FEASIBILITY STUDY OF UPGRADING FMVSS No. 218, MOTORCYCLE HELMETS

David R. Thom
Hugh H. Hurt, Jr
Terry A. Smith
James V. Ouellet

Head Protection Research Laborator
University of Southern California
Los Angeles, CA 90089-0021

SEPTEMBER 1997

Final Report
Contract Order No. DTNH22-97-P-02001

Prepared for

United States Department of Transportation
National Highway Traffic Safety Administration
Office of Contracts and Procurement
400-7th Street, S.W.
Washington, DC 20590

Prepared for the Department of Transportation, National Highway Traffic Safety Administration, under Contract Order No. DTNH22-97-P-02001. The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the National Highway Traffic Safety Administration.

Technical Report Documentation Page

1. Report No. Contract DTNH22-97-P-02001	**2. Government Accession No.**	**3. Recipient's Catalog No.**
4. Title and Subtitle Feasibility Study of Upgrading FMVSS No. 218, Motorcycle Helmets		**5. Report Date** September 1997
		6. Performing Organization Code
7. Author(s) David R. Thom, Hugh H. Hurt, Jr., Terry A. Smith, James V. Ouellet		**8. Performing Organization Report No.** HPRL-97-1014
9. Performing Organization Name and Address Head Protection Research Laborator University of Southern California 927 W. 35th Place Los Angeles, CA 90089-0021		**10. Work Unit No. (TRAIS)**
		11. Contract or Grant No. DTNH22-97-P-02001
12. Sponsoring Agency Name and Address U.S. Dept. of Transportation National Highway Traffic Safety Administration 400 7th St. S.W. Washington, DC 20590		**13. Type of Report and Period Covered** Final Report Januar - September 1997
		14. Sponsoring Agency Code
15. Supplementary Notes		

16. Abstract

The current Federal Motor Vehicle Safety Standard for motorcycle helmets (FMVSS No. 218) has its roots in the American National Standards Institute motorcycle helmet standard of 1966 (ANSI Z90.1, 1966). While FMVSS No. 218 has evolved somewhat since its promulgation in 1974, it is in great need of updating to account for the present helmet populations as well as to facilitate harmonization with international standards. The tasks performed in this contract were designed to evaluate potential changes to the standard with three goals: (1) increased protection for the user, (2) international harmonization, and (3) updating to incorporate the current state of the industry.

Initial review of international standards and relevant scientific literature identified areas in which FMVSS No. 218 can be upgraded. The areas of upgrade include alternative pass/fail criteria, test headforms, test apparatus, conditioning requirements, retention system performance, projection requirements, impact velocity, penetration resistance, labeling, and faceshield penetration resistance.

Laboratory comparison testing was undertaken to quantify the laboratory performance aspects of the above requirements. Testing showed statistically significant effects for impact velocity, test headforms, test apparatus. Helmet performance was not significantly affected by decreased environmental conditioning time. Laboratory test procedures for positional stability and face shield penetration resistance show a need for addition of such a test to FMVSS No. 218. The literature review and test results are compared and discussed for possible upgrades of FMVSS No. 218.

17. Key Words Motorcycle Helmets, Test Apparatus, Failure Criteria, Test Headforms, Time Duration, Acceleration, Penetration, Labeling, Eye Protection, Systems Check, Positional Stability, Environmental Conditioning	**18. Distribution Statement** Document available to the public through the National Technical Information Service Springfield, VA 22161

19. Security Classif. (of this report) Unclassified	**20. Security Classif. (of this page)** Unclassified	**21. No. of Pages** 179	**22. Price**

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

TABLE OF CONTENTS

LIST OF TABLES

TASK I: LITERATURE AND INTERNATIONAL STANDARDS REVIEW

TASK II: COMPARISON TESTING

TASK III DISCUSSION AND CONCLUSIONS

LIST OF FIGURES

EXECUTIVE SUMMARY

The current Federal Motor Vehicle Safety Standard for motorcycle helmets (FMVSS No. 218) has its roots in the American National Standards Institute motorcycle helmet standard of 1966 (ANSI Z90.1, 1966). While FMVSS No. 218 has evolved somewhat since its promulgation in 1974, it is in great need of updating to account for the present helmet populations as well as to facilitate harmonization with international standards. The tasks performed in this contract were designed to evaluate potential changes to the standard with three goals: (1) increased protection for the user, (2) international harmonization, and (3) updating to incorporate the current state of the industry.

Initial review of international standards and relevant scientific literature identified areas in which FMVSS No. 218 can be upgraded. The areas of upgrade include alternative pass/fail criteria, test headforms, test apparatus, conditioning requirements, retention system performance, projection requirements, impact velocity, penetration resistance, labeling, and faceshield penetration resistance.

Laboratory comparison testing was undertaken to quantify the laboratory performance aspects of the above requirements. Testing showed statistically significant effects for impact velocity, test headforms, and test apparatus. Helmet performance was not significantly affected by decreased environmental conditioning time. Laboratory test procedures for positional stability and retention performance show a need for addition of such a test to FMVSS No. 218.

The literature review and test results are compared and discussed for possible upgrades of FMVSS No. 218. The following conclusions were made:

1. Allowable peak headform acceleration should be reduced from 400g to 300g.
2. The effect of an increase of the dwell time limitation at 200g from 2.0 to 2.2 milliseconds is indefinite. These test data exceedances do not justify a change.
3. The 4.0 millisecond limit at 150g can be eliminated to simplify the standard with no effect on safety.
4. ISO impact test headforms should be considered for adoption into FMVSS No. 218.
5. The ECE-type test apparatus is complex but not as severe as the monorail currently used.
6. Retain the current pre- and post-test systems check procedure for within-laboratory systems checking.
7. Adopt the ASTM calibration sphere to allow inter-laboratory systems comparisons.
8. The pre-test environmental conditioning time can be reduced to 4 hours.
9. A maximum allowable pre-test conditioning time should be added, e.g. 24 hours as used by other standards.
10. Retain the current impact velocity of 6.0 m/s for the flat anvil tests, and 5.2 m/s for the hemi anvil tests.
11. Retain the current penetration resistance test which is simple and meaningful.
12. Add a test for positional stability to S7.3.
13. No change needed regarding internal or external projections
14. Commercially available labels can be specified to reduce counterfeiting. Helmet Identification Number and manufacturer registry would provide consumer assurance of DOT compliance.
15. Add a faceshield penetration test as specified in VESC-8.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the assistance of the following people:

NHTSA Contract Manager:	William J.J. Liu, Ph.D.
NHTSA Safety Assurance:	Chris Lash
Laboratory Technicians:	Luis Carbajal Brad James
Statistical Analysis:	Skip Eastman, Ph.D.
Word Processing:	Julia May Wong
Documentary Videotape:	Dan Doyle James Mulryan

TASK I: LITERATURE AND INTERNATIONAL STANDARDS REVIEW

Summary: Identify and Review Upgrade Areas

I.1. Impact Attenuation Tests
I.1.a. Test Criteria
I.1.b. Test Headforms
I.1.c. Test Equipment
I.1.d. Test Conditioning
I.1.e. Impact Velocit
I.2. Penetration Tests
I.3. Retention Tests
I.3.b. Positional Stabilit
I.4. Projections
I.5. Labeling
I.6. Face Shield Penetration

The above areas are reviewed for relevant research and related international helmet performance standards in the areas specified.

Identified Upgrade Areas

I.1. Impact Attenuation Test

I.1.a. Test Criteria

Current: Peak ≤ 400g, 200g-2.0msec, 150g-4msec

Upgrade: Peak ≤ 300g, 200g-2.2msec, no limit at 150g.

I.1.b. Test headforms

Current: DOT Small, Medium, and Large headforms.

Upgrade: ISO E, J, M.

I.1.c. Test Equipment

Current: Monorail drop test equipment.

Upgrade: ECE-type guided free fall test equipment.

Current: Impact test headforms used for pre- and post-test system calibration.

Update: ASTM spherical impactor for pre- and post-test system calibration.

I.1.d. Test Conditioning

Current: Ambient, Low temperature, high temperature, and water immersion.

Upgrade: Reduce the required time in conditioning from 12 to 4 hours.

I.1.e. Impact Velocity

Current: At each impact site--two successive, identical impacts at 6.0 m/s onto the flat anvil and at 5.2 m/s onto the hemispherical anvil.

Upgrade: At each impact site--the first impact at 6.9 m/s onto the flat anvil and at 6.0 m/s onto the hemispherical anvil. The second impact at each site unchanged from the current requirement.

I.2. Penetration test

Current: Drop a pointed metal striker from 3 meters onto the test helmet, headform contact is failure criteria.

Upgrade: Replace test with curb anvil or edge anvil test.

I.3. Retention test

Current: Apply static, symmetrical load on chin strap

Upgrade: Add a positional stability (roll-off) test.

I.4. Projections

Current: Exterior--maximum 5 mm, interior--none allowed

Upgrade: Interior--use Snell requirement (smooth) or smooth and maximum 5mm.

I.5. Labeling

Current: Labeled permanently.

Upgrade: Specific method of permanent labeling, e.g., etching, molding-in or exhibit registration number.

I.6. New Requirements

I.6.1. Add face shield impact test requirements for helmets equipped with face shields. Adopt part of the VESC-8 requirements.

Review Identified Upgrade Areas

I.1. IMPACT ATTENUATION TESTS

Table 1.A summarizes the impact attenuation test methods and failure criteria for major international standards. Current FMVSS No. 218 impact energy levels are realistic, with the flat anvil impacts corresponding to the 90th percentile of all traffic accident impacts (Hurt, Ouellet & Thom, 1981). Double impacts which exist as part of the standard tests are not typical of accident events, but the requirement is an acceptable procedure which provides a margin of safety for the consumer. While there is always the temptation to increase the impact energy level with the expectation of providing greater protection, any change which is without research support ma adversely affect accident performance. For example, if the impact energy of the standard were increased, the typical design change would be an increase in either liner density or liner thickness. These changes could provide the greater impact attenuation but may increase headform accelerations for impacts less than the standard test (Smith, et al, 1993; Thom & Hurt, 1992).

I.1.a. TEST CRITERIA

The current limitation of 400g for the peak headform acceleration is antiquated in comparison with other standards of the last two decades. ANSI Z-90.1 changed the peak headform acceleration limit from 400g to 300g with the 1979 version, and essentially all other international standards use a limit of 300g. The DOT standard should be revised to a limit of 300g, because modern helmet technology easily provides helmets to perform within such limits. Review of recent DOT tests by contractors show that only bogus or novelty helmets exceed the 300g limit, and ordinary helmets with acceptable performance clearly perform within a 300g limit (Thom & Hurt, 1992).

The scientific community generally concurs that some relationship exists between head acceleration, time duration and tolerance to head injury. However, the exact nature of this relationship has not been clearly identified. Many methods currently consolidate the relationship between head acceleration and time duration, for example, Head Injury Criterion (HIC) and Gadd Severity Index (SI), yet all methods have been criticized regarding their application to head protection (Newman, 1975, 1982). Until an acceptable means of analysis is developed, time duration appears to be acceptable since it does have some basis in human tolerance (Ono, 1980). However, the most frequent impact attenuation failure of otherwise well qualified helmets is to slightly exceed the 200g dwell time limit.

Another factor is the conflict which exists between the DOT requirements and competing Snell requirements (Thom & Hurt, 1992). The flat anvil impacts for DOT are 89.6J (66ft-lbs) but 150J for Snell; the limits are 400g for DOT but 300g for Snell. Snell has no dwell time limits but DOT

has duration limits of 2.0ms at 200g and 4.0ms at 150g. Helmets that attempt to meet the requirements of both DOT and Snell generally tend to have higher liner density and stronger shells, otherwise the hemispherical anvil impact at the forehead region is likely to fail Snell qualification. As a consequence, higher helmet stiffness equates to higher peak headform accelerations and longer dwell times, with the prospect of failing the DOT dwell time limit of 2.0ms at 200g. It is a chronic problem that Snell qualified helmets are more likely to fail DOT dwell time limits. This is not a problem of the DOT standard providing unrealistic requirements. The dwell time limits have a substantial base in human tolerance limits and must not be forsaken because of this conflict, but reinforced as a basic requirement of head protection for motorcyclists. Research has shown (Thom, 1992) that helmets which exceed 265g on the DOT flat anvil impacts will most likely exceed the 2.0ms dwell time limit, so reduction of the DOT peak headform acceleration limit to 300g would have no interaction with dwell time limits, adverse or proverse. Table 1.A also lists the type, sizes and weights of the test headforms used by major international helmet performance standards. Note that the majority of these standards use ISO headforms as specified in standard EN960, 1995.

Table 1.A
Summary of International Helmet Standards

Standard	Year	Drop Test Apparatus	Headforms	Headform Sizes	Drop Assembly Weight	Anvils	Impact Criteria	Number of Impacts	Failure Criteria
FMVSS No. 218	1988	Monorail	DOT	Small Medium Large	3.5 kg 5.0 kg 6.1 kg	Flat Hemi	Velocity: 6.0 m/s 5.2 m/s	Two @ each of 4 sites	< 400g 2.0 msec @ 200g 4.0 msec @ 150g
ANSI Z90.1	1992	Monorail or Guide-Wire	DOT or ISO	Small Medium Large or A,E,J,M	5.0 kg	Flat Hemi	Velocity: Flat & Hemi: 1st 6.9 m/s 2nd 6.0 m/s	Two @ each of 4 sites	≤ 300g
AS 1698	1988	"Guided Fall"*	Magnesium AS 2512.1 (DOT)	A B C D	3.5 kg 4.0 kg 5.0 kg 6.0 kg	Flat Hemi	Drop Height: 1830 1385	Two @ each of 4 sites	≤ 300g 3.0 msec @ 200g 6.0 msec @ 150g
BS 6658	1985	"Guided Fall"*	ISO	A,E,J,M	5.0 kg	Type A Flat Hemi Type B Flat Hemi	Velocity: 1st 7.5 m/s 2nd 5.3 m/s 1st 7.0 m/s 2nd 5.0 m/s 1st 6.5 m/s 2nd 4.6 m/s 1st 6.0 m/s 2nd 4.3 m/s	Two (same anvil) @ each of 3 sites Two (same anvil) @ each of 3 sites	≤ 300g (Multi-part shells shall remain intact)
CAN3-D230	1985	"Guided Fall"*	ISO	A,E,J,M	5.0 kg	Flat Hemi	Velocity: 1st 5.1 m/s 2nd 7.2 m/s 1st 4.3 m/s 2nd 6.1 m/s	Two @ each of 4 sites	Low Energy: ≤ 200g High Energy: ≤ 300g
Snell M-95	1995	Monorail or Guide-Wire	ISO	A,E,J,M	≥ 5.0 kg, ≤ 6.5 kg	Flat Hemi Edge	Energy: Flat & Hemi 1st 150J 2nd 110J Edge 150J	Flat & Hemi: Two each @ 4 sites Edge: One impact @ one site	≤ 300g
ECE 22.4	1995	Unrestrained Headform with Tri-Axial Accelerometer	ISO	A E J M O	3.1 4.1 4.7 5.6 6.0	Flat Curb	Velocity: 7.5 m/s for both anvils	4 sites per helmet in sequence with 5th test @ 4 m/s or 8.5 m/s	Resultant ≤ 275g HIC ≤ 2400

* Apparatus not further specified

** Small & Large DOT headforms not currently available in 5 kg.

Table 1.B
Test Headform Comparison

Headform	DOT Small	DOT Medium	DOT Large	ISO E	ISO J	ISO M
Circumference	49 cm	56 cm	60 cm	54 cm	57 cm	60 cm
Assembly Weight	3.5 kg	5.0 kg	6.1 kg	4.1 kg	4.7 kg	5.6 kg

I.1.c. TEST EQUIPMENT

Considerable work has been done over the years comparing the test performance of the twin guide-wire test apparatus to the monorail apparatus (Henderson, 1975; Bishop, 1989). Both of these systems hold the headform relatively rigid during the impact and utilize a single axis accelerometer. The United States Consumer Product Safety Commission (US CPSC) is currentl evaluating these two systems relative to the proposed bicycle helmet standard. FMVSS No. 218 specifies the use of the monorail test apparatus.

The ECE 22 standard for motorcycle helmets requires the use of a completely different type of test system (ECE 22.4, 1995). This system carries a loose headform equipped with a tri-axial accelerometer in a headform support assembly. In contrast to both the twin guide-wire and the monorail, the ECE apparatus allows unrestrained motion of the test headform during the impact attenuation test. The literature search did not locate any record of side-by-side comparison of the monorail or twin guide-wire and the ECE basket type apparatus.

I.1.c.2. PRE- AND POST-TEST SYSTEMS CHECK

The current pre- and post-test systems check is detailed in the Laboratory Test Procedure for FMVSS 218 (TP-218-03). The procedure is designed to ensure that the impact attenuation test system is functional and does not change significantly during the course of a test. The headform position is specified and a drop height of 50 ± 5 inches is recommended to result in a nominal 400g impact with minimum of one msec. duration at 200g. Small variations of headform position notably affect the peak acceleration.

The American Society for Testing and Materials (ASTM) F1446 Instrument Systems Check procedure requires the use of a spherical impactor that is unaffected by position since it is a true sphere. The spherical impactors have been matched to modular elastomer programmers (MEP) by the manufacturer (US Testing). With the impact velocity specified at 5.44 m/s, the range of expected accelerations is a narrow 389 ± 8g.

I.1.d. TEST CONDITIONING

Table 1.C. shows conditioning requirements for international standards. Tests at HPRL show high temperature conditioned helmets reach thermal equilibrium at 50C in less than one hour.

Table 1.C
Environmental Conditioning Requirements

Standard	Year	Conditioning Environment	Time In Conditioning	Time Out Before Test	Reconditioning
FMVSS No. 218	1988	Ambient Hot Cold Water	Minimum 12 hours, no maximum	Start at 2 min. Finish by 4 min.	If tested in < 4 min., 3 min. recondition If tested > 4 min., 3 min. for each min., out > 4 min.
ANSI Z90.1	1992	Ambient Hot Cold Water Solvent	4 to 24 hours	Immediately, 3 min.	15 min.
BS 6658	1985	Ambient Hot Cold Water Solvent	4 to 24 hours	Water >15<45 minute drain Temperature 40± 5 sec.	Not specified
CAN3-D230	1985	Ambient Hot Cold	Min. 4 hours	Not specified	Not specified
Snell M-95	1995	Ambient Hot Cold Water Solvent *	4 to 24 hours	Begin <2 min.	Not specified
ECE 22.4	1995	Solvent & Ambient Solvent & Hot Solvent & Cold (-20) Solvent &UV Water Spray	Ambient > 4 hours Hot -- 4 to 6 hours Cold -- 4 to 6 hours UV -- 48 hours Water -- 4 to 6 hours	< 2 min.	Not specified

*Optional

I.1.e. IMPACT VELOCITY

Impact velocity is a major area for review. One of the proposed upgrade items is to increase the impact velocity for the first (of two) impact at each site. The literature has been reviewed for justification for such a change, the design modifications needed, and its potential impact on the protective capabilities of FMVSS No. 218 qualified helmets.

The current body of scientific literature suggests that there is no basis for an increase in the impact velocit requirements of FMVSS No. 218. In a study of 355 helmets worn in a group of 900 motorcycle accidents by Hurt, et al. (1981), the depth of crush was measured in approximately 200 helmets. The data indicated that damage from a single six foot impact test corresponded to the 90th percentile for the amount of crush found in these helmeted head impacts. Sarrailhe (1984) concluded that conventional test procedures have resulted in highl successful protective devices, and the protection will not be improved by increasing the energy in the impact test.

In theory, an increase in the impact test velocity could theoretically replicate the damage to a slightly higher percentage of accident helmets (i.e. include helmets damaged at higher impact speed). However, since many of these impacts are high speed and beyond the limits of contemporary helmets, a small increment in impact test velocity may not result in a significant improvement in the percentage of the helmet damage that can be replicated. Evidence of this may be found in the fact that there are no published data presented to date which demonstrate that helmets meeting standards with a higher impact test velocity provide any greater protection than helmets which simply meet the requirements of FMVSS No. 218.

It could be assumed that by increasing the test energy requirements, the amount of protection afforded by the helmet will also increase. Fundamentally, this would appear to be a desirable situation, that is, a helmet which can absorb more energy without an increase in the risk of head injury to the wearer. From a design perspective, the helmet designer can modify the helmet to absorb more energy b increasing the stiffness of the helmet. A helmet that has an increased stiffness will absorb more energy; however, its increased stiffness may produce deleterious effects at lower impact velocities. This may pose a potential problem for those riders that are involved in low energy accidents. Since the relative distribution of all motorcycle accidents is largely skewed to the left (i.e. greater frequency of low speed impacts), the effects of this potential change to the standard must merit serious consideration.

There is currently a conflict between FMVSS No. 218 and the Laboratory Test Procedure (TP-218-03). The standard specifies the minimum impact velocities for each anvil configuration while the test procedure states +0/-5%. The tolerance for impact velocity should ensure that minimum value is achieved or exceeded by ordinary variability. So rather than the +0/-5% allowed by TP 218-03, 1992, the tolerance should be +5/-0% to ensure that the public is guaranteed that minimum performance of the standard.

I.2. PENETRATION TESTS

The penetration test of the DOT standard is difficult to justify in the light of modern helmet technology because it is such a simple test. A 3 kg penetrator is dropped from 3m in a guided free fall to impact anywhere within the test zone. The advantage is that the test is very severe, simple, repeatable and absolutely denies qualification to an inferior helmet. The test is usuall applied at the vertex of the test helmet, where the liner is thickest and the shell has the highest rigidity due to curvature. Because of the difficulty in aligning the headform for an impact from the vertical trajectory of the penetrator, the sides of the helmet near the test boundaries are rarel subject to this test. This is unfortunate because the shell in these areas has the lowest stiffness due to less curvature and edge effects, and is most vulnerable to the penetration test. The DOT penetration test is useful in excluding obviously deficient helmets such as the bogus and novelt helmets.

Aldman (1984) proposed an alternative methodology based on contact pressure measured at the apex of a hemispherical headform. Mills and Gilchrist (1991) note that resistance to penetration by a sharp object is likely to conflict with impact attenuation requirements on flat or deformable surfaces. A similar conflict is found when comparing flat anvil test performance with more aggressive test anvils, i.e. hemispherical, curbstone or edge (Thom & Hurt, 1992).

I.3. RETENTION TESTS

I.3.a. STRENGTH AND STIFFNESS

The current DOT retention system test (Table 1.D) qualifies the strength of the system of chin strap, fastening hardware, shell, and attachments. The system must sustain a steady 1335N (300lb) symmetrical downward pull by an appliance simulating the lower runs of the mandible. The limiting deflection is 2.5cm (1.0in). Since the helmet must be mounted on a headform to resist the applied load, the deflection of the interior comfort padding is included. No limit to strength is specified to account for human tolerance for axial cervical distraction, but there is no evidence yet developed for such need. While power boat racing accidents may develop severe "bucketing" forces on a helmet exposed to high speed water impact, no equivalent forces seem to occur in motorcycle collisions, unless the helmet gets run over and snagged on a vehicle's undercarriage, which is a very rare but dangerous occurrence (Hurt, et al., 1981).

Table 1.D
Retention System Test Methods and Failure Criteria

Standard	Year	Helmet Mounting	Static		Dynamic				Failure Criteria			Positional Stability		
			Preload	Test Load	Preload	Test Mass	Drop Height	Number of Tests	Dynamic Extension	Residual Extension	Buckle Slip	Test Type	Test Mass & Drop	Limit
FMVSS No. 218	1988	Headfor	223 N, 30 sec.	1335 N, 120 sec.				One		≤ 25		None		
ANSI Z90.1	1992	Headform or Base			23 kg	38 kg	120	One	< 30			None		
AS 1698	1988	Headfor	225 N, 30 sec.	1110 N, 120 sec.				One		< 25		None		
BS 6658	1985	Headform & Helmet Base			7 kg (support assembly)	10 kg	750	Two (Strap not tightened)	1st 32 2nd 25	16 8mm		Forward Roll-Off	10 kg-0.75	Stay on Headfor
CAN3-D230	1985	Helmet Base			7 kg	10 kg	750	Two (Strap not tightened)	1st 32 2nd 25		8 mm Total	None		
Snell M-95	1995	Headfor			23 kg	38 kg	120	One	≤ 30			Forward & Rearward Roll-Off	4.0 kg-0.6 m	Stay on Headfor
ASTM F1446 (draft)	1997											Forward & Rearward Roll-Off	4 kg-0.6 m or** 10 kg-0.6 m	Stay on Headfor
ECE 22.4	1995				15 kg	10 kg	750		< 35	< 25mm ***		Forward Roll-Off	10 kg-0.5 m	< 30 degree angle change

* Preload removed "immediately prior" to test load.

** Drop mass and height to be specified by individual perfor ance standards.

*** Measured 2 minutes after testing.

Several other standards require dynamic tests for the retention system, propounding a closer relation to accident events. Typically, these dynamic tests (Table 1.D) employ a symmetrical static preload, then a mass is dropped to apply a sudden symmetrical force by arresting the falling mass. Some of these tests allow the helmet's lower edge to rest upon a flat surface rather than mounting the helmet upon a headform, thus the contribution of the interior comfort padding is not included in the test measurements. One advantage of the dynamic retention system test is to initiate slipping of the fastening components which may not occur during a static test. Another advantage is to provoke release of "quick fasten/quick release" fasteners of the chin strap, which may be inertially sensitive to the sudden motion of the dynamic test, however this has not been proven to be a significant factor. Experience with a limited number of accident cases at the Head Protection Research Laboratory seems to show that such "quick fasten/quick release" devices are more likely to fail due to direct contact with the buckle during accident events.

I.3.b. POSITIONAL STABILITY

A severe motorcycle collision can cause human body impact accelerations on the order of 25 to 40g. With anterior chest impact an inertial force of the helmet can be in the range of 333 to 533N (75 to 120lb) for a three pound helmet, which is clearly within the retention system strength capability of a qualified DOT helmet (1333N or 300lb). However, an inertial force forward on a helmet can dislodge the helmet and cause it to rotate forward and "roll-off" unless the geometry of the helmet and retention system prevents this motion. Of course, this mobilit of the helmet upon the head is greatly dependent on the coverage, with the partial coverage helmet being the most mobile and the full facial coverage helmet being most restrained by the presence of the chin bar. If the retention system of the helmet does not have the correct geometr to resist "roll-off", the helmet can be ejected or allow parts of the head that are normall protected to be exposed, regardless of the strength and stiffness of that retention system. The present DOT standard does not test for problems of positional stability. Several of the foreign helmet standards incorporate a positional stability, roll-off test. It appears that the most applicable standard containing effective roll-off testing is the draft standard ASTM F1446-97 (Table 1.D) which has been adopted for Snell M95. The ASTM standard employs the ISO headforms but could just as easily be modified simply to specify the current DOT headforms. Either the ISO or DOT headforms could be specified since most manufacturers and laboratories have both sets of headforms. However, the use of DOT headforms would require validation because no such testing has been done during the ASTM F08 Committee deliberations to evolve the test procedure. The simplest approach would be to adopt the ASTM test with ISO headforms and change the drop mass to be compatible with motorcycle helmets (the 4 kg drop mass was evolved for testing bicycle helmets; a 10 kg drop mass was originally considered) or simplify to a static force applied to represent the inertial force, e.g., 533N (120lb). Because the roll-off susceptibility is a problem of geometry and kinematics rather than strength and stiffness, the roll-off test cannot be combined with existing tests and requires separate procedures and equipment.

Table 1.E
Projection Limitations of International Standards

Standard	Year	External Projections	Internal Projections*
FMVSS No. 218	1988	Projections outside the helmet shell are limited to those required for the operation of essential accessories, and shall not protrude more than 5 mm.	No rigid projections inside.
ANSI Z90.1	1992	No permanent external projections greater than 5mm in height.	None
AS 1698	1988	Only rigid projections for attachment of eye protection, communication, attachment systems, and life support systems, which should not exceed 5mm in height.	Above test line: projections only for eye protection, communication, and life support equipment, shall not exceed 2mm from the internal surface of the shell. Between test line and basic plane: projections for chin strap attachment shall be no greater than 5mm. Other projections shall be no greater than 2mm, measured from the internal surface of the shell. Below the basic plane: rigid projections shall be in locations and of size, so that it is unlikely to cause injury to the wearer.
BS 6658	1985	Not Specified: Tested in Oblique Impact Resistance test.	No sharp edges on the inside of the helmet, and rigid projections shall be covered by protective padding.
CAN3-D230	1985	General: $\leq$ 5mm. Rivet heads should be radiused and project no more than 2mm above the outer surface of the shell.	No inward facing sharp edges. Rigid internal projections should be covered by protective padding.
Snell M-95	1995	Greater than 7mm in height must easily break away. All other projections must be smoothly faired and offer minimal frictional resistance to tangential impact forces.	Rivets and other projections must offer no laceration or puncture hazard.
ECE 22.4	1995	$\leq$ 5mm: detachable goggle fitting exempted. Everything smooth and faired. Rivet heads, $\leq$ 2mm.	No inward facing sharp edges. Rigid internal projections should be covered by protective padding.

I.4. PROJECTIONS

Table 1.E. summarizes projection requirements for major international standards. FMVSS No. 218 specifies at S5.5 that external, rigid projections are limited to 5mm. The contours within this 5mm limit are not specified and the device often found on helmets is a riveted-on snap base for mounting of visors or other accessories. Rivets are often specifically mentioned and limited to 2mm in height with smooth, curved surfaces.

Internal projections are either prohibited outright or limited by definition to those without sharp edges. Another provision is that any internal projection must be covered with protective padding. Internal projections have two possible methods of injury to the wearer. Most obvious is the potential for penetration or laceration from an unprotected projection. Equally threatening is the injury mechanism of direct transmission of force from the helmet exterior through to the head by a non-penetrating internal projection.

A common accessory added to helmets is an audio communication system including speakers mounted in the helmet interior. While these are not installed by any of the current helmet manufacturers, they are offered as retrofit accessories. These systems are often questioned with regard to the relevance of FMVSS No. 218's prohibition of internal projections. For installation, some of these systems require significant modification of the helmet by removal of a portion of the energ -absorbing liner. This clearly requires that the installer violate the FMVSS No. 218 required labeling instruction of “Make no modifications.” (S5.6.1.f.3)

I.5. LABELING

The requirement for an external "DOT" label on the rear of the helmet has been an identified area of labeling requiring further research. There are two problems currently identified with regard to this label: First is the failure to meet the placement and/or size requirement by otherwise qualified helmets from major manufacturers. The specific placement requirement cannot always be maintained for some helmet designs and therefore compliance tests done for DOT-NHTSA b contractors often result in a failure of this labeling requirement. This type of inconsequential non-compliance may erode the public's perception of the standard.

The second area where labeling is a problem is that of reference to FMVSS No. 218 in states that mandate helmet use when riding a motorcycle. A problem frequently noted is the presence of an external "DOT" label on unqualified, bogus helmets. The requirement for a one cm. high "DOT" label in a color that contrasts to the helmet shell is simple enough to be counterfeited easily at the retailer or consumer level.

Table 1.F summarizes the labeling requirements of major international standards. Note that two standards, ECE 22.4 and Snell M95 require serialized labels on each helmet sold, although neither of these require that the label be visible on the helmet exterior. Both ECE and BS

specify a "Kite Mark" indicating compliance. All the reviewed standards have words to the effect that the required labels should be "permanent" or "durable." Only the private Snell M95 standard specifies that the serialized label must not be removable intact.

The areas for possible upgrade in labeling include redefining just what is a "permanent label," exploring more durable or non-removable exterior labels, and the possibility of requiring serialization with a “Helmet Identification Number” (HIN) similar to a Vehicle Identification Number (VIN). Label manufacturers are being consulted to determine current labeling capabilities that may be applicable to motorcycle helmets. Possibilities include thermoset labels that create a formidable bond and license tag-type labels that would be difficult to counterfeit and difficult to remove intact.

Table 1.F
Labeling Requirements

Standard	Year	Manufacturer Name	Model	Size	Manufacture Date	External Compliance Label	Serialized or Kitemark	Construction Materials	Not-Recommended Chemicals	Other
FMVSS No. 218	1988	Yes	Yes	Yes	Yes	"DOT" 1 cm high in contrasting color between 2.9 and 3.5 cm from bottom edge of helmet	None	Yes	Yes	
ANSI Z90.1	1992	Yes	Yes	Yes	Yes	None	ANSI Z90.1, 1992	No	Yes	
BS 6658	1985	Yes	Yes	Yes	Yes	BSI Kitemark	BS 6658 1985, type A or B	Yes, warning if thermoplastic	Yes	
CAN3-D230	1985	Yes	Yes	Yes	Yes	None	CAN-D230-M85	No	Yes	
Snell M-95	1995	Yes	Yes	Yes	Yes	Optional	Serialized Label (not removable intact)	No	Yes	
ECE 22.4	1995	Yes	No	Yes	Yes	Optional	ECE 22 Approval Mark incorporating serial number	No	Yes	Helmet Mass

I.6. FACE SHIELD PENETRATION

The use of face shields is typical in the full facial coverage helmet; however no test is specified in the DOT standard. Table 1.G compares the various international tests and requirements for the strength of face shields. Those standards that contain a face shield requirement specify a penetration-type test incorporating a projectile striking the face shield. Failure criteria are either: (1) penetration into the protected space, or (2) penetration or fracture of the face shield. Two standards have been in effect in the U.S. for many years and are fully applicable to the motorcycle helmet eye protection problem. The Vehicle Equipment Safety Commission Regulation VESC-8 (Table 1.G), is "Minimum Requirements for Motorcyclists' Eye Protection" (VESC-8, 1980). While the VESC is defunct, that standard was widely accepted in industry and is still in use, being required by most states in motorcyclist eye protection laws. In addition, American National Standards Institute, -87.1 (1989) "Practice for Occupational and Educational Eye and Face Protection" is another widely accepted consensus standard. Either of these standards could be incorporated as the requirement for integral or accessory face shields for the DOT standard. The VESC-8 standard appears preferable because of its specific application to motorcycle equipment. The VESC test employs a steel dart, 44.2g (1.56oz) in a free fall from 4.27m (14 ft) to contact the optically qualified eye covering without permanent intrusion. This gives a minimum level of protection from small objects contacting the face shield at 9.15 m/s (30 fps). It is important to note that research has shown that the value of helmet faceshields lies primarily in the preservation of vision, not impact protection. In fact, Hurt and colleagues (1981) found injuries to the visual apparatus to be very rare.

Table 1.G
Face Shield Strength Requirements

Helmet Standard	Year	Requirement, Reference Standard	Test Method	Failure Criteria
FMVSS No. 218	1988	None		
ANSI Z90.1	1992	None		
AS 1698	1988	Yes AS 1609-1981	6 mm Steel Ball @ 50 m/s	Fracture or Penetration
BS 6658	1985	Yes BS 4110-1982 Grade Z*	6.35 mm Steel Ball @ 119 m/s	Fracture or Penetration
CAN3-D230	1985	None		
Snell M-95	1995	Yes, M95	1 gm Lead Pellet @ 138 /s	Penetration
→	1989	**ANSI -87**	44.2 gm Weighted Needle @ 5 m/s	Penetration
→	1980	**VESC-8**	44.2 gm Steel Projectile @ 9.1 m/s	Penetration

* Highest of 4 categories

TASK II: COMPARISON TESTING

Conduct Comparison Tests

HPRL conducted comparison tests between the current FMVSS No. 218 and the proposed upgrade test procedures to establish feasibility and to demonstrate improved requirements. For each proposed upgrade item, HPRL conducted the comparison tests according to the required number of tests of the item in the current FMVSS No. 218. For proposed new procedures, conducted a complete set of tests according to procedure requirements.

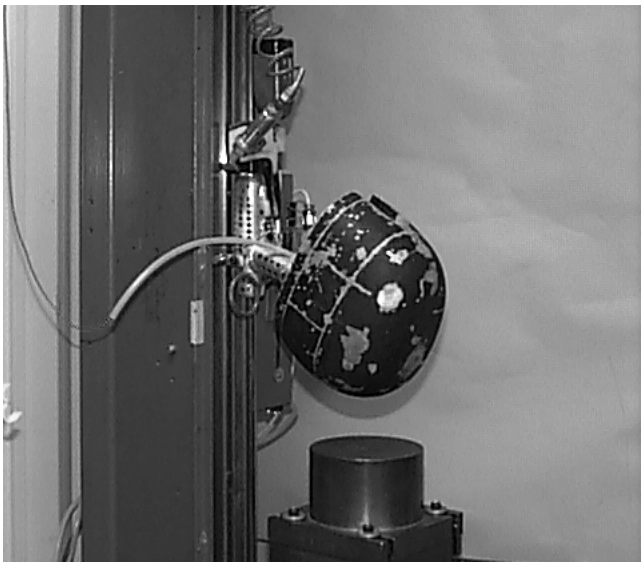
II.1. FMVSS No. 218 / TP 218-03 DISCREPANCIES

Comparison Tests--When there is any discrepancy between the standard (FMVSS No. 218) and the test procedure (TP 218-03), the standard was used. Impact velocities were at or above the minimum as specified in the Standard, not the -5% allowed by the Test Procedure. Impact sites were chosen based on worst-case predicted results. For example, flat anvil impacts located on the sides and rear of the helmet since previous testing experience indicated failures were more likely there. Table 2.A, found in the Appendix, lists all required test helmets.

II.1.a. BASELINE TESTS AND TEST CRITERIA

HPRL conducted comprehensive baseline tests consisting of the following as specified in the current FMVSS No. 218 (1988). See Appendix, Table 2.B. These tests were conducted on the monorail test apparatus shown in Figure 1.

Figure 1
Monorail Test Apparatus with DOT Medium Headform and Flat Anvil



Sevent -two helmets of three expected performance levels, tested on three headform sizes (Small, Medium, Large), at all environmental conditions specified in the standard (ambient, high and low temperature, and water immersed). These tests were conducted on the monorail test apparatus as specified in FMVSS No. 218 at S7.1.6.

In order to provide test data for all combinations of impact anvil/impact location, duplicate samples of all helmets were used. This "double" test provided impact tests against both anvil configurations (flat and hemispherical) at four locations on each helmet. Subsequent tests made for comparative purposes were assured of comprehensive data for direct comparison. Thirt -six of these baseline helmets were tested for penetration resistance and retention system strength.

Preliminary tests of five full-facial coverage helmets were performed to determine an contribution of the chinbar portion of the helmet to impact attenuation tests within the test area specified by FMVSS No. 218. These tests have been reported to the Contract Manager and the tests of full-facial coverage helmets were conducted using the following procedure:

> The tests that can be physically performed on the unmodified helmet (both sides and rear impact locations) will be done with the helmet unmodified. The chinbar will then be removed for the final impact in the center of the brow.

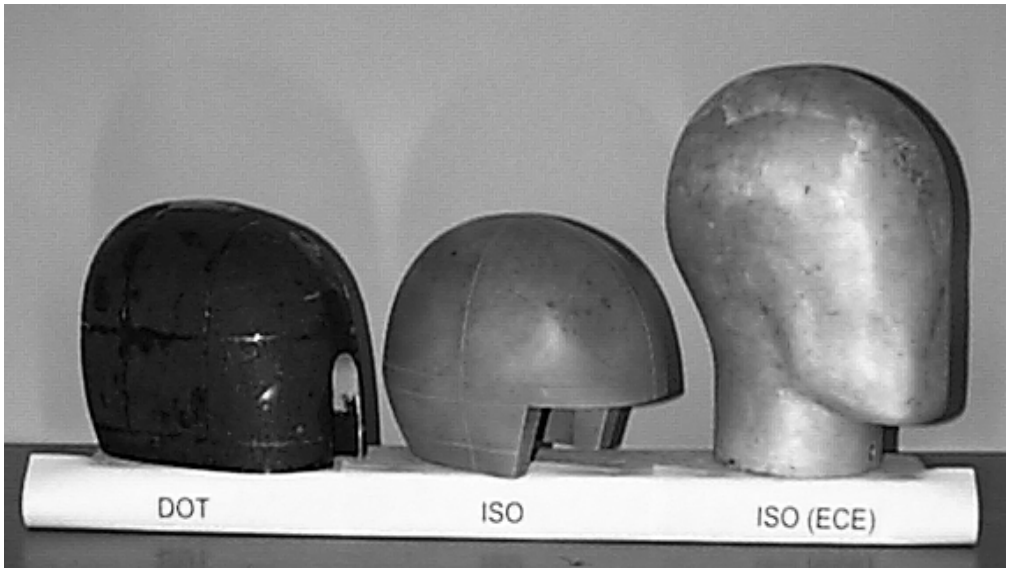
II.1.b. ALTERNATIVE HEADFORMS

HPRL conducted comprehensive tests of an identical 36 helmets using International Standards Organization (ISO) headforms (see Appendix, Table 2.C). These tests were conducted on the monorail test apparatus as currently specified in FMVSS No. 218 at S.7.1.6. This test series duplicated the baseline tests but used ISO headforms. Table 2.D gives data for the comparison of the two types of headforms. Figure 2 shows the three types of headforms in equivalent sizes (ISO J and DOT Medium). The ISO headforms are most closely comparable by size rather than weight. While there is a much smaller, size "A" ISO headform, it is applicable to very small children who are not part of the motorcycle user population. There is also an extra large (62 cm) ISO size “O” headform. There is no comparable extra large DOT headform size.

Table 2.D
Test Headform Comparison

Headform	DO Small	DO Medium	DO Large	ISO E	ISO J	ISO M
Circumference	49 c	56 c	60 c	54 c	57 c	60 c
Weight	3.5 kg	5.0 kg	6.1 kg	4.1 kg	4.7 kg	5.6 kg

Figure 2
Test Headforms (DOT Medium, ISO J)

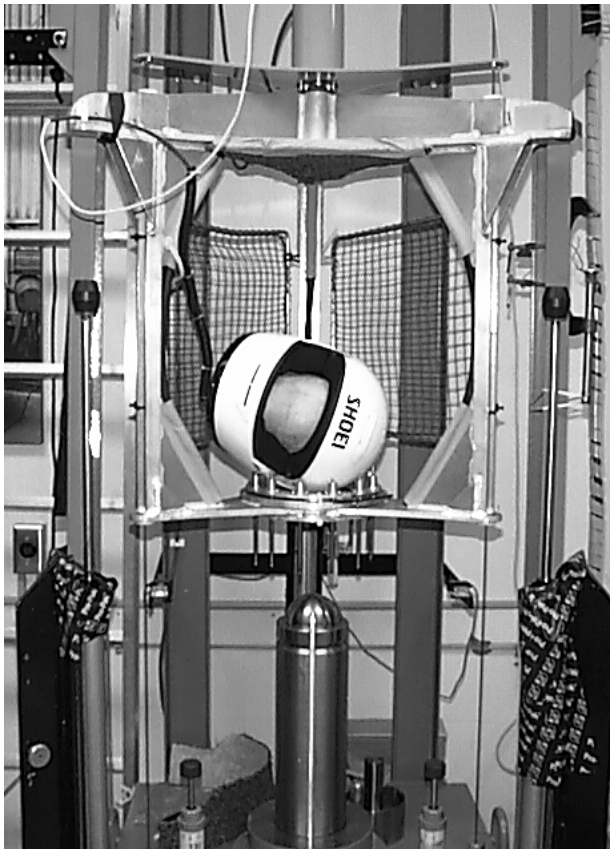


II.1.c.1. ALTERNATIVE TEST APPARATUS

Selected tests of 36 equivalent helmets using the guided free-fall test apparatus as specified b ECE 22, etc. (see Appendix, Table 2.E). Because of the mechanics of this test, the ISO test headforms are complete including the neck, however they have the same weights as the ISO headform impact assembly (see Figure 2).

Both the test machinery and electronic instrumentation are considerably more complicated than those currently required by FMVSS No. 218. The ECE apparatus is shown in Figure 3. The helmeted headform is guided only until impact, then unrestrained rebound response is limited b the basket walls. Tri-axial accelerometer instrumentation is required with the ECE test, then the resultant peak acceleration is computed.

Figure 3
ECE-Type Test Apparatus



II.1.c.2. PRE- AND POST-TEST SYSTEMS CHECK

Comparison testing was conducted comparing the Pre- and Post-Test Systems check currentl specified in TP-218-03 and the spherical impactor developed by the American Society for Testing and Materials (ASTM) F08.53 Subcommittee.

II.1.d. CONDITIONING

Comparison of test data from the Baseline Tests (II.1.a) and additional tests of 27 helmets to determine the effect of a shorter length of time in the conditioning environments. In addition, directly comparable impacts (i.e. left and right side, same anvil) were tested for time-out-of-conditioning effects. See Appendix, Table 2.F.

II.1.e. ALTERNATIVE IMPACT VELOCITIES

See Appendix, Table 2.G. These tests were performed on an additional 36 helmets for direct comparison to the Baseline tests. These tests following the current FMVSS No. 218 specifications and used the same locations and anvils as the Baseline 1 tests. The only difference in the tests was increased impact velocity for the first of two impacts at each location.

The results of this test series determined the impact velocities used for the following tests.

II.2. ALTERNATIVE PENETRATION TESTS

See Appendix, Table 2.H. Tests of 27 helmets (conditioned to ambient, cold, and hot) were conducted to compare the current penetration test with alternatives of impact tests onto a metal edge and curb shaped anvil. The curb anvil simulates a common street side curb with a 105 degree angle and 15mm radiused edge as described in ASTM F1446: 16.4.5. The edge anvil used is 5mm wide and 300mm long at the impact surface.

II.3.a. ADDITIONAL RETENTION TEST

Positional Stability. See Appendix, Table 2.I for tests of three levels of helmet coverage (partial, full, full-facial) from four manufacturers. The positional stability tests were from the standards of ASTM F08 (ASTM draft) and Snell Memorial Foundation (M95). Duplicate tests were conducted using DOT reference headforms as an alternative to the ISO headforms. Other testing was conducted on volunteer human subjects with simple pass/fail criteria.

II.4. PROJECTION REQUIREMENTS

Measurement and analysis of interior and exterior features on helmets from Baseline Tests was conducted for possible revision of definition and requirements for projections. Each feature was evaluated for description and height of projection, as well as smoothness and coverage b another component of the helmet.

II.5. LABELING

Development of alternative labeling requirements are considered to reduce the counterfeiting of current DOT labels and improve identification of properly qualified helmets for the enforcement of mandatory helmet use laws. Alternative labeling methods were considered, as follows: (1) manufacturing alternative labels, (2) molding of identification into the helmet, (3) requiring a helmet identification number to be placed in each helmet, or (4) other labeling alternatives.

II.6. FACESHIELD PENETRATION RESISTANCE

Two standards have been in effect in the U.S. for many years and are applicable to the standardization of motorcycle helmet eye protection. The Vehicle Equipment Safety Commission Regulation VESC-8, 1980 was developed as a specification for eye protection devices for motorcycle use. Another standard is the American National Standards Institute, Z-87.1 (1989) "Practice for Occupational and Educational Eye and Face Protection." Failure criteria are either: (1) penetration into the protected space, or (2) penetration or fracture of the face shield.

Tests of currently available face shields to the mechanical penetration requirements of VESC-8 were conducted to validate those requirements for inclusion in the updating of FMVSS No. 218. VESC-8 also includes optical requirements which were not included in the current work.

Results

A complete listing of all performance test data is found in the Appendix, Table 2.Y.

II.0.a. TEST HELMET CONSTRUCTION

Representative helmets of those tested in this work were disassembled and their construction details are noted in Table 2.J.

Table 2.J
Test Helmet Construction

			HELMET SHELL		HELMET LINER			
Group	**Coverage**	**Helmet Size**	**Shell Material**	**Shell Thickness (mm)**	**Liner Weight (gm)**	**Liner Volume (ml)**	**Density (lb./cu. ft.)**	**Nominal Thickness (mm)**
A	Partial	XS	ABS	5.0	110	2450	2.7	30
A	Partial	M	ABS	5.0	131	2250	3.4	35
A	Partial	XL	ABS	5.0	113	2000	3.3	25
B	Full	XS	Polycarbonate	3.8	147	2900	3.0	30
B	Full Face	L	Polycarbonate	3.8	222	3700	3.5	35
B	Full Face	XL	Polycarbonate	3.8	183	3100	3.5	35
C	Full Face	XS	Fiberglass and Polyester Resin	3.8	136	4250	1.9	38
C	Full Face	M	Fiberglass and Polyester Resin	3.8	124	3500	2.1	36
C	Full Face	L	Fiberglass and Polyester Resin	3.8	121	3700	1.9	32

II.0.b. SELECTION OF IMPACT LOCATIONS

HPRL performed preliminary tests to determine the effect of modifying full-facial coverage helmets by removal of the chinbar. Five full-facial coverage, polycarbonate shell helmets were tested on the flat anvil with varying degrees of modification as noted below. Helmets 1-4 were tested squarely on the sides and mid- sagittal at front and rear (0, 90, 180, 270 degrees).

--Helmet 1 No modification (1401gm as tested).
--Helmet 2 Chinbar removed prior to any testing (1173 gm).
--Helmet 3 Lower portion of helmet removed, leaving the test area only intact (809 gm).
--Helmet 4 No modification for first three impacts (1401gm), chinbar removed to allow center of brow impact (1144 gm).
--Helmet 5 No modification, impacts at "corners" of helmet (50, 145, 210, 310 degrees—impact locations accessible without modification of helmet, 1399 gm).

Table 2.K shows the results of these DOT flat anvil tests. The peak acceleration results var within impact location by 0.8% to 7% for all tests but one (front impact #1, 11%) including the highly modified helmet No. 3. This variation is unremarkable and far less than the 20-24% difference shown between critical side and sub-critical corner impact locations.

In order to minimize any question of the effect of chinbar removal on overall results, the first three impact tests on each helmet were done with the helmets completely intact. The chinbar was then removed for the fourth and final test at the center of the brow.

Table 2.K
Effect Of Impact Location On Peak Headform Acceleration

	Condition	**Location**	**Right #1**	**Right #2**	**Rear #1**	**Rear #2**	**Left #1**	**Left #2**	**Front #1**	**Front #2**
Helmet 1 ***	OEM	Peak g	212	252	219	253	201	246	**	**
		T@200g	1.0	2.6	0.9	2.7	0.1	2.7	**	**
Helmet 4 ***	OEM*	Peak g	208	252	217	250	215	245	178	222
		T@200g	0.9	2.6	0.8	2.9	0.4	2.7	0.0	1.8
Helmet 2	CB removed	Peak g	207	240	207	238	224	260	175	224
		T@200g	0.6	2.4	0.4	2.9	0.6	2.7	0.0	1.9
Helmet 3	Test Area	Peak g	200	227	207	242	205	243	186	224
		T@200g	0.1	2.1	0.6	2.0	0.7	2.2	0.0	1.9
		Location	**Right Front #1**	**Right Front #2**	**Left Front #1**	**Left Front # 2**	**Left Rear #1**	**Left Rear #2**	**Right Rear #1**	**Right Rear #2**
Helmet 5	OEM	Peak g	167	208	173	206	196	227	216	265
		T@200g	0.0	0.9	0.0	0.2	0.0	2.7	0.9	2.9

* Helmet intact for first 3 impacts, chinbar removed for last impact at brow
** No impact possible due to mechanical interference of monorail apparatus
*** Helmets and impacts identical for first 3 impacts

Summary of Test Criteria for All Test Groups

II.1.a. ALTERNATIVE IMPACT VELOCITY

HPRL performed additional analysis of the Baseline and Alternative Velocity test data. The results are summarized in Table 2.L below. For information only, an additional row of data has been added to Table 2.L showing the count and percent of impacts exceeding 2.5 msec. at 200g.

The majority of the failures at the proposed increased velocities are:

i. Group A; peak acceleration greater than 300g. (from 5.2% to 18.8%)
   Group A; dwell time @ 200g (2.0 msec, 2.1% to 17.7%: 2.2 msec 1.0% to 11.5%)
ii. Group B; dwell times at 200g
   (2.0 msec, 12.5% to 35.4%, 2.2 msec, 8.9% to 34.4%, 2.5 msec, 4.2% to 22.9%)
iii. Group C;; dwell times at 200g (2.0 msec, 2.1% to 4.2%)

The 200g dwell time failure data presented in Table 2.L shows that a change of the limit from 2.0 msec to 2.2 msec affects all helmet types, but the small number of failures is insufficient for statistical analysis.

It was decided that the remaining tests were all carried out at the proposed (higher) impact velocities. See section III.1.e for discussion of the possible implications of this change.

I.6. FACE SHIELD PENETRATION

The use of face shields is typical in the full facial coverage helmet; however no test is specified in the DOT standard. Table 1.G compares the various international tests and requirements for the strength of face shields. Those standards that contain a face shield requirement specify a penetration-type test incorporating a projectile striking the face shield. Failure criteria are either: (1) penetration into the protected space, or (2) penetration or fracture of the face shield. Two standards have been in effect in the U.S. for many years and are fully applicable to the motorcycle helmet eye protection problem. The Vehicle Equipment Safety Commission Regulation VESC-8 (Table 1.G), is "Minimum Requirements for Motorcyclists' Eye Protection" (VESC-8, 1980). While the VESC is defunct, that standard was widely accepted in industry and is still in use, being required by most states in motorcyclist eye protection laws. In addition, American National Standards Institute, -87.1 (1989) "Practice for Occupational and Educational Eye and Face Protection" is another widely accepted consensus standard. Either of these standards could be incorporated as the requirement for integral or accessory face shields for the DOT standard. The VESC-8 standard appears preferable because of its specific application to motorcycle equipment. The VESC test employs a steel dart, 44.2g (1.56oz) in a free fall from 4.27m (14 ft) to contact the optically qualified eye covering without permanent intrusion. This gives a minimum level of protection from small objects contacting the face shield at 9.15 m/s.

It is important to note that research has shown that the value of helmet faceshields lies primaril in the preservation of vision, not impact protection. In fact, Hurt and colleagues (1981) found injuries to the visual apparatus to be very rare.

Table 2.L
Increased Velocity Test Failure Summary

Test Criteria	**Baseline** n=576			**Alternate Velocity** n=288		
	Group A n=192	Group B n=192	Group C n=192	Group A n=96	Group B n=96	Group C n=96
Fail Current 218	10 (5.2%)	25 (13.0%)	4 (2.1%)	29 (30.2%)	35 (36.5%)	7 (7.3%)
Fail Proposed 218	12 (6.3%)	17 (8.9%)	3 (1.6%)	27 (28.1%)	34 (35.4%)	2 (2.1%)
≥ 400g	6 (3.1%)	0	0	10 (10.4%)	1 (1.0%)	0
≥ 300g	10 (5.2%)	0	0	18 (18.8%)	1 (1.0%)	0
≥ 4.0 ms @ 150g	0	1 (0.5 %)	0	2 (2.1%)	0	5 (5.2%)
≥ 2.0 ms @ 200g	4 (2.1%)	24 (12.5%)	4 (2.1%)	17 (17.7%)	34 (35.4%)	4 (4.2%)
≥ 2.2 ms @ 200g	2 (1.0%)	17 (8.9%)	3 (1.6%)	11 (11.5%)	33 (34.4%)	2 (2.1%)
≥ 2.5 ms @ 200g	0	8 (4.2%)	3 (1.6%)	9 (9.4%)	22 (22.9%)	(1.0%)

* Current 218 Requirements: ≤ 400g peak acceleration, ≤ 4.0 msec @ 150g, ≤ 2.0 msec @ 200g
** Proposed 218 Upgrade: ≤ 300g peak acceleration, no limit @ 150g, ≤ 2.2 msec @ 200g
*** Flat Anvil: Impact No. 1 @ 6.9 m/s, No. 2 @ 6.0 m/s
Hemi Anvil: Impact No. 1 @ 6.0 m/s, No. 2 @ 5.2 m/s

Table 2.M summarizes the count and percentage of the total number of tests for any failures of test criteria for the seven test groups. Note that this summary table combines all helmet brands and sizes, and counts each of the 1764 impact tests. Note that dwell times at 200g are included at several values: the current 2.0 msec. limit, the proposed 2.2 msec., as well as 2.4 msec., 2.6 msec., and 2.8 msec. For greater detail, see Table 2.N (Appendix) which cross-tabulates the counts of failures of each criteria for all individual helmets. Note that individual helmets without failure of any of the criteria are not included in the table. Table 2.O (Appendix) lists the means of peak acceleration, and dwell times at 150 and 200g for the individual helmets. Table 2.Y (Appendix) lists performance test data for all tests except roll-off. Summaries and discussions of these data are found in the respective sections of this report.

Note that the data in Table 2.M shows the results for all helmet types and sizes combined. The total number of impacts exceeding 2.0 msec @ 200g is 52 (5.8% of 892 impacts) for the Baseline (B1 + B2) and Conditioning (CD) groups combined. The number of impacts exceeding 2.2 msec @ 200g is 42 (4.7%): the majority (87%) of the impacts failing at 2.0 msec still fail at 2.2 msec.

Table 2.M
Test Group by Failure Criteria
(N=1764)

	Baseline			Conditioning	ISO Headforms	Increased Velocity	Alternative Apparatus	Alternative Anvils
Values greater than: count, (%)	B1 (n=288)	B2 (n=288)	B1 + B2 (n=576)	CD (n=216)	HF (n=288)	AV (n=288)	AA (n=288)	PN (n=108)
400g	3 (1.0)	3 (1.0)	6 (1.0)	3 (1.4)	6 (2.1)	11 (3.8)	4 (1.4)	1 (0.9)
300g	3 (1.0)	7 (2.4)	10 (1.7)	4 (1.9)	37 (12.8)	19 (6.6)	10 (3.5)	3 (2.8)
4.0 ms @ 150g	1 (0.3)	0	1 (0.15)	0	9 (3.1)	7 (2.4)	5 (1.7)	14 (13.0)
2.0 ms @ 200g	20 (6.9)	13 (4.5)	33 (5.7)	19 (8.8)	84 (29.2)	55 (19.1)	8 (2.8)	3 (2.8)
2.2 ms @ 200g	15 (5.2)	8 (2.8)	23 (4.0)	19 (8.8)	74 (25.7)	46 (16.0)	6 (2.1)	2 (1.9)
2.4 ms @ 200g	9 (3.1)	4 (1.4)	13 (2.3)	4 (1.9)	55 (19.1)	40 (13.9)	5 (1.7)	0
2.6 ms @ 200g	6 (2.1)	1 (0.3)	7 (1.2)	3 (1.4)	46 (16.0)	20 (6.9)	3 (1.0)	0
2.8 ms @ 200g	1 (0.3)	0	1 (0.15)	0	28 (9.7)	11 (3.8)	1 (0.3)	0

Table 2.P.a distinguishes pass/fail for both current and proposed criteria for the three helmet types by individual impact tests. Table 2.P.b shows failures of the current and proposed criteria summarized for each helmet. This summary counts each helmet that has one or more failures so that a helmet with one failure is counted equally with another helmet that failed several impact tests. Type C, the premium helmet tested, shows a generally lower failure rate in all tests. The precise number and type of failures for individual helmets are found in Table 2.N (Appendix).

Table 2.P.a Pass/Fail Criteria by Test Groups for Individual Impact Tests

		BASELINE n=576			CONDITIONING n=216			INCREASED VELOCITY n=288		
Helmet Type	**Failures, count (%)**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
CURRENT	> 400g	6 (1.0)	0 (0)	0 (0)	3 (1.0)	0 (0)	0 (0)	10 (3.5)	1 (0.3)	0 (0)
	> 4.0 ms @ 150g	0 (0)	1 (0.017)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.7)	0 (0)	5 (1.7)
	> 2.0 ms @ 200g	4 (0.7)	25 (4.3)	4 (.06)	13 (4.5)	6 (2.1)	0 (0)	17 (5.9)	34 (11.8)	4 (1.4)
	All Current Criteria	10 (1.7)	26 (4.5)	4 (.06)	16 (5.5)	6 (2.1)	0 (0)	29 (10)	35 (12.2)	9 (3.1)
PROPOSED	> 300g	10 (1.7)	0 (0)	0 (0)	4 (1.4)	0 (0)	0 (0)	18 (6.3)	1 (.3)	0 (0)
	> 2.2 ms @ 200g	2 (0.35)	18 (3.1)	3 (.52)	5 (1.7)	5 (1.7)	0 (0)	11 (3.8)	33 (11.5)	2 (0.7)
	All Proposed Criteria	12 (2.1)	18 (3.1)	3 (.52)	9 (3.1)	5 (1.7)	0 (0)	29 (10)	34 (11.8)	2 (0.7)
		ISO HEADFORMS n=288			**PENETRATION n=108**			**ECE APPARATUS n=288**		
Helmet Type	**Failures, count (%)**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
CURRENT	> 400g	6 (2.1)	0 (0)	0 (0)	1 (0.9)	0 (0)	0 (0)	4 (1.4)	0 (0)	0 (0)
	> 4.0 ms @ 150g	2 (0.7)	1 (0.3)	6 (2.1)	3 (2.8)	7 (6.5)	4 (3.7)	0 (0)	2 (0.7)	3 (1.0)
	> 2.0 ms @ 200g	32 (11.1)	34 (11.8)	18 (6.3)	0 (0)	0 (0)	3 (2.8)	2 (0.7)	5 (1.7)	1 (0.003)
	All Current Criteria	40 (13.9)	35 (12.1)	24 (8.3)	4 (3.7)	7 (6.5)	7 (6.5)	6 (2.1)	7 (2.4)	4 (1.4)
PROPOSED	> 300g	32 (11.1)	5 (1.7)	0 (0)	3 (2.8)	0 (0)	0 (0)	9 (3.1)	1 (0.3)	0 (0)
	> 2.2 ms @ 200g	28 (9.7)	32 (11.1)	14 (4.9)	0 (0)	0 (0)	2 (1.9)	2 (0.7)	4 (1.4)	0 (0)
	All Proposed Criteria	60 (20.8)	37 (12.8)	14 (4.9)	3 (2.8)	0 (0)	2 (1.9)	11 (3.8)	5 (1.7)	0 (0)

Table 2.P.b Pass/Fail Criteria for Test Groups by Individual Helmets

		BASELINE n=72			CONDITIONING n=27			INCREASED VELOCITY n=36		
Helmet Type	**Failures, count (%)**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
	All Current Criteria	9 (12.5)	17 (23.6)	3 (4.2)	7 (25.9)	4 (14.8)	0	11 (30.5)	11 (30.5)	5 (13.9)
	All Proposed Criteria	12 (16.7)	14 (19.4)	2 (2.8)	6 (22.2)	3 (11.1)	0	9 (25.0)	11 (30.5)	2 (5.6)
		ISO HEADFOR S n=36			**PENETRATION n=27**			**ECE APPARATUS n=36**		
Helmet Type	**Failures, count (%)**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
	All Current Criteria	12 (33.3)	10 (27.8)	8 (22.2)	3 (11.1)	3 (11.1)	5 (18.5)	4 (11.1)	4 (11.1)	4 (11.1)
	All Proposed Criteria	12 (33.3)	8 (22.2)	7 (19.4)	3 (11.1)	0	2 (7.4)	5 (13.9)	5 (13.9)	0

Peak Headform Acceleration by Test Groups

Table 2.Q lists the summary results and statistical significance of the peak headform accelerations for the test groups for the anvil configurations. Table 2.R (Appendix) cross-tabulates grouped peak headform acceleration by impact location. Data from Table 2.R for the Baseline tests (B1 and B2) show the vulnerability of the center of the brow (front) impact location. All peak headform accelerations above 300g occurred at this location.

II.1.b. TEST HEADFORMS:
DOT FMVSS No. 218 vs. International Standards Organization

These tests of DOT FMVSS No. 218 headforms (AV) and International Standards Organization (ISO) headforms (HF) are at the higher impact velocities specified in Table 2.S below. The only variable between these tests is the headform type. For flat and hemispherical anvil tests combined, there was no statistically significant difference of peak headform accelerations (see Table 2.Q). However, the flat anvil tests did show a statistically significant increase for the ISO headforms. The hemispherical anvil tests showed a slight decrease in mean peak headform acceleration that was not statisticall significant.

II.1.c.1. TEST APPARATUS: Monorail vs. ECE-Type

Comparison of the ISO test headform (HF) group to the Alternative Apparatus (AA) group allows a direct comparison of test equipment, since both groups used ISO headforms and the higher impact velocities noted in Table 2.S. The result was a statistically significant 33g reduction of overall peak acceleration (see Table 2.Q). This reduction is primarily due to decreased accelerations for the flat anvil tests, a difference of 52g. The hemispherical anvil test results involved much lower peak accelerations and were not statistically different.

II.1.c.2. TEST APPARATUS: Monorail Using DOT Headforms vs. ECE-Type

All peak accelerations shown in Table 2.Q were significantly lower on the ECE-Type apparatus. Unlike the apparatus comparison with ISO headforms (HF vs. AA), these tests showed similar reductions of peak acceleration, averaging 26g for both flat and hemispherical anvils. Note that ECE No. 22.4 has a HIC value limitation of 2400 in its impact attenuation tests (see Table 1.A). HIC values were not computed for this study.

II.1.d. REDUCED ENVIRONMENTAL CONDITIONING TIME

There were no statistically significant differences between these groups. While statistically insignificant, it is interesting to note in Table 2.P.a that there was a higher failure rate for the CD test, Group A (marginally qualified) helmets. Post-test disassembly and examination of the test helmets revealed variations in construction (liner thickness and density) that would affect test performance.

Table 2.Q
Peak Headform Acceleration by Test Groups

Test Type	Test Group	Anvil	Mean Peak Acceleration	t-value	Significance
Baseline 1 (B1) vs. Baseline 2 (B2)	Baseline 1	Flat & Hemi Combined	173	0.54	0.590
	Baseline 2	Flat & Hemi Combined	170		
	Baseline 1	Flat	209	0.31	0.756
	Baseline 2	Flat	210		
	Baseline 1	Hemispherical	137	1.34	0.180
	Baseline 2	Hemispherical	130		
Baseline 1 (B1) vs. Increased Velocity (AV)	Baseline 1	Flat & Hemi Combined	173	4.93	**0.000**
	Increased Velocit	Flat & Hemi Combined	201		
	Baseline 1	Flat	209	6.22	**0.000**
	Increased Velocit	Flat	228		
	Baseline 1	Hemispherical	137	-3.84	**0.000**
	Increased Velocit	Hemispherical	174		
Baseline 1 (B1) vs. Reduced Conditioning Time (CD)	Baseline 1	Flat & Hemi Combined	173	-0.92	0.359
	Reduced Cond. Time	Flat & Hemi Combined	178		
	Baseline 1	Flat	209	-1.84	0.067
	Reduced Cond. Time	Flat	215		
	Baseline 1	Hemispherical	137	-0.45	0.654
	Reduced Cond. Time	Hemispherical	140		
ISO Headforms (HF) vs. DOT Headforms (AV)	ISO	Flat & Hemi Combined	210	1.37	0.171
	DOT	Flat & Hemi Combined	201		
	ISO	Flat	252	5.53	**0.000**
	DOT	Flat	228		
	ISO	Hemispherical	167	-0.59	0.556
	DOT	Hemispherical	173		
Monorail, ISO Headforms (HF) vs. Alternate Apparatus (AA)	Monorail	Flat & Hemi Combined	210	5.12	**0.000**
	ECE	Flat & Hemi Combined	177		
	Monorail	Flat	252	11.79	**0.000**
	ECE	Flat	200		
	Monorail	Hemispherical	167	1.27	0.205
	ECE	Hemispherical	154		
Monorail, DOT Headforms (AV) vs. Alternate Apparatus (AA)	Monorail	Flat & Hemi Combined	201	-4.51	**0.000**
	ECE	Flat & Hemi Combined	175		
	Monorail	Flat	228	-7.87	**0.000**
	ECE	Flat	200		
	Monorail	Hemispherical	173	-2.42	**0.016**
	ECE	Hemispherical	149		

FMVSS No. 218 currently requires both impacts at a site to be started at 2 minutes and completed within 4 minutes of removal from the conditioning environments. All first impact tests in this project were started at 2 minutes and the second 1.5 minutes later. The side impacts for the Decreased Conditioning time tests were directly compared to the equivalent side impacts in the Baseline tests by reducing the time out of conditioning from 2 minutes to 1 minute. This resulted in both impact tests being completed in slightly over 2 minutes. There was no significant effect found for this accelerated testing. The mean peak headform accelerations were: current requirements 176g and the accelerated group 173g (t=.41, p=.682).

II.1.e. INCREASED IMPACT VELOCITY

The current FMVSS No. 218 specifies impact velocity of 6.0 m/s for flat anvil impacts (both first and second impacts at each site) and 5.2 m/s for both hemispherical anvil impacts. The increased velocity test series used a flat anvil test velocity of 6.9 m/s for the first impact and retained the original 6.0 m/s for the second impact at each site. The hemispherical anvil test velocity was increased to 6.0 m/s for the first impact and retained the original 5.2 m/s for the second impact at each site. These velocities and the increased impact energies for the different test headforms are shown in Table 2.S below.

Table 2.S
Increased Impact Velocity and Energy

Headform (Weight)	Flat Anvil Velocity 1 (m/s)	Energy (Joules)	Flat Anvil Velocity 2 (m/s)	Energy (Joules)	Hemi Anvil Velocity 1 (m/s)	Energy (Joules)	Hemi Anvil Velocity 2 (m/s)	Energy (Joules)
DOT Small (3.5 kg.)	**6.9**	**84**	**6.0**	**63**	**6.0**	**63**	**5.2**	**47**
DOT Medium (5.0 kg.)	**6.9**	**119**	**6.0**	**90**	**6.0**	**90**	**5.2**	**68**
DOT Large (6.1 g.)	**6.9**	**145**	**6.0**	**110**	**6.0**	**110**	**5.2**	**82**
ISO E (4.1 kg.)	**6.9**	**98**	**6.0**	**74**	**6.0**	**74**	**5.2**	**55**
ISO J (4.7 kg.)	**6.9**	**112**	**6.0**	**85**	**6.0**	**85**	**5.2**	**64**
ISO M (5.6 kg.)	**6.9**	**133**	**6.0**	**101**	**6.0**	**101**	**5.2**	**76**

Higher impact velocities showed statistically significant increases in peak acceleration for both flat and hemispherical anvils. There is a greatly increased incidence of failure of all impact attenuation criteria, with the mean value for headform acceleration increasing 34g (hemispherical anvil). The helmets also begin to show high peak accelerations in locations other than the brow at these higher impact velocities (Table 2.R, Appendix).

II.2. ALTERNATIVE PENETRATION REQUIREMENTS

These tests were performed to evaluate the helmet's impact attenuation performance when tested against aggressive anvil surfaces. The tests consisted of a single impact per site at the higher impact velocity of 6.9 m/s. All of groups B and C passed all tests but there were several failures in group A. See Tables 2.P.a and 2.P.b.

Comparison of the alternative anvils showed no statistically significant difference between the two. The mean peak headform acceleration for the curb anvil was 202g and the edge anvil was 193g ($t=0.94$, $p=.349$).

Table 2.T
Dwell Time Differences Between Test Groups

Test Type	Test Group	Anvil	Mean Time @ 150g	t value	Significance	Mean Time @ 200g	t value	Significance
Baseline 1 (B1) vs. Baseline 2 (B2)	Baseline 1	Flat & Hemi Combined	1.717	1.83	0.670	0.446	1.19	0.236
	Baseline 2	Flat & Hemi Combined	1.484			0.373		
	Baseline 1	Flat	3.208	5.23	**0.000**	0.855	1.06	0.292
	Baseline 2	Flat	2.759			0.747		
	Baseline 1	Hemispherical	0.225	0.29	0.773	0.037	2.51	**0.013**
	Baseline 2	Hemispherical	0.208			0.000		
Baseline 1 (B1) vs. Increased Velocity (AV)	Baseline 1	Flat & Hemi Combined	1.717	-1.65	0.100	0.446	-5.35	**0.000**
	Increased Velocit	Flat & Hemi Combined	1.936			0.855		
	Baseline 1	Flat	3.208	-4.58	**0.000**	0.855	-6.46	**0.000**
	Increased Velocit	Flat	3.442			1.583		
	Baseline 1	Hemispherical	0.225	-2.77	**0.006**	0.037	-2.9	**0.004**
	Increased Velocit	Hemispherical	0.353			0.126		
Baseline 1 (B1) vs. Reduced Conditioning Time (CD)	Baseline 1	Flat & Hemi Combined	1.717	0.15	0.878	0.446	-0.47	0.642
	Reduced Cond. Tim	Flat & Hemi Combined	1.695			0.478		
	Baseline 1	Flat	3.208	0.23	0.817	0.855	-0.52	0.607
	Reduced Cond. Tim	Flat	3.195			0.914		
	Baseline 1	Hemispherical	0.225	0.49	0.627	0.037	-0.24	
	Reduced Cond. Tim	Hemispherical	0.194			0.043		
Baseline 1 (B1) vs. Alternate Apparatus (AA)	Baseline 1	Flat & Hemi Combined	1.716	-1.32	0.186	0.446	1.82	0.069
	ECE	Flat & Hemi Combined	1.549			0.340		
	Baseline 1	Flat	3.208	-5.20	**0.000**	0.855	2.64	**0.009**
	ECE	Flat	2.745			0.594		
	Baseline 1	Hemispherical	0.225	-1.84	0.066	0.037	1.82	0.069
	ECE	Hemispherical	0.353			0.085		
ISO Headforms (HF) vs. DOT Headforms (AV)	ISO	Flat & Hemi Combined	2.056	0.9	0.368	1.054	2.13	**0.034**
	DO	Flat & Hemi Combined	1.936			0.855		
	ISO	Flat	3.509	-1.41	0.160	2.030	3.87	**0.000**
	DO	Flat	3.442			1.583		
	ISO	Hemispherical	0.603	-1.91	0.058	0.078	-1.38	0.168
	DO	Hemispherical	0.429			0.126		

Table 2.T (continued)

Test Type	Test Group	Anvil	Mean Time @ 150g	t value	Significance	Mean Time @ 200g	t value	Significance
Monorail, ISO Headforms (HF) vs. Alternative Apparatus(AA)	Monorail	Flat & Hemi Combined	2.056	-3.99	**0.000**	1.054	8.96	**0.000**
	ECE	Flat & Hemi Combined	1.549			0.340		
	Monorail	Flat	3.509	-8.79	**0.000**	2.030	14.12	**0.000**
	ECE	Flat	2.745			0.594		
	Monorail	Hemispherical	0.603	-2.84	**0.005**	0.078	-0.22	0.822
	ECE	Hemispherical	0.353			0.085		
Monorail, DOT Headforms (AV) vs. Alternative Apparatus(AA)	Monorail	Flat & Hemi Combined	1.935	-3.02	**0.003**	0.855	7.17	**0.000**
	ECE	Flat & Hemi Combined	1.549			0.340		
	Monorail	Flat	3.442	-7.95	**0.000**	1.583	9.35	**0.000**
	ECE	Flat	2.745			0.594		
	Monorail	Hemispherical	0.429	-0.95	0.343	0.126	1.18	0.238
	ECE	Hemispherical	0.353			0.085		

Dwell Time Differences by Test Groups

The various test groups were compared for the statistical differences between dwell times at 150 and 200g. Table 2.T above, shows the summary of these comparisons.

