

## Laboratory Test Report Number: C21014-1

(Amendment to Laboratory Test report number C21014, which it replaces)

24<sup>th</sup> March 2021

**Requested by:**

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Client order number: SLPWR-2101

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## Summary

At the request of Second Life Products Wales, testing was carried out on the samples listed below.

## Test Material

Table 1 lists the materials received for testing and the corresponding R-TECH identities. The materials were received for testing at R-TECH Materials on 10/02/2021

*Table 1 List of supplied materials for test*

<b>Material Description</b>	<b>R-TECH Identity</b>
12.5 mm EKOpoly	125
19 mm Anti-Slip Sheet	19A

## Test Details

Tests were carried out according to the standards requested by the customer. These tests are listed in

Table 2.

Testing was completed during the period 18/02/2021 to 25/02/2021

Test samples were allowed to condition in the laboratory at  $23\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$  and  $50\% \text{ RH} \pm 5\%$  RH, for a minimum of 16 hours prior to testing.

The results given in this report relate only to the materials submitted for test and may not be representative of other samples or batches.

Note the results for the 19 mm EKOpoly testing carried out in report C17002 are included in this report for reference purposes. These tests were complete during the period 24/11/2016 to 14/12/2016.

Table 2 List of test standards and deviations

Test	Standard	Deviations from standard
Shore D Hardness	ISO 868:2003	
Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement	ASTM D792-13	
Plastics – Determination of tensile properties – Part 4: Test conditions for isotropic and orthotropic fibre-reinforced plastic composites	BS EN ISO 527-4:1997	
Plastics – Determination of flexural properties	BS EN ISO 178:2019	
Plastics – Determination of temperature of deflection under load Part 2: Plastics and ebonite	BS EN ISO 75-2:2013	
Plastics – Determination of water absorption	BS EN ISO 62:2008 Method 1	Results expressed in mg Temperature tolerance $\pm 2^{\circ}\text{C}$ Diffusion coefficient not calculated
Plastics – Determination of compressive properties	BS EN ISO 604:2003	

## Results Summary

Table 3 cast results summary

Property	Units	Test Method	Result		
			125	19	19A
Tensile strength	MPa	BS EN ISO 527-4	3.19	3.47	3.06
Tensile chord modulus at 0.05-0.25 % strain	GPa	BS EN ISO 527-4	0.35	0.26	0.18
Elongation at break	%	BS EN ISO 527-4	1.50	4.38	2.76
Water Absorption	mg	ISO 62	1677	385	2314
TDUL 1.80	°C	BS EN ISO 75-2	44.2	DNT	DNT
TDUL 0.45	°C	BS EN ISO 75-2	64.4	DNT	62.9
Compressive Strength	MPa	BS EN ISO 604	4.4	2.4	3.4
Flexural strength	MPa	BS EN ISO 178	6.62	8.3	11.4
Flexural modulus 0.05 to 0.25% strain	GPa	BS EN ISO 178	2.0	0.37	0.48
Density	g/cm <sup>3</sup>	ASTM D792	0.593	0.492	0.595
Shore D Hardness	N/A	ISO 868:2003	65	60	48

Note: DNT denotes Did Not Test. This was due to the height of the sample exceeding the capacity of the machine for 1.8Mpa loading.

## 12.5 mm EKOpoly Water Absorption

BS EN ISO 62:2008

Method: Method 1      Material: 12.5 mm EKOpoly      Test date: 25/02/21  
 Immersion period: 168 hours      Tester: MA      Balance: Sartorius CP64

*Table 4 Laminate water absorption results*

Sample ID	Weight before immersion (g)	Weight after 168h immersion (g)	Water absorption (mg)
125/1	18.0279	19.9285	1901
125/2	18.2543	19.7602	1506
125/3	18.5406	20.1650	1624
<b>Mean</b>			1677
<b>Standard deviation</b>			203

## 12.5 mm EKOpoly Laminate Tensile Properties

BS EN ISO 527-4:1997

Job number:	C21014	Machine:	Zwick Z250 250kN	Temperature:	22.0 °C
Sub job ID:	125	Strain measurement:	Zwick biaxial 25 mm GL	Humidity:	50.0 % RH
Test speed:	2 mm/min	Vernier:	Digital (M32)	Test date:	19/02/21
Material:	12.5 mm EKOpoly	Micrometer:	Round end analogue (M57)	Tester:	MA

Table 5 Laminate tensile specimen dimensions

Sample ID	Width (mm)	Thickness (mm)	So (mm <sup>2</sup> )
125XTR/1	24.89	13.00	323.57
125XTR/2	25.31	12.36	312.83
125XTR/3	25.12	12.19	306.21
125XTR/4	24.96	12.57	313.75
125XTR/5	24.48	13.20	323.14

Table 6 Laminate tensile results

Sample ID	Max force (kN)	Max stress (MPa)	Strain at max stress (%)	Modulus 0.05 % to 0.25 % strain (GPa)
125XTR/1	1.04	3.21	1.44	0.36
125XTR/2	0.71	2.25	1.09	0.29
125XTR/3	1.10	3.59	1.74	0.35
125XTR/4	1.06	3.38	1.59	0.35
125XTR/5	1.13	3.50	1.62	0.34

Table 7 Laminate tensile statistics

	Max force (kN)	Max stress (MPa)	Strain at max stress (%)	Modulus 0.05 % to 0.25 % strain (GPa)
Mean	1.01	3.19	1.50	0.34
Standard deviation	0.17	0.54	0.25	0.03
Max	1.13	3.59	1.74	0.36
Min	0.71	2.25	1.09	0.29
Mean +2SD	1.35	4.27	2.00	0.39
Mean -2SD	0.66	2.11	0.99	0.28
Coefficient of Variation (%)	0.171	0.170	0.169	0.085

