How to specify contract upholstery fabrics

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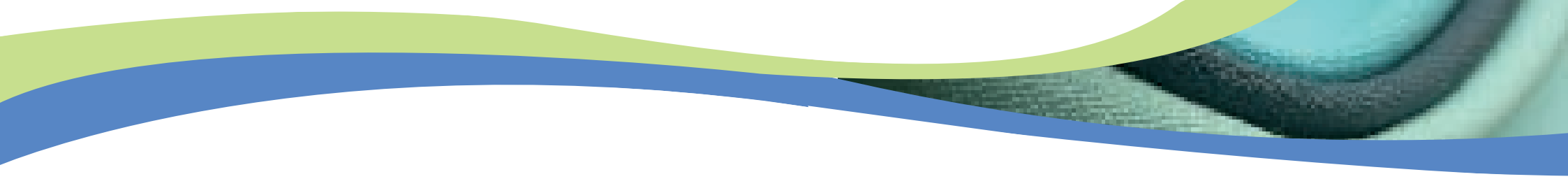

This booklet, designed to complement the RIBA accredited CPD seminar, contains a synopsis of key information to help in the specification process of contract fabrics for seating and vertical surface applications.

Fundamental questions to consider when specifying fabrics are as follows:

1. What is the fabric to be used for?
2. What is the fabric made of?
3. What flammability level is required?
4. What abrasion level is required?
5. What are the environmental considerations?
6. What are the implications for fabric care and maintenance?

1. What is the fabric to be used for?

At the most basic level it's crucial to know whether the fabric will be used to cover a seat or a panel, as there are fundamental differences in terms of fabric width and technical characteristics, specifically abrasion and flammability.

- A seating fabric will typically be 140cm wide (or in some cases may be 130cm or 150cm) and should have a severe contract abrasion rating so that it doesn't wear out with usage. There are also specific flammability requirements, typically ranging from cigarette and match levels to Crib 5 Medium Hazard.

- A panel fabric will be wider, usually around 170cm to fit the width of typical office screens. They are usually lighter in weight than upholstery fabrics as they don't need to perform in terms of abrasion resistance. There are also different flammability requirements which look at rate and spread of flame under BS 476.

	Seating	Panel
Width	140cm	170cm
Abrasion	Severe contract (minimum 40,000 cycles)	Not applicable
Flammability	Cigarette Match Crib 5 (Medium Hazard)	BS 476 Spread of flame

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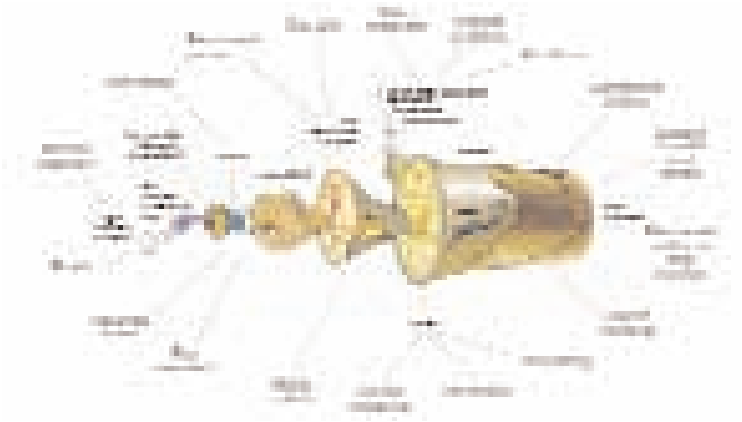
2. What is the fabric made of?

Once you've decided whether you need a seating or a panel fabric, it's wise to think about the actual fabric composition, which will affect technical performance, appearance and wear.

Fibre types fall into two broad groups: natural and man-made.

2.1 Natural fibres – wool

Wool is an extremely complex fibre that has evolved from nature over millions of years. It is widely used in the contract furnishing industry thanks to its excellent performance properties that are genetically built into each fibre which no man-made creation has ever been able to duplicate.



The complexity of the actual fibre structure of wool is seen in the schematic diagram. From the innermost helix the fibre develops into a three-dimensional corkscrew pattern which imparts natural crimp, elasticity, resilience and stretch, allowing wool to be bent and twisted over 30,000 times without danger of breaking or being damaged. The outermost layer consists of a series of overlapping scales called cuticles, which act like tiny roof tiles causing liquid water to bead up and roll off, but which readily admit water vapour (from the air or perspiration), making wool a "breathable" fibre because it can absorb and evaporate moisture.

