

Australian/New Zealand Standard™

**Protective footwear for firefighters—
Requirements and test methods
(EN 15090:2012, MOD)**

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CSIRO Textile and Fibre Technology
Department of Defence, Australia
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Australian/New Zealand Standard™

Protective footwear for firefighters— Requirements and test methods (EN 15090:2012, MOD)

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PREFACE

This Standard was prepared by the Joint Standards Australia/New Zealand Committee SF-049, Firefighters PPE, to supersede AS/NZS 4821:2006, *Protective footwear for firefighters—Requirements and test methods*.

The objective of this Standard is to provide minimum performance requirements for firefighters' footwear intended for firefighting and associated activities to enable the manufacture and selection of footwear that does not melt or ignite when exposed to flame or risks to which firefighters may be exposed.

This Standard is an adoption with national modifications and has been reproduced from EN 15090:2012, *Footwear for firefighters*, and has been varied as indicated to take account of Australian/New Zealand conditions. The modifications are specified in Appendix ZZ.

It is the Committee's intention that consideration will be given to having this Standard withdrawn when both ISO Standards, *Wildland firefighting personal protective equipment—Requirements and test methods*, (ISO 16073:2011) and *PPE for firefighters—Test methods and requirements for PPE used by firefighters who are at risk of high heat exposures and flame engulfment while fighting fires in structures*, (part of the ISO 11999 series) are published and adopted as Australian/New Zealand Standards.

As this Standard is reproduced from an International Standard, the following applies:

- (a) In the source text 'this European Standard' should read 'this Australian/New Zealand Standard'.
- (b) A full point substitutes for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

<i>Reference to International Standard</i>	<i>Australian/New Zealand/New Zealand Standard</i>
ISO	AS/NZS
6942 Protective clothing—Protection against heat and fire—Method of test: Evaluation of materials and material assemblies when exposed to a source of radiant heat	4502 Methods for evaluating clothing for protection against heat and fire 4502.1 Part 1: Evaluation of thermal behaviour of materials and material assemblies when exposed to a source of radiant heat

Only normative references that have been adopted as Australian or Australian/New Zealand Standards have been listed.

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

CONTENTS

1	Scope	6
2	Normative references	6
3	Terms and definitions	6
4	Classification, design and type	6
4.1	Classification.....	6
4.2	Design	7
4.3	Type.....	7
5	Sampling and conditioning.....	7
6	Requirements	8
6.1	Types and classifications	8
6.2	General requirements.....	8
6.3	Thermal behaviour.....	13
6.3.1	Insulation against heat.....	13
6.3.2	Radiant heat	14
6.3.3	Flame resistance.....	14
6.4	Compression resistance of the toepuff.....	14
6.5	Resistance to chemicals	15
6.6	Electrical properties	15
6.6.1	General.....	15
6.6.2	Electrically insulating footwear.....	15
6.6.3	Antistatic footwear.....	15
6.7	Outsole.....	15
6.7.1	Cleat design.....	15
6.7.2	Cleat height	15
6.7.3	Cleat height in the waist area	15
6.7.4	Heel breast.....	15
6.8	Zipper	16
6.8.1	Zipper construction	16
6.8.2	Zipper (slide fastener) puller attachment strength.....	16
6.8.3	Zipper (slide fastener) lateral strength	16
7	Test methods.....	16
7.1	Insulation against heat.....	16
7.2	Radiant heat	16
7.3	Flame resistance test	17
7.3.1	Conditioning and sampling	17
7.3.2	Procedure	17
7.4	Compression resistance of the toepuff.....	18
7.5	Zipper	19
7.5.1	Puller attachment strength	19
7.5.2	Lateral strength.....	19
8	Marking	20
9	Information to be supplied.....	21
9.1	General.....	21
9.2	Antistatic footwear.....	22
9.3	Insocks.....	23

Annex A (informative) Example of guidelines and considerations for performing a risk	24
A.1 General	24
A.2 General approach for conducting a risk assessment	24
A.3 Recommended factors for identifying and evaluating fire fighter risks	25
A.4 Types of footwear for firefighters	26
Annex B (normative) Assessment of the footwear by the laboratory during testing of thermal behaviour	28
B.1 General	28
B.2 Criteria for the assessment of the state of footwear	28
Annex C (informative) Assessment of the footwear by the wearer	30
C.1 General	30
C.2 Criteria for the assessment of the state of footwear	30
Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 89/686/EEC	32
Bibliography	34

INTRODUCTION

The purpose of this standard is to provide minimum performance requirements and test methods for footwear for firefighters which is intended for use for fire fighting and associated activities. A risk assessment should be used to determine whether the footwear covered by this standard is suitable for the intended use for the expected exposure. Firefighters should be trained in the use, care and maintenance of the footwear covered by this standard, including an understanding of its limitations.

