

***SAFETY COMPLIANCE TESTING FOR FMVSS No. 218  
MOTORCYCLE HELMETS***

Vega, Model – XT Half Helmet

Size – L

Prepared By

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SwRI Report No 18.10499.FTR.08-019



September 27, 2008

Final Report 218-SRI-08-019

Prepared For

**U.S. Department of Transportation**

National Highway Traffic Safety Administration

Office of Vehicle Safety Compliance, NVS-220

1200 New Jersey Ave., S.E.

Washington, DC 20590



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Final Report Acceptance by OVSC:

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Acceptance Date: October 31, 2008

HS# 640192

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report Number 218-SRI-08-019	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle FINAL REPORT OF FMVSS NO. 218 COMPLIANCE TESTING OF VEGA, MODEL - XT HALF HELMET, SIZE - L MOTORCYCLE HELMET		5. Report Date September 27, 2008	
		6. Performing Organization Code SRI	
7. Author(s) Daniel J. Pomerening, Manager		8. Performing Organization Report No. 18.10499.FTR.08-019	
9. Performing Organization Name and Address Southwest Research Institute® 6220 Culebra Road San Antonio, TX 78238-5166		10. Work Unit No.	
		11. Contract or Grant No. DTHN22-04-C-11002	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Compliance, NVS-220 1200 New Jersey Ave., S.E. Washington, D.C. 20590		13. Type of Report and Period Covered Final Test Report	
		14. Sponsoring Agency Code NVS-220	
16. Abstract Compliance tests were conducted on the Vega Model XT Half Helmet motorcycle helmet in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-218-06.  Test failures identified were as follows:  Impact (S5.1, S7.1): There was a single impact failure with dwells in excess of 2.0 msec at 200 g: Right Side, Water Immersed helmet, flat anvil, 2 <sup>nd</sup> drop, 2.08 msec  Labeling (S5.6): There were labeling failures with information lacking on the instructions to the purchaser: Helmet can be seriously..... Apply only the following.....			
17. Key Words Compliance Testing Safety Engineering FMVSS No. 218		18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services (NPO-411) 1200 New Jersey Ave., S.E. Washington, D.C. 20590 <a href="mailto:tis@dot.gov">tis@dot.gov</a> FAX 202-493-2833	
19. Security Classification (of this report) Unclassified	20. Security Classification (of this page) Unclassified	21. No. of Pages 40	22. Price

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**SECTION 1      PURPOSE OF COMPLIANCE TEST**

## **1 PURPOSE OF COMPLIANCE TEST**

This testing was conducted as part of the Department of Transportation, National Highway Traffic Safety Administration's Federal Motor Vehicle Safety Standard (FMVSS) No. 218, "Motorcycle Helmets"<sup>1</sup> Compliance Program. The purpose of the test was to determine if the production helmets supplied by the Office of Vehicle Safety Compliance satisfy the requirements of TP-218-06<sup>2</sup>, as governed by the contract.

## **2 TEST PROCEDURE**

The Southwest Research Institute Test Procedure for FMVSS No. 218<sup>3</sup> submitted to the Office of Vehicle Safety Compliance, National Highway Traffic Safety Administration, contains the specific procedures used to conduct this test. The Southwest Research Institute Test Procedure for FMVSS No. 218 as modified by project specific process travelers is in accordance with TP-218-06.

The test procedure shall not be in conflict with any portion of FMVSS No. 218 nor amendments in effect as noted in the applicable contract.

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<sup>1</sup> National Highway Traffic Safety Administration, Federal Motor Vehicle Safety Standard (FMVSS) No. 218, "Motorcycle Helmets", 49 CFR Chapter V Section 571.218, August 20, 1973 as last amended FR 12529 on April 15, 1988.

<sup>2</sup> National Highway Traffic Safety Administration, TP-218-06, Laboratory Test Procedure for FMVSS 218 Motorcycle Helmets, November 30, 2006.

<sup>3</sup> Southwest Research Institute, SwRI Test Procedure for Compliance Testing in Accordance with FMVSS No. 218 for Motorcycle Helmets, May 2006.

**SECTION 2            COMPLIANCE TEST DATA SUMMARY**

## 1 HELMET DATA

Helmet Brand Name: Vega  
Helmet Model Designation: XT Half Helmet  
Helmet Manufacturer: HD Power Sports Safety Products, Ltd.  
Helmet Size Designation: L  
Helmet Coverage: Partial  
Helmet Position Index (HPI): 50.0 mm  
Shell Material: Fiberglass  
Liner Material: Expanded Polystyrene  
Buckle Description: D-Ring

Helmet	A Ambient	B Low Temp	C High Temp	D Water Immersed	E Spare
Shell Color/Pattern	Black	Black	Black	Flat Black	
Weight (grams)	889	835	826	794	
Month & Year of Manufacture	06/2006	06/2006	03/2008	01/2006	

*Comments:*

The HPI was supplied by NHTSA based on information obtained from the manufacturer.

The weight was with all auxiliary equipment removed ready for testing.

Photographs of the helmets are given in Appendix C (Photographs of Equipment).

The helmet data given was based on information provided with the helmets, information provided by NHTSA, and measured data.

Only four samples were received.

## 2 SUMMARY OF TEST RESULTS

HELMET	A Ambient	B Low Temp	C High Temp	D Water Immersed
IMPACT (S5.1, S7.1)	PASS	PASS	PASS	FAIL
PENETRATION (S5.2, S7.2)	PASS	PASS	PASS	PASS
RETENTION (S5.3, S7.3)	PASS	PASS	PASS	PASS

CONFIGURATION (S5.4)	PASS
PERIPHERAL VISION/BROW OPENING (S5.4)	PASS
LABELING (S5.6)	FAIL

*Comments:*

Impact (S5.1, S7.1): There was a single impact failure with dwells in excess of 2.0 msec at 200 g:

Right Side, Water Immersed helmet, flat anvil, 2<sup>nd</sup> drop, 2.08 msec

Labeling (S5.6): There were labeling failures with information lacking on the instructions to the purchaser:

Helmet can be seriously.....  
Apply only the following.....

## 3 SELECTION OF APPROPRIATE HEADFORM (S6.1)

Selection of the headform used during testing is based on the helmet size designation, marked on the helmet, as identified in the following table. If the size range is not specified on the helmet, consult with the COTR before beginning the test. As identified in FMVSS No. 218, if the helmet size designation falls into more than one of the size ranges, it shall be tested on each appropriate headform. Consult with the COTR before beginning the test.

HELMET SIZE DESIGNATION	HEADFORM SIZE	WEIGHT
≤ 6 3/4 ≤ European size 54	Small	3.5, +0.00, -0.063 kg 7.8, +0.00, -0.14 lbs
>6 3/4 but ≤ 7 1/2 >European Size 54 but ≤ European Size 60	Medium	5.0, +0.00, -0.090 kg 11.0, +0.00, -0.20 lbs
> 7 1/2 > European size 60	Large	6.1, +0.00, -0.108 kg 13.4, +0.00, -0.24 lbs

*Comments:* A large headform was used based on information the manufacturer provided to NHTSA. The total weight of the drop assembly was 6.06 kg.

Recorded by: Manny Gonzalez

Approved by: Daniel Pomerening

September 27, 2008

#### 4 CONDITIONING FOR TESTING (S6.4)

The helmets shall be conditioned for not less than 12 hours in the specified environmental condition shown below, prior to testing.

IDENTIFICATION	CONDITIONS	HELMET
Ambient Conditions	21°C ± 6°C, 40% to 60% RH, Site Pressure 59°F to 81°F	A
Low Temperature	-10°C +8°C, -0°C 14°F to 28°F	B
High Temperature	50°C +0°C, -4°C 115°F to 122°F	C
Water Immersion	25°C ± 6°C 66°F to 88°F	D

The maximum time during which the helmet may be out of the conditioning environment shall not exceed 4 minutes. It must then be returned to the conditioning environment for a minimum of 3 minutes for each minute or portion of a minute in excess of 4 minutes out of the conditioning environment or 12 hours, whichever is less, prior to resumption of testing.

The first test shall be performed at a time greater than 2 minutes after removal from conditioning. The second test in a sequence shall be performed before the 4-minute limit.

The helmets were conditioned prior to testing. Records of the conditioning are given in Section 3.1 (Conditioning Environments).

*Comments:* None.

### 5 IMPACT TESTING (S5.1 & S7.1)

The helmets were subjected to the impact attenuation testing in accordance with the requirements of S5.1 and S7.1 of FMVSS No. 218.

Vega, Ltd., XT Half Helmet  
Impact Testing

Temperature C	Relative Humidity %
19	46

Headform Size = Large  
Impact Position on Crown

Drop Assembly Weight = 6.06 kg

System Check	Drop No	Drop Height (cm)	Vel (m/sec)	Peak Acceleration (g)	Dwell Time (msec)	
					at 150 g's	at 200 g's
Pre Test	1A	107	4.57	402	2.00	1.74
	2A	107	4.50	402	2.00	1.72
	3A	107	4.50	403	2.00	1.74
Pre Test Average			---	402	---	---
Post Test	1B	107	4.50	401	2.00	1.72
	2B	107	4.51	400	2.00	1.72
	3B	107	4.50	399	2.00	1.74
Post Test Average			---	400	---	---
Difference Between Pre Test and Post Test Averages				-2	Difference Not to Exceed 40 g's	

Vega, Ltd., XT Half Helmet  
Impact Testing

Helmet Designation	Helmet Condition	Helmet Type	Impact Location (+/- 45 degrees)							
		Partial/Full	Forehead		Left Side		Right Side		Rear	
		Complete	Left Front		Right Rear		Right Front		Left Rear	
		Impact No.	1	2	1	2	1	2	1	2
A	Ambient	Anvil	Hemi		Hemi		Flat		Flat	
		Test Record No.	3	4	11	12	19	20	27	28
		Peak g	120	143	129	276	205	241	174	226
		ms @ 150 g	0.00	0.00	0.00	1.56	2.72	2.66	2.28	2.94
		ms @ 200 g	0.00	0.00	0.00	0.90	0.42	1.76	0.00	1.42
		Velocity m/sec	5.27	5.19	5.19	5.28	5.94	6.04	5.93	6.04
B	Low Temperature	Anvil	Hemi		Hemi		Flat		Flat	
		Test Record No.	5	6	13	14	21	22	29	30
		Peak g	104	186	125	236	203	265	159	249
		ms @ 150 g	0.00	1.60	0.00	1.66	2.72	2.54	1.86	2.80
		ms @ 200 g	0.00	0.00	0.00	0.78	0.00	1.58	0.00	1.66
		Velocity m/sec	5.20	5.27	5.19	5.27	5.94	6.05	5.94	5.93
C	High Temperature	Anvil	Hemi		Hemi		Flat		Flat	
		Test Record No.	7	8	15	16	23	24	31	32
		Peak g	101	245	122	361	190	231	166	391
		ms @ 150 g	0.00	1.52	0.00	1.42	2.72	2.74	1.60	2.16
		ms @ 200 g	0.00	0.82	0.00	0.98	0.00	1.52	0.00	1.52
		Velocity m/sec	5.28	5.28	5.28	5.28	5.94	5.94	6.04	6.05
D	Water Immersed	Anvil	Hemi		Hemi		Flat		Flat	
		Test Record No.	9	10	17	18	25	26	33	34
		Peak g	88	183	136	266	229	267	193	253
		ms @ 150 g	0.00	1.10	0.00	1.60	2.94	2.86	2.62	2.78
		ms @ 200 g	0.00	0.00	0.00	0.82	1.58	2.08	0.00	1.88
		Velocity m/sec	5.19	5.28	5.27	5.28	5.94	5.94	5.94	6.05

Comments: The helmet failed the impact testing. There was a single impact failure with dwells in excess of 2.0 msec at 200 g:

Right Side, Water Immersed helmet, flat anvil, 2<sup>nd</sup> drop, 2.08 msec

Recorded by: Manny Gonzalez

Approved by: Daniel Pomerening

## 6 PENETRATION (S5.2 & S7.2)

The helmets were subjected to the penetration test in accordance with the requirements of S5.2 and S7.2 of FMVSS No. 218.

Weight of Striker: 3, +0.000, -0.029 kg  
6.625, +0.000, -0.065 lbs

Point of Striker: Included angle of 60°, +1.0°, -0.0°  
Cone height of 3.8, +0.25, -0.00 cm (1.5, +0.1, -0.0 inches)  
Radius of 0.5, +0.08, -0.0 mm (0.19, +0.003, -0.000 inches)  
Minimum hardness of 60 Rockwell (Scale C)

The height of the free fall drop was 300, +0.00, -3.05 cm (118.1, +0.0, -1.2 inches) as measured from the striker point to the impact point on the outer surface of the test helmet. Two penetration blows are applied to each helmet at least 7.6 cm (3 inches) apart and at least 7.6 cm (3 inches) from the centers of any impacts applied during the impact attenuation test.

When tested, the test helmet shall be failed if the striker has made an indentation in the headform.

