

A STUDY ON STRENGTH PROPERTIES OF WOVEN LEATHER USED IN LEATHER PRODUCTS

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A study on Woven Leather

01

Scope

02

Objectives

03

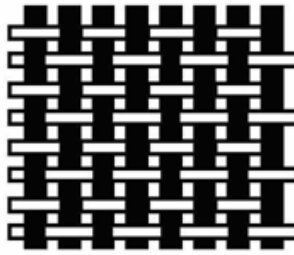
Methodology

04

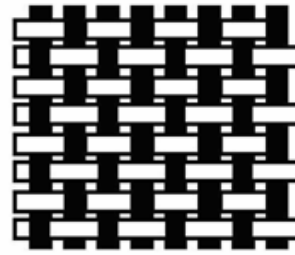
Findings

Textile Weaving

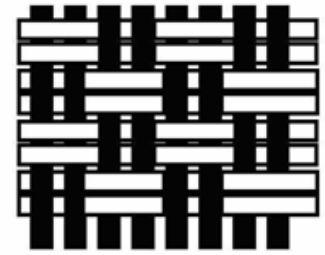
- Textile manufacturing technique
- Two sets of yarn/thread are intertwined at right angles to make a fabric
- Warp – Longitudinal
- Weft - Lateral



Plain weave
(directional)



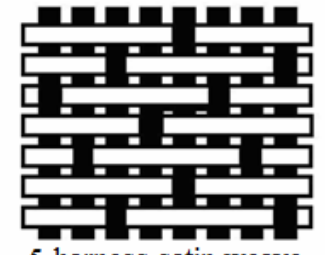
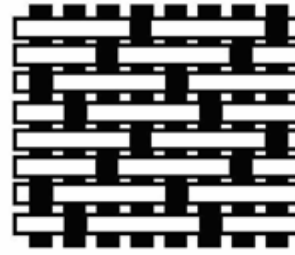
Plain weave
(uniform)



Basket (panama) weave



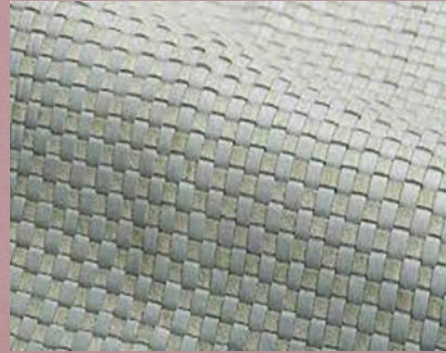
Various twill weaves



5-harness satin weave

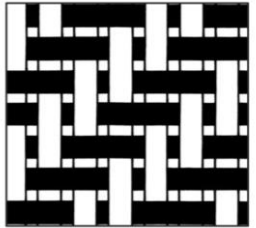
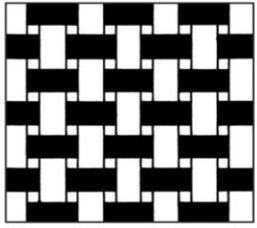
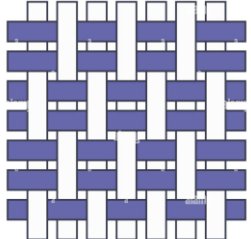
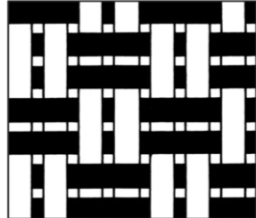
Leather Weaving

- Raw material – Natural Leather (Low Grade)
- Straps of leather in various width dimensions are used for leather weaving
- The width dimension of leather strap depends on the design



Woven leather mat

Leather Weaving Patterns

Twill Weave	Plain Weave	Rib Weave	Basket Weave
<ul style="list-style-type: none"> • Loose end weave style • Involves an even number of same length strips 	<ul style="list-style-type: none"> • Strips of same length and width half running perpendicular to the other half 	<ul style="list-style-type: none"> • Similar to plain weave except those strips placed horizontal are wider than those placed vertically 	<ul style="list-style-type: none"> • Similar to plain weave except two vertical strands are woven over and under two horizontal strands and repeated
<p data-bbox="256 751 421 775">Twill Weave</p> 	<p data-bbox="666 751 830 775">Plain Weave</p> 	 <p data-bbox="1062 999 1294 1021">Warp rib weave regular</p>	<p data-bbox="1522 758 1709 780">Basket Weave</p> 

