Footwear Production Level IV

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Occupational standards and February 2020

Version 1 Curriculum

Module Title: - coordinate product development and processes

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Table of Contents

LG # 25	LO #1- Prepare and confirm technical specifications

Instruction Sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics –

- Sample specification
- Sample material or product to confirm specification
- Detail technical specification sheet

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to –

- Prepare or obtain sample specification
- Examine sample material or product to confirm specification
- Prepare and document detail technical specification sheet

Learning Activities

1. Read the specific objectives of this Learning Guide.
2. Read the information written in the "Information Sheets".
3. Accomplish the "Self-check". Request the key answer / key to correction from your teacher or you can request your teacher to check it for you.
4. If you earned a satisfactory evaluation proceed to the next information. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activities.
5. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	Sample specification

1.1. Definition and purpose of Specification

What is specification?

It is the act of specifying. It can also be called as a detailed, exact statement of particulars, especially a statement prescribing materials, dimensions, and quality of work for something to be built, installed, or manufactured. Or it may be a single item or article that has been specified.

Production of any model or product is characterized by manufacturing, designed and produced as per the specification of customers within prefixed time and cost. This comprises of general purpose machines arranged into different departments. Each job demands unique technological requirements, demands processing on machines in a certain sequence.

Though there may be many terminologies of specifications around the globe, but the most commonly used specifications in the industry are called as Technical Specification (often abbreviated as spec). It is a type of technical standard which consists of an explicit set of requirements to be satisfied by a material, design, product, or service. If a material, product, or service fail to meet one or more of the applicable specifications, it may be referred to as being out of specification, the abbreviation OOS may also be used.

In casual usage, under spec or over spec are used when something is worse or better than specified, though in general (such as for sizes) there is only a notion of "in spec" or "out of spec", not "better" or "worse".

These technical specifications may also be developed by any of various kinds of organizations, both public and private. Example organization types include a corporation, a consortium (a small group of corporations), a trade association (an industry-wide group of corporations), a national government (including its military, regulatory agencies, and national laboratories and institutes), a professional association (society), a purpose-made standards organization such as ISO, or vendor-neutral developed generic requirements. It is common for one organization to refer to the standards of another. Voluntary standards may become mandatory if adopted by a government or business contract.

Generally specification sheet is designed according to the order sample and most of the time, it is sent by customer along with the order sheet. This helps in identifying the material he concern for the shoe upper to be made and dictate all production terms as per the sample. This is a kind of agreement between buyer and manufacturer regarding deal of particular products.

Manufacturer cannot neglect the given specifications during making the shoe and buyer will have to accept the related product, if it is to be made according to the specifications given. Specification can be of regarding following types:

- Material specifications,
- Technical specifications
- Machinery specifications,
- Method specifications and
- Packing and dispatch specifications.

These specifications are collected from the buyer and recording has been done at various levels of the system. All the concerns information is sent to the respective departments and necessary considerations are taken care of. Transparency is made at all levels of production for the necessary specifications to be followed and necessary steps are taken for the remedial action.

In any of the industry, broadly the specifications consist of the following three types:

a) Design Specification

A design specification provides explicit information about the requirements for a product and how the product is to be put together. It is the most traditional kind of specification, having been used historically in many types of industries, and represents the kind of thinking in which the personnel of these industries have been trained. Its use is called for where a structure or product has to be specially made to meet a unique need. For example, a design specification must include all necessary drawings, dimensions, environmental factors, ergonomic factors, aesthetic factors, cost, maintenance that will be needed, quality, safety, documentation and description. It also tells specific examples of how the design of the product should be executed, helping others work properly.

Whereas a product design specification (PDS), a sub-part of the design specification, is a statement of what a not-yet-designed product is intended to do. Its aim is to ensure that the subsequent design and development of a product meets the needs of the user. Product design specification is one of the elements of product lifecycle management. The product design specification acts as an initial boundary in the development of products.

The design specification or the product design specification can be published by a manufacturer to help people choose products or to help use the products or it may be specified by the customer outsourcing his product manufacturing to the manufacturer elsewhere outside his premise.

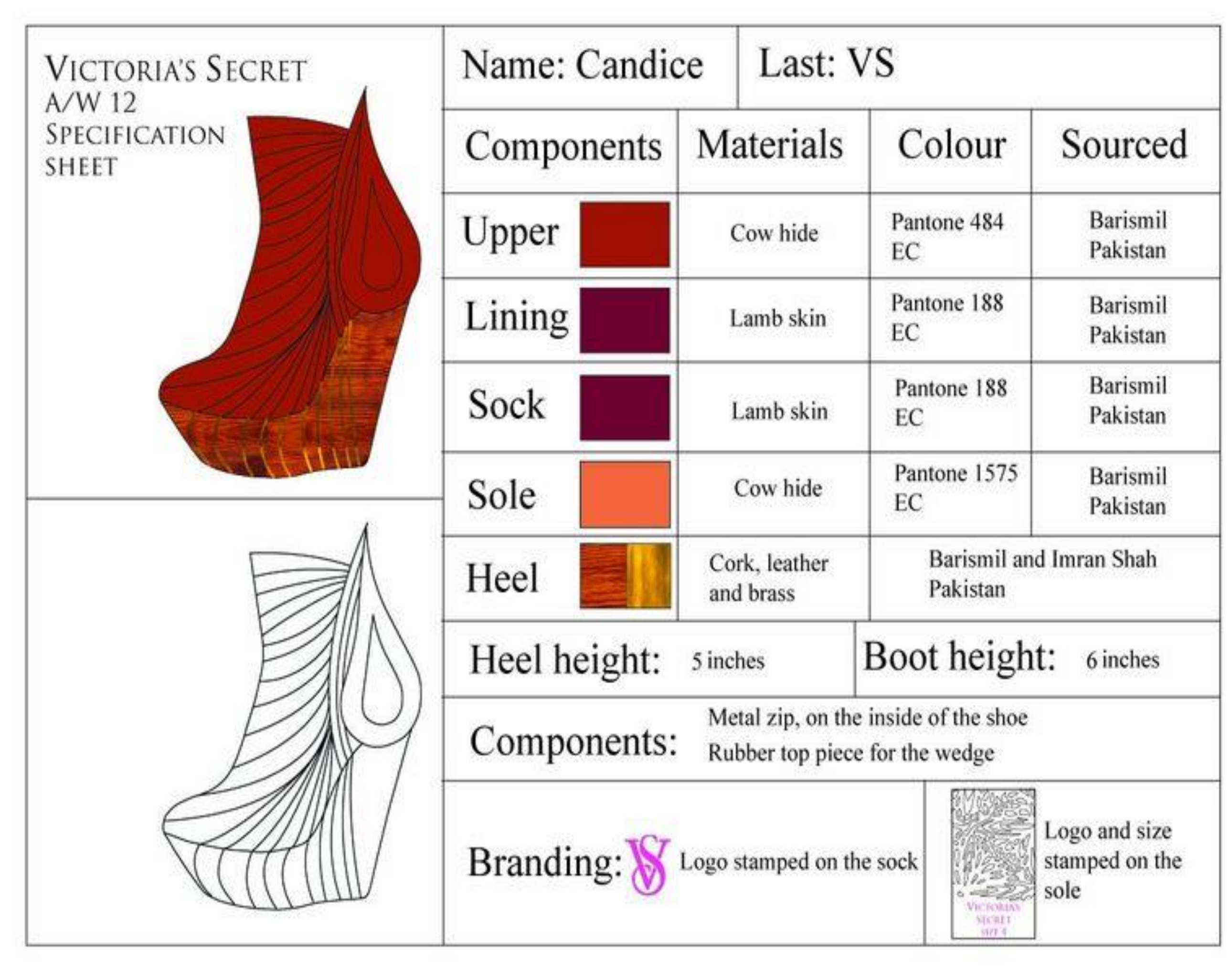
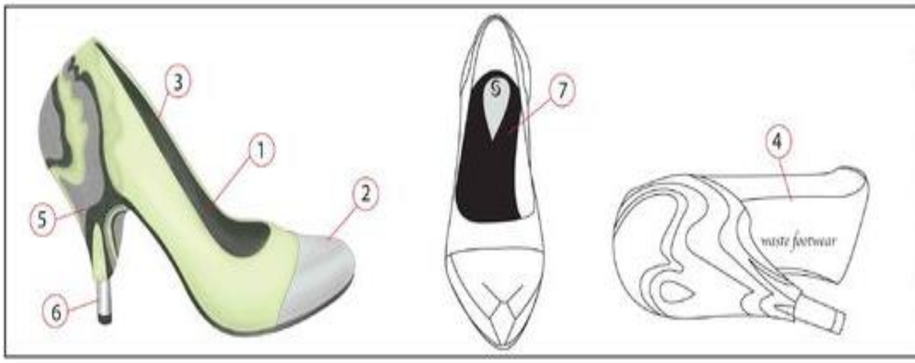


Figure 1 Design Specification of a Ladies shoe

Savosina
zero waste footwear

Specification sheet; S/S 2012
Collection:Layers of possibilities
Style: Spruce



Date: 12.05.2012
Article number: 12052012
Customer: Mrs Rzhevskaya
Last: 1639
Sample size: UK 5 1/2 (ladies)
Pair:1
Pattern: Spruce
Delivery: 12.06.2012

Upper:	(1) Vamp Upper (material N1); (2) Toe cup (material N2)
Lining:	(3) Vamp Lining & Counter Lining (material N3)
Insole:	Texton insole board (thickness 4mm), metal shank is required.
Outsole:	(4) Black leather, "zero waste footwear" heat pressed, 10mm away from the heel.
Heel:	(5) Layers of leather rolled around the heel base and sanded down(material N3, N4, N5) and aluminum piece-(6) (please see page 2)
Sock:	(7) Black suede(material N3) and grey kid skin(material N2), Logo foil heat pressed onto the sock. Heat press the Logo 1st and then cut out the Logo pattern. Place two foams (4mm) under the Logo pattern, then under sock pattern(use double sided tape) and stitch all elements together. Memo foam and soft foam place before the sock for more comfort.
Closing:	Toe cup stitched to vamp upper with a blind seam, place nylon tape over the seam, closed seam at the back. Stitch counter lining and vamp lining together. Top line-run and turn. When the heel is done, mark the edges of the heel on the upper with silver pen and roughen the upper surface. Apply neoprene glue to both: upper and the heel.
Stitching:	3mm, black nylon thread - weight 60.

	Material	Supplier	Colour	Code
1	Cow hide	Alma house	Light green	372 EC
2	Kid	Alma house	Light grey	cool grey 2 EC
3	Kid	Alma house	Black	black EC
4	Cow hide	Alma house	Green	577 EC
5	Cow hide	Alma house	Grey	cool gery 7 EC

Figure 2 Design Specification of a ladies high heeled shoe

b) Process Specification

A process specification is a method used to document, analyze and explain the decision-making logic and formulas used to create final product from process input raw material. Its objective is to flow down and specify regulatory/engineering requirements and procedures. A high-quality, consistent product requires clear and complete process specifications.

A process specification reduces ambiguity, allowing an individual or organization to obtain a precise description of executed tasks and accomplishments and validate system design, including the raw material availability and operation flow diagrams.

The process logic is best represented through structured English, decision tables, decision trees or specified formulas or algorithms and is used to communicate engineering requirements and procedures to businesses involved in the creation of a process. Process descriptions may exist on a form or in a computer aided software engineering (CASE) tool repository. The logic is specified in an ontology that provides a formal description of the components and their relationships that make up a process. The ontology was developed at the National Institute of Standards and Technology (NIST), and has been approved as an international standard in the document ISO 18629.

Process specifications are not created for processes requiring physical input or output, processes representing simple data validation or processes with pre-existing and prewritten code.

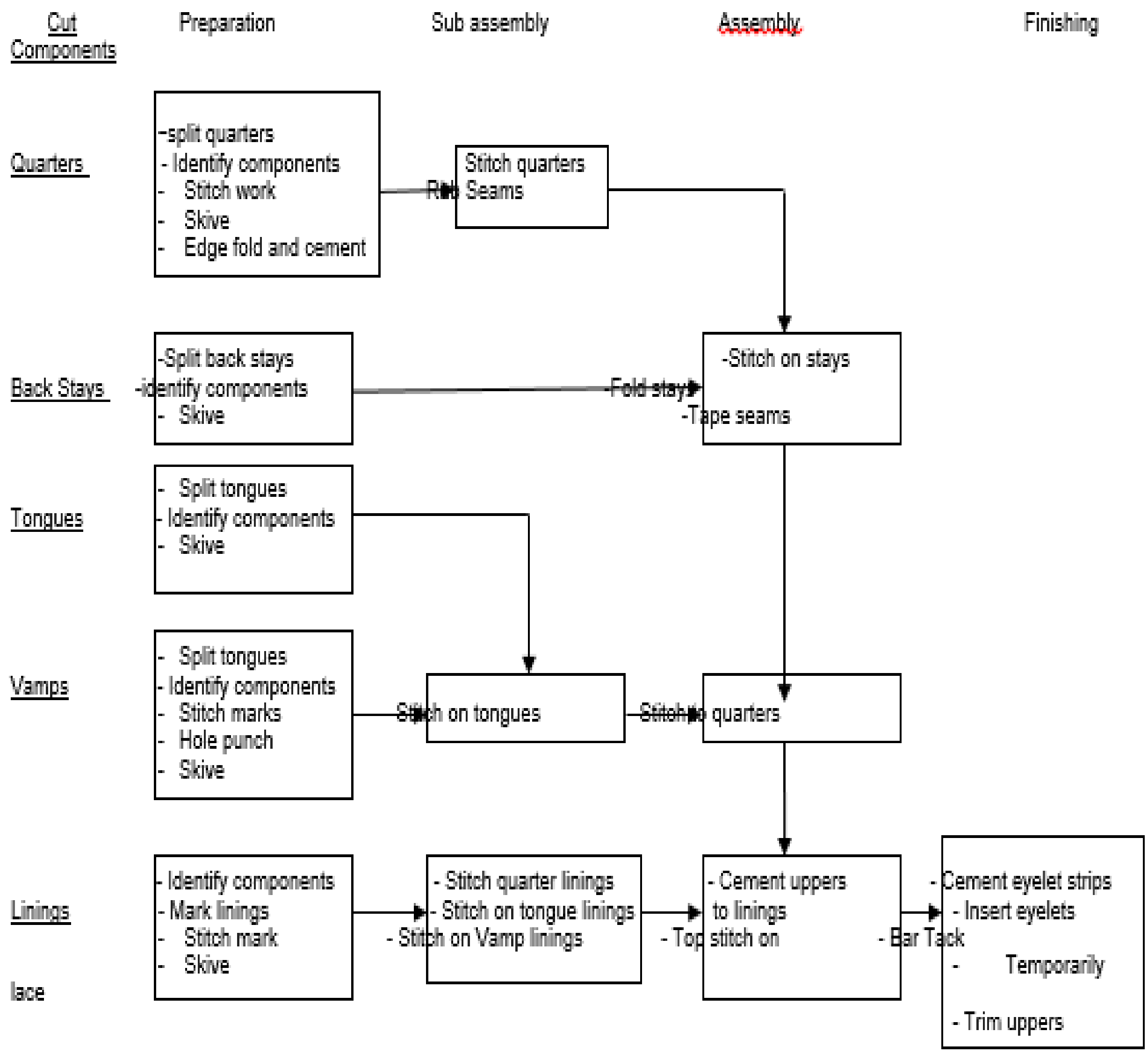


Figure 3 Process specification of a stitching department in footwear manufacturing

c) Performance Specification

A performance specification states requirements in terms of the required results with criteria for verifying compliance, but without stating the methods for achieving the required results. A performance specification defines the functional requirements for the item, the environment in which it must operate, and interface and interchangeability characteristics.

A performance specification is a specification setting forth performance requirements determined necessary for the item involved to perform and last as required. Should a material specification, product or service fail to meet one or more of the applicable specifications, it may be referred to as being out of performance.

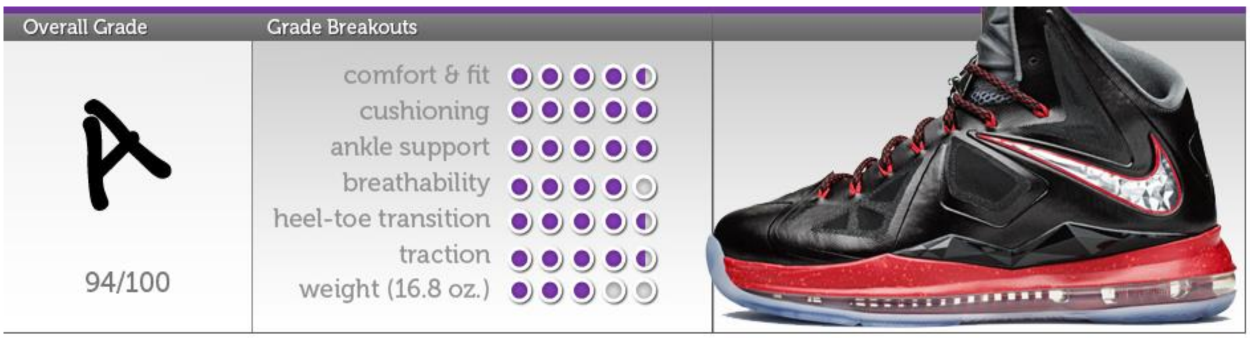


Figure 4 Performance specification of a sports shoe

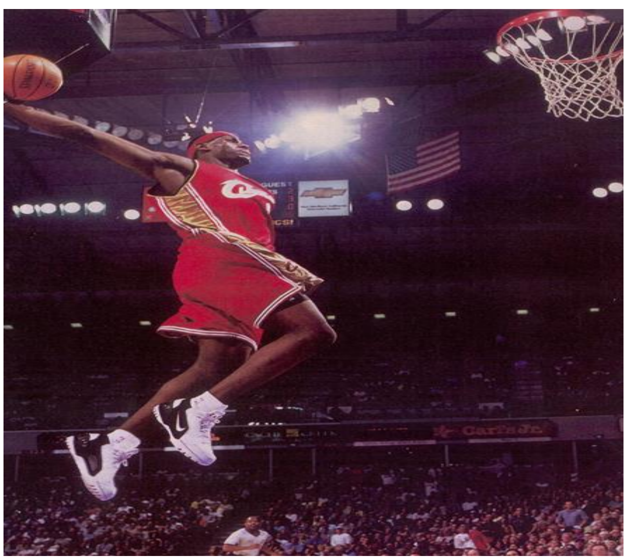


Figure 5 Performance enhancement of the basketball player

Purpose of specification:

The four main purposes of a technical specification document are that it:

- Demonstrates that requirements can be met
- Clearly states any issues or difficulties
- Interprets requirements into instructions for the manufacturing line.

- Provides detail about resources upon which the manufacturing factory might need to collaborate - schemas, sequence diagrams, interfaces, physical resources etc.

1.1.1. CHARACTERISTICS OF SAMPLE PRODUCT

The essential characteristics of a just right sample product are listed as follows:

1. Product should optimally perform its major operate (task).
2. It must be simple to restore at a low repair value.
3. It should be very dependable to make use of.
4. It should observe ideas of aesthetics.
5. It have to be a durable one.
6. It can be simply produced in massive numbers at minimum manufacturing value.
7. It have to be simple to supply and use (handle).
8. It should even be compact.

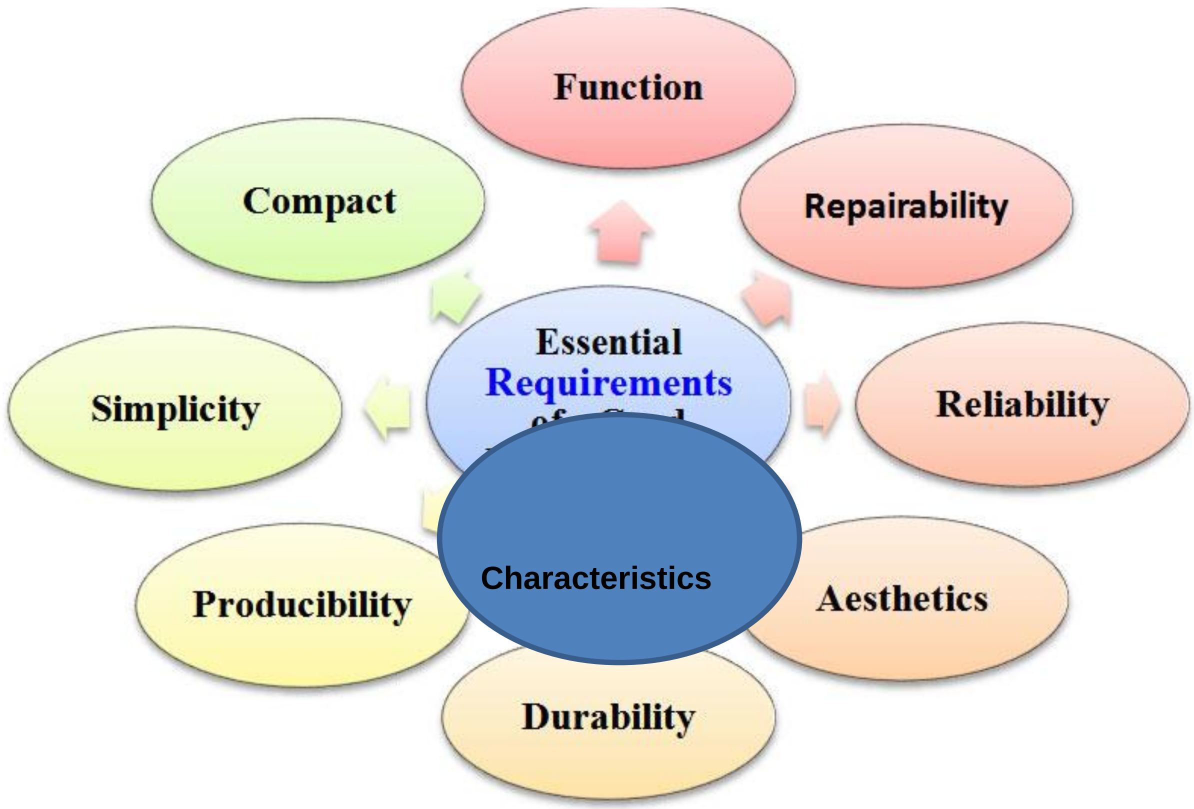


Figure 6 characteristics of sample product

Design and Features:-

The design and feature of the sample in case of footwear can be as per the following:-

1. **.FLEXIBLETY**

2. **COMFORTABILITY**

3. **DURABILITY**

4. **PURPOSE ORIENTED** – The design should be purpose oriented as different types of shoe for different activities. Now lots of brands are making multipurpose shoes also.
5. **MATERIAL** - There should be specific and good material used.

6. **LIGHT WEIGHT** – Lightweight product will provide easy walking and longtime wearing to the wearer.
7. **GRIP** – Because of high instep, lateral height, medial height and back height.

1.1.2. Sample Product Evaluation Procedures

For manufacture the quality and durable product as well as to establish the brand value, it is necessary that the product should be technically sound. So the sample Evaluation is important, by which we come to know about the appearance; the internal technicalities like materials, patterns, measurements etc. and the test report to make it durable.