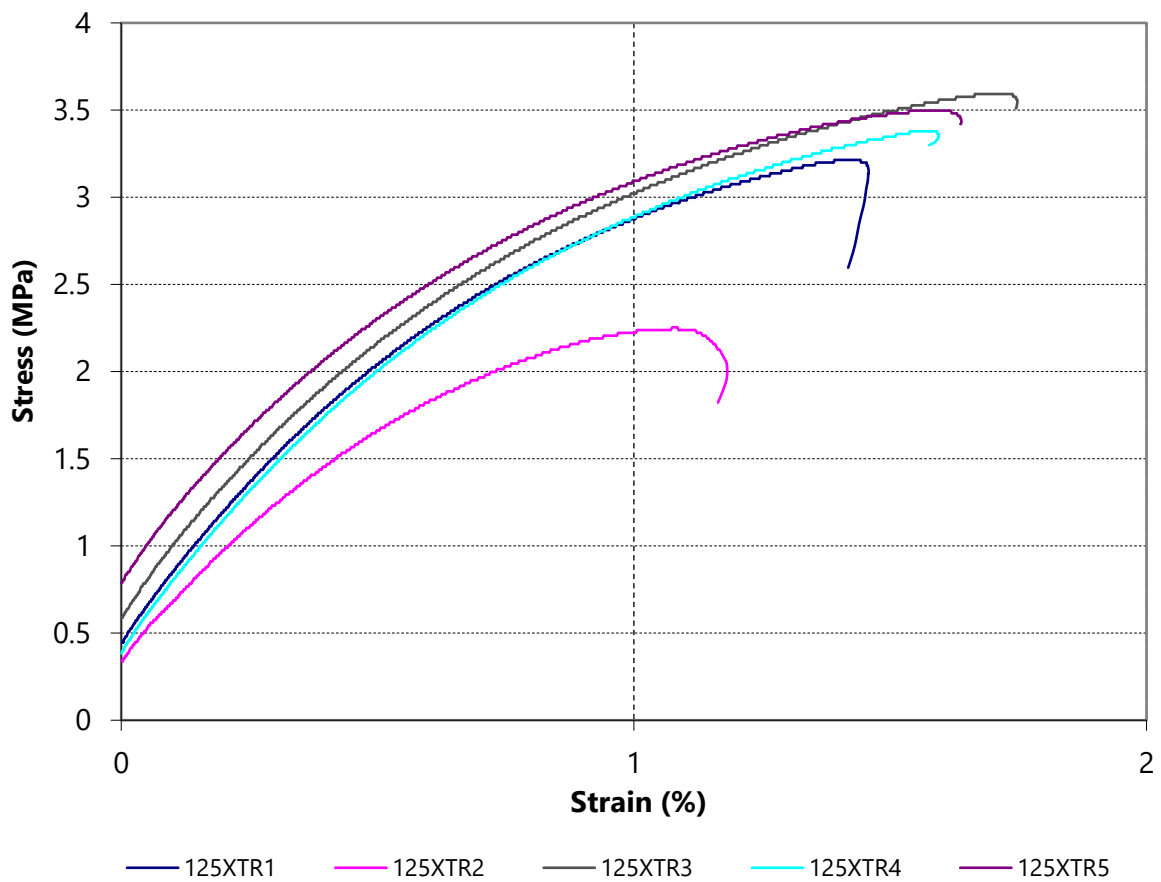


Figure 1 Laminate tensile series graph



*Figure 2 Photograph of tensile samples after testing*

## 12.5 mm EKOpoly Laminate Flexural Properties

ASTM D790-15<sup>E2</sup>

Job number:	C21014	Machine:	Zwick Z10 10kN	Surface in tension:	Tool side
Sub job ID:	125	Strain measurement:	Epsilon deflectometer	Direction of test:	N/A
Tester:	MA	Vernier:	Digital (M32)	Material class:	Class II
Material:	12.5 mm EKOpoly	Micrometer:	Flat end digital (M55) Round end analogue (M53)	Temperature:	21.7 °C
Test speed:	2.0 mm/min	Specimen grips:	3-point bend rig	Humidity:	51.0 % RH
				Test date:	23/02/21

Table 8 Laminate flexural specimen dimensions

Sample ID	Width (mm)	Thickness (mm)	So (mm <sup>2</sup> )	Flex Support (mm)
125XFR/2	20.29	12.18	247.13	149.9
125XFR/3	20.39	12.19	248.55	149.9
125XFR/4	20.29	12.24	248.35	149.9
125XFR/5	20.21	12.29	248.38	149.9
125XFR/6	19.92	12.25	244.02	149.9

Note sample 125XFR/1 removed and replaced by 125XFR/2 due to incorrect test setup.

Table 9 Laminate flexural results

Sample ID	Max force (N)	Max flexural stress (MPa)	Modulus 0.1 % to 0.3 % strain (GPa)
125XFR/2	88.9	6.64	0.500
125XFR/3	92.4	6.86	0.523
125XFR/4	89.3	6.61	0.487
125XFR/5	93.0	6.85	0.467
125XFR/6	81.4	6.12	0.517

Table 10 Laminate flexural statistics

	Max force (N)	Max flexural stress (MPa)	Modulus 0.1 % to 0.3 % strain (GPa)
<b>Mean</b>	89.0	6.62	2.0
<b>Standard deviation</b>	4.65	0.300	0.11
<b>Max</b>	93.0	6.86	2.2
<b>Min</b>	81.4	6.12	1.9
<b>Mean +2SD</b>	98.3	7.22	2.2
<b>Mean -2SD</b>	79.7	6.02	1.8
<b>Coefficient of Variation (%)</b>	5.22	4.54	5.55

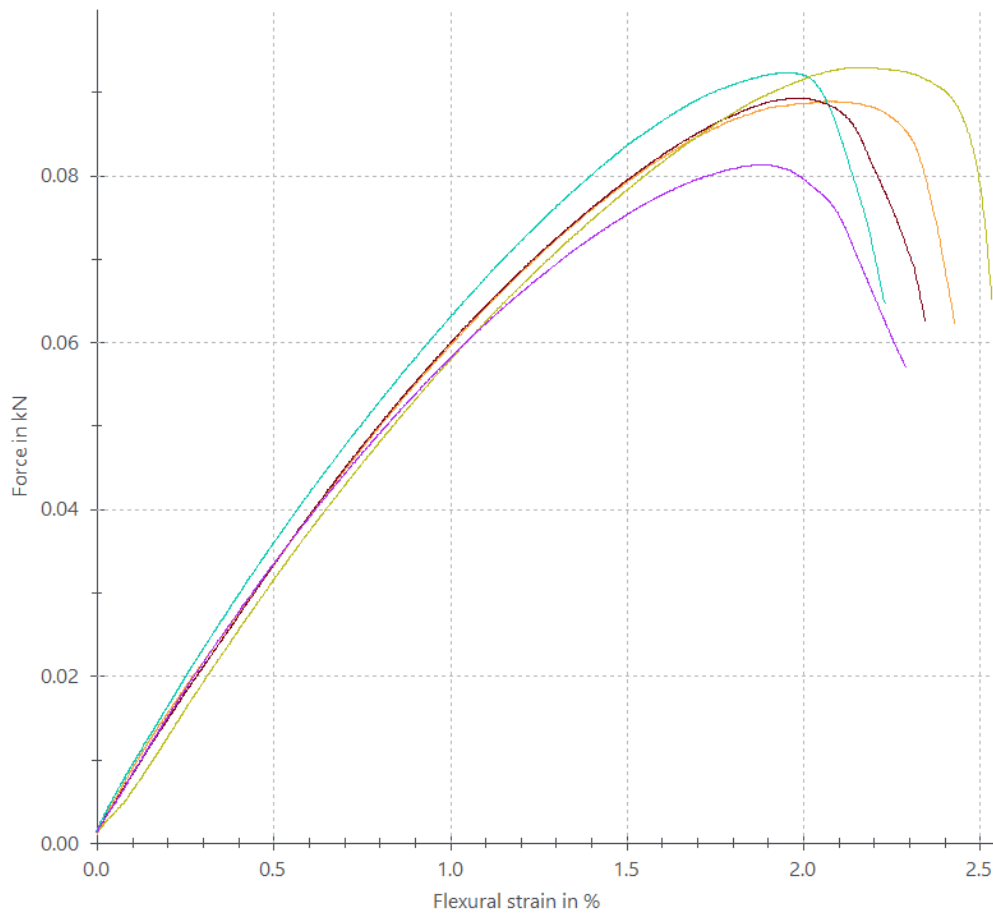
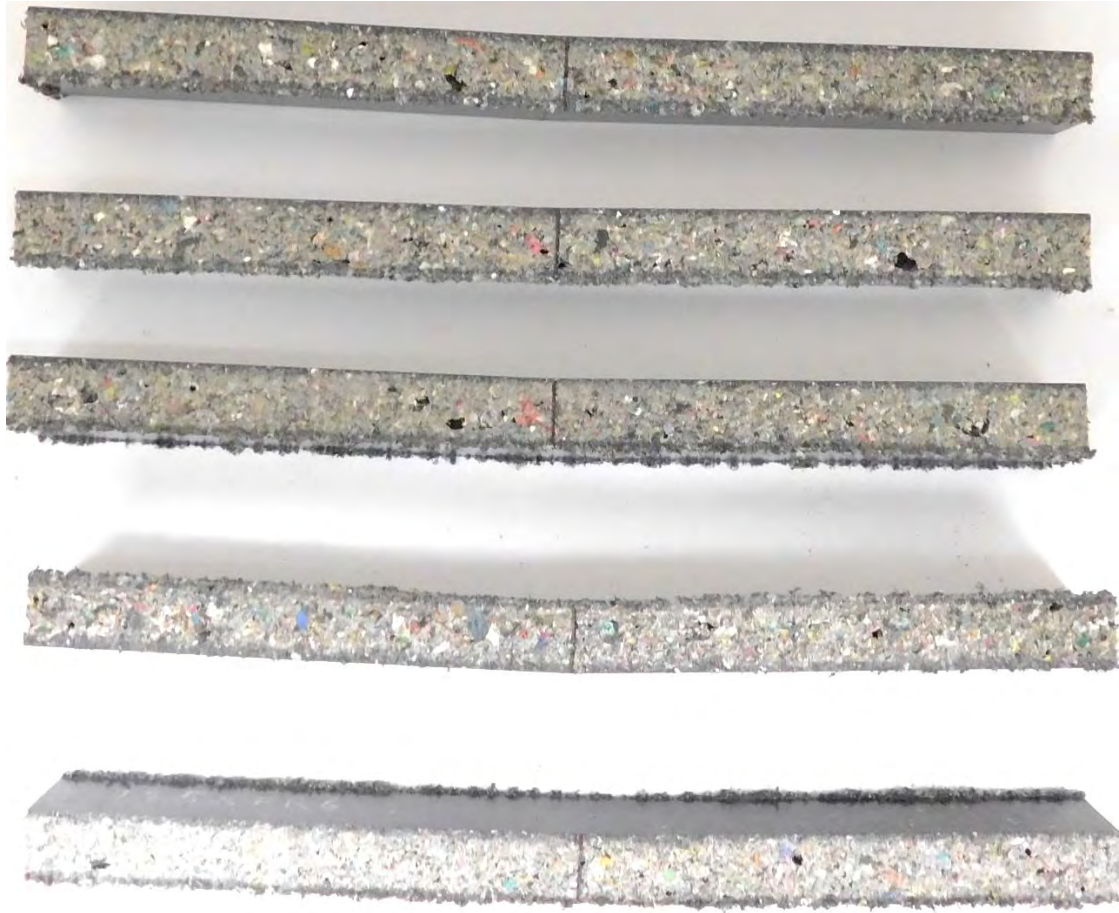


