REPORT NUMBER: 8708-SLEDNCAP-35

CHILD RESTRAINT SYSTEM IN DYNAMIC SLED TEST BRITAX ADVANTAGE WITH A HYIII 3 YEAR OLD BRITAX ADVANTAGE WITH A CRABI

TEST NUMBER: 08-3-36

PREPARED BY:
VERIDIAN ENGINEERING
4455 GENESEE STREET
BUFFALO, NEW YORK 14225

AUGUST 27TH, 2003

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
400 SEVENTH STREET, SW, ROOM 5311
WASHINGTON, D.C. 20590

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-01-D-32005

Prepared by: _____ Date: _____
David P. Roberts, Project Engineer

Reviewed by: _____ Date: _____
David P. Roberts, Head of Occupant Protection and Safety Research

FINAL REPORT ACCEPTED BY:

_____
Manager, New Car Assessment Program

_____
Date of Acceptance

_____
COTR, NCAP Dynamic Sled Test Program

_____
Date of Acceptance

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Child Restraint Systems in Dynamic Sled Test P3- Britax Advantage with a HYIII 3 year old P4- Britax Advantage with a Crabi		5. Report Date August 27th, 2003 6. Performing Organization Code
7. Author David P. Roberts		8. Performing Organization Report No. 8708-SLEDNCAP-35
9. Performing Organization Name and Address Veridian Engineering 4455 Genesee Street Buffalo, NY 14225		10. Work Unit No. 11. Contract or Grant No. DTNH22-01-D-32005
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration 400 Seventh St , S.W. Washington, DC 20590		13. Type of Report and Period Covered Final Report July 2003 – February 2004 14. Sponsoring Agency Code

15. Supplementary Notes

Reviewed by: _____ Program Manager

Approved by: _____ Head, Occupant Protection & Safety Research Section, Transportation Sciences Center

16. Abstract

This report contains the results of tests performed in accordance with FMVSS 213 Final Rule Published June 24th, 2003 for FMVSS 213 Child Restraint Systems.

Two (2) seats were tested during this run. Position 3 was a Britax Advantage Child Restraint System. This seat was tested with a HYIII 3 year old ATD.

Position 4 was a Britax Advantage Child Restraint System. This seat was tested with a Crabi ATD.

17. Key Words FMVSS 213 Child Restraint Systems Indicant Compliance Testing	18. Distribution Statement		
19. Security Classif. (of this report) UNCLASSIFIED	20. Security Classif. (of this page) UNCLASSIFIED	21. No. of Pages	22. Price

TABLE OF CONTENTS

SECTION 1

PURPOSE AND TEST PROCEDURE

1.1 PURPOSE

This dynamic sled testing is part of the FY' 03 New Car Assessment Program (NCAP) sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract Number DTNH22-01-D-32005. The purpose of this test is to obtain child seat research data for frontal dynamic testing.

1.2 TEST PROCEDURE

This frontal dynamic sled test was conducted in accordance with the child restraint test procedure provided by the FMVSS No. 213 Final Rule published June 24th, 2003. Any reference to FMVSS No. 213 in this document refers to the Final Rule published June 24th, 2003, for FMVSS No. 213 Child Restraint Systems.

The test was conducted at Veridian Engineering on August 27th, 2003 at a speed of 46.6 kph (29.0 mph). The FMVSS No. 213 sled pulse was used as a crash pulse. The requirements specified in the FMVSS No. 213 were also followed.

The bench seat contained two (2) anthropomorphic test devices (ATDs). One (1) Hybrid III 3 Year Old ATD, Serial Number S/N 044, was instrumented with head, chest, and pelvic tri-axial accelerometers. This ATD was also instrumented with upper and lower neck load cells. This dummy was placed in a Britax Advantage child seat and the seat was located in Position 3 – Right Rear Passenger.

One (1) Crabi ATD, Serial Number S/N 102, was instrumented with head, chest, and pelvic tri-axial accelerometers, and upper neck load cells. This dummy was placed in a Britax Advantage child seat and the seat was located in Position 4 – Left Rear Passenger. The ATDs were positioned according to the child seat manufacturer's instructions. The data was digitally sampled at 20,000 samples per second and processed per Section IP11 of the Laboratory Test Procedure.

Post test observations of the seats indicated that the middle belt covers came off both seats.

SECTION 2

CHILD RESTRAINT INFORMATION

Test No.: 08-3-36 Test Date: August 27th, 2003

POSITION 3

Child Restraint Type (forward-facing, rearward facing, booster)	REARWARD FACING
LATCH or NON-LATCH	LATCH
Harness Type	5 POINT
Child Restraint Manufacturer	BRITAX
Child Restraint Model	ADVANTAGE
Model Number	E9L2228
Date of Manufacture	7/09/2003
Child Restraint Height Limits (mm)	482 - 1016
Child Restraint Weight Limits (kg)	2.3 – 18.2
Weight of Child Restraint (kg)	7.9

POSITION 4

Child Restraint Type (forward-facing, rearward facing, booster)	REARWARD FACING
LATCH or NON-LATCH	LATCH
Harness Type	5 POINT
Child Restraint Manufacturer	BRITAX
Child Restraint Model	ADVANTAGE
Model Number	E9L2228
Date of Manufacture	9/04/2002
Child Restraint Height Limits (mm)	482 - 1016
Child Restraint Weight Limits (kg)	2.3 – 18.2
Weight of Child Restraint (kg)	7.9

SECTION 3

POST-TEST OBSERVATIONS

Test No.: 08-3-36 Test Date: August 27th, 2003

POSITION 3

Child Seat	BRITAX ADVANTAGE
Belt Fraying	NONE
Stress Marks	NONE
Cracks	NONE
Buckle Stress	NONE
Latch Hooks	NONE
Max. Seat Rotation (deg.)	51
Velocity (kph)	46.6
Acceleration (G's)	23.4

POSITION 4

Child Seat	BRITAX ADVANTAGE
Belt Fraying	NONE
Stress Marks	NONE
Cracks	NONE
Buckle Stress	NONE
Latch Hooks	NONE
Max. Seat Rotation (deg.)	45
Velocity (kph)	46.6
Acceleration (G's)	23.4

SECTION 4

ATD INJURY CRITERIA AND SENSOR DATA
POSITION 3 – HYIII THREE YEAR OLD

Test No.: 08-3-36 Test Date: August 27th, 2003

HEAD PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	P3 (Right) Rear Passenger			
			Max	Time	Min	Time
Head CG	X	G's	60.1	79.0	-1.8	138.8
Head CG	Y	G's	21.3	82.3	-3.9	65.1
Head CG	Z	G's	34.2	64.7	-9.6	95.4
Head CG Resultant	N/A	G's	63.7	78.9		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	P3 (Right) Rear Passenger			
			Max	Time	Min	Time
Chest CG	X	G's	39.9	84.5	-3.6	222.1
Chest CG	Y	G's	7.3	68.9	-5.6	106.5
Chest CG	Z	G's	30.6	59.1	-5.7	98.2
Chest CG Resultant	N/A	G's	40.2	84.5		

SEAT BELT SENSOR PEAK VALUES

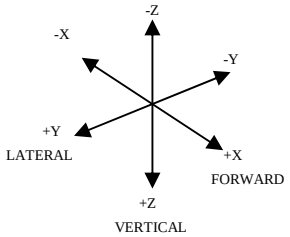
Location	Axis	Units	P3 (Right) Rear Passenger			
			Max	Time	Min	Time
Tether Belt	N/A	Newtons	NA	NA		

HEAD INJURY CRITERIA (HIC)

Location	P3 (Right) Rear Passenger			
	HIC	Avg. G's	T^1	T^2
Head CG Primary (36 msec)	688.5	51.6	62.4	98.4
Head CG Primary (15 msec)	409.9	59.5	72.3	87.4

CHEST CLIP (3 MSEC)

Location	P3 (Right) Rear Passenger		
	Clip	T^1	T^2
Chest CG Primary	38.2	83.6	86.6



ATD INJURY CRITERIA AND SENSOR DATA…(continued)
POSITION 3 - HYIII THREE YEAR OLD

Test No.: 08-3-36 Test Date: August 27th, 2003

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	P3 (Right) Rear Passenger			
			Max	Time	Min	Time
Pelvis	X	G's	42.6	55.0	-8.7	213.7
Pelvis	Y	G's	9.8	71.8	-8.2	94.9
Pelvis	Z	G's	38.1	18.6	-521.7	117.7

UPPER NECK PEAK FORCES AND MOMENTS

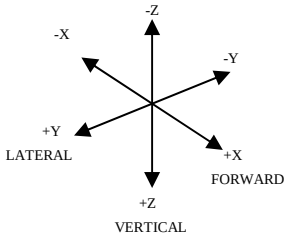
Location	Axis	Units	P3 (Right) Rear Passenger			
			Max	Time	Min	Time
Neck Force	X	Newtons	128.4	99.2	-191.8	64.7
Neck Force	Y	Newtons	197.8	101.5	-52.9	52.2
Neck Force	Z	Newtons	1168.2	67.4	-2.2	-18.5
Neck Moment	X	Nm	8.0	96.2	-5.2	110.4
Neck Moment	Y	Nm	8.0	62.2	-7.8	99.3
Neck Moment	Z	Nm	3.2	170.8	-7.0	102.3

LOWER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	P3 (Right) Rear Passenger			
			Max	Time	Min	Time
Neck Force	X	Newtons	371.3	87.9	-22.2	141.1
Neck Force	Y	Newtons	193.9	100.7	-50.2	51.4
Neck Force	Z	Newtons	1206.0	67.5	-26.0	95.2
Neck Moment	X	Nm	18.8	81.0	-8.3	52.5
Neck Moment	Y	Nm	5.2	197.4	-17.2	87.9
Neck Moment	Z	Nm	6.5	106.6	-3.1	172.4

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	P3 (Right) Rear Passenger			
			Max	Time	Min	Time
Chest CG	X	mm	0.0	-14.4	-12.8	106.6



SECTION 4

ATD INJURY CRITERIA AND SENSOR DATA
POSITION 4 - CRABI

Test No.: 08-3-36 Test Date: August 27th, 2003

HEAD PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	P4 (Left) Rear Passenger			
			Max	Time	Min	Time
Head CG	X	G's	62.3	82.8	-3.1	169.1
Head CG	Y	G's	4.3	79.9	-3.4	64.8
Head CG	Z	G's	32.0	60.9	-25.5	93.3
Head CG Resultant	N/A	G's	62.8	82.8		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	P4 (Left) Rear Passenger			
			Max	Time	Min	Time
Chest CG	X	G's	36.4	89.6	-3.6	134.0
Chest CG	Y	G's	4.1	80.3	-2.1	52.0
Chest CG	Z	G's	24.6	51.0	-16.6	85.3
Chest CG Resultant	N/A	G's	39.4	89.4		

SEAT BELT SENSOR PEAK VALUES

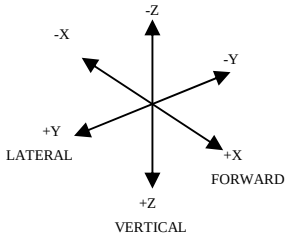
Location	Axis	Units	P4 (Left) Rear Passenger			
			Max	Time	Min	Time
Tether Belt	N/A	Newtons	NA	NA		

HEAD INJURY CRITERIA (HIC)

Location	P4 (Left) Rear Passenger			
	HIC	Avg. G's	T^1	T^2
Head CG Primary (36 msec)	516.6	46.0	59.0	95.0
Head CG Primary (15 msec)	345.0	55.6	76.0	91.0

CHEST CLIP (3 MSEC)

Location	P4 (Left) Rear Passenger		
	Clip	T^1	T^2
Chest CG Primary	38.1	87.9	90.9



ATD INJURY CRITERIA AND SENSOR DATA…(continued)
POSITION 4 - CRABI

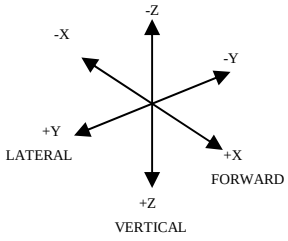
Test No.: 08-3-36 Test Date: August 27th, 2003

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	P4 (Left) Rear Passenger			
			Max	Time	Min	Time
Pelvis	X	G's	4.9	196.1	-34.1	53.8
Pelvis	Y	G's	5.2	51.4	-4.7	61.8
Pelvis	Z	G's	6.0	84.0	-36.5	50.8

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	P4 (Left) Rear Passenger			
			Max	Time	Min	Time
Neck Force	X	Newtons	329.9	56.0	-133.5	89.1
Neck Force	Y	Newtons	44.0	58.6	-67.5	89.8
Neck Force	Z	Newtons	808.2	55.3	-590.0	95.6
Neck Moment	X	Nm	1.7	106.6	-3.0	89.8
Neck Moment	Y	Nm	9.3	92.1	-12.0	55.9
Neck Moment	Z	Nm	0.8	101.0	-0.5	93.6



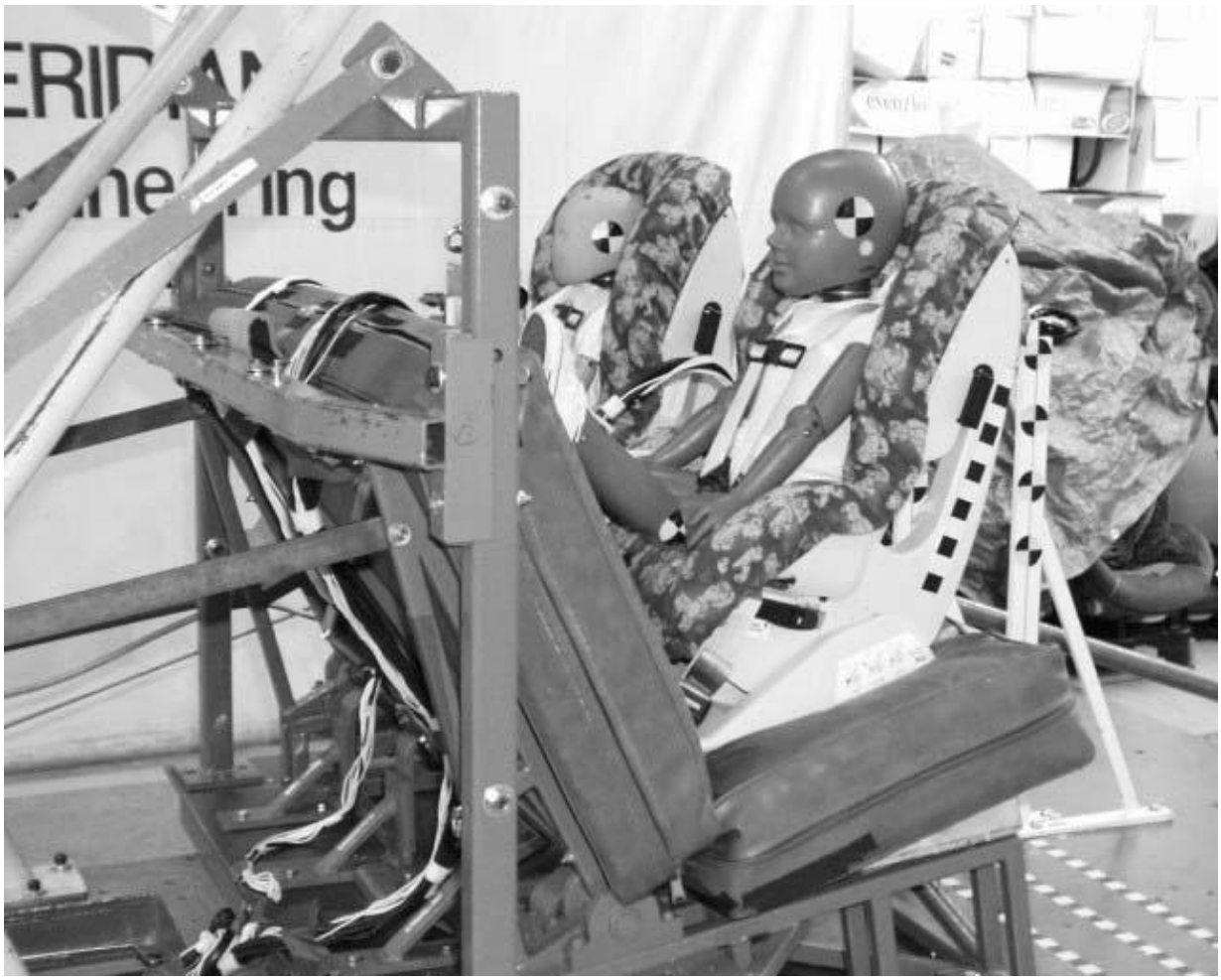
SECTION 5

SLED TEST SET-UP

Test No.: 08-3-36 Test Date: August 27th, 2003

An FMVSS 213 test bench was fastened on the sled in order to simulate a frontal impact. Two child seats were placed on the bench and fastened in a manner suggested in the owner's manual of the child seat. Stadia poles were set up to measure the seat back rotation.

Pre-test Infant and Car Seat Positions



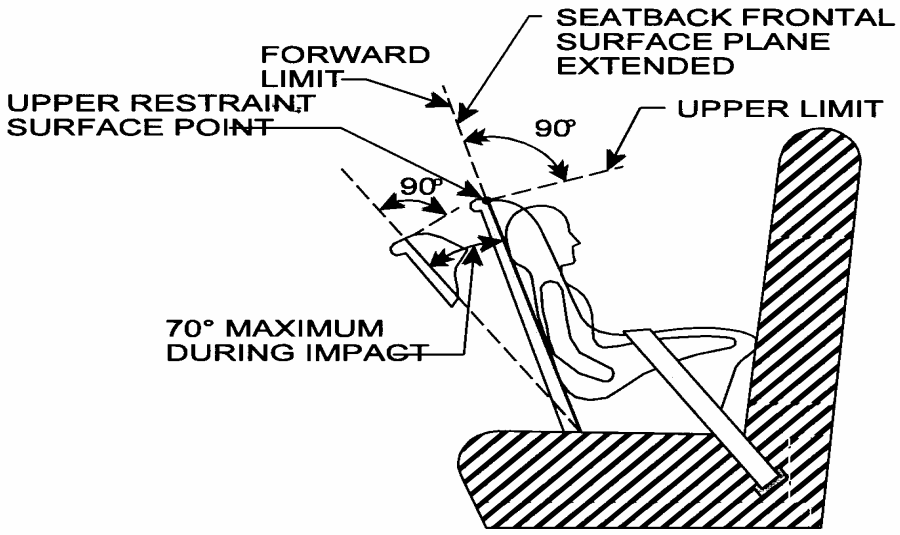
SECTION 6

CAMERA LOCATION

Test No.: 08-3-36 Test Date: August 27th, 2003

There were two cameras mounted onto the sled carriage for views of the left and right side of the child seat.

REAR FACING CHILD RESTRAINT FORWARD AND UPPER HEAD EXCURSION LIMITS



NOTE: Limits illustrated move during dynamic testing

SECTION 7

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Pre Test Right Rear Side View

Post Test Right Rear Side View

Pre Test Right Side View

Post Test Right Side View

Pre Test Left Side View

Post Test Left Side View

Pre Test Left Rear Side View

Post Test Left Rear Side View

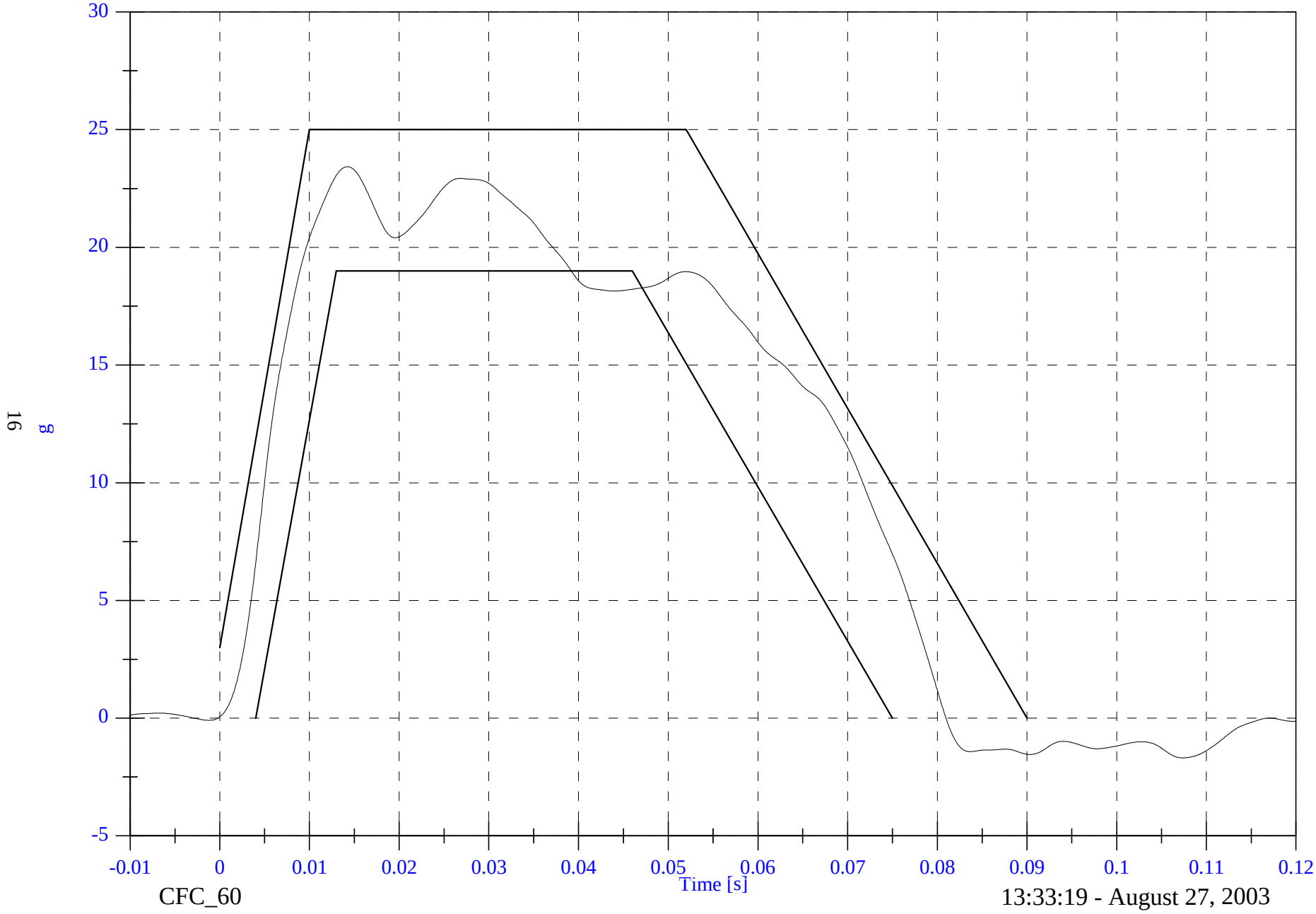
SECTION 8

Data Plots

Sled Test NCAP SLED 08-3-36

Sled Pulse Corridor

Max: 23.4 [g] at 0.014 [s]
Min: -1.7 [g] at 0.107 [s]



16

CFC_60

13:33:19 - August 27, 2003

FACILITY: HYGE SLED DATE: August 27, 2003
TEST#: 08-3-36
TITLE: Sled Test NCAP SLED 08-3-36