01

Scope

Need for the project

Factors affecting quality



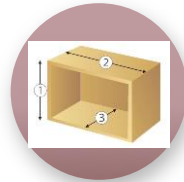
Raw material

All parts of low grade leather is used for making straps



Design

Strength is related to various weave designs



Weaving Technique

- Strap cutting method
- Width of leather strap

02

Objectives

Aim of the project

Objectives

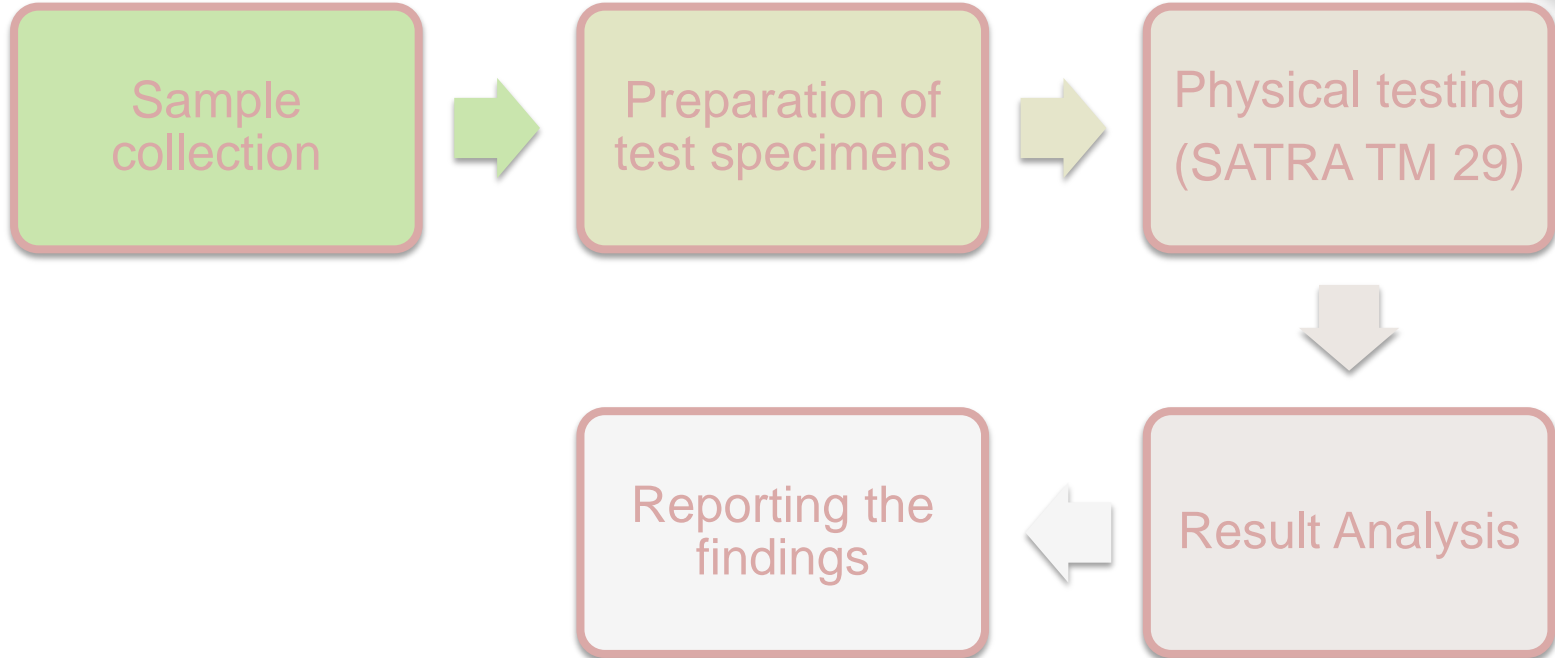
- To study the various factors that affects the strength of woven leather
- To study the relationship between cutting direction of leather straps used in woven leather and its strength after weaving
- To study the relationship between widths of leather straps used in woven leather and strength properties after weaving
- To study the relationship between weave design and strength properties of woven leather

