



Protective helmets for structural firefighting



This Australian Standard® was prepared by Committee SF-049, Firefighters' Personal Protective Equipment. It was approved on behalf of the Council of Standards Australia on 5 April 2012.

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 - Australasian Fire and Emergency Service Authorities Council
 - Australian Chamber of Commerce and Industry
 - Australian Industry Group
 - Council of Textile and Fashion Industries of Australia
 - CSIRO Textile and Fibre Technology
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 - NSW Rural Fire Service Association
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 - Testing Interests (Australia)
 - United Firefighters Union of Australia
 - University of Otago New Zealand
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-

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Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

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Australian Standard®

Protective helmets for structural firefighting

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee SF-049, Firefighters' Personal Protective Equipment, to supersede AS/NZS 4067:2004, *Firefighters' helmets*.

This Standard incorporates Amendment No. 1 (October 2014) and Amendment No. 2 (May 2020). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

A2

Amendment No. 2 to this Standard was prepared by the Australian members of Joint Standards Australia/Standards New Zealand Committee SF-049, Firefighters Personal Protective Equipment. As a consequence of Amendment No. 2, which is published as an Australian-only amendment, the designation of this Standard has been changed from AS/NZS 4067:2012 to AS 4067:2012.

Clauses 5.13 and Q1 in this Standard deviate from SG-006 Clause 34 in that they specify the accreditation of testing laboratories and third party laboratory testing, respectively. This was approved by the Standards Development and Accreditation Committee (SDAC) on 8 November 2019.

It has been the Committee's intention to align this Standard in the future with relevant ISO Standards for firefighters' PPE when these are published. The objective of the current revision is to progress this alignment by adopting test methods from both EN 443 and NFPA 1971 in place of, or additional to, former requirements.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a Standard, whereas an 'informative' appendix is only for information and guidance.

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STANDARDS AUSTRALIA

Australian Standard
Protective helmets for structural firefighting

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies requirements for helmets designed to protect the head from a blow by a heavy or sharp object, as well as adverse environmental conditions likely to be encountered in structural firefighting.

A2 | This Standard specifies performance criteria for faceshields, ear and neck protectors where these are fitted to the helmet. Other accessories performance criteria are not covered by this Standard.

Requirements for aftermarket accessories are given in Appendix Q.

Those organizations responsible for other specialist functions, e.g. bush firefighting, are urged to use protective equipment specifically designed for these activities, e.g. Type 3 helmets specified in AS/NZS 1801.

1.2 OBJECTIVE

The objective of this Standard is to specify helmets that are to be worn for structural firefighting in order to reduce the severity of head and facial injury associated with such activities.

1.3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

- | | |
|--------|---|
| 1815 | Metallic materials—Rockwell hardness test |
| 1815.1 | Test methods (Scales A, B, C, D, E, F, G, H, K, N, T) |
| 2755 | Textile fabrics—Burning behaviour |
| 2755.1 | Part 1: Determination of ease of ignition of vertically oriented specimens |
| 2755.2 | Part 2: Measurement of flame spread properties of vertically oriented specimens |

AS/NZS

- | | |
|--------|---|
| 1337 | Personal eye protection |
| 1337.0 | Part 0: Eye and face protectors—Vocabulary |
| 1337.1 | Part 1: Eye and face protectors for occupational applications |
| 1698 | Protective helmets for vehicle users |
| 1801 | Occupational protective helmets |
| 1906 | Retroreflective materials and devices for road traffic control purposes |
| 1906.1 | Part 1: Retroreflective sheeting |
| 2512 | Methods of testing protective helmets |
| 2512.1 | Method 1: Definitions and headforms |
| 2512.2 | Method 2: General requirements for the conditioning and preparation of test specimens and laboratory conditions |

- 2512.3.1 Method 3.1: Determination of impact energy attenuation—Helmet drop test
 2512.5.1 Method 5.1: Determination of strength of retention system—Static strength

AS/NZS

- 2512.7.1 Method 7.1: Determination of stability of protective helmets—Static stability
 2512.9 Method 9: Determination of load distribution

