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3i Intenational Innovative Industries S.A.

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Under the aegis of the Major of Athens,
Mr. Demetres L. Avramopoulos

Today, June 23rd 2000, at Technopolis
in the city of Athens, is being awarded

Anniversary Millennium Prize 2000
"High Quality of Products and Services"

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Αριθμός Πιστοποιητικού: **1787/Δ**

Ημερομηνία 1ης Έκδοσης : **03/08/2015**
Ημερομηνία 2ης Έκδοσης : **10/09/2018**

Το πιστοποιητικό ισχύει ως την : **09/09/2021**

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FACTORY: 68TH KLM ATHENS-LAMIA NATIONAL ROAD – LAMIA, RITSONA, CHALKIDA/ GREECE

Implements quality management system that conforms to the requirements of the standard

EN ISO 9001:2015

for the following scope:

- **DESIGN & PRODUCTION OF EXPANDED INSULATING PIPES & SHEETS OF SYNTHETIC RUBBER**
- **CONSTRUCTION OF BOILERS**

Certificate Number: **1787/Δ**

1ST Issue Date: **03/08/2015**
2ND Issue Date: **10/09/2018**

This Certificate is valid till: **09/09/2021**

For the Certification Body,

GEORGE BRISKOLAS
Managing Director

The validity of this certificate is subject to annual surveillances.
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Lack of fulfillment of the conditions set out in the contract No. [illegible]/2018 may render this certificate invalid.

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Notified Body 1020

CERTIFICATE
OF CONSTANCY OF PERFORMANCE

No. 1020 – CPR – 010041326

In compliance with Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 (the Construction Products Regulation or CPR), this certificate applies to the construction product:

Thermal insulation products for building equipment and industrial installations - Factory made flexible elastomeric foam (FEF) products

Type/variation: ISOPIPE TC Tubes; ISOPIPE TC Sheets; ISOCLIMA RT Tubes; ISOCLIMA RT Sheets; ISOTUBE IP Tubes; ISOTUBE IP Sheets

placed on the market under the name or trade mark of

3i International Innovative Industries S.A.

Nafpliou & Daskalogianni, 144 52, Metamorfosi, Athens, Greece

VAT: 094460772

and produced in the manufacturing plant

3i International Innovative Industries S.A., 68km National Road, Athens-Lamia, 341 00 Ritsona, Halkida, Greece

This certificate attests that all provisions concerning the assessment and verification of constancy of performance described in Annex ZA of the standard

EN 14304:2009+A1:2013

under system 1 for the performance set out in this certificate are applied and that the factory production control conducted by the manufacturer is assessed to ensure the

constancy of performance of the construction product.

This certificate was first issued on 11.06.2019 and will remain valid as long as neither the harmonised standard, the construction product, the AVCP methods nor the manufacturing conditions in the plant are modified significantly, unless suspended or withdrawn by the notified product certification body.

The stamp of the Notified Body 1020

Prague, 11 June, 2019

Ing. Iveta Jiroutová
Deputy manager of the Notified Body

0003A099_4_2018_02

TECHNICKÝ A ZKUŠEBNÍ ÚSTAV STAVEBNÍ PRAHA, s.p.
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Prosecká 811/76a, 190 00 Praha 9, Czech Republic

Authorized Body 204
Notified Body 1020
Branch 0100 - Praha

REPORT

on the initial type test

pursuant to Article 5 Clause 1 b) of the Czech Republic Government Decree No. 190/2002 Coll. (system of conformity assessment 3), and in compliance with Direction 89/106/EEC of the Council of the European Communities (Construction Products Direction-CPD), as amended by Direction 93/68/EEC of the Council of the European Communities

No. 1020 - CPD – 010030388

Trade name:

Thermal insulation products for building equipment and industrial installations - Factory made flexible elastomeric foam (FEF)

Type/variant: ISOPIPE HT, ISOPIPE UV - EN 14304 (Flat and Cylindrical)

Manufacturer:

3i International Innovative Industries SA

Address:	Nafpliou & Daskalogianni, 14452, Metamorfosi, Attiki, Greece
Plant:	3i International Innovative Industries SA
Address:	68Km National Road Athens-Lamia, Greece
Order:	Z010120268

Number of Report pages including title page: 5 Number of Annexes: 0

The person taking responsibility for the content of this report:

Ing. Michal Vindyš
Head Assessor

The person taking responsibility for correctness of this report:

Stamp of Notified body 1020

Praha, 23 October 2012

Ing. Iveta Jiroutová
Deputy Manager of the Notified Body 1020

Technical and Test Institute for Construction Prague, Branch 0100-Praha, Prosecká 811/76a, 190 00 Praha, Czech Republic
Phone.: 286 019 400, Fax:+420 286 891 393, Internat.: +420 286 019 400, e-mail: Info@tzus.cz, http://www.tzus.cz
Bank Name: KB Praha 1 Czech Republic, Account Number: 1501-931/0100, INo: 000 15679, VAT: CZ00015679

1 Specification of tested subject

Information about the product – description and intended use:

Factory made flexible elastomeric foam products which are used for the thermal insulation of building equipment and industrial installations with an operating temperature in the range of approximately - 50 °C to + 85 °C(ISOPIPE UV) and/or + 150 °C(ISOPIPE HT). The products are manufactured in the form of sheets, pipes, rolls or systems with or without coating and/or self-adhesive backing and/or different closure systems.

ISOPIPE HT insulation is produced with a density of 70-85 kg/m^3

ISOPIPE HT and ISOPIPE UV does not release any potentially damaging elements into ozone layer and is free of halogen and CFCs

ISOPIPE UV is variant ISOPIPE HT with UV covering

Technical specification:	14304:2009
Trade marks:	ISOPIPE HT, ISOPIPE UV - EN 14304 (Flat and Cylindrical)
Information about the manufacturer:	
Name:	3i International Innovative Industries SA
Address:	Nafpliou & Daskalogianni, 14452, Metamorfosi, Attiki, Greece
Information about the plant:	
Plant adress:	68Km National Road Athens-Lamia, Greece

Date of the test ending: 25.09.2012

2 Sampling

Date of sampling and delivery:	13.06.2012
Place of sampling:	TZUS Praha, s.p., AZL 1018.5
Sampler:	Ing. Michal Vindyš
Sampling method:	
Transport mode:	by courier
Date of the taking over:	13.06.2012

3 Testing methods, standards and procedures

The tests were carried out according to standard EN 14304:2009

Thermal insulation products for building equipment and industrial installations - Factory made flexible elastomeric foam (FEF) - according to EN 14304:2009

Test methods:

EN 12667	Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance
EN 823	Thermal insulating products for building applications - Determination of thickness
EN 13501-1+A1	Fire classification of construction products and building elements - Part 1: Classification using test data from reaction to fire tests
EN ISO 11925-2	Reaction to fire tests - Ignitability of building products subjected to direct impingement of flame - Part 2: Single-flame source test
EN 1609	Thermal insulating products for building applications - Determination of short term water absorption by partial immersion
EN 826	Thermal insulating products for buildings applications - Determination of compression behaviour
EN 13468	Thermal insulation products for building equipment and industrial installations - Determination of trace quantities of water soluble chloride, fluoride, silicate, sodium ions and pH

4 Test results

Starting and ending dates of tests: from 2012-07-08 to 2012-09-25.

The test specimens were conditioned before testing 14 days at a temperature (23±2) °C and relative humidity (50±5) % and than it were tested.

Result of the test of determination of thermal conductivity was taken from the Test protocol Nr. 070-037686 from 2012-09-14, issued by TZÚS Praha, s.p., Branch 0700-Ostrava, Accredited testing laboratory 1018.7

Result of the tests (determination of length, width, thickness, apparent density, short term water absorption by partial immersion) was taken from the Test protocol Nr. 010-030389 from 2012-10-12, issued by TZÚS Praha, s.p., Branch 0100-Praha, Accredited testing laboratory 1018.5

Prüfungenbericht Nr. 9011621000, ISOPIPE TC, 2006-08-31, MPA Universität Stuttgart, Otto-Graf-Institut.

Reports No 15779-1/2 and 15779-2/2 from 10 October 2012, CSI a.s. , AZL 1007.7

Classification of Reaction to Fire in accordance with ČSN EN 13501-1+A1:2010, PK-12-090 from 10 October 2012, CSI a.s., NB 1390

4.1 Classification of reaction to fire

The products ISOPIPE HT/UV are classified in accordance with EN 13501-1+A1

Specification of test: EN 14304:2009 (Article 4.2.4)

The samples of ISOPIPE HT/UV were tested according to EN ISO 11925-2, Annex A

Conditioning according to EN 13238, Article 4.3.c

Date receipt of samples: 13.08.2012

Date of test: 10.10.2012

Test was carried out by: Vít Slaboch

Result of test (Single-flame source test) and classification reaction to fire:

Test method	Parameter	Result	Compliance of parameter
EN ISO 11925-2, Annex A	$F_s \leq 150$ mm	yes	yes (E)
	ignition of filter paper	no	no (E)

Fire Behaviour	Smoke production		Flaming droplets	
E	s	not classified	d	not classified

Reaction to fire classification: E

4.2 Determination of thermal conductivity

Specification of test: EN 14304:2009 (Article 4.3.4)

Determination according to test method: EN 12667:2001

Test and measuring equipment: LaserComp FOX 801

Test was carried out by: Ing. Tomáš Klepáč

Test was carried out: 2012-09-04 to 2012-09-07

The test was carried out at a room temperature (23±2) °C and relative humidity (50±5) %.

Property	Mean temperature	Measured values	Declared values
Mean value of thermal conductivity coefficient λ_{mean}	0	0,034 W/(mK)	≤ 0,035 W/(mK)
	10	0,035 W/(mK)	≤ 0,037 W/(mK)
	20	0,036 W/(mK)	≤ 0,038 W/(mK)
	30	0,038 W/(mK)	≤ 0,039 W/(mK)
	40	0,039 W/(mK)	≤ 0,040 W/(mK)

4.3 Determination of length

Test specimen: full size according to EN 13163:2008 Table 1

Determination according to test method: EN 822

Test was carried out by: Jiří Novák

The test was carried out at a room temperature (23±2) °C and relative humidity (50±5) %.

Test results – flat isolation:

Property	Measured values	Declared values	Dimensional tolerances in accordance with EN 14304
Thickness d_D	19,08 mm	19 mm	± 1,5 %
	40,08 mm	40 mm	± 2,0 %

Product complies with requirements to tolerances for thickness in accordance with EN 14304.

Test results – cylindrical isolation:

Property	Measured values	Declared values	Dimensional tolerances in accordance with EN 14304
Thickness d_D	19,08 mm	19 mm	± 2,5 %
	30,06 mm	30 mm	± 2,5 %

Product complies with requirements to tolerances for thickness in accordance with EN 14304.

4.4 Release of dangerous substances

According to the statement issued by the manufacturer does not contain hazardous chemicals.

4.5 Determination of compressive stress at 10 % deformation

Compressive strength is not applicable for FEF products.

4.6 Determination of short term water absorption by partial immersion

Specification of test: EN 14304:2009 (Article 4.3.4)

Determination according to test method: EN 1609, Method A

Test was carried out by: Jiří Novák

The test was carried out at a room temperature (23±2) °C and relative humidity (50±5) %.

4.3.1 ISOPIPE HT

Test sample	1	2	3
short term water absorption by partial immersion W_p [kg/m^2]	0,06	0,07	0,06
Arithmetic average [kg/m^2]			0,06

4.3.2 ISOPIPE UV

Test sample	1	2	3
short term water absorption by partial immersion W_p [kg/m^2]	0,05	0,06	0,04
Arithmetic average [kg/m^2]			0,05

No test results of the water absorption W_p, shall exceed 0,1 kg/m^2 (WS01)

4.7 Release of corrosive substances

Specification of test: EN 14304:2009 (Article 4.3.6)

Determination according to test method: EN 13468

Test was carried out by: B. Müller

The test was carried out at a room temperature (23±2) °C and relative humidity (50±5) %.

Property	Measured values	Declared values
Thickness d_D	pH 8,93	pH 8,5±1
	Cl⁻ 0,038 %	Cl⁻ < 0,05 %

5 Annexes

No annexes

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Notified Body 1020
Branch 0100 – Prague

REPORT

on the outcome of the assessment and verification of constancy of performance of the product

according to the Regulation (EU) 305/2011 of the European Parliament and of the Council of 9 March 2011 (the Construction Products Regulation or CPR) and Commission Delegated Regulation (EU) No 568/2014, of the Annex V, Cl. 1.2 (system 1)

No. 010-041325

Trade name:

Thermal insulation products for building equipment and industrial installations - Factory made flexible elastomeric foam (FEF) products according to EN 14304:2009+A1:2013

- *products according to Annex No. 1*

type / variation: sheets and tubes

Manufacturer:

3i International Innovative Industries S.A.

INo:	094460772
Address:	Nafpliou & Daskalogianni, 144 52, Metamorfosi, Athens, Greece
Plant:	3i International Innovative Industries S.A.
Address:	68km National Road. Athens-Lamia, 341 00 Ritsona, Halkida, Greece
Order:	Z010190029

Number of report pages including title page: 6 Number of Annexes: 0

Stamp of the Notified Body 1020

Praha, 11.06.2019

Ing. Klára Bednářová
Chief Assessor

Technical and Test Institute for Construction Prague, Branch 0100-Praha, Prosecká 811/76a,190 00 Praha, Czech Republic
Tel.: 286 019 403, Fax:+420 286 891 393, Internet.: +420 286 019 400, e-mail: info@tzus.cz, www.tzus.cz
Bank Name: KB Praha 1 Czech Republic, Account Number: 1501-531/0100, INo: 000 15679, VAT: CZ00015679

1. General

1.1 Information about the manufacturer

Manufacturer: 3i International Innovative Industries S.A.

Address: Nafpliou & Daskalogianni, 144 52, Metamorfosi, Athens, Greece

Plant: 3i International Innovative Industries S.A.

Address: 66km National Road, Athens-Lamia, 341 00 Ritsona, Halkida, Greece

1.2 Information about the product and its intended use

Factory made flexible elastomeric foam (FEF) products according to EN 14304:2009+A1:2013

Note: Flexible elastomeric foam(FEF) - closed cell flexible foam, made of natural or synthetic rubber, or a mixture of the two and containing other polymers and other chemicals which may be modified by organic or inorganic additives.

Trade names: products according to Annex No. 1

Intended use: thermal insulation products for building equipment and industrial installations

1.3 List of documentation provided by the manufacturer to the assessment and verification of constancy of performance (AVCP)

- application for performance of activity of notified body – AVCP system1
- manufacturer´s documentation – production control (integral part of QMS)
- List of procedures
- List of work instructions
- Quality manual – STD 006 of 09.08.2018
- Certificate No. 1787/Δ according to EN ISO 9001:2015 of 10.09.2018 with validity till 09.09.2021
- Written declaration of the manufacturer of 27.05.2019 (adding of fire retardants)

1.4 List of the other documentation used during the product AVCP

- Regulation (EU) 305/2011 of the European Parliament and of the Council of 9 March 2011 and Commission Delegated Regulation (EU) No 568/2014
- Factory production control audit checklist of 28.05.2019

1.5 Technical specification relating to the AVCP (as amended)

- EN 14304:2009+A1:2013 Thermal insulation products for building equipment and industrial installations - Factory made flexible elastomeric foam (FEF) products – Specification
- EN 13172: 2012 Thermal insulation products - Evaluation of conformity

1.6 Information about previous AVCP

Previous assessment and verification of contanstancy of performance was performed under the order No. Z010120229 (certificate of constancy of performance No. 1020-CPR-010030261).

2 Product Assessment

2.1 Technical requirements

The following characteristics were assessed according to EN 14304:2009+A1:2013

Table 1:

No	Product characteristic	AVCP system
1.	Reaction to fire	1
2.	Thermal resistance and thermal conductivity coefficient	1
3.	Release of dangerous substances	1
4.	Water permeability	1
5.	Compression strength	1
6.	Release of corrosive substances	1

2.2 List of the Test Reports:

1 Report No. 0077/DC/REA/19-3 of 30.01.2019, issued by CSI S.P.A A SOCIO UNICO, Notified Body 0497
2 Report No. 19081 of 13.05.2019, issued by Danish Technological Institute, Notified Body 1235
3 Test report No. 412108129 of 01.06.2018, issued by ITC a.s., Testing laboratory
4 Manufacturer´s declaration (release of dangerous substances) of 30.05.2019

2.3 Assessment on the basis of testing, calculation and declaration

2.3.1 Reaction to fire

Table 2:

Product characteristic	AVCP system	Classification report	Test method	Test result
Reaction to fire	1	0077/DC/REA/19-3	EN 13501-1+A1	class B-s3 d0

2.3.2 Thermal resistance

Table 3:

Product characteristic	AVCP system	Test report	Test method	Test result
Thermal conductivity coefficient Thickness 43,5 mm and at temperature 0.02°C Thickness 44.79 and at temperature 10.03°C Thickness 49.4 and at temperature 39.86°C	1	19081	EN 12667	0.03316 W/m.K 0.03436 W/m.K 0.03847 W/m.K

Note: Declared thermal conductivity values shall be declared according to Cl. 4.3.3 of EN 14304:2009+A1:2013

2.3.3 Compression behaviour

Not relevant for FEF products according to note [5] in Table ZA.1 of EN 14304:2009+A1:2013.

2.3.4 Water permeability

Not declared

2.3.5 Release of dangerous substances

Table 4:

Product characteristic	AVCP system	Declaration	Test method	Test result
Release of dangerous substances	1	Written declaration of the manufacturer in accordance with REACH regulation	———	Positive assessment

2.3.6 Release of corrosive substances

Table 5:

Product characteristic	AVCP system	Test report	Test method	Test result
Release of corrosive substances F^- Cl^- SiO_2 Na^+ pH	1	412108129	EN 13468	< 50 mg/kg 241 mg/kg 57.8 mg/kg 120 mg/kg 8.54

2.4 Requirement of the technical specification regarding factory production control:

- Requirements are laid down in EN 14304:2009+A1:2013 and EN 13172: 2012

2.5 Evaluation of the factory production control assessment results:

- The assessment was carried out 28.05.2019 in the factory of 3i International Innovative Industries S.A.:
  Assessors: Klára Bednářová, Zdeněk Kočí (Notified Body 1020)
  Konstantinos Psychogios (external auditor of Notified Body 1020)
- The assessment of the factory production control was based on the criteria of the technical specification EN 14304:2009+A1:2013 and also in accordance with ČSN EN 13172: 2012.
- Technical documentation of the manufacturer contains description of the FPC.
- There is a system of regular tests in the framework of inter-operation inspections, the manufacturer requires from the subcontractors proof of the quality of the raw materials supplied.
- The technological process complies with the implementing rules, clearly defines the preparation requirements, the individual production phases, the storage and dispatching of the products.

- The manufacturer performs regular tests according to the control plan and performs quality control of subcontracting.
- Calibration and service maintenance of measuring and production equipment are performed at prescribed intervals and records are kept.
- Non-conformities have not been identified.
- **The surveillance is scheduled for November 2019.**

3 Conclusion

- The sample of products fulfil the requirements of the technical specification.
- The FPC is in accordance with the harmonised technical specification and ensures that the declared performances are achieved.
- Findings and conclusions mentioned in this report are valid providing the conditions under which FPC assessment was carried out remain unchanged (e.g. technical regulations, technical specifications, production technology, incoming raw and manufacturing equipment).
- In compliance with provision of the CPR Art. 1.2, Annex V surveillance reports containing FPC assessment and evaluation have to be complementary to the technical documentation.

4 Annexes

1 List of assessed products
2 Checklist of 26.05.2019
3 Report No. 0077/DC/REA/19-3 of 30.01.2019, issued by CSI S.P.A A SOCIO UNICO, Notified Body 0497
4 Report No. 19081 of 13.05.2019, issued by Danish Technological Institute, Notified Body 1235
5 Test report No. 412108129 of 01.06.2018, issued by ITC a.s., Testing laboratory
6 Manufacturer's declaration (release of dangerous substances) of 30.05.2019

Annex No. 1 to the report on the outcome of the assessment and verification of constancy of performance of the product No. 010-041325

List of assessed products

Table No. 1

No.	Trade name	ST(+)	ST(-)
1	ISOPIPE TC Tubes	105°C	-60°C
2	ISOPIPE TC Sheets	95°C	-60°C
3	ISOCLIMA RT Tubes	105°C	-60°C
4	ISOCLIMA RT Sheets	95°C	-60°C
5	ISOTUBE P Tubes	105°C	-60°C
6	ISOTUBE P Sheets	95°C	-60°C

Stamp of the Notified Body 1020

Prague, 11.06.2019

Ing. Klára Bednářová
Chief assessor

ΟΡΓΑΝΙΣΜΟΣ ΒΙΟΜΗΧΑΝΙΚΗΣ ΙΔΙΟΚΤΗΣΙΑΣ

ΔΙΠΛΩΜΑ ΕΥΡΕΣΙΤΕΧΝΙΑΣ

Αριθμ. **1004469**

Έχοντας υπόψη :

α) το άρθρο 8 παρ. 11 του νόμου 1733/87 "Μεταφορά τεχνολογίας, εφευρέσεις, τεχνολογική καινοτομία και σύσταση Επιτροπής Ατομικής Ενέργειας"

β) την υπ' αρ. 15928/ΕΦΑ/1253 απόφαση του Υπουργού Βιομηχανίας, Ενέργειας και Τεχνολογίας "Κατάθεση αίτησης για χορήγηση Διπλώματος Ευρεσιτεχνίας ή Πιστοποιητικού Υποδείγματος Χρησιμότητας στον ΟΒΙ και τήρηση βιβλίων"

γ) την αίτηση που κατέθεσε ο ενδιαφερόμενος στον Ο.Β.Ι. στις **6-11-2002** με αριθμό **20020100479** ,

Απονέμουμε

Δίπλωμα Ευρεσιτεχνίας με θεωρημένα όλα τα κατά νόμον απαιτούμενα σχετικά έγγραφα , στην εταιρεία :

3i INTERNATIONAL INNOVATIVE INSULATION ΑΝΩΝΥΜΗ ΒΙΟΜΗΧΑΝΙΚΗ ΕΤΑΙΡΕΙΑ ΥΔΡΑΥΛΙΚΩΝ ΚΑΙ ΜΟΝΩΤΙΚΩΝ ΕΙΔΩΝ
Δασκαλογιάννη και Ναυπλίου, 14452, ΜΕΤΑΜΟΡΦΩΣΗ ΑΤΤΙΚΗΣ

ΙΤΛΟΣ : " ΕΛΑΣΤΟΜΕΡΕΙΣ ΑΦΡΩΔΕΙΣ ΘΕΡΜΟΜΟΝΩΤΙΚΟΙ ΣΩΛΗΝΕΣ ΛΥΟ ΣΤΡΩΜΑΤΩΝ "

ΦΕΥΡΕΤΗΣ(ΕΣ) : ΤΖΑΝΟΣ ΚΩΝΣΤΑΝΤΙΝΟΣ

ΙΕΘΝΗΣ ΤΑΞΙΝΟΜΗΣΗ (INT.CL.[7]) : F16L 59/14, B32B 7/12

ο Δίπλωμα Ευρεσιτεχνίας αυτό, ισχύει μέχρι : **7-11-2022**

Αθήνα 01/03/2004

Ο ΔΙΟΙΚΗΤΗΣ

ΣΤΕΦΑΝΟΥΔΑ ΣΑΜΟΥΗΛΙΔΗΣ

ΟΡΓΑΝΙΣΜΟΣ ΒΙΟΜΗΧΑΝΙΚΗΣ ΙΔΙΟΚΤΗΣΙΑΣ

ΟΡΓΑΝΙΣΜΟΣ
ΒΙΟΜΗΧΑΝΙΚΗΣ
ΙΔΙΟΚΤΗΣΙΑΣ (Ο.Β.Ι.)

ΕΚΘΕΣΗ ΕΡΕΥΝΑΣ

Αριθμ. αιτ. Δ.Ε. : 20020100479 Αριθμ. Δ.Ε. : 1004469

Κατηγ.	ΣΧΕΤΙΚΑ ΕΓΓΡΑΦΑ & αναφορές σε τμήματά τους	Σχέση με αξίωση	Διεθν. Ταξινόμηση Int. Cl. 7
	Η έρευνα βασίστηκε σε έγγραφα που κατατέθηκαν μετά το 1978 [illegible] Ευρωπαϊκές, Διεθνείς & Αμερικάνικες αιτήσεις ΔΕ, σε περιλήψεις [illegible] σε Ελληνικές αιτήσεις ΔΕ [illegible]. Γίνεται είναι δυνατόν να αναφερθούν στην Έκθεση Έρευνας και έγγραφα [illegible]		F16L 59/14 B32B 7/12
Y	JP56117626 A / (BOOSTAR KOGYO) 16/09/81 * Περίληψη : Σχέδιο *	1 - 3	
Y	WO02077614 A / (ARMACELL ENTERPRISE GMBH) 03/10/02 * Περίληψη : Σχέδιο *	1 - 3	
Y	JP58057395 A / (FURUKAWA ELECTRIC CO LTD) 05/04/83 * Περίληψη : Σχέδιο *	1 - 3	
A	GB2136528 A / (KABELMETAL ELECTRO GMBH) 19/09/84 * Ολόκληρο το έγγραφο *	1, 2	
A	US5571625 A / (PORTE et al.) 05/11/96		**Τεχνικά πεδία που ερευνήθηκαν** F16L B32B B29D

Ανήκει στο 1004469 Δ.Ε.
Αθήνα 01/03/2004
Με εντολή
Γεν. Δ/ντή

Ο.Β.Ι. ΟΡΓΑΝΙΣΜΟΣ ΒΙΟΜΗΧΑΝΙΚΗΣ ΙΔΙΟΚΤΗΣΙΑΣ

Μάντης

Ημερομηνία ολοκλήρωσης της Έκθεσης Έρευνας : 12/12/2003

X : Έγγραφο Πολύ Σχετικό
Y : Έγγραφο πολύ σχετικό σε συνδυασμό με άλλο έγγραφο της ίδιας κατηγορίας
A : Τεχνολογικό υπόβαθρο
O : Μη γραπτή αποκάλυψη
P : Ενδιάμεσο έγγραφο
& : Μέλος της ίδιας οικογένειας ευρεσιτεχνιών
T : Θεωρία ή Αρχή της βάσης της εφεύρεσης
E : Προγενέστερο έγγραφο ΔΕ που δημοσιεύθηκε κατά ή μετά την ημερομηνία κατάθεσης
D : Έγγραφο αναφερόμενο στην αίτηση
L : Έγγραφο αναφερόμενο για άλλους λόγους

- 1 -

Materials Testing Institute
University of Stuttgart
. . Box 80 11 40
70511 Stuttgart
Germany

MPA STUTTGART
Otto-Graf-Institut
Materials Testing Institute University of Stuttgart

Test Report

ISOPIPE TC
Soluble Salts according to DIN 1988 T 7

Client:	3i International Innovative-Insulation S.A. P.O.Box 75 Shimatari 32009 Greece
Order-No. (Client):	Order Test according to DIN 1988-7
Order-No. (MPA):	**901 1621 000 /intern 206 0130 Vo**
Test Item:	**Closed cell NBR ISOPIPE TC 13 x 18 mm** **Date of production 2006-01-18**
Specification Applied:	DIN 1988- 7
Date of Receipt of Test Item	2006-05-11
Date of Test:	2006-08-24
Date of Report:	2006-09-06
Page 1 of	3 text pages
Enclosures :	0
Supplements:	0
Total Number of Pages:	3
Number of Reports:	1

The test results relate only to the items tested.

1 Purpose of Investigation

Determination of soluble ions (Chloride, Nitrite and Ammonia) and pH-value in closed cell insulation material based on NBR-Rubber type ISOPIPE TC 13 x 18 mm (2006-01-18) according to "Codes of Practice for drinking water installation (TRWI); prevention of corrosion damage and calcarrous deposit formation; DVGW code of practice – DIN 1988 T 7".

2 Tests and Analyses Performed

Aqueous Leaching of crushed closed cell NBR-Rubber (24 h ; temperature 60 °C)

Determination of chloride and nitrite in the leachate: DIN EN ISO 10304-1

Determination of ammonia in the leachate: ISO 7150-1

Determination of pH-value in the leachate: DIN 38404-5

3 Results of Investigation

Parameter	Content in NBR ISOPIPE TC 13x18 mm (2006-01-18)	Permissible content according to DIN 1988 T 7
Chloride	0,038 %	0,05 % (insulationmaterial for stainless steel pipes)
Ammonia	0,088 %	0,2 % (insulationmaterial for pipes based on copper material)
Nitrite	n.d.	Nitrite-free (insulationmaterial for pipes based on copper material)
pH-value	8,93	No requirement

n.d. = not detectable (detection limit 0,0005 %)

Materialprüfungsanstalt Universität Stuttgart
D-70569 Stuttgart (Vaihingen)
Pfaffenwaldring 32
USt.-ID-Nr.: DE 147794186

Phone +49 0711 685 - 0
Telefax +49 711 685 - 62635
Internet: www.mpa.uni-stuttgart.de

Baden-Württembergische (BW) Bank Stuttgart
Account No. 1 054 611 700 BLZ 600 200 30
IBAN: DE89 6002 0030 1054 6117 00
BIC/SWIFT-Code: BWBKDE66600

4 Summary

The tested insulation material ISOPIPE TC 13x 18 mm fullfills the requirements of DIN 1988 T 7 (clause 5.3) for insulation material for pipes made of stainless steel and copper materials

Prepared by

B. Müller
Testing Engineer

UNIVERSITÄT STUTTGART
MATERIALPRÜFUNGSANSTALT (MPA)

Approved and released by

Dr. G. Volland
Head of Department

BB ANC
BŪVMATERIĀLU BŪVIZSTRĀDĀJUMU ATBILSTĪBAS NOVĒRTĒŠANAS CENTRS
LV- 1012, Rīga, Kr.Barona iela 99/1A
tālr. 7 27 38 44, tālr./fakss 7 31 37 58
e-pasts: bbanc@delfi.lv
http: //home.delfi.lv/bbanc

Atbilstības Sertifikāts

Nr BBANC-419/03

DERĪGUMA TERMIŅŠ 2004. gada 01. oktobris

ATBILSTĪBAS SERTIFIKĀTS IZSNIEGTS: SIA "HIDROPOLS", Latvijas Republika, LV-1009 Rīga, Matīsa iela 74-55. R/A Nr. 000327915.

SERTIFIKĀTS APLIECINA, KA PRODUKTS: "International Innovative Insulation S.A." ražotie cauruļu izolācijas materiāli no sintētiskā kaučuka:

- čaulas: ISOPIPES, ISOCOIL ar biezumu 6,9,13,19,25,32 mm; Ø 6-139 mm;
- loksnes: ISOSHEETS ar biezumu 6,9,13,19,25,32 mm.

Kodi 4008, 4009.

Ražotnes adrese: 68th Km Nat. Rd. Athens-Lamia, 34100 Ritsona-Halkida, Grieķija.

ATBILST: Saskaņā ar ražotāja specifikācijā (degtspējas grupa: degoša; siltumvadītspējas koeficients $\lambda_{10^{\circ}C} \leq 0,038$ W/m·K; tilpummasa 65-75 kg/m^3; ūdens tvaika difūzijas pretestības faktors $\mu \geq 4000$) deklarētajām īpašībām.

PRODUKTS SERTIFICĒTS, PAMATOJOTIES UZ:

1. BBANC Sertifikācijas shēmu IF.
2. Produkta uzglabāšanas novērtēšanas protokolu no 13.08.2003.
3. RTU PMPL testēšanas pārskatu Nr. 480 no 01.09.2003.
4. VBI BTL testēšanas pārskatu Nr. 03/591 no 10.09.2003.
5. VUGD ZPP UIL testēšanas pārskatu Nr. 343 no 18.08.2003.
6. SIA "HIDROPOLS" Atbilstības deklarāciju no 10.09.2003.
7. BBANC sertifikācijas pārskatu Nr. 900/1 no 10.09.2003.

LATVIJAS REPUBLIKA BB ANC Sertifikācijas centrs Nr. 621 2003. gada 11. septembrī SABIEDRĪBA AR IEROBEŽOTU ATBILDĪBU

BBANC direktors: Uldis Rekners

Sertifikāta kopija bez licenzenta zīmoga nav derīga.

3 NOV 2010 11:26 FROM:ELOT ΕΠΕ 2310797592 TO:0222620972006 P:2

ΕΛΟΤ

ΔΙΕΥΘΥΝΣΗ ΕΡΓΑΣΤΗΡΙΩΝ ΔΟΚΙΜΩΝ
ΕΡΓΑΣΤΗΡΙΟ ΠΟΛΥΜΕΡΩΝ & ΕΛΑΣΤΙΚΩΝ
Βι Πε Θ. ΧΑΪΔΟΣ - Τηλ. 2310/79.08.45, Fax 2310/79.75.92, e-mail lap@elot.gr

Κωδικός Έκθεσης: 6.005Δ1/09
Ημερομηνία Έκδοσης: 2010-05-03
Σελίδα 1 από 2

ΕΚΘΕΣΗ ΔΟΚΙΜΩΝ

Ημερομηνία εκτέλεσης δοκιμών: από 2009-09-14 έως 2009-11-05 &
από 2010-03-11 έως 2010-04-30

ΣΤΟΙΧΕΙΑ ΑΙΤΟΥΝΤΟΣ & ΔΕΙΓΜΑΤΩΝ

Όνομα και Διεύθυνση Αιτούντος: 3i ΑΒΕ
ΕΡΓΟΣΤΑΣΙΟ ΜΟΝΩΤΙΚΩΝ
68ο χλμ. Ε.Ο. ΑΘΗΝΩΝ - ΛΑΜΙΑΣ
Τ.Κ. 322 00

Υποβολή αιτήσεως: 2009-08-04 Υποβολή δειγμάτων: 2008-08-04

Κατασκευαστής: 3i ΑΒΕ, ΕΛΛΑΔΑ

Περιγραφή και Χαρακτηρισμός δειγμάτων:
ΕΥΚΑΜΠΤΟΣ ΕΛΑΣΤΟΜΕΡΗΣ ΑΦΡΟΣ
ISO PIPE UV Φ 18 X 9 mm (1)
ISO PIPE HT (μαύρο) Φ 28 X 19 mm (2)
(6 τεμ. μήκους 70 cm)

Τα δείγματα φέρουν επισήμανση με στοιχεία
(1) ISO PIPE UV by 3i 9 X 19 ¾" Cu > 2 < 3007091525
(2) ΑΝΕΥ

Δοκιμή η οποία ζητήθηκε σύμφωνα με το πρότυπο ISO 4892-2:2006

1. Δοκιμή γήρανσης

ΕΛΟΤ

ΔΙΕΥΘΥΝΣΗ ΕΡΓΑΣΤΗΡΙΩΝ ΔΟΚΙΜΩΝ
ΕΡΓΑΣΤΗΡΙΟ ΠΟΛΥΜΕΡΩΝ & ΕΛΑΣΤΙΚΩΝ
ΒΙ.ΠΕ.Θ. ΣΙΝΔΟΣ - Τηλ. 2310/79 88 45, Fax 2310/79 75 90, e-mail: [illegible]

Κωδικός Έκθεσης: 6.005Δ1/09
Ημερομηνία έκδοσης: 2010-05-03
Σελίδα 2 από 2

1. <u>ΔΟΚΙΜΕΣ</u>

1.1. <u>Δοκιμή γήρανσης</u>

1.1.1. Απαίτηση & Μέθοδος δοκιμής: Σύμφωνα με το ISO 4892-2

1.1.2. Αποτελέσματα:

ΔΟΚΙΜΙΑ	ΣΥΝΘΗΚΕΣ ΔΟΚΙΜΗΣ			ΣΥΜΠΕΡΙΦΟΡΑ ΔΟΚΙΜΙΟΥ		ΣΥΜΦΩΝΕΙ	
	Συσκευή γήρανσης	Συνολική ποσότητα ακτινοβολίας που απορροφήθηκε από το δοκίμιο (kJ/m²)	Χρόνος έκθεσης σε ακτινοβολία (ώρες)	Απαιτούμενη	Πραγματική	ΝΑΙ	ΟΧΙ
ISO PIPE UV Φ 18 X 9 mm ISO PIPE HT (μαύρο) Φ 28 X 19 mm	XENON	4 320,0	3	Να μην παρουσιάζει μείωση ελαστικότητας, εμφανείς αλλοιώσεις χρώματος, ρωγμές στην εξωτερική επιφάνεια	Δεν παρουσιάζει	√	

Τα αποτελέσματα δοκιμών αφορούν στα δείγματα εύκαμπτου ελαστομερούς αφρού ISO PIPE UV Φ 18 X 9 mm και ISO PIPE HT (μαύρο) Φ 28 X 19 mm, της εταιρείας κατασκευής 3i ΑΒΕ, που προσκομίσθηκαν στο Εργαστήριο Πολυμερών και Ελαστικών (Ε.Π.Ε.) της ΕΛΟΤ Α.Ε., από την ανωτέρω εταιρία, και μόνο αυτά.

Θεσσαλονίκη: 2010-05-03

Λ. ΑΝΔΡΕΠΕΛΟΥ
Προϊσταμένη Ε.Π.Ε.

Ε.Π.Ε. Ε03 03/5/30-11-07

MIRTEC EBETAM

MATERIALS INDUSTRIAL RESEARCH & TECHNOLOGY CENTER S.A.

LABORATORY TEST REPORT

Standard relevant for drafting of the report: ΕΛΟΤ EN ISO/IEC 17025

01.	TESTING LABORATORY	: POLYMER & ELASTOMER TESTING LABORATORY
02.	LABORATORY ADDRESS	: INDUSTRIAL AREA SINDOS 57 022
03.	TEST ITEM DELIVERY DATE	: 4-04-2014
04.	CLIENT NAME	: 3i INTERNATIONAL INNOVATIVE INDUSTRIES S.A.
05.	CLIENT ADDRESS	: NAYPLIOY 36 & DASKALOGIANNI, 14452 ATHENS GR
06.	PROJECT CODE No	: 8029
07.	ITEM IDENTIFICATION No	: 1183

STATEMENT OF VALIDITY OF TEST RESULTS

The results of this test relate ONLY to the items that have been subjected to this test.

STATEMENT OF VALIDITY FOR THE REPRODUCTION OF THIS REPORT

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08.	TEST REPORT No DATE OF ISSUE	: PL/LT/TH/05-14/90 : 6/05/2014
09.	DATE OF PERFORMANCE OF TEST	: 2/05/2014
10.	SPECIMEN IDENTIFICATION CODE	: SEE ATTACHED ICENDIFICATION CHART
11.	SAMPLING PERFORMED BY	: -
	SAMPLING ACCORDING TO	: -
12.	PROJECT DESCRIPTION	: DETERMIATION OF VICAT SOFTENING POINT ISO 306 **PROJECT DATA**: EVA BASED FILM TESTING
13.	ITEM DESCRIPTION	: ISOPIPE UV SOLAR
	ITEM MATERIAL	: EVA
14.	PERSON ACCEPTING TECHNICAL RESPONSIBILITY	: MICHALIS CHASAPIS
15.	TEST DESCRIPTION/SPECIMENT DESCRIPTION	: CONTROL OF DIMENSIONS : DETERMINATION OF VICAT SOFTENING POINT
16.	EQUIPMENT USED	: MICROMETER : CEAST VICAT TESTER : THERMAL PRESSER SCHWABENTHAN
17.	STANDARDS/SPECIFICATIONS	: EN 3126, ISO 306
18.	NON-STANDARDIZED PROCEDURE	: -

Page 1 of 2

GP - LAB / EN01 (4.1.2.04.08) PT/LT/TH/05-2014/90

MIRTEC EBETAM

Incoming Specimen Code Chart

Code	Description	Manufacturer	DN1	DN2
1183	EVA BASED FILM (BLACK)	3i	-	-

Specimen Identification Chart

Code	Marking
1183	-

19. Testing

Determination of VICAT softening point

Code	Method/ Stand	Sample Thickness (mm)	Bath Temperature (°C)	VICAT softening point (°C)		CONFORMING	
				Requirement	Result	YES	NO
1183	ISO 306 A50	3.5	23	-	82.5	-	-
1183	ISO 306 A50	3.5	23	-	84	-	-

The test results relate to the samples as described and defined exactly in Incoming Specimen Code Chart & Specimen Identification Chart, which were brought to the Polymer & Elastomer Testing Laboratory, by 3i INTERNATIONAL INNOVATIVE INDUSTRIES S.A.

For the Laboratory

Michalis [illegible]
Physicist MSc

Thessaloniki 19/6/2014

Checked by

Athanasios [illegible]
Northern Greece Director

EBETAM·MIRTEC·EBETAM·MIRTEC· ME

LGAI

LGAI Technological Center, S.A.
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E - 08193 Bellaterra (Barcelona)
T +34 93 567 20 00
F +34 93 567 20 [illegible]
www.applus.com

Applus+ LGAI

Bellaterra : 29 de octubre de 2010
Expediente nº : 10/101.926-2053
Referencia del peticionario : **ISOPIPE IBERICA , S.L**
Y en su representación al Sr. Javier Escamez
C/ Alfred Nobel , 29
P. I. Valldoriolf
08430 LA ROCA DEL VALLÈS
(Barcelona)

INFORME DE ENSAYO

MATERIAL RECIBIDO

Con fecha de 16 de septiembre del 2010 se ha recibido material referenciado según peticionario:

" ISOPIPE UV 30x35 "

Observaciones: Muestreo del material recibido realizado por el peticionario

ENSAYOS SOLICITADOS

** Envejecimiento a la intemperie mediante luz de Xenon según norma UNE EN ISO 4892/2 Método A (condiciones de exterior)*

FECHA DE REALIZACIÓN DE LOS ENSAYOS: del 21/09/2010 al 27/10/2010

LGAI Technological Center S.A. Inscrita en el registro Mercantil de Barcelona, Tomo [illegible], Folio [illegible], Hoja Nº [illegible] Inscripción 1ª C.I.F.: [illegible]

PROCEDIMIENTOS Y RESULTADOS

ENVEJECIMIENTO ARTIFICIAL ACELERADO AL INTEMPERIE MEDIANTE LUZ DE XENON

Método de ensayo s/n **UNE EN ISO 4892** "Plastics: Methodes of exposure to laboratorio Light sources. Xenon-arc lamps"

Condiciones de ensayo Método A (condiciones de exterior):
- Aparato utilizado: Whesther-Cmeter con lámpara de Xenón (ATLAS)
- Irradiancia (300-400 nm): (60±2) W/m²
- Filtros exterior e interior: Borosilicato (condiciones de exterior)
-Temperatura de patrón negro: (65±3) ºC
-Temperatura de cámara: (38±3) ºC
- Humedad relativa: (50±10) %
- Ciclo de **lluvia:** 102 min. luz
  18 min. luz+ lluvia

*** Duración total de la exposición :** 500 horas

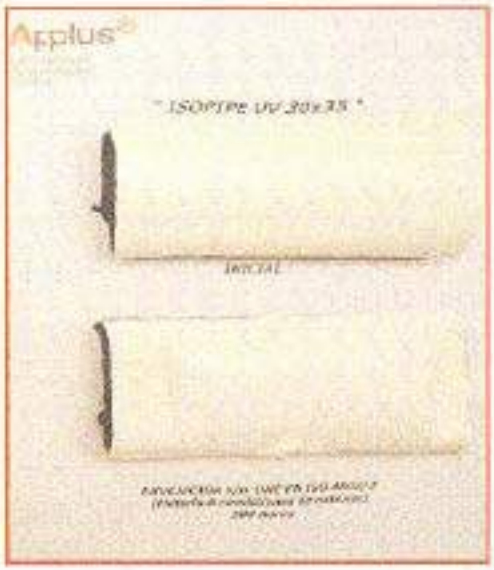
Muestras de ensayo:
Las muestras de ensayo se expusieron por la parte del recubrimiento exterior y por la parte interior (espuma).

Expresión de resultados: observación visual, evaluación de formación de grietas o fisuras

Finalizado el ensayo se comprueba el aspecto de las muestras :

** No hay ningún cambio de aspecto apreciable a simple vista en las muestras ensayadas.*
- *No hay cambio de color significativo en la muestra ensayada.*
- *El recubrimiento exterior no presenta roturas, agrietamientos, ni fisuras.*
- *No se observa ningún otro síntoma de deterioramiento a simple vista .*

- *La muestra expuesta por la parte de la espuma no presenta apenas ninguna variación visual, solamente ligero endurecimiento al tacto.*



Applus⊕ Firmado digitalmente por Marina Curto Diego
LGAI

Responsable de IPE
Product Conformity B.U.
LGAI Technological Center

Los resultados se refieren exclusivamente a la muestra, producto o material entregados al Laboratorio, tal como se indica en el apartado correspondiente a la descripción de Material Recibido, y ensayado en las condiciones indicadas en este documento.

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12. LGAI Technological Center #2 (ES)

LGAI

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www.applus.com

Applus+
LGAI

Bellaterra : 29 de octubre de 2010

Expediente nº : 10/101.926-2054

Referencia del peticionario : **ISOPIPE IBERICA , S.L**
Y en su representación el Sr. Javier Bocanegra
C.) Alfred Nobel , 29
P. I. Valldoriolf
08430 LA ROCA DEL VALLÈS
(Barcelona)

INFORME DE ENSAYO

MATERIAL RECIBIDO

Con fecha de 16 de septiembre del 2010 se ha recibido material referenciado según peticionario:

" ISOPIPE UV PLUS 30 X 42 "

Observaciones: Muestreo del material recibido realizado por el peticionario

ENSAYOS SOLICITADOS

** Envejecimiento a la intemperie mediante luz de Xenon según norma UNE EN ISO 4892/2 Método A (condiciones de exterior)*

FECHA DE REALIZACIÓN DE LOS ENSAYOS: del 21/09/2010 al 27/10/2010

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LGAI Technological Center S.A. Inscrita en el registro Mercantil de Barcelona, Tomo [illegible], Folio [illegible], hoja Nº [illegible] Inscripción [illegible] C.I.F. : [illegible]

PROCEDIMIENTOS Y RESULTADOS

ENVEJECIMIENTO ARTIFICIAL ACELERADO AL INTEMPERIE MEDIANTE LUZ DE XENON

Método de ensayo s/n **UNE EN ISO 4892** "Plastics: Methodes of exposure to laboratorio Light sources. Xenon-arc lamps"

Condiciones de ensayo Método A (condiciones de exterior):
- Aparato utilizado: Wheather-Ometer con lámpara de Xenón (ATLAS)
- Irradiancia (300-400 nm): (60±2) W/m²
- Filtros exterior e interior: Borosilicato (condiciones de exterior)
-Temperatura de panón negro: (65±3) ºC
-Temperatura de cámara: (38±3) ºC
- Humedad relativa: (50±10) %
- Ciclo de lluvia: 102 min. luz
  18 min. luz+ lluvia

*** Duración total de la exposición : 500** horas

Muestras de ensayo:
Las muestras de ensayo se expusieron por la parte del recubrimiento exterior y por la parte interior (espuma).

Expresión de resultados: observación visual, evaluación de formación de grietas o fisuras

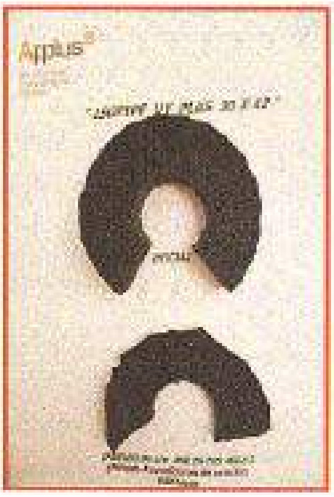
Finalizado el ensayo se comprueba el aspecto de las muestras:

** No hay ningún cambio de aspecto apreciable a simple vista en las muestras ensayadas.*
- *No hay cambio de color significativo en la muestra ensayada.*
- *El recubrimiento exterior no presenta roturas, agrietamientos, ni fisuras.*
- *No se observa ningún otro síntoma de deterioramiento a simple vista.*

Applus®
LGAI

Expediente número: 10/101.926-2053 **Página 3 de 3**

- La muestra expuesta por la parte de la espuma no presenta apenas ninguna variación visual, solamente ligero endurecimiento al tacto.



Applus® Firmado digitalmente por Marina Corto Diego
LGAI

Responsable de IPE
Product Conformity B.U.
LGAI Technological Center

Los resultados se refieren exclusivamente a la muestra, producto o material entregados al Laboratorio, tal como se indica en el apartado correspondiente a la descripción de Material Recibido, y ensayado en las condiciones indicadas en este documento.

Applus+, garantiza que este trabajo se ha realizado dentro de lo exigido por nuestro Sistema de Calidad y Sostenibilidad, habiéndose cumplido las condiciones contractuales y la normativa legal.
En el marco de nuestro programa de mejora les agradecemos nos transmitan cualquier comentario que consideren oportuno, dirigiéndose al responsable que firma este escrito, o bien, al Director de Calidad de Applus+, en la dirección: satisfaccion.cliente@appluscorp.com

Zentrum für Konstruktionswerkstoffe
Staatliche Materialprüfungsanstalt Darmstadt
Fachgebiet und Institut für Werkstoffkunde
Prof. Dr.-Ing. Matthias Oechsner

TECHNISCHE UNIVERSITÄT DARMSTADT

English version without legal liability

Test Report F 18 0720

1st copy

Client:	3I International Innovative Industries S.A. 26, Nafplioy Str. 14452 Athens Griechenland/Greece
Order of:	2018-04-20 Party ordering/reference: ---
Subject of order:	Testing of a foamed insulation product labelled ISOPIPE HT-HF for halogen content in accordance with DIN VDE 0472 - section 815, issue 03-1989
Material tested:	Sections of a black foamed insulation pipe
Provision clause:	German is official language of MPA Darmstadt statements. In case of doubt or dispute due to textual, grammatical, semantical, hermeneutical or linguistical provisions to this English test report – in particular within legal procedures – MPA Darmstadt reserves the right of explanation in German language.
Sampling:	The test material was delivered by the costumer.
Samples received:	2018/04/20
Date of testing:	2018/04/23 till 2018/04/26
Sample whereabouts:	The test material will be disposed after six month.

Staatliche Materialprüfungsanstalt Darmstadt
Werkstoffanalytik – Chemische Analytik
Grafenstraße 2, 64283 Darmstadt

Pages: -2-
Tables: -1-
Figures: —
Attachments: —

Date of the report: 2018/04/26 Reference: F/FS/Pu/Hl

Managing Director

by proxy

Dr.-Ing. Casper Pusch

Official in charge

Dr.-Ing. Rainer Hill

1 Object of the testing

The ratio of the halogen content -which is fluorine, chlorine, bromine and iodine- in a black foamed insulation material labelled ISOPIPE HT-HF is to be determined as requested by the order in accordance with DIN VDE 0472 section 815 "Testing of cable and isolated lines", from the edition dated March 1989.

The following specimen material was delivered by the client for testing purposes: A section of a black foamed insulation pipe with a wall thickness of approximately 18 mm.

2 Performance of the testing

Parts of the sample were combusted in a digestion bomb filled with sodium peroxide (so called Wurzschnitt digestion). The combustion products were then dissolved in nitric acid or in acetic acid.

Afterwards the determination of the halogen contents in the obtained solutions was performed by means of spectrophotometric analysis according to DIN VDE 0472 section 815. Chlorine, bromine and iodine were determined according to section 3.1, type of testing "A", the content of fluorine was determined according to section 3.2, type of testing "B".

3 Results of the tests

The tests on the specimen material described under item 2 of the report resulted in the contents (based on the amount of insulation material weighed) set out in **Table 1**.

Table 1: Analysis results

Parameter	Content **insulation pipe** ISOPIPE HT-HF
Chlorine, bromine, iodine as chlorine	0,07 ± 0,03 % w/w
Fluorine	<0,1 % w/w

4 Evaluation of the test results

Halogen-free in the sense of the standard DIN VDE 0472 section 815 means that the mass fractions calculated for the halogens chlorine, bromine and iodine as chlocine are less than 0,2 % w/w and fluorine less than 0,1 % w/w.

These requirements are met by the examined sample labelled ISOPIPE HT-HF.

MPA NRW.
Materialprüfungsamt Nordrhein-Westfalen
PRÜFEN • ÜBERWACHEN • ZERTIFIZIEREN

Marsbruchstraße 186 · 44287 Dortmund · Postfach: 44045 Dortmund · Telefon (0231) 45 02-0 · Telefax (0231) 4565 49 · E-Mail: info@mpanrw.de

TEST REPORT

No. 420002765-E-18e

Test laboratory
Department 2
Thermal protection - plastics, elastomers and similar products – chemical analysis

Client
3i International Innovative Industries SA
68 km Nat. Road Athens – Lamia
34 100 Ritsona, Halkida
Greece

Date of order: 20 April 2018
Receipt of sample(s): 26 April / 22 May 2018
Date of the sampling: --- (delivered)
Date of test: 26 April – 04 July 2018

Commissioned task
Determination of maximum service temperature according to DIN EN 14707:2013-01 for the product **Isopipe TC** and acc. EN 14706:2015 (D) for the product **Isorolls TC**

Description of the specimen / quantity of samples / designation of samples
Thermal insulation consisting of polyethylene foam (PEF)

- 15 specimens with dimensions of 200mm x 200mm x 20mm (l x w x t)
  Designation by customer: "**Isorolls TC**" – PEF (grayish/black)
- 7 specimens with dimensions of 22mm x 20mm x 2000mm (inner diameter x thickness of specimen x length)
  Designation by customer: "**Isopipe TC**" – PEF (grayish/black)

Description of sampling
The sample material was delivered by the client.

Description of the test / underlying test method
Determination of maximum service temperature according to EN 14706:2015 (D)
Determination of maximum service temperature according to DIN EN 14707:2013-01

Test results

	Product:	
	Isorolls TC	**Isopipe TC**
1. measuring Δz_1	3,1 % / MST: 85°C (s. annex 1*)	9,4 % MST: 110°C (s. annex 4*)
2. measuring Δz_2	1,4 % / MST: 85°C (s. annex 2*)	2,2 % MST: 110°C (s. annex 5*)
3. measuring Δz_3	2,1 % / MST: 85°C (s. annex 3*)	9,7 % MST: 110°C (s. annex 6*)
Mean value Δz_x	**2,0 % (dilation)**	**7,0 % (dilation)**

* Single test results are summarized in the annexes of this test report.

Dortmund, 04 July 2018
By order

Sö 05.07.18
Dipl.-Ing. (FH) Sonntag
Clerk

16.7.18
Dipl.-Ing. Th. Kloos
Head of accredited laboratory

This test report comprises 1 page(s) and 6 annex(es).

MARINE DIVISION
17 bis Place des Reflets - La Défense 2
92400 Courbevoie - France
Tel. 33 1 42 91 52 91
Fax. 33 1 42 91 28 94
www.veristar.com

Certificate number: 16733/A1 EC
File number : ACI 1360/020/001
Annex A1 Item number : A.1/3.18d
This certificate is not valid when presented without the full attached schedule composed of 7 sections

EC TYPE EXAMINATION CERTIFICATE

as per Module B of European Union Council Directive 96/98/EC on marine equipment as last amended by Commission Directive 2002/75/EC of 2 September 2002

This certificate is issued to

3i INTERNATIONAL INNOVATIVE INSULATION S.A.

RITSONA - CHALKIDA - GREECE

for the type of product

SURFACE MATERIALS AND FLOOR COVERINGS WITH LOW FLAME-SPREAD CHARACTERISTICS: PIPE INSULATION COVERS

Low Flame-Spread Characteristics Insulation Material "ISOPIPE TC" & "ISOPIPE SBI"
Thickness range : 9 mm to 32 mm

Regulations and standards :
SOLAS 74 Convention, as amended by 2000 SOLAS Amendments, Regs. II-2/3.29, II-2/3.40.5, II-2/5.3.2.4, II-2/6.2 - IMO Resolution MSC.97(73) (2000 HSC Code) 7.4.3.4 to 7.4.3.6 - IMO Resolution A.653(16) - IMO Resolution MSC.61(67), Annex 1, Parts 2 & 5, and Annex 2 - ISO 1716(1973) - IMO MSC/Circ.916, as amended by IMO MSC/Circ.1008 - IMO MSC/Circ.1004.

This certificate is issued under the French Maritime Authority to attest that BUREAU VERITAS did undertake the relevant type-examination procedures for the product identified above which was found to comply with the relevant requirements of the Council Directive 96/98/EC of 20 December 1996 as amended.

This certificate is valid until : 03 Apr 2011

At Paris la Défense, on : 11 Apr 2006

For BUREAU VERITAS, Notified Body N°0062
By order of the Secretary

J.BENOIT

Approval office

BUREAU VERITAS SURVEYORS AT PARIS 1828 INTERNATIONAL REGISTER PARIS

Local office : BV PIRAEUS
Surveyor : G. Saliaris

BUREAU VERITAS SURVEYORS AT PARIS 1828 INTERNATIONAL REGISTER PIRAEUS

G. D. SALIARIS
SENIOR SURVEYOR
BUREAU VERITAS - PIRAEUS

This certificate does not allow to issue the Declaration of Conformity and to affix the mark of conformity (wheelmark) to the products corresponding to this type. To this end, the production-control phase module (D, E or F) of Annex B of the Directive is to be complied with and controlled by a written inspection agreement with a notified body.
This certificate remains valid until the date stated above, unless cancelled or revoked, provided the conditions indicated in the subsequent page(s) are complied with and the product remains satisfactory in service. This certificate will not be valid if the applicant makes any changes or modifications to the approved product, which have not been notified to, and agreed in writing with BUREAU VERITAS. Should the specified regulations or standards be amended during the validity of this certificate, the product(s) is/are to be re-approved prior to it/they being placed on board vessels to which the amended regulations or standards apply. BUREAU VERITAS S.A. is designated by the French Maritime Authority as a "notified body" under the terms of the French Regulations Division 140 Chapter 140-2. This certificate is issued within the scope of the General Conditions of BUREAU VERITAS Marine Division. Any Person not a party to the contract pursuant to which this document is delivered may not assert a claim against BUREAU VERITAS for any liability arising out of errors or omissions which may be contained in said document, or for errors of judgement, fault or negligence committed by personnel of the Society or of its Agents in establishment or issuance of this document, and in connection with any activities for which it may provide.

THE SCHEDULE OF APPROVAL

1. PRODUCT DESCRIPTION :

Low Flame-Spread Characteritics Insulation Material
"ISOPIPE TC" & "ISOPIPE SBI"

Insulation sheets and pipes synthetic rubber.
Thickness range : 9 mm to 32 mm.
Density : 61-70 kg/m3

2. DOCUMENTS AND DRAWINGS :

As per Manufacturer's manual(s) or instruction(s) for installation.

3. TEST REPORTS :

3.1- Test report N° 2003-2042 dated 04.12.2003 as per IMO Resolution A.653(16) from Siemens Axiva GmbH &Co. KG, Germany.
3.2- Test report N° 2006-1170 dated 29.03.2006 as per IMO Resolution A.653(16) from Siemens Axiva GmbH &Co. KG, Germany.

4. APPLICATION / LIMITATION :

4.1- Insulation material for cold service piping (i.e. refrigeration systems and chilled water piping for air-conditioning systems) and approved for use as a low flame spread surface material.
4.2- This product complies with Annex 2 paragraph 2-2 of FTP Code [Part 2 - Smoke and Toxicity criteria].
4.3- Calorific value to be less than 45 MJ/m² as per ISO 1716, when required.
4.4- Approval valid for ships having to comply with SOLAS 74 Convention, as amended, and for units having to comply with IMO Resolution A649 (The "MODU Code").

On board installation & Maintenance requirements :

4.5- The Manufacturer's instruction manual should be kept on board.
4.6- The fitting aboard to be the same as used for the test.

5. PRODUCTION SURVEY REQUIREMENTS :

5.1- The production conformity assessment module shall either be "D, Production Quality Assurance" or "E, Product Quality Assurance" or "F, product verification."
5.2- Each equipment or batch of equipment is to be supplied with its manual (or instruction) for installation, use & maintenance in the language required by the Ship's Flag Administration.