03

Methodology

Experimental method used in the project

Methodology



Samples

- 18 samples were collected
 - Base material - Goat Leather
 - Design – 3 different designs (Dama, Double Dama, Double Jump)
 - Width of Strap – 4mm, 5mm and 7mm
 - Strap cutting method – Straight cut and Circular strap cut

Samples

- Strap cutting method



- Circular strap cutting method



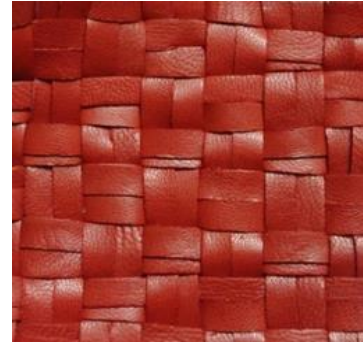
Weave Designs



Dama



Double Jump



Double Dama

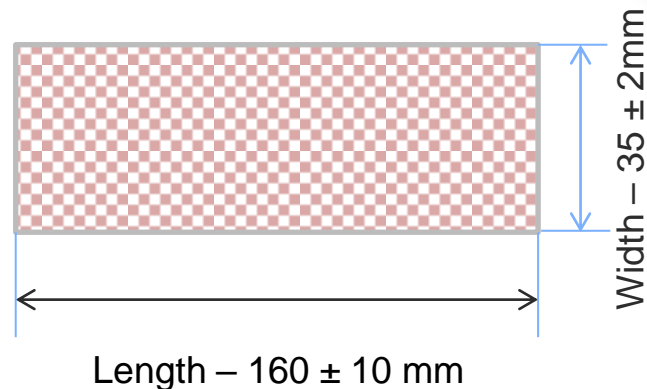
Physical Testing

- SATRA TM 29 - Breaking Strength and Extension at Break
- Apparatus: Universal testing machine (Brand: Testometric UK, Model: M350)
- A rectangular specimen is gradually stretched by a tensile testing machine until it fails.



Preparation of Test Specimen

- Rectangular specimen
- Conditioning of samples:
 - Temperature: $23 \pm 2^{\circ} \text{C}$ or $20 \pm 2^{\circ} \text{C}$
 - Relative Humidity: $50 \pm 4\%$ or $65 \pm 4\%$
 - Duration – 48 hours



Test Procedure

- The test specimen was clamped from both the ends to each of the jaws of the tensile testing machine
- The machine was operated so that the jaws separate at a speed of 50 ± 5 mm/min
- The machine was stopped once the test specimen fails.

Testing Procedure



Breaking Strength.mp4

Result Parameters

- Breaking Force (F in Newtons)
- Extension at Break (E in millimeters)

