REPORT NUMBER: 8708-SLEDNCAP-24

CHILD RESTRAINT SYSTEM IN DYNAMIC SLED TEST BRITAX EXPRESSWAY ISOFIX WITH A HYIII THREE YEAR OLD BRITAX HUSKY MARINA WITH A HYIII THREE YEAR OLD

TEST NUMBER: 08-3-24
08-3-25

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

AUGUST 7TH, 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: _____
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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

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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.

One (1) seat was tested during run 08-3-24. Position 6 was a Britax Expressway ISOFIX Child Restraint System. This seat was tested with a HYIII 3 year old ATD.

One (1) seat was tested during run 08-3-25. Position 6 was a Britax Husky Marina Child Restraint System. This seat was tested with a HYIII 3 year old ATD.

17. Key Words FMVSS 213 Child Restraint Systems 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

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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

These frontal dynamic sled test were 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.

Test 08-3-24 was conducted at Veridian Engineering on August 7th, 2003 at a speed of 47.1 kph (29.3 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 one anthropomorphic test device (ATD). One (1) Hybrid III 3 year old size ATD, Serial Number 142, was instrumented with head, chest, and pelvic tri-axial accelerometers, and upper and lower neck load cells. The child ATD was 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.

Test 08-3-25 was conducted at Veridian Engineering on August 7th, 2003 at a speed of 47.1 kph (29.3 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 one anthropomorphic test device (ATD). One (1) Hybrid III 3 year old size ATD, Serial Number 142, was instrumented with head, chest, and pelvic tri-axial accelerometers, and upper and lower neck load cells. The child ATD was 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.

Position 6 – Lower Neck My was clipped during test 08-3-25.

SECTION 2

CHILD RESTRAINT INFORMATION

Test No.: 08-3-24 Test Date: August 7th, 2003

Child Restraint Type (forward-facing, rearward facing, booster)	FORWARD FACING
LATCH or NON-LATCH	LAP BELT WITH TETHER
Harness Type	5 -POINT
Child Restraint Manufacturer	BRITAX
Child Restraint Model	EXPRESSWAY ISOFIX
Model Number	E9L2906
Date of Manufacture	5/29/2003
Child Restraint Height Limits (mm)	686 – 1016
Child Restraint Weight Limits (kg)	9.7 – 18.1
Weight of Child Restraint (kg)	8.6

Test No.: 08-3-25 Test Date: August 7th, 2003

Child Restraint Type (forward-facing, rearward facing, booster)	FORWARD FACING
LATCH or NON-LATCH	LAP BELT WITH TETHER
Harness Type	5 -POINT
Child Restraint Manufacturer	BRITAX
Child Restraint Model	HUSKY MARINA
Model Number	E9L3028
Date of Manufacture	6/12/2003
Child Restraint Height Limits (mm)	483 - 1346
Child Restraint Weight Limits (kg)	10.0 - 36
Weight of Child Restraint (kg)	11.6

SECTION 3

POST-TEST OBSERVATIONS

Test No.: 08-3-24 Test Date: August 7th, 2003

Child Seat	BRITAX EXPRESSWAY ISOFIX
Belt Fraying	NONE
Stress Marks	NONE
Cracks	NONE
Buckle Stress	NONE
Latch Hooks	NONE
Max. Head Excursion (mm)	584
Max. Knee Excursion (mm)	640
Velocity	47.1
Acceleration (G's)	23.3

Test No.: 08-3-25 Test Date: August 7th, 2003

Child Seat	BRITAX HUSKY MARINA
Belt Fraying	NONE
Stress Marks	NONE
Cracks	NONE
Buckle Stress	NONE
Latch Hooks	NONE
Max. Head Excursion (mm)	556
Max. Knee Excursion (mm)	686
Velocity	47.1
Acceleration (G's)	23.2

SECTION 4

HYBRID III 3 YEAR OLD ATD INJURY CRITERIA AND SENSOR DATA

Test No.: 08-3-24 Test Date: August 7th, 2003

HEAD PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	P6 (Center) Rear Passenger			
			Max	Time	Min	Time
Head CG	X	G's	37.1	190.8	-31.1	91.3
Head CG	Y	G's	9.5	91.3	-10.6	96.1
Head CG	Z	G's	52.8	77.8	0.0	-10.0
Head CG Resultant	N/A	G's	57.2	77.8		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	P6 (Center) Rear Passenger			
			Max	Time	Min	Time
Chest CG	X	G's	8.9	219.3	-31.7	52.2
Chest CG	Y	G's	2.4	40.0	-2.1	76.3
Chest CG	Z	G's	15.0	77.1	-47.0	57.6
Chest CG Resultant	N/A	G's	54.7	56.4		

SEAT BELT SENSOR PEAK VALUES

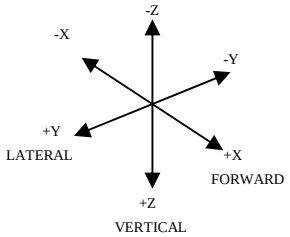
Location	Axis	Units	P6 (Center) Rear Passenger			
			Max	Time	Min	Time
Tether Belt	N/A	Newtons	NA	NA		

HEAD INJURY CRITERIA (HIC)

Location	P6 (Center) Rear Passenger			
	HIC	Avg. G's	T^1	T^2
Head CG Primary (36 msec)	430.0	42.7	59.9	95.9
Head CG Primary (15 msec)	311.1	53.3	68.1	83.1

CHEST CLIP (3 MSEC)

Location	P6 (Center) Rear Passenger		
	Clip	T^1	T^2
Chest CG Primary	53.6	55.1	58.1



HYBRID III 3 YEAR OLD ATD INJURY CRITERIA AND SENSOR DATA…(continued)

Test No.: 08-3-24 Test Date: August 7th, 2003

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	P6 (Center) Rear Passenger			
			Max	Time	Min	Time
Pelvis	X	G's	11.3	153.2	-42.1	57.1
Pelvis	Y	G's	3.1	43.3	-6.2	57.9
Pelvis	Z	G's	9.3	87.4	-57.7	57.9

UPPER NECK PEAK FORCES AND MOMENTS

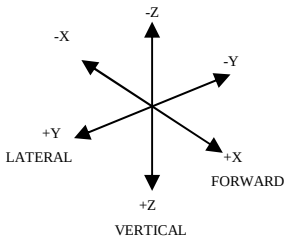
Location	Axis	Units	P6 (Center) Rear Passenger			
			Max	Time	Min	Time
Neck Force	X	Newtons	31.4	236.4	-722.9	83.9
Neck Force	Y	Newtons	25.8	75.1	-47.1	92.0
Neck Force	Z	Newtons	1763.4	74.9	-37.6	223.5
Neck Moment	X	Nm	3.0	78.2	-2.6	103.8
Neck Moment	Y	Nm	6.5	67.5	-13.2	40.6
Neck Moment	Z	Nm	2.0	93.4	-0.7	159.9

LOWER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	P6 (Center) Rear Passenger			
			Max	Time	Min	Time
Neck Force	X	Newtons	261.3	190.4	-1624.8	78.2
Neck Force	Y	Newtons	40.7	64.9	-39.0	160.9
Neck Force	Z	Newtons	701.8	74.8	-175.6	56.8
Neck Moment	X	Nm	3.4	75.7	-5.7	97.3
Neck Moment	Y	Nm	129.0	78.5	-16.2	191.7
Neck Moment	Z	Nm	2.4	63.5	-1.5	160.2

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	P6 (Center) Rear Passenger			
			Max	Time	Min	Time
Chest CG	X	mm	0.3	249.9	-23.0	90.9



HYBRID III 3 YEAR OLD ATD INJURY CRITERIA AND SENSOR DATA

Test No.: 08-3-25 Test Date: August 7th, 2003

HEAD PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	P6 (Center) Rear Passenger			
			Max	Time	Min	Time
Head CG	X	G's	79.0	171.4	-60.3	72.2
Head CG	Y	G's	9.9	171.0	-5.8	100.0
Head CG	Z	G's	37.3	45.4	-0.0	-18.9
Head CG Resultant	N/A	G's	81.3	171.4		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	P6 (Center) Rear Passenger			
			Max	Time	Min	Time
Chest CG	X	G's	15.4	189.3	-53.1	42.5
Chest CG	Y	G's	2.2	188.8	-6.0	80.2
Chest CG	Z	G's	12.8	189.3	-29.5	59.2
Chest CG Resultant	N/A	G's	53.2	42.5		

SEAT BELT SENSOR PEAK VALUES

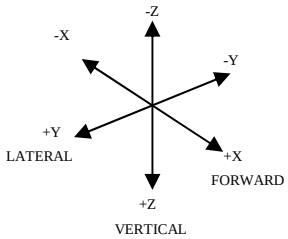
Location	Axis	Units	P6 (Center) Rear Passenger			
			Max	Time	Min	Time
Tether Belt	N/A	Newtons	NA	NA		

HEAD INJURY CRITERIA (HIC)

Location	P6 (Center) Rear Passenger			
	HIC	Avg. G's	T^1	T^2
Head CG Primary (36 msec)	591.2	48.5	47.9	83.9
Head CG Primary (15 msec)	372.4	57.3	66.2	81.2

CHEST CLIP (3 MSEC)

Location	P6 (Center) Rear Passenger		
	Clip	T^1	T^2
Chest CG Primary	49.8	41.1	44.1



HYBRID III 3 YEAR OLD ATD INJURY CRITERIA AND SENSOR DATA…(continued)

Test No.: 08-3-25 Test Date: August 7th, 2003

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	P6 (Center) Rear Passenger			
			Max	Time	Min	Time
Pelvis	X	G's	25.2	82.3	-37.2	63.4
Pelvis	Y	G's	3.8	51.6	-7.0	66.6
Pelvis	Z	G's	14.5	191.4	-56.9	74.1

UPPER NECK PEAK FORCES AND MOMENTS

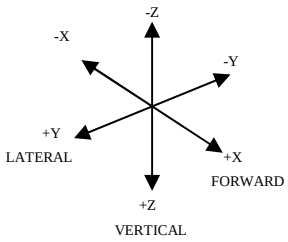
Location	Axis	Units	P6 (Center) Rear Passenger			
			Max	Time	Min	Time
Neck Force	X	Newtons	89.7	165.6	-1428.5	71.9
Neck Force	Y	Newtons	23.8	54.5	-68.3	92.4
Neck Force	Z	Newtons	1968.9	73.4	-51.0	189.4
Neck Moment	X	Nm	1.8	56.7	-5.3	94.8
Neck Moment	Y	Nm	7.0	66.0	-25.3	49.1
Neck Moment	Z	Nm	2.8	104.8	-2.8	219.8

LOWER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	P6 (Center) Rear Passenger			
			Max	Time	Min	Time
Neck Force	X	Newtons	318.7	171.3	-2223.9	74.8
Neck Force	Y	Newtons	77.5	47.9	-90.3	91.2
Neck Force	Z	Newtons	1081.5	45.3	-593.2	72.2
Neck Moment	X	Nm	3.3	53.9	-13.2	92.6
Neck Moment	Y	Nm	N/A	N/A	-20.4	171.0
Neck Moment	Z	Nm	1.3	124.3	-7.4	92.6

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	P6 (Center) Rear Passenger			
			Max	Time	Min	Time
Chest CG	X	mm	0.0	-16.1	-29.2	90.5



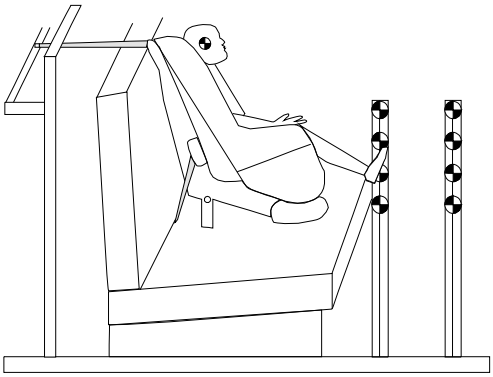
SECTION 5

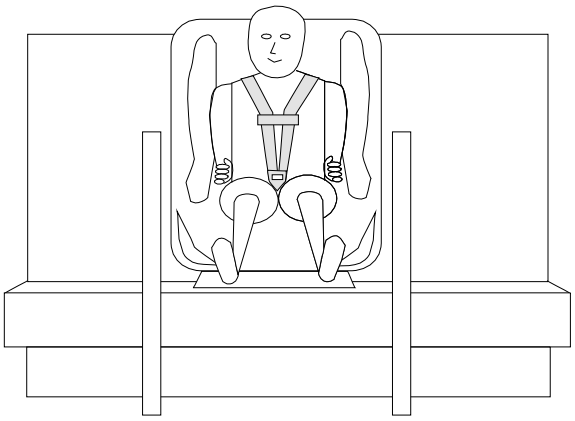
SLED TEST SET-UP

Test No.: 08-3-24 Test Date: August 7th, 2003
Test No.: 08-3-25 Test Date: August 7th, 2003

An FMVSS 213 test bench was fastened on the sled in order to simulate a frontal impact. One child seat was 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 dummy head and knee excursions.

Pre-test Infant and Car Seat Positions



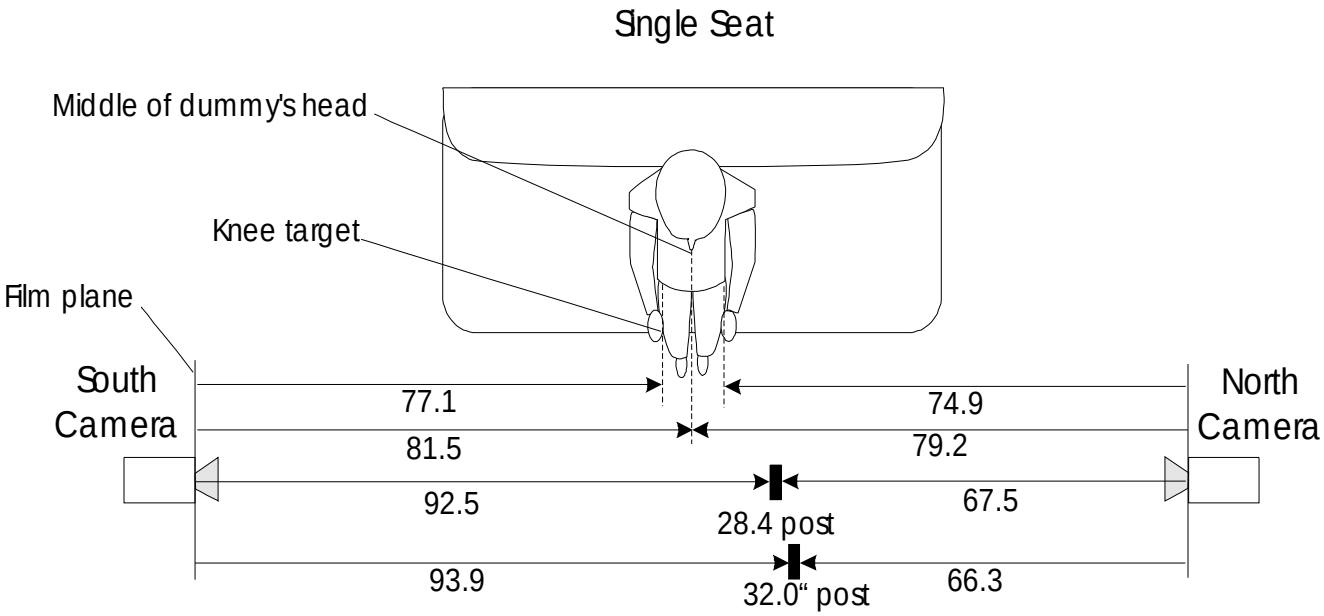


SECTION 6

CAMERA LOCATION

Test No.: 08-3-24 Test Date: August 7th, 2003
Test No.: 08-3-25 Test Date: August 7th, 2003

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



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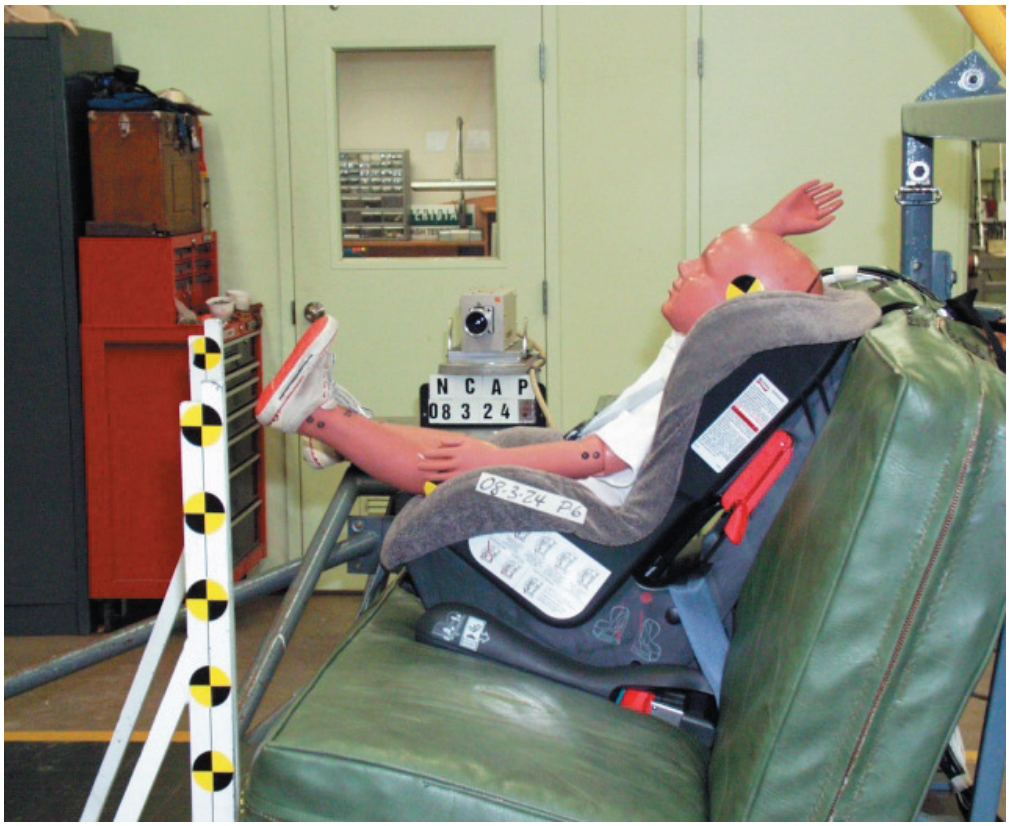
Pre Test Right Front View - Test 08-3-24

Post Test Right Front View - Test 08-3-24

Pre Test Left Front View - Test 08-3-24

Post Test Left Front View - Test 08-3-24

Pre Test Left Side View - Test 08-3-24



Post Test Left Side View - Test 08-3-24

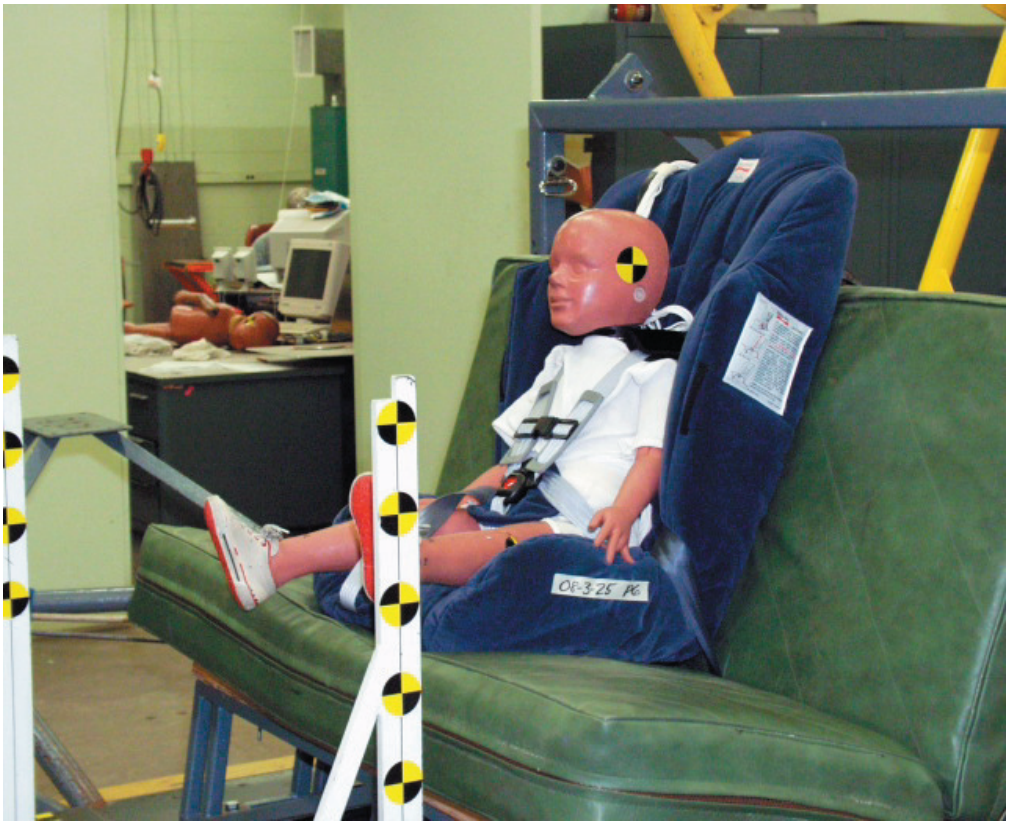
Pre Test Right Side View - Test 08-3-25

Post Test Right Side View - Test 08-3-25

Pre Test Right Front View - Test 08-3-25

Post Test Right Front View - Test 08-3-25

Pre Test Left Front View - Test 08-3-25



Post Test Left Front View - Test 08-3-25

Pre Test Left Side View - Test 08-3-25

Post Test Left Side View - Test 08-3-25

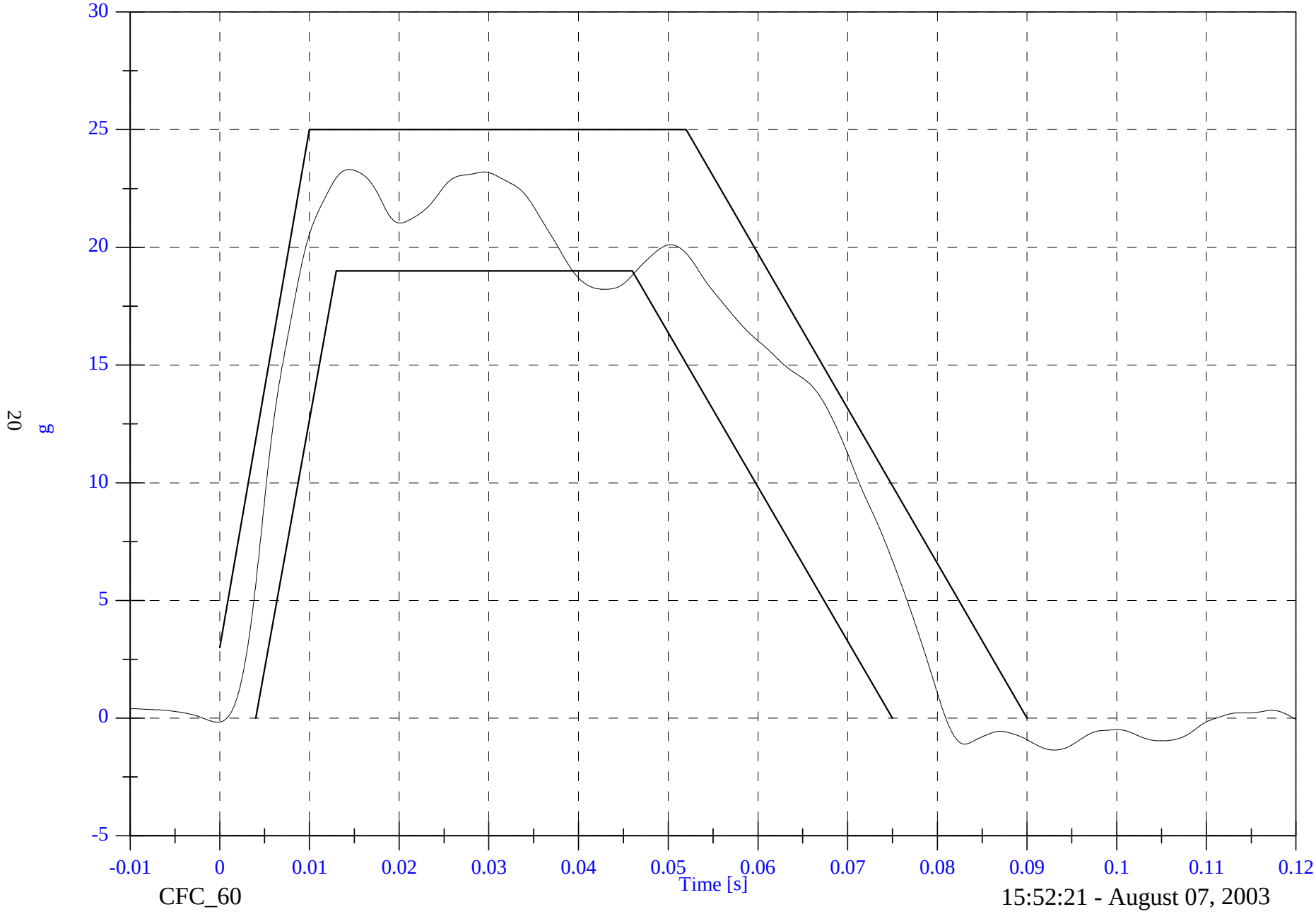
SECTION 8

Data Plots

Sled Test NCAP SLED 08-3-24

Sled Pulse Corridor

Max: 23.3 [g] at 0.014 [s]
Min: -1.8 [g] at 1.141 [s]



CFC_60

15:52:21 - August 07, 2003

FACILITY: HYGE SLED DATE: August 07, 2003
TEST#: 08-3-24
TITLE: Sled Test NCAP SLED 08-3-24

CHN	NAME	Unit	Max	msec	Min	msec	Filt	Comment
26	Sled Acceleration	g	23.3	14.4	-1.4	93.0	CFC_60	
27	Sled Acceleration Velocity	kph	47.1	80.8	-0.0	-20.0	CFC_180	
28	Sled Acceleration Displacement	mm	2706.6	249.9	-0.1	-9.8	CFC_180	
29	P6 Head x	g	37.1	190.8	-31.1	91.3	CFC_1000	
30	P6 Head y	g	9.5	91.3	-10.6	96.1	CFC_1000	
31	P6 Head z	g	52.8	77.8	0.0	-10.0	CFC_1000	
32	P6 Head Resultant	g	57.2	77.8	0.0	-17.7	CFC_1000	
33	P6 Upper Neck Fx	N	31.4	236.4	-722.9	83.9	CFC_1000	
34	P6 Upper Neck Fy	N	25.8	75.1	-47.1	92.0	CFC_1000	
35	P6 Upper Neck Fz	N	1763.4	74.9	-37.6	223.5	CFC_1000	
36	P6 Upper Neck F Resultant	N	1865.1	74.9	0.0	-16.2	CFC_1000	
37	P6 Upper Neck Mx	N-m	3.0	78.2	-2.6	103.9	CFC_600	
38	P6 Upper Neck My	N-m	6.5	67.5	-13.2	40.6	CFC_600	
39	P6 Upper Neck Mz	N-m	2.0	93.4	-0.7	159.9	CFC_600	
40	P6 Upper Neck M Resultant	N-m	13.2	40.6	0.0	-11.8	CFC_600	
41	P6 Lower Neck Fx	N	261.3	190.4	-1624.8	78.2	CFC_1000	
42	P6 Lower Neck Fy	N	40.7	64.9	-39.0	160.9	CFC_1000	
43	P6 Lower Neck Fz	N	701.8	74.8	-175.6	56.8	CFC_1000	
44	P6 Lower Neck F Resultant	N	1754.9	78.0	0.0	-18.0	CFC_1000	
45	P6 Lower Neck Mx	N-m	3.4	75.7	-5.7	97.3	CFC_600	
46	P6 Lower Neck My	N-m	129.0	78.5	-16.2	191.7	CFC_600	
47	P6 Lower Neck Mz	N-m	2.4	63.5	-1.5	160.2	CFC_600	
48	P6 Lower Neck M Resultant	N-m	129.0	78.5	0.0	-16.8	CFC_600	
49	P6 Chest x	g	8.9	219.3	-31.7	52.2	CFC_180	
50	P6 Chest y	g	2.4	40.0	-2.1	76.3	CFC_180	
51	P6 Chest z	g	15.0	77.1	-47.0	57.6	CFC_180	
52	P6 Chest Resultant	g	54.7	56.4	0.0	-19.6	CFC_180	
53	P6 Pelvic x	g	11.3	153.2	-42.1	57.1	CFC_1000	
54	P6 Pelvic y	g	3.1	43.3	-6.2	57.9	CFC_1000	
55	P6 Pelvic z	g	9.3	87.4	-57.7	57.9	CFC_1000	
56	P6 Pelvic Resultant	g	71.6	57.2	0.0	-18.2	CFC_1000	
57	P6 Head Red z	g	75.1	77.7	-13.5	194.7	CFC_1000	
58	P6 Chest Compression	mm	0.3	249.9	-23.0	90.9	CFC_600	
59	P6 Upper Neck Mocy	N-m	6.5	67.5	-13.2	40.6	CFC_600	

