EVALUATION OF TWILL WEAVE FABRICS MADE OF BLENDED ERI-MODAL AND ERI-ACRYLIC YARNS SUITABLE FOR DIFFERENT DRESS DESIGNS

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IN

TEXTILES AND APPAREL DESIGNING

By

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CERTIFICATE – I

This is to certify that the thesis entitled **"Evaluation of twill weave fabrics made of blended eri-modal and eri-acrylic yarns suitable for different dress designs";** submitted to the Faculty of Community Science, Assam Agricultural University in partial fulfillment for the degree of **Doctor of Philosophy (Home Science)** in **Textiles and Apparel Designing** is a record of research work carried out by **Sunita Boruah** under my personal supervision and guidance.

All helps received by her have been duly acknowledged.

No part of this thesis has been reproduced elsewhere for any degree.

Place : Jorhat

Dated:……., 2018

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CERTIFICATE – II

This is to certify that the thesis entitled **"Evaluation of twill weave fabrics made of blended eri-modal and eri-acrylic yarns suitable for different dress designs"** submitted by **Sunita Boruah, Roll No. 15-HDJ-06** to the Assam Agricultural University in partial fulfilment of the requirement for the degree of **Doctor of Philosophy (Home Science)** in the discipline of **Textiles and Apparel Designing** has been examined and approved by the Student's Advisory Committee after viva-voce.

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ABSTRACT

Dress designing has always been an important art and a well- designed garment has beauty and appropriateness, which makes it right for the wearer. To achieve a good fit, it is necessary to give attention to finer details such as fabric structure, individual proportion and contours. In textiles, fabrics are manufactured in wide varieties and designs which are produced by different weaving techniques that enhance the look of aesthetic value of the apparels. Union fabrics are those, where fabrics are created with warp of one kind of yarn and weft of another yarn or blended yarn in one direction or both warp and weft direction of different blended yarn. Weaving of such fabrics has opened a new era with limitless possibilities in the field of textile, as well as in fashion world. The review of the literature suggested that there is an increased interest in blending of silk with other fibres but limited work has been done regarding blending of eri silk with modal and acrylic on commercial spinning system.

Therefore, the investigation was carried out to "Evaluation of twill weaves fabrics made of blended eri-modal and eri-acrylic yarns suitable for different dress designs" with the objectives to blend the yarns in different proportions using selected fibres, to analyse the physical properties of selected fibres and yarns, to construct the union fabrics of different twill weaves using selected yarns, to assess the mechanical, comfort and tactile properties of woven fabrics, to design and construct different dresses based on the fabric properties and to take opinion on constructed dresses.

The study was limited in three different types of fibres- eri silk, modal and acrylic and three blend proportions were selected, 30:70, 50:50 and70:30.The weaves were limited to only twill weave and derivatives of twill i.e. herringbone and diamond.

The present study was conducted to analyze the physical and mechanical characteristics of fibre. The count and diameter of eri silk fiber were higher than modal and acrylic fiber. Whiteness index and the Initial Modulus were found to be highest in modal and lowest in eri-silk. Fibre density and moisture content observed maximum in eri silk followed by modal and acrylic. The tenacity and specific work of rupture of acrylic fibre was greater than modal and eri silk fibre. The results indicated that elongation per cent for eri silk is higher as compared to modal and acrylic fibre.

Six developed yarns with varying proportions and one definite count (1/30s) with Z twist were prepared. From the study it was found that the physical and mechanical properties of yarn samples of both the controlled and blended were significant at 5% level of significance and all the samples were found to be different with each other.

The developed twill, herringbone and diamond weaves woven fabrics were analyzed for physical, mechanical and comfort properties. Interaction among all the tested samples, the highest fabric count and cloth cover factor were observed in EA 30:70 with diamond weave in both direction. The fabric weight and thickness of all the controlled samples were in increasing trend as compared to union fabrics. Regarding the interaction between all the test fabrics in both the way i.e. warp and weft way controlled eri silk with diamond fabrics was exhibited highest mean value in stiffness, drape co-efficient and dimensional stability. Maximum mean value of flexural rigidity was observed in sample EM 30:70 and the crease recovery angle of all the test samples in both warp and weft direction was seen in sample EA 30:70 with twill weave.The highest wicking height in both the warp and weft direction was observed in controlled modal with diamond weave. Among all the test fabrics, EA 30:70 were exhibited highest values of tensile strength and loss in mass in warp and weft-way. The modal test fabrics with twill weave showing increase trend of air permeability and thermal conductivity. The maximum mean value of thermal insulation was observed in sample controlled acrylic with diamond weave.

Subjective evaluations of union fabrics were done by 100 respondents to assess the fabrics visual inspection like appearance, lustre, handle, texture and suitability of products prepared from union fabrics. Respondent opined that all the woven samples have good appearance, soft in hand and smooth in texture. It was observed that cent percent of respondents found eri-modal blended union fabrics with three weaves were high in lustre. The rank order of preferences for the constructed dresses were evaluated by the respondents and it was interesting to note that the rank order of preferences for selection of dress designs and the constructed dresses were found to be similar. The costs of blended yarn were got reduced in comparison to that of 100 per cent eri-silk yarn and it was also observed that the cost of blended union fabrics of different proportion that got reduced in comparison to that of controlled eri silk fabrics.

LIST OF ABBREVIATIONS

AATCC	: American Association of Textile Chemist and Colorist.
ASTM	: American Society for Testing Materials
BS	: British Standards
cc	: Cubic centimetre
cm	: Centimetre
cN/tex	:Centi-Newton/tex
e.g.	: Exempli gratia (for example)
et al.	: Et alii (and others)
Fig.	: Figure
g/denier	: gram per denier
gf	: gram-force
g/tex	:gram/tex
IS	: Indian standards
Kg.f.	: kilogram-force
Lbs	: pound-force
M	: Meter(s)
m:l	: Material to liquor ratio
mg	: Miligram
min	: Minutes(s)
Ml	: Mililitre(s)
mm	: Milimeter (s)
Ne	: Numerical expression
Nm	: Nanometer(s)
tpi	: twist per inch.
tpm	: twist per meter.
viz.	: Videlicet (namely)

CHAPTER I
INTRODUCTION

Dress design is the applied art dedicated to the design of clothing and lifestyle accessories created within the cultural and social influences of a specific time. Dress designing has always been an important art and a well- designed garment has beauty and appropriateness, which makes it right for the wearer. A garment is attractive only if it fits well. To achieve a good fit, it is necessary to give attention to finer details such as fabric structure, individual proportion and contours (Kothari, 2011).

A pleasing combination of line, colour and fabric adds up to a costume that is "in good taste". A person having good taste partly knows how to choose clothes that suit the occasion. But beyond that, having good taste means being able to recognize good design. Many studies revealed that increased level of dress consciousness of individuals have contributed to the development of innovative designs in the modern age because selection of dresses is an important factor in consumer's choice of cloth and design and construct the dresses accordingly. Today, in the competitive era consumers of textiles look for new fashions, which not only means silhouette of the garment but also the type of fabrics used, construction details, aesthetic appearance and cost effectiveness (Patiland Naik, 1999).

In the present age of fashion and style, not only women, but everybody wants to look different and stylish. Gone are the days when fashion and clothing were known to be a women's domain. Today, everybody wants to look good (Bakewell *et al.,* 2006).

Fashion literally means style of the clothes that we wear. Fashion can be considered as an invention of modern age. Value and importance of fashion is increasing day by day. The word fashion has come since the day of inception of human civilization. Fashion affects each and everyone in one way or the other. Fashion is an expression, a means to communicate (wiki.answer.com).

In today's time, fashion plays a distinctive role and often it is a habitual trend in the style in which a person dresses. It refers to the use of prevailing styles along with the acceptance of the new creations of textile designers by a group of people at particular period of time (Marshal, 2009).

Textile materials are of interest to everyone as these are an integral part of civilized life. Since time immemorial, man has used textiles for various purposes, such as for covering, warmth, personal adornment and even to display personal wealth (Thomas, 1998).

In textiles, fabrics are manufactured in wide varieties and designs, which are produced by different weaving techniques that enhance the look of aesthetic value of the apparels. Weaving is the method or process of interlacing two or more sets of yarns or similar materials so that they cross each other at usually right angles to produce woven fabric (Tortora and Merkel, 2005).

Weaves are regarded as the structural pattern of different fabrics and the characteristics of fabrics such as nubby or soft, loose or tight are depended largely on the structure of the weave. They can also cause a huge variance regarding the fabric's durability or strength. Weaves fall into three main categories, namely Basic weaves (which are the most popular and include plain, twill, satin and those weaves that are developed from them), Fancy weaves and Compound weaves (Wynne ,1997).

The order of interlacing which causes diagonal lines of warp and weft floats to be formed in the fabric is called twill weave. The basic weaves of these diagonal lines are continuous but in some of their derivatives, they may be broken or reversed periodically. The design of twill weave appears in the both sides of the fabric. It is possible to produce more fancy designs in twills than in plain weaves. In addition to their distinctive appearance and high strength, twill fabrics tend to show soil less readily than plain-weave fabrics. The major advantages of a twill fabric are that it is durable and wears well, resists soiling, and has good resistance to wrinkling (Gupta S., Garg N. and Saini R., 1999).

The derivatives of twill weave are Herringbone twill, Diamond design, Diaper design, Broken twill, Elongated design, Stepped twill, Shaded twill, Combined twill

and Rearranged twill. Herringbone twill is constructed in a different manner from the ordinary zigzag twill. Though it's also depends on reversal of twill direction. Diamond is also a derivative of twill weave. It is constructed on the basis of zigzag twill principle. It is obtained by combining horizontal and vertical zigzag twill. So here in the repeat the number of both warp and weft thread are double then that in basic twill. Diamond is a reversible design. So it may be divided into two equal partsin both vertical and horizontal axis. Pointed or V-drafting system is used to produce diamond design (textilelearner.blogspot.in).

Union fabrics are those, where fabric are created with warp of one kind of yarn and weft of another yarn. Union fabric can also be produced by using blended yarn in one direction or both warp and weft direction of different blended yarn. Weaving of such fabrics has opened a new era with limitless possibilities in the field of textile, as well as in fashion world (Koranne *et al*, 2015).

Blending of fibrous materials is a technique to achieve and satisfy the requirements of both, the manufacturers and consumers. It is an intimate mixture of fibres of different composition, length, diameter or colour spun together into one yarn in which the constituent fibres are present in the same yarn, in planned proportions (Kadolph and Langford, 1996).

Blending of fibres is usually made with different fibres having dissimilarity in their properties, with a view to achieving or improving certain characters of the yarn or its processing performances. Fabric produced from the blended yarn might have better characteristics than the in a fabric produced from a single fibre. The blending of fibre is done to develop drape properties, comfortability, durability and many other properties of the fabric products (Prakash *et al.*, 2012).

In a country like India with extremes of temperature and humidity, garments made from natural fibres or their blends are certainly preferred to synthetics or blended synthetics either with natural or manmade for the reason of environment and health. Fibre fineness, density, strength, cross-sectional shape and surface properties of eri silk fibre promise its blending capability with cotton, wool and similar finer fibres.

Natural fibres are self-blended in order to improve the uniformity of the fibre. This improves spinning, weaving and finishing efficiency and results in a more uniform final product. Reasons for producing blended fabrics are to reduce cost or to obtain a different appearance, to obtain a greater number of desirable characteristics that cannot be obtained by using one fibre alone such as absorbency, comfort, lightness, cross dyed effect, wearing, furnishing and dyeing efficiency. Fibres have been blended to produce fabric and articles of improved functionality also (Singh, 2008).

Silk is the most cherished of all the textile fibres. It is the queen of all the fibres and have the most exciting characters like extra lustre, extreme smooth feeling and good insulation. The most attractive property of silk fibre is high resistance to deformation (Vatsala *et al*., 2002).

India, has the distinction of being the only country in the world, producing all the four commercially exploited silk varieties *viz*. mulberry silk produced throughout the country, tropical tasar, temperate/oak tasar, produced by tribal inhabiting Central India and Sub-Himalayan Region, eri silk (spun silk produced mainly in N. E. Region, now practiced in many other states) and muga – golden silk produced only in Brahmaputra valley of Assam province in NE Region. The non-mulberry silks (Tasar, Muga&Eri) are now being popularized as Vanya silk (Anon, 2017-18).

Unlike mulberry silk, *vanya* silk is wild in nature and reared in open fields on trees in natural forests and perennial plantations except eri which is multivoltine silkworm "*Samia ricini"*is reared in indoor conditions and completely domesticated (Jolly *et al.*, 1981). The Eri cocoons are open mouthed and Silk produced by this group are simple, elegant and natural with uniqueness in colours. However, there is immense scope for product development and diversification to address consumer preferences in different parts of world.

The Eri or Endi silk is a rather stiff silk of natural grey or beige colour. It makes attractive rough textured shawls that are mostly sold in domestic market. Eri silk is popularly known as "poor man's" silk. Eri silk is also termed as the "Ahimsa silk". As it possesses excellent thermal property, closer to wool, it is mainly utilized to manufacture of shawls, jackets and blankets (Gogoi and Kalita, 2009). Eri yarn

can also be interwoven with man-made fibre such as modal, rayon, acrylic, polyester to produce union fabrics.

Modal is wood pulp based cellulosic fibre, made out of pure wooden chips from the beech tree technically, as the European Schneider Zelkova tree. While viscose can be obtained from the wood pulp from a number of different trees. In many ways Modal acts like cotton, but it also have some significant advantages over cotton. Modal displays high dimensional stability, both for low shrinkage and low un recoverable extension. It blends beautifully with almost all textile fibres, viz. Cotton, wool, silk and synthetics. It is more hygroscopic in nature i.e. absorbs 50% more water than cotton and as strong as polyester with excellent wear resistance. (www.holistic-interior-designs.com).

Modal's distinguishing characteristics are its high wet strength and its extra softness. It is sometimes referred to as "soft as a feather" and the "softest fibre in the world". They are also wear resistant and strong while maintaining a soft, silky feel. Modal fibres have found a wide variety of uses in clothing, outerwear and household furnishings. As compared to cotton, modal achieves rich colours, retains its appearance after several washes, maintain anti crease properties (in blends) and have relatively easy care. It has an advantage that it is less likely to fade or to form pills as a result of friction. Today modal is widely used in fashionable garments as a replacement for cotton, with an annual production of more than 4000 tons with Indian textile industries (www.fibre2fashion.com).

Acrylic is man- made fibre which was developed in Germany by Moureu in 1893. Since 1954, Bayer as the first producer in Europe (Mahapatra, 2011) has manufactured it on a large scale. Acrylic fibres are rated third in synthetic fibres consumption and hence occupy an important place in the textile industry. High quality acrylic yarn has the potential to be very soft comparable to cashmere in feel and appearance. It is warm, hold colour well and is resistant to stains and wrinkle. 75 per cent of acrylic fibre is used in apparel, 20 per cent in home furnishing and 5 per cent in industrial end-use (Cook, 2005).

In the field of textiles the present era can truly be called the era of blending. Discovery of different types of man-made fibres and the use of them in staple form have opened immense scope to produce textile having diverse properties and visual

appeal to cater the taste of all kinds of people. Jurisdiction selection of fibre for blending can increase the possibilities of newer application of these fibres along with different kinds of products. The survival of textile industry depends primarily on the fabric quality as well as fashion trends meet the national as well as international demands. Diversification in the product can be brought about at various stages *viz*., yarn, fabric, design, fashion and style.

Statements of the problem

From the literature, it has been found that till now not much work has been done on Eri union fabric in a systematic manner. Further, considering the different properties of Eri silk, Modal and Acrylic an attempt is made in the present study to produce the structural design fabrics with twill weave and its variation. Today's consumer can enjoy the unique richness of union fabrics made by Eri silk with excellent softness and lustre of Modal and wrinkle resistance with light weight of Acrylic. The union fabric obtained will offer flexibility in choosing varieties of Eri fabric with cost effective yet attractive fabric. Therefore, the combination of the modal and acrylic with Eri silk will reduce the cost of Eri fabric as well as decrees weight of the fabric. The combination will improve the wash and wear, warmth, elasticity and anti-crease properties of the Eri fabric. Moreover, the central silk board of India and industry like Fabric Plus Pvt. Ltd. has also taken up the products diversification of Eri silk.

Hence, the present study is planned for "**Evaluation of twill weave fabrics made of blended eri-modal and eri-acrylic yarns suitable for different dress designs**", with the following objectives:

1. To blend the yarns in different proportions using selected fibers.
2. To analyze the physical properties of selected fibers and yarns.
3. To construct the union fabric of different twill weaves using selected yarns.
4. To assess the mechanical, comfort and tactile properties of woven fabrics.
5. To design and construct different dresses based on the fabric properties.
6. To take opinion on constructed dresses.

Delimitations of the study

1. The study is limited in three different types of fibers- eri silk, modal and acrylic.

2. Three blend proportions are selected, 70:30, 50:50 and 30:70.

3. The weaves are limited to only twill weave and derivatives of twill i.e. herringbone and diamond.

4. The dresses are designed only for two seasons i.e. autumn and spring.

5. UK Size drafting instructions given by Helen Joseph-Armstrong are used for pattern making of different dress designs.

Organization of the Thesis

The thesis has been organized in 5 chapters. Chapter I: Introduction includes introductory work, statements of problems, objectives of the study and limitations of the research. Chapter II: Review of literature is focused in the light of relevant past studies. Chapter III: deals with the research methodology of the study. The result and discussion are given in chapter IV. The summary and conclusion are given in chapter V. The bibliography and appendices are placed at the end of the thesis.

CHAPTER II

REVIEW OF LITERATURE

In this chapter, an endeavour has been made to provide an overview of various aspects and issues related to this research work through the review of studies already carried out both at the national and international level in the textile industry. The available literatures in the content of the different aspects of the investigation have been reviewed extensively keeping in the view of the objectives of the study. The relevant literature reviewed for the purpose of the study has been highlighted and is presented under the following sub-headings:

2.1 Fibre and it's properties

2.1.1Eri silk

2.1.2 Modal

2.1.3 Acrylic

2.2 Blending of textile fibres

2.3Fabric structure

2.3.1. Weaving

2.3.2 Twill weave and it's variation

2.4 Union fabric

2.4.1 Mechanical properties

2.4.2 Functional properties

2.4.3 Comfort properties

2.5 Dress designing

2.6 Design development through computer aided designing (CAD)

2.7 Consumer's acceptance for the developed garments

2.1 Fibre and it's properties

Fibres are the fundamental units used in fabrication of textile yarns and fabrics. It is an individual, fine, hair like substance. Fibers usually are grouped and twisted together into a continuous stand called yarns. Fibers may be from natural sources or they may be man-made.

There are several primary properties necessary for a polymeric material to make an adequate fiber: (1) fiber length to width ratio, (2) fiber uniformity, (3) fiber strength and flexibility, (4) fiber extensibility and elasticity, and (5) fiber cohesiveness. Certain other fiber properties increase its value and desirability in its intended end-use but are not necessary properties essential to make a fiber. Such secondary properties include moisture absorption characteristics, fiber resiliency, abrasion resistance, density, luster, chemical resistance, thermal characteristics, and flammability (Jahan.2017).

Presented here are the insights of researches on three types of fibres *viz.* Eri, modal and acrylic taken by the researcher for the present study:

2.1.1 Eri silk

The term Eri culture has been derived from the word Eri or Eranda meaning castor, the most important food plant of Eri silk worm. The Eri silkworm "*Samia ricini*" feeds on castor leaf is reared indoors in Assam, Bihar and West Bengal. The cocoons are remarkably soft, white or yellowish. The filament of Eri silk is exceedingly delicate that it is impracticable to reel of the silk as moth pierce the cocoon (Dantayagi, 1983).

The Eri silk have a natural grey or beige and white colour. The tenacity of the Eri silk is 3-3.5 g/den. The elongation of Eri silk is 20-22 per cent. The Eri silk is finer than other wild silk. It is highly hygroscopic in nature and has a good thermal quality.

Dhavalikar (1962) has conducted a study on moisture, ash and nitrogen contents in fibroins of the four different Indian silks. The nitrogen content varies only within the narrow limits of 18.60-18.90 per cent. The ash content of tassar (0.05%) and eri (0.04%) are appreciable less.

Thangavelu (1989) has termed eri silk as ‘Ahimsa’ silk because unlike other types of silk the pupa is not killed during the process of spinning of yarn. The pupas are converted to moth and emerge out without causing any harm to the cocoon shell.

Koshy (1998) stated that eri silk is next to tasar in commercial importance. As the eri cocoons are cut open for pupae and they are not reelable they go either for hand or machine spinning. Eri silk availability is mostly in the form of hand spun coarser yarn and is now presently consumed in the local domestic market for the making of chadder a traditional wrapper for the rural folk.

Eri silk worms may be the species of *Philosamia ricini* of *P. cynthia*. The main food plant of eri worms are *Ricinus communis* (castor) and *Manihotutilisima* (tapioca). Eri cocoons are open ended cocoons and are not continuous like mulberry silk and also not even or uniform in nature (Rao, 1999). This is produced by the worm *Attacus ricinii* belonging to the family Saturnidae. This silk is mainly produced in East Asia. The silk worm feeds on leaves of the castor plant (*Ricinus communis*). The co-coons have the silk threads arranged in an irregular manner hence it has to be spun and cannot be reeled. The silk threads on the cocoon are very loose and glossy. But they are not as durable as mulberry silk.

Somashekhar (2003) revealed that eri silk possesses excellent thermal properties and offer tremendous blending possibilities with other natural silks, wool, cotton, jute and synthetic fibers.

Suryanarayan *et al.* (2003) found that eri silk has certain excellent properties which are unique in many respect such as fineness, density, cross sectional shape, surface properties etc. which plays an important role in determining the end use of a fibre.

Sreenivasa *et al.* (2005) mentioned that eri silk is durable and strong with a typical texture. Eri silk is similar to cotton fibre and has unique aesthetic appeal.

Kariyappa *et al.* (2007) conducted a study on “ Effect of mechanical raising on properties of eri spun silk fabrics” and observed that after raising of the fabric, properties like fabric thickness, abrasion resistance, linear density of yarn, breaking strength, thickness and thermal insulation values are increased, water repellency remains the same and elongation percentage, fabric weight, air permeability, cover

factor, bursting strength, drape coefficients, stiffness and fabric shrinkage are decreased. He also concluded that after raising of fabric, the fabric becomes bulkier, thicker, lighter in weight, warmer and softer and raised fabrics are more durable. Besides this, fabric has water absorbency properties. Hence fabric is more comfortable to wear. The raised eri fabric is both suited for making, blankets, baby blankets and jackets which is best suited for summer as well as winter seasons.

Eri silk is also known as endi or erandi, multivoltine silk spun from open-ended cocoons. Eri silk is a product of domesticated silkworms, *Samia ricini* that feed mainly on castor leaves. The silk is used indigenously for preparation of chaddars or wrappers. The beautiful eri fabric which is known for its durability is a regular winter wrapper for Assamese people. This culture is mainly practiced in the North-Eastern states and Assam (Reddy and Shankar, 2008).

The Eri cloths can be an excellent material for shirting, suiting, neckties, bed spreads, curtain and other furnishing. Eri is the softest and warmest among all the silks. It can be blend with fibres like Polyester, Wool, Ramie etc. and improved technologies can be adopted in production of spun yarns to prepare varieties of products (Gogoi *et al.* 2009).

Gogoi and Kalita (2009) stated that the count of the eri yarn were found to be 10s-12s while the twist of the yarn were found to be between 8-12 tpi. The breaking strength and elongation were found to be 16.16 g/tex and 15.9 per cent. The density and wicking height of eri yarns were found to be 2.01 g/cc and 5 cm. The brightness of the yarn was found to be 19 per cent. The moisture contents and water absorbencies of the yarn were found to be 19.3 and 21 per cent. The ash content of the eri silk yarns were found to be 1.2 per cent. The sericin and fibroin contents of the yarns were found to be 4.93 and 95.07 per cent.

Over the period of a decade annual production of eri raw silk has significantly increased to **18.6% (5,629 MT)** from 2460 MT (2009-10) which is **30,263 MT** of total raw silk production in India. The sector is a means of livelihood to 1.83 lakh farm families (Anon., 2017-18).

2.1.2 Modal

Modal is a wood pulp based cellulosic fibre, made out of pure wooden chips from the beech tree, technically as the European Schneider Zelkova3.2 tree. While viscose rayon can be obtained from the wood pulp from a number of different trees, Modal uses only beech wood, thus it is essentially a variety of viscose rayon; a generic name for modified viscose rayon fibre that has high tenacity and high wet modulus.

Modal fibres are defined in International Standard ISO 206: 999 (E) as high wet modulus, high breaking strength regenerated cellulose fibres produced by using particular viscose rayon, and regeneration bath compositions which allows greater molecular orientation during stretch and coagulation of the fibres.

Again, Modal as defined by the International Bureau for Standardization of Manmade Fibres (BISFA) is a distinct viscose rayon fibre genre, which has a higher wet modulus and satisfies a minimum value of tenacity in the wet stage at 5% elongation.

Technical advancements in rayon processing have led to improved rayon fabrics such as high wet modulus (HWM) rayon. These technical advancements have created a rayon that is not only less prone to stretching when wet but more importantly they have a closed loop processing that allows 99.5% of the chemical solvents to be recycled and reused and any remaining emissions and pollutants can be decomposed in waste treatment plants.

The most outstanding feature of modal fabrics is its high wet modulus and alkali resistance. Modal possess lower elongation and higher wet modulus as it has high rate of polymerization. It has good dimensional stability even after repeated laundering. The strength and elasticity are comparable to that of cotton. This yarn is used for high quality woven fabrics and knitted materials. Modal is about 50% more water absorbent per unit volume than cotton. It’s designed to dye similar to cotton and is colour fast when washed (Mishra, 2000).

According to Ullmann’s (2008), “Modal has a rounder cross section, is more crystalline oriented structure so that the dry fiber is relatively strong. It has a breaking tenacity of 2.5 to 5.0 g/d, a breaking elongation of 9 to 18 percent when dry

and 20% when wet and an elastic recovery greater than that of cotton. Modal possesses lower elongation and higher wet modulus as it has high rate of polymerization. It is lustrous and has a smoother surface than mercerized cotton. Modal fibers come in two varieties- polynosic and High Wet Modulus (HWM). Both are based on higher quality viscose than regular staple (6-8% cellulose, 6.5-8.5% sodium hydroxide, 40-50% carbon disulfide). Modal fibers are always cut into staple lengths and spun on conventional viscose spinning equipment.

According to Kadolph (2009), Modal has a more crystalline and oriented structure so that the dry fiber is relatively strong. It has greater durability, stability and strength when compared to cotton. They can be mercerized and finished to minimize shrinkage. They also wrinkle less than regular rayon in washing and drying.

Ajmeri and Bhattacharya (2013), conducted a study on "Comparative analysis of the thermal comfort properties of knitted fabrics made of cotton and modal fibres" to produce knitted fabrics with better comfort properties by utilizing the excellent characteristics of these fibres. First, short staple yarns were spun having linear densities Ne 30/1, and Ne 40/1.Then, pique knitted fabrics were produced with different tightness factor with these yarns and the thermal comfort parameters of fabrics were measured on Laser Comp. model Fox 314. The results indicated that modal pique fabrics are considered preferred candidates for warmer climate sportswear, particularly due to their lower thermal resistance, higher thermal conductivity and higher air permeability.

Efeze *et al*. (2014) studied on Sidarhombifolia/Modal – Cotton Union Fabrics.In this study, two types of fabrics were produced from SRF/modal-union yarns which were spun on Ring and Open-end spinning machines. The fabrics woven from ring and open-end spun yarns were referred in this study as Ring fabric and OE fabric respectively. Cotton yarn constituted the warp way of the fabric and SRF/modal yarn the weft way. Subjective evaluation revealed that the two samples of fabrics produced were brittle and prickled the skin. The O-E fabric was more brittle and heavier than the ring fabric. The results, after treatment, showed overall improvement in fabric handle but O-E fabric obtained better handle properties than ring fabric. These differences were greatly manifested in drape coefficient, abrasion

resistance and the bending length. Even though OE fabric, showed better handle properties than ring fabric, both fabrics still needs to undergo further softening to enhance their acceptability.

According to Gnanapriya and Jeyakodi (2015), Modal is very soft, shiny in nature and silk feel than mercerized cotton with the ability to absorb up to 50% more water than cotton. Fabrics made from modal drape well and do not pills like cotton.

Wasif *et al.* (2018) studied of mechanical and comfort properties of modal with cotton and regenerated fibers blended woven fabrics. The purpose of this work was to compare the performance and comfort properties of regenerated cellulose fibers. For this purpose, cotton, viscose, modal, bamboo, and viscose fibers were taken. The pure blends of each fiber and 50:50 blends of modal blended with cotton fiber and regenerated fibers were taken. Normal yarn of count 20 tex was made and then plain woven fabrics were prepared. The warp-wise and weft-wise tensile and tear strengths were recorded. In addition, tests of air permeability, moisture management, thermal resistance test, and water vapor permeability were executed. It is found that the 100% modal fabrics give higher mechanical and comfort properties. In case of blends, modal: viscose (50:50) gives higher mechanical and comfort properties in woven fabrics.

2.1.3 Acrylic

Acrylic fibers are synthetic fibers made from a polymer (polyacrylonitrile) with an average molecular weight of ~100,000, about 1900 monomer units It was first developed in the mid-1940s but was not produced in large quantities until the 1950s. Strong and warm, acrylic fiber is often used for sweaters and tracksuits and as linings for boots and gloves, as well as in furnishing fabrics and carpets. It is manufactured as a filament, then cut into short staple lengths similar to wool hairs, and spun into yarn.

Modacrylic is a modified acrylic fiber that contains at least 35% and at most 85% acrylonitrile monomer.Theco-monomers vinylchloride, vinylidene chloride or vinyl bromide used in modacrylic give the fiber flame retardant properties. End-uses of modacrylic include faux fur, wigs, hair extensions and protective clothing.

Acrylic is lightweight, soft, and warm, with a wool-like feel. It can also be made to mimic other fibers, such as cotton when spun on short staple equipment. Some acrylic is extruded in colored or pigmented form; other is extruded in "ecru", otherwise known as "natural," "raw white," or "undyed." Pigmented fiber has the highest light fastness. Its fibers are very resilient compared to both other synthetics and natural fibers. Some acrylic is used in clothing as a less expensive alternative to cashmere, due to the similar feeling of the materials. Some acrylic fabrics may fuzz or pill easily, though there are low-pilling variants. Acrylic takes color well, is washable, and is generally hypoallergenic. End-uses include socks, hats, gloves, scarves, sweaters, home furnishing fabrics, and awnings. Acrylic can also be used to make fake fur and to make many different knitted clothes.

As acrylic is a synthetic fiber, the larvae of clothes moths are unable to digest it. However, acrylic fibers that are blended with wool or soiled may be eaten as a consequence of having blended fibers.

It can also be used in lightweight woven fabrics in 100 per cent form and in blends with cotton and rayon. These are used for women's blouses and dresses. Acrylic and wool worsted fabrics are used for men's suiting (Collier, 1974).

The acrylic fibres are resistant to acids. Dilute solution of alkalis does not effect on the mechanical properties of acrylic fibres. It is resistant to most common organic substances. The acrylic fibres are the most sunlight and weather resistant fibres in common use. The acrylics are produced as delustred fibres and are used to produce such as knitwear, curtains, pile fabric, upholstery fabrics, imitation fur etc. (Gohl *et al*. 1985).

The acrylic fibres are man-made, synthetic polymer based, polyacrylonitrile filaments or staple fibres. The term acrylic is derived from Latin word "acryl" which means bitter, irritating or pungent and is descriptive of the compound, acrylic acid. The acrylic fibres are regular, translucent and slightly wavy filament or staple fibres with density of 1.16 g/cm^3. Acrylic fibres have a tenacity of 5 g/denin dry state and 4-8 g/den in wet state. Acrylic has a moisture regain of 1.5-2 per cent at 65 per cent RH. The breaking elongation of acrylic fibre is 5 per cent in both states. It has a good thermal stability. The fibre has a high elastic recovery from small extensions i.e. 85

per cent after 4 per cent extension when the load is released immediately. The tensile strength is 2.5-4.5 g/den in dry state (Cook, 2005).

Acrylic can be thought of as artificial wool. It is made from the unlikely combination of coal, air, water, oil, and limestone. DuPont first made acrylic fibers in 1944 and began commercial production in 1950. It is spun by either dry spinning or wet spinning. In dry spinning, the dissolved polymers are extruded into warm air. The fibers solidify by evaporation. In wet spinning, the polymer is dissolved and extruded into a bath and then dried (Textile School, 2018).

2.2 Blending of textile fibres

The term ‘blending’ is used by the yarn manufacturer to describe specifically the sequence of processes required to convert two or more kinds of staple fibres into a single yarn composed of an intimate mixture of the component fibres. This is necessary to obtain a uniform yarn from different varieties of the same fibrous polymer. Blending is the technique to combine fibres which emphasizes the good qualities and minimizes poor qualities of the fibers. Blending also makes the fabric manufacturing process economical.

The long continuous filament fibers can't be used for blending because they're too long and too difficult to handle. Also, natural fibers, such as wool and cotton, with which many manufactured fibers are blended, are very short. Therefore, before blending, man-made fibers are first cut into short fibers, called staple fibers. The staple fibers can more easily be twisted with the shorter natural fibers, or with staple fibers of another manufactured fiber. The highlights of studies on blending of textile fibres are described here under:

Kemp and Owen, (1955) studied the strength and mechanical behaviour of nylon/cotton blended yarns, and they found that dependence exists between the behaviour of the two fiber types: the cotton fibers in the blended yarn break at strains considerably less than the breaking strain of an all-cotton yarn.

Strength and elongation performance of bamboo raw fiber blending yarn is analyzed by using blending yarn strength modal. Elongation at break of bamboo raw fiber blending is changed at critical blending ratio, elongation at break is increasing with the content when the content of high elongation fiber is exceeding critical

blending ratio and when fiber content of high elongation is lower than critical blending ratio, elongation at break is not change. Strength of bamboo raw fiber blending yarn appears low valley at critical blending ratio. Critical blending ratio of bamboo raw fiber in bamboo raw fiber cotton blending yarn, bamboo raw fiber bamboo fiber blending yarn and bamboo raw fiber. Tencel blending yarn is 22%,19%,33% (Li. *et al*., 1993).

Bhattacharya *et al.*(1994) had discussed about the blending of coconut fibre jute fibres- two non-similar fibres for production of home textiles. Jute and coconut fibres are different from each other so far as their production, characterization, physical, chemical properties and end-uses are concerned. Coconut fibre have been softened in four ways namely autoclaving, boiling in NaOH, soaking in NaOH solution and passing through mechanical gears. Any one of the methods or in combination with more can be adopted to soften the coconut fibres prior to blending with jute, considering the cost involvement in the process and the product envisaged.

Pan and Postle (1995) investigated that fibre blend ratio was found to influence not only the yarn strength but also the yarn strength distribution. The properties of blended yarn cannot be explained merely in terms of the proportion of the different constituent fibres in the blend.

Roy (1995) reported that a novelty high bulk yarn developed from blends of three fibres, *viz.*, jute, high shrink acrylic and polypropylene using steam relaxation treatment. The special characteristics of this new yarn are high bulk and soft feel.