Dwell Time at 150g

It is important to note that this criterion of helmet impact performance has never been a critical measure. In the current FMVSS No. 218, essentially any helmet which succeeds in qualifying to the 200g- 2.0 msec. limit will also qualify to the 150g-4.0 msec. limit. In the 576 test impacts of the Baseline tests, there was only one exceedance of the 4.0 msec. limit. In subsequent tests with greater impact velocity, there were more frequent exceedances of the 4.0 msec. limit at 150g (see Table 2.M). These comparisons show statistically significant differences for several groups comparing velocity and test equipment.

Dwell time at 200g

II.1.a. BASELINE TESTS

The two baseline tests (B1, B2) show no overall difference when data for both flat and hemispherical anvils are combined for comparison. However, when the data for the two anvils are separated, there is a statistically significant difference between the hemispherical anvil test results, due to the increased vulnerability of the front (brow) to the more aggressive hemispherical anvil. (See Table 2.R, Appendix)

II.1.b. TEST HEADFORMS:
DOT FMVSS No. 218 vs. International Standards Organization

The ISO headforms overall produced a statistically significant increase in dwell time at 200g. In particular, this was due to the significant increase of dwell time on the flat anvil impacts. Hemispherical impacts were not significantly different.

II.1.c. PRE- AND POST-TEST SYSTEMS CHECK

Table 2.U shows the descriptive statistics for the comparison between the current TP-218-03 specified pre- and post-test system check procedure and an alternative method. The test data summarized in Table 2.U shows that the consistency of the impact test results is largel a function of the MEP used. The least consistent MEP (No.1) had a peak acceleration standard deviation of 11.65g (worst case) while the most consistent MEP (No.3) resulted in a more consistent 5.35g standard deviation (worst case).

II.1.c.1. TEST APPARATUS: Monorail vs. ECE-Type

The results show a statistically significant reduction in dwell time at 200g for the flat anvil tests. This is one of the most dramatic reductions in these tests, from a mean of 2.03 msec. for the monorail with ISO headforms to 0.594 msec. on the ECE apparatus. There was no statisticall significant difference between results for the hemispherical anvil tests.

High Speed Video Analysis

A series of impact tests with the ECE test apparatus and monorail test apparatus were conducted using a Kodak Ektapro high speed video system which captured the entire helmet impact sequence at a sampling rate of 1000 frames per second. Penetration tests were also videotaped using the same system with a sampling frequency of 2000 frames per second. Images were stored digitally and subsequently downloaded to a VHS video system at several different playback speeds.

Table 2.U
Pre- and Post-Test System Calibration

Headform, Size	DOT Small	DOT Medium	DOT Large	ASTM Sphere
MEP No. 1	n=7	n=7	n=7	n=7
Peak Acceleration, g				
Mean	386.13	391.29	398.14	394.60
Minimum	382.36	386.82	390.26	381.02
Maximum	393.12	402.44	423.45	406.41
Std. Deviation	4.03	5.18	11.65	9.99
Sig. of Variance, MEP 1 vs. MEP 2	**p=.009**	p=.574	p=.129	**p=.003**
Time @ 150g				
Mean	2.57	2.51	2.43	2.49
Std. Deviation	0.053	0.057	0.048	0.057
Time @ 200g				
Mean	2.17	2.20	2.10	2.15
Std. Deviation	0.048	0.042	0.047	0.071
Velocity, m/s				
Mean	4.69	4.75	4.80	4.70
Std. Deviation	0.019	0.012	0.029	0.007
MEP No. 2	n=7	n=7	n=7	n=7
Peak Acceleration, g				
Mean	382.64	389.75	381.93	409.79
Minimum	380.56	382.42	378.52	406.85
Maximum	384.44	403.96	385.87	411.77
Std. Deviation	1.53	6.94	2.83	1.72
Sig. of Variance, MEP 2 vs. MEP 3	**p=.024**	p=.484	p=.084	**p=.006**
Time @ 150g				
Mean	2.61	2.66	2.53	2.64
Std. Deviation	0.032	0.052	0.050	0.08
Time @ 200g				
Mean	2.23	2.27	2.20	2.20
Std. Deviation	0.042	0.080	0.067	0.00
Velocity, m/s				
Mean	5.01	5.10	5.10	4.91
Std. Deviation	0.015	0.012	0.012	1.723
MEP No. 3	n=7	n=7	n=7	n=7
Peak Acceleration, g				
Mean	401.63	390.95	393.12	403.64
Minimum	394.67	387.32	391.25	397.08
Maximum	410.27	399.02	394.67	410.25
Std. Deviation	5.35	4.19	1.37	5.05
Time @ 150g				
Mean	2.40	2.34	2.32	2.40
Std. Deviation	0.047	0.053	0.042	0.000
Time @ 200g				
Mean	2.11	2.04	1.99	2.04
Std. Deviation	0.032	0.070	0.032	0.052
Velocity, m/s				
Mean	5.02	4.96	5.10	5.23
Std. Deviation	0.018	0.071	0.014	0.006

The ECE test equipment consists of a full configuration (complete with neck) ISO test headform fitted with a tri-axial accelerometer at the center of gravity. (See Figure 2 on page 21). A helmet was placed on the test headform and the headform and helmet were oriented to make contact at the appropriate site and supported using a free fall support cage assembly. The headform, helmet and support cage assembly were raised to the appropriate drop height and released. The cage assembly proceeded to fall towards the impact anvil which then projects through a hole located in the bottom of the cage assembly. (See Figure 3 on page 22). This allows the cage assembly to clear the test anvil while the anvil makes direct contact with the helmet. Since the helmet was not fixed inside the cage assembly, it was free to move in any direction following the initial impact. Although there was very little motion during the primary impact into the test anvil, the secondar motion following the primary impact (i.e. the impact into the roof of the carriage assembly and the second impact onto the test anvil) caused a great deal of secondary damage to the helmet and the headform system. Additional tests in which there were secondary impacts may not indicate the true performance of the helmet, since the helmet could already have experienced some damage due to these secondary impacts. This characteristic may be unique to this particular design of ECE test apparatus, however, the potential of secondary helmet impacts does relate a major problem with the ECE test procedures.

The amount of helmet and headform rotational motion observed during the ECE test procedures was obviously greater than the rotation observed during the monorail test procedures. This was because the center of gravity of the ISO test headform is not aligned with the point of impact on the test helmet. As a result of this offset, a moment was generated about the center of mass of the headform and helmet system, causing helmet rotation. The presence of rotation during the ECE test procedures indicates that some of the kinetic energy of the impact is directed into rotational kinetic energy rather than impact with the test anvil. A monorail test apparatus has a fixed and guided impact; therefore none of the kinetic energy of the impact is converted into post-impact rotational kinetic energy. Therefore, the total amount of energy creating measured acceleration during an ECE test impact is less than for the monorail. This agreement of video and accelerometer data confirm that the ECE test is less severe than those tests conducted with the monorail.

II.1.c.2. TEST APPARATUS: Monorail Using DOT Headforms vs. ECE-Type

As with the previous comparison of headform types with alternative test apparatus (HF vs. AA), there was a statistically significant decrease in the dwell times on flat anvil tests, but no statistically significant difference for the hemispherical anvil tests.

II.1.d. DECREASED CONDITIONING TIME

The current FMVSS No. 218 requires environmental conditioning “for 12 hours” (S6.4). The reduced time in conditioning tests consisted of a test series identical to the baseline (B1) except that the test was begun after the helmets had been in conditioning for four hours rather than twelve or more. There were no statistically significant differences between 12 and 4 hours of pre-test environmental conditioning time. The reduced time-out-of-conditioning tests showed no significant differences in dwell times at either 150g (t=.28, p=.779) or 200g (t= .41, p=.680).

II.1.e. INCREASED IMPACT VELOCITY

All these tests show statistically significant increases in dwell times at 200g for both flat and hemispherical anvils.

II.2. ALTERNATIVE PENETRATION REQUIREMENTS

Additional impact attenuation tests using aggressive curbstone and metal edge anvils were performed. The Baseline (B1) helmets were tested for penetration resistance as currentl specified in FMVSS No. 218 paragraph S7.2. Of the 36 helmets tested (twice on each helmet) there was only one failure. The failure was on a low-temperature conditioned ABS shell (Type A) helmet, and was due to fracturing of the shell. Both the polycarbonate (Type B) and fiberglass (Type C) helmets passed these tests with minimal damage. See Table 2.Y, Appendix for the listing of all test results.

II.3. RETENTION SYSTEM TESTS

II.3.a. RETENTION SYSTEM STRENGTH

All helmets were tested for retention system strength as specified in FMVSS No. 218 paragraph S7.3. There were two individual failures, both of the ABS shell (Type A) helmets. These two failures occurred after water and low temperature conditioning, respectively, and both slightl exceeded the 2.5cm limit at 2.6cm. Table 2.V shows the results of these baseline FMVSS No. 218 retention system strength tests.

Table 2.V
FMVSS No. 218 Baseline Retention System Strength Test Results

Test Helmet Group	Headform Size	Condition	Elongation, mm	Mean for Model/Size	Pass/Fail (>25mm)
A	Small	Ambient	22	23.8	Pass
		Water	**26**		**Fail**
		Cold	**26**		**Fail**
		Hot	21		Pass
A	Medium	Ambient	20	20.3	Pass
		Water	21		Pass
		Cold	20		Pass
		Hot	20		Pass
A	Large	Ambient	20	21.5	Pass
		Water	25		Pass
		Cold	20		Pass
		Hot	21		Pass
B	Small	Ambient	15	15.0	Pass
		Water	14		Pass
		Cold	15		Pass
		Hot	16		Pass
B	Medium	Ambient	19	19.0	Pass
		Water	20		Pass
		Cold	18		Pass
		Hot	19		Pass
B	Large	Ambient	18	16.8	Pass
		Water	17		Pass
		Cold	16		Pass
		Hot	16		Pass
C	Small	Ambient	21	20.0	Pass
		Water	18		Pass
		Cold	20		Pass
		Hot	21		Pass
C	Medium	Ambient	14	13.3	Pass
		Water	12		Pass
		Cold	13		Pass
		Hot	14		Pass
C	Large	Ambient	15	13.0	Pass
		Water	12		Pass
		Cold	12		Pass
		Hot	13		Pass

II.3.b. POSITIONAL STABILITY

A test method has been developed by the ASTM F08.53 committee to determine the positional stability of protective helmets. The method was adopted by the Snell Memorial Foundation in 1995. This test procedure involves placing the test helmet on an appropriate headform which is supported at an angle 45 degrees below horizontal. A hook and strap is then fastened to the rear (for forward roll-off testing) of the helmet. A guide rod is attached to the strap and a sliding weight is allowed to drop along the guide rod, abruptly loading the helmet when arrested at the bottom of the guide rod. The drop weight and height can be varied, with the current Snell test being a 4 kg. weight dropped 60 cm. The original ASTM draft standard listed a 10 kg weight for motor sports helmets, so tests were performed with this weight as well.

Six models of helmets were tested for their resistance to roll-off as part of this work. For each set, all available sizes were obtained for testing. Because some models have more available sizes, the number of tests actually performed per set varies. Several helmets were tested on each size headform, for example, sizes XXS, XS, S would typically fit the DOT Small and ISO E headforms but would be too small for testing on the larger headforms. Conversely, larger helmets were not tested on headforms that were clearly too small. The test headform data is summarized below in Table 2.W.

Scaling of helmet movement was done on a 5-point scale:

1) No movement
2) Some movement, won't come off
3) Might come off with more force
4) Ejected with resistance
5) Ejected easily, minimal resistance
6) Retained on 4 kg mass test, ejected on 10 kg mass test
   (this value applicable only to headform testing, not human subjects)

Table 2.W
DOT and ISO Test Headform Forward Roll-Off Result Summary

Headforms (All sizes combined)	Helmet (Count in category)	Retained, minimal movement	Retained, some movement	Retained, possibly ejected with greater force	Ejected with resistance	Ejected with minimal resistance	Retained in 4kg test, ejected on 10 kg test	No. Tests	Percent Ejected
DO	Partial 1	0	1	0	2	1	3	7	86
ISO	Partial 1	1	1	0	0	0	7	9	78
Human	Partial 1	0	6	7	42	51	n/a	106	88
DO	Partial 2	2	2	0	0	0	2	6	33
ISO	Partial 2	2	4	0	0	0	0	6	0
Human	Partial 2	3	36	13	14	9	n/a	75	31
DO	Partial 3	1	1	0	0	1	1	4	50
ISO	Partial 3	1	1	0	0	1	1	4	50
Human	Partial 3	3	21	1	3	20	n/a	48	48
DO	Full Coverage	0	4	0	1	0	4	9	56
ISO	Full Coverage	0	0	0	0	4	5	9	100
Human	Full Coverage	2	25	20	26	29	n/a	102	54
DO	Full-Facial 1	2	5	0	0	0	0	7	0
ISO	Full-Facial 1	0	4	1	0	1	1	7	29
Human	Full-Facial 1	32	47	1	1	0	n/a	81	1
DO	Full-Facial 2	0	6	2	0	0	0	8	0
ISO	Full-Facial 2	0	8	0	1	0	0	9	11
Human	Full-Facial 2	29	51	7	1	0	n/a	88	1

The correlation of data between ejection rates for humans and the DOT headform using the 10 kg drop weight is presented and discussed in Section III.3.2

II.4. PROJECTIONS

Table 2.X shows a list of the external and internal projections for the helmets tested during this project. In preparing this list, the helmets were completely disassembled and any discontinuit was noted. This includes such benign features as slightly projecting (e.g., 1.5 mm) plastic ventilation control moldings. In the case of internal projections, almost all design features listed in Table 2.X are covered by either the expanded polystyrene (EPS) energ -absorbing liner or other interior padding.

All external projections were either below the maximum height or easily removed and therefore not rigid, e.g. lightweight plastic ventilation devices.

Approximately 5% of the helmets currently being sold have an outer covering of leather or fabric. Such a covering may influence the helmet's friction with the ground. None of the helmets tested in this project had this feature, and no tests were performed to evaluate its effect.

Table 2.X
Internal and External Projections

	External Projections		Internal Projections*		Covered by
	Object	Height	Object	Height	
A (Medium)	Snap Base	4.2 mm	Strap hanger plate	4.3 mm	35 mm EPS helmet liner
	Rivet head	1.15 mm	Snap base molding	0.75 mm	35 mm EPS helmet liner
A (Extra Large)	Snap Base	4.0 mm	Strap hanger plate	4.5 mm	25 mm EPS helmet liner
	Rivet head	0.75 mm	Snap base molding	1.9 mm	25 mm EPS helmet liner
B (Extra Small)	Snap Base	0.7 mm	Strap hanger plate	2.0 mm	0.75 mm vinyl pad
	Rivet head	2.0 mm			
B (Large)	Crown Air Vent	8.2 mm	Strap Hanger Plate	4.0 mm	35 mm EPS helmet liner
	Brow Air Vents	1.0 mm	Brow Vent Molding	1.5 mm	40 mm EPS helmet liner
	Chin Air Vent	2.0 mm	Edge Bead Clips	4.0 mm	EPS Cheek pad-35 mm, EPS Liner-35 mm, EPS Chin Pad-20 mm
	Faceshield Cover Plate	5.5 mm			
	Rivet head	covered by faceshield cover plate			
B (Extra Large)	Crown Air Vent	8.1 mm	Strap hanger plate	4.0 mm	35mm EPS liner and 35mm EPS cheek pad
	Brow Air Vents	1.0 mm	Brow vent molding	1.5 mm	40 mm EPS helmet liner
	Chin Air Vents	2.0 mm	Edge Bead Clips	4.0 mm	35mm EPS helmet liner in rear, 30 mm EPS cheek pad, and 20mm EPS chin pad
	Faceshield Cover Plate	5.0 mm			
	Rivet head	covered by faceshield cover plate			
C (Large)	Brow Air Vent	2.4 mm	Brow Vent Molding	1.7 mm	32 mm helmet liner
	Chin Air Vent	5.0 mm	Strap Hanger Plate	2.6 mm	32mm EPS helmet liner and 35 mm EPS cheek pad
	Faceshield Cover Plate	4.0 mm			
	Rivet head	covered by faceshield cover plate			

* Projects beyond continuous underlying surface, may be additional layers between it and wearer's head.

II.5. LABELING

There were no laboratory performance tests conducted in this area.

II.6. FACESHIELD PENETRATION RESISTANCE

Samples of all faceshields were tested to the mechanical requirements as specified b VESC-8, 1980. The faceshields were environmentally conditioned as specified in FMVSS No. 218 prior to testing. There were no penetration failures of any of the full facial coverage test helmet faceshields. Additional tests of other available faceshields at ambient environmental condition also showed a predominating ability to withstand the VESC-8 penetration resistance requirements. The only failure encountered was an old faceshield made of thin acetate sheet stock. The VESC-8 penetrator caused a 22mm hole through this faceshield.

TASK III DISCUSSION AND CONCLUSIONS

HPRL contacted major motorcycle helmet distributors and determined that low priced helmets in the same price range as Group A constitute approximately 40% of the market and medium priced helmets such as Group B are approximately the same at 40%. The higher priced helmets such as Group C constitute the minority of helmet sales. Annual sales of motorcycle helmets are estimated at approximately 1.2 million. Any proposed changes to the standard must be weighed for their potential impact on each group of helmets and the costs to consumers. Low and medium cost helmets are approximatel 80% of all helmets sold thus any changes affecting these helmets will be significant to consumers.

The series of tests conducted for this project gives detailed test data for a small selection of the many helmet brands and models that are available in the market today. The selected helmet models are broadly representative of the categories currently available. Therefore, these tests provide depth of test data for the helmet models actually tested, and represent a limited selection of the wide variety of brands and models of helmets currently available. In this way, these tests correctly represent the helmets currentl available to motorcyclists.

The data presented in Table 2.M show that the proposed increase in the 200g dwell time limit will reduce failures from this criterion by approximately 13%. Since only 52 impacts (out of 892, 5.8%) failed this criterion, the change would not have any major impact on pass/fail rates. The comparison of the failures for each helmet type found in Table 2.P.b shows that the change of criteria at current impact velocities is not likely to have a major effect on the failure rate. It is worthwhile to note (see Table 2.N) that man of the failures of the marginally qualified helmets (group A) to the proposed criteria are peak headform accelerations greater than 300g. These contrast with the groups B and C helmets which fail the 200g dwell time limitation and have peak headform accelerations less than 300g.

The reduction of the peak headform acceleration limit to 300g is an important step to increase the safety of DOT qualified helmets and improve international harmonization. However, a dwell time increase from 2.0 ms to 2.2 ms at 200g is unlikely to have any measurable impact on the accident performance of qualified helmets, either positive or negative. The 4.0 ms limit at 150g is not a critical measure at current impact velocities, and therefore should be eliminated to simplify the standard. However, at higher impact velocities, failures do occur.

The testing reported on here does not indicate any compelling justification either for or against changing the dwell time limit at 200g from 2.0 msec to 2.2 msec. The human tolerance literature is not specific enough to distinguish criticality to this degree of precision, but it does support some sort of limitation of dwell time at 200g.

III.1.a. BASELINE TESTS

Helmets are constructed of an outer shell and energ -absorbing liner. There are two major areas for comparison: shell material type and thickness, and energ -absorbing liner thickness and density. Previous research has found that liner density has a dramatic effect on test performance (Mills & Gilchrist, 1991, Thom & Hurt, 1992). Note that the group C helmets that had the highest pass rate (see Tables 2.P.a,b) have the lowest density liners: approximately two pounds per cubic foot (see Table 2.J). This excellent performance is possible because of the combination of the strong and a stiff shell and the soft, low-density liner. The group B helmets have considerably denser liners and showed consistently longer dwell times in all tests.

III.1.b. TEST HEADFORMS:
DOT FMVSS No. 218 vs. International Standards Organization

A significant difference was observed between the DOT test headforms (AV) and the ISO test headforms (HF) when tested under identical conditions. The data indicated that the peak headform acceleration values for the flat anvil tests are higher when ISO test headforms were used in place of DOT test headforms. The difference was not sufficient to cause failures in well designed motorcycle helmets; however, it could cause marginall qualified helmets to fail a flat anvil test given the fact that ISO test headforms would result in higher peak headform accelerations. No significant differences were noted between headforms for the hemispherical anvil tests.

The adoption of the ISO test headforms would harmonize the DOT standard with other international motorcycle helmet standards which already use the ISO test headform. The anthropometric characteristics of the ISO test headforms are also considered to be more representative of the general population of human head shapes than the DOT test headforms (Gilchrist, et al., 1988).

III.1.c.1. TEST APPARATUS: Monorail vs. ECE-Type

The data presented in Table 2.S indicated that there was a significant difference in peak headform acceleration and dwell time at 200g for the flat anvil tests. These differences were attributed largely to the differences in mass distribution of the test apparatus and the subsequent dynamics of the impact. Given the fact that the peak headform accelerations were consistently higher for the monorail tests, it may be assumed that these tests are more rigorous and represent a worst case scenario when compared to the same tests conducted using the ECE test apparatus. The ECE-type apparatus is considerably more complicated and yet it is a less severe test. There is no safety benefit to the use of the ECE apparatus in spite of its complexity, and therefore no justification for its use in FMVSS No. 218.

The ECE-22.4 standard sets limits of than 275g and a HIC value no greater than 2400. None of the other motorcycle helmet standards use HIC. The use of HIC has been both supported (Lockett, 1985) and criticized (Newman, 1975, 1982). It should be noted that HIC was developed for use with the Hybrid III headform in automotive crash testing, not motorcycle helmet testing using rigid alloy headforms. Because of its absence from the majority of motorcycle standards, HIC was not analyzed in this work.

III.1.c.2. PRE- AND POST-TEST SYSTEMS CHECK

Table 2.U shows the descriptive statistics for the comparison between the current TP-218 specified pre- and post-test system check procedure and an alternative method. Since the current test procedure specifies that the first three impacts are to be discarded as "warm-up" tests, the data were analyzed with the first three impacts removed from each test series. Analysis of the test data summarized previously in Table 2.U shows that the consistency of the impact test results is largely a function of the MEP used. The most inconsistent MEP allowed the peak acceleration (worst case) to vary by 11.65g while the best MEP limited the standard deviation to 5.35g (worst case).

III.1.d. DECREASED CONDITIONING TIME

The data presented in Tables 2.Q and 2.T show no statistically significant effect of reducing the pre-test environmental conditioning time from 12 to 4 hours. Internationally, the four hour minimum is widely used (see Table 1.C). From a practical standpoint, reducing the environmental conditioning time to four hours allows helmets to be conditioned and tested in one work day, rather than requiring an overnight delay for conditioning. Also, same-day conditioning allows tests to be performed on all five days in a standard 40 hour work week.

There was no compelling reason found in this research to strictly maintain the requirement of "Start-at-two-minutes, finish-by-four." However, from a consistenc standpoint, specifying the timing of the tests is a sound practice.

FMVSS No. 218 does not currently specify any maximum time for the conditioning. While no testing was done to determine the potential effects of long-term environmental conditioning, e.g. 48 hours or longer, it would seem prudent to establish a reasonable maximum, such as 24 hours. There may be long term effects of environmental conditioning over weeks or months that are not currently addressed since there is no maximum time specified.

III.1.e. INCREASED IMPACT VE OCITY

In order to meet the current or proposed test criteria at increased velocity, the inexpensive $50 helmets in Group A would require extensive redesign of both shell and liner which could double the retail price to around $100. The $140 Group B helmets would also need significant modifications that could increase the price to around $200. Only the premium $210 Group C helmet will pass the proposed increased velocity tests without significant modification.

Implementation of the proposed increased impact velocities would either (1) disqualify a large number of currently available, low and mid-priced helmets that have been shown to be effective in preventing or reducing brain injuries or, (2) require extensive design changes that would greatly increase the cost of these helmets. Elimination of these lower cost helmets will cause financial hardship to the consumer, especially younger riders without clear safety benefit to those users. In voluntary helmet use states, increasing the cost of the majority of helmets is likely to discourage helmet use.

Future improvements in head protection systems should come from further decreases in allowable headform acceleration rather than increases in impact energy.

III.2. PENETRATION TESTS

DOT contractors for compliance testing to FMVSS No. 218 should include penetration tests at the helmet sides near the test boundaries rather than only at the helmet apex.

III.3.a. POSITIONAL STABILITY

In order to validate the findings of the laboratory roll-off tests performed as part of Task II (see Table 2.V), roll-off tests were conducted on volunteer human subjects. The results of these tests are summarized in Table 3.A below. The fifty subjects were mostl military or university personnel. Test procedures and purposes were explained to each subject and head circumference in horizontal and coronal planes was measured. Subjects were asked to put on and fasten the helmet so that the strap was in contact with the skin under the chin, but loose enough to slide one finger comfortably between the chin strap and the chin. They were asked to rotate the helmet rearward (to check for rearward stability) and then forward. Subjects were asked to pull vigorously on the helmet, enough to cause discomfort, but not to the point of causing pain. Some helmets would come off quite easily, others only with discomfort. Since subjects were pulling the helmets off their own heads, they could easily monitor helmet movement, personal discomfort and a sense of how likely the helmet was to come off with additional force.

Helmets included two full-facial models, one full-coverage (open face) and three partial coverage models. Four to six sizes were available in each model for testing. Subjects tried on at least two sizes of each model. Subjects were also asked to rate which size provided the best fit in each model when multiple sizes were tried.

The test methodology was to have a volunteer subject first try on the helmet size most likel to be his "best fit" based on head measurement in the horizontal plane. If the subject was unable to pull that size off, then the next larger size was tried (since motorcyclists sometimes wear too large a helmet). Conversely, if the rider did pull off his "best fit" in a particular model, the next smaller size was tried as well to see if that also could be pulled off.

Scaling of helmet movement for human subjects was done on a 5-point scale:

1) No movement
2) Some movement, won't come off
3) Might come off with more force
4) Ejected with resistance
5) Ejected easily, minimal resistance

Table 3.A
Comparison of Human Subject and Test Headform Ejection Data

Count, (%)	Retained, minimal movement	Retained, some movement	Retained, possibl ejected with greater force	Ejected with resistance	Ejected with minimal resistance		Total Ejected Count, (%)
Helmet			*Human Subjects*				
Partial 1	0	6 (5.7)	7 (6.6)	42 (39.6)	51 (48.1)		93 (87.7)
Partial 2	3 (4.0)	36 (48.0)	13 (17.3)	14 (18.7)	9 (12.0)		23 (30.7)
Partial 3	3 (6.3)	21 (43.8)	1 (2.1)	3 (6.3)	20 (41.7)		23 (48.0)
Full Coverage	1 (2.0)	25 (24.5)	20 (19.6)	26 (25.5)	29 (28.4)		55 (53.9)
Full Facial 1	32 (39.5)	47 (58.0)	1 (1.2)	1 (1.2)	0		1 (1.2)
Full Facial 2	29 (33.0)	51 (58.0)	7 (8.0)	1 (1.1)	0		1 (1.1)
Test Headforms (DOT and ISO Combined)						Retained in 4 kg test, ejected on 10 kg test	
Partial 1	1 (6.3)	2 (12.5)	*	2 (12.5)	1 (6.3)	10 (62.5)	13 (81.3)
Partial 2	4 (33.3)	6 (50.0)	2 (16.7)	0	0	2 (16.7)	2 (16.7)
Partial 3	2 (25.0)	2 (25.0)	2 (25.0)	0	2 (25.0)	2 (25.0)	4 (50.0)
Full Coverage	0	4 (22.2)	9 (50.0)	1 (5.6)	4 (22.0)	9 (50.0)	14 (77.6)
Full Facial 1	2 (14.3)	9 (64.3)	1 (7.1)**	1 (7.1)	0	1 (7.1)	2 (14.2)
Full Facial 2	0	14 (82.4)	2 (11.8)	1 (5.9)	0	0	1 (5.9)

* Failed retest with 10 kg weight.
** Passed retest with 10 kg weight

Comparison of human and headform data suggest that the 4 kg, 60cm test is not a rigorous test of positional stability for motorcycle helmets, allowing helmets to pass the roll-off test that were easily pulled off by human subjects. In particular, Partial 1 had an 88% ejection rate for human subjects, 81% for the 10 kg. test, but only 19% using the 4 kg drop weight. Ideally, the acceptable test protocol should approximate results for human subjects: the 4 kg test as used in Snell M1995 appears to be insufficient and the 10 kg test appears to be necessary for rigorous testing. Table 3.B lists the human subject and laboratory test data for the DOT headforms and 10 kg. drop weight.

Table 3.B
Summary of 10 kg. Laboratory Tests to Human Subject Test Results

Helmet	Partial 1	Partial 2	Partial 3	Full Coverage	Full Face Coverage 1	Full Face Coverage 2
Human subject ejection (%)	88	31	48	54	1	1
DOT Headform 10 kg ejection %	86	33	50	56	0	0

The right hand column of Table 3.A shows the percentage of a given model helmet ejected during testing. Note that in many cases there are inconsistencies between the results for the DOT and ISO headforms. It is important to note that because of the small number of laboratory roll-off tests, the percent ejected is strongly influenced by an individual test.

In general, the DOT headforms retain the full-coverage and full-facial coverage helmets better while the ISO headforms retain the partial coverage helmets more effectively (See Table 2.W). Helmet ejection rates vary strongly as a function of helmet coverage: generally, the more coverage, the less likely the helmet was to come off. Ejection rates for human subjects on these partial coverage helmets ranged from 50-88%. In contrast, human subjects could pull off the full facial coverage helmets less than 1% of the time.

The data for helmet ejection in human subject roll-off tests a remarkable range of variability. Helmet ejection rates ranged from less than 1% to nearly 90%. Such variability is not uncommon in the absence of a performance standard, and the data for some of the helmets tested here suggest unacceptable levels of positional instability.

Finally, it is important to remember that the six helmet models tested for positional stability were not randomly selected from the total helmet population. In fact, some of the helmets were used precisely because of unfavorable performance in laboratory tests. Human subject testing confirmed these laboratory observations that particular helmet models were vulnerable to roll-off ejection. As a result, the test data presented indicate a higher percentage of helmets with poor positional stability than in the actual helmet population. For example, Hurt et. al., (1981) reported that about 5% of helmets came off in an accident, and half of those were not even fastened.

III.4. PROJECTIONS

There are two means by which an internal projection could be related to head injury of the wearer. First is the potential for penetration injury. An example would be that of a self-tapping screw used to mount an accessory to the outside of the shell and protruding inward toward the head.

The second potential injury mechanism is that of a rigid internal projection transmitting force directly from impact to the outside of the shell to the head inside. An example could be a thick and rigid audio speaker mounted inside the helmet and unprotected b EPS liner or other padding. While there are not currently any manufacturers making helmets with built-in sound systems, such systems are a common aftermarket addition. The potential for injury by an internally mounted audio speaker is highly dependent on the configuration of the energ -absorbing liner, the structure and rigidity of the speaker. The worst case for transmitted force would be a thick and rigid speaker (or other component, such as a battery) mounted directly to the interior of the helmet shell and not surrounded by energ -absorbing liner--probably below the test area of FMVSS No. 218--near the wearer's ear. A more benign installation would be a thin, crushable speaker that is recessed into the thick, energy-absorbing EPS liner.

There are no data to suggest that the minor surface discrepancies listed in Table 2.X present any type of hazard to wearers. No impact or other testing was performed in this project to quantify any real potential for effect on performance tests.

III.5. LABELING

The current exterior labeling requirement for FMVSS No. 218 is found in section S5.6.1 (e). The section reads, "The symbol DOT, 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 3/8 inch [(1 cm) high, centered laterally with the horizontal centerline of the symbol located a minimum of 1 1/8 inches (2.9 cm) and a maximum of 1 3/8 inches (3.5 cm) from the bottom edge of the posterior portion of the helmet.]"
(53 F.R. 11280-April 6, 1988. Effective: October 3, 1988).

In jurisdictions with mandatory helmet use, this external "DOT" label is often found on unqualified helmets that lack an energ -absorbing liner or other construction features necessary to meet the performance and labeling requirements of FMVSS No. 218. Such counterfeit DOT labels have severely confounded enforcement of helmet use laws. Most of the manufacturers of these unqualified (a.k.a. "bogus" or "novelty") helmets are unknown, and there is no restriction to the use of such counterfeit labels by the manufacturer, distributor, retail seller, or final purchaser. The FMVSS No. 218 description: "This symbol shall appear on the outer surface, in a color that contrasts with the background" does not interfere with counterfeiting.

An alternative to the external labeling is the molding of "DOT" into the shell of the helmet. Manufacturers of both fiberglass reinforced plastic and thermoplastic shell helmets were contacted for comments on the feasibility of such a molded in symbol. For reasons of manufacturing (difficulty of mold release, finishing, and painting) or reasons of distribution (e.g., foreign sales), every manufacturer objected to a requirement of a molded in "DOT."

Several manufacturers of high quality labels were contacted for alternatives. Labels with higher security and greater resistance to counterfeiting are readily available and are used commonly in the serializing of electronic equipment. Such modern labels can be serialized to provide positive identification of manufacturer, manufacture date, production lot, etc.

A typical problem for a consumer is contact with a helmet manufacturer for repair work or warranty claim. Without original packaging, it is very difficult to identify and locate a helmet manufacturer where there is only an "assembled in (foreign country)" or Dunn & Bradstreet number, e.g., "DUNS 123456." Such a lack of identification and warrant presence is an unreasonable hardship for consumers. The proposal for full and complete identification of the manufacturer, with labeling to include a "Helmet Identification Number" (HIN) should be considered. A registry of manufacturers should be established with development of serialized helmet identification numbers for helmets to be distributed. A modern helmet labeling requirement would include the "DOT" plus numbered or bar coded HIN and manufacturer identification for consumer information.

Product information from two label manufacturers is provided under separate cover.

No laboratory test can simulate the fit of a helmet on every possible human head. For this reason, the contractor suggests adding a labeling requirement to S5.6.1(f)(5) such as: "Retention system positional stability test: with the chin strap securely fastened, it should not be possible for the helmet to be removed when pulled upward from the rear. If the helmet can be removed in this way, a smaller size or different helmet model should be selected."

Summary of Discussion and Conclusions

III.1.a. Test Criteria
Priority: High

-S5.1 (1) Reduce allowable peak headform acceleration from 400 to 300g.
(2) The safety effect of an increase the dwell time limitation at 200g from 2.0 to 2.2 milliseconds is undetermined by these tests.
(3) Eliminate the 4.0 millisecond limit at 150g.

III.1.b. Alternative Headforms—ISO
Priority: Medium

-S7.1.8 ISO impact test headforms should be considered for adoption into FMVSS No. 218.

III.1.c.1. Alternative Test Apparatus--ECE-Type
Priority: Low

S7.1.6 The contractor recommends against the adoption of this test apparatus.

III.1.c.2. Pre- and Post-Test Systems Check
Priority: Medium

(1) Retain the current procedure which is adequate for a pre- and post-test systems check of a single impact attenuation test system.
(2) Adopt the ASTM Sphere to allow inter-laboratory systems checking.

III.1.d. Decreased Conditioning Time
Priority: Medium

S6.4.1 (1) The pre-test conditioning time should be reduced to a minimum of 4 hours.
(2) A maximum allowable pre-test conditioning time should be added, e.g. 24 hours as used by other standards.

III.1.e. Alternative (Increased) Impact Velocities
Priority: Medium

S7.1.4 (a) Retain the current impact velocity of 6.0 m/s for the flat anvil tests.
S7.1.4 (b) Retain the current impact velocity of 5.2 m/s for the hemi anvil tests.

III.2. Alternative Penetration Requirements--Alternative Impact Anvils
Priority: Low

(1) Retain the current penetration test which is simple, meaningful and repeatable.
(2) Do not add edge or curb anvil to the current impact attenuation requirements.

III.3. Additional Retention System Test for Positional Stability
Priority: Very High

(1) Add a test for positional stability to S7.3 based on the ASTM draft.
(2) Specify the use of a 10 kg. drop mass.
(3) Utilize DOT reference headforms for the positional stability test.

III.4. Projection Requirements

Priority: Low

S5.5 Internal or external projections are not an identifiable problem in the use of helmets.

No recommendation for change.

III.5. Labeling

Priority: High

S5.6 Commercially available labels are available to reduce counterfeiting and incorporate serialization. Requirement of a Helmet Identification Number (HIN) would establish qualification of motorcycle helmets similar to the Vehicle Identification Number (VIN) found on motor vehicles meeting other FMVSS's.

III.6. Faceshield Penetration Test

Priority: High

The test specified in VESC-8 is trivial for current faceshields and should be included as a minimum requirement in FMVSS No. 218.

REFERENCES

Aldman, B, A Method for the Assessment of the Load Distributing Capacity of Protective Helmets Proposed to Replace the Current Resistance-To-Penetration Test, IRCOBI, 1984.

American Standard Specifications for Protective Headgear for Vehicular Users. ASA Z90.1. New York: American Standards Association; 1966.

American National Standard Specifications for Protective Headgear for Vehicular Users. ANSI Z90.1. New York: American National Standards Institute; 1971.

American National Standard Supplement to Specifications for Protective Headgear for Vehicular Users. ANSI Z90.1a. New York: American National Standards Institute; 1973.

American National Standard Supplement to Specifications for Protective Headgear for Vehicular Users. ANSI Z90.1b. New York: American National Standards Institute; 1979.

American National Standard for Protective Headgear for Motor Vehicular Users. ANS Z90.1. New York: American National Standards Institute; 1992.

American National Standards Institute. Standard Practice for Occupational and Educational Eye and Face Protection. Z87.1-1989; 1989.

Standard Test Methods for Equipment and Procedures Used in Evaluating the Performance Characteristics of Protective Headgear. American Society for Testing and Materials (ASTM) F 1446 - 95a. 1995.

(Draft) Standard Specification for Helmet Stability and Roll-Off Testing. American Society for Testing and Materials (ASTM). 1995.

Bishop, Patrick J., A Comparison of Two Drop Test Protocols for Evaluating Helmet Performance: Monorail vs. Guidewire. ISO/TC83/SL5, 1988.

British Standard Specification for Protective Helmets for Vehicle Users. British Standards Institution. BS 6658; 1985.

British Standard Specification for Eye-protectors for Vehicle Users. BS 4110:1979; 1979.

California Highway Patrol, Personal Communication, Sgt. M. Nivens, 1994.

EN960, Headforms for Use in the Testing of Protective Helmets, 1995.

Federal Motor Vehicle Safety Standard No. 218. 49 CFR 571.218, U.S. Department of Transportation, National Highway Traffic Safety Administration; 1974.

Federal Motor Vehicle Safety Standard No. 218. 49 CFR 571.218, U.S. Department of Transportation, National Highway Traffic Safety Administration; 1979.

Federal Motor Vehicle Safety Standard No. 218. 49 CFR 571.218, U.S. Department of Transportation, National Highway Traffic Safety Administration; 1988.

Gilchrist, A, Mills, N.J., Khan, T., Survey of Head, Helmet and Headform Sizes Related to Motorcycle Helmet Design, Ergonomics 31, No. 10, pp. 1395-1412, 1988.

Henderson, G., Correlation Anomalies Between Helmet Drop-Test Systems, Jan. 15, 1975.

Hurt, H.H., Ouellet, J.V., Thom, D.R., Motorcycle Accident Cause Factors and Identification of Countermeasures, Vol. I: Technical Report, National Highway Traffic Safety Administration, U.S. Department of Transportation, NTIS PB81 -206443, Final Report, January, l98l.

Liu, W.J.J., Analysis of Motorcycle Helmet Test Data for FMVSS No. 218. Proceedings of the International Motorcycle Safety Conference, Motorcycle Safety Foundation, Vol. 3, pp. 1325-1345; 1980.

Liu, W.J., Current Status of FMVSS No. 218, Motorcycle Helmets, Proceedings of the 1990 International Motorcycle Safety Conference, Motorcycle Safety Foundation, Vol.1, pp. 3-105 to 3-126; 1990.

Lockett, F.J., Biomechanics Justification for Empirical Head Tolerance Criteria. Journal of Biomechanics, Vol. 18, No. 3, pp. 217-224, 1985.

Lombard, C.F., Advani, S.H., Impact Protection of the Head and Neck, USAF-Industry Two-Wheel Motor Vehicle Safety Seminar, 1966 (also refer to U.S. Patent No. 2,625,683 of January, 1953).

Motorcycle Industry Magazine, Vol. 15, No. 8 Dec. 1994.

Mills, N.J. & Gilchrist, A., The Effectiveness of Foams in Bicycle and Motorcycle Helmets. Accident Analysis and Prevention, Vol. 23, Nos. 2/3, pp. 153-163, 1991.

Newman, J.A., On the Use of the Head Injury Criterion (HIC) in Protective Headgear Evaluation. 19th Stapp Car Crash Conference, Society of Automotive Engineers 751162, 1975.

Newman, J.A., The Influence of Time Duration as a Failure Criterion in Helmet Evaluation. Society of Automotive Engineers 821008, 1982.

Ono, K. Kikuchi, A, Nakamura, N., Human Head Tolerance to Sagittal Impact: Reliable Estimation Deduced from Experimental Head Injury Using Subhuman Primates and Human Cadaver Skulls. Proceedings of the 24th Stapp Car Crash Conference, Society of Automotive Engineers, SAE 801303, 1980.

Sarrailhe, S.R., Do Tougher Standards Lead to Better Helmets? IRCOBI, 1984.

Smith. T.A., The Effect of Liner Density on the Impact Attenuation Characteristics of Bicycle Helmets. Unpublished Manuscript; 1993.

Snell Memorial Foundation, 1995 Standard for Protective Headgear for Use with Motorcycles and Other Automotive Vehicles. New York: Snell Memorial Foundation. M95; 1995.

Standard for Protective Headgear in Motor Vehicle Applications. Ontario: Canadian Standards Association. CAN3-D230; 1985.

Standards Association of Australia. Eye Protectors for Motorcyclists and Racing Car Drivers. AS 1609-1981; 1981.

Standards Association of Australia. Methods of Testing Protective Helmets. AS2512.1-1984, AS2512.2-1983, AS2512.3.1-1981, AS2512.5; 1986.

Thom, D.R. & Hurt, H.H. Jr., Conflicts of Contemporary Motorcycle Helmet Standards, 36th Proceedings of the Association for the Advancement of Automotive Medicine, 1992.

TP-218-00, Laboratory Procedure for Motorcycle Helmet Testing, DOT-NHTSA, March 1974, revised 1984 (TP-218-02), 1992 (TP-218-03).

Uniform Provisions Concerning the Approval of Protective Helmets and of Their Visors for Drivers and Passengers of Motor Cycles and Mopeds. United Nations. E/ECE/324; May, 1995.

Vehicle Equipment Safety Commission. Minimum Requirements for Motorcyclists' Eye Protection. Regulation VESC-8; 1980.

APPENDIX

Table 2.A
Summary of Test Helmets

Helmet Test Sample Summary			Test Series Code	Sizes	Conditions	Helmet Levels	Helmets needed
II.1.a	Table 2.B	Baseline Tests					
		Flat & Hemi anvils	B1	3	4	3	36
		Flat & Hemi anvils	B2	3	4	3	36
	Table 2.K	Chin bar removal tests	B3	1	1	4	4
		Extra helmets for lost data		3	1	1	9
II.1.	Table 2.C	Alternative Headforms	HF	3	4	3	36
II.1.c.	Table 2.E	Alternative Apparatus	AA	3	4	3	36
II.1.c.	Table 2.U	Pre/Post Test Systems Check	PP	0	0	0	0
II.1.	Table 2.F	Conditioning	CD	3	3	3	27
II.1.e	Table 2.G	Alternative Velocity	AV	3	4	3	36
II.	Table 2.H	Alternative Penetration Tests	PN	3	3	3	27
II.3.	Table 2.I	Positional Stabilit	PS	All Available	4	5	30
II.	Table 2.X	Projections					0
II.	Table 1.F	Labeling					0
II.	Table 1.G	Face Shield Penetration					0
Total Test Helmets							**277**
Test Helmets							
Group	**Headform**	**Shell Material**	**Coverage**				
A	S, M, L	ABS	Partial				
B	S	Polycarbonate	Full				
B	M	Polycarbonate	Full-Facial				
B	L	Polycarbonate	Full-Facial				
C	S, M, L	Fiberglass	Full-Facial				

Table 2.B
Baseline Tests, Second Set

Baseline--Second set of 36 helmets tested with the anvil locations reversed from first set												
Helmet Type, Expected performance level A (ABS shell)												
		Impact order, Location, Anvil, and Velocity										
DOT Headform	**Condition**	**Left**	**Left**	**Rear**	**Rear**	**Right**	**Right**	**Front**	**Front**	**OTHER**	**FILE**	**HELMET ID**
Small	Ambient	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2A	B2AS-A
Medium	Ambient	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2A	B2AM-A
Large	Ambient	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2A	B2AL-A
Small	Water	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2A	B2AS-B
Medium	Water	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2A	B2AM-B
Large	Water	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2A	B2AL-B
Small	Low	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2A	B2AS-C
Medium	Low	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2A	B2AM-C
Large	Low	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2A	B2AL-C
Small	High	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2A	B2AS-D
Medium	High	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2A	B2AM-D
Large	High	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2A	B2AL-D
Helmet Type, Expected performance level B (Polycarbonate shell)												
		Impact order, Location, Anvil, and Velocity										
DOT Headform	**Condition**	**Left**	**Left**	**Rear**	**Rear**	**Right**	**Right**	**Front**	**Front**	**OTHER**	**FILE**	**HELMET ID**
Small	Ambient	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2B	B2BS-A
Medium	Ambient	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2B	B2BM-A
Large	Ambient	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2B	B2BL-A
Small	Water	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2B	B2BS-B
Medium	Water	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2B	B2BM-B
Large	Water	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2B	B2BL-B
Small	Low	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2B	B2BS-C
Medium	Low	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2B	B2BM-C
Large	Low	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2B	B2BL-C
Small	High	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2B	B2BS-D
Medium	High	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2B	B2BM-D
Large	High	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2B	B2BL-D
Helmet Type, Expected performance level C (Fiberglass Shell)												
		Impact order, Location, Anvil, and Velocity										
DOT Headform	**Condition**	**Left**	**Left**	**Rear**	**Rear**	**Right**	**Right**	**Front**	**Front**	**OTHER**	**FILE**	**HELMET ID**
Small	Ambient	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2C	B2CS-A
Medium	Ambient	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2C	B2CM-A
Large	Ambient	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2C	B2CL-A
Small	Water	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2C	B2CS-B
Medium	Water	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2C	B2CM-B
Large	Water	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2C	B2CL-B
Small	Low	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2C	B2CS-C
Medium	Low	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2C	B2CM-C
Large	Low	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2C	B2CL-C
Small	High	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2C	B2CS-D
Medium	High	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2C	B2CM-D
Large	High	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	None	B2C	B2CL-D

Table 2.B
Baseline Tests, First Set

BASELINE--Current Impact Attenuation Test Specifications (FMVSS 218, 1988)												
This test series to be used as the baseline for direct comparison with the series following.												
Helmet Type, Expected performance level A (ABS shell)												
		Impact order, Location, Anvil, and Velocity										
DOT Headform	**Condition**	**Left**	**Left**	**Rear**	**Rear**	**Right**	**Right**	**Front**	**Front**	**OTHER**	**FILE**	**HELMET ID**
Small	Ambient	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1A0	B1AS-A
Medium	Ambient	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1A0	B1AM-A
Large	Ambient	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1A0	B1AL-A
Small	Water	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1A0	B1AS-B
Medium	Water	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1A0	B1AM-B
Large	Water	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1A0	B1AL-B
Small	Low	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1A0	B1AS-C
Medium	Low	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1A0	B1AM-C
Large	Low	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1A0	B1AL-C
Small	High	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1A0	B1AS-D
Medium	High	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1A0	B1AM-D
Large	High	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1A0	B1AL-D
Helmet Type, Expected performance level B (Polycarbonate shell)												
		Impact order, Location, Anvil, and Velocity										
DOT Headform	**Condition**	**Left**	**Left**	**Rear**	**Rear**	**Right**	**Right**	**Front**	**Front**	**OTHER**	**FILE**	**HELMET ID**
Small	Ambient	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1B0	B1BS-A
Medium	Ambient	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1B0	B1BM-A
Large	Ambient	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1B0	B1BL-A
Small	Water	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1B0	B1BS-B
Medium	Water	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1B0	B1BM-B
Large	Water	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1B0	B1BL-B
Small	Low	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1B0	B1BS-C
Medium	Low	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1B0	B1BM-C
Large	Low	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1B0	B1BL-C
Small	High	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1B0	B1BS-D
Medium	High	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1B0	B1BM-D
Large	High	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1B0	B1BL-D
Helmet Type, Expected performance level C (Fiberglass Shell)												
		Impact order, Location, Anvil, and Velocity										
DOT Headform	**Condition**	**Left**	**Left**	**Rear**	**Rear**	**Right**	**Right**	**Front**	**Front**	**OTHER**	**FILE**	**HELMET ID**
Small	Ambient	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1C	B1CS-A
Medium	Ambient	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1C	B1CM-A
Large	Ambient	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1C	B1CL-A
Small	Water	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1C	B1CS-B
Medium	Water	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1C	B1CM-B
Large	Water	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1C	B1CL-B
Small	Low	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1C	B1CS-C
Medium	Low	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1C	B1CM-C
Large	Low	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1C	B1CL-C
Small	High	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1C	B1CS-D
Medium	High	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1C	B1CM-D
Large	High	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a@6.0m/s	Flat2a@6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a @5.2m/s	Hemi2a @5.2m/s	Penetr., Retent	B1C	B1CL-D

Table 2.C
Alternative Headforms, Variable Mass per EN 960

Proposed changes to Impact Attenuation Test Specifications--Alternative Headforms, ISO sizes E, J, M with variable mass per EN 960.											
This test series performed on the monorail test apparatus for compared with the baseline series.											
Helmet Type, Expected performance level A (ABS shell)											
		Impact order, Location, Anvil, and Velocity									
ISO Headform	**Condition**	**Left**	**Left**	**Rear**	**Rear**	**Right**	**Right**	**Front**	**Front**	**FILE**	**HELMET ID**
E @ 4.1kg	Ambient	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFA0	HFAE-A
J @ 4.7 kg	Ambient	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFA0	HFAJ-A
M @ 5.6 kg	Ambient	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFA0	HFAM-A
E @ 4.1kg	Water	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFA0	HFAE-B
J @ 4.7 kg	Water	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFA0	HFAJ-B
M @ 5.6 kg	Water	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFA0	HFAM-B
E @ 4.1kg	Low	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFA0	HFAE-C
J @ 4.7 kg	Low	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFA0	HFAJ-C
M @ 5.6 kg	Low	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFA0	HFAM-C
E @ 4.1kg	High	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFA0	HFAE-D
J @ 4.7 kg	High	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFA0	HFAJ-D
M @ 5.6 kg	High	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFA0	HFAM-D
Helmet Type, Expected performance level B (Polycarbonate shell)											
		Impact order, Location, Anvil, and Velocity								**FILE**	**HELMET ID**
		Left	**Left**	**Rear**	**Rear**	**Right**	**Right**	**Front**	**Front**		
E @ 4.1kg	Ambient	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFB0	HFBE-A
J @ 4.7 kg	Ambient	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFB0	HFBJ-A
M @ 5.6 kg	Ambient	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFB0	HFBM-A
E @ 4.1kg	Water	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFB0	HFBE-B
J @ 4.7 kg	Water	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFB0	HFBJ-B
M @ 5.6 kg	Water	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFB0	HFBM-B
E @ 4.1kg	Low	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFB0	HFBE-C
J @ 4.7 kg	Low	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFB0	HFBJ-C
M @ 5.6 kg	Low	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFB0	HFBM-C
E @ 4.1kg	High	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFB0	HFBE-D
J @ 4.7 kg	High	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFB0	HFBJ-D
M @ 5.6 kg	High	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFB0	HFBM-D
Helmet Type, Expected performance level C (Fiberglass Shell)											
		Impact order, Location, Anvil, and Velocity								**FILE**	**HELMET ID**
		Left	**Left**	**Rear**	**Rear**	**Right**	**Right**	**Front**	**Front**		
E @ 4.1kg	Ambient	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFC0	HFCE-A
J @ 4.7 kg	Ambient	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFC0	HFCJ-A
M @ 5.6 kg	Ambient	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFC0	HFCM-A
E @ 4.1kg	Water	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFC0	HFCE-B
J @ 4.7 kg	Water	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFC0	HFCJ-B
M @ 5.6 kg	Water	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFC0	HFCM-B
E @ 4.1kg	Low	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFC0	HFCE-C
J @ 4.7 kg	Low	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFC0	HFCJ-C
M @ 5.6 kg	Low	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFC0	HFCM-C
E @ 4.1kg	High	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFC0	HFCE-D
J @ 4.7 kg	High	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFC0	HFCJ-D
M @ 5.6 kg	High	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	HFC0	HFCM-D

Table 2.E
Alternative Test Apparatus

Proposed changes to Impact Attenuation Test Specifications--Alternative Test Apparatus, ECE-Type basket test											
This test series to be compared with the baseline series.											
Helmet Type, Expected performance level A (ABS shell)											
		Impact order, Location, Anvil, and Velocity									
Headform	**Condition**	**Left**	**Left**	**Rear**	**Rear**	**Right**	**Right**	**Front**	**Front**	**FILE**	**HELMET ID**
ISO E (Full)	Ambient	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAA0	AAAE-A
ISO J (Full)	Ambient	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAA0	AAAJ-A
ISO M (Full)	Ambient	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAA0	AAAM-A
ISO E (Full)	Water	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAA0	AAAE-B
ISO J (Full)	Water	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAA0	AAAJ-B
ISO M (Full)	Water	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAA0	AAAM-B
ISO E (Full)	Low	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAA0	AAAE-C
ISO J (Full)	Low	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAA0	AAAJ-C
ISO M (Full)	Low	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAA0	AAAM-C
ISO E (Full)	High	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAA0	AAAE-D
ISO J (Full)	High	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAA0	AAAJ-D
ISO M (Full)	High	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAA0	AAAM-D
Helmet Type, Expected performance level B (Polycarbonate shell)											
		Impact order, Location, Anvil, and Velocity									
Headform	**Condition**	**Left**	**Left**	**Rear**	**Rear**	**Right**	**Right**	**Front**	**Front**	**FILE**	**HELMET ID**
ISO E (Full)	Ambient	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAB0	AABE-A
ISO J (Full)	Ambient	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAB0	AABJ-A
ISO M (Full)	Ambient	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAB0	AABM-A
ISO E (Full)	Water	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAB0	AABE-B
ISO J (Full)	Water	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAB0	AABJ-B
ISO M (Full)	Water	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAB0	AABM-B
ISO E (Full)	Low	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAB0	AABE-C
ISO J (Full)	Low	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAB0	AABJ-C
ISO M (Full)	Low	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAB0	AABM-C
ISO E (Full)	High	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAB0	AABE-D
ISO J (Full)	High	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAB0	AABJ-D
ISO M (Full)	High	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAB0	AABM-D
Helmet Type, Expected performance level C (Fiberglass Shell)											
		Impact order, Location, Anvil, and Velocity									
Headform	**Condition**	**Left**	**Left**	**Rear**	**Rear**	**Right**	**Right**	**Front**	**Front**	**FILE**	**HELMET ID**
ISO E (Full)	Ambient	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAC0	AACE-A
ISO J (Full)	Ambient	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAC0	AACJ-A
ISO M (Full)	Ambient	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAC0	AACM-A
ISO E (Full)	Water	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAC0	AACE-B
ISO J (Full)	Water	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAC0	AACJ-B
ISO M (Full)	Water	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAC0	AACM-B
ISO E (Full)	Low	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAC0	AACE-C
ISO J (Full)	Low	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAC0	AACJ-C
ISO M (Full)	Low	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAC0	AACM-C
ISO E (Full)	High	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAC0	AACE-D
ISO J (Full)	High	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAC0	AACJ-D
ISO M (Full)	High	Flat1@6.9 m/sec	Flat2@6.0 m/sec	Flat1a @ 6.9 m/sec	Flat2a @ 6.0 m/sec	Hemi1 @ 6.0 m/sec	Hemi2 @ 5.2 m/sec	Hemi1a @ 6.0 m/sec	Hemi2a @ 5.2 m/sec	AAC0	AACM-D

Table 2.F
Time in Conditioning Tests

Proposed changes to Impact Attenuation Test Specifications--Reduced time (4 hours) in Conditioning Environment.											
This test series to be compared with the baseline series.											
Helmet Type, Expected performance level A (ABS shell)											
		Impact order, Location, Anvil, and Velocity									
DOT Headform	**Condition**	**Left**	**Left**	**Rear**	**Rear**	**Right**	**Right**	**Front**	**Front**	**FILE**	**HELMET ID**
Small	Water	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDA0	CDAS-B
Medium	Water	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDA0	CDAM-B
Large	Water	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDA0	CDAL-B
Small	Cold	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDA0	CDAS-C
Medium	Cold	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDA0	CDAM-C
Large	Cold	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDA0	CDAL-C
Small	High	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDA0	CDAS-D
Medium	High	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDA0	CDAM-D
Large	High	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDA0	CDAL-D
Helmet Type, Expected performance level B (Polycarbonate shell)											
		Impact order, Location, Anvil, and Velocity									
DOT Headform	**Condition**	**Left**	**Left**	**Rear**	**Rear**	**Right**	**Right**	**Front**	**Front**	**FILE**	**HELMET ID**
Small	Water	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDB0	CDBS-B
Medium	Water	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDB0	CDBM-B
Large	Water	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDB0	CDBL-B
Small	Cold	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDB0	CDBS-C
Medium	Cold	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDB0	CDBM-C
Large	Cold	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDB0	CDBL-C
Small	High	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDB0	CDBS-D
Medium	High	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDB0	CDBM-D
Large	High	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDB0	CDBL-D
Helmet Type, Expected performance level C (Fiberglass Shell)											
		Impact order, Location, Anvil, and Velocity									
DOT Headform	**Condition**	**Left**	**Left**	**Rear**	**Rear**	**Right**	**Right**	**Front**	**Front**	**FILE**	**HELMET ID**
Small	Water	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDC0	CDCS-B
Medium	Water	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDC0	CDCM-B
Large	Water	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDC0	CDCL-B
Small	Cold	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDC0	CDCS-C
Medium	Cold	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDC0	CDCM-C
Large	Cold	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDC0	CDCL-C
Small	High	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDC0	CDCS-D
Medium	High	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDC0	CDCM-D
Large	High	Flat1@6.0m/s	Flat2@6.0m/s	Flat1a @6.0m/s	Flat2a @6.0m/s	Hemi1@5.2m/s	Hemi2@5.2m/s	Hemi1a@5.2m/s	Hemi2a@5.2m/s	CDC0	CDCL-D

Table 2.G
Alternative Impact Velocities

Proposed changes to Impact Attenuation Test Specifications--Alternative Impact Velocities for first impacts.											
This test series to be performed following the baseline and conditioning series.											
Helmet Type, Expected performance level A (ABS shell)											
		Impact order, Location, Anvil, and Velocity									
DOT Headform	**Condition**	**Left**	**Left**	**Rear**	**Rear**	**Right**	**Right**	**Front**	**Front**	**FILE**	**HELMET ID**
Small	Ambient	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVA0	AVAS-A
Medium	Ambient	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVA0	AVAM-A
Large	Ambient	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVA0	AVAL-A
Small	Water	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVA0	AVAS-B
Medium	Water	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVA0	AVAM-B
Large	Water	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVA0	AVAL-B
Small	Low	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVA0	AVAS-C
Medium	Low	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVA0	AVAM-C
Large	Low	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVA0	AVAL-C
Small	High	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVA0	AVAS-D
Medium	High	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVA0	AVAM-D
Large	High	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVA0	AVAL-D
Helmet Type, Expected performance level B (Polycarbonate Shell)											
		Impact order, Location, Anvil, and Velocity									
DOT Headform	**Condition**	**Left**	**Left**	**Rear**	**Rear**	**Right**	**Right**	**Front**	**Front**	**FILE**	**HELMET ID**
Small	Ambient	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVB0	AVBS-A
Medium	Ambient	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVB0	AVBM-A
Large	Ambient	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVB0	AVBL-A
Small	Water	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVB0	AVBS-B
Medium	Water	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVB0	AVBM-B
Large	Water	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVB0	AVBL-B
Small	Low	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVB0	AVBS-C
Medium	Low	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVB0	AVBM-C
Large	Low	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVB0	AVBL-C
Small	High	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVB0	AVBS-D
Medium	High	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVB0	AVBM-D
Large	High	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVB0	AVBL-D
Helmet Type, Expected performance level C (Fiberglass Shell)											
		Impact order, Location, Anvil, and Velocity									
DOT Headform	**Condition**	**Left**	**Left**	**Rear**	**Rear**	**Right**	**Right**	**Front**	**Front**	**FILE**	**HELMET ID**
Small	Ambient	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVC0	AVCS-A
Medium	Ambient	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVC0	AVCM-A
Large	Ambient	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVC0	AVCL-A
Small	Water	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVC0	AVCS-B
Medium	Water	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVC0	AVCM-B
Large	Water	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVC0	AVCL-B
Small	Low	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVC0	AVCS-C
Medium	Low	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVC0	AVCM-C
Large	Low	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVC0	AVCL-C
Small	High	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVC0	AVCS-D
Medium	High	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVC0	AVCM-D
Large	High	Flat1@6.9m/s	Flat2@6.0m/s	Flat1a @6.9m/s	Flat2a @6.0m/s	Hemi1@6.0m/s	Hemi2@5.2m/s	Hemi1a@6.0 m/s	Hemi2a@5.2m/s	AVC0	AVCL-D

Table 2.H
Penetration Alternatives: Curb and Edge* Anvil Tests

Penetration Requirement comparison tests							
Helmet Type, Expected performance level A (ABS shell							
		Impact order, Location, Anvil, and Velocity					
DOT Headform	**Condition**	**Left**	**Rear**	**Right**	**Front**	**FILE**	**HELMET ID**
Small	Ambient	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNA0	PNAS-A
Medium	Ambient	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNA0	PNAM-A
Large	Ambient	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNA0	PNAL-A
Small	Low	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNA0	PNAS-C
Medium	Low	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNA0	PNAM-C
Large	Low	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNA0	PNAL-C
Small	High	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNA0	PNAS-D
Medium	High	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNA0	PNAM-D
Large	High	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNA0	PNAL-D
Helmet Type, Expected performance level B (Polycarbonate shell							
		Impact order, Location, Anvil, and Velocity					
DOT Headform	**Condition**	**Left**	**Rear**	**Right**	**Front**	**FILE**	**HELMET ID**
Small	Ambient	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNB0	PNBS-A
Medium	Ambient	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNB0	PNBM-A
Large	Ambient	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNB0	PNBL-A
Small	Low	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNB0	PNBS-C
Medium	Low	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNB0	PNBM-C
Large	Low	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNB0	PNBL-C
Small	High	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNB0	PNBS-D
Medium	High	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNB0	PNBM-D
Large	High	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNB0	PNBL-D
Helmet Type, Expected performance level C (Fiberglass Shell							
		Impact order, Location, Anvil, and Velocity					
DOT Headform	**Condition**	**Left**	**Rear**	**Right**	**Front**	**FILE**	**HELMET ID**
Small	Ambient	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNC0	PNCS-A
Medium	Ambient	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNC0	PNCM-A
Large	Ambient	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNC0	PNCL-A
Small	Low	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNC0	PNCS-C
Medium	Low	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNC0	PNCM-C
Large	Low	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNC0	PNCL-C
Small	High	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNC0	PNCS-D
Medium	High	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNC0	PNCM-D
Large	High	Curb 1 @6.9 m/sec	Curb 2 @ 6.9 m/sec	Edge 1 @ 6.9 m/sec	Edge 2 @ 6.9 m/sec	PNC0	PNCL-D
* Curb anvil--105 degree with 15mm radiused edge, Edge anvil--5mm wide by 300mm long.							