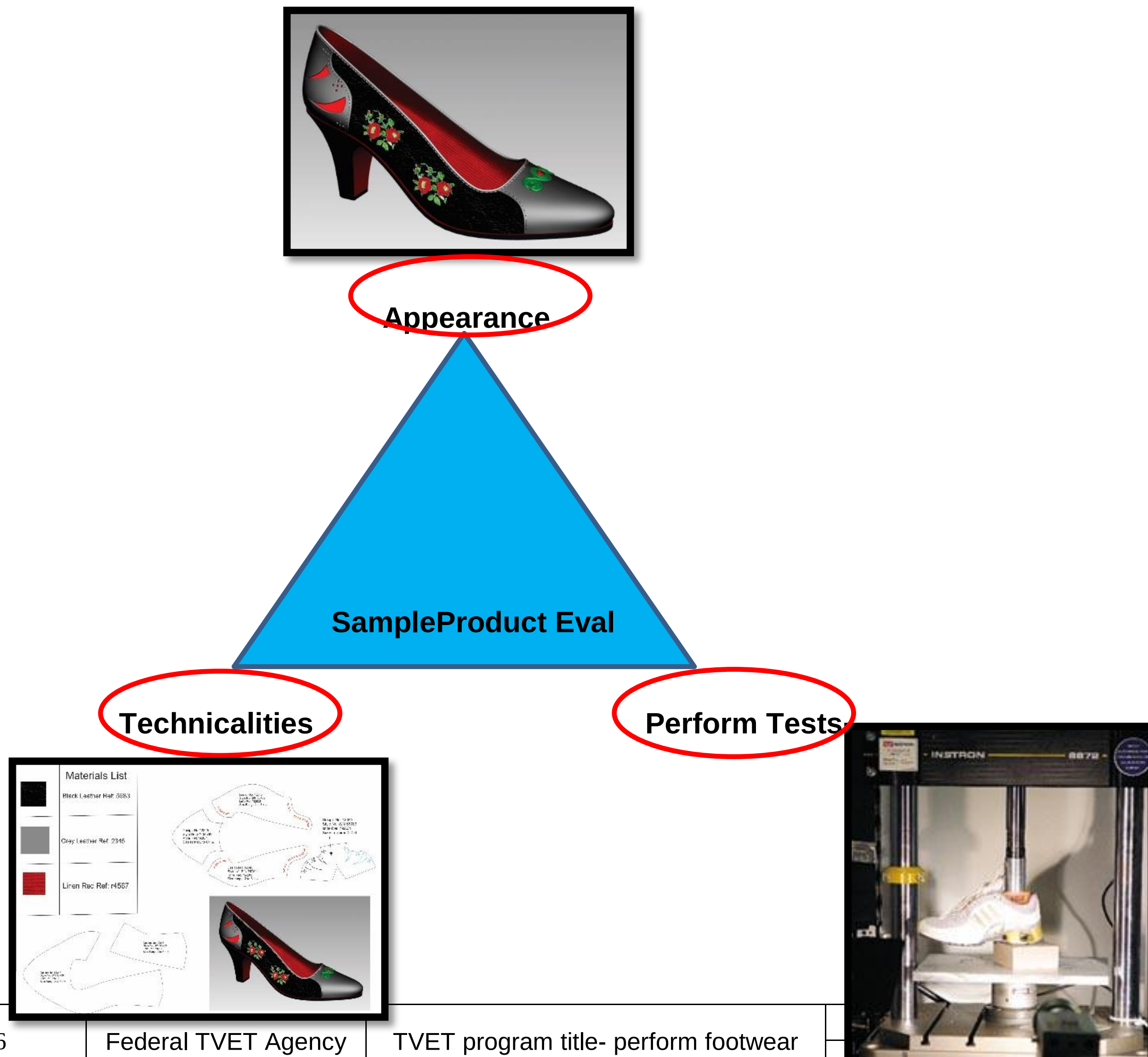


Figure 7 sample product evaluation procedures

- **EVALUATING BY APPEARANCE**

To evaluate the sample in this category, following points should be taken care of:-

- ✓ The First Look
- ✓ Model Info
- ✓ Last
- ✓ Size
- ✓ Manufacturer Details
- ✓ Season
- ✓ The Color Selection
- ✓ The Material Selection
- ✓ The Sample Analysis as per current Fashion & Trends

Figure 8 appearance evaluation of sample

In appearance category the details can be found out by the Tag Card attached on the samples itself.

- **EVALUATING AS PER TECHNICAL DETAILS**

Following evaluation can be done in the Technical Evaluation category:-

- ✓ The Style lines
- ✓ Design Drawings
- ✓ Pattern Evaluations
- ✓ The Manufacturing Details like-about cutting, stitching, lasting soling etc.

- ✓ Quality & Type of Material
- ✓ The Cost
- ✓ Durability
- ✓ The used Construction Techniques

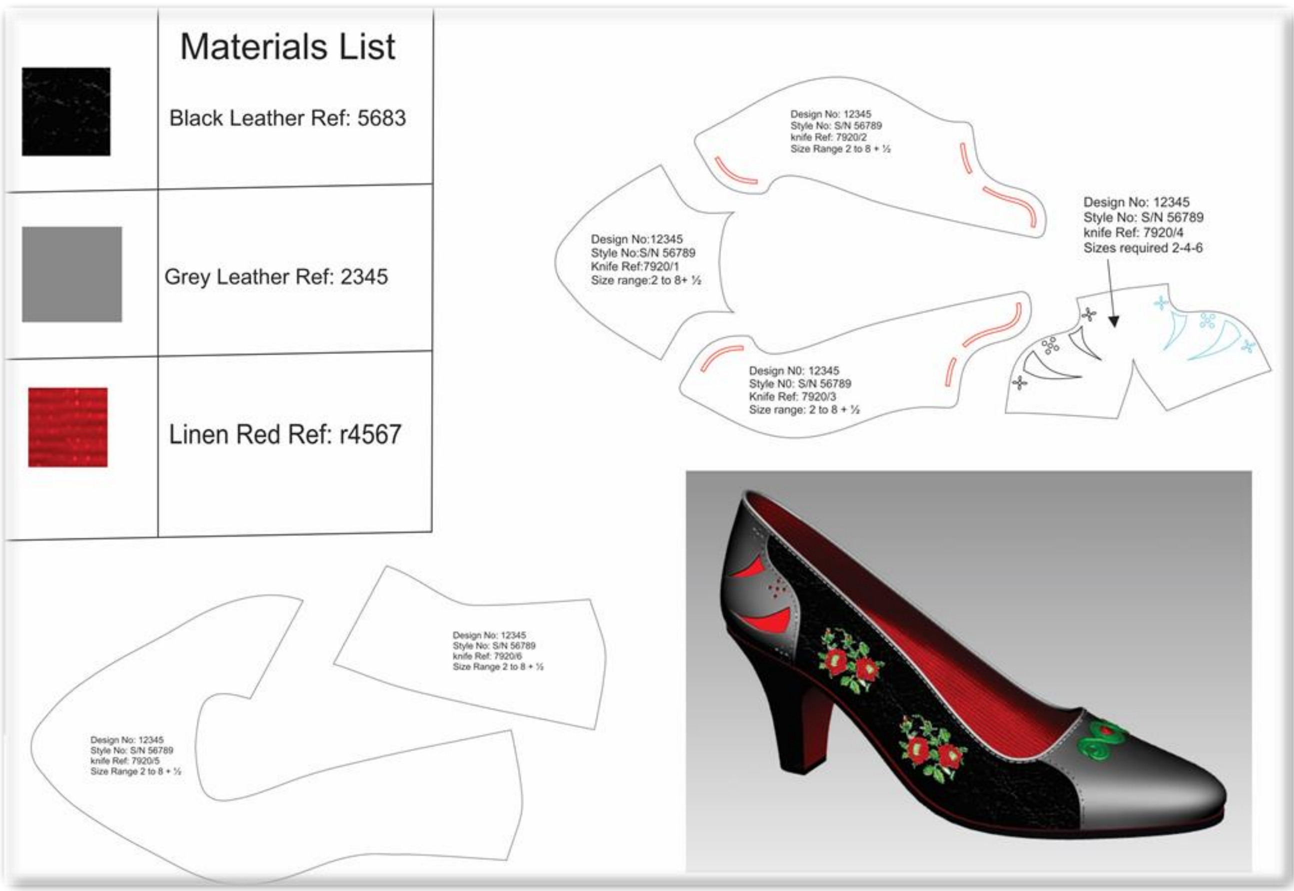


Figure 9 technical evaluation of sample

- **EVALUATING AS PER DIFFERENT TESTS**

Its always better to perform the tests on the samples to know the actual information's about the construction, materials and the quality standards. Following tests can be perform on the sample shoe to get the information.

- ✓ The Flexing Test

- ✓ The Tear Down Test
- ✓ The Rock Test

QUALITY CHECK POINT FOR SAMPLE							
CUSTOMER: DATE:							
SAMPLE ORDER NO.	CUSTOMER REF.			ARTICLE NUMBER		LAST NUMBER	
COLOR	SIZE					QTY	
CATEGORY		MEN/LADIES/CHILDREN		FITTING		CONSTRUCTION	
WALLIA DESIGN REF.:			PL. CHECK AS PER THE SAMPLE REQUIREMENT				
		ATTRIBUTES	Pass	FAIL	COMMENTS		
	1	APPEARNCE					
	a.	Shade matching					
	b.	Grain matching					
	C	Centering					
	D	Back height between pairs					
	E	Quarter top line height between pairs					
	F	Opening of throat					
	G	Vamp length					
	H	Marks on Heel grip/lining					
	I	Mark on upper					
	J	Impression of Toe puff/counter					
	K	Eye let spacing					

	L	**Loose threads**			
	M	**Shank impression**			
	N	**Adhesive marks**			
	O	**Clinching of eyelets/rivets**			
	P	**Equal lace length**			
	Q	**Wrinkles**			
	R	**Over roughing**			
	S	**Sole bonding**			
	T	**Lebels**			
	U	**Sole clean**			
	V	**Size check**			
	W	**Packing**			
	2	**Threads**			
Whether costing sheet & material specification sheet available?					
Checked by			**DISPATCH DATE**		

- ✓ GSM test (if possible)
- ✓ Asker C & Shore A (in case of hardness EVA/Rubber soles)

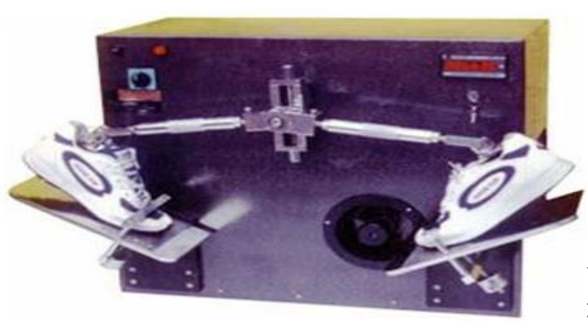


Figure 10 Shoe flexing test is in progress

Figure 11 Hardness tester

Self-Check 1	**Written Test**

Name: _________________________ Date: _______________

Time started: _______________________ Time finished: ____________________

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

Section 1

Fill in the blanks **(1X5 Points)**

1. Specification is a detailed exact statement of __________________.
2. Design identification helps in necessary ____________in production.
3. Cushioning is one of attributes of _____________ specification.
4. Specification interprets requirements into _____________or the manufacturing line.
5. A ________________specification is a method used to document, analyze and explain.

Section 2

True & False **(1X5 Points)**

1. Closed specification is buyer specific.
2. Design specification can also include environmental factors.
3. The main purpose of the specification is not to meet the technical requirement.
4. Design specification uses the environmental factors into consideration

5. Ankle support in footwear is a part of design specification.

Section 3

Short Answers **(2x5=10 Points)**

1. Briefly explain the meaning of specification.
2. What is the process specification?
3. What is the purpose of specification?
4. Why is design specification used?
5. Roughly into how many types can the specification be broken into?

2.1. Sample material or product to confirm specification

2.1.1. Open & closed specification

a) Open Specification:

An open specification is a specification created and controlled in an open and fair process, by an association or a standardization body intending to achieve inter-operability and inter-changeability.

An open specification is not controlled by a single company or individual or by a group with discriminatory membership criteria.

E.g. In the footwear industry the open specifications are those which are normally standardized and can be used by any one inside the industry around the globe.

b) Closed specification:

A closed specification is that which require certain trade name products or proprietary processes. Provisions for alternatives are not included. It is a group representing a particular occupation or craft or the business and / or work in which one engages regularly and may require manual skill.

E.g. In the footwear industry the closed specification are those which pertain to a particular product/article and cannot be used for any other type of unit or article and they can also be buyer specific.

- **Identification of design**

Shoe upper design is very important to be identified prior to proceeding for making specification and for production. Design identification helps in necessary planning and recognizing the facts and figures of production. The whole production team is informed about the related sample and the work allocation is done accordingly. Few of the common shoe designs are as follows:

- Derby,
- Oxford,
- Moccasin,
- Slip-on,
- Sandal
- Court Shoe and

- Boot etc.

Derby: The main visual feature of the derby shoe construction is that, the quarter overlays the vamp or the vamp is fixed under the quarter during stitching. This style of shoe is designed in such a way that throat opening is more and thus enhances the easy insertion of foot in to the shoe. Special lock (derby lock) is provided on the quarter front to enhance the strength of the stitch against frequent opening.

Figure 12 derby

Few variations of derby shoes are:

- Toecap derby,
- Wing cap derby,
- Mudguard derby,
- Brogue derby and
- Monk shoe.

Oxford: The main visual feature of the oxford shoe construction is that the vamp overlays the quarter or the quarter is fixed under the vamp. This style of shoe is designed in such a way that throat opening is less as compared to the other shoes and thus restricts the foot insertion in to the shoe. This type of shoe ensures the user to wear, exact size or even one size up to the normal fitting to feel comfortable during wearing.

Figure 13 oxford

Few variations of oxford shoes are:

- Toecap oxford,
- Wing cap oxford,
- Brogue & semi brogue shoe.

Court Shoe: Low cut design exposing instep and having no additional means of fastening,

Figure 14 court

Sandal: Any open shoe employing straps, thongs, ribbons etc. to form the upper and attachment.

Figure 15 Sandal

Slip-on: Shoe, which has no method of fastening and the foot is merely slipped in to the shoe.

Figure 16 Slip-on

Moccasin: This type of footwear having one-piece sole and vamp with tongue extension insert. The vamp extends under the foot and its upper edges are attached to the apron covering the top of the foot. This type of footwear has heavy wax thread stitching on Apron or plug, which is the front portion. If it is a true moccasin, this is a very comfortable and flexible shoe. This type of shoe is very expensive.

In order to save the upper material, another type of moccasin is made, which aesthetically looks like a genuine moccasin, the changes are made in the bottom portion and the shoe is lasted like any other cement lasted footwear by using the full insole. This is called as mock moccasin.

Figure 17 Moccasin

2.1.2. Sequence of operation:

The first step after the identification of the design is to make a flow chart of the process of manufacturing, which is as below:

a) Lasts and design:

The first requirement in the manufacturing of the footwear is the requirement of the Last**.** The word 'last' is derived from the old Anglo-Saxon word 'laest' which means footprint or foot track. The last determines the fit and feel of the shoe as well as 'wear performance'. It is the 3 dimensional standardization of a human foot.

Lasts used to be made of hardwood, but now are mainly made of plastic as they don't swell or shrink. Metal lasts are used in some manufacturing processes. The design of the last is determined by the shoe manufacturer. Many thousands of people are measured annually to make sure that the lasts produced by the company match the feet of the general population.

A model maker translates specifications into original models - other sizes and widths are graded up or down from the original - holding true to the last shape. Design considerations of the last include: foot movements, manufacturing process, intended population, purpose of footwear and fashion. There are over 30 measurements required in the construction of a modern last. Lasts can be 'straight' or 'curved' (flared) - either in flared or out flared.

Figure 18 Lasts

In the design section, the standard sectional patterns of the shoe are produced for the uppers, linings, insoles, heels, soles, stiffeners, backers and toe puffs by taking the last as the standard form. The lasting allowance is added. After the made patterns are checked for accuracy as per specification, they are then graded for different sizes either manually or by machine. The materials used in making of the shoes are cut from these working patterns.

The temporary dies for manual cutting or the knife dies for machine cutting and the sole moulds for the unit soles or dies for fabrication of sole are then made for the various sizes of the shoe. The dies and moulds are made in-house if the facility is available, majorly it is outsourced.

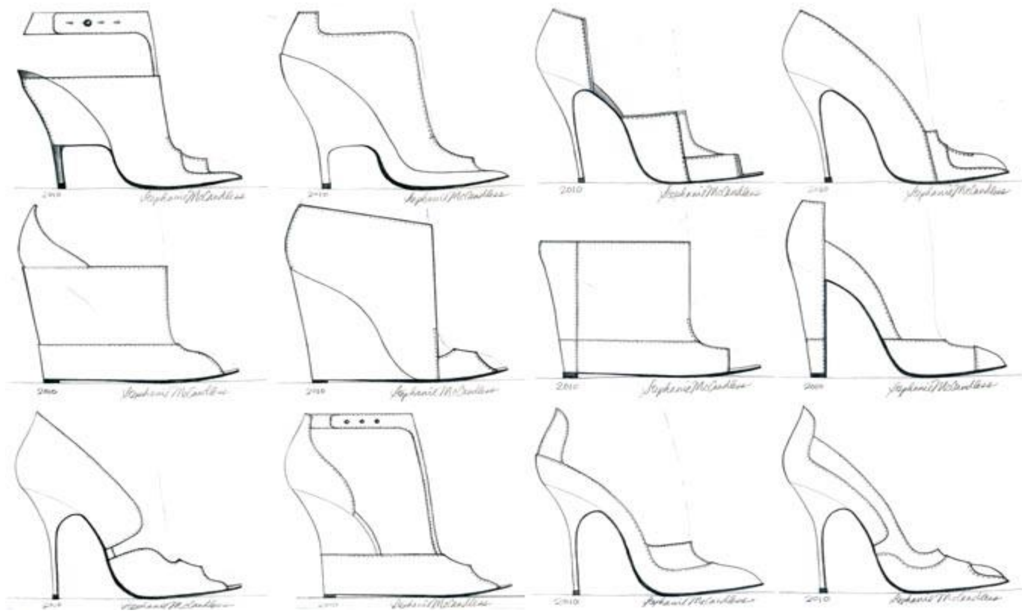


Figure 19 Different designs of shoe

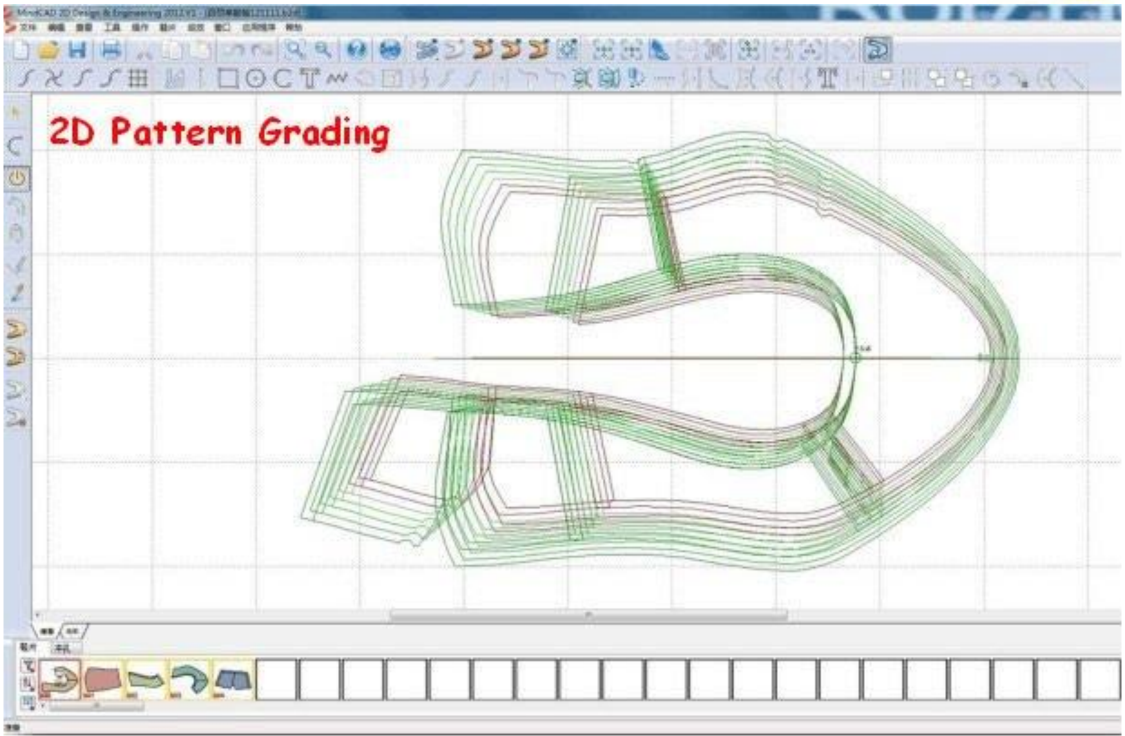


Figure 20 Pattern grading of Vamp portion of a footwear

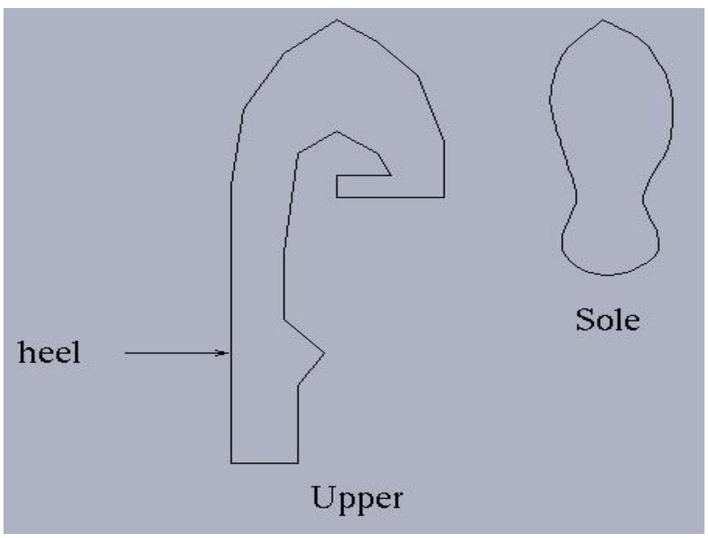


Figure 21 Patterns of a Shoe

b) Cutting**:**

Traditionally called 'clicking', is an art of cutting leather taking care of the nature of the material - grain, blemishes, tightness etc.

The different pattern dies on being made, come to the cutting section. Also in this section the specified leather or synthetic, out of which the footwear is to be made is graded for quality and size and cut as per the optimum cutting norms specification.

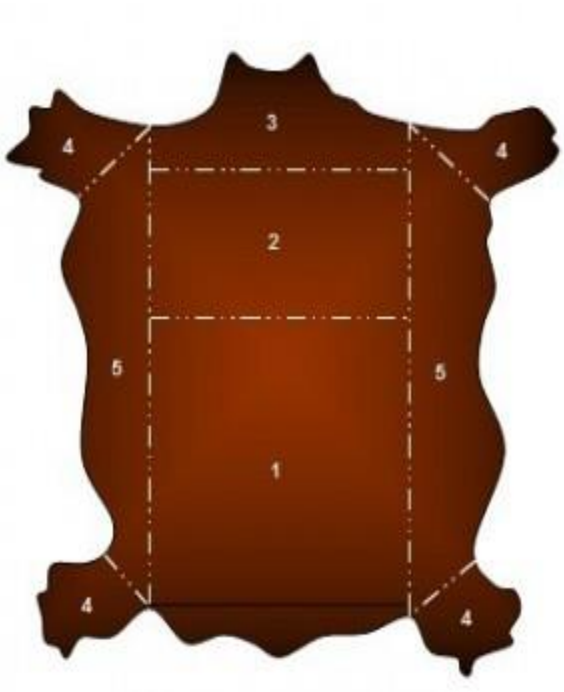
Cutting is done by hand with curved hand knives or with a beam press with shaped press knives to the required pattern.

While cutting the upper, lining or sock material, the cutting section also takes into consideration the direction of the cut of the patterns and other quality aspects. A strict quality control in the department ensures least wastage of the material hence making the product cheaper and competitive.

The cut component of the upper and lining are paired, checked for quality, upper grain matching and colour, stamped for sizes and then dispatched to the stitching or the closing section.

Figure 22 Footwear cutting dies

Figure 23 Swing arm cutting press



1 - Back, the best texture. Used in the toe / shoes wings inside and outside waist.

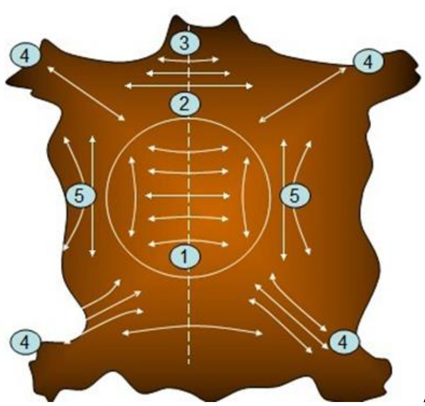
2 - Shoulder texture somewhat less. Used in the toe / shoes wings inside and outside waist.

3- Head, poor texture. Used in areas which are not so visible.

4 - Hooves, poor texture. Used in areas which are not so visible.

5 - Abdomen, poor texture. Used in areas which are not so visible.

Figure 24 the texture of leather material distribution



Arrows showing the direction of stretch

Figure 25 Leather extending direction

c) Closing:

Uppers are counted, checked, matched and marked for identification. They are pierced, punched, embossed or perforated, and then skived, seamed, positioned with linings and sewn. All the aesthetic coverings/modifications to the upper are carried out in this department of the factory

Proper planning is required before feeding the upper components in to the production line to make the final upper. This planning includes:

- Sequence of operations for upper to be made,
- Machine layout
- Work allocation to the operators
- Trial production
- Bottle neck area identification
- Development of various guides and tools and
- Quality control.

The above said points are taken care of by most of the manufacturers and identified as helpful during inline production. Quality and productivity during closing could be obtained by following these measures before going for actual production. Upper making is a process of assembling upper cut component all together by following particular sequences.

The components are attached/stitched one aside another or one over another by zigzag seam, close seam, reverse close seam, lap seam or blind seam as per the specification. During sewing, the component converts from 2 dimension to 3 dimension and finally takes upper shape, which is ready to mould on last. Correct sequence of operation has been required during upper closing & quality standards are maintained according to specification given.

Figure 26 in the closing room, the cut pieces of leather are assembled and stitched

d) Making:

The completed upper and sole are united together to make a complete footwear. The method of construction depends upon the style and purpose of the shoe. Making is basically of two processes:

i) Lasting: It is a process of stretching upper on to last. The upper is stretched over the last and attached at the bottom. Strain is applied at different points on the upper to stretch it on. All the stretch is taken out of leather during lasting, such that the shoe maintains the last shape

The lasting process can be done both by hand and machine.

ii) Attaching the sole**:** There are many different methods for attaching sole to upper e.g. cemented construction, injection moulded, veldschoen construction, machine welted, vulcanized construction, slip lasted construction, machine sewn construction etc.

