# Chapter Two

# Fundamental Weaves and There derivatives

# Introduction

- ✓ Woven structure is the manner in which groups of warp yarns are raised by the harness, to permit insertion of the weft yarn in the given weave pattern,
- ✓ Which affects the fabric durability and appearance.
- ✓ Apart from the woven structure,
  - ✓ Fabric density (warp and weft per inch)
  - ✓ Fabric weight
  - ✓ Yarn count
  - ✓ Yarn twist
- ✓ The THREE fundamental weaves used for the majority of fabrics are Plain, Twill and Satin

- ✓ Each kind of the fundamental weave is determined by **Repeat** of weave [R] and **Shift** [S]
- ✓ Repeat is indicates the minimum number of warp and weft threads for a given weave. Warp repeat ($R_o$) and weft repeat ($R_y$)
- ✓ Shift is indicates the distance from a painted square on a thread to its corresponding painted square on its adjacent thread.
- ✓ The shift can be counted in warp way ($S_o$) and in weft way ($S_y$) (mostly in warp way)

- ✓ The shift can be either positive or negative, depending on the direction of counting. Counting from the left to right or from low to high gives **positive shift,** and the reverse will gives **negative shift.**
- ✓ Every warp and weft must have **at least one warp or weft overlap** with in the repeat [R].

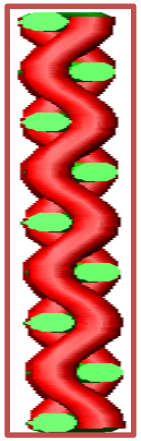
# 1. PLAIN WEAVE

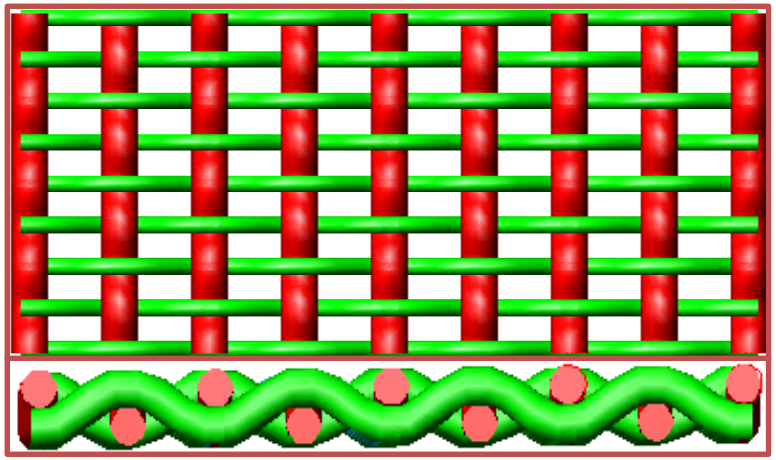
- ✓ Plain weave is the simplest and most commonly used type of weave.
  - ✓ It is found in a wide range of fabrics and also it has wide range of application. Variously known as “calico” or “tabby” weave.
- ✓ Plain weave is usually denoted by **fractions,**
  - ✓ The numerator refers to the number of warp overlaps
  - ✓ The denominator refers to the number of weft overlaps
- ✓ It requires TWO harness, (1/1) Because the weave repeats in every two ends and picks, Weave repeat [R] = 2 and Shift [S] =1
- ✓ But it requires four, six or more heald shafts when the number of ends/cm becomes large with skip draft.