AMBIENT TEMPERATURE °C	AMBIENT RELATIVE HUMIDITY %
21	49

TEST	HELMET	CONDITION	PASS	FAIL
1	A	Ambient	PASS	
2	A	Ambient	PASS	
3	B	Low Temperature	PASS	
4	B	Low Temperature	PASS	
5	C	High Temperature	PASS	
6	C	High Temperature	PASS	
7	D	Water Immersed	PASS	
8	D	Water Immersed	PASS	

*Comments:* This helmet passed the penetration testing. The free fall drop was 298.24 cm.

## 7 RETENTION SYSTEM TESTING (S5.3 & S7.3)

The helmets were subjected to the retention system testing in accordance with the requirements of S5.3 and S7.3 of FMVSS No. 218.

READING	APPLIED LOAD	AMBIENT TEMPERATURE °C	AMBIENT RELATIVE HUMIDITY %
INITIAL	22.7, +4.54, -0.0 kg 50, +10, -0 lbs.	21	49
FINAL	136, +0.0, -4.5 kg 300, +0.0, -10.0 lbs		

The acceptance criteria shall be that the retention system remained intact without elongating more than 2.54 cm (1 inch).

HELMET	CONDITIONS	INITIAL READING (cm)	FINAL READING (cm)	ELONGATION (cm)
A	Ambient	0.00	0.79	0.79
B	Low Temperature	0.00	1.35	1.35
C	High Temperature	0.00	0.77	0.77
D	Water Immersed	0.00	0.75	0.75

Time histories for the retention system testing are given in Section 3.3 Retention Time Histories. Given on these plots are the conditioning environment, load, and elongation.

*Comments:* This helmet passed the retention testing.

## 8 PERIPHERAL VISION AND BROW OPENING (S5.4)

The helmet shall provide a minimum peripheral vision of 105° to each side of the mid-sagittal plane through the basic plane. The brow opening shall be at least 2.54 cm (1 inch) above all points in the basic plane that are within the angles of peripheral vision.

	REQUIREMENTS	TEST RESULTS
PERIPHERAL VISION	> 105°	> 105 °
BROW OPENING	> 2.54 cm	> 2.54 cm

*Comments:* This helmet passed the peripheral vision and brow opening testing.

## 9 CONFIGURATION (S5.4)

The configuration of this helmet must be such that it has a protective surface of continuous contour at all points above the test line.

*Comments:* The helmet passed the configuration requirements.

## 10 LABELING (S5.6)

Each helmet shall be permanently and legibly labeled, in a manner such that the label(s) can be easily read without removing padding or any other permanent part. The following information shall be included:

REQUIRED INFORMATION	PASS	FAIL
(1) Manufacturer's name or identification.	PASS	
(2) Precise model designation.	PASS	
(3) Size.	PASS	
(4) Month and year of manufacture.	PASS	
(5) The DOT symbol, constituting the manufacturer's certification that the helmet conforms to the applicable Federal Motor Vehicle Safety Standards. This symbol shall appear on the outer surface, in a color that contrasts with the background, in letters at least 1 cm (0.375 inch) high centered laterally with the horizontal centerline on the symbol located a minimum of 2.9 cm (1.125 inches) and a maximum of 3.5 cm (1.375 inches) from the bottom edge of the posterior portion of the helmet.	PASS	
(6) Instruction to the Purchaser as follows:		
Shell and liner constructed of (identify type(s) of materials)	PASS	
The helmet can be seriously damaged by some common substances without the damage being visible to the user.		FAIL
Apply only the following: (Recommended cleaning agents, paints, adhesives, etc. as appropriate).		FAIL
Make no modifications.	PASS	
Fasten helmet securely.	PASS	
If the helmet experiences a severe blow, return it to the manufacturer for inspection or destroy and replace it.	PASS	

*Comments:* The helmet failed the labeling requirements. There were labeling failures with information lacking on the instructions to the purchaser:

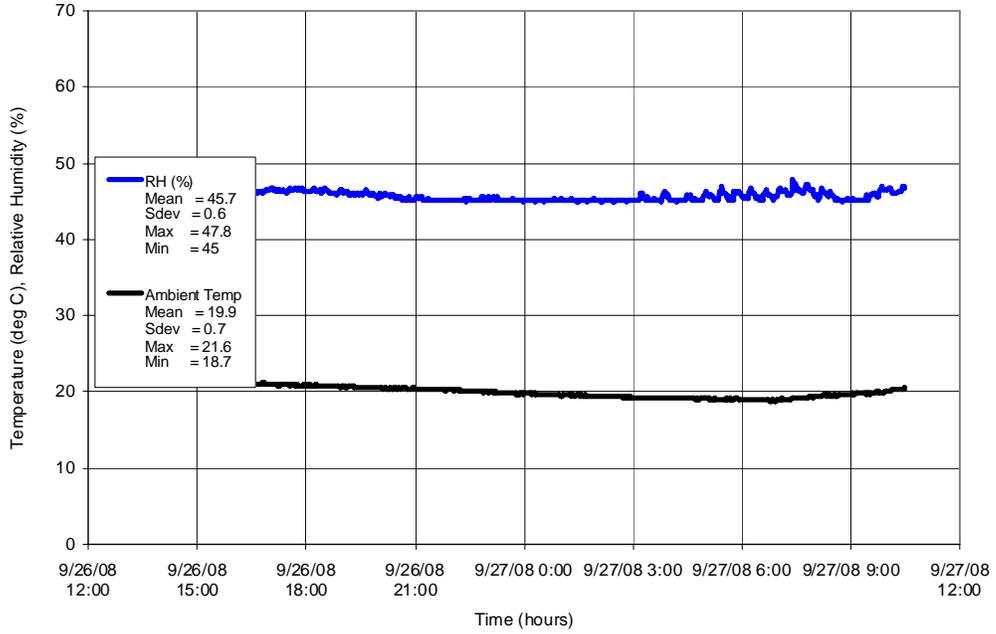
- Helmet can be seriously.....
- Apply only the following.....

**SECTION 3**

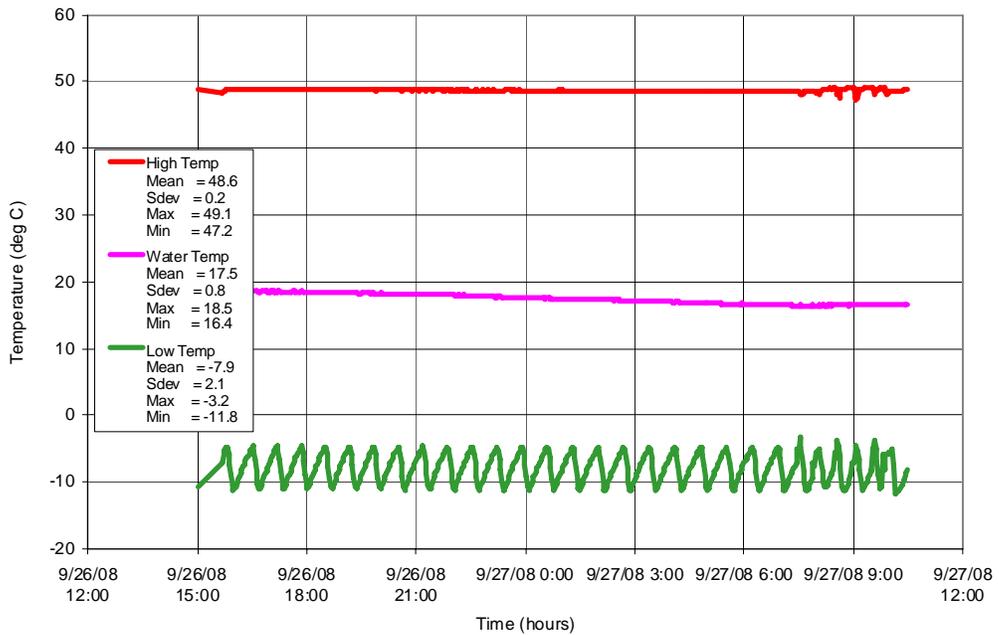
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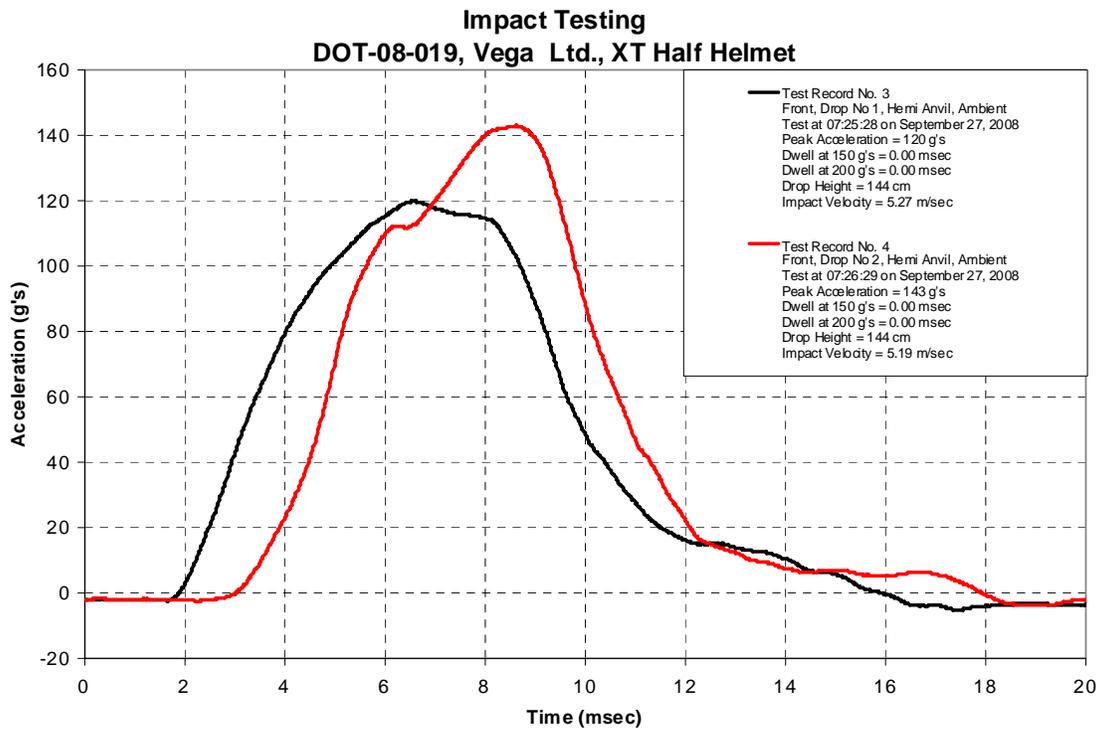
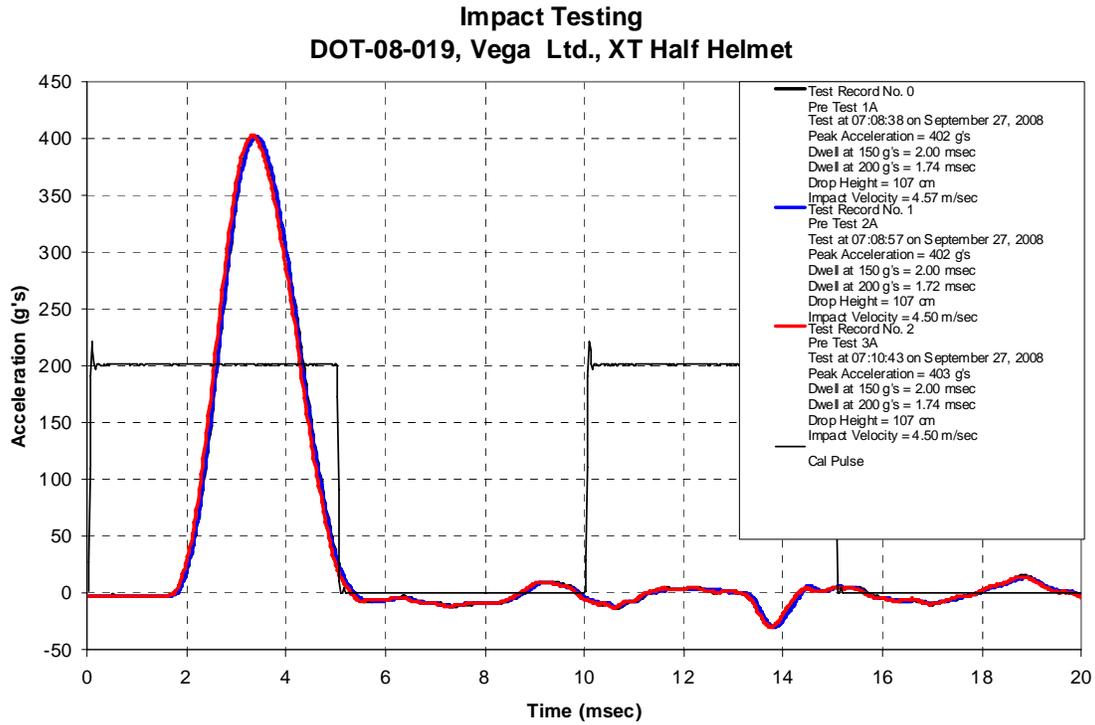
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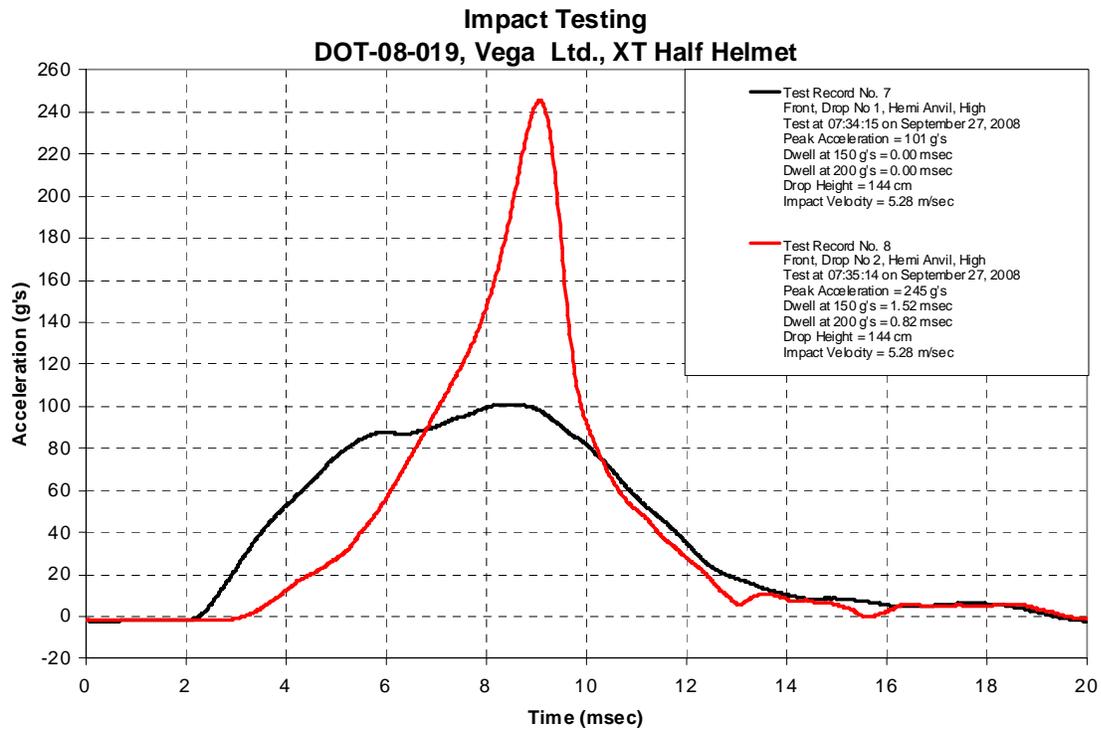
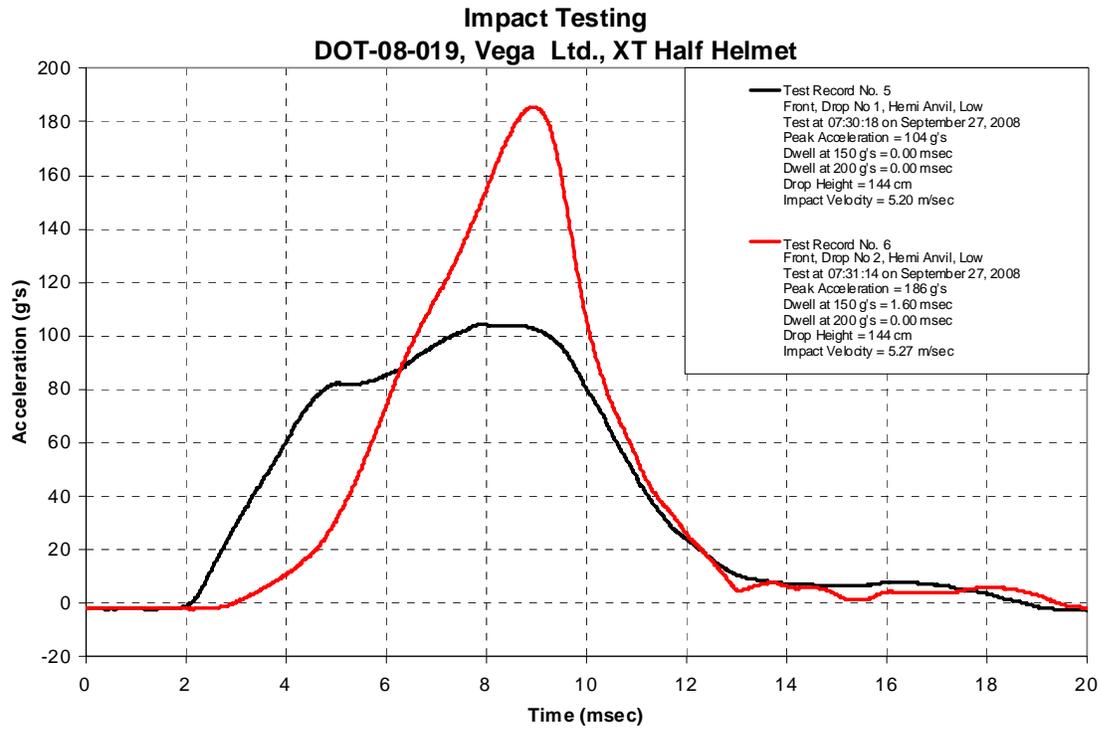


