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Chapter 8 Woven apparel fabrics

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Abstract

This chapter considers the different woven manufacturing processes used in the production of apparel fabrics. It details the main apparel fabric types and looks at the key performance requirements of those fabrics, in relation to both the weave structure and the fibre type. The chapter then goes on to briefly describe important considerations in the design process and the various end uses for woven fabric. Application examples detailed towards the end of the chapter, include fabrics that are timeless classics and fabrics that are established fashion favourites.

Key words; apparel, weave, fabric characteristics.

8.1 Introduction

Woven fabrics for apparel are extensive in range and diverse in nature, and have developed over the centuries to meet a wide range of requirements and end uses. Functional or decorative, aesthetically pleasing or high-performance, the combinations of fibre, yarn, texture, weave, colour and finish provide a vast range of possible options. This chapter will focus on the more widely used woven apparel fabrics, their characteristics, performance and applications.

8.2 Performance requirements

8.2.1 Overview of the manufacturing process

The majority of woven apparel fabrics are produced on one of three loom types: a tappet loom, dobby loom or a jacquard loom. Tappet looms are used to produce designs that require 12 shafts or less and are more economical than dobby looms. Dobby power are used for small scale patterns beyond the capability of the tappet loom and are generally used for designs that require over 12 shafts and up to 32 shafts. Fabric types produced on these two loom types include are fabrics of all weights and in any type of fibre from natural to man-made fine voile's, silk satin's and cotton shirting, through to heavier weight denim and woollen tweed jacketing. Jacquard looms are used to create larger figured designs, which cannot be produced on a dobby loom and where the warp threads are controlled individually through a patterning mechanism which can be a mechanical one or linked to a Computer Aided Design system. Fabric types produced on this type of loom include the ornate and decorative, brocade, damask and cloqué. The fabrics produced on both of these loom types are termed flat-woven but there is another category of apparel fabrics that require specialist looms in order to form a pile on the surface of the cloth.

Pile woven fabrics including velvet and corduroy consist of a base ground fabric with an extra layer of loops formed in either the warp or the weft direction by an extra set of yarns. The loops formed by these extra yarns may be left intact i.e. uncut, as in the case of terry towelling or cut (either on or off the machine in the finishing process) creating a raised surface of yarn tufts or pile for fabrics like velvet and velveteen.

Apparel fabrics may be woven in ecru (un-dyed, natural colour) ready to be piece-dyed on demand, or colour-woven (fibre or yarn-dyed), as is the case with tweed and tartan fabrics. Woven fabrics also make up a large percentage of the base cloths used in the printing industry, where their inherent stability makes them an ideal substrate for achieving good print registration and clarity of design.

8.2.2 Trends and design

The popularity of woven fabrics for fashion is subject to seasonal trends influenced by catwalk collections and by the trend prediction company's that specialise in creating key directions for the colour, texture and patterning. The demand for the cloth types that make up the clothing staples of shirts, suits, jeans and coats remains fairly constant, but are subject to minor seasonal changes in terms of colour, fibre composition, and finish. This continuous development keeps them up to date and in line with current taste.

The design content of woven fabrics can vary, dependent on the fabric type and the desired end use. Plain or semi-plain fabrics that have been in use for hundreds of years require little design beyond the minor changes in construction or finish, but change may be driven by a change to the proposed fibre or yarn type. The development of a fabric woven from a new sustainable fibre for example may require some special loom settings, fabric sett, weave structure and finishing route before the optimum result is achieved. At the other end of the scale, jacquard woven designs and colour-and-weave fabrics (a Prince of Wales check for example) may necessitate multiple trials of possible weave design and or colour options before a new design is signed off. Fabric options may be offered in multiple colourways in a sample book, or in a design blanket (as is often the case in the worsted suiting industry).

The majority of the manufacturing for apparel fabric sold to the British High Street is now situated overseas in order to be able to produce material at the price point and quantity needed in order to remain competitive. The companies that do retain a manufacturing and weaving presence in the United Kingdom, are usually specialists in the production of high-end, bespoke or high-performance fabrics for end uses

including suiting, coating and ties. These specialists retain a presence in areas of the country that traditionally concentrated on the production of worsted, woollen, tweed, cotton, or silk manufacture, drawing on hundreds of craftsmanship in those regions.