Mann *et al.* (1998) did a study on jute/ acrylic fibres blended yarns with different ratio of fibres, 100/0, 10/90, 20/80, 30/70, 40/60, 50/50. They concluded that the blending of jute with acrylic fibres add to the strength, tenacity and elongation of blended yarn. Jute blending is much coarser when blended with viscous, which has wider choice of fineness will improve the resultant yarn in different parameter including aesthetic values, blending will help diversification of fabric goods.

Fiber blending has been a common practice in the textile industry for a long time, stimulated to a great degree by the availability of an ever-increasing number of man-made. fibers. Fiber blending can achieve quality products that cannot be

realized using one fiber type alone, and it can also reduce the cost by substituting a less expensive fiber for a more costly one (Pan and Chen, 2002).

Mitra *et al.* (2004) studied the use of natural lingo-cellulosic fibres and their blends for textile application. Ligno-cellulosic long vegetable fibres like jute, mesta, Roselle, flax, banana, pineapple, ramie, sisal, manila etc have wide textile use.

Chollakup *et al*. (2005) carried out an investigation on "Silk waste/ cotton blended yarn in cotton micro spinning: physical properties and fiber arrangement of blended yarn". In this study an attempt was made to blend one type of silk fiber waste-pierced cocoon-prepared as short silk fiber with cut length of 35 nm with cotton fibre to obtain further data concerning two blending techniques in micro spinning and to compare pure and blended yarns. The intimate draw frame blending as well as the roll setting in the drawing system were also being examined.

An experiment on "Studies on blending of eri silk and polyester" was carried out by Nadiger *et al.* (2005). In this study an attempt was made to produce the fabrics using mulberry silk and cotton as warp with eri silk/polyester blend yarn of 40:60 ratio. Fabrics of 100 per cent pure mulberry silk and 100 per cent pure cotton were considered as control. Comparison was made on the performances of the fabrics of 100 per cent pure mulberry silk and 100 per cent pure cotton with different blend ratios by conducting physical tests. The results revealed that drapability of 100 per cent silk fabric was better than that 100 per cent of cotton fabric. It was also examined that eri silk and polyester blended yarn showed an improvement in drapability when it was woven with cotton yarn. The increased in the polyester content in the yarn lead to better draping quality when compared to eri silk. Blending of eri silk with polyester improved the mechanical properties and also comforts properties of the fabrics. The 40:60 eri silk/polyester blend ratio appear to give optimum properties both at yarn and fabric stages.

Papnai and Goel (2005) carried out a study on "Blending for yarn Amelioration". The investigation revealed that the expensive fine wool fibre can be blended with less expensive and easily available fibres. Mulberry silk was used to extend its rightful use and also to reduce cost. Different ratios of mulberry silk waste blended and rambouillet wool were processed on khadi system for opening, carding and combing. Yarn count of the yarns prepared from rambouillet wool and mulberry

silk waste blend was decreased with increasing proportion of silk fibre waste in yarn. Strength was also found to be improved by blending as compared to that of pure rambuillet wool yarn and it was found that strength was increased with increasing proportion of mulberry silk waste in yarns.

Sarkar *et al.* (2005) made an attempt to study the development of blended yarns. According to the study blending of different fibres is primarily adopted for the improvement of technological and or economical properties of the yarn. Fine type of yarn (84 to 207 tex) needed for producing fine and strong fabrics like furnishing, upholstery, industrial fabrics. Long, fine natural fibres like ramie; flax and pineapple fibres were used in making of blended yarns with jute.

Singh *et al*. (2006) concluded that jute-viscose (60: 40) blended yarn is better than 100 per cent jute yarn in yarn tensile and yarn diameter point of view. Higher content of viscose (5%) with the blend of jute generate higher irregularity particularly in fine yarn (122tex) and 50:50 jute-viscose blended yarn apparently appears smooth and lustrous compared to all other blends. The 50:50 jute-viscose 182tex (6lb) yarn has comparatively lower coefficient of variation of tensile and yarn diameter.

Different fibres can be blended in textile structures to obtain the desirable properties of each of the fibres in the blend. A blended yarn or fabric generally displays an averaging of the properties of the constituent fibres. A cotton/polyester blended has higher wrinkle recovery than a 100 per cent cotton fabric, but lower recovery than all polyester fabric. Blend ratio used to describe textile blends is the percentage by weight of each fibre in the blend (Charnakar *et al.*, 2007).

Chellamani *et al.* (2007) in their experimental study on processing of silk/cotton blends in short staple ring spinning system, have explained the technology of production of spun silk yarn from silk waste which involves a long sequence of machines. There has been a great demand for silk blended fabrics in recent years due to increased price of raw silk. Therefore, this study was carried out with the objectives of spinning of silk/cotton blended yarns in short staple spinning systems, evaluation of quality attributes of silk/cotton blended yarns and the assessment of handle and performance properties of silk/cotton fabrics. It concluded by stating that 60s and 80s combed yarns were spun and there is a

tendency for the silk/cotton blended yarns to show better yarn quality attributes is terms of imperfections and hairiness. The thermal conductivity of silk/cotton blended yarn fabrics is relatively better as there was a marked improvement in the comfort characteristics making it ideal for summer wear. The total hand value as measured by Kawabata Evaluation system was better for the cotton/silk blended yarn fabrics.

Shilpa *et al.* (2007) studied the different blends with cotton *viz.*, cotton and linen, cotton and jute, cotton and ramie, cotton and wool, cotton and viscose, cotton and tencel. They mentioned that blending of cotton with viscose offers softness, moisture absorbance and superior comfort with all ideal characters for manufacture of innerwear, leisure wear, sport swears and in many others.

Eri cocoons were prepared into short fibers and subsequently blended with cotton fiber in order to develop the new fiber blended yarn in the short spinning system. The Eri and cotton fibers were blended using the draw frame blending with varying blending factors, *viz*. blending composition (0–100%) and yarn counts (30 and 50 tex). The results showed that Eri fiber which was longer and stronger than cotton fiber, affected the fiber distribution in the yarn cross-section. The mechanical properties of the blended fibers and yarns increased with increasing silk content. Longer fibers of Eri silk tended to move towards the yarn core, especially at silk content higher than 50%. Moreover, stronger and more extensible Eri silk fiber gave an advantage to the improvement of mechanical properties of those blended yarns with silk content higher than 50%. This is an advantage of Eri silk in the aspect of rendering the strength to the blended yarns and fabrics (Chollakup, *et al.*, 2008).

Gun *et al.* (2008) analysed the dimensional and physical properties of plain knitted fabric manufactured from 50/50 bamboo/cotton yarn and compared them with those of 50/50 viscose/cotton and 50/50 modal/cotton blended fabrics. They reported that fabrics made from these three yarns had a similar appearance. The study analysed the weight per unit area, thickness, bursting strength, air permeability and pilling of the fabrics, and it was found that the weight, thickness and air permeability was independent of the fibre type, for example bamboo/cotton knitted fabric had lower pilling and modal/cotton yarn had higher bursting strength.

Das *et al*. (2009) Stated that blending has an important role in moisture related comfort properties of clothing. From the present study it has been observed that water vapour permeability and absorbency of the material increases with the increased hydrophilicity of the material. A hygroscopic material can absorb water vapour from the humid air close to the sweating skin or in direct contact with the skin and releases it in dry air. The rapidity or rates here greatly influence the thermo-physiological comfort, but hydrophilic proportion has an adverse effect on the liquid moisture transmission behaviour. The vertical as well as horizontal wicking of the material decreases with the increase in viscose proportion in the polyester/viscose blended fabrics. So higher is the hydrophilic proportion in the blended material, it will offer quicker absorption of the sweat from the skin, leaving it dry. But higher hydrophilicity causes reduced liquid spreading, which accounts for moisture accumulation in the clothing causing damp and sticky feeling. Therefore when sweat production is high, a higher proportion of polyester fiber will be helpful. Small viscose proportion will act for the quick absorption of the perspiration from the skin and higher polyester proportion will help to spread the absorbed liquid to the outer surface of the fabric, due to its high wicking property.

Das *et al.* (2010) studied machinery for extraction and traditional spinning of plant fibre and found that vegetable fibres are produced from bast, fruit, seed, leaf and sheath of plant. They are discrete of single entities as in cotton; lingo-cellulosic meshy as in jute and mesta; long as in jute, mesta, flax, sisal, ramie, PALF; and short as in areca nut, kapok. Some of them like cotton and ramie are strong and fine with high length to breadth aspect ratio for good spin ability to yarn for fabric. Primarily, cotton is used for apparel; jute and mesta for packaging; ramie for fabrics, ropes and currency paper blanks; sisal for rope; flax for linen; sun hemp for rope and tissue paper, etc.

Majumdar *et al.* (2010) opined that blends of synthetic fibres with natural fibres offer the most valuable possibilities for combining desirable physical properties, because the two components are so dissimilar. In blends of polyester or acrylic fibres with cotton or viscose the synthetic component provides crease recovery, dimensional stability, tensile strength, abrasion resistance and easy care properties, whilst the cellulosic fibres contributes moisture absorption, antistatic

characteristics and reduced pilling. Blending of different fibres is a very common practice in the spinning industries. Blending different fibres is a widely practised means of enhancing the performance and the aesthetics qualities of a fabric.

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Nkiwane *et al.* (2010), stated that the 30%/70% wild-silk/cotton blend yarn was suitable for knitting resulting in good knitting performance with no end breakages recorded This is attributed to the strength and elongation displayed by the yarn which proved to be suitable for the knitting machine gauge used. The non-uniformity observed during yarn testing did not have visible effect on the appearance of the plain knitted fabric, neither were there any needle breaks due to the high number of thick places on the yarn. The fabric on relaxation showed sensitivity to wet treatment; this is attributed to the hydrophilic fibres constituting the blend yarn.

Blending is one of the methods to create novel combinations in many ways. Blends combine the attributes of each of its component, minimize the negative characteristics and economize the cost of the material (Gahlot and Pant, 2011).

Mallik *et al*.(2011) conducted a study on the effects of plain and 3/1 twill weave designs on the tensile strength of polyester-cotton blended fabrics. The results of this study show that weave design plays a significant role in the tensile strength of woven fabrics. PC plain fabrics show significantly higher strength in both warp and weft directions than 3/1 twill fabrics at the same construction parameters. This difference in strength of plain and 3/1 twill samples ranges from 4-14% with respect to light, medium and heavy construction. There is a difference of 65 N in warp direction and 61 N in weft direction at fabric count of 160 which is highly

significant. Thus, weave design is an important parameter which has remarkable influence on the tensile strength of woven fabrics.

Bhardawaj and Juneja (2012) reported that for the study the plain woven union fabric has been prepared from three different ratios of blended yarn of jute viscose/polyester with cotton (ratio 30/70, 50/50, 70/30). The fabric construction was done by using plain weave. Jute viscose/polyester used 30/70, 50/50, 70/30 ratio in the filling direction and 100 per cent cotton was used in warp direction. It was observe that 30/70 jute viscose/polyester union fabric is better than other ratio and it also reduce the cost of the product. Crease recovery and water absorbency of this fabric was poor but in this fabric cotton was used in warp direction so it overcame these properties.

Prakash *et al.* (2012) studied on comparison of physical properties of the bamboo/cotton blended yarn with 100 per cent cotton yarn. The bamboo/cotton blend ratios of each category of yarn (30s, 40s and 50s) were 67:33, 50:50 and 33:67, respectively. For each individual count of yarn, it was observed from the test result that the properties of 50:50/bamboo: cotton blended yarn showed very nearer property to the 100 per cent cotton yarn. For Count (30s), 67:33/bamboo: cotton showed very closer property to the 50:50/bamboo: cotton blended yarn. It was also observed that for each count of yarns, which showed decreasing property with the increase of bamboo in the blend. The quality characters depend upon the ratio of bamboo and cotton in the blend.

Choudhuri *et al.* (2013) reported that eri/acrylic blended yarn has been prepared at different blend ratio and found that tenacity of the blended yarn reduces with the increase in proportion of eri fibre in the blend, which is comparatively weaker as compared to acrylic. Whereas breaking elongation increases with the increase in coarseness of the yarn.

Kalita *et al.* (2013) stated that ramie blended with different types of silk showed good results, but 50:50 blends showed the best result than 60:40 blends. The breaking load of 50:50 blends ranged from 131.75-189.16 lb for different type of silk. Therefore, blending of ramie with different silk with different blend proportions offers excellent scope for producing a variety of materials for different uses.

Sheeba *et al*. (2013) Studied on Bamboo/Cotton & Bamboo/Polyester Blended Woven Fabric The main aim of this research is to know about the resemblances and differences between natural, manmade and regenerated fabrics. This research is done by blending the two selected fibers, cotton and polyester with the regenerated fiber bamboo, then the blended yarn are weaved, wet processing and finished with Fragrance finish. And they are compared for various properties between the two finished fabrics, before and after laundering. On comparison it was clear that the bamboo/cotton fabrics showed certain, better geometrical, physical and mechanical properties; whereas bamboo/polyester fabrics showed, better comfort and absorbency properties. Bamboo fabrics are now a day's filling the vacancy in the textile material development in our textile production nation and these will inevitably stimulate the new fabric development through blending and finishing, among the cotton, wool and silk and bring the textile corporations a new opportunity.

Mengüç (2016), in the study, "A research on yarn and fabric characteristics of Acrylic/Wool/Angora blends" depicted that blending acrylic fiber with wool and Angora rabbit fiber, increases the CVm, thin/thick places and neps of the yarn. Yarns containing 100% acrylic and 70% acrylic/10% wool/20% angora have the highest tensile strength. In case of yarn friction co-efficient, 70% acrylic/20% wool /10% angora containing yarn has the highest coefficient of yarn to pin and yarn to yarn friction values. However, 70% acrylic/30% angora and 100% acrylic yarns have lower values, supplying smoother yarn surface. 100% acrylic yarn and 70% acrylic/10% wool/20% angora yarn have the highest breaking strength values, similarly, the fabrics of these yarns have the highest bursting strength values. 70%acrylic/10% wool/20% angora fabric and 70% acrylic/30% angora fabric have the lowest circular bending rigidity, which mean that they have the softest handle.

Çelik and Kaynak (2017), in the study," Effect of fiber blending ratios of cotton/polyester yarns on retained splice diameter" reported that the diameter of spliced portion effects not only appearance of the splice joints but also physical characteristics such as packing density, strength, specific volume of the yarn. In this study, the effect of cotton/polyester fiber blend ratios on spliced portion diameter at different slicing air pressures was investigated. For this aim, three yarn samples

100% cotton, 80-20% CO-PES and 50- 50% CO-PES were produced with 40/1 Ne. Each yarn samples was spliced at three different pressures; 4 bar, 5 bar and 6 bar.

2.3 Fabric structure

The study of the effect of the weave structures on the properties of woven fabrics is of importance for various reasons. First, it is of interest as a property of the fabrics, it may lead to a better understanding of their nature, and, in particular, of the way in which they affect the comfort and functional properties of fabrics. Second, the weave structures can be widely used for representing the fabrics in cloth analysis division of a textile mill. Third, textile fabrics are used in technical textiles and home furnishings and for this their properties must be satisfactory.

2.3.1. Weaving

In textiles, fabrics are manufactured in wide varieties and designs. And different designs and effects are produced on fabric with various mechanisms which are helpful to form different weaves and lots of design which enhances the look of apparels. Weaving is the one of the various mechanisms of fabric manufacturing and another conceptual term of the study that needs to be discussed.Woven fabrics are produced as result of interlacing two sets of yarns, warp and weft which runs lengthwise and crosswise respectively in the fabric. The order of successive movements between these two sets of yarns determines the physical appearance of the fabric identified as the weave or the structure.

Furthermore, fabric weaves are regarded as the structural pattern of different fabrics. Without the fabric weave, fabric may never be constructed. How loose, decorative, tight, nubby or soft a certain fabric is, depends largely on the fabric weave. They can also cause a huge variance regarding the fabrics durability or strength. Thus, it was felt necessary to review few articles to know the effect of the weave on fabric properties:

Schiefer *et al.* (1933) discussed the effect of the weave on the strength, elongation, take-up, tear resistance, fabric assistance, and air permeability of cloth. For this purpose a series of 42 cloths were woven from the same cotton yarns in weaves comprising plain, twill, rib, mock leno, basket, sateen, and various combinations of these weaves. In general a cloth which is closely woven, firm, and

has a large number of threads interlacings per unit area and short floats has a greater strength, elongation, and take-up and has a lower tear resistance and air permeability than a cloth of the same weight which is loosely woven, sleazy, and has a small number of thread interlacings per unit area and long floats. The strength and elongation decrease as the tear resistance is increased.

Taylor (1959) concluded that the strongest weaves would be those, which had greatest number of intersections in the weave repeat and thus had more fiber-binding effect from the mutual pressure of the yarns. Simple weaves (plain, twill, etc.) therefore, would be strongest due to large number of intersections.

Hamilton (1964) described that the structural tightness of a woven fabric governed by three basic factors which were the number of warp and weft threads per inch; the effective thickness of these threads in fabric; and the way the warp and weft threads interlace to form the actual cloth, i.e. weave design.

Ping and Greenwood (1986) stated that all fabric properties were not equally influenced by the weave. The tensile strength in either the warp or weft direction, for instance, was primarily the function of yarn strength, with the weave playing only a minor part.

According to Soller (2004), each weave type has its advantages and disadvantages. There is virtually no difference in the strength of the fabric and its weave. Choose weave based on aesthetics, how complex the curves are, and the weight of the fabric needed for its application. That being said, every time each fibre bends over or under another, that very small bend in the fibre can make "very" tiny strength differences. These differences should generally be ignored and are only mentioned for accuracy, not for fabric consideration.

Tortora and Merkel (2005) define weaving as the method or process of interlacing two or more sets of yarns or similar materials so that they cross each other at usually right angles to produce woven fabric. It further explains it is the act of causing two systems of yarn, warp and filling, to interlace. This may be done on a power or hand loom or by several manual methods.

The types of weaves have often been mistaken for types of fabrics. Each different fibre content advances towards the hand and drape of the fabric. There are

many different types of weaves. Some are plain and some are fancy, but all use the basic "under & over" technique of weaving. The basic types of weaves are Plain weave, Twill weave and Satin weave (Types of weaves, 2007).

Malik *et al.* (2009) in their study on “Influence of Plain and Twill (3/1) Weave Designs on the Tensile Strength of PC Blended Fabrics” revealed that weave design plays a significant role in the tensile strength of woven fabrics. PC plain fabrics show significantly higher strength in both warp and weft directions than 3/1 twill fabrics at the same construction parameters.

Weaving is the textile art in which two distinct sets of yarns or threads, called the warp and the filling or weft (older woof), are interlaced with each other to form a fabric or cloth. The warp threads run lengthways of the piece of cloth, and the weft runs across from side to side. Cloth is woven on a loom, a device for holding the warp threads in place while the filling threads are woven through them. Weft is an old English word meaning "that which is woven". It concludes that, weaving in general involves the interlacing of two sets of threads at right angles to each other: the warp and the weft (Weaving, 2010).

Ferdous *et al.* (2014) in their article, “A Comparative Study on Tensile Strength of Different Weave Structures” stated that the tensile behaviour of a fabric isvastly reliant on the weave designs. Higher interlacement causes higher crimp in the load bearing direction may lead to lower breaking strength and too much larger floats also cause lower breaking strength due of looser structure.

Sundaresan and Arunraj, (2016) conducted a study on, “Behavioural Analysis of Multi Design Woven Fabric”. Mainly plain, twill, sateen and matt and it’s combined structure were produced with identical parameters for the study. It was found that the multi design material have good crease recovery, abrasion resistance and tearing strength when compared to other fabrics. In case of high abrasion resistance, this type of fabric can be used in the various fields such as seat covers etc., using different yarns either natural or manmade. It can also be used for geotextiles where abrasion resistance, crease recovery, tearing strength is high.

Akter (2017), “An Investigation on Different Physical Properties of Cotton Woven Fabrics”, produced some sample fabrics with plain, 2/2 twill, 3/1 twill and 4-

end satin weave structure using four different weft counts. By means of regression, the correlation coefficient and correlation between different properties of fabrics were investigated. The findings of this study revealed that the crease recovery angle and the bending length are inversely proportional to each other. It was also found that with the increasing of weft yarn counts lead to a decreasing in stiffness, abrasion resistance and increasing increase recovery angle. The pilling and wrinkle recovery affected very low by the increase of weft yarn count and for the variation of weave structure. Plain weave was superior to other structures in stiffness whereas twill weave showed higher crease recovery.

Zhong *et al.* (2017) conducted "Research on the Modeling Method for Digital Weaving Based on the Information of Physical Yarns and Fabric Pattern". For this study they designed a yarn information acquisition device which can be used for extracting the characteristic parameters of 2D image of the yarns involved in weaving. The method proposed reflected the actual visual effect of yarn weaving patterns for the specified structure, and provide scientific method for the analysis and evaluation on the yarn properties and quality.

2.3.2 Twill weave and it's variation

Varma and Chakraberty, (1971) A Study of Tensile Properties of Twill-Woven Fabrics. Four 8-end twill-weave structures (1/7, 2/6, 315, and 4/4) were chosen to study the tensile behavior of fabrics in relation to the varying float length and the number of picks per inch. For each weave structure at a given warp set, a range of picks per inch was woven. Warp sets were 30, 44, and 60 ends per inch. The results indicate that, with increase in float length, the warp strength decreases. With increasing float length, localization of rupture and binding effect decrease, thereby reducing the strength. There is practically no effect of float length on the weft strengths. Further, the warp strength of the fabric increases with picks per inch ul to a certain limit and then it starts decreasing. This limit depends upon the nature of the weave. Also, the dependence of elongation on maximum float length and number of picks per inch is discussed.

Alamdar (2005) conducted a study on "Behaviour of the twill weave woven fabrics during relaxation" to look into the behaviour of the twill weave woven fabrics during relaxation (when the weaving tension is released). Ten, 50-metre rolls of twill weave woven fabrics were produced. The fabrics were marked in a rectangular form at the weaving loom. After 48 hours of relaxation, the new shapes and sizes were recorded. The shapes of almost all of the samples were changed to parallelogram, even though they differed in size. The work showed that the manner of fabric deformation during relaxation depends upon the fabric structure. It indicates that contraction due to relaxation of the twill weave causes the woven fabric to skew. in the direction of the twill. The quantity of the skewness is related to the float length and the twill type. Fabrics with longer float length have higher skewness.

Malik *et al.* (2011) studied the "Influence of Plain and Twill (3/1) Weave Designs on the Tensile Strength of PC Blended Fabrics" to investigate the effects of plain and 3/1 twill weave designs on the tensile strength of polyester-cotton blended fabrics. After enzymatic desizing, tensile strength of fabric samples was determined as per standard test method. The results of this study show that weave design plays a significant role in the tensile strength of woven fabrics. PC plain fabrics show significantly higher strength in both warp and weft directions than 3/1 twill fabrics at the same construction parameters. This difference in strength of plain and 3/1 twill samples ranges from 4-14 % with respect to light, medium and heavy construction.

2.4 Union fabric

The union fabric is made by using different yarn in warp and weft direction. The union fabric is durable, crease resistant, absorbent, lustrous and resiliency etc. The various kind of union fabric can be produced by combination of cotton, rayon, ramie, polyester, acrylic etc with silk to reduce the cost of the silk fabric as well as the weight of the fabric (Gupta *et al.*, 2007).

2.4.1 Mechanical properties

The physical and mechanical properties are assessed to determine the appearance, performance and serviceability of the fabric. The test samples were assessed for yarn count, yarn twist, cloth count, mass per unit area, cloth thickness,

cloth stiffness, cloth crease recovery and dimensional stability. Cited below are few of the relevant studies conducted to determine the mechanical properties of the fabric.

Khan and Suryanarayana (2007) observed that various kinds of Tasar union fabric can be produced by the combination of warp and weft respectively eg: Cotton and Reeled silk, Rayon and Reeled Tasar, Ramie and Tasar etc. different combination with Tasar silk reduced the cost of Tasar fabric as well as weight of the fabric. The combination of polyester with Tasar improved the wash and wear along with anti-crease properties.

Sanapapamma and Naik (2007) developed an ahimsa silk shirting. Four varieties of shirting material were produced namely ahimsa silk and ahimsa silk (control), cotton and ahimsa silk, Tricot and ahimsa silk, filature silk and ahimsa silk. The sample were tested for their mechanical properties and the test revealed that in the warp way, maximum crease recovery (70.6°) was found in fabric made from silk/wool and minimum crease recovery (53° and 65.8°) was found in silk/cotton fabric. Further the result revealed that coarser yarn and irregular surface of control sample possessed maximum thickness than other sample. Among other woven fabric cotton and ahimsa silk was relatively thicker than other two samples.

Arora and Sharma (2010) conducted a study on "Physical properties of silk based union fabric". Silk, polyester, blend (p/v), wool and cotton yarns were selected to produce union fabric and physical properties were tested. The test revealed that Fabric made from silk and wool had minimum dimensional stability i.e. 9.62 per cent and 9.52 per cent in warp and weft directions. Further the result revealed that coarser yarn and irregular surface of control sample possessed maximum thickness than other sample. The entire sample had same number of warp thread. In case of weft, maximum number of threads (41) was observed in silk and cotton woven sample, followed by silk and silk sample and minimum number of threads (34) were found in silk and blend.

Silk, polyester, blend (polyester/viscose), wool and cotton union fabric were developed to test their physical properties. It stated that maximum crease recovery (70.6) was found in fabric made of silk and wool and minimum crease recovery (53 and 65.8) in silk and cotton fabric. In case of weft direction, maximum crease recovery (120) was seen in silk and polyester woven sample (Arora and Sharma, 2010).

Kulkarni *et al.* (2011) conducted a study on "Physical properties of developed viscose rayon and eri silk union fabrics". A union fabric of Viscose rayon and Viscose rayon (control), Viscose rayon and Eri silk (2/40s), Viscose rayon and Eri silk (2/60s) and Viscose rayon and Eri silk (2/80s) were developed. The result revealed that the values of cloth stiffness were greater in weft direction than warp for all the union fabrics. This may be because of coarseness and heaviness of Eri silk. Further the result revealed that Viscose rayon and Eri silk of 2/40s (VRE1) exhibited maximum thickness. Viscose rayon and Eri silk of 2/40s (VRE1) union fabric showed highest bending length and Least bending length was exhibited by control sample i.e. Viscose Rayon and Viscose rayon (VR).

Garbyal (2015) conducted a study on "Angora/merino and eri silk: a new union woven fabric for fashion" to study the effect of properties yarn with different weave design on resultant union woven fabric, their visual properties were evaluated. Eri silk, 2 ply angora/merino and twisted angora/merino yarns were tested for the physical properties like yarn count, twist per inch. The count of twisted angora/merino yarn was high as compared toun twisted angora/merino yarn due to the twist imparted since twists provide bulkiness to yarn and weight of twisted angora/merino yarn was more as compared to the untwisted angora/merino yarn. It was also found that the by changing twist in yarn content in warp and weft direction, the texture of union woven fabric can be changed, while the design of the fabric constant.

2.4.2 Functional properties

Cloth tensile strength, tear strength, abrasion, drapability, pilling, colour fastness *etc.* are some of the functional properties that decide the durability and serviceability of any fabric. Some of the studies related to functional properties of the fabric are presented under the following headings:

Jeyakodi *et al.* (2015) conducted "A study on the functional properties of silk and polyester/lyocell mixed fabric". This mixed fabric is compared with 100% silk for some of the basic properties like absorbency, water retention, wicking, water vapour permeability, air permeability, K/S values, colour fastness and antimicrobial property. The results showed that the absorbency is good in both the 100% silk fabric and silk mixed fabric. However the mixed fabric gives increased absorption

than the 100% silk fabric. The water retention character is more in the silk mixed fabric than the 100% silk fabric. As the absorption and water retention behaviour are more, obviously the wicking value is also good in both the type of fabrics, however the mixed fabrics show more wicking behaviour compared to the 100% silk fabric. The silk and its mixed fabric give good values of water vapour permeability and air permeability. However due to the presence of lyocell in the mixed fabric which facilitates the increase of these behaviors. The k/s values and the fastness properties (wash, light and rubbing) are mostly similar in both the 100% silk fabric and silk mixed fabric.

Sreenivasa *et al.* (2005) conducted a study on "Development and characterization of Eri silk blended union fabrics". An attempt has been done to develop Eri silk Polyester blended yarns on short staple spinning system to diversify the Eri silk utilization. Using the developed eri polyester blended yarns in weft direction and using different fibres in warp (cotton, silk), eri union blended fabrics were constructed. The fabrics were prepared with plain weave. Woven fabrics were tested for physical, mechanical and functional properties and results were analyzed statistically. It was found that all the fabrics are exhibiting higher pilling tendency except the fabric made out of silk warp and weft.

Sanapapamma and Naik (2007) studied on durability of ahimsa silk shirting. Four varieties of shirting material were produced namely ahimsa silk and ahimsa silk (control), cotton and ahimsa silk, Tricot and ahimsa silk, filature silk and ahimsa silk. The sample were tested for their mechanical properties and revealed that all the fabric showed slight to moderate pilling owing to their fibre content and yarn type.

Kulkarni *et al*. (2011) conducted a study on "Physical properties of developed viscose rayon and eri silk union fabrics". In this study an attempt was made to develop union fabrics using viscose rayon as warp with eri silk of three different yarn counts *viz.*, 2/40s, 2/60s and 2/80s as weft on a semi automatic power loom. A union fabric of Viscose rayon x Viscose rayon (control), Viscose rayon x Eri silk (2/40s), Viscose rayon x Eri silk (2/60s) and Viscose rayon x Eri silk (2/80s) were developed. Further, union fabrics were evaluated for physical properties. The result revealed that the test samples showed very severe pilling except Viscose rayon x Eri silk 2/40s (VRE1), showed severe pilling owing to their fibre content and yarn type.

Kundu *et al.* (1996) conducted a study on "Biopolishing of jute-cotton union fabric". It was found that biopolishing of jute-cotton union fabric with cellulose enzyme reduces hairiness, increases drapability and imparts a soft handle and an elegant look to the fabric. The improvements are stable and durable as the fabric characteristics are permanently altered by the action of enzyme.

Linganur *et al.* (1988) conducted a study on "Feasibility of blending cotton with silk" and reported that silk and cotton were mixed in the proportion of 80:20, 60:40, 40:60 and 20:80, respectively. Breaking elongation was assessed and the results revealed that breaking elongation of yarns gradually decreased with the increase in cotton percentage of the blend, since the breaking elongation of cotton was lower compared to that of silk.

An experiment on "Eri silk as blended material with cotton for ring spinning" was conducted by Chollakup *et al.* (2005) and reported that Eri silk can be easily spun with cotton. The blended slivers were spun by ring spinning technique at 50:50 ratios. It was examined that blends of Eri silk and cotton fibers at 50:50 did not improve the elongation and evenness of yarn.

Sanapapamma and Naik (2007) tested the durability of ahimsa silk shirting. Four varieties of shirting material were produced namely Ahimsa silk and Ahimsa silk (control), Cotton and Ahimsa silk. Tricot and Ahimsa silk, Filature silk and Ahimsa silk. All the samples possessed lesser elongation per cent in the weft direction as compared to the warp direction.

Azad and Jafrin (2009) carried out an experiment on the effect of size material on jute–cotton union fabric". The cotton yarn was used in the warp direction and jute yarn was used in the weft direction. The size material was used only for warp yarn i.e. cotton yarn. From the experimental results, it was found that the strength of the sized union fabric was better than the unsized union fabric although other properties were similar to each other.

Ammayappan *et al*. (2010) also studied effect of Silicone and urethane finishing treatment on performance properties of Enzyme treated wool/cotton union fabric and concluded that the enzyme treatments improve the finish add-on, wicking ability, drape ability, dry crease recovery angle, shrink resistance and softness with

reduction in tearing strength while the subsequent finishing treatments significantly improve the performance properties especially with retention of tearing strength.

The effect of protease/lipase enzyme pretreated followed by polysiloxane based combination finishing on handle properties of wool:cotton union fabric was studied by Ammayappan and Moses (2010). The results inferred that both enzymes improve the handle of the union fabric irrespective of their nature and subsequent combination finishing further improves handle. It was concluded that combination finish on Savinase treated union fabric imparts better handle properties than corresponding Lipolase treated ones and finished-only fabric.

Kulkarni *et al.* (2011) developed union fabrics using viscose rayon as warp with eri silk of three different yarn counts *viz.*, 2/40s, 2/60s and 2/80s as weft on a semi-automatic power loom. A union fabric of Viscose rayon and Viscose rayon (control), Viscose rayon and Eri silk (2/40s), Viscose rayon and Eri silk (2/60s) and Viscose rayon and Eri silk (2/80s) were developed. Further, union fabrics were evaluated for physical properties. The result revealed that Viscose rayon and Eri silk of 2/40s (VRE1) union fabric possessed greater tensile strength may be because of yarn composition of Eri silk, a spun silk with coarser yarn count where each constituent fibre in the yarn share more load than finer yarn, thus increasing the breaking strength of the fabric. Moreover, the result revealed that In general weft way elongation (%) was lower than warp. It was also observed that Viscose rayon and Viscose (control, VR) showed higher elongation (%) may be due to fibre content of Eri silk which is considered to be more plastic than elastic.

A study on “Bending properties of wet abraded woven fabrics” was conducted by Joshua (1994). It was inferred that moisture content in the abraded fabric enhanced the stiffness. Large amount of moisture in the fabric sample and the type of abradant used for abrasion altered the mode of fabric abrasion significantly. The difference between the wet abraded and damp abraded fabrics indicated that the presence of moisture favorably supported the abrasion resistance. The damp abraded test sample showed higher percentage of variation in bending properties than the weft when compared with unabraded fabrics.

A study entitled “A comparative study on some mechanical properties of Eri and cotton fabrics” was carried out by De and Mitra (2005). In the present study

four different sets of fabrics, each of Eri silk and cotton with varied construction were used. It was found that percentage weight loss during abrasion is lower in case of Eri fabric. Four varieties of shirting materials viz., ahimsa silk x ahimsa silk (control), cotton x ahimsa silk, tericot x ahimsa silk and filature silk x ahimsa silk were tested for resistance to abrasion with loss in thickness and mass of the above mentioned fabrics in the study "Durability of ahimsa silk shirtings". It is observed that on abrasion, loss in cloth thickness was remarkable in control sample as compared to other fabric samples which may be due to frictional abrasion that lead to fibre breakage and therefore consequent decrease in the mass of the fabric (Sanapapamma and Naik, 2007).

Kulkarni *et al.*(2011) stated that union fabric made form 2/40s was coarser, thicker than the fabric made from 2/60s and 2/80s. The result revealed that Viscose Rayon and Eri silk of 2/40s showed better resistance to abrasion compared to 2/60s and 2/80s viscose rayon and eri silk. Viscose rayon and Viscose rayon (VR) exhibited low resistance to abrasion attributed to finer yarn count, low thickness value and pliable texture.

Dhingra *et al.* (1981) conducted "a study of tensile and bending properties of woven cotton fabrics" and concluded that the bending characteristics of cotton woven fabric are largely determined by the tightness of the weave.

Collier (1991) carried out a study on "Measurement of fabric drape and its relation to fabric mechanical properties and subjective evaluation". The drape of seventeen fabric samples with different yarn content, constructional details and cloth weight were measured using a digital drape tester and the values were significantly correlated. Drape is correlated with mechanical properties, among which bending rigidity was found to be most closely associated with fabric drapes.