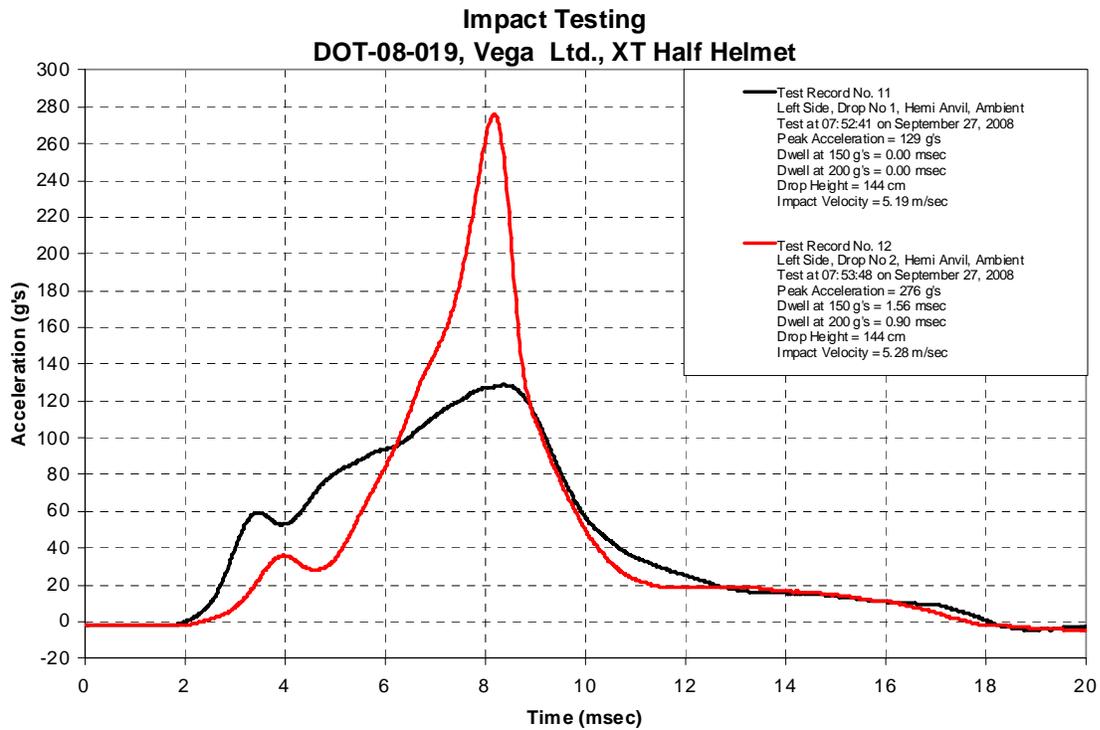
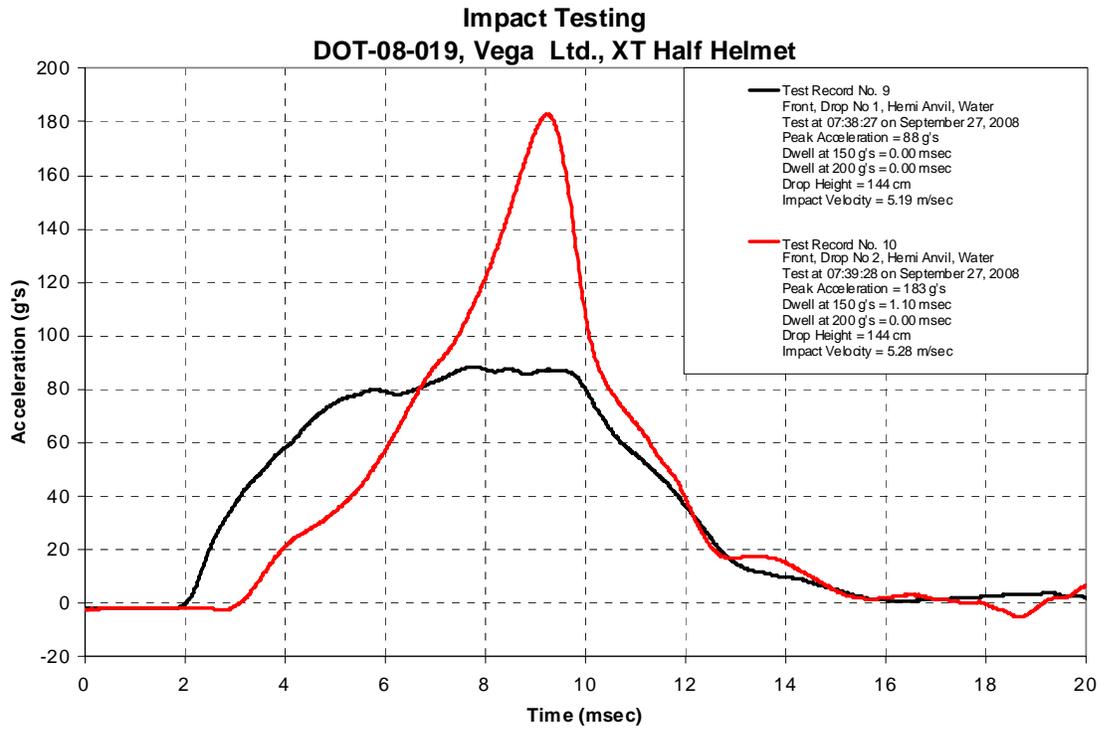
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DOT-08-019, Vega, Ltd., XT Half Helmet