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FACILITY: HYGE SLED                          DATE: August 07, 2003
TEST#: 08-3-24
TITLE: Sled Test NCAP SLED 08-3-24
Version 5.00
=========================
P6 HIC(36 ms): 430.0
    t1: 59.9 msec
    t2: 95.9 msec
    Duration: 36.0 msec
    Average Acceleration: 42.7 g
    Input channels: P6 Head x (2) CFC_1000
                    P6 Head y (3) CFC_1000
                    P6 Head z (4) CFC_1000

P6 UP NECK Fx:  Max:     31.4 N 236.4 msec
                Min:   -722.9 N  83.9 msec
    Input channel: P6 Upper Neck Fx (6) CFC_1000

P6 UP NECK Fz:  Max:   1763.4 N  74.9 msec
                Min:    -37.6 N 223.5 msec
    Input channel: P6 Upper Neck Fz (8) CFC_1000

P6 UP NECK Mocy (3YO Child OOP)
                Max:      6.5 N-m  67.5 msec
                Min:    -13.2 N-m  40.6 msec
    Input channels: P6 Upper Neck Fx (6) CFC_600
                    P6 Upper Neck My (10) CFC_600
              Docy: 0

P6 UP NECK Nij (3YO Child OOP)
                Ntf:  0.86 Nij  74.7 msec    CVt: 2120 CVf: 68
                Nte:  0.83 Nij  80.3 msec    CVt: 2120 CVe: 27
                Ncf:  0.05 Nij 368.6 msec    CVc: 2120 CVf: 68
                Nce:  0.12 Nij 217.8 msec    CVc: 2120 CVe: 27
    Input channels: P6 Upper Neck Fz (8) CFC_600
                    P6 Upper Neck Mocy [N-m, CFC_600] (55)
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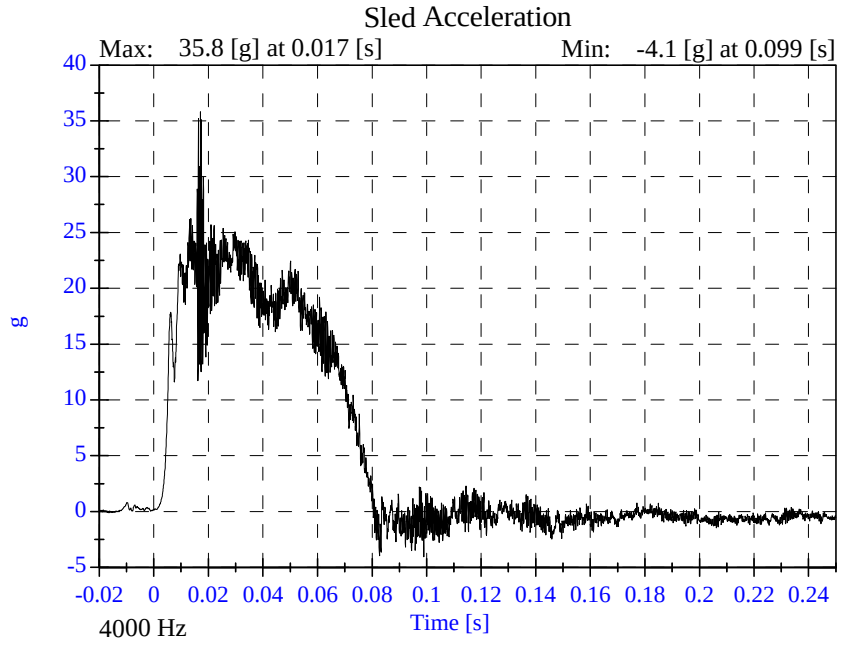
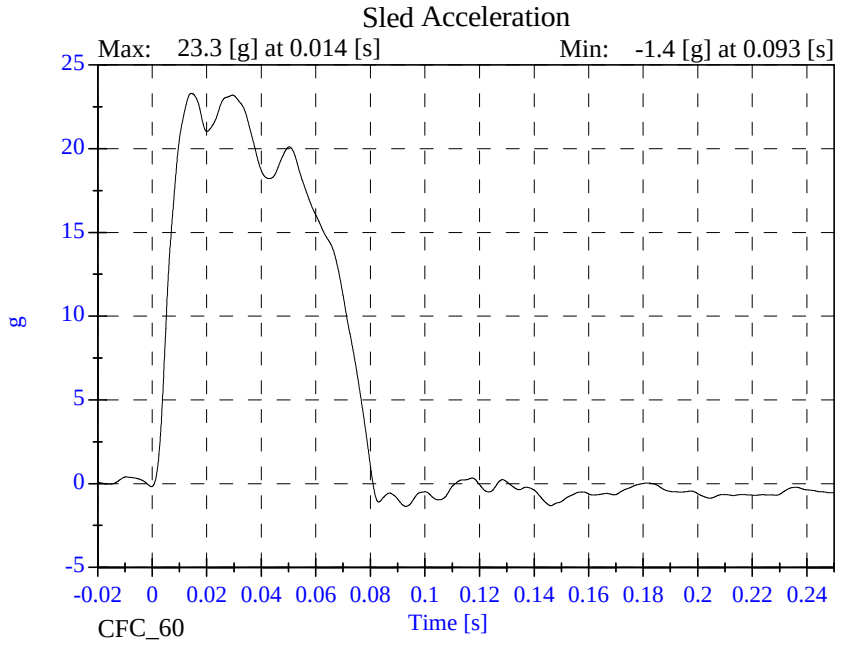
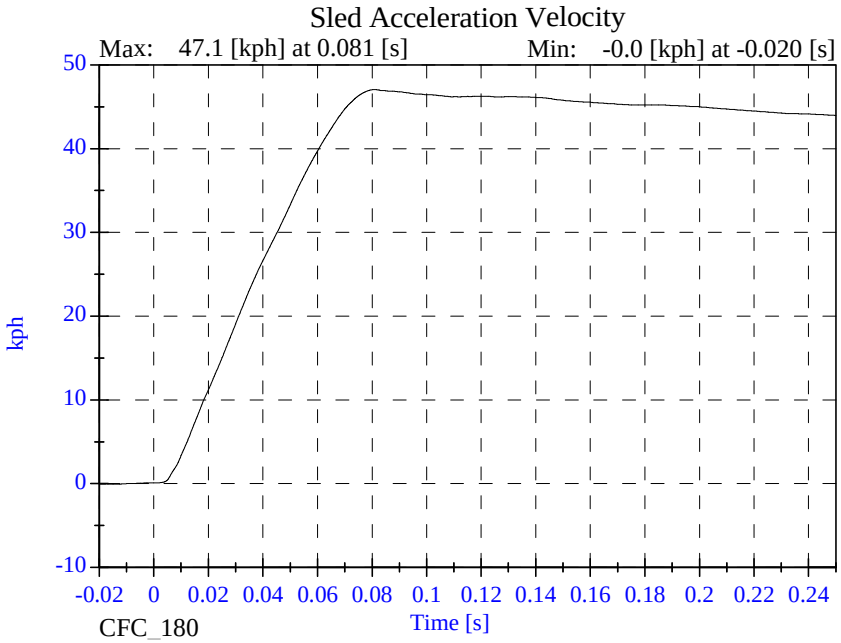
FACILITY: HYGE SLED                          DATE: August 07, 2003
TEST#: 08-3-24
TITLE: Sled Test NCAP SLED 08-3-24
Version 5.00
=========================
P6 CLIP(3 ms): 53.6 g
    t1: 55.1 msec
    t2: 58.1 msec
    Duration: 3.0 msec
P6 CSI: 378.9
    Input channels: P6 Chest x (18) CFC_180
                    P6 Chest y (19) CFC_180
                    P6 Chest z (20) CFC_180

