



ACADEMIC YEAR 2024-2025, SEMESTER – II
STUDY MATERIAL FOR B.Sc., FASHION TECHNOLOGY
FABRIC STRUCTURE AND DESIGN



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FABRIC STRUCTURE AND DESIGN

SEMESTER – II



ACADEMIC YEAR 2024-25

PREPARED BY

FASHION TECHNOLOGY DEPARTMENT



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UNIT – I

ELEMENTS OF WOVEN DESIGN

Basic Elements of Woven Fabric Design:

Basic elements of woven fabric design are:

1. Weave Plan
2. Drafting Plan
3. Lifting Plan
4. Denting Plan

1. Weave Plan:

Weave plan illustrates the interlacing of ends & picks in the fabric under consideration. It shows the up & down of each yarn in a fabric sample. Weave plan is drawn on a graph paper.

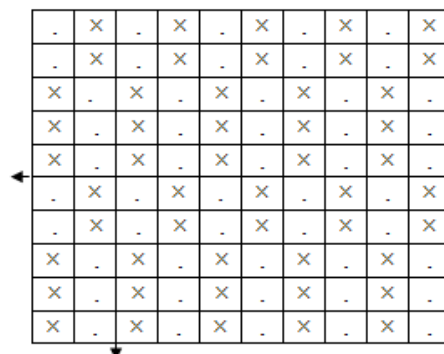


Fig: Weave plan

This is a representation of design of a plain weave:

- The vertical line (column) represents warp yarn.
- The horizontal line (row) represents weft yarn.
- ← ↓ Represents repeat unit.
- 'X' represents warp over weft.
- Empty box represents weft over warp.
- # Represents starting point.

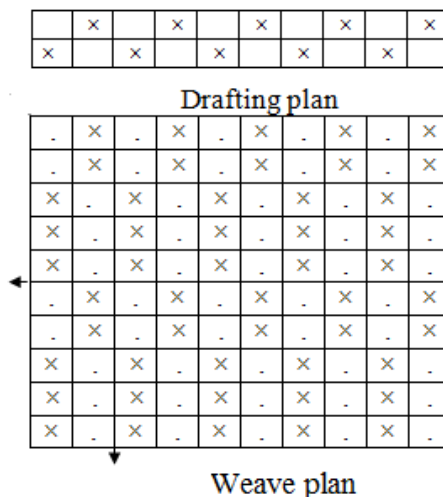


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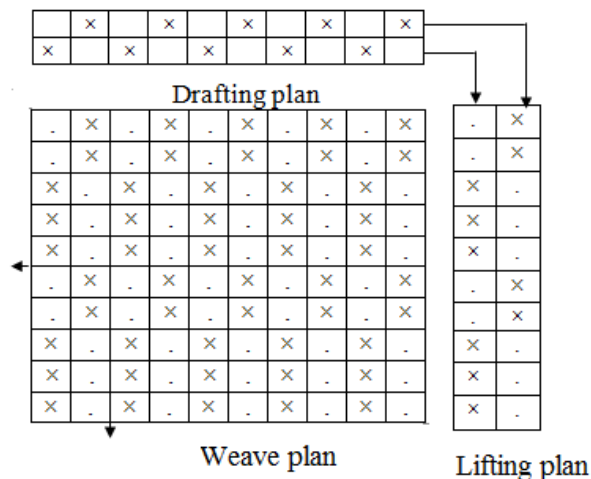
2. Drafting Plan:

Drafting plan indicates the number of heald shafts required to make a design and also indicates the threading of warp through heald eyes of heald shafts it is drawn top of the weave plan.



3. Lifting Plan:

Lifting plan indicates the selection of heald shafts to be lifted or lowered on each successive insertion of weft or pick. Lifting plan is drawn at the right side of the weave plan.



4. Denting Plan:

The process of inserting warp yarn through dent is called denting and the plan that indicate the order in which denting is done is called denting plan. This is done for keeping uniform spacing between yarns of warp sheets. Usually two yarns are passed through each dent.

Methods of fabric representation:

A weave is the interlacing pattern of the warp and weft. Two kinds of interlacing are possible :



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- (i) Warp overlap in which warp is above weft
- (ii) Weft overlap in which weft is above warp

When the warp is lifted above the inserted weft, a warp overlap is obtained. When the warp thread is lowered, the weft thread is inserted above the warp thread and the weft overlap is obtained.

There are two practical methods of weave representation :

- (i) Linear
- (ii) Canvas

In the linear method each warp thread is represented by a vertical line and each weft thread by a horizontal line. The point of intersection of lines corresponding to a warp overlap is marked by the dot, and the point of intersection corresponding to weft overlap remains unmarked.. Though this is a simple method, it is seldom used because the designer has to draw plenty of horizontal and vertical lines, which is time consuming.

In the canvas method, a squared paper is employed, on which each vertical space represents a warp thread and each horizontal space represents a weft thread. Each square therefore indicates an intersection of warp and weft thread. To show the warp overlap, a square is filled in or shaded. The blank square indicates that the weft thread is placed over the warp i.e. weft overlap. Several types of marks may be used to indicate the warp overlap. The 'x' mark is most commonly used.

A weave diagram is shown below (Fig. 2.1).

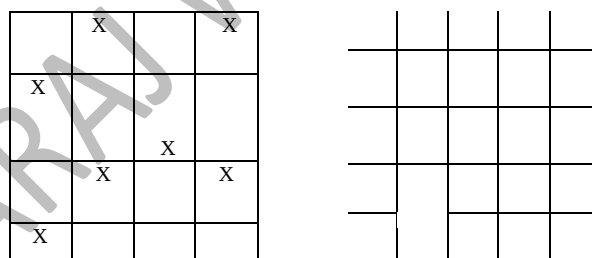


Fig. 2 . 1 .Weave representation (Canvas method)

Draft and Lifting plan construction:

The draft or drawing plan indicates the manner of drawing the ends through the heald eyes and it also denotes the number of heald shaft required for a given weave repeat. The choice of the type of drafting plan depends upon the type of fabric woven.

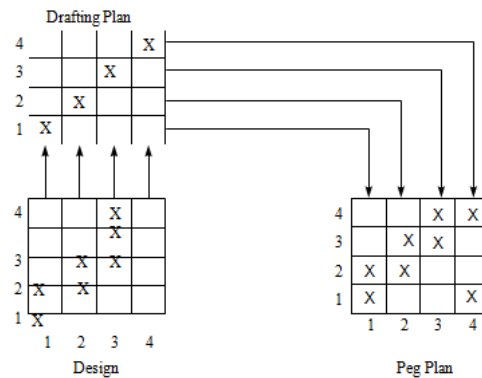
The peg or lifting plan provides useful information to the weaver. It denotes the order of lifting of heald shafts. In a peg plan the vertical spaces indicate the heald shafts and the horizontal spaces



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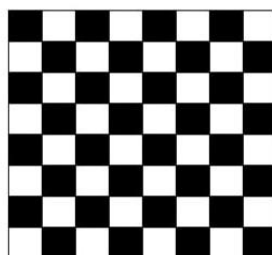
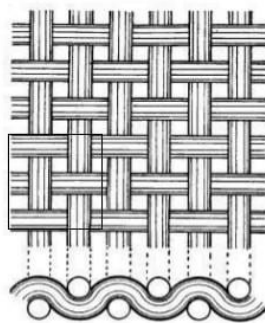
indicate the picks. The peg plan depends upon the drafting plan. In the case of a straight draft, the peg plan will be the same as the design. Hence no peg plan is necessary in the case of a straight draft.