Table 2.I
Positional Stability Tests

Style	Headform	No. Helmets
Partial 1	Small & ISO E	3
Partial 1	Medium & ISO J	2
Partial 1	Large & ISO M	2
Partial 2	Small & ISO E	2
Partial 2	Medium & ISO J	2
Partial 2	Large & ISO M	1
Partial 3	Small & ISO E	1
Partial 3	Medium & ISO J	1
Partial 3	Large & ISO M	1
Full Coverage	Small & ISO E	2
Full Coverage	Medium & ISO J	1
Full Coverage	Large & ISO M	3
Full Facial 1	Small & ISO E	1
Full Facial 1	Medium & ISO J	1
Full Facial 1	Large & ISO M	2
Full Facial 2	Small & ISO E	2
Full Facial 2	Medium & ISO J	1
Full Facial 2	Large & ISO M	2
Total No. Helmets Required		**30**

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	**Count**	**Pass/Fail Old Limits OLDPASS**	**Pass/Fail Proposed Standards NEWPASS**	**Helmet Failure @400 FAIL400**	**Helmet Failure @300 FAIL300**	**Dwell Time Failure – FAIL150**	**Row Total**
AAA006	5	1	2	0	1	0	2
							.7
AAA008	7	2	2	2	2	0	2
							.7
AAA009	8	0	1	0	1	0	1
							.4
AAA010	9	2	4	1	3	0	4
							1.4
AAA011	10	1	2	1	2	0	2
							.7
AAB006	17	2	1	0	0	1	2
							.7
AAB007	18	1	1	0	0	0	1
							.4
AAB008	19	1	1	0	0	1	1
							.4
AAB009	20	1	1	0	0	0	1
							.4
AAB013	24	0	1	0	1	0	1
							.4
AAC002	26	1	0	0	0	1	1
							.4
	Column	255	216	31	83	36	278
	Total	91.7	77.7	11.2	29.9	12.9	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	**Count**	**Dwell Time Failure – FOLD200**	**Dwell Time Failure – FNEW200**	**FNEW24**	**FNEW26**	**FNEW28**	**Row Total**
AAA006	5	1	1	1	1	0	2
							.7
AAA008	7	0	0	0	0	0	2
							.7
AAA009	8	0	0	0	0	0	1
							.4
AAA010	9	1	1	1	0	0	4
							1.4
AAA011	10	0	0	0	0	0	2
							.7
AAB006	17	2	1	1	1	1	2
							.7
AAB007	18	1	1	0	0	0	1
							.4
AAB008	19	1	1	1	1	0	1
							.4
AAB009	20	1	1	1	0	0	1
							.4
AAB013	24	0	0	0	0	0	1
							.4
AAC002	26	0	0	0	0	0	1
							.4
	Column	202	161	117	79	41	278
	Total	72.7	57.9	42.1	28.4	14.7	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	**Count**	**Pass/Fail Old Limits OLDPASS**	**Pass/Fail Proposed Standards NEWPASS**	**Helmet Failure @400 FAIL400**	**Helmet Failure @300 FAIL300**	**Dwell Time Failure – FAIL150**	**Row Total**
AAC003	27	1	0	0	0	1	1
							.4
AAC006	29	1	0	0	0	0	1
							.4
AAC007	30	1	0	0	0	1	1
							.4
AVA001	37	3	2	1	2	1	4
							1.4
AVA003	39	4	3	0	1	0	4
							1.4
AVA004	40	1	0	0	0	0	1
							.4
AVA005	41	2	0	0	0	1	2
							.7
AVA006	42	3	3	0	0	0	3
							1.1
AVA007	43	3	2	0	1	0	3
							1.1
AVA008	44	1	1	0	0	0	1
							.4
AVA009	45	2	3	2	3	0	3
							1.1
	Column	255	216	31	83	36	278
	Total	91.7	77.7	11.2	29.9	12.9	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	**Count**	**Dwell Time Failure – FOLD200**	**Dwell Time Failure – FNEW200**	**FNEW24**	**FNEW26**	**FNEW28**	**Row Total**
AAC003	27	0	0	0	0	0	1
							.4
AAC006	29	1	0	0	0	0	1
							.4
AAC007	30	0	0	0	0	0	1
							.4
AVA001	37	1	0	0	0	0	4
							1.4
AVA003	39	4	3	3	1	1	4
							1.4
AVA004	40	1	0	0	0	0	1
							.4
AVA005	41	1	0	0	0	0	2
							.7
AVA006	42	3	3	3	1	1	3
							1.1
AVA007	43	3	2	2	1	1	3
							1.1
AVA008	44	1	1	1	1	1	1
							.4
AVA009	45	0	0	0	0	0	3
							1.1
	Column	202	161	117	79	41	278
	Total	72.7	57.9	42.1	28.4	14.7	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	Count	Pass/Fail Old Limits OLDPASS	Pass/Fail Proposed Standards NEWPASS	Helmet Failure @400 FAIL400	Helmet Failure @300 FAIL300	Dwell Time Failure – FAIL150	Row Total
AVA010	46	2	4	2	4	0	4
							1.4
AVA011	47	3	4	1	3	0	5
							1.8
AVA012	48	5	5	4	4	0	5
							1.8
AVB001	49	4	4	0	0	0	4
							1.4
AVB002	50	4	4	0	0	0	4
							1.4
AVB003	51	4	4	0	0	0	4
							1.4
AVB004	52	4	4	0	0	0	4
							1.4
AVB005	53	2	1	0	0	0	2
							.7
AVB007	55	1	1	0	0	0	1
							.4
AVB008	56	1	1	1	1	0	1
							.4
AVB009	57	4	4	0	0	0	4
							1.4
	Column	255	216	31	83	36	278
	Total	91.7	77.7	11.2	29.9	12.9	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	**Count**	**Dwell Time Failure – FOLD200**	**Dwell Time Failure – FNEW200**	**FNEW24**	**FNEW26**	**FNEW28**	**Row Total**
AVA010	46	0	0	0	0	0	4
							1.4
AVA011	47	2	1	1	0	0	5
							1.8
AVA012	48	1	1	0	0	0	5
							1.8
AVB001	49	4	4	4	1	0	4
							1.4
AVB002	50	4	4	3	3	2	4
							1.4
AVB003	51	4	4	3	2	1	4
							1.4
AVB004	52	4	4	3	2	1	4
							1.4
AVB005	53	2	1	1	0	0	2
							.7
AVB007	55	1	1	0	0	0	1
							.4
AVB008	56	0	0	0	0	0	1
							.4
AVB009	57	4	4	3	2	1	4
							1.4
	Column	202	161	117	79	41	278
	Total	72.7	57.9	42.1	28.4	14.7	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	Count	Pass/Fail Old Limits OLDPASS	Pass/Fail Proposed Standards NEWPASS	Helmet Failure @400 FAIL400	Helmet Failure @300 FAIL300	Dwell Time Failure – FAIL150	Row Total
AVB010	58	3	3	0	0	0	3
							1.1
AVB011	59	4	4	0	0	0	4
							1.4
AVB012	60	4	4	0	0	0	4
							1.4
AVC001	61	2	0	0	0	1	2
							.7
AVC002	62	2	1	0	0	1	2
							.7
AVC003	63	1	1	0	0	1	1
							.4
AVC004	64	1	0	0	0	1	1
							.4
AVC010	70	1	0	0	0	1	1
							.4
B1A003	75	1	1	0	0	0	1
							.4
B1A007	77	1	1	1	1	0	1
							.4
B1A009	79	2	1	1	1	0	2
							.7
	Column	255	216	31	83	36	278
	Total	91.7	77.7	11.2	29.9	12.9	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	Count	Dwell Time Failure – FOLD200	Dwell Time Failure – FNEW200	FNEW24	FNEW26	FNEW28	Row Total
AVB010	58	3	3	3	0	0	3
							1.1
AVB011	59	4	4	4	3	0	4
							1.4
AVB012	60	4	4	4	2	1	4
							1.4
AVC001	61	1	0	0	0	0	2
							.7
AVC002	62	2	1	1	1	1	2
							.7
AVC003	63	1	1	1	0	0	1
							.4
AVC004	64	0	0	0	0	0	1
							.4
AVC010	70	0	0	0	0	0	1
							.4
B1A003	75	1	1	0	0	0	1
							.4
B1A007	77	0	0	0	0	0	1
							.4
B1A009	79	1	0	0	0	0	2
							.7
	Column	202	161	117	79	41	278
	Total	72.7	57.9	42.1	28.4	14.7	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	Count	Pass/Fail Old Limits OLDPASS	Pass/Fail Proposed Standards NEWPASS	Helmet Failure @400 FAIL400	Helmet Failure @300 FAIL300	Dwell Time Failure – FAIL150	Row Total
B1A010	80	1	1	1	1	0	1
							.4
B1A013	83	1	0	0	0	0	1
							.4
B1B001	85	2	2	0	0	0	2
							.7
B1B002	86	2	1	0	0	0	2
							.7
B1B003	87	2	2	0	0	0	2
							.7
B1B004	88	2	2	0	0	0	2
							.7
B1B005	89	2	1	0	0	0	2
							.7
B1B006	90	1	1	0	0	0	1
							.4
B1B007	91	2	1	0	0	0	2
							.7
B1B008	92	2	1	0	0	1	2
							.7
B1C015	105	2	2	0	0	0	2
							.7
	Column	255	216	31	83	36	278
	Total	91.7	77.7	11.2	29.9	12.9	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	**Count**	**Dwell Time Failure – FOLD200**	**Dwell Time Failure – FNEW200**	**FNEW24**	**FNEW26**	**FNEW28**	**Row Total**
B1A010	80	0	0	0	0	0	1
							.4
B1A013	83	1	0	0	0	0	1
							.4
B1B001	85	2	2	2	1	0	2
							.7
B1B002	86	2	1	1	1	0	2
							.7
B1B003	87	2	2	1	1	0	2
							.7
B1B004	88	2	2	1	1	1	2
							.7
B1B005	89	2	1	0	0	0	2
							.7
B1B006	90	1	1	0	0	0	1
							.4
B1B007	91	2	1	1	0	0	2
							.7
B1B008	92	1	1	0	0	0	2
							.7
B1C015	105	2	2	2	1	0	2
							.7
	Column	202	161	117	79	41	278
	Total	72.7	57.9	42.1	28.4	14.7	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	Count	Pass/Fail Old Limits OLDPASS	Pass/Fail Proposed Standards NEWPASS	Helmet Failure @400 FAIL400	Helmet Failure @300 FAIL300	Dwell Time Failure – FAIL150	Row Total
B1C017	107	1	1	0	0	0	1
							.4
B2A005	109	0	1	0	1	0	1
							.4
B2A007	111	1	1	1	1	0	1
							.4
B2A008	112	1	1	1	1	0	1
							.4
B2A009	113	0	1	0	1	0	1
							.4
B2A010	114	0	1	0	1	0	1
							.4
B2A011	115	0	1	0	1	0	1
							.4
B2A012	116	1	1	1	1	0	1
							.4
B2A014	118	1	1	0	0	0	1
							.4
B2B001	121	1	1	0	0	0	1
							.4
B2B003	123	2	1	0	0	0	2
							.7
	Column	255	216	31	83	36	278
	Total	91.7	77.7	11.2	29.9	12.9	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	**Count**	**Dwell Time Failure – FOLD200**	**Dwell Time Failure – FNEW200**	**FNEW24**	**FNEW26**	**FNEW28**	**Row Total**
B1C017	107	1	1	1	1	0	1
							.4
B2A005	109	0	0	0	0	0	1
							.4
B2A007	111	0	0	0	0	0	1
							.4
B2A008	112	0	0	0	0	0	1
							.4
B2A009	113	0	0	0	0	0	1
							.4
B2A010	114	0	0	0	0	0	1
							.4
B2A011	115	0	0	0	0	0	1
							.4
B2A012	116	0	0	0	0	0	1
							.4
B2A014	118	1	1	0	0	0	1
							.4
B2B001	121	1	1	1	1	0	1
							.4
B2B003	123	2	1	1	0	0	2
							.7
	Column	202	161	117	79	41	278
	Total	72.7	57.9	42.1	28.4	14.7	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	**Count**	**Pass/Fail Old Limits OLDPASS**	**Pass/Fail Proposed Standards NEWPASS**	**Helmet Failure @400 FAIL400**	**Helmet Failure @300 FAIL300**	**Dwell Time Failure – FAIL150**	**Row Total**
B2B004	124	1	1	0	0	0	1
							.4
B2B005	125	2	2	0	0	0	2
							.7
B2B006	126	1	1	0	0	0	1
							.4
B2B007	127	1	1	0	0	0	1
							.4
B2B008	128	1	0	0	0	0	1
							.4
B2B009	129	1	0	0	0	0	1
							.4
B2B011	131	1	0	0	0	0	1
							.4
B2C012	143	1	0	0	0	0	1
							.4
CDA001	145	3	1	0	0	0	3
							1.1
CDA002	146	4	2	0	1	0	4
							1.4
CDA003	147	3	2	0	0	0	3
							1.1
	Column	255	216	31	83	36	278
	Total	91.7	77.7	11.2	29.9	12.9	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	**Count**	**Dwell Time Failure – FOLD200**	**Dwell Time Failure – FNEW200**	**FNEW24**	**FNEW26**	**FNEW28**	**Row Total**
B2B004	124	1	1	1	0	0	1
							.4
B2B005	125	2	2	0	0	0	2
							.7
B2B006	126	1	1	1	0	0	1
							.4
B2B007	127	1	1	0	0	0	1
							.4
B2B008	128	1	0	0	0	0	1
							.4
B2B009	129	1	0	0	0	0	1
							.4
B2B011	131	1	0	0	0	0	1
							.4
B2C012	143	1	0	0	0	0	1
							.4
CDA001	145	3	1	0	0	0	3
							1.1
CDA002	146	4	2	1	0	0	4
							1.4
CDA003	147	3	2	0	0	0	3
							1.1
	Column	202	161	117	79	41	278
	Total	72.7	57.9	42.1	28.4	14.7	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HEL ET NUMBER	Count	Pass/Fail Old Limits OLDPASS	Pass/Fail Proposed Standards NEWPASS	Helmet Failure @400 FAIL400	Helmet Failure @300 FAIL300	Dwell Time Failure – FAIL150	Row Total
CDA004	148	1	1	1	1	0	1
							.4
CDA005	149	2	1	1	1	0	2
							.7
CDA006	150	1	1	1	1	0	1
							.4
CDA008	151	2	0	0	0	0	2
							.7
CDB001	154	2	2	0	0	0	2
							.7
CDB002	155	2	2	0	0	0	2
							.7
CDB003	156	1	1	0	0	0	1
							.4
CDB008	161	1	0	0	0	0	1
							.4
HFA001	172	4	4	0	3	0	4
							1.4
HFA002	173	4	4	0	4	0	4
							1.4
HFA003	174	4	4	0	4	0	4
							1.4
	Column	255	216	31	83	36	278
	Total	91.7	77.7	11.2	29.9	12.9	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HEL ET NUMBER	**Count**	**Dwell Time Failure – FOLD200**	**Dwell Time Failure – FNEW200**	**FNEW24**	**FNEW26**	**FNEW28**	**Row Total**
CDA004	148	0	0	0	0	0	1
							.4
CDA005	149	1	0	0	0	0	2
							.7
CDA006	150	0	0	0	0	0	1
							.4
CDA008	151	2	0	0	0	0	2
							.7
CDB001	154	2	2	1	1	0	2
							.7
CDB002	155	2	2	2	2	0	2
							.7
CDB003	156	1	1	0	0	0	1
							.4
CDB008	161	1	0	0	0	0	1
							.4
HFA001	172	4	3	2	2	1	4
							1.4
HFA002	173	4	4	4	4	1	4
							1.4
HFA003	174	4	4	3	2	2	4
							1.4
	Column	202	161	117	79	41	278
	Total	72.7	57.9	42.1	28.4	14.7	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	**Count**	**Pass/Fail Old Limits OLDPASS**	**Pass/Fail Proposed Standards NEWPASS**	**Helmet Failure @400 FAIL400**	**Helmet Failure @300 FAIL300**	**Dwell Time Failure – FAIL150**	**Row Total**
HFA004	175	4	4	0	4	0	4
							1.4
HFA005	176	3	3	0	0	1	3
							1.1
HFA006	177	3	3	0	1	0	3
							1.1
HFA007	178	4	4	0	4	0	4
							1.4
HFA008	179	2	1	0	0	1	2
							.7
HFA009	180	3	5	1	5	0	6
							2.2
HFA010	181	2	3	2	3	0	3
							1.1
HFA011	182	3	2	1	1	0	3
							1.1
HFA012	183	2	3	2	3	0	3
							1.1
HFB001	184	4	4	0	0	0	4
							1.4
HFB002	185	4	4	0	0	0	4
							1.4
	Column	255	216	31	83	36	278
	Total	91.7	77.7	11.2	29.9	12.9	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	**Count**	**Dwell Time Failure – FOLD200**	**Dwell Time Failure – FNEW200**	**FNEW24**	**FNEW26**	**FNEW28**	**Row Total**
HFA004	175	4	4	2	2	1	4
							1.4
HFA005	176	3	3	3	3	1	3
							1.1
HFA006	177	3	3	2	1	1	3
							1.1
HFA007	178	4	4	3	3	1	4
							1.4
HFA008	179	2	1	1	0	0	2
							.7
HFA009	180	2	1	0	0	0	6
							2.2
HFA010	181	0	0	0	0	0	3
							1.1
HFA011	182	2	1	0	0	0	3
							1.1
HFA012	183	0	0	0	0	0	3
							1.1
HFB001	184	4	4	3	3	2	4
							1.4
HFB002	185	4	4	2	2	1	4
							1.4
	Column	202	161	117	79	41	278
	Total	72.7	57.9	42.1	28.4	14.7	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	**Count**	**Pass/Fail Old Limits OLDPASS**	**Pass/Fail Proposed Standards NEWPASS**	**Helmet Failure @400 FAIL400**	**Helmet Failure @300 FAIL300**	**Dwell Time Failure – FAIL150**	**Row Total**
HFB003	186	4	4	0	0	0	4
							1.4
HFB004	187	4	4	0	0	0	4
							1.4
HFB005	188	4	4	0	2	0	4
							1.4
HFB006	189	4	4	0	0	1	4
							1.4
HFB007	190	4	4	0	2	0	4
							1.4
HFB008	191	4	4	0	1	0	4
							1.4
HFB009	192	1	0	0	0	0	1
							.4
HFB012	195	1	0	0	0	0	1
							.4
HFC001	196	2	2	0	0	1	2
							.7
HFC002	197	2	1	0	0	1	2
							.7
HFC003	198	4	3	0	0	1	4
							1.4
	Column	255	216	31	83	36	278
	Total	91.7	77.7	11.2	29.9	12.9	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	**Count**	**Dwell Time Failure – FOLD200**	**Dwell Time Failure – FNEW200**	**FNEW24**	**FNEW26**	**FNEW28**	**Row Total**
HFB003	186	4	4	3	2	1	4
							1.4
HFB004	187	4	4	3	2	2	4
							1.4
HFB005	188	4	4	4	3	1	4
							1.4
HFB006	189	4	4	3	3	3	4
							1.4
HFB007	190	4	4	4	4	3	4
							1.4
HFB008	191	4	4	4	4	3	4
							1.4
HFB009	192	1	0	0	0	0	1
							.4
HFB012	195	1	0	0	0	0	1
							.4
HFC001	196	2	2	1	1	1	2
							.7
HFC002	197	2	1	1	1	1	2
							.7
HFC003	198	4	3	3	1	0	4
							1.4
	Column	202	161	117	79	41	278
	Total	72.7	57.9	42.1	28.4	14.7	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	Count	Pass/Fail Old Limits OLDPASS	Pass/Fail Proposed Standards NEWPASS	Helmet Failure @400 FAIL400	Helmet Failure @300 FAIL300	Dwell Time Failure – FAIL150	Row Total
HFC004	199	1	0	0	0	1	1
							.4
HFC005	200	2	2	0	0	0	2
							.7
HFC006	201	2	1	0	0	1	2
							.7
HFC007	202	4	3	0	0	0	4
							1.4
HFC008	203	2	2	0	0	1	2
							.7
PNA001	208	1	0	0	0	1	1
							.4
PNA005	212	2	0	0	0	2	2
							.7
PNA007	214	0	1	0	1	0	1
							.4
PNA008	215	0	1	0	1	0	1
							.4
PNA009	216	1	1	1	1	0	1
							.4
PNB004	220	3	0	0	0	3	3
							1.1
	Column	255	216	31	83	36	278
	Total	91.7	77.7	11.2	29.9	12.9	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	**Count**	**Dwell Time Failure – FOLD200**	**Dwell Time Failure – FNEW200**	**FNEW24**	**FNEW26**	**FNEW28**	**Row Total**
HFC004	199	0	0	0	0	0	1
							.4
HFC005	200	2	2	0	0	0	2
							.7
HFC006	201	2	1	1	1	1	2
							.7
HFC007	202	4	3	1	1	1	4
							1.4
HFC008	203	2	2	2	1	0	2
							.7
PNA001	208	0	0	0	0	0	1
							.4
PNA005	212	0	0	0	0	0	2
							.7
PNA007	214	0	0	0	0	0	1
							.4
PNA008	215	0	0	0	0	0	1
							.4
PNA009	216	0	0	0	0	0	1
							.4
PNB004	220	0	0	0	0	0	3
							1.1
	Column	202	161	117	79	41	278
	Total	72.7	57.9	42.1	28.4	14.7	100.0

* Percents and totals based on respondents

Table 2.N
Cross-tabulation of Individual Helmets by Pass/Fail Criteria

		FAILURES					
HELMET NUMBER	**Count**	**Pass/Fail Old Limits OLDPASS**	**Pass/Fail Proposed Standards NEWPASS**	**Helmet Failure @400 FAIL400**	**Helmet Failure @300 FAIL300**	**Dwell Time Failure – FAIL150**	**Row Total**
PNB005	221	3	0	0	0	3	3
							1.1
PNB006	222	1	0	0	0	1	1
							.4
PNC001	226	1	0	0	0	1	1
							.4
PNC002	227	1	0	0	0	1	1
							.4
PNC004	229	1	1	0	0	0	1
							.4
PNC005	230	1	0	0	0	1	1
							.4
PNC006	231	1	1	0	0	1	1
							.4
	Column	255	216	31	83	36	278
	Total	91.7	77.7	11.2	29.9	12.9	100.0

* Percents and totals based on respondents

Table 2.O
Individual Helmet Means for Pass/Fail Criteria

Table 2.O
Individual Helmet Means for Pass/Fail Criteria

HELMET NUMBER	Pass/Fail Old Limits Summary	Pass/Fail Proposed Standards Summary	Peak g Mean	Time 150 Mean	Time 200 Mean	Dwell Time Failure —>2.2 Msec @ 200G Mean
AAA001	0	0	157.06	1.36	0.08	0
AAA002	0	0	138.99	0.98	0	0
AAA003	0	0	155.19	1.13	0.05	0
AAA004	0	0	153.38	1.34	0	0
AAA006	1	2	179.35	1.55	0.83	.13
AAA007	0	0	183.31	1.56	0.59	0
AAA008	2	2	246.35	1.61	0.48	0
AAA009	0	1	204.51	1.45	0.21	0
AAA010	2	4	268.99	2.21	1.18	.13
AAA011	1	2	270.78	2.06	0.89	0
AAA012	0	0	179.49	1.66	0.71	0
AAA013	0	0	155.02	1.35	0.14	0
AAB001	0	0	168.51	1.33	0.45	0
AAB002	0	0	161.76	1.45	0.46	0
AAB003	0	0	145.12	0.48	0	0
AAB004	0	0	148.60	1.11	0.33	0
AAB006	2	1	167.13	1.82	0.68	.13
AAB007	1	1	166.54	1.80	0.85	.13
AAB008	1	1	167.04	1.74	0.46	.13
AAB009	1	1	154.94	1.71	0.38	.13
AAB010	0	0	173.58	1.86	0.29	0
AAB011	0	0	159.57	1.51	0.20	0
AAB012	0	0	181.63	1.91	0.39	0
AAB013	0	1	190.95	1.70	0.22	0

Table 2.O
Individual Helmet Means for Pass/Fail Criteria

HELMET NUMBER	Pass/Fail Old Limits Summary	Pass/Fail Proposed Standards Summary	Peak g Mean	Time 150 Mean	Time 200 Mean	Dwell Time Failure —>2.2 Msec @ 200G Mean
AAC001	0	0	169.25	1.65	0.20	0
AAC002	1	0	169.42	1.81	0.46	0
AAC003	1	0	157.25	1.45	0.01	0
AAC005	0	0	152.89	1.01	0	0
AAC006	1	0	198.30	2.34	0.39	0
AAC007	1	0	172.77	1.79	0.35	0
AAC008	0	0	173.84	1.78	0.53	0
AAC009	0	0	181.14	1.79	0.14	0
AAC010	0	0	167.19	1.62	0.05	0
AAC011	0	0	147.34	1.16	0	0
AAC012	0	0	150.27	1.17	0.11	0
AAC013	0	0	171.22	1.53	0.15	0
AVA001	3	2	269.66	2.18	1.20	0
AVA002	0	0	160.21	1.67	0.23	0
AVA003	4	3	222.29	1.86	1.29	0.38
AVA004	1	0	185.82	1.73	0.93	0
AVA005	2	0	181.74	1.66	0.68	0
AVA006	3	3	177.69	1.88	1.26	0.38
AVA007	3	2	208.96	1.76	1.21	0.25
AVA008	1	1	188.84	1.71	1.03	0.13
AVA009	2	3	300.37	2.14	1.14	0
AVA010	2	4	306.45	2.30	1.10	0
AVA011	3	4	291.28	2.20	1.44	0.13
AVA012	5	5	363.78	2.10	1.09	0.13

Table 2.O
Individual Helmet Means for Pass/Fail Criteria

HELMET NUMBER	Pass/Fail Old Limits Summary	Pass/Fail Proposed Standards Summary	Peak g Mean	Time 150 Mean	Time 200 Mean	Dwell Time Failure —>2.2 Msec @ 200G Mean
AVB001	4	4	198.35	1.86	1.29	0.50
AVB002	4	4	189.63	1.84	1.38	0.50
AVB003	4	4	214.85	1.91	1.36	0.50
AVB004	4	4	195.12	1.87	1.35	0.50
AVB005	2	1	184.87	1.94	0.86	0.13
AVB006	0	0	177.38	1.98	0.46	0
AVB007	1	1	175.01	1.90	0.61	0.13
AVB008	1	1	215.10	1.83	0.64	0
AVB009	4	4	189.73	1.76	1.36	0.50
AVB010	3	3	179.93	1.70	1.23	0.38
AVB011	4	4	187.31	1.74	1.34	0.50
AVB012	4	4	177.43	1.78	1.34	0.50
AVC001	2	0	191.45	2.50	0.73	0
AVC002	2	1	187.45	2.36	0.95	0.13
AVC003	1	1	205.08	3.13	0.95	0.13
AVC004	1	0	181.44	2.40	0.31	0
AVC005	0	0	158.41	1.63	0.05	0
AVC006	0	0	151.87	1.41	0	0
AVC007	0	0	165.81	1.69	0.24	0
AVC008	0	0	156.92	1.64	0	0
AVC009	0	0	176.03	1.90	0.34	0
AVC010	1	0	165.35	1.70	0.44	0
AVC011	0	0	190.74	2.20	0.65	0
AVC012	0	0	171.15	1.85	0.33	0

Table 2.O
Individual Helmet Means for Pass/Fail Criteria

HELMET NUMBER	Pass/Fail Old Limits Summary	Pass/Fail Proposed Standards Summary	Peak g Mean	Time 150 Mean	Time 200 Mean	Dwell Time Failure —>2.2 Msec @ 200G Mean
B1A001	0	0	161.81	1.54	0.49	0
B1A002	0	0	158.08	1.50	0.41	0
B1A003	1	1	169.09	1.50	0.66	0.13
B1A004	0	0	156.79	1.43	0.43	0
B1A007	1	1	204.39	1.65	0.50	0
B1A008	0	0	177.60	1.76	0.34	0
B1A009	2	1	209.71	1.76	0.88	0
B1A010	1	1	237.12	1.79	0.44	0
B1A011	0	0	170.29	1.64	0.50	0
B1A012	0	0	182.86	1.19	0.54	0
B1A013	1	0	159.34	1.74	0.39	0
B1A014	0	0	185.04	1.48	0.58	0
B1B001	2	2	170.10	1.66	0.75	0.25
B1B002	2	1	167.16	1.59	0.90	0.13
B1B003	2	2	174.78	1.61	0.66	0.25
B1B004	2	2	160.24	1.73	0.66	0.25
B1B005	2	1	189.13	1.94	0.73	0.13
B1B006	1	1	172.71	1.59	0.66	0.13
B1B007	2	1	190.18	1.80	0.93	0.13
B1B008	2	1	180.41	1.73	0.61	0.13
B1B009	0	0	156.32	1.64	0.25	0
B1B010	0	0	155.75	1.71	0.09	0
B1B011	0	0	161.00	1.73	0.31	0
B1B012	0	0	155.53	1.71	0.15	0

Table 2.O
Individual Helmet Means for Pass/Fail Criteria

HELMET NUMBER	Pass/Fail Old Limits Summary	Pass/Fail Proposed Standards Summary	Peak g Mean	Time 150 Mean	Time 200 Mean	Dwell Time Failure —>2.2 Msec @ 200G Mean
B1C003	0	0	171.99	1.58	0.30	0
B1C004	0	0	157.20	1.75	0	0
B1C005	0	0	173.03	1.75	0.46	0
B1C006	0	0	156.68	1.56	0	0
B1C007	0	0	155.93	1.51	0.03	0
B1C008	0	0	139.68	1.38	0	0
B1C009	0	0	161.96	1.63	0.09	0
B1C010	0	0	148.48	1.26	0	0
B1C015	2	2	193.15	2.68	0.83	0.25
B1C016	0	0	177.64	2.04	0.29	0
B1C017	1	1	201.45	2.74	0.81	0.13
B1C018	0	0	189.07	2.55	0.41	0
B2A005	0	1	171.22	1.38	0.34	0
B2A006	0	0	160.08	1.14	0.14	0
B2A007	1	1	205.14	1.22	0.36	0
B2A008	1	1	216.06	1.44	0.30	0
B2A009	0	1	181.45	1.35	0.44	0
B2A010	0	1	171.06	1.00	0.30	0
B2A011	0	1	185.52	1.50	0.63	0
B2A012	1	1	185.21	1.39	0.43	0
B2A013	0	0	180.59	1.54	0.49	0
B2A014	1	1	162.57	1.59	0.38	0.13
B2A015	0	0	189.07	1.65	0.63	0
B2A016	0	0	179.78	1.61	0.41	0

Table 2.O
Individual Helmet Means for Pass/Fail Criteria

HELMET NUMBER	Pass/Fail Old Limits Summary	Pass/Fail Proposed Standards Summary	Peak g Mean	Time 150 Mean	Time 200 Mean	Dwell Time Failure —>2.2 Msec @ 200G Mean
B2B001	1	1	167.71	1.51	0.66	0.13
B2B002	0	0	156.29	1.38	0.50	0
B2B003	2	1	174.67	1.50	0.83	0.13
B2B004	1	1	165.38	1.54	0.64	0.13
B2B005	2	2	193.78	2.10	0.79	0.25
B2B006	1	1	167.83	1.46	0.56	0.13
B2B007	1	1	182.92	2.05	0.59	0.13
B2B008	1	0	177.29	1.99	0.41	0
B2B009	1	0	154.48	1.49	0.48	0
B2B010	0	0	150.92	1.51	0.39	0
B2B011	1	0	160.27	1.49	0.49	0
B2B012	0	0	153.25	1.46	0.41	0
B2C001	0	0	161.90	1.18	0.18	0
B2C002	0	0	148.23	0.93	0.06	0
B2C003	0	0	175.52	1.98	0.26	0
B2C004	0	0	160.55	1.23	0	0
B2C006	0	0	145.87	1.04	0	0
B2C007	0	0	130.41	0.76	0	0
B2C008	0	0	151.83	1.08	0	0
B2C009	0	0	141.45	0.99	0	0
B2C010	0	0	192.05	2.18	0.46	0
B2C011	0	0	168.08	1.49	0.19	0
B2C012	1	0	192.54	2.39	0.54	0
B2C013	0	0	176.39	1.93	0.19	0

Table 2.O
Individual Helmet Means for Pass/Fail Criteria

HELMET NUMBER	Pass/Fail Old Limits Summary	Pass/Fail Proposed Standards Summary	Peak g Mean	Time 150 Mean	Time 200 Mean	Dwell Time Failure —>2.2 Msec @ 200G Mean
CDA001	3	1	179.96	1.71	1.03	0.13
CDA002	4	2	213.43	1.83	1.14	0.25
CDA003	3	2	196.27	1.74	1.05	0.25
CDA004	1	1	202.30	1.69	0.43	0
CDA005	2	1	233.73	1.95	0.83	0
CDA006	1	1	248.63	1.84	0.71	0
CDA008	2	0	171.16	1.75	0.87	0
CDA009	0	0	175.39	1.61	0.54	0
CDA010	0	0	165.70	1.61	0.53	0
CDB001	2	2	175.56	1.69	0.80	0.25
CDB002	2	2	179.98	1.64	1.04	0.25
CDB003	1	1	165.37	1.58	0.53	0.13
CDB004	0	0	148.83	1.43	0.08	0
CDB005	0	0	156.28	1.68	0.15	0
CDB006	0	0	151.76	1.50	0	0
CDB007	0	0	170.21	1.70	0.46	0
CDB008	1	0	193.25	1.79	0.89	0
CDB009	0	0	178.96	1.66	0.55	0
CDC001	0	0	143.53	1.55	0	0
CDC002	0	0	160.99	1.55	0.14	0
CDC003	0	0	149.03	1.35	0	0
CDC005	0	0	155.48	1.71	0	0
CDC006	0	0	177.25	1.71	0.29	0
CDC007	0	0	170.78	1.49	0.16	0

Table 2.O
Individual Helmet Means for Pass/Fail Criteria

HELMET NUMBER	Pass/Fail Old Limits Summary	Pass/Fail Proposed Standards Summary	Peak g Mean	Time 150 Mean	Time 200 Mean	Dwell Time Failure —>2.2 Msec @ 200G Mean
CDC008	0	0	183.27	2.23	0.38	0
CDC009	0	0	180.51	2.04	0.13	0
CDC010	0	0	179.43	1.76	0.22	0
HFA001	4	4	233.52	1.86	1.30	0.38
HFA002	4	4	237.82	2.35	1.39	0.50
HFA003	4	4	244.01	2.21	1.36	0.50
HFA004	4	4	240.72	2.14	1.29	0.50
HFA005	3	3	198.73	1.96	1.30	0.38
HFA006	3	3	223.52	2.34	1.23	0.38
HFA007	4	4	251.47	2.43	1.35	0.50
HFA008	2	1	190.68	2.01	1.01	0.13
HFA009	3	5	317.80	2.16	1.39	0.13
HFA010	2	3	300.29	2.25	0.91	0
HFA011	3	2	248.23	2.16	1.26	0.13
HFA012	2	3	301.51	2.21	1.19	0
HFB001	4	4	204.91	1.71	1.40	0.50
HFB002	4	4	197.28	1.70	1.31	0.50
HFB003	4	4	203.77	1.74	1.36	0.50
HFB004	4	4	200.99	1.76	1.39	0.50
HFB005	4	4	211.93	1.86	1.44	0.50
HFB006	4	4	194.94	1.94	1.40	0.50
HFB007	4	4	221.26	1.95	1.51	0.50
HFB008	4	4	202.16	1.89	1.54	0.50
HFB009	1	0	174.50	1.86	0.53	0

Table 2.O
Individual Helmet Means for Pass/Fail Criteria

HELMET NUMBER	Pass/Fail Old Limits Summary	Pass/Fail Proposed Standards Summary	Peak g Mean	Time 150 Mean	Time 200 Mean	Dwell Time Failure —>2.2 Msec @ 200G Mean
HFB010	0	0	166.97	1.74	0.43	0
HFB011	0	0	169.57	1.75	0.49	0
HFB012	1	0	167.40	1.70	0.49	0
HFC001	2	2	198.50	2.42	1.13	0.25
HFC002	2	1	189.60	2.31	0.89	0.13
HFC003	4	3	210.20	2.63	1.26	0.38
HFC004	1	0	187.82	2.20	0.71	0
HFC005	2	2	196.05	2.35	0.94	0.25
HFC006	2	1	193.77	2.45	0.94	0.13
HFC007	4	3	210.82	2.66	1.29	0.38
HFC008	2	2	195.78	2.39	1.13	0.25
HFC009	0	0	171.32	1.83	0.28	0
HFC010	0	0	160.76	1.75	0.05	0
HFC011	0	0	173.93	1.66	0.64	0
HFC012	0	0	170.08	1.69	0.45	0
PNA001	1	0	197.14	3.63	0.28	0
PNA002	0	0	194.58	2.78	0.22	0
PNA003	0	0	193.47	2.90	0	0
PNA004	0	0	199.13	3.18	0.18	0
PNA005	2	0	242.82	3.98	1.20	0
PNA006	0	0	223.63	3.48	0.43	0
PNA007	0	1	208.72	1.75	0.30	0
PNA008	0	1	217.79	1.85	0.33	0
PNA009	1	1	287.74	1.48	0.52	0

Table 2.O
Individual Helmet Means for Pass/Fail Criteria

HELMET NUMBER	Pass/Fail Old Limits Summary	Pass/Fail Proposed Standards Summary	Peak g Mean	Time 150 Mean	Time 200 Mean	Dwell Time Failure —>2.2 Msec @ 200G Mean
PNB001	0	0	175.39	1.60	0	0
PNB002	0	0	186.64	2.38	0.10	0
PNB003	0	0	164.79	1.35	0	0
PNB004	3	0	210.8	3.35	0.52	0
PNB005	3	0	213.75	3.70	0.70	0
PNB006	1	0	209.34	3.70	0.57	0
PNB007	0	0	159.30	0.55	0	0
PNB008	0	0	162.49	1.20	0	0
PNB009	0	0	159.54	0.78	0	0
PNC001	1	0	195.43	3.68	0.05	0
PNC002	1	0	195.81	3.30	0.08	0
PNC003	0	0	185.06	2.50	0	0
PNC004	1	1	210.28	3.70	0.88	0.25
PNC005	1	0	225.82	3.80	1.38	0
PNC006	1	1	219.12	3.47	1.27	0.25
PNC007	0	0	163.60	1.25	0	0
PNC008	0	0	167.05	1.60	0	0
PNC009	0	0	162.02	1.15	0	0

Table 2.R
Grouped Headform Accelerations by Impact Location

Table 2.R
Grouped Headform Accelerations by Impact Location

Test Group Value = 3.00 B1

		LOCATE				
NPEAK_G	**Count Row Pct Col Pct**	**Right 1.00**	**Left 2.00**	**Front 3.00**	**Rear 4.00**	**Row Total**
	1	62		54		116
Under 150 G		53.4		46.6		40.3
		86.1		75.0		
	2	8	21	13	32	74
150-199 G		10.8	28.4	17.6	43.2	25.7
		11.1	29.2	18.1	44.4	
	3	2	47		37	86
200-249 G		2.3	54.7		43.0	29.9
		2.8	65.3		51.4	
	4		4	2	3	9
250-299 G			44.4	22.2	33.3	3.1
			5.6	2.8	4.2	
	6			3		3
350 G and up				100.0		1.0
				4.2		
	Column	72	72	72	72	288
	Total	25	25	25	25	100.0

Table 2.R
Grouped Headform Accelerations by Impact Location

Test Group Value = 4.00 B2

		LOCATE				
NPEAK_G	**Count Row Pct Col Pct**	**Right 1.00**	**Left 2.00**	**Front 3.00**	**Rear 4.00**	**Row Total**
	1		62	9	55	126
Under 150 G			49.2	7.1	43.7	43.8
			86.1	12.5	76.4	
	2	20	10	38	17	85
150-199 G		23.5	11.8	44.7	20.0	29.5
		27.8	13.9	52.8	23.6	
	3	45		17		62
200-249 G		72.6		27.4		21.5
		62.5		23.6		
	4	7		1		8
250-299 G		87.5		12.5		2.8
		9.7		1.4		
	5			3		3
300-349 G				100.0		1.0
				4.2		
	6			4		4
350 G and up				100.0		1.4
				5.6		
	Column	72	72	72	72	288
	Total	25	25	25	25	100.0

Table 2.R
Grouped Headform Accelerations by Impact Location

Test Group Value = 5.00 CD

		LOCATE				
NPEAK_G	**Count Row Pct Col Pct**	**Right 1.00**	**Left 2.00**	**Front 3.00**	**Rear 4.00**	**Row Total**
	1	45		41		86
Under 150 G		52.3		47.7		39.8
		83.3		75.9		
	2	8	18	9	22	57
150-199 G		14.0	31.6	15.8	38.6	26.4
		14.8	33.3	16.7	40.7	
	3		29	1	21	51
200-249 G			56.9	2.0	41.2	23.6
			53.7	1.9	38.9	
	4	1	7		10	18
250-299 G		5.6	38.9		55.6	8.3
		1.9	13.0		18.5	
	5				1	1
300-349 G					100.0	0.5
					1.9	
	6			3		3
350 G and up				100.0		1.4
				5.6		
	Column	54	54	54	54	216
	Total	25	25	25	25	100.0

Table 2.R
Grouped Headform Accelerations by Impact Location

Test Group Value = 2.00 AV

		LOCATE				
NPEAK_G	**Count Row Pct Col Pct**	**Right 1.00**	**Left 2.00**	**Front 3.00**	**Rear 4.00**	**Row Total**
	1	52		42		94
Under 150 G		55.3		44.7		32.6
		72.2		58.3		
	2	12	11	18	12	53
150-199 G		22.6	20.8	34.0	22.6	18.4
		16.7	15.3	25.0	16.7	
	3	2	49	1	42	94
200-249 G		2.1	52.1	1.1	44.7	32.6
		2.8	68.1	1.4	58.3	
	4		10		18	28
250-299 G			35.7		64.3	9.7
			13.9		25.0	
	5	1	2			3
300-349 G		33.3	66.7			1
		1.4	2.8			
	6	5		11		16
350 G and up		31.3		68.8		5.6
		6.9		15.3		
	Column	72	72	72	72	288
	Total	25	25	25	25	100.0

Table 2.R
Grouped Headform Accelerations by Impact Location

Test Group Value = 6.00 HF

		LOCATE				
NPEAK_G	**Count Row Pct Col Pct**	**Right 1.00**	**Left 2.00**	**Front 3.00**	**Rear 4.00**	**Row Total**
	1	42		37		79
Under 150 G		53.2		46.8		27.4
		58.3		51.4		
	2	25	3	27	9	64
150-199 G		39.1	4.7	42.2	14.1	22.2
		34.7	4.2	37.5	12.5	
	3	2	35		30	67
200-249 G		3.0	52.2		44.8	23.3
		2.8	48.6		41.7	
	4		23	1	17	41
250-299 G			56.1	2.4	41.5	14.2
			31.9	1.4	23.6	
	5	1	11		16	28
300-349 G		3.6	39.3		57.1	9.7
		1.4	15.3		22.2	
	6	2		7		9
350 G and up		22.2		77.8		3.1
		2.8		9.7		
	Column	72	72	72	72	288
	Total	25	25	25	25	100.0

Table 2.Y
Performance Test Results — Raw Data

Table 2.Y
Performance Test Results — Raw Data

HELME NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
AAA001	R & D Apparatus	5/28/97	Ambient	AAAJ-A	04-96	810	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA001	R & D Apparatus	5/28/97	Ambient	AAAJ-A	04-96	810	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA001	R & D Apparatus	5/28/97	Ambient	AAAJ-A	04-96	810	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA001	R & D Apparatus	5/28/97	Ambient	AAAJ-A	04-96	810	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA001	R & D Apparatus	5/28/97	Ambient	AAAJ-A	04-96	810	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA001	R & D Apparatus	5/28/97	Ambient	AAAJ-A	04-96	810	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA001	R & D Apparatus	5/28/97	Ambient	AAAJ-A	04-96	810	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA001	R & D Apparatus	5/28/97	Ambient	AAAJ-A	04-96	810	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA002	R & D Apparatus	5/28/97	Wet	AAAJ-B	04-96	820	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA002	R & D Apparatus	5/28/97	Wet	AAAJ-B	04-96	820	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA002	R & D Apparatus	5/28/97	Wet	AAAJ-B	04-96	820	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA002	R & D Apparatus	5/28/97	Wet	AAAJ-B	04-96	820	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA002	R & D Apparatus	5/28/97	Wet	AAAJ-B	04-96	820	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA002	R & D Apparatus	5/28/97	Wet	AAAJ-B	04-96	820	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA002	R & D Apparatus	5/28/97	Wet	AAAJ-B	04-96	820	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA002	R & D Apparatus	5/28/97	Wet	AAAJ-B	04-96	820	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA003	R & D Apparatus	5/28/97	Cold	AAAJ-C	04-96	811	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA003	R & D Apparatus	5/28/97	Cold	AAAJ-C	04-96	811	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA003	R & D Apparatus	5/28/97	Cold	AAAJ-C	04-96	811	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA003	R & D Apparatus	5/28/97	Cold	AAAJ-C	04-96	811	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA003	R & D Apparatus	5/28/97	Cold	AAAJ-C	04-96	811	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA003	R & D Apparatus	5/28/97	Cold	AAAJ-C	04-96	811	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA003	R & D Apparatus	5/28/97	Cold	AAAJ-C	04-96	811	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA003	R & D Apparatus	5/28/97	Cold	AAAJ-C	04-96	811	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA004	R & D Apparatus	5/28/97	Hot	AAAJ-D	04-96	814	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA004	R & D Apparatus	5/28/97	Hot	AAAJ-D	04-96	814	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA004	R & D Apparatus	5/28/97	Hot	AAAJ-D	04-96	814	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA004	R & D Apparatus	5/28/97	Hot	AAAJ-D	04-96	814	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA004	R & D Apparatus	5/28/97	Hot	AAAJ-D	04-96	814	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA004	R & D Apparatus	5/28/97	Hot	AAAJ-D	04-96	814	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA004	R & D Apparatus	5/28/97	Hot	AAAJ-D	04-96	814	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA004	R & D Apparatus	5/28/97	Hot	AAAJ-D	04-96	814	Medium	ISO	Size J	4.70	NO TES	NO TES
AAA006	R & D Apparatus	6/2/97	Wet	AAAE-B	04-96	826	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAA006	R & D Apparatus	6/2/97	Wet	AAAE-B	04-96	826	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAA006	R & D Apparatus	6/2/97	Wet	AAAE-B	04-96	826	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAA006	R & D Apparatus	6/2/97	Wet	AAAE-B	04-96	826	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAA006	R & D Apparatus	6/2/97	Wet	AAAE-B	04-96	826	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAA006	R & D Apparatus	6/2/97	Wet	AAAE-B	04-96	826	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAA006	R & D Apparatus	6/2/97	Wet	AAAE-B	04-96	826	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAA006	R & D Apparatus	6/2/97	Wet	AAAE-B	04-96	826	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAA007	R & D Apparatus	6/2/97	Cold	AAAE-C	04-96	830	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAA007	R & D Apparatus	6/2/97	Cold	AAAE-C	04-96	830	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAA007	R & D Apparatus	6/2/97	Cold	AAAE-C	04-96	830	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAA007	R & D Apparatus	6/2/97	Cold	AAAE-C	04-96	830	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAA007	R & D Apparatus	6/2/97	Cold	AAAE-C	04-96	830	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAA007	R & D Apparatus	6/2/97	Cold	AAAE-C	04-96	830	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAA007	R & D Apparatus	6/2/97	Cold	AAAE-C	04-96	830	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAA007	R & D Apparatus	6/2/97	Cold	AAAE-C	04-96	830	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAA008	R & D Apparatus	6/6/97	Ambient	AAAM-A	04-96	828	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAA008	R & D Apparatus	6/6/97	Ambient	AAAM-A	04-96	828	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAA008	R & D Apparatus	6/6/97	Ambient	AAAM-A	04-96	828	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAA008	R & D Apparatus	6/6/97	Ambient	AAAM-A	04-96	828	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAA008	R & D Apparatus	6/6/97	Ambient	AAAM-A	04-96	828	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAA008	R & D Apparatus	6/6/97	Ambient	AAAM-A	04-96	828	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAA008	R & D Apparatus	6/6/97	Ambient	AAAM-A	04-96	828	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAA008	R & D Apparatus	6/6/97	Ambient	AAAM-A	04-96	828	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAA009	R & D Apparatus	6/6/97	Wet	AAAM-B	04-96	821	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAA009	R & D Apparatus	6/6/97	Wet	AAAM-B	04-96	821	XLarge	ISO	Size M	5.60	NO TES	NO TES

Table 2.Y
Performance Test Results — Raw Data

DROP NU	HIT NU	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
1	1	NO TES	NO TES	LF	2,4	Flat	168.04	2.60	0.00	6.94	113.18
1	2	NO TES	NO TES	LF	2,4	Flat	202.64	2.30	0.20	6.00	84.60
2	1	NO TES	NO TES	RR	2,4	Flat	187.99	3.40	0.00	6.96	113.84
2	2	NO TES	NO TES	RR	2,4	Flat	219.63	2.60	0.40	6.06	86.30
3	1	NO TES	NO TES	RG	2,4	Hemi	109.63	0.00	0.00	6.00	84.60
3	2	NO TES	NO TES	RG	2,4	Hemi	103.47	0.00	0.00	5.23	64.28
4	1	NO TES	NO TES	FR	2,4	Hemi	133.07	0.00	0.00	6.06	86.30
4	2	NO TES	NO TES	FR	2,4	Hemi	131.99	0.00	0.00	5.25	64.77
1	1	NO TES	NO TES	LF	2,4	Flat	193.56	2.70	0.00	6.98	114.49
1	2	NO TES	NO TES	LF	2,4	Flat	146.82	0.00	0.00	6.08	86.87
2	1	NO TES	NO TES	RR	2,4	Flat	198.36	2.90	0.00	6.98	114.49
2	2	NO TES	NO TES	RR	2,4	Flat	176.50	2.20	0.00	6.03	85.45
3	1	NO TES	NO TES	RG	2,4	Hemi	106.38	0.00	0.00	6.05	86.02
3	2	NO TES	NO TES	RG	2,4	Hemi	101.61	0.00	0.00	5.24	64.53
4	1	NO TES	NO TES	FR	2,4	Hemi	102.69	0.00	0.00	6.05	86.02
4	2	NO TES	NO TES	FR	2,4	Hemi	86.01	0.00	0.00	5.25	64.77
1	1	NO TES	NO TES	LF	2,4	Flat	155.57	0.20	0.00	5.99	84.32
1	2	NO TES	NO TES	LF	2,4	Flat	197.19	2.20	0.00	6.94	113.18
2	1	NO TES	NO TES	RR	2,4	Flat	203.13	3.60	0.30	6.92	112.53
2	2	NO TES	NO TES	RR	2,4	Flat	202.64	3.00	0.10	6.05	86.02
3	1	NO TES	NO TES	RG	2,4	Hemi	123.76	0.00	0.00	6.05	86.02
3	2	NO TES	NO TES	RG	2,4	Hemi	129.63	0.00	0.00	5.23	64.28
4	1	NO TES	NO TES	FR	2,4	Hemi	116.42	0.00	0.00	6.06	86.30
4	2	NO TES	NO TES	FR	2,4	Hemi	113.21	0.00	0.00	5.24	64.53
1	1	NO TES	NO TES	LF	2,4	Flat	183.54	3.00	0.00	6.98	114.49
1	2	NO TES	NO TES	LF	2,4	Flat	193.87	2.20	0.00	6.06	86.30
2	1	NO TES	NO TES	RR	2,4	Flat	186.23	3.00	0.00	6.92	112.53
2	2	NO TES	NO TES	RR	2,4	Flat	194.15	2.20	0.00	6.05	86.02
3	1	NO TES	NO TES	RG	2,4	Hemi	152.30	0.30	0.00	6.00	84.60
3	2	NO TES	NO TES	RG	2,4	Hemi	88.34	0.00	0.00	5.24	64.53
4	1	NO TES	NO TES	FR	2,4	Hemi	118.52	0.00	0.00	6.06	86.30
4	2	NO TES	NO TES	FR	2,4	Hemi	110.07	0.00	0.00	5.26	65.02
1	1	NO TES	NO TES	LF	2,4	Flat	332.20	2.70	1.20	6.94	98.74
1	2	NO TES	NO TES	LF	2,4	Flat	211.90	2.80	0.90	6.03	74.54
2	1	NO TES	NO TES	RR	2,4	Flat	226.68	3.70	2.70	6.94	98.74
2	2	NO TES	NO TES	RR	2,4	Flat	219.69	3.20	1.80	6.05	75.04
3	1	NO TES	NO TES	RG	2,4	Hemi	112.98	0.00	0.00	6.06	75.28
3	2	NO TES	NO TES	RG	2,4	Hemi	109.49	0.00	0.00	5.26	56.72
4	1	NO TES	NO TES	FR	2,4	Hemi	114.60	0.00	0.00	6.05	75.04
4	2	NO TES	NO TES	FR	2,4	Hemi	107.28	0.00	0.00	5.25	56.50
1	1	NO TES	NO TES	LF	2,4	Flat	224.67	3.00	0.90	6.96	99.31
1	2	NO TES	NO TES	LF	2,4	Flat	213.87	2.10	0.90	6.03	74.54
2	1	NO TES	NO TES	RR	2,4	Flat	238.45	4.00	1.60	6.94	98.74
2	2	NO TES	NO TES	RR	2,4	Flat	226.56	3.00	1.30	6.08	75.78
3	1	NO TES	NO TES	RG	2,4	Hemi	117.08	0.00	0.00	6.06	75.28
3	2	NO TES	NO TES	RG	2,4	Hemi	126.23	0.00	0.00	5.26	56.72
4	1	NO TES	NO TES	FR	2,4	Hemi	163.37	0.20	0.00	6.05	75.04
4	2	NO TES	NO TES	FR	2,4	Hemi	156.26	0.20	0.00	5.25	56.50
1	1	NO TES	NO TES	LF	2,4	Flat	187.84	2.50	0.00	6.94	134.86
1	2	NO TES	NO TES	LF	2,4	Flat	188.79	2.10	0.00	6.08	103.51
2	1	NO TES	NO TES	RR	2,4	Flat	203.80	3.10	0.70	6.94	134.86
2	2	NO TES	NO TES	RR	2,4	Flat	217.80	2.70	1.30	6.08	103.51
3	1	NO TES	NO TES	RG	2,4	Hemi	252.66	1.20	0.70	6.09	103.85
3	2	NO TES	NO TES	RG	2,4	Hemi	107.57	0.00	0.00	5.25	77.18
4	1	NO TES	NO TES	FR	2,4	Hemi	565.96	1.30	1.10	6.09	103.85
4	2	NO TES	NO TES	LF	2,4	Flat	999.00	0.00	0.00	0.00	0.00
1	1	NO TES	NO TES	LF	2,4	Hemi	192.30	3.00	0.00	6.98	136.42
1	2	NO TES	NO TES	LF	2,4	Flat	182.88	2.20	0.00	6.08	103.51

Table 2.Y
Performance Test Results — Raw Data

HELMET NUMBER	TEST TYPE	TES DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
AAA009	R & D Apparatus	6/6/97	Wet	AAAM-B	04-96	821	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA009	R & D Apparatus	6/6/97	Wet	AAAM-B	04-96	821	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA009	R & D Apparatus	6/6/97	Wet	AAAM-B	04-96	821	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA009	R & D Apparatus	6/6/97	Wet	AAAM-B	04-96	821	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA009	R & D Apparatus	6/6/97	Wet	AAAM-B	04-96	821	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA009	R & D Apparatus	6/6/97	Wet	AAAM-B	04-96	821	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA010	R & D Apparatus	6/6/97	Cold	AAAM-C	04-96	827	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA010	R & D Apparatus	6/6/97	Cold	AAAM-C	04-96	827	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA010	R & D Apparatus	6/6/97	Cold	AAAM-C	04-96	827	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA010	R & D Apparatus	6/6/97	Cold	AAAM-C	04-96	827	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA010	R & D Apparatus	6/6/97	Cold	AAAM-C	04-96	827	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA010	R & D Apparatus	6/6/97	Cold	AAAM-C	04-96	827	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA010	R & D Apparatus	6/6/97	Cold	AAAM-C	04-96	827	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA010	R & D Apparatus	6/6/97	Cold	AAAM-C	04-96	827	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA011	R & D Apparatus	6/6/97	Hot	AAAM-D	04-96	821	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA011	R & D Apparatus	6/6/97	Hot	AAAM-D	04-96	821	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA011	R & D Apparatus	6/6/97	Hot	AAAM-D	04-96	821	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA011	R & D Apparatus	6/6/97	Hot	AAAM-D	04-96	821	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA011	R & D Apparatus	6/6/97	Hot	AAAM-D	04-96	821	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA011	R & D Apparatus	6/6/97	Hot	AAAM-D	04-96	821	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA011	R & D Apparatus	6/6/97	Hot	AAAM-D	04-96	821	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA011	R & D Apparatus	6/6/97	Hot	AAAM-D	04-96	821	XLarge	ISO	Size M	5.60	NO TEST	NO TEST
AAA012	R & D Apparatus	6/12/97	Ambient	AAAE-A	05/96	831	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
AAA012	R & D Apparatus	6/12/97	Ambient	AAAE-A	05/96	831	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
AAA012	R & D Apparatus	6/12/97	Ambient	AAAE-A	05/96	831	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
AAA012	R & D Apparatus	6/12/97	Ambient	AAAE-A	05/96	831	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
AAA012	R & D Apparatus	6/12/97	Ambient	AAAE-A	05/96	831	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
AAA012	R & D Apparatus	6/12/97	Ambient	AAAE-A	05/96	831	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
AAA012	R & D Apparatus	6/12/97	Ambient	AAAE-A	05/96	831	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
AAA012	R & D Apparatus	6/12/97	Ambient	AAAE-A	05/96	831	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
AAA013	R & D Apparatus	6/12/97	Hot	AAAE-D	03/96	831	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
AAA013	R & D Apparatus	6/12/97	Hot	AAAE-D	03/96	831	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
AAA013	R & D Apparatus	6/12/97	Hot	AAAE-D	03/96	831	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
AAA013	R & D Apparatus	6/12/97	Hot	AAAE-D	03/96	831	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
AAA013	R & D Apparatus	6/12/97	Hot	AAAE-D	03/96	831	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
AAA013	R & D Apparatus	6/12/97	Hot	AAAE-D	03/96	831	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
AAA013	R & D Apparatus	6/12/97	Hot	AAAE-D	03/96	831	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
AAA013	R & D Apparatus	6/12/97	Hot	AAAE-D	03/96	831	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
AAB001	R & D Apparatus	5/21/97	Ambient	AABJ-A	Oct. 91	1391	Large	ISO	Size	4.70	NO TEST	NO TEST
AAB001	R & D Apparatus	5/21/97	Ambient	AABJ-A	Oct. 91	1391	Large	ISO	Size	4.70	NO TEST	NO TEST
AAB001	R & D Apparatus	5/21/97	Ambient	AABJ-A	Oct. 91	1391	Large	ISO	Size	4.70	NO TEST	NO TEST
AAB001	R & D Apparatus	5/21/97	Ambient	AABJ-A	Oct. 91	1391	Large	ISO	Size	4.70	NO TEST	NO TEST
AAB001	R & D Apparatus	5/21/97	Ambient	AABJ-A	Oct. 91	1391	Large	ISO	Size	4.70	NO TEST	NO TEST
AAB001	R & D Apparatus	5/21/97	Ambient	AABJ-A	Oct. 91	1391	Large	ISO	Size	4.70	NO TEST	NO TEST
AAB001	R & D Apparatus	5/21/97	Ambient	AABJ-A	Oct. 91	1391	Large	ISO	Size	4.70	NO TEST	NO TEST
AAB001	R & D Apparatus	5/21/97	Ambient	AABJ-A	Oct. 91	1391	Large	ISO	Size	4.70	NO TEST	NO TEST
AAB002	R & D Apparatus	5/21/97	Wet	AABJ-B	Oct. 91	1370	Large	ISO	Size	4.70	NO TEST	NO TEST
AAB002	R & D Apparatus	5/21/97	Wet	AABJ-B	Oct. 91	1370	Large	ISO	Size	4.70	NO TEST	NO TEST
AAB002	R & D Apparatus	5/21/97	Wet	AABJ-B	Oct. 91	1370	Large	ISO	Size	4.70	NO TEST	NO TEST
AAB002	R & D Apparatus	5/21/97	Wet	AABJ-B	Oct. 91	1370	Large	ISO	Size	4.70	NO TEST	NO TEST
AAB002	R & D Apparatus	5/21/97	Wet	AABJ-B	Oct. 91	1370	Large	ISO	Size	4.70	NO TEST	NO TEST
AAB002	R & D Apparatus	5/21/97	Wet	AABJ-B	Oct. 91	1370	Large	ISO	Size	4.70	NO TEST	NO TEST
AAB002	R & D Apparatus	5/21/97	Wet	AABJ-B	Oct. 91	1370	Large	ISO	Size	4.70	NO TEST	NO TEST
AAB002	R & D Apparatus	5/21/97	Wet	AABJ-B	Oct. 91	1370	Large	ISO	Size	4.70	NO TEST	NO TEST
AAB003	R & D Apparatus	5/21/97	Cold	AABJ-C	Oct. 91	1375	Large	ISO	Size	4.70	NO TEST	NO TEST
AAB003	R & D Apparatus	5/21/97	Cold	AABJ-C	Oct. 91	1375	Large	ISO	Size	4.70	NO TEST	NO TEST
AAB003	R & D Apparatus	5/21/97	Cold	AABJ-C	Oct. 91	1375	Large	ISO	Size	4.70	NO TEST	NO TEST
AAB003	R & D Apparatus	5/21/97	Cold	AABJ-C	Oct. 91	1375	Large	ISO	Size	4.70	NO TEST	NO TEST

Table 2.Y
Performance Test Results — Raw Data

DROP NUM	HIT NUM	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OUT OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCIT (M/S)	ENERGY (JOULES)
2	1	NO TEST	NO TEST	RR	2,4	Flat	176.55	2.20	0.00	6.94	134.86
2	2	NO TEST	NO TEST	RR	2,4	Flat	162.03	1.00	0.00	6.08	103.51
3	1	NO TEST	NO TEST	RG	2,4	Hemi	175.05	0.90	0.00	6.09	103.85
3	2	NO TEST	NO TEST	RG	2,4	Hemi	90.79	0.00	0.00	5.25	77.18
4	1	NO TEST	NO TEST	FR	2,4	Hemi	273.20	1.20	0.80	6.08	103.51
4	2	NO TEST	NO TEST	FR	2,4	Hemi	383.28	1.10	0.90	5.27	77.76
1	1	NO TEST	NO TEST	LF	2,4	Flat	216.28	2.30	0.90	6.03	101.81
1	2	NO TEST	NO TEST	LF	2,4	Flat	225.21	3.30	1.50	6.96	135.64
2	1	NO TEST	NO TEST	RR	2,4	Flat	237.83	3.90	2.50	6.96	135.64
2	2	NO TEST	NO TEST	RR	2,4	Flat	222.15	3.30	1.60	6.08	103.51
3	1	NO TEST	NO TEST	RG	2,4	Hemi	169.05	1.10	0.00	6.08	103.51
3	2	NO TEST	NO TEST	RG	2,4	Hemi	331.17	1.20	0.90	5.27	77.76
4	1	NO TEST	NO TEST	FR	2,4	Hemi	421.91	1.30	1.10	6.06	102.83
4	2	NO TEST	NO TEST	FR	2,4	Hemi	328.32	1.30	0.90	5.28	78.06
1	1	NO TEST	NO TEST	LF	2,4	Flat	198.02	2.70	0.00	6.98	136.42
1	2	NO TEST	NO TEST	LF	2,4	Flat	206.30	2.20	0.80	6.06	102.83
2	1	NO TEST	NO TEST	RR	2,4	Flat	210.30	3.60	1.30	7.00	137.20
2	2	NO TEST	NO TEST	RR	2,4	Flat	226.27	2.90	1.50	6.09	103.85
3	1	NO TEST	NO TEST	RG	2,4	Hemi	270.92	1.40	0.80	6.06	102.83
3	2	NO TEST	NO TEST	RG	2,4	Hemi	419.86	1.20	1.00	5.26	77.47
4	1	NO TEST	NO TEST	FR	2,4	Hemi	260.77	1.30	0.80	6.08	103.51
4	2	NO TEST	NO TEST	FR	2,4	Hemi	373.78	1.20	0.90	5.25	77.18
1	1	NO TEST	NO TEST	LF	2,4	Flat	233.55	3.30	1.30	6.96	99.31
1	2	NO TEST	NO TEST	LF	2,4	Flat	222.48	2.60	1.20	6.08	75.78
2	1	NO TEST	NO TEST	RR	2,4	Flat	240.81	4.00	1.60	6.94	98.74
2	2	NO TEST	NO TEST	RR	2,4	Flat	227.62	3.40	1.60	6.06	75.28
3	1	NO TEST	NO TEST	RG	2,4	Hemi	116.63	0.00	0.00	6.06	75.28
3	2	NO TEST	NO TEST	RG	2,4	Hemi	122.00	0.00	0.00	5.26	56.72
4	1	NO TEST	NO TEST	FR	2,4	Hemi	133.48	0.00	0.00	6.08	75.78
4	2	NO TEST	NO TEST	FR	2,4	Hemi	139.34	0.00	0.00	5.27	56.93
1	1	NO TEST	NO TEST	LF	2,4	Flat	210.75	2.90	1.00	6.94	98.74
1	2	NO TEST	NO TEST	LF	2,4	Flat	184.95	2.10	0.00	6.08	75.78
2	1	NO TEST	NO TEST	RR	2,4	Flat	200.78	3.40	0.10	6.94	98.74
2	2	NO TEST	NO TEST	RR	2,4	Flat	183.10	2.40	0.00	6.05	75.04
3	1	NO TEST	NO TEST	RG	2,4	Hemi	118.41	0.00	0.00	6.08	75.78
3	2	NO TEST	NO TEST	RG	2,4	Hemi	110.40	0.00	0.00	5.26	56.72
4	1	NO TEST	NO TEST	FR	2,4	Hemi	121.73	0.00	0.00	6.08	75.78
4	2	NO TEST	NO TEST	FR	2,4	Hemi	110.06	0.00	0.00	5.23	56.07
1	1	NO TEST	NO TEST	LF	2,4	Flat	248.59	3.00	1.80	6.96	113.84
1	2	NO TEST	NO TEST	LF	2,4	Flat	246.46	2.70	1.80	6.06	86.30
2	1	NO TEST	NO TEST	RR	2,4	Flat	176.28	2.40	0.00	6.96	113.84
2	2	NO TEST	NO TEST	RR	2,4	Flat	167.17	2.50	0.00	6.09	87.16
3	1	NO TEST	NO TEST	RG	2,4	Hemi	113.34	0.00	0.00	6.09	87.16
3	2	NO TEST	NO TEST	RG	2,4	Hemi	119.90	0.00	0.00	5.26	65.02
4	1	NO TEST	NO TEST	FR	2,4	Hemi	129.23	0.00	0.00	6.06	86.30
4	2	NO TEST	NO TEST	FR	2,4	Hemi	147.09	0.00	0.00	5.27	65.27
1	1	NO TEST	NO TEST	LF	2,4	Flat	208.30	3.00	1.20	6.92	112.53
1	2	NO TEST	NO TEST	LF	2,4	Flat	229.14	2.60	1.60	6.05	86.02
2	1	NO TEST	NO TEST	RR	2,4	Flat	202.48	3.30	0.90	6.94	113.18
2	2	NO TEST	NO TEST	RR	2,4	Flat	178.73	2.70	0.00	6.03	85.45
3	1	NO TEST	NO TEST	RG	2,4	Hemi	133.61	0.00	0.00	6.05	86.02
3	2	NO TEST	NO TEST	RG	2,4	Hemi	110.51	0.00	0.00	5.25	64.77
4	1	NO TEST	NO TEST	FR	2,4	Hemi	113.82	0.00	0.00	6.05	86.02
4	2	NO TEST	NO TEST	FR	2,4	Hemi	117.53	0.00	0.00	5.26	65.02
1	1	NO TEST	NO TEST	LF	2,4	Flat	151.23	0.10	0.00	6.92	112.53
1	2	NO TEST	NO TEST	LF	2,4	Flat	119.18	0.00	0.00	6.05	86.02
2	1	NO TEST	NO TEST	RR	2,4	Flat	154.12	0.90	0.00	6.96	113.84
2	2	NO TEST	NO TEST	RR	2,4	Flat	172.65	1.80	0.00	6.06	86.30

Table 2.Y
Performance Test Results — Raw Data

HELME NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
AAB003	R & D Apparatus	5/21/97	Cold	AABJ-C	Oct. 91	1375	Large	ISO	Size J	4.70	NO TES	NO TES
AAB003	R & D Apparatus	5/21/97	Cold	AABJ-C	Oct. 91	1375	Large	ISO	Size J	4.70	NO TES	NO TES
AAB003	R & D Apparatus	5/21/97	Cold	AABJ-C	Oct. 91	1375	Large	ISO	Size J	4.70	NO TES	NO TES
AAB003	R & D Apparatus	5/21/97	Cold	AABJ-C	Oct. 91	1375	Large	ISO	Size J	4.70	NO TES	NO TES
AAB004	R & D Apparatus	5/21/97	Hot	AABJ-D	Oct. 91	1375	Large	ISO	Size J	4.70	NO TES	NO TES
AAB004	R & D Apparatus	5/21/97	Hot	AABJ-D	Oct. 91	1375	Large	ISO	Size J	4.70	NO TES	NO TES
AAB004	R & D Apparatus	5/21/97	Hot	AABJ-D	Oct. 91	1375	Large	ISO	Size J	4.70	NO TES	NO TES
AAB004	R & D Apparatus	5/21/97	Hot	AABJ-D	Oct. 91	1375	Large	ISO	Size J	4.70	NO TES	NO TES
AAB004	R & D Apparatus	5/21/97	Hot	AABJ-D	Oct. 91	1375	Large	ISO	Size J	4.70	NO TES	NO TES
AAB004	R & D Apparatus	5/21/97	Hot	AABJ-D	Oct. 91	1375	Large	ISO	Size J	4.70	NO TES	NO TES
AAB004	R & D Apparatus	5/21/97	Hot	AABJ-D	Oct. 91	1375	Large	ISO	Size J	4.70	NO TES	NO TES
AAB004	R & D Apparatus	5/21/97	Hot	AABJ-D	Oct. 91	1375	Large	ISO	Size J	4.70	NO TES	NO TES
AAB006	R & D Apparatus	5/30/97	Ambient	AABE-A	Jan. 95	1122	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB006	R & D Apparatus	5/30/97	Ambient	AABE-A	Jan. 95	1122	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB006	R & D Apparatus	5/30/97	Ambient	AABE-A	Jan. 95	1122	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB006	R & D Apparatus	5/30/97	Ambient	AABE-A	Jan. 95	1122	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB006	R & D Apparatus	5/30/97	Ambient	AABE-A	Jan. 95	1122	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB006	R & D Apparatus	5/30/97	Ambient	AABE-A	Jan. 95	1122	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB006	R & D Apparatus	5/30/97	Ambient	AABE-A	Jan. 95	1122	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB006	R & D Apparatus	5/30/97	Ambient	AABE-A	Jan. 95	1122	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB007	R & D Apparatus	5/30/97	Wet	AABE-B	Jan. 95	1120	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB007	R & D Apparatus	5/30/97	Wet	AABE-B	Jan. 95	1120	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB007	R & D Apparatus	5/30/97	Wet	AABE-B	Jan. 95	1120	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB007	R & D Apparatus	5/30/97	Wet	AABE-B	Jan. 95	1120	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB007	R & D Apparatus	5/30/97	Wet	AABE-B	Jan. 95	1120	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB007	R & D Apparatus	5/30/97	Wet	AABE-B	Jan. 95	1120	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB007	R & D Apparatus	5/30/97	Wet	AABE-B	Jan. 95	1120	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB007	R & D Apparatus	5/30/97	Wet	AABE-B	Jan. 95	1120	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB008	R & D Apparatus	5/30/97	Cold	AABE-C	Jan. 95	1118	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB008	R & D Apparatus	5/30/97	Cold	AABE-C	Jan. 95	1118	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB008	R & D Apparatus	5/30/97	Cold	AABE-C	Jan. 95	1118	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB008	R & D Apparatus	5/30/97	Cold	AABE-C	Jan. 95	1118	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB008	R & D Apparatus	5/30/97	Cold	AABE-C	Jan. 95	1118	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB008	R & D Apparatus	5/30/97	Cold	AABE-C	Jan. 95	1118	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB008	R & D Apparatus	5/30/97	Cold	AABE-C	Jan. 95	1118	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB008	R & D Apparatus	5/30/97	Cold	AABE-C	Jan. 95	1118	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB009	R & D Apparatus	5/30/97	Hot	AABE-D	Jan. 95	1120	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB009	R & D Apparatus	5/30/97	Hot	AABE-D	Jan. 95	1120	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB009	R & D Apparatus	5/30/97	Hot	AABE-D	Jan. 95	1120	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB009	R & D Apparatus	5/30/97	Hot	AABE-D	Jan. 95	1120	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB009	R & D Apparatus	5/30/97	Hot	AABE-D	Jan. 95	1120	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB009	R & D Apparatus	5/30/97	Hot	AABE-D	Jan. 95	1120	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB009	R & D Apparatus	5/30/97	Hot	AABE-D	Jan. 95	1120	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB009	R & D Apparatus	5/30/97	Hot	AABE-D	Jan. 95	1120	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAB010	R & D Apparatus	6/4/97	Ambient	AABM-A	9/95	1301	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB010	R & D Apparatus	6/4/97	Ambient	AABM-A	9/95	1301	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB010	R & D Apparatus	6/4/97	Ambient	AABM-A	9/95	1301	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB010	R & D Apparatus	6/4/97	Ambient	AABM-A	9/95	1301	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB010	R & D Apparatus	6/4/97	Ambient	AABM-A	9/95	1301	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB010	R & D Apparatus	6/4/97	Ambient	AABM-A	9/95	1301	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB010	R & D Apparatus	6/4/97	Ambient	AABM-A	9/95	1301	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB010	R & D Apparatus	6/4/97	Ambient	AABM-A	9/95	1301	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB011	R & D Apparatus	6/4/97	Wet	AABM-B	9/95	1300	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB011	R & D Apparatus	6/4/97	Wet	AABM-B	9/95	1300	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB011	R & D Apparatus	6/4/97	Wet	AABM-B	9/95	1300	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB011	R & D Apparatus	6/4/97	Wet	AABM-B	9/95	1300	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB011	R & D Apparatus	6/4/97	Wet	AABM-B	9/95	1300	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB011	R & D Apparatus	6/4/97	Wet	AABM-B	9/95	1300	XLarge	ISO	Size M	5.60	NO TES	NO TES

Table 2.Y
Performance Test Results — Raw Data

DROP NU	HIT NU	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
3	1	NO TES	NO TES	RG	2,4	Hemi	133.86	0.00	0.00	6.06	86.30
3	2	NO TES	NO TES	RG	2,4	Hemi	113.13	0.00	0.00	5.26	65.02
4	1	NO TES	NO TES	FR	2,4	Hemi	184.57	1.00	0.00	6.08	86.87
4	2	NO TES	NO TES	FR	2,4	Hemi	132.24	0.00	0.00	5.27	65.27
1	1	NO TES	NO TES	LF	2,4	Flat	172.70	1.90	0.00	6.88	111.24
1	2	NO TES	NO TES	LF	2,4	Flat	155.09	0.30	0.00	6.05	86.02
2	1	NO TES	NO TES	RR	2,4	Flat	221.64	3.60	1.80	6.96	113.84
2	2	NO TES	NO TES	RR	2,4	Flat	226.63	3.10	0.80	6.08	86.87
3	1	NO TES	NO TES	RG	2,4	Hemi	100.87	0.00	0.00	6.06	86.30
3	2	NO TES	NO TES	RG	2,4	Hemi	94.18	0.00	0.00	5.24	64.53
4	1	NO TES	NO TES	FR	2,4	Hemi	115.02	0.00	0.00	6.05	86.02
4	2	NO TES	NO TES	FR	2,4	Hemi	102.63	0.00	0.00	5.23	64.28
1	1	NO TES	NO TES	LF	2,4	Flat	182.62	3.30	0.00	6.94	98.74
1	2	NO TES	NO TES	LF	2,4	Flat	185.63	3.30	0.00	6.03	74.54
2	1	NO TES	NO TES	RR	2,4	Flat	227.98	4.10	3.20	6.98	99.88
2	2	NO TES	NO TES	RR	2,4	Flat	239.28	3.90	2.20	6.02	74.29
3	1	NO TES	NO TES	RG	2,4	Hemi	142.46	0.00	0.00	6.08	75.78
3	2	NO TES	NO TES	RG	2,4	Hemi	137.69	0.00	0.00	5.27	56.93
4	1	NO TES	NO TES	FR	2,4	Hemi	112.60	0.00	0.00	6.06	75.28
4	2	NO TES	NO TES	FR	2,4	Hemi	108.77	0.00	0.00	5.25	56.50
1	1	NO TES	NO TES	LF	2,4	Flat	237.60	3.40	2.00	6.98	99.88
1	2	NO TES	NO TES	LF	2,4	Flat	217.48	3.30	0.90	6.05	75.04
2	1	NO TES	NO TES	RR	2,4	Flat	224.24	4.00	2.30	6.92	98.17
2	2	NO TES	NO TES	RR	2,4	Flat	213.20	3.70	1.60	6.06	75.28
3	1	NO TES	NO TES	RG	2,4	Hemi	123.16	0.00	0.00	6.02	74.29
3	2	NO TES	NO TES	RG	2,4	Hemi	101.53	0.00	0.00	5.25	56.50
4	1	NO TES	NO TES	FR	2,4	Hemi	109.79	0.00	0.00	6.09	76.03
4	2	NO TES	NO TES	FR	2,4	Hemi	105.33	0.00	0.00	5.27	56.93
1	1	NO TES	NO TES	LF	2,4	Flat	193.06	3.00	0.00	6.94	98.74
1	2	NO TES	NO TES	LF	2,4	Flat	195.86	2.90	0.00	6.02	74.29
2	1	NO TES	NO TES	RR	2,4	Flat	265.21	4.30	2.80	6.94	98.74
2	2	NO TES	NO TES	RR	2,4	Flat	217.90	3.70	0.90	6.06	75.28
3	1	NO TES	NO TES	RG	2,4	Hemi	116.83	0.00	0.00	6.05	75.04
3	2	NO TES	NO TES	RG	2,4	Hemi	121.57	0.00	0.00	5.24	56.29
4	1	NO TES	NO TES	FR	2,4	Hemi	117.47	0.00	0.00	6.08	75.78
4	2	NO TES	NO TES	FR	2,4	Flat	108.40	0.00	0.00	5.26	56.72
1	1	NO TES	NO TES	LF	2,4	Flat	185.21	2.70	0.00	6.98	99.88
1	2	NO TES	NO TES	LF	2,4	Flat	211.27	3.50	0.50	6.00	73.80
2	1	NO TES	NO TES	RR	2,4	Flat	220.70	3.90	2.50	6.92	98.17
2	2	NO TES	NO TES	RR	2,4	Flat	189.03	3.60	0.00	6.03	74.54
3	1	NO TES	NO TES	RG	2,4	Hemi	110.34	0.00	0.00	6.05	75.04
3	2	NO TES	NO TES	RG	2,4	Hemi	111.29	0.00	0.00	5.24	56.29
4	1	NO TES	NO TES	FR	2,4	Hemi	116.31	0.00	0.00	6.06	75.28
4	2	NO TES	NO TES	FR	2,4	Hemi	95.40	0.00	0.00	5.27	56.93
1	1	NO TES	NO TES	LF	2,4	Flat	206.28	2.90	1.00	6.98	136.42
1	2	NO TES	NO TES	LF	2,4	Flat	201.14	2.70	0.50	6.06	102.83
2	1	NO TES	NO TES	RR	2,4	Flat	191.23	3.80	0.00	6.98	136.42
2	2	NO TES	NO TES	RR	2,4	Flat	180.30	3.40	0.00	6.09	103.85
3	1	NO TES	NO TES	RG	2,4	Hemi	117.44	0.00	0.00	6.03	101.81
3	2	NO TES	NO TES	RG	2,4	Hemi	114.17	0.00	0.00	5.26	77.47
4	1	NO TES	NO TES	FR	2,4	Hemi	155.99	0.60	0.00	6.06	102.83
4	2	NO TES	NO TES	FR	2,4	Hemi	222.12	1.50	0.80	5.26	77.47
1	1	NO TES	NO TES	LF	2,4	Flat	179.59	2.20	0.00	6.05	102.49
1	2	NO TES	NO TES	LF	2,4	Flat	217.46	3.00	1.50	6.98	136.42
2	1	NO TES	NO TES	RR	2,4	Flat	196.65	3.60	0.00	6.96	135.64
2	2	NO TES	NO TES	RR	2,4	Flat	201.55	3.30	0.10	6.06	102.83
3	1	NO TES	NO TES	RG	2,4	Hemi	112.27	0.00	0.00	6.08	103.51
3	2	NO TES	NO TES	RG	2,4	Hemi	91.54	0.00	0.00	5.26	77.47