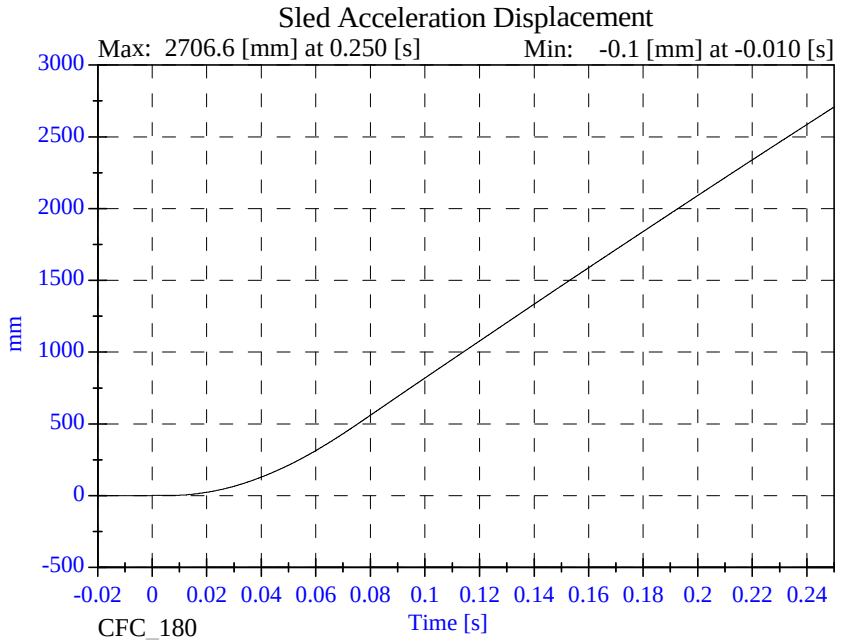
P6 CHEST DISP:  Max:      1.1 mm1500.7 msec
                Min:    -23.0 mm  90.9 msec
    Input channel: P6 Chest Compression (21) CFC_600
=========================
P6 HIC(15 ms): 311.1
    t1: 68.1 msec
    t2: 83.1 msec
    Duration: 15.0 msec
    Average Acceleration: 53.3 g
    Input channels: P6 Head x (2) CFC_1000
                    P6 Head y (3) CFC_1000
                    P6 Head z (4) CFC_1000
=========================
```

Sled Test NCAP SLED 08-3-24 - August 07, 2003



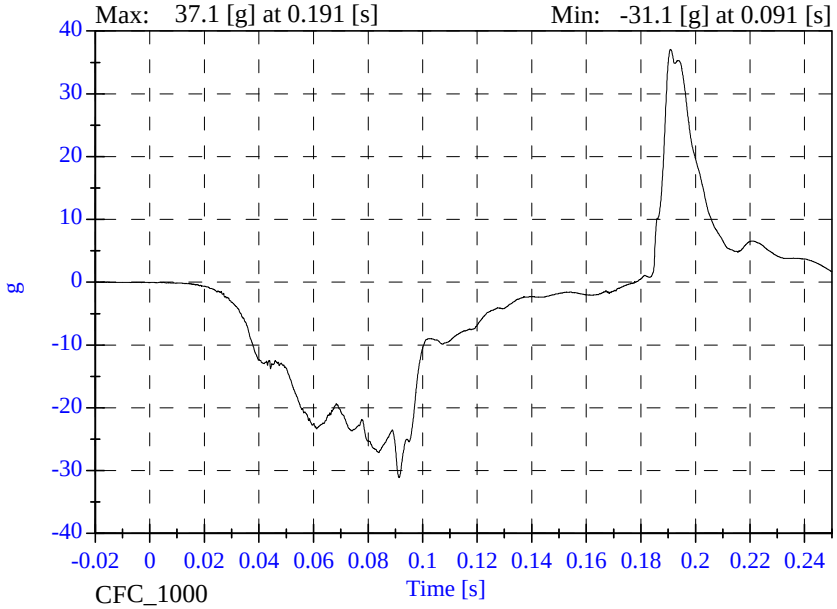




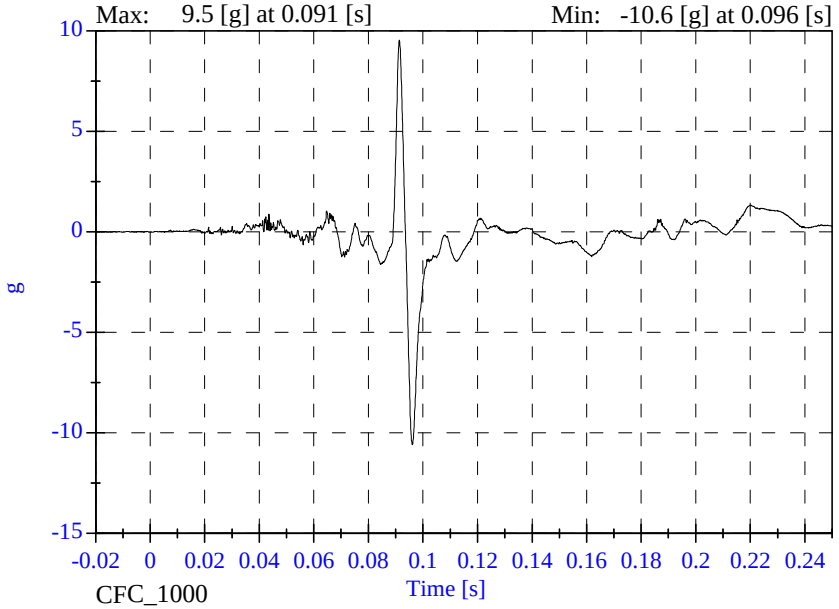


Sled Test NCAP SLED 08-3-24 - August 07, 2003

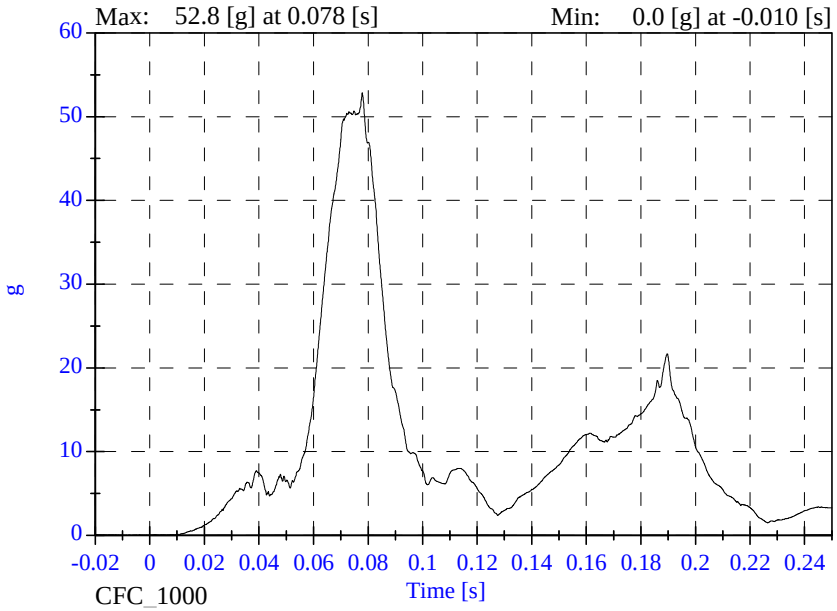
P6 Head x



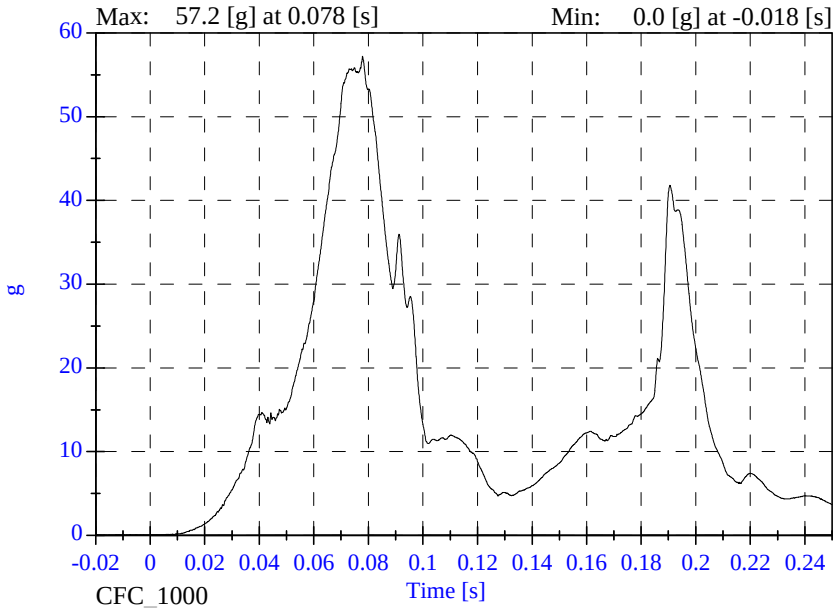
P6 Head y



P6 Head z

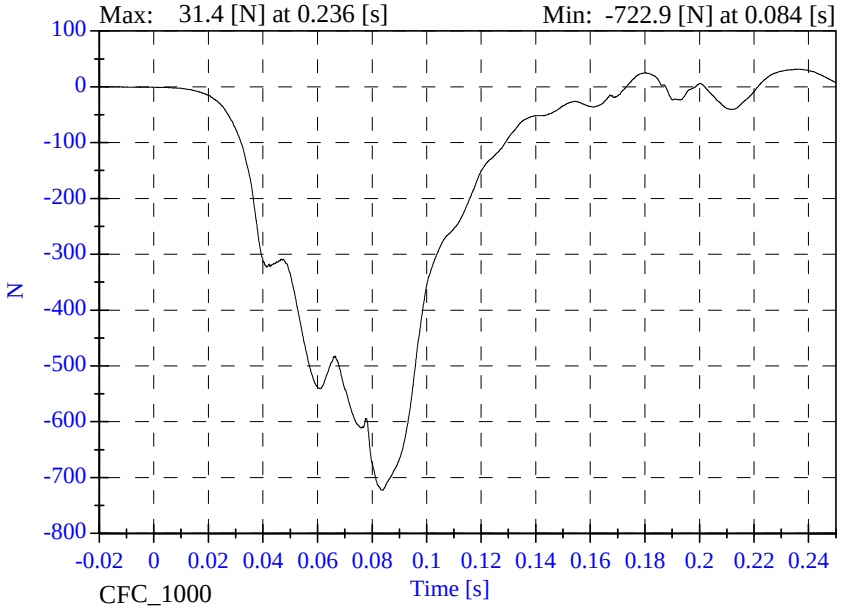


P6 Head Resultant

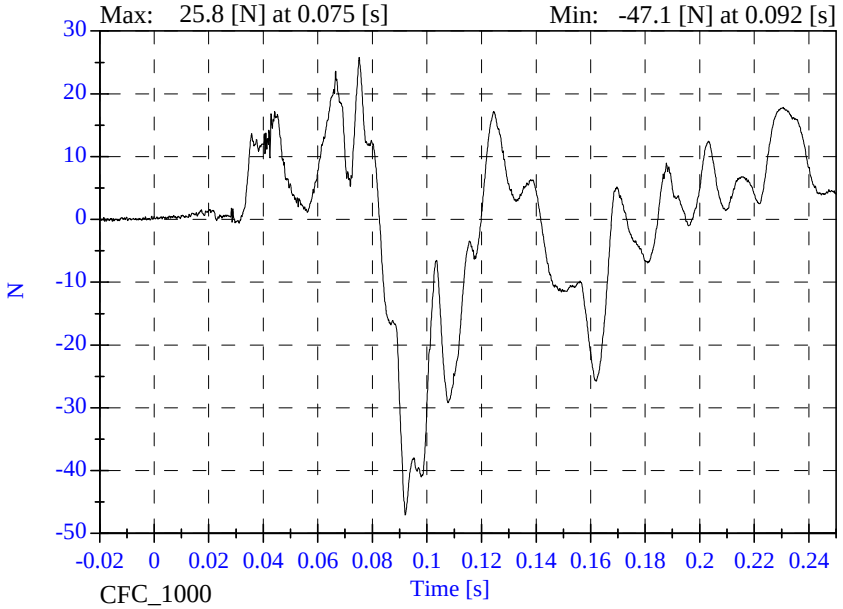


Sled Test NCAP SLED 08-3-24 - August 07, 2003

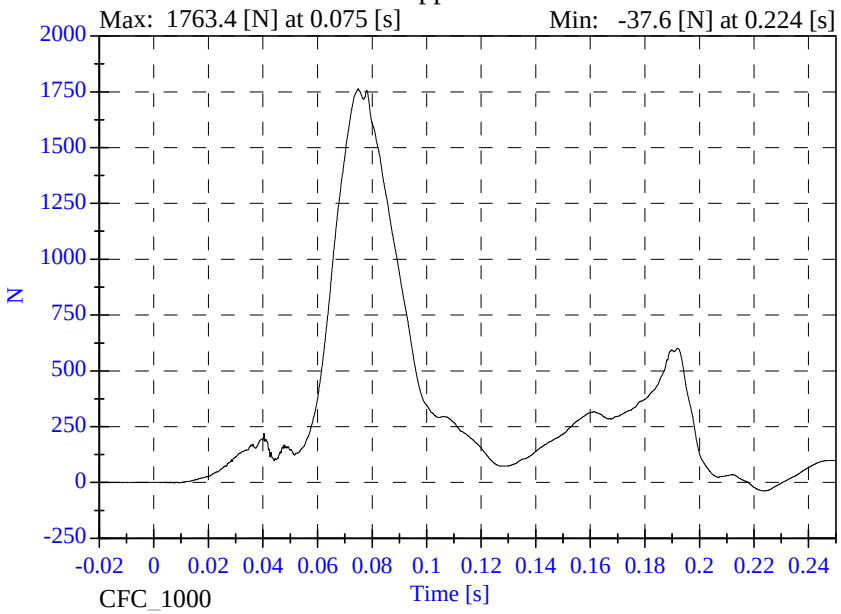
P6 Upper Neck Fx



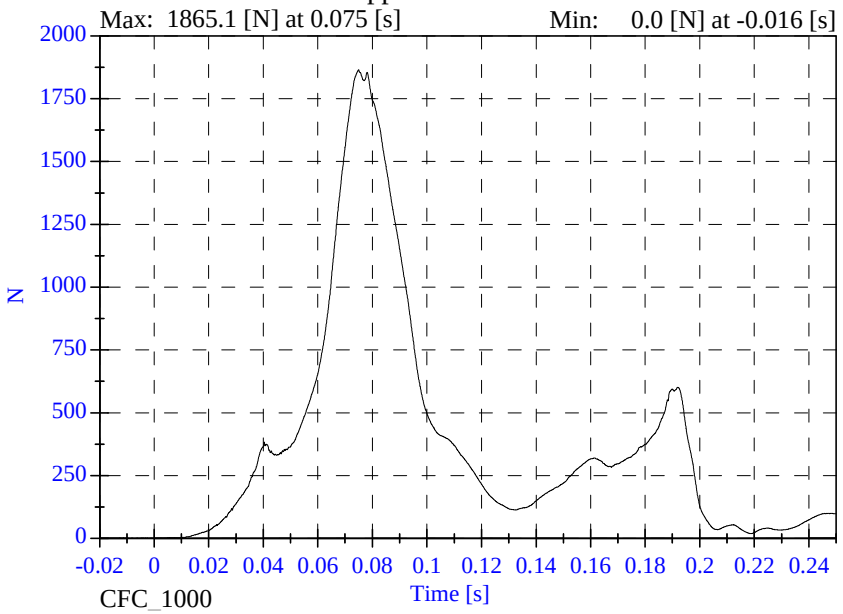
P6 Upper Neck Fy



P6 Upper Neck Fz

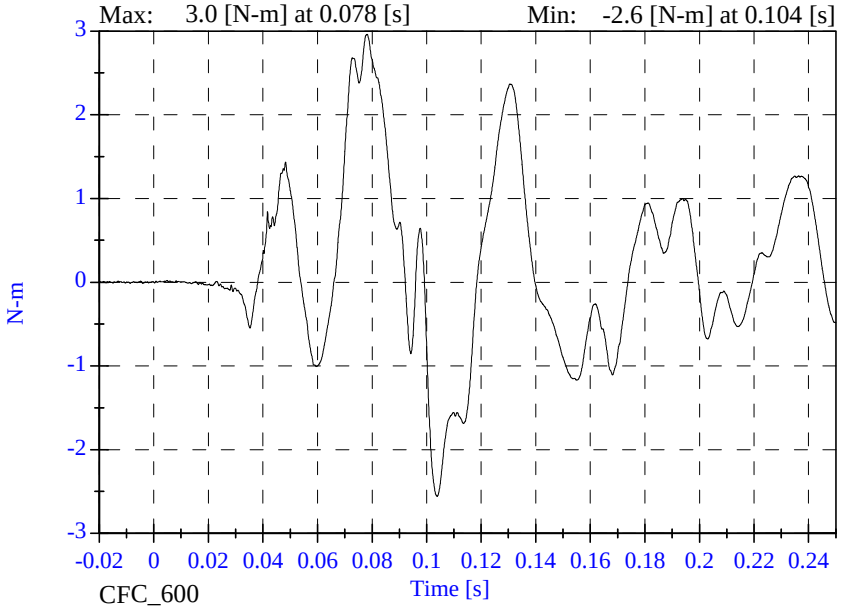


P6 Upper Neck F Resultant

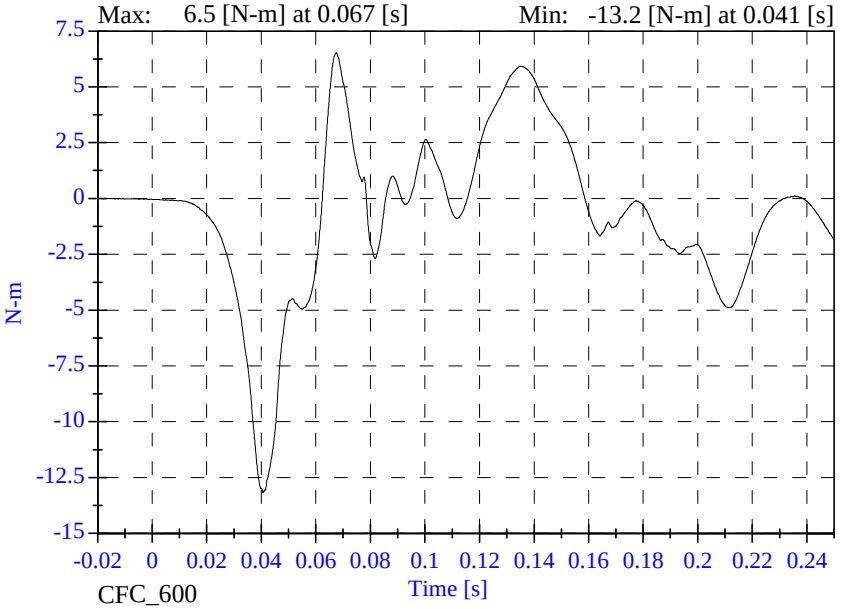


Sled Test NCAP SLED 08-3-24 - August 07, 2003

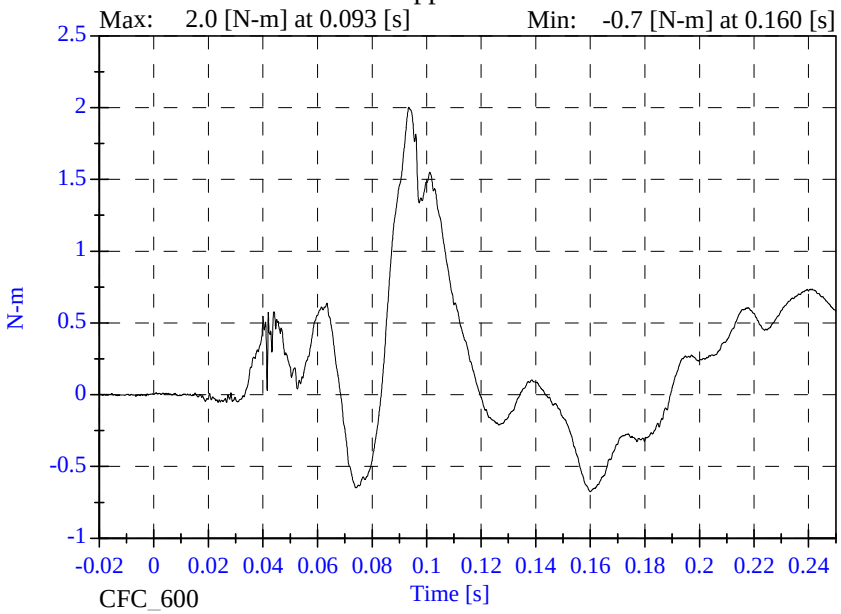
P6 Upper Neck Mx



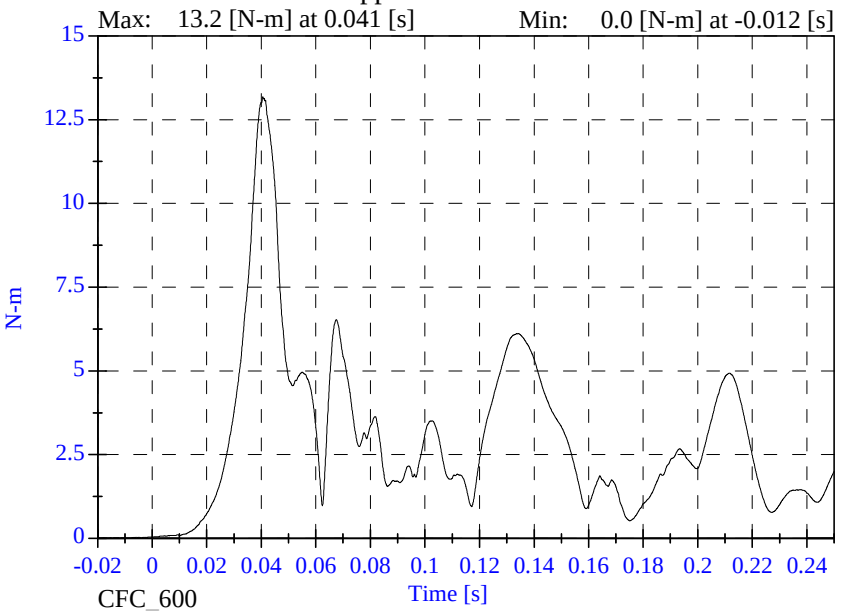
P6 Upper Neck My



P6 Upper Neck Mz

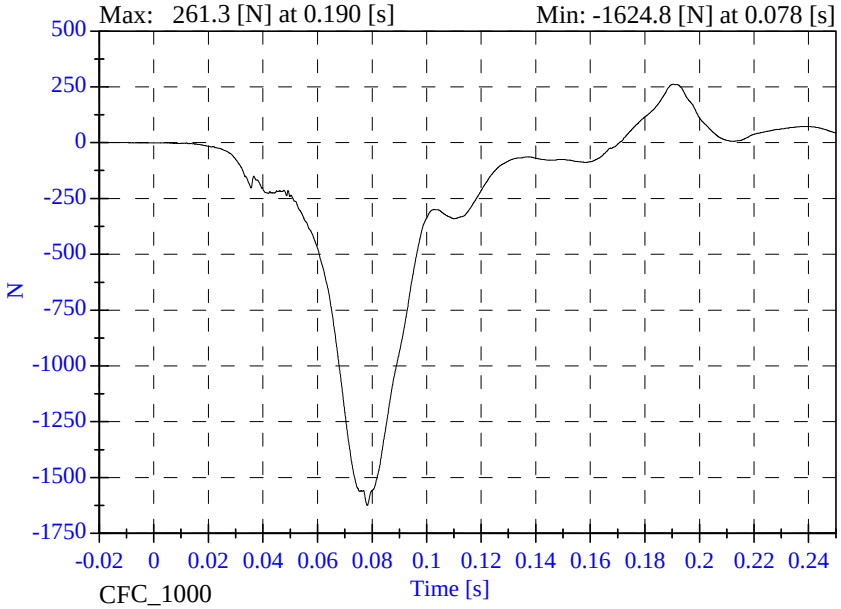


P6 Upper Neck M Resultant

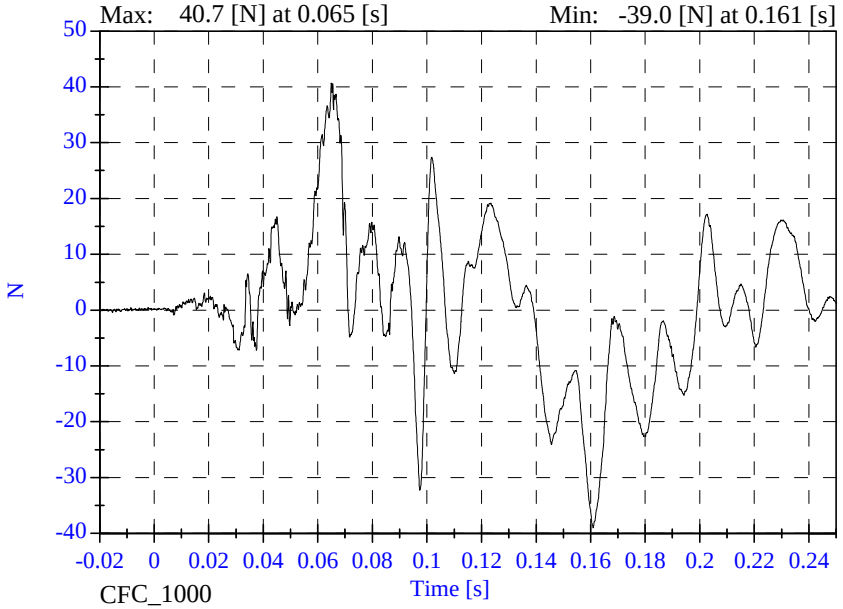


Sled Test NCAP SLED 08-3-24 - August 07, 2003

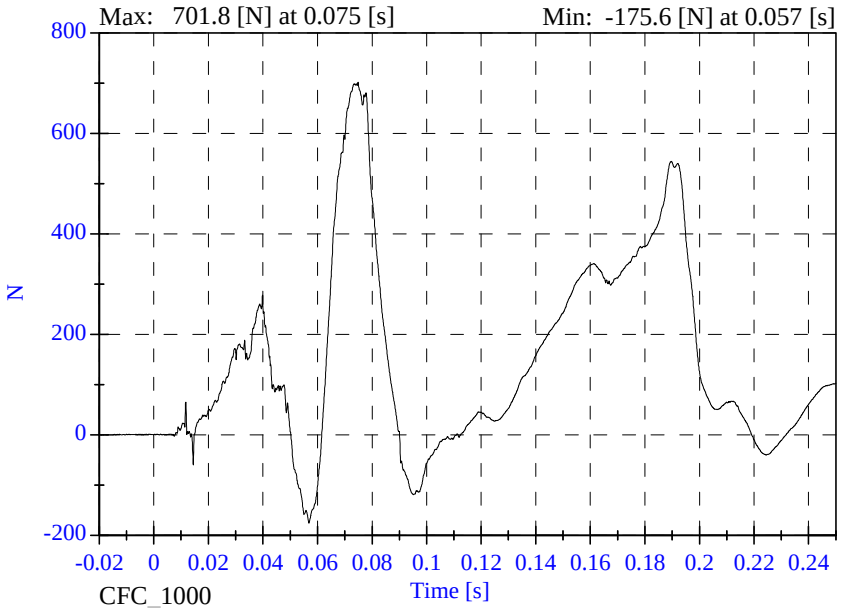
P6 Lower Neck Fx



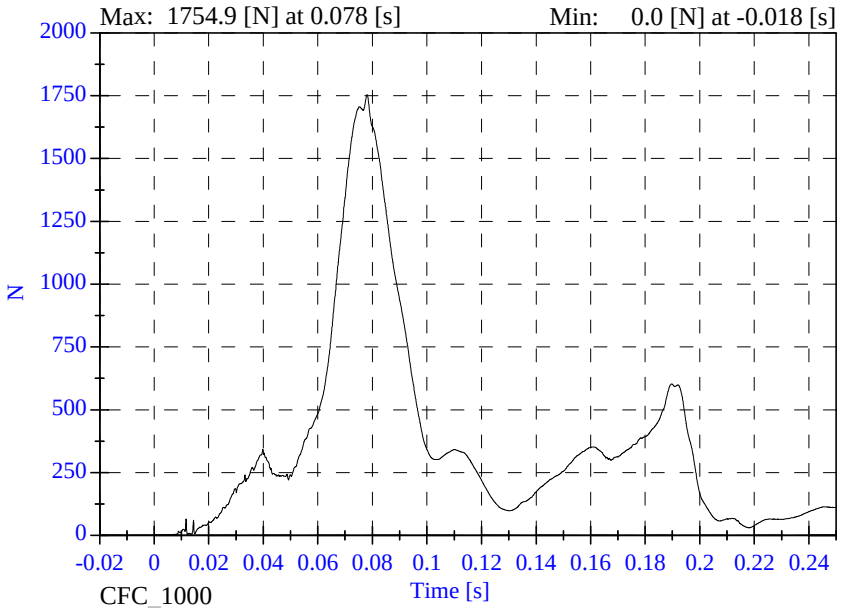
P6 Lower Neck Fy

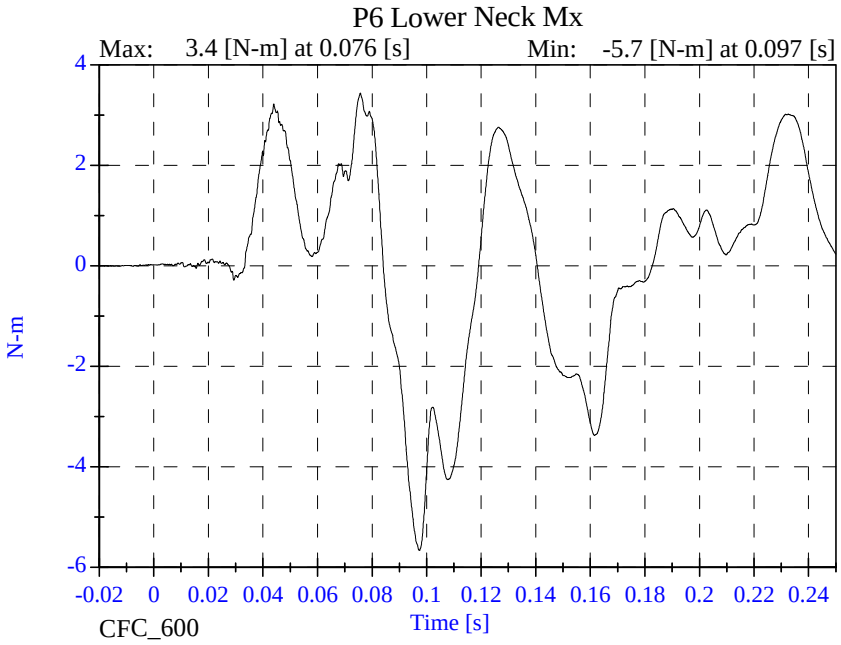


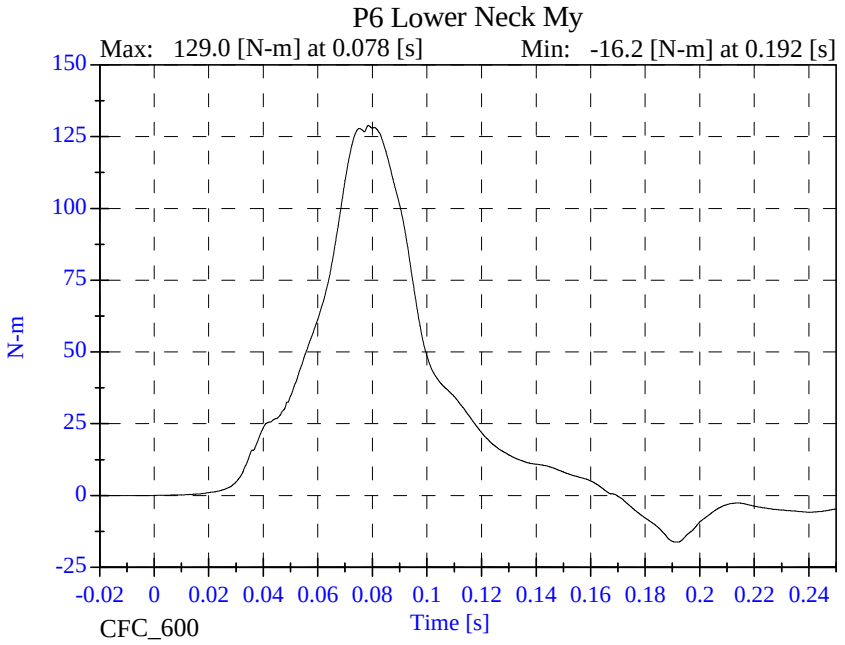
P6 Lower Neck Fz

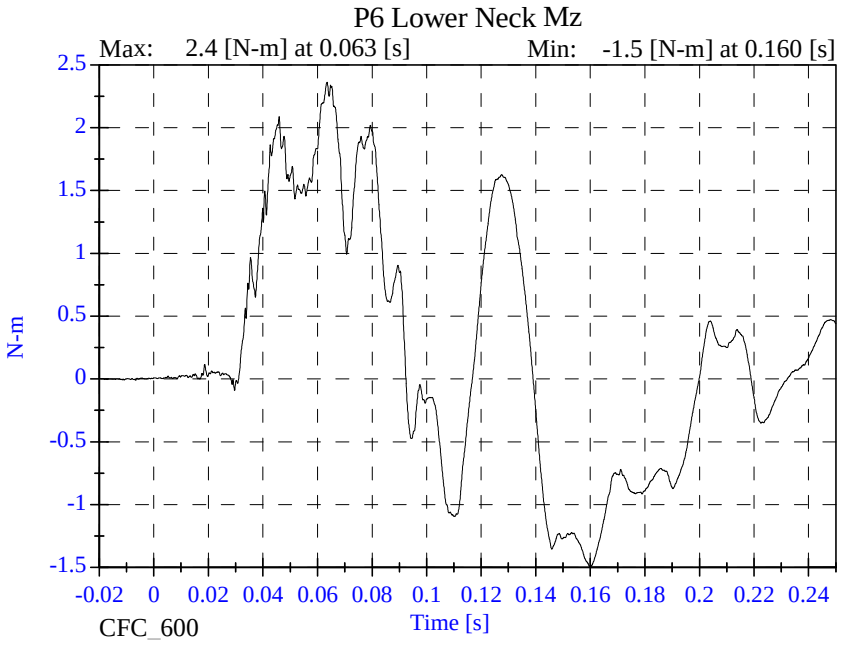


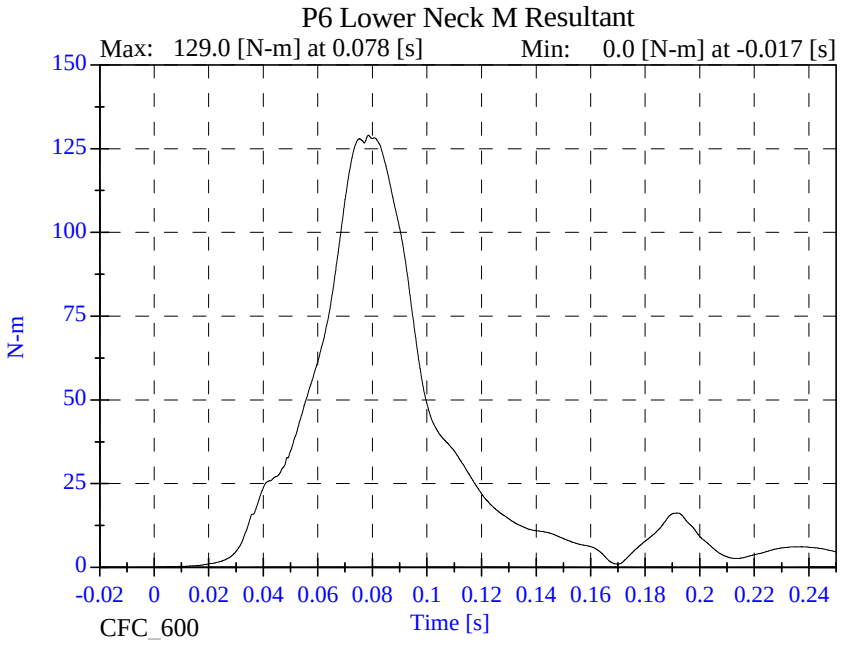
P6 Lower Neck F Resultant




P6 Lower Neck Mx
Max: 3.4 [N-m] at 0.076 [s]
Min: -5.7 [N-m] at 0.097 [s]
N-m
Time [s]
CFC_600

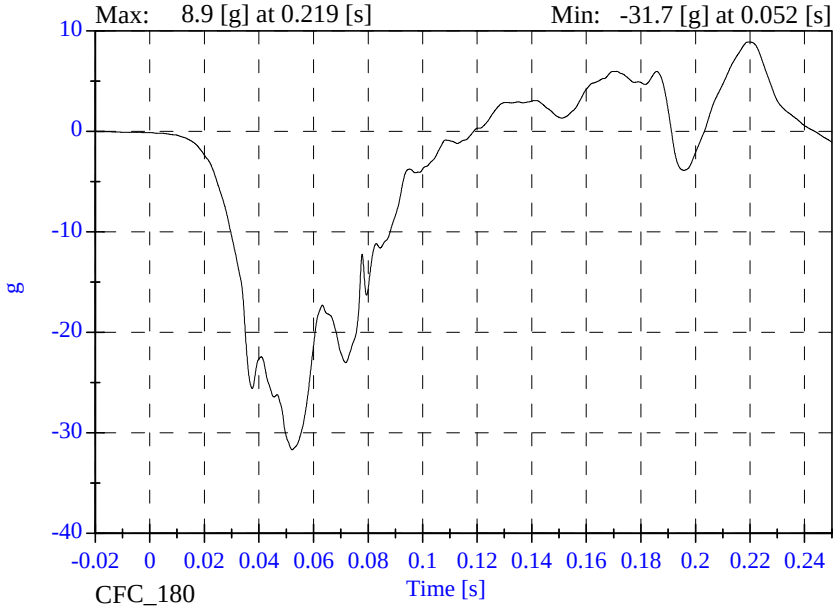

P6 Lower Neck My
Max: 129.0 [N-m] at 0.078 [s]
Min: -16.2 [N-m] at 0.192 [s]
N-m
Time [s]
CFC_600


P6 Lower Neck Mz
Max: 2.4 [N-m] at 0.063 [s]
Min: -1.5 [N-m] at 0.160 [s]
N-m
Time [s]
CFC_600

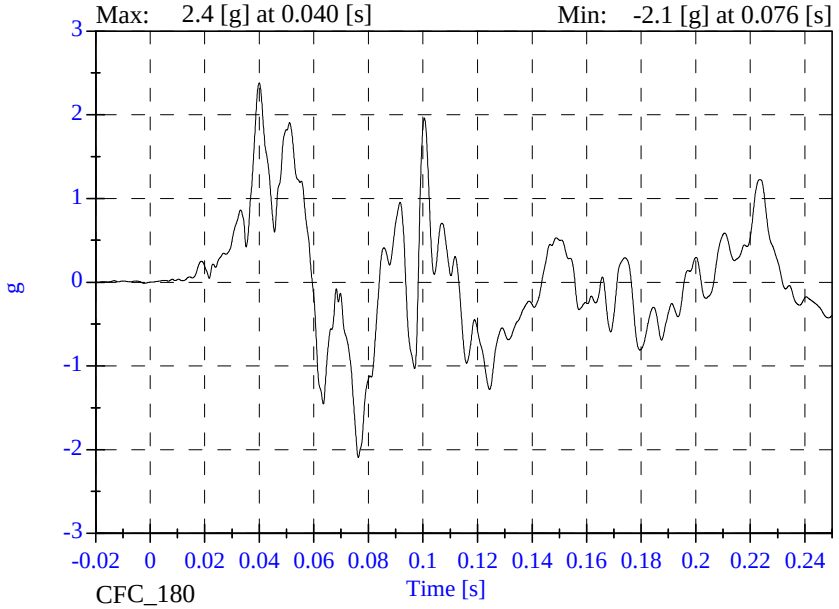

P6 Lower Neck M Resultant
Max: 129.0 [N-m] at 0.078 [s]
Min: 0.0 [N-m] at -0.017 [s]
N-m
Time [s]
CFC_600

Sled Test NCAP SLED 08-3-24 - August 07, 2003

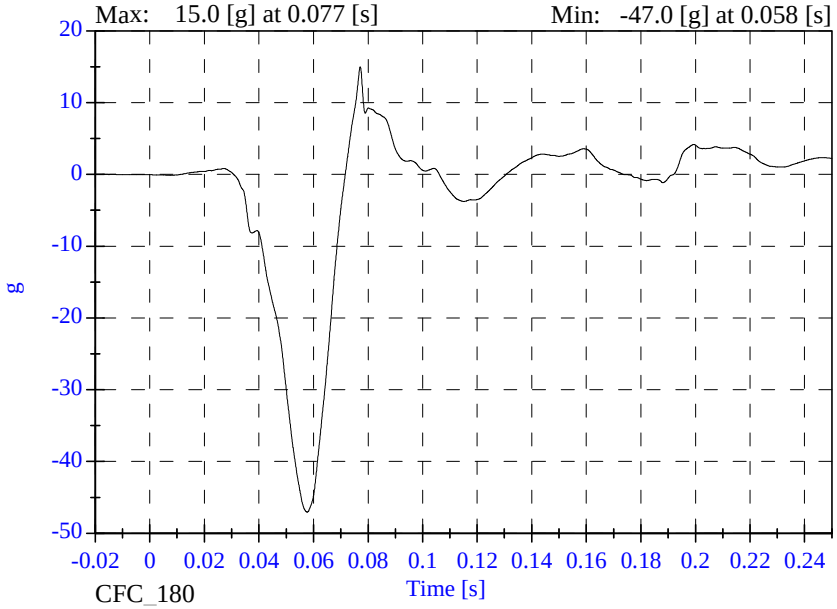
P6 Chest x



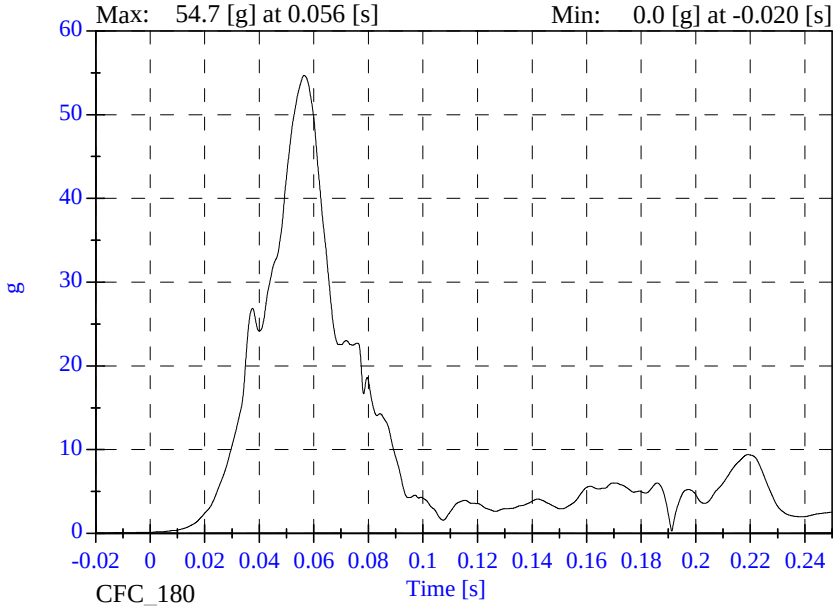
P6 Chest y



P6 Chest z

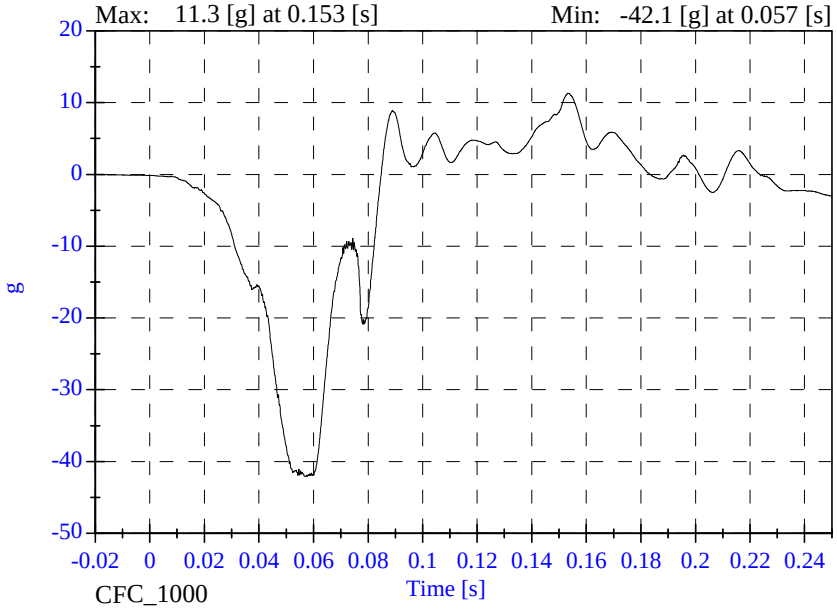


P6 Chest Resultant

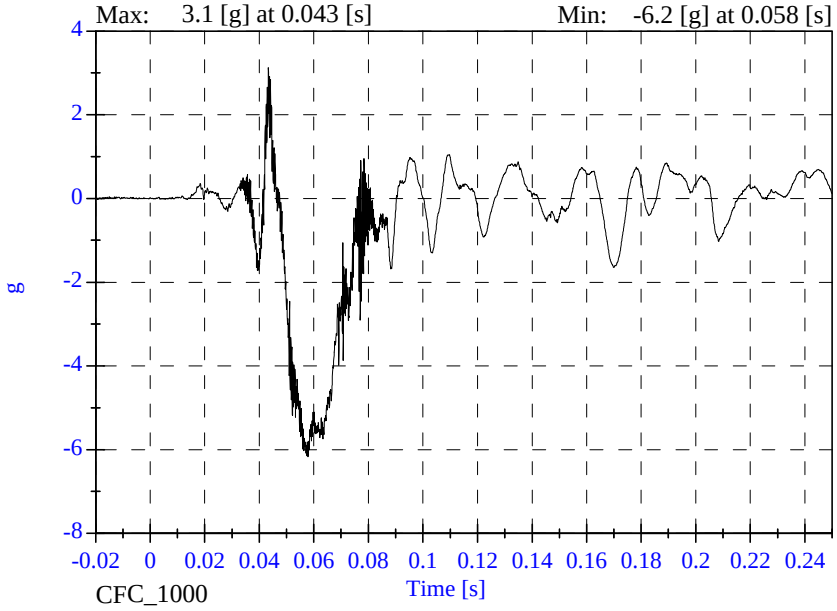


Sled Test NCAP SLED 08-3-24 - August 07, 2003

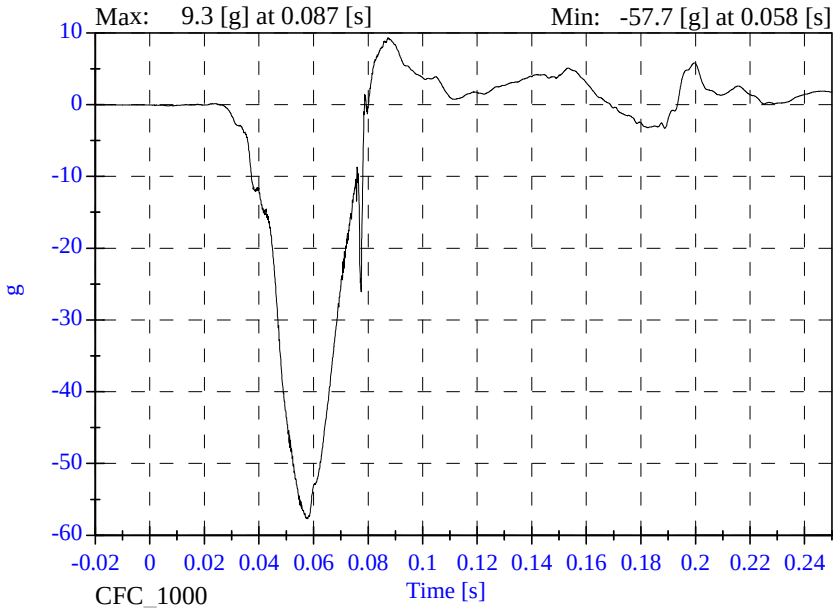
P6 Pelvic x