# Con.....

Plan diagram

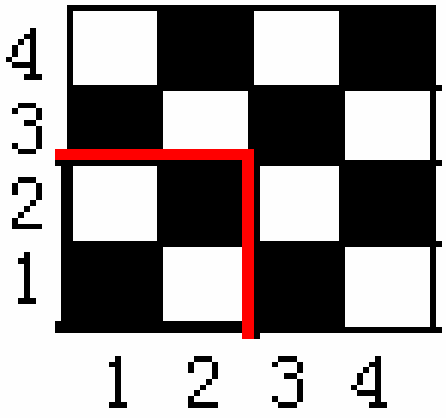
Longitudinal section diagram



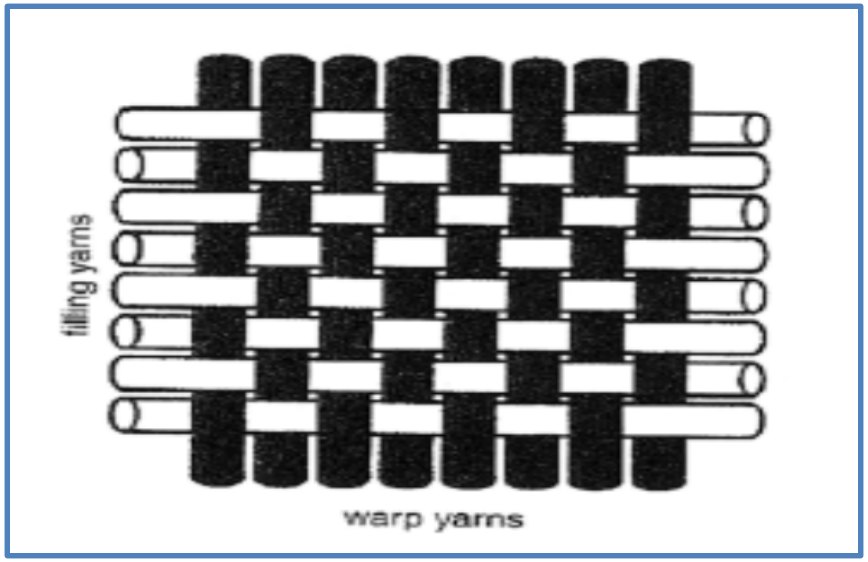


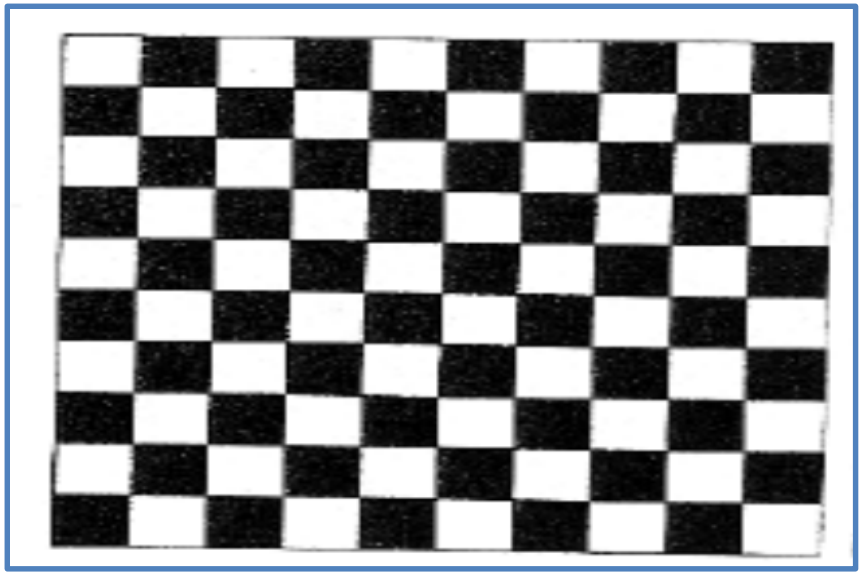
Cross-section diagram

- From the diagram,
  - The 3rd warp thread has the same movement with the 1st, and the 4th same with 2nd.
  - Similarly, the 3rd weft thread is same with the 1st weft thread; the 4th is same with the 2nd.
- Thus, the weave repeats after 2 ends and 2 picks.