Figure 3 Laminate flexural series graph



*Figure 4 Photograph of samples after testing*

## 12.5 mm EKOpoly Temperature of Deflection Under Load 1.80MPa

BS EN ISO 75-2:2013

Machine:	Ceast HDT 3 Vicat (T24)	Material:	12.5 mm EKOpoly	Micrometer:	Flat end digital (M55) Round end analogue (M25)
Vernier:	Digital (M32)	Test date:	23/02/21	Heat transfer medium:	Silicon oil
Applied load:	1.8 MPa				

Table 11 Temperature of deflection under load cast specimen dimensions and results

Sample ID	Width (mm)	Thickness (mm)	Length (mm)	Span (mm)	TDUL (°C)
125/1	11.20	12.15	80.11	64	43.9
125/2	11.52	12.14	79.86	64	44.1
125/3	11.10	12.09	80.17	64	44.6
<b>Mean</b>					44.2

## 12.5 mm EKOpoly Temperature of Deflection Under Load 0.45MPa

BS EN ISO 75-2:2013

Machine:	Ceast HDT 3 Vicat (T24)	Material:	12.5 mm EKOpoly	Micrometer:	Flat end digital (M55) Round end analogue (M25)
Vernier:	Digital (M32)	Test date:	23/02/21	Heat transfer medium:	Silicon oil
Applied load:	1.8 MPa				

Table 12 Temperature of deflection under load cast specimen dimensions and results

Sample ID	Width (mm)	Thickness (mm)	Length (mm)	Span (mm)	TDUL (°C)
125/1	11.23	12.22	80.25	64	64.7
125/2	11.60	12.12	80.18	64	67.3
125/3	11.56	12.03	80.09	64	61.1
<b>Mean</b>					64.4

## 12.5 mm EKOpoly Compressive Strength

BS EN ISO 604/B/1:2003

Job number:	C21014	Machine:	Alpha WDW 100 kN	Temperature:	22.6 °C
Sub job ID:	125	Strain measurement:	N/A	Humidity:	54.4 % RH
Tester:	MA	Micrometer:	Flat end digital (M55)	Test date:	24/02/21
Material:	12.5 mm EKOpoly	Test speed:	1 mm/min		

Table 13 Compressive strength specimen dimensions

Sample ID	Width (mm)	Thickness (mm)	Height (mm)	So (mm <sup>2</sup> )
125XCR/1	11.00	10.64	12.41	117.04
125XCR/2	10.65	10.57	12.43	132.38
125XCR/3	10.96	11.01	12.43	136.23
125XCR/4	11.04	10.81	12.44	119.34
125XCR/5	12.19	9.62	12.42	116.79

Table 14 Compressive strength results

Sample ID	Compressive strength (kN)	Max compressive stress (MPa)	Strain at max strength (%)
125XCR/1	0.39	3.3	4.9
125XCR/2	0.74	5.6	9.2
125XCR/3	0.98	7.2	9.5
125XCR/4	0.34	2.8	6.7
125XCR/5	0.35	3.0	6.3

Table 15 Compressive strength statistics

	Compressive strength (kN)	Max compressive stress (MPa)	Strain at max strength (%)
Mean	0.556	4.4	7.3
Standard deviation	0.287	1.9	2.0
Max	0.975	7.2	9.5
Min	0.335	2.8	4.9
Mean +2SD	1.129	8.2	11.3
Mean -2SD	-0.017	0.5	3.4
Coefficient of Variation (%)	51.544	43.947	26.932