Azad *et al*. (1993) reported that drape property of Novotex union fabrics was one of the most important factors for the consumer as well as producers. The drape property of plain, 2/1 twill and zigzag fabrics were studied. It was observed that drape property of 2/1 twill fabric was better than that of other weaves.

A study on "Stiffness and crease recovery" was conducted by Tarafder and Kauser (1996). From the selected five different shirting materials viz., cent per cent

polyester, 64/36 polyester/cotton, 58/45 polyester/cotton, 45/55 polyester/Viscose and 100 per cent cotton a trend of decrease in drape quality of fabrics was observed with increase in the polyester content and crease recovery of the fabrics depended on the material characteristics in terms of least or most prone to creasing.

"A study of the drapability of P/V blended woven fabrics" was conducted by Tarafder *et al*. (1998). In the present study six different polyester/Viscose blended fabrics viz., 100:0, 80:20, 70:30, 65:35, 55:45 and 48:52 were assessed for drape behaviour. It was observed that 70:30 polyester/Viscose fabric had greater drape co-efficient i.e., 59.70 per cent when compared to other five fabric samples. Minimum drape coefficient of 29.60 per cent was found to be with 48:52 polyester/Viscose blended fabric. It was also learnt that bending length both in warp and weft was greater with 70:30 polyester/Viscose blended fabric and minimum with 48:52 polyester/Viscose blended fabric.

Patali *et al*. (2001) reported that woven samples were developed keeping the warp constant 30 denier polyester with weft variations 3, 4, 5, 6 plies silk yarns and 30 denier polyester yarns. Ach silk yarn was 20-22 deniers and woven sample of polysilk was evaluated for various physical properties like fabric weight, fabric stiffness, drapability etc. visual inspection revealed that 3 ply and 4 ply polysilk resembled the pure silk samples in their softness, drapability and texture.

Kariyappa *et al.* (2007) reported that weave of 3/1 twill with grey warp and blue dyed weft was called denim weave. Denim was made up of cotton and wool combinations. Eri denim fabrics produced on power loom using 2/60s eri spun in the warp and two ply of 2/20s eri spun yarn in weft, reed 80 and 30 picks per inch. These fabrics have good demand in international market.

De and Mitra (2005) carried an investigation on "A comparative study of some mechanical properties of Eri and cotton fabrics". In the present study four different set of Eri fabric and four of cotton were produced each with different cover factor, twist per inch and cover factor. Comparisons were made between different sets of fabric for drapability and the results reported that, Eri fabric with open construction was comparable with cotton whereas the fabric with dense construction became stiffer.

Patel and Joshi (2006) reported that 100 per cent Lyocell, Lyocell/silk and Lyocell/ Polyester union fabrics have been woven in different weaves and designs, dyed, printed and finished. The resultants fabrics have soft and smooth handle, a good drape and are suitable for ladies wear and shirting material. lyocell/silk is also suitable for sarees which have the drape and handle of pure silk.

Desai (2008) studied on Properties of union fabrics, produced with nylon warp and nylon/polyester bicomponent weft yarns. The functional and aesthetic properties were measured and compared with all nylon/polyester union fabrics. Result revealed that the fabric produced from bicomponent yarns have better drape with lower stiffness and concluded that the dye uptake has been tremendously improve.

Shankar *et al*. (2008) reported that the mulberry silk of 20/22 denier in 6 and 12 ply organise twisted and eri silk of 2/60s and 2/80s and 2/120s were used in warp. The warp yarn was dyed to indigo blue shade with acid dyes. The mulberry silk in 6 and 12 ply yarn thread twisted and eri silk of 2/60s, 2/80s and 2/120s grey yarn were used in weft for development of 100 percent silk denim fabrics. These denim fabric were woven in rapier loom having width of 44 inches and 3/1 twill weave. The fabrics were smooth, soft, bulkier in handle and lighter in weight.

Barooah *et al.* (2009) conducted a study on globalization of Muga silk (Through product diversification). The study revealed that the fabric woven with Muga and Bamboo as well as Muga with soya fibres were softer in feel and had a smoother surface. They were more flexible in bending and had better recovery compared to other fabrics. Higher softness and smoothness combined with lower rigidity resulted in higher THV (Total Hand Value) for these fabric.

Haque (2009) experimented on "Effect of weft parameters on weaving performance and fabric properties". Experimental studies were conducted by weaving fabrics with three different picks per inch (PPI) and weft counts. The study shows that weaving performance is affected by the too high cover factor and end breakage was taken as an indication of weaving performance. It was observed that when the count as well as threads/inch of one series of yarn changes the crimp per cent i.e. the consumption of both series of yarns are affected. It was also observed that, as expected, when the threads/inch increases the fabric strength also increases but at higher threads/inch the gain in strength is relatively more.

Arora and Sharma (2010) selected silk, polyester, blend (p/v), wool and cotton yarns to produce union fabric and physical properties were tested. The silk and polyester union fabric showed slightly random sticking or wetting on upper surface had minimum wet ability i.e. 90 rating whereas fabric made from silk and cotton maximum has wet ability of 50 rating of the upper surface.

A union fabric of Viscose rayon and Viscose rayon (control), Viscose rayon and Eri silk (2/40s), Viscose rayon and Eri silk (2/60s) and Viscose rayon and Eri silk (2/80s) were developed. Further, union fabrics were evaluated for physical properties. The result revealed that highest drape coefficient value was observed in case of Viscose rayon and Eri silk of 2/40s (VRE1) which may be due to high bending length and thickness with greater weft-way cover factor. Thus, it can be assumed that greater the stiffness, higher is the drape coefficient (Kulkarni *et al.*, 2011).

Koranne *et al.* (2015) "Properties of jute-cotton union fabrics through wet processing treatments: Part II- Double cloth structures with jute weft in subdued form". In this study these fabrics were subjected to four kinds of wet processing treatments viz. Bleaching, Softening and Enzyme treatment to suppress harshness and prickliness of jute component and to enhance fabric properties. Fabric handle of jute-cotton union double cloth fabric is improved by all the four treatments as reflected through reduction in drape coefficient. Bending length is reduced for a particular weave with particular treatments only. Fabric tensile strength is reduced by all four treatments.

2.4.3 Comfort properties

A study on "Evaluation of comfort properties of polyester Viscose suiting fabrics" was conducted by Mukhopadhyay *et al*. (2002). Polyester Viscose blended yarns of four different blend proportions were used for constructing plain and 2/2 twill suiting fabrics. It was observed that thermal insulation and water vapour resistance increased with the increase in polyester content.

Manyam *et al.* (2013) studied the Comfort Properties of Ecologically Friendly Sisal Union Fabrics to assess the performance characteristics of the enzyme treated sisal fibres with three different enzymes New smooth (2%), Microsil (1.5%),

Sibasof (0.5%) with cellulase enzyme Britacel L+ and also to evaluate the geometrical, handle, comfort and mechanical properties of the woven sisal union fabricswith cotton yarn. It was accentuated that fabric count of sisal union fabrics has improved after treatment with all the three enzymes. Comfort properties of the enzyme treated sisal union fabrics were studied with respect to their air permeability, thermal conductivity and water repellency. The air permeability of treated fabrics was slightly decreased with the enzyme I than other two enzymes. There was no impact of enzyme treatment on water repellency of sisal union fabrics.

2.5 Dress designing

Dress designing is an important art and a well-designed garment has beauty and appropriateness, which makes it right for the wearer opines (Gupta, 1989).The aim of dressmaking is to achieve a graceful, flattering and unbroken and harmonious line expresses (Aitken, 1992). A garment is attractive only if it fits well. To achieve a good fit, it is necessary to give attention to finer details such as individual proportions and contours (Anna, 1996). A dress is generally assembled from several parts. The first stage in the manufacture of garments is the cutting of the materials into necessary pattern shapes. These are then joined together by means of seams to create 3D garments (Harold, 1992)

Gupta *et al.* (1999) opined that a well designed garment has a beauty and appropriateness which make it right for the wearer as well as the occasion. Of course, the prevailing fashion cannot be ignored for dress designing but it can seldom be used as a guide for attractive clothes for everyone. While designing one has to understand the figure and personality of the wearer also.

Chauhan and Saboo (2000) conducted a study on ‘Designing and construction of dresses taking an inspiration from gothic cathedrals featuring stained glass patterns’. Dresses were categorized into three parts viz., one piece, two piece and three piece. In each category, 20 designs were sketched, out of which 10 designs were chosen.

Cooklin (2004) describes designer as a person who 102 develops variations from the core designs. These core designs are garments which contain the main design and fabric features of the collection and they will be used as the themes for

developing the full range of samples. Ideas sometimes originate from the drawing board. Starting with an idea for a silhouette or a neckline, the designer may experiment sketching alternative ways to complete the design. From the two dimensional designs the designer must be able to imagine how the garment will look three dimensionally, when made up in fabric.

Yadav and Sangwan (2008) conducted a study on 'Stylized functional salwar-kameez for working women'. For this study, 100 working women from four cities were selected from different profession, which included lecturer, executive managers, doctors and business. Styles were created using F.B designer version - 6 (apparel designing software). Totally 50 kameez styles and 8 salwar styles were prepared. The 25 preferred styles of kameez and 5 styles of salwar were selected and constructed for further study. Study was conducted to identify the problems faced by working women in the existing clothing practices at work place that make them feel uncomfortable and less active.

Pereira (2008) in 'Pretty in patchwork' expressed her thoughts that, the multilayered patch worked mini skirt fashioned out of layers of chiffon which swirl around prettily in the breeze, is the hottest trend on the ramp today across the globe. The print of the skirt is made to look like patchwork, or the skirts are made out of fabric, pin stacking made by attaching squares of different coloured cloth together. Skirts were usually made of textured voile, in soft abstract florals. The favoured one is the three panelled design which flares gently to the knee and has delicate pin tucks at the waist. Since these skirts are made of very fine voile, they are completely lined and are finished with a discrete zip on the side.

Pandey and Kauvery (2008) performed a study on 'Designing and value addition on stylized choli for young women'. Choli is defined as "short-sleeved bodice worn especially by Indian women". For this study, six stylized cholis were designed each featuring the common factors "comfort and design uniqueness". In the study the cholis were constructed using flat pattern technique, raw silk and taffeta, embellished with Zardosi work and assessed for the the acceptance of young women. Design wise cholis had various style features such as collars, sleeves and placket opening, princess line which gave a more International look and yet cater to the Indian appeal. Result revealed that, these cholis are well suited to Indian women.

Fashion talks, it lives and it grows says. To create fashion, nothing more than paper, pencil, ruler and a table are required, in addition to ideas, curiosity, ambition, concentration and endurance quotes (Entwerfen, 2010). The continual change, fashion involves the exercise of creative design skills which results in products that range from the basic to the rare and elaborate explains (Eaesy, 2009). Fashion today is not restricted to grown-ups, but kids too are becoming fashion conscious these days especially when it comes to dressing (Apparel online, 2010). The need for designer clothing is increasing day by day and it starts right with the birth of a child.

Kashyap and Arora (2011) performed a study on 'Designing of khadi silk jackets using CAD' in Jaipur and an attempt was made to develop the jacket patterns using computer aided designing. On the basis of evaluation, five best designs were selected for jacket construction. Prepared jackets were subjected to evaluation on order to assess its market acceptability by 10 entrepreneurs. The results revealed that, all the design of jackets using CAD was highly appreciated by the entrepreneurs.

Yadav and Arya (2011) conducted a study on 'Designer's opinion regarding value added constructional features for expert potential' and highlighted on additional designing constructional features, worked out keeping in mind the problems pointed out by the respondents existing dresses. The additional designing features worked out in kameez and top/kurta were pocket, collars, back yoke, loop/strip to hold dupatta, velerotapes to secure dupatta inbuilt dupatta, princess line, modified kalidar, cowl style, high neck and front opening style and the additional designing features in trousers were pocket and zipper opening,

Gupta and Sanganeria (2013), conducted "A Study on Acceptability of Lined Jackets Made from Jute Blended and Union Fabrics" to provide diversification for the jute fibre. Eight designs each for long and short jackets were sketched. The set of four selected patterns were cut and stitched with lining using the four different fabrics selected for the study. The results of the detailed study showed that majority of the respondents preferred comfortable lined jackets over jackets without lining. Taffeta was found to be the most preferred fabric for lining followed by satin, lawn and muslin. Most of the respondents preferred jackets with V-neckline, collars, full sleeves, flap pockets, zippers and jackets of short length.

Barmon (2015) conducted a study on developing apparel designs for pear shaped figure between the age group 20-30. For the study she selected ten designs out of thirty designs and constructed with due consideration of the factors like fitting, designs, color combination, trimming, decoration. Constructed garments were suitable for body of the model.

2.6 Design development through computer aided designing (CAD)

Computer is becoming an ever increasing tool for apparel designing. Advanced computer systems of 2 or 3 dimensional concept design were used widely in developed countries. This technology is beneficial for rationalization of production, analysis of fashion and forecast as well as in pattern grading and marking. The advent of CAD is giving designers new freedom to explore and manipulate design in a relatively easy and inexpensive ways. Now with advanced computer technology system the designer can visualize a realistic garment design along with folds, creases, etc. and also restyle a design, change colours and thus, producing better designs in seconds along with perfect drape and fit. Designers can use CAD to create, edit and evaluate designs with fast computer graphics and three-dimensional colour perspective (Yadav *et al.* 2006).

One of the researcher reported that CAD and CAM are major developments in designing and pre-assembly areas. The CAD involves the use of computer graphic system for making designs. The pre-assembly stage of pattern development and grading is often linked to computer controlled cutting system. Main advantages of CAD/CAM are improvement in fabric utilization, reduction in time required to grade and mark new styles, rapid generation and modification of new styles (Bhattacharya, 1992).

The process of designing in the existing manual mode for a complex design could require one week to four weeks time depending on design complexity. But with CAD facility, this process duration can be short ended to few hours and also it is possible to transmit designs to other place. Creation of new designs on the computer allows number of style variations with in no time (Arun, 2001).

As in 2001, the researchers studied about the future of the CAD in garment designing and reported that CAD integration is vital to face competition and for

bigger share in the global apparel market. A CAD system provides quick response (QR) capabilities to an enterprise by compressing the "design-manufacturing-marketing" cycle time. Designs stored in libraries can be recalled, modified and evaluated quickly. The number of prototypes of samples to be physically produced prior to acceptance by customer was greatly reduced, thus resulting in cost and time saving. The enterprise can respond faster to changes in the market (Bidani and Das, 2001).

CAD/CAM application in garment production increased the production with excellent quality of the material in apparel. Due to faster sample production time and higher productivity combined with flexibility of CAD system, the lead-time was considerably reduced. So, all the suppliers, running order throughout the year were advised to implement the same to enhance their highest profit and to maintain their delivery in advance (Somasundaram, 2004).

And the other author mentioned that the modern methods used in garment designing process and the market economy imposes some rules to all garment companies concerning the quality, price, material, fashion line, etc. for all their products. Sometimes, it may take a lot of time to launch a new model in the market. Big companies could buy modern and expensive CAD systems (Lectra, Investronica, Assyst, Optitex) to use them in elaborating the technical documentation needed for manufacturing processes, but for smaller ones, it was required to adapt the modern software of engineering design Auto CAD (Avadanei *et al.* 2005).

Developing new designs by using the computer and transferring the designs that are obtained to textile surfaces will not only increase and facilitate the production in a more practical manner, but also helps to you create identical designs. This means serial manufacturing of the products at standard quality and increasing their added values. Moreover, creating textile designs using the laser will also contribute to the value of the product as far as the consumer is concerned because it will not cause any wearing off and deformation in the texture of the fabric unlike the other method (Ozguney, 2007).

Modeling of realistic garments is essential for creating believable virtual environments. Sketch-based modeling of garments presents an appealing, easy to use alternative to the established modeling approaches which are time consuming and

require significant tailoring expertise. Unfortunately, the results created using existing sketch-based methods lack realism. Driven by human perception of garment sketches, we propose a context-aware garment sketch interpretation based on a set of observations about key factors that affect the shape of garments. Based on this analysis investigators developed a geometric method for sketch-based modeling of garments which obtained more realistic results than previous techniques (Robson *et al.* 2011).

Sharma *et al*. (2014) conducted worked on "Digitalization of Madhubani designs for transferring on apparels using screen printing technique" and reported that in India most of the states have their own traditional fabrics and designs distinctive of that area. Madhubani paintings from the Mithila region of Bihar state capture the heart of people. However the technique involved in producing Madhubani design is very much time and energy consuming. The present study was an initial step in direction of creating Madhubani Designs using CAD technology and applying prepared designs on the apparels using screen-printings technique. Screen printingis a fast method of producing designs, does not required expensive equipment, save time and energy and is not laborious. Since the procedure is very simple and easy to execute, a rural women can easily adopt it as a mode of income generation and enhance her quality of life. In this article may proved to be beneficial for those women who want to start an enterprises as they can follow up these guide lines for designing, preparation of screens and printing procedure.

Kaur *et al*. (2015) reported in her study "Creation of simulated *Phulkari* patterns using computer aided designing" revealed that the traditional craft can be suitably blended with the Computer Aided Designing (CAD) to enhance the pace of production in this fast changing world of fashion. The CAD software can be used for storing and reproducing all kinds of traditional Phulkari motifs that are fading on its way to transmission to the future generations. Fashion articles like jacket, handbag, stole, potli bag, belt, footwear, and headband were designed and illustrated on Coreldraw and Corel Photo Paint. The articles were drawn and filled with the required colours on Coreldraw. The softwares can further be used for simulation of the traditional embroidery effects and visualization of the embroidery patterns prior to the actual production of the product. Simulation of Phulkari embroidery designs

through Computer Aided Design (CAD) was created and illustrated on fashion articles to overcome the above mentioned barrier. This would help to blend the traditional craft with modernity, making it capable to compete in the modern technological world. It will create an everlasting trend for the modern consumer and keep the craft alive.

Rani (2016) conducted an article on "Adaptation and Application of Henna Motifs for Fabric Painting" to create designs from selected henna motifs for saris with CAD software. The results stated that the use of CAD has helped in creating new and complex designs using henna motifs and reduced the time involved in the entire process of textile designing. The adaptation of CAD made it possible to visualize textile designs in different colour combinations on monitor as well as to develop new patterns by systematic arrangement of different motifs proportionately; hence entire designs could be stored for future reference.

2.7 Consumer's acceptance for the developed garments

Consumers are the 'King' of marketing. Any product development always depends on the choice and preference of the consumers, which differ widely. There are wide varieties of textiles available for the consumers in today's era putting them in great dilemma while selecting the fabrics. Hence, it is necessary to study the consumer purchasing behaviour towards textiles by reviewing some of the articles listed below:

Dimingo (1983), Dress materials of teenagers can be identified as a 'fashion sensitive segment' in the textile market. Western clothes like jeans, short tops. 'Miniskirts, frocks, 'T- shirts, etc have become part and parcel of the lifestyles of the teenagers. Kids wear' is highly fashion oriented in character. This has a special relevance in Kerala, as the Keralites take extreme care in dressing up their children in relation to another one.' Positioning refers to a product's image in relation to directly competitive products'. A positively positioned shop will always be the destination of the prospective buyer as and when he goes out for shopping. In other words, positive positioning generates a preference for the shop. Variety rating can be pointed out as the fundamental criterion for developing preference for a textile shop. Variety rating denotes the process of assessing of products available at the textile shop in terms of the 'depth and width of each product line'. It is reflected in the form

of a wide variety of clothing having different quality, style, texture, design, colour and price range.

Today an average consumer demands various properties for garments which they buy like appearance, comfort, durability, ease of wear, maintenance of shape and luster, suitability to the occasion and versatility for many occasions which lead to greatest satisfaction (Thomas ,1988).

'Consumption pattern of textiles' was reported by Kagi (2005) where in the demand for textiles or as a product depends on various factors such as price, price of its substitutes, income of the consumer, consumer tastes and preferences, size and composition of population, advertisement and publicity, income distribution, climatic conditions, Government policies *viz*. tax policy, price policy, licensing policy, monetary policy and EXIM policy. Textile being the basic necessity will have continuous demand and with the rise in population, the future demand is likely to be more.

Sujata and Vastrad (2011) conducted a study on "Patchwork quilt value added products - Consumer acceptance" with a view to develop patchwork quilt value added products, thus throwing light on the opinion of consumers towards modernization of traditional quilt (*kaudi)* making technology. Traditional quilt value added products included quilt tops with random placement of swatches giving less importance to size, shape, colour, texture and fibre content. It was found that majority of the consumers from both rural and urban areas preferred the combination of mosaic patchwork with quilting technique followed by block and crazy patchworks. Among the patchwork quilt value added products, all the mosaic quilt value added products were highly accepted by both rural and urban consumers. Consumers also opined that if more number of items were developed through patchwork and quilting technique, that products may hold lots of market potentials and can be adapted to cottage level. Women can start a small enterprise for developing articles as per demand by forming self-help group.

Karolia and Prakash (2014) conducted a study on "Design and development of fashion accessories inspired from the hand woven shawls of Nagaland" with the major objective of documenting the history, origin, weaving techniques, motifs and significance of the hand woven textiles and ornaments of Nagaland. Inspired from

these textiles fashion accessories, i.e. bags, belts and neckwear were designed and constructed and its market acceptability was studied. The study revealed that the products were highly appealing in the market and there was lot of scope to develop such products. The respondents and shopkeepers also acknowledged that the attempt was very innovative and creative to make people aware of the textiles of Nagaland and the study helped uplift, preserve and popularize the hand woven textiles of the state by product diversification.

APPENDIX – I

PROFORMA FOR SELECTION OF DESIGN

Dear respondent,

I am a Ph.D. student in the department of Textiles and Apparel Designing, College of Community Science, Assam Agricultural University, Jorhat-13. I am conducting a study on "Evaluation of twill weave fabrics made of blended eri-modal and eri-acrylic yarns suitable for different dress designs". In this regard, I wish to carry out a survey on the knowledge and preferences against the dress designs sketched. To carry out the survey, I have prepared an interview schedule and sketches different dress designs. Kindly help me by giving your opinions against the following questions. Your contribution and valuable suggestions in this regard will certainly help me in selecting suitable dress designs for my research work.

Thanking you.

Yours sincerely,

(Sunita Boruah)
Ph.D. (C.Sc.)student
Deptt. of Textiles & Apparel Designing
College of Community Science
AAU, Jorhat-13

APPENDIX – II

SCHEDULE

1. Name :
2. Age :
3. Education Qualification :

   Ph.D.-

   Graduate -

   Undergraduate-

4. Occupation :
5. 40 numbers of dress designs are shown to you. Please give your order of preferences of dress designs which are suitable Girls, Boys, Women and Men.

i. Design of dresses (For Girls)

Design No.	**Order of preference**				
	Excellent (5)	**Very good (4)**	**Good (3)**	**Fair (2)**	**Poor (1)**
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

ii. Design of dresses (For Boys)

Design No.	Order of preference				
	Excellent (5)	Very good (4)	Good (3)	Fair (2)	Poor (1)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

iii. Design of dresses (For Women)

Design No.	Order of preference				
	Excellent (5)	Very good (4)	Good (3)	Fair (2)	Poor (1)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

iv. Design of dresses (For Men)

Design No.	Order of preference				
	Excellent (5)	**Very good (4)**	**Good (3)**	**Fair (2)**	**Poor (1)**
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

APPENDIX III

Preparation of Basic Bodice Block for girls followed by Helen Joseph Armstrong, 2015

The basic block of UK size 14 (301/2 inches) for girls (kids) was selected for drafting, following the instructions given by Helen Joseph-Armstrong.

Standard Measurement Chart for Girls

SL NO.	CIRCUMFERENCE MEASUREMENTS:	Grade: 1" Size: 14(UK)
(Ease not included)		
1.	Bust/Chest	30 ½
2.	Waist	26
3.	Hip	32
UPPER TORSO (bodice)		
4.	Center length:	
	Front	14 ½
	Back	16 ½
5.	Full length:	
	Front	12
	Back	13 ¼
6.	Shoulder slope:	
	Front	14 ¾
	Back	14 ¾
7.	Side length	7 ¼
8.	Shoulder length	4 1/8
9.	Across shoulder:	
	Front	6 5/8
	Back	6 ½
10.	Across chest	5 ½
11.	Bust/Chest arc	7 ¾
12.	Across back	6 ¾
13.	Back arc	7 7/8
14.	Waist arc:	
	Front	6 ¾
	Back	6 ¼
15	Hip arc	
	Front	7 1/2
	Back	8 1/2
16	Side waist to hip	7

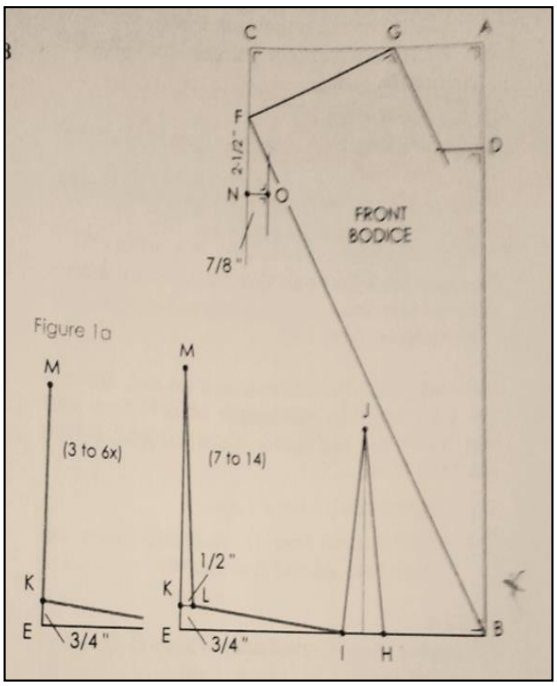
BASIC PATTERN SET FOR GIRLS

Measurements Needed:

- (5) Full length F_____ B _____.
- (9) Across shoulder F_____ B _____.
- (4) Center length F_____ B _____.
- (11) Bust or Chest arc _____.
- (6) Shoulder slop F_____ B _____.
- (8) Shoulder length _____.
- (7) Side length _____.
- (13) Back arc _____.
- (14) Waist arc F_____ B _____.

Front Bodice Draft

Figure



A-B= full length (5), plus 1/16".

A-C= across shoulder (9). Square a 5" line down from C.

B-D= center front length (4), less 3/8" from D.

B-E= chest arc (11), plus1/2". Square out from B and up from E.

B-F= slop (6), plus 1/8" touches on Cline.

F-G= shoulder length (8), touches A-C line.

Square from G-D line.

B-H= 2 1/4" , or to princess line. Mark dart leg.

H-I= dart intake: 1"

E-K-L = 3/4" up from E. Mark K. Square in 1/2" from K. Mark and Label L.

L-I = draw waistline to I.

L-M = side length (7). Draw line to intersect with the K-M line.

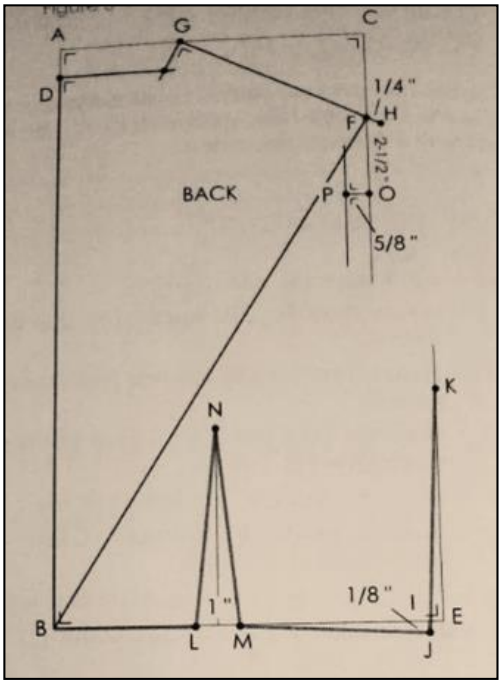
F-N = 2 1/2" down from F. Mark N.

N-O = 7/8" squared from N. Mark and square out from both sides of O, as shown.

- Neckline shape: Curved ruler touches G-D and diagonal mark.
- Armhole shape: Curved ruler touches F,O and M.

Back Bodice Draft

Figure



A-B= full length (5), plus 1/16".

A-C= across shoulder (9). Square a 5" line down from C.

B-D= center front length (4), Mark and square 4" line from D.

B-E= back arc (13), plus 5/8". Square out from B and up from E.

B-F= slop (6), plus 1/8" touches on Cline.

A-G= 2 3/4 " Mark.

G-H= shoulder length (8), plus 1/4" for ease.

Passes through F. G-H line to intersect with D line.

B-I= waist arc (14), plus 1/4" ease and 1" for dart intake.

I-J= square down 1/8".

J-K= side length (7). Draw line from J to K, touching E line.

B-L= 21/2", or use princess measurement. Label L.

L-M = side length (7). Draw line to intersect with the K-M line.

F-O = 2 1/2" down from F. Mark O.

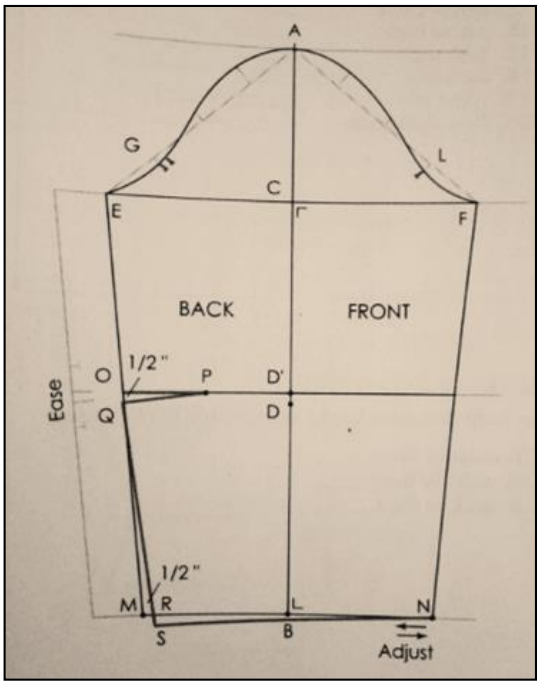
O-P = 5/8" squared from O. Mark and square out from both sides of P, as shown.

- Neckline shape: Curved ruler touches G-D and diagonal mark.
- Armhole shape: Curved ruler touches H,P and K..

Sleeve Draft Measurements

The standard sleeve draft measurements apply to the sizes given.

- Sizes = 14"
- Sleeve length = 19 1/2"
- Cap height = 5"
- Biceps = 11 1/4"



Basic Sleeve

Figure

- A- B = Sleeve lengths_.
- A - C = Cap height mark _.
- C- D = One-half of C to B.
- D to D = 3/4″ mark. Square lines from A, C, D, B.
- C to E = One half of biceps measurement. Mark compare placement of the tow marks and mark biceps in between. Label E draw a line from A to E; draw a line E from A to E; divide into fourths. Mark and label.
- C to F = C to E
- Draw a line from a to F .divide into fourths, mark and label.
- B- M = 1 Inches less then C- E.
- B - P = B- M.
- Draw a line from M to E and N to F.

Preparing Sleeve Cap for Shaping

- Square out from H, I, (back sleeve) and J, K (front sleeve) to the amount given.

- Square in at G (back sleeve) and L (front sleeve). Choose the amount for the size being drafted.

  Shaping the sleeve cap

- Place a French rule touching A, J, K. Continue the line past K. Place the rule touching F, L and blend with K line.
- Place a French rule touching A, I, H. Continue the line past H. Place the rule touching E, G and blend with H line.

Basic Skirt Draft

Measurement Needed

- Skirt length : 20"
- (15) Hip arc F _____, B_____..
- (16) Waist to hip _____.
- (14) Waist arc F _____, B _____.

Figure

A-B = skirt length. Draw a line from A to B.

A-C = waist to hip (16). Mark and label HBL.

C-D = hip arc. Add the front and back hip arc (15) together, plus 3/4" for hip ease and square the line.

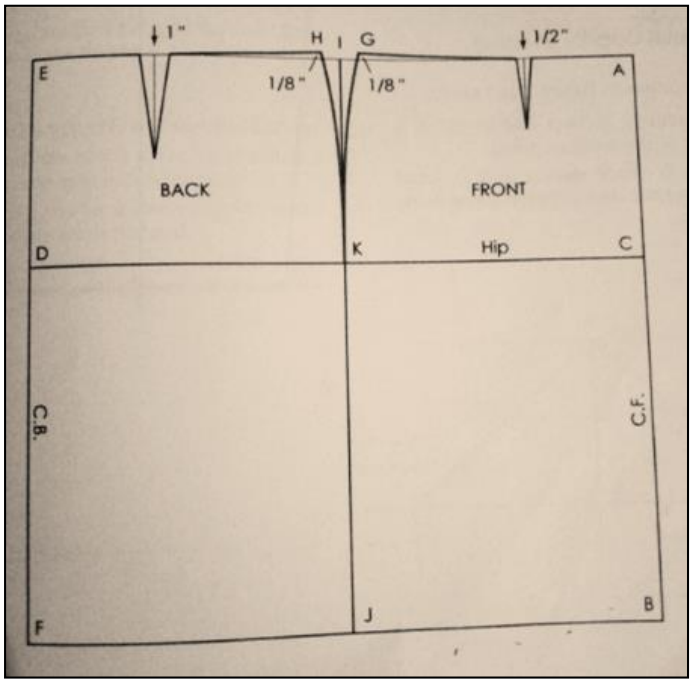
A-E = C-D.

Square a line from A.

B-F = C-D.

Square a line from B.

Connect a line from E to F.



A-G = front waist arc (14), plus 1/4" (ease), and 1/2" for dart intake. Mark.

E-H = back waist arc (14), plus 1/4"(ease), and 1" for dart intake. Mark.

Side Seam Placement

- Mark a point centered between points H and G. Label I and square down to hemline.Label hem J and hip K.

Dart Placement

- Front skirt: Mark the first dart leg, to match the front bodice dart leg. Mark dart intake 1/2".
- Back skirt : Mark the first dart leg to match the back bodice dart leg. Mark dart intake 1".
- Mark centers of each dart and square down 21/2" inches for front dart and 3 to 5 inches for back dart.
- Draw dart legs to dart points of the front and back skirt.

Hipline

- Draw hipline up from K to 1/8" past H and G.
- Draw waistline curve from H and G to dart legs.
- Walk waistlines of the skirt with bodice. Adjust at side seam if necessary.

