

GUIDELINES



**NSW DEPARTMENT OF
PRIMARY INDUSTRIES**

**TESTING
OF
NON-METALLIC
MATERIALS
FOR USE IN
UNDERGROUND
COAL MINES**

MDG 3006 MTR 8

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FOREWORD

The use of non-metallic materials in an underground coal mine has potential to initiate a fire or explosion, propagate a fire and emit toxic emissions into the confined environment if the risks are not adequately dealt with

This guideline, *Testing of non-metallic materials for use in underground coal mines*, has been compiled to assist in assessing the risks for the use of such materials and in formulating appropriate testing standards. It can be considered good industry practice for mitigating the risks associated with the use of non-metallic materials in an underground coal mine at this time.

This is a 'Published Guideline'.

The principles stated in this document are intended as general guidance only assisting in the setting of safety standards. Owners, operators and managers should rely upon their own advice, skills and experience in applying safety standards to be observed in individual workplaces. Adherence to the guidelines does not itself assure compliance with the general duty of care.

The State of New South Wales and its officers or agents including individual authors or editors will not be held liable for any loss or damage whatsoever (including liability for negligence and consequential losses) suffered by any person acting in reliance or purported reliance upon this Guideline.

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SECTION 1 PURPOSE AND SCOPE

1.1 TITLE

This guideline is a materials testing report (MDG 3006 MTR 8) for the *Testing of non-metallic materials for use in underground coal mines*.

1.2 PURPOSE

The purpose of the guideline is to minimise risks to health and safety of people from the use of non-metallic materials in an underground coal mine by providing appropriate testing requirements where there is a risk of;

- (i) A static electric discharge,
- (ii) Combustibility of the material
- (iii) Fire initiation,
- (iv) Fire propagation, or
- (v) Toxic products of combustion entering the mine environment

1.3 SCOPE

The guideline extends to all coal mines in New South Wales where non-metallic materials are being used in underground and applies to mine operators (employers), employees, contractors, designers, manufacturers, suppliers and hirers, whose work involves, includes or is in connection with the supply of nonmetallic materials to the mine.

The outcome sought by this guideline is to provide testing requirements for non-metallic materials where use or application of the material may create a risk to the health, safety and welfare of people working in underground mine.

Note: This guideline is intended to assist in the evaluation of risk and may not comprehensively cover all safety-related aspects of diesel engine pollutants that may give rise to other hazards.

1.4 COMMENCEMENT

This guideline will take effect on and from the date of publication.

1.5 INTERPRETATION

1.5.1 Recommended Practices

Words such as:

- “*shall*” - indicates a strongly recommended course of action
- “*should*” - indicate recommended courses of action.
- “*May*” or “*consider*” - indicate a possible course of action that the guideline is indicating the duty holder should consider. However, you may choose an alternative method of achieving a safe system of work.

1.5.2 Legal Requirements

Words such as:

- “*must*”
- “*requires*” or “*mandatory*” - indicate that legal requirements exist, which must be complied with.

Note: Sections of this document are specified by the Chief Inspector in Gazette as mandatory pursuant to the Coal Mines Health and Safety Regulation 2006.

1.6 APPLICABLE LEGISLATION

Occupational health and safety legislation:

- The *Occupational Health and Safety Act 2000*
- The *Occupational Health and Safety Regulation 2001*

Mining legislation:

- The *Coal Mine Health and Safety Act 2002*
- The *Coal Mine Health and Safety Regulation 2006*

1.7 ALTERNATIVES

Alternative methods of providing safety based on risk assessment may be used provided that the level of safety offered by alternatives is at least equal to or better than that provided by the methods given in this Guideline.

1.8 REFERENCES

The following standards are referred to in this guideline

A list of documents reference in this guideline is included in Appendix A.

1.9 ABBREVIATIONS

AS	Australian Standards
DPI	Department of Primary Industries NSW
FRAS	Fire resistant anti-static

1.10 DEFINITIONS

For the purpose of this document the definitions below apply.

1.10.1 Chief Inspector

Insert definition

1.10.2 Competent Person

A person who has acquired through training, qualifications or experience, or a combination of them, the knowledge and skills to carry out that task.

SECTION 2 GENERAL REQUIREMENTS

2.1 OCCUPATIONAL HEALTH AND SAFETY

2.1.1 Legislative Framework

The Occupational Health and Safety legislative framework for safety on coal mine sites is represented by the diagram in Appendix 9.3.

This diagram highlights the hierarchy of legislation and the legislative considerations when managing mechanical engineering safety on a mine.

2.1.2 OHS Act 2000 and OHS Regulation 2001

The OHS Act 2000 and the OHS Regulation 2001 requires:

⇒ Designers, manufacturers and suppliers of plant must ensure plant is safe and without risk to health or safety when properly used and must provide adequate information for its safe use.

This requires designer to identify any foreseeable hazards that have potential to harm health or safety, assess the risks and take action to eliminate or control the risks

⇒ Employers need to ensure the health and safety of their employees by addressing workplace health and safety through a process of risk management and consultation.

To effectively implement this guideline designers, manufacturers, suppliers of plant and employers need to be aware of these requirements and have systems and procedures in place to apply them.

Designers, manufacturers and suppliers of plant and employers are advised to consult the OHS Act 2000 and the OHS Regulation 2001, particularly Chapter 5 'Plant', for details of these requirements.

This guideline provides guidance on how these requirements can be met.