CHN	NAME	Unit	Max	msec	Min	msec	Filt	Comment
41	Sled Acceleration	g	23.4	14.2	-1.7	107.3	CFC_60	
42	Sled Acceleration Velocity	kph	46.6	80.9	-0.1	-11.0	CFC_180	
43	Sled Acceleration Displacement	mm	2637.7	250.0	-0.0	-2.0	CFC_180	
44	P3 Head x	g	60.1	79.0	-1.8	138.8	CFC_1000	
45	P3 Head y	g	21.3	82.3	-3.9	65.1	CFC_1000	
46	P3 Head z	g	34.2	64.7	-9.6	95.4	CFC_1000	
47	P3 Head Resultant	g	63.7	78.9	0.0	-4.1	CFC_1000	
48	P3 Upper Neck Fx	N	128.4	99.2	-191.8	64.7	CFC_1000	
49	P3 Upper Neck Fy	N	197.8	101.5	-52.9	52.2	CFC_1000	
50	P3 Upper Neck Fz	N	1168.2	67.4	-2.2	-18.5	CFC_1000	
51	P3 Upper Neck F Resultant	N	1176.5	67.3	0.1	-5.8	CFC_1000	
52	P3 Upper Neck Mx	N-m	8.0	96.2	-5.2	110.4	CFC_600	
53	P3 Upper Neck My	N-m	8.0	62.2	-7.8	99.3	CFC_600	
54	P3 Upper Neck Mz	N-m	3.2	170.8	-7.0	102.3	CFC_600	
55	P3 Upper Neck M Resultant	N-m	12.9	98.7	0.0	-13.4	CFC_600	
56	P3 Lower Neck Fx	N	371.3	87.9	-22.2	141.1	CFC_1000	
57	P3 Lower Neck Fy	N	193.9	100.7	-50.2	51.4	CFC_1000	
58	P3 Lower Neck Fz	N	1206.0	67.5	-26.0	95.2	CFC_1000	
59	P3 Lower Neck F Resultant	N	1235.9	67.6	0.0	-2.7	CFC_1000	
60	P3 Lower Neck Mx	N-m	18.8	81.0	-8.3	52.5	CFC_600	
61	P3 Lower Neck My	N-m	5.2	197.4	-17.2	87.9	CFC_600	
62	P3 Lower Neck Mz	N-m	6.5	106.6	-3.1	172.4	CFC_600	
63	P3 Lower Neck M Resultant	N-m	22.6	81.1	0.0	-10.9	CFC_600	
64	P3 Chest x	g	39.9	84.5	-3.6	222.1	CFC_180	
65	P3 Chest y	g	7.3	68.9	-5.6	106.5	CFC_180	
66	P3 Chest z	g	30.6	59.1	-5.7	98.2	CFC_180	
67	P3 Chest Resultant	g	40.2	84.5	0.0	-13.0	CFC_180	
68	P3 Pelvic x	g	42.6	55.0	-8.7	213.7	CFC_1000	
69	P3 Pelvic y	g	9.8	71.8	-8.2	94.9	CFC_1000	
70	P3 Pelvic z	g	38.1	18.6	-521.7	117.7	CFC_1000	
71	P3 Pelvic Resultant	g	521.7	117.7	0.0	-17.5	CFC_1000	
72	P3 Chest Compression	mm	0.0	-14.4	-12.8	106.6	CFC_600	
73	P3 Head Red z	g	36.1	52.7	-13.3	95.8	CFC_1000	
74	P3 Upper Neck Mocy	N-m	8.0	62.2	-7.8	99.3	CFC_600	

FACILITY: HYGE SLED DATE: August 27, 2003
TEST#: 08-3-36
TITLE: Sled Test NCAP SLED 08-3-36

CHN	NAME	Unit	Max	msec	Min	msec	Filt	Comment
75	P4 Head x	g	62.3	82.8	-3.1	169.1	CFC_1000	
76	P4 Head y	g	4.3	79.9	-3.4	64.8	CFC_1000	
77	P4 Head z	g	32.0	60.9	-25.5	93.3	CFC_1000	
78	P4 Head Resultant	g	62.8	82.8	0.0	-14.6	CFC_1000	
79	P4 Upper Neck Fx	N	329.9	56.0	-133.5	89.1	CFC_1000	
80	P4 Upper Neck Fy	N	44.0	58.6	-67.5	89.8	CFC_1000	
81	P4 Upper Neck Fz	N	808.2	55.3	-590.0	95.6	CFC_1000	
82	P4 Upper Neck F Resultant	N	872.3	55.3	0.0	-10.3	CFC_1000	
83	P4 Upper Neck Mx	N-m	1.7	106.6	-3.0	89.8	CFC_600	
84	P4 Upper Neck My	N-m	9.3	92.1	-12.0	55.9	CFC_600	
85	P4 Upper Neck Mz	N-m	0.8	101.0	-0.5	93.6	CFC_600	
86	P4 Upper Neck M Resultant	N-m	12.1	55.9	0.0	1.4	CFC_600	
87	P4 Chest x	g	36.4	89.6	-3.6	134.0	CFC_180	
88	P4 Chest y	g	4.1	80.3	-2.1	52.0	CFC_180	
89	P4 Chest z	g	24.6	51.0	-16.6	85.3	CFC_180	
90	P4 Chest Resultant	g	39.4	89.4	0.0	-11.5	CFC_180	
91	P4 Pelvic x	g	4.9	196.1	-34.1	53.8	CFC_1000	
92	P4 Pelvic y	g	5.2	51.4	-4.7	61.8	CFC_1000	
93	P4 Pelvic z	g	6.0	84.0	-36.5	50.8	CFC_1000	
94	P4 Pelvic Resultant	g	49.0	52.7	0.0	-13.2	CFC_1000	
95	P4 Upper Neck Mocy	N-m	9.9	91.8	-13.9	55.9	CFC_600	

```
FACILITY: HYGE SLED                          DATE: August 27, 2003
TEST#: 08-3-36
TITLE: Sled Test NCAP SLED 08-3-36
Version 5.00
========================
P3 HIC(36 ms): 688.5
    t1: 62.4 msec
    t2: 98.4 msec
    Duration: 36.0 msec
    Average Acceleration: 51.6 g
    Input channels: P3 Head x (2) CFC_1000
                    P3 Head y (3) CFC_1000
                    P3 Head z (4) CFC_1000

P3 UP NECK Fx:  Max:    128.4 N  99.2 msec
                Min:   -191.8 N  64.7 msec
    Input channel: P3 Upper Neck Fx (6) CFC_1000

P3 UP NECK Fz:  Max:   1168.2 N  67.4 msec
                Min:     -2.2 N -18.5 msec
    Input channel: P3 Upper Neck Fz (8) CFC_1000

P3 UP NECK Mocy (3YO Child)
                Max:      8.0 N-m  62.2 msec
                Min:     -7.8 N-m  99.3 msec
    Input channels: P3 Upper Neck Fx (6) CFC_600
                    P3 Upper Neck My (10) CFC_600
              Docy: 0

P3 UP NECK Nij (3YO Child)
                Ntf:  0.57 Nij  65.6 msec    CVt: 2340 CVf: 68
                Nte:  0.30 Nij  98.2 msec    CVt: 2340 CVe: 30
                Ncf:  0.00 Nij -18.5 msec    CVc: 2120 CVf: 68
                Nce:  0.00 Nij  -0.9 msec    CVc: 2120 CVe: 30
    Input channels: P3 Upper Neck Fz (8) CFC_600
                    P3 Upper Neck Mocy [N-m, CFC_600] (85)
```

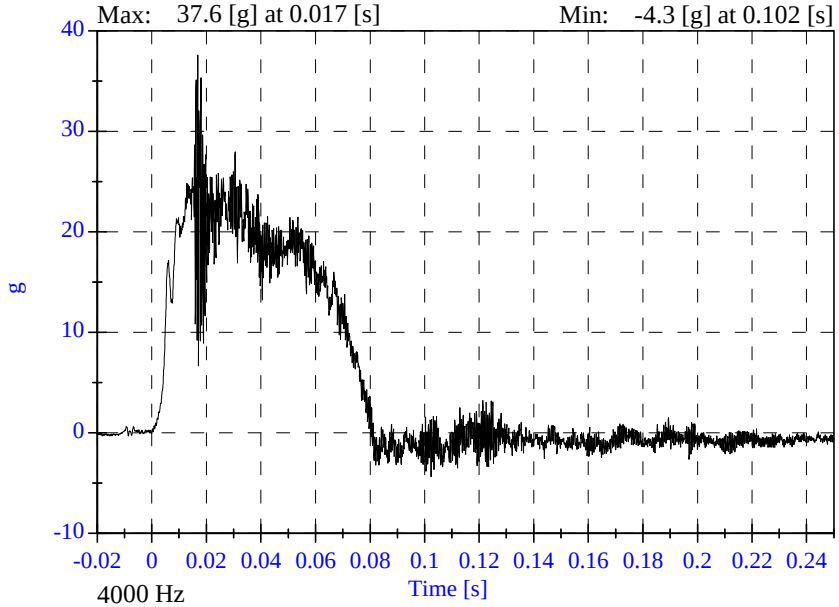
```
FACILITY: HYGE SLED                          DATE: August 27, 2003
TEST#: 08-3-36
TITLE: Sled Test NCAP SLED 08-3-36
Version 5.00
=========================
P3 CLIP(3 ms): 38.2 g
    t1: 83.6 msec
    t2: 86.6 msec
    Duration: 3.0 msec
P3 CSI: 366.0
    Input channels: P3 Chest x (18) CFC_180
                    P3 Chest y (19) CFC_180
                    P3 Chest z (20) CFC_180

P3 CHEST DISP:  Max:      0.0 mm -14.4 msec
                Min:    -12.8 mm 106.6 msec
    Input channel: P3 Chest Compression (21) CFC_600
=========================
P3 HIC(15 ms): 409.9
    t1: 72.3 msec
    t2: 87.4 msec
    Duration: 15.0 msec
    Average Acceleration: 59.5 g
    Input channels: P3 Head x (2) CFC_1000
                    P3 Head y (3) CFC_1000
                    P3 Head z (4) CFC_1000
=========================
```

```
FACILITY: HYGE SLED                          DATE: August 27, 2003
TEST#: 08-3-36
TITLE: Sled Test NCAP SLED 08-3-36
Version 5.00
=========================
P4 HIC(36 ms): 516.6
    t1: 59.0 msec
    t2: 95.0 msec
    Duration: 36.0 msec
    Average Acceleration: 46.0 g
    Input channels: P4 Head x (25) CFC_1000
                    P4 Head y (26) CFC_1000
                    P4 Head z (27) CFC_1000

P4 UP NECK Fx:  Max:    329.9 N  56.0 msec
                Min:   -133.5 N  89.1 msec
    Input channel: P4 Upper Neck Fx (28) CFC_1000

P4 UP NECK Fz:  Max:    808.2 N  55.3 msec
                Min:   -590.0 N  95.6 msec
    Input channel: P4 Upper Neck Fz (30) CFC_1000

P4 UP NECK Mocy (1YO Infant OOP)
                Max:      9.9 N-m  91.8 msec
                Min:    -13.9 N-m  55.9 msec
    Input channels: P4 Upper Neck Fx (28) CFC_600
                    P4 Upper Neck My (32) CFC_600
              Docy: 0.0058

P4 UP NECK Nij (1YO Infant OOP)
                Ntf:  0.19 Nij  81.3 msec    CVt: 1460 CVf: 43
                Nte:  1.37 Nij  55.9 msec    CVt: 1460 CVe: 17
                Ncf:  0.61 Nij  94.5 msec    CVc: 1460 CVf: 43
                Nce:  0.13 Nij 110.7 msec    CVc: 1460 CVe: 17
    Input channels: P4 Upper Neck Fz (30) CFC_600
                    P4 Upper Neck Mocy [N-m, CFC_600] (91)
```

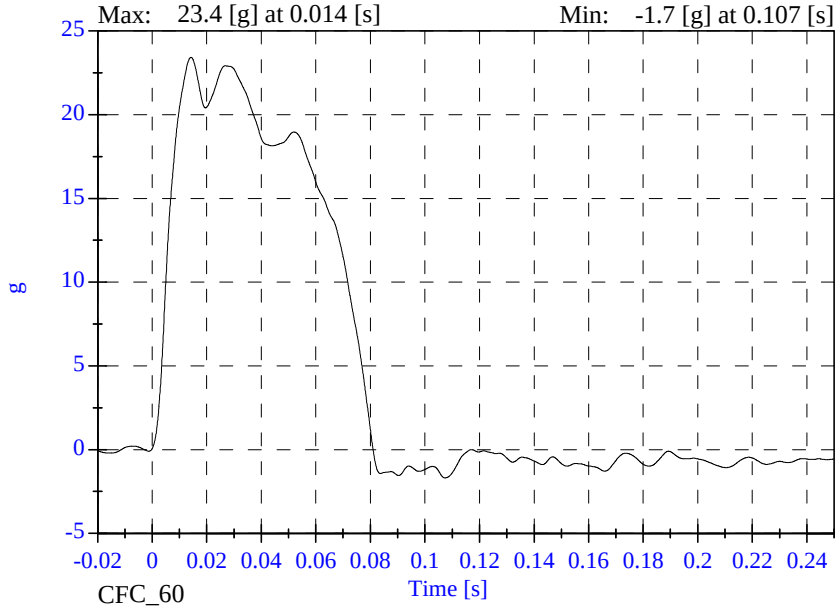
```
FACILITY: HYGE SLED                          DATE: August 27, 2003
TEST#: 08-3-36
TITLE: Sled Test NCAP SLED 08-3-36
Version 5.00
=========================
P4 CLIP(3 ms): 38.1 g
    t1: 87.9 msec
    t2: 90.9 msec
    Duration: 3.0 msec
P4 CSI: 388.0
    Input channels: P4 Chest x (34) CFC_180
                    P4 Chest y (35) CFC_180
                    P4 Chest z (36) CFC_180
=========================
P4 HIC(15 ms): 345.0
    t1: 76.0 msec
    t2: 91.0 msec
    Duration: 15.0 msec
    Average Acceleration: 55.6 g
    Input channels: P4 Head x (25) CFC_1000
                    P4 Head y (26) CFC_1000
                    P4 Head z (27) CFC_1000
=========================
```