8.2.3 Fabric specification

When specifying or selecting a fabric for apparel end use, a number of considerations need to be taken into account. The fashion designer, having designed or selected a specific garment shape, will be looking to maximise certain characteristics through the careful selection of a fabric that will compliment and fulfil the vision for their collection. A sensitivity to and knowledge of the characteristics of fabrics, along with a creative approach to their use is essential and central to the sourcing of the appropriate cloth for a given garment. Consideration of how the fabric will drape on the body and how it will be affected by the cut of the garment should be considered, along with inherent properties such as how open or dense, stiff or floppy, fluffy or smooth it is. Fabric comfort can be described as the extent of stretch and its recovery from extension. Woven fabrics are not naturally as stretchy as knitted constructions, but 'stretch woven fabrics' can be created through the use of elastomeric yarns.

The target customer and garment style needs to be considered when selecting a fabric, in order to match the performance of the cloth to its intended end use. How much will the garment be worn, in what situations will it need to perform, how long is it expected to last and how will it be laundered? These are all key questions to be answered along with the cost constraints of the range.

Fabric selection

When choosing the type of fabric, it is important to match the performance of desired fabric properties to the end purposes. Fabrics for work-wear need to have good durability, abrasion resistance and clean-ability. Outerwear needs to protect, insulate, and be hardwearing. Conversely finer and lightweight fabrics for eveningwear or lingerie are selected for their aesthetic qualities, drape, and handle. The combination of yarn and fibre type along with the weave, gives the designer further options to engineer a fabric to meet the garment requirements. A fibre such as wool has better extension than say flax (linen cloth), which is inherently stiff and has poor crease-recovery. More densely packed threads in the warp can help to improve tensile strength, than a higher pick rate in the weft, and a higher twist in the yarn will help give further strength to cope with the stresses and strains during weaving.

Weave properties and characteristics

Fabric properties are diverse, with weave structure, fibre type, fabric sett, yarn type and finishing route all affecting the characteristics of a given cloth. Some properties are inherent to a fibre type such as its stiffness, thermal properties, handle or drape. The weave type, including the length of floats in the structure will also influence these properties. The amount and direction of the twist in a yarn affects the handle, drape and other surface and physical properties.

One of the simplest weave structures, plain weave produces a plain, non-directional surface that may be fine or coarse dependant on linear density of the warp and weft yarns. Taffeta is a good example of a fabric woven in plain weave, a weave that is used for many lightweight and sheer fabrics. The high number of binding points (also known as interlacements) in this structure gives firmer and stronger fabrics than that

in a twill weave structure using the same fabric sett and yarn linear density. Plain weave is less susceptible to distortion of the threads in the fabric.

Twill weaves in which the yarns are usually more loosely bound than plain weave provide fabrics that are more supple and have a degree of natural stretch especially when cut on the bias (45° to the selvedge direction). Twills have a distinctive appearance as in the example of cavalry twills and the double-twill in this cloth not only defines the look of the cloth, but also the way in which it handles. In the case of Denim, the longer floats in the warp direction of the twill (3/1 twill is most common) can be used to hide the un-dyed weft.

Hopsack has a greater resistance to tearing compared to a fabric constructed from plain weave, as the pairs of ends work together in the structure. Hopsack fabrics can however create problems with seam fatigue, where it is more difficult to secure the more loosely bound ends and picks with the sewing thread. Loose weaves with long floats, do have better tear strength as the threads slip and move past each other rather than ripping straightaway.

The smooth face of satin woven fabrics creates an ideal surface for printing, embossing or embroidery applications. The durability and appearance retention of cord and velvet fabrics should be considered when designing as they have a tendency to wear out through pile loss or flattening of the pile. In the case of velvet, a 'w' weave where the tufts are locked in place by two picks rather than one will help the pile retention.

8.3 Types of woven apparel fabric

Apparel woven fabrics can be categorised according to their end use whether it be for intimate apparel, dresses, shirting, casual wear, outerwear such as suiting, coating or for a performance or sports wear (see Table 8.1). An easier approach to classifying the broad range of fabrics for fashion is to group them according to their weight as followed in this chapter.

