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Dresden, 2011-09-23

PI

## Test report Order-number: 221004

**Customer:** Northland Forest Products  
PO Box 369  
16 Church St.  
Kingston, NH 03848-0369  
USA

**Order date:** 2011-02-09

**Service:** Durability test of thermally modified yellow poplar against fungi

**Brand name:** Cambia

**Contractor:** Entwicklungs- und Prüflabor Holztechnologie GmbH (EPH)  
Zellescher Weg 24  
01217 Dresden, Germany

**Person in charge:** Dipl.-Biol. Katharina Plaschkies

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Dr. Wolfram Scheiding  
Head of Laboratory Biological Testing

The test report includes 5 pages and an annex with 6 pages. Copies of selected parts of the report have to be permitted in writing by EPH.

## Service

Durability test of Cambia (thermally modified Yellow Poplar, *Liriodendron tulipifera* L.) against fungi:

Part 1) Test on the durability against wood destroying basidiomycetes according to CEN/TS 15083-1:2005

Part 2) Test on the durability against soft rot fungi according to CEN/TS 15083-2:2005

## Test material

- Cambia, thermally modified timber from Yellow poplar (*Liriodendron tulipifera* L., Tulip-tree):
  - 9 boards Sample receipt: 2011-03-28
- Raw density after kiln drying [kg/m<sup>3</sup>):

board 1	board 2	board 3	board 4	board 5	board 6	board 7	board 8	board 9
520	531	512	456	505	480	536	495	524

## Reference wood species:

- *Fagus sylvatica* L. (European beech)
- Raw density after kiln drying: 695 kg/m<sup>3</sup>

## 1 Test on the durability against wood destroying basidiomycetes

### 1.1 Test performance

Test procedure:	CEN/TS 15083-1:2005: Durability of wood and wood-based products - Determination of the natural durability of solid wood against wood-destroying fungi, test methods - Part 1: Basidiomycetes.
Test fungi:	<i>Coniophora puteana</i> DSM 3085 <i>Trametes (Coriolus) versicolor</i> CTB 863A
Replicates:	32 specimens for each test fungus, 2-4 ones from each board
Dimension of the specimens:	50 mm x 25 mm x 15 mm
Leaching procedure before the test:	DIN EN 84:1997-05: Wood preservatives - Accelerated ageing of treated wood prior to biological testing - Leaching procedure. 2011-04-07 – 2011-04-21
Sterilisation:	water damp
Duration of the fungus test:	16 weeks
Inoculation date:	2011-05-19
Emplacement/removal date:	2011-06-01/2011-09-21

## 1.2 Validity of the test

*Coniophora puteana* DSM 3085, mass loss on Beech: 39,91 %<sup>1</sup>

*Trametes versicolor* CTB 863A, mass loss on Beech: 32,39 %<sup>1</sup>

The test was valid, because the demanded values of the average mass losses were exceeded by all test fungi.

<sup>1)</sup> average value from 12 single values (see annex, table A1-A2)

## 1.3 Results for Cambia

**Tab. 1:** Results from the test against basidiomycetes according to CEN/TS 15083-1

	Mass loss after fungus test [%] <sup>2</sup>	Durability class according to CEN/TS 15083-1:2005 <sup>3</sup>
<i>Coniophora puteana</i> DSM 3085	0,32	1
<i>Trametes versicolor</i> CTB 863A	0,69	1

<sup>2)</sup> median value from 32 single ones (see annex, tables A3-A4)

<sup>3)</sup> description for the preliminary classification:

Durability class	1	2	3	4	5
Median mass loss	≤ 5 %	> 5 % ... ≤ 10 %	> 10 % ... ≤ 15 %	> 15 % ... ≤ 30 %	> 30 %



## 2 Test on the durability against soft rot fungi

### 2.1 Test performance

Test procedure:	CEN/TS 15083-2:2005: Durability of wood and wood-based products - Determination of the natural durability of solid wood against wood-destroying fungi, test methods - Part 2: Soft rotting micro-fungi.
Fungus substrate:	Garden Soil as a terrestrial microcosm
Replicates:	30 specimens, 3-4 from each board
Duration of the fungus test:	16 weeks
Dimension of the specimens:	100 mm x 10 mm x 5 mm
Leaching procedure before the test:	DIN EN 84:1997-05: Wood preservatives - Accelerated ageing of treated wood prior to biological testing - Leaching procedure. 2011-04-07 – 2011-04-21
Duration of the fungus test:	16 weeks
Emplacement/removal date:	2011-05-19/2011-09-12

### 2.2 Validity of the test

The test was valid, because the demanded values of the average mass losses were exceeded by all test fungi and soft rot were microscopically found.

