

# Serviceability, Wear and Abrasion

**Serviceability:** An Article which is serviceable is capable of performing useful service; its serviceability ceases when it can no longer do so. It's a relative term. A fabric which is serviceable for one may not be for another. For some fashion concern lady, a dress of 3 months back may be unserviceable although it's still new or not damaged.

However, there are certain factors that limit the serviceability. They are colour, wear, abrasion and time. Usually, time element is the most influencing factor in deciding serviceability.

## **Purpose of Serviceability Testing:**

1. To determine as objectively and precisely as possible whether the application under investigation is a valid and suitable use for the fiber, yarn or fabric, and consequently will have reasonable prospects of commercial success as a long-term proposition. It will be appreciated that this statement applies particularly to the launching of a new fibre, yarn, or fabric, which can bring credit or discredit to the company.
2. To compare a number of different fibers, yarns, or fabrics, as part of market research.
3. To determine the influence of cloth structure and finishing on performance.
4. To asses suitability for purpose in instances where the fabric or article is considered "borderline" by laboratory testing against a performance specification.
5. To determine suitability for making up e.g. seaming properties, pleating and creasing properties.
6. To assist in establishing criteria for laboratory testing and standards performance.

**Wear:** Wear is the net result of a number of agencies which reduce the serviceability of an article. It is the amount of deterioration of a fabric due to breaking, cutting, removal of the fibres. Some of the more important agencies are -

- Bending and stretching
- Tearing
- Abrasion
- Laundering
- Cleaning

**The nature and type of these agents is so varied in type.**

**Wear Index (W.I) =  $\frac{\text{Weight Loss in mg} \times \text{No. of Cycle tested}}{1000}$**

**If wear index increases, abrasion resistance decreases and vice-versa.**

**Abrasion:** Abrasion is one aspect of wear and is the rubbing away of the component fibers and yarns of the fabric.

Abrasion may be classified as follows-

1. **Plane or flat abrasion:** A flat area of material is abraded.
2. **Edge abrasion:** This kind of abrasion occurs at collars and folds.
3. **Flex abrasion:** In this case, rubbing is accompanied by flexing and bending.

These three types are only broad divisions and in actual service a complex mixture of some or all types is found.

### **Points to be consider before abrasion testing:**

1. **Condition of specimen:** The fabric will be conditioned and tested in a standard testing atmosphere.
2. **Choice of testing instrument:** Depending upon the types of testing to be done the instrument may be chosen, e.g., Flat abrasion, Flexing Abrasion etc.
3. **Choice of abrasive motion:** The rubbing movement may be reciprocating, rotary or multi-directional.
4. **Direction of abrasion:** When the abrasive motion is unidirectional the abrasion resistance in specific directions can be measured. In many cases differences will be observed between warp way and weft way abrasion resistance. If desired, the direction of abrasion can be at angles to the warp and weft directions.
5. **Choice of abradant:** The severity of the abrasion will vary with the nature of the abradant. Where possible the abrasive qualities of the material used should remain constant during the test and be capable of being reproduced for successive tests. Steel and silicon carbide, for example, will give reasonably constant abrasive qualities. In other instances, the abradant may be a second piece of the tested fabric, a standard worsted or canvas fabric, emery cloth of various grades. With such materials, however, there is the risk of their abrasive properties changing during a test and a tendency for bits of abraded fibre to clog the surface. Some instruments have special methods of removing the link from the abradant.
6. **Backing the specimen:** The hardness of the backing of the specimen may affect the results. In some testes a hard backing is used in others a felt or foam rubber. In one instrument the sample is mounted over an inflated rubber diaphragm.
7. **Cleanliness of the specimen instrument:** The region to be abraded should be handed as little as possible and be free from foreign

matter such as the wax, graphite etc otherwise they will act as lubricants and affect the end-point of test result.

8. **Tension on the specimen:** Variation in the tension on the specimen will alter the result, and therefore, standardized method of mounting the specimen should be used.
9. **The pressure between abradant and specimen:** The severity of the abrasion will obviously be affected by the pressure applied. Here, again suitable standards must be set-up. High pressure will reduce the time taken to reach the end-point of a test but the acceleration of the destruction of the fabric may lead to false conclusion.
10. **The end point of the test:** The end-point may be the completion of a given number of abrasion cycles, the appearance of a hole or broken threads, the rupture of the specimen. Automatic stop motions are often built into the tester so that the motor is switched off as soon as a hole appears or the specimen breaks.

#### **Assessment of abrasion damage:**

Several methods of judging the amount of damage are given below-

1. Comparison of abraded specimen with an unabraded specimen.
2. The number of cycles required to produce a hole, broken threads or broken strip.
3. Loss in weight, often plotted against the number of cycles.
4. Change in thickness, e.g., loss of pile height. In some cases, the napping or raising effect of abrasion may cause an increase in thickness particularly in the early stages of a test.
5. Loss in Strength, e.g. tensile, bursting, or tearing strength. The loss may be expressed in percentage of unabraded strength. Some laboratories may determine residual strength after a given number of cycles.
6. Change in other properties, e.g. air permeability, lusture.
7. Microscopic examination of damage of yarns and fibres.

**Interpretation of the Result:** No general rule is given on the interpretation of the result from abrasion tests. The effect of special finishing treatments can be assessed by determining the abrasion resistance of the fabric before and after the finishing treatments. It's a series of different tests which are used to make rating of the fabric.

### **Abrasion testing instruments:**

A list of some abrasion testing instruments is mentioned below:

- The Wool Industries Research Association (W.I.R.A.) Abrasion Tester
- The Linen Industries Research Association (L.I.R.A.) Abrasion Tester
- The Taber Abraser (American)
- The Shiefer Machine (American)
- The Wyzenbeek Abrasion Tester (American)
- The Stoll Universal Wear Tester (American)
- The L.I.N.R.A. Wear Tester
- The Accelerotor
- **The B.F.T. Abrasion Testing Machine**
- **Martindale abrasion tester.**