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Textiles Prüfwesen
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Testing Laboratory Textile Services & Innovations

Certified by the DAP Deutsches Akkreditierungssystem Prüfwesen GmbH (German Certifying System)

The certification is valid for the testing procedures indicated in the certificate - in the test report marked with *



Contact Person	Extension	Our Ref.	Date
Eugenie Bockelmann	271-719	bo-sk	16 June 2004

Expert Report

Investigation No.: 04.6.9.0002-I

Client: Textiles Prüfwesen, Mr. Michael Bösch,
Max-Fischer-Strasse 11, 86397 Bobingen

Test material received: 11 x 2 samples upholstery fabric

Parts of test material examined: 11 x 2 samples upholstery fabric

Date received: 25 February 2004

Aim of investigation: Testing resistance to abrasion using the Martindale Test

On selected upholstery materials resistance to abrasion of the textile fabric was tested using the Martindale Process. The upholstery materials were first tested in the new state, that is, with no soiling or pre-treatment, following DIN EN ISO 12947-2. In a second cycle (extended trial), tests were carried out on the same materials to compare resistance to abrasion in the new condition and that to be found after the fabrics had been cleaned by the client as per work procedure no.: WP/42-version 0.



The sample materials were evaluated at test intervals stipulated by the client: that is, according to the standard " Determination of abrasion resistance of textile fabrics using the Martindale Process DIN EN ISO 12947-2" and at an abrasion rate of 12 kPa. The following factors were assessed: fibrous quality of the surface, formation of pills, shining of fibre ends and the degree of damage in surface change. The abrasion testing was broken off when any surface change amounted to the material being destroyed or rendered useless.

The client described the upholstery materials used in the tests as follows:

Article	Category	Description	Colour	m ² -weight in grams
6	4	Trevira CS	Cream-yellow	342
15	2	Modacrylic velour	Light brown	410
16	3	Wool (non-flammable finish)	Plain yellow	448
19	1	Trevira CS	Dark blue-turquoise	525
20	1	Trevira CS	Dark blue-gold	491
22	4	Trevira CS + anti-soil finish	Ochre-light brown	341
23	5	Trevira CS + anti-soil finish	Beige – ochre	473
26	4	Trevira CS + anti-soil finish	Cream	233
29	2	Trevira CS velour	Red	479
32	3	Trevira CS	Grey-beige	412
33	5	Trevira CS	beige-apricot	377

Key:

Category 1 = double fabric

Category 2 = velour

Category 3 = coarse uneven surface

Category 4 = flat fabric

Category 5 = chenille effect

The tables, included in the following appendix (pages 1 to 11), display the results of the abrasion test on new material for each separate sample. The assessment of the result with regard to the abrasion test on the cleaned textiles compared with the new material is also included.



Summary of results - conclusion

Resistance to abrasion is dependent on the tenacity and fineness of the fibres involved, and on the yarn and fabric construction. Although made from the same fibres, the materials tested possessed varying degrees of fineness and different yarn and fabric constructions. They consequently displayed great variations in their resistance to abrasion.

The abrasion resistance testing indicated that cleaning undertaken as per work procedure No WP 42- version 0, (extended trial), had no detrimental effects in terms of resistance to abrasion on Trevira CS materials when compared with their original condition.

The expert report includes 3 pages and 1 appendix (11 pages).

Schloss Hohenstein, 16 June 2004

Director of the Department
Textile Services & Innovations

pp:

Wilhelm Weiss



Head of Department
Textile Analysis:

Textiling. Eugenie Bockelmann



Results of abrasion test on new sample 6:

Article	Category	Description	Colour	m ² -weight in grams											
6	4	Trevira CS	cream-yellow	342											
cycles	fibrous-ness		pill formation				shininess of fibre/filament ends			degree of damage in surface change					
	low	high	no pill	≤ 5 pill	6-10 pill	11-19 pill	≥ 20 pill	low	high	very high	none	hardly any	evid- ent	severe	very severe
900	X		X									X			
1300	X		X										X		
2000		X	X					X					X		
3000		X	X					X					X		
4000		X	X					X						X	
5000		X	X					X						X	
6000		X	X					X						X	
8000		X	X					X						X	
10000		X	X						X					X	
12000		X	X						X						X
14000		X	X						X						X
16000		X	X						X						X
18000		X	X						X						X
20000		X	X							X					X
25000		X	X							X					X
30000		X	X							X					X
35000		X	X							X					X
40000		X	X							X					X
50000		X	X							X					X

Evaluation:

Destruction of one sample at 50000 cycles, of three others at 55000 cycles. After treatment according to the recommended cleaning and work procedure no. WP-42 – version 0 (extended trial), the material sample was subjected to a repeat of the test for resistance to abrasion. At 50000 cycles the samples displayed the same surface appearance and local destruction of yarn as the untreated material.



