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Kronotex Fußboden GmbH & Co. KG
Herrn Gunnar Thielecke
Wittstocker Chaussee 1

D - 16909 Heiligengrabe

Dresden, April 26, 2006
im/gec

Test Report
No. 266 049

Client:	Kronotex Fußboden GmbH & Co. KG Wittstocker Chaussee 1 D - 16909 Heiligengrabe
Date of Order:	March 21, 2006
Order:	Determination of Thermal Resistance of Laminate Flooring according to EN 12667
Contractor:	EPH – Laboratorium Werkstoff- und Produktprüfung (WPP)
Person in Charge:	J. Gecks, Dipl.-Ing.

i.V. Devantier

B. Devantier, Dr.-Ing.
Head of Laboratory WPP

The test report contains 7 pages. Every duplication in part requires a permit of EPH. The test results are only related to the tested material.

1 Terms of Reference

The Entwicklungs- und Prüflabor Holztechnologie GmbH (EPH) was ordered by Kronotex Fußboden GmbH & Co. KG to determine the thermal resistance of 7 variants of laminate flooring according to EN 12667, thereon EN 14041 refers to.

2 Test Material

Sampling and supply of the material was carried out by the Client. The test material was sent to the Contractor by the client and got to the laboratory (EPH) on March 30, 2006. The test samples (500 mm x 500 mm) were cut by the Client. The samples were assigned to the variants, based on the determination of the thickness.
The Contractor used the following variant identification:

Table 1 Sample information

Variant	Description	Nominal Thickness [mm]	Dimensions [mm x mm x mm]	Sample No.
1	Laminate flooring 6 mm	6	500 x 500 x t	1_1, 2, 3, 4
2	Laminate flooring 7 mm	7	500 x 500 x t	2_1, 2, 3, 4
3	Laminate flooring 8 mm	8	500 x 500 x t	3_1, 2, 3, 4
4	Laminate flooring 10 mm	10	500 x 500 x t	4_1, 2
5	Laminate flooring 12 mm	12	500 x 500 x t	5_1, 2
6	Flooring with sound design 8 mm	8	500 x 500 x t	6_1, 2, 3, 4
7	Flooring with sound design 12 mm	12	500 x 500 x t	7_1, 2

t ... thickness

3 Realization

The determination of thermal resistances was carried out according to EN 12667 and EN 12664 respectively.

The laminate flooring was categorised as material, which was layered perpendicular to the heat flow. The thermal resistance was determined accordingly.

For determination of the thermal resistance was used a two-plate-device "TLP 900-H".

The samples were stored in a climate of 23 °C and 50 % rH after arrival at the EPH. After the climate storage, the samples were tested promptly.

4 Results

Table 2 Sample information, variant 1

	Unit	Sample			
		1_1	1_2	1_3	1_4
Length	mm	499.5	499.9	499.9	500.2
Width	mm	500.4	500.2	500.4	500.3
Thickness in built-in state	mm	6.1	6.1	6.1	6.1
Density in conditioned state	kg/m³	934	918	912	920
Surface density in conditioned state	kg/m²	5.7	5.6	5.6	5.6

Table 3 Test data, variant 1

Measurement no.	ϑ_{wm} [°C]	ϑ_{km} [°C]	ϑ_{wm}-ϑ_{km} [K]	ϑ_m [°C]	λ_g [W/(m·K)]
1	18.5	8.4	10.0	13.5	0.13115
2	28.4	18.3	10.0	23.4	0.13384
3	38.2	28.2	10.0	33.2	0.13548

Following measuring values were determined (variant 1):

Thermal conductivity: $\lambda^{10}_{23/50} = 0.131$ W/(m·K)

Thermal resistance: $R^{10}_{23/50} = 0.0467$ (m²K)/W

Table 4 Sample information, variant 2

	Unit	Sample			
		2_1	2_2	2_3	2_4
Length	mm	500.4	500.8	500.6	500.5
Width	mm	500.3	500.2	500.0	500.3
Thickness in built-in state	mm	6.7	6.7	6.7	6.7
Density in conditioned state	kg/m³	896	902	906	897
Surface density in conditioned state	kg/m²	6.0	6.0	6.1	6.0

Table 5 Test data, variant 2

Measurement no.	ϑ_{wm} [°C]	ϑ_{km} [°C]	ϑ_{wm}-ϑ_{km} [K]	ϑ_m [°C]	λ_g [W/(m·K)]
1	14.6	4.8	9.8	9.7	0.12537
2	24.5	14.8	9.7	19.6	0.12821
3	34.3	24.6	9.7	29.5	0.13047

Following measuring values were determined (variant 2):

Thermal conductivity: $\lambda^{10}_{23/50} = 0.126$ W/(m·K)

Thermal resistance: $R^{10}_{23/50} = 0.0535$ (m²K)/W

Table 6 Sample information, variant 3

	Unit	Sample			
		3_1	3_2	3_3	3_4
Length	mm	499.9	499.9	499.7	499.9
Width	mm	500.3	500.2	500.3	500.0
Thickness in built-in state	mm	7.8	7.7	7.7	7.7
Density in conditioned state	kg/m³	908	912	908	911
Surface density in conditioned state	kg/m²	7.0	7.1	7.0	7.0

Table 7 Test data, variant 3

Measurement no.	ϑ_{wm} [°C]	ϑ_{km} [°C]	ϑ_{wm}-ϑ_{km} [K]	ϑ_m [°C]	λ_g [W/(m·K)]
1	16.4	6.3	10.0	11.4	0.13201
2	26.3	16.3	10.0	21.3	0.13491
3	36.1	26.1	10.0	31.1	0.13675

Following measuring values were determined (variant 3):

