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14th of March, 2014

M.S.T.C. TEST REPORT T14-00162/0001

Company:	Subpro Pty. Ltd.
Sample Description:	*Subpro Underground Gas Bag (SP-02)* – inflatable borehole plug bag; approx. 90 gsm woven white poly prop material with black conductive stripes
Intended Use:	Non-Defined Applications – with reference to Ventilating Sheet [Refer *MDG3608*, Sections 7 (- and 4.2)]
Sample No.:	T14-00162/0001

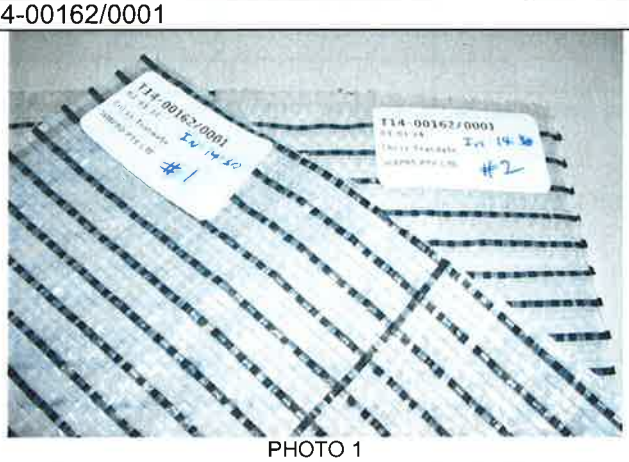

PHOTO 1

SUMMARY

The material **complied** with the Fire Resistance requirements of *MDG3608*, 4.2.1.

The material **complied** with the Electrical Resistance requirements of *MDG3608*, 4.2.2.

The Oxygen Index of the material was determined as specified by *MDG3608*, 4.2.4.

Analysed by: A. R Checked by: J. Sanders

Authorised by:

FOR G. Slater
Manager, Mine Safety Technology Centre

NATA
WORLD RECOGNISED ACCREDITATION
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Accreditation No 2325
Endorsed tests indicated by logo on test page

FIRE RESISTANCE – 1kW Burner Flame Test

Sample:

Subpro Underground Gas Bag (SP-02) – inflatable borehole plug bag; approx. 90 gsm woven white poly prop material with black conductive stripes

Test Date:

5th of March, 2014

Results:

Test No.	*Persistence of Flame (s)*	*Persistence of After Glow (s)*	*Extent of Shrivel (mm)*
1	0*	0	180
2	0*	0	165
3	0*	0	180
4	0*	0	180
5	0*	0	200
6	0*	0	195
Mean	0* s	0 s	185 mm

* Indicates that the material shrivelled sufficiently to remove itself from the visible burner flame.

Note:

- Sample sizes: 360 mm x 50 mm.
- 20 s flame duration.

Method of Analysis:

MDG3608, Appendix C2.1 – *One Kilowatt Burner Flame Test*
(– adapted from *NCB Specification 245:1985, Appendix 2 – Spirit Burner Flame Test* procedure)

Any variation from Standard/Test Method:

None. A 1kW Barthel burner conforming to the requirements of *IEC 60695-11-2* was used.

Requirements:

The material shall fail the test if any of the following occur:

a) If at any time:
   (i) A flame on two or more test pieces extends above the marker, or
   (ii) a glow on two or more test pieces extends above the marker.

b) If after the burner flame has been removed:
   (iii) the mean persistence time of the flame of the six test pieces exceeds 3 seconds, or the persistence time of the flame on any test piece exceeds 10 seconds, or
   (iv) the mean persistence time of the glow of the six test pieces exceeds 10 seconds, or if the persistence time of the glow on any test piece exceeds 30 seconds.

Sample Status:

Due to the shrivelling of each test piece away from the burner flame, no definite statement can be made in respect to the compliance of the material against the Fire Resistance requirements of *MDG3608,* 4.2.1.1.