Lightweight fabrics

Supple, lightweight, silky, smooth, transparent, open, cool and crisp, are all words that describe fabrics that go into garments ranging from lingerie, to shirting and into evening wear. Fabrics in this category include: foulard, gauze, habutai, muslin, organza. These are discussed below:

- Foulard is a soft, lustrous, lightweight fabric, traditionally woven in silk yarns and using a 2/2 twill weave, making it suitable for ties, scarves and linings. More often than not this apparel fabric is printed and is now also widely produced using synthetic yarns such as viscose, polyester, or acetate.
- Gauze is used for veils and trimmings; this is another fabric with an open semi-translucent construction that imparts a fluid, floppy handle. Constructed in plain weave or a leno construction that gives a more stable fabric (the warp ends using special heald wires cross over one-another to trap the weft).
- Habutai is the name of this soft, silk cloth originates from the Japanese word, meaning lightweight. The fabric is woven with silk yarns that still contain the natural gum from the silk cocoon, and using plain weave to create cloth suitable for dresses, blouses and scarves.
- Muslin is a lightweight cloth suitable for dresses, scarves and blouses. Woven in an open construction to form a soft, fine fabric, usually made from cotton. Muslin fabrics are usually woven in grey form (un-dyed ready for bleaching,

dyeing or printing) and the construction used is either plain weave or a leno weave.

- Organza fabric is used primarily for evening and wedding dress fabrics, where a stiff, sheer fabric is required. Plain weave in construction with an open sett, organza can be made from silk or man-made fibres that have a high-twist.

Additional stiffness is imparted into the fabric through the application of gum or resin in the finishing process.

Medium lightweight

Functional, textural, plain, semi-plain, checked or finished to a high shine, these fabrics are used extensively for shirting, dress fabrics, and nightwear. Mechanical finishing processes such as mercerisation or a schreiner finish give an even sheen and smooth appearance to satin and taffeta type fabrics. Fabrics in this category include: acetate lining, madras, oxford, satin, sateen, and taffeta. These are discussed below:

- Acetate lining – Acetate fabric is as the name suggests, made from acetate fibres or yarns and is primarily used for lining fabrics, dress fabrics and some lingerie.
- Madras – originally produced in the Indian city of the same name (now called Chennai), and now synonymous with shirting fabric that is plain woven, striped or checked. Madras has a fine, lightweight and airy handle and often colour woven, an effect that was traditionally created with vegetable dyes. The tendency for these dyes to bleed, has led to the use of colourfast yarns being employed in the production today's woven fabrics.

- Oxford is an inexpensive cotton or cotton/polyester shirting fabric named after a shirt worn by the undergraduates at the University of Oxford; this cloth is soft with a slight lustre. Two warp yarns are woven as one, in hopsack weave construction and typically with a white ground and coloured stripes or checks. The easy care nature of this fabric makes it suitable for casual shirts and blouses.
- Sateen is a completely weft faced structure that is named after another of the four elementary weave structures, and is commonly used as a lining fabric for suits. The weave structure resembles the back of a satin cloth, but differs in a lower density of warp threads and a high number of picks per centimetre. 5-end sateen is the usual weave structure used in conjunction with a weft yarn that is usually coarser than the warp and may be mercerized (in the case of cotton) or given a 'schreiner' finish to give a smooth lustrous look.
- Satin derives its name from the weave structure used in this fabric, where the longer warp floats produce a smooth even surface with no obvious patterning. The longer the warp threads as in the case of an 8-end satin (each warp thread floats over seven weft picks) the more luxurious the cloth. Duchesse satin is an example of this. Traditionally made from silk yarns, but now also produced in a range of man-made fibres and other natural fibres such as cotton, there are a wide range of qualities and weights that are produced to meet many different end uses. Satin cloth for intimate apparel is typically lustrous in appearance as a result of using high lustre yarns in either silk or a man-made fibre such as polyester
- Taffeta is a medium weight fabric, constructed in plain weave fabric that forms a slight ribbed appearance in weft-direction, resulting in a crisp hand a lustrous appearance. Taffeta is most often used for formal wear, and is

usually produced in a solid colour but is also woven with contrasting colours in the warp and weft in to give a changeant effect.

Medium weight plain

Calico is one of the staples of the fashion industry through its extensive use for toiles and mock-ups of garments. Texture features heavily in this category in fabrics like seersucker that use chemical finishes or differential shrinkage to achieve surface interest and crepe which uses the weave structure to create an pebbly feel to the cloth. Fabric in this area include; Calico, Crepe, Flannelette, Grosgrain. Percale, Poplin, Seersucker, Terry. These are discussed below:

- Calico is often woven in unbleached cotton, characterized by the presence of flecks of seed matter from the plant. Plain weave is used for this utility fabric, a fabric that creases easily and is frequently sized to give it an added stiffness. Used in its plain state for use as toiles in dress making it also seen printed with small bright floral patterns in the United States.
- Crêpe is a lightweight fabric of silk, rayon, cotton, wool, man-made, or blended fibers, with a distinctive crinkled surface. This fabric type has a number of variations including crepe de chine, crêpe marocain, crêpe chiffon and moss crêpe. The crinkled surface is obtained through the use of either crêpe yarns (yarns that have such a high twist that the yarn kinks) a combination of yarns with alternating 's' and 'z' twist, by a chemical treatment causing areas to shrink and pucker, embossing, or through the weave itself (usually with thicker warp yarns and thinner filling yarns).
- Flannelette is frequently used in nightwear for both men's and women's pyjamas. This fabric is usually constructed in a twill or plain weave, using cotton yarns where the surface fibres have been raised in finishing to give a

soft handle. Flannelette was traditionally used for sheets, but is less commonly used since the introduction of central heating.

