

Onbone Oy

Kalevankatu 3 A 43
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Order Natural aging at 23 °C and testing

Sample information Samples provided by Onbone Oy. Lot III, code P-2337, 20 pieces of 100 x 800 x 4 mm splints. Splint manufacture date: 15.4.2010.

Description of testing The samples were aged naturally for 4 years under the controlled atmosphere of +23 ±2 °C and 50 ± 5 % RH at the Muovipoli Oy laboratory. The samples were stored loose in the package they were delivered in. A series of tests was performed on the samples according to the test schedule appointed by Onbone Oy during the 4 years of aging.

Flexural strength testing was performed according to SFS-EN ISO 178 using Lloyd EZ20 universal testing machine with an accuracy rating of 1 (SFS-EN ISO 7500-1). The testing was carried out in a three-point bend test setup using a crosshead movement speed of 2 mm/min and a support span of 64 mm.

The test pieces were prepared according to instructions provided by Onbone Oy as follows: at the test point, 2 splints were cut with a bandsaw to yield 12 test pieces from both splints for a total of 24 test pieces. After balancing 5 test pieces from each splint was randomly selected for flexural testing for a total of 10 test pieces per test point.

One splint was cut to prepare 10 test pieces for weighing. Eight of the resulting test pieces had the dimensions of 8,1 x 7,2 x 4 mm, two with the dimensions of 7,3 x 6,8 x 4 mm. The samples were weighed according to the same schedule as the 3-point bend testing.

Results

Results for flexural testing are listed in table 1. The results show deviation between test points but no clear indication of material degradation. Figures 1-3 illustrate the development of stress, strain and flexural modulus between test points. The stress-strain curves of the bend test are presented in figures 5-13.

Results for weighing are listed in table 2. An increase in mass can be seen during the first three test points after which the results seem to oscillate in a cyclic pattern. The results of weighing are illustrated in figure 4.

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Table 1. Results for 3-point bend test

SFS-EN ISO 178

Test speed: 2 mm/min

Test limit: 12 mm

Span: 64 mm

Sample	Code		Maximum Load (N)	Stress at Maximum Load (MPa)	Percentage Strain at Maximum Load	Stress at Limit (MPa)	Young's Modulus (MPa)
0	0-point reference	am.	32	17,5	0,044	12,8	971
		sd.	3	1,5	0,006	1,5	69
1	100417	am.	34	19,0	0,046	17,8	1060
		sd.	2	1,2	0,007	1,2	103
2	110615	am.	35	19,5	0,047	18,1	1050
		sd.	3	1,7	0,006	1,7	97
3	111017	am.	35	18,4	0,044	17,0	1010
		sd.	2	1,2	0,005	1,2	90
4	120417	am.	37	19,9	0,042	18,1	1150
		sd.	4	2,0	0,004	1,4	166
5	121017	am.	37	20,1	0,039	18,0	1240
		sd.	4	1,9	0,003	2,0	121
6	130417	am.	31	16,6	0,042	14,9	975
		sd.	4	2,2	0,008	2,2	87
7	131017	am.	35	19,2	0,043	17,5	1070
		sd.	4	2,3	0,005	1,9	132
8	140417	am.	33	17,5	0,042	15,7	968
		sd.	3	1,7	0,005	1,4	103

Figure 1. Flexural modulus

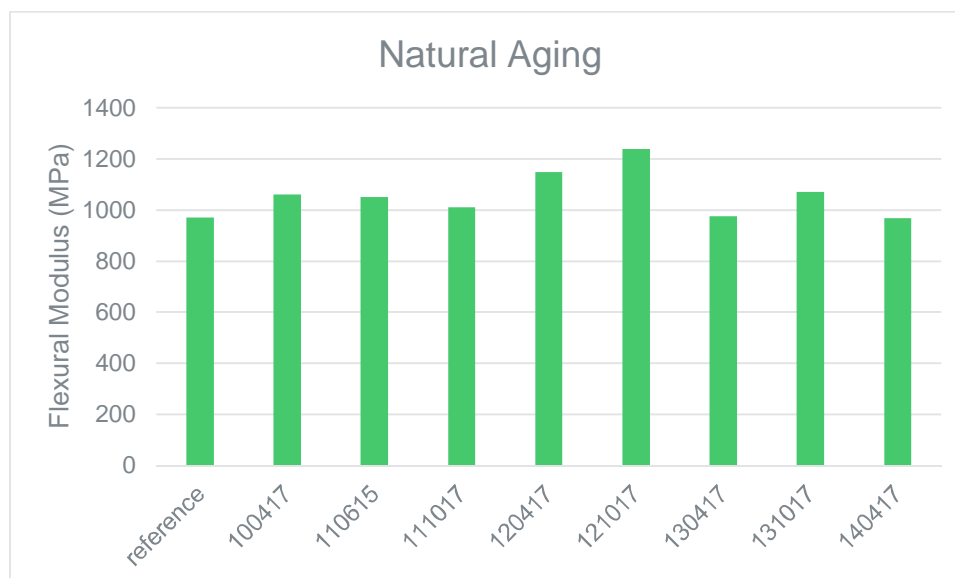


Figure 2. Maximum flexural stress (Stress at yield)