AUSTRALIAN/NEW ZEALAND STANDARD

Protective footwear for firefighters—Requirements and test methods (EN 15090:2012, MOD)**1 Scope**

This European standard specifies minimum requirements and test methods for the performance of three types (see 4.3) of footwear for use by firefighters for fire suppression, general-purpose rescue, fire rescue and hazardous materials emergencies.

This European standard does not cover special personal protective equipment used in high-risk situations (for example, the conditions described in ISO 15538).

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 13832-3:2006, *Footwear protecting against chemicals — Part 3: Requirements for footwear highly resistant to chemicals under laboratory conditions*

EN 50321, *Electrically insulating footwear for working on low voltage installations*

EN ISO 6942:2002, *Protective clothing — Protection against heat and fire — Method of test: Evaluation of materials and material assemblies when exposed to a source of radiant heat (ISO 6942:2002)*

EN ISO 15025:2002, *Protective clothing — Protection against heat and flame — Method of test for limited flame spread (ISO 15025:2000)*

EN ISO 20344:2011, *Personal protective equipment — Test methods for footwear*

EN ISO 20345:2011, *Personal protective equipment — Safety footwear*

ISO 15538, *Protective clothing for firefighters — Laboratory test methods and performance requirements for protective clothing with a reflective outer surface*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 20345:2011 apply.

4 Classification, design and type**4.1 Classification**

Footwear for firefighters shall be classified in accordance with Table 1.

Table 1 — Classification of footwear

Classification	Description
Class I	Footwear made from leather and other materials, excluding all-rubber or all-polymeric footwear
Class II	All-rubber (i.e. entirely vulcanized) or all-polymeric (i.e. entirely moulded) footwear

4.2 Design

Footwear shall conform to one of designs B to E of Figure 3 of EN ISO 20345:2011.

4.3 Type

The types of footwear for firefighters shall be as follows:

- Type 1: Outdoor interventions, fire and wildland firefighting; no protection against penetration, no toe protection, no protection against chemical hazards;
- Type 2: All fire suppression and rescue interventions where protection against penetration, and toe protection are needed, no protection against chemical hazards;
- Type 3: All fire suppression and rescue interventions where protection against penetration and toe protection are needed, including protection against chemical hazards.

5 Sampling and conditioning

The minimum number of samples shall be that specified in Clause 6 of EN ISO 20344:2011, together with the minimum number of test pieces taken from each sample, as given in Table 2.

Wherever possible, test pieces shall be taken from the whole footwear unless otherwise stated in this standard and in EN ISO 20344.

If it is not possible to obtain a large enough test piece from the footwear, then a sample of the material from which the component has been manufactured may be used instead and this shall be noted in the test report.

Where samples are required from each of three sizes, these shall comprise the largest, smallest and a middle size of the footwear under test.

All test pieces shall be conditioned in a standard atmosphere of $(23 \pm 2) ^\circ\text{C}$ and $(50 \pm 5) \%$ relative humidity for a minimum of 48 h before testing, unless otherwise stated in the test method.

The maximum time which shall elapse between removal from the conditioning atmosphere and the start of testing shall be not greater than 10 min, unless otherwise stated in the test method.

Each test piece shall individually satisfy the specific requirement, unless otherwise stated in the test method.

NOTE The uncertainty of measurement for each test method described in the present standard may be assessed. One of the two following approaches should be used:

- a statistical method, e.g. that given in ISO 5725-2 [20];

- a mathematical method, e.g. that given in ENV 13005 [3].

Table 2 — Minimum number of samples and test specimens or test pieces

Property to be determined ^a	Reference	Number of samples	Number of test pieces from each sample	Test only on the final footwear
Radiant heat	6.3.2	1 pair	See 7.2	Yes
Flame	6.3.3	1 pair	See 7.3	Yes
Compression resistance of footwear forepart	6.4	1 pair from each of three sizes	1 pair	Yes
Zipper puller attachment strength	6.8.2	3 zippers		No
Zipper lateral strength	6.8.3	3 zippers		No

^a Table 1 of EN ISO 20344:2011 applies.

6 Requirements

6.1 Types and classifications

The permitted combinations of types of footwear for firefighters (see 4.3) and classes I and II (see 4.1) shall be as given in Table 3. As specified in 4.2, design A shall not be used.