6. MARKING OF PRODUCT :

- ⊛ conformity mark and number of the Notified Body undertaking surveillance module (where BV, 0062).
- Last two digits of year mark affixed.

7. OTHERS :

7.1- This approval is given on the understanding that the manufacturer will accept full responsibility for informing shipbuilders or their sub-contractors of the proper methods of fitting and general maintenance of the approved equipment and the conditions of this approval.
7.2- This certificate supersedes EC Type Examination Certificate N° 16733/A0 EC issued on 03.04.2006 by the Society.

G. D. SALIARIS
SENIOR SURVEYOR
BUREAU VERITAS - PIRAEUS

BUREAU VERITAS PARIS 1828 INTERNATIONAL REGISTER

*** END OF CERTIFICATE ***

MARINE DIVISION
17 Bis Place des Reflets - La Défense 2
92400 Courbevoie - France
Tel. 33 1 42 91 53 48
Fax 33 1 42 91 28 94

Certificate number

SMS.W.I.CE.D/62631/A.0

QUALITY SYSTEM APPROVAL

This is to certify that the Quality System of :

3i INTERNATIONAL INNOVATIVE INSULATION S.A.

is approved according to the European Council Directive 96/98 EC on Marine Equipment, as amended
for Module D
Production Quality Assurance

Works address :

RITSONA - CHALKIDA (GREECE)

Item designation(s) (as detailed in the attached Schedule of Approval) :
SURFACE MATERIALS AND FLOOR COVERINGS WITH LOW FLAME-SPREAD CHARACTERISTICS: PIPE INSULATION COVERS (A13181)

This Approval will remain valid provided that the periodical audits and inspections are carried out by Bureau Veritas as stated in the mutual Agreement.

The Approval is valid until : 17/04/2010

For BUREAU VERITAS
George Saliaris

On : 27/04/2007

BV Mod. Ad.E 618 - (07/04)

Annex to Certificate number SMS.W.I.CE.D/62631/A.0

THE SCHEDULE OF APPROVAL

1 - LIST OF EQUIPMENT AND RELATED TYPE EXAMINATION CERTIFICATE(S) :

Certificate number	Valid until	Item number	Item designation	Type designation
16733/A1	03/04/2011	A1/318d	Surface materials and floor coverings with low flame-spread characteristics	Pipe insulation covers

2 - CONDITIONS FOR THE VALIDITY OF THE APPROVAL :

- The Type Examination Certificate(s) is (are) valid
- Bureau Veritas is to be informed immediately of any modification to the Quality system, in order to take appropriate actions.

3. MARKING OF THE EQUIPMENT OR ITS PACKAGING

The equipment or its packaging is to be marked as specified in the Article 11 of the Directive, and section 9 of the Schedule of approval of the Type Examination Certificate(s).

4. OTHERS

This Approval also covers the equipment manufactured from the ---.

*** *Last page (End of Document)* ***

BUREAU VERITAS PIRAEUS (GREECE)

G.D. SALIARIS
SENIOR SURVEYOR
BUREAU VERITAS - PIRAEUS

Test Report

Report no.: 19081

DANISH TECHNOLOGICAL INSTITUTE

Gregersensej
DK-2630 Taastrup
Tel. +45 72 20 30 00
Fax +45 72 20 20 19

info@teknologisk.dk
www.teknologisk.dk

Assignor: 3i International Innovative Industries
Attn: Maria Angelatou
28 Nafpliou & Daskalogianni Str., 14452, Metamorfosi, Attiki
quality@isopipe.gr

Subject: **Flexible elastomeric foam: ISOPIPE TC**
See details on page 2.

Sampling: The test material was forwarded by the client and received at the Danish Technological Institute on the dates given on page 2. Marking, information and the labelling are given by the assignor.

Method: See page 2.

Equipment DYNATECH: 1) Horizontal GHP 270-T-2050, encapsuleted in a thermostatic controlled box, 2) Shunt resistor 270-T-2062, 3) Data logger ID6184, 4) Slide caliper 270-T-2052 and telescoping gauge, 5) Balance 270-T-2054 for weight of the sample, 6) Laboratory temperature 270-T-2070 and 7) Laboratory air humidity 270-T-2088.

Result: The test results are given on page 2.

Storage: The test material will be destroyed after 1 month, unless otherwise agreed.

Terms: The accredited test was carried out according to DANAK's general conditions see www.danak.dk and according to the General Terms and Conditions regarding Commissioned Work Accepted by the Danish Technological Institute, which apply at the time of signing the agreement. The test is only valid for the tested specimen. The test report may only be extracted, if the laboratory has approved the extract.

Construction product regulation: The Danish Technological Institute guarantees that employees carrying out tests to be used together with harmonized standards under notification no. 1235 according to EU regulation 305/2011, article 43, satisfy all the requirements made for capability, integrity and impartiality. You find the CPR here: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=uriserv:OJ.C_.2017.257.01.0016.01.ENG

Date/place: 2019.05.13, Danish Technological Institute, Energy and Climate, Taastrup

Signature: Test responsible
Otto Paulsen, Head of Laboratory
Thermal Laboratory TELA

Registered Laboratory for Thermal Conductivity Testing (www.key-mark.org) RL02503

ilac-MRA DANAK

DANISH TECHNOLOGICAL INSTITUTE

Test results

Manufacturer
3i International Innovative Industries

Sampled by
-

Invoice to
3i International Innovative Industries
Attn: Mario Angelatou
28 Nafpliou & Daskalogianni Str.,
14452, Metamorfosi, Attiki
quality@isopipe.gr

Test sample
Material: Flexible elastomeric foam: ISOPIPE TC
Dimensions [mm]: 600 x 600 x 25
Control no.: - Marked: Batch No. 900331
Requisition no.: -

Table 1: Test samples

		1	2
Length	mm	597	596
Width	mm	575	571
Weight at arrival	kg	-	-
Weight before test	kg	0,853	0,838
Weight after test	kg	0,853	0,838
Change of mass during test	kg	0,000	0,000
Moisture during test	weight %	-	-

Test specimen
Two sheets placed above each other as a sandwich construction for one test specimen.

Conditioning
None

Operator
AXS

Dates
Sampled: 2019.04.16
Test sample manufactured: -
Test sample received at DTI: 2019.04.29
Testing: 2019.05.01 – 2019.05.09

Results
See tables 2 and 3.
Measurement uncertainty: ±2%

Table 2: Test details

Testing point no.			1	2	3
Mean surface temperature of specimen	Hot side	°C	5,04	20,10	49,75
	Cold side	°C	-5,1	0,62	29,98
Mean temperature difference		K	10,14	19,48	19,77
Mean temperature		°C	-0,03	10,36	39,86
Temperature in cabinet		°C	0,29	10,19	36,19
Room temperature		°C	2,32	10,15	25,26
Heat flow q_{meas}		W/m²	7,75	15,45	15,40
Thermal resistance R_{meas}		m²·K/W	1,29	1,27	1,28

Table 3: Test results

Pkt. no	Tm, oC	Thickness, mm	Density, kg/m3	lambda, W/(mK)
1	-0,01	43,45	56,9	0,03316
2	10,03	44,79	55,2	0,03436
3	39,86	49,8	50,1	0,03847

Remarks
Deviations from the standard: None.

Thickness measured at the laboratory ambient temperature of 22 °C according to EN 823: 24,7mm. This thickness was used for calculation of the thermal conductivity at test point No.3 which has a temperature above the ambient (Annex C in EN 14304).

Method
Test is carried out according to:

DS/EN 14304:2005	Thermal insulation products for building equipment and industrial installations - Factory made flexible elastomeric foam (FEF) products
DS/EN 12667:2001	Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance
DS/EN 823:2013	Thermal insulating products for building applications. Determination of thickness

ΕΘΝΙΚΟ ΚΕΝΤΡΟ ΕΡΕΥΝΑΣ ΦΥΣΙΚΩΝ ΕΠΙΣΤΗΜΩΝ
"ΔΗΜΟΚΡΙΤΟΣ" / "DEMOKRITOS"
NATIONAL CENTER FOR SCIENTIFIC RESEARCH

ΕΡΓΑΣΤΗΡΙΟ ΔΟΚΙΜΩΝ ΗΛΙΑΚΩΝ & ΑΛΛΩΝ ΕΝΕΡΓΕΙΑΚΩΝ ΣΥΣΤΗΜΑΤΩΝ
LABORATORY OF TESTING SOLAR & OTHER ENERGY SYSTEMS

ΕΚΘΕΣΗ ΔΟΚΙΜΩΝ

ΠΡΟΣΔΙΟΡΙΣΜΟΣ ΙΔΙΟΤΗΤΩΝ ΘΕΡΜΙΚΗΣ ΜΕΤΑΔΟΣΗΣ ΣΕ ΣΤΑΘΕΡΗ ΚΑΤΑΣΤΑΣΗ, ΘΕΡΜΟΜΟΝΩΤΙΚΟΥ ΚΕΛΥΦΟΥΣ ΓΙΑ ΚΥΚΛΙΚΟΥΣ ΑΓΩΓΟΥΣ

ΣΥΜΦΩΝΑ ΜΕ ΤΟ ΠΡΟΤΥΠΟ ΕΛΟΤ ΕΝ ISO 8497:1997

TEST REPORT

DETERMINATION OF STEADY-STATE THERMAL TRANSMISSION PROPERTIES OF THERMAL INSULATION FOR CIRCULAR PIPES

ACCORDING THE ELOT EN ISO 8497:1997 STANDARD

ΑΡΙΘΜΟΣ ΔΟΚΙΜΗΣ / TEST REFERENCE
SpTHR04/102

153-10 Αγ. Παρασκευή, Αττική
Τηλ.: 210 6503815
Fax: 210 6544592

GR- 153 10 Ag. Paraskevi, Greece
Tel.: +30-210-6503815
Fax: +30-210-6544592

E-mail: sollab@ipta.demokritos.gr

Web site: http://www.solar.demokritos.gr

ΕΚΘΕΣΗ ΔΟΚΙΜΩΝ

ΠΡΟΣΔΙΟΡΙΣΜΟΣ ΙΔΙΟΤΗΤΩΝ ΘΕΡΜΙΚΗΣ ΜΕΤΑΔΟΣΗΣ ΣΕ ΣΤΑΘΕΡΗ ΚΑΤΑΣΤΑΣΗ, ΘΕΡΜΟΜΟΝΩΤΙΚΟΥ ΚΕΛΥΦΟΥΣ ΓΙΑ ΚΥΚΛΙΚΟΥΣ ΑΓΩΓΟΥΣ

ΣΥΜΦΩΝΑ ΜΕ ΤΟ ΠΡΟΤΥΠΟ ΕΛΟΤ ΕΝ ISO 8497:1997

TEST REPORT

DETERMINATION OF STEADY-STATE THERMAL TRANSMISSION PROPERTIES OF THERMAL INSULATION FOR CIRCULAR PIPES

ACCORDING THE ΕΛΟΤ EN ISO 8497:1997 STANDARD

ΕΛΟΤ ΕΝ ISO 8497:1997 "Thermal insulation – Determination of steady-state thermal transmission properties of thermal insulation for circular pipes"

ΕΡΓΑΣΤΗΡΙΟ ΔΟΚΙΜΩΝ ΗΛΙΑΚΩΝ & ΑΛΛΩΝ ΕΝΕΡΓΕΙΑΚΩΝ ΣΥΣΤΗΜΑΤΩΝ
ΕΚΕΦΕ "ΔΗΜΟΚΡΙΤΟΣ" / NCSR "DEMOKRITOS"
LABORATORY OF TESTING SOLAR & OTHER ENERGY SYSTEMS

ΕΚΕΦΕ ΔΗΜΟΚΡΙΤΟΣ
ΕΡΓ/ΡΙΟ ΗΛΙΑΚΩΝ - ΕΝΕΡΓ/ΚΩΝ ΣΥΣΤ/ΤΩΝ
ΠΡΟΪΣΤ/ΝΟΣ Β. ΜΠΕΛΕΣΙΩΤΗΣ
ΤΗΛ.: 6544592 - FAX: 6544592
153 10 ΑΓ. ΠΑΡΑΣΚΕΥΗ - ΑΤΤΙΚΗ

Σ. Μπαμπαλής / S. Babalis
Υπεύθυνος Δοκιμών / Responsible for Testing

Β. Μπελεσιώτης / V. Belessiotis
Προϊστάμενος / Laboratory Head

Ημερομηνία / Date: 26/10/2004

ΣΗΜΕΙΩΣΕΙΣ:

1) *Τα αποτελέσματα αφορούν μόνο τα δοκίμια στα οποία πραγματοποιήθηκαν οι δοκιμές και τα οποία προσκομίστηκαν από τον πελάτη.*
2) *Η παρούσα έκθεση δεν επιτρέπεται να αναπαραχθεί παρά μόνο στο σύνολό της χωρίς την γραπτή έγκριση του Εργαστηρίου.*

NOTES:

1) *The results are related only with the specimens on which the tests performed and which were delivered by the customer.*
2) *This report can be reproduced without the written permission of the Laboratory only in full.*

Test reference: SpTHR04/102

ΕΚΘΕΣΗ ΔΟΚΙΜΩΝ / *TEST REPORT*

Πελάτης: 3i-International Innovative Insulation S.A. 68 χλμ. Ε.Ο. Αθηνών-Λαμίας Τηλ.: 22620 71867 Fax: 22620 72006	*Customer: 3i-International Innovative Insulation S.A.* *68 Km Nat. Road Ath-Lam* *Tel.:* 22620 71867 *Fax:* 22620 72006
Ημερομηνία παραλαβής θερμομονωτικού υλικού (σε καλή κατάσταση) / *Receipt date of insulating material (in good condition):*	4/09/2004

1. ΠΕΡΙΓΡΑΦΗ ΘΕΡΜΟΜΟΝΩΤΙΚΟΥ Ή ΔΟΜΙΚΟΥ ΥΛΙΚΟΥ / *DESCRIPTION OF INSULATING MATERIAL*

1.1 Βασικά Στοιχεία Υλικού / *Basic Material Data*

- Κατασκευαστής / *Manufacturer* .. 3i-International Innovative Insulation S.A.
- Εμπορική ονομασία υλικού / *Commercial name* ..... Isopipe UV 9X15
- Είδος υλικού / *Material type*
  - Μονωτικό υλικό / *Insulating* [✓]
  - Δομικό υλικό / *Construction* [ ]
  - Άλλο / *Other* [ ]
- Χαρακτηρισμός υλικού / *Material Characteristics*

Εύκαμπτο *Flexible*	✓	Άκαμπτο *Inflexible*		Ημιάκαμπτο *Semi-flexible*	
Αφρώδες *Foamy*	✓	Ινώδες *Fibrous*		Κοκκώδες *Granular*	

- Περιγραφή υλικού / *Description of the specimen*

Αφρώδες ελαστικό μονωτικό υλικό υπό μορφή κελύφους κυκλικού αγωγού με επικάλυψη στην εξωτερική πλευρά λευκής ελαστικής μεμβράνης ανθεκτικής σε UV. / Cellular elastic insulating material for circular pipes with the outer surface coated with an elastic UV resistant membrane

1.2 Ετοιμασία δοκιμίων / *Specimen preparation*

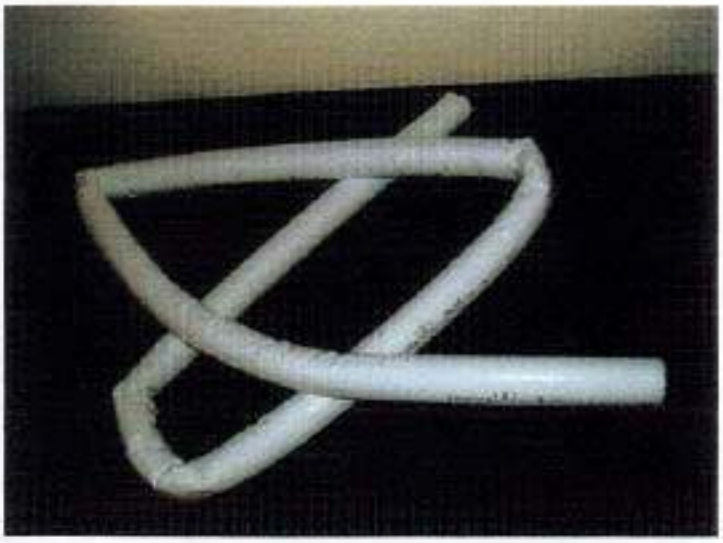
Πελάτης *Customer*	✓	Εργαστήριο *Laboratory*		Από μεγαλ. τεμαχ. *From large piece*	

1.3 Αριθμός δοκιμίων υλικού / *Number of specimens* ..... 3 τεμ./ pcs

1.4 Μέσες διαστάσεις δοκιμίων κατά την παραλαβή
Average dimensions of specimen, as delivered

- Μέσο μήκος αγωγού / *Average pipe length* ..... 2 m
- Μέσο πάχος μονωτικού / *Average insulation thickness* ..... 9 mm
- Εσωτερική διάμετρος / *Internal diameter* ..... 15 mm

1.6 Φωτογραφία δοκιμίου / *Specimens Photo*



Εικόνα 1. Δείγμα δοκιμίου μέτρησης (θερμομονωτικό κέλυφος για κυκλικούς αγωγού

2. ΠΡΟΕΡΓΑΣΙΑ ΔΟΚΙΜΙΩΝ ΥΛΙΚΟΥ / *CONDITIONING OF SPECIMENS*

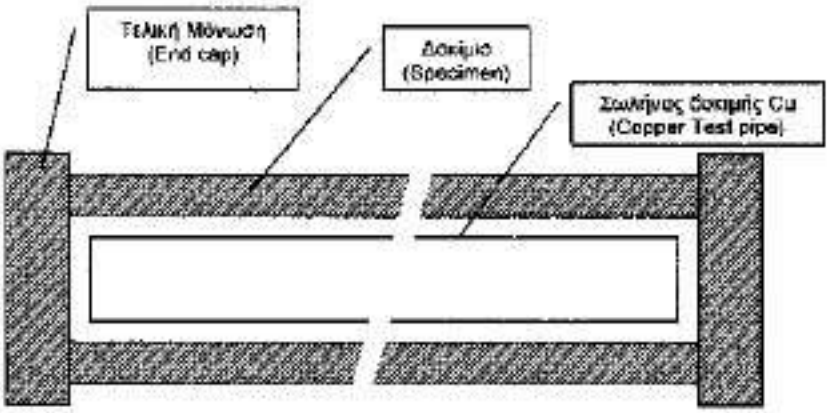
2.1 Τρόπος προεργασίας / *Conditioning method*

Δεν έγινε προεργασία του δοκιμίου / *No preconditioning of the specimens has been done*

3. ΠΕΡΙΓΡΑΦΗ ΕΞΟΠΛΙΣΜΟΥ ΔΟΚΙΜΗΣ

3.1 Συσκευή δοκιμής

Η συσκευή δοκιμής, η οποία κατασκευάσθηκε ειδικά για την περίπτωση (σχ. 1), ακολουθεί τον σχεδιασμό της συσκευής που περιγράφεται στο πρότυπο ΕΛΟΤ ΕΝ ISO 9497: 1994 με την μέθοδο «calculated end apparatus» προσαρμοσμένη κατάλληλα για την περίσταση.



Σχήμα 1. Τομή της διάταξης δοκιμής

Η συσκευή αποτελείται από τον χάλκινο σωλήνα δοκιμής (Copper Test Pipe) εξωτερικής διαμέτρου 15 mm και μήκους 2 m επενδεδυμένο με το προς δοκιμή υλικό, έτσι ώστε η εσωτερική πλευρά του να εφάπτεται ακριβώς με την εξωτερική επιφάνεια του σωλήνα δοκιμής σε όλο του το μήκος (εικόνα 2).

Ο σωλήνας δοκιμής είναι κλεισμένος από τις δύο πλευρές με το ίδιο υλικό από το οποίο αποτελείται ο σωλήνας δοκιμής με πρόβλεψη εξόδου των αγωγών τροφοδοσίας των ηλεκτρικών αντιστάσεων.

Το μονωτικό κέλυφος της δοκιμής (test specimen) τοποθετείται στην εξωτερική πλευρά του σωλήνα χαλκού (Copper Test Pipe) έτσι ώστε να καλύπτει όλη την επιφάνεια του σωλήνα. Τα πλευρικά τμήματα του σωλήνα δοκιμής μονώνονται τοποθετώντας επίπεδη πλάκα αφρώδους ελαστικού μονωτικού υλικού του ιδίου τύπου με τον προς δοκιμή σωλήνα πάχους 19 mm.

Εικόνα 2. Σωλήνας δοκιμής και δοκίμιο

Εσωτερικά του χάλκινου σωλήνα δοκιμής τοποθετείται συγκεκριμένος αριθμός ηλεκτρικών αντιστάσεων συνδεδεμένων παράλληλα έτσι ώστε όταν τροφοδοτούνται με συνεχές ρεύμα να δημιουργείται η επιθυμητή θερμοκρασία δοκιμής στην εξωτερική πλευρά του σωλήνα χαλκού, που αντιστοιχεί στην εσωτερική πλευρά του σωληνοειδούς κελύφους.

Οι ηλεκτρικές αντιστάσεις συστρέφονται και διατάσσονται πυκνά εντός του σωλήνα έτσι ώστε όλο το ενεργό μήκος τους να ευρίσκεται εντός του σωλήνα δοκιμής και να εξασφαλίζεται η ομοιόμορφη κατανομή της θερμοκρασίας σε όλη την επιφάνεια μέτρησης (όπως προέκυψε και από τις μετρήσεις θερμοκρασίας σε σημεία της επιφάνειας). Θερμοζεύγη τοποθετούνται περιμετρικά, σε κατάλληλα σημεία επί του χάλκινου σωλήνα δοκιμής, για την μέτρηση της θερμοκρασίας.

Η θερμοκρασία περιβάλλοντος καθορίζεται κάθε φορά ανάλογα με την επιθυμητή μέση θερμοκρασία του δοκιμίου τοποθετώντας την συσκευή δοκιμής και την διάταξη μέτρησης εντός ισχυρά μονωμένου θαλάμου ελεγχόμενων σταθερών συνθηκών θερμοκρασίας και μετράται με θερμοζεύγος τοποθετημένο στον αέρα πλησίον της συσκευής δοκιμής ενώ ο αέρας εσωτερικά ευρίσκεται σε ακινησία, όπως απαιτεί το πρότυπο.

Όλα τα θερμοζεύγη που χρησιμοποιούνται για την μέτρηση της θερμοκρασίας καθώς και οι καταγραφείς ηλεκτρικών μεγεθών καταλήγουν στην κάρτα πολυπλεξίας του Data Logger και καταγράφονται στον Η/Υ.

3.2 Μέτρηση θερμοκρασίας

Επί της εξωτερικής επιφάνειας του σωλήνα χαλκού στις συγκεκριμένες θέσεις μέτρησης της θερμοκρασίας, η οποία αντιστοιχεί στην εσωτερική επιφάνεια του δοκιμίου (T_0), τοποθετήθηκαν θερμοζεύγη τύπου Τ τα οποία παρουσιάζουν υψηλότερη ακρίβεια μέτρησης θερμοκρασίας (0.5 °C). Στις ίδιες

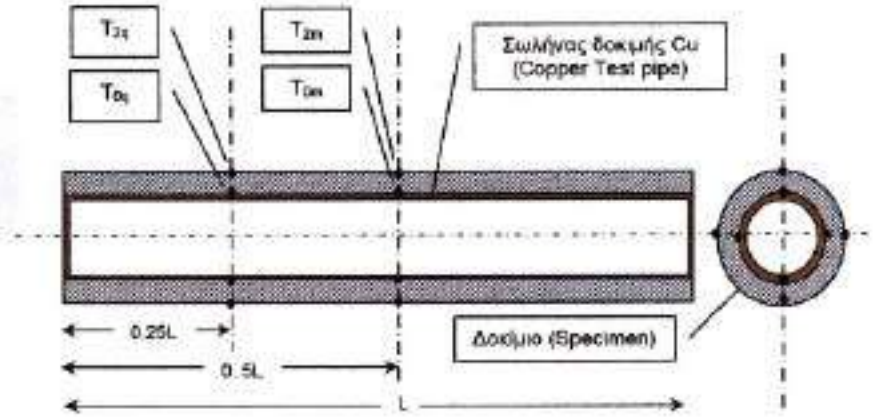
θέσεις μετράται η θερμοκρασία επί της εξωτερικής επιφάνειας του δοκιμίου (T_2) χρησιμοποιώντας θερμοζεύγη ίδιου τύπου.

Οι θέσεις στις οποίες καταγράφηκε η κατανομή της θερμοκρασίας περιμετρικά είναι το μέσον του σωλήνα δοκιμής (απόσταση 1 m από την άκρη του σωλήνα) και στο ¼ αυτής (απόσταση 0.5 m από την άκρη του σωλήνα) έτσι ώστε να υλοποιηθεί η μέθοδος υπολογισμού van Rinsum.

Σε κάθε θέση επικολλήθηκαν, με μικρή ποσότητα μαλακής κόλλησης, στην επιφάνεια του χαλκού, περιμετρικά του σωλήνα, τέσσερα (4) θερμοστοιχεία, έτσι ώστε να εξασφαλίζεται η ομοιομορφία της κατανομής της θερμοκρασίας σε όλη την περίμετρο, όπως φαίνεται στο σχήμα 2.

Με τον τρόπο αυτό εξασφαλίζεται ο έλεγχος της ομοιομορφίας της θερμοκρασίας επί της κάθε περιοχής μέτρησης. Λαμβάνοντας δε υπ' όψιν την αντιστοιχία των θερμοστοιχείων κατά την κατακόρυφη διεύθυνση είναι επιτρεπτή η εξαγωγή της μέσης θερμοκρασίας και της διαφοράς θερμοκρασίας κατά την διάρκεια της δοκιμής.

Η θερμοκρασία περιβάλλοντος μετρήθηκε με ένα θερμοζεύγος τύπου Κ.



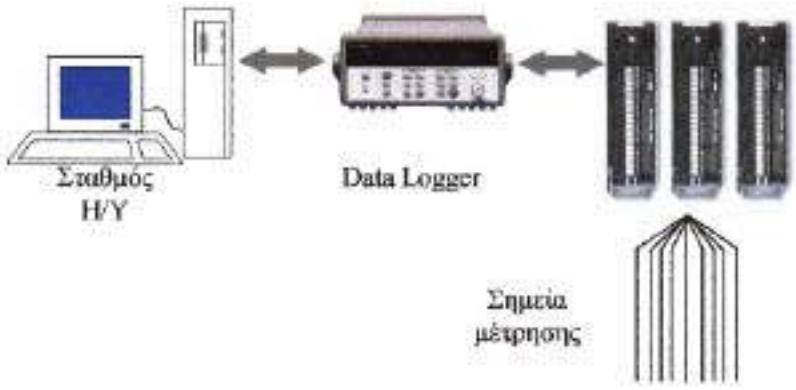
Σχήμα 2. Τοποθέτηση θερμοστοιχείων επί μίας των επιφανειών της συσκευής δοκιμής

Τα δεδομένα που απαιτούνται για την μέτρηση της θερμικής αγωγιμότητας είναι οι θερμοκρασίες επί των επιφανειών στα τέσσερα σημεία T_{0m}, T_{2m}, T_{0q}, T_{2q} και η θερμοκρασία περιβάλλοντος T_{amb}, και καταγράφονται από τα θερμοζεύγη, καθώς και η τάση και η ένταση του ρεύματος που διαρρέει τις αντιστάσεις. Συνολικά έχουν τοποθετηθεί 16 θερμοζεύγη επί των επιφανειών και ένα για την καταγραφή της θερμοκρασίας περιβάλλοντος.

Όλες οι μετρήσεις καταγράφονται από σύστημα αυτομάτου συλλογής δεδομένων (Data Logger) συνδεδεμένο με Η/Υ (σχ. 3), χρησιμοποιώντας το

λογισμικό Visual Engineering Environment, και στην συνέχεια αποθηκεύονται σε κατάλληλη μορφή και επεξεργάζονται σε φύλλο λογισμικού EXCEL.

Η διάταξη της αλυσίδας μέτρησης και καταγραφής παρουσιάζεται στο επόμενο σχήμα 3.



Σχήμα 3. Διάταξη καταγραφής δεδομένων

3.3 Διεξαγωγή δοκιμών και μεθοδολογία υπολογισμού

Για την διεξαγωγή της μέτρησης η συσκευή τροφοδοσίας με συνεχές ρεύμα, το Data Logger και ο Η/Υ τοποθετήθηκαν σε θάλαμο σταθερών συνθηκών θερμοκρασίας.

Στην συνέχεια η ηλεκτρική αντίσταση τροφοδοτείται με σταθερή ηλεκτρική τάση, μέσω της συσκευής τροφοδοσίας, με αποτέλεσμα να διαρρέεται από διαφορετική σταθερή ένταση ρεύματος ανάλογα με την ρύθμιση.

Η ηλεκτρική ισχύς που παρέχεται στην αντίσταση μετατρέπεται σε θερμική ενέργεια η οποία και διαχέεται ακτινικά, λόγω της ισχυρής πλευρικής μόνωσης, κατά προτίμηση μέσω της κεντρικής διάταξης δοκιμής και το δοκίμιο. Με την σειρά τοποθέτησης από τις ηλεκτρικές αντιστάσεις η θερμότητα διαρρέει τον χάλκινο σωλήνα δοκιμής, όπου η θερμοκρασία καθίσταται ομοιόμορφη, στην συνέχεια διαρρέει το δοκίμιο μέτρησης από αφρώδες ελαστικό μονωτικό υλικό και διαχέεται στο περιβάλλον.

Σε κάθε μία από τις επιφάνειες μέτρησης, όπου έχουν τοποθετηθεί τα τρία θερμοστοιχεία, καταγράφονται οι θερμοκρασίες και στην συνέχεια λαμβάνεται ο μέσος όρος που αποτελεί και την μέση θερμοκρασία της εν λόγω επιφάνειας στο κάθε σημείο.

Στην παράγραφο των αποτελεσμάτων δίνονται οι μέσες θερμοκρασίες που καταγράφονται από τα 4 θερμοζεύγη σε κάθε ένα σημείο μέτρησης και

είναι αυτές που προκύπτουν όταν η συσκευή έλθει σε πλήρη ισορροπία, δηλαδή οι θερμοκρασίες που καταγράφονται από τα θερμοζεύγη της αυτής επιφάνειας και είναι περίπου ίδιες.

Στους πίνακες αυτούς καταγράφονται οι μέσες θερμοκρασίες στα τέσσερα σημεία T_{0m}, T_{2m}, T_{0x}, T_{2x}, η θερμοκρασία περιβάλλοντος T_{amb} του θαλάμου σταθερών συνθηκών και η θερμική ισχύς που αντιστοιχεί στην μέση θερμοκρασία δοκιμής.

Στην συνέχεια από αυτές τις τιμές υπολογίζεται η θερμική αγωγιμότητα του δοκιμίου με την μέθοδο του van Rinsum όπως αναφέρεται κατωτέρω.

Κατ' αρχήν υπολογίζεται μία κατά προσέγγιση τιμή της θερμικής αγωγιμότητας του δοκιμίου από την σχέση:

$$\lambda' = \frac{\Phi \cdot \ln(D_2 - D_0)}{2\pi(T_{0m} - T_2)}$$

όπου Φ είναι η ροή θερμότητας σε W, D_2 και D_0 η εξωτερική και εσωτερική διάμετρος του δοκιμίου και T_2 η μέση τιμή της θερμοκρασίας της εξωτερικής επιφάνειας του δοκιμίου.

Στην συνέχεια υπολογίζεται ένας συντελεστής διόρθωσης c από την σχέση:

$$c = \frac{2\pi\lambda'}{A_1\lambda_1 \cdot \ln(D_2/D_0)}$$

όπου A_1 και λ_1 είναι η εγκάρσια διατομή και η θερμική αγωγιμότητα του χάλκινου σωλήνα δοκιμής.

Από την ανωτέρω σχέση υπολογίζεται μία θερμοκρασία διόρθωσης ΔT_{0m} της επιφανειακής θερμοκρασίας του σωλήνα δοκιμής από την σχέση:

$$\Delta T_{0m} = \frac{(T_{0m} - T_{0x})}{\cosh(X\sqrt{c})}$$

όπου T_{0x} είναι η μέση θερμοκρασία της επιφάνειας του σωλήνα σε μία απόσταση X (που στην περίπτωσή μας είναι 0.5 m).

Η διορθωμένη θερμική αγωγιμότητα υπολογίζεται από την σχέση:

$$\lambda = \frac{\Phi \cdot \ln(D_2 - D_0)}{2\pi L(T_{0m} + \Delta T_{0m} - T_2)} \quad [W/mK]$$

Η θερμική αντίσταση υπολογίζεται από την σχέση:

$$r = \frac{1}{\lambda} \quad [mKW]$$

Να σημειωθεί ότι οι τιμές ισχύουν μόνο για την συγκεκριμένη τοποθέτηση του σωλήνα δοκιμής και του δοκιμίου που είναι οριζόντια.

Διενεργήθηκαν πέντε σειρές μετρήσεων μεταβάλλοντας την τάση και την ένταση του ρεύματος και κατά συνέπεια την ροή θερμότητας της συσκευής. Από αυτό προέκυψαν πέντε διαφορετικές μέσες θερμοκρασίες δοκιμίου οι οποίες υπολογίσθηκαν ως μέσος όρος των θερμοκρασιών μεταξύ της εσωτερικής και της εξωτερικής θερμοκρασίας αυτού.

$$T_m = \frac{(T_{0m} - T_{2m})}{2}$$

Οι τιμές των μεγεθών δίνονται συγκεντρωτικά σε πίνακα

4. ΑΠΟΤΕΛΕΣΜΑΤΑ ΜΕΤΡΗΣΕΩΝ / *TEST RESULTS*

4.1 Πρώτη μέτρηση / *First measurement*

Μέση θερμοκρασία δοκιμής T_m ..... 31.6 °C
Mean temperature

Μέση θερμοκρασία επί του σωλήνα δοκιμής στο μέσον T_{0m} ..... 36.09 °C
Mean temperature on the test pipe at the centre

Μέση θερμοκρασία επί του σωλήνα δοκιμής σε απόσταση 0.5 m T_{0x} ..... 35.96 °C
Mean temperature on the test pipe at a 0.5 m distance

Μέση θερμοκρασία επί του δοκιμίου στο μέσον T_{2m} ..... 27.31 °C
Mean temperature on the specimen surface at the centre

Μέση θερμοκρασία επί του δοκιμίου σε απόσταση 0.5 m T_{2x} ..... 27.09 °C
Mean temperature on the specimen surface at a 0.5 m distance

Μέση θερμοκρασία περιβάλλοντος T_{amb} ..... 24.52 °C
Mean ambient temperature

Μέση θερμική ισχύς Φ ..... 5.27 W
Mean heat flow rate

Μέση θερμική αγωγιμότητα λ ..... 0.0375 W/mK
Mean thermal conductivity

Μέση θερμική αντίσταση r ..... 26.64 mK/W
Mean thermal resistivity

4.2 Δεύτερη μέτρηση / *Second measurement*

Μέση θερμοκρασία δοκιμής T_m ..... 38.5 °C
Mean temperature

Μέση θερμοκρασία επί του σωλήνα δοκιμής στο μέσον T_{0m} ..... 47.30 °C
Mean temperature on the test pipe at the centre

Μέση θερμοκρασία επί του σωλήνα δοκιμής σε απόσταση 0.5 m T_{0x} ..... 47.29 °C
Mean temperature on the test pipe at a 0.5 m distance

Μέση θερμοκρασία επί του δοκιμίου στο μέσον T_{2m} ..... 29.81 °C
Mean temperature on the specimen surface at the centre

Μέση θερμοκρασία επί του δοκιμίου σε απόσταση 0.5 m T_{2x} ..... 29.43 °C
Mean temperature on the specimen surface at a 0.5 m distance

Μέση θερμοκρασία περιβάλλοντος T_{amb} ..... 24.55 °C
Mean ambient temperature

Μέση θερμική ισχύς Φ..... 10.92 W
Mean heat flow rate

Μέση θερμική αγωγιμότητα λ ..... 0.0391 W/mK
Mean thermal conductivity

Μέση θερμική αντίσταση r ..... 25.58 mK/W
Mean thermal resistivity

4.3 Τρίτη μέτρηση / *Third measurement*

Μέση θερμοκρασία δοκιμής T_m ..... 39.3 °C
Mean temperature

Μέση θερμοκρασία επί του σωλήνα δοκιμής στο μέσον T_{0m} ..... 48.34 °C
Mean temperature on the test pipe at the centre

Μέση θερμοκρασία επί του σωλήνα δοκιμής σε απόσταση 0.5 m T_{0x} ..... 48.32 °C
Mean temperature on the test pipe at a 0.5 m distance

Μέση θερμοκρασία επί του δοκιμίου στο μέσον T_{2m} ..... 30.23 °C
Mean temperature on the specimen surface at the centre

Μέση θερμοκρασία επί του δοκιμίου σε απόσταση 0.5 m T_{2x} ..... 30.23°C
Mean temperature on the specimen surface at a 0.5 m distance

Μέση θερμοκρασία περιβάλλοντος T_{amb} ..... 24.98 °C
Mean ambient temperature

Μέση θερμική ισχύς Φ..... 11.11 W
Mean heat flow rate

Μέση θερμική αγωγιμότητα λ ..... 0.0385 W/mK
Mean thermal conductivity

Μέση θερμική αντίσταση r ..... 25.97 mK/W
Mean thermal resistivity

4.4 Τέταρτη μέτρηση / *Forth measurement*

Μέση θερμοκρασία δοκιμής T_m ..... 50.60 °C
Mean temperature

Μέση θερμοκρασία επί του σωλήνα δοκιμής στο μέσον T_{0m} ..... 66.11 °C
Mean temperature on the test pipe at the centre

Μέση θερμοκρασία επί του σωλήνα δοκιμής σε απόσταση 0.5 m T_{0x} ..... 66.38 °C
Mean temperature on the test pipe at a 0.5 m distance

Μέση θερμοκρασία επί του δοκιμίου στο μέσον T_{2m} ..... 35.17 °C

Mean temperature on the specimen surface at the centre

Μέση θερμοκρασία επί του δοκιμίου σε απόσταση 0.5 m T_{2c} ..... 34.76 °C
Mean temperature on the specimen surface at a 0.5 m distance

Μέση θερμοκρασία περιβάλλοντος T_{amb} ..... 25.66 °C
Mean ambient temperature

Μέση θερμική ισχύς Φ ..... 20.11 W
Mean heat flow rate

Μέση θερμική αγωγιμότητα λ ..... 0.0409 W/mK
Mean thermal conductivity

Μέση θερμική αντίσταση r ..... 24.45 mK/W
Mean thermal resistivity

4.5 Πέμπτη μέτρηση / *Fifth measurement*

Μέση θερμοκρασία δοκιμής T_m ..... 56.20 °C
Mean temperature

Μέση θερμοκρασία επί του σωλήνα δοκιμής στο μέσον T_{0m} ..... 75.96 °C
Mean temperature on the test pipe at the centre

Μέση θερμοκρασία επί του σωλήνα δοκιμής σε απόσταση 0.5 m T_{0c} ..... 76.04 °C
Mean temperature on the test pipe at a 0.5 m distance

Μέση θερμοκρασία επί του δοκιμίου στο μέσον T_{2m} ..... 36.62 °C
Mean temperature on the specimen surface at the centre

Μέση θερμοκρασία επί του δοκιμίου σε απόσταση 0.5 m T_{2c} ..... 36.37 °C
Mean temperature on the specimen surface at a 0.5 m distance

Μέση θερμοκρασία περιβάλλοντος T_{amb} ..... 25.87 °C
Mean ambient temperature

Μέση θερμική ισχύς Φ ..... 25.45 W
Mean heat flow rate

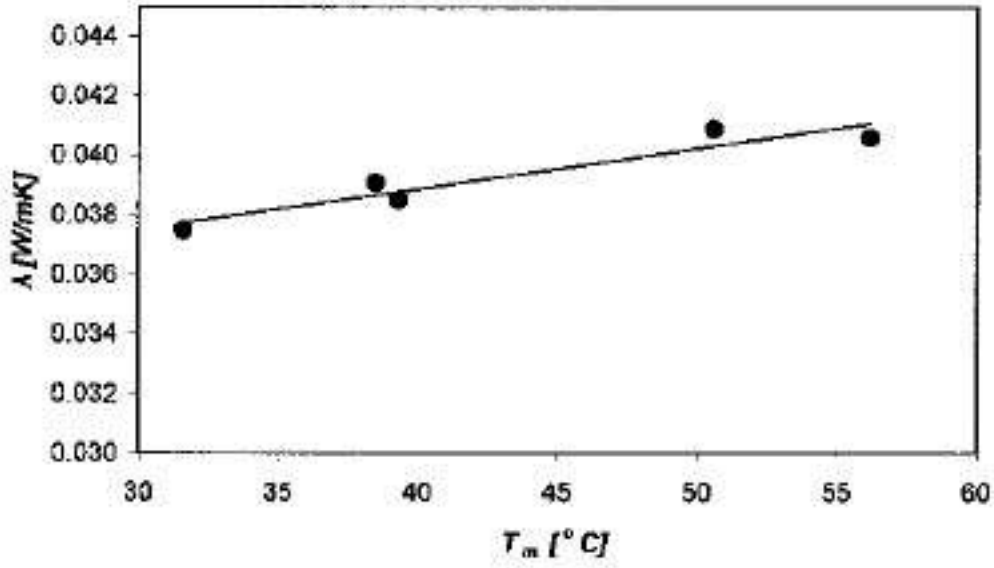
Μέση θερμική αγωγιμότητα λ ..... 0.0406 W/mK
Mean thermal conductivity

Μέση θερμική αντίσταση r ..... 24.63 mK/W
Mean thermal resistivity

5. ΙΔΙΟΤΗΤΕΣ ΜΕΤΑΔΟΣΗΣ ΘΕΡΜΟΤΗΤΑΣ
THERMAL TRANSMISSION PROPERTIES

5.1.1 Μετρηθείσες τιμές θερμικής αγωγιμότητας δοκιμίου (λ)
Measured thermal conductivity

Δοκιμή *Test*	Μέση θερμοκρασία δοκιμίου *Average specimen temperature* T (°C)	Θερμική αγωγιμότητα *Thermal conductivity* λ (W / m K)
1	31.6	0.0375
2	38.5	0.0391
3	39.3	0.0385
4	50.6	0.0409
5	56.2	0.0406

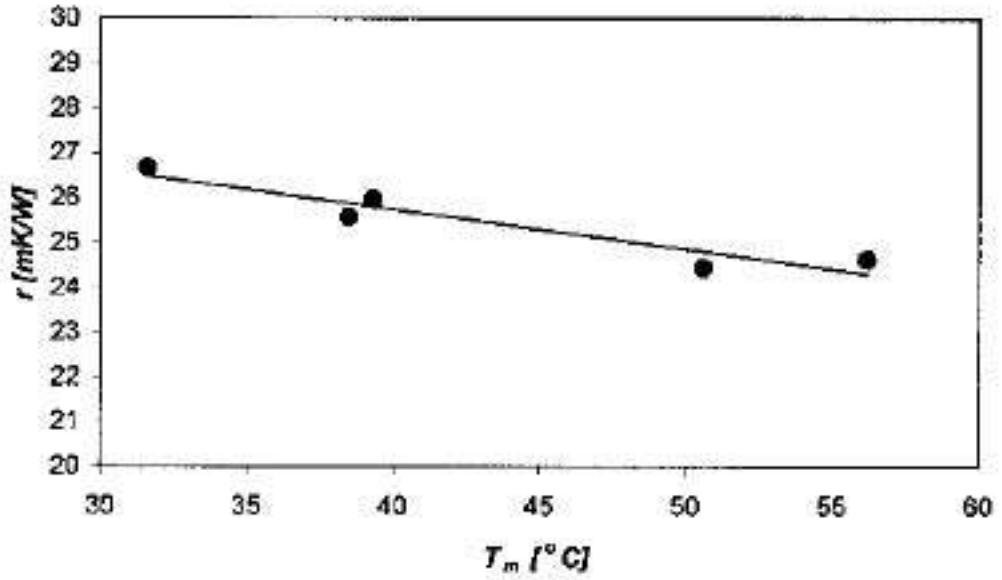


5.1.2 Εάν υποτεθεί ότι η σχέση μεταξύ λ και T είναι γραμμική στο διάστημα θερμοκρασιών από 31 °C έως 56 °C τότε η γραμμική σχέση μεταξύ τους είναι:

$$\lambda = 0.033453 + 0.000136 * T$$

5.2.1 Μετρηθείσες τιμές θερμικής αντίστασης δοκιμίου (*r*)
Measured thermal resistivity

Δοκιμή ***Test***	**Μέση θερμοκρασία δοκιμίου** ***Average specimen temperature*** **T (°C)**	**Θερμική αντίσταση** ***Thermal resistance*** ***r* (m K / W)**
1	31.6	26.66
2	38.5	25.57
3	39.3	25.97
4	50.6	24.44
5	56.2	24.63



5.2.2 Εάν υποτεθεί ότι η σχέση μεταξύ r και T είναι γραμμική στο διάστημα θερμοκρασιών από 31 °C έως 56 °C τότε η γραμμική σχέση μεταξύ τους είναι:

$$r = 29.263 - 0.0878 * T$$

ΕΘΝΙΚΟ ΚΕΝΤΡΟ ΕΡΕΥΝΑΣ ΦΥΣΙΚΩΝ ΕΠΙΣΤΗΜΩΝ
"ΔΗΜΟΚΡΙΤΟΣ" / "DEMOKRITOS"
NATIONAL CENTER FOR SCIENTIFIC RESEARCH

ΕΡΓΑΣΤΗΡΙΟ ΔΟΚΙΜΩΝ ΗΛΙΑΚΩΝ & ΑΛΛΩΝ ΕΝΕΡΓΕΙΑΚΩΝ ΣΥΣΤΗΜΑΤΩΝ
LABORATORY OF TESTING SOLAR & OTHER ENERGY SYSTEMS

ΕΚΘΕΣΗ ΔΟΚΙΜΩΝ

ΠΡΟΣΔΙΟΡΙΣΜΟΣ ΙΔΙΟΤΗΤΩΝ ΘΕΡΜΙΚΗΣ ΜΕΤΑΔΟΣΗΣ ΣΕ ΣΤΑΘΕΡΗ ΚΑΤΑΣΤΑΣΗ, ΘΕΡΜΟΜΟΝΩΤΙΚΟΥ ΚΕΛΥΦΟΥΣ ΓΙΑ ΚΥΚΛΙΚΟΥΣ ΑΓΩΓΟΥΣ

ΣΥΜΦΩΝΑ ΜΕ ΤΟ ΠΡΟΤΥΠΟ ΕΛΟΤ ΕΝ ISO 8497:1997

TEST REPORT

DETERMINATION OF STEADY-STATE THERMAL TRANSMISSION PROPERTIES OF THERMAL INSULATION FOR CIRCULAR PIPES

ACCORDING THE ΕΛΟΤ ΕΝ ISO 8497:1997 STANDARD

ΑΡΙΘΜΟΣ ΔΟΚΙΜΗΣ / TEST REFERENCE
SpTHR04/103

153-10 Αγ. Παρασκευή, Αττική
Τηλ.: 210 6503815
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ΕΚΘΕΣΗ ΔΟΚΙΜΩΝ

ΠΡΟΣΔΙΟΡΙΣΜΟΣ ΙΔΙΟΤΗΤΩΝ ΘΕΡΜΙΚΗΣ ΜΕΤΑΔΟΣΗΣ ΣΕ ΣΤΑΘΕΡΗ ΚΑΤΑΣΤΑΣΗ, ΘΕΡΜΟΜΟΝΩΤΙΚΟΥ ΚΕΛΥΦΟΥΣ ΓΙΑ ΚΥΚΛΙΚΟΥΣ ΑΓΩΓΟΥΣ

ΣΥΜΦΩΝΑ ΜΕ ΤΟ ΠΡΟΤΥΠΟ ΕΛΟΤ EN ISO 8497:1997

TEST REPORT

DETERMINATION OF STEADY-STATE THERMAL TRANSMISSION PROPERTIES OF THERMAL INSULATION FOR CIRCULAR PIPES

ACCORDING THE ELOT EN ISO 8497:1997 STANDARD

EN ISO 8497:1997 "Thermal insulation – Determination of steady-state thermal transmission properties of thermal insulation for circular pipes"

ΕΡΓΑΣΤΗΡΙΟ ΔΟΚΙΜΩΝ ΗΛΙΑΚΩΝ & ΑΛΛΩΝ ΕΝΕΡΓΕΙΑΚΩΝ ΣΥΣΤΗΜΑΤΩΝ
ΕΚΕΦΕ "ΔΗΜΟΚΡΙΤΟΣ" / NCSR "DEMOKRITOS"
LABORATORY OF TESTING SOLAR & OTHER ENERGY SYSTEMS

ΕΚΕΦΕ ΔΗΜΟΚΡΙΤΟΣ
ΕΡΓ.ΙΟ ΗΛΙΑΚΩΝ - ΕΝΕΡΓ.ΚΩΝ ΣΥΣΤ.ΤΩΝ
ΠΡΟΪΣΤ.ΜΕΝΟΣ Β. ΜΠΕΛΕΣΙΩΤΗΣ
ΤΗΛ.: 6544592 - FAX: 6544595
15310 ΑΓ. ΠΑΡΑΣΚΕΥΗ - ΑΤΤΙΚΗ

Σ. Μπαμπαλής / S. Babalis
Υπεύθυνος Δοκιμών / Responsible for Testing

Β. Μπελεσιώτης / V. Belessiotis
Προϊστάμενος / Laboratory Head

Ημερομηνία / Date: 26/10/2004

ΣΗΜΕΙΩΣΕΙΣ:

1) *Τα αποτελέσματα αφορούν μόνο τα δοκίμια στα οποία πραγματοποιήθηκαν οι δοκιμές και τα οποία προσκομίστηκαν από τον πελάτη.*
2) *Η παρούσα έκθεση δεν επιτρέπεται να αναπαραχθεί παρά μόνο στο σύνολό της χωρίς την γραπτή έγκριση του Εργαστηρίου.*

NOTES:

1) *The results are related only with the specimens on which the tests performed and which were delivered by the customer.*
2) *This report can be reproduced without the written permission of the Laboratory only in full.*

Test reference: SpTHR94/103

ΕΚΘΕΣΗ ΔΟΚΙΜΩΝ / *TEST REPORT*

Πελάτης:	3i-International Innovative Insulation S.A. 68 χλμ. Ε.Ο. Αθηνών-Λαμίας	*Customer:*	*3i-International Innovative Insulation S.A.* *68 Km Nat. Road Ath-Lam*
Τηλ.:	22620 71867	*Tel.:*	22620 71867
Fax:	22620 72006	*Fax:*	22620 72006
Ημερομηνία παραλαβής θερμομονωτικού υλικού (σε καλή κατάσταση) / *Receipt date of insulating material (in good condition):*			4/09/2004

1. ΠΕΡΙΓΡΑΦΗ ΘΕΡΜΟΜΟΝΩΤΙΚΟΥ Ή ΔΟΜΙΚΟΥ ΥΛΙΚΟΥ / *DESCRIPTION OF INSULATING MATERIAL*

1.1 Βασικά Στοιχεία Υλικού / *Basic Material Data*

- Κατασκευαστής / *Manufacturer* .. 3i-International Innovative Insulation S.A.
- Εμπορική ονομασία υλικού / *Commercial name* ..... Isopipe TC 9X10
- Είδος υλικού / *Material type*
  - Μονωτικό υλικό / *Insulating* ☑
  - Δομικό υλικό / *Construction* ☐
  - *Άλλο / Other* ☐
- Χαρακτηρισμός υλικού / *Meterial Characteristics*

Εύκαμπτο *Flexible*	☑	Άκαμπτο *Inflexible*	☐	Ημίκαμπτο *Semi-flexible*	☐
Αφρώδες *Foamy*	☑	Ινώδες *Fibrous*	☐	Κοκκώδες *Granular*	☐

- Περιγραφή υλικού / *Description of the specimen*

  Αφρώδες ελαστικό μονωτικό υλικό υπό μορφή κελύφους κυκλικού αγωγού.
  Cellular elastic insulating material for circular pipes

1.2 Ετοιμασία δοκιμίων / *Specimen preparation*

Πελάτης *Customer*	☑	Εργαστήριο *Laboratory*	☐	Από μεγαλ. τεμαχ. *From large piece*	☐

1.3 Αριθμός δοκιμίων υλικού / *Number of specimens* ..... 3 τεμ./ pcs

1.4 Μέσες διαστάσεις δοκιμίων κατά την παραλαβή
Average dimensions of specimen, as delivered

- Μέσο μήκος αγωγού / *Average pipe length* ..... 2 m
- Μέσο πάχος μονωτικού / *Average insulation thickness* ..... 9 mm
- Εσωτερική διάμετρος / *Internal diameter* ..... 12 mm

1.6 Φωτογραφία δοκιμίου / *Specimens Photo*

Εικόνα 1. Δείγμα δοκιμίου μέτρησης (θερμομονωτικό κέλυφος για κυκλικούς αγωγούς)

2. ΠΡΟΕΡΓΑΣΙΑ ΔΟΚΙΜΙΩΝ ΥΛΙΚΟΥ / *CONDITIONING OF SPECIMENS*

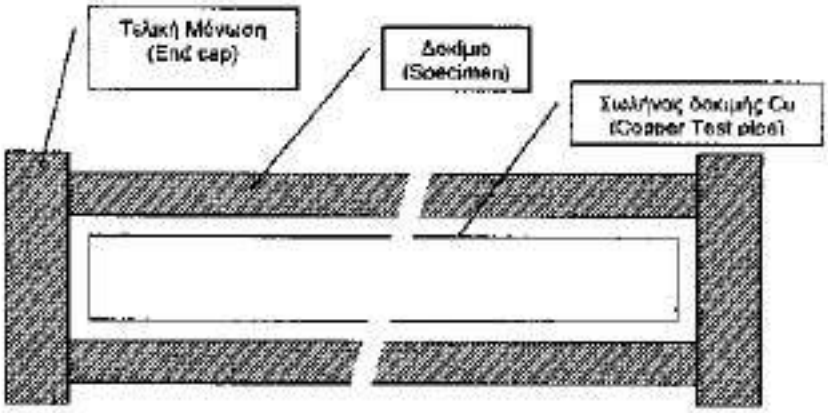
2.1 Τρόπος προεργασίας / *Conditioning method*

Δεν έγινε προεργασία του δοκιμίου / *No preconditioning of the specimens has been done.*

3. ΠΕΡΙΓΡΑΦΗ ΕΞΟΠΛΙΣΜΟΥ ΔΟΚΙΜΗΣ

3.1 Συσκευή δοκιμής

Η συσκευή δοκιμής, η οποία κατασκευάσθηκε ειδικά για την περίπτωση (σχ. 1), ακολουθεί τον σχεδιασμό της συσκευής που περιγράφεται στο πρότυπο ΕΛΟΤ EN ISO 8497: 1994 με την μέθοδο «calculated end apparatus» προσαρμοσμένη κατάλληλα για την περίσταση.

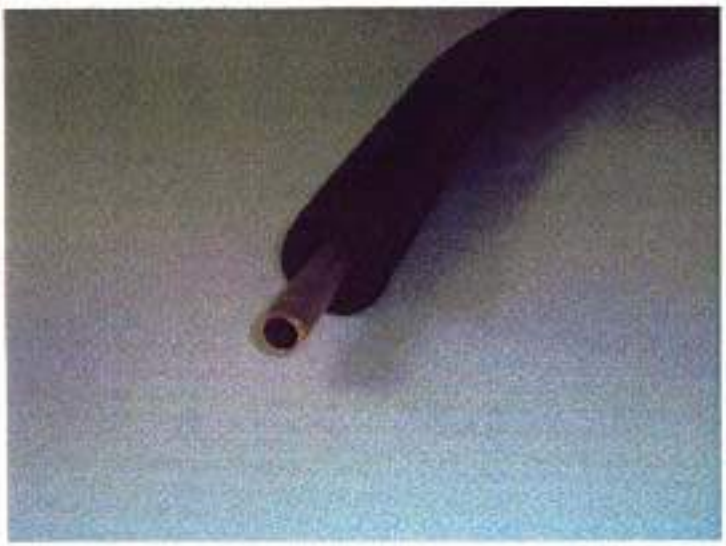


Σχήμα 1. Τομή της διάταξης δοκιμής

Η συσκευή αποτελείται από τον χάλκινο σωλήνα δοκιμής (Copper Test Pipe) εξωτερικής διαμέτρου 12 mm και μήκους 2 m επενδεδυμένο με το προς δοκιμή υλικό, έτσι ώστε η εσωτερική πλευρά του να εφάπτεται ακριβώς με την εξωτερική επιφάνεια του σωλήνα δοκιμής σε όλο του το μήκος (εικόνα 2).

Ο σωλήνας δοκιμής είναι κλεισμένος από τις δύο πλευρές με το ίδιο υλικό από το οποίο αποτελείται ο σωλήνας δοκιμής με πρόβλεψη εξόδου των αγωγών τροφοδοσίας των ηλεκτρικών αντιστάσεων.

Το μονωτικό κέλυφος της δοκιμής (test specimen) τοποθετείται στην εξωτερική πλευρά του σωλήνα χαλκού (Copper Test Pipe) έτσι ώστε να καλύπτει όλη την επιφάνεια του σωλήνα. Τα πλευρικά τμήματα του σωλήνα δοκιμής μονώνονται τοποθετώντας επίπεδη πλάκα αφρώδους ελαστικού μονωτικού υλικού του ιδίου τύπου με τον προς δοκιμή σωλήνα πάχους 19 mm.



Εικόνα 2. Σωλήνας δοκιμής και δοκίμιο

Εσωτερικά του χάλκινου σωλήνα δοκιμής τοποθετείται συγκεκριμένος αριθμός ηλεκτρικών αντιστάσεων συνδεδεμένων παράλληλα έτσι ώστε όταν τροφοδοτούνται με συνεχές ρεύμα να δημιουργείται η επιθυμητή θερμοκρασία δοκιμής στην εξωτερική πλευρά του σωλήνα χαλκού, που αντιστοιχεί στην εσωτερική πλευρά του σωληνοειδούς κελύφους.

Οι ηλεκτρικές αντιστάσεις συστρέφονται και διατάσσονται πυκνά εντός του σωλήνα έτσι ώστε όλο το ενεργό μήκος τους να ευρίσκεται εντός του σωλήνα δοκιμής και να εξασφαλίζεται η ομοιόμορφη κατανομή της θερμοκρασίας σε όλη την επιφάνεια μέτρησης (όπως προέκυψε και από τις μετρήσεις θερμοκρασίας σε σημεία της επιφάνειας). Θερμοζεύγη τοποθετούνται περιμετρικά, σε κατάλληλα σημεία επί του χάλκινου σωλήνα δοκιμής, για την μέτρηση της θερμοκρασίας.

Η θερμοκρασία περιβάλλοντος καθορίζεται κάθε φορά ανάλογα με την επιθυμητή μέση θερμοκρασία του δοκιμίου τοποθετώντας την συσκευή δοκιμής και την διάταξη μέτρησης εντός ισχυρά μονωμένου θαλάμου ελεγχόμενων σταθερών συνθηκών θερμοκρασίας και μετράται με θερμοζεύγος τοποθετημένο στον αέρα πλησίον της συσκευής δοκιμής ενώ ο αέρας εσωτερικά ευρίσκεται σε ακινησία, όπως απαιτεί το πρότυπο.

Όλα τα θερμοζεύγη που χρησιμοποιούνται για την μέτρηση της θερμοκρασίας καθώς και οι καταγραφείς ηλεκτρικών μεγεθών καταλήγουν στην κάρτα πολυπλεξίας του Data Logger και καταγράφονται στον Η/Υ.