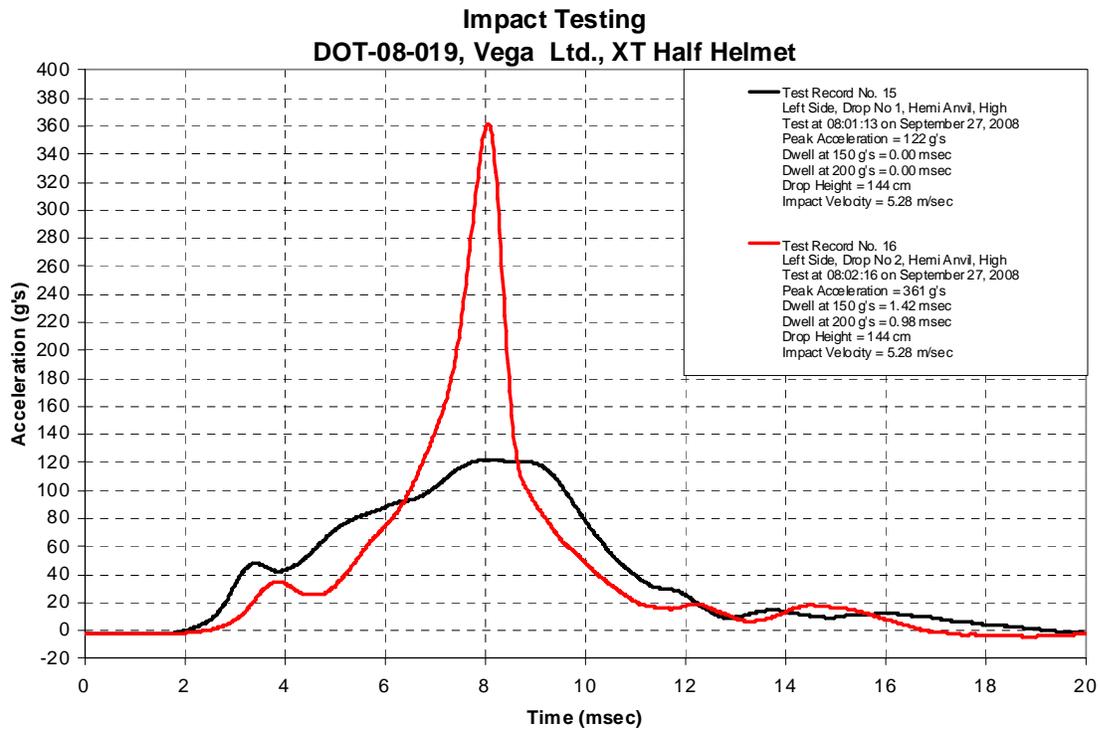
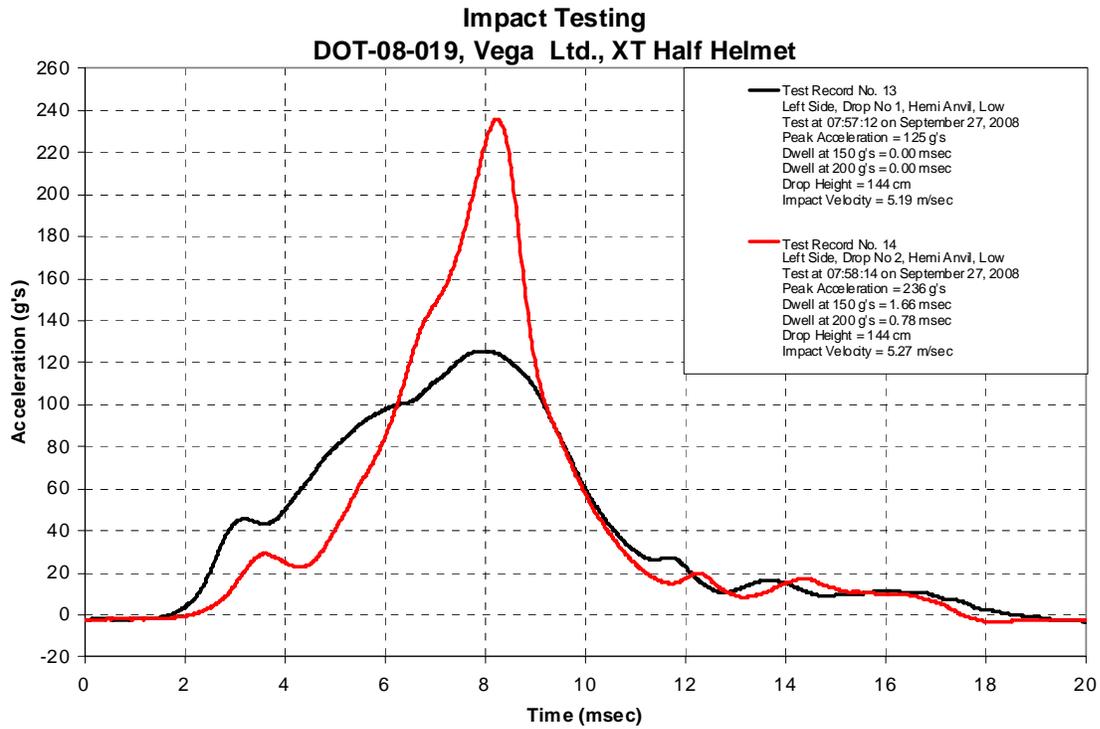


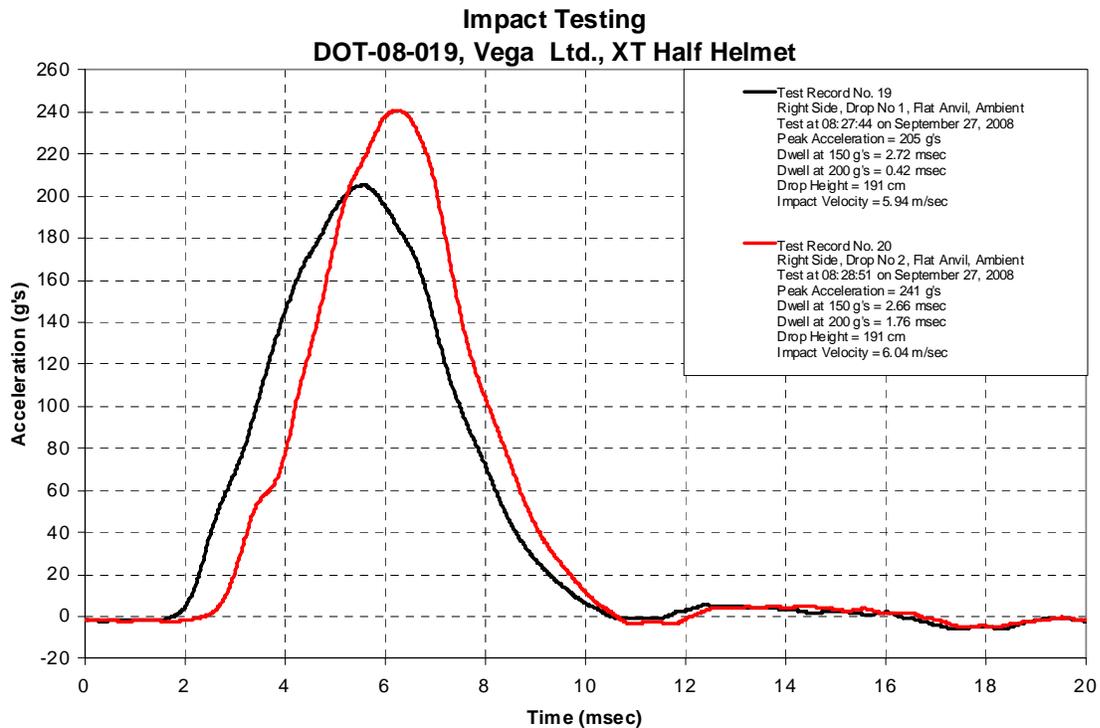
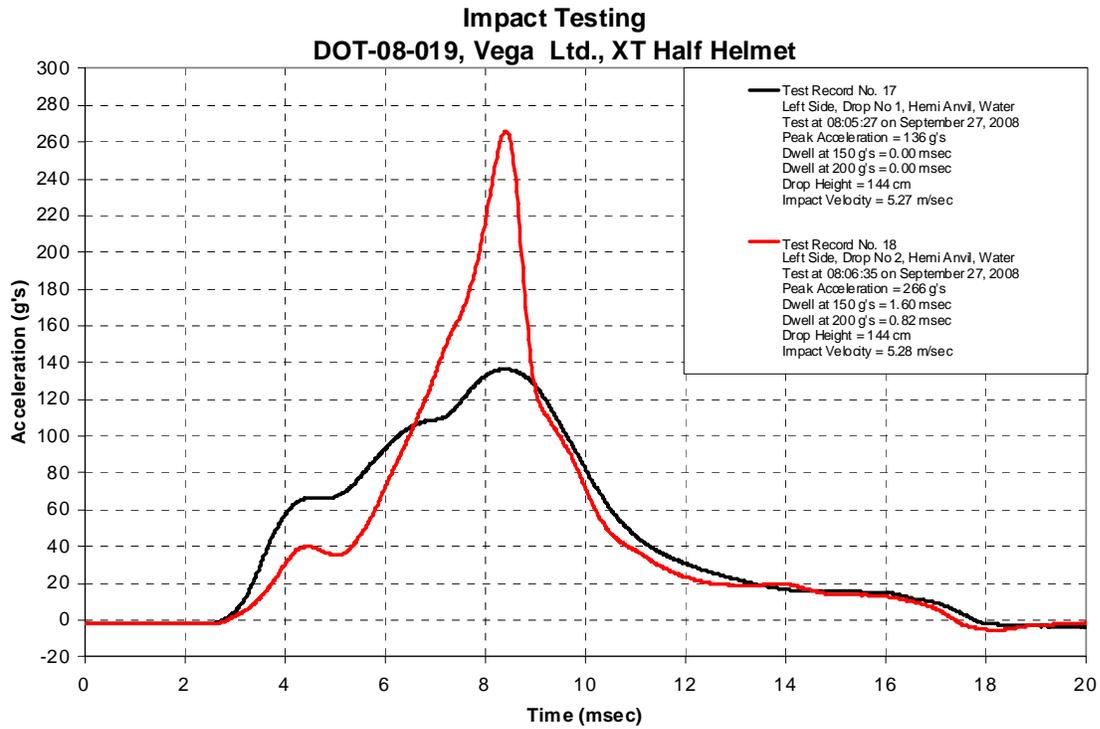
## 2 IMPACT TIME HISTORIES

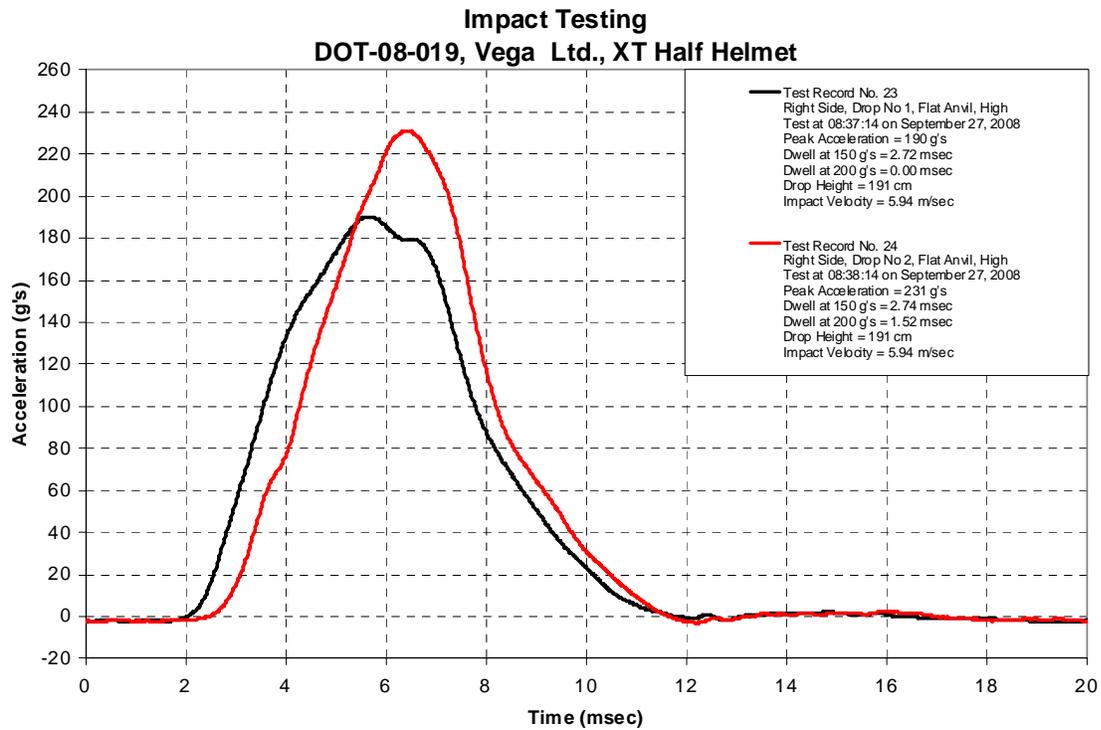
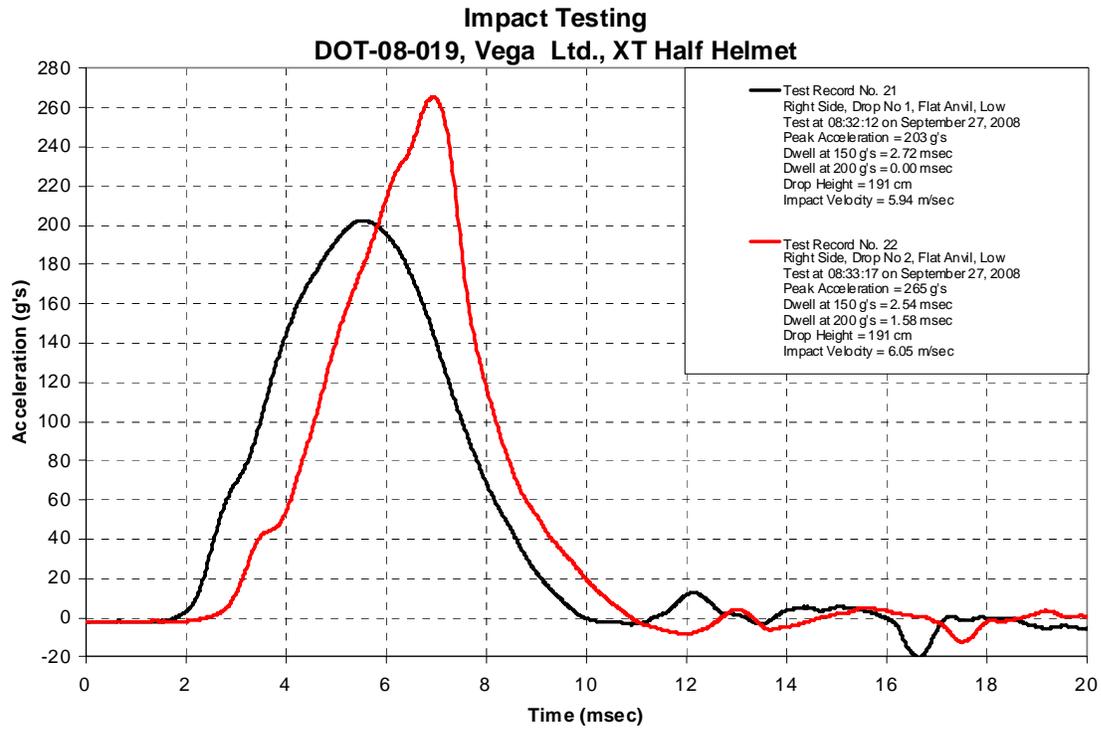