Repeat



- Fabric with a plain weave is **reversible**, Face and back are the same, Unless one side is chosen as the face by finishing or printing.
- It can be classified as: Balanced or Square plain weave and Unbalanced plain weave, which can be warp faced and weft faced plain weave

# Con……

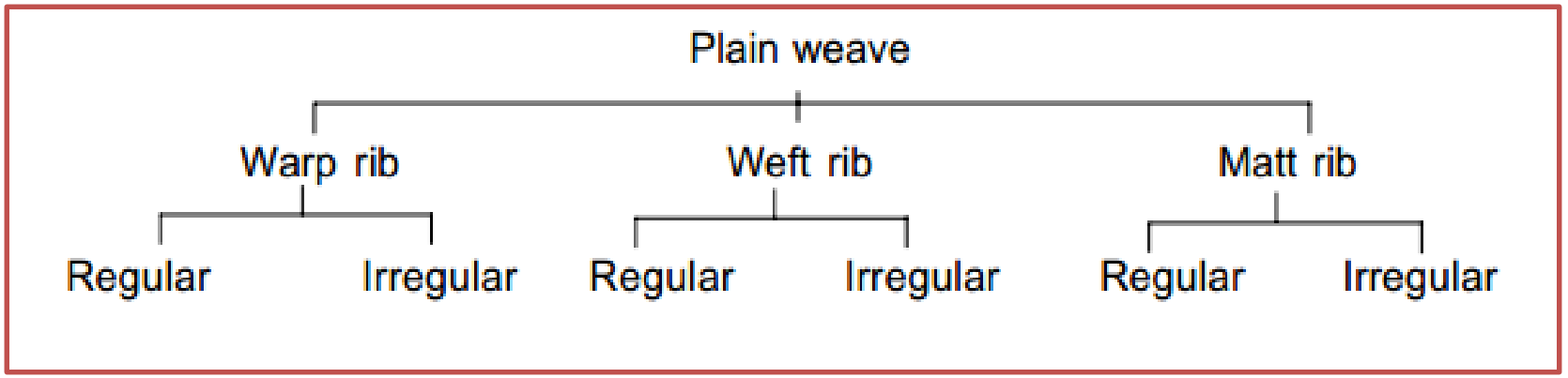
- ✓ Balanced or Square plain weave : Density of yarn. Linear density and Crimp are the same
- ✓ Unbalanced plain weave it can be :
  - ✓ Warp faced plain weave
    - ✓ EPC > PPC
    - ✓ Warp crimp<Weft crimp
    - ✓ Warp yarn is finer
  - ✓ Weft faced plain weave
    - ✓ PPC > EPC
    - ✓ Weft crimp < Warp crimp
    - ✓ Weft yarn is finer

# Plain weave characteristics

- ✓ It has firm construction, Because it has maximum number of binding points. The threads interlace on **alternate order** of 1 up and 1 down. (50% up and 50% down)
- ✓ The thread density is limited, Cloth thickness and mass per unit area are limited.
- ✓ It ravels less than other weaves.
- ✓ It has good wear resistance than others (abrasion resistance).
- ✓ It has lower wrinkle resistance than others.
- ✓ It has lower tear strength than others, Because when tearing a plain weave fabric, the yarn breaks one at a time.
- ✓ It provides a good background for printed and embossed design. Because it have a flat surface.

# PLAIN WEAVE DERIVATIVES

- ✓ The plain weave may be modified by extending it in **warp** or **weft way** or **both.**




**1. Rib weave**

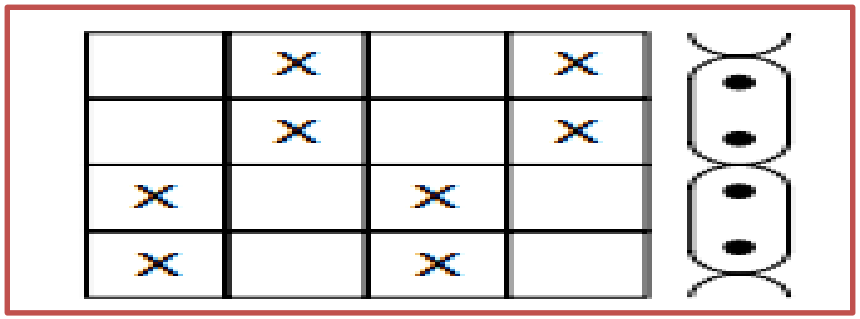
- ✓ The extension of the plain weave in **either warp** or **weft direction** thus produces a rib effect.

