

Chapter- 6:.....

Weave Designing

6.1. INTRODUCTION

Woven Fabrics are made up of vertical (Length wise) yarns called **Warp** and horizontal (width wise) yarns called **Weft**. These threads are interlaced with one another in many different ways and each class of structure forms the **Design**. The warp threads are also known individually as Ends and the weft threads are known as **Picks or Filling**.

The woven structures are divided into two major categories:

Simple Structure:

When the Ends and Pick intersect with one another at right angle and are respectively parallel to each other, then the structure is called as Simple Structure. In these structures there is only one series of ends and one series of picks and they equally contribute to performance, utility and aesthetic appearance.

Compound Structure:

In this structure, there are more than one series of ends and picks and some of which will be responsible for performance and some would be employed purely for the ornamentation purpose. They may also not be parallel to each other.

6.2. METHOD OF FABRIC REPRESENTATION

The unit of a woven fabric is the point of intersection of warp and weft. This intersection is of two types:

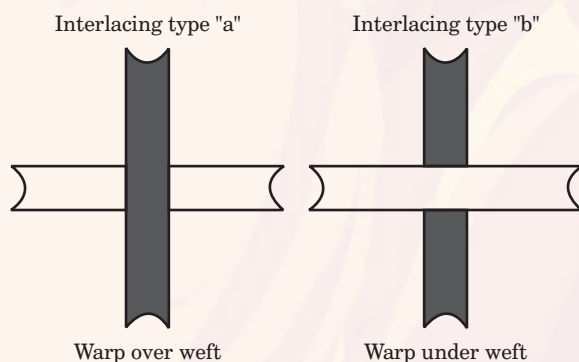


Fig 6.1: Condition 1: Warp over Weft
Condition 2: Warp under Weft



- ❖ End raised over the Pick to obtain the intersection
- ❖ End lowered under the pick to obtain the intersection

A number of different intersections combine to make a unit of a **design** or one **Repeat of the weave**. A simplest design that can make a cloth requires two ends and two picks as a repeat of a design. As the Fig: 6.2 represents one unit of a design (shown in red border), the adjoining units are identical to the first one. Therefore, usually it is sufficient to represent the interlacing pattern of the design as one Repeat.



Fig 6.2: One unit of a Design
(Red outline)



Fig 6.3: Interlacing Diagram

The design depiction as shown in the Fig 6.3 represents warp 1 going over weft 1 and below weft2, and warp2 going below weft1 and above weft2. This is called as an Interlacing Diagram. They are very laborious to prepare and hence are generally not employed especially when large designs have to be made.

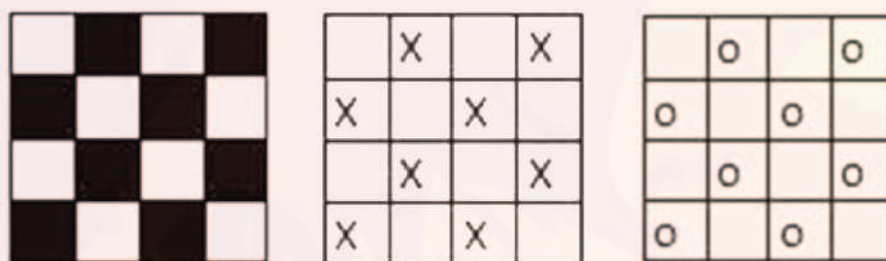


Fig 6.4: Design on Design Paper / Point Paper

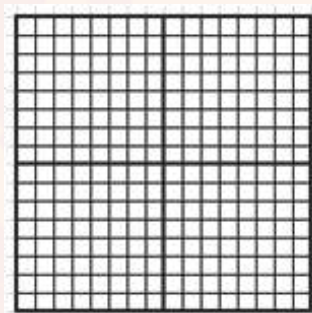


Fig 6.5: Design Paper / Point Paper /Squared Paper

The common method used for design depiction is **Design Paper** (Point Paper, Squared Paper) as shown in Fig 6.5. This offers an easier method of representing the interlacing. The standard textile design paper is ruled in groups of 8 x 8, these being separated by bold lines. Each vertical space represents warp end and each horizontal space represents weft end, therefore, each square grid represents intersection of an end and a pick. A mark in this square indicates "Warp over weft" and a blank indicates "Warp under weft". Any kind of mark can be used (X, O, etc.) and sometimes several types of marks are used simultaneously in one design to indicate different colour or thickness of yarn. (Example Fig 6.4). Whichever marks are used it must be remembered that Point Paper is not a general representation of the design but is a specified plan of the order of thread interlacing, and that each square is the point of intersection of a warp end and a weft pick. To interlace, the threads must cross each other and therefore in one complete repeat of a design there must be at least one mark and at least one blank in every vertical space and every horizontal space. Otherwise the threads will not interlace and merely form loose floats which do not become woven into the fabric (Fig 6.3).