Figure 27 the shoe is listed on the top sides by a fore-part lasting machine

e) Finishing:

In this department the shoe is given an aesthetic look, made ready for sale in the market. Pairing, cleaning, buffing, application of final stains and liquid or wax polishes, then the shoe is tagged, boxed and it is sent off to the market.

Figure 28 Finishing of the footwear

The manufacturing of a shoe, as can be seen is a complicated process, requiring a combination of art and precision engineering. It requires 100 to 175 different types of operations to make an average shoe. For the purpose of ease, clarity and understanding, it is advisable to make specification sheets of every article before proceeding for production.

2.1.3. Sizing System

A shoe size is a numerical indication of the fitting size of a shoe for a person. Shoe size is represented by length and ball girth.

The length of a foot is commonly defined as the distance between two parallel lines that are perpendicular to the foot and in contact with the most prominent toe and the most prominent part of the heel. Foot length is measured with the subject standing barefoot and the weight of the body equally distributed on both feet.

The size of the left and right foot is often slightly different for many people. In order to choose a shoe size, both feet should be measured and then the shoe size should be chosen based on the larger foot.

Each shoe is suitable for a small interval of foot lengths. The length of the inner cavity of a shoe must typically be 1520 mm longer than the length of the foot, but this relation varies between different types of shoes.

There are three characteristic lengths that a shoe-size system can refer to:

i) The average length of foot for which a shoe is suitable.

ii) The length of the inner cavity of the shoe. This measure has the advantage that it can be measured easily on the finished product.

iii) The length of the last, the foot-shaped template over which the shoe is manufactured.

All these measures differ substantially from each other for the same shoe

Several shoe-size systems are used today worldwide. In some regions, it is even customary to use different shoe-size systems for different types of shoes (e.g., men's, women's, children's, sport or safety shoes).

Some common sizing systems used worldwide are listed below:

- English Sizing System

- French Sizing System also called Paris Point System
- American Sizing System
- Mondo point

a) English Sizing System:

Inches	(Foot
1	**0**
2	
3	
4	
5	**1**
	2
	3
6	**4**
	5
	6
7	**7**
	8
	9
8	**10**
	11
	12
9	**13**
	1
	2
10	**3**
	4
	5
11	**6**
	7
	8

12	**9**	
	10	
	11	

The length scale for English sizes commences with size 0 which is 4 inches long, and progresses 3 full sizes or 6 half sizes to the inch until size 13-1/2 is reached, here the numbering recommences, the next size being size 1 and continuing to include the largest sizes.

The smaller size scale size 0 to 13-1/2 measures from 4 inches to 8 3/6 inches and the larger scale size 1 to 12 measures from 8-2/3 inches to 12-1/3 inches.

The English Size Scale

1. The English size stick begins with zero at 4 inches.
2. It advances by one-third inch per size.
3. Half sizes are one sixth of an inch.
4. Children's sizes run to 13-1/2.
5. Adult sizes recommended at 1.

Examples

A child's size 9 is 7 inches.

A boy's size 2 is 9 inches.

A man's or women's size 5 is 1 0 inches.

A size 8 is 11 inches.

These are basic measurements

b) French Size Scale (Paris Points)

The French size Scale (or Paris Points) is related to the C.G.S Measurement system.

French sizes are calculated on a scale of 3 sizes to 2 centimeters. There are no half sizes.

The first size begins with the first centimeter and progresses consecutively down the scale. By referring to the English size Scale and The French size scale a comparison can be made.

Approximate equivalent French and English sizes are:

English child's 10 = French 28

English girl's 1 = French 33

English woman's 5 = French 38

English man's 8 = French 42

French Paris
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3
4
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6
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Centime
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c) USA Size Scale:

This scale is identical to The UK scale except that it starts at 3-11/12 instead of 4.

Marking

USA sizes on ladies shoes are often shown multiplied by 10, e.g. 6-1/2=65.

Ladies Sizes as an example:

ENGLISH	5
AMERICAN	6-1/2(65)
FRENCH (CONTINENTAL)	38

Width markings

It is common practice to indicate the width of a shoe by a letter or a number. The exact notation is decided upon by the individual manufacturer.

The UK, USA and Continental basic scales.

1
2
3
4
5
6
7
8
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11
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UK

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d) Mondo point Systems:

The Mondo point system is the same as measuring the foot (not the shoe) in Millimeters (or millimeters, mm.). However, some companies treat Mondo point as Centimeters (Centimetres, cm.). So a shoe may be labeled either 240 (mm) or 24 (cm) if it is designed for a foot that is 240 millimeters long (including some wiggle room for socks). One can see Mondo point sizes with two numbers separated by a slash, e.g. 240/95. The second number is the width of the foot in millimeters.

Closing operation detail

Manufacturing leather uppers involves preparation, stitching and finishing operations. They consist of a relatively large number of short operations ranging from visual inspection at a bench to assembling the various components on a stitching machine. In terms of work content, stitching is usually the most important of the three types of operations involved in upper manufacture. Usually, a greater proportion of the workforce is engaged in stitching than in any other activity. Even in its most capital-intensive form, stitching is still a labor-intensive process.

Upper closing cannot be done properly, if right sequences of operation are not considered as per the design and need. Processes that are considered to be complicated are needed to be broken down in to smaller work contents for easy outcome during production. Sequences of the operations are the process of assembling the upper cut components in such a way, that their productivity and quality can be maintained.

During production, the capacity loading requires certain basic calculation, and correct operation sequence is one of them. Operation sequences are designed prior to the feeding of the upper cut components in to the production conveyor.

The sequence of operations is based on the following:

- Type of design
- Material type

- Machine, tools and equipment
- Number of components of upper
- Edge and top line treatments
- Different seams
- Eyeleting and
- Ornamentations.

Sequence of operations is designed in following ways:

- Splitting (as per the required thickness),
- Fusing (if required),
- Crimping (if required),
- Stamping,
- Checking and marking of cut components,
- Edge colour (raw edge treatment) as per specification given,
- Skiving,

The above operations of sequences are common for most of the leather uppers and may be done separately in preparation department apart to the upper closing room, which may have separate entity in footwear industry. It depends on the space available for the merging of two similar departments together or required individual existence.

For the purpose of simplicity an example of the sequence of operation in the closing room has been shown in the form of a diagram

The Figure shows an example of the sequence of operations necessary to produce uppers for an elaborate style of men's leather upper.

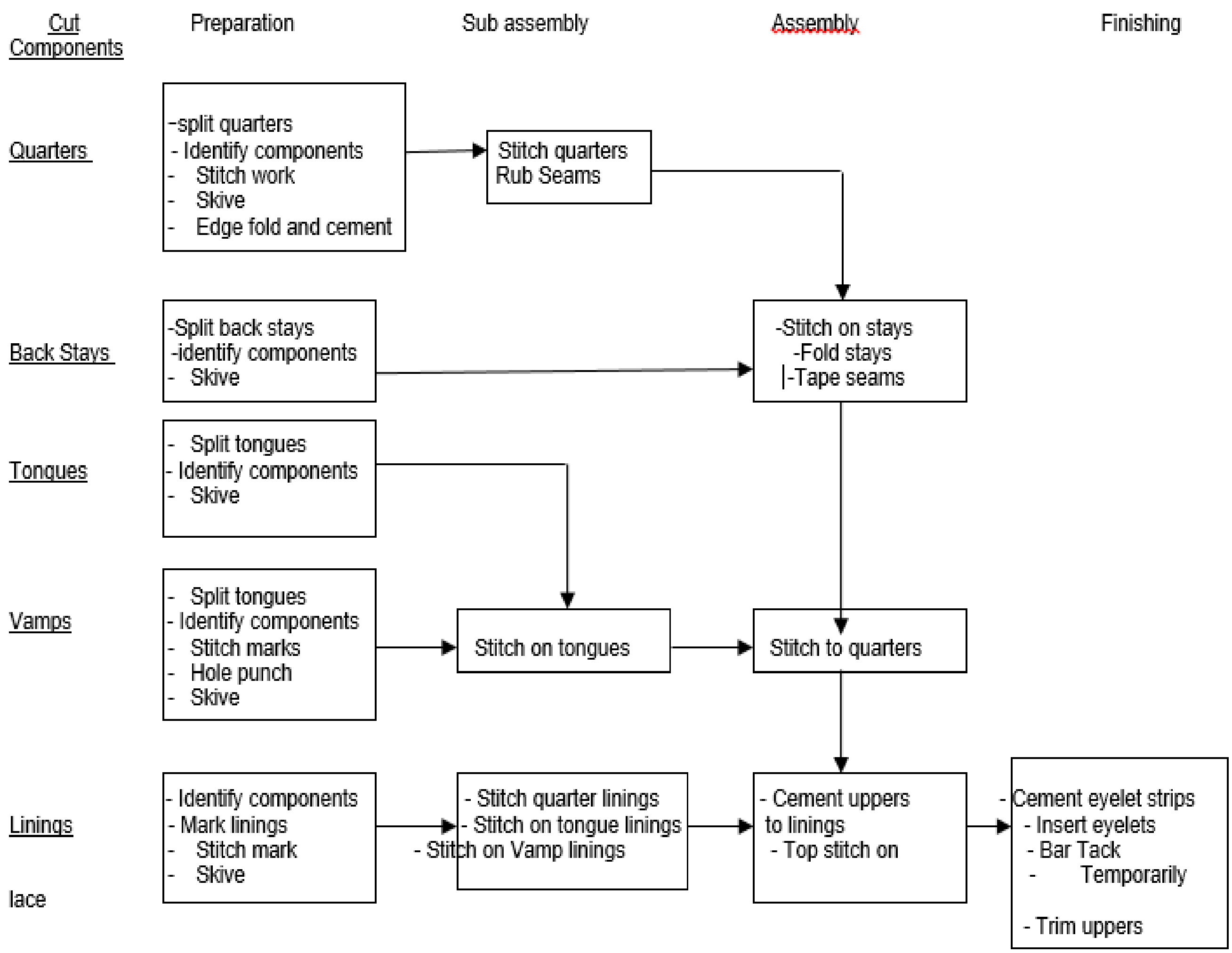


Figure 29 Sequence of operations necessary to produce uppers for an elaborate style of men's leather upper

The sequence of operations required to prepare components prior to stitching and finishing may vary widely from style to style. In large factories, each type of work may be carried out in a separate department and, sometimes, stitching of different types of upper is divided between a numbers of departments. If the lot, or batch, sizes of components were very large, each operation shown in the figure above may need to be performed on a separate machine. On the other hand, small enterprises may carry out many of the stitching operations on a single machine.

i) Leather splitting: Cut leather components that are thicker than required or have uneven thickness due to loose flesh adhering to their underside can be split on a band knife machine. The whole area of the component is reduced to the pre-set thickness.

ii) Lining marking: It is common for details of each pair of shoes to be marked on the uppers. Marking helps identify pairs of shoes at subsequent stages of manufacture, and facilitates the ordering of repeats by trade customers. Details usually include style number, size, width fitting and last number. On unlined shoes, the information is sometimes printed on top of the tongue, but in the majority of cases it is marked on the quarter linings.

iii) Hole punching: Some leather upper design styles require decorative perforations round the edge of toe caps. Hole patterns are also often cut on the forepart of children's sandals. The manual punching tools or hole punching machines may be used for hole punching.

iv) Sock embossing: Brand names and trademarks are usually embossed onto the plastic coated fabric or thin leather socks that are cemented over the seat or the whole of the insole once the sole has been lasted. Normally, gold colored or silver foiled plastic foil is used for this transfer process although, in the past, the discoloring action of a heated die was sometimes used to produce a contrast on leather socks.

v) Skiving: Skiving is the term used to describe the tapering required on the flesh side of some edges of upper components. On fabric backed materials, it may be necessary to skive the top rather than the flesh surface. The objectives of this important operation are to permit easy assembly, good appearance and wearer comfort. Skiving machines are available for the purpose.

vi) Edge folding and cementing: This operation either manually or by machine may be carried out on unassembled components or on partly stitched uppers. Several methods of folding over and cementing down the top lines of uppers are available.

vii) Upper stitching: Stitching may be carried out by hand or by stitching machines. However, manual stitching is rarely used in the construction of uppers except in the stitching of moccasins for the production of decorative effects. Generally stitching machines are employed for the reason that the machines are extremely productive. Most stitching machines produce lock stitches which have a top thread fed by the needle and a bottom thread fed from a bobbin. The lock between the top and the bottom threads should be concealed within the material. Chain stitches only require a top thread, but it unravels if the thread breaks.

Stitched seams can be produced on components with edges cut to matching or different contours when flat. When the contours do not match, stitching them together produces assemblies with seams curved in three dimensions at once. This reduces the amount of curvature that it is necessary to impart during lasting.

Machines having flat beds are used for a wide range of work, such as stitching in eyelet reinforcing strips and other work that can easily be stitched on a flat surface.

In post bed machines, the bobbin is located at the top of a vertical post below the needle. The small working platform at the top of the post enables sprung seams to be constructed more easily than on flat bed machines, since the material can hang down clear of the area being stitched. Machines are available with a choice of the post located to the left or right of the needle.

The various other machines used in the closing department with their performance operations are given as below:

Table 1 Brief description of some machines suitable for stitching uppers

Operations	Description
Under edge trimming of top lines	Single (needle) , post (bed), roller (presser)
Zig zag	Single, flat, roller
Barring machine	Single, cylinder. (arm), barring tack set up
Flat binding	Single, cylinder., tape feed with binder
Back strapping	Single, post, for non-parallel back straps
Cording (raised seam)	Twin, flat, roller with air cording attachments
Repairs machine (treadle Powered)	Often purchased second hand
French binding	Single, post, roller with guide, top tape drum and pad needle plate
Close row (1.5mm.) stitching	Twin, flat, roller
rowing back seams of leather lining	Twin, flat, with row modification
Intermediate operations,	Single, post, roller
For heavy (up to 8 cord) decorative stitching	Single, cylinder., roller
Intermediate operations (lighter)	Single, flat, roller, auto-underbed trimming and needle control
Intermediate operations (lighter)	Single, flat, roller (simple machine)

viii) <u>Moccasin seams</u>: Moccasin seams are variants of open seams and are most often used to attach moccasin aprons to their vamp wings. They may be formed on an arm-type coarse stitching machine or by hand. Covered moccasin seams, in which the edge of the apron is doubled over the vamp, are more weather-proof than open seams, but hand stitching of the latter takes less than half as much time as on the former. Often, outworkers carry out hand stitching. Where it is carried out in-house, the operation can be simply mechanized without losing the hand-finished appearance

(xi) Stitching aids: Stitching machine attachments and work guides can be inexpensive substitutes for operator training and experience in the achievement of high standards of accuracy and levels of output. Some types of aids are listed below:

a) Work guides: - Adjustable guide and presser foot for running on French bindings.

- Adjustable roller edge guide consisting of a short round vertical steel peg attached to the table for control of the overlap width on lapped seams. These guide stout leather better than soft leather.
- Presser foot and guide to aid the insertion of zips using twin needle machines

b) Needle threaders: Can be fitted to a wide variety of stitching machines

c) Holding aids: Clamps to hold work during such operations as decorative stitching and tongue attaching.

d) General aids: - Under edge trimming knives for cutting off excess lining material during top line stitching.

- Thread break detector which stops the stitcher after a break and when the bobbin runs out.
- Device for lowering clamp, starting machine and lifting clamp During semi-automatic tongue attaching work.

xii) Stitched upper finishing: Between stitching operations, and after stitching is completed, it is usually necessary to perform several additional operations in order to prepare uppers for the lasting stage. These operations are briefly described below:

a) Seam reducing: The first operation is seam reducing. It involves cutting down the bulk of stitched back seams by removing the excess material on the seam and then flattening what is left under pressure. These two operations are separated when performed manually. They are on the other hand combined when performed by special purpose seam reducing machines.
b) Taping: As an alternative to a stitched silked seam, woven tape or paper tape can be cemented to the inside of the closed back seam either with the aid of a special purpose machine or by hand.
c) Eyelet Reinforcing: Eyelet reinforcements can be stitched into uppers
d) Punching and Eyelet Insertion: There are wide varieties of techniques available for the punching of eyelet holes and the insertion and clinching of metal eyelets.
e) Temporary lacing: This operation can be carried out by machine or by hand. Temporary laces are tied through the eyelets on lacing shoes so that the uppers maintain their shape during lasting. When casual styles of shoe have elastic gussets rather than laces, fabric tabs are sewn in at the same time as the gussets. The tabs are cut out after lasting.
f) General fitting and puff attaching: When toe puffs are assembled to the upper at this stage rather than during lasting, they may be attached with the help of a mechanical cement applicator or by hand. Decorative trims may be stapled or stuck on after lasting to reduce the risk of their being damaged.
g) Upper trimming: The final trimming of loose threads from the uppers is carried out by hand with scissors. Although a flame is sometimes used to burn off threads, no powered machine is available for this operation. Where the lasting allowance on uppers requires cementing prior to lasting, the cement can be

applied by brush or with the aid of an automatic supply unit. If hot melt adhesives are used for cement lasting this operation is unnecessary. Linings and toe puff edges usually require trimming back to expose the lasting margin or allowance of the upper

2.1.4. Work method (in house production, full or partial outsourcing, work transportation)

There are different methodologies by means of which the work can be done in an organization. The product can be made in-house, or it can be outsourced partially or fully depending on the fact whether the manufacturing facility has enough capacity for production, or enough resources namely manpower, material, finance, capacity and area.

a) In house production-

An organization whose production is existing, originating, or carried on within the group or organization or its facilities is called an in-house production. When an owner of the company decides to go for an in house production he has to take into consideration all the investments he has to undergo in terms of man, machine, capital, material. The entire production cycle is monitored strictly and rigorously to achieve high quality standards

b) Out sourcing either partially or fully-

Outsourcing is any task, operation, job or process that could be performed by employees within an organization, but is instead contracted to a third party for a significant period of time. In addition, the functions that are performed by the third party can be performed on-site or off-site. Hiring a temporary employee while any other staff is on a special leave is not outsourcing. Out sourcing can be done within the country or off shoring.

Sometimes the labour intensive operation in the work sequence may be partially outsourced and the rest of the work is done in house in order to keep a tight control on the quality and costs. Moreover in the manufacturing countries the purchase order is given to those industries that show their in-house manufacturing facilities. Partial outsourcing is also done if the manufacturing plant capacity is not very high and the delivery period is very short. These are some of the reasons of partial outsourcing by the manufacturing facility.

The most common model of outsourcing that is in the news today refers to jobs that are being sent overseas to different countries across. This is more commonly called off shoring.

There are many reasons why a company may choose to outsource a particular function of their business. Most have the end-result-in-mind that they are going to save time and/or money. Other reasons include:

- **Resource Shortages Relieved by Outsourcing**

A particularly strong reason to outsource involves a shortage of a critical resource. This can be available employees that possess knowledge in a certain area, availability of raw material and a labor force at a level and price that will offset the cost of higher prices alternatives.

- **Outsourcing Provides the Ability to Concentrate On the Core Business**

Some necessary, but peripheral operations are outsourced most frequently. This gives the managers the ability to concentrate on the core business issues instead of getting distracted by required, yet minor matters. A good example is the factories that outsource its security operations to a third party company specializing in security.

- **Outsourcing Yields Cost Savings**

The prices of labor and/or materials keep increasing and competition keeps forcing prices lower. If there is an outsourcing solution that can save your company money and overcomes the disadvantages of outsourcing, these areas should be investigated.

- **Outsourcing Provides Flexibility**

Seasonal or cyclical demands that ebb-and-flow put varying demands on the resources of the company. An outsourcing contract could provide the flexibility needed to stabilize these varying demands. Example: A business brings in extra accountants during tax season and when being audited by the holding company that owns the business.

- **Reduce Overhead Costs through Outsourcing**

Some functions require a large outlay of money just to get started. This expenditure could be avoided by contracting with a third party.

- **Continuity & Risk Management**

Periods of high employee turnover will add uncertainty and inconsistency to the operations. Outsourcing will provided a level of continuity to the company while reducing the risk that a substandard level of operation would bring to the company.

Example: The human resource manager is on an extended medical leave and the two administrative assistants leave for new jobs in a very short period of time. Outsourcing the human resource function would reduce the risk and allow the company to keep operating.

- **Develop Internal Staff**

A large project needs to be undertaken that requires skills that your staff does not possess. On-site outsourcing of the project will bring people with the skills you need into your company. Your people can work alongside of them to acquire the new skill set.

Disadvantages of outsourcing:

- **Loss of Managerial Control**

Whether a contract is signed to have another company perform the function of an entire department or single task, turning the management and control of that function over to another company. Though there is a presence of s contract, yet the managerial control will belong to another company. The outsourcing company will not be driven by the same standards and mission that drives the company. They will be driven to make a profit from the services that they are providing to the businesses.

- **Hidden Costs**

A contract is signed with the outsourcing company that will cover the details of the service that they will be providing. Anything not covered in the contract will be the basis for you to pay additional charges. Additionally, An additional legal fees is experienced to retain a lawyer to review the contacts signed.

- **Threat to Security and Confidentiality**

The life-blood of any business is the information that keeps it running. The payroll, medical records or any other confidential information that will be transmitted to the outsourcing company, will create a risk that the confidentiality may be compromised. If the outsourced function involves sharing proprietary, company data or knowledge (e.g. product drawings, formulas, etc.), then this must also be taken into account. Evaluation of the outsourcing company should be done carefully to make sure that the data is protected and the contract has a penalty clause if an incident occurs.

- **Quality Problems**

The outsourcing company will be motivated by profit. Since the contract will fix the price, the only way for them to increase profit will be to decrease expenses. As long as they meet the conditions of the contract, payment is done. In addition, the ability to rapidly respond to changes in the business environment is lost. The contract will be very specific and extra payment has to be done for changes.

- **Tied to the Financial Well-Being of another Company**

Since part of the operations of the business is turned over to another company, the business is now tied to the financial well-being of that company. It wouldn't be the first time that an outsourcing company could go bankrupt.

- **Bad Publicity and ill-Will**

The word "outsourcing" brings to mind different things to different people. If you live in a community that has an outsourcing company and they employ your friends and neighbors, outsourcing is good. If your friends and neighbors lost their jobs because they were shipped across the state, across the country or across the world, outsourcing will bring bad publicity. If you outsource part of your operations, morale may suffer in the remaining work force.

c) Work Transportation

For high production units material flow from one workstation to another is very important as this takes lot of time and can disturb the desired output if the material is not feeded on time at different work stations. Various methods are adopted by production units to transport the material to different workstations. Material handling is important to control the production.

Raw material, semi-finished, work in progress or finished products can be transported by bins, trolleys or conveyors to various locations in the factory. Production units adopt any of these methods as per the capacity of the factories, which they find most suitable to transport the material. These transportation techniques have their own advantages and disadvantages.

The main methods of transportation are as follows:

i) Basket/Bins
ii) Trolleys
iii) Transporters
iv) Conveyors

I. Basket/Bins

In this method basket or bins are used to move the material from one workstation to another. Batch of 10 –12 pairs are put in one basket. A full time feeder is required to move the basket to different workstations that collect the basket from the operator when he finishes his operation and then move it to another operator for the next operation or the operator himself will pass on the basket to the other worker on completion of his work. The salient points of this system are:

- Manual transportation process
- Machinery can be in any order. However, it is best to have some sort of sequence
- A place should be allocated for basket storage.
- The batch size of preferably 10-12 pairs determines the basket size.
- Baskets are inexpensive.
- More than one style can be in progress at the same time.
- Work can be split, e.g. in a footwear stitching section, the linings and outsides can be sent to different operators within the section and they can be re- joined at another operation.

- Requires a high work in progress. Work in progress means the total no. of pairs on the floor, at the end of a normal working day.
- Baskets are heavy to carry around (depending upon the lot size). Both supervisor and the operators become tired by the end of the day.
- It is easy for the work to become lost if it is a complicated job as operators can hide a basket of work under an easier job and keep on working by placing other baskets on top of it, as a result of which, it never moves or progresses through the section, creating production sequence shortages.
- Baskets can have ribbons attached or the rim can be painted in different colors to denote the production sequence.

  e.g. Colors day planning for production sequence:

Table 2 colors day planning

Mon	Tues	Wed	Thurs	Fri	Sat
Black	Red	Green	Blue	Brown	Yellow

II. Trolleys

In this system trolleys of different sizes are used to move the upper to different workstation. Trolley is easier to move in the shop floor and can contain several trays.

A batch of 10 to 12 pairs is put in each tray. Trolleys are moved to different workstation after the completion of work at one work station. Each trolley will hold uppers of one style only. The salient points of this system are:

- The trolley is approximately: 1" Wide x 2" Long, 4" deep trays, 6" between trays, 3 trays per trolley. This gives space for 10- 12 pairs/ tray= 30- 36 pairs per trolley. Hence, 28 trolleys are required for a day's work of 1000 pairs.
- A colored card identifies the day's work in daily sequence as per the basket system.
- The machinery and manual workstation should be placed in clusters to avoid back tracking. Although with some designs, it is almost impossible to avoid back- tracking.
- The cluster areas should be marked out on the floor leaving enough room for trolley storage. Signs can also be hung from the ceiling.

- The footwear being processed should have a sequence card made for each individual style. This is placed on the side of each trolley. Only that style of footwear could be loaded on that particular trolley.
- Handling frequency is less than that of the basket system, with the operator completing 30- 36 pairs before the trolley is moved on.