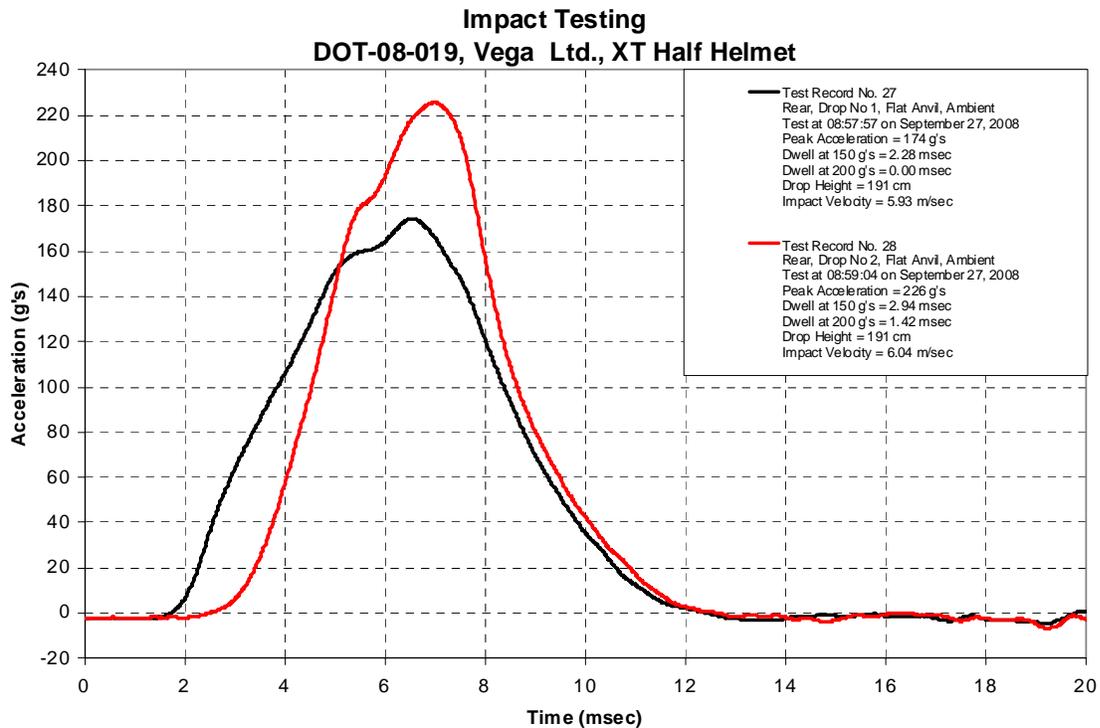
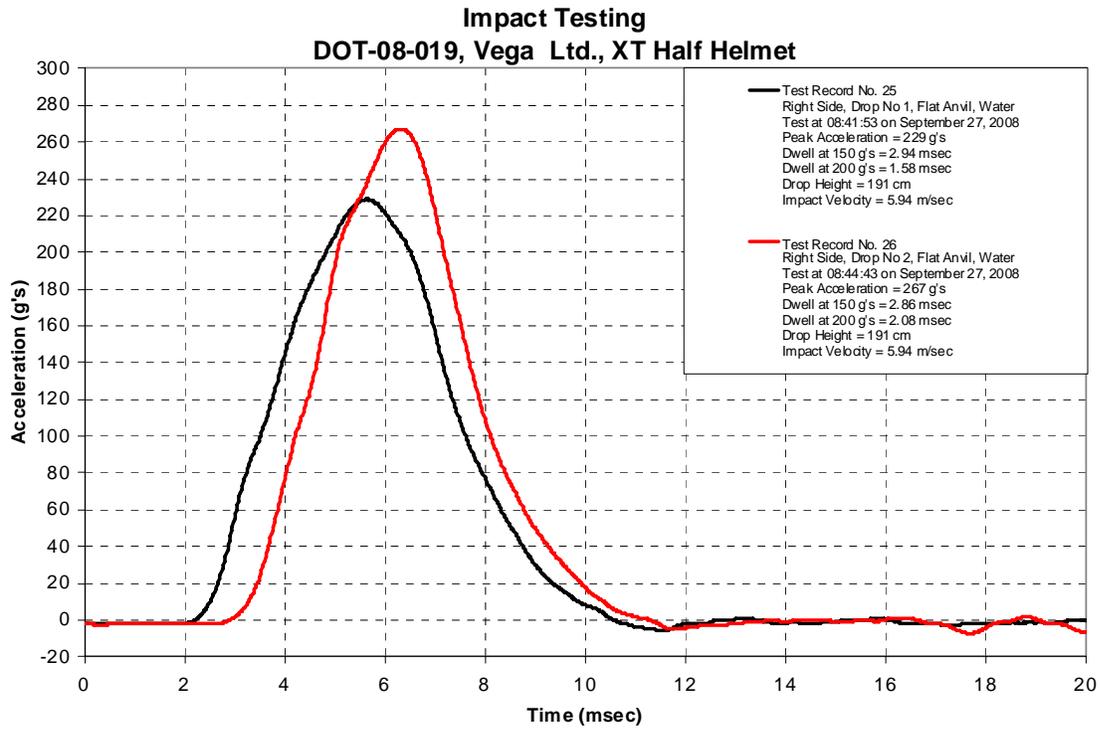


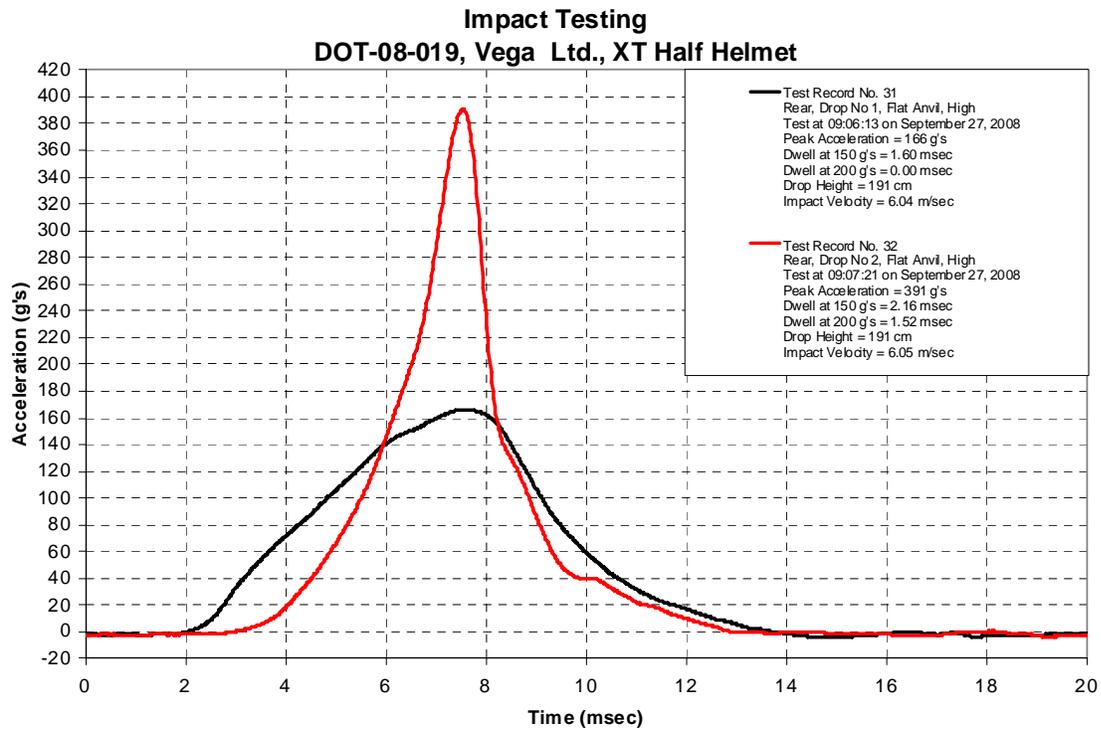
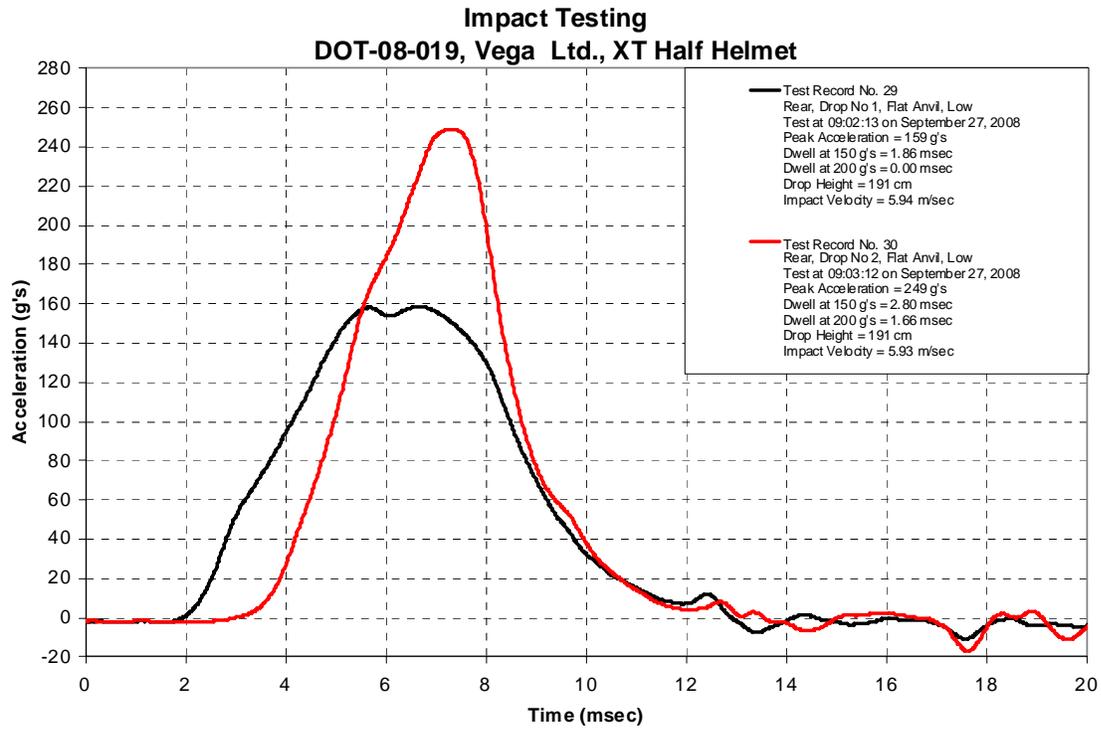


