STATE OF WISCONSIN)
) SS.
DEPARTMENT OF TRANSPORTATION)

MVD 18

TO ALL TO WHOM THESE PRESENTS SHALL COME, GREETINGS:

I, James L. Karns, Administrator of the Division of Motor Vehicles of the State of Wisconsin Department of Transportation, and legal custodian of the official records of said division, do hereby certify that the annexed, attached created Chapter MVD 18, entitled "Protective Headgear--Standards and Specifications," of the published Wisconsin Administrative Code, marked "Exhibit A," has been duly approved and adopted by me as Administrator of said division, this 3rd day of May, 1968.

I further certify that these newly-created rules attached to my Order as "Exhibit A" which are being filed with the offices of the Revisor of Statutes and Secretary of State, respectively, have been compared by me with the original on file in this division, and that each respective copy, including "Exhibit A", is a true and correct copy of the original Order and attached "Exhibit A" on file with this division.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the official seal of the Department of Transportation at the Hill Farms State Office Building in the city of Madison, Wisconsin, this 3rd day of May, 1968.

(SEAL)

James L. Karns
Administrator
Division of Motor Vehicles
Wisconsin Department of Transportation

BEFORE THE DEPARTMENT OF TRANSPORTATION OF THE STATE OF WISCONSIN
DIVISION OF MOTOR VEHICLES

IN THE MATTER OF THE ADOPTION OF CHAPTER MVD 18 OF THE WISCONSIN ADMINISTRATIVE CODE; RULES RELATIVE TO PROTECTIVE HEADGEAR AND EYE PROTECTION FOR MOTORCYCLISTS UNDER 347.485, WIS. STATS.	* * * * *	ORDER ADOPTING RULES

Pursuant to authority vested in the Administrator of the Division of Motor Vehicles of the Wisconsin Department of Transportation under sections 110.06, and more specifically under 347.485, Wis. Stats., created by Chapter 292 of the Laws of 1967; and, after due notice and public hearing held April 15, 1968, at 9:30 a.m., in Room 256, Hill Farms State Office Building, 4802 Sheboygan Avenue, Madison, Wisconsin; and, as provided under Chapter 227, Wis. Stats.; and, after due consideration to the objections and suggestions of those persons attending such public hearing relative to the various portions of the rules, create and adopt rules thereunder in "Exhibit A" attached hereto;

IT IS HEREBY ORDERED, That Chapter MVD 18 of the Wisconsin Administrative Code, entitled "Protective Headgear--Standards and Specifications," is hereby created as made and provided in "Exhibit A" attached hereto, adopted hereby, and made a part of this Order by reference.

This rule shall become effective July 1, 1968.

Dated at Madison, Wisconsin, this 3rd day of May, 1968.

(SEAL)

Administrator
Division of Motor Vehicles
Wisconsin Department of Transportation

May 16, 1967

The Honorable Bronson C. La Follette
Attorney General
State Capitol
Madison, Wisconsin 53702

Dear Mr. La Follette:

We are making a revision of our school bus rules and regulations, and publishing notice of Hearing thereof for the 29th day of June 1967.

We are adopting certain National standards in authoritative publications therein by reference, which require the approval of the Revisor of Statutes and the Attorney General's office. We are submitting the same to your offices for your perusal, and trust that they will meet with your approval to adopt the same by reference rather than proceed with publishing these lengthy standards in the whole.

Yours very truly,

JAMES L. KARNS
Commissioner

JLK:jbd
Enclosure
cc: James J. Burke
Revisor of Statutes
State Capitol
Madison, Wisconsin 53702

The State of Wisconsin
Office of Attorney General
Madison

BRONSON C. LA FOLLETTE
ATTORNEY GENERAL

ARLEN C. CHRISTENSON
DEPUTY ATTORNEY GENERAL

March 22, 1968

Mr. James L. Karns, Administrator
Division of Motor Vehicles
Department of Transportation
4802 Sheboygan Avenue
Madison, Wisconsin 53702

Dear Mr. Karns:

In your letter of March 15, 1968, you state that, in adopting new administrative rules, you propose to incorporate therein, by reference, certain portions of the 1968 Society of Automotive Engineers handbook and the 1966 Edition of the American Standards Institute. You ask for our consent, as provided in sec. 227.025, Wis. Stats. This statute provides that we shall so consent where the rules are of limited public interest, and where the incorporated standards are readily available in published form.

The proposed rules relate to brake systems for towed vehicles and protective headgear for motorcyclists. The incorporated standards are available from the publishers, which are the Society of Automotive Engineers and the American Standards Association. We conclude that these rules are of limited public interest and that the standards are readily available in published form.

We, therefore, give our consent to the incorporation by reference of these standards in the proposed new rules.

Very truly yours,

Bronson C. La Follette

BRONSON C. LA FOLLETTE
Attorney General

James J. Burke

JAMES J. BURKE
Revisor of Statutes

MAR 23 1968

"EXHIBIT A"

PROTECTIVE HEADGEAR--STANDARDS AND SPECIFICATIONS

18.01 Applicability
18.02 Definitions
18.03 Construction
18.04 Materials
18.05 Extent of Protection
18.06 Test Samples
18.07 Test Conditions
18.08 Shock Absorption Test
18.09 Penetration Test
18.10 Retaining System Test
18.11 Test Equipment & Preparation of such Equipment
18.12 Calibration of Test Equipment
18.13 Certification & Approval
18.14 Manner of Wearing
18.15 Reflector Requirements
18.16 Identification Requirements

NOTE: Chapter 347.485, Wis. Stats., provides for the approval of standards, specifications, and type of protective headgear and the manner of wearing such headgear.

Section 347.485 (1)(a), Wis. Stats., no person shall operate or ride upon a motor-driven cycle on any highway unless such person is wearing protective headgear of a type and in the manner approved by the commissioner.

Section 347.485 (1)(b), Wis. Stats., no person shall sell or offer for sale any protective headgear for use by a driver or passenger on a motor-driven cycle, not meeting the standards and specifications approved by the commissioner.

Section 347.485 (1)(c), Wis. Stats., the standards and specifications for protective headgear referred to in this section shall be such as to provide a high level of protection at reasonable cost to the consumer.

MVD 18.01

(1) Every non-resident shall use protective headgear as prescribed, except that such headgear will be approved for usage in Wisconsin even though it does not comply with this order, but meets the standards and specifications of his state of residence. If his state of residence does not have standards or specifications for protective headgear, then such headgear shall be in compliance with this order.

(2) Protective headgear shall not be required of operators or passengers of three-wheeled vehicles which are equipped with cabs entirely enclosing the passenger compartment.

(3) Protective headgear purchased by a resident prior to the effective date of this order, which headgear can be identified as meeting these requirements, may be labeled as acceptable by the Division.

MVD 18.02 DEFINITIONS

(1) Area of Protection is defined as entire area of the head above the reference plane.

(2) Basic Plane is defined as a plane at the level of the external auditory meatus and the inferior margin of the orbit. Also referred to as the anatomical plane.

(3) Division - as used herein means the Division of Motor Vehicles of the Department of Transportation of the State of Wisconsin.