FIRE RESISTANCE - Spirit Lamp Test

Sample:

Subpro Underground Gas Bag (SP-02) – inflatable borehole plug bag; approx. 90 gsm woven white poly prop material with black conductive stripes

Test Date:

5th of March, 2014

Results:

Test No.	*Persistence of Flame (s)*	*Persistence of After Glow (s)*	*Extent of Shrivel (mm)*
1	0*	0	145
2	0*	0	140
3	0*	0	150
4	0*	0	170
5	4*	0	140
6	0*	0	135
Mean	< 1* s	0 s	147 mm

* Indicates that the material shrivelled out of contact with the flame during the flame application period.

Note:

- Sample sizes: 360 mm x 75 mm.
- 10 s flame duration.
- Samples tested as received.

Method of Analysis:

MDG3608, Clause C3.1.

(– *adapted from NCB Specification 245:1985, Appendix 3 - Spirit Lamp Test* procedure)

Any variation from Standard/Test Method:

None.

Requirements:

The material shall fail the test where any of the following occur:

(1) the mean persistence time of the flame of the six test pieces exceeds 6 seconds, or the persistence time of the flame on any single test piece exceeds 12 seconds; or

(2) the mean persistence time of the glow of the six test pieces exceeds 10 seconds, or if the persistence time of the glow on any single test piece exceeds 30 seconds.

Should the material shrivel away such that the flame does not make contact with the material for the entire application time, the test shall be deemed invalid and the Follow-Up Flame Test shall be performed.

Sample Status:

Due to the shrivelling of each test piece away from the burner flame, no definite statement can be made in respect to the compliance of the material against the Fire Resistance requirements of *MDG3608*, 4.2.1.2.

The 'Follow-Up' fire resistance flame test was therefore applied to the material.

FIRE RESISTANCE – 'Follow-Up' Flame Test

Sample:

Subpro Underground Gas Bag (SP-02) – inflatable borehole plug bag; approx. 90 gsm woven white poly prop material with black conductive stripes

Test Date:

5th of March, 2014

Results:

Test No.	*Persistence of Flame (s)*	*Persistence of After Glow (s)*	*Extent of Shrivel (mm)*
1	0	0	310
2	5	0	360
3	3	0	340
4	5	0	360
5	17	0	340
6	0	0	360
Mean	5 s	0 s	345 mm

Notes:

- Spirit lamp raised steadily so that it remained in contact with the test piece - i.e. the material was not allowed to shrivel away from the flame.
- Duration of flame application: 15 s.
- Tested at ambient 21°C and 60% relative humidity
- Sample sizes: as supplied - 360 mm x 75 mm.

Method of Analysis:

MDG3608, Clause C4.1 [– adapted from *NCB Specification 245:1985, Appendix 4 - 'Follow Up' Flame Test* (Revised Method)].

Any variation from Standard/Test Method:

None.

Requirements:

The material shall fail the test where any of the following occur:

(1) the mean persistence time of the flame of the six test pieces exceeds 60 seconds or the persistence time of the flame on any one test piece exceeds 80 seconds;
(2) the mean persistence time of the glow of the six test pieces exceeds 60 seconds, or if the persistence time of the glow on any single test piece exceeds 80 seconds; or
(3) the material is completely consumed.

Sample Status:

The material complied with the Fire Resistance requirements of *MDG3608*, 4.2.1.2.

The material **complied** with the Fire Resistance requirements of *MDG3608*, 4.2.1.

ELECTRICAL RESISTANCE

Sample:

Subpro Underground Gas Bag (SP-02) – inflatable borehole plug bag; approx. 90 gsm woven white poly prop material with black conductive stripes

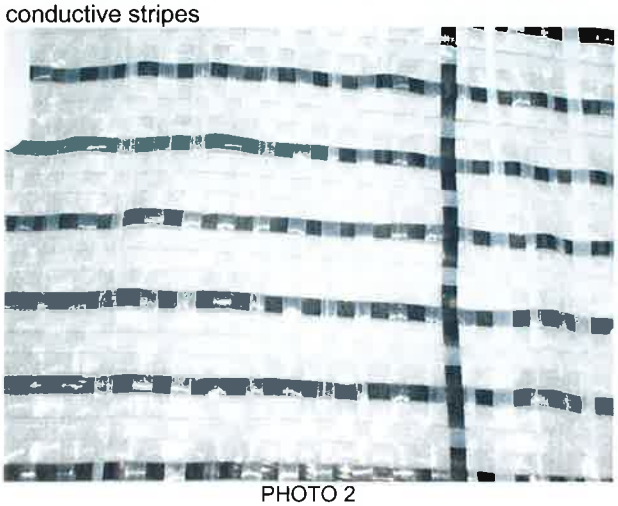

PHOTO 2

Test Dates:

5th of March, 2014

Results:

Test Piece	Electrical Resistance (MΩ)	
	Upper Surface	Lower Surface
1	< 0.1	< 0.1
2	< 0.1	< 0.1
Mean	< 0.1 MΩ	< 0.1 MΩ

Notes:

a) Samples conditioned at 22°C with 50% relative humidity for > 2 hours in an unrestrained state.
b) Samples tested at ambient temperature of 21°C with 60% relative humidity.
c) Sample sizes: 300 mm x 300 mm.
d) No conductivity solution was applied between the electrodes and the sample material.

Method of Analysis:

MDG3608, Clause C5 – *Electrical Resistance of Flat Surfaces Test* [– adapted from *NCB Specification 245:1985, Appendix 5 - Electrical Resistance of Flat Surfaces Test.*

Any variation from Standard/Test Method:

Yes – samples conditioned in relative humidity < 60%.

Requirements:

The average value of the electrical resistance on both the upper and lower surfaces of the sheeting shall not be greater than 300 MΩ (300 x 10^6 ohms), and shall remain so in use.

Sample Status:

The material complied with the electrical resistance requirements of *MDG3608*, 4.2.2.1.

The material **complied** with the *Electrical Resistance* requirements of *MDG3608*, 4.2.2.

OXYGEN INDEX

Sample:

Subpro Underground Gas Bag (SP-02) – inflatable borehole plug bag; approx. 90 gsm woven white poly prop material with black conductive stripes

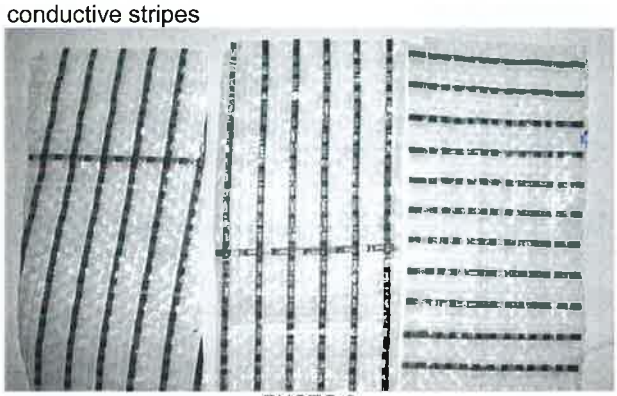

PHOTO 3

Test Date:

7th of March, 2014

Results:

	% O_2
Oxygen Index	20.8

Notes:

a) Oxygen concentrations are percentage by volume.
b) Propagating ignition [*ISO4589-2:1996* ignition 'Procedure B']
c) Sample size: 140 mm x 50 mm [*ISO4589-2:1996* test specimen form: V (– flexible sheet)]
d) The result relate only to the behaviour of the test specimens under the conditions of the test and these results shall not be used to infer the fire hazards of the materials in other forms or under other fire conditions.
e) Samples conditioned at 23°C and 50% relative humidity for >88hrs.
f) The black conductive stripes increased burning duration/propagated flame more readily than white material. The limiting Oxygen Index readings were obtained using sample pieces with 'diagonal-vertical' or 'vertical' stripes (- refer left and central sample pieces shown in PHOTO 3).

Method of Analysis:

ISO 4589-2:1996(E) Determination of Burning Behaviour by Oxygen Index – Part 2 Ambient-temperature test.

Any variation from Standard/Test Method:

No.

Requirements:

The Oxygen Index of the material must be determined in accordance with *ISO 4589-2:1996* for characterisation of the material. Subsequent testing of the product must be within ± 3 points of that originally obtained, but in no case shall be less than 28%.

Sample Status:

The Oxygen Index of the sample was determined as specified by *MDG3608*, 4.2.4.