3.2 Μέτρηση θερμοκρασίας

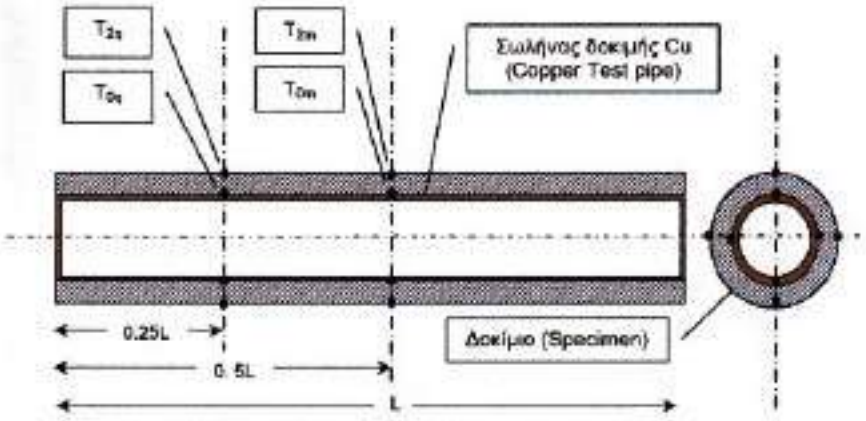
Επί της εξωτερικής επιφάνειας του σωλήνα χαλκού στις συγκεκριμένες θέσεις μέτρησης της θερμοκρασίας, η οποία αντιστοιχεί στην εσωτερική επιφάνεια του δοκιμίου (T_0), τοποθετήθηκαν θερμοζεύγη τύπου Τ τα οποία παρουσιάζουν υψηλότερη ακρίβεια μέτρησης θερμοκρασίας (max 0.5 °C). Στις ίδιες θέσεις μετράται η θερμοκρασία επί της εξωτερικής επιφάνειας του δοκιμίου (T_2) χρησιμοποιώντας θερμοζεύγη ίδιου τύπου.

Οι θέσεις στις οποίες καταγράφηκε η κατανομή της θερμοκρασίας περιμετρικά είναι το μέσον του σωλήνα δοκιμής (απόσταση 1 m από την άκρη του σωλήνα) και στο ¼ αυτής (απόσταση 0.5 m από την άκρη του σωλήνα) έτσι ώστε να υλοποιηθεί η μέθοδος υπολογισμού van Rinsum.

Σε κάθε θέση επικολλήθηκαν, με μικρή ποσότητα μαλακής κόλλησης, στην επιφάνεια του χαλκού, περιμετρικά του σωλήνα, τέσσερα (4) θερμοστοιχεία, έτσι ώστε να εξασφαλίζεται η ομοιομορφία της κατανομής της θερμοκρασίας σε όλη την περίμετρο, όπως φαίνεται στο σχήμα 2.

Με τον τρόπο αυτό εξασφαλίζεται ο έλεγχος της ομοιομορφίας της θερμοκρασίας επί της κάθε περιοχής μέτρησης. Λαμβάνοντας δε υπ' όψιν την αντιστοιχία των θερμοστοιχείων κατά την κατακόρυφη διεύθυνση είναι επιτρεπτή η εξαγωγή της μέσης θερμοκρασίας και της διαφοράς θερμοκρασίας κατά την διάρκεια της δοκιμής.

Η θερμοκρασία περιβάλλοντος μετρήθηκε με ένα θερμοζεύγος τύπου Κ.



Σχήμα 2. Τοποθέτηση θερμοστοιχείων επί μίας των επιφανειών της συσκευής δοκιμής

Τα δεδομένα που απαιτούνται για την μέτρηση της θερμικής αγωγιμότητας είναι οι θερμοκρασίες επί των επιφανειών στα τέσσερα σημεία T_{0m}, T_{2m}, T_{0q}, T_{2q} και η θερμοκρασία περιβάλλοντος T_{amb}, και καταγράφονται από τα θερμοζεύγη, καθώς και η τάση και η ένταση του ρεύματος που διαρρέει τις αντιστάσεις.

Συνολικά έχουν τοποθετηθεί 16 θερμοζεύγη επί των επιφανειών και ένα για την καταγραφή της θερμοκρασίας περιβάλλοντος.

Όλες οι μετρήσεις καταγράφονται από σύστημα αυτομάτου συλλογής δεδομένων (Data Logger) συνδεδεμένο με Η/Υ (σχ. 3), χρησιμοποιώντας το λογισμικό Visual Engineering Environment, και στην συνέχεια αποθηκεύονται σε κατάλληλη μορφή και επεξεργάζονται σε φύλλο λογισμικού EXCEL.

Η διάταξη της αλυσσίδας μέτρησης και καταγραφής παρουσιάζεται στο επόμενο σχήμα 3.

Σχήμα 3. Διάταξη καταγραφής δεδομένων

3.3 Διεξαγωγή δοκιμών και μεθοδολογία υπολογισμού

Για την διεξαγωγή της μέτρησης η συσκευή τροφοδοσίας με συνεχές ρεύμα, το Data Logger και ο Η/Υ τοποθετήθηκαν σε θάλαμο σταθερών συνθηκών θερμοκρασίας.

Στην συνέχεια η ηλεκτρική αντίσταση τροφοδοτείται με σταθερή ηλεκτρική τάση, μέσω της συσκευής τροφοδοσίας, με αποτέλεσμα να διαρρέεται από διαφορετική σταθερή ένταση ρεύματος ανάλογα με την ρύθμιση.

Η ηλεκτρική ισχύς που παρέχεται στην αντίσταση μετατρέπεται σε θερμική ενέργεια η οποία και διαχέεται ακτινικά, λόγω της ισχυρής πλευρικής μόνωσης, κατά προτίμηση μέσω της κεντρικής διάταξης δοκιμής και το δοκίμιο. Με την σειρά τοποθέτησης από τις ηλεκτρικές αντιστάσεις η θερμότητα διαρρέει τον χάλκινο σωλήνα δοκιμής, όπου η θερμοκρασία καθίσταται ομοιόμορφη, στην συνέχεια διαρρέει το δοκίμιο μέτρησης από αφρώδες ελαστικό μονωτικό υλικό και διαχέεται στο περιβάλλον.

Σε κάθε μία από τις επιφάνειες μέτρησης, όπου έχουν τοποθετηθεί τα τρία θερμοστοιχεία, καταγράφονται οι θερμοκρασίες και στην συνέχεια λαμβάνεται ο μέσος όρος που αποτελεί και την μέση θερμοκρασία της εν λόγω επιφάνειας στο κάθε σημείο.

Στην παράγραφο των αποτελεσμάτων δίνονται οι μέσες θερμοκρασίες που καταγράφονται από τα 4 θερμοζεύγη σε κάθε ένα σημείο μέτρησης και είναι αυτές που προκύπτουν όταν η συσκευή έλθει σε πλήρη ισορροπία, δηλαδή οι θερμοκρασίες που καταγράφονται από τα θερμοζεύγη της αυτής επιφάνειας και είναι περίπου ίδιες.

Στους πίνακες αυτούς καταγράφονται οι μέσες θερμοκρασίες στα τέσσερα σημεία T_{0m}, T_{2m}, T_{0x}, T_{2x}, η θερμοκρασία περιβάλλοντος T_{amb} του θαλάμου σταθερών συνθηκών και η θερμική ισχύς που αντιστοιχεί στην μέση θερμοκρασία δοκιμής.

Στην συνέχεια από αυτές τις τιμές υπολογίζεται η θερμική αγωγιμότητα του δοκιμίου με την μέθοδο του van Rinsum όπως αναφέρεται κατωτέρω.

Κατ' αρχήν υπολογίζεται μία κατά προσέγγιση τιμή της θερμικής αγωγιμότητας του δοκιμίου από την σχέση:

$$\lambda' = \frac{\Phi \cdot \ln(D_2 - D_0)}{2\pi(T_{0m} - T_2)}$$

όπου Φ είναι η ροή θερμότητας σε W, D_2 και D_0 η εξωτερική και εσωτερική διάμετρος του δοκιμίου και T_2 η μέση τιμή της θερμοκρασίας της εξωτερικής επιφάνειας του δοκιμίου.

Στην συνέχεια υπολογίζεται ένας συντελεστής διόρθωσης c από την σχέση:

$$c = \frac{2\pi\lambda'}{A_1\lambda_1 \cdot \ln(D_2/D_0)}$$

όπου A_1 και λ_1 είναι η εγκάρσια διατομή και η θερμική αγωγιμότητα του χάλκινου σωλήνα δοκιμής.

Από την ανωτέρω σχέση υπολογίζεται μία θερμοκρασία διόρθωσης ΔT_{0m} της επιφανειακής θερμοκρασίας του σωλήνα δοκιμής από την σχέση:

$$\Delta T_{0m} = \frac{(T_{0m} - T_{0x})}{\cosh(X\sqrt{c})}$$

όπου T_{0x} είναι η μέση θερμοκρασία της επιφάνειας του σωλήνα σε μία απόσταση X (που στην περίπτωσή μας είναι 0.5 m).

Η διορθωμένη θερμική αγωγιμότητα υπολογίζεται από την σχέση:

$$\lambda = \frac{\Phi \cdot \ln(D_2 - D_0)}{2\pi l \lambda (T_{0w} + \Delta T_{0w} - T_2)} \quad [W/mK]$$

Η θερμική αντίσταση υπολογίζεται από την σχέση:

$$r = \frac{1}{\lambda} \quad [mK/W]$$

Να σημειωθεί ότι οι τιμές ισχύουν μόνο για την συγκεκριμένη τοποθέτηση του σωλήνα δοκιμής και του δοκιμίου που είναι οριζόντια.

Διενεργήθηκαν πέντε σειρές μετρήσεων μεταβάλλοντας την τάση και την ένταση του ρεύματος και κατά συνέπεια την ροή θερμότητας της συσκευής. Από αυτό προέκυψαν πέντε διαφορετικές μέσες θερμοκρασίες δοκιμίου οι οποίες υπολογίσθηκαν ως μέσος όρος των θερμοκρασιών μεταξύ της εσωτερικής και της εξωτερικής θερμοκρασίας αυτού.

$$T_m = \frac{(T_{0w} - T_{2w})}{2} \quad [°C]$$

Οι τιμές των μεγεθών δίνονται συγκεντρωτικά σε πίνακα

4. ΑΠΟΤΕΛΕΣΜΑΤΑ ΜΕΤΡΗΣΕΩΝ / *TEST RESULTS*

4.1 Πρώτη μέτρηση / *First measurement*

Μέση θερμοκρασία δοκιμής T_m ..... 30.0 °C
Mean temperature

Μέση θερμοκρασία επί του σωλήνα δοκιμής στο μέσον T_{0m} ..... 32.89 °C
Mean temperature on the test pipe at the centre

Μέση θερμοκρασία επί του σωλήνα δοκιμής σε απόσταση 0.5 m T_{0x} ..... 32.24 °C
Mean temperature on the test pipe at a 0.5 m distance

Μέση θερμοκρασία επί του δοκιμίου στο μέσον T_{2m} ..... 27.26 °C
Mean temperature on the specimen surface at the centre

Μέση θερμοκρασία επί του δοκιμίου σε απόσταση 0.5 m T_{2x} ..... 27.39 °C
Mean temperature on the specimen surface at a 0.5 m distance

Μέση θερμοκρασία περιβάλλοντος T_{amb} ..... 25.53 °C
Mean ambient temperature

Μέση θερμική ισχύς Φ ..... 3.11 W
Mean heat flow rate

Μέση θερμική αγωγιμότητα λ ..... 0.0398 W/mK
Mean thermal conductivity

Μέση θερμική αντίσταση r ..... 25.13 mK/W
Mean thermal resistivity

4.2 Δεύτερη μέτρηση / *Second measurement*

Μέση θερμοκρασία δοκιμής T_m ..... 38.80 °C
Mean temperature

Μέση θερμοκρασία επί του σωλήνα δοκιμής στο μέσον T_{0m} ..... 44.06 °C
Mean temperature on the test pipe at the centre

Μέση θερμοκρασία επί του σωλήνα δοκιμής σε απόσταση 0.5 m T_{0x} ..... 42.44 °C
Mean temperature on the test pipe at a 0.5 m distance

Μέση θερμοκρασία επί του δοκιμίου στο μέσον T_{2m} ..... 30.06 °C
Mean temperature on the specimen surface at the centre

Μέση θερμοκρασία επί του δοκιμίου σε απόσταση 0.5 m T_{2x} ..... 30.73 °C
Mean temperature on the specimen surface at a 0.5 m distance

Μέση θερμοκρασία περιβάλλοντος T_{amb} ..... 25.64 °C
Mean ambient temperature

Μέση θερμική ισχύς Φ ..... 7.83 W
Mean heat flow rate

Μέση θερμική αγωγιμότητα λ ..... 0.0401 W/mK
Mean thermal conductivity

Μέση θερμική αντίσταση r ..... 24.94 mK/W
Mean thermal resistivity

4.3 Τρίτη μέτρηση / *Third measurement*

Μέση θερμοκρασία δοκιμής T_m ..... 42.8 °C
Mean temperature

Μέση θερμοκρασία επί του σωλήνα δοκιμής στο μέσον T_{1m} ..... 53.75 °C
Mean temperature on the test pipe at the centre

Μέση θερμοκρασία επί του σωλήνα δοκιμής σε απόσταση 0.5 m $T_{0.5}$ ..... 51.29 °C
Mean temperature on the test pipe at a 0.5 m distance

Μέση θερμοκρασία επί του δοκιμίου στο μέσον T_{2m} ..... 32.63 °C
Mean temperature on the specimen surface at the centre

Μέση θερμοκρασία επί του δοκιμίου σε απόσταση 0.5 m T_{2r} ..... 33.52 °C
Mean temperature on the specimen surface at a 0.5 m distance

Μέση θερμοκρασία περιβάλλοντος T_{amb} ..... 26.00 °C
Mean ambient temperature

Μέση θερμική ισχύς Φ ..... 12.03 W
Mean heat flow rate

Μέση θερμική αγωγιμότητα λ ..... 0.0409 W/mK
Mean thermal conductivity

Μέση θερμική αντίσταση r ..... 24.45 mK/W
Mean thermal resistivity

4.4 Τέταρτη μέτρηση / *Forth measurement*

Μέση θερμοκρασία δοκιμής T_m ..... 61.1 °C
Mean temperature

Μέση θερμοκρασία επί του σωλήνα δοκιμής στο μέσον T_{1m} ..... 65.68 °C
Mean temperature on the test pipe at the centre

Μέση θερμοκρασία επί του σωλήνα δοκιμής σε απόσταση 0.5 m $T_{0.5}$ ..... 65.46 °C
Mean temperature on the test pipe at a 0.5 m distance

Μέση θερμοκρασία επί του δοκιμίου στο μέσον T_{2m} ..... 36.21 °C

Mean temperature on the specimen surface at the centre

Μέση θερμοκρασία επί του δοκιμίου σε απόσταση 0.5 m T_{2x} ..... 37.13 °C
Mean temperature on the specimen surface at a 0.5 m distance

Μέση θερμοκρασία περιβάλλοντος T_{amb} ..... 26.59 °C
Mean ambient temperature

Μέση θερμική ισχύς Φ ..... 17.49 W
Mean heat flow rate

Μέση θερμική αγωγιμότητα λ ..... 0.0432 W/mK
Mean thermal conductivity

Μέση θερμική αντίσταση r ..... 23.15 mK/W
Mean thermal resistivity

4.5 Πέμπτη μέτρηση / *Fifth measurement*

Μέση θερμοκρασία δοκιμής T_m ..... 62.2 °C
Mean temperature

Μέση θερμοκρασία επί του σωλήνα δοκιμής στο μέσον T_{0m} ..... 82.52 °C
Mean temperature on the test pipe at the centre

Μέση θερμοκρασία επί του σωλήνα δοκιμής σε απόσταση 0.5 m T_{0x} ..... 82.24 °C
Mean temperature on the test pipe at a 0.5 m distance

Μέση θερμοκρασία επί του δοκιμίου στο μέσον T_{2m} ..... 41.28 °C
Mean temperature on the specimen surface at the centre

Μέση θερμοκρασία επί του δοκιμίου σε απόσταση 0.5 m T_{2x} ..... 42.85 °C
Mean temperature on the specimen surface at a 0.5 m distance

Μέση θερμοκρασία περιβάλλοντος T_{amb} ..... 26.06 °C
Mean ambient temperature

Μέση θερμική ισχύς Φ ..... 26.0 W
Mean heat flow rate

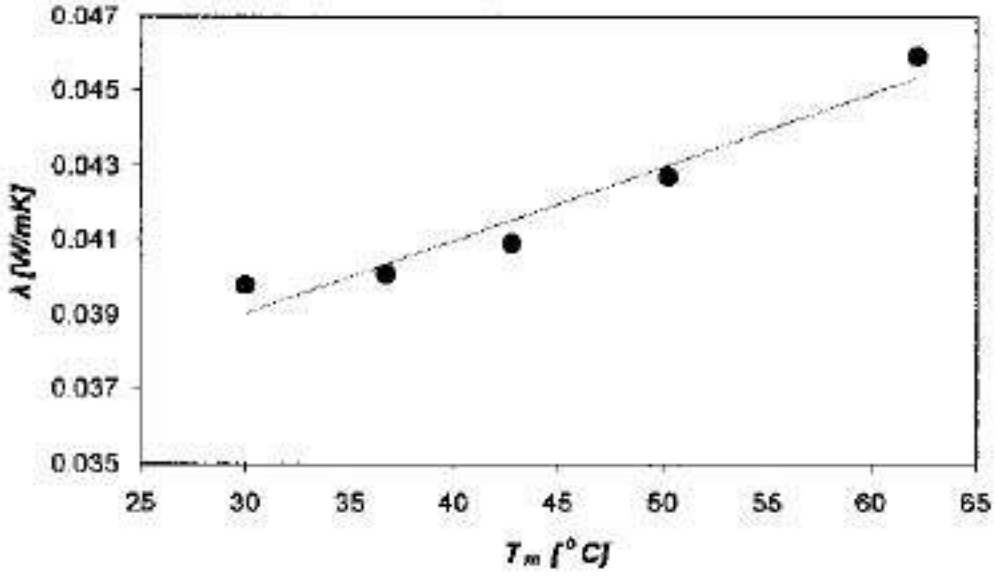
Μέση θερμική αγωγιμότητα λ ..... 0.0459 W/mK
Mean thermal conductivity

Μέση θερμική αντίσταση r ..... 21.79 mK/W
Mean thermal resistivity

5. ΙΔΙΟΤΗΤΕΣ ΜΕΤΑΔΟΣΗΣ ΘΕΡΜΟΤΗΤΑΣ
THERMAL TRANSMISSION PROPERTIES

5.1.1 Μετρηθείσες τιμές θερμικής αγωγιμότητας δοκιμίου (λ)
Measured thermal conductivity

Δοκιμή *Test*	Μέση θερμοκρασία δοκιμίου *Average specimen temperature* T (°C)	Θερμική αγωγιμότητα *Thermal conductivity* λ (W / m K)
1	30.0	0.0398
2	36.8	0.0401
3	42.8	0.0409
4	50.3	0.0427
5	62.2	0.0459



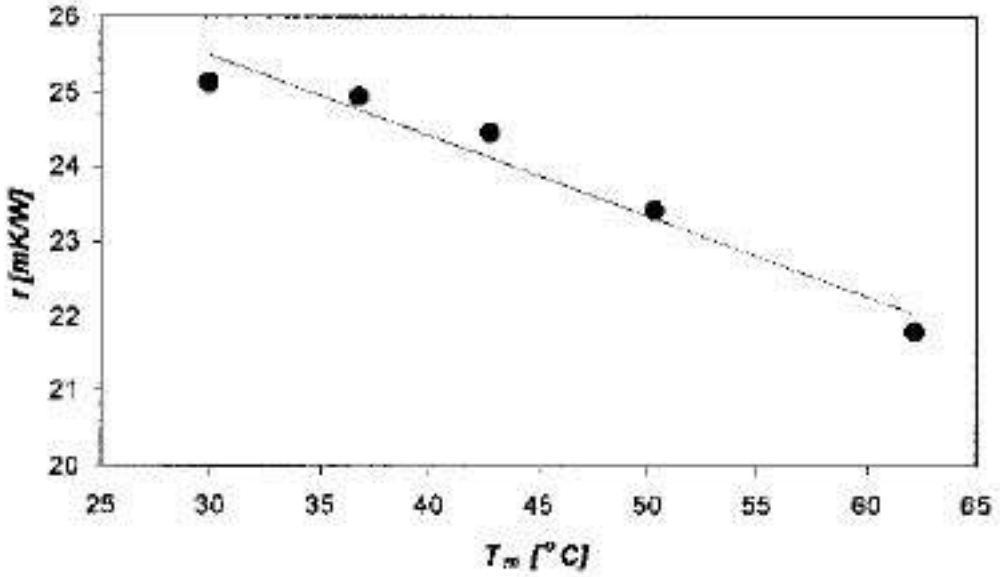
5.2.

5.1.2 Εάν υποτεθεί ότι η σχέση μεταξύ λ και T είναι γραμμική στο διάστημα θερμοκρασιών από 31 °C έως 56 °C τότε η γραμμική σχέση μεταξύ τους είναι:

$$\lambda = 0.033170 + 0.000196 * T$$

5.2.1 Μετρηθείσες τιμές θερμικής αντίστασης δοκιμίου (*r*)
Measured thermal resistivity

Δοκιμή *Test*	**Μέση θερμοκρασία δοκιμίου** *Average specimen temperature* T (°C)	**Θερμική αντίσταση** *Thermal resistance* *r* (m^2 K / W)
1	30.0	25.13
2	36.8	24.94
3	42.8	24.45
4	50.3	23.15
5	62.2	21.79



5.2.2 Εάν υποτεθεί ότι η σχέση μεταξύ r και T είναι γραμμική στο διάστημα θερμοκρασιών από 31 °C έως 56 °C τότε η γραμμική σχέση μεταξύ τους είναι:

$$r = 28.7404 - 0.1080 * T$$

НИ
СИ

1618 София бул. Н.Петков № 36
Телефон: 56 821 ; 55-21-80
Факс: 9 55 96 33

Лист 1
Всичко листове 2

ПРОТОКОЛ ЗА ИЗПИТВАНЕ

N 6-441/22.04.1999 г.

АКРЕДИТИРАН
ИЗПИТВАТЕЛЕН ЦЕНТЪР
ПОСТРОИТЕЛСТВО-ИЦС
НИСИ-ЕООД
Лаборатория "Строителна физика"
Атестат № 553-И/06.08.1998 г. от КСМ
Свидетелство рег.№ 117-02/31.05.1998 г.от ДИТСК

Наименование на продукта: Топлоизолационен материал "isopipe" тип ТС. от синтетична гума

Производител: Завод "31 International-Innovative-Insulation SA, гр.Атина, Гърция

Наименование и номер на стандартизационните документи: Определяне на коефициент на топлопроводност

Количество на изпитваните проби: Три броя пробни образци с размери 200/200/30 мм

Заявител: "ЛАКАЛ" ЕООД, гр.Пловдив
Възл. писмо № 021/14.04.1999 г.
входящ № 536/15.04.1999 г.

Протокол N 4-441/22.04.1999 г.

РЕЗУЛТАТИ ОТ ИЗПИТВАНЕТО

N по ред	Характеристика	Метод на изпитване	Стойност съгласно стандарт или др. документ	Стойност от изпитването	Съотв./несъотв. да/не
1.	Плътност, кг/м³	БДС 16632-87	-	78	-
2.	Коефициент на топлопроводност, Вт/м°С	"	-	0,0374	-

Забележка: Резултатите от изпитванията се отнасят само за изпитваните проби. Извлечения от изпитвателния протокол не могат да се размножават без писмено съгласие на Изпитвателния център по строителство-ИЦС-НИСИ-ЕООД.

ПРОВЕЛ ИЗПИТВАНЕТО: /ст.н.с.инж.М.Алексиева/

ЛАБОРАТОРИЯ: /ст.н.с.инж.К.Дудунов/

ДИРЕКТОР ИЦС: /ст.н.с.инж.Д.Вълкова/

Latvijas Republikas Ekonomikas ministrija
Valsts būvinspekcija
Būvmateriālu testēšanas laboratorija
Kr.Barona ielā 99, Rigā, LV 1012, tālrunis 273805, fakss 276374, Reģ. Nr. 90000426089

VB BTL-T-118

TESTĒŠANAS PĀRSKATS Nr.03/591

Datums:.10.09.03.

Pasūtītājs: SIA " BBANC ",Kr.Barona 99,Riga,LV-1012
Pasūtījums: no 13.08.2003.
Informācija par testēšanas paraugu:

Saņemšanas datums	Testēšanas izpildes datums	Paraugu veids	Pasūtītāja parauga Nr.(šifrs)	Parauga ident.Nr.
15.08.03.	09.09.03.	Sintetisks izolācijas materiāls	990-IM-130803	03/4790

Par paraugu ņemšanu atbild pasūtītājs.
Pasūtītāja sniegtā informācija: saņemta izolācijas čaula – 1,0m (izmēri 54x9mm).
Papildus informācija: izgatavots paraugs ar izmēriem 20,3x24x3,7cm.
Testēšana veikta saskaņā ar GOST 7076-87 prasībām.
Testēšanas apstākļi: Gaisa temperatūra - +20 °C, relatīvais gaisa mitrums –65%.
Testēšanas izmantotā aparatūra: svari,kalibrēšanas sertifikāts Nr.M002K01,
termometrs,kalibrēšanas sertifikāts Nr.S0050K01, siltumvadāmības noteikšanas iekārta Nr.6
Testēšanas rezultāti:

Paraugu ident. Nr.	Parauga blīvums, sausā stāvoklī,kg/m³	Vidējā parauga temperatūra,°C	Temperat.krituma starp paraugu virsmām, °C	Siltumvadāmības koeficients, λ W/(m.K)
03/4790	70	25	9	0,037

Šai pārskatā ir iekļauti eksperimentālie rezultāti no VB BTL testēšanas protokola:Nr.463.
Testēšanas rezultāti attiecas uz produkciju, kas norādīta pārskatā.
Bez testēšanas institūcijas rakstiskās atļaujas nav pieļaujama testēšanas pārskata reproducēšana nepilnā apjomā.

Testēšanas lab. vad. S.Siļģina.

ROMÂNIA
Ministerul Transporturilor, Construcţiilor şi Turismului
Comisia Naţională de Agrement Tehnic în Construcţii

AVIZ TEHNIC

În baza procesului verbal nr. **2-25,** din data de **04.11.2003,** al Comisiei de avizare nr. **2** a agrementelor tehnice în construcţii:

COMISIA NAŢIONALĂ DE AGREMENT TEHNIC ÎN CONSTRUCŢII

AVIZEAZĂ FAVORABIL:

agrementul tehnic nr. **017-05/1048-2003**, elaborat de **IEST BUCURESTI,** pentru produsul **TUBURI IZOLANTE PENTRU CONDUCTE, TIP ISOPIPE**, al cărui producător este **3i INTERNATIONAL INOVATIVE INSULATION SA GRECIA.**

Prezentul **AVIZ TEHNIC** este valabil până la data de **04.11.2005** şi se poate prelungi în situaţia în care titularul face dovada menţinerii aptitudinii de utilizare a obiectului agrementului tehnic, conform prevederilor menţionate la cap. „condiţii" din agrementul tehnic.

Agrementul tehnic este valabil până la data de **15.10.2006**, pentru titular, producător şi distribuitorii din anexa la agrementul tehnic şi nu ţine loc de certificat de calitate.

PREŞEDINTE
Comisia Naţională de Agrement Tehnic în Construcţii
Ion Stănescu

SECRETAR
Comisia Naţională de Agrement Tehnic în Construcţii
Radu Andronescu

PRELUNGIT până la data de……..	**PREŞEDINTE** **Comisia Naţională de Agrement Tehnic în Construcţii**	
PRELUNGIT până la data de……..	**PREŞEDINTE** **Comisia Naţională de Agrement Tehnic în Construcţii**	

MINISTERUL TRANSPORTURILOR, CONSTRUCTIILOR ŞI TURISMULUI
COMISIA NAŢIONALĂ DE AGREMENT TEHNIC ÎN CONSTRUCŢII

Agrement Tehnic
017-05/1048-2003

MATERIAL IZOLANT TIP ISOPIPE

INSULATED MATERIAL TYP ISOPIPE

MATERIEL ISOLE TYPE ISOPIPE

ISOLIERMATERIAL TYPISOPIPE

PRODUCĂTOR:

3i International Inovative Insulation SA
26 Nafpliou st, 14452 Atena, Grecia
Tel: 0030.210.2844555, Fax: 0030.210.2819210

ELABORATOR AGREMENT TEHNIC:

INSTITUTUL EUROPEAN DE STIINTE TERMICE BUCURESTI
Bd. Pache Protopopescu nr.66, sect.2, Bucuresti
Tel. 252.11.57 ; tel/fax: 252.65.45.

GRUPA SPECIALIZATĂ NR. 05
PRODUSE, PROCEDEE SI ECHIPAMENTE PENTRU INSTALATII AFERENTE CONSTRUCTIILOR

TITULAR AGREMENT TEHNIC:

BLACK SEA SUPPLIERS SRL
Str.Interioara nr.2, Constanta
Tel/Fax: 0241/ 637.008, 515.856

Prezentul agrement tehnic este valabil până la data de 15 octombrie 2006 numai însoţit de AVIZUL TEHNIC al Comisiei Naţionale de Agrement Tehnic în Construcţii şi nu ţine loc de certificat de calitate.

COMISIA NAȚIONALĂ DE AGREMENT TEHNIC ÎN CONSTRUCȚII

Grupa specializată nr. 5 „Produse, procedee si echipamente pentru instalatii aferente constructiilor" din cadrul Institutului European de Stiinte Termice analizând documentația de solicitare de agrement tehnic, prezentată de firma BLACK SEA SUPPLIERS SRL și înregistrată cu nr. 317270 din data de 05.08.2003 referitoare la "Material izolant tip ISOPIPE" realizat de firma *3i International Inovative Insulation SA - Grecia*, eliberează prezentul Agrement Tehnic nr. 017-05/1048-2003, în conformitate cu documentele tehnice românești aferente domeniului de referință: I.9 – 1994 „Normativ pentru proiectarea si executarea instalatiilor sanitare", I.13 – 1994 „Normativ pentru proiectarea si executarea instalatiilor de incalzire centrala", C 142-85 „Instructiuni tehnice pentru executarea si receptionarea termoizolatiilor la elementele de instalatie", C 300/94 „Normativ de prevenire a incendiilor pe durata executarii lucrarilor de constructii si instalatii aferente acestora" si Normativ P118-1999 privind siguranta la foc a constructiilor, toate valabile la această dată.

1. Definirea succintă

1.1 Descrierea succinta

Materialul izolant tip ISOPIPE produs de firma *3i International Inovative Insulation SA - Grecia* este un produs ce se utilizeaza in constructii civile si industriale pentru izolarea conductelor si mentine conditiile de confort impuse, prin limitarea pierderilor de caldura ale conductelor (din instalatiile de incalzire, instalatiile sanitare, instalatiile de climatizare-ventilare, instalatiile frigotehnice)

Materialul izolant tip ISOPIPE se prezinta sub forma de tuburi cu grosimea de izolare de 6, 9, 13, 19, 25 si 32mm pentru tevi cu diametre de la 6 pana la 139mm si care lucreaza in domeniile de temperatura - 45°C ÷ +105°C .

Acest material este un material izolant cu structura celulara inchisa, de tip elastomeric, bazat pe cauciuc sintetic.Este un material flexibil, cu o bună rezistentă la microorganisme, cu rezistenta mare la difuzia vaporilor de apa comparativ cu a aerului ($\mu \geq 4000$) si are culoarea neagră.

1.2. Identificarea produselor

Materialul izolant tip ISOPIPE se identifica printr-un cod, in functie de dimensiuni si de caracteristicile tehnice.

Materialul este marcat longitudinal cu urmatoarele date : tipul materialului (ISOPIPE T.C.), sigla unitatii producatoare (3i), clasa de rezistenta la foc si standardul (CL1BS) si dimensiuni (grosime izolatie x diametrul conductei)

Ex.:
ISOPIPE^{R} T.C. by 3iCL 1BS 13x18

2.1.Domeniile de utilizare în constructii, acceptate.

Materialul izolant tip ISOPIPE este un produs ce se utilizeaza la izolarea termică a conductelor de instalatii din constructii civile si industriale.

2.2. Aprecieri asupra produsului.

2.2.1. Aptitudinea de exploatare.

Materialele izolante ISOPIPE au calitatea de a fi utilizate în constructii, deoarece indeplinesc cele sase cerinte esentiale ale Legii 10/1995 privind calitatea în constructii, art. 5:

- *Rezistenta si stabilitatea*

Produsul cât si utilizarea acestuia asigură o rezistentă si stabilitate corespunzătoare specificatiei tehnice.

Materialele izolante nu afecteaza structura de rezistenta a constructiei datorita greutatilor reduse si sunt corespunzatoare conditiilor de mediu acolo unde sunt montate.

Rezistenta si stabilitatea materialelor izolante sunt confirmate si de rezultatele incercarilor prezentate de producator în cartea tehnica care insoteste produsul.

- *Siguranta in exploatare*

Odata montate, materialele izolante nu necesita nici o interventie speciala in timpul exploatarii.

Coeficientii scazuti de conductivitate termica (λ = 0,04 W / m*K) asigura eliminarea aparitiei condensului pe peretii metalici ai conductelor in conditiile de temperatura descrise in documentatia tehnica si o izolare termica foarte buna.

Totusi producatorul recomanda ca la maxim 6 luni sa se efectueze o inspectie la aceste produse, care consta in curatirea sau inlocuirea lor, unde este cazul.

Pentru a se pastra siguranta in exploatare se interzic interventiile executate de către personal neautorizat si inlocuirea materialelor cu altele decat cele puse la dispozitie de producator.

- *Siguranta la foc*

Firma *3i International Inovative Insulation SA - Grecia* garanteaza incadrarea izolatiilor in clasa de siguranta si protectie la foc astfel:

- clasa 1 - buletinul de testare nr.126754, conform normei BS 476, emis de Warrington Fire Research;
- clasa B2 - buletinul de testare nr.H-320/97, conform normei DIN 4102, emis de Forschunginstitut für Wärmeschutz E.V.München Germania;
- clasa M1 - buletinul de testare nr.2001-1789, conform normei NF P 92-507, emis de Siemens-Frankfurt Germania;
- clasa M1 - buletinul de testare nr.C060856 – CEMAT/1, conform normei NF, emis de Laboratoire National D'Essais (LNE) Franta;
- clasa M1 - buletinul de testare nr.115216, 115217 , conform standardului UNI 9177/UNI 8457/UNI 9174, emis de Instituto Giordano s.p.a. Cento Politecnico di Ricerche Italia

Ca urmare produsul prezintă rezistenta la foc si siguranta la incendiu.

- *Igiena, sănătatea oamenilor, refacerea şi protecţia mediului*

Materialul izolant tip ISOPIPE prezinta siguranta in ceea ce priveste igiena si puritatea aerului. Materialele folosite nu emana substante toxice si sunt inofensive fata de organismul omenesc.

Izolaţie termică, hidrofugă şi economia de energie;

Coeficientul scazut de conductivitate termica a izolantului (λ) asigura:

– pierderi termice neinsemnate pentru sistemele izolate cu acest tip de izolant

– eliminarea aparitiei condensului pe peretii conductelor si aparatelor.

Compozitia chimica speciala a materialului asigura timp indelungat o valoare constant ridicata pentru coeficientul de permeabilitate la vapori ($\mu \geq 4000$).

- *Protecţia împotriva zgomotului.*

Materialul izolant tip ISOPIPE nu este generator de zgomot si totodata datorita compozitiei de spuma (inglobeaza mult aer) are importante calitati de izolant fonic reducand sensibil zgomotul instalatiei.

2.2.2.Durabilitatea (fiabilitatea) şi întreţinerea produsului

Ca urmare a calitatii superioare a materialelor, izolantul tip ISOPIPE are o durabilitate estimata de producator de 15 ani in conditii de exploatare normala

Garantia de exploatare acordata de catre distribuitorul pentru România, de un an este o confirmare a durabilitatii materialelor.

Intretinerea lor nu presupune operatiuni dificile, acestea fiind fiabile, rezistente si stabile.

2.2.3. Fabricaţia şi controlul

Materialul izolant tip ISOPIPE este fabricat de firma *3i International Inovative Insulation SA-Grecia* intr-o gama variata de tipodimensiuni.

Fluxul tehnologic este automatizat si controlul calitatii se face dupa fiecare faza respectand cerintele normativelor si standardelor europene: DIN 53479, DIN 52612/52613, DIN 52615, DIN 4102, BS 476, NFP 92501.

Realizarea productiei se face în conformitate cu prevederile planului calitatii ce face parte din sistemul de asigurare a calitatii conform cu exigentele standardului ISO 9002:1994, certificat de BVQI cu certificat nr.81993, valabil la data elaborarii prezentului agrement.

2.2.4. Punerea în operă.

Punerea in opera este simpla, se imbraca teava ce urmeaza a fi montata in instalatie, nu sunt necesare scule sau dispozitive speciale.

Montajul trebuie facut de catre persoane calificate, cu experienta, conform cu instructiunile de instalare elaborate de producator si respectand normativele romanesti in vigoare (I.9 , I.13, C 142 si C 300) si normele generale de protectia muncii.

2.3. Caietul de prescripţii tehnice

2.3.1. Condiţii de concepţie

In elaborarea tehnologiei de fabricatie s-a avut in vedere obtinerea si pastrarea constanta a proprietatilor si caracteristicilor materialului izolant tip ISOPIPE fapt relevat si de obtinerea certificarii conform ISO 9002:1994, care prevede obligativitatea respectarii celor mai de sus.

In plus se respecta regulile de verificare a calitatii declarate in manualul de asigurare a calitatii propriu producatorului.

2.3.2. Condiţii de fabricare

Materialul izolant tip ISOPIPE corespunde prescriptiilor tehnice ale producătorului si normelor specifice de proiectare, fiind in conformitate cu urmatoarele norme si standarde: DIN 53479, DIN 52612/52613, DIN 52615, DIN 4102, BS 476, NFP 92501

Verificarea fabricatiei si controlul calitatii se face conform cu exigentele standardului ISO 9002:1994.

2.3.3. Conditii de livrare

La livrare, materialul izolant tip ISOPIPE trebuie să fie însoţit de certificate de calitate, instrucţiuni de utilizare si exploatare în limba română, declaratia de conformitate, care să ateste conformitatea cu prezentul Agrement Tehnic, potrivit legislaţiei româneşti în vigoare.

Materialul izolant este livrat sub forma de tuburi flexibile de diferite diametre si grosimi si cu lungimea de 2 m. Produsul se livreaza in cutii de carton, iar depozitarea lor se va face intr-un loc ventilat, ferit de inghet.

2.3.4. Conditiile de punere în operă

Punerea in opera se face conform instructiunilor fabricantului si respecta cerintele de siguranta si stabilitate cerute de Legea 10/1995 si normativele romanesti in vigoare (I.9, I.13, C142 si C300).

La punerea in opera se vor respecta cu strictete normele republicane de protectia muncii si normele PSI specifice domeniului.

Concluzii

Aprecierea globală

Utilizarea „Materialului izolant tip ISOPIPE " realizat de firma 3i International Inovative Insulation SA-Grecia, în domeniile de utilizare acceptate este ***apreciată favorabil,*** în condiţiile specifice din România, dacă se respectă prevederile prezentului agrement.

Condiţii

- Calitatea produsului şi metoda de fabricare, au fost examinate de IEST (Romania) şi au fost găsite corespunzatoare şi trebuie menţinute la acest nivel pe toată durata de valabilitate a acestui agrement.
- Acordând acest agrement, Comisia Naţională de Agrement Tehnic în Construcţii, nu se implică în prezenţa şi/sau absenţa drepturilor legale ale firmei de a comercializa, monta sau întreţine materialul izolant tip ISOPIPE .
- Orice recomandare relativ la folosirea în condiţii de siguranţă a materialului izolant tip ISOPIPE, care este conţinută sau se referă la acest agrement tehnic, reprezintă cerinţe minime necesare la punerea sa în operă.

- IEST BUCURESTI răspunde de exactitatea datelor înscrise în Agrementul Tehnic şi de testele care au stat la baza acestor date. Agrementele tehnice nu îi absolva pe furnizori si/sau pe utilizatori de responsabilitatile ce le revin conform reglementarilor in vigoare.
- Verificarea mentinerii aptitudinii de utilizare a materialului izolant va fi realizata conform programului stabilit de catre IEST BUCURESTI – verificari la 12 luni in SITU (verificarea integritatii materialului si a conductivitatii termice), verificarea valabilitatii certificatului pentru sistemul calitatii al unitatii producatoare si certificatele de calitate ale produsului;
- Actiunile cuprinse in program si modul de realizare vor respecta actele normative si reglemantarile tehnice in vigoare.
- IEST BUCURESTI, va informa Comisia Nationala de Agrement Tehnic in Constructii despre rezultatul verificarilor, iar daca acesta nu dovedesc mentinerea aptitudinii de utilizare, va solicita CNATC declansarea actiunii de suspendare a agrementului tehnic.
- Suspendarea se declanseaza si in cazul constatarii prin controale, de catre organisme abilitate, a nerespectarii mentinerii constante a conditiilor de fabricatie si utlizare ale produsului.
- In cazul in care titularul de agrement nu se conformeaza acestor prevederi , se va declansa procedura de retragere a agrementului tehnic.

Valabilitate:
15 octombrie 2006
Prelungirea valabilităţii sau revizuirea prezentului agrement tehnic trebuie solicitată cu cel puţin trei luni înainte de data expirării. În cazul neprelungirii valabilităţii, agrementul tehnic se anulează de la sine.

Preşedinte grupă specializată nr. 05
Prof. dr. ing. Florea CHIRIAC

PREŞEDINTE IEST
Prof. dr. ing. Florea CHIRIAC

3. Remarci complementare ale grupei specializate

La baza intocmirii prezentului agrement tehnic a stat documentatia pusa la dispozitie de catre solicitant.

S-a constatat ca firma producatoare are certificate pentru sistemul calitatii conform cu standardul ISO 9002 cu nr. 81993/24.04.2001 emis de BVQI si buletine de incercari efectuate de Warrington Fire Research , Forschunginstitut für Wärmeschutz E.V.München Germania, Siemens-Frankfurt Germania, Laboratoire National D'Essais (LNE) Franta si Instituto Giordano s.p.a. Cento Politecnico di Ricerche Italia, toate valabile la data elaborarii acestui agrement.

Solicitantul agrementului tehnic se va îngriji ca la punerea în funcţiune şi recepţia la beneficiar a „Materialului izolant tip ISOPIPE", acesta sa aiba elaborate instrucţiuni de exploare şi întreţinere concrete care sa cuprinda şi norme de tehnica securităţii muncii specifice. Solicitantul se va îngriji de urmarirea în exploatarea a functionarii la parametri a acestor materiale izolante.

Materialul izolant tip ISOPIPE este realizat pe baza standardelor aferente fiecarui element. Conformitatea cu aceste standarde garanteaza faptul ca materialul izolant tip ISOPIPE este conceput astfel incat el sa fie utilizat ca parte componenta a instalatiilor din cladiri de locuit, social culturale si administrative si obiective industriale, sub rezerva ca asamblarea sa se faca dupa instructiunile fabricantului si respectand normativele romanesti in vigoare

SINTEZA RAPOARTELOR DE INCERCARE

Caracteristicile tehnice determinate de IEST in laborator pentru materialul izolant sunt prezentate în tabelul de mai jos:

Testul de Laborator	Standard	Valoare Nomin. / Toleranta	U/M	Valoare Reala	Raport de incercare efectuat de
Caracteristici : - flexibilitate - rezistenta la razele UV	-	-	-	buna buna	Forschungsinstitut für Wärmeschutz E.V.München Germania
Conductivitatea termica	Procedura IN8IST	0.04	W/mk	0.039	IEST

Grupa de specialitate nr.5 din cadru IEST isi insuseste rezultatele rapoartelor de incercare efectuate de Warrington Fire Research , Forschunginstitut für Wärmeschutz E.V.München Germania, Siemens-Frankfurt Germania, Laboratoire National D'Essais (LNE) Franta si Instituto Giordano s.p.a. Cento Politecnico di Ricerche Italia

4. Anexe

EXTRASE SEMNIFICATIVE DIN PROCESUL VERBAL nr. 1048 din 01 octombrie 2003 AL SEDINTEI DE DELIBERARE AL GRUPEI SPECIALIZATE

In sedinta grupei specializate nr.5 la care au participat : Prof. dr. ing. Florea Chiriac, Dr. ing.Anica Ilie, Dr. ing. Rodica Dumitrescu, Ing. Madalina Teodora Nichita, reprezentant firma

s-au evidentiat urmatoarele aspecte:

- dosarul este complet si in elaborarea lui au fost respectate instructiunile IAT 1,2-2002, elaborate de MTCT;
- "Materialul izolant tip ISOPIPE", fabricate de 3i International Inovative Insulation SA-Grecia, corespunde celor sase cerinte esentiale cuprinse in Legea 10/1995, privind calitatea in constructii.

Constatând acestea, comisia internă de avizare a **APROBAT** prezentul dosar de agrement tehnic, cu o valabilitate de 3 ani.

Dosarul tehnic al agrementul tehnic nr. 017-05/1048-2003 conținând 45 pagini face parte integrantă din prezentul agrement tehnic.

Raportorul grupei specializate nr. 05

Ing. Cristina Georgescu

Colectiv de elaborare:

Prof. dr. ing. Florea CHIRIAC

Dr. ing. Anica ILIE

Dr. ing. Rodica DUMITRESCU

Ing. Cristina GEORGESCU

Ing.Gianny FLAMAROPOL

Ing. Madalina Teodora NICHITA

Fraunhofer
IBP

Fraunhofer-Institut für Bauphysik IBP

Bauaufsichtlich anerkannte Stelle für
Prüfung, Überwachung und Zertifizierung

Institutsleitung
Prof. Dr. Philip Leistner
Prof. Dr. Klaus Peter Sedlbauer

Test Report P2-112e/2018

Determination of the Thermal Conductivity of Concentric Pipe Insulation "ISOPIPE HT" (35-25) According to EN ISO 8497

Client:
3i International Innovative Industries SA
68 km Nat. Road Athens Lamia
34100 Ritsona, Halkida
GREECE

Stuttgart, April 17, 2018

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-11140-11-04

Prüflabor Wärme-Kennwerte
durch DAkkS GmbH akkreditiert nach
DIN EN ISO/IEC 17025:2005

Prüflabor Wärme-Kennwerte
Nobelstraße 12 | 70569 Stuttgart
Telefon +49 711 970-3333
Telefax +49 711 970-3340
www.ibp.fraunhofer.de/pruefstellen

1 Introduction

The Fraunhofer Institute for Building Physics IBP, Stuttgart, was ordered by the client to determine the thermal conductivity of samples of concentric pipe insulation at three different temperature levels according to EN ISO 8497.

2 Tested Material

Tubular concentric pipe insulation of flexible elastomeric foam made of synthetic rubber and of 2 m length each, uncoated and unlaminated, without imprint or labeling.

Product name: ISOPIPE HT
Product colour: black

3 Sampling, Additional Data

On March 19, 2018, material samples of the following dimension were delivered to the Fraunhofer Institute for Building Physics IBP, Stuttgart, by the client:

sample no.	dimension [mm]	Fraunhofer sample no.
1	35-25	18/064

4 Pre-treatment

The samples were stored at indoor temperature and 50 % RH until mass constancy before testing. No further pre-treatment was conducted.

5 Testing

The thermal conductivity of concentric pipe insulation as a thermal transmission property was to be determined at three different temperature levels according to EN ISO 8497. The measurements were performed in a climate chamber with air as ambient gas by means of heating pipes with protective heating (3 m total length, 1.5 m measuring length). The installation of the test specimen was horizontal and supported by two bearings outside the measuring zone, whereby, due to the dimensions of the test specimen, there was an air layer between test specimen and heating pipe. It was crescent-shaped.

The different temperature levels were regulated by a cryostat and thermostat.

Sample no. 1 was measured in heating pipe position 1.

Period of testing: calendar week 15 in 2018.

6 Test Results

6.1 Thickness of Insulation Layer and Bulk Density

Table 1 lists the measured thickness of the thermal insulation layer and the internal and external diameters according to DIN EN 13467, and the bulk density of the tested pipe insulating material at (23 ± 5) °C as well as the external diameter of the copper heating pipe used.

6.2 Thermal Conductivity

Table 2 lists the measurement results of the thermal conductivity of the test specimen with the dimensions of 35-25 mm at three different temperature levels, the mean temperatures and mean temperature differences as well as the respective input wattage.

Table 3 summarizes the measured values of the thermal conductivity at the three selected temperature levels.

The concentric pipe insulation sample material "ISOPIPE HT" (35-25) shows a measured value of the thermal conductivity of 0.045 W/(m·K) at a mean temperature of 40 °C.

The test results exclusively refer to the test specimens.

The test laboratory is recognized by the Deutsches Institut für Bautechnik (DIBt) as a testing facility under applicable building regulations LBO/BRL No. BWU-10 and as a Notified Body No. 1004 to the terms of the Regulation of Construction Products (EU-BauPVO). It has been granted flexible accreditation under DIN EN ISO/IEC 17025 by the Deutsche Akkreditierungsstelle GmbH (DAkkS) under accreditation No. D-PL-11140-11-04.

This test report comprises 3 pages of text and 3 tables.

Stuttgart, April 17, 2018/MiR

Head of the Test Laboratory	Responsible Engineer
Dipl.-Ing. (FH) Andreas Zeppenfeld	Jan Sigmund

Table 1: Reference and actual values of dimensions according to DIN EN 13467 and bulk density of the tested pipe insulation "ISOPIPE HT" of one dimension at (23 ± 5) °C.

Tested material		Test pipe	Mean internal diameter (measured value)	Mean external diameter (measured value)	Mean thickness of insulation (measured value)	Bulk density (dry)
Sample no.	Reference value	External diameter				
	mm-mm	mm	mm	mm	mm	kg/m³
1	35-25	32.2	32.7	87.0	27.1	72.0

Table 2: Measurement results of the thermal conductivity for the pipe insulation "ISOPIPE HT" of one dimension at three different temperature levels.

Dimension	Mean temperature of sample surface		Ambient temperature	Mean temperature difference	Mean temperature of samples	Mean input wattage of measuring length	Thermal conductivity
	inside	outside					
mm-mm	°C	°C	°C	K	°C	W	W/(m·K)
35-25	5.9	-5.8	-8.9	11.7	0.0	4.453	0.0396
	16.5	4.3	2.2	12.2	10.4	4.819	0.0412
	46.1	34.0	32.7	12.1	40.0	5.172	0.0448

Table 3: Summary of measurement results of the thermal conductivity for the tested pipe insulation "ISOPIPE HT" of one dimension at mean temperatures of 0 °C, 10 °C and 40 °C.

Dimension	Thermal conductivity in dry state at mean temperatures of		
	0 °C	40 °C	65 °C
mm-mm	W/(m·K)	W/(m·K)	W/(m·K)
35-25	0.040	0.041	0.045

Polimēru materiālu pārbaužu laboratorija

Rīgas Tehniskā universitāte

Āzenes ielā 14, Rīgā LV 1048, Tel. 371-7089252, Fax 371-761-5765

TESTĒŠANAS PĀRSKATS *Nr. 480*

1. Parauga nosaukums: ***Sintētisks izolācijas materiāls***
2. Pasūtītājs: ***Būvmateriālu un būvizstrādājumu atbilstības novērtēšanas centrs***
3. Pasūtītāja adrese: ***Rīga, LV-1012, K.Barona 99/1A***
4. Ziņas par paraugiem:
   - piegādāts 1 veida sintētisks izolācijas materiāls
   - piegādāts laboratorijā: ***13.08.03***
5. Darba uzdevums: ***Noteikt ūdens tvaiku difūzijas pretestības faktoru saskaņā ar EN 12086***
6. Testēšana veikta: ***no 14.08.03 līdz 29.08.03***
7. Testēšanas pārskats uz *2 lpp.*
8. Testēšanas pārskats sastādīts 3 eksemplāros

TESTĒŠANAS REZULTĀTI

Ūdens tvaika difūzijas pretestības faktors noteikts saskaņā ar EN 12086 prasībām.

Ūdens tvaiku difūzijas pretestības faktors

Šifrs	Masas izmaiņas, mg/24h	Masas izmaiņa G, mg/h	Parauga laukums S, m²	Ūdens tvaika plūsmas blīvums g, mg/(m²·h)	Ūdens tvaika caurlaidība W, mg/(m²·h·Pa)	Parauga biezums d, m	Ūdens tvaika caurlaidība δ, mg/(m·h·Pa)	Spiediens, mm Hg stabs	δa, mg/(m·h·Pa)	Ūdens tvaika difūzijas pretestības faktors μ	Vidējais ūdens tvaika difūzijas pretestības faktors μ
990-04-43/0803	1,12 1,12 1,11	0,04663 0,04663 0,04625	$38,74\cdot10^{-4}$ $38,74\cdot10^{-4}$ $38,74\cdot10^{-4}$	12,0470 12,0470 11,9386	$5,0466\cdot10^{-3}$ $5,0466\cdot10^{-3}$ $4,9952\cdot10^{-3}$	0,0095 0,0095 0,0095	$4,7886\cdot10^{-5}$ $4,7886\cdot10^{-5}$ $4,7454\cdot10^{-5}$	757 757 757	0,7 0,7 0,7	14618,0512 14618,0512 14751,1274	14662,4999 ± 25

Pārskatā uzrādīta paplašinātā nenoteiktība, kura noteikta kā vidējā kvadrātiskā novirze, kas pareizināta ar pārklāšanās koeficientu k=2, nodrošinot apmēram 95% ticamības līmeni. Vidējā kvadrātiskā novirze izskaitļota saskaņā ar LATAK Dok. Nr.2 "Pagaidu norādījumi testēšanas un kalibrēšanas mērījumu nenoteiktības novērtēšanai". Paplašinātā nenoteiktība ietver sevī nenoteiktības, kuru avoti ir mērinstruments, mērīšanas metodes un apkārtējās vides apstākļi, kā arī testējamā objekta izsauktās īslaicīgās nenoteiktības.

TP-480. Lapa 1 no 2

ZIŅOJUMI:

Testēšanas rezultāti attiecas uz produkciju, kas norādīta pārskatā.
Bez testēšanas institūcijas rakstiskas atļaujas nav pieļaujama testēšanas pārskata reproducēšana nepilnā apjomā.

Testēšanu veica PMPL inženieris **V. Rukšāns**

Testēšanas lab. vad. **J. Zīvāns**

POLIMĒRU MATERIĀLU PĀRBAUŽU LABORATORIJA
RTU

01.09.03

ΠΟΛΥΤΕΧΝΕΙΟ ΚΡΗΤΗΣ
ΣΧΟΛΗ ΜΗΧΑΝΙΚΩΝ ΟΡΥΚΤΩΝ ΠΟΡΩΝ
ΕΡΓΑΣΤΗΡΙΟ ΥΛΙΚΩΝ, Πολυτεχνειούπολη, 73100 ΧΑΝΙΑ

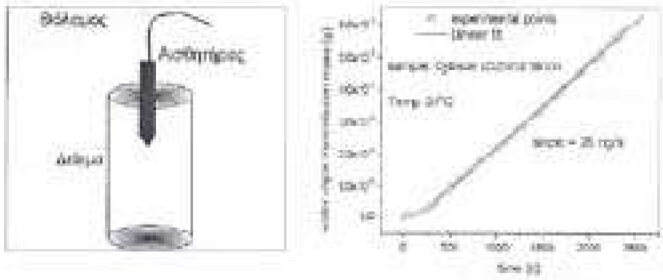
Αναφορά μέτρησης διαπερατότητας υδρατμών σε αφρώδη μονωτικά υλικά Isopipe TC που παρασκευάζει η 3i-Isopipe S.A.

Εισαγωγή

Διαδικασία μέτρησης:
Απ' ευθείας μέτρηση διαπερατότητας με χρήση αισθητήρα σχετικής υγρασίας VK 2005RH, βαθμωμένης ακρίβειας 0.01% και περιοχής μέτρησης 0-95% r.h.[1]
Ο ρυθμός διέλευσης των υδρατμών (g/s) προσδιορίστηκε από την κλίση της ευθείας, $\dot{m}$, στη στάσιμη κατάσταση.
Η διαπερατότητα, P, και ο δείκτης αντίστασης του υλικού στην διαπερατότητα, μ, των υδρατμών υπολογίζονται από τις σχέσεις

$$P = \frac{\dot{m}}{2\pi h\, p_{sat} \Delta RH} \ln\frac{r_2}{r_1} \qquad \mu = \frac{2\pi h\, \delta_a\, p_{sat}\, \Delta RH}{\dot{m}\, \ln(r_2/r_1)},$$

όπου p_{sat} η πίεση των κορεσμένων υδρατμών και δ_a ο συντελεστής διαπερατότητας των υδρατμών στον αέρα στη θερμοκρασία της μέτρησης, ΔRH η διαφορά σχετικής υγρασίας και h, r_1, r_2 το μήκος, η εσωτερική και εξωτερική ακτίνα του κυλίνδρου.



Σχήμα 1.

Θερμοκρασία και σχετική υγρασία: 24°C, 20-70%

Αριθμός και γεωμετρικά χαρακτηριστικά δειγμάτων:
7 δείγματα κυλινδρικής γεωμετρίας μήκους 15 cm εσωτερικής διαμέτρου, Φ, 32 mm και πάχους τοιχώματος, d, 10 mm.

Μέση πυκνότητα δειγμάτων: 53 kg/m^3

Περίοδος μετρήσεων: 01/06/2014 - 30/06/2014

[1] μετά από βαθμονόμηση του οργάνου [illegible]. Έτσι μόνο οι σχετικές μετρήσεις πρέπει να θεωρούνται ακριβείς.

2

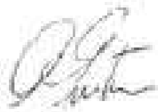
Αποτελέσματα:

Πίνακας 1: Δείγματα: *Isopipe TC 32/19*

α/α	ΔRH	ροή (ng/s)	P ($\times 10^{-11}$ g/(Pa m s))	μ value
1	0.3	16	1.97 ± 0.33	10530 ± 1735
2	0.39	26	2.24 ± 0.29	9237 ± 1184
3	0.42	43.7	2.12 ± 0.37	6610 ± 790
4	0.57	42	2.14 ± 0.13	9694 ± 850
5	0.50	35	2.05 ± 0.20	10204 ± 1023
6	0.52	47	2.53 ± 0.24	8175 ± 786
7	0.5	34	1.90 ± 0.19	10895 ± 1099
Average	-	-	**2.28 ± 0.26**	**9338 ± 1068**

Γιώργος Χουδαλάκης
Ερευνητής

Αλέξανδρος Δ. Γκότσης
Καθηγητής
τηλ. 2821037259
gotsis@science.tuc.gr



3

3i International Innovative Industries S.A.

ISOPIPE

Declaration of Conformity

As a manufacturer, we hereby declare that since March 2015 the manufactured **ISOPIPE** flexible elastomeric foam (FEF) insulation products are certified for their built in resistance to fungi and bacteria and require no further additives.