Sled Test NCAP SLED 08-3-36 - August 27, 2003

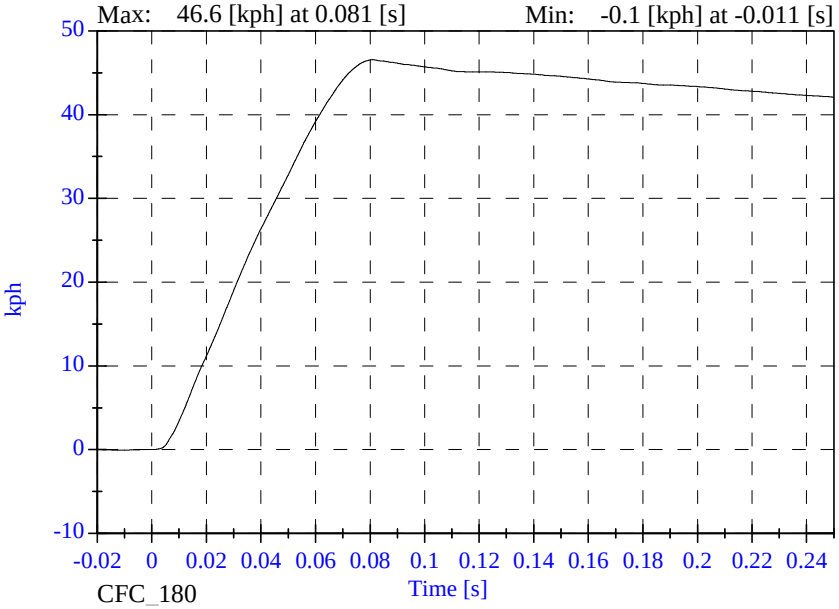
Sled Acceleration



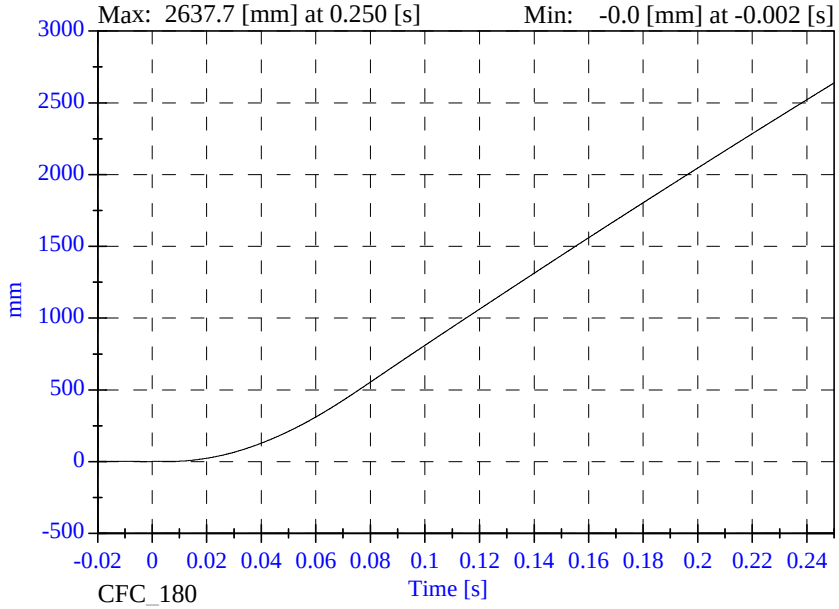
Sled Acceleration



Sled Acceleration Velocity

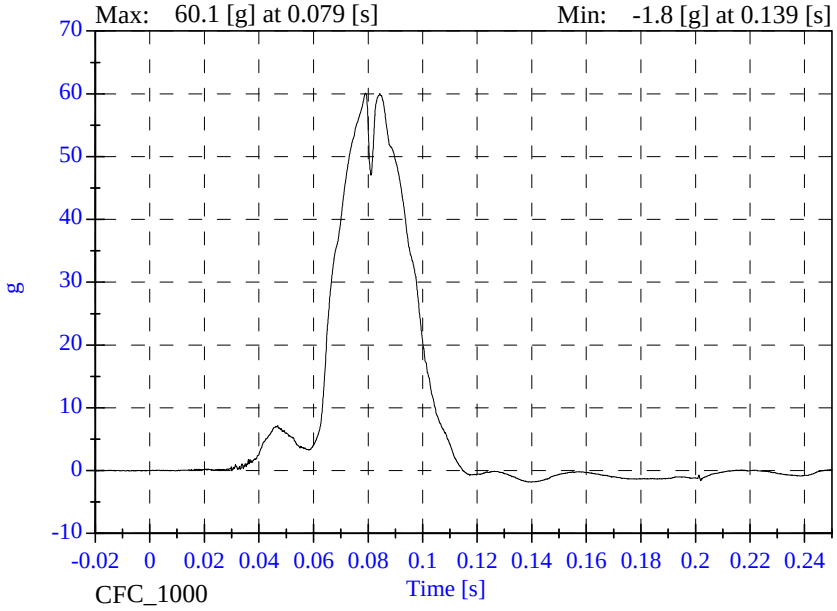


Sled Acceleration Displacement

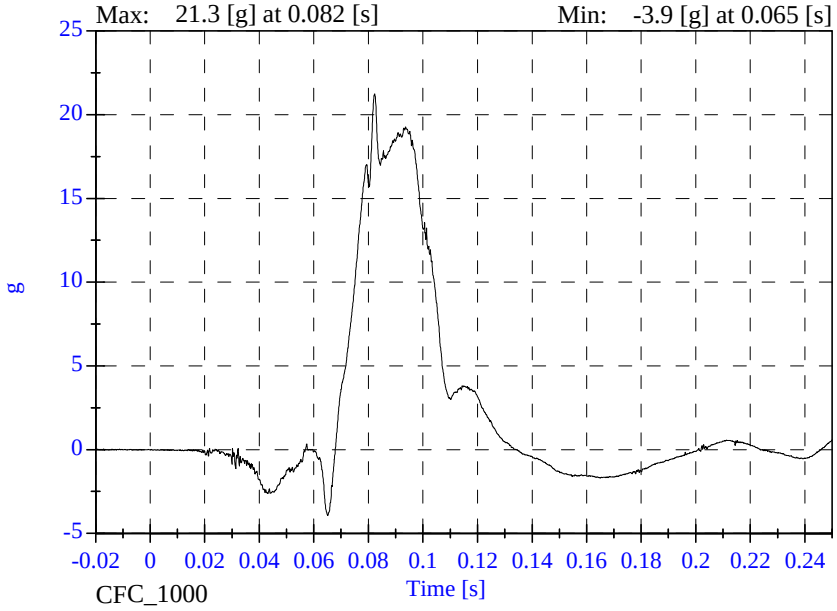


Sled Test NCAP SLED 08-3-36 - August 27, 2003

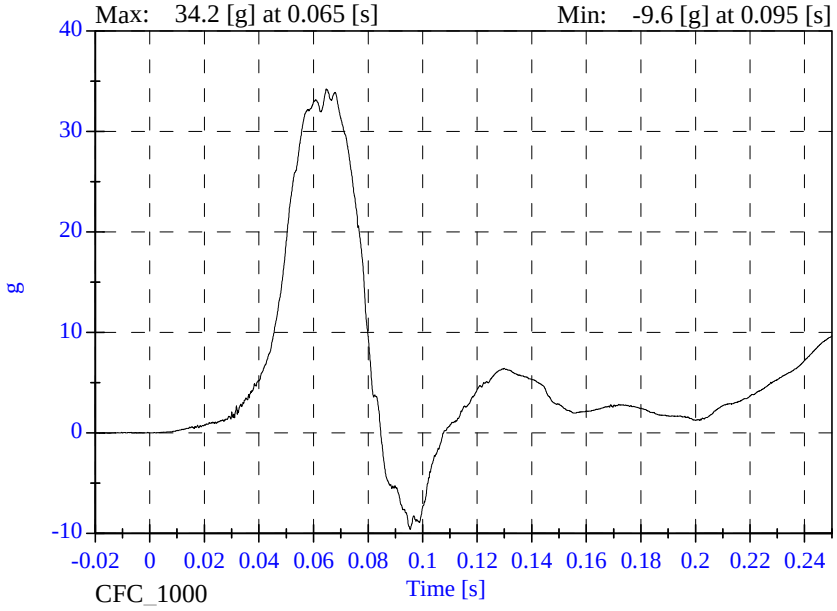
P3 Head x



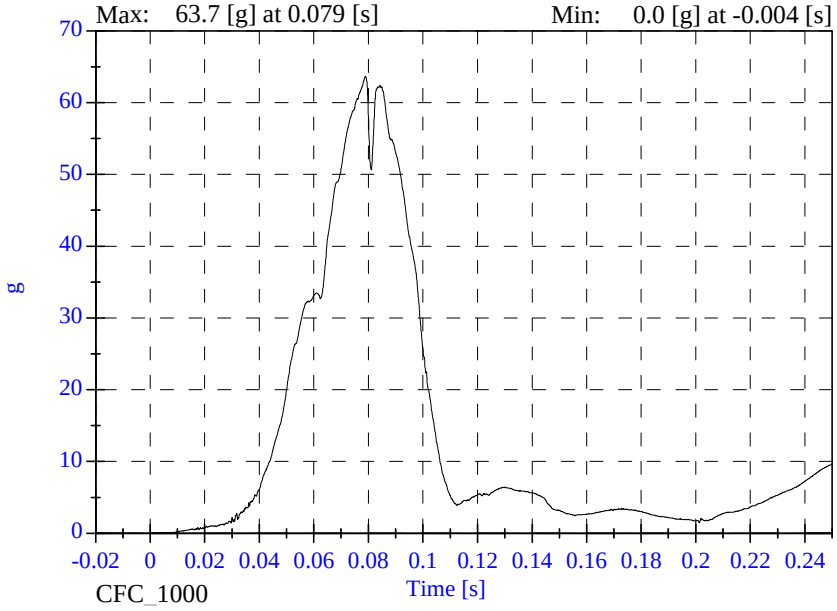
P3 Head y



P3 Head z

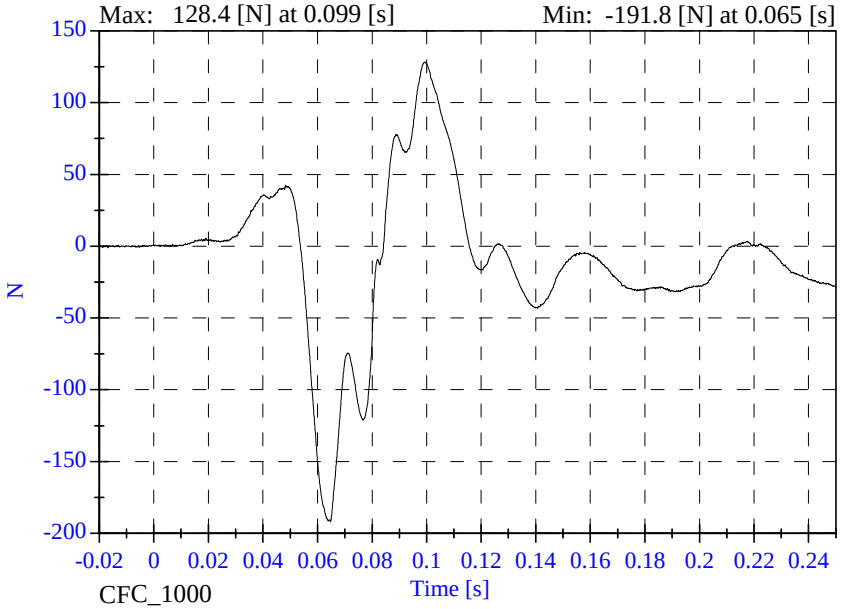


P3 Head Resultant

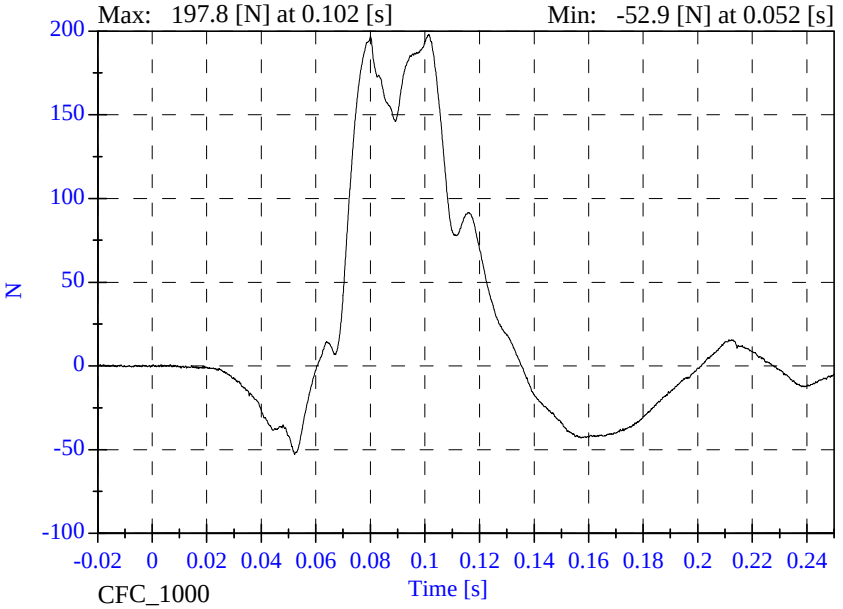


Sled Test NCAP SLED 08-3-36 - August 27, 2003

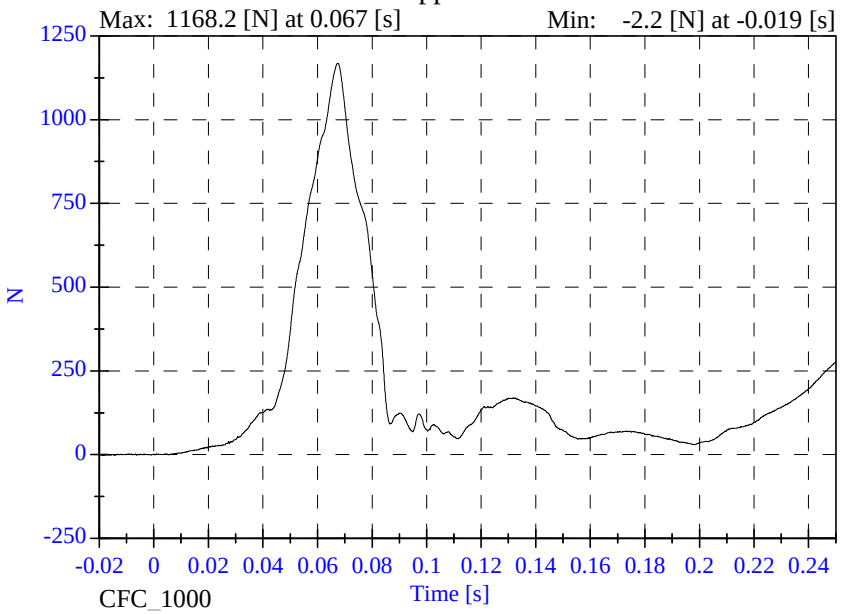
P3 Upper Neck Fx



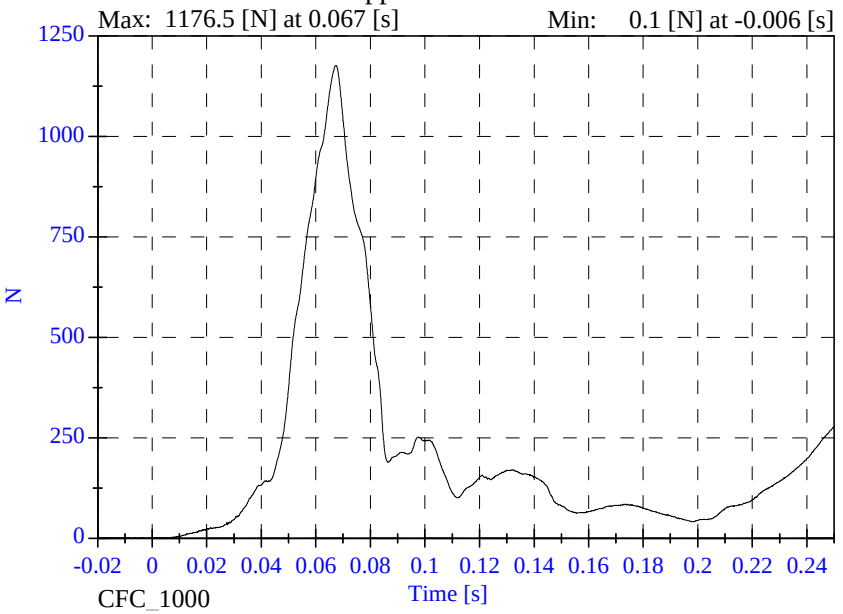
P3 Upper Neck Fy



P3 Upper Neck Fz



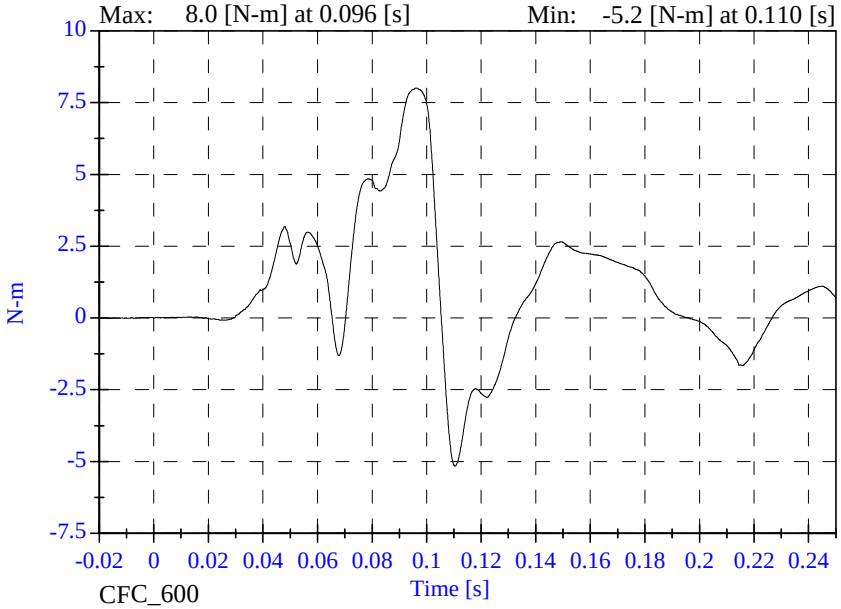
P3 Upper Neck F Resultant



Sled Test NCAP SLED 08-3-36 - August 27, 2003

P3 Upper Neck Mx

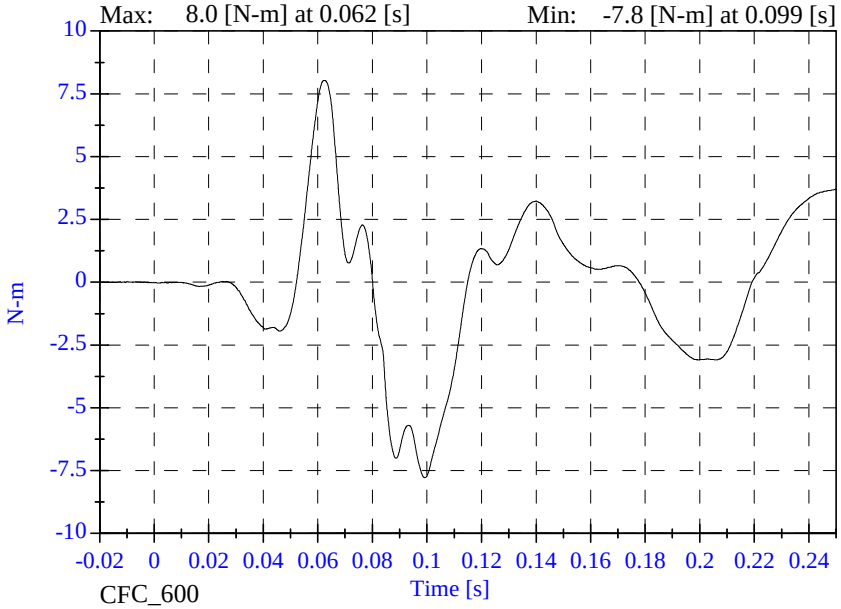
Max: 8.0 [N-m] at 0.096 [s] Min: -5.2 [N-m] at 0.110 [s]



CFC_600

P3 Upper Neck My

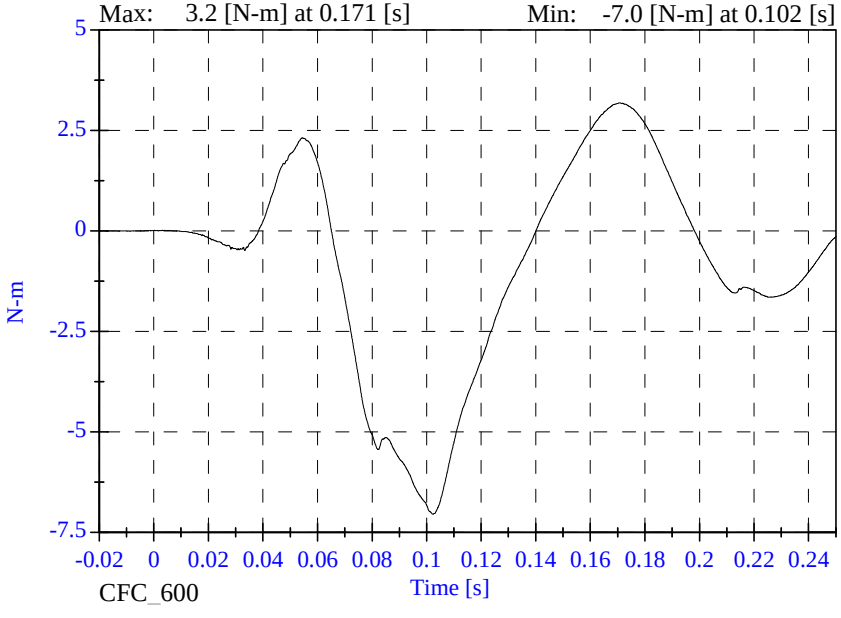
Max: 8.0 [N-m] at 0.062 [s] Min: -7.8 [N-m] at 0.099 [s]



CFC_600

P3 Upper Neck Mz

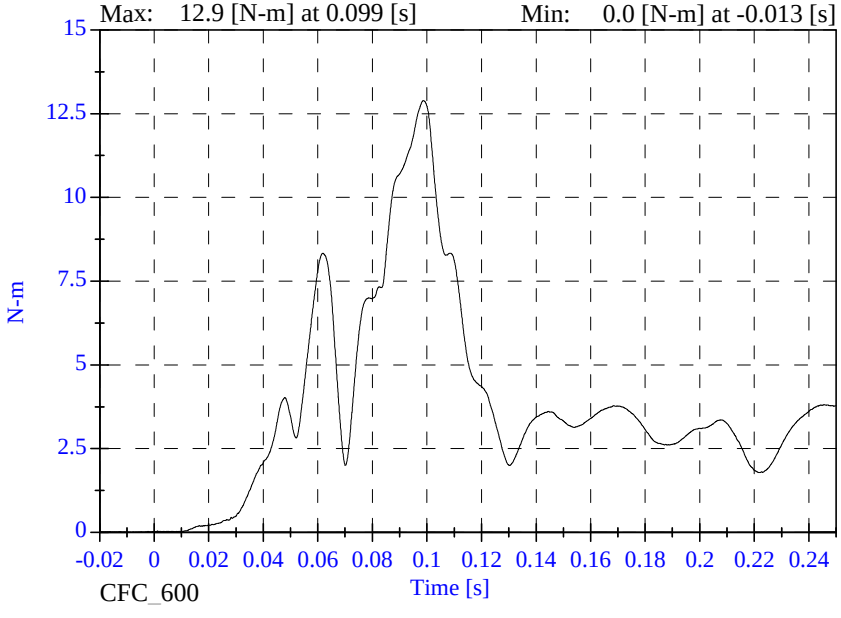
Max: 3.2 [N-m] at 0.171 [s] Min: -7.0 [N-m] at 0.102 [s]



CFC_600

P3 Upper Neck M Resultant

Max: 12.9 [N-m] at 0.099 [s] Min: 0.0 [N-m] at -0.013 [s]

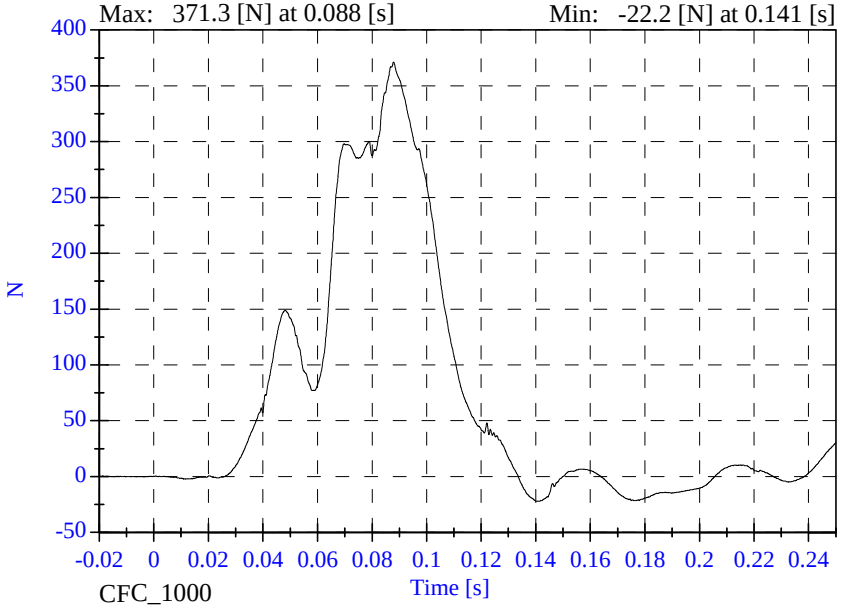


CFC_600

Sled Test NCAP SLED 08-3-36 - August 27, 2003

P3 Lower Neck Fx

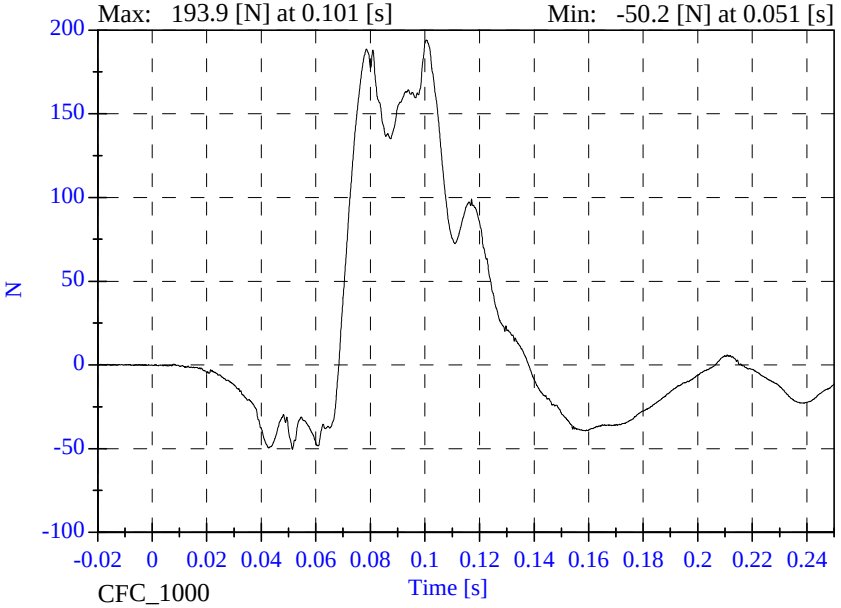
Max: 371.3 [N] at 0.088 [s] Min: -22.2 [N] at 0.141 [s]



CFC_1000

P3 Lower Neck Fy

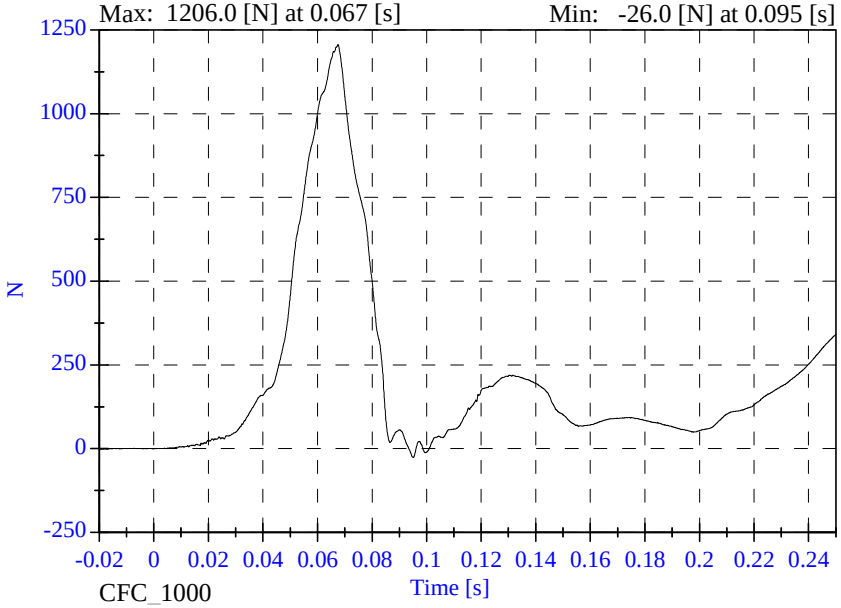
Max: 193.9 [N] at 0.101 [s] Min: -50.2 [N] at 0.051 [s]



CFC_1000

P3 Lower Neck Fz

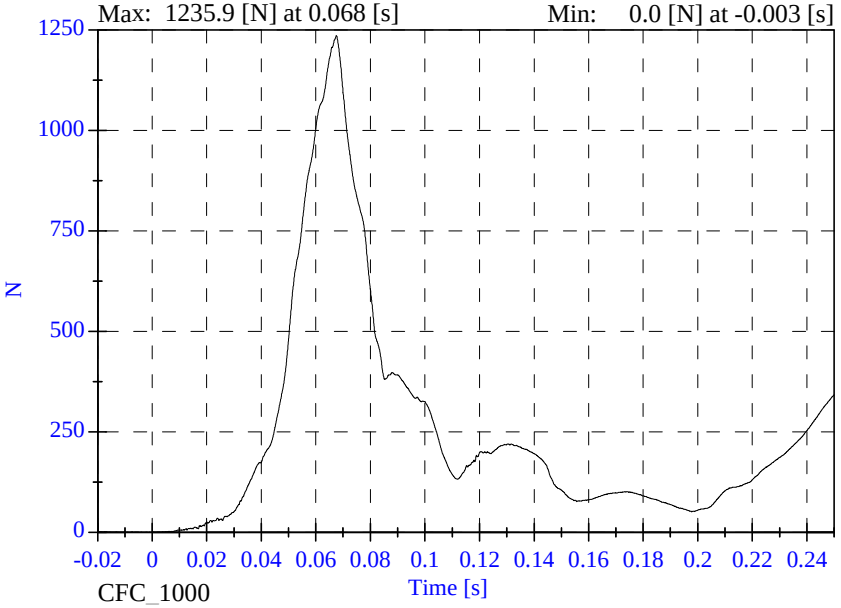
Max: 1206.0 [N] at 0.067 [s] Min: -26.0 [N] at 0.095 [s]



CFC_1000

P3 Lower Neck F Resultant

Max: 1235.9 [N] at 0.068 [s] Min: 0.0 [N] at -0.003 [s]

