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Confidential Report

Our Ref: 29/00652G/05/14

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Our Ref: 29/00652G/05/14
Your Ref:

Client: Gudbrandsdalens Uldvarefabrik as

Address: N-2626 Lillehammer
Norway

Job Title: Various Tests on One Sample

Client's Order Ref:

Date of Receipt: 20 May 2014

Description of Sample(s): One sample of woven fabric in three colours, referenced by the Client:-

9203 – Koksdal

Work Requested: Abrasion resistance Martindale – ISO 12947-2
Modified Martindale pilling – EN ISO 12945-2
Seam slippage – EN ISO 13936-2
Dimensional stability to dry cleaning – EN ISO 3175-2
Fire tests – IMO A652 (16) and EN 1021-1 & 2
Colour fastness to rubbing, perchloroethylene – EN ISO 105-D02
Colour fastness to rubbing, foam detergent – EN ISO 105-X12
Colour fastness to dry cleaning – EN ISO 105-D01
Colour fastness to water spotting – ISO 105-E16
Colour fastness to perspiration – EN ISO 105-E04

Note: as instructed by the Client, the physical tests were carried out on one colour from the sample and the colour fastness tests were carried out on all three colours from the sample.

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Testing atmosphere: Unless otherwise specified the sample(s) has been conditioned and tested, where appropriate, in the standard atmosphere for conditioning and testing textiles (BS EN ISO 139:2005 + A1:2011) of 65±4% r.h. and 20±2°C.

Determination of the Abrasion Resistance of Fabrics by the Martindale Method – Determination of Specimen Breakdown

Date of test start: 04.06.14 Four specimens from the sample were tested, under a nominal pressure of 12 kPa(795±7g) in accordance with BS EN ISO 12947-2:1998, using a Martindale abrasion tester as described in BS EN ISO 12947-1:1998.

The reference abradant was mounted over woven backing felt and specimen breakdown (end point) was reached when two separate threads had completely broken. The change of shade of the test specimens was assessed at 5,000 and 15,000 rubs in accordance with ISO 105-A02. The tested specimens are enclosed.

| | <u>No. of rubs to end point</u> |
|-------|---------------------------------|
| | 53,000 |
| | 50,000 |
| | 58,000 |
| | <u>58,000</u> |
| mean: | 55,000 |

Assessment: maximum colour change at 5,000 rubs: grey scale 4-5
maximum colour change at 15,000 rubs: grey scale 3-4

Determination of Fabric Propensity to Surface Fuzzing and Pilling–Modified Martindale Method (#)

Specimens from the sample were tested on a modified Martindale Abrasion Machine, using wool abradant fabric and a loading weight of 415 ± 2g. The specimens were tested for 500, 1,000, 2,000, 5,000 rubs, as stated in Annex A, Table A.1, following the Category 1 procedure for upholstery fabrics described in BS EN ISO 12945-2:2000, with additional assessments at 7,000 and 10,000 rubs, as requested by the Client. A tested specimen is enclosed. The specimens were visually assessed at the required intervals and rated according to Table 1 of the Standard, summarised as follows:-

| | | |
|---|---|--|
| 5 | - | no change |
| 4 | - | slight surface fuzzing and/or partially formed pills |
| 3 | - | moderate surface fuzzing and/or moderate pilling |
| 2 | - | distinct surface fuzzing and/or distinct pilling |
| 1 | - | dense surface fuzzing and/or severe pilling |

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| <u>Number of rubs</u> | <u>Pilling grade</u> | <u>Description</u> |
|-----------------------|----------------------|--------------------|
| 500 | 3-4 | pilling/fuzzing |
| 1,000 | 3 | pilling/fuzzing |
| 2,000 | 3 | pilling/fuzzing |
| 5,000 | 3-4 | pilling/fuzzing |
| 7,000 | 3-4 | pilling/fuzzing |
| 10,000 | 4 | pilling/fuzzing |

Determination of the Slippage Resistance of Yarns at a Seam in Woven Fabric–Fixed Load

Method

Date of test: 13.06.14. Five specimens from each direction of the sample were tested in accordance with BS EN ISO 13936-2: 2004 (2007), sampling was carried out following Annex A of the Standard. The seam opening was measured under a reduced load of 5N after applying a maximum force of 180N to the specimens.