Mass loss on Beech after 16 weeks: 24,3 %<sup>1</sup>(Mean value, single values s. annex, table A5)

The following specimens were microscopically investigated:

Reference Beech: B7, B15, B20, B27, B45

Test specimens: 1, 2, 9, 17, 25

Soft rot fungi were found in all investigated specimens (examples s. annex, pictures 1-2).

### 2.3 Results for Cambia

**Tab. 2:** Results from the test against soft rot fungi according to CEN/TS 15083-2

Mass loss after fungus test [%], median value from 30 single values (see annex, table A6)	1,87
x - value = mass loss test specimens/mass loss reference specimens	0,08
Durability class <sup>1</sup> :	1

<sup>1</sup>) Basis for the classification of the preliminary durability class according to CEN/TS 15083-2:2005

Durability class	1	2	3	4	5
x-value	≤ 0,15	> 0,15 to ≤ 0,30	> 0,30 to ≤ 0,60	> 0,60 to ≤ 0,90	> 0,90

### 3 Summary

The durability against fungi of an assortment of 9 boards of Cambia (thermally modified Yellow Poplar, *Liriodendron tulipifera* L.) was tested in lab.

The assortment reached the highest durability class 1 in the following tests:

- test against soft rot fungi according to CEN/TS 15083-2 and
- test against basidiomycetes (*Coniophora puteana* DSM 3085, *Trametes versicolor* CTB 863A) according to CEN/TS 15083-1.

Dresden, 2011-09-23

  
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Dipl.-Biol. Katharina Plaschkies

Person in charge

**Annex:**     - single values  
              - figures

**Table A1:** Durability of the reference sapwood of Beech (*Fagus sylvatica*) against *Coniophora puteana* DSM 3085 (virulence, single values), CEN/TS 15083-1

Specimen	Mass after kiln drying before the fungus test [g]	Raw density after kiln drying [kg/m <sup>3</sup> ]	Mass after kiln drying after the fungus test [g]	Mass loss [%]	Wood moisture after fungus test [%]
V13	12,73	678,93	7,51	41,01	56,32
V14	12,84	684,80	7,62	40,65	58,79
V15	12,67	675,73	7,66	39,54	63,05
V16	12,90	688,00	8,10	37,21	62,84
V17	12,95	690,67	7,71	40,46	55,90
V18	12,35	658,67	7,12	42,35	59,13
V19	13,10	698,67	7,50	42,75	64,13
V20	12,91	688,53	7,62	40,98	62,07
V21	12,61	672,53	7,86	37,67	54,83
V22	12,78	681,60	8,00	37,40	55,50
V23	13,88	740,27	8,49	38,83	63,84
V24	13,32	710,40	7,99	40,02	64,08
			Mean value:	39,91	

**Table A2:** Durability of the reference sapwood of Beech (*Fagus sylvatica*) against *Trametes versicolor* CTB 863A (virulence, single values), CEN/TS 15083-1

Specimen	Mass after kiln drying before the fungus test [g]	Raw density after kiln drying [kg/m <sup>3</sup> ]	Mass after kiln drying after the fungus test [g]	Mass loss [%]	Wood moisture after fungus test [%]
V1	13,33	710,93	8,05	39,61	45,71
V2	13,47	718,40	8,82	34,52	59,18
V3	13,38	713,60	9,15	31,61	50,49
V4	13,02	694,40	9,57	26,50	53,81
V5	12,95	690,67	9,30	28,19	69,35
V6	13,20	704,00	8,74	33,79	47,48
V7	12,95	690,67	9,32	28,03	52,58
V8	13,05	696,00	9,76	25,21	55,84
V9	13,18	702,93	8,93	32,25	59,46
V10	12,96	691,20	8,66	33,18	47,00
V11	13,32	710,40	8,14	38,89	48,53
V12	13,00	693,33	8,20	36,92	56,10
			Mean value:	32,39	



**Table A3:** Durability of thermally modified Yellow Pine against *Coniophora puteana* DSM 3085 (Single values) , CEN/TS 15083-1