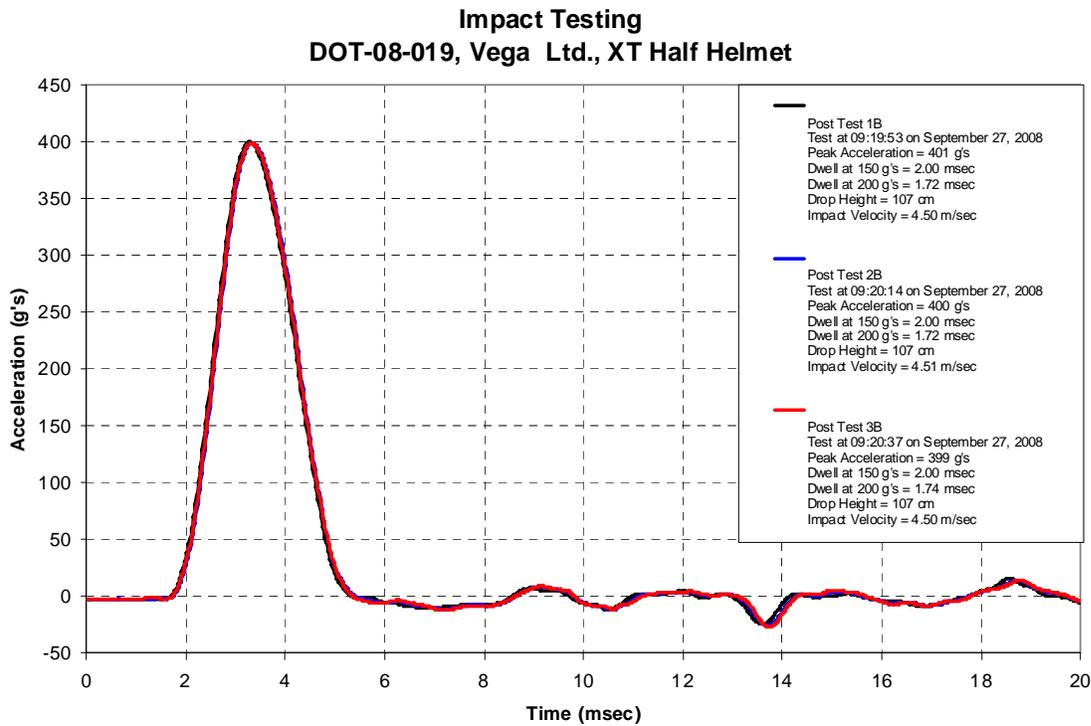
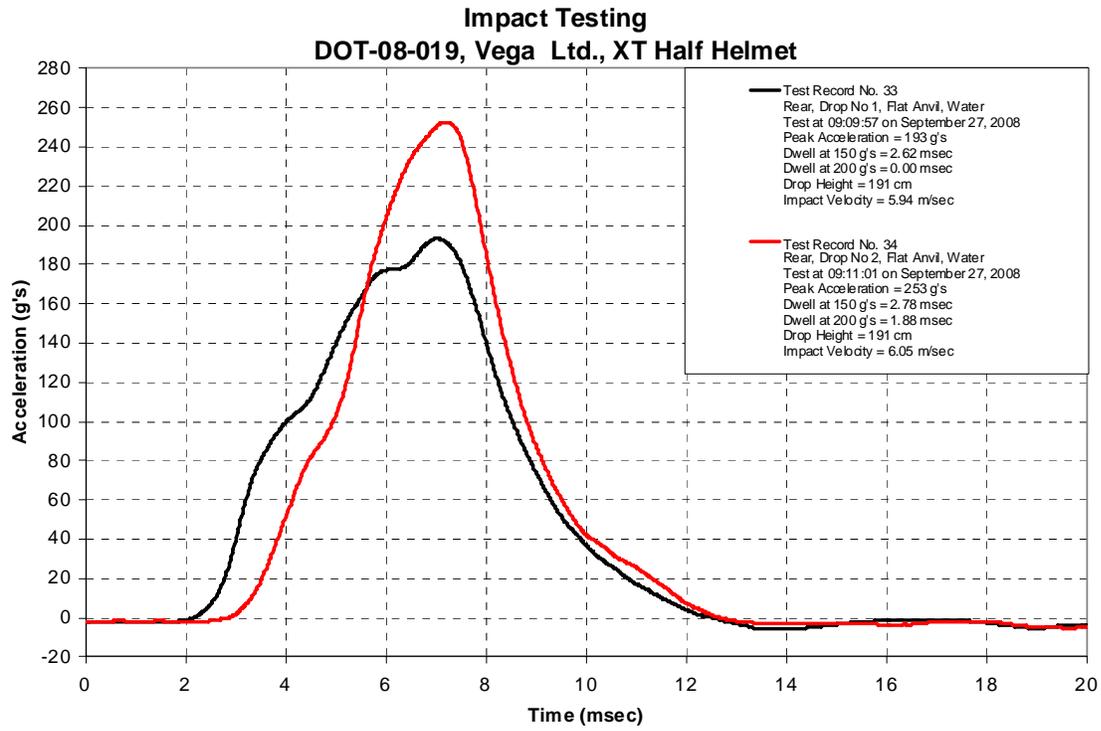






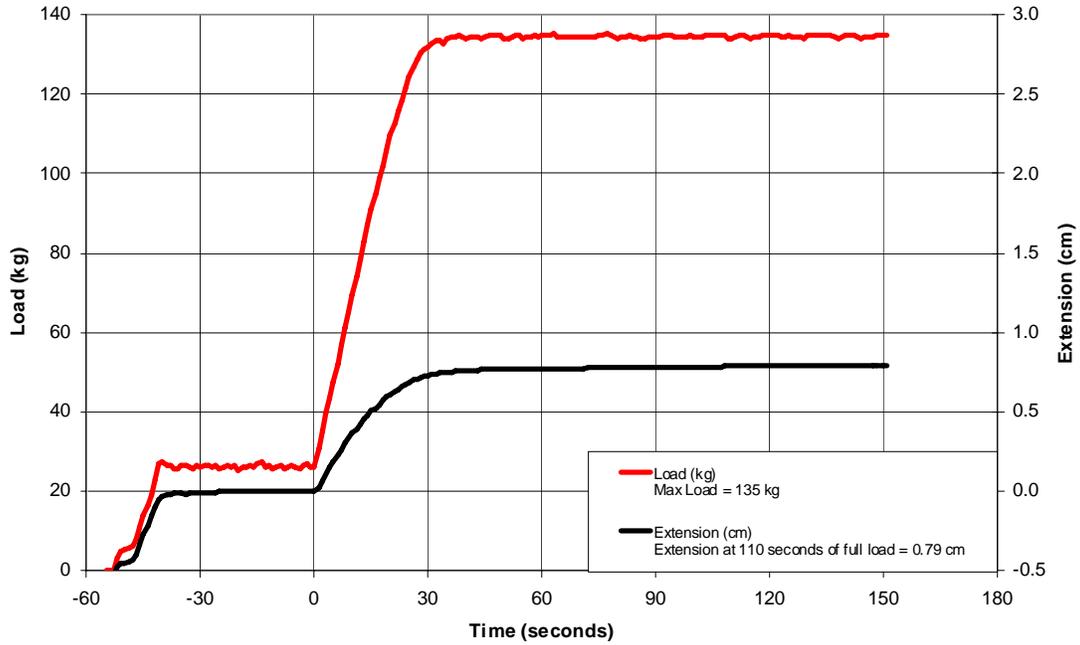




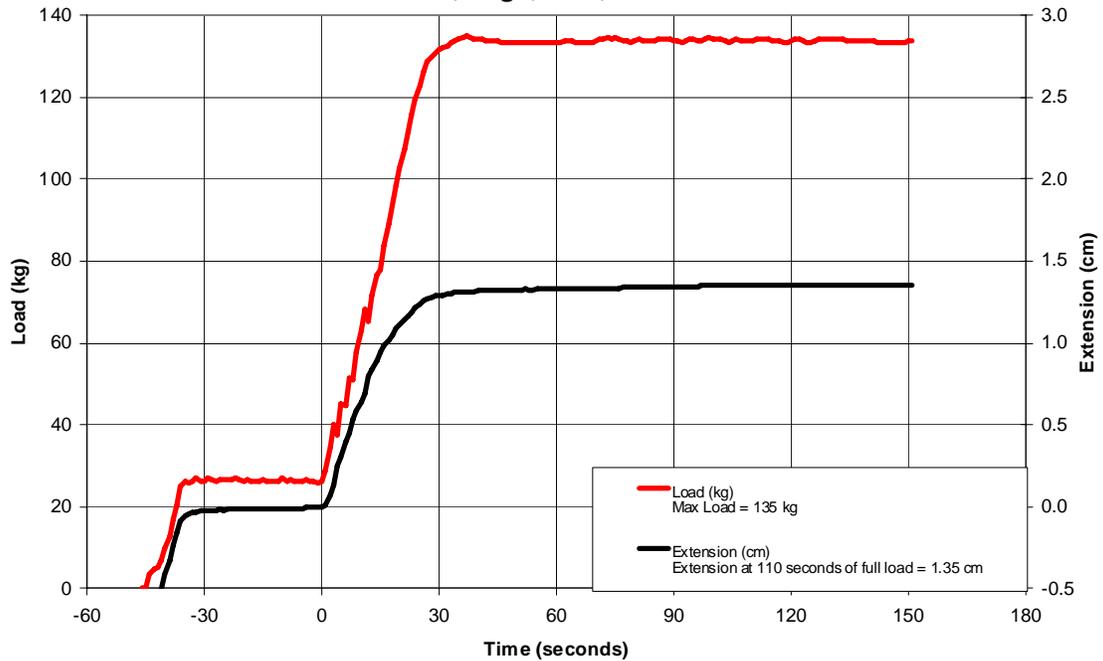


### 3 RETENTION TIME HISTORIES

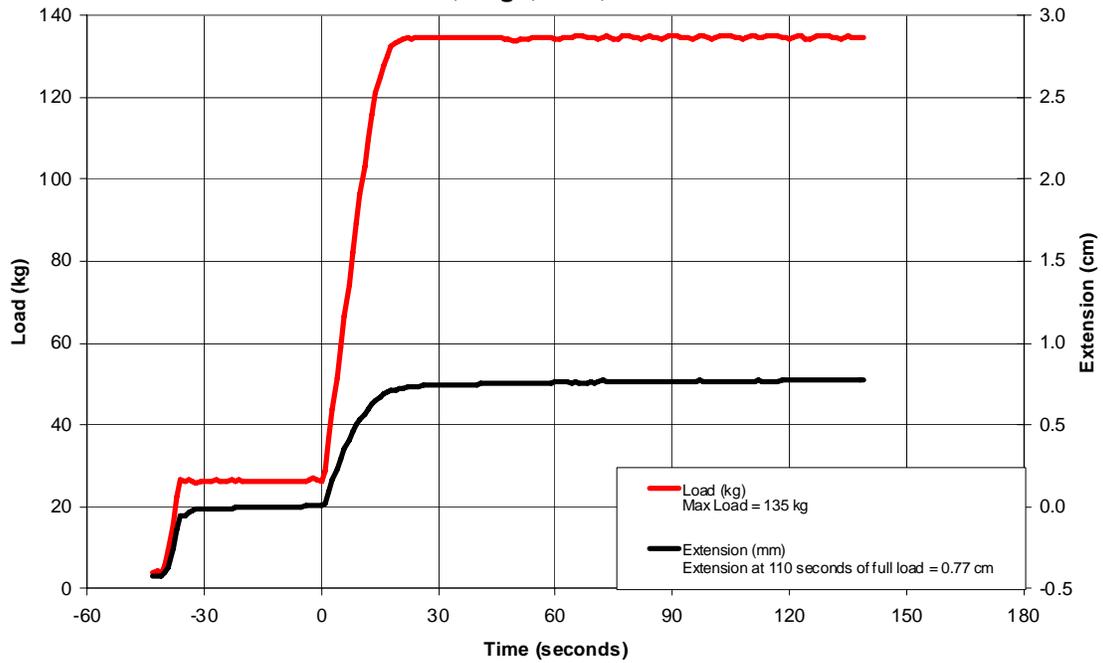
**Ambient Temperature Retention Testing 09/27/08**  
**DOT-08-019, Vega, Ltd., XT Half Helmet**



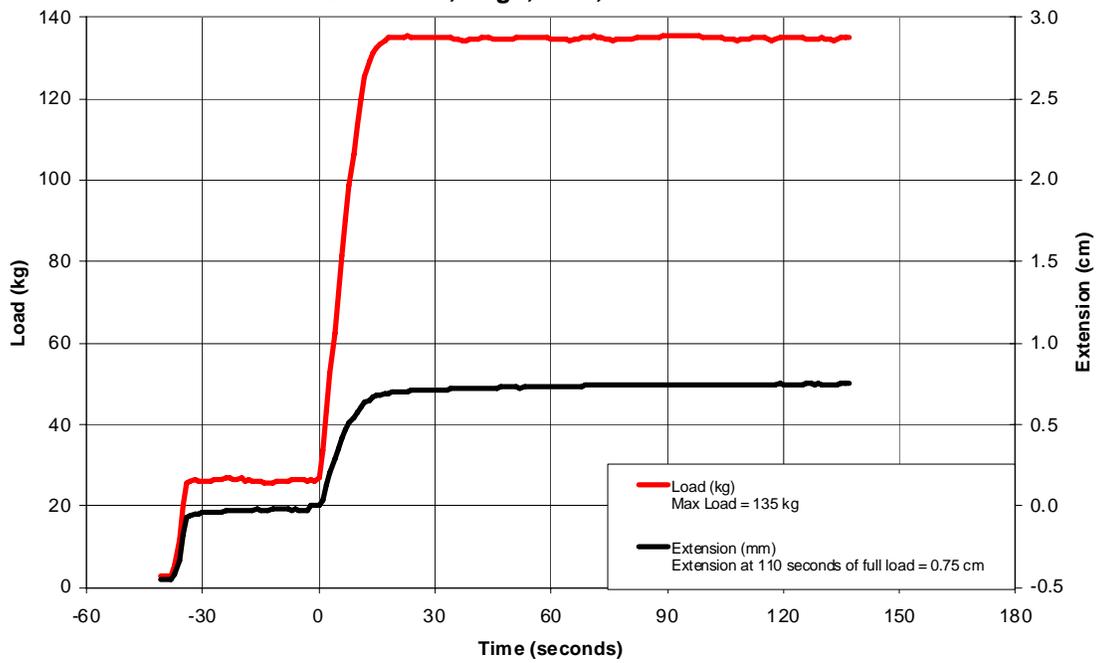
**Low Temperature Retention Testing 09/27/08**  
**DOT-08-019, Vega, Ltd., XT Half Helmet**



### High Temperature Retention Testing 09/27/08 DOT-08-019, Vega, Ltd., XT Half Helmet



### Water Immersed Retention Testing 09/27/08 DOT-08-019, Vega, Ltd., XT Half Helmet



## **SECTION 4            TEST FAILURE DETAILS**

Impact (S5.1, S7.1): There was a single impact failure with dwells in excess of 2.0 msec at 200 g: Right Side, Water Immersed helmet, flat anvil, 2<sup>nd</sup> drop, 2.08 msec

Labeling (S5.6): There were labeling failures with information lacking on the instructions to the purchaser:

    Helmet can be seriously.....