- Grosgrain fabrics are traditionally used for ties and the appearance of this fabric is described by the translation of grosgrain, which literally means 'large cord'. A strong cloth usually made from silk or man-made continuous filament, it can be quite expensive due to the weight of the heavier weft yarns and highly sett warp yarns (Fig 8.1) Woven in a plain weave construction, the combination of sett and yarns makes this an ideal fabric on which to create moiré effects popular for dresses and eveningwear. A moiré fabric has a watermark effect on the surface created by one of two methods. The rib or corded nature of this type of fabric is essential in creating a true moiré fabric which is a mix of flattened and still rounded areas of the cloth, that result after two fabrics are stitched face-to-face and pressed through two heated, smooth and heavy rollers. The other method for creating a moiré effect uses an embossed roller with the characteristic watermark pattern engraved onto its surface, thus flattening the ribs of the fabric to this pattern.
- Percale is used for shirts and dresses in apparel and has a fine smooth handle due to the closely sett yarns. This fabric produced in combed cotton or Egyptian cotton yarns and either piece dyed, printed or just bleached.
- Poplin was originally made for the pope and referred to a 'Papalino' this is a lustrous and hardwearing fabric. A light cross-rib effect is formed through the use of plain weave combined with a warp sett that could have up to twice as many ends per centimetre as weft picks. Poplin is used for functional fabrics including, jackets, dresses, shirts and linings.

- Seersucker fabrics are traditionally used in summer weight shirts, or informal suits. The characteristic puckered stripe effect is either created through controlled tension differences in sections of the warp during weaving, through the use of yarns with differential shrinkage, or using chemical finishes (Fig 8.2)
- Terry is produced on a loom fitted with a terry mechanism and an extra warp (pile warp) that forms uncut loops or pile on one or both sides of the fabric. Cotton fibres are usually used in the production of this cloth, where its inherent absorbency is suited to its use in dressing gowns.

Medium weight patterned

This category of fabrics is characterised by complex ornate patterns formed by jacquard weaving. Metallic threads, lustrous yarns and sumptuous textures, create a beautiful range of fabrics used in exclusive and high-end garments. Fabrics include; brocade, cloque and damask. These are discussed below:

- Brocade is an ornamental fabric usually produced on a jacquard loom, to achieve highly patterned, multicoloured, richly figured patterns for use in evening dress fabrics and accessories. Traditionally figured with gold or silver thread, brocade was woven in silk, and the resulting cloth was of a heavy weight in comparison to damask. Brocade fabrics are usually designed so that only the face of the fabric shows the true pattern, combining simple ground weaves (twill, plain weave, satin, sateen) and supplementary figuring yarns in the warp or weft direction.
- Cloqué is characterised by the three-dimensional blister effect that is created in this apparel fabric, produced by weaving a double cloth fabric that combines warp and weft yarns with differential shrinkage. A blister effect

results in the finishing process and may also be produced through a combination of weave structures that allow for more or less shrinkage (Fig 8.3). These fabrics are used in a range of ladies apparel including, lingerie, eveningwear and blouses.

- Damask jacquard fabric's opulent appearance makes it most suitable for eveningwear, and it is characterised by large-scale classical patterns, more frequently seen for interior and table-wear uses. Satin and sateen weaves are used to create this reversible fabric, which has a subtle sheen in the warp direction, contrasted with a more matt weft yarn.