DRAFTING NOTE: Need to contextualise to be more specific to non-metallic materials

2.1.3 Control of Risk

The OHS regulation requires risks (that cannot be reasonably eliminated) to be controlled in the following order:

- a) Substitute the hazard for a hazard of lesser risk
- b) Isolate the hazard from people
- c) Minimise the risk by the use of engineering measures
- d) Minimise the risk by the administrative means, eg SWP
- e) Use of PPE

2.1.4 Consultation

Employers are required by the OHS Act 2000 to consult with employees when taking steps to assess and control workplace risks.

Further guidance can be obtained in the 'OHS Consultation' Code of Practice 2001 by WorkCover NSW

2.1.5 Information

The Occupational Health and Safety Regulation 2001 require all available information to be provided to users with respect to:

- (i) identifying the hazards for the use of non-metallic materials

- (ii) assessing the risks from these hazards
- (iii) eliminating or controlling those risks
- (iv) providing information

2.2 RISK MANAGEMENT

2.2.1 Hazard Identification

All hazards must be identified and dealt with so that they are eliminated or controls established to minimise the risk.

Specific hazards associated with use of non-metallic materials in underground coal mines which may lead to a risk the health and safety of personal injury may include but not be limited to:

- a) The initiation of fire due to:
 - i) Friction between the non-metallic material and a fixed surface.
 - ii) Discharge of static electricity
 - iii) Heating or melting of the non-metallic material

Note: Coal dust may ignite at 150⁰ C
- b) Propagation of the fire due to:
 - i) The quantity of non-metallic materials
 - ii) The properties of the non-metallic material supporting combustion
- c) Sparking a potentially gaseous environment due to a static electrical charge being discharged.

Note: A static charge may build up with air movement over the non-metallic material. Risk varies on velocity, dust laden air streams, and exposed surface area and contact with other items.
- d) Products of combustion producing toxic emissions

2.2.2 Risk Assessment

Legislation is quite specific in regards to the management (hazard identification, assess the risks, review the risks, control the risks, information, audit, monitor and review) of risks to health and safety in particular the hierarchy of controls.

Designers, manufacturers and suppliers shall carry out a design risk assessment to identify all risks and implement appropriate risk controls prior to the supply of any non-metallic materials into an underground coal mine.

This risk assessment should be reassessed whenever variations in design, use, conditions or environment could change the risk.

Risk assessments shall be in accordance with **AS 4024.1301 MDG 1010, AS 4360**, or equivalent recognised standards such as the 'National Minerals Industry Safety and Health Risk Assessment Guideline'.

In the context of non-metallic materials it is preferable to:

- a) Use a metallic material where reasonable practicable
- b) Remove the non-metallic material from potential heat sources or air movements
- c) Use a fire resistant and anti static material where there is a risk
- d) Minimise the quantities of non-metallic material
- e) Use materials with lower toxicity of products of combustion

- f) Implement appropriate emergency plans
- g) Implement appropriate safe work procedures
- h) Use personal protective equipment (PPE)

2.2.3 Audit, Monitor & Review

The management of diesel engine pollutants should be audited, monitored and reviewed at appropriate periodic intervals.

Fluid systems should be audited, monitored and reviewed at appropriate periodic intervals and in the advent of an incident for compliance to the design standard and this guideline.

2.3 DOCUMENTATION

Accurate records should be kept and maintained on the risk assessment, testing and purpose of the non-metallic material.

2.4 QUALITY PLAN

Non-metallic materials should be manufactured in accordance to a recognised quality system.

Note: This is require to ensure consistence of the tested material to that being supplied

2.5 MATERIALS TESTING

2.5.1 Laboratory

Unless specified otherwise, all testing must be carried out by:

- a) A laboratory in Australia that is unrelated to the manufacturer/supplier and is accredited for the test by the National Association of Testing Authorities Australia (NATA), or
- b) A laboratory acceptable to the Chief Inspector.

2.5.2 Alternative Equivalent Tests

Alternative equivalent tests to those specified in this guideline may be used provided the alternative provides an equivalent level of safety and is acceptable to the Chief Inspector.

2.5.3 FRAS materials

Unless specified otherwise in this document or by Gazettal, all FRAS rated non-metallic materials must be tested at intervals not exceeding five (5) years or whenever there is a change in the supply of the raw products or a change in the manufacturing process

2.6 LABELLING OF MATERIALS

All non-metallic materials should be appropriately labelled such that the following can be identified:

- a) Date of manufacture or batch number
- b) Testing certificates that relate to the material

SECTION 3 CONVEYOR BELTING AND ACCESSORIES

3.1 UNDERGROUND CONVEYOR BELTING

All conveyor belting, slicing materials and belting repair material used in underground parts of a coal operation must meet all requirement of AS 4606:2000.

The following tests must be carried out at intervals not exceeding five (5) years or whenever there is a change in the supply of the raw products or a change in the manufacturing process.

- a) Combustion propagation characteristics (Gallery test), refer clause 7.1 of AS 4606:2000.
- b) Ignition and maximum surface temperature of belting subject to friction (Drum friction test), refer clause 7.2 of AS 4606:2000.
- c) Ignition and flame propagation characteristics (Finger burn test), refer clause 7.3 of AS 4606:2000.
- d) Oxygen index, refer clause 7.4 of AS 4606:2000.
- e) Resistivity, refer clause 7.5 of AS 4606:2000.