ISOPIPE products were tested according to:

ASTM G21-09 and showed no visible signs of fungal growth
ASTM E-2180-07 and showed no bacterial growth

Place and Date of Issue: Athens, 20/03/2015

3i INTERNATIONAL INNOVATIVE INDUSTRIES S.A.
Head Office: 26 Nafpliou Str., - 144 52
ATHENS-GREECE TEL: +30
FACTORY: 68TH NAT. RD
TEL: 4630 -
GREECE -

Plant: 68th km Nat. Rd Athens-Lamia
34100 Ritsona Halkida – GREECE

Head office: 26 Nafpliou str 144Athens – Greece
Tel: +302102844555 Fax: +302102819210

Annex 1 of Declaration of Conformity

Tests performed
ASTM E-2180
Standard Method for Determining the Activity of Incorporated Antimicrobial Agent(s) in Polymeric or Hydrophobic Material

Test Germ: *Staphylococcus aureus* DSM 799/ATCC 6538
Date of receipt of sample: Oct-17-2014
Test laboratory: QualityLabs BT GmbH
Setup-Code: 141024-10183-2180-01

No	Sample name	Sample code	t_0(cell count/inoculum)			CV [%]	T_{24}(cell count/inoculum)			CV [%]	Reduction [%]
1	Reference Sample	101832210140001	$2.6x10^6$	$2.9x10^6$	$2.4x10^6$	8.5	$<1 \times 10^1$	$<1 \times 10^1$	$<1 \times 10^1$	0	-
2	Antimicrobial Sample	101832210140003									

Initial cell count / inoculum 2.5 x 10^5 / 200 µl
Initials of the editor TN
Measurement ended on Oct-28-2014
Interpretation of the results based on the measurements
The t_0-Value of the reference sample showed no bacterial growth. Therefore all belonging samples could not be evaluated.

Test Germ: *Escherichia coli* DSM 1576/ATCC 8739
Date of receipt of sample: Oct-17-2014
Test laboratory: QualityLabs BT GmbH
Setup-Code: 141027-10183-2180-01

No	Sample name	Sample code	t_0(cell count/inoculum)			CV [%]	T_{24}(cell count/inoculum)			CV [%]	Reduction [%]
1	Reference Sample	101832210140001	$1.9x10^6$	$2.3x10^6$	$1.9x10^6$	11.1	$2.8x10^1$	$2.5x10^1$	$1.1x10^1$	66.4	-
2	Antimicrobial Sample	101832210140003					$<1 \times 10^1$	$<1 \times 10^1$	$<1 \times 10^1$	0.0	>99.99

Initial cell count / inoculum 2.5 x 10^5 / 200 µl
Initials of the editor TN
Measurement ended on Oct-29-2014
Interpretation of the results based on the measurements
NONE

References
ASTM E-2180-07: Standard Test Method for Determining the Activity of Incorporated Antimicrobial Agent(s) in Polymeric or Hydrophobic Materials
ASTM E-1054-08: Standard Test Methods for Evaluation of Inactivators of Antimicrobial Agents

Plant: 68th km Nat. Rd Athens-Lamia
34100 Ritsona Halkida – GREECE

Head office: 26 Nafpliou str 144Athens – Greece
Tel: +302102844555 Fax: +302102819210

Annex 2 of Declaration of Conformity

Tests performed

ASTM G21 - 09
Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

Test Germ: Fungus-Spore Suspension
Date of receipt of sample: Oct-17-2014
Test laboratory: QualityLabs BT GmbH
Setup-Code: 141113-10183-B21-01

Level	Fungal Growth
0	None
1	Traces of growth (less than 10%)
2	Light growth (10 - 30%)
3	Medium growth (30 - 60%)
4	Heavy growth (60% to complete coverage)

Fungus spore suspension consistnig of following strains:
Aspergillus niger ATCC 9642, *Aureobasidium pullulans* ATCC 15233, *Penicillium pinophilum* ATCC 11797, Chaetomium globosum ATCC 6205, Gliocladium virens ATCC 9645

Testing period 4 weeks

Sample		Rating score after 4 weeks (0-4)			Comment
1	Reference Sample	0	0	0	None
2	Antimicrobial Sample	0	0	0	None

Interpretation of the results based on the measurements
All samples, including the reference showed no visible signs of fungal growth.
Under microscopic evaluation fungal spores from the inoculum were detectable, but showed no signs of growth.

Plant: 68th km Nat. Rd Athens-Lamia
34100 Ritsona Halkida – GREECE

Head office: 26 Nafpliou str 144Athens – Greece
Tel: +302102844555 Fax: +302102819210

Estimation of porosity in flexible elastomeric foam insulation Isopipe - TC produced by 3i-International Innovative Industries S.A.

5/4/2017

Sample identification: Foam insulation material described as, "Flexible elastomeric Foam Insulation", identified as: "Isopipe TC"

Test Procedure: Direct measurement of open porosity by liquid absorption.

Embedding samples of foam insulation in water or hexane, and determination of the absorbed liquid volume, by the increase of the sample mass.

Test Results: When hexane was used, the result of the measurement was that 92% of the porosity corresponds to closed pores, while when water was used, the percentage was increased to 98.5%.
In the first case, the result is possibly affected by the probable swelling of the elastomer by the hexane (organic solvent). In the second case, the measurement is affected by the fact that in open pores of relative small dimensions, increase pressure is required to overcome the capillary pressure. This phenomenon has not been taken into account, but in our opinion, the result of the second measurement is closer to the actual value.

Georgios Houdalakis

Researcher

Materials Laboratory
School of Mineral Resourses Engineering
Technical University of Crete
73100, Chania

Alexandros D. Gotsis

Professor of Technical University of Crete

Εκτίμηση πορώδους στο αφρώδες μονωτικό υλικό Isopipe - TC που παρασκευάζει η 3i-Isopipe S.A.

5/4/2017

Διαδικασία μέτρησης: Απ' ευθείας μέτρηση ανοιχτού πορώδους με απορρόφηση υγρών:

Εμβάπτιση δειγμάτων του αφρώδους μονωτικού σε νερό ή εξάνιο και προσδιορισμός του όγκου του προσροφημένου υγρού από την αύξηση της μάζας του δείγματος .

Αποτελέσματα: Όταν χρησιμοποιήθηκε εξάνιο, το αποτέλεσμα της μέτρησης ήταν ότι το **92%** του πορώδους αντιστοιχεί σε κλειστούς πόρους, ενώ όταν χρησιμοποιήθηκε νερό το ποσοστό αυτό ήταν **98.5%**. Στην πρώτη περίπτωση, το αποτέλεσμα πιθανώς επηρεάζεται από την πιθανή διόγκωση του ελαστομερούς από το εξάνιο (οργανικός διαλύτης). Στην δεύτερη περίπτωση οι μετρήσεις επηρεάζονται από το ότι στους ανοικτούς πόρους σχετικά μικρών διαστάσεων απαιτείται πρόσθετη πίεση για να υπερνικηθούν οι τριχοειδείς πιέσεις. Τα φαινόμενα αυτά δεν έχουν ληφθεί υπ' όψιν, αλλά κατά τη γνώμη μας το αποτέλεσμα της δεύτερης μέτρησης είναι πιο κοντά στην πραγματική τιμή.

Γιώργος Χουδαλάκης

Ερευνητής

Εργαστήριο Υλικών
Σχολή Μηχανικών Ορυκτών Πόρων
Πολυτεχνείο Κρήτης
73100, Χανιά

Αλέξανδρος Δ. Γκότσης

Καθηγητής Πολυτεχνείου Κρήτης

Quality Labs

Test Report ASTM E-2180

Work Order	1856
Setup-Code	141113-10183-821-01

Quality Labs
BIOMATERIAL TESTING

Test Report

ASTM G21 - 09

Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

Test Object:

Isopipe – Foam Samples

Work Order	1958
Setup-Code	141113-10183-B21-01

Report on Findings

Client: **Address:**	Isopipe 68 km Nat. Road Athens-Lamia 341 00 Ritsona, Halkida Greece
Work order no.:	1957.1
Test object:	Isopipe – Foam Samples
Sample description:	Foam
Date of receipt of sample:	Oct-17-2014
Type of test:	ASTM G21 - 09: Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
Test Germ:	Fungus-Spore Suspension
Test laboratory:	QualityLabs BT GmbH
Address:	Neumeyerstrasse 48a 90411 Nuremberg, Germany
Setup-Code:	141113-10183-B21-01
Sample material:	n.b.
No. of pages in report:	6

Report on findings to the client: **Place and date of preparation:** Nuremberg, Dec-18-2014
Recipient: Isopipe

Approved:

Harald Gresser, Laboratory Director
QualityLabs BT GmbH

Released:

Dr. Jörg Brünke, Managing Director
QualityLabs BT GmbH

Work Order	1956
Setup-Code	141113-10183-B21-01

Test description

Anti-bacterial activity is determined in accordance with ASTM G21 - 9

Test samples are placed in a humidified chamber. The sample are then inoculated with a fungus pore suspension' (1x10' spores/ml) and subsequently incubated at 28 to 30°C with a relative humidity > 85%. After 2 and 4 weeks the samples examined for visible fungal growth. For this purpose following rating chart:

Stufe	Pilzwachstum
0	None
1	Traces of growth (less than 10%)
2	Light growth (10 - 30%)
3	Medium growth (30 - 60%)
4	Heavy growth (60% to complete coverage)

Fungus spore suspension consistig of following strains:

Aspergillus niger ATCC 9642, *Aureobasidium pullulans* ATCC 15233, *Penicillium pinophilum* ATCC 11797, Chaetomium globosum ATCC 6205, Gliocladium virens ATCC 9645

Work Order	1956
Setup-Code	141113-10183-B21-01

References to deviations, preincubations, special test conditions

Testing period 4 weeks

Test Report ASTM E-2180

Work Order	1908
Setup Code	[illegible]

Test Results

	Sample	Rating Score after 4 Weeks (0 – 4)			Comment
1	Reference Sample	0	0	0	None
2	Antimicrobial Sample A	0	0	0	None
3	Antimicrobial Sample B	0	0	0	None

*See "Interpretation of Results", page 5

Work Order	1858
Setup-Code	141113-10183-821-01

Comments on test objects

NONE

Interpretation of the results based on the measurements

All samples, including the reference showed no visible signs of fungal growth.
Under microscopic evaluation fungal spores from the inoculum were detectable, but showed no signs of growth.

Editor: Mr. Brünke ____ **Crosschecked:** Mrs. Leisgang ____

References

ASTM G21 - 9: ASTM G21 - 09: Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

Quality Labs

Test Report ASTM E-2180

Work Order	1957.1
Setup-Code	141024-10183-2180-01

Quality Labs
BIOMATERIAL TESTING

Test Report

ASTM E-2180

Standard Method for Determining the Activity of Incorporated Antimicrobial Agent(s) in Polymeric or Hydrophobic Material

Test Object:

Isopipe - Staphylococcus aureus

Quality Labs

Test Report ASTM E-2180

Work Order	1957.1
Setup-Code	141024-10183-2180-01

Report on Findings

Client: **Address:**	Isopipe 68 km Nat. Road Athens-Lamia 341 00 Ritsona, Halkida Greece
Work order no.:	1957.1
Test object:	Isopipe - Staphylococcus aureus
Sample description:	Foam
Date of receipt of sample:	Oct-17-2014
Type of test:	ASTM E-2180-07: Standard Method for Determining the Activity of Incorporated Antimicrobial Agent(s) in Polymeric or Hydrophobic Material
Test Germ:	*Staphylococcus aureus* DSM 799/ATCC 6538
Test laboratory:	QualityLabs BT GmbH
Address:	Neumeyerstrasse 46a 90411 Nuremberg, Germany
Setup-Code:	141024-10183-2180-01
Sample material:	n.b.
No. of pages in report:	6

Report on findings to the client:	**Place and date of preparation:**	Nuremberg, Oct-31-2014
	Recipient:	Isopipe

Approved:

Harald Gerauer, Laboratory Director
QualityLabs BT GmbH

Released:

Dr. Jörg Brönlé, Managing Director
QualityLabs BT GmbH

Work Order	1957.1
Setup-Code	141024-10183-2180-01

Declaration on Quality Assurance

This investigation was performed and supervised according to the standard operating procedure "SOP for ASTM E-2180-07" by QualityLabs BT GmbH. The laboratory and process are continually monitored by independent, external authorities, as well as by internal audits.

Archiving

A copy of the test report, a protocol of the measurement as well as the accompanying correspondence and business records are archived by QualityLabs BT GmbH. The retention period is at least 10 years.

Test description

Anti-bacterial activity is determined in accordance with ASTM E-2180-07.

During the test, a thin film of agar-slurry containing the bacteria (2.5 x 10^5 / Inoculum) is applied directly to the test sample (3 cm x 3 cm). Immediately after inoculation, the bacteria from the reference sample are separated from the sample surfaces using ultrasound and vortex devices and the number of viable germs (CFU – colony-forming units) is determined (t_0 value). A further set of reference samples and samples given anti-microbial treatment is incubated with bacteria in a film of agar-slurry in a damp environment at 37°C. After a minimum of 24 hours, the bacteria are separated from the sample surfaces using ultrasound and vortex devices and the number of viable germs is determined (t_{24} value).

Work Order	1957.1
Setup-Code	141024-10183-2180-01

References to deviations, preincubations, special test conditions

NONE

Quality Labs

Test Report ASTM E-2180

Work Order	1957.1
Setup-Code	141024-10183-2180-01

Test Results

No.	Sample Name	Sample Code	t_0 (cell count / inoculum)			CV [%]	t_{24} (cell count / inoculum)			CV [%]	Reduction [%]
1	Reference Sample	101832210140001	2.6×10^5	2.9×10^5	2.4×10^5	8.5	$<1 \times 10^1$	$<1 \times 10^1$	$<1 \times 10^1$	0.0	-*
2	Antimicrobial Sample A	101832210140002					$<1 \times 10^1$	$<1 \times 10^1$	$<1 \times 10^1$	0.0	-
3	Antimicrobial Sample B	101832210140003					$<1 \times 10^1$	$<1 \times 10^1$	$<1 \times 10^1$	0.0	-

*see "Interpretation of Results", page 5

Test strain	*Staphylococcus aureus* DSM 799/ATCC 6538
Initial cell count / inoculum	**2.5×10^5 / 200 µl**
Initials of the editor	TN
Measurement ended on	Oct-26-2014

EN 24.09.2014 TN

Work Order	1957.1
Setup-Code	141024-10183-2180-01

Comments on test objects

NONE

Interpretation of the results based on the measurements

The t_{24}-Value of the reference sample showed no bacterial growth. Therefore all belonging samples could not be evaluated.

Editor: Mr. Nagengast

Crosschecked: Mrs. Leisgang

References

ASTM E-2180-07: Standard Test Method for Determining the Activity of Incorporated Antimicrobial Agent(s) In Polymeric or Hydrophobic Materials

ASTM E-1054-08: Standard Test Methods for Evaluation of Inactivators of Antimicrobial Agents

Quality Labs

Test Report ASTM E-2180

Work Order	1957.2
Setup-Code	141027-10183-2180-01

Test Report

ASTM E-2180

Standard Method for Determining the Activity of Incorporated Antimicrobial Agent(s) in Polymeric or Hydrophobic Material

Test Object:

Isopipe - Escherichia coli

EN 24.09.2014 TN

Quality Labs

Test Report ASTM E-2180

Work Order	1957.2
Setup-Code	141027-10183-2180-01

Report on Findings

Client: **Address:**	Isopipe 68 km Nat. Road Athens-Lamia 341 00 Ritsona, Halkida Greece
Work order no.:	1957.2
Test object:	Isopipe - Escherichia coli
Sample description:	Foam
Date of receipt of sample:	Oct-17-2014
Type of test:	ASTM E-2180-07: Standard Method for Determining the Activity of Incorporated Antimicrobial Agent(s) in Polymeric or Hydrophobic Material
Test Germ:	*Escherichia coli* DSM 1576/ATCC 8739
Test laboratory:	QualityLabs BT GmbH
Address:	Neumeyerstrasse 46a 90411 Nuremberg, Germany
Setup-Code:	141027-10183-2180-01
Sample material:	n.b.
No. of pages in report:	6

Report on findings to the client: **Place and date of preparation:** Nuremberg, Oct-31-2014
Recipient: Isopipe

Approved:

Harald Gerauer, Laboratory Director
QualityLabs BT GmbH

Released:

Dr. Jörg Brünke, Managing Director
QualityLabs BT GmbH

Work Order	1957.2
Setup-Code	141027-10183-2180-01

Declaration on Quality Assurance

This investigation was performed and supervised according to the standard operating procedure "SOP for ASTM E-2180-07" by QualityLabs BT GmbH. The laboratory and process are continually monitored by independent, external authorities, as well as by internal audits.

Archiving

A copy of the test report, a protocol of the measurement as well as the accompanying correspondence and business records are archived by QualityLabs BT GmbH. The retention period is at least 10 years.

Test description

Anti-bacterial activity is determined in accordance with ASTM E-2180-07.

During the test, a thin film of agar-slurry containing the bacteria (2.5×10^5 / Inoculum) is applied directly to the test sample (3 cm x 3 cm). Immediately after inoculation, the bacteria from the reference sample are separated from the sample surfaces using ultrasound and vortex devices and the number of viable germs (CFU – colony-forming units) is determined (t_0 value). A further set of reference samples and samples given anti-microbial treatment is incubated with bacteria in a film of agar-slurry in a damp environment at 37°C. After a minimum of 24 hours, the bacteria are separated from the sample surfaces using ultrasound and vortex devices and the number of viable germs is determined (t_{24} value).

EN 24.09.2014 TN

References to deviations, preincubations, special test conditions

NONE

Quality Labs

Test Report ASTM E-2180

Work Order	1957.2
Setup-Code	141027-10183-2180-01

Test Results

No.	Sample Name	Sample Code	t_0 (cell count / inoculum)			CV [%]	t_{24} (cell count / inoculum)			CV [%]	Reduction [%]
1	Reference Sample	101832210140001	1.9×10^6	2.3×10^6	1.9×10^6	11.1	2.8×10^6	2.5×10^7	1.1×10^7	86.4	-
2	Antimicrobial Sample A	101832210140002					$<1 \times 10^1$	1.6×10^5	2.7×10^6	95.2	**96.25**
3	Antimicrobial Sample B	101832210140003					$<1 \times 10^1$	$<1 \times 10^1$	$<1 \times 10^1$	0.0	**>99.99**

*see "Interpretation of Results", page 5

Test strain	*Escherichia coli* DSM 1576/ATCC 8739
Initial cell count / inoculum	**2.5×10^6 / 200 µl**
Initials of the editor	TN TN
Measurement ended on	Oct-29-2014

EN 24.09.2014 TN

Work Order	1957.2
Setup-Code	141027-10183-2180-01

Comments on test objects

NONE

Interpretation of the results based on the measurements

NONE

Editor: Mr. Nagengast

Crosschecked: Mrs. Leisgang

References

ASTM E-2180-07: Standard Test Method for Determining the Activity of Incorporated Antimicrobial Agent(s) In Polymeric or Hydrophobic Materials

ASTM E-1054-08: Standard Test Methods for Evaluation of Inactivators of Antimicrobial Agents

**Summary Of WARRES No's. 126754 (Incorporating Supplement No. 1) & 141893
Including Opinion Of Compliance With The
Requirements For A Class 0 Surface
As Defined In Paragraph A13(b)
Of Approved Document B,
(2000 Edition Incorporating 2002 Amendments)
'Fire Safety', To The Building Regulations 2000**

Sponsored By

**3I SA
Nafpliou & Daskalogiani
14452 Metamorfosi
Athens
Greece**

Warrington FIRE research

**Summary Of WARRES No's. 126754 (Incorporating Supplement No. 1) & 141893
Including Opinion Of Compliance With The
Requirements For A Class 0 Surface
As Defined In Paragraph A13(b)
Of Approved Document B,
(2000 Edition Incorporating 2002 Amendments)
'Fire Safety', To The Building Regulations 2000**

Sponsored By

**3I SA
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Greece**

Terms Of Reference

To assess the results of tests to BS 476:Part 6:1989 and BS 476:Part 7:1997, obtained on specimens of a product and to provide an opinion of compliance with the requirements for a Class O surface, as defined in Approved Document B to the Building Regulations 2000.

Introduction

Specimens of a product have been tested in accordance with the test methods specified in BS 476: Part 6: 1989 'Method of test for fire propagation of products' and BS 476: Part 7: 1997 'Surface spread of flame test for materials'. The results of the tests are fully reported in the test reports WARRES No's. 126754 (Incorporating Supplement No. 1) and 141893.

This summary test report has been prepared at the request of the sponsor and relates the results of the tests to the requirements for a Class 0 surface of a material or composite product, as defined in paragraph A13(b) of Approved Document B, 'Fire Safety', to the Building Regulations 2000.

This summary should be read in conjunction with, and not accepted as a substitute for, the test reports WARRES No's. 126754 (Incorporating Supplement No. 1) and 141893. Those test reports may include additional information which may be relevant to the assessment of the potential fire hazard of the product.

Description Of Test Specimens

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

General description	Closed cell rubber based thermal insulation having two identical faces
Trade name	"Isopipe TC"
Detailed description / composition details	Manufactured utilising a blend of synthetic rubber, rubber protective additives, plasticisers and flame retardants
Name of manufacturer	3i SA
Density	70kg/m^3
Thickness	13 mm
Colour	"Black"

Continued on next page

Trade name of flame retardant	See 'Note 1' below
Genetic type of flame retardant	Sb2O3, CHLOROPARAFIN 50%
Amount of flame retardant	See 'Note 1' below
Brief description of manufacturing process	Extrusion, continuous vulcanisation and expansion in hot air tunnel.

Note 1: The sponsor of the test was unwilling to provide this information

The specimens were supplied by the sponsor. Warrington Fire Research Centre was not involved in any selection or sampling procedure.

Face Subjected To Tests

The specimens were mounted in the test positions such that one face was exposed to the heating conditions of the tests.

Results Of Tests

The following results were obtained for the specimens, which were tested.

BS 476: Part 6: 1989

Fire propagation index, I	=	10.1
subindex, i_1	=	5.8
subindex, i_2	=	3.8
subindex, i_3	=	0.5

BS 476: Part 7: 1997

Class 1 surface spread of flame

The test results relate only to the behaviour of the test specimens of the product under the particular conditions of the test, they are not intended to be the sole criterion for assessing the potential hazard of the product in use.

Opinion

We consider the results of the tests detailed above demonstrate that the product, as tested, complies with the requirements for Class 0, as defined in paragraph A13(b) of Approved Document B, 'Fire Safety', to the Building Regulations 2000.

Validity Of Opinion

This opinion is based on the requirements of the Building Regulations at the date of this report. If the Building Regulations are revised or amended in any way subsequent to that date, care must be taken to ensure that this opinion is not invalidated by those revisions or amendments.

Warrington FIRE research

The opinion has been formulated on the assumption that the specimens are representative of the product in practice. Warrington Fire Research Centre was not involved in any sampling or selection procedures which would confirm this or in any audit testing which would provide confidence in the consistency of the product in the tests.

Responsible Officer

T MORT
Acting Technical Officer
Reaction to Fire Testing

Approved

P E LYTHGOE
Testing Manager
Reaction to Fire Testing
for and on behalf of
WARRINGTON FIRE RESEARCH CENTRE

Date Of Original Issue: 7th October 2004

Date of Issue 2: 7th December 2004

Test Report

WARRES No. 141893

BS 476: Part 6: 1989
Method Of Test For
Fire Propagation For Products

Sponsored By

3I (SA)
Nafpliou & Daskalogiani
14452 Metamorfosi
Athens
Greece

Warrington Fire Research Centre Ltd, Holmesfield Road, Warrington, UK WA1 2DS
Tel: int + (0) 1925 655116, Fax: int + (0) 1925 646672, Website: www.wfrc.co.uk Reg. No. 1247124

Test Report

WARRES No. 141893

BS 476: Part 6: 1989
Method Of Test For
Fire Propagation For Products

Sponsored By

3I (SA)
Nafpliou & Daskalogiani
14452 Metamorfosi
Athens
Greece

This is copy No. 1 of Test Report WARRES No. 141893 which has been issued at the request of the sponsor

1 Purpose Of Test

To determine the fire propagation index of specimens of a product when they are tested in accordance with BS 476: Part 6: 1989 'Fire tests on building materials and structures, method of test for fire propagation for products'.

2 Scope Of Test

BS 476: Part 6: 1989 specifies a method of test, the result being expressed as a fire propagation index, that provides a comparative measure of the contribution to the growth of fire made by an essentially flat material, composite or assembly. It is primarily intended for the assessment of the performance of internal wall and ceiling linings.

3 Description Of Test Specimens

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

General description	Closed cell rubber based thermal insulation having two identical faces
Trade name	"Isopipe TC"
Detailed description / composition details	Manufactured utilising a blend of synthetic rubber, rubber protective additives, plasticisers and flame retardants
Name of manufacturer	3i SA
Density	70kg/m^3
Thickness	13 mm
Colour	"Black"
Trade name of flame retardant	See 'Note 1' below
Genetic type of flame retardant	Sb2O3, CHLOROPARAFIN 50%
Amount of flame retardant	See 'Note 1' below
Brief description of manufacturing process	Extrusion, continuous vulcanisation and expansion in hot air tunnel.

Warrington Fire research

Note 1: The sponsor of the test was unwilling to provide this information

The specimens were supplied by the sponsor. Warrington Fire Research Centre was not involved in any selection or sampling procedure.

4 Conditioning Of Specimens

The specimens were received on the 6th September 2004.

Prior to testing the specimens were conditioned to constant mass at a temperature of 23 ± 2°C and a relative humidity of 50 ± 5%.

5 Date Of Test

The test was performed on the 21st and 22nd September 2004.

6 Test Procedure

The test was performed in accordance with the procedure specified in BS 476: Part 6: 1989 and this report should be read in conjunction with that British Standard.

7 Form In Which Specimens Were Tested

The specimens were tested in the form of a material.

8 Exposed Face

One face of the specimens was exposed to the heating conditions of the test.

9 Test Results

The test results relate only to the behaviour of the test specimens of the product under the particular conditions of test, they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

The test results relate only to the specimens of the product in the form in which they were tested. Small differences in the composition or thickness 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 specimens which were tested.

A total of three specimens was tested. The laboratory record sheet relating to each of the test specimens is appended to this report.

Throughout the test on each specimen careful observation was made of the product's behaviour within the apparatus and special note was taken of any of the phenomena listed in clause 10.2 of the Standard. None of the listed phenomena was observed and the test results on all three specimens tested were valid.

Warrington Fire research

The following test results were obtained for the product.

Fire propagation index, I	=	10.1
subindex, i_1	=	5.8
subindex, i_2	=	3.8
subindex, i_3	=	0.5

NOTE: If a suffix 'R' is included in the above fire propagation index, I, then this indicates that the results should be treated with caution.

10 Interpretation Of Test Results

Attention is drawn to Appendix 1, entitled 'Effect of thermal characteristics on the performance of assemblies'.

11 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.

Responsible Officer

T MORT
Acting Technical Officer
Reaction to Fire Testing

Approved

P E LYTHGOE
Testing Manager
Reaction to Fire Testing
for and on behalf of
WARRINGTON FIRE RESEARCH CENTRE

Date Of Issue: 7th October 2004

Appendix 1

Effect of Thermal Characteristics on the Performance of Assemblies

The result of a test in accordance with BS 476: Part 6: 1989 is applicable only to the specimens in the form in which they were tested. Small differences in the composition or thickness of the product may significantly affect the performance during the test and may therefore invalidate the test result. It is important that the specimens which are tested fully represent the product which is supplied and the manner in which it will be used. This may require a product to be tested in a number of different ways to determine the classification which will be achieved in its different methods of use.

A surface coating, for example, may be applied to a selected substrate using a particular method and application rate. The test classification which is achieved for that set of specimens will be applicable only to that situation. If the substrate or method and rate of application in a particular practical situation are different from that which was tested, then it will be necessary to determine the classification which will be achieved for that situation. Similarly, specimens incorporating a wallcovering must be fully representative of the situation which occurs in practice and will normally consist of the wallcovering bonded to a chosen substrate with a chosen adhesive; the test result will apply only to that composite system. The same principle applies to any composite or assembly which is being investigated.

It is sometimes possible to assume a 'worst case' situation which will enable a chosen set, or sets, of specimens to be constructed and tested to provide a foundation for the assessment of the probable performance of variations within the system. Similarly, it is sometimes possible to formulate a series of exploratory tests to investigate the effect of variations within a product or system, usually culminating in a series of formal tests to provide the basis for a composite assessment of pre-determined variables. In such cases, however, it is essential that careful planning of the programmes is undertaken by suitably qualified fire safety practitioners.

The following is re-produced from Appendix B of BS 476: Part 6: 1989:

> With thin materials or composites, particularly those with a high thermal conductivity, the presence of an air gap and the nature of any underlying construction may significantly affect the ignition performance of the exposed surface. Increasing the thermal capacity of the underlying construction increases the "heat sink" effect and may delay ignition of the exposed surface. Any backing provided to the test specimen and in intimate contact with it, such as the non-combustible packing pieces, may alter this "heat sink" effect and may be fundamental to the test result itself. The influence of the underlying layers on the performance of the assembly should be understood and care should be taken to ensure that the result obtained on any assembly is relevant to its use in practice.
>
> The following advice is offered on the construction and preparation of test specimens:
>
> (a) Where the thermal properties of the product are such that no significant heat loss to the underlying layers can occur, e.g. a material/composite greater than approximately 6 mm thick of high thermal capacity and/or low thermal conductivity, then the product should be tested backed only by the specimen holder.
>
> (b) Where the product is normally used as a free-standing sheet and the characteristics noted in (a) do not apply, then an airspace should be provided at the back of the product by testing over asbestos cement perimeter battens 20 mm wide and 12.5 mm thick.
>
> (c) Where the product is to be used over a low density non-combustible substrate and the characteristics noted in (a) do not apply, then the product should be tested in conjunction with that substrate.
>
> (d) Where the product is to be used over a combustible substrate and the characteristics noted in (a) do not apply, then the product should be tested in conjunction with that substrate.

Laboratory Record Sheet

FIRE PROPAGATION TEST - B.S.476-PART 6:1989

Sponsor : International Innovative Insulation S.A.

Specimen No : 1

Date : 21/09/2004

Time mins t	Specimen Temperature Deg C Ts	Calibration Temperature Deg C Tc	Ts-Tc/10t	Sub Index Of Performance
0.50	24	14	2.00	
1.00	33	21	1.20	
1.50	39	25	0.93	
2.00	43	30	0.65	
2.50	47	35	0.48	
3.00	53	38	0.50	5.76
4.00	100	68	0.80	
5.00	151	104	0.94	
6.00	171	128	0.72	
7.00	188	154	0.49	
8.00	203	171	0.40	
9.00	208	186	0.24	
10.00	219	196	0.23	3.82
12.00	230	211	0.16	
14.00	236	216	0.14	
16.00	242	227	0.09	
18.00	242	234	0.04	
20.00	244	238	0.03	0.47
Total Index of Performance S			=	10.05

SubIndex s_1 5.76

SubIndex s_2 3.82

SubIndex s_3 0.47

Index of Performance S 10.05

Warrington FIRE research

Laboratory Record Sheet

FIRE PROPAGATION TEST - B.S.476:PART 6:1989

Sponsor : International Innovative Insulation S.A.

Specimen No : 2

Date : 21/09/2004

Time mins t	Specimen Temperature Deg C Ts	Calibration Temperature Deg C Tc	Ts-Tc/10t	Sub Index Of Performance
0.50	25	14	2.20	
1.00	33	21	1.20	
1.50	39	25	0.93	
2.00	43	30	0.65	
2.50	48	35	0.52	
3.00	50	38	0.40	5.90
4.00	102	68	0.85	
5.00	150	104	0.92	
6.00	169	128	0.68	
7.00	188	154	0.49	
8.00	199	171	0.35	
9.00	209	186	0.26	
10.00	216	196	0.20	3.74
12.00	230	211	0.16	
14.00	239	216	0.16	
16.00	245	227	0.11	
18.00	248	234	0.08	
20.00	252	238	0.07	0.58
Total Index of Performance S			=	10.23

SubIndex s_1 5.90

SubIndex s_2 3.74

SubIndex s_3 0.58

Index of Performance S 10.23

Warrington FIRE research

Laboratory Record Sheet

FIRE PROPAGATION TEST - B.S.476:PART 6:1989

Sponsor : International Innovative Insulation S.A.

Specimen No : 3

Date : 22/09/2004

Time mins t	Specimen Temperature Deg C Ts	Calibration Temperature Deg C Tc	Ts-Tc/10t	Sub Index Of Performance
0.50	26	14	2.40	
1.00	32	21	1.10	
1.50	35	25	0.67	
2.00	41	30	0.55	
2.50	47	35	0.48	
3.00	56	38	0.60	5.80
4.00	91	68	0.58	
5.00	145	104	0.82	
6.00	169	128	0.68	
7.00	195	154	0.59	
8.00	205	171	0.43	
9.00	217	186	0.34	
10.00	222	196	0.26	3.69
12.00	228	211	0.14	
14.00	236	216	0.14	
16.00	244	227	0.11	
18.00	248	234	0.08	
20.00	252	238	0.07	0.54
Total Index of Performance S			=	10.03

SubIndex s_1 5.80

SubIndex s_2 3.69

SubIndex s_3 0.54

Index of Performance S 10.03

Warrington FIRE research

Test Report

WARRES No. 126754

BS 476: Part 7: 1997
Method For Classification Of The
Surface Spread Of Flame Of Products

Sponsored By

3i SA
Nafpliou & Daskalogiani
14452 Metamorfosi
Athens
Greece

Warrington FIRE research

Test Report

WARRES No. 126754

BS 476: Part 7: 1997
Method For Classification Of The
Surface Spread Of Flame Of Products

Sponsored By

3i SA
Nafpliou & Daskalogiani
14452 Metamorfosi
Athens
Greece

Purpose Of Test

To determine the classification of specimens of a product when they are tested in accordance with BS 476: Part 7: 1997, "Fire tests on building materials and structures, method for classification of the surface spread of flame of products".

Scope Of Test

BS 476: Part 7: 1997 specifies a method of test for measuring the lateral spread of flame along the surface of a specimen of a product orientated in the vertical position, and a classification system based on the rate and extent of flame spread. It provides data suitable for comparing the performances of essentially flat materials, composites, or assemblies, which are used primarily as the exposed surfaces of walls or ceilings.

Description Of Test Specimens

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

The specimens comprised 'ISOPIPE TC (colour reference 'Black')', a closed cell, rubber based thermal insulation product having two identical faces, a thickness of 10mm and a density of 70kg/m^3.

The specimens were supplied by the sponsor. Warrington Fire Research Centre was not involved in any selection or sampling procedure.

Conditioning Of Specimens

The specimens were received on the 23rd August 2002.

Prior to test the specimens were conditioned to constant mass at a temperature of 23 ± 2°C and a relative humidity of 50 ± 10%.

Date Of Test

The test was performed on the 28th August 2002.

Warrington FIRE research

6 **Test Procedure**

The test was performed in accordance with the procedure specified in BS 476: Part 7: 1997, and this report should be read in conjunction with that British Standard.

7 **Form In Which The Specimens Were Tested**

The specimens were tested in the form of a material.

8 **Exposed Face**

One face of the specimens was exposed to the radiant heat of the test when the specimens were mounted in the test position.

9 **Test Results And Classification**

The test results relate only to the behaviour of the test specimens of the product under the particular conditions of test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

The test results relate only to the specimens of the product in the form in which they were tested. Small differences in the composition or thickness 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 specimens which were tested.

The test results for the individual specimens, together with observations made during the test and comments on any difficulties encountered during the test are given in Table 1.

IN ACCORDANCE WITH THE CLASS DEFINITIONS GIVEN IN BS 476: PART 7: 1997, THE SPECIMENS TESTED ARE CLASSIFIED AS CLASS 1.

Note: If the prefix 'D' or suffix 'R' or 'Y' is included in the classification, this indicates that the results should be treated with caution. An explanation of the reason for the prefix and suffixes is given in Appendix 1, together with the irradiance along the horizontal reference line of the specimen position during the test and the classification limits specified in the Standard.

10 **Interpretation Of Test Results**

Attention is drawn to Appendix 2 entitled "Effect of thermal characteristics on the performance of assemblies".

11 **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.

Warrington FIRE research

Responsible Officer

J COAKLEY
Technical Officer -
Testing Department

Approved

C DEAN
Laboratory Supervisor
Testing Department
For and on behalf of
WARRINGTON FIRE RESEARCH CENTRE

Date Of Issue : 02 September 2002

Table 1

SPECIMEN No.	1	2	3	4	5	6
Maximum distance travelled at 1.5 minutes (mm)	60	60	60	60	60	60
Distance (mm)	Time to travel to indicated distance (minutes, seconds)					
75						
165						
190						
215						
240						
265						
290						
375						
455						
500						
525						
600						
675						
710						
750						
785						
825						
900						
Time to reach maximum distance travelled (minutes, seconds)	1.00	1.00	1.00	1.00	1.00	1.00
Maximum distance travelled in 10 minutes (mm)	60	60	60	60	60	60

Note: Six specimens are usually tested. If the test on any specimen is deemed to be invalid, as defined in the Standard, it is permissible for up to a maximum of nine specimens to be tested in order to obtain the six valid test results.

OBSERVATIONS MADE DURING TEST AND COMMENTS ON ANY DIFFICULTIES ENCOUNTERED DURING THE TEST.

In the case of each specimen, flashing occurred in the first minute of the test, extending up to a maximum distance of 240mm.

Warrington FIRE research

Appendix 1

Irradiance along the horizontal reference line of the specimen position during the test.

Distance along reference line from the hotter end of the specimen position (in mm)	75	225	375	525	675	825
Irradiance at points specified above (kW/m^2)	32.5	21.0	14.5	10.0	7.0	5.0

Note: a tolerance of ± 0.5 kW/m^2 is specified on the irradiance measurement.

Classification of spread of flame

CLASSIFICATION	SPREAD OF FLAME AT 1.5 MIN		FINAL SPREAD OF FLAME	
	LIMIT	LIMIT FOR ONE SPECIMEN IN SAMPLE	LIMIT	LIMIT FOR ONE SPECIMEN IN SAMPLE
	mm	mm	mm	mm
Class 1	165	165 + 25	165	165 + 25
Class 2	215	215 + 25	455	455 + 45
Class 3	265	265 + 25	710	710 + 75
Class 4	exceeding the limits for Class 3			

Explanation of prefix and suffixes which may be added to the classification

1. A suffix R is added to the classification if more than six specimens are required in order to obtain six valid test results (e.g. class 2R).

2. A prefix D is added to the classification of any product which does not comply with the surface characteristics specified in the Standard and has therefore been tested in a modified form (e.g. class D3).

3. A suffix Y is added to the classification if any softening and/or other behaviour that may affect the flame spread occurs (e.g. class 3Y).

For example, a classification of D3RY could be achieved indicating (a) a modified surface has been used; (b) a class 3 result has been obtained; (c) additional specimens have been used to obtain 6 valid results and; (d) softening and/or other behaviour has occurred which is considered to have affected the test result.

Warrington Fire research

Appendix 2
Effect of Thermal Characteristics on the Performance of Specimens

The result of the test in accordance with BS 476: Part 7: 1987 is applicable only to the specimens in the form in which they were tested. Small differences in the composition or thickness of the product may significantly affect the performance during the test and may therefore invalidate the test result. It is important that the specimens which are tested fully represent the product which is supplied and the manner in which it will be used. This may require a product to be tested in a number of different ways to determine the classification which will be achieved in its different methods of use.

A surface coating, for example, may be applied to a selected substrate using a particular method and application rate. The test classification which is achieved for that set of specimens will be applicable only to that situation. If the substrate or method and rate of application in a particular practical situation are different from that which was tested, then it will be necessary to determine the classification which will be achieved for that situation. Similarly, specimens incorporating a wallcovering must be fully representative of the situation which occurs in practice and will normally consist of the wallcovering bonded to a chosen substrate with a chosen adhesive; the test result will only apply to that composite system. The same principle applies to any composite or assembly which is being investigated.

It is sometimes possible to assume a 'worst case' situation which will enable a chosen set, or sets, of specimens to be constructed and tested to provide a foundation for the assessment of the probable performance of variations within the system. Similarly, it is sometimes possible to formulate a series of exploratory tests to investigate the effect of variations within a product or system, usually culminating in a series of formal tests to provide the basis for a composite assessment of pre-determined variables. In such cases, however, it is essential that careful planning of the programmes is undertaken by suitably qualified fire safety practitioners.

The following is re-produced from Appendix B of BS 476: Part 7: 1997;

With thin materials or composites, particularly those with a high thermal conductivity, the presence of an air gap and the nature of any underlying construction may significantly affect the ignition performance of the exposed surface. Increasing the thermal capacity of the underlying construction increases the "heat sink" effect and may delay ignition of the exposed surface. Any backing provided to the test specimen and in intimate contact with it, such as the non-combustible spacers, may alter this "heat sink" effect and may be fundamental to the test result itself. The influence of the underlying layers on the performance of the assembly should be understood and care should be taken to ensure that the result obtained on any assembly is relevant to its use in practice.

The following advice is offered on the construction and preparation of test specimens;

(a) Where the thermal properties of the product are such that no significant heat loss to the underlying layers can occur, e.g. a material or composite greater than approximately 6 mm thick of high thermal capacity and/or low thermal conductivity, then the product should be tested backed only by the backing board.

(b) Where the product is normally used as a free-standing sheet and the characteristics noted in (a) do not apply, then an air space should be provided at the back of the product by testing over spacers of non-combustible insulation board 20 mm wide and (25 ± 1)mm thick.

(c) Where the product is to be used over a low density non-combustible substrate and the characteristics noted in (a) do not apply, then the product should be tested in conjunction with that substrate.

(d) Where the product is to be used over a combustible substrate and the characteristics noted in (a) do not apply, then the product should be tested in conjunction with that substrate.

NOTE: Discussions are taking place in ISO/TC92/SC1 concerning the possible use of a restricted range of reference substrates (mainly non-combustible) where it is not apparent or possible to test materials or products in the representative end-use substrate.

Warrington Fire research

SIEMENS

Siemens Axiva GmbH&Co.KG
Brandhaus Höchst
Industriepark Höchst, C 369
D-65926 Frankfurt am Main

Brandschachtprüfung 2001 - 1788 19.12.2001

Auftraggeber: FA.3I INTERNATIONAL INNOVATIVE ISULATION S.A.

Probekörper: ISOPIPE SHEET

Aufbau: BASIS: SYNTHETIC RUBBER

Dicke: 5.00 [mm]

Klimalagerung (23°C/50% rel. Feuchte) bis zur Gewichtskonstanz: ja

Gewicht: n. gemess.

Versuchsdatum:		19.12.2001	Flammhöhe:		
Methanverbrauch:	Soll	350 [Nl]	Maximum:		90 [cm]
	Ist	349 [Nl]	Zeitpunkt:		0 ' 23 ''
Luftverbrauch:	Soll	175 [Nl]	Dauer:		0 ' 37 ''
	Ist	174 [Nl]			
			Rauchgas:		
Entflammung nach:		0 ' 02 ''	Max. Temperatur:		120 [°C]
Durchbrennen nach:		1 ' 11 ''	Zeitpunkt:		0 ' 36 ''
Brennen auf der Rückseite:		ja	Min. Transmission:		0 [%]
Abfallen von brennenden Teilen:		nein	Zeitpunkt:		0 ' 18 ''
Beeinträchtigung der Brennerflamme durch abfallende Teile:		nein	Integ.Rauchd.:		< 400 [% * min]
Brennen auf dem Siebboden:		nein	Restlänge:	A	19 [cm]
Versuchsende nach:		10 ' 00 ''		B	18 [cm]
Nachbrennen:		0 ' 00 ''		C	19 [cm]
Nachglimmen:		0 ' 07 ''		D	18 [cm]
Bemerkungen:			Mittelwert:		18 [cm]

Anforderung der Brandschachtprüfung (gemäß DIN 4102-16) erfüllt für Baustoffklasse DIN 4102-B1

schwer entflammbar **ja**

Prüfer:

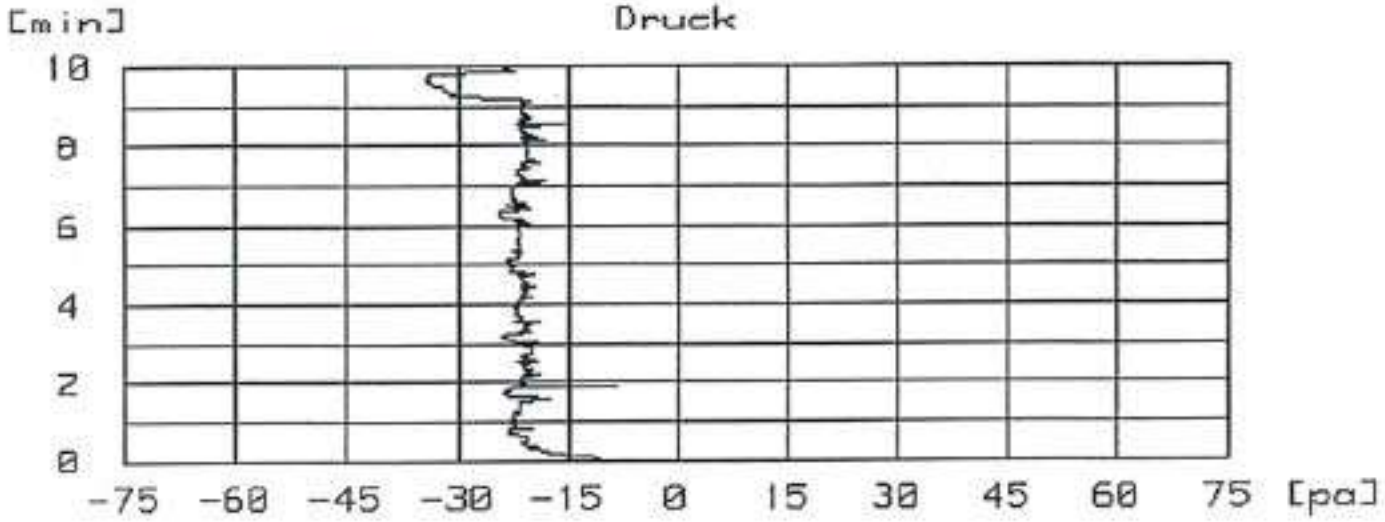
Genehmigt:

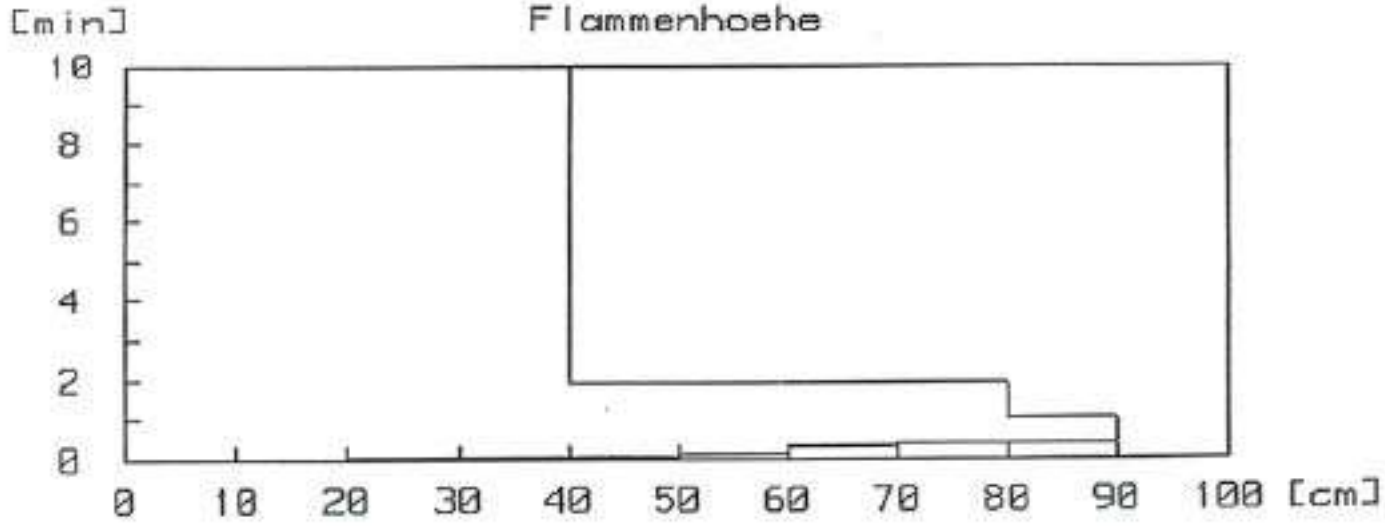
SIEMENS

Siemens Axiva GmbH&Co.KG
Brandhaus Höchst
Industriepark Höchst, C 369
D-65926 Frankfurt am Main

Brandschachtprüfung	2001 - 1788	19.12.2001

Anlage 2



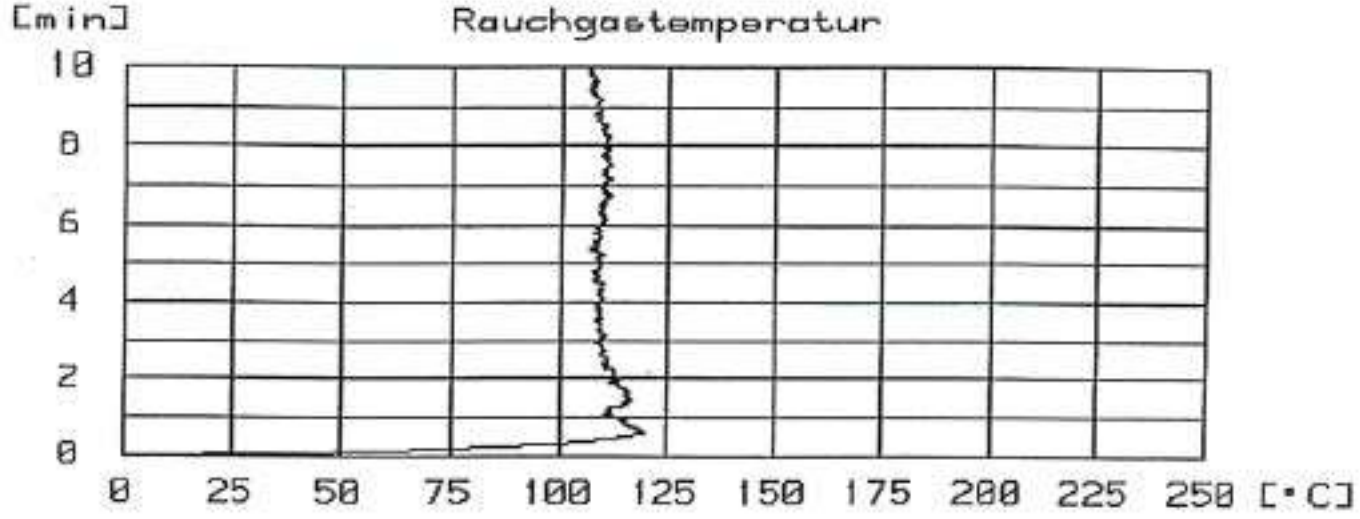


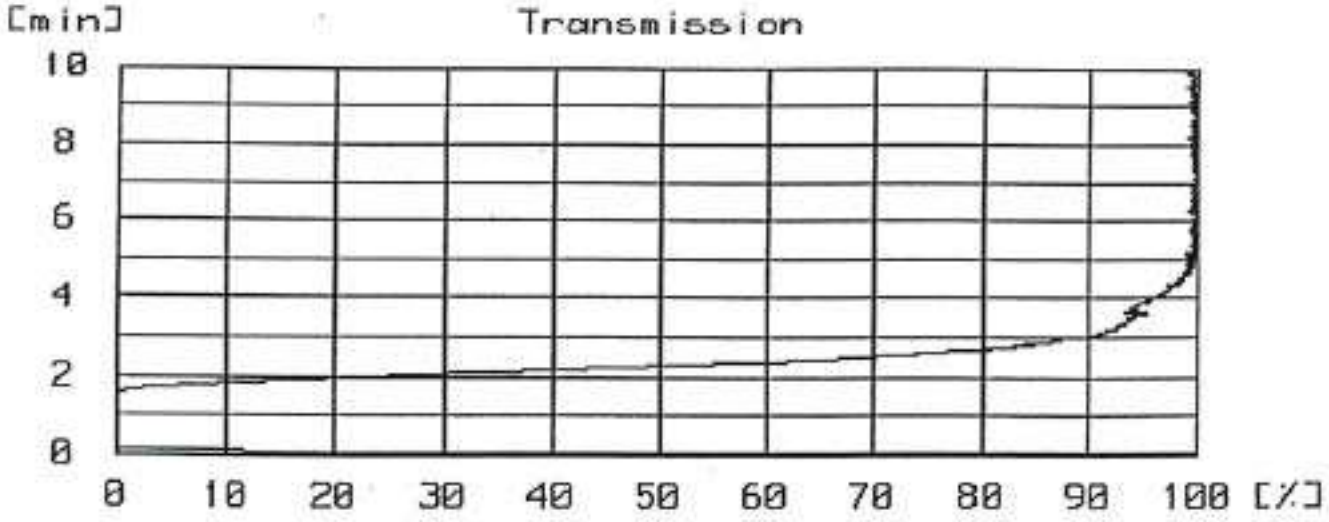
SIEMENS

Siemens Axiva GmbH&Co.KG
Brandhaus Höchst
Industriepark Höchst, C 369
D-65926 Frankfurt am Main

Brandschachtprüfung	2001 - 1788	19.12.2001

Anlage 1





34. Siemens Axiva GmbH & CO KG #2 (DE)

SIEMENS

Siemens Axiva
GmbH & Co. KG
Brandhaus Höchst
Industriepark Höchst, C 369
D-65926 Frankfurt am Main

Bericht	**2003-1905**	**10.10.2003**

Thema: **Prüfung nach DIN 4102-1 auf die Baustoffklasse B2 und B1 an einem Rohrmaterial, für die Fa. 3i International Innovative Insulation S.A.**

Kurzfassung:

Im Auftrag der Fa. 3i International Innovative Insulation S.A. waren 5 Proben eines Rohrmaterials mit Kantenbeflammung im Brennkasten nach DIN 50050-1 (1/88) zu prüfen und die Brandschachtprüfung durchzuführen.

Probenbezeichnung: Rohrmaterial, „Isopipe SBI"
Rohre Innen 22 mm, Dicke 9 mm

Eingangsdatum: **06.10.2003** Prüfdatum: **08.10.2003**

Messungen/Beobachtungen: siehe Anlage 1 – 4

Klassifizierung: Das Material erfüllt:
Die Anforderungen an die Baustoffklasse B2 (Kantenbeflammung) nach DIN 4102-1 und die Anforderungen an die Baustoffklasse B1 nach DIN 4102-1.

Dieser Bericht umfaßt 1 Seite und 4 Anlagen

Hinweise: # Das Prüfergebnis bezieht sich nur auf die geprüften Proben. Prüfbericht in 2-facher Ausfertigung.
Die auszugsweise Vervielfältigung dieses Prüfberichts ist nur mit Genehmigung des Prüflabors zulässig.

Verteiler	Unterschriften
3i International Innovation Insulation S.A. Plant: 68° km. Nat. Road Athens-Lamia G – 34100 Ritsona Griechenland	Prüfer: *Garcia, Schmid* Genehmigt: *Kh. Schenkel* *stellv. Leiter der Prüfstelle*

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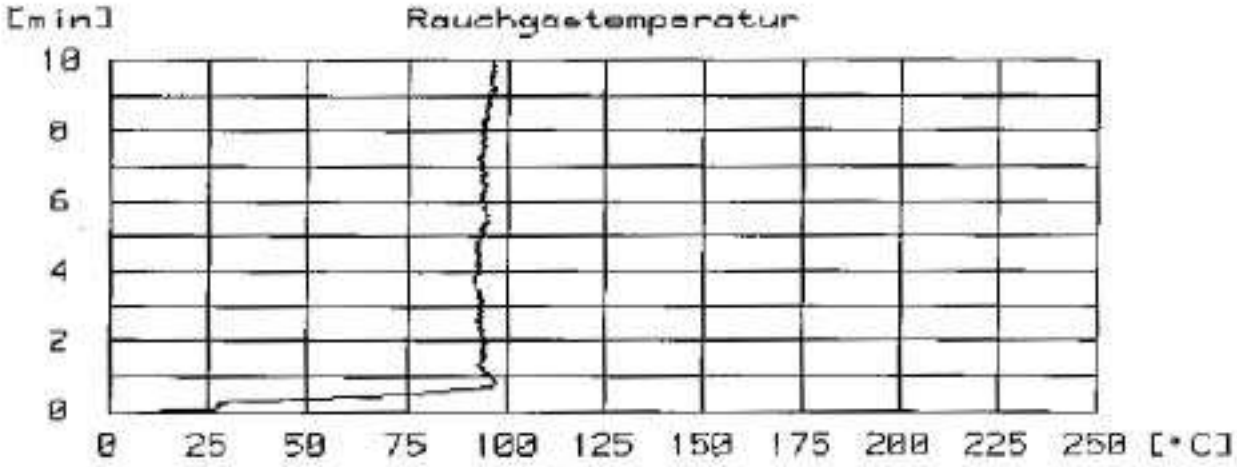
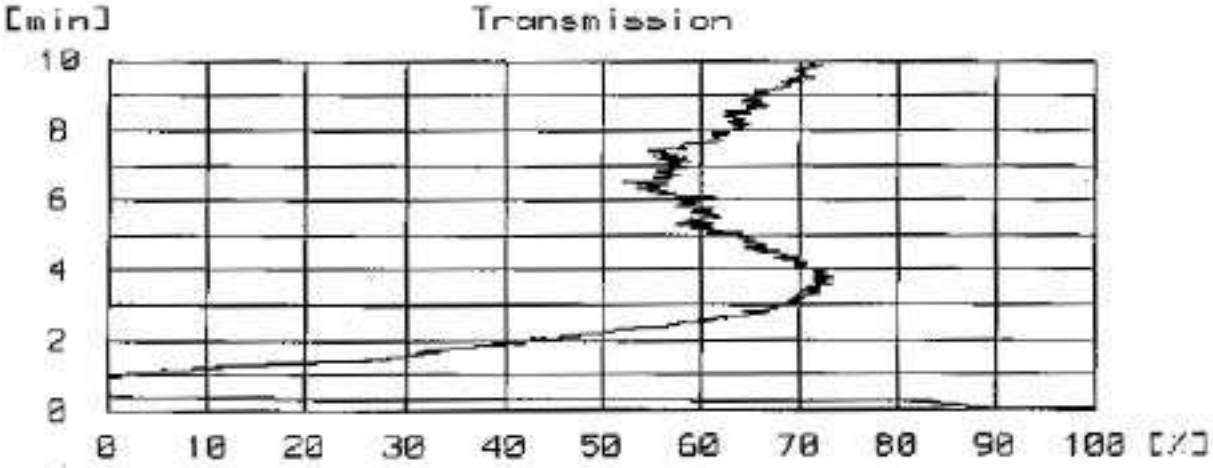
Industriepark Höchst, C 369
D-65926 Frankfurt am Main

Brandschachtprüfung	2003 - 1905	08.10.2003

Anlage 1





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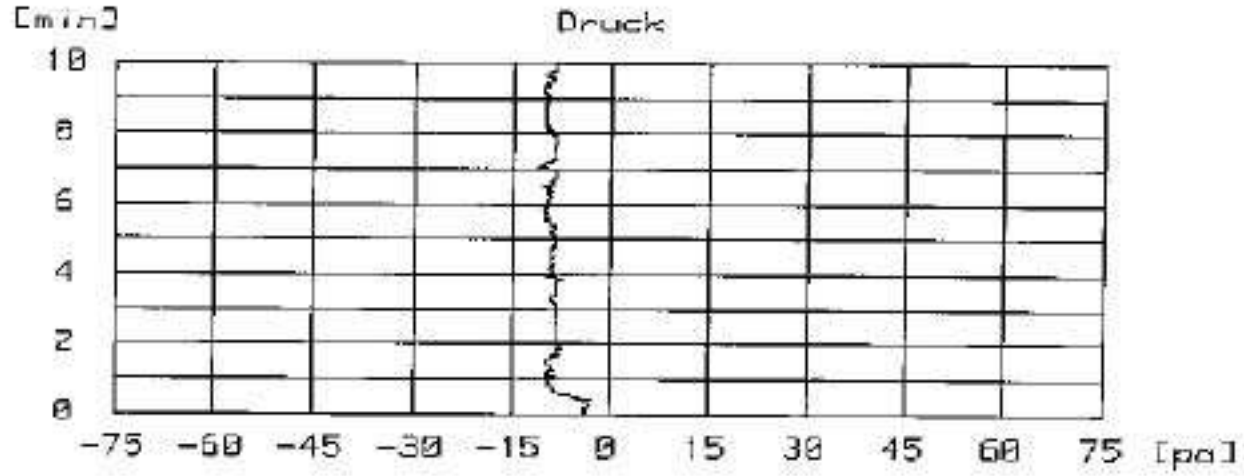
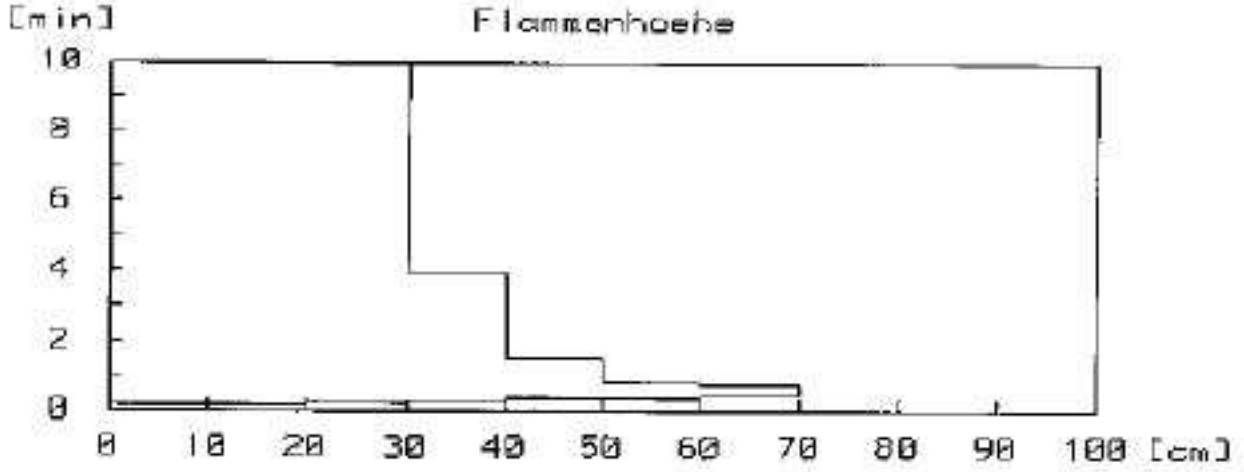
Brandschachtprüfung	2003 - 1905	08.10.2003

Anlage 2





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Bericht	2003-1905	Anlage 1	10.10.2003

Prüfblatt nach DIN 4102-1 B2

Auftraggeber: Fa. 3i International Innovative Insulation S.A.

