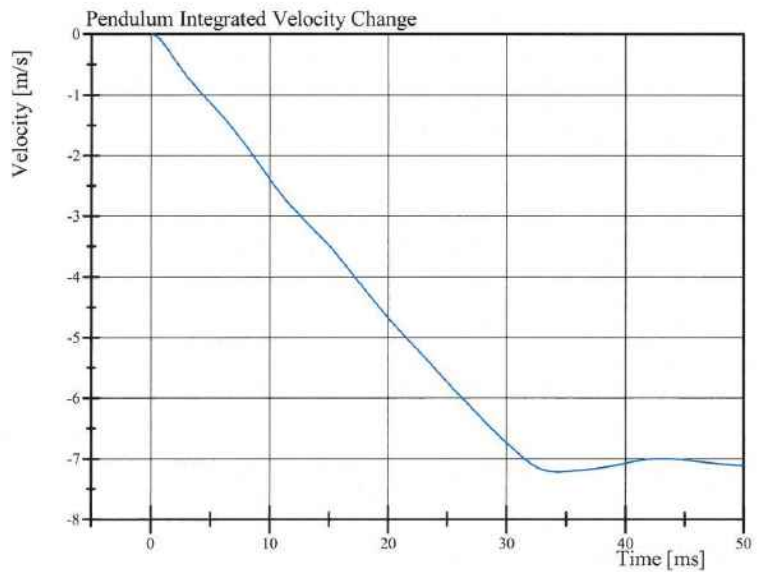
Neck Flexion

HIII 5th Serial No. 426 Certification No. 39-2

Test Date: 11/15/2016



Filter Class: CFC_180
Max: 4.2 g at 40.1 ms
Min: -30.2 g at 1.8 ms



Filter Class: CFC_180
Max: 0.0 m/s at 0.0 ms
Min: -7.2 m/s at 34.3 ms

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

11.15.2016 16:48:12 1845

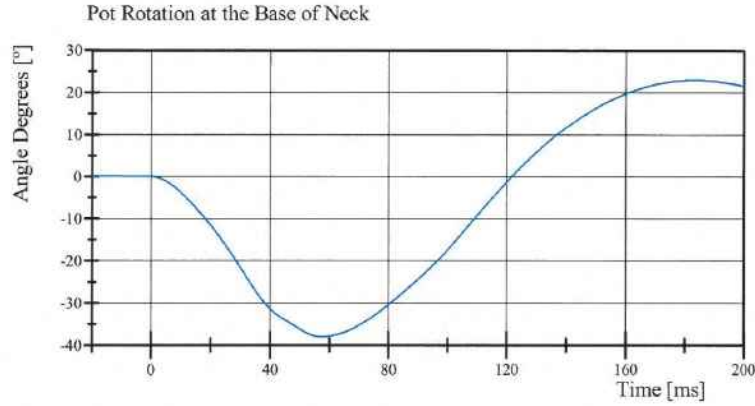


Transportation Research Center Inc.

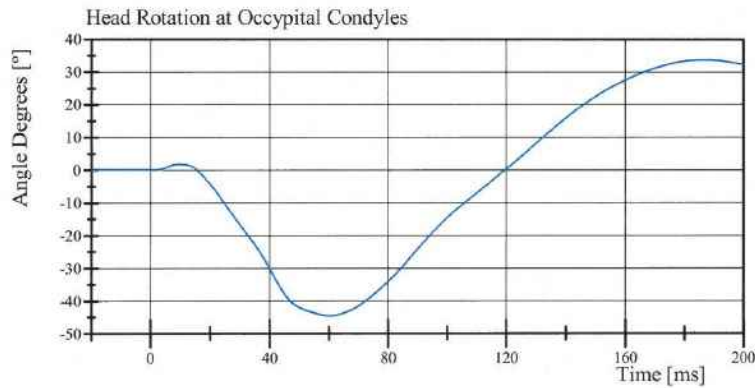
Neck Flexion

HIII 5th Serial No. 426 Certification No. 39-2

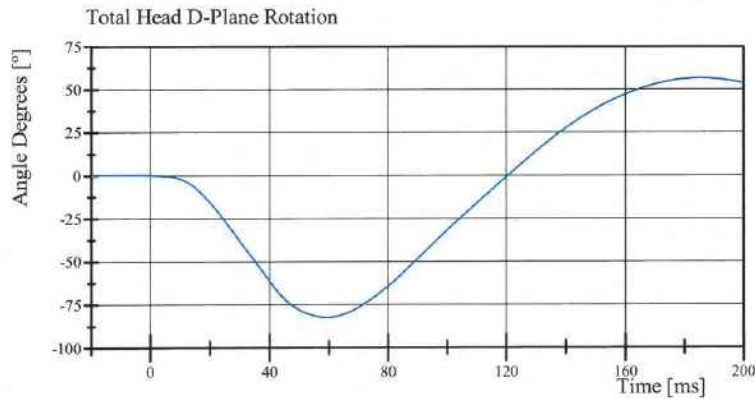
Test Date: 11/15/2016



Filter Class: CFC_60
Max: 23.0 ° at 183.6 ms
Min: -38.1 ° at 57.6 ms



Filter Class: CFC_60
Max: 33.7 ° at 187.0 ms
Min: -44.7 ° at 60.4 ms



Filter Class: CFC_60
Max: 56.7 ° at 185.5 ms
Min: -82.6 ° at 59.5 ms

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

11.15.2016 16:48:13 1845

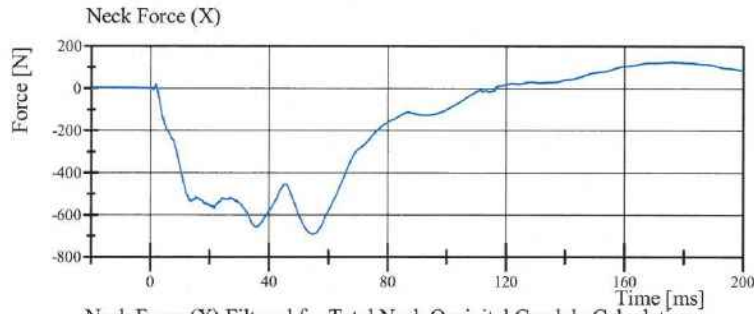


Transportation Research Center Inc.

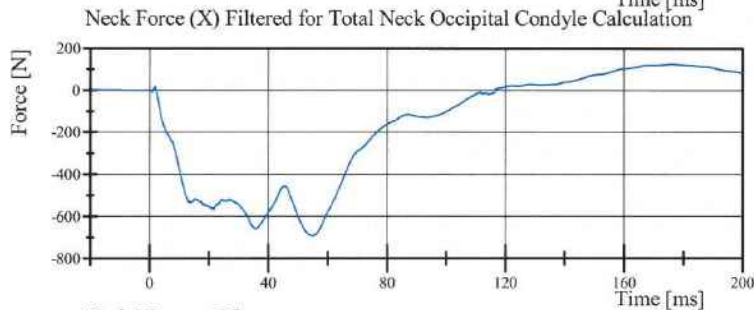
Neck Flexion

HIII 5th Serial No. 426 Certification No. 39-2

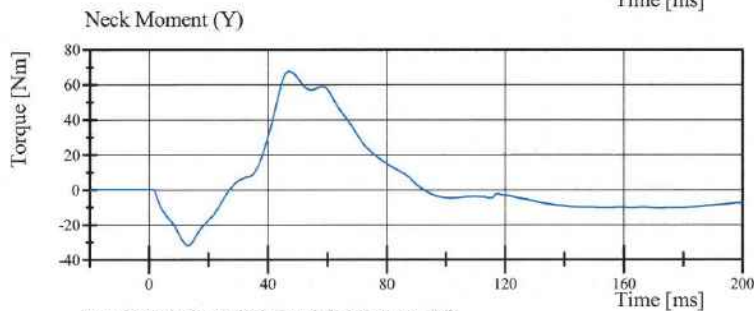
Test Date: 11/15/2016



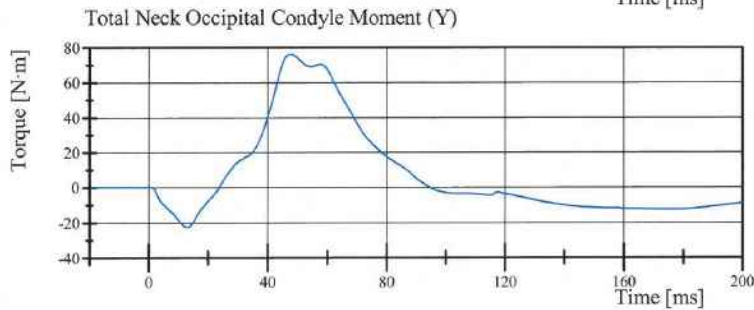
Filter Class: CFC_1000
Max: 126.6 N at 176.4 ms
Min: -693.4 N at 54.9 ms



Filter Class: CFC_600
Max: 126.1 N at 176.2 ms
Min: -692.9 N at 54.9 ms



Filter Class: CFC_600
Max: 67.4 Nm at 47.2 ms
Min: -32.3 Nm at 13.4 ms



Filter Class: Without_(Constai
Max: 76.2 N·m at 47.9 ms
Min: -22.8 N·m at 13.3 ms

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

11.15.2016 16:48:14 1845



Transportation Research Center Inc.

Neck Extension

HIII 5th Serial No. 426 Certification No. 39-1

Test Date: 11/16/2016

| Test Parameter | Specification | Test Results | Pass |
|---|-----------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 31 % | Yes |
| Pendulum Velocity | (-5.95) - (-6.19) m/s | -6.096 m/s | Yes |
| Pendulum Integrated Velocity Change at 10ms | 1.5 - 1.9 m/s | 1.81 m/s | Yes |
| Pendulum Integrated Velocity Change at 20ms | 3.1 - 3.9 m/s | 3.63 m/s | Yes |
| Pendulum Integrated Velocity Change at 30ms | 4.6 - 5.6 m/s | 5.25 m/s | Yes |
| Total Head D-Plane Rotation | 99 - 114 ° | 102.2 ° | Yes |
| Total Neck Occipital Condyles Moment Between 99° and 114° Rotation | (-53) - (-65) N·m | -59.3 N·m | Yes |
| Total Neck Occipital Condyles Moment Decay to -10 N·m | 94 - 114 ms | 101.3 ms | Yes |

Test meets specifications.

Comments:

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

11.16.2016 07:01:09 3115

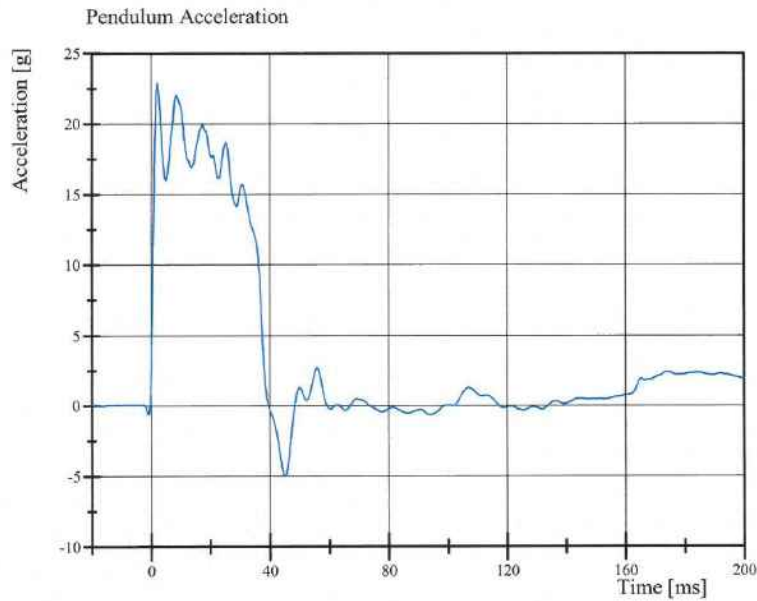


Transportation Research Center Inc.

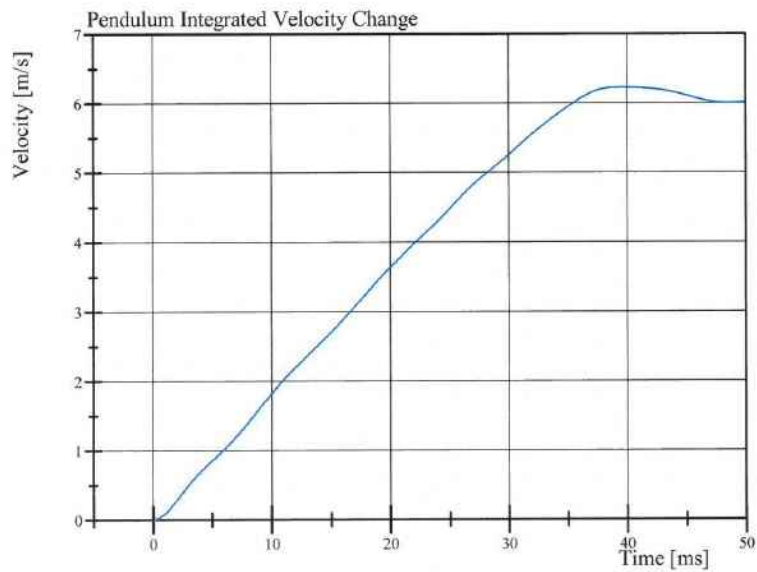
Neck Extension

HIII 5th Serial No. 426 Certification No. 39-1

Test Date: 11/16/2016



Filter Class: CFC_180
Max: 22.8 g at 2.2 ms
Min: -5.0 g at 45.3 ms



Filter Class: CFC_180
Max: 6.2 m/s at 39.6 ms
Min: 0.0 m/s at 0.0 ms

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

11.16.2016 07:01:26 3115

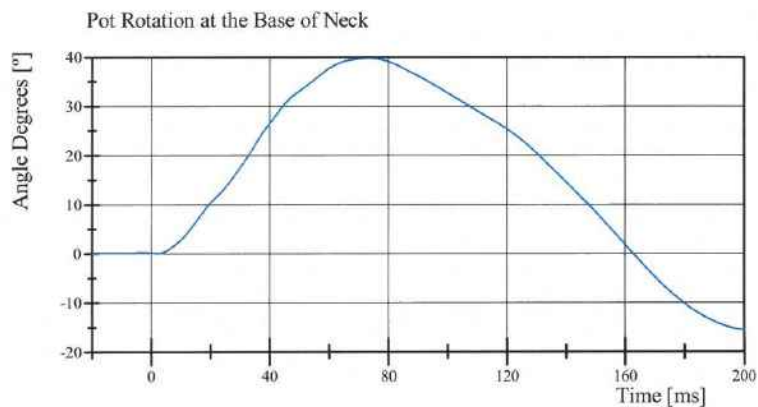


Transportation Research Center Inc.

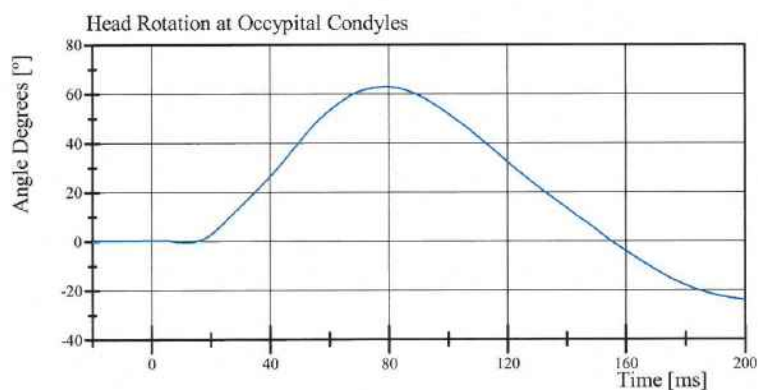
Neck Extension

HIII 5th Serial No. 426 Certification No. 39-1

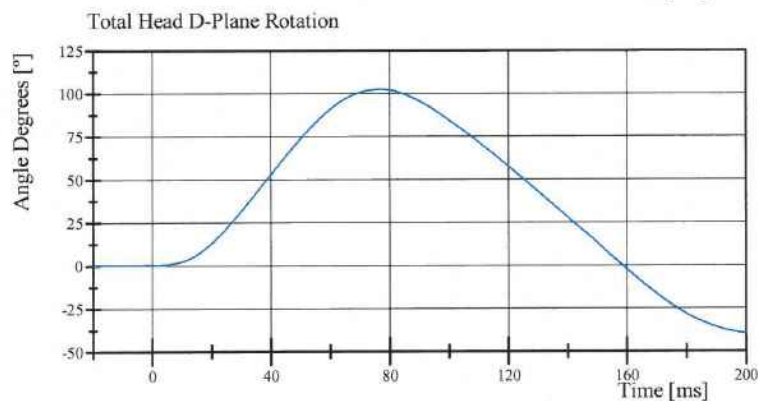
Test Date: 11/16/2016



Filter Class: CFC_60
Max: 39.6 ° at 73.3 ms
Min: -15.5 ° at 200.0 ms



Filter Class: CFC_60
Max: 62.8 ° at 79.1 ms
Min: -24.0 ° at 200.0 ms



Filter Class: CFC_60
Max: 102.2 ° at 76.9 ms
Min: -39.5 ° at 200.0 ms

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

11.16.2016 07:01:27 3115

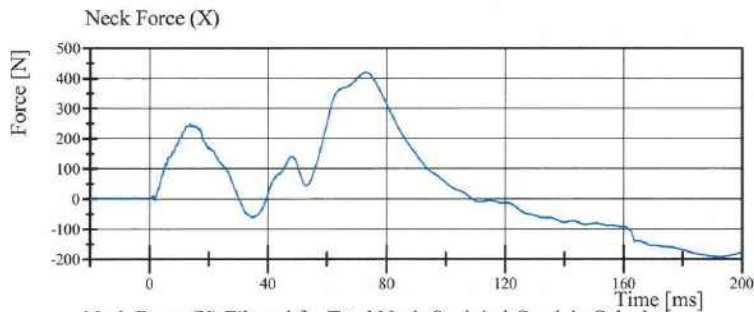


Transportation Research Center Inc.

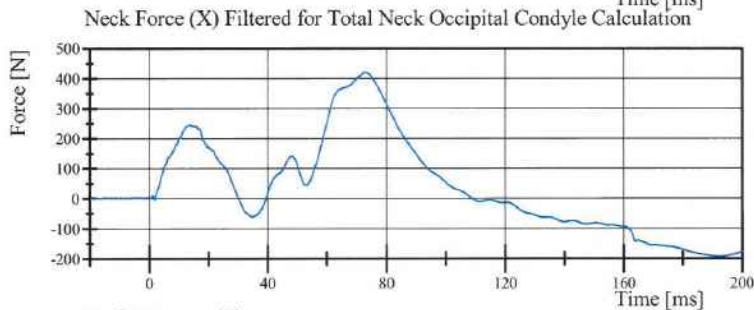
Neck Extension

HIII 5th Serial No. 426 Certification No. 39-1

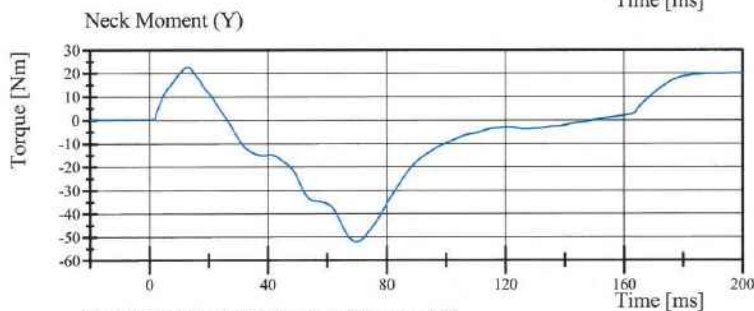
Test Date: 11/16/2016



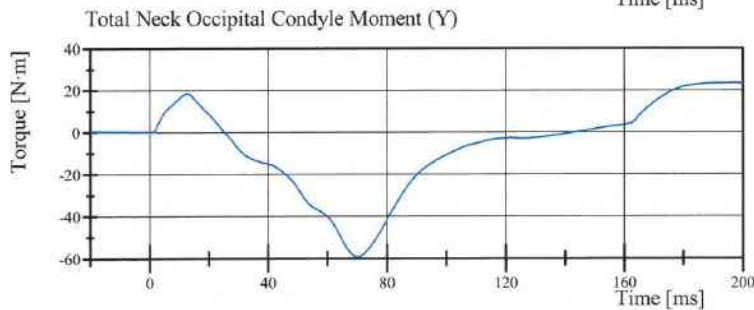
Filter Class: CFC_1000
Max: 419.3 N at 72.8 ms
Min: -193.3 N at 192.0 ms



Filter Class: CFC_600
Max: 419.2 N at 72.9 ms
Min: -193.1 N at 192.3 ms



Filter Class: CFC_600
Max: 22.5 Nm at 12.7 ms
Min: -52.2 Nm at 69.8 ms



Filter Class: Without_Constai
Max: 23.5 N·m at 195.7 ms
Min: -59.3 N·m at 70.2 ms

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

11.16.2016 07:01:28 3115



Transportation Research Center Inc.

Front Thorax

HIII 5th Serial No. 426 Certification No. 39-3

Test Date: 11/15/2016

| Test Parameter | Specification | Test Results | Pass |
|--|-----------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 26 % | Yes |
| Probe Velocity | 6.59 - 6.83 m/s | 6.687 m/s | Yes |
| Probe Force Peak Between 50.0 mm and 58.0 mm Chest Deflection | (-3,900) - (-4,400) N | -4,320.9 N | Yes |
| Probe Force Peak Between 18.0 mm and 50.0 mm Chest Deflection | \geq (-4,600) N | -4,541.7 N | Yes |
| Maximum Chest Compression | (-50) - (-58) mm | -50.2 mm | Yes |
| Internal Hysteresis | 69 - 85 % | 74.2 % | Yes |

Test meets specifications.

Comments:

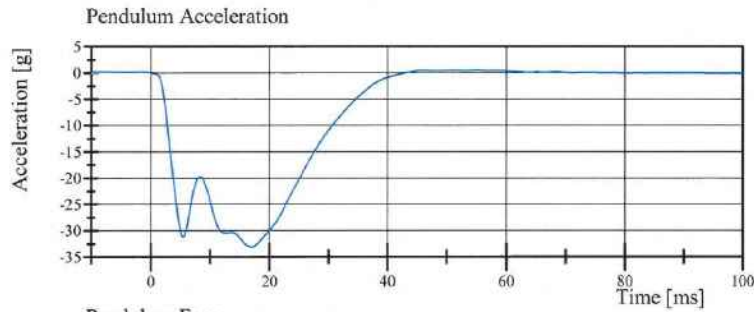


Transportation Research Center Inc.

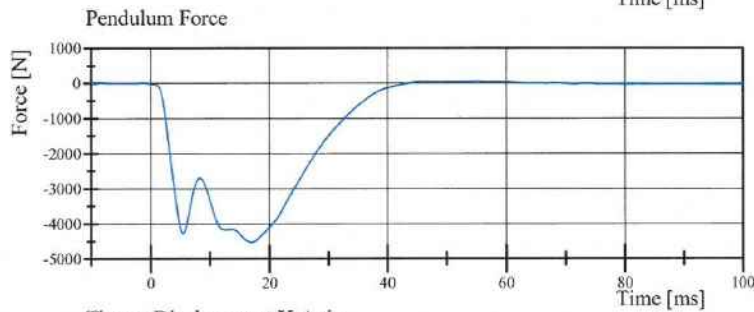
Front Thorax

HIII 5th Serial No. 426 Certification No. 39-3

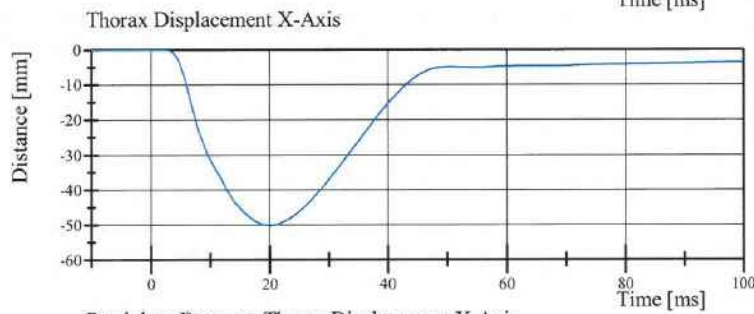
Test Date: 11/15/2016



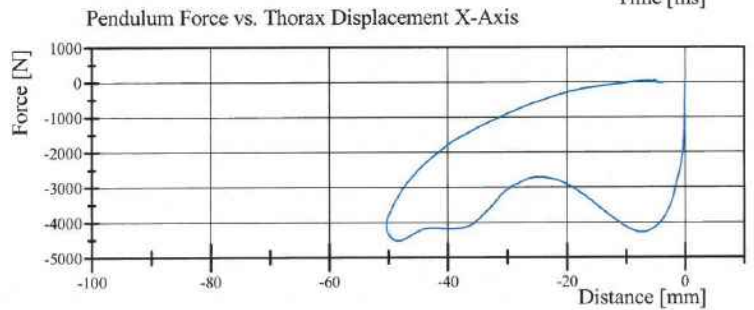
Filter Class: CFC_180
Max: 0.4 g at 55.1 ms
Min: -33.2 g at 17.0 ms



Filter Class: CFC_180
Max: 59.8 N at 55.1 ms
Min: -4,541.7 N at 17.0 ms



Filter Class: CFC_600
Max: 0.0 mm at -4.2 ms
Min: -50.2 mm at 20.2 ms



Filter Class: CFC_180
Max: 59.8 N at -5.2 mm
Min: -4,541.7 N at -48.4 mm

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

11.15.2016 12:41:58 404



Transportation Research Center Inc.

Hybrid III Small Female Torso Flexion



NHTSA

Serial Number: 426

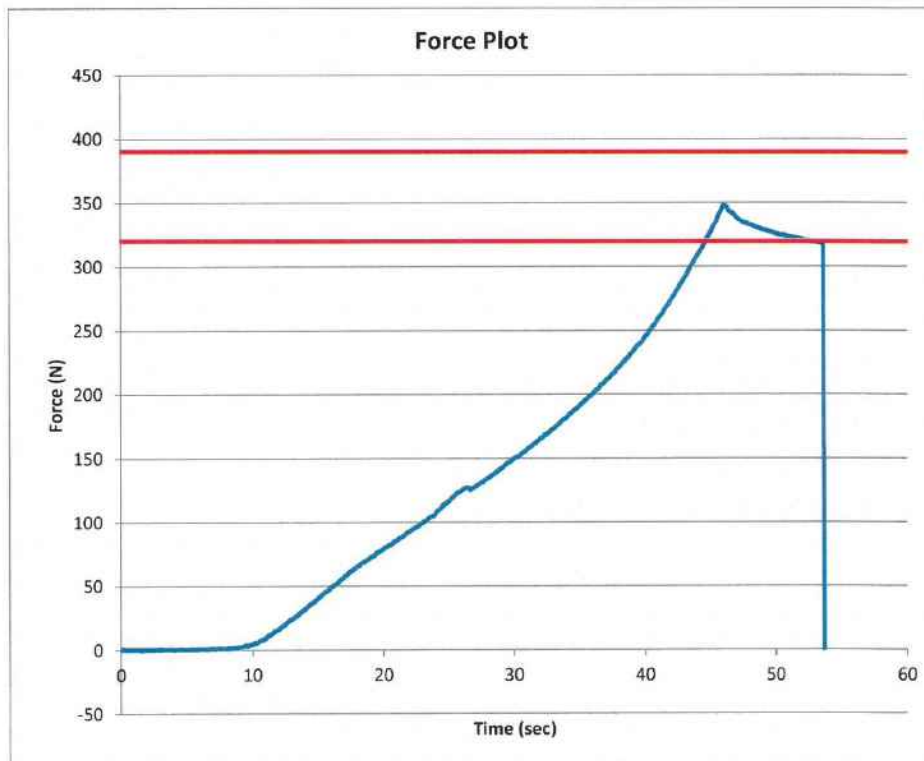
Date: 11/15/2016

Test Number: 1

Time: 17:25

Comments:

| TEST PARAMETER | SPECIFICATION | TEST RESULTS |
|--------------------------|---------------|-------------------|
| Temperature | 18.9 - 25.6 | 21.7 °C Pass |
| Humidity | 10 - 70 | 30 % Pass |
| Average Angular Velocity | 0.5 - 1.5 | 0.86 deg/sec Pass |
| Initial Angle | 0 - 20 | 13.91 deg Pass |
| Peak Force at 45.12° | 320 - 390 | 348.34 N Pass |
| Final Angle | -8 - 8 | 4.64 deg Pass |



Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 39-1
Test Date: 11/15/2016

| Test Parameter | Specification | Test Results | Pass |
|-------------------|-----------------------|--------------|------|
| Temperature | 18.9 - 25.6 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 22 % | Yes |
| Probe Velocity | 2.08 - 2.13 m/s | 2.101 m/s | Yes |
| Peak Femur Force | (-3,450) - (-4,060) N | -3,967.2 N | Yes |

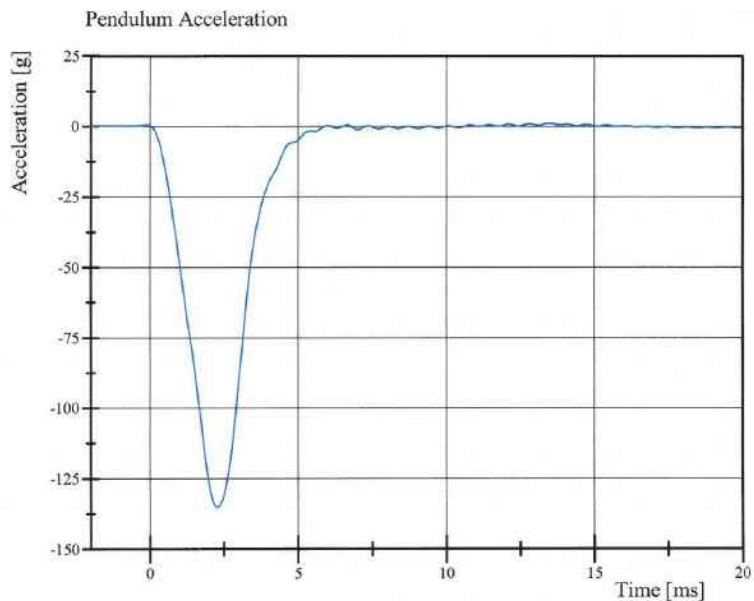
Test meets specifications.

Comments:

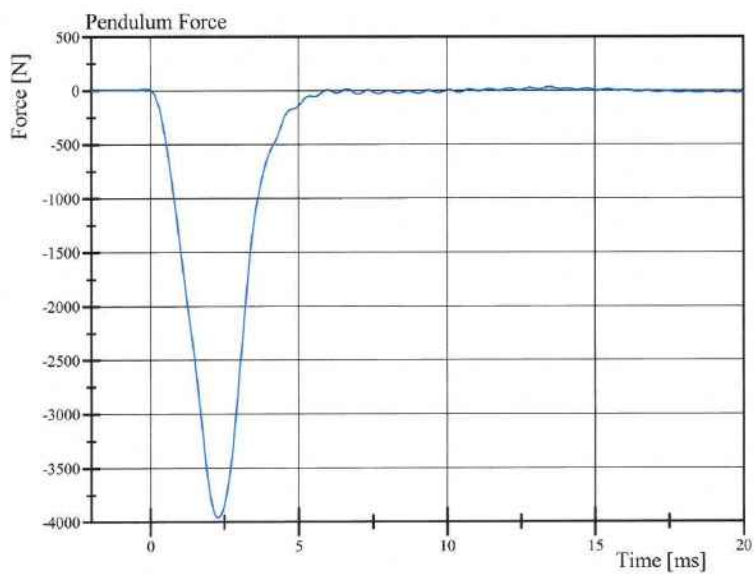


Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 39-1
Test Date: 11/15/2016



Filter Class: CFC_600
Max: 1.1 g at 13.4 ms
Min: -135.3 g at 2.3 ms



Filter Class: CFC_600
Max: 32.1 N at 13.4 ms
Min: -3,967.2 N at 2.3 ms

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

11.15.2016 08:34:52 1732



Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 39-1
Test Date: 11/15/2016

| Test Parameter | Specification | Test Results | Pass |
|-------------------|-----------------------|--------------|------|
| Temperature | 18.9 - 25.6 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 22 % | Yes |
| Probe Velocity | 2.08 - 2.13 m/s | 2.112 m/s | Yes |
| Peak Femur Force | (-3,450) - (-4,060) N | -3,749.3 N | Yes |

Test meets specifications.

Comments:

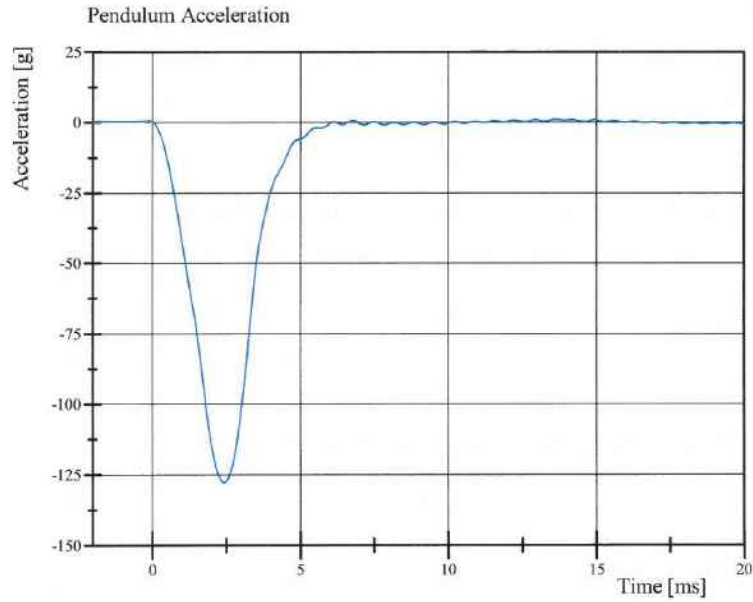
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

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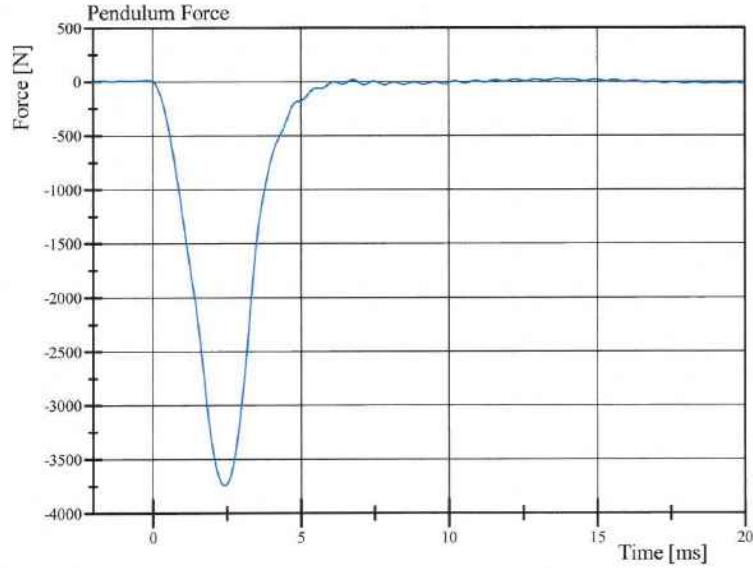


Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 39-1
Test Date: 11/15/2016



Filter Class: CFC_600
Max: 0.9 g at 13.6 ms
Min: -127.9 g at 2.4 ms



Filter Class: CFC_600
Max: 26.0 N at 13.6 ms
Min: -3,749.3 N at 2.4 ms

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

11.15.2016 08:47:13 1727



How to Research Stiffness Data

Stiffness Calculations - Contractor Report

Contractor Report

NHTSA Test

9986

FINAL REPORT NUMBER: SINCAP-TRC-17-004

**NEW CAR ASSESSMENT PROGRAM (NCAP)
MOVING DEFORMABLE BARRIER SIDE IMPACT TEST**

**Toyota Motor Manufacturing Canada, Inc.
2017 Toyota Corolla 4DR Sedan
NHTSA NUMBER: M20175106**

**PREPARED BY:
Transportation Research Center Inc.
10820 State Route 347
P. O. Box B-67
East Liberty, OH 43319**



Report Date: December 20, 2016

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Crashworthiness Standards
Mail Code: NRM-110
1200 New Jersey Ave, SE, Room W43-410
Washington, D.C. 20590**

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If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement.

Report Prepared By: ILO Project Operations Group

Report Approved By: 

John Shultz

Approval Date: December 20, 2016

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

Technical Report Documentation Page

| 1. Report No. SINCAP-TRC-17-004 | 2. Government Accession No. | 3. Recipient's Catalog No. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|-----------|---------------------|--|--|--|-------------------------|-------|------|--------|---|-----|------|-----|---------------------------------|----|----|------|-----------------------|---|------|-------|-----------------------|---|------|----------|--------------------------|---|-----|------|-------------------------|--|--|--|-------------------------|-------|------|--------|---|-----|------|-----|------------------------------------|-----|----|------|---|---|------|---------|---------------------------------|----|-----|------|----------------------------------|----|-----|------|
| 4. Title and Subtitle Final Report of New Car Assessment Program Side Impact MDB Testing of a 2017 Toyota Corolla 4DR Sedan, NHTSA No.: M20175106 | | 5. Report Date December 20, 2016 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 6. Performing Organization Code TRC Inc. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7. Author(s) John Shultz, Project Manager | | 8. Performing Organization Report Number 161116 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9. Performing Organization Name and Address Transportation Research Center Inc. 10820 State Route 347 East Liberty, OH 43319 | | 10. Work Unit No. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NRM-110) 1200 New Jersey Ave, SE, Room W43-410 Washington, DC 20590 | | 13. Type of Report and Period Covered Final Test Report November 16, 2016 – December 20, 2016 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 14. Sponsoring Agency Code NRM-110 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15. Supplemental Notes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16. Abstract <p>This 55 / 28 km/h 90° Moving Deformable Barrier SINCAP Side Impact Test was conducted on the subject 2017 Toyota Corolla 4DR Sedan, in accordance with the specifications of the Office of Crashworthiness Standards Test Procedure for the generation of consumer information on vehicle side crash protection. This test was conducted by Transportation Research Center Inc. in East Liberty, Ohio, on November 16, 2016.</p> <p>The impact velocity of the Moving Deformable Barrier (MDB) was 62.55 km/h, and the ambient temperature at the struck (left) side of the target vehicle at the time of impact was 21.4° C. The target vehicle post-test maximum crush was 205 mm at Level 2. The test vehicle's performance was as follows:</p> <table border="1"> <thead> <tr> <th colspan="4">Driver ATD (ES-2re)</th> </tr> <tr> <th>Measurement Description</th> <th>Units</th> <th>IARV</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td>N/A</td> <td>1000</td> <td>130</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>44</td> <td>18.9</td> </tr> <tr> <td>Total Abdominal Force</td> <td>N</td> <td>2500</td> <td>577.1</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td>N</td> <td>6000</td> <td>-1,571.1</td> </tr> <tr> <td>Lower Spine Acceleration</td> <td>G</td> <td>82*</td> <td>29.6</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="4">Passenger ATD (SID-IIs)</th> </tr> <tr> <th>Measurement Description</th> <th>Units</th> <th>IARV</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td>N/A</td> <td>1000</td> <td>392</td> </tr> <tr> <td>Lower Spine Resultant Acceleration</td> <td>g's</td> <td>82</td> <td>73.9</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td>N</td> <td>5525</td> <td>3,477.0</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>38*</td> <td>39.2</td> </tr> <tr> <td>Maximum Abdominal Rib Deflection</td> <td>mm</td> <td>45*</td> <td>27.1</td> </tr> </tbody> </table> <p>* Proposed IARV</p> <p>The doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.</p> | | | | Driver ATD (ES-2re) | | | | Measurement Description | Units | IARV | Result | Head Injury Criteria (HIC ₃₆) | N/A | 1000 | 130 | Maximum Thoracic Rib Deflection | mm | 44 | 18.9 | Total Abdominal Force | N | 2500 | 577.1 | Pubic Symphysis Force | N | 6000 | -1,571.1 | Lower Spine Acceleration | G | 82* | 29.6 | Passenger ATD (SID-IIs) | | | | Measurement Description | Units | IARV | Result | Head Injury Criteria (HIC ₃₆) | N/A | 1000 | 392 | Lower Spine Resultant Acceleration | g's | 82 | 73.9 | Total Pelvic Force (sum of acetabular and iliac forces) | N | 5525 | 3,477.0 | Maximum Thoracic Rib Deflection | mm | 38* | 39.2 | Maximum Abdominal Rib Deflection | mm | 45* | 27.1 |
| Driver ATD (ES-2re) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measurement Description | Units | IARV | Result | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Head Injury Criteria (HIC ₃₆) | N/A | 1000 | 130 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maximum Thoracic Rib Deflection | mm | 44 | 18.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Abdominal Force | N | 2500 | 577.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pubic Symphysis Force | N | 6000 | -1,571.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lower Spine Acceleration | G | 82* | 29.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Passenger ATD (SID-IIs) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measurement Description | Units | IARV | Result | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Head Injury Criteria (HIC ₃₆) | N/A | 1000 | 392 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lower Spine Resultant Acceleration | g's | 82 | 73.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Pelvic Force (sum of acetabular and iliac forces) | N | 5525 | 3,477.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maximum Thoracic Rib Deflection | mm | 38* | 39.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maximum Abdominal Rib Deflection | mm | 45* | 27.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17. Key Words New Car Assessment Program (NCAP) Side Impact MDB ES-2re SID-IIs | | 18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, NPO-411 1200 New Jersey Ave, SE Washington, DC 20590 e-mail: tis@nhtsa.dot.gov FAX: 202-493-2833 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19. Security Classification (of this report) Unclassified | 20. Security Classification (of this page) Unclassified | 21. Number of Pages 216 | 22. Price | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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SECTION 1
TEST PURPOSE AND PROCEDURE

TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test was conducted as part of the MY 2017 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-14-D-00354. The purpose of this test is to generate comparative side impact performance in a 2017 Toyota Corolla 4DR Sedan. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated October 2015.

SECTION 2

SUMMARY OF TEST RESULTS

A 2017 Toyota Corolla 4DR Sedan was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 62.55 km/h (38.87 mph). The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by the Transportation Research Center Inc. in East Liberty, Ohio, on November 16, 2016. Pre-test and post-test photographs of the test vehicle and the MDB and the dummies (ES-2-re and SID-IIs) are included in this report.

Dummies were placed in the driver and left rear designated seating positions according to instructions specified in the OCWS Side Impact Laboratory Test Procedure, dated October 2015. The side impact event was documented by 11 cameras. Camera locations are included in this report.

The dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)

Primary and redundant head CG tri-axial accelerometers

Chest upper rib, middle rib, and lower rib y-axis displacement potentiometers

Abdomen forward, middle, and rear y-axis load cells

Lower spine (T12) tri-axial accelerometers

Pubic symphysis y-axis load cell

PASSENGER ATD (SID-IIs)

Primary and redundant head CG triaxial accelerometers

Chest upper rib, middle rib, and lower rib y-axis displacement potentiometers

Abdomen upper rib and lower rib y-axis displacement potentiometers

Lower spine (T12) tri-axial accelerometers

Acetabulum and iliac wing y-axis load cells

APPENDIX B contains the vehicle and dummy response data. Dummy configuration and performance verification data can be found in APPENDIX C of this report. APPENDIX D of this report contains the test equipment and instrumentation calibration data.

Dummy injury readings were recorded as follows:

| Measurement Description | Driver ATD (ES-2-re) | | |
|---|----------------------|-----------|----------|
| | Units | Threshold | Result |
| Head Injury Criteria (HIC ₃₆) | N/A | 1000 | 130 |
| Maximum Thoracic Rib Deflection | mm | 44 | 18.9 |
| Combined Abdominal Force | N | 2500 | 577.1 |
| Pubic Symphysis Force | N | 6000 | -1,571.1 |
| Lower Spine (T12) Resultant Acceleration | G | 82* | 29.6 |

* Proposed IARV

| Measurement Description | Passenger ATD (SID-IIs) | | |
|--|-------------------------|-----------|---------|
| | Units | Threshold | Result |
| Head Injury Criteria (HIC ₃₆) | N/A | 1000 | 392 |
| Lower Spine (T12) Resultant Acceleration | G | 82 | 73.9 |
| Total Pelvic Force (sum of acetabular and iliac forces) | N | 5525 | 3,477.0 |
| Maximum Thoracic Rib Deflection | mm | 38* | 39.2 |
| Maximum Abdominal Rib Deflection | mm | 45* | 27.1 |

* Proposed IARV

Supplemental Restraint Information is given below:

| Restraint Type | Left Front (Driver) Occupant Location 1 | | Left Rear (Passenger) Occupant Location 4 | |
|--------------------------|--|----------|--|----------|
| | Mounted | Deployed | Mounted | Deployed |
| Frontal Airbag | Yes | No | | |
| Side Curtain Airbag | Yes | Yes | Yes | Yes |
| Side Torso/Pelvis Airbag | Yes | Yes | No | N/A |
| Side Pelvis Airbag | No | N/A | No | N/A |
| Knee Airbag | Yes | No | No | N/A |
| Seat Belt Pretensioner | Yes | Yes | No | N/A |
| Seat Belt Load Limiter | Yes | Unknown | No | N/A |
| Other | No | N/A | No | N/A |

GENERAL COMMENTS

All doors remained closed throughout the test. No fuel spillage occurred during the impact or the static rollover test which followed. Injury values for the Driver ATD (ES-2-re) were within the established performance thresholds. The Passenger ATD (SID-IIs) Upper Thorax Rib Deflection exceeded the threshold value.

SECTION 3
OCCUPANT AND VEHICLE INFORMATION

**DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
Test Program: SINCAP Side Impact

NHTSA No.: M20175106
Test Date: 11/16/16

TEST VEHICLE INFORMATION AND OPTIONS

| | |
|--------------------------|-------------------|
| NHTSA No. | M20175106 |
| Model Year | 2017 |
| Make | Toyota |
| Model | Corolla LE |
| Body Style | 4 Door |
| VIN | 2T1BURHEXHC750301 |
| Body Color | Slate Metallic |
| Odometer Reading (km/mi) | 9 |
| Engine Displacement (L) | 1.8 |
| Type/No. Cylinders | Inline/4 |
| Engine Placement | FRT/ Transverse |
| Transmission Type | Automatic CVT |
| Transmission Speeds | N/A |
| Overdrive | Yes |
| Final Drive | FWD |
| Roof Rack | No |
| Sunroof/T-Top | No |
| Running Boards | No |
| Tilt Steering Wheel | Yes |
| Power Seats | No |
| Anti-Lock Brakes (ABS) | Yes |

| | |
|-----------------------------------|-----|
| Traction Control System (TCS) | Yes |
| Auto-Leveling System | No |
| Automatic Door Locks (ADL) | Yes |
| Power Window Auto-Reverse | Yes |
| Other Optional Feature | No |
| Driver Front Airbag | Yes |
| Driver Curtain Airbag | Yes |
| Driver Head/Torso Airbag | No |
| Driver Torso Airbag | No |
| Driver Torso/Pelvis Airbag | Yes |
| Driver Pelvis Airbag | No |
| Driver Knee Airbag | Yes |
| Rear Pass. Curtain Airbag | Yes |
| Rear Pass. Head/Torso Airbag | No |
| Rear Pass. Torso Airbag | No |
| Rear Pass. Torso/Pelvis Airbag | No |
| Rear Passenger Pelvis Airbag | No |
| Driver Seat Belt Pretensioner | Yes |
| Rear Pass. Seat Belt Pretensioner | No |
| Driver Load Limiter | Yes |
| Rear Passenger Load Limiter | No |
| Other Safety Restraint | Yes |

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

DATA FROM CERTIFICATION LABEL

| | |
|---------------------|---|
| Manufactured By | Toyota Motor Manufacturing Canada, Inc. |
| Date of Manufacture | 09/16 |
| Vehicle Type | Passenger Car |

| | |
|-----------------|------|
| GVWR (lb) | 3820 |
| GAWR Front (lb) | 2070 |
| GAWR Rear (lb) | 1850 |

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

| Measured Parameter | Front | Rear | Third | Total |
|----------------------------------|-------|------|-------|-------|
| Designated Seating Capacity DSC) | 2 | 3 | N/A | 5 |
| Capacity Weight (VCW) (kg) | | | | 381 |
| DSC x 68.04 (kg) | | | | 340.2 |
| Cargo Weight (RCLW) (kg) | | | | 40.8 |

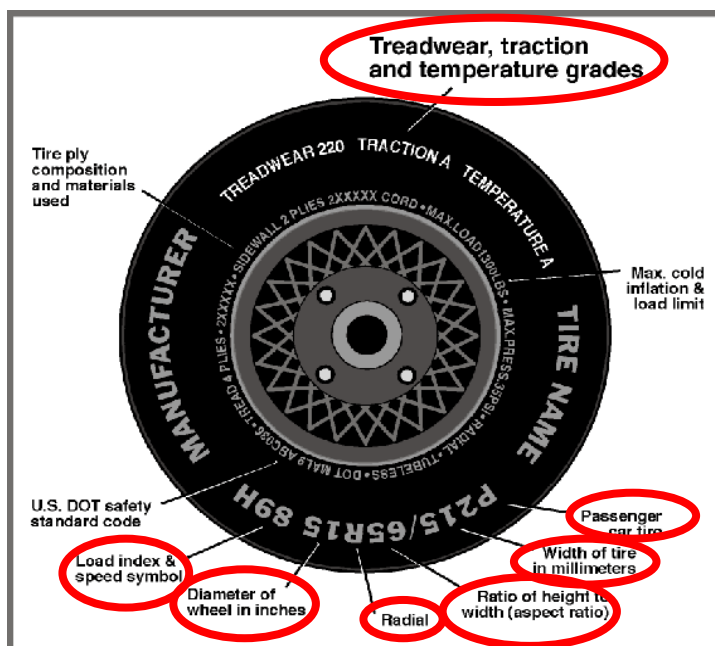
VEHICLE SEAT TYPE

| Seating Location | Type of Seat Pan | | | | Type of Seat Back | | |
|-------------------------|------------------|-------|-------------|-----------|-------------------|------------|---------|
| | Bucket | Bench | Split Bench | Contoured | Fixed | Adjustable | |
| | | | | | | w/ Lever | w/ Knob |
| Front Seat | Yes | N/A | N/A | | N/A | Yes | N/A |
| Rear or Second Row Seat | N/A | N/A | Yes | Yes | Yes | N/A | N/A |
| Third Row Seat | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

DATA SHEET NO. 1 (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: SINCAP Side Impact

NHTSA No.: M20175106
 Test Date: 11/16/16



DATA FROM TIRE PLACARD

| Measured Parameter | Front | Rear |
|-----------------------------|---------------------------|---------------------------|
| Maximum Tire Pressure (kPa) | 350 | 350 |
| Cold Pressure (kPa) | 220 | 220 |
| Recommended Tire Size | P205/55R16 | P205/55R16 |
| Tire Size on Vehicle | P205/55R16 | P205/55R16 |
| Tire Manufacturer | Michelin | Michelin |
| Tire Model | Primacy MXV4 | Primacy MXV4 |
| Treadwear | 620 | 620 |
| Traction | A | A |
| Temperature Grades | A | A |
| Tire Plies Sidewall | 1 | 1 |
| Tire Plies Body | 4 | 4 |
| Load Index/Speed Symbol | 89H | 89HM |
| Tire Material | Polyester/Polyamide/Steel | Polyester/Polyamide/Steel |
| DOT Safety Code Left | B3WC 02NX 3216 | B3WC 02NX 3216 |
| DOT Safety Code Right | B3WC 02NX 3216 | B3WC 02NX 3216 |

DATA SHEET NO. 1 (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: SINCAP Side Impact

NHTSA No.: M20175106
 Test Date: 11/16/16

TIRE PRESSURES

| | Units | LF | RF | LR | RR |
|----------------|-------|-----|-----|-----|-----|
| As Delivered | kPa | 234 | 241 | 262 | 255 |
| Tire Placard | kPa | 220 | 220 | 220 | 220 |
| Owner's Manual | kPa | N/A | N/A | N/A | N/A |
| As Tested | kPa | 220 | 220 | 220 | 220 |

MDB TIRE SPECIFICATIONS

| | Units | Requirement | LF | RF | LR | RR |
|---------------|-------|--------------|------------|------------|------------|------------|
| Tire Size | | P205/75R15 | P205/75R15 | P205/75R15 | P205/75R15 | P205/75R15 |
| Tire Pressure | kPa | 200 ± 21 kPa | 207 | 207 | 207 | 207 |

TEST VEHICLE AXLE WEIGHTS

| | Units | As Delivered (UVW) | | | As Tested (ATW) | | | Fully Loaded | | |
|--------|-------|--------------------|-----------|--------|-----------------|-----------|--------|--------------|-----------|--------|
| | | Front Axle | Rear Axle | Total | Front Axle | Rear Axle | Total | Front Axle | Rear Axle | Total |
| Left | kg | 404.6 | 267.8 | | 460.0 | 321.8 | | 451.8 | 335.4 | |
| Right | kg | 395.2 | 247.0 | | 403.0 | 289.6 | | 400.8 | 292.4 | |
| Ratio | % | 60.8 | 39.2 | | 58.5 | 41.5 | | 57.6 | 42.4 | |
| Totals | kg | 799.8 | 514.8 | 1314.6 | 863.0 | 611.4 | 1474.4 | 852.6 | 627.6 | 1480.4 |

TARGET TEST WEIGHT CALCULATION

| Measured Parameter | Units | Value | |
|--|-------|--------|---------|
| Total As Delivered Weight (UVW) | kg | 1314.6 | (A) |
| Actual Weight of 1 P572V ATD (SID-IIs) Dummy Used | kg | 125.0 | (B) |
| Rated Cargo/Luggage Weight (RCLW) | kg | 40.8 | (C) |
| Calculated Vehicle Target Weight (TVT _W) | kg | 1480.4 | (A+B+C) |

Does the measured As Tested Vehicle Weight lie within the required weight range (i.e. Calculated Test Vehicle Target Weight – 4.5 kg to 9 kg)? YES NO

TEST VEHICLE ATTITUDES AND CG

| Measurement Description | Units | Fully Loaded | As Tested | Meets Requirement |
|--|-------|--------------|-----------|-------------------|
| LF | mm | 700 | 699 | Yes |
| RF | mm | 710 | 708 | Yes |
| RR | mm | 717 | 718 | Yes |
| LR | mm | 703 | 705 | Yes |
| Vehicle CG (Aft of Front Axle) | mm | 1146 | 1120 | |
| Vehicle CG (Left(+)/Right(-) from Longitudinal Centerline) | mm | +49 | +46 | |

***The "As Tested" vehicle attitude measurements must be equal to or within ± 10 mm of the "Fully Loaded" vehicle attitude measurements at each wheel well. Indicate "Yes" or "No" for "Meets Requirement".

Test height adjustable suspension setting, if applicable:

N/A

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVT_W

| Component Description | Weight (kg) |
|---|-------------|
| Ballast: None | 0.0 |
| Removed: Right tail light, rear bumper fascia and trunk liner | 5.2 |

¹ Rated cargo and luggage weight limited to 41 kg or 90 lbs.

DATA SHEET NO. 2

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

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: SINCAP Side Impact

NHTSA No.: M20175106
 Test Date: 11/16/16

SEAT POSITIONING

The driver seat, front center seat (if applicable), and right front passenger's seat should be set to the mid-track, lowest, mid-angle position. The struck-side rear passenger's seat, rear center seat, and non-struck side rear passenger's seats should be set to the rear-most, lowest, mid-angle position.

SCRL ANGLE RANGE

| Seat | SCRL(°) | | |
|---------------------------|---------|-------|------|
| | Max. | Min. | Mid |
| Driver Seat | 16.0 | 19.4 | 17.7 |
| Front Passenger Seat | N/A | N/A | 15.7 |
| Front Center Seat* | N/A | N/A | N/A |
| Struck Side Rear Seat | N/A | Fixed | 17.9 |
| Non-Struck Side Rear Seat | N/A | Fixed | 17.1 |
| Rear Center Seat* | N/A | Fixed | 15.9 |

* If applicable.

SEAT HEIGHT AND ANGLE

| Seat | As Tested SCRL Angle (Mid) (°) | As Tested SCRP Height (mm) | SCRP Height Position | SCRP Height (mm) | | |
|---------------------------|--------------------------------|----------------------------|----------------------|------------------|--------------|--------------|
| | | | | Rearmost | Mid-Fore/Aft | Forward-Most |
| Driver Seat | 17.7 | 156 | Max | N/A | N/A | N/A |
| | | | Mid | 146 | 156 | 165 |
| | | | Min | N/A | N/A | N/A |
| Front Passenger Seat | 15.7 | 140 | Max | N/A | N/A | N/A |
| | | | Mid | 130 | 140 | 150 |
| | | | Min | N/A | N/A | N/A |
| Front Center Seat* | N/A | N/A | Max | N/A | N/A | N/A |
| | | | Mid | N/A | N/A | N/A |
| | | | Min | N/A | N/A | N/A |
| Struck Side Rear Seat | 17.9 | Fixed | Max | N/A | N/A | N/A |
| | | | Mid | N/A | N/A | N/A |
| | | | Min | N/A | N/A | N/A |
| Non-Struck Side Rear Seat | 17.1 | Fixed | Max | N/A | N/A | N/A |
| | | | Mid | N/A | N/A | N/A |
| | | | Min | N/A | N/A | N/A |
| Rear Center Seat* | 15.9 | Fixed | Max | N/A | N/A | N/A |
| | | | Mid | N/A | N/A | N/A |
| | | | Min | N/A | N/A | N/A |

* If applicable.

DATA SHEET NO. 2 (CONTINUED)

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

Test Vehicle: 2017 Toyota Corolla 4DR Sedan

NHTSA No.: M20175106

Test Program: SINCAP Side Impact

Test Date: 11/16/16

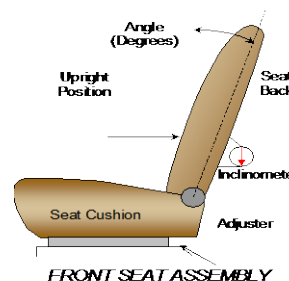
SEAT FORE/AFT POSITION

| Seat | Total Fore/Aft Travel | | Test Position from Forwardmost Position | |
|---------------------------|-----------------------|---------|---|--------|
| | mm | Detents | mm | Detent |
| Driver Seat | 240 | 25 | 120 | 12 |
| Front Passenger Seat | 240 | 25 | 120 | 12 |
| Front Center Seat* | N/A | N/A | N/A | N/A |
| Struck Side Rear Seat | Fixed | N/A | Fixed | N/A |
| Non-Struck Side Rear Seat | Fixed | N/A | Fixed | N/A |
| Rear Center Seat* | Fixed | N/A | Fixed | N/A |

* If applicable

SEAT BACK ANGLE ADJUSTMENT

The driver's seat back is positioned to the manufacturer's designated seat back angle. The front center and front passenger's seat backs are positioned in a similar manner as the driver's seat back. The struck side rear seat back is positioned such that the dummy's head is level. The rear center and non-struck side rear outboard seat backs are positioned in a similar manner as the struck-side rear seat back.



| Seat | Total Seat Back Angle Range | | Test Position from Most Upright | |
|---------------------------------------|-----------------------------|---------|---------------------------------|--------|
| | Degrees | Detents | Degrees | Detent |
| Driver Seat w/ Seated Dummy | 55.7 | 29 | 2.4 | 3 |
| Front Passenger Seat | 55.4 | 29 | 2.6 | 3 |
| Front Center Seat* | N/A | N/A | N/A | N/A |
| Struck Side Rear Seat w/ Seated Dummy | Fixed | N/A | Fixed | N/A |
| Non-Struck Side Rear Seat | Fixed | N/A | Fixed | N/A |
| Rear Center Seat* | Fixed | N/A | Fixed | N/A |

* If applicable

SEAT BELT ANCHORAGE ADJUSTMENT

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1.

| | Total # of Positions | Placed in Position # |
|-------------|-------------------------|----------------------|
| Driver Seat | 4, Numbered from 0 to 3 | 3, Uppermost |
| Rear Seat | 1, Fixed | 1, Fixed |

HEAD RESTRAINT ADJUSTMENT

The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

| | Total # of Positions | Placed in Position # |
|-------------|-------------------------|----------------------|
| Driver Seat | 3, Numbered from 0 to 2 | 2, Uppermost |
| Rear Seat | 3, Numbered from 0 to 2 | 2, Uppermost |

DATA SHEET NO. 2 (CONTINUED)

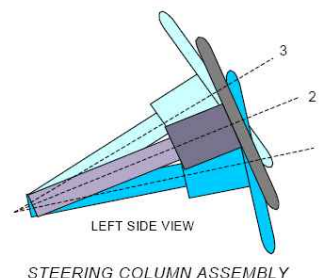
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: SINCAP Side Impact

NHTSA No.: M20175106
 Test Date: 11/16/16

STEERING COLUMN ADJUSTMENT

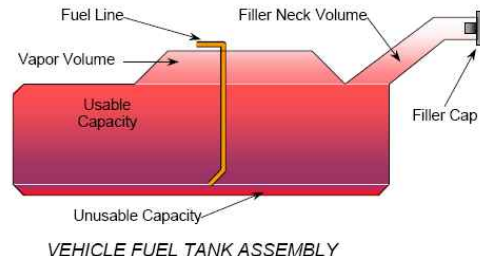
Steering wheel and column adjustments are made so that the steering wheel hub is at the center of its geometric locus it describes when it moves through its full range of motion.



| | Degrees | Fore/Aft Position (mm) |
|-----------------------------------|---------|------------------------|
| Lowermost, Position No. 1 | 20.8 | |
| Geometric Center, Position No. 2 | 22.5 | |
| Uppermost, Position No. 3 | 24.2 | |
| Telescoping Steering Wheel Travel | | 34 |
| Test Position | 22.5 | 17 |

FUEL PUMP

The electric fuel pump is activated when the ignition is turned on.