Results of abrasion test on new sample 15:

Article	Category	Description	Colour	m ² -weight in grams											
15	2	Modacrylic velour	Light brown	410											
cycles	fibrous-ness		pill formation				shininess of fibre/filament ends			degree of damage in surface change					
	low	high	no pill	≤ 5 pill	6-10 pill	11-19 pill	≥ 20 pill	low	high	very high	none	hardly any	evident	severe	very severe
900	X		X									X			
1300	X		X									X			
2000	X		X									X			
3000	X		X					X				X			
4000	X		X					X				X			
5000	X		X					X					X		
6000		X	X					X					X		
8000		X	X					X					X		
10000	X		X					X						X	
12000	X		X					X						X	
14000	X		X					X						X	
16000	X		X					X						X	
18000	X		X						X					X	
20000	X		X						X					X	
25000	X		X						X						X
30000	X		X						X						X
35000	X		X						X						X

Evaluation:

At 30000 cycles the pile was almost totally abraded. At 35000 cycles the warp and weft threads in the base material showed signs of destruction. After treatment according to the recommended cleaning and work procedure no. WP-42 –version 0 (extended trial), the material sample was subjected to a repeat of the test for resistance to abrasion. At 35000 cycles the samples displayed the same surface appearance and local destruction of yarn as the untreated material.



Results of abrasion test on new sample 16:

Article	Category	Description	Colour	m ² -weight in grams
16	3	wool (inflammable finish)	Plain yellow	448

cycles	fibrous-ness		pill formation				shininess of fibre/filament ends			degree of damage in surface change					
	low	high	no pill	≤ 5 pill	6-10 pill	11-19 pill	≥ 20 pill	low	high	very high	none	hardly any	evident	severe	very severe
900	X				X								X		
1300		X			X								X		
2000		X		X									X		
3000	X		X									X			
4000		X	X									X			
5000		X	X									X			
6000		X	X									X			
8000		X	X									X			
10000		X	X									X			
12000		X	X									X			
14000	X		X										X		
16000		X	X										X		
18000		X	X					X					X		
20000		X	X					X						X	
25000	X			X				X						X	
30000	X			X				X						X	
35000	X		X					X						X	
40000	X		X					X						X	

Evaluation:

While the samples did not show any crucial damage in surface appearance, examination under the stereomicroscope revealed that individual threads had worn through at 35000 cycles. The test was stopped at 40000 cycles. After treatment according to the recommended cleaning and work procedure no. WP-42 –version 0 (extended trial), the material sample was subjected to a repeat of the test for resistance to abrasion. At 35000 cycles the samples displayed the same surface appearance and local destruction of yarn as the untreated material.



Results of abrasion test on new sample 19:

Article	Category	Description	Colour	m ² -weight in grams
19	1	Trevira CS	Dark blue-turquoise	525

cycles	fibrousness		pill formation					shininess of fibre/filament ends			degree of damage in surface change				
	low	high	no pill	≤ 5 pill	6-10 pill	11-19 pill	≥ 20 pill	low	high	very high	none	hardly any	evident	severe	very severe
900	X		X									X			
1300	X		X									X			
2000		X	X										X		
3000		X		X				X					X		
4000		X		X				X					X		
5000		X		X				X						X	
6000		X		X				X						X	
8000		X		X					X					X	
10000		X	X						X					X	
12000		X	X						X						X

Evaluation:

The abrasion test produced great changes in the surface of the sample material, with very substantial fibrousness and severe damage to the surface appearance. Some threads were destroyed at 12000 cycles. After treatment according to the recommended cleaning and work procedure no. WP-42 –version 0 (extended trial), the material sample was subjected to a repeat of the test for resistance to abrasion. At 12000 cycles the samples displayed the same surface appearance and local destruction of yarn as the untreated material.