Advantages of wool

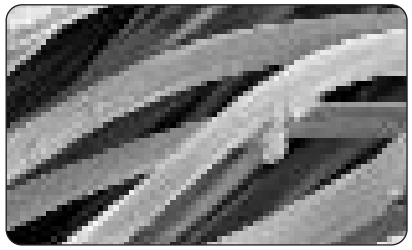
- 100% natural, renewable and compostable
- Naturally long lasting appearance – inherently soil hiding
- Naturally flame retardant
- Natural crimp and stretch
- Feelgood fibre – temperature and moisture regulator
- Saturated colour – dyes beautifully

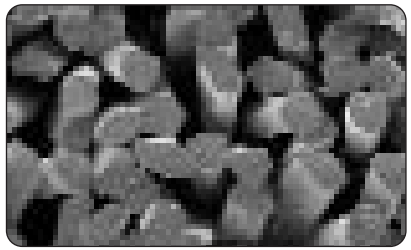
Disadvantages of wool

- Certain woollen yarns can have a prickly handle
- Mid – high price

2.2 Man-made fibres – petroleum based

The main synthetic fibre types used in contract furnishing are polyester and polypropylene, plus polyamide (nylon) which tends to be blended with other fibre types such as wool for extra abrasion resistance.





Polyester: the main visual difference from wool is the uniform nature of the fibre in terms of smoothness, shape and dimensions. Polypropylene would look very similar.

Petroleum based synthetic fibres are made by a polymerisation process which is the joining together of a chain of repeating small molecules called monomers. The same process is used to create plastics for wide-ranging uses from packaging and drinks bottles to telephones and PCs.

Advantages

- Synthetic fibres do not absorb liquids and moisture, so will therefore resist staining. Any staining will actually remain on the fibre surface rather than penetrating deeper within.
- Synthetic fibres are relatively easy to care for in that they can simply be wiped down with a damp cloth.
- Synthetic fibres are produced by an extrusion process, creating smooth "non-prickly" fibres with an even diameter
- The price points for synthetics are currently lower than for wool, although pricing is subject to oil price fluctuations.

Advantages of synthetics

- Non-absorbent – resists staining
- Easy care – wipe clean, some bleach cleanable
- Non-prickly
- Cost effective

Disadvantages

- Non-renewable fibres
- Can be perceived as cheap
- More regular cleaning required
- Dyed colour not as saturated as wool

Disadvantages

- The virgin raw material is oil-based, so comes from a non-renewable supply which will one day run out. Some recycled options are available, especially for polyester from both post-consumer and post-industrial sources.

- Synthetics can sometimes be perceived as cheap: they don't look as good for as long as wool, as they can become shiny with use and more regular cleaning is required to remove dirt from the surface of the fibre. Also, due to the chemical make-up of synthetics the depth of colour achievable is not as great as compared to wool.

Tip:

Specify wool - for environmental sustainability and long-lasting appearance on all furniture styles

Specify synthetics – for a lower cost fabric solution with easy care properties

3. Technical specifications – flammability

Flammability is arguably the most important technical attribute of a fabric, because it can have crucial safety implications in the event of a fire. The higher the flammability rating, the slower a fabric will burn, hence the greater the escape time.

There are many flammability standards across both seating and panel fabrics:

- The single standard for contract seating which is acceptable throughout the EU is EN 1021 Parts 1 and 2 (cigarette and match). Higher level standards in the UK are BS 5852 and BS 7176.
- The standard which applies to vertical surface fabrics is BS 476 Part 7.

3.1 Cigarette and match EN 1021 Parts 1 and 2 (2006)

A standard test rig is constructed from fabric and foam to form a simulated chair.

In Part 1 of the test a lighted cigarette is placed in the angle of the test rig and left to smoulder along its entire length. After 60 minutes no smouldering or flaming of the fabric should be observed. In Part 2 of the test a butane flame 35mm in height is used to represent a burning match. It is applied for 15 seconds and after the flame is removed, there should be no burning of the fabric after two minutes.

3.2 BS 5852 (2006) – Ignition Source 5

In BS 5852 there are actually eight ignition sources. The most frequently quoted are Ignition Source 0 (cigarette), Ignition Source 1 (match) and Ignition Source 5 (crib 5). The heat produced from the wooden crib 5 structure is 16 times more intense than a match. For a pass to be recorded, all flaming should cease within 10 minutes. Also, any charring should be within 100mm either side of the crib and the foam cannot be burnt through its full thickness.