Strength Property

- **Breaking Strength (N/mm) = $\frac{F}{W}$**

Where,

W – Width of the specimen in mm

- **Extension at break (%) = $\frac{[E] \times 100}{GL}$**

Where,

GL – Initial Jaw separation of the tensile machine in mm

04

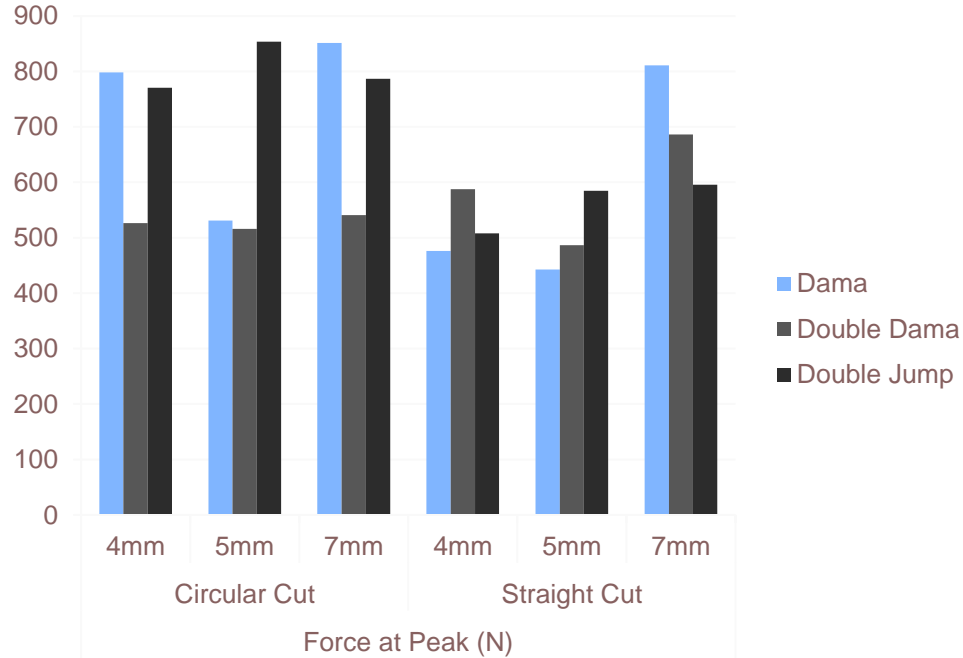
Findings

Research Findings from the Test Results

Results - Force at Peak (N)

Force at Peak (N)						
	Circular Cut			Straight Cut		
Weave Design	4mm	5mm	7mm	4mm	5mm	7mm
Dama	798.3	530.7	851.3	476.23	442.65	810.8
Double Dama	526.4	516	540.64	587.5	486.36	686.2
Double Jump	770.4	853.7	786.9	507.7	584.8	595.8

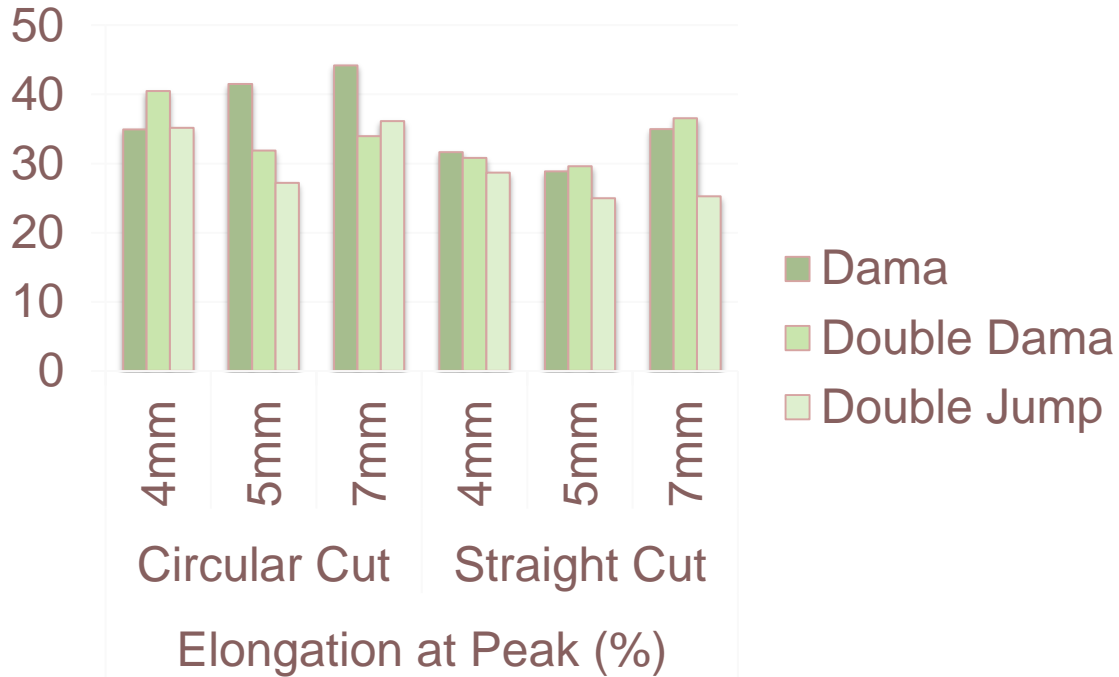
Results - Force at Peak (N)



Results - Elongation at Peak (%)

Elongation at Peak (%)						
	Circular Cut			Straight Cut		
Weave Design	4mm	5mm	7mm	4mm	5mm	7mm
Dama	34.944	41.491	44.207	31.639	28.87	34.955
Double Dama	40.491	31.87	33.966	30.81	29.625	36.541
Double Jump	35.158	27.206	36.114	28.674	24.971	25.266