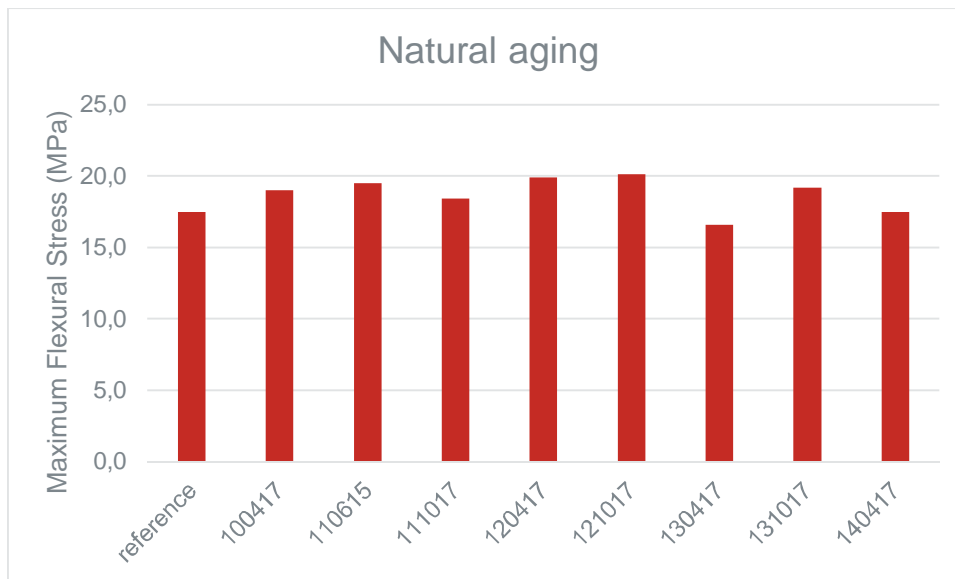


Figure 3. Flexural strain at yield

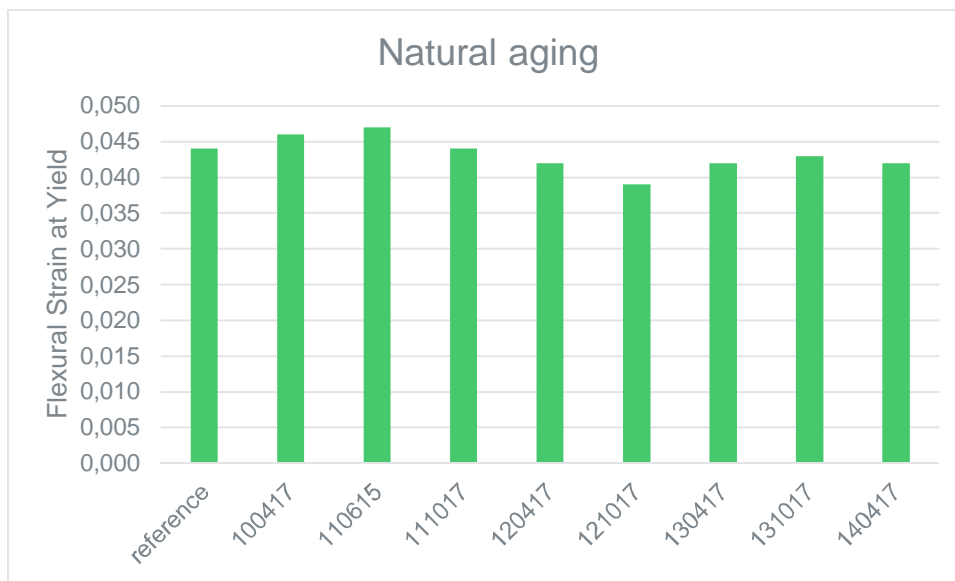


Table 2. Results of weighing

Sample	Test point								
	21.1.2011 0	17.4.2011 1	15.6.2011 2	17.10.2011 3	17.4.2012 4	17.10.2012 5	17.4.2013 6	17.10.2013 7	17.4.2014 8
1	20,2445	20,3251	20,3362	20,3584	20,3535	20,3599	20,3501	20,3511	20,3568
2	20,1379	20,2203	20,2329	20,2537	20,2479	20,2536	20,2435	20,2453	20,2505
3	23,7470	23,8573	23,8744	23,8988	23,8915	23,8990	23,8864	23,8888	23,8944
4	23,7163	23,8506	23,8676	23,8933	23,8854	23,8931	23,8804	23,8835	23,8884
5	23,9627	24,0941	24,1118	24,1371	24,1296	24,1373	24,1246	24,1275	24,1332
6	23,9940	24,1010	24,1194	24,1444	24,1368	24,1450	24,1323	24,1344	24,1406
7	24,0739	24,1842	24,2035	24,2290	24,2205	24,2288	24,2164	24,2195	24,2242
8	23,7516	23,8871	23,9058	23,9313	23,9234	23,9319	23,9198	23,9209	23,9264
9	23,5907	23,7140	23,7314	23,7555	23,7482	23,7568	23,7443	23,7463	23,7520
10	23,8798	23,9954	24,0132	24,0374	24,0310	24,0406	24,0276	24,0297	24,0353
Total	231,0984 100 %	232,2291 100,489 %	232,3962 100,562 %	232,6389 100,667 %	232,5678 100,636 %	232,6460 100,670 %	232,5254 100,617 %	232,5470 100,627 %	232,6018 100,651 %