Results of abrasion test on new sample 20:

Article	Category	Description	Colour	m ² -weight in grams											
20	1	Trevira CS	Dark blue/gold	491											
cycles	fibrous-ness		pill formation				shininess of fibre/filament ends			degree of damage in surface change					
	low	high	no pill	≤ 5 pill	6-10 pill	11-19 pill	≥ 20 pill	low	high	very high	none	hardly any	evident	severe	very severe
900	X		X									X			
1300	X		X									X			
2000	X			X				X				X			
3000	X			X				X					X		
4000		X			X				X				X		
5000		X		X					X				X		
6000		X		X					X				X		
8000		X	X						X				X		
10000		X	X						X				X		
12000		X	X						X					X	
14000		X	X						X					X	
16000		X	X						X					X	
18000		X		X					X					X	
20000		X		X						X					X
25000		X			X					X					X
30000		X			X					X					X
35000		X				X				X					X
40000		X				X				X					X

Evaluation:

Due to its technical construction there are floating fibres on the surface of this sample. The surface therefore tends towards high fibrousness and to change. The test revealed a high degree of shininess. The test was stopped at 40000 cycles, because single threads were destroyed. After treatment according to the recommended cleaning and work procedure no. WP-42 –version 0 (extended trial), the material sample was subjected to a repeat of the test for resistance to abrasion. At 40000 cycles the samples displayed the same surface appearance and local destruction of yarn as the untreated material.



Results of abrasion test on new sample 22:

Article	Category	Description	Colour	m ² -weight in grams
22	4	Trevira CS + anti-soil finish	ochre-light brown	341

cycles	fibrousness		pill formation				shininess of fibre/filament ends			degree of damage in surface change					
	low	high	no pill	≤ 5 pill	6-10 pill	11-19 pill	≥ 20 pill	low	high	very high	none	hardly any	evident	severe	very severe
900		X				X							X		
1300		X				X							X		
2000		X			X			X					X		
3000		X			X			X						X	
4000		X		X				X						X	
5000		X	X					X						X	
6000		X	X						X					X	
8000		X	X						X					X	
10000		X	X						X					X	
12000		X	X						X					X	
14000		X	X						X					X	
16000		X	X						X					X	
18000		X	X						X						X
20000		X	X						X						X

Evaluation:

There was considerable pilling at the lower cycles. At higher cycles the pills were rubbed off. The result was high fibrousness in the surface that produced severe damage in the surface structure. Testing for abrasion resistance was broken off at 20000 cycles as many threads were destroyed. After treatment according to the recommended cleaning and work procedure no. WP-42 –version 0 (extended trial), the material sample was subjected to a repeat of the test for resistance to abrasion. At 20000 cycles the samples displayed the same surface appearance and local destruction of yarn as the untreated material.



Results of abrasion test on new sample 23:

Article	Category	Description	Colour	m ² -weight in grams											
23	5	Trevira CS + Anti-soil finish	beige-ochre	473											
cycles	fibrous- ness		pill formation				shininess of fibre/filament ends			degree of damage in surface change					
	low	high	no pill	≤ 5 pill	6-10 pill	11-19 pill	≥ 20 pill	low	high	very high	none	hardly any	evident	severe	very severe
900			X								X				
1300			X								X				
2000			X									X			
3000			X									X			
4000			X									X			
5000	X		X										X		
6000	X		X					X					X		
8000	X		X						X				X		
10000	X		X						X				X		
12000	X		X						X				X		
14000	X		X						X					X	
16000	X		X						X					X	
18000	X		X						X					X	
20000															

Evaluation:

Examined under the stereomicroscope the surface structure revealed from about 8000 cycles onwards a greater degree of shininess and clear changes. It was also evident that the surface fibres were in part loosened, producing a very threadbare appearance. The darker parts of the pile displayed less resistance here than the light parts. At 18000 cycles more severe abrasion and loosening of the fibres could be detected, especially in the case of the darker ones. After treatment according to the recommended cleaning and work procedure no. WP-42 –version 0 (extended trial), the material sample was subjected to a repeat of the test for resistance to abrasion. At 18000 cycles the samples displayed the same surface appearance and local destruction of yarn as the untreated material.



Results of abrasion test on new sample 26:

Article	Category	Description	Colour	m ² -weight in grams											
26	4	Trevira CS + Anti-soil finish	cream	233											
cycles	fibrous- ness		pill formation				shininess of fibre/filament ends			degree of damage in surface change					
	low	high	no pill	≤ 5 pill	6-10 pill	11-19 pill	≥ 20 pill	low	high	very high	none	hardly any	evident	severe	very severe
900	X		X								X				
1300	X		X								X				
2000	X		X									X			
3000		X	X										X		
4000		X	X										X		
5000		X	X					X					X		
6000		X	X					X						X	
8000		X	X					X						X	
10000		X	X					X						X	
12000		X	X					X						X	
14000		X	X					X					X		
16000		X	X					X					X		
18000		X	X						X				X		
20000		X	X						X					X	
25000		X	X						X						X
30000		X	X						X						X
35000		X	X						X						X

Evaluation:

The various samples displayed very different reactions in the abrasion testing. 20000 cycles was enough to destroy the threads in the case of one material. Others revealed the same reaction at 30000 or 35000 cycles. After treatment according to the recommended cleaning and work procedure no. WP-42 –version 0 (extended trial), the material sample was subjected to a repeat of the test for resistance to abrasion. At 30000 to 35000 cycles the samples displayed the same surface appearance and local destruction of yarn as the untreated material.



