Official Flexural Strength Report

Vuba Resin Product

VUBA
SURFACES

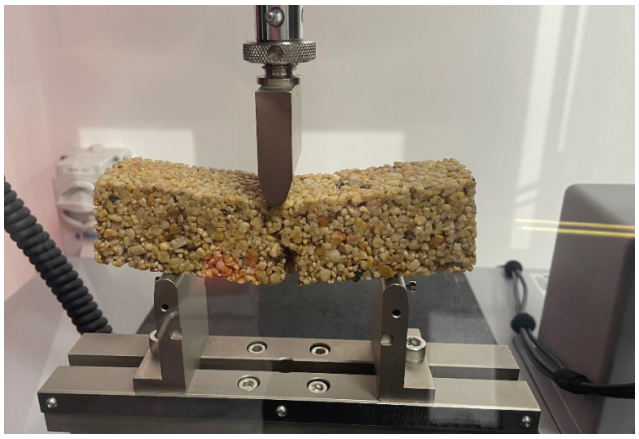
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INTRODUCTION

In the Resin Bound industry, assessing flexural strength is crucial for ensuring structural durability and it is yet to be a mandatory requirement for products on the market. As a leading manufacturer, Vuba is dedicated to enhancing the industry and encouraging a higher standard of products. On the 7th of March 2024, we conducted a test study comparing the flexural strength of our standard and moisture-tolerant resins with two industry competitors, following the British Standard procedure BS EN 13892-2:2022 at a UKAS accredited laboratory.

Additionally, we examined the performance of the same resin products after extreme moisture damage to provide insights into their resilience. This report presents a detailed analysis of our resin bound's flexural strength characteristics, aiming to offer the industry a comprehensive understanding of their reliability compared to others in the market. This study underscores Vuba's commitment to innovation and quality assurance, as well as our confidence in our products being the best on the market.







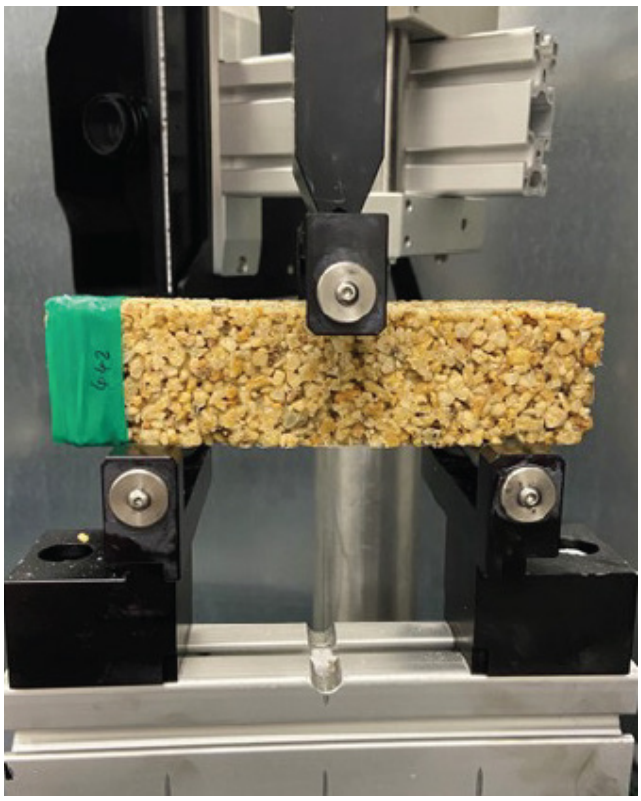
SAMPLE PREPERATION

The sample preparation for the flexural strength testing was conducted to ensure consistency and fairness across all materials tested. At the Vuba Lab, we made test specimens measuring 160mm x 40mm x 40mm, dimensions following the British standard. Each manufacturer's specifications were strictly adhered to during sample preparation. Part A and Part B components of the resins were precisely weighed and thoroughly mixed before being combined with a standardised aggregate blend of Autumn Quartz, renowned for its robustness. The mixture was then carefully trowelled into British Standard moulds to maintain uniformity. All samples were allowed to cure for a period of 10 days, a duration proven to ensure complete curing and maximum strength development. This methodical approach to sample preparation guarantees reliability and integrity in the subsequent flexural strength assessments, facilitating fair comparisons between different materials.