Construction of Elementary weaves:

1. Plain Weave

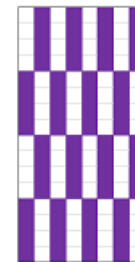
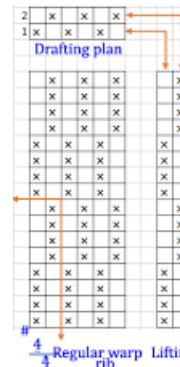
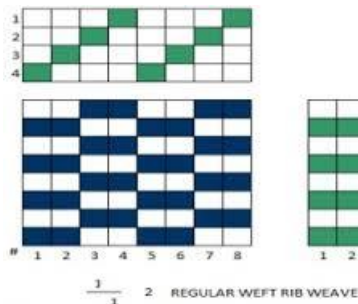
- Intersection of two sets of yarns at right angles to each other
- Warp yarns are raised in a simple alternating sequence
- Weft yarns pass over and under the warp yarns in a simple alternating sequence
- Result: a simple, grid-like fabric with equal warp and weft yarn densities





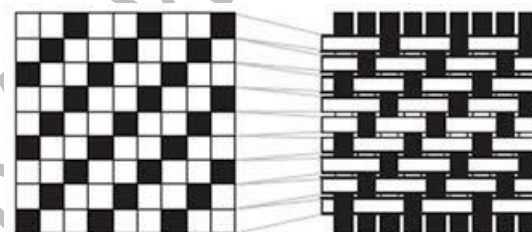
2. Rib Weave

- A variation of plain weave where the warp and weft yarns are alternately raised and lowered
- Creates a fabric with a ribbed or striped effect
- Result: a fabric with a textured, dimensional appearance



3. Twill Weave

- Similar to plain weave, but with a diagonal rib effect
- Warp yarns are raised in a stepped sequence, creating a diagonal line
- Weft yarns pass over and under the warp yarns in a stepped sequence
- Result: a fabric with a diagonal rib effect and a softer, more pliable texture than plain weave



Modification of twill weave:

Right-Hand Twill and Left-Hand Twill

- Right-hand twill: the twill line runs from the top right to the bottom left
- Left-hand twill: the twill line runs from the top left to the bottom right.





4. Satin Weave

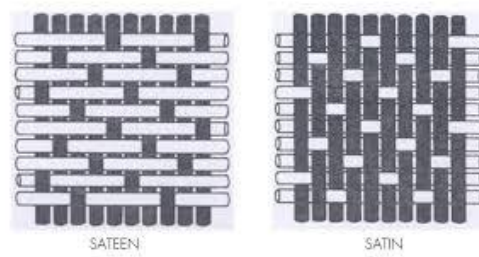
- A float weave where the warp yarns float over several weft yarns before intersecting
- Warp yarns are raised in a specific sequence to create a smooth, unbroken surface
- Weft yarns pass under the warp yarns in a specific sequence
- Result: a smooth, lustrous fabric with a soft, slippery texture

5. Sateen weave

Sateen weave is a type of weave that produces a smooth, lustrous fabric with a soft, satin-like texture.

Characteristics of Sateen Weave:

1. **Float weave:** Sateen weave is a float weave, where the warp yarns float over several weft yarns before intersecting.
2. **Warp yarn dominance:** The warp yarns are more visible on the surface of the fabric, giving it a smooth, lustrous appearance.
3. **Weft yarn hiding:** The weft yarns are hidden from view, creating a smooth, even surface.
4. **Soft and smooth texture:** Sateen weave produces a fabric with a soft, smooth texture that is gentle against the skin.





Unit-II

TYPES OF WEAVES

Ordinary and brighten honey comb:

The ordinary honeycomb weave is a type of weave that produces a fabric with a honeycomb-like texture and appearance.

Characteristics of Ordinary Honeycomb Weave:

1. **Twill-based weave:** The ordinary honeycomb weave is based on a twill weave, with a twill line that runs diagonally across the fabric.
2. **Honeycomb cells:** The weave produces a series of honeycomb-like cells, with each cell consisting of a group of warp and weft yarns.
3. **Warp and weft yarns:** The warp yarns are raised in a specific sequence to create the honeycomb cells, while the weft yarns pass through the cells to hold them in place.
4. **Texture and appearance:** The ordinary honeycomb weave produces a fabric with a textured, honeycomb-like appearance and a soft, smooth feel.

Types of Ordinary Honeycomb Weave:

1. **Regular honeycomb:** This is the most common type of ordinary honeycomb weave, with a regular, repeating pattern of honeycomb cells.
2. **Irregular honeycomb:** This type of ordinary honeycomb weave has an irregular, non-repeating pattern of honeycomb cells.
3. **Modified honeycomb:** This type of ordinary honeycomb weave has a modified, altered pattern of honeycomb cells.

Advantages of Ordinary Honeycomb Weave:

1. **Texture and appearance:** The ordinary honeycomb weave produces a fabric with a unique, textured appearance and a soft, smooth feel.
2. **Durability:** The ordinary honeycomb weave is a durable weave that can withstand wear and tear.
3. **Versatility:** The ordinary honeycomb weave can be used to create a wide range of fabrics, from lightweight fabrics to heavyweight fabrics.



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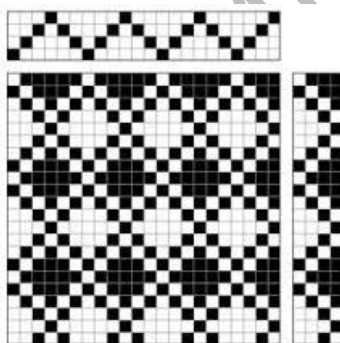


Disadvantages of Ordinary Honeycomb Weave:

1. **Complexity:** The ordinary honeycomb weave is a complex weave that requires a high degree of skill and expertise to produce.
2. **Time-consuming:** The ordinary honeycomb weave is a time-consuming weave to produce, as it requires a high degree of precision and attention to detail.
3. **Limited flexibility:** The ordinary honeycomb weave has limited flexibility, as it is a rigid weave that cannot be easily stretched or distorted.

Applications of Ordinary Honeycomb Weave:

1. **Fashion fabrics:** The ordinary honeycomb weave is often used to create fashion fabrics, such as dresses, skirts, and tops.
2. **Home textiles:** The ordinary honeycomb weave is also used to create home textiles, such as bedding, towels, and tablecloths.
3. **Technical textiles:** The ordinary honeycomb weave can also be used to create technical textiles, such as filtration media, medical textiles, and industrial textiles.



Modifications of Ordinary honey comb weave:

1. Expanded Honeycomb Weave

- Increasing the size of the honeycomb cells to create a more open, airy fabric.
- This modification is often used to create lightweight, breathable fabrics.

2. Condensed Honeycomb Weave

- Decreasing the size of the honeycomb cells to create a more dense, compact fabric.
- This modification is often used to create heavyweight, durable fabrics.



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3. Honeycomb Weave with Variable Cell Size

- Creating honeycomb cells of varying sizes to add texture and visual interest to the fabric.
- This modification is often used to create unique, decorative fabrics.

4. Honeycomb Weave with Different Yarn Types

- Using different types of yarns, such as cotton, polyester, or wool, to create a fabric with varying textures and properties.
- This modification is often used to create fabrics with specific performance characteristics.

5. Honeycomb Weave with Color Effects

- Using different colors or color combinations to create a fabric with unique visual effects.
- This modification is often used to create fabrics with decorative or aesthetic appeal.

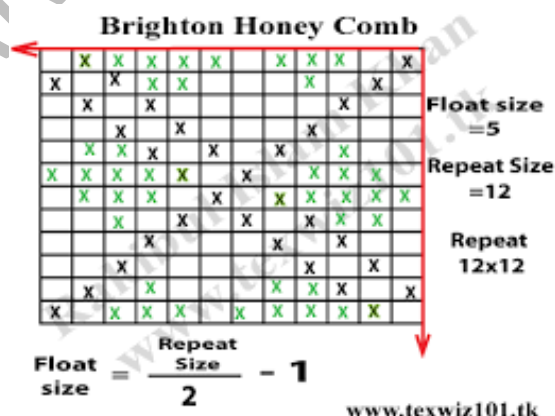
6. Honeycomb Weave with Twill or Satin Effects

- Combining the honeycomb weave with twill or satin weaves to create a fabric with unique texture and visual effects.
- This modification is often used to create fabrics with complex, intricate designs.

7. Honeycomb Weave with Jacquard or Dobby Effects

- Using jacquard or dobby looms to create complex, intricate designs within the honeycomb weave.
- This modification is often used to create fabrics with unique, decorative designs.

