



# Performance Testing

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*Ellen Roaldi*



*Move Forward with Confidence*





## Why Test?

## ► Why Test?

- Performance and Quality
- Testing Process
- ASTM D 5034
- ASTM D 1424
- ASTM D 1683
- Basic Factors to consider for a Reasonable Test program
- Summary



# Why Test?



## Why do we test products?

## ► Brand Protection

- Avoid Regulatory and Safety Issues
- Customer Complaints and Returns
- Negative Exposure in the Media
- Recalls



## ► Other Reasons

- Mandatory Reasons
- Contractual Agreements
- Performance
- Quality
- Claims
- Labeling



**Testing will follow the specified standards within the region specified by retail / purchasers or based on the area of distribution.**

For the US, general practice will follow ASTM or AATCC methodology. These methods are developed

- ▶ Standard review process (5 year review)
- ▶ Established Precision and Bias (P & B)

*\*\* When testing choose an accredited test lab. Having the essentials in place to test will provide repeatability when testing to a method, and it will contribute to the confidence of the test result.*

- ▶ **Lab Accreditation: Example: ISO 17025 and A2LA: Applicable to Testing and Calibration Organizations**
  - *Covers technical competency requirements not covered by ISO 9001*
  - The Lab must be a legal entity that can be held responsible.
  - *To address issues of liability / accountability, uniqueness & independence of operation.*

***How is this done?***

# Testing Process

## Answer:

- 1) Document policies & procedures necessary to assure quality of test results.
- 2) Proper resources and performance of methods
- 3) Company should have good document control
- 4) Proper equipment and consumables
- 5) Records
- 6) Trained and proficient staff



## ► Why is this so important?

- Daily the information a lab delivers assists the customer to make good buying decisions, and to verify the products they have contracted. Methods are impacted by conditions, equipment, methods and consumables and proper trainings, calibrations, verifications, etc.
- Repeatability inter-laboratory and between labs is important, thus laboratory procedures are necessary:

## ► Lets look at 2 or 3 standards, the details of the test for:

- Breaking Strength/Elongation Grab Method (Tensile Strength)
- Tearing Strength - Pendulum method
- Seam Slippage



# **Breaking Strength/Elongation Grab Method**

- ▶ **Scope:** This method covers the breaking strength and elongation determined by the grab procedure
  - This method is applicable to woven, nonwoven and felted fabrics. It is not recommended for glass or knit fabrics
  - The grab method is a strength/elongation test in which the central part of the width of a specimen is gripped in the clamp for example- a specimen is 100 mm wide with a 25 mm clamp placed in the middle of the fabric. This determines “effective strength and elongation”; that is the strength of the yarns in a specific test width with the assistance of adjacent yarns. This cannot be used for direct comparison with yarn strength determinations
  - A 100 mm wide fabric specimen is mounted centrally in clamps of a tensile tester and a force is applied until specimen rupture
  - The grab method for the determining the breaking strength and elongation is considered satisfactory for acceptance. Consideration after fabric treatments, such as sanding or fabric abrasion.

# ASTM D5034 Breaking Strength/Elongation Grab Method and Method Differences

Property	ASTM D5034	EN ISO 13934-2	JIS L1093
Scope	Woven , non woven and felted products	Woven fabric with or <b>with out a finish or elastomeric yarns</b>	<b>Woven fabric</b>
Sample Preparation	-Condition for 4 hrs -100X 150 mm specimens	-Condition for 4 hrs -100 mm X 200 mm specimens	-Condition for <b>24</b> hrs -100 mm X 200 mm specimens
Machine set up	-10% to 90% of the range -gauge length to 100mm. - Gauge length -speed 300 mm/min	<b>-20% to 80% of the range</b> -gauge length to 100mm. -speed to <b>50mm/min</b>	<b>20% to 80% of the range</b> -gauge length to 100mm -speed to <b>50mm/min</b>

# ASTM D5034 Breaking Strength/Elongation Grab Method and Method Differences

Property	ASTM D5034	EN ISO 13934-2	L-1093
Report	-Average and Ind. breaking load and elongation. - Mode of failure	-Average and Ind. breaking load and elongation. - <b>Mode of failure **</b>	-Average and direction of tear/ exclude any result where cross tearing
Reliability of methods	Precision and Bias	<b>No P &amp; B</b>	<b>No P &amp; B</b>

\*\* Note: Most European retail standards test to a minimum of 500 N

# ASTM D5034 Breaking Strength/Elongation Grab Method

Determination of breaking force and elongation of textile fabrics. Indicates the Potential Strength of the Fabric



