17. Preparation for Textile Weaving

Errol Wood

Learning objectives

On completion of this topic you should be able to:

- Describe and explain the differences between fabrics made from (a) solutions, (b) directly from fibres, (c) from yarns and (d) composite/multi-component fabrics
- Outline the history of weaving from its traditional roots to the modern high speed looms
- Briefly explain the basic steps in weaving
- Describe the requirements for (a) warp yarns and (b) weft yarns
- Describe the sectional warping and beam warping procedures
- Outline the drawing-in process
- Explain why yarn sizing is required and how this is carried out

Key terms and concepts

Films, foams, felts, nonwoven fabrics, knitted fabrics, composite fabrics, shuttle weaving, shuttleless weaving, warp yarn, weft yarn, sizing, drawing-in, creel, sectional warping, swift, beam warping, lease, heald, heald frame, harness, reed, warp break detection.

Introduction to the topic

While the term ‘weaving’ is mostly used for the process of interlacing yarns on a loom to form a woven fabric, it is actually a series of processes which convert yarn into fabric which is suitable for tailoring (Ormerod and Sondhelm, 1995). The processing steps are as follows:

- Winding and clearing
- Weft winding
- Warping
- Sizing and other applications
- Entering and knotting
- Loom operation
- Finishing
- Inspection and measuring.

The first five operations are those that prepare the yarns for weaving, the main theme of this lecture. Subsequent lectures discuss weaving technologies and the structure, quality and performance of woven fabrics.

The selection of suitable yarns and the preparation of yarn for weaving have a considerable influence on weaving efficiency. Yarn breakage at the loom must be minimised and this is only possible if (a) the yarn is of uniform quality, (b) it is wound onto a suitable package in the best possible way, and (c) the yarn is suitably treated before use. These requirements apply to varying extents with warp and weft yarn.

The general reference for this lecture is the comprehensive text by Ormerod and Sondhelm, *“Weaving Technology and Operations’* (Ormerod and Sondhelm, 1995). The text by Lord and Mohamed (Lord and Mohamed, 1982) is also a useful reference.

17.1 Types of textile fabrics

Fabrics can be made from solutions, directly from fibres and filaments, from yarns, and from a combination of these materials. A different fabric may be made by adding another layer to a previously made fabric. The fabric-forming process determines the following characteristics of a fabric, eg,

1. Appearance and texture
2. Performance and care requirements during use
3. Cost.

Fabrics from solutions

Films are made by extruding solutions through narrow slits into warm air or on to a revolving drum. The drum may be *embossed* to produce surface textured film. Films:

1. Are waterproof, soil resistant, and wind proof
2. Are non-fibrous, and hence are of low cost
3. May lack strength unless backed by fabric, may have poor drape, and may not be able to breathe
4. Can be modified by processes such as laminating or quilting with other fabrics, for example, adding other fabrics to a polyurethane windbreaker fabric to make it absorbent and warm.

Foams incorporate air into an elastic-like substance such as polyurethane. Foams are lofty, springy, and bulky. Combined with fabric, foams give comfort and warmth in low-cost fabrics.

Fabrics made directly from fibres

Felts contain only animal fibres such as wool. The fibres are carded, laid down in a thick batt, sprayed with water, and passed between hot agitating plates that entangle and mat the fibres. Compared with woven and knitted fabrics, felts are thick, dense, stiff, and unsuited to apparel. Felts have no grain and don't fray or unravel. However, they lack strength.

Nonwoven fabrics are fibres which are bonded and/or interlocked mechanically, chemically, with heat, or a combination of these processes. Nonwovens are cheaper than woven or knitted fabrics and are widely used for both disposable and durable items. One kind of nonwoven is needle-punched felt, which has largely replaced wool felts. Needle punching is applicable to most textile fibres.

Fabrics from yarns

Braid is made of diagonally and lengthwise interlaced yarns, rather like plaited hair. Braids are narrow fabrics used mainly for trims. Shoelaces are a circular form of braid.

Knitted fabrics are interlocked loops of yarn. Knitted fabrics are stretchy, elastic, porous, and resilient, and so are ideal for apparel, especially form-fitting garments. These fabrics may be made by weft knitting (Figure 17.1) and warp knitting (Figure 17.2).

Figure 17.1 Weft Knit Structure. Source: Wood, 2006.

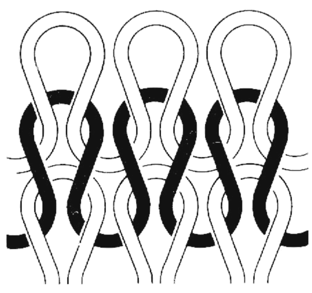
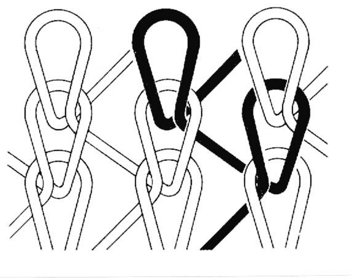
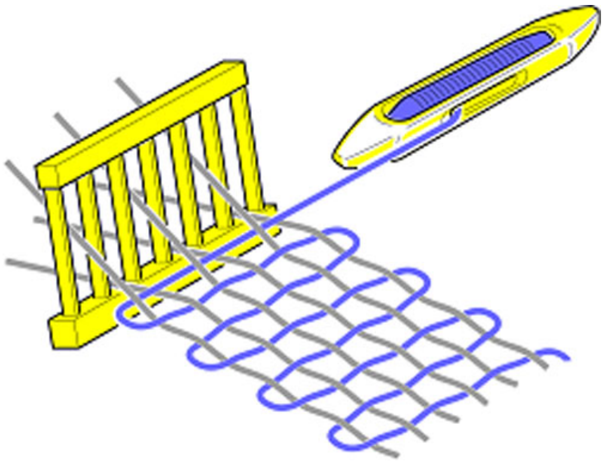


Figure 17.2 Warp Knit Structure. Source: Wood, 2006.