FUEL TANK CAPACITY

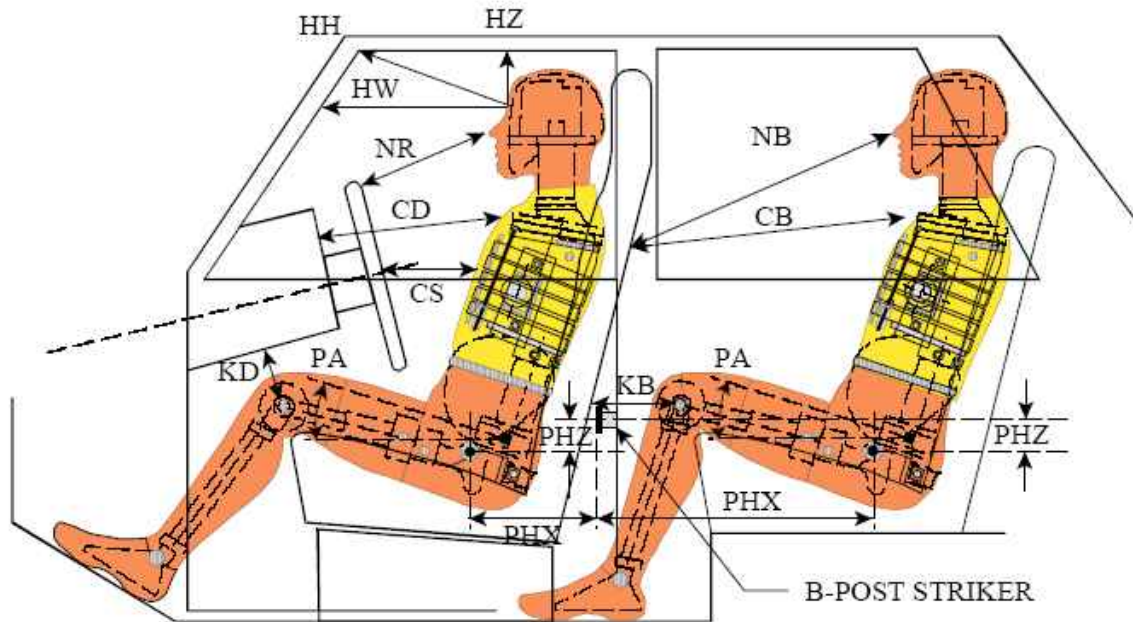
| | Liters |
|---|--------|
| Usable Capacity of "Standard Tank" (see Form No. 1) | 48.8 |
| Usable Capacity of "Optional Tank" (see Form No. 1) | N/A |
| Usable Capacity of Standard Tank (see Owner's Manual) | 50.0 |
| Usable Capacity of Optional Tank (see Owner's Manual) | N/A |
| 93% of Usable Capacity | 45.4 |
| Actual Amount of Solvent Used in Test | 45.4 |
| 1/3 of Usable Capacity | 16.3 |

Is the Actual Amount of Solvent Used in the test equal to 93% ± 1% of the Usable Capacity stated in on Form No. 1? YES NO

**DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
Test Program: SINCAP Side Impact

NHTSA No.: M20175106
Test Date: 11/16/16



LEFT SIDE VIEW

NOTE: 2-DOOR VEHICLE SHOWN.
REAR DUMMY PHX & PHZ
MEASUREMENTS FOR A 4-DOOR
VEHICLE WOULD USE THE C-POST
STRIKER AS A REFERENCE POINT

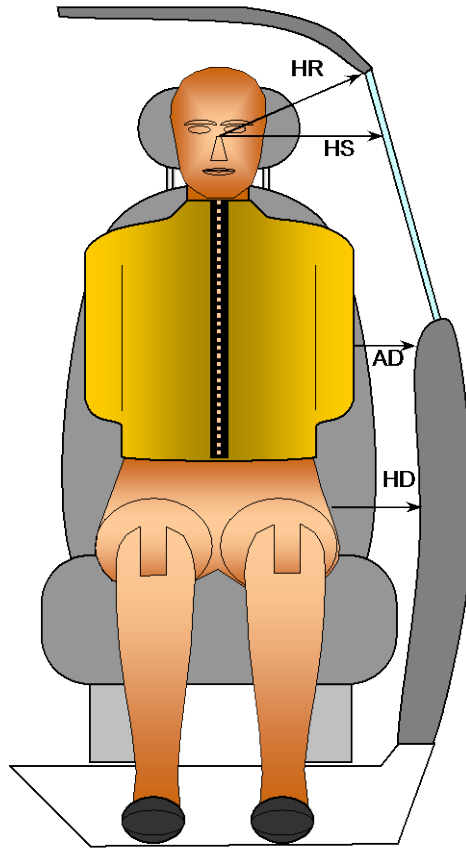
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

| Driver Code | Pass. Code | Measurement Description | Driver | | Passenger | |
|---------------------------|---------------------------|-------------------------------|-------------|-------|-------------|-------|
| | | | Length (mm) | Angle | Length (mm) | Angle |
| HH | | Header to Header | 344 | | | |
| HW | | Header to Windshield | 602 | | | |
| HZ | HZ | Head to Roof Liner | 153 | | 237 | |
| NR | NB | Nose to Rim/Seat Back | 415 | | 673 | |
| CD | CB | Chest to Dash/Seat Back | 518 | | 626 | |
| CS | | Chest to Steering Wheel | 292 | | | |
| KD(L)/KDA(L) [°] | KB(L)/KBA(L) [°] | Left Knee to Dash/Seat Back | 120 | 23.7 | 335 | 0.0 |
| KD(R)/KDA(R) [°] | KB(R)/KBA(R) [°] | Right Knee to Dash/Seat Back | 117 | 25.0 | 337 | 0.0 |
| PAX [°] | PAX [°] | Pelvic Tilt Angle X | | 0.1 | | 0.0 |
| | PAY [°] | Pelvic Tilt Angle Y | | | | 21.7 |
| PHX | PHX | Hip Point to Striker (X-Axis) | 219 | | 333 | |
| PHZ | PHZ | Hip Point to Striker (Z-Axis) | 203 | | 342 | |

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: SINCAP Side Impact

NHTSA No.: M20175106
 Test Date: 11/16/16



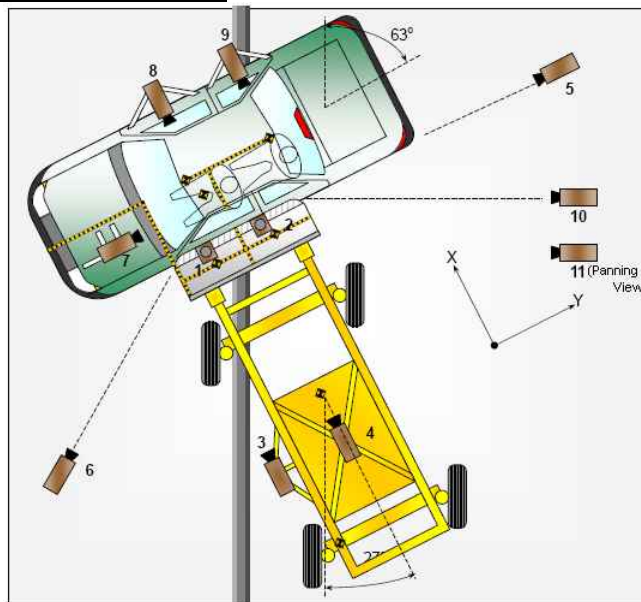
FRONT VIEW OF DUMMY

| Code | Description | Units | Driver | Passenger |
|------|---------------------|-------|--------|-----------|
| HR | Head to Side Header | mm | 117 | 231 |
| HS | Head to Side Window | mm | 200 | 349 |
| AD | Arm to Door | mm | 80 | 152 |
| HD | H-Point to Door | mm | 164 | 167 |

**DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA**

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
Test Program: SINCAP Side Impact

NHTSA No.: M20175106
Test Date: 11/16/16



CAMERA LOCATIONS AND DATA

| No. | Camera View | Coordinates (mm) | | | Lens Length (mm) | Operating Frame Rate (fps) |
|-----|-------------------------|------------------|------|------|------------------|----------------------------|
| | | X | Y | Z | | |
| 1 | Overhead Overall | -160 | 1150 | 5692 | 8.5 | 1000 |
| 2 | Overhead Close-up | 0 | 770 | 5692 | 16 | 1000 |
| 3 | Left Impact Point (MDB) | 1811 | 890 | 860 | 25 | 1000 |
| 4 | Side Overall (MDB) | 2625 | 0 | 1500 | 12.5 | 1000 |
| 5 | Rear | 0 | 5646 | 1080 | 20 | 1000 |
| 6 | Left Front | 2438 | 4339 | 1070 | 20 | 1000 |
| 7 | Driver Front (OB) | | | | 25 | 1000 |
| 8 | Driver Side (OB) | | | | 12.5 | 1000 |
| 9 | Passenger Side (OB) | | | | 12.5 | 1000 |
| 10 | Real-time Left Rear | | | | Zoom | 30 |
| 11 | Real-time Inrun | | | | Zoom | 30 |

Reference: Impact Point projected to Ground; +X = To Front of MDB +Y = To Right of MDB; +Z = Down

*All measurements accurate to ± 6 mm.

If applicable, explain why camera(s) did not operate as intended: N/A

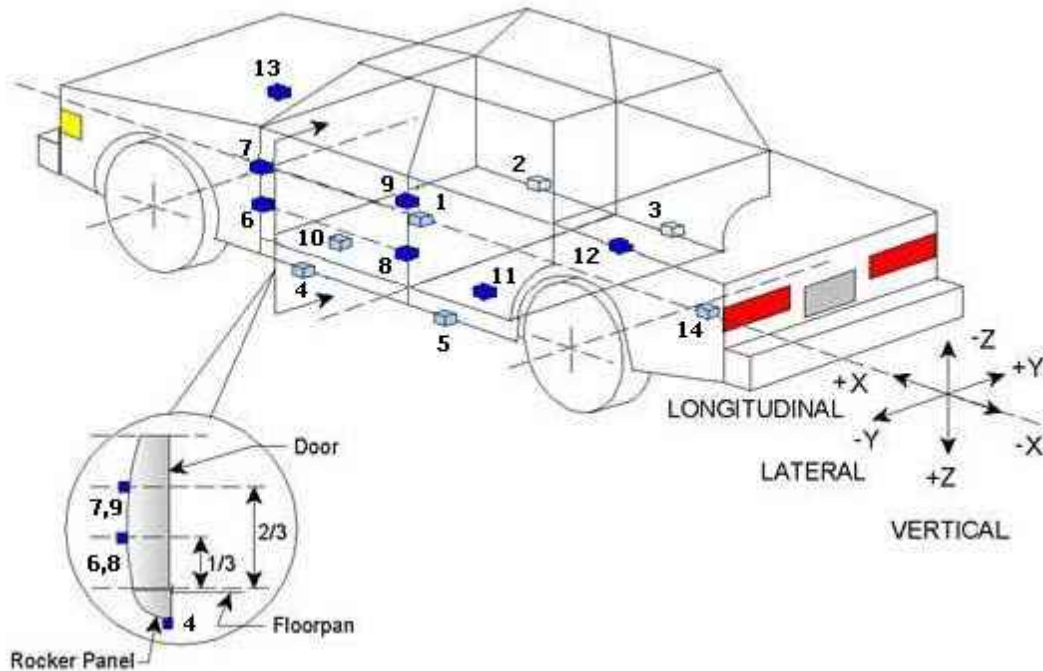
INSTRUMENTATION

| | |
|----------------------------------|-----------|
| Driver Dummy Channels | 16 |
| Passenger Dummy Channels | 16 |
| Vehicle Structure Accelerometers | 23 |
| MBD Accelerometers | 5 |
| TOTAL | 60 |

**DATA SHEET NO. 6
TEST VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
Test Program: SINCAP Side Impact

NHTSA No.: M20175106
Test Date: 11/16/16



TEST VEHICLE ACCELEROMETER LOCATIONS

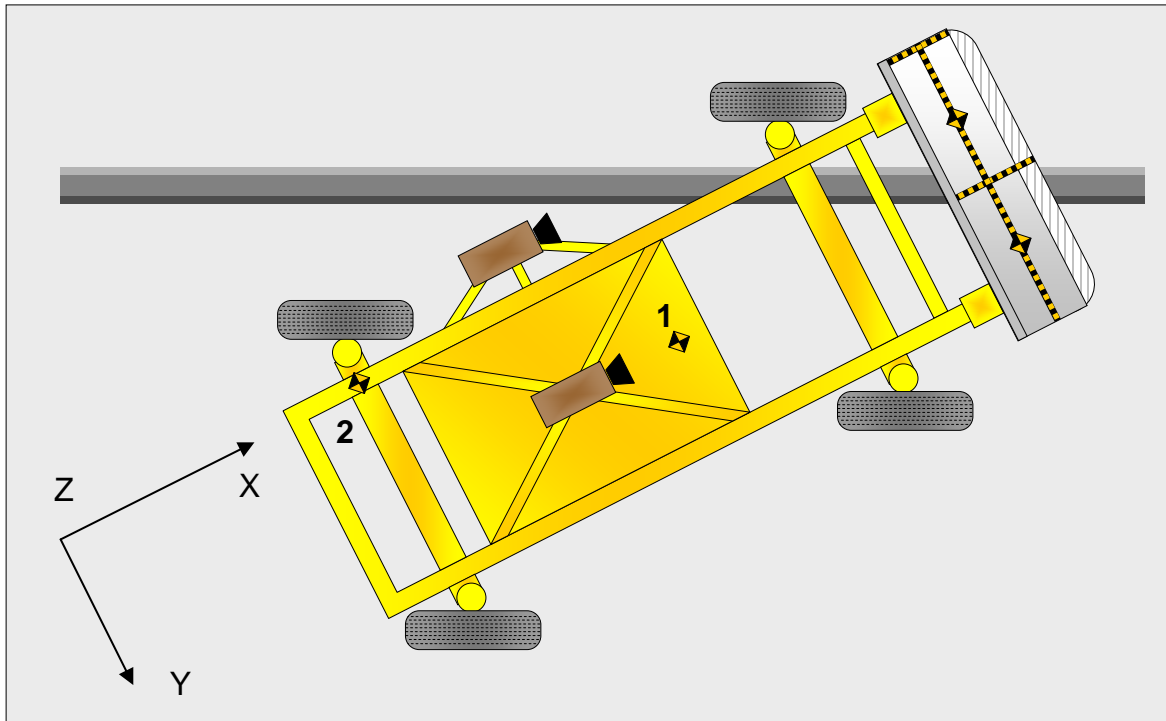
| Loc. No. | Accelerometer Location | Coordinates (mm) | | |
|----------|-----------------------------|------------------|------|------|
| | | X | Y | Z |
| 1 | Vehicle CG | 2842 | 11 | -812 |
| 2 | Right Sill at Front Seat | 2820 | 705 | -306 |
| 3 | Right Sill at Rear Seat | 1955 | 705 | -312 |
| 4 | Left Sill at Front Door | 2758 | -700 | -305 |
| 5 | Left Sill at Rear Door | 1935 | -705 | -320 |
| 6 | A-Post Lower | 3220 | -815 | -485 |
| 7 | A-Post Middle | 3245 | -815 | -802 |
| 8 | B-Post Lower | 2142 | -805 | -520 |
| 9 | B-Post Middle | 2105 | -795 | -880 |
| 10 | Front Seat Track | 2390 | -540 | -310 |
| 11 | Rear Seat Structure | 1498 | -595 | -350 |
| 12 | Right Rear Occ. Compartment | 1700 | 710 | -316 |
| 13 | Engine Block | 3880 | 25 | -297 |
| 14 | Rear Above Axle | 1080 | 0 | -482 |

Reference: X - Rear surface of vehicle (+ forward)
Y - Vehicle Centerline (+ to right)
Z - Ground Plane (+ down)

**DATA SHEET NO. 7
MDB ACCELEROMETER LOCATIONS**

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: SINCAP Side Impact

NHTSA No.: M20175106
 Test Date: 11/16/16



MDB ACCELEROMETER LOCATIONS

| Loc. No. | Accelerometer Location | Coordinates (mm) | | |
|----------|------------------------|------------------|------|------|
| | | X | Y | Z |
| 1 | MDB CG | -2179 | 0 | -505 |
| 2 | MDB Rear | -3648 | -650 | -618 |

Reference : X - Face of MDB (+ forward)
 Y - MDB Centerline (+ to right)
 Z - Ground Plane (+ down)

**DATA SHEET NO. 8
POST-TEST OBSERVATIONS**

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: SINCAP Side Impact

NHTSA No.: M20175106
 Test Date: 11/16/16

TEST DUMMY INFORMATION AND CONTACT POINTS

| Dummy Body Part | Front Seat Dummy (ES2-re) | Rear Seat Dummy (SID-IIs) |
|-------------------|----------------------------------|----------------------------------|
| Face | SCAB | SCAB |
| Top of Head | Assist handle, Head liner | SCAB, Head liner |
| Left Side of Head | SCAB | SCAB |
| Back of Head | None | SCAB |
| Left Shoulder | SCAB, SAB, Door panel | SCAB |
| Upper Torso | Seat back bolster, SAB | None |
| Lower Torso | Seat back bolster | Door panel |
| Left Hip | Seat cushion bolster, Door panel | Seat cushion bolster, Door panel |
| Left Knee | Door panel | Door panel |

POST-TEST DOOR PERFORMANCE

| Description | Struck Side | | Non-Struck Side | | Trunk Lid |
|--|-------------|------|-----------------|------|-----------|
| | Front | Rear | Front | Rear | |
| Remained Closed and Operational | No | No | Yes | Yes | Yes |
| Total Separation from Vehicle at Hinges or Latches | No | No | No | No | No |
| Latch or Hinge Systems Pulled Out of Their Anchorages | No | No | No | No | No |
| Disengaged from Latched Position | No | No | No | No | No |
| Latch Separated from Striker | No | No | No | No | No |
| Jammed Shut | Yes | Yes | No | No | No |
| If Door Opened at Striker, Record Width of Opening at Striker (mm) | N/A | N/A | N/A | N/A | N/A |

POST-TEST SEAT PERFORMANCE

| Description | Struck Side | | Non-Struck Side | |
|--|-------------|------|-----------------|------|
| | Front | Rear | Front | Rear |
| Seat Movement Along Seat Track | No | N/A | No | N/A |
| Seat Disengagement from Floor pan | No | N/A | No | N/A |
| Seat Back Movement from Initial Position | No | No | No | No |
| Seat Back Collapse | No | No | No | No |

POST-TEST STRUCTURAL OBSERVATIONS

| Critical Areas of Performance | Observations and Conclusions |
|-------------------------------|---------------------------------------|
| Pillar Performance | Good |
| Sill Separation | None |
| Windshield Damage | None |
| Side Window Damage | Driver and passenger window shattered |
| Other Notable Effects | None |

**DATA SHEET NO. 8 (CONTINUED)
POST TEST OBSERVATIONS**

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
Test Program: SINCAP Side Impact

NHTSA No.: M20175106
Test Date: 11/16/16

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

| Restraint Type | Struck Side Driver | | Struck Side Rear Passenger | |
|--------------------------|--------------------|----------|----------------------------|----------|
| | Mounted | Deployed | Mounted | Deployed |
| Frontal Airbag | Yes | No | | |
| Knee Airbag | Yes | No | | |
| Side Curtain Airbag | Yes | Yes | Yes | Yes |
| Side Torso/Pelvis Airbag | Yes | Yes | No | N/A |
| Side Pelvis Airbag | No | N/A | No | N/A |
| Seat Belt Pretensioner | Yes | Yes | No | N/A |
| Seat Belt Load Limiter | Yes | Unknown | No | N/A |
| Other | No | N/A | No | N/A |

IMPACT POINT LOCATION DATA

| Measured Parameter | Units | Tolerance | Value |
|--|-------|---------------------------------|-------|
| Vehicle Wheel Base | mm | | 2703 |
| Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point) | mm | | 412 |
| Actual Impact Point (Aft of Front Axle) | mm | | 418 |
| Horizontal Offset (+ forward / - rearward) | mm | +/- 50 of Intended Impact point | -6 |
| Vertical Offset (+ down / - up) | mm | +/- 20 of Intended Impact point | -5 |

**DATA SHEET NO. 9
MDB SUMMARY OF RESULTS**

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: SINCAP Side Impact

NHTSA No.: M20175106
 Test Date: 11/16/16

MDB SPECIFICATIONS

| Measurement Description | Length (mm) |
|---|-------------|
| Overall Width of Framework Carriage | 1252 |
| Overall Length Including Honeycomb Face | 4115 |
| Wheel Base of Framework Carriage | 2591 |
| C.G. Location aft of Front Axle | 1109 |

MDB WEIGHTS

| | Units | Front Axle | Rear Axle | Total |
|--------|-------|------------|-----------|--------|
| Left | kg | 420.0 | 256.4 | 676.4 |
| Right | kg | 359.6 | 327.0 | 686.6 |
| Ratio | % | 57.2 | 42.8 | 100.0 |
| Totals | kg | 779.6 | 583.4 | 1363.0 |

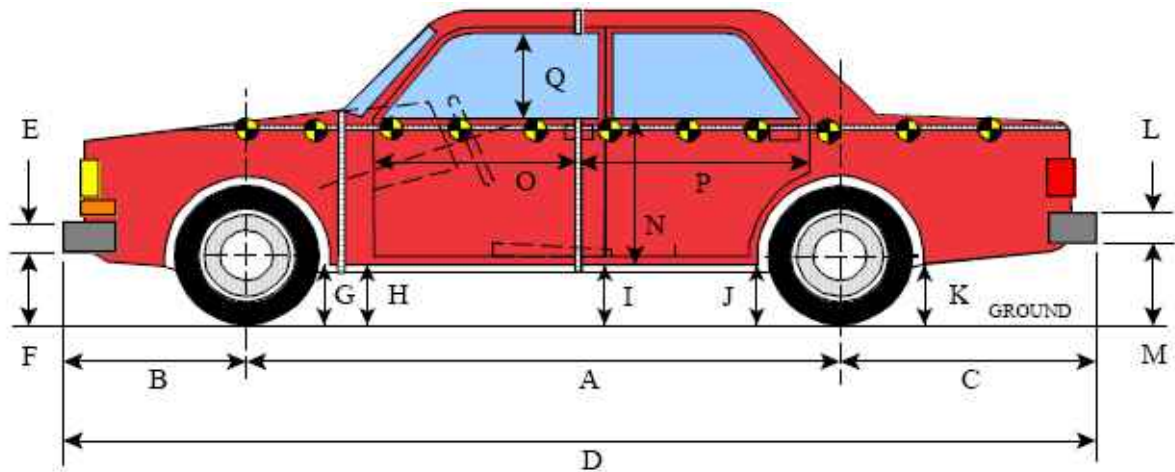
SPEED AND IMPACT ANGLE DATA

| Measured Parameter | Units | Requirement | Value |
|---|---------|--------------|-------|
| Trap No. 1 Velocity (Primary) | km/h | 61.1 to 62.7 | 62.55 |
| Trap No. 2 Velocity (Redundant) | km/h | 61.1 to 62.7 | 62.56 |
| MDB CL to Target Vehicle CL | degrees | 88.5 to 91.5 | 90 |
| MDB Forward Line of Motion to Target Vehicle CL | degrees | 62.5 to 63.5 | 63 |
| MDB Crabbed Angle to MDB Forward Line of Motion | degrees | 26 to 28 | 27 |

**DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
Test Program: SINCAP Side Impact

NHTSA No.: M20175106
Test Date: 11/16/16



LEFT SIDE VIEW

All MEASUREMENTS IN (mm) WITH TOLERANCE OF ± 3 mm

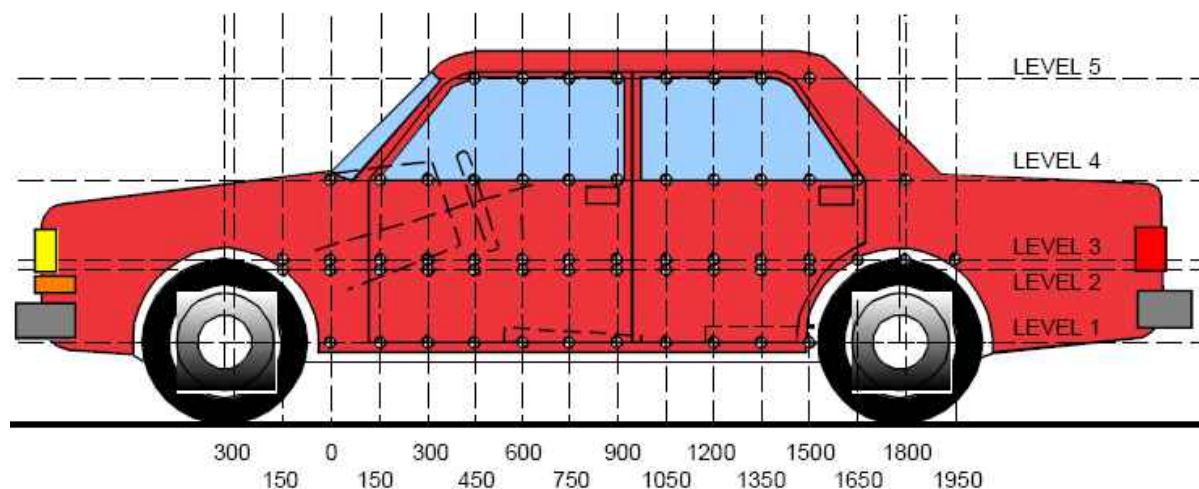
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

| Code | Measurement Description | Pre-Test | Post-Test | Difference |
|------|--|----------|-----------|------------|
| A | Wheelbase | 2703 | 2703 | 0 |
| B | Front Axle to Front Surface of Vehicle | 980 | 950 | 30 |
| C | Rear Axle to Rear Surface of Vehicle | 970 | 1002 | -32 |
| D | Total Length at Centerline | 4650 | 4655 | -5 |
| E | Front Bumper Thickness | 102 | 102 | 0 |
| F | Front Bumper Bottom to Ground | 418 | 408 | 10 |
| G | Sill Height at Front Wheel Well | 203 | 240 | -37 |
| H | Sill Height at Front Door Leading Edge | 201 | 240 | -39 |
| I | Sill Height at B-Pillar | 238 | 240 | -2 |
| J1 | Sill Height at Rear Wheel Well | 218 | 246 | -28 |
| J2 | Pinch Weld Height at Rear Wheel Well | 156 | 189 | -33 |
| K | Sill Height Aft of Rear Wheel Well | 260 | 310 | -50 |
| L | Rear Bumper Thickness | 165 | 165 | 0 |
| M | Rear Bumper Bottom to Ground | 423 | 472 | -49 |
| N | Sill Height to Window Bottom Sill | 715 | 460 | 255 |
| O | Front Door Leading Edge to Impact CL | 831 | 697 | 134 |
| P | Rear Door Trailing Edge to Impact CL | 1401 | 1110 | 291 |
| Q | Front Window Opening | 418 | 380 | 38 |
| R | Right Side Length | 4521 | 4540 | -19 |
| S | Left Side Length | 4520 | 4555 | -35 |
| T | Vehicle Width | 1768 | 1765 | 3 |

DATA SHEET NO. 11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: SINCAP Side Impact

NHTSA No.: M20175106
 Test Date: 11/16/16



LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

| Level | Measurement Description | Height Above Ground | Maximum Exterior Static Crush | Distance From Impact |
|-------|-------------------------|---------------------|-------------------------------|----------------------|
| 1 | Sill Top | 265 | 31 | 1050 |
| 2 | Driver Hip Point | 538 | 205 | 600 |
| 3 | Mid-Door | 610 | 189 | 600-750 |
| 4 | Window Sill | 905 | 160 | 1650 |
| 5 | Window Top | 1395 | 9 | 1350-1500 |

NOTE: The above measurements were taken along the vertical impact reference line.
 Vehicle measurements forward of the vertical impact reference line are negative.

DATA SHEET NO. 11 (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: SINCAP Side Impact

NHTSA No.: M20175106
 Test Date: 11/16/16

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

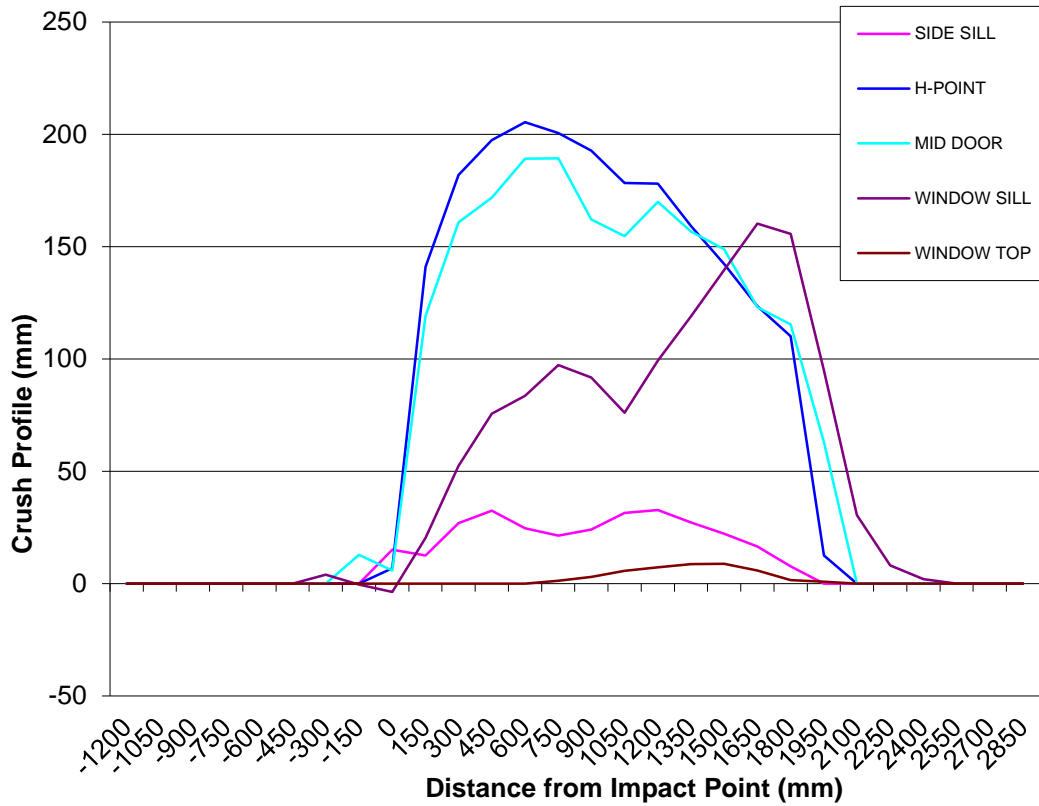
| | Pre-Test | | | | | Post-Test | | | | | Difference | | | | |
|------|----------|-----|-----|-----|-----|-----------|-----|-----|-----|-----|------------|-----|-----|-----|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| -900 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| -750 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| -600 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| -450 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| -300 | 0 | 0 | 0 | 776 | 0 | 0 | 0 | 0 | 772 | 0 | 0 | 0 | 0 | 4 | 0 |
| -150 | 0 | 0 | 876 | 781 | 0 | 0 | 0 | 863 | 782 | 0 | 0 | 0 | 13 | -1 | 0 |
| 0 | 838 | 872 | 870 | 783 | 0 | 823 | 865 | 864 | 787 | 0 | 15 | 7 | 6 | -4 | 0 |
| 150 | 832 | 869 | 870 | 794 | 0 | 820 | 728 | 750 | 774 | 0 | 12 | 141 | 120 | 20 | 0 |
| 300 | 834 | 870 | 871 | 802 | 0 | 807 | 688 | 710 | 750 | 0 | 27 | 182 | 161 | 52 | 0 |
| 450 | 836 | 870 | 872 | 810 | 0 | 803 | 673 | 701 | 734 | 0 | 33 | 197 | 171 | 76 | 0 |
| 600 | 836 | 870 | 873 | 817 | 0 | 811 | 665 | 684 | 734 | 0 | 25 | 205 | 189 | 83 | 0 |
| 750 | 834 | 870 | 873 | 824 | 534 | 812 | 669 | 684 | 726 | 533 | 22 | 201 | 189 | 98 | 1 |
| 900 | 833 | 869 | 872 | 830 | 556 | 809 | 676 | 710 | 739 | 553 | 24 | 193 | 162 | 91 | 3 |
| 1050 | 832 | 867 | 871 | 835 | 563 | 801 | 688 | 716 | 758 | 558 | 31 | 179 | 155 | 77 | 5 |
| 1200 | 834 | 865 | 870 | 838 | 567 | 802 | 687 | 700 | 739 | 559 | 32 | 178 | 170 | 99 | 8 |
| 1350 | 836 | 862 | 867 | 841 | 567 | 808 | 703 | 710 | 722 | 558 | 28 | 159 | 157 | 119 | 9 |
| 1500 | 836 | 860 | 864 | 842 | 566 | 814 | 718 | 715 | 703 | 557 | 22 | 142 | 149 | 139 | 9 |
| 1650 | 835 | 860 | 861 | 840 | 565 | 819 | 736 | 737 | 680 | 559 | 16 | 124 | 124 | 160 | 6 |
| 1800 | 833 | 865 | 863 | 837 | 556 | 825 | 755 | 748 | 681 | 555 | 8 | 110 | 115 | 156 | 1 |
| 1950 | 0 | 872 | 873 | 824 | 535 | 0 | 859 | 811 | 730 | 534 | 0 | 13 | 62 | 94 | 1 |
| 2100 | 0 | 0 | 0 | 822 | 0 | 0 | 0 | 0 | 792 | 0 | 0 | 0 | 0 | 30 | 0 |
| 2250 | 0 | 0 | 0 | 822 | 0 | 0 | 0 | 0 | 814 | 0 | 0 | 0 | 0 | 8 | 0 |
| 2400 | 0 | 0 | 0 | 811 | 0 | 0 | 0 | 0 | 809 | 0 | 0 | 0 | 0 | 2 | 0 |
| 2550 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2700 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2850 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

NOTE: Pre-test measurements are taken when the vehicle is in the "As Tested" weight condition. Vehicle measurements forward of the vertical impact reference line are negative. The crush profile grid is established prior to the test based on an estimated impact point.

DATA SHEET NO. 11 (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
Test Program: SINCAP Side Impact

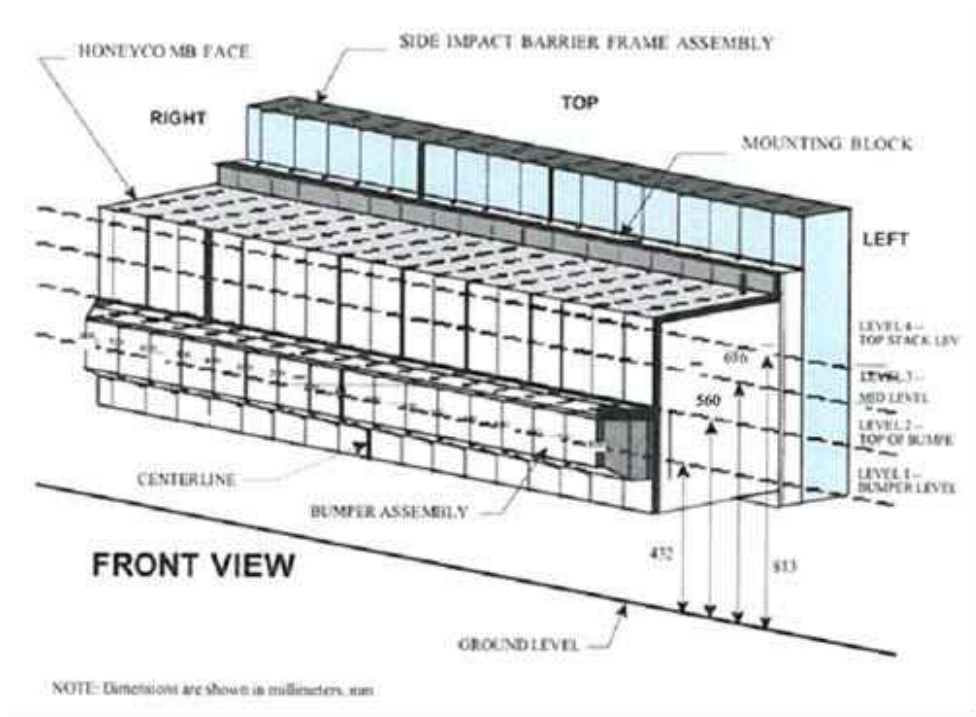
NHTSA No.: M20175106
Test Date: 11/16/16



**DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS**

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
Test Program: SINCAP Side Impact

NHTSA No.: M20175106
Test Date: 11/16/16



MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

| Row | Vertical Location | | From Centerline | | Maximum Crush |
|-----|-------------------|--------|-----------------|------------|---------------|
| | Description | Height | Distance | Direction | |
| A | Center of Bumper | 432 | 800 | Right | 236 |
| B | Top of Bumper | 560 | 300-300 | Right-Left | 373 |
| C | Mid-Level | 686 | 800 | Left | 88 |
| D | Top of Stack | 813 | 100 | Right | 108 |

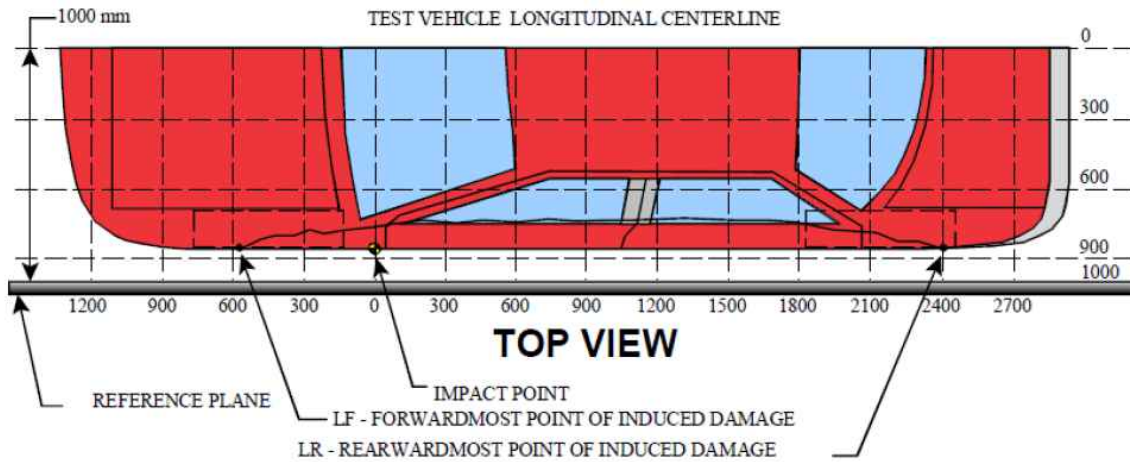
DEFORMABLE BARRIER STATIC CRUSH

| Stack Level | Distance Right of Center | | | | | | | | C/L | Distance Left of Center | | | | | | | |
|-------------|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-------------------------|-----|-----|-----|-----|-----|-----|-----|
| | 800 | 700 | 600 | 500 | 400 | 300 | 200 | 100 | | 0 | 100 | 200 | 300 | 400 | 500 | 600 | 700 |
| 1 | 236 | 236 | 227 | 212 | 199 | 195 | 191 | 182 | 175 | 165 | 158 | 151 | 145 | 140 | 136 | 138 | 149 |
| 2 | 147 | 141 | 132 | 126 | 122 | 373 | 373 | 373 | 373 | 373 | 373 | 373 | 79 | 74 | 71 | 72 | 94 |
| 3 | 66 | 60 | 55 | 53 | 50 | 49 | 56 | 87 | 73 | 45 | 32 | 26 | 29 | 33 | 42 | 57 | 88 |
| 4 | 30 | 14 | 17 | 26 | 39 | 53 | 91 | 108 | 93 | 81 | 58 | 34 | 43 | 48 | 54 | 71 | 99 |

DATA SHEET NO. 13
VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle: 2017 Toyota Corolla 4DR Sedan
 Test Program: SINCAP Side Impact

NHTSA No.: M20175106
 Test Date: 11/16/16



MEASUREMENT CONVENTIONS:
 Forward of the impact point (towards front of vehicle) is considered negative (-).
 Rearward of the impact point (toward rearend of vehicle) is considered positive (+).

VEHICLE DAMAGE PROFILE DISTANCES¹

| DPD | Distance From Impact Point (mm) | Level | Post-Test (mm) | Pre-Test (mm) | Crush (mm) |
|-----|---------------------------------|-------|----------------|---------------|------------|
| 1 | 2400 | 4 | 811 | 809 | 2 |
| 2 | 1800 | 4 | 837 | 681 | 156 |
| 3 | 1350 | 2 | 862 | 703 | 159 |
| 4 | 750 | 2 | 870 | 669 | 201 |
| 5 | 150 | 2 | 869 | 728 | 141 |
| 6 | -300 | 4 | 776 | 772 | 4 |

MDB DAMAGE PROFILE DISTANCES

| DPD | Distance From Center of MDB | Level | Post-Test (mm) | Pre-Test (mm) | Crush (mm) |
|-----|-----------------------------|-------|----------------|---------------|------------|
| 1 | 800 mm Left of Center | 1 | 327 | 475 | 149 |
| 2 | 500 mm Left of Center | 1 | 346 | 486 | 140 |
| 3 | 200 mm Left of Center | 2 | 11 | 384 | 373 |
| 4 | 200 mm Right of Center | 2 | 11 | 384 | 373 |
| 5 | 500 mm Right of Center | 1 | 274 | 486 | 212 |
| 6 | 800 mm Right of Center | 1 | 236 | 472 | 236 |

**DATA SHEET NO. 14
FMVSS NO. 301 STATIC ROLLOVER RESULTS**

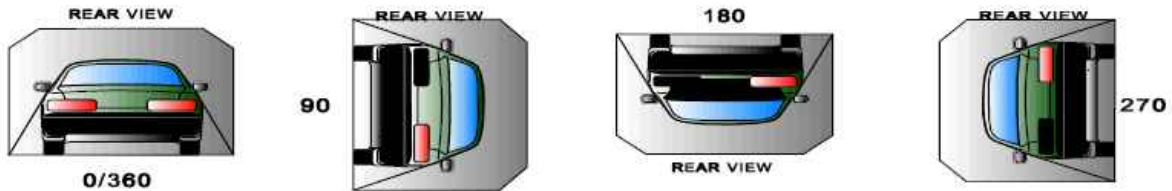
Test Vehicle: 2017 Toyota Corolla 4DR Sedan
Test Program: SINCAP Side Impact

NHTSA No.: M20175106
Test Date: 11/16/16

Test Time: 13:41 **Temperature:** 21.3°C

- A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable is 1 ounce)
- B. For the 5 minute period after motion ceases: 0 oz.
(Maximum allowable is 5 ounces)
- C. For the following 25 minutes: 0 oz.
(Maximum allowable is 1 ounce/minute)
- D. Spillage Details: None

FMVSS 301 STATIC ROLLOVER DATA



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

| Test Phase | Rotation Time | Hold Time | Total Time |
|------------|---------------|-----------|------------|
| 0 to 90 | 90 | 330 | 420 |
| 90 to 180 | 90 | 330 | 840 |
| 180 to 270 | 90 | 330 | 1260 |
| 270 to 360 | 90 | 330 | 1680 |

FMVSS NO. 301 ROLLOVER SPILLAGE TABLE

| Test Phase | First 5 Minutes | Sixth Minute | Seventh Minute | Eighth Minute |
|------------|-----------------|--------------|----------------|---------------|
| 0 to 90 | 0 | 0 | 0 | N/A |
| 90 to 180 | 0 | 0 | 0 | N/A |
| 180 to 270 | 0 | 0 | 0 | N/A |
| 270 to 360 | 0 | 0 | 0 | N/A |

ROLLOVER 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. 15

DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA

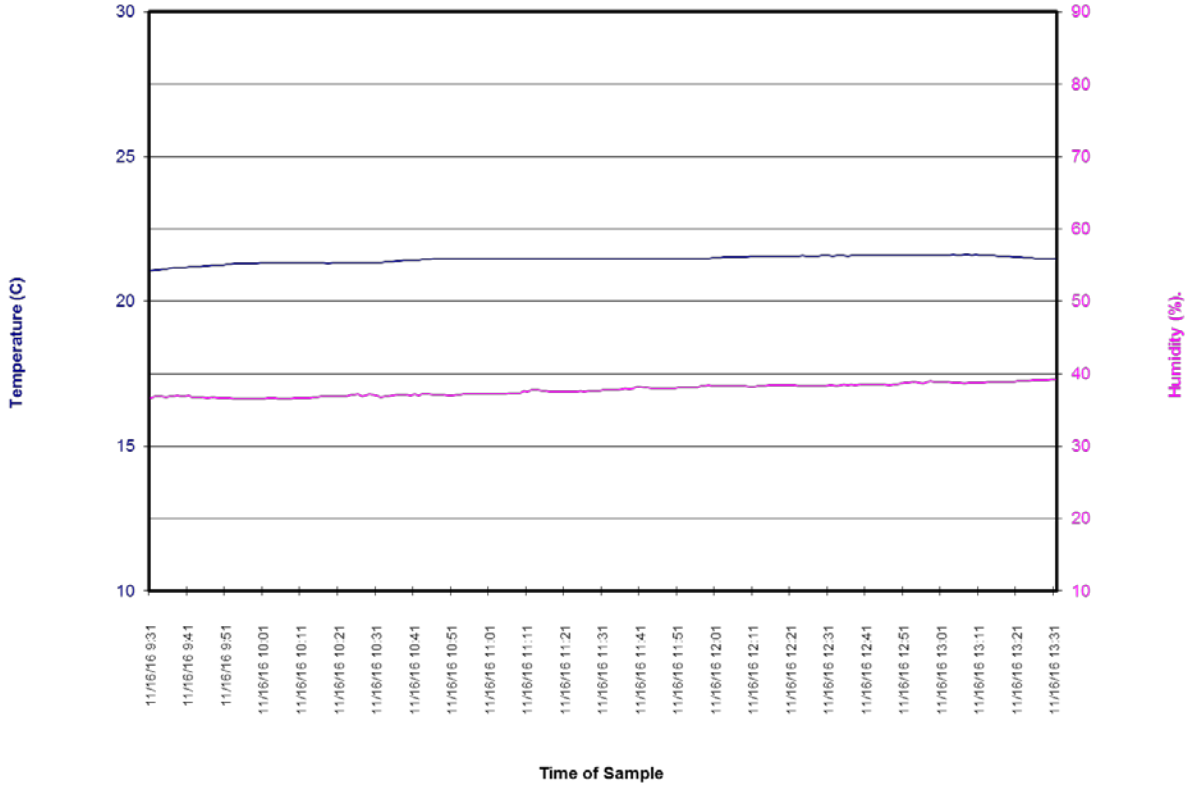
Test Vehicle: 2017 Toyota Corolla 4DR Sedan

NHTSA No.: M20175106

Test Program: SINCAP Side Impact

Test Date: 11/16/16

M201751062017 Toyota Corolla 4DR Sedan Left MDB Impact 161116: Test Time 13:41



**APPENDIX A
PHOTOGRAPHS**

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| 002 | As-Delivered Left Rear $\frac{3}{4}$ View of Test Vehicle | A-6 |
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| 004 | Post-Test Frontal View of Test Vehicle | A-7 |
| 005 | Pre-Test Left Front $\frac{3}{4}$ View of Test Vehicle | A-8 |
| 006 | Post-Test Left Front $\frac{3}{4}$ View of Test Vehicle | A-8 |
| 007 | Pre-Test Left Side View of Test Vehicle | A-9 |
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| 041 | Pre-Test Close-Up View of Driver Seat Back or Head Restraint | A-27 |
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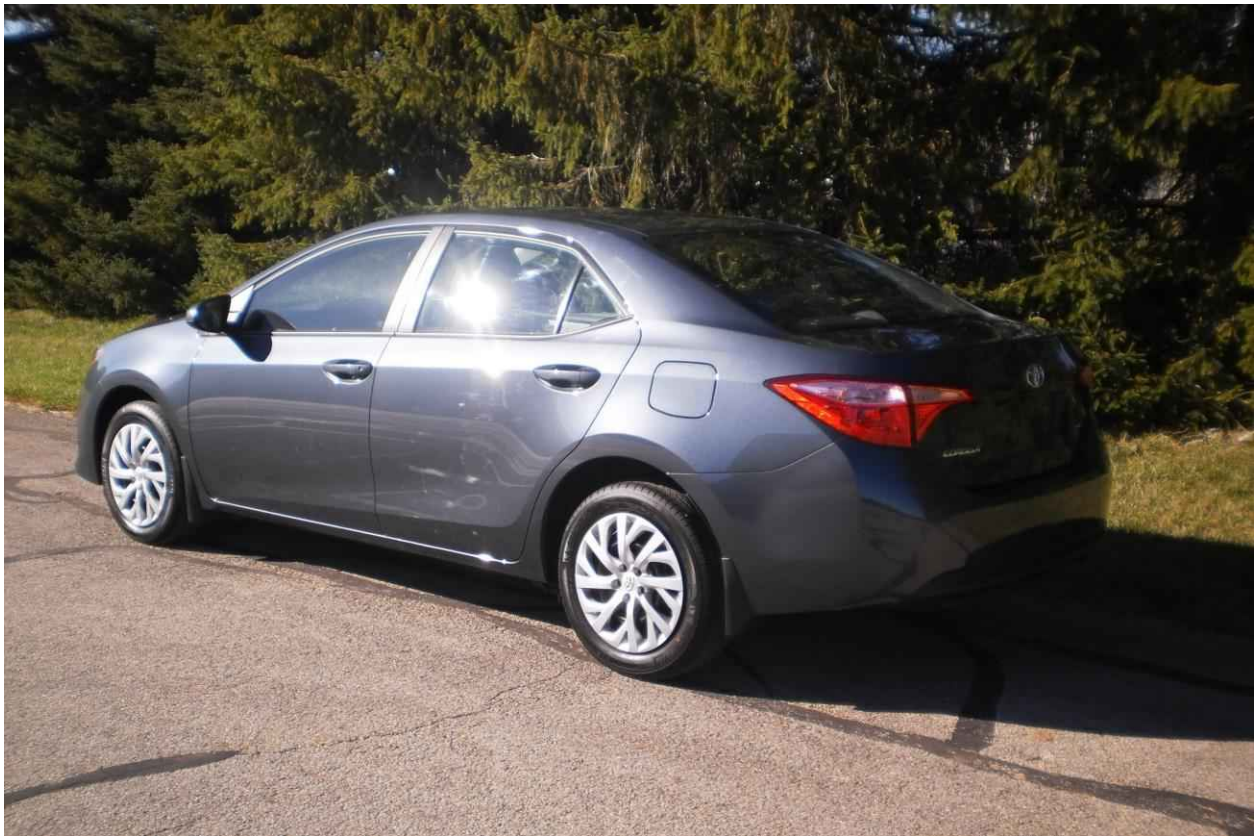
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| 080 | Post-Test Rear Passenger Dummy Close-Up Pelvis Contact with Side Airbag View | A-47 |
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| 103 | Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual | A-60 |
| 104 | Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual | A-60 |



001 As-Delivered Right Front $\frac{3}{4}$ View of Test Vehicle



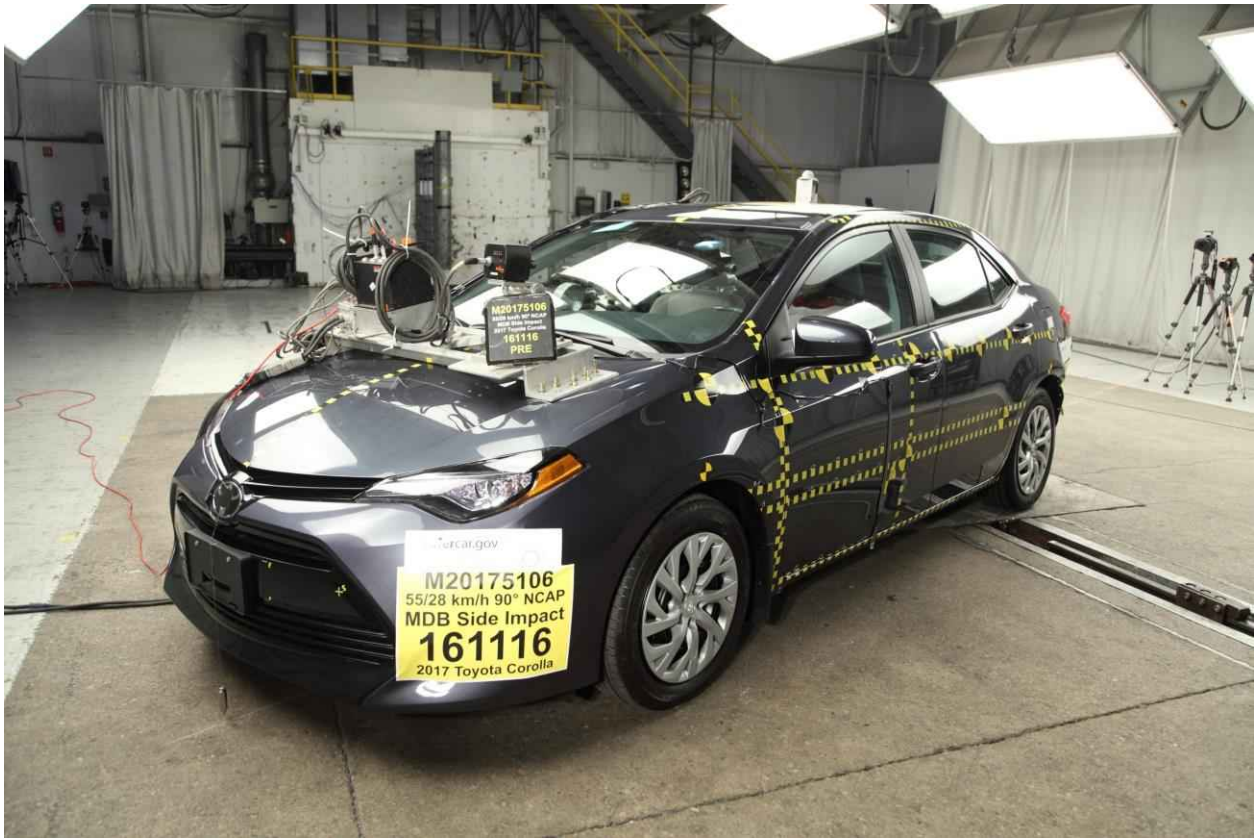
002 As-Delivered Left Rear $\frac{3}{4}$ View of Test Vehicle



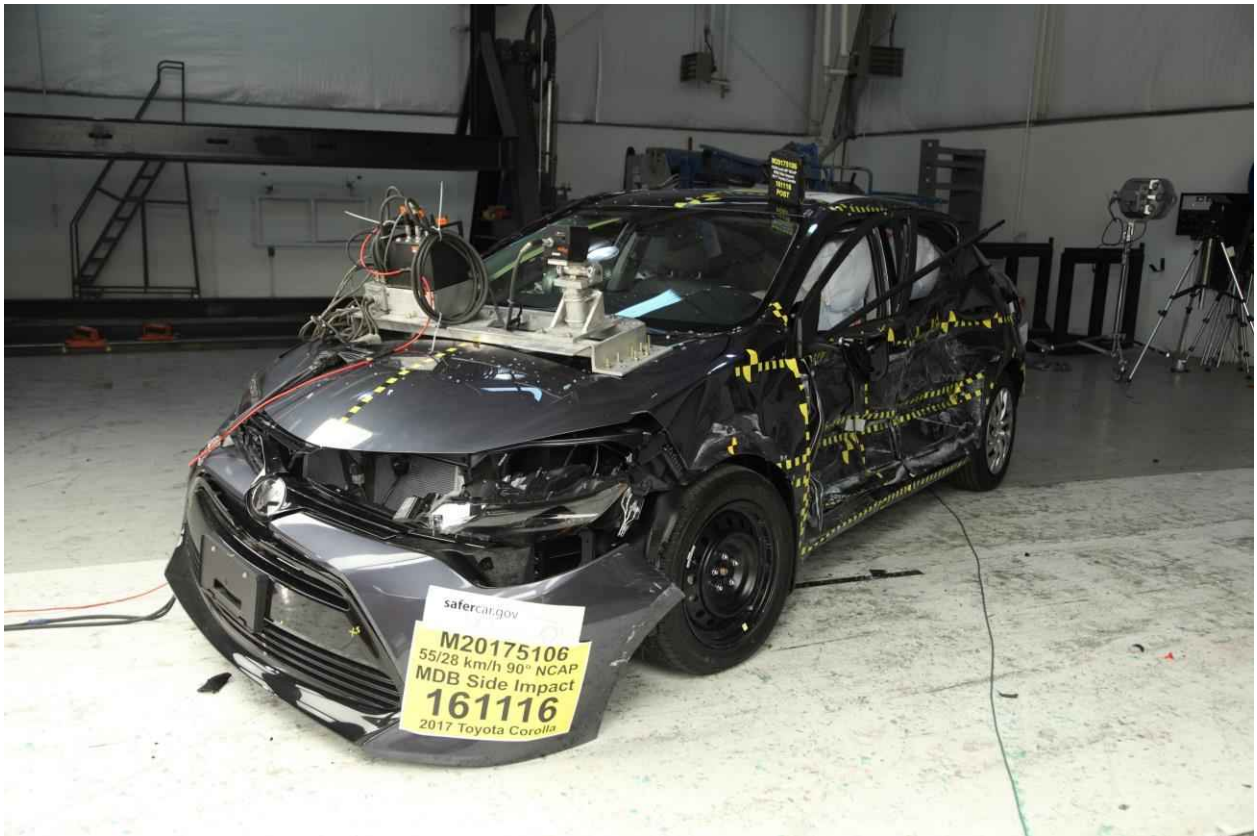
003 Pre-Test Frontal View of Test Vehicle



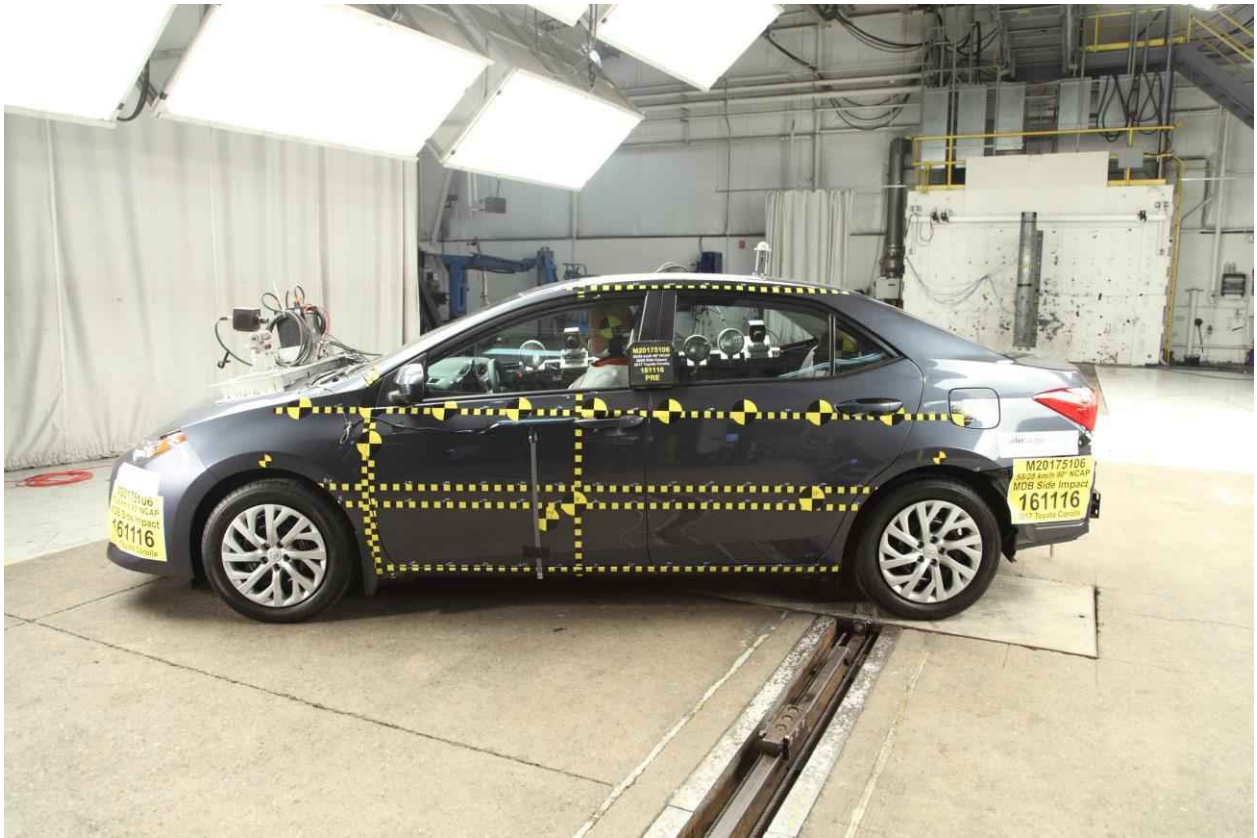
004 Post-Test Frontal View of Test Vehicle



005 Pre-Test Left Front $\frac{3}{4}$ View of Test Vehicle



006 Post-Test Left Front $\frac{3}{4}$ View of Test Vehicle



007 Pre-Test Left Side View of Test Vehicle



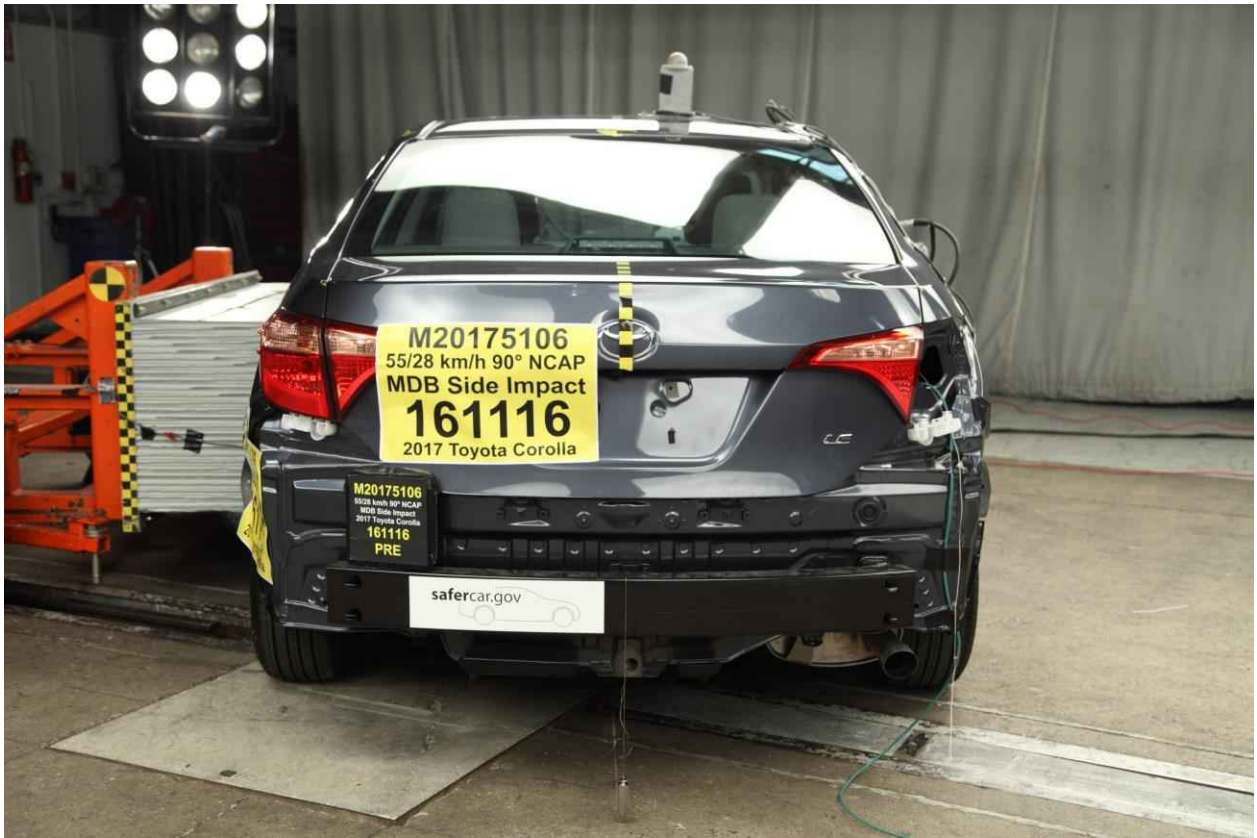
008 Post-Test Left Side View of Test Vehicle



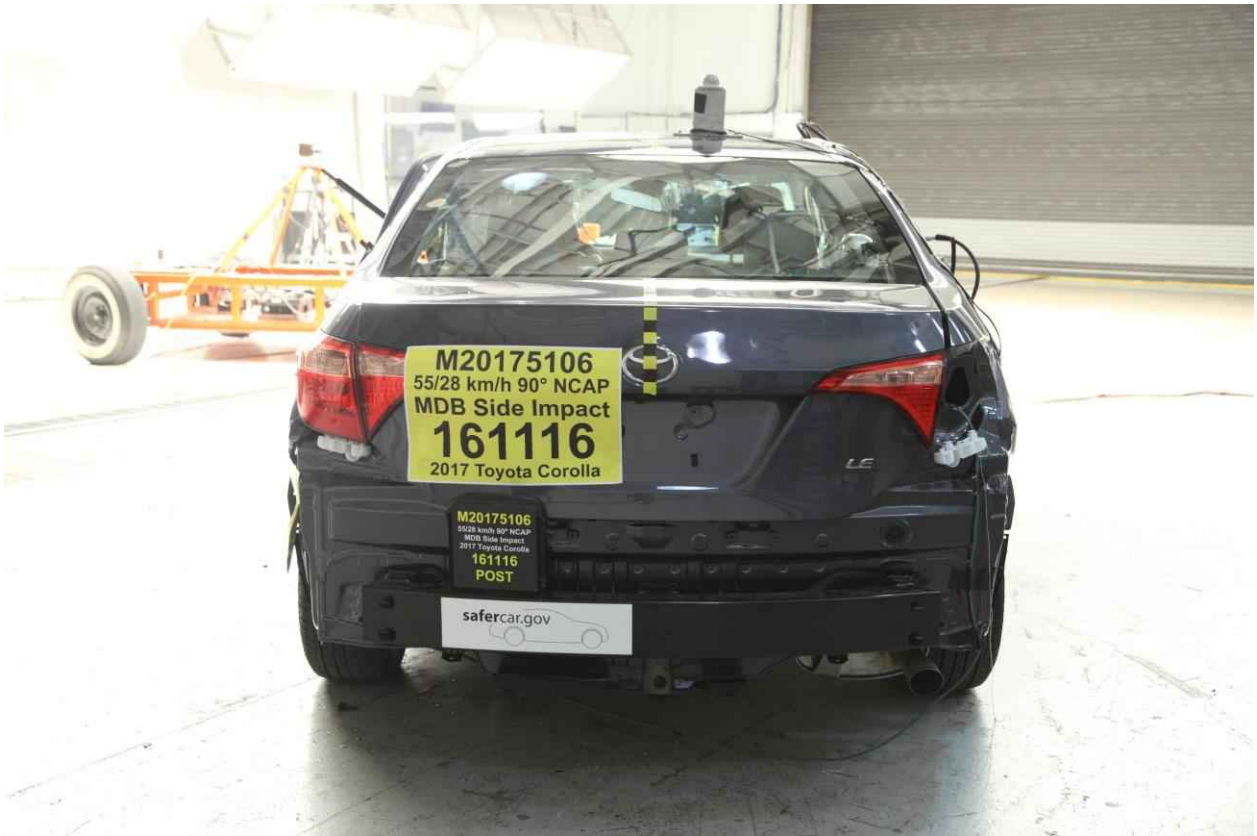
009 Pre-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