III. Transporters

Material handling requires too much of manual movement which cause too much wastage of time and loss of production. To overcome the difficulty in handling of the goods gravity conveyor or motorized/powered conveyors are now commonly used in many factories. Material can be moved from zone to zone under the gravity flow or through a powered conveyor.

- **Gravity Transporter**

It is an economical and efficient means of transporting product where power is not required. It can be easily installed, dismantled and relocated. Material is moved from zone to zone or workstation-to-workstation under gravity flow by manual push. Such conveyors are useful in upper section or packing section in shoe factory.Gravity conveyors can have skate wheel or roller to convey the good to different location under the gravity flow. These conveyors can have curve shapes as well to suit the production requirement. These conveyors can be engineered to carry light, medium and heavy weight and can have variety of length and width.

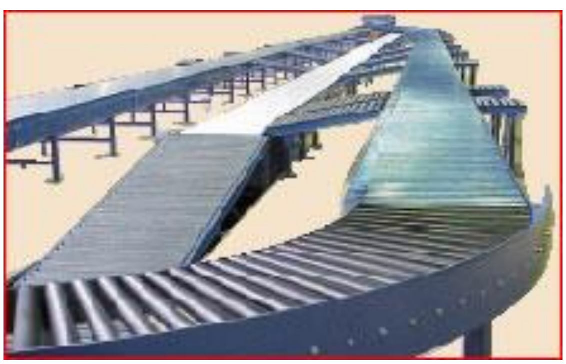


Figure 30 Gravity roller conveyor

Figure 31 Gravity skate wheel conveyor

In closing section of the footwear manufacturing such conveyor can be classified as Feeder-Operator-Operator as feeder just feeds the work initially then operator himself moves the work by manual push to next operator after completion of the work.

- **Motorized Transporter**

Such transporter requires power driven roller or belt. This type of conveyor can handle heavier load and can be driven at various speed. These roller and belts also provides a solid surface for people working with products helping to improve efficiency. Such conveyor can also move products up an incline, delivering reliable transportation between different conveying elevations. This type of transporter in the closing section of the footwear manufacturing, requires a full time feeder who feeds the work to different operators and receive the finished work from them through the powered belt.

The basic system of a motorized transporter consists of a conveyor belt used in the transferring of the boxes from the dispatching point to the workstations and a series of work stations situated on either side of the conveyor belt whose distance in between, is determined by the size of the work tables as well as the size of the boxes.

IV. Shoe conveyor

Figure 32 A mechanized footwear conveyor

The conveyor is majorly used in the lasting section of the footwear manufacturing process. It provides a systematic production process. Apart from improving skill, quality, production, it also saves time. It requires a minimum space to avoid over crowd on the production floor. Minimum maintenance is required. Better lighting and air pipe distribution system is present on the Y bars.

Modular Systems are other systems of transportation. Popular in this are the Just in time or JIT and Kanban system.

Just-In-time manufacturing, or JIT, is a management philosophy aimed at eliminating manufacturing wastes by producing only the right amount and combination of parts at the right place at the right time. This is based on the fact that wastes result from any activity that adds cost without adding value to the product, such as transferring of inventories from one place to another or even the mere act of storing them.

The goal of JIT, therefore, is to minimize the presence of non-value-adding operations and non-moving inventories in the production line. This will result in shorter throughput times, better on-time delivery performance, higher equipment utilization, lesser space requirement, lower costs, and greater profits.

Kanban systems are often associated with JIT implementation. In fact, some people have the impression that JIT requires the use of a Kanban system. Having a Kanban system is not a strict requirement of JIT implementation, but its use as a tool for practicing JIT has become quite popular owing to its simplicity.

The Japanese refer to Kanban as a simple parts-movement system that depends on cards and boxes/containers to take parts from one workstation to another on a production line. Kanban stands for Kan- card, Ban-signal. The essence of the Kanban concept is that a supplier or the warehouse should only deliver components to the production line as and when they are needed, so that there is no storage in the production area. Within this system, workstations located along production lines only produce/deliver desired components when they receive a card and an empty container, indicating that more parts will be needed in production. In case of line interruptions, each workstation will only produce enough components to fill the container and then stop.

In addition, Kanban limits the amount of inventory in the process by acting as an authorization to produce more inventories. Since Kanban is a chain process in which orders flow from one process to another, the production or delivery of components are pulled to the production line. In contrast to the traditional forecast oriented method where parts are pushed to the line

There are two main types of Kanban (some other variations are also used):

(i) Production Kanban (P-Kanban): signals the need to produce more parts.

(ii) Conveyance Kanban (C-Kanban): signals the need to deliver more parts to the next work center (also called a “move Kanban” or a “withdrawal Kanban”).

- **Motion and Time**
    - ✓ **Motion Study**

The analysis of an operation or a set of operations arranged sequentially for the attainment of the end objective is carried out in terms of the individual motions of a worker as well as his work place layout and ergonomics for the attainment of the highest level of productivity is known as motion analysis.

The purpose of the motion analysis is to design an improved method which eliminates unnecessary motions and employs human efforts more productively.

The objective is also to cause minimum fatigue to the operators and at the same time obtain maximum productivity from them.

The steps of motion analysis are as below:

a) Select the operation to be studied

b) List and chart various motions performed by the operator

c) Identify the productive and idle motions. Separate them out. Also identify the complex motions which are difficult to perform.

d) Eliminate the non-productive and unnecessary motions. Simplify the complex motions. Standardize the activities as far as possible.

e) Redesign the existing operating procedure by employing the minimum number of motions in the most appropriate sequence and in accordance with the principle of the motion economy.

f) Impart necessary instructions to the worker so that he develops a proper habit cycle in performing the repetitive jobs, so that the execution of these jobs happen automatically with lesser stress or fatigue and with better accuracy and speed.

g) Check once again the procedure in the light of point (e)

h) The procedure should now to be standardized.

- ✓ **Time Study**

Time Study is also known as work measurement.

Time study is a direct and continuous observation of a task, using a timekeeping device (e.g., decimal minute stopwatch, computer-assisted electronic stopwatch, and videotape camera) to record the time taken to accomplish a task and it is often used when:

- There are repetitive work cycles of short to long duration,

- Wide variety of dissimilar work is performed, or
- Process control elements constitute a part of the cycle.

The objectives or the advantages of work measurement are as follows:

- It determines the time required to do the job
- Compares the alternative methods and establishes the fastest method
- Decides manpower required for the job
- Decides equipment required
- Provides information for effective production planning and maintenance procedure
- Aids at calculating exact delivery dates
- Decides realistic labour budgeting
- Provides basis for standard costing system
- Provides a basis for a fair and sound incentive scheme
- Results in effective labour control

✓ **Work Standard**

Based on the above mentioned motion study and the time study, work standard for the process of manufacturing is now defined.

Work Standard basically means the number of man-hours allocated for the completion of a specific task.

A work standard is a written description of how a process should be done. It guides consistent execution. At its best, it documents a current "best practice" and ensures that it is implemented throughout a company. At a minimum, it provides a baseline from which a better approach can be developed.

Standards are an essential requirement for any company seeking to continuously improve. All continuous improvement methods leverage learning to get better results from their business efforts. Standards provide the baseline references that are necessary for learning. A standard operating procedure supplies a stable platform for collecting performance measurements. The standard and its profile of performance yields the information people need to uncover improvement opportunities, make and measure improvements, and extract learning.

In manufacturing some of the work standards documents required are as follows:

- Work Instructions
- Operation drawings
- Operation Instruction Sheets
- Process condition sheets
- Quality Control sheets
- Tooling layout drawings, etc.

  ✓ **Third party Performance criteria**

The term “third party” is broadly defined to include all entities that have entered into a business relationship with the organization, whether the third party is a bank or a nonbank, affiliated or not affiliated, regulated or non-regulated, a wholly- or partially-owned subsidiary, or a domestic or a foreign organization.

Organizations generally enter into third-party relationships by outsourcing certain operational functions to a third party or by using a third party to make products and services available that the organizations does not originate. Also, organizations may enter into arrangements with third parties in which the organization funds directly or indirectly through a line of credit certain products originated by a third party.

The criteria for the third-party performance are as follows:

- The organization’s relationship with the third party is a new relationship or involves implementing new organization activities.
- The relationship has a material effect on the organization’s revenues or expenses;
- The third party performs critical functions.

- The third party stores, accesses, transmit, or perform transactions on sensitive customer information.
- The third-party relationship significantly increases the organization's geographic market.
- The third party provides a product or performs a service involving credit or cash payment transactions.
- The third party poses risks that could materially affect the organization's earnings, capital, or reputation.
- The third party provides a product or performs a service that covers or could cover a large number of consumers.
- The third party provides a product or performs a service that implicates several or higher risk consumer protection regulations.
- The third party markets products or services directly to organization customers that could pose a risk of financial loss to the individual.

✓ **Tools requirement**

Every industry uses different types of tools for manufacturing products. For the purpose of tools requirement, the footwear manufacturing process is taken here as an example so that there is an understanding of specific tools required in the process.

1. **Cutting department**: clicking bench, clicking board, marking bench, preparation bench, dies, hand cutting knives, grinder
2. **Stitching or the closing department**: bench, handheld punches, needles, threads, stitching dies, tape dispenser, press using electric iron element, laces, scissors, a burner to burn the extra threads
3. **Component department**: insole beveling, bench, press knives, sole bench, insole moulding.
4. **Lasting or the bottoming department**: Pincers, acrylic hammer, tacks, nails, tubular steel jack, tack lifter, bench, abrasive grit rings

5. **Finishing department**: finishing bench, spray booth and guns, cloth and woolen brushes, shoe trees, shoe boxes etc.

✓ **Bottoming Process**

The bottoming process better known as the making department is divided into three sections:

a) Assembly
b) Lasting
c) Bottoming

a) Assembly prior to lasting:

Uppers from the closing room, soles and insoles from the bottom stock preparation section, heels and shanks from the suppliers, all these items are brought together in the assembly area. A last plant register is also maintained giving the stocks of shoe lasts in current use. All these items must be available in time before any lasting operation commences as in the present business situation the whole shoe order must be processed within a very short lead time.

The uppers and the components are put together according to the work ticket orders. This should ensure that the stock of shoe lasts are used as often and economically possible – 'last turnaround' – and in order to achieve the smooth running of the lasting sequence, it is essential that all the uppers and components are available to complete each ticket of work.

b) Lasting:

A shoe always has to be made on a last to achieve a shape, to give the necessary comfort and fit. Lasting is the process of stretching, compressing of the upper leather material mainly on the seat area over the last and securing it to the insole, runner etc., so that the upper conforms to the last contours.

The areas of the last which present the greatest difficulties in lasting are mostly those in which the major shape changes occur, to facilitate shape retention it is essential to apply correct strains at certain major points.

The amount and direction of strains must be suitable to both material and the design of the upper to help produce good shape retention throughout the life of the shoe. Shoes must be lasted to match in pairs so that the design of the uppers is correctly matched. It is important that the back height should be according to specification; otherwise if the back is too high, the shoe will rub the heel, if too low the shoe may not fit the foot as desired.

The top line of every shoe must be reasonably tight. It is essential during lasting that the top line is pulled somewhat taut to maintain correctly the balanced top lines. If the initial stretch is not taken out of the upper, the top line becomes loose, resulting in poor fitting shoes. The top line must also be correctly balanced, i.e. the outside quarter should be 3mm below the height of the inside quarter, the reason for this being the difference in the anklebone height, or according to the specification.

Traditional hand lasting involves the use of twelve basic lasting strains, which make the upper conform to the shape of the last. The order in which these lasting strains are taken can vary to suit the individual situation, and the lasting operator may modify the order, to make sure that the upper is lasted properly. For example, if the upper is tending to the swing to the outside then the operator will remedy this by pulling the upper from the inside first, in other words, the operator will:

- Ensure that the upper conforms to the shape of the last
- That the upper is positioned centrally on the last
- The upper components are falling on the proper place on the last as specified by the designer.

Lasting strains are set by the operator in the modern lasting machines. For quick setting of a machine for various last shapes, upper models and sizes, the forepart lasting operators have computer operated machines which enable all the machine settings to be summoned from the computer memory so that the machines give the desired result. However, at times the operator needs to make corrections for settings for individual uppers.

- **Shape of Upper**:

Lasting involves forming the upper by stretching it over the last. For foot comfort the upper must conform to the shape of the last and retain much of it. Also the shoe upper after a period of wear must also conform to the shape of the foot.

To last the upper well we should use minimum strain to make the upper conform to the last. By stretching too tight we may cause upper cracks and inadequate shape retention of the shoe. For quality and productivity it is important to skillfully design and maintain the whole production process from material selection to pattern engineering, cutting, closing and lasting.

Traditionally, for adequate shape retention the upper was left to the last for two to three days, or even longer. Today new techniques are used which will give a better shape retention of the upper in a much shorter time. These methods are known as combination of mulling and heat setting and there are a number of variations to these two basic processes. Research has shown that if the leather upper is mulled before lasting in which moisture is imparted into the leather fibre, and lasted and subsequent heat setting done immediately after, the result is better shape retention properties in the final upper.

Mulling can be done in a variety of ways but each method if done correctly will give the required results. The great advantage of mulling is that it allows the leather upper to be stretched more easily and it is less likely to crack. Perhaps the most common method in use today is to subject the vamp area to steam vapours immediately before forepart lasting.

After lasting heat setting is usually carried out after the upper has been completely lasted before any of the bottoming operations (roughing etc.) are done. Heat setting will ensure about 70 -80%shape retention of most types of upper material, including PU and PVC coated fabrics but there is usually no advantage in using moisture on manmade upper materials, only dry air is used and the temperature related to time will vary according to the material.

c) Bottoming

The attachment of the sole to the upper is either by thread or adhesive in the majority of the footwear made today. The sole can be directly attached to the upper. Alternatively the attachment can be indirect with the material between the upper and the sole. Indirect method of attachment is easier to repair than the direct methods.

The sequence of operations involved in the Bottoming process is as follows:

1. Insole tacking: Insole tacking is one of several operations carried out before lasting, whereby insoles are temporarily fastened onto the bottom of the last. This operation may be carried out manually or with the help of special purpose tacking machines.

(i) Manual insole tacking: At small levels of output, insole tacking may be carried out with the help of a worn magnetized file for tapping the tacks through the insole into the last bottom. In this operation, the socket on top of the last is located on a vertical steel column -called a jack - fixed to a bench.

(ii) Insole tacking machines: At high levels of output, the use of special purpose tacking machines may be justified. In some systems, steel studs are permanently fixed in the bottom of the last, and insoles are pushed onto them by a machine. Although expensive, this approach has the advantage that tacks cannot be inadvertently left in the shoe.

Normally, three tacks are inserted for each insole. However, small enterprises which do not possess an insole moulding machine, often insert five or six tacks on the forepart, and two or three tacks over the waist and seat. These tacks hold the insole tight to the last during lasting.

2. Stiffener Insertion: Where stiffeners do not have to be inserted immediately before lasting, and there is a sufficient volume to justify the operation being separated from

lasting, heel stiffeners may be manually placed into the pocket between the quarter lining and the quarter.

3. Upper Conditioning: The absorption of moisture by leather uppers before lasting, and their subsequent drying after lasting greatly enhance the shape retention properties of leather uppers. Although synthetic upper materials do not absorb water, their fabric backers may do so. They may therefore be heated either with or without moisture prior to lasting and then dried in the normal manner after lasting.

A variety of moisture conditioning techniques are available, water may be mixed with a soapy wetting solution may be sponged on the uppers. A more satisfactory result may be obtained if the uppers are suspended over a tray of boiling water so that steam permeates the leather, or the uppers may be placed in a cabinet in which the temperature and moisture content of the air are controlled at predetermined levels. In this case, uppers require spending a short period in the conditioning cabinet.

d) Cement-lasting: Although many systems of lasting are available, they all involve pulling the upper over the last and fastening it over the bottom edge of the insole. Cement is now used in the majority of lasted shoes but the whole shoe is not always cement-lasted since tacks may be used to last the sides. A major benefit of cement-lasting a whole shoe is the elimination of the risk of having a loose tack injuring the wearer. As an example only cement-lasting is considered here.

i) Manual cement-lasting

Manual cement-lasting techniques are usually appropriate at low production levels. In general, one operator carries out cement lasting for a whole shoe. Some operators prefer to mount the last on a jack and to stand at a bench, while others find it most convenient to sit on a low stool beside a low bench on which are laid the materials and tools. A pair of special purpose lasting pincers, with curved and deeply serrated jaws and incorporating a light hammer head, is used to stretch the upper over the last and to fix the lasting allowance to the insole.

If preassembled stiffeners are not used, the operator may have to dip a stiffener (usually pre-moulded leather-board) into a pot of latex and then position it. Similarly a puff (usually woven cotton) may have to be dipped into an acetone solvent before inserting it.

Hand lasting usually requires greater skill than any other footwear manufacturing task. The aspects of the job that are most difficult to master are the attainment of the correct directions and degrees of strain, and the achievement of uniformity between a pair of shoes in terms of squareness, back height and the fit and shape of the top line.

In manual cement lasting, tacks may be used to temporarily hold uppers in position on the last. Usually the toe is drafted over and fixed first. The back and sides are usually fixed after the toe area has been attached. The order in which each stage is completed depends on the preference of the operator. The final stage includes careful pleating of the lasting allowance and the removal of any puckers from the upper round the heel and toe.

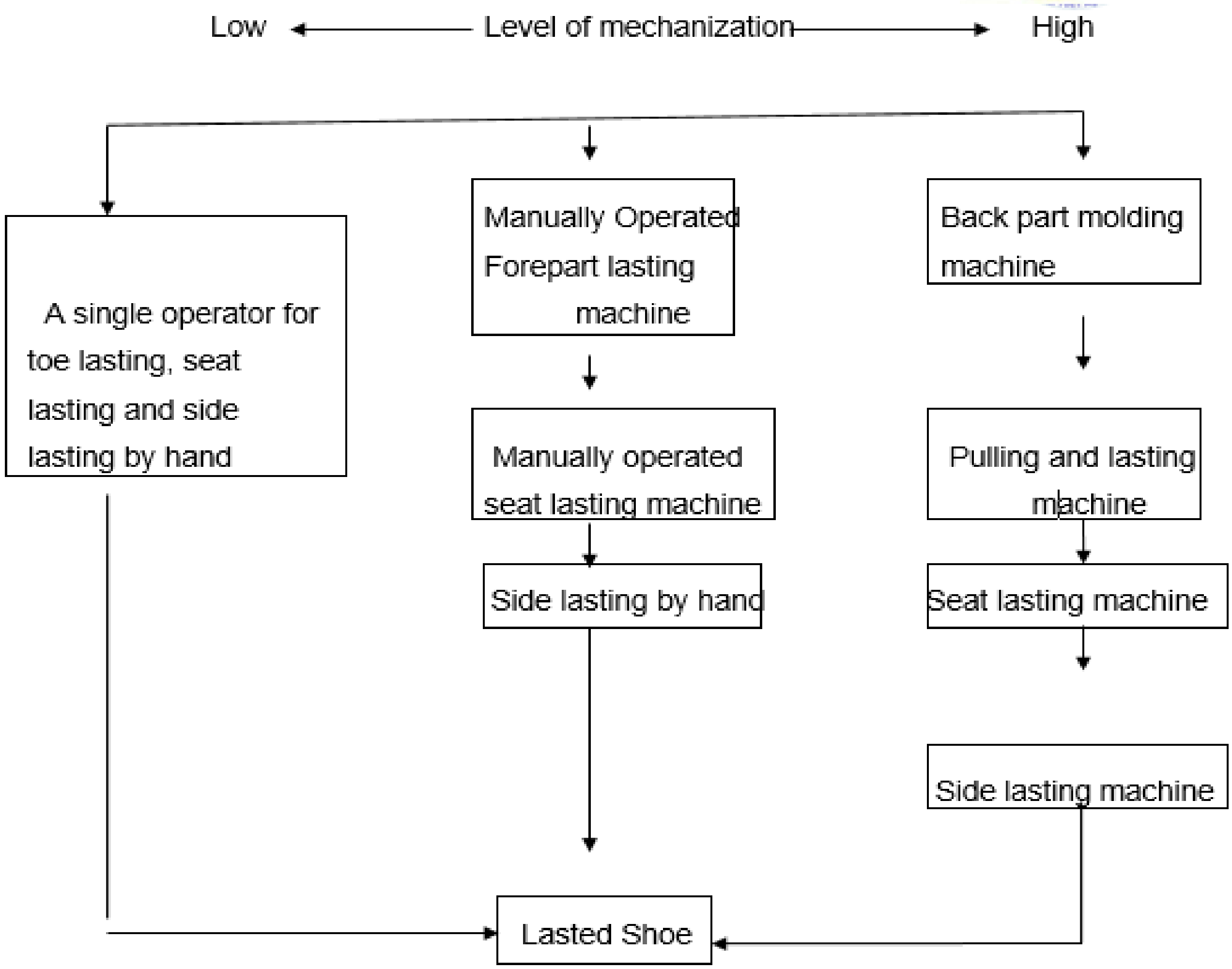


Figure 33 several alternative lasting systems

ii) <u>Mechanized cement lasting</u>

Manual cement lasting is generally inappropriate at high levels of production. This operation is therefore carried out with the help of special purpose machines.

A wide range of machines are available for cement lasting foreparts, sides and seats. Machines are also available that combine pairs of these operations. Consequently, there is a wide spectrum of complete systems that can either toe or seat-last first. As a result of recent technological developments, the quality of work now attainable with expensive modern machinery is often as good as if not better than, that produced by highly skilled operators.

e) Tack Removal and Inspection: Tacks inserted to temporarily hold the insole to the last are removed after lasting. Usually hand held saw toothed tack lifters are used. For large scales of production, high speed tack extracting machines are also available. The operator removing tacks may also check on the quality of the lasting.

f) Heat Setting: Allowing uppers that were conditioned with moisture before lasting to dry naturally has an important disadvantage: it increases the investment in work-in progress and the number of lasts in circulation. It may also lead to the development of mildew and rust stains may be caused by steel plates fitted to last bottoms. Artificial drying may therefore be used in order to avoid the above problems. Infra-red and other forms of radiant heat constitute one artificial drying source. However, they may result in uneven drying. Blown air should, on the other hand, produce more satisfactory results. One expensive method now available involves passing the shoes through a heating chamber on a conveyor belt. In the first half of the chamber moist air is circulated at high speed to stress-relieve the surface. The air circulating in the second half is hot and dry to remove all moisture and set the upper firmly. Hot air blown from a hair dryer can carry out the same operation.

g) Bottom Roughing: The object of this operation is to provide a good keying surface for the adhesive used to attach the lasted margin of the upper to the sole unit. The operation removes the finished outward facing surface of the upper material and flattens the pleats round the forepart and seat. Roughing can be done manually with a knife for leveling the folds and a wire brush for roughening the grain, or by a machine which uses a wire brush or emery covered wheel clamped to a bench top. Some skill is necessary to ensure that a clean "feather" edge is produced where the sole and upper meet.

h) Shank Attaching: Shanks not riveted to the bottom of the insole before lasting are attached at this stage. They can be stapled in position with a manually powered or pneumatic powered staple gun, or can be attached with adhesive applied by brush.

i) Bottom Cementing: A brush or cement applying machine can be used to spread adhesive onto the roughened lasted margin on the bottom of the shoe. Cement applying inbuilt nozzles are present in the machine. The adhesive may be dried naturally or by heat.

j) Bottom Filler Insertion: Pieces of felt or scraps of thick leather are attached to the elliptical area in the middle of the forepart of the insole, and to the exposed part of the seat inside the lasting margin. Usually, the operation is performed manually. The cement can be applied to one side of the component with a manually fed, electrically powered machine

k) Sole Laying: Before placing the sole unit on the shoe bottom, the adhesive on both surfaces must be activated. This is often done by infra-red or quartz-halogen radiant heating.

The next step is to attach the sole unit to the shoe bottom. In small enterprises manual sole laying is done. It consists of hammering the units to affect adhesion after careful positioning of the components. Care is taken as hammering may cut the upper at the feather edge.

Hydraulically powered machines which can apply loads of about three tones or uses compressed air to apply the load through a flexible rubber diaphragm are majorly used in the industry.

l) Last Removal: Once the sole is attached, the last is removed or slipped from the shoe. This can be done manually using a lasting jack to support the last, or with the help of a pneumatically powered last-slipping machine. Whether lasts are slipped by hand or machine, top lines and seams can be damaged if care is not taken.

At this stage, the shoes are ready for finishing operations.

m) Shoe finishing and packing:

- Crease Removal: Crease removal is the first operation of the finishing stage. It involves the removal of any creases on fine grained upper leathers. Various types of machines may be used for this purpose.
- Hot air treeing machine: These machines produce a blast of steam as well as one of hot air. These machines are available at various levels of sophistication.
- Upper Repair: The next step is to repair damages to the surface of the upper material. This may be done with the help of wax crayon to cover blemishes and with cement to fix down cuts.
- Sock Insertion: A sock (which may have a backing pad of foam cemented to it) can be cemented either manually, with a brush, or by passing it through a cement applying machine. The sock is then inserted into the shoe.
- Upper Dressing: The sequence of this operation includes the following:
    - Cleaning of upper with a proprietary cleaning fluid or a spirit based solvent,
    - Application of a cream dressing by hand,
    - Application of a liquid dressing with a sponge or a sprayer. Some manufacturers in developing countries use a dressing mixture made of car enamel of the required pigmentation and solvent,
    - An alternative to liquid dressing is the brushing of uppers. This may be done with hand held brushes, bench mounted power drills fitted with mops, and specially designed brushing machines.
- Lacing: In lacing styles, laces are inserted into the uppers by hand.
- Packaging: Information on shoe styles and sizes are written or printed on labels which are attached to packaging.
- Shoe boxes can be assembled either on machines or cemented or stapled by hand.
- Inspection: Shoes rejected at the final inspection are returned to the repair section.