Lace is fabric in which yarns are knotted, interlaced, interlooped, or twisted together into very open-weave fabrics. It is often used as decorative edgings.
Woven fabrics are two or more sets of yarns, interlaced at right angles to each other (Figure 17.3). The characteristics of these fabrics are discussed in more detail in the lecture "Structure and properties of woven fabrics."

Figure 17.3 Making a plain weave fabric using a shuttle loom.
Source: Sulzer Textil.



Composite and multi-component fabrics

Composites include coated, flocked, foam/fibre, and tufted fabrics. Multi-component fabrics are generally bonded and laminated together.

Coated fabrics are stronger than unsupported films and uncoated fabrics. Polyvinyl chloride and polyurethane are common coatings for fabric used in upholstery, handbags, footwear, and leather-like apparel.

Flocked fabric is produced when an electrostatic field brings one end of fibres into contact with an adhesive-coated fabric substrate. Flocking makes figures and motifs on garments, and can give an overall pile to fabric.

Foam/fibre fabrics are like films, except that the solution (usually polyurethane) contains fibres. Most of the fibres remain on the surface to imitate suede.

Tufting is done by needles pushing yarns or slivers through a fabric substrate. The yarns form loops that can be cut or left uncut. Tufting is a cheaper way of making pile fabrics than weaving or knitting. Tufting is widely used in making rugs, carpets, upholstery, coat linings, and candlewick bedspreads.

Bonded or laminated fabrics can be made by joining fabrics by an adhesive or a foam-forming process. *Thermal bonding* uses fibres or films of low melting-point polymers to give adhesion between fabrics. A heat treatment melts the bonding polymer but does not affect the fabrics.

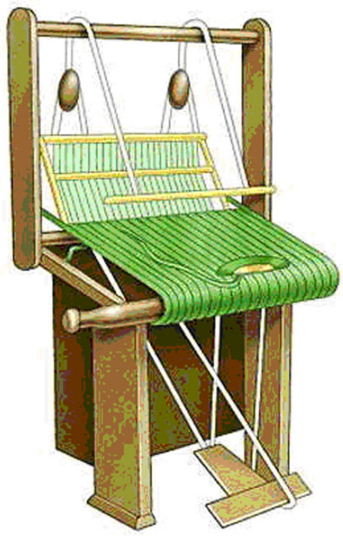
Laminating combines the features of different fabrics in one fabric. Delamination, or the layers coming apart, is a possible problem.

Quilting is when wadding, batting, or foam is stitched between two fabric surfaces. Some bedcovers, dressing gowns, and windbreaker jackets are made from quilted fabrics, which are bulky, warm, and decorative. Stitch breakage can occur.

17.2 Historical overview

Despite the primitive methods used, the art of weaving had reached quite an advanced state over 2000 years ago, when intricate designs were produced on hand looms (Figure 17.4).

Figure 17.4 A simple hand loom. Source: Wood, 2006.



The revolution came in 1773 when John Kay invented the flying shuttle loom that doubled the production of the handloom. This initiated a new era in weaving.

Joseph Marie Jacquard, a French textile manufacturer invented a punched-card system for programming designs on a silk-weaving loom (the Jacquard loom). In 1801 he constructed looms that used a series of punched cards to control the pattern of longitudinal warp threads depressed before each sideways passage of the shuttle.

The next breakthrough was the invention of the power loom by Roberts. A huge increase in productivity was made possible through this innovation, and commercialisation proceeded so quickly that by 1833 there were 100,000 power looms in Britain alone, as well as 250,000 hand looms.

A period of 50 years elapsed until the invention of the automatic pirn-changing loom by Northrop in 1889 and soon afterwards further developments in the form of complete warp and weft stop motions arrived. A shuttle is usually quite heavy, tending to make weaving slow, cumbersome and expensive. Furthermore, the frequent pirn changes required (and winding of these) add to the cost of shuttle weaving. For these reasons, various types of shuttleless weft insertion systems have been developed.

The concept of shuttleless weaving can be traced back to the 19th century, starting with rapier technology. By the 1970s the rapier, projectile and jet-loom technologies had been fully commercialised, but they initially suffered from a number of limitations in productivity.

However, in the past few decades, the weaving machinery manufacturers have focused a lot of attention on speed and weft-insertion rate, design capability, machine reliability and efficiency and fabric quality. The most recent development has been the 'multi-phase' loom in which the weft is inserted in continuous waves across the machine, rather than one weft at a time. Modern looms for textile fabrics can achieve weft insertion rates exceeding 2,500 metre per minute and 2000 picks per minute.