Material: Rohrmaterial, „Isopipe SBI"
Rohre Innen 22 mm, Dicke 9 mm

Klimalagerung (23°C / 50% rel. F.): 24 h

Prüfrichtung: längs, Kantenbeflammung

Beflammungszeit: 15 [s]

Proben Nr.			1	2	3	4	5
Probendicke		[µm]	9	9	9	9	9
Erreichen der 150mm Meßmarke nach		[s]	-	-	-	-	-
Gesamtbrennzeit		[s]	15	15	15	15	15
Abfallen von	nicht brennend nach	[s]	-	-	-	-	-
Probenteilen	brennend nach	[s]	-	-	-	-	-

Bemerkungen:

Prüfrichtung: quer, Kantenbeflammung

Beflammungszeit: 15 [s]

Proben Nr.			1	2	3	4	5
Probendicke		[µm]					
Erreichen der 150mm Meßmarke nach		[s]					
Gesamtbrennzeit		[s]					
Abfallen von	nicht brennend nach	[s]					
Probenteilen	brennend nach	[s]					

Bemerkungen:

Prüfer: Gehrke

Genehmigt: Kh. Schenkel

Kh. Schenkel
stellv. Leiter der Prüfstelle

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D-65926 Frankfurt am Main

Brandschachtprüfung	2003 - 1905	08.10.2003

Auftraggeber: 3I INTERNATIONAL INNOVATIVE INSULATION S.A.

Probekörper: ROHRMATERIAL "ISOPIPE SBI"

Aufbau: ROHRE INNEN 22MM DICKE 9MM

Dicke: 9.00 [mm]

Klimalagerung (23°C/50% rel. Feuchte) bis zur Gewichtskonstanz: 39

Gewicht: n. gemess.

Versuchsdatum:		08.10.2003	Flammhöhe:		
Methanverbrauch:	Soll	350 [Nl]	Maximum:		70 [cm]
	Ist	350 [Nl]	Zeitpunkt:		0 ' 29 ''
Luftverbrauch:	Soll	175 [Nl]	Dauer:		0 ' 18 ''
	Ist	174 [Nl]			
			Rauchgas:		
Entflammung nach:		0 ' 10 ''	Max. Temperatur:		97 [°C]
Durchbrennen nach:		nicht erfolgt	Zeitpunkt:		0 ' 50 ''
Brennen auf der Rückseite:		nein	Min. Transmission:		0 [%]
Abfallen von brennenden Teilen:		nein	Zeitpunkt:		0 ' 28 ''
Beeinträchtigung der Brennerflamme durch abfallende Teile:		nein	Integ.Rauchd.:		441 [% * min]
Brennen auf dem Siebboden:		nein	Restlänge:	A	25 [cm]
Versuchsende nach:		10 ' 00 ''		B	27 [cm]
Nachbrennen:		0 ' 00 ''		C	24 [cm]
Nachglimmen:		0 ' 00 ''		D	24 [cm]

Bemerkungen: Proben wurden mit 15mm Abstand 10mm

PromatplatteMittelwert hinterlegt 25 [cm]

Anforderung der Brandschachtprüfung (gemäß DIN 4102-16) erfüllt für Baustoffklasse DIN 4102-B1		Prüfer:	[signature]
schwer entflammbar	ja	Genehmigt:	[signature]

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Bericht	**2003-1906**	**10.10.2003**

Thema:	**Prüfung nach DIN 4102-1 auf die Baustoffklasse B2 und B1 an einem Flachmaterial, für die Fa. 3i International Innovative Insulation S.A.**

Kurzfassung:

Im Auftrag der Fa. 3i International Innovative Insulation S.A. waren 5 Proben eines Flachmaterials mit Kantenbeflammung im Brennkasten nach DIN 50050-1 (1/88) zu prüfen und die Brandschachtprüfung durchzuführen.

Probenbezeichnung: Flachmaterial, „Isopipe SBI"
Density 0,070 g/m³

Eingangsdatum: **06.10.2003** Prüfdatum: **08.10.2003**

Messungen/Beobachtungen: siehe Anlage 1 – 4

Klassifizierung: Das Material erfüllt:
Die Anforderungen an die Baustoffklasse B2 (Kantenbeflammung) nach DIN 4102-1 und die Anforderungen an die Baustoffklasse B1 nach DIN 4102-1.

Dieser Bericht umfaßt 1 Seite und 4 Anlagen

Hinweise: # Das Prüfergebnis bezieht sich nur auf die geprüften Proben. Prüfbericht in 2-facher Ausfertigung.
Die auszugsweise Vervielfältigung dieses Prüfberichts ist nur mit Genehmigung des Prüflabors zulässig.

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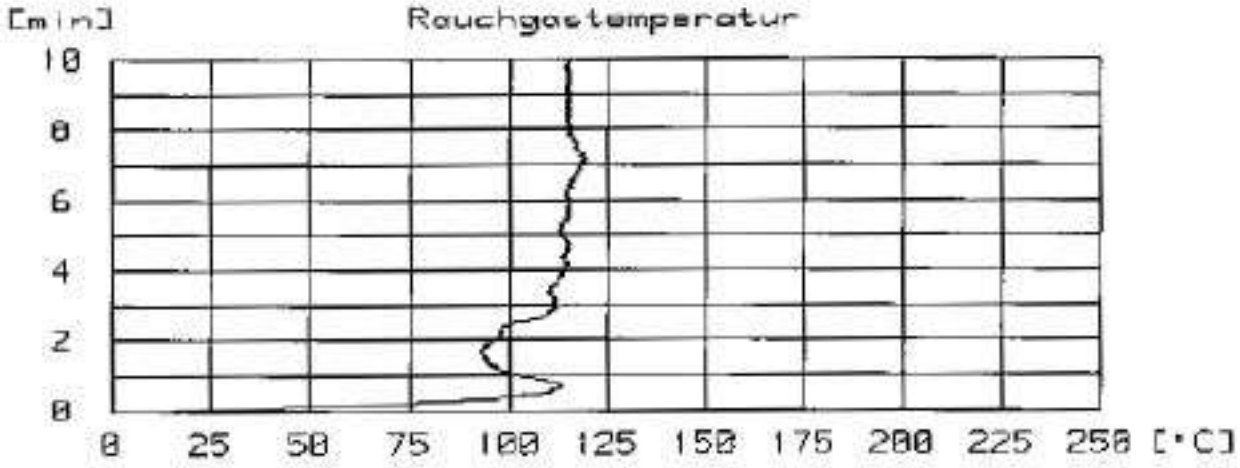
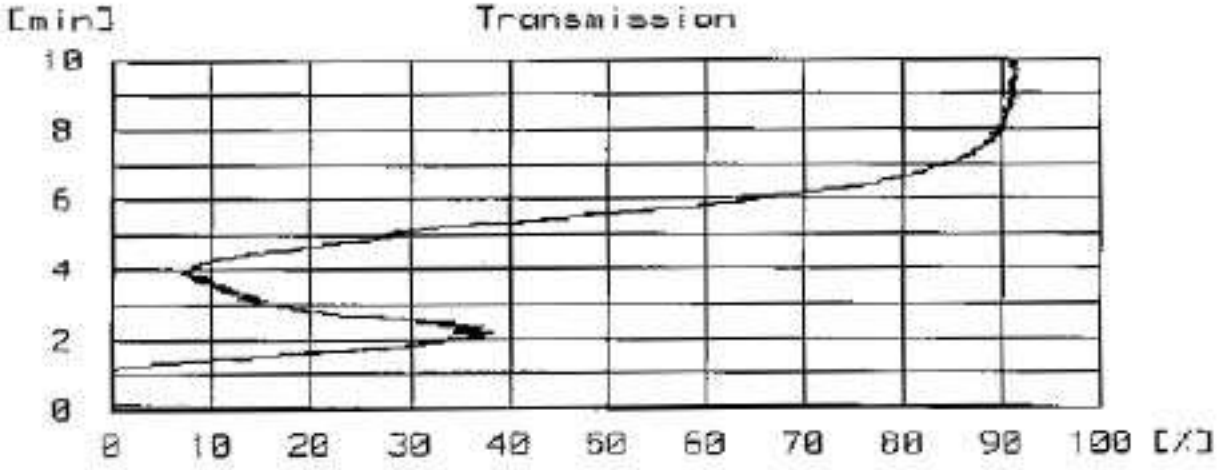
Brandschachtprüfung	2003 - 1906	08.10.2003

Anlage 1





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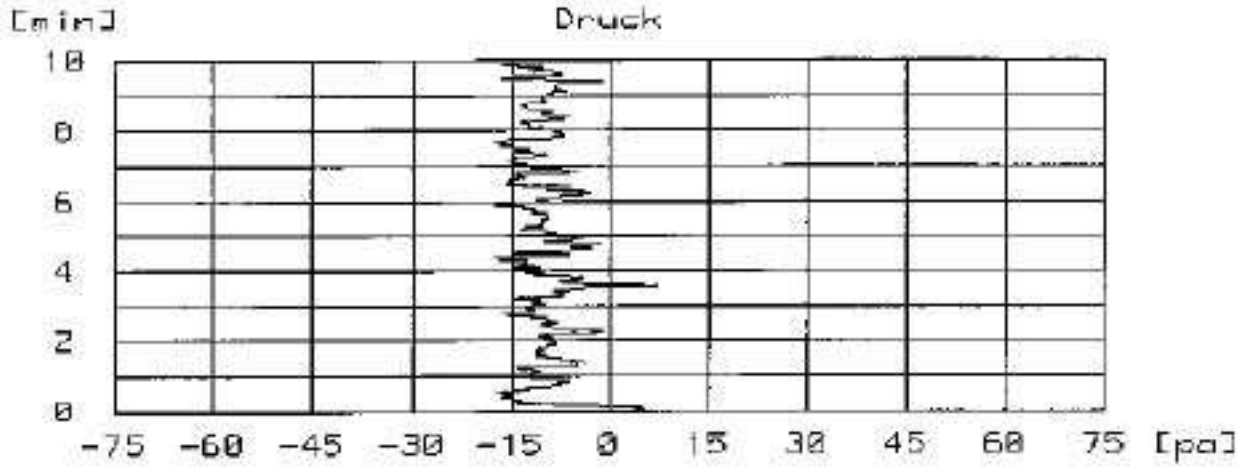
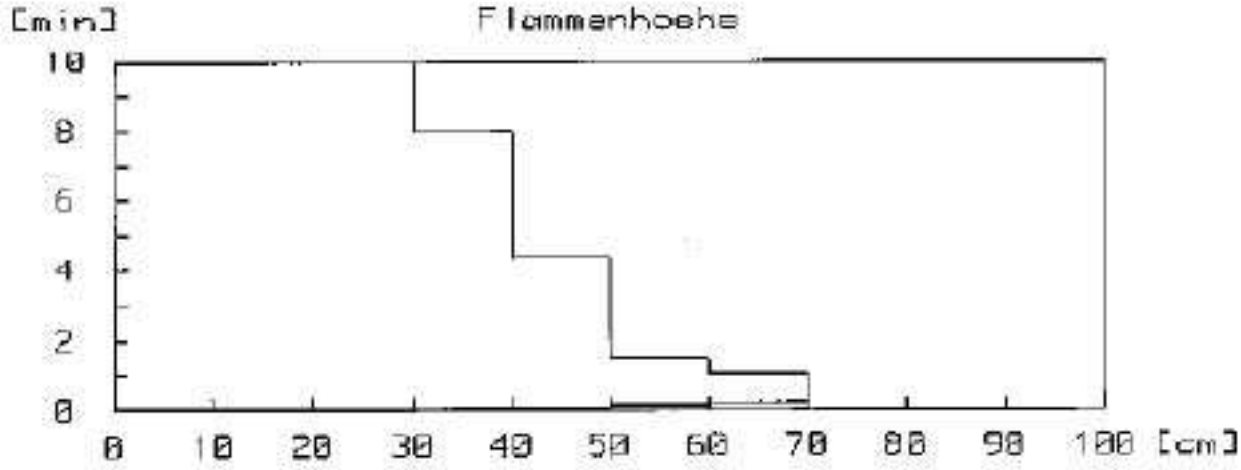
Brandschachtprüfung	2003 - 1906	08.10.2003

Anlage 2





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Brandschachtprüfung	2003 - 1906	08.10.2003

Auftraggeber: 3I INTERNATIONAL INNOVATIVE INSULATION S.A

Probekörper: FLACHMATERIAL "ISOPIPE SBI"

Aufbau: FLACHMATERIAL DENSITY 0,070 g/m3

Dicke: 9.00 [mm]

Klimalagerung (23°C/50% rel. Feuchte) bis zur Gewichtskonstanz: ja

Gewicht: n. gemess

Versuchsdatum:		08.10.2003	Flammhöhe:		
Methanverbrauch:	Soll	350 [Nl]	Maximum:		70 [cm]
	Ist	350 [Nl]	Zeitpunkt:		0 ' 13 ''
Luftverbrauch:	Soll	175 [Nl]	Dauer:		0 ' 49 ''
	Ist	174 [Nl]			
			Rauchgas:		
Entflammung nach:		0 ' 02 ''	Max. Temperatur:		119 [°C]
Durchbrennen nach:		nicht erfolgt	Zeitpunkt:		7 ' 04 ''
Brennen auf der Rückseite:		nein	Min. Transmission:		0 [%]
Abfallen von brennenden Teilen:		nein	Zeitpunkt:		0 ' 14 ''
Beeinträchtigung der Brennerflamme durch abfallende Teile:		nein	Integ.Rauchd.:		526 [% * min]
			Restlänge:	A	18 [cm]
Brennen auf dem Siebboden:		nein		B	16 [cm]
Versuchsende nach:		10 ' 00 ''		C	18 [cm]
Nachbrennen:		0 ' 00 ''		D	19 [cm]
Nachglimmen:		0 ' 00 ''			

Bemerkungen: Proben wurden mit 1mm Blechplatten hinterlegt Mittelwert: 17 [cm]

Anforderung der Brandschachtprüfung (gemäß DIN 4102-16) erfüllt für Baustoffklasse DIN 4102-B1

schwer entflammbar: ja

Prüfer:

Genehmigt:

Siemens Axiva
GmbH & Co. KG
Branchaus Höchst
Industriepark Höchst, C 369
D-65926 Frankfurt am Main

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Bericht	2003-1906	Anlage 1	10.10.2003

Prüfblatt nach DIN 4102-1 B2

Auftraggeber: Fa. 3i International Innovative Insulation S.A.

Material: Flachmaterial, „Isopipe SBI"
Density 0,070 g/m³

Klimalagerung (23°C / 50% rel. F.): 48 h

Prüfrichtung: längs, Kantenbeflammung

Beflammungszeit: 15 [s]

Proben Nr.			1	2	3	4	5
Probendicke		[µm]	9	9	9	9	9
Erreichen der 150mm Meßmarke nach		[s]	-	-	-	-	-
Gesamtbrennzeit		[s]	15	15	15	15	15
Abfallen von	nicht brennend nach	[s]	-	-	-	-	-
Probenteilen	brennend nach	[s]	-	-	-	-	-

Bemerkungen:

Prüfrichtung: quer, Kantenbeflammung

Beflammungszeit: 15 [s]

Proben Nr.			1	2	3	4	5
Probendicke		[µm]					
Erreichen der 150mm Meßmarke nach		[s]					
Gesamtbrennzeit		[s]					
Abfallen von	nicht brennend nach	[s]					
Probenteilen	brennend nach	[s]					

Bemerkungen:

Prüfer: Bürcle

Genehmigt: Schenkel

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Bericht **2001-1789** **19.12.2001**

Thema: Epiradiateur-Prüfung nach NF 92-501 an einem Material für die Fa. 3i International Innovative Insulation S.A..

Kurzfassung:

Im Auftrag der Fa. 3i International Innovative Insulation S.A. waren 4 Proben eines Materiales nach NF P 92-501 im Epiradiateur zu prüfen.

Materialkennzeichnung: ISOPIPE sheet, Dicke 5mm

Probenaufbau: Basis: synthetic rubber
Plasticisers
Mineral flame retardant fillers (Alumina trihydrated, magnesium hydroxide)
Organic anticoxidants
Flame retardants
Sulphur containing Curing agents

Eingangsdatum : **17.12.2001** Versuchsdatum: **19.12.2001**

Messungen/Beobachtungen: siehe Anlage 1

Klassifizierungsindex: **0** (Kurzzeitiges oberflächliches Brennen auf Vorder- und / oder Rückseite der Proben nach 20 – 45 Sekunden, jeweils < 5 Sekunden)

Nach Prüfung von 4 Proben erfüllt das Material die Anforderungen der **Klasse M1** nach NF P 92-507.

Dieser Bericht umfaßt 1 Seite und 1 Anlage.

Hinweise: # Das Prüfergebnis bezieht sich nur auf die geprüften Proben. Prüfbericht in 2-facher Ausfertigung.
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D-65926 Frankfurt am Main

Bericht	2001-1789	Anlage 1	19.12.2001

Auftraggeber: 3i international Innovative Insulation S.A.

Klimalagerung: (23°C/50% r.F.) >24h

Material: ISOPIPE sheet, Dicke 5mm

Eingangsdatum: 17.12.01

Prüfraum: 21°C/ 54%r.F.

Flammenhöhe

zeit	1	2	3	4
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Entzündung und Verlöschen der Vorderseite

	1	2	3	4
ti1	-	-	-	-
e1	-	-	-	-
ti1	-	-	-	-
e1	-	-	-	-
ti1	-	-	-	-
e1	-	-	-	-

Entzündung und Verlöschen der Rückseite

	1	2	3	4
ti2	-	-	-	-
e2	-	-	-	-
ti2	-	-	-	-
e2	-	-	-	-
ti2	-	-	-	-
e2	-	-	-	-

Kennzahlen

	1	2	3	4	MW
Summe Flammenhöhe	0	-	-	0	
Entzündungszeit ti	-	-	-	-	
Entzündungsdauer	-	-	-	-	
Klassifizierung q	0,00	0,00	0,00	0,00	0,00

wenn nicht zutreffend -

Prüfer: Schönig

Genehmigt: Kh.Schoebel
stellv.Leiter der Prüfstelle

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Testreport 2003-2042 04.12.2003

Test-procedure: **Testing of the surface flammability to certificate a low flame-spread characteristic according to Resolution MSC.61(67), FTP Code, Annex 1, Part 5**

Test institute: Brandhaus Höchst, Siemens Axiva GmbH & Co. KG,
Industriepark Höchst, C 369, D-60528 Frankfurt am Main

Customer: 3i International Innovation Insulation S.A.
Plant: 68° km. Nat. Road Athens-Lamia
G – 34100 Ritsona / Griechenland

Manufacturer: 3i International Innovation Insulation S.A.
Plant: 68° km. Nat. Road Athens-Lamia / G – 34100 Ritsona / Griechenland

Details of the product / test material:

Product:	Thermal insulating material; color: black
Article:	Isopipe sbi
Construction:	Manufactured on basis of synthetic rubber and contains flame retardants, Rubber protective additives and plasticizers; density: 0,070 g/cm³
Type of product:	Flat material
Use of product:	Thermal insulating pipes and sheets

Date of arrival: 25.11.2003 **Date of test:** 04.12.2003

Details of the test specimen:

3 (5) test specimen, dimensions: 800 mm x 155 mm

Nominal thickness:	9 mm	**Determ. thickness:**	9 mm
Nominal weight of surface:	-	**Determ. Weight of surface:**	679 g/m²
Colour top(test-)side:	black	**Colour underside:**	black
		Design:	uni

Further remarks:

Preparations for test:

Clima storage (23°C / 50 % relative humidity): > 72h

Test arrangement: vertical

Ignition source: Pilot flame vertical (non impinging mode): specimen 1-3

Specimen fixing/-backing: According to the requirements the specimens were wrapped in a single sheet of aluminium and were backed by and fixed to a cool board of non combustible refractory material (thickness 10 mm / density: 800 kg/m³)..

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Testreport 2003-2042 04.12.2003

Testresults:

Specimen no.			1	2	3	4	5
Measuring results:							
Ignition after		[s]	1	1	1		
Reaching the 50 mm station after		[s]	1	5	1		
the 100 mm station after		[s]	10	-	10		
the 150 mm station after		[s]	-	-	-		
the 200 mm station after		[s]	-	-	-		
the 250 mm station after		[s]	-	-	-		
the 300 mm station after		[s]	-	-	-		
the 350 mm station after		[s]	-	-	-		
the 400 mm station after		[s]	-	-	-		
Flames extinguish after		[s]	90	90	90		
Final spread of flame up to		[mm]	100	50	130		
Total duration of the test		[s]	270	270	270		
Observationsn:							
Specimen drips	No burning after	[s]	30	30	30		
off / pieces fall off	Burning after	[s]	-	-	-		
Smoke generation after		[s]	1	1	1		
Charring after		[s]	1	1	1		
Charring up to		[mm]	550	550	550		

Further remarks:	At once ignition and strong smoke production at the contact of the ignition flame.

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Testreport 2003-2042 04.12.2003

Surface flammability characteristic (measurement)

Specimen no.	Q_i MJ/m²	Q_{sb} MJ/m²	CFE kW/m²	Q_t MJ	q_p kW
1	0	n.d.	49,5	0,018	0,75
2	0	n.d.	50,5	0,009	0,15
3	0	n.d.	47,1	0,015	0,15
4					
5					
Average	**0**	**n.d.**	**49,03**	**0,014**	**0,35**

n.d. = according MSC.61(67), FTP Code, Annex 1, Part 5 not determinable, because 150 mm – mark not reached.

Surface flammability criteria

Materials giving average values for all of the surface flammability criteria as listed in the following table, are considered to meet the requirements for a low flame-spread characteristic in compliance with the relevant regulations of SOLAS.

Typ of material	Q_{sb} MJ/m²	CFE kW/m²	Q_t MJ	q_p kW
Limits for bulkhead, wall and ceiling linings	**≥ 1,5**	**≥ 20,0**	**≤ 0,7**	**≤ 4,0**
Limits for floor coverings	**≥ 0,25**	**≥ 7,0**	**≤ 2,0**	**≤ 10,0**

Q_{sb} = Heat for sustained burning

CFE = Critical flux at extinguishment

Q_t = Total heat release

q_p = Peak heat release rate

Q_i = Heat for ignition

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Testreport 2003-2042 04.12.2003

Classification:

The tested product:

Thermal insulating material; color: black
Isopipe sbi

passes the requirements for low flame spread according to IMO FTPC Part 5
(Test according to Resolution A.653(16) / Compliance with the regulations II-2/3.8, II-2/34 und II-2/49 SOLAS 1974)

for the use as thermal insulating pipes and sheets.

In accordance with IMO FTPC, Annex 2, 2.2, in general surface materials and primary deck coverings with both the total heat release $Q_t < 0{,}2$ MJ and the peak heat release rate $q_p < 1{,}0$ kW (in accordance with part 5, annex1 / resolution A.653(16)) are considered to comply with the requirements of part 2, annex 1 without further testing.

Remarks:

The test results relate only the behaviour of the test specimen of a product under the particular conditions of the test. They are not intended to be the only criterion that can cause potential fire hazards of the product in use.

The report contains 5 pages

Photo: see page 5

Remarks: # The result is only valid in regard to the tested samples. / Test report twice (german and english)
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Distributor	Signatures
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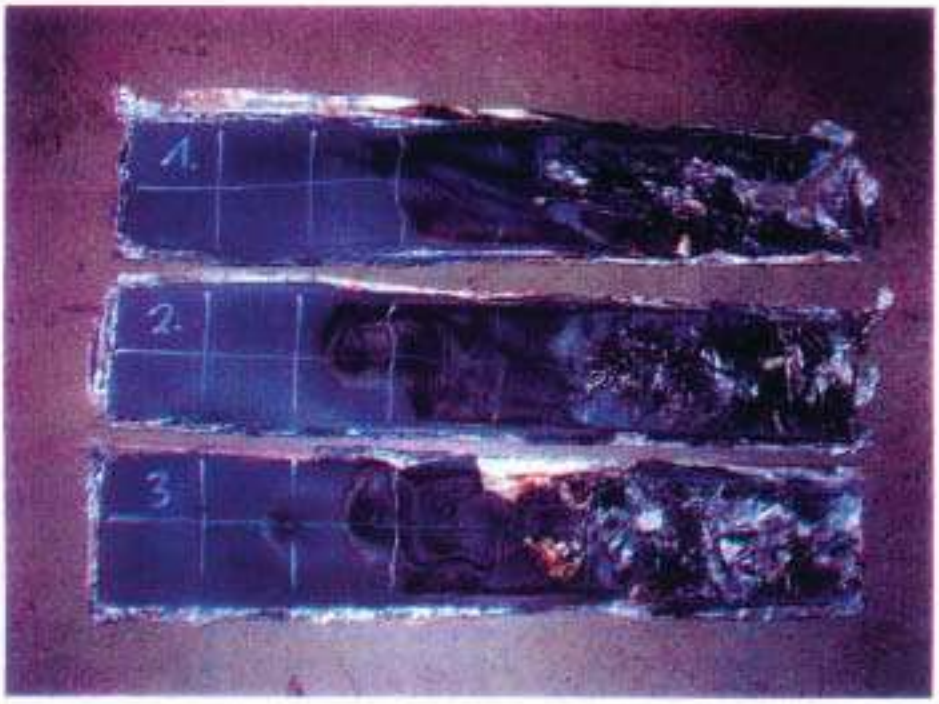
Das Brandhaus Höchst ist von der Bundesrepublik Deutschland anerkannte Prüfstelle für Brandprüfungen nach FTP-Code der IMO

Testreport	2003-2042	04.12.2003



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e-mail: brandhaus@siemens-axiva.com internet: www.siemens-axiva.com

FORSCHUNGSINSTITUT FÜR WÄRMESCHUTZ E.V. MÜNCHEN
Forschungs- und Prüftätigkeit auf dem Gebiet des Wärme- und Feuchteschutzes im Bauwesen und bei betriebstechnischen Anlagen
Staatlich anerkannte Prüf-, Überwachungs-, und Zertifizierungsstelle für Bauprodukte
Direktorium: Dr.-Ing. J. Achziger und Dipl.-Ing. H. Zehendner

82166 Gräfelfing Lochhamer Schlag 4 Tel.: 089/858000

PRÜFZEUGNIS *)
Nr. H-320/97
Prüfung des Brandverhaltens nach DIN 4102 Teil 1, Mai 1981, Baustoffklasse B2

Antragsteller: IBP International Building Products GmbH
35394 Giessen

Probenahme:
Ort: -
Datum: -
Art: durch Antragsteller im November 1997 übersandt

Bezeichnung: "ISOPIPE T.C. by 3i" 9 x 15

Art und Lieferform:
Wärmedämmschlauch aus Schaumstoff auf der Basis von synthetischem Kautschuk, Farbe: schwarz, Innendurchmesser: 15 mm, Dämmschichtdicke ca. 9 mm, Rohdichte: ca. 80 kg/m³.

Prüfung:
Die Prüfung erfolgte nach Abschnitt 6.2.4, Versuchsdurchführung und zwar mit Kantenbeflammung nach dem Abschnitt 6.2.4.2, mit Flächenbeflammung nach Abschnitt 6.2.4.3, und bei mehrschichtigen Baustoffen auch mit Beflammung der Probenvorderkante nach Abschnitt 6.2.4.5.

Ergebnisse:

Beflammung nach Abschnitt	6.2.4.2				
Probe Nr.	1	2	3	4	5
Dicke (mm)	9	9	9	9	9
Entzündung (s)	<0,5				
Erreichen der Meßmarke (s)	-	-	-	-	-
Größte Höhe der Flamme (cm)	6	6	6	6	6
Selbstverlöschen der Flamme (s)	16	16	16	16	16
Ende des Nachbrennens/ -glimmens (s)	-	-	-	-	-
Flammen wurden gelöscht (s)	-	-	-	-	-
Rauchentwicklung	mäßig				
Brennendes Abfallen (Abtropfen)	-	-	-	-	-
Aussehen nach der Prüfung	mäßig verbrannt, stark verrußt				

Besondere Beobachtungen: Brandkegel: 3 cm hoch, 0,9 cm tief

Beurteilung:
Der geprüfte Baustoff gilt in der Dicke _ 9 mm nach dem Abschnitt 6.2. als DIN 4102-B2, da die Meßmarke bei den Prüfungen von der Flammenspitze nicht erreicht wird.

Hinweis:
Dieses Prüfzeugnis ersetzt nicht ein ggfs. erforderliches "allgemeines bauaufsichtliches Prüfzeugnis".

Gräfelfing, 14. Januar 1998 Wi/Es

Das Direktorium

Dipl.-Ing. H. Zehendner

Forschungsinstitut für Wärmeschutz e.V. München FIW MÜNCHEN 2

Sachgebietsleiter

Dipl.-Ing. (FH) W. Albrecht

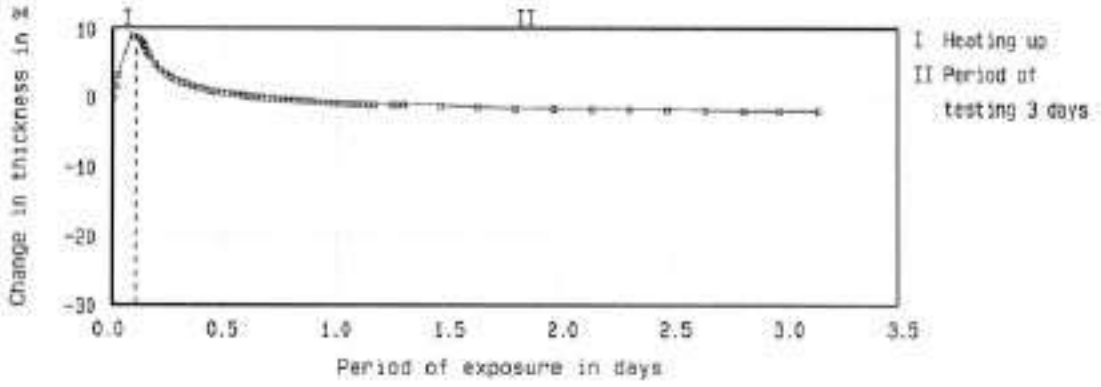
*) Die auszugsweise Veröffentlichung des Prüfzeugnisses ist nur mit schriftlicher Genehmigung des FIW München zulässig.

Determination of the behavior at high temperatures according to EN14707

Test report No: M-084a/10

Applicant:	**3i International Innovative Insulation S.A., Athens/Griechenland**
Material:	**Isopipe HT**
Material identification: (as given)	Tube made of flexible elastomeric foam; Colour: black Production code: 58080719
Sampling:	Sent by applicant
Goods Receipt:	No. 2857
Preparation of the material:	Tested thickness: 18.2 mm Mass: 65.4 g Density: 76.7 kg/m³ Testing load: 0.05 kN/m² (related to the surface: Diameter of test pipe x length)
Test equipment: Test conditions:	test pipe according to **EN14707:2005** , Diameter of test pipe: 28 mm, Length: 320 mm according to EN 14707:2005 Annex B

Experimental data: Change in thickness versus time at 150 °C warm side temperature
Speed of heating up to test temperature: 1 K/min



Properties of the material after measurement up to 150 °C warm side:

Self heating: —
Mass: 65.4 g Change in mass: 0.0 %

Remarks: —

Result: The change in thickness at 150 °C for testing time of 3 days was -1.9%.

Hint: For the hot-surface performance in practice, other longtime static and/or dynamic loading conditions will influence the dimensional stability of elastic, non rigid insulants accordingly.

Final remarks: -

Gräfelfing, 29.06.2010

Technical supervisor:
Dipl.-Ing. R. Alberti

Forschungsinstitut für Wärmeschutz e.V. München 13

Tester:
S. Tana

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ASTM E 84-16 Test Charts

Sample: "Isopipe TC"

Chart 1. FLAME SPREAD

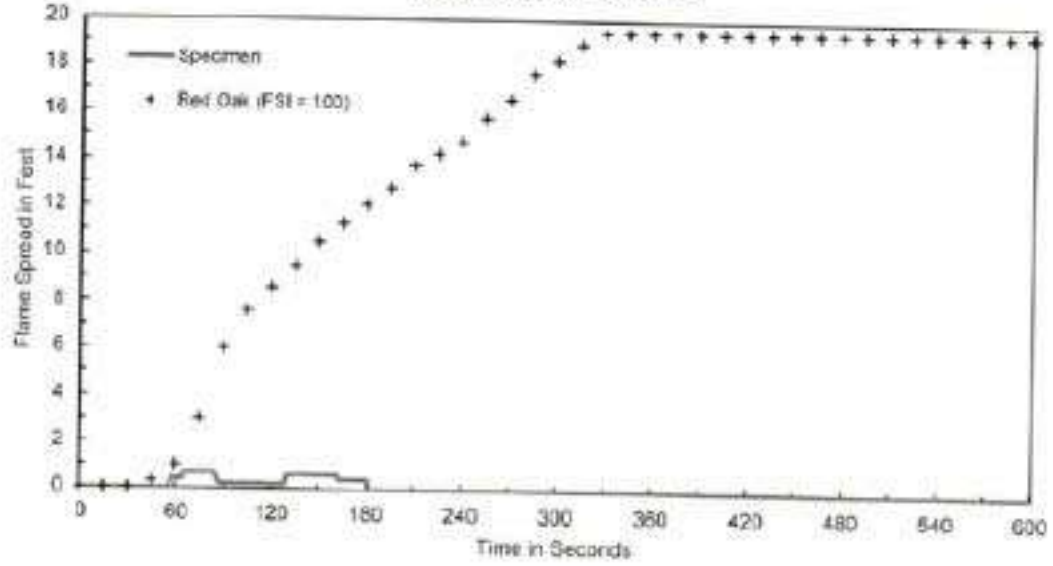
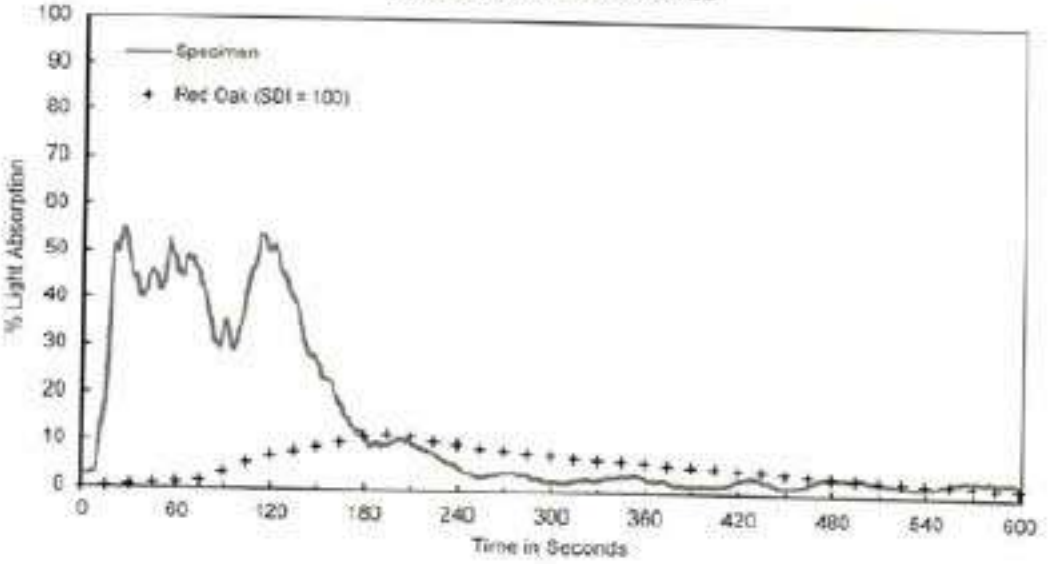


Chart 2. SMOKE DEVELOPED



Calculated Flame Spread (CFS)	Rounded Flame Spread Index (FSI)	Calculated Smoke Developed (CSD)	Rounded Smoke Developed Index (SDI)	Maximum 23' Air Temperature (°F)
3.3	**5**	215.7	**200**	398

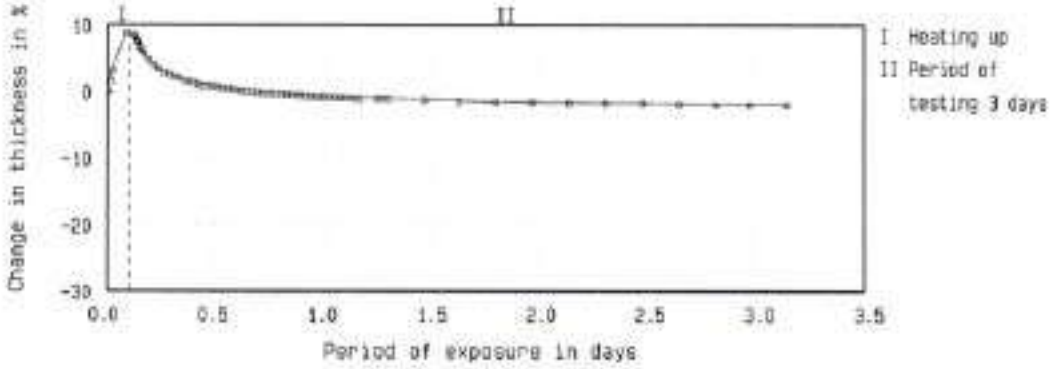
Forschungsinstitut für Wärmeschutz e.V. München

Determination of the behavior at high temperatures according to EN14707

Test report No: M-084a/10

Applicant:	**3i International Innovative Insulation S.A., Athens/Griechenland**
Material:	**Isopipe HT**
Material identification: (as given)	Tube made of flexible elastomeric foam; Colour: black Production code: 58080719
Sampling:	Sent by applicant
Goods Receipt:	No. 2967
Preparation of the material:	Tested thickness: 18.2 mm Mass: 65.4 g Density: 76.7 kg/m³ Testing load: 0.05 kN/m² (related to the surface: Diameter of test pipe x length)
Test equipment:	test pipe according to **EN14707:2005** , Diameter of test pipe: 28 mm, Length: 320 mm
Test conditions:	according to EN 14707:2005 Annex B

Experimental data: Change in thickness versus time at 150 °C warm side temperature
Speed of heating up to test temperature: 1 K/min



Properties of the material after measurement up to 150 °C warm side:

Self heating: —
Mass: 65.4 g Change in mass: 0.0 %

Remarks: —

Result: The change in thickness at 150 °C for testing time of 3 days was -1.8%.

Hint: For the hot-surface performance in practice, other longtime static and/or dynamic loading conditions will influence the dimensional stability of elastic, non rigid insulants accordingly.

Final remarks: -

Gräfelfing, 29.06.2010

Technical supervisor:
Dipl.-Ing. R. Alberti

Forschungsinstitut für Wärmeschutz e.V. München FIW MÜNCHEN 13

Tester:
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Hoch
Fladungen

Prüfinstitut für das Brandverhalten von Bauprodukten, Dipl.-Ing. (FH) Andreas Hoch
Bauaufsichtlich anerkannte Prüf-, Überwachungs- und Zertifizierungsstelle

PRÜFZEUGNIS

zum Nachweis des Brandverhaltens nach DIN 4102, Teil 1

Nr. PZ-Hoch-04653

Antragsteller:	**3i** INTERNATIONAL INNOVATIVE INSULATION S.A. ISOPIPE 28-30 Nafpliou St 144 52 Metamorfossi – Athens - GREECE
Art des Prüfmaterials:	Rohrisolierhülse
Bezeichnung des Prüfmaterials:	**Isopipe UV**
Inhalt des Antrags:	Prüfung auf Normalentflammbarkeit zur Einreihung in die Baustoffklasse B2 nach DIN 4102, Teil 1. (Mai 1998)
Geltungsdauer des Prüfzeugnisses:	31. Dezember 2009*)
Ergebnis:	**Das geprüfte Produkt erfüllt die Anforderungen der Baustoffklasse B2 für normalentflammbare Baustoffe nach DIN 4102, Teil 1.**

Hoch
Fladungen

Dieses Prüfzeugnis umfasst 3 Seiten.

Dieses Prüfzeugnis ersetzt nicht ein notwendiges allgemeines bauaufsichtliches Prüfzeugnis.

*) Verlängerung auf Antrag.

1. **Beschreibung des Versuchsmaterials im Anlieferungszustand:**

PN 3295: Rohrisolierhülse aus Kautschuk mit außenliegender weißer PE-Folie mit der Bezeichnung: **„Isopipe UV"**

Von der Prüfstelle ermittelte Kennwerte:
Außendurchmesser ≈ 62 mm, Innendurchmesser = 24mm
Metergewicht = 220g/m

Weitere Angaben sind dem Prüfinstitut nicht bekannt. Muster sind hinterlegt.

2. **Herstellung und Vorbehandlung der Proben:**

Aus dem angelieferten Material wurden für den Kantentest Proben in der Länge von 19 cm und für den Flächentest Proben in der Länge von 23cm hergestellt.
Die Proben wurden in einem Klima 23/50 bis zur Gewichtskonstanz gelagert.

3. **Probenanordnung:**

- auf Stahlrohr aufgezogen -

4. **Prüfdatum:** KW 50 in 2004

5. **Versuchsergebnisse:**

Die Prüfungen wurden nach DIN 4102-1, Abschnitt 6.2.5.2 durchgeführt.

PN 3295: „Isopipe UV"	Kantentest					Flächentest					Dim.
Proben-Nr.	1	2	3	4	5	1	2	3	4	5	
Entzündung[1)]	1	1	1	1	1	1	1	1	1	1	s
Erreichen d. Messmarke[1) 2)]	J.	J.	J.	J.	J.	J.	J.	J.	J.	J.	s
Maximale Flammenhöhe	13	11	14	13	12	10	11	11	9	10	cm
Zeitpunkt	17	15	19	18	20	15	14	15	15	15	s
Selbstverlöschen der Flammen Ende des Nachbrennens[1)]	J.	J.	J.	J.	J.	17	17	17	16	16	s
Ende des Glimmens[1)]	J.	J.	J.	J.	J.	J.	J.	J.	J.	J.	s
Flammen wurden gelöscht nach[1)]	30	30	30	30	30	J.	J.	J.	J.	J.	s
Rauchentwicklung (visuell)	stark					stark					
Brennendes Abtropfen innerhalb 20 s[1)]	J.	J.	J.	J.	J.	J.	J.	J.	J.	J.	s
Aussehen nach der Prüfung: Die Proben sind zerstört bis max. Breite 4cm x Höhe 10cm.											

[1)] Zeitangaben ab Versuchsbeginn
[2)] innerhalb 20 Sekunden
J. kein Auftreten des Ereignisses
-- keine Angabe

6. **Bemerkungen** - keine -

7. **Klassifizierung:**

7.1 **Einreihung in die Baustoffklasse:**

Aufgrund der vorstehenden Prüfungsergebnisse wird das in Abschnitt 1 beschriebene Versuchsmaterial als normalentflammbarer Baustoff in die Baustoffklasse "DIN 4102 - B2" eingereiht. Diese Klassifizierung gilt für die Anwendung mit innenliegendem Rohr.

7.2 **Beurteilung bezüglich brennenden Abtropfens/Abfallens:**

Das geprüfte Material gilt nach DIN 4102-1, Abschnitt 6.2.6.1, als nicht brennend abtropfend.

8. **Besondere Hinweise:**

Dieses Prüfzeugnis ersetzt nicht ein evtl. zusätzlich notwendiges "allgemeines bauaufsichtliches Prüfzeugnis".

Die o. a. Klassifizierung gilt nur für das in Ziffer 1 beschriebene Material. Der Verbund von brennbaren Materialien mit anderen, nichtbrennbaren oder brennbaren Materialien kann das Brandverhalten so ungünstig beeinflussen, daß die o. a. Baustoffklasse nicht mehr zutrifft. Es ist daher notwendig, das Brandverhalten von anderen als den geprüften Material-Verbunden (z.B. freihängend) nach DIN 4102 gesondert nachzuweisen.

Dieses Prüfzeugnis gilt nicht, wenn der Baustoff als Bauprodukt im Sinne der Landesbauordnungen verwendet wird (MBO § 20, Abs.3.)

Nach DIN 4102-1, Abschnitt 7, ist der Baustoff mit folgender Kennzeichnung zu versehen:

DIN 4102 – B2

9. **Gültigkeitsdauer dieses Prüfzeugnisses:**

Dieses Prüfzeugnis gilt bis zum auf der Seite 1 genannten Zeitpunkt.
Die Gültigkeitsdauer kann auf Antrag verlängert werden.

Sollten sich die den Brandprüfungen zugrunde gelegten Normen, bauaufsichtliche Richtlinien oder Prüfgrundsätze vor diesem Termin ändern, so wird dieses Prüfzeugnis in jedem Fall ungültig.

Fladungen, den 08. Dezember 2004

Sachbearbeiter

(Dipl.-Ing.(FH) Jürgen Hammer)

Leiter der Prüfstelle:

(Dipl.-Ing.(FH) Andreas Hoch)

RAPPORTO DI PROVA / *TEST REPORT*

NUMERO / NUMBER	DATA DI EMISSIONE / EMISSION DATE
0077\DC\REA\19_2	30/01/2019

BUSINESS UNIT	LABORATORIO / LABORATORY
B. U. Prodotto	Fisica della Combustione
B. U. Product	Physics of Combustion

IDENTIFICAZIONE E DESCRIZIONE DEL CAMPIONE / SPECIMEN DESCRIPTION

Isopipe TC

CLIENTE / CUSTOMER

3I - INTERNATIONAL INNOVATIVE INDUSTRIES SA
68 Km Nat. Road Athens-Lamia
GR-34100 RITSONA (GREECE)

NORMA DI RIFERIMENTO / REFERENCE STANDARD

EN ISO 11925-2 – Reaction to fire tests for building products – Part 2: Ignitability when subjected to direct impingement of flame (ISO 11925-2:2010)

egolf

GQ001 REV.00

CSI S.p.A. a socio unico
Società ad attività di direzione e coordinamento di IMQ Group S.r.l.
REA MI 1466310
R.I./C.F./P.I. 11380160151
Cap. Soc. € 1.040.000
Sede legale
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direzione-csi@legalmail.it | info@csi-spa.com | www.csi-spa.com

0077\DC\REA\19_2 30/01/2019

Dati generali / General data

Data ricevimento campione / Date of test specimen arrival:	03/12/2018
Data accettazione campione /Date of test specimen acceptance:	03/12/2018
Data inizio prove / Test beginning date:	29/01/2019
Data fine prove / Test end date:	29/01/2019
Luogo di prova/ Test site:	Viale Lombardia, 20, 20021 Bollate (MI) Italia
Deviazione dai metodi di prova/ Deviations from test methods:	NO/NO

Campionamento/Sampling

Il campionamento e il prelievo iniziali sono stati eseguiti da ispettore FIW e poi spediti al laboratorio dal Committente della prova. / The initial sampling has been done by FIW aduitor and then the customer sent the samples to the laboratory.

Campioni analizzati / Samples tested:

12 provette campione denominate / 12 specimens of sample identified:

Isopipe TC

Descrizione	:	Isolante elastomerico espanso per tubazioni.
Description	:	Elastomeric insulation foam for pipes.
Densità / Density	:	55±5 kg/m³
Spessore / Thickness	:	25 mm

Tipo di substrato: tubo in acciaio come da EN 15715:2009.
Substrate type: steel pipe complying EN 15715:2009.

Condizionamento secondo EN 13238: 23 °C - 50 % u.r. per 336 ore
Conditioning compliing EN 13238: 23 °C - 50 % r.h. for 336 hours

Dichiarazioni / Statement

I risultati di prova contenuti nel presente rapporto si riferiscono esclusivamente al campione provato / Test results contained in this test report pertain exclusively to the tested specimen

Il presente rapporto non può essere riprodotto parzialmente senza l'autorizzazione del Responsabile del Centro / This test report cannot be reproduced partially without the consent of the test center managing director

I dati tecnici riportati nella descrizione del campione sono desunti dalla scheda tecnica allegata dal cliente al campione di prova. / The technical data reported on the specimen description are taken from client technical sheet.

I risultati di prova si riferiscono esclusivamente al comportamento dei provini di un materiale nelle particolari condizioni della prova; essi non sono destinati ad essere l'unico criterio per la valutazione della pericolosità potenziale del materiale in opera. / The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

Risultati / Results:

Metodo di prova / Test method: EN ISO 11925-2:2010

Posizione del campione / Sample position:
Verticale, bloccato sul telaio standard, provato come tubo di lunghezza 250 mm.
Vertical position on standard frame, tested as pipe 250 mm long.

Tipo di innesco: Superficie
Impingment method: Surface
Tempo di innesco: 30 s
Flame application time: 30s

Identificazione provetta Specimen identification	Innesco [Si/No] Ignition [Yes/No]	Raggiungimento traguardo 150 mm entro 60 s [Si/No] Flame tip reaches 150 mm in 60 s [Yes/No]	Tempo per raggiungere traguardo 150 mm [s] Time at which flame reaches 150 mm [s]	Innesco del filtro di carta [Si/No] Ignition of the filter paper [Yes/No]
1	Si / Yes	No	0	No
2	Si / Yes	No	0	No
3	Si / Yes	No	0	No
4	Si / Yes	No	0	No
5	Si / Yes	No	0	No
6	Si / Yes	No	0	No

Tipo di innesco: Estremità
Impingment method: Edge
Tempo di innesco: 30 s
Flame application time: 30s

Identificazione provetta Specimen identification	Innesco [Si/No] Ignition [Yes/No]	Raggiungimento traguardo 150 mm entro 60 s [Si/No] Flame tip reaches 150 mm in 60 s [Yes/No]	Tempo per raggiungere traguardo 150 mm [s] Time at which flame reaches 150 mm [s]	Innesco del filtro di carta [Si/No] Ignition of the filter paper [Yes/No]
1	Si / Yes	No	0	No
2	Si / Yes	No	0	No
3	Si / Yes	No	0	No
4	Si / Yes	No	0	No
5	Si / Yes	No	0	No
6	Si / Yes	No	0	No

Fs < 150 mm in 60 s

DATA *Date*	Settore Fisica della Combustione *Physics of Combustion Sector*	B. U. Prodotto *B. U. Product*
30/01/2019	Dr. Lorenzo Zavaglio	Ing. P. Fumagalli

Documento firmato digitalmente ai sensi del D. Lgs. N. 82 del 7 Marzo 2005 e successive modifiche
Digitally signed document in accordance with Legislative Decree n. 82 dated March 7th 2005 and subsequent amendments.

42. CSI Spa #2 (IT)

RAPPORTO DI PROVA / *TEST REPORT*

NUMERO / NUMBER	DATA DI EMISSIONE / EMISSION DATE
0077\DC\REA\19_1	30/01/2019

BUSINESS UNIT	LABORATORIO / LABORATORY
B. U. Prodotto	Fisica della Combustione
B. U. Product	Physics of Combustion

IDENTIFICAZIONE E DESCRIZIONE DEL CAMPIONE / SPECIMEN DESCRIPTION

Isopipe TC

CLIENTE / CUSTOMER

3I - INTERNATIONAL INNOVATIVE INDUSTRIES SA

68 Km Nat. Road Athens-Lamia

GR-34100 RITSONA (GREECE)

NORMA DI RIFERIMENTO / REFERENCE STANDARD

EN 13823:2010+A1:2014 - Reaction to fire tests for building products – Building products excluding floorings exposed to the thermal attack by a single burning item

Pag. 1 di/of 8

GQ001 REV.00

CSI S.p.A. a socio unico società ad attività di direzione e coordinamento di IMQ Group S.r.l.
REA MI 1466310 R.I./C.F./P.I. 11380160151 Cap. Soc. € 1.040.000
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direzione-csi@legalmail.it | info@csi-spa.com | www.csi-spa.com

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Data fine prove / Test end date:	29/01/2019
Luogo di prova/ Test site:	Viale Lombardia, 20, 20021 Bollate (MI) Italia
Deviazione dai metodi di prova/ Deviations from test methods:	NO/NO

Campionamento/Sampling

Il campionamento e il prelievo iniziali sono stati eseguiti dal Committente della prova. / The initial sampling has been done by the customer.

Campioni analizzati / Samples tested:

3 provette campione denominate / 3 specimens of sample identified:

Isopipe TC

Descrizione	:	Isolante elastomerico espanso per tubazioni
Description	:	Elastomeric insulation foam for pipes.
Densità / Density	:	55±5 kg/m^3
Spessore / Thickness	:	25 mm

Tipo di substrato: tubo in acciaio come da EN 15715:2009.
Substrate type: steel pipe complying EN 15715:2009.

Allestimento del campione: Costruzione del provino come da EN 15715:2009. Giunto orizzontale standard..
Specimen mounting and fixing: Specimen mounting complying to EN 15715:2009. Standard horizontal joint.

Condizionamento secondo EN 13238: 23 °C - 50 % u.r. per 336 ore
Conditioning compliing EN 13238: 23 °C - 50 % r.h. for 336 hours

Dichiarazioni / Statement

I risultati di prova contenuti nel presente rapporto si riferiscono esclusivamente al campione provato / Test results contained in this test report pertain exclusively to the tested specimen

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I risultati di prova si riferiscono esclusivamente al comportamento dei provini di un materiale nelle particolari condizioni della prova; essi non sono destinati ad essere l'unico criterio per la valutazione della pericolosità potenziale del materiale in opera. / The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

Fotografie / Photographs:

Vista frontale ala lunga
Long wing front view

Angolo verticale esterno dell' ala lunga
Long wing vertical outer edge

Risultati / Results:

Metodo di prova / Test method: EN 13823:2010+A1:2014

Identificazione provetta *Specimen identification*	FIGRA 0.2MJ/0.4MJ [W/s]	THR [MJ]	LFS [Si/Yes – No/No]	SMOGRA [m^2/s^2]	TSP [m^2]	FDP [No/No - <10s - >10s]
1	158,7 a/at 345s 86,5 a/at 375s	4,6	No/No	906,6	521,7	No/No
2	214,9 a/at 336s 121,3 a/at 366s	4,7	No/No	888,0	457,8	No/No
3	195,1 a/at 342s 126,2 a/at 366s	4,3	No/No	964,0	480,9	No/No
Media *Average*	**189,6 111,3**	**4,5**	**No/No**	**919,5**	**486,8**	**No/No**

FIGRA = fire growth rate index

THR = total heat release

LFS = lateral flame spread

SMOGRA = smoke growth rate index

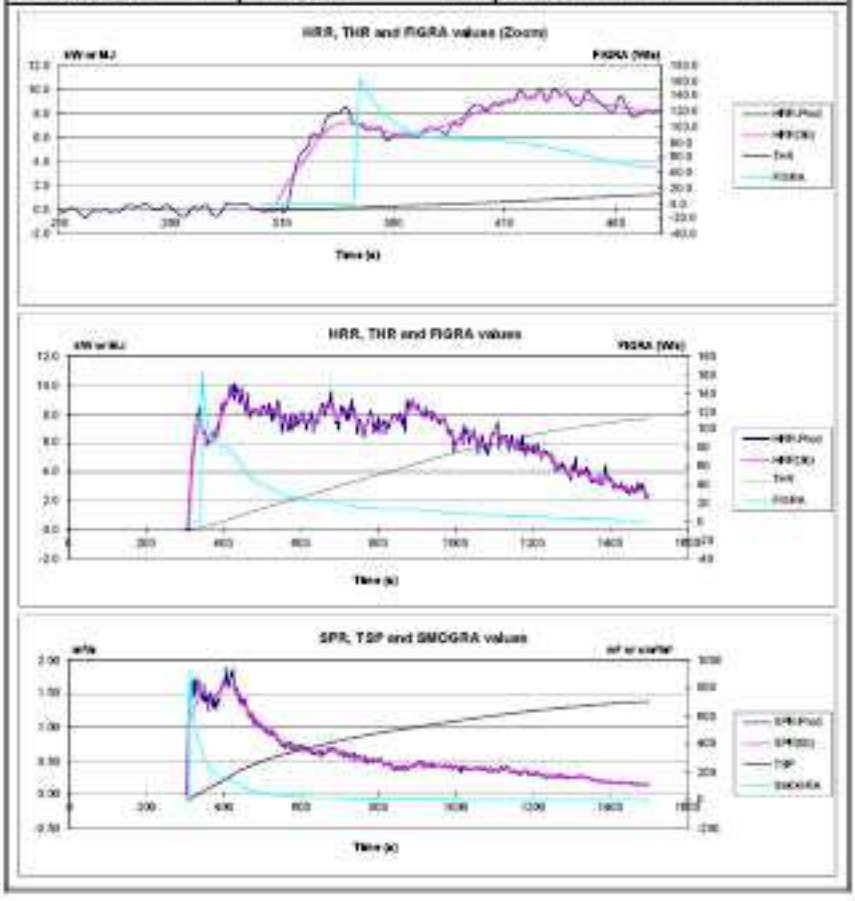
TSP = total smoke production

FDP = flaming droplets or particles

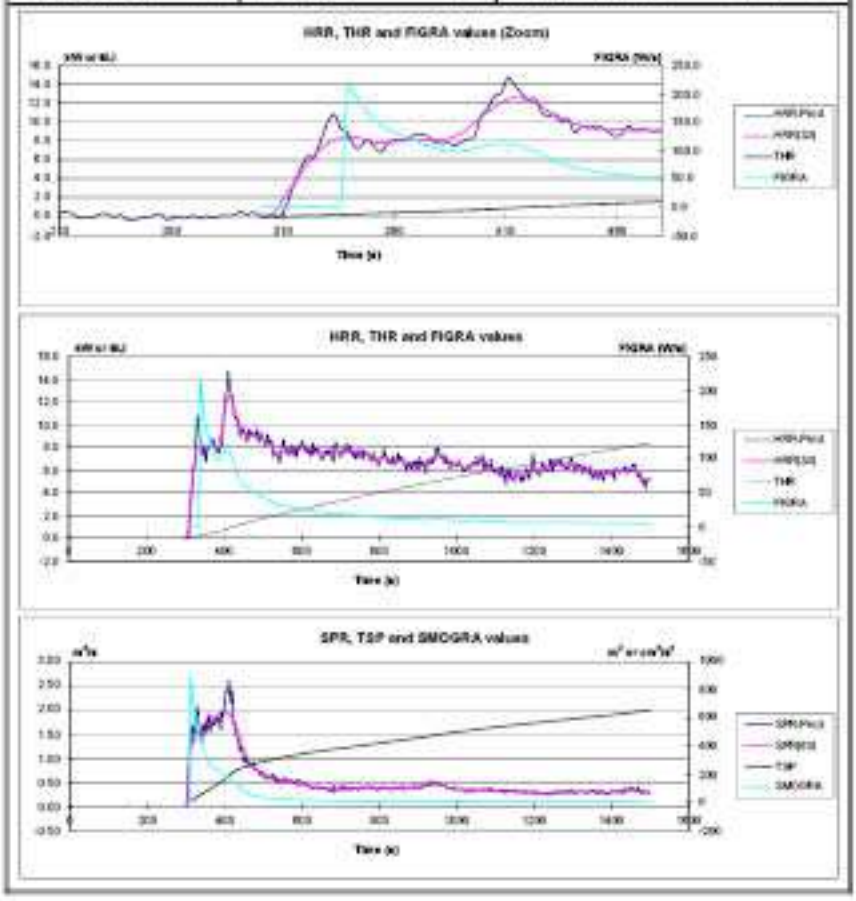
DATA *Date*	Settore Fisica della Combustione *Physics of Combustion Sector*	B. U. Prodotto *B. U. Product*
30/01/2019	Dr. Lorenzo Zavaglio	Ing. P. Fumagalli

Documento firmato digitalmente ai sensi del D. Lgs. N. 82 del 7 Marzo 2005 e successive modifiche
Digitally signed document in accordance with Legislative Decree n. 82 dated March 7th 2005 and subsequent amendments.