Figure 4. Weighing

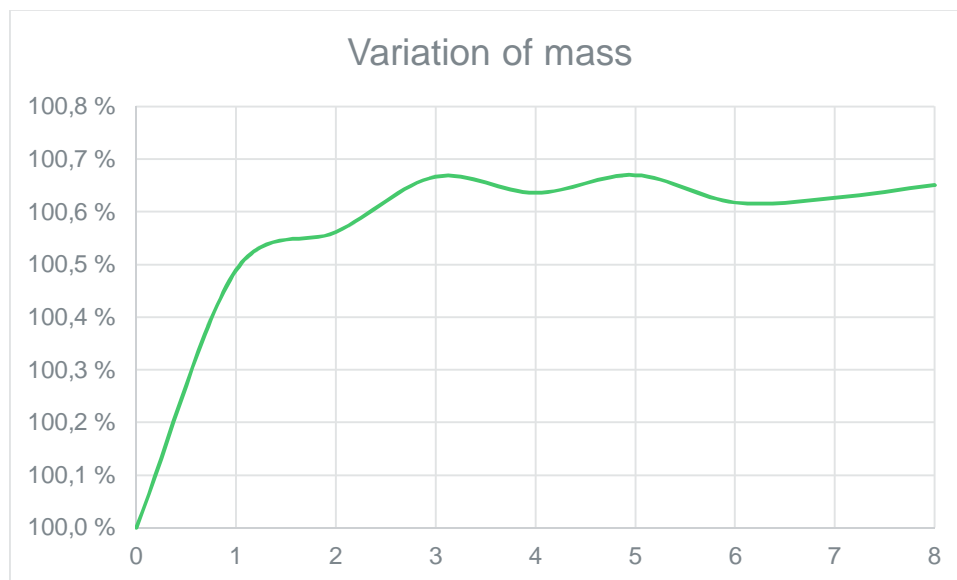


Figure 5. 0-point reference