Brighton Honey comb weave:





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The Brighton honeycomb weave is a type of honeycomb weave that originated in Brighton, England. It is characterized by:

Characteristics:

1. **Unique cell structure:** The Brighton honeycomb weave has a unique cell structure, with each cell consisting of a group of warp and weft yarns that intersect in a specific way.
2. **Diagonal rib:** The Brighton honeycomb weave has a diagonal rib effect, created by the intersection of the warp and weft yarns.
3. **Soft and smooth texture:** The Brighton honeycomb weave produces a fabric with a soft, smooth texture and a subtle sheen.

Construction:

1. **Warp yarns:** The warp yarns are raised in a specific sequence to create the honeycomb cells.
2. **Weft yarns:** The weft yarns pass through the cells to hold them in place.
3. **Interlacing:** The warp and weft yarns interlace in a specific way to create the diagonal rib effect.

Advantages:

1. **Unique texture and appearance:** The Brighton honeycomb weave produces a fabric with a unique texture and appearance.
2. **Soft and smooth:** The fabric is soft and smooth to the touch.
3. **Durable:** The Brighton honeycomb weave is a durable weave that can withstand wear and tear.

Disadvantages:

1. **Complex construction:** The Brighton honeycomb weave has a complex construction that requires a high degree of skill and expertise.
2. **Time-consuming:** The weave is time-consuming to produce, as it requires a high degree of precision and attention to detail.

Applications:

1. **Fashion fabrics:** The Brighton honeycomb weave is often used to create fashion fabrics, such as dresses, skirts, and tops.
2. **Home textiles:** The weave is also used to create home textiles, such as bedding, towels, and tablecloths.



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3. **Technical textiles:** The Brighton honeycomb weave can also be used to create technical textiles, such as filtration media, medical textiles, and industrial textiles.

Huck A Back weave:

Huck a back weave is a type of woven fabric that originated in the 18th century. It is characterized by:

Characteristics:

1. **Towel-like texture:** Huck a back weave has a unique, towel-like texture with a soft, absorbent, and durable surface.
2. **Floats and picks:** The weave is created using floats and picks, which are the warp and weft yarns that intersect to form the fabric.
3. **Specific binding:** The warp and weft yarns are bound together in a specific way to create the characteristic texture and appearance of the fabric.

Construction:

1. **Warp yarns:** The warp yarns are raised in a specific sequence to create the floats.
2. **Weft yarns:** The weft yarns pass through the floats to create the picks.
3. **Binding:** The warp and weft yarns are bound together in a specific way to create the characteristic texture and appearance of the fabric.

Advantages:

1. **Absorbent and durable:** Huck a back weave is highly absorbent and durable, making it ideal for towels, washcloths, and other bath textiles.
2. **Soft and comfortable:** The fabric is soft and comfortable against the skin, making it suitable for a wide range of applications.
3. **Easy to care for:** Huck a back weave is easy to care for, as it can be machine washed and dried.

Disadvantages:

1. **Limited drape:** Huck a back weave has limited drape, making it less suitable for garments that require a high degree of drape and flexibility.
2. **May shrink:** The fabric may shrink if it is not properly pre-treated before washing.

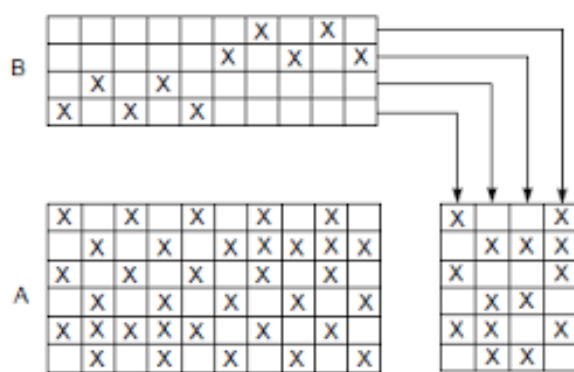


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Applications:

1. **Towels and washcloths:** Huck a back weave is commonly used to make towels, washcloths, and other bath textiles.
2. **Bath robes and mats:** The fabric is also used to make bath robes, mats, and other bathroom accessories.
3. **Home textiles:** Huck a back weave can also be used to make other home textiles, such as tablecloths, napkins, and tea towels.



Huck A Back modification:

A "huck a back weave modification" refers to a variation of the huck a back weave, a traditional pick-up weaving technique.

Materials Needed

- Weaving shuttle
- Weaving needle
- Warp yarn
- Weft yarn
- Scissors
- Measuring tape or ruler

Huck a Back Weave Modification Steps

1. **Set up your loom:** Set up your loom with the warp yarn, making sure it's tight and evenly spaced.
2. **Thread your shuttle:** Thread your weaving shuttle with the weft yarn.



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3. **Begin the huck a back weave:** Start the huck a back weave pattern by passing the shuttle over one warp yarn, then under the next one.
4. **Modify the pattern:** To modify the pattern, you can change the number of warp yarns you pass the shuttle over or under. For example, you could pass the shuttle over two warp yarns, then under one.
5. **Continue the pattern:** Continue the modified pattern, making sure to maintain a consistent tension on the weft yarn.
6. **Finish the weave:** When you reach the end of the warp yarn, secure the weft yarn with a knot and trim the excess.

Crepe weave:

A crepe weave is a type of textile weave that produces a fabric with a crinkled or pebbled surface. Here's more information about crepe weave:

Characteristics of Crepe Weave

- **Crinkled surface:** Crepe weave produces a fabric with a distinctive crinkled or pebbled surface.
- **Soft and lightweight:** Crepe weave fabrics are typically soft, lightweight, and drape well.
- **Flexible:** Crepe weave fabrics are often used in garments that require flexibility, such as dresses and blouses.

How Crepe Weave is Created

Crepe weave is created using a specific type of loom or weaving technique. Here's a simplified overview:

1. **Warp preparation:** The warp yarns are prepared by stretching and twisting them to create tension.
2. **Weft insertion:** The weft yarns are inserted into the warp yarns using a specific type of shuttle or weaving needle.
3. **Beating:** The weft yarns are beaten into place using a beater or batten, which creates the crinkled surface.

Types of Crepe Weave

There are several types of crepe weave, including:

- **Plain crepe:** A basic crepe weave that produces a fabric with a subtle crinkled surface.
- **Satin crepe:** A type of crepe weave that produces a fabric with a smooth, lustrous surface.



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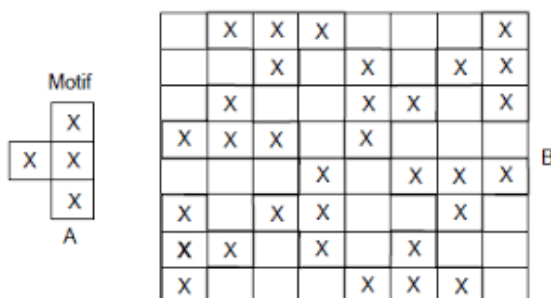


- **Jacquard crepe:** A type of crepe weave that uses a jacquard loom to produce complex, intricate designs.

Uses of Crepe Weave

Crepe weave fabrics are used in a variety of applications, including:

- **Fashion garments:** Crepe weave fabrics are often used in dresses, blouses, and other fashion garments.
- **Home decor:** Crepe weave fabrics can be used to create unique and textured home decor items, such as throw pillows and wall hangings.
- **Crafting:** Crepe weave fabrics can be used in various craft projects, such as quilting and embroidery.



Mock Leno weave:

Mock Leno weave is a type of weaving technique that mimics the appearance of Leno weave, but with a simpler and more efficient method.

Characteristics of Mock Leno Weave

- **Similar appearance to Leno weave:** Mock Leno weave creates a fabric with a similar open, mesh-like appearance to Leno weave.
- **Simplified weaving technique:** Mock Leno weave uses a simpler weaving technique than traditional Leno weave, making it easier to learn and produce.
- **Increased weaving speed:** Mock Leno weave can be woven at a faster rate than traditional Leno weave, making it a more efficient choice for production.

