

Australian Standard™

**Telecommunications cables—
Insulation, sheath and jacket**

This Australian Standard was prepared by Committee TE/9, Materials for Telecommunication Cable. It was approved on behalf of the Council of Standards Australia on 3 December 1999 and published on 11 May 2000.

The following interests are represented on Committee TE/9:

Australian Chamber of Commerce and Industry
Australian Electrical and Electronic Manufacturers Association
Optus Communications
Plastics and Chemicals Industry Association
Telstra Corporation

Keeping Standards up-to-date

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about Standards can be found by visiting the Standards Australia web site at www.standards.com.au and looking up the relevant Standard in the on-line catalogue.

Alternatively, the printed Catalogue provides information current at 1 January each year, and the monthly magazine, *The Australian Standard*, has a full listing of revisions and amendments published each month.

We also welcome suggestions for the improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Contact us via email at mail@standards.com.au, or write to the Chief Executive, Standards Australia International Ltd, PO Box 1055, Strathfield, NSW 2135.

This Standard was issued in draft form for comment as DR 97304.

Australian Standard™

**Telecommunications cables—
Insulation, sheath and jacket**

Originated as AS 1049—1971.
Previous edition 1996.
Fourth edition 2000.

COPYRIGHT

© Standards Australia International

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher.

Published by Standards Australia International Ltd
GPO Box 5420, Sydney, NSW 2001, Australia

ISBN 0 7337 2939 8

PREFACE

This Standard was prepared by the Standards Australia Committee TE/9, Materials for Telecommunication Cable, to supersede AS 1049—1996. In the course of preparation, this Standard has incorporated relevant material from UL 444, *Communications cables*.

The objective of this Standard is to provide polymer manufacturers, telecommunications cable manufacturers and end users with requirements and test methods for plastics used in telecommunications cables insulation, sheathing and jackets in order to maintain quality control and acceptance levels at the various stages of manufacture.

The objective of this revision is to incorporate requirements for additional materials used for insulation, sheaths and jackets.

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.

Statements expressed in mandatory terms in footnotes and notes to tables are deemed to be requirements of this Standard.

CONTENTS

	<i>Page</i>
SECTION 1 SCOPE AND GENERAL	
1.1 SCOPE	6
1.2 APPLICATION	6
1.3 MATERIAL SELECTION	10
1.4 REFERENCED DOCUMENTS	12
1.5 DEFINITIONS	13
1.6 ACRONYMS	15
SECTION 2 PE INSULATION	
2.1 SCOPE OF SECTION	17
2.2 COMPOUND	17
2.3 INSULATION	19
SECTION 3 PA 12 SOLID INSULATION	
3.1 SCOPE OF SECTION	24
3.2 MATERIAL TESTS	24
SECTION 4 NON-HALOGENATED PPO-BASED MATERIAL (CONTAINING A FIRE/FLAME RETARDANT) FOR SOLID INSULATION	
4.1 SCOPE OF SECTION	25
4.2 MATERIAL TESTS	25
SECTION 5 PVC SOLID INSULATION	
5.1 SCOPE OF SECTION	27
5.2 MATERIAL TESTS	27
SECTION 6 PP SOLID INSULATION	
6.1 SCOPE OF SECTION	29
6.2 MATERIAL TESTS	29
SECTION 7 PE SHEATH OR PE JACKET	
7.1 SCOPE OF SECTION	30
7.2 COMPOUND	30
7.3 SHEATH OR JACKET	31
SECTION 8 PA 12 JACKET	
8.1 SCOPE OF SECTION	34
8.2 COMPOUND	34
8.3 JACKET	34
SECTION 9 INTEGRALLY-BONDED PE SHEATH AND PA 12 JACKET	
9.1 GENERAL	36
9.2 COMPOUND	36
9.3 INTEGRALLY-BONDED SHEATH AND JACKET	36