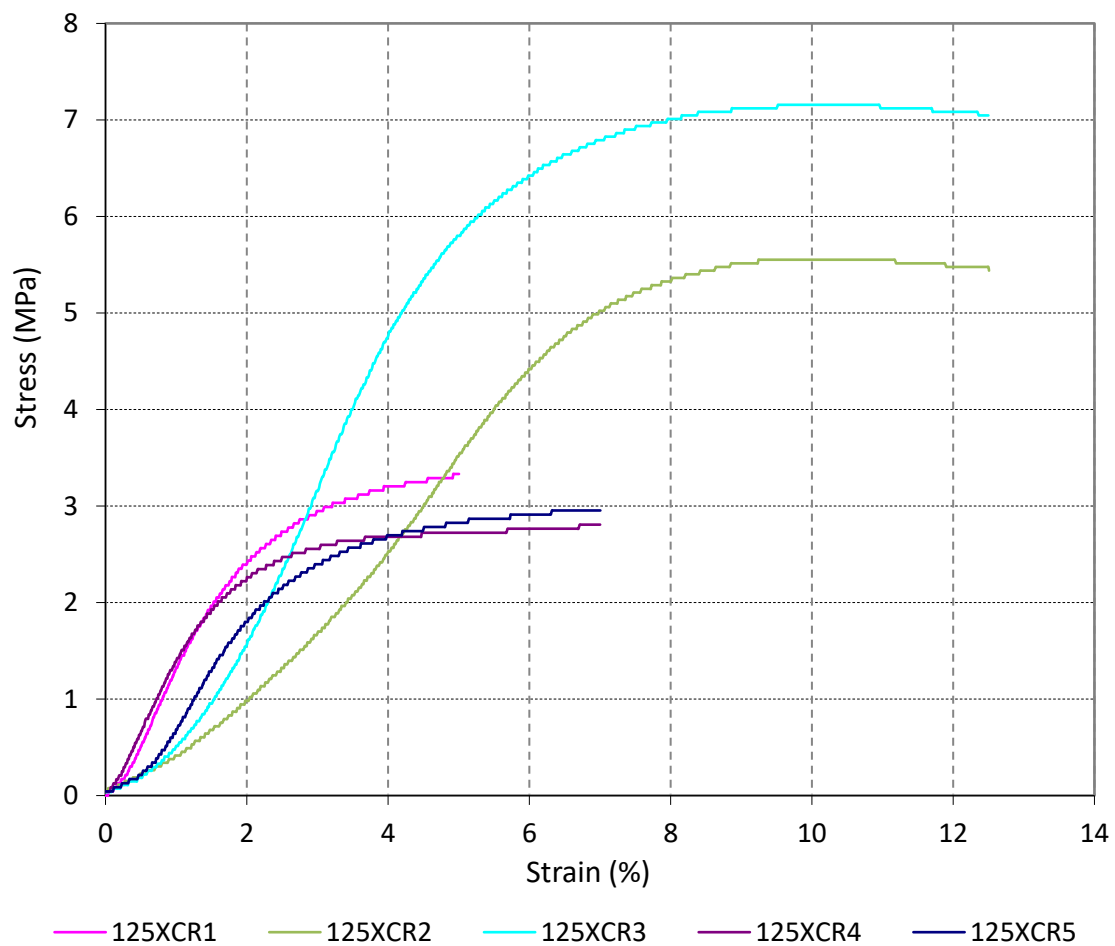


Figure 5 Compressive strength series graph



*Figure 6 Photograph of compressive strength samples after testing*

## 12.5 mm EKOpoly Density Determination

ASTM D792-13

Method: Method A of Test Method D792      Material: 12.5 mm EKOpoly      Balance: Satorious YDK 01  
 Test date: 25/02/21      Tester: MA

Table 16 Density determination results

Specimen ID	Sample mass in air (g)	Sample mass in distilled water (g)	Water temperature (°C)	Distilled water density (g/cm <sup>3</sup> )	Specimen density (g/cm <sup>3</sup> )
125/1	1.8751	-1.3645	23.6	0.997	0.577
125/2	1.8200	-1.4999	23.3	0.997	0.547
125/3	1.9588	-1.0208	23.4	0.997	0.656
				<b>Mean</b>	<b>0.593</b>

## 12.5 mm EKOpoly Shore D Hardness

Job number: C21014      Test Standard: ISO 868:2003  
 Sub job ID: 125      Temperature: 22.6°C  
 Hardness Machine: Shore D Hardness Impressor (T43)      Humidity: 48.7 % RH  
 Shore D Test Blocks: 22,23,32,33,88,74      Test date: 18/02/21  
 Material: 12.5 mm EKOpoly

Table 17 Shore D Hardness Results

Sample ID	Measured Hardness					Mean
125/1	64	65	67	65	65	65
125/2	64	66	66	70	66	66
125/3	65	63	58	67	59	62
						<b>65</b>

## 19 mm Anti-Slip Sheet Water Absorption

BS EN ISO 62:2008

Method: Method 1      Material: 19 mm Anti Slip Sheet      Test date: 25/02/21  
 Immersion period: 168 hours      Tester: MA      Balance: Sartorius CP64

*Table 18 Laminate water absorption results*

Sample ID	Weight before immersion (g)	Weight after 168h immersion (g)	Water absorption (mg)
19A/1	27.4015	30.4126	3011
19A/2	28.4773	30.4599	1982
19A/3	28.7901	30.7409	1950
		<b>Mean</b>	2314
		<b>Standard deviation</b>	604

## 19 mm Anti-Slip Sheet Laminate Tensile Properties

BS EN ISO 527-4:1997

Job number:	C21014	Machine:	Zwick Z250 250kN	Temperature:	22.3 °C
Sub job ID:	19A	Strain measurement:	Zwick biaxial 25 mm GL	Humidity:	51.9 % RH
Test speed:	2 mm/min	Vernier:	Digital (M54)	Test date:	20/02/21
Material:	19 mm Anti Slip Sheet	Micrometer:	Round end analogue (M25)	Tester:	MA/CDM

Table 19 Laminate tensile specimen dimensions

Sample ID	Width (mm)	Thickness (mm)	So (mm <sup>2</sup> )
19AXTR/1	25.48	20.16	513.68
19AXTR/2	25.17	20.21	508.69
19AXTR/3	26.00	20.16	524.16
19AXTR/4	24.75	20.10	497.48
19AXTR/5	27.22	20.29	552.29

Table 20 Laminate tensile results

Sample ID	Max force (kN)	Max stress (MPa)	Strain at max stress (%)	Modulus 0.05 % to 0.25 % strain (GPa)
19AXTR/1	1.44	2.80	2.13	0.156
19AXTR/2	1.57	3.09	2.71	0.190
19AXTR/3	1.72	3.28	2.90	0.187
19AXTR/4	1.59	3.20	3.22	0.196
19AXTR/5	1.61	2.92	2.84	0.189

Table 21 Laminate tensile statistics

	Max force (kN)	Max stress (MPa)	Strain at max stress (%)	Modulus 0.05 % to 0.25 % strain (GPa)
Mean	1.59	3.06	2.76	0.18
Standard deviation	0.1	0.197	0.398	0.016
Max	1.72	3.28	3.22	0.20
Min	1.44	2.80	2.13	0.16
Mean +2SD	1.79	3.45	3.56	0.22
Mean -2SD	1.39	2.67	1.96	0.15
Coefficient of Variation (%)	6.32	6.45	14.43	8.68

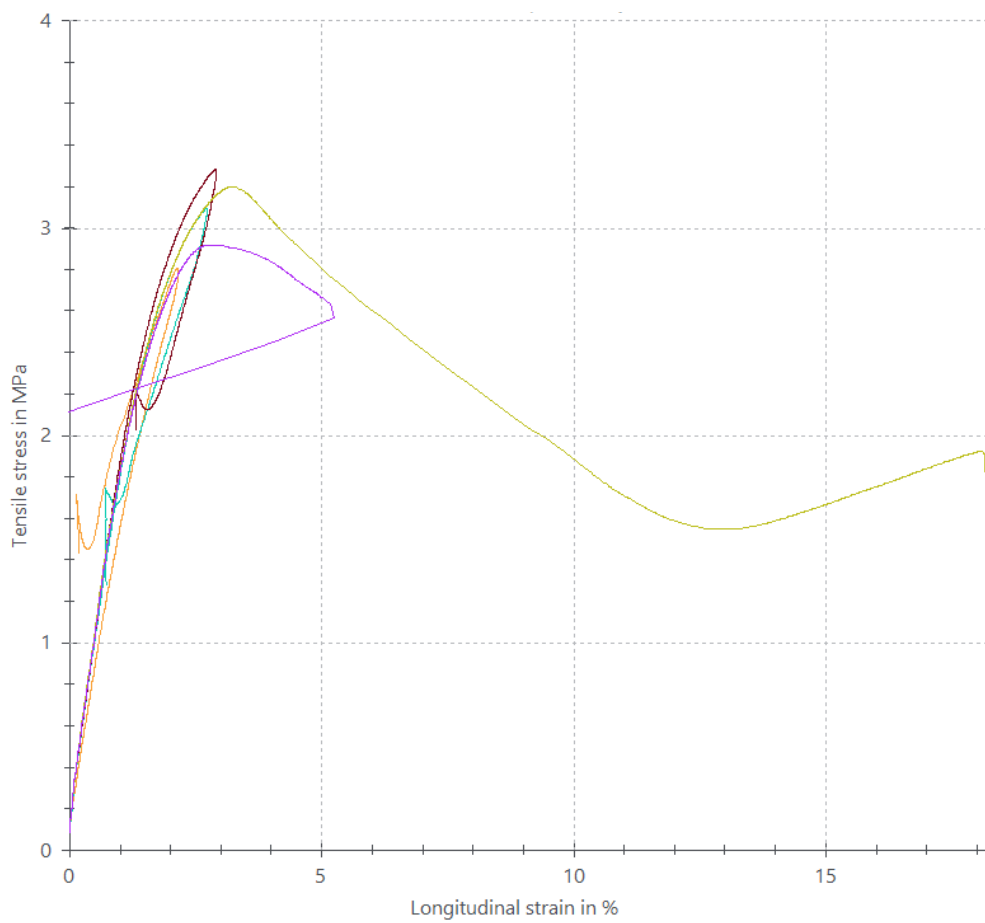


Figure 7 Laminate tensile series graph



*Figure 8 Photograph of tensile samples after testing*

## 19 mm Anti-Slip Sheet Laminate Flexural Properties

ASTM D790-15<sup>E2</sup>

Job number:	C20086	Machine:	Zwick Z10 10kN	Surface in tension:	Tool side
Sub job ID:	19A	Strain measurement:	Epsilon deflectometer	Direction of test:	N/A
Tester:	MA	Vernier:	Digital (M32)	Material class:	Class II
Material:	19 mm Anti Slip Sheet	Micrometer:	Flat end digital (M55) Round end analogue (M25)	Temperature:	21.6 °C
Test speed:	2.0 mm/min	Specimen grips:	3-point bend rig	Humidity:	52.5 % RH
				Test date:	24/02/21