    Apply only the following.....

**APPENDIX A      INTERPRETATIONS OR DEVIATIONS FROM FMVSS NO. 218**

All testing was performed in accordance with the requirements of FMVSS NO. 218.

**APPENDIX B EQUIPMENT LIST AND CALIBRATION INFORMATION**

**Table 1. Instrumentation List for SwRI Protective Headgear Testing**

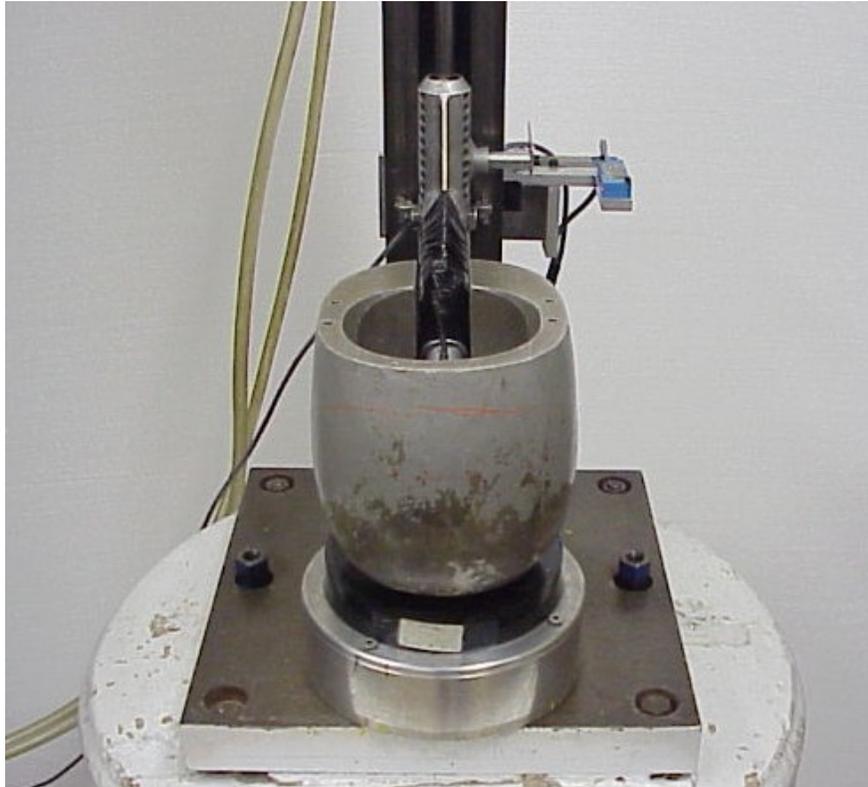
ITEM NO.	DESCRIPTION	MANUFACTURER AND MODEL	SERIAL NO	ACCURACY	DATE OF LAST CALIB.	DATE OF NEXT CALIB.
1	Data Acquisition Card	National Instruments PCIMIO-16E-4	None	System Software Validation Procedure	NA	NA
	Data Acquisition Software	National Instruments / Labview for Windows	Ver 6			
	Data Acquisition Computer	Dell Computer Optiplex GX280	BVRV261			
2	Humidity and Temperature Transmitter	Omega / HX41	0599-6004	Manufacturer's Specification and System Software Verification Procedure	07/14/08	07/14/09
	Isolated Voltage Output	Omega / OM5-II-4-20	9213-15 9149-08			
3	Thermocouple Wire and Thermocouple Input Module	Omega / OM5-LTC-J2-C	21266 21261 21253	System Software Verification Procedure	04/11/08	04/11/09
4	Optical Velocity Transducer	Biokinetic and Associates Velocity Gate / 048-004-9411	9505-007	System Software Verification Procedure	04/11/08	04/11/09
5	Test Accelerometer	Endevco / 2262-1000	NL05	System Software Verification Procedure	04/11/08	04/11/09
	Strain Gage Conditioner	Measurement Group Inc. / 2120A	102130			
	Strain Gage Power Supply	Measurements Group Inc. / 2110A	102034			
	Filter	Frequency Devices, Inc. / 5BAF-LPBU4 4 Pole Butterworth 1.75 KHz	None			
6	Load Cell	Western / 51	830-7X	System Software Verification Procedure	04/11/08	04/11/09
	Strain Gage Conditioner	Measurement Group Inc. / 2120A	102130			
	Strain Gage Power Supply	Measurements Group Inc. / 2110A	102034			
	Isolated Voltage Output	Intelligent Measurement / PCI-5B41-02	None			
7	Potentiometer	Humphrey / RP14-0601-1	87	System Software Verification Procedure	04/11/08	04/11/09
	Isolated Voltage Output	Intelligent Measurement / PCI-5B41-02	None			
8	Scale	Ohaus Scale Corp / 20 Kg / 45 lb	SwRI 5485	Manufacturer's Specification	04/18/08	10/18/08
9	Function Generator	Agilent / 33220A	MY44029640	Manufacturer's Specification	03/06/08	03/06/09

**Table 2. Test Apparatus List for SwRI Protective Headgear Testing Requiring One-Time Dimensions Checks or No Calibration**

ITEM NO.	DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	ACCURACY	DATE OF DIMENSIONAL CHECK
1	DOT Headforms	Controlled Casting	Small, Medium, and Large	None	+0.31 inches	6/89
		CADEX	Large	4914	+0.31 inches	2/08
2	ISO Impact Headforms		A, E, J, M, and O			
3	ISO Full Headforms		A, E, J, M, and O			
4	Drop Assembly	SwRI	Small, Medium, and Large	None	TP-218-06	6/89
5	Modular Elastomeric Programmer (MEP)	MTS Systems Corp.	None	None	N/A	N/A
6	Spherical Impactor with MEP					
7	Static Retention Test System	SwRI				
8	Chin Strap Fixture	SwRI	1	1	TP-218-06	1/80
9	Static Weights (Steel)	SwRI	1	1	±0.1 lbs.	2/94
10	Hydraulic Cylinder	Enerpac	RD46	1	N/A	N/A
11	Hydraulic Pump	Enerpac	P-18	CC 4511	N/A	N/A
12	Dynamic Retention Test System					
13	Chin Strap Fixture	SwRI	1	1	TP-218-06	1/80
14	Dynamic Weights (Steel)				±0.1 lbs.	
15	Roll-off Test System					
16	Penetration Striker	SwRI	1	1	TP-218-06	1/80
17	Environmental Conditioner	EDPAC	Mini Tech 90	None	N/A	N/A
18	Oven with Digitronic Control	Despatch Industries Inc.	LDB1-69	128710	N/A	N/A
19	Freezer with Omega Temperature Controller	Sears	9105010 CN100TC	S10204102 6 4011302	N/A	N/A
20	Peripheral Vision Template	SwRI	1	1	±15 min	1/80

## APPENDIX C      PHOTOGRAPHS

### Test Equipment Photos



**SwRI Helmet Test Equipment Photo 1. Monorail Impact Tester with MEP Pad, DOT Headform, SwRI Drop Assembly, and Velocity Gate**



**SwRI Helmet Test Equipment Photo 2. Flat Anvil Impact Configuration**



**SwRI Helmet Test Equipment Photo 3. Hemispherical Anvil Impact Configuration**



**SwRI Helmet Test Equipment Photo 4.  
Penetration Resistance Tester Configured for  
Crown Locations**



**SwRI Helmet Test Equipment Photo 5.  
Penetration Resistance Tester Configured for  
Side, Front, and Rear Locations**



**SwRI Helmet Test Equipment Photo 6. Retention System Tester with Supported DOT Headform,  
Simulated Jaw, and Displacement Measuring System**

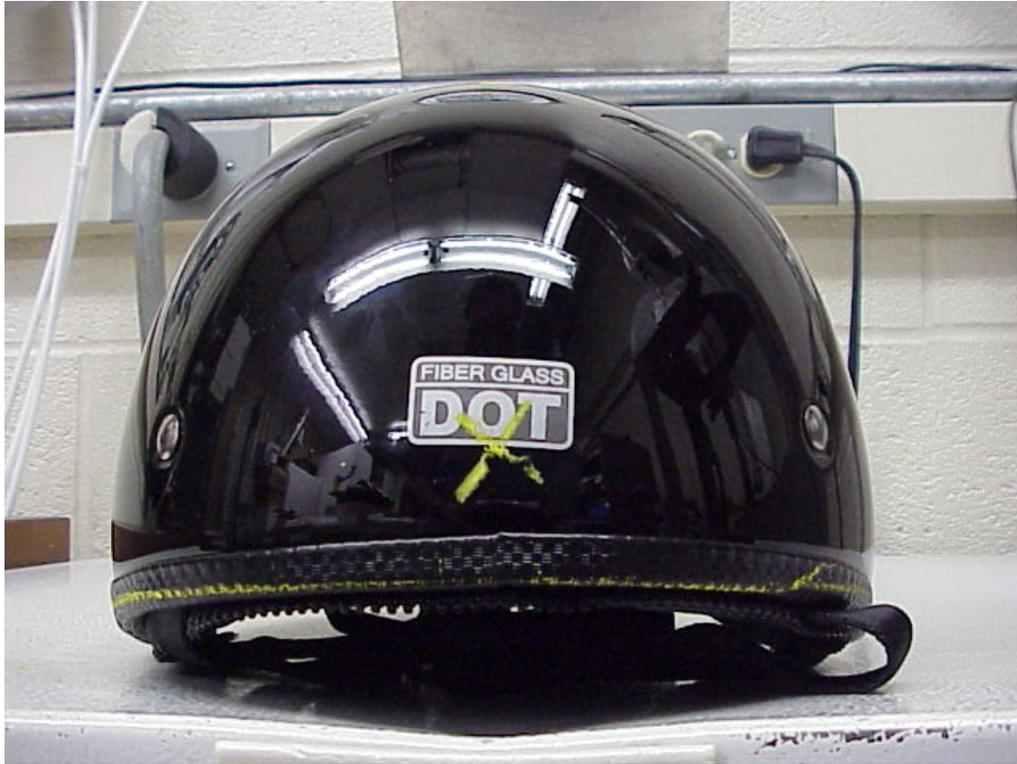
### Helmet Photographs



Helmet Photograph 1. Front View Vega, XT Half Helmet, L



Helmet Photograph 2. Side View Vega, XT Half Helmet, L



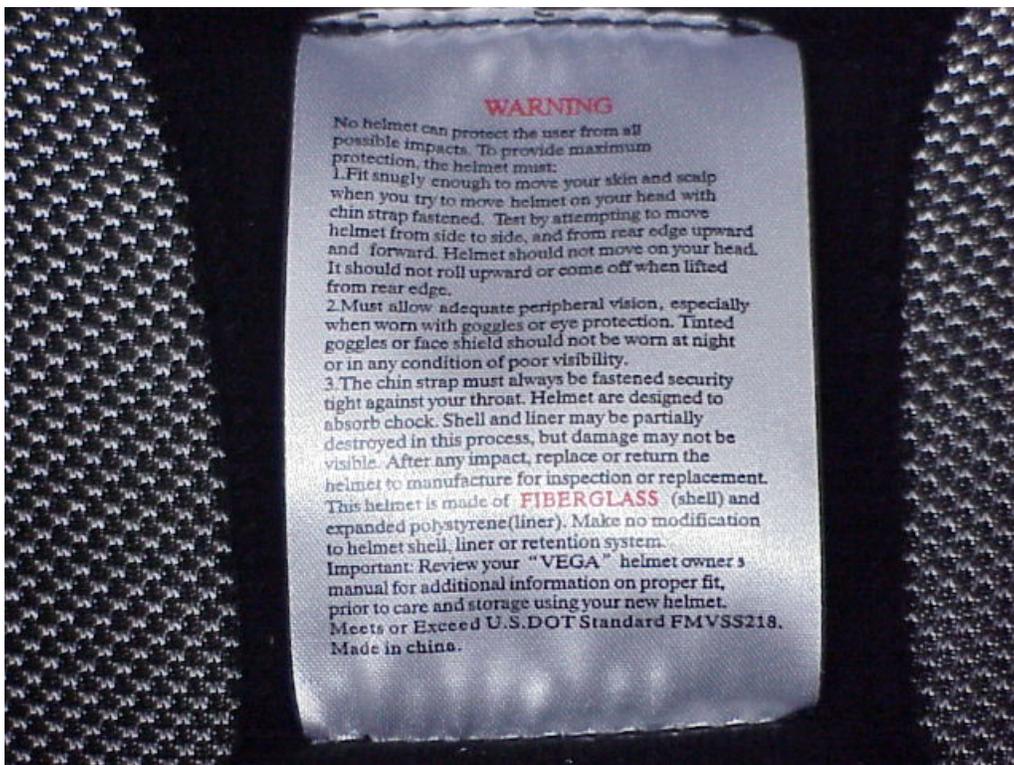
**Helmet Photograph 3. Rear View Vega, XT Half Helmet, L**