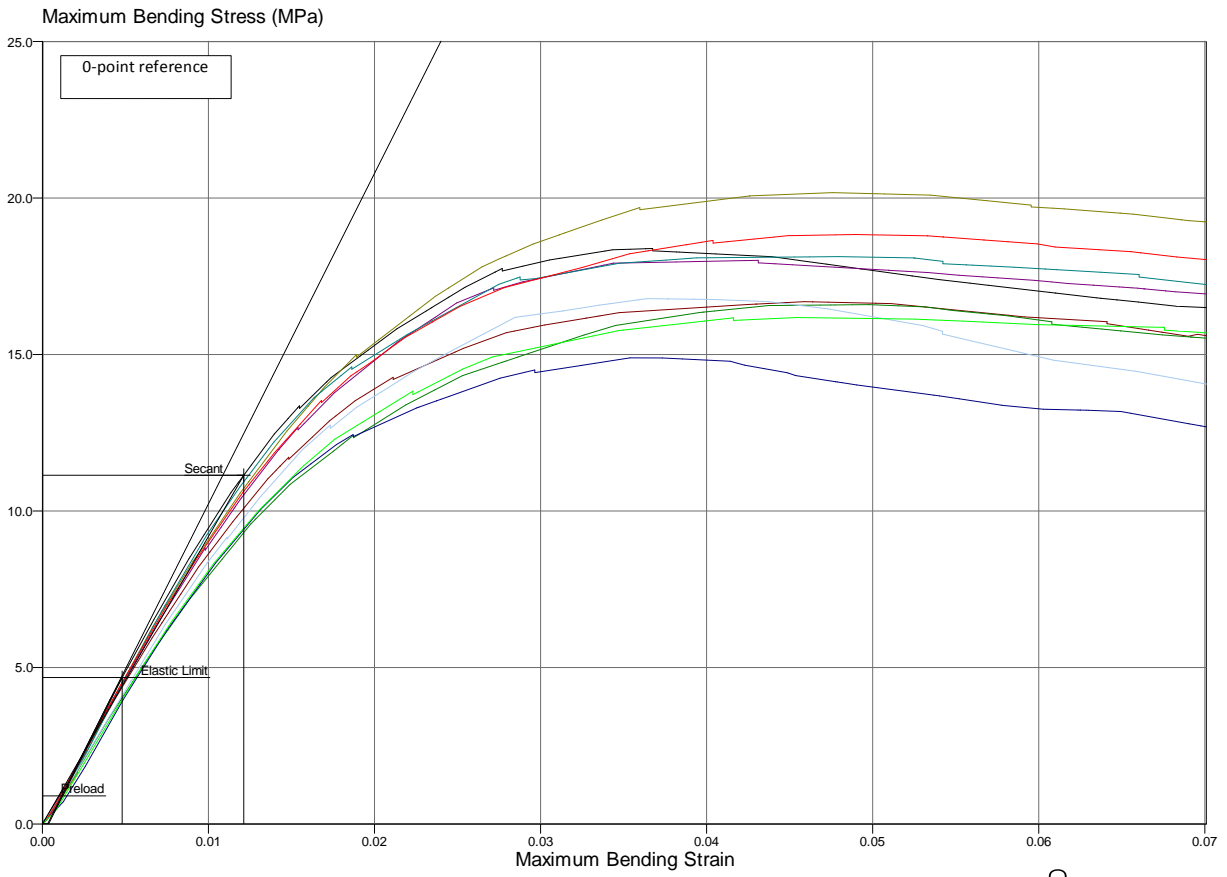
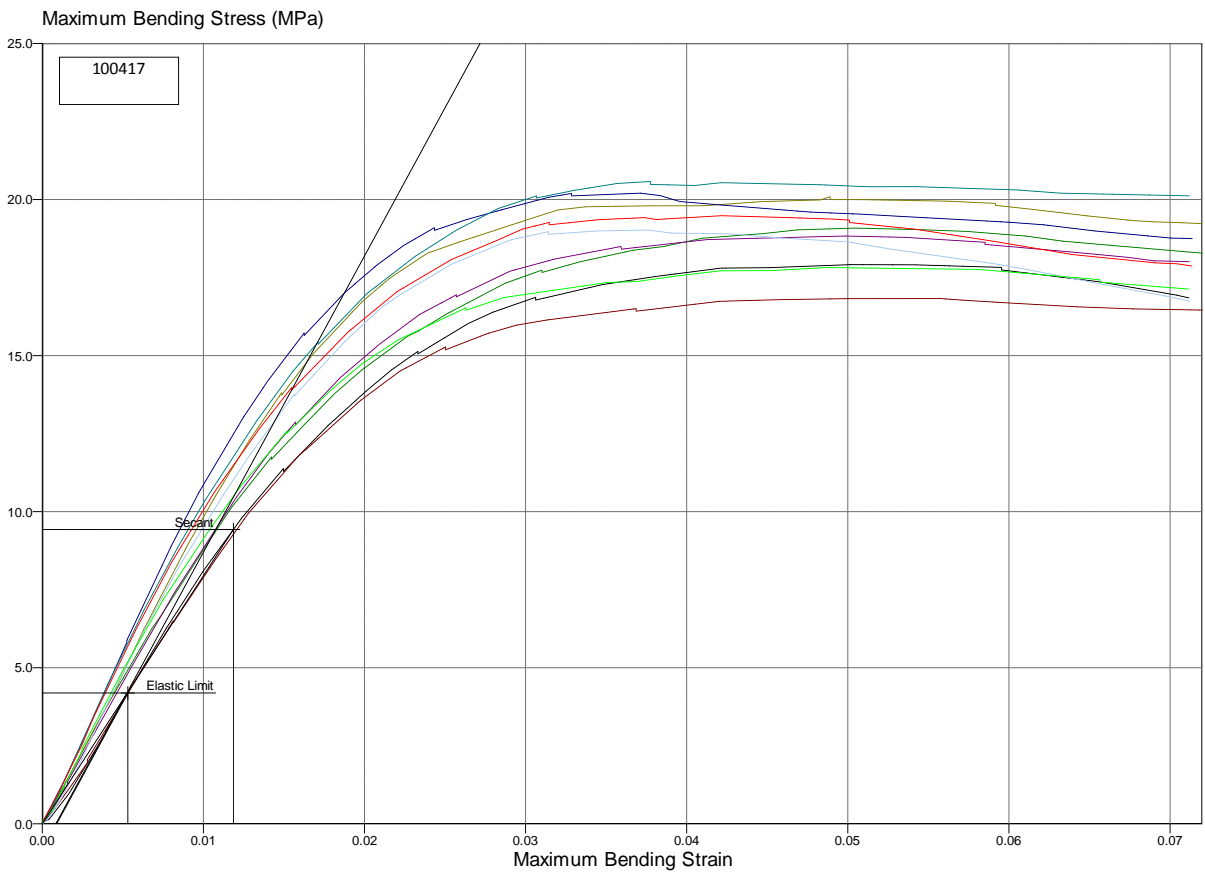


