Static Load Testing of Amazing Auto Seat Swivel

TRC Inc. Test Numbers:

F200714A, F200714B, F200714C, F200810

Prepared By:

Transportation Research Center Inc.

10820 State Route 347

P. O. Box B-67

East Liberty, OH 43319

Final Report

July - August 2020

Prepared For:

Amazing Auto LLC.

14118 52nd Ave W.

Edmonds, WA 98026

Notice

Transportation Research Center Inc. does not endorse or certify products of manufacturers. The manufacturer's name appears solely to identify the test article. Transportation Research Center Inc. assumes no liability for the report or use thereof. It is responsible for the facts and the accuracy of the data presented herein. This report does not constitute a standard, specification, or regulation.

Test Performed By: Michael Postle, Engineering Technician II

Report Approved August 21, 2020 By:

Kristi Hill-Smith
Project Manager

Table of Contents

Section 1.0

Purpose and Test Procedure

Purpose

This seating system component level test was conducted for Amazing Auto LLC. by Transportation Research Center Inc. (TRC Inc.). The purpose of this test was to evaluate the performance of the Amazing Auto universal seat swivel when subjected to the load requirements of FMVSS 207, “Seating Systems”.

Test Procedure

This test series was conducted using the National Highway Traffic Safety Administration (NHTSA) Office of Vehicle Safety Compliance (OVSC) Laboratory Test Procedure No. TP-207-09 as a guideline. Data was obtained in accordance with “FMVSS 207; Seating Systems S5.3”.

Amazing Auto LLC provided TRC with a single passenger seating system consisting of pedestal base with the test article seat swivel attached and a fore/aft only manually adjustable seat frame. Hardware to mount the seat to the swivel was also provided. All mounting hardware was torqued to 43.0 N/m prior to testing. To help isolate the test loads to just the test article swivel component, the seat frame and attachment of the pedestal to the bed plate were reinforced.

With the seating system in mid track position, the FMVSS 207 regulation load of twenty (20) times the weight of the seat assembly was to be applied at the seating system’s center of gravity in a forward and in a rearward direction. Additionally, with the seating system in full rear position, a force required to produce the FMVSS 207 regulation moment of 373 N/m was to be applied about the seating reference point (SRP).

Section 2.0

FVMSS 207 Seating Systems Test Summary

Test Results Summary

This seating system component level test series of the Amazing Auto universal seat swivel was conducted by TRC Inc. on July 14, 2020.

No permanent deformation was observed and the swivel continued to function as designed when the unit under test was subjected to the performance requirements of FMVSS 207 Forward Force, Rearward Force and Rearward Moment.

Test F200714 A was the Forward Load on the Seat Frame test. The weight of the seat assembly was 22.2 kg. The FMVSS 207 regulation forward load, twenty times the weight of the seat assembly, was 4,355 N. The test load applied was 105% of the regulation forward load. The peak forward force observed was 4,603 N. The minimum required load was continuously met for more than required 5 seconds.

Test F200714 B was the Rearward Load on the Seat Frame test. The weight of the seat assembly was 22.2 kg. The required FMVSS 207 regulation rearward load, twenty times the weight of the seat assembly, was 4,355 N. The test load applied was 105% of the regulation rearward load. The peak rearward force observed was 4,605 N. The minimum required load was continuously met for more than the required 5 seconds.

Test F200714 C was the Rear Moment test. The load to produce the rearward moment was applied on the upper seat back cross member 406 mm above the SRP. A load of 965 N would have produced the required FMVSS 207 regulation rearward moment. The test load applied was 105% of the required regulation rearward moment load. The peak force observed was 992 N. The minimum required load was continuously met for more than the required 5 seconds.

Test F200810 was an additional test requested by Amazing Auto LLC. This was a forward loading test at the CG of the seating system until failure. To further isolate the test forces to just the Amazing Auto seat swivel component, the seat fore/aft adjustment tracks were welded in the mid track position. The seat was then loaded at a rate of 356 N per second. The peak forward force of 34207.4 N was observed at 95.2 seconds. The failure point of the seating system was the rear seat frame assembly just above the seat adjustment tracks.

Test Article Information

Manufacturer:	Seat from Dodge ProMaster		
Model/Driver Seat:	Unknown	S/N	Unknown

Manufacturer:	Amazing Auto LLC. Universal Seat Swivel		
Model:	Unknown	S/N	Unknown

FMVSS 207 Forward Force

Load	Load Application Angle	
	Lateral	Vertical
Seat Force	0.0°	0.0°

FMVSS 207 Rearward Force

Load	Load Application Angle	
	Lateral	Vertical
Seat Force	0.0°	0.0°

FMVSS 207 Rearward Moment

Load	Load Application Angle	
	Lateral	Vertical
Seat Moment	0°	0.3°

Section 3.0

Test Equipment

Static Test Fixture

Manufacturer	Model	S/N
TMSI	MUTLI-CTL	81553-1

Transducer Information

Load Cell	Model	S/N	Calibration Date
1	1110A0	293313A	5/18/2020
2	1110A0	298611A	5/18/2020
3	1110A0	298609A	5/18/2020
4	1110A0	298617A	5/18/2020
5	1110A0	298612A	5/18/2020
6	1110A0	125627A	8/4/2020
7	1110A0	283301A	5/18/2020
8	1110A0	283314A	5/18/2020

.