(4) External Auditory Meatus refers to the external opening of the ear.

(5) Harness is defined as the complete assembly by means of which the protective headgear is maintained in position on the wearer's head.

(6) Inferior Margin of Orbit is the bottom of the bony rim of the eye opening.

(7) Orbit is the bony rim of the eye socket.

(8) Projection is any part that juts out or extends beyond the surface in abrupt fashion.

(9) Protective Headgear is a device primarily intended to protect the upper part of the wearer's head against a blow or from impacts.

(10) Reference Plane is a plane 2.36 in. (60 mm) above and parallel to the basic (anatomical) plane, which shall be located on each head form.

(11) Shell is defined as the outer material that provides the general form of the headgear.

MVD 18.03 CONSTRUCTION

The construction of the protective headgear shall be such as to meet the performance standards, having the necessary means of absorbing impact energy. Any optional devices fitted to a protective headgear shall be so designed that they are unlikely to cause injury to the wearer in the event of an accident.

MVD 18.04 MATERIALS

Materials used in the protective headgear shall be of durable quality. Their physical properties shall not change appreciably under normal use for the expected life of the protective headgear under exposure to sun, rain, temperature variations, dust, vibrations, contact with body tissues and fluids and products normally used on the skin and hair, nor shall they cause skin irritation or disease if they come into contact with the skin of the wearer.

MVD 18.05 EXTENT OF PROTECTION

(1) The area of protection as defined shall be protected by the protective headgear so as to meet the requirements as to shock absorption and to withstand impact and penetration as prescribed.

(2) The protective headgear shall be designed so that no part will be inadvertently detached during normal use including impact conditions encountered in accidents.

(3) The protective headgear shall be designed to provide a range of peripheral vision of 120 degrees to each side of a focus line.

MVD 18.06 TEST SAMPLES

(1) To qualify under these standards, protective headgear shall be tested in accordance with the procedures set forth herein. The tests shall be conducted on stock protective headgear as offered for sale.

(2) After a particular model has been approved by the Administrator, further tests to verify continued satisfactory performance may be required from time to time. Consideration will be given to limiting further tests provided there is no change in materials or manufacture.

(3) Four protective headgear will be required for qualification testing.

(4) The reference plane shall be marked on protective headgear prior to testing, and all tests shall be above the reference plane.

MVD 18.07 TEST CONDITIONS

(1) Ambient Temperature. Ambient temperature tests will be conducted on the first protective headgear in a room in which the ambient temperature is $75\pm5^{\circ}F$. The protective headgear shall be maintained in the ambient temperature for a period of not less than 4 hours immediately prior to testing.

(2) Low Temperature. The second protective headgear shall be tested under low temperature conditions after being cooled in a mechanically cooled apparatus to a temperature of $-10\pm2^{\circ}C$. for a period of not less than 4 hours nor more than 24 hours.

(3) Water Immersion. The third protective headgear shall be tested after immersion in water at a temperature of $25\pm5^{\circ}C$. for a period not less than 4 hours nor more than 24 hours.

(4) High Temperature. The fourth protective headgear shall be tested after being heated in a suitable oven at a temperature of $50\pm2^{\circ}C$. for a period not less than 4 hours nor more than 24 hours.

(5) Testing shall begin within 5 minutes after removal from the environments specified in (2), (3), and (4), and shall be completed before the temperature and/or moisture content has changed appreciably from the specified conditions.

MVD 18.08 SHOCK ABSORPTION TEST (IMPACT TEST)

(1) Shock absorption shall be measured by imparted acceleration to an appropriately instrumented movable head form, by either of the following means: (a) dropping in guided fall upon a fixed, rigid anvil, or (b) mounted on a freely pivoting arm, and being impacted by an appropriate bobweight dropped in guided fall.

(2) Acceptable Acceleration Levels:

(a) Any peak acceleration exceeding 400 G's shall be cause for rejection of the protective headgear.

(b) Accelerations between 200 and 400 G's shall be cause for rejection of the protective headgear if the total time of such acceleration measured at the 200 G level exceeds 2 milliseconds.

(c) Accelerations in excess of 150 G's for more than 4 milliseconds shall be cause for rejection of the protective headgear.

(d) The acceptable acceleration levels set forth in this section shall apply to ambient temperature impact, low temperature impact, high temperature impact, and water immersion impact tests.

(3) Each protective headgear shall be impacted with two identical impacts in not less than four sites. The impact sites shall be above the reference plane, and separated from each other by a distance equal to one-fifth or more of the maximal circumference of the protective headgear.

(4) Two steel impactor or anvil configurations shall be used. One shall be flat, theother hemispherical.

(5) The flat impactor shall have a minimum surface area of 19.6 square inches (127 square centimeters) i.e., 5-inch diameter face; the hemispherical impactor shall have a 1.9-inch (4.8 centimeter) radius.

(6) An equal number of paired impacts shall be applied with each configuration.

(7) The test head form shall be of low resonance magnesium alloy (K-1A), and shall weigh 11+0.2 - 0.0 pounds (5 kilograms + 0.091 - 0). This weight shall include the supporting arm if testing by dropping upon a rigid anvil. The same weight shall be used for the impacting bobweight if testing is done according to the pivoting head form system.

(8) The impact energy utilized shall be 50 foot pounds (7.42 kilogram meters) with the hemispherical anvil face (54 in. or 134 cm drop) and 66 foot pounds (9.8 kilogram meters) with the flat anvil face (72 in. or 183 cm drop) if testing is in accordance with (a) of 18.08 (1).

It shall be 120 foot pounds (17.8 kilogram meters) with the hemispherical striker (131 in. or 332 cm) and 160 foot pounds (23.8 kilogram meters) with a flat striker (175 in. or 443 cm) if testing is in accordance with (b) of 18.08 (1).

(NOTE: This test is identical with Section 9, Tests for Helmets, in USA Standard Z90.1-1966.)

MVD 18.09 PENETRATION TEST

(1) The complete protective headgear shall be placed on a rigid head form covered with an electrically-conducting material. Penetration tests shall be conducted by dropping a 6-pound, 10-ounce (3 kilogram) penetration striker a distance of 39.37 inches (1 meter) measured from the outer surface of the protective headgear to the tip of the striker. The impact tip of the striker shall be a cone with an included angle of 60° and an altitude of at least 1.5 inches. The radius of the striking point shall be .0197 in. (0.5 mm) and its hardness 60 Rockwell (scale C).

(2) The protective headgear shall be subjected to impact of the striker dropped (free fall) onto the outside surface of the protective headgear in a direction essentially perpendicular to the surface. The points of impact shall be one in each 60° quadrant of the protective headgear at radial distance 4.5 ± 0.5 in. from the apex and also at the apex. Ten impacts in these quadrants shall be accomplished on the four sample protective headgear with at least one impact on each sample.

(3) The protective headgear shall be rejected if electrical contact is made between the impactor and the conducting surface of the head form during any of the ten impacts supplied in 18.09 (2).