Table 22 Laminate flexural specimen dimensions

Sample ID	Width (mm)	Thickness (mm)	So (mm <sup>2</sup> )	Flex Support (mm)
19AXFR/1	21.19	20.33	430.79	149.9
19AXFR/2	21.18	20.29	429.74	149.9
19AXFR/3	21.30	20.28	431.96	149.9
19AXFR/4	19.81	20.24	400.95	149.9
19AXFR/5	18.26	20.14	367.76	149.9

Table 23 Laminate flexural results

Sample ID	Max force (N)	Max flexural stress (MPa)	Modulus 0.1 % to 0.3 % strain (GPa)
19AXFR/1	424	10.9	0.494
19AXFR/2	460	11.9	0.533
19AXFR/3	472	12.1	0.496
19AXFR/4	384	10.7	0.409
19AXFR/5	383	11.6	0.487

Table 24 Laminate flexural statistics

	Max force (N)	Max flexural stress (MPa)	Modulus 0.1 % to 0.3 % strain (GPa)
<b>Mean</b>	424	11.4	0.48
<b>Standard deviation</b>	41.4	0.629	0.046
<b>Max</b>	472	12.1	0.53
<b>Min</b>	383	10.7	0.41
<b>Mean +2SD</b>	507	12.7	0.58
<b>Mean -2SD</b>	342	10.2	0.39
<b>Coefficient of Variation (%)</b>	9.75	5.51	9.43

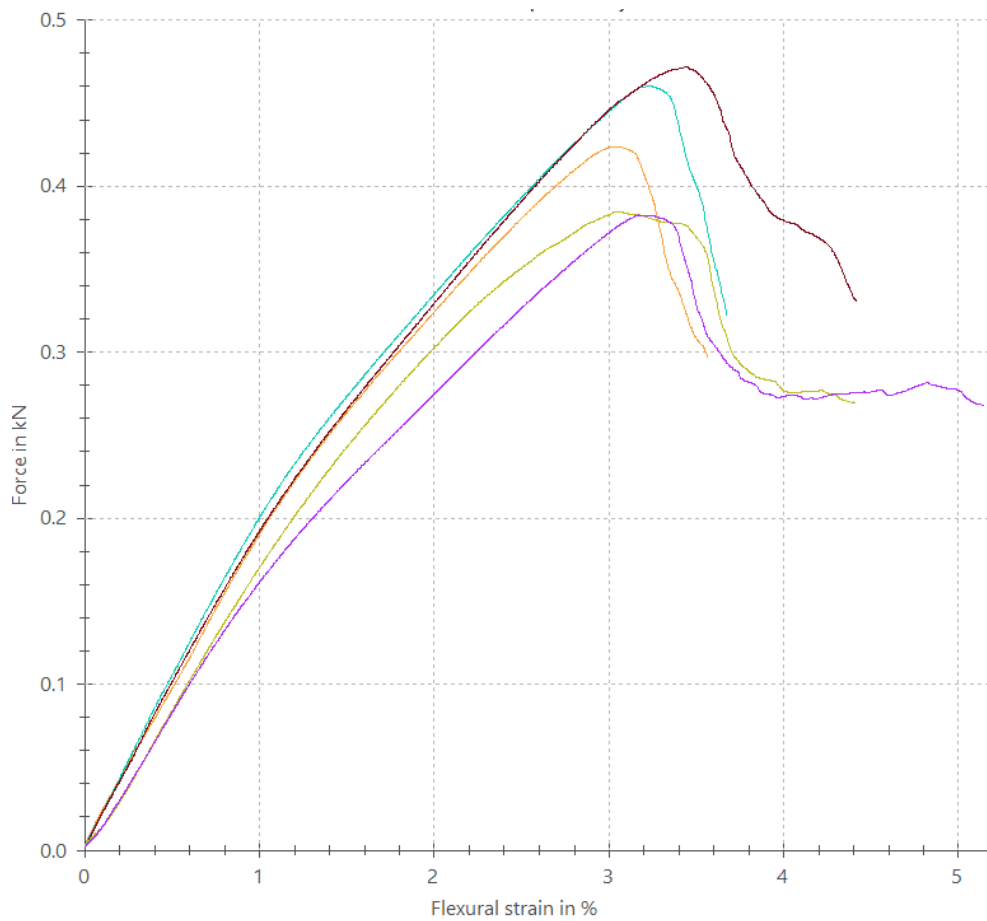


Figure 9 Laminate flexural series graph



*Figure 10 Photograph of samples after testing*

## 19 mm Anti-Slip Sheet Temperature of Deflection Under Load 1.80MPa

BS EN ISO 75-2:2013

Machine: Ceast HDT 3      Material: 19 mm Anti Slip Sheet      Micrometer: Flat end digital (M55)  
 Vicat (T24)  
 Vernier: Digital (M32)      Test date: 24/02/21      Heat transfer medium: Silicon oil  
 Applied load: 1.8 MPa

Table 25 Temperature of deflection under load cast specimen dimensions and results

Sample ID	Width (mm)	Thickness (mm)	Length (mm)	Span (mm)	TDUL (°C)
19A/1	11.56	20.02	80.22	64	-
19A/2	10.42	20.03	80.81	64	-
19A/3	11.10	20.13	82.39	64	-
<b>Mean</b>					-

Note: unable to test 1.8MPa loading on 19mm thick material

## 19 mm Anti-Slip Sheet Temperature of Deflection Under Load 0.45MPa

BS EN ISO 75-2:2013

Machine: Ceast HDT 3      Material: 19 mm Anti Slip Sheet      Micrometer: Flat end digital (M55)  
 Vicat (T24)      Round end analogue (M25)  
 Vernier: Digital (M32)      Test date: 24/02/21      Heat transfer medium: Silicon oil  
 Applied load: 1.8 MPa

Table 26 Temperature of deflection under load cast specimen dimensions and results

Sample ID	Width (mm)	Thickness (mm)	Length (mm)	Span (mm)	TDUL (°C)
19A/1	11.31	19.98	79.98	64	56.3
19A/2	11.11	19.95	79.99	64	67.7
19A/3	11.00	19.88	82.48	64	64.7
<b>Mean</b>					62.9

## 19 mm Anti-Slip Sheet Compressive Strength

BS EN ISO 604/B/1:2003

Job number:	C21014	Machine:	Alpha WDW 100 kN	Temperature:	22.3 °C
Sub job ID:	19A	Strain measurement:	N/A	Humidity:	50.2 % RH
Tester:	MA	Micrometer:	Flat end digital (M**) Round end analogue (M55)	Test date:	24/02/21
Material:	19 mm Anti Slip Sheet	Test speed:	1 mm/min		

Table 27 Compressive strength specimen dimensions

Sample ID	Width (mm)	Thickness (mm)	Height (mm)	So (mm <sup>2</sup> )
19AXCR/1	9.78	11.44	20.66	111.88
19AXCR/2	9.86	11.31	20.69	111.52
19AXCR/3	9.83	11.26	20.69	110.69
19AXCR/4	10.56	11.25	20.58	118.80
19AXCR/5	10.35	10.95	20.50	113.33