Appendix A

Photographs

List of Photographs

TRC Inc. Test Number F200714

Overall Seat Swivel Setup

Figure 1 Seat Base and Swivel Attachment to Bed Plate - Front View

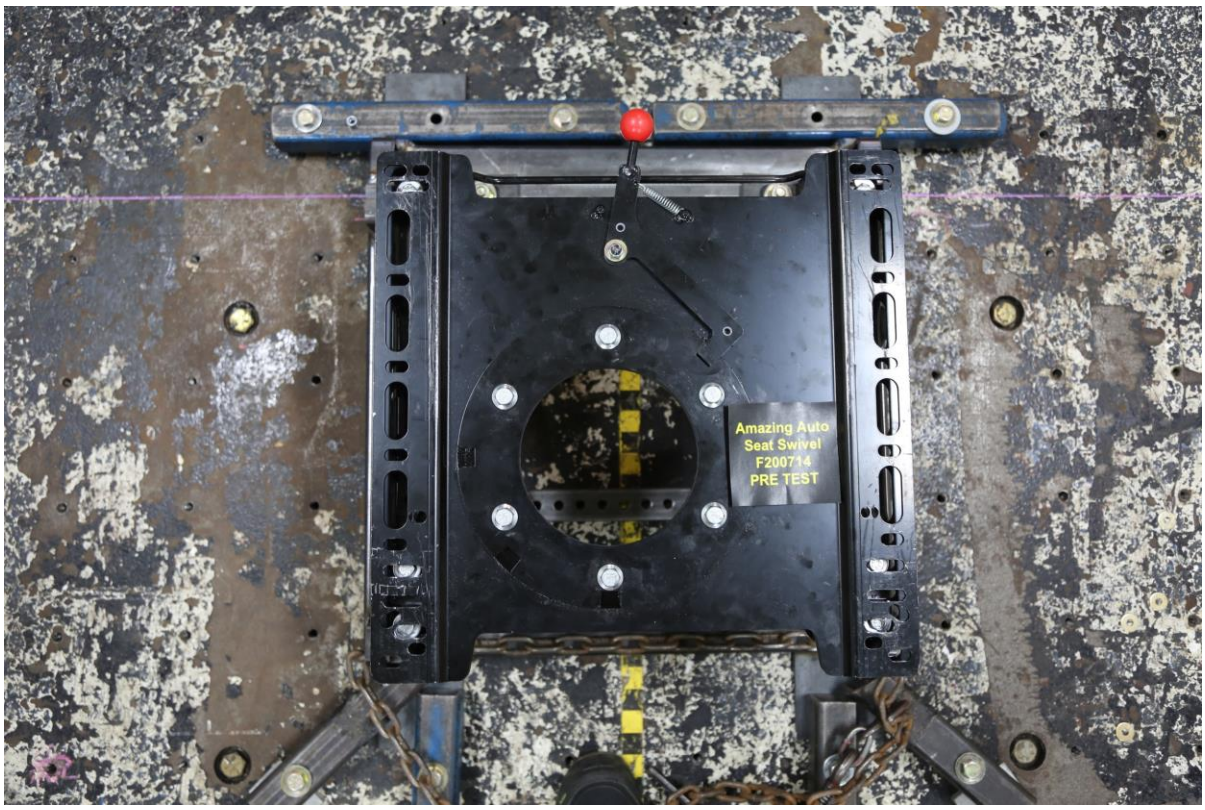


Figure 2 Seat Base and Swivel Attachment to Bed Plate - Top View

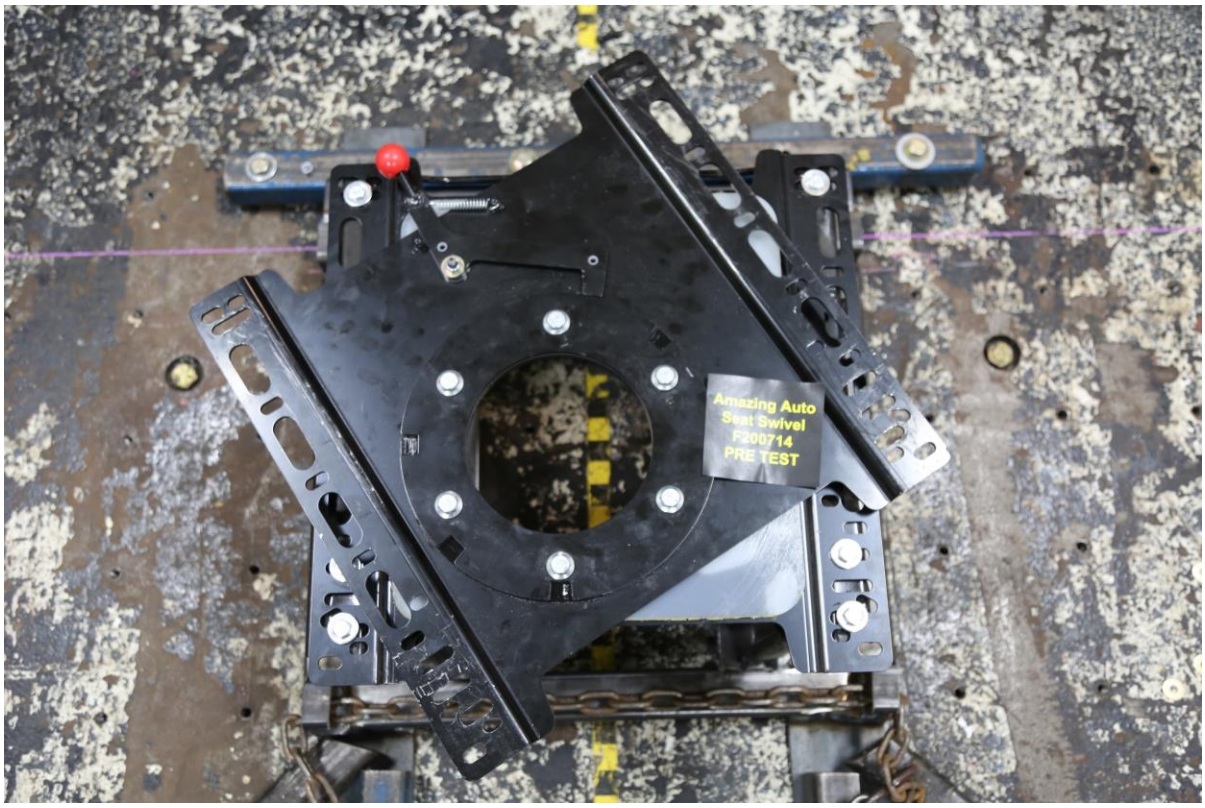


Figure 3 Swivel Attachment Bolts to Seat Base - Top View

Figure 4 Seat Frame Attachment Bolts to Swivel - Rear View

Figure 5 Seat Frame Attachment Bolts to Swivel - Front View

Figure 6 Swivel Attachment – Demonstrating Bolt Torque

List of Photographs

TRC Inc. Test Number F200714 A

Seat Swivel System Forward 20G Load Test

Figure 7 F200714 A Pre-Test Front View

Figure 8 F200714 A Post-Test Front View

Figure 9 F200714 A Pre-Test Left Front View

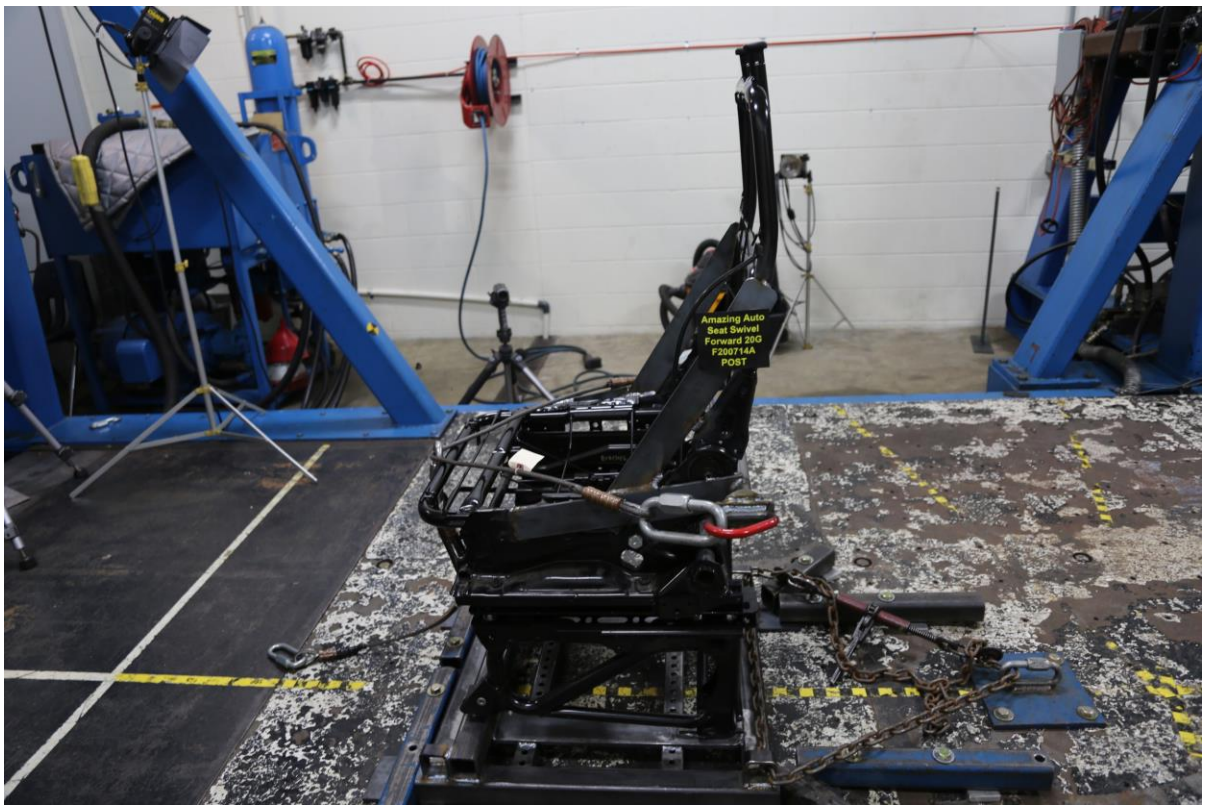