AS ISO/IEC

- A2 | 17011 Conformity assessment—Requirements for accreditation bodies accrediting conformity assessment bodies
 17025 General requirements for the competence of testing and calibration laboratories

- A2 | AS/NZS ISO
 31000 Risk management—Guidelines

ISO

- 6487 Road vehicles—Measurement techniques in impact tests—Instrumentation
 15025 Protective clothing—Protection against heat and flame—Method of test for limited flame spread
 17493 Clothing and equipment for protection against heat—Test method for convective heat resistance using a hot air circulating oven

ASTM

- B152 Standard specification for copper sheet, strip, plate and rolled bar

BS

- 6809 Method for calibration of radiometers for use in fire testing

EN

- 136 Respiratory protective devices—Full face masks—Requirements, testing, marking
 443 Helmets for fire fighting in buildings and other structures

NFPA

- 1971 Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting

SAE

- J211 Instrumentation for impact test—Part 1: Electronic Instrumentation

1.4 DEFINITIONS

- A2 | For the purpose of this Standard, the definitions given in AS/NZS 2512.1 and AS/NZS 1337.0, and the following apply:

1.4.1 Accessory

Additional item that may be attached to an item of personal protective equipment (PPE), but is not necessary to fulfil all the requirements of this Standard. For a helmet, the accessory may be permanently attached to the helmet (e.g. bracket) or not permanently attached to the helmet (e.g. torch, earmuffs, etc.).

1.4.2 Shall

Indicates that a statement is mandatory.

1.4.3 Should

Indicates a recommendation.

SECTION 2 MATERIALS OF CONSTRUCTION

Except as specifically provided for in this Standard, the characteristics of the materials used in the manufacture of helmets shall be suitable for the purpose.

NOTE: Recommendations for characteristics of suitable materials are given in Appendix A.

SECTION 3 DESIGN AND CONSTRUCTION

3.1 GENERAL

3.1.1 Helmet construction

Helmets for structural firefighting shall consist of a shell, an energy absorbing system, a retention system, retroreflective markings, ear and neck covers, and a faceshield.

NOTE: The manufacturer of helmets should be able to demonstrate compliance with this Standard.

3.1.2 Internal projections

A1

Projections on the internal surface of the shell above the test line shall be covered with protective padding and shall not be greater than 5 mm in height, measured from the nominal internal surface of the shell. Internal projections may be recessed (see Figure 3.1) to reduce or remove the amount of projection past the nominal internal surface.

Projections above the test line shall be impacted directly over the site of the internal projection in accordance with Appendix H and shall be assessed that the projection has not made contact with the headform.

All rigid internal projections below the test line and above the reference plane shall not be greater than 5 mm as shown in Figure 3.1 and shall not contact the wearer when the helmet is worn in the correct manner as specified by the manufacturer.

NOTE: Rigid internal projections include items associated with the helmet assembly (e.g. nuts).

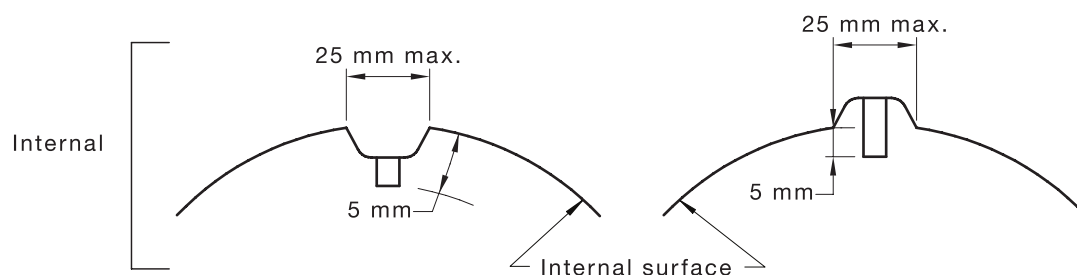


FIGURE 3.1 NOMINAL INTERNAL PROJECTION MEASUREMENT

3.2 SHELL

3.2.1 Shell construction

The shell shall be smoothly finished and be of uniform strength and thickness as far as is practicable. All exposed edges of the helmet shell and its associated hardware shall be radiused.