Table 2.Y
Performance Test Results — Raw Data

HELMET NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
AAB011	R & D Apparatus	6/4/97	Wet	AABM-B	9/95	1300	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB011	R & D Apparatus	6/4/97	Wet	AABM-B	9/95	1300	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB012	R & D Apparatus	6/4/97	Cold	AABM-C	9/95	1320	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB012	R & D Apparatus	6/4/97	Cold	AABM-C	9/95	1320	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB012	R & D Apparatus	6/4/97	Cold	AABM-C	9/95	1320	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB012	R & D Apparatus	6/4/97	Cold	AABM-C	9/95	1320	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB012	R & D Apparatus	6/4/97	Cold	AABM-C	9/95	1320	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB012	R & D Apparatus	6/4/97	Cold	AABM-C	9/95	1320	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB012	R & D Apparatus	6/4/97	Cold	AABM-C	9/95	1320	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB012	R & D Apparatus	6/4/97	Cold	AABM-C	9/95	1320	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB013	R & D Apparatus	6/4/97	Hot	AABM-D	9/95	1321	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB013	R & D Apparatus	6/4/97	Hot	AABM-D	9/95	1321	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB013	R & D Apparatus	6/4/97	Hot	AABM-D	9/95	1321	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB013	R & D Apparatus	6/4/97	Hot	AABM-D	9/95	1321	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB013	R & D Apparatus	6/4/97	Hot	AABM-D	9/95	1321	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB013	R & D Apparatus	6/4/97	Hot	AABM-D	9/95	1321	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB013	R & D Apparatus	6/4/97	Hot	AABM-D	9/95	1321	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAB013	R & D Apparatus	6/4/97	Hot	AABM-D	9/95	1321	XLarge	ISO	Size M	5.60	NO TES	NO TES
AAC001	R & D Apparatus	5/27/97	Ambient	AACJ-A	11/95	1413	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC001	R & D Apparatus	5/27/97	Ambient	AACJ-A	11/95	1413	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC001	R & D Apparatus	5/27/97	Ambient	AACJ-A	11/95	1413	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC001	R & D Apparatus	5/27/97	Ambient	AACJ-A	11/95	1413	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC001	R & D Apparatus	5/27/97	Ambient	AACJ-A	11/95	1413	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC001	R & D Apparatus	5/27/97	Ambient	AACJ-A	11/95	1413	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC001	R & D Apparatus	5/27/97	Ambient	AACJ-A	11/95	1413	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC001	R & D Apparatus	5/27/97	Ambient	AACJ-A	11/95	1413	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC002	R & D Apparatus	5/27/97	Cold	AACJ-C	11/95	1434	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC002	R & D Apparatus	5/27/97	Cold	AACJ-C	11/95	1434	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC002	R & D Apparatus	5/27/97	Cold	AACJ-C	11/95	1434	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC002	R & D Apparatus	5/27/97	Cold	AACJ-C	11/95	1434	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC002	R & D Apparatus	5/27/97	Cold	AACJ-C	11/95	1434	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC002	R & D Apparatus	5/27/97	Cold	AACJ-C	11/95	1434	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC002	R & D Apparatus	5/27/97	Cold	AACJ-C	11/95	1434	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC002	R & D Apparatus	5/27/97	Cold	AACJ-C	11/95	1434	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC003	R & D Apparatus	5/27/97	Hot	AACJ-D	11/95	1423	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC003	R & D Apparatus	5/27/97	Hot	AACJ-D	11/95	1423	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC003	R & D Apparatus	5/27/97	Hot	AACJ-D	11/95	1423	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC003	R & D Apparatus	5/27/97	Hot	AACJ-D	11/95	1423	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC003	R & D Apparatus	5/27/97	Hot	AACJ-D	11/95	1423	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC003	R & D Apparatus	5/27/97	Hot	AACJ-D	11/95	1423	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC003	R & D Apparatus	5/27/97	Hot	AACJ-D	11/95	1423	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC003	R & D Apparatus	5/27/97	Hot	AACJ-D	11/95	1423	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC005	R & D Apparatus	5/27/97	Wet	AACJ-B	missing	1420	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC005	R & D Apparatus	5/27/97	Wet	AACJ-B	missing	1420	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC005	R & D Apparatus	5/27/97	Wet	AACJ-B	missing	1420	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC005	R & D Apparatus	5/27/97	Wet	AACJ-B	missing	1420	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC005	R & D Apparatus	5/27/97	Wet	AACJ-B	missing	1420	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC005	R & D Apparatus	5/27/97	Wet	AACJ-B	missing	1420	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC005	R & D Apparatus	5/27/97	Wet	AACJ-B	missing	1420	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC005	R & D Apparatus	5/27/97	Wet	AACJ-B	missing	1420	Medium	ISO	Size J	4.70	NO TES	NO TES
AAC006	R & D Apparatus	6/2/97	Ambient	AACE-A	2/97	1479	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC006	R & D Apparatus	6/2/97	Ambient	AACE-A	2/97	1479	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC006	R & D Apparatus	6/2/97	Ambient	AACE-A	2/97	1479	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC006	R & D Apparatus	6/2/97	Ambient	AACE-A	2/97	1479	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC006	R & D Apparatus	6/2/97	Ambient	AACE-A	2/97	1479	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC006	R & D Apparatus	6/2/97	Ambient	AACE-A	2/97	1479	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC006	R & D Apparatus	6/2/97	Ambient	AACE-A	2/97	1479	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC006	R & D Apparatus	6/2/97	Ambient	AACE-A	2/97	1479	XSmall	ISO	Size E	4.10	NO TES	NO TES

Table 2.Y
Performance Test Results — Raw Data

DROP NUM	HIT NUM	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCIT (M/S)	ENERGY (JOULES)
4	1	NO TES	NO TES	FR	2,4	Hemi	128.91	0.00	0.00	6.05	102.49
4	2	NO TES	NO TES	FR	2,4	Hemi	148.60	0.00	0.00	5.28	78.06
1	1	NO TES	NO TES	LF	2,4	Flat	213.92	2.40	1.10	6.08	103.51
1	2	NO TES	NO TES	LF	2,4	Flat	220.56	2.60	1.30	6.94	134.86
2	1	NO TES	NO TES	RR	2,4	Flat	191.01	3.70	0.00	6.98	136.42
2	2	NO TES	NO TES	RR	2,4	Flat	175.36	3.20	0.00	6.06	102.83
3	1	NO TES	NO TES	RG	2,4	Hemi	123.50	0.00	0.00	6.06	102.83
3	2	NO TES	NO TES	RG	2,4	Hemi	137.88	0.00	0.00	5.28	78.06
4	1	NO TES	NO TES	FR	2,4	Hemi	177.88	1.70	0.00	6.05	102.49
4	2	NO TES	NO TES	FR	2,4	Hemi	212.91	1.70	0.70	5.25	77.18
1	1	NO TES	NO TES	LF	2,4	Flat	310.72	2.20	1.00	6.92	134.08
1	2	NO TES	NO TES	LF	2,4	Flat	198.80	2.40	0.00	6.08	103.51
2	1	NO TES	NO TES	RR	2,4	Flat	180.70	3.60	0.00	7.00	137.20
2	2	NO TES	NO TES	RR	2,4	Flat	177.38	3.20	0.00	6.09	103.85
3	1	NO TES	NO TES	RG	2,4	Hemi	118.40	0.00	0.00	6.06	102.83
3	2	NO TES	NO TES	RG	2,4	Hemi	151.39	0.10	0.00	5.27	77.76
4	1	NO TES	NO TES	FR	2,4	Hemi	233.63	1.40	0.80	6.08	103.51
4	2	NO TES	NO TES	FR	2,4	Hemi	156.55	0.70	0.00	5.27	77.76
1	1	NO TES	NO TES	LF	2,4	Flat	165.06	1.90	0.00	6.92	112.53
1	2	NO TES	NO TES	LF	2,4	Flat	166.12	1.10	0.00	6.03	85.45
2	1	NO TES	NO TES	RR	2,4	Flat	229.98	3.50	1.60	6.70	105.49
2	2	NO TES	NO TES	RR	2,4	Flat	185.01	2.30	0.00	6.06	86.30
3	1	NO TES	NO TES	RG	2,4	Hemi	135.60	0.00	0.00	6.02	85.16
3	2	NO TES	NO TES	RG	2,4	Hemi	132.03	0.00	0.00	5.23	64.28
4	1	NO TES	NO TES	FR	2,4	Hemi	176.53	2.70	0.00	6.06	86.30
4	2	NO TES	NO TES	FR	2,4	Hemi	163.63	1.70	0.00	5.27	65.27
1	1	NO TES	NO TES	LF	2,4	Flat	208.96	3.70	1.00	6.94	113.18
1	2	NO TES	NO TES	LF	2,4	Flat	206.98	2.10	0.50	5.92	82.36
2	1	NO TES	NO TES	RR	2,4	Flat	219.14	4.10	1.70	6.77	107.71
2	2	NO TES	NO TES	RR	2,4	Flat	239.88	3.30	0.50	6.05	86.02
3	1	NO TES	NO TES	RG	2,4	Hemi	137.19	0.00	0.00	6.08	86.87
3	2	NO TES	NO TES	RG	2,4	Hemi	142.90	0.00	0.00	5.24	64.53
4	1	NO TES	NO TES	FR	2,4	Hemi	172.24	0.70	0.00	6.08	86.87
4	2	NO TES	NO TES	FR	2,4	Hemi	156.64	0.60	0.00	5.23	64.28
1	1	NO TES	NO TES	LF	2,4	Flat	192.08	3.10	0.00	6.76	107.39
1	2	NO TES	NO TES	LF	2,4	Flat	189.54	2.00	0.00	6.11	87.73
2	1	NO TES	NO TES	RR	2,4	Flat	201.36	4.10	0.10	6.76	107.39
2	2	NO TES	NO TES	RR	2,4	Flat	188.34	2.40	0.00	6.14	88.59
3	1	NO TES	NO TES	RG	2,4	Hemi	142.08	0.00	0.00	6.15	88.88
3	2	NO TES	NO TES	RG	2,4	Hemi	106.10	0.00	0.00	5.27	65.27
4	1	NO TES	NO TES	FR	2,4	Hemi	128.87	0.00	0.00	6.11	87.73
4	2	NO TES	NO TES	FR	2,4	Hemi	109.66	0.00	0.00	5.28	65.51
1	1	NO TES	NO TES	LF	2,4	Flat	157.72	0.30	0.00	6.98	114.49
1	2	NO TES	NO TES	LF	2,4	Flat	146.94	0.00	0.00	6.05	86.02
2	1	NO TES	NO TES	RR	2,4	Flat	173.75	2.60	0.00	6.96	113.84
2	2	NO TES	NO TES	RR	2,4	Flat	183.44	2.30	0.00	6.05	86.02
3	1	NO TES	NO TES	RG	2,4	Hemi	131.00	0.00	0.00	6.03	85.45
3	2	NO TES	NO TES	RG	2,4	Hemi	110.04	0.00	0.00	5.26	65.02
4	1	NO TES	NO TES	FR	2,4	Hemi	159.95	1.40	0.00	6.06	86.30
4	2	NO TES	NO TES	FR	2,4	Hemi	160.28	1.50	0.00	5.28	65.51
1	1	NO TES	NO TES	LF	2,4	Flat	218.95	3.40	0.50	6.96	99.31
1	2	NO TES	NO TES	LF	2,4	Flat	192.99	2.50	0.00	6.08	75.78
2	1	NO TES	NO TES	RR	2,4	Flat	243.90	3.90	2.10	6.96	99.31
2	2	NO TES	NO TES	RR	2,4	Flat	224.68	2.40	0.50	6.06	75.28
3	1	NO TES	NO TES	RG	2,4	Hemi	172.07	1.40	0.00	6.02	74.29
3	2	NO TES	NO TES	RG	2,4	Hemi	177.57	0.20	0.00	5.27	56.93
4	1	NO TES	NO TES	FR	2,4	Hemi	184.42	3.00	0.00	6.05	75.04
4	2	NO TES	NO TES	FR	2,4	Hemi	171.80	1.90	0.00	5.24	56.29

Table 2.Y
Performance Test Results — Raw Data

HELME NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
AAC007	R & D Apparatus	6/2/97	Wet	AACE-B	2/97	1494	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC007	R & D Apparatus	6/2/97	Wet	AACE-B	2/97	1494	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC007	R & D Apparatus	6/2/97	Wet	AACE-B	2/97	1494	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC007	R & D Apparatus	6/2/97	Wet	AACE-B	2/97	1494	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC007	R & D Apparatus	6/2/97	Wet	AACE-B	2/97	1494	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC007	R & D Apparatus	6/2/97	Wet	AACE-B	2/97	1494	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC007	R & D Apparatus	6/2/97	Wet	AACE-B	2/97	1494	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC007	R & D Apparatus	6/2/97	Wet	AACE-B	2/97	1494	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC008	R & D Apparatus	6/2/97	Cold	AACE-C	1/97	1478	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC008	R & D Apparatus	6/2/97	Cold	AACE-C	1/97	1478	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC008	R & D Apparatus	6/2/97	Cold	AACE-C	1/97	1478	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC008	R & D Apparatus	6/2/97	Cold	AACE-C	1/97	1478	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC008	R & D Apparatus	6/2/97	Cold	AACE-C	1/97	1478	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC008	R & D Apparatus	6/2/97	Cold	AACE-C	1/97	1478	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC008	R & D Apparatus	6/2/97	Cold	AACE-C	1/97	1478	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC008	R & D Apparatus	6/2/97	Cold	AACE-C	1/97	1478	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC009	R & D Apparatus	6/2/97	Hot	AACE-D	12/96	1437	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC009	R & D Apparatus	6/2/97	Hot	AACE-D	12/96	1437	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC009	R & D Apparatus	6/2/97	Hot	AACE-D	12/96	1437	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC009	R & D Apparatus	6/2/97	Hot	AACE-D	12/96	1437	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC009	R & D Apparatus	6/2/97	Hot	AACE-D	12/96	1437	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC009	R & D Apparatus	6/2/97	Hot	AACE-D	12/96	1437	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC009	R & D Apparatus	6/2/97	Hot	AACE-D	12/96	1437	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC009	R & D Apparatus	6/2/97	Hot	AACE-D	12/96	1437	XSmall	ISO	Size E	4.10	NO TES	NO TES
AAC010	R & D Apparatus	6/4/97	Ambient	AACM-A	11/95	1413	Large	ISO	Size M	5.60	NO TES	NO TES
AAC010	R & D Apparatus	6/4/97	Ambient	AACM-A	11/95	1413	Large	ISO	Size M	5.60	NO TES	NO TES
AAC010	R & D Apparatus	6/4/97	Ambient	AACM-A	11/95	1413	Large	ISO	Size M	5.60	NO TES	NO TES
AAC010	R & D Apparatus	6/4/97	Ambient	AACM-A	11/95	1413	Large	ISO	Size M	5.60	NO TES	NO TES
AAC010	R & D Apparatus	6/4/97	Ambient	AACM-A	11/95	1413	Large	ISO	Size M	5.60	NO TES	NO TES
AAC010	R & D Apparatus	6/4/97	Ambient	AACM-A	11/95	1413	Large	ISO	Size M	5.60	NO TES	NO TES
AAC010	R & D Apparatus	6/4/97	Ambient	AACM-A	11/95	1413	Large	ISO	Size M	5.60	NO TES	NO TES
AAC010	R & D Apparatus	6/4/97	Ambient	AACM-A	11/95	1413	Large	ISO	Size M	5.60	NO TES	NO TES
AAC011	R & D Apparatus	6/4/97	Wet	AACM-B	11/95	1429	Large	ISO	Size M	5.60	NO TES	NO TES
AAC011	R & D Apparatus	6/4/97	Wet	AACM-B	11/95	1429	Large	ISO	Size M	5.60	NO TES	NO TES
AAC011	R & D Apparatus	6/4/97	Wet	AACM-B	11/95	1429	Large	ISO	Size M	5.60	NO TES	NO TES
AAC011	R & D Apparatus	6/4/97	Wet	AACM-B	11/95	1429	Large	ISO	Size M	5.60	NO TES	NO TES
AAC011	R & D Apparatus	6/4/97	Wet	AACM-B	11/95	1429	Large	ISO	Size M	5.60	NO TES	NO TES
AAC011	R & D Apparatus	6/4/97	Wet	AACM-B	11/95	1429	Large	ISO	Size M	5.60	NO TES	NO TES
AAC011	R & D Apparatus	6/4/97	Wet	AACM-B	11/95	1429	Large	ISO	Size M	5.60	NO TES	NO TES
AAC011	R & D Apparatus	6/4/97	Wet	AACM-B	11/95	1429	Large	ISO	Size M	5.60	NO TES	NO TES
AAC012	R & D Apparatus	6/4/97	Cold	AACM-C	11/95	1420	Large	ISO	Size M	5.60	NO TES	NO TES
AAC012	R & D Apparatus	6/4/97	Cold	AACM-C	11/95	1420	Large	ISO	Size M	5.60	NO TES	NO TES
AAC012	R & D Apparatus	6/4/97	Cold	AACM-C	11/95	1420	Large	ISO	Size M	5.60	NO TES	NO TES
AAC012	R & D Apparatus	6/4/97	Cold	AACM-C	11/95	1420	Large	ISO	Size M	5.60	NO TES	NO TES
AAC012	R & D Apparatus	6/4/97	Cold	AACM-C	11/95	1420	Large	ISO	Size M	5.60	NO TES	NO TES
AAC012	R & D Apparatus	6/4/97	Cold	AACM-C	11/95	1420	Large	ISO	Size M	5.60	NO TES	NO TES
AAC012	R & D Apparatus	6/4/97	Cold	AACM-C	11/95	1420	Large	ISO	Size M	5.60	NO TES	NO TES
AAC012	R & D Apparatus	6/4/97	Cold	AACM-C	11/95	1420	Large	ISO	Size M	5.60	NO TES	NO TES
AAC013	R & D Apparatus	6/4/97	Hot	AACM-D	11/95	1414	Large	ISO	Size M	5.60	NO TES	NO TES
AAC013	R & D Apparatus	6/4/97	Hot	AACM-D	11/95	1414	Large	ISO	Size M	5.60	NO TES	NO TES
AAC013	R & D Apparatus	6/4/97	Hot	AACM-D	11/95	1414	Large	ISO	Size M	5.60	NO TES	NO TES
AAC013	R & D Apparatus	6/4/97	Hot	AACM-D	11/95	1414	Large	ISO	Size M	5.60	NO TES	NO TES
AAC013	R & D Apparatus	6/4/97	Hot	AACM-D	11/95	1414	Large	ISO	Size M	5.60	NO TES	NO TES
AAC013	R & D Apparatus	6/4/97	Hot	AACM-D	11/95	1414	Large	ISO	Size M	5.60	NO TES	NO TES
AAC013	R & D Apparatus	6/4/97	Hot	AACM-D	11/95	1414	Large	ISO	Size M	5.60	NO TES	NO TES
AAC013	R & D Apparatus	6/4/97	Hot	AACM-D	11/95	1414	Large	ISO	Size M	5.60	NO TES	NO TES
AVA001	Increased Velocity	4/16/97	Ambient	AVAM-A	5-96	828	Medium	DO	Size C	5.00	NO TES	NO TES
AVA001	Increased Velocity	4/16/97	Ambient	AVAM-A	5-96	828	Medium	DO	Size C	5.00	NO TES	NO TES

Table 2.Y
Performance Test Results — Raw Data

DROP NU	HIT NU	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
1	1	NO TES	NO TES	LF	2,4	Flat	208.35	4.00	1.40	6.94	98.74
1	2	NO TES	NO TES	LF	2,4	Flat	183.26	2.20	0.00	6.06	75.28
2	1	NO TES	NO TES	RR	2,4	Flat	229.21	4.10	1.00	7.00	100.45
2	2	NO TES	NO TES	RR	2,4	Flat	207.49	3.90	0.40	6.08	75.78
3	1	NO TES	NO TES	RG	2,4	Hemi	137.73	0.00	0.00	6.03	74.54
3	2	NO TES	NO TES	RG	2,4	Hemi	130.65	0.00	0.00	5.17	54.79
4	1	NO TES	NO TES	FR	2,4	Hemi	151.02	0.10	0.00	6.00	73.80
4	2	NO TES	NO TES	FR	2,4	Hemi	134.48	0.00	0.00	5.14	54.16
1	1	NO TES	NO TES	LF	2,4	Flat	211.46	3.10	0.90	6.92	98.17
1	2	NO TES	NO TES	LF	2,4	Flat	213.16	3.10	0.50	6.05	75.04
2	1	NO TES	NO TES	RR	2,4	Flat	227.23	3.70	1.70	6.94	98.74
2	2	NO TES	NO TES	RR	2,4	Flat	218.31	2.70	1.10	6.06	75.28
3	1	NO TES	NO TES	RG	2,4	Hemi	186.34	1.60	0.00	6.05	75.04
3	2	NO TES	NO TES	RG	2,4	Hemi	141.23	0.00	0.00	5.25	56.50
4	1	NO TES	NO TES	FR	2,4	Hemi	100.90	0.00	0.00	6.03	74.54
4	2	NO TES	NO TES	FR	2,4	Hemi	92.06	0.00	0.00	5.23	56.07
1	1	NO TES	NO TES	LF	2,4	Flat	196.08	3.40	0.00	6.92	98.17
1	2	NO TES	NO TES	LF	2,4	Flat	179.15	1.80	0.00	6.03	74.54
2	1	NO TES	NO TES	RR	2,4	Flat	221.18	3.60	1.10	7.00	100.45
2	2	NO TES	NO TES	RR	2,4	Flat	188.05	1.30	0.00	6.05	75.04
3	1	NO TES	NO TES	RG	2,4	Hemi	155.47	0.20	0.00	6.03	74.54
3	2	NO TES	NO TES	RG	2,4	Hemi	174.64	0.60	0.00	5.26	56.72
4	1	NO TES	NO TES	FR	2,4	Hemi	174.05	2.40	0.00	6.05	75.04
4	2	NO TES	NO TES	FR	2,4	Hemi	160.48	1.00	0.00	5.26	56.72
1	1	NO TES	NO TES	LF	2,4	Flat	202.77	3.50	0.30	6.92	134.08
1	2	NO TES	NO TES	LF	2,4	Flat	191.75	1.80	0.00	6.06	102.83
2	1	NO TES	NO TES	RR	2,4	Flat	200.14	3.70	0.10	6.94	134.86
2	2	NO TES	NO TES	RR	2,4	Flat	199.68	2.50	0.00	6.06	102.83
3	1	NO TES	NO TES	RG	2,4	Hemi	127.13	0.00	0.00	6.05	102.49
3	2	NO TES	NO TES	RG	2,4	Hemi	94.95	0.00	0.00	5.25	77.18
4	1	NO TES	NO TES	FR	2,4	Hemi	178.25	1.50	0.00	6.06	102.83
4	2	NO TES	NO TES	FR	2,4	Hemi	142.85	0.00	0.00	5.23	76.59
1	1	NO TES	NO TES	LF	2,4	Flat	166.83	3.00	0.00	6.96	135.64
1	2	NO TES	NO TES	LF	2,4	Flat	143.85	0.00	0.00	6.03	101.81
2	1	NO TES	NO TES	RR	2,4	Flat	178.51	3.70	0.00	6.98	136.42
2	2	NO TES	NO TES	RR	2,4	Flat	190.71	2.60	0.00	6.11	104.53
3	1	NO TES	NO TES	RG	2,4	Hemi	120.50	0.00	0.00	6.06	102.83
3	2	NO TES	NO TES	RG	2,4	Hemi	132.29	0.00	0.00	5.23	76.59
4	1	NO TES	NO TES	FR	2,4	Hemi	123.27	0.00	0.00	6.05	102.49
4	2	NO TES	NO TES	FR	2,4	Hemi	122.76	0.00	0.00	5.25	77.18
1	1	NO TES	NO TES	LF	2,4	Flat	56.64	0.00	0.00	6.94	134.86
1	2	NO TES	NO TES	LF	2,4	Flat	165.91	1.90	0.00	6.06	102.83
2	1	NO TES	NO TES	RR	2,4	Flat	204.21	3.60	0.60	6.94	134.86
2	2	NO TES	NO TES	RR	2,4	Flat	202.57	2.10	0.30	6.08	103.51
3	1	NO TES	NO TES	RG	2,4	Hemi	108.98	0.00	0.00	6.08	103.51
3	2	NO TES	NO TES	RG	2,4	Hemi	120.60	0.00	0.00	5.26	77.47
4	1	NO TES	NO TES	FR	2,4	Hemi	193.46	1.80	0.00	6.05	102.49
4	2	NO TES	NO TES	FR	2,4	Hemi	149.81	0.00	0.00	5.27	77.76
1	1	NO TES	NO TES	LF	2,4	Flat	180.04	2.90	0.00	7.02	137.99
1	2	NO TES	NO TES	LF	2,4	Flat	182.73	2.20	0.00	6.06	102.83
2	1	NO TES	NO TES	RR	2,4	Flat	243.05	2.90	1.20	6.94	134.86
2	2	NO TES	NO TES	RR	2,4	Flat	187.99	2.70	0.00	6.06	102.83
3	1	NO TES	NO TES	RG	2,4	Hemi	110.16	0.00	0.00	6.06	102.83
3	2	NO TES	NO TES	RG	2,4	Hemi	98.30	0.00	0.00	5.24	76.88
4	1	NO TES	NO TES	FR	2,4	Hemi	183.74	0.90	0.00	6.08	103.51
4	2	NO TES	NO TES	FR	2,4	Hemi	183.74	0.60	0.00	5.25	77.18
1	1	NO TES	NO TES	LF	2,4	Flat	263.30	3.60	2.10	6.94	120.41
1	2	NO TES	NO TES	LF	2,4	Flat	236.96	2.50	1.60	6.05	91.51

Table 2.Y
Performance Test Results — Raw Data

HELME NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
AVA001	Increased Velocity	4/16/97	Ambient	AVAM-A	5-96	828	Medium	DO	Size C	5.00	NO TES	NO TES
AVA001	Increased Velocity	4/16/97	Ambient	AVAM-A	5-96	828	Medium	DO	Size C	5.00	NO TES	NO TES
AVA001	Increased Velocity	4/16/97	Ambient	AVAM-A	5-96	828	Medium	DO	Size C	5.00	NO TES	NO TES
AVA001	Increased Velocity	4/16/97	Ambient	AVAM-A	5-96	828	Medium	DO	Size C	5.00	NO TES	NO TES
AVA001	Increased Velocity	4/16/97	Ambient	AVAM-A	5-96	828	Medium	DO	Size C	5.00	NO TES	NO TES
AVA001	Increased Velocity	4/16/97	Ambient	AVAM-A	5-96	828	Medium	DO	Size C	5.00	NO TES	NO TES
AVA002	Increased Velocity	4/16/97	Wet	AVAM-B	5-96	814	Medium	DO	Size C	5.00	NO TES	NO TES
AVA002	Increased Velocity	4/16/97	Wet	AVAM-B	5-96	814	Medium	DO	Size C	5.00	NO TES	NO TES
AVA002	Increased Velocity	4/16/97	Wet	AVAM-B	5-96	814	Medium	DO	Size C	5.00	NO TES	NO TES
AVA002	Increased Velocity	4/16/97	Wet	AVAM-B	5-96	814	Medium	DO	Size C	5.00	NO TES	NO TES
AVA002	Increased Velocity	4/16/97	Wet	AVAM-B	5-96	814	Medium	DO	Size C	5.00	NO TES	NO TES
AVA002	Increased Velocity	4/16/97	Wet	AVAM-B	5-96	814	Medium	DO	Size C	5.00	NO TES	NO TES
AVA002	Increased Velocity	4/16/97	Wet	AVAM-B	5-96	814	Medium	DO	Size C	5.00	NO TES	NO TES
AVA002	Increased Velocity	4/16/97	Wet	AVAM-B	5-96	814	Medium	DO	Size C	5.00	NO TES	NO TES
AVA003	Increased Velocity	4/16/97	Cold	AVAM-C	5-96	834	Medium	DO	Size C	5.00	NO TES	NO TES
AVA003	Increased Velocity	4/16/97	Cold	AVAM-C	5-96	834	Medium	DO	Size C	5.00	NO TES	NO TES
AVA003	Increased Velocity	4/16/97	Cold	AVAM-C	5-96	834	Medium	DO	Size C	5.00	NO TES	NO TES
AVA003	Increased Velocity	4/16/97	Cold	AVAM-C	5-96	834	Medium	DO	Size C	5.00	NO TES	NO TES
AVA003	Increased Velocity	4/16/97	Cold	AVAM-C	5-96	834	Medium	DO	Size C	5.00	NO TES	NO TES
AVA003	Increased Velocity	4/16/97	Cold	AVAM-C	5-96	834	Medium	DO	Size C	5.00	NO TES	NO TES
AVA003	Increased Velocity	4/16/97	Cold	AVAM-C	5-96	834	Medium	DO	Size C	5.00	NO TES	NO TES
AVA003	Increased Velocity	4/16/97	Cold	AVAM-C	5-96	834	Medium	DO	Size C	5.00	NO TES	NO TES
AVA004	Increased Velocity	4/16/97	Hot	AVAM-D	5-96	831	Medium	DO	Size C	5.00	NO TES	NO TES
AVA004	Increased Velocity	4/16/97	Hot	AVAM-D	5-96	831	Medium	DO	Size C	5.00	NO TES	NO TES
AVA004	Increased Velocity	4/16/97	Hot	AVAM-D	5-96	831	Medium	DO	Size C	5.00	NO TES	NO TES
AVA004	Increased Velocity	4/16/97	Hot	AVAM-D	5-96	831	Medium	DO	Size C	5.00	NO TES	NO TES
AVA004	Increased Velocity	4/16/97	Hot	AVAM-D	5-96	831	Medium	DO	Size C	5.00	NO TES	NO TES
AVA004	Increased Velocity	4/16/97	Hot	AVAM-D	5-96	831	Medium	DO	Size C	5.00	NO TES	NO TES
AVA004	Increased Velocity	4/16/97	Hot	AVAM-D	5-96	831	Medium	DO	Size C	5.00	NO TES	NO TES
AVA004	Increased Velocity	4/16/97	Hot	AVAM-D	5-96	831	Medium	DO	Size C	5.00	NO TES	NO TES
AVA005	Increased Velocity	4/18/97	Ambient	AVAS-A	1-95	777	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA005	Increased Velocity	4/18/97	Ambient	AVAS-A	1-95	777	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA005	Increased Velocity	4/18/97	Ambient	AVAS-A	1-95	777	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA005	Increased Velocity	4/18/97	Ambient	AVAS-A	1-95	777	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA005	Increased Velocity	4/18/97	Ambient	AVAS-A	1-95	777	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA005	Increased Velocity	4/18/97	Ambient	AVAS-A	1-95	777	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA005	Increased Velocity	4/18/97	Ambient	AVAS-A	1-95	777	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA005	Increased Velocity	4/18/97	Ambient	AVAS-A	1-95	777	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA006	Increased Velocity	4/18/97	Wet	AVAS-B	1-95	830	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA006	Increased Velocity	4/18/97	Wet	AVAS-B	1-95	830	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA006	Increased Velocity	4/18/97	Wet	AVAS-B	1-95	830	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA006	Increased Velocity	4/18/97	Wet	AVAS-B	1-95	830	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA006	Increased Velocity	4/18/97	Wet	AVAS-B	1-95	830	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA006	Increased Velocity	4/18/97	Wet	AVAS-B	1-95	830	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA006	Increased Velocity	4/18/97	Wet	AVAS-B	1-95	830	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA006	Increased Velocity	4/18/97	Wet	AVAS-B	1-95	830	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA007	Increased Velocity	4/18/97	Cold	AVAS-C	1-95	825	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA007	Increased Velocity	4/18/97	Cold	AVAS-C	1-95	825	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA007	Increased Velocity	4/18/97	Cold	AVAS-C	1-95	825	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA007	Increased Velocity	4/18/97	Cold	AVAS-C	1-95	825	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA007	Increased Velocity	4/18/97	Cold	AVAS-C	1-95	825	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA007	Increased Velocity	4/18/97	Cold	AVAS-C	1-95	825	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA007	Increased Velocity	4/18/97	Cold	AVAS-C	1-95	825	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA007	Increased Velocity	4/18/97	Cold	AVAS-C	1-95	825	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA008	Increased Velocity	4/18/97	Hot	AVAS-D	1-95	826	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA008	Increased Velocity	4/18/97	Hot	AVAS-D	1-95	826	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA008	Increased Velocity	4/18/97	Hot	AVAS-D	1-95	826	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA008	Increased Velocity	4/18/97	Hot	AVAS-D	1-95	826	XSmall	DO	Size A	3.50	NO TES	NO TES

Table 2.Y
Performance Test Results — Raw Data

DROP NU	HIT NU	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
2	1	NO TES	NO TES	RR	2,4	Flat	235.03	4.20	2.00	6.92	119.72
2	2	NO TES	NO TES	RR	2,4	Flat	247.65	3.40	1.80	6.02	90.60
3	1	NO TES	NO TES	RG	2,4	Hemi	132.94	0.00	0.00	5.99	89.70
3	2	NO TES	NO TES	RG	2,4	Hemi	203.24	1.40	0.30	5.26	69.17
4	1	NO TES	NO TES	FR	2,4	Hemi	398.55	1.30	0.90	6.06	91.81
4	2	NO TES	NO TES	FR	2,4	Hemi	439.57	1.00	0.90	5.24	68.64
1	1	NO TES	NO TES	LF	2,4	Flat	220.25	3.50	1.80	6.92	119.72
1	2	NO TES	NO TES	LF	2,4	Flat	195.41	3.10	0.00	6.09	92.72
2	1	NO TES	NO TES	RR	2,4	Flat	191.55	3.70	0.00	6.96	121.10
2	2	NO TES	NO TES	RR	2,4	Flat	192.50	3.10	0.00	6.09	92.72
3	1	NO TES	NO TES	RG	2,4	Hemi	114.39	0.00	0.00	6.05	91.51
3	2	NO TES	NO TES	RG	2,4	Hemi	117.33	0.00	0.00	5.24	68.64
4	1	NO TES	NO TES	FR	2,4	Hemi	139.75	0.00	0.00	6.06	91.81
4	2	NO TES	NO TES	FR	2,4	Hemi	110.49	0.00	0.00	5.25	68.91
1	1	NO TES	NO TES	LF	2,4	Flat	287.70	3.60	2.60	6.96	121.10
1	2	NO TES	NO TES	LF	2,4	Flat	306.75	3.30	2.50	6.03	90.90
2	1	NO TES	NO TES	RR	2,4	Flat	287.24	3.90	3.00	6.92	119.72
2	2	NO TES	NO TES	RR	2,4	Flat	285.31	3.30	2.20	6.05	91.51
3	1	NO TES	NO TES	RG	2,4	Hemi	156.34	0.20	0.00	6.00	90.00
3	2	NO TES	NO TES	RG	2,4	Hemi	151.03	0.40	0.00	5.22	68.12
4	1	NO TES	NO TES	FR	2,4	Hemi	156.37	0.20	0.00	6.06	91.81
4	2	NO TES	NO TES	FR	2,4	Hemi	147.60	0.00	0.00	5.26	69.17
1	1	NO TES	NO TES	LF	2,4	Flat	237.91	3.80	1.80	6.92	119.72
1	2	NO TES	NO TES	LF	2,4	Flat	243.28	3.00	1.50	6.03	90.90
2	1	NO TES	NO TES	RR	2,4	Flat	242.86	3.60	2.20	6.92	119.72
2	2	NO TES	NO TES	RR	2,4	Flat	253.55	3.40	1.90	6.02	90.60
3	1	NO TES	NO TES	RG	2,4	Hemi	118.35	0.00	0.00	6.00	90.00
3	2	NO TES	NO TES	RG	2,4	Hemi	126.15	0.00	0.00	5.20	67.60
4	1	NO TES	NO TES	FR	2,4	Hemi	137.81	0.00	0.00	6.02	90.60
4	2	NO TES	NO TES	FR	2,4	Hemi	126.61	0.00	0.00	5.20	67.60
1	1	NO TES	NO TES	LF	2,4	Flat	274.99	3.40	2.10	6.92	83.80
1	2	NO TES	NO TES	LF	2,4	Flat	241.83	2.80	1.00	6.09	64.90
2	1	NO TES	NO TES	RR	2,4	Flat	226.21	4.10	1.40	6.79	80.68
2	2	NO TES	NO TES	RR	2,4	Flat	216.37	2.90	0.90	6.05	64.05
3	1	NO TES	NO TES	RG	2,4	Hemi	126.60	0.00	0.00	6.03	63.63
3	2	NO TES	NO TES	RG	2,4	Hemi	113.38	0.00	0.00	5.25	48.23
4	1	NO TES	NO TES	FR	2,4	Hemi	152.92	0.10	0.00	6.08	64.69
4	2	NO TES	NO TES	FR	2,4	Hemi	101.63	0.00	0.00	5.23	47.87
1	1	NO TES	NO TES	LF	2,4	Flat	226.17	4.00	2.60	6.94	84.29
1	2	NO TES	NO TES	LF	2,4	Flat	221.30	3.30	1.90	6.12	65.55
2	1	NO TES	NO TES	RR	2,4	Flat	234.02	4.00	3.00	6.88	82.84
2	2	NO TES	NO TES	RR	2,4	Flat	248.20	3.70	2.60	6.09	64.90
3	1	NO TES	NO TES	RG	2,4	Hemi	126.15	0.00	0.00	6.05	64.05
3	2	NO TES	NO TES	RG	2,4	Hemi	122.18	0.00	0.00	5.30	49.16
4	1	NO TES	NO TES	FR	2,4	Hemi	124.66	0.00	0.00	6.05	64.05
4	2	NO TES	NO TES	FR	2,4	Hemi	118.82	0.00	0.00	5.24	48.05
1	1	NO TES	NO TES	LF	2,4	Flat	307.67	3.60	2.60	6.85	82.11
1	2	NO TES	NO TES	LF	2,4	Flat	296.96	3.10	2.20	6.23	67.92
2	1	NO TES	NO TES	RR	2,4	Flat	257.90	3.80	3.00	6.90	83.32
2	2	NO TES	NO TES	RR	2,4	Flat	250.06	3.60	1.90	6.03	63.63
3	1	NO TES	NO TES	RG	2,4	Hemi	147.09	0.00	0.00	6.00	63.00
3	2	NO TES	NO TES	RG	2,4	Hemi	125.62	0.00	0.00	5.28	48.79
4	1	NO TES	NO TES	FR	2,4	Hemi	147.12	0.00	0.00	6.03	63.63
4	2	NO TES	NO TES	FR	2,4	Hemi	139.27	0.00	0.00	5.23	47.87
1	1	NO TES	NO TES	LF	2,4	Flat	229.12	3.60	1.70	6.86	82.35
1	2	NO TES	NO TES	LF	2,4	Flat	244.74	2.70	1.50	6.00	63.00
2	1	NO TES	NO TES	RR	2,4	Flat	240.30	3.80	3.00	6.85	82.11
2	2	NO TES	NO TES	RR	2,4	Flat	255.99	3.60	2.00	6.05	64.05

Table 2.Y
Performance Test Results — Raw Data

HELME NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
AVA008	Increased Velocity	4/18/97	Hot	AVAS-D	1-95	826	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA008	Increased Velocity	4/18/97	Hot	AVAS-D	1-95	826	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA008	Increased Velocity	4/18/97	Hot	AVAS-D	1-95	826	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA008	Increased Velocity	4/18/97	Hot	AVAS-D	1-95	826	XSmall	DO	Size A	3.50	NO TES	NO TES
AVA009	Increased Velocity	4/21/97	Ambient	AVAL-A	3-96	834	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA009	Increased Velocity	4/21/97	Ambient	AVAL-A	3-96	834	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA009	Increased Velocity	4/21/97	Ambient	AVAL-A	3-96	834	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA009	Increased Velocity	4/21/97	Ambient	AVAL-A	3-96	834	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA009	Increased Velocity	4/21/97	Ambient	AVAL-A	3-96	834	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA009	Increased Velocity	4/21/97	Ambient	AVAL-A	3-96	834	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA009	Increased Velocity	4/21/97	Ambient	AVAL-A	3-96	834	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA009	Increased Velocity	4/21/97	Ambient	AVAL-A	3-96	834	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA010	Increased Velocity	4/21/97	Wet	AVAL-B	3-96	837	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA010	Increased Velocity	4/21/97	Wet	AVAL-B	3-96	837	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA010	Increased Velocity	4/21/97	Wet	AVAL-B	3-96	837	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA010	Increased Velocity	4/21/97	Wet	AVAL-B	3-96	837	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA010	Increased Velocity	4/21/97	Wet	AVAL-B	3-96	837	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA010	Increased Velocity	4/21/97	Wet	AVAL-B	3-96	837	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA010	Increased Velocity	4/21/97	Wet	AVAL-B	3-96	837	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA010	Increased Velocity	4/21/97	Wet	AVAL-B	3-96	837	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA011	Increased Velocity	4/16/97	Cold	AVAL-C	5-96	843	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA011	Increased Velocity	4/16/97	Cold	AVAL-C	5-96	843	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA011	Increased Velocity	4/16/97	Cold	AVAL-C	5-96	843	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA011	Increased Velocity	4/16/97	Cold	AVAL-C	5-96	843	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA011	Increased Velocity	4/16/97	Cold	AVAL-C	5-96	843	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA011	Increased Velocity	4/16/97	Cold	AVAL-C	5-96	843	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA011	Increased Velocity	4/16/97	Cold	AVAL-C	5-96	843	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA011	Increased Velocity	4/16/97	Cold	AVAL-C	5-96	843	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA012	Increased Velocity	4/16/97	Hot	AVAL-D	5-96	857	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA012	Increased Velocity	4/16/97	Hot	AVAL-D	5-96	857	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA012	Increased Velocity	4/16/97	Hot	AVAL-D	5-96	857	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA012	Increased Velocity	4/16/97	Hot	AVAL-D	5-96	857	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA012	Increased Velocity	4/16/97	Hot	AVAL-D	5-96	857	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA012	Increased Velocity	4/16/97	Hot	AVAL-D	5-96	857	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA012	Increased Velocity	4/16/97	Hot	AVAL-D	5-96	857	XLarge	DO	Size D	6.10	NO TES	NO TES
AVA012	Increased Velocity	4/16/97	Hot	AVAL-D	5-96	857	XLarge	DO	Size D	6.10	NO TES	NO TES
AVB001	Increased Velocity	4/17/97	Ambient	AVBS-A	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB001	Increased Velocity	4/17/97	Ambient	AVBS-A	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB001	Increased Velocity	4/17/97	Ambient	AVBS-A	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB001	Increased Velocity	4/17/97	Ambient	AVBS-A	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB001	Increased Velocity	4/17/97	Ambient	AVBS-A	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB001	Increased Velocity	4/17/97	Ambient	AVBS-A	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB001	Increased Velocity	4/17/97	Ambient	AVBS-A	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB001	Increased Velocity	4/17/97	Ambient	AVBS-A	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB002	Increased Velocity	4/17/97	Wet	AVBS-B	7-96	1102	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB002	Increased Velocity	4/17/97	Wet	AVBS-B	7-96	1102	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB002	Increased Velocity	4/17/97	Wet	AVBS-B	7-96	1102	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB002	Increased Velocity	4/17/97	Wet	AVBS-B	7-96	1102	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB002	Increased Velocity	4/17/97	Wet	AVBS-B	7-96	1102	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB002	Increased Velocity	4/17/97	Wet	AVBS-B	7-96	1102	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB002	Increased Velocity	4/17/97	Wet	AVBS-B	7-96	1102	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB002	Increased Velocity	4/17/97	Wet	AVBS-B	7-96	1102	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB003	Increased Velocity	4/17/97	Cold	AVBS-C	7-96	1100	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB003	Increased Velocity	4/17/97	Cold	AVBS-C	7-96	1100	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB003	Increased Velocity	4/17/97	Cold	AVBS-C	7-96	1100	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB003	Increased Velocity	4/17/97	Cold	AVBS-C	7-96	1100	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB003	Increased Velocity	4/17/97	Cold	AVBS-C	7-96	1100	XSmall	DO	Size A	3.50	NO TES	NO TES
AVB003	Increased Velocity	4/17/97	Cold	AVBS-C	7-96	1100	XSmall	DO	Size A	3.50	NO TES	NO TES

Table 2.Y
Performance Test Results — Raw Data

DROP NU	HIT NU	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
3	1	NO TES	NO TES	RG	2,4	Hemi	137.84	0.00	0.00	6.03	63.63
3	2	NO TES	NO TES	RG	2,4	Hemi	125.15	0.00	0.00	5.20	47.32
4	1	NO TES	NO TES	FR	2,4	Hemi	135.85	0.00	0.00	6.02	63.42
4	2	NO TES	NO TES	FR	2,4	Hemi	141.71	0.00	0.00	5.22	47.68
1	1	NO TES	NO TES	LF	2,4	Flat	200.81	2.80	0.10	6.90	145.21
1	2	NO TES	NO TES	LF	2,4	Flat	219.83	2.70	1.50	6.00	109.80
2	1	NO TES	NO TES	RR	2,4	Flat	225.21	3.70	1.90	6.94	146.90
2	2	NO TES	NO TES	RR	2,4	Flat	241.38	3.10	2.00	6.18	116.49
3	1	NO TES	NO TES	RG	2,4	Hemi	224.77	1.20	0.60	6.00	109.80
3	2	NO TES	NO TES	RG	2,4	Hemi	432.76	1.10	0.90	5.28	85.03
4	1	NO TES	NO TES	FR	2,4	Hemi	378.55	1.30	1.10	6.08	112.75
4	2	NO TES	NO TES	FR	2,4	Hemi	479.63	1.20	1.00	5.25	84.07
1	1	NO TES	NO TES	LF	2,4	Flat	204.14	3.50	0.90	6.94	146.90
1	2	NO TES	NO TES	LF	2,4	Flat	192.96	3.00	0.00	6.06	112.01
2	1	NO TES	NO TES	RR	2,4	Flat	226.23	3.70	2.00	7.06	152.02
2	2	NO TES	NO TES	RR	2,4	Flat	228.15	3.20	1.90	6.14	114.98
3	1	NO TES	NO TES	RG	2,4	Hemi	398.54	1.40	1.10	5.99	109.43
3	2	NO TES	NO TES	RG	2,4	Hemi	432.72	1.10	0.90	5.31	86.00
4	1	NO TES	NO TES	FR	2,4	Hemi	350.72	1.30	1.00	6.02	110.53
4	2	NO TES	NO TES	FR	2,4	Hemi	418.10	1.20	1.00	5.27	84.71
1	1	NO TES	NO TES	LF	2,4	Flat	232.09	3.10	2.00	6.94	146.90
1	2	NO TES	NO TES	LF	2,4	Flat	229.16	2.60	1.90	6.05	111.64
2	1	NO TES	NO TES	RR	2,4	Flat	279.47	3.80	2.60	7.02	150.31
2	2	NO TES	NO TES	RR	2,4	Flat	251.58	3.20	2.10	6.00	109.80
3	1	NO TES	NO TES	RG	2,4	Hemi	168.09	1.10	0.00	6.02	110.53
3	2	NO TES	NO TES	RG	2,4	Hemi	310.70	1.30	0.90	5.26	84.39
4	1	NO TES	NO TES	FR	2,4	Hemi	384.88	1.30	1.00	6.00	109.80
4	2	NO TES	NO TES	FR	2,4	Hemi	474.24	1.20	1.00	5.23	83.43
1	1	NO TES	NO TES	LF	2,4	Flat	201.31	3.00	0.20	6.94	146.90
1	2	NO TES	NO TES	LF	2,4	Flat	204.29	2.60	0.60	6.02	110.53
2	1	NO TES	NO TES	RR	2,4	Flat	280.91	3.40	2.30	6.77	139.79
2	2	NO TES	NO TES	RR	2,4	Flat	240.35	3.00	1.60	6.02	110.53
3	1	NO TES	NO TES	RG	2,4	Hemi	598.78	1.20	1.10	6.06	112.01
3	2	NO TES	NO TES	RG	2,4	Hemi	512.76	1.10	0.90	5.30	85.67
4	1	NO TES	NO TES	FR	2,4	Hemi	406.84	1.30	1.00	6.05	111.64
4	2	NO TES	NO TES	FR	2,4	Hemi	464.96	1.20	1.00	5.27	84.71
1	1	NO TES	NO TES	LF	2,4	Flat	263.28	3.80	2.70	6.85	82.11
1	2	NO TES	NO TES	LF	2,4	Flat	247.64	3.30	2.60	6.03	63.63
2	1	NO TES	NO TES	RR	2,4	Flat	262.30	4.00	2.50	6.90	83.32
2	2	NO TES	NO TES	RR	2,4	Flat	279.44	3.80	2.50	6.08	64.69
3	1	NO TES	NO TES	RG	2,4	Hemi	144.14	0.00	0.00	6.05	64.05
3	2	NO TES	NO TES	RG	2,4	Hemi	131.97	0.00	0.00	5.29	48.97
4	1	NO TES	NO TES	FR	2,4	Hemi	128.55	0.00	0.00	6.05	64.05
4	2	NO TES	NO TES	FR	2,4	Hemi	129.48	0.00	0.00	5.24	48.05
1	1	NO TES	NO TES	LF	2,4	Flat	249.64	3.70	2.80	6.90	83.32
1	2	NO TES	NO TES	LF	2,4	Flat	260.85	3.40	2.30	6.08	64.69
2	1	NO TES	NO TES	RR	2,4	Flat	249.14	3.90	3.00	6.92	83.80
2	2	NO TES	NO TES	RR	2,4	Flat	252.99	3.70	2.90	6.06	64.27
3	1	NO TES	NO TES	RG	2,4	Hemi	133.94	0.00	0.00	6.06	64.27
3	2	NO TES	NO TES	RG	2,4	Hemi	122.69	0.00	0.00	5.25	48.23
4	1	NO TES	NO TES	FR	2,4	Hemi	121.19	0.00	0.00	6.08	64.69
4	2	NO TES	NO TES	FR	2,4	Hemi	126.59	0.00	0.00	5.25	48.23
1	1	NO TES	NO TES	LF	2,4	Flat	264.77	3.50	2.70	6.86	82.35
1	2	NO TES	NO TES	LF	2,4	Flat	287.77	3.20	2.40	6.06	64.27
2	1	NO TES	NO TES	RR	2,4	Flat	273.56	3.90	3.20	6.92	83.80
2	2	NO TES	NO TES	RR	2,4	Flat	283.30	3.70	2.60	6.06	64.27
3	1	NO TES	NO TES	RG	2,4	Hemi	157.40	0.80	0.00	6.06	64.27
3	2	NO TES	NO TES	RG	2,4	Hemi	135.85	0.00	0.00	5.23	47.87

Table 2.Y
Performance Test Results — Raw Data

HELMET NUMBE	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBE	MAN DATE	SAMPLE WEIGH	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
AVB00	Increased Velocity	4/17/97	Cold	AVBS-C	7-96	1100	XSmall	DOT	Size A	3.50	NO TES	NO TES
AVB00	Increased Velocity	4/17/97	Cold	AVBS-C	7-96	1100	XSmall	DOT	Size A	3.50	NO TES	NO TES
AVB00	Increased Velocity	4/17/97	Hot	AVBS-D	7-96	1111	XSmall	DOT	Size A	3.50	NO TES	NO TES
AVB00	Increased Velocity	4/17/97	Hot	AVBS-D	7-96	1111	XSmall	DOT	Size A	3.50	NO TES	NO TES
AVB00	Increased Velocity	4/17/97	Hot	AVBS-D	7-96	1111	XSmall	DOT	Size A	3.50	NO TES	NO TES
AVB00	Increased Velocity	4/17/97	Hot	AVBS-D	7-96	1111	XSmall	DOT	Size A	3.50	NO TES	NO TES
AVB00	Increased Velocity	4/17/97	Hot	AVBS-D	7-96	1111	XSmall	DOT	Size A	3.50	NO TES	NO TES
AVB00	Increased Velocity	4/17/97	Hot	AVBS-D	7-96	1111	XSmall	DOT	Size A	3.50	NO TES	NO TES
AVB00	Increased Velocity	4/17/97	Hot	AVBS-D	7-96	1111	XSmall	DOT	Size A	3.50	NO TES	NO TES
AVB00	Increased Velocity	4/17/97	Hot	AVBS-D	7-96	1111	XSmall	DOT	Size A	3.50	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Ambient	AVBL-A	9-95	1276	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Ambient	AVBL-A	9-95	1276	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Ambient	AVBL-A	9-95	1276	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Ambient	AVBL-A	9-95	1276	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Ambient	AVBL-A	9-95	1276	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Ambient	AVBL-A	9-95	1276	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Ambient	AVBL-A	9-95	1276	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Ambient	AVBL-A	9-95	1276	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Wet	AVBL-B	9-95	1279	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Wet	AVBL-B	9-95	1279	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Wet	AVBL-B	9-95	1279	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Wet	AVBL-B	9-95	1279	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Wet	AVBL-B	9-95	1279	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Wet	AVBL-B	9-95	1279	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Wet	AVBL-B	9-95	1279	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Wet	AVBL-B	9-95	1279	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Cold	AVBL-C	9-95	1279	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Cold	AVBL-C	9-95	1279	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Cold	AVBL-C	9-95	1279	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Cold	AVBL-C	9-95	1279	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Cold	AVBL-C	9-95	1279	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Cold	AVBL-C	9-95	1279	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Cold	AVBL-C	9-95	1279	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Cold	AVBL-C	9-95	1279	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Hot	AVBL-D	9-95	1296	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Hot	AVBL-D	9-95	1296	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Hot	AVBL-D	9-95	1296	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Hot	AVBL-D	9-95	1296	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Hot	AVBL-D	9-95	1296	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Hot	AVBL-D	9-95	1296	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Hot	AVBL-D	9-95	1296	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/21/97	Hot	AVBL-D	9-95	1296	XLarge	DOT	Size D	6.10	NO TES	NO TES
AVB00	Increased Velocity	4/22/97	Ambient	AVBM-A	10-91	1371	Medium	DOT	Size C	5.00	NO TES	NO TES
AVB00	Increased Velocity	4/22/97	Ambient	AVBM-A	10-91	1371	Medium	DOT	Size C	5.00	NO TES	NO TES
AVB00	Increased Velocity	4/22/97	Ambient	AVBM-A	10-91	1371	Medium	DOT	Size C	5.00	NO TES	NO TES
AVB00	Increased Velocity	4/22/97	Ambient	AVBM-A	10-91	1371	Medium	DOT	Size C	5.00	NO TES	NO TES
AVB00	Increased Velocity	4/22/97	Ambient	AVBM-A	10-91	1371	Medium	DOT	Size C	5.00	NO TES	NO TES
AVB00	Increased Velocity	4/22/97	Ambient	AVBM-A	10-91	1371	Medium	DOT	Size C	5.00	NO TES	NO TES
AVB00	Increased Velocity	4/22/97	Ambient	AVBM-A	10-91	1371	Medium	DOT	Size C	5.00	NO TES	NO TES
AVB00	Increased Velocity	4/22/97	Ambient	AVBM-A	10-91	1371	Medium	DOT	Size C	5.00	NO TES	NO TES
AVB01	Increased Velocity	4/22/97	Wet	AVBM-B	10-91	1400	Medium	DOT	Size C	5.00	NO TES	NO TES
AVB01	Increased Velocity	4/22/97	Wet	AVBM-B	10-91	1400	Medium	DOT	Size C	5.00	NO TES	NO TES
AVB01	Increased Velocity	4/22/97	Wet	AVBM-B	10-91	1400	Medium	DOT	Size C	5.00	NO TES	NO TES
AVB01	Increased Velocity	4/22/97	Wet	AVBM-B	10-91	1400	Medium	DOT	Size C	5.00	NO TES	NO TES
AVB01	Increased Velocity	4/22/97	Wet	AVBM-B	10-91	1400	Medium	DOT	Size C	5.00	NO TES	NO TES
AVB01	Increased Velocity	4/22/97	Wet	AVBM-B	10-91	1400	Medium	DOT	Size C	5.00	NO TES	NO TES
AVB01	Increased Velocity	4/22/97	Wet	AVBM-B	10-91	1400	Medium	DOT	Size C	5.00	NO TES	NO TES
AVB01	Increased Velocity	4/22/97	Wet	AVBM-B	10-91	1400	Medium	DOT	Size C	5.00	NO TES	NO TES

Table 2.Y
Performance Test Results — Raw Data

DROP NUM	HIT NUM	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCIT (M/S)	ENERGY (JOULES)
4	1	NO TES	NO TES	FR	2,4	Hemi	148.03	0.00	0.00	6.06	64.27
4	2	NO TES	NO TES	FR	2,4	Hemi	168.11	0.20	0.00	5.23	47.87
1	1	NO TES	NO TES	LF	2,4	Flat	244.28	3.80	2.80	7.67	102.95
1	2	NO TES	NO TES	LF	2,4	Flat	266.23	3.40	2.60	6.05	64.05
2	1	NO TES	NO TES	RR	2,4	Flat	255.94	4.00	3.10	6.90	83.32
2	2	NO TES	NO TES	RR	2,4	Flat	270.13	3.70	2.30	6.05	64.05
3	1	NO TES	NO TES	RG	2,4	Hemi	150.50	0.10	0.00	6.05	64.05
3	2	NO TES	NO TES	RG	2,4	Hemi	126.56	0.00	0.00	5.23	47.87
4	1	NO TES	NO TES	FR	2,4	Hemi	131.49	0.00	0.00	6.06	64.27
4	2	NO TES	NO TES	FR	2,4	Hemi	115.84	0.00	0.00	5.26	48.42
1	1	NO TES	NO TES	LF	2,4	Flat	218.81	3.80	2.20	6.92	146.05
1	2	NO TES	NO TES	LF	2,4	Flat	219.87	3.20	1.60	6.02	110.53
2	1	NO TES	NO TES	RR	2,4	Flat	250.60	3.80	2.50	6.94	146.90
2	2	NO TES	NO TES	RR	2,4	Flat	209.10	3.20	0.60	6.05	111.64
3	1	NO TES	NO TES	RG	2,4	Hemi	123.66	0.00	0.00	6.12	114.24
3	2	NO TES	NO TES	RG	2,4	Hemi	136.34	0.00	0.00	5.29	85.35
4	1	NO TES	NO TES	FR	2,4	Hemi	130.02	0.00	0.00	6.05	111.64
4	2	NO TES	NO TES	FR	2,4	Hemi	190.56	1.50	0.00	5.27	84.71
1	1	NO TES	NO TES	LF	2,4	Flat	211.55	3.50	1.90	6.96	147.75
1	2	NO TES	NO TES	LF	2,4	Flat	213.47	3.00	1.30	6.06	112.01
2	1	NO TES	NO TES	RR	2,4	Flat	190.59	3.90	0.00	6.94	146.90
2	2	NO TES	NO TES	RR	2,4	Flat	196.93	3.80	0.00	6.08	112.75
3	1	NO TES	NO TES	RG	2,4	Hemi	119.76	0.00	0.00	6.08	112.75
3	2	NO TES	NO TES	RG	2,4	Hemi	140.75	0.00	0.00	5.23	83.43
4	1	NO TES	NO TES	FR	2,4	Hemi	135.40	0.00	0.00	6.06	112.01
4	2	NO TES	NO TES	FR	2,4	Hemi	210.56	1.60	0.50	5.20	82.47
1	1	NO TES	NO TES	LF	2,4	Flat	211.57	3.40	1.80	6.90	145.21
1	2	NO TES	NO TES	LF	2,4	Flat	238.42	3.10	2.30	6.02	110.53
2	1	NO TES	NO TES	RR	2,4	Flat	198.33	3.90	0.00	6.90	145.21
2	2	NO TES	NO TES	RR	2,4	Flat	208.64	3.50	0.80	6.06	112.01
3	1	NO TES	NO TES	RG	2,4	Hemi	119.80	0.00	0.00	6.06	112.01
3	2	NO TES	NO TES	RG	2,4	Hemi	130.99	0.00	0.00	5.28	85.03
4	1	NO TES	NO TES	FR	2,4	Hemi	128.08	0.00	0.00	6.03	110.90
4	2	NO TES	NO TES	FR	2,4	Hemi	164.21	1.30	0.00	5.29	85.35
1	1	NO TES	NO TES	LF	2,4	Flat	210.02	3.60	2.00	6.92	146.05
1	2	NO TES	NO TES	LF	2,4	Flat	213.51	2.90	1.80	6.03	110.90
2	1	NO TES	NO TES	RR	2,4	Flat	190.11	3.70	0.00	6.90	145.21
2	2	NO TES	NO TES	RR	2,4	Flat	202.30	3.30	0.30	6.03	110.90
3	1	NO TES	NO TES	RG	2,4	Hemi	118.31	0.00	0.00	6.11	113.86
3	2	NO TES	NO TES	RG	2,4	Hemi	139.73	0.00	0.00	5.24	83.75
4	1	NO TES	NO TES	FR	2,4	Hemi	143.23	0.00	0.00	6.02	110.53
4	2	NO TES	NO TES	FR	2,4	Hemi	503.59	1.10	1.00	5.27	84.71
1	1	NO TES	NO TES	LF	2,4	Flat	239.36	3.60	2.50	6.86	117.65
1	2	NO TES	NO TES	LF	2,4	Flat	245.69	3.30	2.40	6.00	90.00
2	1	NO TES	NO TES	RR	2,4	Flat	281.38	3.60	3.20	6.90	119.03
2	2	NO TES	NO TES	RR	2,4	Flat	246.21	3.60	2.80	6.08	92.42
3	1	NO TES	NO TES	RG	2,4	Hemi	120.20	0.00	0.00	6.03	90.90
3	2	NO TES	NO TES	RG	2,4	Hemi	131.92	0.00	0.00	5.24	68.64
4	1	NO TES	NO TES	FR	2,4	Hemi	127.57	0.00	0.00	6.05	91.51
4	2	NO TES	NO TES	FR	2,4	Hemi	125.53	0.00	0.00	5.23	68.38
1	1	NO TES	NO TES	LF	2,4	Flat	241.80	3.40	2.60	6.92	119.72
1	2	NO TES	NO TES	LF	2,4	Flat	234.05	3.00	2.00	6.06	91.81
2	1	NO TES	NO TES	RR	2,4	Flat	231.11	3.70	2.60	6.94	120.41
2	2	NO TES	NO TES	RR	2,4	Flat	245.73	3.50	2.60	6.05	91.51
3	1	NO TES	NO TES	RG	2,4	Hemi	120.20	0.00	0.00	6.02	90.60
3	2	NO TES	NO TES	RG	2,4	Hemi	127.58	0.00	0.00	5.25	68.91
4	1	NO TES	NO TES	FR	2,4	Hemi	118.25	0.00	0.00	6.12	93.64
4	2	NO TES	NO TES	FR	2,4	Hemi	120.68	0.00	0.00	5.25	68.91

Table 2.Y
Performance Test Results — Raw Data

HELMET NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
AVB011	Increased Velocity	4/22/97	Cold	AVBM-C	10-91	1373	Medium	DOT	Size C	5.00	NO TEST	NO TEST
AVB011	Increased Velocity	4/22/97	Cold	AVBM-C	10-91	1373	Medium	DOT	Size C	5.00	NO TEST	NO TEST
AVB011	Increased Velocity	4/22/97	Cold	AVBM-C	10-91	1373	Medium	DOT	Size C	5.00	NO TEST	NO TEST
AVB011	Increased Velocity	4/22/97	Cold	AVBM-C	10-91	1373	Medium	DOT	Size C	5.00	NO TEST	NO TEST
AVB011	Increased Velocity	4/22/97	Cold	AVBM-C	10-91	1373	Medium	DOT	Size C	5.00	NO TEST	NO TEST
AVB011	Increased Velocity	4/22/97	Cold	AVBM-C	10-91	1373	Medium	DOT	Size C	5.00	NO TEST	NO TEST
AVB011	Increased Velocity	4/22/97	Cold	AVBM-C	10-91	1373	Medium	DOT	Size C	5.00	NO TEST	NO TEST
AVB011	Increased Velocity	4/22/97	Cold	AVBM-C	10-91	1373	Medium	DOT	Size C	5.00	NO TEST	NO TEST
AVB012	Increased Velocity	4/22/97	Hot	AVBM-D	10-91	1374	Medium	DOT	Size C	5.00	NO TEST	NO TEST
AVB012	Increased Velocity	4/22/97	Hot	AVBM-D	10-91	1374	Medium	DOT	Size C	5.00	NO TEST	NO TEST
AVB012	Increased Velocity	4/22/97	Hot	AVBM-D	10-91	1374	Medium	DOT	Size C	5.00	NO TEST	NO TEST
AVB012	Increased Velocity	4/22/97	Hot	AVBM-D	10-91	1374	Medium	DOT	Size C	5.00	NO TEST	NO TEST
AVB012	Increased Velocity	4/22/97	Hot	AVBM-D	10-91	1374	Medium	DOT	Size C	5.00	NO TEST	NO TEST
AVB012	Increased Velocity	4/22/97	Hot	AVBM-D	10-91	1374	Medium	DOT	Size C	5.00	NO TEST	NO TEST
AVB012	Increased Velocity	4/22/97	Hot	AVBM-D	10-91	1374	Medium	DOT	Size C	5.00	NO TEST	NO TEST
AVB012	Increased Velocity	4/22/97	Hot	AVBM-D	10-91	1374	Medium	DOT	Size C	5.00	NO TEST	NO TEST
AVC001	Increased Velocity	4/17/97	Ambient	AVCS-A	2-97	1450	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC001	Increased Velocity	4/17/97	Ambient	AVCS-A	2-97	1450	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC001	Increased Velocity	4/17/97	Ambient	AVCS-A	2-97	1450	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC001	Increased Velocity	4/17/97	Ambient	AVCS-A	2-97	1450	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC001	Increased Velocity	4/17/97	Ambient	AVCS-A	2-97	1450	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC001	Increased Velocity	4/17/97	Ambient	AVCS-A	2-97	1450	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC001	Increased Velocity	4/17/97	Ambient	AVCS-A	2-97	1450	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC001	Increased Velocity	4/17/97	Ambient	AVCS-A	2-97	1450	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC002	Increased Velocity	4/17/97	Wet	AVCS-B	2-97	1473	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC002	Increased Velocity	4/17/97	Wet	AVCS-B	2-97	1473	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC002	Increased Velocity	4/17/97	Wet	AVCS-B	2-97	1473	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC002	Increased Velocity	4/17/97	Wet	AVCS-B	2-97	1473	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC002	Increased Velocity	4/17/97	Wet	AVCS-B	2-97	1473	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC002	Increased Velocity	4/17/97	Wet	AVCS-B	2-97	1473	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC002	Increased Velocity	4/17/97	Wet	AVCS-B	2-97	1473	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC002	Increased Velocity	4/17/97	Wet	AVCS-B	2-97	1473	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC003	Increased Velocity	4/17/97	Cold	AVCS-C	2-97	1461	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC003	Increased Velocity	4/17/97	Cold	AVCS-C	2-97	1461	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC003	Increased Velocity	4/17/97	Cold	AVCS-C	2-97	1461	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC003	Increased Velocity	4/17/97	Cold	AVCS-C	2-97	1461	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC003	Increased Velocity	4/17/97	Cold	AVCS-C	2-97	1461	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC003	Increased Velocity	4/17/97	Cold	AVCS-C	2-97	1461	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC003	Increased Velocity	4/17/97	Cold	AVCS-C	2-97	1461	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC003	Increased Velocity	4/17/97	Cold	AVCS-C	2-97	1461	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC004	Increased Velocity	4/17/97	Hot	AVCS-D	2-97	1476	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC004	Increased Velocity	4/17/97	Hot	AVCS-D	2-97	1476	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC004	Increased Velocity	4/17/97	Hot	AVCS-D	2-97	1476	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC004	Increased Velocity	4/17/97	Hot	AVCS-D	2-97	1476	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC004	Increased Velocity	4/17/97	Hot	AVCS-D	2-97	1476	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC004	Increased Velocity	4/17/97	Hot	AVCS-D	2-97	1476	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC004	Increased Velocity	4/17/97	Hot	AVCS-D	2-97	1476	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC004	Increased Velocity	4/17/97	Hot	AVCS-D	2-97	1476	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
AVC005	Increased Velocity	4/21/97	Ambient	AVCL-A	11-95	1420	Large	DOT	Size D	6.10	NO TEST	NO TEST
AVC005	Increased Velocity	4/21/97	Ambient	AVCL-A	11-95	1420	Large	DOT	Size D	6.10	NO TEST	NO TEST
AVC005	Increased Velocity	4/21/97	Ambient	AVCL-A	11-95	1420	Large	DOT	Size D	6.10	NO TEST	NO TEST
AVC005	Increased Velocity	4/21/97	Ambient	AVCL-A	11-95	1420	Large	DOT	Size D	6.10	NO TEST	NO TEST
AVC005	Increased Velocity	4/21/97	Ambient	AVCL-A	11-95	1420	Large	DOT	Size D	6.10	NO TEST	NO TEST
AVC005	Increased Velocity	4/21/97	Ambient	AVCL-A	11-95	1420	Large	DOT	Size D	6.10	NO TEST	NO TEST
AVC005	Increased Velocity	4/21/97	Ambient	AVCL-A	11-95	1420	Large	DOT	Size D	6.10	NO TEST	NO TEST
AVC005	Increased Velocity	4/21/97	Ambient	AVCL-A	11-95	1420	Large	DOT	Size D	6.10	NO TEST	NO TEST
AVC006	Increased Velocity	4/21/97	Wet	AVCL-B	11-95	1408	Large	DOT	Size D	6.10	NO TEST	NO TEST
AVC006	Increased Velocity	4/21/97	Wet	AVCL-B	11-95	1408	Large	DOT	Size D	6.10	NO TEST	NO TEST

Table 2.Y
Performance Test Results — Raw Data

DROP NUM	HIT NUM	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
1	1	NO TEST	NO TEST	LF	2,4	Flat	261.83	3.60	2.70	6.90	119.03
1	2	NO TEST	NO TEST	LF	2,4	Flat	247.68	3.30	2.50	6.02	90.60
2	1	NO TEST	NO TEST	RR	2,4	Flat	229.10	3.60	2.70	6.90	119.03
2	2	NO TEST	NO TEST	RR	2,4	Flat	245.73	3.40	2.80	6.06	91.81
3	1	NO TEST	NO TEST	RG	2,4	Hemi	119.25	0.00	0.00	6.06	91.81
3	2	NO TEST	NO TEST	RG	2,4	Hemi	132.92	0.00	0.00	5.23	68.38
4	1	NO TEST	NO TEST	FR	2,4	Hemi	125.06	0.00	0.00	6.05	91.51
4	2	NO TEST	NO TEST	FR	2,4	Hemi	136.87	0.00	0.00	5.22	68.12
1	1	NO TEST	NO TEST	LF	2,4	Flat	236.43	3.70	2.60	6.88	118.34
1	2	NO TEST	NO TEST	LF	2,4	Flat	230.55	3.30	2.50	6.03	90.90
2	1	NO TEST	NO TEST	RR	2,4	Flat	215.98	3.70	2.70	6.86	117.65
2	2	NO TEST	NO TEST	RR	2,4	Flat	244.25	3.50	2.90	6.06	91.81
3	1	NO TEST	NO TEST	RG	2,4	Hemi	116.81	0.00	0.00	6.08	92.42
3	2	NO TEST	NO TEST	RG	2,4	Hemi	127.50	0.00	0.00	5.20	67.60
4	1	NO TEST	NO TEST	FR	2,4	Hemi	120.75	0.00	0.00	5.99	89.70
4	2	NO TEST	NO TEST	FR	2,4	Hemi	127.14	0.00	0.00	5.24	68.64
1	1	NO TEST	NO TEST	LF	2,4	Flat	225.70	3.70	2.10	6.90	83.32
1	2	NO TEST	NO TEST	LF	2,4	Flat	216.38	3.10	1.50	6.08	64.69
2	1	NO TEST	NO TEST	RR	2,4	Flat	218.37	4.10	1.40	6.96	84.77
2	2	NO TEST	NO TEST	RR	2,4	Flat	209.53	3.30	0.80	6.09	64.90
3	1	NO TEST	NO TEST	RG	2,4	Hemi	184.19	2.00	0.00	6.02	63.42
3	2	NO TEST	NO TEST	RG	2,4	Hemi	149.52	0.00	0.00	5.25	48.23
4	1	NO TEST	NO TEST	FR	2,4	Hemi	166.66	1.80	0.00	6.05	64.05
4	2	NO TEST	NO TEST	FR	2,4	Hemi	161.25	2.00	0.00	5.29	48.97
1	1	NO TEST	NO TEST	LF	2,4	Flat	217.92	4.00	2.10	6.94	84.29
1	2	NO TEST	NO TEST	LF	2,4	Flat	217.92	3.60	1.90	6.12	65.55
2	1	NO TEST	NO TEST	RR	2,4	Flat	222.31	4.20	3.00	6.98	85.26
2	2	NO TEST	NO TEST	RR	2,4	Flat	205.67	3.80	0.60	6.09	64.90
3	1	NO TEST	NO TEST	RG	2,4	Hemi	169.08	1.50	0.00	6.09	64.90
3	2	NO TEST	NO TEST	RG	2,4	Hemi	154.90	0.80	0.00	5.27	48.60
4	1	NO TEST	NO TEST	FR	2,4	Hemi	163.22	1.00	0.00	6.09	64.90
4	2	NO TEST	NO TEST	FR	2,4	Hemi	148.56	0.00	0.00	5.25	48.23
1	1	NO TEST	NO TEST	LF	2,4	Flat	240.33	3.80	2.00	6.94	84.29
1	2	NO TEST	NO TEST	LF	2,4	Flat	220.33	3.40	1.40	6.06	64.27
2	1	NO TEST	NO TEST	RR	2,4	Flat	235.46	4.10	2.50	6.90	83.32
2	2	NO TEST	NO TEST	RR	2,4	Flat	244.78	3.90	1.70	6.05	64.05
3	1	NO TEST	NO TEST	RG	2,4	Hemi	165.67	2.90	0.00	6.03	63.63
3	2	NO TEST	NO TEST	RG	2,4	Hemi	160.76	1.60	0.00	5.23	47.87
4	1	NO TEST	NO TEST	FR	2,4	Hemi	196.88	2.90	0.00	6.03	63.63
4	2	NO TEST	NO TEST	FR	2,4	Hemi	176.41	2.40	0.00	5.23	47.87
1	1	NO TEST	NO TEST	LF	2,4	Flat	202.74	3.40	0.50	6.94	84.29
1	2	NO TEST	NO TEST	LF	2,4	Flat	203.23	3.00	0.20	6.05	64.05
2	1	NO TEST	NO TEST	RR	2,4	Flat	214.41	4.20	1.50	6.90	83.32
2	2	NO TEST	NO TEST	RR	2,4	Flat	206.22	3.60	0.30	6.03	63.63
3	1	NO TEST	NO TEST	RG	2,4	Hemi	158.79	1.00	0.00	6.05	64.05
3	2	NO TEST	NO TEST	RG	2,4	Hemi	134.93	0.00	0.00	5.23	47.87
4	1	NO TEST	NO TEST	FR	2,4	Hemi	175.36	2.00	0.00	6.05	64.05
4	2	NO TEST	NO TEST	FR	2,4	Hemi	155.80	2.00	0.00	5.22	47.68
1	1	NO TEST	NO TEST	LF	2,4	Flat	193.97	3.30	0.00	6.90	145.21
1	2	NO TEST	NO TEST	LF	2,4	Flat	190.05	2.80	0.00	6.08	112.75
2	1	NO TEST	NO TEST	RR	2,4	Flat	192.09	3.70	0.00	6.94	146.90
2	2	NO TEST	NO TEST	RR	2,4	Flat	201.36	3.20	0.40	6.08	112.75
3	1	NO TEST	NO TEST	RG	2,4	Hemi	117.81	0.00	0.00	6.08	112.75
3	2	NO TEST	NO TEST	RG	2,4	Hemi	113.95	0.00	0.00	5.22	83.11
4	1	NO TEST	NO TEST	FR	2,4	Hemi	140.77	0.00	0.00	6.00	109.80
4	2	NO TEST	NO TEST	FR	2,4	Hemi	117.31	0.00	0.00	5.22	83.11
1	1	NO TEST	NO TEST	LF	2,4	Flat	168.56	2.70	0.00	6.94	146.90
1	2	NO TEST	NO TEST	LF	2,4	Flat	167.16	2.00	0.00	6.03	110.90