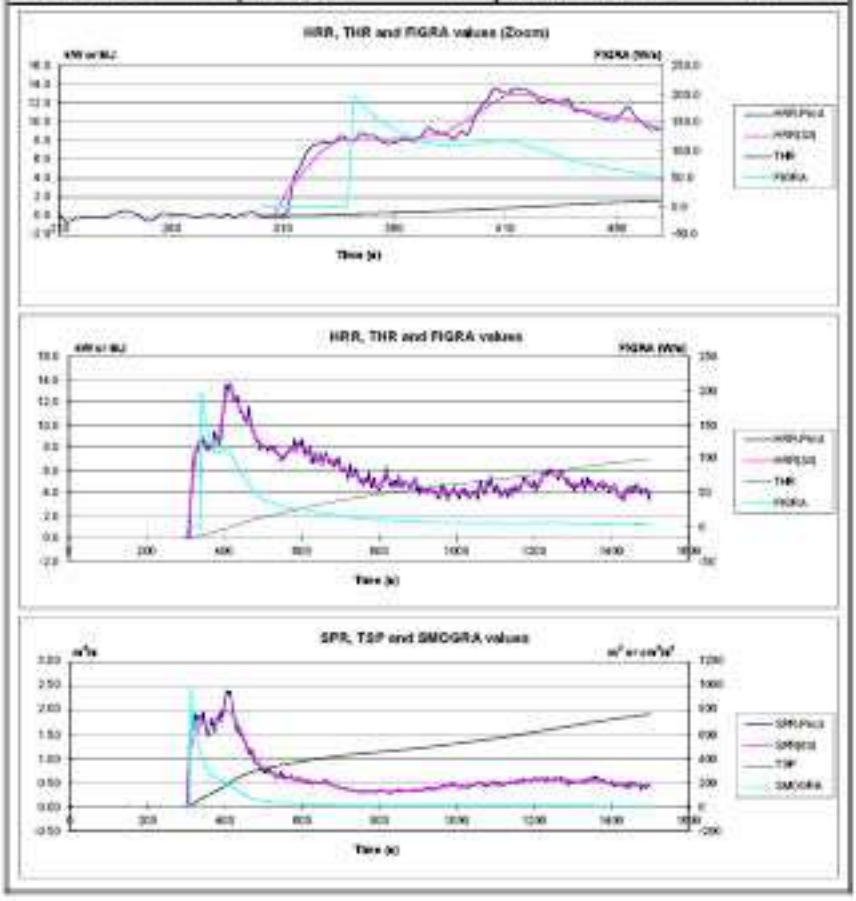
SBI Test Report



SBI Test Report



SBI Test Report



RAPPORTO DI PROVA / *TEST REPORT*

NUMERO / NUMBER	DATA DI EMISSIONE / EMISSION DATE
0077\DC\REA\19_3	30/01/2019

BUSINESS UNIT	LABORATORIO / LABORATORY
B. U. Prodotto	Fisica della Combustione
B. U. Product	Physics of Combustion

IDENTIFICAZIONE E DESCRIZIONE DEL CAMPIONE / SPECIMEN DESCRIPTION

Isopipe TC

CLIENTE / CUSTOMER

SI - INTERNATIONAL INNOVATIVE INDUSTRIES SA

68 km Nat. Road Athens-Lamia

GR-34100 RITSONA (GREECE)

NORMA DI RIFERIMENTO / REFERENCE STANDARD

EN 13501-1:2007+A1:2009 - Fire classification of construction products and building elements - Part 1: Classification using test data from reaction to fire tests

CSI S.p.A. a socio unico
soggetta ad attività di direzione e
coordinamento di M2 Gestioni S.r.l.

REA MI 1466310
R.I./C.F./P.I. 11360160151
Cap. Soc. € 1.040.000

Sede legale
Italia | 20030 Seregno (MI) | Cascina Traversagna 21
direzione-csi@legalmail.it | info@csi-spa.com | www.csi-spa.com

1. Dati generali / General data

Identificazione delle norme di riferimento / Standard reference identification:

- EN 13501-1:2007+A1:2009 - Fire classification of construction products and building elements - Part 1: Classification using test data from reaction to fire tests.
- EN ISO 11925-2:2010 Reaction to fire tests for building products - part. 2 -ignitability when subjected to direct impingement of flame.
- EN 13823:2010+A1:2014 - Reaction to fire tests for building products _ Building products excluding floorings exposed to the thermal attack by a single burning item.

2. Identificazione delle procedure / Procedures identification

Deviazione dai metodi di prova/ Deviations from test methods: NO/NO

3. Dettagli del prodotto classificato / Details of classified product

3.1. Natura e impiego / Nature and end use application :

Il prodotto ISOPIPE TC è definito come un isolante in elastomero flessibile espanso (FEF). La sua classificazione è valida per le seguenti condizioni di impiego:
The product ISOPIPE TC is defined as an flexible elastomeric foam (FEF) insulation. Its classification is valid for the following end use application(s):

- Parete – Incollato su supporto incombustibile
- Wall – Glued on non combustible substrate
- Soffitto – Incollato su supporto incombustibile
- Ceiling – Glued on non combustible substrate

3.2. Descrizione / Description :

Il prodotto ISOPIPE TC è compiutamente descritto nei rapporti di prova in sussidio della classificazione elencati in 5.1
The product ISOPIPE TC is fully described in the test reports in support of the classification listed in 5.1.

4. Dichiarazioni / Statements

- Questo rapporto di classificazione definisce la classificazione assegnata al prodotto indicato in copertina secondo le procedure stabilite nella norma EN 13501-1.
  This classification report defines the classification assigned to the product mentioned on the cover in accordance with the procedures given in EN 13501-1.
- I risultati di prova contenuti nel presente rapporto di classificazione si riferiscono esclusivamente al campione provato
  Test results contained in this classification report relate only to the specimens tested.
- Il presente rapporto di prova non può essere riprodotto parzialmente senza l'autorizzazione del Responsabile di Laboratorio
  test report shall not be reproduced except in full without the written approval of the Managing Director.

5. Rapporti di prova e risultati di prova in supporto di questa classificazione / Test reports and test results in support of this classification

5.1. Rapporti di prova / test reports

Nome del laboratorio / Name of laboratory	Nome del Committente / Name of sponsor	Numero di identificazione del rapporto di prova / Test report ref. No.	Metodo di prova / test method
CSI S.p.A.	3I - INTERNATIONAL INNOVATIVE INDUSTRIES SA	0077/DC/REA/19_1	EN 13823
CSI S.p.A.	3I - INTERNATIONAL INNOVATIVE INDUSTRIES SA	0077/DC/REA/19_2	EN ISO 11925-2

5.2. Risultati di prova per prodotti isolanti termici per tubazioni lineari / Test results for linear pipe thermal insulation products

Metodo di prova / Test method	Parametro / Parameter	Numero di prove / Number of tests	Risultati / Results	
			Parametri continui media / Continuous parameter average	Parametri di conformità / Compliance parameter
EN ISO11925-2 Attacco della fiamma in superficie Surface flame attack Applicazione 30 s / 30 s exposure	Fs ≤ 150 mm	6	(-)	S / Y
Attacco della fiamma all'estremità Edge flame attack Applicazione 30 s / 30 s exposure	Fs ≤ 150 mm	6	(-)	S / Y
Gocce/parti accese / Flamig droplets/particle	Innesco della carta da filtro/ Ignition of the filter paper	12	(-)	S / Y
EN 13823	FIGRA $_{0,2MJ}$	3	189,6	(-)
	FIGRA $_{0,4MJ}$		111,3	(-)
	LFS < Edge		(-)	S / Y
	THR$_{600s}$ [MJ]		4,5	(-)
	SMOGRA [m^2/s^2]	3	919,5	(-)
	TSP$_{600s}$ [m^2]		486,8	(-)
	Gocce/parti accese Flaming droplets/ particles	3	(-)	S / Y

6. **Classificazione e campo diretto di applicazione / Classification and direct field of application**

6.1. Riferimenti e campo diretto di applicazione / Reference and direct field of application

Questa classificazione è stata condotta conformemente alla clausola 10.2 della EN 13501-1:2007+A1:2009.
This classification has been carried out in accordance with clause 10.2 of EN 13501-1:2007+A1:2009.

6.2. Classificazione / Classification
Il prodotto ISOPIPE TC in relazione al suo comportamento alla reazione al fuoco è classificato:
The product ISOPIPE TCin relation to its fire reaction behaviour is classified:

B_L

La classificazione aggiuntiva in relazione allo sviluppo di fumo è:
The additional classification in relation to smoke production is:

s3

La classificazione aggiuntiva in relazione alle gocce/particelle accese è:
The additional classification in relation to flaming droplets/particles is:

d0

Il formato per la classificazione di reazione al fuoco per i prodotti isolanti termici per tubazioni lineari è la seguente:
The format of the reaction to fire classification for cons for linear pipe thermal insulation products is:

Comportamento al fuoco Fire behaviour		Sviluppo di fumo Smoke production			Parti infiammate Flaming droplets	
B_L	**-**	**s**	**3**	**-**	**d**	**0**

6.3. Campo di applicazione / Field of application
Questa classificazione è valida per le seguenti condizioni di impiego /
This classification is valid for the following end use conditions:

- Rivestimento di tubazioni
  Pipe covering
- Spessore fino a 25 mm
  Until 25 mm thick

7. Limitazioni / Limitations

7.1. Avvertimento / Warning

Questo documento non rappresenta un'approvazione di tipo od una certificazione del prodotto
This document does not represent type approval or certification of the product.

DATA *Date*	Settore Fisica della Combustione *Physics of Combustion Sector*	B. U. Prodotto *B. U. Product*
	Dr. Lorenzo Zavaglio	Ing. P. Fumagalli
30/01/2019		

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Digitally signed document in accordance with Legislative Decree n. 82 dated March 7th 2005 and subsequent amendments.

44. VKF AEAI (CH)

Vereinigung Kantonaler Feuerversicherungen

Auskunft über die Anwendbarkeit
gemäss den Schweizerischen
Brandschutzvorschriften

VKF Technische Auskunft Nr. 27749

Gesuchsteller
3i International Innovative Industries SA
Nafpliou 26 & Daskaloglanni
144 52 Metamorfosi Attiki
Greece

Hersteller
3i International Innovative Industries SA
144 52 Metamorfosi Attiki
Greece

Gruppe	142 - Rohrisolationen
Produkt	ISOPIPE TC
Beschrieb	Rohrisolation aus Elastomerschaum, RD=52.5kg/m3
Anwendung	RF2 (cr)
Unterlagen	LNE, Paris: Prüfbericht 'P157526 DE/1' (14.06.2016), Prüfbericht 'P157526 DE/2' (14.06.2016), Klassifizierungsbericht 'P157526 DE/3' (14.06.2016); ZUS, Prag: Bescheinigung der Leistungsbeständigkeit '1020-CPR-010030261' (10.01.2014); Hersteller: Leistungserklärung '1020-CPR-010030261' (01.07.2016)
Prüfbestimmungen	EN ISO 11925-2, EN 13823
Beurteilung	Klassifizierung BL-s3,d0

Gültigkeitsdauer	31.12.2023
Ausstelldatum	22.03.2016
Ersetzt Dokument vom	-

Anerkennungsstelle der
kantonalen Brandschutzbehörden

M. Donzé
Marcel Donzé

G. Rappo
Gérald Rappo

CSI

DIVISIONE: **TESTING-CERTIFICAZIONE**
DIVISION: ***TESTING & CERTIFICATION***

LABORATORIO: **Fisica della Combustione**
LABORATORY: ***Physics of Combustion***

RAPPORTO DI PROVA *(Test Report)*	Pag. di/*of* pag.	**1/5**
N° **0437\DC\REA\18_1**	Data: *Date:*	**14/05/2018**

IDENTIFICAZIONE E DESCRIZIONE DEL CAMPIONE:
SPECIMEN DESCRIPTION:

Nome commerciale ....: **ISOPIPE TC ROLLS**
Product Name
Descrizione ....: **Isolante elastomerico espanso**
Description ....: ***Elastomeric insulation foam***

DATI IDENTIFICATIVI DEL CLIENTE:
CLIENT:

Nome / *Name*.............................: **3I - INTERNATIONAL INNOVATIVE INDUSTRIES SA**
Indirizzo / *Address*.....................: **68 km Nat. Road Athens-Lamia**
Città / *City*..................................: **GR-34100 Ritsona (Greece)**

NORMA DI RIFERIMENTO:
REFERENCE STANDARD:

Norma Tecnica /*Technical standard*: **ISO 5658-2:2006+A1:2011 - Reaction-to-fire tests – Spread of flame – Part 2: Lateral spread on building products in vertical configuration**

DISTRIBUZIONE ESTERNA:
OUTSIDE DISTRIBUTION:

Originale cliente
Original : Client

DISTRIBUZIONE INTERNA:
INSIDE DISTRIBUTION:

Copia capo laboratorio
Copy: Head of laboratory

ENTE DI ACCREDITAMENTO:
ACCREDITATION BODY:

ACCREDIA

LAB N°0006
Signatory of EA, IAF and ILAC
Mutual Recognition Agreements

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CSI S.p.A.
Sede Legale
Cascina Traversagna 21
20030 SENAGO (MI)

Direzione - Uffici - Laboratori
Viale Lombardia 20 - 20021 BOLLATE (MI)
Tel. +39 02 383301 - Fax +39 02 3503940
www.csi-spa.com

REA [illegible]
Registro Imprese [illegible]
C.F./P.I. [illegible]
Cap. Soc. [illegible]

DATI GENERALI / *GENERAL DATA :*

- Data ricevimento campioni / *Product supply date* ....: **13.03.2018**
- Data esecuzione prove / *Date of test* ....: **11.05.2018**
- Identificazione delle norme di riferimento ....: **ISO 5658-2:2006+A1:2011**
  Standard reference identification

  Campionamento / *Sampling* ....: **Provette ricavate dal laboratorio su lotto di materiale fornito dal cliente.**
  Specimens taken from sample supplied by the client.

  Prova di Reazione al fuoco secondo la metodologia ..: **ISO 5658-2:2006+A1:2011**
  Reaction fire test methodology

  Condizionamento / *Conditioning* ....: **23±2 °C – 50±5 % u.r. fino massa costante**
  23±2°C – 50±5% r.h. until constant mass

- Procedura normalizzata / *Standard procedure* ....: **SI / *Yes***
- Deviazione dai metodi di prova ....: **NO / *No***
  Standard procedure deviation
- Controllo calcoli / *Calculation check* ....: **SI / *Yes***

CAMPIONI ANALIZZATI / *SAMPLES TESTED:*

- 3 Provette campione denominate / 3 *Specimens of sample identified:*

  ISOPIPE TC ROLLS

  Descrizione ....: **Isolante elastomerico espanso**
  Description ....: ***Elastomeric insulation foam***
  Massa areica ....: **57,5 ± 7,5 kg/m²** Spessore....: **13 mm**
  Mass per area unit ....: ***57,5 ± 7,5 kg/m²*** *Thickness* ....: ***13 mm***

Tipo di substrato / *Substrate type:*
Lastra in acciaio come da EN 45545-2:2013+A1:2015 tabella 7.
Stell sheet complying to EN 45545-2:2013+A1:2015 table 7.
Allestimento del campione / *Specimen mounting and fixing:*
Incollato su supporto.
Glued on substrate.

DICHIARAZIONE / *STATEMENTS :*

- I risultati di prova contenuti nel presente rapporto si riferiscono esclusivamente al campione provato.
  Test results contained in this test report relate only to specimens tested.
- Il presente rapporto non può essere riprodotto parzialmente senza l'autorizzazione del Responsabile del Centro.
  The test report shall not be reproduced except in full without the written approval of the Managing Director.
- I dati tecnici riportati nella descrizione del campione sono desunti dalla scheda tecnica allegata dal cliente al campione di prova.
  The technical data reported on the specimen description are taken from client technical sheet.

RISULTATI / RESULTS:

ISO 5658-2:2006+A1:2011

Identificazione della provetta/ *Specimen identification*	**N. 1**	**N. 2**	**N. 3**	**Media** *Average*
Tempo di innesco / *Ignition time* [s]	1	2	1	**1**
Tempo di spegnimento / Flame out time [s]	13	10	15	**13**
Zona danneggiata / *Extent of burn* [mm]	370	370	370	**370**
Durata della prova / *Test duration* [s]	600	600	600	**600**
Calore medio per la combustione sostenuta / *Average heat for substained burning* [MJ/m^2]	0,281	0,077	0,038	**0,132**
Flusso di calore critico allo spegnimento *Critical heat flux at extinguishment* CFE [KW/m^2]	21,57	21,57	21,57	**21,57**

	RAPPORTO DI PROVA *(Test Report)*	Pag. di/*of* pag. 5/5
CSI	N° 0437\DC\REA\18_1	Data: *Date:* 14/05/2018

Il prodotto **è conforme** alla norma EN 45545-2:2013 requisiti **R1** per HL1, HL2 e HL3
per la prova **T02**
The product complies with the test T02 requirement R1 for HL1, HL2 and HL3 of standard EN 45545-2:2013

DATA *Date*	Settore Fisica della Combustione *Physics of Combustion Sector*	B. U. Prodotto *B. U. Product*
14/05/2018	Lorenzo Zavaglio	Ing. P. Fumagalli

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Mod. 31 Rev. 8

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Data: 2018.05.14 16:37:26 +02'00'

DIVISIONE: **TESTING-CERTIFICAZIONE**
DIVISION: ***TESTING & CERTIFICATION***

LABORATORIO: **Fisica della Combustione**
LABORATORY: ***Physics of Combustion***

RAPPORTO DI PROVA
(Test Report)

Pag. di/*of* pag. **1/4**

N° **0048\DC\TOX\18**

Data: *Date:* **14/05/2018**

IDENTIFICAZIONE E DESCRIZIONE DEL CAMPIONE:
SPECIMEN DESCRIPTION:

Nome commerciale ..... : **ISOPIPE TC ROLLS**
Product Name

Descrizione ..... : **Isolante elastomerico espanso**
Description ..... : ***Elastomeric insulation foam***

DATI IDENTIFICATIVI DEL CLIENTE:
CLIENT:

Nome / *Name*..... : **3I - INTERNATIONAL INNOVATIVE INDUSTRIES SA**
Indirizzo / *Address*..... : **68 km Nat. Road Athens-Lamia**
Città / *City*..... : **GR-34100 Ritsona (Greece)**

NORMA DI RIFERIMENTO:
REFERENCE STANDARD:

Norma Tecnica /*Technical standard*: **ISO 5659-2:2017**
Regola tecnica /*Technical rule*: **EN 45545-2:2013+A1:2015**

DISTRIBUZIONE ESTERNA: *OUTSIDE DISTRIBUTION:*	DISTRIBUZIONE INTERNA: *INSIDE DISTRIBUTION:*
Originale cliente *Original : Client*	**Copia capo laboratorio** *Copy: Head of laboratory*

ENTE DI ACCREDITAMENTO:
ACCREDITATION BODY:

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO

LAB N°0106
Signatory of EA, IAF and ILAC
Mutual Recognition Agreements

DATI GENERALI / *GENERAL DATA :*

- Data ricevimento campioni / *Product supply date* ....: **16.02.2018**
- Data esecuzione prove / *Date of test* ....: **19.03.2018**
- Identificazione delle norme di riferimento ....: **ISO 5659-2:2017**
  Standard reference identification **EN 45545-2:2013+A1:2015**

  Identificazione dei metodi di prova ....: //
  Test method identification

  Campionamento / *Sampling* ....: **Provette ricavata dal laboratorio su lotto di materiale fornito dal cliente.**
  Specimens taken by the laboratory on samples supplied by the client.

  Prova di Reazione al fuoco secondo la metodologia ..: **ISO 5659-2:2017**
  Reaction fire test methodology **EN 45545-2:2013+A1:2015 Annex C Method 1**

  Condizionamento / *Conditioning* ....: **23±2 °C – 50±5% u.r. per 36 ore**
  23±2°C – 50±5% r.h. for 36 hours

- Procedura normalizzata / *Standard procedure* ....: **SI / *Yes***
- Deviazione dai metodi di prova ....: **NO / *No***
  Standard procedure deviation
- Controllo calcoli / *Calculation check* ....: **SI / *Yes***

CAMPIONI ANALIZZATI / *SAMPLES TESTED:*

- 3 Provette campione denominate / 3 *Specimens of sample identified:*

  ISOPIPE TC ROLLS

  Descrizione ....: **Isolante elastomerico espanso**
  Description ....: ***Elastomeric insulation foam***
  Massa areica ....: **57,5 ± 7,5 kg/m²** Spessore....: **13 mm**
  Mass per area unit ....: ***57,5 ± 7,5 kg/m²*** *Thickness* ....: ***13 mm***

DICHIARAZIONE / *STATEMENTS*:

- I risultati di prova contenuti nel presente rapporto si riferiscono esclusivamente al campione provato.
  Test results contained in this test report relate only to specimens tested.
- Il presente rapporto non può essere riprodotto parzialmente senza l'autorizzazione del Responsabile del Centro.
  The test report shall not be reproduced except in full without the written approval of the Managing Director.
- I dati tecnici riportati nella descrizione del campione sono desunti dalla scheda tecnica allegata dal cliente al campione di prova.
  The technical data reported on the specimen description are taken from client technical sheet
- Questi risultati di prova si riferiscono solo al comportamento del prodotto nelle particolari condizioni di questa prova e non vogliono essere l'unico criterio per accertare il potenziale rischio di incendio del prodotto in utilizzo.
  These test results relate only to the behaviour of the product under the particular conditions of this test, and they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

RISULTATI / RESULTS:

- Metodo di prova / *Test method*:

  ISO 5659-2:2017

OPACITA' DEI FUMI / *SMOKE DENSITY*

	NON FLAMING 50 KW/m²		
Campione / *Specimen* N°	**D_{4min}**	**D_{max}**	**VOF4**
1	203,6	207,8	678,4
2	191,0	192,8	607,4
3	188,1	190,5	620,7
Media / Average	**194,2**	**197,0**	**635,5**

TOSSICITA' DEI FUMI / *SMOKE TOXICITY*

GAS	CONCENTRAZIONE 240 s *CONCENTRATION 240 s* ppm	CONCENTRAZIONE 480 s *CONCENTRATION 480 s* ppm
ANIDRIDE CARBONICA *CARBON DIOXIDE*	65,9	192,5
OSSIDO DI CARBONIO *CARBON MONOXIDE*	56,2	74,5
ACIDO CLORIDRICO *HYDROGEN CLORIDE*	<0,1	<0,1
ACIDO BROMIDRICO *HYDROGEN BROMIDE*	<0,1	<0,1
ACIDO FLUORIDRICO *HYDROGEN FLUORIDE*	<0,1	<0,1
ACIDO CIANIDRICO *HYDROGEN CIANIDE*	<0,1	<0,1
OSSIDI DI AZOTO *NITROGEN OXIDES*	9,0	10,4
ANIDRIDE SOLFOROSA *SULPHUR DIOXIDE*	1,1	4,2

NON FLAMING 50 KW/m2	
CIT 240s	CIT 480s
0,04	0,05

Il prodotto è **conforme** alla norma EN 45545-2:2013 requisiti **R1** per HL1
per le prove **T10.01, T10.02** e **T11.01**
*The product complies with the tests **T10.01, T10.02** and **T11.01** requirement **R1** for HL1*
of standard EN 45545-2:2013

DATA *Date*	Settore Fisica della Combustione *Physics of Combustion Sector*	B. U. Prodotto *B. U. Product*
14/05/2018	Lorenzo Zavaglio	Ing. P. Fumagalli

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Digitally signed document in accordance with Legislative Decree n. 82 dated March 7th 2005 and subsequent amendments.

Data: 2018.05.14
16:39:06 +02'00'

CSI

DIVISIONE: **TESTING-CERTIFICAZIONE**
DIVISION: ***TESTING & CERTIFICATION***

LABORATORIO: **Fisica della Combustione**
LABORATORY: ***Physics of Combustion***

	RAPPORTO DI PROVA *(Test Report)*	Pag. di/*of* pag. 1/5
	N° **0437\DC\REA\18_2**	Data: *Date:* **14/05/2018**

IDENTIFICAZIONE E DESCRIZIONE DEL CAMPIONE:
SPECIMEN DESCRIPTION:

Nome commerciale ....: **ISOPIPE TC ROLLS**
Product Name
Descrizione ....: **Isolante elastomerico espanso**
Description ....: ***Elastomeric insulation foam***

DATI IDENTIFICATIVI DEL CLIENTE:
CLIENT:

Nome / *Name*.........................: **3I - INTERNATIONAL INNOVATIVE INDUSTRIES SA**
Indirizzo / *Address*..................: **68 km Nat. Road Athens-Lamia**
Città / *City*...............................: **GR-34100 Ritsona (Greece)**

NORMA DI RIFERIMENTO:
REFERENCE STANDARD:

Norma Tecnica /*Technical standard*: **ISO 5660-1:2015 - Reaction-to-fire tests – Heat release, smoke production and mass loss rate**

DISTRIBUZIONE ESTERNA:
OUTSIDE DISTRIBUTION:

Originale cliente
Original : Client

DISTRIBUZIONE INTERNA:
INSIDE DISTRIBUTION:

Copia capo laboratorio
Copy: Head of laboratory

ENTE DI ACCREDITAMENTO:
ACCREDITATION BODY:

ACCREDIA
[illegible]

LAB N°0106
Signatory of EA, IAF and ILAC
Mutual Recognition Agreements

GRUPPO IMQ

CSI S.p.A.
Sede Legale
Cascina Traversagna 21
20010 [illegible] (MI)

Direzione - Uffici - Laboratori
Viale Lombardia, 20 - 20021 BOLLATE (MI)
Tel. +39 02 383301 - Fax +39 02 3503940
[illegible]

REA 1466116
Registro Imprese 152168/8028/18
C.F./P.I. IT 11360160151
Cap. Soc. € 1.040.000

DATI GENERALI / *GENERAL DATA* :

- Data ricevimento campioni / *Product supply date* ....: **18.04.2018**
- Data esecuzione prove / *Date of test* ....: **04.05.2018**
- Identificazione delle norme di riferimento ....: **ISO 5660-1:2015**
  Standard reference identification

  Campionamento / *Sampling* ....: **Provette ricavate dal laboratorio su lotto di materiale fornito dal cliente.**
  Specimens taken from sample supplied by the client.

  Prova di Reazione al fuoco secondo la metodologia...: **ISO 5660-1:2015**
  Reaction fire test methodology

  Condizionamento / *Conditioning* ....: **23±2 °C – 50±5 % u.r. fino a massa costante**
  23±2°C – 50±5% r.h. until constant mass

- Procedura normalizzata / *Standard procedure* ....: **SI / *Yes***
- Deviazione dai metodi di prova ....: **NO / *No***
  Standard procedure deviation
- Controllo calcoli / *Calculation check*....: **SI / *Yes***

CAMPIONI ANALIZZATI / *SAMPLES TESTED*:

- 3 Provette campione denominate / 3 *Specimens of sample identified*:

ISOPIPE TC ROLLS

Descrizione ....: **Isolante elastomerico espanso**
Description ....: ***Elastomeric insulation foam***
Massa areica ....: **57,5 ± 7,5 kg/m²** Spessore....: **13 mm**
Mass per area unit....: ***57,5 ± 7,5 kg/m²*** *Thickness* ....: ***13 mm***

Tipo di substrato / *Substrate type*:
Lastra in acciaio come da EN 45545-2:2013+A1:2015 tabella 7.
Stell sheet complying to EN 45545-2:2013+A1:2015 table 7.
Allestimento del campione / *Specimen mounting and fixing*:
Fissato su supporto.
Fixed on substrate.

DICHIARAZIONE / *STATEMENTS*:

- I risultati di prova contenuti nel presente rapporto si riferiscono esclusivamente al campione provato.
  Test results contained in this test report relate only to specimens tested.
- Il presente rapporto non può essere riprodotto parzialmente senza l'autorizzazione del Responsabile del Centro.
  The test report shall not be reproduced except in full without the written approval of the Managing Director.
- I dati tecnici riportati nella descrizione del campione sono desunti dalla scheda tecnica allegata dal cliente al campione di prova.
  The technical data reported on the specimen description are taken from client technical sheet.

RISULTATI / RESULTS:

Metodo di prova / *Test method*: **ISO 5660-1**

PROVINO N° / *SPECIMEN N°*	**1**	**2**	**3**	**Media** *Average*
Colore / *Colour*	Nero / *Black*	Nero / *Black*	Nero / *Black*	-
Spessore / *Thickness* [mm]	13	13	13	**13**
Preparazione del provino / *Specimen preparation*	Presenza del telaio di contenimento / *Retainer frame presence*			-
Area della superficie del provino / *Specimen surface area* [cm^2]	88,4	88,4	88,4	**88,4**
Massa iniziale del provino / *Specimen initial mass* [g]	69	68	69	**69**
Costante di calibrazione C della velocità del flusso nel condotto / *Orifice flow rate calibration costant C*	0,0417	0,0417	0,0417	**0,0417**
Irraggiamento / *Heat flux* [kW/m^2]	50	50	50	**50**
Velocità del flusso nel condotto di estrazione / *Exhaust system flow rate* [m^3/s]	0,024	0,024	0,024	**0,024**
Tempo di innesco / *Time to ignition* [s]	1	1	1	**1**
Tempo estinzione fiamma / *Flameout* [s]	46	44	52	**47**
Tempo di durata della prova / *Test end time* [s]	1200	1200	1200	**1200**
Valore medio nei primi 180 s dopo l'innesco / *Average values for the first 180 s after ignition* [kW/m^2]	40,6	39,1	38,4	39,4
Valore medio nei primi 300 s dopo l'innesco / *Average values for the first 300 s after ignition* [kW/m^2]	33,0	22,1	24,5	26,5
Calore totale rilasciato / *Total heat release* [MJ/m^2]	27,3	15,3	16,8	19,8
Picco del tasso di rilascio di calore / *Heat release rate peak* [kW/m^2]	96,7	83,4	85,9	60,4
Tasso di rilascio di calore medio / *Average heat release rate* [kW/m^2]	22,9	12,9	14,5	16,8
Massima emissione media di calore / *Maximum Average Heat Emission* (MAHRE) [kW/m^2]	92,3	77,5	80,4	**83,4**

	RAPPORTO DI PROVA *(Test Report)*	Pag. di/*of* pag. 5/5
CSI	N° 0437\DC\REA\18_2	Data: *Date:* 14/05/2018

Il prodotto è **conforme** alla norma EN 45545-2:2013+A1:2015 requisiti **R1** per HL1 e HL2
per la prova **T03.01**
*The product complies with the test **T03.01** requirement **R1** for HL1 and HL2 of standard EN 45545-2:2013+A1:2015*

DATA *Date*	Settore Fisica della Combustione *Physics of Combustion Sector*	B. U. Prodotto *B. U. Product*
14/05/2018	Lorenzo Zavaglio	Ing. P. Fumagalli

Documento firmato digitalmente ai sensi del D. Lgs. N. 82 del 7 Marzo 2005 e successive modifiche
Digitally signed document in accordance with Legislative Decree n. 82 dated March 7th 2005 and subsequent amendments.

Mod. RI. Rev. 8

ACCREDIA

GRUPPO IMQ

Data: 2018.05.14 16:38:16 +02'00'

LABORATORIO PREVENZIONE INCENDI s.r.l.
I-59100 PRATO - Loc. La Querce - Via della Quercia, 11
Telefono 0574.575.320 - Telefax 0574.575.323
e.mail: lapi@laboratoriolapi.it
web site: www.laboratoriolapi.it

CERTIFICATO DI REAZIONE AL FUOCO N. 5564

A) PRODUTTORE: **3 I International Innovative Insulation A.B.E.**

B) DENOMINAZIONE COMMERCIALE DEL MATERIALE:

ISOPIPE (32 mm)

C) CODICE DI IDENTIFICAZIONE DEL MATERIALE: **L/5564/2006**

D) IMPIEGO: **ISOLAMENTI DI TUBAZIONI E DI SERBATOI**

E) POSA IN OPERA: **APPOGGIATO A SUPPORTO INCOMBUSTIBILE**

In esito alle prove UNI 8457 (1987) - UNI 8457/A1 (1996); UNI 9174 (1987) - UNI 9174/A1 (1996) di cui ai Decreti Ministeriali del 26.06.84 e del 03.09.01 e successive modifiche e integrazioni, relativamente ai campioni presentati, al materiale commercialmente denominato **ISOPIPE (32 mm)** è attribuita, ai sensi del metodo di classificazione UNI 9177 (1987), la

CLASSE 1 (UNO)

di reazione al fuoco.

Costituiscono parte integrante del presente certificato n. **4** allegati.

IL DIRETTORE DEL LABORATORIO
Dott. Gian Carlo Borsini

Prato, 14.06.2006

Il presente certificato è valido unicamente per la campionatura sottoposta a prova.

Rapporto di prova n° L 5564/1

METODO DI PROVA

UNI 8457 (1987) - UNI 8457/A1 (1996)

Allegato al Certificato n° L 5564

Materiale: Anisotropo

Posa in opera: PARETE APPOGGIATO SU SUPPORTO INCOMBUSTIBILE

Provetta n°	Tempo post-combustione in secondi	Tempo post-incandescenza in secondi	Zona danneggiata in mm	Gocciolamento
1	0	0	90	Assente
2	0	0	95	Assente
3	0	0	90	Assente
4	0	0	90	Assente
5	0	0	80	Assente
6	0	0	90	Assente
7	0	0	90	Assente
8	0	0	100	Assente
9	0	0	85	Assente
10	0	0	95	Assente

Metodo di preparazione UNI 9176 (1998): D

	Valore	U. M.	Livello
Tempo di post-combustione	0	s	1
Tempo di post-incandescenza	0	s	1
Zona danneggiata	91	mm	1
Gocciolamento	Assente		1

CATEGORIA

I

Note:
- LATO ESPOSTO: LATO LISCIO -

LAPI SRL LABORATORIO PREVENZIONE INCENDI
Legalmente riconosciuto - Autorizzato dal Ministero dell'Interno

Data Prova: 14/06/2006

L'Operatore

Rapporto di prova n° **L 5564/2**

METODO DI PROVA

UNI 9174 (1987) - UNI 9174/A1 (1996)

Allegato al Certificato n° L 5564

Materiale: Anisotropo

			100	150	200	250	300	350	400	450	500	550	600	650	700	750	800
Tempo (in secondi) per raggiungere la distanza di mm	Provetta n°	1	58	=													
		2	49	=													
		3	51	=													
Velocità media di propagazione della fiamma in mm/sec.	Provetta n°	1	N.D.														
		2	N.D.														
		3	N.D.														

		Velocità propagazione fiamma in mm/min		Zona danneggiata in mm		Tempo post-incandescenza in secondi		Gocciolamento	
		Valore	Livello	Valore	Livello	Valore	Livello	Valore	Livello
Provetta n°	1	N.D.	1	100	1	N.D.	1	Spente	1
	2	N.D.	1	100	1	N.D.	1	Spente	1
	3	N.D.	1	100	1	N.D.	1	Spente	1

Metodo di preparazione UNI 9176 (1998): D

CATEGORIA

I

Posizione: PARETE

Posa in opera: PARETE APPOGGIATO SU SUPPORTO INCOMBUSTIBILE

Note:
- SENSO LONGITUDINALE -
- LATO ESPOSTO: LATO LISCIO -

LAPI - LABORATORIO PREVENZIONE INCENDI S.r.l.

Legenda
N.D.: Non Determinabile
La velocità è non determinabile quando la fiamma non raggiunge i 150 mm.
Il tempo di post-incandescenza è non determinabile quando la fiamma non raggiunge i 300 mm.

LAPI SRL LABORATORIO PREVENZIONE INCENDI
Legalmente riconosciuto - Autorizzato dal Ministero dell'Interno

Data Prova

14/06/2006

L'Operatore

LABORATORIO PREVENZIONE INCENDI s.r.l.
I-59100 PRATO - Loc. La Querce - Via della Querce, 11
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e.mail: lapi@laboratoriolapi.it
web site: www.laboratoriolapi.it

CERTIFICATO DI REAZIONE AL FUOCO N. 5563

A) PRODUTTORE: **3 I International Innovative Insulation A.B.E.**

B) DENOMINAZIONE COMMERCIALE DEL MATERIALE:

ISOPIPE (3 mm)

C) CODICE DI IDENTIFICAZIONE DEL MATERIALE: **L/5563/2006**

D) IMPIEGO: **ISOLAMENTI DI TUBAZIONI E DI SERBATOI**

E) POSA IN OPERA: **APPOGGIATO A SUPPORTO INCOMBUSTIBILE**

In esito alle prove UNI 8457 (1987) - UNI 8457/A1 (1996); UNI 9174 (1987) - UNI 9174/A1 (1996) di cui ai Decreti Ministeriali del 26.06.84 e del 03.09.01 e successive modifiche e integrazioni, relativamente ai campioni presentati, al materiale commercialmente denominato **ISOPIPE (3 mm)** è attribuita, ai sensi del metodo di classificazione UNI 9177 (1987), la

CLASSE 1 (UNO)

di reazione al fuoco.

Costituiscono parte integrante del presente certificato n. **4** allegati.

IL DIRETTORE DEL LABORATORIO
Dott. Gian Carlo Borsini

Prato, 14.06.2006

Il presente certificato è valido unicamente per la campionatura sottoposta a prova.

Rapporto di prova n° **L 5563/3**

METODO DI PROVA

UNI 9174 (1987) - UNI 9174/A1 (1996)

Allegato al Certificato n° L 5563

Materiale: Anisotropo

			100	150	200	250	300	350	400	450	500	550	600	650	700	750	800
Tempo (in secondi) per raggiungere la distanza di mm	**Provetta n°**	1	1	4	=												
		2	2	5	=												
		3	4	9	=												
Velocità media di propagazione della fiamma in mm/sec.	**Provetta n°**	1	0	16,67													
		2	0	16,67													
		3	0	10,00													

		Velocità propagazione fiamma in mm/min		Zona danneggiata in mm		Tempo post-incandescenza in secondi		Gocciolamento	
		Valore	Livello	Valore	Livello	Valore	Livello	Valore	Livello
Provetta n°	1	1000	2	150	1	N.D.	1	Assente	1
	2	1000	2	150	1	N.D.	1	Assente	1
	3	600	2	150	1	N.D.	1	Assente	1

Metodo di preparazione UNI 9176 (1998): D

CATEGORIA

1

Posizione: PARETE

Posa in opera: PARETE APPOGGIATO SU SUPPORRTO INCOMBUSTIBILE

Note:
- SENSO TRASVERSALE -
- LATO ESPOSTO: LATO LISCIO -

Legenda
N.D.: Non Determinabile
La velocità è non determinabile quando la fiamma non raggiunge i 150 mm.
Il tempo di post-incandescenza è non determinabile quando la fiamma non raggiunge i 300 mm.

LAPI SRL LABORATORIO PREVENZIONE INCENDI
Legalmente riconosciuto - Autorizzato dal Ministero dell'Interno

Data Prova **14/06/2006**

L'Operatore

Rapporto di prova n° **L 5563/2**

METODO DI PROVA

UNI 9174 (1987) - UNI 9174/A1 (1996)

Allegato al Certificato n° L 5563

Materiale: Anisotropo

			100	150	200	250	300	350	400	450	500	550	600	650	700	750	800
Tempo (in secondi) per raggiungere la distanza di mm	**Provetta n°**	1	2	5	=												
		2	1	4	=												
		3	2	8	=												
Velocità media di propagazione della fiamma in mm/sec.	**Provetta n°**	1	0	16,67													
		2	0	16,67													
		3	0	8,33													

		Velocità propagazione fiamma in mm/min		Zona danneggiata in mm		Tempo post-incandescenza in secondi		Gocciolamento	
		Valore	Livello	Valore	Livello	Valore	Livello	Valore	Livello
Provetta n°	1	1000	2	150	1	N.D.	1	Assente	1
	2	1000	2	150	1	N.D.	1	Assente	1
	3	500	2	150	1	N.D.	1	Assente	1

Metodo di preparazione UNI 9176 (1998): D

CATEGORIA

I

Posizione: PARETE

Posa in opera: PARETE APPOGGIATO SU SUPPORTO INCOMBUSTIBILE

Note:
- SENSO LONGITUDINALE -
- LATO ESPOSTO: LATO LISCIO -

Legenda
N.D.: Non Determinabile
La velocità è non determinabile quando la fiamma non raggiunge i 150 mm.
Il tempo di post-incandescenza è non determinabile quando la fiamma non raggiunge i 300 mm

LAPI SRL LABORATORIO PREVENZIONE INCENDI
Legalmente riconosciuto - Autorizzato dal Ministero dell'Interno

Data Prova **14/06/2006**

L'Operatore

Rapporto di prova n° **L 5563/1**

METODO DI PROVA

UNI 8457 (1987) - UNI 8457/A1 (1996)

Allegato al Certificato n° **L 5563**

Materiale: Anisotropo

Posa in opera: PARETE APPOGGIATO SU SUPPORTO INCOMBUSTIBILE

Provetta n°	Tempo post-combustione in secondi	Tempo post-incandescenza in secondi	Zona danneggiata in mm	Gocciolamento
1	0	0	90	Assente
2	0	0	95	Assente
3	0	0	95	Assente
4	0	0	90	Assente
5	0	0	80	Assente
6	0	0	90	Assente
7	0	0	100	Assente
8	0	0	90	Assente
9	0	0	85	Assente
10	0	0	80	Assente

Metodo di preparazione UNI 9176 (1998): D

	Valore	U. M.	Livello
Tempo di post-combustione	0	s	1
Tempo di post-incandescenza	0	s	1
Zona danneggiata	90	mm	1
Gocciolamento	Assente		1

CATEGORIA

I

Note:
- LATO ESPOSTO: LATO LISCIO -

LAPI SRL LABORATORIO PREVENZIONE INCENDI
Legalmente riconosciuto - Autorizzato dal Ministero dell'Interno

Data Prova
14/06/2006

L'Operatore

scheda tecnica

A) AZIENDA PRODUTTRICE: **3i International Innovative Insulation S.A.**

B) DENOMINAZIONE COMMERCIALE DEL MATERIALE: **ISOPIPE**

C) DESCRIZIONE DEL MATERIALE:

Elastomero espanso a celle chiuse per isolamento termico (3 mm)

1) **Natura dei componenti**:

Gomma nitrilica	al 15%
Pvc	al 15%
Agenti vulcanizzanti, espandenti, antifiamma ed antiozonanti	al 70%
totale	100%

2) **Formato**: Rotoli h.100 cm, 150 cm
Tubi con diam. Interno da 6 mm a 42 mm
Spessore 3 mm

3) **Peso: 210** g/mq

Il materiale è anisotropo a facce diverse
Lato in vista : lato liscio

D) ASSIEMAGGIO DEI DIVERSI COMPONENTI: **MESCOLAZIONE**

E) POSA IN OPERA: **appoggiato a supporto incombustibile**

F) IMPIEGO: **Isolamenti di tubazioni e di serbatoi**

G) MANUTENZIONE: **lavaggio con acqua e comune detersivo**

Data, 04/04/2006

3i INT. INNOVATIVE INSULATION ABE
Head Office: 26, Nafpliou Str. - 14452
ATHENS-GREECE TEL: ++30-210-2854555 - FAX: ++30-2102619219
FACTORY: 68th Km Nat. Rd Athens-Lamia, 34100 Ritsona Hellas
TEL: ++30-262-71867 FAX: ++30-262-72006
GREECE - VAT REG No EL 094460772

Allegato al Certificato di Reazione al Fuoco n.005563 del 14 GIU 06
LA.P.I. s.r.l.
Laboratorio Prevenzione Incendi

Firma (il Legale Rappresentante)

MOD. 4 VHC

26245

Ministero dell'Interno

DIPARTIMENTO DEI VIGILI DEL FUOCO, DEL SOCCORSO PUBBLICO E DELLA DIFESA CIVILE

DIREZIONE CENTRALE PER LA PREVENZIONE E LA SICUREZZA TECNICA

AREA V – PROTEZIONE PASSIVA

VISTO il Decreto Ministeriale 26 giugno 1984 concernente "Classificazione di reazione al fuoco ed omologazione ai fini della prevenzione incendi ";

VISTI il Decreto Ministeriale 03 Settembre 2001, recante "Modifiche ed integrazioni al Decreto 26 giugno 1984 concernente classificazione di reazione al fuoco ed omologazione ai fini della prevenzione incendi " e il Decreto Ministeriale 28 maggio 2002 recante rettifiche al decreto medesimo;

VISTA la circolare del Ministero dell'Interno n. 17 MI.SA. (87) 10 del 16 aprile 1987 concernente "REAZIONE AL FUOCO. Omologazioni ed estensioni delle omologazioni per materiali omogenei prodotti in spessori e colori variabili";

VISTA l'istanza presentata dalla ditta 3I INTERNATIONAL INNOVATIVE INSULATION ABE sita in 26, Nafpliou Str. - 14452 ATHENS (GRECIA), produttrice del materiale denominato "ISOPIPE" per ottenere l'omologazione del materiale stesso nella serie di spessori da 3 mm. a 32 mm.;

VISTI i certificati di reazione al fuoco nn. 5563 e 5564 del 14/06/2006 e le successive note integrative nn. 35/Min/08/GG-36/Min/08/GG del 12/12/2008 emessi per il predetto materiale dal L.A.P.I. S.p.A. di PRATO ;

VISTE le schede tecniche, allegate ai predetti certificati, prodotte dalla ditta 3I INTERNATIONAL INNOVATIVE INSULATION ABE di ATHENS (GRECIA)

SI OMOLOGA

con il numero di codice EUGR2773C50D100001, il prototipo del materiale denominato "ISOPIPE" prodotto dalla ditta 3I INTERNATIONAL INNOVATIVE INSULATION ABE di ATHENS (GRECIA), ai soli fini della prevenzione incendi, nella CLASSE di REAZIONE al FUOCO 1 (UNO) e se ne AUTORIZZA la riproduzione nella serie di spessori da3 mm. a 32 mm., ai sensi dei decreti ministeriali citati in premessa, conformemente a tutte le caratteristiche apparenti e non apparenti, nonché a quelle dichiarate dalla predetta ditta nelle schede tecniche parimenti citate in premessa.

Sul marchio o sulla dichiarazione di conformità, da allegarsi ad ogni tipo di fornitura del materiale oggetto della presente omologazione, dovranno essere riportati:

- NOME DEL PRODUTTORE: Ditta 3I INTERNATIONAL INNOVATIVE INSULATION ABE (o altro segno distintivo);
- ANNO DI PRODUZIONE: (da indicarsi);
- CLASSE DI REAZIONE AL FUOCO: 1 (UNO);
- CODICE: EUGR2773C50D100001;
- POSA IN OPERA: APPOGGIATO SU SUPPORTO INCOMBUSTIBILE;
- IMPIEGO: ISOLAMENTI DI TUBAZIONI E DI SERBATOI;
- MANUTENZIONE: METODO "D" COME DA UNI 9176 (1998).

Si richiamano tutti gli obblighi di legge spettanti al produttore e a tutti i soggetti comunque interessati, a norma del Codice Civile, del Codice Penale e dei decreti ministeriali 26 giugno 1984 e 3 settembre 2001.

Il presente atto, ad eccezione dei casi di decadenza e revoca dell'omologazione previsti dall'art. 9, punti 2 e 3, del D.M. 26/6/84, ha una validità di anni 5 dalla data di rilascio ed è rinnovabile alla sua scadenza. Inoltre il presente atto decade, ai fini della produzione, al termine del periodo di coesistenza previsto per la specificazione tecnica relativa al materiale medesimo, in conformità a quanto previsto dal D.M. 10/03/2005 al quale si rimanda per gli opportuni approfondimenti.

Roma, 17 LUG. 2009

Fasc. 3807 sott. 3178

IL DIRETTORE CENTRALE
(STOCCHI)

N.B. IL PRESENTE ATTO DI OMOLOGAZIONE E' RIPRODUCIBILE UNICAMENTE NELLA SUA INTEGRALE STESURA

YMPÄRISTÖMINISTERIÖN
TYYPPIHYVÄKSYNTÄPÄÄTÖS

Dno: YM34/6221/2007 1 (7)

Annettu: 27.3.2007

Voimassa: 31.12.2007

Ympäristöministeriö on maankäyttö- ja rakennuslain 148 §:n (231/2003) nojalla sekä huomioon ottaen rakennustuotteiden hyväksynnästä annetun lain (230/2003) 4 luvun säännökset myöntänyt seuraavan tyyppihyväksynnän.

TUOTE

Isopipe®, synteettisestä kumista valmistettu putkieriste, jonka tiheys on noin 65 kg / m³.

HAKIJA

Leklar Oy, Helsinki

VALMISTAJA

3i-International-Innovative-Insulation S.A., Ritsona-Halkida, Kreikka

HYVÄKSYNNÄN LAAJUUS

Tällä hyväksynnällä todetaan tuotteen täyttävän Suomen rakentamismääräyskokoelman vaatimusten palonkestävyyden osalta seuraavasti:

- **luokka B-s3, d0**
- osastoivissa seinissä olevien eristettyjen putkiläpivientien **palonkestävyysajat 30-120 minuuttia**, pääosin liitteenä olevien taulukoiden 1-4 mukaan.

HYVÄKSYNNÄN EHDOT

Tuote asennetaan hakijan laatimien asennusohjeiden mukaisesti seinään. Saumattoman eristeputken sulkemiseen käytetään läpiviennin kohdalla NMC FIX liimaa.

Taulukoissa 1-4 esitetyt läpivientien palonkestävyysajat koskevat osastoivia seiniä, jotka ovat kevytbetonia. Testatut seinät ovat 100 mm...250 mm. Testatut eristeet ovat olleet saumattomia ja yhdessaumaisia.

Läpivientiaukot on täytettävä ja tiivistettävä huolellisesti hakijan antamien ohjeiden mukaisesti M 100 laastilla tai palotekniseltä ominaisuuksiltaan vastaavaa laastia käyttäen.

Läpivientikohdassa putkien ulkopintojen keskinäisen etäisyyden tulee olla vähintään 50 mm.

LAADUNVALVONTA

Laadunvalvonnassa noudatetaan valmistajan ja [illegible] laitoksen välillä tehtyä, 23.9.2004 allekirjoitettua sopimusta. Putkieristeet testataan pudotettavassa testilaitteessa EN 13823 Single Burning Item testillä kerran hyväksynnän voimassaoloaikana ja tulos ilmoitetaan ympäristöministeriölle.

MERKITSEMINEN

Tuotepakkaukset on merkittävä pysyvästi siten, että niistä ilmenee tyyppihyväksyntämerkintä, numerolla YM100/2004, tuotenimi, valmistajan nimi, valmistusajankohdan ilmoittavat merkinnät.

YMPÄRISTÖMINISTERIÖ
ASUNTO- JA RAKENNUSOSASTO
Postiosoite: PL 35, 00023 VALTIONEUVOSTO
Puhelin: (09) 160 07
Telefax: (09) 160 39545
www.ymparisto.fi

Dno: YM34/6221/2007 2 (2)

HUOMAUTUKSET	Suunnittelussa ja asennustyössä noudatetaan hakijan/valmistajan antamia ohjeita. Ohjeissa tulee ilmetä tämän hyväksynnän laajuus ja ehdot.
	Paloteknisen käyttäytymisen luokitus on tehty standardin EN 13501-1:2002 mukaan.
	Läpivienti on testattu standardin prEN 1366-3 mukaan.
VOIMASSAOLOAIKA	Tällä päätöksellä kumotaan 1.10.2004 annettu tyyppihyväksyntä hakemus YM100/6221/2004.
	Päätös tulee voimaan 27.3.2007 ja on voimassa toistaiseksi, kuitenkin enintään 31.12.2007.
HYVÄKSYNNÄN PERUSTEET	- TÜV NORD BALTIK Ltd. Tallinna, VIRO Test report TLV-29/04 (12.8.2004) - TÜV NORD BALTIK Ltd, Tallinna, VIRO Test report TLV-30/04 (16.8.2004) - TÜV NORD BALTIK Ltd, Tallinna, VIRO Test report TLV-31/04 (19.8.2004) - TÜV NORD BALTIK Ltd, Tallinna, VIRO Test report TLV-32/04 (23.8.2004) - Tyyppihyväksyntäpäätös YM100/6221/2004 (1.10.2004) - TNO Report 2003-CVB-R0300 (October 2003)

Tulosryhmän päällikkö
Rakennusneuvos

Teppo Lehtinen

Yli-insinööri

Olavi Lilja
puh. 0400 143 944
faksi 09-1603 9356
olavi.lilja@ymparisto.fi

LIITTEET	Tarkastuksen kohteet Tyyppihyväksyntämerkki Olosuhteiden valvontaohje Valitusosoitus
TIEDOKSI:	Vergas Dimitris, Melitos 13, 17121 N. Smirni Greece - TÜV NORD BALTIK Ltd, FIRE Laboratory Mustamäe 11, 10144 Tallinn, VIRO

olsyp yml34 2007.doc

LIITE
(YM34/622/2007)
1 (2)

ISOPIPE®-putkien sisällä päällystettyjen metalliputkien läpivientien palonkestoaikoja (minuuttena) on esitetty taulukoissa 1-4.

TAULUKKO 1 Osastoivan kivisteisen seinän paksuus vähintään 200 mm, **saumaton** putkieriste, metalliputki

Putken φ (")	Putken φ (mm)	Putkieriste (mm)		
		9	13	19
1/8	10,2	120	120	120
1/4	13,5	120	120	120
3/8	17,2	120	120	120
½	21,3	120	120	120
¾	26,4	120	90	90
1	33,7	120	90	90
1 ¼	42,4	120	90	90
1 ½	48,3	120	90	90
2	60,3	120	90	90
2½	76,1	120	90	60
3	88,9	60	60	60
3½	101,6	60	60	60
4	114,3	60	60	60

TAULUKKO 2 Osastoivan kivisteisen seinän paksuus vähintään 250 mm, **saumaton** putkieriste, metalliputki

Putken φ (")	Putken φ (mm)	Putkieriste (mm)		
		9	13	19
10,2	10,2	120	120	120
13,5	13,5	120	120	120
3/8	17,2	120	120	120
½	21,3	120	120	120
¾	26,4	120	90	90
1	33,7	120	90	90
1 ¼	42,4	120	90	90
1 ½	48,3	120	90	90
2	60,3	120	90	90
2 ½	76,1	120	90	90
3	88,9	90	90	90
3 ½	101,6	90	90	90
4	114,3	90	90	90

putken koko φ (") putken ulko φ (mm)

TAULUKKO 3 Osastoivan ydinaineksen seinän paksuus vähintään 100 mm, **Yksisuomainen ja liimattu** ensio metalliputki

Putken φ (")	Putken φ (mm)	Putkienste (mm)		
		9	13	19
1/8	10,2	90	60	60
1/4	13,5	90	60	60
3/8	17,2	90	60	60
½	21,3	60	30	30
¾	26,4	60	30	30
1	33,7	30	30	30
1 1/4	42,4	30	30	30
1 ½	48,3	30	30	30
2	60,3	30	30	30
2 ½	76,1	30	30	30
3	88,9	30	30	30
3 ½	101,6	30	30	30
4	114,3	30	30	30

TAULUKKO 4 Osastoivan seinän paksuus vähintään 150 mm, **yksisuomainen ja liimattu** eriste, metalliputki

Putken φ (")	Putken φ (mm)	Putkieriste (mm)		
		9	13	19
1/8	10,2	120	90	90
1/4	13,5	120	90	60
3/8	17,2	120	90	60
½	21,3	120	90	60
¾	26,4	120	90	60
1	33,7	30	30	60
1 1/4	42,4	30	30	60
1 ½	48,3	30	30	60
2	60,3	30*	30	60
2 ½	76,1	30	30	30
3	88,9	30	30	30
3 ½	101,6	30	30	30
4	114,3	30	30	30

putken sisä φ ("), putken ulko φ (mm)

C E R T I F I K A T

TYPGODKÄNNANDEBEVIS 0795

MED BESLUT OM TILLVERKNINGSKONTROLL

SAKORD: BRANDSKYDD — BBR 5
Rörisolering — BSAB: RB

RÖRISOLERING ISOPIPE® UV, ISOPIPE® TC, ISOCOIL

Innehavare
ISOPIPE, 3i, International Innovative Insulation S.A., 68th Km Nat. Rd Athens-Lamia,
341-00 Ritsona Halkida, Grekland, Hemsida: www.isopipe.eu
Tel. +30-22620 89800, Fax. +30-22620-72006
Information lämnas av
V V S International AB, Box 19, SE-186 03 BROTTBY
Tel +46 8-624 24 40, fax +46 8-624 24 16.

Produkt
ISOPIPE (UV, TC) resp. ISOCOIL, rörisolering av cystergummi, densitet ca 65 kg/m^3, i olika dimensioner och olika utförandetyper.

Avsedd användning
Rörisolering av metallrörledningar i utrymmen med höga krav på skydd mot snabb brandspridning.

Godkännande
Produkten godkänns med avseende på följande avsnitt i Boverkets Byggregler (BBR):

Byggprodukter med bestyrkta egenskaper	1:4
Standarder	1:5
Brandteknisk klass B-s3, d0*	5:22

* Brandteknisk klass Baustoffklasse DIN 4102-B2 efter provning enligt DIN 4102-1.