DESIGN NO. D1G

Adaptation of the Basic Bodice Block to aInverted Box -Pleated Dress

The Dartless Draft

Pattern Plot and Manipulation

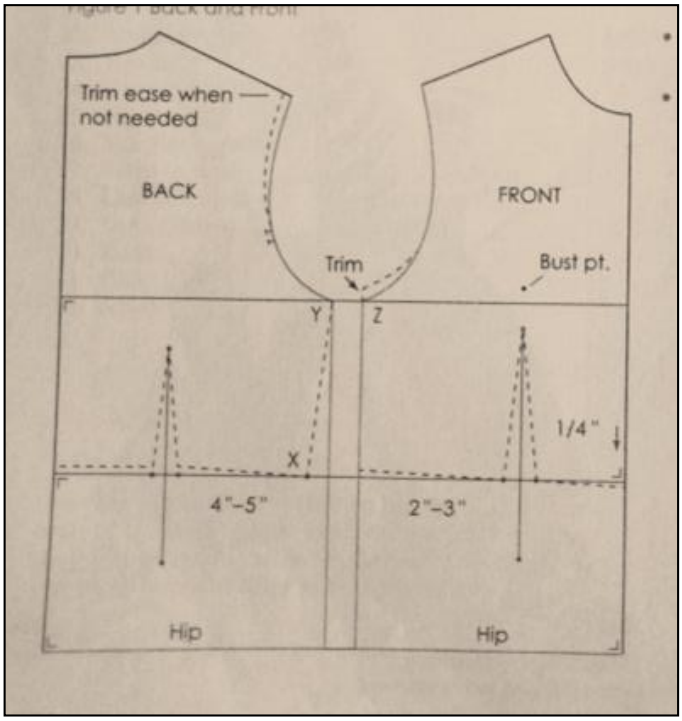
Figure Front and Back

Front

- Square a line across paper and square up. Place the center front waist of the bodice ¼ inch below square and trace the bodice front.

Dot-mark dart legs and bust point.

- Mark the center of the dart leg, and draw a parallel line with the center front 2 to 3 inches below the waist.
- Extend a line down from center front waist to equal hip depth and square a 20-inch line across paper; from this point, square a line up from the hip.



Back

- Place center back pattern on the center line of the paper, with the side waist touching square line. Trace and label X (waist) and Y (armhole).
- Dot-mark the waist dart. Mark dart

center and draw a parallel line with

center back 4 to 5 inches below the waist.

- Square a line from the center back, touching and passing Y to center front. Label Z at side front seam and draw the armhole. At this point, measurement the front and back armhole.

Inverted Box-Pleated Skirt

Pattern Plot and Manipulation

Figure

- Trace basic front and back skirt.
- Draw a tentative line from the dart

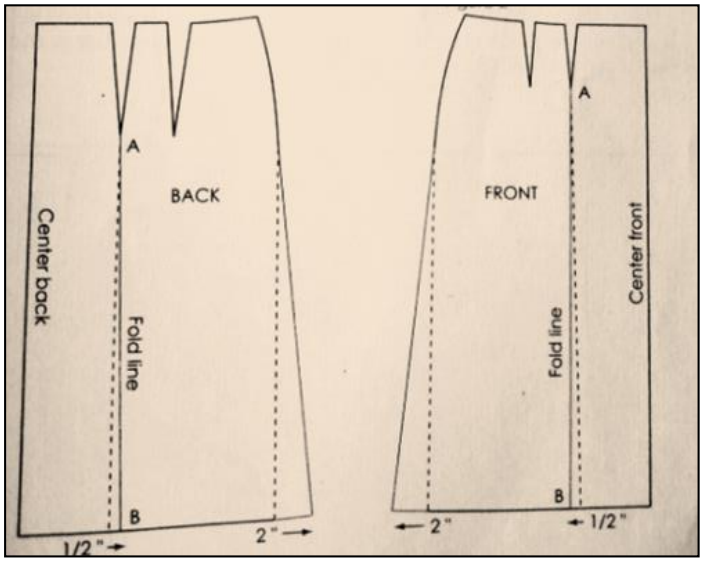
point to hem, parallel to center , and mark

½ inch. Label B. Draw a line from Bto the

dart point. Label A (PLEATED GUIDE).

- Measure out 2 inches at side seam for A-line silhouette. Draw a line to the outermost part of the hip. Blend hemline.

- Cut the paper.
- Place pattern on paper and trace the dart leg (A), ending at point B (shade area).
- Remove the pattern.
- Measure 3 inches from dart leg (A) and 6 inches from point B. Draw a line. Label it C-D.
- Repeat these measurements for E-F.



- Draw a center line up from point A.
- Fold the A-B line to the C-D line.
- Fold the E-F line to the A-B line.

DESIGN NO. D2G

Adaptation of the Basic Bodice Block to Princess StylineFrilledFrock

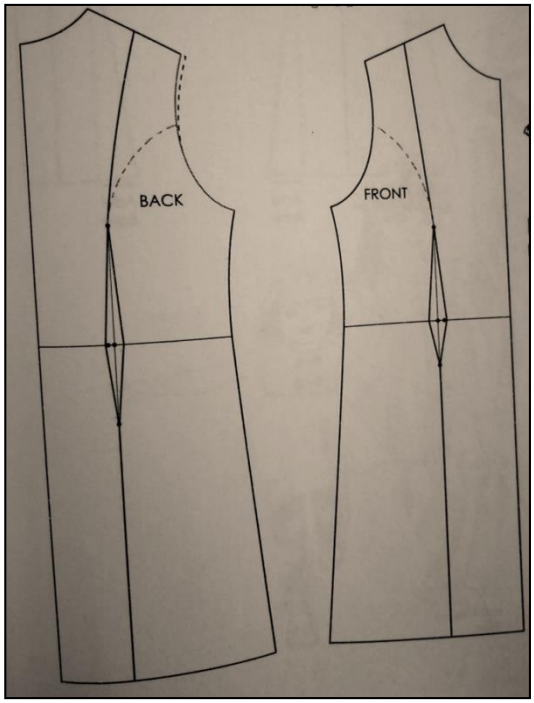
Shift Draft

Pattern Plot and Manipulation

Figure

- Trace front and back basic bodice patterns and all markings, including darts.
- Extend center front line to the desired length and square across and up to the armhole.
- Square across the back pattern to the armhole and square down equal to side length of the front.
- Square across the hem and up to center back.
- Mark a point 1/2to ¾ inch in from mid-point of the side seam. Label X.
- Add 1 1/2to 2 inches out at the side seam for an A-line silhouette. Mark a point ¼ inch up and draw a curved hemline.

- Draw side seam from hem to point X, and connect to the armhole, as illustrated. Blend at X.



- Cut the front shift from paper.

  Dart: Extended lines through center of the darts to

  length indicated. Draw dart legs to waistline.

- Cut the patterns from the paper.

Princess Draft

- Trace the front and back shift patterns.
- Plot the style from the mid-shoulder and the mid-armhole. The styline touches the dart point.
- Draw lines from the dart points to hem, parallel to front and back center lines.

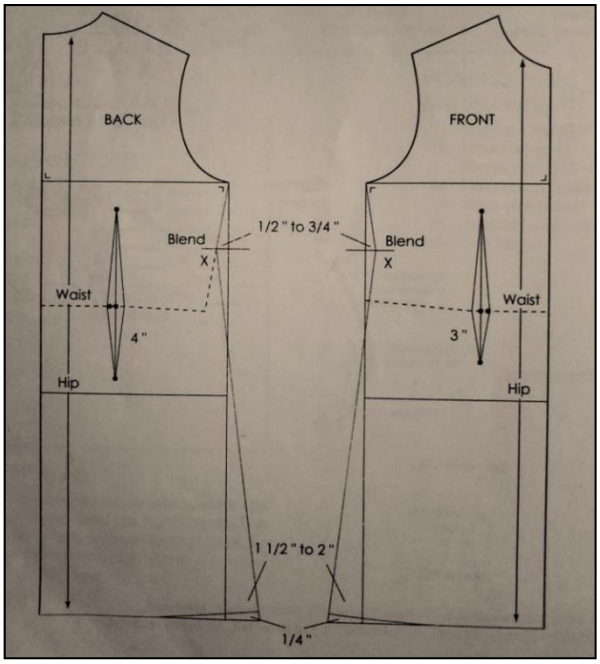
DESIGN NO. D3G

Adaptation of the Basic Bodice Block to Princess Styline Frockwith cape

Shift Draft

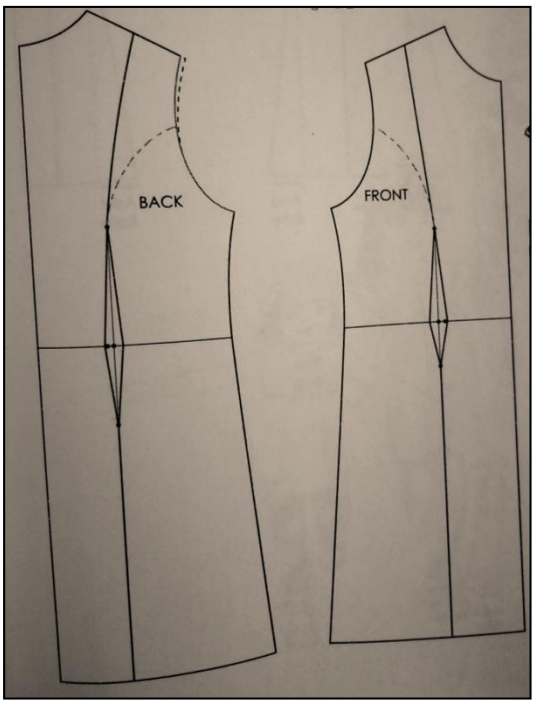
Pattern Plot and Manipulation

Figure



- Trace front and back basic bodice patterns and all markings, including darts.
- Extend center front line to the desired length and square across and up to the armhole.
- Square across the back pattern to the armhole and square down equal to side length of the front.

- Square across the hem and up to center back.
- Mark a point 1/2to ¾ inch in from mid-point of the side seam. Label X.
- Add 1 1/2to 2 inches out at the side seam for an A-line silhouette. Mark a point ¼ inch up and draw a curved hemline.
- Draw side seam from hem to point X, and connect to the armhole, as illustrated. Blend at X.

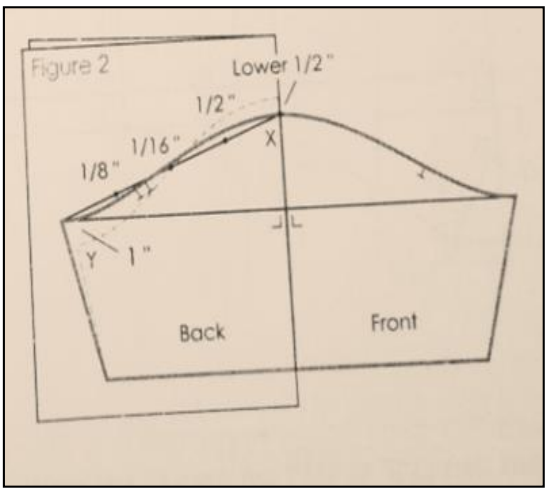


- Cut the front shift from paper.

  Dart: Extended lines through center of the darts to length indicated. Draw dart legs to waistline.
- Cut the patterns from the paper.

Princess Draft

- Trace the front and back shift patterns.
- Plot the style from the mid-shoulder and the mid-armhole. The styline touches the dart point.
- Draw lines from the dart points to hem, parallel to front and back center lines.

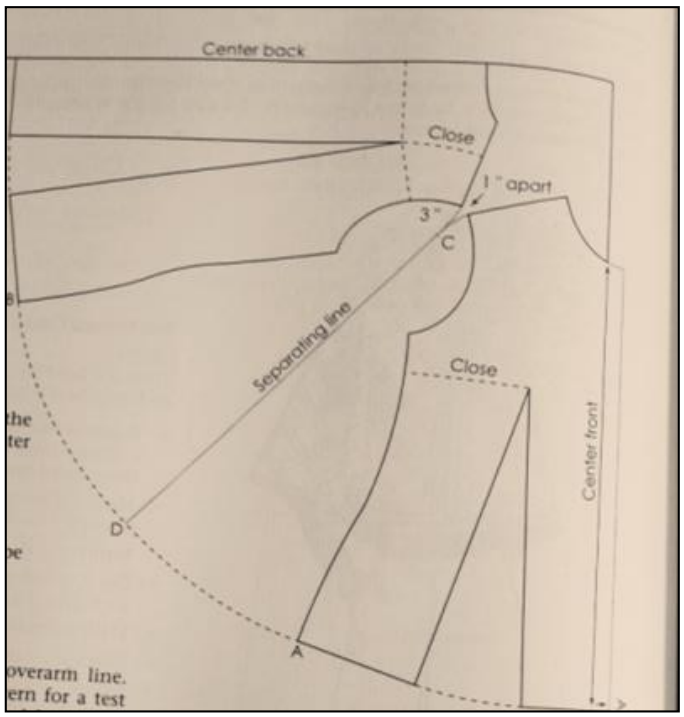


Sleeve

- Trace sleeve on fold to desired length.
- Lower cap 1/2". Raise biceps 1" and extend line.
- Draw line from X to biceps line equal to armhole measurement.
- Divide into fourths and mark measurements given. Draw cap curve as shown.

The Flared Cape Draft

Figure



Trace the front and back pattern, transferring shoulder and side darts to hip level, and cut from paper.

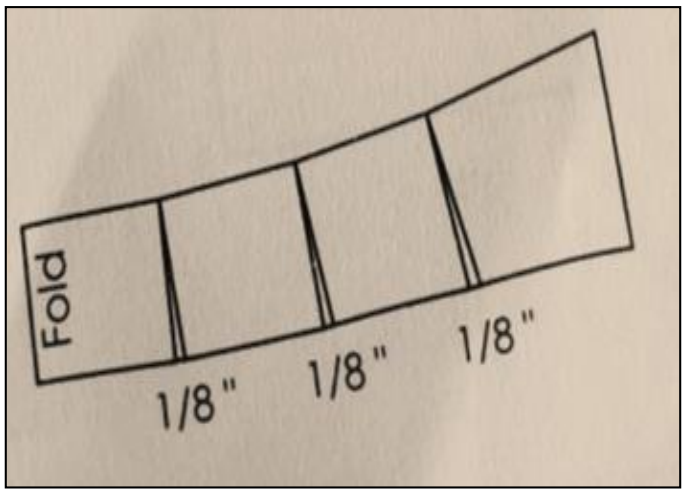
- Square a line on paper. Place the back and front on a square line, with shoulder tips 1 inch apart and trace. Label side hips A and B.
- Mark the center between shoulder tips and points A and B. Draw separating line. Label D.
- Mark C 3 inches down on the line from shoulder tips.
- Draw a curved shoulder from C to the front

  and back mid-shoulders.
- Mark a notch at the shoulder tips.
- Shape the hemline to desired length. The new

  hemline is parallel with hip level.
- Draw a 1-inch extension at center back for button

  and buttonhole, if desired.

Collar



- Draw rectangle: width 3/4 " and length = back

  and front neckline plus 3/4" extension.
- Draw collar on top of collar stand and trace.
- Slash and spread collar.

DESIGN NO. D4G

Adaptation of the Basic Bodice Block to Frock Coat

Coat Draft

Figure

Trace the front and back dartless pattern (shown as broken lines). Use the illustration and measurements for draft the jacket and coat foundations. The sleeve draft follows.

Measurements Needed

Size: 14 (UK- KIDS)

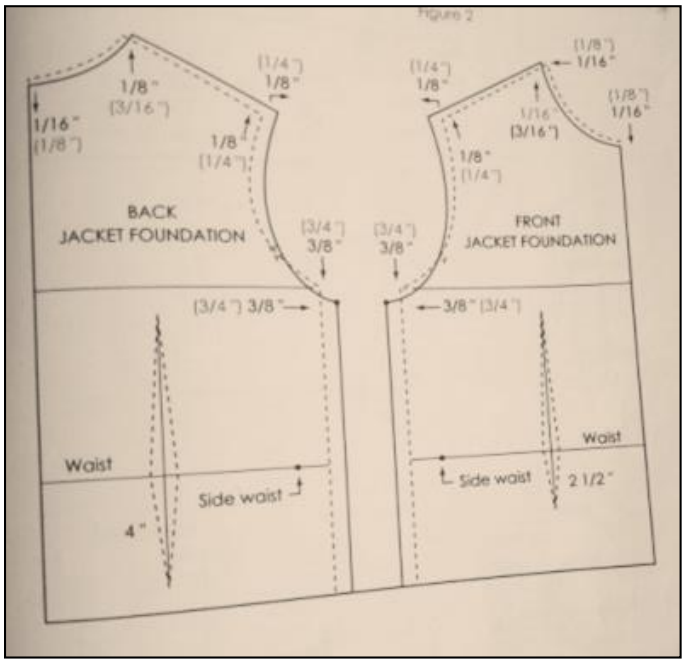
Sleeve length: 19 1/2"

Cap height: 6"

Bicep: 13 1/2"

Record sleeve measurements for coat of the modal size.

Draft the coat sleeve as per basic sleeve.



- Increase cap fullness.
- Raise armhole.
- Adjust sleeve by equal amount.

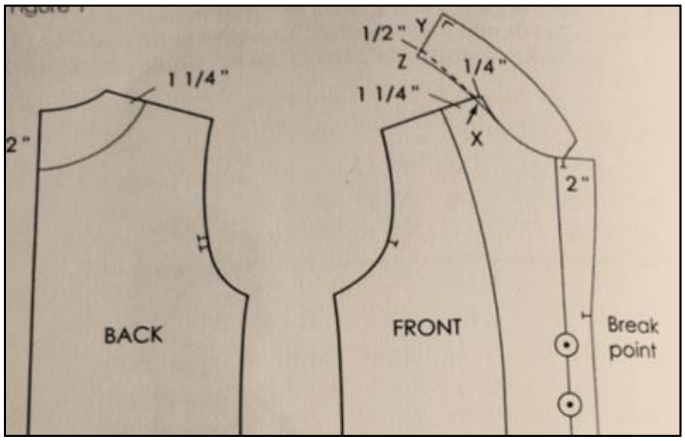
Coat with Notch Collar

Figure

- Trace the back pattern. Use illustration to plot the pattern.

Figure

- Trace the coat pattern.



- Add ¾ inch for extension. Draw the line from hem to brea-point.

Lapel

- Draw a 2-inch line out from center front neck.
- Mark a notch ½ inch past center front neck.
- Draw the facing (1 ¼ inch from neck, 2 ½ at hem).

Collar

Measure in ¼ inch from shoulder neck. Label X.

- Draw a straight line from curve of mid-neck to X and

continue to equal back neck measurement of the jacket,

plus 1/8 inch. Label Y.

- Mark ½ inch down from Y. Label Z.
- Draw a curved line from X to Z.
- Square up 2 ½ inches from the X-Z line. Draw the collar parallel to neckline, ending ½ inch or more from the lapel.
- Trace the front facing.
- Place folded paper under the back pattern and transfer the facing.

Upper Collar

- Transfer the collar to paper and cut on the fold.

Under collar

- Trace upper collar and trim the collar's edge.
- Mark a notch ¼ inch in from the center back.

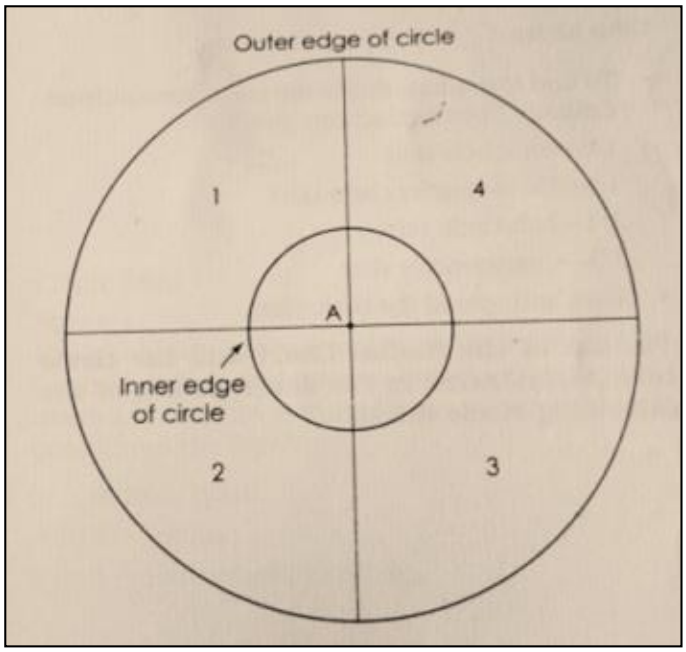
Circle Skirt

Corner fold of paper is X. Mark the following.

X to Y= radius measurement.

Y to Z= skirt length.

Figure



- Cut the skirt from paper.
- Cut away one quarter-section from the circle skirt.
- If two seams were calculated, cut in half.
- If four seams were calculated, cut the skirt into four equal parts.

Preparation of Basic Bodice Block for boys followed by Helen Joseph Armstrong, 2015

The basic block of UK size 10 (28 1/2 inches) for boys (kids) was selected for drafting, following the instructions given by Helen Joseph-Armstrong.

Standard Measurement Chart for Boys

SL NO.	**CIRCUMFERENCE MEASUREMENTS:**	**Grade: 1"** **Size: 10(UK)**
(Ease not included)		
1.	Chest	28 ½
2.	Waist	24
3.	Hip	30
4.	Center length:	
	Front	11
	Back	12 ¼
5.	Full length:	
	Front	13 ¼

SL NO.	CIRCUMFERENCE MEASUREMENTS:	Grade: 1" Size: 10(UK)
	Back	13
6.	Shoulder slope:	
	Front	13 ½
	Back	13
7.	Side length	6 ½
8.	Shoulder length	4
9.	Across shoulder:	
	Front	6 3/8
	Back	6 ¼
10.	Across chest	5 ¼
11.	Chest arc	7 ¼
12.	Across back	5 ½
13.	Back arc	7 3/8
14.	Waist arc:	
	Front	6 1/4
	Back	5 ¾
15	Hip arc	
	Front	7
	Back	8
16	Side waist to hip	6
17	Side waist to knee	18
18	Side waist to ankle	32
19	Side waist to floor	35
20	Upper thigh	17
21	Knee	12 ½
22	Calf	12
23	Ankle	8 1/2
24	Foot entry	11
25	Trunk length	49 ½
26	Crotch length	23

SL NO.	CIRCUMFERENCE MEASUREMENTS:	Grade: 1"
		Size: 10(UK)
27	Crotch depth	8 ½
28	Over arm sleeve length	17 ½
29	Biceps	10 ½
30	Hand entry	8 1/8
31	Cap height	4 ¾

BASIC PATTERN SET FOR BOYS

Measurements Needed:

- (5) Full length F_____ B _____.
- (9) Across shoulder F_____ B _____.
- (4) Center length F_____ B _____.
- (11) Chest arc _____.
- (6) Shoulder slop F_____ B _____.
- (8) Shoulder length _____.
- (7) Side length _____.
- (13) Back arc _____.
- (14) Waist arc F_____ B _____.

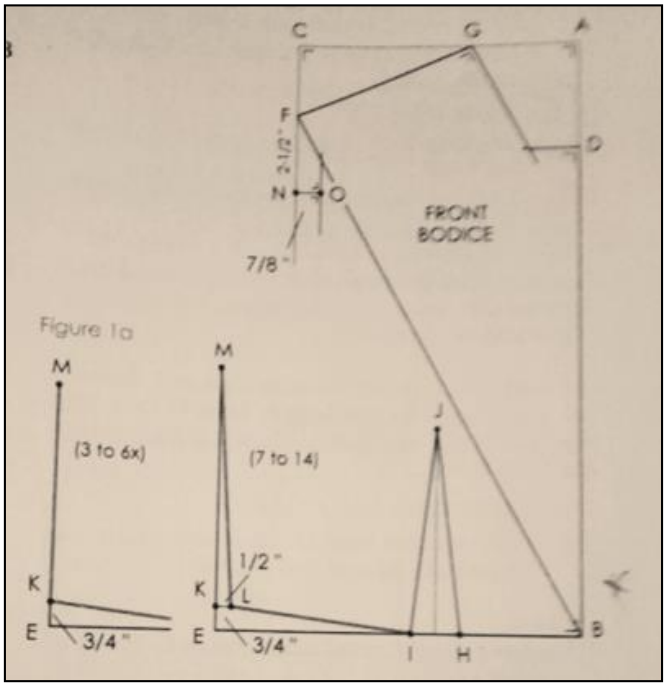
Front Bodice Draft

Figure

A-B= full length (5), plus 1/16".

A-C= across shoulder (9). Square a 5" line down from C.

B-D= center front length (4), less 3/8" from D.



B-E= chest arc (11), plus1/2". Square out from B and up from E.

B-F= slop (6), plus 1/8" touches on Cline.

F-G= shoulder length (8), touches A-C line.

Square from G-D line.

E-K-L = 3/4" up from E. Mark K. Square in 1/2" from K. Mark and Label L.

L-I = draw waistline to I.

L-M = side length (7). Draw line to intersect with the K-M line.

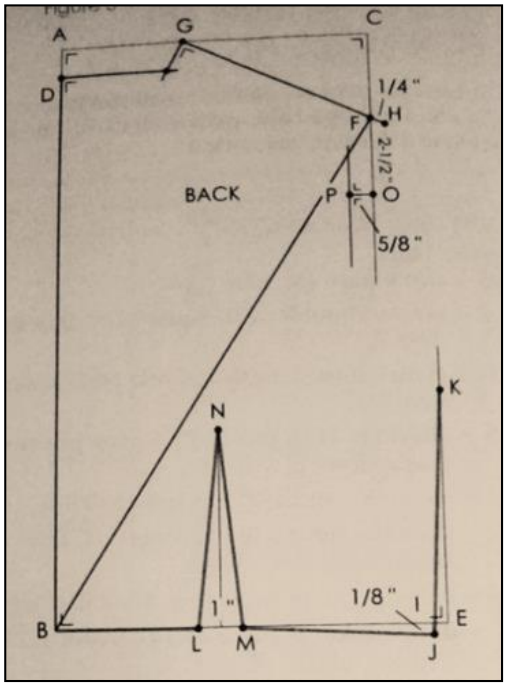
F-N = 2 1/2" down from F. Mark N.

N-O = 7/8" squared from N. Mark and square out from both sides of O, as shown.

Figure

- Neckline shape: Curved ruler touches G-D and diagonal mark.
- Armhole shape: Curved ruler touches F,O and M.

Back Bodice Draft



Figure

A-B= full length (5), plus 1/16".

A-C= across shoulder (9). Square a 5" line down from C.

B-D= center front length (4), Mark and square 4" line from D.

B-E= back arc (13), plus 5/8". Square out from B and up from E.

B-F= slop (6), plus 1/8" touches on Cline.

A-G= 2 3/4 " Mark.

G-H= shoulder length (8), plus 1/4" for ease. Passes through F. G-H line to intersect with D line.

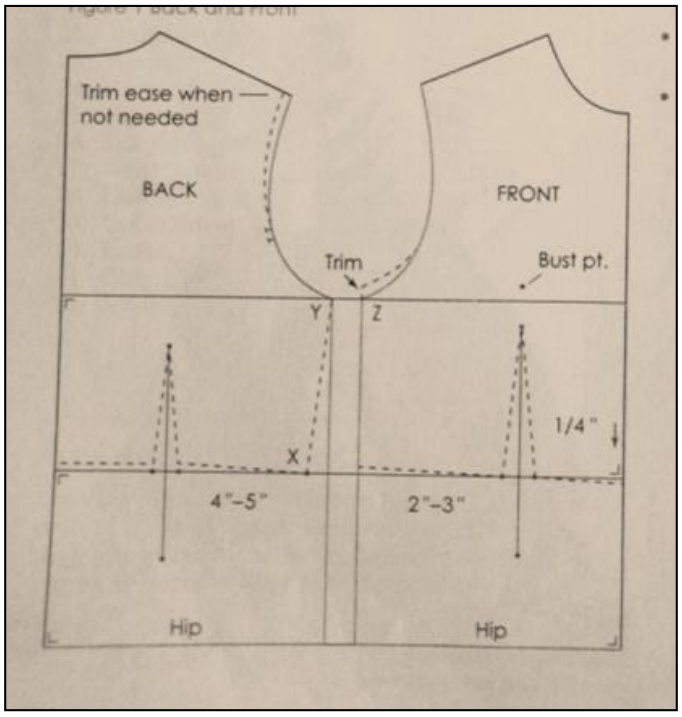
B-I= waist arc (14), plus 1/4" ease.

I-J= square down 1/8".

J-K= side length (7). Draw line from J to K, touching E line.

F-O = 2 1/2" down from F. Mark O.

O-P = 5/8" squared from O. Mark and square out from both sides of P, as shown.



Figure

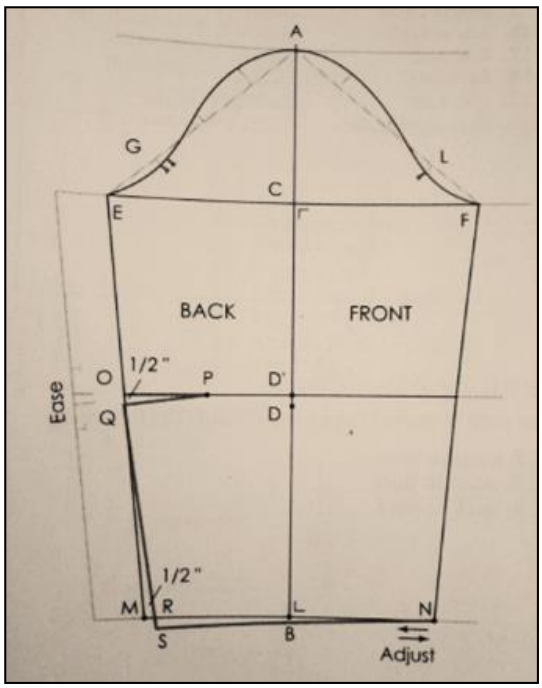
- Neckline shape: Curved ruler touches G-D and diagonal mark.
- Armhole shape: Curved ruler touches H, P and K.

Sleeve Draft Measurements

The standard sleeve draft measurements apply to the sizes given.

- Sizes = 14"
- Sleeve length = 19 1/2"
- Cap height = 5"
- Biceps = 11 1/4"

Basic Sleeve



Figure

- A- B = Sleeve lengths_.
- A - C = Cap height mark _.
- C- D = One-half of C to B.

- D to D = 3/4″ mark. Square lines from A, C, D, B.
- C to E = One half of biceps measurement. Mark compare placement of the tow marks and mark biceps in between. Label E draw a line from A to E; draw a line E from A to E; divide into fourths. Mark and label.
- C to F = C to E
- Draw a line from a to F .divide into fourths, mark and label.
- B- M = 1 Inches less then C- E.
- B - P = B- M.
- Draw a line from M to E and N to F.

  Preparing Sleeve Cap for Shaping

  Figure
- Square out from H, I, (back sleeve) and J, K (front sleeve) to the amount given.
- Square in at G (back sleeve) and L (front sleeve). Choose the amount for the size being drafted.

  Figure

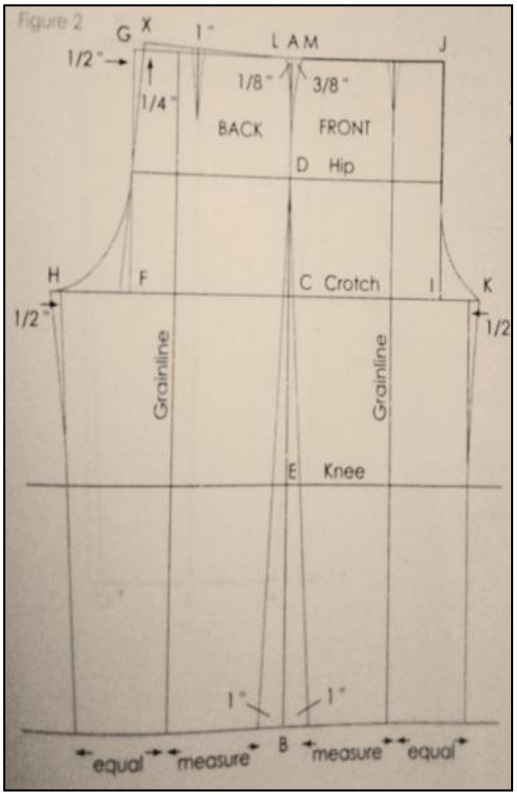
  Shaping the sleeve cap
- Place a French rule touching A, J, K. Continue the line past K. Place the rule touching F, L and blend with K line (Figure 3a).
- Place a French rule touching A, I, H. Continue the line past H. Place the rule touching E, G and blend with H line (Figure 3b).

BASIC PANT FOUNDATION FOR TROUSER

Measurements Needed

- (18) Waist to ankle (pant length) _____.
- (27) Crotch depth _____.

- (15) Hip arc, plus ½ inch F_____ B_____.
- (14) Waist arc, plus ½ inch F_____ B_____.
- (20) Upper thigh _____.
- (24) Foot entry _____.



Drafting instruction

Figure

- A-B = Waist to ankle (pent length)
- A-C = Crotch depth plus $^{3}/_{4}$″ ease (varies)
- A-C = Hip depth: one half of C-D plus 1″ (toward crotch level).
- Square out from both sides of A, B, C, D and E.

Back:

- C-F = Back hip plus $^{1}/_{4}$″ (ease)
- D-G = Same as C-F.
- A-H = Same as C-F.
- Connect G with H.
- G-X = One half of G-H.
- G-I = One half of G-D.

Front:

- C-J = Front hip plus ¼″ (ease).
- D-K = Same as C-J.
- A-L = Same as C-J.
- Connect K with L.
- K-X = One half of K-L.

- K-M = One forth of K-D.

Back Dart Intake (or use personal darts)

- H-N = 3/4″. Mark.
- N-O = Waist measurement, plus 2¼″.
- N-P = 3″. Mark 1″ intake for each dart and space 1¼″ apart.

Mark centers of each dart and square down 4½″.

Front Dart Intake (or use personal darts)

- L-Q = Waist measurement, plus 1 1/4″.
- L-R = 3″. Mark ½″ intake for each dart and space 1 1/4″ apart.
- Mark centers of each dart and square down 3″.

Front dart intake (or use personal darts)

- L-Q = Waist measurement, plus 1 1/4″ apart.
- Mark canters of sacs dart and square down 3″.

Back:

- N-S = 1/4″ squared up from N. Draw line from S to X to crotch level.
- G-T = 2″ diagonal line (less 1/8 to ¼″ for sizes under 10).
- Draw the crotch curve from I to X, touching or blending at T.

Front:

- K-U = 1½″ diagonal line.
- Draw the crotch curve from M to X, touching or blending at U.

Back:

- Draw a slight inward curved line from S to O.
- Draw a slight inward curved line from 1/4″ below L to Q.

  Front:

- Draw dart legs to the waistline and rue by adding to shorter legs.

- Draw hip curves just above C and to Q.

Back:

D-V = One-half of D- M, plus 1/4″. Square up and down from W (grain line).

Front:

- D-W = One –half of D-M, plus 1/4″. Square up and down from W (grain line).
- Mark hemline widths (1/2″ less for sizes under 10). Adjust at F.

Out seams: Draw straight lines from ankle marks to C (blend with hipline).

Inseams: Mark ½″ in front M and L and draw straight lines to ankle marks. Draw inward curved lines from I and M, blending close to knee level.