17.3 The basics of weaving

Woven fabric is produced on a loom, whether it be a simple hand loom or a sophisticated machine loom. The basic operating principles are the same; to explain these the essential parts of a simple shuttle loom are shown in Figure 17.5. This is a two-harness loom in which adjacent warp yarns are threaded through alternate healds so that the weft thread passes over and then under alternate warp threads in a plain weave fabric.

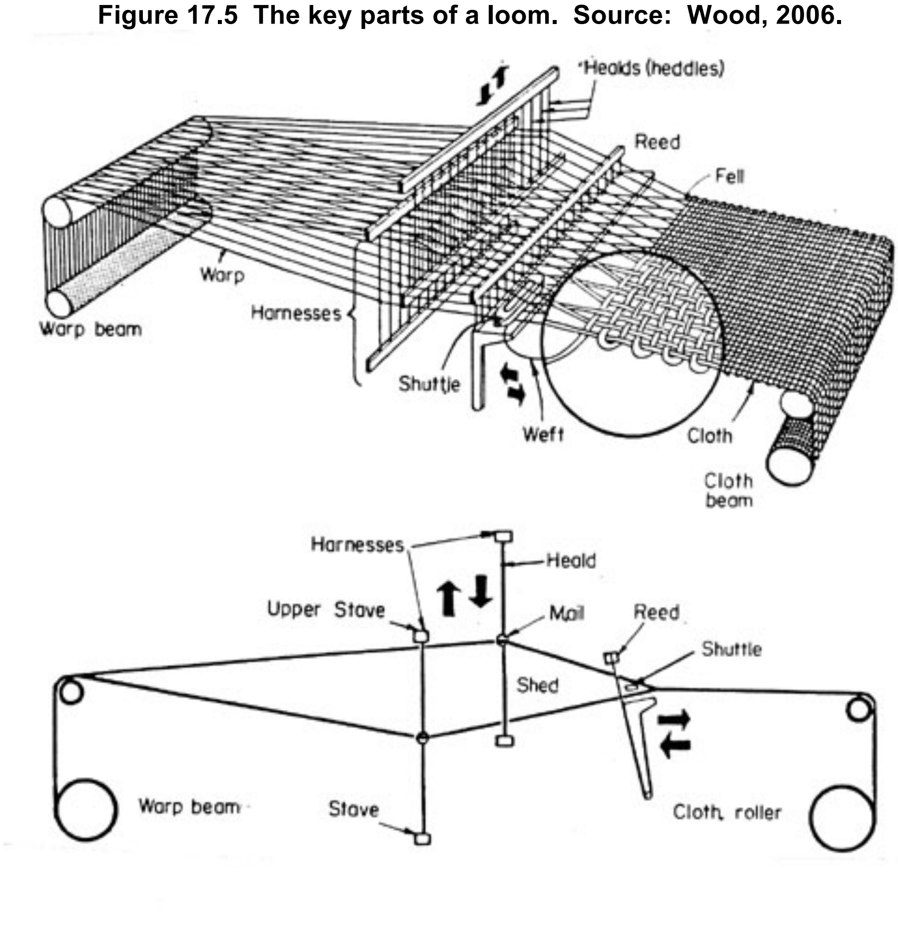
The basic steps in yarn preparation and weaving are as follows:

1. *Warping:* The warp yarn is wound onto a beam
2. *Sizing*: This involves treating the beamed yarns with starch to improve the weaving performance
3. *Drawing-in*: The warp threads are drawn off the *beam* and threaded through the *heald shafts*

The following three steps are repeated in rapid succession in the weaving sequence:

4. *Shedding*: By raising and lowering the heald shafts the warp threads are divided into two layers to create an open space called a *shed*. The weave pattern is determined by which threads are raised or lowered
5. *Picking*: When a shed has been formed, the *shuttle* (or alternatively a rapier, air jet or water jet) carries the weft yarn through the shed
6. *Beat-up*: After picking, the weft yarn is pushed against the already woven fabric by the movement of the *reed*. At the same time the shed is formed again and the process repeats.

Figure 17.5 The key parts of a loom. Source: Wood, 2006.



While in the traditional loom a shuttle is used to insert the weft yarns, in modern high speed machines a variety of insertion mechanisms are used. These are outlined in the next lecture "*Weaving technologies and structures*".

Woven fabric construction characteristics

Woven fabrics have two or more sets of yarns interlaced at right angles to each other.

Warp: The yarns which run the length of the fabric are called *warp yarns* or ends.

Weft: Yarns which cross the warp are called *weft yarns*, filling, or picks. The right-angle interlacing of yarns gives woven cloth more firmness and rigidity than knits, braids, or lace.

Woven fabrics vary in:

1. the interlacing pattern
2. the colour of interlacing threads
3. the ***sett***, which is the amount of ends and/or picks in a cloth and is expressed as number of threads per centimetre, and
4. the ***balance***, which is the ratio of warp to weft in relation to the number of threads per centimetre and their counts.

The sett and balance of fabric are discussed in the lecture *"Fabric quality and performance*".

Preparation of warp yarns for weaving

Good warp preparation is an essential requirement to achieve optimum efficiency and fabric quality from modern, high-speed weaving machines.

Warp yarn characteristics

Warp yarns must be selected to give both the weaving performance necessary to efficiently produce fabric, and also to meet the product performance and end-user requirements.