Notes:

1. Conveyor belting must be design registered with the DPI before it is used in an underground coal mine.
2. Design registration is automatically cancelled where these intervals are exceeded without new tests being undertaken.

All other testing, as specified in AS 4606:2000 must be carried out:

- a) On each batch of belting manufactured or prior to delivery of the belting to the mine, and
- b) When the belting has been in service for more than five (5) years at the mine

A copy of all test certificates must be provided with the supply of the belting to the mine, along with any design registration documentation. These documents must be maintained in a plant safety file for the lifecycle of the conveyor belt.

3.2 MINOR CONVEYOR ACCESSORIES

All non-metallic minor (quantity) conveyor accessories such as scraper blades, ploughs, skirt rubbers, and pulley lagging must have the following properties.

- a) *Ignitability and flame propagation characteristics (Finger burn test)*

Meet the requirements of clause 7.3 of AS 4606:2000.

- b) *Oxygen index*

Meet the requirements of clause 7.4 of AS 4606:2000. The result shall be not less than 28%.

When the material is tested or retested at a later stage the results shall be within ± 3 points of that originally obtained but in no case shall be less than 28%.

- c) *Electrical resistivity*

For electrical surface resistivity meet the requirements of clause 7.5 of AS 4606:2000.

Where the normal electrical discharge path is between two surfaces (through resistance), the average of two resistance measurements shall not exceed 300 M Ω when tested to clause 7.2 or 7.3 of ISO 2878:2005.

In addition to a), b), and c) and above; conveyor pulley lagging shall meet the requirements of clause 7.2 of AS 4660:2000 (drum friction test).

3.3 NON-METALLIC CONVEYOR IDLERS OR IDLER LAGGING

All non-metallic conveyor idlers or metallic idlers with non-metallic lagging must meet the following requirements:

3.3.1 Combustion propagation characteristics (gallery test)

Meet the requirements of clause 7.1 of AS 4606:2000 in accordance with a modified procedure, to AS 1334.12:1996.

The modified procedure shall be subject to the acceptability of the Chief Inspector of Coal Mines.

Note: A draft test procedure is included in appendix 9.3

3.3.2 Ignitability and maximum surface temperature of idler subject to friction

The purpose of this test is to determine if a seized idler can initiate a fire by friction between the seized idler and the moving conveyor belting due to; self ignition, melting of the non-metallic material or excessive surface temperatures.

A seized idler must be tested under the following conditions:

- a) Conveyor belting shall run continuously over the idler at a speed of not less than the designed belt speed or 3.0 m/s, which ever is the greater, and
- b) The idler shall be loaded with a normal (perpendicular) load of at least 125% of the maximum design dynamic load applied to the idler from the conveyor, and
- c) At least one metal belt clip joint shall be included in the conveyor belt, and
- d) The type of conveyor belting intended for use on the idler in the mine environment that provides the worst results shall be used in the test.
- e) The conveyor belting shall be run dry during the test.
- f) The conveyor shall run continuously over a period of at least 2 hours past the point where temperature stabilisation has occurred or for a period of 8 hours, which ever is the lesser.

At the completion of or during the above test;

- (i) The surface temperature of the idler must not exceed 325⁰C,
- (ii) There must be no visible flaming or visible glowing, and
- (iii) The material shall not melt at a temperature above 150⁰C.

The procedure for this test shall be subject to the acceptability by the Chief Inspector.

Note: A draft test procedure is included in appendix 9.3.

3.3.3 Ignitability and flame propagation characteristics (Finger burn test)

Meet the requirements of clause 7.3 of AS 4660:2000 for all non-metallic materials used in the construction of the idler, excluding bearing weather shields.

3.3.4 Oxygen Index

When tested in accordance with ISO 4589-2:1996, the result shall be not less than 28% for all non-metallic materials used in the construction of the idler, excluding bearing weather shields.

If the material is tested or retested at a later stage the results shall be within ± 3 points of that originally obtained but in no case shall be less than 28%.

3.3.5 Electrical Resistivity

For surface resistivity, each non-metallic material, excluding bearing weather shields, must meet the requirements of clause 7.3 of AS 4660:2000.

Where the normal electrical discharge path is between two surfaces (through resistance), the average of two resistance measurements shall not exceed 300 M Ω when tested to clause 7.2 or 7.3 of ISO 2878:2005.

In addition to the above, there must be a positive means of discharging an electrical charge on the surface of the idler to the conveyor structure. This means must be acceptable of the Chief Inspector.

3.3.6 Toxicity of Products of Combustion

A toxicity test must be carried out in accordance with NES 713:2006. This test must be carried before any gallery or friction testing is undertaken, refer clauses 3.3.1 and 3.3.2.

As a minimum, the total combined toxicity index (for all combustible materials used in the construction of the idler), when tested in accordance with NES 713 shall not exceed 5.0.

Note: Alternative toxicity test methods are subject to acceptability of the Chief Inspector

The supplier must be able to quantitatively demonstrate the products of the combustion (in the event of a large fire) from the use of the non-metallic idlers in the underground environment will not provide an unacceptable health risk to people working in the mine.

3.3.7 Documentation

A copy of all test certificates must be provided with the supply of the idler to the end user along with identification of the type and quantum of each non-metallic material. These documents must be maintained in a plant safety file for non-metallic idlers at the mine.