010 Post-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



011 Pre-Test Rear View of Test Vehicle



012 Post-Test Rear View of Test Vehicle



013 Pre-Test Right Side View of Test Vehicle



014 Post-Test Right Side View of Test Vehicle



015 Pre-Test Overhead View of Test Area



016 Post-Test Overhead View of Test Area



017 Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle



018 Pre-Test Right Side View MDB Positioned Against Side of Test Vehicle



019 Pre-Test Close-Up View of Impact Point Target



020 Post-Test Close-Up View of Impact Point Target



021 Pre-Test Left Front Door Latch Close-Up



022 Post-Test Left Front Door Latch Close-Up



023 Pre-Test Left Rear Door Latch Close-Up



024 Post-Test Left Rear Door Latch Close-Up



025 Pre-Test Front Close-Up View of Driver Dummy

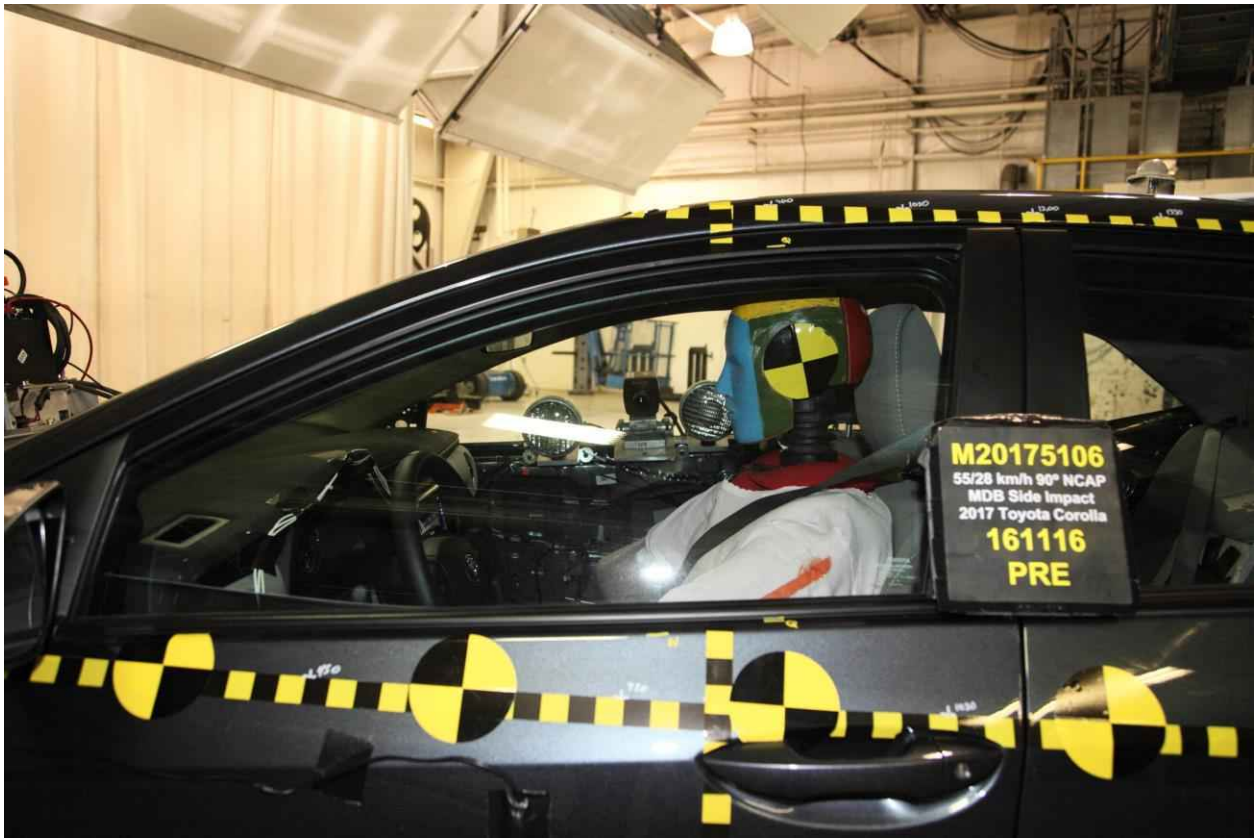


026 Post-Test Front Close-Up View of Driver Dummy



027 Pre-Test Left Side View of Driver Dummy Showing Belt and Chalking

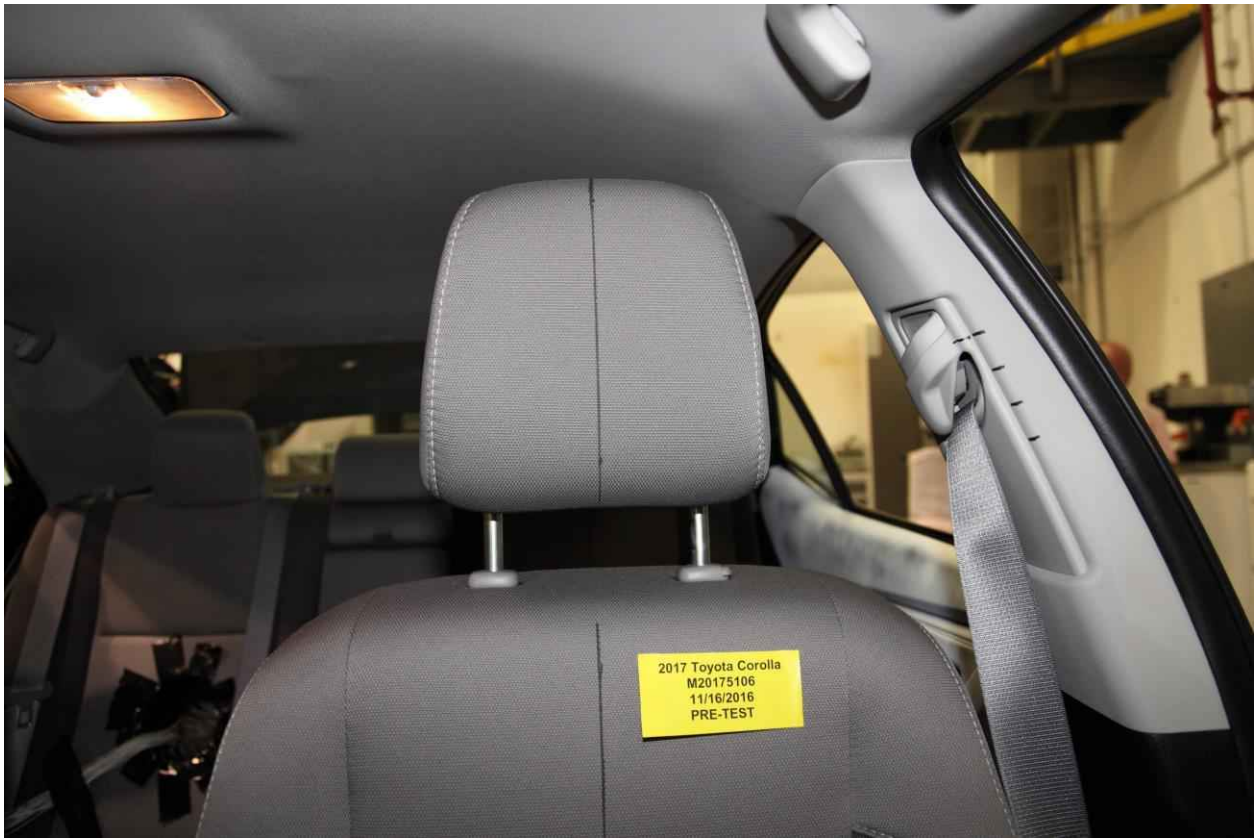
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028 Pre-Test Left Side View of Driver Dummy Shoulder and Door Top



029 Post-Test Left Side View of Driver Dummy Shoulder and Door Top



030 Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning



031 Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint



032 Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning



033 Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan



034 Pre-Test Placement of Driver Dummy Feet



035 Pre-Test View of Belt Anchorage for Driver Dummy



036 Pre-Test Left Side View of Steering Wheel

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037 View of Disengaged Parking Brake



038 Pre-Test View of Parking Brake



039 Pre-Test Close-Up Left Side View of Driver Seat Track



040 Pre-Test Close-Up Left Side View of Driver Seat Back



041 Pre-Test Close-Up View of Driver Seat Back or Head Restraint

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042 Pre-Test Driver Dummy and Door Clearance View



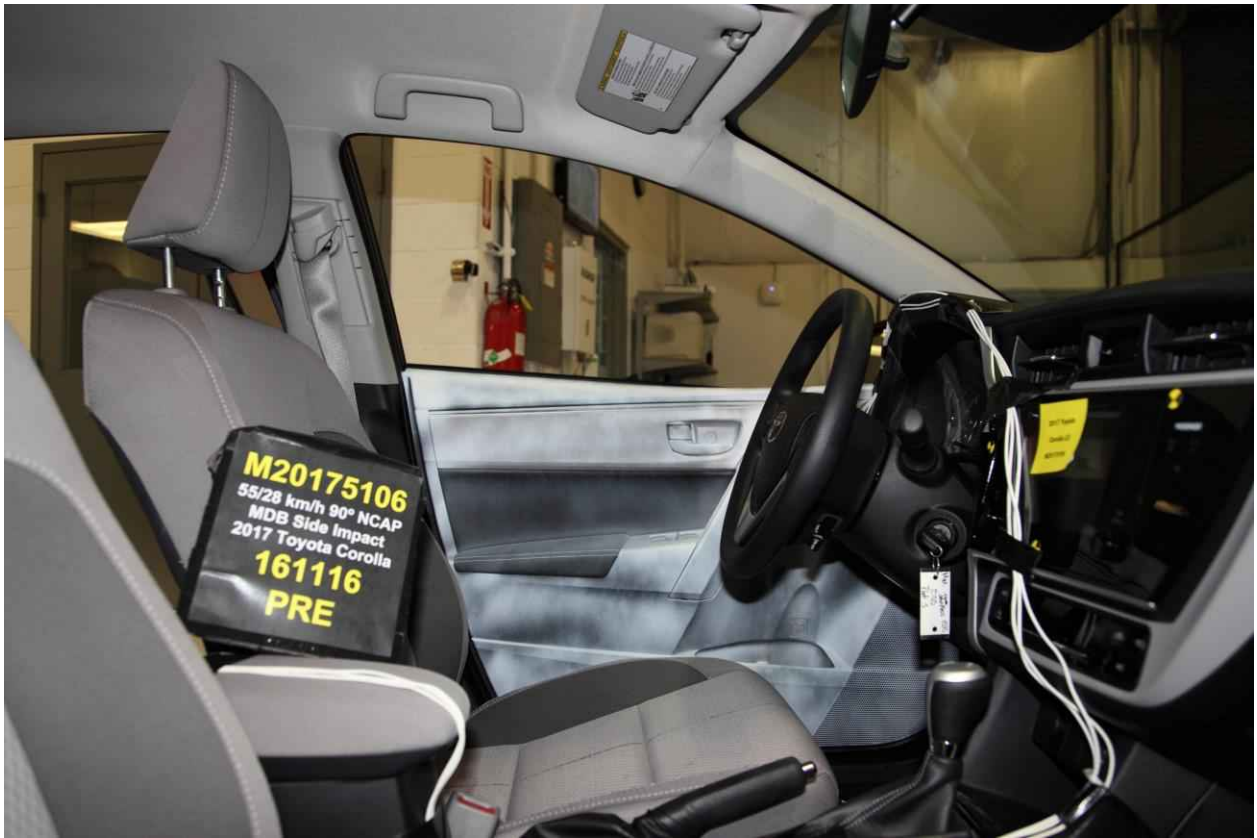
043 Post-Test Driver Dummy and Door Clearance View



044 Pre-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment



045 Post-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment



046 Pre-Test Driver Inner Door Panel View



047 Post-Test Driver Inner Door Panel View



048 Post-Test Driver Dummy Close-Up Head Contact with Vehicle View



049 Post-Test Driver Dummy Close-Up Head Contact with Side Airbag View



050 Post-Test Driver Dummy Close-Up Torso Contact with Vehicle Interior View



051 Post-Test Driver Dummy Close-Up Torso Contact with Side Airbag View



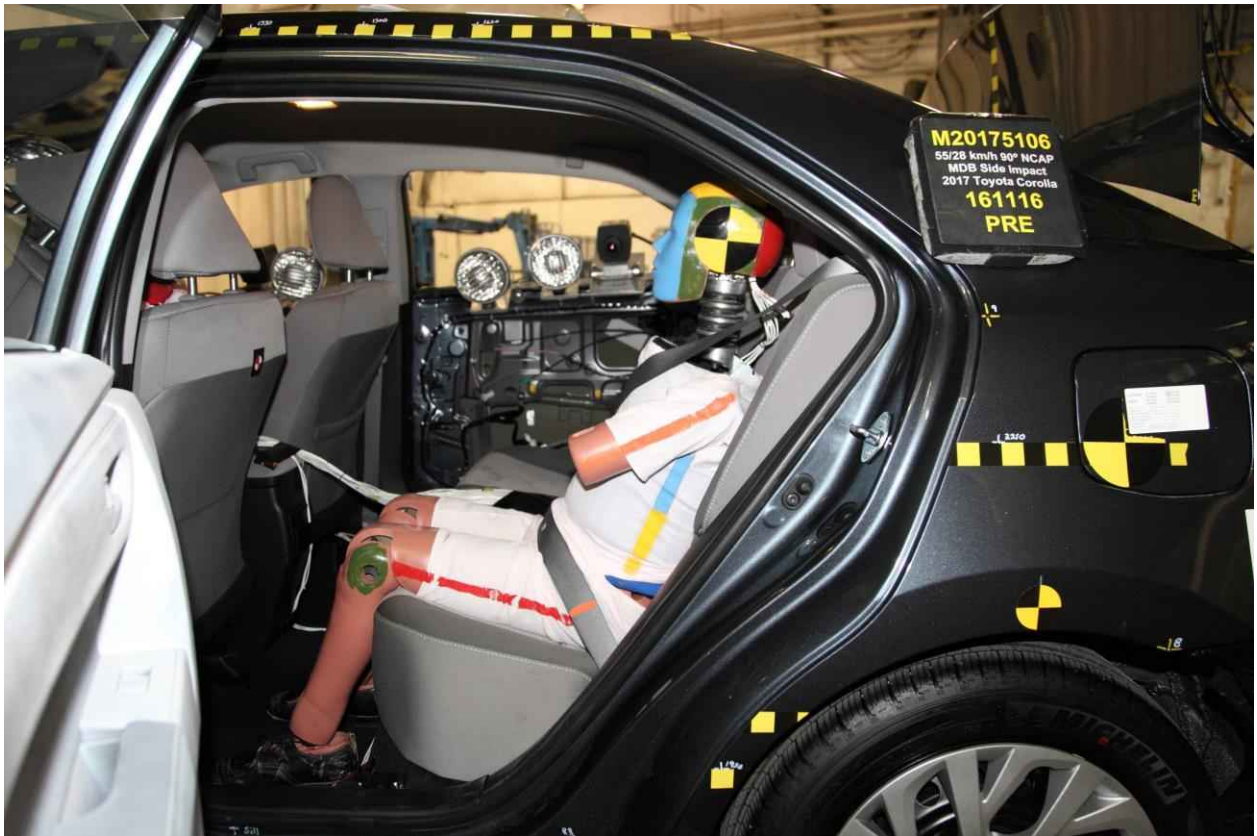
052 Post-Test Driver Dummy Close-Up Pelvis Contact View



053 Post-Test Driver Dummy Close-Up Pelvis Contact with Side Airbag View



054 Post-Test Driver Dummy Close-Up Knee Contact View



055 Pre-Test Left Side View of Passenger Dummy Showing Belt and Chalking



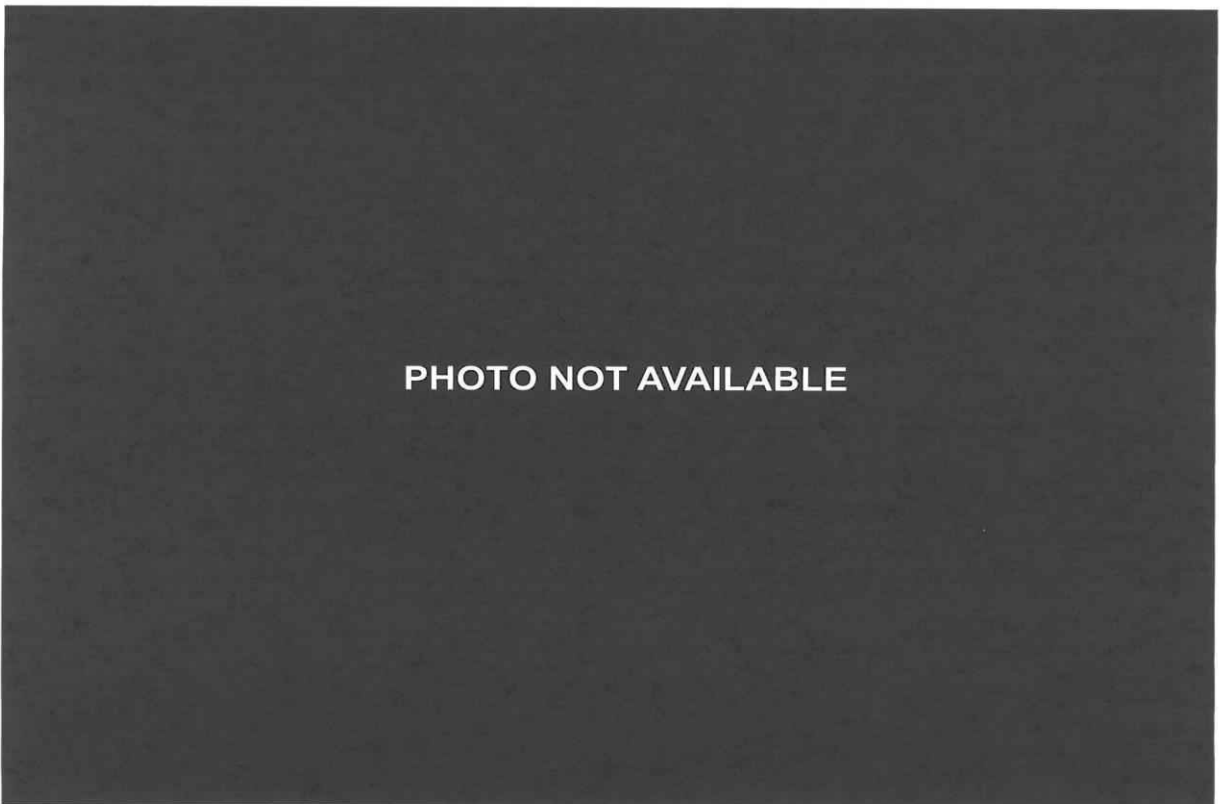
056 Pre-Test Left Side View of Passenger Dummy Shoulder and Door Top View



057 Post-Test Left Side View of Passenger Dummy Shoulder and Door Top View



058 Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning



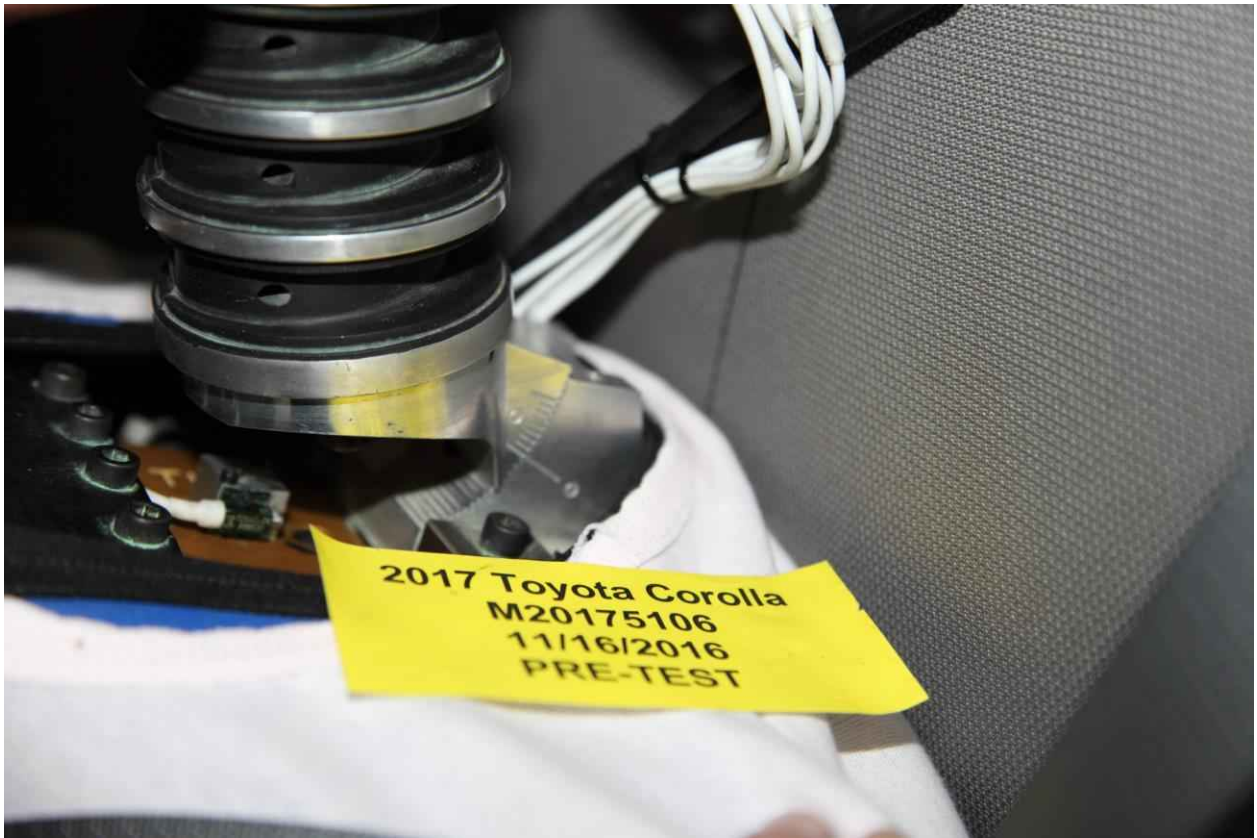
059 Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint



060 Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning



061 Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan



062 Pre-Test View of Rear Passenger Dummy Neck Showing Position of Adjustable Neck Bracket



063 Pre-Test View of Rear Passenger Dummy Head Showing Dummy Head is Level



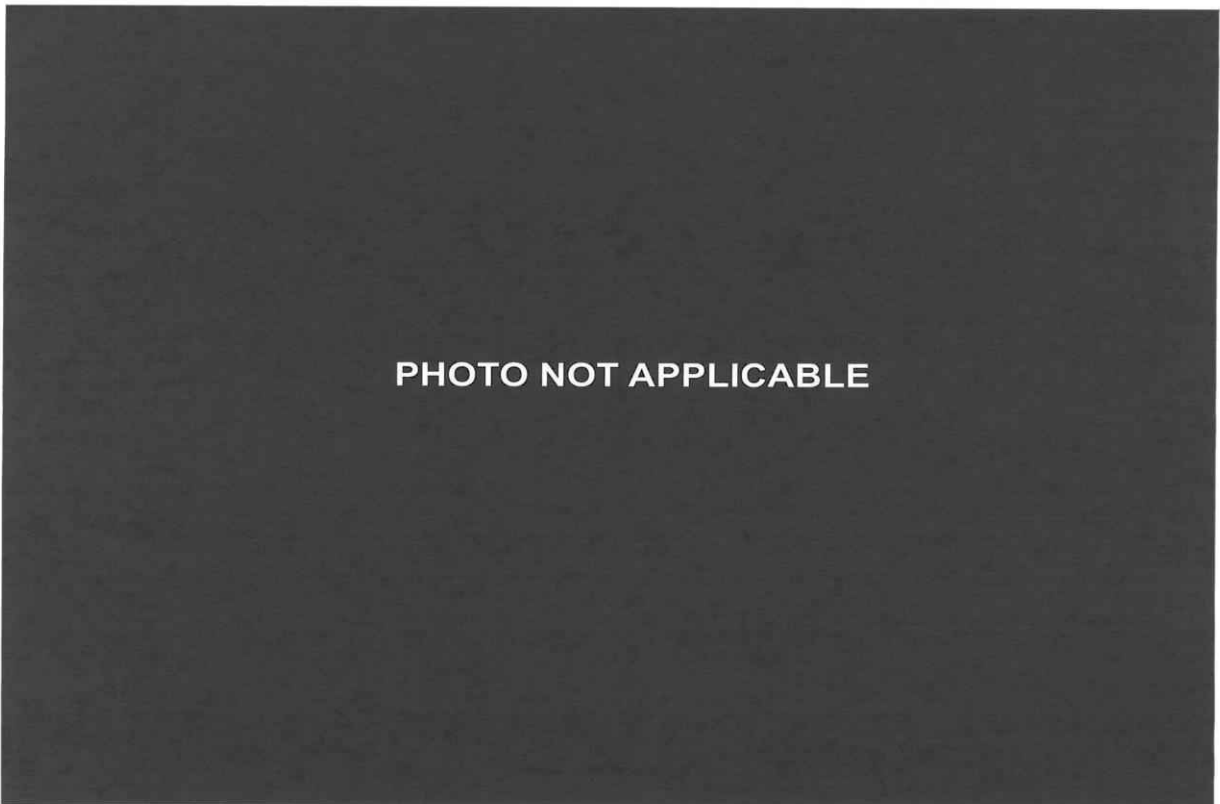
064 Pre-Test Placement of Rear Passenger Dummy Feet



065 Pre-Test View of Belt Anchorage for Rear Passenger Dummy



066 Pre-Test Close-Up Left Side View of Rear Passenger Seat Track



067 Pre-test Close-Up Left Side View of Rear Passenger Seat Back



068 Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint

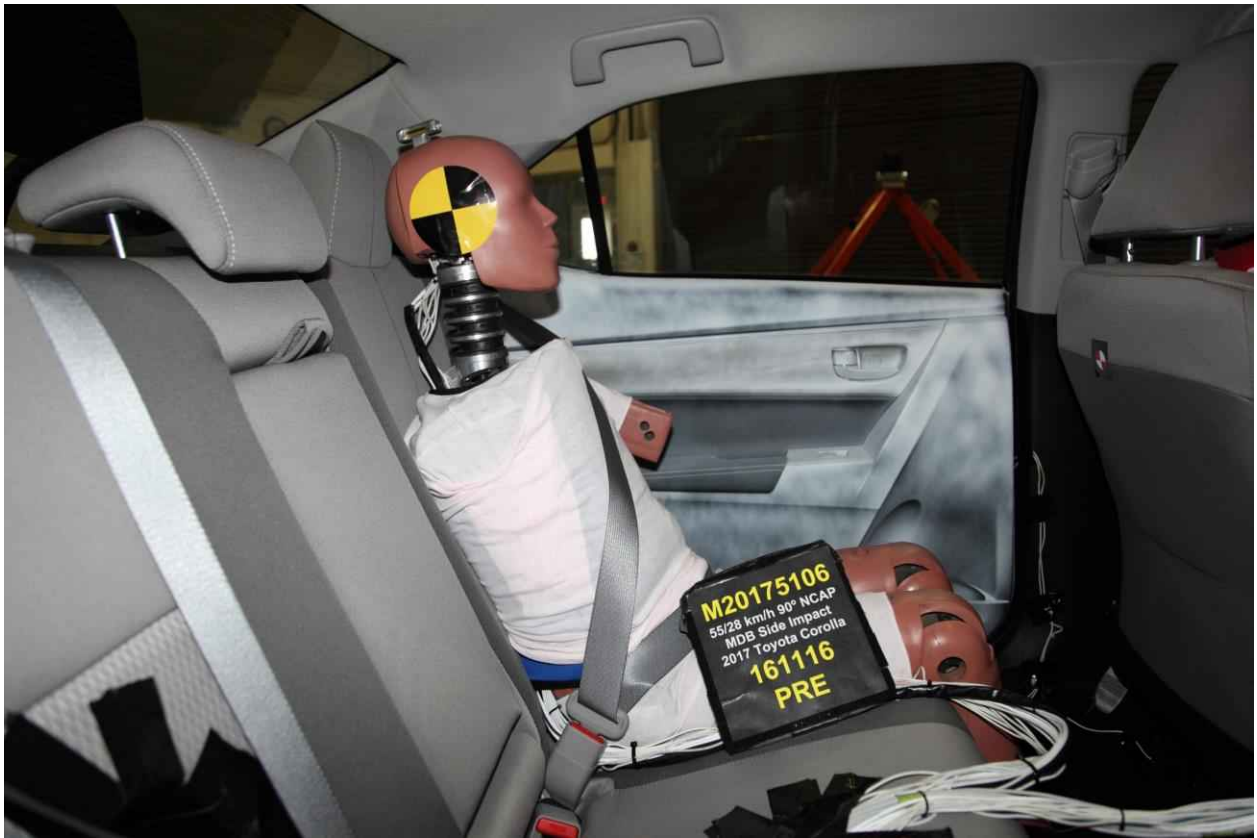
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069 Pre-Test Passenger Dummy and Door Clearance View



070 Post-Test Passenger Dummy and Door Clearance View



071 Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



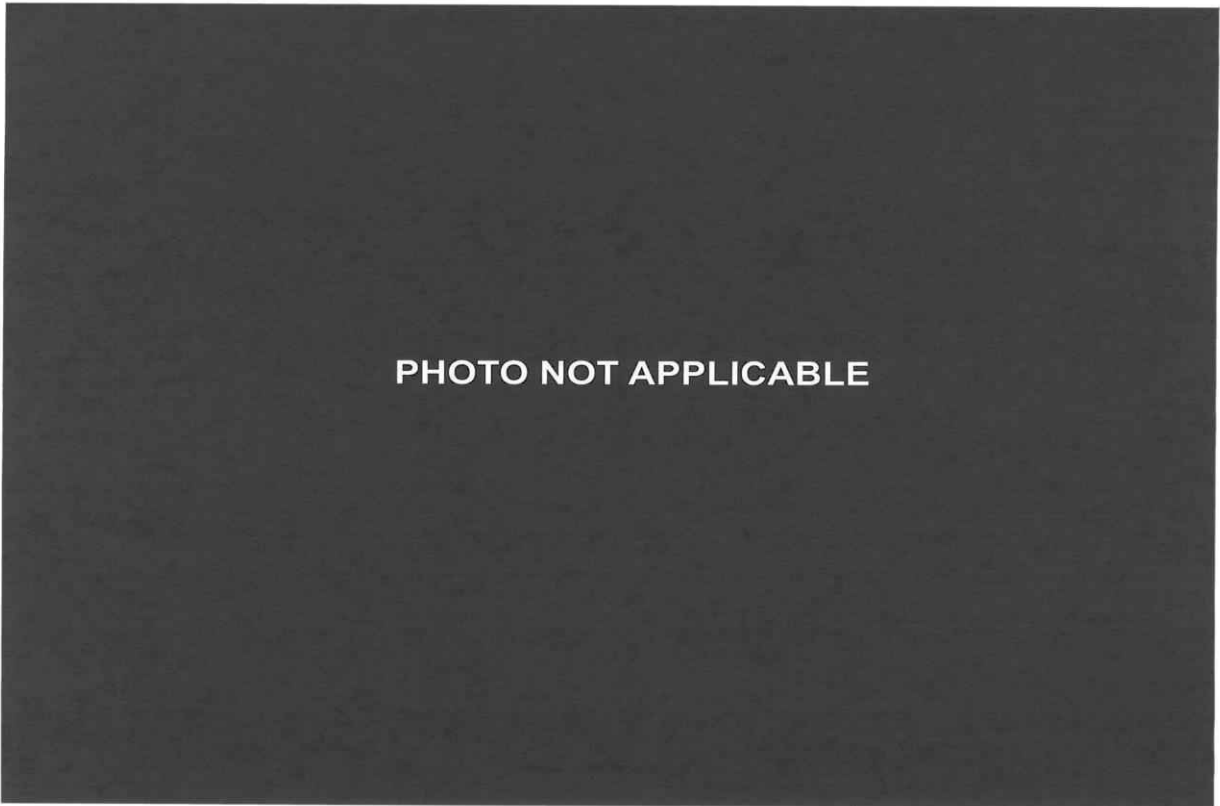
072 Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



073 Pre-Test Passenger Inner Door Panel View



074 Post-Test Passenger Inner Door Panel View



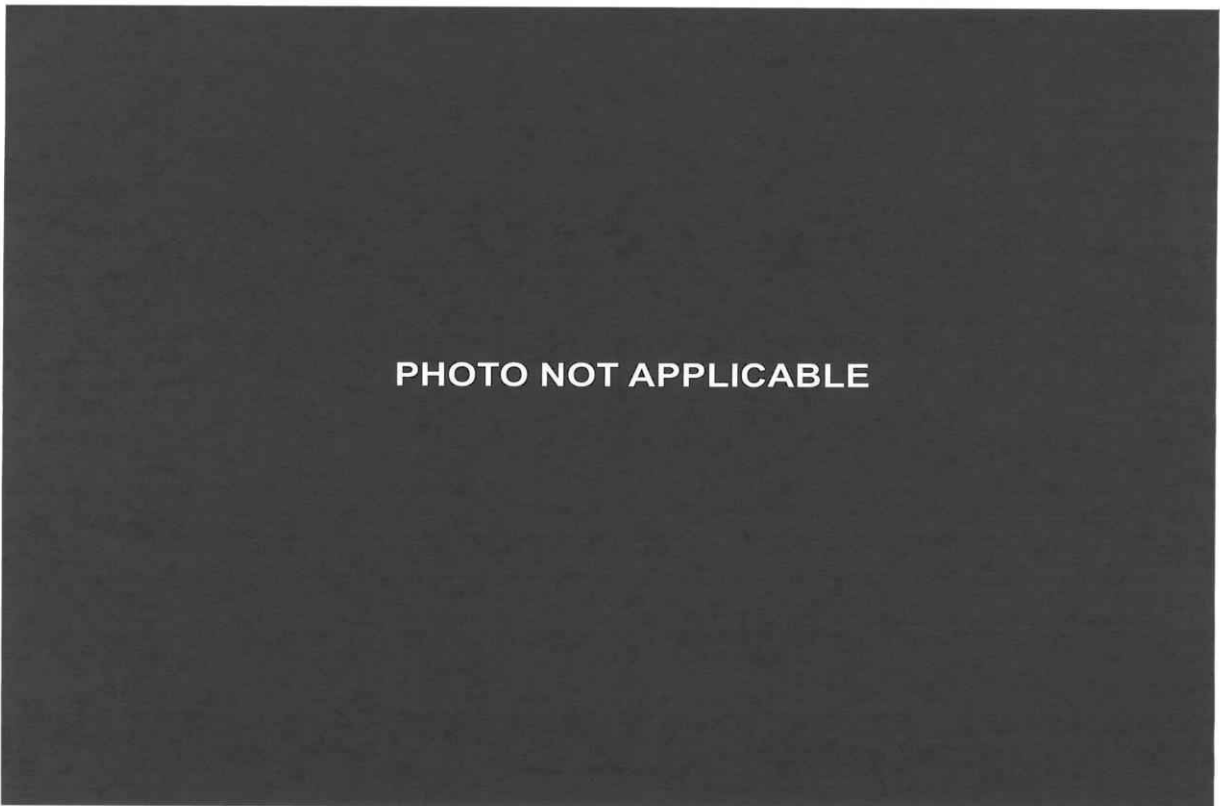
075 Post-Test Rear Passenger Dummy Close-Up Head Contact with Vehicle View



076 Post-Test Rear Passenger Dummy Close-Up Head Contact with Side Airbag View



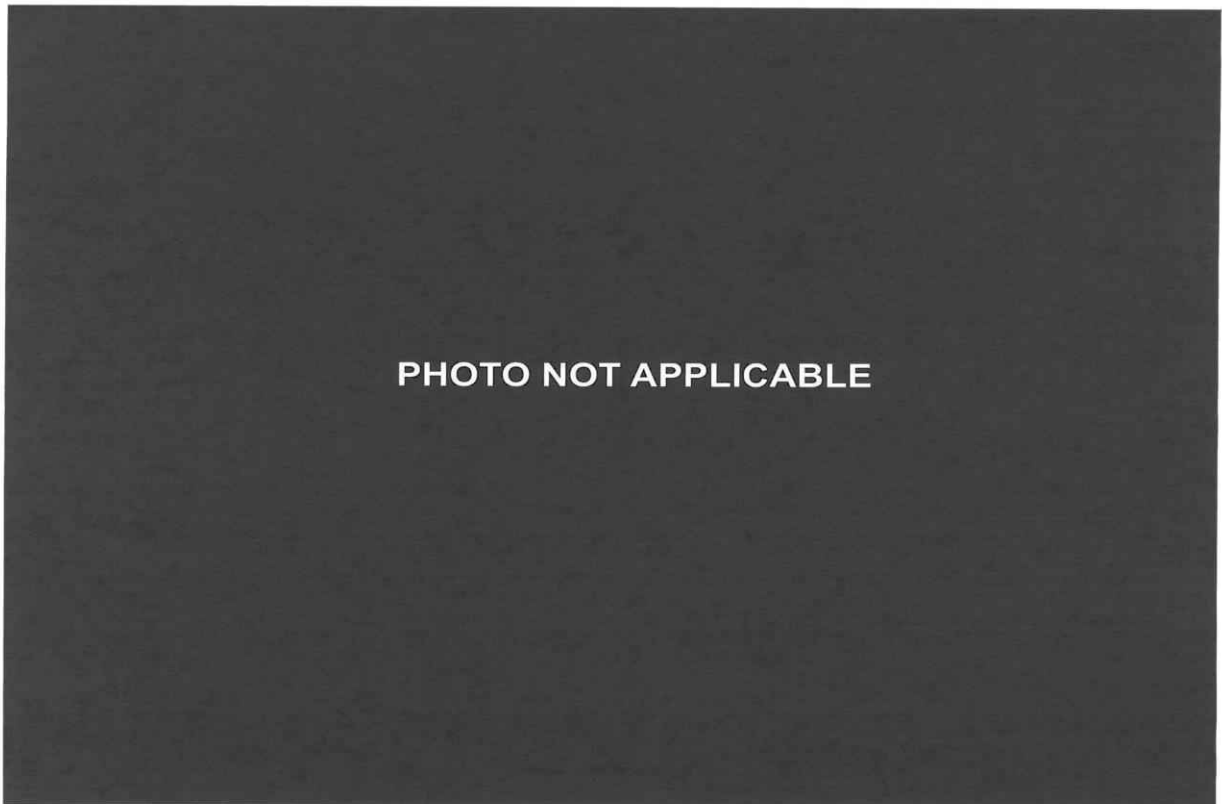
077 Post-Test Rear Passenger Dummy Close-Up Torso Contact with Vehicle Interior View



078 Post-Test Rear Passenger Dummy Close-Up Torso Contact with Side Airbag View



079 Post-Test Rear Passenger Dummy Close-Up Pelvis Contact View



080 Post-Test Rear Passenger Dummy Close-Up Pelvis Contact with Side Airbag View



081 Post-Test Rear Passenger Dummy Close-Up Knee Contact View

Intentionally Left Blank



082 Pre-Test View of Fuel Filler Cap or Fuel Filler Neck



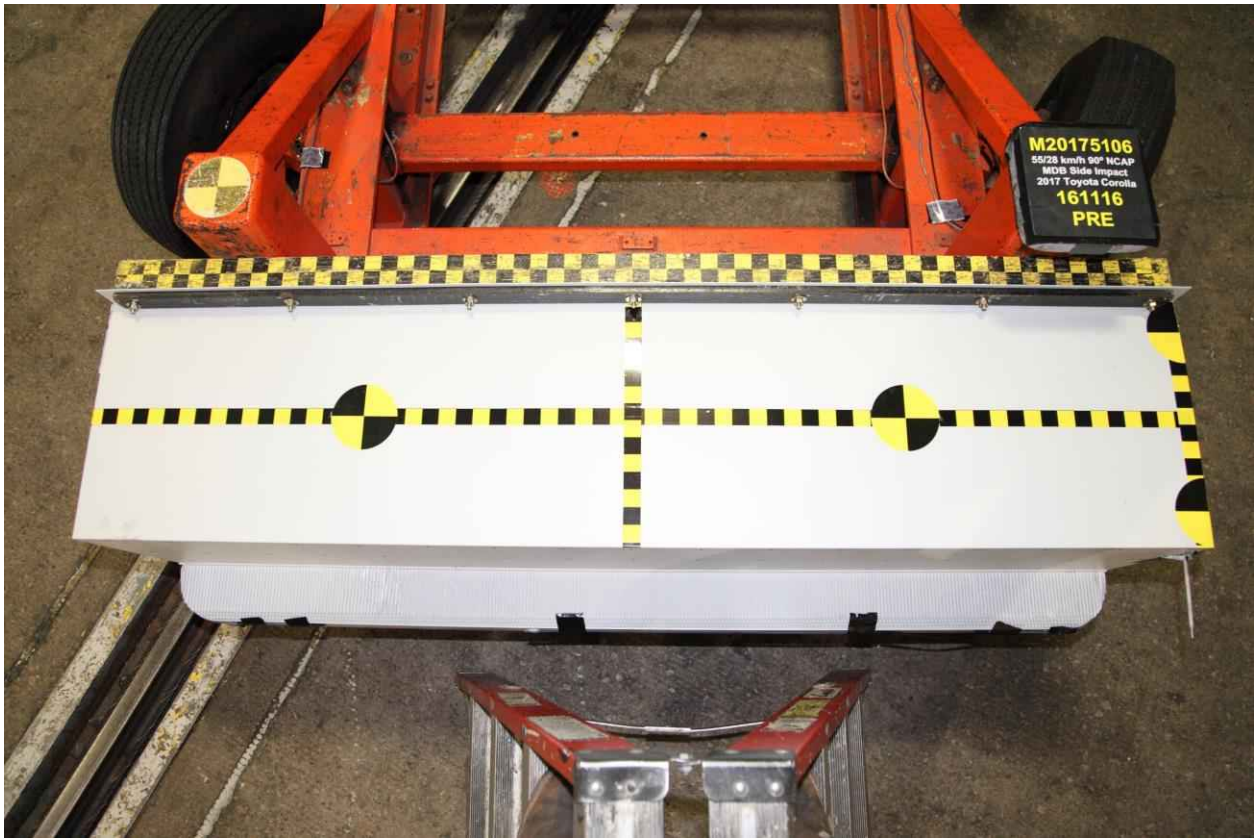
083 Post-Test View of Fuel Filler Cap or Fuel Filler Neck



084 Pre-Test Front View of MDB Impactor Face



085 Post-Test Front View of MDB Impactor Face



086 Pre-Test Top View of MDB Impactor Face



087 Post-Test Top View of MDB Impactor Face



088 Pre-Test Left Side View of MDB Impactor Face



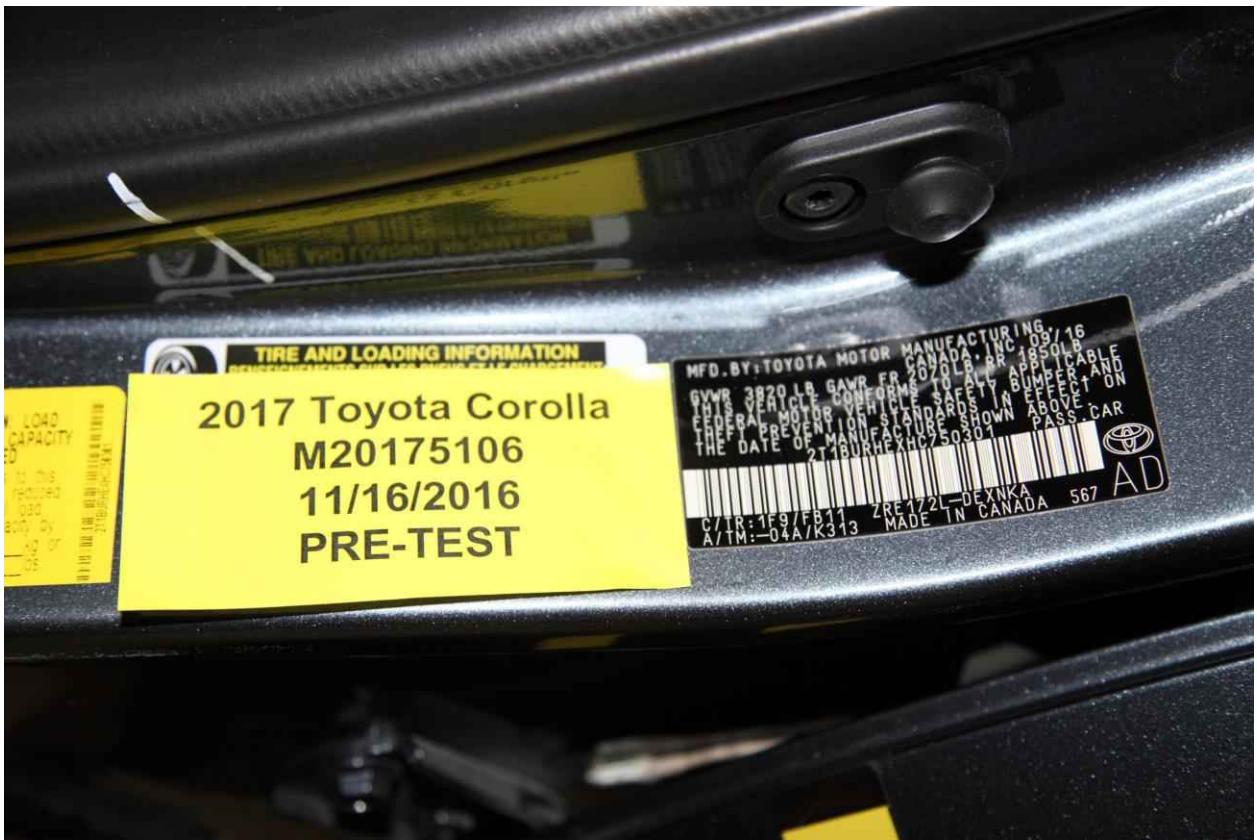
089 Post-Test Left Side View of MDB Impactor Face



090 Pre-Test Right Side View of MDB Impactor Face



091 Post-Test Right Side View of MDB Impactor Face



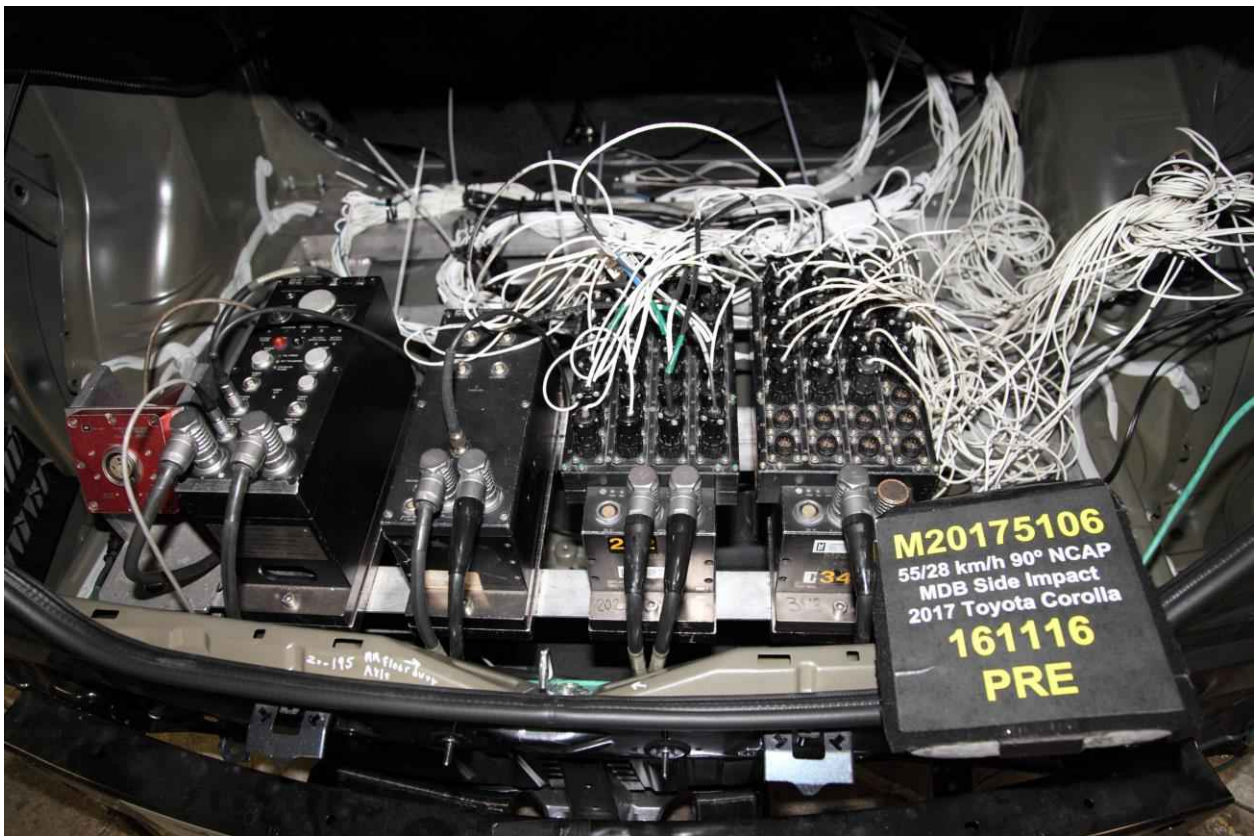
092 Close-Up View of Vehicle Certification Label



092a Close-Up View of Reduced Load Capacity Label



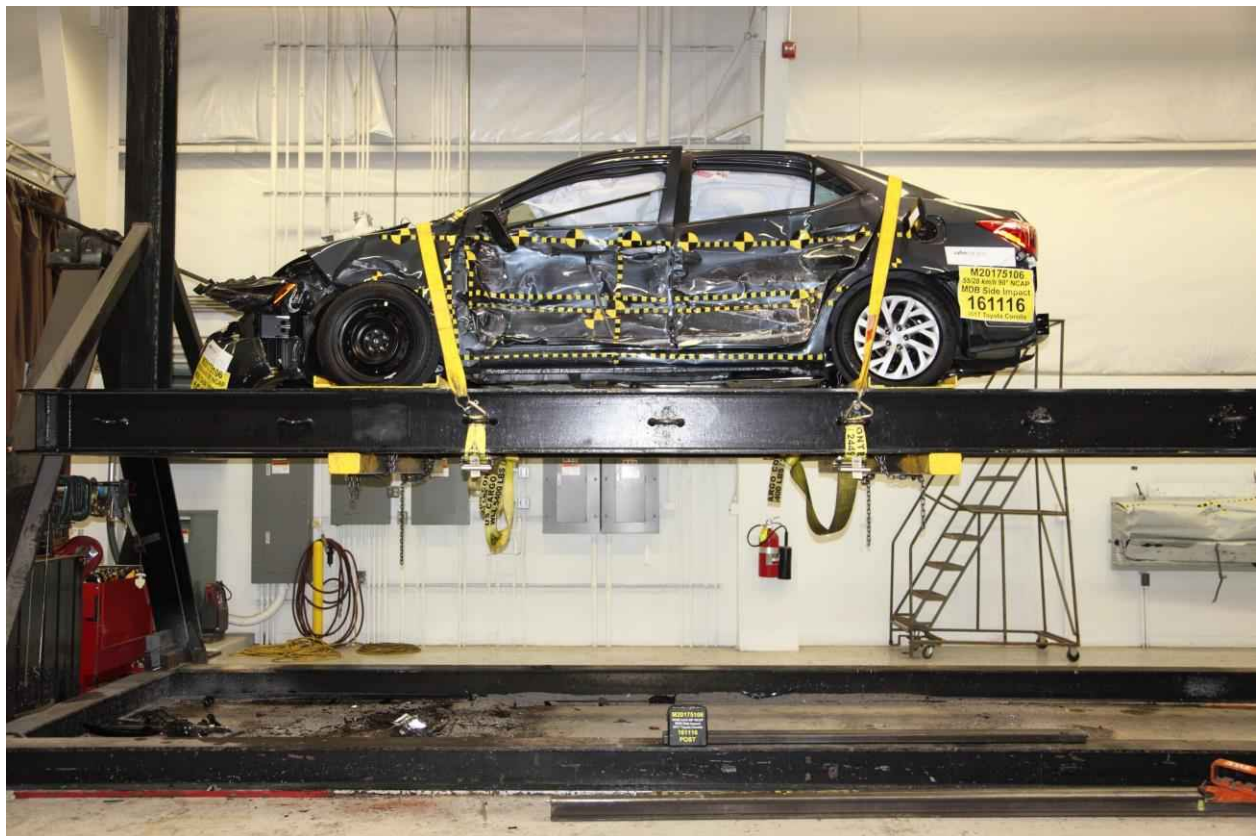
093 Close-Up View of Vehicle Tire Information Placard or Label



094 Pre-Test Ballast View



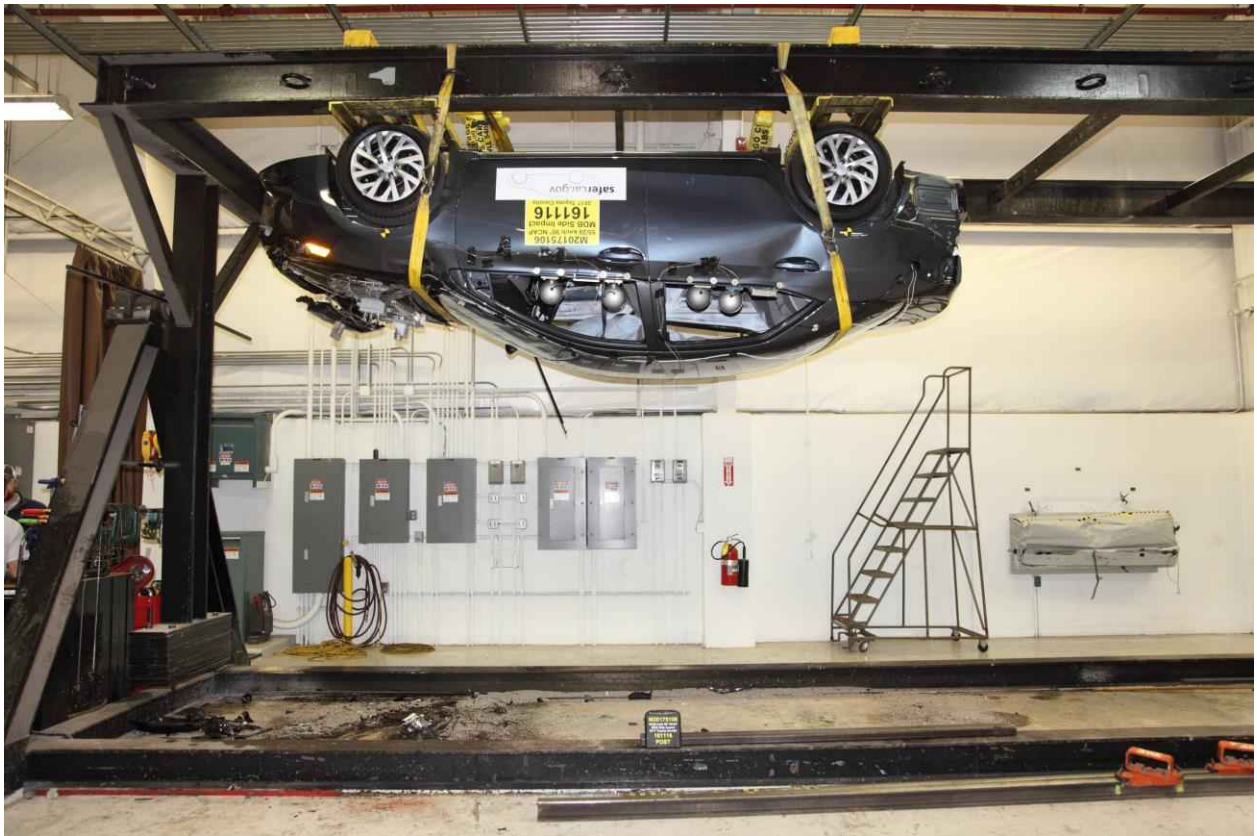
095 Post-Test Primary Speed Trap Read-Out



096 FMVSS No. 301 Static Rollover 0 Degrees



097 FMVSS No. 301 Static Rollover 90 Degrees



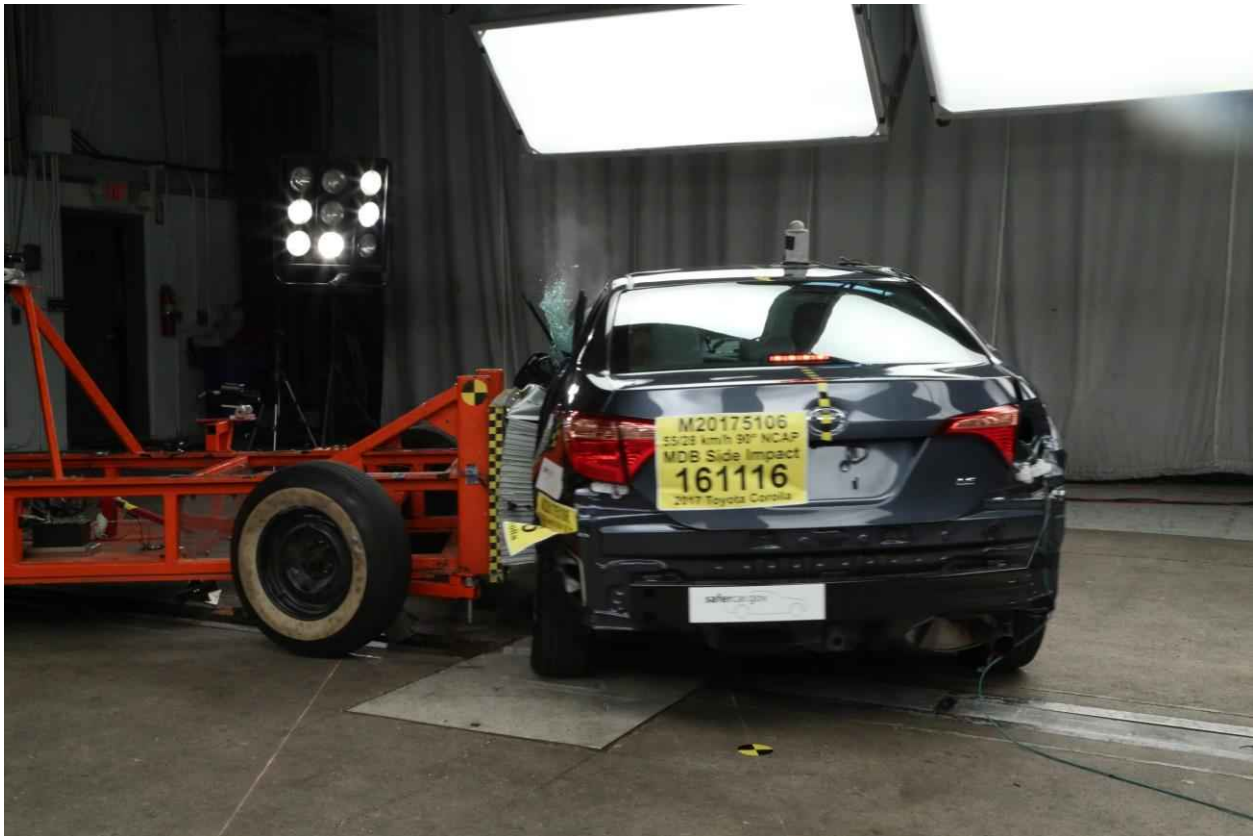
098 FMVSS No. 301 Static Rollover 180 Degrees



099 FMVSS No. 301 Static Rollover 270 Degrees



100 FMVSS No. 301 Static Rollover 360 Degrees



101 Impact Event



TOYOTA
Let's Go Places

DESC: **COROLLA** LE
VIN: **2T1BURHEXHC750301**
YR/MDL: 2017/1852A
CLR: SLATE METALLIC/FB11 (01F9/11)
FINAL ASSEMBLY POINT: CAMBRIDGE, ONTARIO, CANADA

STANDARD EQUIPMENT

MECHANICAL & PERFORMANCE

- 1.8L 4-cyl DOHC 16-Valve Dual VVT-i
- Continuously Variable Transmission
- 16-in Wide Vent Steel Wheels
- And P205/55R16 Tires

SAFETY & CONVENIENCE

- Toyota Safety Sense-P: Pre-Collision Sys w/Pedestrian Detection, Dynamic Radar Cruise Control, Lane Departure Alert w/Steering Assist, Automatic High Beams
- Star Safety System Includes: VSC, TRAC, Anti-lock Brake System, EBD, Brake Assist & Smart Stop Technology
- 8 Airbags: Dr & Fr Pass Adv Airbag Sys, Dr & Fr Pass Seat-Mounted Side Airbags, Dr Knee Airbag, Pass Seat Cushion Airbag
- Front & Rear Side Curtain Airbags
- LATCH (Lower Anchors & Tethers for Children) for Outboard Rear Seating Positions Only
- Whiplash-Injury Lessening Front Seats

EXTERIOR

- Bi-LED Headlights
- LED Daytime Running Lights in Headlight
- Color-Keyed Heated Power Outside Mirrors

INTERIOR

- Premium Fabric-Trimmed 6-Way Adj Dr Seat
- 4-Way Adj Fr Pass Seat w/Seatback Pocket
- Entune Audio w/1.6in Touch-screen and Entune Multimedia Bundle (AUX/USB/7-Ady Voice Recognition, Siri Eyes Free
- 3.5-in Monochrome TFT Multi-Info Display
- Integrated Backup Camera w/Projected Pth Steering Wheel w/Audio & Bluetooth
- Hands-Free Phone Voice Command Controls
- Auto Climate Control w/ Pollen Filter and Push Button Controls
- Remote Keyless Entry System
- Power Door Locks and Windows
- **Full Tank of Gas**

MANUFACTURER'S SUGGESTED RETAIL PRICE \$18,935.00

OPTIONAL EQUIPMENT

| | | |
|----|-------------------------------------|--------|
| FE | 50 State Emissions | 249.00 |
| ZT | All Weather Floor Liners/Cargo Tray | 129.00 |
| MF | Mudguards | |

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 |
| Side Crash | Front seat: Not Rated Rear seat: Not Rated |
| Rollover | ★★★★ |

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

EPA DOT Fuel Economy and Environment

Fuel Economy

32 MPG (combined city/hwy)
28 MPG city | 36 MPG highway

You save \$1,250 in fuel costs over 5 years compared to the average new vehicle.

Annual fuel Cost \$1,150

Fuel Economy & Greenhouse Gas Rating (tailpipe only) 7 (Best)

Smog Rating (tailpipe only) 6 (Best)

fuueleconomy.gov

DELIVERY PROCESSING AND HANDLING FEE 865.00

TOTAL \$20,175.00

The New Vehicle Limited Warranty provides 3-year/50,000-mile basic coverage. See dealer for details. An extended service contract may be available for the vehicle. Ask dealer for details. Manufacturer's suggested retail price includes manufacturer's recommended pre-delivery service. Gasoline, license and title fees, applicable federal, state and local taxes and dealer and distributor installed options and accessories are not included in the manufacturer's suggested retail price. ToyotaCare, which covers normal factory scheduled maintenance for two years or 25,000 miles, whichever occurs first, is included as part of the sales price of the vehicle for qualifying buyers. See participating dealer for eligibility and coverage details.

Delivered by Truck to: 31175 WEST HEAR RD WILLIAMSVILLE NY 14221

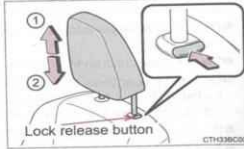
102 Monroney Label

Head restraints

Head restraints are provided for all seats.

Front seats

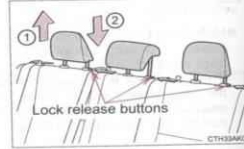
- ① Up
Pull the head restraints up.
- ② Down
Push the head restraint down while pressing the lock release button.



Rear seats

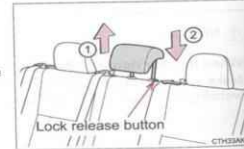
► Type A

- ① Up
Pull the head restraints up.
- ② Down
Push the head restraint down while pressing the lock release button.



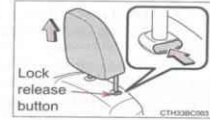
► Type B

- ① Up
Pull the head restraints up.
- ② Down
Push the head restraint down while pressing the lock release button.