Fig 6.6: Wrong Design - Warp 1 and Warp 5 are forming loose floats



Fig 6.7: Faulty Repeat Unit - one complete repeat must be in a rectangular form

Any weave repeats on a definite number of ends and picks. Generally, one repeat unit is indicated on the design paper. The ends and pick in a repeating unit may be equal or unequal but a complete repeat must be in a rectangular form as the threads interlace at right angle. (Fig: 6.7). If a repeat unit extends over 8 ends and 8 picks, every portion must extend over 8 ends and 8 picks. It is necessary for marks and blanks to join correctly at all the sides of a design, as when the pattern repeats to make a cloth, an unbroken weave results. An incomplete repeat or faulty repeat will result in faulty construction of a fabric.



However, a weave can start from different positions, as this does not affect the appearance of the fabric, although one repeat may appear to look different. (Fig 6.8a and 6.8b)

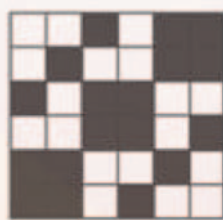


Fig: 6.8a

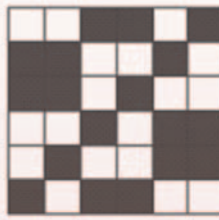


Fig: 6.8b

Same weave but the starting position is different

6.3. CONSTRUCTION OF DRAFTS AND PEG PLANS

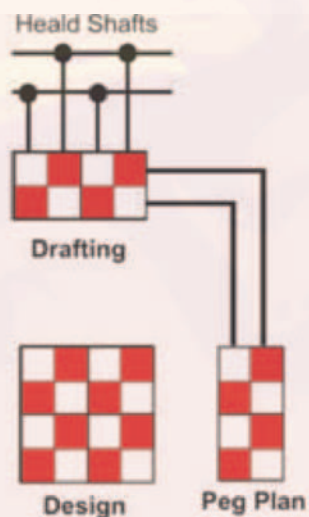


Fig 6.9: Design, Draft and Peg Plan

A Draft indicates the number of Heald Shafts to be used to produce a given design and the order in which the warp ends are to be threaded through the heald eyes of the healds.

There are various methods for indicating the draft but the most common and convenient method is the use of design paper. In this method the draft is drawn exactly over the design and the horizontal spaces represent the healds and the vertical space indicates each corresponding warp end (Fig.: 6.9).

The principle of drafting a pattern is that all the ends working in different orders require separate heald shafts. This means that as a heald shaft is an entity, therefore all the ends passing through a given heald shaft will work alike. The converse of this rule may not always be true as occasionally for convenience and better performance the ends that are working alike are passed through different healds. It may be noted that number of picks in a repeat is of no consequence for a drafting pattern, this will be considered in Lifting Plan.

The Lifting Plan or the Peg Plan defines the selection of heald shafts to be raised or lowered on each successive insertion of pick.

The peg plan is drawn alongside the design. The numbered vertical spaces of the peg plan correspond with the numbered heald shafts in the draft and the number of horizontal spaces is equal to the picks in the design. The vertical space 1 in the peg plan indicates how the first heald will be operated; the numbered 2, the second heald and so on. The plan further shows which heald shafts will be raised and lowered on successive picks. Thus the diagram indicated that on first pick the healds 1 is raised and 2 are lowered; on second pick heald 2 is raised and heald 1 is lowered; on third pick again healds 1 is raised and 2 are lowered and on fourth pick heald 2 is raised and 1 is lowered.