Figure 10 F200714 A Post-Test Left Front View

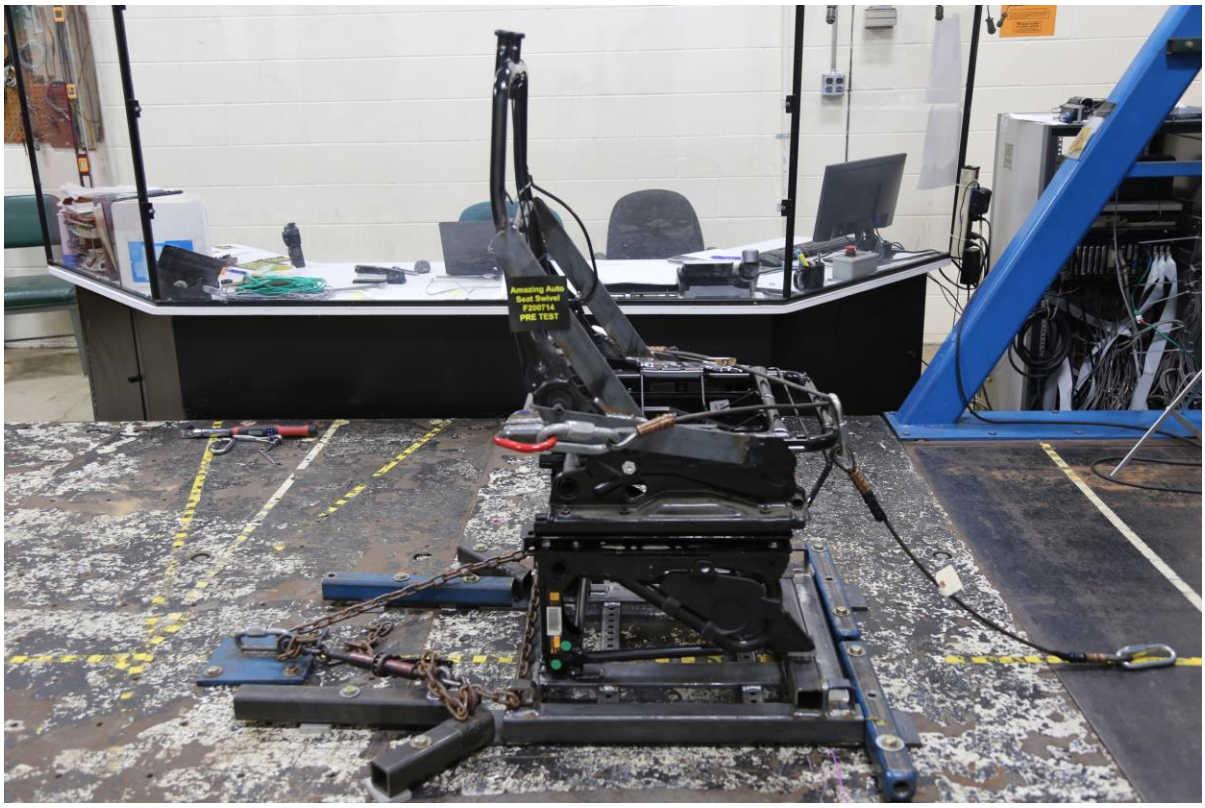


Figure 11 F200714 A Pre-Test Right Front View

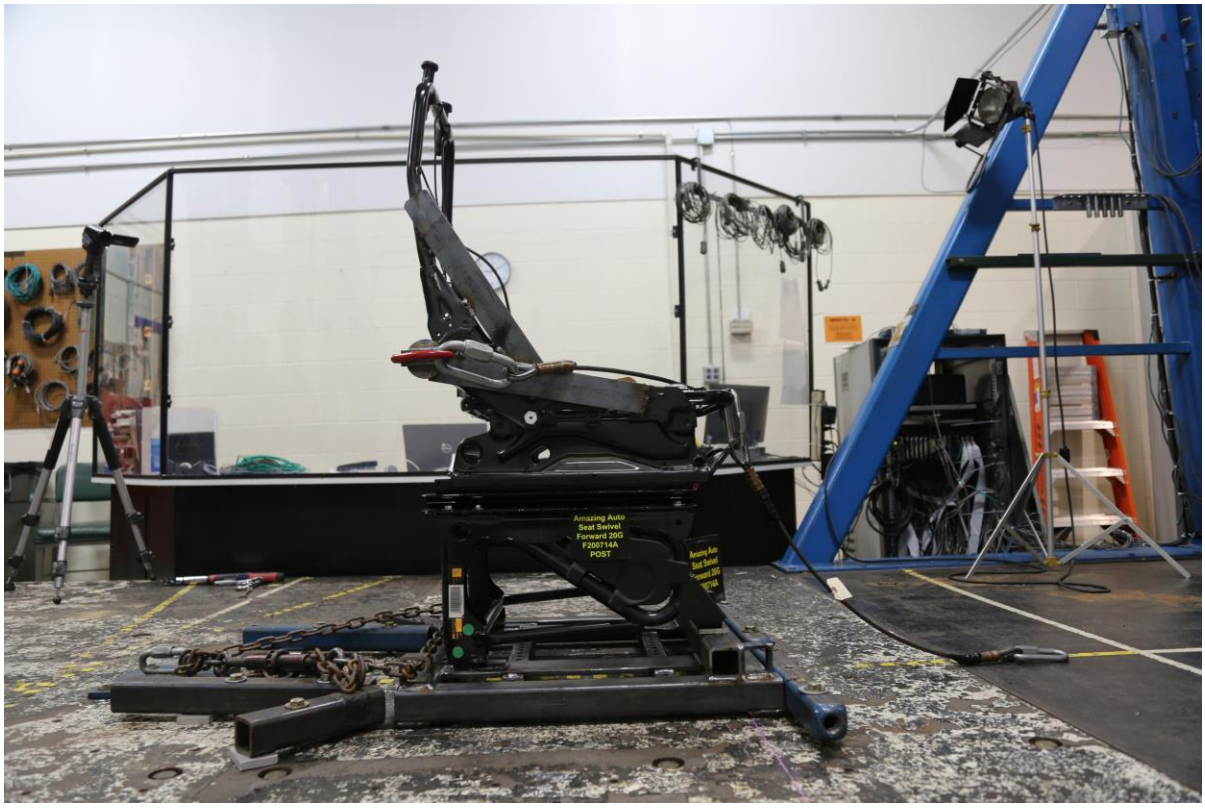


Figure 12 F200714 A Post-Test Right Front View

Figure 13 F200714A Pre-Test Swivel Attachment View

INTENTIONALLY LEFT BLANK

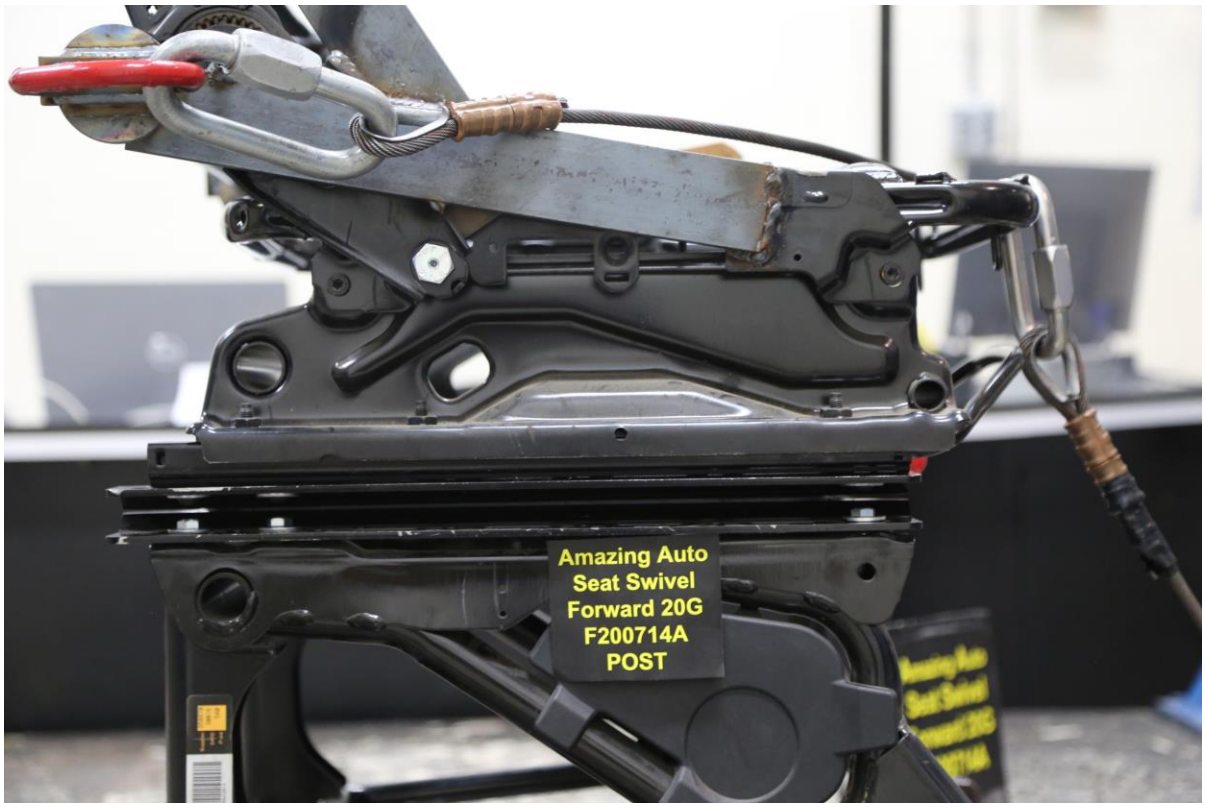


Figure 14 F200714 Post-Test Swivel Attachment View 1

Figure 15 F200714A Post-Test Swivel Attachment View 2

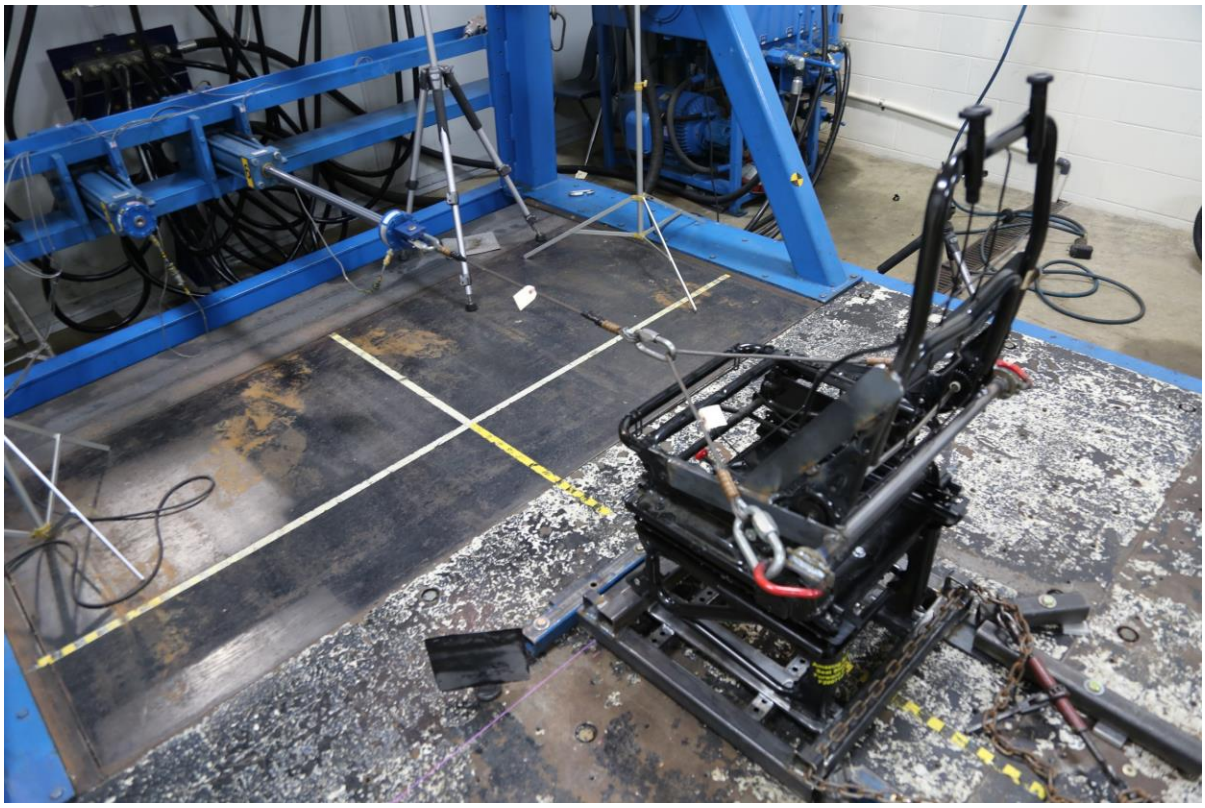


Figure 16 F200714A Seat at Pre-Load Left Side View

Figure 17 F200714A Seat at Pre-Load Right Side View

List of Photographs

TRC Inc. Test Number F200714 B

Seat Swivel System Rearward 20G Load Test

Figure 18 F200714 B Pre-Test Front View

Figure 19 F200714 B Post-Test Front View

Figure 20 F200714 B Pre-Test Left View