3.2.2 Shell conspicuity

The helmet shall have retroreflective markings fitted on the shell exterior. A minimum of 26 cm² of the markings shall be visible when the helmet is viewed from any angle at or above the reference plane. A material which combines both the fluorescent and retroreflective properties may be used. Care should be exercised when selecting marking materials to ensure they will not degrade the helmet shell.

NOTE: Darker colours, e.g. black, may be generally less conspicuous than others.

3.2.3 Retroreflective material

The retroreflective materials intended for application to the shell exterior shall have a coefficient of luminous intensity per square metre (CIL/m²) of not less than 85 candela per lux per square metre (cd/lux/m²) when measured in accordance with AS/NZS 1906.1, with an observation angle of 0.2° and an entrance angle of -4°.

3.3 RETENTION SYSTEM

3.3.1 General

The retention system should be constructed so that when properly fastened, the helmet cannot be dislodged from its normal position on the wearer's head when tested in accordance with Clause 5.8.3. The chinstrap system shall meet the requirements of Clause 5.8.1.

3.3.2 Chinstrap

The width of material employed which comes into direct contact with the wearer shall be not less than 19 mm.

3.3.3 Chinstrap release

It should be possible for the wearer to remove the helmet by releasing the chinstraps, using one hand wearing a structural firefighting glove.

3.3.4 Liner, cradle and headband assembly

The harness, when correctly adjusted, should fit securely to the wearer's head.

The size or range of sizes of the harness shall be marked in accordance with Clause 6.1.

NOTE: Attention is drawn to the wide range of head sizes of people in the workforce (size 61/8 = 50 cm circumference and size 75/8 = 64 cm circumference). Accordingly, it is desirable to produce an adjustable harness or a range of harness sizes to ensure a correct and comfortable fit.

Where a sweatband is fitted it shall be not less than 25 mm in width for a length of 100 mm either side of the centre of the forehead. The remainder shall be not less than 12 mm in width. The sweatband shall be replaceable.

If the sweatband is integral with the harness, the harness shall be replaceable.

Where fitted, a nape strap shall—

- (a) be adjustable in increments of not more than 5 mm; and
- (b) have no protrusions on the inside of the strap which exceeds 2 mm.

3.4 FACESHIELD

A1

Helmets for structural firefighting shall be equipped with a faceshield that complies with the requirements of Clause 5.9. The faceshield shall extend a minimum of 43 mm below the basic plane when the helmet is adjusted to the headform in accordance with the manufacturer's instructions and 45° to each side of the mid-sagittal plane from the convergence of the mid-sagittal and coronal planes as deployed on the helmet. The faceshield shall be marked as specified in Clause 6.3.

3.5 EAR AND NECK PROTECTION

The helmet shall be designed to protect the wearer's ears and neck from heat. This may be achieved by—

- (a) having protectors integral with the helmet shell; or
- (b) providing for the attachment of ear and neck protectors.

Ear and neck protectors shall comply with the performance requirements of Clause 5.10.

NOTE: Ear and neck protectors may be combined.

3.6 HELMET ACCESSORIES AND ASSOCIATED EQUIPMENT

3.6.1 General

A2

The addition of helmet accessories shall not degrade the helmet performance below the performance requirements of this Standard. Any accessories that are permanently affixed to the helmet, e.g. helmet brackets, shall be considered as part of the helmet itself for the purpose of testing.

NOTE: A risk assessment should be conducted in accordance with AS/NZS ISO 31000.

3.6.2 Additional personal protective devices

The design of helmets to facilitate the simultaneous wearing of eye protectors, hearing protectors, and self-contained breathing apparatus (SCBA) should not adversely affect the performance of the helmet or the operation of any of its components.

3.6.3 Associated equipment

Other equipment that is associated with the use of the helmet, e.g. electronic communications equipment, should not adversely affect the performance of the helmet or the operation of any of its components.