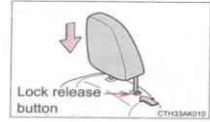
Removing the head restraints (except for fixed rear head restraints)

Pull the head restraint up while pressing the lock release button.



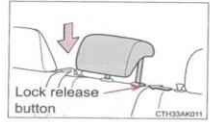
Installing the head restraints (except for fixed rear head restraints)

► Front seats and rear outside seats
Align the head restraint with the installation holes and push it down to the lock position. Press and hold the lock release button when lowering the head restraint.



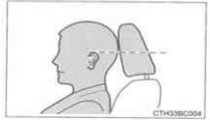
► Rear center seat

Align the head restraint with the installation holes and push it down to the lowest lock position while pressing the lock release button.



Adjusting the height of the head restraints (except for fixed rear head restraints)

Make sure that the head restraints are adjusted so that the center of the head restraint is closest to the top of your ears.



Adjusting the rear center seat head restraint

Always raise the head restraint one level from the stowed position when using.

3
Operation of each component

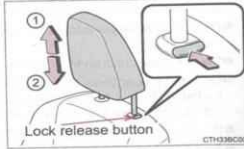
103 Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

Head restraints

Head restraints are provided for all seats.

Front seats

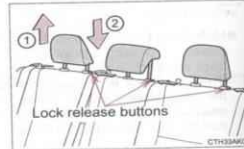
- ① Up
Pull the head restraints up.
- ② Down
Push the head restraint down while pressing the lock release button.



Rear seats

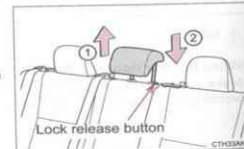
► Type A

- ① Up
Pull the head restraints up.
- ② Down
Push the head restraint down while pressing the lock release button.



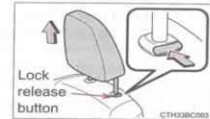
► Type B

- ① Up
Pull the head restraints up.
- ② Down
Push the head restraint down while pressing the lock release button.



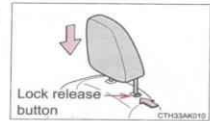
Removing the head restraints (except for fixed rear head restraints)

Pull the head restraint up while pressing the lock release button.



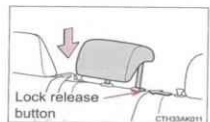
Installing the head restraints (except for fixed rear head restraints)

► Front seats and rear outside seats
Align the head restraint with the installation holes and push it down to the lock position. Press and hold the lock release button when lowering the head restraint.



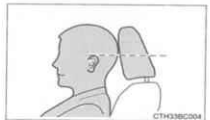
► Rear center seat

Align the head restraint with the installation holes and push it down to the lowest lock position while pressing the lock release button.



Adjusting the height of the head restraints (except for fixed rear head restraints)

Make sure that the head restraints are adjusted so that the center of the head restraint is closest to the top of your ears.



Adjusting the rear center seat head restraint

Always raise the head restraint one level from the stowed position when using.

3
Operation of each component

104 Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS

Driver & Passenger Dummy Instrumentation Plots

| No. | Description | Page |
|------------|---|-------------|
| 1 | Driver Head Acceleration (X) Primary vs. Time | B-5 |
| 2 | Driver Head Acceleration (Y) Primary vs. Time | B-5 |
| 3 | Driver Head Acceleration (Z) Primary vs. Time | B-5 |
| 4 | Driver Head Resultant Acceleration Primary vs. Time | B-5 |
| 5 | Driver Upper Thorax Rib Deflection (Y) vs. Time | B-6 |
| 6 | Driver Middle Thorax Rib Deflection (Y) vs. Time | B-6 |
| 7 | Driver Lower Thorax Rib Deflection (Y) vs. Time | B-6 |
| 8 | Driver Thorax Rib Deflection Maximum vs. Time | B-6 |
| 9 | Driver Anterior Abdominal Force (Y) vs. Time | B-7 |
| 10 | Driver Middle Abdominal Force (Y) vs. Time | B-7 |
| 11 | Driver Posterior Abdominal Force (Y) vs. Time | B-7 |
| 12 | Driver Total Abdominal Force (Y) vs. Time | B-7 |
| 13 | Driver Pubic Symphysis Force (Y) vs. Time | B-8 |
| 14 | Passenger Head Acceleration (X) Primary vs. Time | B-9 |
| 15 | Passenger Head Acceleration (Y) Primary vs. Time | B-9 |
| 16 | Passenger Head Acceleration (Z) Primary vs. Time | B-9 |
| 17 | Passenger Head Resultant Acceleration Primary vs. Time | B-9 |
| 18 | Passenger Lower Spine T12 Acceleration (X) vs. Time | B-10 |
| 19 | Passenger Lower Spine T12 Acceleration (Y) vs. Time | B-10 |
| 20 | Passenger Lower Spine T12 Acceleration (Z) vs. Time | B-10 |
| 21 | Passenger Lower Spine T12 Resultant Acceleration vs. Time | B-10 |
| 22 | Passenger Iliac Force on Impact Side (Y) vs. Time | B-11 |
| 23 | Passenger Acetabulum Force on Impact Side (Y) vs. Time | B-11 |
| 24 | Passenger Total Pelvic Force on Impact Side (Y) vs. Time | B-11 |

The following additional data can be obtained from the Research and Development section of the NHTSA website (<http://www.nhtsa.dot.gov>)

Additional Driver & Passenger Dummy Instrumentation Data

Driver Lower Spine T12 Acceleration (X)
Driver Lower Spine T12 Acceleration (Y)
Driver Lower Spine T12 Acceleration (Z)
Passenger Upper Thorax Rib Deflection (Y)
Passenger Middle Thorax Rib Deflection (Y)
Passenger Lower Thorax Rib Deflection (Y)
Passenger Upper Abdomen Rib Deflection (Y)
Passenger Lower Abdomen Rib Deflection (Y)
Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Passenger Head Acceleration Redundant (X)
Passenger Head Acceleration Redundant (Y)
Passenger Head Acceleration Redundant (Z)

Vehicle Instrumentation Data

Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Right Side Sill at Front Seat Acceleration (X)
Right Side Sill at Front Seat Acceleration (Y)
Right Side Sill at Front Seat Acceleration (Z)
Right Side Sill at Rear Seat Acceleration (X)
Right Side Sill at Rear Seat Acceleration (Y)
Right Side Sill at Rear Seat Acceleration (Z)
Left Side Sill at Front Seat Acceleration (Y)
Left Side Sill at Rear Seat Acceleration (Y)
Lower A-Post Acceleration (Y)
Middle A-Post Acceleration (Y)
Lower B-Post Acceleration (Y)
Middle B-Post Acceleration (Y)
Front Seat Track Acceleration (Y)
Rear Seat Structure Acceleration (Y)
Right Rear Occupant Compartment Acceleration (Y)
Engine Block (X)
Engine Block (Y)
Rear Floorpan Above Axle Acceleration (X)
Rear Floorpan Above Axle Acceleration (Y)
Rear Floorpan Above Axle Acceleration (Z)

MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)
MDB Center of Gravity Acceleration (Y)
MDB Center of Gravity Acceleration (Z)
MDB Rear Acceleration (X)
MDB Rear Acceleration (Y)
Left MDB Contact Switch
Right MDB Contact Switch

NHTSA

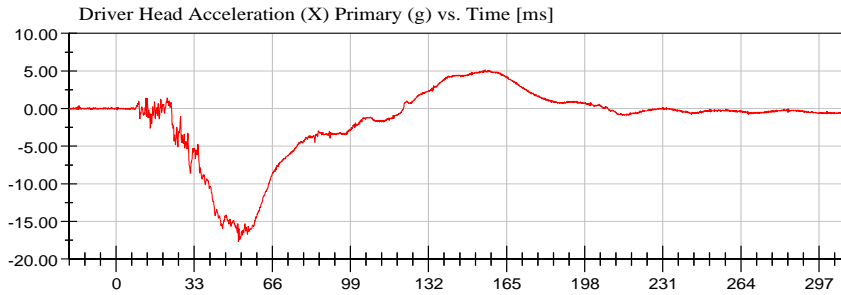
Test Lab: CTF

Test Number: 161116 (M20175106)

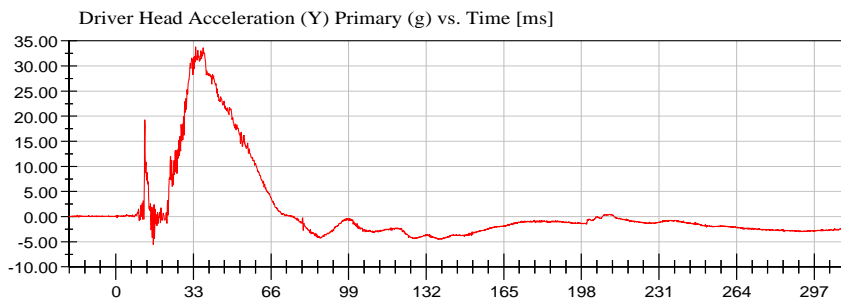
Test Date: 11/16/2016

Position #1 ES-2 Dummy with Rib Extension (F030)

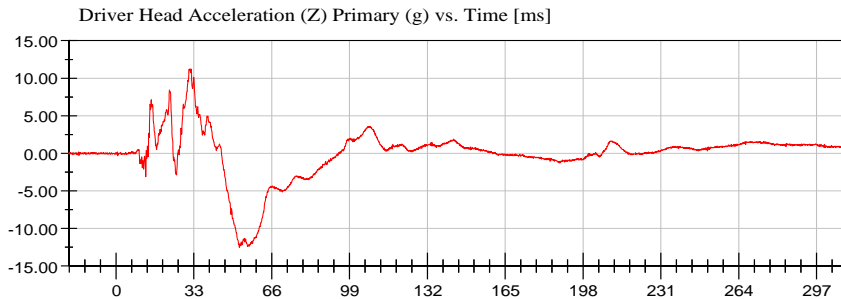
Position #4 SID IIs Dummy (305)



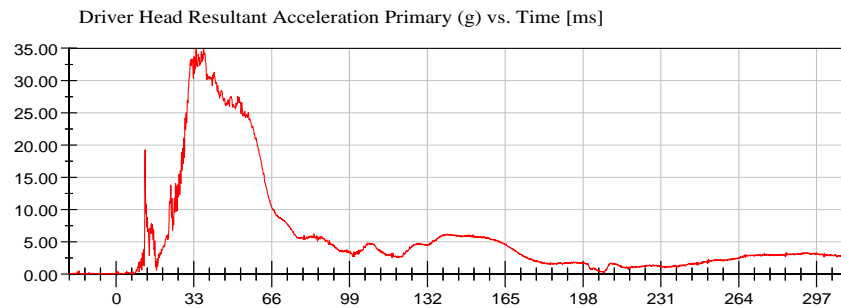
<Max>
5.14 g at 155.92 ms
<Min>
-17.70 g at 51.68 ms
CFC_1000



<Max>
33.79 g at 34.00 ms
<Min>
-5.57 g at 15.92 ms
CFC_1000



<Max>
11.25 g at 31.36 ms
<Min>
-12.49 g at 52.24 ms
CFC_1000



<Max>
34.86 g at 37.12 ms
<Min>
0.02 g at -18.80 ms
CFC_1000



NHTSA

Test Lab: CTF

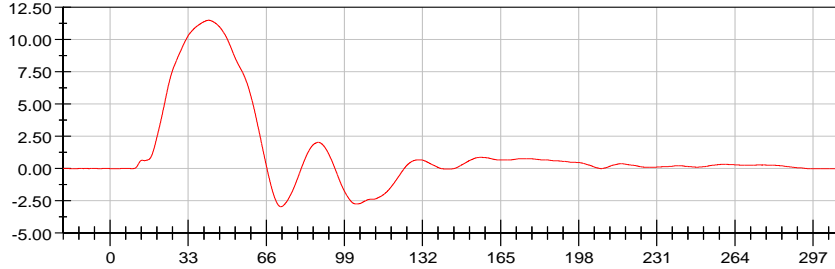
Test Number: 161116 (M20175106)

Test Date: 11/16/2016

Position #1 ES-2 Dummy with Rib Extension (F030)

Position #4 SID IIs Dummy (305)

Driver Upper Thorax Rib Deflection (Y) (mm) vs. Time [ms]



<Max>

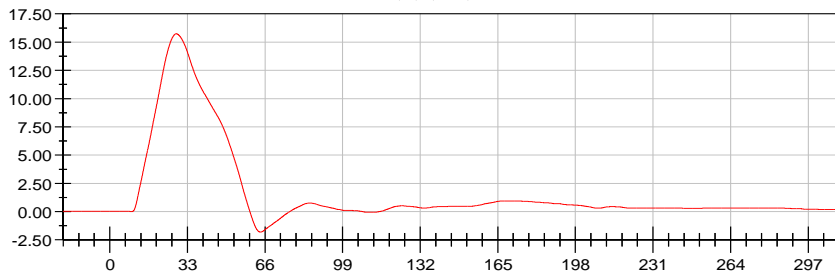
11.50 mm at 41.60 ms

<Min>

-2.96 mm at 72.16 ms

CFC_180

Driver Middle Thorax Rib Deflection (Y) (mm) vs. Time [ms]



<Max>

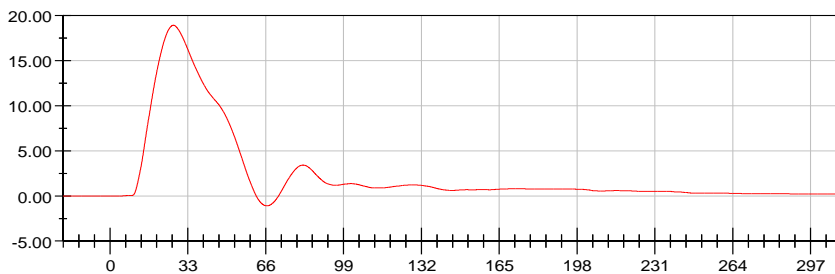
15.74 mm at 28.32 ms

<Min>

-1.83 mm at 64.08 ms

CFC_180

Driver Lower Thorax Rib Deflection (Y) (mm) vs. Time [ms]



<Max>

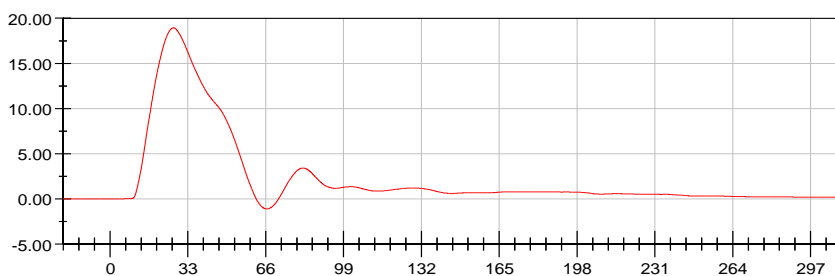
18.94 mm at 26.88 ms

<Min>

-1.09 mm at 66.56 ms

CFC_180

Driver Thorax Rib Deflection Maximum (mm) vs. Time [ms]



<Max>

18.94 mm at 26.88 ms

<Min>

-1.09 mm at 66.56 ms

CFC_180



NHTSA

Test Lab: CTF

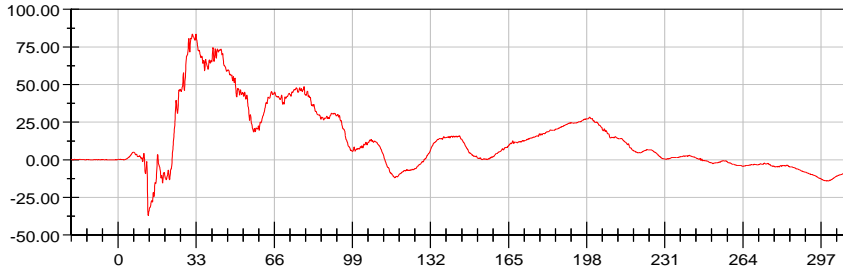
Test Number: 161116 (M20175106)

Test Date: 11/16/2016

Position #1 ES-2 Dummy with Rib Extension (F030)

Position #4 SID IIs Dummy (305)

Driver Anterior Abdominal Force (Y) (N) vs. Time [ms]



<Max>

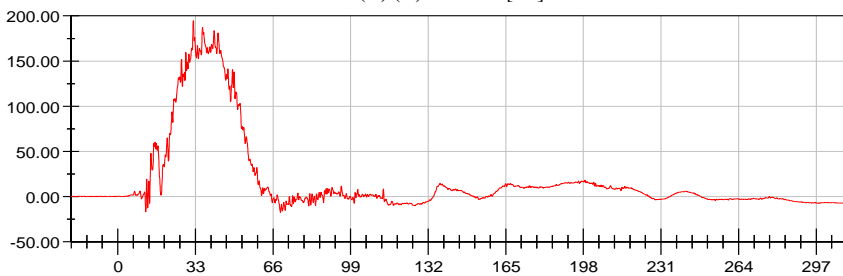
83.61 N at 32.88 ms

<Min>

-36.99 N at 12.72 ms

CFC_600

Driver Middle Abdominal Force (Y) (N) vs. Time [ms]



<Max>

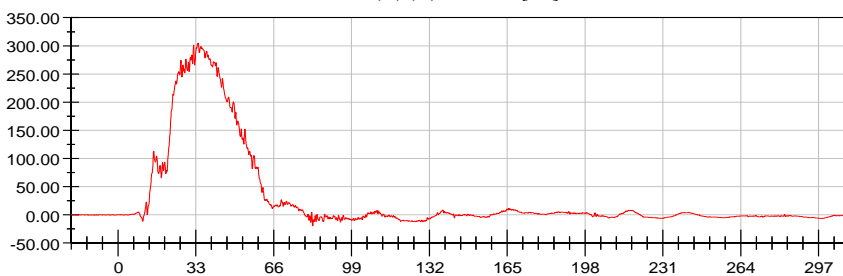
194.75 N at 32.08 ms

<Min>

-17.62 N at 69.12 ms

CFC_600

Driver Posterior Abdominal Force (Y) (N) vs. Time [ms]



<Max>

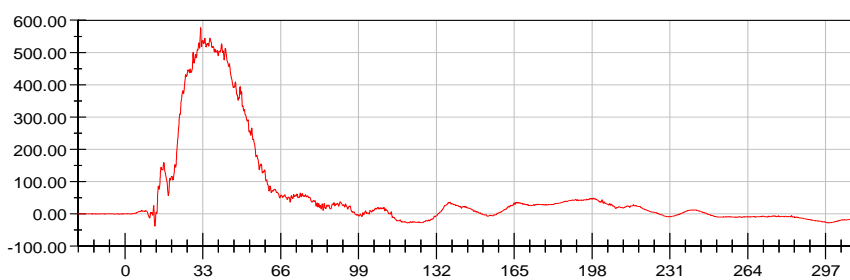
304.56 N at 33.92 ms

<Min>

-19.35 N at 82.56 ms

CFC_600

Driver Total Abdominal Force (Y) (N) vs. Time [ms]



<Max>

577.05 N at 32.08 ms

<Min>

-38.16 N at 12.64 ms

CFC_600



NHTSA

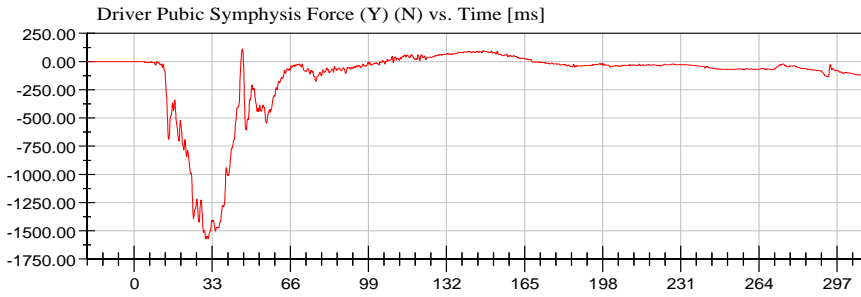
Test Lab: CTF

Test Number: 161116 (M20175106)

Test Date: 11/16/2016

Position #1 ES-2 Dummy with Rib Extension (F030)

Position #4 SID IIs Dummy (305)



<Max>

111.89 N at 45.76 ms

<Min>

-1,571.14 N at 30.32 ms

CFC_600



NHTSA

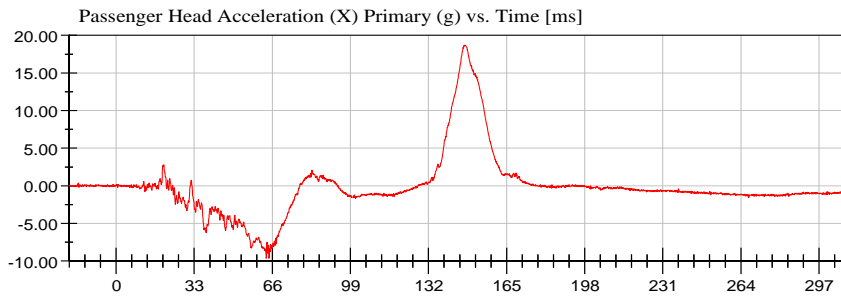
Test Lab: CTF

Test Number: 161116 (M20175106)

Test Date: 11/16/2016

Position #1 ES-2 Dummy with Rib Extension (F030)

Position #4 SID IIs Dummy (305)



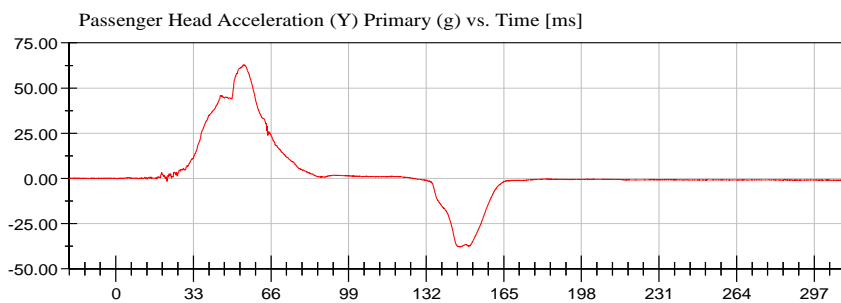
<Max>

18.69 g at 147.12 ms

<Min>

-9.63 g at 63.44 ms

CFC_1000



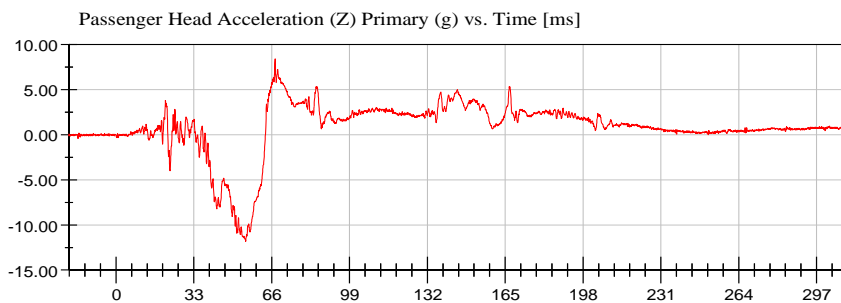
<Max>

62.89 g at 54.56 ms

<Min>

-38.08 g at 146.32 ms

CFC_1000



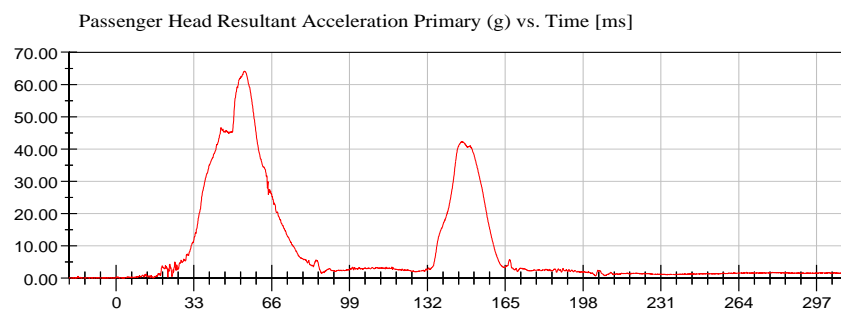
<Max>

8.42 g at 67.44 ms

<Min>

-11.82 g at 54.96 ms

CFC_1000



<Max>

64.18 g at 54.56 ms

<Min>

0.03 g at -19.04 ms

CFC_1000



NHTSA

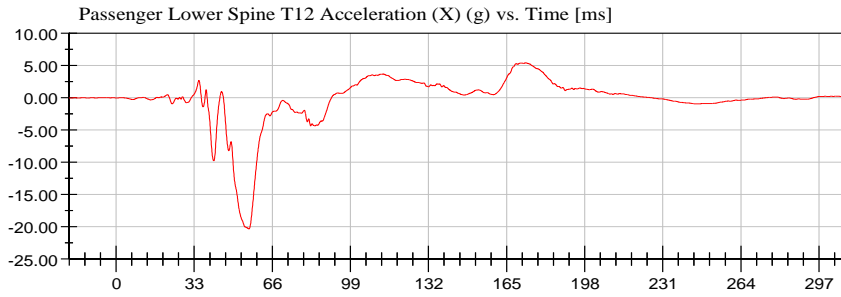
Test Lab: CTF

Test Number: 161116 (M20175106)

Test Date: 11/16/2016

Position #1 ES-2 Dummy with Rib Extension (F030)

Position #4 SID IIs Dummy (305)



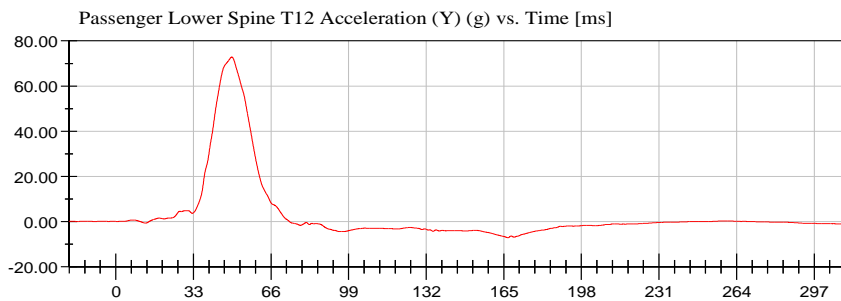
<Max>

5.43 g at 173.12 ms

<Min>

-20.32 g at 56.08 ms

CFC_180



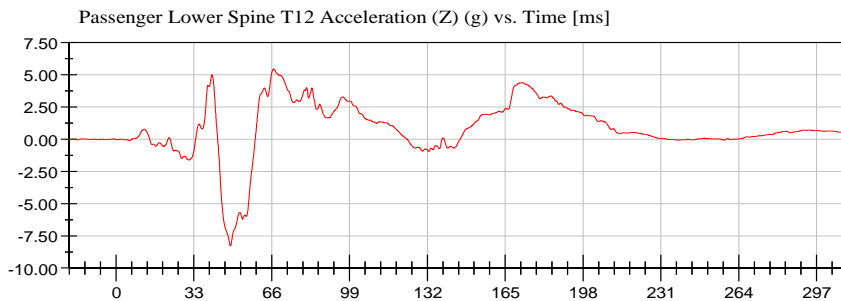
<Max>

72.86 g at 49.28 ms

<Min>

-7.20 g at 166.80 ms

CFC_180



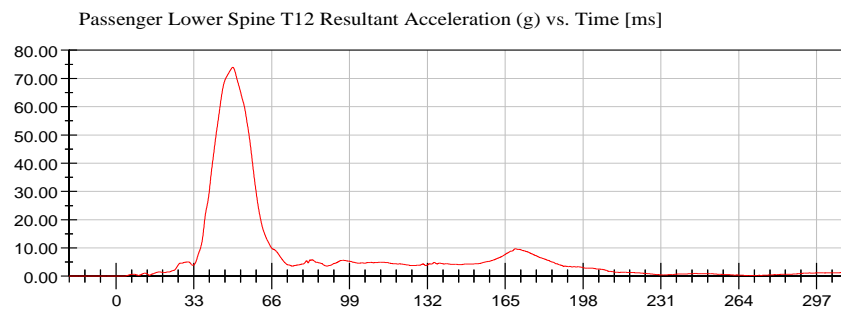
<Max>

5.46 g at 66.80 ms

<Min>

-8.29 g at 48.56 ms

CFC_180



<Max>

73.92 g at 49.44 ms

<Min>

0.01 g at -2.48 ms

CFC_180



NHTSA

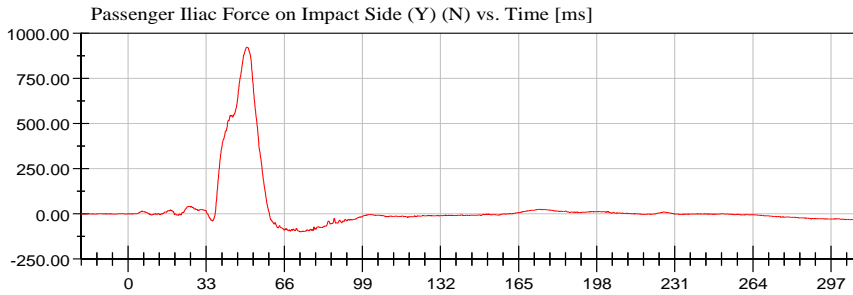
Test Lab: CTF

Test Number: 161116 (M20175106)

Test Date: 11/16/2016

Position #1 ES-2 Dummy with Rib Extension (F030)

Position #4 SID IIs Dummy (305)



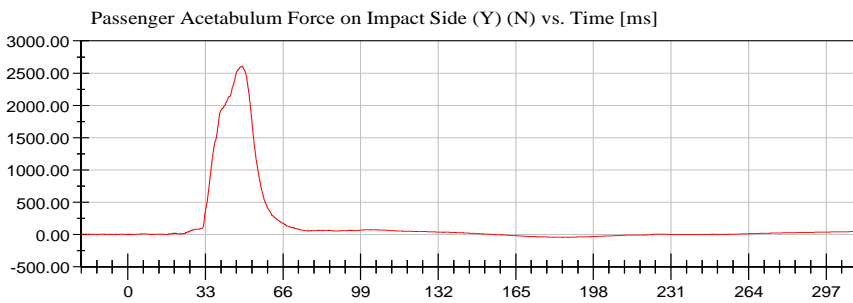
<Max>

923.00 N at 50.24 ms

<Min>

-99.05 N at 72.72 ms

CFC_600



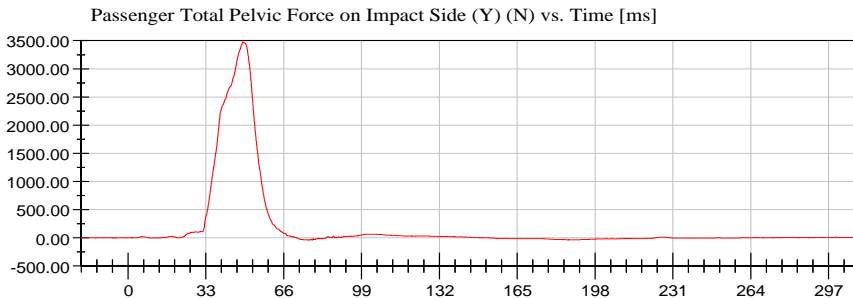
<Max>

2,607.66 N at 48.48 ms

<Min>

-47.49 N at 184.72 ms

CFC_600



<Max>

3,477.02 N at 48.80 ms

<Min>

-38.71 N at 76.56 ms

CFC_600



APPENDIX C
DUMMY PERFORMANCE CALIBRATION TEST DATA

TABLE OF CALIBRATION MEASUREMENTS AND PLOTS

ES-2re (Driver) Dummy

Description

Table 1. External Measurements

Table 2. Head Drop Test

- Head (X) Acceleration (G's) vs. Time (ms)
- Head (Y) Acceleration (G's) vs. Time (ms)
- Head (Z) Acceleration (G's) vs. Time (ms)
- Resultant Head Acceleration (G's) vs. Time (ms)

Table 3 Neck Pendulum Test

- Pendulum Velocity (m/s) vs. Time (ms)
- Flexion Angle (°) vs. Time (ms)
- Potentiometer A (°) vs. Time (ms)
- Potentiometer B (°) vs. Time (ms)
- Potentiometer C (°) vs. Time (ms)

Table 4. Shoulder Impact Test

- Impactor Acceleration (G's) vs. Time (ms)

Table 5. Thorax – Upper Rib Drop Test

- Upper Rib Displacement @ 459 mm Drop Height (mm) vs. Time (ms)
- Upper Rib Displacement @ 815 mm Drop Height (mm) vs. Time (ms)

Table 6. Thorax – Middle Rib Drop Test

- Middle Rib Displacement @ 459 mm Drop Height (mm) vs. Time (ms)
- Middle Rib Displacement @ 815 mm Drop Height (mm) vs. Time (ms)

Table 7. Thorax – Lower Rib Drop Test

- Lower Rib Displacement @ 459 mm Drop Height (mm) vs. Time (ms)
- Lower Rib Displacement @ 815 mm Drop Height (mm) vs. Time (ms)

Table 8. Thorax – Full Body Impact Test

- Pendulum Acceleration (G's) vs. Time (ms)
- Impactor Force (kN) vs. Time (ms)
- Upper Rib Displacement (mm) vs. Time (ms)
- Middle Rib Displacement (mm) vs. Time (ms)
- Lower Rib Displacement (mm) vs. Time (ms)

Table 9. Abdomen Impact Test

- Impactor Force (kN) vs. Time (ms)
- Front Abdomen Force (kN) vs. Time (ms)
- Middle Abdomen Force (kN) vs. Time (ms)
- Rear Abdomen Force (kN) vs. Time (ms)
- Total Abdomen Force (kN) vs. Time (ms)

Table 10. Lumbar Spine Flexion Test

- Pendulum Velocity (m/s) vs. Time (ms)
- Spine Flexion Angle (°) vs. Time (ms)
- Potentiometer A (°) vs. Time (ms)
- Potentiometer B (°) vs. Time (ms)
- Potentiometer C (°) vs. Time (ms)

Table 11. Pelvis Impact Test

- Pendulum Acceleration (G's) vs. Time (ms)
- Impactor Force (kN) vs. Time (ms)
- Pubic Symphysis (Y) Force (kN) vs. Time (ms)

TABLE OF CALIBRATION MEASUREMENTS AND PLOTS

SID-IIs (Rear Passenger) Dummy

Description

Table 1. External Measurements

Table 2. Head Drop Test

- Head (X) Acceleration (G's) vs. Time (ms)
- Head (Y) Acceleration (G's) vs. Time (ms)
- Head (Z) Acceleration (G's) vs. Time (ms)
- Resultant Head Acceleration (G's) vs. Time (ms)

Table 3. Lateral Neck Pendulum Test

- Pendulum Velocity (m/s) vs. Time (ms)
- Flexion Angle (°) vs. Time (ms)
- Moment About Occipital Condyle (Nm) vs. Time (ms)

Table 4. Shoulder Impact Test

- Impactor Acceleration (G's) vs. Time (ms)
- Shoulder Displacement (mm) vs. Time (ms)
- Upper Spine Acceleration (G's) vs. Time (ms)

Table 5. Thorax (With Arm) Impact Test

- Impactor Acceleration (G's) vs. Time (ms)
- Shoulder Displacement (mm) vs. Time (ms)
- Upper Rib Displacement (mm) vs. Time (ms)
- Middle Rib Displacement (mm) vs. Time (ms)
- Lower Rib Displacement (mm) vs. Time (ms)
- Upper Spine Acceleration (G's) vs. Time (ms)
- Lower Spine Acceleration (G's) vs. Time (ms)

Table 6. Thorax (Without Arm) Impact Test

- Impactor Acceleration (G's) vs. Time (ms)
- Upper Rib Displacement (mm) vs. Time (ms)
- Middle Rib Displacement (mm) vs. Time (ms)
- Lower Rib Displacement (mm) vs. Time (ms)
- Upper Spine Acceleration (G's) vs. Time (ms)
- Lower Spine Acceleration (G's) vs. Time (ms)

Table 7. Abdomen Impact Test

- Impactor Acceleration (G's) vs. Time (ms)
- Upper Abdominal Rib Displacement (mm) vs. Time (ms)
- Lower Abdominal Rib Displacement (mm) vs. Time (ms)
- Lower Spine Acceleration (G's) vs. Time (ms)

Table 8. Pelvis Plug Quasi-Static Test (Optional*)

Table 9. Pelvis Acetabulum Impact Test

- Impactor Acceleration (G's) vs. Time (ms)
- Pelvis (Y) Acceleration (G's) vs. Time (ms)
- Acetabulum Force (N) vs. Time (ms)

Table 10. Pelvis Iliac Impact Test

- Impactor Acceleration (G's) vs. Time (ms)
- Pelvis (Y) Acceleration (G's) vs. Time (ms)
- Iliac Force (N) vs. Time (ms)

Pre-Test Calibration Sheets
Driver S/N F030

Transportation Research Center Inc.
572U ES-2re Dummy
External Dimensions
Serial No. F030 Calibration No. 42

| Symbol | Description | Specification | Results | Pass |
|--------|--|---------------|---------|------|
| | | mm | mm | |
| 1 | Sitting Height | 900.0 - 918.0 | 910 | Yes |
| 2 | Seat to Shoulder Joint | 558.0 - 572.0 | 559 | Yes |
| 3 | Seat to Lower Face of Thoracic Spine Box | 346.0 - 356.0 | 350 | Yes |
| 4 | Seat to Hip Joint (center of bolt) | 97.0 - 103.0 | 98 | Yes |
| 5 | Sole to Seat, Sitting | 433.0 - 451.0 | 444 | Yes |
| 6 | Head Width | 152.0 - 158.0 | 155 | Yes |
| 7 | Shoulder/Arm Width | 461.0 - 479.0 | 475 | Yes |
| 8 | Thorax Width | 322.0 - 332.0 | 326 | Yes |
| 9 | Abdomen Width | 273.0 - 287.0 | 280 | Yes |
| 10 | Pelvis Lap Width | 359.0 - 373.0 | 365 | Yes |
| 11 | Head Depth | 196.0 - 206.0 | 204 | Yes |
| 12 | Thorax Depth | 262.0 - 272.0 | 263 | Yes |
| 13 | Abdomen Depth | 194.0 - 204.0 | 200 | Yes |
| 14 | Pelvis Depth | 235.0 - 245.0 | 240 | Yes |
| 15 | Back of Buttocks to Hip Joint (center of bolt) | 150.0 - 160.0 | 158 | Yes |
| 16 | Back of Buttocks to Front of Knee | 597.0 - 615.0 | 605 | Yes |



Baseline 10/07/05

Transportation Research Center Inc.

Left Lateral Head Drop
ES-2re Serial No. F030 Certification No. 42-4
Test Date: 11/15/2016

| Test Parameter | Specification | Test Results | Pass |
|---|----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.6 °C | Yes |
| Relative Humidity | 10 - 70 % | 24 % | Yes |
| Peak Resultant Acceleration | 125 - 155 g | 142.0 g | Yes |
| Peak Longitudinal Acceleration | (-15) - 15 g | 7.5 g | Yes |
| Is Resultant Acceleration Curve Unimodal within 15% of Main Pulse? | Yes | Yes | Yes |

Test meets specifications.

Comments:

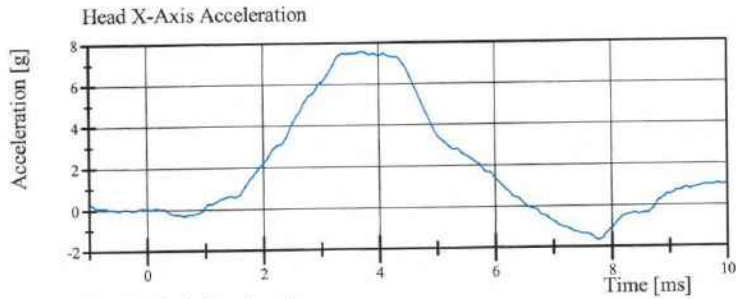
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.15.2016 10:10:09 361

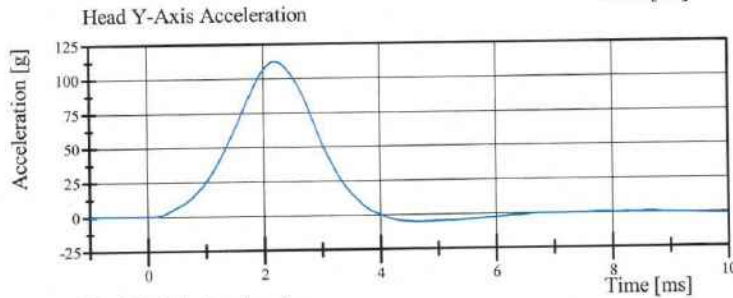


Transportation Research Center Inc.

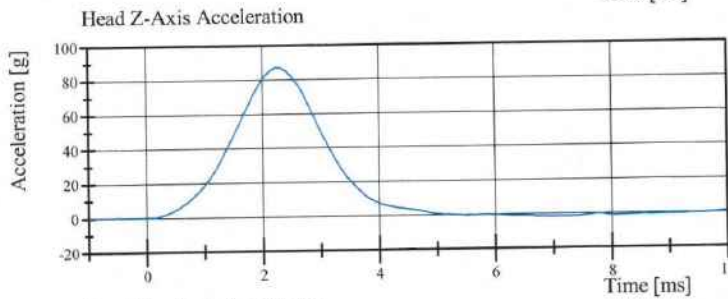
Left Lateral Head Drop
ES-2re Serial No. F030 Certification No. 42-4
Test Date: 11/15/2016



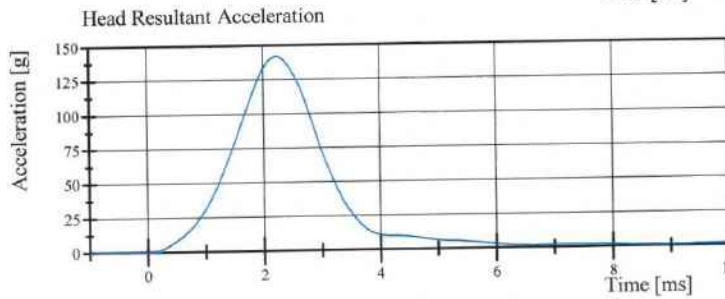
Filter Class: CFC_1000
Max: 7.5 g at 3.7 ms
Min: -1.7 g at 7.8 ms



Filter Class: CFC_1000
Max: 112.3 g at 2.2 ms
Min: -5.4 g at 4.7 ms



Filter Class: CFC_1000
Max: 86.9 g at 2.2 ms
Min: -1.5 g at 7.0 ms



Filter Class: CFC_1000
Max: 142.0 g at 2.2 ms
Min: 0.0 g at -0.6 ms

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

11.15.2016 10:10:18 361



Transportation Research Center Inc.

Left Lateral Neck

ES-2re Serial No. F030 Certification No. 42-1

Test Date: 11/14/2016

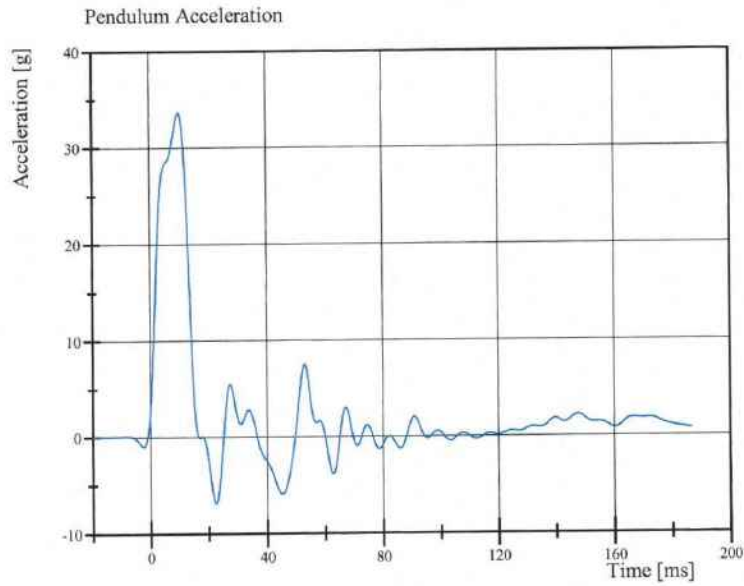
| Test Parameter | Specification | Test Results | Pass |
|--|---------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.1 °C | Yes |
| Relative Humidity | 10 - 70 % | 23 % | Yes |
| Pendulum Integrated Velocity Change within Corridor | Yes | Yes | Yes |
| Pendulum Velocity | (-3.3) - (-3.5) m/s | -3.37 m/s | Yes |
| Maximum Headform Flexion | | | |
| Peak | (-49) - (-59) deg | -54.1 deg | Yes |
| Time of Peak | 54 - 66 ms | 60.4 ms | Yes |
| Headform Flexion Decay | | | |
| - Peak to Zero | 53 - 88 ms | 63.8 ms | Yes |

Test meets specifications.

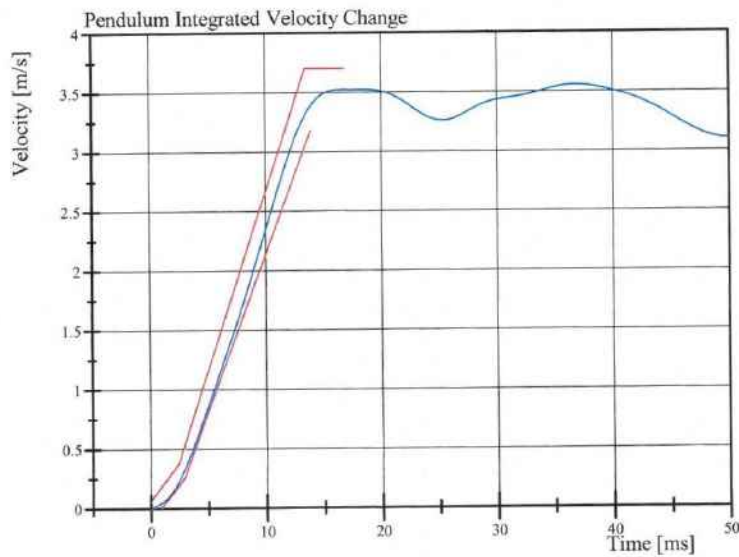
Comments:

Transportation Research Center Inc.

Left Lateral Neck
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016



Filter Class: CFC_60
Max: 33.6 g at 10.1 ms
Min: -7.0 g at 22.6 ms



Filter Class: CFC_60
Max: 3.6 m/s at 36.8 ms
Min: 0.0 m/s at 0.0 ms

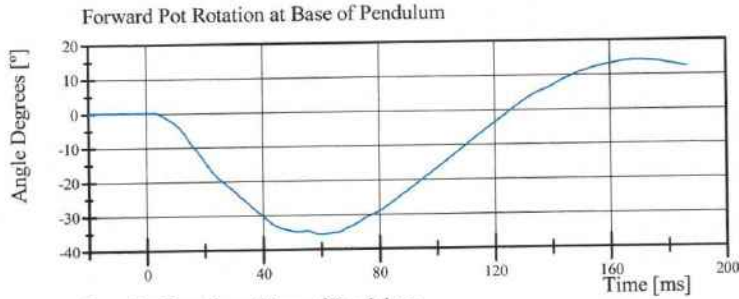
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.14.2016 14:42:34 1494

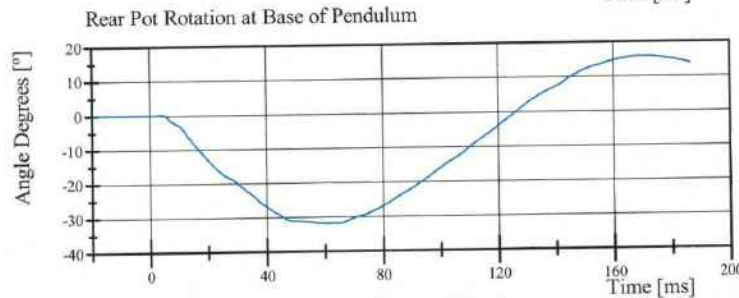


Transportation Research Center Inc.

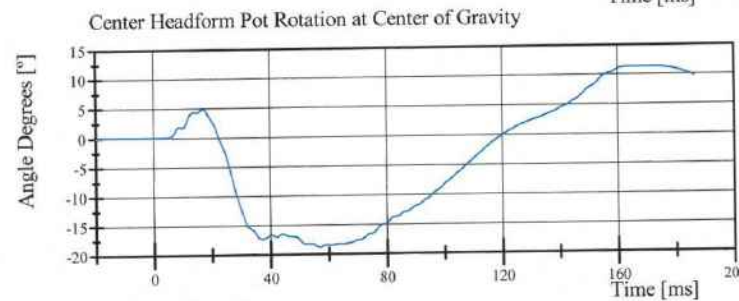
Left Lateral Neck
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016



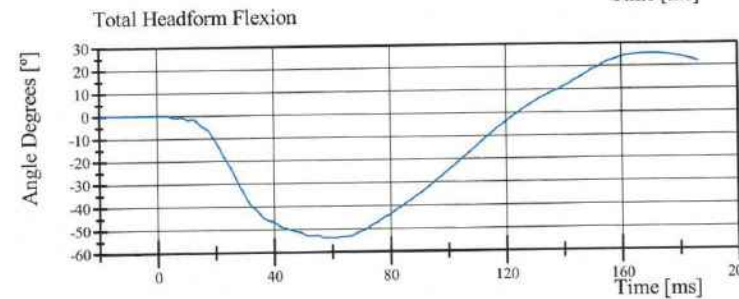
Filter Class: CFC_180
Max: 14.1 ° at 169.0 ms
Min: -35.7 ° at 60.0 ms



Filter Class: CFC_180
Max: 16.0 ° at 170.8 ms
Min: -31.9 ° at 61.0 ms



Filter Class: CFC_180
Max: 11.3 ° at 169.6 ms
Min: -18.9 ° at 56.9 ms



Filter Class: CFC_180
Max: 25.5 ° at 169.1 ms
Min: -54.1 ° at 60.4 ms

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

11.14.2016 14:42:35 1494



Transportation Research Center Inc.

Left Lateral Shoulder
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016

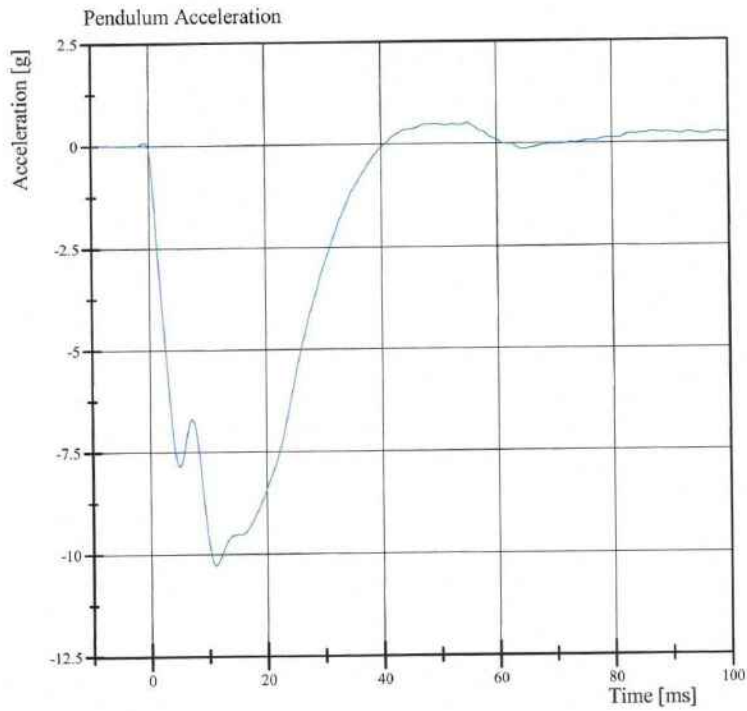
| Test Parameter | Specification | Test Results | Pass |
|-------------------------|--------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.1 °C | Yes |
| Relative Humidity | 10 - 70 % | 22 % | Yes |
| Test Probe Velocity | 4.2 - 4.4 m/s | 4.28 m/s | Yes |
| Test Probe Acceleration | (-7.5) - (-10.5) g | -10.29 g | Yes |

Test meets specifications.

Comments:

Transportation Research Center Inc.

Left Lateral Shoulder
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016



Filter Class: CFC_180
Max: 0.5 g at 55.0 ms
Min: -10.3 g at 11.2 ms

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

11.14.2016 15:38:56 542



Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016

| Test Parameter | Specification | Test Results | Pass |
|---|----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.7 °C | Yes |
| Relative Humidity | 10 - 70 % | 21 % | Yes |
| 3.0 m/s Test Rib Displacement (454 mm to 464 mm) | 36 - 40 mm | 36.4 mm | Yes |

Test meets specifications.

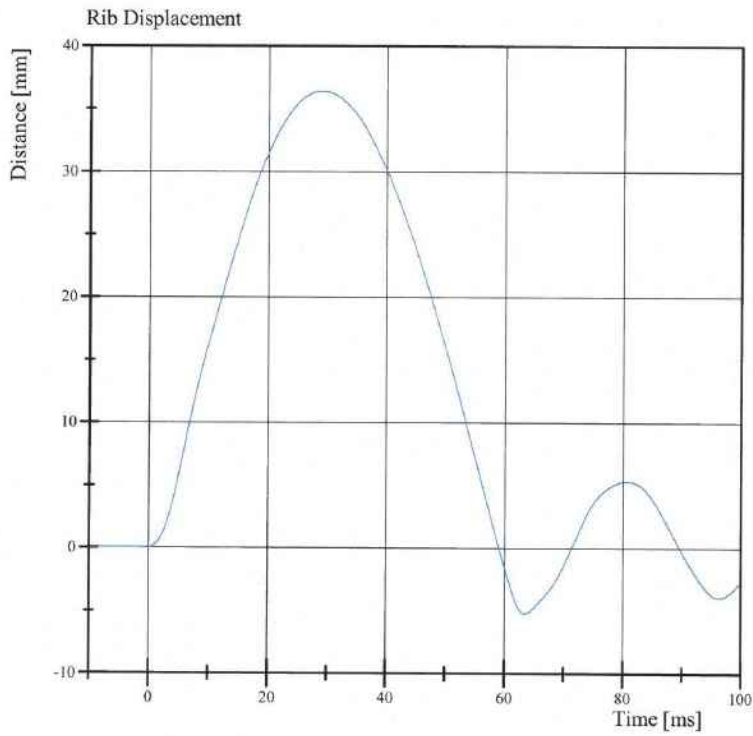
Comments:

Drop Height: 462



Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016



Filter Class: CFC_180
Max: 36.4 mm at 29.0 ms
Min: -5.2 mm at 63.5 ms



Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016

| Test Parameter | Specification | Test Results | Pass |
|---|----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.6 °C | Yes |
| Relative Humidity | 10 - 70 % | 21 % | Yes |
| 4.0 m/s Test Rib Displacement (807 mm to 823 mm) | 46 - 51 mm | 46.4 mm | Yes |

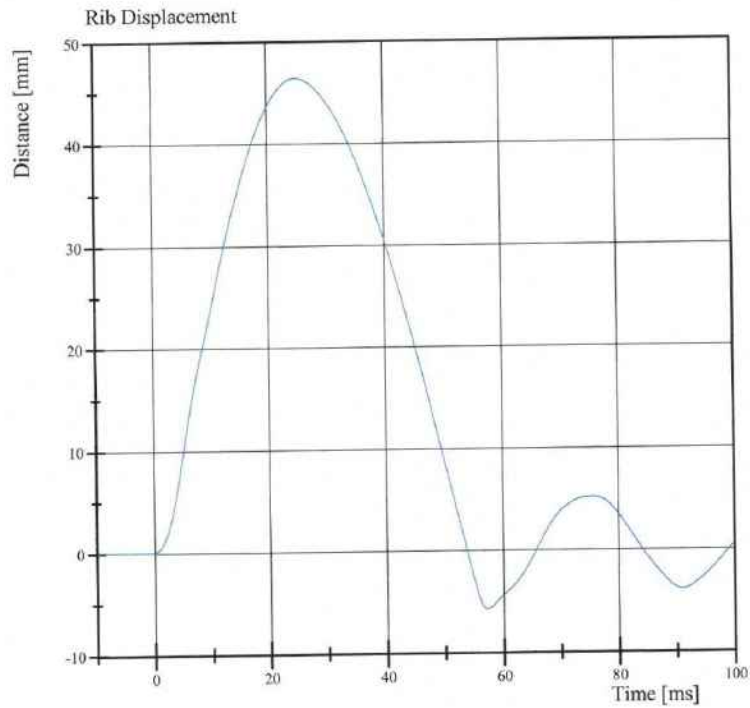
Test meets specifications.

Comments:

Drop Height: 816

Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016



Filter Class: CFC_180
Max: 46.4 mm at 25.1 ms
Min: -5.7 mm at 57.3 ms

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

11.14.2016 12:52:32 703



Transportation Research Center Inc.

3.0 m/s Center Full Rib Module
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016

| Test Parameter | Specification | Test Results | Pass |
|---|----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 22 % | Yes |
| 3.0 m/s Test Rib Displacement (454 mm to 464 mm) | 36 - 40 mm | 36.7 mm | Yes |

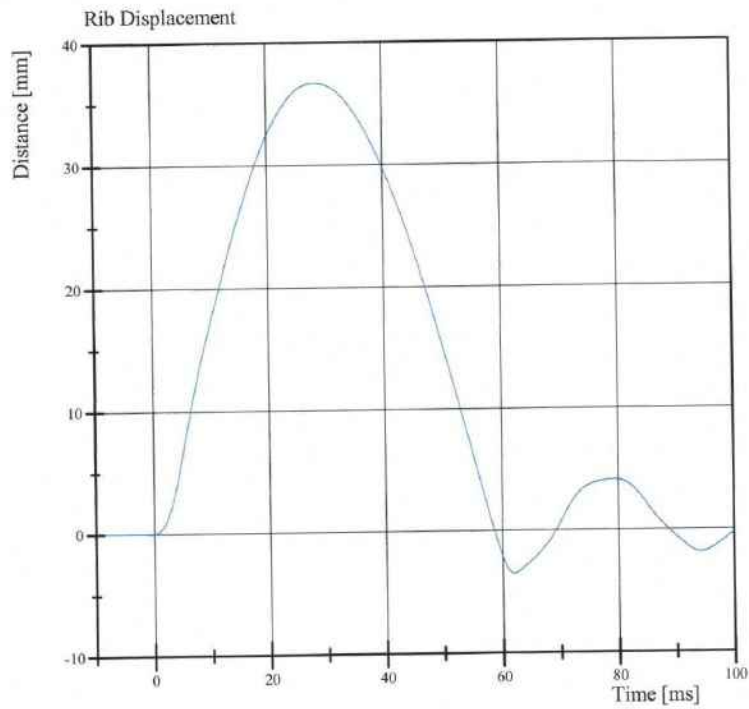
Test meets specifications.

Comments:

Drop Height: 462

Transportation Research Center Inc.

3.0 m/s Center Full Rib Module
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016



Filter Class: CFC_180
Max: 36.7 mm at 28.5 ms
Min: -3.5 mm at 62.0 ms

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

11.14.2016 13:16:52 879



Transportation Research Center Inc.

4.0 m/s Center Full Rib Module
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016

| Test Parameter | Specification | Test Results | Pass |
|---|----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.7 °C | Yes |
| Relative Humidity | 10 - 70 % | 21 % | Yes |
| 4.0 m/s Test Rib Displacement (807 mm to 823 mm) | 46 - 51 mm | 47.9 mm | Yes |

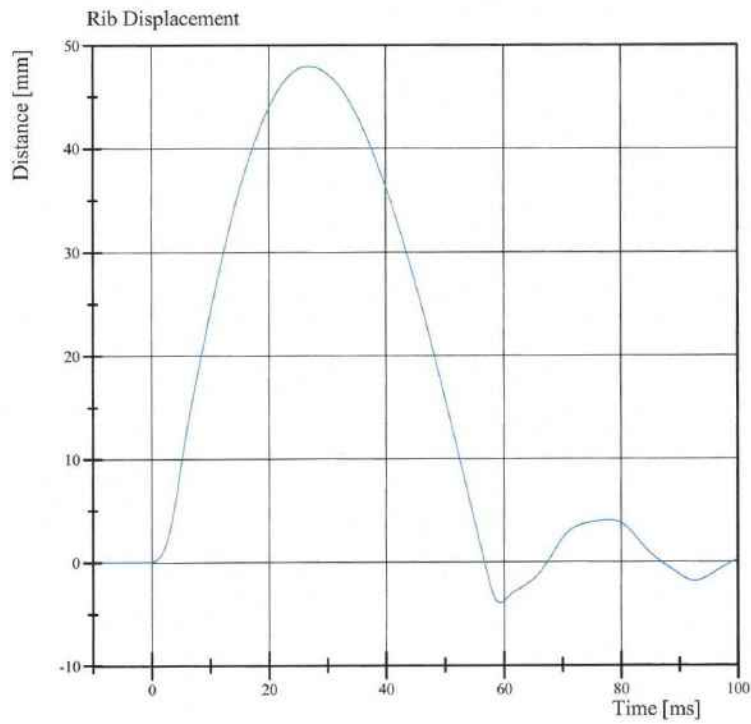
Test meets specifications.

Comments:

Drop Height: 816

Transportation Research Center Inc.

4.0 m/s Center Full Rib Module
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016



Filter Class: CFC_180
Max: 47.9 mm at 26.9 ms
Min: -3.9 mm at 59.4 ms

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

11.14.2016 13:09:05 693



Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016

| Test Parameter | Specification | Test Results | Pass |
|---|----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 22 % | Yes |
| 3.0 m/s Test Rib Displacement (454 mm to 464 mm) | 36 - 40 mm | 36.3 mm | Yes |

Test meets specifications.

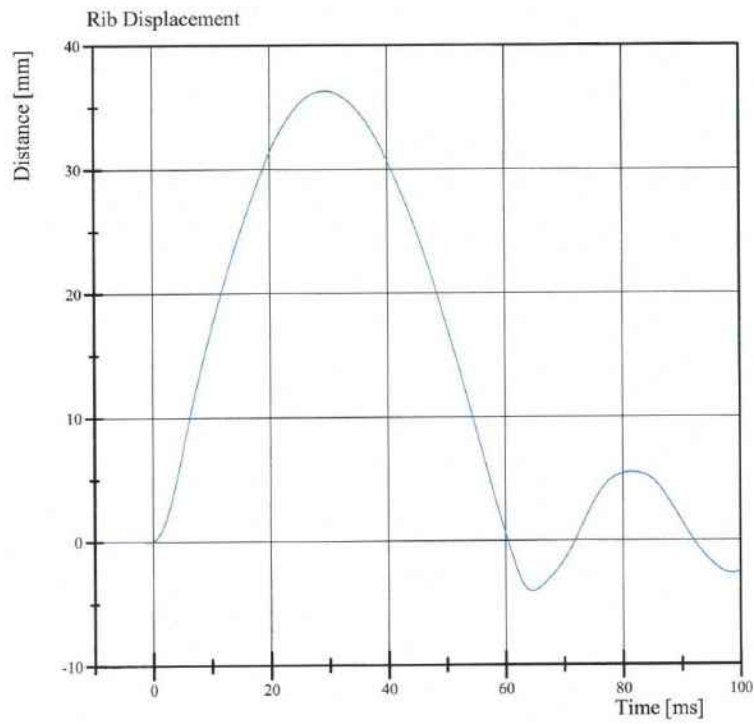
Comments:

Drop Height: 462



Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016



Filter Class: CFC_180
Max: 36.3 mm at 29.6 ms
Min: -4.0 mm at 64.6 ms

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

11.14.2016 13:33:39.870



Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016

| Test Parameter | Specification | Test Results | Pass |
|---|----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 22 % | Yes |
| 4.0 m/s Test Rib Displacement (807 mm to 823 mm) | 46 - 51 mm | 47.5 mm | Yes |

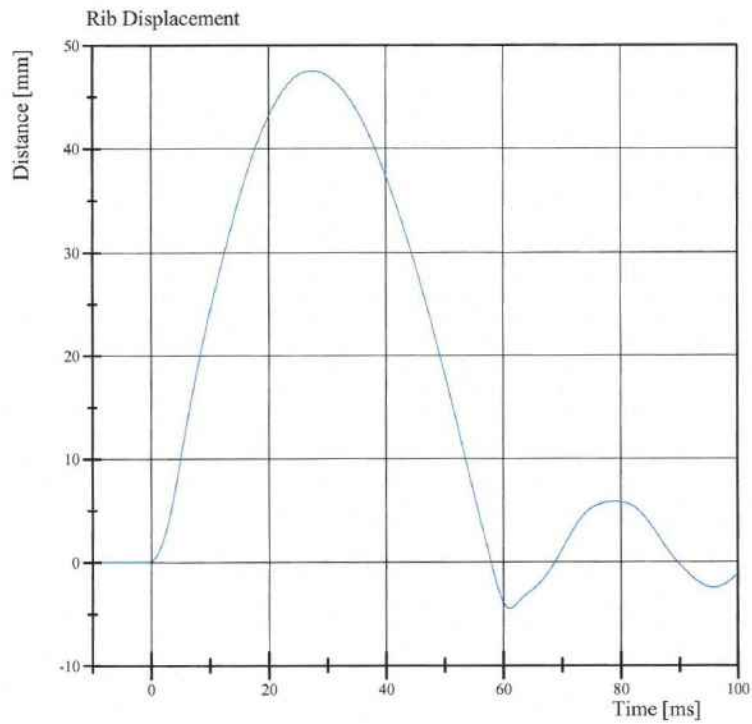
Test meets specifications.