Thermal conductivity: $\lambda^{10}_{23/50} = 0.132$ W/(m·K)

Thermal resistance: $R^{10}_{23/50} = 0.0587$ (m²K)/W

Table 8 Sample information, variant 4

	Unit	Sample	
		4_1	4_2
Length	mm	500.1	500.3
Width	mm	500.1	500.5
Thickness in built-in state	mm	10.1	10.1
Density in conditioned state	kg/m³	907	912
Surface density in conditioned state	kg/m²	9.2	9.2

Table 9 Test data, variant 4

Measurement no.	ϑ_{wm} [°C]	ϑ_{km} [°C]	ϑ_{wm}-ϑ_{km} [K]	ϑ_m [°C]	λ_g [W/(m·K)]
1	13.6	6.3	7.3	9.9	0.13550
2	23.5	16.2	7.3	19.8	0.13880
3	33.3	26.1	7.2	29.7	0.14116

Following measuring values were determined (variant 4):

Thermal conductivity: $\lambda^{10}_{23/50} = 0.136$ W/(m·K)

Thermal resistance: $R^{10}_{23/50} = 0.0745$ (m²K)/W

Table 10 Sample information, variant 5

	Unit	Sample	
		5_1	5_2
Length	mm	499.9	499.2
Width	mm	500.0	499.2
Thickness in built-in state	mm	12.2	12.2
Density in conditioned state	kg/m³	929	920
Surface density in conditioned state	kg/m²	11.3	11.2

Table 11 Test data, variant 5

Measurement no.	ϑ_{wm} [°C]	ϑ_{km} [°C]	ϑ_{wm}-ϑ_{km} [K]	ϑ_m [°C]	λ_g [W/(m·K)]
1	17.9	7.9	10.0	12,9	0.13768
2	27.7	17.8	10.0	22,8	0.13982
3	37.5	27.6	10.0	32,6	0.14079

Following measuring values were determined (variant 5):

Thermal conductivity: $\lambda^{10}_{23/50}$ = 0.137 W/(m·K)

Thermal resistance: $R^{10}_{23/50}$ = 0.0885 (m²K)/W

Table 12 Sample information, variant 6

	Unit	Sample			
		6_1	6_2	6_3	6_4
Length	mm	499.5	500.3	500.2	499.8
Width	mm	500.3	499.1	499.8	500.0
Thickness in built-in state	mm	8.4	8.4	8.5	8.5
Density in conditioned state	kg/m³	988	984	991	974
Surface density in conditioned state	kg/m²	8.3	8.3	8.4	8.2

Table 13 Test data, variant 6

Measurement no.	ϑ_{wm} [°C]	ϑ_{km} [°C]	ϑ_{wm}-ϑ_{km} [K]	ϑ_m [°C]	λ_g [W/(m·K)]
1	18.6	8.7	9.8	13.6	0.13927
2	28.5	18.7	9.8	23.6	0.14304
3	38.3	28.5	9.8	33.4	0.14588

Following measuring values were determined (variant 6):

Thermal conductivity: $\lambda^{10}_{23/50}$ = 0.138 W/(m·K)

Thermal resistance: $R^{10}_{23/50}$ = 0.0690 (m²K)/W

Table 14 Sample information, variant 7

	Unit	Sample	
		7_1	7_2
Length	mm	500.0	499.8
Width	mm	500.4	500.4
Thickness in built-in state	mm	13.1	13.1
Density in conditioned state	kg/m^3	987	985
Surface density in conditioned state	kg/m^2	12.9	12.9

Table 15 Test data, variant 7

Measurement no.	ϑ_{wm} [°C]	ϑ_{km} [°C]	$\vartheta_{wm}-\vartheta_{km}$ [K]	ϑ_m [°C]	λ_g [W/(m·K)]
1	14.6	4.8	9.7	9.7	0.13068
2	24.4	14.7	9.7	19.6	0.13405
3	34.2	24.6	9.7	29.4	0.13678

Following measuring values were determined (variant 7):

Thermal conductivity: $\lambda^{10}_{23/50} = 0.131$ W/(m·K)

Thermal resistance: $R^{10}_{23/50} = 0.100$ $(m^2K)/W$

Symbol legend:

ϑ_{wm}	Mean temperature of sample surface on heating plate
ϑ_{km}	Mean temperature of sample surface on cooling plate
$\vartheta_{wm}-\vartheta_{km}$	Average temperature difference
ϑ_m	Mean temperature of sample
λ_g	Average thermal conductivity
$\lambda^{10}_{23/50}$	Thermal conductivity at 10 °C mean temperature in conditioned state
$R^{10}_{23/50}$	Thermal resistance at 10 °C mean temperature in conditioned state

5 Evaluation

There is not a characteristic value for thermal resistance R of laminate flooring in EN 12524.

The standard value of $R \leq 0.15$ $(m^2K)/W$ for floor heatings suitability of materials, which was fixed by the German Federal Association Radiant Panel Heating, was fulfilled by the tested variants of laminate flooring.

Table 16 Result summary

Variant	Description	$\lambda^{10}_{23/50}$ [W/(m·K)] (measured value)	$R^{10}_{23/50}$ [$(m^2K)/W$] (measured value)	R [$(m^2K)/W$] (standard value)
1	Laminate flooring 6 mm	0.131	0.0467	≤ 0.15
2	Laminate flooring 7 mm	0.126	0.0535	
3	Laminate flooring 8 mm	0.132	0.0587	
4	Laminate flooring 10 mm	0.136	0.0745	
5	Laminate flooring 12 mm	0.137	0.0885	
6	Flooring with sound design 8 mm	0.138	0.0690	
7	Flooring with sound design 12 mm	0.131	0.100	

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Person in Charge