SECTION 4 TEST SAMPLES AND CONDITIONING

4.1 GENERAL

Eleven helmets including replacement parts shall be supplied for testing purposes. The helmets shall be of one size and in the condition as offered for sale.

Helmets which have been subjected to any test described in this Standard shall be suitably marked and shall not be used or offered for sale.

Table 4.1 lists the test methods in sequence and specifies which sample helmet is to be tested and under what conditions the test is conducted. Clause 4.3 specifies the characteristics of each condition.

4.2 TEST SAMPLES

4.2.1 Helmets

The eleven sample helmets (A to K) shall be conditioned in accordance with Clause 4.3, with the exception of Helmet A for flame resistance, and tested in the order set out in Table 4.1. Tests shall be carried out on helmets without fitted accessories unless the accessories are part of the test. Once accessories are removed, the test authority shall not replace them.

A1 | Where the internally-mounted faceshield is an integral part of the helmet, it shall be deployed to in-use position without interfering with the test equipment before commencing the test.

Sample I shall be tested for penetration resistance to Clause 5.7 after durability and high temperature conditioning in accordance with Clause 4.3.3(a) with all its accessories fitted. It shall then be conditioned again to the same temperature as before and tested as required in Clause 5.9(b). In the event the faceshield is internally-mounted in the helmet, it shall be deployed to in-use position to enable conditioning to take place. For this sample, penetration resistance testing shall be carried out only once and only on the top test area. See Figure N1.

All helmets except A, J and K are subjected to durability conditioning as described in Appendix G, prior to conditioning.

Where accessory mounting devices are permanently fixed to the shell, the helmet shall be tested in that configuration, e.g. torch bracket and ear muff bracket.

Sample I shall be initially tested for penetration resistance to Clause 5.7 after durability and high temperature conditioning in accordance with Clause 4.3.1 with all its accessories fitted. It shall then be conditioned as required for high temperature faceshield conditioning as in Clause 4.3.3(a), and tested as required in Clause 5.9(b). For this sample, penetration resistance testing shall be carried out only once and only on the top test area. See Figure H2.

NOTE: It is intended that helmets continue to be tested in sequence, even if they are damaged, until they fail a test.

An additional faceshield sample may be used to test the requirements of Clause 5.9(d).

4.2.2 Replacement parts

One complete set of replacement parts shall be supplied in the same condition as offered for sale.

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TABLE 4.1
ALLOCATION OF SAMPLE HELMETS

Test order	Characteristic to be tested	Clause	Helmet and face shield conditioning (see Clauses 4.3.1 and 4.3.3)						
			Temperature			Wet	Solvent	Radiant heat	Faceshield high temp.
			High	Low	Room				
1	Electrical insulation	5.1	-	-	A	-	-	-	-
2	Flame propagation	5.2	-	-	A	-	-	-	-
3	Convective heat exposure	5.3	-	-	B	-	-	-	-
4	Radiant heat exposure	5.4	-	-	C	-	-	-	-
5	Mechanical rigidity	5.12	-	-	J	-	-	-	-
6	Faceshields	5.9	-	F	E	G	-	-	I
7	Impact energy (attenuation)	5.5	E	F	-	G	D	H	-
8	Horizontal peripheral vision	5.11	-	K	-	-	-	-	-
9	Impact resistance (force)	5.6	-	K	-	-	-	C	-
10	Penetration resistance	5.7	E/I	F	C	G	D	-	-
11	Retention system (chinstrap)	5.8	E	F	B	G	D	-	-
12	Ear and neck protectors	5.10	-	F	-	G	-	-	-

4.3 CONDITIONING

4.3.1 Helmet conditionings

4.3.1.1 Durability conditioning

All helmets except Helmet A (see Table 4.1) shall be subject to the durability conditioning described in Appendix G prior to conditioning. For Helmet A, the durability conditioning shall be done between Tests 1 and 2 of Appendix C.