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TESTING METHOD

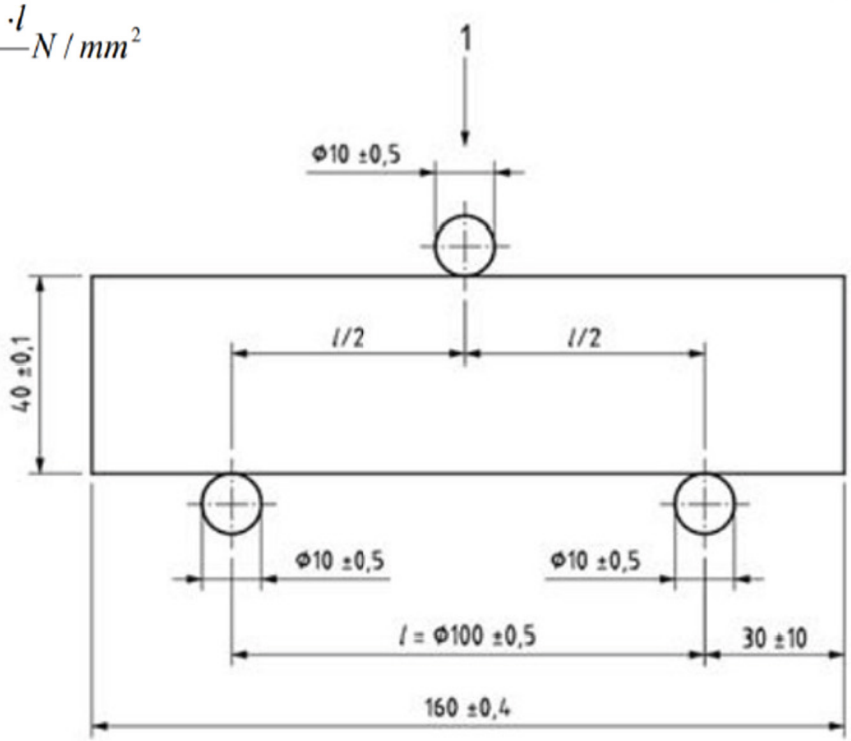
The test program encompassed 12 Flexural Strength assessments for Resin Bound Surfacing, conducted under ambient conditions. Each resin, including Standard Vuba Resin, Vuba MT Resin, and those of the two leading competitors, made up three specimens, totalling 12. Then a further set of 12 moisture-damaged specimens. 24 specimens which mere split into 8 bags of 3 identical specimens were tested in one day. Upon arrival at the lab, all materials and specimens underwent rigorous incoming receipt inspection to ensure adherence to specimen geometry, traceability, and overall quality control standards.



The lab performed testing according to BS EN 13892-2:2022 guidelines, maintaining ambient laboratory conditions throughout. Load and displacement were recorded during testing, with the load applied uniformly until failure, ensuring standardised procedures. The maximum load applied (Ff in N) was documented, and the flexural strength (Rf in N/mm²) was calculated using the prescribed equation.

$$R_f = \frac{1{,}5F_f \cdot l}{bd^2} N/mm^2$$

Dimensions in millimetres



Key
1 load

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Post-testing, the two halves of the specimens were securely returned to their original packaging and returned to Vuba.

The laboratory used by Vuba work hard to be impartial, even specifying the below in their test brief:
"All measurements will be made using calibrated metrology and recorded. Measurement of critical dimensions as defined by the relevant test standards will be conducted on all specimens prior to testing. All specimens will also be visually inspected to ensure there are no defects or damage present which may adversely affect the test results, and all observations will be recorded. Specimens found to contain significant defects will be excluded from testing unless agreed otherwise with Vuba Resin Products."