	<i>Page</i>
SECTION 10 PVC SHEATH OR JACKET	
10.1 SCOPE OF SECTION	38
10.2 MATERIAL TESTS	38
10.3 CABLES EXPOSED TO UV RADIATION	38
SECTION 11 NHMH FOR SHEATH OR JACKET	
11.1 SCOPE OF SECTION	41
11.2 MATERIAL TESTS	41
SECTION 12 FLUOROPOLYMER INSULATION, SHEATH OR JACKET	
12.1 SCOPE OF SECTION	43
12.2 MATERIAL TESTS	43
SECTION 13 PEFR INSULATION, SHEATH OR JACKET	
13.1 SCOPE OF SECTION	45
13.2 MATERIAL TESTS	45
SECTION 14 SRPVC INSULATION, SHEATH OR JACKET	
14.1 SCOPE OF SECTION	46
14.2 MATERIAL TESTS	46
SECTION 15 CROSSLINKED POLYMER INSULATION, SHEATH OR JACKET	
15.1 SCOPE OF SECTION	47
15.2 MATERIAL TESTS	47
APPENDICES	
A TEST METHOD 1: DETERMINATION OF VISUAL APPEARANCE	49
B TEST METHOD 2: DETERMINATION OF DENSITY	50
C TEST METHOD 3: DETERMINATION OF MELT FLOW INDEX	51
D TEST METHOD 4: DETERMINATION OF SOFTNESS NUMBER	55
E TEST METHODS 5 AND 6: DETERMINATION OF TENSILE STRENGTH AT BREAK/YIELD AND ELONGATION AT BREAK— BEFORE AND AFTER AGEING	57
F TEST METHOD 7: FLEXIBILITY AFTER AGEING	64
G TEST METHOD 8: PRESSURE TEST AT HIGH TEMPERATURE	65
H TEST METHOD 9: DETERMINATION OF SHRINKBACK	66
I TEST METHOD 10: DETERMINATION OF STRIPPING	68
J TEST METHOD 11: COLD BEND PERFORMANCE	70
K TEST METHOD 12: DETERMINATION OF HEAT SHOCK	72
L TEST METHOD 13: DETERMINATION OF ENVIRONMENTAL STRESS-CRACKING	73
M TEST METHOD 14: DETERMINATION OF BOND STRENGTH	79
N TEST METHOD 15: DETERMINATION OF BENDING PERFORMANCE	83
O TEST METHODS 16 AND 17: CONFIRMATION OF STABILIZER TYPE AND DETERMINATION OF STABILIZER CONCENTRATION	84

P	TEST METHOD 18: DETERMINATION OF COMPATIBILITY OF PE INSULATION WITH FILLING COMPOUND	92
Q	TEST METHOD 19: DETERMINATION OF CORROSION	98
R	TEST METHOD 20: DETERMINATION OF VOLATILE LOSS	99
S	TEST METHOD 21: DETERMINATION OF CARBON BLACK CONCENTRATION	101
T	TEST METHOD 22: DETERMINATION OF CARBON BLACK DISPERSION	103
U	TEST METHOD 23: DETERMINATION OF COLOUR DIFFERENCE BY VISUAL ASSESSMENT	107
V	TEST METHOD 24: DETERMINATION OF COLOUR DIFFERENCE BY INSTRUMENTAL ASSESSMENT	109
W	TEST METHOD 25: QUALITATIVE EVALUATION OF BLEEDING OF COLOURANTS	110
X	TEST METHOD 26: DETERMINATION OF COLOURFASTNESS TO DAYLIGHT	112
Y	TEST METHOD 27: DETERMINATION OF COLOURFASTNESS TO WATER	117
Z	TEST METHOD 28: PLASTICIZER COMPATIBILITY	118
AA	TEST METHOD 29: VOLUME RESISTIVITY	119
AB	TEST METHOD 30: DIELECTRIC STRENGTH	120
AC	TEST METHOD 31: SPARK TEST	121
AD	TEST METHODS 32 AND 33: DETERMINATION OF DIELECTRIC DISSIPATION FACTOR AND RELATIVE PERMITTIVITY	122
AE	TEST METHOD 34: DETERMINATION OF COMBUSTION	126
AF	TEST METHOD 35: SIMULTANEOUS DETERMINATION OF IGNITABILITY, FLAME PROPAGATION, HEAT RELEASE AND SMOKE RELEASE	128
AG	TEST METHOD 36: DETERMINATION OF DRIP	130
AH	PREPARATION OF COMPRESSION MOULDED PE PLAQUE	132
AI	PREPARATION OF COMPRESSION MOULDED PVC PLAQUE	136
AJ	PURCHASING GUIDELINES	138

STANDARDS AUSTRALIA

Australian Standard

Telecommunication cables—Insulation, sheath and jacket

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE This Standard specifies the material requirements of the finished products and some of the compounds used to manufacture telecommunication cables and provides test methods to evaluate the properties specified.

The Standard specifies the composition, physical, electrical requirements and test methods of various materials, insulation, sheath and jacket as follows:

- (a) *Sections 2 to 15* Sections 2 to 15 specify the requirements of the compounds and finished products.
- (b) *Appendices A to AI* Appendices A to AI provide a set of reference test methods for determination of compliance with the requirements of this Standard.

NOTE: Appendix AJ provides recommendations for purchasing guidelines to be supplied at the time of enquiry or order of the cable.

This Standard does not cover cables using materials that are semi-conductive.

This Standard does not include such aspects of telecommunication cables as spacers or cores in co-axial cables.

This Standard does not include dimensions or electrical requirements of completed cables.

1.2 APPLICATION This Standard is intended for use by the following:

- (a) Polymer manufacturers, to form the basis of the raw material quality control procedures for the manufacture of PE and PA 12 compounds.
- (b) Cable manufacturers, to form the basis of the cable material quality control procedures for the manufacture of a range of insulation, sheath and jackets of different materials.
- (c) Cable end-users, to form the basis of the cable acceptance procedures for the completed cable.

For different cable materials, tests are performed on—

- (i) compounds;
- (ii) insulation, sheath and jacket materials taken during manufacture; and
- (iii) insulation, sheath and jacket materials taken from completed cable.

These requirements are summarized in Table 1.1.