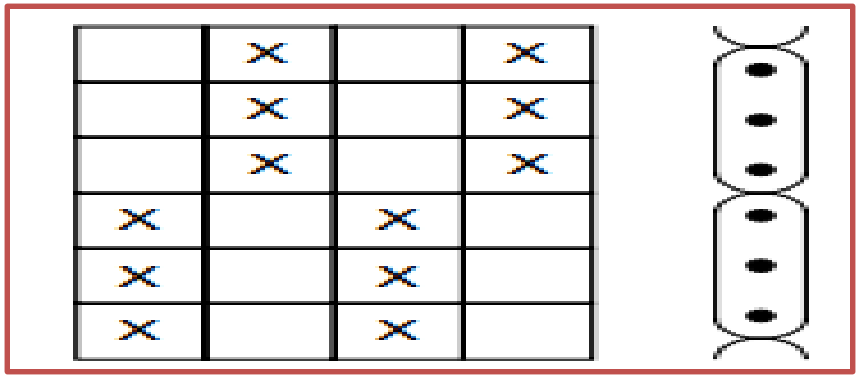
# Con……

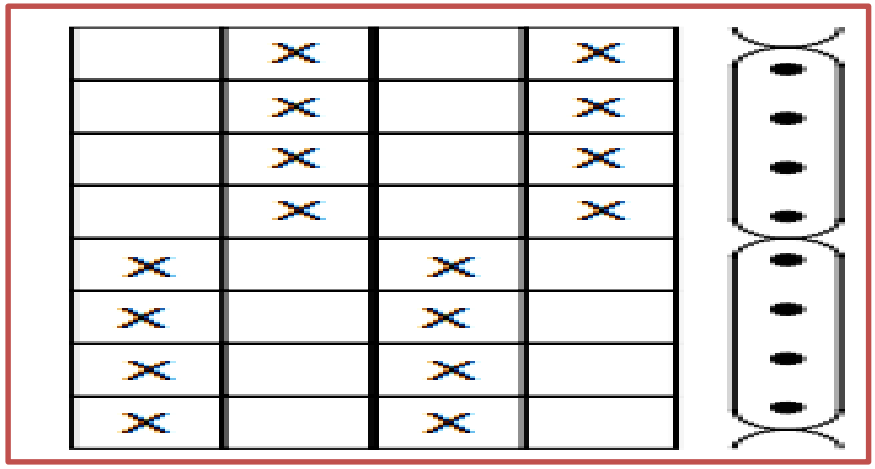
## 1.1 WARP RIB

- ✓ These are produced by extending the plain weave in **warp way direction** and can be constructed on **regular** and **irregular basis.**
- ✓ The warp rib is denoted by a fraction.
  - ✓ The numerator shows the number of warp overlapping and the denominator, the number of weft overlapping on the same thread within the repeat.
  - ✓ The sum of the fraction numerator and denominator is equal to the **weft repeat.**