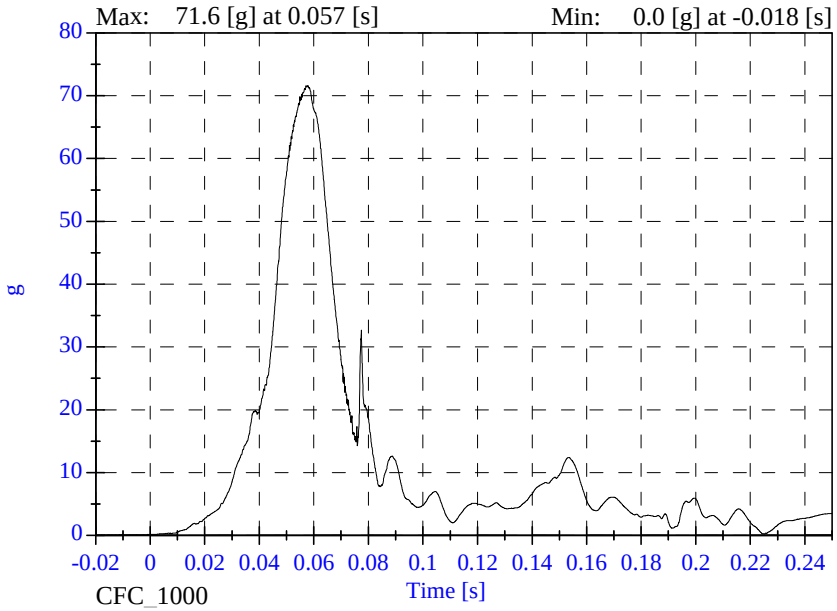
P6 Pelvic y



P6 Pelvic z



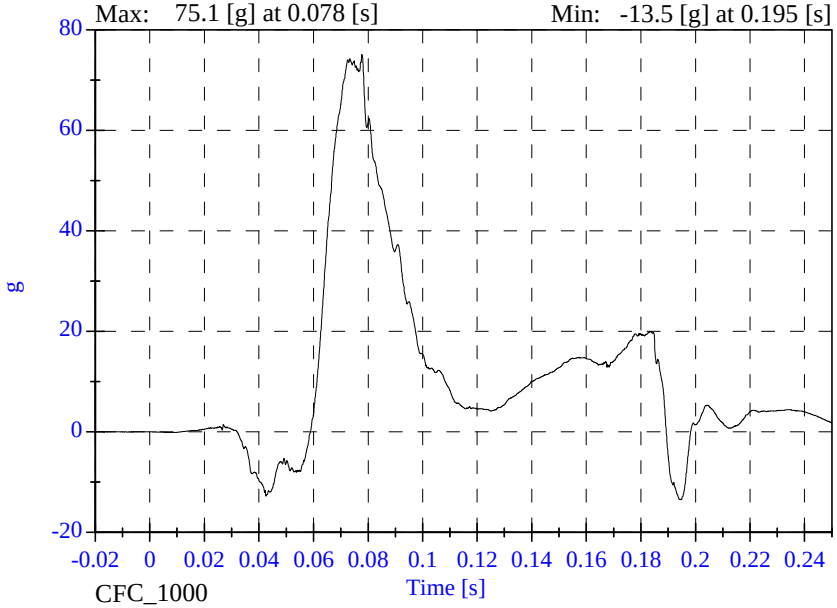
P6 Pelvic Resultant



Sled Test NCAP SLED 08-3-24 - August 07, 2003

P6 Head Red z

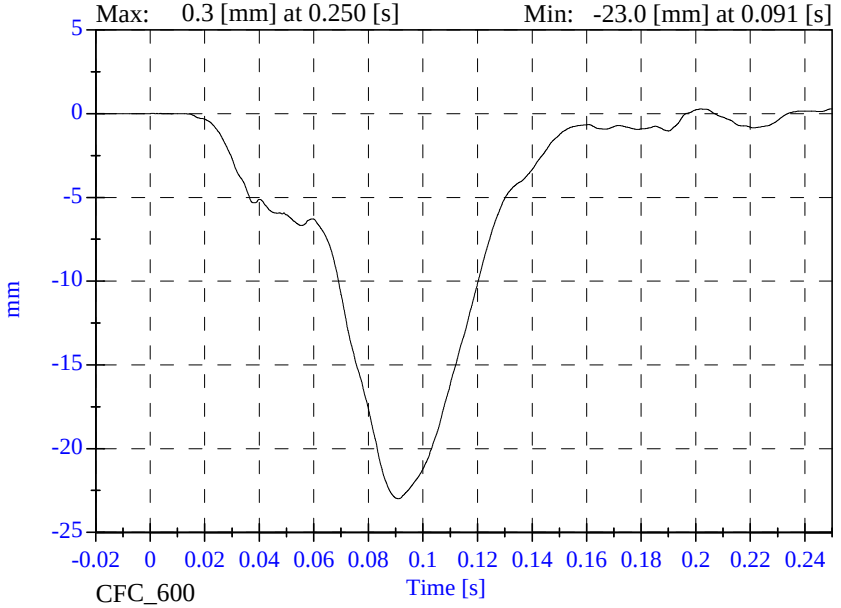
Max: 75.1 [g] at 0.078 [s] Min: -13.5 [g] at 0.195 [s]



CFC_1000

P6 Chest Compression

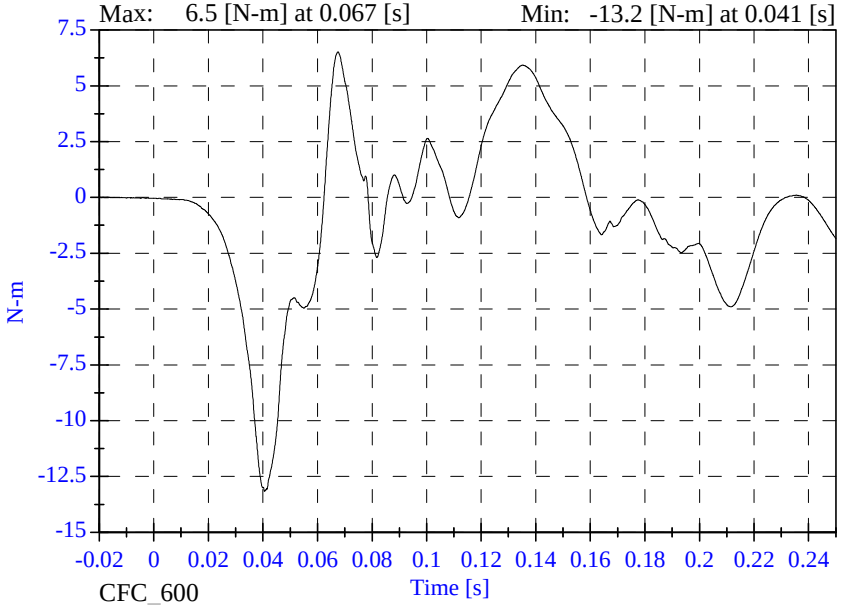
Max: 0.3 [mm] at 0.250 [s] Min: -23.0 [mm] at 0.091 [s]



CFC_600

P6 Upper Neck Mocy

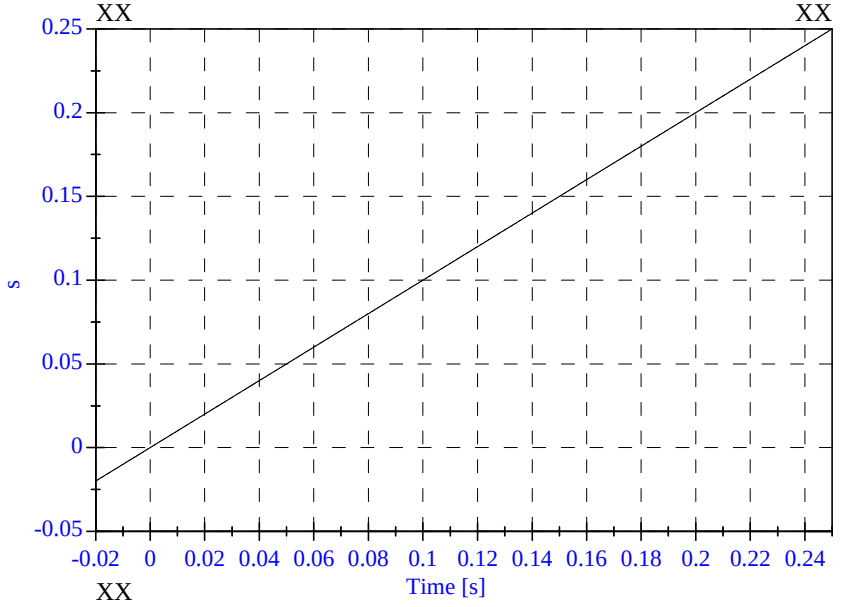
Max: 6.5 [N-m] at 0.067 [s] Min: -13.2 [N-m] at 0.041 [s]



CFC_600

BLANK

XX XX

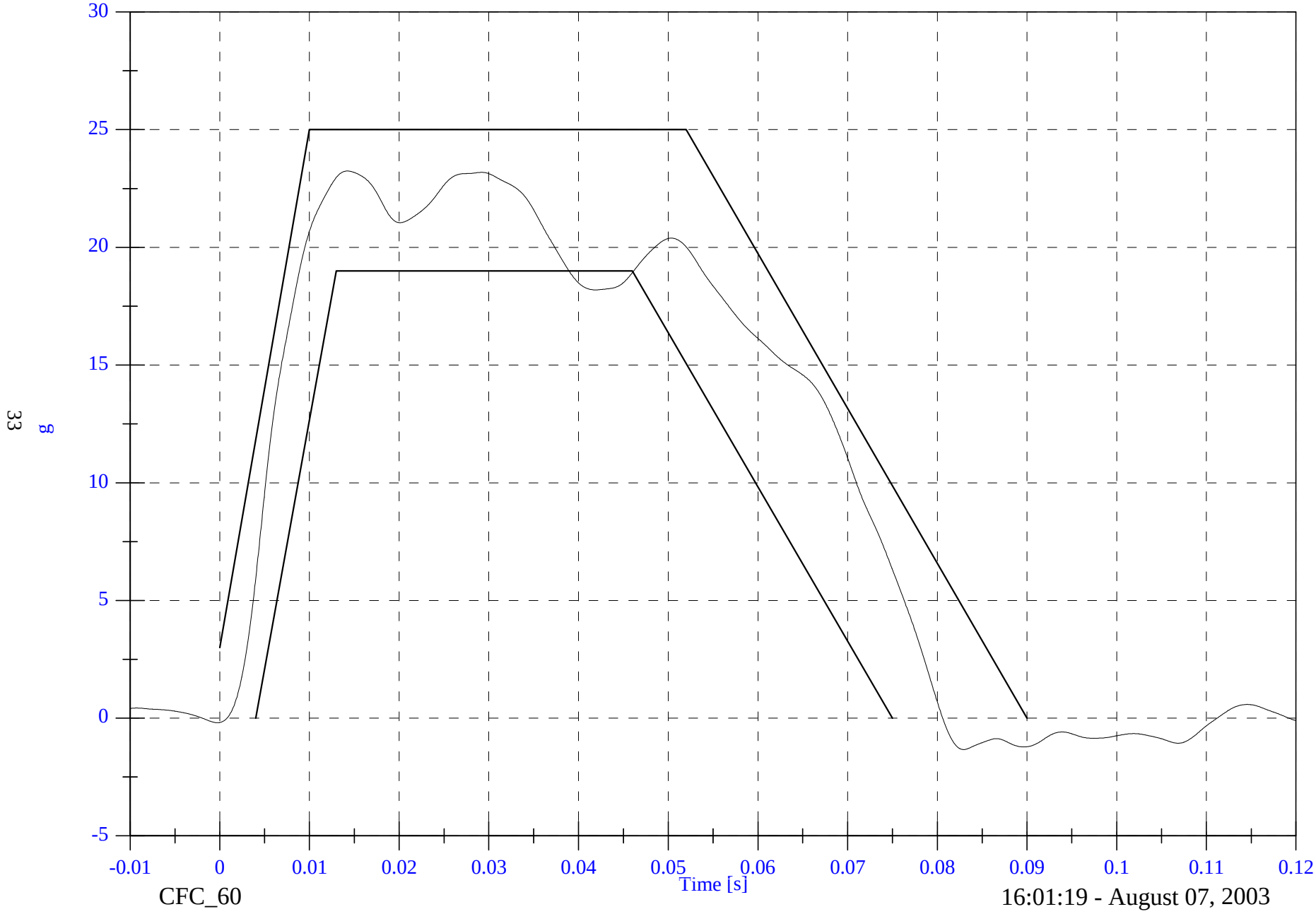


XX

Sled Test NCAP SLED 08-3-25

Sled Pulse Corridor

Max: 23.2 [g] at 0.014 [s]
Min: -1.3 [g] at 0.083 [s]



33

CFC_60

16:01:19 - August 07, 2003

FACILITY: HYGE SLED DATE: August 07, 2003
TEST#: 08-3-25
TITLE: Sled Test NCAP SLED 08-3-25

CHN	NAME	Unit	Max	msec	Min	msec	Filt	Comment
26	Sled Acceleration	g	23.2	14.2	-1.3	82.9	CFC_60	
27	Sled Acceleration Velocity	kph	47.1	80.7	-0.0	-20.0	CFC_180	
28	Sled Acceleration Displacement	mm	2707.7	250.0	-0.2	-9.7	CFC_180	
29	P6 Head x	g	79.0	171.4	-60.3	72.2	CFC_1000	
30	P6 Head y	g	9.9	171.0	-5.8	100.0	CFC_1000	
31	P6 Head z	g	37.3	45.4	-0.0	-18.9	CFC_1000	
32	P6 Head Resultant	g	81.3	171.4	0.0	-19.8	CFC_1000	
33	P6 Upper Neck Fx	N	89.7	165.6	-1428.5	71.9	CFC_1000	
34	P6 Upper Neck Fy	N	23.8	54.5	-68.3	92.4	CFC_1000	
35	P6 Upper Neck Fz	N	1968.9	73.4	-51.0	189.4	CFC_1000	
36	P6 Upper Neck F Resultant	N	2425.9	71.9	0.0	-11.0	CFC_1000	
37	P6 Upper Neck Mx	N-m	1.8	56.7	-5.3	94.8	CFC_600	
38	P6 Upper Neck My	N-m	7.0	66.0	-25.3	49.1	CFC_600	
39	P6 Upper Neck Mz	N-m	2.8	104.8	-2.8	219.8	CFC_600	
40	P6 Upper Neck M Resultant	N-m	25.4	49.1	0.0	-18.0	CFC_600	
41	P6 Lower Neck Fx	N	318.7	171.3	-2223.9	74.8	CFC_1000	
42	P6 Lower Neck Fy	N	77.5	47.9	-90.3	91.2	CFC_1000	
43	P6 Lower Neck Fz	N	1081.5	45.3	-593.2	72.2	CFC_1000	
44	P6 Lower Neck F Resultant	N	2285.8	73.0	0.0	-14.4	CFC_1000	
45	P6 Lower Neck Mx	N-m	3.3	53.9	-13.2	92.6	CFC_600	
46	P6 Lower Neck My	N-m	169.7	67.8	-20.4	171.0	CFC_600	
47	P6 Lower Neck Mz	N-m	1.3	124.3	-7.4	92.6	CFC_600	
48	P6 Lower Neck M Resultant	N-m	170.0	67.8	0.0	-16.0	CFC_600	
49	P6 Chest x	g	15.4	189.3	-53.1	42.5	CFC_180	
50	P6 Chest y	g	2.2	188.8	-6.0	80.2	CFC_180	
51	P6 Chest z	g	12.8	189.3	-29.5	59.2	CFC_180	
52	P6 Chest Resultant	g	53.2	42.5	0.0	-16.7	CFC_180	
53	P6 Pelvic x	g	25.2	82.3	-37.2	63.4	CFC_1000	
54	P6 Pelvic y	g	3.8	51.6	-7.0	66.6	CFC_1000	
55	P6 Pelvic z	g	14.5	191.4	-56.9	74.1	CFC_1000	
56	P6 Pelvic Resultant	g	63.3	74.1	0.0	-17.4	CFC_1000	
57	P6 Chest Compression	mm	0.0	-16.1	-29.2	90.5	CFC_600	
58	P6 Head Red z	g	58.5	71.2	-39.2	171.0	CFC_1000	
59	P6 Upper Neck Mocy	N-m	7.0	66.0	-25.3	49.1	CFC_600	