Table 3 — Relationship between types of footwear and classes

Types of footwear	Class I of Table 1	Class II of Table 1
1	Possible	Possible
2	Possible	Possible
3	Not possible	Possible
NOTE Type 3 footwear for firefighters are suitable for use with chemical protective clothing in accordance with EN 943-2, where appropriate.		

6.2 General requirements

Footwear for firefighters shall conform to the requirements specified in Table 4.

Table 4 — General requirements

		Requirements	Reference		Type 1		Type 2		Type 3	Marking symbol
			EN ISO 20345:2011	EN 15090	Class		Class		Class II	
					I	II	I	II		
General	Footwear construction	Type and classifications		4.1 and 6.1	X	X	X	X	X	
		Height of upper	5.2.1		X	X	X	X	X	
		Specific ergonomic features	5.3.4		X	X	X	X	X	
		Leakproofness	5.3.3		N/A	X	N/A	X	X	
		Water resistance	6.2.5		X	N/A	X	N/A	N/A	
	Seat region	Design B Figure 3 of EN ISO 20345:2011	5.2.2		X	X	—	—	—	
		Design C and D Figure 3 of EN ISO 20345:2011	5.2.2		X	X	X	X	X	
		Design E Figure 3 of EN ISO 20345:2011	5.2.2		N/A	N/A	N/A	X	X	
Whole footwear	Sole performance	Construction	5.3.1.1		X	N/A	X	N/A	N/A	
		Upper/outsole bond strength	5.3.1.2		X	N/A	X	N/A	N/A	
		Insulation against heat		6.3.1	X At least H ₁	X At least H ₁	X At least H ₁	X At least H ₁	X At least H ₁	H ₁ or H ₂ or H ₃
		Slip resistance	5.3.5		X	X	X	X	X	SRA SRB SRC
		Energy absorption of seat region	6.2.4		X	X	X	X	X	

		Flame resistance		6.3.3	X	X	X	X	X	
		Penetration resistance	6.2.1		O	O	X	X	X	P
	Toe protection	General	5.3.2.1		O	O	X	X	X	T (only for type 1)
		Internal length of toe caps	5.3.2.2		O	O	X	X	X	
		Impact resistance	5.3.2.3		O	O	X	X	X	
		Compression resistance	5.3.2.4		O	O	X	X	X	
		Corrosion resistance of metallic toe caps	5.3.2.5.1		O	O	X	X	X	
		Non-metallic toe caps	5.3.2.5.2		O	O	X	X	X	
		Compression resistance of toe puff		6.4	*	*	N/A	N/A	N/A	R
	Electrical properties	Electrically insulating footwear ▲		6.6.2	X	X	X	X	X	See EN 50321
		Antistatic footwear ▲		6.6.3						A
	Resistance to chemical environment	Cold insulation of sole complex	6.2.3.2		*	*	*	*	*	CI
		Resistance to chemicals		6.5	N/A	*	N/A	*	X	CH
	Accessories	Zipper		6.8	O	N/A	O	N/A	N/A	
		Metatarsal protection	6.2.6		*	*	*	*	*	M
		Ankle protection	6.2.7		*	*	*	*	*	AN
Upper		Thickness	5.4.2		N/A	X	N/A	X	X	
		Tear strength	5.4.3		X	N/A	X	N/A	N/A	
		Tensile properties	5.4.4		X	X	X	X	X	

		Flexing resistance	5.4.5		N/A	X	N/A	X	X	
		Water vapour permeability and coefficient	5.4.6		X	N/A	X	N/A	N/A	
		pH value	5.4.7		X	N/A	X	N/A	N/A	
		Hydrolysis	5.4.8		N/A	X	N/A	X	X	
		Chromium VI content	5.4.9		X	N/A	X	N/A	N/A	
		Water penetration and water absorption	6.3.1		X	N/A	X	N/A	N/A	
		Radiant heat		6.3.2	X	X	X	X	X	
		Flame resistance		6.3.3	X	X	X	X	X	
Lining	Vamp	Tear strength	5.5.1		X	N/A	X	N/A	N/A	
		Abrasion resistance	5.5.2		X	N/A	X	N/A	N/A	
		Water vapour permeability and coefficient	5.5.3		X	N/A	X	N/A	N/A	
		pH value	5.5.4		X	N/A	X	N/A	N/A	
		Chromium VI content	5.5.5		X	N/A	X	N/A	N/A	
	Quarter	Tear strength	5.5.1		O	N/A	O	N/A	N/A	
		Abrasion resistance	5.5.2		O	N/A	O	N/A	N/A	
		Water vapour permeability and coefficient	5.5.3		O	N/A	O	N/A	N/A	
		pH value	5.5.4		O	N/A	O	N/A	N/A	
		Chromium VI content	5.5.5		O	N/A	O	N/A	N/A	
Tongue		Tear strength	5.6.1		O	N/A	O	N/A	N/A	
		pH value	5.6.2		O	N/A	O	N/A	N/A	
		Chromium VI content	5.6.3		O	N/A	O	N/A	N/A	