Comments:

Drop Height: 816

Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016



Filter Class: CFC_180
Max: 47.5 mm at 27.6 ms
Min: -4.5 mm at 61.1 ms

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

11.14.2016 13:25:14 679



Transportation Research Center Inc.

Left Lateral Thorax

ES-2re Serial No. F030 Certification No. 42-1

Test Date: 11/14/2016

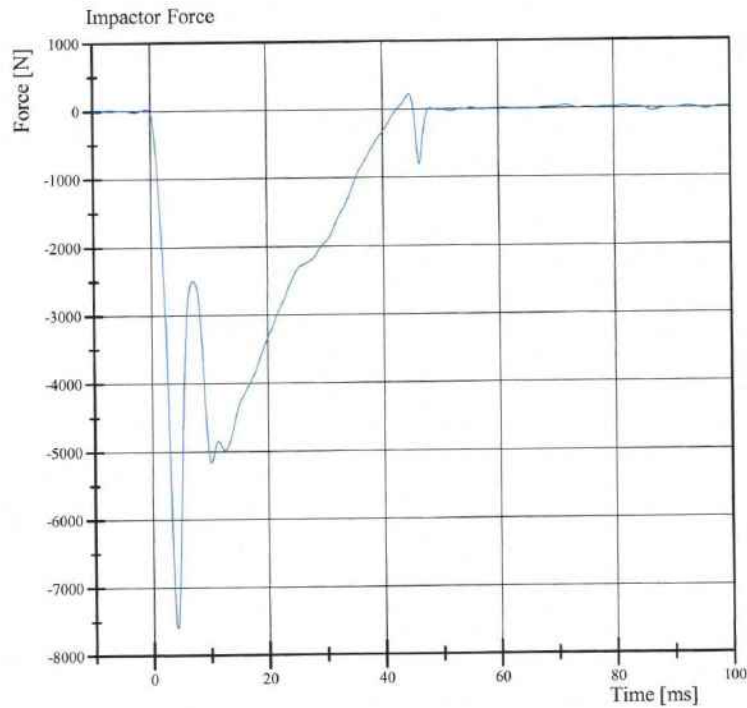
| Test Parameter | Specification | Test Results | Pass |
|--------------------------------|-----------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.4 °C | Yes |
| Relative Humidity | 10 - 70 % | 22 % | Yes |
| Impactor Velocity | 5.4 - 5.60 m/s | 5.553 m/s | Yes |
| Peak Impactor Force after 6 ms | (-5,100) - (-6,200) N | -5,172.6 N | Yes |
| Upper Rib Displacement | 34 - 41 mm | 36.8 mm | Yes |
| Center Rib Displacement | 37 - 45 mm | 41.9 mm | Yes |
| Lower Rib Displacement | 37 - 44 mm | 41.1 mm | Yes |

Test meets specifications.

Comments:

Transportation Research Center Inc.

Left Lateral Thorax
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016



Filter Class: CFC_180
Max: 220.1 N at 44.6 ms
Min: -7,608.6 N at 4.2 ms

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

11.14.2016 15:47:53 432

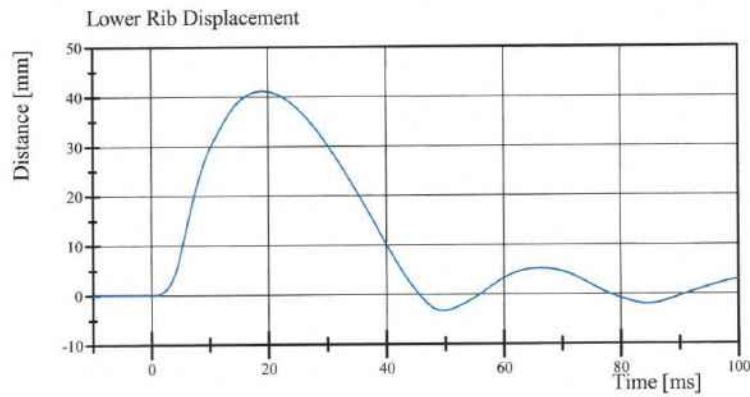
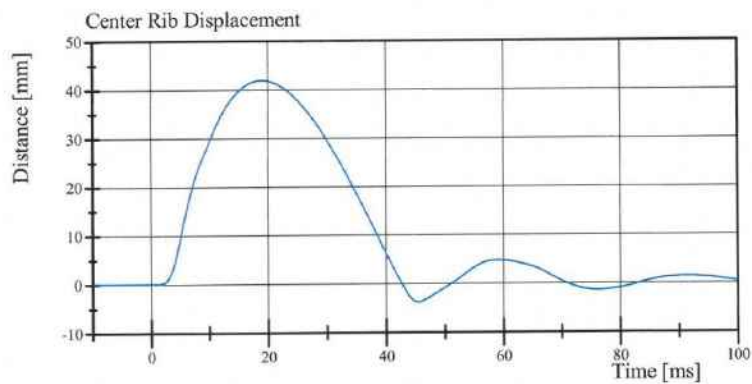
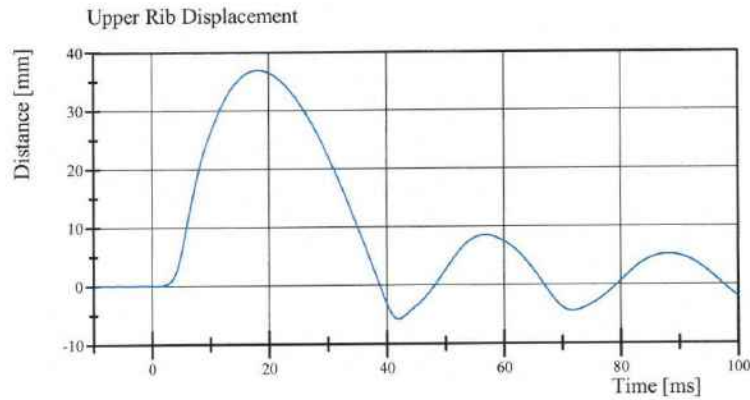


Transportation Research Center Inc.

Left Lateral Thorax

ES-2re Serial No. F030 Certification No. 42-1

Test Date: 11/14/2016



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

11.14.2016 15:47:55 432



Transportation Research Center Inc.

Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016

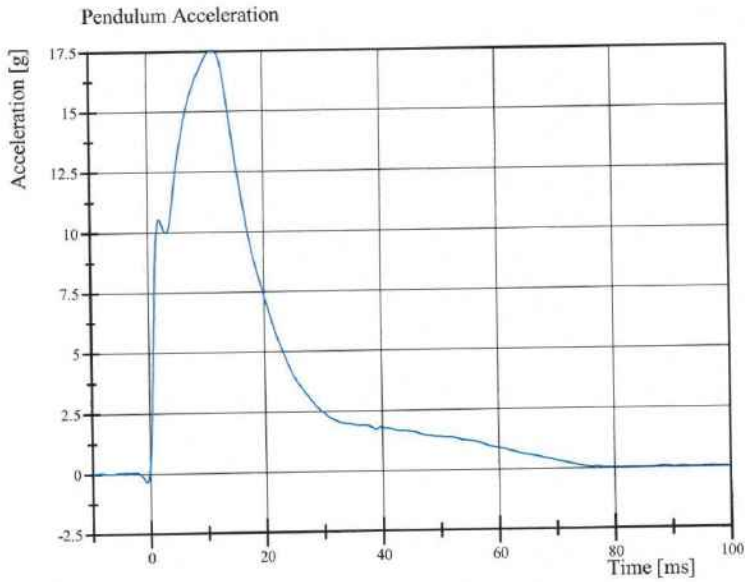
| Test Parameter | Specification | Test Results | Pass |
|-----------------------|-----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.7 °C | Yes |
| Relative Humidity | 10 - 70 % | 22 % | Yes |
| Test Probe Velocity | 3.9 - 4.1 m/s | 4.06 m/s | Yes |
| Test Probe Force | | | |
| Peak | 4,000 - 4,800 N | 4,010.6 N | Yes |
| Time of Peak | 10.6 - 13.0 ms | 11.36 ms | Yes |
| Total Abdominal Force | | | |
| Peak | 2,200 - 2,700 N | 2,382.3 N | Yes |
| Time of Peak | 10.0 - 12.3 ms | 11.04 ms | Yes |

Test meets specifications.

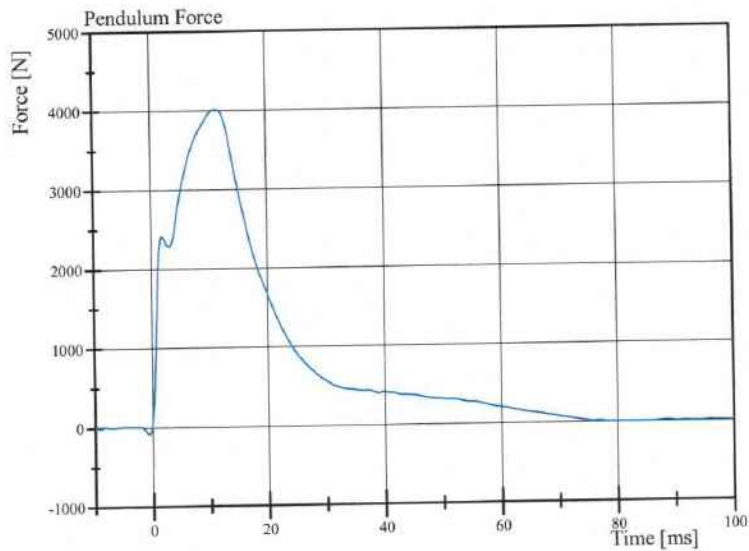
Comments:

Transportation Research Center Inc.

Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016



Filter Class: CFC_180
Max: 17.5 g at 11.4 ms
Min: -0.4 g at -0.6 ms



Filter Class: CFC_180
Max: 4,010.6 N at 11.4 ms
Min: -85.7 N at -0.6 ms

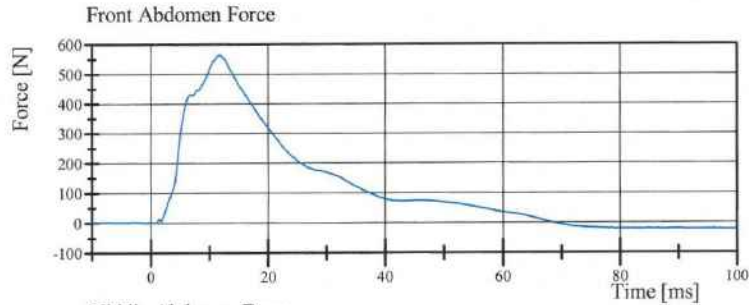
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

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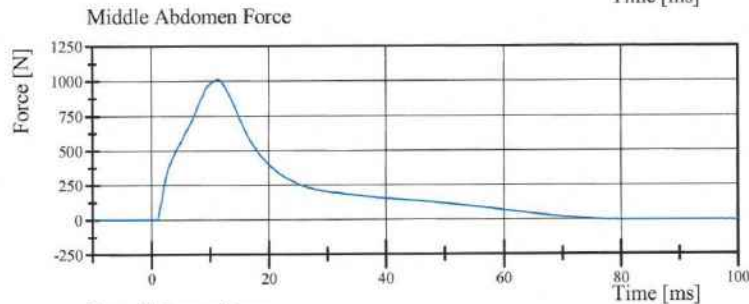


Transportation Research Center Inc.

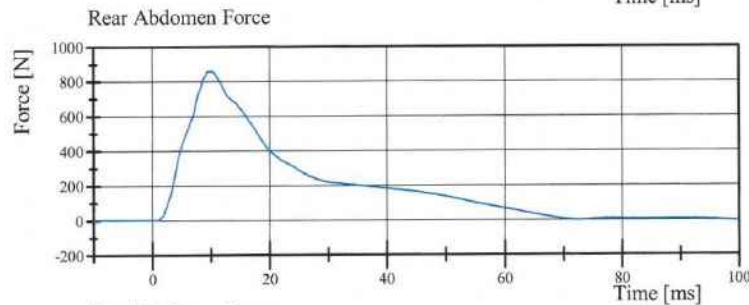
Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016



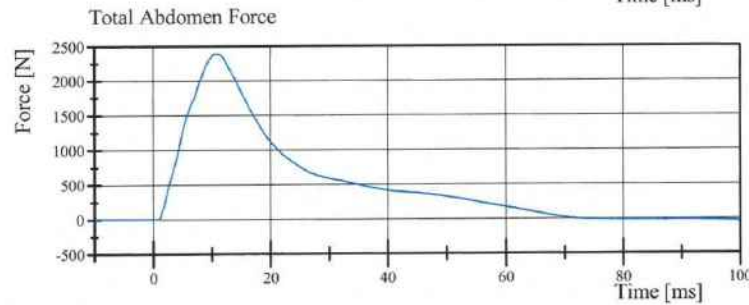
Filter Class: CFC_600
Max: 562.8 N at 11.8 ms
Min: -21.6 N at 98.1 ms



Filter Class: CFC_600
Max: 1,008.7 N at 11.4 ms
Min: -3.8 N at 99.2 ms



Filter Class: CFC_600
Max: 860.4 N at 10.2 ms
Min: -4.2 N at 100.0 ms



Filter Class: CFC_600
Max: 2,382.3 N at 11.0 ms
Min: -29.1 N at 99.6 ms

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

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Transportation Research Center Inc.

Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 42-6
Test Date: 11/14/2016

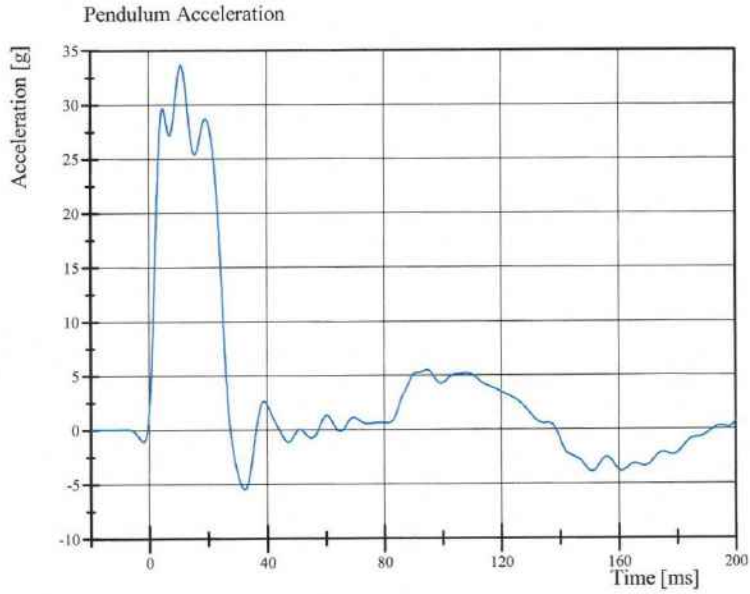
| Test Parameter | Specification | Test Results | Pass |
|--|-----------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 22.0 °C | Yes |
| Relative Humidity | 10 - 70 % | 22 % | Yes |
| Pendulum Integrated Velocity Change within Corridor | Yes | Yes | Yes |
| Pendulum Velocity | (-5.95) - (-6.15) m/s | -6.114 m/s | Yes |
| Maximum Headform Flexion | | | |
| Peak | (-45) - (-55) deg | -51.2 deg | Yes |
| Time of Peak | 39 - 53 ms | 45.5 ms | Yes |
| Headform Flexion Decay | | | |
| - Peak to Zero | 37 - 57 ms | 37.1 ms | Yes |

Test meets specifications.

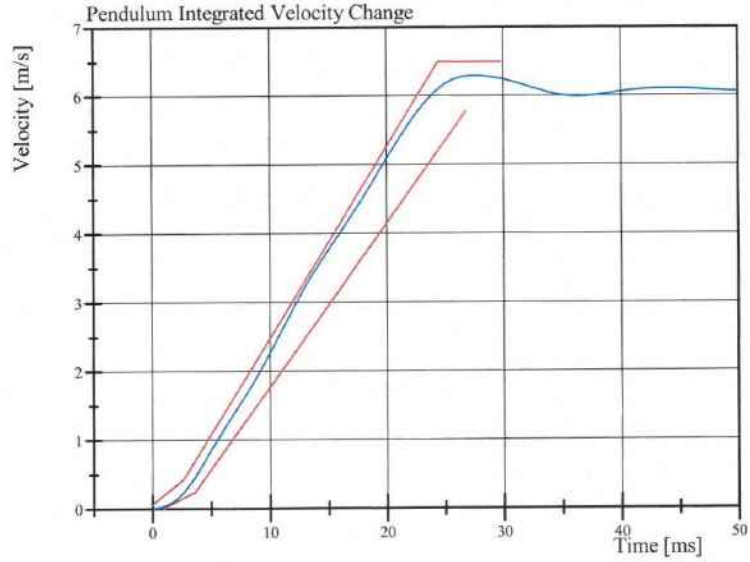
Comments:

Transportation Research Center Inc.

Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 42-6
Test Date: 11/14/2016



Filter Class: CFC_60
Max: 33.6 g at 11.0 ms
Min: -5.5 g at 32.4 ms



Filter Class: CFC_60
Max: 6.3 m/s at 27.6 ms
Min: 0.0 m/s at 0.0 ms

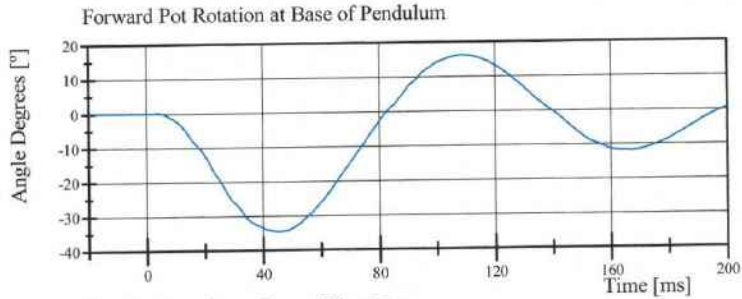
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

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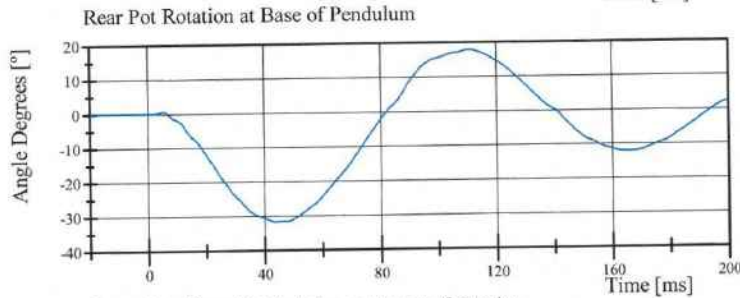


Transportation Research Center Inc.

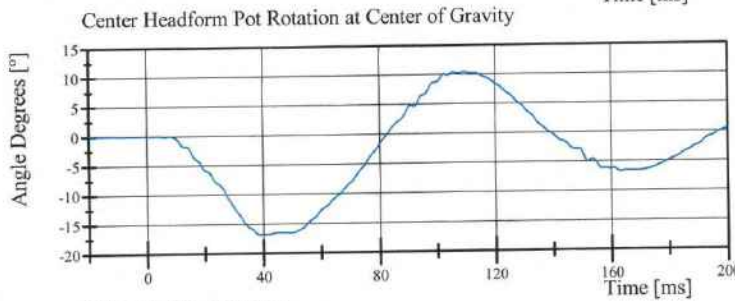
Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 42-6
Test Date: 11/14/2016



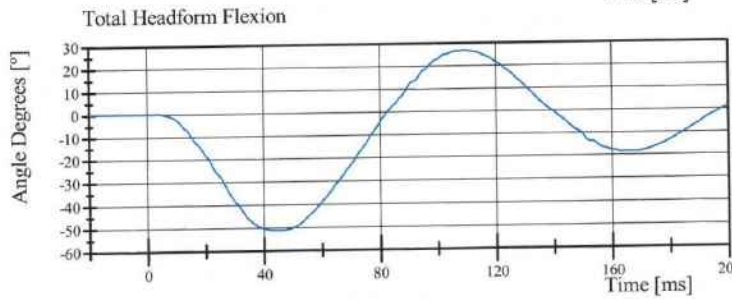
Filter Class: CFC_180
Max: 16.3 ° at 108.9 ms
Min: -34.6 ° at 45.4 ms



Filter Class: CFC_180
Max: 17.9 ° at 110.8 ms
Min: -31.7 ° at 44.0 ms



Filter Class: CFC_180
Max: 10.5 ° at 109.4 ms
Min: -16.9 ° at 39.0 ms



Filter Class: CFC_180
Max: 26.7 ° at 109.2 ms
Min: -51.2 ° at 45.5 ms

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

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Transportation Research Center Inc.

Left Lateral Pelvis
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016

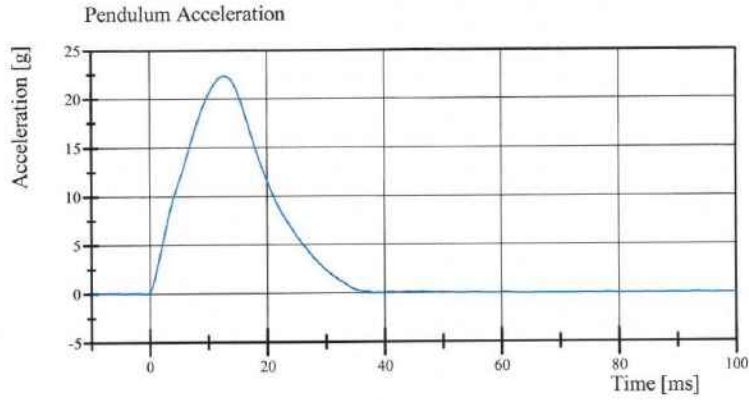
| Test Parameter | Specification | Test Results | Pass |
|-----------------------|-----------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 22 % | Yes |
| Test Probe Velocity | 4.2 - 4.4 m/s | 4.32 m/s | Yes |
| Test Probe Force | | | |
| Peak | 4,700 - 5,400 N | 5,118.4 N | Yes |
| Time of Peak | 11.8 - 16.1 ms | 12.80 ms | Yes |
| Pubic Symphysis Force | | | |
| Peak | (-1,230) - (-1,590) N | -1,297.4 N | Yes |
| Time of Peak | 12.2 - 17.0 ms | 13.28 ms | Yes |

Test meets specifications.

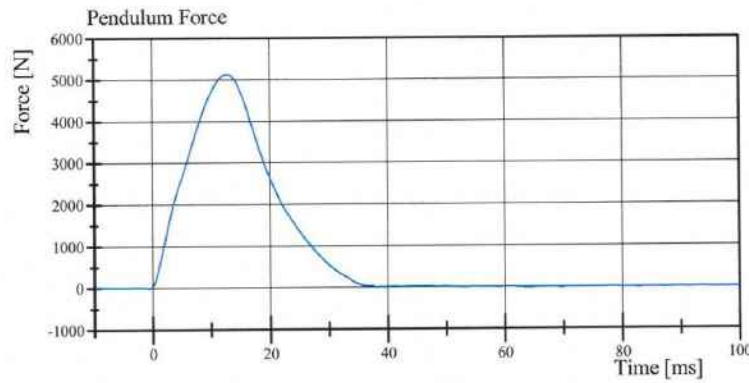
Comments:

Transportation Research Center Inc.

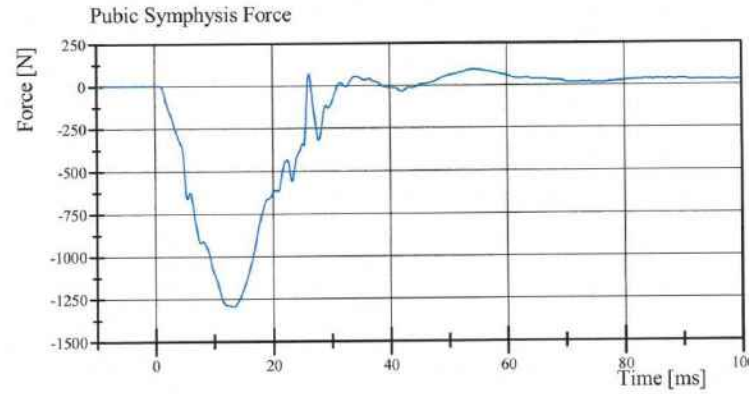
Left Lateral Pelvis
ES-2re Serial No. F030 Certification No. 42-1
Test Date: 11/14/2016



Filter Class: CFC_180
Max: 22.3 g at 12.8 ms
Min: -0.1 g at 64.2 ms



Filter Class: CFC_180
Max: 5,118.4 N at 12.8 ms
Min: -13.0 N at 64.2 ms



Filter Class: CFC_600
Max: 93.0 N at 54.4 ms
Min: -1,297.4 N at 13.3 ms

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

11.14.2016 16:02:48 524.



**Post-Test Calibration Sheets
Driver S/N F030**

Transportation Research Center Inc.
572U ES-2re Dummy
External Dimensions
Serial No. F030 Calibration No. 43

| Symbol | Description | Specification | Results | Pass |
|--------|--|---------------|---------|------|
| | | mm | mm | |
| 1 | Sitting Height | 900.0 - 918.0 | 910 | Yes |
| 2 | Seat to Shoulder Joint | 558.0 - 572.0 | 559 | Yes |
| 3 | Seat to Lower Face of Thoracic Spine Box | 346.0 - 356.0 | 350 | Yes |
| 4 | Seat to Hip Joint (center of bolt) | 97.0 - 103.0 | 98 | Yes |
| 5 | Sole to Seat, Sitting | 433.0 - 451.0 | 444 | Yes |
| 6 | Head Width | 152.0 - 158.0 | 155 | Yes |
| 7 | Shoulder/Arm Width | 461.0 - 479.0 | 475 | Yes |
| 8 | Thorax Width | 322.0 - 332.0 | 326 | Yes |
| 9 | Abdomen Width | 273.0 - 287.0 | 280 | Yes |
| 10 | Pelvis Lap Width | 359.0 - 373.0 | 365 | Yes |
| 11 | Head Depth | 196.0 - 206.0 | 204 | Yes |
| 12 | Thorax Depth | 262.0 - 272.0 | 263 | Yes |
| 13 | Abdomen Depth | 194.0 - 204.0 | 200 | Yes |
| 14 | Pelvis Depth | 235.0 - 245.0 | 240 | Yes |
| 15 | Back of Buttocks to Hip Joint (center of bolt) | 150.0 - 160.0 | 158 | Yes |
| 16 | Back of Buttocks to Front of Knee | 597.0 - 615.0 | 605 | Yes |



Baseline 10/07/05

Transportation Research Center Inc.

Left Lateral Head Drop

ES-2re Serial No. F030 Certification No. 43-3

Test Date: 11/18/2016

| Test Parameter | Specification | Test Results | Pass |
|---|----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.6 °C | Yes |
| Relative Humidity | 10 - 70 % | 39 % | Yes |
| Peak Resultant Acceleration | 125 - 155 g | 139.4 g | Yes |
| Peak Longitudinal Acceleration | (-15) - 15 g | 9.5 g | Yes |
| Is Resultant Acceleration Curve Unimodal within 15% of Main Pulse? | Yes | Yes | Yes |

Test meets specifications.

Comments:

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

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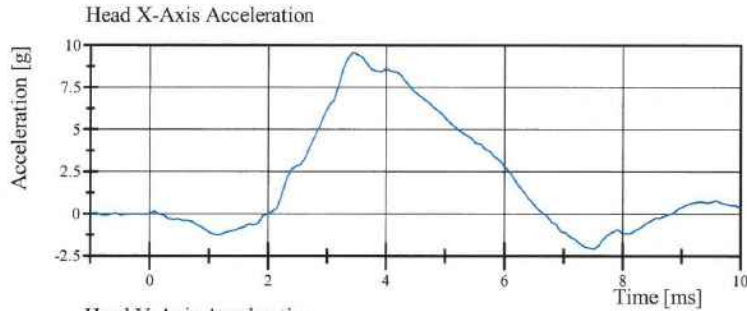


Transportation Research Center Inc.

Left Lateral Head Drop

ES-2re Serial No. F030 Certification No. 43-3

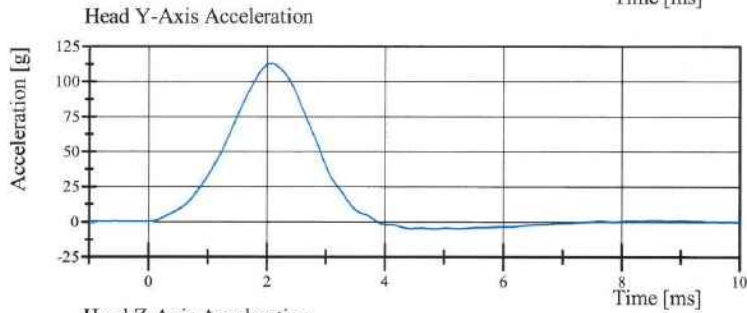
Test Date: 11/18/2016



Filter Class: CFC_1000

Max: 9.5 g at 3.4 ms

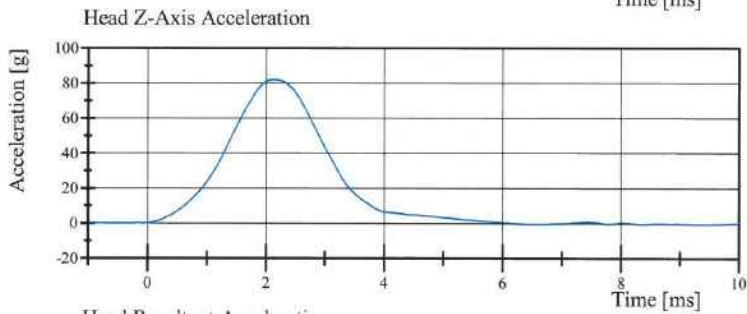
Min: -2.1 g at 7.5 ms



Filter Class: CFC_1000

Max: 112.8 g at 2.1 ms

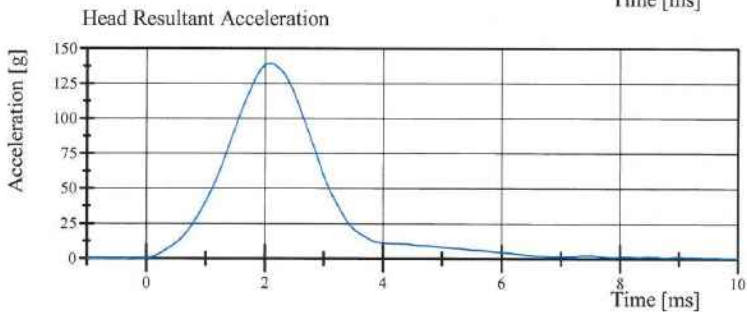
Min: -5.1 g at 4.8 ms



Filter Class: CFC_1000

Max: 81.9 g at 2.1 ms

Min: -0.4 g at 6.6 ms



Filter Class: CFC_1000

Max: 139.4 g at 2.1 ms

Min: 0.0 g at -0.6 ms

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

11.18.2016 10:12:27 362



Transportation Research Center Inc.

Left Lateral Neck

ES-2re Serial No. F030 Certification No. 43-1

Test Date: 11/17/2016

| Test Parameter | Specification | Test Results | Pass |
|--|---------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| Pendulum Integrated Velocity Change within Corridor | Yes | Yes | Yes |
| Pendulum Velocity | (-3.3) - (-3.5) m/s | -3.37 m/s | Yes |
| Maximum Headform Flexion | | | |
| Peak | (-49) - (-59) deg | -55.9 deg | Yes |
| Time of Peak | 54 - 66 ms | 56.9 ms | Yes |
| Headform Flexion Decay | | | |
| - Peak to Zero | 53 - 88 ms | 67.4 ms | Yes |

Test meets specifications.

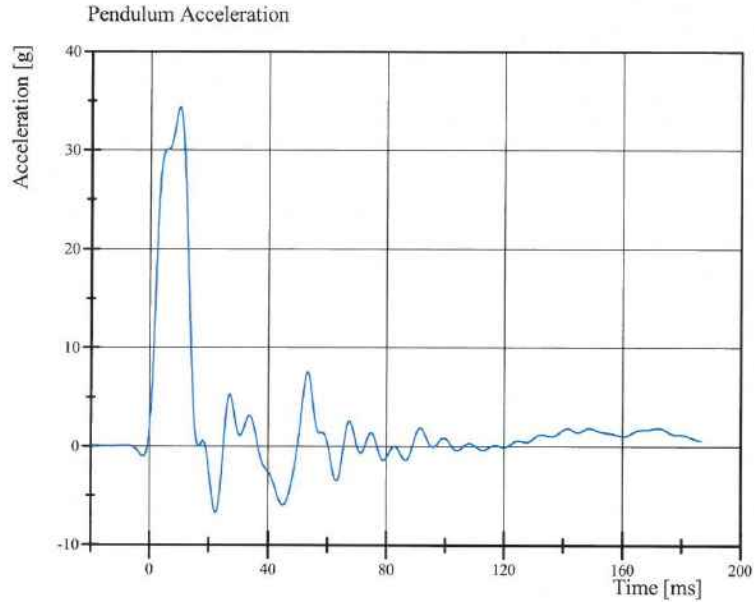
Comments:

Transportation Research Center Inc.

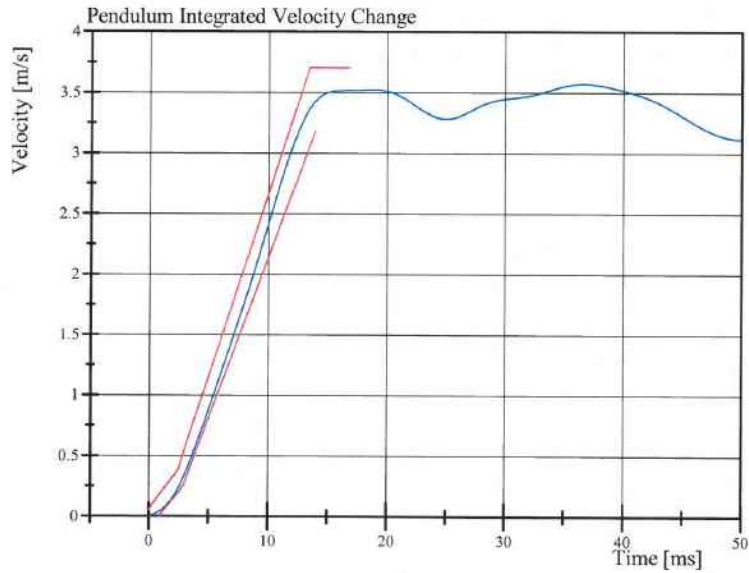
Left Lateral Neck

ES-2re Serial No. F030 Certification No. 43-1

Test Date: 11/17/2016



Filter Class: CFC_60
Max: 34.3 g at 10.1 ms
Min: -6.8 g at 22.4 ms



Filter Class: CFC_60
Max: 3.6 m/s at 36.6 ms
Min: 0.0 m/s at 0.0 ms

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

11.17.2016 14:21:22 1493

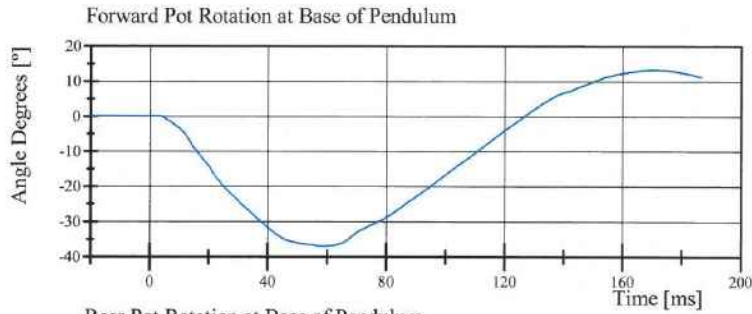


Transportation Research Center Inc.

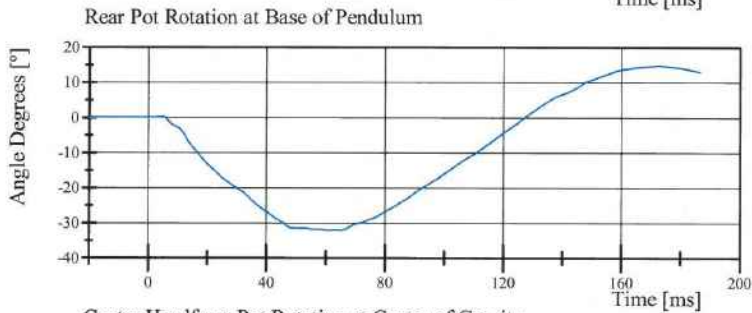
Left Lateral Neck

ES-2re Serial No. F030 Certification No. 43-1

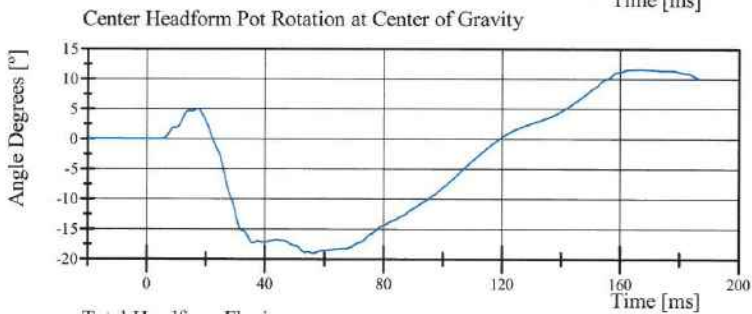
Test Date: 11/17/2016



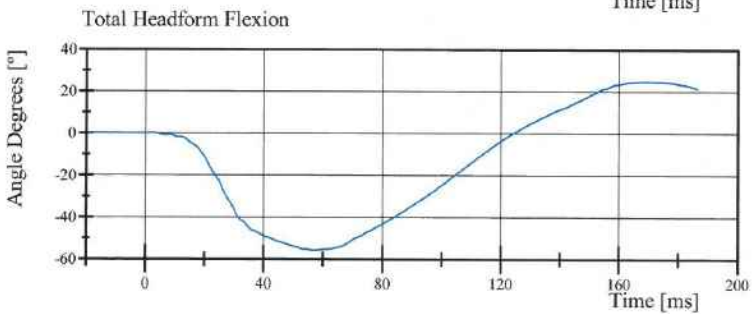
Filter Class: CFC_180
Max: 13.3 ° at 170.1 ms
Min: -37.1 ° at 58.4 ms



Filter Class: CFC_180
Max: 14.8 ° at 172.6 ms
Min: -32.2 ° at 61.0 ms



Filter Class: CFC_180
Max: 11.6 ° at 167.0 ms
Min: -19.0 ° at 56.4 ms



Filter Class: CFC_180
Max: 24.9 ° at 169.5 ms
Min: -55.9 ° at 56.9 ms

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

11.17.2016 14:21:23 1493



Transportation Research Center Inc.

Left Lateral Shoulder
ES-2re Serial No. F030 Certification No. 43-1
Test Date: 11/17/2016

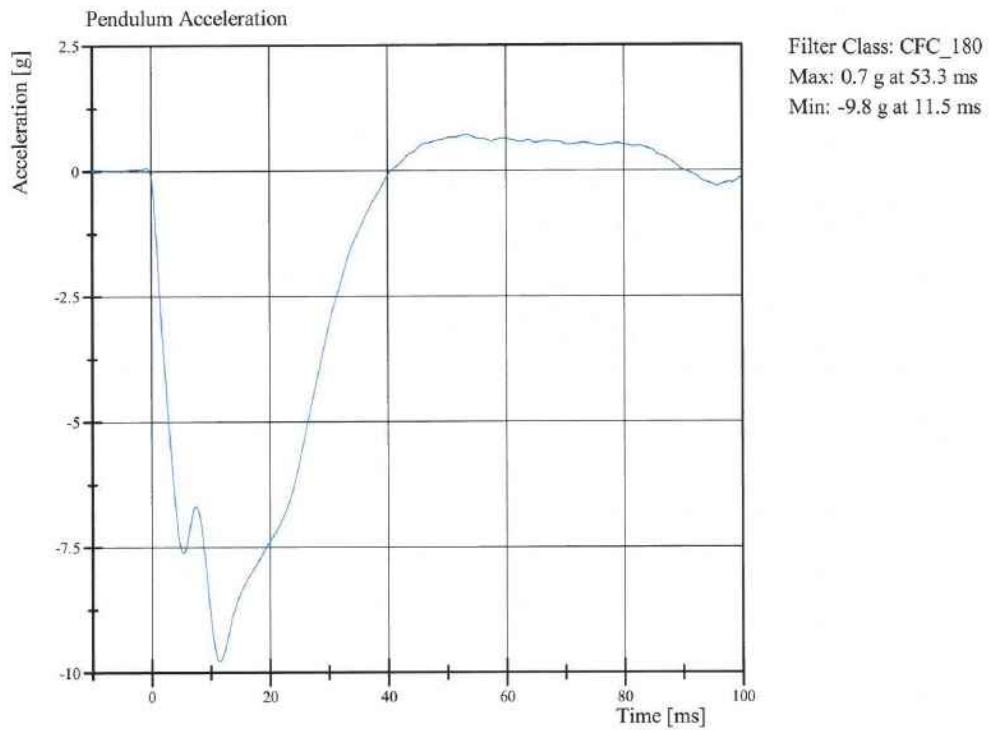
| Test Parameter | Specification | Test Results | Pass |
|-------------------------|--------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.6 °C | Yes |
| Relative Humidity | 10 - 70 % | 39 % | Yes |
| Test Probe Velocity | 4.2 - 4.4 m/s | 4.28 m/s | Yes |
| Test Probe Acceleration | (-7.5) - (-10.5) g | -9.79 g | Yes |

Test meets specifications.

Comments:

Transportation Research Center Inc.

Left Lateral Shoulder
ES-2re Serial No. F030 Certification No. 43-1
Test Date: 11/17/2016



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

11.17.2016 15:23:14 541



Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 43-1
Test Date: 11/17/2016

| Test Parameter | Specification | Test Results | Pass |
|---|----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| 3.0 m/s Test Rib Displacement (454 mm to 464 mm) | 36 - 40 mm | 36.7 mm | Yes |

Test meets specifications.

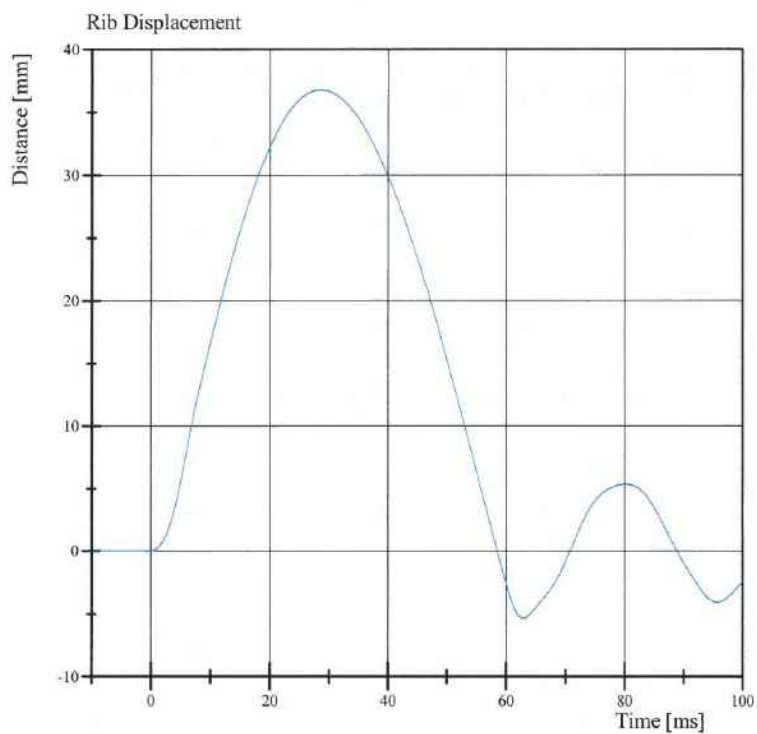
Comments:

Drop Height: 462



Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 43-1
Test Date: 11/17/2016



Filter Class: CFC_180
Max: 36.7 mm at 28.6 ms
Min: -5.4 mm at 62.9 ms

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

11.17.2016 13:45:23 869



Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 43-2
Test Date: 11/17/2016

| Test Parameter | Specification | Test Results | Pass |
|---|----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.1 °C | Yes |
| Relative Humidity | 10 - 70 % | 39 % | Yes |
| 4.0 m/s Test Rib Displacement (807 mm to 823 mm) | 46 - 51 mm | 46.3 mm | Yes |

Test meets specifications.

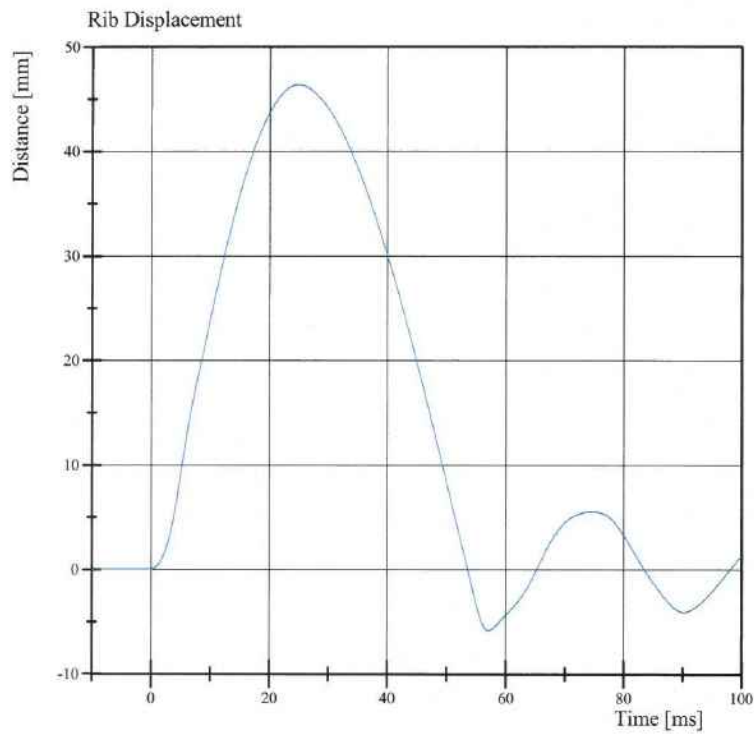
Comments:

Drop Height: 816



Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 43-2
Test Date: 11/17/2016



Filter Class: CFC_180
Max: 46.3 mm at 25.0 ms
Min: -5.9 mm at 57.1 ms

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

11.17.2016 13:36:27 699



Transportation Research Center Inc.

3.0 m/s Center Full Rib Module
ES-2re Serial No. F030 Certification No. 43-1
Test Date: 11/17/2016

| Test Parameter | Specification | Test Results | Pass |
|---|----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.7 °C | Yes |
| Relative Humidity | 10 - 70 % | 37 % | Yes |
| 3.0 m/s Test Rib Displacement (454 mm to 464 mm) | 36 - 40 mm | 36.8 mm | Yes |

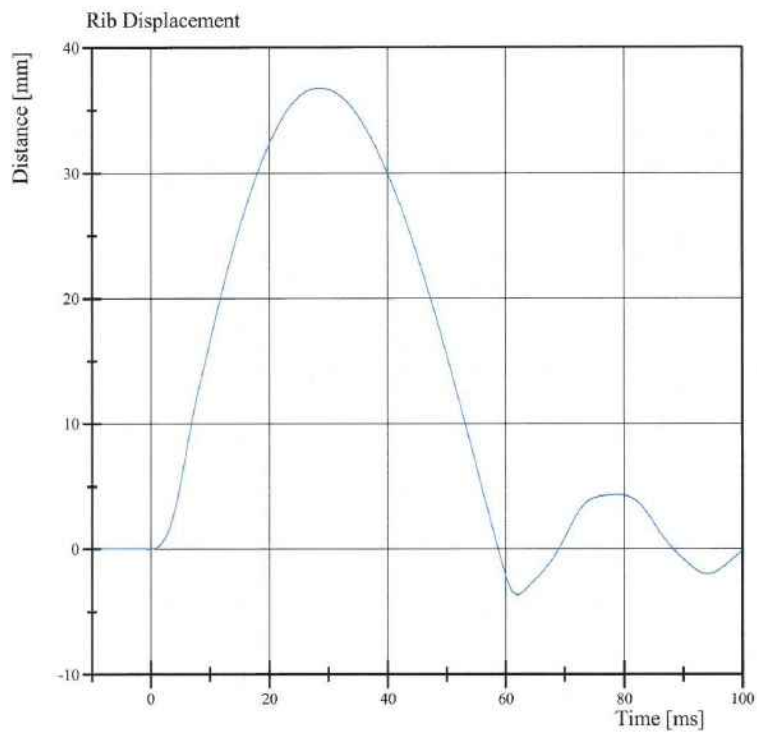
Test meets specifications.

Comments:

Drop Height: 462

Transportation Research Center Inc.

3.0 m/s Center Full Rib Module
ES-2re Serial No. F030 Certification No. 43-1
Test Date: 11/17/2016



Filter Class: CFC_180
Max: 36.8 mm at 28.5 ms
Min: -3.6 mm at 62.0 ms

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

11.17.2016 13:57:23 890



Transportation Research Center Inc.

4.0 m/s Center Full Rib Module
ES-2re Serial No. F030 Certification No. 43-1
Test Date: 11/17/2016

| Test Parameter | Specification | Test Results | Pass |
|---|----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| 4.0 m/s Test Rib Displacement (807 mm to 823 mm) | 46 - 51 mm | 48.2 mm | Yes |

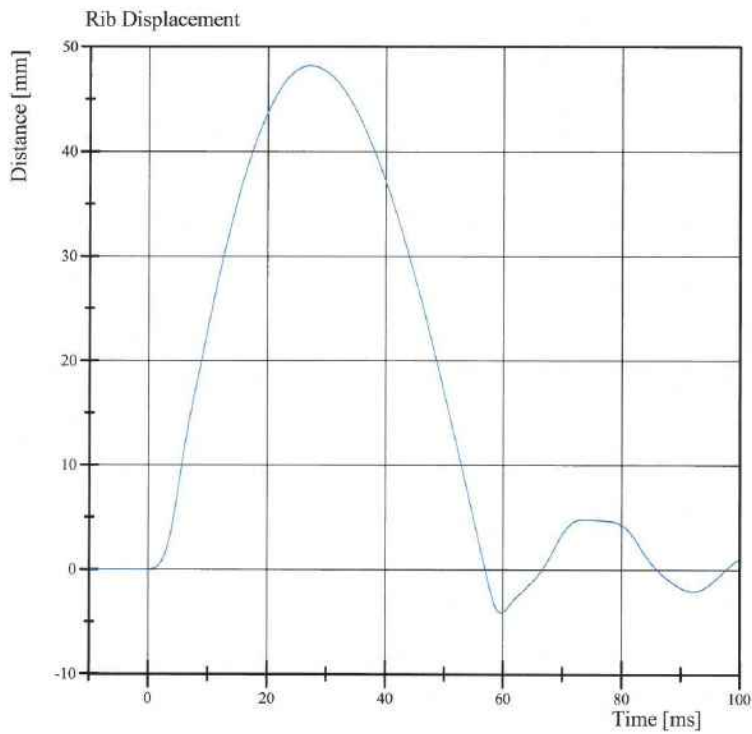
Test meets specifications.

Comments:

Drop Height: 816

Transportation Research Center Inc.

4.0 m/s Center Full Rib Module
ES-2re Serial No. F030 Certification No. 43-1
Test Date: 11/17/2016



Filter Class: CFC_180
Max: 48.2 mm at 27.2 ms
Min: -4.1 mm at 59.7 ms

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

11.17.2016 13:51:53 702



Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 43-1
Test Date: 11/17/2016

| Test Parameter | Specification | Test Results | Pass |
|---|----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.6 °C | Yes |
| Relative Humidity | 10 - 70 % | 39 % | Yes |
| 3.0 m/s Test Rib Displacement (454 mm to 464 mm) | 36 - 40 mm | 37.0 mm | Yes |

Test meets specifications.

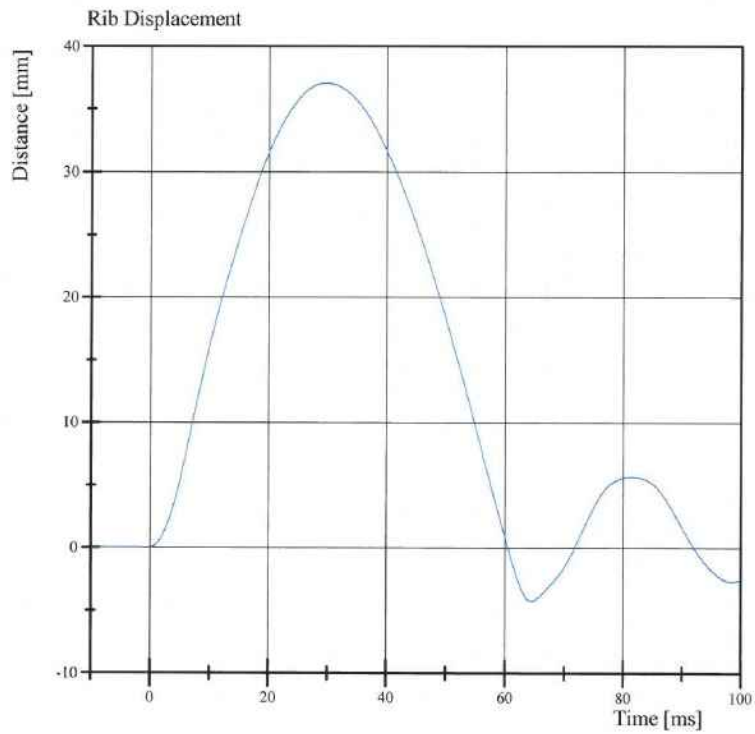
Comments:

Drop Height: 462



Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 43-1
Test Date: 11/17/2016



Filter Class: CFC_180
Max: 37.0 mm at 29.6 ms
Min: -4.2 mm at 64.5 ms

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

11.17.2016 14:11:14 866



Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 43-1
Test Date: 11/17/2016

| Test Parameter | Specification | Test Results | Pass |
|---|----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 20.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 39 % | Yes |
| 4.0 m/s Test Rib Displacement (807 mm to 823 mm) | 46 - 51 mm | 48.0 mm | Yes |

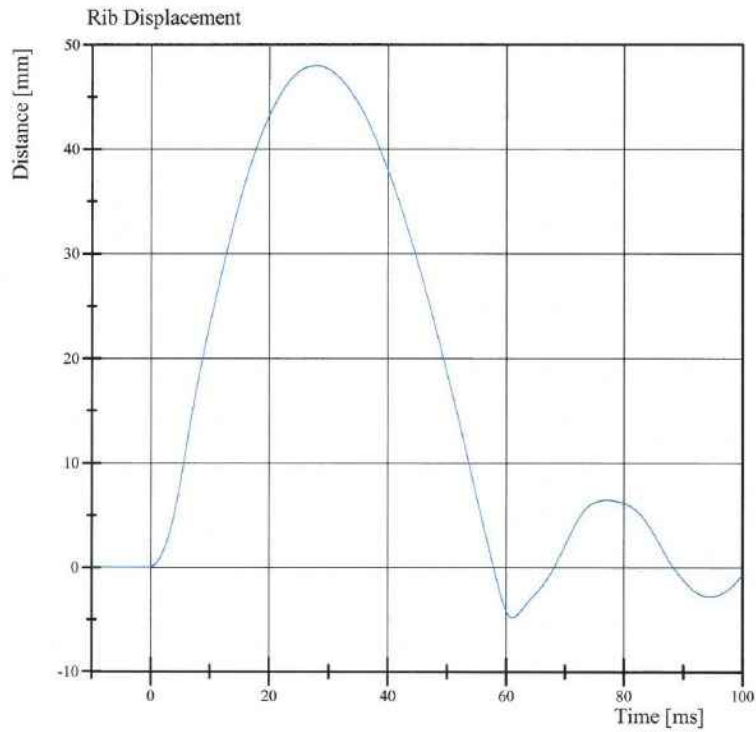
Test meets specifications.

Comments:

Drop Height: 816

Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 43-1
Test Date: 11/17/2016



Filter Class: CFC_180
Max: 48.0 mm at 28.0 ms
Min: -4.8 mm at 61.1 ms

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

11.17.2016 14:03:29 697



Transportation Research Center Inc.

Left Lateral Thorax
ES-2re Serial No. F030 Certification No. 43-1
Test Date: 11/17/2016

| Test Parameter | Specification | Test Results | Pass |
|--------------------------------|-----------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| Impactor Velocity | 5.4 - 5.60 m/s | 5.547 m/s | Yes |
| Peak Impactor Force after 6 ms | (-5,100) - (-6,200) N | -5,172.6 N | Yes |
| Upper Rib Displacement | 34 - 41 mm | 37.7 mm | Yes |
| Center Rib Displacement | 37 - 45 mm | 42.1 mm | Yes |
| Lower Rib Displacement | 37 - 44 mm | 40.9 mm | Yes |

Test meets specifications.

Comments:

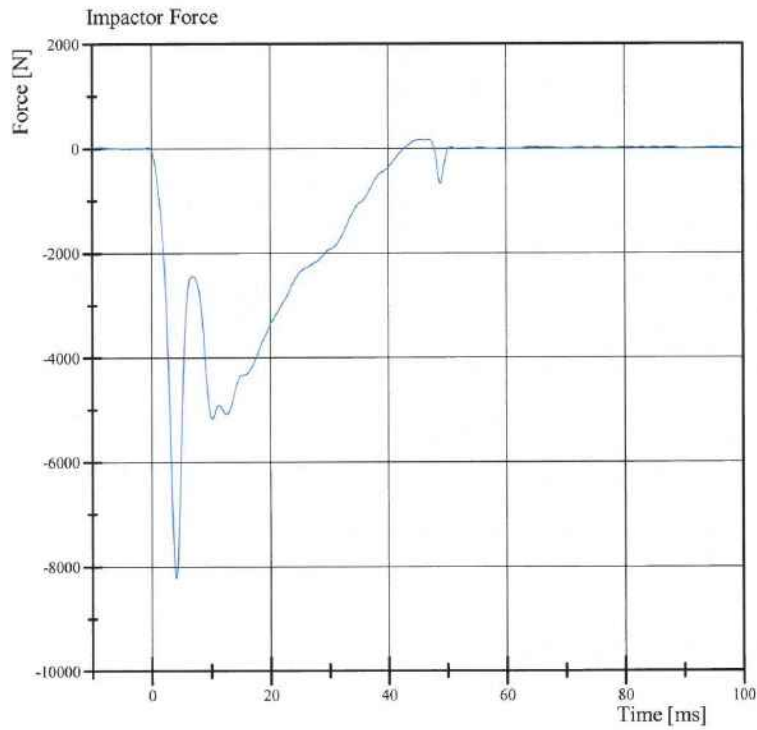
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.17.2016 15:29:07 445



Transportation Research Center Inc.

Left Lateral Thorax
ES-2re Serial No. F030 Certification No. 43-1
Test Date: 11/17/2016



Filter Class: CFC_180
Max: 164.2 N at 46.9 ms
Min: -8,241.4 N at 4.1 ms

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

11.17.2016 15:29:53.445

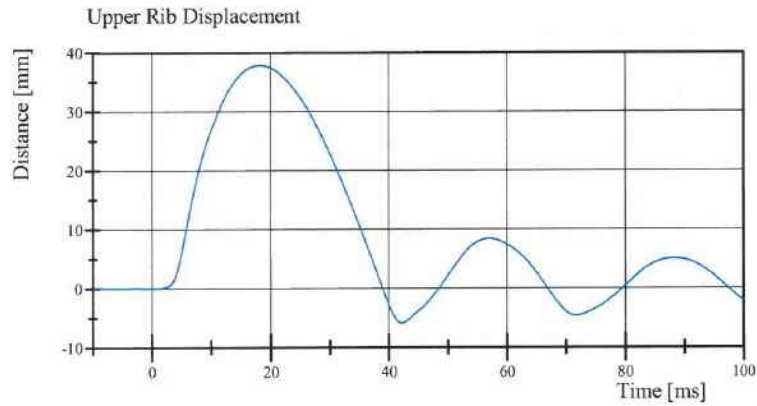


Transportation Research Center Inc.

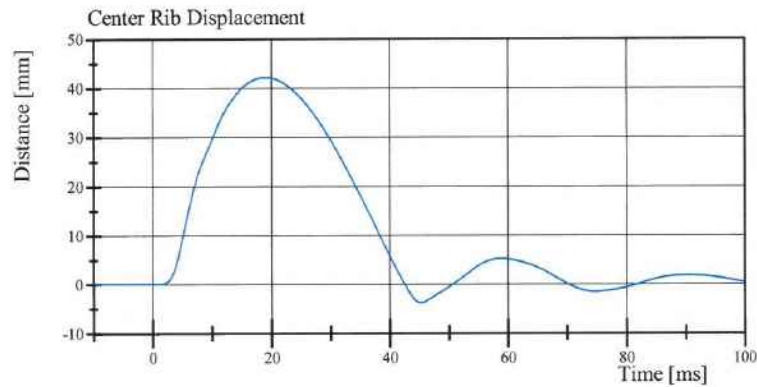
Left Lateral Thorax

ES-2re Serial No. F030 Certification No. 43-1

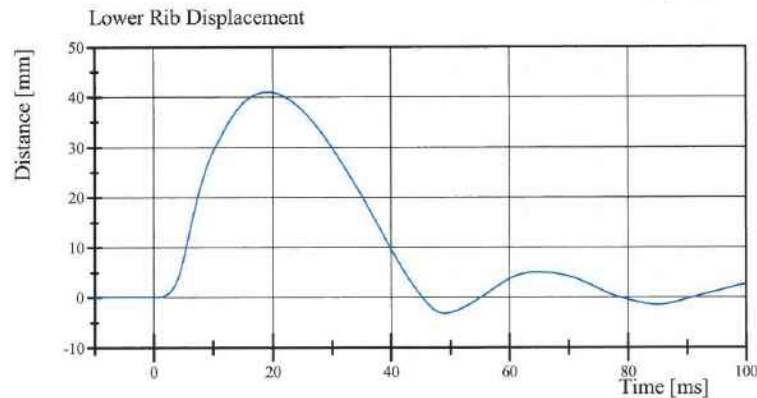
Test Date: 11/17/2016



Filter Class: CFC_180
Max: 37.7 mm at 18.2 ms
Min: -5.9 mm at 42.2 ms



Filter Class: CFC_180
Max: 42.1 mm at 19.0 ms
Min: -3.8 mm at 45.2 ms



Filter Class: CFC_180
Max: 40.9 mm at 19.2 ms
Min: -3.2 mm at 49.1 ms

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

11.17.2016 15:29:54 445



Transportation Research Center Inc.

Left Lateral Abdomen

ES-2re Serial No. F030 Certification No. 43-1

Test Date: 11/17/2016

| Test Parameter | Specification | Test Results | Pass |
|-----------------------|-----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 22.0 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| Test Probe Velocity | 3.9 - 4.1 m/s | 4.06 m/s | Yes |
| Test Probe Force | | | |
| Peak | 4,000 - 4,800 N | 4,006.9 N | Yes |
| Time of Peak | 10.6 - 13.0 ms | 12.16 ms | Yes |
| Total Abdominal Force | | | |
| Peak | 2,200 - 2,700 N | 2,418.1 N | Yes |
| Time of Peak | 10.0 - 12.3 ms | 10.64 ms | Yes |

Test meets specifications.

Comments:

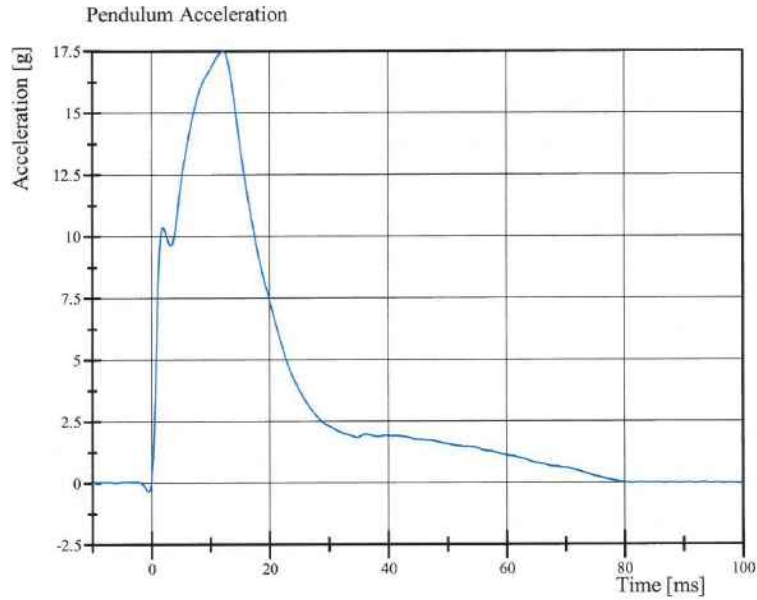


Transportation Research Center Inc.