Specimen	Board	Mass after kiln drying before the fungus test	Raw density after kiln drying	Mass after kiln drying after the fungus test	Corrected mass loss, correction value = -0,02	Wood moisture after fungus test
		[g]	[kg/m <sup>3</sup> ]	[g]	[%]	[%]
3	1	9,70	517,33	9,60	1,05	23,75
4	1	9,71	517,87	9,65	0,64	22,90
5	2	10,09	538,13	10,06	0,32	24,35
6	2	9,97	531,73	9,93	0,42	25,18
7	2	9,67	515,73	9,64	0,33	28,84
8	2	9,72	518,40	9,71	0,12	26,47
9	3	9,29	495,47	9,29	0,02	24,65
10	3	9,20	490,67	9,20	0,02	25,00
13	4	8,53	454,93	8,52	0,14	24,18
14	4	8,45	450,67	8,45	0,02	25,09
15	4	8,80	469,33	8,79	0,13	23,09
16	4	8,62	459,73	8,66	0,00	23,56
17	5	9,64	514,13	9,56	0,85	24,16
18	5	9,72	518,40	9,67	0,53	25,75
19	5	9,52	507,73	9,50	0,23	24,32
20	5	9,58	510,93	9,49	0,96	24,66
21	6	9,30	496,00	9,26	0,45	24,41
22	6	8,86	472,53	8,84	0,25	25,23
23	6	8,91	475,20	8,87	0,47	32,58
24	6	9,12	486,40	9,09	0,35	33,88
25	7	10,77	574,40	10,38	3,64	24,57
26	7	10,27	547,73	9,74	5,18	25,15
27	7	10,08	537,60	10,08	0,02	23,02
28	7	9,76	520,53	9,47	2,99	27,98
29	8	8,37	446,40	8,40	0,00	31,19
30	8	7,88	420,27	7,89	0,00	34,09
31	8	7,72	411,73	7,72	0,02	33,94
32	8	7,65	408,00	7,65	0,02	32,16
33	9	9,52	507,73	9,36	1,70	26,07
34	9	9,77	521,07	9,71	0,63	24,82
35	9	9,55	509,33	9,46	0,96	20,93
36	9	9,74	519,47	9,29	4,64	23,68
				Median value:	0,32	

**Table A4:** Durability of thermally modified Yellow Pine against *Trametes versicolor* CTB 863A (Single values), CEN/TS 15083-1

Specimen	Board	Mass after kiln drying before the fungus test	Raw density after kiln drying	Mass after kiln drying after the fungus test	Corrected mass loss, correction value = -0,02	Wood moisture after fungus test
		[g]	[kg/m <sup>3</sup> ]	[g]	[%]	[%]
37	1	9,73	518,93	9,66	0,74	44,51
38	1	9,91	528,53	9,84	0,73	44,21
39	1	9,72	518,40	9,72	0,02	43,11
40	1	9,75	520,00	9,68	0,74	42,98
41	2	10,05	536,00	10,00	0,52	44,70
42	2	10,09	538,13	10,08	0,12	37,20
43	2	10,23	545,60	10,22	0,12	40,70
44	2	9,81	523,20	9,79	0,22	43,00
45	3	10,09	538,13	10,08	0,12	38,49
46	3	9,32	497,07	9,30	0,23	42,26
47	3	9,39	500,80	9,33	0,66	38,37
48	3	9,69	516,80	9,64	0,54	50,10
51	4	8,52	454,40	8,50	0,25	36,00
52	4	8,58	457,60	8,61	0,00	44,02
53	5	9,04	482,13	9,00	0,46	40,78
54	5	9,46	504,53	9,24	2,35	48,05
55	5	9,31	496,53	9,16	1,63	44,32
56	5	9,48	505,60	9,35	1,39	39,25
57	6	8,76	467,20	8,74	0,25	42,68
58	6	8,84	471,47	8,80	0,47	50,00
59	6	8,84	471,47	8,83	0,13	45,53
60	6	9,34	498,13	9,30	0,45	43,98
61	7	9,76	520,53	9,31	4,63	50,48
62	7	9,91	528,53	9,25	6,68	45,41
63	7	9,86	525,87	9,65	2,15	41,45
64	7	10,04	535,47	9,68	3,61	43,60
67	8	11,91	635,20	11,78	1,11	43,29
68	8	10,93	582,93	10,58	3,22	41,49
69	9	9,89	527,47	9,81	0,83	38,12
70	9	10,03	534,93	9,88	1,52	43,72
71	9	10,21	544,53	9,96	2,47	47,89
72	9	9,96	531,20	9,89	0,72	27,60
				Median value:	0,69	



**Table A5:** Durability of the reference sapwood of Beech (*Fagus sylvatica*) against soft rot fungi (virulence, single values) after 16 weeks, CEN/TS 15083-2