Figure 21 F200714 B Post-Test Left View

Figure 22 F200714 B Pre-Test Right View

Figure 23 F200714 B Post-Test Right View

Figure 24 F200714 B Pre-Test Rear View

Figure 25 F200714 B Post-Test Rear View

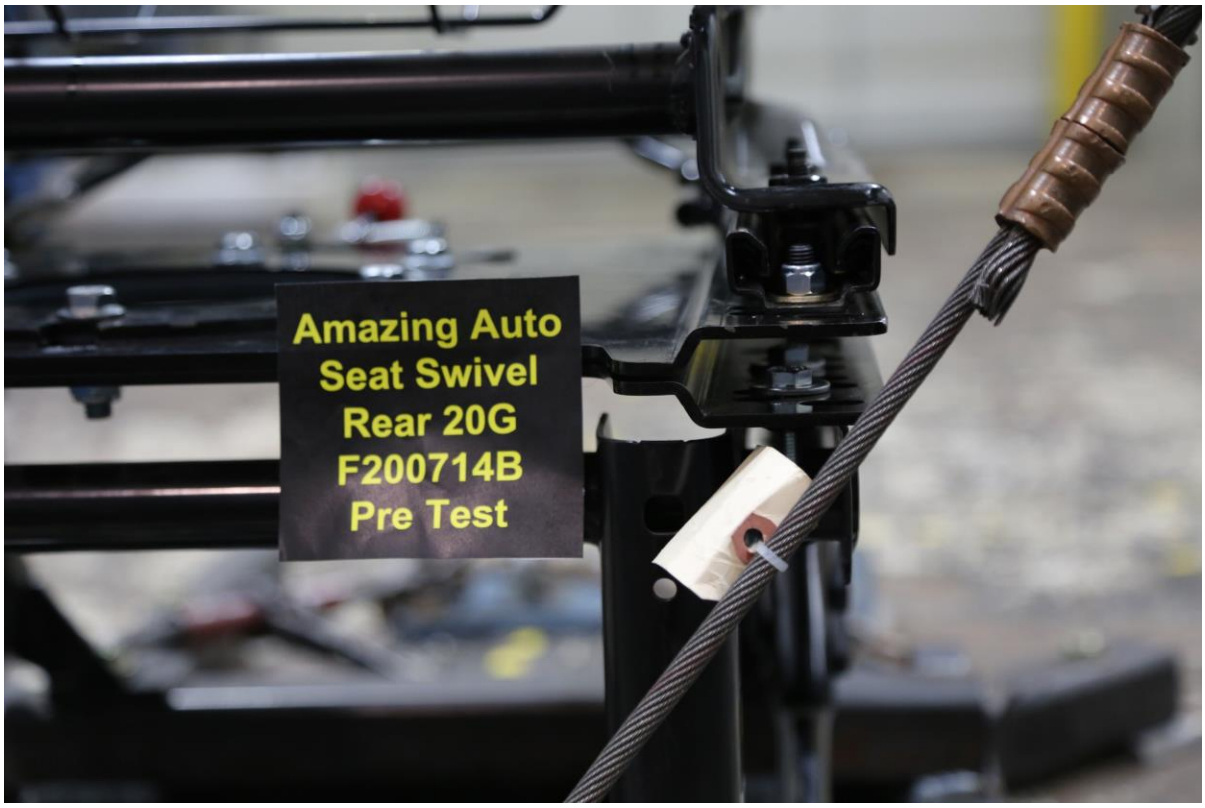


Figure 26 F200714 B Pre-Test Swivel Attachment View 1

Figure 27 F200714 B Post-Test Swivel Attachment View 1

Figure 28 F200714 B Post-Test Swivel Attachment View 2

INTENTIONALLY LEFT BLANK

Figure 29 F200714 B Seat at Pre-Load Left Side View

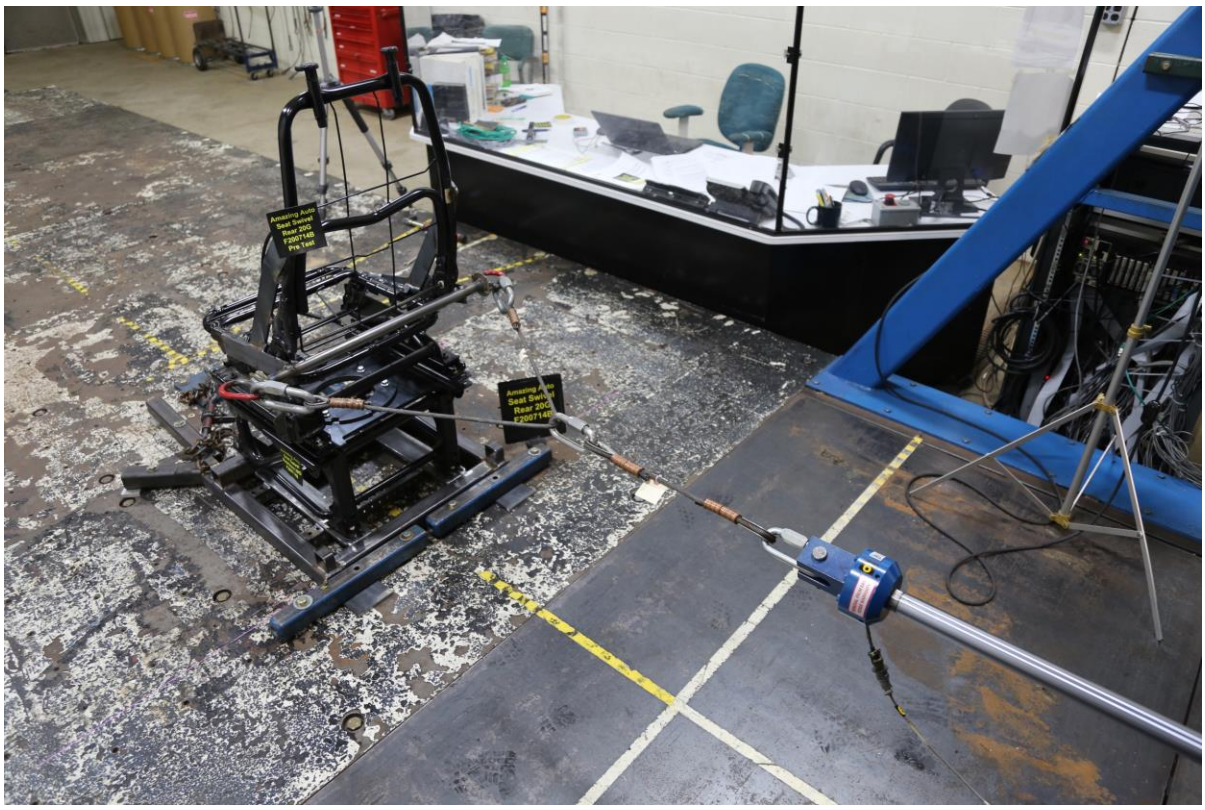


Figure 30 F200714 B Seat at Pre-Load Rear View

List of Photographs

TRC Inc. Test Number F200714 C

Seat Swivel System Rear Moment Test

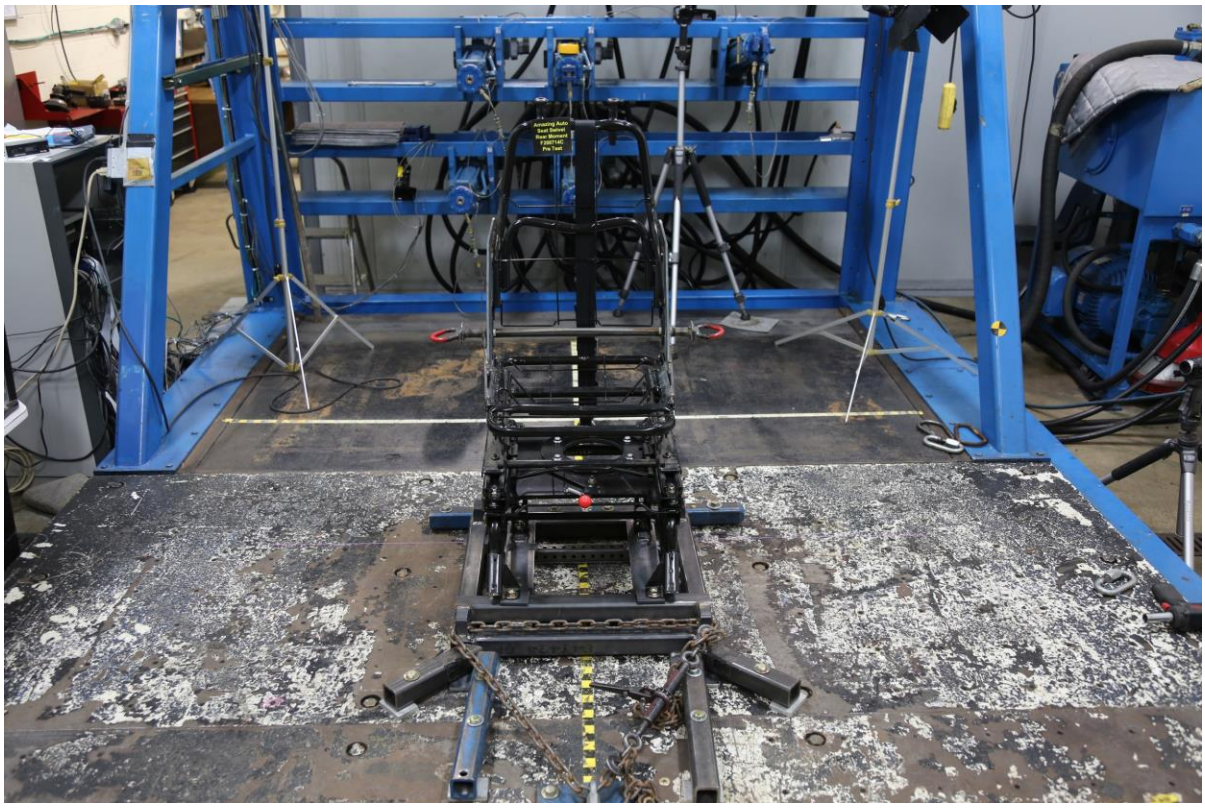


Figure 31 F200714 C Pre-Test Front View

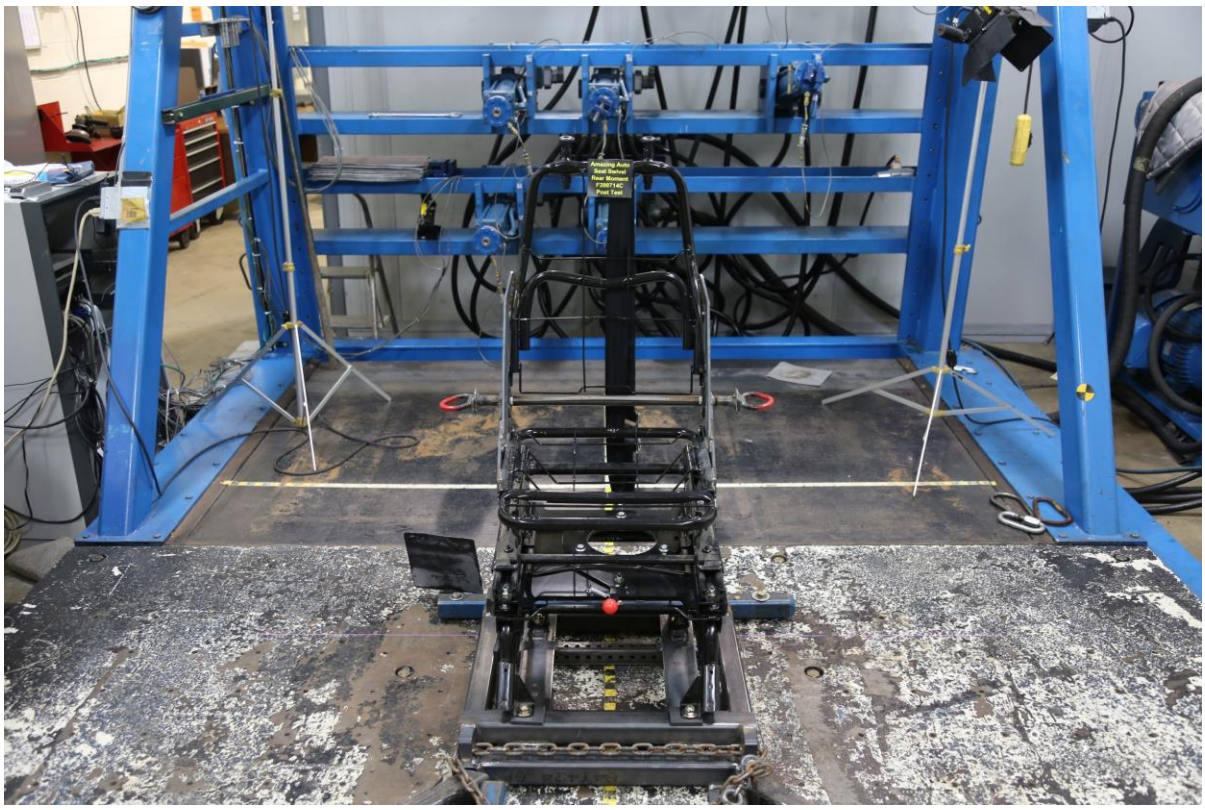


Figure 32 F200714 C Post-Test Front View