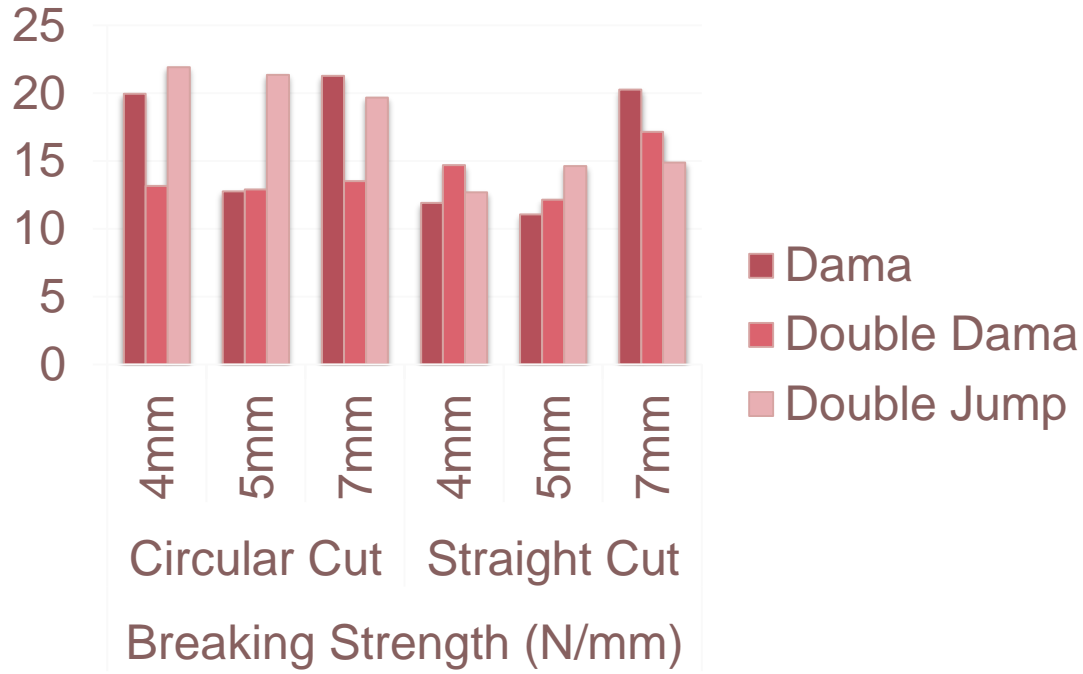
Results - Elongation at Peak (%)



Results - Breaking Strength (N/mm)

Breaking Strength (N/mm)						
	Circular Cut			Straight Cut		
Weave Design	4mm	5mm	7mm	4mm	5mm	7mm
Dama	19.957	12.77	21.282	11.906	11.066	20.27
Double Dama	13.16	12.9	13.51	14.688	12.159	17.155
Double Jump	21.913	21.343	19.673	12.693	14.62	14.895

Results - Breaking Strength (N/mm)



Findings

- Significant difference in Force at peak is observed between circular cut and round cut irrespective of weave design
- The circular cut samples require more force when compared to the straight cut samples
- Circular cutting can be preferred for articles that demand more strength
- The elongation was more in circular cut than the straight cut samples
- The strength appears to be better for circular cut samples
- The breaking strength shows no significant difference among the weave design in straight cut samples
- The breaking strength shows significant changes with respect to weave design for circular cut samples

Take away

The leather strap cutting direction, strap width and weave design can be optimized for various leather products like handbags and shoes based on their end use

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**Co-authors
and Students**

**Almighty God
and Family**

Footwear Design and Development Institute, Chennai



Courses Offered

B. Design (Footwear Designing) - 4 Years

B. Design (Fashion Designing) - 4 Years

B. Design (Leather Goods and Accessories Designing) - 4 Years

BBA - Retail and Fashion Merchandise - 3 Years

M. Design (Footwear Design and Production) - 2 Years

MBA - Retail and Fashion Merchandise - 2 Years

Short Term Programmes

Thanks!

Does anyone have any questions?

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