3.3 BS 7176 (1995)

BS 7176 is a flammability performance standard based on BS 5852, but with an additional important parameter based on defining "Hazard" categories linked directly to the combination of different ignition sources used in the flammability test.

It is important to note that Hazard categories are guidelines only and end-users can demand higher rated fabrics than the particular category into which their premises fall. For example, offices, schools and colleges are classified as Low Hazard under BS 7176, yet Medium Hazard fabrics are increasingly specified.

Tip

For greater fire safety in contract areas, specify Medium Hazard Ignition Source 5.

	Low Hazard	Medium Hazard	High Hazard
Requirements	Resistant to ignition source: smouldering cigarette of BS EN 1021-1:2006. Resistant to ignition source: match flame equivalent of BS EN 1021-2:2006	Resistant to ignition source: smouldering cigarette of BS EN 1021-1:2006. Resistant to ignition source: match flame equivalent of BS EN 1021-2:2006. Resistant to ignition source 5 in section 4 of BS 5852:2006.	Resistant to ignition source: smouldering cigarette of BS EN 1021-1:2006. Resistant to ignition source: match flame equivalent of BS EN 1021-2:2006. Resistant to ignition source 7 in section 4 of BS 5852:2006.
Typical examples	Offices Schools Colleges Universities Museums Exhibitions Day Centres	Hotel Bedrooms Public buildings Restaurants Services' messes Places of public entertainment Public halls Public houses and bars Casinos Hospitals and hostels	Sleeping accommodation in certain hospital wards and in certain hostels Offshore installations

High Hazard is typically required in higher risk areas with little means of escape, for example in prison cells and on offshore oil installations. High Hazard includes ignition of a larger wooden crib (crib 7) - all flaming should cease after 13 minutes.

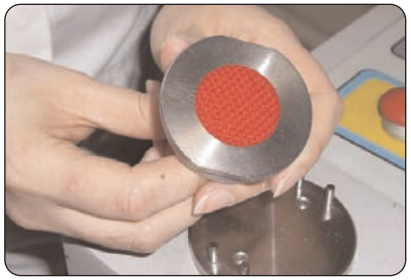
3.4 BS 476 Part 7 (1997)

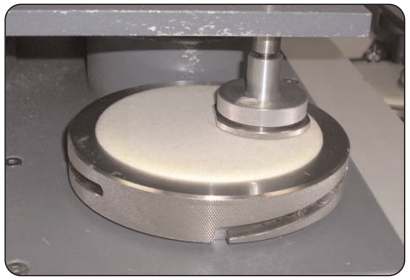
For screen and panel fabrics, and wall coverings, the flammability standard is BS 476 Part 7. It looks at how fast and how far flame spreads during a 10 minute test. The highest classification is Class 1.

Classification of spread of flame				
Classification	Spread of flame at 1.5 minutes		Final spread of flame	
	Limit (mm)	Limit for one specimen in sample (mm)	Limit (mm)	Limit for one specimen in sample (mm)
Class 1 Class 2 Class 3	165 215 265	165 + 25 215 + 25 265 + 25	165 455 710	165 + 25 455 + 45 710 + 75
Class 4	Exceeding the limits for class 3			

4. Technical specifications – abrasion

Abrasion performance is established by the Martindale test which simulates wear and tear. The test fabric is rubbed against a worsted suiting fabric and the apparatus measures the number of cycles. The end of the test is when three threads have broken and the abrasion value is the number of cycles completed at that time.





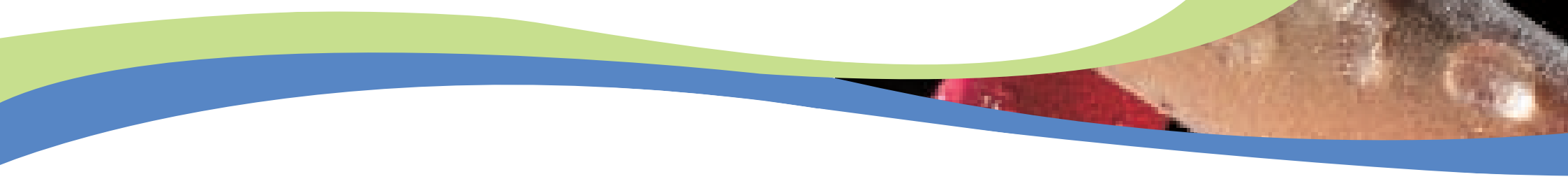
Fabrics intended for "severe contract use" should achieve at least 40,000 abrasion cycles (as per BS EN 2543 (2004) which is a broad based standard defined as "The specification for woven and knitted fabrics for upholstery").