The **yarn count** range will be determined by the loom set-up and the product required. Within the capacity of the loom, yarn counts will be varied depending on the fabric construction and sett.

Medium- to high-**twist** staple yarns, and filament yarns, are generally used in warps. The twist must be sufficient to give the strength required of a warp, but must not be so high as to lower the yarn extension (stretch) and make it brittle and easy to break with the sudden load changes that the yarn undergoes during the weaving cycle.

The **fibre content** of the warp will be determined by the product specification and end use, but also by the yarn performance needed in the warp during weaving. Both staple yarns from natural fibres and filament yarns from synthetic fibres can be used for warps but in general the warp yarns are constructed for their performance and ability to withstand considerable strain in weaving, while the design and product characteristics are imparted by the weft yarns.

Warp yarns need good **tensile strength** and resilience. Low-twist woollen yarns which have low strength are unsuitable in the warp but could be used in the weft. The tension on the warp yarns changes during the weaving cycle as the shed is formed and during beat-up. This change is sudden and places high, short term strain on the warp yarns. Breakages in the warp result in machine downtime and cause a defect in the material which must be mended out at a later stage.

During the weaving process the warp yarn undergoes abrasion as it moves through the loom and also abrasion with adjacent yarns as the yarns are manipulated during the shed formation. Yarns with low **abrasion resistance** will quickly abrade and break, resulting in downtime and fabric defects that require mending.

Uneven yarns will also give problems in the warp since the unevenness will result in weakness in the yarns and also an increase in abrasion when thicker parts of the yarn pass through the loom, or rub against adjacent yarns. Uneven yarns will also result in appearance faults in the finished fabric.

The final stage of yarn making is **winding**, during which the yarn is cleared of faults and knots that might obstruct weaving. The yarn is wound into packages of appropriate size for weaving. Automatic winding and clearing machines rapidly detect yarn faults, cut out the faulty section and re-join the yarn by pneumatic splicing.

In weaving, the next operation is either warp preparation or weft preparation.

Warp preparation

Good warp preparation is an essential requirement for achieving efficiency and fabric quality from modern high-speed weaving machines. The two main types of warping systems used for wool yarn preparation are section warping and direct (or beam warping).

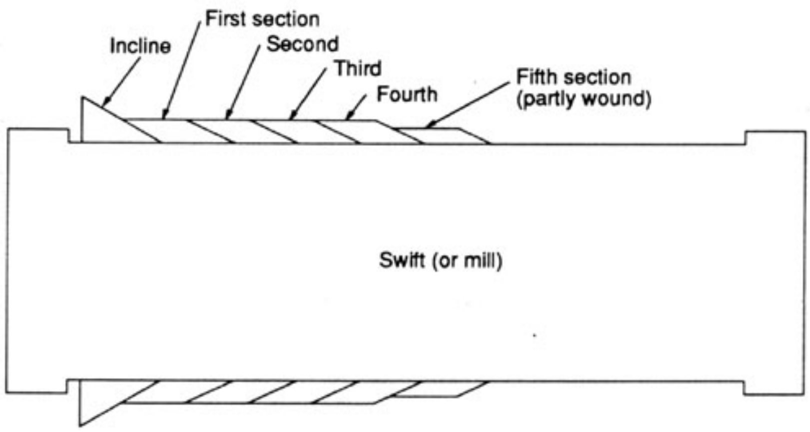
Sectional warping

Sectional warping is the commonly used system for producing woollen and worsted warps. It is a very flexible system that not only allows for full warp preparation from an individual yarn but can also enable warps to be prepared with a combination of yarns of different count and/or colour. Sectional warping is ideal when more than one colour of warp yarn is used to form patterns, such as in stripes and checks.

In sectional warping the yarn in each section is first wound on to a *swift* or *mill*. From there, all threads are drawn off together on to a warp beam. Figure 17.6 shows how the first section of warp yarns are wound up an incline at the left-hand end of the swift. The inclined build-up prevents sections from collapsing, which is likely to occur if sections are built up vertically.

One end of the drum is conical in shape and may be either a fixed angle (typically 11^{o} or 14^{o}) or variable angle type. To commence warping, the yarn packages required to form the section band are mounted onto pegs in the creel. Each thread is passed through its tensioning unit, leasing device and finally through the warping reed where the threads are dented to the required sectional width.

Figure 17.6 Cross section of sectional warping. Source: Wood, 2006.



Using as an example a warp with a total of 3,400 ends and a width of 170 cm gives 20 ends per centimetre. If 200 warp packages are used, 17 full sections are required to complete the warp, with each section being 10 cm wide.

All required data, such as total warp ends, ends per section, warp width required, yarn counts, warp density and warp length, are entered at the control station and the machine positions itself for winding the first section. During winding the section band is traversed so that the warp threads accumulate along the incline of the cone. Subsequent sections are formed on the angled platform provided by the previously formed section.

It is important that there is an accurate build-up on each section, precise fit of the various sections, and equal length and tension of all warp threads.

The sectional warp is then beamed off (ie, wound) onto the weaving machine's warp beam. Optional yarn waxing or sizing may be carried out at this stage.

Beam warping (or direct) warping
Beam warping is occasionally used in the preparation of single count wool warps for lightweight, plain, piece-dyed fabrics, and may be associated with the sizing treatment.