Suiting fabrics

Smart, uniform, hard-wearing conservative and classic. The timeless elegance of the woven fabrics used in suiting is little changed in essence, but they have managed to keep their appeal in the uniform of the workplace. Suiting fabrics include, worsted, barrathea, and serge. These are discussed below:

- Worsted fabrics are made from fine long staple fibres that have been carded and combed to align the fibres in parallel. Worsted yarns are tightly twisted and woven to form smooth, fine surface texture that has a crisp and firm hand. Usually woven in a twill weave, the resulting fabric is more durable than woollen spun fabrics, and more expensive to produce. Used predominantly for suiting and formal work-wear in part due to the clean-cut appearance of the fabric that has a flat and smooth finish. Wool is the most common fibre used in worsted fabrics, but at the high end of the market blends that mix wool with cashmere, silk or the extremely rare Qivuiik fibre are also used.
- Barrathea fabric is used for neckties, uniforms and trousers, this fabric has a smooth pebbly surface is usually woven for worsted suiting's. The weave is a

twilled hopsack, but other broken-rib variations are used in the production of cotton and silk fabrics.

- Serge is a hardwearing worsted-wool cloth; with a 2/2 twill weave construction. Compactly woven with high-twist yarns, it usually has a smooth face that becomes shiny with wear. End uses include coats, skirts, suiting and uniforms, where the fabric's natural ability to hold a crease is invaluable.

Jacketing fabrics

Warmth and protection from the elements are combined in these hard wearing cloths. Medium weight jacket fabrics include; flannel, and gaberdine. These are discussed below:

- Flannel is medium-weight, and is normally a plain or twill weave fabric that is typically made from cotton, a cotton blend, or wool. This fabric is finished to give a very soft hand; by brushing on both sides the fiber is lifted to create a soft, slightly fuzzy surface.
- Gaberdine is a functional fabric with clearly defined diagonal twill lines on the face. This fabric is most suited to outerwear such as raincoats, jackets or trousers, skirts and sportswear. It can be made from cotton/polyester, polyester or viscose, but the best quality fabrics are made from wool (Fig 8.4). Tightly woven, the smooth uniform finish helps to make the fabric water repellent and hardwearing.

Work wear and casual wear

These fabrics are widely used both in the workplace and also extensively for casual wear. A mixture of traditional and conservative fabrics, including others that change each season following the latest whims of fashion are all represented in this section.

Fabrics include; cavalry twill, chino, denim, drill and moleskin. These are discussed below:

- Cavalry twill fabric is formed by a steep pronounced double twill, this fabric is ideal for trousers, jackets, coats and as it was originally, for uniforms (Fig 8.5). Made from woollen or worsted yarns traditionally, it is now also produced in other natural and man-made fibres to give a strong wearing fabric.
- Chino cotton or cotton/polyester fabric also uses a warp-faced twill weave as its structure. Hardwearing with a slight sheen, its name has been adopted for a style of casual trouser in the USA but originates from China where it was first made.
- Denim a hardwearing utility cloth has developed into one of the staples of the apparel industry. Denim which is full to the touch, has diagonal ribbing formed with a twill weave (2/1 or 3/1 twill) uses contrasting colours in the warp and weft (typically blue warp and white weft). Traditionally made from cotton, but now available in polyester/cotton blends, lyocell and combined with an elastomeric to give added comfort, this fabric is produced in a vast number of variations for both men's and women's wear.
- Drill fabric covers a variety of materials that are used for shirts, suiting's and uniforms. A 3/1 twill is often used in combination with good quality, high-twist, cotton yarn to form very durable woven fabric, where the twill lines run in the opposite direction (bottom right to top left) to other fabrics. Drill may be undyed, warp striped or piece dyed as in the case of Khaki, a colour that gave its name to this army uniform cloth.
- Moleskin has a fine-brushed nap on the surface of this cloth, giving it the appearance of fine suede. This medium-weight fabric is usually made from cotton and woven using a satin-based weave with short weft floats on the

surface, which are raised in finishing to give the suede-like handle. Trousers, work wear and jackets are all produced in this cloth.

Pile and texture

Surface texture including exaggerated ribs, cut pile surfaces, and sumptuous soft hand are all created through the use of weave structure, special yarns, and in the case of velvet and corduroy, cut brushed fibres aligned in finishing. Ranging from the casual look of cord through to the luxurious opulence of velvet, these fabrics can suffer from the trends of fashion.

Fabrics of pile construction are velvet and velveteen and corduroy whereas Bedford cord and Pique create ridges or cords using the weave structure alone.

- Bedford Cord can be seen in use in coats, trousers, uniforms and other outerwear. A specific weave construction is used to create cords in the fabric that are formed by the tightly sett warp, in contrast to weft floats on the back of the cloth that causes the fabric to buckle. The name of this firm hardwearing cloth comes from the duke of Bedford who used the cloth to clothe his troops in the 15th century.
- Corduroy fabric is formed from raised and cut pile ribs of pile running down the length of the fabric. Usually woven in cotton, and of varying width (expressed in wale's per inch) this fabric is suitable for trousers, jackets and skirts.
- Pique derives its name from the French word to quilt, and has an embossed look. Double cloth weaves are used in conjunction with one fine and one thicker warp yarn that stitch together at intervals forming cords or ribs on the

surface. Used in sportswear, dress shirts and waistcoats, the fabric is usually of cotton and piece dyed.