	SPECIMEN ID	WIDTH (MM)	DEPTH (MM)	LENGTH (MM)	MASS (G)	FLEXURAL	AVERAGE MPA
Vuba Resin	TS05_0703_A	41.01	40.28	160.25	430	8.335	8.504
	TS05_0703_B	40.8	40.34	160.52	430	7.803	
	TS05_0703_C	41	41.32	160.4	456	9.376	
Vuba Resin (Submerged in Water)	TS06_0703_A	40.81	41.15	160.85	434	2.556	2.7
	TS06_0703_B	40.73	42.03	160.85	449	2.899	
	TS06_0703_C	39.73	41.31	160.85	430	2.674	
Best Performing Competitor	TS09_0703_A	40.59	41.87	160.98	446	6.803	6.692
	TS09_0703_B	38.16	39.96	160.43	398	6.359	
	TS09_0703_C	40.8	41.7	162.24	460	6.915	
Best Performing Competitor (Submerged in Water)	TS10_0703_A	40.6	40.74	161.05	437	1.807	1.725
	TS10_0703_B	40.74	40.15	160.96	434	1.752	
	TS10_0703_C	41.06	41.88	160.5	446	1.616	
Previous Market Leader by Volume (Now Vuba)	TS11_0703_A	41.41	39.56	160.86	430	6.78	5.997
	TS11_0703_B	42.23	41.29	159.97	446	5.442	
	TS11_0703_C	41.3	39.65	160.52	423	5.769	
Previous Market Leader by Volume (Now Vuba) (Submerged in Water)	TS12_0703_A	41.28	41.18	160.65	442	0.828	0.752
	TS12_0703_B	41.09	39.98	161.18	427	0.693	
	TS12_0703_C	41.05	41.01	160.36	434	0.737	

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What were the results?

Flexural Strength MPA

Vuba Resin
8.504

Best Performing Competitor
6.692

Previous Market Leader by Volume (Now Vuba)
5.997

Flexural Strength MPA (Moisture Damage)

Vuba Resin
2.7

Best Performing Competitor
1.725

Previous Market Leader by Volume (Now Vuba)
0.752

* Average

The test results revealed that Vuba Standard Resin stands out as the industry's top performer in terms of flexural strength, closely trailed by our Vuba MT Resin. Notably, the flexural strength scores obtained for Vuba's products significantly surpassed those of our industry competitors. Vuba achieved remarkable highs, with scores reaching 9.376 and 8.66, showcasing exceptional strength. Furthermore, even under moisture-damaged conditions, Vuba MT Resin demonstrated its effectiveness by excelling with a high score of 3.801, underscoring its purpose and design. These results affirm Vuba's commitment to providing superior-quality resin solutions that outperform competitors in both standard and challenging environmental conditions.

5 Appendix B: Individual Test Reports

The results from each bag of 3 specimens are presented on a single report.

Customer Name : Vuba Resin Products
Batch : TS03_0703
Material Name : Resin Bound Surfacing

Test Name : Cell 2 - 3 Point Bend 400mm/min
Test Date : 07/03/2024 13:44
Preload : Off
Sample Height : 40.000 mm

Test No	Time of Test	Specimen ID	Mass (g)	Test Engineer	Length (mm)	Depth (mm)	Width (mm)	Density (kg/m³)
1	07/03 13:44:31	TS03_0703_A	442	RE	160.76	41.86	41.87	1568.708
2	07/03 13:46:57	TS03_0703_B	427	RE	162.28	40.44	40.54	1604.974
3	07/03 13:50:14	TS03_0703_C	427	RE	160.77	39.98	42.26	1571.993
Min						39.98	40.54	1568.708
Mean						40.76	41.557	1581.892
Max						41.86	42.26	1604.974

Test No	Flexural Strength (N/mm²)	Force @ Peak (N)
1	7.443	3640.4
2	7.133	3152.7
3	6.892	3103.8
Min	6.892	3103.8
Mean	7.156	3298.967
Max	7.443	3640.4