How Mock Leno Weave is Created

Mock Leno weave is created using a specific type of weaving technique. Here's a simplified overview:



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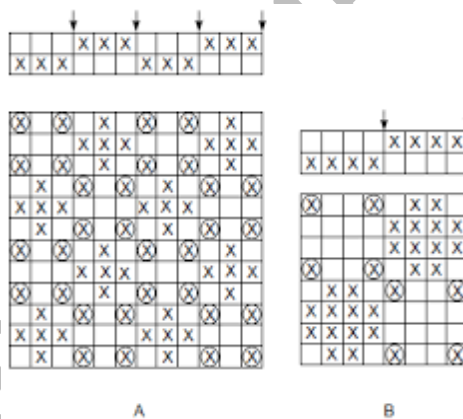


1. **Warp preparation:** The warp yarns are prepared by stretching and tensioning them on the loom.
2. **Weft insertion:** The weft yarns are inserted into the warp yarns using a specific type of shuttle or weaving needle.
3. **Pick-up stick:** A pick-up stick is used to select and lift specific warp yarns, creating the open, mesh-like appearance of Mock Leno weave.

Uses of Mock Leno Weave

Mock Leno weave is used in a variety of applications, including:

- **Fashion fabrics:** Mock Leno weave is often used to create lightweight, breathable fabrics for fashion garments.
- **Home decor:** Mock Leno weave can be used to create unique and textured home decor items, such as throw pillows and wall hangings.
- **Technical textiles:** Mock Leno weave can be used to create technical textiles, such as filtration fabrics and medical textiles.





UNIT-III

FIGURED FABRIC

Extra warp and extra weft figuring:

Extra warp figuring:

Extra Warp Figuring (EWF) in fabric structure refers to a weaving technique where additional warp yarns are introduced to create specific designs, patterns, or textures.

Characteristics:

1. Additional warp yarns beyond the ground weave
2. Creates raised or embossed designs
3. Can produce various textures and effects
4. Often used for decorative or functional purposes

Types of EWF:

1. Float weaving: Warp yarns float over weft yarns
2. Satin weaving: Warp yarns form satin-like patterns
3. Jacquard weaving: Complex designs using extra warp yarns
4. Brocade weaving: Raised patterns using extra warp yarns

Fabric Properties:

1. Increased texture and dimension
2. Enhanced visual interest
3. Improved durability (depending on yarns used)
4. Potential for moisture-wicking properties

Applications:

1. Upholstery and interior textiles
2. Fashion fabrics (evening wear, couture)
3. Technical textiles (medical, industrial)
4. Home decor (table runners, wall coverings)



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Design Considerations:

1. Yarn selection (type, color, texture)
2. Weave density and pattern
3. Figure placement and frequency
4. Integration with ground weave

Weaving Techniques:

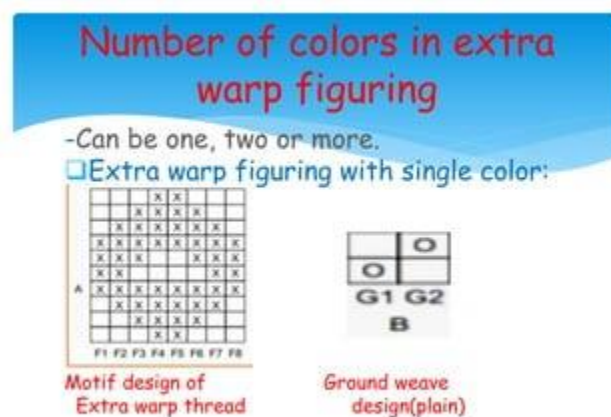
1. Handloom weaving
2. Power loom weaving
3. Jacquard loom weaving
4. Computer-aided design (CAD) software

Benefits:

1. Unique textile designs
2. Enhanced aesthetic appeal
3. Increased fabric value
4. Potential for brand differentiation

Challenges:

1. Increased production complexity
2. Higher material costs
3. Requires skilled labor
4. Potential for yarn breakage





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Extra weft figuring:

Extra weft figuring involves inserting additional weft yarns or threads into the fabric during the weaving process to create specific designs or patterns. These extra wefts are woven in a way that they don't follow the regular weft pattern, instead, they float on the surface of the fabric or form loops.

Types of Extra Weft Figuring:

There are several types of extra weft figuring techniques:

1. Floating weft: Extra weft yarns float on the surface of the fabric, creating designs or patterns.
2. Loop weft: Extra weft yarns form loops on the fabric's surface.
3. Pile weft: Extra weft yarns create a pile or plush effect.

Fabric Structure:

Extra weft figuring alters the fabric's structure by:

1. Adding texture: Creates texture and dimension.
2. Forming patterns: Designs or patterns are formed by the extra weft yarns.
3. Increasing thickness: Adds thickness to the fabric.

Applications:

Extra weft figuring is used in various textile applications:

1. Upholstery fabrics
2. Curtains and drapes
3. Fashion fabrics
4. Carpeting
5. Specialty textiles (e.g., lace, embroidery)

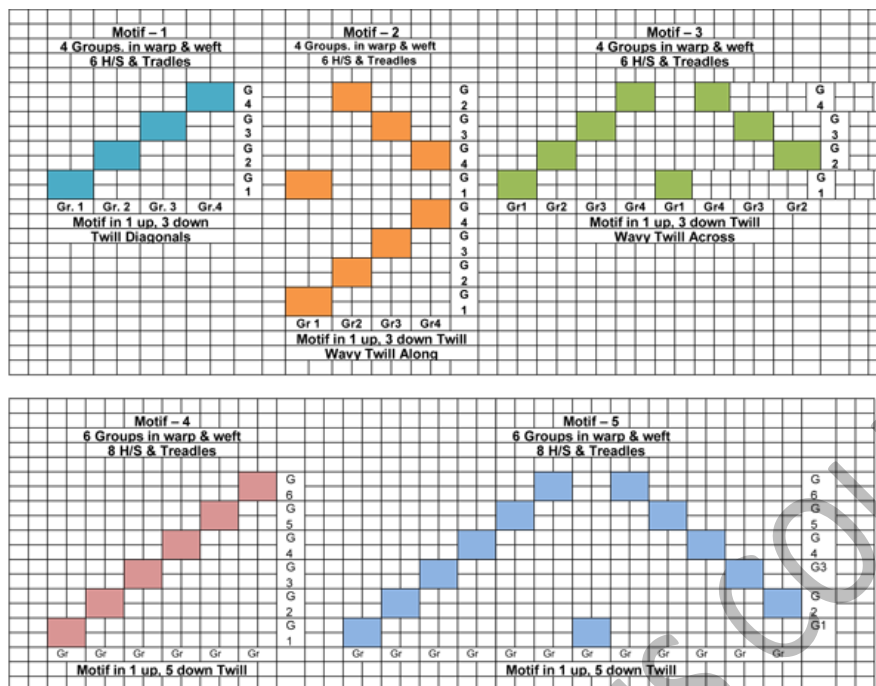
Benefits:

Extra weft figuring offers several benefits:

1. Aesthetics: Enhances visual appeal.
2. Durability: Adds strength and resistance.
3. Functionality: Can provide insulation or cushioning.



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Single and two colours:

Single and two-color figured fabrics refer to textiles with patterns created using weaving or printing techniques, typically featuring one or two dominant colors. Here are some examples and characteristics:

Single-Color Figured Fabrics:

1. Brocade: A rich, raised pattern fabric with gold or silver thread designs.
2. Velvet: Soft, plush fabric with a raised pile creating a dimensional effect.
3. Jacquard: Intricately woven fabric with complex designs using a special loom.

Two-Color Figured Fabrics:

1. Tartan: A classic Scottish plaid pattern featuring crisscrossing stripes.
2. Gingham: A checked or plaid fabric with alternating light and dark squares.
3. Houndstooth: Broken checks or distorted plaids, often in contrasting colors.