**CRE Tensile Tester**





# Tear Strength

# ASTM D1424 Tear Strength

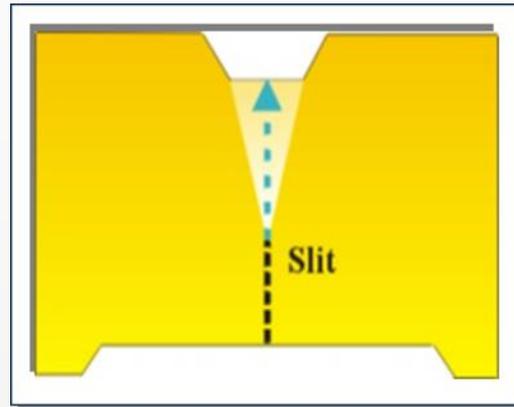
- ▶ **Scope:** This method covers the determination of tearing strength of fabric by falling pendulum or Elmendorf apparatus.

Tearing strength is the resistance of a fabric to withstand a tearing force required to propagate a tear after its initiation.

- ▶ **Importance:**
  - This test for determination of tear strength is used extensively through the trade and applies to most fabric types. This test is suited for the machine direction of warp knit fabrics and not suited for either direction of other types of knit fabric.
  - This test may be used for acceptance testing of commercial shipments of fabrics. By agreement, an interlaboratory study may need to be conducted to determine any bias between laboratories.

# ASTM D1424 Tear Strength

- A 20mm slit is centrally cut in a test specimen held between two clamps and a force is applied which propagates the slit as a tear through the specimen.



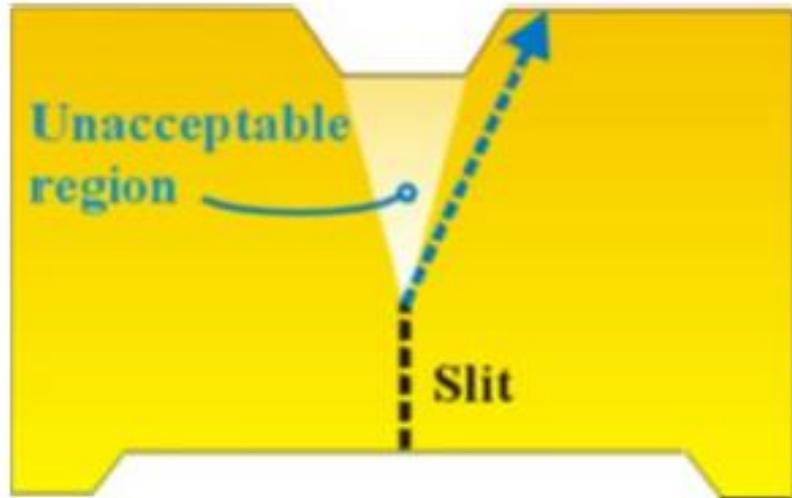
- The resistance to tearing is either factored into the equipment scale using the pendulum capacity or read from a digital display computed by the microprocessor within the instrument. The resistance is recorded as the tearing strength of the specimen