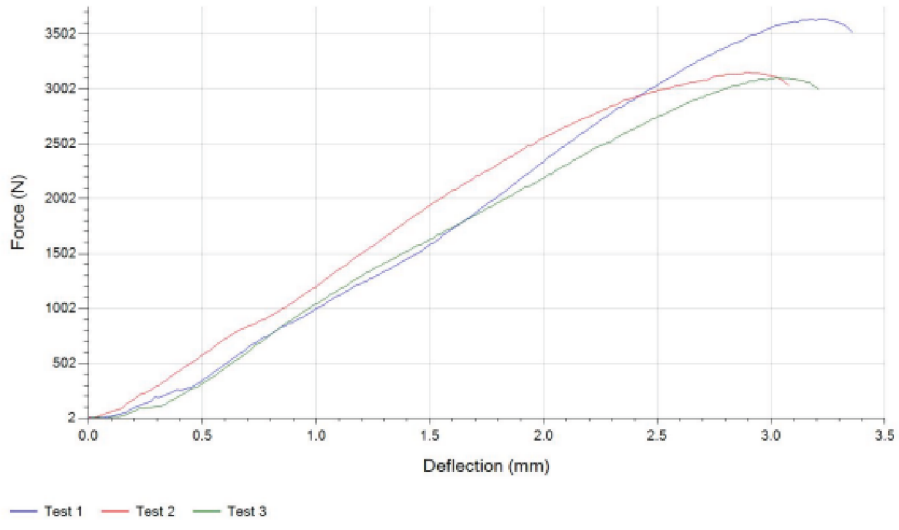


Figure 1: Test report for Batch 1

5 Appendix B: Individual Test Reports

The results from each bag of 3 specimens are presented on a single report.

Customer Name : Vuba Resin Products
Batch : TS04_0703
Material Name : Resin Bound Surfacing

Test Name : Cell 2 - 3 Point Bend
Test Date : 07/03/2024 13:53
Preload : Off
Sample Height : 40.000 mm

Test No	Time of Test	Specimen ID	Mass (g)	Test Engineer	Length (mm)	Depth (mm)	Width (mm)	Density (kg/m³)
1	07/03 13:54:29	TS04_0703_A	422	RE	160.81	40.81	40.92	1571.438
2	07/03 13:56:41	TS04_0703_B	434	RE	160.24	40.43	42.08	1591.986
3	07/03 13:58:46	TS04_0703_C	427	RE	160.99	40.29	41.0	1605.639
Min						40.29	40.92	1571.438
Mean						40.51	41.333	1589.688
Max						40.81	42.08	1605.639

Test No	Flexural Strength (N/mm²)	Force @ Peak (N)
1	3.547	1611.4
2	3.462	1587.4
3	3.444	1528.0
Min	3.444	1528.0
Mean	3.484	1575.6
Max	3.547	1611.4

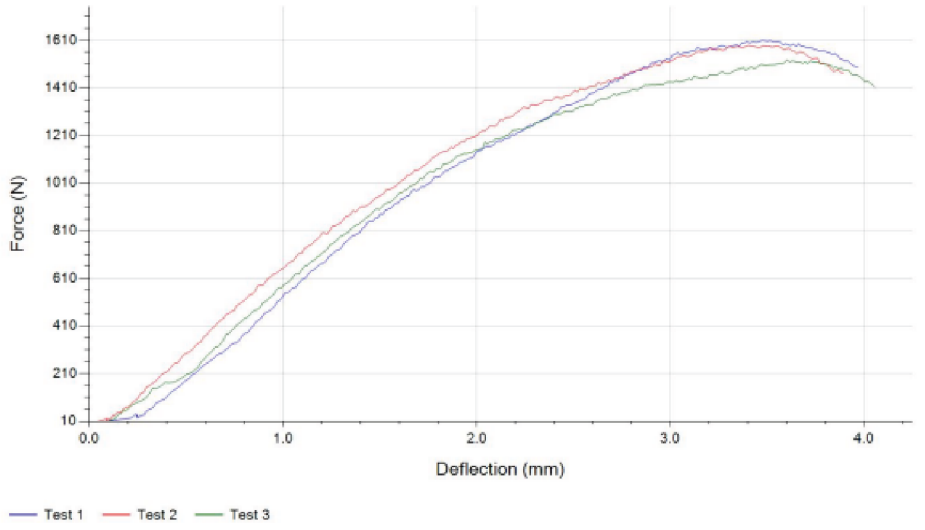


Figure 2: Test report for Batch 2

5 Appendix B: Individual Test Reports

The results from each bag of 3 specimens are presented on a single report.