Planting:

Planting in figured fabrics refers to a traditional embroidery or needlework technique where designs or motifs are appliquéd or embroidered onto a fabric with a prominent pattern, such as



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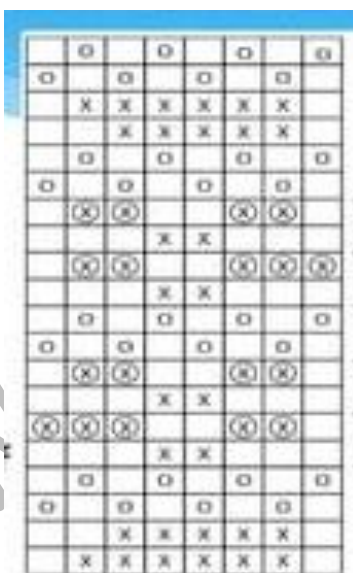


stripes, plaids, or damasks. The goal is to integrate the design seamlessly into the existing fabric pattern, creating a visually appealing and harmonious effect.

There are different methods for planting designs in figured fabrics, including:

1. Appliqué: Cutting out shapes or designs from one fabric and sewing them onto another.
2. Embroidery: Using thread to create designs or motifs directly on the fabric.
3. Needleweaving: Weaving threads to create intricate designs.

Planting in figured fabrics requires careful planning, precision and attention to detail to ensure the design complements the underlying fabric pattern. This technique is often used in various forms of needlework, such as quilting, tapestry, or couture embroidery.



Backed fabric:

In figured fabrics, backed fabric refers to a specific type of fabric construction where two layers of fabric are combined.

The face or outer layer typically features a design or pattern, known as the "figured" aspect. Meanwhile, the backing layer serves as a support or stabilizer, usually made from a simpler, less expensive material.

Here are some key aspects of backed fabric in figured fabrics:

Types of backing:

1. Woven backing: A woven fabric, often of simpler design and less expensive than the face fabric.
2. Knitted backing: A knitted fabric used for stretchy or flexible figured fabrics.



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3. Fusible backing: A thin layer of adhesive that bonds the face and backing fabrics.

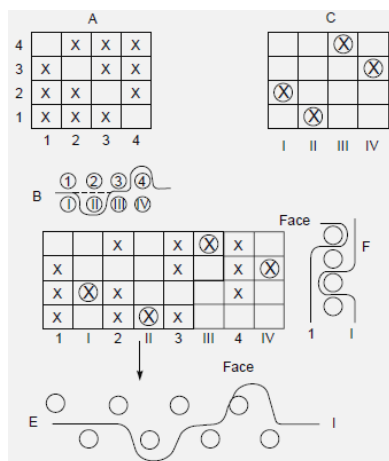
Functions of backing:

1. Stability: Provides structural support to prevent stretching or distortion.
2. Concealment: Hides wrong sides or seams of the face fabric.
3. Economy: Reduces material costs by using less expensive fabric for the backing.

Common applications:

1. Upholstery: Backed fabrics are often used for furniture and car interiors.
2. Apparel: Lined garments, like coats and jackets.
3. Home decor: Drapes, curtains, and tablecloths.

Backed fabric construction enhances the overall durability and appearance of figured fabrics, making them suitable for various applications.



Warp and weft backed fabrics:

Warp backed fabrics:

Warp-backed fabrics, also known as warp-back or double-warp fabrics, are a type of fabric structure where two sets of warp yarns are used to create a fabric with distinct front and back sides. Here's a breakdown of this fabric structure:

Construction:

In warp-backed fabrics, two separate sets of warp yarns are woven together with a single set of weft yarns.



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Key Characteristics:

1. Double warp layers: Two distinct layers of warp yarns, one for the face (front) and one for the back.
2. Separate weave: Each warp layer has its own weave pattern.
3. Distinct front and back: The face and back of the fabric have different textures, colors, or patterns.
4. Increased thickness: Warp-backed fabrics are generally thicker and more durable.

Advantages:

1. Enhanced stability
2. Improved durability
3. Reduced distortion
4. Increased versatility

Common Applications:

1. Upholstery fabric
2. Heavy-duty industrial textiles
3. Outdoor furniture
4. Specialty clothing (e.g., reversible jackets)

Examples of Warp-Backed Fabrics:

1. Double-weave cotton fabrics
2. Reversible tweed fabrics
3. Jacquard-woven fabrics

Weft backed fabrics:

Weft-backed fabrics, also known as double-weave or backed fabrics, are a type of fabric structure where an additional layer of fabric, called the backing or weft backing, is woven or attached to the primary fabric.

Construction:

In a weft-backed fabric, the primary fabric has a conventional warp and weft structure. The backing layer, which is usually a lightweight fabric, is woven or attached to the primary fabric's weft yarns. This creates a sandwich-like structure with two layers of fabric.



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Characteristics:

Weft-backed fabrics exhibit the following characteristics:

1. Added stability: The backing layer provides additional stability and prevents stretching or distortion of the primary fabric.
2. Improved durability: The double-layer structure enhances the fabric's resistance to wear and tear.
3. Reduced fray: The backing layer helps minimize fraying of the primary fabric.
4. Enhanced insulation: The additional layer can provide improved thermal insulation.
5. Smooth surface: The backing layer can create a smooth surface, ideal for printing, coating, or laminating.

Types of weft backing:

There are several methods to attach the backing layer:

1. Woven backing: The backing layer is woven simultaneously with the primary fabric.
2. Attached backing: The backing layer is woven separately and then attached to the primary fabric using adhesives, stitching, or heat sealing.
3. Knotting: The backing yarns are knotted to the primary fabric's weft yarns.

Applications:

Weft-backed fabrics are used in various applications:

1. Upholstery: Furniture, car seats, and interior design.
2. Technical textiles: Industrial, medical, and agricultural applications.
3. Tent and awning: Outdoor fabrics requiring stability and durability.
4. Geotextiles: Civil engineering and construction projects.
5. Military: Specialized fabrics for uniforms, gear, and equipment.

Advantages and limitations:**Advantages:**

- Enhanced durability and stability
- Improved insulation and smooth surface
- Reduced fray and stretching



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Limitations:

- Increased cost due to additional material and manufacturing process
- Potential for delamination or separation of layers
- Limited flexibility and drape

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UNIT-IV

PILE FABRICS

Pile fabric refers to a type of textile that has a surface characterized by raised loops or tufts of yarn, creating a soft, plush, and often fuzzy texture. The pile can be made from various materials, such as cotton, wool, synthetic fibers, or blends.

Common characteristics of pile fabrics:

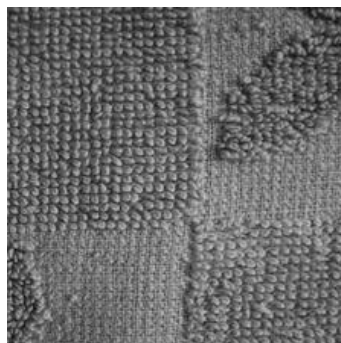
1. Softness: Pile fabrics are known for their exceptional softness and comfort.
2. Texture: The raised loops or tufts create a unique texture that can vary in density and height.
3. Insulation: Pile fabrics provide good insulation, making them suitable for cold-weather clothing and home textiles.
4. Durability: Pile fabrics can be prone to pilling (the formation of small balls of fiber) over time, but quality construction can minimize this.

Types of pile fabrics:

1. Velvet: A luxurious fabric with a dense, plush pile.
2. Fleece: A synthetic fabric with a thick, soft pile.
3. Terrycloth: A fabric with looped piles, often used for towels and robes.
4. Sherpa: A fabric with a thick, fuzzy pile, often used for jackets and blankets.
5. Chenille: A soft, fuzzy fabric with a raised pile.

Uses for pile fabrics:

1. Clothing: Coats, jackets, hoodies, sweatpants, and socks.
2. Home textiles: Blankets, throws, pillows, and upholstery.
3. Furniture: Upholstered furniture, ottomans, and footstools.