3.3.8 Information

All information as required by clauses 96, 105 and 122 of the Occupational Health and Safety Regulation 2001 must be made available to all users of non-metallic idlers

3.3.9 Risk Assessment

A risk assessment on the risks to health and safety associated with the use of non-metallic idlers shall be carried out at each location before any non-metallic idlers are used in underground parts of the mine.

The risk assessment shall be carried out in the context of the mine environment and shall consider; minimum ventilation quantities to dilute the products of combustion to below safe people exposure limits, methods for automatic detection and suppression of fires and emergency procedures in the event of a fire to ensure people working inbye have no increase in risk to health and safety from the use of non-metallic idlers.

3.4 SLIDER IMPACT BARS

Non-metallic slider impact bars shall be subject to tests and conditions as referred to in clause 3.3 above except the loading on the bars shall include an allowance for impact based on the velocity and trajectory of material hitting the bars.

SECTION 4 VENTILATION PRODUCTS & ACCESSORIES

4.1 VENTILATION SHEETING

Any ventilating sheet used in a mine underground must have the following properties:

- a) Fire and electrical resistance properties in accordance with NCB Specification 245:1985, and
- b) Oxygen index determined by ISO 4589-2:1996
- c) Air permeability in accordance with NCB Specification 441:1964

4.2 NON-METALLIC FLEXIBLE DUCTING

Non-metallic flexible ventilating ducting used in a mine underground must have the following properties:

- a) Fire and electrical resistance properties in accordance with NCB Specification 245:1985, and
- b) Oxygen index determined by ISO 4589-2:1996
- c) Internal surface resistivity on finished ducting with supporting spiral, coupling band and any accessories in accordance with AS 1180.13A:1983

4.3 JOINING BANDS FOR NON-METALLIC DUCTING

Joining bands for non-metallic ventilating ducting used in a mine underground must have the following properties:

- a) Electrical resistance properties in accordance with NCB Specification 245:1985, and
- b) Oxygen index determined by ISO 4589-2:1996
- c) Internal surface resistivity on finished ducting with supporting spiral, coupling band and any accessories in accordance with AS 1180.13A:1983
- d) Fire resistance in accordance with AS 1180.10B:1982 with flame application time of 20 seconds only

4.4 NON-METALLIC RIGID VENTILATION DUCTING

Non-metallic rigid ventilating ducting used in a mine underground must have the following properties:

- a) Fire and electrical properties in accordance with clauses 2.1 and 2.2 of AS 2660:1991, and
- b) Oxygen index determined by ISO 4589-2:1996

SECTION 5 MATERIALS POLYMERISED UNDERGROUND

5.1 GENERAL

Where products (polyurethanes, organomineral resins, phenolic resins and similar products) are to be polymerised underground they must have the following properties:

- a) A maximum exothermic temperature no greater than 150°C as determined by Mine Safety Method A : 98/1070 (March 2003).
- b) The material, when tested in accordance with NCB 245:1985 shall not exceed 300 MΩ for the average of two resistance measurements.
- c) Fire Resistance properties as determined by Mine Safety Method C : 98/1070 (March 2003).

When tested in accordance with the above method, the materials shall fail if any of the following occur;

- (i) After a burner exposure time of 20 seconds, the means persistence time of the flame or glow is greater than 10 seconds, or
 - (ii) After a burner exposure time of 60 seconds, the means persistence time of the flame or glow is greater than 30.
- d) Fire Propagation properties as determined by Mine Safety Method D : 98/1070 (March 2003)

When tested in accordance with the above method, the materials shall fail if any of the following occur;

- (i) After a burner exposure time of 20 seconds, the means persistence time of the flame or glow is greater than 10 seconds, or
 - (ii) After a burner exposure time of 20 seconds, the material is completely consumed.
- e) A flashpoint of each individual liquid component must be greater than 38°C as determined by AS 2106.2 – 2005.
 - f) The chemical nature of each individual liquid component must be chemically characterised to detect the presence of any substance which is prohibited for use/storage in NSW underground coal mines. For example it shall not contain isocyanate in the form of toluene diisocyanate (TDI).
 - g) Oxygen Index

When tested in accordance with ISO 4589-2:1996, the result shall be not less than 28%.

If the material is tested or retested at a later stage the results shall be within ± 3 points of that originally obtained but in no case shall be less than 28%.

- h) The MSDS must be in the form acceptable to the DPI as described in appendix 9.2.

5.2 HIGH RISK ACTIVITY

The use and polymerisation of such materials may be considered a high risk activity pursuant to the *Coal Mines Health and Safety Regulation 2006*.

If the use is considered a high risk activity it must be carried out by a licensed person in accordance with a code of practice specified by the Chief Inspector.

Notes:

1. Further advice should be sought from the DPI before its use and polymerisation of such materials is undertaken.
2. Additional testing requirements may be specified by the Chief Inspector.

SECTION 6 VISCOUS MATERIALS

6.1 HYDRAULIC FLUIDS

Any fire resistant hydraulic fluids lubricant and emulsifying oil for dilute emulsions must comply with the requirements and properties documented in MDG No. 3006 MRT2.

6.2 GREASES

Any lubricating grease used in a mine underground shall have the following properties:

- a) A flashpoint of greater than 38°C as determined by AS 2106.2:2005
- b) Fire resistant in accordance with 5th Report of the European Coal and Steel Organisation Part III, 3.2.
- c) The MSDS should be in the form acceptable to the DPI s described in appendix 9.2.