MVD 18.10 RETAINING SYSTEM TEST

(1) The retention system of the protective headgear shall be tested by placing the protective headgear on a rigid head form. The chin strap or other chin restraining device shall be placed around a movable anvil approximating the size of the human jaw. Thesimulated jaw shall be located in approximately the correct relative position on the head form.

(2) The movable simulated jaw bone shall be moved downward with respect to the head form until a force of 300 pounds (136 kilograms) is applied to the simulated jaw bone. The retention system and its attachments shall support this force without failure and without greater than 1 in. (2.54 cm) increase in vertical distance from the top of the protective headgear to the bottom of the simulated jaw bone.

(3) If the extension between the simulated jaw and the top of the protective headgear is greater than 1 in. (2.54 cm) or if any part of the retention system fails, the protective headgear shall be rejected.

(4) The retention system shall be tested as specified herein at ambient temperature.

MVD 18.11 TEST EQUIPMENT & PREPARATION OF SUCH EQUIPMENT

(1) All equipment shall be turned on and allowed to warm up for at least 30 minutes or until equilibrium is reached, whichever time is greater, prior to any testing.

(2) The instrumentation shall be calibrated according to the manufacturer's recommendation prior to and after each series of tests. If the system is out of calibration at the end of a test series, the entire series shall be discarded.

(3) A record shall be made of each impact and retained as a permanent record of the acceleration-time history.

(4) The test equipment shall be identical or equivalent to that specified in Section 13 of USA Standard Z90.1-1966, with the exception that the head form and penetration striker shall be modified to conform to 18.09 (1).

MVD 18.12 CALIBRATION OF TEST EQUIPMENT

(1) The equipment shall be calibrated in accordance with the procedure recommended by the manufacturer. It shall be allowed to warm up until equilibrium is reached prior to any testing.

(2) The instrumentation shall be recalibrated after each series of tests. Any change in the calibration before and after testing shall be cause for rejection of the test series.

(3) In addition to the manufacturer's component calibration specified in (1), the entire system shall be checked before and after each series of tests for calibration by dropping the head form on a section of rigid foam plastic and comparing this calibration with previous calibrations on the same or identical foam plastic. This calibration must be within predetermined tolerance prior to and after testing. If it is out of tolerance, the test series shall be discarded.

(4) A permanent acceleration-time history record of each impact shall be made.

MVD 18.13 CERTIFICATION AND APPROVAL

(1) Tests to demonstrate compliance with requirements of these specifications and standards shall be performed by independent testing agencies considered by the Division of Motor Vehicles to be qualified to conduct such tests. Test reports shall be complete showing test results as against minimum or maximum values prescribed by the applicable standards and specifications and shall be certified by the testing agency with respect to accuracy and compliance with the requirements for approval.

(2) A manufacturer desiring approval of a protective headgear shall submit to the Administrator of the Division of Motor Vehicles, Department of Transportation, Madison, Wisconsin, a test report, from an independent testing laboratory acceptable to the State, certified as required in sub-paragraph (1) of this section. A sample of the protective headgear will not be required by the Division.

MVD 18.14 MANNER OF WEARING

The protective headgear shall be worn on the head with chin strap properly fastened, and in contact with the chin or jaw.

MVD 18.15 REFLECTORIZED HEADGEAR

Protective headgear may have a reflectorized surface or have affixed on the left and right side of the protective headgear reflectorized material.

MVD 18.16 IDENTIFICATION REQUIREMENTS

Each make and model protective headgear approved by the Division shall be labeled on the outside of the protective headgear above the base of the rear of the protective headgear with letters and/or numbers at least 1/4 inch in height with the manufacturer's tradename and model name or number under which the protective headgear has been approved.

This rule becomes effective July 1, 1968.

NOTE: The 1966 edition of USA Standards referred to in the above and foregoing rules may be obtained from USA Standards Institute, 10 East 40th Street, New York, New York.

The State of Wisconsin
Office of Attorney General
Madison

BRONSON C. LA FOLLETTE
ATTORNEY GENERAL

ARLEN C. CHRISTENSON
DEPUTY ATTORNEY GENERAL

March 22, 1968

Mr. James L. Karns, Administrator
Division of Motor Vehicles
Department of Transportation
4802 Sheboygan Avenue
Madison, Wisconsin 53702

Dear Mr. Karns:

In your letter of March 15, 1968, you state that, in adopting new administrative rules, you propose to incorporate therein, by reference, certain portions of the 1968 Society of Automotive Engineers handbook and the 1966 Edition of the American Standards Institute. You ask for our consent, as provided in sec. 227.025, Wis. Stats. This statute provides that we shall so consent where the rules are of limited public interest, and where the incorporated standards are readily available in published form.

The proposed rules relate to brake systems for towed vehicles and protective headgear for motorcyclists. The incorporated standards are available from the publishers, which are the Society of Automotive Engineers and the American Standards Association. We conclude that these rules are of limited public interest and that the standards are readily available in published form.

We, therefore, give our consent to the incorporation by reference of these standards in the proposed new rules.

Very truly yours,

Bronson C. La Follette

BRONSON C. LA FOLLETTE
Attorney General

James J. Burke

JAMES J. BURKE
Revisor of Statutes

MAR 27 1968

ASA
Reg. U.S. Pat. Off.
Z90.1-1966
UDC 614.891:629.82

American Standard Specifications for

Protective Headgear for Vehicular Users

USA Standard

This USA Standard is one of nearly 3000 standards approved as American Standards by the American Standards Association. On August 24, 1966, the ASA was reconstituted as the United States of America Standards Institute. Standards approved as American Standards are now designated USA Standards. There is no change in their index identification or technical content.

Sponsor
Sports Car Club of America

Approved June 22, 1966
AMERICAN STANDARDS ASSOCIATION
INCORPORATED

American Standard

Registered United States Patent Office

An American Standard implies a consensus of those substantially concerned with its scope and provisions. An American Standard is intended as a guide to aid the manufacturer, the consumer, and the general public. The existence of an American Standard does not in any respect preclude anyone, whether he has approved the standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standard. American Standards are subject to periodic review and users are cautioned to obtain the latest editions. Producers of goods made in conformity with an American Standard are encouraged to state on their own responsibility in advertising, promotion material, or on tags or labels, that the goods are produced in conformity with particular American Standards.

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Foreword

(This Foreword is not part of American Standard Specifications for Protective Headgear for Vehicular Users, Z90.1-1966.)

On December 9, 1960 the Sports Car Club of America requested that the American Standards Association initiate a project to prepare specifications on the subject of road-users helmets. A general conference was held at the ASA headquarters in April 1961 which was attended by representatives from various consumer groups, helmet manufacturing companies, testing organizations, and both the Army and Naval branches of the military service. The Safety Standards Board established Sectional Committee Z90 and charged it with the responsibility for establishing a safety code for vehicular head protection. The scope of the committee was to establish safety requirements for head protection for automobile drivers engaged in high hazard activities or occupations, and for motorcyclists. The committee is presently considering the expansion of its scope to include headgear protection for other high hazard athletic activities such as football, baseball, and skiing.

There exists a great number of widely varying uses for protective headgear. The resulting differences in design requirements may result in very necessary compromises involving factors which include comfort, weight, visual, and auditory requirements as well as degree and extent of protection. It is therefore essential that any specific standard be applied or utilized only within the scope of its intended application.