```
FACILITY: HYGE SLED                          DATE: August 07, 2003
TEST#: 08-3-25
TITLE: Sled Test NCAP SLED 08-3-25
Version 5.00
=========================
P6 HIC(36 ms): 591.2
    t1: 47.9 msec
    t2: 83.9 msec
    Duration: 36.0 msec
    Average Acceleration: 48.5 g
    Input channels: P6 Head x (2) CFC_1000
                    P6 Head y (3) CFC_1000
                    P6 Head z (4) CFC_1000

P6 UP NECK Fx:  Max:     89.7 N 165.6 msec
                Min:  -1428.5 N  71.9 msec
    Input channel: P6 Upper Neck Fx (6) CFC_1000

P6 UP NECK Fz:  Max:   1968.9 N  73.4 msec
                Min:    -51.0 N 189.4 msec
    Input channel: P6 Upper Neck Fz (8) CFC_1000

P6 UP NECK Mocy (3YO Child OOP)
                Max:      7.0 N-m  66.0 msec
                Min:    -25.3 N-m  49.1 msec
    Input channels: P6 Upper Neck Fx (6) CFC_600
                    P6 Upper Neck My (10) CFC_600
              Docy: 0

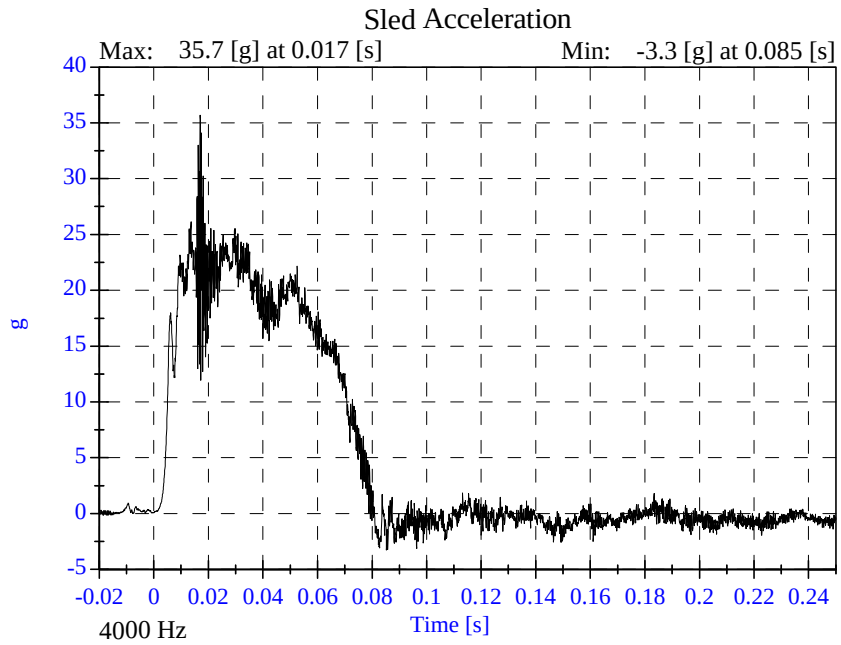
P6 UP NECK Nij (3YO Child OOP)
                Ntf:  0.92 Nij  71.1 msec    CVt: 2120 CVf: 68
                Nte:  1.38 Nij  47.9 msec    CVt: 2120 CVe: 27
                Ncf:  0.05 Nij 325.6 msec    CVc: 2120 CVf: 68
                Nce:  0.35 Nij 193.4 msec    CVc: 2120 CVe: 27
    Input channels: P6 Upper Neck Fz (8) CFC_600
                    P6 Upper Neck Mocy [N-m, CFC_600] (55)
```

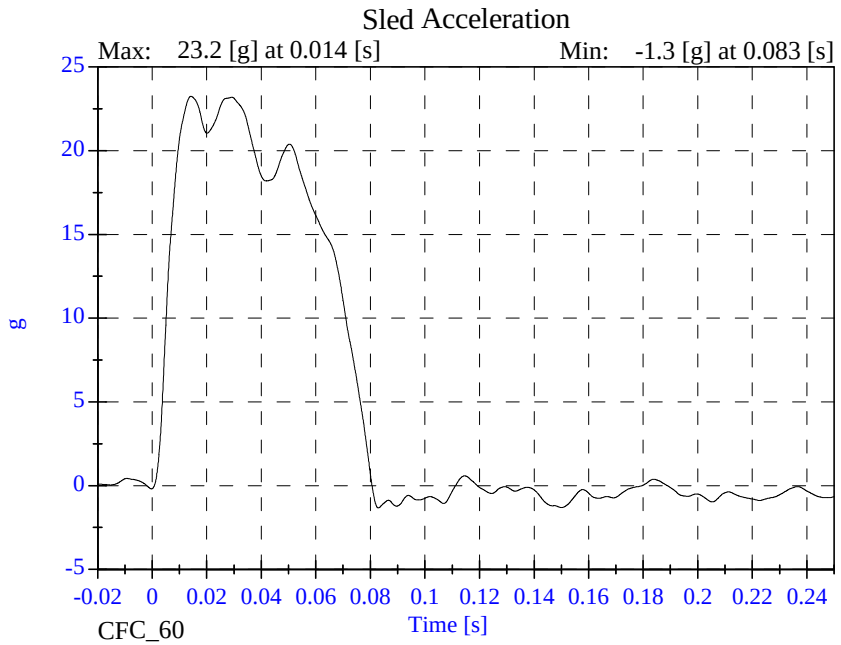
```
FACILITY: HYGE SLED                          DATE: August 07, 2003
TEST#: 08-3-25
TITLE: Sled Test NCAP SLED 08-3-25
Version 5.00
=========================
P6 CLIP(3 ms): 49.8 g
    t1: 41.1 msec
    t2: 44.1 msec
    Duration: 3.0 msec
P6 CSI: 385.0
    Input channels: P6 Chest x (18) CFC_180
                    P6 Chest y (19) CFC_180
                    P6 Chest z (20) CFC_180

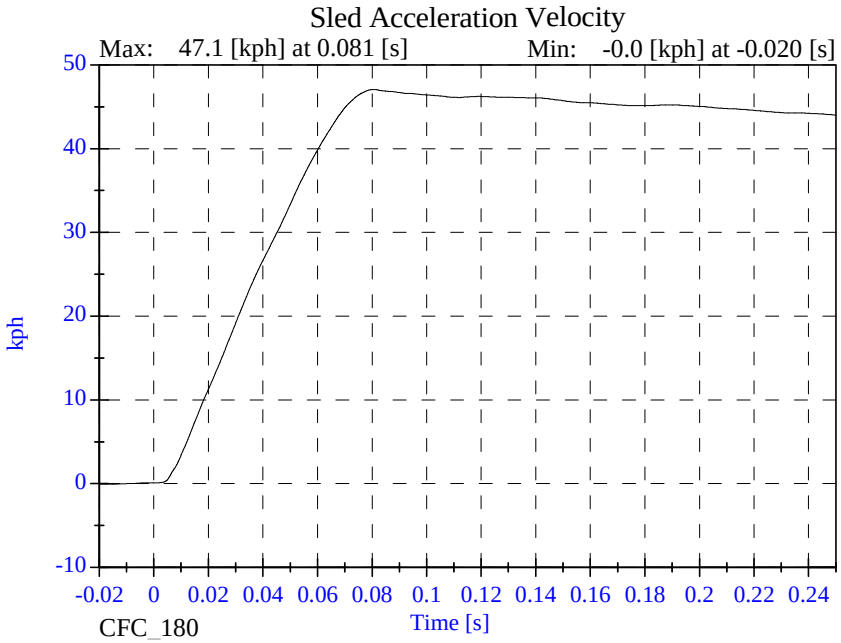
P6 CHEST DISP:  Max:      0.5 mm 1472.8 msec
                Min:    -29.2 mm   90.5 msec
    Input channel: P6 Chest Compression (21) CFC_600