För avsedd användning uppfyller produkten följande krav i 2§ Lag om tekniska egenskapskrav på byggnadsverk m.m. (BVL):
2. Säkerhet i händelse av brand

Giltighetstid
Beslutsdatum 2007 09 28. Dnr 370/07. Typgodkännandet gäller t o m 2012 09 28.
Godkännandet förutsätter att tillverkningskontroll utförs enligt kontrollanvisningar och innehavaren årligen rapporterar till Swedcert om utförd tillverkningskontroll.
Vid leverans till byggplats skall produkten åtföljas av tillverkarförsäkran enligt BFS 2000:27, Typ 2.

SWEDCERT AB

Bertil Wolgast
VD

Bilaga 1	Tillhörande handlingar	2007 09 28
Bilaga 2	Produktmärkning	2007 09 28
Bilaga 3	Kontrollanvisningar	2007 09 28
Bilaga 4	Bedömningsutdrag	2007 09 28

Rozalia Gyarmati
Tekniskt ansvarig

SWEDCERT

SWEDCERT AB, Campus Gräsvik 1, S-371 73 Karlskrona. Tel +46 (0)455 303600, Fax +46 (0)455 10424

C E R T I F I K A T

TYPGODKÄNNANDEBEVIS 0794

MED BESLUT OM TILLVERKNINGSKONTROLL

SAKORD: BRANDSKYDD — BBR 5
Genomföringar i vägg och bjälklag — BSAB: ZSC, PPC
Rörgenomföringar

Rörgenomföringar av metallrör
ISOLERADE MED ISOPIPE

Innehavare
ISOPIPE, 3i, International Innovative Insulation S.A., 68th Km Nat. Rd Athens-Lamia,
343-00 Ritrona Halkida, Grekland, Hemsida: www.isopipe.eu
Tel. +30-22620 89800, Fax. +30-22620-72006
Information lämnas av
V V S International AB, Box 19, SE-186 03 BROTTBY
Tel +46 8-624 24 40, fax +46 8-624 24 16.

Produkt
Rörgenomföringar av metallrör isolerade med ISOPIPE (UV, TC, -COIL) rörisolering av syntetgummi.
Genomföringarnas brandteknisk klass EI 30-EI 120.
Genomföringarnas utförande och övriga förutsättningar framgår av tillhörande handlingar.

Avsedd användning
Rörgenomföringar i brandcellsskiljande byggnadsdel i brandteknisk klass EI 30-EI 120.
Genomföringar i bjälklag och väggar av massivt obrännbart material typ betong, lättbetong och tegel.

Godkännande
Produkterna godkänns med avseende på följande avsnitt i Boverkets Byggregler (BBR):

Brandteknisk klass upp till EI 120 *	5:221
Skydd mot brand- och brandgasspridning mellan brandceller	5:6

* Brandteknisk klass upp till EI 120 enligt tillhörande handlingar

För avsedd användning uppfyller produkten följande krav i 2§
Lag om tekniska egenskapskrav på byggnadsverk m.m. (BVL):
2. Säkerhet i händelse av brand

Giltighetstid
Beslutsdatum 2007 09 28. Dnr 370/07. Typgodkännandet gäller t o m 2012 09 28.
Godkännandet förutsätter att produkterna ISOPIPE (UV, TC, -COIL) rörisolering är typgodkända och tillverkningskontrollerade, och att innehavaren årligen rapporterar till Swedcert om utförd tillverkningskontroll.
Vid leverans till byggplats skall produkten åtföljas av tillverkarförsäkran enligt BFS 2000:27, Typ 2.

SWEDCERT AB

Bertil Wolgast
VD

Bilaga 1	Tillhörande handlingar	2007 09 28
Bilaga 2	Produktmärkning	2007 09 28
Bilaga 3	Kontrollanvisningar	2007 09 28
Bilaga 4	Beräkningsunderlag	2007 09 28

Rozalia Gyarmati
Tekniskt ansvarig

SWEDCERT

SWEDCERT AB, Campus Gräsvik 1, S-371 75 Karlskrona, Tel +46 (0)455 305600, Fax +46 (0)455 70436

51. TNO Center For Fire Research (NL)

TNO Building and Construction Research

[illegible]

Centre for Fire Research
Van Mourik Broekmanweg 6
P.O. Box 49
2600 AA Delft

www.tno.nl

T +31 15 276 30 00
F +31 15 276 30 25

TNO report

2003-CVB-R0300

EN ISO 11925-2: 2002 Ignitability and
EN 13823: 2002 Single Burning Item examination
of Isopipe SBI synthetic rubber foam insulation;
thickness 10 mm

Date	October 2003
Author(s)	A.J. Lock W. Lengkeek
Sponsor	3i International Innovative Insulation ABE 26 Nafpliou Str. 14452 ATHENS-GREECE

This report was compiled in October 2003. [illegible]

Project name	Reaction to fire
Project number	006.15100/01.73.01

Number of pages	8
Number of appendices	2

Product:
3i **Isopipe** SBI black synthetic rubber foam insulation; **thickness 10 mm.**

Purpose of test:
Determination of the ignitability of the product when subjected to direct impingement of flame according to EN-ISO 11925-2: 2002 – *Single flame source* and reaction to fire performance and smoke production in accordance with EN 13823: 2002 – *Single Burning Item* (SBI) – for the Euro classification according to EN 13501-1: 2002.

Contractor, manufacturer and production site:
3i International Innovative Insulation ABE
68 Nafpliou Str. - 14452
ATHENS-GREECE.

Dates of examination:
September 19, 2003.
Month of report issue and report number:
October 2003: **2003-CVB-R300.**

Product description:
The Isopipe SBI is a black coloured foam insulation material with smooth surface based on synthetic rubber with plasticisers and mineral flame retardant fillers.
The insulation material was glued with Isoglue a compound substance. The specifications of the material composition are on file at TNO.

Density and thickness:
Surface density: approx. 0.6-0.75 kg/m^2, nominally: 10 mm.
Density: approx. 75 kg/m^3.

Mounting configuration:
The mounting of the panels was according a specific "end use application".
The insulation material was glued on a steel plate with a thickness of approx. 1 mm.

Samples of product:
Sampling procedures by contractor
Age at time of examination: no information available
Date of receipt: September 8, 2003.

Examination:

Preparations for ignitability and Single Burning Item:

Prior to the examination specimens were prepared, by conditioning the submitted samples at a temperature of 23 ± 2 °C and a relative humidity of 50 ± 5 %. One week for the ignitability samples and ten days for the SBI samples.

Method of examination for ignitability:

This examination was carried out according to paragraph 7 of the EN-ISO 11925-2: 2002 by using the so-called ***Edge*** and ***Surface ignition*** with flame application times of 15 seconds and 30 seconds for 6 samples each.

Method of examination for Single Burning Item:

The examination was carried out according to paragraph 8 of the EN 13823: 2002.

The specimens were examined in combination with a calcium silicate (CaSi) backing board directly behind the specimen assembly. A total of three SBI tests were carried out.

The test results are noted in the tables at the next page.

Test results:

EN 13501-1: 2002 classification parameter results of the 3I Isopipe SBI Insulation foam glued on steel sheet – nominal thickness 30 mm.

A – Ignitability according to EN ISO 11925-2: 2002

Number of samples	Flame application time	Moment of passing the "150 mm" marker	Average flame height over 6 tests	After-burning time	Damaged/affected specimen area (height x width)
	[s]	[s]	[mm]	[s]	[mm]
6	15 and 30 (Edge ignition)	∞ (6x) no passing	35 / 35	0	60 x 25 / 70 x 25
6	15 and 30 (Surface ignition)	∞ (6x) no passing	50 / 55	0	70 x 20 / 80 x 25

B – Single Burning Item according to EN 13823: 2002

Test no.	Heat production / flame spread				Smoke production		Flaming debris	
	$FIGRA_{0.2MJ}$ [W/s]	$FIGRA_{0.4MJ}$ [W/s]	THR_{600s} [MJ]	LFS_{edge} [Y/N]	SMOGRA [m^2/s^2]	TSP_{600s} [m^2]	$FDP_{\leq 10s}$ [Y/N]	$FDP_{>10s}$ [Y/N]
1	187	27	2.0	N	1968	232	N	N
2	178	29	2.0	N	2557	354	N	N
3	140	26	1.9	N	3152	319	N	N
Values for classification	168	27	2.0	N	2559	312	N	N

Observations: Several product parts drop on the floor (not burning).

Conclusion:
3i International Innovative Insulation **Isopipe SBI** black synthetic rubber foam insulation; thickness 10 mm, tested in threefold in accordance with EN 13823: 2002, meet the SBI requirements of the Euro-classification standard EN 13501-1: 2002 for the classes: **C / s3 / d0** (see item 1 under additional remarks).
Based on the amending Decision 2000/147/EC of 26/06/03 implementing Council Directive 89/106/EEC as regards the classification of the reaction to fire performance of Linear pipe thermal insulation products will be classes: **B / s3 / d0.**

Additional remarks:

1. A formal classification cannot be given on basis of the results in the SBI test method only. This classification is to be assessed in accordance with the **EN 13501-1: 2002 - "Classification using fire reaction tests"**. A description of the classification requirement is given in Annex A.

2. The field of application of the test results is limited to the end use applications in accordance with the mounting used in the test.

3. Graphs of rate of heat release $HRR_{av}(t)$, total heat release THR(t), 1000·$HRR_{av}(t)/(t-300)$, rate of smoke production $SPR_{av}(t)$, total smoke production TSP(t) and 10000·$SPR_{av}(t)/(t-300)$, are presented in Annex B.

4. In the classification parameter results of the tests not all the checks were OK. The error is performed due to a too high temperature difference between the duct and the ambient temperature (< 4 °C) and/or a too low volume flow (< 0.5 m^3/s) in the duct, but these errors had a negligible effect on the final results of the test.

5. The test results relate to the behaviour of the test specimens of a material under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the material in use.

A.J. Lock

Dr. F. Paap

European Group of Official Laboratories for Fire testing
Certificate No 54

Latvijas Nacionālais akreditācijas birojs
LATAK - T - 085 - 03 - 2006/A

VALSTS UGUNSDZĒSĪBAS UN GLĀBŠANAS DIENESTS
ZINĀTNISKI PETNIECISKĀ PĀRVALDE
UGUNSDZĒSĪBAS IZMĒĢINĀJUMU LABORATORIJA
Pētersalas iela 10, Rīga, LV – 1045, tālrunis 7326107, fakss 7326119

Cietu vielu un materiālu degtspējas grupas
eksperimentālās noteikšanas
TESTĒŠANAS PĀRSKATS

Nr. 343

Testēšanas datums: 2003. gada 18. augustā

Pasūtītājs, adrese: BŪVMATERIĀLU UN BŪVIZSTRĀDĀJUMU
ATBILSTĪBAS NOVĒRTĒŠANAS CENTRS
(BBANC)
Kr. Barona 99, Rīga, LV-1012
Tālr./Fakss: 7-313758

Parauga apraksts:

BBANC iesniedza sintētiska izolācijas materiāla paraugu (0,4 m caurules apvalks 54*9 mm) – 1 gab., PE plēves iepakojumā.

Saskaņā ar LVS 263:2000 "Cietu vielu un materiālu degtspējas grupas eksperimentālās noteikšanas metode" no iesniegtā sintētiska izolācijas materiāla parauga laboratorijas izmēģinājumu veikšanai izgatavoti paraugi ar izmēriem (150x60x10)mm – 3 gab.

Ražotājs: Parauga šifrs Nr. 990-IM-130803

Paraugu iesniegšanas datums: 2003. gada 13. augustā.

Paraugu identifikācijas numurs: Nr.343

Testēšanas pamatojums: BBANC vēstule Nr. 307/2003 no 2003. gada 13. augusta.
Testēšanas vieta: Ugunsdzēsības izmēģinājumu laboratorija
Pētersalas iela 10, Rīga LV – 1045
Tālr.: 7326107
Fakss: 7326119

Testēšanas apstākļi: Gaisa temperatūra - +21 °C
Relatīvais gaisa mitrums - 65 %
Atmosfēras spiediens - 100,8 kPa

Testēšanā izmantotā aparatūra:

1. Iekārta OTM (sertifikāts Nr. TK 08/04/03, ar darbības laiku līdz 2004. gada 02. aprīlim).
2. Potenciometrs KSP-4, Nr.3980, uzlīme Nr.164877 derīgs līdz 2004. gada 01. jūlijam.
3. Termoelektriskais pārveidotājs Nr. 12, verificēšanas sertifikāts Nr. S1437 VO2 derīgs līdz 2004. gada 01. jūlijam.
4. Svari SAC-62 kalibrēšans sertifikāts Nr. M 0623K03, no 2003. gada 20. jūnija (kalibrēšanas uzlīme Nr. 11675). Atkārtotas kalibrēšanas intervāls pēc nepieciešamības.
5. Rotametrs PM-A-0.1 ГУЗ Nr. 4072794.
6. Hronometrs, 1629, verificēšanas sertifikāts Nr. R 222 V03 derīgs līdz 2004. gada 11. jūnijam (uzlīme Nr.203330).
7. Lineāls, metāliskais, uzlīme Nr. 1901559. Atkārtota metroloģiskā pārbaude pēc nepieciešamības.

Testēšanas metode, apraksts: Izmēģinājumi veikti pēc UIL metodes Nr. 4, kas pamatojas uz LVS 263:2000 "Cietu vielu un materiālu degtspējas grupas eksperimentālās noteikšanas metode"
Izmēģinājumu plākšņu paraugu ar izmēriem (150*60) mm un faktisko biezumu ne lielāku par 30 mm nostiprina iekārtas turētājā. Ieslēdz automātisko potenciometru, aizdedzina gāzes degli un regulē gāzes padevi tā, lai 3 min. laikā būtu (200±5)°C. Paraugu ievada degšanas kamerā un iztur (300±2)s.
Ja izmēģirājumu maksimālā temperatūra tmax nepārsniedz 260°C, tad izmēģinājuma laiks ir (300±2)s. Paraugu iztur kamerā līdz pilnīgai atdzišanai un tad sver.
Ja izmēģinājuma tmax pārsniedz 260°C, tad izmēģinājumu ilgumu nosaka laiks līdz max temperatūras sasniegšanai.

Testēšanas rezultāti:

Nr. p.k.	Paraugu Izmēri, mm	Kameru s t °C, līdz eksper.	Degšanas produktu max. t °C	Max. temperat. Sasniegšanas Laiks (s)	Parauga svars		Masas Zudums	
					Līdz eksp. gr	Pēc eksp. gr	gr.	%
1	150*60*10	200	465	24	5,5	2,1	3,4	61,8
2	150*60*10	200	480	26	5,6	2,2	3,4	60,7
3	150*60*10	200	465	25	5,5	2,3	3,2	58,2
vid.								**60,2**

Izmēģinājumi rāda, ka ΔTmax > 60°C, Δm> 60%.

Pārskata sastādīšanas datums: 2003. gada 18. augustā.

Laboratorijas vadītājs Ugunsdzēsības izmēģinājumu laboratorija L. Kačanovs 7-582239

Testēšanas rezultāti attiecas tikai uz izmēģinātajiem paraugiem.
Bez testēšanas laboratorijas rakstiskas atļaujas aizliegta testēšanas pārskata reproducēšana nepilnā apjomā.

РОССИЙСКАЯ ФЕДЕРАЦИЯ

СЕРТИФИКАТ СООТВЕТСТВИЯ

(обязательная сертификация)

№ C-GR.ПБ73.В.00263 (номер сертификата соответствия) ТР 0866337 (учетный номер бланка)

ЗАЯВИТЕЛЬ (наименование и местонахождение заявителя): "3i International Innovative Insulation SA" 68 km Nat. Rd. Athens-Lamia, 34100 Ritsona Halkida Греция , тел. +30 210 2823603.

ИЗГОТОВИТЕЛЬ (наименование и местонахождение изготовителя продукции): "3i International Innovative Insulation SA" 68 km Nat. Rd. Athens-Lamia, 34100 Ritsona Halkida Греция , тел. +30 210 2823603.

ОРГАН ПО СЕРТИФИКАЦИИ (наименование и местонахождение органа по сертификации, выдавшего сертификат соответствия): Орган по сертификации ООО "Гильдия Качества" (ООО "ГК"),ОГРН 1117746462399 аттестат аккредитации № РПБ.RU.ПБ73 от 31.10.2011 г., 115088, г. Москва, ул. Шарикоподшипниковская, д. 4, корп. 12, тел. +7(906) 793-71-63

ПОДТВЕРЖДАЕТ, ЧТО ПРОДУКЦИЯ (информация об объекте сертификации, позволяющая идентифицировать объект): Материалы теплоизоляционные эластомерные на основе пенополиуретана, марки: ISOPIPE, ISOROLLS, ISOSHEETS, удельная плотность материала – 60-75 (кг/м3).

Серийный выпуск

код ОК 005 (ОКП): 57 6869

код ЕКПС:

код ТН ВЭД России: 3921131000

СООТВЕТСТВУЕТ ТРЕБОВАНИЯМ ТЕХНИЧЕСКОГО РЕГЛАМЕНТА (ТЕХНИЧЕСКИХ РЕГЛАМЕНТОВ) (наименование технического регламента Российской Федерации), на соответствие требованиям которого проводилась сертификация: Технического регламента о требованиях пожарной безопасности (Федеральный закон от 22.07.2008г. № 123-ФЗ) (См. приложение - бланк № 0394286)

ПРОВЕДЕННЫЕ ИССЛЕДОВАНИЯ (ИСПЫТАНИЯ) И ИЗМЕРЕНИЯ: Протокол испытаний № СР13-5-31/3 от 31.05.2013г. ИЛ ООО "Гильдия Качества", аттестат аккредитации РПБ.RU.ИН96 от 31.10.2011, 115088, г. Москва, ул. Шарикоподшипниковская, д. 4, корп. 12

ПРЕДСТАВЛЕННЫЕ ДОКУМЕНТЫ (документы, представленные заявителем в орган по сертификации в качестве доказательства соответствия продукции требованиям технического регламента (технических регламентов)): Заявка-декларация № 1147 от 15.04.2013г. Сертификат системы менеджмента качества ГОСТ ISO 9001-2011 № СДСГК RU.ОС05.К01885 от 15.04.2013 г. выдан ОС АНО «Калуга-Тест» номер аттестата аккредитации СДСГК RU.3608.ОС05 от 11.01.2010 г.

СРОК ДЕЙСТВИЯ СЕРТИФИКАТА СООТВЕТСТВИЯ с 31.05.2013 по 30.05.2016

М.П. для сертификатов

Руководитель (заместитель руководителя) органа по сертификации (подпись, инициалы, фамилия): А.С. Хромова

Эксперт (эксперт) (подпись, инициалы, фамилия): Э.П. Тынчерова

РОССИЙСКАЯ ФЕДЕРАЦИЯ

ПРИЛОЖЕНИЕ
к СЕРТИФИКАТУ СООТВЕТСТВИЯ № C-GB.ПБ73.В.00263

(обязательная сертификация)

ТР 0394286
(учетный номер бланка)

код ОК 005 (ОКП)	Наименование и обозначение продукции
код ТН ВЭД СНГ	
576869 3921131000	Материалы теплоизоляционные эластомерные на основе пенополиуретана, марки: ISOPIPE, ISOROLLS, ISOSHEETS, удельная плотность материала – 60-75 (кг/м3). Сведения о национальных стандартах, применяемых на добровольной основе для соблюдения требований Федерального закона от 22 июля 2008г. № 123-ФЗ «Технический регламент о требованиях пожарной безопасности»

Обозначение и наименование национального стандарта	Наименование, код, номер, дата нормативного документа федерального органа исполнительной власти, которым утвержден применяемый национальный стандарт	Проверяемые при испытаниях характеристики
ГОСТ 30244-94 "Материалы строительные. Методы испытаний на горючесть"	Постановление Минстроя России от 4 августа 1995 г. № 18-79.	Группа горючести – слабогорючие (Г1)
ГОСТ 30402-96 «Материалы строительные. Метод испытаний на воспламеняемость.»	Постановление Минстроя России от 24.06.96 г. N 18-40.	Группа воспламеняемости – умеренновоспламеняемые (В2)
ГОСТ 12.1.044-89 п. 4.18 «Система стандартов безопасности труда. Пожаровзрывоопасность веществ и материалов. Номенклатура показателей и методы их определения.»	Постановление Государственного комитета СССР по управлению качеством продукции и стандартам от 12.12.89 № 3683	Группа дымообразования – с высокой дымообразующей способностью (Д3)
ГОСТ 12.1.044-89 п. 4.20 «Система стандартов безопасности труда. Пожаровзрывоопасность веществ и материалов. Номенклатура показателей и методы их определения.»	Постановление Государственного комитета СССР по управлению качеством продукции и стандартам от 12.12.89 № 3683	Группа токсичности – высокоопасные (Т3)

Руководитель (заместитель руководителя) органа по сертификации — А.С. Хромова
подпись, инициалы, фамилия

Эксперт (эксперты) — Э.Ш. Тынчерова
подпись, инициалы, фамилия

Centrum stavebního inženýrství a.s.

Fire Technical Laboratory

AUTHORIZED BODY No. 212

NOTIFIED BODY No. 1390

CLASSIFICATION OF REACTION TO FIRE IN ACCORDANCE WITH EN 13501-1:2007+A1:2009

Applicant: EUROCERT S.A.
Greece

Prepared by: Centrum stavebního inženýrství a.s.
Pražská 16
102 21 Praha 10
Czech Republic

Product name: *ISOPIPE TC UV*

Classification report No.: PK-11-114

Issue number: 1/2

Date of issue: 24th November 2011

This classification report consists of 4 pages and may only be used or reproduced in its entirety.

Address:
PRAŽSKÁ 16, 102 21 PRAHA 10, Czech Republic, E mail: cslas@cslas.cz, http://www.cslas.cz
Reg. No. 45274860, VAT No. CZ45274860. The Company is registered in the Commercial Register administered by the Municipal Court of Prague (section B, inset 1595).
Fire Technical Laboratory, E-mail: ptl@cslas.cz
Phone: +420 281 017 111, Fax: +420 281 017 466

1. DETAILS OF CLASSIFIED PRODUCT

Nature and end use application:

Classification of the product *ISOPIPE TC UV* is valid for the following end use application:

Thermal insulation product.

Description:

The product *ISOPIPE TC UV* is fully described in the test report in support of the classification listed in clause 2.

2. TEST REPORTS AND TEST RESULTS IN SUPPORT OF THIS CLASSIFICATION

Test reports

Name of laboratory	Name of sponsor	Test report ref. no.	Test method
CSI a.s., Fire technical laboratory	TZÚS Praha s.p.	15779-1/2 18779-2/2	ČSN EN ISO 11925-2

Measured values

Test method	Parameter	Number of test	Results	
			Continuous parameter mean (m)	Compliance parameters
ČSN EN ISO 11925-2 exposition = 15 s	$Fs \leq 150$ mm (1) $Fs \leq 150$ mm (2) ignition of filter paper	6 6 12	(-)	yes yes no

(-): not applicable
(1): surface flame attack
(2): edge flame attack

Test results

Test method	Parameter	Mean value	Criterion compliance
ČSN EN ISO 11925-2	$Fs \leq 150$ mm (1)	yes	yes (E_L)
	ignition of filter paper	no	no

(1): until 20. second from the start of exposition

3. CLASSIFICATION AND DIRECT FIELD OF APPLICATION

Reference and direct field of application

This classification has been carried out in accordance with the clauses 13.3 of EN 13501-1:2007+A1:2009.

Classification

The product *ISOPIPE TC UV*, in relation to its reaction to fire behaviour is classified:

E_L

The additional classification in relation to smoke production is:

not classified

The additional classification in relation to flaming droplets/particles is:

not classified

The format of the reaction to fire classification for *ISOPIPE TC UV* is:

Fire behaviour		Smoke production			Flaming droplets	
E_L	-	s	not classified	-	d	not classified

Reaction to fire classification: E_L

Field of application

This classification is valid for the following end use conditions:

- without substrate

4. LIMITATIONS

Restrictions

This classification report is valid until 24th November 2016, provided that the technical specifications of the product will not be changed.

Warning

This document does not represent type approval or certification of the product.

Prepared:

Martina Strmisková

Reviewed:

Vít Slaboch
head of laboratory

Centrum stavebního inženýrství a.s., Fire technical laboratory, Pražská 16, 102 00 Praha 10
phone: +420281017111, fax: +420281017455, e-mail ptl@csias.cz, www.csias.cz/ptl

Accredited testing laboratory No. 1007.7

TEST REPORT No. 15779-1/2

on Fire and Technical Characteristics

L 1007.7

Our ref.: PTL – 263/11	Number of pages: 1+Appendix
Sponsor: Technický a zkušební ústav stavební Praha s.p., Prosecká 811/76a, 190 00 Praha 9 (01/161/11/Vi)	

TEST ITEM

Product name: ISOPIPE TC UV

Standard: Undeclared **Manufacturer:** 3i International-Innovative-industries S.A., Greece

Composition: Rubber, foil

Appearance: The pipe made of black rubber foam coated with white foil. Wall thickness 8 mm, outer diameter 31 mm.

Date of receipt of the sample: 2011-11-21 **Sampling:** The samples were delivered by the sponsor

Date of realization of tests: 2011-11-24

TEST METHOD: ČSN EN ISO 11925 – 2

Conditioning of the test specimens and filter paper: according to the ČSN EN 13238, clause 4.2

Flame application time: 15 s

MEASURED VALUES AND THE TEST RESULTS

EDGE FLAME ATTACK

Sample No.:	**1**	**2**	**3**	**1**	**2**	**3**
Ignition of the sample:	yes	yes	yes	yes	yes	yes
Time to reaching mark [s]:	no	no	no	no	no	no
Ignition of the filter paper:	no	no	no	no	no	no

Observation during the test: The product has extinguished spontaneously.

Conclusion: The test results relate to the behaviour of the test specimen of a product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product of use. The results of tests are concerned only with the subject of testing.

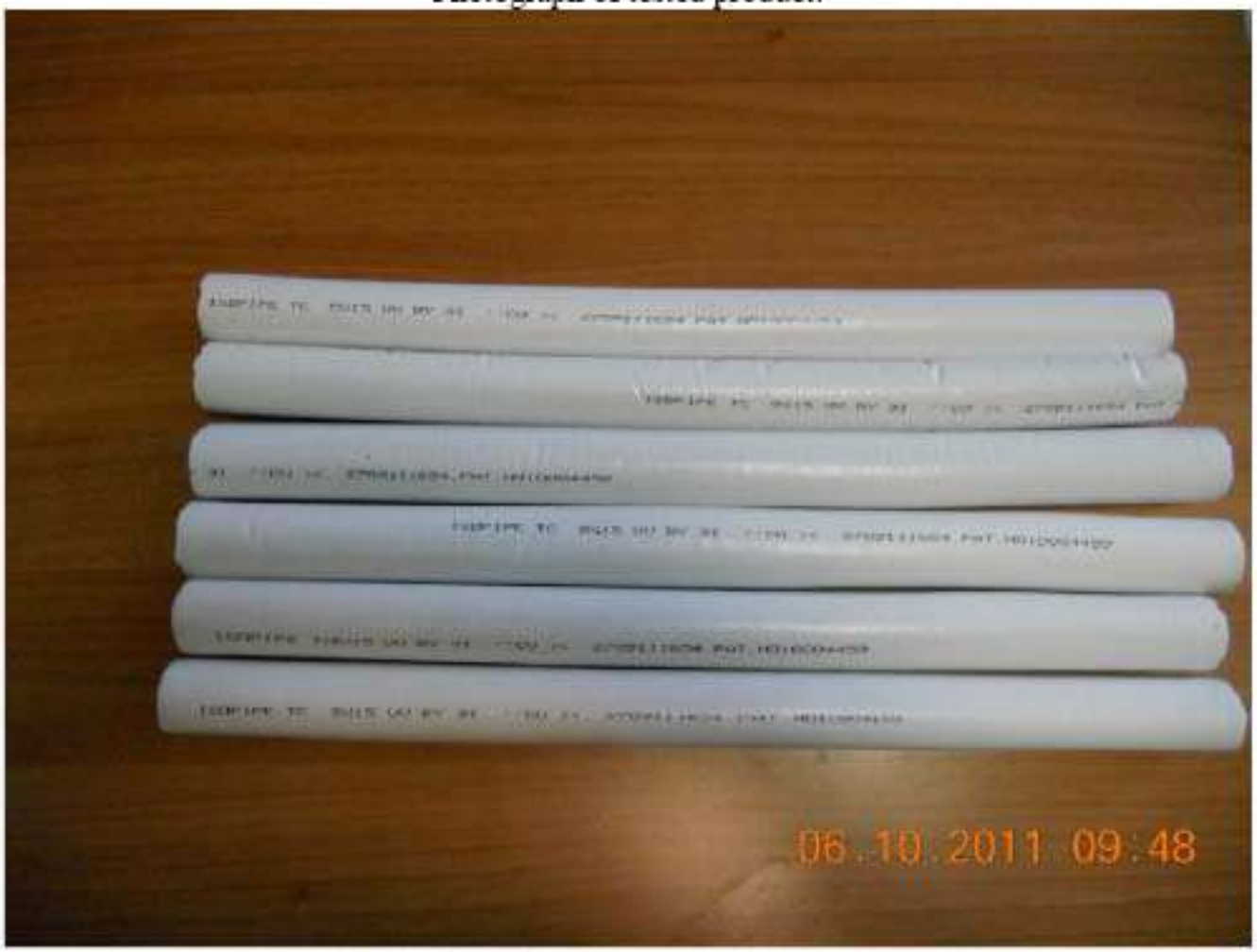
The protocol shall not be reproduced except in full without the written approval of the testing laboratory.

Responsible person: Vít Slaboch

Date: 24th November 2011 Vít Slaboch

POŽÁRNĚ TECHNICKÁ LABORATOŘ – AKREDITOVANÁ ZKUŠEBNÍ LABORATOŘ č. 1007 – PTL – Centrum stavebního inženýrství a.s.

Photograph of tested product:



Centrum stavebního inženýrství a.s., Fire technical laboratory, Pražská 16, 102 00 Praha 10
phone: +420281017111, fax: +420281017455, e-mail ptl@csias.cz, www.csias.cz/ptl

Accredited testing laboratory No. 1007.7

TEST REPORT No. 15779-2/2

on Fire and Technical Characteristics

L 1007.7

Our ref.: PTL – 263/11	Number of pages: 1+Appendix
Sponsor: Technický a zkušební ústav stavební Praha s.p., Prosecká 811/76a, 190 00 Praha 9 (01/161/11/Vi)	

TEST ITEM

Product name: ISOPIPE TC UV

Standard: Undeclared **Manufacturer:** 3i International-Innovative-industries S.A., Greece

Composition: Rubber, foil

Appearance: The pipe made of black rubber foam coated with white foil. Wall thickness 8 mm, outer diameter 31 mm.

Date of receipt of the sample: 2011-11-21 **Sampling:** The samples were delivered by the sponsor

Date of realization of tests: 2011-11-24

TEST METHOD: ČSN EN ISO 11925 – 2

Conditioning of the test specimens and filter paper: according to the ČSN EN 13238, clause 4.2

Flame application time: 15 s

MEASURED VALUES AND THE TEST RESULTS

SURFACE FLAME ATTACK

Sample No.:	**1**	**2**	**3**	**1**	**2**	**3**
Ignition of the sample:	yes	yes	yes	yes	yes	yes
Time to reaching mark [s]:	no	no	no	no	no	no
Ignition of the filter paper:	no	no	no	no	no	no

Observation during the test: The product has extinguished spontaneously.

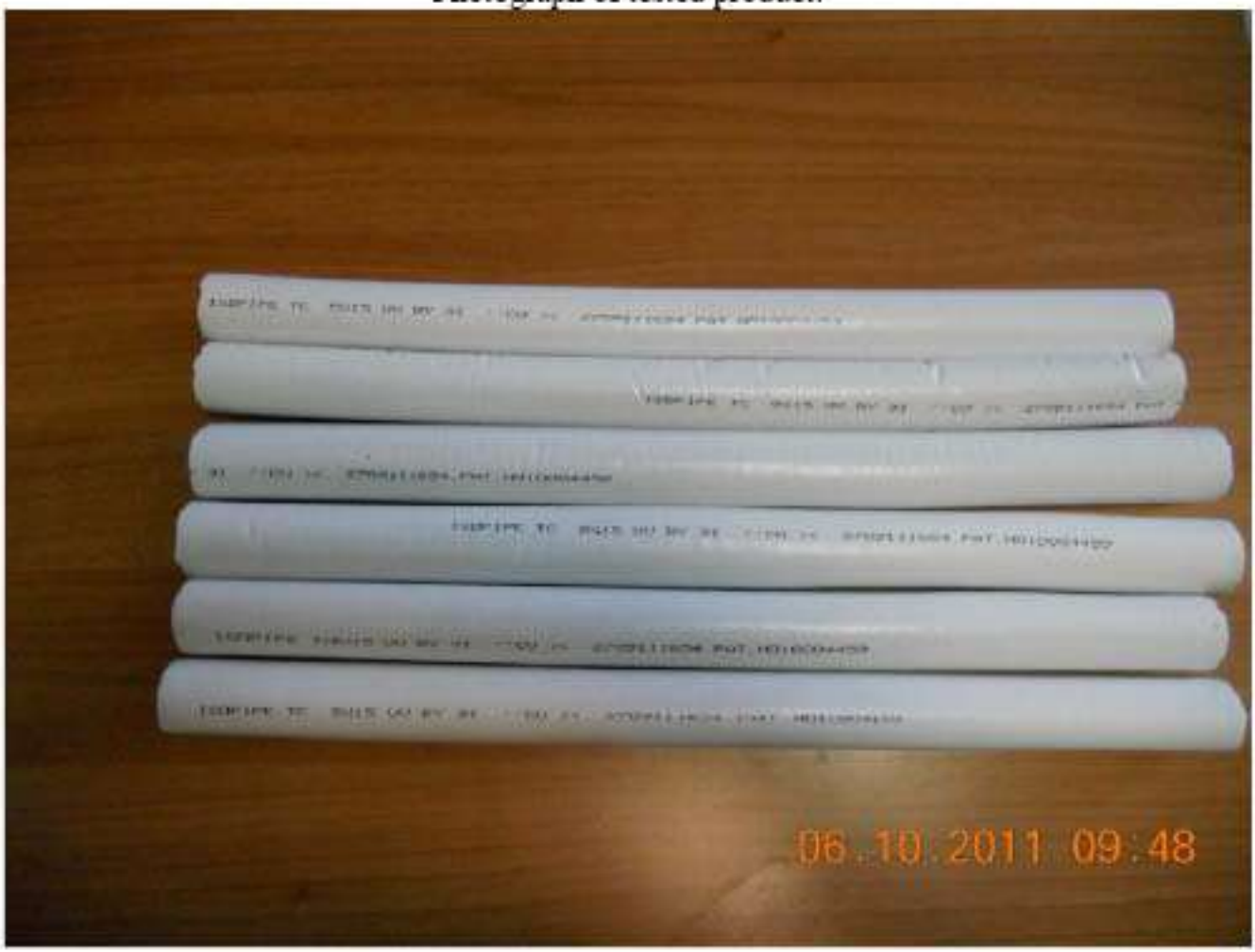
Conclusion: The test results relate to the behaviour of the test specimen of a product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product of use. The results of tests are concerned only with the subject of testing.

The protocol shall not be reproduced except in full without the written approval of the testing laboratory.

Responsible person: Vít Slaboch

Date: 24th November 2011 Vít Slaboch

Photograph of tested product:



CSI

DIVISIONE: *DIVISION:*	**TESTING-CERTIFICAZIONE** ***TESTING & CERTIFICATION***	LABORATORIO: *LABORATORY:*	**Fisica della Combustione** ***Physics of Combustion***

RAPPORTO DI PROVA *(Test Report)*	Pag. di/*of* pag.	**1/6**
N° **0022\DC\TOX\18**	Data *Date:*	**09/03/2018**

IDENTIFICAZIONE E DESCRIZIONE DEL CAMPIONE:
SPECIMEN DESCRIPTION:

Nome commerciale ....: **ISOPIPE TC ROLLS**
Product Name

Descrizione ....: **Isolante elastomerico espanso**
Description ....: ***Elastomeric insulation foam***

DATI IDENTIFICATIVI DEL CLIENTE:
CLIENT:

Nome / *Name*...............................: **3I - INTERNATIONAL INNOVATIVE INDUSTRIES SA**
Indirizzo / *Address*.......................: **68 km Nat. Road Athens-Lamia**
Città / *City*.....................................: **GR-34100 Ritsona (Greece)**

NORMA DI RIFERIMENTO:
REFERENCE STANDARD:

Norma Tecnica /*Technical standard:* **UNI CEI 11170 Veicoli ferroviari - Linee guida per la protezione al fuoco dei veicoli ferrotranviari ed a via guidata.**

DISTRIBUZIONE ESTERNA: *OUTSIDE DISTRIBUTION:*	DISTRIBUZIONE INTERNA: *INSIDE DISTRIBUTION:*
Originale cliente ***Original: Client***	**Copia capo laboratorio** ***Copy: Head of laboratory***

ENTE DI ACCREDITAMENTO:
ACCREDITATION BODY:

ACCREDIA

LAB N°0036
Signatory of EA, IAF and ILAC
Mutual Recognition Agreements

GRUPPO IMQ

CSI S.p.A.
Sede Legale

DATI GENERALI / *GENERAL DATA* :

- Data ricevimento campioni / *Product supply date* ....: **29.01.2018**
- Data esecuzione prove / *Date of test* ....: **06.03.2018**
- Data fine esecuzione prove / End test date ....: **07.03.2018**
- Identificazione delle norme di riferimento ....: **NF F 16-101 – 1988**
  Test method identification **UNI CEI 11170**
  Determinazione dell'indice di tossicità secondo norme:
  Toxicity index determination according to standards:
  AFNOR NF X 70/100 – 2006,
  NF 16-101 – 1988.
  Determinazione della densità ottica dei fumi e calcolo dell'indice di fumo secondo norme:
  Smoke optical density determination and smoke index calculation according to standards:
  AFNOR NF 10-702-1 -1995,
  AFNOR NF 10-702-2 – 1994
  AFNOR NF F 16-101 - 1988.

1) **"DETERMINAZIONE DEI GAS EFFLUENTI DALLA COMBUSTIONE E/O PIROLISI DI MATERIALI ORGANICI E CALCOLO DELL'INDICE DI TOSSICITA' CONVENZIONALE"**
1) ***"DETERMINATION OF TOXICITY INDEX OF GASES FROM COMBUSTION AND/OR PIROLISYS OF ORGANIC MATERIALS AND CONVENTIONAL TOXICITY INDEX CALCULATION"***

Le combustioni e/o pirolisi, effettuate per la determinazione dell'indice di tossicità, vengono realizzate bruciando circa 1 g di campione in un forno tubolare statico, preriscaldato a 600 °C ± 5 °C, al flusso d'aria di 2 l/min per 20 minuti.
The combustions and/or pyrolisys performed for the determination for toxicity index has been carried out burning 1 g of sample in a tube static furnace per-heated at a temperature of 600°C ± 5°C and maintained for 20 min, with an air flow of 2 l/min.

- Procedura normalizzata / *Standard procedure* ....: **SI / *Yes***
- Deviazione dai metodi di prova ....: **NO / *No***
  Standard procedure deviation
- Controllo calcoli / *Calculation check* ....: **SI / *Yes***

2) **"DETERMINAZIONE DELLA DENSITÁ OTTICA DEI FUMI E CALCOLO DELL'INDICE DI FUMO"**
2) ***"SMOKE OPTICAL DENSITY DETERMINATION AND SMOKE INDEX CALCULATION"***

- Procedura normalizzata / *Standard procedure* ....: **SI / *Yes***
- Deviazione dai metodi di prova ....: **NO / *No***
  Standard procedure deviation
- Controllo calcoli / *Calculation check* ....: **SI / *Yes***

CONDIZIONI DI PROVA / *TEST CONDITIONS*

- Condizioni di prova / *Test conditions* : **Flaming** / Non flaming
- Temperatura iniziale della camera / *Start chamber temperature*: 35 ± 3 °C

CAMPIONAMENTO / *SAMPLING*

Il campionamento iniziale è stato eseguito dal cliente.
The specimens have been sent by the client.
Il campionamento eseguito per la prova è stato effettuato prelevando casualmente un provino dal campione fornito.
The test sampling has been performed taking a specimen from the sample supplied random.

CAMPIONI ANALIZZATI / *SAMPLES TESTED*:

- Provette campione denominate / *Specimens of sample identified*:

ISOPIPE TC ROLLS

Massa areica ..... :	**57,5 ± 7,5 kg/m²**	Spessore..... :	**13 mm**
Mass per area unit..... :	***57,5 ± 7,5 kg/m²***	*Thickness* ..... :	***13 mm***

DICHIARAZIONE / *STATEMENTS* :

- I risultati di prova contenuti nel presente rapporto si riferiscono esclusivamente al campione provato.
  Test results contained in this test report relate only to specimens tested.
- Il presente rapporto non può essere riprodotto parzialmente senza l'autorizzazione del Responsabile del Centro.
  The test report shall not be reproduced except in full without the written approval of the Managing Director.
- I dati tecnici riportati nella descrizione del campione sono desunti dalla scheda tecnica allegata dal cliente al campione di prova.
  The technical data reported on the specimen description are taken from client technical sheet

RISULTATI / *RESULTS*

1) **"DETERMINAZIONE DEI GAS EFFLUENTI DALLA COMBUSTIONE E/O PIROLISI DI MATERIALI ORGANICI E CALCOLO DELL'INDICE DI TOSSICITA' CONVENZIONALE"**
1) ***"DETERMINATION OF TOXICITY INDEX OF GASES FROM COMBUSTION AND/OR PIROLISYS OF ORGANIC MATERIALS AND CONVENTIONAL TOXICITY INDEX CALCULATION"***

GAS	CONCENTRAZIONE *CONCENTRATION* [mg/g]
ANIDRIDE CARBONICA *CARBON DIOXIDE*	342
OSSIDO DI CARBONIO *CARBON MONOXIDE*	77,8
ACIDO CLORIDRICO *HYDROGEN CLORIDE*	72,1
ACIDO BROMIDRICO *HYDROGEN BROMIDE*	2,5
ACIDO FLUORIDRICO *HYDROGEN FLUORIDE*	< 0,1
ACIDO CIANIDRICO *HYDROGEN CIANIDE*	< 0,1
ANIDRIDE SOLFOROSA *SULPHUR DIOXIDE*	5,7

METODI DI ANALISI / *ANALISYS METHOD*:

CO, CO_2	INFRAROSSO NON DISPERSIVO / *NON DISPERSIVE INFRARED*
HCl, HBr, HF	POTENZIOMETRIA, ELETTRODI IONOSELETTIVI, CROMATOGRAFIA IONICA *POTENTIOMETRIC TITRATION, IONSELECTIVE ELETRODS, ION CHROMATOGRAPHY*
SO_2	TITOLAZIONE ACIDIMETRICA, CROMATOGRAFIA IONICA *ACID TITRATION, IONIC CHROMATOGRAPHY*
HCN	CROMATOGRAFIA IONICA, TITOLAZIONE *ION CHROMATOGRAPHY, TITRATION*

INDICE DI TOSSICITA' CONVENZIONALE (ITC) = 56,6
CONVENTIONAL TOXICITY INDEX (ITC)

2) "DETERMINAZIONE DELLA DENSITÀ OTTICA DEI FUMI E CALCOLO DELL'INDICE DI FUMO"
2) *"SMOKE OPTICAL DENSITY DETERMINATION AND SMOKE INDEX CALCULATION"*

- **Condizione Non Flaming** / *Non-Flaming condition*

	1 NF	2 NF	3 NF	Media *Average*
Densità ottica specifica massima (Dm) *Maximal optical specific density*	144,7	-	-	-
Tempo per raggiungere Dm *Time to reach Dm* [min]	20:00	-	-	-
Densità ottica specifica massima corretta *Corrected maximal optical specific density*	140,0	-	-	-
Tempo per raggiungere Ds 16 *Time to reach Ds 16* [min]	0:14	-	-	-
VOF4	382,4	-	-	-
Scarto massimo fra Dm su 3 determinazioni *Maximal deviation between Dm in 3 determinations*	-			

- **Condizione Flaming** / *Flaming condition*

	1 F	2 F	3 F	Media *Average*
Densità ottica specifica massima (Dm) *Maximal optical specific density*	147,3	156,1	154,9	152,8
Tempo per raggiungere Dm *Time to reach Dm [min]*	4:40	4:22	4:22	-
Densità ottica specifica massima corretta *Corrected maximal optical specific density*	142,0	149,5	146,6	146,0
Tempo per raggiungere Ds 16 *Time to reach Ds 16* [min]	0:11	0:12	0:11	-
VOF4	439,7	468,1	452,6	453,5
Scarto massimo fra Dm su 3 determinazioni *Maximal deviation between Dm in 3 determinations*	9			

Calcolo dell'indice di fumo "I.F." / *"I.F." index calculation*:

$$I.F. = \frac{Dm}{100} + \frac{VOF4}{30} + \frac{ITC}{2} = 44{,}9$$

CLASSE DI FUMO / *SMOKE CLASS*: F3 (TRE / *THREE*)

DATA *Date*	Settore Fisica della Combustione *Physics of Combustion Sector*	B. U. Prodotto *B. U. Product*
09/03/2018	Lorenzo Zavaglio	Ing. P. Fumagalli

Documento firmato digitalmente ai sensi del D. Lgs. N. 82 del 7 Marzo 2005 e successive modifiche
Digitally signed document in accordance with Legislative Decree n. 82 dated March 7th 2005 and subsequent amendments.

Data: 2018.03.09
14:37:51 +01'00'

Testing, calibrating, advising

ASTM E 84 Surface Burning Characteristics of "Isopipe TC" Flexible Elastomeric Foam Insulation

A Report To:	**3i - International Innovative Industries S.A.** Nafpliou & Daskalogianni 144 52 Metamorfosis Attica Greece
Phone:	+30 22620 71867
Attention: E-mail:	Tzanos Lazaros logistics@isopipe.gr
Submitted by:	Exova Warringtonfire North America
Report No.	17-002-296 4 Pages
Date:	June 6, 2017

ACCREDITATION To ISO/IEC 17025 for a defined Scope of Testing by the International Accreditation Service

SPECIFICATIONS OF ORDER

Determine the Flame Spread and Smoke Developed Indices based upon a single test conducted in accordance with ASTM E 84-16, as per Exova Warringtonfire North America Quotation No. 17-002-470,760 dated May 10, 2017.

SAMPLE IDENTIFICATION (Exova sample identification number 17-002-S0298)

Foam insulation material, described as: "Flexible Elastomeric Foam Insulation", identified as: "Isopipe TC"

TEST PROCEDURE

The method, designated as ASTM E 84-16 "*Standard Method of Test for Surface Burning Characteristics of Building Materials*", is designed to determine the relative surface burning characteristics of materials under specific test conditions, where the material under test is mounted so that it forms the ceiling of a horizontal fire tunnel. A specified airflow is introduced through the tunnel and a specified flame is applied to one end. Observations are then made regarding the flame spread along the specimen. Results are expressed in terms of Flame Spread Index (FSI) and Smoke Developed Index (SDI). There is no established relationship between those two values.

Although the procedure is applicable to materials, products and assemblies used in building construction for development of comparative surface spread of flame data, the test results may not reflect the relative surface burning characteristics of tested materials under all building fire conditions.

SAMPLE PREPARATION

The test specimen consisted of a total of 3 sections of material, each approximately 0.65 inches (17 mm) in thickness by 21 inches (533 mm) in width by 96 inches (2438 mm) in length. The sections were butted together during testing to create the specimen length. Prior to testing, the specimen was conditioned to constant weight at a temperature of 73 ± 5°F (23 ± 3°C) and a relative humidity of 50 ± 5%. During testing, the specimen was supported over its full surface area by 2 inch (50 mm) hexagonal wire mesh and was further supported across its width by 0.25 inch (6 mm) steel rods spaced nominally at 24 inch (610 mm) intervals.

The testing was performed on: 2017-06-02

SUMMARY OF TEST PROCEDURE

The tunnel is preheated to 150 ± 5°F (66 ± 2.8°C), as measured by the floor-embedded thermocouple located 23.25 feet (7087 mm) downstream of the burner ports, and is allowed to cool to 105 ± 5°F (40.5 ± 2.8°C), as measured by the floor-embedded thermocouple located 13 feet (3962 mm) from the burners. The tunnel lid is then raised and the test sample is placed along the ledges of the tunnel so as to form a continuous ceiling 24 feet (7315 mm) long, approximately 12 inches (305 mm) above the floor. Three 8 foot (2438 mm) sections of 0.25 inch (6 mm) cement board are then placed on the back side of the sample and the lid is then lowered into place.

SUMMARY OF TEST PROCEDURE (continued)

Upon ignition of the gas burners, the flame spread distance is observed and recorded every second. Flame spread distance versus time is plotted. Calculations ignore all flame front recessions and Flame Spread Index (FSI) is determined by calculating the total area under the curve for the test sample. If the area under the curve (A) is less than or equal to 97.5 min·ft, then FSI = 0.515·A; if greater, FSI = 4900/(195-A). FSI is then rounded to the nearest multiple of 5.
Smoke Developed Index (SDI) is determined by dividing the total area under the obscuration curve by that of red oak, and multiplying by 100. SDI is then rounded to the nearest multiple of 5 if less than 200. SDI values over 200 are rounded to the nearest multiple of 50.

TEST RESULTS

SAMPLE	Flame Spread Index (FSI)	Smoke Developed Index (SDI)
"Isopipe TC"	5	200

Observations of Burning Characteristics

The specimen ignited approximately 11 seconds after exposure to the test flame. Sagging and intumescent charring was observed.

The flame front advanced to a maximum distance of 0.7 feet (0.2 metres) at approximately 64 seconds.

Interpretation of Test Results

Industry documents such as the International Building Code (IBC) or NFPA 101 Life Safety Code refer to ASTM E 84 (UL 723, NFPA 255) test results using the following material classification categories:

	Flame-Spread Index (FSI)	Smoke Development Index (SDI)
Class 1 or Class A	0 - 25	450 Maximum
Class 2 or Class B	26 - 75	450 Maximum
Class 3 or Class C	76 - 200	450 Maximum

Results Classification (if applicable):	Class 1 or Class A

Lazarus Machado,
Technician

Ian Smith,
Technical Manager

Note: This report and service are covered under Exova Canada Inc. Standard Terms and Conditions of Contract which may be found on the Exova website (www.exova.com), or by calling 1-866-263-9368.

MIRTEC ΑΝΩΝΥΜΗ ΕΤΑΙΡΕΙΑ ΒΙΟΜΗΧΑΝΙΚΗΣ ΕΡΕΥΝΑΣ, ΤΕΧΝΟΛΟΓΙΚΗΣ ΑΝΑΠΤΥΞΗΣ & ΕΡΓΑΣΤΗΡΙΑΚΗΣ ΔΟΚΙΜΗΣ, ΠΙΣΤΟΠΟΙΗΣΗΣ ΚΑΙ ΠΟΙΟΤΗΤΑΣ
MATERIALS INDUSTRIAL RESEARCH & TECHNOLOGY CENTER S.A.

MBETAM

1986 - 2016

LABORATORY TEST REPORT

Standard relevant for drafting of the report: ΕΛΟΤ ΕΝ ISO/ IEC 17025

01.	TESTING LABORATORY	: POLYMER & RUBBER TESTING LABORATORY
02.	LABORATORY ADDRESS	: INDUSTRIAL AREA SINDOS 57 022
03.	TEST ITEM DELIVERY DATE	: 2/5/2014
04.	CLIENT NAME	: 3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.
05.	CLIENT ADDRESS	: 68 km Nat. Rd. Athens-Lamia, 34100 RITSONA HALKIDA
06.	PROJECT CODE No	: G8311
07.	ITEM IDENTIFICATION No	: 1183.04.01-1183.04.05

STATEMENT OF VALIDITY OF TEST RESULTS

The results of this test relate ONLY to the items that have been subjected to this test.

STATEMENT OF VALIDITY FOR THE REPRODUCTION OF THIS REPORT

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08.	TEST REPORT No	: PL/LT/TH/6-17/431.04
	DATE OF ISSUE	: 23/8/2017
09.	DATE OF PERFORMANCE OF TEST	: 30/6/2014-24/12/2016
10.	SPECIMEN IDENTIFICATION CODE	: SEE ATTACHED IDENDIFICATION CHART
11.	SAMPLING PERFORMED BY	: -
	SAMPLING ACCORDING TO	: -
12.	PROJECT DESCRIPTION	: WEATHERING TEST ON FLEXIBLE ELASTOMERIC FOAM INSULATION PROJECT DATA: WEATHERING TEST ON FLEXIBLE ELASTOMERIC FOAM INSULATION PRODUCTS DURATION: 5000h
13.	ITEM DESCRIPTION	: FLEXIBLE ELASTOMERIC FOAM INSULATION COMMERCIAL NAME **"ISOPIPE TC SOLAR WHITE"**
	ITEM MATERIAL	: PC BASED
14.	PERSON ACCEPTING TECHNICAL RESPONSIBILITY	: MICHALIS CHASAPIS
15.	TEST DESCRIPTION/SPECIMENT DESCRIPTION	: ATLAS Ci65A : DATACOLOUR SPECTRAFLASH SF 450, SOURCE D65, CMC 2:1
17.	STANDARDS/SPECIFICATIONS	: ISO 4892-2
18.	NON-STANDARDIZED PROCEDURE	: -

Main: Head Office: Athens Office: Thessaloniki Office: Athens Branch: Athens Laboratories:

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Incoming Specimen Code Chart

Code	Description	Manufacturer	DN1	DN2
1183.04.01	FLEXIBLE ELASTOMERIC FOAM INSULATION WHITE	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.04.02	FLEXIBLE ELASTOMERIC FOAM INSULATION WHITE	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.04.03	FLEXIBLE ELASTOMERIC FOAM INSULATION WHITE	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.04.04	FLEXIBLE ELASTOMERIC FOAM INSULATION WHITE	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.04.05	FLEXIBLE ELASTOMERIC FOAM INSULATION WHITE	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		

Specimen Identification Chart

Code	Marking
1183.04.01	-
1183.04.02	-
1183.04.03	-
1183.04.04	-
1183.04.05	-

EBETAM IRTEC

19. Testing

Weathering test by exposure to Xenon Lamp according to ISO 4892-2

		PARAMETERS						RESULTS	
Code	Method/ Standart	Dry circle	Wet Cycle (water spay)	Black Standard Temperature (°)	Chamber temperature (°)	Humidity (%)	Duration (h)	Appearance *	Decolorization (DE)
1.183.04.02-1.183.04.05	ISO 4892-2 Method A	102 min 0.51W/m²/nm	102 min 0.51W/(m²/am)	65±3	38±3	50±10	5000	No visual defects	2.9

*=Visual deformation, blisters, void, cracks, delaminations etc

The test results relate to the samples as described and defined exactly in Incoming Specimen Code Chart & Specimen Identification Chart, which were brought to the Polymer & Elastomer Testing Laboratory, by 3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.

For the Laboratory

Michalis Chrestos
Physicist MSc

Thessaloniki 23/8/2017

Checked by

Athanasios Kourtesis
Northern Greece Director

EBETAM-IRTEC-EBETAM-IRTEC

MIRTEC ΑΝΩΝΥΜΗ ΕΤΑΙΡΕΙΑ ΒΙΟΜΗΧΑΝΙΚΗΣ ΕΡΕΥΝΑΣ, ΤΕΧΝΟΛΟΓΙΑΣ & ΑΝΑΠΤΥΞΗΣ ΕΡΓΑΣΤΗΡΙΑΚΩΝ ΔΟΚΙΜΩΝ, ΠΕΤΡΕΛΑΙΟΕΙΔΩΝ ΚΑΙ ΠΟΛΥΜΕΡΩΝ
MATERIALS INDUSTRIAL RESEARCH & TECHNOLOGY CENTER S.A.

BETAM

1986 - 2016

LABORATORY TEST REPORT

Standard relevant for drafting of the report: ΕΛΟΤ ΕΝ ISO/ IEC 17025

01.	TESTING LABORATORY	: POLYMER & RUBBER TESTING LABORATORY
02.	LABORATORY ADDRESS	: INDUSTRIAL AREA SINDOS 57 022
03.	TEST ITEM DELIVERY DATE	: 2/5/2014
04.	CLIENT NAME	: 3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.
05.	CLIENT ADDRESS	: 68 km Nat. Rd. Athens-Lamia, 34100 RITSONA HALKIDA
06.	PROJECT CODE No	: 68311
07.	ITEM IDENTIFICATION No	: 1183.05.01-1183.05.05

STATEMENT OF VALIDITY OF TEST RESULTS

The results of this test relate ONLY to the items that have been subjected to this test.

STATEMENT OF VALIDITY FOR THE REPRODUCTION OF THIS REPORT

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08.	TEST REPORT No	: PL/LT/TH/6-17/431.05
	DATE OF ISSUE	: 23/6/2017
09.	DATE OF PERFORMANCE OF TEST	: 30/6/2014-24/12/2016
10.	SPECIMEN IDENTIFICATION CODE	: SEE ATTACHED IDENDIFICATION CHART
11.	SAMPLING PERFORMED BY	: -
	SAMPLING ACCORDING TO	: -
12.	PROJECT DESCRIPTION	: WEATHERING TEST ON FLEXIBLE ELASTOMERIC FOAM INSULATION PROJECT DATA: WEATHERING TEST ON FLEXIBLE ELASTOMERIC FOAM INSULATION PRODUCTS DURATION: 5000h
13.	ITEM DESCRIPTION	: FLEXIBLE ELASTOMERIC FOAM INSULATION COMMERCIAL NAME **"ISOPIPE TC SOLAR BLACK"**
	ITEM MATERIAL	: PO BASED
14.	PERSON ACCEPTING TECHNICAL RESPONSIBILITY	: MICHALIS CHASAPIS
15.	TEST DESCRIPTION/SPECIMENT DESCRIPTION	: ATLAS C/65A : DATACOLOUR SPECTRAFLASH SF 450, SOURCE D65, CMC 2.1
17.	STANDARDS/SPECIFICATIONS	: ISO 4892-2
18.	NON-STANDARDIZED PROCEDURE	: -

Head Office: ... Tel.: ... Fax: ... E-mail: ...
Athens Office: ... Tel.: ... Fax: ... E-mail: ...
Thessaloniki Office: ... Tel.: ... Fax: ... E-mail: ...
Athens Branch: ... Tel.: ... E-mail: ...
Athens Laboratories: ... Tel.: ... Fax: ... E-mail: ...

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Incoming Specimen Code Chart

Code	Description	Manufacturer	DN1	DN2
1183.05.01	FLEXIBLE ELASTOMERIC FOAM INSULATION BLACK	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.05.02	FLEXIBLE ELASTOMERIC FOAM INSULATION BLACK	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.05.03	FLEXIBLE ELASTOMERIC FOAM INSULATION BLACK	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.05.04	FLEXIBLE ELASTOMERIC FOAM INSULATION BLACK	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.05.05	FLEXIBLE ELASTOMERIC FOAM INSULATION BLACK	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		

Specimen Identification Chart

Code	Marking
1183.05.01	-
1183.05.02	-
1183.05.03	-
1183.05.04	-
1183.05.05	-

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19. Testing

Weathering test by exposure to Xenon Lamp according to ISO 4892-2

		PARAMETERS						RESULTS	
Code	Method/ Standard	Dry circle	Wet Cycle (water spay)	Black Standard Temperature (°)	Chamber temperature (°)	Humidity (%)	Duration (h)	Appearance *	Decolorization (DE)
1183.05.02-1183.05.05	ISO 4892-2 Method A	102 min 0.51W/(m²/nm)	102 min 0.51W/(m²/nm)	65±3	38±3	50±10	5000	No visual defects	0.7

*=Visual deformation, blisters, void, cracks, delaminations etc

The test results relate to the samples as described and defined exactly in Incoming Specimen Code Chart & Specimen Identification Chart, which were brought to the Polymer & Elastomer Testing Laboratory, by 3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A..

