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TNO report

TC-RAP-05-14202/mso

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Pilkington PLC
EN 572 part 3:Basic soda lime silicate glass
products- Polished wire glass
ITT Pyroshield Safety Clear Glass

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Date	August 23, 2005
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Contents

1 **Introduction3**

2 **Experimental.....4**

2.1 Producer of the test samples4

2.2 Product description.....4

2.3 Thickness.....5

2.4 Light transmittance.....6

3 **Test results7**

3.1 Chemical composition.....7

3.2 Thickness.....7

3.3 Light transmittance.....7

4 **Conclusion.....9**

5 **Signature10**

1 Introduction

Pilkington has commissioned TNO Industry and Science, BU Testing and Consultancy with the assessment of the performance of polished *wired glass as defined in EN 572-1, for used in building*.

According to EN 572-9: 2004 'Evaluation of conformity' an initial type testing of a float glass product is aimed to establish if a product conforms to the definition of soda lime silicate glass.

An initial type testing concerns the product aspects, as listed below:

1. Chemical composition
2. Thickness
3. Light transmittance

The product description "P 2012 AT09" was supplied by the manufacturer and shall be added to this initial type test report by the manufacturer. It was to the manufacturer's responsibility that the samples delivered for initial type test are representative to the production and normal production deviations were included in the delivered test samples.

If any deviation of applied materials/process/machines is encountered (and a so-called major change), re-type testing or additional tests may be required. This decision and responsibility belongs to the manufacturer. The product description is the lead for determining the window of these rules.

The following paragraphs describe the tests, the results and the conclusions.

2 Experimental

2.1 Producer of the test samples

Pilkington St. Helens (manufacturer of the samples)
Pilkington Doncaster (polished the samples)

Under responsibility of:

Pilkington PLC
Prescot Road
St. Helens
Merseyside WA10 3TT
United Kingdom

2.2 Product description

Product:	Pyroshield Safety Clear Glass
Nominal thickness:	6 mm
Dimensions of tested glass specimens:	876 x 1938 mm
Number of test specimens:	8

One samples per thickness was used for thickness measurements. After these measurements one samples was cut for the chemical analysis. One sample was prepared for optical measurements according EN410.

2.2.1 General composition according to the European Standard

The basic glass products covered by the European Standard EN 572 part 1 to part 9 are all manufactured from soda lime silicate glass. The magnitude of the proportions by mass of the principal constituents of soda lime silicate glass covered by these standards is as follows:

General chemical composition of soda lime silicate glass

Element as oxide	Mass percent (w/w %)
Silicon oxide (SiO ₂)	69 % to 74 %
Calcium oxide (CaO)	5 % to 14 %
Sodium oxide (Na ₂ O)	10 % to 16 %
Magnesium oxide (MgO)	0 % to 6 %
Aluminium oxide (Al ₂ O ₃)	0 % to 3 %
Others	0 % to 5 %

In addition to the above general composition, these glasses may also contain small quantities of other substances.

2.2.2 The chemical analysis by X-Ray Fluorescence Spectrometry

The analysis has been done by Philips Material Analyses by the XRF method. The composition of the glass, as an identification analysis, is executed on the sample using the analysis programme IQ+. IQ+ is, comparable with Uni-Quant, a software package that calculates a semi quantitative composition, using a series of overview scans detecting the elements mentioned below:

F, Na, Mg, Al, Si, P, S, Cl, Ar, K, Ca, Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, Ge, As, Se, Br, Kr, Rb, Sr, Y, Zr, Nb, Mo, Tc, Ru, Rh, Pd, Ag, Cd, In, Sn, Sb, Te, I, Xe, Cs, Ba, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Hf, Ta, W, Re, Os, Ir, Pt, Au, Hg, Tl, Pb, Bi, Po, At, Rn, Fr, Ra, Ac, Th, Pa, U, Np, Pu en Am.