Table 2.Y
Performance Test Results — Raw Data

HELME NUMBER	TEST TYPE	TEST DAT	TEST COND	SAMPLE NUMBER	MAN DAT	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
AVC006	Increased Velocity	4/21/97	Wet	AVCL-B	11-95	1408	Large	DO	Size D	6.10	NO TES	NO TES
AVC006	Increased Velocity	4/21/97	Wet	AVCL-B	11-95	1408	Large	DO	Size D	6.10	NO TES	NO TES
AVC006	Increased Velocity	4/21/97	Wet	AVCL-B	11-95	1408	Large	DO	Size D	6.10	NO TES	NO TES
AVC006	Increased Velocity	4/21/97	Wet	AVCL-B	11-95	1408	Large	DO	Size D	6.10	NO TES	NO TES
AVC006	Increased Velocity	4/21/97	Wet	AVCL-B	11-95	1408	Large	DO	Size D	6.10	NO TES	NO TES
AVC006	Increased Velocity	4/21/97	Wet	AVCL-B	11-95	1408	Large	DO	Size D	6.10	NO TES	NO TES
AVC007	Increased Velocity	4/21/97	Cold	AVCL-C	11-95	1412	Large	DO	Size D	6.10	NO TES	NO TES
AVC007	Increased Velocity	4/21/97	Cold	AVCL-C	11-95	1412	Large	DO	Size D	6.10	NO TES	NO TES
AVC007	Increased Velocity	4/21/97	Cold	AVCL-C	11-95	1412	Large	DO	Size D	6.10	NO TES	NO TES
AVC007	Increased Velocity	4/21/97	Cold	AVCL-C	11-95	1412	Large	DO	Size D	6.10	NO TES	NO TES
AVC007	Increased Velocity	4/21/97	Cold	AVCL-C	11-95	1412	Large	DO	Size D	6.10	NO TES	NO TES
AVC007	Increased Velocity	4/21/97	Cold	AVCL-C	11-95	1412	Large	DO	Size D	6.10	NO TES	NO TES
AVC007	Increased Velocity	4/21/97	Cold	AVCL-C	11-95	1412	Large	DO	Size D	6.10	NO TES	NO TES
AVC007	Increased Velocity	4/21/97	Cold	AVCL-C	11-95	1412	Large	DO	Size D	6.10	NO TES	NO TES
AVC008	Increased Velocity	4/21/97	Hot	AVCL-D	11-95	1434	Large	DO	Size D	6.10	NO TES	NO TES
AVC008	Increased Velocity	4/21/97	Hot	AVCL-D	11-95	1434	Large	DO	Size D	6.10	NO TES	NO TES
AVC008	Increased Velocity	4/21/97	Hot	AVCL-D	11-95	1434	Large	DO	Size D	6.10	NO TES	NO TES
AVC008	Increased Velocity	4/21/97	Hot	AVCL-D	11-95	1434	Large	DO	Size D	6.10	NO TES	NO TES
AVC008	Increased Velocity	4/21/97	Hot	AVCL-D	11-95	1434	Large	DO	Size D	6.10	NO TES	NO TES
AVC008	Increased Velocity	4/21/97	Hot	AVCL-D	11-95	1434	Large	DO	Size D	6.10	NO TES	NO TES
AVC008	Increased Velocity	4/21/97	Hot	AVCL-D	11-95	1434	Large	DO	Size D	6.10	NO TES	NO TES
AVC008	Increased Velocity	4/21/97	Hot	AVCL-D	11-95	1434	Large	DO	Size D	6.10	NO TES	NO TES
AVC009	Increased Velocity	4/22/97	Ambient	AVCM-A	11-95	1413	Medium	DO	Size C	5.00	NO TES	NO TES
AVC009	Increased Velocity	4/22/97	Ambient	AVCM-A	11-95	1413	Medium	DO	Size C	5.00	NO TES	NO TES
AVC009	Increased Velocity	4/22/97	Ambient	AVCM-A	11-95	1413	Medium	DO	Size C	5.00	NO TES	NO TES
AVC009	Increased Velocity	4/22/97	Ambient	AVCM-A	11-95	1413	Medium	DO	Size C	5.00	NO TES	NO TES
AVC009	Increased Velocity	4/22/97	Ambient	AVCM-A	11-95	1413	Medium	DO	Size C	5.00	NO TES	NO TES
AVC009	Increased Velocity	4/22/97	Ambient	AVCM-A	11-95	1413	Medium	DO	Size C	5.00	NO TES	NO TES
AVC009	Increased Velocity	4/22/97	Ambient	AVCM-A	11-95	1413	Medium	DO	Size C	5.00	NO TES	NO TES
AVC009	Increased Velocity	4/22/97	Ambient	AVCM-A	11-95	1413	Medium	DO	Size C	5.00	NO TES	NO TES
AVC010	Increased Velocity	4/22/97	Wet	AVCM-B	11-95	1420	Medium	DO	Size C	5.00	NO TES	NO TES
AVC010	Increased Velocity	4/22/97	Wet	AVCM-B	11-95	1420	Medium	DO	Size C	5.00	NO TES	NO TES
AVC010	Increased Velocity	4/22/97	Wet	AVCM-B	11-95	1420	Medium	DO	Size C	5.00	NO TES	NO TES
AVC010	Increased Velocity	4/22/97	Wet	AVCM-B	11-95	1420	Medium	DO	Size C	5.00	NO TES	NO TES
AVC010	Increased Velocity	4/22/97	Wet	AVCM-B	11-95	1420	Medium	DO	Size C	5.00	NO TES	NO TES
AVC010	Increased Velocity	4/22/97	Wet	AVCM-B	11-95	1420	Medium	DO	Size C	5.00	NO TES	NO TES
AVC010	Increased Velocity	4/22/97	Wet	AVCM-B	11-95	1420	Medium	DO	Size C	5.00	NO TES	NO TES
AVC010	Increased Velocity	4/22/97	Wet	AVCM-B	11-95	1420	Medium	DO	Size C	5.00	NO TES	NO TES
AVC011	Increased Velocity	4/22/97	Cold	AVCM-C	11-95	1417	Medium	DO	Size C	5.00	NO TES	NO TES
AVC011	Increased Velocity	4/22/97	Cold	AVCM-C	11-95	1417	Medium	DO	Size C	5.00	NO TES	NO TES
AVC011	Increased Velocity	4/22/97	Cold	AVCM-C	11-95	1417	Medium	DO	Size C	5.00	NO TES	NO TES
AVC011	Increased Velocity	4/22/97	Cold	AVCM-C	11-95	1417	Medium	DO	Size C	5.00	NO TES	NO TES
AVC011	Increased Velocity	4/22/97	Cold	AVCM-C	11-95	1417	Medium	DO	Size C	5.00	NO TES	NO TES
AVC011	Increased Velocity	4/22/97	Cold	AVCM-C	11-95	1417	Medium	DO	Size C	5.00	NO TES	NO TES
AVC011	Increased Velocity	4/22/97	Cold	AVCM-C	11-95	1417	Medium	DO	Size C	5.00	NO TES	NO TES
AVC011	Increased Velocity	4/22/97	Cold	AVCM-C	11-95	1417	Medium	DO	Size C	5.00	NO TES	NO TES
AVC012	Increased Velocity	4/22/97	Hot	AVCM-D	11-95	1396	Medium	DO	Size C	5.00	NO TES	NO TES
AVC012	Increased Velocity	4/22/97	Hot	AVCM-D	11-95	1396	Medium	DO	Size C	5.00	NO TES	NO TES
AVC012	Increased Velocity	4/22/97	Hot	AVCM-D	11-95	1396	Medium	DO	Size C	5.00	NO TES	NO TES
AVC012	Increased Velocity	4/22/97	Hot	AVCM-D	11-95	1396	Medium	DO	Size C	5.00	NO TES	NO TES
AVC012	Increased Velocity	4/22/97	Hot	AVCM-D	11-95	1396	Medium	DO	Size C	5.00	NO TES	NO TES
AVC012	Increased Velocity	4/22/97	Hot	AVCM-D	11-95	1396	Medium	DO	Size C	5.00	NO TES	NO TES
AVC012	Increased Velocity	4/22/97	Hot	AVCM-D	11-95	1396	Medium	DO	Size C	5.00	NO TES	NO TES
AVC012	Increased Velocity	4/22/97	Hot	AVCM-D	11-95	1396	Medium	DO	Size C	5.00	NO TES	NO TES
B1A001	Baseline	2/21/97	Ambient	B1AM-A	4-96	845	Medium	DO	Size C	5.00	PASS	PASS
B1A001	Baseline	2/21/97	Ambient	B1AM-A	4-96	845	Medium	DO	Size C	5.00	PASS	PASS
B1A001	Baseline	2/21/97	Ambient	B1AM-A	4-96	845	Medium	DO	Size C	5.00	PASS	PASS
B1A001	Baseline	2/21/97	Ambient	B1AM-A	4-96	845	Medium	DO	Size C	5.00	PASS	PASS

Table 2.Y
Performance Test Results — Raw Data

DROP NU	HIT NU	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
2	1	NO TES	NO TES	RR	2,4	Flat	192.01	3.80	0.00	6.96	147.75
2	2	NO TES	NO TES	RR	2,4	Flat	187.12	2.70	0.00	6.06	112.01
3	1	NO TES	NO TES	RR	2,4	Hemi	100.77	0.00	0.00	6.02	110.53
3	2	NO TES	NO TES	RR	2,4	Hemi	117.83	0.00	0.00	5.19	82.16
4	1	NO TES	NO TES	FR	2,4	Hemi	151.48	0.10	0.00	6.03	110.90
4	2	NO TES	NO TES	FR	2,4	Hemi	130.05	0.00	0.00	5.20	82.47
1	1	NO TES	NO TES	LF	2,4	Flat	201.26	3.60	0.30	6.90	145.21
1	2	NO TES	NO TES	LF	2,4	Flat	204.66	2.90	0.80	6.05	111.64
2	1	NO TES	NO TES	RR	2,4	Flat	194.87	3.70	0.00	6.94	146.90
2	2	NO TES	NO TES	RR	2,4	Flat	206.17	3.30	0.80	6.05	111.64
3	1	NO TES	NO TES	RR	2,4	Hemi	122.20	0.00	0.00	6.02	110.53
3	2	NO TES	NO TES	RR	2,4	Hemi	122.21	0.00	0.00	5.19	82.16
4	1	NO TES	NO TES	FR	2,4	Hemi	145.20	0.00	0.00	6.02	110.53
4	2	NO TES	NO TES	FR	2,4	Hemi	129.95	0.00	0.00	5.18	81.84
1	1	NO TES	NO TES	LF	2,4	Flat	191.07	3.70	0.00	6.94	146.90
1	2	NO TES	NO TES	LF	2,4	Flat	189.59	2.90	0.00	6.02	110.53
2	1	NO TES	NO TES	RR	2,4	Flat	189.08	3.60	0.00	6.92	146.05
2	2	NO TES	NO TES	RR	2,4	Flat	193.95	2.90	0.00	6.05	111.64
3	1	NO TES	NO TES	RR	2,4	Hemi	111.92	0.00	0.00	6.02	110.53
3	2	NO TES	NO TES	RR	2,4	Hemi	116.31	0.00	0.00	5.19	82.16
4	1	NO TES	NO TES	FR	2,4	Hemi	143.74	0.00	0.00	6.02	110.53
4	2	NO TES	NO TES	FR	2,4	Hemi	119.73	0.00	0.00	5.23	83.43
1	1	NO TES	NO TES	LF	2,4	Flat	209.57	3.70	0.90	6.90	119.03
1	2	NO TES	NO TES	LF	2,4	Flat	186.20	3.00	0.00	6.02	90.60
2	1	NO TES	NO TES	RR	2,4	Flat	210.10	3.80	1.00	6.90	119.03
2	2	NO TES	NO TES	RR	2,4	Flat	206.66	3.00	0.80	6.06	91.81
3	1	NO TES	NO TES	RG	2,4	Hemi	141.65	0.00	0.00	6.05	91.51
3	2	NO TES	NO TES	RG	2,4	Hemi	138.35	0.00	0.00	5.23	68.38
4	1	NO TES	NO TES	FR	2,4	Hemi	161.29	1.30	0.00	6.02	90.60
4	2	NO TES	NO TES	FR	2,4	Hemi	154.42	0.40	0.00	5.24	68.64
1	1	NO TES	NO TES	LF	2,4	Flat	208.63	3.60	0.90	6.98	121.80
1	2	NO TES	NO TES	LF	2,4	Flat	178.34	2.50	0.00	6.09	92.72
2	1	NO TES	NO TES	RR	2,4	Flat	210.03	4.20	1.40	6.92	119.72
2	2	NO TES	NO TES	RR	2,4	Flat	208.64	3.30	1.20	6.06	91.81
3	1	NO TES	NO TES	RG	2,4	Hemi	126.59	0.00	0.00	6.05	91.51
3	2	NO TES	NO TES	RG	2,4	Hemi	114.85	0.00	0.00	5.25	68.91
4	1	NO TES	NO TES	FR	2,4	Hemi	144.71	0.00	0.00	6.06	91.81
4	2	NO TES	NO TES	FR	2,4	Hemi	131.02	0.00	0.00	5.27	69.43
1	1	NO TES	NO TES	LF	2,4	Flat	218.91	3.50	1.60	6.90	119.03
1	2	NO TES	NO TES	LF	2,4	Flat	206.63	3.00	0.70	6.05	91.51
2	1	NO TES	NO TES	RR	2,4	Flat	220.86	3.90	1.40	6.96	121.10
2	2	NO TES	NO TES	RR	2,4	Flat	225.69	3.30	1.50	6.05	91.51
3	1	NO TES	NO TES	RG	2,4	Hemi	150.09	0.10	0.00	6.06	91.81
3	2	NO TES	NO TES	RG	2,4	Hemi	146.17	0.00	0.00	5.24	68.64
4	1	NO TES	NO TES	FR	2,4	Hemi	181.70	2.20	0.00	6.08	92.42
4	2	NO TES	NO TES	FR	2,4	Hemi	175.88	1.60	0.00	5.27	69.43
1	1	NO TES	NO TES	LF	2,4	Flat	205.21	3.50	0.90	6.90	119.03
1	2	NO TES	NO TES	LF	2,4	Flat	189.58	2.70	0.00	6.03	90.90
2	1	NO TES	NO TES	RR	2,4	Flat	210.12	3.90	0.90	6.90	119.03
2	2	NO TES	NO TES	RR	2,4	Flat	208.60	3.20	0.80	6.00	90.00
3	1	NO TES	NO TES	RG	2,4	Hemi	121.69	0.00	0.00	6.08	92.42
3	2	NO TES	NO TES	RG	2,4	Hemi	122.69	0.00	0.00	5.22	68.12
4	1	NO TES	NO TES	FR	2,4	Hemi	162.24	1.50	0.00	6.02	90.60
4	2	NO TES	NO TES	FR	2,4	Hemi	149.03	0.00	0.00	5.25	68.91
1	1	20	NO TES	LF	2,4	Flat	229.12	3.10	1.90	6.00	90.00
1	2	20	NO TES	LF	2,4	Flat	207.19	2.80	0.20	6.02	90.60
2	1	20	NO TES	RR	2,4	Flat	196.42	3.30	0.00	6.03	90.90
2	2	20	NO TES	RR	2,4	Flat	220.31	3.10	1.80	6.09	92.72

Table 2.Y
Performance Test Results — Raw Data

HELMET NUMBE	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBE	MAN DATE	SAMPLE WEIGH	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
B1A001	Baseline	2/21/97	Ambient	B1AM-A	4-96	845	Medium	DOT	Size C	5.00	PASS	PASS
B1A001	Baseline	2/21/97	Ambient	B1AM-A	4-96	845	Medium	DOT	Size C	5.00	PASS	PASS
B1A001	Baseline	2/21/97	Ambient	B1AM-A	4-96	845	Medium	DOT	Size C	5.00	PASS	PASS
B1A001	Baseline	2/21/97	Ambient	B1AM-A	4-96	845	Medium	DOT	Size C	5.00	PASS	PASS
B1A002	Baseline	2/21/97	Wet	B1AM-B	4-96	840	Medium	DOT	Size C	5.00	PASS	PASS
B1A002	Baseline	2/21/97	Wet	B1AM-B	4-96	840	Medium	DOT	Size C	5.00	PASS	PASS
B1A002	Baseline	2/21/97	Wet	B1AM-B	4-96	840	Medium	DOT	Size C	5.00	PASS	PASS
B1A002	Baseline	2/21/97	Wet	B1AM-B	4-96	840	Medium	DOT	Size C	5.00	PASS	PASS
B1A002	Baseline	2/21/97	Wet	B1AM-B	4-96	840	Medium	DOT	Size C	5.00	PASS	PASS
B1A002	Baseline	2/21/97	Wet	B1AM-B	4-96	840	Medium	DOT	Size C	5.00	PASS	PASS
B1A002	Baseline	2/21/97	Wet	B1AM-B	4-96	840	Medium	DOT	Size C	5.00	PASS	PASS
B1A002	Baseline	2/21/97	Wet	B1AM-B	4-96	840	Medium	DOT	Size C	5.00	PASS	PASS
B1A003	Baseline	2/21/97	Cold	B1AM-C	4-96	824	Medium	DOT	Size C	5.00	PASS	FAIL
B1A003	Baseline	2/21/97	Cold	B1AM-C	4-96	824	Medium	DOT	Size C	5.00	PASS	FAIL
B1A003	Baseline	2/21/97	Cold	B1AM-C	4-96	824	Medium	DOT	Size C	5.00	PASS	FAIL
B1A003	Baseline	2/21/97	Cold	B1AM-C	4-96	824	Medium	DOT	Size C	5.00	PASS	FAIL
B1A003	Baseline	2/21/97	Cold	B1AM-C	4-96	824	Medium	DOT	Size C	5.00	PASS	FAIL
B1A003	Baseline	2/21/97	Cold	B1AM-C	4-96	824	Medium	DOT	Size C	5.00	PASS	FAIL
B1A003	Baseline	2/21/97	Cold	B1AM-C	4-96	824	Medium	DOT	Size C	5.00	PASS	FAIL
B1A003	Baseline	2/21/97	Cold	B1AM-C	4-96	824	Medium	DOT	Size C	5.00	PASS	FAIL
B1A004	Baseline	2/21/97	Hot	B1AM-D	4-96	825	Medium	DOT	Size C	5.00	PASS	PASS
B1A004	Baseline	2/21/97	Hot	B1AM-D	4-96	825	Medium	DOT	Size C	5.00	PASS	PASS
B1A004	Baseline	2/21/97	Hot	B1AM-D	4-96	825	Medium	DOT	Size C	5.00	PASS	PASS
B1A004	Baseline	2/21/97	Hot	B1AM-D	4-96	825	Medium	DOT	Size C	5.00	PASS	PASS
B1A004	Baseline	2/21/97	Hot	B1AM-D	4-96	825	Medium	DOT	Size C	5.00	PASS	PASS
B1A004	Baseline	2/21/97	Hot	B1AM-D	4-96	825	Medium	DOT	Size C	5.00	PASS	PASS
B1A004	Baseline	2/21/97	Hot	B1AM-D	4-96	825	Medium	DOT	Size C	5.00	PASS	PASS
B1A004	Baseline	2/21/97	Hot	B1AM-D	4-96	825	Medium	DOT	Size C	5.00	PASS	PASS
B1A007	Baseline	2/24/97	Ambient	B1AL-A	4-96	842	XLarge	DOT	Size D	6.10	PASS	PASS
B1A007	Baseline	2/24/97	Ambient	B1AL-A	4-96	842	XLarge	DOT	Size D	6.10	PASS	PASS
B1A007	Baseline	2/24/97	Ambient	B1AL-A	4-96	842	XLarge	DOT	Size D	6.10	PASS	PASS
B1A007	Baseline	2/24/97	Ambient	B1AL-A	4-96	842	XLarge	DOT	Size D	6.10	PASS	PASS
B1A007	Baseline	2/24/97	Ambient	B1AL-A	4-96	842	XLarge	DOT	Size D	6.10	PASS	PASS
B1A007	Baseline	2/24/97	Ambient	B1AL-A	4-96	842	XLarge	DOT	Size D	6.10	PASS	PASS
B1A007	Baseline	2/24/97	Ambient	B1AL-A	4-96	842	XLarge	DOT	Size D	6.10	PASS	PASS
B1A007	Baseline	2/24/97	Ambient	B1AL-A	4-96	842	XLarge	DOT	Size D	6.10	PASS	PASS
B1A008	Baseline	2/24/97	Wet	B1AL-B	4-96	850	XLarge	DOT	Size D	6.10	PASS	PASS
B1A008	Baseline	2/24/97	Wet	B1AL-B	4-96	850	XLarge	DOT	Size D	6.10	PASS	PASS
B1A008	Baseline	2/24/97	Wet	B1AL-B	4-96	850	XLarge	DOT	Size D	6.10	PASS	PASS
B1A008	Baseline	2/24/97	Wet	B1AL-B	4-96	850	XLarge	DOT	Size D	6.10	PASS	PASS
B1A008	Baseline	2/24/97	Wet	B1AL-B	4-96	850	XLarge	DOT	Size D	6.10	PASS	PASS
B1A008	Baseline	2/24/97	Wet	B1AL-B	4-96	850	XLarge	DOT	Size D	6.10	PASS	PASS
B1A008	Baseline	2/24/97	Wet	B1AL-B	4-96	850	XLarge	DOT	Size D	6.10	PASS	PASS
B1A008	Baseline	2/24/97	Wet	B1AL-B	4-96	850	XLarge	DOT	Size D	6.10	PASS	PASS
B1A009	Baseline	2/24/97	Cold	B1AL-C	4-96	850	XLarge	DOT	Size D	6.10	PASS	PASS
B1A009	Baseline	2/24/97	Cold	B1AL-C	4-96	850	XLarge	DOT	Size D	6.10	PASS	PASS
B1A009	Baseline	2/24/97	Cold	B1AL-C	4-96	850	XLarge	DOT	Size D	6.10	PASS	PASS
B1A009	Baseline	2/24/97	Cold	B1AL-C	4-96	850	XLarge	DOT	Size D	6.10	PASS	PASS
B1A009	Baseline	2/24/97	Cold	B1AL-C	4-96	850	XLarge	DOT	Size D	6.10	PASS	PASS
B1A009	Baseline	2/24/97	Cold	B1AL-C	4-96	850	XLarge	DOT	Size D	6.10	PASS	PASS
B1A009	Baseline	2/24/97	Cold	B1AL-C	4-96	850	XLarge	DOT	Size D	6.10	PASS	PASS
B1A009	Baseline	2/24/97	Cold	B1AL-C	4-96	850	XLarge	DOT	Size D	6.10	PASS	PASS
B1A010	Baseline	2/24/97	Hot	B1AL-D	4-96	854	XLarge	DOT	Size D	6.10	PASS	PASS
B1A010	Baseline	2/24/97	Hot	B1AL-D	4-96	854	XLarge	DOT	Size D	6.10	PASS	PASS
B1A010	Baseline	2/24/97	Hot	B1AL-D	4-96	854	XLarge	DOT	Size D	6.10	PASS	PASS
B1A010	Baseline	2/24/97	Hot	B1AL-D	4-96	854	XLarge	DOT	Size D	6.10	PASS	PASS
B1A010	Baseline	2/24/97	Hot	B1AL-D	4-96	854	XLarge	DOT	Size D	6.10	PASS	PASS
B1A010	Baseline	2/24/97	Hot	B1AL-D	4-96	854	XLarge	DOT	Size D	6.10	PASS	PASS

Table 2.Y

Performance Test Results — Raw Data

DROP NUM	HIT NUM	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OUT OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
3	1	20	NO TES	RG	2,4	Hemi	100.25	0.00	0.00	5.26	69.17
3	2	20	NO TES	RG	2,4	Hemi	114.94	0.00	0.00	5.26	69.17
4	1	20	NO TES	FR	2,4	Hemi	108.48	0.00	0.00	5.25	68.91
4	2	20	NO TES	FR	2,4	Hemi	117.79	0.00	0.00	5.24	68.64
1	1	21	NO TES	LF	2,4	Flat	208.14	3.10	0.70	6.05	91.51
1	2	21	NO TES	LF	2,4	Flat	205.69	1.90	0.10	5.99	89.70
2	1	21	NO TES	RR	2,4	Flat	207.15	3.40	0.70	6.09	92.72
2	2	21	NO TES	RR	2,4	Flat	223.77	3.60	1.80	6.09	92.72
3	1	21	NO TES	RG	2,4	Hemi	100.69	0.00	0.00	5.30	70.22
3	2	21	NO TES	RG	2,4	Hemi	115.84	0.00	0.00	5.29	69.96
4	1	21	NO TES	FR	2,4	Hemi	98.75	0.00	0.00	5.26	69.17
4	2	21	NO TES	FR	2,4	Hemi	104.63	0.00	0.00	5.24	68.64
1	1	20	NO TES	LF	2,4	Flat	204.21	2.90	0.10	5.98	89.40
1	2	20	NO TES	LF	2,4	Flat	234.54	2.70	1.70	6.02	90.60
2	1	20	NO TES	RR	2,4	Flat	214.56	3.40	1.20	6.12	93.64
2	2	20	NO TES	RR	2,4	Flat	237.44	3.00	2.30	6.03	90.90
3	1	20	NO TES	RG	2,4	Hemi	104.09	0.00	0.00	5.25	68.91
3	2	20	NO TES	RR	2,4	Hemi	123.67	0.00	0.00	5.24	68.64
4	1	20	NO TES	FR	2,4	Hemi	112.92	0.00	0.00	5.23	68.38
4	2	20	NO TES	FR	2,4	Hemi	121.26	0.00	0.00	5.26	69.17
1	1	20	NO TES	LF	2,4	Flat	201.75	2.70	0.10	6.02	90.60
1	2	20	NO TES	LF	2,4	Flat	220.80	2.60	1.40	5.99	89.70
2	1	20	NO TES	RR	2,4	Flat	195.43	3.10	0.00	6.08	92.42
2	2	20	NO TES	RR	2,4	Flat	215.95	3.00	1.90	6.02	90.60
3	1	20	NO TES	RG	2,4	Hemi	99.25	0.00	0.00	5.25	68.91
3	2	20	NO TES	RR	2,4	Hemi	112.89	0.00	0.00	5.24	68.64
4	1	20	NO TES	FR	2,4	Hemi	99.71	0.00	0.00	5.27	69.43
4	2	20	NO TES	FR	2,4	Hemi	108.52	0.00	0.00	5.27	77.80
1	1	20	NO TES	LF	2,4	Flat	182.75	2.40	0.00	6.06	112.01
1	2	20	NO TES	LF	2,4	Flat	212.02	2.70	1.10	6.03	110.90
2	1	20	NO TES	RR	2,4	Flat	191.48	2.80	0.00	6.03	110.90
2	2	20	NO TES	RR	2,4	Flat	224.27	3.00	1.90	6.05	111.64
3	1	20	NO TES	RG	2,4	Hemi	97.27	0.00	0.00	5.28	85.03
3	2	20	NO TES	RG	2,4	Hemi	171.94	1.00	0.00	5.24	83.75
4	1	20	NO TES	FR	2,4	Hemi	142.72	0.00	0.00	5.22	83.11
4	2	20	NO TES	FR	2,4	Hemi	412.69	1.30	1.00	5.20	82.47
1	1	25	NO TES	LF	2,4	Flat	197.41	3.30	0.00	6.03	110.90
1	2	25	NO TES	LF	2,4	Flat	212.95	3.10	1.40	6.06	112.01
2	1	25	NO TES	RR	2,4	Flat	189.55	3.00	0.00	6.03	110.90
2	2	25	NO TES	RR	2,4	Flat	213.01	3.30	0.60	6.02	110.53
3	1	25	NO TES	RG	2,4	Hemi	95.28	0.00	0.00	5.26	84.39
3	2	25	NO TES	RG	2,4	Hemi	127.07	0.00	0.00	5.28	85.03
4	1	25	NO TES	FR	2,4	Hemi	121.70	0.00	0.00	5.18	81.84
4	2	25	NO TES	FR	2,4	Hemi	263.79	1.40	0.70	5.16	81.21
1	1	20	NO TES	LF	2,4	Flat	204.75	3.00	0.60	6.06	112.01
1	2	20	NO TES	LF	2,4	Flat	231.58	3.00	1.90	6.06	112.01
2	1	20	NO TES	RR	2,4	Flat	209.12	3.60	1.30	6.09	113.12
2	2	20	NO TES	RR	2,4	Flat	234.50	3.30	2.20	6.05	111.64
3	1	20	NO TES	RG	2,4	Hemi	101.63	0.00	0.00	5.29	85.35
3	2	20	NO TES	RG	2,4	Hemi	142.62	0.00	0.00	5.31	86.00
4	1	20	NO TES	FR	2,4	Hemi	116.83	0.00	0.00	5.24	83.75
4	2	20	NO TES	FR	2,4	Hemi	436.63	1.20	1.00	5.26	84.39
1	1	21	NO TES	LF	2,4	Flat	173.96	2.40	0.00	6.05	111.64
1	2	21	NO TES	LF	2,4	Flat	197.39	2.60	0.00	6.06	112.01
2	1	21	NO TES	RR	2,4	Flat	181.27	2.70	0.00	6.02	110.53
2	2	21	NO TES	RR	2,4	Flat	208.15	3.00	1.00	6.05	111.64
3	1	21	NO TES	RG	2,4	Hemi	95.79	0.00	0.00	5.30	85.67
3	2	21	NO TES	RG	2,4	Hemi	233.50	1.20	0.70	5.28	85.03

Table 2.Y
Performance Test Results — Raw Data

HELMET NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
B1A010	Baseline	2/24/97	Hot	B1AL-D	4-96	854	XLarge	DOT	Size D	6.10	PASS	PASS
B1A010	Baseline	2/24/97	Hot	B1AL-D	4-96	854	XLarge	DOT	Size D	6.10	PASS	PASS
B1A011	Baseline	3/17/97	Hot	B1AS-D	4-96	827	Small	DOT	Size A	3.50	PASS	PASS
B1A011	Baseline	3/17/97	Hot	B1AS-D	4-96	827	Small	DOT	Size A	3.50	PASS	PASS
B1A011	Baseline	3/17/97	Hot	B1AS-D	4-96	827	Small	DOT	Size A	3.50	PASS	PASS
B1A011	Baseline	3/17/97	Hot	B1AS-D	4-96	827	Small	DOT	Size A	3.50	PASS	PASS
B1A011	Baseline	3/17/97	Hot	B1AS-D	4-96	827	Small	DOT	Size A	3.50	PASS	PASS
B1A011	Baseline	3/17/97	Hot	B1AS-D	4-96	827	Small	DOT	Size A	3.50	PASS	PASS
B1A011	Baseline	3/17/97	Hot	B1AS-D	4-96	827	Small	DOT	Size A	3.50	PASS	PASS
B1A011	Baseline	3/17/97	Hot	B1AS-D	4-96	827	Small	DOT	Size A	3.50	PASS	PASS
B1A012	Baseline	3/17/97	Ambient	B1AS-A	4-96	821	XSmall	DOT	Size A	3.50	PASS	PASS
B1A012	Baseline	3/17/97	Ambient	B1AS-A	4-96	821	XSmall	DOT	Size A	3.50	PASS	PASS
B1A012	Baseline	3/17/97	Ambient	B1AS-A	4-96	821	XSmall	DOT	Size A	3.50	PASS	PASS
B1A012	Baseline	3/17/97	Ambient	B1AS-A	4-96	821	XSmall	DOT	Size A	3.50	PASS	PASS
B1A012	Baseline	3/17/97	Ambient	B1AS-A	4-96	821	XSmall	DOT	Size A	3.50	PASS	PASS
B1A012	Baseline	3/17/97	Ambient	B1AS-A	4-96	821	XSmall	DOT	Size A	3.50	PASS	PASS
B1A012	Baseline	3/17/97	Ambient	B1AS-A	4-96	821	XSmall	DOT	Size A	3.50	PASS	PASS
B1A012	Baseline	3/17/97	Ambient	B1AS-A	4-96	821	XSmall	DOT	Size A	3.50	PASS	PASS
B1A013	Baseline	3/17/97	Wet	B1AS-B	4-96	846	Small	DOT	Size A	3.50	PASS	PASS
B1A013	Baseline	3/17/97	Wet	B1AS-B	4-96	846	Small	DOT	Size A	3.50	PASS	PASS
B1A013	Baseline	3/17/97	Wet	B1AS-B	4-96	846	Small	DOT	Size A	3.50	PASS	PASS
B1A013	Baseline	3/17/97	Wet	B1AS-B	4-96	846	Small	DOT	Size A	3.50	PASS	PASS
B1A013	Baseline	3/17/97	Wet	B1AS-B	4-96	846	Small	DOT	Size A	3.50	PASS	PASS
B1A013	Baseline	3/17/97	Wet	B1AS-B	4-96	846	Small	DOT	Size A	3.50	PASS	PASS
B1A013	Baseline	3/17/97	Wet	B1AS-B	4-96	846	Small	DOT	Size A	3.50	PASS	PASS
B1A013	Baseline	3/17/97	Wet	B1AS-B	4-96	846	Small	DOT	Size A	3.50	PASS	PASS
B1A014	Baseline	3/17/97	Cold	B1AS-C	4-96	832	Small	DOT	Size A	3.50	PASS	PASS
B1A014	Baseline	3/17/97	Cold	B1AS-C	4-96	832	Small	DOT	Size A	3.50	PASS	PASS
B1A014	Baseline	3/17/97	Cold	B1AS-C	4-96	832	Small	DOT	Size A	3.50	PASS	PASS
B1A014	Baseline	3/17/97	Cold	B1AS-C	4-96	832	Small	DOT	Size A	3.50	PASS	PASS
B1A014	Baseline	3/17/97	Cold	B1AS-C	4-96	832	Small	DOT	Size A	3.50	PASS	PASS
B1A014	Baseline	3/17/97	Cold	B1AS-C	4-96	832	Small	DOT	Size A	3.50	PASS	PASS
B1A014	Baseline	3/17/97	Cold	B1AS-C	4-96	832	Small	DOT	Size A	3.50	PASS	PASS
B1A014	Baseline	3/17/97	Cold	B1AS-C	4-96	832	Small	DOT	Size A	3.50	PASS	PASS
B1B001	Baseline	3/7/97	Ambient	B1BM-A	10-91	1398	Large	DOT	Size C	5.00	PASS	PASS
B1B001	Baseline	3/7/97	Ambient	B1BM-A	10-91	1398	Large	DOT	Size C	5.00	PASS	PASS
B1B001	Baseline	3/7/97	Ambient	B1BM-A	10-91	1398	Large	DOT	Size C	5.00	PASS	PASS
B1B001	Baseline	3/7/97	Ambient	B1BM-A	10-91	1398	Large	DOT	Size C	5.00	PASS	PASS
B1B001	Baseline	3/7/97	Ambient	B1BM-A	10-91	1398	Large	DOT	Size C	5.00	PASS	PASS
B1B001	Baseline	3/7/97	Ambient	B1BM-A	10-91	1398	Large	DOT	Size C	5.00	PASS	PASS
B1B001	Baseline	3/7/97	Ambient	B1BM-A	10-91	1398	Large	DOT	Size C	5.00	PASS	PASS
B1B001	Baseline	3/7/97	Ambient	B1BM-A	10-91	1398	Large	DOT	Size C	5.00	PASS	PASS
B1B002	Baseline	3/7/97	Wet	B1BM-B	10-91	1401	Large	DOT	Size C	5.00	PASS	PASS
B1B002	Baseline	3/7/97	Wet	B1BM-B	10-91	1401	Large	DOT	Size C	5.00	PASS	PASS
B1B002	Baseline	3/7/97	Wet	B1BM-B	10-91	1401	Large	DOT	Size C	5.00	PASS	PASS
B1B002	Baseline	3/7/97	Wet	B1BM-B	10-91	1401	Large	DOT	Size C	5.00	PASS	PASS
B1B002	Baseline	3/7/97	Wet	B1BM-B	10-91	1401	Large	DOT	Size C	5.00	PASS	PASS
B1B002	Baseline	3/7/97	Wet	B1BM-B	10-91	1401	Large	DOT	Size C	5.00	PASS	PASS
B1B002	Baseline	3/7/97	Wet	B1BM-B	10-91	1401	Large	DOT	Size C	5.00	PASS	PASS
B1B002	Baseline	3/7/97	Wet	B1BM-B	10-91	1401	Large	DOT	Size C	5.00	PASS	PASS
B1B003	Baseline	3/7/97	Cold	B1BM-C	10-91	1401	Large	DOT	Size C	5.00	PASS	PASS
B1B003	Baseline	3/7/97	Cold	B1BM-C	10-91	1401	Large	DOT	Size C	5.00	PASS	PASS
B1B003	Baseline	3/7/97	Cold	B1BM-C	10-91	1401	Large	DOT	Size C	5.00	PASS	PASS
B1B003	Baseline	3/7/97	Cold	B1BM-C	10-91	1401	Large	DOT	Size C	5.00	PASS	PASS
B1B003	Baseline	3/7/97	Cold	B1BM-C	10-91	1401	Large	DOT	Size C	5.00	PASS	PASS
B1B003	Baseline	3/7/97	Cold	B1BM-C	10-91	1401	Large	DOT	Size C	5.00	PASS	PASS
B1B003	Baseline	3/7/97	Cold	B1BM-C	10-91	1401	Large	DOT	Size C	5.00	PASS	PASS
B1B003	Baseline	3/7/97	Cold	B1BM-C	10-91	1401	Large	DOT	Size C	5.00	PASS	PASS

Table 2.Y
Performance Test Results — Raw Data

DROP NUM	HIT NUM	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
4	1	21	NO TEST	FR	2,4	Hemi	271.62	1.10	0.80	5.25	84.07
4	2	21	NO TEST	FR	2,4	Hemi	535.30	1.30	1.00	5.26	84.39
1	1	21	NO TEST	LF	2,4	Flat	202.30	2.60	0.40	6.08	64.69
1	2	21	NO TEST	LF	2,4	Flat	235.45	3.20	1.50	6.05	64.05
2	1	21	NO TEST	RR	2,4	Flat	212.05	3.80	0.60	5.98	62.58
2	2	21	NO TEST	RR	2,4	Flat	228.18	3.50	1.50	5.99	62.79
3	1	21	NO TEST	RG	2,4	Hemi	111.44	0.00	0.00	5.28	48.79
3	2	21	NO TEST	RG	2,4	Hemi	132.95	0.00	0.00	5.26	48.42
4	1	21	NO TEST	FR	2,4	Hemi	108.03	0.00	0.00	5.32	49.53
4	2	21	NO TEST	FR	2,4	Hemi	131.95	0.00	0.00	5.30	49.16
1	1	22	NO TEST	LF	2,4	Flat	214.44	2.50	1.20	5.98	62.58
1	2	22	NO TEST	LF	2,4	Flat	264.29	2.70	1.70	6.03	63.63
2	1	22	NO TEST	RR	2,4	Flat	208.18	2.00	0.50	6.09	64.90
2	2	22	NO TEST	RR	2,4	Flat	241.83	2.30	0.90	6.06	64.27
3	1	22	NO TEST	RG	2,4	Hemi	124.10	0.00	0.00	5.29	48.97
3	2	22	NO TEST	RG	2,4	Hemi	137.31	0.00	0.00	5.25	48.23
4	1	22	NO TEST	FR	2,4	Hemi	134.43	0.00	0.00	5.24	48.05
4	2	22	NO TEST	FR	2,4	Hemi	138.28	0.00	0.00	5.24	48.05
1	1	26	NO TEST	LF	2,4	Flat	202.69	3.30	0.90	6.06	64.27
1	2	26	NO TEST	LF	2,4	Flat	224.68	3.60	2.10	6.12	65.55
2	1	26	NO TEST	RR	2,4	Flat	188.58	3.40	0.00	6.05	64.05
2	2	26	NO TEST	RR	2,4	Flat	201.31	3.60	0.10	6.08	64.69
3	1	26	NO TEST	RG	2,4	Hemi	107.55	0.00	0.00	5.28	48.79
3	2	26	NO TEST	RG	2,4	Hemi	123.15	0.00	0.00	5.28	48.79
4	1	26	NO TEST	FR	2,4	Hemi	106.56	0.00	0.00	5.25	48.23
4	2	26	NO TEST	FR	2,4	Hemi	120.22	0.00	0.00	5.26	48.42
1	1	26	NO TEST	LF	2,4	Flat	239.29	3.20	1.70	6.12	65.55
1	2	26	NO TEST	LF	2,4	Flat	271.05	3.00	1.60	6.09	64.90
2	1	26	NO TEST	RR	2,4	Flat	213.00	2.10	0.40	6.08	64.69
2	2	26	NO TEST	RR	2,4	Flat	226.69	3.50	0.90	6.08	64.69
3	1	26	NO TEST	RG	2,4	Hemi	118.31	0.00	0.00	5.26	48.42
3	2	26	NO TEST	RG	2,4	Hemi	144.20	0.00	0.00	5.26	48.42
4	1	26	NO TEST	FR	2,4	Hemi	119.71	0.00	0.00	5.36	50.28
4	2	26	NO TEST	FR	2,4	Hemi	148.08	0.00	0.00	5.34	49.90
1	1	19	NO TEST	LF	2,4	Flat	213.94	3.30	0.80	6.03	90.90
1	2	19	NO TEST	LF	2,4	Flat	250.05	3.20	2.50	6.03	90.90
2	1	19	NO TEST	RR	2,4	Flat	196.83	3.40	0.00	5.99	89.70
2	2	19	NO TEST	RR	2,4	Flat	236.46	3.40	2.70	6.05	91.51
3	1	19	NO TEST	RG	2,4	Hemi	111.97	0.00	0.00	5.23	68.38
3	2	19	NO TEST	RG	2,4	Hemi	122.65	0.00	0.00	5.24	68.64
4	1	19	NO TEST	FR	2,4	Hemi	99.79	0.00	0.00	5.19	67.34
4	2	19	NO TEST	FR	2,4	Hemi	129.07	0.00	0.00	5.27	69.43
1	1	20	NO TEST	LF	2,4	Flat	224.17	3.00	1.50	6.03	90.90
1	2	20	NO TEST	LF	2,4	Flat	226.19	3.10	2.10	6.02	90.60
2	1	20	NO TEST	RR	2,4	Flat	208.60	3.20	0.90	6.05	91.51
2	2	20	NO TEST	RR	2,4	Flat	238.39	3.40	2.70	6.06	91.81
3	1	20	NO TEST	RG	2,4	Hemi	105.58	0.00	0.00	5.25	68.91
3	2	20	NO TEST	RG	2,4	Hemi	122.20	0.00	0.00	5.23	68.38
4	1	20	NO TEST	FR	2,4	Hemi	97.76	0.00	0.00	5.27	69.43
4	2	20	NO TEST	FR	2,4	Hemi	114.37	0.00	0.00	5.24	68.64
1	1	18	NO TEST	LF	2,4	Flat	201.28	3.00	0.20	6.02	90.60
1	2	18	NO TEST	LF	2,4	Flat	235.92	3.30	2.30	6.02	90.60
2	1	18	NO TEST	RR	2,4	Flat	195.95	3.30	0.00	6.05	91.51
2	2	18	NO TEST	RR	2,4	Flat	245.22	3.30	2.80	6.05	91.51
3	1	18	NO TEST	RG	2,4	Hemi	137.31	0.00	0.00	5.20	67.60
3	2	18	NO TEST	RG	2,4	Hemi	133.85	0.00	0.00	5.24	68.64
4	1	18	NO TEST	FR	2,4	Hemi	110.91	0.00	0.00	5.26	69.17
4	2	18	NO TEST	FR	2,4	Hemi	137.81	0.00	0.00	5.24	68.64

Table 2.Y
Performance Test Results — Raw Data

HELMET NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
B1B004	Baseline	3/7/97	Hot	B1BM-D	10-91	1393	Large	DOT	Size C	5.00	PASS	PASS
B1B004	Baseline	3/7/97	Hot	B1BM-D	10-91	1393	Large	DOT	Size C	5.00	PASS	PASS
B1B004	Baseline	3/7/97	Hot	B1BM-D	10-91	1393	Large	DOT	Size C	5.00	PASS	PASS
B1B004	Baseline	3/7/97	Hot	B1BM-D	10-91	1393	Large	DOT	Size C	5.00	PASS	PASS
B1B004	Baseline	3/7/97	Hot	B1BM-D	10-91	1393	Large	DOT	Size C	5.00	PASS	PASS
B1B004	Baseline	3/7/97	Hot	B1BM-D	10-91	1393	Large	DOT	Size C	5.00	PASS	PASS
B1B004	Baseline	3/7/97	Hot	B1BM-D	10-91	1393	Large	DOT	Size C	5.00	PASS	PASS
B1B004	Baseline	3/7/97	Hot	B1BM-D	10-91	1393	Large	DOT	Size C	5.00	PASS	PASS
B1B005	Baseline	3/21/97	Ambient	B1BS-A	01-95	1131	XSmall	DOT	Size A	5.00	PASS	PASS
B1B005	Baseline	3/21/97	Ambient	B1BS-A	01-95	1131	XSmall	DOT	Size A	5.00	PASS	PASS
B1B005	Baseline	3/21/97	Ambient	B1BS-A	01-95	1131	XSmall	DOT	Size A	5.00	PASS	PASS
B1B005	Baseline	3/21/97	Ambient	B1BS-A	01-95	1131	XSmall	DOT	Size A	5.00	PASS	PASS
B1B005	Baseline	3/21/97	Ambient	B1BS-A	01-95	1131	XSmall	DOT	Size A	5.00	PASS	PASS
B1B005	Baseline	3/21/97	Ambient	B1BS-A	01-95	1131	XSmall	DOT	Size A	5.00	PASS	PASS
B1B005	Baseline	3/21/97	Ambient	B1BS-A	01-95	1131	XSmall	DOT	Size A	5.00	PASS	PASS
B1B005	Baseline	3/21/97	Ambient	B1BS-A	01-95	1131	XSmall	DOT	Size A	5.00	PASS	PASS
B1B006	Baseline	3/21/97	Wet	B1BS-B	09-95	1108	XSmall	DOT	Size A	5.00	PASS	PASS
B1B006	Baseline	3/21/97	Wet	B1BS-B	09-95	1108	XSmall	DOT	Size A	5.00	PASS	PASS
B1B006	Baseline	3/21/97	Wet	B1BS-B	09-95	1108	XSmall	DOT	Size A	5.00	PASS	PASS
B1B006	Baseline	3/21/97	Wet	B1BS-B	09-95	1108	XSmall	DOT	Size A	5.00	PASS	PASS
B1B006	Baseline	3/21/97	Wet	B1BS-B	09-95	1108	XSmall	DOT	Size A	5.00	PASS	PASS
B1B006	Baseline	3/21/97	Wet	B1BS-B	09-95	1108	XSmall	DOT	Size A	5.00	PASS	PASS
B1B006	Baseline	3/21/97	Wet	B1BS-B	09-95	1108	XSmall	DOT	Size A	5.00	PASS	PASS
B1B006	Baseline	3/21/97	Wet	B1BS-B	09-95	1108	XSmall	DOT	Size A	5.00	PASS	PASS
B1B007	Baseline	3/21/97	Cold	B1BS-C	01-95	1125	XSmall	DOT	Size A	5.00	PASS	PASS
B1B007	Baseline	3/21/97	Cold	B1BS-C	01-95	1125	XSmall	DOT	Size A	5.00	PASS	PASS
B1B007	Baseline	3/21/97	Cold	B1BS-C	01-95	1125	XSmall	DOT	Size A	5.00	PASS	PASS
B1B007	Baseline	3/21/97	Cold	B1BS-C	01-95	1125	XSmall	DOT	Size A	5.00	PASS	PASS
B1B007	Baseline	3/21/97	Cold	B1BS-C	01-95	1125	XSmall	DOT	Size A	5.00	PASS	PASS
B1B007	Baseline	3/21/97	Cold	B1BS-C	01-95	1125	XSmall	DOT	Size A	5.00	PASS	PASS
B1B007	Baseline	3/21/97	Cold	B1BS-C	01-95	1125	XSmall	DOT	Size A	5.00	PASS	PASS
B1B007	Baseline	3/21/97	Cold	B1BS-C	01-95	1125	XSmall	DOT	Size A	5.00	PASS	PASS
B1B008	Baseline	3/21/97	Hot	B1BS-D	01-95	1131	XSmall	DOT	Size A	5.00	PASS	PASS
B1B008	Baseline	3/21/97	Hot	B1BS-D	01-95	1131	XSmall	DOT	Size A	5.00	PASS	PASS
B1B008	Baseline	3/21/97	Hot	B1BS-D	01-95	1131	XSmall	DOT	Size A	5.00	PASS	PASS
B1B008	Baseline	3/21/97	Hot	B1BS-D	01-95	1131	XSmall	DOT	Size A	5.00	PASS	PASS
B1B008	Baseline	3/21/97	Hot	B1BS-D	01-95	1131	XSmall	DOT	Size A	5.00	PASS	PASS
B1B008	Baseline	3/21/97	Hot	B1BS-D	01-95	1131	XSmall	DOT	Size A	5.00	PASS	PASS
B1B008	Baseline	3/21/97	Hot	B1BS-D	01-95	1131	XSmall	DOT	Size A	5.00	PASS	PASS
B1B008	Baseline	3/21/97	Hot	B1BS-D	01-95	1131	XSmall	DOT	Size A	5.00	PASS	PASS
B1B009	Baseline	4/11/97	Ambient	B1BL-A	9-95	1292	XLarge	DOT	Size D	6.10	PASS	PASS
B1B009	Baseline	4/11/97	Ambient	B1BL-A	9-95	1292	XLarge	DOT	Size D	6.10	PASS	PASS
B1B009	Baseline	4/11/97	Ambient	B1BL-A	9-95	1292	XLarge	DOT	Size D	6.10	PASS	PASS
B1B009	Baseline	4/11/97	Ambient	B1BL-A	9-95	1292	XLarge	DOT	Size D	6.10	PASS	PASS
B1B009	Baseline	4/11/97	Ambient	B1BL-A	9-95	1292	XLarge	DOT	Size D	6.10	PASS	PASS
B1B009	Baseline	4/11/97	Ambient	B1BL-A	9-95	1292	XLarge	DOT	Size D	6.10	PASS	PASS
B1B009	Baseline	4/11/97	Ambient	B1BL-A	9-95	1292	XLarge	DOT	Size D	6.10	PASS	PASS
B1B009	Baseline	4/11/97	Ambient	B1BL-A	9-95	1292	XLarge	DOT	Size D	6.10	PASS	PASS
B1B010	Baseline	4/11/97	Wet	B1BL-B	9-95	1304	XLarge	DOT	Size D	6.10	PASS	PASS
B1B010	Baseline	4/11/97	Wet	B1BL-B	9-95	1304	XLarge	DOT	Size D	6.10	PASS	PASS
B1B010	Baseline	4/11/97	Wet	B1BL-B	9-95	1304	XLarge	DOT	Size D	6.10	PASS	PASS
B1B010	Baseline	4/11/97	Wet	B1BL-B	9-95	1304	XLarge	DOT	Size D	6.10	PASS	PASS
B1B010	Baseline	4/11/97	Wet	B1BL-B	9-95	1304	XLarge	DOT	Size D	6.10	PASS	PASS
B1B010	Baseline	4/11/97	Wet	B1BL-B	9-95	1304	XLarge	DOT	Size D	6.10	PASS	PASS
B1B010	Baseline	4/11/97	Wet	B1BL-B	9-95	1304	XLarge	DOT	Size D	6.10	PASS	PASS
B1B010	Baseline	4/11/97	Wet	B1BL-B	9-95	1304	XLarge	DOT	Size D	6.10	PASS	PASS
B1B011	Baseline	4/11/97	Cold	B1BL-C	9-95	1279	XLarge	DOT	Size D	6.10	PASS	PASS
B1B011	Baseline	4/11/97	Cold	B1BL-C	9-95	1279	XLarge	DOT	Size D	6.10	PASS	PASS

Table 2.Y
Performance Test Results — Raw Data

DROP NUM	HIT NUM	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
1	1	19	NO TEST	LF	2,4	Flat	192.84	3.50	0.00	6.05	91.51
1	2	19	NO TEST	LF	2,4	Flat	217.88	3.30	2.30	6.03	90.90
2	1	19	NO TEST	RR	2,4	Flat	191.02	3.50	0.00	6.03	90.90
2	2	19	NO TEST	LF	2,4	Flat	224.17	3.50	3.00	6.05	91.51
3	1	19	NO TEST	RG	2,4	Hemi	98.20	0.00	0.00	5.25	68.91
3	2	19	NO TEST	RG	2,4	Hemi	124.14	0.00	0.00	5.22	68.12
4	1	19	NO TEST	FR	2,4	Hemi	102.20	0.00	0.00	5.20	67.60
4	2	19	NO TEST	FR	2,4	Hemi	131.43	0.00	0.00	5.20	67.60
1	1	15	NO TEST	LF	2,4	Flat	192.99	3.40	0.00	6.06	91.81
1	2	15	NO TEST	LF	2,4	Flat	226.69	3.60	2.40	6.06	91.81
2	1	15	NO TEST	RR	2,4	Flat	237.88	3.80	1.30	6.05	91.51
2	2	15	NO TEST	RR	2,4	Flat	278.90	3.80	2.10	6.06	91.81
3	1	15	NO TEST	RG	2,4	Hemi	152.44	0.20	0.00	5.13	65.79
3	2	15	NO TEST	RG	2,4	Hemi	155.87	0.60	0.00	5.19	67.34
4	1	15	NO TEST	FR	2,4	Hemi	117.32	0.00	0.00	5.17	66.82
4	2	15	NO TEST	FR	2,4	Hemi	150.96	0.10	0.00	5.18	67.08
1	1	14	NO TEST	LF	2,4	Flat	206.61	3.30	0.60	6.06	91.81
1	2	14	NO TEST	LF	2,4	Flat	232.08	3.50	2.30	6.05	91.51
2	1	14	NO TEST	RR	2,4	Flat	202.76	2.60	0.40	6.05	91.51
2	2	14	NO TEST	RR	2,4	Flat	241.79	3.30	2.00	6.08	92.42
3	1	14	NO TEST	RG	2,4	Hemi	122.67	0.00	0.00	5.19	67.34
3	2	14	NO TEST	RG	2,4	Hemi	126.08	0.00	0.00	5.18	67.08
4	1	14	NO TEST	FR	2,4	Hemi	124.60	0.00	0.00	5.15	66.31
4	2	14	NO TEST	FR	2,4	Hemi	125.12	0.00	0.00	5.18	67.08
1	1	15	NO TEST	LF	2,4	Flat	217.91	3.50	2.10	6.02	90.60
1	2	15	NO TEST	LF	2,4	Flat	261.34	3.40	2.60	6.05	91.51
2	1	15	NO TEST	RR	2,4	Flat	233.02	3.50	1.30	6.09	92.72
2	2	15	NO TEST	RR	2,4	Flat	268.68	4.00	1.40	6.08	92.42
3	1	15	NO TEST	RG	2,4	Hemi	149.07	0.00	0.00	5.18	67.08
3	2	15	NO TEST	RG	2,4	Hemi	146.07	0.00	0.00	5.15	66.31
4	1	15	NO TEST	FR	2,4	Hemi	118.30	0.00	0.00	5.22	68.12
4	2	15	NO TEST	FR	2,4	Hemi	127.05	0.00	0.00	5.18	67.08
1	1	16	NO TEST	LF	2,4	Flat	202.71	3.50	0.10	5.98	89.40
1	2	16	NO TEST	LF	2,4	Flat	245.20	3.20	2.30	6.00	90.00
2	1	16	NO TEST	RR	2,4	Flat	216.95	3.00	1.10	6.06	91.81
2	2	16	NO TEST	RR	2,4	Flat	266.29	4.10	1.40	6.05	91.51
3	1	16	NO TEST	RG	2,4	Hemi	130.47	0.00	0.00	5.19	67.34
3	2	16	NO TEST	RG	2,4	Hemi	139.75	0.00	0.00	5.19	67.34
4	1	16	NO TEST	FR	2,4	Hemi	115.84	0.00	0.00	5.18	67.08
4	2	16	NO TEST	FR	2,4	Hemi	126.08	0.00	0.00	5.22	68.12
1	1	18	NO TEST	LF	2,4	Flat	188.11	3.10	0.00	5.98	109.07
1	2	18	NO TEST	LF	2,4	Flat	221.81	3.30	2.00	6.06	112.01
2	1	18	NO TEST	RR	2,4	Flat	169.58	2.70	0.00	6.06	112.01
2	2	18	NO TEST	RR	2,4	Flat	198.38	3.40	0.00	6.00	109.80
3	1	18	NO TEST	RG	2,4	Hemi	98.76	0.00	0.00	5.24	83.75
3	2	18	NO TEST	RG	2,4	Hemi	121.70	0.00	0.00	5.25	84.07
4	1	18	NO TEST	FR	2,4	Hemi	99.72	0.00	0.00	5.23	83.43
4	2	18	NO TEST	FR	2,4	Hemi	152.54	0.60	0.00	5.24	83.75
1	1	17	NO TEST	LF	2,4	Flat	198.82	3.20	0.00	6.06	112.01
1	2	17	NO TEST	LF	2,4	Flat	205.65	3.10	0.70	6.06	112.01
2	1	17	NO TEST	RR	2,4	Flat	167.59	2.90	0.00	6.05	111.64
2	2	17	NO TEST	RR	2,4	Flat	195.91	3.60	0.00	6.03	110.90
3	1	17	NO TEST	RG	2,4	Hemi	93.38	0.00	0.00	5.25	84.07
3	2	17	NO TEST	RG	2,4	Hemi	121.24	0.00	0.00	5.26	84.39
4	1	17	NO TEST	FR	2,4	Hemi	106.59	0.00	0.00	5.23	83.43
4	2	17	NO TEST	FR	2,4	Hemi	156.82	0.90	0.00	5.23	83.43
1	1	16	NO TEST	LF	2,4	Flat	189.06	3.00	0.00	6.06	112.01
1	2	16	NO TEST	LF	2,4	Flat	224.24	3.30	1.90	6.02	110.53

Table 2.Y
Performance Test Results — Raw Data

HELMET NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
B1B011	Baseline	4/11/97	Cold	B1BL-C	9-95	1279	XLarge	DOT	Size D	6.10	PASS	PASS
B1B011	Baseline	4/11/97	Cold	B1BL-C	9-95	1279	XLarge	DOT	Size D	6.10	PASS	PASS
B1B011	Baseline	4/11/97	Cold	B1BL-C	9-95	1279	XLarge	DOT	Size D	6.10	PASS	PASS
B1B011	Baseline	4/11/97	Cold	B1BL-C	9-95	1279	XLarge	DOT	Size D	6.10	PASS	PASS
B1B011	Baseline	4/11/97	Cold	B1BL-C	9-95	1279	XLarge	DOT	Size D	6.10	PASS	PASS
B1B011	Baseline	4/11/97	Cold	B1BL-C	9-95	1279	XLarge	DOT	Size D	6.10	PASS	PASS
B1B012	Baseline	4/11/97	Hot	B1BL-D	9-95	1327	XLarge	DOT	Size D	6.10	PASS	PASS
B1B012	Baseline	4/11/97	Hot	B1BL-D	9-95	1327	XLarge	DOT	Size D	6.10	PASS	PASS
B1B012	Baseline	4/11/97	Hot	B1BL-D	9-95	1327	XLarge	DOT	Size D	6.10	PASS	PASS
B1B012	Baseline	4/11/97	Hot	B1BL-D	9-95	1327	XLarge	DOT	Size D	6.10	PASS	PASS
B1B012	Baseline	4/11/97	Hot	B1BL-D	9-95	1327	XLarge	DOT	Size D	6.10	PASS	PASS
B1B012	Baseline	4/11/97	Hot	B1BL-D	9-95	1327	XLarge	DOT	Size D	6.10	PASS	PASS
B1B012	Baseline	4/11/97	Hot	B1BL-D	9-95	1327	XLarge	DOT	Size D	6.10	PASS	PASS
B1B012	Baseline	4/11/97	Hot	B1BL-D	9-95	1327	XLarge	DOT	Size D	6.10	PASS	PASS
B1C003	Baseline	2/27/97	Ambient	B1CM-A	11-95	1557	Medium	DOT	Size C	5.00	PASS	PASS
B1C003	Baseline	2/27/97	Ambient	B1CM-A	11-95	1557	Medium	DOT	Size C	5.00	PASS	PASS
B1C003	Baseline	2/27/97	Ambient	B1CM-A	11-95	1557	Medium	DOT	Size C	5.00	PASS	PASS
B1C003	Baseline	2/27/97	Ambient	B1CM-A	11-95	1557	Medium	DOT	Size C	5.00	PASS	PASS
B1C003	Baseline	2/27/97	Ambient	B1CM-A	11-95	1557	Medium	DOT	Size C	5.00	PASS	PASS
B1C003	Baseline	2/27/97	Ambient	B1CM-A	11-95	1557	Medium	DOT	Size C	5.00	PASS	PASS
B1C003	Baseline	2/27/97	Ambient	B1CM-A	11-95	1557	Medium	DOT	Size C	5.00	PASS	PASS
B1C003	Baseline	2/27/97	Ambient	B1CM-A	11-95	1557	Medium	DOT	Size C	5.00	PASS	PASS
B1C004	Baseline	2/28/97	Wet	B1CM-B	11-95	1592	Medium	DOT	Size C	5.00	PASS	PASS
B1C004	Baseline	2/28/97	Wet	B1CM-B	11-95	1592	Medium	DOT	Size C	5.00	PASS	PASS
B1C004	Baseline	2/28/97	Wet	B1CM-B	11-95	1592	Medium	DOT	Size C	5.00	PASS	PASS
B1C004	Baseline	2/28/97	Wet	B1CM-B	11-95	1592	Medium	DOT	Size C	5.00	PASS	PASS
B1C004	Baseline	2/28/97	Wet	B1CM-B	11-95	1592	Medium	DOT	Size C	5.00	PASS	PASS
B1C004	Baseline	2/28/97	Wet	B1CM-B	11-95	1592	Medium	DOT	Size C	5.00	PASS	PASS
B1C004	Baseline	2/28/97	Wet	B1CM-B	11-95	1592	Medium	DOT	Size C	5.00	PASS	PASS
B1C004	Baseline	2/28/97	Wet	B1CM-B	11-95	1592	Medium	DOT	Size C	5.00	PASS	PASS
B1C005	Baseline	2/28/97	Cold	B1CM-C	11-95	1542	Medium	DOT	Size C	5.00	PASS	PASS
B1C005	Baseline	2/28/97	Cold	B1CM-C	11-95	1542	Medium	DOT	Size C	5.00	PASS	PASS
B1C005	Baseline	2/28/97	Cold	B1CM-C	11-95	1542	Medium	DOT	Size C	5.00	PASS	PASS
B1C005	Baseline	2/28/97	Cold	B1CM-C	11-95	1542	Medium	DOT	Size C	5.00	PASS	PASS
B1C005	Baseline	2/28/97	Cold	B1CM-C	11-95	1542	Medium	DOT	Size C	5.00	PASS	PASS
B1C005	Baseline	2/28/97	Cold	B1CM-C	11-95	1542	Medium	DOT	Size C	5.00	PASS	PASS
B1C005	Baseline	2/28/97	Cold	B1CM-C	11-95	1542	Medium	DOT	Size C	5.00	PASS	PASS
B1C005	Baseline	2/28/97	Cold	B1CM-C	11-95	1542	Medium	DOT	Size C	5.00	PASS	PASS
B1C006	Baseline	2/28/97	Hot	B1CM-D	11-95	1521	Medium	DOT	Size C	5.00	PASS	PASS
B1C006	Baseline	2/28/97	Hot	B1CM-D	11-95	1521	Medium	DOT	Size C	5.00	PASS	PASS
B1C006	Baseline	2/28/97	Hot	B1CM-D	11-95	1521	Medium	DOT	Size C	5.00	PASS	PASS
B1C006	Baseline	2/28/97	Hot	B1CM-D	11-95	1521	Medium	DOT	Size C	5.00	PASS	PASS
B1C006	Baseline	2/28/97	Hot	B1CM-D	11-95	1521	Medium	DOT	Size C	5.00	PASS	PASS
B1C006	Baseline	2/28/97	Hot	B1CM-D	11-95	1521	Medium	DOT	Size C	5.00	PASS	PASS
B1C006	Baseline	2/28/97	Hot	B1CM-D	11-95	1521	Medium	DOT	Size C	5.00	PASS	PASS
B1C006	Baseline	2/28/97	Hot	B1CM-D	11-95	1521	Medium	DOT	Size C	5.00	PASS	PASS
B1C007	Baseline	3/3/97	Ambient	B1CL-A	11-95	1414	Large	DOT	Size D	6.20	PASS	PASS
B1C007	Baseline	3/3/97	Ambient	B1CL-A	11-95	1414	Large	DOT	Size D	6.20	PASS	PASS
B1C007	Baseline	3/3/97	Ambient	B1CL-A	11-95	1414	Large	DOT	Size D	6.20	PASS	PASS
B1C007	Baseline	3/3/97	Ambient	B1CL-A	11-95	1414	Large	DOT	Size D	6.20	PASS	PASS
B1C007	Baseline	3/3/97	Ambient	B1CL-A	11-95	1414	Large	DOT	Size D	6.20	PASS	PASS
B1C007	Baseline	3/3/97	Ambient	B1CL-A	11-95	1414	Large	DOT	Size D	6.20	PASS	PASS
B1C007	Baseline	3/3/97	Ambient	B1CL-A	11-95	1414	Large	DOT	Size D	6.20	PASS	PASS
B1C007	Baseline	3/3/97	Ambient	B1CL-A	11-95	1414	Large	DOT	Size D	6.20	PASS	PASS
B1C008	Baseline	3/3/97	Wet	B1CL-B	11-95	1408	Large	DOT	Size D	6.20	PASS	PASS
B1C008	Baseline	3/3/97	Wet	B1CL-B	11-95	1408	Large	DOT	Size D	6.20	PASS	PASS
B1C008	Baseline	3/3/97	Wet	B1CL-B	11-95	1408	Large	DOT	Size D	6.20	PASS	PASS
B1C008	Baseline	3/3/97	Wet	B1CL-B	11-95	1408	Large	DOT	Size D	6.20	PASS	PASS

Table 2.Y
Performance Test Results — Raw Data

DROP NUM	HIT NUM	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OUT OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCIT (M/S)	ENERGY (JOULES)
2	1	16	NO TEST	RR	2,4	Flat	170.99	2.90	0.00	6.03	110.90
2	2	16	NO TEST	RR	2,4	Flat	204.68	3.50	0.60	6.02	110.53
3	1	16	NO TEST	RG	2,4	Hemi	100.20	0.00	0.00	5.25	84.07
3	2	16	NO TEST	RG	2,4	Hemi	129.02	0.00	0.00	5.27	84.71
4	1	16	NO TEST	FR	2,4	Hemi	105.61	0.00	0.00	5.23	83.43
4	2	16	NO TEST	FR	2,4	Hemi	164.23	1.10	0.00	5.26	84.39
1	1	16	NO TEST	LF	2,4	Flat	189.57	3.30	0.00	6.06	112.01
1	2	16	NO TEST	LF	2,4	Flat	209.13	3.30	1.20	6.05	111.64
2	1	16	NO TEST	RR	2,4	Flat	162.22	2.20	0.00	6.05	111.64
2	2	16	NO TEST	RR	2,4	Flat	194.47	3.50	0.00	6.03	110.90
3	1	16	NO TEST	RG	2,4	Hemi	92.93	0.00	0.00	5.25	84.07
3	2	16	NO TEST	RG	2,4	Hemi	122.21	0.00	0.00	5.25	84.07
4	1	16	NO TEST	FR	2,4	Hemi	101.22	0.00	0.00	5.25	84.07
4	2	16	NO TEST	FR	2,4	Hemi	172.47	1.40	0.00	5.22	83.11
1	1	14	NO TEST	LF	2,4	Flat	212.51	3.80	0.90	6.11	93.33
1	2	14	NO TEST	LF	2,4	Flat	230.60	3.30	1.30	6.09	92.72
2	1	14	NO TEST	RR	2,4	Flat	190.51	2.70	0.00	6.11	93.33
2	2	14	NO TEST	RR	2,4	Flat	200.85	2.80	0.20	6.11	93.33
3	1	14	NO TEST	RG	2,4	Hemi	122.69	0.00	0.00	5.28	69.70
3	2	14	NO TEST	RG	2,4	Hemi	135.86	0.00	0.00	5.28	69.70
4	1	14	NO TEST	FR	2,4	Hemi	136.82	0.00	0.00	5.28	69.70
4	2	14	NO TEST	FR	2,4	Hemi	146.10	0.00	0.00	5.30	70.22
1	1	12	NO TEST	LF	2,4	Flat	186.12	3.40	0.00	6.05	91.51
1	2	12	NO TEST	LF	2,4	Flat	189.05	3.50	0.00	6.08	92.42
2	1	12	NO TEST	RR	2,4	Flat	178.81	3.50	0.00	6.11	93.33
2	2	12	NO TEST	RR	2,4	Flat	189.51	3.60	0.00	6.08	92.42
3	1	12	NO TEST	RG	2,4	Hemi	124.17	0.00	0.00	5.28	69.70
3	2	12	NO TEST	RG	2,4	Hemi	132.91	0.00	0.00	5.28	69.70
4	1	12	NO TEST	FR	2,4	Hemi	123.10	0.00	0.00	5.30	70.22
4	2	12	NO TEST	FR	2,4	Hemi	133.90	0.00	0.00	5.27	69.43
1	1	13	NO TEST	LF	2,4	Flat	213.52	3.90	1.00	6.06	91.81
1	2	13	NO TEST	LF	2,4	Flat	217.38	3.60	1.20	6.06	91.81
2	1	13	NO TEST	RR	2,4	Flat	196.06	3.10	0.00	6.08	92.42
2	2	13	NO TEST	RR	2,4	Flat	217.78	3.30	1.50	6.06	91.81
3	1	13	NO TEST	RG	2,4	Hemi	125.11	0.00	0.00	5.27	69.43
3	2	13	NO TEST	RG	2,4	Hemi	132.93	0.00	0.00	5.28	69.70
4	1	13	NO TEST	FR	2,4	Hemi	130.99	0.00	0.00	5.28	69.70
4	2	13	NO TEST	FR	2,4	Hemi	150.48	0.10	0.00	5.27	69.43
1	1	14	NO TEST	LF	2,4	Flat	191.56	3.50	0.00	6.05	91.51
1	2	14	NO TEST	LF	2,4	Flat	193.45	2.70	0.00	6.05	91.51
2	1	14	NO TEST	RR	2,4	Flat	176.34	3.00	0.00	6.06	91.81
2	2	14	NO TEST	RR	2,4	Flat	195.89	3.30	0.00	6.05	91.51
3	1	14	NO TEST	RG	2,4	Hemi	120.77	0.00	0.00	5.27	69.43
3	2	14	NO TEST	RG	2,4	Hemi	132.49	0.00	0.00	5.28	69.70
4	1	14	NO TEST	FR	2,4	Hemi	112.94	0.00	0.00	5.27	69.43
4	2	14	NO TEST	FR	2,4	Hemi	129.97	0.00	0.00	5.27	69.43
1	1	15	NO TEST	LF	2,4	Flat	185.65	2.80	0.00	6.15	117.25
1	2	15	NO TEST	LF	2,4	Flat	201.78	3.10	0.20	6.14	116.87
2	1	15	NO TEST	RR	2,4	Flat	170.51	2.80	0.00	6.05	113.47
2	2	15	NO TEST	RR	2,4	Flat	195.91	3.40	0.00	6.05	113.47
3	1	15	NO TEST	RG	2,4	Hemi	119.76	0.00	0.00	5.27	86.10
3	2	15	NO TEST	RG	2,4	Hemi	110.45	0.00	0.00	5.27	86.10
4	1	15	NO TEST	FR	2,4	Hemi	124.59	0.00	0.00	5.31	87.41
4	2	15	NO TEST	FR	2,4	Hemi	138.75	0.00	0.00	5.27	86.10
1	1	12	NO TEST	LF	2,4	Flat	172.46	2.50	0.00	6.06	113.84
1	2	12	NO TEST	LF	2,4	Flat	175.38	2.50	0.00	6.06	113.84
2	1	12	NO TEST	RR	2,4	Flat	164.15	3.10	0.00	6.09	114.97
2	2	12	NO TEST	RR	2,4	Flat	176.40	2.90	0.00	6.03	112.72

