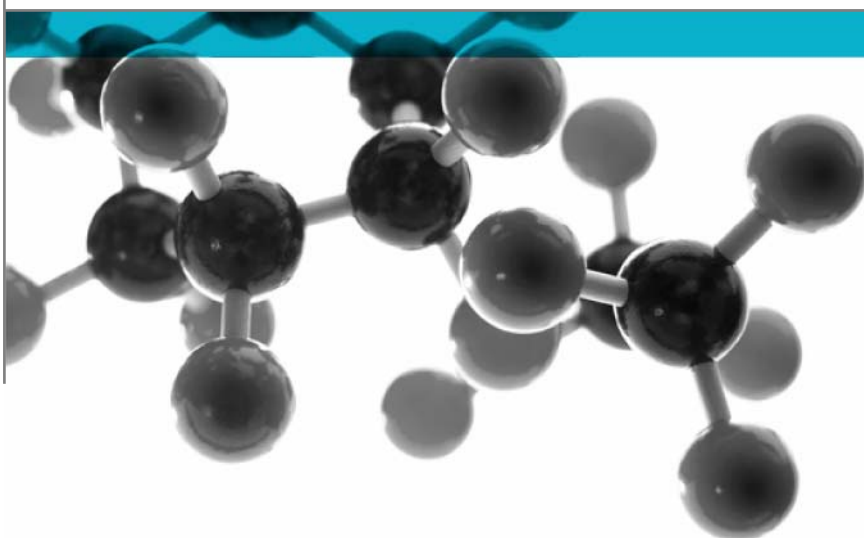


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IEC 60331-11-21



Method of test defined in IEC 60331-11 / -21 for determining the circuit integrity of electric cables under fire conditions

A Report To: Arabian Vermiculite Industries

Date: 17th September 2010

Issue No.: 1

Page 1

Document Reference: Additional test report No. 196978

Testing
Advising
Assuring



Executive Summary

Objective To determine the performance of the following coated cable when it is subjected to the conditions of test specified in IEC 60331-21: 1999, utilising the test apparatus detailed in IEC 60331-11:1999 + A1: 2009.

Generic Description	Product reference	Thickness / diameter	Weight per unit area or density
Coated cable	"Avicoat"	24mm	Not stated
Individual components used to manufacture composite:			
Ablative coating	"Avicoat"	3mm	Not stated
Copper conductor	Not Stated	1.5mm	Not Stated
XLPE conductor insulation	Not Stated	1.0mm	Not Stated
PVC inner sheath	Not Stated	3.0mm	Not Stated
Galvanised steel armour	Not Stated	1.2mm	Not Stated
PVC outer sheath	Not Stated	1.2mm	Not Stated
Please see page 5 of this test report for the full description of the product tested			

Test Sponsor Arabian Vermiculite Industries, 1st Dammam Industrial Area, P.O. Box 7137, Dammam 31462, Kingdom of Saudi Arabia


Test Results: **When tested in accordance with the procedures specified in IEC 60331-21: 1999, utilising the test apparatus detailed in IEC 60331-11: 1999 + A1: 2009, at a temperature of at least 750°C and at a rated voltage of 1000 V-rms, the coated cable maintained it's circuit integrity for 12 minutes and 28 seconds.**

Date of Test 25th August 2010

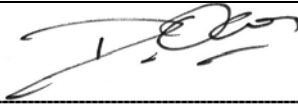
This test report is additional to that issued as WF No. 196058 dated 7th September 2010 and has been issued at the request of the sponsor. The original test report remains valid and is not replaced by this additional test report. The product referred to in the original report and this additional test report has not been re-tested since the original test and neither has a technical review of the original test report resulting in any technical changes been carried out.

The name and address details of the original sponsor have been removed and the details of Arabian Vermiculite Industries have been entered. The original product reference of the coating has been removed and the reference "Avicoat" has been inserted. The name of the manufacturer of the coating has been removed for confidentiality purposes. The sponsor of the test has stated that the material described in this additional report is identical to the material which was tested. Both the original and the alternative name and address details and the original and alternative product references have been documented and the documentation is maintained in the confidential file covering this investigation.

Signatories



Responsible Officer
S. Deeming *
Senior Technical Officer



Authorised **P.P. D.J. Owen**
C. Dean *
Operations Manager

* For and on behalf of **Exova Warringtonfire**.

Report Issued: 17th September 2010

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Document No.: Additional test report No. 196978 Page No.: 2 of 8
 Author: S. Deeming Issue Date: 17th September 2010
 Client: Arabian Vermiculite Industries Issue No.: 1