| <u>Direction</u> | <u>Mean seam opening (mm)</u> |
|---------------------------|-------------------------------|
| warp seam (warp slippage) | 4.6 |
| weft seam (weft slippage) | 4.0 |

Dimensional Stability to Dry Cleaning (#)

The sample was tested in accordance with BS EN ISO 3175-2: 2010. The results are given after one dry clean and finishing treatment, the sign – denotes shrinkage.

| <u>Dimensional change (%)</u> | |
|-------------------------------|-------------|
| <u>warp</u> | <u>weft</u> |
| -1.7 | -1.3 |

Observations after testing: no apparent change in visual appearance.

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**FIRE TESTS ACCORDING TO IMO RESOLUTION A652 (16) ANNEX
Recommendation on Fire Test Procedures for Upholstered Furniture
Methods of test for the ignitability by smokers' materials of upholstered composites for seating
(Adopted on 6 November 1991)**

Date of Test - 25/06/14

Conditioning

Immediately prior to testing the sample was placed in indoor ambient conditions for 72 hours and then conditioned in a standard atmosphere of $20 \pm 5^\circ\text{C}$ temperature and $50 \pm 20\%$ relative humidity for at least 16 hours.

The sample was tested in a room of volume 25m^3 and 22°C .

Procedure

The sample was tested in accordance with the above resolution using ignition sources 0 and 1. The sponsor sampled the material and the specimens were cut from the sample received to the dimensions set out in the standard.

The specimens were mounted over fillings of standard non-FR polyurethane foam of density about $22\text{Kg}/\text{m}^3$.

Requirements

| | |
|--------------------------|---|
| <u>Ignition Source 0</u> | No progressive smouldering or flaming within one hour of the placement of the cigarette. |
| <u>Ignition Source 1</u> | All progressive smouldering and flaming to cease within 120sec of removal of the burner tube. |

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Results

| | Source 0 | | Source 1 | |
|--------------------------------|----------|------|----------|------|
| | -- | -- | 8 | 9 |
| Time of ignition(s) | -- | -- | 8 | 9 |
| Time of extinction (Flame) (s) | -- | -- | 21 | 21 |
| Time of extinction (Smoke) (s) | 1680 | 1821 | 25 | 28 |
| Time of cover split(s) | DNS | DNS | DNS | DNS |
| Melting (Yes or No) | Yes | Yes | Yes | Yes |
| Dripping (Yes or No) | No | No | No | No |
| Charring (Yes or No) | Yes | Yes | Yes | Yes |
| Other phenomena | | | | |
| Pass/Fail | Pass | Pass | Pass | Pass |

DNS Material did not split

Note

The test results relate only to the ignitability of the combination of materials under the particular conditions of test; they are not intended as a means of assessing the full potential fire hazard of the materials in use.

The specimens were tested in the as received condition.

Comment

The above test results indicate that the sample meets the performance requirements as stated in the International Code for Application of Fire Test Procedures (FTP Code)(Resolution MSC.61(67)) Annex 1 Part 8 Test for Upholstered furniture.

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Client: Gudbrandsdalens Uldvarefabrik as

FIRE TESTS ACCORDING TO BS EN 1021-1 2006

Assessment of the ignitability of upholstered furniture. Part I. Ignition Source: Smouldering cigarette

Date of Test: 25/06/14

Conditioning

The sample was water-soaked in accordance with this standard and Immediately prior to testing the sample was conditioned for at least 16 hours at a temperature of $23\pm 2^{\circ}\text{C}$ and relative humidity of $50\pm 5\%$.

The sample was tested in a room of volume 25m^3 and 23°C .

Procedure

The test was carried out in accordance with BS EN 1021-1. The sponsor sampled the material and the specimens were cut from the sample received to the dimensions set out in the standard.

The specimens were mounted over fillings of standard non-FR polyurethane foam of density about $22\text{Kg}/\text{m}^3$.

Tests were made using ignition source 0 in accordance with paragraph 9 of the above standard.

Requirements

The specimens shall not:-

- a) display escalating combustion requiring active extinction.
- b) smoulder or burn until it is essentially consumed within the test duration.
- c) smoulder or burn to the extremities of the specimen, or through the full thickness, within the duration of the test.
- d) smoulder for more than one hour.
- e) show evidence of charring, other than discolouration, for more than 100mm in any direction apart from the nearest part of the original position of the source.