Table 2.Y
Performance Test Results — Raw Data

HELMET NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
B1C008	Baseline	3/3/97	Wet	B1CL-B	11-95	1408	Large	DOT	Size D	6.20	PASS	PASS
B1C008	Baseline	3/3/97	Wet	B1CL-B	11-95	1408	Large	DOT	Size D	6.20	PASS	PASS
B1C008	Baseline	3/3/97	Wet	B1CL-B	11-95	1408	Large	DOT	Size D	6.20	PASS	PASS
B1C008	Baseline	3/3/97	Wet	B1CL-B	11-95	1408	Large	DOT	Size D	6.20	PASS	PASS
B1C009	Baseline	3/3/97	Cold	B1CL-C	11-95	1426	Large	DOT	Size D	6.20	PASS	PASS
B1C009	Baseline	3/3/97	Cold	B1CL-C	11-95	1426	Large	DOT	Size D	6.20	PASS	PASS
B1C009	Baseline	3/3/97	Cold	B1CL-C	11-95	1426	Large	DOT	Size D	6.20	PASS	PASS
B1C009	Baseline	3/3/97	Cold	B1CL-C	11-95	1426	Large	DOT	Size D	6.20	PASS	PASS
B1C009	Baseline	3/3/97	Cold	B1CL-C	11-95	1426	Large	DOT	Size D	6.20	PASS	PASS
B1C009	Baseline	3/3/97	Cold	B1CL-C	11-95	1426	Large	DOT	Size D	6.20	PASS	PASS
B1C009	Baseline	3/3/97	Cold	B1CL-C	11-95	1426	Large	DOT	Size D	6.20	PASS	PASS
B1C009	Baseline	3/3/97	Cold	B1CL-C	11-95	1426	Large	DOT	Size D	6.20	PASS	PASS
B1C010	Baseline	3/3/97	Hot	B1CL-D	11-95	1413	Large	DOT	Size D	6.20	PASS	PASS
B1C010	Baseline	3/3/97	Hot	B1CL-D	11-95	1413	Large	DOT	Size D	6.20	PASS	PASS
B1C010	Baseline	3/3/97	Hot	B1CL-D	11-95	1413	Large	DOT	Size D	6.20	PASS	PASS
B1C010	Baseline	3/3/97	Hot	B1CL-D	11-95	1413	Large	DOT	Size D	6.20	PASS	PASS
B1C010	Baseline	3/3/97	Hot	B1CL-D	11-95	1413	Large	DOT	Size D	6.20	PASS	PASS
B1C010	Baseline	3/3/97	Hot	B1CL-D	11-95	1413	Large	DOT	Size D	6.20	PASS	PASS
B1C010	Baseline	3/3/97	Hot	B1CL-D	11-95	1413	Large	DOT	Size D	6.20	PASS	PASS
B1C010	Baseline	3/3/97	Hot	B1CL-D	11-95	1413	Large	DOT	Size D	6.20	PASS	PASS
B1C015	Baseline	4/4/97	Ambient	B1CS-A	FEB 199	1422	XSmall	DOT	Size A	3.50	PASS	PASS
B1C015	Baseline	4/4/97	Ambient	B1CS-A	FEB 199	1422	XSmall	DOT	Size A	3.50	PASS	PASS
B1C015	Baseline	4/4/97	Ambient	B1CS-A	FEB 199	1422	XSmall	DOT	Size A	3.50	PASS	PASS
B1C015	Baseline	4/4/97	Ambient	B1CS-A	FEB 199	1422	XSmall	DOT	Size A	3.50	PASS	PASS
B1C015	Baseline	4/4/97	Ambient	B1CS-A	FEB 199	1422	XSmall	DOT	Size A	3.50	PASS	PASS
B1C015	Baseline	4/4/97	Ambient	B1CS-A	FEB 199	1422	XSmall	DOT	Size A	3.50	PASS	PASS
B1C015	Baseline	4/4/97	Ambient	B1CS-A	FEB 199	1422	XSmall	DOT	Size A	3.50	PASS	PASS
B1C015	Baseline	4/4/97	Ambient	B1CS-A	FEB 199	1422	XSmall	DOT	Size A	3.50	PASS	PASS
B1C016	Baseline	4/4/97	Wet	B1CS-B	FEB 199	1487	XSmall	DOT	Size A	3.50	PASS	PASS
B1C016	Baseline	4/4/97	Wet	B1CS-B	FEB 199	1487	XSmall	DOT	Size A	3.50	PASS	PASS
B1C016	Baseline	4/4/97	Wet	B1CS-B	FEB 199	1487	XSmall	DOT	Size A	3.50	PASS	PASS
B1C016	Baseline	4/4/97	Wet	B1CS-B	FEB 199	1487	XSmall	DOT	Size A	3.50	PASS	PASS
B1C016	Baseline	4/4/97	Wet	B1CS-B	FEB 199	1487	XSmall	DOT	Size A	3.50	PASS	PASS
B1C016	Baseline	4/4/97	Wet	B1CS-B	FEB 199	1487	XSmall	DOT	Size A	3.50	PASS	PASS
B1C016	Baseline	4/4/97	Wet	B1CS-B	FEB 199	1487	XSmall	DOT	Size A	3.50	PASS	PASS
B1C016	Baseline	4/4/97	Wet	B1CS-B	FEB 199	1487	XSmall	DOT	Size A	3.50	PASS	PASS
B1C017	Baseline	4/4/97	Cold	B1CS-C	FEB 199	1427	XSmall	DOT	Size A	3.50	PASS	PASS
B1C017	Baseline	4/4/97	Cold	B1CS-C	FEB 199	1427	XSmall	DOT	Size A	3.50	PASS	PASS
B1C017	Baseline	4/4/97	Cold	B1CS-C	FEB 199	1427	XSmall	DOT	Size A	3.50	PASS	PASS
B1C017	Baseline	4/4/97	Cold	B1CS-C	FEB 199	1427	XSmall	DOT	Size A	3.50	PASS	PASS
B1C017	Baseline	4/4/97	Cold	B1CS-C	FEB 199	1427	XSmall	DOT	Size A	3.50	PASS	PASS
B1C017	Baseline	4/4/97	Cold	B1CS-C	FEB 199	1427	XSmall	DOT	Size A	3.50	PASS	PASS
B1C017	Baseline	4/4/97	Cold	B1CS-C	FEB 199	1427	XSmall	DOT	Size A	3.50	PASS	PASS
B1C017	Baseline	4/4/97	Cold	B1CS-C	FEB 199	1427	XSmall	DOT	Size A	3.50	PASS	PASS
B1C018	Baseline	4/4/97	Hot	B1CS-D	FEB 199	1479	XSmall	DOT	Size A	3.50	PASS	PASS
B1C018	Baseline	4/4/97	Hot	B1CS-D	FEB 199	1479	XSmall	DOT	Size A	3.50	PASS	PASS
B1C018	Baseline	4/4/97	Hot	B1CS-D	FEB 199	1479	XSmall	DOT	Size A	3.50	PASS	PASS
B1C018	Baseline	4/4/97	Hot	B1CS-D	FEB 199	1479	XSmall	DOT	Size A	3.50	PASS	PASS
B1C018	Baseline	4/4/97	Hot	B1CS-D	FEB 199	1479	XSmall	DOT	Size A	3.50	PASS	PASS
B1C018	Baseline	4/4/97	Hot	B1CS-D	FEB 199	1479	XSmall	DOT	Size A	3.50	PASS	PASS
B1C018	Baseline	4/4/97	Hot	B1CS-D	FEB 199	1479	XSmall	DOT	Size A	3.50	PASS	PASS
B1C018	Baseline	4/4/97	Hot	B1CS-D	FEB 199	1479	XSmall	DOT	Size A	3.50	PASS	PASS
B2A005	Baseline	2/22/97	Ambient	B2AL-A	4-96	841	XLarge	DOT	Size D	6.10	NO TES	NO TES
B2A005	Baseline	2/22/97	Ambient	B2AL-A	4-96	841	XLarge	DOT	Size D	6.10	NO TES	NO TES
B2A005	Baseline	2/22/97	Ambient	B2AL-A	4-96	841	XLarge	DOT	Size D	6.10	NO TES	NO TES
B2A005	Baseline	2/22/97	Ambient	B2AL-A	4-96	841	XLarge	DOT	Size D	6.10	NO TES	NO TES
B2A005	Baseline	2/22/97	Ambient	B2AL-A	4-96	841	XLarge	DOT	Size D	6.10	NO TES	NO TES
B2A005	Baseline	2/22/97	Ambient	B2AL-A	4-96	841	XLarge	DOT	Size D	6.10	NO TES	NO TES

Table 2.Y
Performance Test Results — Raw Data

DROP NUM	HIT NUM	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
3	1	12	NO TEST	RG	2,4	Hemi	95.77	0.00	0.00	5.30	87.08
3	2	12	NO TEST	RG	2,4	Hemi	111.90	0.00	0.00	5.30	87.08
4	1	12	NO TEST	FR	2,4	Hemi	100.20	0.00	0.00	5.28	86.42
4	2	12	NO TEST	FR	2,4	Hemi	121.20	0.00	0.00	5.28	86.42
1	1	12	NO TEST	LF	2,4	Flat	189.51	3.20	0.00	6.09	114.97
1	2	12	NO TEST	LF	2,4	Flat	196.86	3.50	0.00	6.06	113.84
2	1	12	NO TEST	RR	2,4	Flat	181.78	2.90	0.00	6.00	111.60
2	2	12	NO TEST	RR	2,4	Flat	205.11	3.40	0.70	6.05	113.47
3	1	12	NO TEST	RG	2,4	Hemi	119.73	0.00	0.00	5.27	86.10
3	2	12	NO TEST	RG	2,4	Hemi	125.10	0.00	0.00	5.28	86.42
4	1	12	NO TEST	FR	2,4	Hemi	130.00	0.00	0.00	5.29	86.75
4	2	12	NO TEST	FR	2,4	Hemi	147.60	0.00	0.00	5.26	85.77
1	1	13	NO TEST	LF	2,4	Flat	173.85	2.10	0.00	6.08	114.60
1	2	13	NO TEST	LF	2,4	Flat	187.11	2.60	0.00	6.05	113.47
2	1	13	NO TEST	RR	2,4	Flat	162.31	2.50	0.00	6.03	112.72
2	2	13	NO TEST	RR	2,4	Flat	189.61	2.90	0.00	6.05	113.47
3	1	13	NO TEST	RG	2,4	Hemi	108.96	0.00	0.00	5.27	86.10
3	2	13	NO TEST	RG	2,4	Hemi	118.79	0.00	0.00	5.29	86.75
4	1	13	NO TEST	FR	2,4	Hemi	114.36	0.00	0.00	5.29	86.75
4	2	13	NO TEST	FR	2,4	Hemi	132.87	0.00	0.00	5.27	86.10
1	1	21	NO TEST	LF	2,4	Flat	217.37	3.80	2.60	6.02	63.42
1	2	21	NO TEST	LF	2,4	Flat	236.43	3.80	2.70	5.99	62.79
2	1	21	NO TEST	RR	2,4	Flat	195.88	3.90	0.00	6.08	64.69
2	2	21	NO TEST	RR	2,4	Flat	220.77	3.90	1.30	6.08	64.69
3	1	21	NO TEST	RR	2,4	Hemi	155.87	0.50	0.00	5.19	47.14
3	2	21	NO TEST	RR	2,4	Hemi	170.04	0.80	0.00	5.26	48.42
4	1	21	NO TEST	FR	2,4	Hemi	171.50	2.10	0.00	5.27	48.60
4	2	21	NO TEST	FR	2,4	Hemi	177.30	2.60	0.00	5.27	48.60
1	1	18	NO TEST	LF	2,4	Flat	221.23	3.70	1.40	6.09	64.90
1	2	18	NO TEST	LF	2,4	Flat	216.42	3.70	0.80	6.06	64.27
2	1	18	NO TEST	RR	2,4	Flat	205.15	3.80	0.10	6.09	64.90
2	2	18	NO TEST	RR	2,4	Flat	193.43	3.80	0.00	6.17	66.62
3	1	18	NO TEST	RR	2,4	Hemi	142.66	0.00	0.00	5.26	48.42
3	2	18	NO TEST	RR	2,4	Hemi	142.19	0.00	0.00	5.28	48.79
4	1	18	NO TEST	FR	2,4	Hemi	139.24	0.00	0.00	5.27	48.60
4	2	18	NO TEST	FR	2,4	Hemi	160.80	1.30	0.00	5.29	48.97
1	1	20	NO TEST	LF	2,4	Flat	215.42	3.90	2.00	6.02	63.42
1	2	20	NO TEST	LF	2,4	Flat	235.47	3.70	2.70	6.00	63.00
2	1	20	NO TEST	RR	2,4	Flat	206.66	3.80	0.40	6.11	65.33
2	2	20	NO TEST	RR	2,4	Flat	214.93	3.90	1.30	6.03	63.63
3	1	20	NO TEST	RR	2,4	Hemi	192.46	1.60	0.00	5.26	48.42
3	2	20	NO TEST	RR	2,4	Hemi	206.62	1.50	0.10	5.25	48.23
4	1	20	NO TEST	FR	2,4	Hemi	172.99	2.20	0.00	5.37	50.46
4	2	20	NO TEST	FR	2,4	Hemi	167.06	1.30	0.00	5.34	49.90
1	1	21	NO TEST	LF	2,4	Flat	208.59	3.90	0.90	6.02	63.42
1	2	21	NO TEST	LF	2,4	Flat	226.19	3.90	1.50	6.02	63.42
2	1	21	NO TEST	RR	2,4	Flat	192.49	4.00	0.00	6.03	63.63
2	2	21	NO TEST	RR	2,4	Flat	208.66	3.60	0.90	6.02	63.42
3	1	21	NO TEST	RR	2,4	Hemi	161.25	0.60	0.00	5.24	48.05
3	2	21	NO TEST	RR	2,4	Hemi	167.56	0.70	0.00	5.26	48.42
4	1	21	NO TEST	FR	2,4	Hemi	162.68	1.70	0.00	5.22	47.68
4	2	21	NO TEST	FR	2,4	Hemi	185.16	2.00	0.00	5.20	47.32
1	1	NO TEST	3.3 lb/cu.ft.	LF	2,4	Hemi	100.69	0.00	0.00	5.26	84.39
1	2	NO TEST	3.3 lb/cu.ft.	LF	2,4	Hemi	130.03	0.00	0.00	5.25	84.07
2	1	NO TEST	3.3 lb/cu.ft.	RR	2,4	Hemi	96.81	0.00	0.00	5.26	84.39
2	2	NO TEST	3.3 lb/cu.ft.	RR	2,4	Hemi	167.13	0.90	0.00	5.28	85.03
3	1	NO TEST	3.3 lb/cu.ft.	RG	2,4	Flat	177.88	2.40	0.00	5.96	108.34
3	2	NO TEST	3.3 lb/cu.ft.	RG	2,4	Flat	205.20	2.70	1.00	6.05	111.64

Table 2.Y
Performance Test Results — Raw Data

HELMET NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
B2A005	Baseline	2/22/97	Ambient	B2AL-A	4-96	841	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A005	Baseline	2/22/97	Ambient	B2AL-A	4-96	841	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A006	Baseline	2/22/97	Wet	B2AL-B	4-96	847	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A006	Baseline	2/22/97	Wet	B2AL-B	4-96	847	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A006	Baseline	2/22/97	Wet	B2AL-B	4-96	847	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A006	Baseline	2/22/97	Wet	B2AL-B	4-96	847	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A006	Baseline	2/22/97	Wet	B2AL-B	4-96	847	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A006	Baseline	2/22/97	Wet	B2AL-B	4-96	847	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A006	Baseline	2/22/97	Wet	B2AL-B	4-96	847	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A006	Baseline	2/22/97	Wet	B2AL-B	4-96	847	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A007	Baseline	2/22/97	Cold	B2AL-C	4-96	827	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A007	Baseline	2/22/97	Cold	B2AL-C	4-96	827	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A007	Baseline	2/22/97	Cold	B2AL-C	4-96	827	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A007	Baseline	2/22/97	Cold	B2AL-C	4-96	827	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A007	Baseline	2/22/97	Cold	B2AL-C	4-96	827	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A007	Baseline	2/22/97	Cold	B2AL-C	4-96	827	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A007	Baseline	2/22/97	Cold	B2AL-C	4-96	827	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A007	Baseline	2/22/97	Cold	B2AL-C	4-96	827	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A008	Baseline	2/22/97	Hot	B2AL-D	4-96	842	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A008	Baseline	2/22/97	Hot	B2AL-D	4-96	842	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A008	Baseline	2/22/97	Hot	B2AL-D	4-96	842	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A008	Baseline	2/22/97	Hot	B2AL-D	4-96	842	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A008	Baseline	2/22/97	Hot	B2AL-D	4-96	842	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A008	Baseline	2/22/97	Hot	B2AL-D	4-96	842	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A008	Baseline	2/22/97	Hot	B2AL-D	4-96	842	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A008	Baseline	2/22/97	Hot	B2AL-D	4-96	842	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2A009	Baseline	3/12/97	Ambient	B2AM-A2	5-96	826	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A009	Baseline	3/12/97	Ambient	B2AM-A2	5-96	826	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A009	Baseline	3/12/97	Ambient	B2AM-A2	5-96	826	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A009	Baseline	3/12/97	Ambient	B2AM-A2	5-96	826	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A009	Baseline	3/12/97	Ambient	B2AM-A2	5-96	826	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A009	Baseline	3/12/97	Ambient	B2AM-A2	5-96	826	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A009	Baseline	3/12/97	Ambient	B2AM-A2	5-96	826	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A009	Baseline	3/12/97	Ambient	B2AM-A2	5-96	826	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A010	Baseline	3/12/97	Wet	B2AM-B2	5-96	824	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A010	Baseline	3/12/97	Wet	B2AM-B2	5-96	824	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A010	Baseline	3/12/97	Wet	B2AM-B2	5-96	824	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A010	Baseline	3/12/97	Wet	B2AM-B2	5-96	824	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A010	Baseline	3/12/97	Wet	B2AM-B2	5-96	824	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A010	Baseline	3/12/97	Wet	B2AM-B2	5-96	824	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A010	Baseline	3/12/97	Wet	B2AM-B2	5-96	824	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A010	Baseline	3/12/97	Wet	B2AM-B2	5-96	824	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A011	Baseline	3/12/97	Cold	B2AM-C2	5-96	844	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A011	Baseline	3/12/97	Cold	B2AM-C2	5-96	844	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A011	Baseline	3/12/97	Cold	B2AM-C2	5-96	844	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A011	Baseline	3/12/97	Cold	B2AM-C2	5-96	844	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A011	Baseline	3/12/97	Cold	B2AM-C2	5-96	844	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A011	Baseline	3/12/97	Cold	B2AM-C2	5-96	844	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A011	Baseline	3/12/97	Cold	B2AM-C2	5-96	844	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A011	Baseline	3/12/97	Cold	B2AM-C2	5-96	844	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A012	Baseline	3/12/97	Hot	B2AM-D2	5-96	829	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A012	Baseline	3/12/97	Hot	B2AM-D2	5-96	829	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A012	Baseline	3/12/97	Hot	B2AM-D2	5-96	829	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A012	Baseline	3/12/97	Hot	B2AM-D2	5-96	829	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A012	Baseline	3/12/97	Hot	B2AM-D2	5-96	829	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A012	Baseline	3/12/97	Hot	B2AM-D2	5-96	829	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A012	Baseline	3/12/97	Hot	B2AM-D2	5-96	829	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2A012	Baseline	3/12/97	Hot	B2AM-D2	5-96	829	Medium	DOT	Size C	5.00	NO TEST	NO TEST

Table 2.Y
Performance Test Results — Raw Data

DROP NUM	HIT NUM	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
4	1	NO TEST	3.3 lb/cu.ft.	FR	2,4	Flat	190.56	2.50	0.00	6.09	113.12
4	2	NO TEST	3.3 lb/cu.ft.	FR	2,4	Flat	301.43	2.50	1.70	6.06	112.01
1	1	NO TEST	NO TEST	LF	2,4	Hemi	97.78	0.00	0.00	5.25	84.07
1	2	NO TEST	NO TEST	LF	2,4	Hemi	125.61	0.00	0.00	5.29	85.35
2	1	NO TEST	NO TEST	RR	2,4	Hemi	100.19	0.00	0.00	5.26	84.39
2	2	NO TEST	NO TEST	RR	2,4	Hemi	137.83	0.00	0.00	5.25	84.07
3	1	NO TEST	NO TEST	RG	2,4	Flat	179.31	3.10	0.00	6.02	110.53
3	2	NO TEST	NO TEST	RG	2,4	Flat	204.64	2.80	0.10	6.00	109.80
4	1	NO TEST	NO TEST	FR	2,4	Flat	164.69	1.00	0.00	6.02	110.53
4	2	NO TEST	NO TEST	FR	2,4	Flat	270.62	2.20	1.00	6.03	110.90
1	1	NO TEST	NO TEST	LF	2,4	Hemi	101.63	0.00	0.00	5.29	85.35
1	2	NO TEST	NO TEST	LF	2,4	Hemi	121.70	0.00	0.00	5.29	85.35
2	1	NO TEST	NO TEST	RR	2,4	Hemi	97.83	0.00	0.00	5.20	82.47
2	2	NO TEST	NO TEST	RR	2,4	Hemi	129.02	0.00	0.00	5.26	84.39
3	1	NO TEST	NO TEST	RG	2,4	Flat	199.83	2.60	0.00	6.05	111.64
3	2	NO TEST	NO TEST	RG	2,4	Flat	228.16	2.90	1.60	6.03	110.90
4	1	NO TEST	NO TEST	FR	2,4	Flat	195.90	2.60	0.00	6.03	110.90
4	2	NO TEST	NO TEST	FR	2,4	Flat	567.02	1.70	1.30	6.03	110.90
1	1	NO TEST	NO TEST	LF	2,4	Hemi	94.37	0.00	0.00	5.27	84.71
1	2	NO TEST	NO TEST	LF	2,4	Hemi	192.98	1.00	0.00	5.27	84.71
2	1	NO TEST	NO TEST	RR	2,4	Hemi	96.30	0.00	0.00	5.24	83.75
2	2	NO TEST	NO TEST	RR	2,4	Hemi	182.24	1.00	0.00	5.23	83.43
3	1	NO TEST	NO TEST	RG	2,4	Flat	179.28	2.50	0.00	6.06	112.01
3	2	NO TEST	NO TEST	RG	2,4	Flat	217.91	2.70	1.10	6.05	111.64
4	1	NO TEST	NO TEST	FR	2,4	Flat	192.99	2.40	0.00	6.03	110.90
4	2	NO TEST	NO TEST	FR	2,4	Flat	572.37	1.90	1.30	6.08	112.75
1	1	NO TEST	2.7 lb/cu.ft.	LF	2,4	Hemi	104.14	0.00	0.00	5.22	68.12
1	2	NO TEST	2.7 lb/cu.ft.	LF	2,4	Hemi	132.92	0.00	0.00	5.22	68.12
2	1	NO TEST	2.7 lb/cu.ft.	RR	2,4	Hemi	109.52	0.00	0.00	5.26	69.17
2	2	NO TEST	2.7 lb/cu.ft.	RR	2,4	Hemi	131.95	0.00	0.00	5.27	69.43
3	1	NO TEST	2.7 lb/cu.ft.	RG	2,4	Flat	202.74	2.60	0.30	5.96	88.80
3	2	NO TEST	2.7 lb/cu.ft.	RG	2,4	Flat	239.36	3.00	1.60	6.03	90.90
4	1	NO TEST	2.7 lb/cu.ft.	FR	2,4	Flat	194.94	2.70	0.00	6.09	92.72
4	2	NO TEST	2.7 lb/cu.ft.	FR	2,4	Flat	336.04	2.50	1.60	6.05	91.51
1	1	NO TEST	NO TEST	LF	2,4	Hemi	131.94	0.00	0.00	5.27	69.43
1	2	NO TEST	NO TEST	LF	2,4	Hemi	143.19	0.00	0.00	5.27	69.43
2	1	NO TEST	NO TEST	RR	2,4	Hemi	103.58	0.00	0.00	5.26	69.17
2	2	NO TEST	NO TEST	RR	2,4	Hemi	121.24	0.00	0.00	5.28	69.70
3	1	NO TEST	NO TEST	RG	2,4	Flat	186.12	2.90	0.00	6.08	92.42
3	2	NO TEST	NO TEST	RG	2,4	Flat	214.48	3.10	1.20	6.12	93.64
4	1	NO TEST	NO TEST	FR	2,4	Flat	134.84	0.00	0.00	6.09	92.72
4	2	NO TEST	NO TEST	FR	2,4	Flat	333.09	2.00	1.20	6.09	92.72
1	1	NO TEST	NO TEST	LF	2,4	Hemi	108.00	0.00	0.00	5.25	68.91
1	2	NO TEST	NO TEST	LF	2,4	Hemi	128.94	0.00	0.00	5.26	69.17
2	1	NO TEST	NO TEST	RR	2,4	Hemi	102.67	0.00	0.00	5.32	70.76
2	2	NO TEST	NO TEST	RR	2,4	Hemi	128.54	0.00	0.00	5.30	70.22
3	1	NO TEST	NO TEST	RG	2,4	Flat	217.86	3.60	1.30	6.21	96.41
3	2	NO TEST	NO TEST	RG	2,4	Flat	251.58	3.20	2.00	6.20	96.10
4	1	NO TEST	NO TEST	FR	2,4	Flat	192.50	2.60	0.00	6.08	92.42
4	2	NO TEST	NO TEST	FR	2,4	Flat	354.10	2.60	1.70	6.09	92.72
1	1	NO TEST	NO TEST	LF	2,4	Hemi	100.71	0.00	0.00	5.23	68.38
1	2	NO TEST	NO TEST	LF	2,4	Hemi	123.66	0.00	0.00	5.20	67.60
2	1	NO TEST	NO TEST	RR	2,4	Hemi	100.16	0.00	0.00	5.26	69.17
2	2	NO TEST	NO TEST	RR	2,4	Hemi	125.59	0.00	0.00	5.28	69.70
3	1	NO TEST	NO TEST	RG	2,4	Flat	199.79	3.30	0.00	6.18	95.48
3	2	NO TEST	NO TEST	RG	2,4	Flat	235.94	3.10	1.90	6.12	93.64
4	1	NO TEST	NO TEST	FR	2,4	Flat	180.25	2.40	0.00	6.06	91.81
4	2	NO TEST	NO TEST	FR	2,4	Flat	415.62	2.30	1.50	6.08	92.42

Table 2.Y
Performance Test Results — Raw Data

HELME NUMBER	TEST TYPE	TEST DAT	TEST COND	SAMPLE NUMBER	MAN DAT	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
B2A013	Baseline	3/17/97	Ambient	B2AS-A	4-96	820	XSmall	DO	Size A	3.50	NO TES	NO TES
B2A013	Baseline	3/17/97	Ambient	B2AS-A	4-96	820	XSmall	DO	Size A	3.50	NO TES	NO TES
B2A013	Baseline	3/17/97	Ambient	B2AS-A	4-96	820	XSmall	DO	Size A	3.50	NO TES	NO TES
B2A013	Baseline	3/17/97	Ambient	B2AS-A	4-96	820	XSmall	DO	Size A	3.50	NO TES	NO TES
B2A013	Baseline	3/17/97	Ambient	B2AS-A	4-96	820	XSmall	DO	Size A	3.50	NO TES	NO TES
B2A013	Baseline	3/17/97	Ambient	B2AS-A	4-96	820	XSmall	DO	Size A	3.50	NO TES	NO TES
B2A013	Baseline	3/17/97	Ambient	B2AS-A	4-96	820	XSmall	DO	Size A	3.50	NO TES	NO TES
B2A013	Baseline	3/17/97	Ambient	B2AS-A	4-96	820	XSmall	DO	Size A	3.50	NO TES	NO TES
B2A014	Baseline	3/17/97	Wet	B2AS-B	4-96	834	XSmall	DO	Size A	3.50	NO TES	NO TES
B2A014	Baseline	3/17/97	Wet	B2AS-B	4-96	834	XSmall	DO	Size A	3.50	NO TES	NO TES
B2A014	Baseline	3/17/97	Wet	B2AS-B	4-96	834	XSmall	DO	Size A	3.50	NO TES	NO TES
B2A014	Baseline	3/17/97	Wet	B2AS-B	4-96	834	XSmall	DO	Size A	3.50	NO TES	NO TES
B2A014	Baseline	3/17/97	Wet	B2AS-B	4-96	834	XSmall	DO	Size A	3.50	NO TES	NO TES
B2A014	Baseline	3/17/97	Wet	B2AS-B	4-96	834	XSmall	DO	Size A	3.50	NO TES	NO TES
B2A014	Baseline	3/17/97	Wet	B2AS-B	4-96	834	XSmall	DO	Size A	3.50	NO TES	NO TES
B2A014	Baseline	3/17/97	Wet	B2AS-B	4-96	834	XSmall	DO	Size A	3.50	NO TES	NO TES
B2A015	Baseline	3/17/97	Cold	B2AS-C	4-96	844	Small	DO	Size A	3.50	NO TES	NO TES
B2A015	Baseline	3/17/97	Cold	B2AS-C	4-96	844	Small	DO	Size A	3.50	NO TES	NO TES
B2A015	Baseline	3/17/97	Cold	B2AS-C	4-96	844	Small	DO	Size A	3.50	NO TES	NO TES
B2A015	Baseline	3/17/97	Cold	B2AS-C	4-96	844	Small	DO	Size A	3.50	NO TES	NO TES
B2A015	Baseline	3/17/97	Cold	B2AS-C	4-96	844	Small	DO	Size A	3.50	NO TES	NO TES
B2A015	Baseline	3/17/97	Cold	B2AS-C	4-96	844	Small	DO	Size A	3.50	NO TES	NO TES
B2A015	Baseline	3/17/97	Cold	B2AS-C	4-96	844	Small	DO	Size A	3.50	NO TES	NO TES
B2A015	Baseline	3/17/97	Cold	B2AS-C	4-96	844	Small	DO	Size A	3.50	NO TES	NO TES
B2A016	Baseline	3/17/97	Hot	B2AS-D	4-96	840	Small	DO	Size A	3.50	NO TES	NO TES
B2A016	Baseline	3/17/97	Hot	B2AS-D	4-96	840	Small	DO	Size A	3.50	NO TES	NO TES
B2A016	Baseline	3/17/97	Hot	B2AS-D	4-96	840	Small	DO	Size A	3.50	NO TES	NO TES
B2A016	Baseline	3/17/97	Hot	B2AS-D	4-96	840	Small	DO	Size A	3.50	NO TES	NO TES
B2A016	Baseline	3/17/97	Hot	B2AS-D	4-96	840	Small	DO	Size A	3.50	NO TES	NO TES
B2A016	Baseline	3/17/97	Hot	B2AS-D	4-96	840	Small	DO	Size A	3.50	NO TES	NO TES
B2A016	Baseline	3/17/97	Hot	B2AS-D	4-96	840	Small	DO	Size A	3.50	NO TES	NO TES
B2A016	Baseline	3/17/97	Hot	B2AS-D	4-96	840	Small	DO	Size A	3.50	NO TES	NO TES
B2B001	Baseline	3/10/97	Ambient	B2BM-A	10-91	1398	Large	DO	Size C	5.00	NO TES	NO TES
B2B001	Baseline	3/10/97	Ambient	B2BM-A	10-91	1398	Large	DO	Size C	5.00	NO TES	NO TES
B2B001	Baseline	3/10/97	Ambient	B2BM-A	10-91	1398	Large	DO	Size C	5.00	NO TES	NO TES
B2B001	Baseline	3/10/97	Ambient	B2BM-A	10-91	1398	Large	DO	Size C	5.00	NO TES	NO TES
B2B001	Baseline	3/10/97	Ambient	B2BM-A	10-91	1398	Large	DO	Size C	5.00	NO TES	NO TES
B2B001	Baseline	3/10/97	Ambient	B2BM-A	10-91	1398	Large	DO	Size C	5.00	NO TES	NO TES
B2B001	Baseline	3/10/97	Ambient	B2BM-A	10-91	1398	Large	DO	Size C	5.00	NO TES	NO TES
B2B001	Baseline	3/10/97	Ambient	B2BM-A	10-91	1398	Large	DO	Size C	5.00	NO TES	NO TES
B2B002	Baseline	3/10/97	Wet	B2BM-B	10-91	1399	Large	DO	Size C	5.00	NO TES	NO TES
B2B002	Baseline	3/10/97	Wet	B2BM-B	10-91	1399	Large	DO	Size C	5.00	NO TES	NO TES
B2B002	Baseline	3/10/97	Wet	B2BM-B	10-91	1399	Large	DO	Size C	5.00	NO TES	NO TES
B2B002	Baseline	3/10/97	Wet	B2BM-B	10-91	1399	Large	DO	Size C	5.00	NO TES	NO TES
B2B002	Baseline	3/10/97	Wet	B2BM-B	10-91	1399	Large	DO	Size C	5.00	NO TES	NO TES
B2B002	Baseline	3/10/97	Wet	B2BM-B	10-91	1399	Large	DO	Size C	5.00	NO TES	NO TES
B2B002	Baseline	3/10/97	Wet	B2BM-B	10-91	1399	Large	DO	Size C	5.00	NO TES	NO TES
B2B002	Baseline	3/10/97	Wet	B2BM-B	10-91	1399	Large	DO	Size C	5.00	NO TES	NO TES
B2B003	Baseline	3/10/97	Cold	B2BM-C	10-91	1394	Large	DO	Size C	5.00	NO TES	NO TES
B2B003	Baseline	3/10/97	Cold	B2BM-C	10-91	1394	Large	DO	Size C	5.00	NO TES	NO TES
B2B003	Baseline	3/10/97	Cold	B2BM-C	10-91	1394	Large	DO	Size C	5.00	NO TES	NO TES
B2B003	Baseline	3/10/97	Cold	B2BM-C	10-91	1394	Large	DO	Size C	5.00	NO TES	NO TES
B2B003	Baseline	3/10/97	Cold	B2BM-C	10-91	1394	Large	DO	Size C	5.00	NO TES	NO TES
B2B003	Baseline	3/10/97	Cold	B2BM-C	10-91	1394	Large	DO	Size C	5.00	NO TES	NO TES
B2B003	Baseline	3/10/97	Cold	B2BM-C	10-91	1394	Large	DO	Size C	5.00	NO TES	NO TES
B2B003	Baseline	3/10/97	Cold	B2BM-C	10-91	1394	Large	DO	Size C	5.00	NO TES	NO TES
B2B004	Baseline	3/10/97	Hot	B2BM-D	10-91	1401	Large	DO	Size C	5.00	NO TES	NO TES
B2B004	Baseline	3/10/97	Hot	B2BM-D	10-91	1401	Large	DO	Size C	5.00	NO TES	NO TES

Table 2.Y
Performance Test Results — Raw Data

DROP NU	HIT NU	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
1	1	NO TES	3.4 lb/cu.ft.	LF	2,4	Hemi	120.20	0.00	0.00	5.19	47.14
1	2	NO TES	3.4 lb/cu.ft.	LF	2,4	Hemi	141.69	0.00	0.00	5.27	48.60
2	1	NO TES	3.4 lb/cu.ft.	RR	2,4	Hemi	129.49	0.00	0.00	5.27	48.60
2	2	NO TES	3.4 lb/cu.ft.	RR	2,4	Hemi	136.82	0.00	0.00	5.28	48.79
3	1	NO TES	3.4 lb/cu.ft.	RG	2,4	Flat	228.15	3.50	0.90	5.96	62.16
3	2	NO TES	3.4 lb/cu.ft.	RG	2,4	Flat	266.22	3.30	1.40	5.95	61.95
4	1	NO TES	3.4 lb/cu.ft.	FR	2,4	Flat	188.61	2.70	0.00	5.95	61.95
4	2	NO TES	3.4 lb/cu.ft.	FR	2,4	Flat	233.50	2.80	1.60	6.03	63.63
1	1	NO TES	NO TES	LF	2,4	Hemi	122.15	0.00	0.00	5.27	48.60
1	2	NO TES	NO TES	LF	2,4	Hemi	137.28	0.00	0.00	5.28	48.79
2	1	NO TES	NO TES	RR	2,4	Hemi	109.47	0.00	0.00	5.28	48.79
2	2	NO TES	NO TES	RR	2,4	Hemi	114.83	0.00	0.00	5.28	48.79
3	1	NO TES	NO TES	RG	2,4	Flat	194.92	3.40	0.00	6.02	63.42
3	2	NO TES	NO TES	RG	2,4	Flat	227.14	3.50	2.30	6.03	63.63
4	1	NO TES	NO TES	FR	2,4	Flat	192.52	2.70	0.00	6.05	64.05
4	2	NO TES	NO TES	FR	2,4	Flat	202.27	3.10	0.70	6.05	64.05
1	1	NO TES	NO TES	LF	2,4	Hemi	134.87	0.00	0.00	5.24	48.05
1	2	NO TES	NO TES	LF	2,4	Hemi	145.08	0.00	0.00	5.23	47.87
2	1	NO TES	NO TES	RR	2,4	Hemi	143.23	0.00	0.00	5.29	48.97
2	2	NO TES	NO TES	RR	2,4	Hemi	148.56	0.00	0.00	5.26	48.42
3	1	NO TES	NO TES	RG	2,4	Flat	230.08	3.70	1.00	6.12	65.55
3	2	NO TES	NO TES	RG	2,4	Flat	268.15	3.20	1.20	6.09	64.90
4	1	NO TES	NO TES	FR	2,4	Flat	204.25	3.10	0.80	6.03	63.63
4	2	NO TES	NO TES	FR	2,4	Flat	238.34	3.20	2.00	6.03	63.63
1	1	NO TES	NO TES	LF	2,4	Hemi	130.97	0.00	0.00	5.20	47.32
1	2	NO TES	NO TES	LF	2,4	Hemi	150.48	0.10	0.00	5.23	47.87
2	1	NO TES	NO TES	RR	2,4	Hemi	131.43	0.00	0.00	5.29	48.97
2	2	NO TES	NO TES	RR	2,4	Hemi	153.91	0.10	0.00	5.27	48.60
3	1	NO TES	NO TES	RG	2,4	Flat	206.12	3.40	0.40	6.11	65.33
3	2	NO TES	NO TES	RG	2,4	Flat	240.83	3.70	1.10	6.02	63.42
4	1	NO TES	NO TES	FR	2,4	Flat	193.46	2.80	0.00	6.00	63.00
4	2	NO TES	NO TES	FR	2,4	Flat	231.06	2.80	1.80	6.03	63.63
1	1	NO TES	3.5 lb/cu.ft.	LF	2,4	Hemi	102.63	0.00	0.00	5.30	70.22
1	2	NO TES	3.5 lb/cu.ft.	LF	2,4	Hemi	116.27	0.00	0.00	5.27	69.43
2	1	NO TES	3.5 lb/cu.ft.	RR	2,4	Hemi	117.31	0.00	0.00	5.28	69.70
2	2	NO TES	3.5 lb/cu.ft.	RR	2,4	Hemi	134.87	0.00	0.00	5.30	70.22
3	1	NO TES	3.5 lb/cu.ft.	RG	2,4	Flat	210.06	3.30	0.80	6.06	91.81
3	2	NO TES	3.5 lb/cu.ft.	RG	2,4	Flat	253.09	3.20	2.70	6.08	92.42
4	1	NO TES	3.5 lb/cu.ft.	FR	2,4	Flat	185.70	2.60	0.00	6.08	92.42
4	2	NO TES	3.5 lb/cu.ft.	FR	2,4	Flat	221.78	3.00	1.80	6.09	92.72
1	1	NO TES	NO TES	LF	2,4	Hemi	106.00	0.00	0.00	5.29	69.96
1	2	NO TES	NO TES	LF	2,4	Hemi	126.10	0.00	0.00	5.29	69.96
2	1	NO TES	NO TES	RR	2,4	Hemi	106.55	0.00	0.00	5.28	69.70
2	2	NO TES	NO TES	RR	2,4	Hemi	122.19	0.00	0.00	5.27	69.43
3	1	NO TES	NO TES	RG	2,4	Flat	221.70	3.10	2.00	6.11	93.33
3	2	NO TES	NO TES	RG	2,4	Flat	220.86	3.20	2.00	6.08	92.42
4	1	NO TES	NO TES	FR	2,4	Flat	161.73	1.90	0.00	6.08	92.42
4	2	NO TES	NO TES	FR	2,4	Flat	185.16	2.80	0.00	6.09	92.72
1	1	NO TES	NO TES	LF	2,4	Hemi	112.89	0.00	0.00	5.26	69.17
1	2	NO TES	NO TES	LF	2,4	Hemi	126.59	0.00	0.00	5.25	68.91
2	1	NO TES	NO TES	RR	2,4	Hemi	135.36	0.00	0.00	5.23	68.38
2	2	NO TES	NO TES	RR	2,4	Hemi	136.82	0.00	0.00	5.25	68.91
3	1	NO TES	NO TES	RG	2,4	Flat	216.42	3.20	2.20	6.05	91.51
3	2	NO TES	NO TES	RG	2,4	Flat	245.75	3.20	2.50	6.08	92.42
4	1	NO TES	NO TES	FR	2,4	Flat	192.95	2.60	0.00	6.09	92.72
4	2	NO TES	NO TES	FR	2,4	Flat	230.59	3.00	1.90	6.02	90.60
1	1	NO TES	NO TES	LF	2,4	Hemi	104.10	0.00	0.00	5.27	69.43
1	2	NO TES	NO TES	LF	2,4	Hemi	135.82	0.00	0.00	5.27	69.43

Table 2.Y
Performance Test Results — Raw Data

HELMET NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
B2B004	Baseline	3/10/97	Hot	B2BM-D	10-91	1401	Large	DOT	Size C	5.00	NO TEST	NO TEST
B2B004	Baseline	3/10/97	Hot	B2BM-D	10-91	1401	Large	DOT	Size C	5.00	NO TEST	NO TEST
B2B004	Baseline	3/10/97	Hot	B2BM-D	10-91	1401	Large	DOT	Size C	5.00	NO TEST	NO TEST
B2B004	Baseline	3/10/97	Hot	B2BM-D	10-91	1401	Large	DOT	Size C	5.00	NO TEST	NO TEST
B2B004	Baseline	3/10/97	Hot	B2BM-D	10-91	1401	Large	DOT	Size C	5.00	NO TEST	NO TEST
B2B004	Baseline	3/10/97	Hot	B2BM-D	10-91	1401	Large	DOT	Size C	5.00	NO TEST	NO TEST
B2B005	Baseline	3/21/97	Ambient	B2BS-A	01-95	1126	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B005	Baseline	3/21/97	Ambient	B2BS-A	01-95	1126	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B005	Baseline	3/21/97	Ambient	B2BS-A	01-95	1126	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B005	Baseline	3/21/97	Ambient	B2BS-A	01-95	1126	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B005	Baseline	3/21/97	Ambient	B2BS-A	01-95	1126	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B005	Baseline	3/21/97	Ambient	B2BS-A	01-95	1126	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B005	Baseline	3/21/97	Ambient	B2BS-A	01-95	1126	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B005	Baseline	3/21/97	Ambient	B2BS-A	01-95	1126	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B006	Baseline	3/21/97	Wet	B2BS-B	01-95	1113	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B006	Baseline	3/21/97	Wet	B2BS-B	01-95	1113	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B006	Baseline	3/21/97	Wet	B2BS-B	01-95	1113	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B006	Baseline	3/21/97	Wet	B2BS-B	01-95	1113	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B006	Baseline	3/21/97	Wet	B2BS-B	01-95	1113	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B006	Baseline	3/21/97	Wet	B2BS-B	01-95	1113	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B006	Baseline	3/21/97	Wet	B2BS-B	01-95	1113	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B006	Baseline	3/21/97	Wet	B2BS-B	01-95	1113	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B007	Baseline	3/21/97	Cold	B2BS-C	01-95	1110	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B007	Baseline	3/21/97	Cold	B2BS-C	01-95	1110	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B007	Baseline	3/21/97	Cold	B2BS-C	01-95	1110	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B007	Baseline	3/21/97	Cold	B2BS-C	01-95	1110	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B007	Baseline	3/21/97	Cold	B2BS-C	01-95	1110	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B007	Baseline	3/21/97	Cold	B2BS-C	01-95	1110	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B007	Baseline	3/21/97	Cold	B2BS-C	01-95	1110	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B007	Baseline	3/21/97	Cold	B2BS-C	01-95	1110	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B008	Baseline	3/21/97	Hot	B2BS-D	01-95	1126	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B008	Baseline	3/21/97	Hot	B2BS-D	01-95	1126	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B008	Baseline	3/21/97	Hot	B2BS-D	01-95	1126	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B008	Baseline	3/21/97	Hot	B2BS-D	01-95	1126	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B008	Baseline	3/21/97	Hot	B2BS-D	01-95	1126	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B008	Baseline	3/21/97	Hot	B2BS-D	01-95	1126	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B008	Baseline	3/21/97	Hot	B2BS-D	01-95	1126	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B008	Baseline	3/21/97	Hot	B2BS-D	01-95	1126	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
B2B009	Baseline	4/11/97	Ambient	B2BL-A	9-95	1298	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B009	Baseline	4/11/97	Ambient	B2BL-A	9-95	1298	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B009	Baseline	4/11/97	Ambient	B2BL-A	9-95	1298	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B009	Baseline	4/11/97	Ambient	B2BL-A	9-95	1298	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B009	Baseline	4/11/97	Ambient	B2BL-A	9-95	1298	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B009	Baseline	4/11/97	Ambient	B2BL-A	9-95	1298	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B009	Baseline	4/11/97	Ambient	B2BL-A	9-95	1298	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B009	Baseline	4/11/97	Ambient	B2BL-A	9-95	1298	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B010	Baseline	4/11/97	Wet	B2BL-B	9-95	1297	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B010	Baseline	4/11/97	Wet	B2BL-B	9-95	1297	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B010	Baseline	4/11/97	Wet	B2BL-B	9-95	1297	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B010	Baseline	4/11/97	Wet	B2BL-B	9-95	1297	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B010	Baseline	4/11/97	Wet	B2BL-B	9-95	1297	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B010	Baseline	4/11/97	Wet	B2BL-B	9-95	1297	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B010	Baseline	4/11/97	Wet	B2BL-B	9-95	1297	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B010	Baseline	4/11/97	Wet	B2BL-B	9-95	1297	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B011	Baseline	4/11/97	Cold	B2BL-C	9-95	1294	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B011	Baseline	4/11/97	Cold	B2BL-C	9-95	1294	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B011	Baseline	4/11/97	Cold	B2BL-C	9-95	1294	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B011	Baseline	4/11/97	Cold	B2BL-C	9-95	1294	XLarge	DOT	Size D	6.10	NO TEST	NO TEST

Table 2.Y
Performance Test Results — Raw Data

DROP NUM	HIT NUM	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
2	1	NO TEST	NO TEST	RR	2,4	Hemi	117.78	0.00	0.00	5.25	68.91
2	2	NO TEST	NO TEST	RR	2,4	Hemi	130.97	0.00	0.00	5.25	68.91
3	1	NO TEST	NO TEST	RG	2,4	Flat	211.08	3.50	1.00	6.03	90.90
3	2	NO TEST	NO TEST	RG	2,4	Flat	223.75	3.40	2.60	6.06	91.81
4	1	NO TEST	NO TEST	FR	2,4	Flat	179.28	2.50	0.00	6.09	92.72
4	2	NO TEST	NO TEST	FR	2,4	Flat	220.29	2.90	1.50	6.06	91.81
1	1	NO TEST	NO TEST	LF	2,4	Hemi	138.31	0.00	0.00	5.24	48.05
1	2	NO TEST	NO TEST	LF	2,4	Hemi	147.54	0.00	0.00	5.24	48.05
2	1	NO TEST	NO TEST	RR	2,4	Hemi	161.71	1.30	0.00	5.26	48.42
2	2	NO TEST	NO TEST	RR	2,4	Hemi	177.85	1.50	0.00	5.23	47.87
3	1	NO TEST	NO TEST	RG	2,4	Flat	220.87	3.80	0.90	6.00	63.00
3	2	NO TEST	NO TEST	RG	2,4	Flat	257.91	3.70	2.30	6.02	63.42
4	1	NO TEST	NO TEST	FR	2,4	Flat	205.15	3.30	0.80	6.02	63.42
4	2	NO TEST	NO TEST	FR	2,4	Flat	240.89	3.20	2.30	6.03	63.63
1	1	NO TEST	NO TEST	LF	2,4	Hemi	106.55	0.00	0.00	5.28	48.79
1	2	NO TEST	NO TEST	LF	2,4	Hemi	123.15	0.00	0.00	5.27	48.60
2	1	NO TEST	NO TEST	RR	2,4	Hemi	140.73	0.00	0.00	5.27	48.60
2	2	NO TEST	NO TEST	RR	2,4	Hemi	143.15	0.00	0.00	5.29	48.97
3	1	NO TEST	NO TEST	RG	2,4	Flat	237.40	3.90	1.90	6.06	64.27
3	2	NO TEST	NO TEST	RG	2,4	Flat	248.15	3.90	2.60	6.05	64.05
4	1	NO TEST	NO TEST	FR	2,4	Flat	153.93	1.00	0.00	6.05	64.05
4	2	NO TEST	NO TEST	FR	2,4	Flat	189.55	2.90	0.00	6.06	64.27
1	1	NO TEST	NO TEST	LF	2,4	Hemi	111.97	0.00	0.00	5.26	48.42
1	2	NO TEST	NO TEST	LF	2,4	Hemi	128.99	0.00	0.00	5.26	48.42
2	1	NO TEST	NO TEST	RR	2,4	Hemi	171.02	1.40	0.00	5.27	48.60
2	2	NO TEST	NO TEST	RR	2,4	Hemi	188.63	1.40	0.00	5.26	48.42
3	1	NO TEST	NO TEST	RG	2,4	Flat	222.27	3.70	1.50	6.03	63.63
3	2	NO TEST	NO TEST	RG	2,4	Flat	255.45	3.60	2.30	6.02	63.42
4	1	NO TEST	NO TEST	FR	2,4	Flat	176.89	3.00	0.00	6.11	65.33
4	2	NO TEST	NO TEST	FR	2,4	Flat	208.13	3.30	0.90	6.08	64.69
1	1	NO TEST	3.0 lb/cu.ft.	LF	2,4	Hemi	105.55	0.00	0.00	5.25	48.23
1	2	NO TEST	3.0 lb/cu.ft.	LF	2,4	Hemi	128.01	0.00	0.00	5.29	48.97
2	1	NO TEST	3.0 lb/cu.ft.	RR	2,4	Hemi	161.27	1.20	0.00	5.24	48.05
2	2	NO TEST	3.0 lb/cu.ft.	RR	2,4	Hemi	172.94	1.30	0.00	5.28	48.79
3	1	NO TEST	3.0 lb/cu.ft.	RG	2,4	Flat	230.09	3.60	1.20	6.05	64.05
3	2	NO TEST	3.0 lb/cu.ft.	RG	2,4	Flat	251.09	3.60	2.10	6.02	63.42
4	1	NO TEST	3.0 lb/cu.ft.	FR	2,4	Flat	171.02	2.80	0.00	6.06	64.27
4	2	NO TEST	3.0 lb/cu.ft.	FR	2,4	Flat	198.38	3.40	0.00	6.05	64.05
1	1	NO TEST	NO TEST	LF	2,4	Hemi	102.65	0.00	0.00	5.23	83.43
1	2	NO TEST	NO TEST	LF	2,4	Hemi	135.88	0.00	0.00	5.24	83.75
2	1	NO TEST	NO TEST	RR	2,4	Hemi	85.56	0.00	0.00	5.19	82.16
2	2	NO TEST	NO TEST	RR	2,4	Hemi	103.16	0.00	0.00	5.23	83.43
3	1	NO TEST	NO TEST	RG	2,4	Flat	192.05	3.30	0.00	6.02	110.53
3	2	NO TEST	NO TEST	RG	2,4	Flat	225.17	3.10	2.10	5.99	109.43
4	1	NO TEST	NO TEST	FR	2,4	Flat	178.37	2.60	0.00	6.14	114.98
4	2	NO TEST	NO TEST	FR	2,4	Flat	213.01	2.90	1.70	6.09	113.12
1	1	NO TEST	NO TEST	LF	2,4	Hemi	99.23	0.00	0.00	5.25	84.07
1	2	NO TEST	NO TEST	LF	2,4	Hemi	128.52	0.00	0.00	5.26	84.39
2	1	NO TEST	NO TEST	RR	2,4	Hemi	87.02	0.00	0.00	5.24	83.75
2	2	NO TEST	NO TEST	RR	2,4	Hemi	104.56	0.00	0.00	5.25	84.07
3	1	NO TEST	NO TEST	RG	2,4	Flat	200.78	3.30	0.20	6.08	112.75
3	2	NO TEST	NO TEST	RG	2,4	Flat	215.98	3.30	1.80	6.08	112.75
4	1	NO TEST	NO TEST	FR	2,4	Flat	164.64	2.30	0.00	6.11	113.86
4	2	NO TEST	NO TEST	FR	2,4	Flat	206.61	3.20	1.10	6.02	110.53
1	1	NO TEST	NO TEST	LF	2,4	Hemi	105.55	0.00	0.00	5.24	83.75
1	2	NO TEST	NO TEST	LF	2,4	Hemi	144.15	0.00	0.00	5.26	84.39
2	1	NO TEST	NO TEST	RR	2,4	Hemi	88.97	0.00	0.00	5.22	83.11
2	2	NO TEST	NO TEST	RR	2,4	Hemi	106.08	0.00	0.00	5.23	83.43

Table 2.Y
Performance Test Results — Raw Data

HELMET NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
B2B011	Baseline	4/11/97	Cold	B2BL-C	9-95	1294	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B011	Baseline	4/11/97	Cold	B2BL-C	9-95	1294	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B011	Baseline	4/11/97	Cold	B2BL-C	9-95	1294	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B011	Baseline	4/11/97	Cold	B2BL-C	9-95	1294	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B012	Baseline	4/11/97	Hot	B2BL-D	9-95	1284	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B012	Baseline	4/11/97	Hot	B2BL-D	9-95	1284	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B012	Baseline	4/11/97	Hot	B2BL-D	9-95	1284	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B012	Baseline	4/11/97	Hot	B2BL-D	9-95	1284	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B012	Baseline	4/11/97	Hot	B2BL-D	9-95	1284	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B012	Baseline	4/11/97	Hot	B2BL-D	9-95	1284	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B012	Baseline	4/11/97	Hot	B2BL-D	9-95	1284	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2B012	Baseline	4/11/97	Hot	B2BL-D	9-95	1284	XLarge	DOT	Size D	6.10	NO TEST	NO TEST
B2C001	Baseline	3/3/97	Ambient	B2CM-A	11-95	1424	Medium	DOT	Size C	5.20	NO TEST	NO TEST
B2C001	Baseline	3/3/97	Ambient	B2CM-A	11-95	1424	Medium	DOT	Size C	5.20	NO TEST	NO TEST
B2C001	Baseline	3/3/97	Ambient	B2CM-A	11-95	1424	Medium	DOT	Size C	5.20	NO TEST	NO TEST
B2C001	Baseline	3/3/97	Ambient	B2CM-A	11-95	1424	Medium	DOT	Size C	5.20	NO TEST	NO TEST
B2C001	Baseline	3/3/97	Ambient	B2CM-A	11-95	1424	Medium	DOT	Size C	5.20	NO TEST	NO TEST
B2C001	Baseline	3/3/97	Ambient	B2CM-A	11-95	1424	Medium	DOT	Size C	5.20	NO TEST	NO TEST
B2C001	Baseline	3/3/97	Ambient	B2CM-A	11-95	1424	Medium	DOT	Size C	5.20	NO TEST	NO TEST
B2C001	Baseline	3/3/97	Ambient	B2CM-A	11-95	1424	Medium	DOT	Size C	5.20	NO TEST	NO TEST
B2C002	Baseline	3/3/97	Wet	B2CM-B	11-95	1413	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C002	Baseline	3/3/97	Wet	B2CM-B	11-95	1413	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C002	Baseline	3/3/97	Wet	B2CM-B	11-95	1413	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C002	Baseline	3/3/97	Wet	B2CM-B	11-95	1413	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C002	Baseline	3/3/97	Wet	B2CM-B	11-95	1413	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C002	Baseline	3/3/97	Wet	B2CM-B	11-95	1413	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C002	Baseline	3/3/97	Wet	B2CM-B	11-95	1413	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C002	Baseline	3/3/97	Wet	B2CM-B	11-95	1413	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C003	Baseline	3/3/97	Cold	B2CM-C	11-95	1420	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C003	Baseline	3/3/97	Cold	B2CM-C	11-95	1420	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C003	Baseline	3/3/97	Cold	B2CM-C	11-95	1420	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C003	Baseline	3/3/97	Cold	B2CM-C	11-95	1420	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C003	Baseline	3/3/97	Cold	B2CM-C	11-95	1420	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C003	Baseline	3/3/97	Cold	B2CM-C	11-95	1420	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C003	Baseline	3/3/97	Cold	B2CM-C	11-95	1420	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C003	Baseline	3/3/97	Cold	B2CM-C	11-95	1420	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C004	Baseline	3/3/97	Hot	B2CM-D	11-95	1443	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C004	Baseline	3/3/97	Hot	B2CM-D	11-95	1443	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C004	Baseline	3/3/97	Hot	B2CM-D	11-95	1443	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C004	Baseline	3/3/97	Hot	B2CM-D	11-95	1443	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C004	Baseline	3/3/97	Hot	B2CM-D	11-95	1443	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C004	Baseline	3/3/97	Hot	B2CM-D	11-95	1443	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C004	Baseline	3/3/97	Hot	B2CM-D	11-95	1443	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C004	Baseline	3/3/97	Hot	B2CM-D	11-95	1443	Medium	DOT	Size C	5.00	NO TEST	NO TEST
B2C006	Baseline	3/10/97	Ambient	B2CL-A	11-95	1410	Large	DOT	Size D	6.20	NO TEST	NO TEST
B2C006	Baseline	3/10/97	Ambient	B2CL-A	11-95	1410	Large	DOT	Size D	6.20	NO TEST	NO TEST
B2C006	Baseline	3/10/97	Ambient	B2CL-A	11-95	1410	Large	DOT	Size D	6.20	NO TEST	NO TEST
B2C006	Baseline	3/10/97	Ambient	B2CL-A	11-95	1410	Large	DOT	Size D	6.20	NO TEST	NO TEST
B2C006	Baseline	3/10/97	Ambient	B2CL-A	11-95	1410	Large	DOT	Size D	6.20	NO TEST	NO TEST
B2C006	Baseline	3/10/97	Ambient	B2CL-A	11-95	1410	Large	DOT	Size D	6.20	NO TEST	NO TEST
B2C006	Baseline	3/10/97	Ambient	B2CL-A	11-95	1410	Large	DOT	Size D	6.20	NO TEST	NO TEST
B2C006	Baseline	3/10/97	Ambient	B2CL-A	11-95	1410	Large	DOT	Size D	6.20	NO TEST	NO TEST
B2C007	Baseline	3/10/97	Wet	B2CL-B	11-95	1413	Large	DOT	Size D	6.20	NO TEST	NO TEST
B2C007	Baseline	3/10/97	Wet	B2CL-B	11-95	1413	Large	DOT	Size D	6.20	NO TEST	NO TEST
B2C007	Baseline	3/10/97	Wet	B2CL-B	11-95	1413	Large	DOT	Size D	6.20	NO TEST	NO TEST
B2C007	Baseline	3/10/97	Wet	B2CL-B	11-95	1413	Large	DOT	Size D	6.20	NO TEST	NO TEST
B2C007	Baseline	3/10/97	Wet	B2CL-B	11-95	1413	Large	DOT	Size D	6.20	NO TEST	NO TEST
B2C007	Baseline	3/10/97	Wet	B2CL-B	11-95	1413	Large	DOT	Size D	6.20	NO TEST	NO TEST

Table 2.Y
Performance Test Results — Raw Data

DROP NUM	HIT NUM	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OUT OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCIT (M/S)	ENERGY (JOULES)
3	1	NO TEST	NO TEST	RG	2,4	Flat	194.49	3.30	0.00	6.14	114.98
3	2	NO TEST	NO TEST	RG	2,4	Flat	238.35	3.10	2.20	6.05	111.64
4	1	NO TEST	NO TEST	FR	2,4	Flat	183.23	2.50	0.00	6.02	110.53
4	2	NO TEST	NO TEST	FR	2,4	Flat	221.32	3.00	1.70	6.00	109.80
1	1	NO TEST	3.5 lb/cu.ft.	LF	2,4	Hemi	103.62	0.00	0.00	5.23	83.43
1	2	NO TEST	3.5 lb/cu.ft.	LF	2,4	Hemi	149.02	0.00	0.00	5.24	83.75
2	1	NO TEST	3.5 lb/cu.ft.	RR	2,4	Hemi	85.09	0.00	0.00	5.24	83.75
2	2	NO TEST	3.5 lb/cu.ft.	RR	2,4	Hemi	104.15	0.00	0.00	5.22	83.11
3	1	NO TEST	3.5 lb/cu.ft.	RG	2,4	Flat	184.65	3.30	0.00	5.99	109.43
3	2	NO TEST	3.5 lb/cu.ft.	RG	2,4	Flat	220.82	3.20	1.70	6.02	110.53
4	1	NO TEST	3.5 lb/cu.ft.	FR	2,4	Flat	165.13	2.00	0.00	6.05	111.64
4	2	NO TEST	3.5 lb/cu.ft.	FR	2,4	Flat	213.49	3.20	1.60	6.03	110.90
1	1	NO TEST	NO TEST	LF	2,4	Hemi	124.58	0.00	0.00	5.25	71.66
1	2	NO TEST	NO TEST	LF	2,4	Hemi	133.93	0.00	0.00	5.27	72.21
2	1	NO TEST	NO TEST	RR	2,4	Hemi	145.12	0.00	0.00	5.28	72.48
2	2	NO TEST	NO TEST	RR	2,4	Hemi	155.37	0.70	0.00	5.25	71.66
3	1	NO TEST	NO TEST	RG	2,4	Flat	204.22	3.70	0.50	6.02	94.23
3	2	NO TEST	NO TEST	RG	2,4	Flat	216.87	2.80	0.90	6.03	94.54
4	1	NO TEST	NO TEST	FR	2,4	Flat	141.71	0.00	0.00	6.02	94.23
4	2	NO TEST	NO TEST	FR	2,4	Flat	173.43	2.20	0.00	6.03	94.54
1	1	NO TEST	NO TEST	LF	2,4	Hemi	123.64	0.00	0.00	5.23	68.38
1	2	NO TEST	NO TEST	LF	2,4	Hemi	137.31	0.00	0.00	5.27	69.43
2	1	NO TEST	NO TEST	RR	2,4	Hemi	119.69	0.00	0.00	5.27	69.43
2	2	NO TEST	NO TEST	RR	2,4	Hemi	134.89	0.00	0.00	5.26	69.17
3	1	NO TEST	NO TEST	RG	2,4	Flat	203.23	3.90	0.40	6.05	91.51
3	2	NO TEST	NO TEST	RG	2,4	Flat	200.78	3.50	0.10	6.05	91.51
4	1	NO TEST	NO TEST	FR	2,4	Flat	122.64	0.00	0.00	6.05	91.51
4	2	NO TEST	NO TEST	FR	2,4	Flat	143.63	0.00	0.00	6.03	90.90
1	1	NO TEST	NO TEST	LF	2,4	Hemi	132.88	0.00	0.00	5.25	68.91
1	2	NO TEST	NO TEST	LF	2,4	Hemi	168.07	1.20	0.00	5.23	68.38
2	1	NO TEST	NO TEST	RR	2,4	Hemi	149.55	0.00	0.00	5.27	69.43
2	2	NO TEST	NO TEST	RR	2,4	Hemi	171.51	1.40	0.00	5.26	69.17
3	1	NO TEST	NO TEST	RG	2,4	Flat	207.59	3.80	0.80	6.08	92.42
3	2	NO TEST	NO TEST	RG	2,4	Flat	217.37	3.50	1.30	6.08	92.42
4	1	NO TEST	NO TEST	FR	2,4	Flat	170.54	2.60	0.00	6.05	91.51
4	2	NO TEST	NO TEST	FR	2,4	Flat	186.63	3.30	0.00	6.05	91.51
1	1	NO TEST	2.1 lb/cu.ft.	LF	2,4	Hemi	128.05	0.00	0.00	5.26	69.17
1	2	NO TEST	2.1 lb/cu.ft.	LF	2,4	Hemi	147.55	0.00	0.00	5.27	69.43
2	1	NO TEST	2.1 lb/cu.ft.	RR	2,4	Hemi	136.32	0.00	0.00	5.24	68.64
2	2	NO TEST	2.1 lb/cu.ft.	RR	2,4	Hemi	153.92	0.30	0.00	5.27	69.43
3	1	NO TEST	2.1 lb/cu.ft.	RG	2,4	Flat	191.52	3.50	0.00	6.06	91.81
3	2	NO TEST	2.1 lb/cu.ft.	RG	2,4	Flat	199.69	2.60	0.00	6.05	91.51
4	1	NO TEST	2.1 lb/cu.ft.	FR	2,4	Flat	152.43	0.30	0.00	6.05	91.51
4	2	NO TEST	2.1 lb/cu.ft.	FR	2,4	Flat	174.93	3.10	0.00	6.05	91.51
1	1	NO TEST	NO TEST	LF	2,4	Hemi	114.85	0.00	0.00	5.16	82.54
1	2	NO TEST	NO TEST	LF	2,4	Hemi	119.72	0.00	0.00	5.20	83.82
2	1	NO TEST	NO TEST	RR	2,4	Hemi	108.54	0.00	0.00	5.29	86.75
2	2	NO TEST	NO TEST	RR	2,4	Hemi	130.00	0.00	0.00	5.30	87.08
3	1	NO TEST	NO TEST	RG	2,4	Flat	182.71	2.50	0.00	6.11	115.73
3	2	NO TEST	NO TEST	RG	2,4	Flat	199.83	2.70	0.00	6.08	114.60
4	1	NO TEST	NO TEST	FR	2,4	Flat	135.35	0.00	0.00	6.12	116.11
4	2	NO TEST	NO TEST	FR	2,4	Flat	175.93	3.10	0.00	6.11	115.73
1	1	NO TEST	NO TEST	LF	2,4	Hemi	100.67	0.00	0.00	5.24	85.12
1	2	NO TEST	NO TEST	LF	2,4	Hemi	108.50	0.00	0.00	5.25	85.44
2	1	NO TEST	NO TEST	RR	2,4	Hemi	102.18	0.00	0.00	5.27	86.10
2	2	NO TEST	NO TEST	RR	2,4	Hemi	119.23	0.00	0.00	5.25	85.44
3	1	NO TEST	NO TEST	RG	2,4	Flat	180.78	3.00	0.00	5.99	111.23
3	2	NO TEST	NO TEST	RG	2,4	Flat	187.12	3.10	0.00	6.05	113.47

Table 2.Y
Performance Test Results — Raw Data

HELME NUMBER	TEST TYPE	TEST DAT	TEST COND	SAMPLE NUMBER	MAN DAT	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
B2C007	Baseline	3/10/97	Wet	B2CL-B	11-95	1413	Large	DO	Size D	6.20	NO TES	NO TES
B2C007	Baseline	3/10/97	Wet	B2CL-B	11-95	1413	Large	DO	Size D	6.20	NO TES	NO TES
B2C008	Baseline	3/10/97	Cold	B2CL-C	11-95	1391	Large	DO	Size D	6.20	NO TES	NO TES
B2C008	Baseline	3/10/97	Cold	B2CL-C	11-95	1391	Large	DO	Size D	6.20	NO TES	NO TES
B2C008	Baseline	3/10/97	Cold	B2CL-C	11-95	1391	Large	DO	Size D	6.20	NO TES	NO TES
B2C008	Baseline	3/10/97	Cold	B2CL-C	11-95	1391	Large	DO	Size D	6.20	NO TES	NO TES
B2C008	Baseline	3/10/97	Cold	B2CL-C	11-95	1391	Large	DO	Size D	6.20	NO TES	NO TES
B2C008	Baseline	3/10/97	Cold	B2CL-C	11-95	1391	Large	DO	Size D	6.20	NO TES	NO TES
B2C008	Baseline	3/10/97	Cold	B2CL-C	11-95	1391	Large	DO	Size D	6.20	NO TES	NO TES
B2C008	Baseline	3/10/97	Cold	B2CL-C	11-95	1391	Large	DO	Size D	6.20	NO TES	NO TES
B2C009	Baseline	3/10/97	Hot	B2CL-D	11-95	1421	Large	DO	Size D	6.20	NO TES	NO TES
B2C009	Baseline	3/10/97	Hot	B2CL-D	11-95	1421	Large	DO	Size D	6.20	NO TES	NO TES
B2C009	Baseline	3/10/97	Hot	B2CL-D	11-95	1421	Large	DO	Size D	6.20	NO TES	NO TES
B2C009	Baseline	3/10/97	Hot	B2CL-D	11-95	1421	Large	DO	Size D	6.20	NO TES	NO TES
B2C009	Baseline	3/10/97	Hot	B2CL-D	11-95	1421	Large	DO	Size D	6.20	NO TES	NO TES
B2C009	Baseline	3/10/97	Hot	B2CL-D	11-95	1421	Large	DO	Size D	6.20	NO TES	NO TES
B2C009	Baseline	3/10/97	Hot	B2CL-D	11-95	1421	Large	DO	Size D	6.20	NO TES	NO TES
B2C009	Baseline	3/10/97	Hot	B2CL-D	11-95	1421	Large	DO	Size D	6.20	NO TES	NO TES
B2C010	Baseline	4/4/97	Ambient	B2CS-A	FEB 199	1443	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C010	Baseline	4/4/97	Ambient	B2CS-A	FEB 199	1443	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C010	Baseline	4/4/97	Ambient	B2CS-A	FEB 199	1443	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C010	Baseline	4/4/97	Ambient	B2CS-A	FEB 199	1443	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C010	Baseline	4/4/97	Ambient	B2CS-A	FEB 199	1443	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C010	Baseline	4/4/97	Ambient	B2CS-A	FEB 199	1443	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C010	Baseline	4/4/97	Ambient	B2CS-A	FEB 199	1443	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C010	Baseline	4/4/97	Ambient	B2CS-A	FEB 199	1443	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C011	Baseline	4/4/97	Wet	B2CS-B	FEB 199	1425	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C011	Baseline	4/4/97	Wet	B2CS-B	FEB 199	1425	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C011	Baseline	4/4/97	Wet	B2CS-B	FEB 199	1425	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C011	Baseline	4/4/97	Wet	B2CS-B	FEB 199	1425	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C011	Baseline	4/4/97	Wet	B2CS-B	FEB 199	1425	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C011	Baseline	4/4/97	Wet	B2CS-B	FEB 199	1425	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C011	Baseline	4/4/97	Wet	B2CS-B	FEB 199	1425	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C011	Baseline	4/4/97	Wet	B2CS-B	FEB 199	1425	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C012	Baseline	4/4/97	Cold	B2CS-C	FEB 199	1464	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C012	Baseline	4/4/97	Cold	B2CS-C	FEB 199	1464	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C012	Baseline	4/4/97	Cold	B2CS-C	FEB 199	1464	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C012	Baseline	4/4/97	Cold	B2CS-C	FEB 199	1464	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C012	Baseline	4/4/97	Cold	B2CS-C	FEB 199	1464	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C012	Baseline	4/4/97	Cold	B2CS-C	FEB 199	1464	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C012	Baseline	4/4/97	Cold	B2CS-C	FEB 199	1464	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C012	Baseline	4/4/97	Cold	B2CS-C	FEB 199	1464	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C013	Baseline	4/4/97	Hot	B2CS-D	FEB 199	1443	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C013	Baseline	4/4/97	Hot	B2CS-D	FEB 199	1443	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C013	Baseline	4/4/97	Hot	B2CS-D	FEB 199	1443	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C013	Baseline	4/4/97	Hot	B2CS-D	FEB 199	1443	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C013	Baseline	4/4/97	Hot	B2CS-D	FEB 199	1443	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C013	Baseline	4/4/97	Hot	B2CS-D	FEB 199	1443	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C013	Baseline	4/4/97	Hot	B2CS-D	FEB 199	1443	XSmall	DO	Size A	3.50	NO TES	NO TES
B2C013	Baseline	4/4/97	Hot	B2CS-D	FEB 199	1443	XSmall	DO	Size A	3.50	NO TES	NO TES
CDA001	R & D--Conditioning	3/24/97	Wet	CDAM-B	6-96	830	Medium	DO	Size C	5.00	NO TES	NO TES
CDA001	R & D--Conditioning	3/24/97	Wet	CDAM-B	6-96	830	Medium	DO	Size C	5.00	NO TES	NO TES
CDA001	R & D--Conditioning	3/24/97	Wet	CDAM-B	6-96	830	Medium	DO	Size C	5.00	NO TES	NO TES
CDA001	R & D--Conditioning	3/24/97	Wet	CDAM-B	6-96	830	Medium	DO	Size C	5.00	NO TES	NO TES
CDA001	R & D--Conditioning	3/24/97	Wet	CDAM-B	6-96	830	Medium	DO	Size C	5.00	NO TES	NO TES
CDA001	R & D--Conditioning	3/24/97	Wet	CDAM-B	6-96	830	Medium	DO	Size C	5.00	NO TES	NO TES
CDA001	R & D--Conditioning	3/24/97	Wet	CDAM-B	6-96	830	Medium	DO	Size C	5.00	NO TES	NO TES
CDA001	R & D--Conditioning	3/24/97	Wet	CDAM-B	6-96	830	Medium	DO	Size C	5.00	NO TES	NO TES

