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## Test of Soudal Purocol regarding EN 204 D4 requirements

The customer Soudal N.V. commissioned 2006-01-04 SP Swedish National Testing and Research Institute to test the one component polyurethane adhesive Soudal Purocol according to EN 205 Adhesives - Wood adhesives for non-structural applications - Determination of tensile shear strength of lap joints. The tests were made to determine if the adhesive fulfils the requirements for Class D4 according to EN 204.

### 1 Material and methods

Adhesive samples were delivered to SP 2006-01-09. SP has no knowledge about how the adhesive samples were selected. The Purocol sample was marked 446741 11/06.

Beech wood (*Fagus sylvatica* L.) conditioned in 20 °C / 65 % RH was used to produce 5 mm thick lamellae of dimension 140 mm x 700 mm. Lamellae were planed starting 08:00 the day the samples were bonded.

Two ply laminations were produced according to procedure described in EN 205. Bonding of samples with thin bondlines was started 2006-04-12 at 10:26 h. Adhesive spread varied between 172 g/m<sup>2</sup> and 195 g/m<sup>2</sup> single spread. Open assembly time varied between 30 s and 60 s for all laminations. Closed assembly time varied between 3,5 and 10 minutes. The laminations were pressed at 20 °C +/- 1 °C at 0,7 N/mm<sup>2</sup> pressure for 3 h. Full pressure was obtained at 10:36:41.

All bonded laminations were conditioned in 20 °C / 65 % RH after bonding.

Test samples according to EN 205 were cut from the bonded assemblies before being reconditioned in 20 °C / 65 % RH. Tensile shear tests according to EN 205 were carried out 2006-05-09 and 2006-05-10.

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## 2 Results

The results of the tensile shear tests after conditioning according to sequences in EN 205 are summarized in Table 1.

Table 1. Results of tensile shear tests of Purocol bondlines after conditioning.

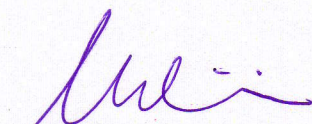
Conditioning sequence EN 204	Requirement (N/mm <sup>2</sup> )	Average shear strength (N/mm <sup>2</sup> )	Standard deviation (N/mm <sup>2</sup> )	Average estimated wood failure (%)
1	10	12,4	1,2	98
3	4	6,2	0,7	0
5	4	5,8	0,9	1
6	8	12,2	1,1	91

## 3 Classification

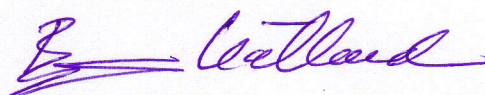
The test results above show that the one-component polyurethane adhesive Soudal Purocol has fulfilled the requirements for durability class D4 in EN 204. It may be labelled as:

**EN 204- D4 adhesive.**

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Appendix 1: Individual test results from tensile shear tests after conditioning

## Individual test results from tensile shear tests after conditioning

Condition sequence 1: 7 days in 20°C / 65% RH. Samples tested dry.

Test piece number	Length (mm)	Width (mm)	Maximum load (N)	Shear strength (N/mm <sup>2</sup> )	Wood failure (%)
P32	10	20	2720	13,6	60
P54	10	20	2350	11,75	100
P414	10	20	2180	10,9	100
P211	10	20	2700	13,5	100
P413	10	20	2490	12,45	100
P615	10	20	2630	13,15	100
P27	10	20	2600	13	100
P49	10	20	2780	13,9	100
P611	10	20	2750	13,75	100
P23	10	20	2330	11,65	100
P45	10	20	2410	12,05	100
P67	10	20	2630	13,15	100
P112	10	20	2120	10,6	100
P18	10	20	1930	9,65	100
P63	10	20	2600	13	100
P41	10	20	2250	11,25	100
P310	10	20	2710	13,55	100
P512	10	20	2530	12,65	100
P14	10	20	2270	11,35	100
P36	10	20	2520	12,6	100

Condition sequence 3: 4 days in water 20°C. Samples tested wet.

Test piece number	Length (mm)	Width (mm)	Maximum load (N)	Shear strength (N/mm <sup>2</sup> )	Wood failure (%)
P312	10,0	20,6	1280	6,2	0
P214	10,0	20,6	1230	6,0	0
P110	10,0	20,6	1270	6,2	0
P29	10,0	20,6	1280	6,2	0
P43	10,0	20,6	1180	5,7	0
P52	10,0	20,6	1270	6,2	0
P56	10,0	20,6	1420	6,9	0
P69	10,0	20,6	1350	6,6	5
P213	10,0	20,6	1580	7,7	0
P65	10,0	20,6	1330	6,5	0
P510	10,0	20,6	1300	6,3	0
P613	10,0	20,6	1450	7,0	0
P25	10,0	20,6	1000	4,9	0
P16	10,0	20,6	1080	5,2	0
P411	10,0	20,6	1030	5,0	0
P11	10,0	20,6	1480	7,2	0
P34	10,0	20,6	1210	5,9	0
P47	10,0	20,6	1430	6,9	0
P61	10,0	20,6	1090	5,3	0
P12	10,0	20,6	1180	5,7	0

Condition sequence 5: 6h in boiling 20°C + 2h water 20°C. Samples tested wet.

Test piece number	Length (mm)	Width (mm)	Maximum load (N)	Shear strength (N/mm <sup>2</sup> )	Wood failure (%)
P31	10,0	20,7	920	4,4	0
P313	10,0	20,7	950	4,6	0
P22	10,0	20,7	1380	6,7	0
P17	10,0	20,7	1090	5,3	0
P53	10,0	20,7	1440	7,0	10
P48	10,0	20,7	1340	6,5	0
P210	10,0	20,7	1250	6,0	0
P614	10,0	20,7	1310	6,3	0
P26	10,0	20,7	1280	6,2	0
P44	10,0	20,7	1070	5,2	0
P314	10,0	20,7	1030	5,0	0
P111	10,0	20,7	1310	6,3	0
P62	10,0	20,7	1370	6,6	0
P66	10,0	20,7	1320	6,4	0
P13	10,0	20,7	1050	5,1	0
P412	10,0	20,7	1250	6,0	0
P39	10,0	20,7	1280	6,2	0
P35	10,0	20,7	1270	6,1	0
P610	10,0	20,7	1490	7,2	0
P511	10,0	20,7	800	3,9	0

Condition sequence 6: 6h in boiling 20°C + 2h water 20°C + 7 days in 20°C / 65% RH.  
Samples tested dry.

Test piece number	Length (mm)	Width (mm)	Maximum load (N)	Shear strength (N/mm <sup>2</sup> )	Wood failure (%)
P64	10	19,95	2460	12,3308	70
P612	10	19,95	2500	12,5313	60
P68	10	19,95	2650	13,2832	100
P513	10	19,95	2160	10,8271	100
P59	10	19,95	2170	10,8772	100
P51	10	19,95	2030	10,1754	100
P55	10	19,95	2300	11,5288	100
P42	10	19,95	2180	10,9273	100
P410	10	19,95	2700	13,5338	95
P46	10	19,95	2520	12,6316	100
P37	10	19,95	2440	12,2306	100
P33	10	19,95	2670	13,3835	100
P311	10	19,95	2790	13,985	100
P212	10	19,95	2720	13,6341	90
P24	10	19,95	2504	12,5514	100
P28	10	19,95	2210	11,0777	100
P19	10	19,95	2290	11,4787	100
P15	10	19,95	2640	13,2331	60
P114	10	19,95	2420	12,1303	80
P113	10	19,95	2360	11,8296	70

Note: Shear strength values calculated according to actual test surface at time of test.