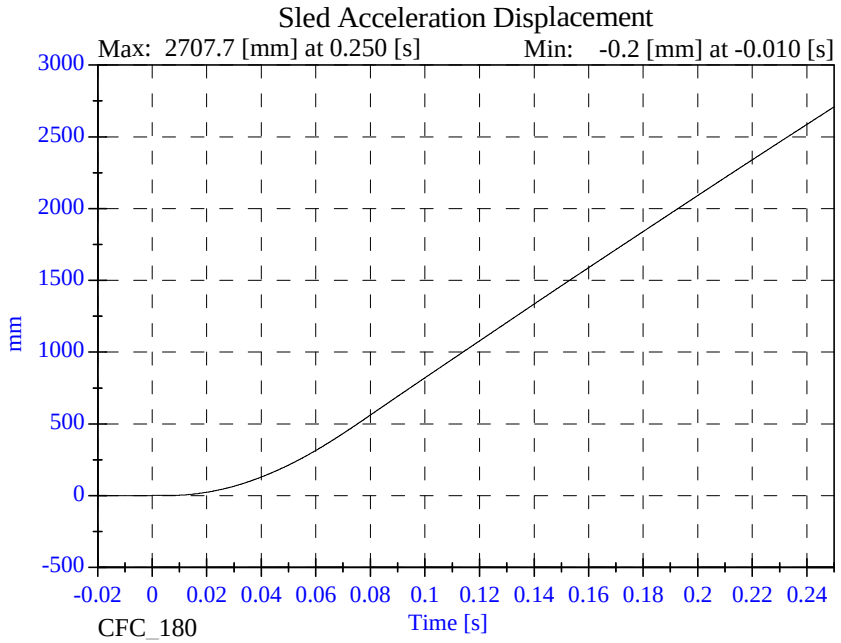
=========================
P6 HIC(15 ms): 372.4
    t1: 66.2 msec
    t2: 81.2 msec
    Duration: 15.0 msec
    Average Acceleration: 57.3 g
    Input channels: P6 Head x (2) CFC_1000
                    P6 Head y (3) CFC_1000
                    P6 Head z (4) CFC_1000
=========================
```

Sled Test NCAP SLED 08-3-25 - August 07, 2003



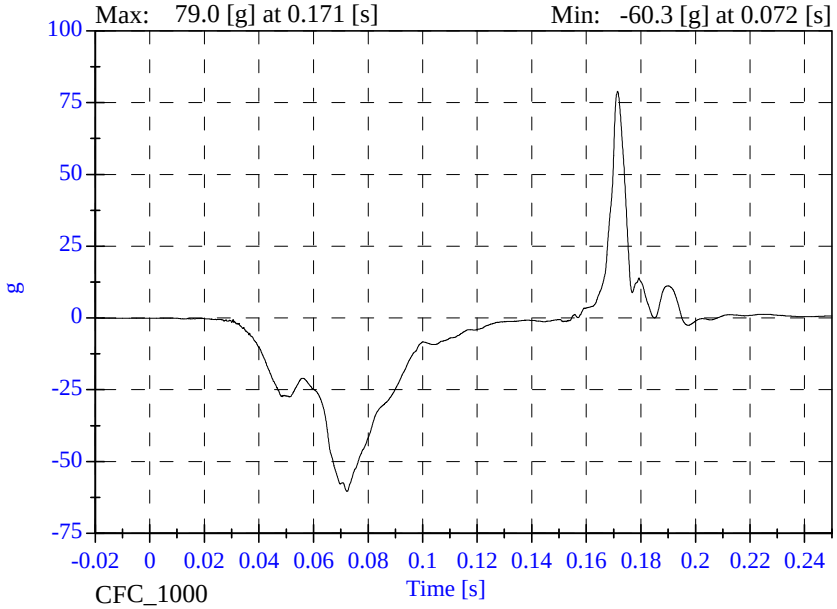




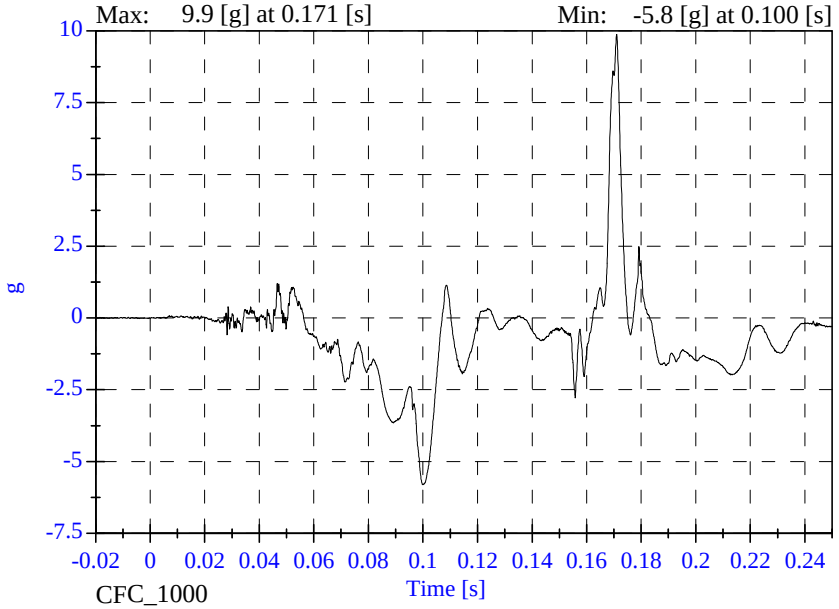


Sled Test NCAP SLED 08-3-25 - August 07, 2003

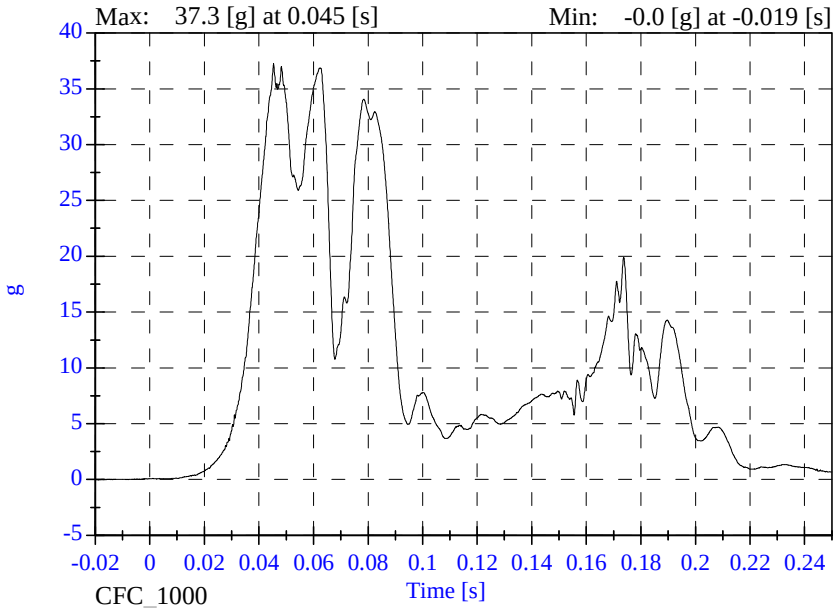
P6 Head x



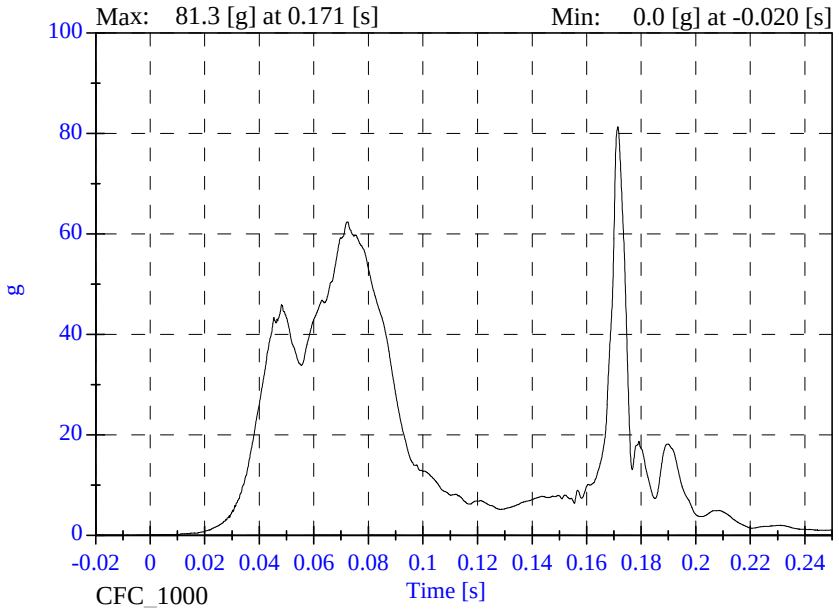
P6 Head y



P6 Head z

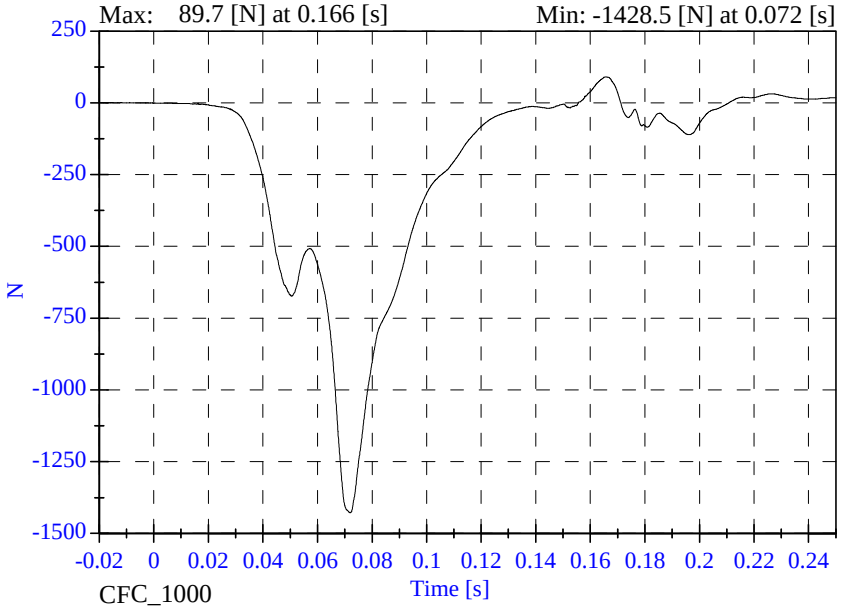


P6 Head Resultant

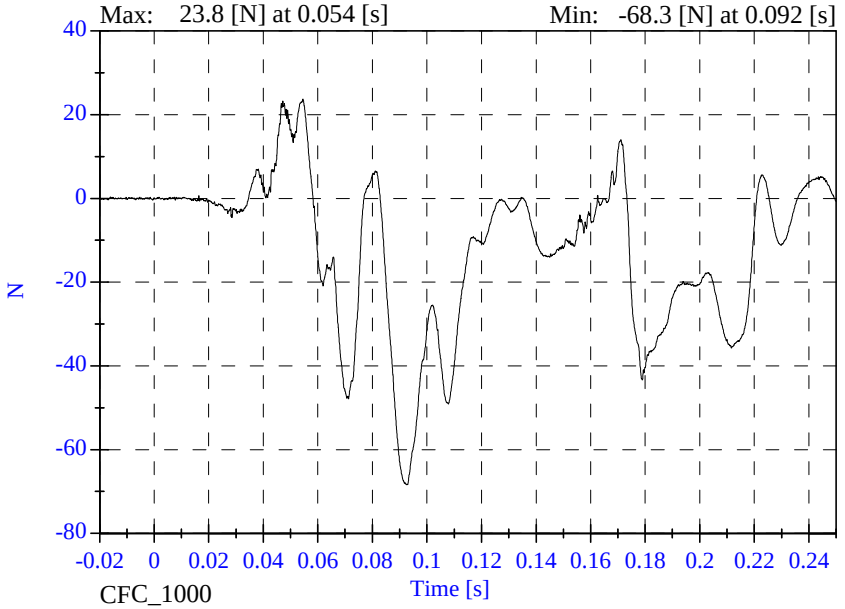


Sled Test NCAP SLED 08-3-25 - August 07, 2003

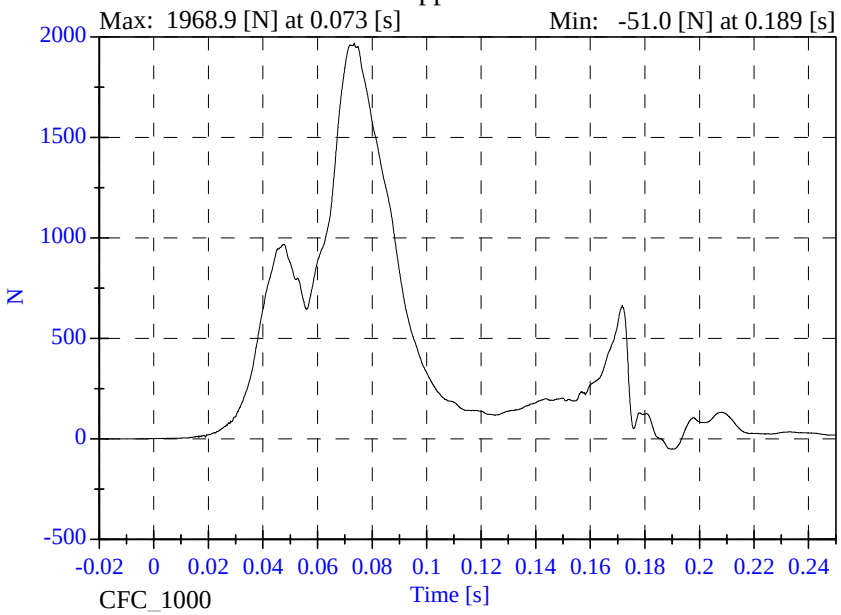
P6 Upper Neck Fx



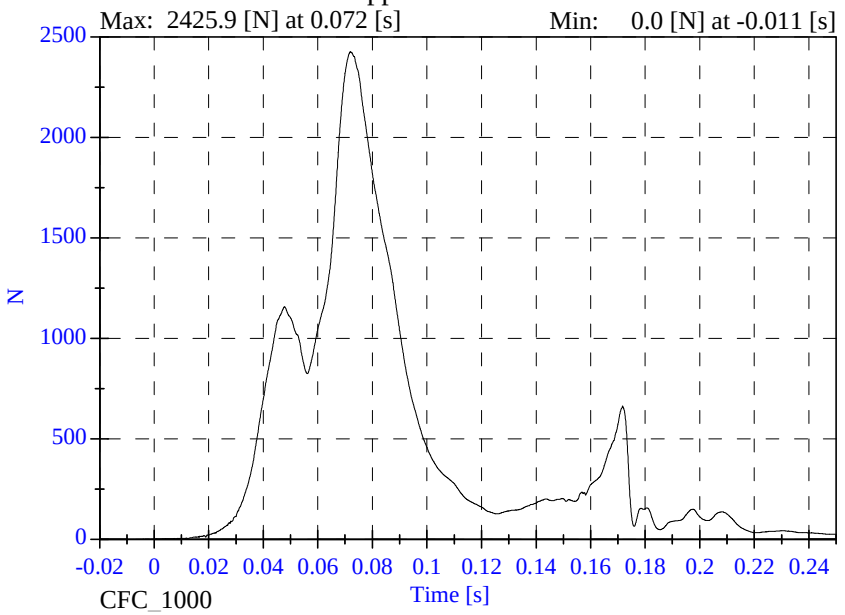
P6 Upper Neck Fy



P6 Upper Neck Fz

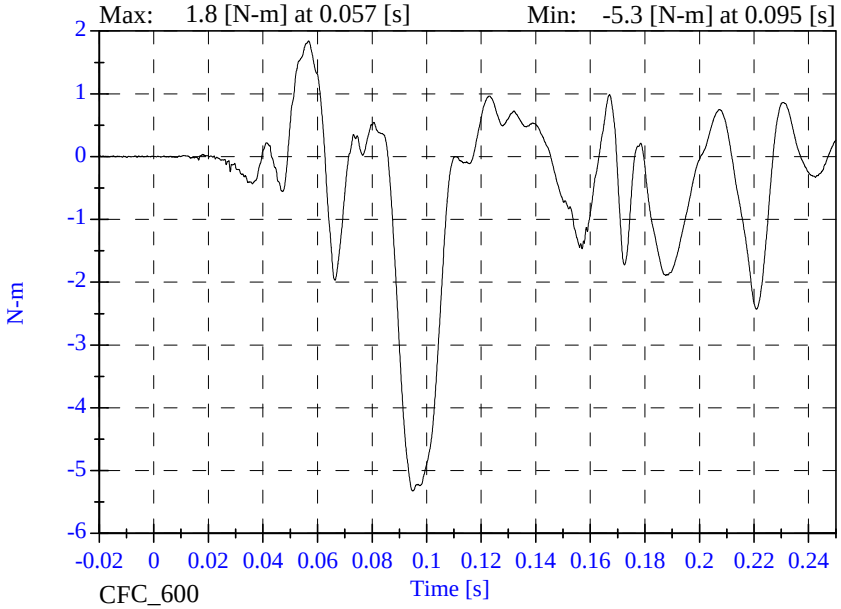


P6 Upper Neck F Resultant

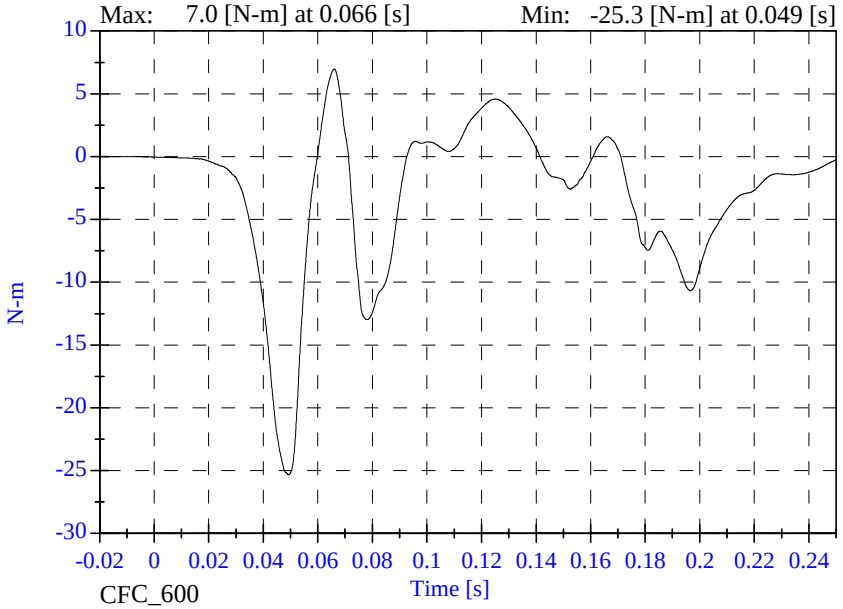


Sled Test NCAP SLED 08-3-25 - August 07, 2003

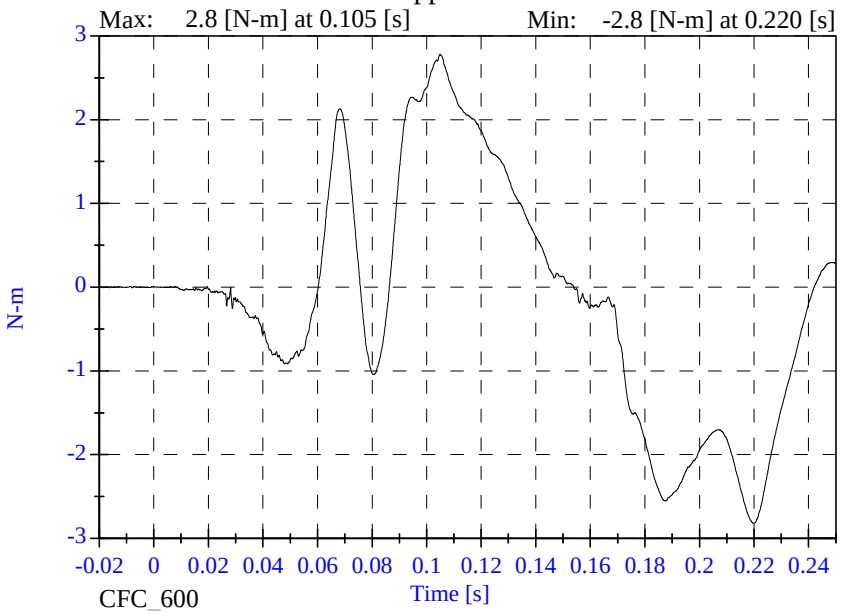
P6 Upper Neck Mx



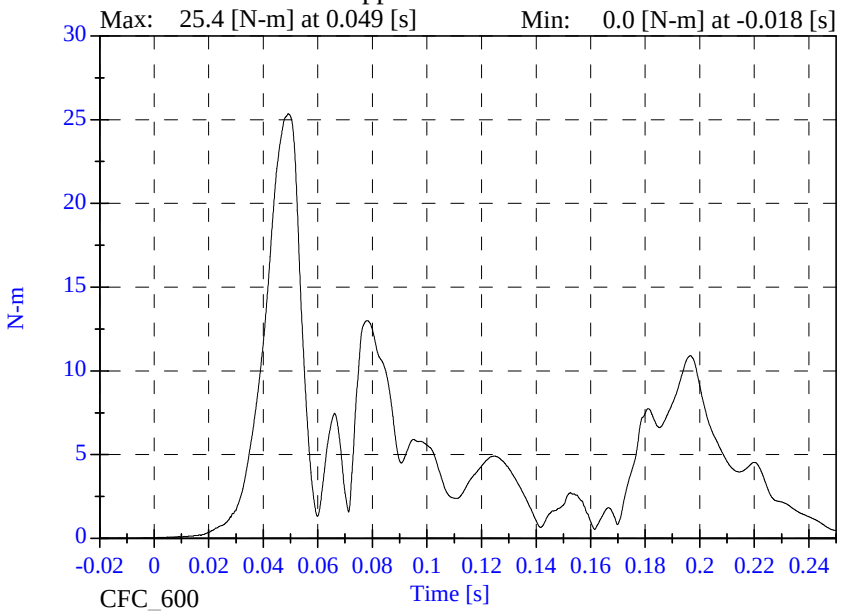
P6 Upper Neck My



P6 Upper Neck Mz



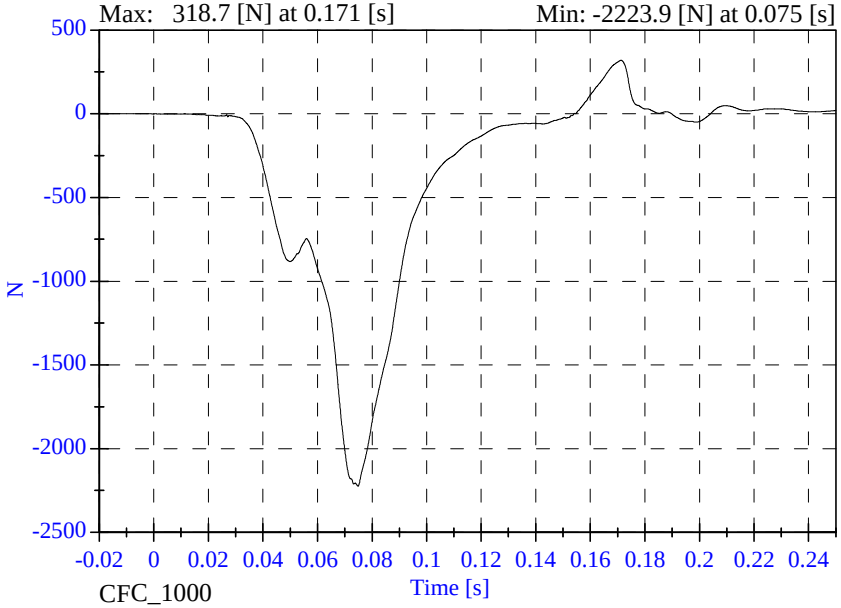
P6 Upper Neck M Resultant



Sled Test NCAP SLED 08-3-25 - August 07, 2003

P6 Lower Neck Fx

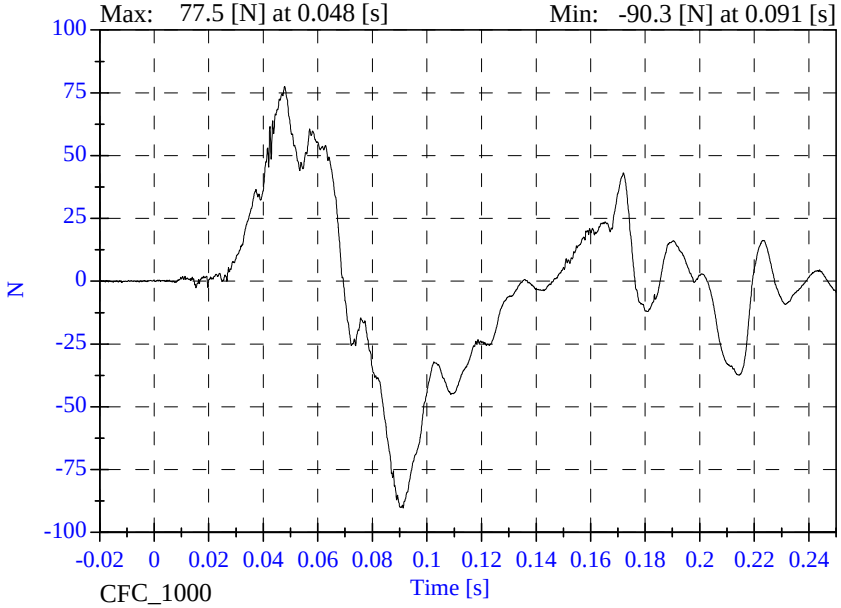
Max: 318.7 [N] at 0.171 [s] Min: -2223.9 [N] at 0.075 [s]



CFC_1000

P6 Lower Neck Fy

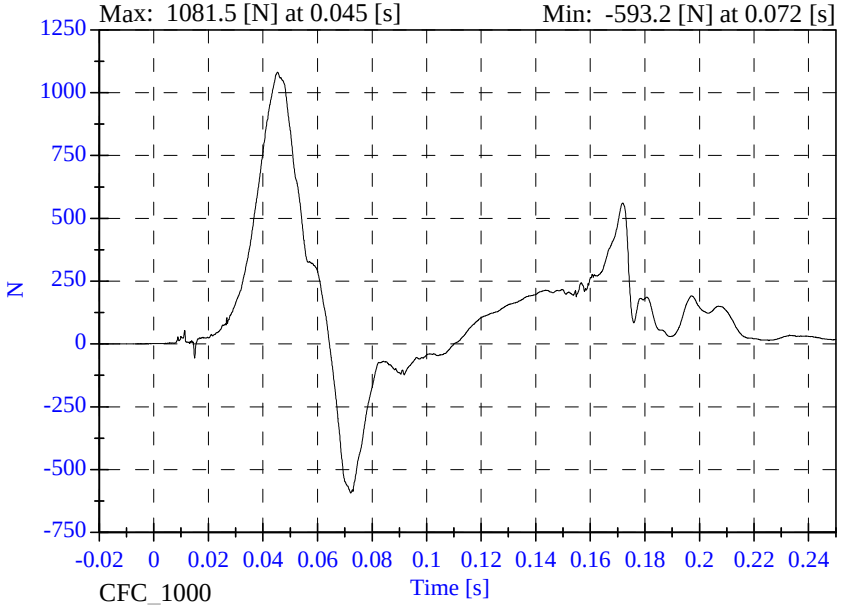
Max: 77.5 [N] at 0.048 [s] Min: -90.3 [N] at 0.091 [s]



CFC_1000

P6 Lower Neck Fz

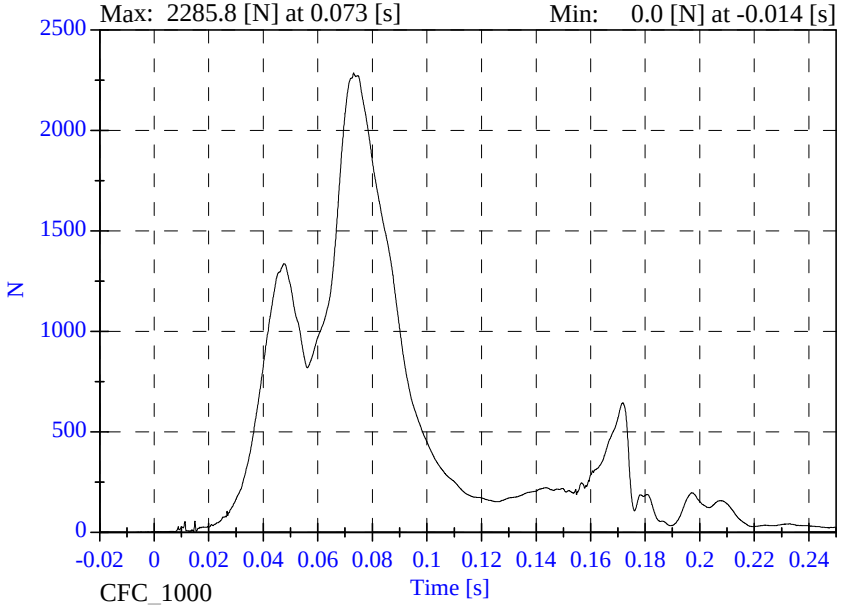
Max: 1081.5 [N] at 0.045 [s] Min: -593.2 [N] at 0.072 [s]



CFC_1000

P6 Lower Neck F Resultant

Max: 2285.8 [N] at 0.073 [s] Min: 0.0 [N] at -0.014 [s]

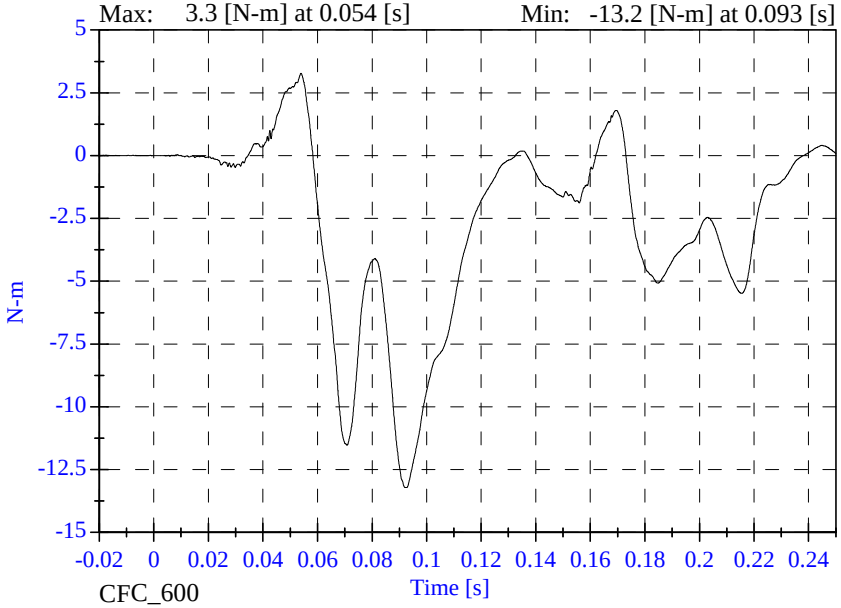


CFC_1000

Sled Test NCAP SLED 08-3-25 - August 07, 2003

P6 Lower Neck Mx

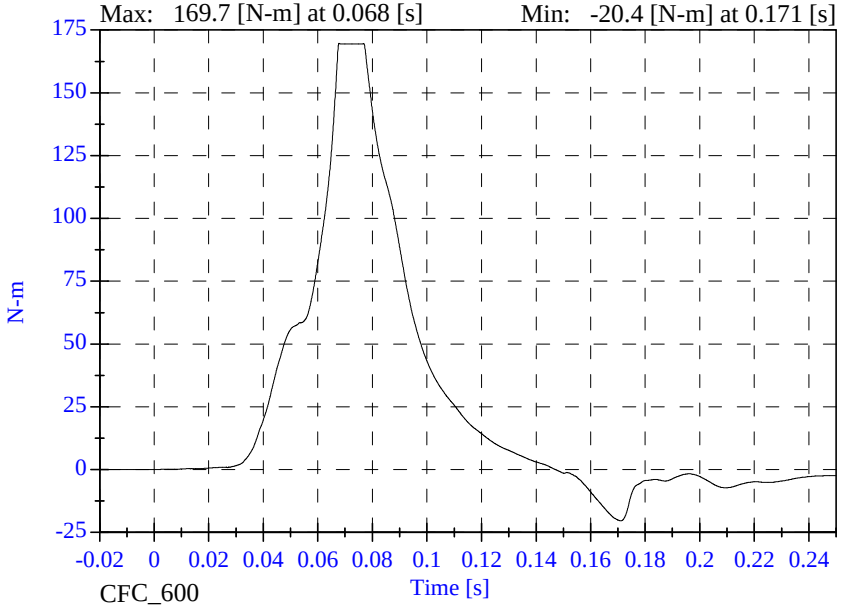
Max: 3.3 [N-m] at 0.054 [s] Min: -13.2 [N-m] at 0.093 [s]



CFC_600

P6 Lower Neck My

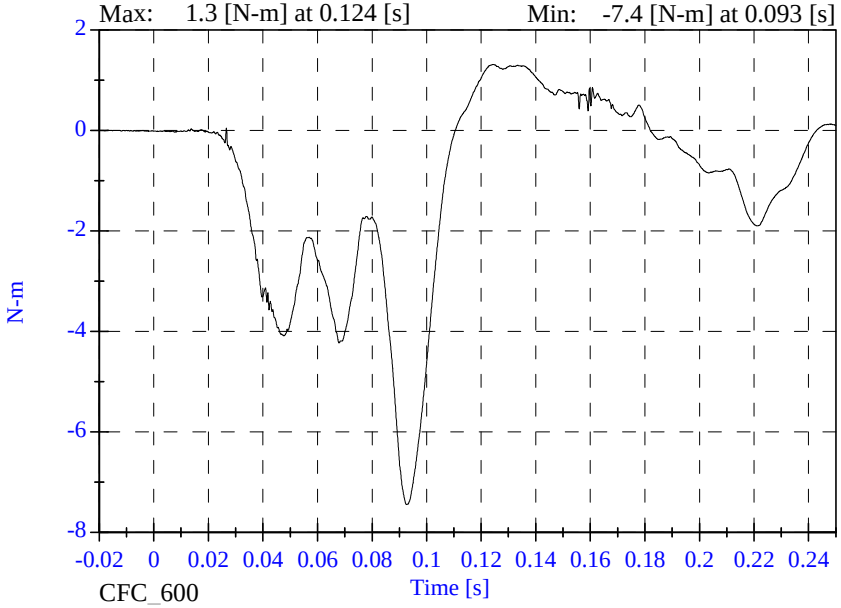
Max: 169.7 [N-m] at 0.068 [s] Min: -20.4 [N-m] at 0.171 [s]



CFC_600

P6 Lower Neck Mz

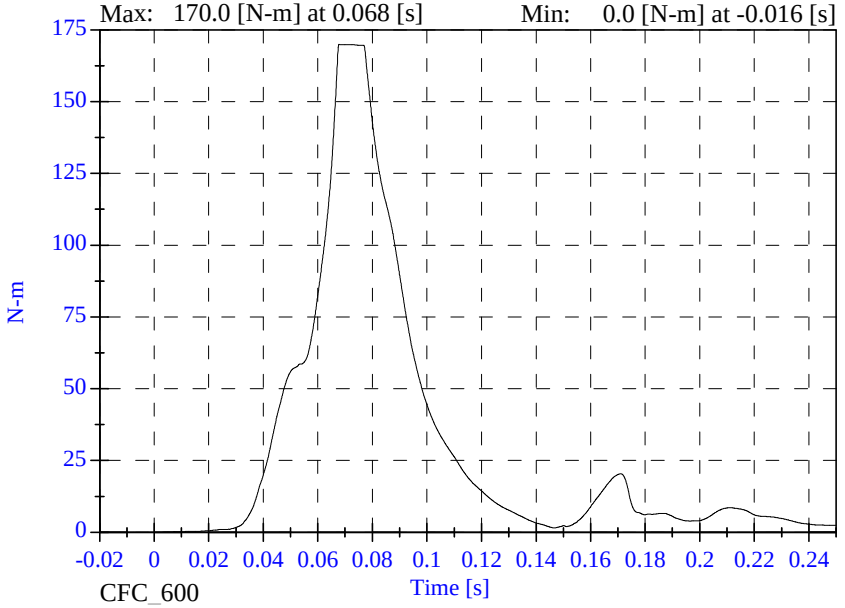
Max: 1.3 [N-m] at 0.124 [s] Min: -7.4 [N-m] at 0.093 [s]



CFC_600

P6 Lower Neck M Resultant

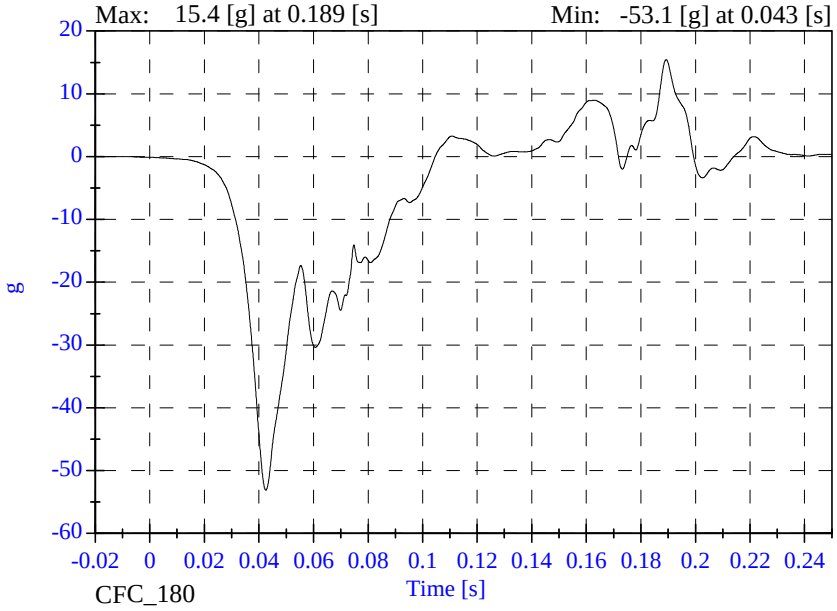
Max: 170.0 [N-m] at 0.068 [s] Min: 0.0 [N-m] at -0.016 [s]



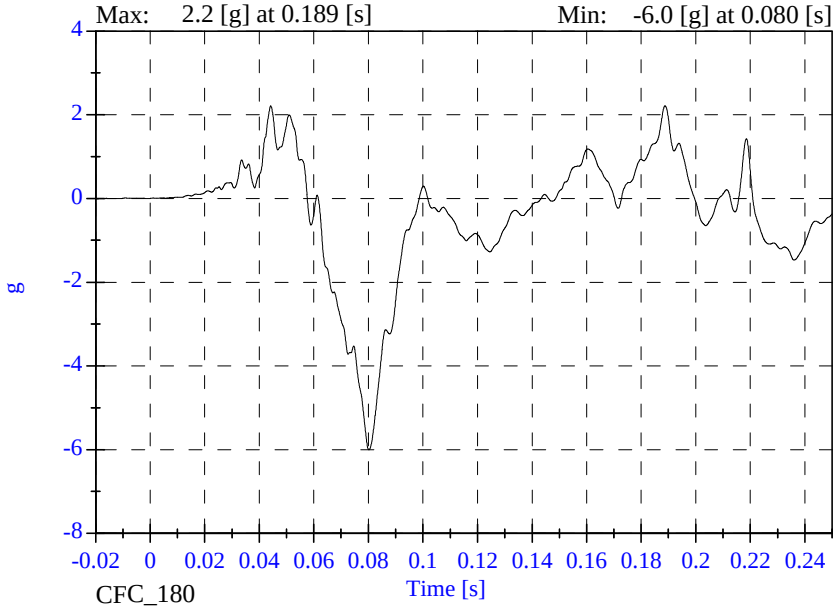
CFC_600

Sled Test NCAP SLED 08-3-25 - August 07, 2003

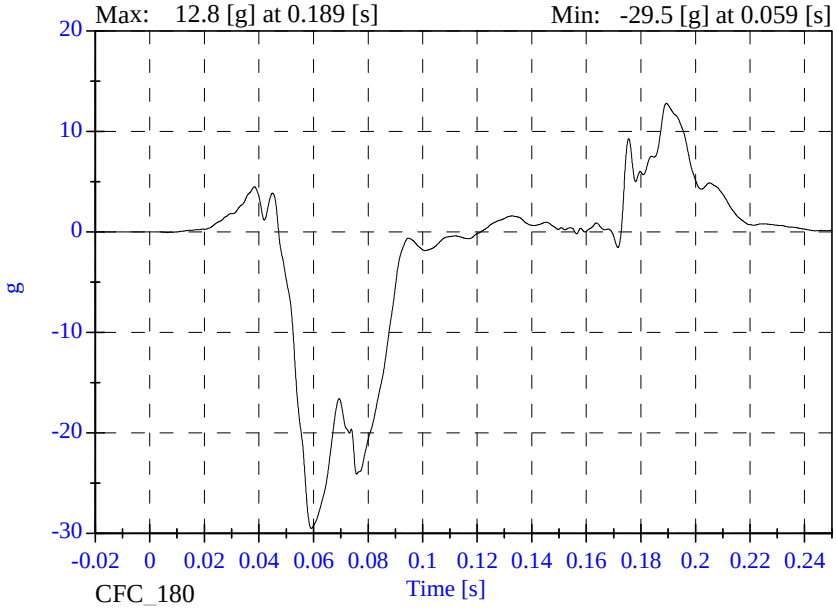
P6 Chest x



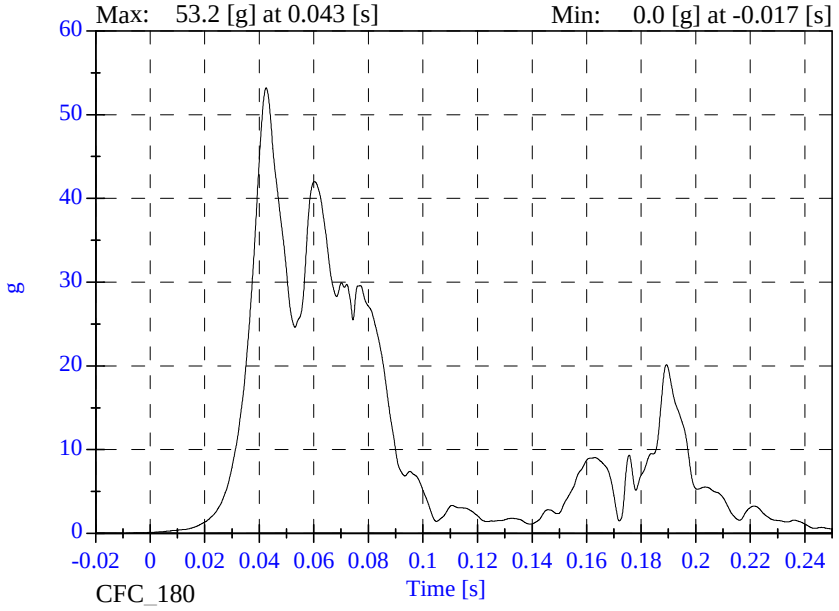
P6 Chest y



P6 Chest z



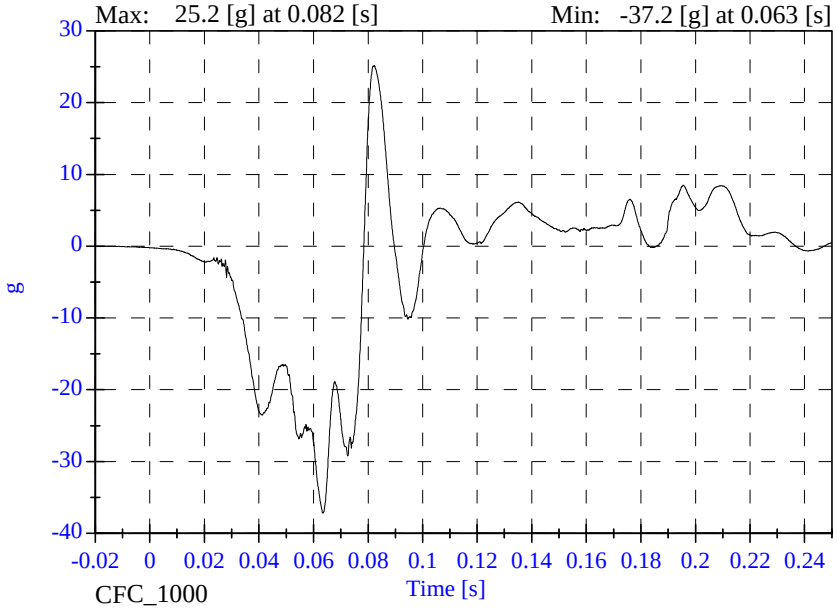
P6 Chest Resultant



Sled Test NCAP SLED 08-3-25 - August 07, 2003

P6 Pelvic x

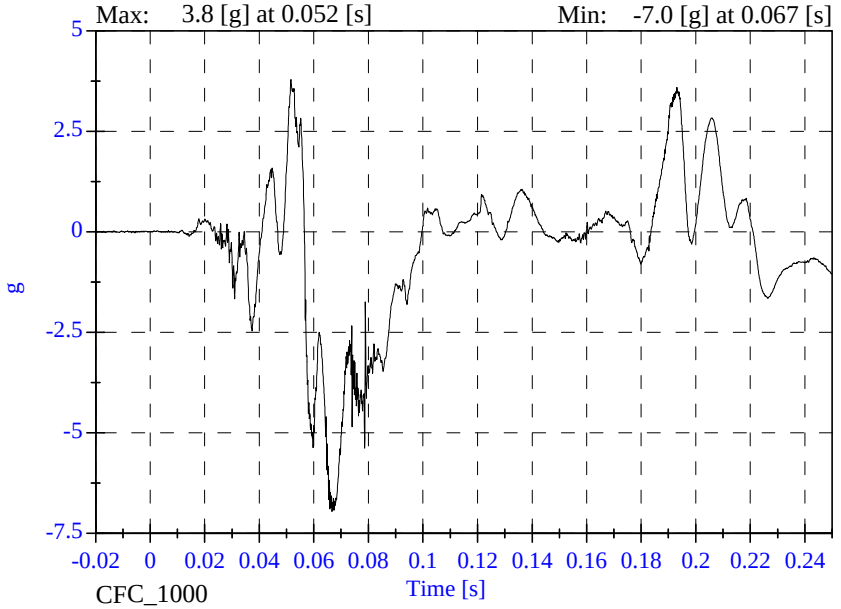
Max: 25.2 [g] at 0.082 [s] Min: -37.2 [g] at 0.063 [s]



CFC_1000

P6 Pelvic y

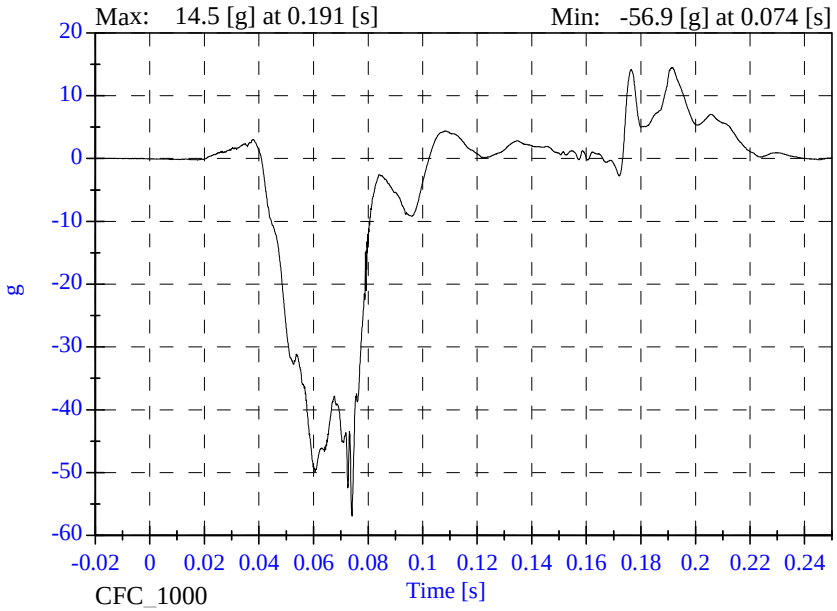
Max: 3.8 [g] at 0.052 [s] Min: -7.0 [g] at 0.067 [s]



CFC_1000

P6 Pelvic z

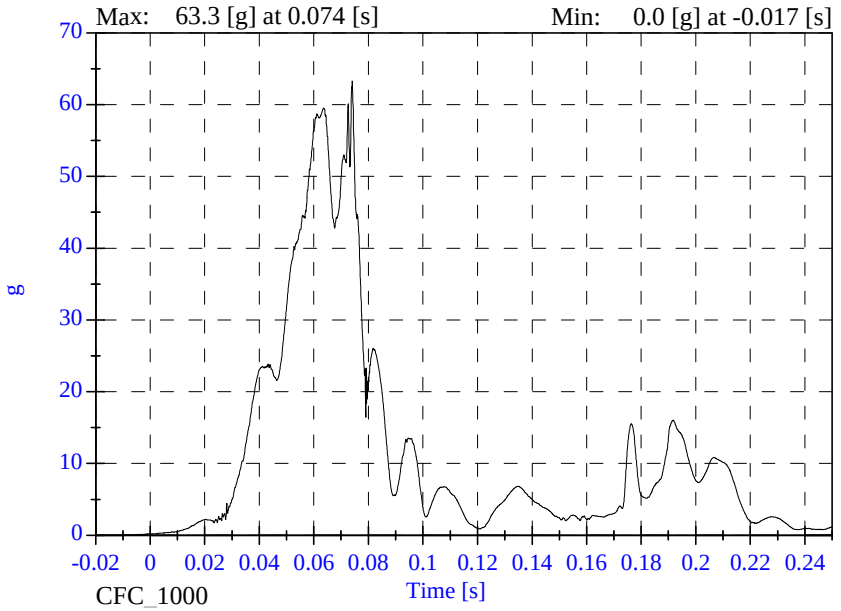
Max: 14.5 [g] at 0.191 [s] Min: -56.9 [g] at 0.074 [s]



CFC_1000

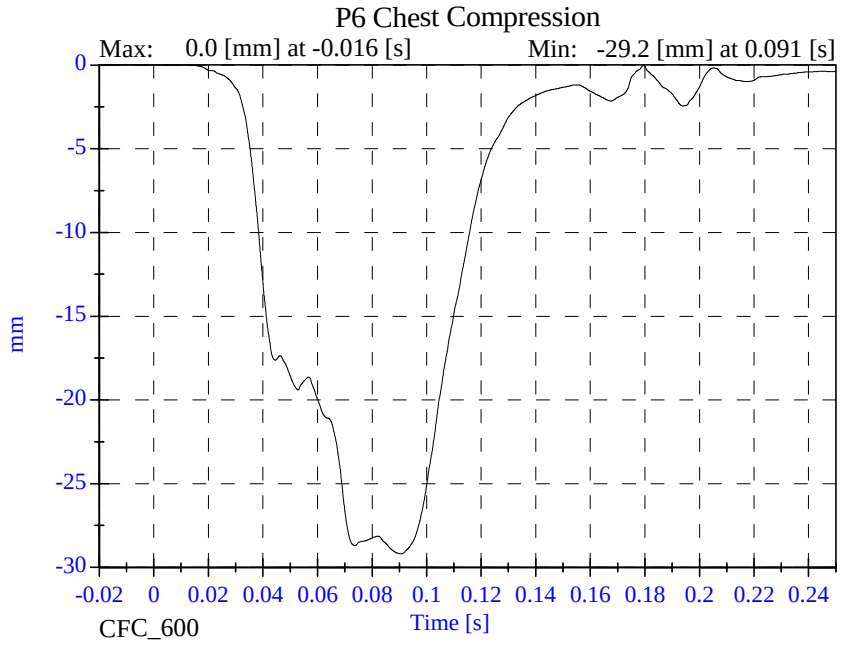
P6 Pelvic Resultant

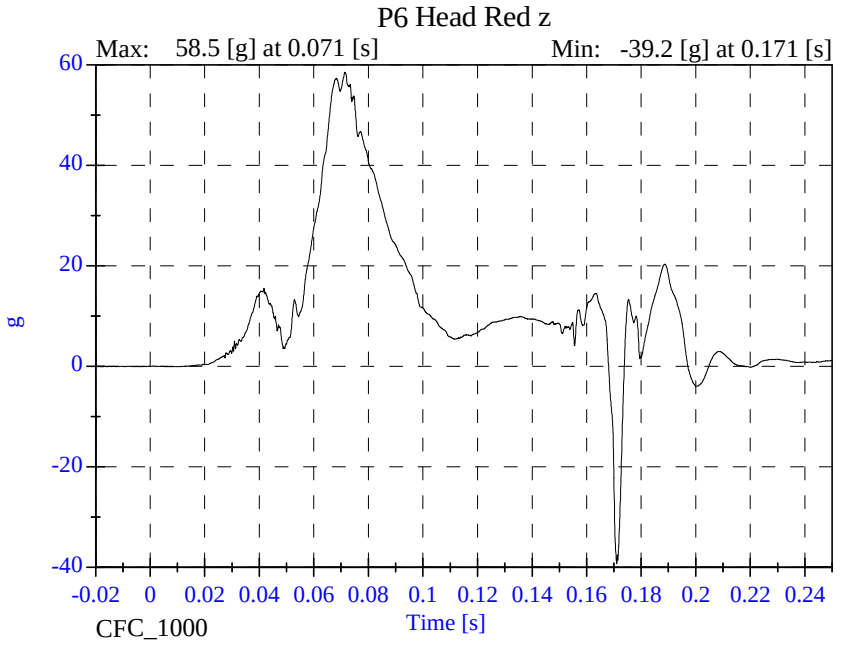
Max: 63.3 [g] at 0.074 [s] Min: 0.0 [g] at -0.017 [s]

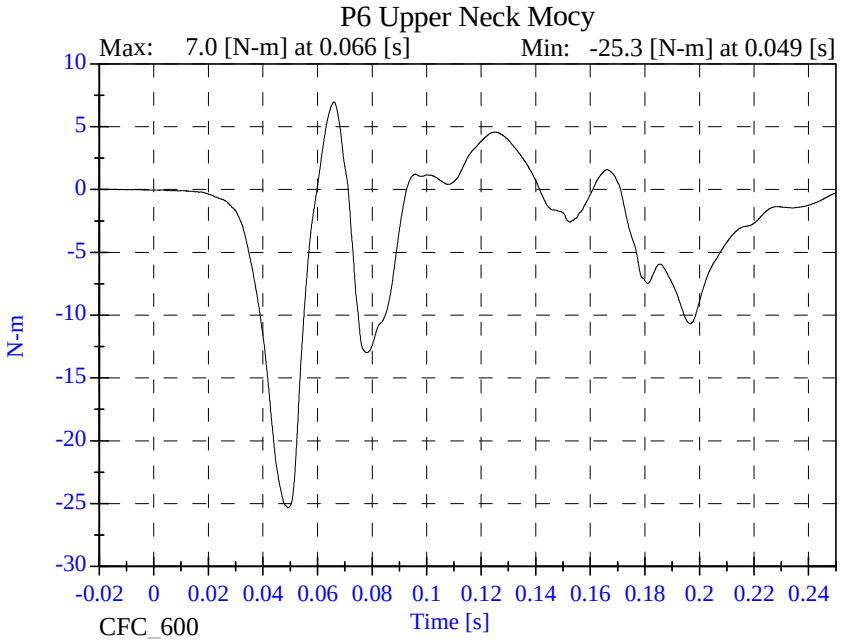