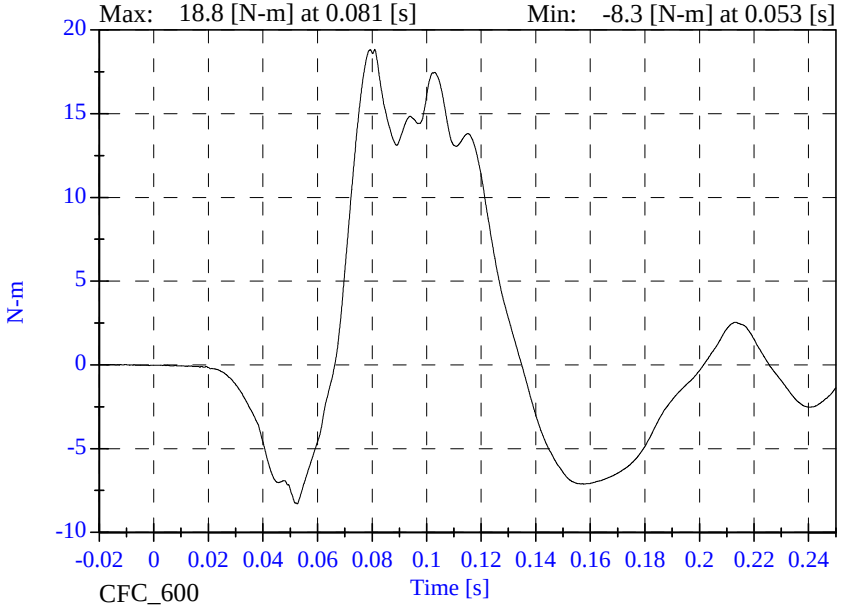


CFC_1000

Sled Test NCAP SLED 08-3-36 - August 27, 2003

P3 Lower Neck Mx

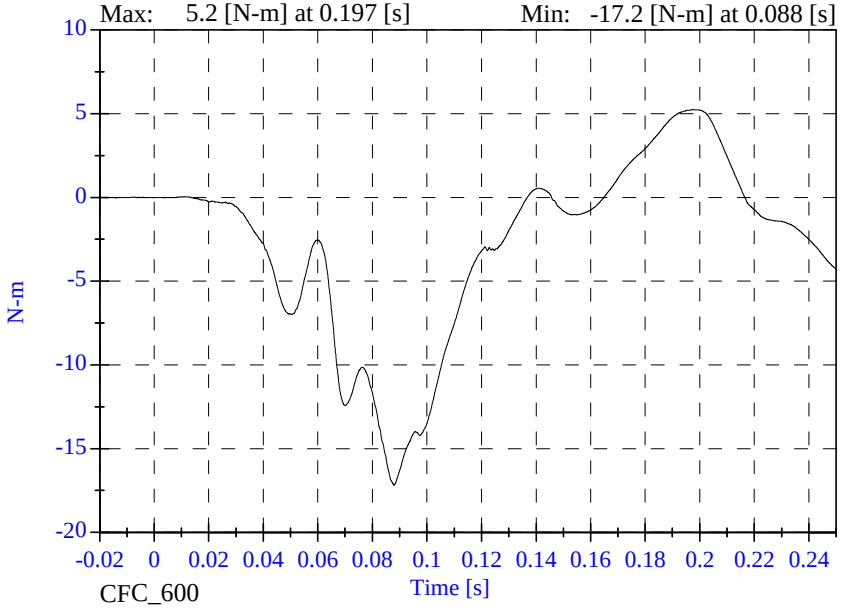
Max: 18.8 [N-m] at 0.081 [s] Min: -8.3 [N-m] at 0.053 [s]



CFC_600

P3 Lower Neck My

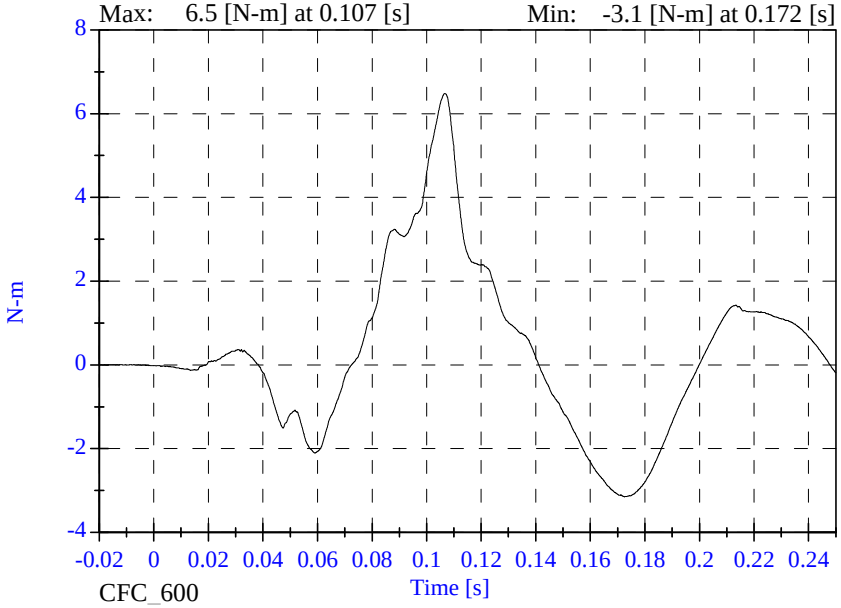
Max: 5.2 [N-m] at 0.197 [s] Min: -17.2 [N-m] at 0.088 [s]



CFC_600

P3 Lower Neck Mz

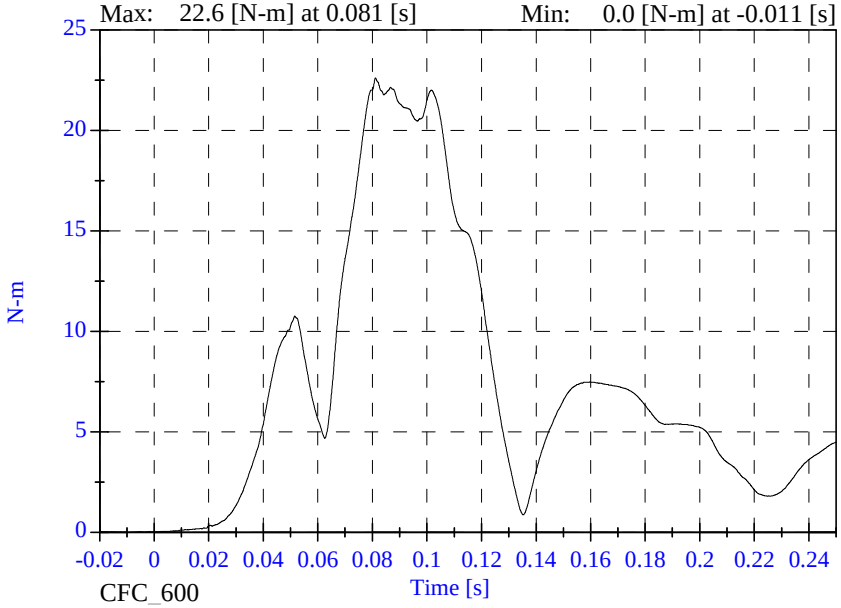
Max: 6.5 [N-m] at 0.107 [s] Min: -3.1 [N-m] at 0.172 [s]



CFC_600

P3 Lower Neck M Resultant

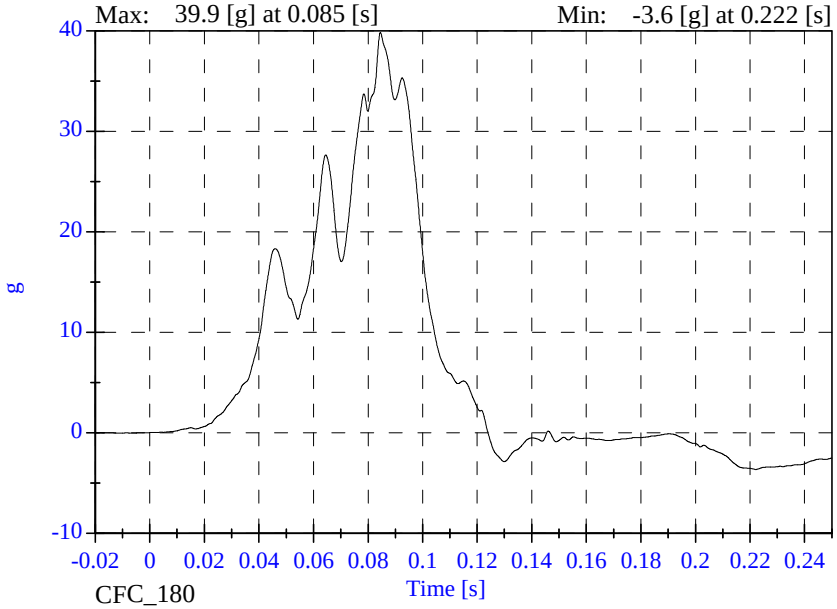
Max: 22.6 [N-m] at 0.081 [s] Min: 0.0 [N-m] at -0.011 [s]