Figure 33 F200714 C Pre-Test Left View

Figure 34 F200714 C Post-Test Left View

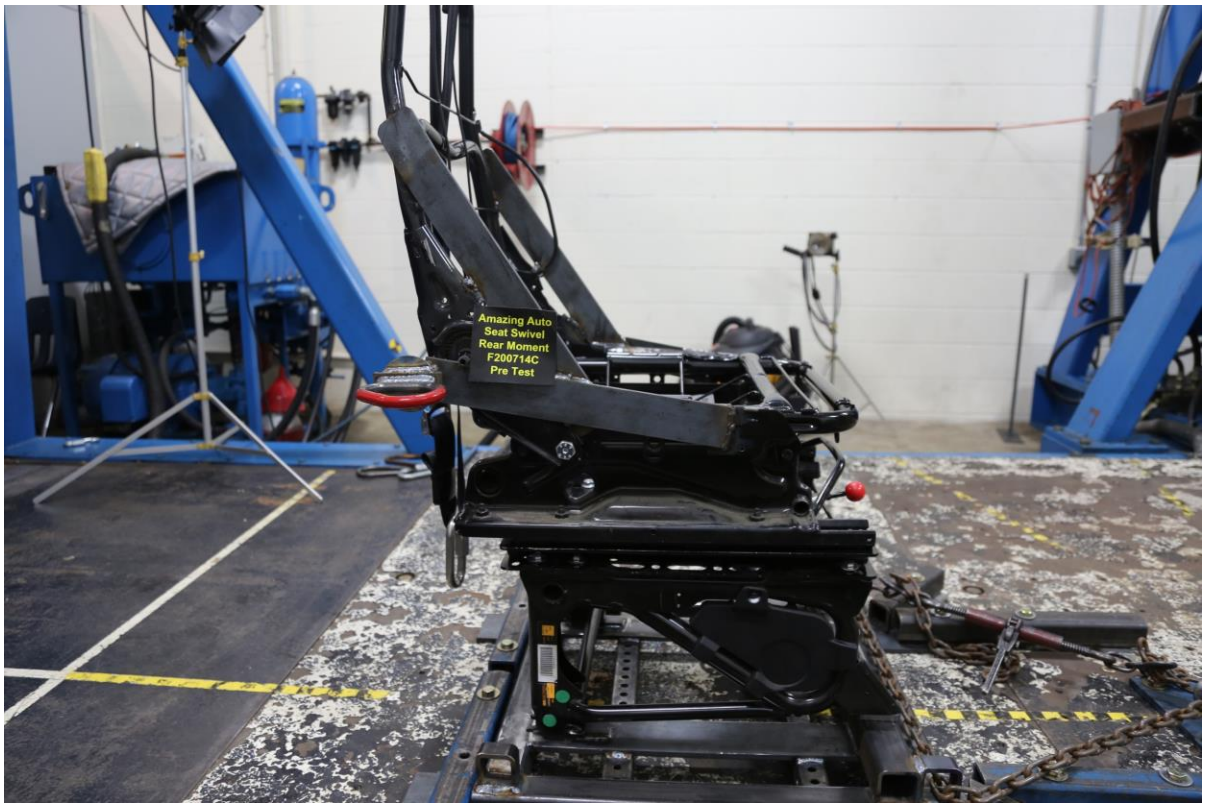


Figure 35 F200714 C Pre-Test Right View

Figure 36 F200714 C Post-Test Right View

Figure 37 F200714 C Pre-Test Rear View

Figure 38 F200714 C Post-Test Rear View

Figure 39 F200714 C Pre-Test Swivel Attachment View 1

Figure 40 F200714 C Post-Test Swivel Attachment View 1

Figure 41 F200714 C Seat at Pre-Load Right Side View

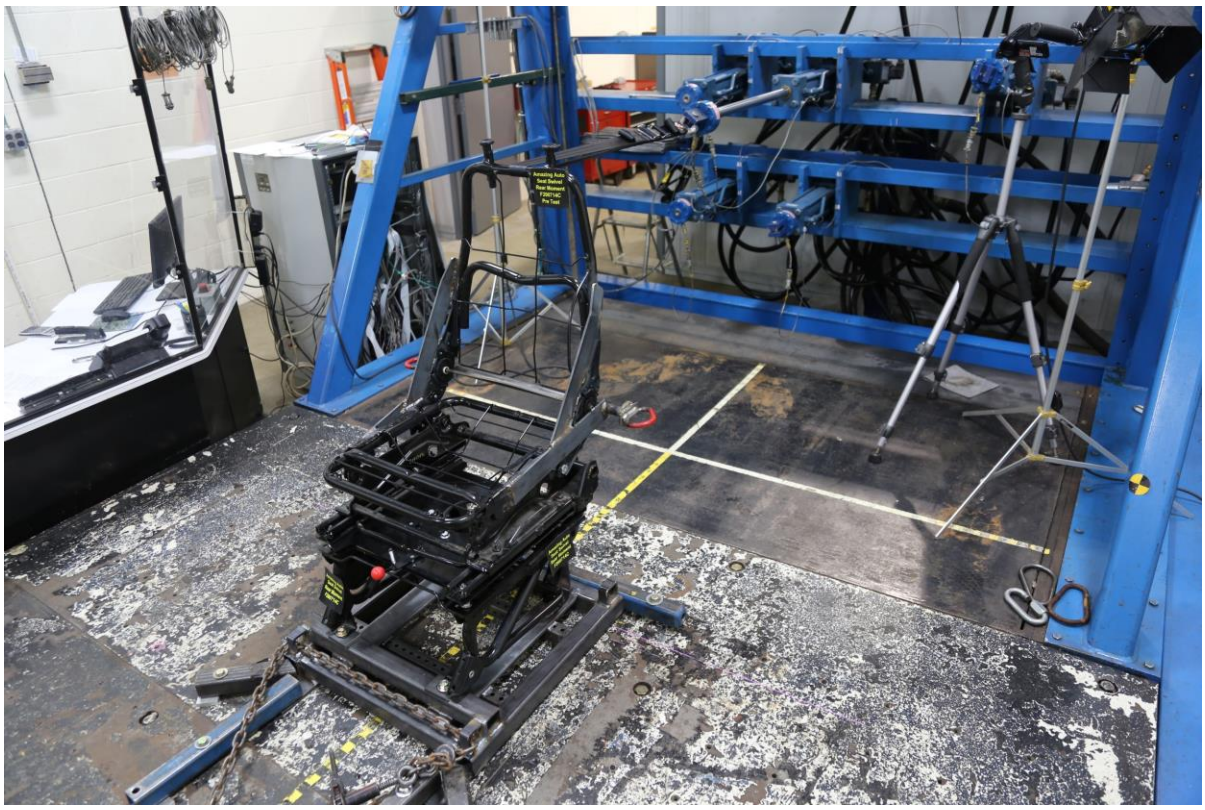


Figure 42 F200714 C Seat at Pre-Load Front View

List of Photographs

TRC Inc. Test Number F200714

Seat Swivel System Post Test Teardown

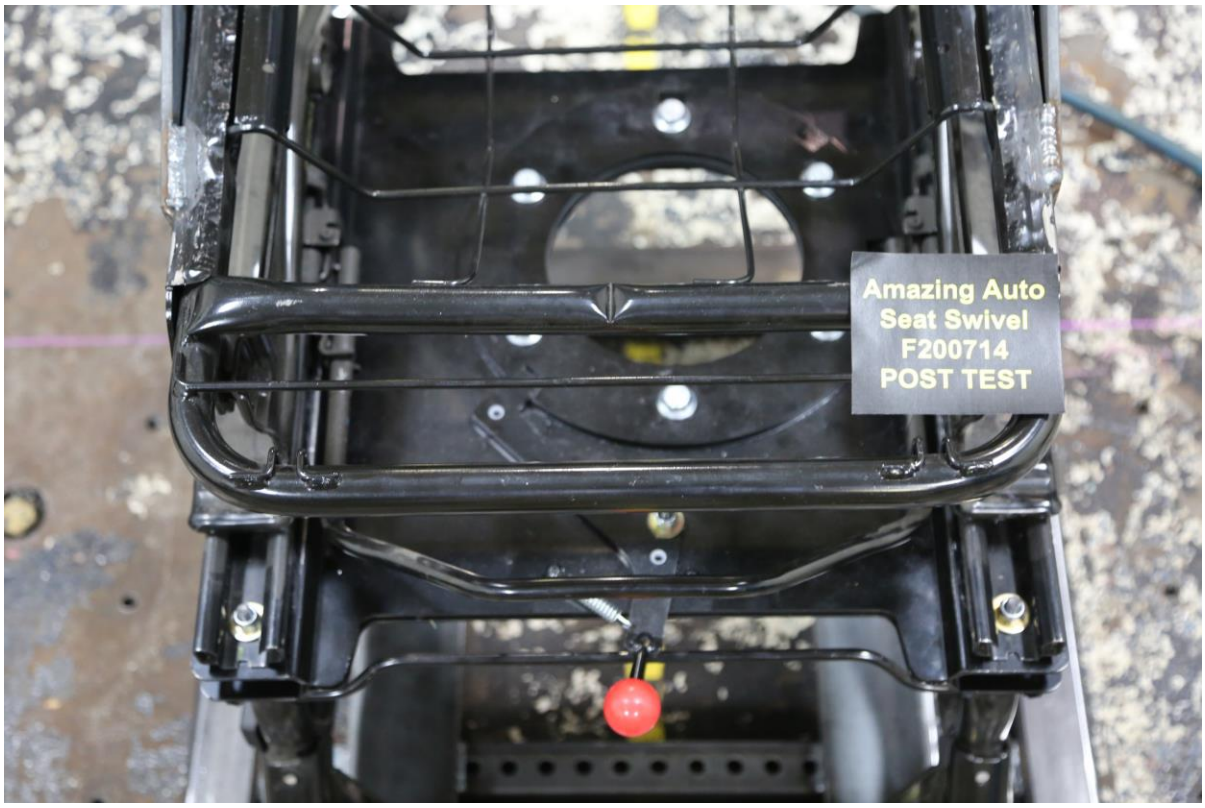


Figure 43 Seat Frame to Swivel Front Attachment Bolts View

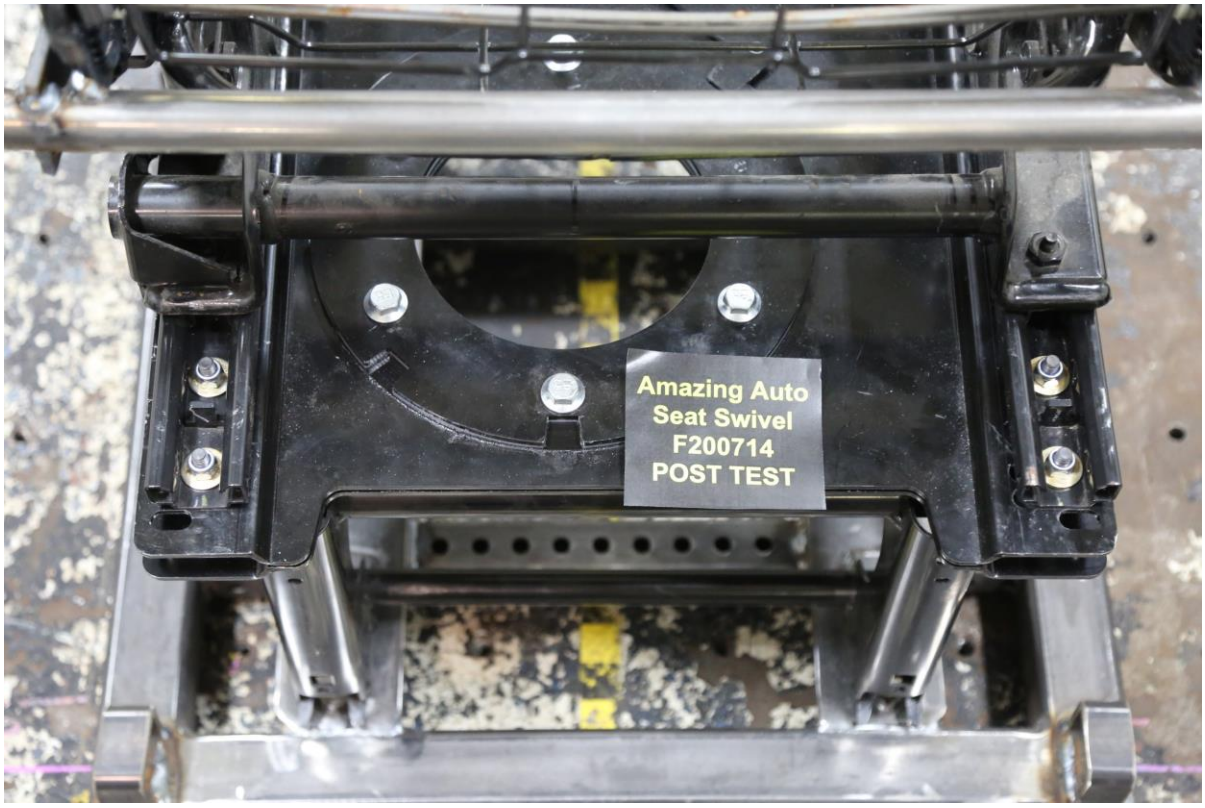


Figure 44 Seat Frame to Swivel Rear Attachment Bolts View