Customer Name : Vuba Resin Products
Batch : TS05_0703
Material Name : Resin Bound Surfacing

Test Name : Cell 2 - 3 Point Bend
Test Date : 07/03/2024 10:18
Preload : Off
Sample Height : 40.000 mm

Test No	Time of Test	Specimen ID	Mass (g)	Test Engineer	Length (mm)	Depth (mm)	Width (mm)	Density (kg/m³)
1	07/03 10:18:43	TS05_0703_A	430	RE	160.25	40.28	41.01	1624.393
2	07/03 11:30:42	TS05_0703_B	430.00	MM	160.52	40.34	40.8	1627.583
3	07/03 11:38:03	TS05_0703_C	456.00	MM	160.40	41.32	41.0	1678.094
Min						40.28	40.8	1624.393
Mean						40.647	40.937	1643.357
Max						41.32	41.01	1678.094

Test No	Flexural Strength (N/mm²)	Force @ Peak (N)
1	8.335	3697.5
2	7.803	3453.8
3	9.376	4375.5
Min	7.803	3453.8
Mean	8.505	3842.267
Max	9.376	4375.5

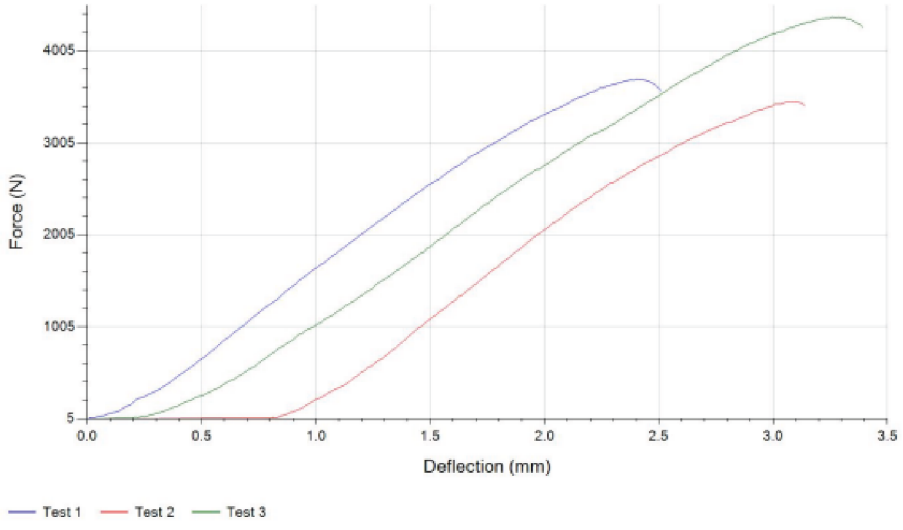


Figure 3: Test report for Batch 3

5 Appendix B: Individual Test Reports

The results from each bag of 3 specimens are presented on a single report.

Customer Name : Vuba Resin Products
Batch : TS06_0703
Material Name : Resin Bound Surfacing

Test Name : Cell 2 - 3 Point Bend
Test Date : 07/03/2024 10:09
Preload : Off
Sample Height : 40.000 mm

Test No	Time of Test	Specimen ID	Mass (g)	Test Engineer	Length (mm)	Depth (mm)	Width (mm)	Density (kg/m³)
1	07/03 10:09:24	TS06_0703_A	434	RE	160.85	41.15	40.81	1606.691
2	07/03 11:42:13	TS06_0703_B	449.00	MM	160.85	42.03	40.73	1630.615
3	07/03 11:45:00	TS06_0703_C	430.00	MM	160.85	41.31	39.73	1628.822
Min						41.15	39.73	1606.691
Mean						41.497	40.423	1622.043
Max						42.03	40.81	1630.615

Test No	Flexural Strength (N/mm²)	Force @ Peak (N)
1	2.556	1177.6
2	2.899	1390.5
3	2.674	1208.6
Min	2.556	1177.6
Mean	2.71	1258.9
Max	2.899	1390.5