Suggestions for improvement gained in the use of this standard will be welcome. They should be sent to the American Standards Association, Incorporated, 10 East 40th Street, New York, N.Y. 10016.

The organizations which participated in this work and the names of their representatives, as listed at the time this standard was submitted to the Sectional Committee for approval, are as follows:

George G. Snively, *Chairman* Asher Chapman, *Secretary*

Organization Represented	*Name of Representative*
American Association for Automotive Medicine	H. A. Fenner, Jr
	A. J. Mirkin *(Alt)*
American Insurance Association	R. C. Ellis
American Motorcycling Association	L. A. Kuchler
American Mutual Insurance Alliance	F. H. Deeg
American Power Boat Association	C. Roberts
	W. A. Smith *(Alt)*
Bell Topex, Incorporated	R. Richter
	F. Heacox *(Alt)*
Cal-Mil Plastic Products, Inc	R. L. Miller
Industrial Safety Equipment Association	Harley N. Trice
	C. Sumwalt *(Alt)*
International Association of Chiefs of Police	W. H. Franey
Buco Company	J. T. Johnson
	D. Webb *(Alt)*
McHal Enterprises	F. F. Welsh
Mine Safety Appliances Company	H. N. Trice
National Association for Stock Car Auto Racing	B. Sall
National Hot Rod Association	J. Hart
National Safety Council	D. Lhotka
	R. Prince *(Alt)*
Sierra Engineering Company	H. P. Heisig
Snell Memorial Foundation	C. O. Chichester
Society of the Plastics Industry, Inc	H. N. Trice
Sports Car Club of America	A. Chapman
	G. G. Snively
U.S. Department of the Army, Quartermaster Research & Engineering Command *(Liaison)*	A. Lastnik
	E. R. Barron *(Alt)*
U.S. Department of the Navy	R. W. Webster
U.S. Naval Aviation	C. L. Ewing
Wayne State University	L. M. Patrick

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American Standard Specifications for

Protective Headgear for Vehicular Users

1. Scope and Purpose

1.1 Scope. These specifications and test methods apply to protective headgear for wear by riders and occupants of vehicles engaged in potentially high hazard activities. This standard specifically excludes eye and face protective devices.

1.2 Purpose. These headgear are designed to mitigate the effects of a blow on the head received in the event of an accident.

1.3 Tests are given to ascertain compliance with the following requirements:

(1) Shock absorption properties of the helmet assembly under various conditions of temperature and humidity

(2) Penetration resistance

(3) Strength of the retaining harness and its attachments.

2. Definitions

For the purpose of these recommendations the following definitions apply:

Basic Plane. A plane at the level of the external auditory meatus and the inferior margin of the orbit. Also referred to as the anatomical plane.

External Auditory Meatus. Refers to the external opening of the ear.

Harness. The complete assembly by means of which the protective headgear is maintained in position on the wearer's head.

Inferior Margin of Orbit. Bottom of the bony rim of the eye opening.

Orbit. The bony rim of the eye socket.

Projection. Any part that juts out or extends beyond the surface in abrupt fashion.

Protective Headgear. A device primarily intended to protect the upper part of the wearer's head against a blow. Some headgear may give protection to additional head areas.

Reference Plane. A plane 2.36 in. (60 mm) above and parallel to the basic (anatomical) plane, which shall be located on each head form.

Shell. The outer material that provides the general form of the headgear.

3. Construction

3.1 General. The construction of the helmet shall be essentially in the form of a shell containing the necessary means of absorbing impact energy. Any optional devices fitted to a shell should be so designed that they are unlikely to cause any injury to the wearer in the event of an accident.

3.2 The assembled helmet shall have a smooth external surface. There should be no external projections greater than $\frac{1}{8}$ in. (3 mm) above the outer surface of the shell of the helmet except a goggle clip, if required.

3.3 The goggle fitting shall project not more than $\frac{3}{16}$ in. (5 mm) above the outer surface of the helmet and be at the back of the helmet. If easily detachable, however, this requirement does not apply.

3.4 Rivet heads shall project not more than $\frac{1}{16}$ in. (1.6 mm) above the outer surface of the helmet and show no sharp edges.

4. Materials

4.1 The materials used in the manufacture of the various parts of a helmet should be of durable quality, i.e., their characteristics should not undergo appreciable alteration under the influence of aging or of the circumstances of use to which the helmet is normally subjected (exposure to sun, rain, cold, dust, vibrations, contact with the skin, effects of sweat, or of products applied to the skin or hair).

4.2 Materials commonly known to cause skin irritation or disease should not be used for those parts of the assembly which come into contact with the skin.

4.3 Materials of a new type shall be subject to study to determine applicability as specified in 4.2.

5. Extent of Protection

The extent of the area of protection shall be as marked on the standard head form with a reference plane line 2.36 in. (60 mm) above the basic plane.

All parts of the helmet above the reference plane shall attenuate shock transmission to at least the minimum

requirements specified in Section 10, Tests for Helmets and Section 11, Penetration Test.

No part of the protective system shall be inadvertently detachable.

6. Sampling for Testing

6.1 For qualification and routine testing, helmets should be taken in the condition as offered for sale.

6.2 In qualification testing the helmets will be required to satisfy all the tests; but when it has been shown by qualification tests that materials are equally protective in performance after exposure to low temperature, moisture, and heat, thereafter for routine testing of specimens consideration should be given to possible relaxation in respect of them by the testing authority, provided there is no change in materials or manufacture.

6.3 Number of Samples. Four helmets are required for qualification testing. Provision shall be made for marking the reference plane on the helmets prior to the test.

7. Conditioning for Testing

7.1 Low Temperature. The helmet shall be conditioned by being exposed to a temperature of −10°C ±2°C for not less than 4 hours, nor more than 24 hours, in a mechanically cooled apparatus.

7.2 Water Immersion. A second helmet shall be immersed in water at a temperature of 25°C ± 5°C for a period of not less than 4 hours, nor more than 24 hours.

7.3 Heat. A third helmet shall be conditioned by being exposed to a temperature of 50°C ± 2°C for a period of not less than 4 hours, nor more than 24 hours.

7.4 All testing shall begin within five minutes from the time of removal from the conditioning equipment as indicated in 7.1, 7.2, and 7.3.

8. Labeling

Every helmet offered for sale shall bear a label which shall include the following statements:

(1) For adequate protection this helmet must fit comfortably and closely, and provide a range of peripheral vision of approximately 120 degrees.

(2) This helmet may be partially destroyed or damaged by a severe blow and even though such damage may not be readily apparent, any helmet subjected to severe impact should be returned to the manufacturer for inspection or should be replaced.

9. Tests for Helmets

9.1 Shock Absorption. Shock absorption shall be measured by imparted acceleration to an appropriately instrumented movable head form, by either of the following means: (1) dropping in guided fall upon a fixed, rigid anvil, or (2) mounted on a freely pivoting arm, and being impacted by an appropriate bobweight dropped in guided fall.