Figure 6. Test point 1, 17.4.2010



General Purpose 3 Point Bend Setup

Figure 7. Test point 2, 15.6.2011

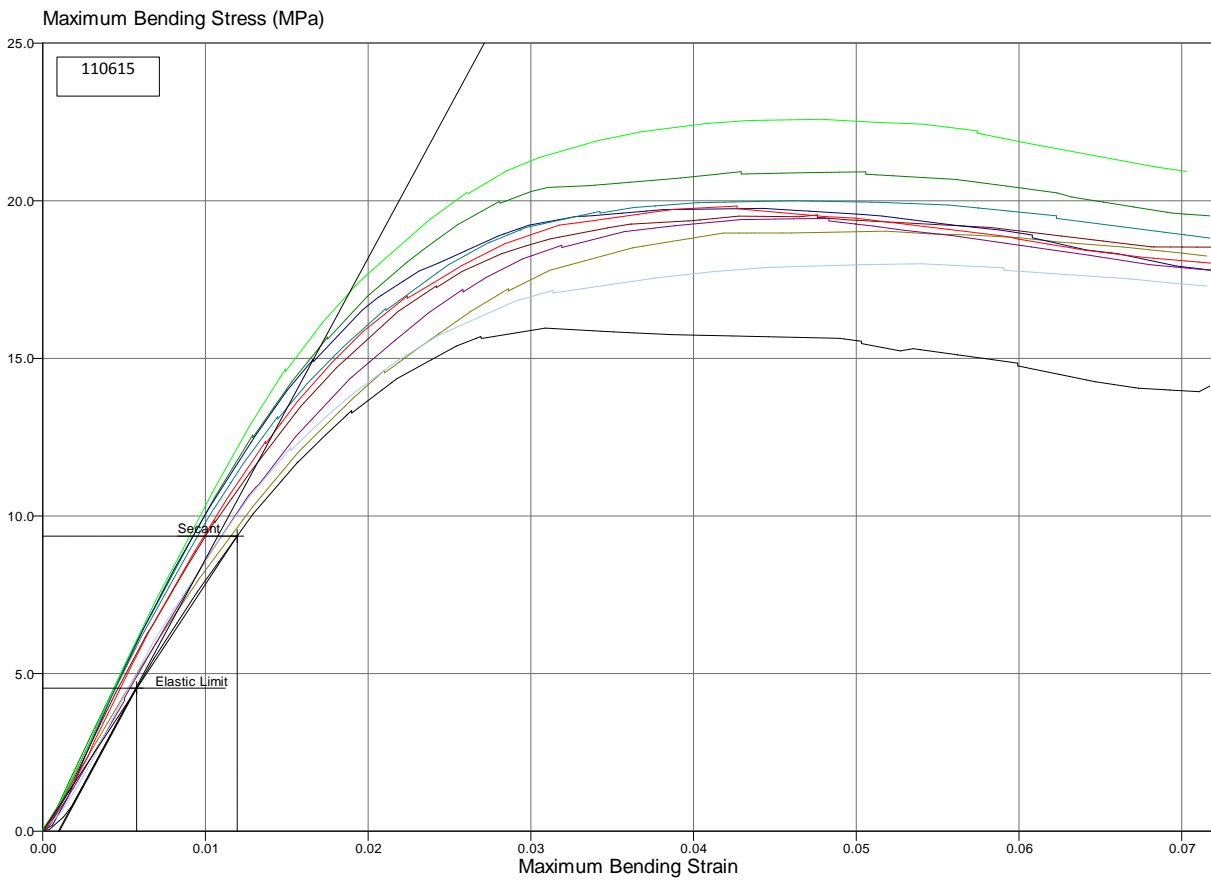