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Results

| | Cigarette | | Comments |
|--|-----------|-----|----------|
| | 1 | 2 | |
| Smouldering Criteria (Yes/No) | | | |
| Unsafe escalating combustion | No | No | |
| Test assembly consumed | No | No | |
| Smoulders to extremities | No | No | |
| Smoulders through thickness | No | No | |
| Smoulders more than 1 hour | No | No | |
| More than 100mm from source | No | No | |
| Ignitability Performance (Yes/No) | | | |
| Unsafe escalating combustion | N/A | N/A | |
| Test assembly consumed | N/A | N/A | |
| Flames to extremities | N/A | N/A | |
| Flames through thickness | N/A | N/A | |
| Ignition / Non Ignition (I/NI) | NI | NI | |

The test results relate only to the ignitability of the combination of materials under the particular conditions of test; they are not intended as a means of assessing the full potential fire hazard of the materials in use.

Comments

A NI designation indicates that the sample met the performance requirements.

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FIRE TESTS ACCORDING TO BS EN 1021-2 2006

Assessment of the ignitability of upholstered furniture. Part 2. Ignition Source: Match flame equivalent.

Date of Test: 25/06/14

Conditioning

The sample was water-soaked in accordance with this standard and Immediately prior to testing the sample was conditioned for at least 16 hours at a temperature of $23\pm 2^{\circ}\text{C}$ and relative humidity of $50\pm 5\%$.

The sample was tested in a room of volume 25m^3 and 23°C .

Procedure

The test was carried out in accordance with BS EN 1021-2. The sponsor sampled the material and the specimens were cut from the sample received to the dimensions set out in the standard.

The specimens were mounted over fillings of standard non-FR polyurethane foam of density about $22\text{Kg}/\text{m}^3$.

Tests were made using ignition source 1 in accordance with paragraph 9 of the above standard.

Requirements

The specimens shall not:-

- a) display escalating combustion requiring active extinction.
- b) smoulder or burn until it is essentially consumed within the test duration.
- c) smoulder or burn to the extremities of the specimen, or through the full thickness, within the duration of the test.
- d) smoulder for more than one hour.
- e) show evidence of charring, other than discolouration, for more than 100mm in any direction apart from the nearest part of the original position of the source.
- f) burn for more than 120s after removal of the burner tube.

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Results

| | Match Flame Equivalent | | Comments |
|--|------------------------|-----|----------|
| | 1 | 2 | |
| Smouldering Criteria (Yes/No) | | | |
| Unsafe escalating combustion | N/A | N/A | |
| Test assembly consumed | N/A | N/A | |
| Smoulders to extremities | N/A | N/A | |
| Smoulders through thickness | N/A | N/A | |
| Smoulders more than 1 hour | N/A | N/A | |
| More than 100mm from source | N/A | N/A | |
| Ignitability Performance (Yes/No) | | | |
| Unsafe escalating combustion | No | No | |
| Test assembly consumed | No | No | |
| Flames to extremities | No | No | |
| Flames through thickness | No | No | |
| Flames longer than 120 seconds | No | No | |
| Ignition / Non Ignition (I/NI) | NI | NI | |

The test results relate only to the ignitability of the combination of materials under the particular conditions of test; they are not intended as a means of assessing the full potential fire hazard of the materials in use.

Comments

A NI designation indicates that the sample met the performance requirements.

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Colour Fastness to Rubbing with Organic Solvents

Each colour from the sample was tested in accordance with BS EN ISO 105-D02:1996 using perchloroethylene as the solvent. The change of colour of the specimens and the staining of the cotton rubbing fabric were assessed using standard grey scales; 5 represents no change of colour or staining and 1 a severe change of colour or staining.

| <u>Colour no.</u> | <u>Direction</u> | <u>Change of colour</u> | <u>Staining of rubbing fabric</u> |
|-------------------|------------------|-------------------------|-----------------------------------|
| 450 | warp | 5 | 4 |
| | weft | 5 | 4-5 |
| 780 | warp | 5 | 4-5 |
| | weft | 5 | 4 |
| 190 | warp | 5 | 3-4 |
| | weft | 5 | 3 |