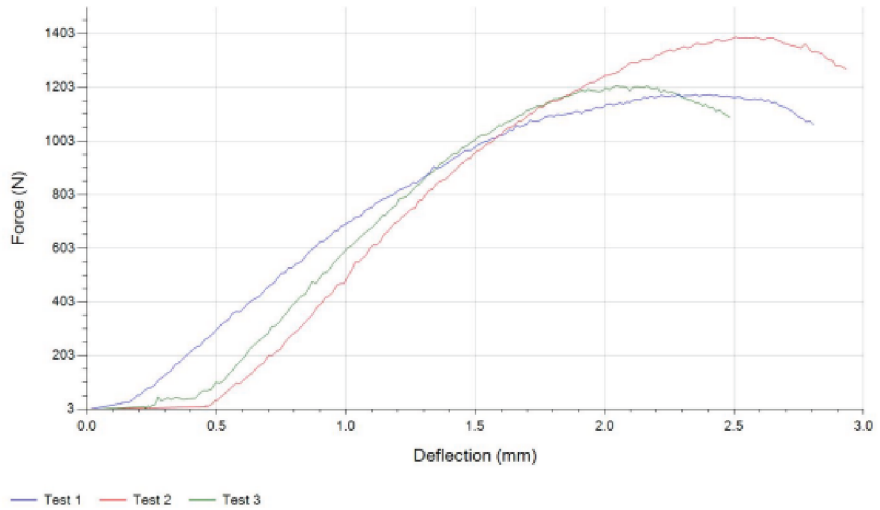


Figure 4: Test report for Batch 4

5 Appendix B: Individual Test Reports

The results from each bag of 3 specimens are presented on a single report.

Customer Name : Vuba Resin Products
Batch : TS09_0703
Material Name : Resin Bound Surfacing

Test Name : Cell 2 - 3 Point Bend
Test Date : 07/03/2024 14:37
Preload : Off
Sample Height : 40.000 mm

Test No	Time of Test	Specimen ID	Mass (g)	Test Engineer	Length (mm)	Depth (mm)	Width (mm)	Density (kg/m³)
1	07/03 14:37:23	TS09_0703_A	446	RE	160.98	41.87	40.59	1630.2
2	07/03 14:39:20	TS09_0703_B	398	RE	160.43	39.96	38.16	1626.91
3	07/03 14:41:54	TS09_0703_C	460	RE	162.24	41.7	40.8	1666.494
Min						39.96	38.16	1626.91
Mean						41.177	39.85	1641.201
Max						41.87	40.8	1666.494

Test No	Flexural Strength (N/mm²)	Force @ Peak (N)
1	6.803	3227.2
2	6.359	2583.2
3	6.915	3270.5
Min	6.359	2583.2
Mean	6.692	3026.967
Max	6.915	3270.5

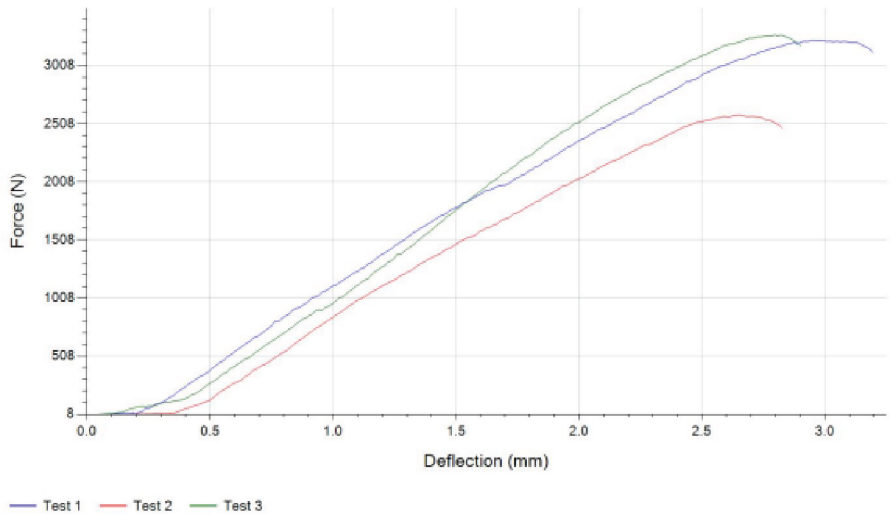


Figure 5: Test report for Batch 5

5 Appendix B: Individual Test Reports

The results from each bag of 3 specimens are presented on a single report.