The elements have been calculated as being present as their stoichiometric oxides and are normalised to 100%. According the composition calculated by IQ+, the glass could be classified as a soda lime glass. Therefore the quantification of the composition is done by analysing the glass again using a calibration system for the analysis of all types of soda lime and boron-silicate glasses. This calibration system foresees in the analysis of the elements Na, Mg, Al, Si, P, S, Cl, K, Ca, Ti, Cr, Mn, Fe, Zn, As, Zr, Sb, Ba and Pb. The IQ+ analysis did not detect other elements with a concentration > 100 ppm, these are not analysed by the calibration system.

2.3 Thickness

The European Standard EN 572-3 gives the following dimensional requirements, tolerances and procedures for measuring the thickness of polished wire glass.

The actual thickness shall be the average of four measurements, taken to the nearest 0.01 mm, one taken at the centre of each side. Measurements shall be by means of an instrument of the calliper micrometer type.

The actual thickness, rounded to the nearest 0.1 mm shall not vary from the nominal thickness by more than the tolerances shown in the table below:

Nominal Thickness (mm)	Limiting values (mm)	
	Minimum	Maximum
6	6.0	7.4
10	9.1	10.9

2.4 Light transmittance

A clear transparent glass product is designated as clear glass when it is not tinted and when its light transmittance:

- after any necessary pre-treatment
- measured according to EN 410, and
- rounded to the nearest 0.01

is greater than or equal to the value given in table below for the nominal thickness of the glass product.

Minimum light transmittance values for designating a transparent glass product as clear glass.

Nominal Thickness (mm)	Minimum value of light transmittance
6	0.85
10	0.81

3 Test results

3.1 Chemical composition

The results of the chemical analysis by XRF method are listed below:

Type of Glass	6 mm Pyroshield	Range	Result
Silicon dioxide	71.5	69-74%	OK
Calcium oxide	8.5	5-14%	OK
Sodium oxide	13.9	10-16%	OK
Magnesium oxide	3.9	0-6%	OK
Aluminium oxide	1.1	0-3%	OK
Others	1.1	0-5%	OK

3.2 Thickness

All thicknesses were carried out using with a Mitutoyo calliper, model 209-642

TNO identification number: A 91237

Calibration certificate: GMER-RVA-040334.

Calibration valid until October 19, 2005.

Function check with NKO calibrated samples: Mitutoyo Cerablock, No. 41900402.

Calibration certificate of the reference standards: 20200479AR.06

Calibration valid until September 2007

The results are as follows:

6 mm	No. 1
Side 1	6.41
Side 2	6.54
Side 3	6.44
Side 4	6.51
Average	6.5
Result	OK

3.3 Light transmittance

For the measurements a Perkin Elmer Lambda 900 UV/Vis/NIR Spectrophotometer equipped with an integrating sphere has been used for this purpose, with the following settings:

- Scan range : from 250 nm till 2,510 nm
- Slit width : 2 nm (UV/Vis)
Servo (2 – 20 nm) (NIR)
- Illuminated sample area : 4 x 14 mm²
- Horizontal (incident) beam divergence : 3.5°
- Vertical (incident) beam divergence : 4.5°
- Sample temperature : 22°C ± 2 °C

The result of the measurement on one sample of nominal thickness 6 mm is given in table below, together with the minimum light transmittance values. The results are calculated according to EN 410.

Nominal Thickness (mm)	EN410 Light Transmittance	Minimum value of light transmittance (6 mm)	Result
6.5	0.84	0.85	OK

4 Conclusion

Three aspects are checked to establish if the clear float glass product of Pilkington conforms to the definition of soda lime silicate glass.

The chemical composition, thickness and light transmittance *fulfil* the requirements mentioned in EN 572 part 3 for basic soda lime silicate glass products-polished wire glass.

5 Signature

Eindhoven, September 2005

TNO Science and Industry



L. van der Ven – le Comte, B.Sc.
Author



K.K. Pahnke, M.Sc.
Head of Department



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5600 HE Eindhoven
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Datum: 23-08-2005

EN 572 deel 3

Basisproducten van natronkalkglas

Gepolijst draadglas

Fabrikant: Pilkington St. Helens (manufacturer of the samples)
Pilkington Doncaster (polished the samples)

Onder verantwoordelijkheid van:
Pilkington PLC
Prescot Road
St. Helens
Merseyside WA10 3TT
United Kingdom

Product:

PYROSHIELD™ SAFETY CLEAR GLASS

Test resultaat:

Voldoet

De geteste monsters **voldoen** aan de gestelde eisen in EN572 deel 3.