Colour Fastness to Rubbing with Detergent (*)

Each colour from the sample was tested following the procedure described in BS EN ISO 105 – X12:2002 using the following test conditions:-

- a Crockmeter as specified in section 4.1.2.
- a cylindrical rubbing finger exerting a downward force of 9N
- wet rubbing using detergent (wet rubbing take-up of 100%)
- conditioning time of the specimens and rubbing cloth minimum 4 hours
- atmospheric conditions during testing 65±4%rh and 20±2°C
- specimens were tested in the warp and weft directions

the change of colour of the specimens and the staining of the cotton rubbing fabric were assessed using standard grey scales; 5 represents no change of colour or staining and 1 a severe change of colour or staining.

| <u>Colour no.</u> | <u>Direction</u> | <u>Change of colour</u> | <u>Staining of rubbing fabric</u> |
|-------------------|------------------|-------------------------|-----------------------------------|
| 450 | warp | 5 | 4 |
| | weft | 5 | 4 |
| 780 | warp | 4-5 (darker) | 3-4 |
| | weft | 4-5 (darker) | 4 |
| 190 | warp | 4-5 (darker) | 2 |
| | weft | 4-5 (darker) | 2 |

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Colour Fastness to Dry Cleaning Using Perchloroethylene Solvent

Each colour from the sample was tested in accordance with BS EN ISO 105 – D01:2010.

The change of colour of the specimen(s) and the staining of the adjacent fabric, multifibre DW, was assessed using standard grey scales; 5 represents no change of colour or staining and 1 represents a severe change of colour or staining.

| Colour no. | Change of colour | Staining of adjacent fabric | | | | | |
|------------|------------------|-----------------------------|--------|-------|-----------|---------|------|
| | | acetate | cotton | nylon | polyester | acrylic | wool |
| 450 | 4-5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 780 | 4-5 | 4-5 | 4-5 | 4-5 | 4-5 | 4-5 | 4-5 |
| 190 | 4-5 | 4-5 | 4-5 | 4-5 | 4-5 | 4-5 | 4-5 |

Colour Fastness to Water Spotting on Upholstery Fabrics (#)

Each colour from the sample was tested in accordance with BS EN ISO 105-E16:2007.

| Colour no. | Inner circle | Outer periphery | Water absorbed after:- |
|------------|--------------|-----------------|------------------------|
| 450 | grade 4-5 | grade 4-5 | 30 minutes |
| 780 | grade 4-5 | grade 4-5 | 30 minutes |
| 190 | grade 4-5 | grade 4-5 | 30 minutes |

Colour Fastness to Perspiration

Each colour from the sample was tested in accordance with BS EN ISO 105-E04:2013 (ISO 105-E04:2013); the test device was positioned in the oven so that the test specimens were in an horizontal position. The change of colour of the specimens and the staining of the adjacent fabric, Multifibre DW, was assessed using standard grey scales; 5 represents no change of colour or staining and 1 a severe change of colour or staining.

| Colour no. | pH | Change of colour | Staining of adjacent fabric | | | | | |
|------------|----------------|------------------|-----------------------------|--------|-------|-----------|---------|------|
| | | | acetate | cotton | nylon | polyester | acrylic | wool |
| 450 | 5.5 (acid) | 4-5 (darker) | 4-5 | 4-5 | 4 | 4-5 | 4-5 | 4-5 |
| | 8.0 (alkaline) | 4-5 (darker) | 4 | 4 | 3-4 | 4 | 4 | 4 |
| 780 | 5.5 (acid) | 4 (darker) | 4-5 | 4-5 | 4 | 4-5 | 4-5 | 4-5 |
| | 8.0 (alkaline) | 4 (darker) | 4 | 4 | 3 | 4 | 4 | 4 |
| 190 | 5.5 (acid) | 4-5 (darker) | 4 | 3-4 | 4 | 3-4 | 4 | 4 |
| | 8.0 (alkaline) | 4-5 (darker) | 4 | 3 | 4 | 3 | 3 | 4 |

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Client: Gudbrandsdalens Uldvarefabrik as

Reported by:  L I Butler (Mrs)
Senior Technician - Textiles

Countersigned by:  J M Bullers (Mrs)
Operational Head – Textiles

(*) test not covered by our UKAS accreditation
(#) test sub-contracted

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