6.3 AEROSOLS

Any aerosol product (solvents, cleaners, degreasers, etc.) shall comply with the requirements and properties documented in MDG No. 3006 MRT2.

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SECTION 7 MISCELLANEOUS

7.1 AIR / WATER HOSE

All air/water hose used in underground coal mines shall meet the requirements of:

- a) Clauses 2.1 and 2.2 of AS 2660:1991 for FRAS properties, and
- b) AS 2122.2:1999

7.2 GRID MESH

Any grid mesh sheet used in an underground coal mine shall have the following properties:

- a) Fire and electrical resistance properties in accordance with NCB Specification 245 : 1985.
- b) Oxygen index determined by ISO 4589-2:1996.

7.3 VEE – BELTS AND WEDGE BELTS

Any V – belt or wedge belts used in an underground coal mine shall have the following properties:

- a) Fire and Electrical Resistance properties in accordance with AS 2784:2002.
- b) Oxygen index determined by ISO 4589-2:1996.

7.4 RIB / ROOF BOLTS

Rib / roof bolts and supports incorporating fibreglass dowels and plastic rods, and nay holding (fastening) nuts shall have the following properties:

- a) Electrical resistance properties according to NCB Technical Memorandum RD / NMMB (84) 3.
- b) Fire resistance properties in accordance to AS 1180.10B:1982.
- c) Oxygen index determined by ISO 4589-2:1996.

7.5 ENCAPULANTS

Encapulants and potting compounds are resins or adhesives which are used to encapsulate circuit boards and semi conductors, fill containers of electronic of electronic components, and infiltrate electrical coils.

Any encapsulant material used in a mine underground shall meet the requirements of AS/NZS 60079:18:2005.

SECTION 8 OTHER NON-METALLIC SOLID MATERIALS

8.1 RISK ASSESSMENT

All other non-metallic materials (not specified above) intended for use in underground parts of a coal mine must be assessed for the risk of;

- a) Combustibility,
- b) Static electric discharge, and
- c) Toxicity of products of combustion in the intended operating environment.

Note: This is not an exhaustive list, there may be other risks present, e.g. excessive temperature from surface friction.

Where there is a risk, the risk assessment should be supplied to the end user.

Where the risk assessment identifies the need for fire resistant, antistatic or limited toxicity properties then the material shall have (as far as reasonably practicable) the relevant properties as specified below or as specified in a relevant recognised standard for the material's application.

Note: Further advice should be sought from the DPI if the following tests are not applicable to the product or application.

8.2 FIRE RESISTANCE

Where there is a fire risk and sufficient quantity of material to sustain or propagate a fire, the material shall contain the following fire resistant properties:

Note: These requirements are not required where it can be reasonably demonstrated that there is no fire risk from the application of the material.

- a) *Ignitability and flame propagation characteristics (Finger burn test)*

When tested in accordance with AS 1334.10:1994 the maximum allowable duration of the visible flame shall be 10 seconds for the average of all tests and 15 seconds for any single test.

- b) *Combustion Propagation Characteristics*

As an alternative to a) above, for hose or hose type products the average duration of the flame of glowing shall not exceed 30 seconds when tested in accordance with AS 1180.10B:1982.

- c) *Oxygen Index*

When tested in accordance with ISO 4589-2:1996, the result shall be not less than 28%.

If the material is tested or retested at a later stage the results shall be within ± 3 points of that originally obtained but in no case shall be less than 28%.

8.3 ANTISTATIC PROPERTIES (ELECTRICAL RESISTIVITY)

Where a non-metallic material is likely to hold an electrostatic charge, (refer AS/NZS 1020:1995) such as large surface areas, moving components, near or touching moving components, or is to path of a dust-laden air-stream the material must be verified for ignition risk of flammable gases expected in underground coal mines.

Verification of ignition risk should be in accordance with the following paragraphs or a recognised standard for the material's application.

Note: FRAS testing is not required where it can be shown that the application of the material prevents any likelihood of electrical charging.

When electrical surface conductivity is required to discharge the static charge; the material, when

tested in accordance with AS 1334.9:1982 shall not exceed 300 MΩ for the average of two resistance measurements or alternatively shall meet the requirements of clause 7.3.2 of AS 60079.0:2005.

Materials subject to high velocity air passing over them or requiring a lower level of electrical resistance shall meet the requirements of clause 2.2 of AS 2660:1991.

Where the normal electrical discharge path is between two surfaces, the average of two resistance measurements shall not exceed 300 MO when tested to Clause 7.2 or 7.3 of ISO 2878:2005.

8.4 TOXICITY OF PRODUCTS OF COMBUSTION

Where there is a risk that the products of combustion of the material, in the event of a fire, is likely to affect the toxicity of the mine environment to a point above safe exposure levels to people, then the requirements of clause 3.3.6 should be considered.

Note: Toxicity testing is not required where it can be reasonably demonstrated that there is no fire risk or risk from the products of combustion.