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Formation of Pile:

Pile fabrics are textiles with a raised surface, created by tufts of yarn or fibers standing upright from the fabric's base. The formation of pile in pile fabrics involves several key steps and techniques:

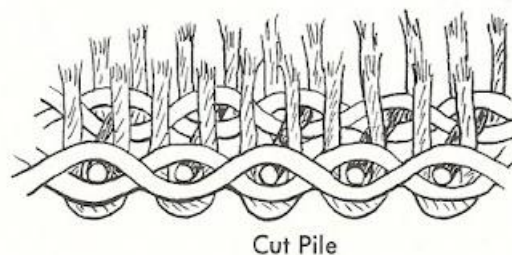
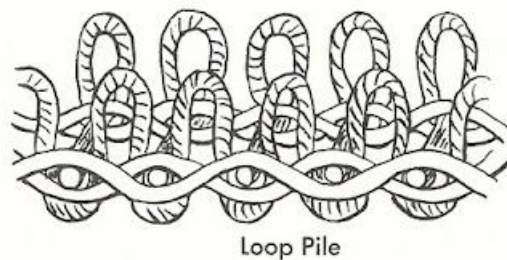
Types of Pile Fabrics

1. Cut Pile: Yarns are cut to create the pile, resulting in a soft and plush texture.
2. Loop Pile: Uncut yarns form loops, creating a durable and flexible texture.
3. Velvet Pile: A specific type of cut pile with a smooth, luxurious surface.

Manufacturing Process

1. Primary Backing Fabric Production: The base fabric is woven or knitted.
2. Yarn Preparation: Pile yarns are wound onto spools.
3. Tufting: A tufting machine inserts yarns into the backing fabric, creating the pile.
4. Cutting or Looping: Depending on the desired pile type, yarns are either cut or left as loops.
5. Finishing Treatments: Chemical or mechanical treatments enhance texture, density and stability.

Understanding the specifics of pile fabric formation helps in choosing the right fabric for various applications, from clothing to upholstery.





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Weft pile:

Weft pile is one of two primary pile constructions:

1. Weft pile (also known as "float pile" or "weft-loop pile")

- * Pile yarns are inserted in the weft direction (across the fabric).
- * Each weft yarn forms a loop or float on the face of the fabric.
- * The loops can be cut or left uncut, depending on the desired texture.

Advantages:

1. Soft, plush texture
2. Less expensive to produce than warp pile
3. Suitable for thick, bulky yarns
4. Often used for decorative fabrics, upholstery, and bedding

Disadvantages:

1. Less durable than warp pile
2. More prone to pilling or snagging
3. May lose shape or become distorted

Common examples of weft pile fabrics include:

1. Terry cloth
2. Velour
3. Fleece
4. Plush fabrics
5. Chenille fabrics

Plain back:

In textile manufacturing, "plain back" refers to a type of fabric construction where the reverse side of the fabric (the "back") has a plain, unpatterned weave.

In pile fabrics, such as velvet, plush, or fleece, the front side of the fabric has a raised pile surface, which creates the soft, textured, and often luxurious feel. However, the back of the fabric, also known as the "wrong side," typically has a simpler weave.



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There are several types of plain back pile fabrics:

Characteristics:

1. Single-side pile: The pile is only on one side of the fabric, with a plain weave on the reverse.
2. Plain weave backing: The back of the fabric has a simple plain weave, often with a different yarn or thread count than the front.
3. No backing pile: There are no piles on the reverse side of the fabric.

Advantages:

1. Cost-effective: Producing plain back pile fabrics can be less expensive than creating double-sided pile fabrics.
2. Easier manufacturing: Simplified construction makes production more efficient.
3. Lightweight: Plain back fabrics are often lighter than double-sided pile fabrics.

Common uses:

1. Upholstery: Plain back pile fabrics are often used for furniture upholstery, where the back of the fabric won't be visible.
2. Apparel: Some clothing items, like jackets or coats, may use plain back pile fabrics for lining or interlining.
3. Home decor: Tablecloths, bedspreads, or other decorative items may feature plain back pile fabrics.

Examples of plain back pile fabrics:

1. Velvet
2. Plush
3. Fleece
4. Terry cloth (with a plain back)
5. Cut pile fabrics (e.g., cut velvet, cut plush)

Twill back:

Twill back in pile fabrics refers to a specific type of fabric construction where the back of the fabric has a twill weave, while the face of the fabric has a pile surface. Here's what it entails:



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Twill Back:

- The back of the fabric features a twill weave, which is a diagonal rib weave.
- The twill weave provides stability, durability, and prevents the pile from sagging or losing its shape.
- The twill back also helps to hide the base fabric, creating a cleaner appearance.

Pile Fabric Characteristics:

- Length: The length of the pile can vary depending on the intended use of the fabric. Common pile lengths include:
 - Low pile (1/16 inch / 1.5 mm): for clothing, upholstery, and interior textiles.
 - Medium pile (1/8 inch / 3 mm): for carpets, rugs, and heavy-duty upholstery.
 - High pile (1/4 inch / 6 mm): for plush toys, decorative items, and specialized textiles.
- Density: The density of the pile refers to how closely packed the fibers are. Higher density piles are more durable and less prone to shedding.
 - Low density: 10,000-20,000 fibers per square inch.
 - Medium density: 20,000-40,000 fibers per square inch.
 - High density: 40,000-60,000 fibers per square inch.
- Fastness of Pile: Fastness refers to how securely the pile fibers are attached to the base fabric.
 - Low fastness: pile fibers may shed or come loose easily.
 - Medium fastness: pile fibers are moderately secure.
 - High fastness: pile fibers are tightly anchored, resistant to shedding.

Factors influencing the fastness of pile include:

1. Type of fiber (natural, synthetic, or blended).
2. Fiber length and diameter.
3. Pile construction (e.g., cut pile, loop pile).
4. Adhesive or bonding method.
5. Base fabric weave and density.



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Examples of fabrics with twill back and pile construction include:

1. Velvet
2. Plush
3. Fleece
4. Corduroy
5. Chenille

These fabrics are commonly used in various applications, such as:

1. Upholstery
2. Clothing (coats, jackets)
3. Home textiles (bedding, curtains)
4. Carpets and rugs
5. Decorative items (toys, accessories)

Corduroy weft plush:

Corduroy:

Corduroy is a type of textile with raised stripes, called "wales," that run parallel to each other. The fabric has a soft, ribbed, or ridged appearance. Corduroy is made from cotton, polyester, or a blend, using a float weave or warp-faced fabric construction.

Weft plush:

Weft plush, also known as weft-piled fabric, is a type of plush fabric constructed by weaving or knitting yarns to create a dense, soft, and plush pile. In weft plush, the yarns run across the fabric (weft direction) rather than lengthwise (warp direction). This creates a fabric with a smooth surface and a soft, velvety texture.

Pile fabrics:

Pile fabrics are characterized by an additional layer of yarns or fibers that stand upright from the fabric's base layer, creating a textured surface. There are several types of pile fabrics, including:

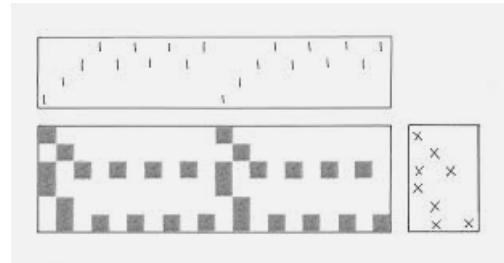
- Cut pile (e.g., velvet)
- Uncut pile (e.g., loop pile or terrycloth)
- Stretch pile



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These fabrics are often used in upholstery, clothing, and home textiles, offering durability, comfort, and aesthetic appeal.



Warp pile:

Warp pile refers to a type of textile or carpet construction where the pile (the surface fibers) is created by weaving or tufting the yarns in a specific way.

In warp pile construction:

1. The foundation of the fabric or carpet consists of two sets of yarns: warp (lengthwise) and weft (crosswise).
2. The warp yarns are stretched on a loom before weaving or tufting.
3. The pile yarns are woven or tufted through the warp yarns, creating the surface texture.
4. The weft yarns are then passed through the warp yarns to secure the pile in place.