6.4. METHOD OF CONSTRUCTION

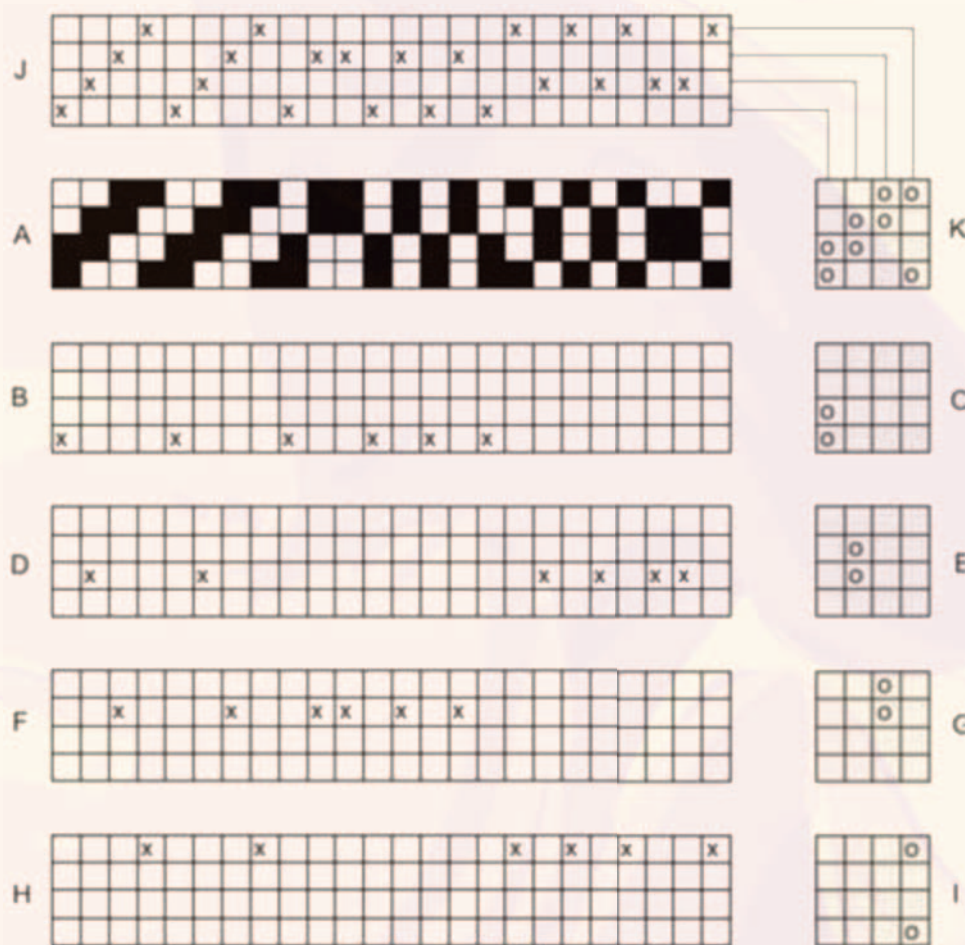


Fig 6.10: Step by step Method of Constructing Draft and Peg Plan from the given Design

The draft is constructed by following rule:

- ❖ All the ends in a design which work alike are drawn through the same heald shaft
- ❖ The ends which are working differently from each other are drawn on different healds.
- ❖ Therefore, the number of heald shafts required in a repeat of a design is equal to the threads in the design that are working differently from each other.

Steps for constructing the Draft and Peg Plan for a Design:

- ❖ The first end is indicated on first heald,
- ❖ Then all the other ends that are working like first end are also indicated in First Heald (Fig 6.10B).
- ❖ The working of first heald is copied from the design to the 1st vertical space of the lifting plan (Fig 6.10C)
- ❖ The next end that works differently from the first end, is indicated on second heald
- ❖ Then the ends which work like this end are also indicated on the second heald (Fig 6.10D).
- ❖ The working of second heald is then copied from the design to the 2nd vertical space of the lifting plan (Fig 6.10E).
- ❖ The process is continued till all the ends in the design have been allocated heald shafts.
- ❖ The final draft and lifting plan for the given design is indicated at Fig 6.10J and Fig 6.10K respectively.

6.5. RELATION BETWEEN DESIGN, DRAFT AND PEG PLAN

The three factors upon which the construction of any woven fabric depends - Design, Draft and Peg Plan- are very closely related to one another and are interdependent. So it is very important to possess a thorough knowledge of these. If any of the 2 components are known then the third can be built. . Example, if one knows the draft and the peg plan then a Design can be made. If design and peg plan are known then a draft can be constructed.