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SECTION 9 APPENDICES

9.1 APPENDIX A – ASSOCIATED DOCUMENTS

9.1.1 Australian Standards (AS/NZS)

AS 1020:1995	<i>The control of undesirable static electricity</i>
AS 1180.10B:1982	<i>Methods of test for hose made from elastomeric materials - Determination of combustion propagation characteristics of a horizontally oriented specimen of hose using surface ignition</i>
AS 1180.13A:1983	<i>Methods of test for hose made from elastomeric materials - Determination of electrical resistance of hose and hose components</i>
AS 1334.10:1994	<i>Methods of testing conveyor and elevator belting - Determination of ignitability and flame propagation characteristics of conveyor belting</i>
AS 1334.9:1982	<i>Methods of testing conveyor and elevator belting - Determination of electrical resistance of conveyor belting</i>
AS 1334.12:1996	<i>Methods of testing conveyor and elevator belting –Determination of combustion propagation characteristics of conveyor belting</i>
AS 2106.2:2005	<i>Methods for the determination of the flash point of flammable liquids (closed cup)-Determination of flash point – Pensky Martens closed cup method</i>
AS 2122.2:1999	<i>Methods of test for determining combustion propagation characteristics of plastics - Determination of minimum oxygen concentration for flame propagation following top surface ignition of vertically orientated specimens</i>
AS 2660:1991	<i>Hose and hose assemblies - Air/water - For underground coal mines</i>
AS 2784 : 2002	<i>Endless wedge belt and V- belt drives</i>
AS 4606:2000	<i>Fire resistant and antistatic requirements for conveyor belting used in underground coal mines</i>
AS 60079.0:2005	<i>Electrical apparatus for explosive gas atmospheres - General requirements</i>
AS 60079:18:2005	<i>Electrical apparatus for explosive gas atmospheres- Part 18 : Construction, test and marking of type of protection encapsulation 'm' electrical apparatus</i>

9.1.2 Department of Primary Industry Publications

MDG No : 3006 MRT2 : April 1995	<i>Materials testing for hydraulic fluids and aerosol products</i>
Mine Safety Test Method : 98/1070 (March 2003)	<i>Materials Testing : Polyurethanes and Organomineral Resins (incorporates Strata Binders and Mine Sealants)</i>

9.1.3 International Standards (ISO)

ISO 2878:2005	<i>Rubber - Antistatic and conductive products - Determination of electrical resistance</i>
ISO 4589-2:1996	<i>Plastics - Determination of burning behaviour by oxygen index - Part 2: Ambient-temperature test</i>

9.1.4 National Coal Board Standards – United Kingdom (NCB)

NCB 245:1985	<i>Fire and electrical resistance properties of supported and unsupported sheeting, issued by the National Coal Board of the United Kingdom</i>
NCB 441:1964	<i>Brattice sheeting made from textile supported plastics, issued by the National Coal Board of the United Kingdom</i>
NCB Technical Memorandum RD /	<i>Antistatic requirement for rigid plastics for underground use</i>

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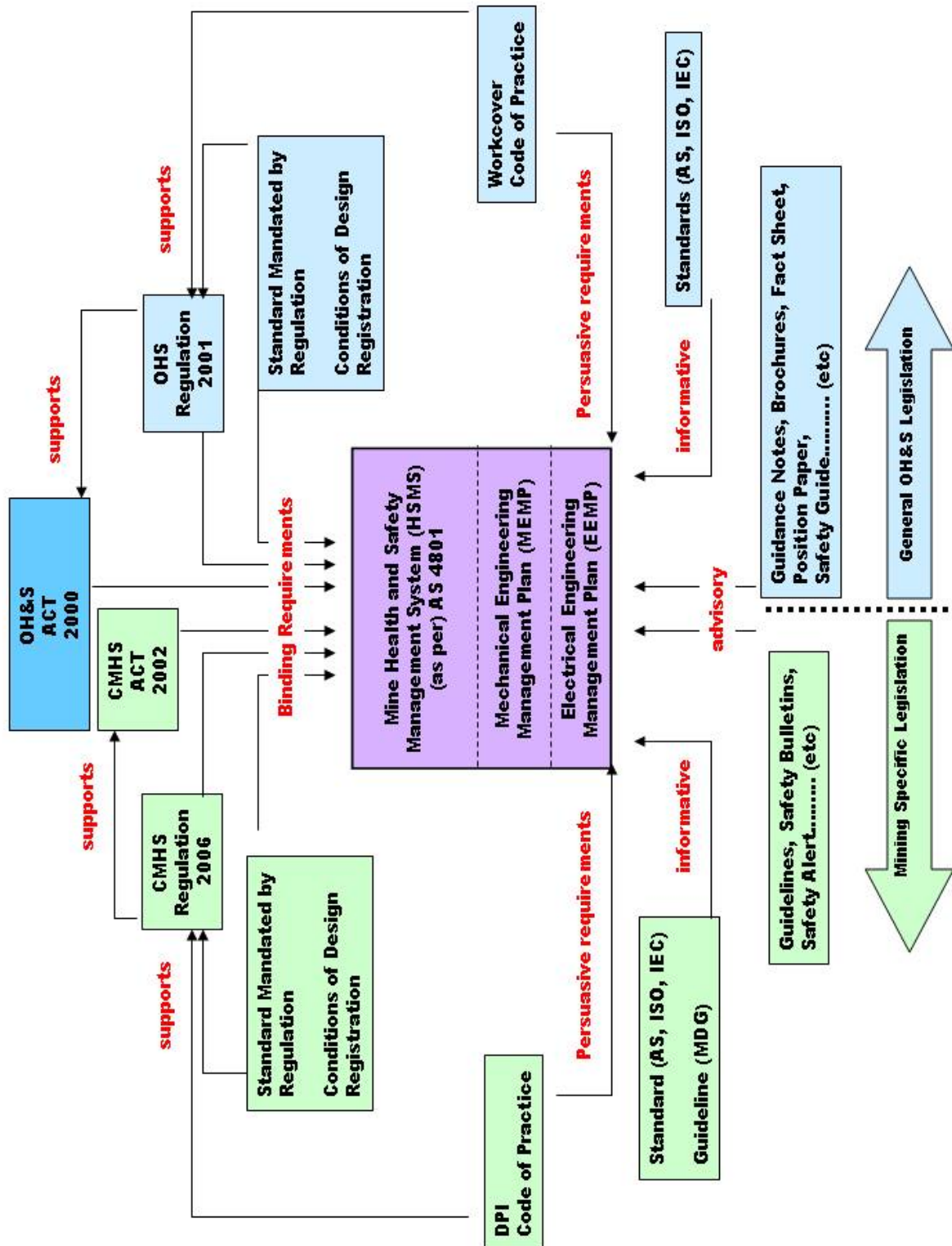
9.1.5 Other Publications