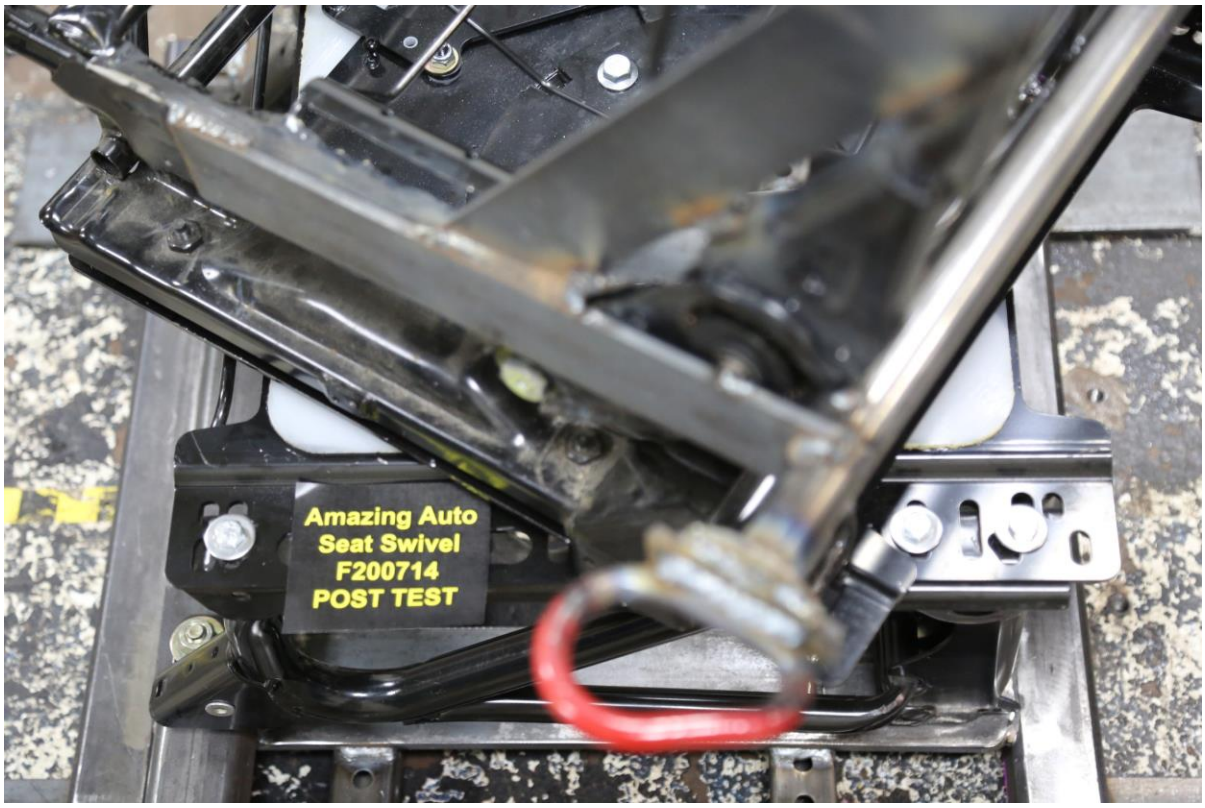


Figure 45 Swivel to Seat Base Left Side Attachment Bolts View

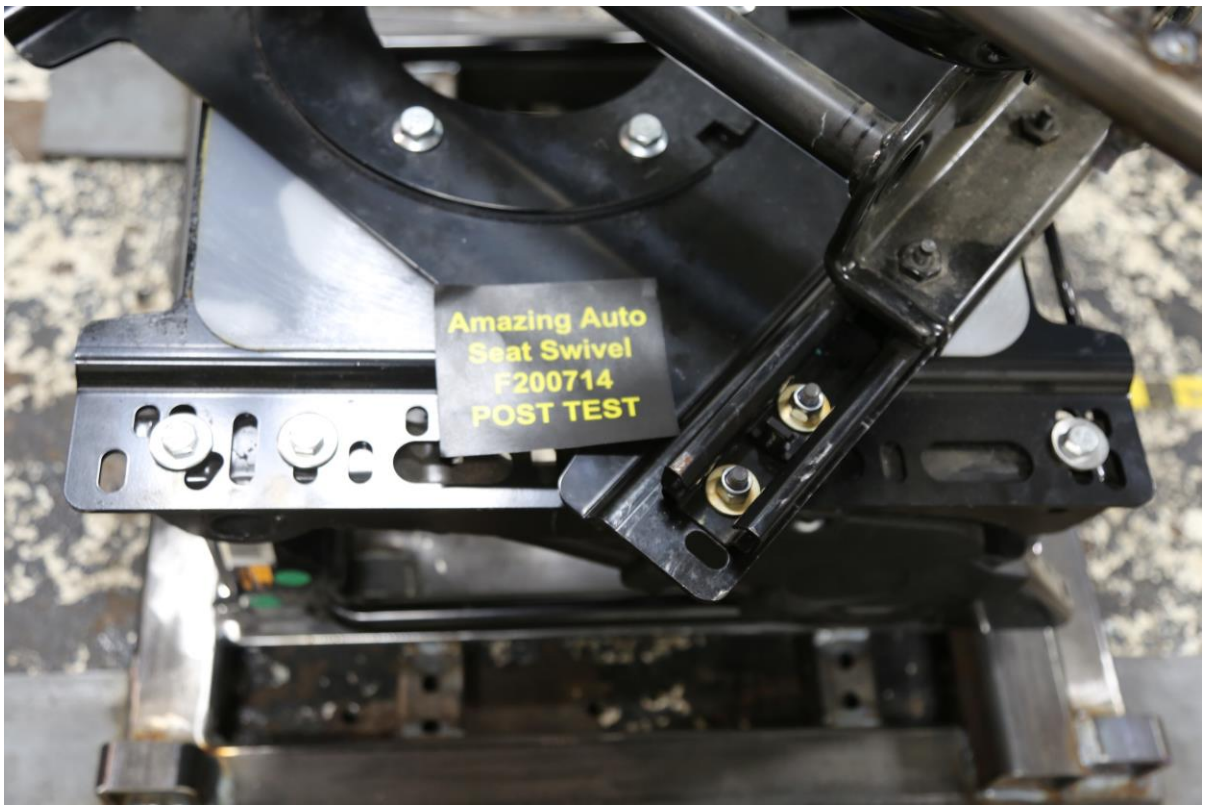


Figure 46 Swivel to Seat Base Right Side Attachment Bolts View

List of Photographs

TRC Inc. Test Number F200810

Seat Swivel Pull to Failure

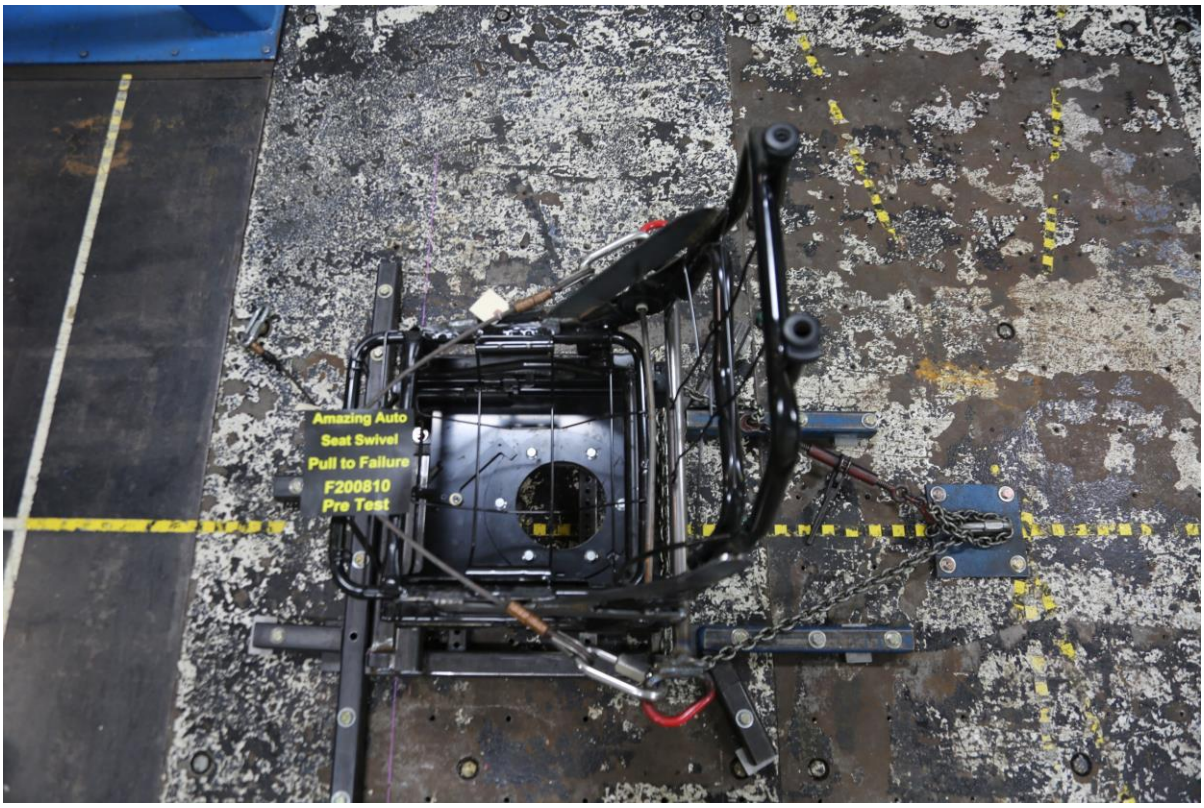


Figure 47 Seat Base and Swivel Attachment to Bed Plate - Top View

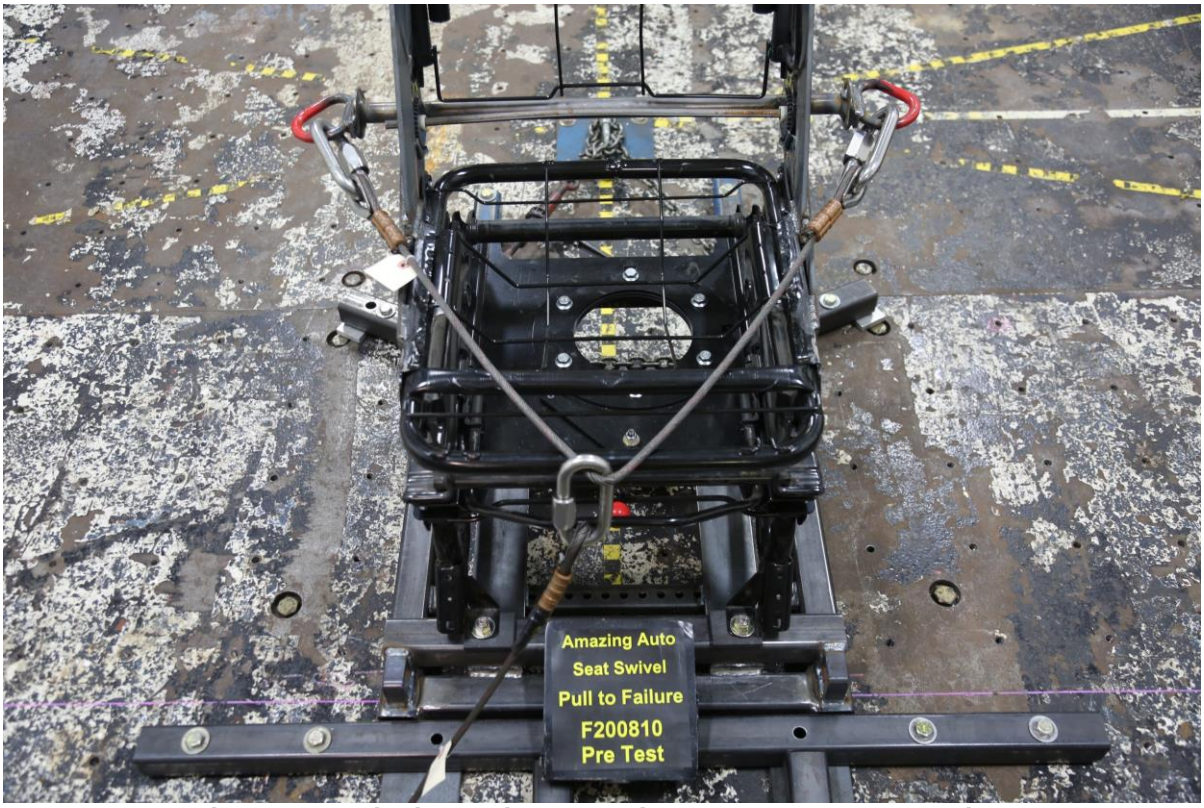


Figure 48 Swivel Attachment Bolts to Seat Base - Top View

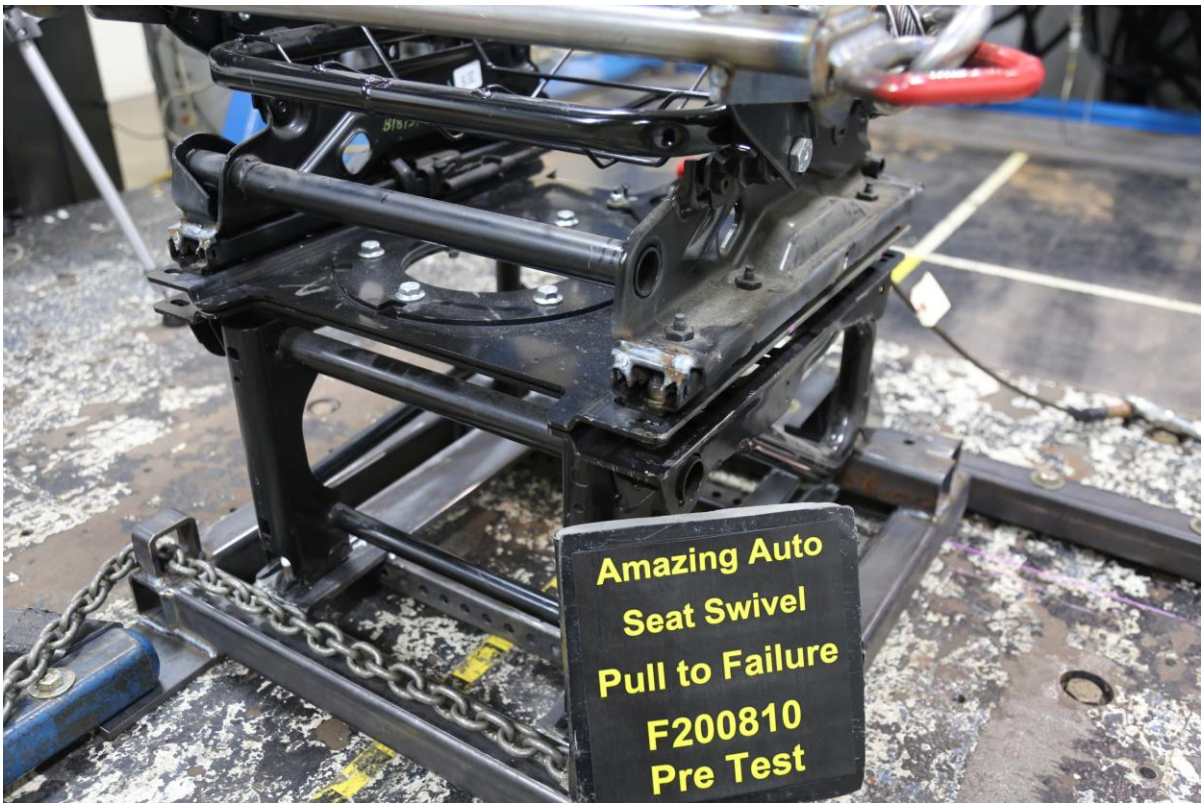


Figure 49 Seat Frame Attachment Bolts to Swivel - Rear View

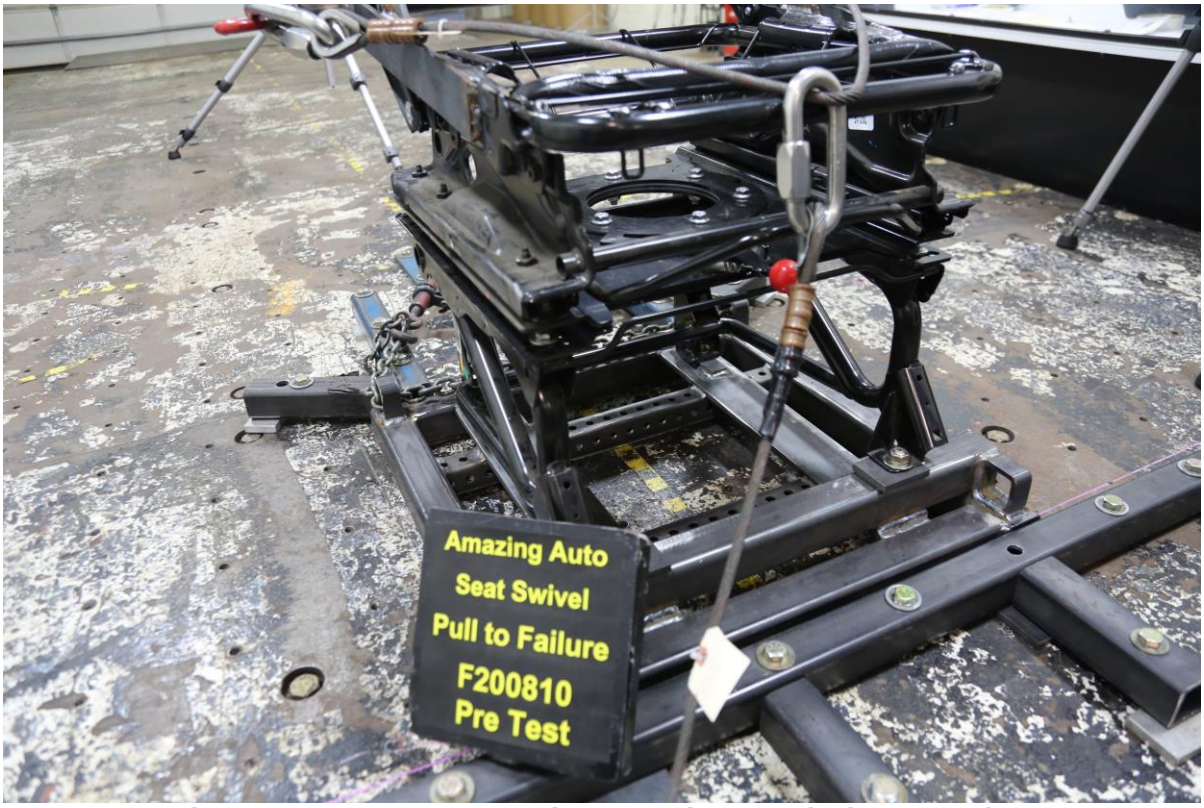


Figure 50 Seat Frame Attachment Bolts to Swivel - Front View

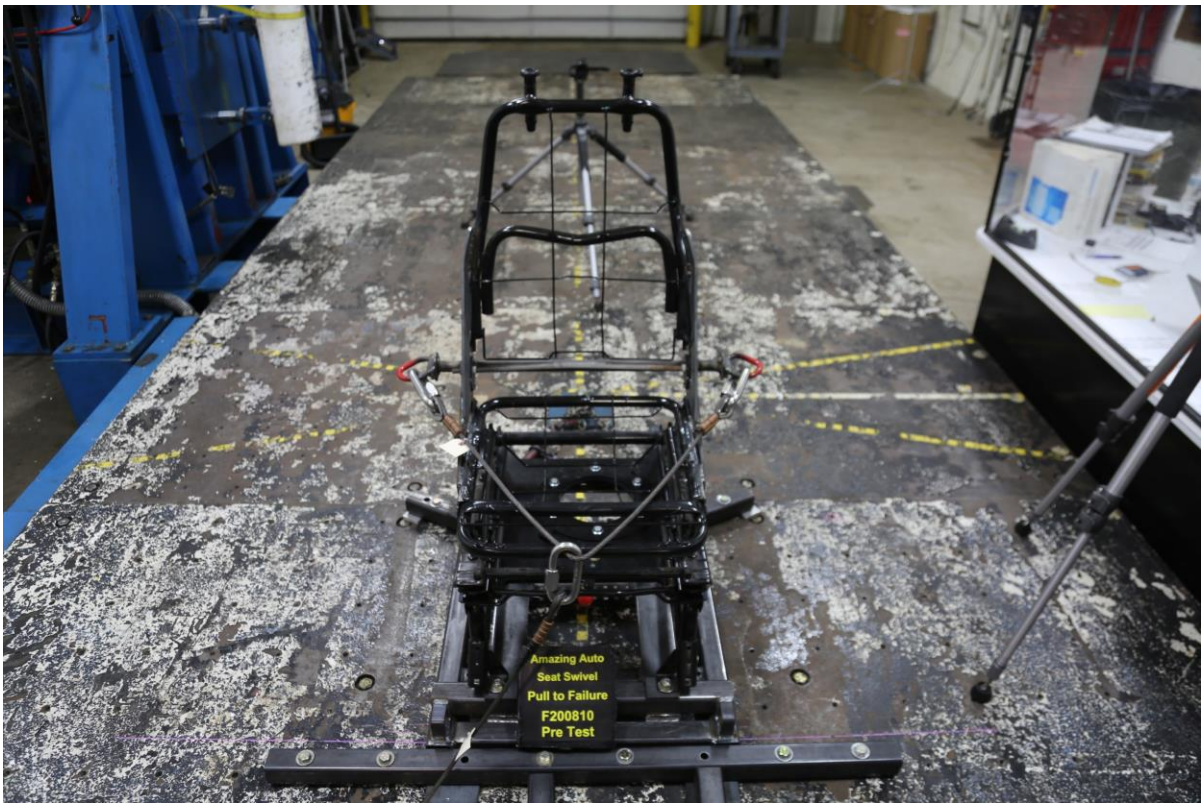


Figure 51 F200810 Pre-Test Front View

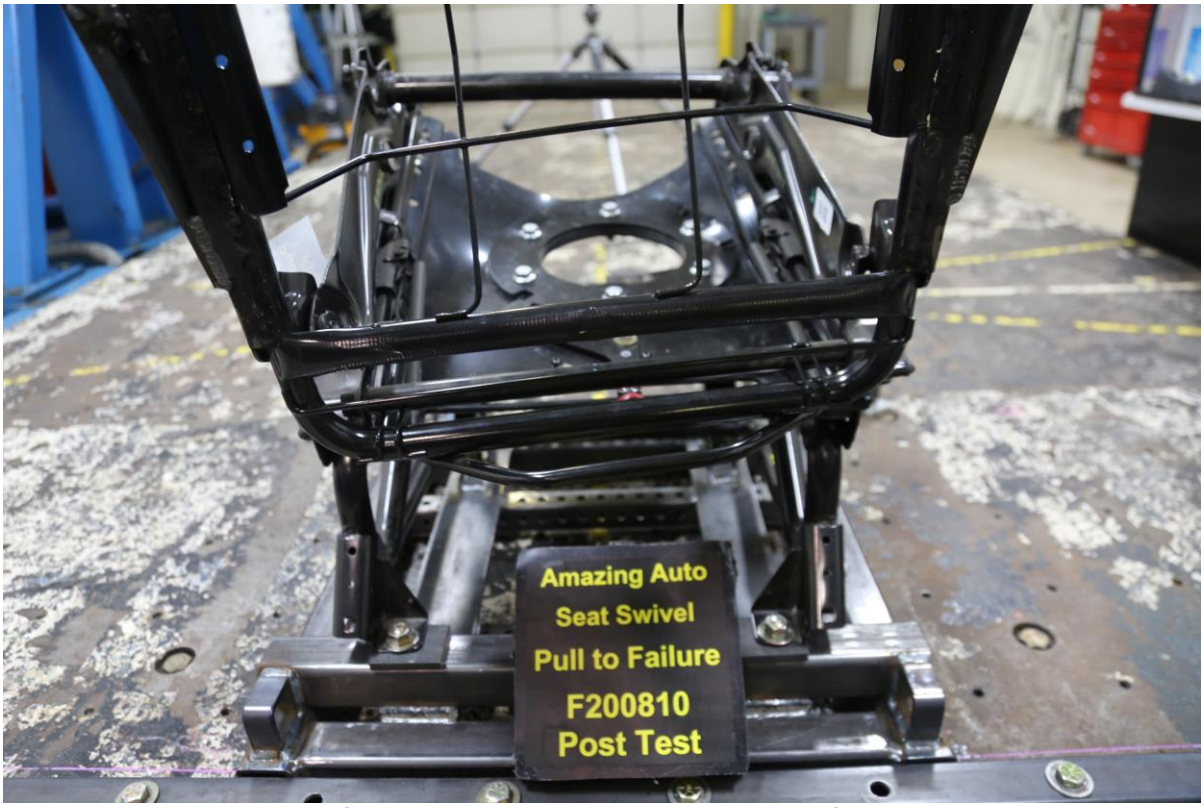