- Velvet is a medium weight cut-pile fabric in which the cut pile stands up very straight to give an even, uniform surface. It is woven using two sets of warp yarns; the extra set creates the pile. Velvet, a luxurious fabric used for eveningwear, accessories and jackets, is commonly made with a filament yarn for high luster and a smooth, soft hand. There are many variations of velvet that are defined by the finish applied, fibre content or length of the pile. Crushed velvet for example is a solid-coloured velvet that is passed through heated rollers in order to press the pile flat in an irregular pattern. Façonné velvet has a pattern 'burnt-out' using a devoré process to selectively remove the pile to reveal the ground weave composed of yarns resistant to the chemicals applied.
- Velveteen fabric is made in a similar way to velvet, but an extra set of weft yarns are used to form the pile instead of an extra set of warp yarns. The resulting fabric has more body than velvet but with less drape.

Heavy weight

These protective outerwear fabrics with textural, hairy surfaces have served as coating fabrics for many generations. The soft colour of the heathered tweed fabrics are influenced by the surrounding landscape and are dyed in fibre form to create complex blends colour woven into simple weave structures. The main fabric types in this category are: loden, tweed, and Harris Tweed. These are discussed below:

- Loden is traditionally woven in the Tyrol region of Austria, this fabric has a brushed, raised surface giving it a warm, tactile surface, usually dyed to a

specific green colour. The felted effect on the surface of this woollen fabric, imparts a natural water-repellence ideal as a coating fabric.

- Tweed is traditionally a term that describes fabrics that are made from wool and are heavy weight and have a rougher, hairy handle. The yarns used to produce tweed fabrics are fibre dyed and blended to produce colours that have a melange effect (Fig 8.6). The rougher surface texture of this fabric type, originally made on the banks of the river Tweed in the Borders means that it is most suitable for outerwear such as coats and jackets that can be lined.
- Harris Tweed is the best known of all the tweeds and is exclusively woven in the Outer Hebrides, on either the Isle Harris or Lewis. Still produced in the homes of the islanders with Scottish wool, dyed locally the colours reflect the landscape of the area, and the fabric is finished in the region and can be accredited with the 'Harris Tweed' trademark. Twill, herringbone and plain structures are used to produce these expensive fabrics yet exclusive fabrics.

Performance apparel fabrics

Protective, functional, breathable, and durable fabrics are the mainstay of the outdoor pursuits and performance sportswear business. Engineered to protect the wearer from the elements or to control the climate of the wearer, garments that use woven fabrics in this category are highly specialised and tested to high standards:

- Goretex® fabric was developed by W.L. Gore and Associates, Inc. and was one of the first fabrics to fill the demand for a waterproof breathable fabric suitable for outdoor pursuits. Goretex® is essentially a sandwich of a woven face fabric (such as polyester) and a membrane of fluorocarbon and a

backing fabric. Many outdoor brands use this fabric and have developed their own propriety fabrics to perform in a similar way, including Lowe Alpine, North Face and Bergaus.

- Ripstop as the name suggests, has a resistance to being torn or ripped. A base weave such as plain weave is intersected at regular intervals in both the warp and weft directions to form a check of double-lifting (2 ends/picks together) ends or picks. These areas as in the case of a hopsack are stronger than the plain weave ground. Usually woven in nylon this lightweight fabric can also be back-coated with silicone to create a more waterproof material.

8.4 Practical design applications

Matching the fabric to the end use requires some knowledge of fabric properties and characteristics, characteristics that can be used to enhance the look, structure or aesthetic of a garment. Fabric shows such as Premier Vision and Interstoff are vital in the fabric selection and development activities of fashion designers. Apparel fabrics at Premiere Vision are promoted through trend direction forums based around such categories as; Relax-Distinction (wool suiting, shirting, jeans & cotton), Seduction (fluid and fancy, silks, fancy woollens and prints), Pulsation (technical and performance fabrics, extreme sports fabrics and lingerie), and Atelier Denim. Designers and fabric selectors need to be assured that the performance of the material meets their parameters for performance in a given garment. New and novel fabrics offered by suppliers may not have gone through such rigorous testing or field trials, requiring a leap of faith from the buyers. Conversations between the designers and producers at these fairs can lead to a valuable exchange of information regarding the performance of previous products and possibly the development of exclusive fabric ranges.