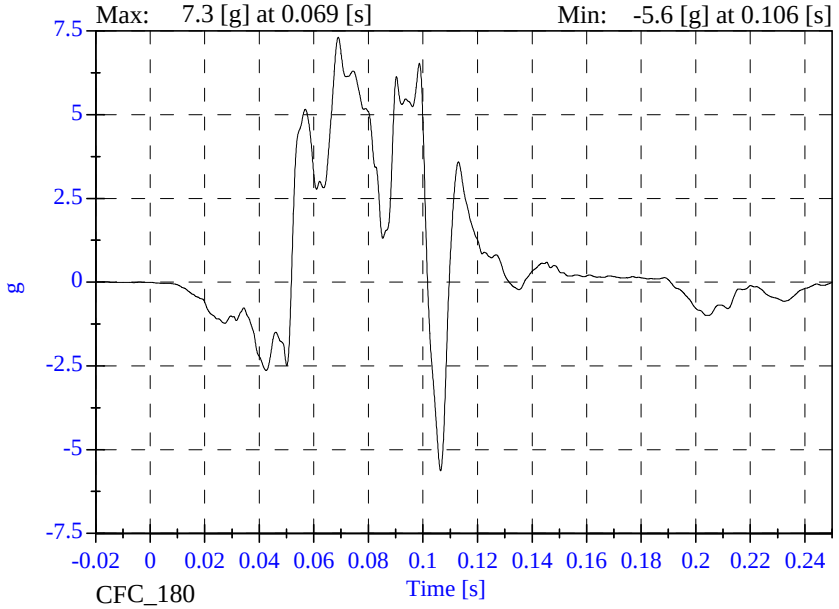
CFC_600

Sled Test NCAP SLED 08-3-36 - August 27, 2003

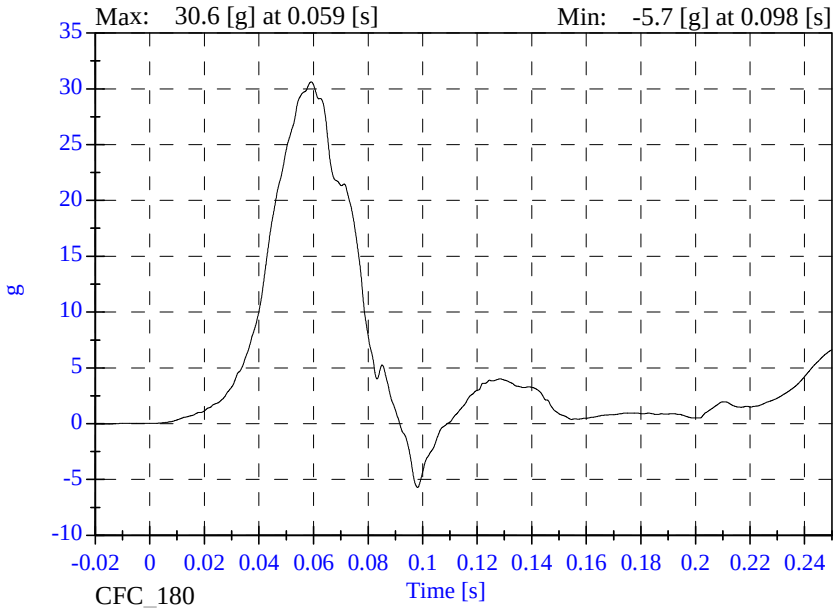
P3 Chest x



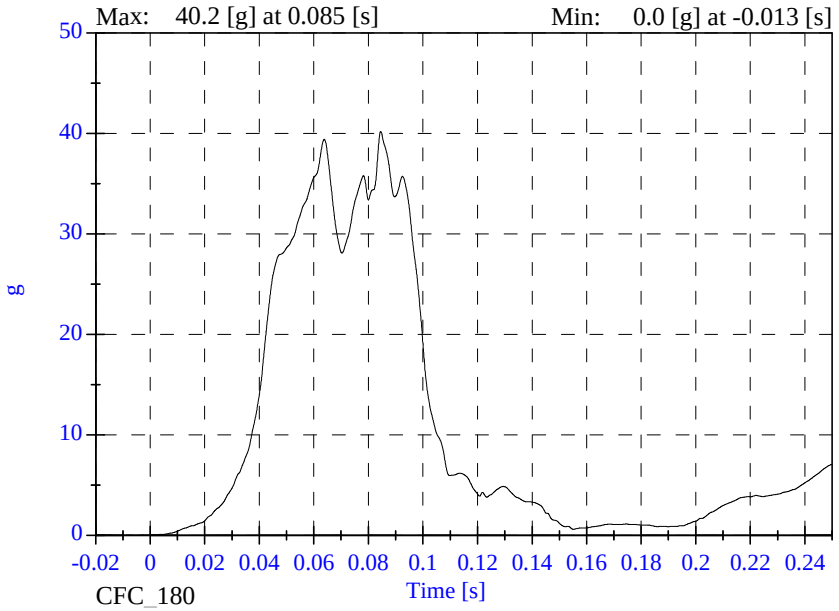
P3 Chest y



P3 Chest z

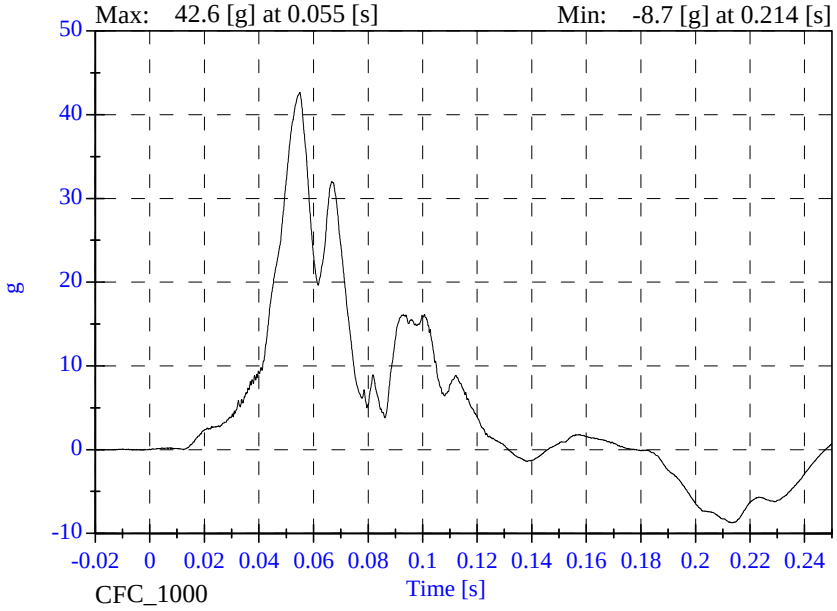


P3 Chest Resultant

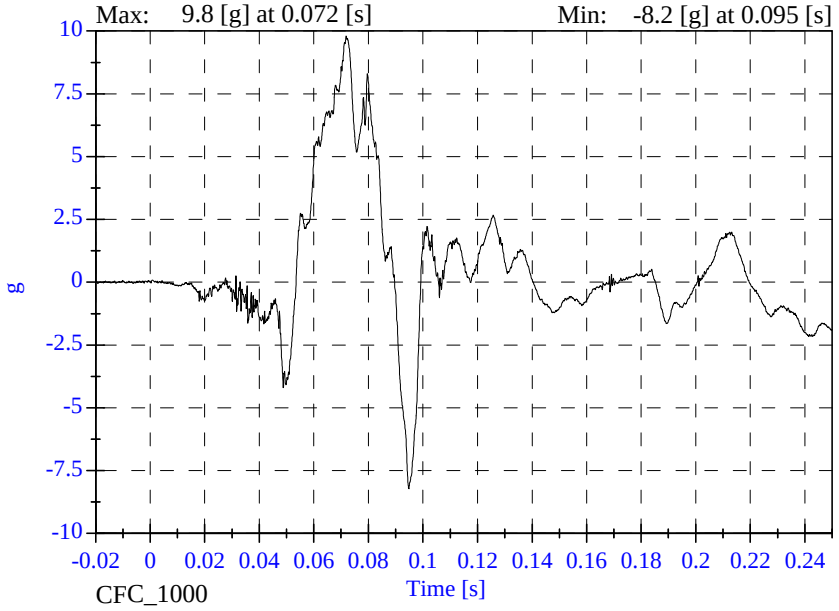


Sled Test NCAP SLED 08-3-36 - August 27, 2003

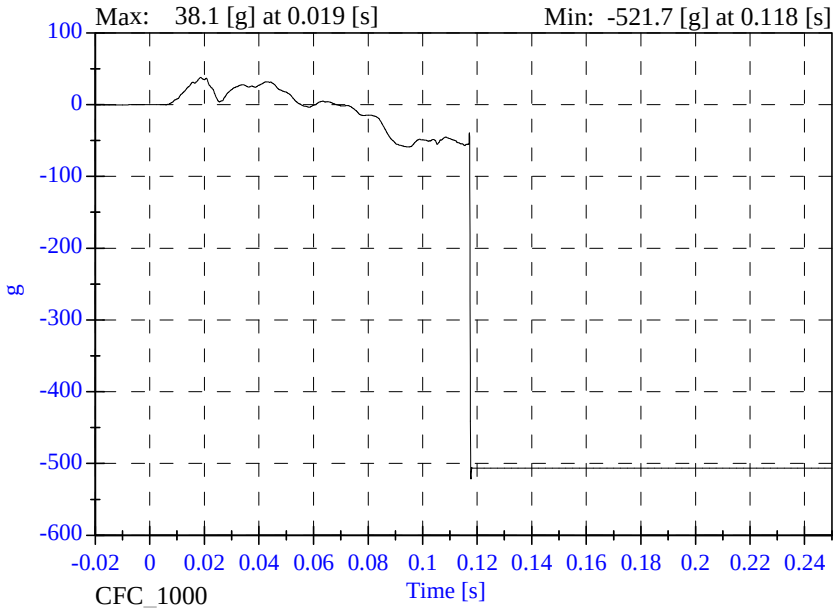
P3 Pelvic x



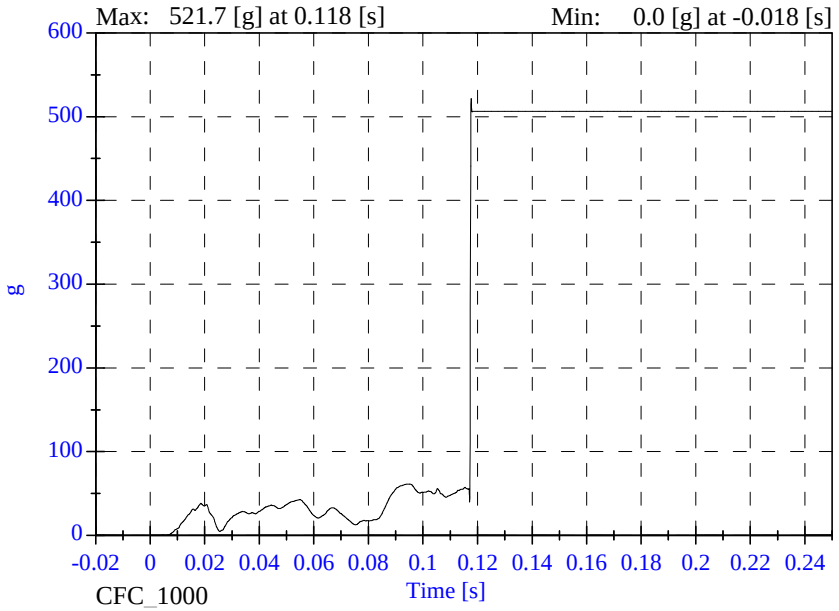
P3 Pelvic y



P3 Pelvic z

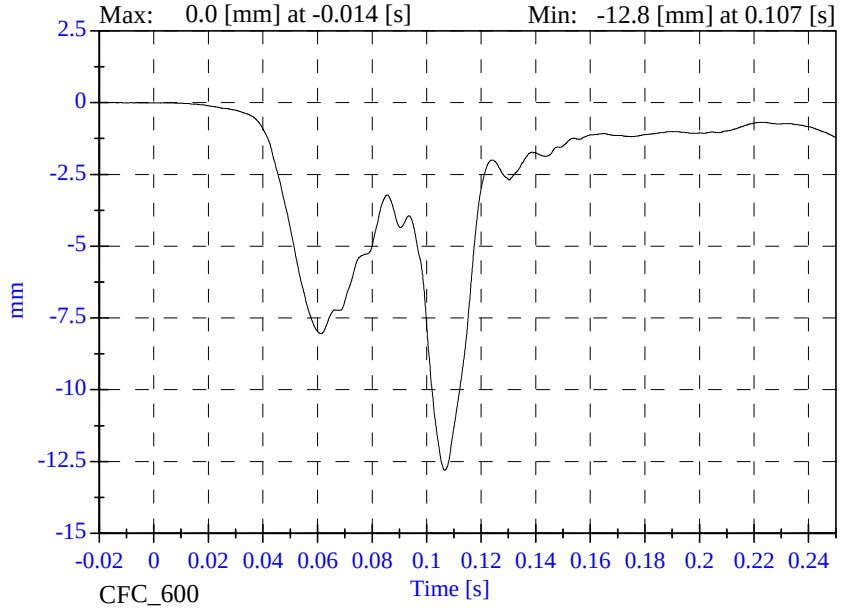


P3 Pelvic Resultant

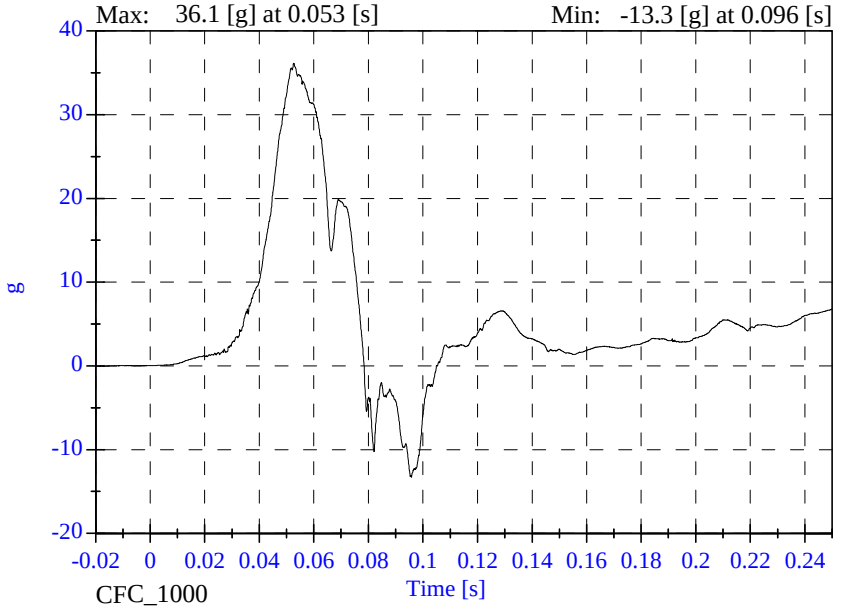


Sled Test NCAP SLED 08-3-36 - August 27, 2003

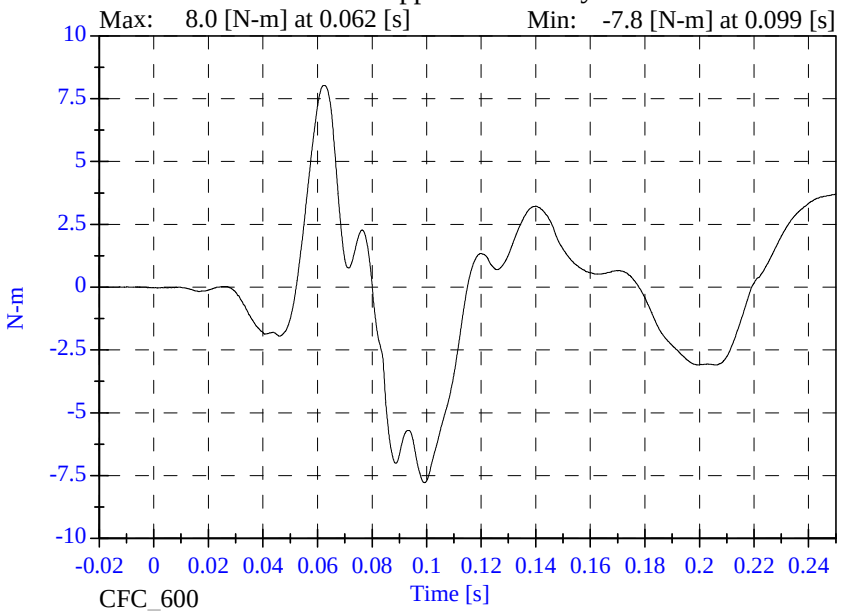
P3 Chest Compression



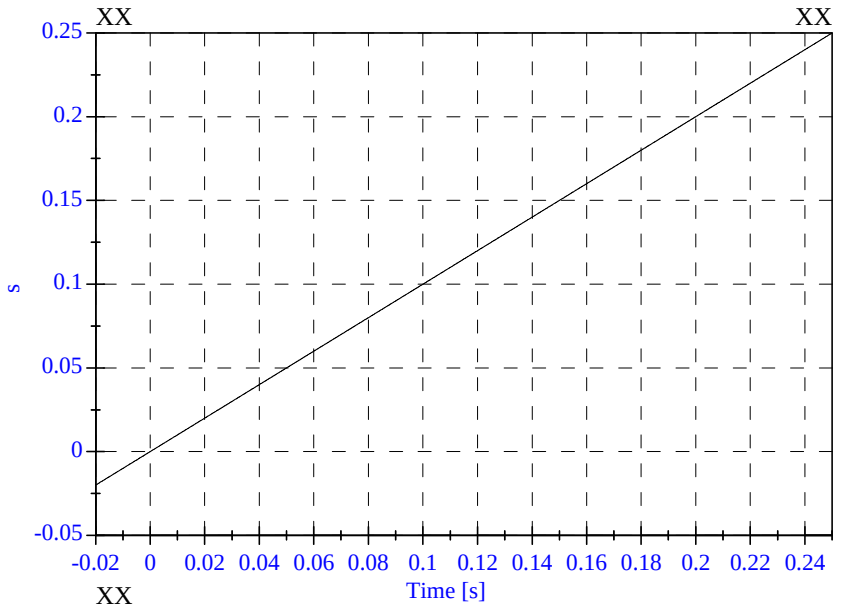
P3 Head Red z



P3 Upper Neck Mocy

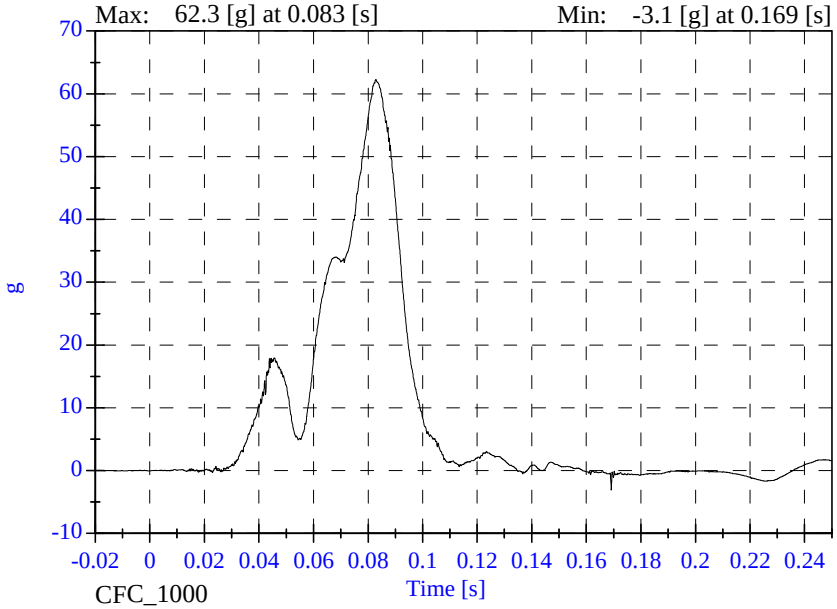


BLANK

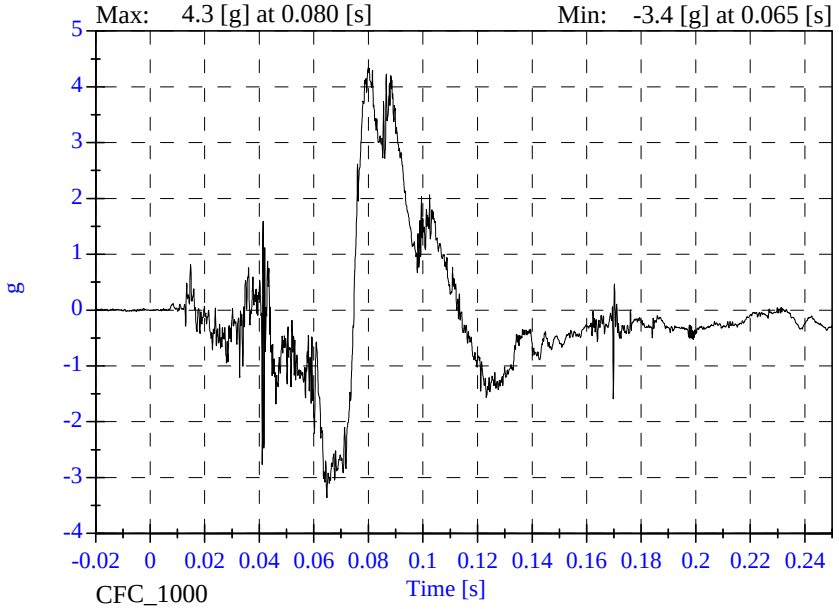


Sled Test NCAP SLED 08-3-36 - August 27, 2003

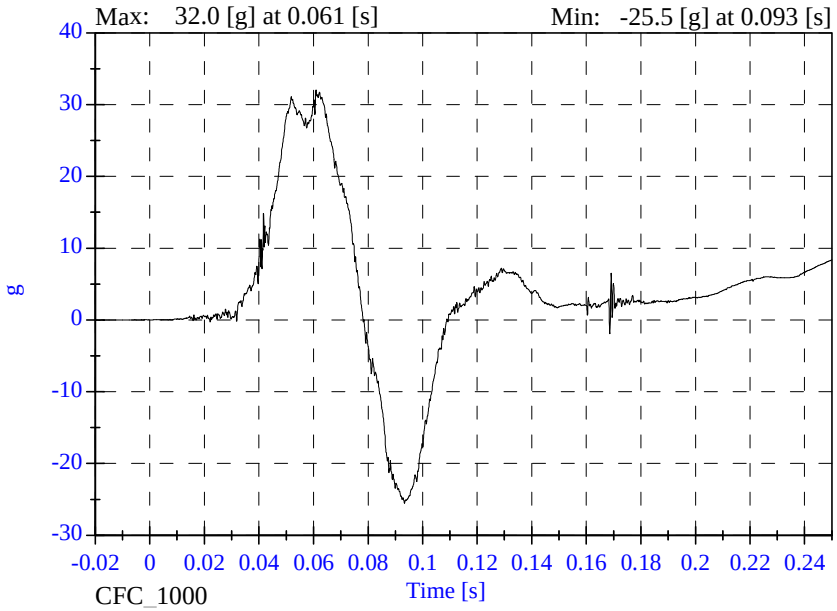
P4 Head x



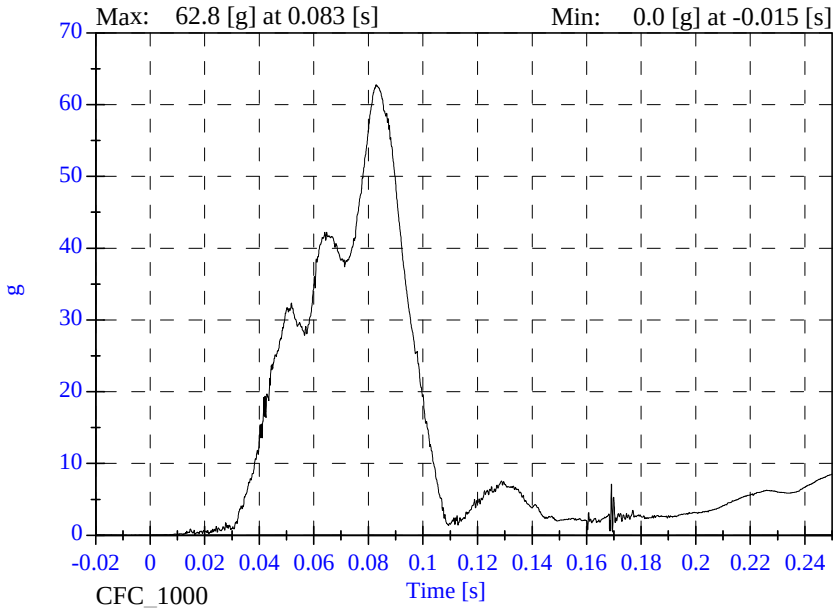
P4 Head y



P4 Head z

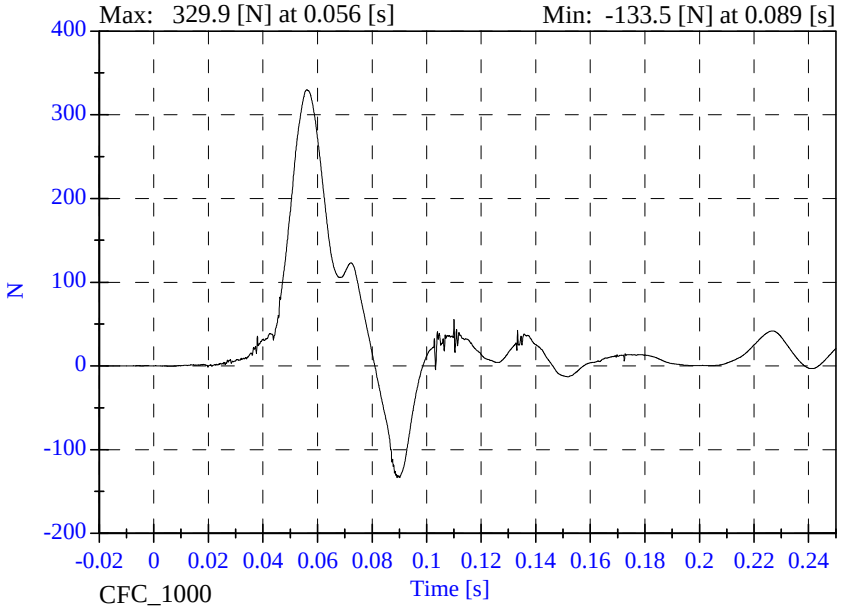


P4 Head Resultant

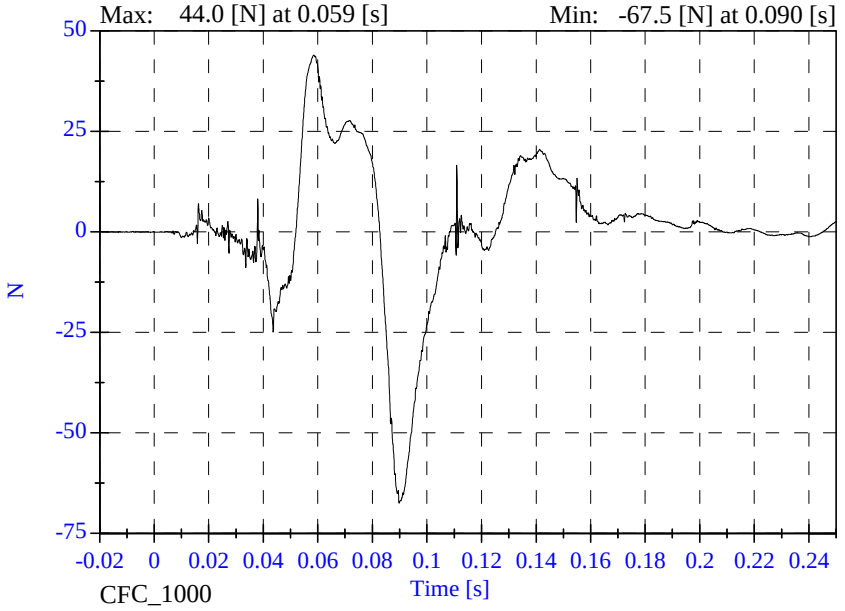


Sled Test NCAP SLED 08-3-36 - August 27, 2003

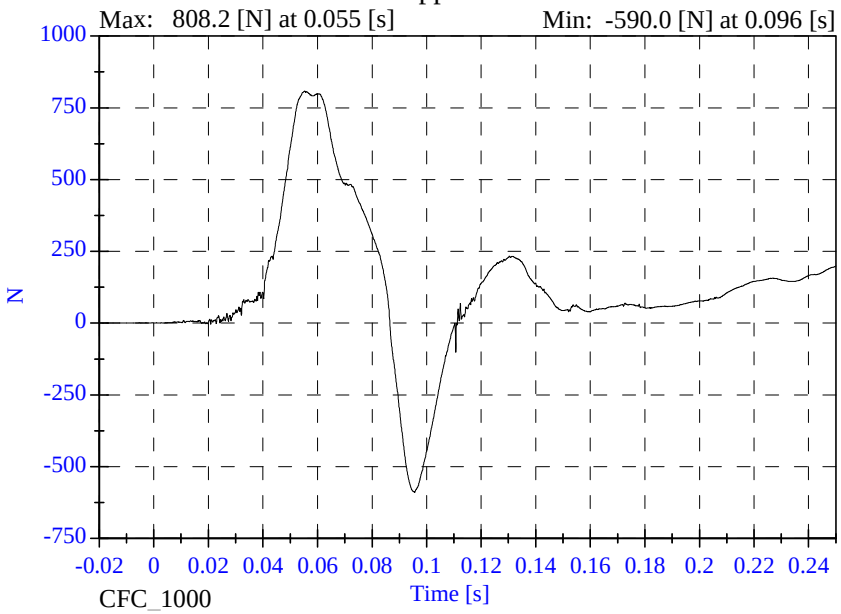
P4 Upper Neck Fx



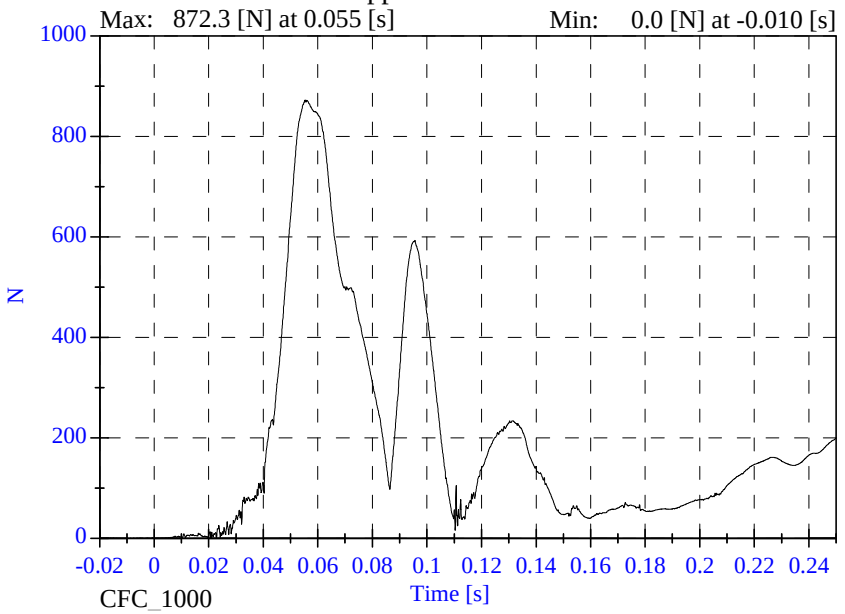
P4 Upper Neck Fy



P4 Upper Neck Fz



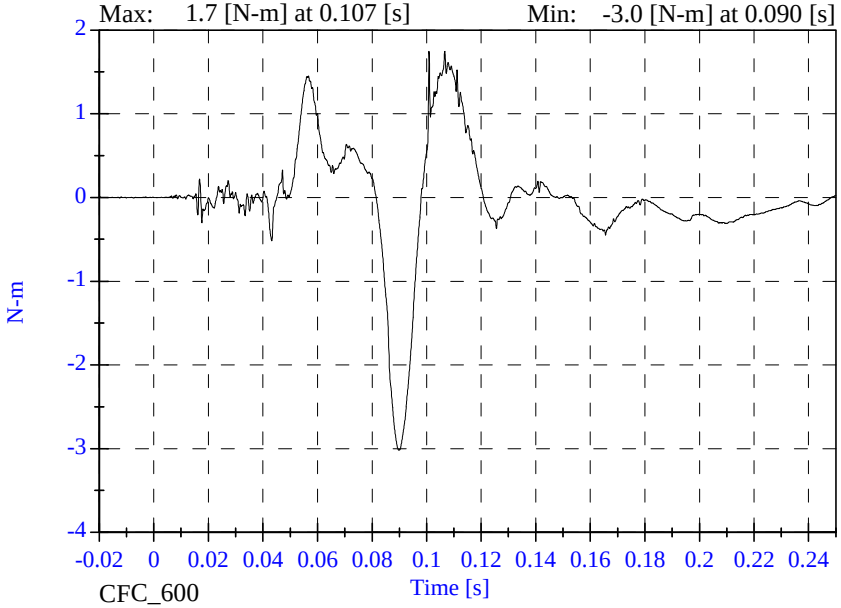
P4 Upper Neck F Resultant



Sled Test NCAP SLED 08-3-36 - August 27, 2003

P4 Upper Neck Mx

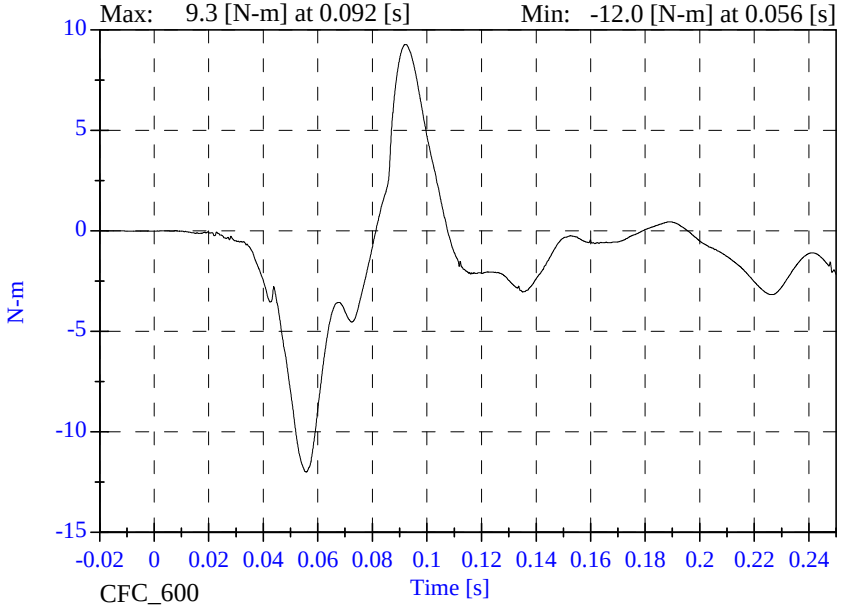
Max: 1.7 [N-m] at 0.107 [s] Min: -3.0 [N-m] at 0.090 [s]



CFC_600

P4 Upper Neck My

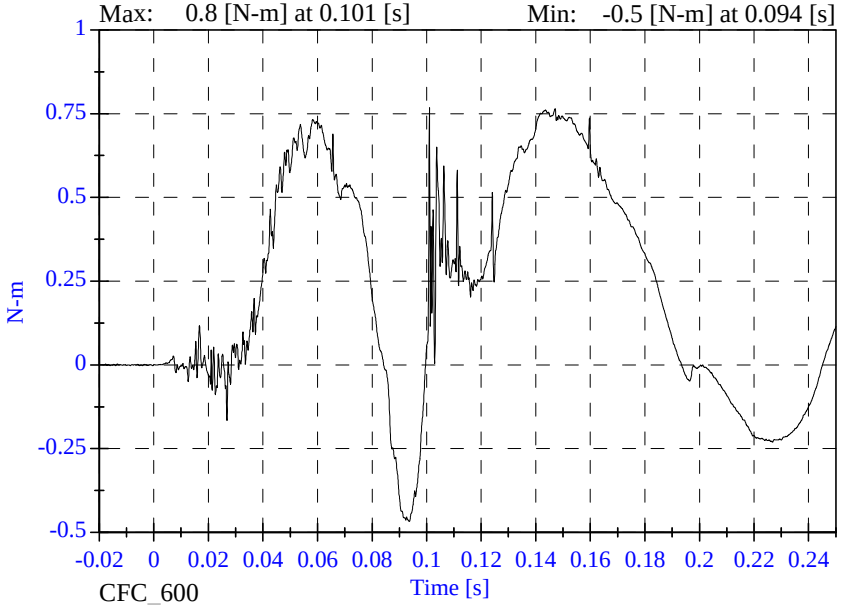
Max: 9.3 [N-m] at 0.092 [s] Min: -12.0 [N-m] at 0.056 [s]



CFC_600

P4 Upper Neck Mz

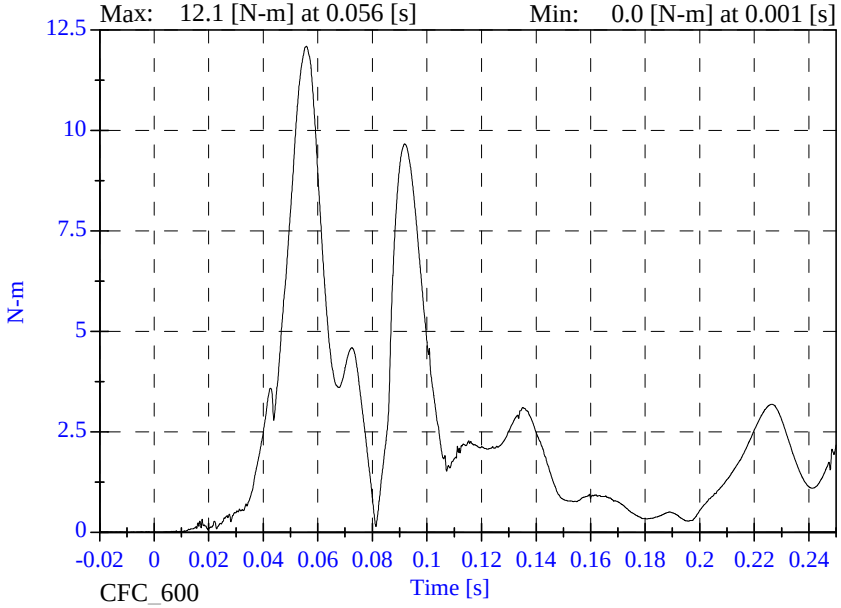
Max: 0.8 [N-m] at 0.101 [s] Min: -0.5 [N-m] at 0.094 [s]



CFC_600

P4 Upper Neck M Resultant

Max: 12.1 [N-m] at 0.056 [s] Min: 0.0 [N-m] at 0.001 [s]