Figure 8. Test point 3, 17.10.2011

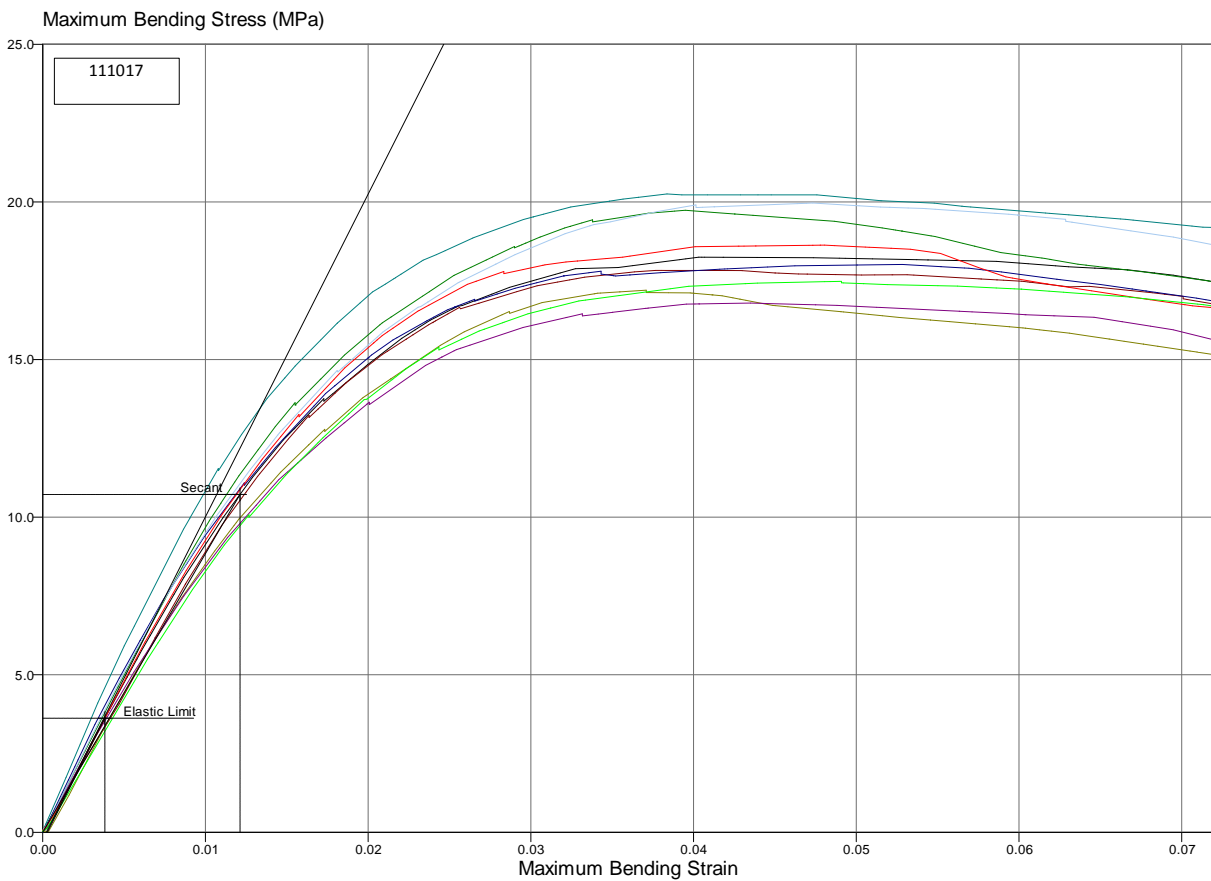


Figure 9. Test point 4, 17.4.2012

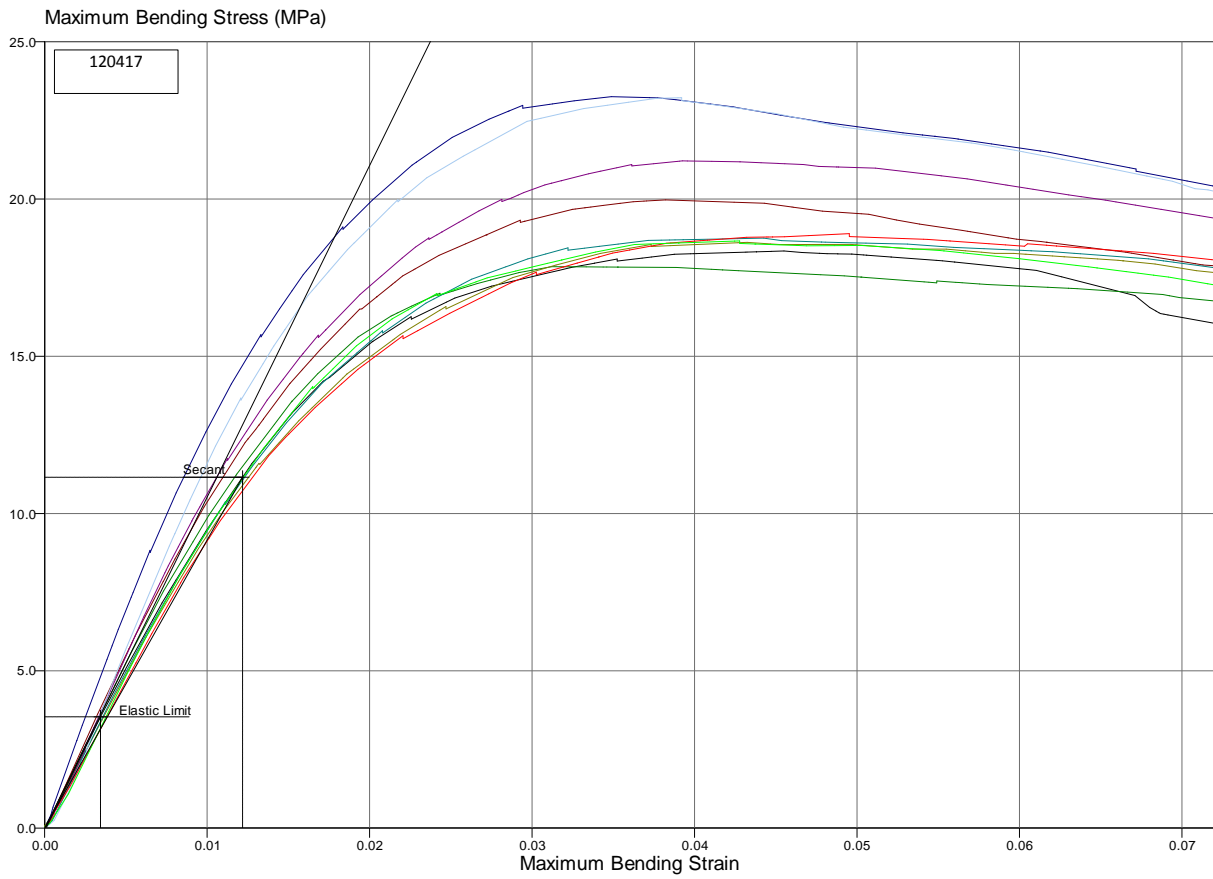