Characteristics of warp pile:

- Durable and resistant to wear
- Can produce a wide range of textures and patterns
- Often used for high-traffic areas or heavy-duty applications
- Can be made from various fibers like wool, nylon, or polyester

Examples of warp pile textiles include:

- Wilton carpets
- Velvet fabrics
- Tufted carpets
- Upholstery fabrics



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Terry pile:

Terry pile is a type of pile fabric characterized by uncut loops on both sides of the fabric. These loops create a soft, absorbent, and plush texture, often used in towels, robes, and other bath accessories.

Here's a breakdown of terry pile fabric:

Key Features:

1. **Looped piles:** Terry pile fabric has uncut loops on both sides, creating a dense and absorbent texture.
2. **Softness:** Terry pile fabrics are renowned for their softness and comfort against the skin.
3. **Absorbency:** The looped piles provide excellent absorbency, making them ideal for bath towels and robes.
4. **Durability:** Terry pile fabrics are generally durable and resistant to wear and tear.

Common Uses:

1. Towels (bath, beach, and hand towels)
2. Robes
3. Bath mats
4. Washcloths
5. Baby blankets and clothing

Variations:

1. **French terry:** A type of terry pile fabric with a softer, more delicate texture.
2. **Turkish terry:** Known for its extra-absorbent and plush texture.

Terry pile fabrics are popular for their comfort, absorbency, and durability, making them a staple in many households.

With the aid of wires:

In the context of terry pile fabrics, wires refer to thin, flexible metal rods or wires that are inserted into the fabric during the weaving or knitting process. These wires are typically made of stainless steel, nylon, or polyester.



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Functions of wires in terry pile fabrics:

The wires serve several purposes:

1. Pile formation: Wires help create and maintain the looped or tufted pile structure of the fabric. They are inserted into the fabric to form the loops, which are then cut or left intact to create the desired texture.
2. Pile height control: Wires regulate the height of the pile, ensuring consistency throughout the fabric.
3. Fabric stability: Wires provide stability to the fabric, preventing excessive stretching or distortion.
4. Absorbency enhancement: The wires help maintain the fabric's absorbency by keeping the pile loops open, allowing water to penetrate easily.
5. Durability: Wires contribute to the fabric's durability by reducing the likelihood of pile collapse or flattening.

Types of wires used:

1. Loop wires: Used to create looped piles.
2. Cut wires: Used to create cut piles.
3. Stretch wires: Used to provide additional stretch to the fabric.

Benefits of using wires in terry pile fabrics:

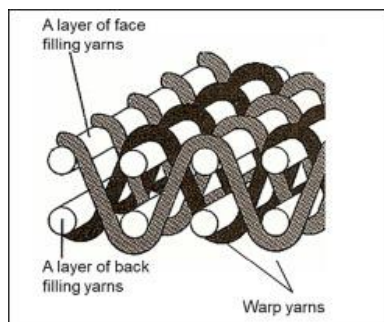
1. Improved absorbency
2. Enhanced durability
3. Softness and texture
4. Consistent pile height
5. Reduced shrinkage

Common applications of terry pile fabrics with wires:

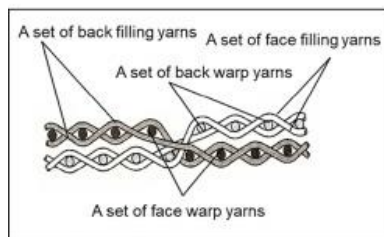
1. Towels
2. Bathrobes
3. Terry cloth clothing
4. Sports clothing
5. Upholstery fabric



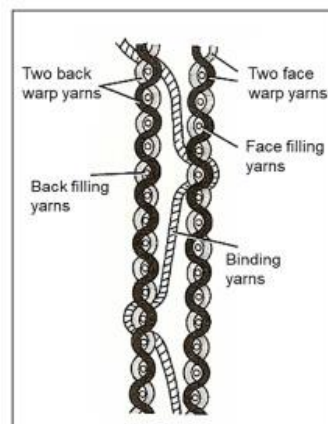
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(A) Double-faced construction



(B) Double-weave (pocket) construction



(C) Double-cloth construction

Face to face warp pile:

Face-to-face warp pile fabric, also known as double-face or reversible pile fabric, is a type of textile fabric with piles on both sides. This unique construction provides several benefits and distinctive characteristics.

Key Features:

1. Reversibility: Both sides of the fabric have piles, making it reversible.
2. Double-layer warp: Two sets of warp yarns create the face and back of the fabric.
3. Pile formation: The piles are formed by looping or cutting the warp yarns.

Advantages:

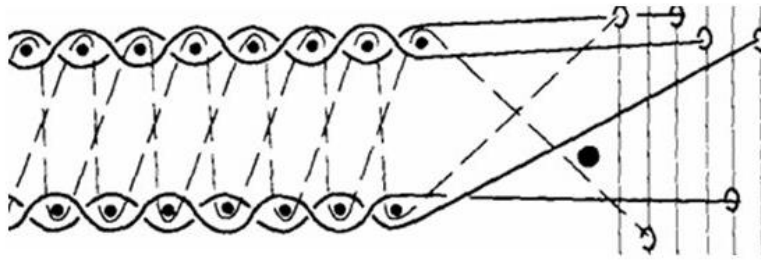
1. Durability: Increased resistance to wear and tear.
2. Reversibility: Can be used on both sides, extending fabric life.
3. Versatility: Suitable for various applications, such as upholstery, clothing, and textiles.

Common Applications:

1. Upholstery fabric
2. Clothing (e.g., jackets, coats)
3. Textiles for furniture and interior design



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UNIT-V

Double cloth:

Double cloth is a type of fabric structure where two separate layers of fabric are woven simultaneously, one on top of the other, using the same set of warp yarns. This construction technique creates a reversible fabric with distinct right and wrong sides, each having its own distinct texture and appearance.

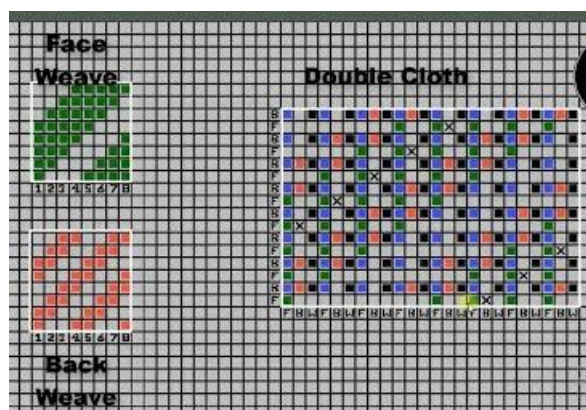
Some key characteristics of double cloth fabrics include:

1. Reversibility: Double cloth fabrics have two distinct sides.
2. Thickness: Double cloth fabrics are thicker and more durable.
3. Insulation: Provides thermal insulation due to trapped air.
4. Texture: Each side can have different textures and patterns.
5. Stability: Reduced stretching or distortion.

Double cloth fabrics are commonly used in various applications:

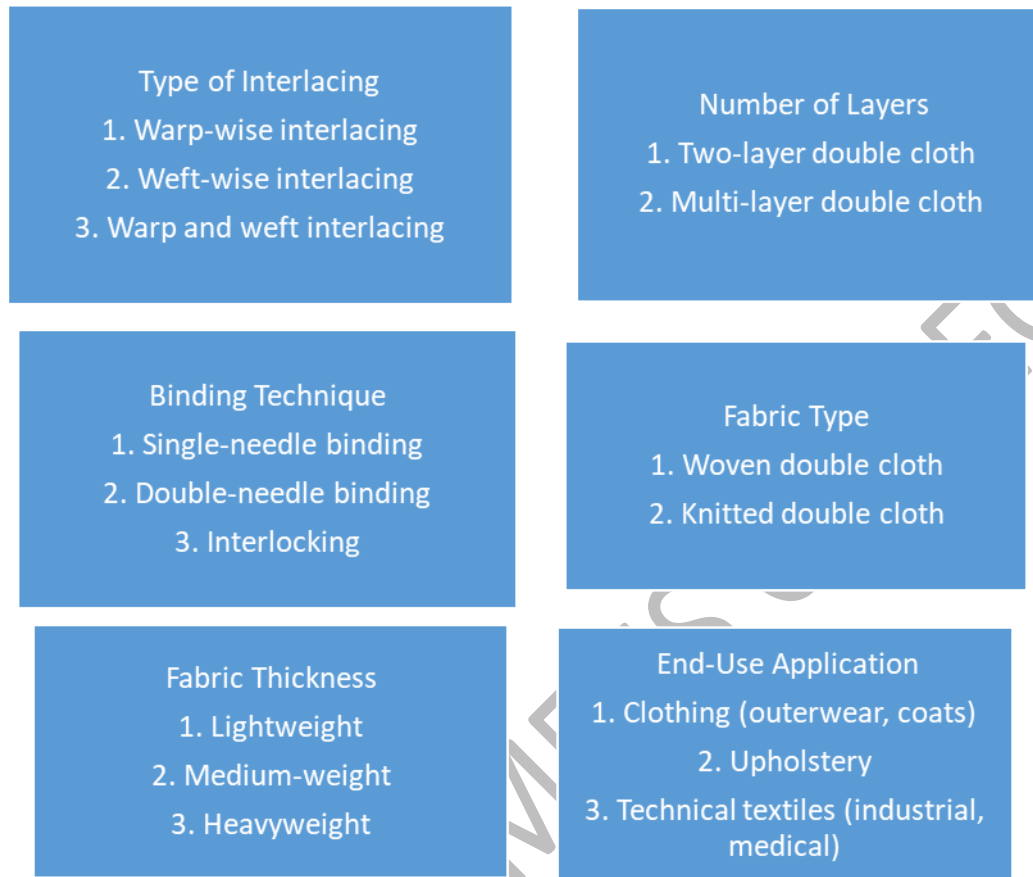
1. Outerwear (coats, jackets)
2. Upholstery
3. Luggage
4. Home decor (curtains, tablecloths)
5. Technical textiles (insulating materials)

Classification of double cloth:





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Self stitched:

In self-stitched double cloth fabric, the two layers are interconnected by weaving the yarns in a way that creates a stitch-like effect. This eliminates the need for additional stitching or sewing to join the layers together.

Characteristics:

- 1. Integrated layers:** The two layers are woven together, eliminating the need for separate stitching.
- 2. No additional thread:** The stitching effect is achieved through the weaving process, without extra thread.
- 3. Reinforced structure:** Self-stitching adds strength and stability to the fabric.

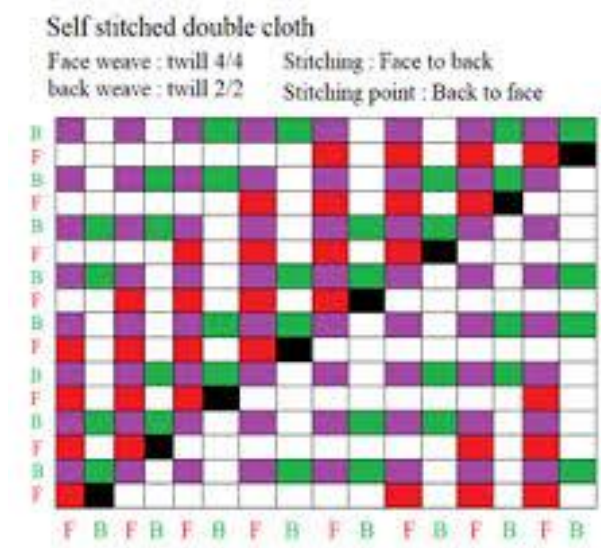
Self-stitched double cloth fabrics are often used in applications where durability and stability are essential, such as:



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1. Workwear
2. Outdoor gear
3. Upholstery
4. Technical textiles



Face to back:

In double cloth fabric structure, "face-to-back" refers to a specific arrangement where:

Face: The outer, visible layer of the fabric (often with a desired design, texture, or color).

Back: The inner layer, typically hidden from view.

In face-to-back construction:

Characteristics:

1. **Distinct layers:** Two separate layers, one visible (face) and one hidden (back).
2. **Reversed orientation:** The back layer is woven in the opposite direction of the face layer.
3. **Integrating yarns:** Yarns from both layers interlace at specific points.

Benefits:

1. **Concealed seams:** No visible seams, creating a clean finish.
2. **Enhanced stability:** Interconnected layers provide added strength.
3. **Reduced fraying:** Enclosed edges minimize fraying.



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Applications:

1. Coats and jackets
2. Upholstery
3. Bags and luggage
4. Technical textiles

Face-to-back double cloth fabrics offer durability, stability, and aesthetic appeal.

Back to face:

In double cloth fabric structure, "back-to-face" refers to a specific arrangement where:

Back: The inner layer.

Face: The outer, visible layer.

In back-to-face construction:

Characteristics:

1. Interconnected layers: Yarns from the back layer pass through to the face layer.
2. Alternating orientation: Back and face layers alternate in orientation.
3. Integrated thickness: Yarns from both layers combine for added thickness.

Benefits:

1. Increased stability: Interconnected layers enhance fabric stability.
2. Improved durability: Alternating orientation reduces wear.
3. Textural interest: Visible yarn crossover creates visual appeal.

Applications:

1. Coats and jackets
2. Upholstery
3. Bags and luggage
4. Home decor

Back-to-face double cloth fabrics offer durability, stability, and aesthetic appeal.



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Both centre stitched:

"Both centre stitched" refers to a specific arrangement where:

Two Layers: Face and back layers are woven simultaneously.

Centre Stitching: Both layers are stitched together at the centre, creating a shared seam.

Characteristics:

1. Shared seam: A single stitch line connects both layers.
2. Interconnected layers: Face and back layers are joined at the centre.
3. Reinforced stability: Centre stitching adds strength.

Benefits:

1. Enhanced durability: Centre stitching prevents layer shifting.
2. Improved stability: Shared seam reinforces fabric structure.
3. Reduced bulk: Single stitch line minimizes thickness.

Applications:

1. Coats and jackets
2. Upholstery
3. Bags and luggage
4. Technical textiles
5. Medical textiles

Both centre stitched double cloth fabrics offer durability, stability, and versatility.

Warp and Weft:

Warp and Weft Stitching: Both warp (lengthwise) and weft (widthwise) yarns stitch the face and back layers together at the centre.

Characteristics:

1. Dual-directional stitching: Warp and weft yarns create intersecting stitch lines.
2. Reinforced structure: Centre stitching in both directions enhances stability.
3. Integrated layers: Face and back layers are securely joined.



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Benefits:

1. Maximum durability: Dual-directional stitching prevents layer shifting.
2. Enhanced stability: Interconnected warp and weft yarns reinforce fabric.
3. Reduced distortion: Centre stitching minimizes fabric deformation.

Applications:

1. Heavy-duty workwear
2. Outdoor gear (tents, awnings)
3. Upholstery (furniture, car seats)
4. Technical textiles (filtration, composites)
5. Medical textiles (implants, prosthetics)

Both centre stitched warp and weft double cloth fabrics offer:

1. High performance
2. Enhanced structural integrity
3. Versatility for demanding applications

Inter changing double cloth:

"Interchanging double cloth" refers to a specific fabric structure where:

Alternating Layers: Two distinct layers, face and back, interchange or alternate in a regular pattern.

Characteristics:

1. Interchanging yarns: Face and back layer yarns alternate in a specific sequence.
2. Alternating picks: Weft yarns from each layer intersect in a regular pattern.
3. Integrated thickness: Yarns from both layers combine for added thickness.

Types of Interchanging Double Cloth:

1. Warp-interchanging: Alternating warp yarns from face and back layers.
2. Weft-interchanging: Alternating weft yarns from face and back layers.
3. Warp-and-weft interchanging: Alternating both warp and weft yarns.



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Benefits:

1. Enhanced stability: Interchanging layers provide added strength.
2. Improved durability: Alternating yarns reduce wear.
3. Visual interest: Interchanging layers create subtle texture and pattern.

Applications:

1. Upholstery
2. Bags and luggage
3. Technical textiles
4. Home decor
5. Fashion textiles (coats, jackets)

Interchanging double cloth fabrics offer:

1. Unique texture
2. Enhanced performance
3. Versatility for various applications

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