Ondertekening:

L. van der Ven-le Comte, B.Sc.

K.K. Pahnke, M.Sc.



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5600 HE Eindhoven
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Date: 08-23-2005

EN 572 part 3

Basic soda lime silicate glass products

Polished wire glass

Producer : Pilkington St. Helens (manufacturer of the samples)
Pilkington Doncaster (polished the samples)

Under responsibility of:
Pilkington PLC
Prescot Road
St. Helens
Merseyside WA10 3TT
United Kingdom

Product:

PYROSHIELD™ SAFETY CLEAR GLASS

Test result:

Pass

The tested samples are **complying** with the requirements of EN 572 part 3.

Signature:

L. van der Ven-le Comte, B.Sc.

K.K. Pahnke, M.Sc.



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Datum: 23-08-2005

EN 572 Teil 3

Basiserzeugnisse aus Kalk-Natronsilicatglas

Poliertes Drahtglas

Hersteller: Pilkington St. Helens (manufacturer of the samples)
Pilkington Doncaster (polished the samples)

Unter Verantwortung von:
Pilkington PLC
Prescot Road
St. Helens
Merseyside WA10 3TT
United Kingdom

Produkt:

PYROSHIELD™ SAFETY CLEAR GLASS

Testergebnis:

Entspricht

Die getesteten Muster **entsprechen** den Anforderungen von EN 572 Teil 3.

Unterschrift:

Ing. L. van der Ven – le Comte

Dipl.-Ing. K.K. Pahnke



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5600 HE Eindhoven
Pays-Bas
Not. Lab. 1154

Date : 23-08-2005

EN 572 Partie 3

Produits de base: verre de silicate sodocalcique

Verre armé poli

Fabricant: Pilkington St. Helens (manufacturer of the samples)
Pilkington Doncaster (polished the samples)

Sous la responsabilité de:
Pilkington PLC
Prescot Road
St. Helens
Merseyside WA10 3TT
United Kingdom

Produit:

PYROSHIELD™ SAFETY CLEAR GLASS

Résultat des essais:

suffit

Les échantillons mis à l'essai *remplissent* les conditions définies dans EN 572 Partie 3.

Signature:

L. van der Ven – le Comte, ingénieur

K.K. Pahnke, ingénieur



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TNO Quality Services B.V. has
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(number 1750) for the European
Construction Products Directive
89/106/EEC.

TNO Quality Services B.V. has
been accredited by the Dutch
Accreditation Council (RvA) as
ISO 17025 test laboratory,
accreditation number L 484.

TNO report

TQS-RAP-09-7433-v2

Test report relating to a glass product according
to European standard EN 572-9, Product aspects,
concerning the product with trade mark:
Pilkington Pyroshield 2 Texture, type: Wired
Patterned, manufacturer: Pilkington Group Ltd.

Date	September 14, 2009
Author(s)	L. van der Ven. B.Sc.
Client	Pilkington Group Limited Prescot Road, St Helens Merseyside WA10 3TT UK
Project number	E09.0442
Project name	EN572 patterned glass
Number of pages	8

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Contents

1	Introduction	3
1.1	Purpose	3
1.2	Description of the samples.....	3
1.3	Sampling procedure.....	3
1.4	Application	3
1.5	Method of testing.....	3
1.6	Put out to contract.....	4
1.7	Privacy statement.....	4
2	Test results.....	5
3	Conclusion	6
4	References.....	7
5	Signature.....	8

1 Introduction

1.1 Purpose

The tests have been performed in order to establish whether or not the product meets the requirements of the European standard EN 572-9 [1].