		Chromium VI content	5.6.3		O	N/A	O	N/A	N/A	
Insole/insocks				See Table 5	X	O	X	O	O	
Outsole		Tear strength	5.8.2		X	X	X	X	X	
		Abrasion resistance	5.8.3		X	X	X	X	X	
		Flexing resistance	5.8.4		X	X	X	X	X	
		Hydrolysis	5.8.5		X	X	X	X	X	
		Interlayer bond strength	5.8.6		O	O	O	O	O	
		Resistance to fuel oil	6.4.2		X	X	X	X	X	
		Cleated area	5.8.1.2		X	X	X	X	X	
		Thickness	5.8.1.1		X	X	X	X	X	
		Cleat design		6.7.1	X	X	X	X	X	
		Cleat height		6.7.2	X	X	X	X	X	
		Cleat height in the waist area		6.7.3	X	X	X	X	X	
		Heel breast		6.7.4	X	X	X	X	X	
		Resistance to hot contacts	6.4.1		X	X	X	X	X	

The applicability of a requirement to a particular classification is indicated in the table by the following:

X means that the requirement has to be met. In some cases the requirement relates only to particular materials within the classification, e.g. value of leather components. This does not mean that other materials are precluded from use.

O means that if the component parts exists, the requirement shall be met:

- means not allowed

* means that if the property is claimed, the requirement given in the appropriate clause shall be met.

▲ means that one of the three requirements shall be chosen.

N/A means the requirement is not applicable.

The absence of X, -, or O means that no requirement is made.

Table 5 — Basic requirements for insoles and/or insocks

Options			Component to be assessed	Requirements to fulfil in EN ISO 20345:2011						
				Thickness 5.7.1	pH 5.7.2	Water absorption desorption 5.7.3	Insole abrasion 5.7.4.2	Insock abrasion 5.7.4.2	Chromium VI 5.7.5	
1	No insole or if present not fulfilling the requirements	Non-removable insock	Insock	X	X	X		X	X	
2	Insole present	No insock	Insole							
		Seat sock present		X	X	X	X		X	
3		Full insock, non-removable	Insock and insole	X		X				
			Insole		X			X	X	
4		Full insock, removable and water permeable	Insole	X	X	X	X		X	
			Insock		X			X	X	
5		Full insock, removable not water permeable	Insole	X	X	X	X		X	
			Insock		X	X		X	X	
NOTE 1 For removable insocks see Clause 9.3.										
NOTE 2 X means that the requirement shall be met.										

6.3 Thermal behaviour

6.3.1 Insulation against heat

When tested in accordance with the method described in 7.1 the footwear shall meet at least one of the levels defined in Tables 6 and 7.

Table 6 — Insulation against heat: requirements for the temperature inside the footwear

Level of performance	HI ₁	HI ₂	HI ₃
Thp (°C)	150	250	250
Inside temperature of the footwear (°C)	< 42 after 30 min		

Table 7 — Insulation against heat: requirements for footwear degradation

Level of performance	HI ₁	HI ₂	HI ₃
Thp (°C)	150	250	250
Total duration of the test	30 min	20 min	40 min
Assessment	After testing, the footwear shall conform to B.2.1.		

6.3.2 Radiant heat

When tested in accordance with the method described in 7.2, the temperature increase for each material combination shall be equal or less than 24 °C. After testing, the footwear shall conform to B.2.2.

6.3.3 Flame resistance

When tested in accordance with the method described in 7.3, the footwear shall neither flame for more than 2 s (after-flame time) nor glow more than 2 s (after-glow time). After testing, the footwear shall conform to B.2.3.

6.4 Compression resistance of the toepuff

When Type 1 footwear is tested in accordance with the method described in 7.4, the clearance under the toepuff at a compression load of (500 + 10) N shall be not less than the appropriate value given in Table 8.

Table 8 — Minimum clearance under toepuff at compression

Size of footwear		Minimum internal clearance mm
Paris points	English	
36 and below	3 and below	12,5
37 and 38	4 and 5	13,0
39 and 40	6	13,5
41 and 42	7 and 8	14,0
43 and 44	9 and 10	14,5
45 and above	11 and above	15,0