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Test Details

Purpose of test	To determine the performance of a specimen of a cable when it is subjected to the conditions of test specified in IEC 60331-21: 1999, utilising the test apparatus detailed in IEC 60331-11:1999 + A1: 2009. The purpose of this test method is to determine whether a cable can maintain circuit integrity when it is exposed to the fire conditions described within the method.
Scope of test	<p>IEC 60331-21: 1999 specifies a test procedure and gives a performance requirement, including a recommended flame application time, for cables of rated voltage up to and including 600/1000 V. It is intended to cover low voltage power cables and control cables with a rated voltage.</p> <p>In accordance with section 7.1 of the test standard, a 90 minute flame application time was used.</p> <p>IEC 60331-11: 1999 + A1: 2009 specifies the test apparatus to be used for testing cables required to maintain circuit integrity when subject to fire alone where the test condition is based upon a flame with a controlled heat output corresponding to a temperature of at least 750°C.</p>
Fire test study group/EGOLF	Certain aspects of some fire test specifications are open to different interpretations. The Fire Test Study Group and EGOLF have identified a number of such areas and have agreed Resolutions which define common agreement of interpretations between fire test laboratories which are members of the Groups. Where such Resolutions are applicable to this test they have been followed.
Instruction to test	The test was conducted on the 25 th August 2010 at the request of the original sponsor of the test.
Provision of test specimens	<p>The specimens were supplied by the original sponsor of the test. Exova Warringtonfire was not involved in any selection or sampling procedure.</p> <p>The specimens were received on the 6th August 2010.</p>
Burner verification procedure	The verification procedure for the burner was conducted in accordance with Annex A of IEC 60331-11: 1999 + A1: 2009 at the start of the test day. This determined the gas & air flow rates and the position of the burner that were used for the subsequent cable tests.

Description of Test Specimens

The description of the specimens given below has been prepared from information provided by the original sponsor of the test. All values quoted are nominal, unless tolerances are given.

General description		Ablative coating applied to a cable		
Product reference (coated cable)		"Avicoat"		
Overall diameter (coated cable)		24mm (stated by original sponsor) 25mm (determined by Exova Warringtonfire)		
Overall weight per unit length (coated cable)		See Note 1 Below		
Coating	Generic type	Ablative coating		
	Product reference	"Avicoat"		
	Detailed description / composition details	See Note 2 Below		
	Name of manufacturer	See Note 3 Below		
	Colour	"White"		
	Number of coats	1		
	Application thickness per coat	3mm		
	Application method	Brush		
	Flame retardant details	See Note 2 Below		
Curing process per coat		Drying at room temperature for 2 weeks		
Cable	Product reference		"CU/XLPE/SWA/PVC"	
	Cable markings		"ELECTRIC CABLE 600/1000V BS 5467 (DRAKA UK) BASEC MADE IN UK"	
	Cable function		Power cable for residential or industrial areas	
	Number of cores		3	
	Voltage rating		600/1000 V	
	Cable manufacturer		Nexans	
	Conductors	Product reference		See Note 1 Below
		Generic type		Copper
		Name of manufacturer		See Note 1 Below
		Total cross-sectional area of each conductor		$3.142 \times 3^2 = 28.28\text{mm}^2$
		Diameter of each strand		1.5mm
		Weight per unit length per strand		See Note 1 Below
	Number of strands per conductor		7	
	Conductor Insulation	Product reference		See Note 1 Below
		Generic type		XLPE
		Name of manufacturer		See Note 1 Below
		Colour		"Brown", "Black", "Grey"
		Thickness		1mm
		Density / weight per unit area		See Note 1 Below
	Flame retardant details		See Note 4 Below	

Continued on next page

Cable (continued)	Inner sheath	Product reference	See Note 1 Below
		Generic type	PVC
		Name of manufacturer	See Note 1 Below
		Colour	"Black"
		Thickness	3mm
		Density / weight per unit area	See Note 1 Below
		Flame retardant details	See Note 4 Below
	Armour	Product reference	See Note 1 Below
		Generic type	Single layer galvanised round steel wire
		Name of manufacturer	See Note 1 Below
		Diameter of each strand	1.2mm
		Weight per unit length of each strand	See Note 1 Below
		Number of strands	34
	Outer sheath	Product reference	See Note 1 Below
		Generic type	PVC
		Name of manufacturer	See Note 1 Below
		Colour	"Black"
		Thickness	1.2mm
		Density / weight per unit area	See Note 1 Below
		Flame retardant details	See Note 4 Below
	Brief description of manufacturing process		Coating is brush applied to the cable at the desired thickness. The original sponsor was unwilling to provide further information relating to the manufacturing process of the coating and was unable to provide information relating to the manufacturing process of the cable.

Note 1 - The original sponsor was unable to provide this information.

Note 2 - The original sponsor was unwilling to provide this information.

Note 3 - The original sponsor of the test has provided this information but at the specific request of the sponsor, these details have been omitted from the report and are instead held on the confidential file relating to this investigation.

Note 4 - The original sponsor of the test has confirmed that no flame retardant additives were utilised in the production of the product / component.

The original sponsor has confirmed that the cable specimen was manufactured by another party and that they were not able to obtain from the manufacturer some details that would normally be included in **Exova Warringtonfire** test reports. The description of the specimen given above is therefore not as complete as would normally be the case for descriptions included in **Exova Warringtonfire** test reports and the description may not fully comply with the requirements of the test standard. In all other respects however the test was conducted fully in accordance with the requirements of the test standard and the test results are valid.

Test Results

Applicability of test result The test results relate only to the specimen of the cable in the form in which it was tested. Small differences in the composition of the product may significantly affect the performance during the test and may therefore invalidate the test results. Care should be taken to ensure that any product, which is supplied or used, is fully represented by the specimen, which was tested.

Results of test **When tested in accordance with the procedures specified in IEC 60331-21: 1999, utilising the test apparatus detailed in IEC 60331-11: 1999 + A1: 2009, at a temperature of at least 750 C and at a rated voltage of 1000 V-rms, the coated cable maintained it's circuit integrity for a duration of 12 minutes and 28 seconds.**

Validity The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over five years old should be considered by the user. The laboratory that issued the report will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test to ensure that they are consistent with current practices, and if required may endorse the test report.

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Revision History

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Revised By:	Approved By:
Reason for Revision:	

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