Product performance

Product performance is a consumer's perception of the level of performance displayed by a product. Actual performance is compared to expected performance in order to determine product satisfaction.

A metrics has to be created within the company to match to their business Key Performance Indicator (KPI) - this is a strategic product management effort. Within various industries and verticals, there will be benchmarks usually identified by analysts researching a competitive space. This is most effective when comparisons are made between versions of the same product, although such studies can be made on competitor products.

It is much easier to measure performance for products already in the market – as the data is available to analyze. In order to measure the performance of a particular product in the market for some time after introduction, a metric that is generally used to track is the number of repeat customers for that product.

There are certain standard market tools to isolate how the product is performing:

- Sales analysis
- Market share analysis
- Financials
- Customers
- Competitors

Available data is gathered, useful metrics is defined for the industry and product type, business KPIs are identified, the product is assessed for performing aligned with business goals. The information is packaged in visual form to highlight patterns.

- **Product Tolerance**

The basic definition of product tolerance is the unwanted but acceptable deviation from a desired dimension, standard or specification and considered non-harmful to the functioning of a part, process, or product over its life cycle. Product Tolerance directly influences the cost and performance of products.

Product tolerance analysis is a name given to a number of approaches used in product design to understand how imperfections in parts as they are manufactured, and in assemblies as they are put together, affect the capability of a product to meet customer expectations. Tolerance analysis is a way of understanding how sources of variation in part dimensions and assembly constraints propagate across parts and assemblies, and how that total variation affects the capability of a design to achieve its design requirements within the process capabilities of manufacturing organizations and supply chains.

Tolerance analysis shows whether the nominal clearances the manufacturer specifies will meet or violate the safety requirement, given manufacturing and assembly variability impact on the minimum clearance.

With shorter product lifecycles, faster time to market, and tighter cost pressures, the characteristics that differentiate a product from its competitors are taken in the details of a design. Manufacturers perform a statistical tolerance analysis over a tolerance stack up in order to improve cycle time and quality and to reduce costs. They look more closely at why they did not get the exact part and assembly dimensions they expected from manufacturing and then attempt to optimize the tolerances on the next version of the product. Tolerance optimization during design has a positive impact on the yields coming out of manufacturing, and better yields directly affect product cost and quality. Analyzing tolerances and variations before trying to produce a product also helps manufacturers avoid time-consuming iterations late in the design cycle.

A statistical tolerance analysis is when the variation of a set of inputs is taken to calculate the expected variation of an output of interest. A product design is composed of multiple features, each with tolerance values that control the variable aspects of those features. Statistical tolerance analysis is used to understand how these tolerances contribute the various performance characteristics of the design.

The simplest form of tolerance analysis is the single direction is called as tolerance Stack up. Tolerance Stack up is created by creating a cross section of a model and adding the tolerance values for each feature in a straight line. The variation in each contributes to the overall output/outcome.

- **Productivity and Work performance**

It is important to start by clarifying the difference between productivity and performance. There is a tendency to confuse productivity and performance, with the two often becoming interchangeable. Productivity is the measure of the efficiency of production whereas performance deals with the way in which someone functions to accomplish something successfully.

As productivity and performance have operational and economic implications for a company, these should be defined and associated "norms" created before being built into KPAs and KPIs.

a) Productivity:

One of the most important responsibilities of an operations manager is to achieve productive use of organization's resources.

Productivity is an index that measures output (goods and services) relative to the input (capital, labor, materials, energy, and other resources) used to produce them.

It is usually expressed as the ratio of output to input:

$$\text{Productivity} = \frac{\text{Output}}{\text{Input}}$$

Production improvement does not necessarily mean productivity improvement. The ways to increase Productivity are as follows:

- Increase output by using the same or a lesser amount of (input) resource.
- Reduce amount of (input) resource used while keeping output constant or increasing it.

- Use more resource as long as output increases at a greater rate.
- Decrease output as long as resource use decreases at a greater rate.
- Production is concerned with the activity of producing goods and services.
- Productivity is concerned with the efficiency and effectiveness with which these goods and services are produced.

Whereas the single factor-approach to measure Productivity is as under:

- Capital - Number of products produced divided by asset value
- Materials - Number of products produced divided by money spent on materials
- Direct Labor - Number of products produced divided by direct labor-hours
- Overhead - Number of products produced divided by money spent on operating cost

b) Work Performance

The variables which affect Labor Productivity hence leading to work performance is as follows:

- Physical work environment
- Technology, equipment, materials, lighting, layout
- Product quality
- Defects, scrap, rework
- Employee job performance
- Employee ability, motivation
- Employee Job Performance

All the above said factors are seen as an infrastructure for work, welfare and life quality and hence defined as "Good work". This broader definition comprises not only working conditions and employment relations, but also the social infrastructure for health, welfare and gender equality. It has nine dimensions:

1. Job security
2. Equal and fair share of production results
3. Worker co-determination
4. Collaborative work organization
5. Skills and competence development at all levels
6. Recurrent education/lifelong learning
7. Flexible and employee-friendly working hours
8. Work place equality and social inclusion
9. A healthy and risk-reducing work environment

Some behavioral scientists believe that individuals are motivated to act in a certain way by a desire to satisfy certain needs such as fulfillment, recognition, affiliation, security and physiological needs.

According to these scientists, at the bottom of the hierarchy are physiological needs. These are the basic needs that must be met to sustain life itself. Satisfying ones physiological needs will be the primary concern of any person and until one has done so one will not be concerned with any other issues.

However, once workers feel reasonably sure of fulfilling their physiological needs, they will seek to satisfy the next need in the hierarchy, that of security.

Security is taken to mean a feeling of protection against physical and psychological harm, as well as security of employment.

For workers who have already satisfied their physiological and their security needs, the next motivating factor is that of affiliation, that is wanting to belong to a group or an organization and to associate with others.

Next on the hierarchical scale is the need to be recognized, and this is followed by the need for fulfillment (also called "self-actualization").

This last need expresses the desire of people or workers to be given an opportunity to show their particular talents.

To a particular level, for the workers' retention, job satisfaction and enhancement of the work performance, there is a need for modifying jobs which may be stated as under:

- Cross-training - so that the workers perform multiple jobs
- Job enlargement – which is a "horizontal" expansion of job tasks; that is, the worker is assigned more tasks at the same general skill level. E.g. In a manufacturing setting, job enlargement might mean having a worker do several tasks at a work station rather than only one or two or in a bank; it might mean training a person to write car loans, and installment loans rather than only one of these.
- Job Enrichment – It involves "vertical" expansion of a job's responsibilities and skills. It may mean that a production worker is involved in the design of the product or production process and is also responsible for his own quality testing, handles customer complaints, or deals directly with suppliers.
- Team production -- organizing workers into teams; assigning management responsibility to teams

1.2.2. Specification measurement:

Specification measurement, not only necessarily mean the numerical data specifications but also the performance measurement and is primarily managing outcome, and one of its main purposes is to reduce or eliminate overall variation in the work product or process. The goal is to arrive at sound decisions about actions affecting the product or process and its output.

For a varied understanding, some of the measurements taken herein are also based on performance measures.

As a process, specification measurement is not simply concerned with collecting data associated with a predefined standard. It is better thought of as an overall management system involving prevention and detection aimed at achieving conformance of the work product or service to the customer's requirements. Additionally, it is concerned with process optimization through increased efficiency and effectiveness of the process or product. These actions occur in a continuous cycle, allowing options for expansion and improvement of the work process or product as better techniques are discovered and implemented.

a) What Are Specification Measures?

Specification measures quantitatively and tells something important about the products, services, and the processes that produce them. These are tools to help understand, manage, and improve what the organizations do.

Specification measures let us know:

· How well we are doing

· If we are meeting our goals

· If our customers are satisfied

· If our processes are in statistical control

· If and where improvements are necessary.

They provide the information necessary to make intelligent decisions about what is to be done. A specification measure is composed of a number and a unit of measure. The number gives a magnitude (how much) and the unit gives the number a meaning (what).

Specification measures are always tied to a goal or an objective (the target). They can show the variation in a process or deviation from actual design specifications. Single-dimensional units of measure usually represent very basic and fundamental measures of some process or product.

Most specification measures can be grouped into one of the following six general categories. However, certain organizations may develop their own categories as appropriate depending on the organization's and the customer's mission:

Effectiveness: A process characteristic indicating the degree to which the process output (work product) conforms to requirements (Are the right things done?)

Efficiency: A process characteristic indicating the degree to which the process produces the required output at minimum resource cost. (Are the things rightly done?)

Quality: The degree to which a product or service meets customer requirements and expectations.

Timeliness: Measures whether a unit of work was done correctly and on time. Criteria must be established to define what constitutes timeliness for a given unit of work. The criterion is usually based on customer requirements.

Productivity: The value added by the process divided by the value of the labor and capital consumed.

Safety: Measures the overall health of the organization and the working environment of its employees.

The following reflect the attributes of an ideal unit of measure:

· Reflects the customer's needs as well as our own
· Provides an agreed upon basis for decision making
· Is understandable
· Applies broadly
· May be interpreted uniformly
· Is compatible with existing capacity
· Is precise in interpreting the results
· Is economical to apply

b) What Are the Benefits of Measurements?

Listed below are seven important benefits of measurements:

- **i)** To identify whether the customer requirements are met. How do we know that we are providing the services/products that our customers require?

- **ii)** To help us understand our processes. To confirm what we know or reveal what we don't know. Do we know where the problems are?

- **iii)** To ensure decisions are based on fact, not on emotion. Are our decisions based upon well documented facts and figures or on intuition and gut feelings?

- **iv)** To show where improvements need to be made? How can the improvement be done?

- **v)** To show if the improvements actually happened. Do we have a clear picture?

- **vi)** To reveal problems that bias, emotion, and longevity cover up. If we have been doing our job for a long time without measurements, we might assume incorrectly that things are going well. (They may or may not be, but without measurements there is no way to tell.)

- **vii)** To identify whether suppliers are meeting our requirements. Do our suppliers know if our requirements are being met?

2.1.5. Specification Format

Table of content:

a) The sketch or the photo of the product complete with details

b) Scope

c) Design
d) Material
e) Manufacture
f) Requirement and tests
g) Marking
h) Sampling and Criteria for conformity
i) Packing
j) Storage, Shelf Life and usage
k) Annexure of various materials required

Product details

The manufacturing details of the product is outlined and specified. For more clarity the example specification can be referred.

Writing style

The instructions mentioned in the specification should have a very clear reference, should have short direct sentence and not ambiguous speech, there should not be any jargons and abbreviations used, definition of all the terminologies used should be very clear.

FOR EXAMPLE:

A SPECIFICATION SHEET OF A BUYER TO THE MANUFACTURER

To make the understanding of the specification format clearer, an example of Derby shoe with P.U. Polyester sole is considered.

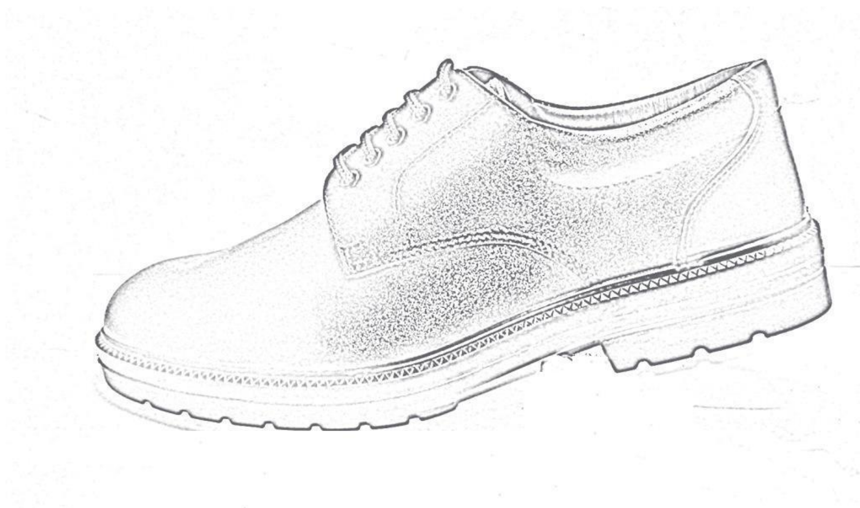


Figure 34 Design/Pattern of Derby Shoe PU Polyester sole

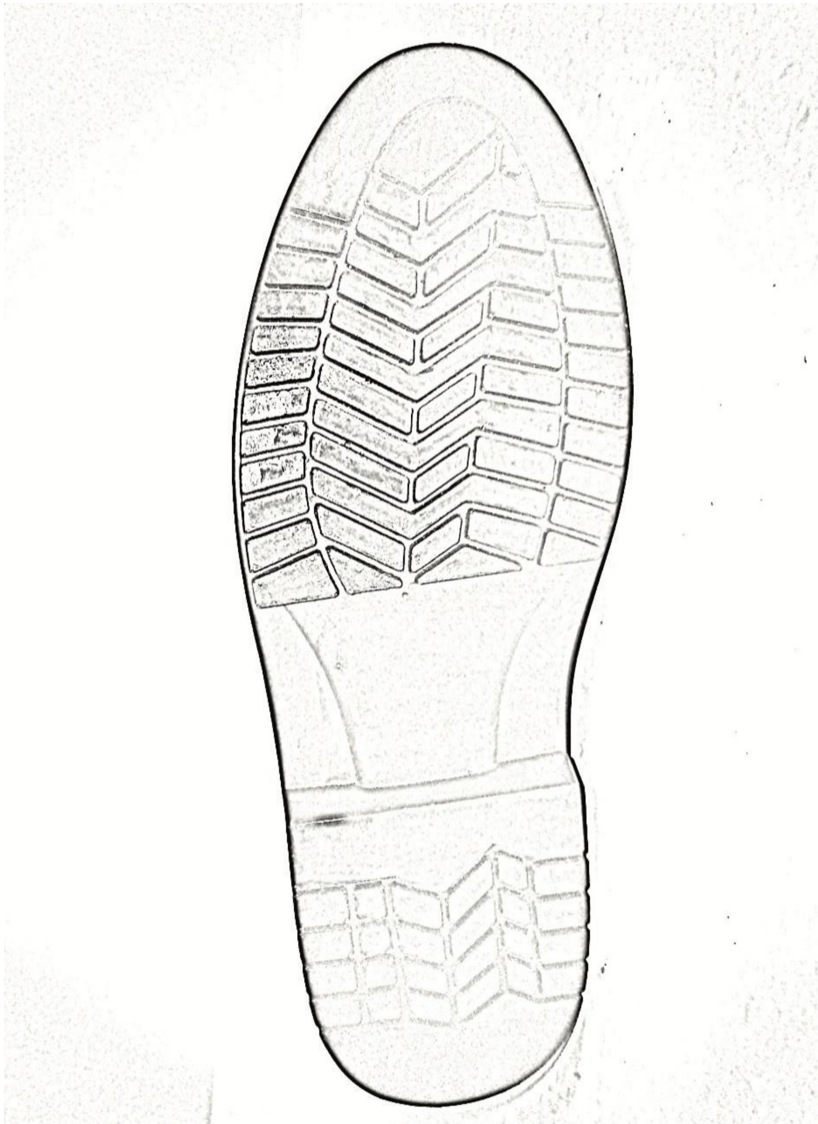


Figure 35 Design/Pattern of PU Polyester sole

a) Scope:

i. This specification covers the requirement of Derby Shoe PU Polyester sole in sizes 5 – 12 (English Sizing System).

ii. Derby Shoes PU Polyester sole described in this specification has been designed to provide smart, durable and comfortable footwear to cater the needs of the Ethiopian market

iii. The Shoes described in this specification are made from Chrome tanned corrected grain leather upper with padded collar, lined with combination tanned lining leather to absorb perspiration. The Shoes are made with cleated PU Polyester sole with anti slip design by any suitable Process.

b) Design:

The Shoe shall be made to design shown in the figure above on last confirming to the dimensions given in the 'H' fitting last.

c) Materials:

- **Upper:** Chrome tanned Smooth Finish C.G. Leather (Thickness 1.4-1.6mm)
- **Vamp lining**: 100% non-woven material min 210 GSM.
- **Quarter Lining**: Combination tanned Leather lining as per International Standard. Thickness 0.9 to 1.1mm
- **Counter Lining**: Suede Leather having thickness 0.9 to 1.1mm
- **Toe Puff and Counter**: For toe puffs and stiffeners well stuck heat activated thermo plastic toe puff & stiffeners of minimum thickness 1.2 mm & 1.8 mm (±0.1mm) respectively shall be used.
- **Eyelets**: Brass enameled Eyelets conforming to International Standard
- **Insole**: Insole will be non-woven material for Strobel construction conforming to International Standard with suitable treatment for providing antistatic properties.
- **In-sock**: Each Shoe shall be provided with a detachable 3.0 mm +_ 1.0 mm thick full in-socks of compress molded EVA having instep arch support. The outer layer of the in-sock shall be covered with Leather.

- **Laces**: Each pair of Shoe shall be provided with a pair of Nylon Round Laces of minimum 80 cm long having minimum mass of 50gms. per 10 Pairs
- **Outsole**: Shall be Polyurethane (PU) sole having anti-slip design. The design and pattern of PU Polyester sole shall be similar to tread design of sole as shown in the figure above only for guidance. Physical requirements of PU Polyester sole are given in Annexure A
- The material used should meet the eco-friendly quality parameters as per Annexure D

d) Manufacture

The Derby shoe PU Polyester sole shall be manufactured as described below:

- The shoe shall be made by PU Polyester sole on lasts confirming to the dimensions given in 'H' fitting last.
- The Shoe shall conform to the design and shape as illustrated in the figures above attached to this specification.
- All upper components shall be cut in such a way to ensure adequate shaping of the components.
- The patterns of the quarters, vamp, lining, toe cap and toe puff etc. shall be so designed and shall be correctly fitted in such a way that these do not form excessive pleats at toe and counter regions during lasting.
- The upper components shall be stitched on lock-stitch machine and seem shall be reinforced with Polyester adhesive tape wherever required.
- Nylon /Polyester sewing thread shall be used for stitching and strobelling of insole with upper.
- In case of derby shoe with toe cap full Chrome leather Toe Cap shall be reinforced with two rows of stitches to the vamp to cover the entire toe portion. Two rows of stitching shall be used at the toecap and counter, and two rows at the sides. The

number of stitches shall be 20-30 per decimeter. Care shall be taken to maintain the space and uniform tension of the stitching at all places.

- The Full tongue shall be so fitted that no wrinkles/step occurs where it is joined to the vamp.
- After closing all ends of the stitching threads be tied and all seams hammered down.
- Toe Puff and stiffener components shall be correctly molded after attachment.
- 5 nos. Brass eyelets shall be fitted in each quarter facing. The eyelet shall be clinched with washer, without distortion.

- The upper shall be Strobel stitched to the insole.
- The Upper shall be force lasted after molding of the counter and stiffeners.
- The sole and heel flashes shall be neatly trimmed for smooth appearance.
- All closing seams on the finishing shoe and stitches on the flange upper shall be given a suitable coating of PU adhesive in order to ensure that all needle holes are completely filled.
- A full in-sock of the specified material shall be struck down neatly on the insole.
- Each pair of Shoe shall be provided with a pair of Nylon round Laces of minimum 80 cm long.
- Each Shoe shall also have the “Name/Trade Mark of Manufacturer”, Size of Shoe and month/year of manufacturing on the waist of outer sole, during molding.
- The socks of the Shoe shall be legibly stamped with the manufacturers name/ recognized trademark and size. Month & year of manufacture shall be marked on inside of the tongue.

e) Requirements and tests

The material used in the manufacture of Shoe shall be tested to the requirements given in this specification.

- **Whole Footwear**

Weight: The weight of one pair of finished Shoe of Size 8 shall not be exceed 800gms with an increase or decrease of 50gms for each bigger or smaller size respectively.

Leg Height: The leg height of the Shoe when tested in accordance with International Standard shall be 70 ± 2 mm, for Size 8 with an increase or decrease by 2.0 mm for each bigger and smaller size.

Upper/Outsole Bond Strength: The bond strength of the upper and the outsole shall be no less than 4.0 N/mm.

Electrical Resistance: After conditioning in a dry and wet atmosphere, the electrical resistance shall be not less than 100 KΩ and not greater than 1000 MΩ.

Energy absorption of seat region: The energy absorption of the seat shall be not less than 20 J

Resistance to harsh environments: The temperature increase on the upper surface of the insole shall be not greater than 22^{o} C and the temperature decrease on the upper surface of the insole shall be not more than 10^{o}C.

Hydrolysis Test: The Shoe shall be placed in High Humidity (100%) at a temperature of 70^{o} C for 5 days and then tested for whole shoe flexing for 100000 cycles. No Crack or damage to the sole is acceptable.

Outsole: Outer thickness and cleat height shall be as under:

Table 4 thickness of out sole

S.No.	Description	Thickness
1.	Minimum Thickness of sole	4 mm
2.	Cleat Height	2.0 mm (Min)
3.	Thickness of sole when measured from outside with side wall . At Forepart	12 mm (Min) 09 mm (Min)

	. At Waist . At Heel	25 mm (Min)

- **Physical requirements of Polyurethane Sole:** PU Polyester sole shall conform to the requirements as mentioned in Annexure A.

f) Marking

Each Shoe shall be legibly marked by the manufacturer on the waist position of the outsole with the detail of Name / Trademark of the manufacturer, month/year of Manufacture and Size of the Shoe. Month and Year of manufacture shall also be marked on inside of the tongue.

g) Sampling and Criteria for conformity

- Manufacturers must satisfy themselves first by carrying out thorough pre-inspection of each lot/ batch that the shoes manufactured are in accordance with the contract and fully conform to the specification, before tendering to QA officer nominated under the terms of contract.
- A declaration by the manufacturer that necessary pre-inspection/ tests have been carried out on the shoes and the same are fit for inspection and test.
- The declaration by the manufacturer shall include the method followed in pre-inspection showing features checked / tested and the test reports be submitted.
- The Derby Shoe pairs of the same description nomenclature and of the same batch belonging to one size and fitting or a set of sizes and fittings offered shall constitute a lot.
- The lot size shall not exceed 10,000 pairs.
- In all cases samples shall be drawn using technique of random sampling as per International Standard. The sampling officer shall first draw the samples for visual, dimensional, and construction parameters and for compliance.

- If found satisfactory on examination as above, the officer may draw (out of it) and send samples for lab testing
- If found satisfactory, a lot shall be accepted and inspection report shall be prepared.

Table: - Sampling plan

S. No.	Lot Size in Pairs	For Visual, Dimensional, Constructional Parameters and compliance to approved sample		For Laboratory Testing for Physical and Chemical Parameters	
		Number of samples to be drawn	Permissible no. of non-conforming samples	Number of samples to be drawn	Permissible no. of non-conforming samples
(1)	(2)	(3)	(4)	(5)	(6)
1.	Up to 2500	50	5	3	0
2.	2501- 6000	90	8	5	0
3.	6001-10000	150	14	7	1

h) Packing

Each pair of Shoe shall be wrapped in tissue paper and shall be packed in a multi ply corrugated box that will form a unit pack.

A paper label with Nomenclature, Manufacturer's name/ Trade mark, Size and Month and Year of Manufacture shall be securely pasted on front of the unit box, which shall be clearly readable.

Suitable number of unit packs shall further be packed in one corrugated carton strong enough to withstand transit hazards and to the satisfaction of inspecting officer.

The Carton, thereafter shall be sealed with adhesive tapes and tape bound with polypropylene tapes if so desired by buyers. Each package shall be legibly marked with.

i. Nomenclature of the shoe
ii. Quantity packed in the package.
iii. Lot and serial No. of the package.
iv. Month and year of manufacturer.
v. Gross weight of the package in kg.
vi. Name and address of the consignee.
vii. Name and recognized trade mark of the supplier

i) Storage, Shelf Life and usage

- These Derby Shoe PU Polyester sole shall have normal shelf life of 12 months
- To have better performance shoes with PU Polyester sole must be issued to the end user as early as possible after receipt in stores.
- The shoes must be stored in Dry and airy environment away from heat like direct sunlight, heaters etc.
- Users to take care that the shoes do not get wet for long time. Incase shoes are wet; it must be dried before next use.
- Regular use of the shoes will increase the life of shoes.