# ASTM D1424 Tear Strength

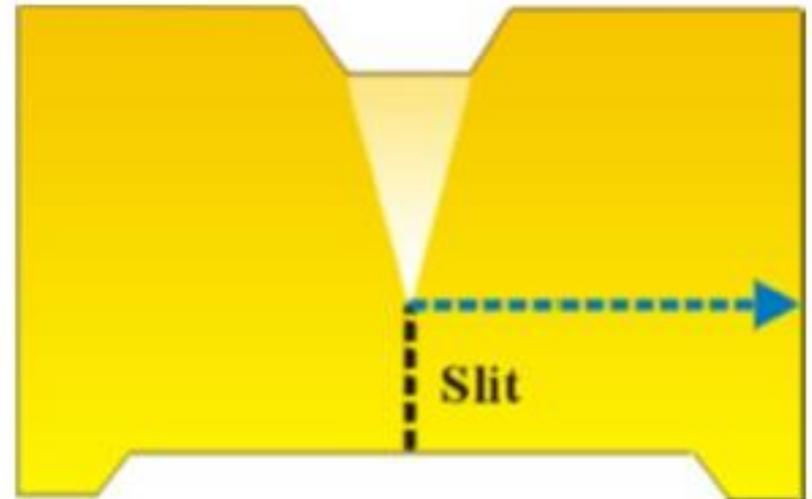


**Falling Pendulum Tester**

# ASTM D1424 Tear Strength



Unacceptable Tear



Untearable Specimen

# ASTM D1424 Tear Strength and Method Differences



BUREAU  
VERITAS

Property	ASTM D1424	EN ISO 13937-1	JIS L1096 SECTION 8.15.5
Scope	Textile fabrics	Textile fabrics	All fabrics <b>except Non wovens and knits</b>
Sample Preparation	<ul style="list-style-type: none"> <li>-Condition 4 hrs before test</li> <li>-Specimen size 100mm X 75 mm</li> <li>-Depth of the cut is 20 ± 0.5mm/depth of the cut is 20 ± 0.5mm</li> <li>- Critical Tear distance = 43 mm</li> </ul>	<ul style="list-style-type: none"> <li>-Condition <b>16 hrs</b> before test</li> <li>-Specimen size</li> <li>-Depth of the cut is 20 ± 0.5mm/depth of the cut is 20 ± 0.5mm</li> <li>- Critical Tear distance = 43 mm</li> </ul>	<ul style="list-style-type: none"> <li>-Condition 4 hrs before test</li> <li>-Specimen size 100mm X 63 mm</li> <li>-Depth of the cut is 20 ± 0.5mm/depth of the cut is 20 ± 0.5mm</li> <li>- Critical Tear distance = 43 mm</li> </ul>
Machine set up	Run between 20 to 80 % range	Run between <b>15 to 85</b> % range	Run between 20 to 80 % range

# ASTM D1424 Tear Strength and Method Differences



Property	ASTM D1424	EN ISO 13937-1	JIS L1096 SECTION 8.15.5
Report	-Average and direction of tear/ exclude any result where cross tearing	- Average and direction of tear/ exclude any result where cross tearing	-Average and direction of tear/ exclude any result where cross tearing
Reliability of methods	Precision and Bias	No P & B	No P & B



# Seam Slippage

# ASTM D1683 Seam Failure / Seam Slippage

- ▶ **Scope:** this method determines the sewn seam strength in woven fabrics by applying a force perpendicular to the direction of sewn seam
  - This method is applicable to seams sewn in lab specimens or seams removed from sewn articles
  - This test method may be used to determine the sewn strength in fabric or finished assemblies and to compare different types of seam/stitch constructions Seam efficiency may be determined as a % of the seam strength divided by fabric strength
  - Due to the differences in fabric constructions, seam types, sewing threads and end use applications, the seam construction must be determined by regulatory or specification requirements, and contract review
  - Force is applied to the sewn seam until the seam ruptures either by ASTM D5034 or ASTM D5035

## Method Evaluates:

- ▶ Seam Failure- the point at which an external force causes: rupture of sewing thread; ruptures the fabric; causes seam slippage; or a combination,  
  
and
- ▶ Needle Damage- the severance of a yarn or fusing caused by the needle passing through the fabric during sewing,  
  
and
- ▶ Slippage - the displacement of one or more yarns in the fabric specimen from their original position in the construction

# ASTM D1683 Seam Failure / Seam Slippage

## ▸ Seam Strength

- This test evaluates the strength of the seam by the separation of seam due to fabric break or seam or stitching thread break



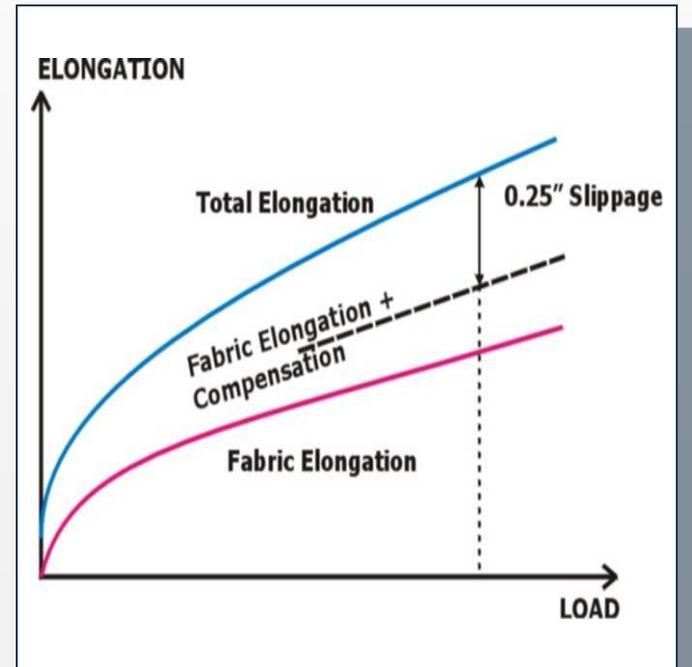
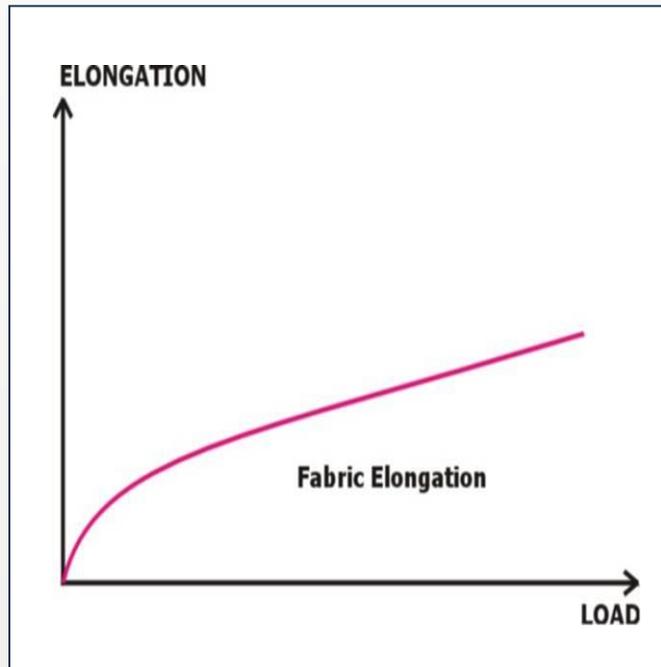
## ▸ Seam Slippage