- (NES 713) *Determination of the toxicity index of the products of combustion from small specimens of materials*, Ministry of defence standard 02-713 Issue 2 13 April 2006, UK,
- Def Stan 02-713 Issue 2
- 5th Report of the European Coal and Steel Organisation Part III, 3.2 *Flame propagation test in a mixture of the fluid with coal dust*
- NOHSC: 2011 (2003) *National Code of Practice for the Preparation of Materials Safety Data Sheets - 2nd Edition*

DRAFT

9.3 OH&S LEGISLATIVE FRAMEWORK FOR MINING IN NSW

The following diagram outlines the Occupational Health and Safety legislative framework for coal mines in NSW.



9.4 APPENDIX C – DRAFT TEST PROCEDURES FOR NON-METALLIC IDLERS

9.4.1 DRAFT Test Protocol - Combustion Propagation Testing

DRAFT TEST PROTOCOL– Non Metallic Conveyor Idler Tests

Revision No. 1

31 October 2006

DETERMINATION OF IGNITABILITY AND MAXIMUM TEMPERATURE OF A STALLED NON-METALLIC CONVEYOR IDLER DUE TO FRICTION

1. SCOPE

This draft test protocol sets out a method for testing the flame propagation characteristics of non-metallic idlers.

2. REFERENCED DOCUMENTS

The following Standards are referred to in this protocol:

AS 1334.12—1996

AS 4606—2000

3. PRINCIPLE

Non-metallic idlers are installed on a trestle and placed in a test gallery subjected to a controlled airflow. A piece of conveyor belting is placed on top of the idlers and the idler/belting assembly is exposed to a flame (from underneath) from a propane burner for a specified time. After the burner is removed the idler/belting assembly is left on the trestle until all visible flame and glow have disappeared and a measurement of the undamaged length is made

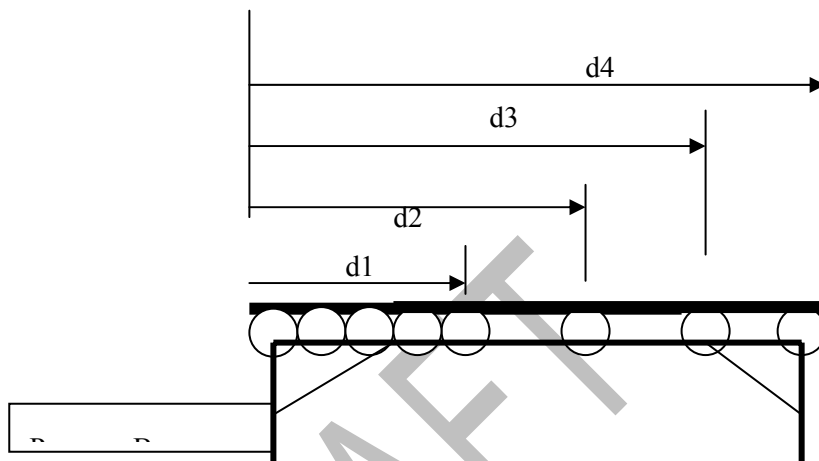
4. APPLICATION TO FIRE HAZARD

These test results on their own are not sufficient to indicate the fire hazard of the idler/conveyor combination under actual fire conditions and consequently should not be applied to the assessment of fire hazard without taking into account additional supportive information.

5. APPARATUS

The apparatus is the same as used in AS 1334.12—1996 *Determination of combustion propagation characteristics of conveyor belting*, with the following exceptions:

The trestle shall be designed in such a way as to allow the installation of the idlers being tested. The idlers shall be mounted on the trestle so that the lowest point of the idler surface is 350mm from the floor of the test gallery. Longitudinal location of the idlers is given in the figure below:



$d1 = 950$ to 1050 mm (skin to skin, measured to idler centre)

$d2 = (d1 + d3) \div 2$ (measured to idler centre)

$d3 = 1750$ mm (measured to idler centre)

$d4 = 2000$ (total length to outside diameter)

6. TEST PIECES

6.1 Samples Full width idler samples are to be supplied for testing. A 4m length (minimum) of conveyor belting is also to be supplied (width 1050- 1200mm).

6.2 Conditioning Samples shall be conditioned at atmospheric temperature and humidity for 24hr prior to testing

7. PROCEDURE

The test procedure shall be the same as given in AS 1334.12—1996 *Determination of combustion propagation characteristics of conveyor belting*, with the following exceptions:

The sample of conveyor belting is to be cut into two separate 2 m long test pieces. A test to AS

1334.12 is to be performed one of the test pieces to determine its propagation characteristics without the influence of the idlers. The undamaged length on the underside of this test piece shall be a maximum of 500mm.