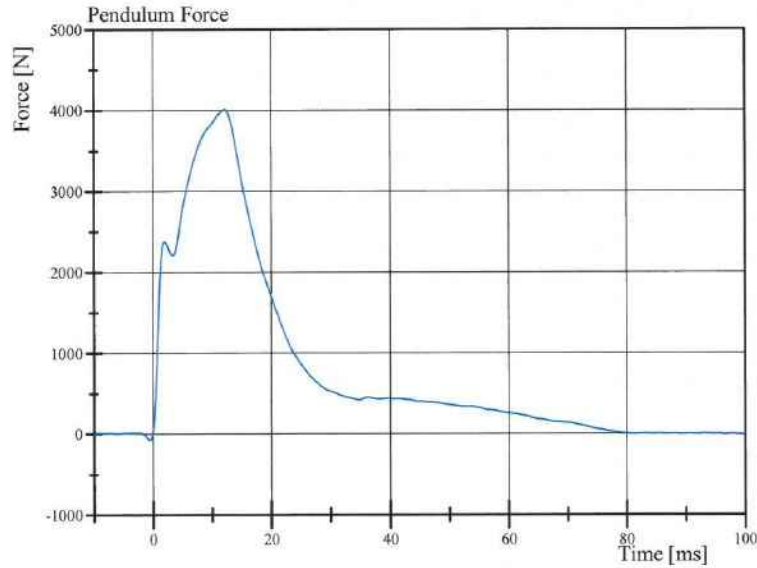
Left Lateral Abdomen

ES-2re Serial No. F030 Certification No. 43-1

Test Date: 11/17/2016



Filter Class: CFC_180
Max: 17.5 g at 12.2 ms
Min: -0.4 g at -0.5 ms



Filter Class: CFC_180
Max: 4,006.9 N at 12.2 ms
Min: -81.5 N at -0.5 ms

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

11.17.2016 15:36:52 576

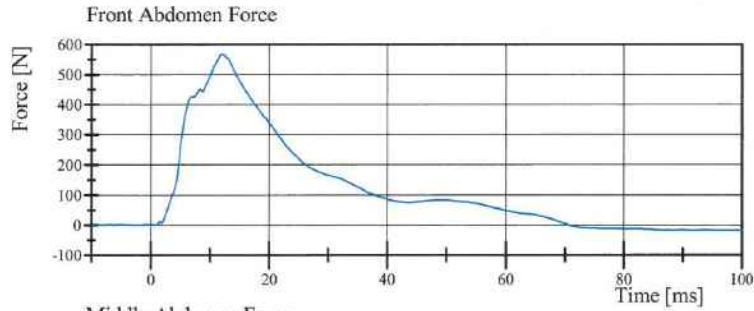


Transportation Research Center Inc.

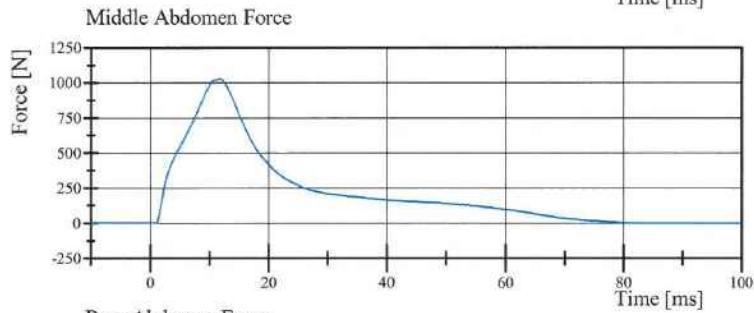
Left Lateral Abdomen

ES-2re Serial No. F030 Certification No. 43-1

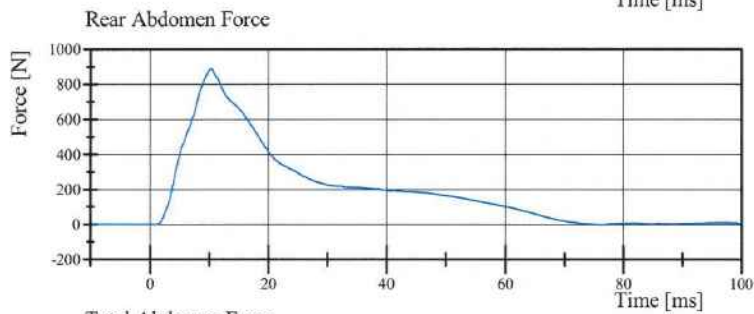
Test Date: 11/17/2016



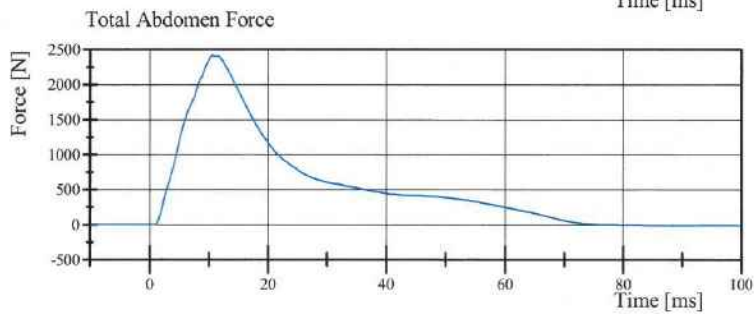
Filter Class: CFC_600
Max: 565.1 N at 12.0 ms
Min: -17.1 N at 99.8 ms



Filter Class: CFC_600
Max: 1,028.2 N at 11.8 ms
Min: -2.2 N at 1.0 ms



Filter Class: CFC_600
Max: 885.6 N at 10.3 ms
Min: -0.3 N at 1.0 ms



Filter Class: CFC_600
Max: 2,418.1 N at 10.6 ms
Min: -12.2 N at 88.4 ms

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

11.17.2016 15:36:52 576



Transportation Research Center Inc.

Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 43-1
Test Date: 11/17/2016

| Test Parameter | Specification | Test Results | Pass |
|--|-----------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.1 °C | Yes |
| Relative Humidity | 10 - 70 % | 39 % | Yes |
| Pendulum Integrated Velocity Change within Corridor | Yes | Yes | Yes |
| Pendulum Velocity | (-5.95) - (-6.15) m/s | -6.105 m/s | Yes |
| Maximum Headform Flexion | | | |
| Peak | (-45) - (-55) deg | -52.7 deg | Yes |
| Time of Peak | 39 - 53 ms | 44.7 ms | Yes |
| Headform Flexion Decay | | | |
| - Peak to Zero | 37 - 57 ms | 38.7 ms | Yes |

Test meets specifications.

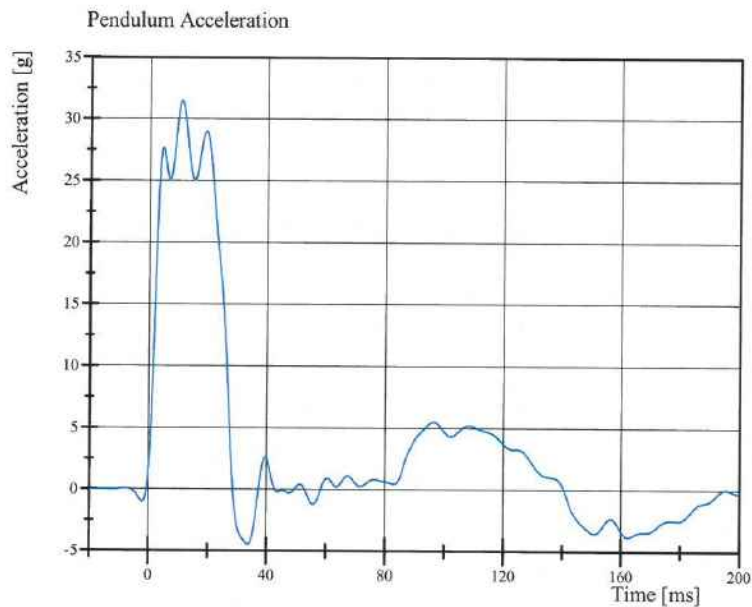
Comments:

Transportation Research Center Inc.

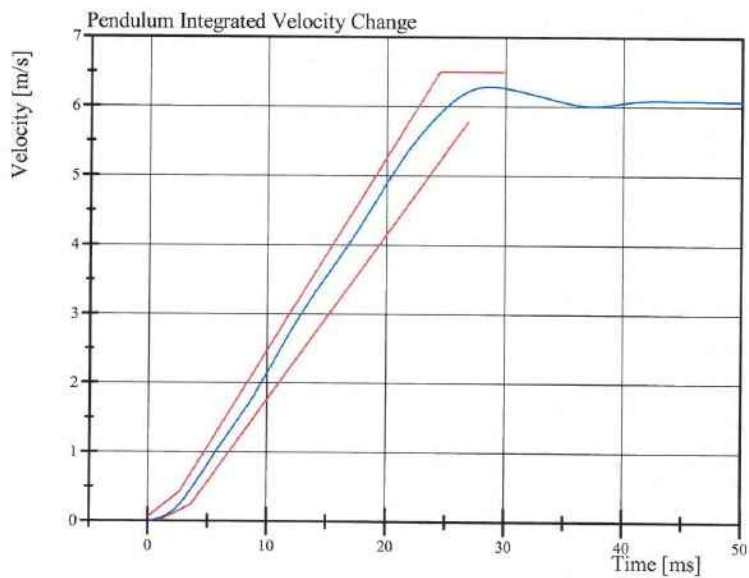
Left Lateral Lumbar

ES-2re Serial No. F030 Certification No. 43-1

Test Date: 11/17/2016



Filter Class: CFC_60
Max: 31.4 g at 10.9 ms
Min: -4.5 g at 33.8 ms



Filter Class: CFC_60
Max: 6.3 m/s at 28.6 ms
Min: 0.0 m/s at 0.0 ms

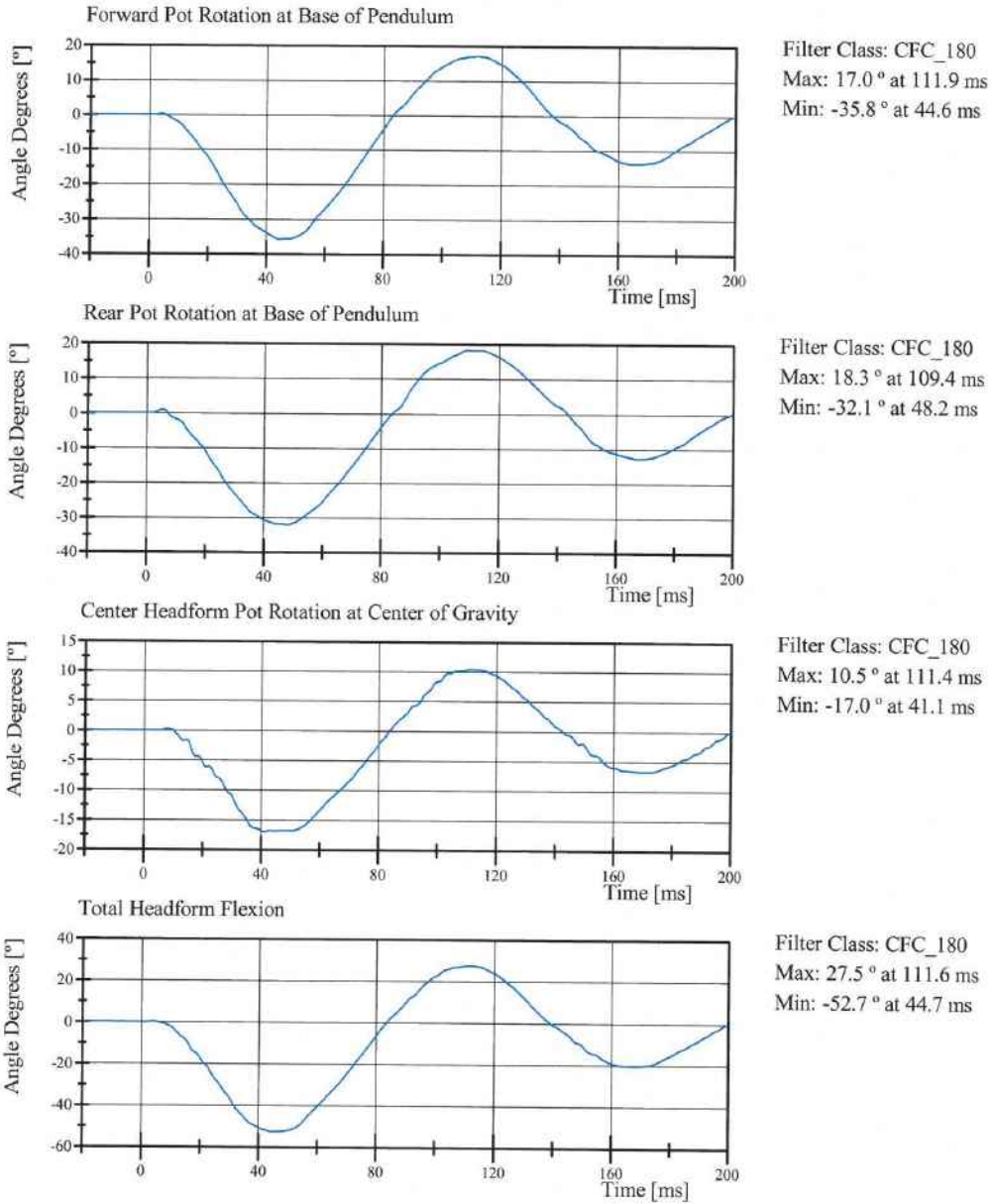
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.17.2016 13:32:24 669



Transportation Research Center Inc.

Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 43-1
Test Date: 11/17/2016



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

11.17.2016 13:32:25 669



Transportation Research Center Inc.

Left Lateral Pelvis
ES-2re Serial No. F030 Certification No. 43-1
Test Date: 11/17/2016

| Test Parameter | Specification | Test Results | Pass |
|-----------------------|-----------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.1 °C | Yes |
| Relative Humidity | 10 - 70 % | 39 % | Yes |
| Test Probe Velocity | 4.2 - 4.4 m/s | 4.32 m/s | Yes |
| Test Probe Force | | | |
| Peak | 4,700 - 5,400 N | 5,166.1 N | Yes |
| Time of Peak | 11.8 - 16.1 ms | 13.44 ms | Yes |
| Pubic Symphysis Force | | | |
| Peak | (-1,230) - (-1,590) N | -1,262.0 N | Yes |
| Time of Peak | 12.2 - 17.0 ms | 13.12 ms | Yes |

Test meets specifications.

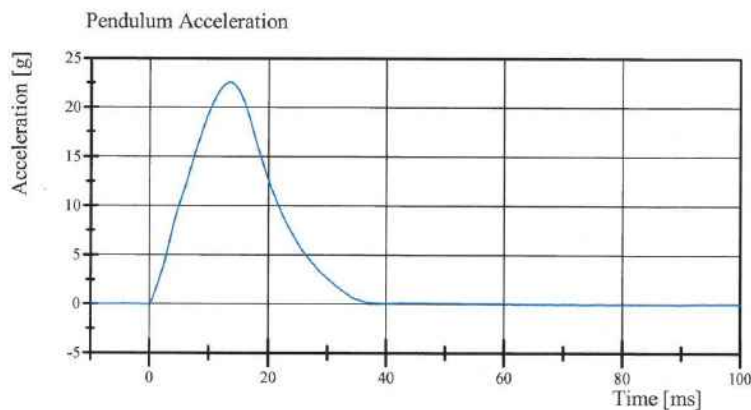
Comments:

Transportation Research Center Inc.

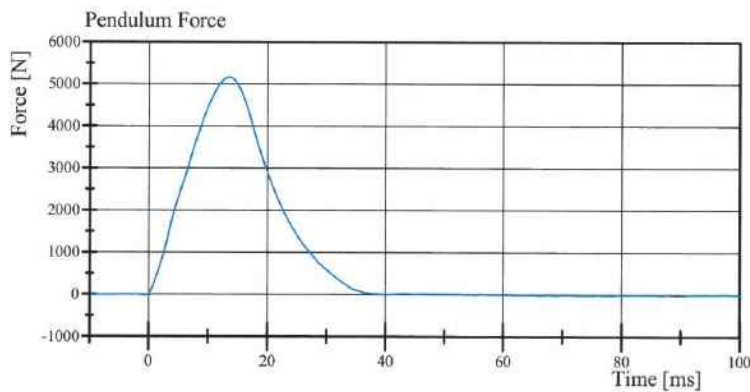
Left Lateral Pelvis

ES-2re Serial No. F030 Certification No. 43-1

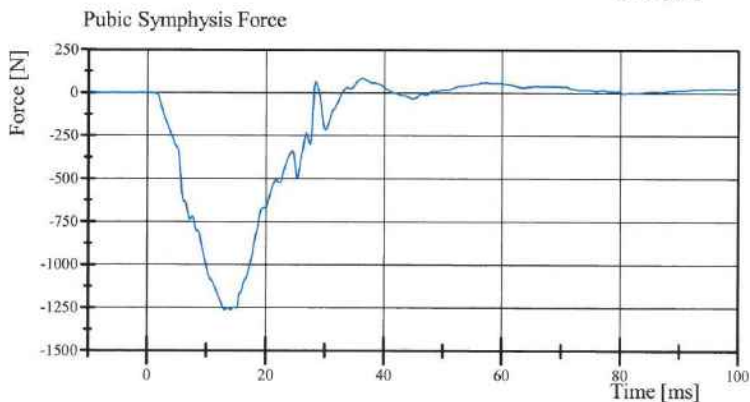
Test Date: 11/17/2016



Filter Class: CFC_180
Max: 22.5 g at 13.4 ms
Min: -0.1 g at 89.4 ms



Filter Class: CFC_180
Max: 5,166.1 N at 13.4 ms
Min: -15.3 N at 89.4 ms



Filter Class: CFC_600
Max: 85.1 N at 36.2 ms
Min: -1,262.0 N at 13.1 ms

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

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Pre-Test Calibration Sheets
Passenger S/N 305

Transportation Research Center Inc.
SIDIIs Dummy - Level D
External Dimensions
Serial No. 305 Calibration No.49

| Symbol | Description | Specification | Results | Pass |
|--------|---|---------------|---------|------|
| | | mm | mm | |
| A | Sitting Height | 772.0 - 788.0 | 777 | Yes |
| B | Shoulder Pivot Height | 437.0 - 453.0 | 447 | Yes |
| C | H-Point Height | 79.0 - 89.0 | 88 | Yes |
| D | H-Point from Seat Back | 141.0 - 151.0 | 143 | Yes |
| E | Shoulder Pivot from Backline | 97.0 - 107.0 | 100 | Yes |
| F | Thigh Clearance | 119.0 - 135.0 | 125 | Yes |
| G | Head Breadth | 140.0 - 148.0 | 145 | Yes |
| H | Head Back from Backline | 40.0 - 46.0 | 45 | Yes |
| I | Head Depth | 178.0 - 188.0 | 183 | Yes |
| J | Head Circumference | 541.0 - 551.0 | 543 | Yes |
| K | Buttock to Knee Length | 514.0 - 540.0 | 535 | Yes |
| L | Popliteal Height | 343.0 - 369.0 | 345 | Yes |
| M | Knee Pivot to Floor Height | 393.0 - 409.0 | 395 | Yes |
| N | Buttock Popliteal Length | 416.0 - 442.0 | 434 | Yes |
| O | Chest Depth without Jacket | 195.0 - 211.0 | 202 | Yes |
| P | Foot Length (right) | 216.0 - 232.0 | 222 | Yes |
| P | Foot Length (left) | 216.0 - 232.0 | 222 | Yes |
| Q | Hip Breadth | 313.0 - 323.0 | 320 | Yes |
| R | Arm Length | 249.0 - 259.0 | 253 | Yes |
| S | Knee Joint to seat Back | 478.0 - 493.0 | 480 | Yes |
| V | Shoulder Width (only one arm installed) | 341.0 - 357.0 | 349 | Yes |
| W | Foot Width (right) | 78.0 - 94.0 | 85 | Yes |
| W | Foot Width (left) | 78.0 - 94.0 | 85 | Yes |
| Y | Chest Circumference with Jacket | 851.0 - 881.0 | 873 | Yes |
| Z | Waist Circumference | 761.0 - 791.0 | 780 | Yes |

Transportation Research Center Inc.

Left Lateral Head Drop
SID IIs Serial No. 305 Certification No. 49-1
Test Date: 11/11/2016

| Test Parameter | Specification | Test Results | Pass |
|---|----------------|--------------|------|
| Temperature | 18.9 - 25.6 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| Peak Head Resultant Acceleration | 115 - 137 g | 118.6 g | Yes |
| Peak Head Longitudinal Acceleration | (-15) - 15 g | 2.5 g | Yes |
| Is Head Resultant Acceleration Curve Unimodal within 15% of Peak? | Yes | Yes | Yes |

Test meets specifications.

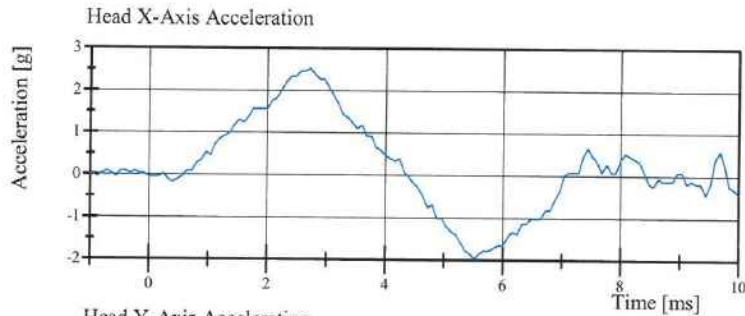
Comments:

Transportation Research Center Inc.

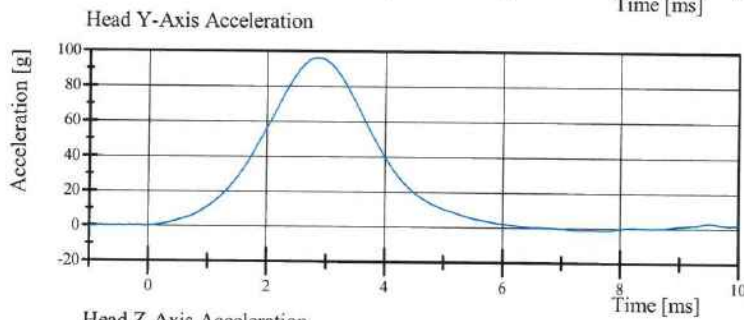
Left Lateral Head Drop

SID IIa Serial No. 305 Certification No. 49-1

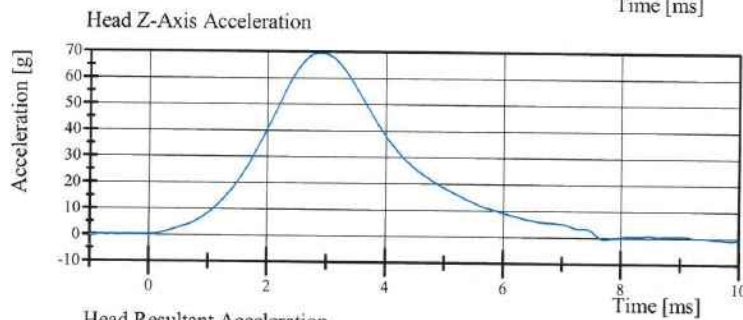
Test Date: 11/11/2016



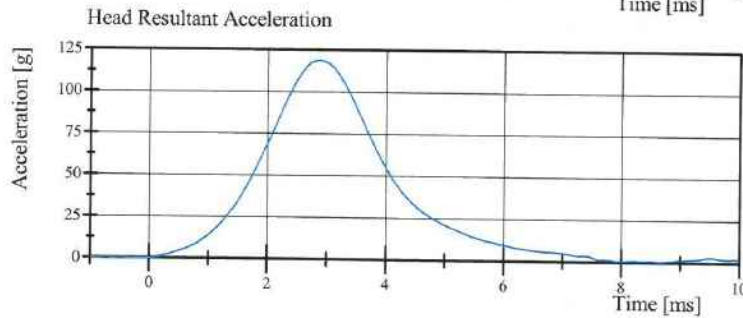
Filter Class: CFC_1000
Max: 2.5 g at 2.7 ms
Min: -2.0 g at 5.5 ms



Filter Class: CFC_1000
Max: 96.1 g at 2.9 ms
Min: -1.2 g at 7.7 ms



Filter Class: CFC_1000
Max: 69.5 g at 2.9 ms
Min: -0.9 g at 9.8 ms



Filter Class: CFC_1000
Max: 118.6 g at 2.9 ms
Min: 0.0 g at -1.0 ms

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

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Transportation Research Center Inc.

Left Lateral Neck
SID IIs Serial No. 305 Certification No. 49-1
Test Date: 11/11/2016

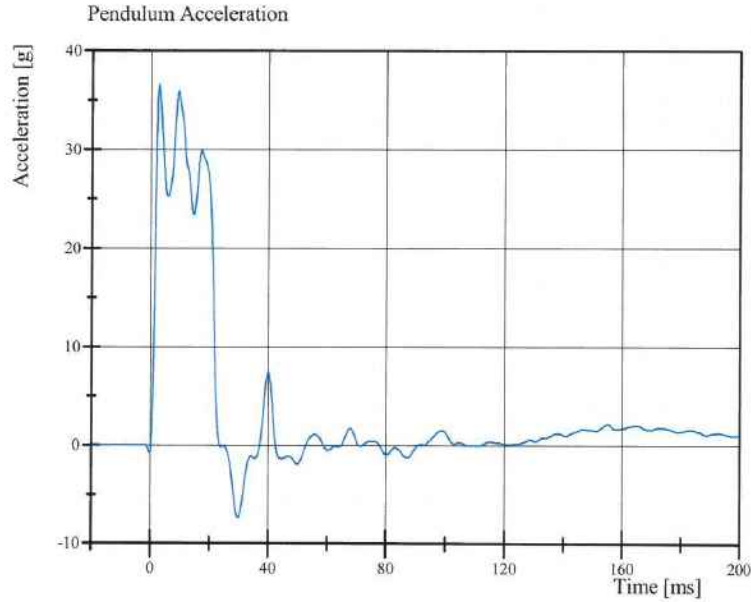
| Test Parameter | Specification | Test Results | Pass |
|--|-----------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| Pendulum Velocity | (-5.51) - (-5.63) m/s | -5.610 m/s | Yes |
| Pendulum Integrated Velocity | | | |
| Change at 10 ms | 2.20 - 2.80 m/s | 2.629 m/s | Yes |
| Change at 15 ms | 3.30 - 4.10 m/s | 4.014 m/s | Yes |
| Change at 20 ms | 4.40 - 5.40 m/s | 5.395 m/s | Yes |
| Change at 25 ms | 5.40 - 6.10 m/s | 5.788 m/s | Yes |
| Change at 25 to 100 ms | 5.50 - 6.20 m/s | 5.790 m/s | Yes |
| Maximum Headform Flexion occurring between 50ms and 70ms. | | | |
| Peak | (-71) - (-81) deg | -77.3 deg | Yes |
| Time of Peak | 50 - 70 ms | 60.1 ms | Yes |
| Total Neck Occipital Condyles Moment | 36 - 44 N·m | 43.3 N·m | Yes |
| Total Neck Occipital Condyles Moment Decay Time to 0 N·m | 102 - 126 ms | 115.8 ms | Yes |

Test meets specifications.

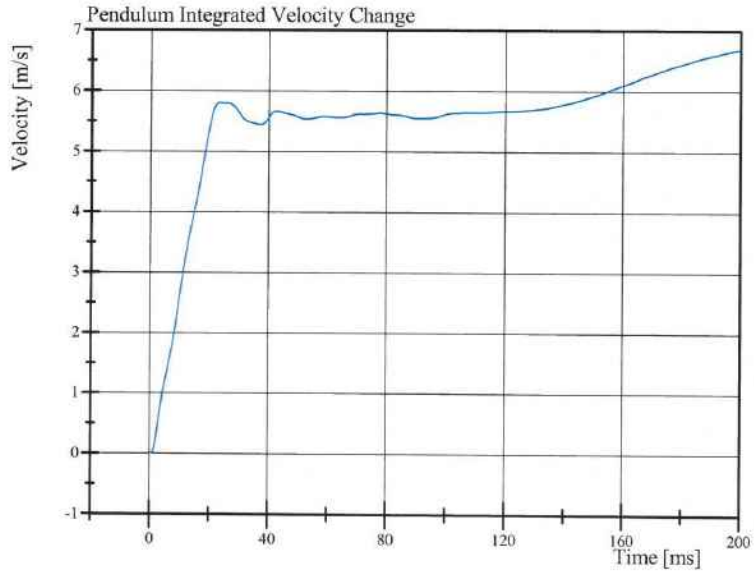
Comments:

Transportation Research Center Inc.

Left Lateral Neck
SID IIs Serial No. 305 Certification No. 49-1
Test Date: 11/11/2016



Filter Class: CFC_180
Max: 36.5 g at 2.7 ms
Min: -7.4 g at 29.9 ms



Filter Class: CFC_180
Max: 6.7 m/s at 200.0 ms
Min: -0.0 m/s at 0.2 ms

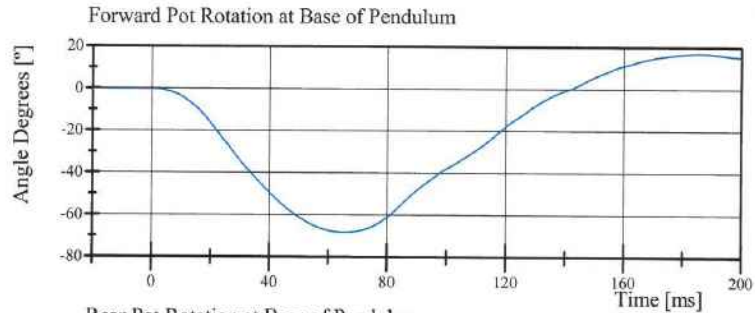
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.11.2016 12:15:59 739

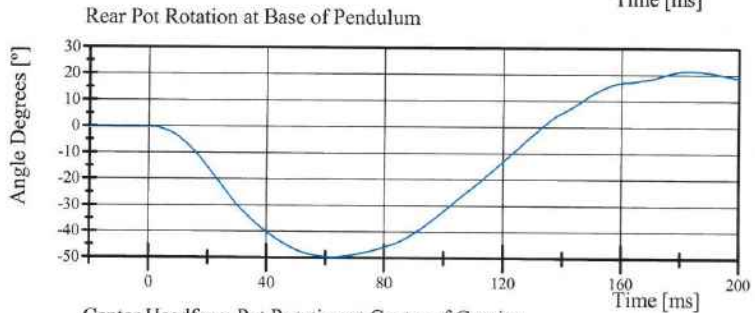


Transportation Research Center Inc.

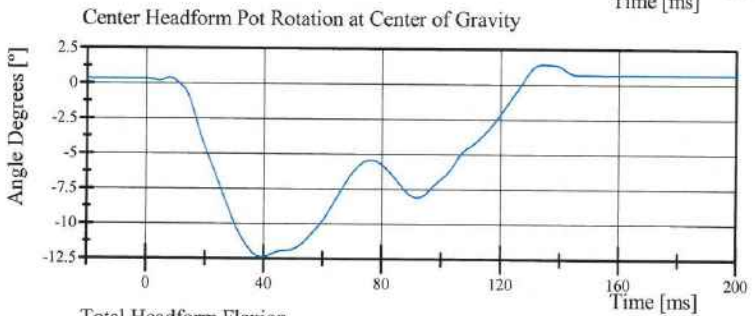
Left Lateral Neck
SID IIs Serial No. 305 Certification No. 49-1
Test Date: 11/11/2016



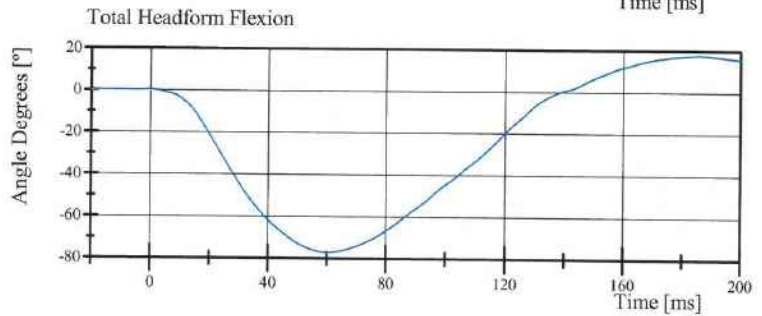
Filter Class: CFC_60
Max: 17.1 ° at 186.0 ms
Min: -68.4 ° at 65.6 ms



Filter Class: CFC_60
Max: 21.4 ° at 183.3 ms
Min: -49.7 ° at 62.0 ms



Filter Class: CFC_60
Max: 1.4 ° at 134.2 ms
Min: -12.4 ° at 39.3 ms



Filter Class: CFC_60
Max: 17.8 ° at 186.0 ms
Min: -77.3 ° at 60.1 ms

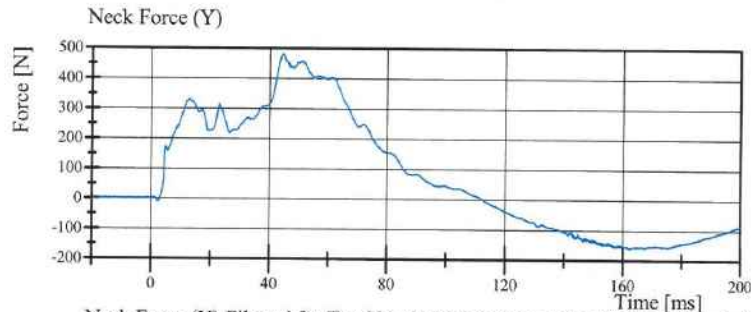
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.11.2016 12:16:00 739

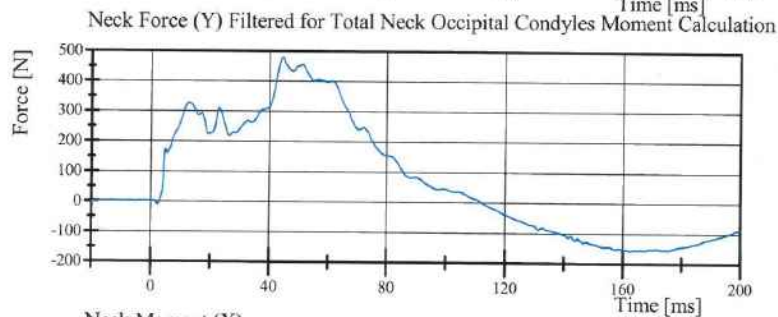


Transportation Research Center Inc.

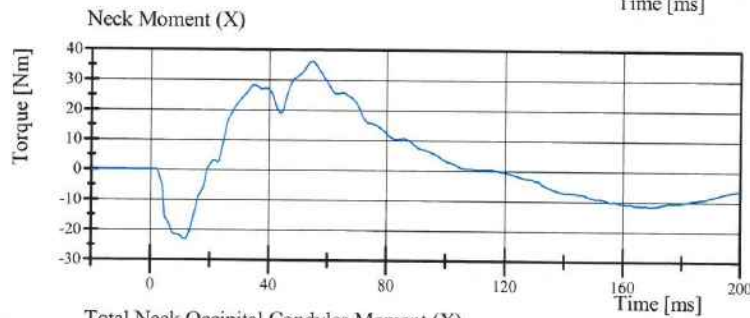
Left Lateral Neck
SID IIs Serial No. 305 Certification No. 49-1
Test Date: 11/11/2016



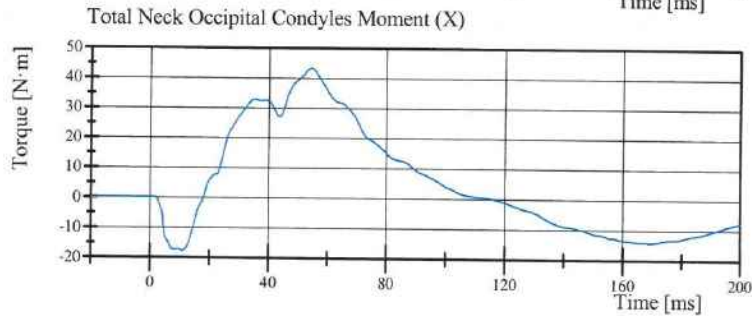
Filter Class: CFC_1000
Max: 479.8 N at 44.5 ms
Min: -160.2 N at 162.3 ms



Filter Class: CFC_600
Max: 479.1 N at 44.5 ms
Min: -158.9 N at 162.2 ms



Filter Class: CFC_600
Max: 36.1 Nm at 54.7 ms
Min: -23.2 Nm at 11.4 ms



Filter Class: Without_(Consta
Max: 43.3 N·m at 54.6 ms
Min: -17.9 N·m at 11.0 ms

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

11.11.2016 12:16:01 739



Transportation Research Center Inc.

Left Lateral Shoulder
SID IIs Serial No. 305 Certification No. 49-1
Test Date: 11/11/2016

| Test Parameter | Specification | Test Results | Pass |
|----------------------------------|-----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.3 °C | Yes |
| Relative Humidity | 10 - 70 % | 37 % | Yes |
| Impactor Velocity | 4.2 - 4.4 m/s | 4.27 m/s | Yes |
| Impactor Acceleration | (-13) - (-18) g | -16.1 g | Yes |
| Shoulder Displacement | 28 - 37 mm | 30.6 mm | Yes |
| Upper Spine Lateral Acceleration | 17 - 22 g | 21.1 g | Yes |

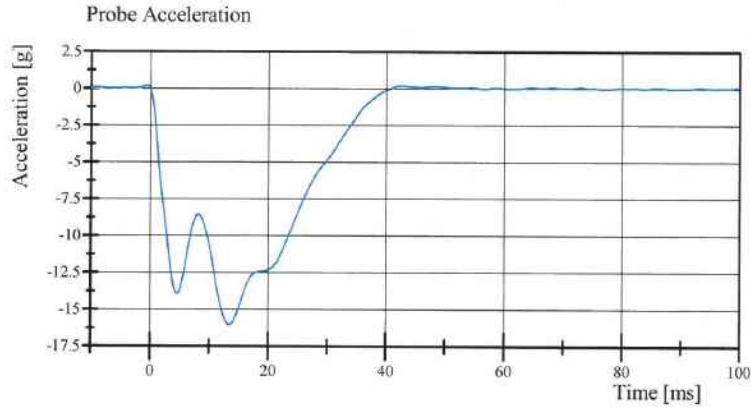
Test meets specifications.

Comments:

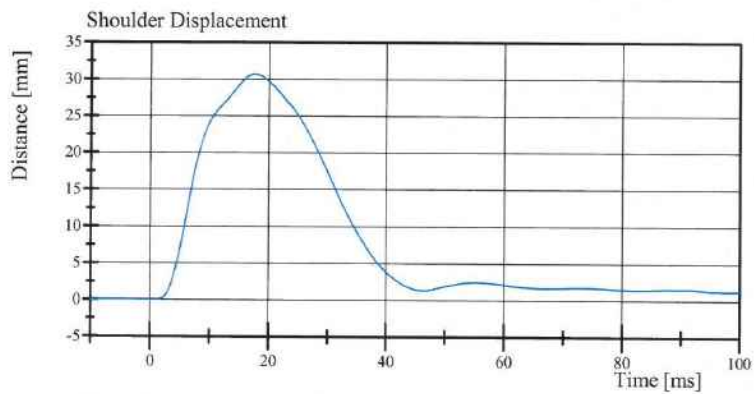


Transportation Research Center Inc.

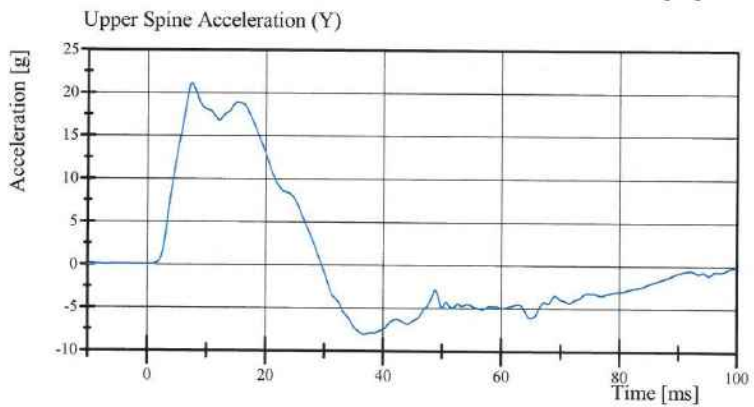
Left Lateral Shoulder
SID IIs Serial No. 305 Certification No. 49-1
Test Date: 11/11/2016



Filter Class: CFC_180
Max: 0.2 g at 42.4 ms
Min: -16.1 g at 13.4 ms



Filter Class: CFC_600
Max: 30.6 mm at 17.7 ms
Min: -0.0 mm at -6.9 ms



Filter Class: CFC_180
Max: 21.1 g at 7.4 ms
Min: -8.1 g at 36.8 ms



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

11.11.2016 11:04:24 875

Transportation Research Center Inc.

Left Lateral Thorax with Arm
SID IIs Serial No. 305 Certification No. 49-1
Test Date: 11/11/2016

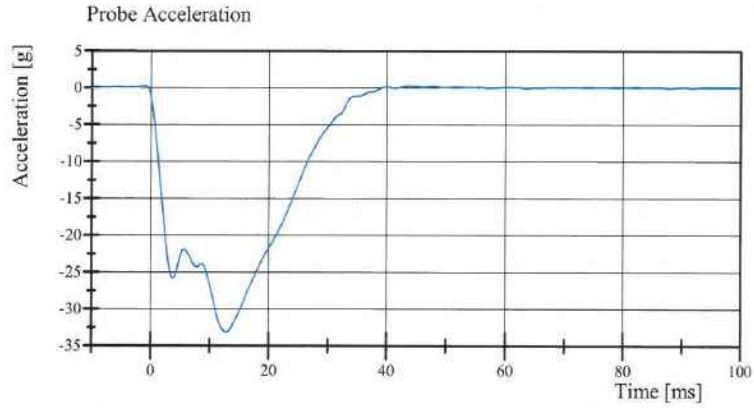
| Test Parameter | Specification | Test Results | Pass |
|----------------------------------|-----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| Impactor Velocity | 6.60 - 6.80 m/s | 6.793 m/s | Yes |
| Impactor Acceleration | (-30) - (-36) g | -33.2 g | Yes |
| Shoulder Displacement | 31 - 40 mm | 34.0 mm | Yes |
| Upper Thorax Rib Displacement | 25 - 32 mm | 26.6 mm | Yes |
| Center Thorax Rib Displacement | 30 - 36 mm | 32.0 mm | Yes |
| Lower Thorax Rib Displacement | 32 - 38 mm | 34.8 mm | Yes |
| Upper Spine Lateral Acceleration | 34 - 43 g | 38.3 g | Yes |
| Lower Spine Lateral Acceleration | 29 - 37 g | 32.8 g | Yes |

Test meets specifications.

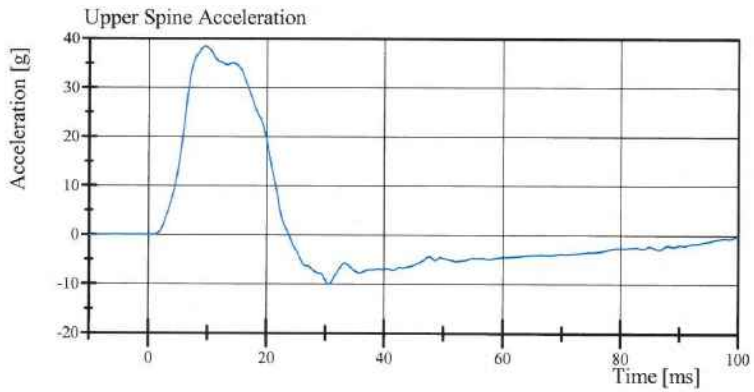
Comments:

Transportation Research Center Inc.

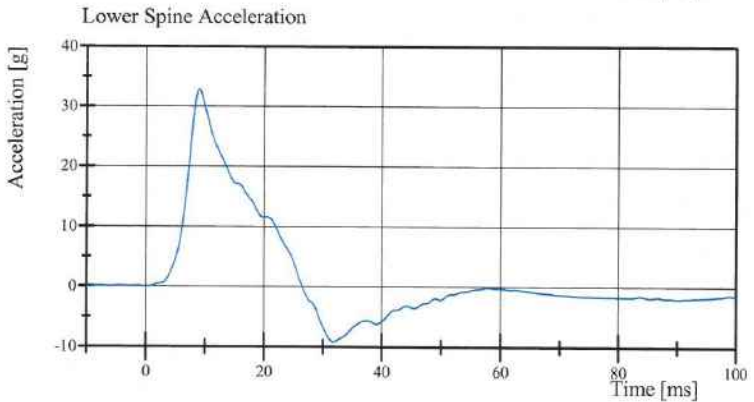
Left Lateral Thorax with Arm
SID IIs Serial No. 305 Certification No. 49-1
Test Date: 11/11/2016



Filter Class: CFC_180
Max: 0.2 g at 43.8 ms
Min: -33.2 g at 12.9 ms



Filter Class: CFC_180
Max: 38.3 g at 9.5 ms
Min: -10.1 g at 30.6 ms



Filter Class: CFC_180
Max: 32.8 g at 9.0 ms
Min: -9.3 g at 31.8 ms

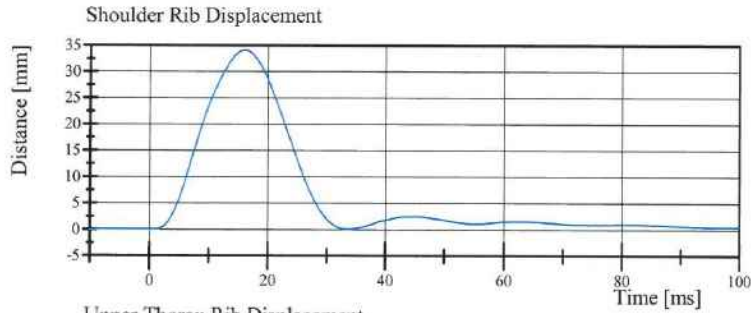


Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

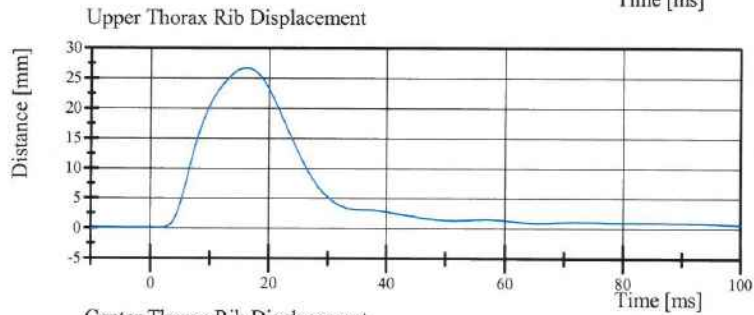
11.11.2016 12:10:40 640

Transportation Research Center Inc.

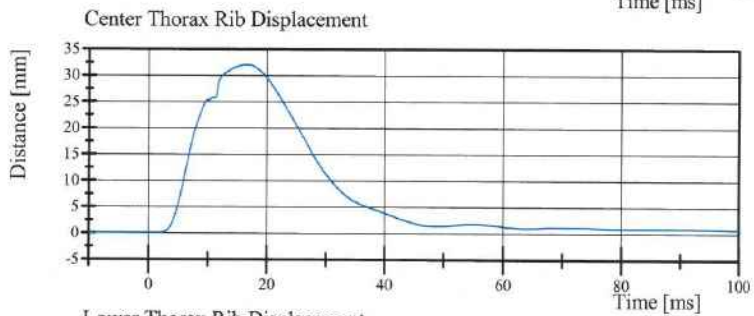
Left Lateral Thorax with Arm
SID IIs Serial No. 305 Certification No. 49-1
Test Date: 11/11/2016



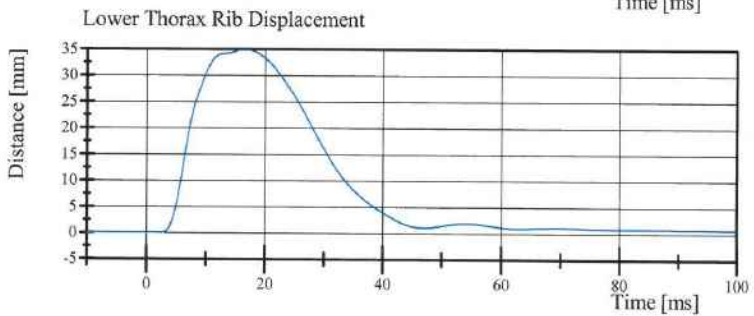
Filter Class: CFC_600
Max: 34.0 mm at 16.0 ms
Min: -0.0 mm at 1.1 ms



Filter Class: CFC_600
Max: 26.6 mm at 16.2 ms
Min: -0.0 mm at -0.9 ms



Filter Class: CFC_600
Max: 32.0 mm at 16.6 ms
Min: -0.0 mm at -10.0 ms



Filter Class: CFC_600
Max: 34.8 mm at 16.1 ms
Min: -0.0 mm at -10.0 ms

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

11.11.2016 12:10:40 640



Transportation Research Center Inc.

Left Lateral Thorax without Arm
SID IIs Serial No. 305 Certification No. 49-1
Test Date: 11/11/2016

| Test Parameter | Specification | Test Results | Pass |
|----------------------------------|-----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| Impactor Velocity | 4.20 - 4.40 m/s | 4.384 m/s | Yes |
| Impactor Acceleration | (-14) - (-18) g | -16.0 g | Yes |
| Upper Thorax Rib Displacement | 32 - 40 mm | 35.6 mm | Yes |
| Center Thorax Rib Displacement | 39 - 45 mm | 40.3 mm | Yes |
| Lower Thorax Rib Displacement | 35 - 43 mm | 37.0 mm | Yes |
| Upper Spine Lateral Acceleration | 13 - 17 g | 15.3 g | Yes |
| Lower Spine Lateral Acceleration | 7 - 11 g | 9.7 g | Yes |

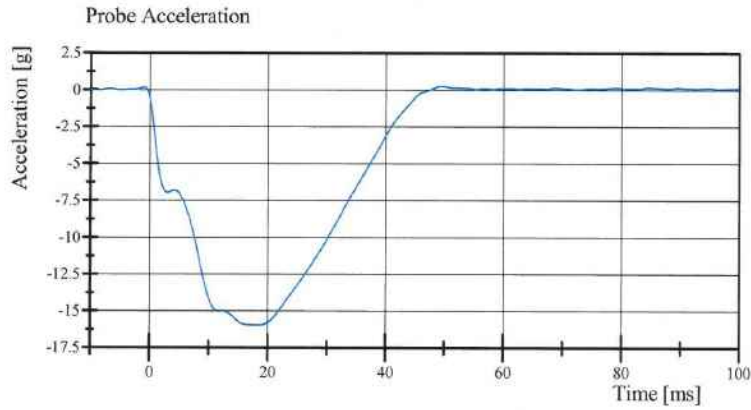
Test meets specifications.

Comments:

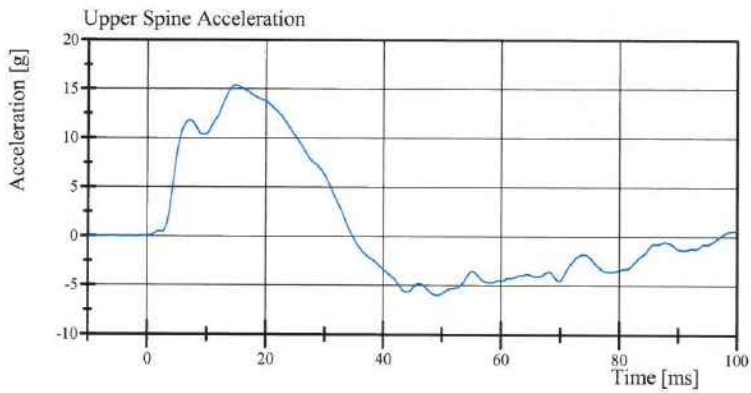


Transportation Research Center Inc.

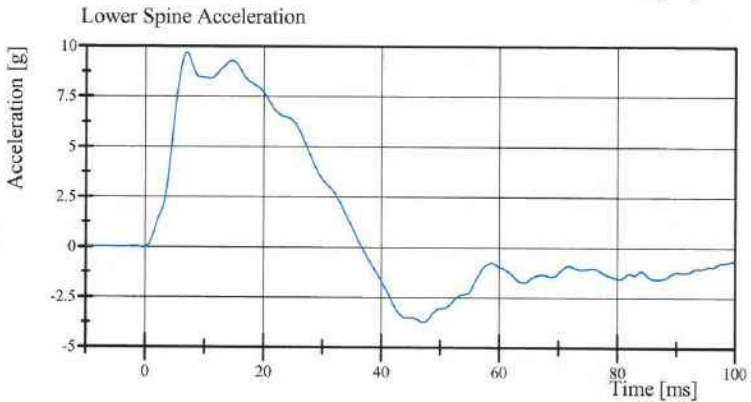
Left Lateral Thorax without Arm
SID IIs Serial No. 305 Certification No. 49-1
Test Date: 11/11/2016



Filter Class: CFC_180
Max: 0.2 g at 49.5 ms
Min: -16.0 g at 18.3 ms



Filter Class: CFC_180
Max: 15.3 g at 14.8 ms
Min: -6.0 g at 49.2 ms



Filter Class: CFC_180
Max: 9.7 g at 7.0 ms
Min: -3.8 g at 47.2 ms

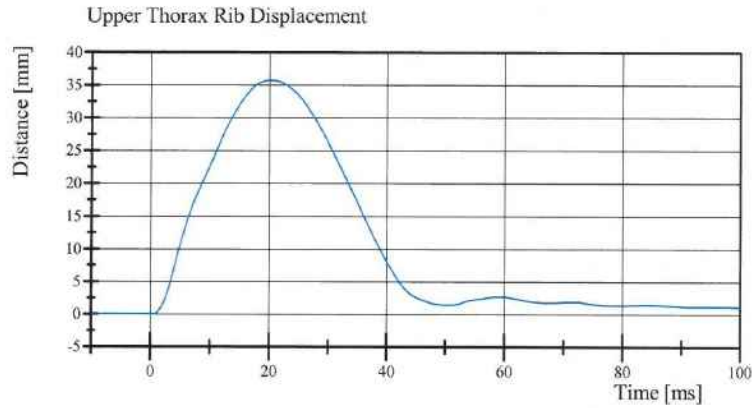


Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

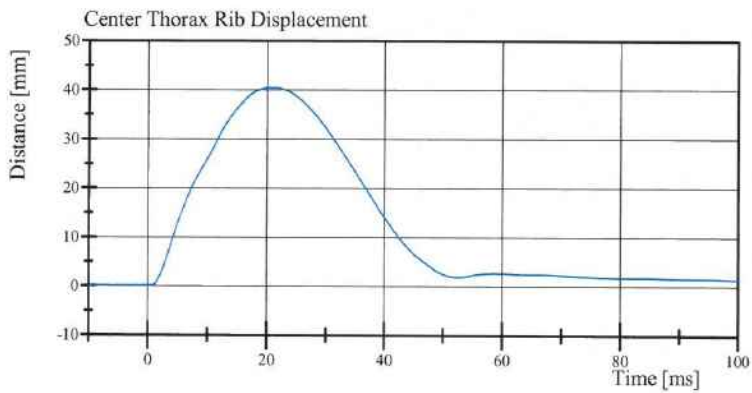
11.11.2016 11:26:00 868

Transportation Research Center Inc.

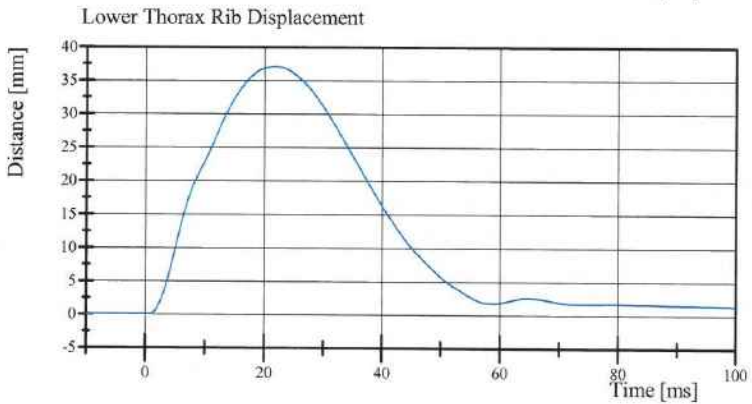
Left Lateral Thorax without Arm
SID IIs Serial No. 305 Certification No. 49-1
Test Date: 11/11/2016



Filter Class: CFC_600
Max: 35.6 mm at 20.3 ms
Min: -0.0 mm at 0.5 ms



Filter Class: CFC_600
Max: 40.3 mm at 21.0 ms
Min: -0.0 mm at -6.2 ms



Filter Class: CFC_600
Max: 37.0 mm at 21.7 ms
Min: -0.0 mm at -4.6 ms



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

11.11.2016 11:26:00 868

Transportation Research Center Inc.

Left Lateral Abdomen
SID IIs Serial No. 305 Certification No. 49-1
Test Date: 11/11/2016

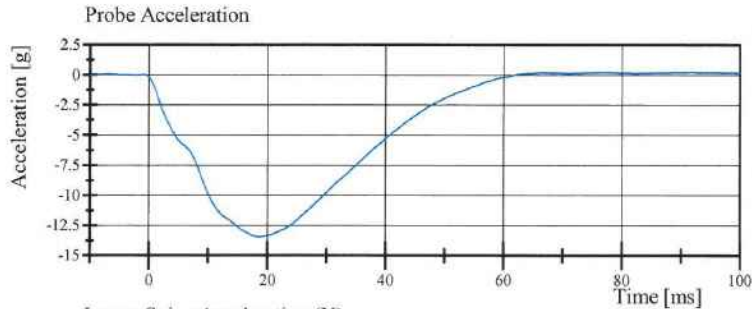
| Test Parameter | Specification | Test Results | Pass |
|----------------------------------|-----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.6 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| Impactor Velocity | 4.2 - 4.4 m/s | 4.24 m/s | Yes |
| Impactor Acceleration | (-12) - (-16) g | -13.5 g | Yes |
| Upper Abdominal Rib Displacement | 36 - 47 mm | 44.5 mm | Yes |
| Lower Abdominal Rib Displacement | 33 - 44 mm | 39.5 mm | Yes |
| Lower Spine Lateral Acceleration | 9 - 14.0 g | 10.34 g | Yes |

Test meets specifications.

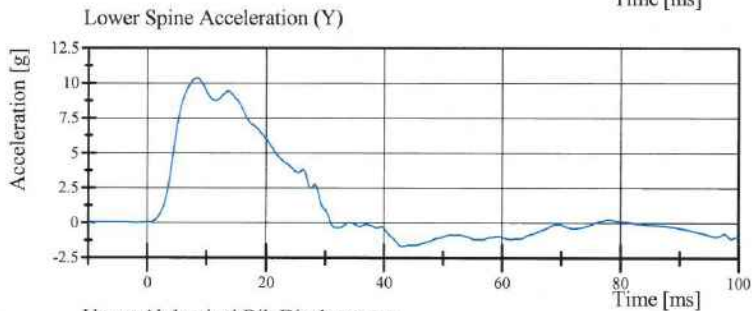
Comments:

Transportation Research Center Inc.

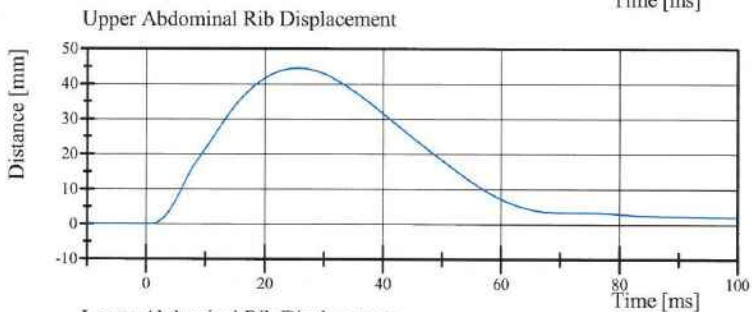
Left Lateral Abdomen
SID IIs Serial No. 305 Certification No. 49-1
Test Date: 11/11/2016



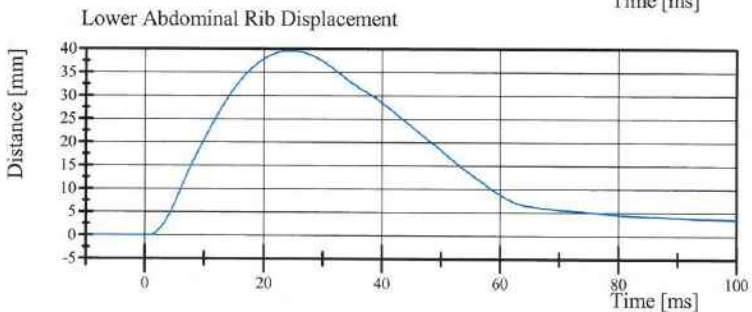
Filter Class: CFC_180
Max: 0.3 g at 91.6 ms
Min: -13.5 g at 18.6 ms



Filter Class: CFC_180
Max: 10.3 g at 8.3 ms
Min: -1.7 g at 43.0 ms



Filter Class: CFC_600
Max: 44.5 mm at 25.5 ms
Min: -0.0 mm at -5.4 ms



Filter Class: CFC_600
Max: 39.5 mm at 24.4 ms
Min: -0.0 mm at 0.8 ms

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

11.11.2016 11:15:42 720



Transportation Research Center Inc.

Left Lateral Pelvis

SID IIs Serial No. 305 Certification No. 49-1

Test Date: 11/11/2016

| Test Parameter | Specification | Test Results | Pass |
|---|---------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 37 % | Yes |
| Pendulum Velocity | 6.6 - 6.8 m/s | 6.61 m/s | Yes |
| Impactor Acceleration | (-38.0) - (-47.0) g | -46.72 g | Yes |
| Peak Pelvis Lateral Acceleration after 6ms | 34 - 42 g | 39.2 g | Yes |
| Acetabulum Force | 3,600 - 4,300 N | 4,163.3 N | Yes |

Test meets specifications.

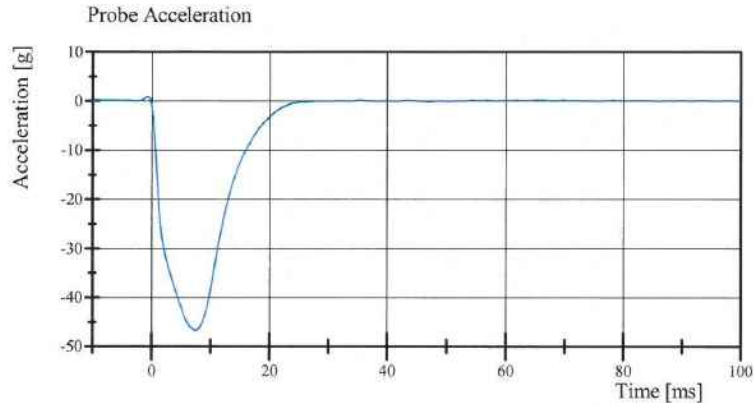
Comments:

Transportation Research Center Inc.