DESIGN NO. D1B

Adaptation of the Basic Bodice Block and Trouser to Asymmetrical Shirt and Peg Pant

Shirt Draft

Figures

Front

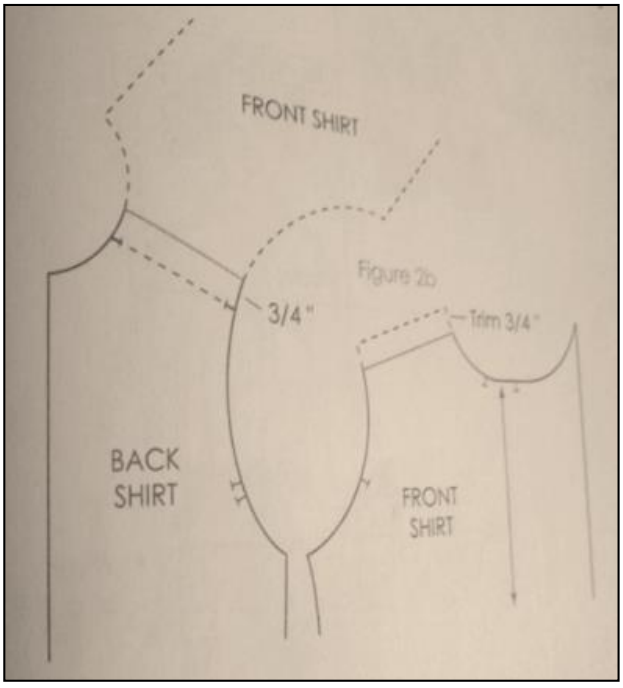
- Fold paper and draw a line 3/4" in front fold

  for the extension.
- Place dartless pattern on the center front line

  and trace the pattern.
- Width tracing wheel, trace neck, part of

  shoulder, and hem.
- Unfold; pencil in neckline. Draw a parallel line

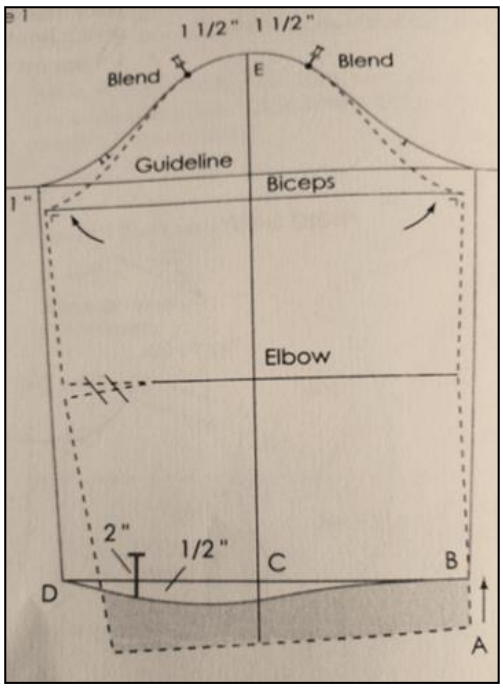
  from shoulder neck tohem for the extension line Notch center front, as shown.



- Extended shoulder to equal back shoulder, lower armhole ½ to 1". Redraw armhole.
- Draw curved shirt tail.

  Back
- Trace the back pattern. Lower armhole to match front armhole and blend.

  Yoke
- Mark one-fourth of center back to waist and square a line across pattern for back yoke.



Shirt Sleeve Draft

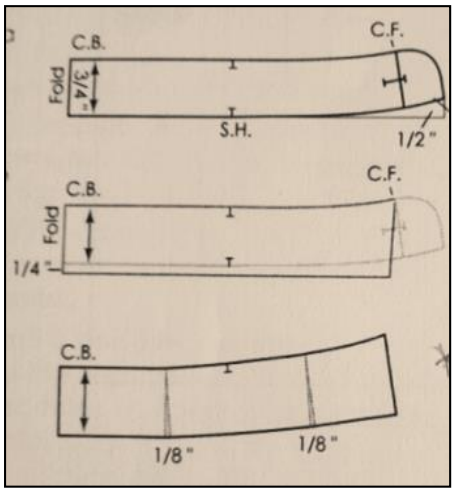
Figure

- Trace the basic sleeve (broken line).
- Measure up 1 inch from the hemline (A) for

  a cuff allowance. Label B.
- Square a line from center grainline (C) touching B.

  Continue the line across the pattern so that line

  C-D equals C-B.
- Draw a parallel line ½ to 1 inch up from biceps.
- Repeat for the front sleeve.
- Draw lines from the lift to hemline of the front and back sleeve.



Collar and Stand

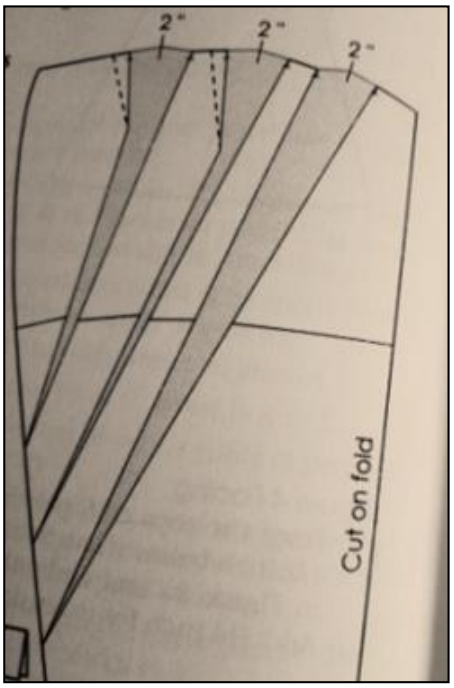
- Draw rectangle: width 3/4 " and length = back and

  front neckline plus 3/4" extension.
- Draw collar on top of collar stand and trace.
- Slash and spread collar.

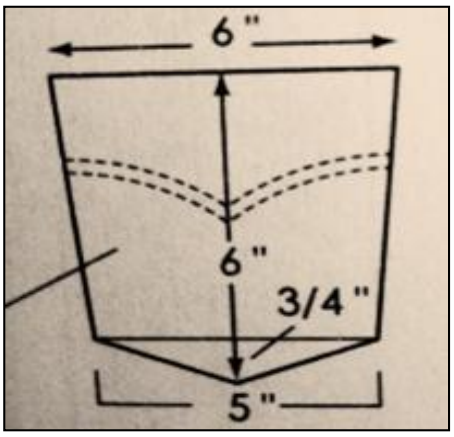
Peg Pant with Pleats

Pattern Plot and Manipulation

Figure



- Trace front trouser.
- Draw a line from 1 inch below center front to dart to dart leg at waist.
- Mark 1 inch in at side hem and draw line to hip for pegged effect.
- Draw slash lines for pleats as shown.
- Cut pattern from paper. Trim broken line areas. Save wedge for waistband.
- Cut slash lines from waist to, not through, side seam and hem.
- Close waist dart (broken line).
- Spread each section 1 ½ inches or more.
- Trace around pattern

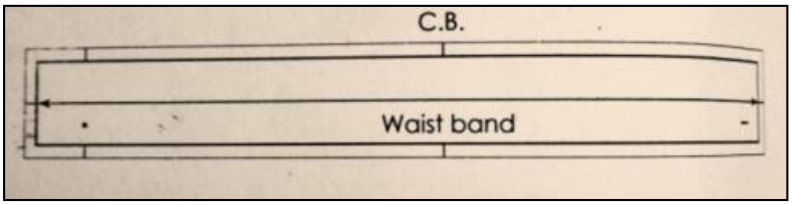


Pocket

Use measurements to draw pocket. Trace pocket.

Belt Construction

Trace basic belt on fold of paper.



- Place wedge section to bottom of

belt at center front and trace.

- Draw grainline and complete

pattern for test to fit.

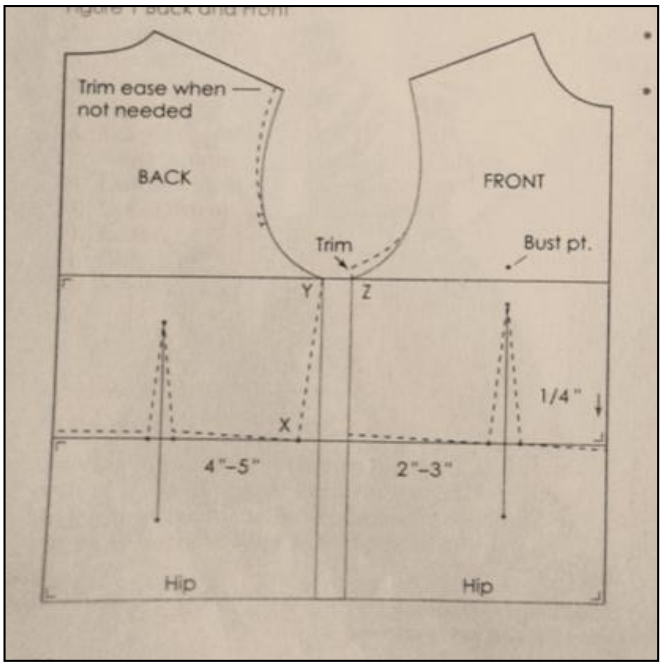
DESIGN NO. D2B

Adaptation of the Basic Bodice Block and Trouser to Half Jacket and Grunge Pant

Coat Draft

Figure

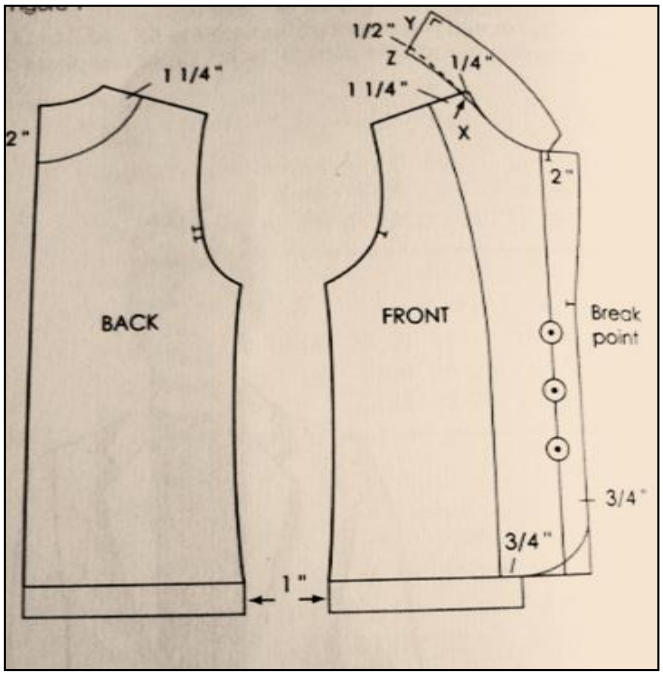
Trace the front and back dartless pattern (shown as broken lines). Use the illustration and measurements for draft the jacket and coat foundations.



Coat with Notch Collar

Figure

- Trace the back pattern. Use illustration to plot the pattern.
- Trace the coat pattern.
- Add ¾ inch for extension. Draw the line from hem to break-point.



Lapel

- Draw a 2-inch line out from center front neck.
- Mark a notch ½ inch past center front neck.
- Draw the facing (1 ¼ inch from neck, 2 ½ at hem).

Collar

- Measure in ¼ inch from shoulder neck. Label X.
- Draw a straight line from curve of mid-neck to X and continue to equal back neck measurement of the jacket, plus 1/8 inch. Label Y.
- Mark ½ inch down from Y. Label Z.

- Draw a curved line from X to Z.
- Square up 2 ½ inches from the X-Z line. Draw the collar parallel to neckline, ending ½ inch or more from the lapel.

  Figure

- Trace the front facing.
- Place folded paper under the back pattern and transfer the facing.

  Upper Collar

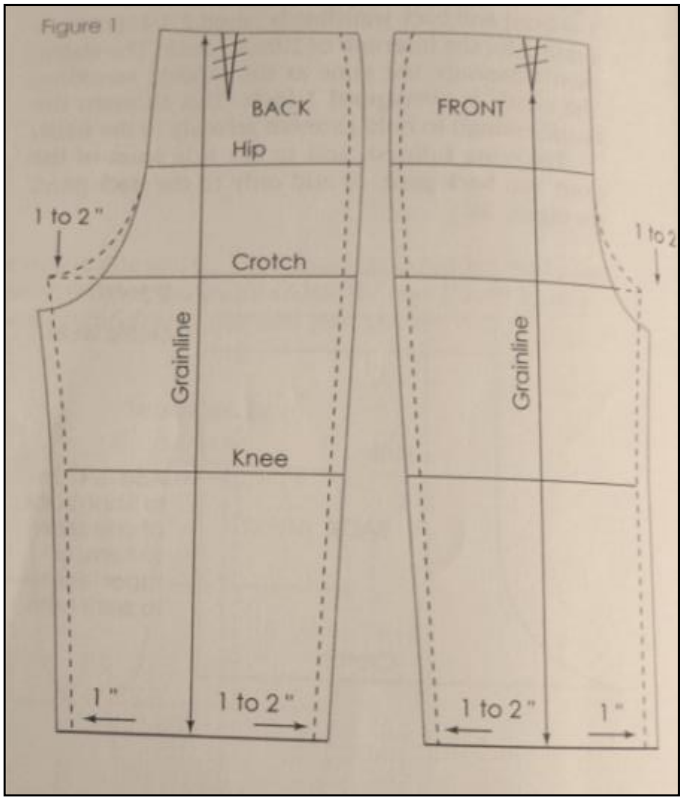
- Transfer the collar to paper and cut on the fold.

  Under collar

- Trace upper collar and trim the collar's edge.
- Mark a notch ¼ inch in from the center back .

Grunge Pant

The trouser foundation is traced and modified to create a grunge pant. The grunge pant has a deep crotch and wide flies extension attached that can be of any length. Follow the illustration and measurement to develop the pant.



DESIGN NO. D3B

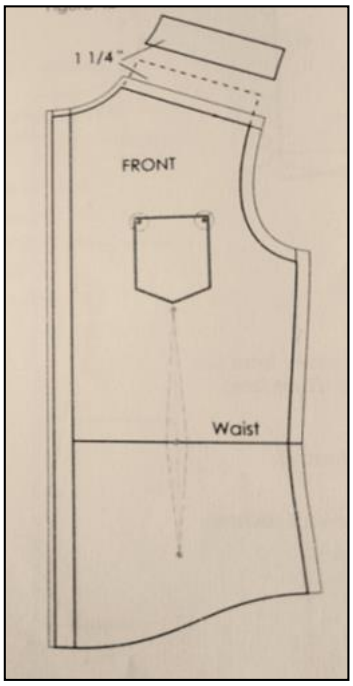
Adaptation of the Basic Bodice Block and Trouser to Casual Shirt and Shorts

Casual Shirt

Pattern Plot and Manipulation

Figure

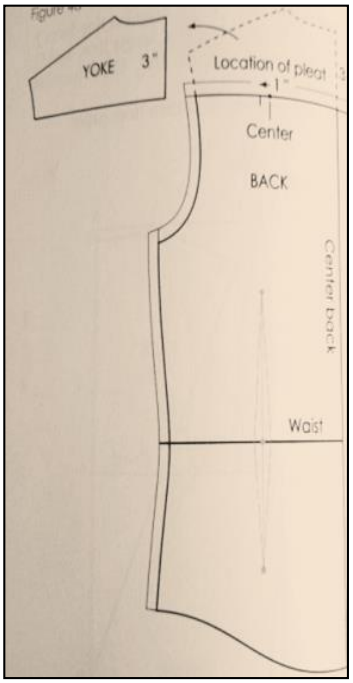
Front



- Square a line across paper and square up. Place the center front waist of the bodice ¼ inch below square and trace the bodice front.
- Extend a line down from center front waist to equal hip depth and square a 20-inch line across paper; from this point, square a line up from the hip.

Back

- Place center back pattern on the center line of the paper, with the side waist touching square line.
- Square a line from the center back, touching and passing C to center front. Label D at side front seam and draw the armhole. At this point, measurement the front and back armhole.



Yoke

Back

Mark 3" down from center back and square across the pattern for yoke line. Cut the pattern and separate the yoke.

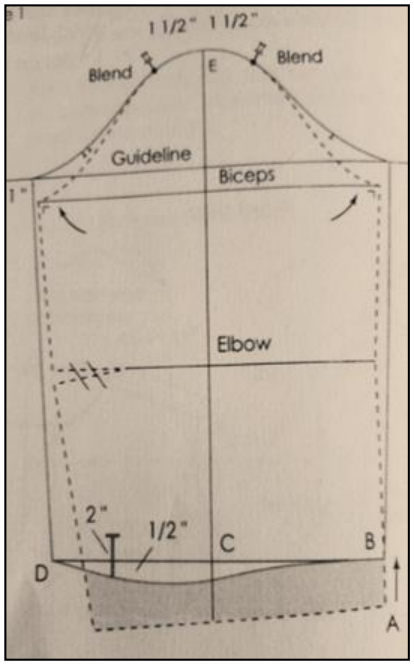
Front

- Draw a line 1 1/4" down from the front shoulder tip and draw a
- parallel line with shoulder. To complete the yoke, cut pattern and separate upper part.
- Add 1/2" seam to the lower pattern and cut.

Completing the Yoke

Match front and back yoke shoulder lines and trace. Add seam and notch shoulder tip and neck.

Sleeve



- Trace sleeve on fold to desired length.
- Lower cap 1/2". Raise biceps 1" and extend line.
- Draw line from X to biceps line equal to armhole measurement.
- Divide into fourths and mark measurements given. Draw cap curve as shown.

Mandarin Collar

Measurement Needed

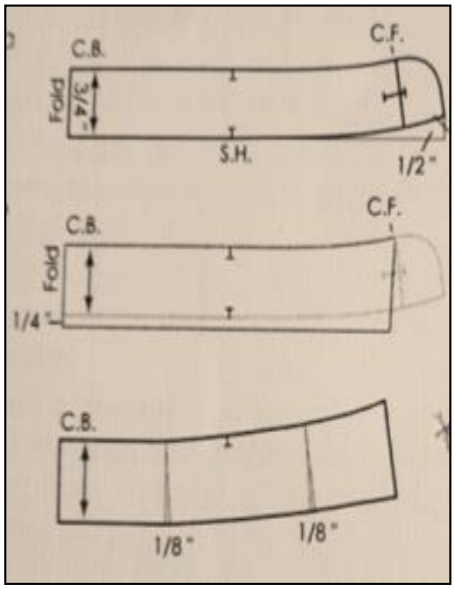
Center back neck: 3"

Center front neck: 5"

Total: 8"

Pattern Plot and Manipulation

Figure



- Square a line in the center of the paper equal to the following measurements:

  A-B = 1inch (collar stand)

  B-C =Total back and front neck. Label C.

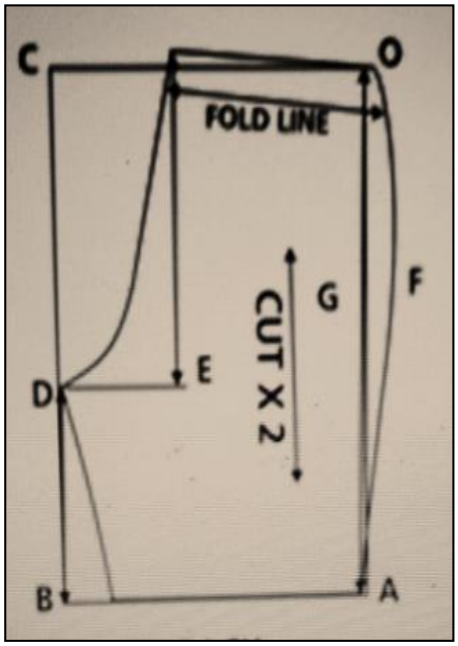
  B-D = Center back to shoulder measurement

- Mark for shoulder notch.

Figure

- Square up ½ inch from C. Mark and label E.
- Draw a curved line from E to D, completing the neckline edge of collar.
- Square a 11/2 inch line at right angles to E-D. Label F.
- Draw a line from A-F, parallel with B-D-E line.
- Cut collar from paper.

Shorts



Figure

Front

O-A = C-B Full length – Belt

C-D= Hip/3 – Belt

D-F =Hip/4 + 2"

D-E =Hip/12 – 1/2" and join D to G

B-H= ½"

Back

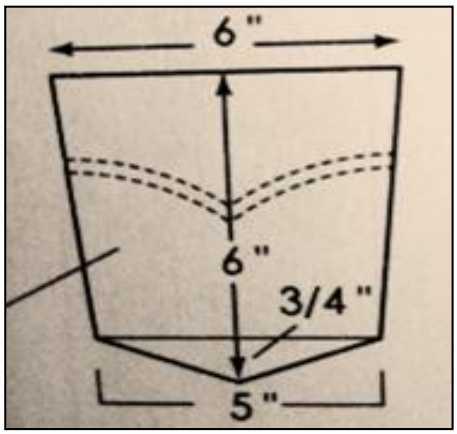
O-A =Full length + 2"

C-D= Hip/3 + 1"

D-F =Hip/4 + 3 ½"

D-E= Hip/12 – 1 ½" and join D to G

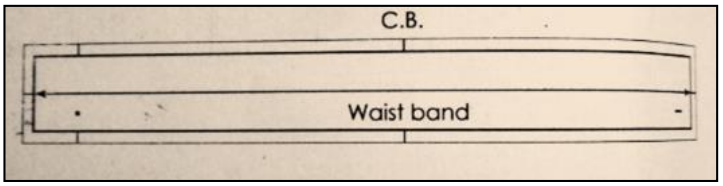
D-H =¾"



Pocket

Use measurements to draw pocket. Trace pocket.

Belt



A-C =1 ½" on fold

C-D =A-B waist + ½"

DESIGN NO. D4B

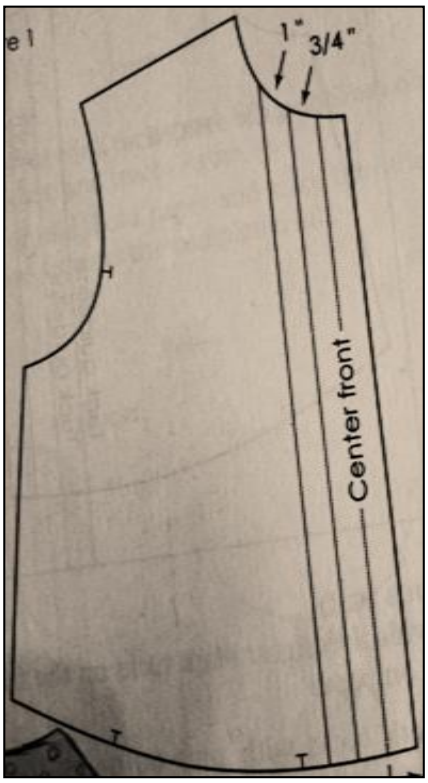
Adaptation of the Basic Bodice Block and Trouser to Pleat Tuck Shirt and Cargo Pant

Pleat Tuck Shirt

Pattern Plot and Manipulation

Figure

Front



- Square a line across paper and square up. Place the center front waist of the bodice ¼ inch below square and trace the bodice front.
- Extend a line down from center front waist to equal hip depth

  and square a 20-inch line across paper; from this point, square

  a line up from the hip.
- Draw a line for the extension ¾ inch from the center front.
- Draw the tuck guideline ¾ inch from center front.
- Draw the second guideline 1 inch from the first line

  Back
- Place center back pattern on the center line of the paper, with the side

  waist touching square line.
- Square a line from the center back, touching and passing C to center front. Label D at side front seam and draw the armhole. At this point, measurement the front and back armhole.

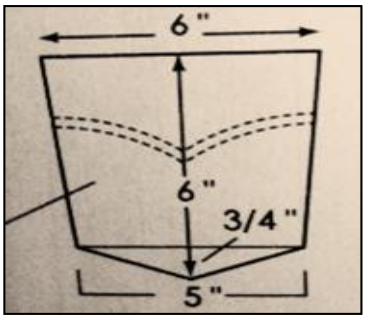
  Yoke

  Back
- Mark 3" down from center back and square across the pattern for yoke line. Cut the pattern and separate the yoke.

  Front
- Draw a line 1 1/4" down from the front shoulder tip and draw a parallel line with shoulder. To complete the yoke, cut pattern and separate upper part.
- Add 1/2" seam to the lower pattern and cut.

Completing the Yoke

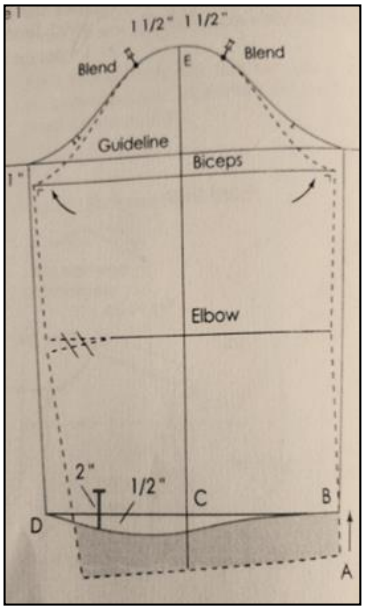
Match front and back yoke shoulder lines and trace. Add seam and notch shoulder tip and neck.



Pocket

Draft the pocket; use measurements as guide.

Draw pocket on the shirt, and mark guide marks for placement.

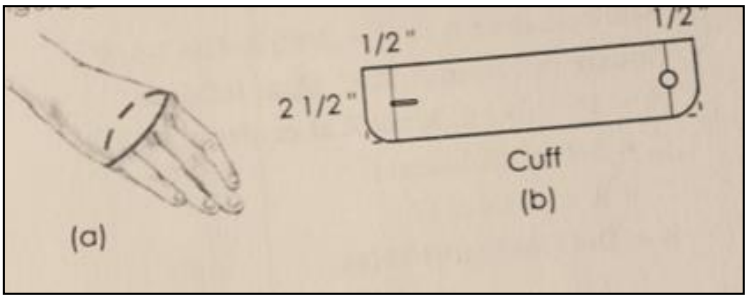


Sleeve

- Trace sleeve on fold to desired length.
- Lower cap 1/2". Raise biceps 1" and extend line.
- Draw line from X to biceps line equal to armhole measurement.
- Divide into fourths and mark measurements given. Draw cap curve as shown.

Cuff

- Measure hand for entry measurement and ½ inch.
- Cuff includes 1" extension for button placement.
- Width of cuff = 2 ½ ".

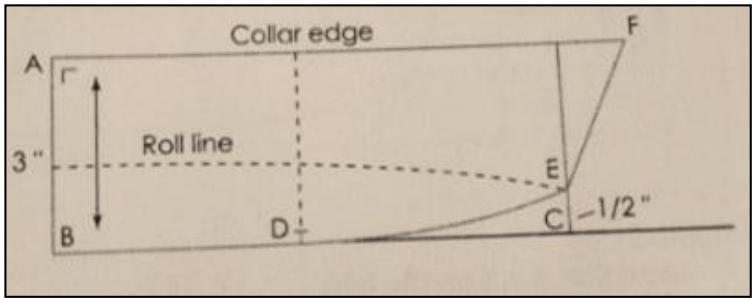


Collar and Stand

Record: Shirt pattern from C.B. neck to shoulder ____ and

shoulder to C.F. neck _____.Total _____.

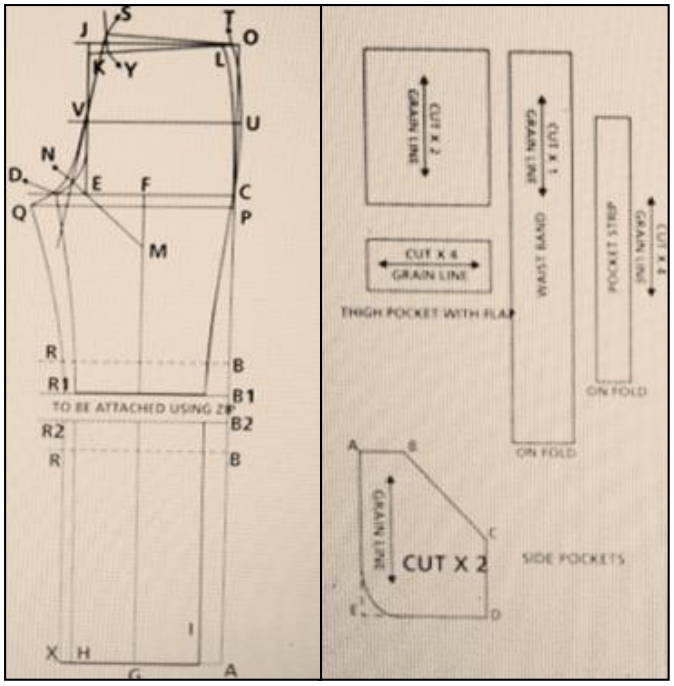
Draw a rectangle 1 3/8" wide and length of the neckline measurement, A to B, plus 3/4". Mark C. Square up from C. Mark shoulder notch, D.



Mark 1/2" up at C. Draw curve lines from C to B and end at D to complete collar stand. Cut from paper.

Cut collar, slash and spread, as shown. Trace and cut two copies and interfacing. Repeat for collar stand.

Cargo Pant



Front

O =Starting point; take measurements from the 1-½ "

Markon the tape, for length, knee and crotch.

O = A Total length of cargo

O – B =Knee length

O – C = Crotch length + 2"

C – D = ¼ of hip + 2 ½ "

D – E= 2" 7. E – J Perpendicular to CD touching the guide line

F = Mid point of CD

F – G = Extend perpendicular to CD till guide line below

G – H = ¼ of bottom opening, also equal to GI usually bottom opening is 22 " in whole

J – K = ½ " & join KO

K – L = ¼ of waist + 1 "

F – M = 1/12 th of hip

M – N = 1/6 th of hip & join D blending through N to line KE, using French curve.

Back

C – P = ½ "

Q – P = CD + 2 ½ "

K – Y= 1 ½ "

Y – S = 1 ½ ", join SO 5. S – T ¼ of waist + 1"

O – U = ½ of OC & U touches the back curve

U – V = ¼ of hip + 1"; join SV & extend; blend line SV till Q.

Pocket Measurement and Placement:

SIDE POCKET : A – E =7" E – D = 5" A – B = 2" C – D = 3"

ANKLE POCKET WITH FLAP : (1 ½" above finished hem) Pocket: 3" X 2 ½" Flap : 2 ½" X 1"

THIGH POCKET WITH FLAP AND BAND : (placed at mid thigh) Pocket : 5"X 7" Flap : 5"X 2"

WAIST BAND :

A-C =1 ½" on fold

C-D =A-B waist + ½"

Preparation of Basic Bodice Block for womenfollowed by Helen Joseph Armstrong, 2015

The basic block of UK size 6 (34" women) was selected for drafting, following the instructions given by Helen Joseph-Armstrong.

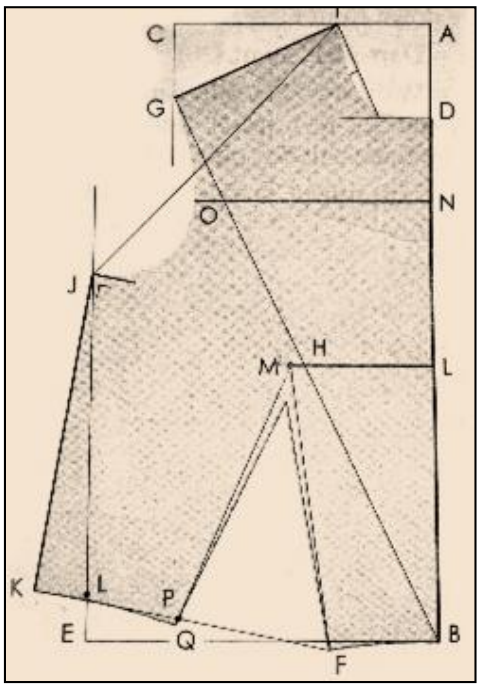
Standard Measurement Chart for Women

SL NO.	CIRCUMFERENCE MEASUREMENTS:	Grade: 1" Size: 6(UK)
(Ease not included)		
1.	Bust	34
2.	Waist	24
3.	Abdomen	32 ½
4.	Hip	35 ½
UPPER TORSO (bodice)		
5.	Center length:	
	Front	14 ½
	Back	16 ½
6.	Full length:	
	Front	17
	Back	17 ½
7.	Shoulder slope:	
	Front	16
	Back	16 ½
8.	Strap front	9 ½
9.	Bust depth:	9
	Bust radius:	2 ¾
10.	Bust span	3 ½

SL NO.	CIRCUMFERENCE MEASUREMENTS:	Grade: 1" Size: 6(UK)
11.	Side length	8 ¼
12.	Back neck	2 ¾
13.	Shoulder length	5 1/8
14.	Across shoulder:	
	Front	7 ¼
	Back	7 3/8
15.	Across chest	6
16.	Across back	6 ¾
17.	Bust arc	9 ¼
18.	Back arc	8 ½
19.	Waist arc:	
	Front	6 ¼
	Back	5 ¾
20.	Dart placement	3
21.	Not needed	3

FRONT BODICE DRAFT

Drafting instruction



- A to B = Full length (6), plus 1/8″ _Draw the line and table
- A to C =Across shoulder, less 1/8″ (14)_

  Square 3″ line down from C line.
- B tot D=Center front length (5)_

  Make and square out 4″.
- B to E = Bust are (17), plus ¼″_

Square out from B, and then square up 11″ from E.

- B to G = Shoulder slope (7), plus 1/8″_

  G touches C line.
- G to H = Bust depth (9)._

  Make on the G _B line.
- G to I=Shoulder lengths (13)_

Square down from I to intersect with D line.

- J TO K=Bust span, plus ¼″ (10)._

  Square from J at center front through H to K.

- D to L = One half of D to J.

  Make down from to D

- L to M = Across chest, plus ¼″ (15)_

  Square a guideline up and down from M.

- B to F =Dart placement (20)._

  Square down 3/16″ from F.

- I to N=New strap, plus 1/8″ (8)_.

  Draw line from I to intersect E line.

- N to O =Side length (11)_.

- N to P = Mark 11/4 inch out from N.

  Personal fit, see formula or adjust after the draft is complete.

- O to P = Side length line is directed to P, and ends when equal to N to O. Draw line from P to F.

Completing waist measurement:

- P to Q = Waist are (19), plus ¼″ ease, less B to F_.

Dart legs: Draw a line from K to F and measure draw dart leg from K thought Q equal to K to F Label R.

Dart point: center a point 5/8″ from bust point. Redraw dart legs from this point to F and R.

Armhole: Draw armhole curve with rule touching G, M, and square line. Do not follow curve past square line.

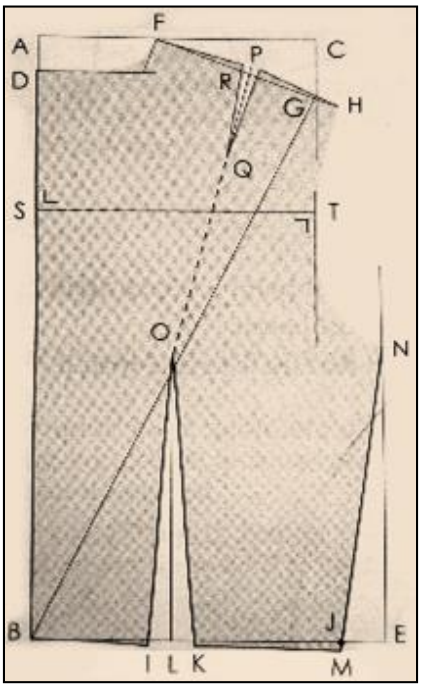
Neckline: draw curve from I to D passing inside the angle line by 1/8″.

BACK BODICE DRAFT

Drafting instruction

- A to B = Full length (6) _.
- A to C = Across shoulder (14) _. Square 3″ down
- B to D = Center back length (5) _. Mark and square out 4″.
- B To E = Back are (18),plus ¾″

Square up from E.