Table 28 Compressive strength results

Sample ID	Compressive strength (kN)	Max compressive stress (MPa)	Strain at max strength (%)
19AXCR/1	0.32	2.9	4.6
19AXCR/2	0.41	3.7	5.3
19AXCR/3	0.35	3.1	5.6
19AXCR/4	0.45	3.7	5.9
19AXCR/5	0.41	3.6	5.4

Table 29 Compressive strength statistics

	Compressive strength (kN)	Max compressive stress (MPa)	Strain at max strength (%)
<b>Mean</b>	0.385	3.4	5.3
<b>Standard deviation</b>	0.051	0.4	0.5
<b>Max</b>	0.445	3.7	5.9
<b>Min</b>	0.320	2.9	4.6
<b>Mean +2SD</b>	0.487	4.2	6.3
<b>Mean -2SD</b>	0.283	2.6	4.3
<b>Coefficient of Variation (%)</b>	13.276	11.387	9.361

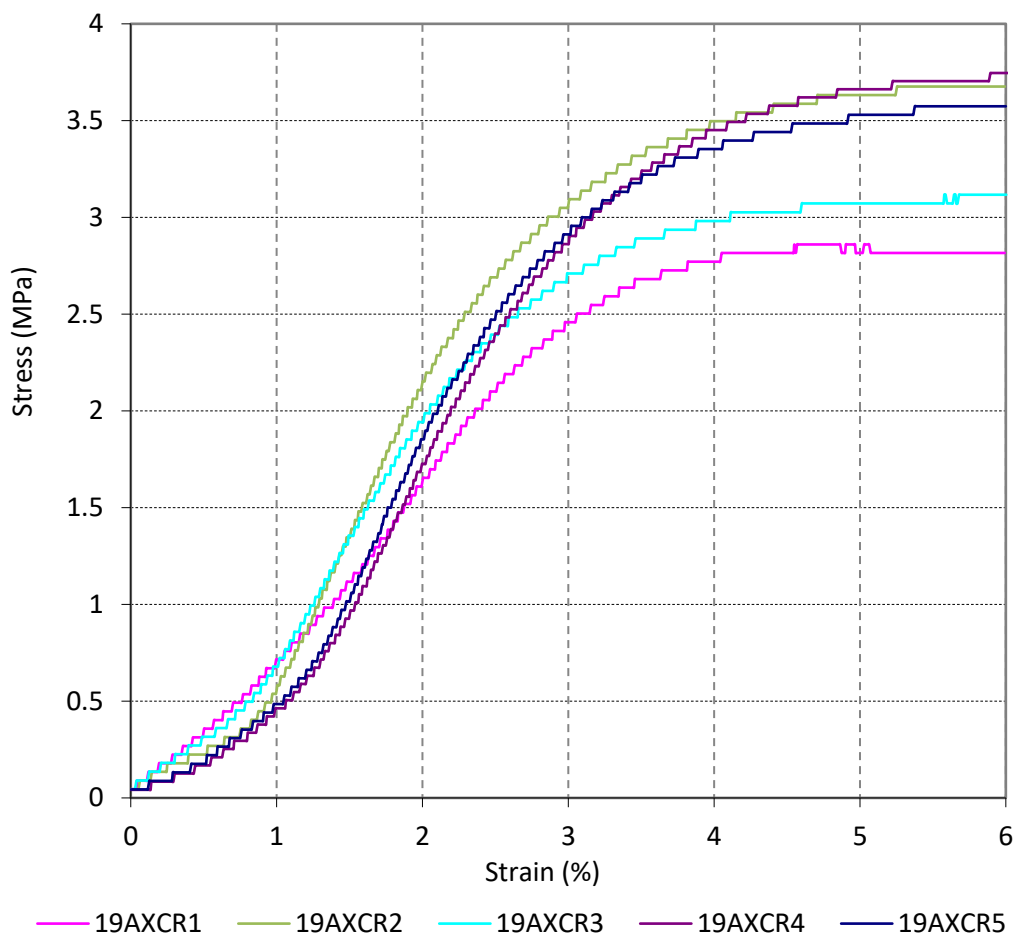


Figure 11 Compressive strength series graph



*Figure 12 Photograph of compressive strength samples after testing*

## 19 mm Anti-Slip Sheet Density Determination

ASTM D792-13

Method: Method A of Test Method D792      Material: 19 mm Anti Slip Sheet      Balance: Satorious YDK 01  
 Test date: 25/02/21      Tester: MA

Table 30 Density determination results

Specimen ID	Sample mass in air (g)	Sample mass in distilled water (g)	Water temperature (°C)	Distilled water density (g/cm <sup>3</sup> )	Specimen density (g/cm <sup>3</sup> )
19A/1	3.8824	-2.1156	23.2	0.997	0.646
19A/2	4.1543	-3.4515	23.0	0.998	0.545
19A/3	3.8729	-2.6160	22.7	0.998	0.595
				<b>Mean</b>	<b>0.595</b>

## 19 mm Anti-Slip Sheet Shore D Hardness

Job number: C21014      Test Standard: ISO 868:2003  
 Sub job ID: 841      Temperature: 22.6°C  
 Hardness Machine: Shore D Hardness Impressor (T43)      Humidity: 48.7 % RH  
 Shore D Test Blocks: 22,23,32,35,88,82      Test date: 18/02/21  
 Material: 19 mm Anti-Slip Sheet

Table 31 Shore D Hardness Results

Sample ID	Measured Hardness					Mean
19A/1	46	46	45	45	47	46
19A/2	51	45	50	49	47	48
19A/3	49	49	52	55	50	51
						<b>48</b>

## 19mm EKOpoly Tensile Properties

BS EN ISO 527-4

Job Number:	C21014	Machine:	Alpha 100kN	Temperature:	23.50°C
Vernier:	Digital (M21)	Extensometer:	Epsilon 50mm GL	Humidity:	47.02%
Material:	EKOpoly 19mm	Test speed:	2mm/min		
Micrometer:	Round Ended Analogue (M25)	Flat End Analogue (M6)			

Table 32 Tensile specimen dimensions

Sample ID	Test Date	Operator	Width(mm)	Thickness(mm)	So(mm <sup>2</sup> )	Lo(mm)
19TD-1	24/11/16	CDM	25.07	19.98	500.90	50
19TD-2	24/11/16	CDM	25.04	20.03	501.55	50
19TD-3	24/11/16	CDM	25.00	20.05	501.25	50
19TD-4	24/11/16	CDM	25.02	20.06	501.90	50
19TD-5	24/11/16	CDM	25.04	20.07	502.55	50

Table 33 Tensile results

Sample ID	Fmax (kN)	StressMax (MPa)	Strain at Max Stress (%)	Emodulus 0.25%strain (MPa)	Emodulus 0.5%strain (MPa)
19TD-1	1.74	3.46	4.99	272.0	229.56
19TD-2	1.84	3.66	4.21	289.5	248.22
19TD-3	1.78	3.54	4.34	264.0	228.22
19TD-4	1.77	3.53	3.99	264.0	236.89
19TD-5	1.58	3.13	4.38	229.0	205.56

Table 34 Tensile properties statistics

Sample ID	Fmax (kN)	StressMax (MPa)	Strain at Max Stress (%)	Emodulus 0.25%strain (MPa)	Emodulus 0.5%strain (MPa)
<b>Mean</b>	1.74	3.47	4.38	263.7	229.69
<b>Standard Deviation</b>	0.10	0.20	0.37	22.02	15.65
<b>Max</b>	1.84	3.66	4.99	289.50	248.22
<b>Min</b>	1.58	3.13	3.99	229.00	205.56
<b>Mean + 2SD</b>	1.93	3.86	5.13	307.73	260.99
<b>Mean - 2SD</b>	1.54	3.07	3.64	219.67	198.39