Usually, a number of individual warp beams (back beams) with an equal number of warp ends are produced. The back beams are then mounted on the beam creel at the rear of the sizing machine. The total contained number of warp ends from the back beams are then run together through the sizing and drying units, and the required warp length wound onto the weaver's beam. Each yarn passes through thread guides and a tension device so that all warp threads are wound on to the beam with equal tension.

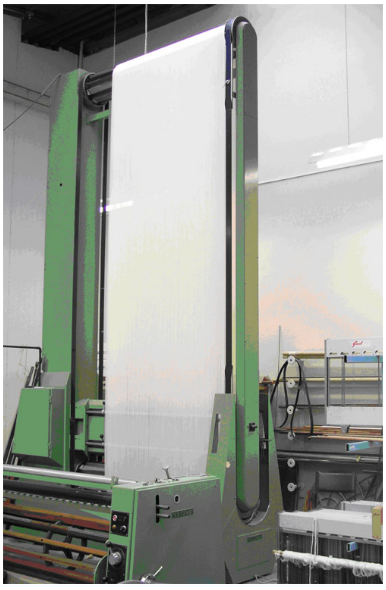
This volume type of warp preparation is common in the cotton industry, but may also be used for worsted warps requiring sizing as a means to improve weaving efficiency and quality.

In direct warping, packages or spools of yarn are placed on a large creel and wound on to a *warp beam* (Figure 17.7). A warp beam is a wide large spool, the same width as the loom and cloth to be woven. The direct wound beam has the total length of *all* the warp threads needed to weave the fabric.

Figure 17.7 Direct winding from a creel onto a warp beam. Source: Benninger AG.

In **single end warping** (or sample warping) a single cone may be used to produce a set of warp yarns. With this machine warp yarns with a maximum length of 40 metres may be wound onto a warp beam. Figure 17.8 shows a Hergeth sample warper machine.

Figure 17.8 Hergeth single end warper.
Photograph supplied by E. Wood courtesy Canesis Network Ltd.



Drawing-in of the warp threads

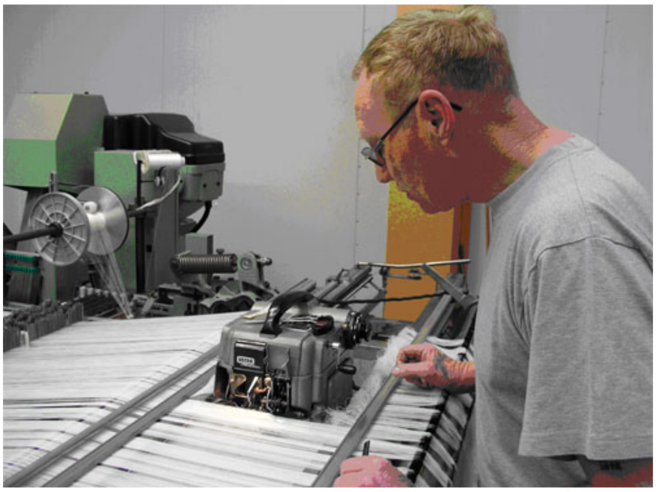
Different circumstances in weaving require three different ways in which the warps are drawn into the loom for weaving.

Follow-on warp

When the warp is identical in quality (total number of ends, width and pattern repeat) to the one previously woven, it is tied in at the weaving machine by means of a knotting machine.

Figure 17.9 shows the procedure. Warp threads already drawn into the loom (at left) are knotted to threads from the loom beam. The furthest threads have been knotted as the machine moves from the right of the operator to his left.

Figure 17.9 Use of a knotting machine to tie in warp yarns.
Photograph supplied by E. Wood courtesy Canesis Network Ltd.



Prior preparation

The warp is knotted into a previously prepared harness set, off the loom.

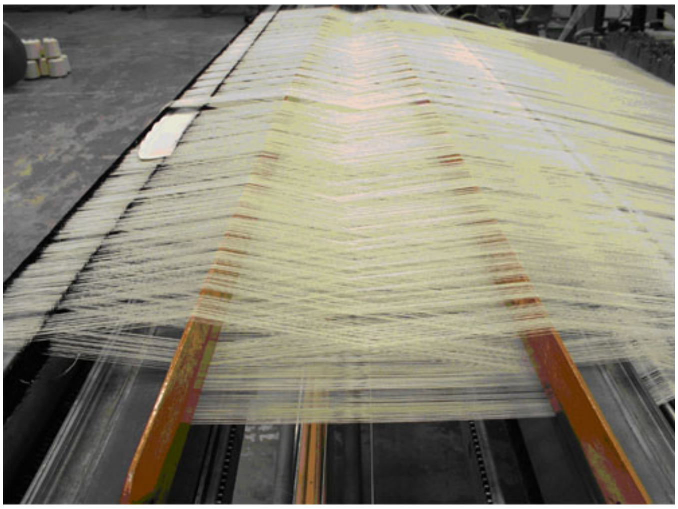
Empty loom

Each individual yarn end is drawn through an eye of a heald wire (or jacquard harness) in the sequence required by the design, and then through the weaving reed. While this has traditionally been a labour-intensive operation, automatic machines are now able to accomplish the entire drawing-in operation under computer control, facilitating short runs.