9.2 Acceptable Acceleration Levels

9.2.1 Any peak acceleration exceeding 400 G's shall be cause for rejection of the helmet.

9.2.2 Accelerations between 200 and 400 G's shall be cause for rejection of the helmet if the total time of such acceleration measured at the 200 G level exceeds 2 milliseconds.

9.2.3 Accelerations in excess of 150 G's for more than 4 milliseconds shall be cause for rejection of the helmet.

9.2.4 The acceptable acceleration levels set forth in this section shall apply to ambient temperature impact, low temperature impact, high temperature impact, and water immersion impact tests.

9.3 Each helmet shall be impacted with two identical impacts in not less than four sites. The impact sites shall be above the reference plane (2.1.7), and separated from each other by a distance equal to one-fifth or more of the maximal circumference of the helmet.

9.4 Two steel impacter or anvil configurations shall be used. One shall be flat, the other hemispherical.

9.5 The flat impactor shall have a minimum surface area of 19.6 square inches (127 square centimeters) i.e., 5-inch diameter face; the hemispherical impactor shall have a 1.9-inch (4.8 centimeter) radius.

9.6 An equal number of paired impacts shall be applied with each configuration.

9.7 The test head form shall be of low resonance magnesium alloy (K-1A), and shall weigh 11 + 0.2 − 0.0 pounds (5 kilograms + 0.091 − 0). This weight shall include the supporting arm if testing by dropping upon a rigid anvil [see 9.1(1)]. The same weight shall be used for the impacting bobweight if testing is done according to the pivoting head form system [see 9.1(2)].

9.8 The impact energy utilized shall be 50 foot pounds (7.42 kilogram meters) with the hemispherical anvil face (54 in. or 134 cm drop) and 66 foot pounds (9.8 kilogram meters) with the flat anvil face (72 in. or 183 cm drop) if testing is in accordance with (1) of 9.1.

It shall be 120 foot pounds (17.8 kilogram meters) with the hemispherical striker (131 in. or 332 cm) and 160 foot pounds (23.8 kilogram meters) with a flat striker (175 in. or 443 cm) if testing is in accordance with (2) of 9.1.

10. Penetration Test

10.1 Sufficient exposure of the inner surface of the helmet shell shall be made by removing padding or harness material so as to allow the unpadded shell to rest upon a rigid head form. The head form shall contain a cylindrical cavity 1.77 in. (4.5 cm) in diameter whose vertical axis shall be centered with that of the striking point. This cavity shall contain a means of electrically recording the instantaneous vertical deflection of the inner surface of the shell within 0.394 in. (1 cm) of the axis, and record contact of the striker tip at a point 0.394 in. (1 cm) below the head form outer surface.

10.2 When tested in the above fashion, the maximum allowable vertical deflection shall not exceed 0.394 in. (1 cm), and penetration of the striker tip as recorded by electrical contact at this point shall not occur.

10.3 Conditions of Penetration Test.

10.3.1 The weight of the penetration test striker shall be 6 pounds 10 ounces (3.0 kilograms).

10.3.2 The point of the striker shall have an included angle of 60 degrees.

10.3.3 The radius of the striking point shall be 0.197 in. (0.5 mm).

10.3.4 The hardness of striking tip shall be 60 Rockwell (scale C).

10.3.5 The height of the fall shall be 39.37 in. (1 meter) as measured from the tip of the striker to the outer surface of the test head form.

11. Test of Retaining System

11.1 The helmet shall be placed upon a test head form with the chin strap fastened over a device approximating the shape of the bony structure of the lower jaw. This shall consist of two metal rollers, each $\frac{1}{2}$ in. (1.27 cm) in diameter, at a distance of 3 in. (7.61 cm) separation on center, which would serve to represent the jawbone.

The helmet shall be supported on the head form so that the points of attachment of the chin strap to the helmet will be subject to the same test as the strap itself.

11.2 A 300-pound (136 kilogram) weight or tension equivalent thereto shall be applied to the device retained by the chin strap. The strap and its attachments must support this weight without parting and without greater than 1 in. (2.54 cm) increase in the vertical distance of the chin strap from the helmet crown.

11.3 The test is designed to test the chin strap harness assembly only. If the helmet has a pad-type suspension that will allow the helmet to settle down over the head form, this settling should not be considered in determining elongation of the chin strap. The vertical movement should be recorded with respect to the strap and shell alone. It shall be tested for ultimate strength and for elongation under tension.

12. Preparation of Test Equipment

12.1 All equipment shall be turned on and allowed to warm up for at least 30 minutes or until equilibrium is reached, whichever time is greater, prior to any testing.

12.2 The instrumentation shall be calibrated according to the manufacturer's recommendation prior to and after each series of tests. If the system is out of calibration at the end of a test series, the entire series shall be discarded.

12.3 The entire system shall be checked before and after each series of tests by impacting a standardized section of a rigid foam plastic, and recording the acceleration-time history of the impact. If the acceleration-time history is out of predetermined tolerance, the entire series of tests shall be discarded.

12.4 A record shall be made of each impact and retained as a permanent record of the acceleration-time history.

13. Test Equipment

13.1 Head Form. A standard head form shown in Figs. 1-5 shall be used in all tests.[1]

13.1.1 ***Center of Gravity.*** The center of gravity of the head form including the crossarm shall lie within a cone with axis vertical and forming a 10-degree included angle with the apex at the point of impact.

13.1.2 ***Weight.*** The combined weight of the crossarm and head form shall be 11 + $\frac{2}{10}$-0 pounds (5 kilograms + 0.091 − 0).

13.1.3 ***Acceleration Transducer.*** The acceleration transducer shall be mounted with the sensitive axis aligned to within 5 degrees of the true vertical when the head form is in the impact position.

13.1.4 ***Head Form Size.*** Medium and large size helmets will be tested on a single head form size. Small size helmets of the same type will be approved if visual inspection shows the construction to be identical to those tested.

13.1.5 ***Reference Plane.*** The standard head form,

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[1] It was necessary for the purposes of these recommendations and in order to give requirements for the extent of protection to define an artifical head form, both to serve as a basis for instrumentation during tests, and to provide fixed parameters for measurement. It is realized that the variation of human head shape is such that the artifical head form may not conform exactly to the shape of any random sample human head, a considerable amount of anthropological data has been reviewed in order to decide the limiting dimensions, and the head form selected is considered suitable to provide accurately fitting protective helmets for approximately 95 per cent of the population of all races.

Information concerning sources of an actual head form or pattern thereof may be obtained by a request addressed to Crager Industries, 5829 East Firestone Boulevard, South Gate, Calif. 90280.

on which the basic plane is marked, shall be positioned on a flat surface so that the basic plane is parallel to this surface. The reference plane shall be scribed on the helmet after it has been positioned on the test head so that the lowermost part of the leading edge at the front of the helmet is 2.36 in. (60 mm) above the basic plane.

13.2 Low Temperature Box. A controlled, mechanically-tooled temperature box at least 2 × 2 × 2 feet inside dimensions shall be available with controlled temperature capability of −10°C + 2°C. It shall hold the prescribed temperature for a minimum of 24 hours.