- This test is to determine the tendency of the yarns to slip out of the seam and whether they would be readily repairable by re-seaming. In such, the stitching or seam thread remain unbroken



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# ASTM D1683 Seam Failure / Seam Slippage and Method Differences

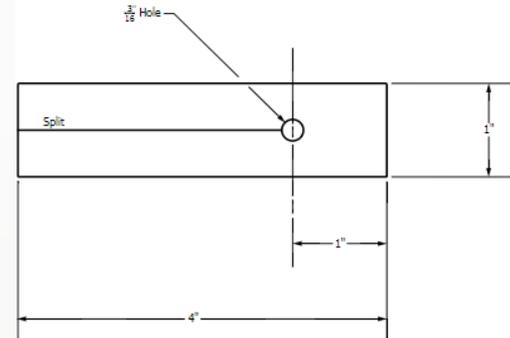
Property	ASTM D1683	EN ISO 13936-1  Not Equivalent	JIS JIS L 1096 SECTION 8.21.1  Not Equivalent
Scope	Textile fabrics / garments - more representative of finished garment	Woven Fabrics / No elastic fabrics	Woven fabrics except elastic
Sample Preparation	-Conditioning std. 4 hrs. Seam differs based on the end use -Specimen size 100mm X 75 mm - Speed 12 in/ min	-Conditioning std. 16 hrs./ washed or non wash Seam differs based on the end use. -Specimen size 100mm X 75 mm - Speed 12 in/ min	-Conditioning std. 4 hrs. recondition after 1 <sup>st</sup> pull. -Specimen size 100mm X 170 mm - Speed 12 in/ min - Gauge 3”

# ASTM D1683 Seam Failure / Seam Slippage and Method Differences

Property	ASTM D1683	EN ISO 13936-1 Not Equivalent	JIS JIS L 1096 SECTION 8.21.1 Not Equivalent
Machine set up	<ul style="list-style-type: none"> <li>-Gauge length of 3"</li> <li>-Clamp gripping width at least 25 mm ( 1")</li> <li>-speed: 12" min.</li> </ul>	<ul style="list-style-type: none"> <li>-Gauge length of 200 mm (8")</li> <li>-Clamp gripping width at least 25 mm ( 1")</li> <li>Various speeds</li> </ul>	<ul style="list-style-type: none"> <li>-Gauge length of 200 mm (8")</li> <li>-Clamp gripping width at least 60 mm ( 2")</li> </ul>
Report	Report individual and average (mm) Mode of failure	Report individual and average (mm) Mode of failure	Report individual and average (mm)
Reliability of methods	Precision and Bias	No P & B	No P & B

Other similar methods include:

- ▶ ASTM D4704: determining the tearing strength of leather by measuring the force required to tear a specimen cut perpendicular to the surface.
- ▶ ASTM D434: Similar to D1683 - covers the determination of the resistance to slippage of filling yarns over warp yarns, or warp yarns over filling yarns, using a standard seam.
- ▶ D2261: covers the measurement of the tearing strength of textile fabrics by the tongue (single rip) procedure using a recording constant-rate-of-extension-type (CRE) tensile testing machine.



# Basic Factors to consider for a Quality Product

- ▶ Product should perform as intended and meet requirements for the country of distribution
- ▶ Consumer perception should be considered for determination of performance
  - What is defined as the useful life of a product?
  - Need to minimize customer returns
- ▶ Developing specifications
  - Mandatory
  - Voluntary
- ▶ What is the competition doing?
- ▶ Reliability and standards review process.
- ▶ Choice of laboratory
- ▶ Audit



## *In Summary: Bottom Line*

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**The final Product is only as good as the  
quality of its...**

- ✓ **Product Design**
  - ✓ **Raw Materials**
  - ✓ **Production Process**
- 
- 
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***Thank You for Attending!***



# Questions?

**For more information, please contact:  
[info@us.bureauveritas.com](mailto:info@us.bureauveritas.com)**

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