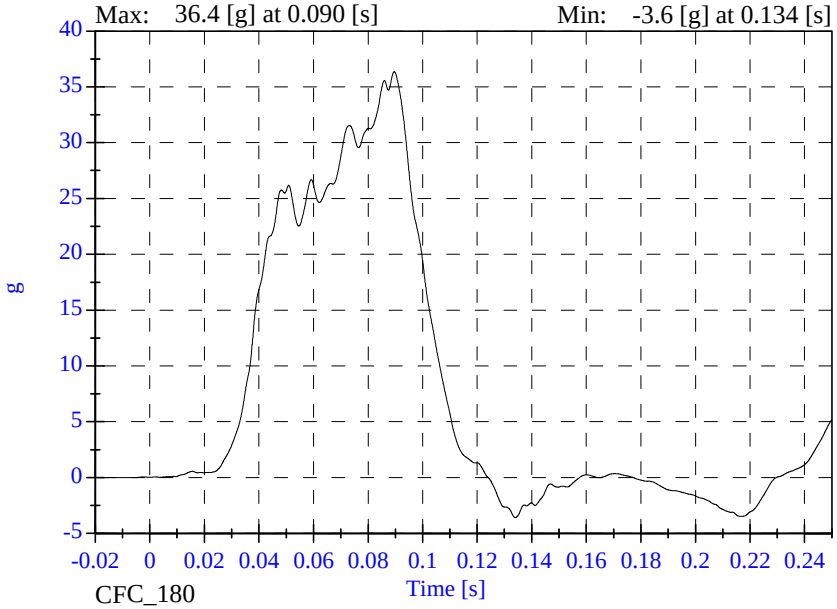


CFC_600

Sled Test NCAP SLED 08-3-36 - August 27, 2003

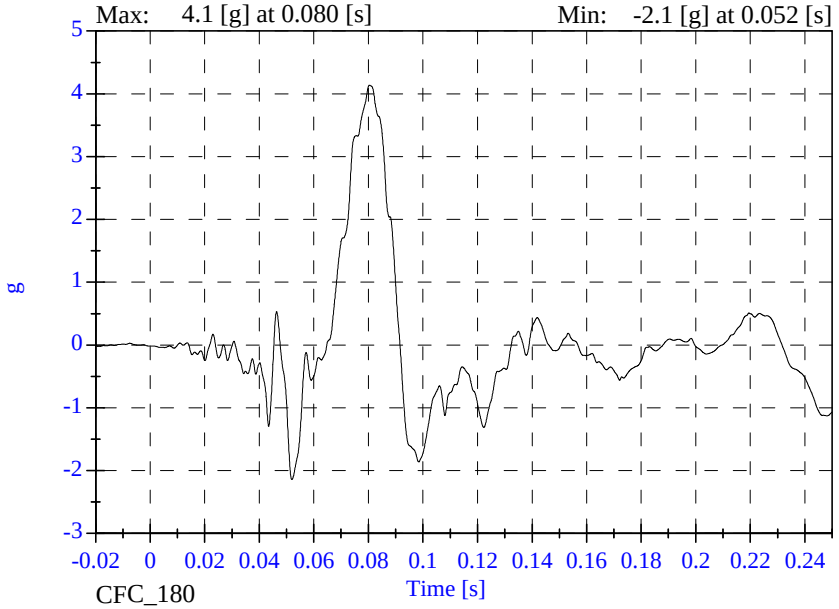
P4 Chest x

Max: 36.4 [g] at 0.090 [s] Min: -3.6 [g] at 0.134 [s]



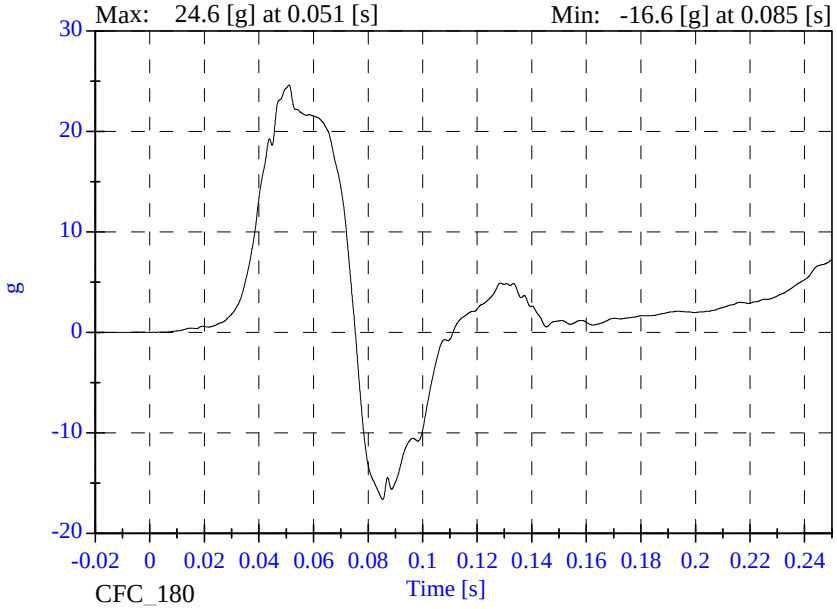
P4 Chest y

Max: 4.1 [g] at 0.080 [s] Min: -2.1 [g] at 0.052 [s]



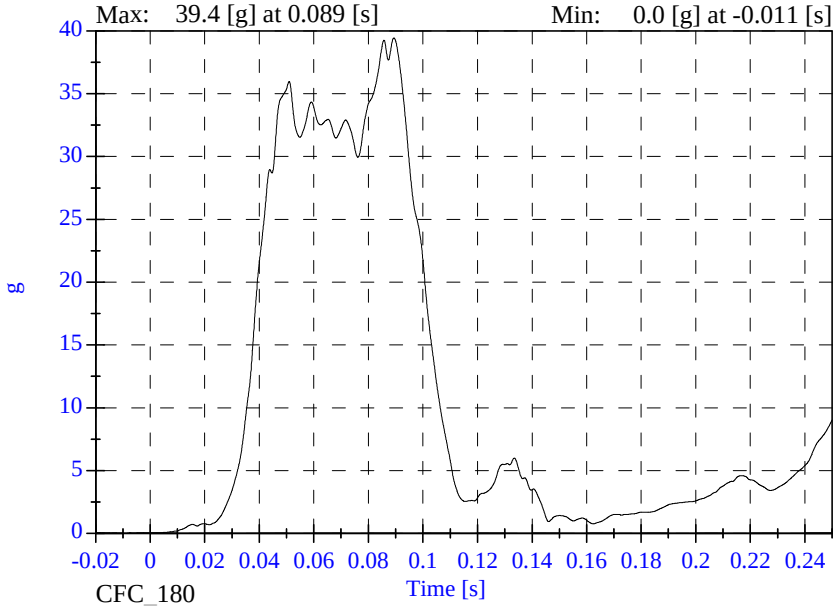
P4 Chest z

Max: 24.6 [g] at 0.051 [s] Min: -16.6 [g] at 0.085 [s]



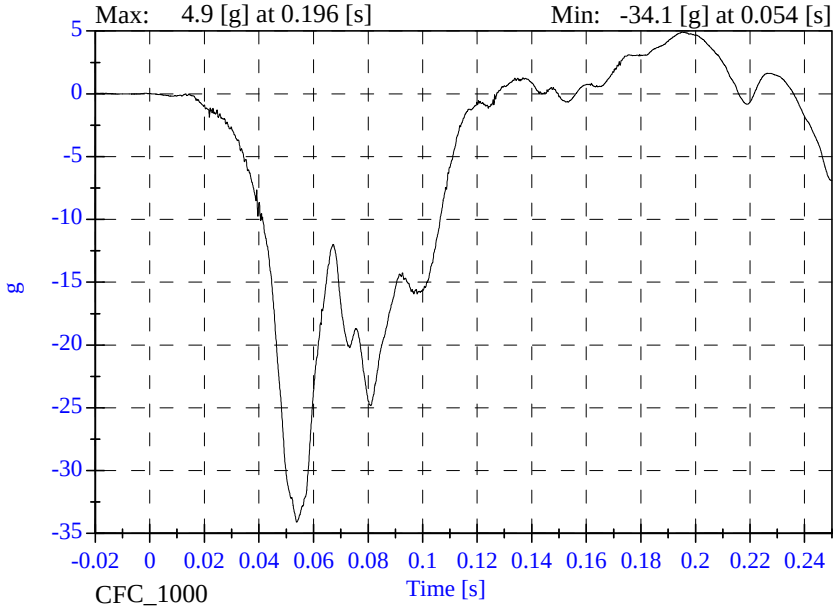
P4 Chest Resultant

Max: 39.4 [g] at 0.089 [s] Min: 0.0 [g] at -0.011 [s]