6.6. TYPES OF DRAFTING

Various systems of drafting are used for weaving of fabrics. Some are common and hence very important to understand, while some are formed as a natural outcome of following the design or the lifting plan for which they are arranged, ex Herringbone or reversed draft .The common drafting systems are as follows:

6.6.1. Straight Draft -



Fig 6.11: Straight Draft

This is the most common and simplest system of drafting. In this drafting, successive ends in the repeat of a design are drawn upon successive healds until the end of the repeat is reached. Therefore, in this system the number of heald shafts required is equal to number of ends in the repeat. For the designs with straight draft, the lifting plan is always the same as design (Fig 6.11)

6.6.2. Skip Draft -



Fig 6.11: Skip Draft

This is used for weaves which are very dense. Normally, these weaves require very less heald shafts but to reduce friction and rubbing between the ends and to avoid crowding of mails on the shaft, Skip draft is used wherein more healds are used than minimum required. Example, Plain weave requires only 2 shafts, but can be drawn on 4 or 6 shafts (Fig. 6.11)

6.6.3. Point Draft-

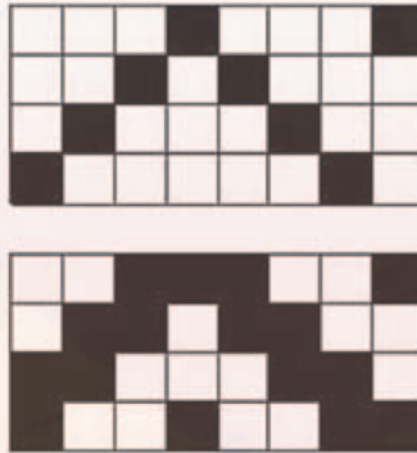


Fig 6.12: Point Draft

These are employed for weaves which are symmetrical about the center, example waved or diamond weave. Its advantage is that large effects can be produced on half the number of heald shafts than that required for straight draft (Fig. 6.12)

6.6.4. Sateen Draft -



Fig 6.13: Sateen Draft

The purpose of this draft is the same as skip draft i.e. to reduce friction between adjacent warps and overcrowding. But in sateen draft this is achieved by staggering the placement of ends. (Fig.6.13)

6.7. DENTING



Fig 6.14: Two ways of representing Denting Pattern

The warp sheet is spread out across width of the loom. The desired density of the warp ends (Ends per inch) is achieved by choosing the right reed and different orders of denting. Order of denting is drawing the ends through split between the two wires in the reed. The most frequent used order of denting is one, two, three or four ends per dent. This can be regular or same across the width of the fabric or sometimes irregular to emphasis certain design features. The Denting pattern is usually indicated below the design as shown in Fig.6.14.

Summary:

The Weave Designing chapter will introduce the student to the actual designing of a fabric. The fabric is designed by the warp and weft interlacing with each other in different ways. Each class of structure that is produced is called a Design. This chapter explains to the students in detail the process followed by a designer / weaver for designing of a fabric on paper before it is actual taken for weaving on loom. It explains the method of fabric representation on paper. The students at the end of the chapter will be able to construct the designs and show its drafting pattern and peg plan.

Unit - 2 Assignment

I. Fill in the Blanks

1. The Winding Process removes the faults in the yarn, like _____ places and _____ places.
2. The process of converting yarn from single end package to a multiple end package is called _____.
3. The two ways of warping process are _____ warping and _____ warping.
4. In _____ warping, the ends of the yarn are wrapped in single operation from the yarn packages onto the warp beam.
5. Sizing of the warp yarn is essential to _____ breakage of the yarn and thus production stops on the weaving machine.
6. The woven structures with more than one series of warp and weft are called _____ Structures.
7. The order in which the warp threads are threaded in the dents of the reed is known as _____.
8. _____ part is related to the Shedding Mechanism.
9. The three basic operations in woven cloth production are _____, _____ and _____.
10. The _____ is defined as the number of ends and picks in a unit of a fabric.
11. The self-finished edges of the fabric are called _____.
12. Dobby Shedding Mechanism is capable of controlling up to _____ healds.
13. The Shedding Mechanism can be achieved in three ways _____ Shedding, _____ Shedding and _____ Shedding.
14. _____ determines the rate at which the warp is fed forward and the tension of the warp yarn.
15. The three factors upon which the construction of any woven fabric depends are _____, _____ and _____.