A second test is then to be performed with the conveyor belting resting on top of the non-metallic idlers

8 CRITERIA

- a) Acceptance criteria is given in AS4606—2000. When tested to the procedure specified in Section 7 the conveyor belt shall have an undamaged length greater than 250mm.

9 REPORT

To be added

DRAFT

9.4.2 DRAFT Test Protocol - Ignitability & Surface Temperature - Idler Subject to Friction

DRAFT TEST PROTOCOL– Non Metallic Conveyor Idler Tests

Revision No. 1

31 October 2006

DETERMINATION OF IGNITABILITY AND MAXIMUM TEMPERATURE OF A STALLED NON-METALLIC CONVEYOR IDLER DUE TO FRICTION

1. SCOPE

This draft test protocol sets out a method for testing the ignition and wear properties of a stalled non-metallic conveyor idler subjected to friction from a moving conveyor belt.

2. REFERENCED DOCUMENT

The following Standards are referred to in this protocol:

3. PRINCIPLE

A friction test apparatus is used to simulate the scenario of a stalled idler with conveyor belting rubbing on it under a normal loading of coal. A stationary idler is made to contact an endless loop of conveyor belting driven around a set of pulleys and idlers with a specified minimum force until:

- a) the idler breaks or deforms in such a way as to remove the fire hazard due to friction
- b) the maximum allowable temperature is exceeded
- c) the idler ignites
- d) the specified time elapses

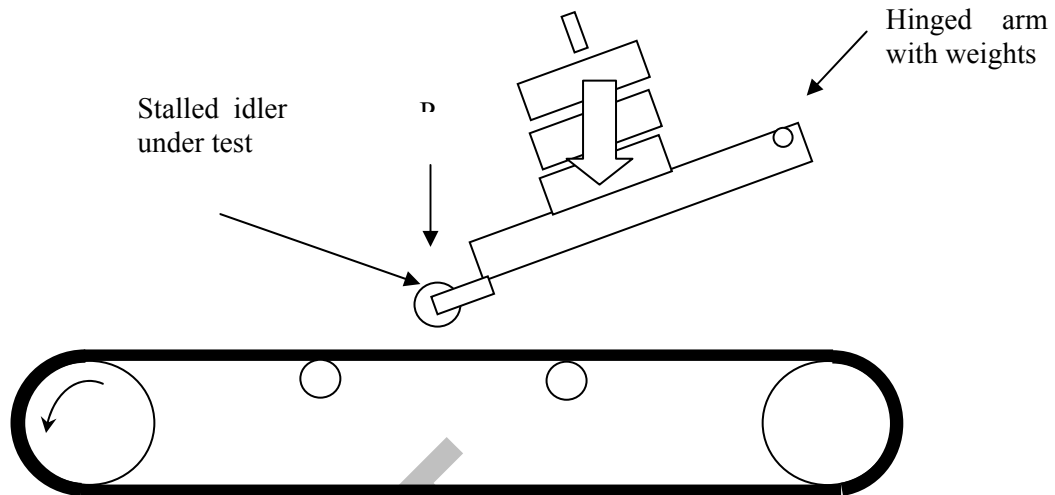
4. APPLICATION TO FIRE HAZARD

These test results on their own are not sufficient to indicate the fire hazard of the idler under actual fire conditions and consequently should not be applied to the assessment of fire hazard without taking into account additional supportive information.

5. APPARATUS

The following is required:

- a) A dynamic test rig consisting of an endless loop of belting being driven around a set of pulleys and idlers at a speed of 3.0 ± 0.5 m/s. The idler being tested is installed at the end of a hinged arm over the belting, loaded to simulate a typical full conveyor load (see sketch below). The arm shall be designed in such a way as to allow it to be periodically raised during a test to facilitate temperature measurement of the contacting surface of the idler.



- b) A suitable non-invasive temperature measuring device
c) A suitable timing device

6. TEST PIECES

- 6.2 Samples** Full width samples are to be supplied for testing. Where the idler is constructed from more than one layer of non-metallic compound, one test sample per layer shall be supplied.
- 6.2 Conditioning** Samples shall be conditioned at atmospheric temperature and humidity for 24hr prior to testing

7. PROCEDURE

- Install the idler on the hinged arm. The test mass on the arm shall ensure the idler contacts the belt with a force of 104kg per 900mm width throughout the test.
- Measure the initial temperature of the surface of the idler to be in contact with the conveyor belt.
- Start the dynamic rig and set a conveyor speed of $3.0 \pm 0.5 \pm 0$ m/s. Lower the hinged arm so that the test idler contacts the conveyor under full test load.
- Raise the arm and record the temperature of the contacting surface of the idler at 15 minute intervals.
- Record the time at which breakage or other deformation that removes the fire hazard of the idler occurs (if any)
- Record the time at which a visible flame is observed (if any)

- g) Record the time at which a temperature $>300^{\circ}\text{C}$ at the contacting surface of the idler is recorded (if any)
- h) Stop the test after 8 hrs of continuous running

8 CRITERIA

When tested to the procedure specified in Section 7 the idler shall not:

- b) Ignite
- c) Have a surface temperature greater than 300 degrees Celsius.

9 REPORT

To be added

DRAFT