Pull through and take a lease (or leize)

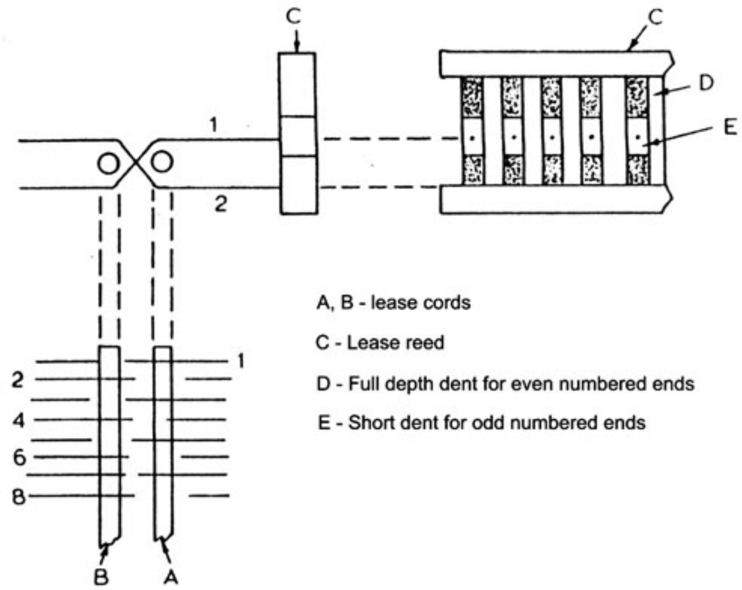
After creeling the yarns are drawn through tensioning devices and stop motions, and then through the lease reed. This reed consists of slots that each take a yarn. This reed maintains the separation and order in the yarns so that they wind on to the beam in an orderly manner. If joining is required, the separation produced by lease reeds enables an automatic knotting machine to operate (Figure 17.10).

Figure 17.10 warp threads separated by lease reeds.
Photograph supplied by E. Wood courtesy Canesis Network Ltd.



To take the lease, the even numbered yarns are allowed to fall to the bottom of the dents. This allows a lease cord to be threaded between the odd and even yarns. Then the even yarns are raised to the top of the dent and a second lease cord is threaded. (See Figure 17.11).

Figure 17.11 One and One lease. Source: Wood, 2006.



Drawing-in and warp tying

Drawing-In is the threading of ends individually in a specified order through a set of healds (Figure 17.12). This has traditionally been a time-consuming, manual process, however modern automatic systems for drawing-in are now available from Staubli (Figure 17.13).

Figure 17.12 Manual drawing in of warp threads. Source: Staubli, Switzerland.

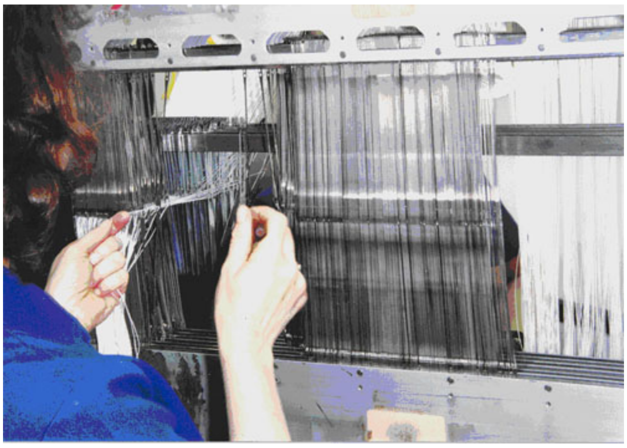
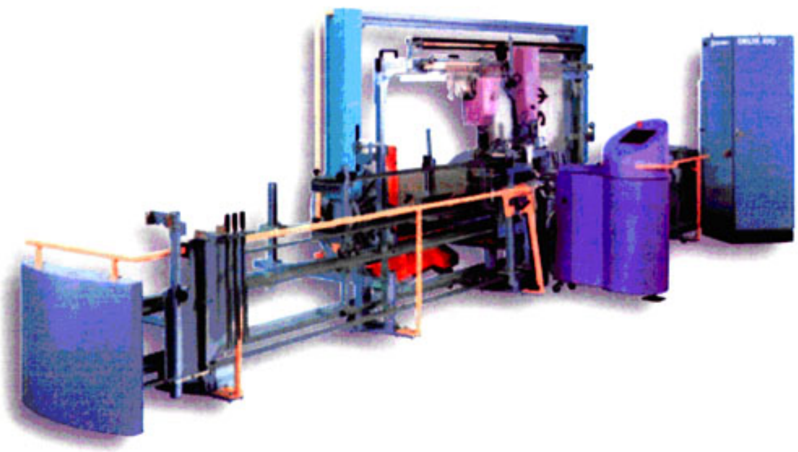


**Figure 17.13 Staubli Delta 110 automatic drawing-in system.
Source: Staubli, Switzerland.**



Healds are flat steel strips or shaped wires with an eye (called a mail) in the middle. They are held in position on a ***Heald frame***. Heald frames are also referred to as shafts.

The number of shafts that make up the set required for a weaving job are known as a ***Gear Harness.***

The ***Draft*** is the plan which is prepared by the designer to show the sequence in which the warp yarns are drawn-in to the heald shafts. This process determines the way in which the structure of the fabric will be formed.