4.3.1.2 Conditioning

The conditioning categories set out in Table 4.1 indicate that test samples shall be conditioned prior to testing as follows:

- (a) *High temperature*—at a temperature of $50 \pm 2^\circ\text{C}$ for not less than 14 h and not more than 24 h unless otherwise indicated.
- (b) *Low temperature*—at a temperature of $-10 \pm 2^\circ\text{C}$ for not less than 14 h and not more than 24 h.
- (c) *Room temperature*—at a temperature of $25 \pm 5^\circ\text{C}$ for not less than 2 h.
- (d) *Wet*—total immersion in water at a temperature of $25 \pm 5^\circ\text{C}$ for not less than 2 h and not more than 8 h.

- (e) *Solvent*—at room temperature in accordance with the solvent conditioning requirements of AS/NZS 2512.2. Shells manufactured from fibre-reinforced materials are exempt from this requirement.
- (f) *Radiant heat*—In accordance with Appendix M.

4.3.2 Helmet testing time limits

After conditioning as in Clause 4.3.1, testing of the helmet shall be completed within the following times (except for retention system testing):

- (a) *High temperature*—within 1 min.
- (b) *Low temperature*—within 1 min.
- (c) *Room temperature*—within 1 min.
- (d) *Radiant heat*—within 20 s.
- (e) *Wet*—within 10 ± 1 min.
- (f) *Solvent*—within 60 min, but not before 30 min have elapsed after conditioning to allow for evaporation of the solvent, and for ample time for chemical degradation of the shell to take place.

Each of the retention system tests at different temperature (Items (a) to (d)) shall be completed within 3.5 min.

After completing each temperature test (Items (a) to (d)), the helmet shall be returned to the conditioning environment.

If, during testing, the time out of the conditioning environment specified in Items (a) to (d) for a helmet exceeds the specified time, the helmet shall be returned to the conditioning environment for a minimum of 15 min, or 3 min for each 1 min out of the conditioning environment, whichever is greater, before testing is resumed. The total time of re-conditioning need not be greater than 2 h.

If the testing is not completed within the times specified in Items (e) and (f) the helmet shall be reconditioned in accordance with Clause 4.3.1.

4.3.3 Faceshield conditioning

Sample faceshields which are to be tested shall be subjected to the following conditioning:

- (a) *High temperature*—at a temperature of $107 \pm 2^\circ\text{C}$ for not less than 20 min and not more than 30 min.
- (b) *Low temperature*—at a temperature of $-10 \pm 2^\circ\text{C}$ for not less than 2 h and not more than 2.5 h.
- (c) *Room temperature*—at a temperature of $25 \pm 5^\circ\text{C}$ for not less than 2 h.
- (d) *Wet*—total immersion in water at a temperature of $25 \pm 5^\circ\text{C}$ for not less than 2 h and not more than 2.5 h.

4.3.4 Faceshield testing time limits

After conditioning in each of the environments in Clause 4.3.3, testing of the faceshield shall be completed within the following times:

- (a) *High temperature*—within 1 min.
- (b) *Low temperature*—within 1 min.
- (c) *Room temperature*—within 1 min.
- (d) *Wet*—within 10 min.

After completing each temperature test (Items (a) to (c)), the helmet shall be returned to the conditioning environment.

If, during testing, the time out of the conditioning environment for a helmet exceeds 1 min, the helmet shall be returned to the conditioning environment for a minimum of 15 min, or 3 min for each 1 min out of the conditioning environment, whichever is greater, before testing is resumed. The total time of re-conditioning need not be greater than 2 h.

If testing is not completed within the specified times, the faceshield shall be re-conditioned in accordance with Clause 4.3.3.

SECTION 5 PERFORMANCE REQUIREMENTS

5.1 ELECTRICAL INSULATION

When helmets are tested to both Tests 1 and 2 in accordance with Appendix C, the leakage current electrical discharge or electrical flashover shall not exceed 3 mA, and there shall be no electrical discharge from the material or flashover at the edge or rim of the helmet.

5.2 FLAME PROPAGATION

When helmets, including protective edging and faceshield, are tested in accordance with Appendix D, the material shall show no visible flame or glow 5 s after removal of the test flame.