Table 2.Y
Performance Test Results — Raw Data

DROP NU	HIT NU	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
4	1	NO TES	NO TES	FR	2,4	Flat	106.52	0.00	0.00	6.09	114.97
4	2	NO TES	NO TES	FR	2,4	Flat	138.28	0.00	0.00	6.09	114.97
1	1	NO TES	NO TES	LF	2,4	Hemi	117.78	0.00	0.00	5.24	85.12
1	2	NO TES	NO TES	LF	2,4	Hemi	130.97	0.00	0.00	5.24	85.12
2	1	NO TES	NO TES	RR	2,4	Hemi	122.69	0.00	0.00	5.26	85.77
2	2	NO TES	NO TES	RR	2,4	Hemi	136.33	0.00	0.00	5.27	86.10
3	1	NO TES	NO TES	RG	2,4	Flat	189.53	3.20	0.00	6.05	113.47
3	2	NO TES	NO TES	RG	2,4	Flat	196.90	3.30	0.00	6.06	113.84
4	1	NO TES	NO TES	FR	2,4	Flat	148.51	0.00	0.00	6.14	116.87
4	2	NO TES	NO TES	FR	2,4	Flat	171.97	2.10	0.00	6.09	114.97
1	1	NO TES	1.9 lb/ct.ft.	LF	2,4	Hemi	115.79	0.00	0.00	5.24	85.12
1	2	NO TES	1.9 lb/ct.ft.	LF	2,4	Hemi	114.36	0.00	0.00	5.24	85.12
2	1	NO TES	1.9 lb/ct.ft.	RR	2,4	Hemi	105.57	0.00	0.00	5.27	86.10
2	2	NO TES	1.9 lb/ct.ft.	RR	2,4	Hemi	128.98	0.00	0.00	5.24	85.12
3	1	NO TES	1.9 lb/ct.ft.	RG	2,4	Flat	173.44	2.30	0.00	6.05	113.47
3	2	NO TES	1.9 lb/ct.ft.	RG	2,4	Flat	184.64	2.60	0.00	6.05	113.47
4	1	NO TES	1.9 lb/ct.ft.	FR	2,4	Flat	141.23	0.00	0.00	6.09	114.97
4	2	NO TES	1.9 lb/ct.ft.	FR	2,4	Flat	167.61	3.00	0.00	6.09	114.97
1	1	NO TES	NO TES	LF	2,4	Hemi	179.77	1.30	0.00	5.20	47.32
1	2	NO TES	NO TES	LF	2,4	Hemi	190.54	1.30	0.00	5.23	47.87
2	1	NO TES	NO TES	RR	2,4	Hemi	160.73	1.40	0.00	5.26	48.42
2	2	NO TES	NO TES	RR	2,4	Hemi	184.18	1.60	0.00	5.25	48.23
3	1	NO TES	NO TES	RG	2,4	Flat	216.41	3.60	1.40	6.06	64.27
3	2	NO TES	NO TES	RG	2,4	Flat	227.65	3.50	1.40	6.05	64.05
4	1	NO TES	NO TES	FR	2,4	Flat	172.97	1.80	0.00	6.02	63.42
4	2	NO TES	NO TES	FR	2,4	Flat	204.15	2.90	0.90	6.02	63.42
1	1	NO TES	NO TES	LF	2,4	Hemi	150.99	0.10	0.00	5.24	48.05
1	2	NO TES	NO TES	LF	2,4	Hemi	145.13	0.00	0.00	5.28	48.79
2	1	NO TES	NO TES	RR	2,4	Hemi	119.23	0.00	0.00	5.27	48.60
2	2	NO TES	NO TES	RR	2,4	Hemi	144.16	0.00	0.00	5.27	48.60
3	1	NO TES	NO TES	RG	2,4	Flat	215.93	3.60	0.70	6.03	63.63
3	2	NO TES	NO TES	RG	2,4	Flat	215.93	3.60	0.80	6.03	63.63
4	1	NO TES	NO TES	FR	2,4	Flat	168.55	1.90	0.00	6.00	63.00
4	2	NO TES	NO TES	FR	2,4	Flat	184.68	2.70	0.00	6.09	64.90
1	1	NO TES	NO TES	LF	2,4	Hemi	169.52	0.90	0.00	5.19	47.14
1	2	NO TES	NO TES	LF	2,4	Hemi	171.95	1.90	0.00	5.20	47.32
2	1	NO TES	NO TES	RR	2,4	Hemi	171.97	1.50	0.00	5.23	47.87
2	2	NO TES	NO TES	RR	2,4	Hemi	199.32	1.90	0.00	5.24	48.05
3	1	NO TES	NO TES	RG	2,4	Flat	212.97	3.80	1.30	6.03	63.63
3	2	NO TES	NO TES	RG	2,4	Flat	225.20	3.80	2.10	6.02	63.42
4	1	NO TES	NO TES	FR	2,4	Flat	183.68	2.40	0.00	6.08	64.69
4	2	NO TES	NO TES	FR	2,4	Flat	205.67	2.90	0.90	6.08	64.69
1	1	NO TES	1.9 lb/ct.ft.	LF	2,4	Hemi	172.96	1.00	0.00	5.26	48.42
1	2	NO TES	1.9 lb/ct.ft.	LF	2,4	Hemi	161.22	0.60	0.00	5.22	47.68
2	1	NO TES	1.9 lb/ct.ft.	RR	2,4	Hemi	141.71	0.00	0.00	5.26	48.42
2	2	NO TES	1.9 lb/ct.ft.	RR	2,4	Hemi	163.19	1.60	0.00	5.25	48.23
3	1	NO TES	1.9 lb/ct.ft.	RG	2,4	Flat	204.73	3.70	0.30	6.03	63.63
3	2	NO TES	1.9 lb/ct.ft.	RG	2,4	Flat	207.65	3.70	1.20	5.99	62.79
4	1	NO TES	1.9 lb/ct.ft.	FR	2,4	Flat	169.07	2.20	0.00	6.08	64.69
4	2	NO TES	1.9 lb/ct.ft.	FR	2,4	Flat	190.57	2.60	0.00	6.05	64.05
1	1	NO TES	NO TES	LF	1,2	Flat	218.39	3.10	1.60	6.14	94.25
1	2	NO TES	NO TES	LF	1,2	Flat	249.59	3.50	2.30	6.12	93.64
2	1	NO TES	NO TES	RR	2,4	Flat	241.78	3.50	2.20	6.09	92.72
2	2	NO TES	NO TES	RR	2,4	Flat	250.08	3.60	2.10	6.08	92.42
3	1	NO TES	NO TES	RG	1,2	Hemi	107.99	0.00	0.00	5.11	65.28
3	2	NO TES	NO TES	RG	1,2	Hemi	131.92	0.00	0.00	5.25	68.91
4	1	NO TES	NO TES	FR	2,4	Hemi	111.48	0.00	0.00	5.27	69.43
4	2	NO TES	NO TES	FR	2,4	Hemi	128.48	0.00	0.00	5.25	68.91

Table 2.Y
Performance Test Results — Raw Data

HELMET NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
CDA002	R & D--Conditioning	3/24/97	Cold	CDAM-C	6-96	838	Medium	DOT	Size C	5.00	NO TES	NO TES
CDA002	R & D--Conditioning	3/24/97	Cold	CDAM-C	6-96	838	Medium	DOT	Size C	5.00	NO TES	NO TES
CDA002	R & D--Conditioning	3/24/97	Cold	CDAM-C	6-96	838	Medium	DOT	Size C	5.00	NO TES	NO TES
CDA002	R & D--Conditioning	3/24/97	Cold	CDAM-C	6-96	838	Medium	DOT	Size C	5.00	NO TES	NO TES
CDA002	R & D--Conditioning	3/24/97	Cold	CDAM-C	6-96	838	Medium	DOT	Size C	5.00	NO TES	NO TES
CDA002	R & D--Conditioning	3/24/97	Cold	CDAM-C	6-96	838	Medium	DOT	Size C	5.00	NO TES	NO TES
CDA002	R & D--Conditioning	3/24/97	Cold	CDAM-C	6-96	838	Medium	DOT	Size C	5.00	NO TES	NO TES
CDA002	R & D--Conditioning	3/24/97	Cold	CDAM-C	6-96	838	Medium	DOT	Size C	5.00	NO TES	NO TES
CDA003	R & D--Conditioning	3/24/97	Hot	CDAM-D	6-96	831	Medium	DOT	Size C	5.00	NO TES	NO TES
CDA003	R & D--Conditioning	3/24/97	Hot	CDAM-D	6-96	831	Medium	DOT	Size C	5.00	NO TES	NO TES
CDA003	R & D--Conditioning	3/24/97	Hot	CDAM-D	6-96	831	Medium	DOT	Size C	5.00	NO TES	NO TES
CDA003	R & D--Conditioning	3/24/97	Hot	CDAM-D	6-96	831	Medium	DOT	Size C	5.00	NO TES	NO TES
CDA003	R & D--Conditioning	3/24/97	Hot	CDAM-D	6-96	831	Medium	DOT	Size C	5.00	NO TES	NO TES
CDA003	R & D--Conditioning	3/24/97	Hot	CDAM-D	6-96	831	Medium	DOT	Size C	5.00	NO TES	NO TES
CDA003	R & D--Conditioning	3/24/97	Hot	CDAM-D	6-96	831	Medium	DOT	Size C	5.00	NO TES	NO TES
CDA003	R & D--Conditioning	3/24/97	Hot	CDAM-D	6-96	831	Medium	DOT	Size C	5.00	NO TES	NO TES
CDA004	R & D--Conditioning	3/26/97	Wet	CDAL-B	6-96	814	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA004	R & D--Conditioning	3/26/97	Wet	CDAL-B	6-96	814	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA004	R & D--Conditioning	3/26/97	Wet	CDAL-B	6-96	814	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA004	R & D--Conditioning	3/26/97	Wet	CDAL-B	6-96	814	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA004	R & D--Conditioning	3/26/97	Wet	CDAL-B	6-96	814	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA004	R & D--Conditioning	3/26/97	Wet	CDAL-B	6-96	814	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA004	R & D--Conditioning	3/26/97	Wet	CDAL-B	6-96	814	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA004	R & D--Conditioning	3/26/97	Wet	CDAL-B	6-96	814	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA005	R & D--Conditioning	3/26/97	Cold	CDAL-C	6-96	813	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA005	R & D--Conditioning	3/26/97	Cold	CDAL-C	6-96	813	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA005	R & D--Conditioning	3/26/97	Cold	CDAL-C	6-96	813	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA005	R & D--Conditioning	3/26/97	Cold	CDAL-C	6-96	813	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA005	R & D--Conditioning	3/26/97	Cold	CDAL-C	6-96	813	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA005	R & D--Conditioning	3/26/97	Cold	CDAL-C	6-96	813	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA005	R & D--Conditioning	3/26/97	Cold	CDAL-C	6-96	813	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA005	R & D--Conditioning	3/26/97	Cold	CDAL-C	6-96	813	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA006	R & D--Conditioning	3/26/97	Hot	CDAL-D	6-96	843	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA006	R & D--Conditioning	3/26/97	Hot	CDAL-D	6-96	843	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA006	R & D--Conditioning	3/26/97	Hot	CDAL-D	6-96	843	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA006	R & D--Conditioning	3/26/97	Hot	CDAL-D	6-96	843	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA006	R & D--Conditioning	3/26/97	Hot	CDAL-D	6-96	843	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA006	R & D--Conditioning	3/26/97	Hot	CDAL-D	6-96	843	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA006	R & D--Conditioning	3/26/97	Hot	CDAL-D	6-96	843	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA006	R & D--Conditioning	3/26/97	Hot	CDAL-D	6-96	843	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDA008	R & D--Conditioning	4/14/97	Wet	CDAS-B	5-96	818	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA008	R & D--Conditioning	4/14/97	Wet	CDAS-B	5-96	818	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA008	R & D--Conditioning	4/14/97	Wet	CDAS-B	5-96	818	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA008	R & D--Conditioning	4/14/97	Wet	CDAS-B	5-96	818	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA008	R & D--Conditioning	4/14/97	Wet	CDAS-B	5-96	818	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA008	R & D--Conditioning	4/14/97	Wet	CDAS-B	5-96	818	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA008	R & D--Conditioning	4/14/97	Wet	CDAS-B	5-96	818	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA008	R & D--Conditioning	4/14/97	Wet	CDAS-B	5-96	818	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA009	R & D--Conditioning	4/14/97	Cold	CDAS-C	5-96	830	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA009	R & D--Conditioning	4/14/97	Cold	CDAS-C	5-96	830	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA009	R & D--Conditioning	4/14/97	Cold	CDAS-C	5-96	830	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA009	R & D--Conditioning	4/14/97	Cold	CDAS-C	5-96	830	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA009	R & D--Conditioning	4/14/97	Cold	CDAS-C	5-96	830	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA009	R & D--Conditioning	4/14/97	Cold	CDAS-C	5-96	830	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA009	R & D--Conditioning	4/14/97	Cold	CDAS-C	5-96	830	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA009	R & D--Conditioning	4/14/97	Cold	CDAS-C	5-96	830	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA010	R & D--Conditioning	4/14/97	Hot	CDAS-D	5-96	806	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA010	R & D--Conditioning	4/14/97	Hot	CDAS-D	5-96	806	XSmall	DOT	Size A	3.50	NO TES	NO TES

Table 2.Y
Performance Test Results — Raw Data

DROP NUM	HIT NUM	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
1	1	NO TEST	NO TEST	LF	1,2	Flat	253.98	3.40	2.20	6.11	93.33
1	2	NO TEST	NO TEST	LF	1,2	Flat	286.73	3.20	2.10	6.11	93.33
2	1	NO TEST	NO TEST	RR	2,4	Flat	273.06	3.50	2.50	6.11	93.33
2	2	NO TEST	NO TEST	RR	2,4	Flat	312.12	3.50	2.30	6.06	91.81
3	1	NO TEST	NO TEST	RG	1,2	Hemi	140.79	0.00	0.00	5.27	69.43
3	2	NO TEST	NO TEST	RG	1,2	Hemi	147.12	0.00	0.00	5.25	68.91
4	1	NO TEST	NO TEST	FR	2,4	Hemi	135.34	0.00	0.00	5.24	68.64
4	2	NO TEST	NO TEST	FR	2,4	Hemi	158.26	1.00	0.00	5.24	68.64
1	1	NO TEST	NO TEST	LF	1,2	Flat	233.02	3.70	1.60	6.06	91.81
1	2	NO TEST	NO TEST	LF	1,2	Flat	276.42	3.50	2.30	6.14	94.25
2	1	NO TEST	NO TEST	RR	2,4	Flat	251.58	3.30	2.10	6.05	91.51
2	2	NO TEST	NO TEST	RR	2,4	Flat	287.23	3.40	2.40	6.02	90.60
3	1	NO TEST	NO TEST	RG	1,2	Hemi	120.68	0.00	0.00	5.25	68.91
3	2	NO TEST	NO TEST	RG	1,2	Hemi	143.21	0.00	0.00	5.23	68.38
4	1	NO TEST	NO TEST	FR	2,4	Hemi	119.26	0.00	0.00	5.24	68.64
4	2	NO TEST	NO TEST	FR	2,4	Hemi	138.77	0.00	0.00	5.22	68.12
1	1	NO TEST	NO TEST	LF	1,2	Flat	195.89	3.10	0.00	6.11	113.86
1	2	NO TEST	NO TEST	LF	1,2	Flat	219.80	3.10	1.40	6.03	110.90
2	1	NO TEST	NO TEST	RR	2,4	Flat	197.85	3.00	0.00	6.11	113.86
2	2	NO TEST	NO TEST	RR	2,4	Flat	210.05	3.00	0.90	6.06	112.01
3	1	NO TEST	NO TEST	RG	1,2	Hemi	98.21	0.00	0.00	5.24	83.75
3	2	NO TEST	NO TEST	RG	1,2	Hemi	135.37	0.00	0.00	5.28	85.03
4	1	NO TEST	NO TEST	FR	2,4	Hemi	130.99	0.00	0.00	5.28	85.03
4	2	NO TEST	NO TEST	FR	2,4	Hemi	430.25	1.30	1.10	5.28	85.03
1	1	NO TEST	NO TEST	LF	1,2	Flat	204.18	2.90	0.30	6.06	112.01
1	2	NO TEST	NO TEST	LF	1,2	Flat	237.90	3.10	1.90	6.08	112.75
2	1	NO TEST	NO TEST	RR	2,4	Flat	210.55	3.20	1.20	6.09	113.12
2	2	NO TEST	NO TEST	RR	2,4	Flat	242.78	3.30	2.20	6.06	112.01
3	1	NO TEST	NO TEST	RG	1,2	Hemi	103.63	0.00	0.00	5.28	85.03
3	2	NO TEST	NO TEST	RG	1,2	Hemi	198.33	1.20	0.00	5.27	84.71
4	1	NO TEST	NO TEST	FR	2,4	Hemi	162.67	0.70	0.00	5.30	85.67
4	2	NO TEST	NO TEST	FR	2,4	Hemi	509.80	1.20	1.00	5.27	84.71
1	1	NO TEST	NO TEST	LF	1,2	Flat	186.61	2.50	0.00	6.08	112.75
1	2	NO TEST	NO TEST	LF	1,2	Flat	221.28	3.00	1.20	6.08	112.75
2	1	NO TEST	NO TEST	RR	2,4	Flat	189.52	2.80	0.00	6.02	110.53
2	2	NO TEST	NO TEST	RR	2,4	Flat	235.96	3.00	2.00	6.06	112.01
3	1	NO TEST	NO TEST	RG	1,2	Hemi	100.18	0.00	0.00	5.31	86.00
3	2	NO TEST	NO TEST	RG	1,2	Hemi	288.16	1.30	0.90	5.28	85.03
4	1	NO TEST	NO TEST	FR	2,4	Hemi	223.24	1.00	0.50	5.26	84.39
4	2	NO TEST	NO TEST	FR	2,4	Hemi	544.05	1.10	1.10	5.24	83.75
1	1	NO TEST	NO TEST	LF	1,2	Flat	227.66	3.30	2.10	6.06	64.27
1	2	NO TEST	NO TEST	LF	1,2	Flat	240.82	3.40	2.20	6.14	65.97
2	1	NO TEST	NO TEST	RR	2,4	Flat	205.25	3.60	0.80	6.02	63.42
2	2	NO TEST	NO TEST	RR	2,4	Flat	220.41	3.70	1.90	6.08	64.69
3	1	NO TEST	NO TEST	RG	1,2	Hemi	113.88	0.00	0.00	5.18	46.96
3	2	NO TEST	NO TEST	RG	1,2	Hemi	126.06	0.00	0.00	5.29	48.97
4	1	NO TEST	NO TEST	FR	2,4	Hemi	111.52	0.00	0.00	5.25	48.23
4	2	NO TEST	NO TEST	FR	2,4	Hemi	123.67	0.00	0.00	5.27	48.60
1	1	NO TEST	NO TEST	LF	1,2	Flat	242.27	3.70	1.10	6.03	63.63
1	2	NO TEST	NO TEST	LF	1,2	Flat	263.72	2.60	1.10	6.06	64.27
2	1	NO TEST	NO TEST	RR	2,4	Flat	217.41	3.00	0.70	6.08	64.69
2	2	NO TEST	NO TEST	RR	2,4	Flat	232.03	3.60	1.40	6.06	64.27
3	1	NO TEST	NO TEST	RG	1,2	Hemi	103.61	0.00	0.00	5.24	48.05
3	2	NO TEST	NO TEST	RG	1,2	Hemi	113.37	0.00	0.00	5.24	48.05
4	1	NO TEST	NO TEST	FR	2,4	Hemi	105.09	0.00	0.00	5.26	48.42
4	2	NO TEST	NO TEST	FR	2,4	Hemi	125.60	0.00	0.00	5.23	47.87
1	1	NO TEST	NO TEST	LF	1,2	Flat	230.07	3.00	1.40	5.99	62.79
1	2	NO TEST	NO TEST	LF	1,2	Flat	240.28	2.80	1.30	6.09	64.90

Table 2.Y
Performance Test Results — Raw Data

HELMET NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
CDA010	R & D--Conditioning	4/14/97	Hot	CDAS-D	5-96	806	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA010	R & D--Conditioning	4/14/97	Hot	CDAS-D	5-96	806	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA010	R & D--Conditioning	4/14/97	Hot	CDAS-D	5-96	806	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA010	R & D--Conditioning	4/14/97	Hot	CDAS-D	5-96	806	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA010	R & D--Conditioning	4/14/97	Hot	CDAS-D	5-96	806	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDA010	R & D--Conditioning	4/14/97	Hot	CDAS-D	5-96	806	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDB001	R & D--Conditioning	4/7/97	Hot	CDBM-D	OCT/91	1395	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB001	R & D--Conditioning	4/7/97	Hot	CDBM-D	OCT/91	1395	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB001	R & D--Conditioning	4/7/97	Hot	CDBM-D	OCT/91	1395	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB001	R & D--Conditioning	4/7/97	Hot	CDBM-D	OCT/91	1395	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB001	R & D--Conditioning	4/7/97	Hot	CDBM-D	OCT/91	1395	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB001	R & D--Conditioning	4/7/97	Hot	CDBM-D	OCT/91	1395	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB001	R & D--Conditioning	4/7/97	Hot	CDBM-D	OCT/91	1395	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB001	R & D--Conditioning	4/7/97	Hot	CDBM-D	OCT/91	1395	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB002	R & D--Conditioning	4/7/97	Cold	CDBM-C	OCT/91	1401	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB002	R & D--Conditioning	4/7/97	Cold	CDBM-C	OCT/91	1401	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB002	R & D--Conditioning	4/7/97	Cold	CDBM-C	OCT/91	1401	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB002	R & D--Conditioning	4/7/97	Cold	CDBM-C	OCT/91	1401	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB002	R & D--Conditioning	4/7/97	Cold	CDBM-C	OCT/91	1401	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB002	R & D--Conditioning	4/7/97	Cold	CDBM-C	OCT/91	1401	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB002	R & D--Conditioning	4/7/97	Cold	CDBM-C	OCT/91	1401	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB002	R & D--Conditioning	4/7/97	Cold	CDBM-C	OCT/91	1401	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB003	R & D--Conditioning	4/7/97	Wet	CDBM-B	OCT/91	1394	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB003	R & D--Conditioning	4/7/97	Wet	CDBM-B	OCT/91	1394	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB003	R & D--Conditioning	4/7/97	Wet	CDBM-B	OCT/91	1394	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB003	R & D--Conditioning	4/7/97	Wet	CDBM-B	OCT/91	1394	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB003	R & D--Conditioning	4/7/97	Wet	CDBM-B	OCT/91	1394	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB003	R & D--Conditioning	4/7/97	Wet	CDBM-B	OCT/91	1394	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB003	R & D--Conditioning	4/7/97	Wet	CDBM-B	OCT/91	1394	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB003	R & D--Conditioning	4/7/97	Wet	CDBM-B	OCT/91	1394	Medium	DOT	Size C	5.00	NO TES	NO TES
CDB004	R & D--Conditioning	4/7/97	Hot	CDBL-D	SEPT/95	1283	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB004	R & D--Conditioning	4/7/97	Hot	CDBL-D	SEPT/95	1283	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB004	R & D--Conditioning	4/7/97	Hot	CDBL-D	SEPT/95	1283	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB004	R & D--Conditioning	4/7/97	Hot	CDBL-D	SEPT/95	1283	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB004	R & D--Conditioning	4/7/97	Hot	CDBL-D	SEPT/95	1283	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB004	R & D--Conditioning	4/7/97	Hot	CDBL-D	SEPT/95	1283	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB004	R & D--Conditioning	4/7/97	Hot	CDBL-D	SEPT/95	1283	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB004	R & D--Conditioning	4/7/97	Hot	CDBL-D	SEPT/95	1283	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB005	R & D--Conditioning	4/7/97	Cold	CDBL-C	SEPT/95	1299	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB005	R & D--Conditioning	4/7/97	Cold	CDBL-C	SEPT/95	1299	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB005	R & D--Conditioning	4/7/97	Cold	CDBL-C	SEPT/95	1299	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB005	R & D--Conditioning	4/7/97	Cold	CDBL-C	SEPT/95	1299	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB005	R & D--Conditioning	4/7/97	Cold	CDBL-C	SEPT/95	1299	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB005	R & D--Conditioning	4/7/97	Cold	CDBL-C	SEPT/95	1299	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB005	R & D--Conditioning	4/7/97	Cold	CDBL-C	SEPT/95	1299	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB005	R & D--Conditioning	4/7/97	Cold	CDBL-C	SEPT/95	1299	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB006	R & D--Conditioning	4/7/97	Wet	CDBL-B	SEPT/95	1320	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB006	R & D--Conditioning	4/7/97	Wet	CDBL-B	SEPT/95	1320	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB006	R & D--Conditioning	4/7/97	Wet	CDBL-B	SEPT/95	1320	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB006	R & D--Conditioning	4/7/97	Wet	CDBL-B	SEPT/95	1320	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB006	R & D--Conditioning	4/7/97	Wet	CDBL-B	SEPT/95	1320	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB006	R & D--Conditioning	4/7/97	Wet	CDBL-B	SEPT/95	1320	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB006	R & D--Conditioning	4/7/97	Wet	CDBL-B	SEPT/95	1320	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB006	R & D--Conditioning	4/7/97	Wet	CDBL-B	SEPT/95	1320	XLarge	DOT	Size D	6.10	NO TES	NO TES
CDB007	R & D--Conditioning	4/14/97	Wet	CDBS-B	7-96	1099	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDB007	R & D--Conditioning	4/14/97	Wet	CDBS-B	7-96	1099	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDB007	R & D--Conditioning	4/14/97	Wet	CDBS-B	7-96	1099	XSmall	DOT	Size A	3.50	NO TES	NO TES
CDB007	R & D--Conditioning	4/14/97	Wet	CDBS-B	7-96	1099	XSmall	DOT	Size A	3.50	NO TES	NO TES

Table 2.Y
Performance Test Results — Raw Data

DROP NUM	HIT NUM	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
2	1	NO TEST	NO TEST	RR	2,4	Flat	203.28	3.50	0.30	6.02	63.42
2	2	NO TEST	NO TEST	RR	2,4	Flat	217.43	3.60	1.20	5.99	62.79
3	1	NO TEST	NO TEST	RG	1,2	Hemi	98.80	0.00	0.00	5.23	47.87
3	2	NO TEST	NO TEST	RG	1,2	Hemi	114.36	0.00	0.00	5.22	47.68
4	1	NO TEST	NO TEST	FR	2,4	Hemi	100.63	0.00	0.00	5.18	46.96
4	2	NO TEST	NO TEST	FR	2,4	Hemi	120.75	0.00	0.00	5.24	48.05
1	1	NO TEST	NO TEST	LF	1,2	Flat	208.13	3.40	0.90	6.00	90.00
1	2	NO TEST	NO TEST	LF	1,2	Flat	255.92	3.30	2.40	6.08	92.42
2	1	NO TEST	NO TEST	RR	2,4	Flat	201.27	3.30	0.40	6.08	92.42
2	2	NO TEST	NO TEST	RR	2,4	Flat	254.93	3.50	2.70	6.08	92.42
3	1	NO TEST	NO TEST	RG	1,2	Hemi	115.33	0.00	0.00	5.28	69.70
3	2	NO TEST	NO TEST	RG	1,2	Hemi	133.37	0.00	0.00	5.29	69.96
4	1	NO TEST	NO TEST	FR	2,4	Hemi	106.06	0.00	0.00	5.23	68.38
4	2	NO TEST	NO TEST	FR	2,4	Hemi	129.46	0.00	0.00	5.25	68.91
1	1	NO TEST	NO TEST	LF	1,2	Flat	223.23	3.20	1.40	6.08	92.42
1	2	NO TEST	NO TEST	LF	1,2	Flat	274.48	3.20	2.70	6.08	92.42
2	1	NO TEST	NO TEST	RR	2,4	Flat	208.61	3.30	1.50	6.08	92.42
2	2	NO TEST	NO TEST	RR	2,4	Flat	260.40	3.40	2.70	6.09	92.72
3	1	NO TEST	NO TEST	RG	1,2	Hemi	106.55	0.00	0.00	5.27	69.43
3	2	NO TEST	NO TEST	RG	1,2	Hemi	127.49	0.00	0.00	5.26	69.17
4	1	NO TEST	NO TEST	FR	2,4	Hemi	106.58	0.00	0.00	5.25	68.91
4	2	NO TEST	NO TEST	FR	2,4	Hemi	132.46	0.00	0.00	5.28	69.70
1	1	NO TEST	NO TEST	LF	1,2	Flat	199.83	3.20	0.00	6.09	92.72
1	2	NO TEST	NO TEST	LF	1,2	Flat	239.29	3.10	2.30	6.09	92.72
2	1	NO TEST	NO TEST	RR	2,4	Flat	195.43	3.10	0.00	6.09	92.72
2	2	NO TEST	NO TEST	RR	2,4	Flat	217.89	3.20	1.90	6.08	92.42
3	1	NO TEST	NO TEST	RG	1,2	Hemi	102.61	0.00	0.00	5.27	69.43
3	2	NO TEST	NO TEST	RG	1,2	Hemi	135.35	0.00	0.00	5.27	69.43
4	1	NO TEST	NO TEST	FR	2,4	Hemi	105.51	0.00	0.00	5.25	68.91
4	2	NO TEST	NO TEST	FR	2,4	Hemi	127.06	0.00	0.00	5.27	69.43
1	1	NO TEST	NO TEST	LF	1,2	Flat	172.91	3.00	0.00	6.15	115.36
1	2	NO TEST	NO TEST	LF	1,2	Flat	204.24	3.10	0.60	6.11	113.86
2	1	NO TEST	NO TEST	RR	2,4	Flat	152.95	0.90	0.00	6.03	110.90
2	2	NO TEST	NO TEST	RR	2,4	Flat	178.81	3.20	0.00	6.02	110.53
3	1	NO TEST	NO TEST	RG	1,2	Hemi	93.82	0.00	0.00	5.24	83.75
3	2	NO TEST	NO TEST	RG	1,2	Hemi	122.13	0.00	0.00	5.24	83.75
4	1	NO TEST	NO TEST	FR	2,4	Hemi	99.21	0.00	0.00	5.23	83.43
4	2	NO TEST	NO TEST	FR	2,4	Hemi	166.60	1.20	0.00	5.19	82.16
1	1	NO TEST	NO TEST	LF	1,2	Flat	188.10	3.10	0.00	6.12	114.24
1	2	NO TEST	NO TEST	LF	1,2	Flat	211.96	3.20	1.10	6.06	112.01
2	1	NO TEST	NO TEST	RR	2,4	Flat	162.22	2.80	0.00	6.02	110.53
2	2	NO TEST	NO TEST	RR	2,4	Flat	201.75	3.50	0.10	6.05	111.64
3	1	NO TEST	NO TEST	RG	1,2	Hemi	102.62	0.00	0.00	5.23	83.43
3	2	NO TEST	NO TEST	RG	1,2	Hemi	126.54	0.00	0.00	5.23	83.43
4	1	NO TEST	NO TEST	FR	2,4	Hemi	102.16	0.00	0.00	5.24	83.75
4	2	NO TEST	NO TEST	FR	2,4	Hemi	154.87	0.80	0.00	5.20	82.47
1	1	NO TEST	NO TEST	LF	1,2	Flat	182.72	2.90	0.00	5.99	109.43
1	2	NO TEST	NO TEST	LF	1,2	Flat	199.78	3.00	0.00	6.05	111.64
2	1	NO TEST	NO TEST	RR	2,4	Flat	160.74	2.30	0.00	6.02	110.53
2	2	NO TEST	NO TEST	RR	2,4	Flat	190.05	3.80	0.00	6.03	110.90
3	1	NO TEST	NO TEST	RG	1,2	Hemi	101.64	0.00	0.00	5.23	83.43
3	2	NO TEST	NO TEST	RG	1,2	Hemi	129.98	0.00	0.00	5.24	83.75
4	1	NO TEST	NO TEST	FR	2,4	Hemi	100.18	0.00	0.00	5.22	83.11
4	2	NO TEST	NO TEST	FR	2,4	Hemi	149.00	0.00	0.00	5.25	84.07
1	1	NO TEST	NO TEST	LF	1,2	Flat	201.77	3.40	0.20	5.95	61.95
1	2	NO TEST	NO TEST	LF	1,2	Flat	225.18	3.50	2.00	5.99	62.79
2	1	NO TEST	NO TEST	RR	2,4	Flat	195.43	3.10	0.00	6.02	63.42
2	2	NO TEST	NO TEST	RR	2,4	Flat	273.05	3.60	1.50	6.11	65.33

Table 2.Y
Performance Test Results — Raw Data

HELME NUMBER	TEST TYPE	TEST DAT	TEST COND	SAMPLE NUMBER	MAN DAT	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
CDB007	R & D--Conditioning	4/14/97	Wet	CDBS-B	7-96	1099	XSmall	DO	Size A	3.50	NO TES	NO TES
CDB007	R & D--Conditioning	4/14/97	Wet	CDBS-B	7-96	1099	XSmall	DO	Size A	3.50	NO TES	NO TES
CDB007	R & D--Conditioning	4/14/97	Wet	CDBS-B	7-96	1099	XSmall	DO	Size A	3.50	NO TES	NO TES
CDB007	R & D--Conditioning	4/14/97	Wet	CDBS-B	7-96	1099	XSmall	DO	Size A	3.50	NO TES	NO TES
CDB008	R & D--Conditioning	4/14/97	Cold	CDBS-C	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
CDB008	R & D--Conditioning	4/14/97	Cold	CDBS-C	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
CDB008	R & D--Conditioning	4/14/97	Cold	CDBS-C	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
CDB008	R & D--Conditioning	4/14/97	Cold	CDBS-C	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
CDB008	R & D--Conditioning	4/14/97	Cold	CDBS-C	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
CDB008	R & D--Conditioning	4/14/97	Cold	CDBS-C	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
CDB008	R & D--Conditioning	4/14/97	Cold	CDBS-C	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
CDB008	R & D--Conditioning	4/14/97	Cold	CDBS-C	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
CDB009	R & D--Conditioning	4/14/97	Hot	CDBS-D	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
CDB009	R & D--Conditioning	4/14/97	Hot	CDBS-D	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
CDB009	R & D--Conditioning	4/14/97	Hot	CDBS-D	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
CDB009	R & D--Conditioning	4/14/97	Hot	CDBS-D	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
CDB009	R & D--Conditioning	4/14/97	Hot	CDBS-D	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
CDB009	R & D--Conditioning	4/14/97	Hot	CDBS-D	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
CDB009	R & D--Conditioning	4/14/97	Hot	CDBS-D	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
CDB009	R & D--Conditioning	4/14/97	Hot	CDBS-D	7-96	1107	XSmall	DO	Size A	3.50	NO TES	NO TES
CDC001	R & D--Conditioning	3/24/97	Wet	CDCL-B	Missing	1435	Large	DO	Size D	6.10	NO TES	NO TES
CDC001	R & D--Conditioning	3/24/97	Wet	CDCL-B	Missing	1435	Large	DO	Size D	6.10	NO TES	NO TES
CDC001	R & D--Conditioning	3/24/97	Wet	CDCL-B	Missing	1435	Large	DO	Size D	6.10	NO TES	NO TES
CDC001	R & D--Conditioning	3/24/97	Wet	CDCL-B	Missing	1435	Large	DO	Size D	6.10	NO TES	NO TES
CDC001	R & D--Conditioning	3/24/97	Wet	CDCL-B	Missing	1435	Large	DO	Size D	6.10	NO TES	NO TES
CDC001	R & D--Conditioning	3/24/97	Wet	CDCL-B	Missing	1435	Large	DO	Size D	6.10	NO TES	NO TES
CDC001	R & D--Conditioning	3/24/97	Wet	CDCL-B	Missing	1435	Large	DO	Size D	6.10	NO TES	NO TES
CDC001	R & D--Conditioning	3/24/97	Wet	CDCL-B	Missing	1435	Large	DO	Size D	6.10	NO TES	NO TES
CDC002	R & D--Conditioning	3/24/97	Cold	CDCL-C	11-95	1389	Large	DO	Size D	6.10	NO TES	NO TES
CDC002	R & D--Conditioning	3/24/97	Cold	CDCL-C	11-95	1389	Large	DO	Size D	6.10	NO TES	NO TES
CDC002	R & D--Conditioning	3/24/97	Cold	CDCL-C	11-95	1389	Large	DO	Size D	6.10	NO TES	NO TES
CDC002	R & D--Conditioning	3/24/97	Cold	CDCL-C	11-95	1389	Large	DO	Size D	6.10	NO TES	NO TES
CDC002	R & D--Conditioning	3/24/97	Cold	CDCL-C	11-95	1389	Large	DO	Size D	6.10	NO TES	NO TES
CDC002	R & D--Conditioning	3/24/97	Cold	CDCL-C	11-95	1389	Large	DO	Size D	6.10	NO TES	NO TES
CDC002	R & D--Conditioning	3/24/97	Cold	CDCL-C	11-95	1389	Large	DO	Size D	6.10	NO TES	NO TES
CDC002	R & D--Conditioning	3/24/97	Cold	CDCL-C	11-95	1389	Large	DO	Size D	6.10	NO TES	NO TES
CDC003	R & D--Conditioning	3/24/97	Hot	CDCL-D	11-95	1420	Large	DO	Size D	6.10	NO TES	NO TES
CDC003	R & D--Conditioning	3/24/97	Hot	CDCL-D	11-95	1420	Large	DO	Size D	6.10	NO TES	NO TES
CDC003	R & D--Conditioning	3/24/97	Hot	CDCL-D	11-95	1420	Large	DO	Size D	6.10	NO TES	NO TES
CDC003	R & D--Conditioning	3/24/97	Hot	CDCL-D	11-95	1420	Large	DO	Size D	6.10	NO TES	NO TES
CDC003	R & D--Conditioning	3/24/97	Hot	CDCL-D	11-95	1420	Large	DO	Size D	6.10	NO TES	NO TES
CDC003	R & D--Conditioning	3/24/97	Hot	CDCL-D	11-95	1420	Large	DO	Size D	6.10	NO TES	NO TES
CDC003	R & D--Conditioning	3/24/97	Hot	CDCL-D	11-95	1420	Large	DO	Size D	6.10	NO TES	NO TES
CDC003	R & D--Conditioning	3/24/97	Hot	CDCL-D	11-95	1420	Large	DO	Size D	6.10	NO TES	NO TES
CDC005	R & D--Conditioning	3/26/97	Wet	CDCM-B	Missing	1440	Medium	DO	Size C	5.00	NO TES	NO TES
CDC005	R & D--Conditioning	3/26/97	Wet	CDCM-B	Missing	1440	Medium	DO	Size C	5.00	NO TES	NO TES
CDC005	R & D--Conditioning	3/26/97	Wet	CDCM-B	Missing	1440	Medium	DO	Size C	5.00	NO TES	NO TES
CDC005	R & D--Conditioning	3/26/97	Wet	CDCM-B	Missing	1440	Medium	DO	Size C	5.00	NO TES	NO TES
CDC005	R & D--Conditioning	3/26/97	Wet	CDCM-B	Missing	1440	Medium	DO	Size C	5.00	NO TES	NO TES
CDC005	R & D--Conditioning	3/26/97	Wet	CDCM-B	Missing	1440	Medium	DO	Size C	5.00	NO TES	NO TES
CDC005	R & D--Conditioning	3/26/97	Wet	CDCM-B	Missing	1440	Medium	DO	Size C	5.00	NO TES	NO TES
CDC005	R & D--Conditioning	3/26/97	Wet	CDCM-B	Missing	1440	Medium	DO	Size C	5.00	NO TES	NO TES
CDC006	R & D--Conditioning	3/26/97	Cold	CDCM-C	Missing	1406	Medium	DO	Size C	5.00	NO TES	NO TES
CDC006	R & D--Conditioning	3/26/97	Cold	CDCM-C	Missing	1406	Medium	DO	Size C	5.00	NO TES	NO TES
CDC006	R & D--Conditioning	3/26/97	Cold	CDCM-C	Missing	1406	Medium	DO	Size C	5.00	NO TES	NO TES
CDC006	R & D--Conditioning	3/26/97	Cold	CDCM-C	Missing	1406	Medium	DO	Size C	5.00	NO TES	NO TES
CDC006	R & D--Conditioning	3/26/97	Cold	CDCM-C	Missing	1406	Medium	DO	Size C	5.00	NO TES	NO TES
CDC006	R & D--Conditioning	3/26/97	Cold	CDCM-C	Missing	1406	Medium	DO	Size C	5.00	NO TES	NO TES

Table 2.Y
Performance Test Results — Raw Data

DROP NU	HIT NU	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
3	1	NO TES	NO TES	RG	1,2	Hemi	117.78	0.00	0.00	5.22	47.68
3	2	NO TES	NO TES	RG	1,2	Hemi	132.91	0.00	0.00	5.25	48.23
4	1	NO TES	NO TES	FR	2,4	Hemi	101.19	0.00	0.00	5.24	48.05
4	2	NO TES	NO TES	FR	2,4	Hemi	114.37	0.00	0.00	5.30	49.16
1	1	NO TES	NO TES	LF	1,2	Flat	224.72	3.70	1.50	5.98	62.58
1	2	NO TES	NO TES	LF	1,2	Flat	262.32	3.60	1.90	6.02	63.42
2	1	NO TES	NO TES	RR	2,4	Flat	269.67	3.40	1.60	6.02	63.42
2	2	NO TES	NO TES	RR	2,4	Flat	283.83	3.60	2.10	6.05	64.05
3	1	NO TES	NO TES	RG	1,2	Hemi	119.26	0.00	0.00	5.22	47.68
3	2	NO TES	NO TES	RG	1,2	Hemi	126.09	0.00	0.00	5.22	47.68
4	1	NO TES	NO TES	FR	2,4	Hemi	129.05	0.00	0.00	5.23	47.87
4	2	NO TES	NO TES	FR	2,4	Hemi	131.02	0.00	0.00	5.23	47.87
1	1	NO TES	NO TES	LF	1,2	Flat	217.38	3.60	1.10	6.02	63.42
1	2	NO TES	NO TES	LF	1,2	Flat	227.69	3.70	1.20	5.99	62.79
2	1	NO TES	NO TES	RR	2,4	Flat	222.31	2.80	0.50	6.00	63.00
2	2	NO TES	NO TES	RR	2,4	Flat	278.93	3.20	1.60	6.03	63.63
3	1	NO TES	NO TES	RG	1,2	Hemi	121.70	0.00	0.00	5.24	48.05
3	2	NO TES	NO TES	RG	1,2	Hemi	147.61	0.00	0.00	5.24	48.05
4	1	NO TES	NO TES	FR	2,4	Hemi	99.25	0.00	0.00	5.22	47.68
4	2	NO TES	NO TES	FR	2,4	Hemi	116.81	0.00	0.00	5.22	47.68
1	1	NO TES	NO TES	LF	1,2	Flat	179.31	3.20	0.00	6.20	117.24
1	2	NO TES	NO TES	LF	1,2	Flat	191.94	3.20	0.00	6.15	115.36
2	1	NO TES	NO TES	RR	2,4	Flat	169.53	3.00	0.00	6.20	117.24
2	2	NO TES	NO TES	RR	2,4	Flat	177.83	3.00	0.00	6.15	115.36
3	1	NO TES	NO TES	RG	1,2	Hemi	99.23	0.00	0.00	5.39	88.61
3	2	NO TES	NO TES	RG	1,2	Hemi	111.39	0.00	0.00	5.37	87.95
4	1	NO TES	NO TES	FR	2,4	Hemi	102.17	0.00	0.00	5.32	86.32
4	2	NO TES	NO TES	FR	2,4	Hemi	116.81	0.00	0.00	5.31	86.00
1	1	NO TES	NO TES	LF	1,2	Flat	190.96	2.90	0.00	6.05	111.64
1	2	NO TES	NO TES	LF	1,2	Flat	211.04	3.10	0.80	6.06	112.01
2	1	NO TES	NO TES	RR	2,4	Flat	175.39	3.10	0.00	6.14	114.98
2	2	NO TES	NO TES	RR	2,4	Flat	201.77	3.30	0.30	6.11	113.86
3	1	NO TES	NO TES	RG	1,2	Hemi	117.77	0.00	0.00	5.38	88.28
3	2	NO TES	NO TES	RG	1,2	Hemi	122.20	0.00	0.00	5.29	85.35
4	1	NO TES	NO TES	FR	2,4	Hemi	127.58	0.00	0.00	5.31	86.00
4	2	NO TES	NO TES	FR	2,4	Hemi	141.21	0.00	0.00	5.35	87.30
1	1	NO TES	NO TES	LF	1,2	Flat	170.95	1.90	0.00	6.11	113.86
1	2	NO TES	NO TES	LF	1,2	Flat	194.46	3.00	0.00	6.09	113.12
2	1	NO TES	NO TES	RR	2,4	Flat	168.56	2.70	0.00	6.15	115.36
2	2	NO TES	NO TES	RR	2,4	Flat	183.26	3.20	0.00	6.08	112.75
3	1	NO TES	NO TES	RG	1,2	Hemi	102.20	0.00	0.00	5.31	86.00
3	2	NO TES	NO TES	RG	1,2	Hemi	109.97	0.00	0.00	5.27	84.71
4	1	NO TES	NO TES	FR	2,4	Hemi	120.17	0.00	0.00	5.29	85.35
4	2	NO TES	NO TES	FR	2,4	Hemi	142.66	0.00	0.00	5.30	85.67
1	1	NO TES	NO TES	LF	1,2	Flat	184.63	3.60	0.00	6.17	95.17
1	2	NO TES	NO TES	LF	1,2	Flat	199.27	3.70	0.00	6.20	96.10
2	1	NO TES	NO TES	RR	2,4	Flat	173.96	3.30	0.00	6.15	94.56
2	2	NO TES	NO TES	RR	2,4	Flat	191.05	3.10	0.00	6.11	93.33
3	1	NO TES	NO TES	RG	1,2	Hemi	111.88	0.00	0.00	5.35	71.56
3	2	NO TES	NO TES	RG	1,2	Hemi	130.93	0.00	0.00	5.29	69.96
4	1	NO TES	NO TES	FR	2,4	Hemi	121.65	0.00	0.00	5.23	68.38
4	2	NO TES	NO TES	FR	2,4	Hemi	130.47	0.00	0.00	5.20	67.60
1	1	NO TES	NO TES	LF	1,2	Flat	199.81	2.80	0.00	6.21	96.41
1	2	NO TES	NO TES	LF	1,2	Flat	218.82	3.30	1.20	6.15	94.56
2	1	NO TES	NO TES	RR	2,4	Flat	199.28	3.30	0.00	6.18	95.48
2	2	NO TES	NO TES	RR	2,4	Flat	215.37	3.40	1.10	6.12	93.64
3	1	NO TES	NO TES	RG	1,2	Hemi	125.54	0.00	0.00	5.28	69.70
3	2	NO TES	NO TES	RG	1,2	Hemi	152.41	0.10	0.00	5.25	68.91

Table 2.Y
Performance Test Results — Raw Data

HELME NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
CDC006	R & D--Conditioning	3/26/97	Cold	CDCM-C	Missing	1406	Medium	DOT	Size C	5.00	NO TEST	NO TEST
CDC006	R & D--Conditioning	3/26/97	Cold	CDCM-C	Missing	1406	Medium	DOT	Size C	5.00	NO TEST	NO TEST
CDC007	R & D--Conditioning	3/26/97	Hot	CDCM-D	Missing	1437	Medium	DOT	Size C	5.00	NO TEST	NO TEST
CDC007	R & D--Conditioning	3/26/97	Hot	CDCM-D	Missing	1437	Medium	DOT	Size C	5.00	NO TEST	NO TEST
CDC007	R & D--Conditioning	3/26/97	Hot	CDCM-D	Missing	1437	Medium	DOT	Size C	5.00	NO TEST	NO TEST
CDC007	R & D--Conditioning	3/26/97	Hot	CDCM-D	Missing	1437	Medium	DOT	Size C	5.00	NO TEST	NO TEST
CDC007	R & D--Conditioning	3/26/97	Hot	CDCM-D	Missing	1437	Medium	DOT	Size C	5.00	NO TEST	NO TEST
CDC007	R & D--Conditioning	3/26/97	Hot	CDCM-D	Missing	1437	Medium	DOT	Size C	5.00	NO TEST	NO TEST
CDC007	R & D--Conditioning	3/26/97	Hot	CDCM-D	Missing	1437	Medium	DOT	Size C	5.00	NO TEST	NO TEST
CDC007	R & D--Conditioning	3/26/97	Hot	CDCM-D	Missing	1437	Medium	DOT	Size C	5.00	NO TEST	NO TEST
CDC008	R & D--Conditioning	4/1/97	Wet	CDCS-B	SEP 96	1444	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC008	R & D--Conditioning	4/1/97	Wet	CDCS-B	SEP 96	1444	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC008	R & D--Conditioning	4/1/97	Wet	CDCS-B	SEP 96	1444	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC008	R & D--Conditioning	4/1/97	Wet	CDCS-B	SEP 96	1444	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC008	R & D--Conditioning	4/1/97	Wet	CDCS-B	SEP 96	1444	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC008	R & D--Conditioning	4/1/97	Wet	CDCS-B	SEP 96	1444	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC008	R & D--Conditioning	4/1/97	Wet	CDCS-B	SEP 96	1444	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC008	R & D--Conditioning	4/1/97	Wet	CDCS-B	SEP 96	1444	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC009	R & D--Conditioning	4/1/97	Cold	CDCS-C	FEB 97	1492	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC009	R & D--Conditioning	4/1/97	Cold	CDCS-C	FEB 97	1492	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC009	R & D--Conditioning	4/1/97	Cold	CDCS-C	FEB 97	1492	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC009	R & D--Conditioning	4/1/97	Cold	CDCS-C	FEB 97	1492	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC009	R & D--Conditioning	4/1/97	Cold	CDCS-C	FEB 97	1492	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC009	R & D--Conditioning	4/1/97	Cold	CDCS-C	FEB 97	1492	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC009	R & D--Conditioning	4/1/97	Cold	CDCS-C	FEB 97	1492	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC009	R & D--Conditioning	4/1/97	Cold	CDCS-C	FEB 97	1492	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC010	R & D--Conditioning	4/1/97	Hot	CDCS-D	FEB 97	1447	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC010	R & D--Conditioning	4/1/97	Hot	CDCS-D	FEB 97	1447	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC010	R & D--Conditioning	4/1/97	Hot	CDCS-D	FEB 97	1447	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC010	R & D--Conditioning	4/1/97	Hot	CDCS-D	FEB 97	1447	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC010	R & D--Conditioning	4/1/97	Hot	CDCS-D	FEB 97	1447	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC010	R & D--Conditioning	4/1/97	Hot	CDCS-D	FEB 97	1447	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC010	R & D--Conditioning	4/1/97	Hot	CDCS-D	FEB 97	1447	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
CDC010	R & D--Conditioning	4/1/97	Hot	CDCS-D	FEB 97	1447	XSmall	DOT	Size A	3.50	NO TEST	NO TEST
HFA001	ISO Headform R&D	5/5/97	Ambient	HFAJ-A	6/27/96	827	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA001	ISO Headform R&D	5/5/97	Ambient	HFAJ-A	6/27/96	827	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA001	ISO Headform R&D	5/5/97	Ambient	HFAJ-A	6/27/96	827	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA001	ISO Headform R&D	5/5/97	Ambient	HFAJ-A	6/27/96	827	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA001	ISO Headform R&D	5/5/97	Ambient	HFAJ-A	6/27/96	827	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA001	ISO Headform R&D	5/5/97	Ambient	HFAJ-A	6/27/96	827	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA001	ISO Headform R&D	5/5/97	Ambient	HFAJ-A	6/27/96	827	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA001	ISO Headform R&D	5/5/97	Ambient	HFAJ-A	6/27/96	827	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA002	ISO Headform R&D	5/5/97	Wet	HFAJ-B	6/27/96	826	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA002	ISO Headform R&D	5/5/97	Wet	HFAJ-B	6/27/96	826	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA002	ISO Headform R&D	5/5/97	Wet	HFAJ-B	6/27/96	826	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA002	ISO Headform R&D	5/5/97	Wet	HFAJ-B	6/27/96	826	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA002	ISO Headform R&D	5/5/97	Wet	HFAJ-B	6/27/96	826	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA002	ISO Headform R&D	5/5/97	Wet	HFAJ-B	6/27/96	826	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA002	ISO Headform R&D	5/5/97	Wet	HFAJ-B	6/27/96	826	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA002	ISO Headform R&D	5/5/97	Wet	HFAJ-B	6/27/96	826	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA003	ISO Headform R&D	5/5/97	Cold	HFAJ-C	6/27/96	827	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA003	ISO Headform R&D	5/5/97	Cold	HFAJ-C	6/27/96	827	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA003	ISO Headform R&D	5/5/97	Cold	HFAJ-C	6/27/96	827	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA003	ISO Headform R&D	5/5/97	Cold	HFAJ-C	6/27/96	827	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA003	ISO Headform R&D	5/5/97	Cold	HFAJ-C	6/27/96	827	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA003	ISO Headform R&D	5/5/97	Cold	HFAJ-C	6/27/96	827	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA003	ISO Headform R&D	5/5/97	Cold	HFAJ-C	6/27/96	827	Medium	ISO	Size J	4.70	NO TEST	NO TEST
HFA003	ISO Headform R&D	5/5/97	Cold	HFAJ-C	6/27/96	827	Medium	ISO	Size J	4.70	NO TEST	NO TEST

Table 2.Y
Performance Test Results — Raw Data

DROP NUM	HIT NUM	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OUT OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCIT (M/S)	ENERGY (JOULES)
4	1	NO TEST	NO TEST	FR	2,4	Hemi	138.27	0.00	0.00	5.19	67.34
4	2	NO TEST	NO TEST	FR	2,4	Hemi	168.51	0.80	0.00	5.24	68.64
1	1	NO TEST	NO TEST	LF	1,2	Flat	193.44	3.10	0.00	6.12	93.64
1	2	NO TEST	NO TEST	LF	1,2	Flat	205.13	2.70	0.50	6.12	93.64
2	1	NO TEST	NO TEST	RR	2,4	Flat	191.53	3.10	0.00	6.08	92.42
2	2	NO TEST	NO TEST	RR	2,4	Flat	209.08	3.00	0.80	6.11	93.33
3	1	NO TEST	NO TEST	RG	1,2	Hemi	132.88	0.00	0.00	5.22	68.12
3	2	NO TEST	NO TEST	RG	1,2	Hemi	148.44	0.00	0.00	5.22	68.12
4	1	NO TEST	NO TEST	FR	2,4	Hemi	137.26	0.00	0.00	5.24	68.64
4	2	NO TEST	NO TEST	FR	2,4	Hemi	148.51	0.00	0.00	5.20	67.60
1	1	NO TEST	NO TEST	LF	1,2	Flat	202.22	4.00	0.20	6.17	66.62
1	2	NO TEST	NO TEST	LF	1,2	Flat	214.91	4.00	1.40	6.15	66.19
2	1	NO TEST	NO TEST	RR	2,4	Flat	192.93	3.80	0.00	6.05	64.05
2	2	NO TEST	NO TEST	RR	2,4	Flat	227.16	3.70	1.40	6.11	86.67
3	1	NO TEST	NO TEST	RG	1,2	Hemi	158.81	0.60	0.00	5.25	48.23
3	2	NO TEST	NO TEST	RG	1,2	Hemi	162.73	0.60	0.00	5.23	47.87
4	1	NO TEST	NO TEST	FR	2,4	Hemi	131.49	0.00	0.00	5.34	49.90
4	2	NO TEST	NO TEST	FR	2,4	Hemi	175.89	1.10	0.00	5.23	47.87
1	1	NO TEST	NO TEST	LF	1,2	Flat	199.30	3.10	0.00	6.12	65.55
1	2	NO TEST	NO TEST	LF	1,2	Flat	210.07	3.20	1.00	6.02	63.42
2	1	NO TEST	NO TEST	RR	2,4	Flat	175.89	3.20	0.00	6.05	64.05
2	2	NO TEST	NO TEST	RR	2,4	Flat	195.40	2.60	0.00	6.03	63.63
3	1	NO TEST	NO TEST	RG	1,2	Hemi	169.04	1.00	0.00	5.25	48.23
3	2	NO TEST	NO TEST	RG	1,2	Hemi	177.33	1.00	0.00	5.25	48.23
4	1	NO TEST	NO TEST	FR	2,4	Hemi	150.97	0.20	0.00	5.27	48.60
4	2	NO TEST	NO TEST	FR	2,4	Hemi	166.05	2.00	0.00	5.26	48.42
1	1	NO TEST	NO TEST	LF	1,2	Flat	191.52	3.40	0.00	6.02	63.42
1	2	NO TEST	NO TEST	LF	1,2	Flat	213.03	3.10	1.20	6.00	63.00
2	1	NO TEST	NO TEST	RR	2,4	Flat	190.54	2.30	0.00	6.02	63.42
2	2	NO TEST	NO TEST	RR	2,4	Flat	205.18	2.50	0.60	6.11	86.67
3	1	NO TEST	NO TEST	RG	1,2	Hemi	158.27	0.70	0.00	5.20	47.32
3	2	NO TEST	NO TEST	RG	1,2	Hemi	157.81	0.40	0.00	5.23	47.87
4	1	NO TEST	NO TEST	FR	2,4	Hemi	149.02	0.00	0.00	5.22	47.68
4	2	NO TEST	NO TEST	FR	2,4	Hemi	170.06	1.70	0.00	5.20	47.32
1	1	NO TEST	NO TEST	LF	2,4	Flat	291.18	3.50	2.80	6.85	110.27
1	2	NO TEST	NO TEST	LF	2,4	Flat	316.58	3.40	2.20	6.03	85.45
2	1	NO TEST	NO TEST	RR	2,4	Flat	312.10	3.60	3.10	6.92	112.53
2	2	NO TEST	NO TEST	RR	2,4	Flat	329.77	3.60	2.30	6.06	86.30
3	1	NO TEST	NO TEST	RG	2,4	Hemi	152.39	0.40	0.00	6.05	86.02
3	2	NO TEST	NO TEST	RG	2,4	Hemi	151.95	0.30	0.00	5.23	64.28
4	1	NO TEST	NO TEST	FR	2,4	Hemi	166.62	0.10	0.00	6.06	86.30
4	2	NO TEST	NO TEST	FR	2,4	Hemi	147.56	0.00	0.00	5.24	64.53
1	1	NO TEST	NO TEST	LF	2,4	Flat	311.22	3.60	2.70	6.86	110.59
1	2	NO TEST	NO TEST	LF	2,4	Flat	331.67	3.10	2.70	5.99	84.32
2	1	NO TEST	NO TEST	RR	2,4	Flat	305.78	3.70	3.00	6.92	112.53
2	2	NO TEST	NO TEST	RR	2,4	Flat	319.45	3.60	2.70	6.05	86.02
3	1	NO TEST	NO TEST	RG	2,4	Hemi	166.65	1.90	0.00	6.03	85.45
3	2	NO TEST	NO TEST	RG	2,4	Hemi	169.60	1.90	0.00	5.26	65.02
4	1	NO TEST	NO TEST	FR	2,4	Hemi	143.22	0.00	0.00	6.05	86.02
4	2	NO TEST	NO TEST	FR	2,4	Hemi	154.93	1.00	0.00	5.24	64.53
1	1	NO TEST	NO TEST	LF	2,4	Flat	310.69	3.60	2.90	6.90	111.88
1	2	NO TEST	NO TEST	LF	2,4	Flat	327.65	3.20	2.40	6.02	85.16
2	1	NO TEST	NO TEST	RR	2,4	Flat	331.17	3.60	3.10	6.90	111.88
2	2	NO TEST	NO TEST	RR	2,4	Flat	342.90	3.50	2.50	6.08	86.87
3	1	NO TEST	NO TEST	RG	2,4	Hemi	171.04	1.00	0.00	6.06	86.30
3	2	NO TEST	NO TEST	RG	2,4	Hemi	165.12	1.80	0.00	5.26	65.02
4	1	NO TEST	NO TEST	FR	2,4	Hemi	144.67	0.00	0.00	6.05	86.02
4	2	NO TEST	NO TEST	FR	2,4	Hemi	158.85	1.00	0.00	5.24	64.53

Table 2.Y
Performance Test Results — Raw Data

HELME NUMBER	TEST TYPE	TEST DAT	TEST COND	SAMPLE NUMBER	MAN DAT	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
HFA004	ISO Headform R&D	5/5/97	Hot	HFAJ-D	6/27/96	825	Medium	ISO	Size J	4.70	NO TES	NO TES
HFA004	ISO Headform R&D	5/5/97	Hot	HFAJ-D	6/27/96	825	Medium	ISO	Size J	4.70	NO TES	NO TES
HFA004	ISO Headform R&D	5/5/97	Hot	HFAJ-D	6/27/96	825	Medium	ISO	Size J	4.70	NO TES	NO TES
HFA004	ISO Headform R&D	5/5/97	Hot	HFAJ-D	6/27/96	825	Medium	ISO	Size J	4.70	NO TES	NO TES
HFA004	ISO Headform R&D	5/5/97	Hot	HFAJ-D	6/27/96	825	Medium	ISO	Size J	4.70	NO TES	NO TES
HFA004	ISO Headform R&D	5/5/97	Hot	HFAJ-D	6/27/96	825	Medium	ISO	Size J	4.70	NO TES	NO TES
HFA004	ISO Headform R&D	5/5/97	Hot	HFAJ-D	6/27/96	825	Medium	ISO	Size J	4.70	NO TES	NO TES
HFA004	ISO Headform R&D	5/5/97	Hot	HFAJ-D	6/27/96	825	Medium	ISO	Size J	4.70	NO TES	NO TES
HFA005	ISO Headform R&D	5/7/97	Ambient	HFAE-A	APR 199	828	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA005	ISO Headform R&D	5/7/97	Ambient	HFAE-A	APR 199	828	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA005	ISO Headform R&D	5/7/97	Ambient	HFAE-A	APR 199	828	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA005	ISO Headform R&D	5/7/97	Ambient	HFAE-A	APR 199	828	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA005	ISO Headform R&D	5/7/97	Ambient	HFAE-A	APR 199	828	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA005	ISO Headform R&D	5/7/97	Ambient	HFAE-A	APR 199	828	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA005	ISO Headform R&D	5/7/97	Ambient	HFAE-A	APR 199	828	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA005	ISO Headform R&D	5/7/97	Ambient	HFAE-A	APR 199	828	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA006	ISO Headform R&D	5/7/97	Wet	HFAE-B	APR 199	828	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA006	ISO Headform R&D	5/7/97	Wet	HFAE-B	APR 199	828	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA006	ISO Headform R&D	5/7/97	Wet	HFAE-B	APR 199	828	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA006	ISO Headform R&D	5/7/97	Wet	HFAE-B	APR 199	828	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA006	ISO Headform R&D	5/7/97	Wet	HFAE-B	APR 199	828	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA006	ISO Headform R&D	5/7/97	Wet	HFAE-B	APR 199	828	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA006	ISO Headform R&D	5/7/97	Wet	HFAE-B	APR 199	828	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA006	ISO Headform R&D	5/7/97	Wet	HFAE-B	APR 199	828	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA007	ISO Headform R&D	5/7/97	Cold	HFAE-C	APR 199	832	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA007	ISO Headform R&D	5/7/97	Cold	HFAE-C	APR 199	832	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA007	ISO Headform R&D	5/7/97	Cold	HFAE-C	APR 199	832	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA007	ISO Headform R&D	5/7/97	Cold	HFAE-C	APR 199	832	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA007	ISO Headform R&D	5/7/97	Cold	HFAE-C	APR 199	832	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA007	ISO Headform R&D	5/7/97	Cold	HFAE-C	APR 199	832	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA007	ISO Headform R&D	5/7/97	Cold	HFAE-C	APR 199	832	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA007	ISO Headform R&D	5/7/97	Cold	HFAE-C	APR 199	832	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA008	ISO Headform R&D	5/7/97	Hot	HFAE-D	APR 199	823	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA008	ISO Headform R&D	5/7/97	Hot	HFAE-D	APR 199	823	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA008	ISO Headform R&D	5/7/97	Hot	HFAE-D	APR 199	823	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA008	ISO Headform R&D	5/7/97	Hot	HFAE-D	APR 199	823	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA008	ISO Headform R&D	5/7/97	Hot	HFAE-D	APR 199	823	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA008	ISO Headform R&D	5/7/97	Hot	HFAE-D	APR 199	823	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA008	ISO Headform R&D	5/7/97	Hot	HFAE-D	APR 199	823	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA008	ISO Headform R&D	5/7/97	Hot	HFAE-D	APR 199	823	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFA009	ISO Headform R&D	5/20/97	Ambient	HFAM-A	4/96	834	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA009	ISO Headform R&D	5/20/97	Ambient	HFAM-A	4/96	834	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA009	ISO Headform R&D	5/20/97	Ambient	HFAM-A	4/96	834	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA009	ISO Headform R&D	5/20/97	Ambient	HFAM-A	4/96	834	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA009	ISO Headform R&D	5/20/97	Ambient	HFAM-A	4/96	834	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA009	ISO Headform R&D	5/20/97	Ambient	HFAM-A	4/96	834	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA009	ISO Headform R&D	5/20/97	Ambient	HFAM-A	4/96	834	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA009	ISO Headform R&D	5/20/97	Ambient	HFAM-A	4/96	834	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA010	ISO Headform R&D	5/20/97	Wet	HFCM-B	4/96	851	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA010	ISO Headform R&D	5/20/97	Wet	HFCM-B	4/96	851	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA010	ISO Headform R&D	5/20/97	Wet	HFCM-B	4/96	851	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA010	ISO Headform R&D	5/20/97	Wet	HFCM-B	4/96	851	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA010	ISO Headform R&D	5/20/97	Wet	HFCM-B	4/96	851	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA010	ISO Headform R&D	5/20/97	Wet	HFCM-B	4/96	851	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA010	ISO Headform R&D	5/20/97	Wet	HFCM-B	4/96	851	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA010	ISO Headform R&D	5/20/97	Wet	HFCM-B	4/96	851	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA011	ISO Headform R&D	5/20/97	Cold	HFAM-C	4/96	833	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA011	ISO Headform R&D	5/20/97	Cold	HFAM-C	4/96	833	XLarge	ISO	Size M	5.60	NO TES	NO TES

Table 2.Y
Performance Test Results — Raw Data

DROP NU	HIT NU	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
1	1	NO TES	NO TES	LF	2,4	Flat	308.62	3.70	2.80	6.90	111.88
1	2	NO TES	NO TES	LF	2,4	Flat	317.92	3.20	2.30	6.02	85.16
2	1	NO TES	NO TES	RR	2,4	Flat	311.66	3.50	2.90	6.90	111.88
2	2	NO TES	NO TES	RR	2,4	Flat	325.37	3.30	2.30	6.08	86.87
3	1	NO TES	NO TES	RG	2,4	Hemi	158.32	0.70	0.00	6.02	85.16
3	2	NO TES	NO TES	RG	2,4	Hemi	188.65	2.30	0.00	6.02	85.16
4	1	NO TES	NO TES	FR	2,4	Hemi	167.63	0.40	0.00	6.05	86.02
4	2	NO TES	NO TES	FR	2,4	Hemi	147.58	0.00	0.00	5.25	64.77
1	1	NO TES	NO TES	LF	2,4	Flat	284.34	3.80	2.80	6.90	97.60
1	2	NO TES	NO TES	LF	2,4	Flat	266.71	3.50	2.70	6.02	74.29
2	1	NO TES	NO TES	RR	2,4	Flat	251.62	4.30	2.90	6.90	97.60
2	2	NO TES	NO TES	RR	2,4	Flat	239.87	3.30	2.00	6.02	74.29
3	1	NO TES	NO TES	RG	2,4	Hemi	138.25	0.00	0.00	6.00	73.80
3	2	NO TES	NO TES	RG	2,4	Hemi	153.91	0.80	0.00	5.24	56.29
4	1	NO TES	NO TES	FR	2,4	Hemi	129.51	0.00	0.00	6.02	74.29
4	2	NO TES	NO TES	FR	2,4	Hemi	125.62	0.00	0.00	5.24	56.29
1	1	NO TES	NO TES	LF	2,4	Flat	298.45	3.50	3.10	6.94	98.74
1	2	NO TES	NO TES	LF	2,4	Flat	261.89	3.30	1.80	6.06	75.28
2	1	NO TES	NO TES	RR	2,4	Flat	308.24	3.80	2.30	6.90	97.60
2	2	NO TES	NO TES	RR	2,4	Flat	274.53	3.30	2.60	6.06	75.28
3	1	NO TES	NO TES	RG	2,4	Hemi	171.52	1.90	0.00	6.02	74.29
3	2	NO TES	NO TES	RG	2,4	Hemi	179.37	1.90	0.00	5.23	56.07
4	1	NO TES	NO TES	FR	2,4	Hemi	140.70	0.00	0.00	6.03	74.54
4	2	NO TES	NO TES	FR	2,4	Hemi	153.44	1.00	0.00	5.27	56.93
1	1	NO TES	NO TES	LF	2,4	Flat	315.59	3.40	3.10	6.86	96.47
1	2	NO TES	NO TES	LF	2,4	Flat	340.94	3.00	2.70	6.03	74.54
2	1	NO TES	NO TES	RR	2,4	Flat	337.53	3.60	2.70	6.85	96.19
2	2	NO TES	NO TES	RR	2,4	Flat	339.95	3.30	2.30	6.05	75.04
3	1	NO TES	NO TES	RG	2,4	Hemi	175.38	2.10	0.00	6.02	74.29
3	2	NO TES	NO TES	RG	2,4	Hemi	190.10	2.30	0.00	5.24	56.29
4	1	NO TES	NO TES	FR	2,4	Hemi	152.45	0.40	0.00	6.05	75.04
4	2	NO TES	NO TES	FR	2,4	Hemi	159.79	1.30	0.00	5.23	56.07
1	1	NO TES	NO TES	LF	2,4	Flat	255.43	3.90	1.80	6.86	96.47
1	2	NO TES	NO TES	LF	2,4	Flat	258.44	3.10	2.10	6.03	74.54
2	1	NO TES	NO TES	RR	2,4	Flat	251.61	4.20	2.50	6.90	97.60
2	2	NO TES	NO TES	RR	2,4	Flat	229.09	3.50	1.70	6.00	73.80
3	1	NO TES	NO TES	RG	2,4	Hemi	132.97	0.00	0.00	6.00	73.80
3	2	NO TES	NO TES	RG	2,4	Hemi	160.29	1.40	0.00	6.02	74.29
4	1	NO TES	NO TES	FR	2,4	Hemi	121.72	0.00	0.00	6.05	75.04
4	2	NO TES	NO TES	FR	2,4	Hemi	115.86	0.00	0.00	5.26	56.72
1	1	NO TES	NO TES	LF	2,4	Flat	306.78	3.50	2.40	6.94	134.86
1	2	NO TES	NO TES	LF	2,4	Flat	343.35	2.20	1.60	6.05	102.49
2	1	NO TES	NO TES	RR	2,4	Flat	232.04	3.80	2.10	6.88	132.54
2	2	NO TES	NO TES	RR	2,4	Flat	237.42	3.10	2.00	6.05	102.49
3	1	NO TES	NO TES	RG	2,4	Hemi	157.81	0.80	0.00	6.05	102.49
3	2	NO TES	NO TES	RG	2,4	Hemi	324.88	1.40	1.00	5.26	77.47
4	1	NO TES	NO TES	FR	2,4	Hemi	386.30	1.30	1.00	6.05	102.49
4	2	NO TES	NO TES	FR	2,4	Hemi	553.80	1.20	1.00	5.25	77.18
1	1	NO TES	NO TES	LF	2,4	Flat	210.61	3.60	1.10	6.92	134.08
1	2	NO TES	NO TES	LF	2,4	Flat	197.87	2.90	0.00	6.08	103.51
2	1	NO TES	NO TES	RR	2,4	Flat	219.39	3.90	1.60	6.94	134.86
2	2	NO TES	NO TES	RR	2,4	Flat	220.84	3.60	1.80	6.05	102.49
3	1	NO TES	NO TES	RG	2,4	Hemi	231.59	1.30	0.70	6.03	101.81
3	2	NO TES	NO TES	RG	2,4	Hemi	369.69	1.30	1.00	5.26	77.47
4	1	NO TES	NO TES	FR	2,4	Hemi	452.31	1.40	1.10	6.06	102.83
4	2	NO TES	NO TES	FR	2,4	Hemi	154.00	0.70	0.00	5.27	77.80
1	1	NO TES	NO TES	LF	2,4	Flat	228.66	3.30	2.00	6.90	133.31
1	2	NO TES	NO TES	LF	2,4	Flat	252.60	2.80	1.90	6.03	101.81