Customer Name : Vuba Resin Products
Batch : TS10_0703
Material Name : Resin Bound Surfacing

Test Name : Cell 2 - 3 Point Bend
Test Date : 07/03/2024 14:45
Preload : Off
Sample Height : 40.000 mm

Test No	Time of Test	Specimen ID	Mass (g)	Test Engineer	Length (mm)	Depth (mm)	Width (mm)	Density (kg/m³)
1	07/03 14:46:00	TS10_0703_A	437	RE	161.05	40.74	40.6	1640.49
2	07/03 14:48:36	TS10_0703_B	434	RE	160.96	40.15	40.74	1648.41
3	07/03 14:50:53	TS10_0703_C	446	RE	160.5	41.88	41.06	1615.973
Min						40.15	40.6	1615.973
Mean						40.923	40.8	1634.958
Max						41.88	41.06	1648.41

Test No	Flexural Strength (N/mm²)	Force @ Peak (N)
1	1.807	811.8
2	1.752	767.0
3	1.616	775.8
Min	1.616	767.0
Mean	1.725	784.867
Max	1.807	811.8

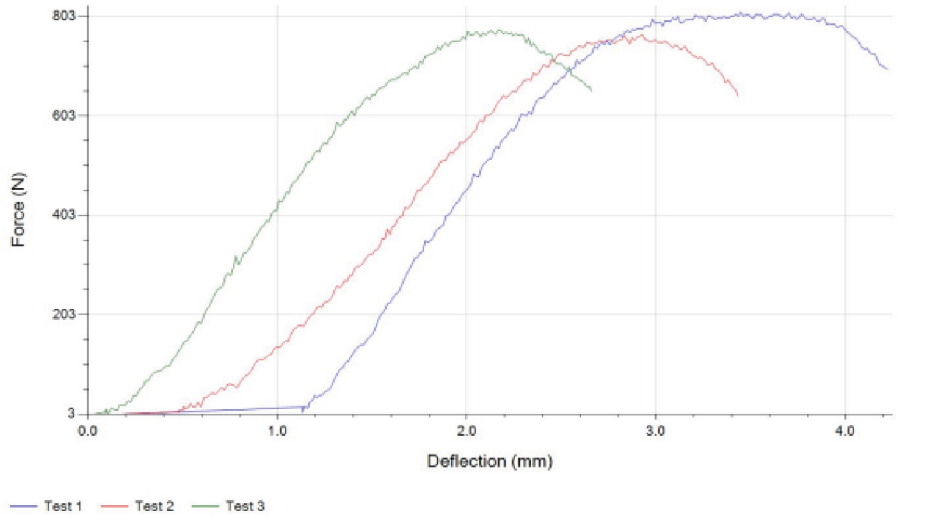


Figure 6: Test report for Batch 6

5 Appendix B: Individual Test Reports

The results from each bag of 3 specimens are presented on a single report.

Customer Name : Vuba Resin Products
Batch : TS11_0703
Material Name : Resin Bound Surfacing

Test Name : Cell 2 - 3 Point Bend
Test Date : 07/03/2024 14:55
Preload : Off
Sample Height : 40.000 mm

Test No	Time of Test	Specimen ID	Mass (g)	Test Engineer	Length (mm)	Depth (mm)	Width (mm)	Density (kg/m³)
1	07/03 14:56:10	TS11_0703_A	430	RE	160.86	39.56	41.41	1631.77
2	07/03 14:59:08	TS11_0703_B	446	RE	159.97	41.29	42.23	1598.933
3	07/03 15:01:16	TS11_0703_C	423	RE	160.52	39.65	41.3	1609.229
Min						39.56	41.3	1598.933
Mean						40.167	41.647	1613.311
Max						41.29	42.23	1631.77

Test No	Flexural Strength (N/mm²)	Force @ Peak (N)
1	6.78	2929.2
2	5.442	2612.0
3	5.769	2497.0
Min	5.442	2497.0
Mean	5.997	2679.4
Max	6.78	2929.2