Figure 10. Test point 5, 17.10.2012

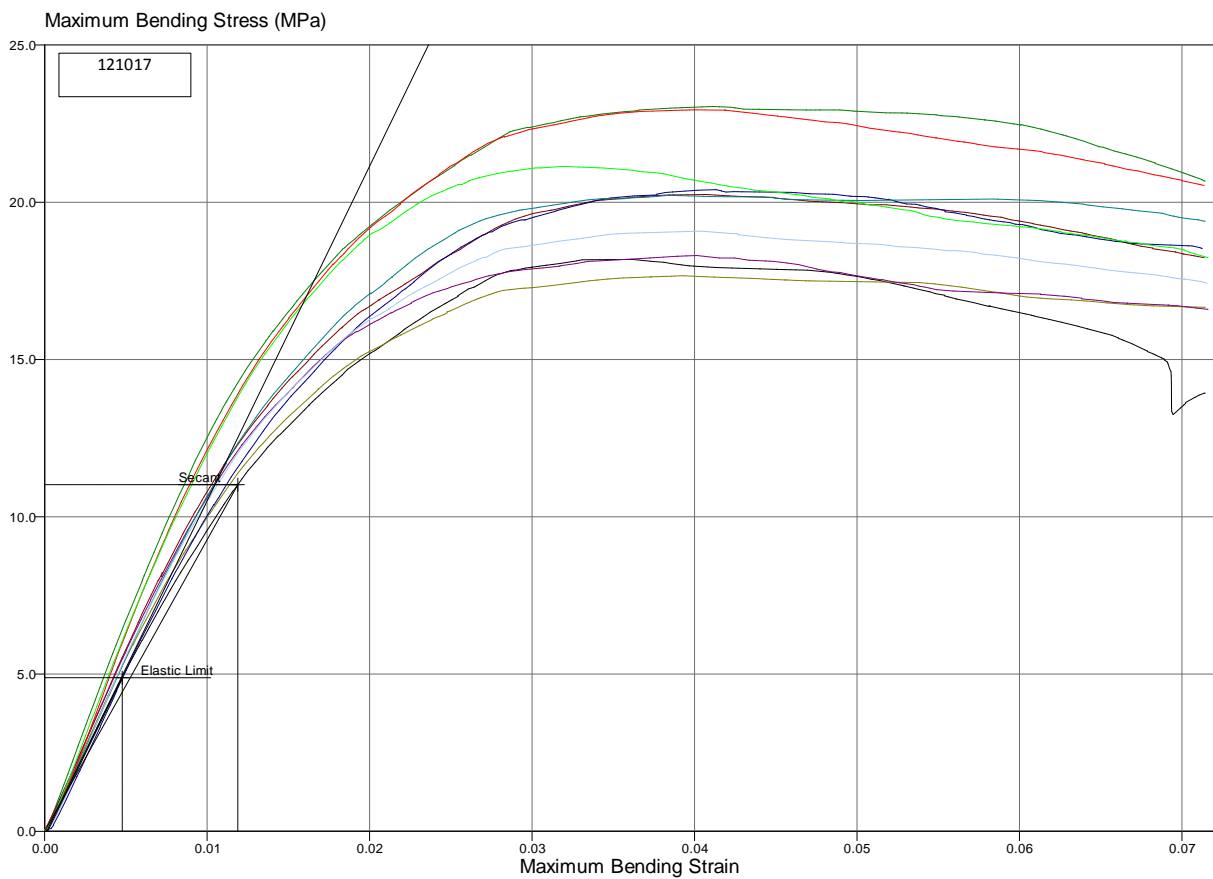


Figure 11. Test point 6, 17.4.2013