Figure 52 F200810 Post-Test Front View

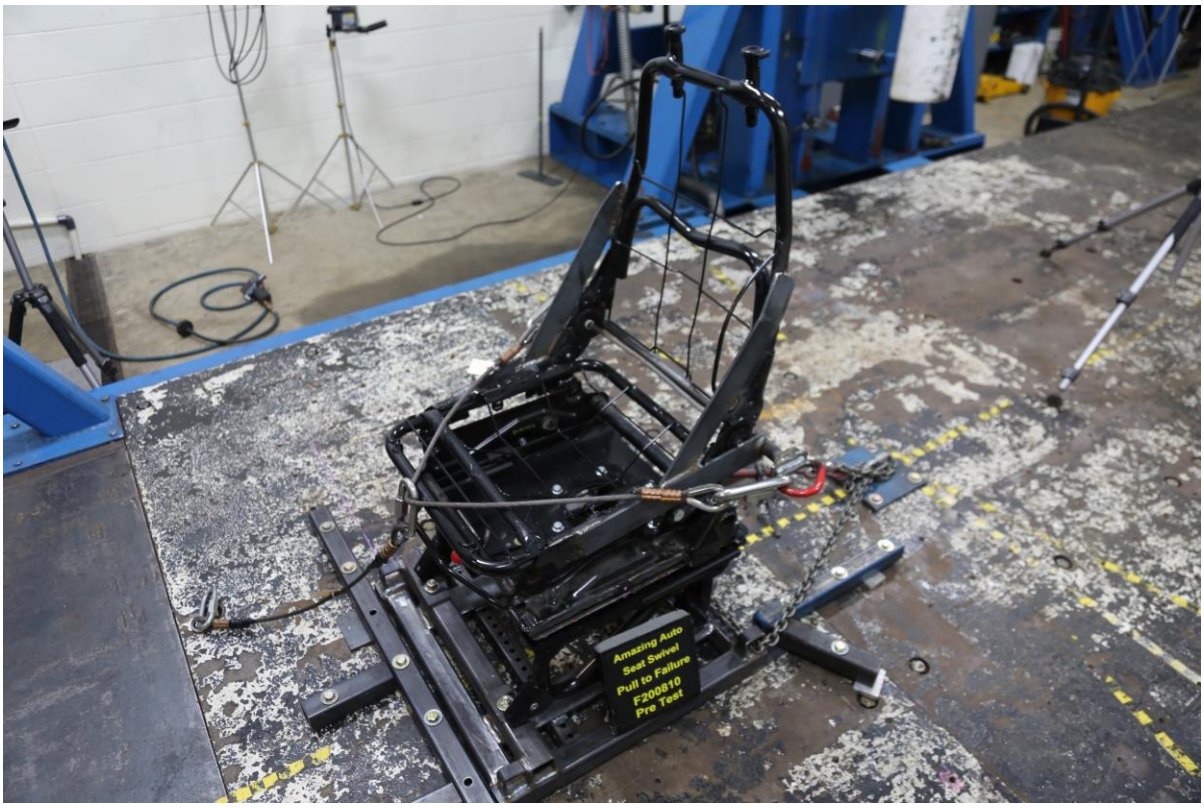


Figure 53 F200810 Pre-Test Left Front View

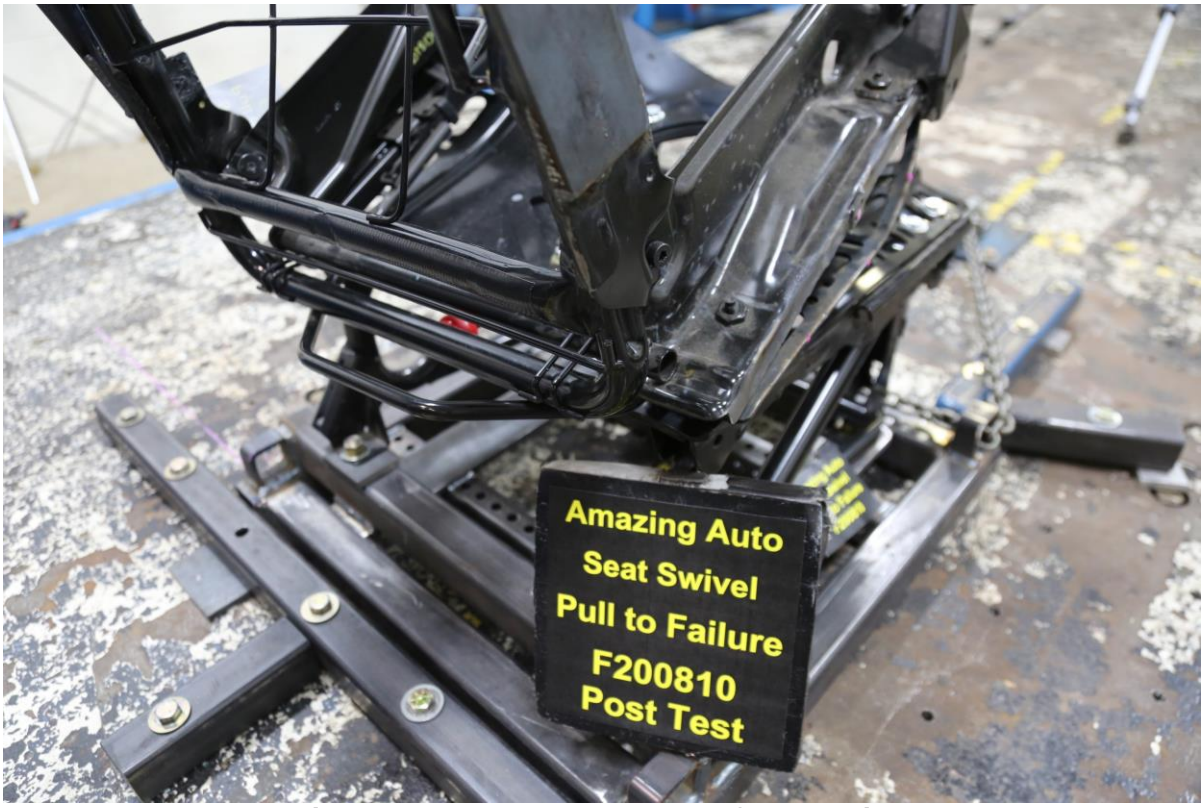


Figure 54 F200810 Post-Test Left Front View

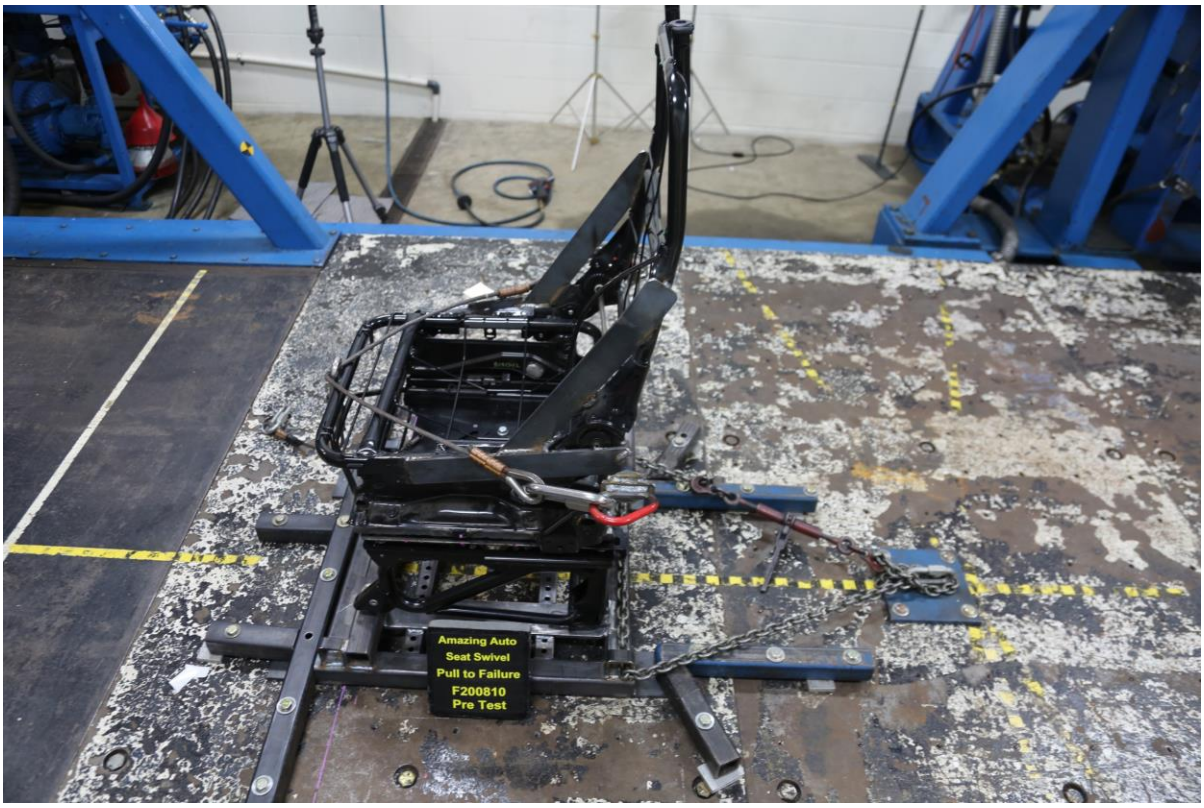


Figure 55 F200810 Pre-Test Left Side View

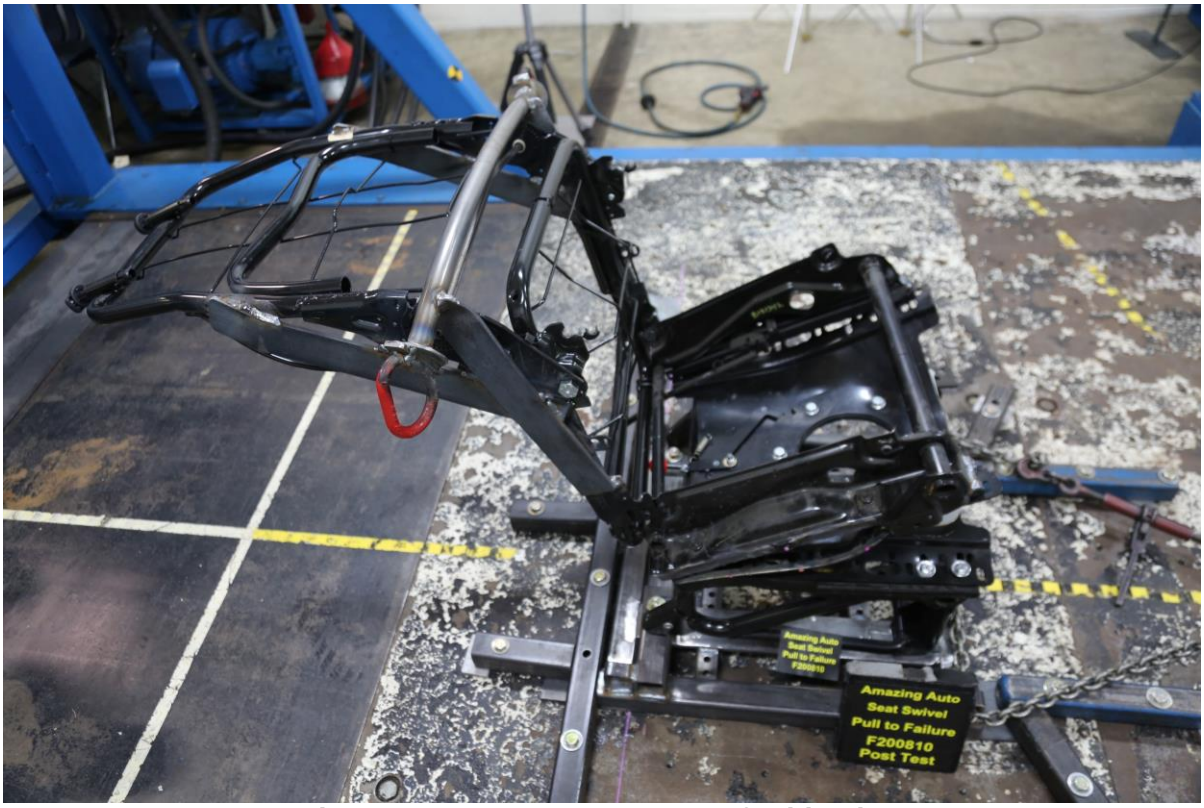


Figure 56 F200810 Post-Test Left Side View

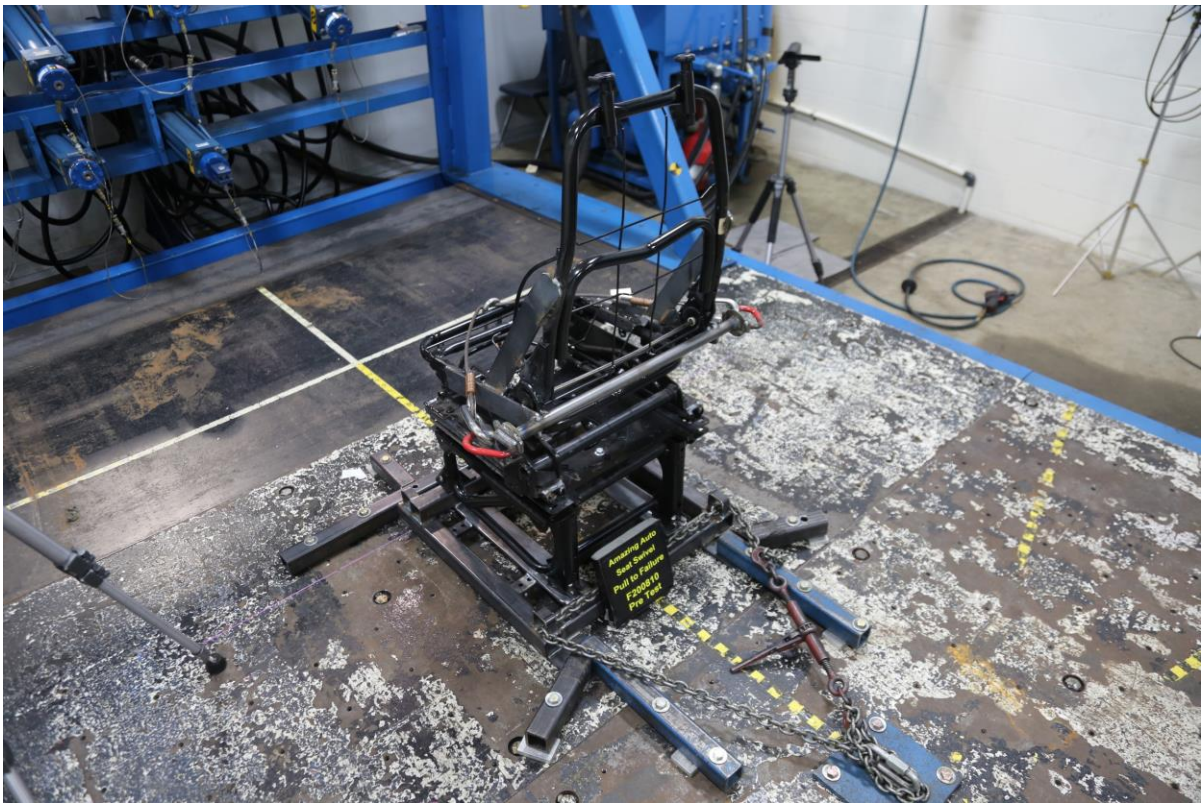


Figure 57 F200810 Pre-Test Left Rear View

Figure 58 F200810 Post-Test Left Rear View

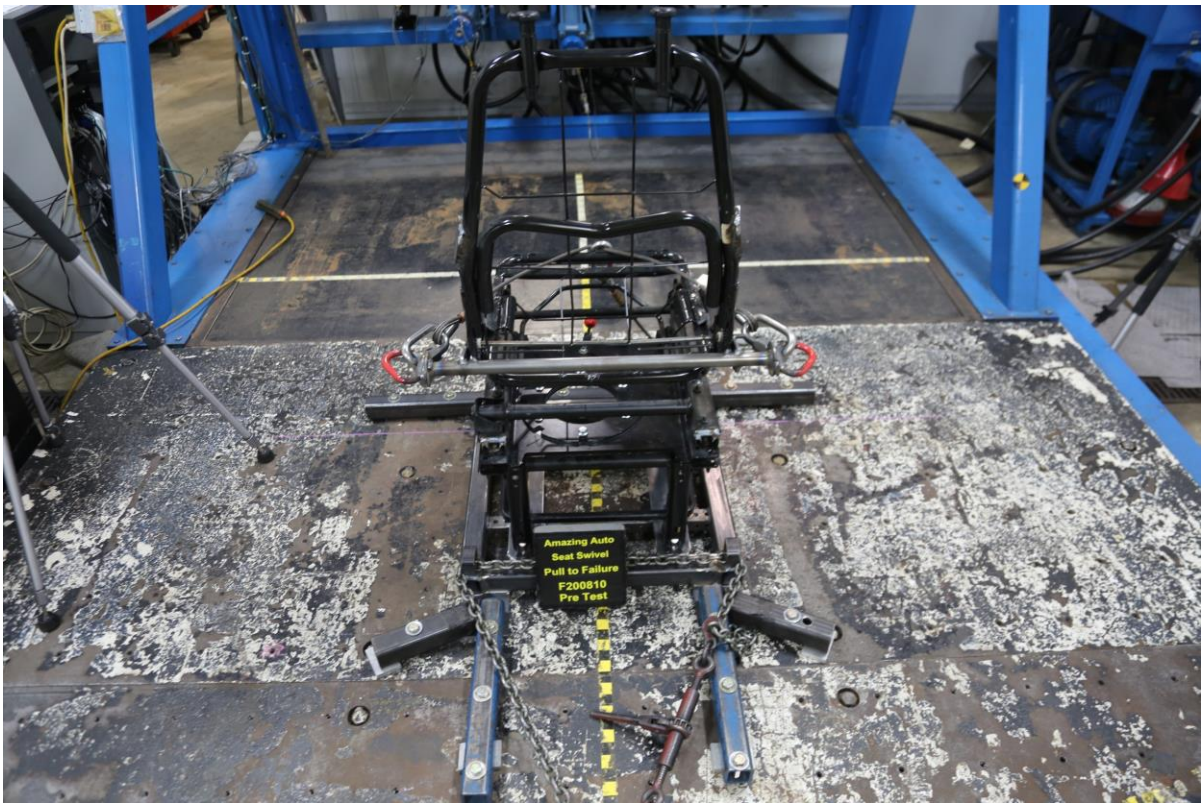


Figure 59 F200810 Pre-Test Rear View

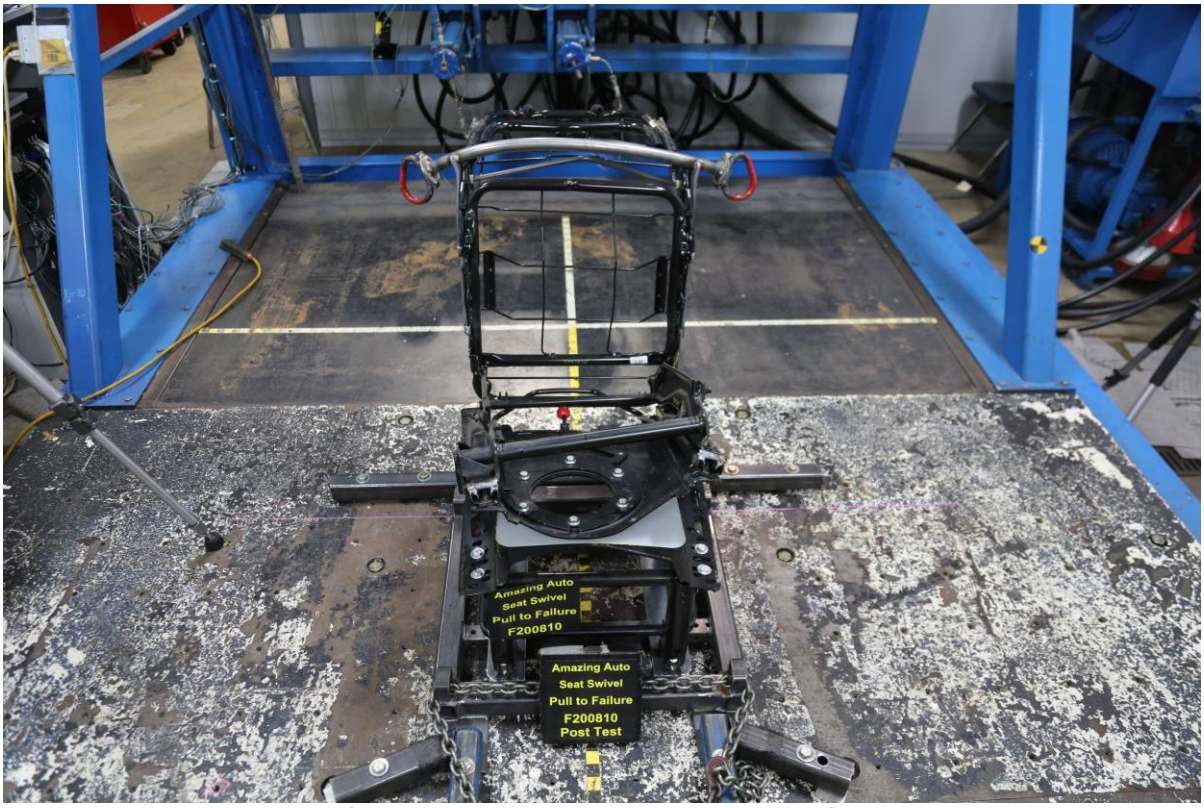


Figure 60 F200810 Post-Test Rear View

Figure 61 F200810 Pre-Test Right Rear View

Figure 62 F200810 Post-Test Right Rear View

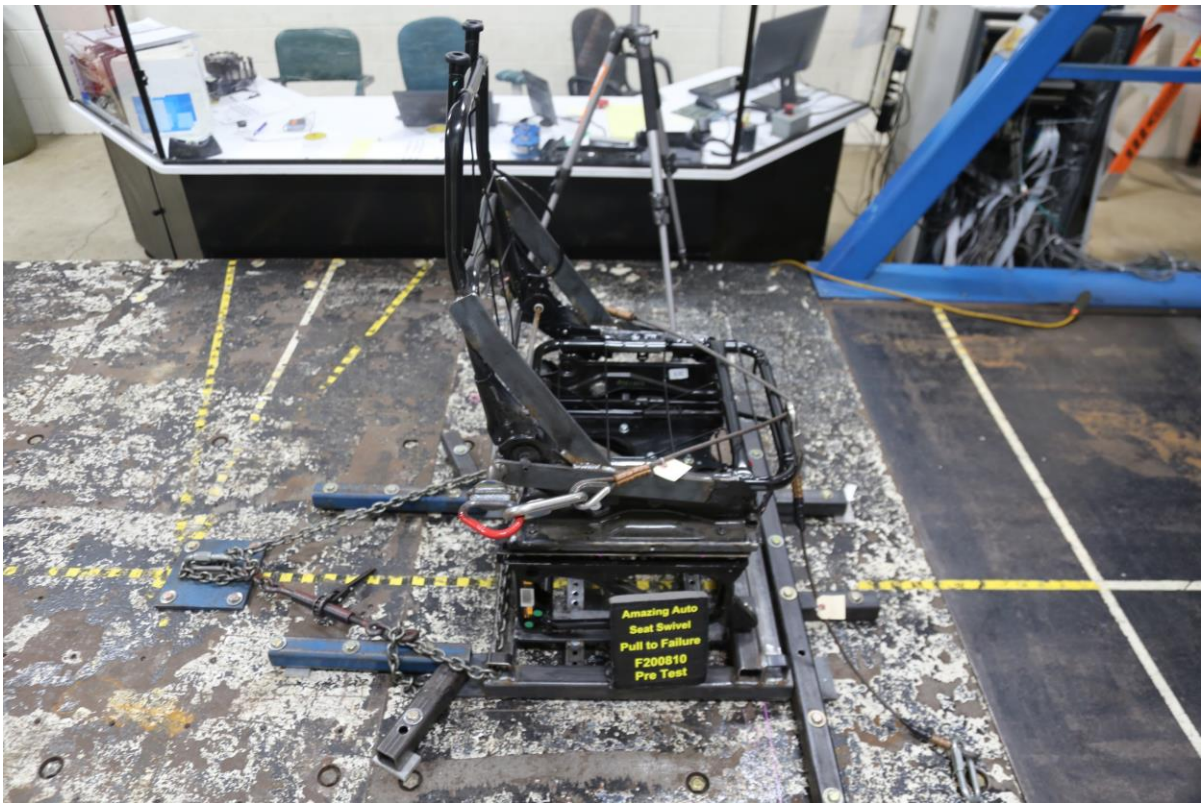