Annexure A

Polyurethane polyester sole

Table: - polyurethane polyester sole requirements as per international standard

S.No.	Property	Minimum Requirement as per International standard
1	Tear Strength	Min. 5k N/m
2	Abrasion	Max volume loss 250mm3
3	Flexing resistance	Max 4mm cut growth till 30000 cycles
4	Hydrolysis	Max 6mm cut growth till 150000 cycles
5	Resistance to fuel oil	Max volume increase 12 %
6	Thickness	Thickness should not be less than 4.0mm & cleat height should not be less than 2.0mm
7	Shore "A" Hardness	50 to 60 Shore "A"

Annexure 'B'

Requirements of upper material

Table: - requirements of upper material

S.No	Property	Minimum Requirement
1	Tear Strength	Min. 120N
2	Water vapour permeability & coefficient	Water vapour permeability shall not be less than 0.8 mg per cm square per hour and the water vapour coefficient shall not be less than 15 mg per cm^2.

3	pH	Min. 3.5, if below 4, the difference figure shall be 0.7
4	Chromium VI content	3mg/kg(max)

Appendix `C'

Requirement of Vamp/Quarter /Counter Lining

Table: - requirements of vamp, quarter and counter lining

S.No	Property	Minimum Requirement
1	Tear Strength	Min. 15 N for Coated fabric and textile & Min. 30 N for Leather
2	Water vapour permeability & coefficient	Water vapour permeability shall not be less than2.0 mg per cm square per hour and the water vapour coefficient shall not be less than 20 mg per cm^2
3	pH for Leather Lining	Min. 3.5, if below 4, the difference figure shall be 0.7
4	Chromium VI content for Leather Lining	3mg/kg(max)

Appendix `D'

Ecofriendly Requirement

Table: - ecofriendly requirements of upper material

Sl	Material	Test
1	Boot Upper (Leather)	Solvent Extractable Matter
		Water Soluble Matter
		F Formaldehyde

		Pentachlorophenol (PCP)
		Coupled amines released from azo-dyes (sum parameters)
2	Upper, lining fabric	Azo dyes
		Pentachlorophenol (PCP)
3	Sole , elastic (polymeric materials)	Phthalates
		Lead
4	Metal parts e.g. eyelets, buckles , zip etc	Nickel free

Note: A. PU soling can be moulded;1. PU Direct Injection, 2. PU Pouring & 3. PU Unit sole can be attached by cementing process

B. However, the footwear made by any process meet the minimum requirements of specification.

- **Evaluation of specification**

The specifications can be evaluated by the customer/buyer or any other third party nominated by the buyer or can be done by the manufacturer within his supply chain and in his in house manufacturing process.

The specification is evaluated for the following reasons:

- Meeting established standards: Certain government policies, environmental regulations, import or domestic country regulations or the purpose of the product for which it is designed are all standardized. Without these standard specifications, the manufacturers and their work force would not be able to make the product as per the requirement.

- Control: Specifications set by the interested parties e.g. buyer, manufacturer etc have to be monitored and controlled. This will help reduce variation in the manufacturing process.
- Self-Assessment: Specifications help in assessing how well a process is doing, thereby focusing on the improvements that have been made or could have been made.
- Continuous Improvement: Specifications can be used to identify defect sources, process trends, and defect prevention, and to determine process efficiency and effectiveness, as well as opportunities for improvement.
- Management Assessment: Without a specification there is no way to be certain we are meeting value-added objectives or that we are being effective and efficient.

Self-Check 2	**Written Test**

Name: _________________________ Date: _______________

Time started: ________________________ Time finished: ____________________

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

Section 1

Fill in the blanks **(1X5 Points)**

1. A strong reason to outsource involves a _____________ of a critical resource
2. Lasting department uses a ___________________ for work transportation
3. _____________ takes the ergonomics and the work environment of the operator into consideration
4. The main feature of a derby shoe is that the quarter _________________ the vamp,
5. A mock moccasin is similar to the _________________construction

Section 2

True & False **(1X5 Points)**

Closed specification is buyer specific.

1. The abdomen of the leather is of a poor texture
2. The upper grain of the leather is not matched during the leather cutting process
3. In an oxford shoe, the vamp overlays the quarter.
4. Design specification can also include environmental factors

Section 3

Short Answers **(2x5=10 Points)**

1. What is the purpose of Motion study?
2. What is the bottoming process?
3. What is product tolerance?
4. What is the difference between productivity and performance?
5. What does specification measure?

3.1. Detail technical specification sheet

3.1.1. Work study as a method of determining specifications

Work study is a generic term for the techniques like method study and work measurement, which are used in the examination of human work in all its contexts, and which leads systematically to the investigating of all the factors which affect the efficiency and economy of the situation being reviewed, in order to affect improvement.

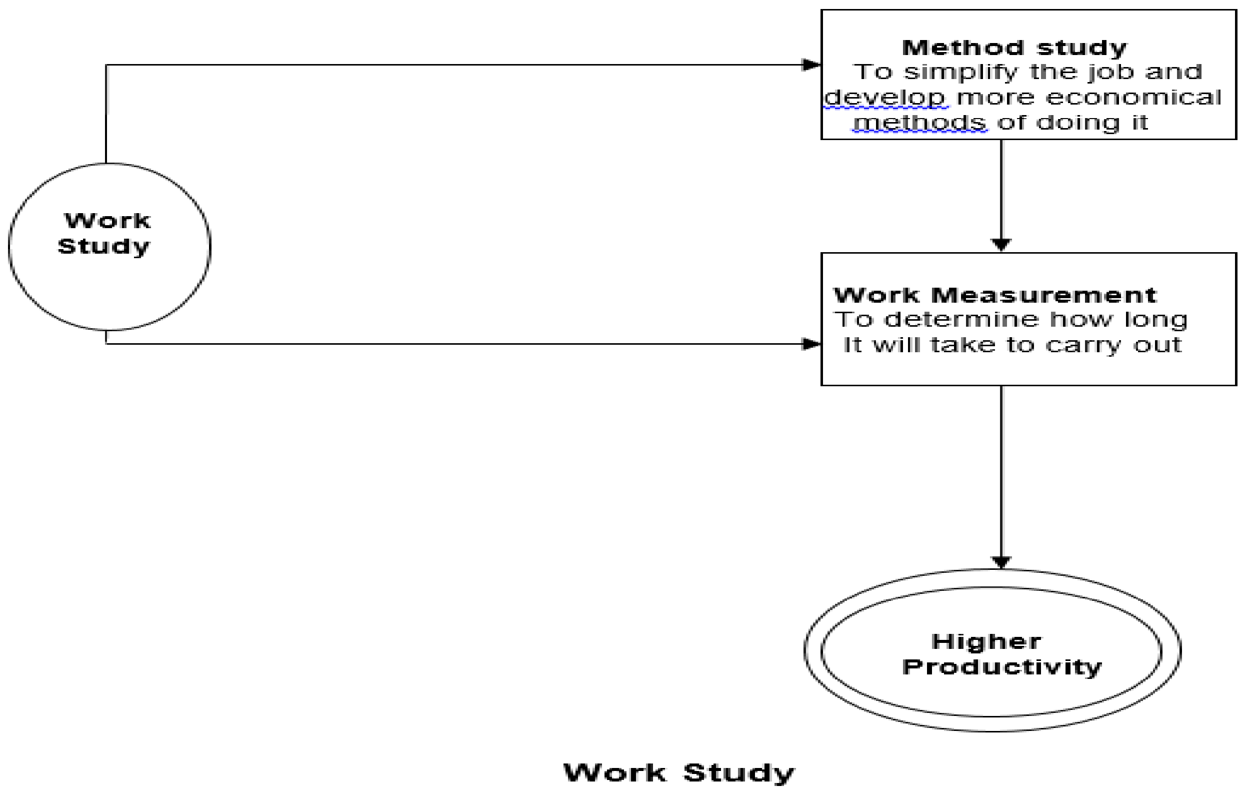


Figure 36 work study flow chart

Work study has three aspects:

1. The most effective use of plant machinery and material
2. The optimal use of human effort

3. The evaluation of human work

The success of the work study when applied within the organization is possible when everyone has a single vision that is intolerance of waste in any form, whether, material, time, effort or human ability.

Work Study

Method Study

Ergonomics;
Quality Management;
JIT (Just-in-time) efforts etc.

Resulting in more effective use Of:
Material, Energy,
Plant, Equipment,
Manpower, Capital,
Information
schemes

Work measurement

With to assess effectiveness

To improve methods of production
Making it possible:

To create cost standards
To compare work methods
To improve planning and control
Basis for sound incentive

Higher productivity

In context of: Health and Safety;
Quality; Quick Response;
Production Volume;
Environmental protection etc.

Higher standard of living

The basic procedure of work study is as follows:

- Select – The job or process to be studied
- Record – from direct observation everything that happens in order to obtain data for analysis
- Examine- the recorded facts critically in following aspects: purpose of the activity, the place where it is performed, the person who is doing it, the means by which it is done.
- Develop- the most practical, economic and effective method by taking into consideration the real limitations of the situation
- Measure – the amount of work involved in the method used and calculates a standard time for doing it.
- Define-the new method and the related time
- Install – the new method and time as agreed standard practice.
- Maintain – that standard practice by regular checks.

Let us consider an example of footwear upper making unit:

Table A footwear upper making unit

Output	Input	Ratio	Resource
400 pairs	8 hours	50 pairs/hrs.	Time
400 pairs	40 Operators	10 pairs/operator	Manpower
400 pairs	200 sq. mtrs	2 pairs/sq.mtr	Space
400 pairs	1000 sq. ft. leather	0.4 pairs/sq.ft	Material
400 pairs	10 Sewing machines	40 pairs/machine	Machines

By using the work study method a better output is obtained from the same input or obtain same output from less input. For example:

Table B work study out put

Output	Input	Ratio	Resource
480 pairs	8 hours	60 pairs/hrs.	Time
520 pairs	40 Operators	13 pairs/operator	Manpower

400 pairs	160 sq. mtrs	2.5 pairs/sq.mtr	Space
500 pairs	1000 sq. ft. leather	0.5 pairs/sq.ft	Material
400 pairs	8 Sewing machines	50 pairs/machine	Machines

There has been some improvement in the ratios from the table A to table B. This ratio is nothing but productivity of its respective resource and can be shown in percentages

Table C improvement in ratio

Resource	Improved Ratio table A	Improved Ratio table B	% Improvement
Time	50 pairs/hr	60 pairs/hr	+ 20%
Manpower	10 pairs/operator	13 pairs/operator	+ 30%
Space	2 pairs/sq.mtr	2.5 pairs/sq.mtr	+25%
Material	0.4 pairs/sq.ft	0.5 pairs/sq.ft	+25%
Machines	40 pairs/machine	50 pairs/machine	+25%

3.1.2. Time study for the job specifications

As already mentioned earlier Time study is a work measurement technique for recording the times of performing a certain specific job or its elements carried out under specified conditions, and for analyzing the data so as to obtain the time necessary for an operator to carry it out at a defined rate of performance.

Time study is always performed on a qualified worker and not on a very fast worker or a slow worker. A qualified worker is one who has acquired the skill, knowledge and other attributes to carry out the work in hand to satisfactory standards of quantity, quality and safety. The study of slow or unskilled workers or of exceptionally fast workers will tend to result in the setting of time standards that are either unduly large (known as "loose" times), and hence uneconomic, or unduly short (known as "tight" times), in which case they are unfair to the worker and will probably be the subject of complaints later.

Performance rating: It is the process during which time study analyst compares the performance of the operator under observation with standard rate of working in his mind.

The performance rating is only for the human unlimited movements not for those elements in operations/movements, which are limited by machine times in operations in skiving, scouring, roughening etc.

Standard Time: It is defined as the time required by an average operator, working at standard rating and desired average skill to complete one piece of job of acceptable quality by the given method.

Standard time = Basic time + total allowances (for relaxation and contingency)

Basic time = Observed time X rating / Standard rating

For example:

Assuming standard rating = 100

Observed time (mins)		Rating		Basic time
0.20	X	100	=	0.20
0.16	X	125	=	0.20
0.25	X	80	=	0.20

These basic times (0.20 mins in the example) represents the time the element would take to perform if the operator were working at the standard rate, instead of the faster one actually observed (0.16 mins). If the operator was judged to be working more slowly than the standard, a basic time less than the selected time would be arrived at.

e.g. 0.25 mins X 80 / 100 = 0.20 mins.

The standard time study would be deviated from the set standards due to the following allowances:

Relaxation Allowance: is an addition to the basic time intended to provide the worker with the opportunity to recover from the physiological and psychological effects for carrying out specified work under specified conditions and to allow attention to personal needs. The amount of allowance will depend on the nature of the job. The allowance provides the necessity to leave the work place to attend to personal needs such as washing, going to the wash room and getting a drink.

Allowance for basic fatigue: This allowance is always a constant, is given to take into the account of the energy expended while carrying out work and to alleviate monotony.

Contingency Allowance: it is a small allowance of time, which may be included in a standard time for small delays as well as for small delays as well as for occasional and minor extra work like changing the needle during the stitching operation, discussing with supervisor, or reworking on the operation etc.

Steps in making a time study

When the work to be measured has been selected, the making of a time study usually consists of the following eight steps:

(1) Obtaining and recording all the information available about the job, the operative and the surrounding conditions, which is likely to affect the carrying out of the work.
(2) Recording a complete description of the method, breaking down the operation into "elements".
(3) Examining the detailed breakdown to ensure that the most effective method and motions are being used, and determining the sample size.

(4) Measuring with a timing device (usually a stop-watch) and recording the time taken by the operative to perform each "element" of the operation.
(5) At the same time, assessing the effective speed of working of the operative relative to the observer's concept of the rate corresponding to standard rating.
(6) Extending the observed times to "basic times".
(7) Determining the allowances to be made over and above the basic time for the operation.
(8) Determining the "standard time" for the operation.

Tools required for standard time computation

In the footwear industry, the production goes according to the order sheet and capacity loading is done according to the production resources and standard time of operations. Operation sequences passes through various operator hands (Multiskill, high skill, skilled, semi-skilled and unskilled) and operators having different mental caliber. In order to have sufficient transparency across all productions levels, there is a need to have an easy method to evaluate quality and productivity during production.

To achieve the end product as per the buyer’s specifications, a set of documents are to be designed, which are very convenient and useful to achieve the quality targets during production. Various documents like order break up sheet, specification sheet, plan sheet, route sheet and sequence of operations are designed to enhance the quality and productivity of upper closing department.

During designing the sequence of operations, one should be very careful regarding the standard time data of each operation. This helps in better planning and controlling during upper closing. It is suggested that during planning the sequence operations should break in to smaller content and thus proper work distribution c be achieved.

a) Order sheet

This tool/document includes all information regarding:

- Customer details,
- Style/design code or article No,

- Style/design details according to the season,
- Order quantity according to the season,
- Dispatch schedule and
- Concerned port and previous references.

b) Route sheet

This tool/document refers to the route of the production for different styles according to the design and their constructions. Shoe designs/styles can be made in many ways and they interpret the route of the product during production.

For convenience and quality production, shoe manufacturing can be divided into different areas, where each operation in the total footwear manufacturing is completed. Each department has its separate entity and sometimes two departments may club together according to the situation. These areas are:

- Sourcing and designing,
- Cutting or clicking section,
- Upper sewing or closing section,
- Bottom components,
- Lasting section and
- Finishing and packing department.

The shoe making resource material travels in a particular sequence from one department to another department till the final shoe is packed. Therefore individual route sheet is made for every single design of shoe and Work in Process goes accordingly.

Route sheet is very helpful in identifying the particular shoe style placement during production. It is filled by the production manager and it pinpoints the exact position of WIP of shoe during production. There may be one route sheet for the one order breakup or separate sheets for different departments.

Table:-

Date	Dept.	Order No	Article No	Plan No	Size	Input (Prs)	WIP (Prs)	Rejection (Prs)	Output (Prs)	Packing (Prs)

c) Lot no

For convenience during shoe production, the complete shoe order is divided into quantities or lots as per the dispatch schedule. This is because:

- Buyers may ask for a breakup in the delivery of the order given rather than asking for the delivery of the whole order at once,
- Shipping of the order to different destinations
- Storage cost or any other damage due to loading-unloading of the material.
- Payment releases and
- Working capital.

The planned dispatch quantities of shoes are divided in to small lots and a lot no. is allocated accordingly. The lot no. is stamped over the components' edges (or any other suitable area), which helps to recognize the component against any mis-happening during production.

Example

Suppose on 1st January, 5000 pairs of shoe uppers order have been received from the buyer, which is to be dispatched according to following:

- Pairs 500 to be dispatched by 31st January,
- Pairs 500 to be dispatched by 31st March,
- Pairs 1200 to be dispatched by 3oth April,
- Pairs 1400 to be dispatched by 31st May,
- Pairs 1400 to be dispatched by 3oth June,

Now for convenience during production the 1st dispatch quantity is divided in the following ways:

- Order break up of first 500 pairs will divided in to five equal lots.
- One Lot of 100 pairs (even number) is considered suitable for calculation purposes during recording and planning.
- Serial all the concerns Lots in numbers like 1, 2, 3, 4 and 5 (100 each).

This 100 pair Lot is allocated further by providing numbering in following ways:

- Take lot number one of 100 pairs and start planning the serial number from one to hundred.
- Material to be issued for cutting will be according to the lot number one.
- Stamping done on above lot material will be given as serial number like order number/article number/size/lot number/serial number.

d) Job card

Work In Process (WIP) during upper closing passes from one operation another by different mode of transportation system. These transporting systems are used according to the capacity and convenience of the product. Some of them are as follows:

- Basket,
- Trolleys and
- Shoebox.

When above carriers are moving on the conveyers, they might be not recognized for their existence. To find out the suitable production lot in these carriers, one must carry some details along with them. The concerned detail is recorded on a card called job card.

These details can be:

- Plan Number
- Article Number,
- Size,
- Number of pairs,
- Lot Number and
- Department concern.

Table job card

XYZ Company, Addis Ababa

Job card

Order No		Date		QC
Article No		Plan No		
Lot NO		Style No		
Size		Pairs	Cutting	
35	1			
36	2		Closing	
37	3			
38	4		Bottom components	
39	5			
40	6		Lasting	
41	7			
42	8		Finishing	
43	9			
44	10		Packing	
45	11			
46	12		Dispatch	

Total Number of Pairs			

e) Daily plan sheet

According to production capacity, daily plan sheet is designed and full lot (particular number) is fed in to the production conveyor during upper making. It helps in building a momentum in production and displays clear picture of production. It also helps in day-to-day planning against any failure or changes to be made to the resources in upper closing department.

To achieve the production targets, production norms are fixed and work is enforced accordingly in to the concerned department. To obtain the predetermined results against targets, following activities are found most suitable:

- Display of worker's skill inventory chart,
- Display daily attendance chart,
- Display concern sample or specification sheet in the department,
- Display sequence of operation chart,
- Display list of machine break down during production hours,
- Display hourly production chart,
- Display reasons that affecting the production,
- Make show boards for every operation, which feels complicated.
- Display necessary feedback of customer.
- Any other instruction chart.

Table Daily Plan Sheet (production)

Date	8.30 9.30	9.30 10.30	10.30 11.30	11.30 12.30	Total Production	1 to 2	2 to 3	3 to 4	4 to 5	Total Production
Monday										
Tuesday										
Wednesday										
Thursday										
Friday										
Saturday										
Total										

f) Specification sheet

Generally specification sheet is designed according to the order sample and most of the time it is sent by the customer along with the order sheet. This helps in identifying the material concerned for the shoe upper to be made and dictate all production terms as per the sample. This is a kind of agreement between buyer and manufacturer regarding the products to be manufactured.

The manufacturer cannot neglect the given specifications while making the shoe and the buyer will have to accept the related product, if it is to be made according to the specifications given. Specification can be of regarding following types:

- Material specifications,
- Technical specifications
- Machinery specifications,
- Method specifications and
- Packing and dispatch specifications.

These specifications are collected from the buyer and recording done at various levels of the system. All the concerned information is sent to the respective departments and necessary considerations are taken care of. Transparency is maintained at all levels of production for the necessary specifications to be followed and necessary steps are taken for the remedial action.

g) Show boards

Show boards are considered to be strong production tools during upper making. These are always based on the sequence of operations and necessary specifications. Sometimes, they also tell about the working methods for a particular operation. It is always suggested that a good quality production can be achieved with the help of right production tools and show boards are one of them.
Show boards are known as the diagrams of complicated and quality sensitive operations in upper closing department, where extra precautions are required.

Following show boards are typically designed in upper closing department for the sake of quality and productivity.

- Skiving (diagram, width, depth and angle of skiving),
- Close or back seam (seam distance, seam treatment, reinforcement tape, stitch density, needle size, needle point, thread type and size),
- Ornament stitching,
- Eyeleting,
- Derby lock,
- Oxford stay and
- Top line treatments.

h) Operations standard time

Upper closing processes are considered complicated and time consuming during making the upper in footwear industry. During production the capacity loading requires certain basic calculation, which includes correct operation sequences and standard time to perform for one particular operation. Other contents of capacity loading are machinery, manpower, raw material and tools and equipment used during production.

Operation standard time is calculated as follows:

- Operation basic time,
- Plus 10 % contingency allowance (depending on the industry)

Basic time is a time taken by the average worker to perform one particular operation under certain guidelines given by the POM during production.

Contingency allowance is calculated against facilities provided to the mass of the factory under HRD considerations as per governance in a civil society.

Self-Check 3	**Written Test**

Name: _________________________ Date: _______________

Time started: ________________________ Time finished: ____________________

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

Section 1

Fill in the blanks **(1X5 Points)**

1. A ____________ is a written description of how a process should be done.
2. Time study is a direct and continuous _______________ of a task.
3. _____________ are always based on the sequence of operations and necessary specifications
4. Individual _____________ sheet is made for every single design of shoe.
5. The job card is required to recognize the lot during _____________________.

Section 2

True & False **(1X5 Points)**

1. Time study is a direct and continuous observation of a task.
2. Work study is a term for the techniques like method study and work measurement.
3. Work study does not lead to higher productivity
4. Relaxation allowance is the necessity of a worker to leave the work place for personal work.
5. Route sheet interpret the route of work during production.

Section 3

Short Answers **(2x5=10 Points)**

1. What are the aspects of work study?
2. Write in brief the documents required in the study of work standard?
3. What are the allowances in the time study
4. What do you understand by Performance rating?
5. Explain in brief the procedure of work study

Operation sheet	application of method study

The following tasks are the main application of method study.

Task 1: determine structure and composition of material or product

Task 2: make calculations, interpret and use data from various sources

Task 3: read, interpret and follow information on work specifications, standard operating

Task 4: procedures and work instructions and other reference material

Task 5: maintain accurate records

Task 6: communicate within the workplace

Task 7: sequence operations

Task 8: meet specifications

Task 9: clarify and check task-related information

Task 10: carry our work according to OHS practices

Lap test	

1. Apply the main tasks of method study.

LG #26	LO2: Identify Options for Production & Alternate Design

Instruction Sheet

This learning guide is developed to provide you the necessary information regarding the identification and confirmation of the production requirements and also the OHS

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to –

- Demonstrate the capability of sample product and the options of the productions.
- Demonstrate the changing of sample product & its Effectiveness.
- Demonstrate the OHS during the production on floor.

Learning Activities

1. Read the specific objectives of this Learning Guide.
2. Read the information written in the "Information Sheets".
3. Accomplish the "Self-check".
4. Request your teacher to observe your demonstration of the exercises and give you feedback.

Information Sheet- 1	capability of sample product and the options of the productions

1.1. Sample Product Development:

The product development center is authorized to develop sample based upon the design development. It is also authorized to conduct sample trial through fit test & the design trials. The design department is also authorized to select the leather / lining & similar material as suitable during the design stage & can change the material based upon feedback/production problems. The designer is also authorized, in consultation with the customer, to carry out amendment as communicated / suggested. The sampling cell is responsible for the preparing the sample as per the design requirement.

Following inputs are required by the sample cell before commencing the sampling activity:

- Design sketch
- Pattern with details such as underlay/raw edge etc.
- Materials as per the specification e.g. - Leather, threads, combinations etc.

The sample department maintains a register of the list of samples developed along with last & sole number corresponding customer reference number/ article code. The register is verified every week for the progress of the sample made.

After the sample development, Production trials and other steps of sampling the product is analyzed for production. Best way of analysis is to prepare an Industrial Engineering.

Industrial engineering is basically a phenomenon by which we find the information about the followings:-

1. Sequence of Production operations
2. Machine Details
3. Workers' information (skilled, semi-skilled or un-skilled)
4. Total no. of workers

5. Per day productivity etc.

Following is an example of I.E. Format of Jogger Sport shoe of Stuck-on construction, go through it and analyze the points.