Once the ends of yarn have been drawn through the healds, they pass through the ***Reed***. The reed controls the width of the warp and assists in placing the pick during weaving.

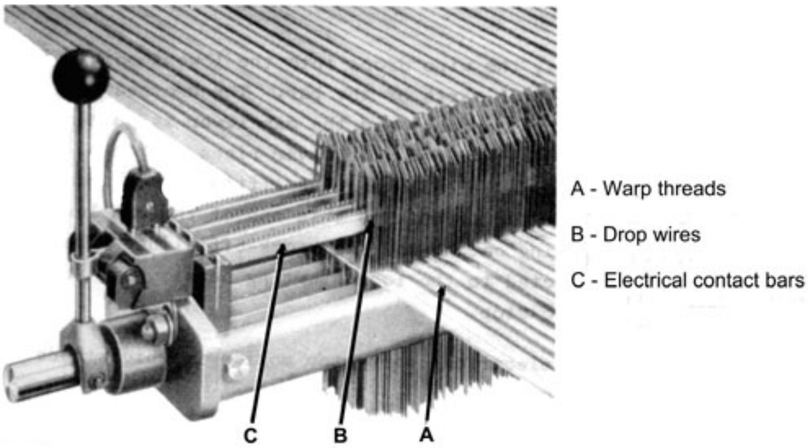
The reed is selected according to the fabric construction: it determines the spacing of the warp threads, guides the shuttle and beats up the weft. There may be two (plain weave), three (2x1 twill) or four (2x2 twill) yarns in each dent space.

Warp break detection

Warp break detectors are used to monitor the ends in the warp for breakage during weaving, and to stop the loom when a breakage occurs. By stopping the machine as soon as the break occurs, the break detector system contributes to quality and efficiency by reducing the amount of mending required.

Each yarn supports a drop wire which falls when the yarn breaks or goes slack, completing an electrical circuit and activating an electronic stop system (Figure 17.14).

Figure 17.14 Warp break detection.
Photograph supplied by E. Wood courtesy Canesis Network Ltd.
Source: Wood (2006).



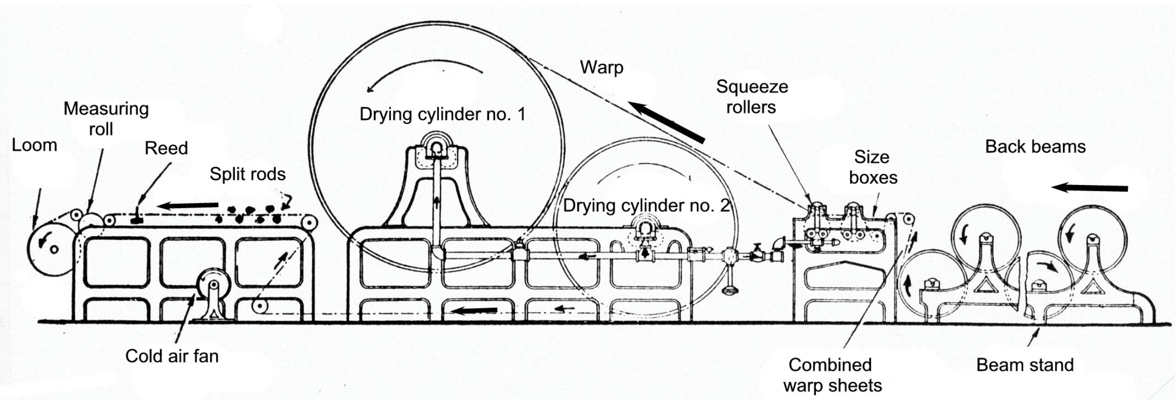
Treatment of warps

Warp yarns undergo significant stresses in weaving. For this reason, warp threads are sometimes *sized* during or after warping. *Sizing* binds the fibres in the yarn together increasing the strength and resistance to mechanical action during weaving, and to make the yarn smooth, thus minimising chafing. It is important that the sizing materials do not interfere with the processes following weaving.

The ingredients used in sizing are usually starches, gums or synthetic adhesives and fatty or oily substances (to act as plasticizers or softeners). Starch solutions are generally used for sizing natural yarns, while synthetic finishes are used for manufactured fibres such as nylon.

To apply the size, the yarns pass through a size bath, then are dried and rewound on to a warp beam (Figure 17.15). Size must be removed before dyeing.

Figure 17.15 Sizing Machine



Wax: Synthetic wax compounds can be added to the warp to act as a mild size, to smooth the yarns, and to act as a lubricant. By reducing the friction between the parts of the weaving machine and the warp, wear on the warp and the shedding of fibres is reduced, thus improving weaving efficiency.

Antistatic Agents: Antistatic agents can be added to reduce problems associated with static generation during the weaving process.

Weft yarns

The properties of weft yarns tend to differ from those required for warp yarns.

The **yarn count** of weft yarns may vary over a wider range than would normally be used in a warp. In addition, design features often require yarns of differing count to be used, subject to being within the count range of the weft insertion mechanism.

Yarn twist may also vary more because of lower strength and extensibility requirements for weft yarns. The twist must be at a level to avoid snarling during the weft insertion process. Fabric strength in the weft direction is affected by the weft yarn twist and this must be taken into account when designing the fabric.