Left Lateral Pelvis

SID IIs Serial No. 305 Certification No. 49-1

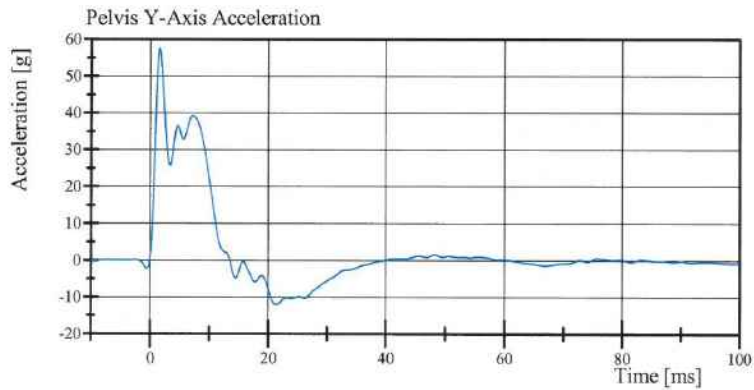
Test Date: 11/11/2016



Filter Class: CFC_180

Max: 0.8 g at -0.7 ms

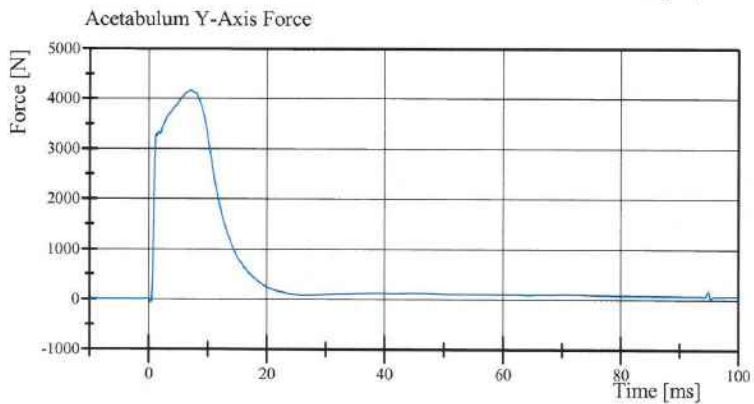
Min: -46.7 g at 7.4 ms



Filter Class: CFC_180

Max: 57.5 g at 1.6 ms

Min: -12.1 g at 21.4 ms



Filter Class: CFC_600

Max: 4,163.3 N at 7.1 ms

Min: -70.8 N at 0.3 ms



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

11.11.2016 12:52:10 473

Transportation Research Center Inc.

Left Lateral Iliac

SID IIs Serial No. 305 Certification No. 49-1

Test Date: 11/11/2016

| Test Parameter | Specification | Test Results | Pass |
|----------------------------------|-----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| Pendulum Velocity | 4.2 - 4.4 m/s | 4.36 m/s | Yes |
| Impactor Acceleration | (-36) - (-45) g | -41.9 g | Yes |
| Peak Pelvis Lateral Acceleration | 28 - 39 g | 31.2 g | Yes |
| Iliac Force | 4,100 - 5,100 N | 4,651.2 N | Yes |

Test meets specifications.

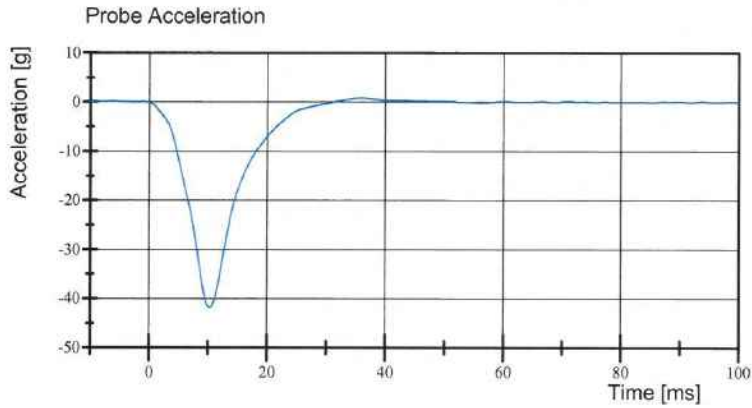
Comments:

Transportation Research Center Inc.

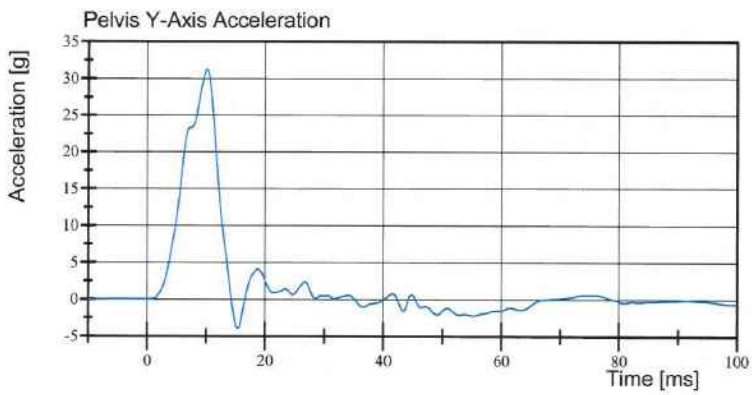
Left Lateral Iliac

SID IIs Serial No. 305 Certification No. 49-1

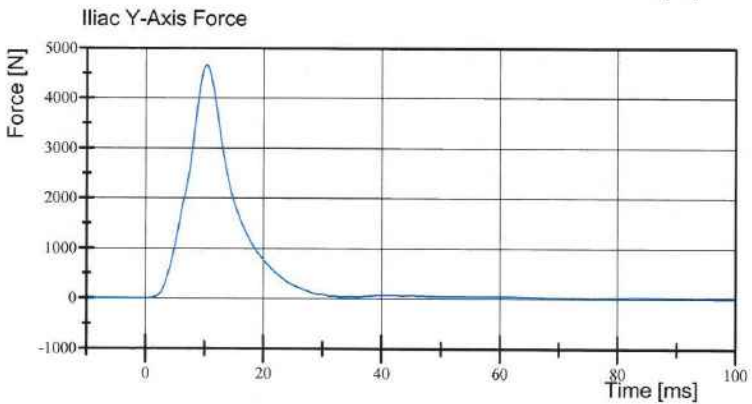
Test Date: 11/11/2016



Filter Class: CFC_180
Max: 0.8 g at 35.9 ms
Min: -41.9 g at 10.3 ms



Filter Class: CFC_180
Max: 31.2 g at 10.1 ms
Min: -4.0 g at 15.4 ms



Filter Class: CFC_600
Max: 4,651.2 N at 10.3 ms
Min: -0.6 N at -3.0 ms



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

11.11.2016 10:52:59 678

**Post-Test Calibration Sheets
Passenger S/N 305**

Transportation Research Center Inc.
SIDI's Dummy - Level D
External Dimensions
Serial No. 305 Calibration No.50

| Symbol | Description | Specification | Results | Pass |
|--------|---|---------------|---------|------|
| | | mm | mm | |
| A | Sitting Height | 772.0 - 788.0 | 777 | Yes |
| B | Shoulder Pivot Height | 437.0 - 453.0 | 447 | Yes |
| C | H-Point Height | 79.0 - 89.0 | 88 | Yes |
| D | H-Point from Seat Back | 141.0 - 151.0 | 143 | Yes |
| E | Shoulder Pivot from Backline | 97.0 - 107.0 | 100 | Yes |
| F | Thigh Clearance | 119.0 - 135.0 | 125 | Yes |
| G | Head Breadth | 140.0 - 148.0 | 145 | Yes |
| H | Head Back from Backline | 40.0 - 46.0 | 45 | Yes |
| I | Head Depth | 178.0 - 188.0 | 183 | Yes |
| J | Head Circumference | 541.0 - 551.0 | 543 | Yes |
| K | Buttock to Knee Length | 514.0 - 540.0 | 535 | Yes |
| L | Popliteal Height | 343.0 - 369.0 | 345 | Yes |
| M | Knee Pivot to Floor Height | 393.0 - 409.0 | 395 | Yes |
| N | Buttock Popliteal Length | 416.0 - 442.0 | 434 | Yes |
| O | Chest Depth without Jacket | 195.0 - 211.0 | 202 | Yes |
| P | Foot Length (right) | 216.0 - 232.0 | 222 | Yes |
| P | Foot Length (left) | 216.0 - 232.0 | 222 | Yes |
| Q | Hip Breadth | 313.0 - 323.0 | 320 | Yes |
| R | Arm Length | 249.0 - 259.0 | 253 | Yes |
| S | Knee Joint to seat Back | 478.0 - 493.0 | 480 | Yes |
| V | Shoulder Width (only one arm installed) | 341.0 - 357.0 | 349 | Yes |
| W | Foot Width (right) | 78.0 - 94.0 | 85 | Yes |
| W | Foot Width (left) | 78.0 - 94.0 | 85 | Yes |
| Y | Chest Circumference with Jacket | 851.0 - 881.0 | 873 | Yes |
| Z | Waist Circumference | 761.0 - 791.0 | 780 | Yes |

Transportation Research Center Inc.

Left Lateral Head Drop

SID IIs Serial No. 305 Certification No. 50-2

Test Date: 11/18/2016

| Test Parameter | Specification | Test Results | Pass |
|---|----------------|--------------|------|
| Temperature | 18.9 - 25.6 °C | 21.1 °C | Yes |
| Relative Humidity | 10 - 70 % | 40 % | Yes |
| Peak Head Resultant Acceleration | 115 - 137 g | 119.8 g | Yes |
| Peak Head Longitudinal Acceleration | (-15) - 15 g | -2.4 g | Yes |
| Is Head Resultant Acceleration Curve Unimodal within 15% of Peak? | Yes | Yes | Yes |

Test meets specifications.

Comments:

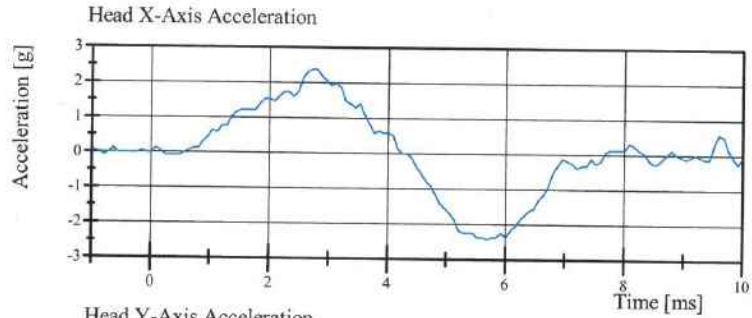
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.18.2016 13:11:54 232

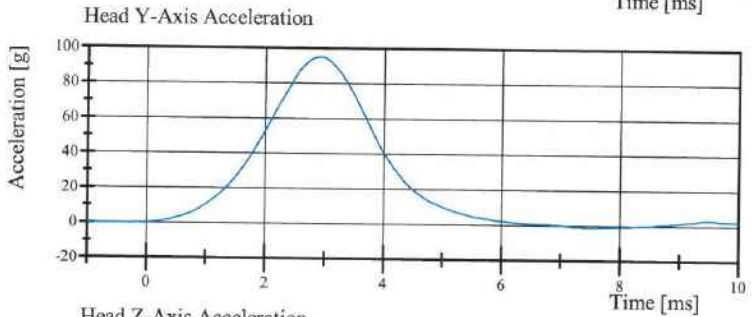


Transportation Research Center Inc.

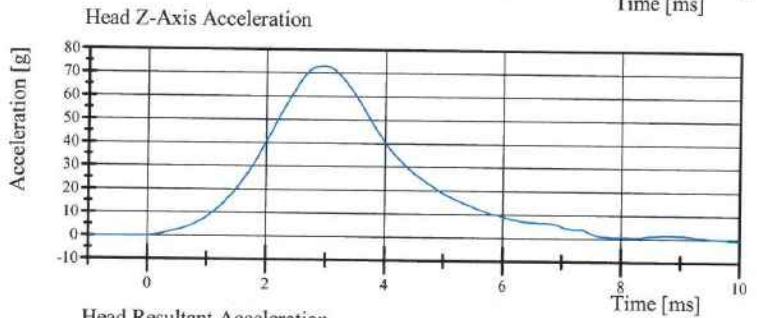
Left Lateral Head Drop
SID IIs Serial No. 305 Certification No. 50-2
Test Date: 11/18/2016



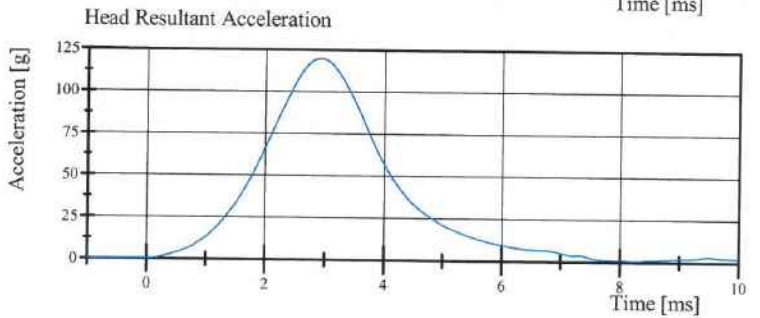
Filter Class: CFC_1000
Max: 2.4 g at 2.7 ms
Min: -2.4 g at 5.7 ms



Filter Class: CFC_1000
Max: 94.9 g at 2.9 ms
Min: -1.2 g at 7.5 ms



Filter Class: CFC_1000
Max: 73.0 g at 3.0 ms
Min: -0.5 g at 10.0 ms



Filter Class: CFC_1000
Max: 119.8 g at 3.0 ms
Min: 0.0 g at -0.5 ms

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

11.18.2016 13:12:00 232



Transportation Research Center Inc.

Left Lateral Neck
SID IIs Serial No. 305 Certification No. 50-1
Test Date: 11/18/2016

| Test Parameter | Specification | Test Results | Pass |
|--|-----------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.7 °C | Yes |
| Relative Humidity | 10 - 70 % | 39 % | Yes |
| Pendulum Velocity | (-5.51) - (-5.63) m/s | -5.608 m/s | Yes |
| Pendulum Integrated Velocity | | | |
| Change at 10 ms | 2.20 - 2.80 m/s | 2.665 m/s | Yes |
| Change at 15 ms | 3.30 - 4.10 m/s | 3.967 m/s | Yes |
| Change at 20 ms | 4.40 - 5.40 m/s | 5.318 m/s | Yes |
| Change at 25 ms | 5.40 - 6.10 m/s | 5.783 m/s | Yes |
| Change at 25 to 100 ms | 5.50 - 6.20 m/s | 5.784 m/s | Yes |
| Maximum Headform Flexion occurring between 50ms and 70ms. | | | |
| Peak | (-71) - (-81) deg | -76.8 deg | Yes |
| Time of Peak | 50 - 70 ms | 64.0 ms | Yes |
| Total Neck Occipital Condyles Moment | 36 - 44 N·m | 41.8 N·m | Yes |
| Total Neck Occipital Condyles Moment | | | |
| Decay Time to 0 N·m | 102 - 126 ms | 122.6 ms | Yes |

Test meets specifications.

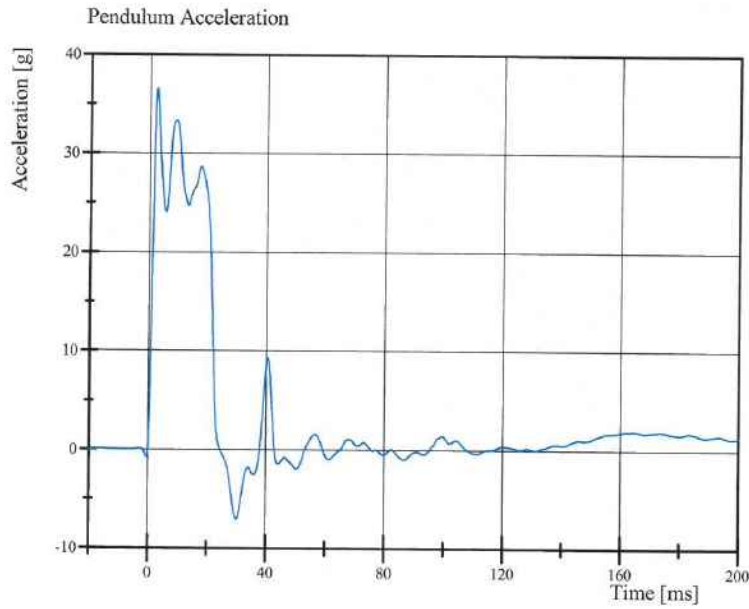
Comments:

Transportation Research Center Inc.

Left Lateral Neck

SID IIs Serial No. 305 Certification No. 50-1

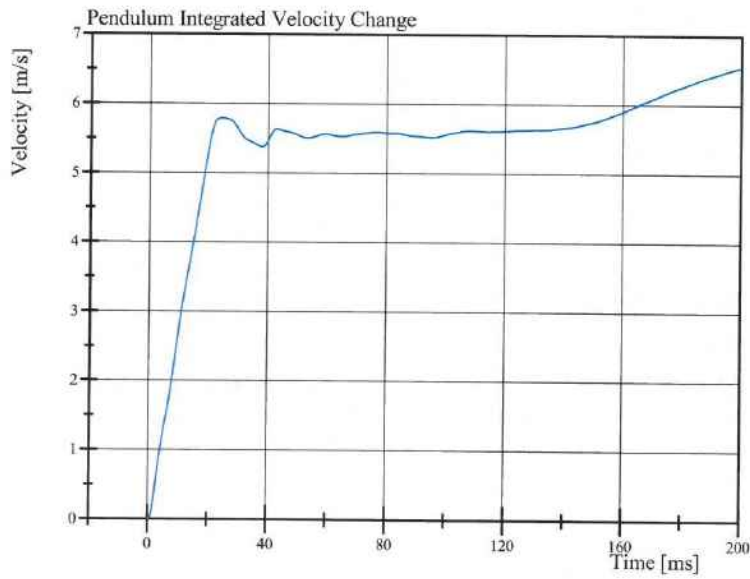
Test Date: 11/18/2016



Filter Class: CFC_180

Max: 36.5 g at 2.5 ms

Min: -7.1 g at 30.2 ms



Filter Class: CFC_180

Max: 6.5 m/s at 200.0 ms

Min: 0.0 m/s at 0.0 ms

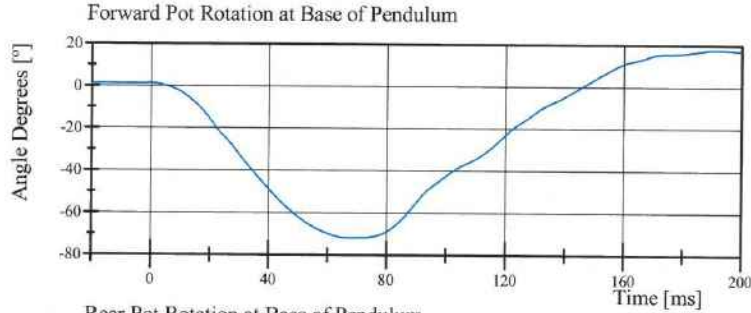
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.18.2016 10:47:42 742

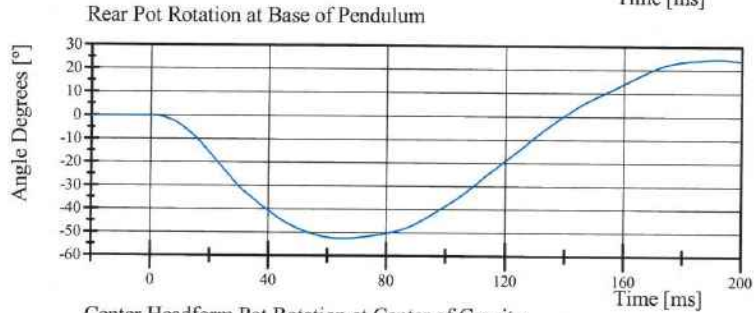


Transportation Research Center Inc.

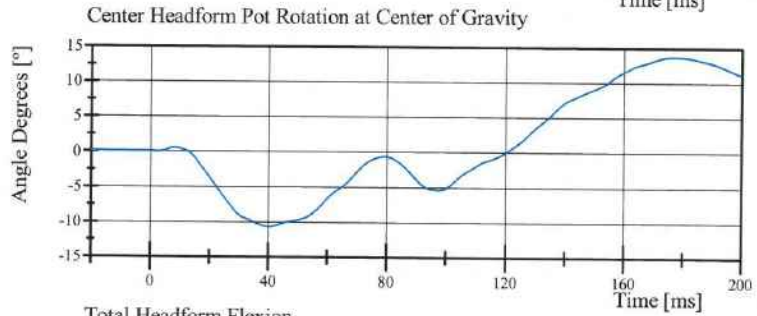
Left Lateral Neck
SID IIs Serial No. 305 Certification No. 50-1
Test Date: 11/18/2016



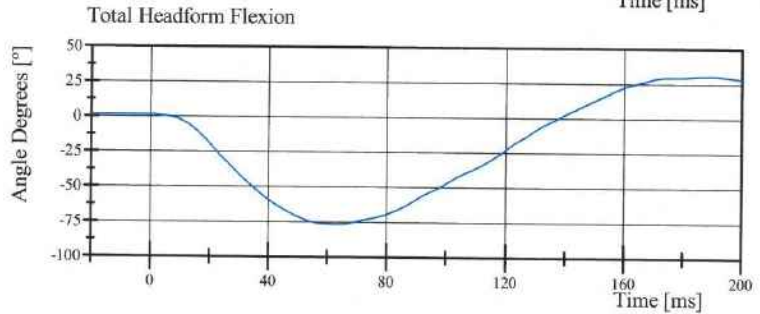
Filter Class: CFC_60
Max: 17.7 ° at 191.4 ms
Min: -71.9 ° at 67.6 ms



Filter Class: CFC_60
Max: 24.6 ° at 192.2 ms
Min: -52.7 ° at 64.7 ms



Filter Class: CFC_60
Max: 13.8 ° at 177.0 ms
Min: -10.7 ° at 40.3 ms



Filter Class: CFC_60
Max: 30.5 ° at 189.4 ms
Min: -76.8 ° at 64.0 ms

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

11.18.2016 10:47:43 742

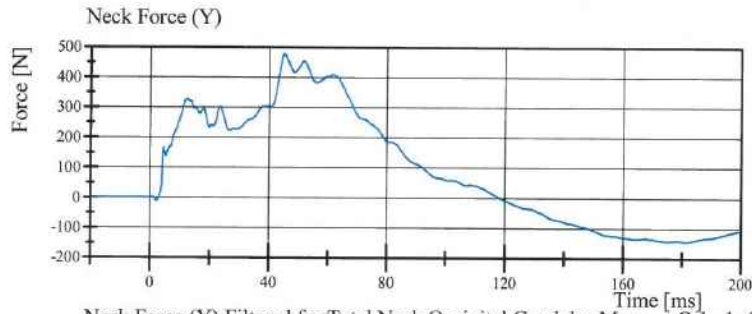


Transportation Research Center Inc.

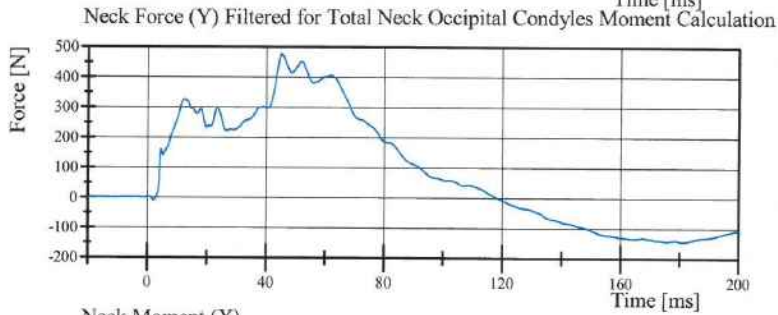
Left Lateral Neck

SID IIs Serial No. 305 Certification No. 50-1

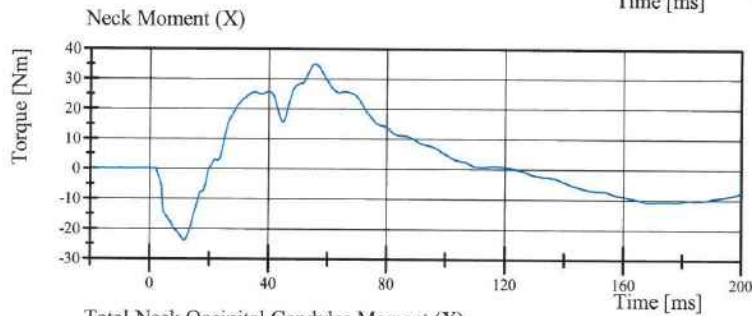
Test Date: 11/18/2016



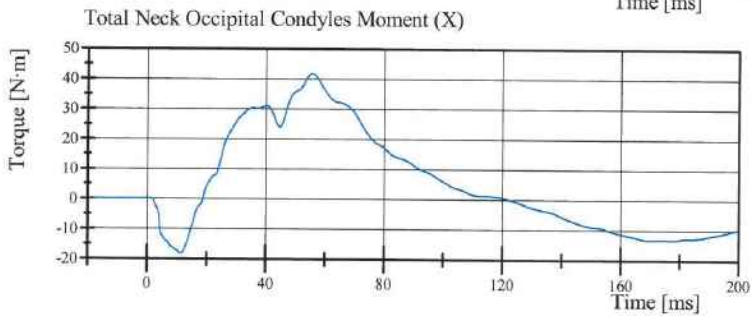
Filter Class: CFC_1000
Max: 478.2 N at 44.9 ms
Min: -143.8 N at 181.3 ms



Filter Class: CFC_600
Max: 477.8 N at 45.0 ms
Min: -143.7 N at 181.4 ms



Filter Class: CFC_600
Max: 35.0 Nm at 55.7 ms
Min: -23.9 Nm at 11.6 ms



Filter Class: Without_(Consta
Max: 41.8 N·m at 55.6 ms
Min: -18.3 N·m at 11.4 ms

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

11.18.2016 10:47:45 742



Transportation Research Center Inc.

Left Lateral Shoulder
SID IIs Serial No. 305 Certification No. 50-1
Test Date: 11/18/2016

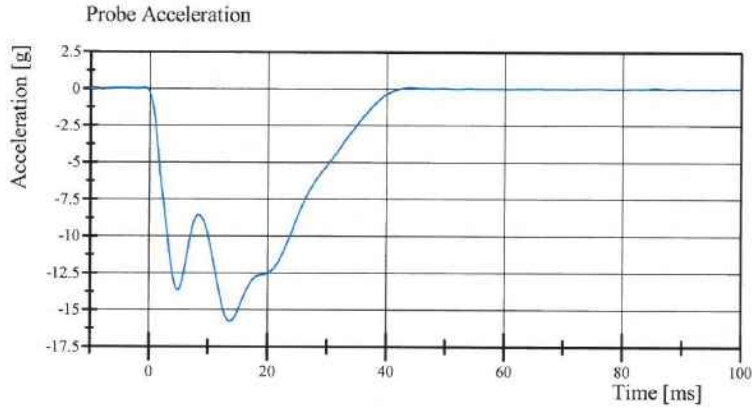
| Test Parameter | Specification | Test Results | Pass |
|----------------------------------|-----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.1 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| Impactor Velocity | 4.2 - 4.4 m/s | 4.27 m/s | Yes |
| Impactor Acceleration | (-13) - (-18) g | -15.8 g | Yes |
| Shoulder Displacement | 28 - 37 mm | 30.6 mm | Yes |
| Upper Spine Lateral Acceleration | 17 - 22 g | 21.0 g | Yes |

Test meets specifications.

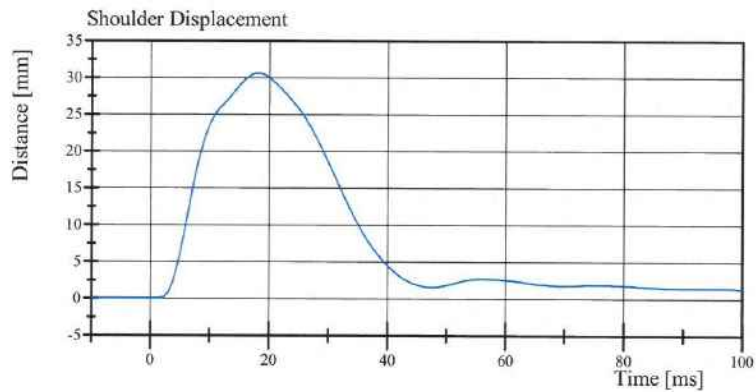
Comments:

Transportation Research Center Inc.

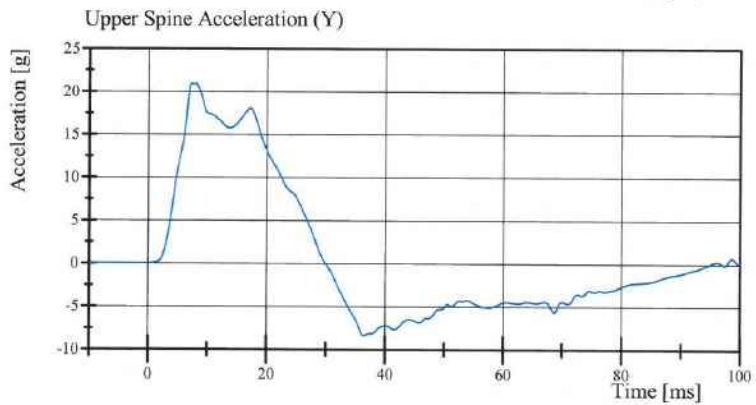
Left Lateral Shoulder
SID IIs Serial No. 305 Certification No. 50-1
Test Date: 11/18/2016



Filter Class: CFC_180
Max: 0.1 g at 85.3 ms
Min: -15.8 g at 13.7 ms



Filter Class: CFC_600
Max: 30.6 mm at 18.2 ms
Min: -0.0 mm at 0.3 ms



Filter Class: CFC_180
Max: 21.0 g at 7.4 ms
Min: -8.4 g at 36.5 ms

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

11.18.2016 08:45:52 868



Transportation Research Center Inc.

Left Lateral Thorax with Arm
SID IIs Serial No. 305 Certification No. 50-2
Test Date: 11/18/2016

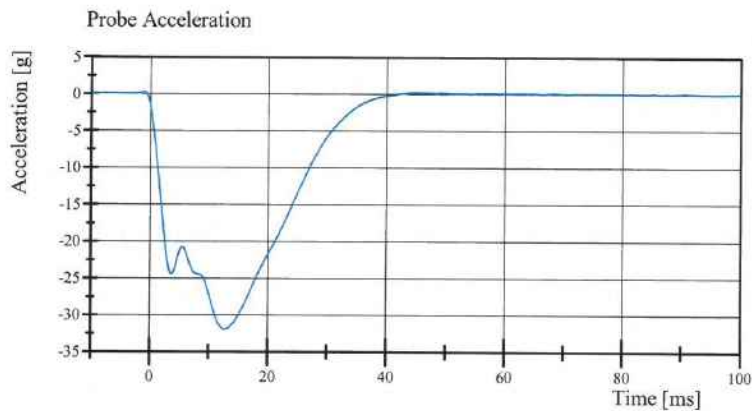
| Test Parameter | Specification | Test Results | Pass |
|----------------------------------|-----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.6 °C | Yes |
| Relative Humidity | 10 - 70 % | 39 % | Yes |
| Impactor Velocity | 6.60 - 6.80 m/s | 6.778 m/s | Yes |
| Impactor Acceleration | (-30) - (-36) g | -31.9 g | Yes |
| Shoulder Displacement | 31 - 40 mm | 33.2 mm | Yes |
| Upper Thorax Rib Displacement | 25 - 32 mm | 26.5 mm | Yes |
| Center Thorax Rib Displacement | 30 - 36 mm | 31.7 mm | Yes |
| Lower Thorax Rib Displacement | 32 - 38 mm | 34.5 mm | Yes |
| Upper Spine Lateral Acceleration | 34 - 43 g | 37.6 g | Yes |
| Lower Spine Lateral Acceleration | 29 - 37 g | 30.3 g | Yes |

Test meets specifications.

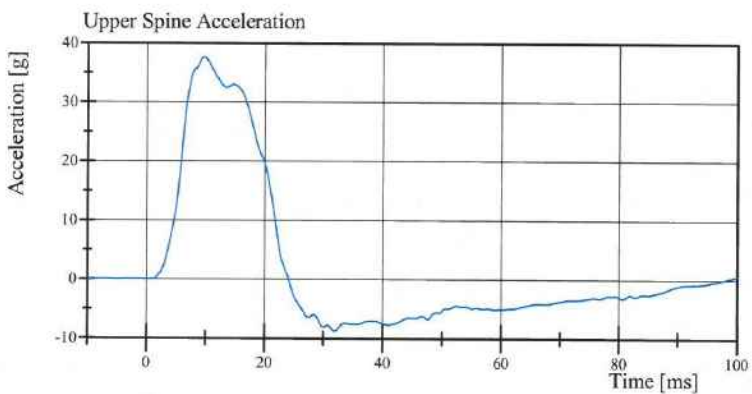
Comments:

Transportation Research Center Inc.

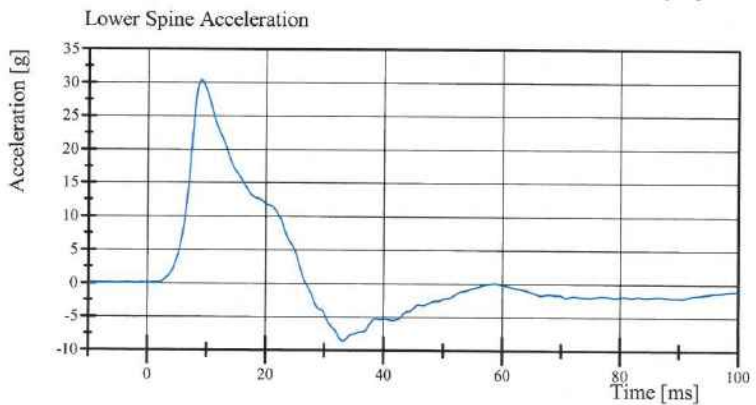
Left Lateral Thorax with Arm
SID IIs Serial No. 305 Certification No. 50-2
Test Date: 11/18/2016



Filter Class: CFC_180
Max: 0.2 g at -1.0 ms
Min: -31.9 g at 12.8 ms



Filter Class: CFC_180
Max: 37.6 g at 9.7 ms
Min: -8.8 g at 31.9 ms



Filter Class: CFC_180
Max: 30.3 g at 9.0 ms
Min: -8.7 g at 33.1 ms

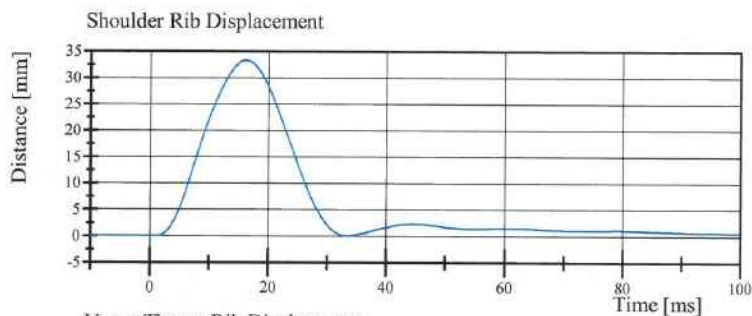
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with Polarity in accordance with J211

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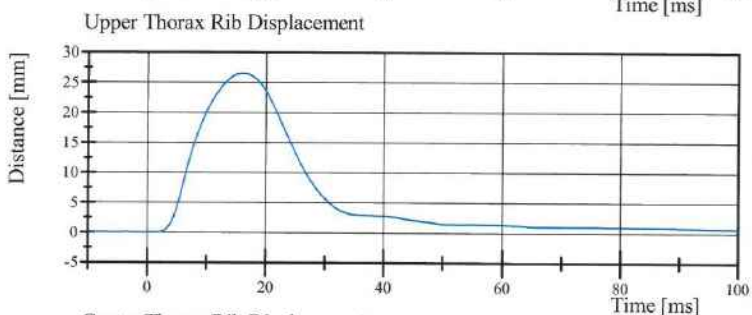


Transportation Research Center Inc.

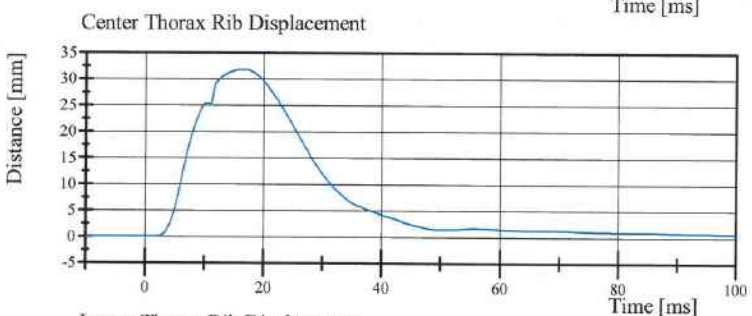
Left Lateral Thorax with Arm
SID IIs Serial No. 305 Certification No. 50-2
Test Date: 11/18/2016



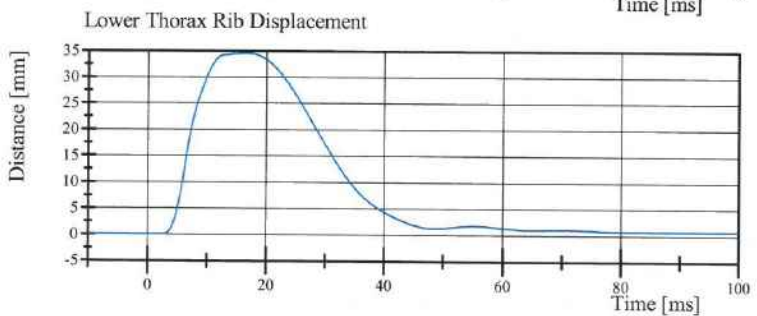
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Min: -0.0 mm at -2.0 ms



Filter Class: CFC_600
Max: 31.7 mm at 16.6 ms
Min: -0.0 mm at -6.2 ms



Filter Class: CFC_600
Max: 34.5 mm at 16.0 ms
Min: -0.0 mm at -1.3 ms

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

11.18.2016 10:36:09 628



Transportation Research Center Inc.

Left Lateral Thorax without Arm
SID IIs Serial No. 305 Certification No. 50-1
Test Date: 11/18/2016

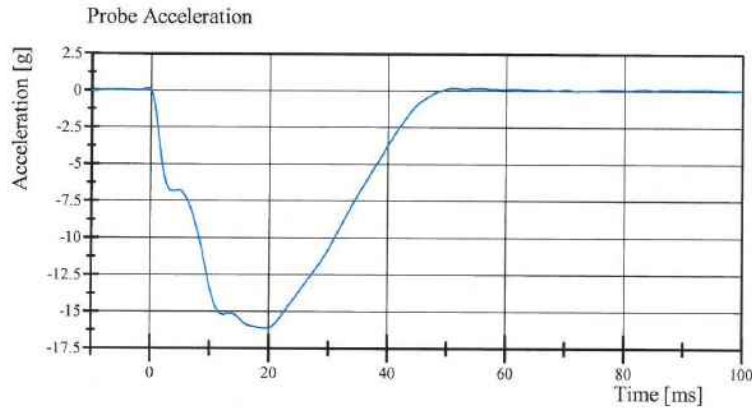
| Test Parameter | Specification | Test Results | Pass |
|----------------------------------|-----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.1 °C | Yes |
| Relative Humidity | 10 - 70 % | 39 % | Yes |
| Impactor Velocity | 4.20 - 4.40 m/s | 4.355 m/s | Yes |
| Impactor Acceleration | (-14) - (-18) g | -16.2 g | Yes |
| Upper Thorax Rib Displacement | 32 - 40 mm | 35.3 mm | Yes |
| Center Thorax Rib Displacement | 39 - 45 mm | 40.8 mm | Yes |
| Lower Thorax Rib Displacement | 35 - 43 mm | 38.0 mm | Yes |
| Upper Spine Lateral Acceleration | 13 - 17 g | 14.5 g | Yes |
| Lower Spine Lateral Acceleration | 7 - 11 g | 9.5 g | Yes |

Test meets specifications.

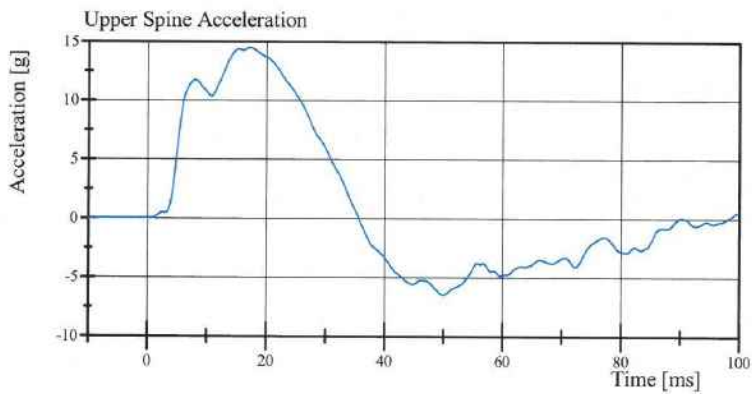
Comments:

Transportation Research Center Inc.

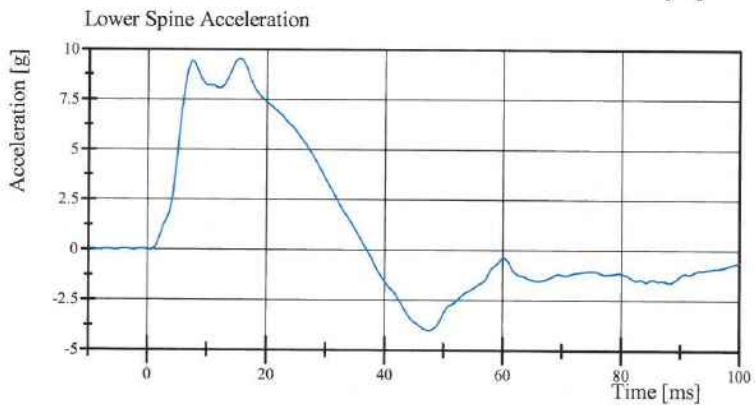
Left Lateral Thorax without Arm
SID IIs Serial No. 305 Certification No. 50-1
Test Date: 11/18/2016



Filter Class: CFC_180
Max: 0.2 g at 55.8 ms
Min: -16.2 g at 19.4 ms



Filter Class: CFC_180
Max: 14.5 g at 17.2 ms
Min: -6.5 g at 50.0 ms



Filter Class: CFC_180
Max: 9.5 g at 15.5 ms
Min: -4.0 g at 47.4 ms

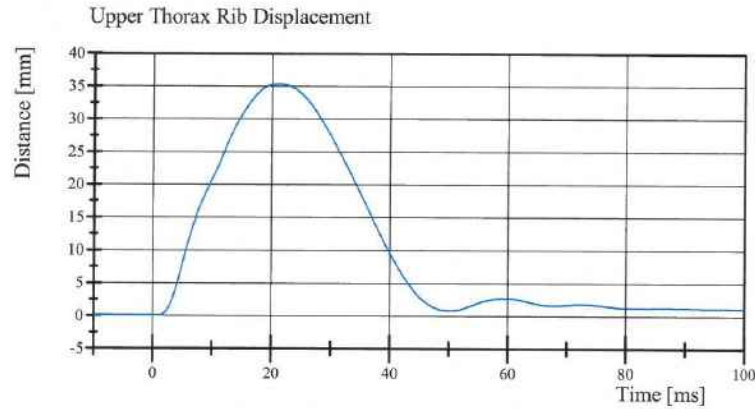
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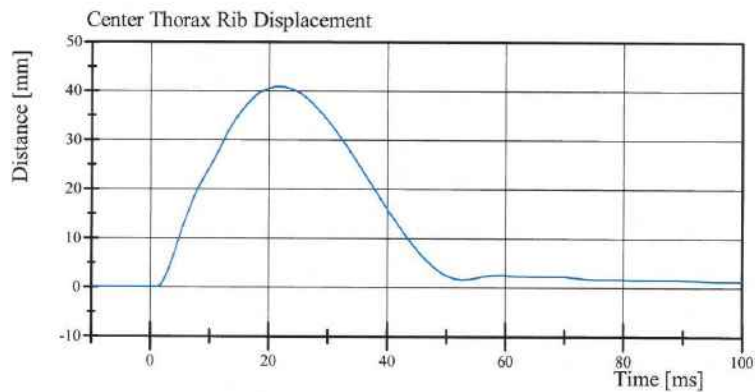


Transportation Research Center Inc.

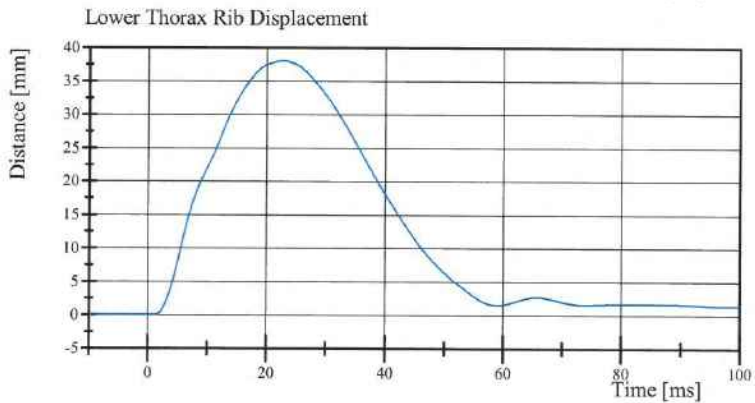
Left Lateral Thorax without Arm
SID IIs Serial No. 305 Certification No. 50-1
Test Date: 11/18/2016



Filter Class: CFC_600
Max: 35.3 mm at 21.3 ms
Min: -0.0 mm at 1.2 ms



Filter Class: CFC_600
Max: 40.8 mm at 21.7 ms
Min: -0.0 mm at 0.9 ms



Filter Class: CFC_600
Max: 38.0 mm at 22.9 ms
Min: -0.0 mm at -9.7 ms

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

11.18.2016 09:20:21 840



Transportation Research Center Inc.

Left Lateral Abdomen
SID IIs Serial No. 305 Certification No. 50-1
Test Date: 11/18/2016

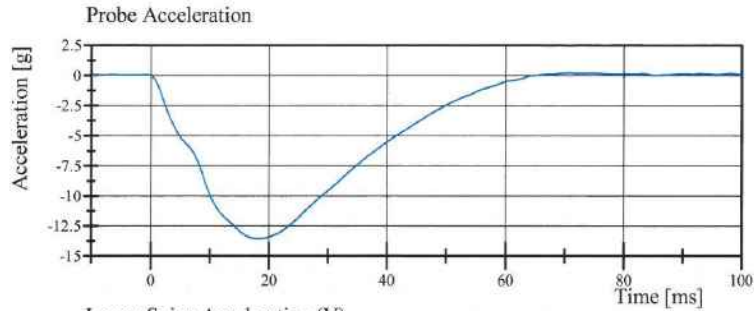
| Test Parameter | Specification | Test Results | Pass |
|----------------------------------|-----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.7 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| Impactor Velocity | 4.2 - 4.4 m/s | 4.27 m/s | Yes |
| Impactor Acceleration | (-12) - (-16) g | -13.6 g | Yes |
| Upper Abdominal Rib Displacement | 36 - 47 mm | 43.7 mm | Yes |
| Lower Abdominal Rib Displacement | 33 - 44 mm | 39.7 mm | Yes |
| Lower Spine Lateral Acceleration | 9 - 14.0 g | 10.34 g | Yes |

Test meets specifications.

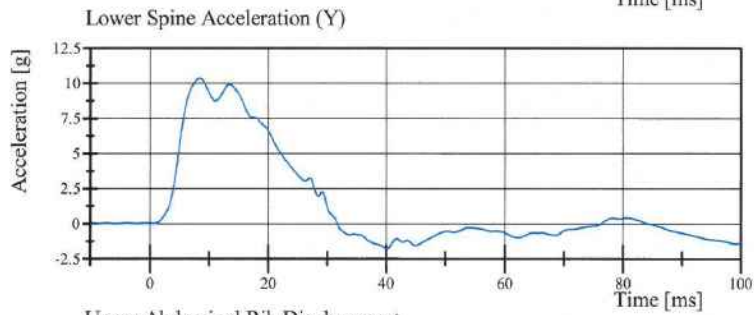
Comments:

Transportation Research Center Inc.

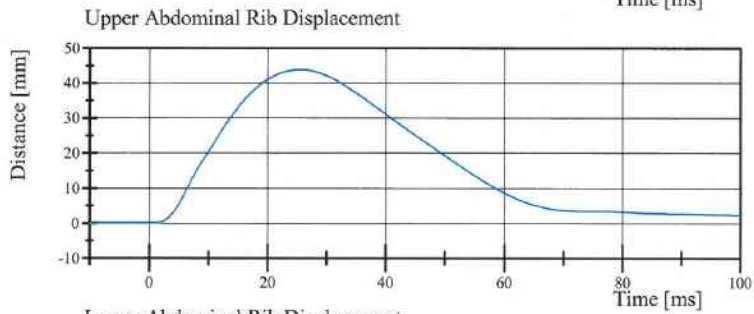
Left Lateral Abdomen
SID II_s Serial No. 305 Certification No. 50-1
Test Date: 11/18/2016



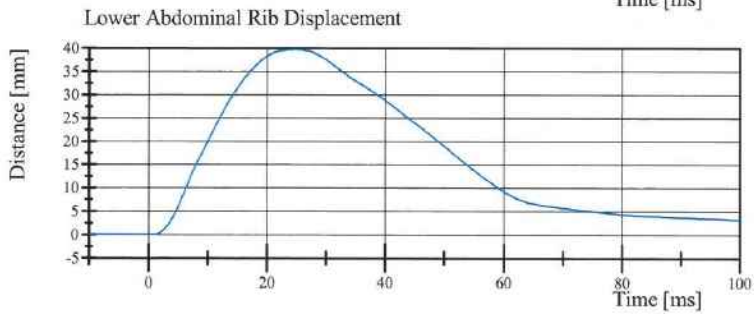
Filter Class: CFC_180
Max: 0.2 g at 70.7 ms
Min: -13.6 g at 18.3 ms



Filter Class: CFC_180
Max: 10.3 g at 8.5 ms
Min: -1.8 g at 40.2 ms



Filter Class: CFC_600
Max: 43.7 mm at 25.5 ms
Min: -0.0 mm at -9.8 ms



Filter Class: CFC_600
Max: 39.7 mm at 25.0 ms
Min: -0.0 mm at -5.5 ms

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

11.18.2016 08:55:09 700



Transportation Research Center Inc.

Left Lateral Pelvis

SID IIs Serial No. 305 Certification No. 50-1

Test Date: 11/18/2016

| Test Parameter | Specification | Test Results | Pass |
|---|---------------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| Pendulum Velocity | 6.6 - 6.8 m/s | 6.62 m/s | Yes |
| Impactor Acceleration | (-38.0) - (-47.0) g | -44.15 g | Yes |
| Peak Pelvis Lateral Acceleration after 6ms | 34 - 42 g | 40.0 g | Yes |
| Acetabulum Force | 3,600 - 4,300 N | 3,862.0 N | Yes |

Test meets specifications.

Comments: Pelvis Pulg#11026

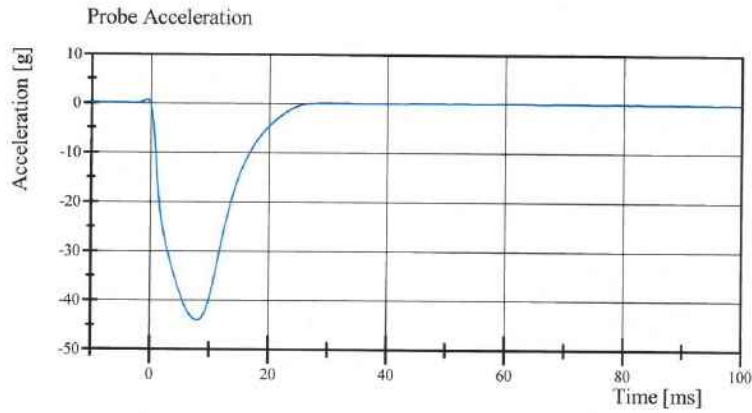


Transportation Research Center Inc.

Left Lateral Pelvis

SID IIs Serial No. 305 Certification No. 50-1

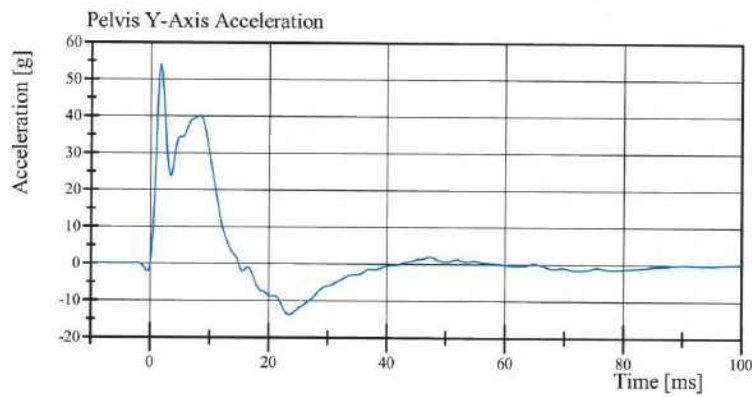
Test Date: 11/18/2016



Filter Class: CFC_180

Max: 0.6 g at -0.6 ms

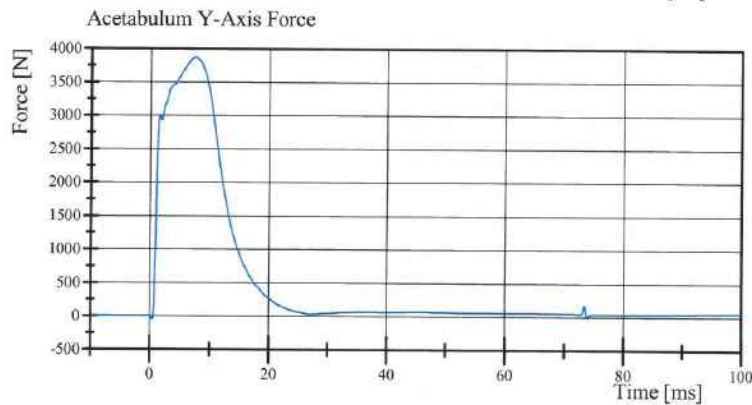
Min: -44.1 g at 8.0 ms



Filter Class: CFC_180

Max: 54.0 g at 1.7 ms

Min: -13.8 g at 23.5 ms



Filter Class: CFC_600

Max: 3,862.0 N at 7.6 ms

Min: -51.4 N at 0.5 ms

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

11.18.2016 08:29:42 447



Transportation Research Center Inc.

Left Lateral Iliac

SID IIs Serial No. 305 Certification No. 50-1

Test Date: 11/18/2016

| Test Parameter | Specification | Test Results | Pass |
|----------------------------------|-----------------|--------------|------|
| Temperature | 20.6 - 22.2 °C | 21.4 °C | Yes |
| Relative Humidity | 10 - 70 % | 39 % | Yes |
| Pendulum Velocity | 4.2 - 4.4 m/s | 4.35 m/s | Yes |
| Impactor Acceleration | (-36) - (-45) g | -42.1 g | Yes |
| Peak Pelvis Lateral Acceleration | 28 - 39 g | 28.5 g | Yes |
| Iliac Force | 4,100 - 5,100 N | 4,678.6 N | Yes |

Test meets specifications.

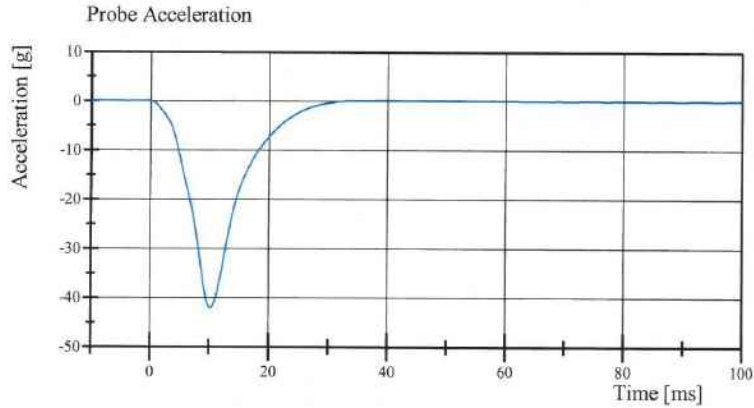
Comments:

Transportation Research Center Inc.

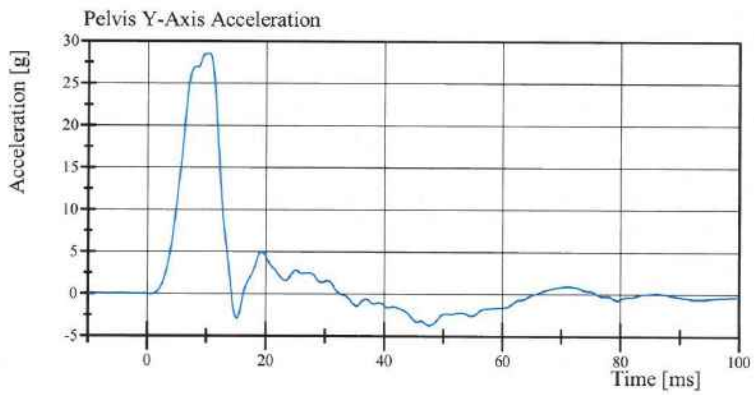
Left Lateral Iliac

SID IIs Serial No. 305 Certification No. 50-1

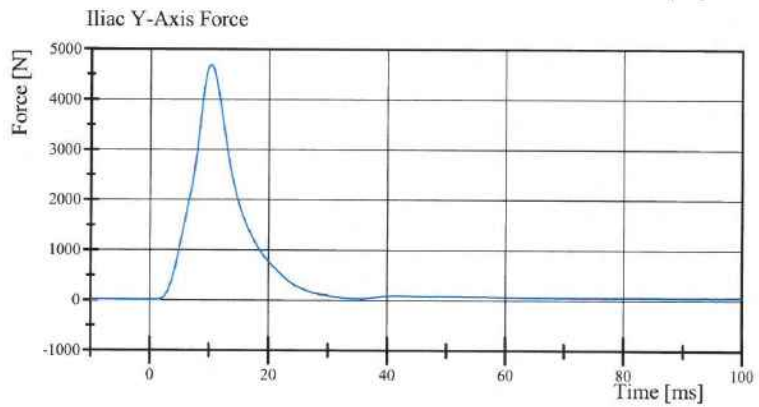
Test Date: 11/18/2016



Filter Class: CFC_180
Max: 0.1 g at 39.7 ms
Min: -42.1 g at 10.2 ms



Filter Class: CFC_180
Max: 28.5 g at 10.5 ms
Min: -3.7 g at 47.6 ms



Filter Class: CFC_600
Max: 4,678.6 N at 10.3 ms
Min: -0.9 N at -10.0 ms

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

11.18.2016 11:03:22 666



APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

TABLE 1 – Dummy Instrumentation (ES-2re)

| | | ES-2re S/N F030 | | | |
|--|--------|-----------------|--------------|------------------|-----------|
| | | Serial Number | Manufacturer | Calibration Date | |
| Head Accelerometers | X | P87680 | Endevco | 21-Sep-16 | |
| | Y | P66873 | Endevco | 10-Nov-16 | |
| | Z | P91950 | Endevco | 6-Oct-16 | |
| Redundant Head Accelerometers | X | P94566 | Endevco | 10-Nov-16 | |
| | Y | P94429 | Endevco | 1-Sep-16 | |
| | Z | P94483 | Endevco | 1-Sep-16 | |
| Thoracic Rib Displacement Potentiometers | Upper | Y | 111 | Honeywell | 29-Sep-16 |
| | Middle | Y | 174 | FTSS | 29-Sep-16 |
| | Lower | Y | 173 | FTSS | 29-Sep-16 |
| Abdomen Load Cells | Front | Y | 1441 | Denton | 18-Mar-16 |
| | Middle | Y | 1436 | Denton | 18-Mar-16 |
| | Rear | Y | 1437 | Denton | 18-Mar-16 |
| Lower Spine Accelerometers (T12) | X | P89126 | Endevco | 21-Sep-16 | |
| | Y | P87139 | Endevco | 21-Sep-16 | |
| | Z | P64884 | Endevco | 21-Sep-16 | |
| Acetabulum Load Cell | Y | N/A | N/A | N/A | |
| Pubic Symphysis Load Cell | Y | 457-FY | Denton | 18-Mar-16 | |

TABLE 2 – Dummy Instrumentation (SID-IIs)

| | | | SID-IIs S/N 305 | | | |
|----------------------------------|---------------|--------|-----------------|--------------|------------------|-----------|
| | | | Serial Number | Manufacturer | Calibration Date | |
| Head Accelerometers | | | X | P90267 | Endevco | 29-Sep-16 |
| | | | Y | P93774 | Endevco | 01-Sep-16 |
| | | | Z | P91566 | Endevco | 21-Sep-16 |
| Redundant Head Accelerometers | | | X | P91615 | Endevco | 21-Sep-16 |
| | | | Y | P93762 | Endevco | 01-Sep-16 |
| | | | Z | P93761 | Endevco | 01-Sep-16 |
| Displacement Potentiometers | Shoulder | | N/A | N/A | N/A | N/A |
| | Thoracic Rib | Upper | Y | 007 | Servo | 29-Sep-16 |
| | | Middle | Y | 1161 | Servo | 29-Sep-16 |
| | | Lower | Y | 037 | Servo | 29-Sep-16 |
| | Abdominal Rib | Upper | Y | 1295 | Servo | 29-Sep-16 |
| | | Lower | Y | 1136 | Servo | 29-Sep-16 |
| Lower Spine Accelerometers (T12) | | | X | P94545 | Endevco | 15-Sep-16 |
| | | | Y | P94647 | Endevco | 21-Sep-16 |
| | | | Z | P94530 | Endevco | 1-Sep-16 |
| Acetabulum Load Cell | | | Y | 103-FY | FTSS | 13-Jun-16 |
| Iliac Wing Load Cell | | | Y | 287-FY | Denton | 22-Mar-16 |
| Pelvis Plug (struck side) | | | | 81023 | Humanetics | 03-Dec-14 |
| Pelvis Plug (non-struck side) | | | | 36473 | FTSS | 23-Sep-10 |

TABLE 3 – Vehicle Instrumentation

| Vehicle Instrumentation | | | Serial Number | Manufacturer | Calibration Date |
|-------------------------|---------------------------------|---|---------------|--------------|------------------|
| 1 | Vehicle Center of Gravity | X | P94489 | Endevco | 31-Oct-16 |
| | Vehicle Center of Gravity | Y | P94426 | Endevco | 26-Jul-16 |
| | Vehicle Center of Gravity | Z | P94550 | Endevco | 26-Jul-16 |
| 2 | Right Sill at Front Seat | X | P94424 | Endevco | 31-Oct-16 |
| | Right Sill at Front Seat | Y | P94541 | Endevco | 26-Jul-16 |
| | Right Sill at Front Seat | Z | P91184 | Endevco | 10-Nov-16 |
| 3 | Right Sill at Rear Seat | X | P94524 | Endevco | 10-Nov-16 |
| | Right Sill at Rear Seat | Y | P94570 | Endevco | 10-Nov-16 |
| | Right Sill at Rear Seat | Z | P94488 | Endevco | 10-Nov-16 |
| 4 | Left Sill at Front Door | Y | P50430 | Endevco | 12-Oct-16 |
| 5 | Left Sill at Rear Door | Y | P93452 | Endevco | 10-Nov-16 |
| 6 | Left A-Post Lower | Y | P94562 | Endevco | 2-Nov-16 |
| 7 | Left A-Post Middle | Y | P94559 | Endevco | 2-Nov-16 |
| 8 | Left B-Post Lower | Y | P63151 | Endevco | 25-Jul-16 |
| 9 | B-Post Middle | Y | P88468 | Endevco | 25-Jul-16 |
| 10 | Front Seat Track | Y | P94504 | Endevco | 27-Oct-16 |
| 11 | Rear Seat Track or Structure | Y | P91492 | Endevco | 27-Oct-16 |
| 12 | Right Rear Occupant Compartment | Y | P94521 | Endevco | 27-Oct-16 |
| 13 | Engine Block | X | P66749 | Endevco | 28-Sep-16 |
| | Engine Block | Y | P94512 | Endevco | 2-Nov-16 |
| 14 | Rear Floorpan Above Axle | X | P88004 | Endevco | 15-Aug-16 |
| | Rear Floorpan Above Axle | Y | P91482 | Endevco | 28-Sep-16 |
| | Rear Floorpan Above Axle | Z | P93550 | Endevco | 25-Jul-16 |

TABLE 4 – MDB Instrumentation

| MDB Instrumentation | | Serial Number | Manufacturer | Calibration Date |
|---|---|---------------|--------------|------------------|
| MDB Center of Gravity | X | P94552 | Endevco | 26-Jul-16 |
| MDB Center of Gravity | Y | P94553 | Endevco | 26-Jul-16 |
| MDB Center of Gravity | Z | P94546 | Endevco | 26-Jul-16 |
| Left Frame Rail at Rear Axle Centerline | X | P93518 | Endevco | 25-Jul-16 |
| Left Frame Rail at Rear Axle Centerline | Y | P93537 | Endevco | 25-Jul-16 |

How to Research Stiffness Data

Stiffness Calculations - Contractor Report

Contractor Report

NHTSA Test

10125

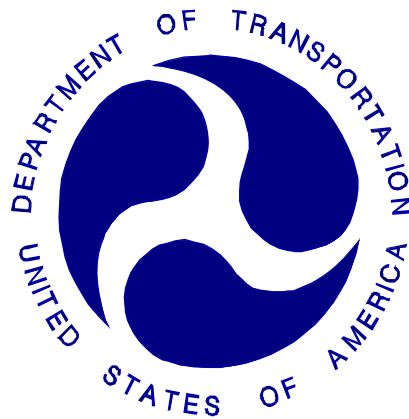
REPORT NUMBER: 301R-CAL-17-004

**SAFETY COMPLIANCE TESTING FOR FMVSS 301R
FUEL SYSTEM INTEGRITY – REAR IMPACT**

**Toyota Motor Manufacturing, Canada, Inc.
2017 Toyota Corolla**

NHTSA NUMBER: C20175102

**PREPARED BY:
CALSPAN CORPORATION
TRANSPORTATION TEST OPERATIONS
P.O. BOX 400
BUFFALO, NEW YORK 14225**



June 5, 2017

FINAL REPORT

**PREPARED FOR:
U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration Enforcement
Office of Vehicle Safety Compliance
Mail Code: NVS-220
1200 New Jersey Avenue, SE
Washington, DC 20590**

This Final Test Report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-16-D-00032.