1.2 Description of the samples

General

Name of the manufacturer	Pilkington Group Limited
Address of the manufacturer	Prescot Road, St Helens Merseyside WA10 3TT UK
Production plant of the samples	Prescot Road, St Helens Merseyside WA10 3TT UK
Line ID where the samples are made	-
Production date	-
Sampling date	-
Trade mark of the product (product name)	Pilkington Pyroshield 2 Texture
Type name of the glass	Wired Patterned
System description, file number	-
Dimensions of the samples	Chemical composition: 50 x 50 mm
	Thickness: 300 x 300 mm
	Light transmittance: 50 x 50 mm

Specific

Kind of glass	Wired patterned glass
Nominal thickness	7 mm

1.3 Sampling procedure

The samples have been submitted by the manufacturer. The test house has had no influence on the selection of the samples.

1.4 Application

The request for testing was submitted by the manufacturer on January 22, 2009. Assignment Form number: 09.A019.

1.5 Method of testing

All applicable tests have been performed according to the European standard EN 572-9 [1].

1.6 Put out to contract

No tests were performed at third parties.

1.7 Privacy statement

Due to privacy reasons, the names of involved personnel that executed the tests, are not disclosed in the report. However, this information is available on internal work sheets, test forms etc. in the project file.

2 Test results

Test results after performing all applicable tests according to Table 2 of the European standard EN 572-9 [1].

Required		Value of the test	Pass / fail
EN 572-1, § 5.1, Chemical composition			
Element as oxide	Mass percent (%)	Mass percent (%)	
Silicon oxide (SiO ₂)	69 to 74	71.8	pass
Calcium oxide (CaO)	5 to 14	8.3	pass
Sodium oxide (Na ₂ O)	10 to 16	12.8	pass
Magnesium oxide (MgO)	0 to 6	3.9	pass
Aluminium oxide (Al ₂ O ₃)	0 to 3	2.0	pass
Others	0 to 5	1.3	pass
EN 572-6, Table 1, Thickness			
Nominal Thickness (mm)	Tolerances (mm)	Thickness (mm)	
7	± 0.7	6.3	pass
EN 572-1, Table 3, Light transmittance			
Nominal Thickness (mm)	Minimum value of light transmittance	Light transmittance	
7	0.79	> 0.80*	pass

* Exact data will be given after a complete EN410

3 Conclusion

The glass product, trade mark: Pilkington Pyroshield 2 Texture, type: Wired Patterned, manufacturer: Pilkington Group Limited, meets the applicable requirements concerning Chemical composition according to EN 572-1 [1], Thickness according to EN 572-6 [2] and Light transmittance according to EN 572-1 [1] as stated in Table 2 of the European standard EN 572-9 [3].

The test results exclusively relate to the tested objects.

Remark 1

When and if changes are made in production method and/or equipment, assessment according to this standard shall be reconsidered and re-tests shall be performed when the changes can lead to different specifications of the glass. The decision and responsibility lies at the manufacturer.

Remark 2



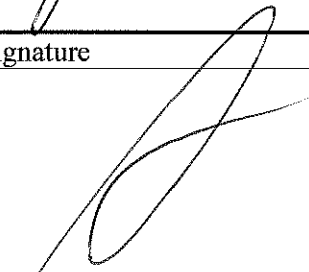
If no reference of the product description was supplied by the manufacturer, than that document shall be added to this test report by the manufacturer. It was to the manufacturer's responsibility that the samples delivered for initial type test are representative to the production and deviations from perfection were included in the delivered test samples.



4 References

- 1 European standard EN 572-1:2004 (E),
Glass in building – Basic soda lime silicate glass products – Part 1: Definitions
and general physical and mechanical properties,
European Committee for Standardization, June 2004.
- 2 European standard EN 572-6:2004 (E),
Glass in building – Basic soda lime silicate glass products – Part 6: Wired
patterned glass,
European Committee for Standardization, June 2004.
- 3 European standard EN 572-9:2004 (E),
Glass in building – Basic soda lime silicate glass products – Part 9: Evaluation
of conformity/Product standard,
European Committee for Standardization, October 2004.

5 Signature

Author Mrs. L. van der Ven Specialist	Signature 
Peer review Mr. M.J.R. Luppens Specialist	Signature 
Approved by Mr. A.J. Piers, B.Sc. Business unit manager	Signature 

(This is the end of this TNO report).