Surface interest - felted appearance

A level of milling or brushing applied to a fabric through finishing them with a combination of heat, pressure and friction gives rise to thick dense fabrics with a felted appearance that do not fray easily. A felted wool garment can be left with unfinished edges, abutted seams or top stitched hems. Fabrics such as Loden, and Melton are ideal candidates for this approach.

Surface interest – texture

The texture of a fabric can alter depending on how we perceive the colour, especially in the case of velvets where the angle at which the fabric is viewed changes the depth of shade. Pile fabrics absorb light and can also have a greater thickness that imparts a rich luxurious look to a garment. Novelty fabrics where texture is created using fancy, boucle, tape and slub yarns woven into colour and weave structures like dogtooth checks are a staple of jackets in the Chanel's collections where cost is not such an issue.

Stretch

Stretch may be imparted into a fabric through finishing. It may as well be inherent in the fibre type or be added through the use of stretch yarns that use fibres such as Spandex or Lycra. The comfort of denim and corduroy are improved through the use of cotton/lycra fibre blends which impart a degree of stretch to the fabric, so that not only is comfort improved, but also wrinkle- resistance and fit. Stretch woven fabrics have also contributed to the development of fabrics that perform for sportswear and outdoor pursuits as well as redefining garment shaping for snug streamlined silhouettes.

Transparency

Fabrics used to produce garments with transparency have beautiful qualities but are also more difficult to work with due to their fineness, slippery surface and tendency to mark. Organza and organdie are examples of semi-transparent or transparent crisp fabrics. Softer fabrics in this category are chiffon, georgette and crepe chiffon, whereas voile, shirting's and gauze sit somewhere between the two. Considerations when pattern cutting and choosing fabrics are the weight, the thickness, shear (distortion of in the warp and weft directions), drape and stretch of the fabric.

Pattern

Directional or large-scale patterns in traditional weave designs like dogtooth and Prince of Wales check require additional care when matching up seams than an equivalent semi plain all over design. Fashion trends influence the popularity and scale of patterned fabrics, as well as the proportions of the garment they are aimed at. Large-scale jacquard motifs need to be carefully placed or used in garments with a greater volume of fabric to fold and drape, and smaller scale patterns are suited to closer fitting garments. Fabric utilisation may well be affected by the matching of these larger scale patterns, with more wastage in the pattern cutting stage.

Tailored Garments

The right choice of fabrics used in combination is significant in creating a well-fitted tailored garment such as a suit. Woollen fabrics for suits may be constructed from yarns produced on the worsted or woollen systems. Worsted yarns are composed of fibres that are longer and finely combed, with a resulting firm flat fabric used for the majority of business suits. Woollen yarns are composed of shorter, uncombed fibres, which are loosely twisted, creating softer, bulkier, hairier fabrics, of which Harris Tweed is a well-known fabric. In these types of garments fabrics needed for hidden

support include; Melton for the collar, and pockets with canvas for other lighter weight interfacings.

Support fabrics

Corsetry requires fabrics to fulfil a role not unlike that of an engineered material, where the body is controlled, or distorted to fit a desired shape. Lustrous and opulent fabrics like satin and silks are supported by carefully chosen control fabrics that impart strength, stability and body to the garment. Canvas is used in corsetry to control the deformation or stretch of the face fabric in the garment, whereas, a cotton drill woven in twill weave provides a strong, natural flexibility suitable for the foundation of the corset. Other support fabrics include, organdie, muslin, and organza. Cotton pocketing uses a closely woven twill or plain weave and has good durability due to the two fold yarns used. Interlining fabrics such as a stiff organza must have the same shrinkage resistance as the other fabrics in the garment, or be fully shrunk already.

8.5 Application Examples

Chanel and Linton Tweeds

The long established relationship between Chanel and Linton Tweeds is a rare example in today's fast fashion, globally sourced, price sensitive world. Originally a producer of 100% woollen cloth, Linton Tweeds faced stiff competition from all the other woollen manufacturers in Scotland and Yorkshire. This Carlisle based weaver, established in 1912 and synonymous with good quality, took steps to differentiate itself from the competition in the late 1960's. In order to make themselves more unique, they developed fabrics that used more exotic and man-made yarns, as well as developing machinery to manufacture their own unique fancy yarns.