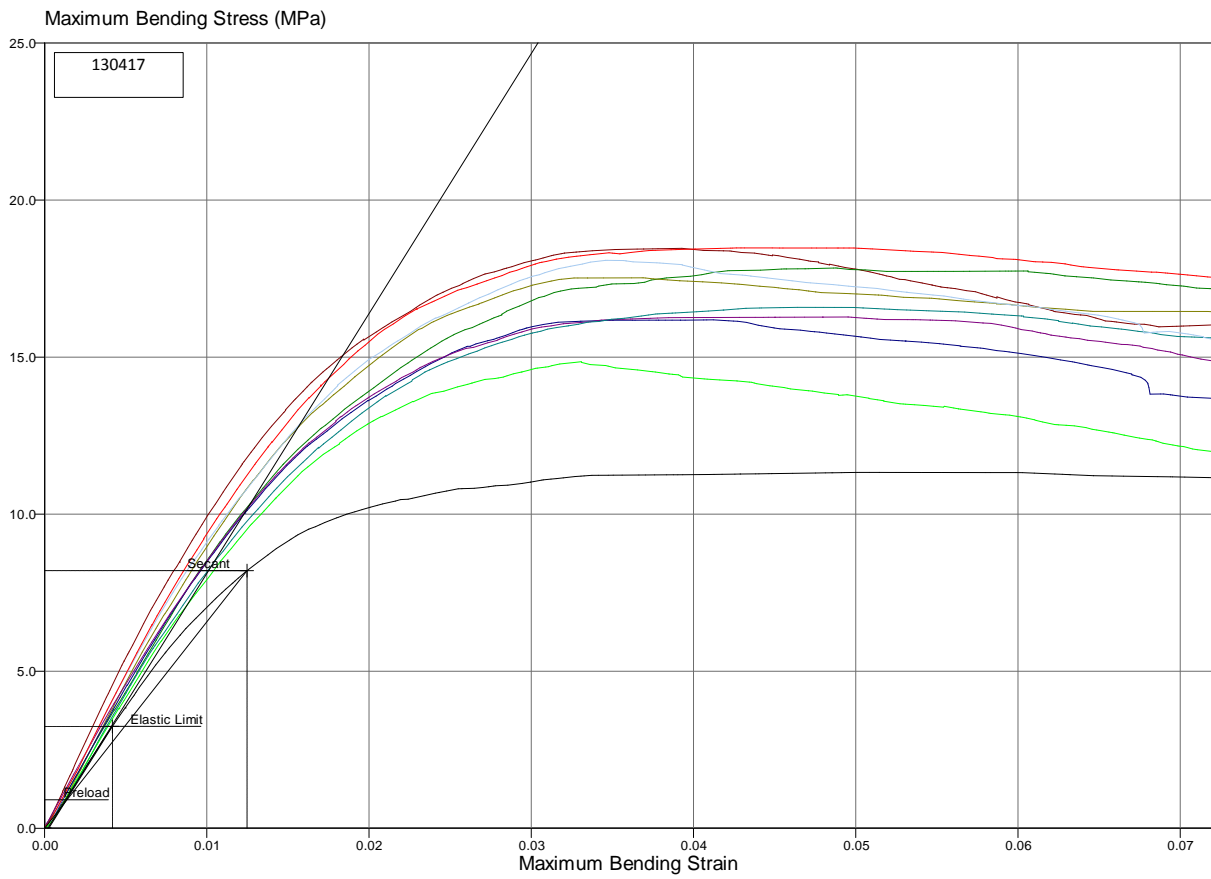


Figure 12. Test point 7, 17.10.2013

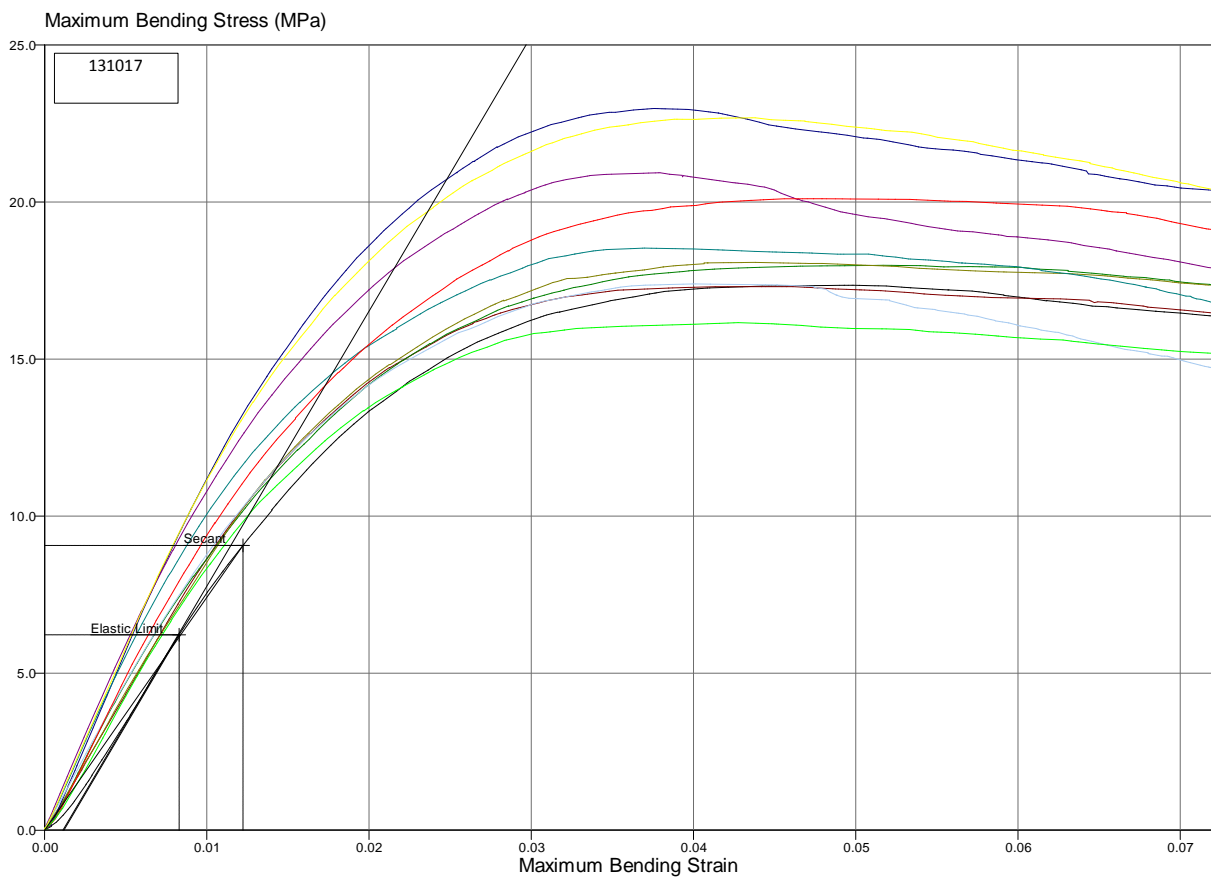


Figure 13. Test point 8, 17.4.2014