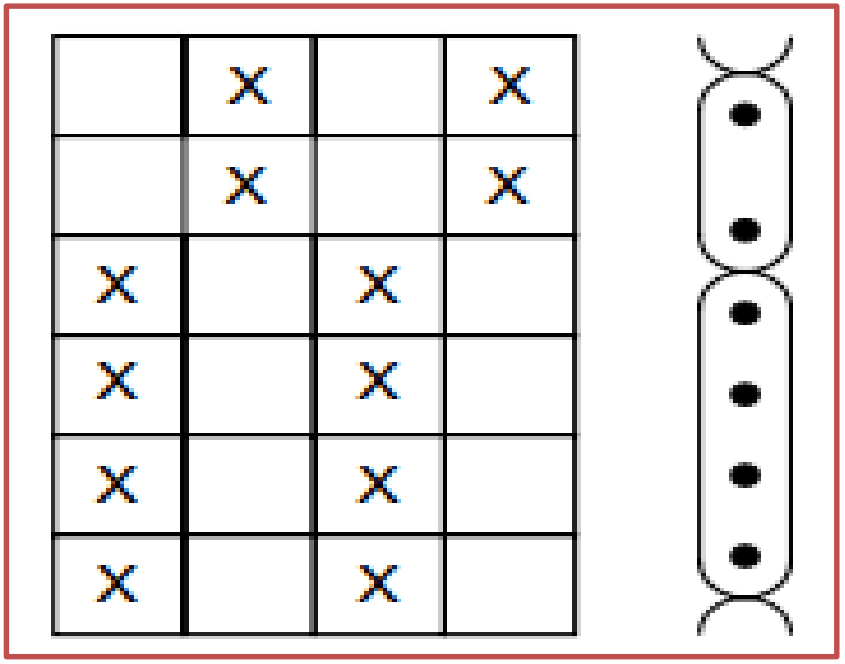
## Warp rib Weave-regular

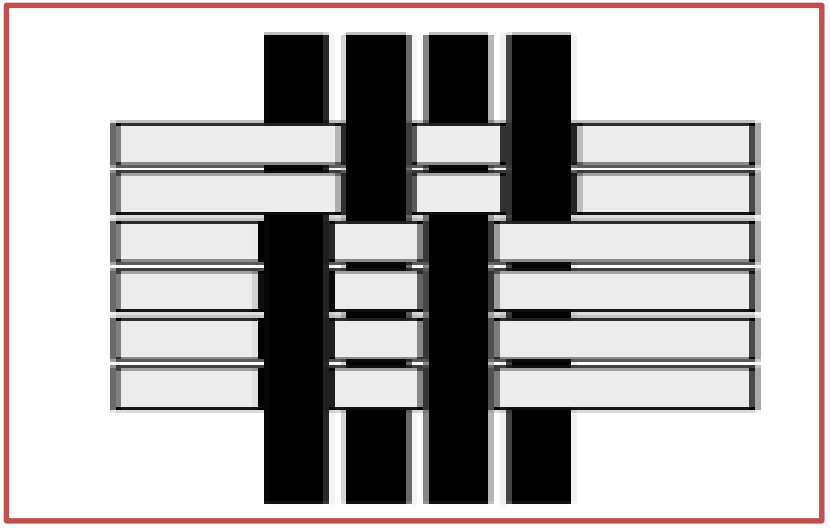






## Warp rib Weaves-irregular

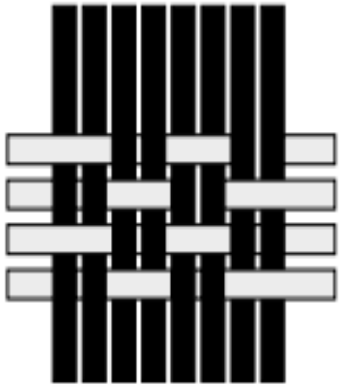




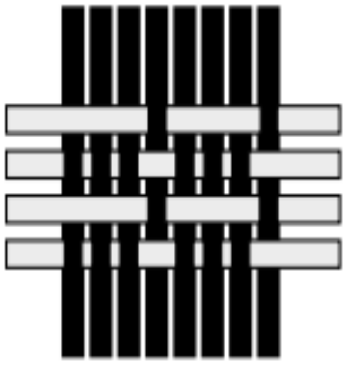
