

# Abrasion Resistance: The Full Story

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## Defining Abrasion

Abrasion resistance is the ability of a fabric to resist surface wear caused by flat rubbing contact with another fabric. There are two different methods commonly used to test abrasion, referred to as Wyzenbeek and Martindale, described in detail further below.

## Remember...

Abrasion levels are often over specified in the faulty assumption that abrasion tests predict a product's overall durability and life span. A recent industry survey indicated that for many end-use applications, factors other than surface abrasion are more likely to result in fabric failure and therefore should be considered when evaluating product durability.

## Considerations Before Specifying

Abrasion resistance is only one component of durability. Considering this in combination with other factors will enable you to choose the most suitable fabrics for your project.

- Always consult with your supplier to confirm that the fabric you are considering should perform well in the onsite environment.
- Review the results of the other ACT recommended physical property tests for durability. Abrasion results alone do not predict a product's lifespan.
- Consider the style and quality of the furniture the specified fabric will be used on; seat pans with a waterfall edge and upholstered arms of a chair are common areas of wear. Is there adequate padding to support the upholstery?
- Take into account the amount of traffic in the environment and the wear the fabric is likely to receive. Keep in mind, the ACT recommended physical tests for durability do not indicate how a product will perform in an abusive environment.
- Determine whether or not the fabric will receive regular professional cleaning. Dirt is the enemy of fabric, but improper cleaning will also shorten the durability/lifespan of the product.
- Evaluate whether or not the end use requires a fabric treatment. Applying treatments, finishes or backings to a fabric may enhance durability, but may also negatively affect flammability resistance, appearance or environmental properties.

## **End-Use Examples**

It is up to the design professional to evaluate what is appropriate for a specific end-use. The following lists are suggestions and examples of end-use specifications based on ACT abrasion categories and are not intended to be comprehensive.

### **General Contract Upholstery**

- Guest seating in executive offices
- Corporate boardrooms
- Private office task seating
- Luxury hotel lobby, suite and guest-room seating
- Time-share seating
- Private aviation / marine

### **Heavy-Duty Upholstery**

- Single shift corporate offices
- Conference rooms
- Professional service waiting rooms
- High-traffic hotel lobbies and guest rooms
- Fine dining areas
- Condo lobbies
- High-traffic fitness facilities
- Assisted living / retirement facilities
- Medical waiting rooms
- Retail seating

### **Extreme wear upholstery situations that may require higher levels of durability:**

- Facilities open 24 hours a day
  - Transportation terminals
  - Telemarketing offices
  - Healthcare emergency rooms
  - Casino gambling areas
  - College dorm rooms
- Public gathering places
  - Theatres
  - Stadiums
  - Lecture halls
  - Student unions / libraries
  - Fast-food restaurants
  - Religious auditoriums
  - Institutional / commercial public spaces

## Interpreting Abrasion Test Results

Categorizing fabrics by abrasion results enables you to compare fabrics for a particular application. But keep in mind that the results of multiple abrasion tests on the same fabric sample can vary by as much as 25,000 +/- Wyzenbeek double-rubs or Martindale cycles.

Changes or differences in humidity, temperature, testing abradant, testing machines and test evaluators – as well as variations in the specified fabric – can cause significant variations in the test results. Additionally, the environment of a testing laboratory cannot replicate the unique conditions of your application.

Abrasion testing does not consistently indicate the future extended appearance of a textile, but the results can be a useful predictor of performance when considered with other durability factors.

- Results of abrasion testing can vary on the same test sample. The use of absolute numbers to compare abrasion test results is not recommended. Consider a range + / - as acceptable.
- Abrasion results can be affected by many things such as coatings, finishes, novelty yarns, pile constructions, patterns with long floats or repeat patterns that have large areas of different surface textures.
- The variability of abrasion testing increases significantly above 50,000 double-rubs / cycles.
- Fabrics with abrasion results below 15,000 Wyzenbeek double rubs / 20,000 Martindale cycles may prove unsatisfactory in contract upholstery application.
- Abrasion results exceeding 100,000 double rubs / cycles are not meaningful in providing additional value in use. Higher abrasion resistance does not necessarily indicate a significant extension of the service life of the fabric
- A fabric with double the number of abrasion cycles does not indicate double the service life.
- There is no correlation between different test methods. It is not possible to estimate the results that might be achieved on one test, by reviewing the results from another (e.g., Martindale & Wyzenbeek.)

## Test Methods

There are two different methods commonly used to test abrasion, referred to as Wyzenbeek and Martindale. There is no correlation between the Wyzenbeek and Martindale tests, so it is not possible to estimate the number of cycles that would be achieved on one test if the results from the other test were known.

### **ASTM D4157-07\* Wyzenbeek (Oscillatory Cylinder)**

The ASTM D4157-07 is a test of the American Society of Testing and Materials. A Wyzenbeek machine is used for this test allowing samples of the test fabric to be pulled tight in a frame and held stationary. Individual test specimens cut from the warp and weft directions are then rubbed back and forth using an ACT approved #10 cotton duck fabric as the abradant. The end point is reached when two yarn breaks occur or when appreciable wear is reached or when 100,000 double rubs are reached. The samples should be checked every 5,000 double rubs, and when an end point is reached because of failure, the rater should back up to the previous 5,000 double rub checkpoint as the test result of abrasion resistance. The test results are therefore to be reported in 5,000 double rub increments.

Experience indicates that 100% olefin fabrics are best-tested using wire screen as the abradant.

The Wyzenbeek method tests flat abrasion resistance of a textile. This test method does not evaluate edge abrasion or any of the other diverse factors that would determine the overall durability of upholstery as used in variety of seating designs.

\* For complete technical details about ASTM D4157-07: <http://www.astm.org>

### **ASTM D4966-98\*\* Martindale**

The ASTM D4966-98 is a test method of the American Society of Testing and Materials. Fabric samples are mounted flat and rubbed in an enlarging elliptical shape using a piece of worsted wool cloth as the abradant. The end point is reached when two yarn breaks occur or when there is a change in shade or appearance that is sufficient to cause a customer to complain. Shade change is assessed as the AATCC gray scale rating of 3 or lower. The samples should be checked every 5,000 cycles, and when an end point is reached because of failure, the rater should back up to the previous 5,000 cycles checkpoint as the test result of abrasion resistance. The test results are therefore to be reported in 5,000 cycles rub increments.

The Martindale method tests flat abrasion resistance of a textile. This test method does not evaluate edge abrasion or any of the other diverse factors that would determine the overall durability of upholstery as used in variety of seating designs.

\*\*For complete technical details about ASTM D4966-98: <http://www.astm.org>