Table sequence of production operation

TENTATIVE I. E. Art.-JOGGER

WORKER	process no	operating flow	MACHINE DETAILS	FEED TYPE
		Operations		
Helper	1	marking on toe mesh	MANUALLY	
Helper	2	marking on qtr. Mesh	MANUALLY	
Helper	3	marking on foxing mesh	MANUALLY	
Helper	4	marking on yellow toe u/l	MANUALLY	
Helper	5	marking on silver toe u/l	MANUALLY	
Helper	6	marking on yellow qtr. u/l	MANUALLY	
Helper	7	marking on silver qtr. u/l	MANUALLY	
Helper	8	marking on foxing ctr. u/l	MANUALLY	
Stitcher	9	stitch bond zig-zag	FLAT BED ZIG-ZAG M/C	DOG FEED
Stitcher	10	toe & qtr. Mesh zig-zag	FLAT BED ZIG-ZAG M/C	DOG FEED
Stitcher	11	both qtr. Zig-zag	FLAT BED ZIG-ZAG M/C	DOG FEED
Stitcher	12	foxing mesh zig-zag	FLAT BED ZIG-ZAG	DOG FEED

			M/C	
Helper	13	super tuff attaching	MANULLY	
Helper	14	cementing on silver toe u/l	CEMENTING M/C	
Helper	15	cementing on yellow toe u/l	CEMENTING M/C	
Helper	16	hammering on silver toe u/l	MANULLY	
Helper	17	hammering on yellow toe u/l	MANULLY	
Stitcher	18	stitching on silver toe u/l	SINGLE NEEDLE POST BED M/C	ROLLAR FEED TYPE
Stitcher	19	stitching on yellow toe u/l	SINGLE NEEDLE POST BED M/C	ROLLAR FEED TYPE
Stitcher	20	stitch bond zig-zag	FLAT BED ZIG-ZAG M/C	DOG FEED TYPE
Helper	21	stitchbond adhesion	MANULLY	8250
Helper	22	stitchbond hammering	MANULLY	
Helper	23	gimping piece cementing	CEMENTING M/C	
Helper	24	gimping piece attaching & hammering	MANULLY	
Stitcher	25	gimping piece stitching	SINGLE NEEDLE POST BED M/C	ROLLAR FEED TYPE
Helper	26	punching and eyeleting at qtr.	PUNCHING M/C	
Helper	27	whole qtr. Cementing	CEMENTING M/C	
Helper	28	whole qtr. Hammering	MANULLY	
Stitcher	29	whole qtr. Stitching	SINGLE NEEDLE POST BED M/C	ROLLAR FEED TYPE
Helper	30	u/l eyestay facing cementing	CEMENTING M/C	
Helper	31	u/l eyestay facing hammering	MANULLY	
Stitcher	32	u/l eyestay facing stitching	SINGLE NEEDLE POST BED M/C	ROLLAR FEED TYPE

Helper	**33**	ctr. Yellow u/l cementing	**CEMENTING M/C**	
Helper	**34**	ctr. Yellow u/l hammering	**MANULLY**	
Stitcher	**35**	ctr. Yellow u/l stitching	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
Helper	**36**	silver foxing cementing	**CEMENTING M/C**	
Helper	**37**	silver foxing hammering	**MANULLY**	
Stitcher	**38**	silver foxing stitching	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
Helper	**39**	ctr. Cementing	**CEMENTING M/C**	
Helper	**40**	ctr. Hammering	**MANULLY**	
Stitcher	**41**	ctr. Stitching	**DOUBLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
Helper	**42**	toe cap cementing		**SPRING STITCHING**
Stitcher	**43**	toe cap attaching & stitching	**DOUBLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
Helper	**44**	loop cementing and attaching	**MANULLY**	**8250**
Helper	**45**	eyestay cementing	**CEMENTING M/C**	**8250**
Helper	**46**	eyestay hammering	**MANULLY**	
Stitcher	**47**	eyestay stitching	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
Helper	**48**	collar eva cementing	**CEMENTING M/C**	
Helper	**49**	collar eva attaching	**MANULLY**	
Stitcher	**50**	collar lining stitching	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
Helper	**51**	collar foam cementing	**CEMENTING M/C SPRAY**	
Helper	**52**	collar foam attaching	**MANULLY**	
Helper	**53**	collar lining folding manually	**MANULLY**	

Helper	**54**	collar lining folding by hook	**MANULLY**	
Stitcher	**55**	eyestay final stitch	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
Stitcher	**56**	foam decoration stitch	**SINGLE NEEDLE POST BED M/C**	**DOG FEED TYPE**
Stitcher	**57**	tongue upper & lining seam	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
Helper	**58**	foam inserting in tongue	**MANULLY**	
Helper	**59**	tongue reversing	**MANULLY**	
Stitcher	**60**	tongue locking stitch	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
Helper	**61**	tongue trimming	**MANULLY**	
Helper	**62**	loop attaching	**MANULLY**	
Stitcher	**63**	tongue stithing	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
Stitcher	**64**	Rounding	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
Stitcher	**65**	counterstiffner putting and stitching.	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
	66	eyelet punching	**PUNCHING M/C**	

This I.E. is providing all the Information regarding Production of this Jogger shoe in Stuck-on method.

2.1. How Effective Is Product Sampling?

It drives sales at point-of-purchase. Firstly, encouraging trial of a product close to point-of-purchase is a great way to drive sales there. Upgrade your product sampling effectiveness through a price promotion.

Consumers respond to product sampling. The sales-boosting effects of product sampling are deeper than they might initially appear. For example, psychologically, “samplers with a heightened awareness of the presence of others at the sampling station may feel a level of social ‘pressure’ to make a post-sample purchase.” Heilman et al. 2011

It generates brand awareness. The product sampling conversion rate is not always measured in sales. Product samples help drive this brand awareness before customers even reach your stand.

It encourages trial. Once aware of a brand, consumers are far more likely to consider trialing it, a decision made much easier when the cost of trial is zero. This would explain why, when asked, “What would induce you to try a new product?”,

According to Hofstede, some humans try to reduce anxiety by minimizing uncertainty. Again, this supports the effectiveness of product sampling – by giving the consumer a chance to use the product, we decrease the customer’s uncertainty and therefore the anxiety about their purchase decision.

Continuing in the vein of psychology, which underpins all of marketing when you think about it, the foot in the door technique helps demonstrate the true importance of encouraging trial, for those still unconvinced. In the context of product sampling, convincing a consumer to sample is the initial commitment, increasing the likelihood of them committing to a purchase at a later date.

It demonstrates value, aiding retention. Since modern marketing is largely relationship-based, it is important to nurture that relationship, providing more value than you are perceived to take.

This can be attributed to the generous nature of product sampling – giving away a product demonstrates that a brand is not entirely driven by money, even if the end goal is in fact sales!

It generates valuable feedback. Increasingly, data is becoming the currency of marketing, we develop new technologies to capture it every day.

In exchange for adding value, product sampling, like all face-to-face marketing activities, gives unprecedented access to deep, considered feedback data from consumers. This is especially useful when trialing new products, or variations on existing products.

The cost of product sampling. Now, whilst we product sampling is supported the figures, it’s important to recognize that there are costs associated when planning a product sampling campaign. This isn’t necessarily a bad thing, after all, very little comes free these days.

Storage: For shorter campaigns this may not be necessary, but if you're shipping tens of thousands of samples throughout the country you're probably going to need somewhere to put it.

Transport: Internal distribution network, smaller companies will have to factor in van hire to transport stock to and from events.

Sampling stands: Stand production can be easily outsourced.

Staff: The most important part – a solid team of brand ambassadors can be the making of a sampling campaign, they are the physical representation of sample.

If you're outsourcing to a product sampling agency, the likelihood is that they will either have their own staffing database, or have an existing relationship with a promotional staffing agency. Either way, stay in open contact with them to ensure everything runs smoothly.

2.2. PRODUCTION METHODS

Different production method varies greatly in how they actually handle the production process but the aim of each is the same: to transform in puts into outputs in the most efficient way. Following are some production methods:-

- **Just in time production (JIT)**

Just in time is a 'pull' system of production, so actual orders provide a signal for when a product should be manufactured. Demand-pull enables a firm to produce only what is required, in the correct quantity and at the correct time.

This means that stock levels of raw materials, components, work in progress and finished goods can be kept to a minimum. This requires a carefully planned scheduling and flow of resources through the production process. Modern manufacturing firms use sophisticated production scheduling software to plan production for each period of time, which includes ordering the correct stock. Information is exchanged with suppliers and customers through EDI (Electronic Data Interchange) to help ensure that every detail is correct.

Supplies are delivered right to the production line only when they are needed. For example, a car manufacturing plant might receive exactly the right number and type of tyres for one day's production, and the supplier would be expected to deliver them to the correct loading bay on the production line within a very narrow time slot.

2.1.1. Advantages of JIT

- Lower stock holding means a reduction in storage space which saves rent and insurance costs
- As stock is only obtained when it is needed, less working capital is tied up in stock
- There is less likelihood of stock perishing, becoming obsolete or out of date
- Avoids the build-up of unsold finished product that can occur with sudden changes in demand
- Less time is spent on checking and re-working the product of others as the emphasis is on getting the work right first time

2.1.2. Disadvantages of JIT

- There is little room for mistakes as minimal stock is kept for re-working faulty product
- Production is very reliant on suppliers and if stock is not delivered on time, the whole production schedule can be delayed
- There is no spare finished product available to meet unexpected orders, because all product is made to meet actual orders – however, JIT is a very responsive method of production

2.2.1. Quick Response Manufacturing (QRM)

(Quick response manufacturing) emphasizes the beneficial effect of reducing internal and external lead times.

Shorter lead times improve quality, reduce cost and eliminate non-value-added waste within the organization while simultaneously increasing the organization's competitiveness and market share by serving customers better and faster. The time-based framework of QRM accommodates strategic variability such as offering custom-engineered products while eliminating dysfunctional variability such as rework and changing due dates.[1] For this reason, companies making products in low or varying volumes have used QRM as an alternative or to complement other strategies such as Lean Manufacturing, Total quality management, Six Sigma or Kaizen.

2.2.2. Quality Circles (Management)

A quality circle is a device or tool used in businesses to improve productivity and job performance at work. Quality circles were first developed in post-war Japan as a means to boost the recovery of industry. However, they have also been used in a number of countries, including the United Kingdom and the United States. Quality circles in the 21st century are often included in broader total quality management strategies.

Usually quality circles within an organization are formed of groups of between three and 12 members which are assigned issues close to their job. Such teams should identify problems and discover long-term solutions, and are vested extensive authority. As employees are charged with problem-solving and overall improvement of the working process, quality circles represent bottom-up innovations in productivity management. Their effectiveness depends on the cooperation of managers, as it is up to them to provide for the implementation of solutions found by employees.

The idea of quality circles was born in Japan when the local scientists' and engineers' union was trying to fill in the gap between job design and actual work production. Japanese workers had shared work principles based on joint efforts and cooperation for centuries. Each member of the Japanese society has the duty to contribute to the progress and improvement of the community, rather than to compete with his or her colleagues. Employees are valued for their competences and skills and team success is highly appreciated by companies. Japanese companies aim at long-term success, therefore quality circles are constantly seeking improvement of the work process that would eventually help make better products. Quality circles gained great popularity throughout Japan and by the 1980s, five in six employees participated in such groups.

Such innovation helped to make Japan's global reputation as manufacturers of a wide range of dependable goods, due to the high quality standards set by the Japanese industries.

The Japanese example served as evidence for the effectiveness of quality circles and soon various Asian and Western organizations tried to apply them. Studies into the implementation of quality circles outside Japan have shown less remarkable results, as managers were seeking short-term profits or implemented quality circle strategies only for a limited period. Although results vary between cases, researchers into quality circles have established that their effectiveness largely depends on the commitment and participation of members, who in the best case should be volunteers. Such involvement often depends on the cooperation of managers and their attitudes toward the efforts of employees. Besides, quality circle members should pass a necessary problem-solving training, while executive higher-ups should be able to implement solutions.

In the United States, quality circles have been integrated into total quality management systems, where they are usually acting as independent task groups. The focus of quality circles was shifted to employee training and creating stimulus for workers to take part in decision-making. At the end of the 20th century quality circles were also adopted in a number of U.S. federal agencies.

Studies have demonstrated that the concept of quality circles is differently understood and implemented both in the private and public sectors. However, there are certain common characteristics that quality circles within organizations share. Their structure resembles a traditional organizational pyramid with a steering or executive committee at the top. Quality circles outline the main quality improving efforts, coordinating and supervising them. A quality circle administrator takes care of the coordination between groups and between circles and the executive committee. A quality circle facilitator, on the other hand, assists group members in the application of specific tools and techniques and manages the problem-solving process.

The minimum necessary requirements for effective quality circles include:

- members should join groups voluntarily;
- members should agree and comply with general rules and norms of quality circles;
- group members should accept and assist the quality circle leader;
- members should cover training on the quality circle process, including problem solving and group dynamics;
- members should know how to use quality circle tools and techniques in order to encounter and fix quality problems.
- The ultimate goal of quality circles is to persistently increase the quality of offered products and services in order to best satisfy the customers' needs and expectations.

- **Team Process**

Learning to make teams work is not an easy task. HCG uses many tools to help ministry teams learn to work together effectively.

In 1965, Bruce Tuckman developed a simple four-stage model of team development that has become an accepted part of thinking about how teams develop. In his article, "Developmental Sequence in Small Groups," Tuckman outlines four stages of team development: Forming, Storming, Norming, and Performing. A successful team knows which stage they are in, and manages transitions between the different stages adeptly.

The Forming stage involves the introduction of team members, either at the initiation of the team, or as members are introduced subsequently. Members are likely to be influenced by the expectations and desires they bring with them, and will be keen to understand how the group will operate. In particular, they will be keen to understand how the leadership is likely to operate, in terms of style and character. This is a stage of transition from a group of individuals to a team.

As team members grow more confident, the team are likely to enter the Storming phase. Team members will have different opinions as to how the team should operate.

The best teams will understand the conflict, actively listen to each other, and navigate an agreed way forwards. Other teams may disintegrate as they bolster their own opinions to weather the storms of the group.

As the teams emerge with an agreed method of operating, the team enters the Norming phase. Team members have signed up to a common working method, and everyone is usually willing to share in this. During this phase, team members are able to reconcile their own opinions with the greater needs of the team. Co-operation and collaboration replace the conflict and mistrust of the previous phase.

Finally the team reaches the final phase, Performing. The emphasis is now on reaching the team goals, rather than working on team process. Relationships are settled, and team members are likely to build loyalty towards each other. The team is able to manage more complex tasks, and cope with greater change. The performing stage can either lead onto: a return to the forming

stage as group membership changes, a new "dorming" stage as the group gets complacent or "adjourning" as the group successfully reaches its goal and completes its work.

Let's explore the implications of each of the four stages for team leaders:

Table implication of team leaders

Forming	Storming	Norming	Performing

Team Leader's Style	More directive approach, outlining how the process will develop and laying down a clear structure.	Leader needs to be supportive, actively listening to team members, and managing the conflict, generating ideas, and explaining decisions.	Leader acts as a team member, as leadership is starting to be shared. Leader helps to develop consensus.	Leader takes overview, but within the day to day running, the group is sharing leadership between members.
Reaction to Leadership	Team members take a tentative, wait and see approach. Leader will be	Leader is under pressure from more vociferous team members.	General support for the leadership within the team. Mutual respect underpins this.	Personal relationships have developed which underpin the leadership relationship.

	allowed to lead, but that doesn't guarantee support.			
Team Process	Process is driven by the leader. Some people are reluctant to contribute openly.	Process likely to break down until conflict is resolved.	The core process should operate smoothly, although there is a danger of focusing on smaller process issues rather than core team work.	Process functions well, and is adjusted as necessary. Leadership is shared and tasks delegated.
Trust within the team	Individuals are not clear about their contribu	Trust is focused into smaller groups as sub-groups and alliances form.	As roles are accepted and clarified, trust and relationships start to develop to a	Team starts to operate on higher levels of trust as loyalty and relationships develop.

	tion. "Getting to know you" phase. Trust may start to be built.		greater degree.	
How Decisions are made	Nominated leader is expected to make decisions. Some more vocal members may dominate.	Decisions are hard to make. Members are unwilling to give way. Compromise is a frequent outcome.	Group is able to come to common decisions. Win-win is more likely than compromise.	Decision making is easier - some decisions are delegated to sub-groups or individuals.

2.2.3. Benchmarking

Benchmarking is the process of comparing an organization's operations and internal processes against those of other organizations within or outside its industry. The other organizations against which the comparisons are made, known as 'benchmark partners', are usually those that are perceived to be the best performers in their class. The purpose of benchmarking is to identify and adopt best known practices that can lead to superior performance. It was a buzzword in the 80's and 90's, but continues to be strongly practiced in various industries today.

Benchmarking is a systematic process - it must have a framework and use a standard set of attributes that are measurable to compare multiple organizations objectively. Benchmarking must be performed on a specific area or activity only, such as operational best practices, information technology, staffing, compensation packages, distribution systems, budgeting, and the like. Limiting the scope of the benchmarking activity allows the formulation of a more focused agenda that provides more useful information from better-targeted benchmark partners.

In general, benchmarking partners are classified into four (4) categories: 1) internal, which pertains to departments, factories, etc. of the same company; 2) competitive, which pertains to direct competitors; 3) functional, which pertains to best-in-class organizations who are in the same field or activities; and 4) generic, which pertains to leading organizations from various fields and industries.

Benchmarking with internal partners is usually the best starting point for a benchmarking program. However, many companies or organizations are not big enough for internal benchmarking, and have to resort to external benchmark partners to get the information they need. Identifying suitable external benchmarking partners depends on the purpose of the benchmarking activity as well as the nature of the benchmarking organization.

For example, it would be good to be able to benchmark against a leading competitor, but this benchmarking arrangement is usually quite difficult to set up because most leading competitors will not divulge their 'trade secrets' to enable a competitor to catch up, resulting in bench mark results that are empty of useful information. In such cases, functional or generic benchmarking partners involving world-class non-competitor companies are viable options, since these are often willing enough to share information with an organization.

Benchmarking consists of five (5) basic steps:

1) Decide on what process or area to benchmark, considering which would give the most leverage or improvement potential;

2) Understand the internal processes or operations involved in the area being benchmarked and collect data on their key performance metrics; a good understanding of how an internal system works would facilitate understanding of those of the benchmark partners;

3) Identify organizations who are best in class in the area to be benchmarked and arrange mutually-beneficial benchmarking activities with them;

4) Conduct the benchmarking activities arranged with the partners; and

5) Analyze the benchmark data and adopt practices that will produce the greatest benefits to the organization.

There are many ways by which the benchmarking proper may be conducted with the benchmarking partner, but one of the most popular ones is by exchanging information through a questionnaire, possibly on a visit to the partner. This may consist of the following steps:

1) Develop a questionnaire that covers all the information that needs to be obtained;

2) Answer the questionnaire internally to test it and so that the same information may be provided reciprocally if the partner asks for it;

3) provide a reason for every question so that its necessity may be rationalized to the partner if necessary;

4) Discuss the questionnaire to clarify its objectives, areas of interest, and areas of confidentiality and sensitivity with the partner; and

5) Arrange a visit with the partner.

If the visit to the benchmarking partner materializes, the following guidelines would be useful:

1) Prepare for the visit thoroughly;

2) define the purpose and objectives well;

3) commit the questionnaire to memory and leave the hard copy behind;

4) Be open and honest during the visit;

5) Avoid being seen by the partner taking down notes, but take down notes nonetheless; 6) reciprocate information requests;

7) Thank the partner again and again.

Benchmarking is just a tool to learn from others, and not a tool to win in business. It will not give information on what products and services customers want, or how to generate more revenues and profits. There are other management techniques to accomplish these objectives. These must complement the regular use of benchmarking to ensure continuous improvement in everything that a company does. Lastly, benchmarking per se is not useful unless knowledge gained from it are put in action to benefit the company.

2.2.4. Man Power Counting

A per the above sequence the following man power is required:-

Table : man power counting

INDEX

	SKILLED WORKER	**7**
	SEMI SKILLED WORKER	**13**
	UNISKILLED	**13**

	WORKER 'A'	
	UN-SKILLED WORKER 'B'	14
	TOTAL	47

Machines

A per the above sequence the following are the requirements of the machine required for stitching department:-

Table : requirements of machine

INDEX

SINGLE NEEDLE POST BED	**ROLLAR TYPE**	**8**
SINGLE NEEDLE POST BED M/C	**DOG FEED**	**1**
FLAT BED ZIG-ZAG M/C	**DOG FEED**	**1**
EYELET PUNCHING M/C	**PULLY**	**1**
	TOTAL	**11**

As per the above I.E. the following manpower would be required for 1000 pairs of Joggers production per day.

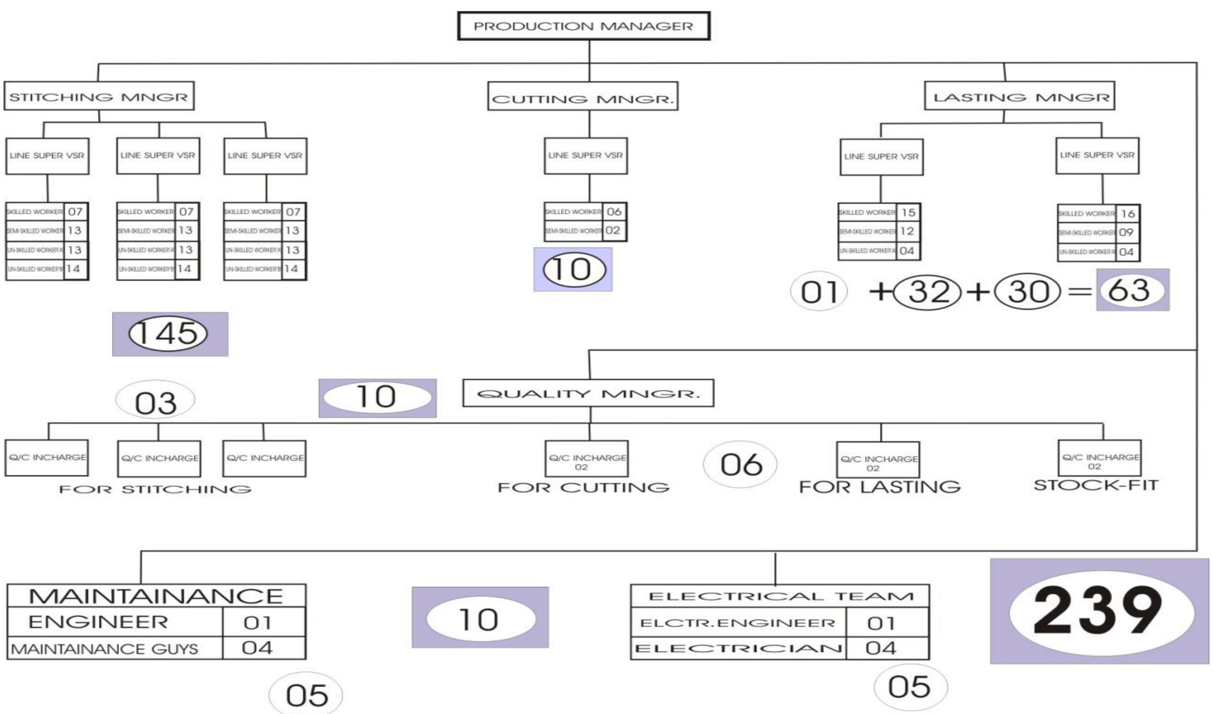


Figure 37: joggers' production

In addition with the design or any alteration in design will direct impact to the I.E and other formats of pre-production preparations, consequently the production methods can be effected as well as the efficiency can be varied.

If any change is required the proper documentation should be done in the same shown format.

Self-Check	Written Test

Name: ___________________________ Date: ________________

(Total marks:-10)

Instructions: Write all your answers in the provided answer sheet on page:-

Directions: Write down the short answers of the following questions. (5X2=10marks)

Q1. What is benchmarking means?

Q2. List benchmarking steps.

Answer Sheet

Score = ___________

Rating: ____________

Name: _________________________ Date: _______________

Answer

1-____

____

____

2-____

____

Information Sheet- 2	OHS practices

2.3 OHS practices

1. Manual handling techniques

Manual handling causes over a third of all workplace injuries. These include work-related musculoskeletal disorders (MSDs) such as pain and injuries to arms, legs and joints, and repetitive strain injuries of various sorts.

The term manual handling covers a wide variety of activities including lifting, lowering, pushing, pulling and carrying. If any of these tasks are not carried out appropriately there is a risk of injury.

Good handling technique for lifting

There are some simple things to do before and during the lift/carry:

- Remove obstructions from the route.
- For a long lift, plan to rest the load midway on a table or bench to change grip.
- Keep the load close to the waist. The load should be kept close to the body for as long as possible while lifting.
- Keep the heaviest side of the load next to the body.
- Adopt a stable position and make sure your feet are apart, with one leg slightly forward to maintain balance

2. Standard operating procedures

Standard Operating Procedures describe how individual processes are carried out and ensure consistency within the factory. Consistency of processing is key to delivering quality goods batch after batch. If correctly implemented, SOPs will improve quality, increase productivity, reduce waste and save costs. All factory processes, however simple, should have a written SOP that provides step by step details of what needs to be done in order to carry out a task such as:

- The equipment used
- Temperature, humidity and lighting requirements

- Timings
- Chemicals used

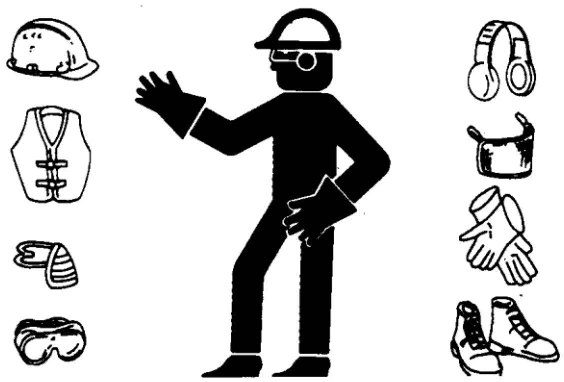
Every article should have a proper SOP, displayed at production floor.