Helmets previously tested to Appendix C shall be wiped dry on the inside of the helmet prior to testing to Appendix D.

5.3 CONVECTIVE HEAT EXPOSURE

A helmet tested in accordance with Appendix E with faceshield in the stowed position shall meet the following requirements:

- (a) No part of the helmet shell or faceshield shall touch the headform.
- (b) No shell distortion in the posterior portion of the headform shall extend more than 40 mm below the original position of the helmet.
- (c) No distortion of the anterior and lateral portions of the helmet shall extend more than 30 mm below the original position of the helmet.
- (d) No charring, melting, dripping or separating of the chinstrap retention system and harness materials shall occur that causes the retention system to no longer meet the requirements of Clause 5.8.1 at least 24 hours after completion of this test.
- (e) No ignition of any part of the helmet assembly shall occur.

5.4 RADIANT HEAT EXPOSURE

When the helmet is tested in accordance with Appendix F using a heat source set to 7.0 kW/m², the temperature inside the helmet on the surface of the headform shall not rise by more than 10°C above the ambient temperature. No part of the helmet shall melt to such a degree as to cause dripping of material. Additionally, any openings such as for ventilation shall be tested separately and shall meet the temperature rise limit given in this Clause.

Following exposure to the radiant heat source, the helmet shall be tested to impact resistance (force) per Appendix N after a period of at least 4 h, i.e. at room temperature on the side that has been exposed to the radiant panel and comply with Clause 5.6.

5.5 IMPACT ENERGY ATTENUATION (ACCELERATION METHOD)

When the helmet is tested in accordance with Appendix H, the headform acceleration shall not exceed the following:

- (a) Maximum peak acceleration (front, sides, back)..... 300g.
- (b) Maximum peak acceleration (top)..... 150g.

In addition, the cumulative duration of acceleration shall not exceed—

- (i) 3.0 ms for accelerations greater than 200g; and
- (ii) 6.0 ms for accelerations greater than 150g.

Faceshields and neckflaps need not be attached for this test. None of the protective components of the helmets shall become detached during the impact attenuation performance tests.

5.6 IMPACT RESISTANCE (FORCE TRANSMISSION METHOD)

When a helmet is tested by the method described in Appendix N, the force transmitted to the headform shall not exceed 15 kN.

5.7 PENETRATION RESISTANCE

When helmets are tested in accordance with Appendix I, the point of the striker shall not make contact with the headform.

5.8 RETENTION SYSTEM

5.8.1 Strength of chinstrap system

When the chinstrap system of each helmet is subjected to a preliminary force of 225 ± 5 N applied for 30 s and then to an additional force of 275 ± 5 N applied for 120 s in accordance with AS/NZS 2512.5.1, the chinstrap system or its attachments shall not separate, and the elongation between the preliminary load and the test load shall not exceed 38 mm.

If the chinstrap system consists of components which can be independently fastened without securing the complete assembly, each component shall independently comply with the requirements of this Clause.

5.8.2 Burning behaviour of chinstrap

When tested for burning behaviour, samples of the chinstraps shall meet or exceed the following requirements:

- (a) The ignition time shall be not less than 20 s when tested in accordance with AS 2755.1.
- (b) Flame spread time shall be not less than 20 s from the start of the application of the igniting flame to the severance of the first marker thread when tested in accordance with AS 2755.2.

NOTES:

- 1 Samples of actual chinstrap assemblies may be used in place of test samples of dimensions nominated in AS 2755.1 and AS 2755.2. For the test in AS 2755.1, how the laboratory chooses to modify the test material (e.g. by stapling or sewing together pieces of sample material) should be noted in the test report. For testing to AS 2755.2, chinstraps should be at least 560 mm in length by the widest width of chin straps used on the helmet.
- 2 The chinstrap retention and release mechanisms and strap 'Free End' retention means (components) are excluded from this test requirement when the ear and neck protectors either—
 - (a) shield the wearer's face from these components; or
 - (b) shield these components from sources of ignition.