- A to F = Back neck (12), plus 1/8″_
- B to G = Shoulder slope (7), plus 1/8″ _
- F to H = Shoulder length (13), plus ½″_. Line may pass G. Square down from F to d line.
- B to I = Dart placement (20) _.
- B To J = Waist are (19), plus dart intake of 11/2″ and ¼″ (ease). (Junior /petite sizes: add 1″ dart intake, plus ¼″ ease.)
- I to K = Dart intake.

  Mark center and label L.
- J to M = Square down 3/16″.
- M to N = Side length (11) _.
- L to O = Square up from L 1″ less then M to N.

  Draw dart legs from O, 1/8″ past I and K.

  Draw slightly curved lines from K to M and from B to I.
- P to Q = Draw A 3″ line in the direction of point O.
- P to R = 1/4″ mark.

  Draw dart leg from Q 1/8″ inch past R and connect to F.

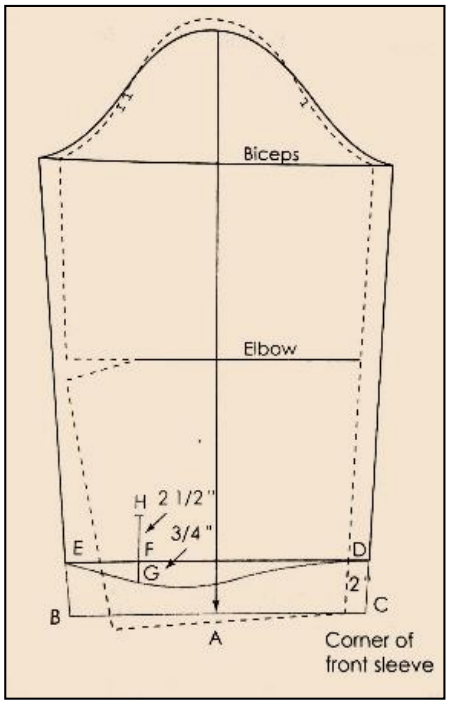
  Mark ¼″ from P. Draw other dart leg from Q - R, and connect to H.

- D to S = One fourth of D to B mark
- S to T = Across back, plus ¼″ (16)_

  Square up and down from T.
- Armhole = Draw armhole with the french curve touching H, T and N. The curve should touch square line.
- Neckline: Draw a 3/8″ angle line from the corner. Draw neckline from F, angle line and ending close to D.

SLEEVE DARFT

Drafting instruction



- Draw a line on paper, mark and label:
- A to B = Sleeve lengths_.
- A to C = Cap height mark _.
- C to D = One-half of C to B.
- D to D = 3/4″ mark. Square lines from A, C, D, B.

Armhole measurement =_. Place a ruler at A and pivot until the measurement touches biceps line. Mark.

- C to E = One half of biceps measurement. Mark compare placement of the tow marks and mark biceps in between. Label E draw a line from A to E; draw a line E from A to E; divide into fourths. Mark and label.
- C to F = C to E
- Draw a line from a to F .divide into fourths, mark and label.
- B to O = 2 Inches less then C to E.
- B to P = B to O
- Draw a line from O to E and P to F.

Square lines from the following:

- G_ in 3/8″
- H_ out ¼″
- K _out 5/8″
- L _ out ¾″
- M_ out $^{3}/_{16}$″
- N_IN ½″

Front cap line:

- Use the French curve to shape the cap line by touching A, L, and M. Draw the curve past m for blending.
- Change the position of the curve rule touching F, and N, and draw curve blending with m line. Draw the curve.

Back cap line:

- Place the curve role so that A, K and H touch draw the curve past H to blend Changes tie position of the curve rule touching E and G, and Draw curve blending with H line.

Completing the sleeve

- Label elbow level S, and extended line R ¼″. Draw a line from R to E.
- Elbow dart:

  R to T = One half of R to D. mark.

  R to U = 1″ mark.

  T to U = R to T. Draw connecting line.

  O to V = 3/4″ mark.

  Draw a line from U through V equal to S to P. Label W.

  W to X = O to P. (adjust at the fitting if necessary.)

Draw a line ending at wrist level. Draw a slightly curved line from X to S to F.

Ease control notches

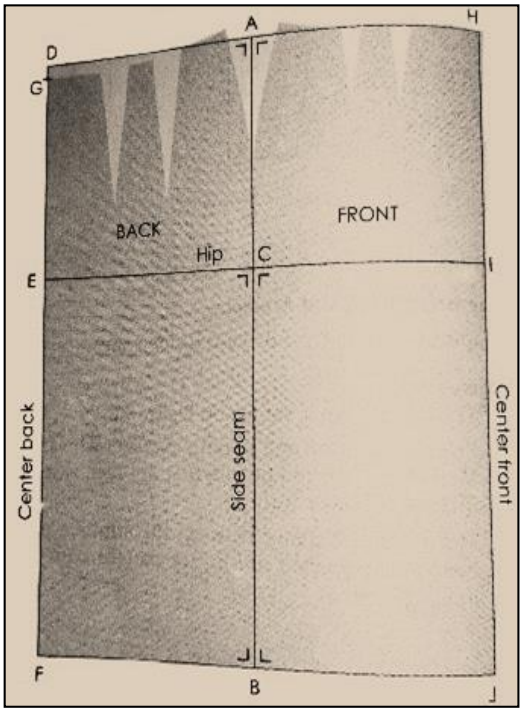
Back_ mark notch ½″ up from G and the second notch ½″ above it.

Front _mark one notch ½″ above N. Continue with instruction to determine cap ease.

SKIRT FRONT AND BACK

Drafting instruction

- A to B = Skirt length.
- A to C = Center front hip depth (25) _.
- A to D = Back hip are (23), plus ½″ (ease).



Squared out from A, C, and B equal to A to D.

Draw center back line F to D. Label E to F.

- E to G = Center back hip dept (25) _.

  Cross mark location.

- A to H = Front hip area (25), plus ½″ (ease) _.

  Squared out from A, C, and B equal to A to H.

- Draw center front line J to H. Label J to I.

Back:

- D to K = Back waist arc (19), plus ¼″. (Ease) and add 2″ for dart intake_.

  Personal fit; use dart intake from dart chart.

- D to L= Dart placement (20)_.

  Mark First dart 1″ from L.

  Mark dart space $1^{1}/_{4}$″ and mark 1″ for second dart.

  Square up and down from K.

Front:

- H to M = Front waist arc (19), plus ¼″ (ease), and add 1″ for dart intake_.

  Personal dart chart.

- H to N = Dart placement (20) _.

  Mark first dart $^{5}/_{8}$″ from N.

  Mark dart space $1^{1}/_{4}$″ and mark $^{5}/_{8}$″ for second dart.

  Square up and down from M.

- C to P = Side hip depth (26) _.

  Draw side seam curve using the skirt curve rule.

  Shift the rule until the depth measurement touches the front and back guidelines. Label P and Q.

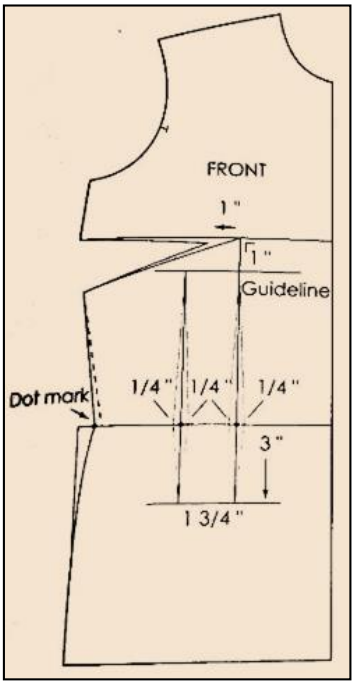
- Back darts: locate centers of each dart intake, and square down 5 ½″ (5″ for juniors and petites).

  Draw dart legs from point to curve line of the waist.

- Front darts: report the process with dart legs 3½″ long.

TORSO DRAFT

Drafting instruction



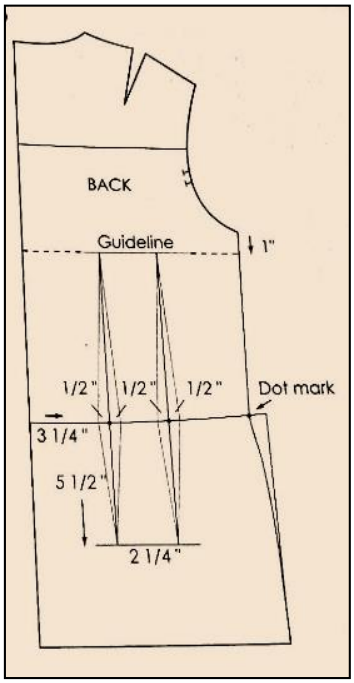
Front:

- Trace the basic one dart pattern. Cut from paper.
- Label side waist X.
- Draw a line from mid – shoulder to bust point. Cut slash lines to, not through, the bust point.

Back:

- Trace and cut the back pattern.

- Label the side waist (x).
- Draw a slash line, as illustrated. Do not slash until later instruction.



Front lower torso:

- Square line and mark the corner line A.

  A to B = Front hip arc, plus ½″ ease. Mark.

  B to C = A-D square up from B and squared from C to the center line (D).

- Don Mark ¾″ in from C.
- Place the bodice on the square line. The center front touches D secure.
- Close the waist dart until point (X) touches the square line .it may not touch the dot mark.
- Trace the pattern, omitting the Brocken lined area.

Back lower torso:

- Square a line and mark corner A.

  A to B = Back hip arc, plus ½″ ease mark.

  B to C = Front hip depth, squared up from B, and squared from C to the center line (D).

- Dot mark ¾″ in from C.

  A to E = Center back hip depth. Cross mark.

- The center back pattern is placed on the vertical line, with the side waist (X) touching line C. the pattern is traced and removed. The added length is between the center beck waist and cross mark. (E).
- Cut a slash line or use the pivotal- transfer method.
- Extend the C line and place center back at point E.

- Trace to the curve of the armhole and pivot until X at the side waist touches C line. Trace remaining armhole but not side seam. Remove the pattern.
- Draw the side seam to the waist ¾″ mark.
- Place center back waist at (D). Trace to curve of the armhole.
- Pivot at the curve of the armhole until the side waist (X). Touches the (C) line. Trace, not including the side seam. Remove the pattern.

Shoulder dart:

- Draw shoulder dart legs to the bust point.
- Center the dart point 1″ up from bust point.
- Draw the dart legs to dart point.
- Draw the hipline curve, as illustrated.

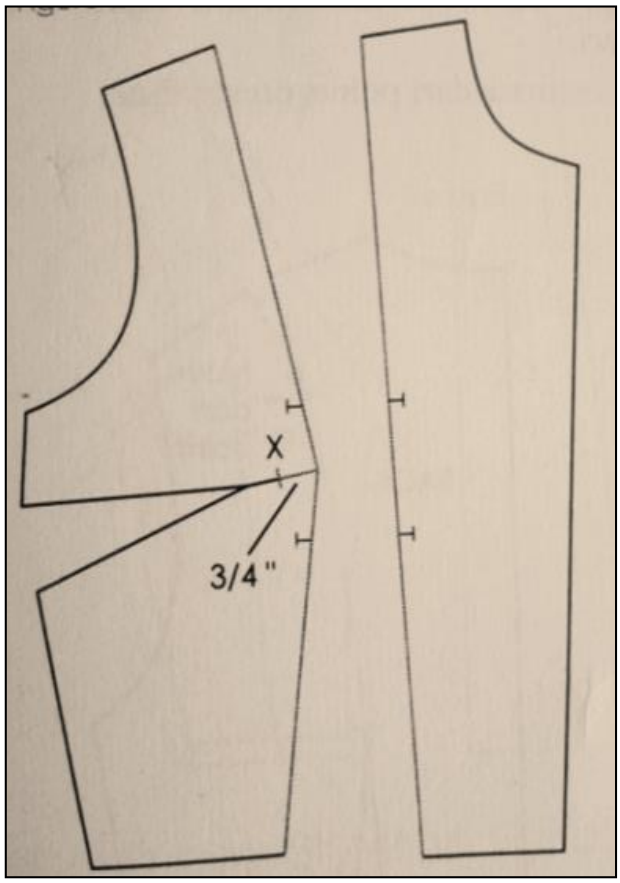
Double-ended darts-front:

- Square a line down from the bust point, ending 3″ below waist Level.
- Square a guideline 1″ below the bust level.
- Draw a parallel line $1^{3}/_{4}$″ from this line.
- Follow illustration for dart intake. Draw dart legs.
- Draw hipline curve do dot mark and continue the line to the armhole.

  Double ended darts _ back
- Square guidelines from center back 1″ below the armhole level and $5^{1}/_{2}$″ below waist.
- Mark $3^{1}/_{4}$″ and $5^{1}/_{2}$″ from center back waist.
- Square lines from each mark to the guidelines.
- Follow the illustration for dart intake. Draw dart legs.

DESIGN NO. D1W

Adaptation of the Basic Bodice Block and basic skirt to a Princess Styleline halter neck top and tiered skirt



Pattern Plot and Manipulation

Princess Styleline

Figure

- Trace front of single dart pattern.
- Draw styleline from mid-shoulder to bust

  point and from bust point to dart leg at waist.
- Crossmark for ease control notches,2 inches

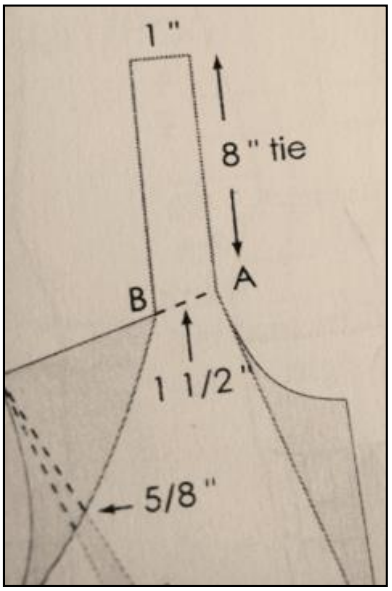
  above and below bust point.
- Draw slash line from bust point to dart point of

  side dart.
- Cross mark ¾ inch from bust point. Label X.
- Cut and separate pattern along styline.
- Shape bust curve.
- To shape front panel, place side panel on top of front

  panel, match waist and bust point.
- Adjust ease control notches on side front panel when

  walking the pattern.
- Trace back pattern .
- Place skirt curve on the shoulder dart leg and waist

  dart point and draw the princess line.
- Crossmark dart points on styline.
- Complete the pattern, as shown.



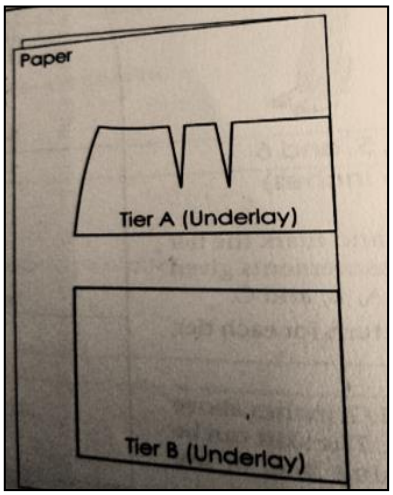
- Center grain line on side panels.

Halter

- Mark neck A and connect to bust level.
- Mark B 1 ½ inches from point A.
- Draw an 8 inch line up from point A parallel

  with the center front line. Square and connect to B.
- Draw an inward curved line from point B

  ending ½ inch or lower below armhole on side seam guide.
- Cut pattern from paper.



Gathered Tiers

Figure

- Trace the front basic skirt and mark the tier

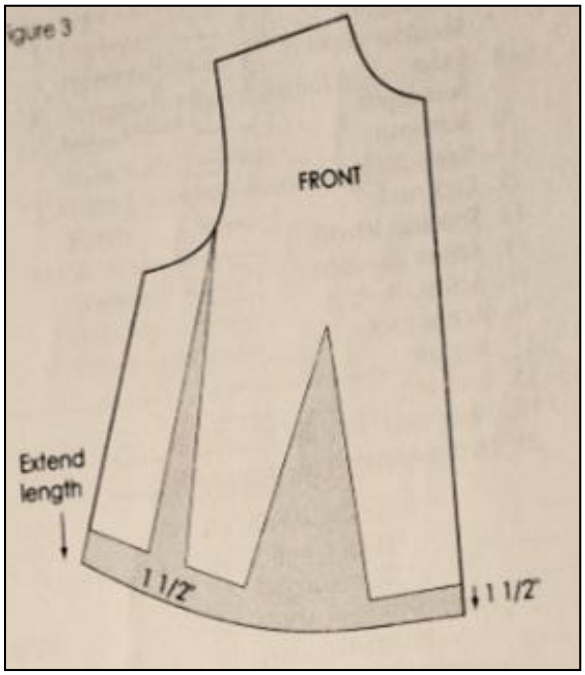
  placement using the measurements given

  (your own). Label tiers A, B,C…..
- Draw vertical lines equal to each tier length;

  add1 inch for the hem in panels. For tiers ,

  add 1 ½ inch underlay.
- Square a line out from each and equal to the fabric

  width and connect to complete each panel.
- Stitch the tiers across the skirt.
- Cut the skirt frame along stitchlines.



DESIGN NO. D2W

Adaptation of the Basic Bodice Block and basic skirt to a crop top and front pleated circler skirt

Crop Top

Pattern Plot and Manipulation

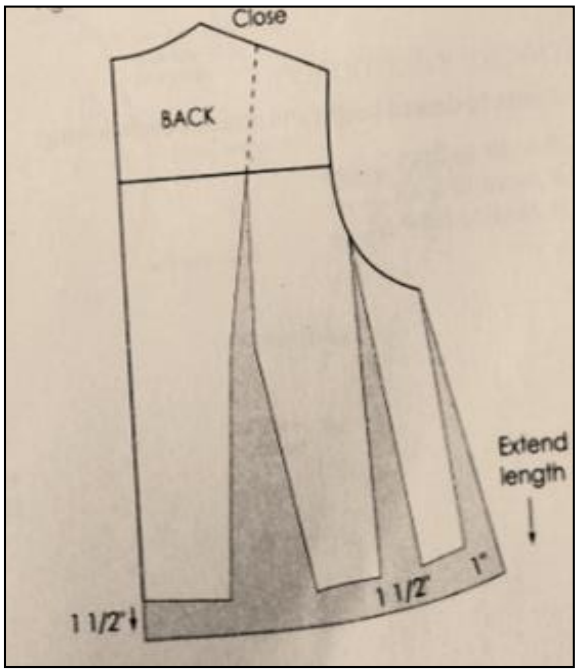
Figure

- Trace front and back patterns. Include the back

horizontal balance line. Add to preferred length.

- Draw slash lines from front and back waist to

approximately 3 inches up from armhole curve.



- Draw slash line from dart points of waist and

shoulder dart to a joining point at the back HBL.

Figure

- Cut slash lines to, not through, armhole (front)

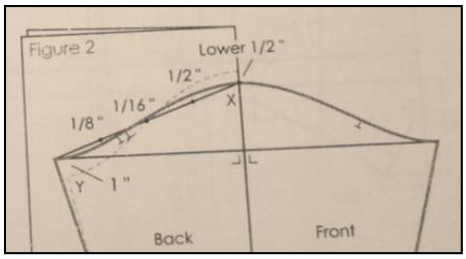
and pivotal point (back).

- Place patterns on paper and spread slash sections

1 inches . Secure pattern and trace.

- Add 1 inch at side seam of back pattern to balance

the fullness between back and front.

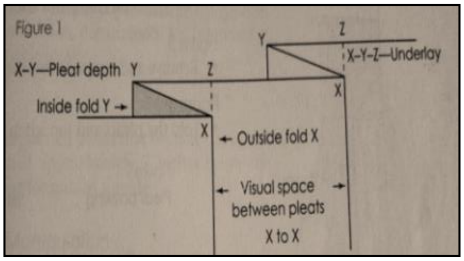


- Complete the pattern for test to fit.

Sleeve

For sleeve trace the basic sleeve up to elbow level.

Front Pleat



Pleat depth is the distance from outside fold of the pleat (labeled X) to the inside fold (labeled Y).

- Pleat underlay is always twice the pleat

depth (X to Y to Z).

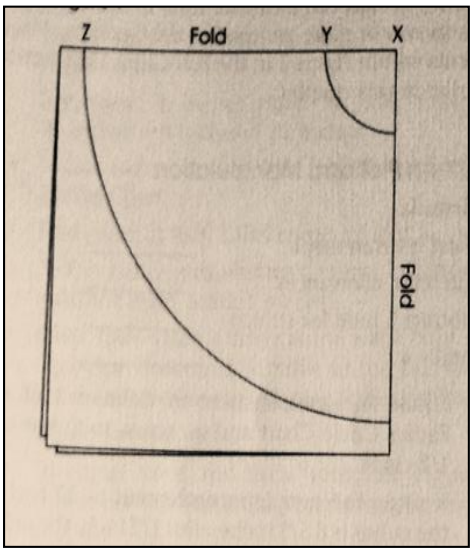
- Distance between pleats: Pleat markings on

the pattern (X-Y=pleat depth; X-Z=pleat underlay; X-X=space between pleats).

Three-Quarter Circle Skirt

Pattern Plot and Manipulation

Formula



Waist measurement _____

Add seam allowances _____

Subtract 1 inch for stretch _____

Total _____

Paper Needed

Cut a 64-inch square of paper. Tape paper to extend length.

- Locate this measurement in Column 1 of the Radius Chart and go across to Column 4, ¾-circle.
- If using the sample measurement of 27inches , the radius is 53/4 inches, less ½ inch; theradius measurement will be 5 ¼ inches. Length plus hem, as desired _____.

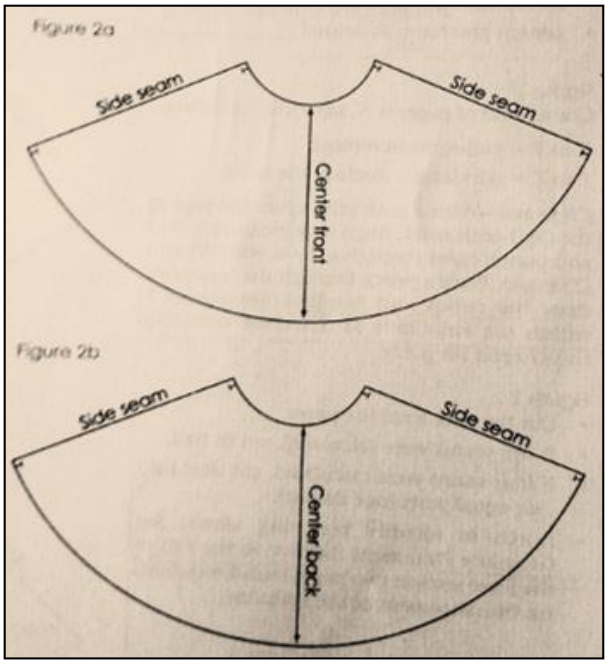
Figure 1

Corner fold of paper is X. Mark the following.

X to Y= radius measurement.

Y to Z= skirt length.

Figure 2 a, b



- Cut the skirt from paper.
- Cut away one quarter-section from the circle skirt.
- If two seams were calculated, cut in half.
- If four seams were calculated, cut the skirt

into four equal parts.

DESIGN NO. D3W

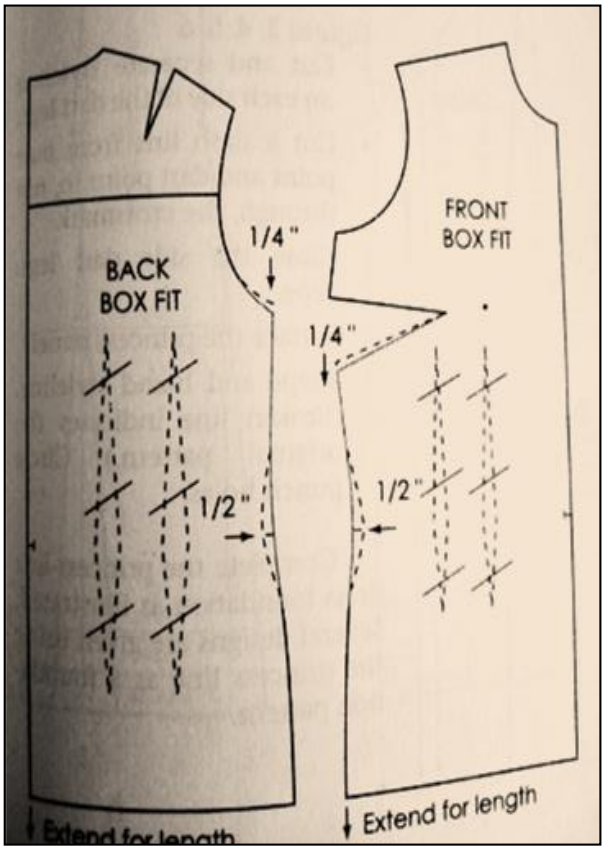
Adaptation of the torso draft to roll collar dress (box-fit dress /without waist dart dress) with side cascade

The Box-Fitted Silhouette

Pattern Plot and Manipulation

Waist darts are left unmarked (broken lines) and unstitched as ease around the waistline.

Modify Torso Foundation for the Box Fit



Front

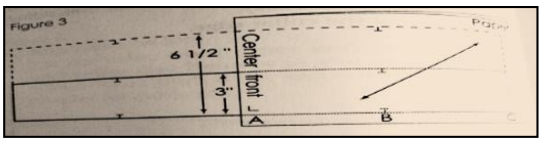
- To prevent the collapse of the side seam, increase the dart intake 1/8 inch. Draw a line to the dart point.

Back

- Lower back armhole 1/8 inch and blend.
- Mark ½ inch or more out from the front and back side seams.
- Draw blending lines to the original side seams. (The shortened side seam length will not affect the balance line of the HBL level of the hipline.)

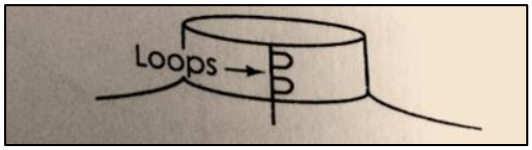
Roll collar (Turtle Neck)

Pattern Plot and Manipulation



Figure

- Trace pattern and adjust neck as illustrated.
- Blend new neckline.

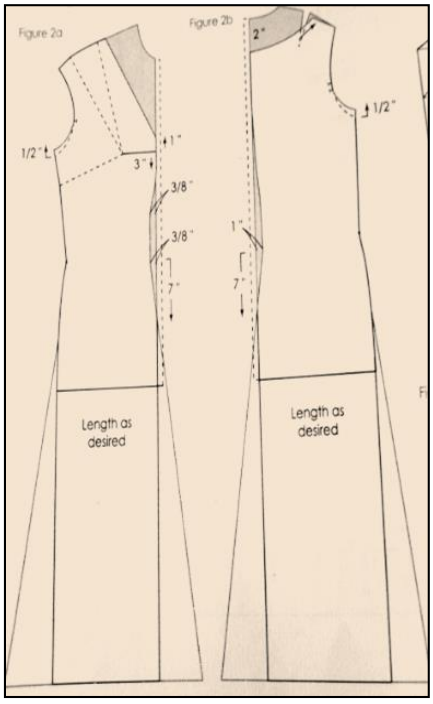


Turtle Band

- Fold paper.
- Square a line from the fold to equal front and back measurement (A, B, C). Mark Bfor notch placement at shoulder.
- Draw parallel lines, spaced 3 inches apart for single fold (1 ½ inches finished width indicate by broken line).
- Connect ends.
- Draw the bias grainline and complete the pattern .
- The center back can be closed with loops and buttons.

Cascade

Circle can be designed as cascade falling from cutout neckline or inserted into sleeves. Circle used in design have an inner circle and an outer circle. The radius is based on the length of the seam to which it is stitched.



DESIGN NO. D4W

Adaptation of the torso draft to slinky dress with circler hemline sleeves

Slinky Dress

Pattern Plot and Manipulation

- Trace the torso patterns, transferring the side dart 1 inch from the shoulder tip.
- Draw a V-neckline at back .
- Draw parallel lines at center front and back .
- Draw the front and back curved center lines, at the adjusted center lines.

Adding Flare

- Extend skirt to the desired length.
- Add flare starting about 7 inch below waistline of the center back, front, and side seam, and ending 5 inches out from side seam at hem.

Circular Hemline Sleeves

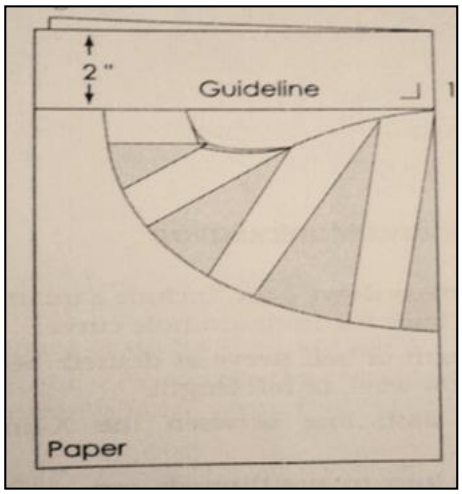
Pattern Plot and Manipulation

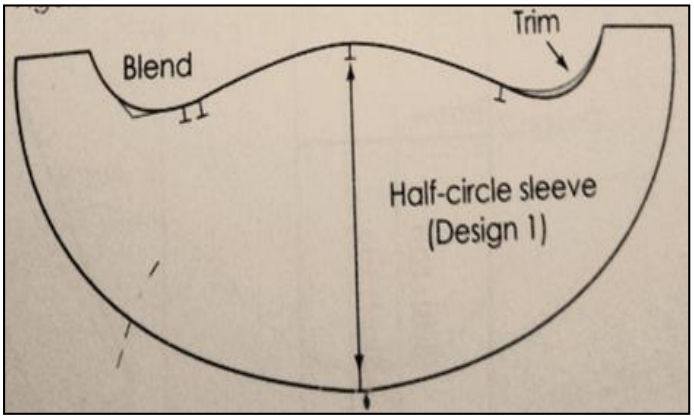
Figure

- Trace dartless sleeve back 2 inches below biceps. Remove pattern. Square line across the sleeve hem.
- Draw slash lines.
- Cut slash lines to, not through, cap.

Fold the paper.

- Square a guidline 2 inches down from fold.
- Spread each section until underseam touches or is parallel with the guideline.
- Trace the sleeve and from sleeve curve. Remove pattern.
- Cut from the paper.





Preparation of Basic Bodice Block for menfollowed by Helen Joseph Armstrong, 2015

The basic block of UK size 38 (38" men) was selected for drafting, following the instructions given by Helen Joseph-Armstrong.

Standard Measurement Chart for Men

SL NO.	**CIRCUMFERENCE MEASUREMENTS:**	**Grade: 2"**
		Size: 38(UK)
(Ease not included)		
1.	Chest	38
2.	Waist	31
3.	Hip	38

SL NO.	CIRCUMFERENCE MEASUREMENTS:	Grade: 2"
		Size: 38(UK)
4.	Center length:	
	Front	20
	Back	19 ½
5.	Full length:	
	Front	18 ¾
	Back	16 ¾
6.	Across shoulder:	
	Front	8 ¾
	Back	8 5/8
7.	Shoulder slope:	
	Front	19
	Back	20
8.	Across back	
9.	Across chest, front	
10.	Shoulder length	
11.	Waist arc	
	Back	
	Front	
12.	Seat depth	5 ¼
13.	Back neck	7 ¼
Leg Measurements		
14.	Thigh	23
15.	Knee	16 ½
16.	Calf	15 ½
17.	Ankle	10 ½
Length Measurement		
18.	waist to ankle	37
19.	waist to knee	23
20.	waist to floor	39 ¾
21.	Trunk length	67 ½
22.	Crotch length	24 ¼

SL NO.	CIRCUMFERENCE MEASUREMENTS:	Grade: 2"
		Size: 38(UK)
23.	Crotch depth	10
Sleeve		
24.	Over arm sleeve length	23
25.	Biceps	15-1/2
26.	Hand entry	10 ½
27.	Cap height	7 -1/8

Basic Shirt Foundation

Measurements Needed

- (5) Full length F_____ B _____.
- (9) Across shoulder F_____ B _____.
- (4) Center length F_____ B _____.
- (9) Across Chest_____.
- (7) Shoulder slop F_____ B _____.
- (10) Shoulder length _____.
- (13) Back neck_____.
- (11) Waist arc F_____ B _____.

Shirt Back Foundation

Figure

A-B = Full length to waist.

Draw line to waist. Mark and continue line to desired shirt length. Mark and label C.

A-D = Across shoulder.

Square from A and square down about 4".

B-E = Center length. Mark and square from E.

B-F = One-half of B-A, less YM = 1 1/4". Mark. MM = 1 1/2". Mark.

F-G = Chest plus 1-1/4". Mark and square from F.

B-H = F-G. Square from B.

C-I = F-G Square from C.

Connect I, H to G.

F-J = Across back plus 1/2". Mark.

J-K = Square up one-third of JM.

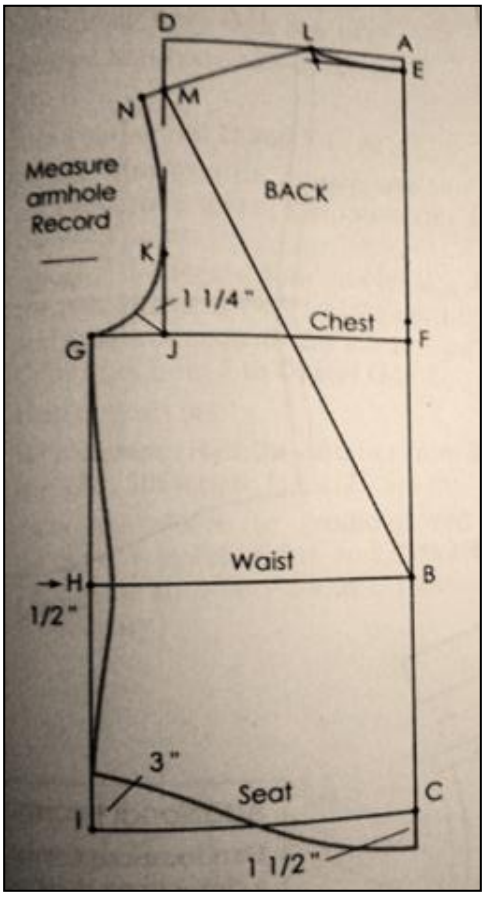
A-L= Back neck plus 1/8".

B-M = Shoulder slop.

L-N = Shoulder length plus 1/2".

Line touches and passes through M.

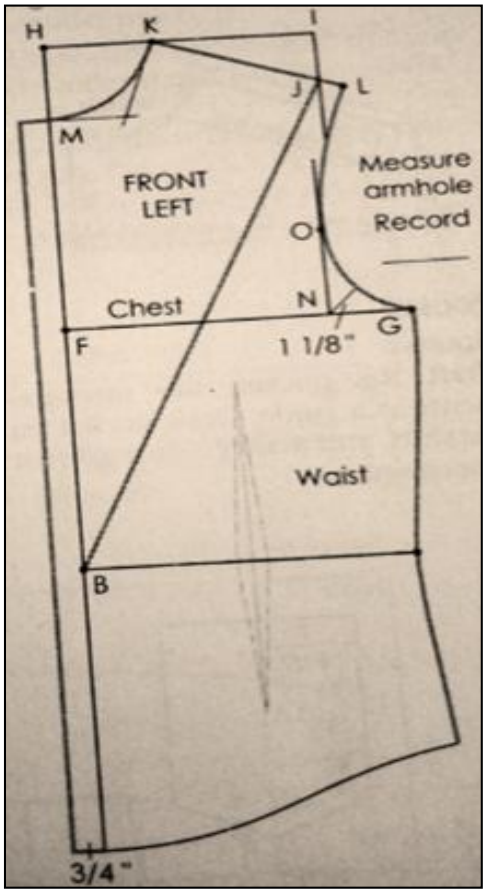
Square down from L to intersect with line E. Draw neckline curve.