Figure 63 F200810 Pre-Test Right Side View

Figure 64 F200810 Post-Test Right Side View

Figure 65 F200810 Pre-Test Right Front View

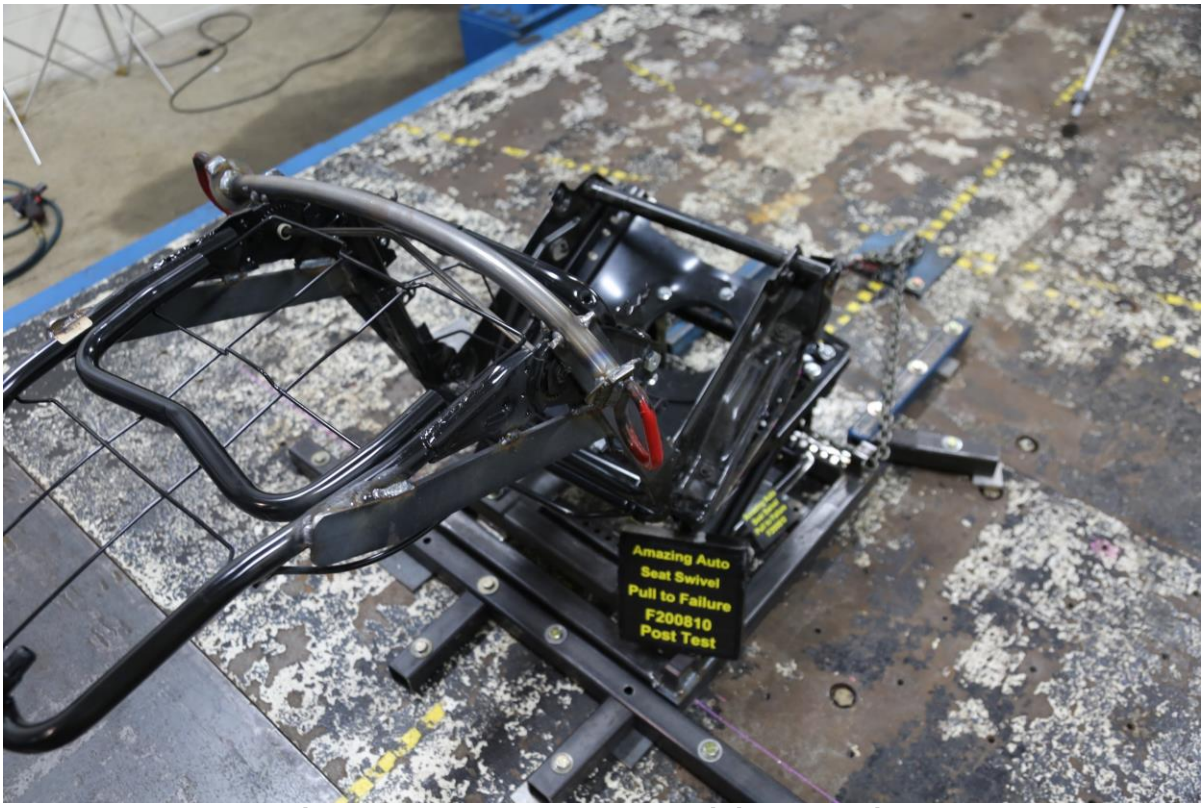


Figure 66 F200810 Post-Test Right Front View

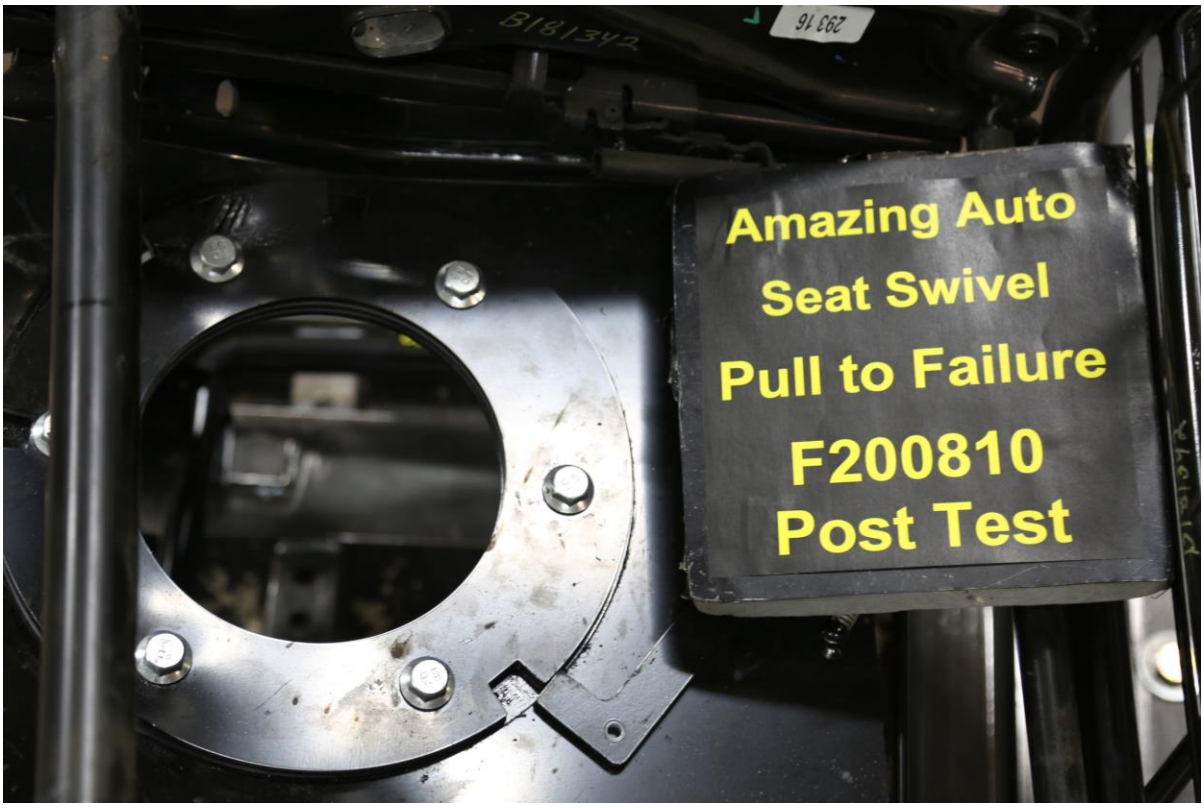


Figure 67 F200810 Pre-Test Swivel Attachment View

Figure 68 F200810 Post-Test Seat Attachment View 1

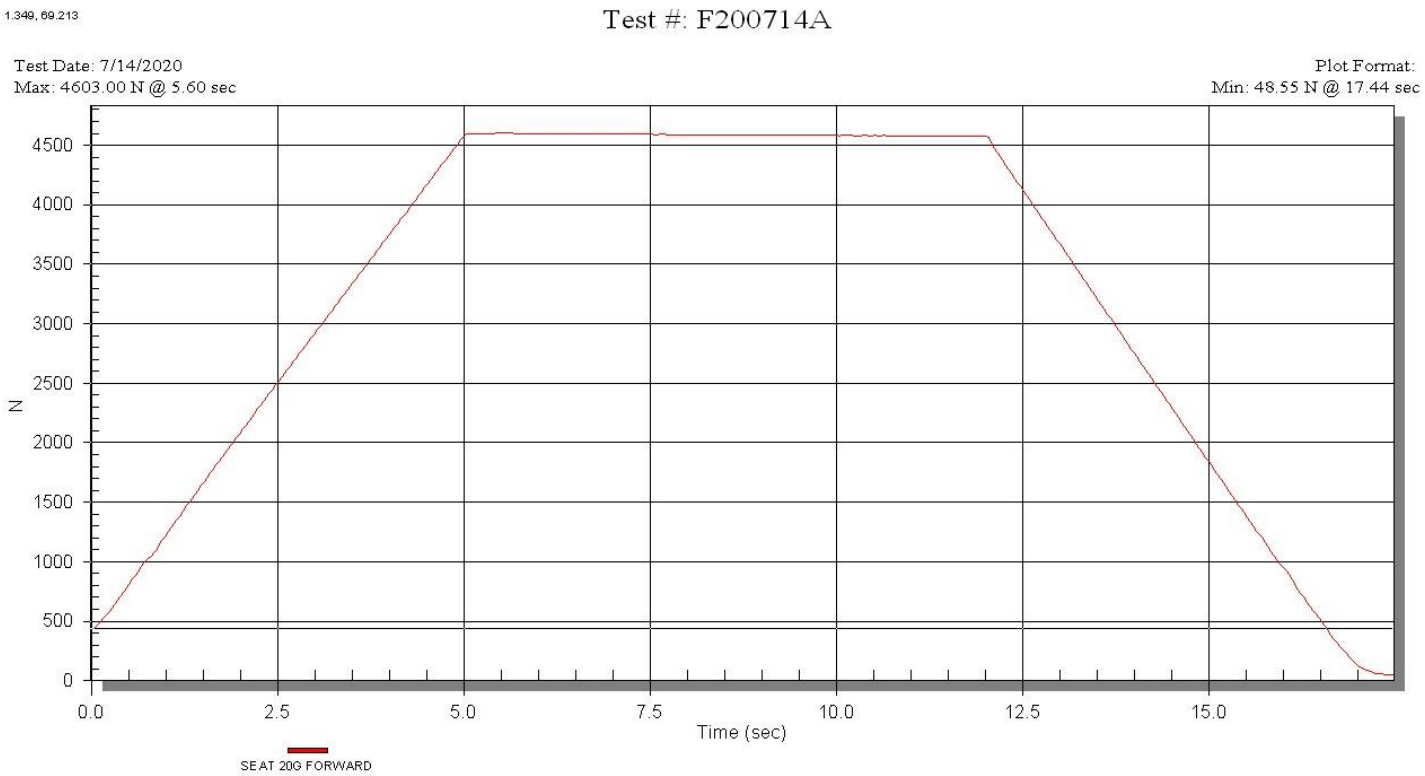
Figure 69 F200810 Post-Test Seat Attachment View 2

Appendix B

Data Plots

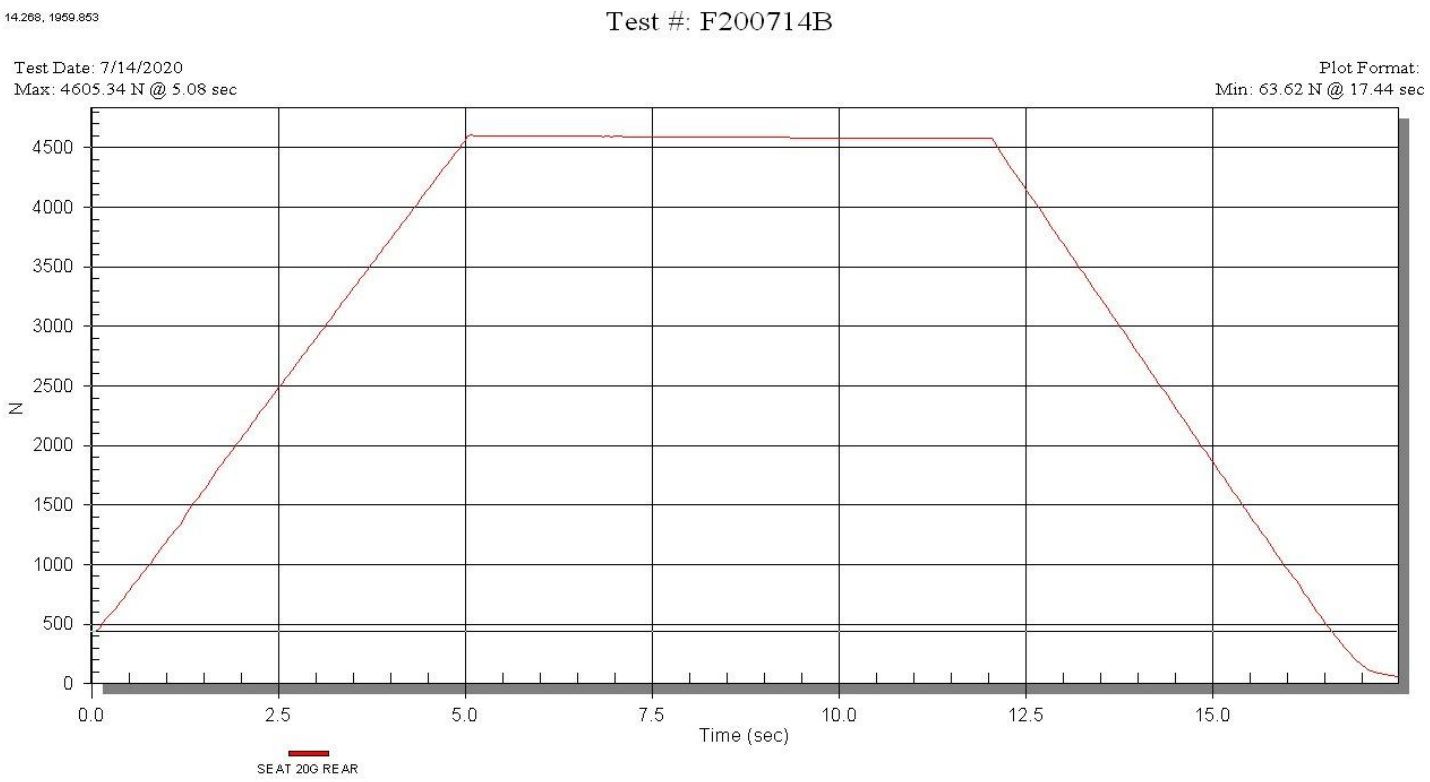
TRC Inc. Test Number F200714 A

Seat Swivel System Forward 20G Load Test



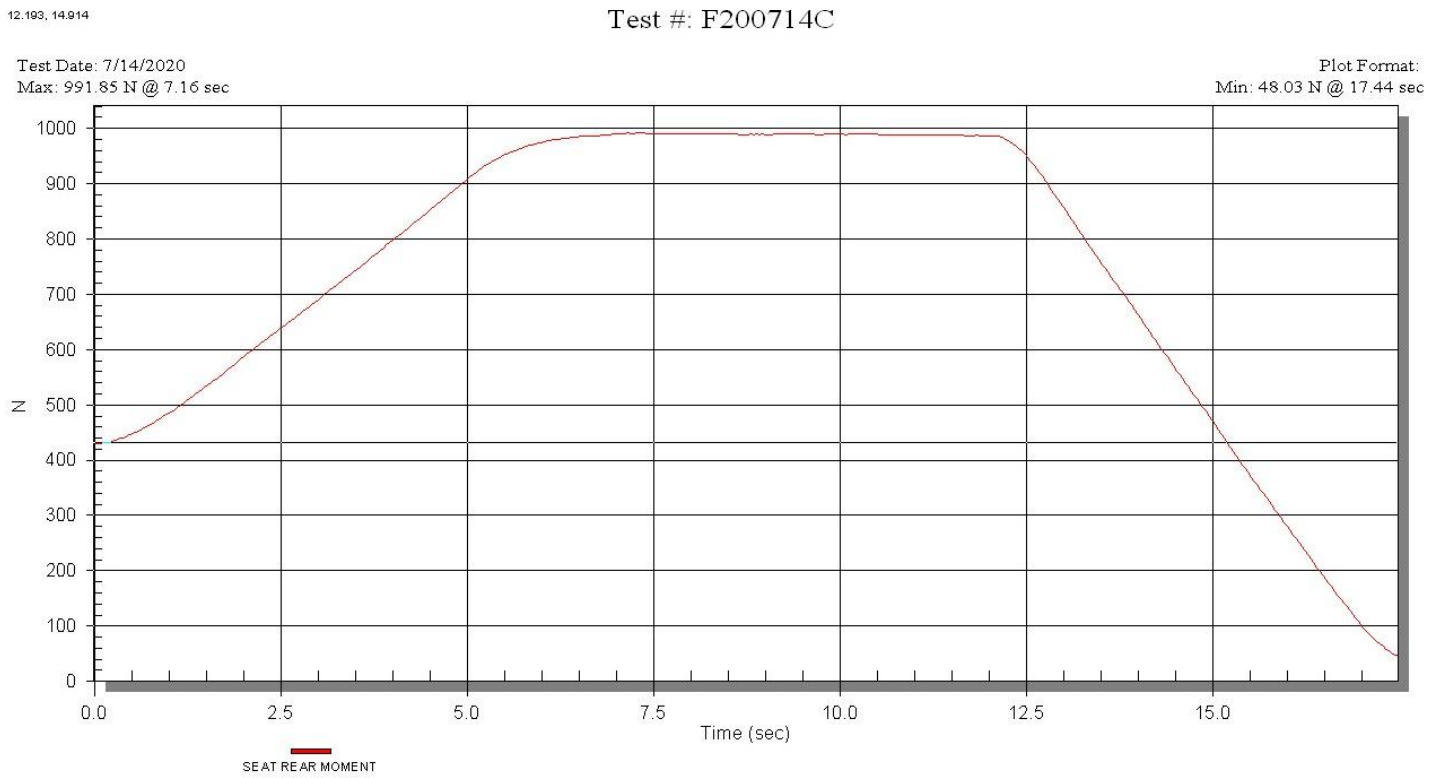
TRC Inc. Test Number F200714 B

Seat Swivel System Rearward 20G Load Test



TRC Inc. Test Number F200714 C

Seat Swivel System Rear Moment Test



TRC Inc. Test Number F200810

Seat Swivel Pull to Failure