Table 2.Y
Performance Test Results — Raw Data

HELME NUMBER	TEST TYPE	TEST DAT	TEST COND	SAMPLE NUMBER	MAN DAT	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
HFA011	ISO Headform R&D	5/20/97	Cold	HFAM-C	4/96	833	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA011	ISO Headform R&D	5/20/97	Cold	HFAM-C	4/96	833	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA011	ISO Headform R&D	5/20/97	Cold	HFAM-C	4/96	833	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA011	ISO Headform R&D	5/20/97	Cold	HFAM-C	4/96	833	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA011	ISO Headform R&D	5/20/97	Cold	HFAM-C	4/96	833	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA011	ISO Headform R&D	5/20/97	Cold	HFAM-C	4/96	833	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA012	ISO Headform R&D	5/20/97	Hot	HFAM-D	4/96	836	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA012	ISO Headform R&D	5/20/97	Hot	HFAM-D	4/96	836	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA012	ISO Headform R&D	5/20/97	Hot	HFAM-D	4/96	836	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA012	ISO Headform R&D	5/20/97	Hot	HFAM-D	4/96	836	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA012	ISO Headform R&D	5/20/97	Hot	HFAM-D	4/96	836	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA012	ISO Headform R&D	5/20/97	Hot	HFAM-D	4/96	836	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA012	ISO Headform R&D	5/20/97	Hot	HFAM-D	4/96	836	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFA012	ISO Headform R&D	5/20/97	Hot	HFAM-D	4/96	836	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Ambient	HFBJ-A	NOV 199	1400	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Ambient	HFBJ-A	NOV 199	1400	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Ambient	HFBJ-A	NOV 199	1400	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Ambient	HFBJ-A	NOV 199	1400	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Ambient	HFBJ-A	NOV 199	1400	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Ambient	HFBJ-A	NOV 199	1400	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Ambient	HFBJ-A	NOV 199	1400	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Ambient	HFBJ-A	NOV 199	1400	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Wet	HFBJ-B	NOV 199	1408	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Wet	HFBJ-B	NOV 199	1408	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Wet	HFBJ-B	NOV 199	1408	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Wet	HFBJ-B	NOV 199	1408	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Wet	HFBJ-B	NOV 199	1408	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Wet	HFBJ-B	NOV 199	1408	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Wet	HFBJ-B	NOV 199	1408	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Wet	HFBJ-B	NOV 199	1408	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Cold	HFBJ-C	NOV 199	1395	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Cold	HFBJ-C	NOV 199	1395	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Cold	HFBJ-C	NOV 199	1395	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Cold	HFBJ-C	NOV 199	1395	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Cold	HFBJ-C	NOV 199	1395	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Cold	HFBJ-C	NOV 199	1395	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Cold	HFBJ-C	NOV 199	1395	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Cold	HFBJ-C	NOV 199	1395	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Hot	HFBJ-D	NOV 199	1403	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Hot	HFBJ-D	NOV 199	1403	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Hot	HFBJ-D	NOV 199	1403	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Hot	HFBJ-D	NOV 199	1403	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Hot	HFBJ-D	NOV 199	1403	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Hot	HFBJ-D	NOV 199	1403	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Hot	HFBJ-D	NOV 199	1403	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/5/97	Hot	HFBJ-D	NOV 199	1403	Large	ISO	Size J	4.64	NO TES	NO TES
HFB00	ISO Headform R&D	5/7/97	Ambient	HFBE-A	JULY 19	1106	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB00	ISO Headform R&D	5/7/97	Ambient	HFBE-A	JULY 19	1106	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB00	ISO Headform R&D	5/7/97	Ambient	HFBE-A	JULY 19	1106	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB00	ISO Headform R&D	5/7/97	Ambient	HFBE-A	JULY 19	1106	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB00	ISO Headform R&D	5/7/97	Ambient	HFBE-A	JULY 19	1106	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB00	ISO Headform R&D	5/7/97	Ambient	HFBE-A	JULY 19	1106	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB00	ISO Headform R&D	5/7/97	Ambient	HFBE-A	JULY 19	1106	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB00	ISO Headform R&D	5/7/97	Ambient	HFBE-A	JULY 19	1106	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB00	ISO Headform R&D	5/7/97	Wet	HFBE-B	JULY 19	1100	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB00	ISO Headform R&D	5/7/97	Wet	HFBE-B	JULY 19	1100	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB00	ISO Headform R&D	5/7/97	Wet	HFBE-B	JULY 19	1100	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB00	ISO Headform R&D	5/7/97	Wet	HFBE-B	JULY 19	1100	XSmall	ISO	Size E	4.10	NO TES	NO TES

Table 2.Y
Performance Test Results — Raw Data

DROP NU	HIT NU	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
2	1	NO TES	NO TES	RR	2,4	Flat	233.01	3.60	2.30	6.88	132.54
2	2	NO TES	NO TES	RR	2,4	Flat	238.31	3.10	2.10	6.05	102.49
3	1	NO TES	NO TES	RG	2,4	Hemi	157.83	0.90	0.00	6.03	101.81
3	2	NO TES	NO TES	RG	2,4	Hemi	185.17	1.10	0.00	5.26	77.47
4	1	NO TES	NO TES	FR	2,4	Hemi	254.08	1.30	0.80	6.03	101.81
4	2	NO TES	NO TES	FR	2,4	Hemi	436.16	1.20	1.00	5.24	76.88
1	1	NO TES	NO TES	LF	2,4	Flat	215.95	3.20	1.60	6.92	134.08
1	2	NO TES	NO TES	LF	2,4	Flat	236.48	2.70	1.80	6.03	101.81
2	1	NO TES	NO TES	RR	2,4	Flat	216.41	3.60	1.20	6.92	134.08
2	2	NO TES	NO TES	RR	2,4	Flat	218.41	3.10	1.30	6.03	101.81
3	1	NO TES	NO TES	RG	2,4	Hemi	220.34	1.30	0.60	6.02	101.47
3	2	NO TES	NO TES	RG	2,4	Hemi	418.10	1.30	1.00	5.26	77.47
4	1	NO TES	NO TES	FR	2,4	Hemi	387.28	1.30	1.00	6.05	102.49
4	2	NO TES	NO TES	FR	2,4	Hemi	499.07	1.20	1.00	5.25	77.18
1	1	NO TES	NO TES	LF	2,4	Flat	266.18	3.50	2.70	6.92	111.17
1	2	NO TES	NO TES	LF	2,4	Flat	268.75	3.20	2.40	6.06	85.25
2	1	NO TES	NO TES	RR	2,4	Flat	276.97	3.70	3.20	6.96	112.46
2	2	NO TES	NO TES	RR	2,4	Flat	288.76	3.30	2.90	6.08	85.82
3	1	NO TES	NO TES	RG	2,4	Hemi	129.04	0.00	0.00	6.03	84.41
3	2	NO TES	NO TES	RG	2,4	Hemi	137.83	0.00	0.00	5.26	64.23
4	1	NO TES	NO TES	FR	2,4	Hemi	131.97	0.00	0.00	6.09	86.10
4	2	NO TES	NO TES	FR	2,4	Hemi	139.76	0.00	0.00	5.23	63.50
1	1	NO TES	NO TES	LF	2,4	Flat	275.46	3.40	2.40	6.98	113.10
1	2	NO TES	NO TES	LF	2,4	Flat	264.30	3.10	2.30	6.08	85.82
2	1	NO TES	NO TES	RR	2,4	Flat	263.82	3.70	3.10	6.98	113.10
2	2	NO TES	NO TES	RR	2,4	Flat	255.05	3.40	2.70	6.11	86.67
3	1	NO TES	NO TES	RG	2,4	Hemi	131.46	0.00	0.00	6.08	85.82
3	2	NO TES	NO TES	RG	2,4	Hemi	144.21	0.00	0.00	5.27	64.47
4	1	NO TES	NO TES	FR	2,4	Hemi	120.29	0.00	0.00	6.05	84.97
4	2	NO TES	NO TES	FR	2,4	Hemi	123.66	0.00	0.00	5.26	64.23
1	1	NO TES	NO TES	LF	2,4	Flat	269.69	3.60	2.60	6.94	111.81
1	2	NO TES	NO TES	LF	2,4	Flat	283.83	3.20	2.40	6.03	84.41
2	1	NO TES	NO TES	RR	2,4	Flat	293.10	3.80	3.10	6.98	113.10
2	2	NO TES	NO TES	RR	2,4	Flat	277.94	3.30	2.80	6.08	85.82
3	1	NO TES	NO TES	RG	2,4	Hemi	137.91	0.00	0.00	6.03	84.41
3	2	NO TES	NO TES	RG	2,4	Hemi	126.15	0.00	0.00	5.27	64.47
4	1	NO TES	NO TES	FR	2,4	Hemi	131.00	0.00	0.00	6.03	84.41
4	2	NO TES	NO TES	FR	2,4	Hemi	110.51	0.00	0.00	5.26	64.23
1	1	NO TES	NO TES	LF	2,4	Flat	257.00	3.70	2.60	6.94	111.81
1	2	NO TES	NO TES	LF	2,4	Flat	276.00	3.30	2.30	6.05	84.97
2	1	NO TES	NO TES	RR	2,4	Flat	293.60	3.60	3.30	6.96	112.46
2	2	NO TES	NO TES	RR	2,4	Flat	254.00	3.50	2.90	6.05	84.97
3	1	NO TES	NO TES	RG	2,4	Hemi	126.56	0.00	0.00	6.06	85.25
3	2	NO TES	NO TES	RG	2,4	Hemi	134.93	0.00	0.00	5.27	64.47
4	1	NO TES	NO TES	FR	2,4	Hemi	129.99	0.00	0.00	6.05	84.97
4	2	NO TES	NO TES	FR	2,4	Hemi	135.83	0.00	0.00	5.26	64.23
1	1	NO TES	NO TES	LF	2,4	Flat	274.87	3.80	2.70	6.86	96.47
1	2	NO TES	NO TES	LF	2,4	Flat	280.36	3.50	2.70	6.05	75.04
2	1	NO TES	NO TES	RR	2,4	Flat	303.80	3.90	3.50	6.96	99.31
2	2	NO TES	NO TES	RR	2,4	Flat	315.99	3.60	2.60	6.06	75.28
3	1	NO TES	NO TES	RG	2,4	Hemi	150.02	0.10	0.00	6.00	73.80
3	2	NO TES	NO TES	RG	2,4	Hemi	126.09	0.00	0.00	5.27	56.93
4	1	NO TES	NO TES	FR	2,4	Hemi	124.62	0.00	0.00	6.02	74.29
4	2	NO TES	NO TES	FR	2,4	Hemi	119.69	0.00	0.00	5.27	56.93
1	1	NO TES	NO TES	LF	2,4	Flat	255.96	4.00	2.90	6.90	97.60
1	2	NO TES	NO TES	LF	2,4	Flat	238.39	3.40	2.30	6.06	75.28
2	1	NO TES	NO TES	RR	2,4	Flat	279.92	4.20	3.10	6.96	99.31
2	2	NO TES	NO TES	RR	2,4	Flat	279.43	3.80	2.90	6.06	75.28

Table 2.Y
Performance Test Results — Raw Data

HELMET NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
HFB006	ISO Headform R&D	5/7/97	Wet	HFBE-B	JULY 19	1100	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB006	ISO Headform R&D	5/7/97	Wet	HFBE-B	JULY 19	1100	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB006	ISO Headform R&D	5/7/97	Wet	HFBE-B	JULY 19	1100	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB006	ISO Headform R&D	5/7/97	Wet	HFBE-B	JULY 19	1100	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB007	ISO Headform R&D	5/7/97	Cold	HFBE-C	JULY 19	1109	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB007	ISO Headform R&D	5/7/97	Cold	HFBE-C	JULY 19	1109	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB007	ISO Headform R&D	5/7/97	Cold	HFBE-C	JULY 19	1109	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB007	ISO Headform R&D	5/7/97	Cold	HFBE-C	JULY 19	1109	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB007	ISO Headform R&D	5/7/97	Cold	HFBE-C	JULY 19	1109	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB007	ISO Headform R&D	5/7/97	Cold	HFBE-C	JULY 19	1109	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB007	ISO Headform R&D	5/7/97	Cold	HFBE-C	JULY 19	1109	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB007	ISO Headform R&D	5/7/97	Cold	HFBE-C	JULY 19	1109	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB008	ISO Headform R&D	5/7/97	Hot	HFBE-D	JULY 19	1108	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB008	ISO Headform R&D	5/7/97	Hot	HFBE-D	JULY 19	1108	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB008	ISO Headform R&D	5/7/97	Hot	HFBE-D	JULY 19	1108	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB008	ISO Headform R&D	5/7/97	Hot	HFBE-D	JULY 19	1108	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB008	ISO Headform R&D	5/7/97	Hot	HFBE-D	JULY 19	1108	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB008	ISO Headform R&D	5/7/97	Hot	HFBE-D	JULY 19	1108	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB008	ISO Headform R&D	5/7/97	Hot	HFBE-D	JULY 19	1108	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB008	ISO Headform R&D	5/7/97	Hot	HFBE-D	JULY 19	1108	XSmall	ISO	Size E	4.10	NO TES	NO TES
HFB009	ISO Headform R&D	5/20/97	Ambient	HFBM-A	9-95	1324	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB009	ISO Headform R&D	5/20/97	Ambient	HFBM-A	9-95	1324	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB009	ISO Headform R&D	5/20/97	Ambient	HFBM-A	9-95	1324	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB009	ISO Headform R&D	5/20/97	Ambient	HFBM-A	9-95	1324	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB009	ISO Headform R&D	5/20/97	Ambient	HFBM-A	9-95	1324	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB009	ISO Headform R&D	5/20/97	Ambient	HFBM-A	9-95	1324	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB009	ISO Headform R&D	5/20/97	Ambient	HFBM-A	9-95	1324	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB009	ISO Headform R&D	5/20/97	Ambient	HFBM-A	9-95	1324	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB010	ISO Headform R&D	5/20/97	Wet	HFBM-B	9-95	1324	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB010	ISO Headform R&D	5/20/97	Wet	HFBM-B	9-95	1324	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB010	ISO Headform R&D	5/20/97	Wet	HFBM-B	9-95	1324	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB010	ISO Headform R&D	5/20/97	Wet	HFBM-B	9-95	1324	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB010	ISO Headform R&D	5/20/97	Wet	HFBM-B	9-95	1324	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB010	ISO Headform R&D	5/20/97	Wet	HFBM-B	9-95	1324	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB010	ISO Headform R&D	5/20/97	Wet	HFBM-B	9-95	1324	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB010	ISO Headform R&D	5/20/97	Wet	HFBM-B	9-95	1324	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB011	ISO Headform R&D	5/20/97	Cold	HFBM-C	9-95	1300	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB011	ISO Headform R&D	5/20/97	Cold	HFBM-C	9-95	1300	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB011	ISO Headform R&D	5/20/97	Cold	HFBM-C	9-95	1300	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB011	ISO Headform R&D	5/20/97	Cold	HFBM-C	9-95	1300	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB011	ISO Headform R&D	5/20/97	Cold	HFBM-C	9-95	1300	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB011	ISO Headform R&D	5/20/97	Cold	HFBM-C	9-95	1300	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB011	ISO Headform R&D	5/20/97	Cold	HFBM-C	9-95	1300	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB011	ISO Headform R&D	5/20/97	Cold	HFBM-C	9-95	1300	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB012	ISO Headform R&D	5/20/97	Hot	HFBM-D	9-95	1297	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB012	ISO Headform R&D	5/20/97	Hot	HFBM-D	9-95	1297	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB012	ISO Headform R&D	5/20/97	Hot	HFBM-D	9-95	1297	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB012	ISO Headform R&D	5/20/97	Hot	HFBM-D	9-95	1297	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB012	ISO Headform R&D	5/20/97	Hot	HFBM-D	9-95	1297	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB012	ISO Headform R&D	5/20/97	Hot	HFBM-D	9-95	1297	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB012	ISO Headform R&D	5/20/97	Hot	HFBM-D	9-95	1297	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFB012	ISO Headform R&D	5/20/97	Hot	HFBM-D	9-95	1297	XLarge	ISO	Size M	5.60	NO TES	NO TES
HFC001	ISO Headform R&D	5/5/97	Ambient	HFCJ-A	FEB 199	1440	Medium	ISO	Size J	4.64	NO TES	NO TES
HFC001	ISO Headform R&D	5/5/97	Ambient	HFCJ-A	FEB 199	1440	Medium	ISO	Size J	4.64	NO TES	NO TES
HFC001	ISO Headform R&D	5/5/97	Ambient	HFCJ-A	FEB 199	1440	Medium	ISO	Size J	4.64	NO TES	NO TES
HFC001	ISO Headform R&D	5/5/97	Ambient	HFCJ-A	FEB 199	1440	Medium	ISO	Size J	4.64	NO TES	NO TES
HFC001	ISO Headform R&D	5/5/97	Ambient	HFCJ-A	FEB 199	1440	Medium	ISO	Size J	4.64	NO TES	NO TES
HFC001	ISO Headform R&D	5/5/97	Ambient	HFCJ-A	FEB 199	1440	Medium	ISO	Size J	4.64	NO TES	NO TES

Table 2.Y
Performance Test Results — Raw Data

DROP NUM	HIT NUM	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OUT OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
3	1	NO TEST	NO TEST	RG	2,4	Hemi	150.99	0.10	0.00	6.08	75.78
3	2	NO TEST	NO TEST	RG	2,4	Hemi	128.48	0.00	0.00	5.27	56.93
4	1	NO TEST	NO TEST	FR	2,4	Hemi	111.94	0.00	0.00	6.08	75.78
4	2	NO TEST	NO TEST	FR	2,4	Hemi	114.38	0.00	0.00	5.26	56.72
1	1	NO TEST	NO TEST	LF	2,4	Flat	296.51	3.90	2.90	6.92	98.17
1	2	NO TEST	NO TEST	LF	2,4	Flat	271.63	3.50	2.70	6.06	75.28
2	1	NO TEST	NO TEST	RR	2,4	Flat	320.45	3.90	3.50	6.90	97.60
2	2	NO TEST	NO TEST	RR	2,4	Flat	327.27	3.60	3.00	6.06	75.28
3	1	NO TEST	NO TEST	RG	2,4	Hemi	163.21	0.70	0.00	6.05	75.04
3	2	NO TEST	NO TEST	RG	2,4	Hemi	135.40	0.00	0.00	5.26	56.72
4	1	NO TEST	NO TEST	FR	2,4	Hemi	130.48	0.00	0.00	6.05	75.04
4	2	NO TEST	NO TEST	FR	2,4	Hemi	125.12	0.00	0.00	5.25	56.50
1	1	NO TEST	NO TEST	LF	2,4	Flat	271.60	3.90	3.10	6.90	97.60
1	2	NO TEST	NO TEST	LF	2,4	Flat	254.02	3.60	2.70	6.05	75.04
2	1	NO TEST	NO TEST	RR	2,4	Flat	291.14	4.00	3.50	6.90	97.60
2	2	NO TEST	NO TEST	RR	2,4	Flat	300.44	3.60	3.00	6.06	75.28
3	1	NO TEST	NO TEST	RG	2,4	Hemi	141.80	0.00	0.00	6.00	73.80
3	2	NO TEST	NO TEST	RG	2,4	Hemi	130.92	0.00	0.00	5.27	56.93
4	1	NO TEST	NO TEST	FR	2,4	Hemi	112.45	0.00	0.00	6.05	75.04
4	2	NO TEST	NO TEST	FR	2,4	Hemi	114.87	0.00	0.00	5.26	56.72
1	1	NO TEST	NO TEST	LF	2,4	Flat	222.27	3.50	2.20	6.92	134.08
1	2	NO TEST	NO TEST	LF	2,4	Flat	233.06	3.00	2.00	6.06	102.83
2	1	NO TEST	NO TEST	RR	2,4	Flat	193.97	3.90	0.00	6.98	136.42
2	2	NO TEST	NO TEST	RR	2,4	Flat	189.61	3.50	0.00	6.06	102.83
3	1	NO TEST	NO TEST	RG	2,4	Hemi	127.99	0.00	0.00	6.05	102.49
3	2	NO TEST	NO TEST	RG	2,4	Hemi	144.67	0.00	0.00	5.28	78.06
4	1	NO TEST	NO TEST	FR	2,4	Hemi	113.87	0.00	0.00	6.06	102.83
4	2	NO TEST	NO TEST	FR	2,4	Hemi	170.53	1.00	0.00	5.25	77.18
1	1	NO TEST	NO TEST	LF	2,4	Flat	221.30	3.40	2.00	6.96	135.64
1	2	NO TEST	NO TEST	LF	2,4	Flat	206.66	2.90	1.40	6.08	103.51
2	1	NO TEST	NO TEST	RR	2,4	Flat	191.48	4.00	0.00	6.98	136.42
2	2	NO TEST	NO TEST	RR	2,4	Flat	191.00	3.60	0.00	6.05	102.49
3	1	NO TEST	NO TEST	RG	2,4	Hemi	130.00	0.00	0.00	6.03	101.81
3	2	NO TEST	NO TEST	RG	2,4	Hemi	145.59	0.00	0.00	5.25	77.18
4	1	NO TEST	NO TEST	FR	2,4	Hemi	117.25	0.00	0.00	6.03	101.81
4	2	NO TEST	NO TEST	FR	2,4	Hemi	132.44	0.00	0.00	5.27	77.76
1	1	NO TEST	NO TEST	LF	2,4	Flat	216.94	3.50	2.00	6.94	134.86
1	2	NO TEST	NO TEST	LF	2,4	Flat	224.24	3.00	1.90	6.06	102.83
2	1	NO TEST	NO TEST	RR	2,4	Flat	195.41	4.00	0.00	6.90	133.31
2	2	NO TEST	NO TEST	RR	2,4	Flat	196.92	3.50	0.00	6.05	102.49
3	1	NO TEST	NO TEST	RG	2,4	Hemi	132.01	0.00	0.00	6.08	103.51
3	2	NO TEST	NO TEST	RG	2,4	Hemi	142.20	0.00	0.00	5.27	77.76
4	1	NO TEST	NO TEST	FR	2,4	Hemi	115.82	0.00	0.00	6.06	102.83
4	2	NO TEST	NO TEST	FR	2,4	Hemi	132.98	0.00	0.00	5.25	77.18
1	1	NO TEST	NO TEST	LF	2,4	Flat	217.82	3.40	2.10	6.90	133.31
1	2	NO TEST	NO TEST	LF	2,4	Flat	218.87	3.00	1.80	6.05	102.49
2	1	NO TEST	NO TEST	RR	2,4	Flat	186.11	3.90	0.00	6.94	134.86
2	2	NO TEST	NO TEST	RR	2,4	Flat	186.67	3.30	0.00	6.08	103.51
3	1	NO TEST	NO TEST	RG	2,4	Hemi	124.22	0.00	0.00	6.06	102.83
3	2	NO TEST	NO TEST	RG	2,4	Hemi	143.15	0.00	0.00	5.27	77.76
4	1	NO TEST	NO TEST	FR	2,4	Hemi	115.81	0.00	0.00	6.06	102.83
4	2	NO TEST	NO TEST	FR	2,4	Hemi	146.56	0.00	0.00	5.25	77.18
1	1	NO TEST	NO TEST	LF	2,4	Flat	232.47	4.20	2.40	6.94	111.81
1	2	NO TEST	NO TEST	LF	2,4	Flat	226.26	2.90	1.60	6.05	84.97
2	1	NO TEST	NO TEST	RR	2,4	Flat	246.24	4.00	3.00	6.81	107.66
2	2	NO TEST	NO TEST	RR	2,4	Flat	242.31	3.80	2.00	6.06	85.25
3	1	NO TEST	NO TEST	RG	2,4	Hemi	144.23	0.00	0.00	5.95	82.19
3	2	NO TEST	NO TEST	RG	2,4	Hemi	133.94	0.00	0.00	5.18	62.29

Table 2.Y
Performance Test Results — Raw Data

HELMET NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGH	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
HFC001	ISO Headform R&D	5/5/97	Ambient	HFCJ-A	FEB 199	1440	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC001	ISO Headform R&D	5/5/97	Ambient	HFCJ-A	FEB 199	1440	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC002	ISO Headform R&D	5/5/97	Wet	HFCJ-B	FEB 199	1454	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC002	ISO Headform R&D	5/5/97	Wet	HFCJ-B	FEB 199	1454	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC002	ISO Headform R&D	5/5/97	Wet	HFCJ-B	FEB 199	1454	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC002	ISO Headform R&D	5/5/97	Wet	HFCJ-B	FEB 199	1454	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC002	ISO Headform R&D	5/5/97	Wet	HFCJ-B	FEB 199	1454	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC002	ISO Headform R&D	5/5/97	Wet	HFCJ-B	FEB 199	1454	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC002	ISO Headform R&D	5/5/97	Wet	HFCJ-B	FEB 199	1454	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC002	ISO Headform R&D	5/5/97	Wet	HFCJ-B	FEB 199	1454	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC003	ISO Headform R&D	5/5/97	Cold	HFCJ-C	NOV 199	1425	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC003	ISO Headform R&D	5/5/97	Cold	HFCJ-C	NOV 199	1425	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC003	ISO Headform R&D	5/5/97	Cold	HFCJ-C	NOV 199	1425	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC003	ISO Headform R&D	5/5/97	Cold	HFCJ-C	NOV 199	1425	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC003	ISO Headform R&D	5/5/97	Cold	HFCJ-C	NOV 199	1425	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC003	ISO Headform R&D	5/5/97	Cold	HFCJ-C	NOV 199	1425	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC003	ISO Headform R&D	5/5/97	Cold	HFCJ-C	NOV 199	1425	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC003	ISO Headform R&D	5/5/97	Cold	HFCJ-C	NOV 199	1425	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC004	ISO Headform R&D	5/5/97	Hot	HFCJ-D	NOV 199	1425	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC004	ISO Headform R&D	5/5/97	Hot	HFCJ-D	NOV 199	1425	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC004	ISO Headform R&D	5/5/97	Hot	HFCJ-D	NOV 199	1425	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC004	ISO Headform R&D	5/5/97	Hot	HFCJ-D	NOV 199	1425	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC004	ISO Headform R&D	5/5/97	Hot	HFCJ-D	NOV 199	1425	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC004	ISO Headform R&D	5/5/97	Hot	HFCJ-D	NOV 199	1425	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC004	ISO Headform R&D	5/5/97	Hot	HFCJ-D	NOV 199	1425	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC004	ISO Headform R&D	5/5/97	Hot	HFCJ-D	NOV 199	1425	Medium	ISO	Size J	4.64	NO TEST	NO TEST
HFC005	ISO Headform R&D	5/7/97	Ambient	HFCE-A	DEC 199	1440	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC005	ISO Headform R&D	5/7/97	Ambient	HFCE-A	DEC 199	1440	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC005	ISO Headform R&D	5/7/97	Ambient	HFCE-A	DEC 199	1440	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC005	ISO Headform R&D	5/7/97	Ambient	HFCE-A	DEC 199	1440	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC005	ISO Headform R&D	5/7/97	Ambient	HFCE-A	DEC 199	1440	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC005	ISO Headform R&D	5/7/97	Ambient	HFCE-A	DEC 199	1440	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC005	ISO Headform R&D	5/7/97	Ambient	HFCE-A	DEC 199	1440	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC005	ISO Headform R&D	5/7/97	Ambient	HFCE-A	DEC 199	1440	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC006	ISO Headform R&D	5/7/97	Wet	HFCE-B	DEC 199	1453	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC006	ISO Headform R&D	5/7/97	Wet	HFCE-B	DEC 199	1453	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC006	ISO Headform R&D	5/7/97	Wet	HFCE-B	DEC 199	1453	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC006	ISO Headform R&D	5/7/97	Wet	HFCE-B	DEC 199	1453	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC006	ISO Headform R&D	5/7/97	Wet	HFCE-B	DEC 199	1453	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC006	ISO Headform R&D	5/7/97	Wet	HFCE-B	DEC 199	1453	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC006	ISO Headform R&D	5/7/97	Wet	HFCE-B	DEC 199	1453	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC006	ISO Headform R&D	5/7/97	Wet	HFCE-B	DEC 199	1453	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC007	ISO Headform R&D	5/7/97	Cold	HFCE-C	DEC 199	1458	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC007	ISO Headform R&D	5/7/97	Cold	HFCE-C	DEC 199	1458	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC007	ISO Headform R&D	5/7/97	Cold	HFCE-C	DEC 199	1458	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC007	ISO Headform R&D	5/7/97	Cold	HFCE-C	DEC 199	1458	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC007	ISO Headform R&D	5/7/97	Cold	HFCE-C	DEC 199	1458	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC007	ISO Headform R&D	5/7/97	Cold	HFCE-C	DEC 199	1458	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC007	ISO Headform R&D	5/7/97	Cold	HFCE-C	DEC 199	1458	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC007	ISO Headform R&D	5/7/97	Cold	HFCE-C	DEC 199	1458	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC008	ISO Headform R&D	5/7/97	Hot	HFCE-D	DEC 199	1460	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC008	ISO Headform R&D	5/7/97	Hot	HFCE-D	DEC 199	1460	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC008	ISO Headform R&D	5/7/97	Hot	HFCE-D	DEC 199	1460	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC008	ISO Headform R&D	5/7/97	Hot	HFCE-D	DEC 199	1460	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC008	ISO Headform R&D	5/7/97	Hot	HFCE-D	DEC 199	1460	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC008	ISO Headform R&D	5/7/97	Hot	HFCE-D	DEC 199	1460	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC008	ISO Headform R&D	5/7/97	Hot	HFCE-D	DEC 199	1460	XSmall	ISO	Size E	4.10	NO TEST	NO TEST
HFC008	ISO Headform R&D	5/7/97	Hot	HFCE-D	DEC 199	1460	XSmall	ISO	Size E	4.10	NO TEST	NO TEST

Table 2.Y
Performance Test Results — Raw Data

DROP NUM	HIT NUM	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
4	1	NO TEST	NO TEST	FR	2,4	Hemi	194.51	2.90	0.00	6.06	85.25
4	2	NO TEST	NO TEST	FR	2,4	Hemi	168.07	1.60	0.00	5.26	64.23
1	1	NO TEST	NO TEST	LF	2,4	Flat	223.26	4.20	2.10	6.98	113.10
1	2	NO TEST	NO TEST	LF	2,4	Flat	206.17	3.50	0.40	6.05	84.97
2	1	NO TEST	NO TEST	RR	2,4	Flat	256.51	4.00	3.10	6.98	113.10
2	2	NO TEST	NO TEST	RR	2,4	Flat	221.40	3.00	1.50	6.06	85.25
3	1	NO TEST	NO TEST	RG	2,4	Hemi	138.37	0.00	0.00	5.99	83.30
3	2	NO TEST	NO TEST	RG	2,4	Hemi	133.45	0.00	0.00	5.25	63.99
4	1	NO TEST	NO TEST	FR	2,4	Hemi	172.04	2.30	0.00	5.96	82.46
4	2	NO TEST	NO TEST	FR	2,4	Hemi	165.61	1.50	0.00	5.22	63.26
1	1	NO TEST	NO TEST	LF	2,4	Flat	239.36	4.10	2.60	6.90	110.53
1	2	NO TEST	NO TEST	LF	2,4	Flat	246.21	3.70	2.20	6.05	84.97
2	1	NO TEST	NO TEST	RR	2,4	Flat	243.77	4.00	2.60	6.94	111.81
2	2	NO TEST	NO TEST	RR	2,4	Flat	249.63	3.60	2.70	6.03	84.41
3	1	NO TEST	NO TEST	RG	2,4	Hemi	155.90	0.60	0.00	6.00	83.57
3	2	NO TEST	NO TEST	RG	2,4	Hemi	150.97	0.10	0.00	5.18	62.29
4	1	NO TEST	NO TEST	FR	2,4	Hemi	198.84	2.60	0.00	6.05	84.97
4	2	NO TEST	NO TEST	FR	2,4	Hemi	196.90	2.30	0.00	5.27	64.47
1	1	NO TEST	NO TEST	LF	2,4	Flat	211.57	3.90	1.40	6.96	112.46
1	2	NO TEST	NO TEST	LF	2,4	Flat	218.90	2.70	1.30	6.05	84.97
2	1	NO TEST	NO TEST	RR	2,4	Flat	219.39	4.10	1.70	6.88	109.89
2	2	NO TEST	NO TEST	RR	2,4	Flat	213.99	3.00	1.30	6.05	84.97
3	1	NO TEST	NO TEST	RG	2,4	Hemi	151.52	0.30	0.00	6.00	83.57
3	2	NO TEST	NO TEST	RG	2,4	Hemi	143.17	0.00	0.00	5.19	62.53
4	1	NO TEST	NO TEST	FR	2,4	Hemi	176.86	2.40	0.00	6.05	84.97
4	2	NO TEST	NO TEST	FR	2,4	Hemi	167.12	1.20	0.00	5.27	64.47
1	1	NO TEST	NO TEST	LF	2,4	Flat	235.95	4.00	2.30	6.90	97.60
1	2	NO TEST	NO TEST	LF	2,4	Flat	223.79	3.10	1.80	6.05	75.04
2	1	NO TEST	NO TEST	RR	2,4	Flat	235.92	3.90	2.40	7.00	100.45
2	2	NO TEST	NO TEST	RR	2,4	Flat	226.68	3.10	1.00	6.03	74.54
3	1	NO TEST	NO TEST	RG	2,4	Hemi	145.63	0.00	0.00	6.05	75.04
3	2	NO TEST	NO TEST	RG	2,4	Hemi	130.51	0.00	0.00	5.28	57.15
4	1	NO TEST	NO TEST	FR	2,4	Hemi	185.76	2.60	0.00	6.02	74.29
4	2	NO TEST	NO TEST	FR	2,4	Hemi	184.15	2.10	0.00	5.25	56.50
1	1	NO TEST	NO TEST	LF	2,4	Flat	220.33	3.90	2.20	6.96	99.31
1	2	NO TEST	NO TEST	LF	2,4	Flat	201.25	3.30	0.10	6.08	75.78
2	1	NO TEST	NO TEST	RR	2,4	Flat	241.30	4.10	3.40	6.98	99.88
2	2	NO TEST	NO TEST	RR	2,4	Flat	222.73	3.70	1.80	6.08	75.78
3	1	NO TEST	NO TEST	RG	2,4	Hemi	148.58	0.00	0.00	6.06	75.28
3	2	NO TEST	NO TEST	RG	2,4	Hemi	145.14	0.00	0.00	5.27	56.93
4	1	NO TEST	NO TEST	FR	2,4	Hemi	185.17	2.50	0.00	6.02	74.29
4	2	NO TEST	NO TEST	FR	2,4	Hemi	185.67	2.10	0.00	5.24	56.29
1	1	NO TEST	NO TEST	LF	2,4	Flat	235.96	3.90	2.40	6.92	98.17
1	2	NO TEST	NO TEST	LF	2,4	Flat	248.66	3.40	2.20	6.05	75.04
2	1	NO TEST	NO TEST	RR	2,4	Flat	270.61	3.90	3.30	6.96	99.31
2	2	NO TEST	NO TEST	RR	2,4	Flat	251.11	3.70	2.40	6.06	75.28
3	1	NO TEST	NO TEST	RG	2,4	Hemi	163.71	1.10	0.00	6.06	75.28
3	2	NO TEST	NO TEST	RG	2,4	Hemi	145.15	0.00	0.00	5.27	56.93
4	1	NO TEST	NO TEST	FR	2,4	Hemi	184.23	2.80	0.00	6.02	74.29
4	2	NO TEST	NO TEST	FR	2,4	Hemi	187.10	2.50	0.00	5.28	57.15
1	1	NO TEST	NO TEST	LF	2,4	Flat	230.60	4.00	2.60	6.92	98.17
1	2	NO TEST	NO TEST	LF	2,4	Flat	222.73	3.30	1.90	6.03	74.54
2	1	NO TEST	NO TEST	RR	2,4	Flat	248.66	4.20	2.70	6.90	97.60
2	2	NO TEST	NO TEST	RR	2,4	Flat	227.60	3.50	1.80	6.05	75.04
3	1	NO TEST	NO TEST	RG	2,4	Hemi	170.50	1.70	0.00	6.05	75.04
3	2	NO TEST	NO TEST	RG	2,4	Hemi	148.58	0.00	0.00	5.26	56.72
4	1	NO TEST	NO TEST	FR	2,4	Hemi	177.83	2.40	0.00	6.03	74.54
4	2	NO TEST	NO TEST	FR	2,4	Hemi	139.75	0.00	0.00	5.26	56.72

Table 2.Y
Performance Test Results — Raw Data

HELME NUMBER	TEST TYPE	TEST DAT	TEST COND	SAMPLE NUMBER	MAN DAT	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
HFC009	ISO Headform R&D	5/20/97	Ambient	HFCM-A	NOV 199	1423	Large	ISO	Size M	5.60	NO TES	NO TES
HFC009	ISO Headform R&D	5/20/97	Ambient	HFCM-A	NOV 199	1423	Large	ISO	Size M	5.60	NO TES	NO TES
HFC009	ISO Headform R&D	5/20/97	Ambient	HFCM-A	NOV 199	1423	Large	ISO	Size M	5.60	NO TES	NO TES
HFC009	ISO Headform R&D	5/20/97	Ambient	HFCM-A	NOV 199	1423	Large	ISO	Size M	5.60	NO TES	NO TES
HFC009	ISO Headform R&D	5/20/97	Ambient	HFCM-A	NOV 199	1423	Large	ISO	Size M	5.60	NO TES	NO TES
HFC009	ISO Headform R&D	5/20/97	Ambient	HFCM-A	NOV 199	1423	Large	ISO	Size M	5.60	NO TES	NO TES
HFC009	ISO Headform R&D	5/20/97	Ambient	HFCM-A	NOV 199	1423	Large	ISO	Size M	5.60	NO TES	NO TES
HFC009	ISO Headform R&D	5/20/97	Ambient	HFCM-A	NOV 199	1423	Large	ISO	Size M	5.60	NO TES	NO TES
HFC010	ISO Headform R&D	5/20/97	Wet	HFCM-B	NOV 199	1405	Large	ISO	Size M	5.60	NO TES	NO TES
HFC010	ISO Headform R&D	5/20/97	Wet	HFCM-B	NOV 199	1405	Large	ISO	Size M	5.60	NO TES	NO TES
HFC010	ISO Headform R&D	5/20/97	Wet	HFCM-B	NOV 199	1405	Large	ISO	Size M	5.60	NO TES	NO TES
HFC010	ISO Headform R&D	5/20/97	Wet	HFCM-B	NOV 199	1405	Large	ISO	Size M	5.60	NO TES	NO TES
HFC010	ISO Headform R&D	5/20/97	Wet	HFCM-B	NOV 199	1405	Large	ISO	Size M	5.60	NO TES	NO TES
HFC010	ISO Headform R&D	5/20/97	Wet	HFCM-B	NOV 199	1405	Large	ISO	Size M	5.60	NO TES	NO TES
HFC010	ISO Headform R&D	5/20/97	Wet	HFCM-B	NOV 199	1405	Large	ISO	Size M	5.60	NO TES	NO TES
HFC010	ISO Headform R&D	5/20/97	Wet	HFCM-B	NOV 199	1405	Large	ISO	Size M	5.60	NO TES	NO TES
HFC011	ISO Headform R&D	5/20/97	Cold	HFCM-C	NOV 199	1417	Large	ISO	Size M	5.60	NO TES	NO TES
HFC011	ISO Headform R&D	5/20/97	Cold	HFCM-C	NOV 199	1417	Large	ISO	Size M	5.60	NO TES	NO TES
HFC011	ISO Headform R&D	5/20/97	Cold	HFCM-C	NOV 199	1417	Large	ISO	Size M	5.60	NO TES	NO TES
HFC011	ISO Headform R&D	5/20/97	Cold	HFCM-C	NOV 199	1417	Large	ISO	Size M	5.60	NO TES	NO TES
HFC011	ISO Headform R&D	5/20/97	Cold	HFCM-C	NOV 199	1417	Large	ISO	Size M	5.60	NO TES	NO TES
HFC011	ISO Headform R&D	5/20/97	Cold	HFCM-C	NOV 199	1417	Large	ISO	Size M	5.60	NO TES	NO TES
HFC011	ISO Headform R&D	5/20/97	Cold	HFCM-C	NOV 199	1417	Large	ISO	Size M	5.60	NO TES	NO TES
HFC011	ISO Headform R&D	5/20/97	Cold	HFCM-C	NOV 199	1417	Large	ISO	Size M	5.60	NO TES	NO TES
HFC012	ISO Headform R&D	5/20/97	Hot	HFCM-D	NOV 199	1411	Large	ISO	Size M	5.60	NO TES	NO TES
HFC012	ISO Headform R&D	5/20/97	Hot	HFCM-D	NOV 199	1411	Large	ISO	Size M	5.60	NO TES	NO TES
HFC012	ISO Headform R&D	5/20/97	Hot	HFCM-D	NOV 199	1411	Large	ISO	Size M	5.60	NO TES	NO TES
HFC012	ISO Headform R&D	5/20/97	Hot	HFCM-D	NOV 199	1411	Large	ISO	Size M	5.60	NO TES	NO TES
HFC012	ISO Headform R&D	5/20/97	Hot	HFCM-D	NOV 199	1411	Large	ISO	Size M	5.60	NO TES	NO TES
HFC012	ISO Headform R&D	5/20/97	Hot	HFCM-D	NOV 199	1411	Large	ISO	Size M	5.60	NO TES	NO TES
HFC012	ISO Headform R&D	5/20/97	Hot	HFCM-D	NOV 199	1411	Large	ISO	Size M	5.60	NO TES	NO TES
HFC012	ISO Headform R&D	5/20/97	Hot	HFCM-D	NOV 199	1411	Large	ISO	Size M	5.60	NO TES	NO TES
PNA001	R&D-PENETRATIO	5/14/97	Ambient	PNAM-A	6/96	839	Medium	DO	Size C	5.00	NO TES	NO TES
PNA001	R&D-PENETRATIO	5/14/97	Ambient	PNAM-A	6/96	839	Medium	DO	Size C	5.00	NO TES	NO TES
PNA001	R&D-PENETRATIO	5/14/97	Ambient	PNAM-A	6/96	839	Medium	DO	Size C	5.00	NO TES	NO TES
PNA001	R&D-PENETRATIO	5/14/97	Ambient	PNAM-A	6/96	839	Medium	DO	Size C	5.00	NO TES	NO TES
PNA002	R&D-PENETRATIO	5/14/97	Cold	PNAM-C	6/96	823	Medium	DO	Size C	5.00	NO TES	NO TES
PNA002	R&D-PENETRATIO	5/14/97	Cold	PNAM-C	6/96	823	Medium	DO	Size C	5.00	NO TES	NO TES
PNA002	R&D-PENETRATIO	5/14/97	Cold	PNAM-C	6/96	823	Medium	DO	Size C	5.00	NO TES	NO TES
PNA002	R&D-PENETRATIO	5/14/97	Cold	PNAM-C	6/96	823	Medium	DO	Size C	5.00	NO TES	NO TES
PNA003	R&D-PENETRATIO	5/14/97	Hot	PNAM-D	6/96	818	Medium	DO	Size C	5.00	NO TES	NO TES
PNA003	R&D-PENETRATIO	5/14/97	Hot	PNAM-D	6/96	818	Medium	DO	Size C	5.00	NO TES	NO TES
PNA003	R&D-PENETRATIO	5/14/97	Hot	PNAM-D	6/96	818	Medium	DO	Size C	5.00	NO TES	NO TES
PNA003	R&D-PENETRATIO	5/14/97	Hot	PNAM-D	6/96	818	Medium	DO	Size C	5.00	NO TES	NO TES
PNA004	R&D-PENETRATIO	5/15/97	Ambient	PNAS-A	10/94	829	XSmall	DO	Size A	3.50	NO TES	NO TES
PNA004	R&D-PENETRATIO	5/15/97	Ambient	PNAS-A	10/94	829	XSmall	DO	Size A	3.50	NO TES	NO TES
PNA004	R&D-PENETRATIO	5/15/97	Ambient	PNAS-A	10/94	829	XSmall	DO	Size A	3.50	NO TES	NO TES
PNA004	R&D-PENETRATIO	5/15/97	Ambient	PNAS-A	10/94	829	XSmall	DO	Size A	3.50	NO TES	NO TES
PNA005	R&D-PENETRATIO	5/15/97	Cold	PNAS-C	5/96	833	XSmall	DO	Size A	3.50	NO TES	NO TES
PNA005	R&D-PENETRATIO	5/15/97	Cold	PNAS-C	5/96	833	XSmall	DO	Size A	3.50	NO TES	NO TES
PNA005	R&D-PENETRATIO	5/15/97	Cold	PNAS-C	5/96	833	XSmall	DO	Size A	3.50	NO TES	NO TES
PNA005	R&D-PENETRATIO	5/15/97	Cold	PNAS-C	5/96	833	XSmall	DO	Size A	3.50	NO TES	NO TES
PNA006	R&D-PENETRATIO	5/15/97	Hot	PNAS-D	5/96	834	XSmall	DO	Size A	3.50	NO TES	NO TES
PNA006	R&D-PENETRATIO	5/15/97	Hot	PNAS-D	5/96	834	XSmall	DO	Size A	3.50	NO TES	NO TES
PNA006	R&D-PENETRATIO	5/15/97	Hot	PNAS-D	5/96	834	XSmall	DO	Size A	3.50	NO TES	NO TES
PNA006	R&D-PENETRATIO	5/15/97	Hot	PNAS-D	5/96	834	XSmall	DO	Size A	3.50	NO TES	NO TES
PNA007	R&D-PENETRATIO	5/16/97	Ambient	PNAL-A	5/96	835	XLarge	DO	Size D	6.10	NO TES	NO TES
PNA007	R&D-PENETRATIO	5/16/97	Ambient	PNAL-A	5/96	835	XLarge	DO	Size D	6.10	NO TES	NO TES

Table 2.Y
Performance Test Results — Raw Data

DROP NU	HIT NU	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
1	1	NO TES	NO TES	LF	2,4	Flat	207.65	3.70	0.60	6.92	134.08
1	2	NO TES	NO TES	LF	2,4	Flat	205.17	3.00	0.50	6.06	102.83
2	1	NO TES	NO TES	RR	2,4	Flat	201.84	3.50	0.50	6.98	136.42
2	2	NO TES	NO TES	RR	2,4	Flat	205.16	2.80	0.60	6.08	103.51
3	1	NO TES	NO TES	RG	2,4	Hemi	120.25	0.00	0.00	6.06	102.83
3	2	NO TES	NO TES	RG	2,4	Hemi	118.75	0.00	0.00	5.24	76.88
4	1	NO TES	NO TES	FR	2,4	Hemi	158.34	1.10	0.00	6.03	101.81
4	2	NO TES	NO TES	FR	2,4	Hemi	153.38	0.50	0.00	5.26	77.47
1	1	NO TES	NO TES	LF	2,4	Flat	170.54	3.30	0.00	6.92	134.08
1	2	NO TES	NO TES	LF	2,4	Flat	175.43	2.60	0.00	6.06	102.83
2	1	NO TES	NO TES	RR	2,4	Flat	200.73	3.70	0.40	6.92	134.08
2	2	NO TES	NO TES	RR	2,4	Flat	199.35	2.80	0.00	6.08	103.51
3	1	NO TES	NO TES	RG	2,4	Hemi	118.75	0.00	0.00	6.03	101.81
3	2	NO TES	NO TES	RG	2,4	Hemi	110.54	0.00	0.00	5.26	77.47
4	1	NO TES	NO TES	FR	2,4	Hemi	156.82	0.90	0.00	6.06	102.83
4	2	NO TES	NO TES	FR	2,4	Hemi	153.93	0.70	0.00	5.27	77.76
1	1	NO TES	NO TES	LF	2,4	Flat	215.90	4.00	1.00	6.92	134.08
1	2	NO TES	NO TES	LF	2,4	Flat	224.21	3.20	1.30	6.03	101.81
2	1	NO TES	NO TES	RR	2,4	Flat	213.54	3.40	1.50	6.90	133.31
2	2	NO TES	NO TES	RR	2,4	Flat	217.36	2.70	1.30	6.03	101.81
3	1	NO TES	NO TES	RG	2,4	Hemi	117.30	0.00	0.00	6.05	102.49
3	2	NO TES	NO TES	RG	2,4	Hemi	122.72	0.00	0.00	5.26	77.47
4	1	NO TES	NO TES	FR	2,4	Hemi	144.64	0.00	0.00	6.03	101.81
4	2	NO TES	NO TES	FR	2,4	Hemi	135.79	0.00	0.00	5.26	77.47
1	1	NO TES	NO TES	LF	2,4	Flat	216.41	3.90	1.00	6.94	134.86
1	2	NO TES	NO TES	LF	2,4	Flat	209.07	3.00	0.80	6.03	101.81
2	1	NO TES	NO TES	RR	2,4	Flat	204.20	3.60	0.80	6.96	135.64
2	2	NO TES	NO TES	RR	2,4	Flat	210.54	3.00	1.00	6.06	102.83
3	1	NO TES	NO TES	RG	2,4	Hemi	121.68	0.00	0.00	6.05	102.49
3	2	NO TES	NO TES	RG	2,4	Hemi	115.81	0.00	0.00	5.27	77.76
4	1	NO TES	NO TES	FR	2,4	Hemi	146.58	0.00	0.00	6.03	101.81
4	2	NO TES	NO TES	FR	2,4	Hemi	136.34	0.00	0.00	5.25	77.18
1	1	NO TES	NO TES	LF	2,4	Edge	182.26	3.30	0.00	6.92	119.72
2	1	NO TES	NO TES	RR	2,4	Edge	209.13	4.10	1.10	6.98	121.80
3	1	NO TES	NO TES	RG	2,4	Curb	198.34	3.40	0.00	6.92	119.72
4	1	NO TES	NO TES	FR	2,4	Curb	198.82	3.70	0.00	6.94	120.41
1	1	NO TES	NO TES	LF	2,4	Edge	208.59	3.60	0.20	6.92	119.72
2	1	NO TES	NO TES	RR	2,4	Edge	217.91	3.90	0.70	6.90	119.03
3	1	NO TES	NO TES	RG	2,4	Curb	188.09	3.30	0.00	6.94	120.41
4	1	NO TES	NO TES	FR	2,4	Curb	163.71	0.30	0.00	6.94	120.41
1	1	NO TES	NO TES	LF	2,4	Edge	188.09	3.50	0.00	6.90	119.03
2	1	NO TES	NO TES	RR	2,4	Edge	197.87	3.90	0.00	6.92	119.72
3	1	NO TES	NO TES	RG	2,4	Curb	190.51	2.90	0.00	6.88	118.34
4	1	NO TES	NO TES	FR	2,4	Curb	197.40	1.30	0.00	6.88	118.34
1	1	NO TES	NO TES	LF	2,4	Edge	191.67	2.70	0.30	6.81	81.16
2	1	NO TES	NO TES	RR	2,4	Edge	206.19	3.50	0.10	6.90	83.32
3	1	NO TES	NO TES	RG	2,4	Curb	187.63	3.50	0.00	6.90	83.32
4	1	NO TES	NO TES	FR	2,4	Curb	211.02	3.00	0.30	6.94	84.29
1	1	NO TES	NO TES	LF	2,4	Edge	223.80	3.70	0.90	6.83	81.64
2	1	NO TES	NO TES	RR	2,4	Edge	281.41	4.40	1.10	6.94	84.29
3	1	NO TES	NO TES	RG	2,4	Curb	218.38	3.70	0.80	6.92	83.80
4	1	NO TES	NO TES	FR	2,4	Curb	247.69	4.10	2.00	6.98	85.26
1	1	NO TES	NO TES	LF	2,4	Edge	187.12	3.10	0.00	6.85	82.11
2	1	NO TES	NO TES	RR	2,4	Edge	243.31	3.50	0.90	6.88	82.84
3	1	NO TES	NO TES	RG	2,4	Curb	199.83	3.50	0.00	6.94	84.29
4	1	NO TES	NO TES	FR	2,4	Curb	264.25	3.80	0.80	6.92	83.80
1	1	NO TES	NO TES	LF	2,4	Edge	152.43	0.10	0.00	6.90	145.21
2	1	NO TES	NO TES	RR	2,4	Edge	169.55	3.00	0.00	6.88	144.37

Table 2.Y
Performance Test Results — Raw Data

HELME NUMBER	TEST TYPE	TEST DAT	TEST COND	SAMPLE NUMBER	MAN DAT	SAMPLE WEIGHT	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
PNA007	R&D-PENETRATIO	5/16/97	Ambient	PNAL-A	5/96	835	XLarge	DO	Size D	6.10	NO TES	NO TES
PNA007	R&D-PENETRATIO	5/16/97	Ambient	PNAL-A	5/96	835	XLarge	DO	Size D	6.10	NO TES	NO TES
PNA008	R&D-PENETRATIO	5/16/97	Cold	PNAL-C	5/96	838	XLarge	DO	Size D	6.10	NO TES	NO TES
PNA008	R&D-PENETRATIO	5/16/97	Cold	PNAL-C	5/96	838	XLarge	DO	Size D	6.10	NO TES	NO TES
PNA008	R&D-PENETRATIO	5/16/97	Cold	PNAL-C	5/96	838	XLarge	DO	Size D	6.10	NO TES	NO TES
PNA008	R&D-PENETRATIO	5/16/97	Cold	PNAL-C	5/96	838	XLarge	DO	Size D	6.10	NO TES	NO TES
PNA009	R&D-PENETRATIO	5/16/97	Hot	PNAL-D	5/96	831	XLarge	DO	Size D	6.10	NO TES	NO TES
PNA009	R&D-PENETRATIO	5/16/97	Hot	PNAL-D	5/96	831	XLarge	DO	Size D	6.10	NO TES	NO TES
PNA009	R&D-PENETRATIO	5/16/97	Hot	PNAL-D	5/96	831	XLarge	DO	Size D	6.10	NO TES	NO TES
PNA009	R&D-PENETRATIO	5/16/97	Hot	PNAL-D	5/96	831	XLarge	DO	Size D	6.10	NO TES	NO TES
PNB001	R&D-PENETRATIO	5/14/97	Ambient	PNBM-A	10/91	1371	Large	DO	Size C	5.00	NO TES	NO TES
PNB001	R&D-PENETRATIO	5/14/97	Ambient	PNBM-A	10/91	1371	Large	DO	Size C	5.00	NO TES	NO TES
PNB001	R&D-PENETRATIO	5/14/97	Ambient	PNBM-A	10/91	1371	Large	DO	Size C	5.00	NO TES	NO TES
PNB001	R&D-PENETRATIO	5/14/97	Ambient	PNBM-A	10/91	1371	Large	DO	Size C	5.00	NO TES	NO TES
PNB002	R&D-PENETRATIO	5/14/97	Cold	PNBM-C	10/91	1373	Large	DO	Size C	5.00	NO TES	NO TES
PNB002	R&D-PENETRATIO	5/14/97	Cold	PNBM-C	10/91	1373	Large	DO	Size C	5.00	NO TES	NO TES
PNB002	R&D-PENETRATIO	5/14/97	Cold	PNBM-C	10/91	1373	Large	DO	Size C	5.00	NO TES	NO TES
PNB002	R&D-PENETRATIO	5/14/97	Cold	PNBM-C	10/91	1373	Large	DO	Size C	5.00	NO TES	NO TES
PNB003	R&D-PENETRATIO	5/14/97	Hot	PNBM-D	10/91	1376	Large	DO	Size C	5.00	NO TES	NO TES
PNB003	R&D-PENETRATIO	5/14/97	Hot	PNBM-D	10/91	1376	Large	DO	Size C	5.00	NO TES	NO TES
PNB003	R&D-PENETRATIO	5/14/97	Hot	PNBM-D	10/91	1376	Large	DO	Size C	5.00	NO TES	NO TES
PNB003	R&D-PENETRATIO	5/14/97	Hot	PNBM-D	10/91	1376	Large	DO	Size C	5.00	NO TES	NO TES
PNB004	R&D-PENETRATIO	5/15/97	Ambient	PNBS-A	1/95	1125	XSmall	DO	Size A	3.50	NO TES	NO TES
PNB004	R&D-PENETRATIO	5/15/97	Ambient	PNBS-A	1/95	1125	XSmall	DO	Size A	3.50	NO TES	NO TES
PNB004	R&D-PENETRATIO	5/15/97	Ambient	PNBS-A	1/95	1125	XSmall	DO	Size A	3.50	NO TES	NO TES
PNB004	R&D-PENETRATIO	5/15/97	Ambient	PNBS-A	1/95	1125	XSmall	DO	Size A	3.50	NO TES	NO TES
PNB005	R&D-PENETRATIO	5/15/97	Cold	PNBS-C	1/95	1132	XSmall	DO	Size A	3.50	NO TES	NO TES
PNB005	R&D-PENETRATIO	5/15/97	Cold	PNBS-C	1/95	1132	XSmall	DO	Size A	3.50	NO TES	NO TES
PNB005	R&D-PENETRATIO	5/15/97	Cold	PNBS-C	1/95	1132	XSmall	DO	Size A	3.50	NO TES	NO TES
PNB005	R&D-PENETRATIO	5/15/97	Cold	PNBS-C	1/95	1132	XSmall	DO	Size A	3.50	NO TES	NO TES
PNB006	R&D-PENETRATIO	5/15/97	Hot	PNBS-D	1/95	1132	XSmall	DO	Size A	3.50	NO TES	NO TES
PNB006	R&D-PENETRATIO	5/15/97	Hot	PNBS-D	1/95	1132	XSmall	DO	Size A	3.50	NO TES	NO TES
PNB006	R&D-PENETRATIO	5/15/97	Hot	PNBS-D	1/95	1132	XSmall	DO	Size A	3.50	NO TES	NO TES
PNB006	R&D-PENETRATIO	5/15/97	Hot	PNBS-D	1/95	1132	XSmall	DO	Size A	3.50	NO TES	NO TES
PNB007	R&D-PENETRATIO	5/16/97	Ambient	PNBL-A	9/95	1300	XLarge	DO	Size D	6.20	NO TES	NO TES
PNB007	R&D-PENETRATIO	5/16/97	Ambient	PNBL-A	9/95	1300	XLarge	DO	Size D	6.20	NO TES	NO TES
PNB007	R&D-PENETRATIO	5/16/97	Ambient	PNBL-A	9/95	1300	XLarge	DO	Size D	6.20	NO TES	NO TES
PNB007	R&D-PENETRATIO	5/16/97	Ambient	PNBL-A	9/95	1300	XLarge	DO	Size D	6.20	NO TES	NO TES
PNB008	R&D-PENETRATIO	5/16/97	Cold	PNBL-C	9/95	1321	XLarge	DO	Size D	6.20	NO TES	NO TES
PNB008	R&D-PENETRATIO	5/16/97	Cold	PNBL-C	9/95	1321	XLarge	DO	Size D	6.20	NO TES	NO TES
PNB008	R&D-PENETRATIO	5/16/97	Cold	PNBL-C	9/95	1321	XLarge	DO	Size D	6.20	NO TES	NO TES
PNB008	R&D-PENETRATIO	5/16/97	Cold	PNBL-C	9/95	1321	XLarge	DO	Size D	6.20	NO TES	NO TES
PNB009	R&D-PENETRATIO	5/16/97	Hot	PNBL-D	9/95	1292	XLarge	DO	Size D	6.20	NO TES	NO TES
PNB009	R&D-PENETRATIO	5/16/97	Hot	PNBL-D	9/95	1292	XLarge	DO	Size D	6.20	NO TES	NO TES
PNB009	R&D-PENETRATIO	5/16/97	Hot	PNBL-D	9/95	1292	XLarge	DO	Size D	6.20	NO TES	NO TES
PNB009	R&D-PENETRATIO	5/16/97	Hot	PNBL-D	9/95	1292	XLarge	DO	Size D	6.20	NO TES	NO TES
PNC00	R&D-PENETRATIO	5/14/97	Ambient	PNCM-A	11/95	1438	Medium	DO	Size C	5.00	NO TES	NO TES
PNC00	R&D-PENETRATIO	5/14/97	Ambient	PNCM-A	11/95	1438	Medium	DO	Size C	5.00	NO TES	NO TES
PNC00	R&D-PENETRATIO	5/14/97	Ambient	PNCM-A	11/95	1438	Medium	DO	Size C	5.00	NO TES	NO TES
PNC00	R&D-PENETRATIO	5/14/97	Ambient	PNCM-A	11/95	1438	Medium	DO	Size C	5.00	NO TES	NO TES
PNC00	R&D-PENETRATIO	5/14/97	Cold	PNCM-C	11/95	1438	Medium	DO	Size C	5.00	NO TES	NO TES
PNC00	R&D-PENETRATIO	5/14/97	Cold	PNCM-C	11/95	1438	Medium	DO	Size C	5.00	NO TES	NO TES
PNC00	R&D-PENETRATIO	5/14/97	Cold	PNCM-C	11/95	1438	Medium	DO	Size C	5.00	NO TES	NO TES
PNC00	R&D-PENETRATIO	5/14/97	Cold	PNCM-C	11/95	1438	Medium	DO	Size C	5.00	NO TES	NO TES
PNC00	R&D-PENETRATIO	5/14/97	Hot	PNCM-D	11/95	1423	Medium	DO	Size C	5.00	NO TES	NO TES
PNC00	R&D-PENETRATIO	5/14/97	Hot	PNCM-D	11/95	1423	Medium	DO	Size C	5.00	NO TES	NO TES
PNC00	R&D-PENETRATIO	5/14/97	Hot	PNCM-D	11/95	1423	Medium	DO	Size C	5.00	NO TES	NO TES
PNC00	R&D-PENETRATIO	5/14/97	Hot	PNCM-D	11/95	1423	Medium	DO	Size C	5.00	NO TES	NO TES

Table 2.Y
Performance Test Results — Raw Data

DROP NU	HIT NU	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OU OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCITY (M/S)	ENERGY (JOULES)
3	1	NO TES	NO TES	RG	2,4	Curb	162.69	1.40	0.00	6.90	145.21
4	1	NO TES	NO TES	LF	2,4	Curb	350.20	2.50	1.20	6.92	146.05
1	1	NO TES	NO TES	LF	2,4	Edge	156.38	0.50	0.00	6.94	146.90
2	1	NO TES	NO TES	RR	2,4	Edge	176.90	3.20	0.00	6.92	146.05
3	1	NO TES	NO TES	RG	2,4	Curb	157.85	1.50	0.00	6.94	146.90
4	1	NO TES	NO TES	LF	2,4	Curb	380.02	2.20	1.30	6.94	146.90
1	1	NO TES	NO TES	LF	2,4	Edge	145.15	0.00	0.00	6.92	146.05
2	1	NO TES	NO TES	RR	2,4	Edge	170.08	2.60	0.00	6.92	146.05
3	1	NO TES	NO TES	RG	2,4	Curb	272.63	1.60	0.90	6.98	148.60
4	1	NO TES	NO TES	LF	2,4	Curb	563.09	1.70	1.20	6.92	146.05
1	1	NO TES	NO TES	LF	2,4	Edge	147.57	0.00	0.00	6.94	120.41
2	1	NO TES	NO TES	RR	2,4	Edge	196.90	2.20	0.00	6.94	120.41
3	1	NO TES	NO TES	RG	2,4	Curb	191.00	2.60	0.00	6.90	119.03
4	1	NO TES	NO TES	FR	2,4	Curb	166.09	1.60	0.00	6.94	120.41
1	1	NO TES	NO TES	LF	2,4	Edge	167.09	1.30	0.00	6.96	121.10
2	1	NO TES	NO TES	RR	2,4	Edge	207.66	2.70	0.40	6.96	121.10
3	1	NO TES	NO TES	RG	2,4	Curb	194.44	3.20	0.00	6.96	121.10
4	1	NO TES	NO TES	FR	2,4	Curb	177.35	2.30	0.00	6.92	119.72
1	1	NO TES	NO TES	LF	2,4	Edge	147.55	0.00	0.00	6.92	119.72
2	1	NO TES	NO TES	RR	2,4	Edge	176.40	1.90	0.00	6.96	121.10
3	1	NO TES	NO TES	RG	2,4	Curb	176.89	2.30	0.00	6.96	121.10
4	1	NO TES	NO TES	FR	2,4	Curb	158.32	1.20	0.00	6.90	119.03
1	1	NO TES	NO TES	LF	2,4	Edge	196.90	4.20	0.00	6.96	84.77
2	1	NO TES	NO TES	RR	2,4	Edge	246.16	4.10	1.20	6.92	83.80
3	1	NO TES	NO TES	RG	2,4	Curb	242.77	4.20	0.90	6.92	83.80
4	1	NO TES	NO TES	FR	2,4	Curb	157.35	0.90	0.00	6.94	84.29
1	1	NO TES	NO TES	LF	2,4	Edge	198.86	4.10	0.00	6.94	84.29
2	1	NO TES	NO TES	RR	2,4	Edge	262.37	4.40	1.60	6.92	83.80
3	1	NO TES	NO TES	RG	2,4	Curb	235.00	4.20	1.20	6.94	84.29
4	1	NO TES	NO TES	FR	2,4	Curb	158.76	2.10	0.00	6.98	85.26
1	1	NO TES	NO TES	LF	2,4	Edge	187.11	3.20	0.00	6.88	82.84
2	1	NO TES	NO TES	RR	2,4	Edge	244.27	4.20	1.20	6.94	84.29
3	1	NO TES	NO TES	RG	2,4	Curb	230.59	3.50	1.10	6.92	83.80
4	1	NO TES	NO TES	FR	2,4	Curb	175.39	3.90	0.00	6.96	84.77
1	1	NO TES	NO TES	LF	2,4	Edge	147.11	0.00	0.00	6.94	149.31
2	1	NO TES	NO TES	RR	2,4	Edge	166.19	0.20	0.00	6.94	149.31
3	1	NO TES	NO TES	RG	2,4	Curb	144.64	0.00	0.00	6.94	149.31
4	1	NO TES	NO TES	FR	2,4	Curb	179.27	2.00	0.00	7.00	151.90
1	1	NO TES	NO TES	LF	2,4	Edge	143.18	0.00	0.00	6.96	150.17
2	1	NO TES	NO TES	RR	2,4	Edge	169.59	2.10	0.00	6.94	149.31
3	1	NO TES	NO TES	RG	2,4	Curb	164.20	0.70	0.00	6.92	148.45
4	1	NO TES	NO TES	FR	2,4	Curb	172.99	2.00	0.00	6.96	150.17
1	1	NO TES	NO TES	LF	2,4	Edge	178.36	1.40	0.00	6.96	150.17
2	1	NO TES	NO TES	RR	2,4	Edge	142.70	0.00	0.00	6.94	149.31
3	1	NO TES	NO TES	RG	2,4	Curb	136.33	0.00	0.00	6.96	150.17
4	1	NO TES	NO TES	FR	2,4	Curb	180.78	1.70	0.00	6.94	149.31
1	1	NO TES	NO TES	LF	2,4	Edge	192.01	3.30	0.00	6.90	119.03
2	1	NO TES	NO TES	RR	2,4	Edge	198.82	3.60	0.00	6.96	121.10
3	1	NO TES	NO TES	RG	2,4	Curb	204.24	4.10	0.20	6.88	118.34
4	1	NO TES	NO TES	FR	2,4	Curb	186.63	3.70	0.00	6.90	119.03
1	1	NO TES	NO TES	LF	2,4	Edge	186.70	2.00	0.00	6.94	120.41
2	1	NO TES	NO TES	RR	2,4	Edge	201.79	3.90	0.20	6.96	121.10
3	1	NO TES	NO TES	RG	2,4	Curb	192.97	3.20	0.00	6.94	120.41
4	1	NO TES	NO TES	FR	2,4	Curb	201.79	4.10	0.10	6.94	120.41
1	1	NO TES	NO TES	LF	2,4	Edge	179.82	1.70	0.00	6.94	120.41
2	1	NO TES	NO TES	RR	2,4	Edge	193.45	3.40	0.00	6.90	119.03
3	1	NO TES	NO TES	RG	2,4	Curb	169.56	2.30	0.00	6.88	118.34
4	1	NO TES	NO TES	FR	2,4	Curb	197.40	2.60	0.00	6.88	118.34

Table 2.Y
Performance Test Results — Raw Data

HELME NUMBER	TEST TYPE	TEST DATE	TEST COND	SAMPLE NUMBER	MAN DATE	SAMPLE WEIGH	SAM SIZE	HEAD FORM TYPE	HEAD FORM SIZE	DROP MASS	PENETR. TEST1	PENETR. TEST2
PNC004	R&D-PENETRATIO	5/15/97	Ambient	PNCS-A	8/95	141	XSmall	DO	Size A	3.50	NO TES	NO TES
PNC004	R&D-PENETRATIO	5/15/97	Ambient	PNCS-A	8/95	141	XSmall	DO	Size A	3.50	NO TES	NO TES
PNC004	R&D-PENETRATIO	5/15/97	Ambient	PNCS-A	8/95	141	XSmall	DO	Size A	3.50	NO TES	NO TES
PNC004	R&D-PENETRATIO	5/15/97	Ambient	PNCS-A	8/95	141	XSmall	DO	Size A	3.50	NO TES	NO TES
PNC005	R&D-PENETRATIO	5/15/97	Cold	PNCS-B	8/95	147	XSmall	DO	Size A	3.50	NO TES	NO TES
PNC005	R&D-PENETRATIO	5/15/97	Cold	PNCS-B	8/95	147	XSmall	DO	Size A	3.50	NO TES	NO TES
PNC005	R&D-PENETRATIO	5/15/97	Cold	PNCS-B	8/95	147	XSmall	DO	Size A	3.50	NO TES	NO TES
PNC005	R&D-PENETRATIO	5/15/97	Cold	PNCS-B	8/95	147	XSmall	DO	Size A	3.50	NO TES	NO TES
PNC006	R&D-PENETRATIO	5/15/97	Hot	PNCS-D	8/95	147	XSmall	DO	Size A	3.50	NO TES	NO TES
PNC006	R&D-PENETRATIO	5/15/97	Hot	PNCS-D	8/95	147	XSmall	DO	Size A	3.50	NO TES	NO TES
PNC006	R&D-PENETRATIO	5/15/97	Hot	PNCS-D	8/95	147	XSmall	DO	Size A	3.50	NO TES	NO TES
PNC006	R&D-PENETRATIO	5/15/97	Hot	PNCS-D	8/95	147	XSmall	DO	Size A	3.50	NO TES	NO TES
PNC007	R&D-PENETRATIO	5/16/97	Ambient	PNCL-A	11/95	139	Large	DO	Size D	6.20	NO TES	NO TES
PNC007	R&D-PENETRATIO	5/16/97	Ambient	PNCL-A	11/95	139	Large	DO	Size D	6.20	NO TES	NO TES
PNC007	R&D-PENETRATIO	5/16/97	Ambient	PNCL-A	11/95	139	Large	DO	Size D	6.20	NO TES	NO TES
PNC007	R&D-PENETRATIO	5/16/97	Ambient	PNCL-A	11/95	139	Large	DO	Size D	6.20	NO TES	NO TES
PNC008	R&D-PENETRATIO	5/16/97	Cold	PNCL-C	11/95	143	Large	DO	Size D	6.20	NO TES	NO TES
PNC008	R&D-PENETRATIO	5/16/97	Cold	PNCL-C	11/95	143	Large	DO	Size D	6.20	NO TES	NO TES
PNC008	R&D-PENETRATIO	5/16/97	Cold	PNCL-C	11/95	143	Large	DO	Size D	6.20	NO TES	NO TES
PNC008	R&D-PENETRATIO	5/16/97	Cold	PNCL-C	11/95	143	Large	DO	Size D	6.20	NO TES	NO TES
PNC009	R&D-PENETRATIO	5/16/97	Hot	PNCL-D	11/95	139	Large	DO	Size D	6.20	NO TES	NO TES
PNC009	R&D-PENETRATIO	5/16/97	Hot	PNCL-D	11/95	139	Large	DO	Size D	6.20	NO TES	NO TES
PNC009	R&D-PENETRATIO	5/16/97	Hot	PNCL-D	11/95	139	Large	DO	Size D	6.20	NO TES	NO TES
PNC009	R&D-PENETRATIO	5/16/97	Hot	PNCL-D	11/95	139	Large	DO	Size D	6.20	NO TES	NO TES

Table 2.Y
Performance Test Results — Raw Data

DROP NUM	HIT NUM	RETENTION STRENGTH	LINER DENSITY	IMPACT LOCATION	TIME OUT OF COND.	ANVIL	PEAK G	TIME @ 150G	TIME @ 200G	VELOCIT (M/S)	ENERGY (JOULES)
1	1	NO TEST	NO TEST	LF	2,4	Edge	219.80	3.50	1.10	6.92	83.80
2	1	NO TEST	NO TEST	RR	2,4	Edge	223.81	4.00	2.30	7.00	85.75
3	1	NO TEST	NO TEST	RG	2,4	Curb	197.39	3.30	0.00	6.90	83.32
4	1	NO TEST	NO TEST	FR	2,4	Curb	200.12	4.00	0.10	6.98	85.26
1	1	NO TEST	NO TEST	LF	2,4	Edge	221.33	3.90	1.00	6.92	83.80
2	1	NO TEST	NO TEST	RR	2,4	Edge	250.59	4.10	2.10	6.98	85.26
3	1	NO TEST	NO TEST	RG	2,4	Curb	206.32	3.70	0.70	6.96	84.77
4	1	NO TEST	NO TEST	FR	2,4	Curb	225.03	3.50	1.70	6.98	85.26
1	1	NO TEST	NO TEST	LF	2,4	Edge	231.54	3.60	1.40	6.92	83.80
2	1	NO TEST	NO TEST	RR	2,4	Edge	224.24	4.10	2.30	6.98	85.26
3	1	NO TEST	NO TEST	RG	2,4	Curb	195.53	3.10	0.00	6.96	84.77
4	1	NO TEST	NO TEST	FR	2,4	Curb	225.15	3.10	1.40	6.90	83.32
1	1	NO TEST	NO TEST	LF	2,4	Edge	163.21	0.80	0.00	6.92	148.45
2	1	NO TEST	NO TEST	RR	2,4	Edge	181.27	3.30	0.00	6.96	150.17
3	1	NO TEST	NO TEST	RG	2,4	Curb	157.44	0.20	0.00	6.92	148.45
4	1	NO TEST	NO TEST	FR	2,4	Curb	152.49	0.70	0.00	6.92	148.45
1	1	NO TEST	NO TEST	LF	2,4	Edge	180.88	1.70	0.00	6.92	148.45
2	1	NO TEST	NO TEST	RR	2,4	Edge	170.04	2.90	0.00	6.94	149.31
3	1	NO TEST	NO TEST	RG	2,4	Curb	151.56	0.50	0.00	6.96	150.17
4	1	NO TEST	NO TEST	FR	2,4	Curb	165.70	1.30	0.00	6.96	150.17
1	1	NO TEST	NO TEST	LF	2,4	Edge	174.44	1.50	0.00	6.96	150.17
2	1	NO TEST	NO TEST	RR	2,4	Edge	176.93	3.10	0.00	6.94	149.31
3	1	NO TEST	NO TEST	RG	2,4	Curb	149.53	0.00	0.00	6.98	151.03
4	1	NO TEST	NO TEST	FR	2,4	Curb	147.17	0.00	0.00	6.92	148.45