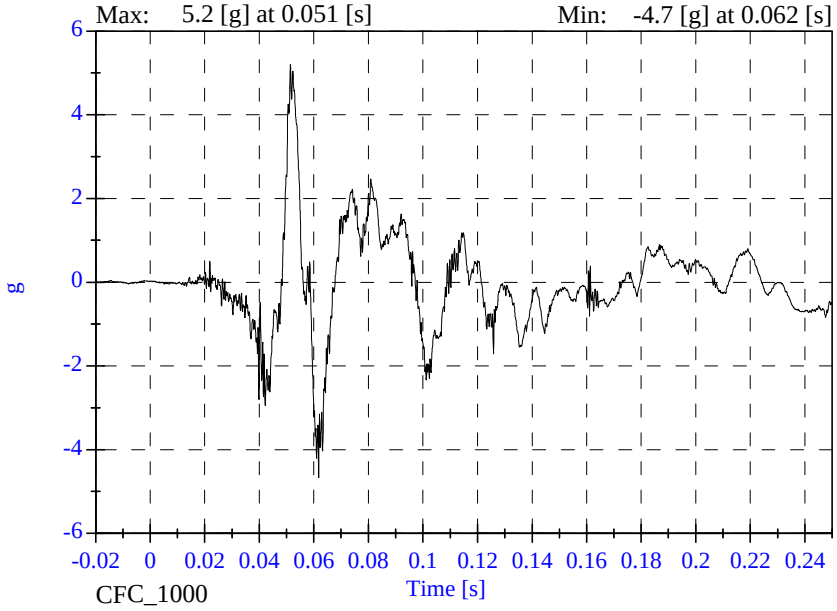


Sled Test NCAP SLED 08-3-36 - August 27, 2003

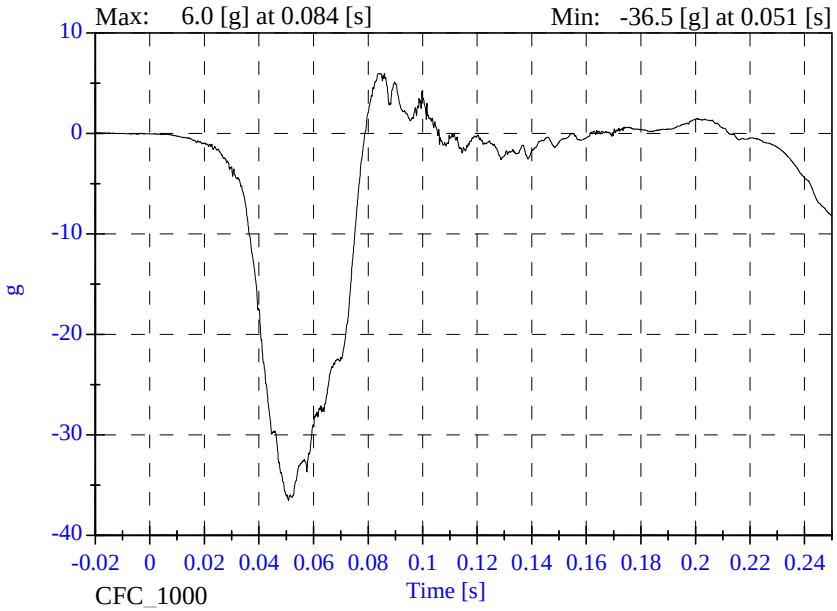
P4 Pelvic x



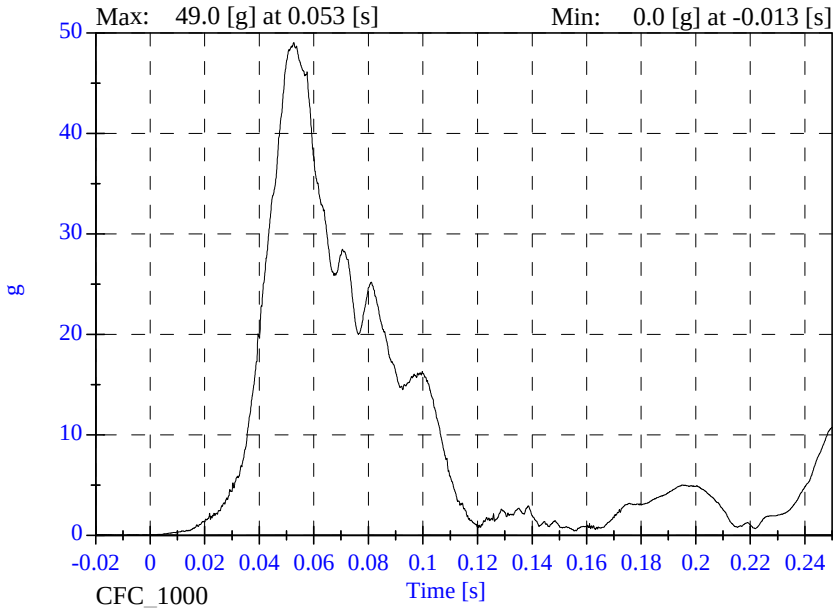
P4 Pelvic y



P4 Pelvic z

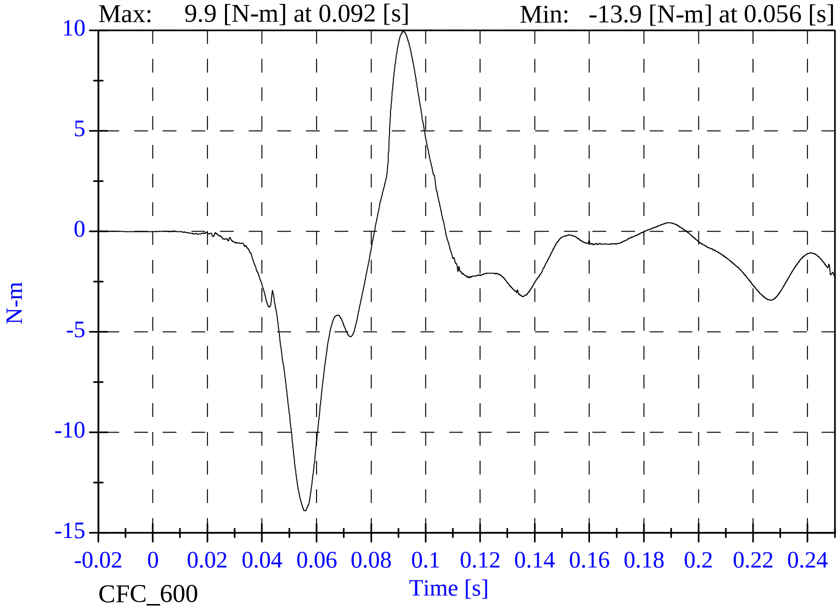


P4 Pelvic Resultant

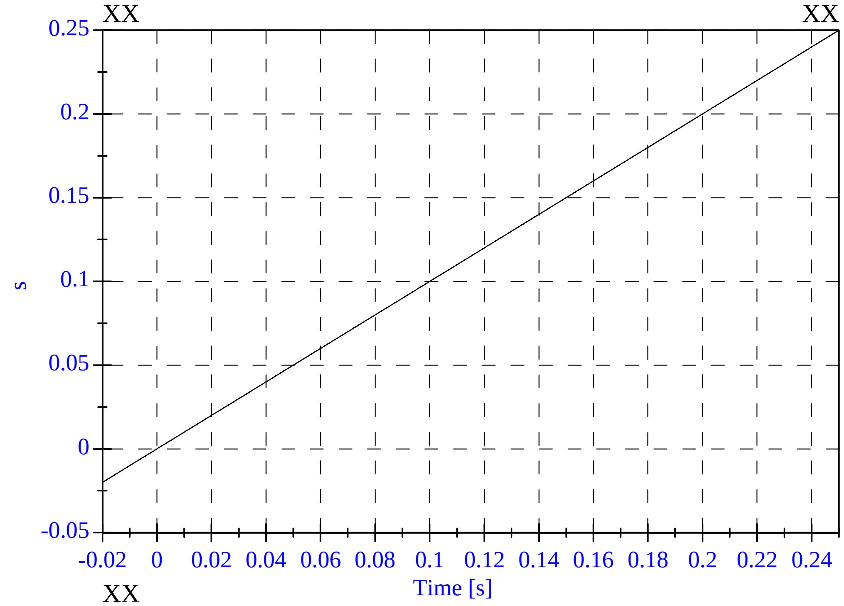


Sled Test NCAP SLED 08-3-36 - August 27, 2003

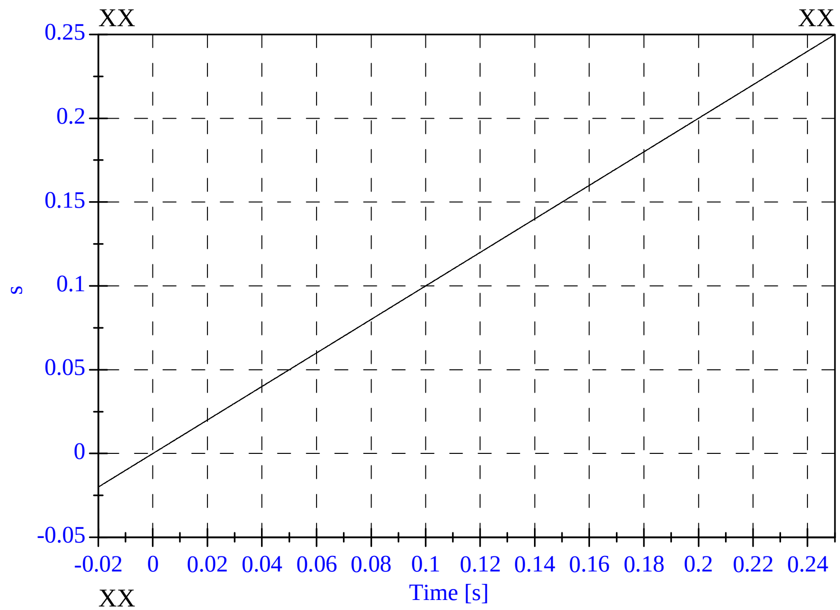
P4 Upper Neck Mocy



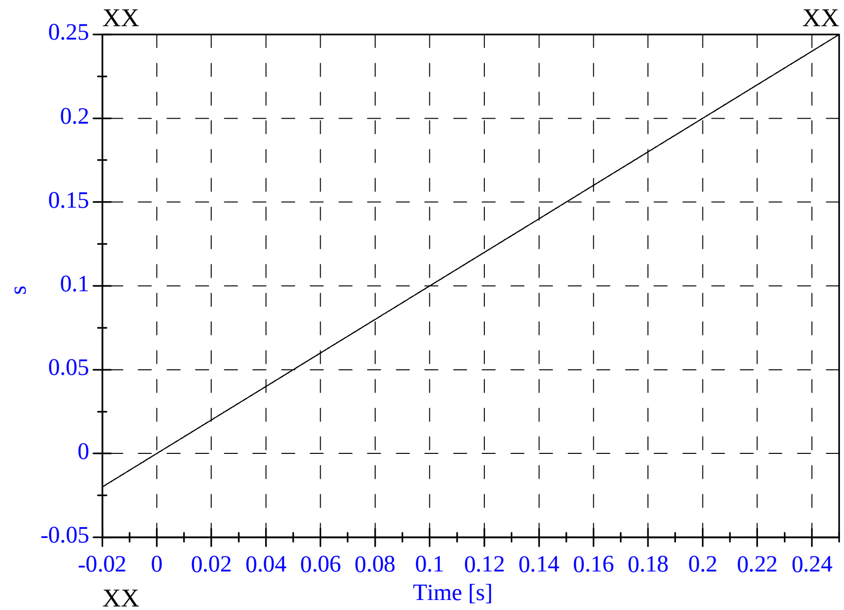
BLANK



BLANK



BLANK



SECTION 9

Compression – Deflection Resistance Test

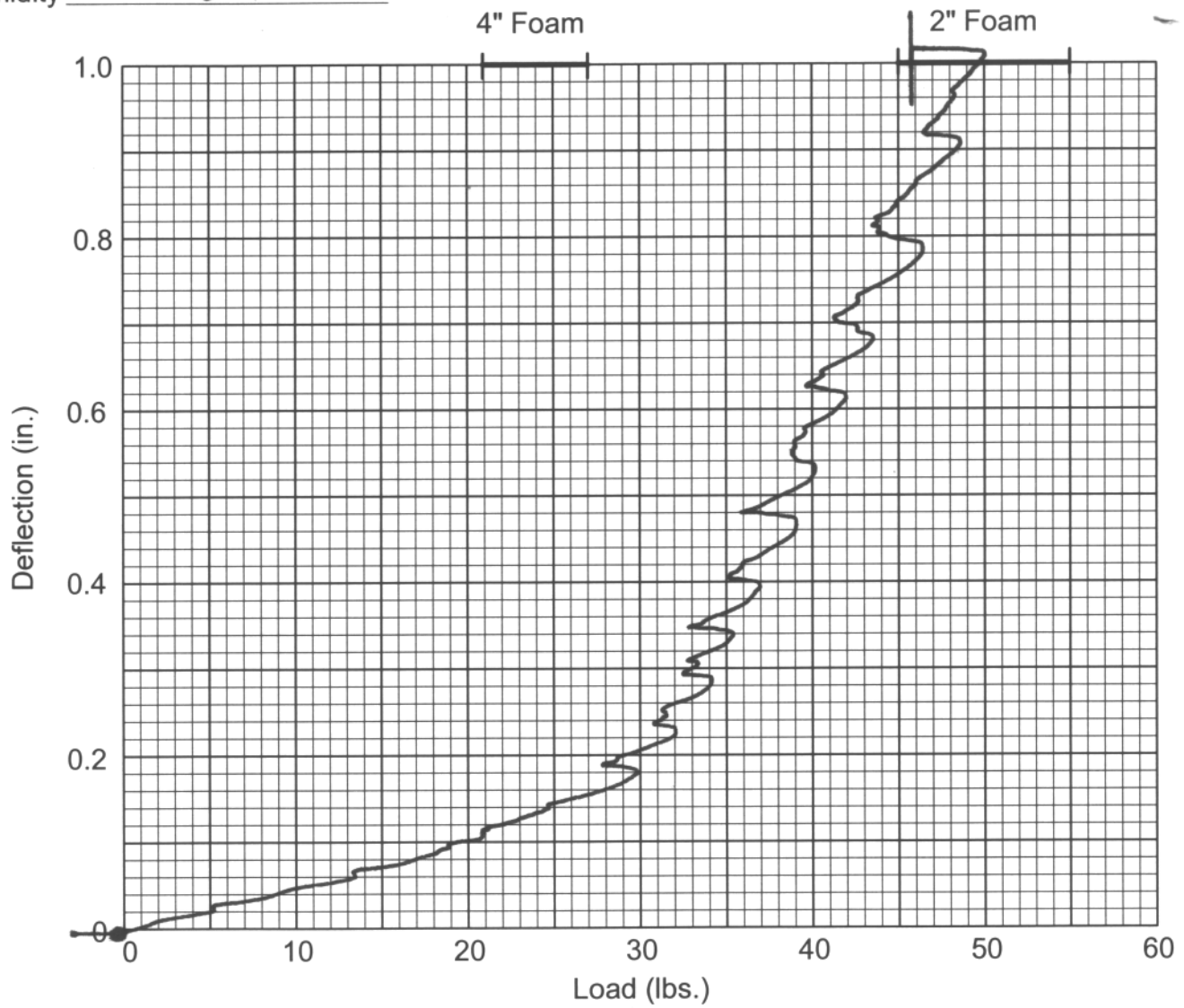
Date 8/20

Performed By SA

Temp. 70°

Humidity 50%

Foam No. 2 20" 2"x24" I 7



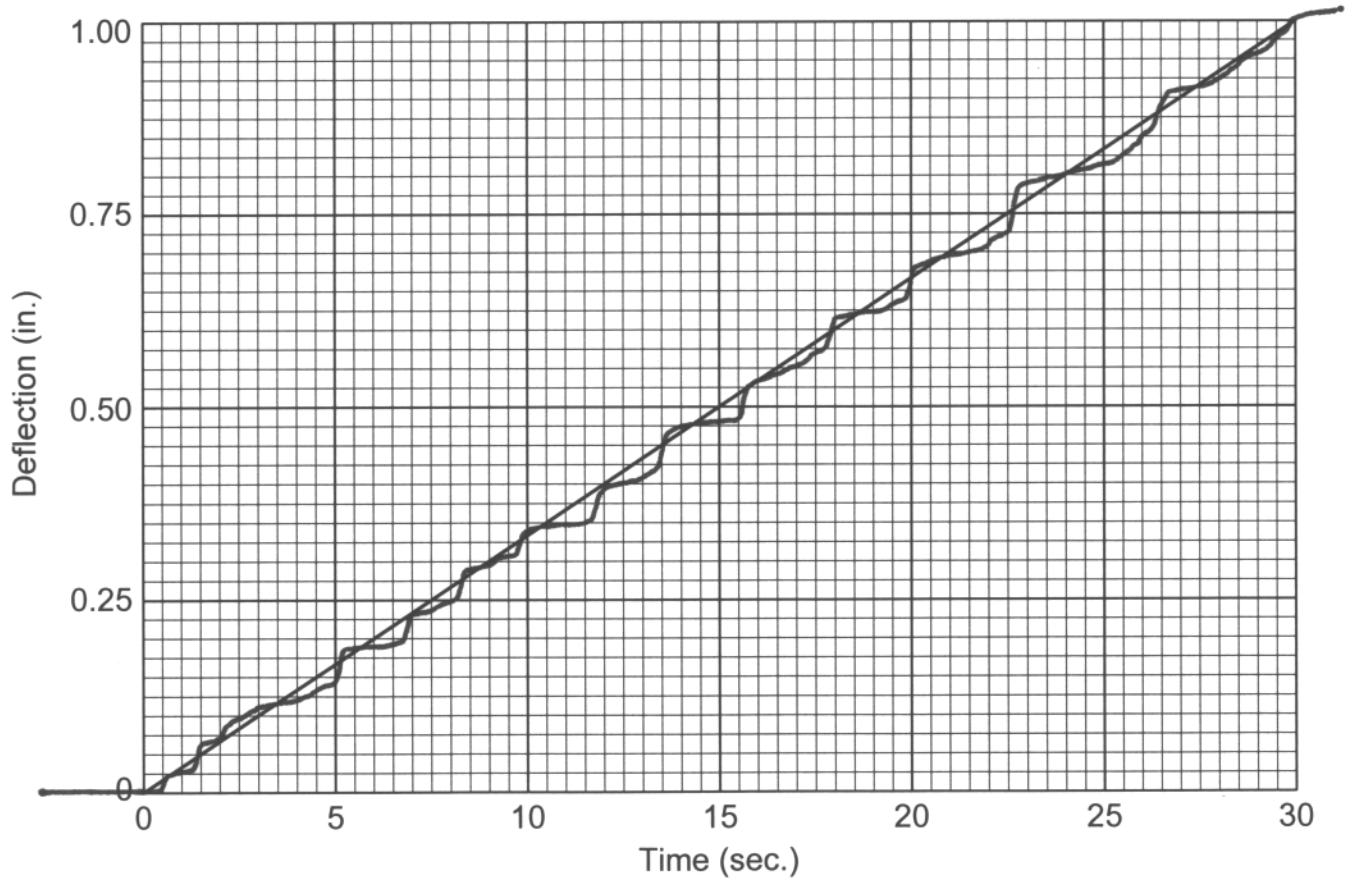
Compression - Deflection Resistance Test
Child Seat Foam

Date _____

Temp 70°

Humidity 50%

Foam No. 2"X 20" 2"X 24" I7

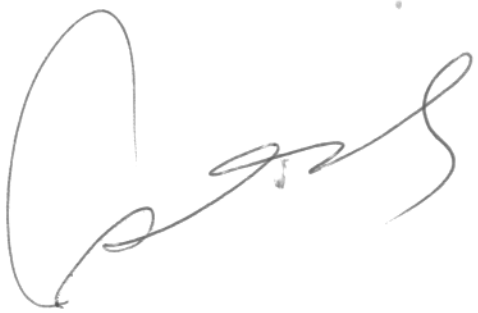


Compression - Deflection Resistance Test Child Seat Foam

SEAT FOAM USAGE LOG

Foam I.D. Number 2"X 20" 2"X24" I 7

Date	Peak Load	Pass/Fail
	45.75 LBS	



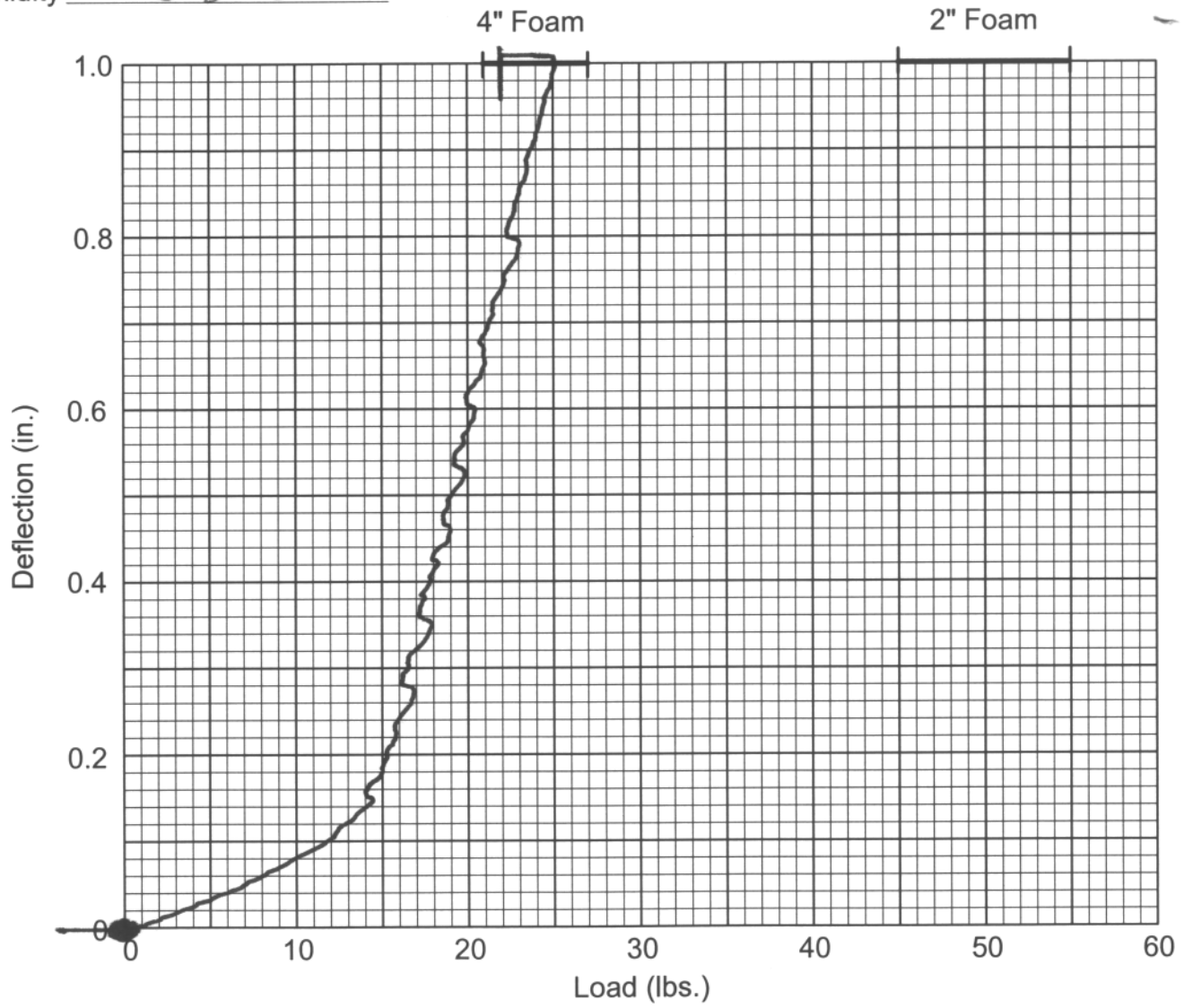
Date _____

Performed By _____

Temp. 70°

Humidity 50%

Foam No. 4 x 20" I 7



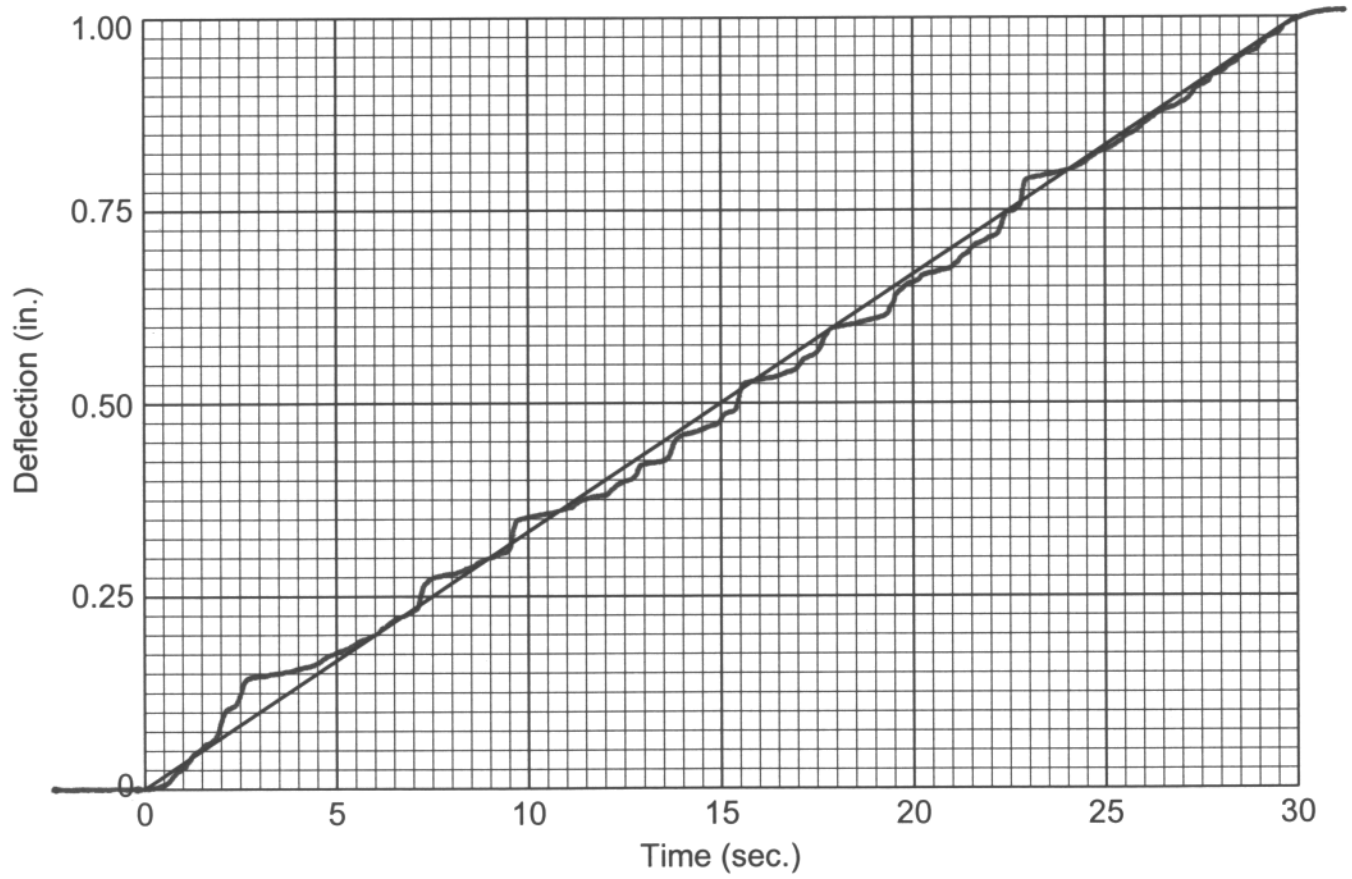
Compression - Deflection Resistance Test
Child Seat Foam

Date _____

Temp 70°

Humidity 50%

Foam No. 4" X 20" TM



Compression - Deflection Resistance Test Child Seat Foam

SEAT FOAM USAGE LOG

Foam I.D. Number 4"X20"I7

Date	Peak Load	Pass/Fail
	22LBS	

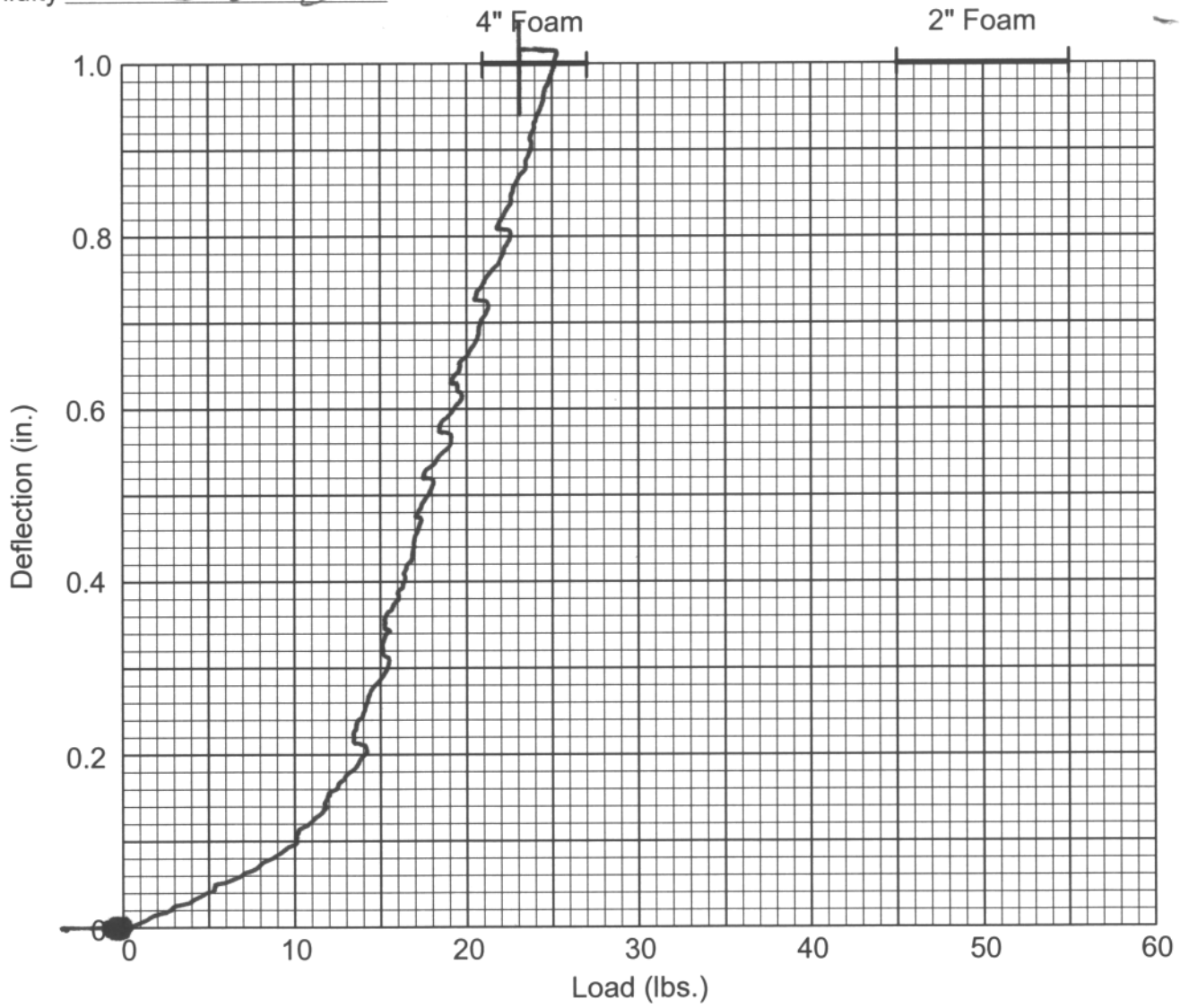
Date _____

Performed By _____

Temp. 70°

Humidity 50%

Foam No. 4" x 24" I 7



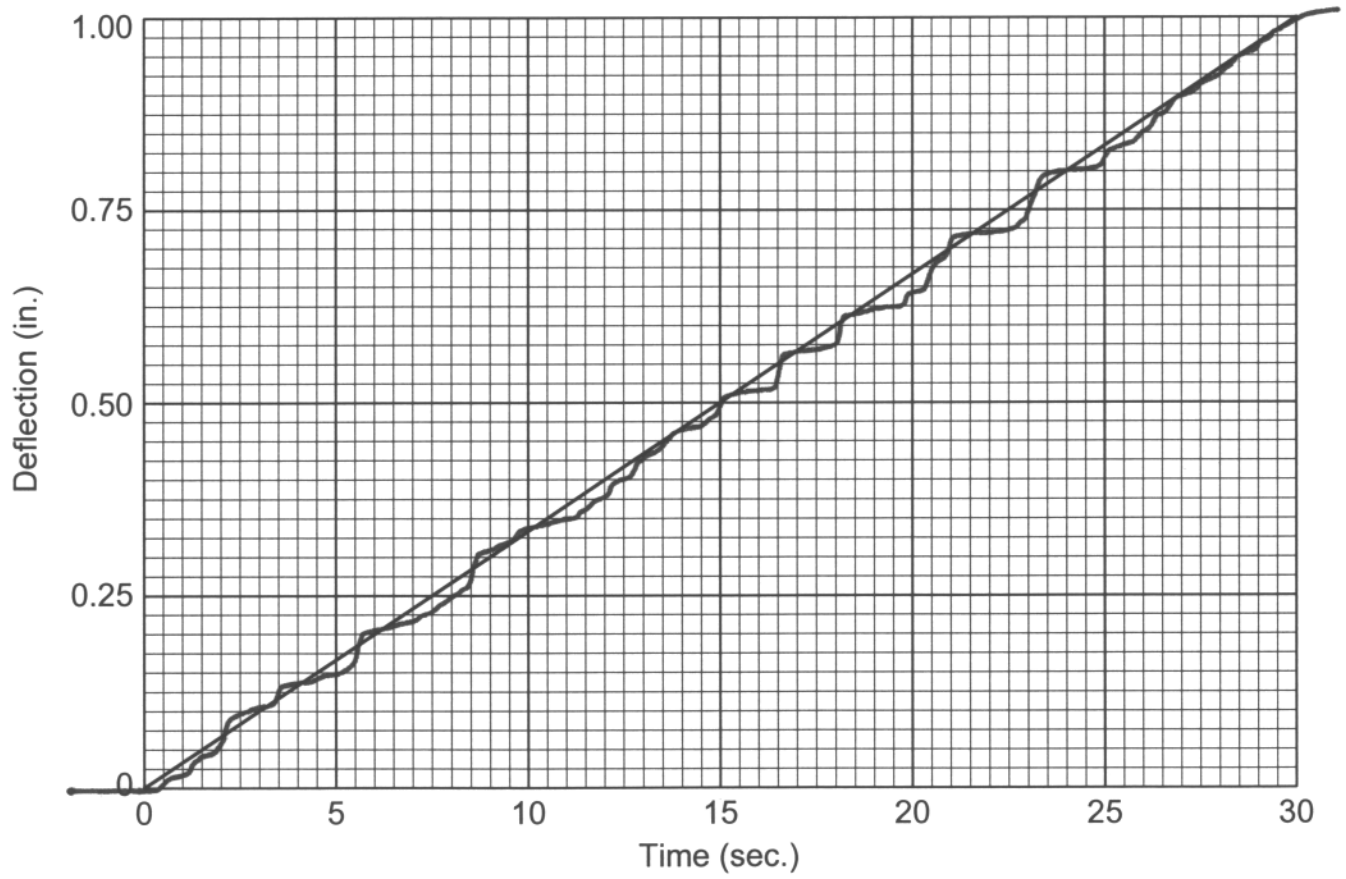
Compression - Deflection Resistance Test
Child Seat Foam

Date _____

Temp 70°

Humidity 50%

Foam No. 4" X 24" I 4



Compression - Deflection Resistance Test Child Seat Foam

SEAT FOAM USAGE LOG

Foam I.D. Number 4"X24"I7

Date	Peak Load	Pass/Fail
	23 LBS	

SECTION 10

Child Dummy Calibration Data Traces and Tables

HYIII 3 Year Old Head Drop Test S/N:044

Part 572P Head Drop | Calibration Date: July 22, 2003

Serial No: 044 | Work File: 4001

----------TEST RESULTS----------

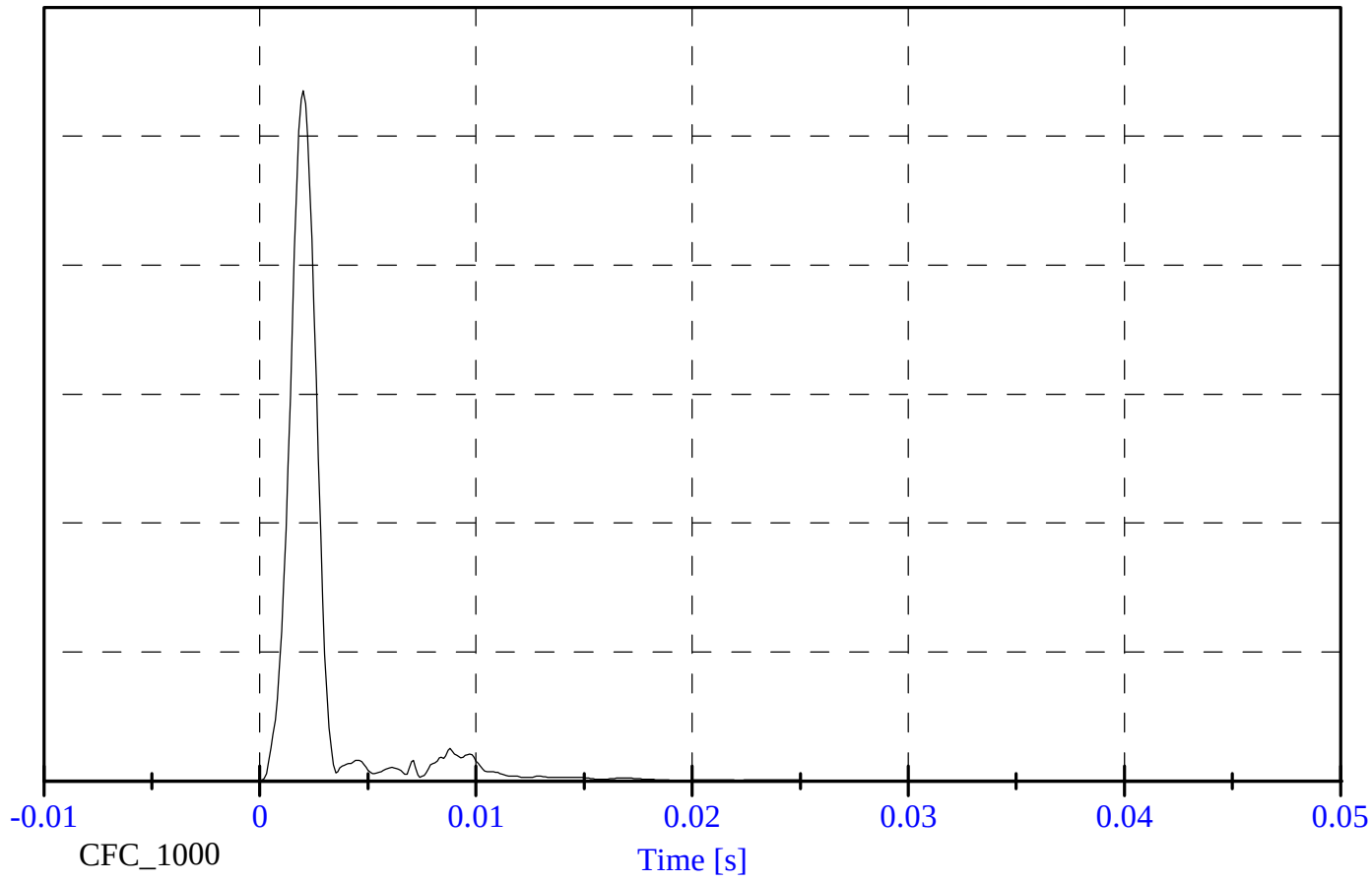
TEST CONDITION	PARAMETERS	RESULTS	STATUS
Lab Temperature:	66.0-78.0 F	70.0 F	Passed
Lab Humidity:	10-70 %	35.00 %	Passed
Peak Resultant Accel.:	250-280 Gs	267.66 Gs	Passed
Peak Lateral Accel.:	15 Gs Max	5.53 Gs	Passed
Curve PerCent NonModal:	< 10%	6.05 %	Passed