II. True or False

1. Yarn Singeing is a compulsory process for fabric manufacturing.
2. After winding the overall strength of the yarn increases which causes less yarn breakage during weaving.
3. Weft yarns also require the Sizing Process.
4. All the ends in a design which work alike are drawn through different heald shafts.
5. Indirect Warping Process would be employed to make warp for Striped Shirt Fabric.
6. Reed Count is defined as number of dents in two inches.
7. Straight Draft is employed for weaves which are symmetrical about the center, example waved or diamond weave.
8. Drafting defines the selection of heald shafts to be raised or lowered on each successive insertion of pick.
9. A mark in this square of a Design Paper indicates "Warp over weft".
10. Picking can be done before Shedding.

III. Select the Correct Answer from the options given below (MCQs):

1. The "Pirning" process is need in
 - a. Handloom
 - b. Rapier
 - c. Projectile
 - d. Airjet
2. The Sizing Process is done after
 - a. Winding
 - b. Drawing-In
 - c. Warping
 - d. Creeling
3. The ends which are working differently from each other are drawn on _____ healds.
 - a. Different
 - b. Same
 - c. Common
 - d. Similar



4. The process of removing the size paste from the fabric after weaving is called
 - a. Resizing
 - b. Sizing
 - c. Degumming
 - d. Desizing
5. The metallic comb made up of wires, which also determines the fabric density, is called
 - a. Heald Wire
 - b. Reed
 - c. Density meter
 - d. Comber
6. The _____ Motion can be described as the heart of weaving as it is here that the nature of the interlacing or the weave is decided.
 - a. Picking
 - b. Beating
 - c. Shedding
 - d. Warp Let-Off
7. To get the required warp density
 - a. Number of Heald Shafts are varied
 - b. More warp beams are used
 - c. Let Off Speed is increased
 - d. Reeds of different counts are used.
8. The Drafting system in which the number of heald shafts required is equal to number of ends in the repeat is
 - a. Skip Draft
 - b. Sateen Draft
 - c. Pointed Draft
 - d. Straight Draft
9. The common method used for design depiction is
 - a. Design Paper
 - b. Graph Paper

- c. Drawing Paper
 - d. Brown Paper
10. a large metallic frame on which yarn packages are placed is known as
- a. Yarn Stand
 - b. Iron Frame
 - c. Creel
 - d. Package Holder

IV. Define the Following terms:

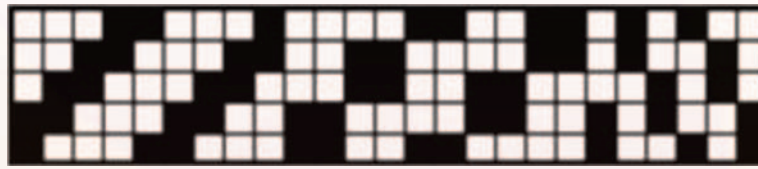
- 1. Indirect Warping
- 2. Reed Count
- 3. Design, Draft and Peg Plan
- 4. Straight Draft
- 5. Shedding
- 6. Picking
- 7. Beating
- 8. Heald Shaft
- 9. Yarn Preparatory
- 10. EPI and PPI

V. Answer the following the Questions:

- 1. Explain the passage of yarn on the loom with diagram.
- 2. Explain the Yarn Preparatory Process with the help of a Flow Diagram.
- 3. Write a short note on "Basic Operations in Woven Cloth Production".
- 4. Describe the steps in construction of Draft and Peg Plan for a given Design.
- 5. What is the total number of Ends in a 45" wide fabric, if the EPI of the fabric is 96?
- 6. The weaver is using a reed of 32s Reed Count to weave an 8" wide fabric. If he puts 4 ends per dent then what is the EPI of the fabric and the total number of ends in the fabric?
- 7. What are the various Drafting Systems? Explain with diagrams.



8. Draw Draft and Peg plan for the following Design.



9. Write a short note on "Shedding Mechanism".
10. What is denting?
11. Enumerate the uses of Heald Shaft and Reed.