For the Laboratory

Michalis Charalampis
Physicist MSc

Thessaloniki 23/8/2017

Checked by

Athanasios Kourtesis
Northern Greece Director

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MIRTEC ΑΝΩΝΥΜΗ ΕΤΑΙΡΕΙΑ ΒΙΟΜΗΧΑΝΙΚΗΣ ΕΡΕΥΝΑΣ ΤΕΧΝΟΛΟΓΙΚΗΣ ΑΝΑΠΤΥΞΗΣ & ΠΡΟΣΤΑΣΙΑΣ ΠΕΡΙΒΑΛΛΟΝΤΟΣ ΚΑΙ ΠΟΙΟΤΗΤΑΣ
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1986 - 2016

LABORATORY TEST REPORT

Standard relevant for drafting of the report: ΕΛΟΤ ΕΝ ISO/ IEC 17025

01.	TESTING LABORATORY	: POLYMER & RUBBER TESTING LABORATORY
02.	LABORATORY ADDRESS	: INDUSTRIAL AREA SINDOS 57 022
03.	TEST ITEM DELIVERY DATE	: 2/5/2014
04.	CLIENT NAME	: 3 - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.
05.	CLIENT ADDRESS	: 69 km Nat. Rd. Athens-Lamia, 34100 RITSONA HALKIDA
06.	PROJECT CODE No	: 68311
07.	ITEM IDENTIFICATION No	: 1183.09.01-1183.09.05

STATEMENT OF VALIDITY OF TEST RESULTS

The results of this test relate ONLY to the items that have been subjected to this test.

STATEMENT OF VALIDITY FOR THE REPRODUCTION OF THIS REPORT

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08.	TEST REPORT No	: PL/LT/TH/6-17/431.09
	DATE OF ISSUE	: 23/6/2017
09.	DATE OF PERFORMANCE OF TEST	: 30/6/2014-24/12/2016
10.	SPECIMEN IDENTIFICATION CODE	: SEE ATTACHED IDENDIFICATION CHART
11.	SAMPLING PERFORMED BY	: -
	SAMPLING ACCORDING TO	: -
12.	PROJECT DESCRIPTION	: WEATHERING TEST ON FLEXIBLE ELASTOMERIC FOAM INSULATION PROJECT DATA: WEATHERING TEST ON FLEXIBLE ELASTOMERIC FOAM INSULATION PRODUCTS DURATION: 5000h
13.	ITEM DESCRIPTION	: FLEXIBLE ELASTOMERIC FOAM INSULATION COMMERCIAL NAME **"ISOPIPE TC SOLAR SILVER"**
	ITEM MATERIAL	: PO BASED
14.	PERSON ACCEPTING TECHNICAL RESPONSIBILITY	: MICHALIS CHASAPIS
15.	TEST DESCRIPTION/SPECIMENT DESCRIPTION	: ATLAS C65A
		: DATACOLOUR SPECTRAFLASH SF 450, SOURCE D65, CMC 2:1
17.	STANDARDS/SPECIFICATIONS	: ISO 4892-2
18.	NON-STANDARDIZED PROCEDURE	: -

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Incoming Specimen Code Chart

Code	Description	Manufacturer	DN1	DN2
1183.09.01	FLEXIBLE ELASTOMERIC FOAM INSULATION SILVER	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.09.02	FLEXIBLE ELASTOMERIC FOAM INSULATION SILVER	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.09.03	FLEXIBLE ELASTOMERIC FOAM INSULATION SILVER	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.09.04	FLEXIBLE ELASTOMERIC FOAM INSULATION SILVER	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.09.05	FLEXIBLE ELASTOMERIC FOAM INSULATION SILVER	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		

Specimen Identification Chart

Code	Marking
1183.09.01	-
1183.09.02	-
1183.09.03	-
1183.09.04	-
1183.09.05	-

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19. Testing

Weathering test by exposure to Xenon Lamp according to ISO 4892-2

		PARAMETERS						RESULTS	
Code	Method/ Standard	Dry circle	Wet Cycle (water spay)	Black Standard Temperature (°)	Chamber temperature (°)	Humidity (%)	Duration (h)	Appearance *	Decolorization (DE)
1163.05.02-1163.09.05	ISO 4892-2 Method A	102 min 0.51W/(m²/nm)	102 min 0.51W/(m²/nm)	65±3	38±3	50±10	480	No visual defects	0.7

*=Visual deformation, blisters, void, cracks, delaminations etc

The test results relate to the samples as described and defined exactly in Incoming Specimen Code Chart & Specimen Identification Chart, which were brought to the Polymer & Elastomer Testing Laboratory by 3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.

For the Laboratory

Michalis Chasapis
Physicist MSc

Thessaloniki 20/9/2017

Checked by

Athanasios Kourtesis
Northern Greece Director

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ΑΝΩΝΥΜΗ ΕΤΑΙΡΕΙΑ ΒΙΟΜΗΧΑΝΙΚΗΣ ΕΡΕΥΝΑΣ, ΤΕΧΝΟΛΟΓΙΑΣ ΚΑΙ ΑΝΑΠΤΥΞΗΣ
& ΠΙΣΤΟΠΟΙΗΣΗΣ ΠΡΟΪΟΝΤΩΝ, ΠΕΤΡΟΠΟΙΗΣΗΣ ΚΑΙ ΠΟΙΟΤΗΤΑΣ
MATERIALS INDUSTRIAL RESEARCH & TECHNOLOGY CENTER S.A.

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1986 - 2016

LABORATORY TEST REPORT

Standard relevant for drafting of the report: ΕΛΟΤ ΕΝ ISO/ IEC 17025

01.	TESTING LABORATORY	: POLYMER & RUBBER TESTING LABORATORY
02.	LABORATORY ADDRESS	: INDUSTRIAL AREA SINDOS 5Γ 022
03.	TEST ITEM DELIVERY DATE	: 2/5/2014
04.	CLIENT NAME	: 3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.
05.	CLIENT ADDRESS	: 68 km Nat. Rd. Athens-Lamia, 34100 RITSONA HALKIDA
06.	PROJECT CODE No	: 68311
07.	ITEM IDENTIFICATION No	: 1183.11.01-1183.11.05

STATEMENT OF VALIDITY OF TEST RESULTS

The results of this test relate ONLY to the items that have been subjected to this test.

STATEMENT OF VALIDITY FOR THE REPRODUCTION OF THIS REPORT

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08.	TEST REPORT No	: PL/LT/THΫ́-17/431.11
	DATE OF ISSUE	: 23/8/2017
09.	DATE OF PERFORMANCE OF TEST	: 30/6/2014-24/12/2016
10.	SPECIMEN IDENTIFICATION CODE	: SEE ATTACHED IDENDIFICATION CHART
11.	SAMPLING PERFORMED BY	: -
	SAMPLING ACCORDING TO	: -
12.	PROJECT DESCRIPTION	: WEATHERING TEST ON FLEXIBLE ELASTOMERIC FOAM INSULATION PROJECT DATA: WEATHERING TEST ON FLEXIBLE ELASTOMERIC FOAM INSULATION PRODUCTS DURATION: 5000h
13.	ITEM DESCRIPTION	: FLEXIBLE ELASTOMERIC FOAM INSULATION COMMERCIAL NAME "ISOPIPE TC HEAVY DUTY"
	ITEM MATERIAL	: ALUMINIUM COATING WITH UV PROTECTION
14.	PERSON ACCEPTING TECHNICAL RESPONSIBILITY	: MICHALIS CHASAPIS
15.	TEST DESCRIPTION/SPECIMENT DESCRIPTION	: ATLAS C65A : DATACOLOUR SPECTRAFLASH SF 450, SOURCE D65, CMC 2:1
17.	STANDARDS/SPECIFICATIONS	: ISO 4892-2
18.	NON-STANDARDIZED PROCEDURE	: -

Head Office ... Tel. ... Fax ... E-mail: ...
Athens Office ... Tel. ... Fax ... E-mail: ...
Thessaloniki Office ... Tel. ... Fax ... E-mail: ...
Athens Branch ... Tel. ... E-mail: ...
Thessaloniki Branch ... Tel. ... Fax ... E-mail: ...
Athens Laboratories ... Tel. ... Fax ... E-mail: ...

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Incoming Specimen Code Chart

Code	Description	Manufacturer	DN1	DN2
1183.11.01	FLEXIBLE ELASTOMERIC FOAM INSULATION ALUMINIUM	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.11.02	FLEXIBLE ELASTOMERIC FOAM INSULATION ALUMINIUM	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.11.03	FLEXIBLE ELASTOMERIC FOAM INSULATION ALUMINIUM	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.11.04	FLEXIBLE ELASTOMERIC FOAM INSULATION ALUMINIUM	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.11.05	FLEXIBLE ELASTOMERIC FOAM INSULATION ALUMINIUM	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		

Specimen Identification Chart

Code	Marking
1183.11.01	-
1183.11.02	-
1183.11.03	-
1183.11.04	-
1183.11.05	-

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19. Testing

Weathering test by exposure to Xenon Lamp according to ISO 4892-2

		PARAMETERS						RESULTS	
Code	Method/ Standard	Dry circle	Wet Cycle (water spay)	Black Standard Temperature (°)	Chamber temperature (°)	Humidity (%)	Duration (h)	Appearance *	Decolorization (DE)
1183.11.02-1183.11.05	ISO 4892-2 Method A	102 min 0.51W/(m²/nm)	102 min 0.51W/(m²/nm)	65±3	38±3	50±10	400	No visual defects	-

*=Visual deformation, blisters, void, cracks, delaminations etc

The test results relate to the samples as described and defined exactly in Incoming Specimen Code Chart & Specimen Identification Chart, which were brought to the Polymer & Elastomer Testing Laboratory, by 3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.

For the Laboratory

Michalis Chasapis
Physicist MSc

Thessaloniki 23/8/2017

Checked by

Athanasios Koutsis
Northern Greece Director

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MATERIALS INDUSTRIAL RESEARCH & TECHNOLOGY CENTER S.A.

1986 - 2016

LABORATORY TEST REPORT

Standard relevant for drafting of the report: ΕΛΟΤ EN ISO/ IEC 17025

01.	TESTING LABORATORY	: POLYMER & RUBBER TESTING LABORATORY
02.	LABORATORY ADDRESS	: INDUSTRIAL AREA SINDOS 57 022
03.	TEST ITEM DELIVERY DATE	: 2/5/2014
04.	CLIENT NAME	: 3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.
05.	CLIENT ADDRESS	: 68 km Nat. Rd. Athens-Lamia, 34100 RITSONA HALKIDA
06.	PROJECT CODE No	: 06311
07.	ITEM IDENTIFICATION No	: 1183.07.01-1183.07.06

STATEMENT OF VALIDITY OF TEST RESULTS

The results of this test relate ONLY to the items that have been subjected to this test.

STATEMENT OF VALIDITY FOR THE REPRODUCTION OF THIS REPORT

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08.	TEST REPORT No DATE OF ISSUE	: PL/LT/TH/8-17/431.07 : 23/8/2017
09.	DATE OF PERFORMANCE OF TEST	: 30/6/2014-24/12/2016
10.	SPECIMEN IDENTIFICATION CODE	: SEE ATTACHED IDENDIFICATION CHART
11.	SAMPLING PERFORMED BY	: -
	SAMPLING ACCORDING TO	: -
12.	PROJECT DESCRIPTION	: WEATHERING TEST ON FLEXIBLE ELASTOMERIC FOAM INSULATION **PROJECT DATA**: WEATHERING TEST ON FLEXIBLE ELASTOMERIC FOAM INSULATION PRODUCTS DURATION: 5000h
13.	ITEM DESCRIPTION	: FLEXIBLE ELASTOMERIC FOAM INSULATION COMMERCIAL NAME **"ISOPIPE HT"**
	ITEM MATERIAL	: EVA BASED
14.	PERSON ACCEPTING TECHNICAL RESPONSIBILITY	: MICHALIS CHASAPIS
15.	TEST DESCRIPTION/SPECIMENT DESCRIPTION	: ATLAS CI65A
		: DATACOLOUR SPECTRAFLASH SF 450, SOURCE D65, CMC 2:1
17.	STANDARDS/SPECIFICATIONS	: ISO 4892-2
18.	NON-STANDARDIZED PROCEDURE	: -

MIRTEC BETAM

Incoming Specimen Code Chart

Code	Description	Manufacturer	DN1	DN2
1183.07.01	FLEXIBLE ELASTOMERIC FOAM INSULATION BLACK	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.07.02	FLEXIBLE ELASTOMERIC FOAM INSULATION BLACK	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.07.03	FLEXIBLE ELASTOMERIC FOAM INSULATION BLACK	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.07.04	FLEXIBLE ELASTOMERIC FOAM INSULATION BLACK	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		
1183.07.05	FLEXIBLE ELASTOMERIC FOAM INSULATION BLACK	3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.		

Specimen Identification Chart

Code	Marking
1183.07.01	-
1183.07.02	-
1183.07.03	-
1183.07.04	-
1183.07.05	-

MIRTEC
EBETAM

19. Testing

Weathering test by exposure to Xenon Lamp according to ISO 4892-2

		PARAMETERS						RESULTS	
Code	Method/ Standard	Dry circle	Wet Cycle (water spay)	Black Standard Temperature (°)	Chamber temperature (°)	Humidity (%)	Duration (h)	Appearance *	Decolorization (DE)
1183.07.03-1183.07.06	ISO 4892.2 Method A	102 min 0,51W/(m²nm)	102 min 0,51W/(m²nm)	65±3	38±3	50±10	480	No visual defects	3,8

*=Visual deformation, blisters, void, cracks, delaminations etc

The test results relate to the samples as described and defined exactly in Incoming Specimen Code Chart & Specimen Identification Chart, which were brought to the Polymer & Elastomer Testing Laboratory by 3i - INTERNATIONAL INNOVATIVE INDUSTRIES S.A.

For the Laboratory

Michalis Chasapis
Physicist MSc

Thessaloniki, 23/8/2017

Checked by

Athanasios Kourtesis
Northern Greece Director

ΑΡΙΣΤΟΤΕΛΕΙΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΟΝΙΚΗΣ / ARISTOTLE UNIVERSITY OF THESSALONIKI

ΠΙΣΤΟΠΟΙΗΤΙΚΟ ΔΟΚΙΜΗΣ / TEST REPORT

Δείκτης Ηχομείωσης μετρημένος σύμφωνα με το DIN EN ISO 140-3:2005 σε θαλάμους δοκιμών αερόφερτου ήχου / Sound Reduction Index measured according to DIN EN ISO 140-3:2005 in airborne sound test rooms

ΑΡΙΘΜΟΣ ΔΟΚΙΜΗΣ / TEST REPORT NUMBER

A.583.2012

ΗΜΕΡΟΜΗΝΙΑ / DATE

10.07.2012

CERT

ΕΣΥΔ

Κοινοποιημένος Φορέας Αρ.2326
Notified Body Nr. 2326

ΕΡΓΑΣΤΗΡΙΟ ΑΡΧΙΤΕΚΤΟΝΙΚΗΣ ΤΕΧΝΟΛΟΓΙΑΣ / LABORATORY OF ARCHITECTURAL TECHNOLOGY
54124 Thessaloniki, University Campus, Tel. +30 2310 995501, Fax: +30 2310 995504, technology@arch.auth.gr, www.window.gr

ΤΟΜΕΑΣ ΑΡΧΙΤΕΚΤΟΝΙΚΟΥ ΣΧΕΔΙΑΣΜΟΥ ΚΑΙ ΑΡΧΙΤΕΚΤΟΝΙΚΗΣ ΤΕΧΝΟΛΟΓΙΑΣ / DEPARTMENT OF ARCHITECTURAL DESIGN & ARCHITECTURAL TECHNOLOGY - ΤΜΗΜΑ ΑΡΧΙΤΕΚΤΟΝΩΝ ΜΗΧΑΝΙΚΩΝ / SCHOOL OF ARCHITECTURE - ΠΟΛΥΤΕΧΝΙΚΗ ΣΧΟΛΗ / FACULTY OF TECHNOLOGY

1. ΓΕΝΙΚΟΙ ΟΡΟΙ / GENERAL CONDITIONS

Το πιστοποιητικό αυτό είναι το αποτέλεσμα της δοκιμής της ηχομονωτικής ικανότητας ενός δομικού στοιχείου. Περιγράφει αναλυτικά τα αποτελέσματα της δοκιμής που έγινε στο συγκεκριμένο δοκίμιο δομικού στοιχείου και προσδιορίζει την ηχομονωτική του ικανότητα με ένα μονόπμο μέγεθος.

Η δοκιμή της ηχομονωτικής ικανότητας έγινε στο Εργαστήριο Αρχιτεκτονικής Τεχνολογίας του Τμήματος Αρχιτεκτόνων σύμφωνα με τις διαδικασίες της Υ.Α. ΚΑ/679/22.6.95, Φ.Ε.Κ. 826, τεύχος Β', άρθρο 1, παράγραφος 2 και μετά από σχετικές εγκρίσεις των αρμοδίων οργάνων του Αριστοτελείου Πανεπιστημίου Θεσσαλονίκης.

Το αποτέλεσμα της δοκιμής αφορά αποκλειστικά το δοκίμιο που χρησιμοποιήθηκε. Για να αποδίδει ένα δοκίμιο τις ίδιες τιμές με αυτές που δίδονται στο φύλλο αποτελεσμάτων, θα πρέπει να είναι όμοιο τόσο από άποψη κατασκευής όσο και από άποψη εφαρμογής με το δοκίμιο που χρησιμοποιήθηκε. Κάθε διαφοροποίηση, έστω και μικρή, μπορεί να οδηγήσει σε διαφορετικά αποτελέσματα.

Η δοκιμή πραγματοποιήθηκε σε εργαστηριακές συνθήκες, ώστε να προκύψει η πραγματική ηχομονωτική ικανότητα του δοκιμίου. Σε περίπτωση εφαρμογής του κάτω από άλλες συνθήκες ως προς τις πλευρικές μεταδόσεις, ο Δείκτης Ηχομείωσης που δίνει το πιστοποιητικό δοκιμής μπορεί να μειωθεί, ιδιαίτερα αν τα πλευρικά χωρίσματα έχουν ίση ή μικρότερη ηχομονωτική ικανότητα.

Το Εργαστήριο διατηρεί το δικαίωμα να χρησιμοποιεί τα αποτελέσματα των δοκιμών σε επιστημονικές δημοσιεύσεις, επιστημονικές ανακοινώσεις, ερευνητικές εργασίες, καθώς και κάθε είδους ανάλογες εργασίες καθαρά επιστημονικού ή ερευνητικού χαρακτήρα, χωρίς να αναφέρει το όνομα του Αναθέτη ή τον τύπο του προϊόντος.

This test report is the result of a laboratory test of the sound insulation properties of a building element. The results obtained from measurements on the specific building element are presented in detail, and a single figure rating for its sound insulaton propertes is calculated.

This sound insulation test was performed by the Architectural Technology Laboratory of the School of Architecture, in accordance with the procedures of the Y.A. KA/679/22.6.95, F.E.K. 826, part B', article 1, peregraph 2 and after the appropriate approvals by the administrative authorities of the Aristotle University of Thessaloniki.

The test result reflects exclusively on the properties of the specific test specimen. The tests have taken place under laboratory conditions, so as to obtain the actual sound insulation properties of the test specimen. Under different mounting conditions involving flanking sound transmission, the Sound Reduction Index might be reduced, especially if the flanking partitions have equal or inferior sound insulation properties.

The Laboratory maintains the right to use the test results in scientific publications, scientific papers, research reports, and any other kind of studies of purely research or scientific nature, without revealing the name of the Client or the type of the product.

2. ΔΙΑΔΙΚΑΣΙΕΣ / PROCEDURES

2.1 Εφαρμοζόμενα Πρότυπα / Applied Standards

DIN EN ISO 140-3:2005, Acoustics – Measurement of sound insulation in buildings and of building elements – Part 3: Laboratory measurements of airborne sound insulation of building elements

DIN EN ISO 717-1:2006 Acoustics – Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation (ISO 717-1:1996 + AM1:2006); German version EN ISO 717-1:1996 + A1:2006

EA - 2/17: 2009
EA Guidance on the horizontal requirements conformity assessment bodies for notification purposes

DIN EN 14351-1:2006
Fenster und Türen - Produktnorm Leistungseigenschaften - Teil 1: Fenster und Außentüren ohne Eigenschaften bezüglich Feuerschutz und/oder Rauchdichtheit; Deutsche Fassung EN 14351-1:2006

DIN EN 1279-5:2010
Glas im Bauwesen - Mehrscheiben-Isolierglas - Teil 5: Konformitätsbewertung; Deutsche Fassung EN 1279-5:2005+A2:2010

DIN EN 13241-1:2004
Tore - Produktnorm - Teil 1: Produkte ohne Feuer- und Rauchschutzeigenschaften; Deutsche Fassung EN 13241-1:2003

2.2 Διαδικασία Δοκιμής/ Test Procedure

Το δοκίμιο εφαρμόστηκε στους θαλάμους δοκιμών από τον Αναθέτη. Η δοκιμή υλοποιήθηκε σύμφωνα με τις διαδικασίες που καθορίζονται στο πρότυπο DIN EN ISO 140-3:2005, Acoustics – Measurement of sound insulation in buildings and of building elements - Part 3:Laboratory measurements of airborne sound insulation of building elements.

Για τον προσδιορισμό του Δείκτη Ηχομείωσης R χρησιμοποιήθηκε η σχέση:

$$R = L_1 - L_2 + 10\log (S/A) \text{ σε dB όπου:}$$

L_1: η μέση στάθμη ηχητικής πίεσης στο θάλαμο εκπομπής σε dB
L_2: η μέση στάθμη ηχητικής πίεσης στο θάλαμο λήψης σε dB
S: η επιφάνεια του δοκιμίου σε m^2
A: η ηχοαπορρόφηση του θαλάμου λήψης που προκύπτει από τη σχέση:

$$A = 0.163 (V/T) \text{ σε } m^2 \text{ όπου:}$$

V: ο όγκος του θαλάμου λήψης σε m^3
T: ο χρόνος αντήχησης του θαλάμου λήψης σε s

Χρόνος αντήχησης: Για τον προσδιορισμό του χρόνου αντήχησης πραγματοποιήθηκαν μετρήσεις σε 6 διαφορετικές θέσεις μικροφώνου.

Θόρυβος βάθους: Δεν απαιτήθηκε διόρθωση για το θόρυβο βάθους

Τα αποτελέσματα της δοκιμής στις ζώνες συχνοτήτων από 100 μέχρι 3150 Hz (ως τριτοοκτάβες) χρησιμοποιήθηκαν για τον προσδιορισμό του Σταθμισμένου Δείκτη Ηχομείωσης του δοκιμίου σύμφωνα με το πρότυπο DIN EN ISO 717-1:2006.

The test specimen was mounted in the test room by the Client. The test took place under laboratory conditions, according to DIN EN ISO 140-3:2005, Acoustics – Measurement of sound insulation in buildings and of building elements - Part 3: Laboratory measurements of airborne sound insulation of building elements.

In order to calculate the Sound Reduction Index R, the following equation was used:

$$R = L_1 - L_2 + 10\log (S/A) \text{ in dB where:}$$

L_1: the average sound pressure level in the source room in dB
L_2: the average sound pressure level in the receiving room in dB
S : the area of the test specimen in m^2
A : the equivalent sound absorption area in the receiving room given by the equation

$A = 0.163 (V/T)$ in m^2 where:

V: the volume of the receiving room in m^3
T: the reverberation time of the receiving room in s

Reverberation time: The reverberation time was measured in 6 microphone positions.

Background noise: No background noise correction was required.

The test results in the frequency bands from 100 to 3150 Hz (in third octaves) were used to calculate the Weighted Sound Reduction Index of the test specimen according to DIN EN ISO 717-1:2006.

2.3 Χρησιμοποιούμενος εξοπλισμός / Equipment used

Συσκευή / Apparatus	Τύπος / Type	Κατασκευαστής / Manufacturer	Κωδικός / Code
Noise level analyser	Nor 840-2	Norsonic	EQ-C013
Microphone preamplifiers	Nor 1201	Norsonic	X001, X002
Microphones	Nor 1225	Norsonic	X-C005, X-C006
Rotating Microphone boom	JS23	Bruel & Kjaer	EQ017
Dodecahedron loudspeaker	Lab-1217	Roister	EQ019
Amplifier	POA-4400A	Denon	Z1

2.4 Θάλαμοι Δοκιμών / Test Rooms

Οι θάλαμοι δοκιμών είναι κατασκευασμένοι σύμφωνα με τις απαιτήσεις του προτύπου EN ISO 140-1:1997* / The test rooms meet the requirements of the EN ISO 140-1:1997* standard.

** EN ISO 140-1:1997 Acoustics–Measurement of sound insulation in buildings and of building elements – Part 1: Requirements for laboratory test facilities with suppressed flanking transmission*

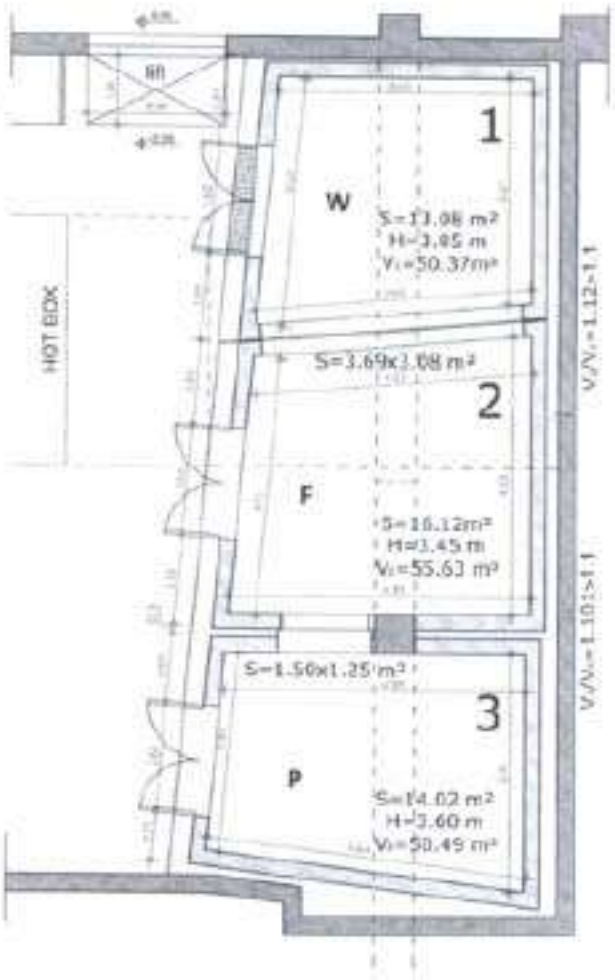
Αβεβαιότητα / Uncertainty

1.Αναπαραγωγισιμότητα / Reproducibility

σ	Χειριστής α	Χειριστής β
R_w	0	0
ε	0	0
σr	0.58	0.58

2.Επαναληψιμότητα / Repeatability

	σ
R_w	0
ε	0.25
σr	0.51



Διαστάσεις ανοίγματος δοκιμίου/
Test opening dimensions: 1500x1250 mm

Όγκος Θαλάμου εκπομπής/
Source Room Volume: 56 m^3

Όγκος Θαλάμου λήψης/
Receiving Room Volume: 51 m^3

Ήχος δοκιμής/Test noise: Ροζ θόρυβος /Pink noise

Φίλτρα/Filters: τριτοοκταβικά/third octave

3. ΔΟΚΙΜΙΟ / TEST SPECIMEN

3.1 Περιγραφή / Description

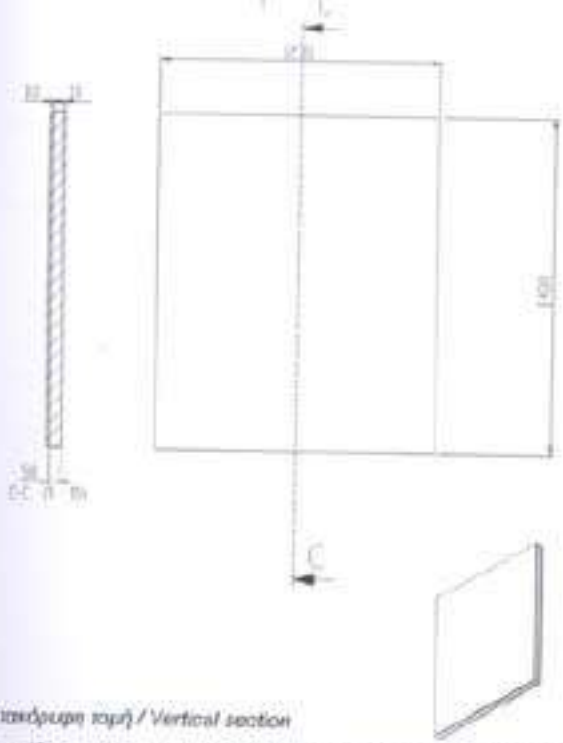
Προϊόν/Product:	Πανελ διαχωριστικών εσωτερικού χώρου / Internal dividing partitions panel
Κατασκευαστής/Manufacturer:	**3i International Innovative Industries A.B.E. / 3i International Innovative Industries S.A.**
Ανάθέτης/Client:	3i International Innovative Industries A.B.E. / 3i International Innovative Industries S.A.
Διεύθυνση/Address:	Ναυπλίου & Δασκαλογιάννη 14452 Μεταμόρφωση Αττικής www.isopipe.eu / Nafpliou & Daskalogianni 144 52 Metamorfossi Athens, www.isopipe.eu
Εγκατάσταση/ installation:	3i International Innovative Industries A.B.E. / 3i International Innovative Industries S.A.
Ονομασία προϊόντος/Product name:	**ISOSOUND 150kg/m³**
Ημερομηνία παραγωγής/Production date:	27/06/2012
Διαστάσεις δοκιμίου/ Sample dimensions:	1480 x 1230 mm

3.2 Κατασκευή / Construction

Πάνελ διαχωριστικών εσωτερικού χώρου τοποθετημένο σύμφωνα με το πρότυπο DIN EN ISO 140-3:2005, Acoustics – Measurement of sound insulation in buildings and of building elements - Part 3: Laboratory measurements of airborne sound insulation of building elements.
Αποτελείται από γυψοσανίδα πάχους 10mm, φύλλο Isosound πυκνότητας 150kg/m³ και πάχους 50mm, γυψοσανίδα πάχους 10mm. Το συνολικό πάχος της κατασκευής είναι 70 mm.

Internal dividing partitions panel, installed according to DIN EN ISO 140-3:2005, Acoustics – Measurement of sound insulation in buildings and of building elements - Part 3: Laboratory measurements of airborne sound insulation of building elements standard.
The panel is made of 10mm thick plasterboard, a 50mm thick Isosound sheet with a density of 150kg/m³, and a 10mm thick plasterboard. The total width of the construction is 70 mm.

3.3 Απεικόνιση / Drawing



Κατακόρυφη τομή / Vertical section

Τα σχέδια εταιμάστηκαν από τον Ανάθέτη / The drawings have been prepared by the Client.

4. ΑΠΟΤΕΛΕΣΜΑΤΑ ΔΟΚΙΜΗΣ / TEST RESULTS

Οι τιμές του Δείκτη Ηχομείωσης Αερόφερτου Ήχου του δοκιμίου δίδονται στο επισυναπτόμενο διάγραμμα στη σελίδα 8 σε συνάρτηση με την συχνότητα. / The values of the Airborne Sound Reduction Index of the test specimen are given in the annexed data sheet in page 8 as a function of frequency.

Ο παρακάτω Σταθμισμένος Δείκτης Ηχομείωσης για φάσμα συχνοτήτων από 100Hz ως 3150Hz είναι αποτέλεσμα αξιολόγησης σύμφωνα με το πρότυπο EN ISO 717-1:2006 / The following Weighted Sound Reduction Index for the frequency range from 100Hz to 3150Hz is the result of evaluation according to EN ISO 717-1:2006.

Διαπιστωθείσα τιμή / Determined value

Σταθμισμένος Δείκτης Ηχομείωσης / Weighted Sound Reduction Index:

$R_w (C;C_t) = 40 (-2;-7)$ dB

Θεσσαλονίκη/Thessaloniki, 10.07.2012

Διαπιστευμένο Εργαστήριο Δοκιμών / Accredited Test Laboratory E.SY.D. No 704

Κοινοποιημένος Φορέας / Notified Body NB 2326

Εμμανουήλ Τζεκάκης / Emmanuel Tzekakis
Καθηγητής /Professor
Διευθυντής του Εργαστηρίου /Director of the Laboratory

Βασίλειος Βασιλειάδης / Vasilios Vasiliadis
Μηχανολόγος Μηχανικός / Mechanical Engineer
Υπεύθυνος Υποστήριξης Δοκιμών/Test Support Engineer

Δείκτης Ηχομείωσης
Sound Reduction Index

σύμφωνα με το/according to
DIN EN ISO 140-3:2005

Κατασκευαστής/Manufacturer: **3i International Innovative Industries A.B.E. / 3i International Innovative Industries S.A.**
Ανάδοχος/Client: 3i International Innovative Industries A.B.E. / 3i International Innovative Industries S.A.
Εγκατάσταση/ Installation: 3i International Innovative Industries A.B.E. / 3i International Innovative Industries S.A.

Ονομασία προϊόντος/Product name: **ISOSOUND 150kg/m³**
Ημερομηνία παραγωγής / Production date : 27/06/2012
Θάλαμοι δοκιμών/Test rooms: FF
Ημερομηνία δοκιμής/Testing date: 16/07/2012
Διαστάσεις δοκιμού / Sample dimensions : 1480 x 1230 mm

Περιγραφή του δοκιμίου & της διάταξης τοποθέτησης / Sample & mounting description:
Πάνελ διαχωριστικών εσωτερικού χώρου τοποθετημένο σύμφωνα με το πρότυπο DIN EN ISO 140-3:2005. Αποτελείται από γυψοσανίδα πάχους 10mm, φύλλο Isosound πυκνότητας 150kg/m³ και πάχους 50mm, γυψοσανίδα πάχους 10mm. Το συνολικό πάχος της κατασκευής είναι 70 mm.
Internal dividing partitions panel, installed according to DIN EN ISO 140-3:2005. The panel is made of 10mm thick plasterboard, a 50mm thick Isosound sheet with a density of 150kg/m³, and a 10mm thick plasterboard. The total width of the construction is 70 mm.

S δοκιμού/S test specimen:	1,82 m²
Επιφανειακή μάζα/Mass per unit:	kg/m²
Θερμοκρασία/Temperature:	27 °C
Σχετική υγρασία/Relative humidity:	59 %
V θαλάμου Εκπομπής/V Source Room:	56 m³
V θαλάμου Λήψης/V Receiving Room:	51 m³

f(Hz)	R(dB)	R_{min}(dB)
50	-	
63	-	
80	-	
100	21,2	37,9
125	28,3	37,2
160	21,3	41,4
200	23,3	39,7
250	28,3	43,4
315	29,6	46,5
400	37,6	47,1
500	42,2	50,8
630	44,9	53,8
800	43,4	54,5
1000	41,5	55,8
1250	46,2	54,1
1600	51,1	53,4
2000	50,7	55,2
2500	51,4	55,9
3150	49,2	55,9
4000	48,2	56,8
5000	46,1	52,7

Διαπιστωθείσα τιμή / Determined value

Σταθμισμένος Δείκτης Ηχομείωσης σύμφωνα με τα αποτελέσματα μετρήσεων σε θαλάμους δοκιμών σε τριοκτάβες
Weighted Sound Reduction Index according to measurement results in test rooms in third octaves

$R_w (C;C_{tr}) = 40 (-2;-7)$ dB

$C_{50-3150}$ = dB $C_{50-5000}$ = dB $C_{100-5000}$ = -1 dB
$C_{100-5000}$ = dB $C_{50-5000}$ = dB $C_{100-5000}$ = -7 dB

Αριθμός/Number: A.583.2012
Ημερομηνία/Date: 10.07.2012

Εργαστήριο Αρχιτεκτονικής Τεχνολογίας / Laboratory of Architectural Technology
Κοινοποιημένος Φορέας / Notified Body: NB 2326
Διευθυντής/Director: Ε. Τζεκάκης / E. Tzekakis
Υπογραφή/Signature:

63. Aristotle University of Thessaloniki A.582.2012 #2 (GR)

ΔΟΚΙΜΗ/TEST: A.582.2012

ΣΕΛΙΔΑ/PAGE 1/6

ΑΡΙΣΤΟΤΕΛΕΙΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΟΝΙΚΗΣ / ARISTOTLE UNIVERSITY OF THESSALONIKI

ΠΙΣΤΟΠΟΙΗΤΙΚΟ ΔΟΚΙΜΗΣ / TEST REPORT

Δείκτης Ηχομείωσης μετρημένος σύμφωνα με το DIN EN ISO 140-3:2005 σε θαλάμους δοκιμών αερόφερτου ήχου / Sound Reduction Index measured according to DIN EN ISO 140-3:2005 in airborne sound test rooms

ΑΡΙΘΜΟΣ ΔΟΚΙΜΗΣ / TEST REPORT NUMBER

A.582.2012

ΗΜΕΡΟΜΗΝΙΑ / DATE

10.07.2012

Δοκιμές Αρ.Πιστ. 734
Tests Cert № 734

Κοινοποιημένος Φορέας Αρ 2326
Notified Body Nr. 2326

ΕΡΓΑΣΤΗΡΙΟ ΑΡΧΙΤΕΚΤΟΝΙΚΗΣ ΤΕΧΝΟΛΟΓΙΑΣ / LABORATORY OF ARCHITECTURAL TECHNOLOGY
54124 Thessaloniki, University Campus, Tel: +30 2310 995501, Fax: +30 2310 995504, technology@arch.auth.gr, www.window.gr

ΤΟΜΕΑΣ ΑΡΧΙΤΕΚΤΟΝΙΚΟΥ ΣΧΕΔΙΑΣΜΟΥ ΚΑΙ ΑΡΧΙΤΕΚΤΟΝΙΚΗΣ ΤΕΧΝΟΛΟΓΙΑΣ | DEPARTMENT OF ARCHITECTURAL DESIGN & ARCHITECTURAL TECHNOLOGY - ΤΜΗΜΑ ΑΡΧΙΤΕΚΤΟΝΩΝ ΜΗΧΑΝΙΚΩΝ | SCHOOL OF ARCHITECTURE - ΠΟΛΥΤΕΧΝΙΚΗ ΣΧΟΛΗ | FACULTY OF TECHNOLOGY

1. ΓΕΝΙΚΟΙ ΟΡΟΙ / GENERAL CONDITIONS

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Η δοκιμή της ηχομονωτικής ικανότητας έγινε στο Εργαστήριο Αρχιτεκτονικής Τεχνολογίας του Τμήματος Αρχιτεκτόνων σύμφωνα με τις διαδικασίες της Υ.Α. ΚΑ/679/22.8.96, Φ.Ε.Κ. 826, τεύχος Β', άρθρο 1, παράγραφος 2 και μετά από σχετικές εγκρίσεις των αρμοδίων οργάνων του Αριστοτελείου Πανεπιστημίου Θεσσαλονίκης.

Το αποτέλεσμα της δοκιμής αφορά αποκλειστικά το δοκίμιο που χρησιμοποιήθηκε. Για να αποδίδει ένα δοκίμιο τις ίδιες τιμές με αυτές που δίδονται στο φύλλο αποτελεσμάτων, θα πρέπει να είναι όμοιο τόσο από άποψη κατασκευής όσο και από άποψη εφαρμογής με το δοκίμιο που χρησιμοποιήθηκε. Κάθε διαφοροποίηση, έστω και μικρή, μπορεί να οδηγήσει σε διαφορετικά αποτελέσματα.

Η δοκιμή πραγματοποιήθηκε σε εργαστηριακές συνθήκες, ώστε να προκύψει η πραγματική ηχομονωτική ικανότητα του δοκιμίου. Σε περίπτωση εφαρμογής του κάτω από άλλες συνθήκες ως προς τις πλευρικές μεταδόσεις, ο Δείκτης Ηχομείωσης που δίνει το πιστοποιητικό δοκιμής μπορεί να μειωθεί, ιδιαίτερα αν τα πλευρικά χωρίσματα έχουν ίση ή μικρότερη ηχομονωτική ικανότητα.

Το Εργαστήριο διατηρεί το δικαίωμα να χρησιμοποιεί τα αποτελέσματα των δοκιμών σε επιστημονικές δημοσιεύσεις, επιστημονικές ανακοινώσεις, ερευνητικές εργασίες, καθώς και κάθε είδους ανάλογες εργασίες καθαρά επιστημονικού ή ερευνητικού χαρακτήρα, χωρίς να αναφέρει το όνομα του Αναθέτη ή τον τύπο του προϊόντος.

This test report is the result of a laboratory test of the sound insulation properties of a building element. The results obtained from measurements on the specific building element are presented in detail, and a single figure rating for its sound insulation properties is calculated.

This sound insulation test was performed by the Architectural Technology Laboratory of the School of Architecture, in accordance with the procedures of the Y.A. KA/679/22.8.96, F.E.K. 629, part B', article 1, paragraph 2 and after the appropriate approvals by the administrative authorities of the Aristotle University of Thessaloniki.

The test result reflects exclusively on the properties of the specific test specimen. The tests have taken place under laboratory conditions, so as to obtain the actual sound insulation properties of the test specimen. Under different mounting conditions involving flanking sound transmission, the Sound Reduction Index might be reduced, especially if the flanking partitions have equal or inferior sound insulation properties.

The Laboratory maintains the right to use the test results in scientific publications, scientific papers, research reports, and any other kind of studies of purely research or scientific nature, without revealing the name of the Client or the type of the product.

2. ΔΙΑΔΙΚΑΣΙΕΣ / PROCEDURES

2.1 Εφαρμοζόμενα Πρότυπα / Applied Standards

DIN EN ISO 140-3:2005, Acoustics – Measurement of sound insulation in buildings and of building elements - Part 3: Laboratory measurements of airborne sound insulation of building elements

DIN EN ISO 717-1:2006 Acoustics – Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation (ISO 717-1:1996 + AM1:2006);
German version EN ISO 717-1:1996 + A1:2006

EA - 2/17: 2009
EA Guidance on the horizontal requirements conformity assessment bodies for notification purposes

DIN EN 14351-1:2006
Fenster und Türen - Produktnorm Leistungseigenschaften - Teil 1: Fenster und Außentüren ohne Eigenschaften bezüglich Feuerschutz und/oder Rauchdichtheit; Deutsche Fassung EN 14351-1:2006

DIN EN 1279-5:2010
Glas im Bauwesen - Mehrscheiben-Isolierglas - Teil 5: Konformitätsbewertung; Deutsche Fassung EN 1279-5:2005+A2:2010

DIN EN 13241-1:2004
Tore - Produktnorm - Teil 1: Produkte ohne Feuer- und Rauchschutzeigenschaften; Deutsche Fassung EN 13241-1:2003

2.2 Διαδικασία Δοκιμής/ Test Procedure

Το δοκίμιο εφαρμόστηκε στους θαλάμους δοκιμών από τον Αναθέτη. Η δοκιμή υλοποιήθηκε σύμφωνα με τις διαδικασίες που καθορίζονται στο πρότυπο DIN EN ISO 140-3:2005, Acoustics – Measurement of sound insulation in buildings and of building elements - Part 3:Laboratory measurements of airborne sound insulation of building elements.

Για τον προσδιορισμό του Δείκτη Ηχομείωσης R χρησιμοποιήθηκε η σχέση:

$$R = L_1 - L_2 + 10\log (S/A) \text{ σε dB όπου:}$$

L_1: η μέση στάθμη ηχητικής πίεσης στο θάλαμο εκπομπής σε dB
L_2: η μέση στάθμη ηχητικής πίεσης στο θάλαμο λήψης σε dB
S: η επιφάνεια του δοκιμίου σε m^2
A: η ηχοαπορρόφηση του θαλάμου λήψης που προκύπτει από τη σχέση:

$$A = 0.163\ (V/T) \text{ σε } m^2 \text{ όπου:}$$

V: ο όγκος του θαλάμου λήψης σε m^3
T: ο χρόνος αντήχησης του θαλάμου λήψης σε s

Χρόνος αντήχησης: Για τον προσδιορισμό του χρόνου αντήχησης πραγματοποιήθηκαν μετρήσεις σε 6 διαφορετικές θέσεις μικροφώνου.

Θόρυβος βάθους: Δεν απαιτήθηκε διόρθωση για το θόρυβο βάθους.

Τα αποτελέσματα της δοκιμής στις ζώνες συχνοτήτων από 100 μέχρι 3150 Hz (σε τριτοοκτάβες) χρησιμοποιήθηκαν για τον προσδιορισμό του Σταθμισμένου Δείκτη Ηχομείωσης του δοκιμίου σύμφωνα με το πρότυπο DIN EN ISO 717-1:2006.

The test specimen was mounted in the test room by the Client. The test took place under laboratory conditions, according to DIN EN ISO 140-3:2005, Acoustics – Measurement of sound insulation in buildings and of building elements - Part 3: Laboratory measurements of airborne sound insulation of building elements.

In order to calculate the Sound Reduction Index R, the following equation was used:

$$R = L_1 - L_2 + 10\log (S/A) \text{ in dB where:}$$

L_1: the average sound pressure level in the source room in dB
L_2: the average sound pressure level in the receiving room in dB
S : the area of the test specimen in m^2
A : the equivalent sound absorption area in the receiving room given by the equation:

$A = 0.163 (V/T)$ in m^2 where:

V: the volume of the receiving room in m^3
T: the reverberation time of the receiving room in s

Reverberation time: The reverberation time was measured in 6 microphone positions.

Background noise: No background noise correction was required.

The test results in the frequency bands from 100 to 3150 Hz (in third octaves) were used to calculate the Weighted Sound Reduction Index of the test specimen according to DIN EN ISO 717-1:2006.

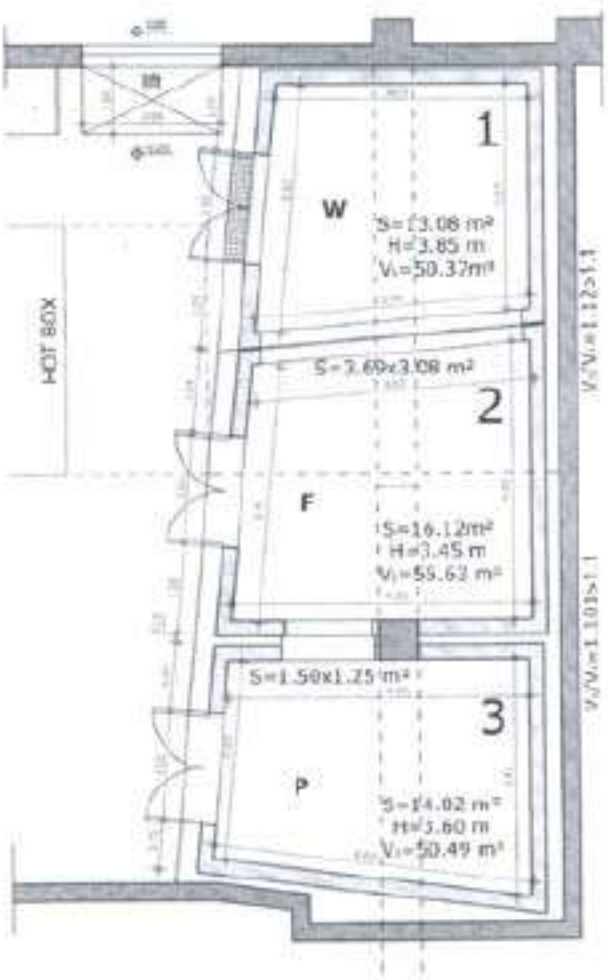
2.3 Χρησιμοποιούμενος εξοπλισμός / Equipment used

Συσκευή / Apparatus	Τύπος / Type	Κατασκευαστής / Manufacturer	Κωδικός / Code
Noise level analyser	Nor 840-2	Norsonic	EQ-C013
Microphone preamplifiers	Nor 1201	Norsonic	X001, X002
Microphones	Nor 1225	Norsonic	X-C005, X-C006
Rotating Microphone boom	3923	Bruel & Kjaer	EQ017
Dodecahedron loudspeaker	Lab-1217	Roister	EQ019
Amplifier	POA-4400A	Denon	Z1

2.4 Θάλαμοι Δοκιμών / Test Rooms

Οι Θάλαμοι δοκιμών είναι κατασκευασμένοι σύμφωνα με τις απαιτήσεις του προτύπου EN ISO 140-1:1997* / The test rooms meet the requirements of the EN ISO 140-1:1997* standard

** EN ISO 140-1:1997 Acoustics-Measurement of sound insulation in buildings and of building elements – Part 1: Requirements for laboratory test facilities with suppressed flanking transmission*



Αβεβαιότητα / Uncertainty

1.Αναπαραγωγισιμότητα / Reproducibility

σ	Χειριστής α	Χειριστής β
R_w	0	0
c	0	0
ct	0.58	0.58

2.Επαναληψιμότητα / Repeatability

	σ
R_w	0
c	0.25
ct	0.51

Διαστάσεις ανοίγματος δοκιμίου/
Test opening dimensions: 1500x1250 mm

Όγκος Θαλάμου εκπομπής/
Source Room Volume: 56 m^3

Όγκος Θαλάμου λήψης/
Receiving Room Volume: 51 m^3

Ήχος δοκιμής/Test noise: Ροζ θόρυβος /Pink noise

Φίλτρα/Filters: τριτοοκταβικά/third octave

3. ΔΟΚΙΜΙΟ / TEST SPECIMEN

3.1 Περιγραφή / Description

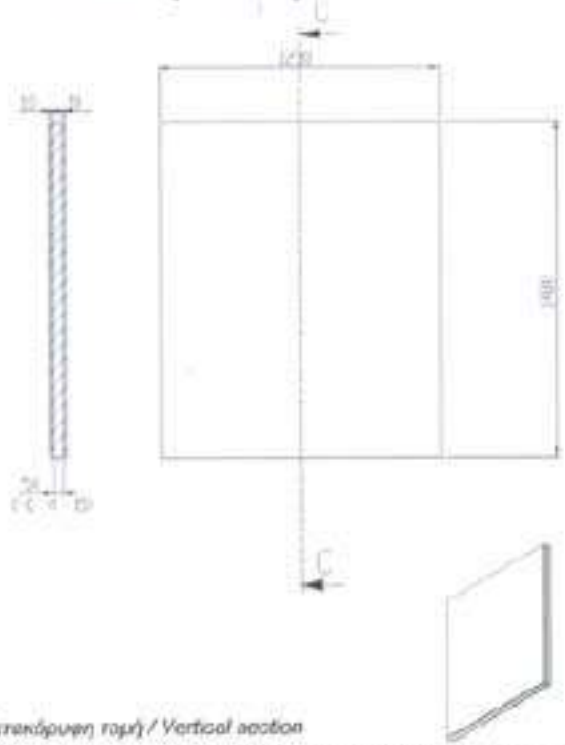
Προϊόν/Product:	Πάνελ διαχωριστικών εσωτερικού χώρου / Internal dividing partitions panel
Κατασκευαστής/Manufacturer:	**3i International Innovative Industries A.B.E. / 3i International Innovative Industries S.A.**
Αναθέτης/Client:	3i International Innovative Industries A.B.E. / 3i International Innovative Industries S.A.
Διεύθυνση/Address:	Ναυπλίου & Δασκαλογιάννη, 14452 Μεταμόρφωση Αττικής, www.isopipe.eu / Nafplou & Daskalogianni 144 52 Metamorfossi, Athens, www.isopipe.eu
Εγκατάσταση/ Installation:	3i International Innovative Industries A.B.E. / 3i International Innovative Industries S.A.
Ονομασία προϊόντος/Product name:	**ISOBOUND 250kg/m^3**
Ημερομηνία παραγωγής/Production date:	27/06/2012
Διαστάσεις δοκιμίου/ Sample dimensions:	1480 x 1230 mm

3.2 Κατασκευή / Construction

Πάνελ διαχωριστικών εσωτερικού χώρου τοποθετημένο σύμφωνα με το πρότυπο DIN EN ISO 140-3:2005, Acoustics – Measurement of sound insulation in buildings and of building elements - Part 3: Laboratory measurements of airborne sound insulation of building elements.
Αποτελείται από γυψοσανίδα πάχους 10mm, φύλλο Isosound πυκνότητας 250kg/m^3 και πάχους 50mm, γυψοσανίδα πάχους 10mm. Το συνολικό πάχος της κατασκευής είναι 70 mm.

Internal dividing partitions panel, installed according to DIN EN ISO 140-3:2005, Acoustics – Measurement of sound insulation in buildings and of building elements - Part 3: Laboratory measurements of airborne sound insulation of building elements standard.
The panel is made of 10mm thick plasterboard, a 50mm thick Isosound sheet with a density of 250kg/m^3, and a 10mm thick plasterboard. The total width of the construction is 70 mm.

3.3 Απεικόνιση / Drawing



Κατακόρυφη τομή / Vertical section

Τα σχέδια σταμάτησαν από τον Αναθέτη / The drawings have been prepared by the Client.

4. ΑΠΟΤΕΛΕΣΜΑΤΑ ΔΟΚΙΜΗΣ / TEST RESULTS

Οι τιμές του Δείκτη Ηχομείωσης Αερόφερτου Ήχου του δοκιμίου δίδονται στο επισυναπτόμενο διάγραμμα στη σελίδα 8 σε συνάρτηση με την συχνότητα. / The values of the Airborne Sound Reduction Index of the test specimen are given in the annexed data sheet in page 8 as a function of frequency.

Ο παρακάτω Σταθμισμένος Δείκτης Ηχομείωσης για φάσμα συχνοτήτων από 100Hz ως 3150Hz είναι αποτέλεσμα αξιολόγησης σύμφωνα με το πρότυπο EN ISO 717-1:2006 / The following Weighted Sound Reduction Index for the frequency range from 100Hz to 3150Hz is the result of evaluation according to EN ISO 717-1:2006

Διαπιστωθείσα τιμή / Determined value

Σταθμισμένος Δείκτης Ηχομείωσης / Weighted Sound Reduction Index:

R_w (C;C_{tr}) = 43 (-1;-5) dB

Θεσσαλονίκη/Thessaloniki, 10.07.2012

Διαπιστευμένο Εργαστήριο Δοκιμών / Accredited Test Laboratory E.SY.D. No 704

Κοινοποιημένος Φορέας / Notified Body NB 2326

Εμμανουήλ Τζεκάκης / Emmanuel Tzekakis
Καθηγητής /Professor
Διευθυντής του Εργαστηρίου /Director of the Laboratory

Βασίλειος Βασιλειάδης / Vasilios Vasiliadis
Μηχανολόγος Μηχανικός / Mechanical Engineer
Υπεύθυνος Υποστηρίξης Δοκιμών/Test Support Engineer

Δείκτης Ηχομείωσης
Sound Reduction Index

σύμφωνα με το/according to
DIN EN ISO 140-3:2005

Κατασκευαστής/Manufacturer: **3i International Innovative Industries A.B.E. / 3i International Innovative Industries S.A.**
Αναθέτης/Client: 3i International Innovative Industries A.B.E. / 3i International Innovative Industries S.A.
Εγκαταστάτης/Installation: 3i International Innovative Industries A.B.E. / 3i International Innovative Industries S.A.

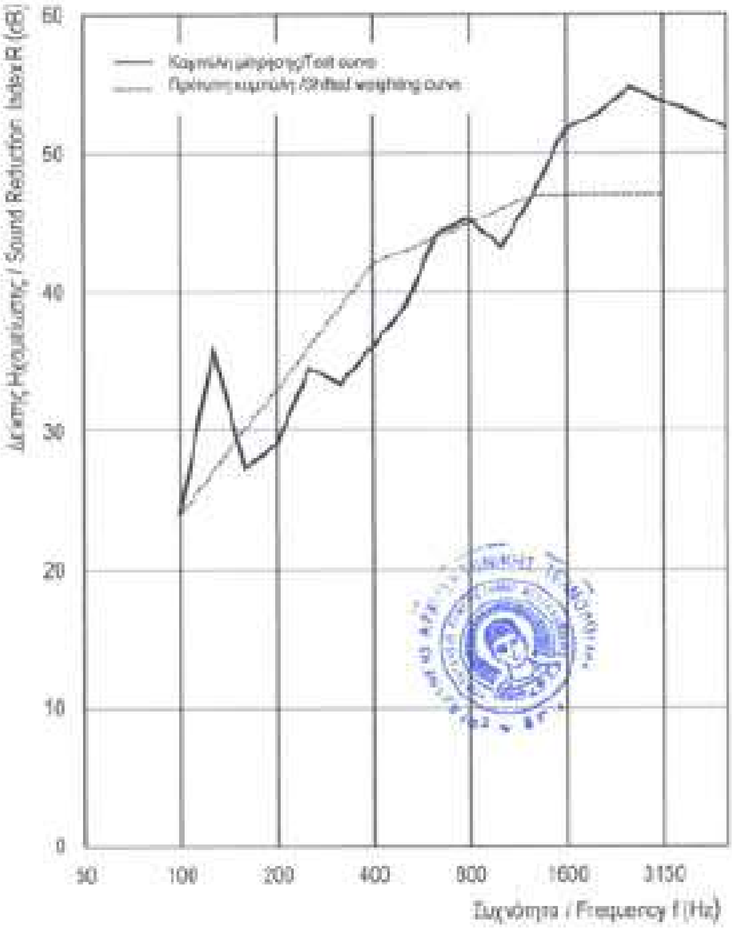
Ονομασία προϊόντος/Product name: **ISOSOUND 250kg/m³**
Ημερομηνία παραγωγής / Production date: 27/06/2012
Θάλαμοι δοκιμών/Test rooms: PF
Ημερομηνία δοκιμής/Testing date: 10/07/2012
Διαστάσεις δοκιμίου / Sample dimensions: 1480 x 1230 mm

Περιγραφή του δοκιμίου & της διάταξης τοποθέτησης / Sample & mounting description:

Internal dividing partitions panel, installed according to DIN EN ISO 140-3:2005. The panel is made of 10mm thick plasterboard, a 50mm thick Isosound sheet with a density of 250kg/m³, and a 10mm thick plasterboard. The total width of the construction is 70 mm.

S test specimen: 1,82 m²
Mass per unit: kg/m²
Θερμοκρασία/Temperature: 27 C°
Relative humidity: 50 %
V Source Room: 56 m³
V Receiving Room: 34 m³

f(Hz)	R(dB)	R_{ref}(dB)
50	-	
63	-	
80	-	
100	24,1	37,5
125	35,9	37,2
160	27,3	41,4
200	29,9	39,7
250	34,6	43,4
315	33,4	46,5
400	35,9	47,1
500	39,8	50,8
630	44,3	53,8
800	45,3	54,5
1000	43,3	55,8
1250	47,9	54,1
1600	51,7	53,4
2000	52,8	55,2
2500	54,7	55,9
3150	53,8	55,6
4000	52,8	56,8
5000	51,9	52,7



Determined value

Σταθμισμένος Δείκτης Ηχομείωσης
Weighted Sound Reduction Index
according to measurement results in test rooms in third octaves

R_w (C;C_{tr}) = 43 (-1;-5) dB

$C_{50-3150}$ =	dB	$C_{50-5000}$ =	dB	$C_{100-5000}$ =	-1 dB
$C_{tr,50-3150}$ =	dB	$C_{tr,50-5000}$ =	dB	$C_{tr,100-5000}$ =	-5 dB

Αριθμός/Number: A.582.2012
Ημερομηνία/Date: 10.07.2012

Εργαστήριο Αρχιτεκτονικής Τεχνολογίας / Laboratory of Architectural Technology
Notified body NB 2320
Διευθυντής/Director: Ε. Τζεκάκης / E. Tzekakis
Υπογραφή/Signature

Notes

3i International Innovative Industries S.A.

3i International Innovative Industries S.A.

www.isopipe.eu