HYIII 3 Year Old Head Drop Test S/N:044

Head Resultant

Max: 267.7 [g] at 0.002 [s]

Min: 0.0 [g] at -0.080 [s]



Hybrid III Head Neck Extention Test S/N:044

Part 572P	Neck Extension Test	Calibration Date:	July 22, 2003
Serial No:	144	Work File:	4001

----------TEST RESULTS----------

TEST CONDITION	PARAMETERS	RESULTS	STATUS
Lab Temperature:	69.0-72.0 F	70.00 F	Passed
Lab Humidity:	10-70 %	35.00 %	Passed
Test Pendulum Speed:	11.58-12.38 ft/s	12.30 ft/s	Passed
----------PENDULUM PULSE----------			
Pulse at 6 ms:	3.30- 4.60 ft/s	3.89 ft/s	Passed
Pulse at 10 ms:	6.20- 8.20 ft/s	6.94 ft/s	Passed
Pulse at 14 ms:	9.20-11.50 ft/s	9.47 ft/s	Passed
----------D PLANE ROTATION----------			
Maximum Rotation:	83.0-93.0 Deg	86.18 Deg	Passed
----------MOMENT ABOUT THE OCCIPITAL CONDYLE----------			
Max Occipital Moment:	-53.30--43.70 N-m	-45.61 N-m	Passed
Occiptal Moment Decay:	60.0-80.0 ms	71.60 ms	Passed

Hybrid III 3 Year Old Head Neck Flexion Test S/N:044

Part 572P	Neck Flexion Test	Calibration Date:	July 22, 2003
Serial No:	044	Work File:	4001

----------TEST RESULTS----------

TEST CONDITION	PARAMETERS	RESULTS	STATUS
Lab Temperature:	20.6-22.2 C	21.11 C	Passed
Lab Humidity:	10-70 %	36.00 %	Passed
Test Pendulum Speed:	5.40- 5.60 m/s	5.60 m/s	Passed
----------PENDULUM PULSE----------			
Pulse at 10 ms:	2.00- 2.70 m/s	2.13 m/s	Passed
Pulse at 15 ms:	3.00- 4.00 m/s	3.10 m/s	Passed
Pulse at 20 ms:	4.00- 5.10 m/s	4.20 m/s	Passed
----------D PLANE ROTATION----------			
Maximum Rotation:	70.0-82.0 Deg	81.53 Deg	Passed
----------MOMENT ABOUT THE OCCIPITAL CONDYLE----------			
Max Occipital Moment:	42.00- 53.00 N-m	47.85 N-m	Passed
Occiptal Moment Decay:	60.0-80.0 ms	74.00 ms	Passed

Hybrid III 3 Year Old Thorax Test S/N:044

Part 572P Thorax Impact — Calibration Date: July 22, 2003

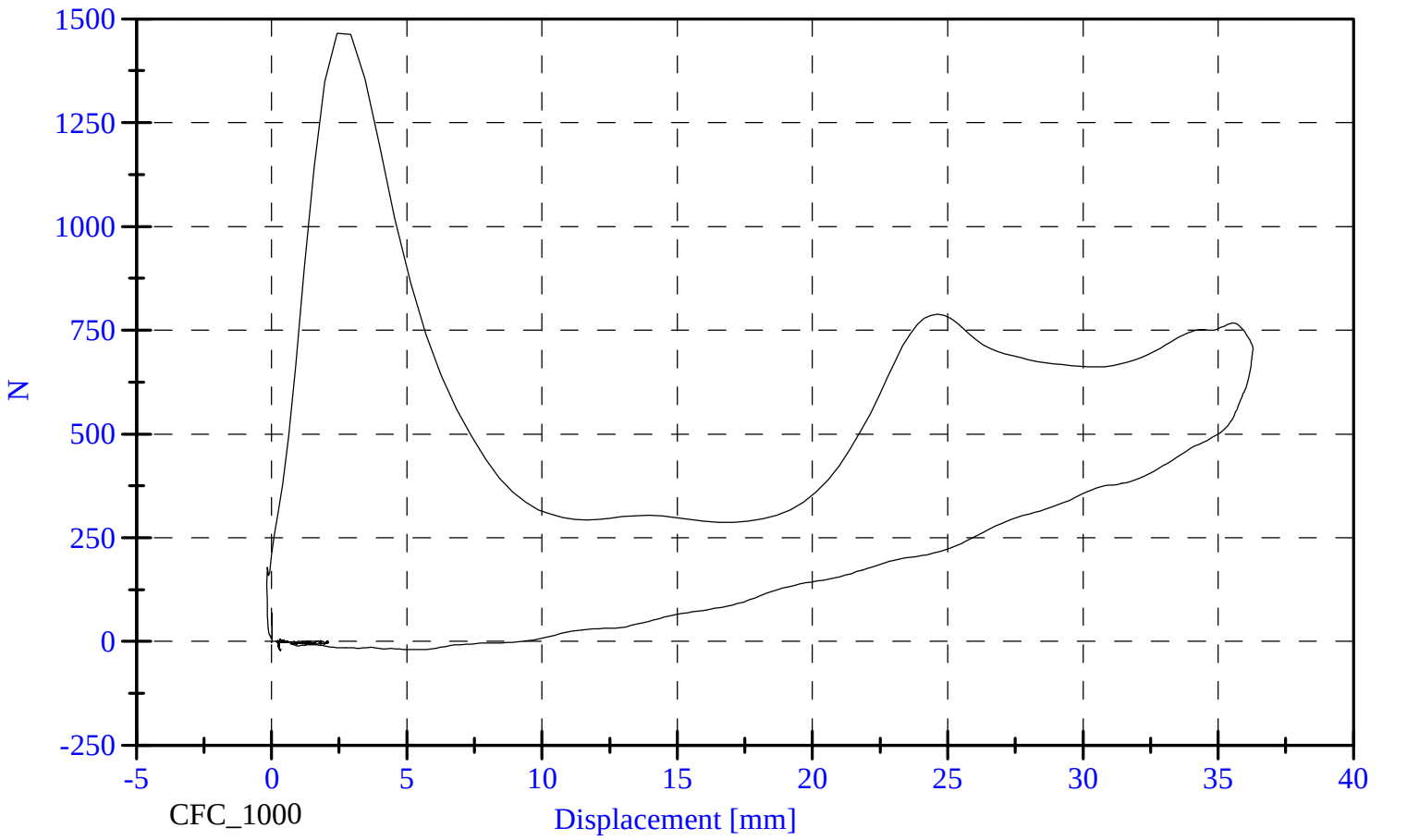
Serial No: 044 — Work File: 4001

----------TEST RESULTS----------

TEST CONDITION	PARAMETERS	RESULTS	STATUS
Lab Temperature:	20.6-22.2 C	21.1 C	Passed
Lab Humidity:	10-70 %	36.00 %	Passed
Pendulum Velocity:	5.90- 6.10 m/s	6.08 m/s	Passed
Maximum Deflection:	32.00-38.00 mm	36.28 mm	Passed
Maximum Res. Force:	680.00- 810.00 N	767.48 N	Passed
Internal Hysteresis:	65-85 %	73.20 %	Passed
Pass Sternum Force Criteria?:	860.00 N	788.71	Passed

Hybrid III 3 Year Old Thorax Test S/N:044 — Probe Force vs. Displacement

Max: 1465.5 [N] at 2.421 [mm]
Min: -21.7 [N] at 0.325 [mm]



CRABI 1 Year Old Front Head Drop Test S/N:102

Part 572R Frontal Head Drop | Calibration Date: July 22, 2003

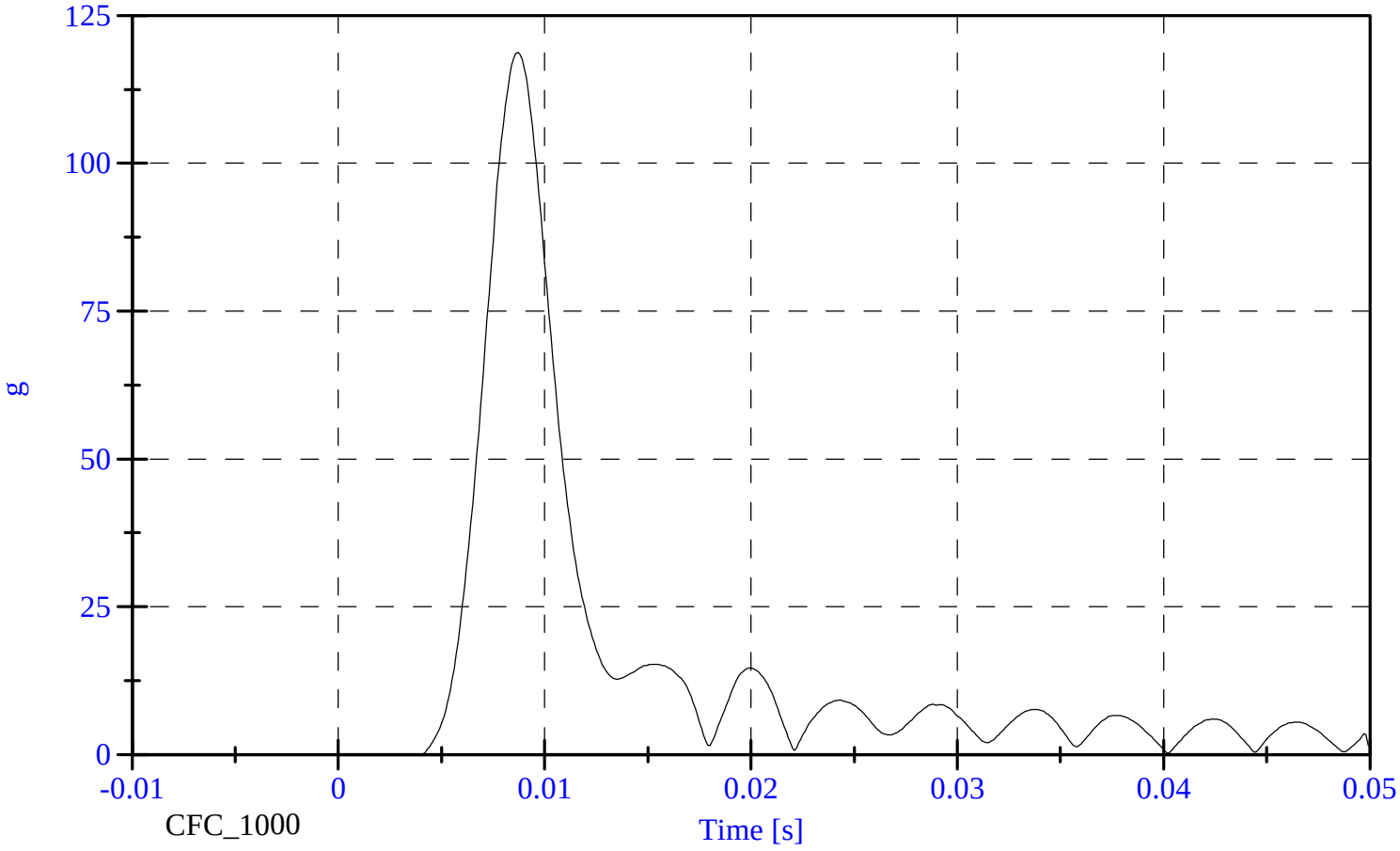
Serial No: 102 | Work File: 4001

----------TEST RESULTS----------

TEST CONDITION	PARAMETERS	RESULTS	STATUS
Lab Temperature:	66.0-78.0 F	70.0 F	Passed
Lab Humidity:	10-70 %	35.00 %	Passed
Peak Resultant Accel.:	100-120 Gs	118.77 Gs	Passed
Peak Lateral Accel.:	15 Gs Max	1.38 Gs	Passed
Curve PerCent NonModal:	< 17%	12.87 %	Passed

CRABI 1 Year Old Head Drop Test S/N:102 Head Resultant

Max: 118.8 [g] at 0.009 [s]
Min: 0.0 [g] at -0.004 [s]



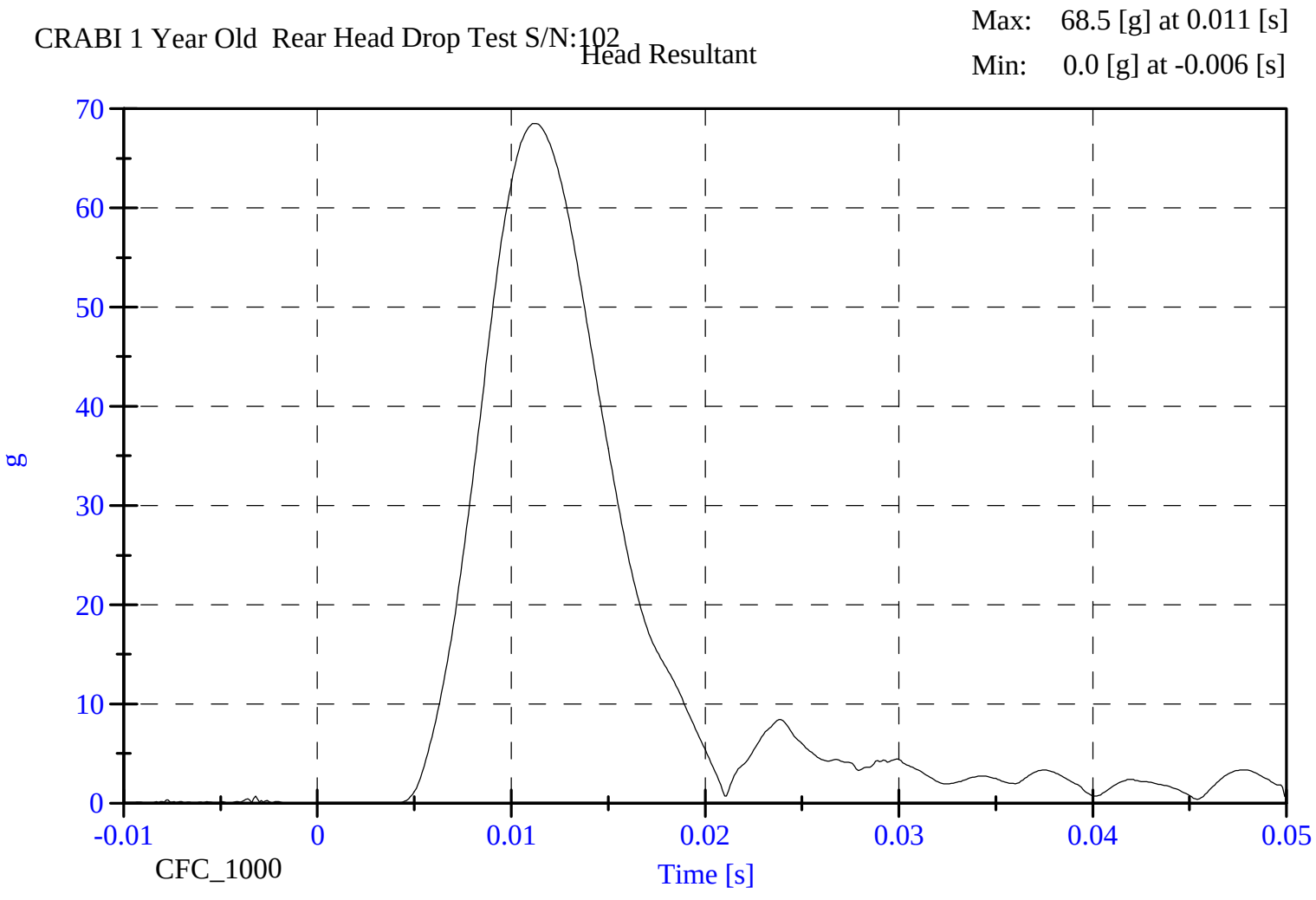
CRABI 1 Year Old Rear Head Drop Test S/N:102

Part 572R Rear Head Drop | Calibration Date: July 22, 2003

Serial No: 102 | Work File: 4001

----------**TEST RESULTS**----------

TEST CONDITION	PARAMETERS	RESULTS	STATUS
Lab Temperature:	18.9-25.6 C	21.1 C	Passed
Lab Humidity:	10-70 %	35.00 %	Passed
Peak Resultant Accel.:	55-71 Gs	68.52 Gs	Passed
Peak Lateral Accel.:	15 Gs Max	2.06 Gs	Passed
Curve PerCent NonModal:	< 17%	12.32 %	Passed



Crabi 1 Year Old Head Neck Extention Test S/N:102

Part 572R	Neck Extension Test	Calibration Date:	July 24, 2003
Serial No:	102	Work File:	4001

----------TEST RESULTS----------

TEST CONDITION	PARAMETERS	RESULTS	STATUS
Lab Temperature:	20.6-22.2 C	21.11 C	Passed
Lab Humidity:	10-70 %	36.00 %	Passed
Test Pendulum Speed:	2.40- 2.60 m/s	2.47 m/s	Passed
----------PENDULUM PULSE----------			
Pulse at 6 ms:	0.80- 1.20 m/s	1.12 m/s	Passed
Pulse at 10 ms:	1.50- 2.10 m/s	1.99 m/s	Passed
Pulse at 14 ms:	2.20- 2.90 m/s	2.56 m/s	Passed
----------D PLANE ROTATION----------			
Maximum Rotation:	80.0-92.0 Deg	84.72 Deg	Passed
----------MOMENT ABOUT THE OCCIPITAL CONDYLE----------			
Max Occipital Moment:	-23.00--12.00 N-m	-17.31 N-m	Passed
Occiptal Moment Decay:	76.0-90.0 ms	77.10 ms	Passed

Crabi 1 Year Old Head Neck Flexion Test S/N:102

Part 572R	Neck Flexion Test	Calibration Date:	July 24, 2003
Serial No:	102	Work File:	4093

----------TEST RESULTS----------

TEST CONDITION	PARAMETERS	RESULTS	STATUS
Lab Temperature:	20.6-22.2 C	21.11 C	Passed
Lab Humidity:	10-70 %	36.00 %	Passed
Test Pendulum Speed:	5.10- 5.30 m/s	5.20 m/s	Passed
----------PENDULUM PULSE----------			
Pulse at 10 ms:	1.60- 2.30 m/s	2.13 m/s	Passed
Pulse at 20 ms:	3.40- 4.20 m/s	4.18 m/s	Passed
Pulse at 25 ms:	4.30- 5.20 m/s	5.02 m/s	Passed
----------D PLANE ROTATION----------			
Maximum Rotation:	75.0-86.0 Deg	84.26 Deg	Passed
----------MOMENT ABOUT THE OCCIPITAL CONDYLE----------			
Max Occipital Moment:	36.00- 45.00 N-m	38.52 N-m	Passed
Occiptal Moment Decay:	60.0-80.0 ms	69.10 ms	Passed

SECTION 11

Test Equipment and Instrumentation Calibration

Calibrations for Test 08-3-36

SHORTNAME	SENSCOM	CALDATE
Sled Ax	MFG: ENDEVCO S/N: 10301	6/23/2003
P3 HDCG Ax	MFG: ENDEVCO S/N: P17912	7/17/2003
P3 HDCG Ay	MFG: ENDEVCO S/N: P17743	7/17/2003
P3 HDCG Az	MFG: ENDEVCO S/N: P15319	6/26/2003
P3 HDCG RAz	MFG: ENDEVCO S/N: P16279	6/25/2003
P3 CHST Ax	MFG: ENDEVCO S/N: P15334	7/17/2003
P3 CHST Ay	MFG: ENDEVCO S/N: P15321	7/17/2003
P3 CHST Az	MFG: ENDEVCO S/N: P17758	7/17/2003
P3 CHST Dx	MFG: SERVO S/N: 044	7/22/2003
P3 PVCN Ax	MFG: ENDEVCO S/N: P16755	7/17/2003
P3 PVCN Ay	MFG: ENDEVCO S/N: P15591	7/17/2003
P3 PVCN Az	MFG: ENDEVCO S/N: P16155	7/17/2003
P3 NEKU Fx	MFG: Denton S/N: 248-FX	7/18/2003
P3 NEKU Fy	MFG: Denton S/N: 248-FY	7/18/2003
P3 NEKU Fz	MFG: Denton S/N: 248-FZ	7/18/2003
P3 NEKU Mx	MFG: Denton S/N: 248-MX	7/18/2003
P3 NEKU My	MFG: Denton S/N: 248-MY	7/18/2003
P3 NEKU Mz	MFG: Denton S/N: 248-MZ	7/18/2003
P3 NEKL Fx	MFG: Denton S/N: 249Fx	7/18/2003
P3 NEKL Fy	MFG: Denton S/N: 249Fy	7/18/2003
P3 NEKL Fz	MFG: Denton S/N: 249Fz	7/18/2003
P3 NEKL Mx	MFG: Denton S/N: 249Mx	7/18/2003
P3 NEKL My	MFG: Denton S/N: 249My	7/18/2003
P3 NEKL Mz	MFG: Denton S/N: 249Mz	7/18/2003
P4 HDCG Ax	MFG: ENDEVCO S/N: J27496	7/15/2003
P4 HDCG Ay	MFG: ENDEVCO S/N: J27366	7/15/2003
P4 HDCG Az	MFG: ENDEVCO S/N: AJ7G1	7/15/2003
P4 CHST Ax	MFG: ENDEVCO S/N: J19625	7/14/2003
P4 CHST Ay	MFG: ENDEVCO S/N: J14381	7/14/2003
P4 CHST Az	MFG: ENDEVCO S/N: J20054	7/14/2003
P4 PVCN Ax	MFG: ENDEVCO S/N: ACC14	7/15/2003
P4 PVCN Ay	MFG: ENDEVCO S/N: ALA71	7/15/2003
P4 PVCN Az	MFG: ENDEVCO S/N: J14687	7/15/2003
P4 NEKU Fx	MFG: DENTON S/N: 283-FX	7/16/2003
P4 NEKU Fy	MFG: DENTON S/N: 283-FY	7/16/2003
P4 NEKU Fz	MFG: DENTON S/N: 283-FZ	7/16/2003
P4 NEKU Mx	MFG: DENTON S/N: 283-MX	7/16/2003
P4 NEKU My	MFG: DENTON S/N: 283-MY	7/16/2003
P4 NEKU Mz	MFG: DENTON S/N: 283-MZ	7/16/2003

SECTION 12

Link to High Speed Movies

Test 08-3-36 North View

Test 08-3-36 South View