Results of abrasion test on new sample 29:

Article	Category	Description	Colour	m ² -weight in grams											
29	2	Trevira CS velour	red	479											
cycles	fibrousness		pill formation				shininess of fibre/filament ends			degree of damage in surface change					
	low	high	no pill	≤ 5 pill	6-10 pill	11-19 pill	≥ 20 pill	low	high	very high	none	hardly any	evident	severe	very severe
900	X		X								X				
1300	X		X									X			
2000	X		X									X			
3000	X				X			X					X		
4000	X			X				X					X		
5000	X			X				X					X		
6000	X			X				X					X		
8000	X			X				X					X		
10000	X			X				X					X		
12000	X			X				X					X		
14000	X			X				X					X		
16000	X			X				X					X		
18000	X				X			X						X	
20000	X				X			X						X	
25000	X			X					X					X	
30000	X			X					X					X	
35000	X			X					X					X	
40000	X		X						X					X	
50000	X		X						X					X	
60000	X		X						X					X	
70000	X		X						X						X
80000	X		X						X						X
90000	X		X						X						X

Evaluation:

There was uniform abrasion of the pile from the velour fabric surface, causing damage and shininess on the fibre ends. The surface appearance altered substantially altered due to the shortening of the fibres. At 50000 cycles therefore the material had not worn through. Testing continued until 90000 cycles was reached when it was



broken off, since the pile was practically worn down to the base material. After treatment according to the recommended cleaning and work procedure no. WP-42 –version 0 (extended trial), the material sample was subjected to a repeat of the test for resistance to abrasion. At 90000 cycles the samples displayed the same surface appearance and local destruction of yarn as the untreated material.

Results of abrasion test on new sample 32:

Article	Category	Description	Colour	m ² -weight in grams											
32	3	Trevira CS	grey-beige	412											
cycles	fibrous-ness		pill formation				shininess of fibre/filament ends			degree of damage in surface change					
	low	high	no pill	≤ 5 pill	6-10 pill	11-19 pill	≥ 20 pill	low	high	very high	none	hardly any	evident	severe	very severe
900	X		X								X				
1300	X		X								X				
2000		X	X					X				X			
3000		X	X					X					X		
4000		X	X					X					X		
5000		X	X					X					X		
6000		X	X					X					X		
8000		X	X						X					X	
10000		X		X					X					X	
12000		X		X						X				X	
14000		X		X						X				X	
16000		X	X							X					X
18000		X	X							X					X
20000		X	X							X					X
25000	X		X							X					X

Evaluation:

Surface loops are abraded flat at higher cycles, causing severe damage to the surface appearance. A high degree of shininess resulted in a change of colour, making the material appear paler and greyer after the abrasion. Testing was broken off at 25000 cycles, as at this point the loops were almost completely flattened. After treatment according to the recommended cleaning and work procedure no. WP-42 –version 0 (extended trial), the material sample was subjected to a repeat of the test for resistance to abrasion. At 25000 cycles the samples displayed the same surface appearance and local destruction of yarn as the untreated material.



Results of abrasion test on new sample 33:

Article	Category	Description	Colour	m ² -weight in grams
33	5	Trevira CS	beige-aprikot	377

cycles	fibrous-ness		pill formation				shininess of fibre/filament ends			degree of damage in surface change					
	low	high	no pill	≤ 5 pill	6-10 pill	11-19 pill	≥ 20 pill	low	high	very high	none	hardly any	evident	severe	very severe
900			X								X				
1300			X								X				
2000			X										X		
3000			X					X					X		
4000			X					X					X		
5000			X					X					X		
6000	X		X						X					X	
8000	X		X						X					X	
10000	X		X							X				X	
12000	X		X							X				X	

Evaluation:

At relatively low cycles the pile fibres of the chenille became shiny when the ends were abraded. At 12000 cycles they were almost totally worn away, so that it was hardly possible to recognize the original appearance of the material. After treatment according to the recommended cleaning and work procedure no. WP-42 –version 0 (extended trial), the material sample was subjected to a repeat of the test for resistance to abrasion. At 12000 cycles the samples displayed the same surface appearance and local destruction of yarn as the untreated material.