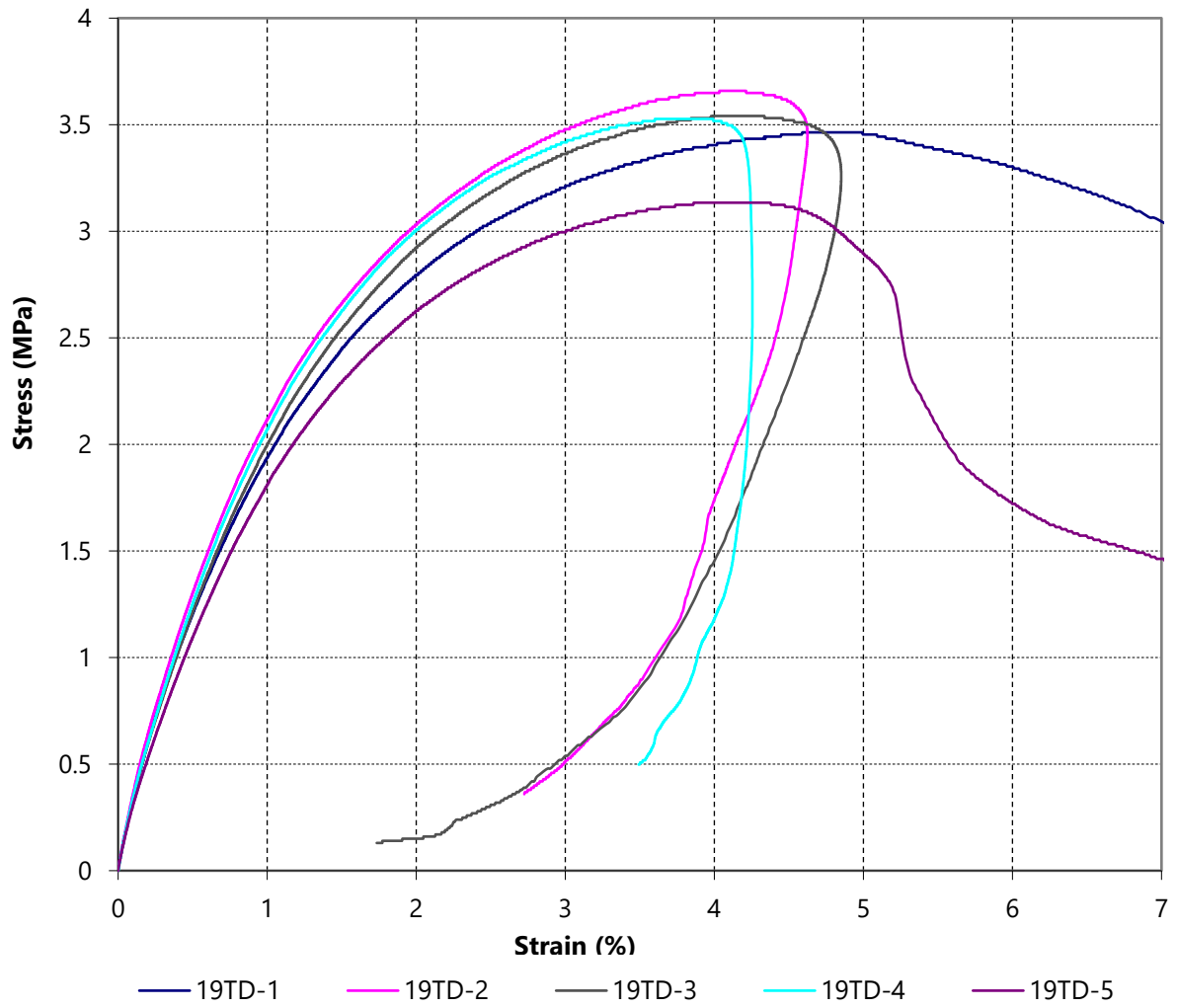


Figure 13 Tensile strength series graph

## 19mm EKOpoly Compressive Strength

BS EN ISO 604/B1:2003

Job Number:	C21014	Machine:	Alpha WDW 100kN	Temperature:	23.32°C
Vernier:	Digital (M21)	Extensometer:	Epsilon 50mm GL	Humidity:	50.97%
Material:	EKOpoly 19mm	Test Speed:	1mm/min		
Cure:	24 hours @ ambient	Post Cure:		16 hours at 40°C	
Micrometer:	Round Ended Analogue (M25) Flat End Analogue (M6)				

Table 35 Compressive strength specimen dimensions

Sample ID	Test Date	Operator	Width(mm)	Thickness(mm)	So(mm <sup>2</sup> )
19CS-1	02/12/2016	CDM	9.97	10.15	101.20
19CS-2	02/12/2016	CDM	10.13	10.09	102.21
19CS-3	02/12/2016	CDM	10.07	10.11	101.81
19CS-4	02/12/2016	CDM	10.17	10.13	103.02
19CS-5	02/12/2016	CDM	10.08	10.16	102.41

Table 36 Compressive strength results

Sample ID	Compressive Strength (kN)	Compressive Stress (MPa)	Strain at Max Strength (%)
19CS-1	0.295	2.9	4.5
19CS-2	0.265	2.6	4.5
19CS-3	0.255	2.5	4.7
19CS-4	0.185	1.8	5.0
19CS-5	0.240	2.3	4.8

Table 37 Compressive strength statistics

Sample ID	Compressive Strength (kN)	Compressive Stress (MPa)	Strain at Max Strength (%)
<b>Mean</b>	0.248	2.4	4.7
<b>Standard Deviation</b>	0.041	0.4	0.2
<b>Max</b>	0.295	2.9	5.0
<b>Min</b>	0.185	1.8	4.5
<b>Mean + 2SD</b>	0.329	3.3	5.1
<b>Mean - 2SD</b>	0.167	1.6	4.3