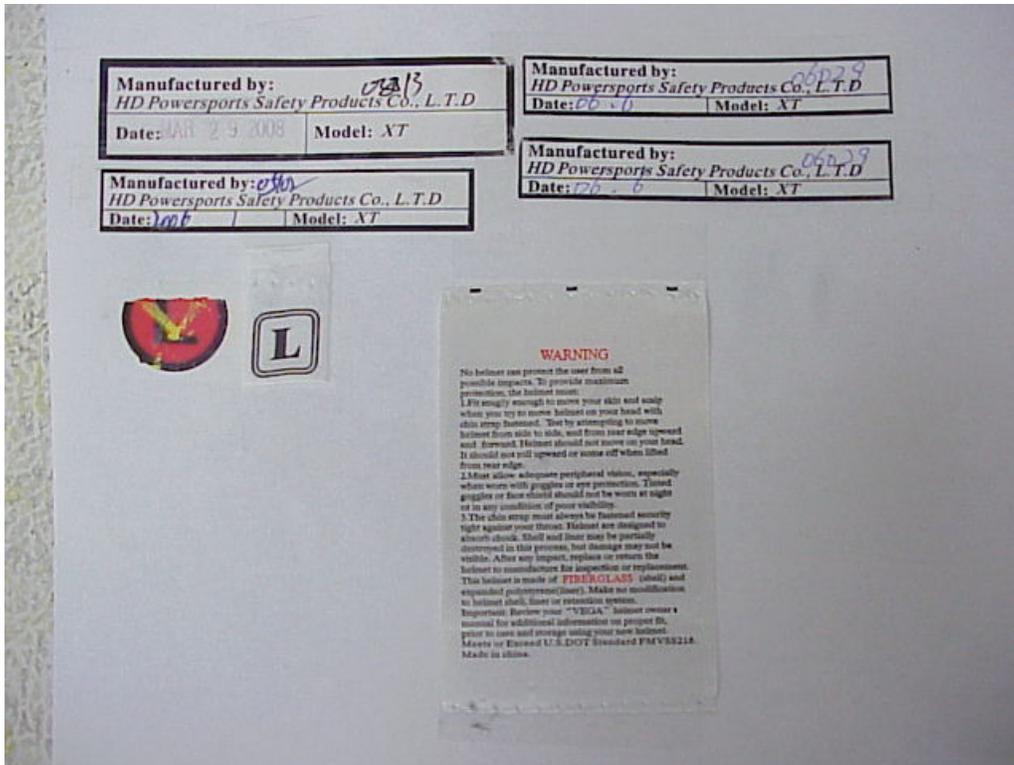
**Helmet Photograph 4. Top View Vega, XT Half Helmet, L**



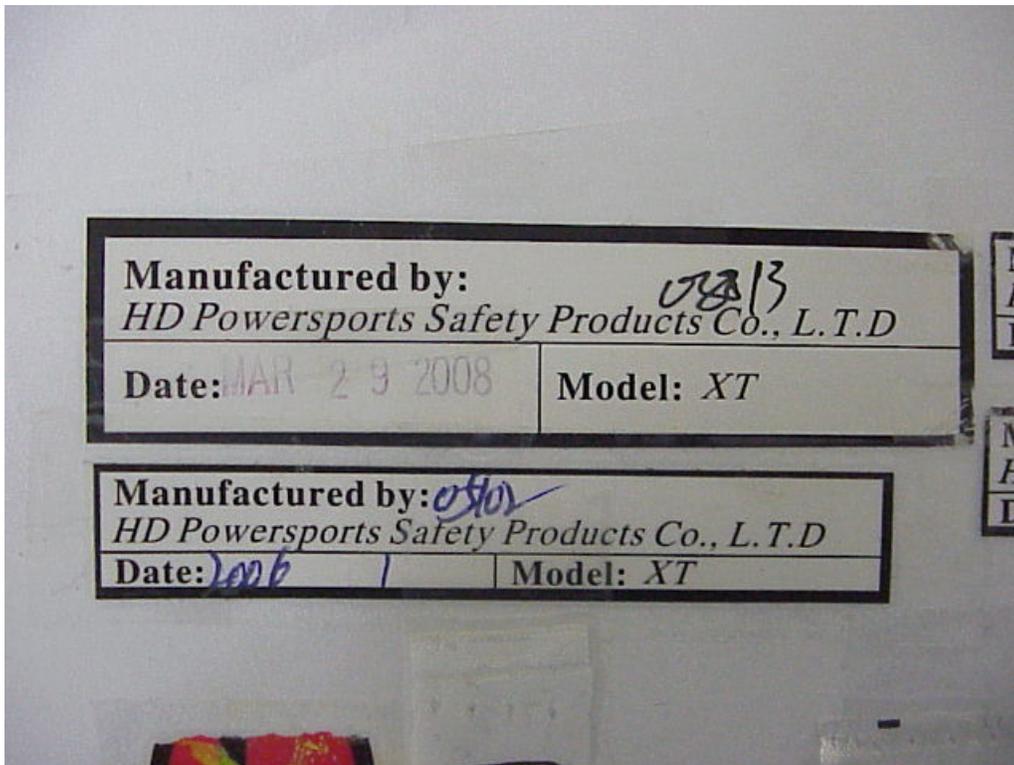
Helmet Photograph 5. Interior View Vega, XT Half Helmet, L



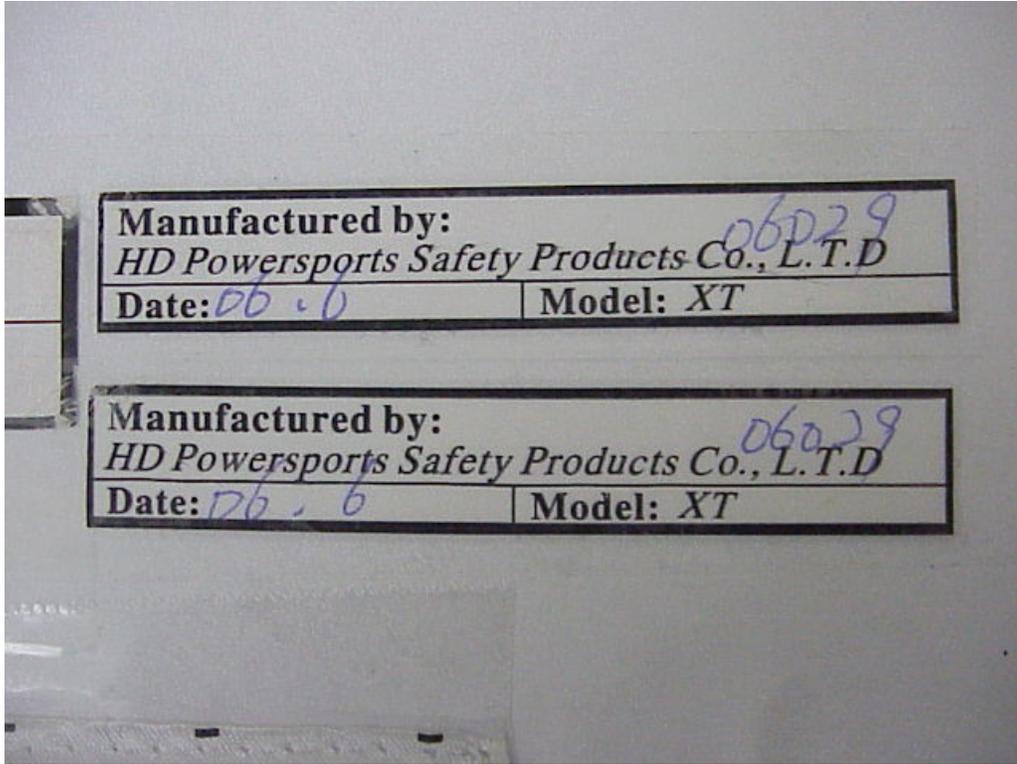
Helmet Photograph 6. Labeling 1 Vega, XT Half Helmet, L



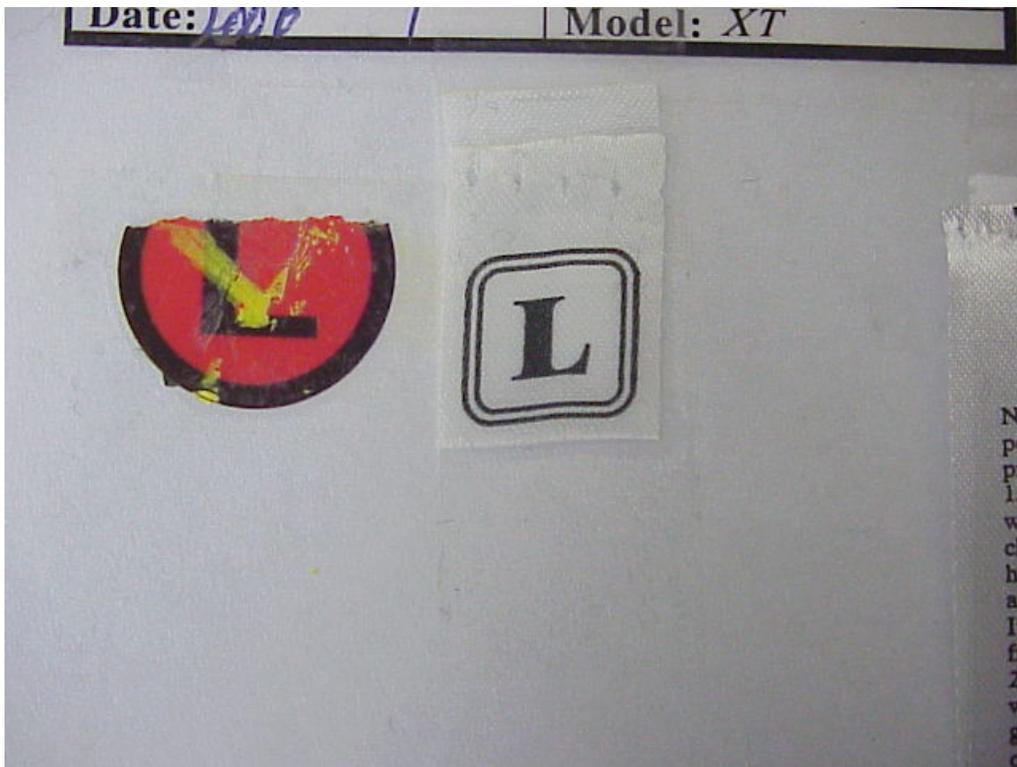
Helmet Photograph 7. Labeling 2 Vega, XT Half Helmet, L



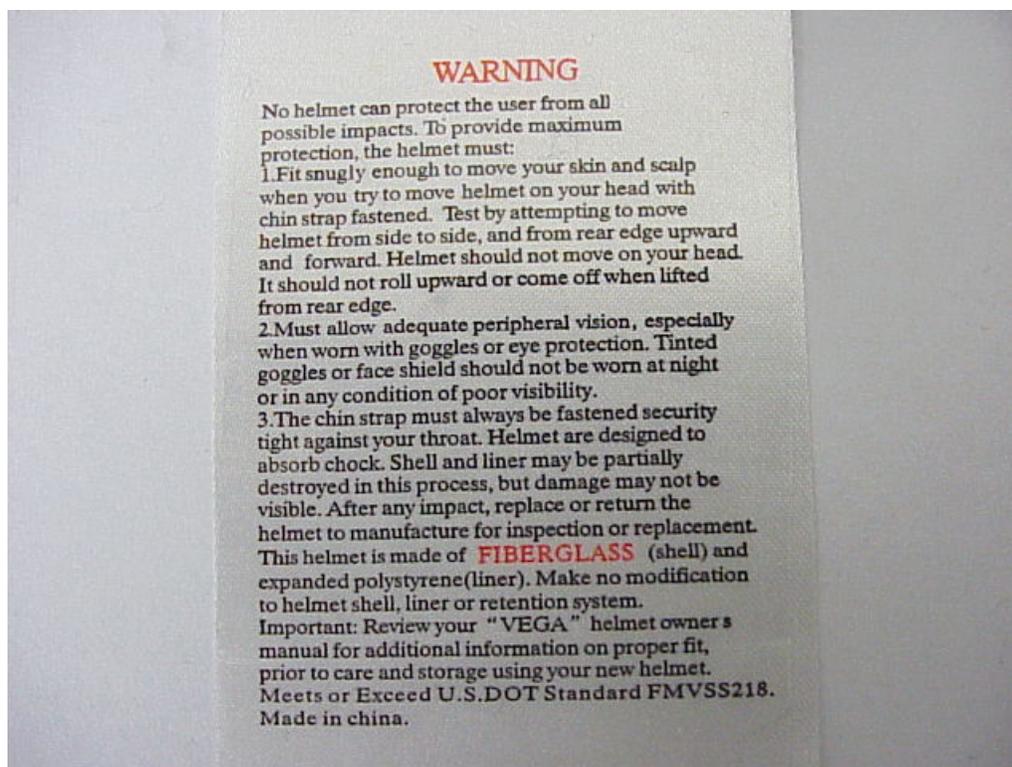
Helmet Photograph 8. Labeling 3 Vega, XT Half Helmet, L



Helmet Photograph 9. Labeling 4 Vega, XT Half Helmet, L



Helmet Photograph 10. Labeling 5 Vega, XT Half Helmet, L



Helmet Photograph 11. Labeling 6 Vega, XT Half Helmet, L