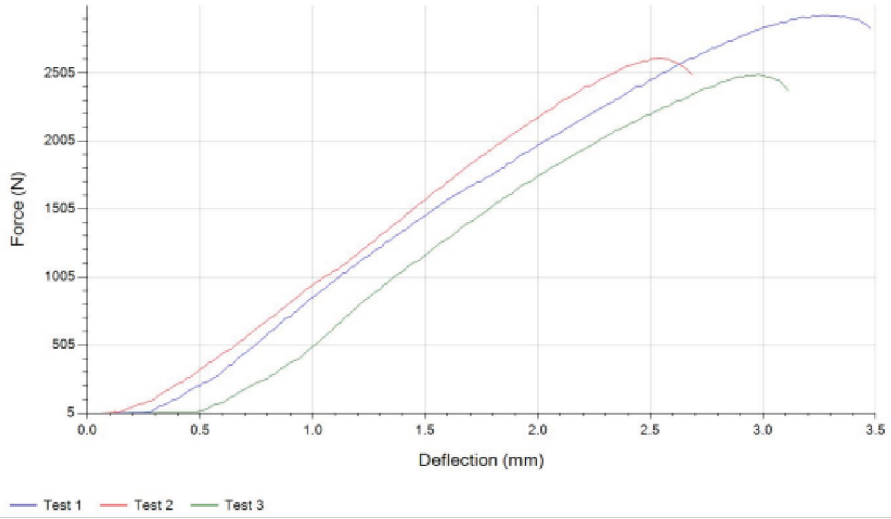


Figure 7: Test report for Batch 7

5 Appendix B: Individual Test Reports

The results from each bag of 3 specimens are presented on a single report.

Batch : TS12_0703
Material Name : Resin Bound Surfacing
Test Standard : Vuba 400mm/min

Test Name : Cell 2 - 3 Point Bend 400mm/min
Test Date : 07/03/2024 15:06
Preload : Off
Sample Height : 40.000 mm

Test No	Time of Test	Specimen ID	Mass (g)	Test Engineer	Length (mm)	Depth (mm)	Width (mm)	Density (kg/m³)
1	07/03 15:06:19	TS12_0703_A	442	RE	160.65	41.18	41.28	1618.51
2	07/03 15:09:27	TS12_0703_B	427	RE	161.18	39.98	41.09	1612.641
3	07/03 15:11:48	TS12_0703_C	434	RE	160.36	41.01	41.05	1607.647
Min						39.98	41.05	1607.647
Mean						40.723	41.14	1612.933
Max						41.18	41.28	1618.51

Test No	Flexural Strength (N/mm²)	Force @ Peak (N)
1	0.828	386.2
2	0.693	303.3
3	0.737	339.3
Min	0.693	303.3
Mean	0.752	342.933
Max	0.828	386.2

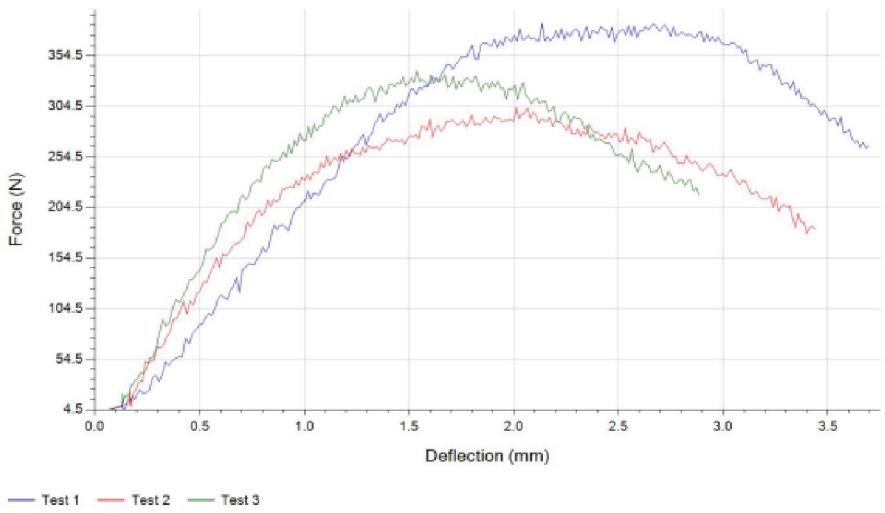


Figure 8: Test report for Batch 8

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