The **fibre content** of weft yarns can be more varied because of the lower requirements for strength, evenness and extensibility on the weft yarns. Yarns of different fibre content are often woven together to produce design effects.

The **strength requirement** from a weaving point of view is less for weft yarns, and yarn can be woven into the weft provided it meets the strength requirement of the weft insertion mechanism. Some of these impart relatively low tensions on the yarn when compared with the tensions in the warp. Yarn strength is often important for fabric performance however, and this must be considered as part of the fabric specification during the design stage.

The **abrasion resistance** of the weft yarns is determined entirely by the end use and yarns must be selected to meet the performance requirements of the fabric. It is not uncommon to see fabrics where the weft has worn away leaving the warps still in place. This is also a function of fabric sett which was discussed earlier.

Intentional variations in **yarn evenness** are often used as design effects in woven fabrics and these yarns can be used in the weft as long as the level of unevenness is within the capabilities of the weft insertion system.

Readings

The following readings are available on CD

1. Seyam, A.M., 2003. Technological advances in weaving and weaving preparation machinery continue. ITMA, 2003. Vol 3, Issue 3, Autumn 2003.

Movies

A video clip is on the CD.

Activities	Available on WebCT
Multi-Choice Questions	Submit answers via WebCT
Useful Web Links	Available on WebCT
Assignment Questions	Choose ONE question from ONE of the topics as your assignment. Short answer questions appear on WebCT. Submit your answer via WebCt

Summary

Summary Slides are available on CD

While the term 'weaving' is mostly used for the process of interlacing warp and weft yarns on a loom to form a woven fabric, it is actually a sequence of integrated processes for converting yarn into a fabric which is suitable for tailoring. The processing steps are as follows:

- Winding and clearing
- Weft winding
- Warping
- Sizing and other applications
- Entering and knotting
- Loom operation
- Finishing
- Inspection and measuring.

The first five operations are those that prepare the yarns for weaving, the main theme of this lecture. Subsequent lectures discuss weaving technologies and the structure, quality and performance of woven fabrics.

The selection of suitable yarns and the preparation of yarn for weaving have a considerable influence on weaving efficiency. Yarn breakage at the loom must be minimised and this is only possible if (1) the yarn is of uniform quality, (2) it is wound onto a suitable package in the best possible way, and (3) the yarn is suitably treated before use. These requirements apply to varying extents to the warp and weft yarns, respectively.

References

Benninger A.G. Photograph retrieved from Benninger website, 10th October, 2006. **www.benninger.ch**.

Ormerod, A. and Sondhelm, W.S., 1995, *Weaving Technology and Operations*, The Textile Institute, ISBN 1 870812 76 X.

Lord, P.R. and Mohamed, 1982, *Weaving: Conversion of Yarn To Fabric*, Second Edition, Merrow Publishing Company Ltd, ISBN 0 900 54178 4.

Staubli_Staubli Delta 110 automatic drawing in system. Zurich, Switzerland. Retrieved 20th October, 2006 from website **http://www.staubli.com**.

Sulzer Textil. Diagram supplied courtesy of Mr Rene Koenig of Sultex Ltd., Ruti, Switzerland.

Glossary of terms

Beating-up	One of the main weaving actions where the pick of the weft yarn left in the warp shed is forced up to the fell of the cloth
Beam	A large cylinder, with flanges at each end, onto which warp yarns are wound for weaving
Beam warping	Winding a part of the total number of ends of a warp in full width onto a back beam
Creel	A structure for holding supply packages in textile processing
Dent	The unit of a reed comprising a reed wire and the spacing between adjacent wires
Drawing-in	The process of drawing the threads of a warp through the eyes of a heald and the dents of a reed
End	An individual warp thread
Fell	The line of termination of a woven fabric formed by the last weft thread

Harness	Heald and heald frames and/or Jacquard cords used for forming a shed
Heald	A metal strip or wire with an eye in the centre through which a warp yarn is threaded, so that its movement can be controlled in weaving
Heald frame (or shaft)	A rectangular which is used to hold the healds in position
Jacquard mechanism	A shedding mechanism, attached to a loom, that gives individual control of several hundred warp threads and thus enables large figured designs to be produced
Lease	A formation of the ends of a warp that maintains an orderly arrangement during warping and preparation processes, and in weaving
Pick	A single weft thread in a woven fabric
Pick (or shot)	A single operation of the weft insertion mechanism in weaving
Reed	A set of closely spaced, parallel wires for separating the warp threads, determining the spacing of the warp threads, guiding the shuttle or rapier and beating-up the weft
Sectional warping	A two-stage method of preparing a warp on a beam
Sett	The density of ends or picks in a woven fabrics, usually expressed as the number threads per centimetre
Shed	The opening formed when the warp threads are separated in the weaving process
Shedding	The operation of forming a shed, in weaving
Sizing	The application of a compound to warps (and sometimes weft yarns) before weaving to enable them to better resist abrasion
Swift	The large spool onto which yarns are wound from the creel in sectional warping. An incline at one end prevents the sections from collapsing
Warping	The winding of warp yarns onto a beam
Weaving lease	A lease in a warp in a weaving machine at the rear of the healds, which is maintained by two transverse (or lease) rods
Weft and warp	The threads width ways and long ways respectively in a woven fabric