Figure

Armhole shape: Draw 1 1/4" diagonal line from J. Draw armhole touching N, K angle line, and G. Indent side waist 1/2" to 3/4". Draw hemline curve and side seam.

Front Left Shirt



Figure

Turn back pattern over and lightly draw from downward and around pattern to F (chest line).

B-H = Full length

H-I = Across shoulder plus 1/2"

Square from H and square down 4 inches.

B-H = Slop line touches guideline.

H-K= A-L of the back neck.

K-L = Shoulder length, plus 1/2".

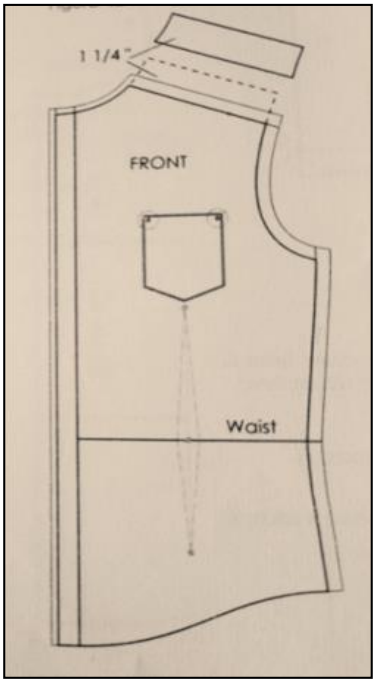
B-M = Center front length, less3/8" and square Kline.

F-N = Across chest, plus 1/4". Square up 4". Label O.

Armhole shape: Draw 1-1/8" diagonal line from N.

Draw a 3/4" wide extension line parallel with the center front. Cut the pattern from paper

Front left: Turn front pattern over and trace . Draw a 1-1/4" parallel line to the extension. Mark fold line and notch 3/4" out from center (b). Cut the pattern from paper.



Yoke

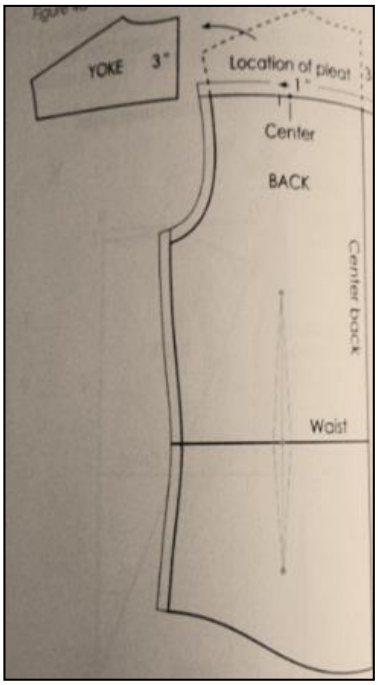
Back

- Mark 3" down from center back and square across the pattern

  for yoke line. Cut the pattern and separate the yoke.

Front

- Draw a line 1 1/4" down from the front shoulder tip and draw a parallel line with shoulder. To complete the yoke, cut pattern and separate upper part.
- Add 1/2" seam to the lower pattern and cut.



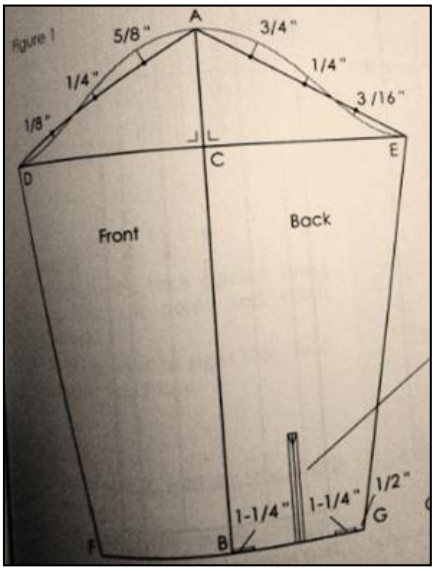
Completing the Yoke

Match front and back yoke shoulder lines and trace. Add seam and notch shoulder tip and neck.

Pocket

Draft the pocket; use measurements as guide. Draw pocket on the shirt, and mark guide marks for placement.

Sleeve

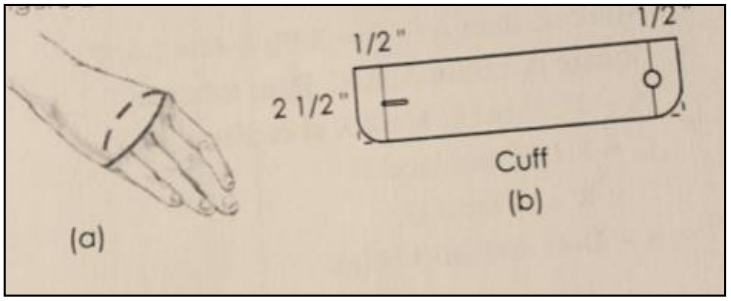


Trace sleeve on fold to desired length.

- Lower cap 1/2". Raise biceps 1" and extend line.
- Draw line from X to biceps line equal to armhole measurement.
- Divide into fourths and mark measurements given. Draw cap curve as shown.

Cuff

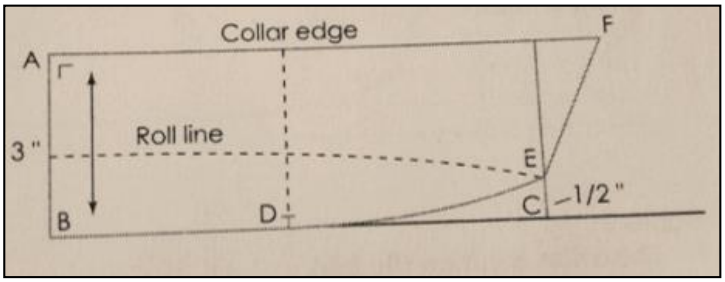
- Measure hand for entry measurement and ½ inch.
- Cuff includes 1" extension for button placement.
- Width of cuff = 2 ½ ".



Collar and Stand

Record: Shirt pattern from C.B. neck to shoulder ____ and

shoulder to C.F. neck _____.Total _____.



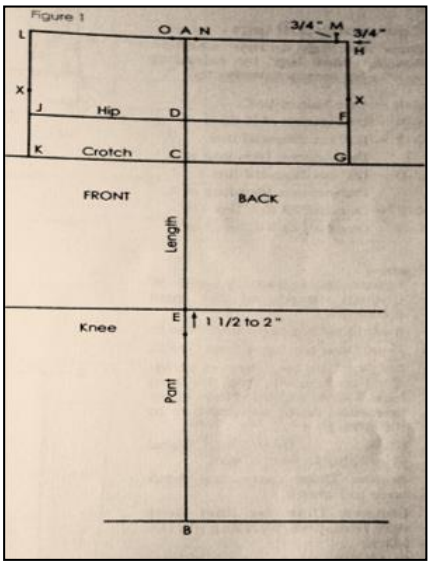
Draw a rectangle 1 3/8" wide and length of the neckline measurement, A to B, plus 3/4". Mark C. Square up from C. Mark shoulder notch, D.

Mark 1/2" up at C. Draw curve lines from C to B and end at D to complete collar stand. Cut from paper.

Cut collar, slash and spread, as shown. Trace and cut two copies and interfacing. Repeat for collar stand.

Basic Pant Foundation

Figure



A-B= Pant length

A-C= C rotch depth, plus 3/4".

C-D= Hip depth: one-third of C-A.

C-E= Knee depth: one-half of C-B, minus 11/2" to 2".

Square out from A,D,C,E,B.

D-F= Back hip arc, plus 1/4".

C-G and A-H=D-F. Connect G-H.

G-X= Half of G-H.

D-J= Front hip arc, plus 1/4".

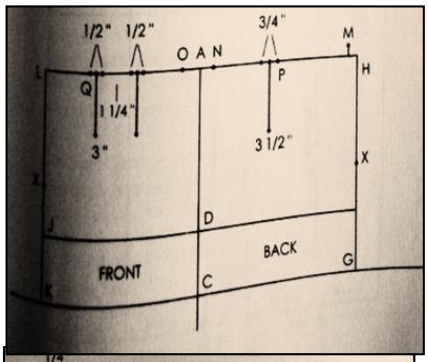
C-K and A-L=D-J. Connect K with L.

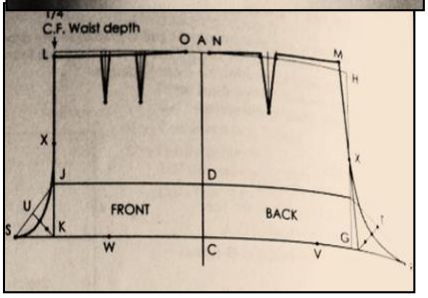
K-X=Half of K-L.

H-M= Mark in 3/4" and up 3/4".

M-N= Back=waist arc, plus 1" includes 1 dart.

L-O= Front=waist arc, plus 11/4" includes 2 darts.



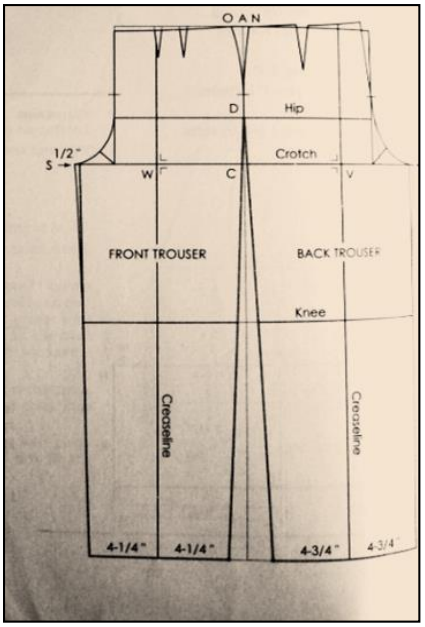


Mark Dart Legs and Intake

Figure

H-P= One-half of M-N, plus 1/2".Mark dart intake ; square down 31/2" from center.

L-Q= One-third of L-O. Mark dart q space 11/4" and mark second dart. Square down 3" from centers.



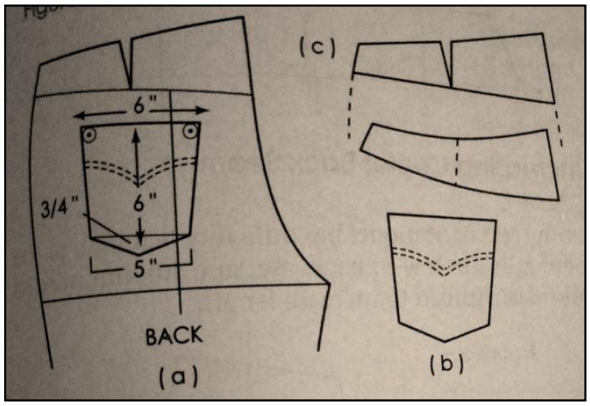
Figure

- Square lines from V and W through length of the pant.
- Back=Draw hip curve from N-D.

- Front= Draw hip curve from O to D.
- Leg line= The back hem is generally 1 inch greater than the front hem.

Back Pocket and Yoke

Figures



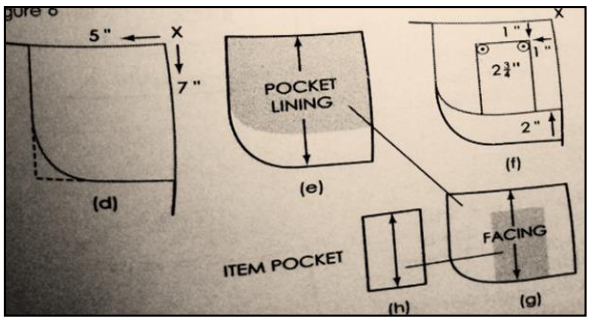
- Use measurements to draw pocket(a).

  Trace pocket(b). Draw yoke use in

  measurements.

- Trace yoke and close dart(c).

Front Pocket Backing-Lining Pattern



- Draw front pocket (d). Trace for lining pattern (e).
- Plot the backing, facing, and item pocket using measurements given (f).
- Trace pattern for facing (g) and item

  pocket (h).

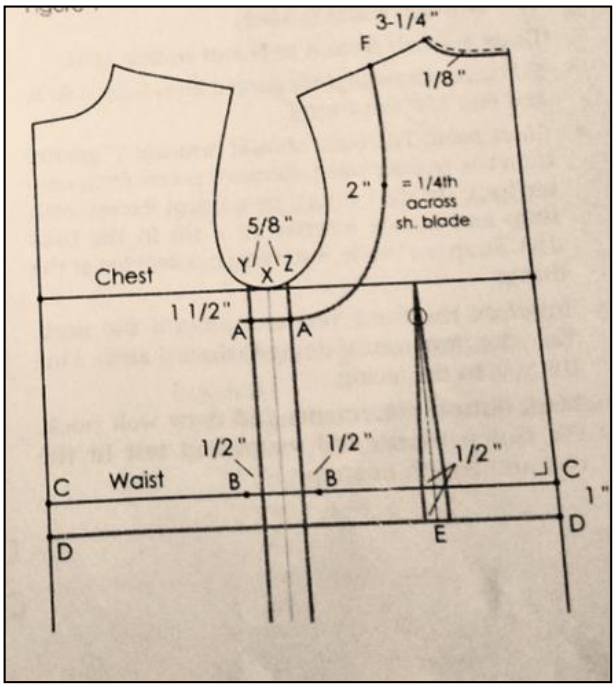
DESIGN NO. D1M

Waist Coat and Long Slack Pant

Waist Coat

Pattern Plot and Manipulation

Figure



- Trace coat foundation 5" below waist.
- Mark chest and waist. Draw a line 1/8" parallel to the neckline.

A= 1/1/2" below X, Y AND Z. Mark across lines.

B= 1/2" in from each side waist on Y, Z lines.

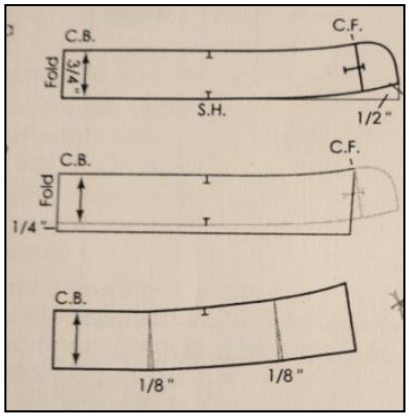
C= Center back waist. Mark 1" down. Label D.

Square from center back to center front.

E= Center between B and C. Mark and square in both directions, ending at chest. Mark 3/8" to 1/2" for dart intake. Draw darts from E ending at chest line.

F= 31/4" from neck. Draw armhole from F, touching the 2" mark and ending A.

Collar and Stand

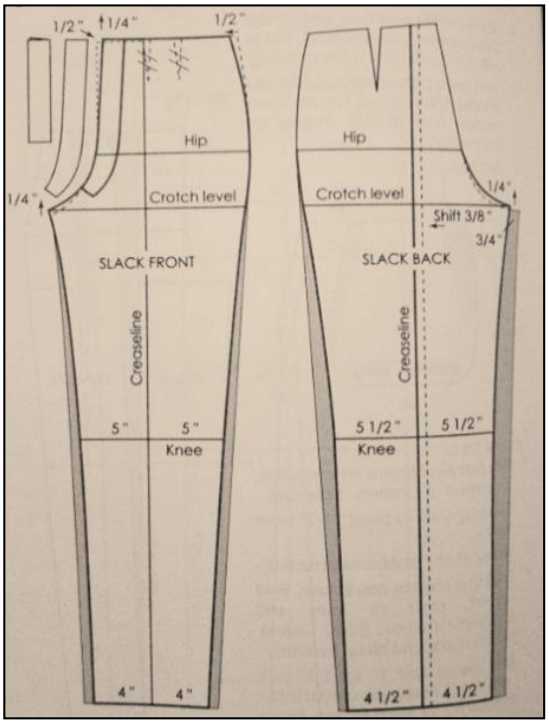


- Draw rectangle: width 3/4 " and length = back and front neckline plus 3/4" extension.
- Draw collar on top of collar stand and trace.
- Slash and spread collar.

Slack Foundation

Figure

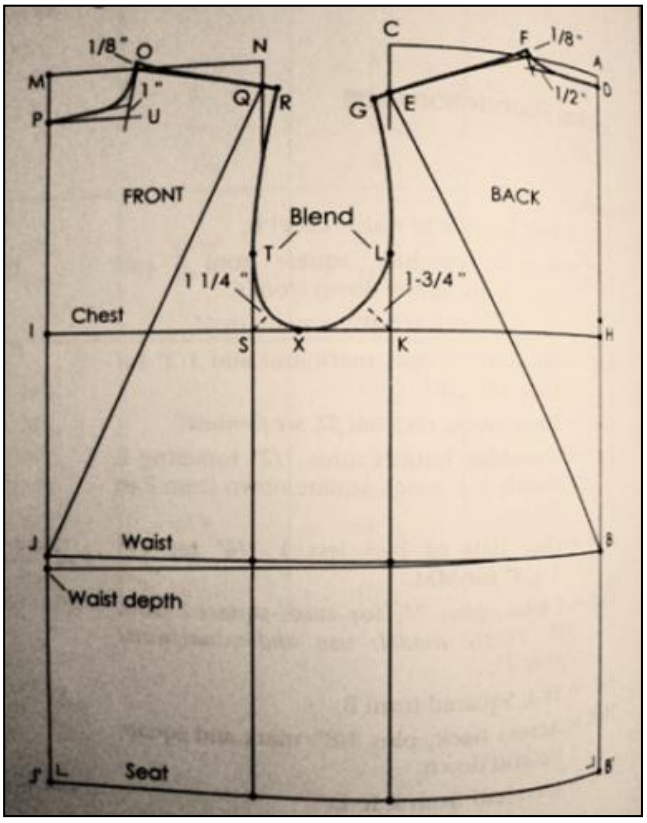
Front



- Trace the basic pant foundation.
- Measure 1/2" in at center front and up 1/4".
- Draw line to hip level and a curved line ending 1/4" up from crotch point.
- Mark 1/2" at side waist and blend to hip. Trim excess.
- Use hem measurements and draw lines from hem to knee and a curved line to crotch point.
- Draw fly and trace. Draw shield on fold.

Back

- Reduce inseam 3/4".
- Raise crotch level 1/4".
- Mark back welt and far pocket.
- Shift creaseline 3/8".
- Draw new creaseline through length of the pattern.
- Draw crotch curve to blend with hip.
- Mark hem measurements and draw lines from hem to knee.
- Add seam and 1 inch fold-back hem.



DESIGN NO. D2M

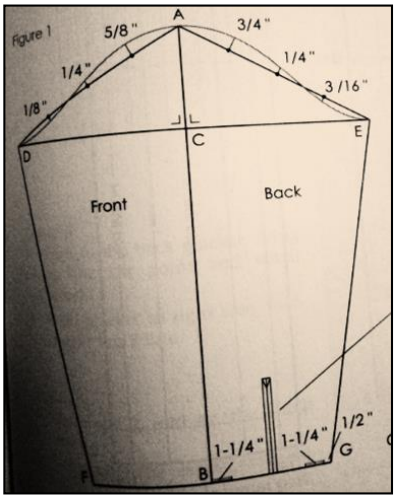
Shirt with Mandarin Collar and Slack Pant

Shirt

Pattern Plot and Manipulation

Figure

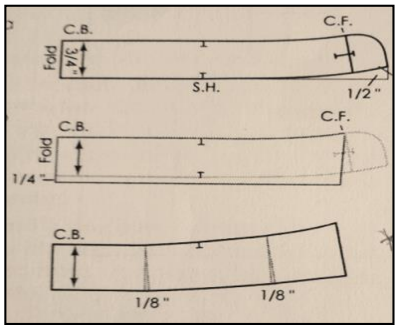
Adding fullness: Slash and spread 1/2" and lower armholes 1".



- Trace the basic front and back shirt foundation.
- Trace sleeve on fold to desired length.
- Lower cap 1/2". Raise biceps 1" and extended line.
- Draw line from X to biceps line equal to armhole measurement.
- Divide into fourths and mark measurements

given. Draw cap curve as shown.

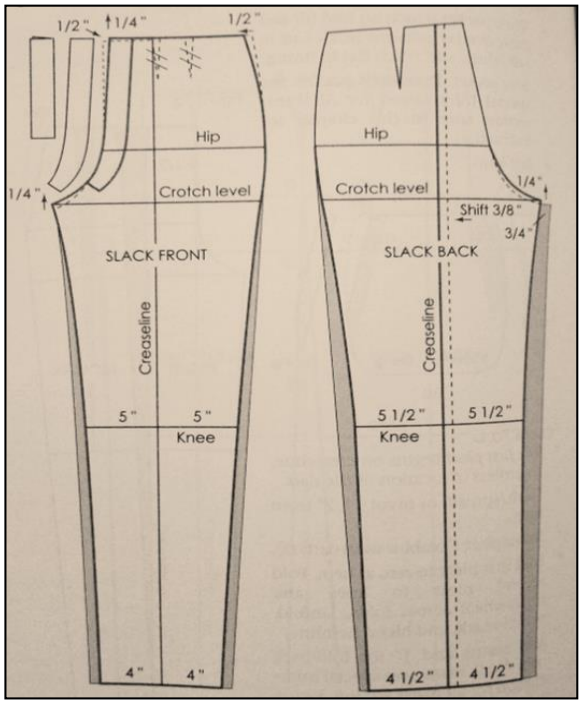
Collar and Stand



- Draw rectangle: width 3/4 " and length = back and front neckline plus 3/4" extension.
- Draw collar on top of collar stand and trace.
- Slash and spread collar.
- **Slack Pant**

Figure

Front



- Trace the basic pant foundation.
- Measure 1/2" in at center front and up 1/4".
- Draw line to hip level and a curved line ending 1/4" up from crotch point.
- Mark 1/2" at side waist and blend to hip. Trim excess.
- Use hem measurements and draw lines from hem to knee and a curved line to crotch point.
- Draw fly and trace. Draw shield on fold.

Back

- Reduce inseam 3/4".
- Raise crotch level 1/4".
- Mark back welt and far pocket.
- Shift creaseline 3/8".
- Draw new creaseline through length of the pattern.
- Draw crotch curve to blend with hip.

- Mark hem measurements and draw lines from hem to knee.

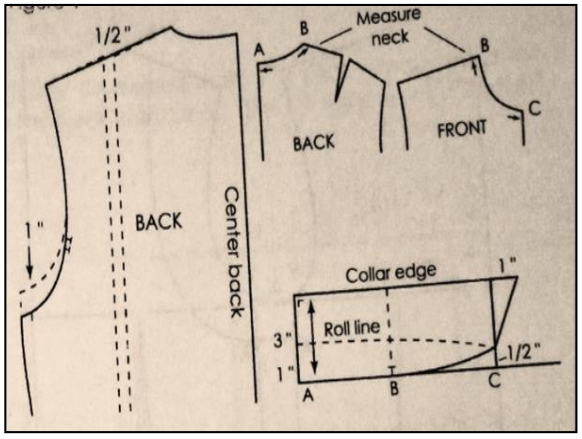
  Add seam and 1 inch fold-back hem.

DESIGN NO. D3M

Lapel Shirt and Trouser

Shirt

Pattern Plot and Manipulation

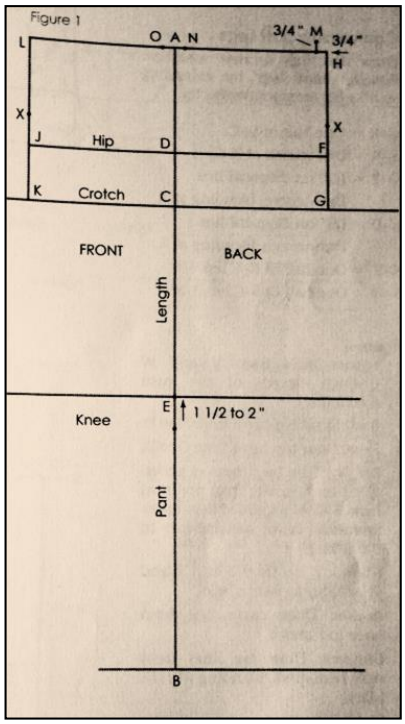


Figure

Adding fullness:

Slash and spread 1/2" and lower armholes 1".

- Trace the basic front and back shirt foundation.
- Trace sleeve on fold to desired length.
- Lower cap 1/2". Raise biceps 1" and extended line.
- Draw line from X to biceps line equal to armhole measurement.
- Divide into fourths and mark measurements given. Draw cap curve as shown.



Lapel

- Draw a 2-inch line out from center front neck.
- Mark a notch ½ inch past center front neck.
- Draw the facing (1 ¼ inch from neck, 2 ½ at hem).

Basic pant foundation for Trouser

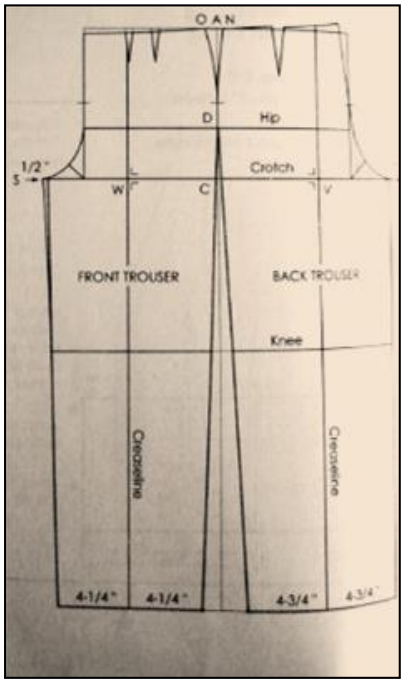
Figure

A-B= Pant length

A-C= C rotch depth, plus 3/4".

C-D= Hip depth: one-third of C-A.

C-E= Knee depth: one-half of C-B, minus 11/2" to 2".



Square out from A,D,C,E,B.

D-F= Back hip arc, plus 1/4".

C-G and A-H=D-F. Connect G-H.

G-X= Half of G-H.

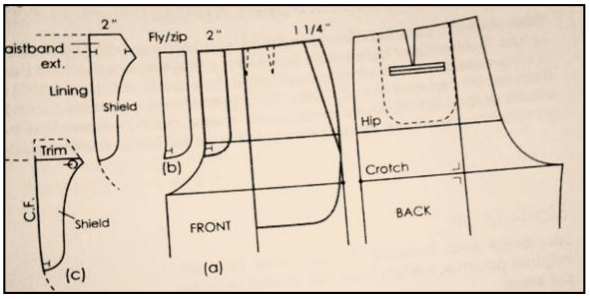
D-J= Front hip arc, plus 1/4".

C-K and A-L=D-J. Connect K with L.

K-X=Half of K-L.

H-M= Mark in 3/4" and up 3/4".

M-N= Back=waist arc, plus 1" includes 1 dart.



L-O= Front=waist arc, plus 11/4" includes 2 darts.

Mark Dart Legs and Intake

Figure

H-P= One-half of M-N, plus 1/2".Mark dart intake ;

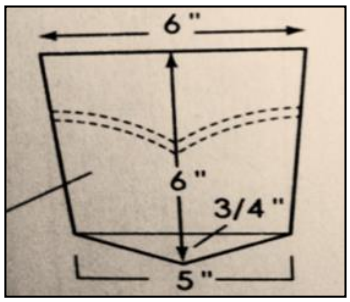
square down 31/2" from center.

L-Q= One-third of L-O. Mark dart q space 11/4" and mark second dart. Square down 3" from

centers.

- Square lines from V and W through length of the pant.
- Front= Draw hip curve from O to D.
- Leg line= The back hem is generally 1 inch greater than the front hem.
- The first pleat begins on creaseline, regardless of location of the dart.
- Slash/Spread, or pivot 11/2" from hem.
- Second pleat, combine waist darts.

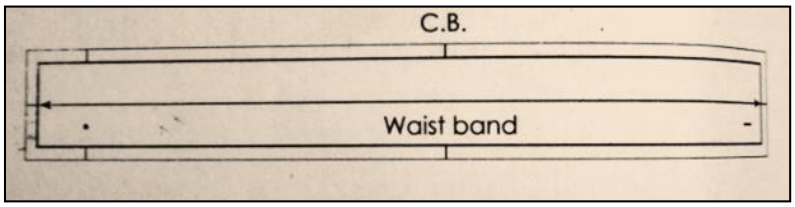
- Fold first pleat to zero at hem.
- Right side: Extend 2" from X. Draw point; mark buttonhole.
- Back side: mark for metal hook.
- Left side: Shield is 2" from X.
- Back: Add 1" to center back, allowing for waist modification.



Pocket Patterns

Use measurements to draw pocket

Waist Band

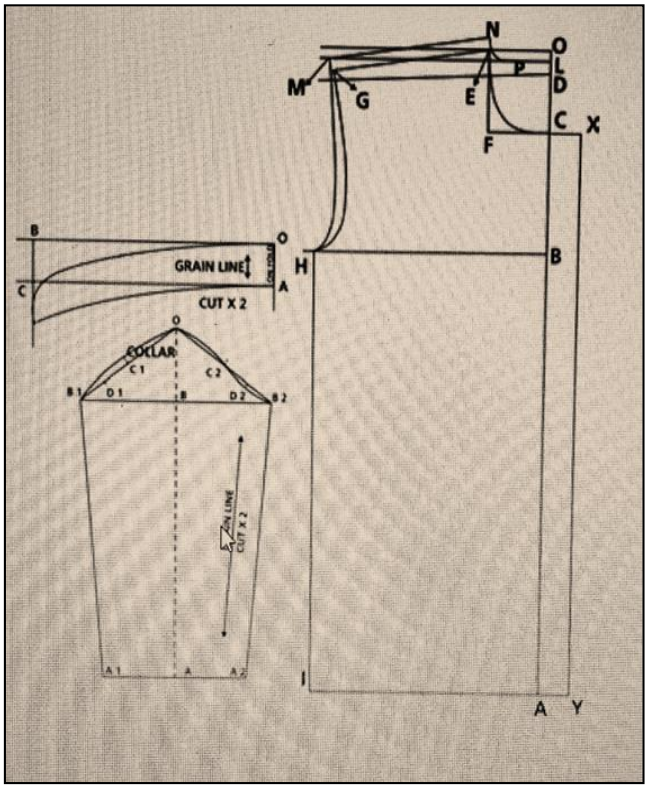


Figure

Length=waist measurement plus 1/2" ease and 11/4" for extension.

Width= 21/2".

Add 1/2" seam. Notch extension and at the center back.



DESIGN NO. D4M

Sherwani Coat and Pleated Pant

Sherwani Coat

Front

Figure

O Starting point

O – A Total length of Sherwani

O – B ¼th of chest

O – C 1/12 th of chest

O – D Shoulder drop = 1 ½"

O – E 1/12 th of chest; = O – C

E – F Join E – F parallel to O – C

D – G ½ of shoulder & join E – G

B – H ¼ of chest + 2"

H – I Perpendicular to HB, join till total length

G – H Join using French curve

E – C Join using French curve

X – Y 2" away, parallel to CA (for placket)

A –I BH + 2"

Back

O – L 1/2"; draw a line parallel to O – E

M – N 2" Parallel& equal from GE; MG & NE perpendicular to GE

N – P Draw a curve using French curve

M – H Draw a curve using French curve

Sleeves

O Starting point

O – A Length of sleeve

O – B 1/ 12th of chest + 3"

B – B1 ¼ of chest, also equal to B – B2

A – A1 1/6th of chest, also equal to A – A2

Join B1 – O; A1 – B1

C 1& C2 Mid of O – B1 & O – B2

D1 & D2 Mid of C1 – B1 &Mid point of C2 – B2

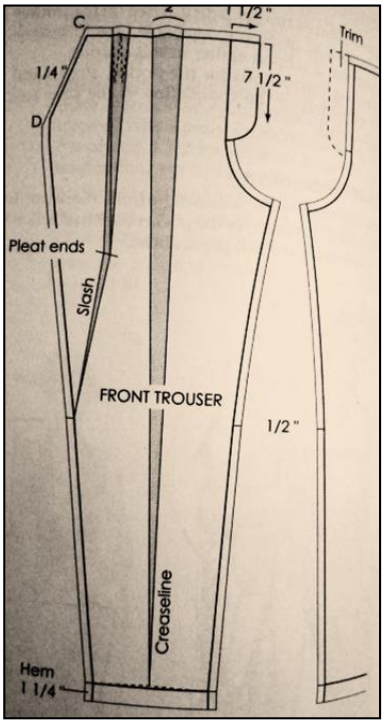
Collar

O Starting point

O – A 1 ½"(on fold)

O – B ½ of neck; also OB = AC

Convert lines OB & OC into curves& blend them as shown in fig.



Pleated Pant

Pattern Plot and Manipulation

Figure

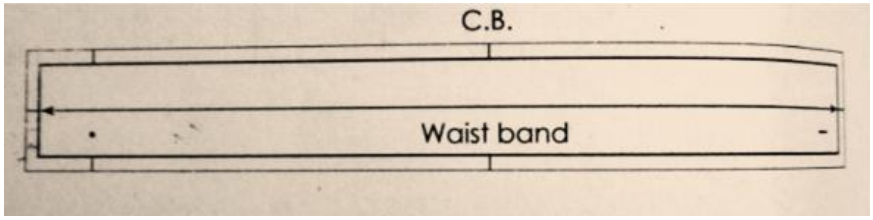
- Trace the front and back trouser foundations.
- Cut pant pattern from paper.
- Pocket entry preparation

X-C=13/4 ".

X-D= 61/2". Draw a line from C-D.

- Cut on creaseline from waist to hem.
- The first pleat begins on creaseline, regardless of location of the dart.
- Slash/Spread, or pivot 51/2" from hem.
- Second pleat, combine waist darts.
- Increases the fold first pleat to zero at hem.
- Right side: Extend 2" from X. Draw point; mark buttonhole.
- Back side: mark for metal hook.
- Left side: Shield is 2" from X.

Waist Band



Figure

Length=waist measurement plus 1/2" ease and 11/4" for extension. Width= 21/2".

Add 1/2" seam. Notch extension and at the center back.

APPENDIX – IV

PROFORMA FOR EVALUATION OF CONSTRUCTED DRESSES

Dear respondent,

I am a Ph.D. student in the department of Textiles and Apparel Designing, College of Community Science, Assam Agricultural University, Jorhat-13. I am conducting a study on "Evaluation of twill weave fabrics made of blended eri-modal and eri-acrylic yarns suitable for different dress designs". In this regard, I would like to know your opinion on certain matters regarding the woven fabrics and constructed dresses. To evaluate the study, I have prepared an interview schedule and show the picture of constructed dresses. Kindly help me by giving your opinions against the following questions.

Thanking you.