5.8.3 Helmet stability

When tested in accordance with AS/NZS 2512.7.1, using a force of 50 ± 0.5 N for a period of not less than 15 s and not greater than 30 s, the helmet shall neither completely expose nor completely obscure the test band.

5.9 FACESHIELDS

Faceshields shall comply with the following requirements:

- (a) *Burning behaviour*—When tested in accordance with Appendix J, the material of the faceshield shall show no visible flame or glow 5 s after removal of the burner.
- (b) *Impact resistance*—Faceshields conditioned in accordance with Clause 4.3.3 and tested in accordance with each test in Appendix K, shall be considered to have failed—
 - (i) if the faceshield cracks through its entire thickness into two or more pieces;
 - (ii) if more than 5 mg of the faceshield material becomes detached from a part of the faceshield surface, remote from the part struck by the ball;
 - (iii) if the ball passes through the faceshield;
 - (iv) if contact is made between the faceshield and the contact sensor (in Test 1); or
 - (v) if contact is made between the faceshield and the eye of the headform (in Tests 2 and 3).
- (c) *Resistance to hot solids*—When tested in accordance with Appendix L, complete penetration shall not occur within a period of 5 s of the hot steel ball contacting the sample faceshield.
- (d) *Transmittance and refractive properties and scratch resistance*—Faceshields shall—
 - (i) meet the appropriate requirements of Table 5.1;
 - (ii) meet the appropriate refractive power requirements of AS/NZS 1337.1; and
 - (iii) have a delta haze value less than 25% when measured in accordance with Clause 8.23 of NFPA 1971:2007.

TABLE 5.1
TRANSMITTANCE REQUIREMENTS FOR FACESHIELDS

Type of ocular/filter	Luminous transmittance (τ_c) %	Minimum spectral transmittance for wavelengths 470 nm to 650 nm	Minimum relative visual attention for signal light detection (Q)			
	Min.		Red	Yellow	Green	Blue
Tinted	43.0	$0.20\tau_v$	0.80	0.80	0.80	0.80
Untinted	80.0					

NOTES:

- 1 Values are to be determined using the methods described in AS/NZS 1337.1.
- 2 The coloration limits are intended to exclude oculars/filters which may affect the detection or recognition of colours including colour signals.

- A1 | (e) *Contact with liquid chemicals*—When tested against the chemicals listed in Table 5.2 in accordance with Appendix B, the faceshield shall demonstrate no visible damage to the assembly and continue to meet the requirements of Clause 5.9, Items (a) and (b).

TABLE 5.2
LIST OF TEST CHEMICALS FOR RESISTANCE
TESTING OF VISOR ASSEMBLIES

Chemical	Concentration (w/v%)
Sulphuric acid	30 (aqueous)
Sodium hydroxide	10 (aqueous)
Butan-1-ol	undiluted
n-heptane	undiluted

5.10 EAR AND NECK PROTECTORS

5.10.1 Limited flame spread

When tested in accordance with ISO 15025, Procedure A (Surface ignition) and B (Bottom-edge ignition) and the material shall be subjected to flame for 10 s and the following shall be observed:

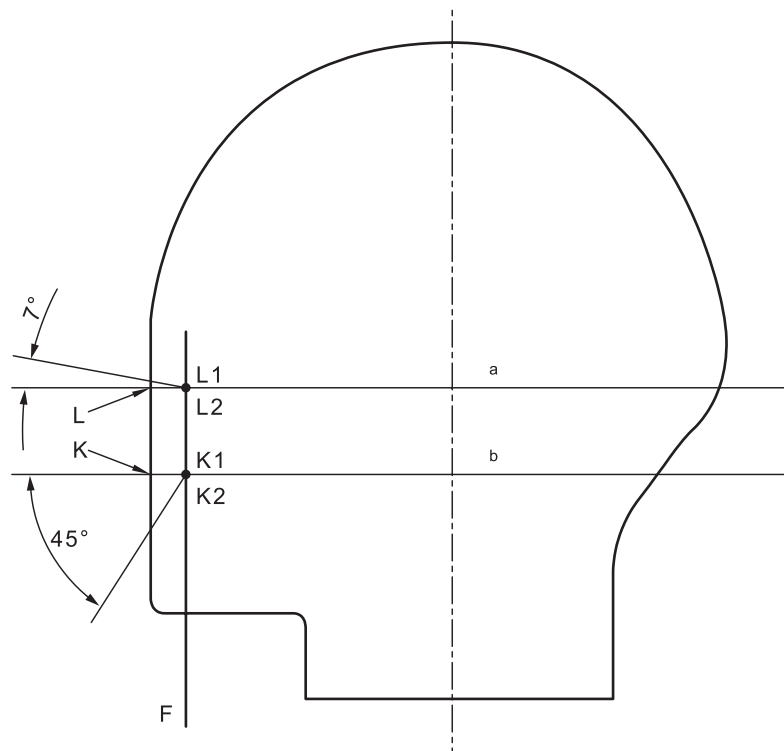
- (a) No specimen shall give hole formation.
- (b) No specimen shall give molten or flaming debris.
- (c) The mean after-flame time shall be ≤ 2 s.
- (d) The mean afterglow time shall be ≤ 2 s.
- (e) No afterglow shall spread beyond the flame spread area into the undamaged area.

Observation (a) is exempted from Procedure B assessment.

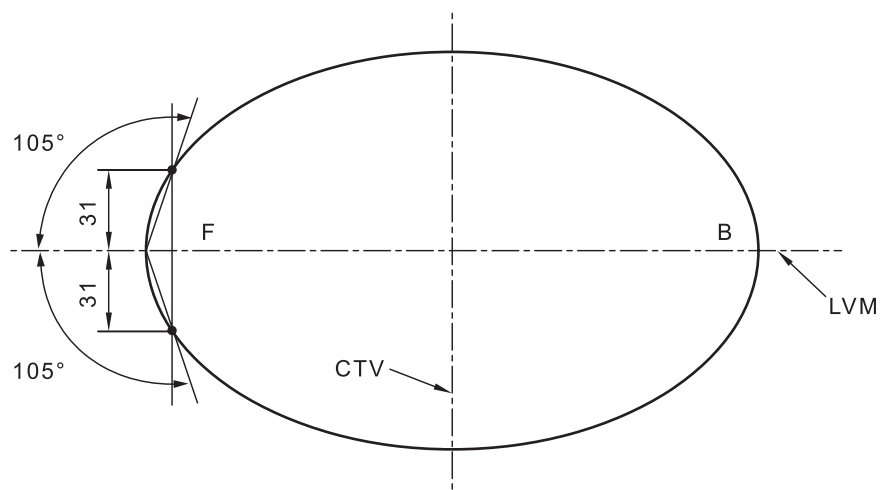
5.11 HORIZONTAL PERIPHERAL VISION

When a helmet is adjusted on a headform meeting the requirements of AS/NZS 2512.1, marked in accordance with Figure 5.1, and laden with a ballast having a mass of 5.0 ± 0.5 kg, the wearer's field of vision is measured and shall correspond to the following angles:

- (a) A dihedral angle of at least 105° measured horizontally between L and K on each side of the sagittal plane which passes through point L.
- (b) An upper dihedral angle greater than 7° above the reference plane and which is defined by the straight line passing through L1–L2.
- (c) A lower dihedral angle greater than 45° under the basic plane and which is defined by the straight line passing through K1–K2 situated on the surface of the headform as 31 mm on each side of point K.



a) Section of headform at longitudinal vertical median plane



b) Section of headform at the reference plane

LEGEND:

CTV: Central transverse vertical plane

LVM: Longitudinal vertical median plane

F: Front

B: Back

DIMENSIONS IN MILLIMETRES

FIGURE 5.1 FIELD OF VISION**5.12 MECHANICAL RIGIDITY**

When a helmet is tested by the method described in Appendix O, the maximum transverse and longitudinal deformations of the helmet shall not exceed 40 mm. The residual deformations shall not exceed 15 mm.