13.3 High Temperature Box. A controlled temperature box at least 2 × 2 × 2 feet inside dimensions shall be available with controlled temperature capability of 50°C + 2°C. It shall hold the prescribed temperature for a minimum of 24 hours.

13.4 Acceleration Transducer. The acceleration transducer shall have a natural frequency of 20,000 cycles per second or greater and be capable of withstanding a 2,000 G's shock without damage.

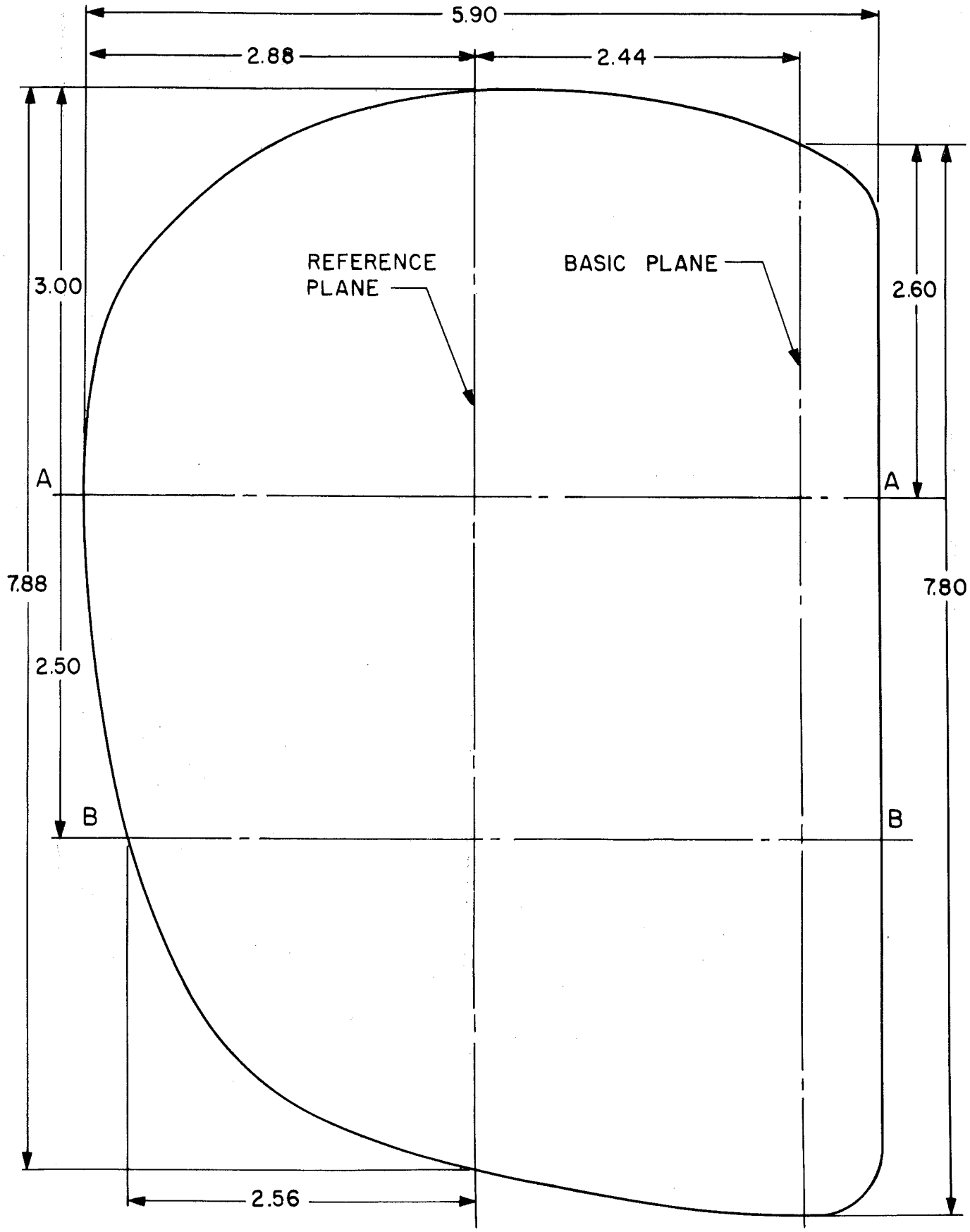

Fig. 1
Contour at ℄
Standard Test Head Form for Vehicular Helmet

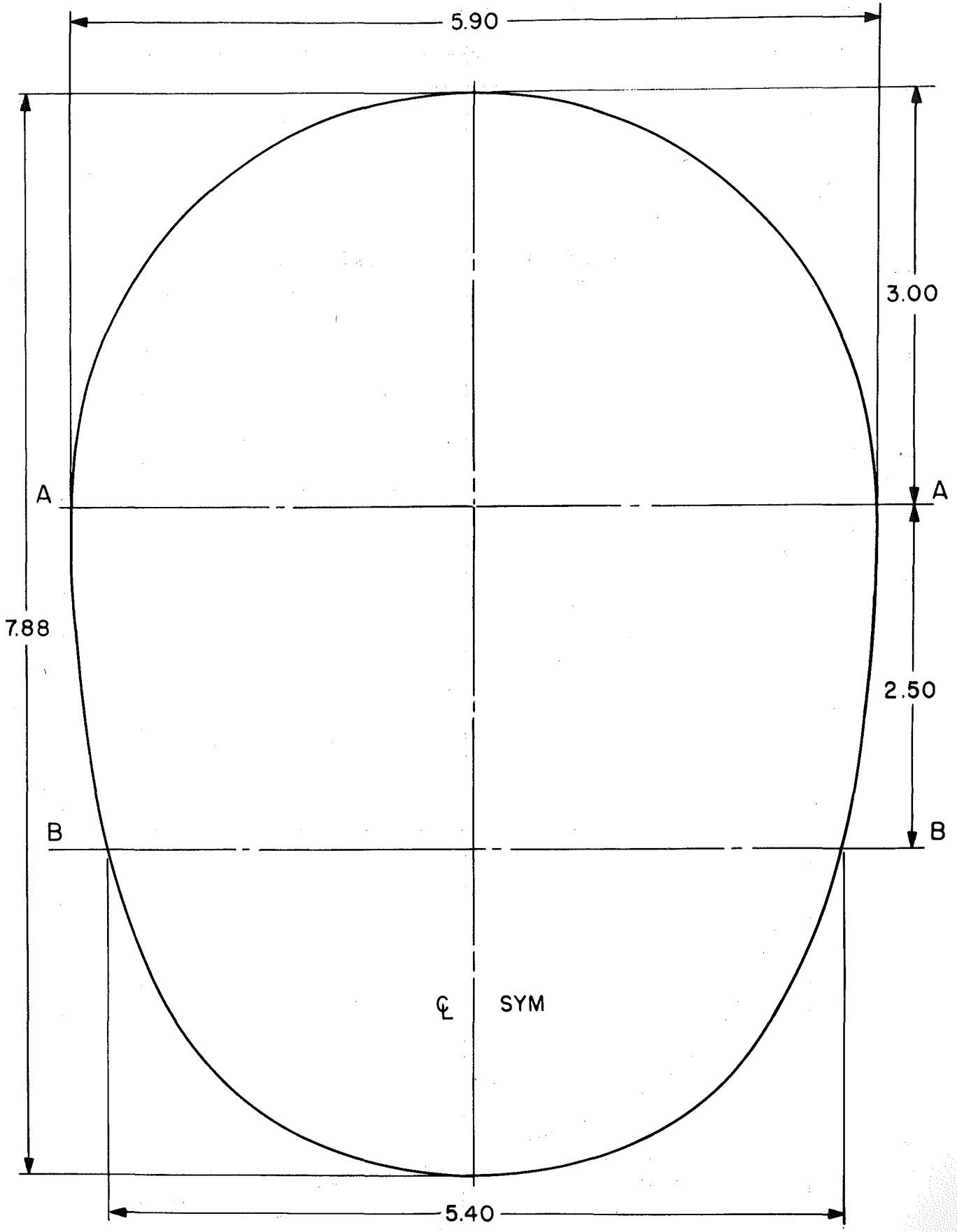

Fig. 2
Contour at Reference Plane
Standard Test Head Form for Vehicular Helmet

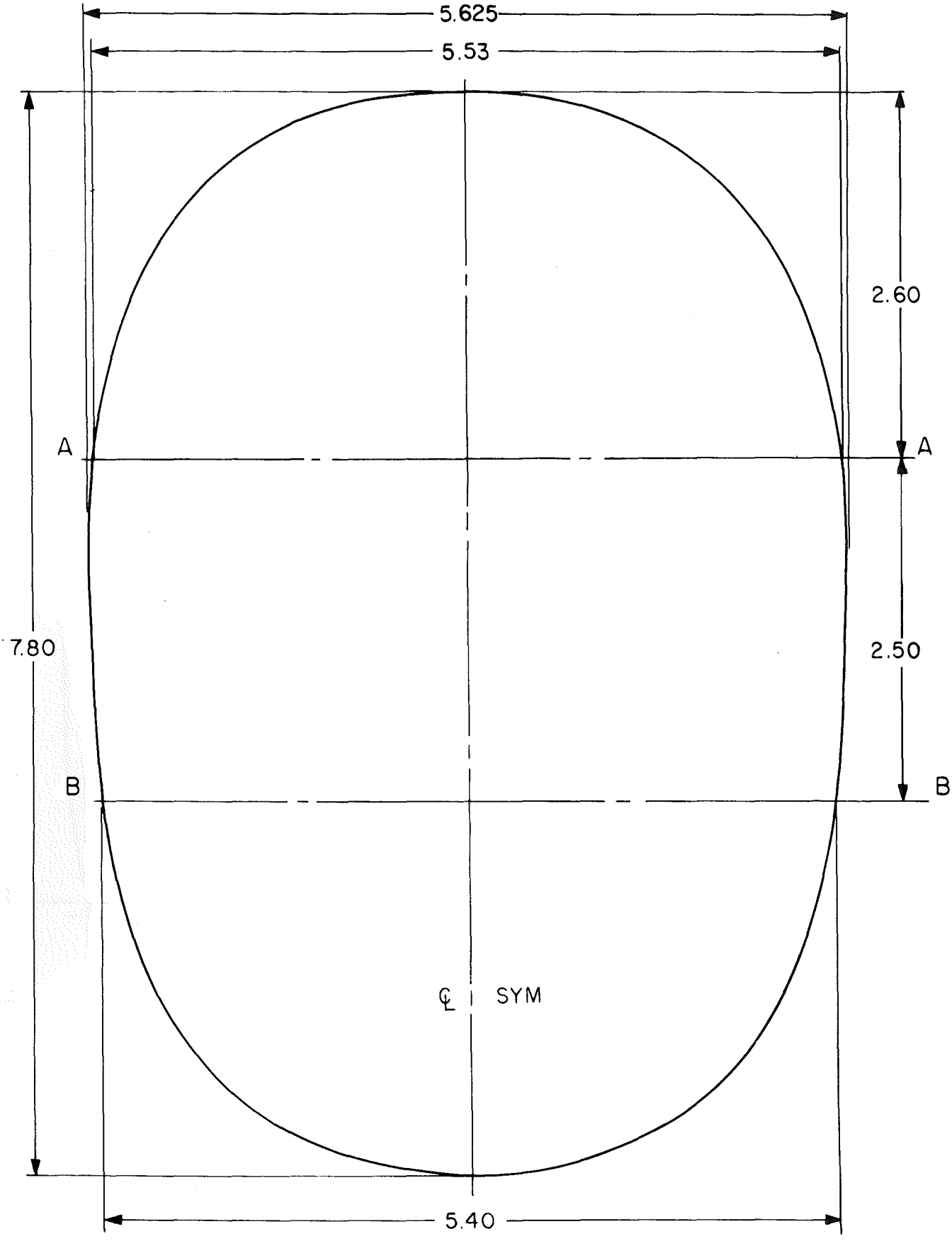

Fig. 3
Contour at Basic Plane
Standard Test Head Form for Vehicular Helmet

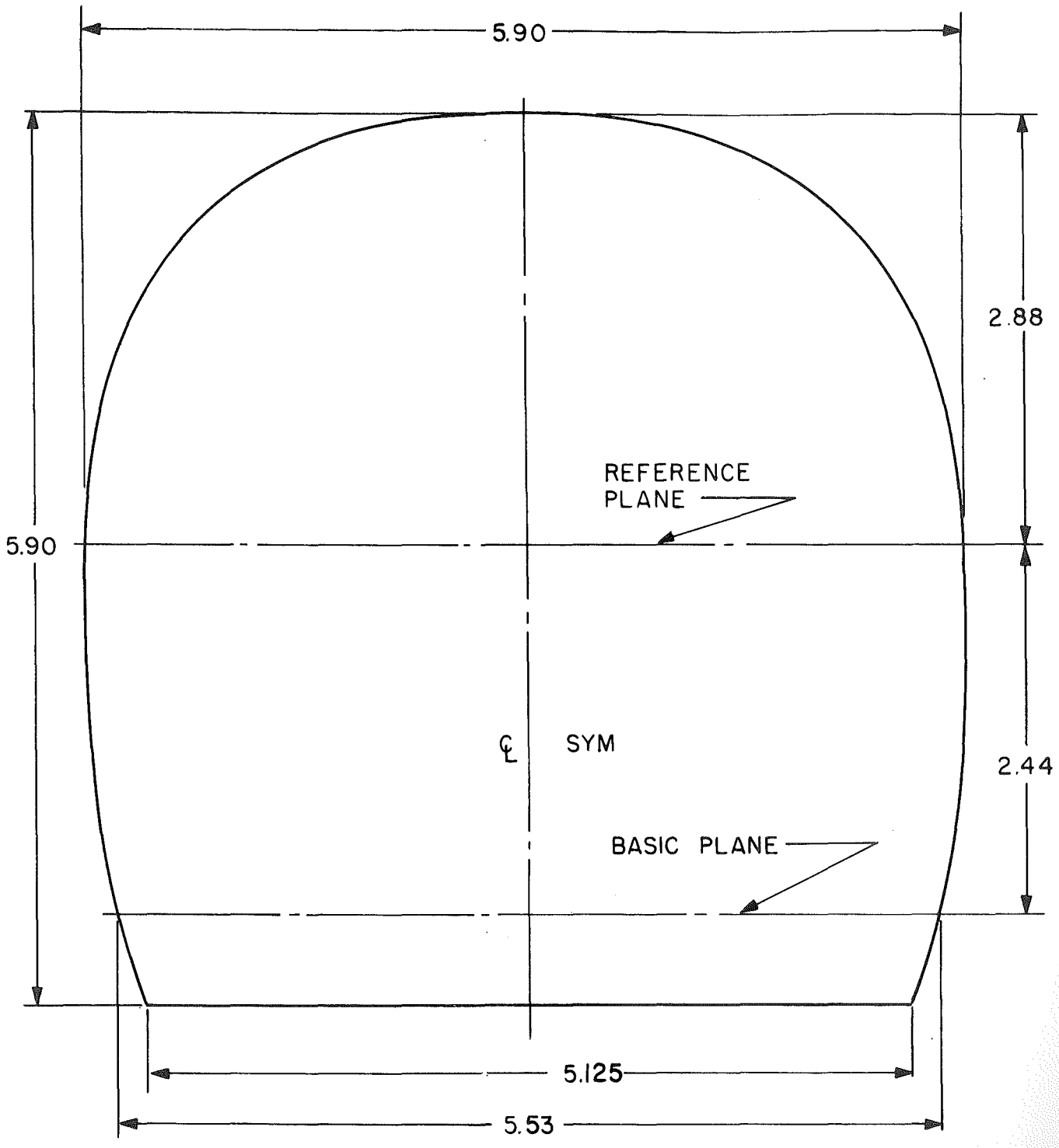

Fig. 4
Contour at Plane A-A
Standard Test Head Form for Vehicular Helmet

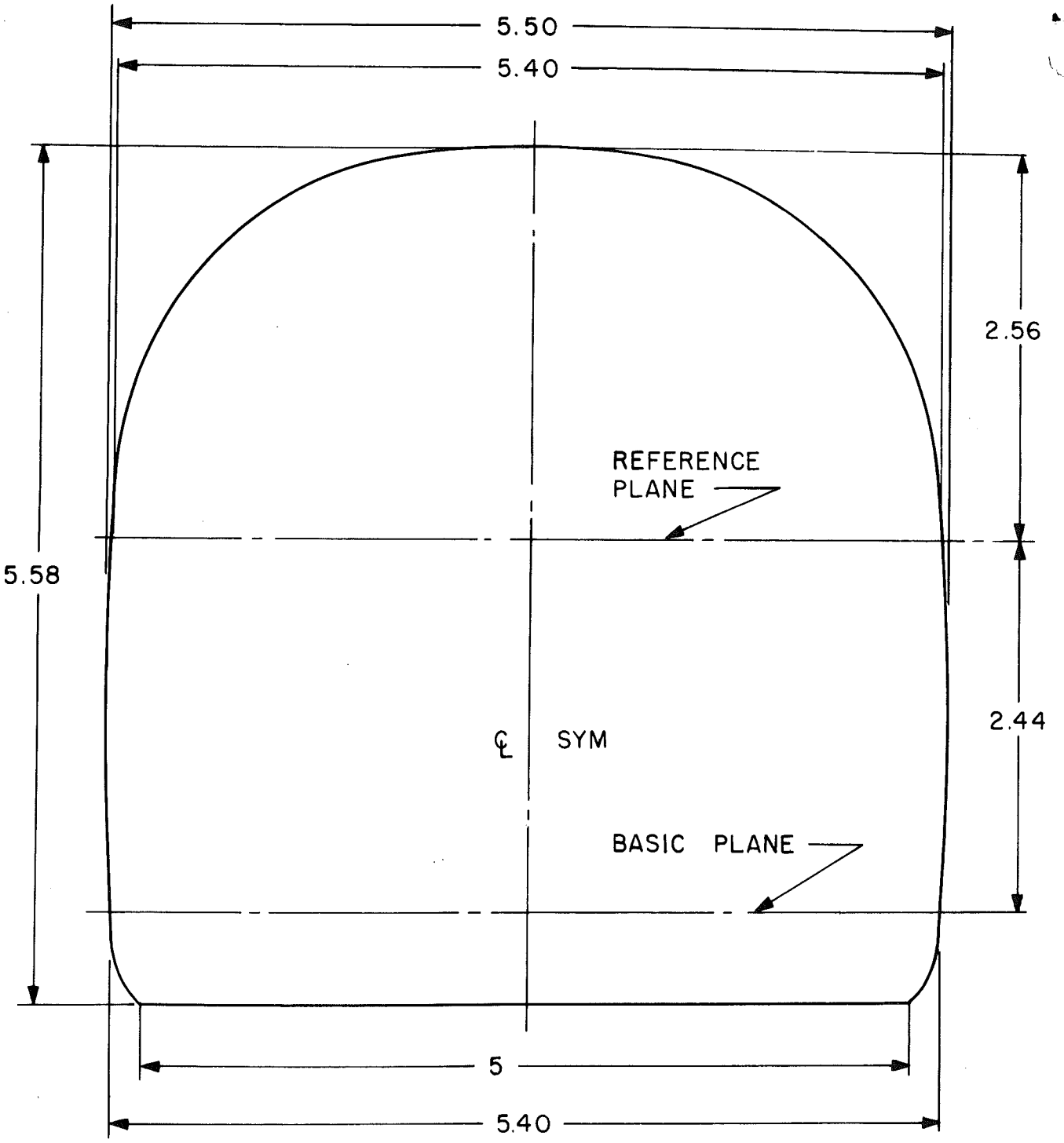

Fig. 5