Yours sincerely,

(SunitaBoruah)
Ph.D. (C.Sc.) student
Deptt. of Textiles & Apparel Designing
College of Community Science
AAU, Jorhat-13

APPENDIX – V

SCHEDULE

I. Name of respondent:
II. Age:
III. Sex:
IV. Educational qualification:
V. Occupation :
VI. Twenty seven different types of fabrics have been displayed. These fabrics have been prepared using different blended yarns (Eri, Modal and Acrylic) in three different ratios (70:30, 50:50, 30:70) and three twill weaves (Twill, Herringbone Twill and Diamond Twill). Kindly give your opinion regarding general appearance, lustre, texture and handle for the displayed fabrics. (Tick mark your answer)

Types of fabric	**General appearance**			**Lustre**			**Handle**			**Texture**	
	Good (3)	**Fair (2)**	**Poor (1)**	**High (3)**	**Moderate (2)**	**Low (1)**	**Soft (3)**	**Crisp (2)**	**Stiffs (1)**	**Smooth (2)**	**Rough (1)**
ET											
EH											
ED											
MT											
MH											
MD											
AT											
AH											
AD											
EMT 70:30											
EMH 70:30											

Types of fabric	General appearance			Lustre			Handle			Texture	
	Good (3)	Fair (2)	Poor (1)	High (3)	Moderate (2)	Low (1)	Soft (3)	Crisp (2)	Stiffs (1)	Smooth (2)	Rough (1)
EMD 70:30											
EMT 50:50											
EMH 50:50											
EMD 50:50											
EMT 30:70											
EMH 30:70											
EMD 30:70											
EAT 70:30											
EAH 70:30											
EAD 70:30											
EAT 50:50											
EAH 50:50											
EAD 50:50											
EAT 30:70											
EAH 30:70											
EAD 30:70											

VII. 16 numbers of dress designs are shown to you. Please give your order of preferences of dress designs against the following questions.

1. **General appearances of the constructed dresses:**

Design No.	Excellent (5)	Very good (4)	Good (3)	Fair (2)	Poor (1)
D1G					
D2G					
D3G					
D4G					
D1B					
D2B					
D3B					
D4B					
D1W					
D2W					
D3W					
D4W					
D1M					
D2M					
D3M					
D4M					

Note: D= Design, G =Girls, B= Boys, W= Women, M= Men

2. **Design of the dresses:**

Design No.	Excellent (5)	Very good (4)	Good (3)	Fair (2)	Poor (1)
D1G					
D2G					
D3G					
D4G					
D1B					
D2B					
D3B					
D4B					
D1W					
D2W					
D3W					
D4W					
D1M					
D2M					
D3M					
D4M					

Note: D= Design, G = Girls, B= Boys, W= Women, M= Men

3. Order of Preferences of the constructed dresses:

Design No.	Highly preferred	Preferred	Less preferred
For Girls			
D1G			
D2G			
D3G			
D4G			
For Boys			
D1B			
D2B			
D103B			
D4B			
For women			
D1W			
D2W			
D3W			
D4W			
For men			
D1M			
D2M			
D3M			
D4M			

Note: D= Design, G =Girls, B=Boys, W= Women, M= Men

4. The rank order of preferences for the displayed dresses:

Design No.	**For Girls**
D1G	
D2G	
D3G	
D4G	
	For Boys
D1B	
D2B	
D3B	
D4B	
	For women
D1W	
D2W	
D3W	
D4W	
	For men
D1M	
D2M	
D3M	
D4M	

Note: D= Design, G =Girls, B= Boys, W= Women, M= Men

COST SHEET

DESIGN No. D1B

Fabric Information		**Design/ Style Information**		**SKETCH**
Fabric Code	Errandi-Mingle E30A70	Product Code	D1B	
Resource	Eri silk-Acrylic	Price	Rs. 4,250 .00	
Weave structure	Twill	Season	Autumn	
Width	40"	Date	14/05/2018	
Price/m.	Rs. 642.00	Item	Asymmetrical Shirt and Peg Pant	
Fabric Type	Union	Size	10	
Content	Warp- 100% Erisilk Weft- Blended yarn (Eri-Acrylic 30:70)	Colours	Off white	
Colours	Off white			
Salesman	Dept. of Textiles and Apparel Designing, AAU, Jorhat-13			

1. Material	**Price (Rs./m)**	**Amount (m)**	**Total Costs (Rs.)**
Eri silk-Acrylic	642.00	3	1,926.00
Black Fabric	50.00	1	50.00

2. Trimming	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**
Buttons	5.00	9	45.00
Zippers	20.00	1	20.00
Elastic			
Belts			
Shoulder pad			
Pad			

3. Surface embellishments	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**

4. Labour	**Price (Rs./m)**	**Amount (hr.)**	**Total Costs (Rs.)**
Stitching charge	@1 500/item	-	1500.00
TOTAL			**3,541.00**
5. % OF MARKUP	**@20%**	**-**	**708.20**
Total selling price			**4,249.20 =4,250.00**

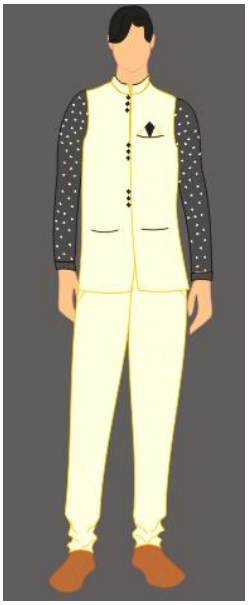
COST SHEET

DESIGN No. D1G

Fabric Information		**Design/Style Information**		**SKETCH**
Fabric Code	Errandi-Mingle E70M30	Product Code	D1G	
Resource	Eri silk-Modal	Price	Rs. 4,900.00	
Weave structure	Twill	Season	Spring	
Width	40"	Date	14/05/2018	
Price/m.	Rs. 838.00	Item	Box Pleated Frock	
Fabric Type	Union	Size	14	
Content	Warp- 100% Eri silk Weft- Blended yarn (Eri-Modal 70:30)	Colours	Off white	
Colours	Off white			
Salesman	Dept. of Textiles and Apparel Designing, AAU, Jorhat-13			
1. Material	**Price (Rs./m)**	**Amount (m)**	**Total Costs (Rs.)**	
Eri silk-Modal	838.00	3	2,514.00	
Lining	50.00	3	150.00	
Embroidered Net	650.00	1	650.00	
2. Trimming	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**	
Buttons				
Zippers	20.00	1	20.00	
Elastic				
Belts				
Shoulder pad				
Pad				
3. Surface embellishments	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**	
Embroidery				
4. Labour	**Price (Rs./m)**	**Amount (hr.)**	**Total Costs (Rs.)**	
Stitching charge	@ 750/item	-	750.00	
TOTAL			**4,084.00**	
5. % OF MARKUP	**@20%**	**-**	**816.80**	
Total selling price			**4,900.80 =4,900.00**	

COST SHEET

DESIGN No. D1M

Fabric Information		**Design/Style Information**		**SKETCH**
Fabric Code	Errandi-Mingle E70A30	Product Code	D1M	
Resource	Eri silk-Acrylic	Price	Rs.7,983.00	
Weave structure	Herringbone	Season	Autumn	
Width	40"	Date	14/05/2018	
Price/m.	Rs. 838.00	Item	Waist Coat and Long Slack Pant	
Fabric Type	Union	Size	38	
Content	Warp- 100% Eri silk Weft- Blended yarn (Eri -Acrylic 70:30)	Colours	Off white	
Colours	Off white			
Salesman	Dept. of Textiles and Apparel Designing, AAU, Jorhat-13			
1. Material	**Price (Rs./m)**	**Amount (m)**	**Total Costs (Rs.)**	
Eri silk-Acrylic	838.00	4	3,352.00	
Lining	50.00	3	150.00	
2. Trimming	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**	
Buttons	5.00	16	80.00	
Zippers	20.00	1	20.00	
Elastic				
Belts				
Shoulder Pad	50	1	50.00	
3. Surface embellishments	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**	
4. Labour	**Price (Rs./m)**	**Amount (hr.)**	**Total Costs (Rs.)**	
Stitching charge	@ 3000/item	-	3,000.00	
TOTAL			**6,652.00**	
5. % OF MARKUP	**@20%**	**-**	**1330.40**	
Total selling price			**7,982.40 =7,983.00**	

COST SHEET

DESIGN No. D1W

Fabric Information		**Design/Style Information**		**SKETCH**
Fabric Code	Errandi-Mingle E30M70	Product Code	D1W	
Resource	Eri silk-Modal	Price	Rs.4,528.00	
Weave structure	Herringbone	Season	Spring	
Width	40"	Date	14/05/2018	
Price/m.	Rs. 642.00	Item	Princess Styline Halter Neck Top and Tiered Skirt	
Fabric Type	Union	Size	6	
Content	Warp- 100% Eri silk Weft- Blended yarn (Eri-Modal 30:70)	Colours	Off white	
Colours	Off white			
Salesman	Dept. of Textiles and Apparel Designing, AAU, Jorhat-13			
1. Material	**Price (Rs./m)**	**Amount (m)**	**Total Costs (Rs.)**	
Eri silk-Modal	642.00	4	2,568.00	
Net Fabric	150.00	1.5	225.00	
Lining	50.00	3	150.00	
2. Trimming	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**	
Buttons				
Zippers	20.00	1	20.00	
Elastic				
Belts				
Shoulder pad				
Pad	60.00	1	60.00	
3. Surface embellishments	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**	
4. Labour	**Price (Rs./m)**	**Amount (hr.)**	**Total Costs (Rs.)**	
Stitching charge	@ 750/item	-	750.00	
TOTAL			**3,773.00**	
5. % OF MARKUP	**@20%**	**-**	**754.60**	
Total selling price			**4,527.60 =4,528.00**	

COST SHEET

DESIGN No. D2W

Fabric Information		**Design/Style Information**		**SKETCH**
Fabric Code	Errandi-Mingle E50A50	Product Code	D2W	
Resource	Eri silk-Acrylic	Price	Rs. 6,816.00	
Weave structure	Twill	Season	Autumn	
Width	40"	Date	14/05/2018	
Price/m.	Rs. 740.00	Item	Embellished Crop Top and Front Pleated Circular Skirt	
Fabric Type	Union	Size	6	
Content	Warp- 100% Eri silk Weft- Blended yarn (Eri-Acrylic 50:50)	Colours	Off white	
Colours	Off white			
Salesman	Dept. of Textiles and Apparel Designing, AAU, Jorhat-13			

1. Material	**Price (Rs./m)**	**Amount (m)**	**Total Costs (Rs.)**
Eri silk-Acrylic	740.00	5	3,700.00
Lining	50.00	3	150.00

2. Trimming	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**
Buttons			
Zippers	20.00	1	20.00
Elastic			
Belts			
Hanging Pom Pom	100.00	1	100.00
Pad	60	1	60.00

3. Surface embellishments	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**
Lace	900.00	1	900.00

4. Labour	**Price (Rs./m)**	**Amount (hr.)**	**Total Costs (Rs.)**
Stitching charge	@ 750/item	-	750.00
TOTAL			**5,680.00**
5. % OF MARKUP	**@20%**	**-**	**1,136.00**
Total selling price			**6,816.00**

COST SHEET

DESIGN No. D2B

Fabric Information		**Design/Style Information**		**SKETCH**
Fabric Code	Errandi-Mingle E70A30	Product Code	D2B	
Resource	Eri silk-Acrylic	Price	Rs. 4,895.00	
Weave structure	Diamond	Season	Autumn	
Width	40"	Date	14/05/2018	
Price/m.	Rs. 838.00	Item	Half Jacket and Grunge Pant	
Fabric Type	Union	Size	10	
Content	Warp- 100% Erisilk Weft- Blended yarn (Eri-Acrylic 70:30)	Colours	Off white	
Colours	Off white			
Salesman	Dept. of Textiles and Apparel Designing, AAU, Jorhat-13			

1. Material	**Price (Rs./m)**	**Amount (m)**	**Total Costs (Rs.)**
Eri silk-Acrylic	838.00	3	2,514.00

2. Trimming	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**
Buttons	5.00	9	45.00
Zippers	20.00	1	20.00
Elastic			
Belts			
Shoulder pad			
Pad			

3. Surface embellishments	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**

4. Labour	**Price (Rs./m)**	**Amount (hr.)**	**Total Costs (Rs.)**
Stitching charge	@1 500/item	-	1,500.00
TOTAL			**4,079.00**
5. % OF MARKUP	**@20%**	**-**	**815.80**
Total selling price			**4,894.80 =4,895.00**

COST SHEET

DESIGN No. D2G

Fabric Information		**Design/Style Information**		**SKETCH**
Fabric Code	Errandi-Mingle E30M70	Product Code	D2G	
Resource	Eri silk-Modal	Price	Rs. 2,285.00	
Weave structure	Herringbone	Season	Spring	
Width	40"	Date	14/05/2018	
Price/m.	Rs. 642.00	Item	Princess Styline Frilled Frock	
Fabric Type	Union	Size	14	
Content	Warp- 100% Eri silk Weft- Blended yarn (Eri-Modal 30:70)	Colours	Off white	
Colours	Off white			
Salesman	Dept. of Textiles and Apparel Designing, AAU, Jorhat-13			

1. Material	**Price (Rs./m)**	**Amount (m)**	**Total Costs (Rs.)**
Eri silk-Modal	642.00	2	1,284.00
Lining	50.00	2	100.00

2.Trimming	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**
Buttons			
Zippers	20.00	1	20.00
Elastic			
Belts			
Shoulder pad			
Pad			

2. Surface embellishments	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**
Lace	100	2	200.00

3. Labour	**Price (Rs./m)**	**Amount (hr.)**	**Total Costs (Rs.)**
Stitching charge	@ 500/item	-	500.00
TOTAL			**1,904.00**
4. % OF MARKUP	**@20%**	**-**	**380.80**
Total selling price			**2,284.80 =2,285.00**

COST SHEET

DESIGN No. D2M

Fabric Information		**Design/Style Information**		**SKETCH**
Fabric Code	Errandi-Mingle E30M70	Product Code	D2 M	
Resource	Eri silk-Modal	Price	Rs. 4,378.00	
Weave structure	Diamond	Season	Spring	
Width	40"	Date	14/05/2018	
Price/m.	Rs. 642.00	Item	Shirt with Mandarin Collar and Slack Pant	
Fabric Type	Union	Size	38	
Content	Warp- 100% Erisilk Weft- Blended yarn (Eri-Modal 30:70)	Colours	Off white	
Colours	Off white			
Salesman	Dept. of Textiles and Apparel Designing, AAU, Jorhat-13			

1. Material	**Price (Rs./m)**	**Amount (m)**	**Total Costs (Rs.)**
Eri silk-Modal	860.00	4	2,568.00
Piping Fabric	50.00	1	50.00

2. Trimming	**Price(Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**
Buttons	1.00	10	10.00
Zippers	20.00	1	20.00
Elastic			
Belts			
Pad			

3. Surface embellishments	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**
Embroidered			

4. Labour	**Price (Rs./m)**	**Amount (hr.)**	**Total Costs (Rs.)**
Stitching charge	@ 1000/item	-	1000.00
TOTAL			**3,648.00**
5. % OF MARKUP	**@20%**	**-**	**729.60**
Total selling price			**4,377.60 =4,378.00**

COST SHEET

DESIGN No. D3B

Fabric Information		**Design/Style Information**		**SKETCH**
Fabric Code	Errandi-Mingle E30M70	Product Code	D3B	
Resource	Eri silk-Modal	Price	Rs. 2,819.00	
Weave structure	Herringbone	Season	Spring	
Width	40"	Date	14/05/2018	
Price/m.	Rs. 642.00	Item	Casual Shirt and Shorts	
Fabric Type	Union	Size	10	
Content	Warp- 100% Erisilk Weft- Blended yarn (Eri-Modal 30:70)	Colours	Off white	
Colours	Off white			
Salesman	Dept. of Textiles and Apparel Designing, AAU, Jorhat-13			

1. Material	**Price (Rs./m)**	**Amount (m)**	**Total Costs (Rs.)**
Eri silk-Modal	642.00	2	1,284.00

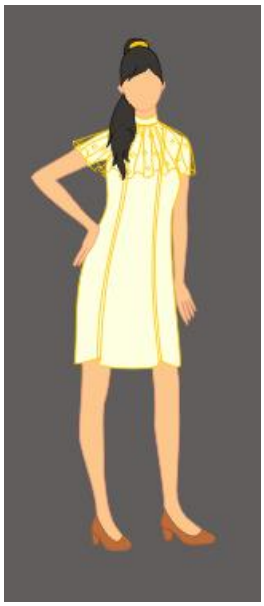
2. Trimming	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**
Buttons	5.00	9	45.00
Zippers	20.00	1	20.00
Elastic			
Belts			
Shoulder pad			
Pad			

3. Surface embellishments	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**

4. Labour	**Price (Rs./m)**	**Amount (hr.)**	**Total Costs (Rs.)**
Stitching charge	@1 000/item	-	1,000.00
TOTAL			**2,349.00**
5. % OF MARKUP	**@20%**	**-**	**469.80**
Total selling price			**2,818.80 =2,819.00**

COST SHEET

DESIGN No. D3G

Fabric Information		**Design/Style Information**		**SKETCH**
Fabric Code	Errandi-Mingle E70A30	Product Code	D3G	
Resource	Eri silk-Acrylic	Price	Rs.2,935 .00	
Weave structure	Twill	Season	Autumn	
Width	40"	Date	14/05/2018	
Price/m.	Rs. 838.00	Item	Princess Styline Frock with Cape	
Fabric Type	Union	Size	14	
Content	Warp- 100% Eri silk Weft- Blended yarn (Eri-Acrylic 70:30)	Colours	Off white	
Colours	Off white			
Salesman	Dept. of Textiles and Apparel Designing, AAU, Jorhat-13			

1. Material	**Price (Rs./m)**	**Amount (m)**	**Total Costs (Rs.)**
Eri silk-Acrylic	838.00	2	1,676.00
Lining	50.00	2	100.00
Net Fabric	150.00	1	150.00

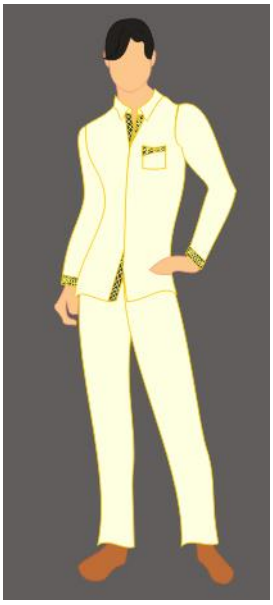
2. Trimming	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**
Buttons			
Zippers	20.00	1	20.00
Elastic			
Belts			
Shoulder pad			
Pad			

3. Surface embellishments	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**

4. Labour	**Price (Rs./m)**	**Amount (hr.)**	**Total Costs (Rs.)**
Stitching charge	@ 500/item	-	500.00
TOTAL			**2,446.00**
5. % OF MARKUP	**@20%**	**-**	**489.20**
Total selling price			**2,935.20 =2,935.00**

COST SHEET

DESIGN No. D3M

Fabric Information		**Design/Style Information**		**SKETCH**
Fabric Code	Errandi-Mingle E50M50	Product Code	D3M	
Resource	Eri silk-Modal	Price	Rs. 4,908.00	
Weave structure	Diamond	Season	Spring	
Width	40"	Date	14/05/2018	
Price/m.	Rs. 740.00	Item	Lapel Shirt and Trouser	
Fabric Type	Union	Size	38	
Content	Warp- 100% Eri silk Weft- Blended yarn (Eri Silk-Modal 50:50)	Colours	Off white	
Colours	Off white			
Salesman	Dept. of Textiles and Apparel Designing, AAU, Jorhat-13			

1. Material	**Price (Rs./m)**	**Amount (m)**	**Total Costs (Rs.)**
Eri silk-Modal	740.00	4	2,960.00
Black woven Fabric	100.00	1	100.00

2. Trimming	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**
Buttons	1.00	10	10.00
Zippers	20.00	1	20.00
Elastic			
Belts			
Pad			

3. Surface embellishments	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**
Embroidered			

4. Labour	**Price (Rs./m)**	**Amount (hr.)**	**Total Costs (Rs.)**
Stitching charge	@ 1000/item	-	1000.00
TOTAL			**4,090.00**
5. % OF MARKUP	**@20%**	**-**	**818.00**
Total selling price			**4,908.00**

COST SHEET

DESIGN No. D3W

Fabric Information		**Design/Style Information**		**SKETCH**
Fabric Code	Errandi-Mingle E30M70	Product Code	D3W	
Resource	Eri silk-Modal	Price	Rs.4,652.00	
Weave structure	Twill	Season	Spring	
Width	40"	Date	14/05/2018	
Price/m.	Rs. 642.00	Item	Roll Collar Dress with Side Cascade	
Fabric Type	Union	Size	6	
Content	Warp- 100% Eri silk Weft- Blended yarn (Eri-Modal 30:70)	Colours	Off white	
Colours	Off white			
Salesman	Dept. of Textiles and Apparel Designing, AAU, Jorhat-13			

1. Material	**Price (Rs./m)**	**Amount (m)**	**Total Costs (Rs.)**
Eri silk-Modal	642.00	3.5	2,247.00
Lining	50.00	3	150.00

2. Trimming	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**
Buttons	10.00	1	10.00
Zippers	20.00	1	20.00
Elastic			
Belts			
Pad			

3. Surface embellishments	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**
Embroidered	700.00	1	700.00

4. Labour	**Price (Rs./m)**	**Amount (hr.)**	**Total Costs (Rs.)**
Stitching charge	@ 750/item	-	750.00
TOTAL			**3,877.00**
5. % OF MARKUP	**@20%**	**-**	**775.40**
Total selling price			**4,652.40 =4,652.00**

COST SHEET

DESIGN No. D4M

Fabric Information		**Design/Style Information**		**SKETCH**
Fabric Code	Errandi-Mingle E50A50	Product Code	D4M	
Resource	Eri silk-Acrylic	Price	Rs.7,692 .00	
Weave structure	Diamond	Season	Autumn	
Width	40"	Date	14/05/2018	
Price/m.	Rs. 740.00	Item	Sherwani Coat and Pleated Pant	
Fabric Type	Union	Size	38	
Content	Warp- 100% Eri silk Weft- Blended yarn (Eri-Acrylic 50:50)	Colours	Off white	
Colours	Off white			
Salesman	Dept. of Textiles and Apparel Designing, AAU, Jorhat-13			

1. Material	**Price (Rs./m)**	**Amount (m)**	**Total Costs (Rs.)**
Eri silk-Acrylic	740.00	4	2,960.00
Black woven fabric	150.00	1	150.00
Lining	50.00	3	150.00

2. Trimming	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**
Buttons	5.00	16	80.00
Zippers	20.00	1	20.00
Elastic			
Belts			
Shoulder Pad	50	1	50.00

3. Surface embellishments	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**

4. Labour	**Price (Rs./m)**	**Amount (hr.)**	**Total Costs (Rs.)**
Stitching charge	@ 3000/item	-	3,000.00
TOTAL			**6,410.00**
5. % OF MARKUP	**@20%**	**-**	**1,282.00**
Total selling price			**7,692.00**

COST SHEET

DESIGN No. D4B

Fabric Information		**Design/Style Information**		**SKETCH**
Fabric Code	Errandi-Mingle E50M50	Product Code	D4B	
Resource	Eri silk-Modal	Price	Rs. 3,942.00	
Weave structure	Twill	Season	Spring	
Width	40"	Date	14/05/2018	
Price/m.	Rs. 740.00	Item	Pleated Shirt and Cargo Pant	
Fabric Type	Union	Size	10	
Content	Warp- 100%Eri silk Weft- Blended yarn (Eri-Modal 50:50)	Colours	Off white	
Colours	Off white			
Salesman	Dept. of Textiles and Apparel Designing, AAU, Jorhat-13			

1. Material	**Price (Rs./m)**	**Amount (m)**	**Total Costs (Rs.)**
Eri silk-Modal	740.00	3	2,220.00

2. Trimming	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**
Buttons	5.00	9	45.00
Zippers	20.00	1	20.00
Elastic			
Belts			
Shoulder pad			
Pad			

3. Surface embellishments	**Price (Rs.)**	**Quantity (piece)**	**Total Costs(Rs.)**

4. Labour	**Price (Rs./m)**	**Amount (hr.)**	**Total Costs(Rs.)**
Stitching charge	@1 000/item	-	1,000.00
TOTAL			**3,285.00**
5. % OF MARKUP	**@20%**	**-**	**657.00**
Total selling price			**3,942.00**

COST SHEET

DESIGN No. D4G

Fabric Information		**Design/Style Information**		**SKETCH**
Fabric Code	Errandi-Mingle E30A70	Product Code	D4G	
Resource	Eri silk-Acrylic	Price	Rs.3,218.00	
Weave structure	Diamond	Season	Autumn	
Width	40"	Date	14/05/2018	
Price/m.	Rs. 642.00	Item	Frock Coat	
Fabric Type	Union	Size	14	
Content	Warp- 100% Eri silk Weft- Blended yarn (Eri-Acrylic 30:70)	Colours	Off white	
Colours	Off white			
Salesman	Dept. of Textiles and Apparel Designing, AAU, Jorhat-13			

1. Material	**Price (Rs./m)**	**Amount (m)**	**Total Costs (Rs.)**
Eri silk-Acrylic	642.00	3	1,926.00
Lining	50.00	2	100.00
Printed Fabric	100.00	1	100.00

2. Trimming	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**
Buttons	6.00	6	36.00
Zippers	20.00	1	20.00
Elastic			
Belts			
Shoulder pad			
Pad			

3. Surface embellishments	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**

4. Labour	**Price (Rs./m)**	**Amount (hr.)**	**Total Costs (Rs.)**
Stitching charge	@ 500/item	-	500.00
TOTAL			**2,682.00**
5. % OF MARKUP	**@20%**	**-**	**536.40**
Total selling price			**3,218.40 =3,218.00**

COST SHEET

DESIGN No. D4W

Fabric Information		**Design/Style Information**		**SKETCH**
Fabric Code	Errandi-Mingle E30A70	Product Code	D4W	
Resource	Eri silk-Acrylic	Price	Rs.3,937.00	
Weave structure	Herringbone	Season	Autumn	
Width	40"	Date	14/05/2018	
Price/m.	Rs. 642.00	Item	Slinky Dress with Circular Hemline Sleeve	
Fabric Type	Union	Size	6	
Content	Warp- 100% Eri silk Weft- Blended yarn (Eri-Acrylic 30:70)	Colours	Off white	
Colours	Off white			
Salesman	Dept. of Textiles and Apparel Designing, AAU, Jorhat-13			

1. Material	**Price (Rs./m)**	**Amount (m)**	**Total Costs (Rs.)**
Eri silk-Acrylic	642.00	4	1926.00
Lining	50.00	3	150.00
Net Fabric	250.00	1.5	375.00

2. Trimming	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**
Buttons			
Zippers	20.00	1	20.00
Elastic			
Belts			
Pad	60	1	60.00

3. Surface embellishments	**Price (Rs.)**	**Quantity (piece)**	**Total Costs (Rs.)**

4. Labour	**Price (Rs./m)**	**Amount (hr.)**	**Total Costs (Rs.)**
Stitching charge	@ 750/item	-	750.00
TOTAL			**3,281.00**
5. % OF MARKUP	**@20%**	**-**	**656.20**
Total selling price			**3,937.20 =3,937.00**

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Fabric Code	100% Acrylic D
Fabric Type	Control
Warp	Acrylic 100%
Weft	Acrylic 100%

Weave	Diamond Twill
Reed Count	60
Loom Picks	64
Cloth width	40"
Rate (Rs.)	Rs. 495/mt.

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Fabric Code	100% Acrylic H
Fabric Type	Control
Warp	Acrylic 100%
Weft	Acrylic 100%

Weave	Herringbone Twill
Reed Count	60
Loom Picks	48
Cloth width	40"
Rate (Rs.)	Rs. 495/mt.

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Fabric Code	100% Acrylic T
Fabric Type	Control
Warp	Acrylic 100%
Weft	Acrylic 100%

Weave	Twill
Reed Count	60
Loom Picks	62
Cloth width	40"
Rate (Rs.)	Rs. 495/mt.

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Fabric Code	100% Eri Silk D
Fabric Type	Control
Warp	Eri silk 100%
Weft	Eri silk 100%

Weave	Diamond Twill
Reed Count	80
Loom Picks	70
Cloth width	40"
Rate (Rs.)	Rs. 985/mt.

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Fabric Code	100% Eri Silk H
Fabric Type	Control
Warp	Eri silk 100%
Weft	Eri silk 100%

Weave	Herringbone Twill
Reed Count	80
Loom Picks	50
Cloth width	40"
Rate (Rs.)	Rs. 985/mt.

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Fabric Code	100% Eri Silk T
Fabric Type	Control
Warp	Eri silk 100%
Weft	Eri silk 100%

Weave	Twill
Reed Count	80
Loom Picks	69
Cloth width	40"
Rate (Rs.)	Rs. 985/mt.

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Fabric Code	Errandi-Mingle D E30A70
Fabric Type	Union
Warp	Eri silk 100%
Weft	Blended yarn(Eri silk-Acrylic 30:70)

Weave	Diamond Twill
Reed Count	80
Loom Picks	45
Cloth width	40"
Rate (Rs.)	Rs. 850/mt.

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Fabric Code	Errandi-Mingle H E30A70
Fabric Type	Union
Warp	Eri silk 100%
Weft	Blended yarn (Eri silk-Acrylic 30:70)

Weave	Herringbone Twill
Reed Count	80
Loom Picks	44
Cloth width	40"
Rate (Rs.)	Rs. 850/mt.

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Fabric Code	Errandi-Mingle T E30A70
Fabric Type	Union
Warp	Eri silk 100%
Weft	Blended yarn (Eri silk-Acrylic 30:70)

Weave	Twill
Reed Count	80
Loom Picks	44
Cloth width	40"
Rate (Rs.)	Rs. 850/mt.

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Fabric Code	Errandi-Mingle D E50A50
Fabric Type	Union
Warp	Eri silk 100%
Weft	Blended yarn (Eri silk-Acrylic 50:50)

Weave	Diamond Twill
Reed Count	80
Loom Picks	52
Cloth width	40"
Rate (Rs.)	Rs. 850/mt.

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Fabric Code	Errandi-Mingle H E50A50
Fabric Type	Union
Warp	Eri silk 100%
Weft	Blended yarn (Eri silk-Acrylic 50:50)

Weave	Herringbone Twill
Reed Count	80
Loom Picks	46
Cloth width	40"
Rate (Rs.)	Rs. 850/mt.

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Fabric Code	Errandi-Mingle T E50A50
Fabric Type	Union
Warp	Eri silk 100%
Weft	Blended yarn (Eri-silk-Acrylic 50:50)

Weave	Twill
Reed Count	80
Loom Picks	54
Cloth width	40"
Rate (Rs.)	Rs. 850/mt.

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Fabric Code	Errandi-Mingle D E70A30
Fabric Type	Union
Warp	Eri silk 100%
Weft	Blended yarn (Eri silk-Acrylic 70:30)

Weave	Diamond Twill
Reed Count	80
Loom Picks	54
Cloth width	40"
Rate (Rs.)	Rs. 850/mt.

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Fabric Code	Errandi-Mingle H E70A30
Fabric Type	Union
Warp	Eri silk 100%
Weft	Blended yarn (Eri silk-Acrylic 70:30)

Weave	Herringbone Twill
Reed Count	80
Loom Picks	50
Cloth width	40"
Rate (Rs.)	Rs. 850/mt.

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Fabric Code	Errandi-Mingle T E70A30
Fabric Type	Union
Warp	Eri silk 100%
Weft	Blended yarn (Eri Silk-Acrylic 70:30)

Weave	Twill
Reed Count	80
Loom Picks	55
Cloth width	40"
Rate (Rs.)	Rs. 850/mt.

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Fabric Code	Errandi-Mingle D E30M70
Fabric Type	Union
Warp	Eri silk 100%
Weft	Blended yarn (Eri silk –Modal 30:70)

Weave	Diamond Twill
Reed Count	80
Loom Picks	62
Cloth width	40"
Rate (Rs.)	Rs. 860/mt.

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Fabric Code	Errandi-Mingle H E30M70
Fabric Type	Union
Warp	Eri silk 100%
Weft	Blended yarn (Eri silk –Modal 30:70)

Weave	Herringbone Twill
Reed Count	80
Loom Picks	44
Cloth width	40"
Rate (Rs.)	Rs. 860/mt.

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Fabric Code	Errandi-Mingle T E30M70
Fabric Type	Union
Warp	Eri silk 100%
Weft	Blended yarn (Eri silk –Modal 30:70)

Weave	Twill
Reed Count	80
Loom Picks	50
Cloth width	40"
Rate (Rs.)	Rs. 860/mt.

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Fabric Code	Errandi-Mingle D E50M50
Fabric Type	Union
Warp	Eri silk 100%
Weft	Blended yarn (Eri silk-Modal 50:50)

Weave	Diamond Twill
Reed Count	80
Loom Picks	58
Cloth width	40"
Rate (Rs.)	Rs. 860/mt.

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Fabric Code	Errandi-Mingle H E50M50
Fabric Type	Union
Warp	Eri silk 100%
Weft	Blended yarn (Eri silk-Modal 50:50)

Weave	Herringbone Twill
Reed Count	80
Loom Picks	48
Cloth width	40"
Rate (Rs.)	Rs. 860/mt.

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Fabric Code	Errandi-Mingle T E50M50
Fabric Type	Union
Warp	Eri silk 100%
Weft	Blended yarn (Eri silk-Modal 50:50)

Weave	Twill
Reed Count	80
Loom Picks	56
Cloth width	40"
Rate (Rs.)	Rs. 860/mt.

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Fabric Code	Errandi-Mingle D E70M30
Fabric Type	Union
Warp	Eri silk 100%
Weft	Blended yarn (Eri silk –Modal 70:30)

Weave	Diamond Twill
Reed Count	80
Loom Picks	55
Cloth width	40"
Rate (Rs.)	Rs. 860/mt.

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Fabric Code	Errandi-Mingle H E70M30
Fabric Type	Union
Warp	Eri silk 100%
Weft	Blended yarn (Eri silk-Modal 70:30)

Weave	Herringbone Twill
Reed Count	80
Loom Picks	55
Cloth width	40"
Rate (Rs.)	Rs. 860/mt.

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Fabric Code	Errandi-Mingle T E70M30
Fabric Type	Union
Warp	Eri silk 100%
Weft	Blended yarn (Eri silk-Modal 70:30)

Weave	Twill
Reed Count	80
Loom Picks	55
Cloth width	40"
Rate (Rs.)	Rs. 860/mt.

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Fabric Code	100% Modal D
Fabric Type	Control
Warp	Modal 100%
Weft	Modal 100%

Weave	Diamond Twill
Reed Count	60
Loom Picks	64
Cloth width	40"
Rate (Rs.)	Rs. 570/mt.

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Fabric Code	100% Modal H
Fabric Type	Control
Warp	Modal 100%
Weft	Modal 100%

Weave	Herringbone Twill
Reed Count	28
Loom Picks	65
Cloth width	40"
Rate (Rs.)	Rs. 570/mt.

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Fabric Code	100% Modal T
Fabric Type	Control
Warp	Modal 100%
Weft	Modal 100%

Weave	Twill
Reed Count	28
Loom Picks	56
Cloth width	40"
Rate (Rs.)	Rs. 570/mt.