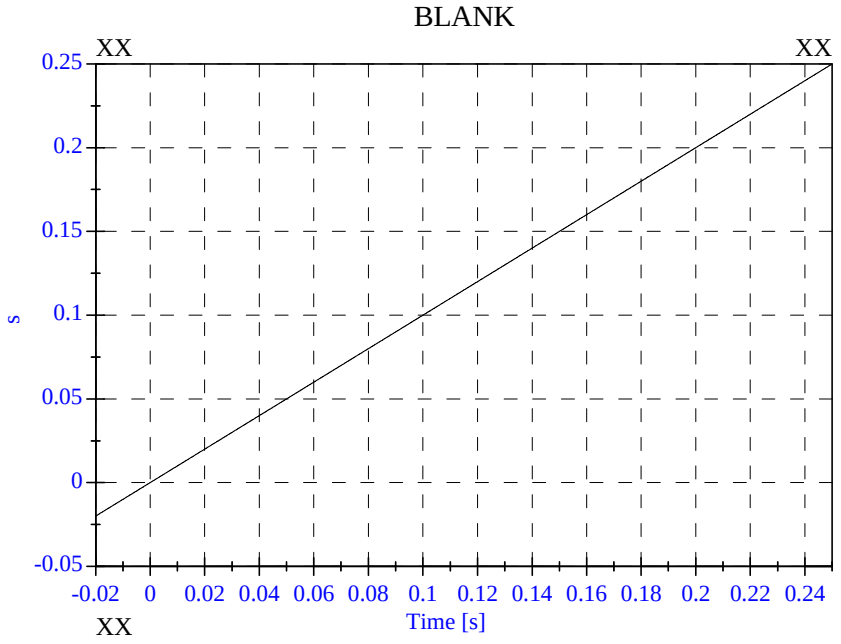
CFC_1000

Sled Test NCAP SLED 08-3-25 - August 07, 2003









SECTION 9

Compression – Deflection Resistance Test

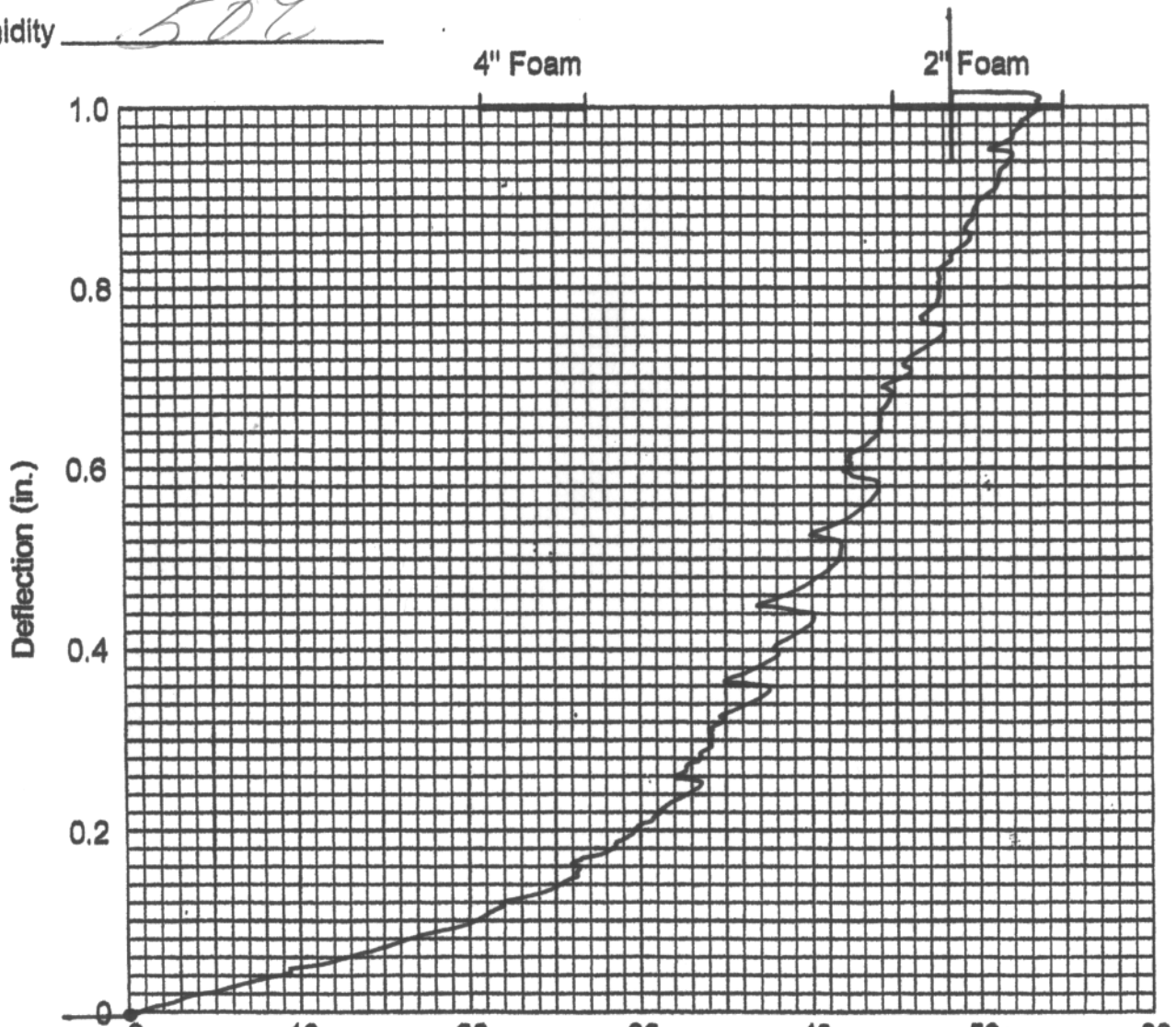
Date 8/4/03

Performed By

Temp. 70°

Humidity 50%

Foam No. 2"x20" 2"x24" I1



Compression - Deflection Resistance Test
Child Seat Foam

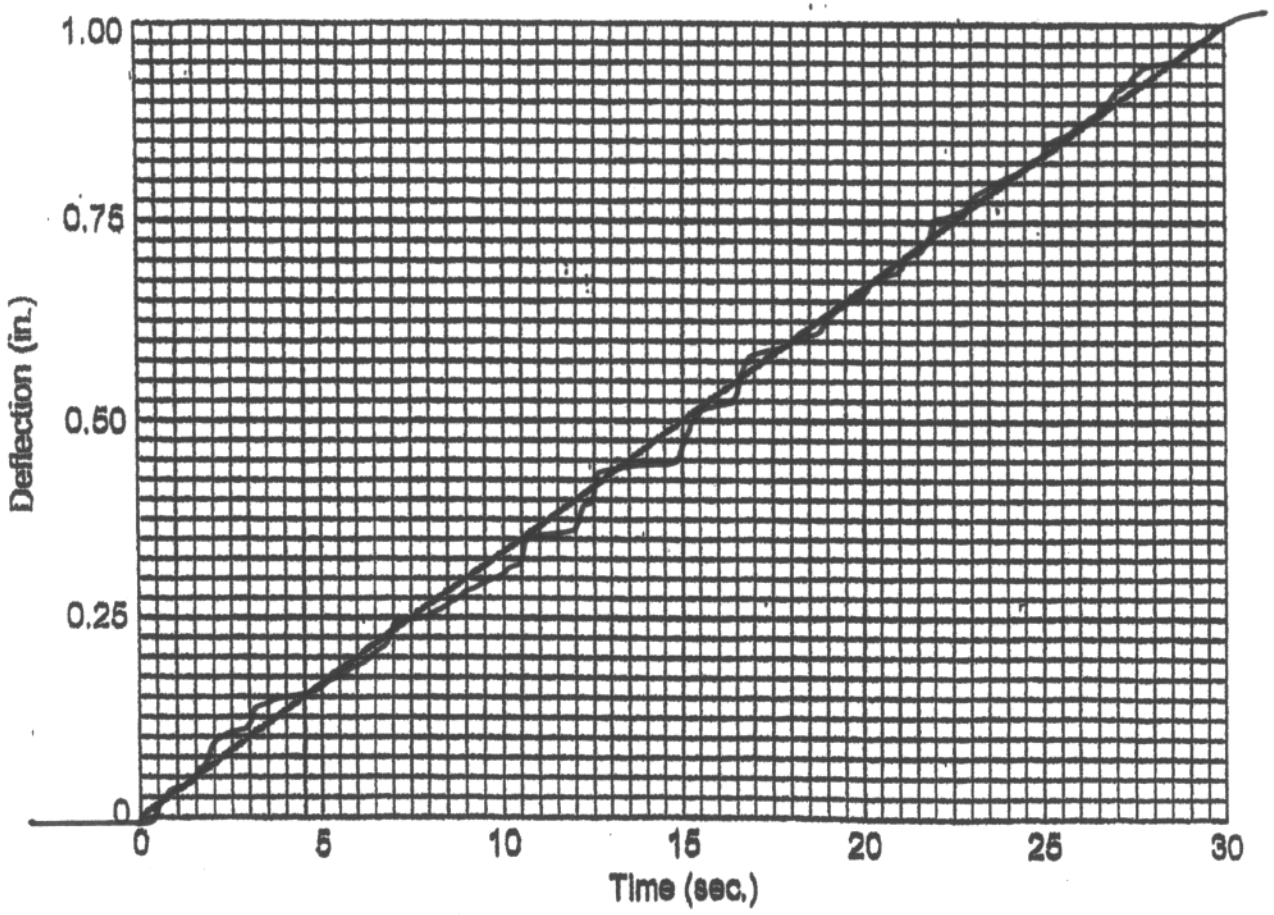
RUN 08-3-24

Date 8/7/03

Temp 70°

Humidity 50%

Foam No 2" X 20" 2" X 24" II



RUN 08-3-24

Compression - Deflection Resistance Test Child Seat Foam

SEAT FOAM USAGE LOG

Foam I.D. Number 2"x 20" 2"x 24" I/

Date	Peak Load	Pass/Fail
8/7/03	48.5 LBS	Pass

RUN 08-3-24

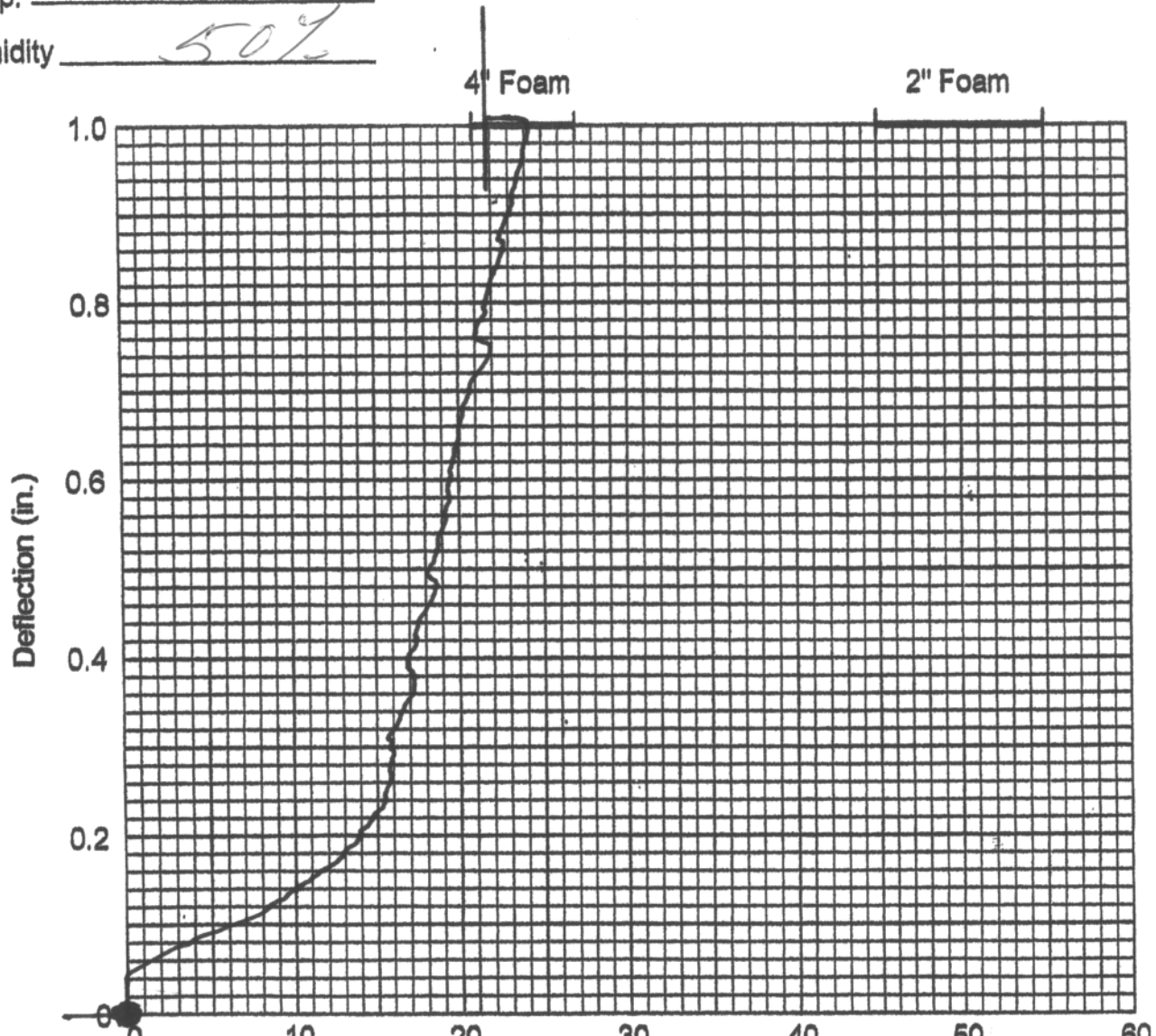
Date 8/7/03

Performed By SD

Temp. 70°

Humidity 50%

Foam No. 4" & 2" I/



Compression - Deflection Resistance Test
Child Seat Foam

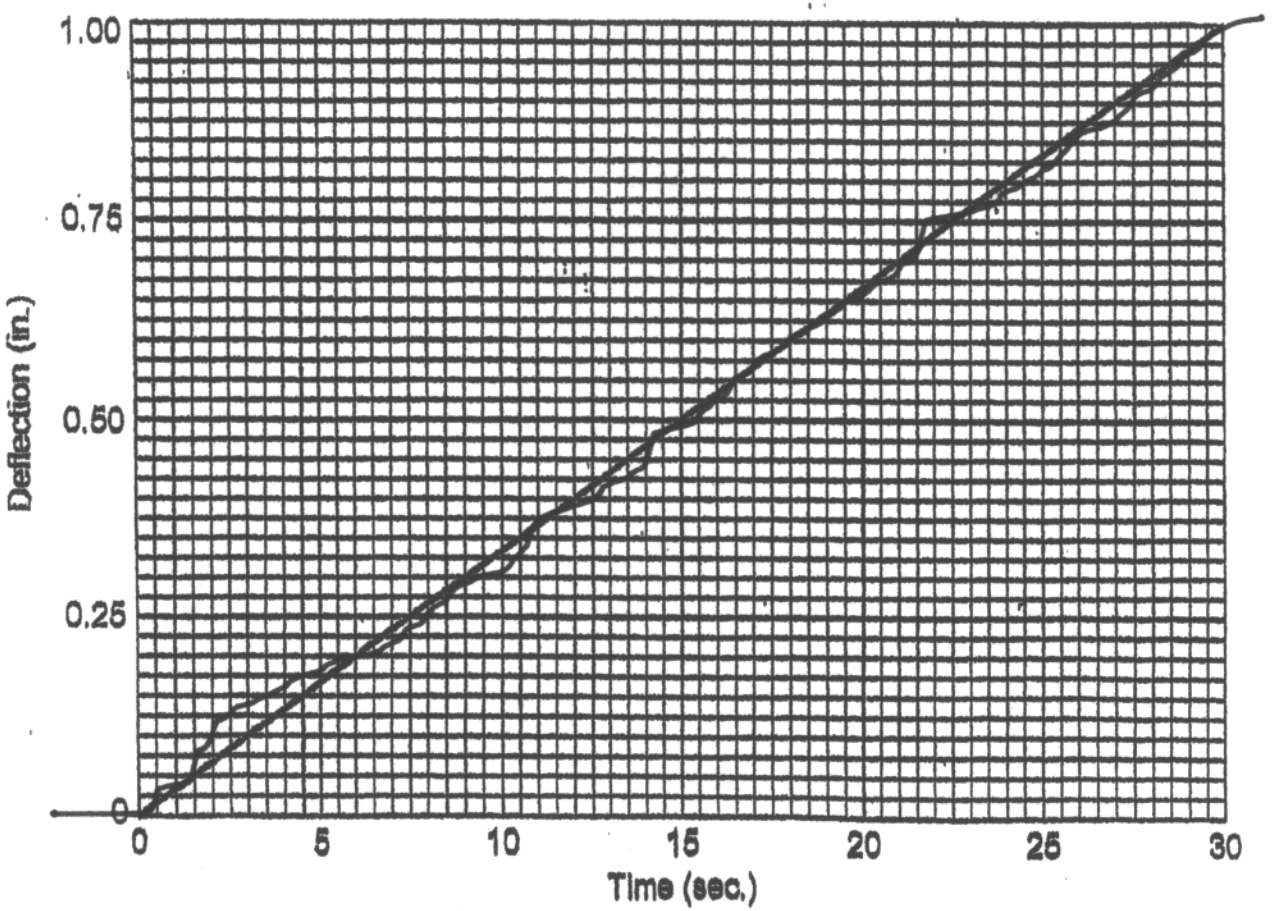
RUN 08-3-24

Date 8/7/03

Temp 70°

Humidity 50%

Foam No. 4"X20" I



RUN 08-3-24

Compression - Deflection Resistance Test Child Seat Foam

SEAT FOAM USAGE LOG

Foam I.D. Number 4"X20" I

Date	Peak Load	Pass/Fail
8/7/03	22 LBS	Pass

RUN 08-3-24

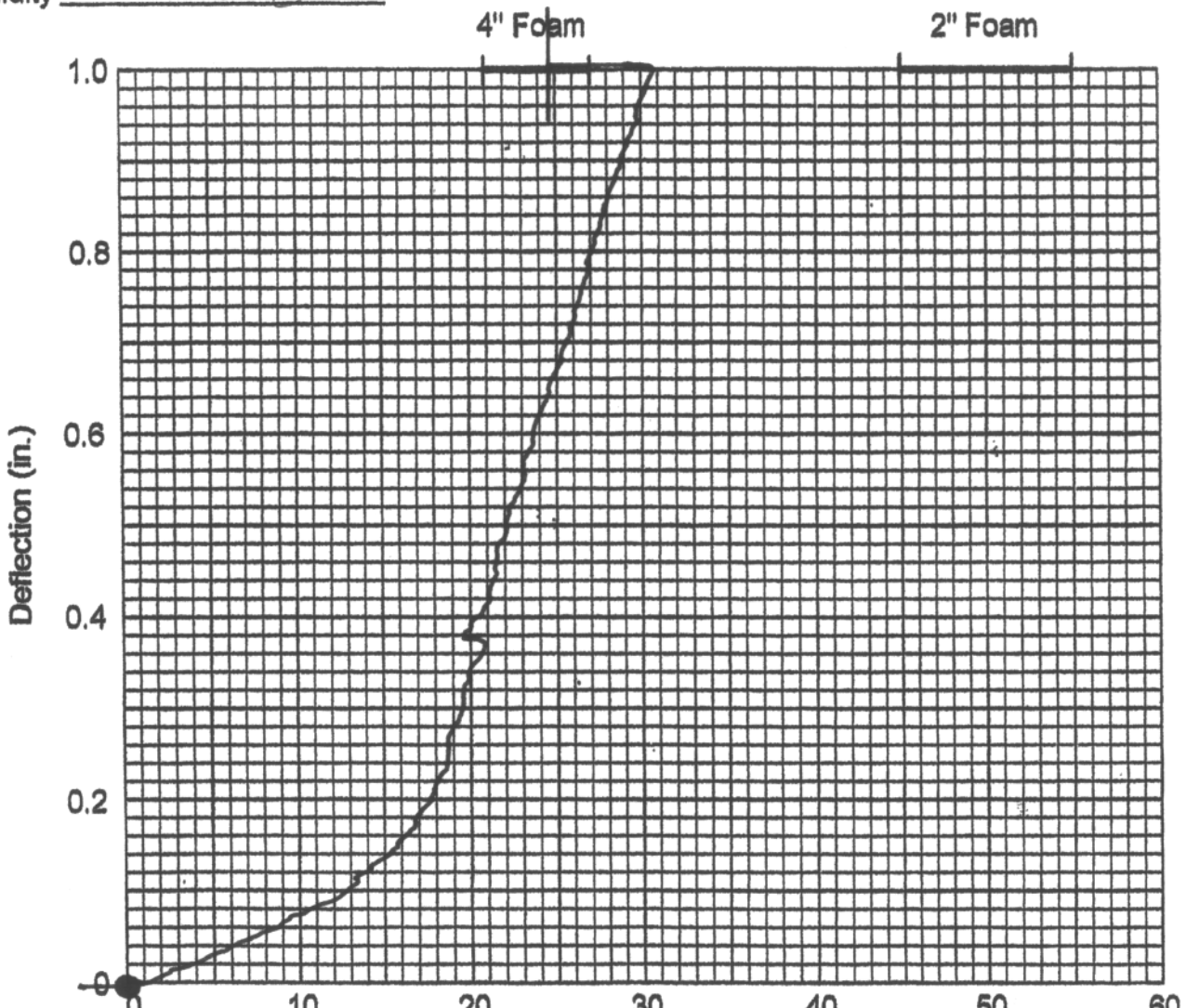
Date 8/7/03

Performed By SD

Temp. 70°

Humidity 50%

Foam No. 4" x 24" I I



Compression - Deflection Resistance Test
Child Seat Foam

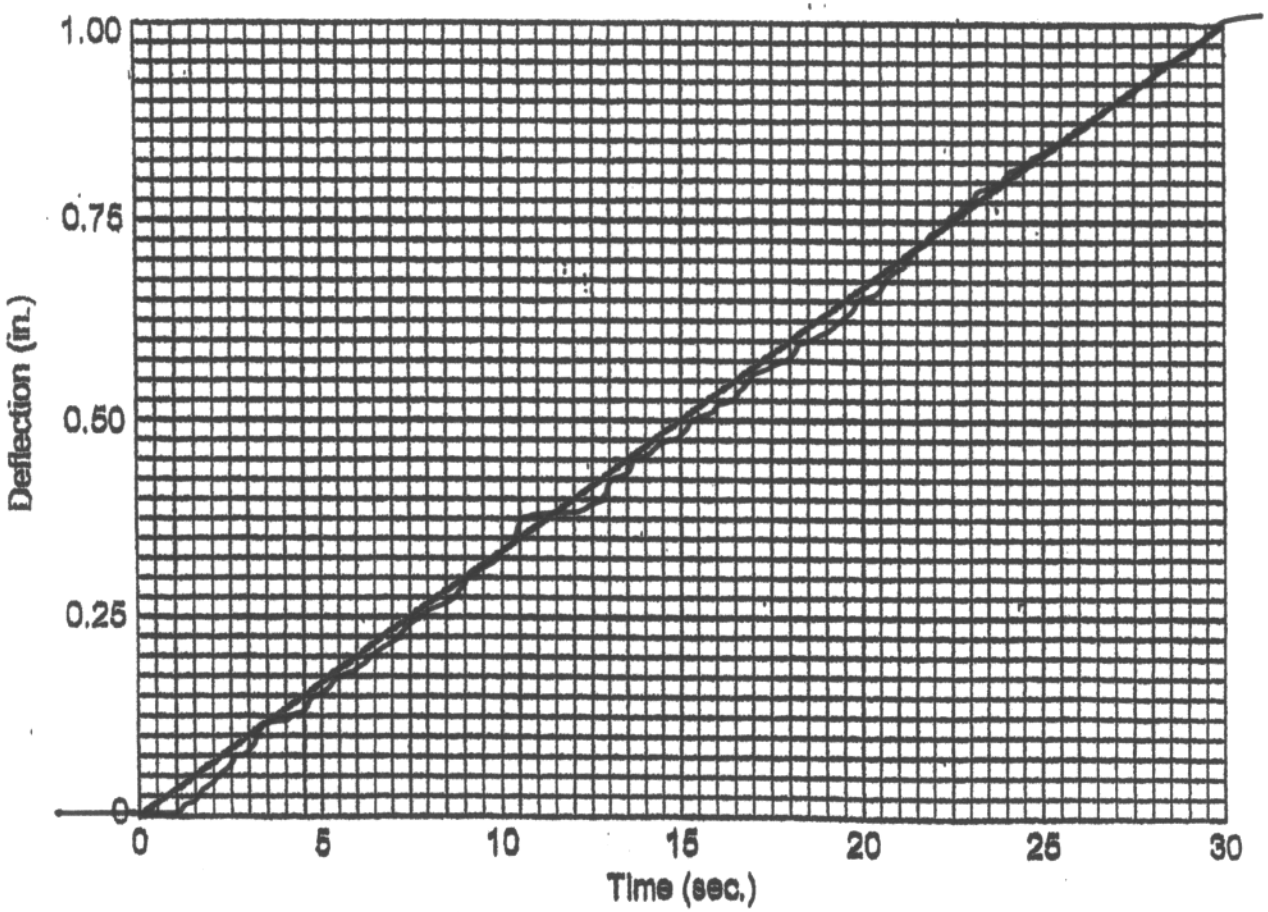
RUN 08-3-24

Date 8/7/03

Temp 70°

Humidity 50%

Foam No. 4" X 24" I 1



Compression - Deflection Resistance Test Child Seat Foam

RUN 08-3-24

SEAT FOAM USAGE LOG

Foam I.D. Number 4" x 24" I/

Date	Peak Load	Pass/Fail
8/7/03	24.5 LBS	

RUN 08-3-24

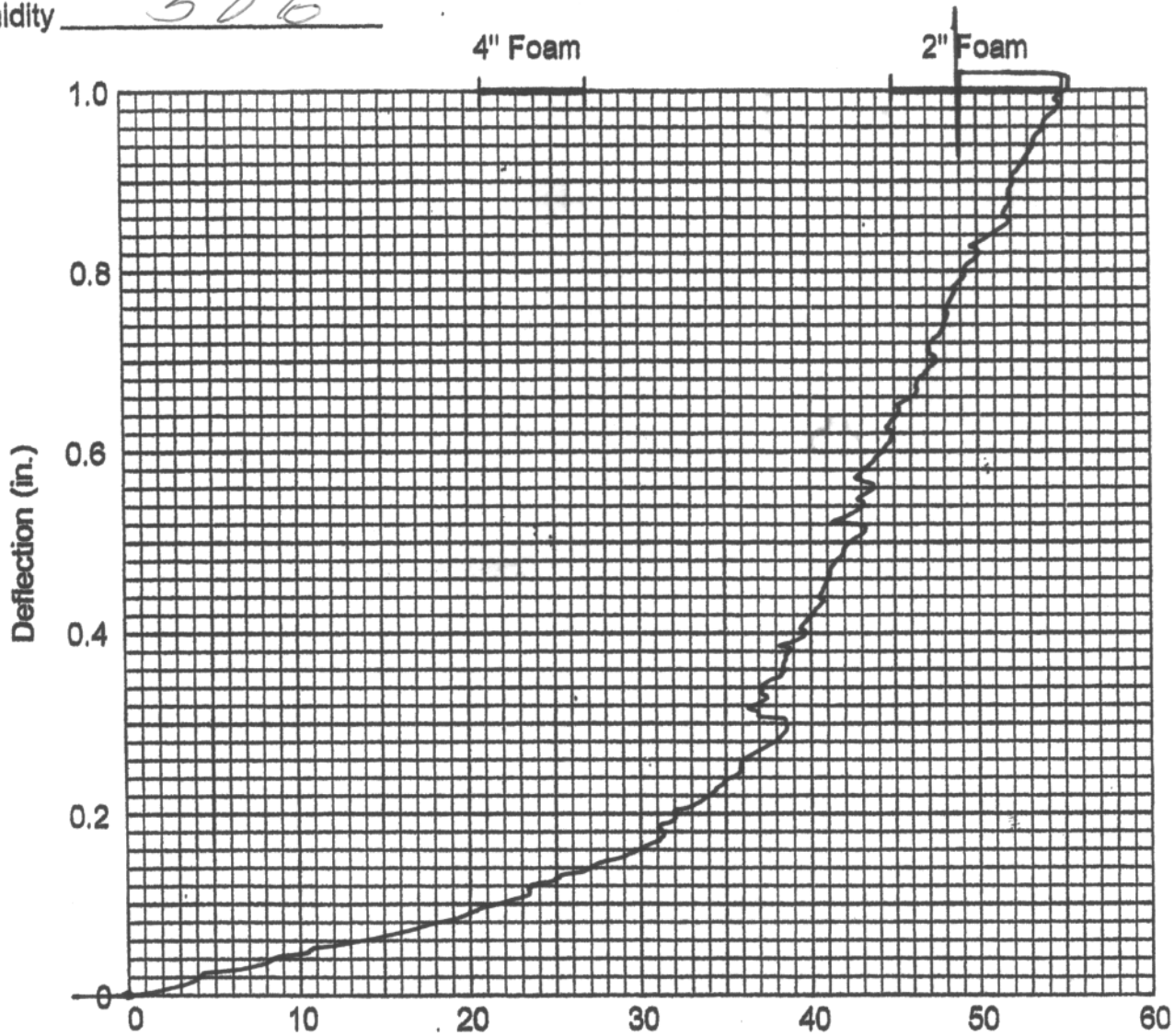
Date (8/7/03 SD

Foam No. 2"x20" 2"x24" I3

Performed By

Temp. 70°

Humidity 50%



Compression - Deflection Resistance Test
Child Seat Foam

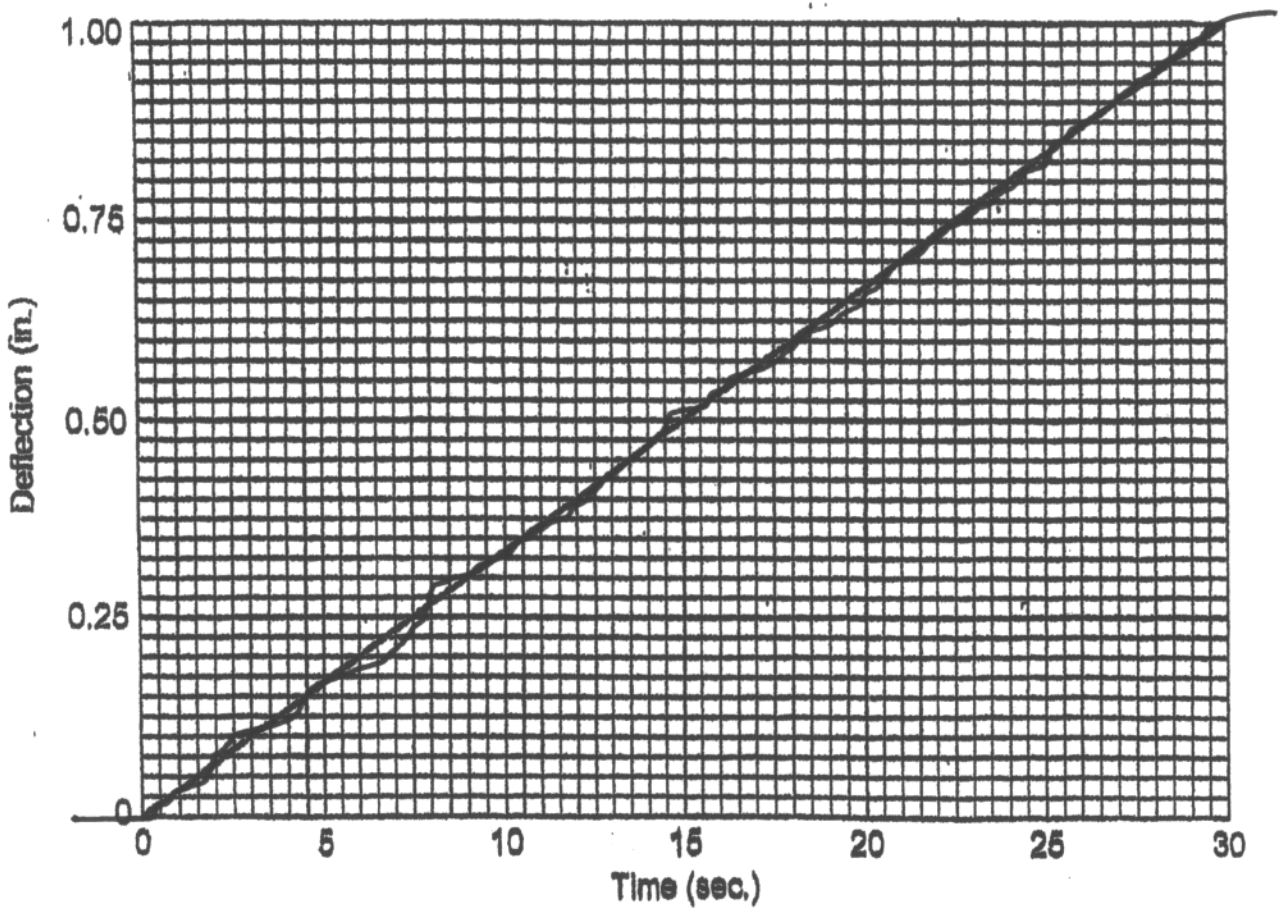
RUN 08-3-25

Date 8/4/03

Temp 70°

Humidity 50%

Foam No. 2"X 20" 2"X 24" I-3



RUN 08-3-25

Compression - Deflection Resistance Test Child Seat Foam

SEAT FOAM USAGE LOG

Foam I.D. Number 2"X 20" 2"X 24" I3

Date	Peak Load	Pass/Fail
8/7/03	49 LBS	

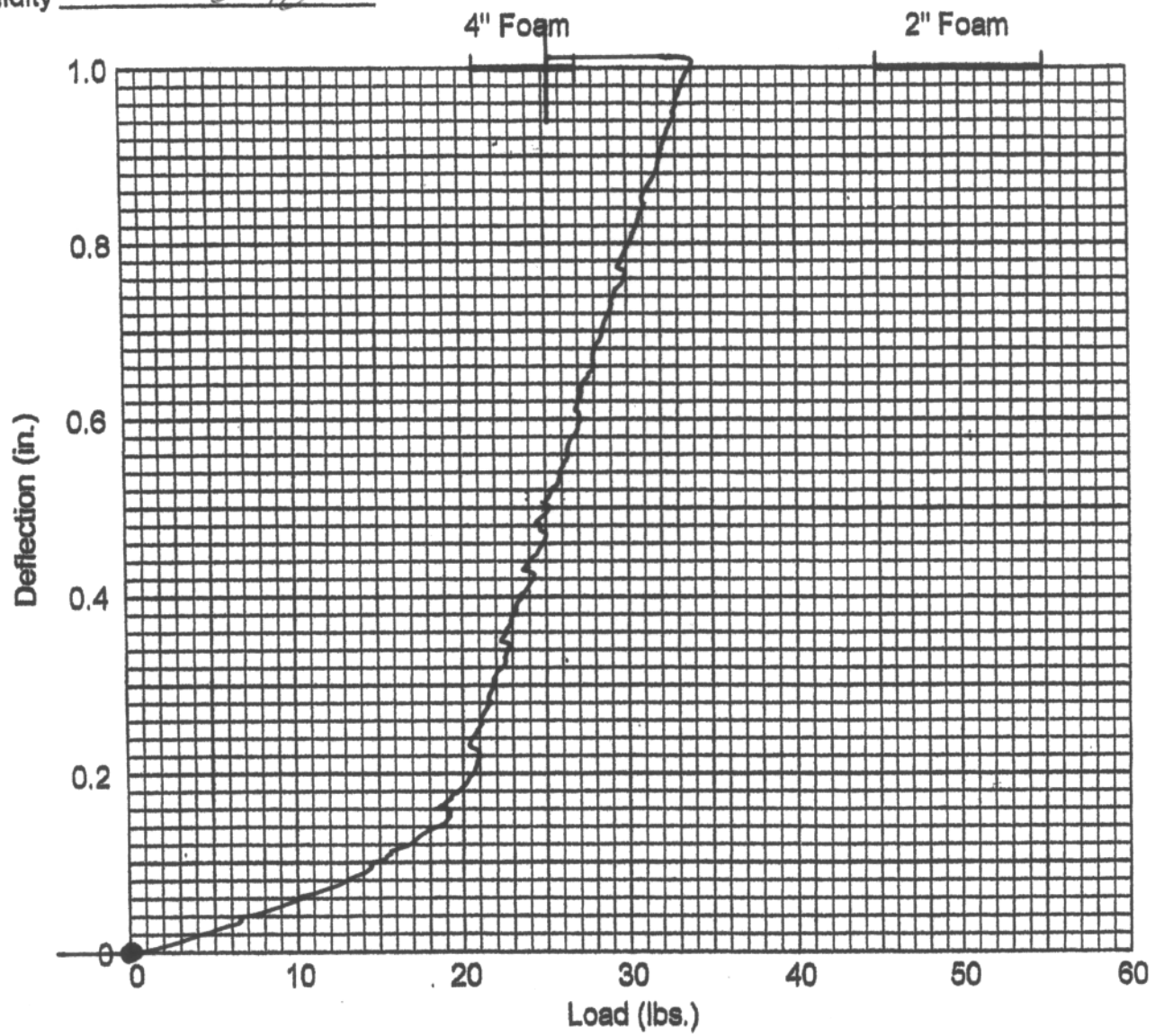
Date 8/7/03

Foam No. 4"x24" I3

Performed By SD

Temp. 70°

Humidity 56%



Compression - Deflection Resistance Test
Child Seat Foam

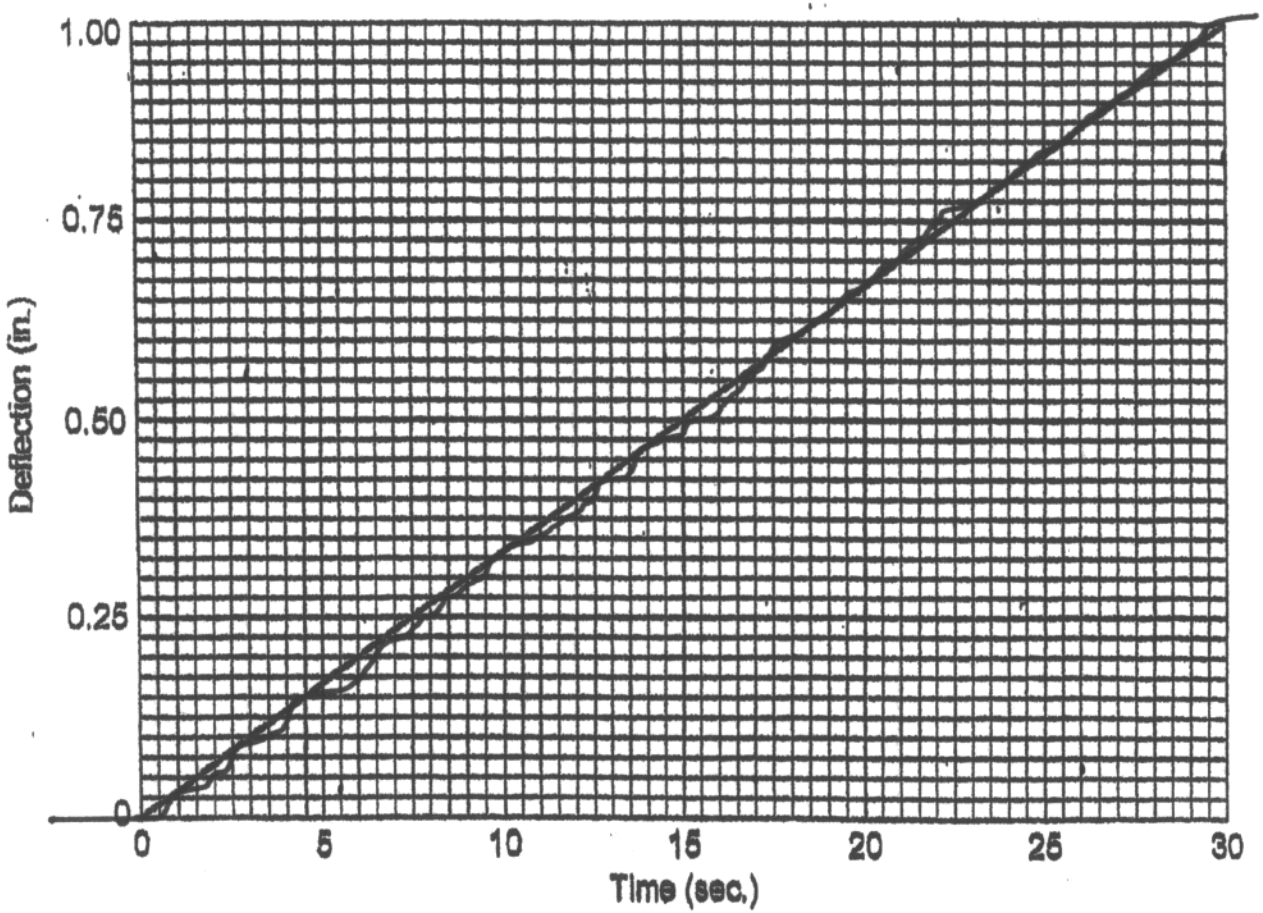
RUN 08-3-25

Date 8/7/03

Temp 70°

Humidity 50%

Foam No. 4" X 24" IB



Compression - Deflection Resistance Test Child Seat Foam

RUN 08-3-25

SEAT FOAM USAGE LOG

Foam I.D. Number 4"X24" I3

Date	Peak Load	Pass/Fail
8/4/03	25.25 LBS	PASS

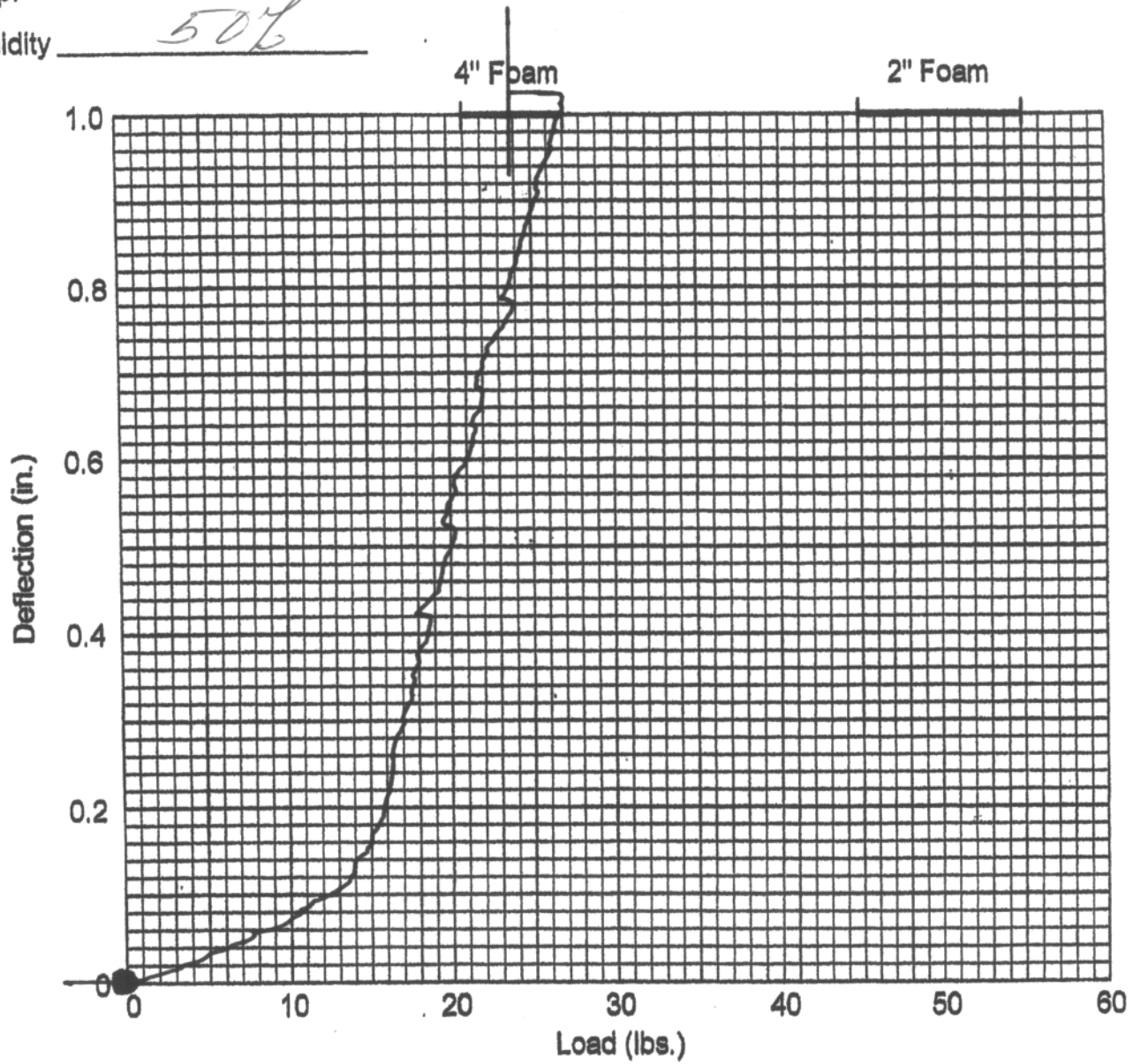
Date 8/7/03

Performed By SD

Temp. 70°

Humidity 50%

Foam No. 4"x20" I-3



Compression - Deflection Resistance Test
Child Seat Foam

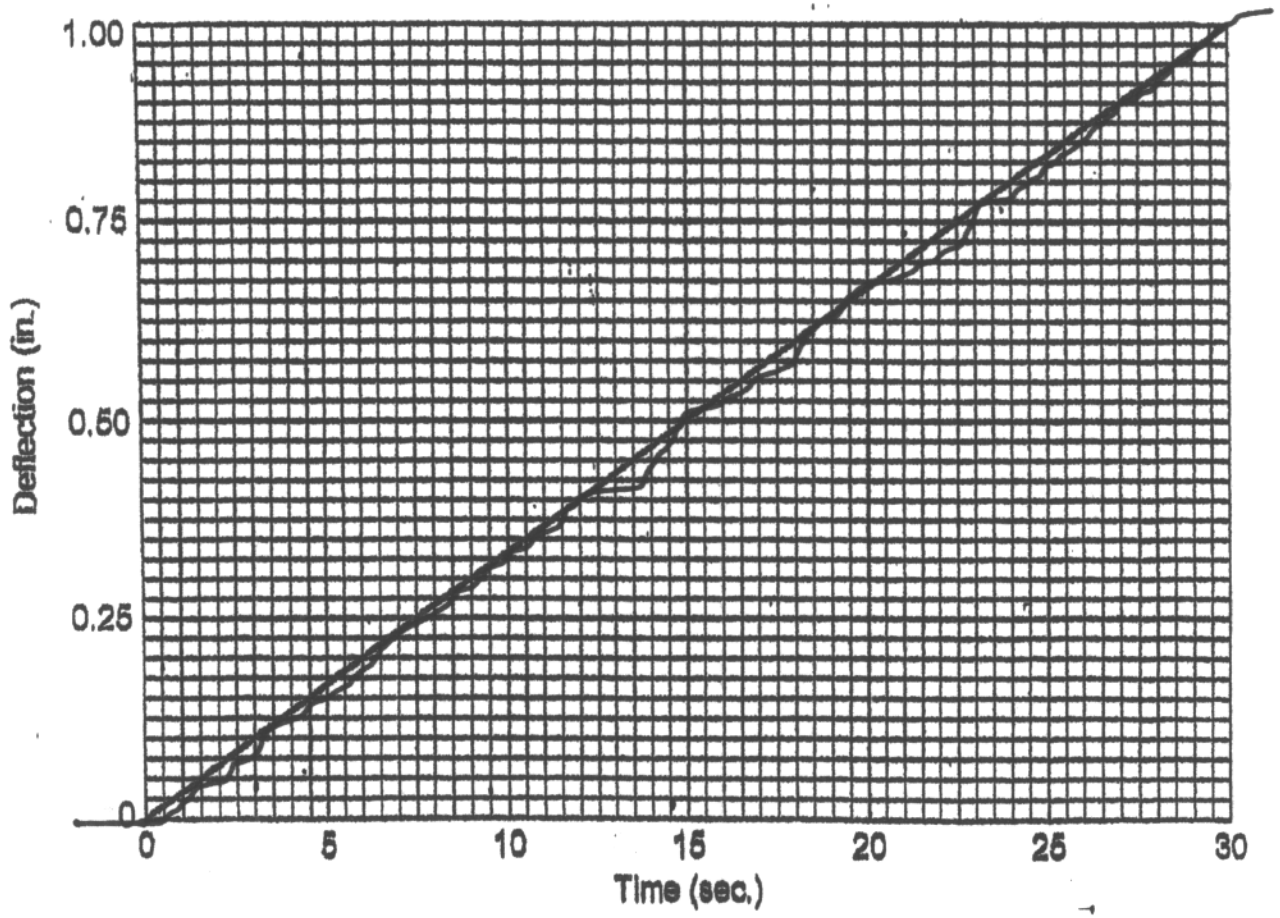
RUN 08-3-25

Date 8/4/03

Temp 70°

Humidity 50%

Foam No. 4"X20" I3



Compression - Deflection Resistance Test Child Seat Foam

RUN 08-3-25

SEAT FOAM USAGE LOG

Foam I.D. Number 4"X 20" I-3

Date	Peak Load	Pass/Fail
8/7/03	24 LBS	

RUN 08-3-25

SECTION 10

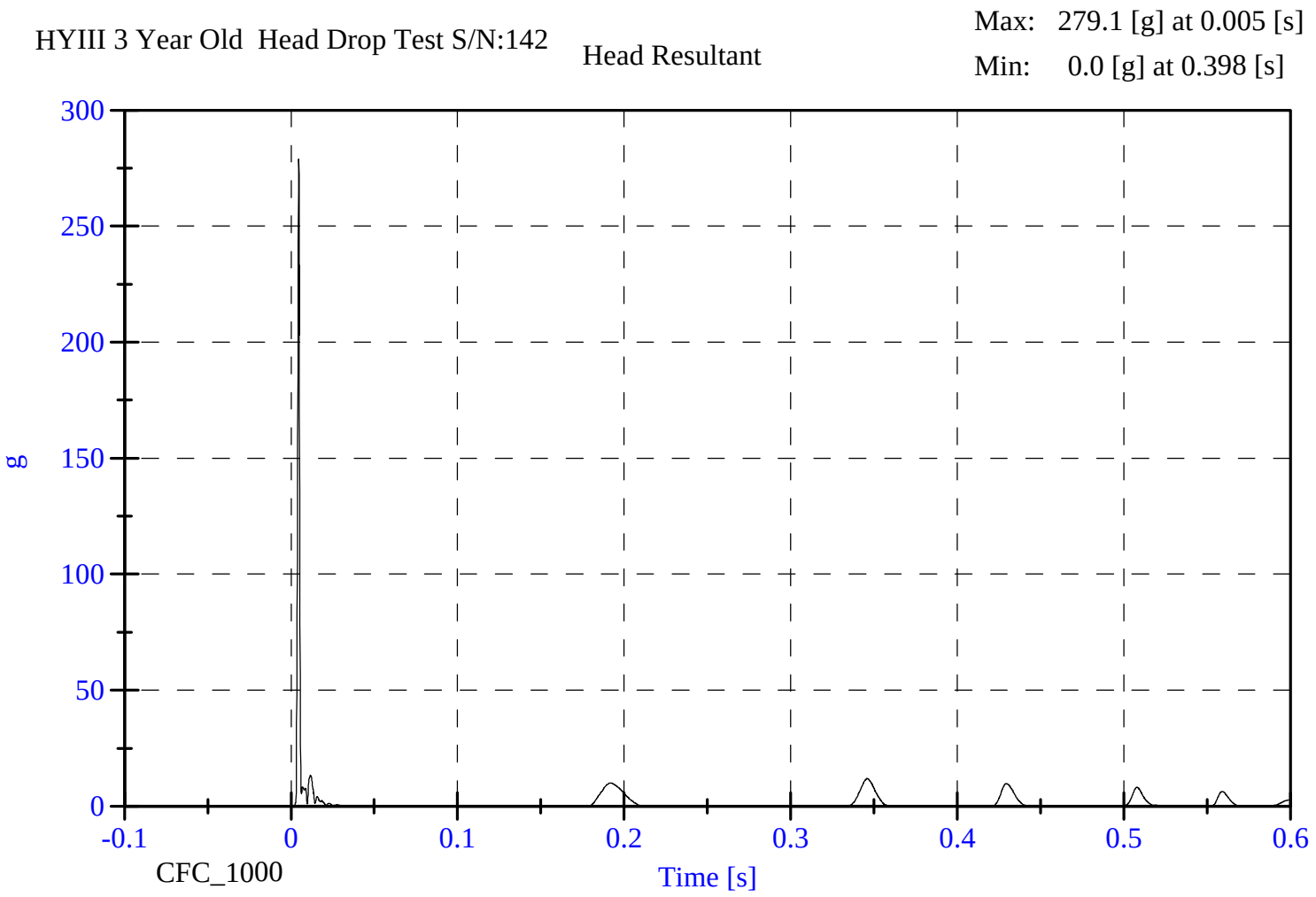
Child Dummy Calibration Data Traces and Tables

HYIII 3 Year Old Head Drop Test S/N:142

Part 572P Head Drop		Calibration Date:	July 21, 2003
Serial No:	142	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	279.06 Gs	Passed
Peak Lateral Accel.:	15 Gs Max	14.76 Gs	Passed
Curve PerCent NonModal:	< 10%	4.82 %	Passed