Contour at Plane B-B
Standard Test Head Form for Vehicular Helmet

AMERICAN STANDARDS

The standard in this booklet is one of over 2,600 standards approved to date by the American Standards Association, Incorporated.

The ASA provides the machinery for creating voluntary standards. It serves to eliminate duplication of standards activities and to weld conflicting standards into single, nationally accepted standards under the designation "American Standards."

Each standard represents general agreement among maker, seller, and user groups as to the best current practice with regard to some specific problem. Thus the completed standards cut across the whole fabric of production, distribution, and consumption of goods and services. American Standards, by reason of ASA procedures, reflect a national consensus of manufacturers, consumers, and scientific, technical, and professional organizations, and governmental agencies. The completed standards are used widely by industry and commerce and often by municipal, state, and federal governments.

The ASA, under whose auspices this work is being done, is the American clearinghouse and coordinating body for standards activity on the national level. Founded in 1918, it is a federation of 135 trade associations, technical societies, professional groups, and consumer organizations. Some 2,000 companies are affiliated with the ASA as company members.

ASA is the United States member of the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC), and the Pan American Standards Commission (COPANT). Through these channels American industry makes its position felt on the international level. American Standards are on file in the libraries of the national standards bodies of more than 50 countries.

For a free list of all American Standards or information about membership in the ASA, write:

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