Specimen	Mass after kiln drying before the fungus test	Raw density after kiln drying	Mass after kiln drying after the fungus test	Mass loss	Wood moisture after fungus test
	[g]	[kg/m <sup>3</sup> ]	[g]	[%]	[%]
B1	3,00	600,00	2,50	16,67	145,20
B2	2,81	562,00	1,85	34,16	230,27
B3	3,23	646,00	2,53	21,67	144,66
B4	2,81	562,00	1,69	39,86	253,25
B5	3,13	626,00	2,65	15,34	150,57
B6	3,03	606,00	2,58	14,85	145,74
B7	3,09	618,00	2,24	27,51	182,59
B8	3,29	658,00	2,45	25,53	151,02
B9	3,00	600,00	1,84	38,67	228,26
B10	3,25	650,00	2,62	19,38	146,18
B11	3,06	612,00	2,78	9,15	131,65
B12	3,25	650,00	2,46	24,31	145,12
B13	3,01	602,00	2,51	16,61	157,77
B14	2,91	582,00	1,70	41,58	250,00
B15	2,73	546,00	1,73	36,63	243,93
B16	2,85	570,00	2,33	18,25	169,53
B17	3,08	616,00	2,22	27,92	157,66
B18	2,96	592,00	2,04	31,08	162,25
B19	3,01	602,00	1,91	36,54	199,48
B20	2,92	584,00	2,12	27,40	156,60
B21	2,67	534,00	1,94	27,34	188,14
B22	2,78	556,00	2,23	19,78	152,91
B23	3,20	640,00	2,40	25,00	143,33
B24	2,95	590,00	2,21	25,08	148,87
B25	3,22	644,00	2,23	30,75	152,47
B26	2,90	580,00	2,30	20,69	111,74
B27	2,78	556,00	2,45	11,87	129,80
B28	2,75	550,00	2,12	22,91	132,08
B29	2,77	554,00	2,17	21,66	133,18
B30	2,83	566,00	2,20	22,26	139,09
B31	2,68	536,00	1,97	26,49	149,75
B33	2,84	568,00	2,50	11,97	132,00
B34	3,51	702,00	2,97	15,38	123,91
B35	2,81	562,00	2,30	18,15	164,35
B36	2,83	566,00	2,36	16,61	153,39
B37	3,44	688,00	2,84	17,44	129,58
B38	2,80	560,00	1,98	29,29	180,81
B39	2,83	566,00	2,32	18,02	159,48
B40	2,81	562,00	2,34	16,73	141,88
B41	2,94	588,00	2,46	16,33	144,31
B42	3,15	630,00	2,29	27,30	166,81
B43	2,93	586,00	2,10	28,33	168,57
B44	2,94	588,00	2,35	20,07	144,26
B45	2,83	566,00	1,83	35,34	228,96
B46	2,89	578,00	2,42	16,26	147,93
B47	3,16	632,00	2,43	23,10	156,38
B48	2,86	572,00	1,89	33,92	211,11
			Mean value:	24,30	

**Table A6:** Durability of thermally modified Yellow Pine against soft rot fungi (virulence, single values) after 16 weeks, CEN/TS 15083-2

Specimen	Board	Mass after kiln drying before the fungus test [g]	Mass after kiln drying after the fungus test [g]	Mass loss [%]	Wood moisture after fungus test [%]
1	1	2,47	2,38	3,64	109,66
2	2	2,64	2,56	3,03	106,25
3	3	2,47	2,44	1,21	78,69
4	4	2,43	2,41	0,82	101,24
5	5	2,39	2,30	3,77	115,65
6	6	2,49	2,42	2,81	86,36
7	7	2,54	2,45	3,54	114,69
8	8	2,67	2,60	2,62	108,46
9	9	2,96	2,83	4,39	80,21
10	1	2,64	2,59	1,89	101,16
11	1	2,33	2,27	2,58	84,14
12	2	2,61	2,58	1,15	67,83
13	3	2,43	2,42	0,41	59,92
14	4	2,49	2,49	0,00	52,21
15	5	2,50	2,47	1,20	66,40
16	6	2,68	2,62	2,24	78,24
17	7	2,65	2,51	5,28	110,36
18	8	2,88	2,87	0,35	94,77
19	9	3,02	2,90	3,97	53,45
20	2	2,58	2,57	0,39	73,54
21	1	2,43	2,34	3,70	87,18
22	2	2,42	2,43	0,00	85,60
23	3	2,43	2,44	0,00	72,13
24	4	2,50	2,46	1,60	63,82
25	5	2,45	2,39	2,45	78,66
26	6	2,70	2,65	1,85	83,02
27	7	2,85	2,81	1,40	97,51
28	8	2,18	2,17	0,46	113,36
29	9	3,00	2,91	3,00	56,70
30	3	2,44	2,44	0,00	72,95
			Median:	1,87	





**Figure 1:** specimen B31; beech, caverns of soft rot fungi, M 600:1



**Figure 2:** specimen 1; TMT Yellow Poplar, caverns of soft rot fungi, M 600:1