Hybrid III Head Neck Extention Test S/N:142

Part 572P	Neck Extension Test	Calibration Date:	July 16, 2003
Serial No:	142	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	3.88 ft/s	Passed
Pulse at 10 ms:	6.20- 8.20 ft/s	6.82 ft/s	Passed
Pulse at 14 ms:	9.20-11.50 ft/s	9.36 ft/s	Passed
----------D PLANE ROTATION----------			
Maximum Rotation:	83.0-93.0 Deg	84.20 Deg	Passed
----------MOMENT ABOUT THE OCCIPITAL CONDYLE----------			
Max Occipital Moment:	-53.30--43.70 N-m	-44.75 N-m	Passed
Occiptal Moment Decay:	60.0-80.0 ms	65.30 ms	Passed

Hybrid III 3 Year Old Head Neck Flexion Test S/N:142

Part 572P	Neck Flexion Test	Calibration Date:	July 16, 2003
Serial No:	142	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:	17.65-18.45 ft/s	18.34 ft/s	Passed
----------PENDULUM PULSE----------			
Pulse at 10 ms:	6.60- 8.90 ft/s	7.19 ft/s	Passed
Pulse at 15 ms:	9.80-13.10 ft/s	10.46 ft/s	Passed
Pulse at 20 ms:	13.10-16.70 ft/s	14.31 ft/s	Passed
----------D PLANE ROTATION----------			
Maximum Rotation:	70.0-82.0 Deg	77.80 Deg	Passed
----------MOMENT ABOUT THE OCCIPITAL CONDYLE----------			
Max Occipital Moment:	42.00- 53.00 N-m	50.03 N-m	Passed
Occiptal Moment Decay:	60.0-80.0 ms	73.8 ms	Passed

Hybrid III 3 Year Old Thorax Test S/N:142

Part 572P Thorax Impact — Calibration Date: July 21, 2003

Serial No: 142 — Work File: 4001

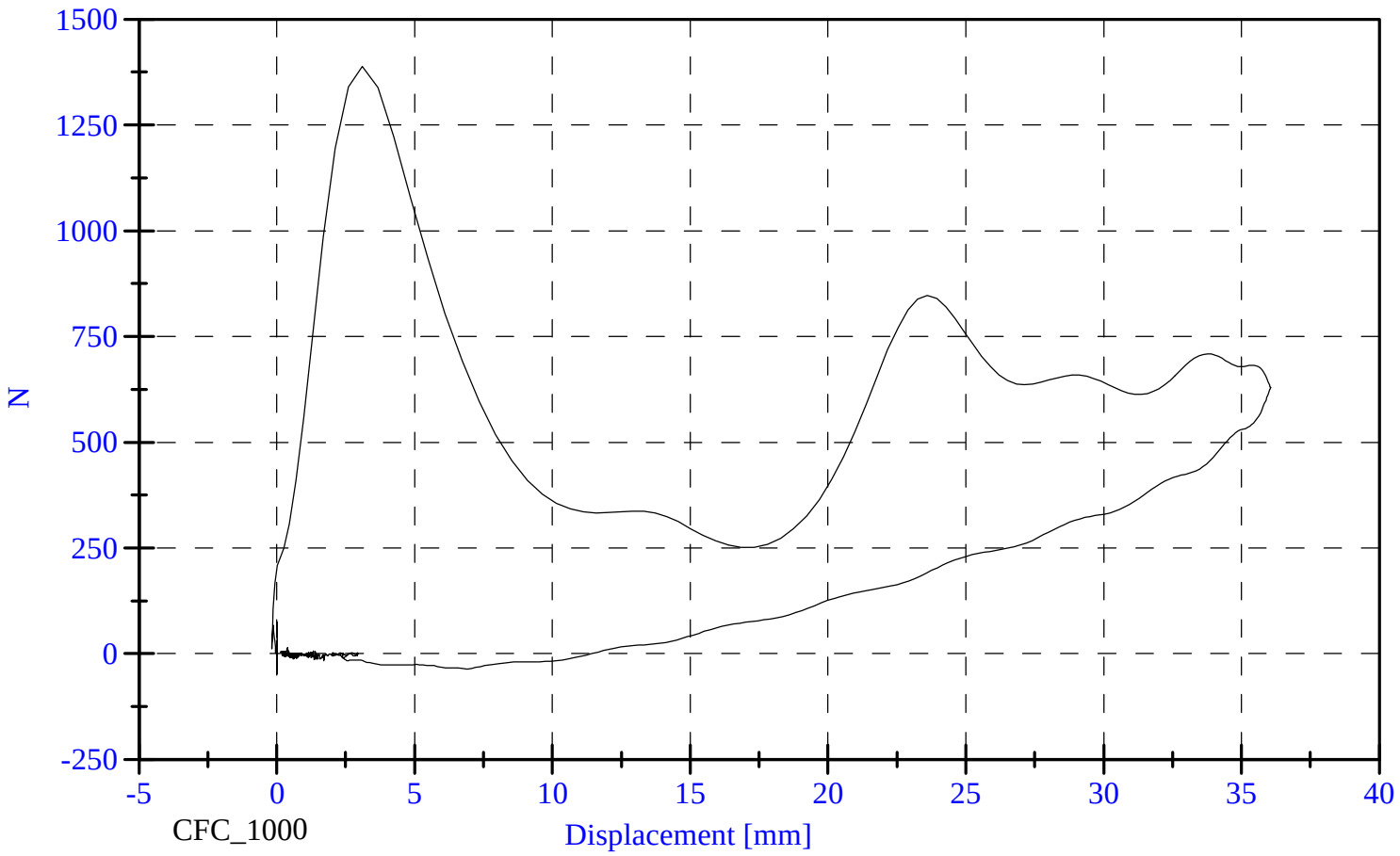
----------TEST RESULTS----------

TEST CONDITION	PARAMETERS	RESULTS	STATUS
Lab Temperature:	20.6-22.2 C	21.1 C	Passed
Lab Humidity:	10-70 %	34.00 %	Passed
Pendulum Velocity:	5.90- 6.10 m/s	6.07 m/s	Passed
Maximum Deflection:	32.00-38.00 mm	36.06 mm	Passed
Maximum Res. Force:	680.00- 810.00 N	709.45 N	Passed
Internal Hysteresis:	65-85 %	75.47 %	Passed
Pass Sternum Force Criteria?:	860.00 N	846.79	Passed

Hybrid III 3 Year Old Thorax Test S/N:142 — Probe Force vs. Displacement

Max: 1388.0 [N] at 3.104 [mm

Min: -48.5 [N] at 0.011 [mm]



SECTION 11

Test Equipment and Instrumentation Calibration

Calibrations for Run 08-3-24 and Run 08-3-25

SHORTNAME	SENSCOM	CALDATE
Sled Ax	MFG: ENDEVCO S/N: 24144	7/24/2003
P6 HDCG Ax	MFG: ENTRAN S/N: 99108-F29	7/15/2003
P6 HDCG Ay	MFG: ENTRAN S/N: 99102-F12	7/15/2003
P6 HDCG Az	MFG: ENTRAN S/N: 00L13-F03	7/15/2003
P6 HDCG RAz	MFG: ENTRAN S/N: 98G18-F18	7/15/2003
P6 CHST Ax	MFG: ENTRAN S/N: 99108-F30	7/15/2003
P6 CHST Ay	MFG: ENTRAN S/N: 99108-F28	7/15/2003
P6 CHST Az	MFG: ENTRAN S/N: 99H30-Z04	7/15/2003
P6 CHST Dx	MFG: SERVO S/N: 142	7/22/2003
P6 PVCN Ax	MFG: ENTRAN S/N: 99102-F06	7/15/2003
P6 PVCN Ay	MFG: ENTRAN S/N: 99102-F15	7/15/2003
P6 PVCN Az	MFG: ENTRAN S/N: 99G29-Q13	7/15/2003
P6 NEKU Fx	MFG: Denton S/N: 213-FX	7/21/2003
P6 NEKU Fy	MFG: Denton S/N: 213-Fy	7/21/2003
P6 NEKU Fz	MFG: Denton S/N: 213-Fz	7/21/2003
P6 NEKU Mx	MFG: Denton S/N: 213-Mx	7/21/2003
P6 NEKU My	MFG: Denton S/N: 213-My	7/21/2003
P6 NEKU Mz	MFG: Denton S/N: 213-Mz	7/21/2003
P6 NEKL Fx	MFG: Denton S/N: 214Fx	7/21/2003
P6 NEKL Fy	MFG: Denton S/N: 214-Fy	7/21/2003
P6 NEKL Fz	MFG: Denton S/N: 214-Fz	7/21/2003
P6 NEKL Mx	MFG: Denton S/N: 214-Mx	7/21/2003
P6 NEKL My	MFG: Denton S/N: 214-My	7/21/2003
P6 NEKL Mz	MFG: Denton S/N: 214-Mz	7/21/2003

SECTION 12

Link to High Speed Movies

Test 08-3-24 North View

Test 08-3-24 South View

SECTION 12

Link to High Speed Movies

Test 08-3-25 North View

Test 08-3-25 South View