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Prepared By: Alexander Rudniski
Alexander Rudniski, Engineer Technician

Approved By: Edward Dutton
Edward J. Dutton, Test Engineer Director
Transportation Test Operations

Approval Date: June 5, 2017

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted By: _____

Acceptance Date: _____

TECHNICAL REPORT STANDARD TITLE PAGE

| | | | |
|--|--|---|------------------|
| 1. Report No. 301R-CAL-17-004 | 2. Government Accession No. | 3. Recipient's Catalog No. | |
| 4. Title and Subtitle Final Report of FMVSS 301R Compliance Rear Impact Testing of a 2017 Toyota Corolla NHTSA No.: C20175102 | | 5. Report Date June 5, 2017 | |
| | | 6. Performing Organization Code CAL | |
| 7. Author(s) Alexander Rudniski, Engineer Technician Edward Dutton, Senior Test Engineer | | 8. Performing Organization Report No. CAL-DOT-2017-004 | |
| 9. Performing Organization Name and Address Calspan Corporation Transportation Test Operations P.O. Box 400 Buffalo, New York 14225 | | 10. Work Unit No. | |
| | | 11. Contract or Grant No. DTNH22-16-D-00032 | |
| 12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Compliance- Enforcement Mail Code: NVS-220 1200 New Jersey Avenue, SE Washington, D.C. 20590 | | 13. Type of Report and Period Covered Final Test Report June 2, 2017 - June 5, 2017 | |
| | | 14. Sponsoring Agency Code NVS-220 | |
| 15. Supplementary Notes | | | |
| 16. Abstract A compliance test was conducted on a 2017 Toyota Corolla four door sedan in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-301R-02 for the determination of FMVSS 301R compliance. Test failures identified were as follows: None - The test vehicle appeared to comply with all requirements of FMVSS 301R "Fuel System Integrity – Rear Impact." | | | |
| 17. Key Words Compliance Testing Safety Engineering FMVSS 301R | | 18. Distribution Statement <u>Copies of this report are available from:</u> National Highway Traffic Safety Administration Technical Reference Division (TIS) (NPO-230) 1200 New Jersey Avenue, SE Washington, D.C. 20590 Telephone No. (202) 366-4946 | |
| 19. Security Classification of Report UNCLASSIFIED | 20. Security Classification of Page UNCLASSIFIED | 21. No. of Pages 39 | 22. Price |

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SECTION 1

PURPOSE AND TEST PROCEDURE

This rear impact test is part of the FMVSS 301R Compliance Test Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-16-D-00032. The purpose of this test was to determine if the subject vehicle, a 2017 Toyota Corolla four door sedan, meets the performance requirements of FMVSS No. 301R "Fuel System Integrity – Rear Impact." The test was conducted in accordance with the Office of Vehicle Safety Compliance's Laboratory Test Procedure (TP-301R-02, dated January 17, 2007).

SECTION 2

COMPLIANCE TEST RESULTS SUMMARY

A 1,510 kg 2017 Toyota Corolla four door sedan was impacted from the rear by a 1357.0 kg moving barrier at a velocity of 79.24 kph (49.23 mph). The test was performed by Calspan Corporation on June 2, 2017

The test vehicle was equipped with a 50.3 liter fuel tank which was filled to 93 percent capacity with stoddard fluid prior to impact. Additional ballast (37 kg) was secured in the vehicle's rear passenger foot well. Two ballast Part 572E 50th percentile male Anthropomorphic Test Devices (ATD) were placed in the front occupant seating positions.

The crash event was recorded by three high-speed cameras and one real-time camera. High-speed camera locations and other pertinent camera information can be found on page 3-7 of this report. Pre- and post-test photographs of the vehicle can be found in Appendix A.

There was no fuel system fluid spillage following the impact and including all portions of the static rollover test. The maximum vehicle longitudinal crush was 740 millimeters of which the average was 588 millimeters. The vehicle appeared to comply with all the requirements of FMVSS No. 301 "Fuel System Integrity."

SECTION 3

SUMMARY OF TEST RESULTS

This section contains information reporting for the following Data Sheets:

Data Sheet No. 1 – Test Vehicle Specifications

Data Sheet No. 2 – Pre-Test Data

Data Sheet No. 3 – Moving Deformable Barrier (MDB) Data

Data Sheet No. 4 – High Speed Camera Locations and Data Summary

Data Sheet No. 5 – Post-Test Data

Data Sheet No. 6 – FMVSS No. 301 Static Rollover Test Data

**DATA SHEET NO. 1
TEST VEHICLE SPECIFICATIONS**

Test Vehicle: 2017 Toyota Corolla four door sedan
 Test Program: FMVSS 301R Compliance Rear Impact Test

NHTSA No.: C20175102
 Test Date: 6/2/2017

TEST VEHICLE INFORMATION AND OPTIONS

| | |
|--------------------------|-------------------|
| NHTSA No. | C20175102 |
| Model Year | 2017 |
| Make | Toyota |
| Model | Corolla |
| Body Style | Four Door Sedan |
| Body Color | Red |
| Odometer Reading (km/mi) | 12.9 km / 8 mi |
| Engine Displacement (L) | 1.8 |
| Type/No. Cylinders | I4 |
| Engine Placement | Transverse |
| Transmission Type | Automatic |
| Transmission Speeds | CVT |
| Final Drive | Front Wheel Drive |

| | |
|-----------------------------------|-----|
| Overdrive | Yes |
| Air Conditioning (AC) | Yes |
| All-Wheel Drive (AWD) | No |
| Anti-Lock Brakes (ABS) | Yes |
| Automatic Door Locks (ADL) | Yes |
| Power Brakes | Yes |
| Power Seats | No |
| Power Steering | Yes |
| Power Windows | Yes |
| Stability Control (Auto-Leveling) | No |
| Sunroof/T-Top | No |
| Tilt Steering Wheel | Yes |
| Traction Control System (TCS) | Yes |

DEALER AND DELIVERY INFORMATION FROM CERTIFICATION LABEL

| | |
|---------------------|--|
| Manufactured By | Toyota Motor Manufacturing, Canada, Inc. |
| Date of Manufacture | 09/16 |
| VIN | 2T1BURHE8HC754623 |

| | |
|-----------------|------|
| GVWR (kg) | 1733 |
| GAWR Front (kg) | 939 |
| GAWR Rear (kg) | 839 |

TIRE PLACARD & SIDEWALL INFORMATION

Tire Placard Location: Driver's Door Sill

Spare Tire Type: T135/80R16

| Measured Parameter | Front | Rear |
|--|--------------|--------------|
| Tire Manufacturer | Michelin | Michelin |
| Tire Name | Primacy MXV4 | Primacy MXV4 |
| Tire Type | All Weather | All Weather |
| Max. Tire Pressure (kPa) | 350 | 350 |
| Recommended Tire Size | P205/55R16 | P205/55R16 |
| Load Index/Speed Symbol | 89H | 89H |
| Recommended Cold Tire Pressure (kPa) | 220 | 220 |
| Tire Size on Vehicle | P205/55R16 | P205/55R16 |
| Treadwear/ Traction Grade/ Temperature Grade | 320 / A / A | 320 / A / A |

VEHICLE CAPACITY DATA

| Measured Parameter | Front | Rear | Third | Total |
|---|--------|-------|-------|-------|
| Designated Seating Capacity (DSC) | 2 | 3 | - | 5 |
| Seat Type (Bench, Bucket, or Split Bench) | Bucket | Bench | - | |
| Capacity Weight (VCW) (kg) | | | | 390 |
| DSC X 68.04 (kg) | | | | 340.2 |
| Cargo Weight (RCLW) (kg) | | | | 49.8 |

**DATA SHEET NO. 2
PRE-TEST DATA**

Test Vehicle: 2017 Toyota Corolla four door sedan
 Test Program: FMVSS 301R Compliance Rear Impact Test

NHTSA No.: C20175102
 Test Date: 6/2/2017

TEST VEHICLE WEIGHTS

| | Units | As Delivered (UVW) | | | As Tested (ATW) | | |
|--------|-------|--------------------|------|-------|-----------------|------|-------|
| | | Front | Rear | Total | Front | Rear | Total |
| Left | kg | 408 | 260 | | 469 | 301 | |
| Right | kg | 393 | 251 | | 435 | 305 | |
| Ratio | % | 61 | 39 | | 60 | 40 | |
| Totals | kg | 801 | 511 | 1312 | 904 | 606 | 1510 |

TARGET TEST WEIGHT CALCULATION (TTW)

| Measured Parameter | Units | Value | |
|--------------------------------------|-------|--------|---------|
| Total Unloaded Vehicle Weight (UVW) | kg | 1312 | (A) |
| Rated Cargo/Luggage Weight (RCLW) | kg | 49.8 | (B) |
| Weight of two P572E ATDS @ 74kg each | kg | 155.4 | (C) |
| Target Vehicle Test Weight (TVTW) | kg | 1517.2 | (A+B+C) |

*As tested Weight = (TVTW -10kg) <=ATW < (TVTW -5kg); TVTW = Weight of Test Vehicle with 2 dummies and 49.8kg of Cargo Weight

GENERAL TEST VEHICLE DATA

| Measured Parameter | Units | Value |
|--|-------|----------------|
| Vehicle Wheelbase | mm | 2701 |
| Vehicle Length (at Centerline) | mm | 4646 |
| Vehicle Width | mm | 1761 |
| Weight of Ballast Secured in Cargo Area ¹ | kg | 37 |
| Type of Ballast | | Lead Shot |
| Method of Securing Ballast | | Rear Foot Well |
| Components Removed for Weight Reduction | | 0 |
| Vehicle Width at Widest Point | mm | 1775 |
| Vehicle Width at Widest Point Location | | C-Pillar |
| Centerline offset for impact line | mm | 355 |
| Filler neck side (left/right) | | Left |

¹ Ballast weight does not include the weight of instrumentation, on-board cameras and data acquisition system

TEST VEHICLE ATTITUDE AND CG

| | Units | Left | | Right | | CG (aft of front axle) |
|--------------------|-------|-------|------|-------|------|---------------------------|
| | | Front | Rear | Front | Rear | |
| As Delivered (UVW) | mm | 697 | 716 | 699 | 718 | 1052 |
| As Tested (ATW) | mm | 668 | 689 | 674 | 695 | 1084 |

**DATA SHEET NO. 2 (Continued)
PRE-TEST DATA**

Test Vehicle: 2017 Toyota Corolla four door sedan
 Test Program: FMVSS 301R Compliance Rear Impact Test

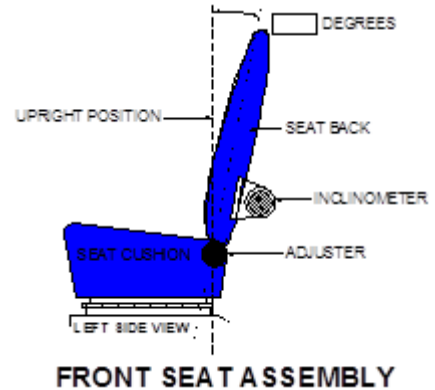
NHTSA No.: C20175102
 Test Date: 6/2/2017

SEATING

Nominal Design Riding Position (for adjustable driver and passenger seat backs). *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.*

Driver Seat Instructions: The driver seat back was positioned according to the Nominal Design Riding position listed in FORM 1.

Passenger Seat Instructions: The passenger seat back was positioned to the Nominal Design Riding position listed in FORM 1.

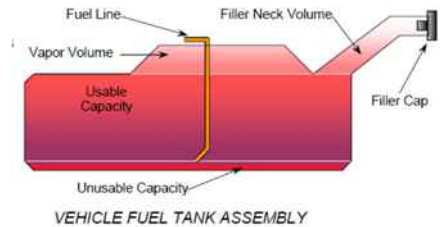


| Measured Parameter | Deg. |
|---------------------------|------|
| Driver Seat Back Angle | 3.1 |
| Passenger Seat Back Angle | 3.4 |

SEAT FORE/AFT POSITIONING

Driver Seat: Was positioned according to the Nominal Design Riding position listed in FORM1.
 Passenger Seat: Was positioned according to the Nominal Design Riding position listed in FORM1.

| | Total Travel | Test Position |
|----------------|--------------|---------------|
| Driver Seat | 240mm | 120mm |
| Passenger Seat | 240mm | 120mm |



FUEL TANK CAPACITY DATA

| Measured Parameter | Reference | Liters |
|--------------------------------------|---------------------------|---------------|
| Fuel System Capacity (Standard Tank) | Owner's Manual | 50.3 |
| COTR Usable Capacity (Standard Tank) | Form No. 1 | 50.3 |
| Test Volume Range | 92-94% of Usable Capacity | 46.27 – 47.28 |
| Actual Test Volume (Solvent Used) | 93% of Usable Capacity | 46.78 |

FUEL SYSTEM DATA

| Measured Parameter | Value |
|---|------------------|
| Test Fluid Type | Stoddard Solvent |
| Test Fluid Specific Gravity | 0.764 |
| Test Fluid Kinematic Viscosity (centistokes) | 0.96 |
| Test Fluid Color | Purple |
| Electric Fuel Pump? | Yes |
| Can Activate Electric Fuel Pump with Ignition Switch On but Engine Off? | Yes |

Fuel Pump Comments : None

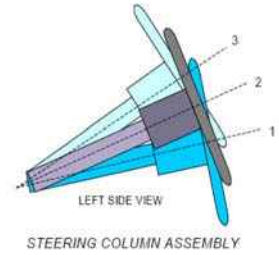
DATA SHEET NO. 2 (Continued)
PRE-TEST DATA

Test Vehicle: 2017 Toyota Corolla four door sedan
Test Program: FMVSS 301R Compliance Rear Impact Test

NHTSA No.: C20175102
Test Date: 6/2/2017

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the center of its geometric locus it describes when it moves through its full range of motion.



Operational Instructions: Tilt wheel was positioned to mid-range at 22.3 degrees. The For/aft travel
Was set to mid position at 20 mm.

SEAT BELT UPPER ANCHORAGE

Nominal design riding position

Operational Instructions: Anchorage were set to the most upright position.

COMMENTS: None

**DATA SHEET NO. 3
MOVING DEFORMABLE BARRIER (MDB) DATA**

Test Vehicle: 2017 Toyota Corolla four door sedan
 Test Program: FMVSS 301R Compliance Rear Impact Test

NHTSA No.: C20175102
 Test Date: 6/2/2017

MDB Face Manufacturer: Cellbond MDB Face Serial No. 118133

MDB SPECIFICATIONS

| Measurement Description | Length (mm) |
|---|-------------|
| Overall Width of Framework Carriage | 1250 |
| Overall Length of MDB (incl. honeycomb impactor face) | 4120 |
| Wheelbase of Framework Carriage | 2591 |
| Tread of Framework Carriage (Front & Rear) | 1880 |
| CG Location of Front Axle | 1136 |

MDB WEIGHTS

| | Units | Front | Rear | Total |
|--------|-------|-------|-------|--------|
| Left | kg | 358.0 | 322.0 | 680.0 |
| Right | kg | 404.0 | 273.0 | 677.0 |
| Ratio | % | 56.2% | 43.8% | 100.0% |
| Totals | kg | 762.0 | 595.0 | 1357.0 |

MDB TIRE SIZE & PRESSURES

| | Units | Requirement | Left Front | Right Front | Left Rear | Right Rear |
|---------------|-------|-------------|------------|-------------|------------|------------|
| Tire Size | | P205/75R15 | P205/75R15 | P205/75R15 | P205/75R15 | P205/75R15 |
| Tire Pressure | kPa | 200 ± 21 | 207 | 207 | 207 | 207 |

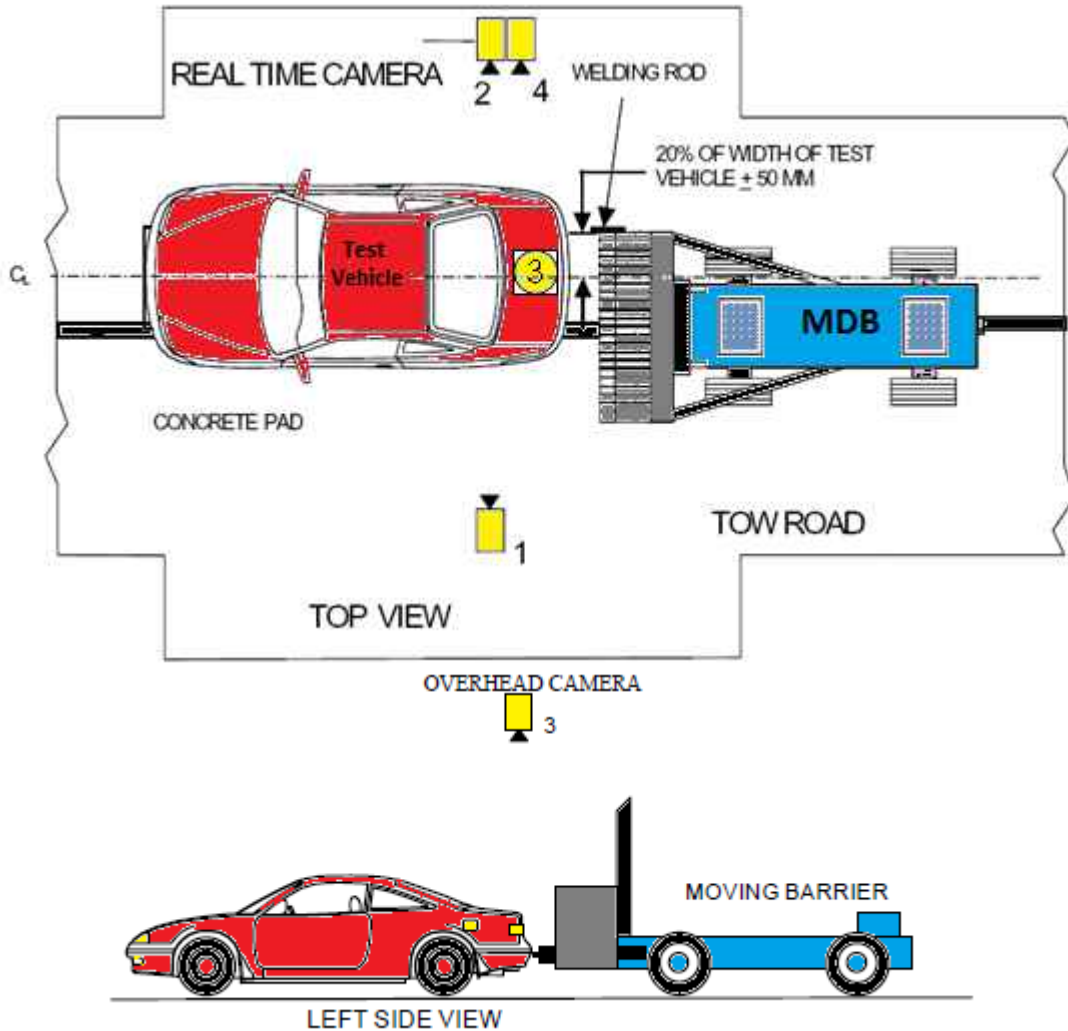
Brake Abort System? (Yes/No): Yes

Date of Last MDB Calibration: May 15, 2010

**DATA SHEET NO. 4
HIGH SPEED CAMERA LOCATIONS AND DATA SUMMARY**

Test Vehicle: 2017 Toyota Corolla four door sedan
 Test Program: FMVSS 301R Compliance Rear Impact Test

NHTSA No.: C20175102
 Test Date: 6/2/2017



| No. | Camera View | Coordinates (mm) | | | Angle (Deg) | Lens (mm) | Film Speed (fps) |
|-----|------------------|------------------|--------|-------|-------------|-----------|------------------|
| | | X* | Y* | Z* | | | |
| 1 | Left Side View | 1613 | -10318 | -1036 | 0.4 | 20 | 1000 |
| 2 | Real-Time Camera | | | | | | 60 |
| 3 | Overhead View | 1102 | 0 | 5292 | 90 | 14 | 1000 |
| 4 | Right Side View | 1768 | 10195 | -978 | 0.1 | 24 | 1000 |

* Reference (from point of impact); all measurements accurate to within ± 6 mm.

X = (Impact Point) + Forward

Y = (Impact Point) + To Right

Z = (Ground Level) + Down

**DATA SHEET NO. 5
POST-TEST DATA**

Test Vehicle: 2017 Toyota Corolla four door sedan
 Test Program: FMVSS 301R Compliance Rear Impact Test

NHTSA No.: C20175102
 Test Date: 6/2/2017

VIN: 2T1BURHE8HC754623

REQUIRED IMPACT VELOCITY RANGE: 78.5 to 80.1 km/h

ACTUAL IMPACT VELOCITY (WITHIN 1.5 M OF IMPACT PLANE)

| Measurement Description | Units | Speed |
|-------------------------|-------|-------|
| Trap No. 1 | km/h | 79.24 |
| Trap No. 2 | km/h | 79.14 |

WELDING ROD IMPACT POINT

| Measurement Description | Tolerance | Units | Value |
|--|-----------|-------|-------|
| Vertical distance from target center (+ is above) | ±40 mm | mm | -6 |
| Horizontal distance from target center (+ is right) | ±50 mm | mm | -6 |

STODDARD SOLVENT SPILLAGE MEASUREMENT:

- A. From impact until vehicle motion ceases:
 (Maximum allowable is 28 grams) 0 grams
- B. For the 5-minute period after motion ceases:
 (Maximum allowable is 28 grams) 0 grams
- C. For the next 25 minutes:
 (Maximum allowable is 28 grams/minute) 0 grams
- D. Spillage Details: No Spillage Occurred

**DATA SHEET NO. 5
POST-TEST DATA (Continued)**

Test Vehicle: 2017 Toyota Corolla four door sedan
 Test Program: FMVSS 301R Compliance Rear Impact Test

NHTSA No.: C20175102
 Test Date: 6/2/2017

DOOR OPENING AND SEAT TRACK INFORMATION

| Description | Driver | Passenger |
|-----------------------|----------------------|----------------------|
| Locked/Unlocked Doors | Unlocked | Unlocked |
| Front Door Opening | Closed & Operational | Closed & Operational |
| Rear Door Opening | Jammed | Jammed |
| Seat Track Shift (mm) | 0 | 25 |
| Seat Back Failure | Reclined | Reclined |
| Glazing Damage | None | None |

POST TEST STRUCTURAL OBSERVATIONS

| Critical Areas of Performance | Observations and Conclusions |
|-------------------------------|------------------------------|
| Windshield Damage | None |
| Window Damage | None |
| Other Notable Effects | Rear Windshield Shattered |

VEHICLE CRUSH MEASUREMENTS: LENGTH

| Measurement | Left Side | Centerline | Right Side |
|-------------|-----------|------------|------------|
| Pre-Test | 4543 | 4646 | 4546 |
| Post-Test | 3803 | 4013 | 4156 |
| Crush | -740 | -633 | -390 |

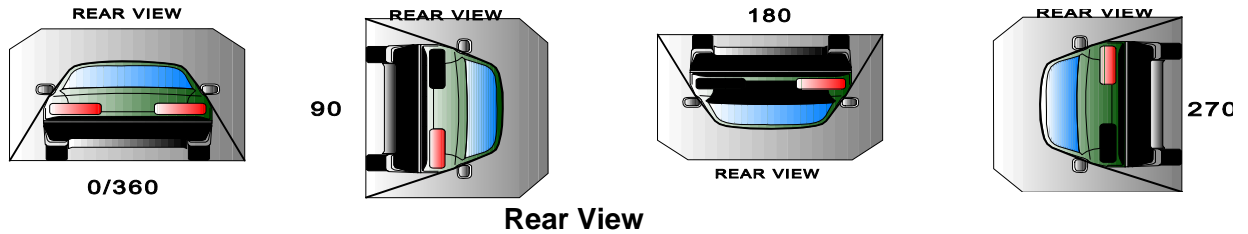
VEHICLE CRUSH MEASUREMENTS: WHEELBASE

| Measurement | Left Side | Right Side |
|-------------|-----------|------------|
| Pre-Test | 2701 | 2701 |
| Post-Test | 2630 | 2695 |
| Crush | -71 | -6 |

**DATA SHEET NO. 6
FMVSS NO. 301 STATIC ROLLOVER TEST DATA**

Test Vehicle: 2017 Toyota Corolla four door sedan
 Test Program: FMVSS 301R Compliance Rear Impact Test

NHTSA No.: C20175102
 Test Date: 6/2/2017



ROLLOVER SOLVENT COLLECTION TIME TABLE

| Test Phase | Rotation Time (spec. 1 -3 min) | | Hold Time | Total Time | | Next Whole Minute Interval |
|--------------|-----------------------------------|---------|-----------|------------|---------|----------------------------------|
| | Minutes | Seconds | | Minutes | Seconds | |
| 0° to 90° | 1 | 15 | 5 | 6 | 15 | 7 |
| 90° to 180° | 1 | 5 | 5 | 6 | 5 | 7 |
| 180° to 270° | 1 | 2 | 5 | 6 | 2 | 7 |
| 270° to 360° | 1 | 6 | 5 | 6 | 6 | 7 |

FMVSS 301 REQUIREMENTS TABLE (Maximum allowable solvent spillage)

| First 5 Minutes (grams) | 6th Minute (grams) | 7th Minute (grams) | 8th Minute (grams) |
|----------------------------|-----------------------|-----------------------|-----------------------|
| 142 | 28 | 28 | 28 |

ACTUAL TEST VEHICLE STODDARD SOLVENT SPILLAGE TABLE

| Test Phase | First 5 Minutes (grams) | 6th Minute (grams) | 7th Minute (grams) | 8th Minute (grams) |
|--------------|----------------------------|-----------------------|-----------------------|-----------------------|
| 0° to 90° | 0 | 0 | 0 | |
| 90° to 180° | 0 | 0 | 0 | |
| 180° to 270° | 0 | 0 | 0 | |
| 270° to 360° | 0 | 0 | 0 | |

ROLLOVER STODDARD SOLVENT SPILLAGE LOCATION TABLE

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

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

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| 2 | Vehicle Tire Placard | A-3 |
| 3 | Pre-Test Front View | A-4 |
| 4 | Post-Test Front View | A-4 |
| 5 | Pre-Test Left Side View | A-5 |
| 6 | Post-Test Left Side View | A-5 |
| 7 | Pre-Test Right Side View | A-6 |
| 8 | Post-Test Right Side View | A-6 |
| 9 | Pre-Test Left Front 3/4 View | A-7 |
| 10 | Post-Test Left Front 3/4 View | A-7 |
| 11 | Pre-Test Right Front 3/4 View | A-8 |
| 12 | Post-Test Right Front 3/4 View | A-8 |
| 13 | Pre-Test Left Rear 3/4 View | A-9 |
| 14 | Post-Test Left Rear 3/4 View | A-9 |
| 15 | Pre-Test Right Rear 3/4 View | A-10 |
| 16 | Post-Test Right Rear 3/4 View | A-10 |
| 17 | Pre-Test Rear View | A-11 |
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| 22 | Post-Test MDB Left Side View | A-13 |
| 23 | Pre-Test MDB Right Side View | A-14 |
| 24 | Post-Test MDB Right Side View | A-14 |
| 25 | Pre-Test MDB Top View | A-15 |
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| 29 | Pre-Test Front Underbody View | A-17 |
| 30 | Post-Test Front Underbody View | A-17 |
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| 32 | Post-Test Mid Underbody View | A-18 |
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| 39 | Rollover 90° View | A-22 |
| 40 | Rollover 180° View | A-22 |
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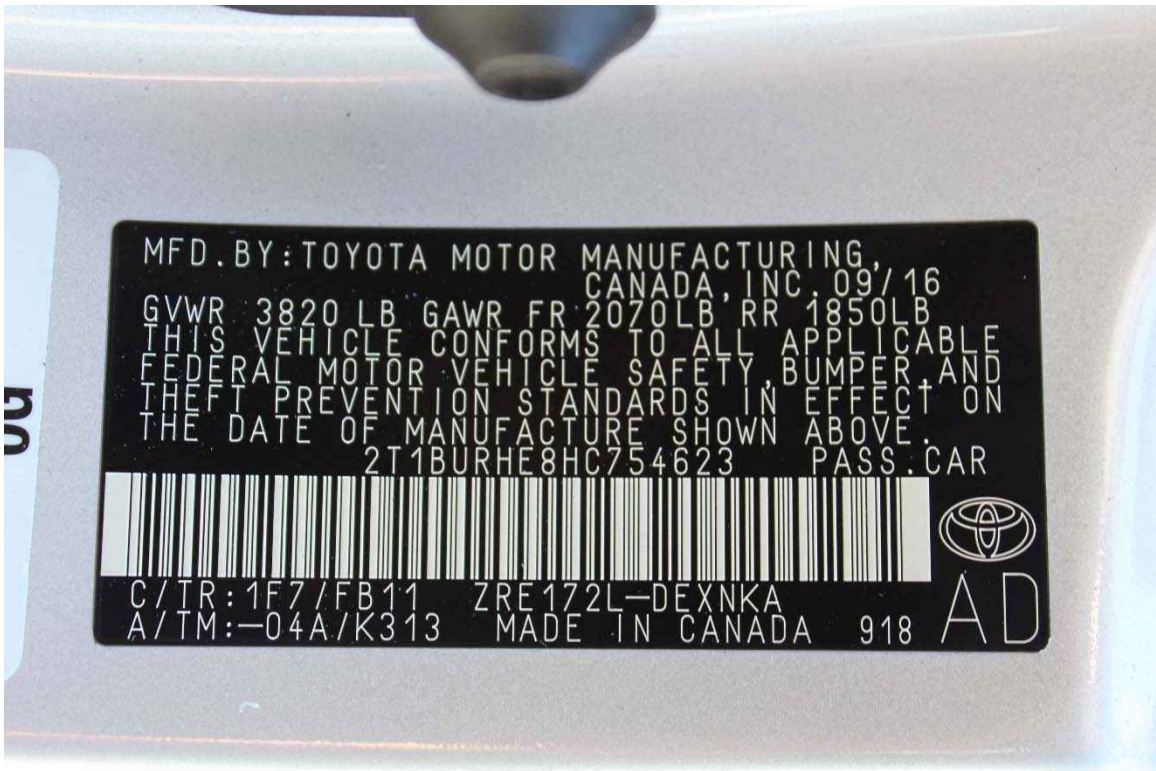


Figure A-1: Vehicle Certification Placard

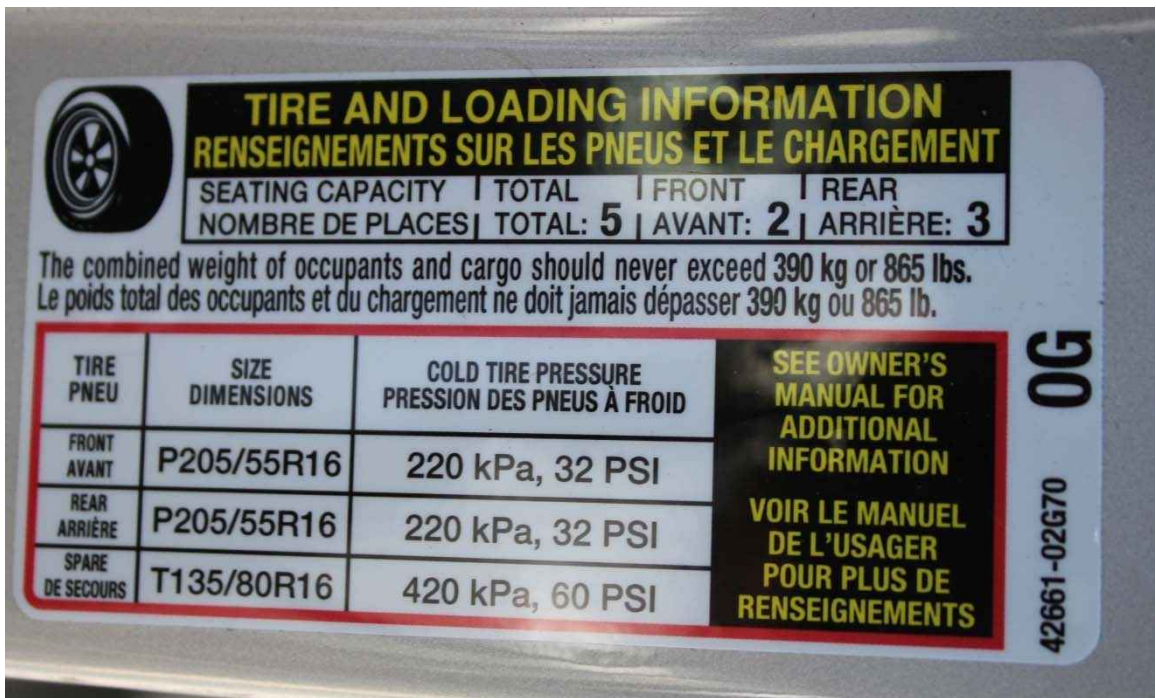


Figure A-2: Vehicle Tire Placard

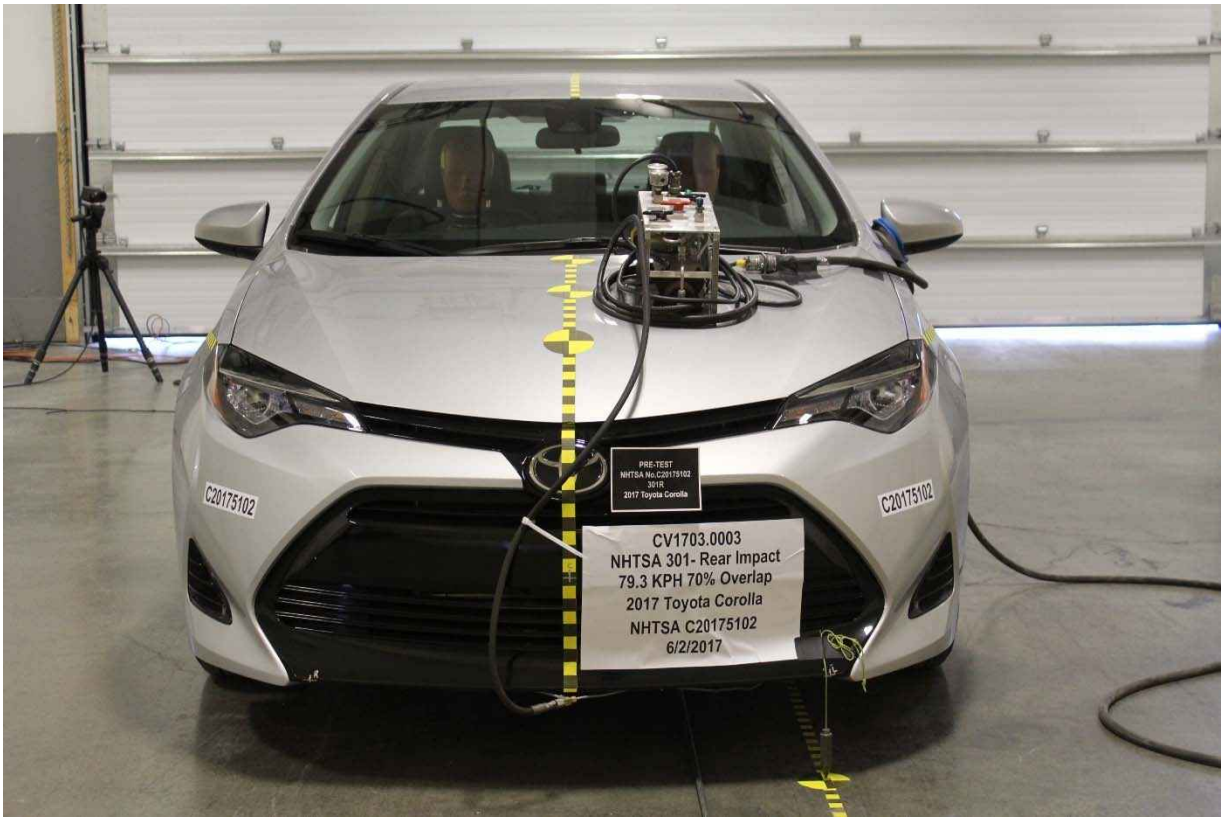


Figure A-3: Pre-Test Front View

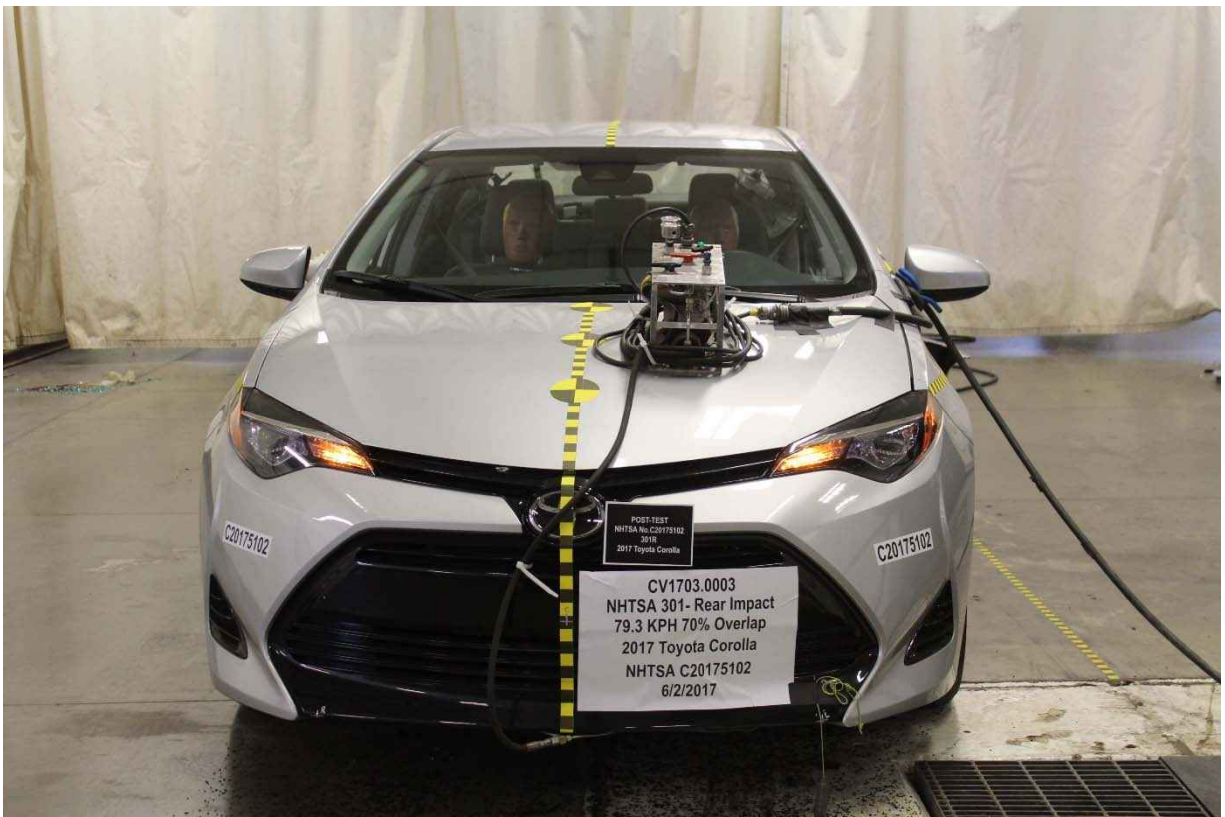


Figure A-4: Post-Test Front View



Figure A-5: Pre-Test Left Side View



Figure A-6: Post-Test Left Side View



Figure A-7: Pre-Test Right Side View



Figure A-8: Post-Test Right Side View



Figure A-9: Pre-Test Left Front 3/4 View



Figure A-10: Post-Test Left Front 3/4 View



Figure A-11: Pre-Test Right Front 3/4 View



Figure A-12: Post-Test Right Front 3/4 View



Figure A-13: Pre-Test Left Rear 3/4 View

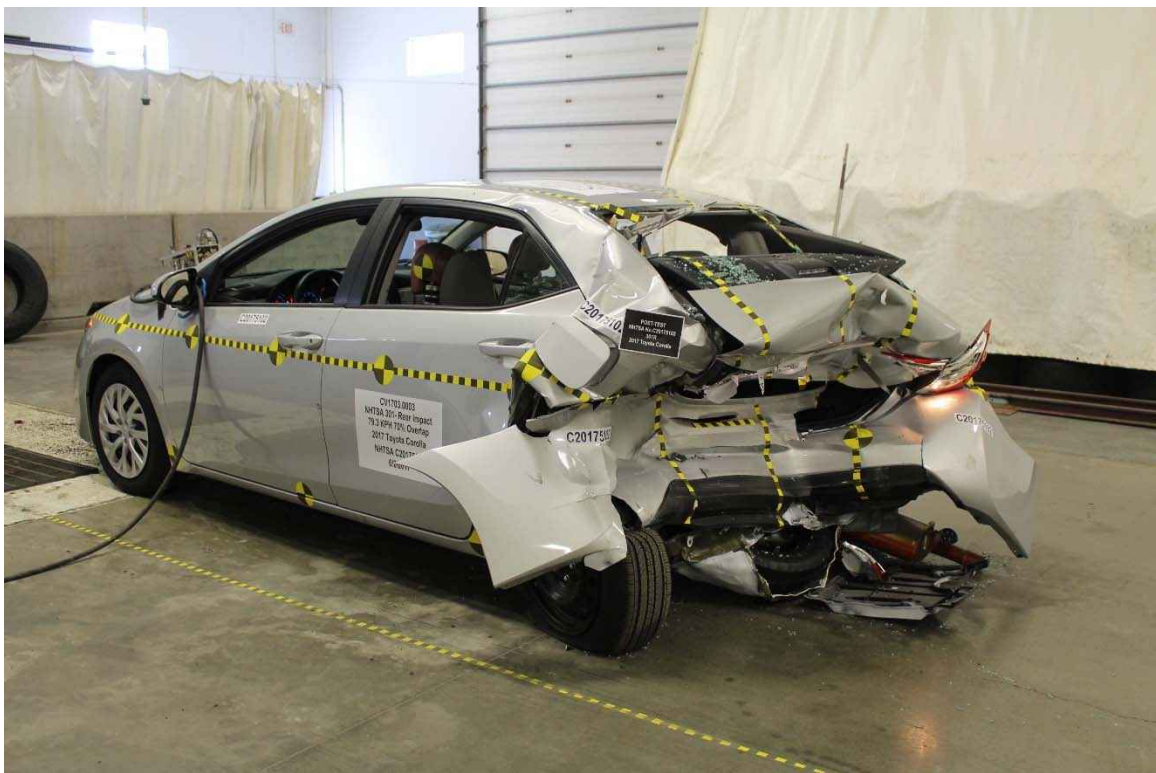


Figure A-14: Post-Test Left Rear 3/4 View



Figure A-15: Pre-Test Right Rear 3/4 View



Figure A-16: Post-Test Right Rear 3/4 View



Figure A-17: Pre-Test Rear View



Figure A-18: Post-Test Rear View



Figure A-19: Pre-Test MDB Front View



Figure A-20: Post-Test MDB Front View



Figure A-21: Pre-Test MDB Left Side View



Figure A-22: Post-Test MDB Left Side View



Figure A-23: Pre-Test MDB Right Side View



Figure A-24: Post-Test MDB Right Side View



Figure A-25: Pre-Test MDB Top View

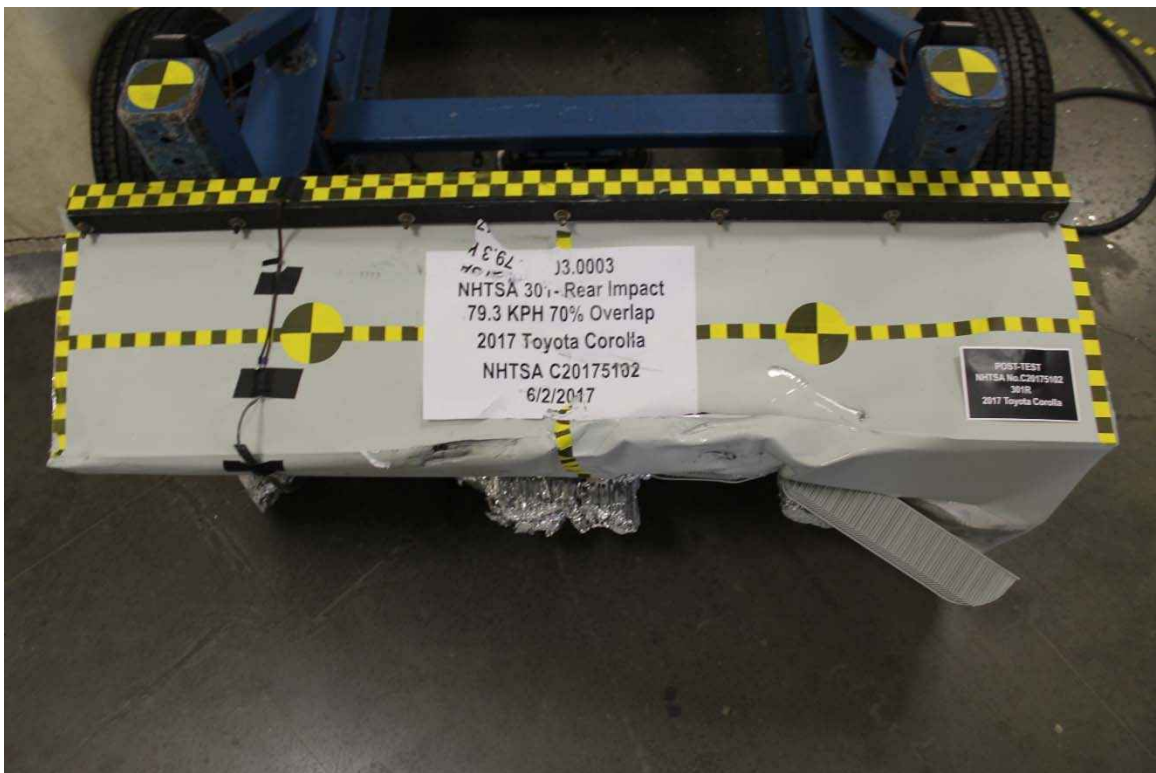


Figure A-26: Post-Test MDB Top View

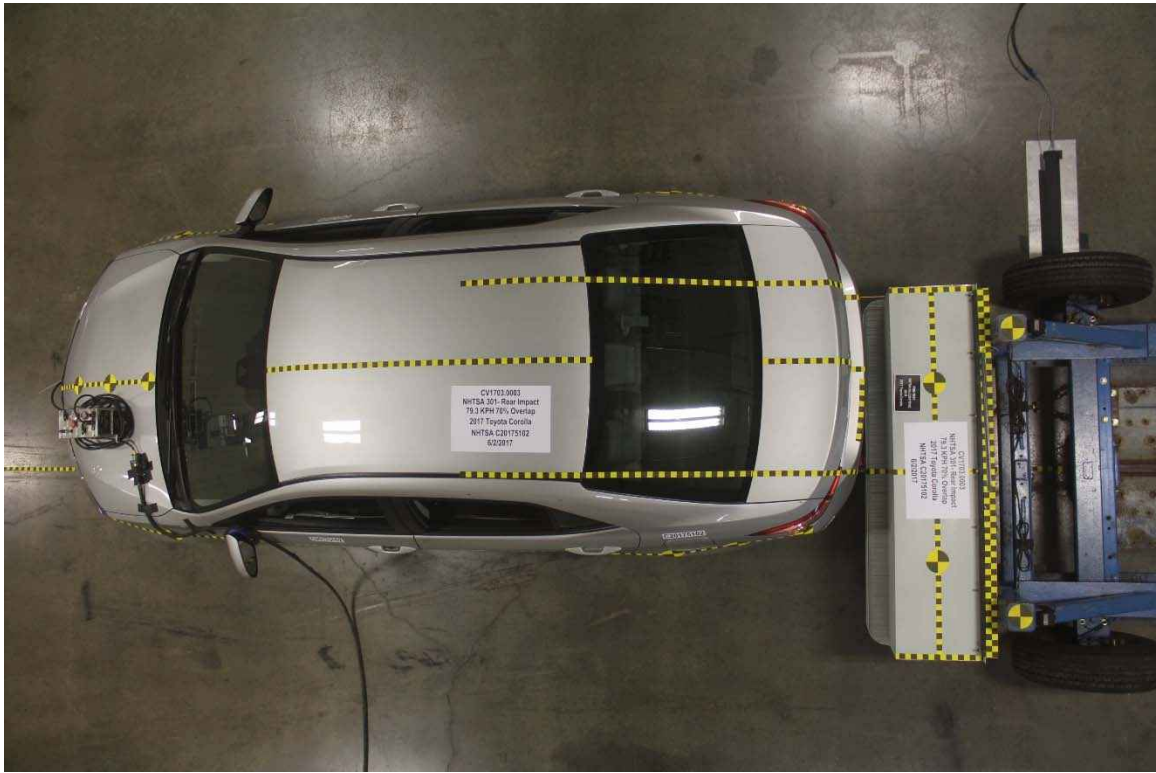


Figure A-27: Pre-Test Overhead Vehicle and MDB View



Figure A-28: Post-Test Impact Target View

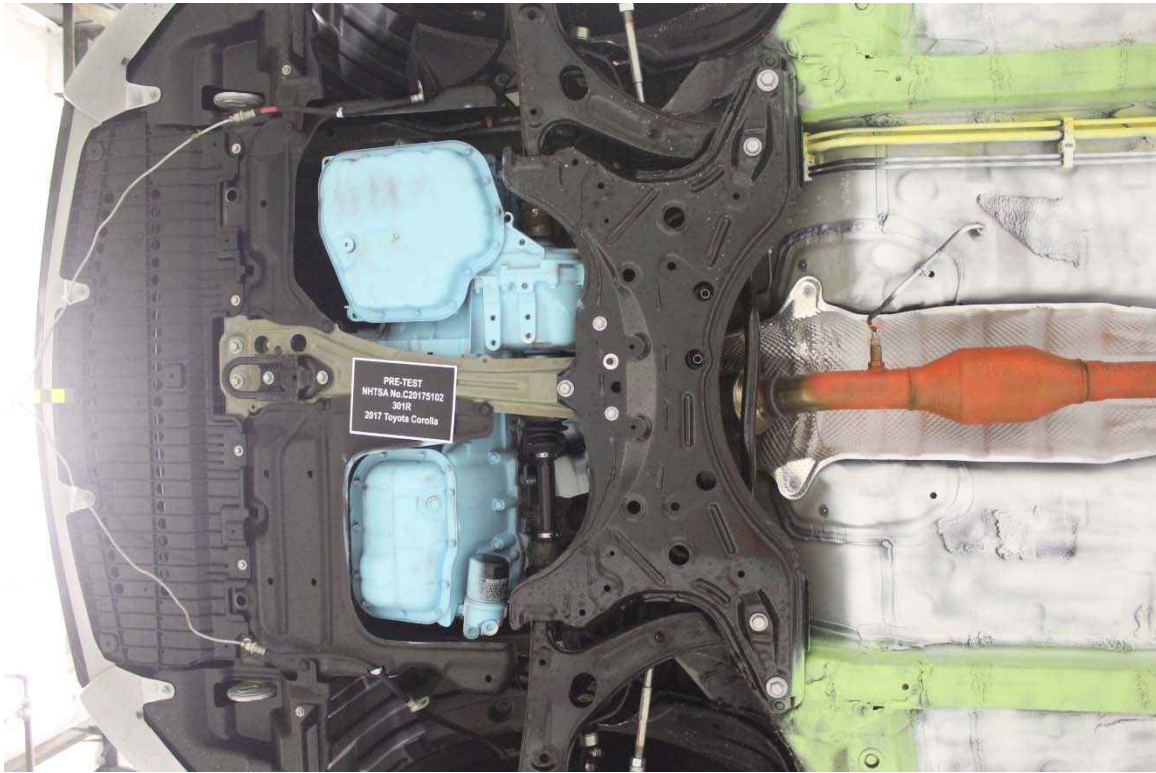


Figure A-29: Pre-Test Front Underbody View

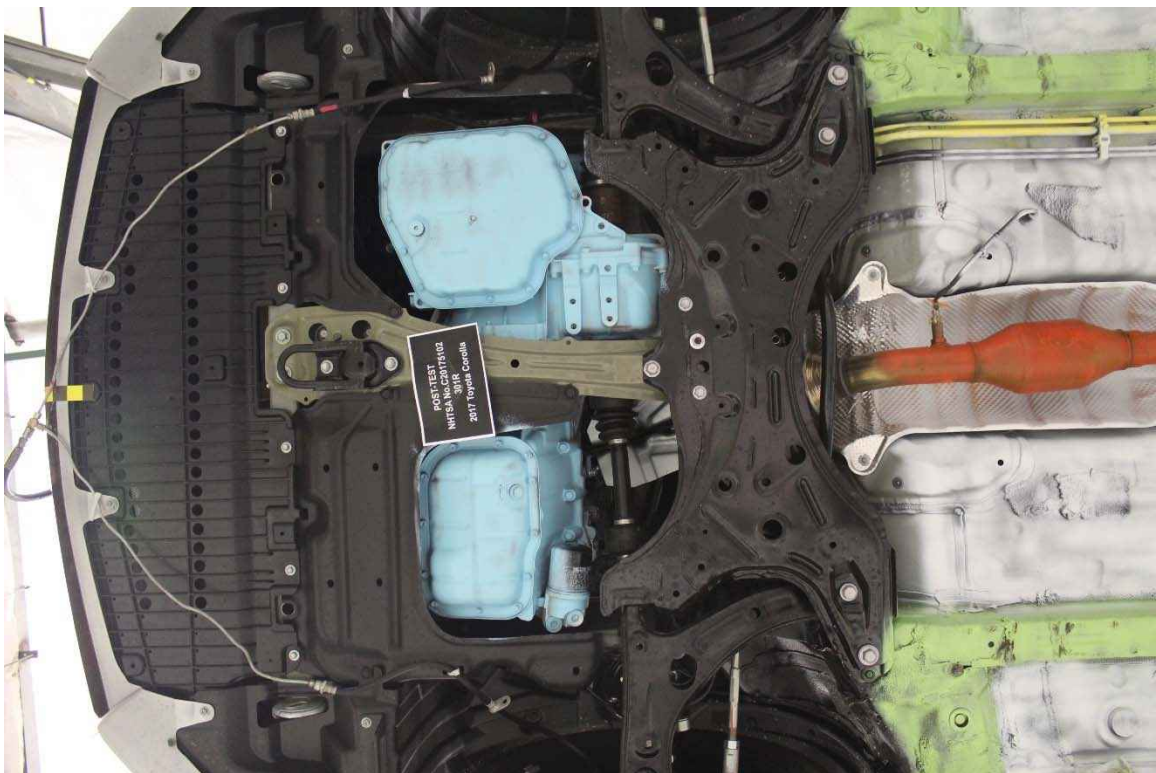


Figure A-30: Post-Test Front Underbody View

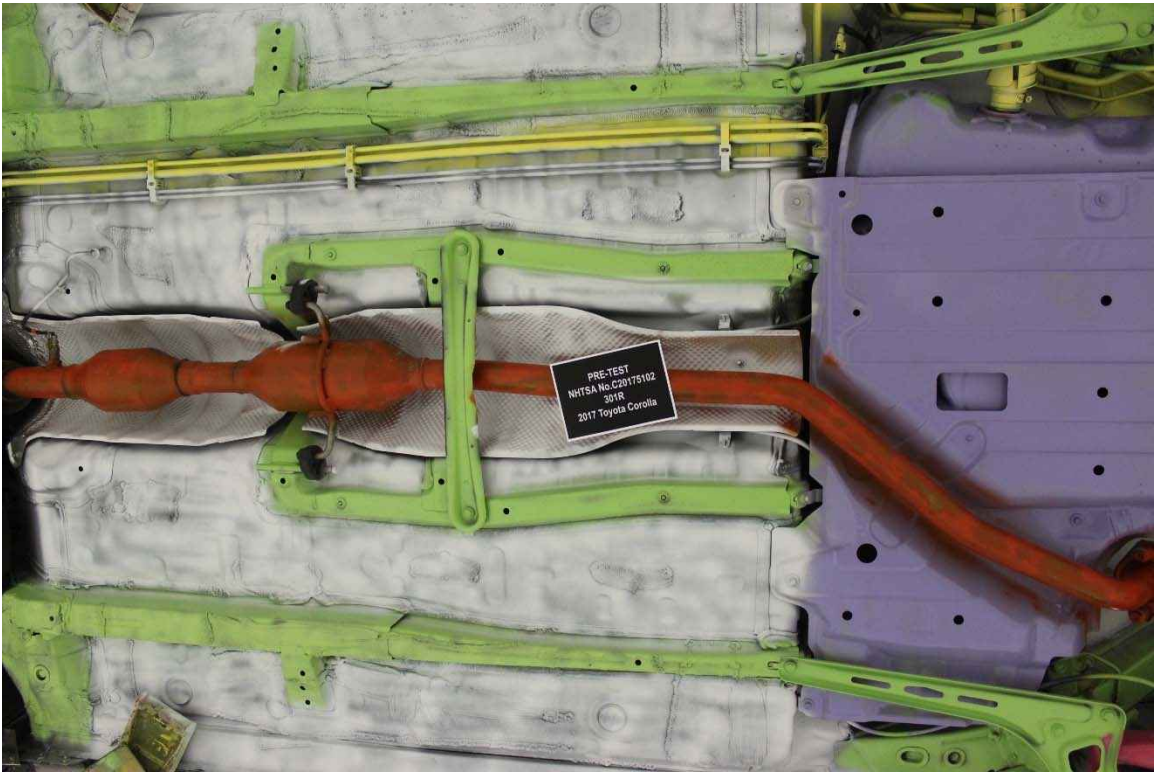


Figure A-31: Pre-Test Mid Underbody View

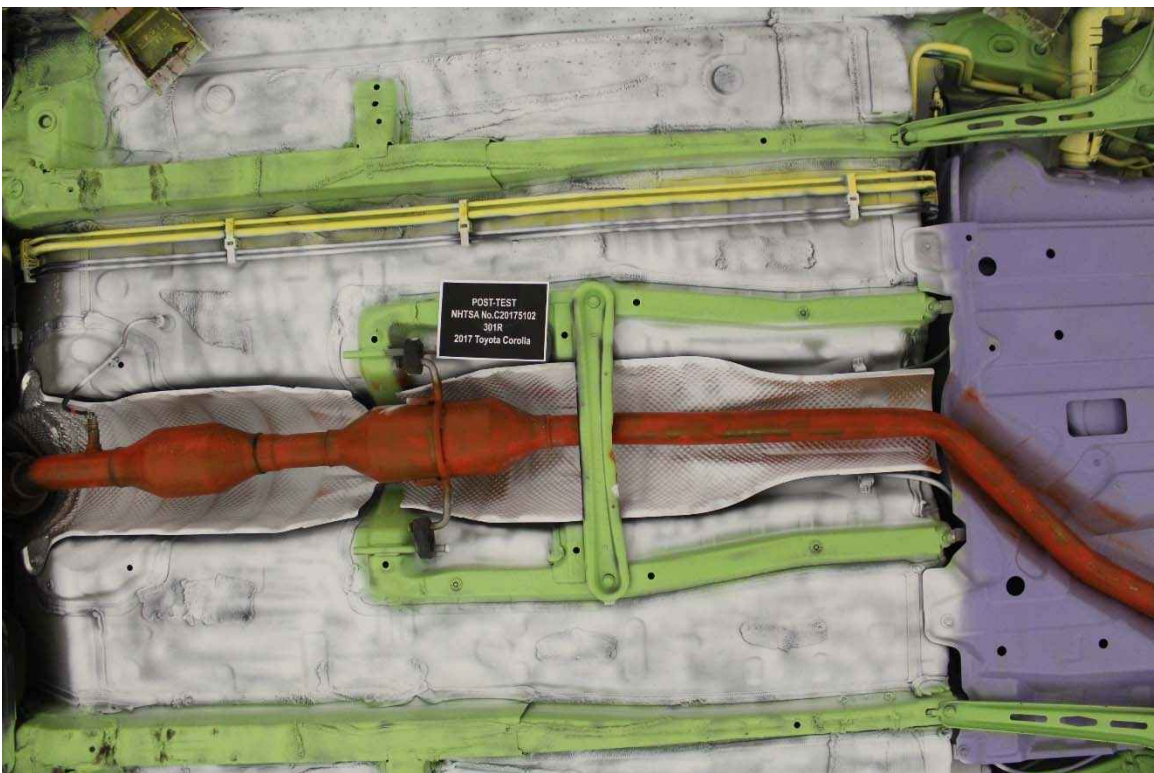


Figure A-32: Post-Test Mid Underbody View



Figure A-33: Pre-Test Rear Underbody View



Figure A-34: Post-Test Rear Underbody View



Figure A-35: Pre-Test Fuel Filler Cap View



Figure A-36: Post-Test Fuel Filler Cap View



Figure A-37: Impact View



Figure A-38: Speed Trap View*

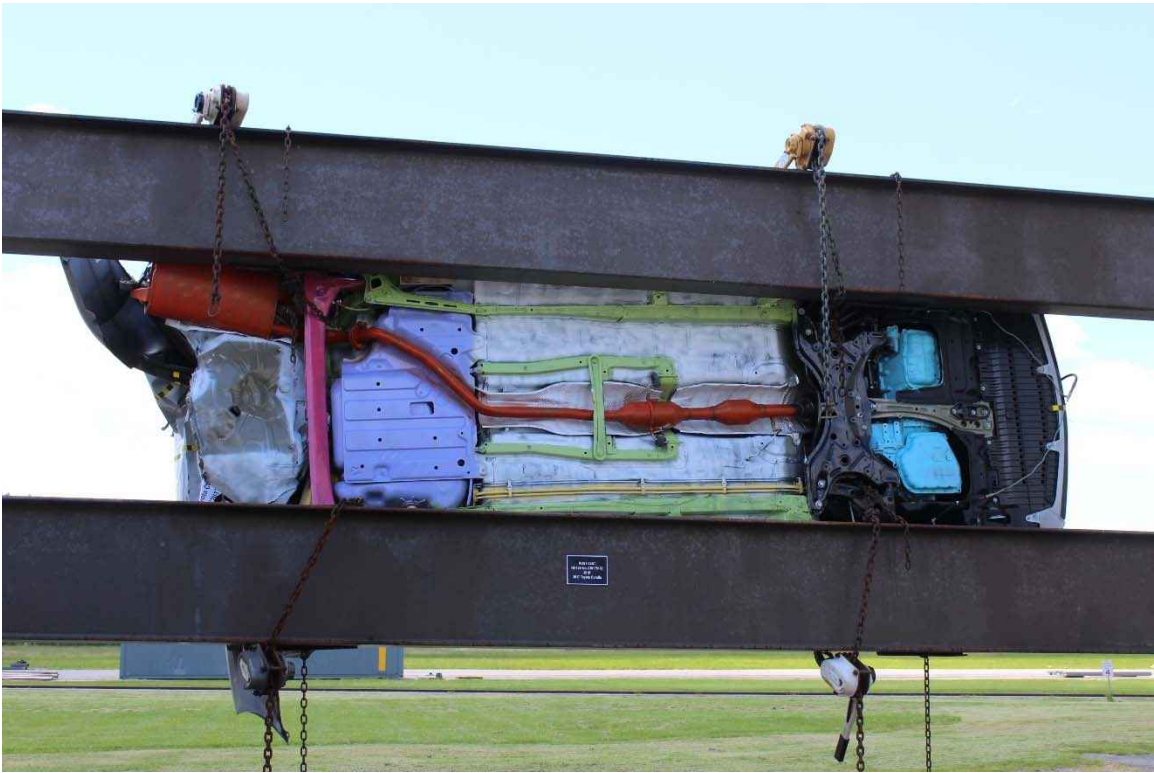


Figure A-39: Rollover 90° View



Figure A-40: Rollover 180° View



Figure A-41: Rollover 270° View



Figure A-42: Rollover 360° View