## 1.2 WEFT RIB

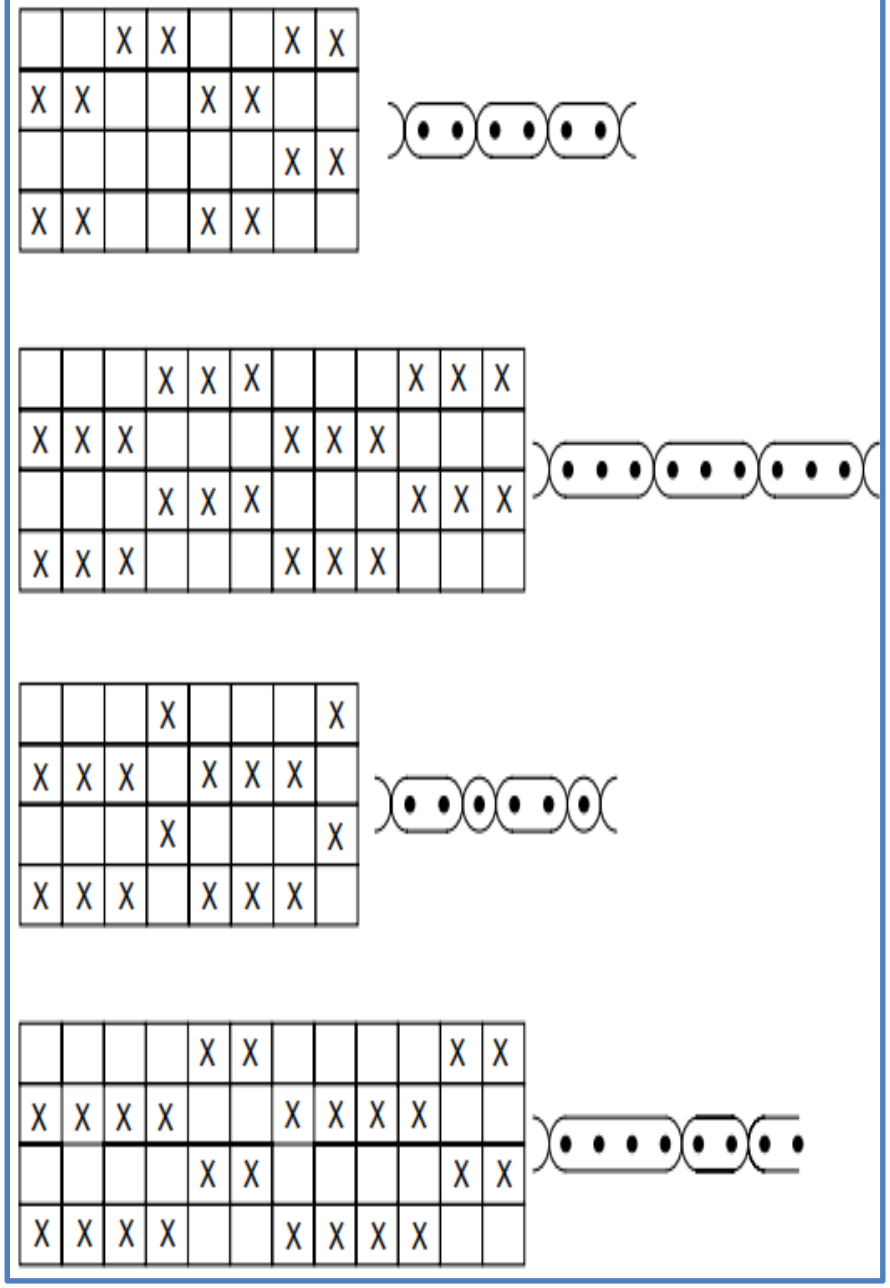
- Constructed by extending the plain weave in weft direction and can be constructed on regular and irregular basis.
- The sum of the fraction of numerator and denominator is equal to the warp repeat.