A long association with the couture houses of Paris had brought the company a high profile but little financial reward, but this was helped when the introduction of the ready-to-wear collections took off for their haute couture customers such as Chanel. Linton's expanded their horizons to supply markets in Japan and the USA, and they now promote their ranges at Premier Vision in Paris, as well as in Milan, Japan and New York.

The novelty woven fabrics that Linton's create are elegant, fancy tweeds suitable for ladies jackets, skirts and coats. The fabrics that they produce for Chanel and other couture names are woven in short runs and are usually non repeatable. Typical fabric constructions are based on hopsack, herringbone, basket weave, leno weaves and colour and weave effects including the 4-point star and the hounds-tooth check.

The Chanel suit became the status symbol of the 1950's generation, and was updated by Karl Lagerfeld when he took over design at the label in the 1980's. Using inspiration from past collections, lighter tweed fabrics with a softer look using new yarns were developed for use in the iconic collarless style jacket now synonymous with Chanel. The tweed fabric from Linton Tweeds continues to be re-invented, updated and transcends fashion having established itself as one of the signature looks of Chanel.

Denim

'Denim is more than just a cotton fabric; it inspires strong opinion within the hearts of historians, designers, teenagers, movie stars, reporters and writers' (Downey 2007)

First produced in Nimes, France, the name of this cloth originated from the town that it was originally woven in and was described as 'de Nimes' (from Nimes) a name that evolved into name, denim that we know today. This hardwearing serge cloth was

originally imported in the 1850's into the USA as a canvas for tents, and was adapted for work wear during the gold rush by Loeb (Levi) Strauss.

Denim jeans did not start their rise into mainstream fashion until the 1950's with the teenage rebellion around James Dean and his film 'Rebel without a cause'. In the 1960's and 70's denim became a staple of fashion trends, adapting its look to fit the style of those eras. Denim has elevated its status even further since the 1980's, as it has been styled, finished and labelled, to command high prices in the collections of the top fashion brands. The art of finishing denim has created a whole new area of specialist knowledge around the colouration and fit of jeans as well as the destruction, manipulation and embellishment of this seemingly simple fabric.

The blue colour synonymous with denim originally came from the natural Indigo dye, and then moved to a synthetic version in the 19th century. Cotton is still the dominant fibre type used in the manufacture of jeans, with other synthetic fibres such as Lyocell, a cotton-like cellulosic, taking a small market share. The comfort and stretch of denim is enhanced where cotton and lycra are blended, and other properties have been developed by mixing cotton with polyamide or polyester.

One of the first companies to introduce a 'distressed denim' look in the 1980's was Italian company, Diesel. Their 'aged/already worn' look was slow to take off, but this aesthetic is now at the forefront of trends for denim worldwide. The art of finishing denim, now ranges from sandblasting, acid-washing, bleaching, resin treatments, stone-washing with pumice and whiskering, a process that simulates the creases formed through years of normal wear. Throughout all these changes the one constant factor that characterises denim, has been the 3/1twill structure.

The future of worsted suiting

Woven worsted fabric produced over the centuries for the top names of London's Savile Row, appear little changed on the face of it, but have in reality evolved into a diverse collection of luxury fabric's. Worsted suiting traditionally produced in wool and using weave structures that include, plain-weave, twill, herringbone, and satin has moved forward to embrace the needs of the modern day consumer as well as the bespoke international market for these fabrics.

Product developments led by the Woolmark company and Australian Wool Innovation Ltd (AWI), have continued the International Wool Secretariat 'Cool Wool' campaign which was first introduced in the early 1990's. The promotion of wool as a trans-seasonal fibre is supported by its natural properties, durability, and ability to respond to changes in both environmental and body temperatures has led to Merino Cool™ which uses the finest Merino fibres and results in fabrics that weigh less than 165 gm². These lightweight breathable fabrics have excellent drape, making them suitable for use in less structured garments and for warmer climates.

The concept of the machine washable suit has also been taken one step further through the application of a polymeric shrink-resistant finish to plain woven, wool/polyester blend fabric. The sustainable qualities of wool fabrics have been promoted by the designer Paul Smith and improved efficiency and care for natural resources are at the heart of the latest campaign to promote benefits of this fibre in woven and knitted fabrics. "MerinoFresh™ technology has been developed with the environment in mind; a MerinoFresh™ garment typically requires less water and energy for after care than conventional woven products" according to Australian Wool Innovation. This push for development between the fibre suppliers, weavers and

finishers and promotional activities like the Campaign for Wool is ensuring a bright future for one of the longest established and traditional worsted weave industries.

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