Intended duty (BS 2543)	Abrasion performance
OD = Occasional domestic	6,000
LD = Light domestic	15,000
GD = General domestic	20,000
HD = Heavy domestic	25,000
SD = Severe domestic/general contract	30,000
SC = Severe contract	40,000

Tip

Always specify severe contract and look for a guarantee of durability 5 year guarantee 10 year guarantee

The durability of leather is measured in flexes, whereby a small sample of leather is bent back and forth to assess suppleness and check for surface cracking. Any crack – no matter how small – is a fail. For domestic furniture the general requirement is 20,000 flexes, while for contract and transport it is 100,000.



5. Environmental considerations

We're becoming increasingly aware in all our choices of environmental impacts and the need for long-term environmental sustainability. The choice which specifiers make in their fabric selection can play its own part in contributing to a more sustainable future. Here are some of the environmental choices to think about:

- Fabric composition
  - Natural and renewable fibres (eg wool)
  - Non-renewable fibres from oil-based resources (polyester and polypropylene)
  - Recycled raw materials
  - Life cycle assessment

- Durability and longevity
  - Severe contract abrasion performance (40,000 Martindale cycles)
  - Appearance retention, care and maintenance
  - Chemical performance enhancements

5.1 Lifecycle assessment

LCA is a tool for measuring the impact of a product on the environment, in its widest form from raw material, through production, to final product use, disposal or recycling. A snapshot from a detailed LCA of different fibre types shows the energy consumption for fibre manufacture:

Fibre type	Energy consumption (kwh/kg of fibre)
Wool	17.5
Viscose	27.8
Polypropylene	31.9
Polyester	34.7
Nylon	69.4

Source: Barker and Pellow (2006), Life Cycle Assessment - New Zealand Merino Industry : The AgriBusiness Group.

A separate LCA investigates the difference between virgin polyester compared to post-industrial recycled polyester:

Global Warming Potential:	46% improvement	Eutrophication Potential:	44% improvement
Embodied Energy:	66% improvement	Photochemical Oxidant Potential:	89% improvement
Embodied Mass:	57% improvement	Fresh Water Toxicity Potential:	20% improvement
Water Used:	27% improvement	Human Toxicity Potential:	39% improvement
Ozone Depletion Potential:	64% improvement	Terrestrial Ecotoxicity Potential:	18% improvement

Source: Interface Research Corporation (2002) : Life Cycle Assessment Report - recycled polyester fabric versus virgin polyester fabric.

5.2 Chemical performance enhancements

There is a vast array of performance enhancements targeting – among other things – improved flammability, stain repellency or anti-microbial/anti-bacterial effect. These can be applied at various stages in the manufacturing process, for example at the fibre production stage, at the dye stage, or as a post-treatment or back coating. Due to the large number of treatments available based on different chemistry, it is wise seeking clarification from the fabric manufacturer how the enhancement is achieved and whether there is any environmental implication.

6. Fabric care and maintenance

Fabric care really applies to the end-user to ensure that fabrics continue to look good and last for years. There are some important points that relate to both abrasion performance and fabric composition:

- Abrasion – it should be noted that if a fabric achieves "severe contract" performance level, then it is very unlikely to wear out under normal everyday usage. It is much more likely to "dirty out" before it wears out, through lack of proper care and maintenance.

- Composition – because of their non-absorbent nature, synthetics are easier to clean than wool, but they do need more regular cleaning to remove surface staining. Wool fabrics are inherently soil hiding.

The best recommendation is to ensure that fabrics are vacuumed regularly (like car upholstery) to remove dust and grit which can act as abradants. Next, ensure that any stains and liquid spills are attended to quickly, using a clean damp cloth to remove moisture and lift the stain. Finally, it is advisable to employ specialist contract cleaning services for deep cleaning on an annual or bi-annual basis.

Tip

Vacuuming is the easiest means of prolonging the life of an upholstery fabric. We don't think twice about vacuuming our car upholstery, so why not our contract furniture?