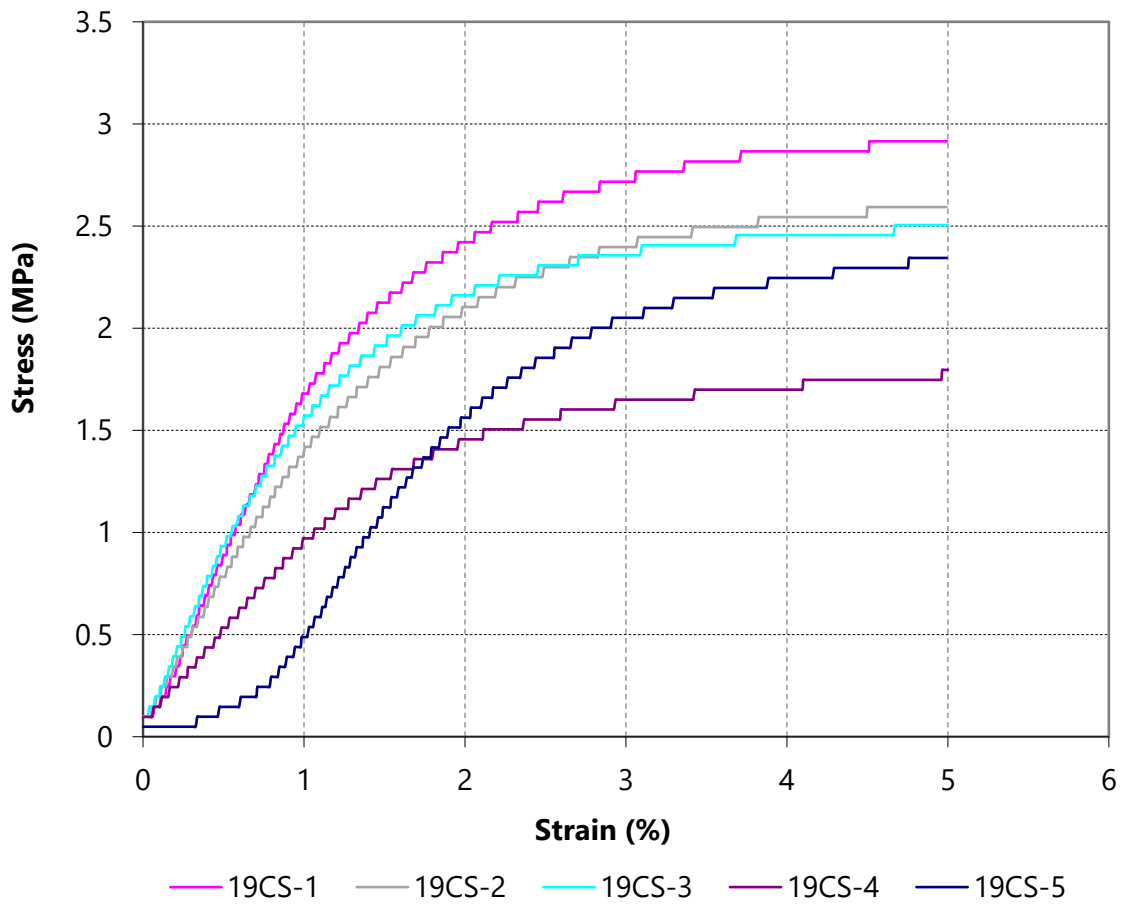


Figure 14 Compressive strength series graph

## 19mm EKOpoly Flexural Properties

BS EN ISO 170:1998

Job Number :	C21014	Load cell :	10kN
Customer :	Second Life Products Wales	Extensometer :	Crosshead
Material :	EKOpoly 19mm	Specimen grips :	3 point bend rig
Tester :	CDM	Test speed :	2 mm/min
Temperature :	23.92 °C	Surface in Tension:	Moulded Surface
Humidity :	49.59 %		

Table 38 Flexural strength specimen dimensions

Sub-Job No.	Sample No.	Width (mm)	Thickness (mm)	S0 (mm <sup>2</sup> )	Flex Support (mm)
19XFD	1	15.02	19.50	292.89	154.9
19XFD	2	15.00	19.25	288.75	154.9
19XFD	3	15.11	19.23	290.57	154.9
19XFD	4	15.07	19.51	294.02	154.9
19XFD	5	14.94	19.51	291.48	154.9

Table 39 Flexural strength results

Sub-Job No.	Sample No.	Max Force (N)	Flexural Stress Max (MPa)	Flexural Modulus (MPa)
19XFD	1	219.3	8.9	359.26
19XFD	2	183.8	7.7	376.43
19XFD	3	181.6	7.6	346.04
19XFD	4	215.1	8.7	375.84
19XFD	5	215.6	8.8	387.54

Table 40 Flexural strength statistics

Sample ID	Max Force (N)	Flexural Stress (MPa)	Flexural Modulus (MPa)
Mean	203.1	8.3	369.02
Standard Deviation	18.7	0.7	16.34
Max	219.3	8.9	387.54
Min	181.6	7.6	346.04
Mean + 2SD	240.5	9.7	401.17
Mean - 2SD	165.7	7.0	336.43

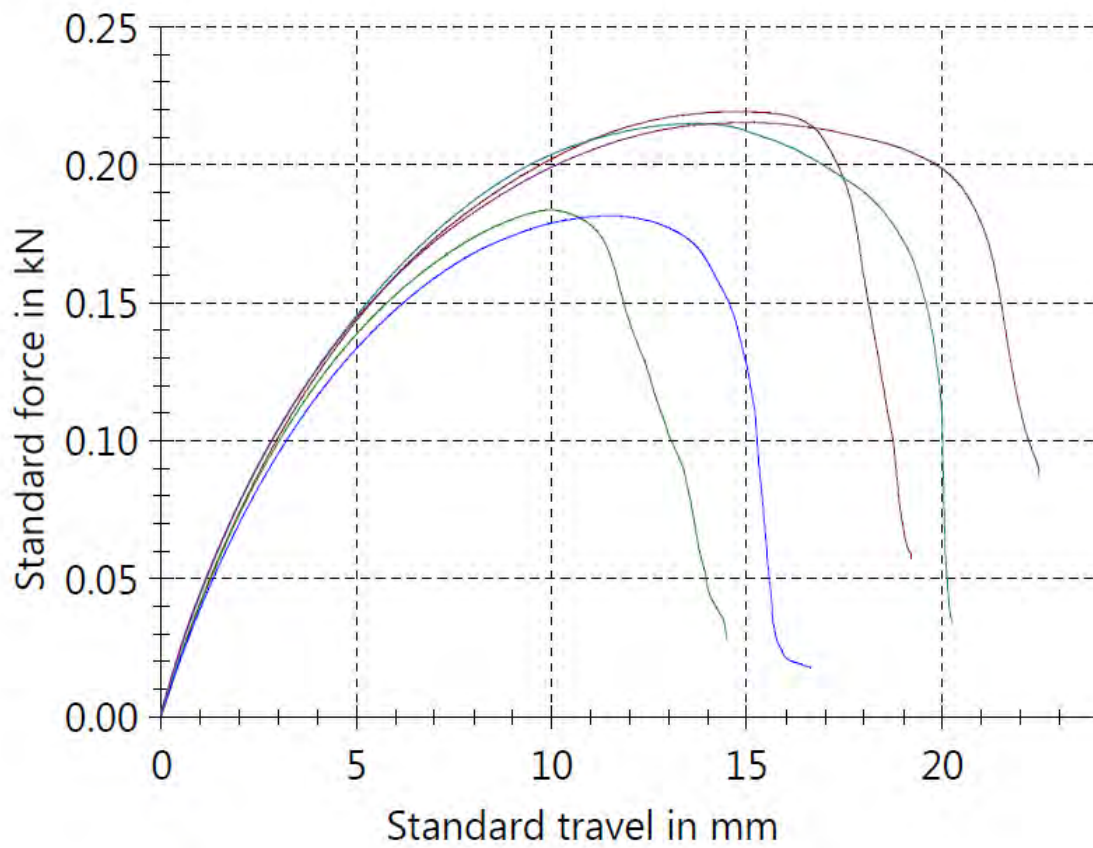


Figure 15 Compressive strength series graph

## 19mm EKOpoly Shore Hardness

ISO 868

Instrument: Checkline Europe AD-300-D

Table 41 Shore Hardness results

Sample no.	Hardness (Shore D)				
1	60	60	60	59	61
2	61	60	61	59	61
3	60	59	59	61	58
4	59	60	59	58	58
5	59	60	61	60	61
				<b>Mean</b>	<b>59.8</b>

## 19mm EKOpoly Water Absorption

ISO 62:2008

Table 42 Water absorption results

Sample No.	Weight before immersion (g)	Weight after 168 hour immersion (g)	Water absorption (mg)	Swell (%)
1	22.9324	23.234	301.0	0.09
2	23.8849	24.3269	492.0	0.12
3	25.6002	25.9617	361.5	0.08
<b>Mean</b>			<b>385</b>	<b>0.10</b>

## 19mm EKOpoly Density

ASTM D792-13

Table 43 Density results

Specimen ID	Mass in air (g)	Mass in distilled water (g)	Temperature of water (°C)	Density of distilled water (g/cm <sup>3</sup> )	Density of specimen (g/cm <sup>3</sup> )
1	4.3247	-4.4390	22.0	0.998203	0.492592
2	4.1279	-4.1909	22.0	0.998203	0.495322
3	4.2172	-4.4200	22.0	0.998203	0.487383
				<b>Mean</b>	<b>0.491765</b>

**Authorisation**

Reported by:

Natallie Jack

**Administrative Assistant**



Authorised by:

Dr Geraint Havard

**Composites Manager**



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End of report

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