Weft rib Weaves-regular



Weft rib Weaves-irregular



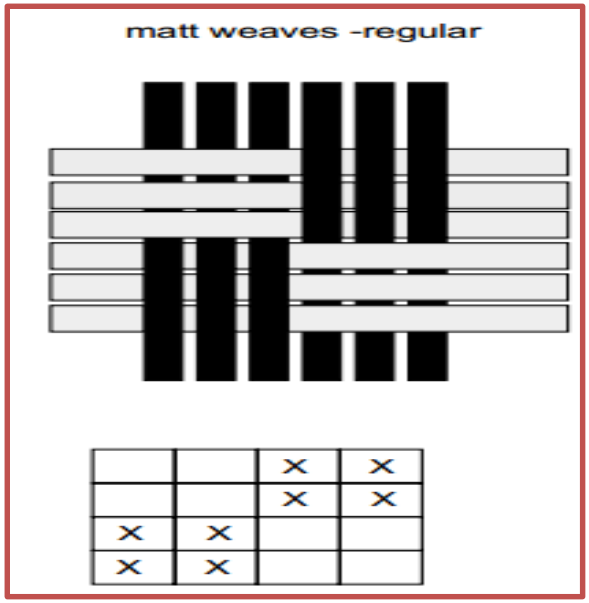


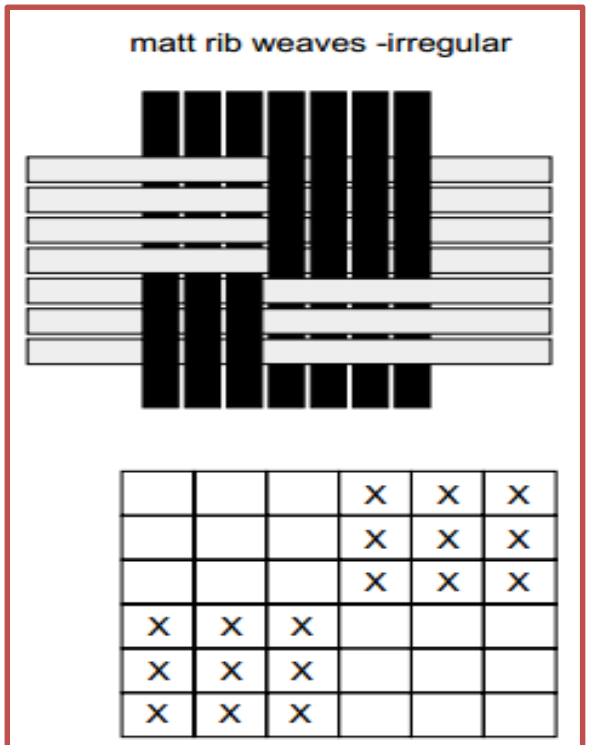
# Con.....

- ✓ In both the warp and weft rib weaves,
  - ✓ the appearance of the cloth depends on the respective thread settings, and to achieve good effects:
  - ✓ the **weft rib** can be enhanced with a high number of picks per inch and a comparatively low number of ends per inch.
  - ✓ the **warp rib** effect can be enhanced with a high number of ends per inch and a comparatively low number of picks per inch.
  - ✓ The prominence of the rib can be increased by suitable use of coarse and fine yarns.
- ✓ Rib weaves are used in extensively employed for window blinds in railway and other vehicles, and upholstering furniture.

## 2. Matt or hopsack weave

- ✓ These weaves are also variously known as hopsack or basket weaves.
- ✓ The matt rib structures result from **extending** the plain weave in **both directions**
- ✓ In case of **regular matt weave**, the plain weaves are **extended equally** in the warp and weft directions
- ✓ In case of **irregular matt weaves**, the plain weave is **extended unevenly** or irregularly in the warp and weft directions.



- ✓ Matt weave finds extensive uses for a great variety of fabrics such as dress materials, shirting's, etc.

Home work

1. Give the design, draft and peg plan for the following :
   (*a*) 2/3 warp rib
   (*b*) 5/5 warp rib
   (*c*) 4/2 weft rib
   (*d*) 6/3 weft rib
   (*e*) 4/4 matt rib
   (*f*) 2/4 matt rib
   (*g*) 4/3 matt rib