- 3-Personal protective equipment

Guard against injury from flying pieces of metal or debris; wear goggles or safety glasses.

Wear close fitting clothing and safety equipment appropriate to the job.

Prolonged exposure to loud noise can cause impairment or loss of hearing. Wear suitable hearing protection such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.



At the time of production the necessary protective equipment should be used.

4- Safe Manual Material Handling

Many jobs require frequent lifting, carrying, pushing, pulling, lowering and raising materials by hand. These job tasks are often referred to as manual materials handling. Staff who lift or perform other materials handling tasks may be at risk for back or other injuries. These injuries may be prevented by redesigning jobs and practicing safe handling techniques.

Layout of Work Area

- The layout of work areas can be arranged to prevent awkward postures such as bending, twisting, and overreaching
- Work surfaces should be at waist height, or height-adjustable, to prevent bending
- There should be sufficient space to turn around and prevent twisting
- Materials that will be manually lifted should not be stored directly on the floor
- Frequently used and heavy items should be stored between knee and waist height
- Elevated platforms or step stools should be provided to reach items above chest level

S.M.A.R.T. Lifting Technique

Size up the load

- Assess the size, weight, and shape. Remove obstacles from the load (such as loose wrapping materials).
- Assess whether the load actually needs to be moved
- Where is the load going to be placed? Remove obstacles from your path.
- Determine whether mechanical or assistance from a co-worker is required

Move the load as close to your body as possible

- Stay close throughout the lift
- The whole hand should be used to ensure a firm grip

Always bend your knees

- Maintain balance
- Keep feet apart and in a comfortable position
- Minimize bending at the waist
- Bend your knees to a semi squat

Raise the load with your legs

- Lift smoothly, without jerking
- Maintain the normal curve of your spine throughout the lift

- Tighten the abdominal muscles and exhale while lifting

Turn your feet in the direction that you want to move the load

- Avoid unnecessary bending, twisting, and reaching
- Change direction by turning your feet and not your back
- To set down a load, squat down and keep your head up. Let your legs do the work

5-Taking of rest breaks

Workers over 18 are usually entitled to 3 types of rest break.

- **Rest breaks at work**

Workers have the right to one uninterrupted 20 minute rest break during their working day (this could be a tea or lunch break), if they work more than 6 hours a day.

- **Daily rest**

Workers have the right to 11 hours rest between working days (eg if you finish work at 8pm, they shouldn't start work again until 7am the next day).

- **Weekly rest**

Workers have the right to:

- an uninterrupted 24 hours without any work each week, or
- 48 hours each fortnight

A worker's employment contract may say they're entitled to more or different rights to breaks from work.

Work that puts health and safety at risk

An employer should give an employee enough breaks to make sure their health and safety isn't at risk if that work is 'monotonous' (eg work on a production line).

Domestic workers in a private house (eg a cleaner or au pair) aren't entitled to rest breaks for health and safety reasons

6- Ergonomic arrangement of workplaces

Ergonomics is the study of people while they use equipment in specific environments to perform certain tasks. Ergonomics seeks to minimize adverse effects of the environment upon people and thus to enable each person to maximize his or her contribution to a given job.

This industry guide:

• Explains generally how measurements of human traits can be used to further workplace safety, health, comfort and productivity.

• Discusses how to enhance worker safety by combining principles that govern the action of forces with knowledge of the human body.

• Analyzes properties of illumination and explains how proper illumination makes for a safer workplace by reducing worker fatigue.

• Shows how hand tools can be designed to reduce injuries to employees and to lessen trauma to their body members.

• Illustrates ways to recognize proper sitting positions and to construct seating arrangements to minimize stress to the lumbar region.

• Demonstrates how workspaces can be designed to decrease psychological stress and to increase employee motivation.

• Directs attention to the benefits of proper selection and strategic arrangement of controls and displays for the machinery operation.

• Offers general information about ways to reduce back injuries that result from manual lifting and offers more specialized guidelines for evaluating physical stresses imposed by lifting.

• Refines the concept of the worker with a disability and suggests ways of meeting the special needs of people with disabilities.

• Stimulates new thinking about problems (such as those from the sustained operation of computers) brought about by technological advancements.

Figure 38 ergonomic arrangement of workplace

7-Following marked walkways

For routine workings on production floor& in case of emergency these mark ways are very useful**.** They provide the directions to evacuate the premises.

Figure 39 marked walkways

8-Safe storage of equipment

The equipment storage should be at best place, so that the equipment should be reached in case of emergency.

9-Housekeeping

There should be proper housekeeping arrangements on the production floor also the display-board should be placed.

10-Reporting accidents and incidents

Every accidents and incidents should be reported on time and with appropriate personnel, so that the necessary action can be taken.

Self-Check	Written Test

Name: _________________________ Date: _______________

(Total marks:-10)

Instructions: Write all your answers in the provided answer sheet on page:-

Directions: Write down the short answers of the following questions.

(5X2=10marks)

Q1. What should be the main OHS on the production floor?

Q2. What are the main information that we get with the help of I. E.?

Answer Sheet

Score = ___________

Rating: ____________

Name: _________________________ Date: _______________

Answer

1-____

____

____

2-____

____

LG #27	LO3: Prepare and manage tools for production

Instruction Sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Different tools and equipment
- Required tools
- The appropriateness of prepared tools and equipment

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Identify different tools and equipment
- Prepare and /or manage required tools
- Check the appropriateness of prepared tools and equipment

Learning Activities

1. Read the specific objectives of this Learning Guide.
2. Read the information written in the “Information Sheets 1”.
3. Accomplish the “Self-check 1”. Request the key answer / key to correction from your teacher or you can request your teacher to check it for you.
4. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #2.
5. Read the information written in the “Information Sheet 2”.
6. Accomplish the “Self-check 2”. Again you can request the key answer / key to correction from your teacher or you can request your teacher to check it for you.
7. If your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity # 2.
8. Read the information written in the “Information Sheet 3”.
9. Accomplish the “Self-check 3”. Again you can request the key answer / key to correction from your teacher or you can request your teacher to check it for you.

10. If your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity # 5

1.1. Different tools and equipment

1.1.1. Identification of materials

Source of material (Leather, type, non-leather, textile etc.)

The earliest known shoes are sandals dating from approximately 7,000 or 8,000 BCE, found in the Fort Rock Cave in the US state of Oregon. in 1938. The world's oldest leather shoe, made from a single piece of cowhide laced with a leather cord along seams at the front and back, was found in a cave in Armenia in 2008 and is believed to date to 3,500 B.C. Ötzi the Iceman's shoes, dating to 3,300 BC, featured brown bearskin bases, deerskin side panels, and a bark-string net, which pulled tight around the foot. However, it is estimated that shoes may have been used long before this, but it is difficult to find evidence of the earliest footwear due to the highly perishable nature of early shoes. These earliest designs were very simple in design, often mere "foot bags" of leather to protect the feet from rocks, debris, and cold. They were more commonly found in colder climates.

Many early natives in North America wore a similar type of footwear known as the moccasin. These are tight-fitting, soft-soled shoes typically made out of leather or bison hides. Many moccasins were also decorated with various beads and other adornments. Moccasins were not designed to get wet, and in wet weather and warm summer months, most Native Americans went barefoot.

As civilizations began to develop, thong sandals (the precursors of the modern flip-flop) were worn. This practice dates back to pictures of them in ancient Egyptian murals from 4,000 B.C. One pair found in Europe was made of papyrus leaves and dated to be approximately 1,500 years old. They were also worn in Jerusalem during the time of Jesus Christ. Thong sandals were worn by many civilizations and made from a wide variety of materials. Ancient Egyptian sandals were made from papyrus and palm leaves. The Masai of Africa made them out of rawhide. In India they were made from wood. In China and Japan, rice straw was used. The leaves of the sisal plant were used to make twine for sandals in South America while the natives of Mexico used the Yucca plant.

The Egyptians and Hindus made some use of ornamental footwear, such as a sole less sandal known as a "Cleopatra", which did not provide any practical protection for the foot.

A common casual shoe worn in the Pyrenees during the Middle Ages are espadrilles. These are sandals with braided jute soles and a fabric upper portion, and often include fabric laces that tie around the ankle. The term is French and comes from the esparto grass.

Figure 40 Dutch patterns, ca. 1465. Made of wood and leather

Many medieval shoes were made using the turn shoe method of construction, in which the upper was turned flesh side out, and was lasted onto the sole and joined to the edge by a seam. The shoe was then turned inside-out so that the grain was outside. Some shoes were developed with toggled flaps or drawstrings to tighten the leather around the foot for a better fit.

In the 15th century, the Crakow was fashionable in Europe. This style of shoe is named because it is thought to have originated in Kraków, the capitol of Poland. The style is characterized by the point of the shoe, known as the "polaine", which often was supported by a whalebone tied to the knee to prevent the point getting in the way while walking.

As seen above majorly the footwear in the earlier days were either made out of leather or natural material such as wood and jute. Since the mid-20th Century, advances in rubber, plastics, synthetic cloth, and industrial adhesives have allowed manufacturers to create shoes that stray considerably from traditional crafting techniques. Leather, which had been the primary material in earlier styles, has remained standard in expensive dress shoes, but athletic shoes often have little or no real leather. Soles, which were once laboriously hand-stitched on, are now more often machine stitched or simply glued on. Many of these newer materials, such as rubber and plastics, have made shoes less biodegradable. It is estimated that most mass-produced shoes require 1000 years to degrade in a landfill. In the late 2000s, some shoemakers picked up on the issue and began to produce shoes made entirely from degradable materials, such as the Nike etc.

The commonly materials used in the manufacture of footwear include:

- Leather composition leather and fur skin
- Plastics
- Rubber
- Textiles
- Wood
- Jute etc.

Leather

- **Veal Calf** - these calves are normally of an age of up 10 months old, providing a premium fine leather that is of quite a strong nature. Therefore, this leather is often used as an upper material in many high quality men's and women's boots and shoes. This leather will always be lined.

- **Yearling** - this leather comes from the skin of an older animal, up to the age of 2 years. The grain is courser than in calf, but stronger. This leather can be found in men's, women's and children's shoes and as a dress leather is always lined.
- **Hide** - made from the skin of a fully grown adult cow. Again, this leather is even courser than either calf of yearling but is much firmer and stronger. It is normally referred to as 'a side of leather' due to its being cut from the backbone for handling convenience. This leather is very suitable for both work boots and strong shoes. Due to its strength these skins are normally too thick for the use of footwear uppers and are split into layers. The outer layer (hair follicle side) is used for uppers and if this outer layer has been blemished or scarred in any way, the surface can be buffed to remove any imperfections before a finish is applied. The leather is then known as 'corrected grain' leather. Boots that are made with hide/ox-hide/willow leather are made as unlined boots due to the thickness of the leather.
- **Goat or Kid** - this type of leather is much softer than that of a calf, but in the same instance is more likely to scuff and be subject to wear and tear. Kid leather, obtained from the younger animal, is finer in grain and has a glossy appearance. Both Goat and Kid leather are used in men's and women's fashion and comfort shoes and is particularly popular in good quality moccasins. In either of its forms, be it Kid or Goat, this leather has a very distinctive grain, which is found around the follicles.
- **Kangaroo** - this is lightweight supple leather that is both soft and pliable to wear. It is also surprisingly strong for its weight and is often found in both fashion and sporting footwear, and in dress and casual boots. This leather is always lined.
- **Buffalo** - this leather has an attractive and distinctive surface grain pattern; coming from the water buffalo. When used for shoe uppers, the majority of the buffalo leather will have come from young animals and is often used in casual and dress shoes and sometimes for linings.

- **Camel** - a naturally heavily grained finished leather that is both tough and robust. This leather originates from Australian camels that are either from farmed or wild, culled stock found in Central Australia. One of its most distinctive features is found in the healed scars that arise from desert living. Again, this leather can be used for both dress and work footwear.
- **Pigskin** - makes for an excellent lining material as it is soft, loose fibred leather. Usually appearing in pairs, the follicle pores are deep and quite distinctive. It is sometimes possible for the grain side of the skin to be napped to produce pig suede.
- **Sheepskin** - soft and loose fibred leather. This type of leather isn't as strong as others and for that reason is usually used with the wool still intact as a lining for slippers or cold weather footwear.
- **Deerskin** - is often used in very high quality footwear for both men's and women's boots and shoes. This leather is a hard-wearing, soft and very comfortable leather to wear and has a slight surface texture.
- **Exotic leathers** - other creatures, such as lizards, snakes, crocodiles and ostriches, have skin that can be tanned for shoe and boot uppers or as decorative panels and trims for other footwear. As they have a very distinctive appearance and are difficult to work with, these leathers are expensive and require a strong backing material.

Plastics:

Most plastics contain organic polymers. The vast majority of these polymers are based on chains of carbon atoms alone or with oxygen, sulfur, or nitrogen as well.

There are two types of plastics: thermoplastics and thermosetting polymers. Thermoplastics are the plastics that do not undergo chemical change in their composition when heated and can be molded again and again. Examples include polyethylene, polypropylene, polystyrene and polyvinyl chloride. Common thermoplastics range from 20,000 to 500,000 atomic mass unit, while thermo sets are assumed to have infinite molecular weight. These chains are made up of many repeating molecular units, known as repeat units, derived from monomers; each polymer chain will have several thousand repeating units.

Thermo sets can melt and take shape once; after they have solidified, they stay solid. In the thermosetting process, a chemical reaction occurs that is irreversible. The vulcanization of rubber is a thermosetting process.

Figure 41 plastics

Rubber:

Natural rubber is an elastomer (an elastic hydrocarbon polymer) that originally was derived from latex, a milky colloidal suspension found in specialized vessels in some plants.

Most rubber products are vulcanized, a process which involves heating with a small quantity of sulphur (or equivalent cross-linking agent) so as to stabilize the polymer chains, over a wide range of temperature.

Methods for processing rubber include mastication and various operations like mixing, calendaring, extrusion, all processes being essential to bring crude rubber into a state suitable for shaping the final product. The former breaks down the polymer chains, and lowers their molecular mass so that viscosity is low enough for further processing. After this has been achieved, various additions can be made to the material ready for cross-linking. Rubber is first compounded with additives like sulphur, carbon black and accelerators. It is converted into a dough-like mixture which is called "compound" then milled into sheets of desired thickness. Rubber may then be extruded or molded before being cured.

Figure 42 rubbers

Textile:

Canvas - Canvas is a fabric typically used in making sneakers. Originally derived from hemp, canvas now consists of other durable materials such as cotton and flax. Canvas is an extremely versatile footwear material because it's easy to clean and easy to dye.

Figure 43 textile

Nylon - Nylon is a synthetic fabric often found in running shoes. Developed in the early 1930s, nylon is a light and airy fabric that may be woven to cover the outside of a running shoe. Nylon is ideal for running shoes because it allows the foot to breathe, which is especially important for athletes who are constantly on the move.

Figure 44 nylon

Satin - Produced from low-twist filament yarns, satin is a sumptuous fabric often favored for wedding gowns and shoes. There are several different types of satin, including duchesse satin, a crisp satin often used in bridal gowns, and slipper satin, a heavier, stiff satin used for shoes. If you're seeking an even more lavish bridal shoe, opt for a silk satin fabric.

Figure 45 satin

Denim - Denim is a tough and versatile cotton fabric. Denim has its origins in 18th century Europe, where it was sought after in France, England and Italy. Today, denim is a wardrobe staple and may even be the primary fabric for a fashionable pair of shoes, whether they're sneakers, ballet flats or wedge sandals.

Figure 46 denim

Wood:

Wood is a hard, fibrous structural tissue found in the stems and roots of trees and other woody plants. Majorly the shoe industry used wood either to make lasts, heels or wooden thongs.

Jute:

Figure 47 wood shoe

JUTE: - Jute is a long, soft, shiny vegetable fiber that can be spun into coarse, strong threads. Jute is one of the most affordable natural fibers and is second only to cotton in amount produced and variety of uses of vegetable fibers. Jute fibers are composed primarily of the plant materials cellulose and lignin. It falls into the bast fiber category (fiber collected from bast or skin of the plant) along with kenaf, industrial hemp, flax (linen), ramie, etc. The industrial term for jute fiber is raw jute. The fibers are off-white to brown, and 1–4 metres (3–13 feet) long. Jute is also called "the golden fiber" for its color and high cash value.

Figure 48 jute shoe

Characteristic applications

Leather:

Traditionally, leather is the preferred choice of material for a shoe or boots upper material and has been so for thousands of years, with the first known leather shoe dating back over a staggering six thousand years. To date, the majority of high-quality shoe brands continue to follow in our ancestors' wise use of leather as it offers numerous qualities, which are often left missed out in other materials.

- The form of a shoe can often be maintained easier in a leather form whilst still having the ability to take on minor adjustments in order to accommodate the particular shape of someone's feet. It has the property of both elasticity and plasticity.
- Leather's properties allow it to absorb and transmit perspiration and heat away from the foot as it is porous in nature due to the hair follicle pores present.
- Leather can often be restored by polishing as it has a good surface abrasion.
- It is a comfortable material that can be worn in both hot and cold temperatures.
- It flexes easily with the foot, and isn't substantially weakened with folding or creasing.

Plastics:

The characteristics of plastics are defined chiefly by the organic chemistry of the polymer such as hardness, density, and resistance to heat, organic solvents, oxidation, and ionizing radiation. In particular, most plastics will melt upon heating to a few hundred degrees Celsius. While plastics can be made electrically conductive, with the conductivity of up to 80 kS/cm in stretch-oriented polyacetylene, pure plastics have low toxicity due to their insolubility in water.

Rubber:

Rubber exhibits unique physical and chemical properties. Rubber's stress-strain behavior exhibits the Mullins effect and the Payne effect, and is often modeled as hyper elastic. Rubber strain crystallizes. Natural rubber is susceptible to vulcanization and sensitive to ozone cracking. Natural rubber is an elastomer and a thermoplastic. Once the rubber is vulcanized, it will turn into a thermo set.

Wood:

Wood is strong in tension and resists compression. Its stiffness and elastic strength are more dependent upon the sound wood than upon localized defects. The breaking strength is very susceptible to defects in the wood.

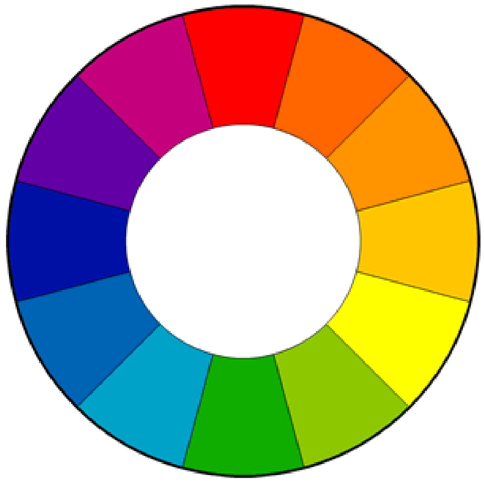
Jute:

Jute has either replaced cotton or blended with it. It is a strong, durable, color and light-fast fiber. Its UV protection, sound and heat insulation, low thermal conduction and anti-static properties make it a wise choice for common usage. Also, fabrics made of jute fibers are carbon-dioxide neutral and naturally decomposable. These characteristics are also the reason why jute can be used in high performance technical textiles.

Color detail:

With colors one can set a mood, attract attention, or make a statement. Colors can be used to energize, or to cool down. By selecting the right color scheme, an ambiance of elegance, warmth or tranquility can be created, or an image of playful youthfulness can be conveyed. Color can be the most powerful design element if learnt to use it effectively.

Colors affect everybody in numerous ways, both mentally and physically. A strong red color has been shown to raise the blood pressure, while a blue color has a calming effect. Being able to use colors consciously and harmoniously can help one create spectacular results.



The **color wheel** or **color circle** is the basic tool for combining colors. The first circular color diagram was designed by Sir Isaac Newton in 1666.

The color wheel is designed so that virtually any colors picked from it will look good together. Over the years, many variations of the basic design have been made, but the most common version is a wheel of 12 colors based on the RYB (or artistic) color model.

Traditionally, there are a number of color combinations that are considered especially pleasing. These are called **color harmonies** or **color chords** and they consist of two or more colors with a fixed relation in the color wheel.

Color Impact is designed to dynamically create a color wheel to match the base color.

Primary, secondary and tertiary colors:

In the RYB (or subtractive) color model, the **primary colors** are red, yellow and blue.

The three **secondary colors** (green, orange and purple) are created by mixing two primary colors.

Another six **tertiary colors** are created by mixing primary and secondary colors.

The color circle can be divided into **warm and cool colors.**

Warm colors are vivid and energetic, and tend to advance in space.

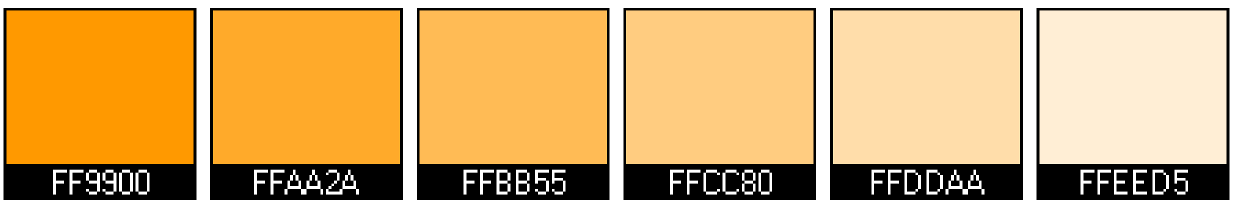
Cool colors give an impression of calm, and create a soothing impression.

White, black and gray are considered to be neutral.

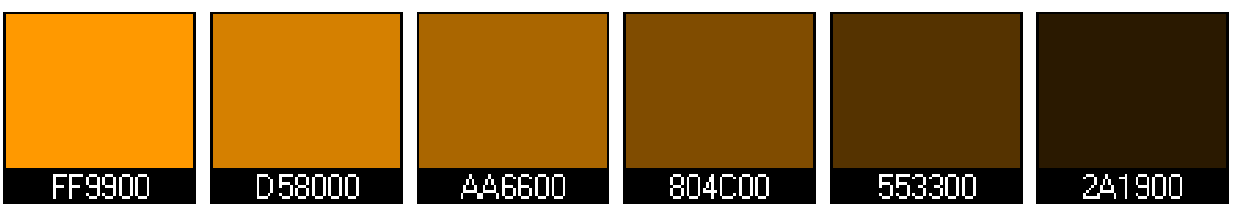
Tint, shade and tone:

If a color is made lighter by adding white, the result is called a **tint**. If black is added, the darker version is called a **shade**. And if gray is added, the result is a different **tone**. However the tints, shades and tones will also change with the finish and texture of the material due to the reflection and the refraction of the light falling on its surface.

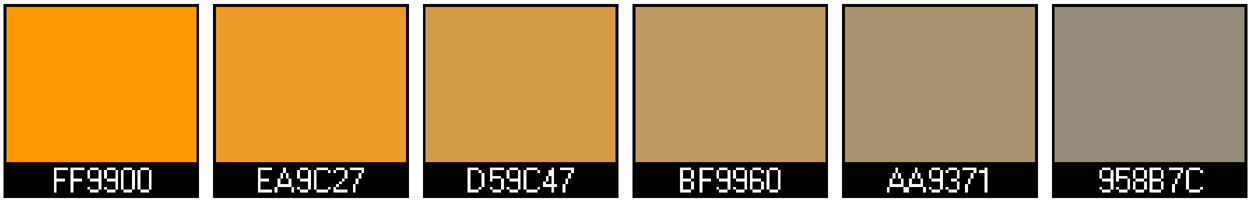
Tints - adding white to a pure hue:

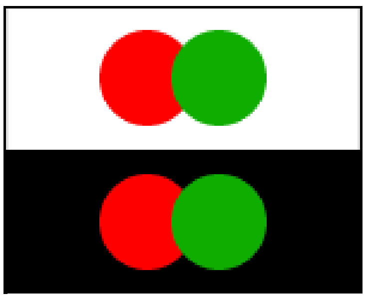


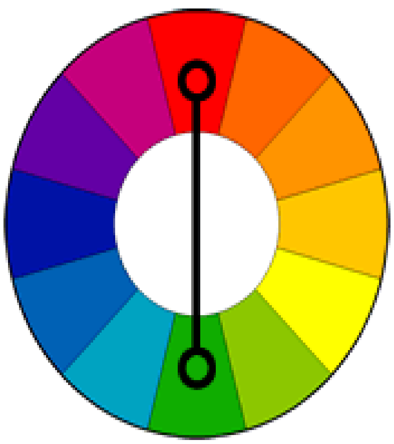
Shades - adding black to a pure hue:



Tones - adding gray to a pure hue:



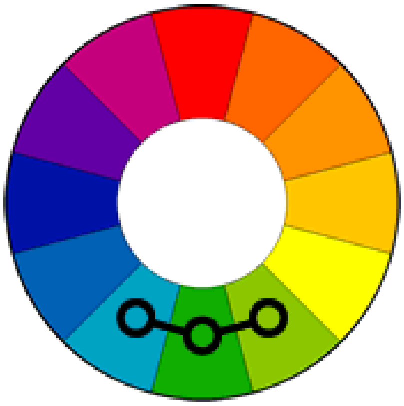


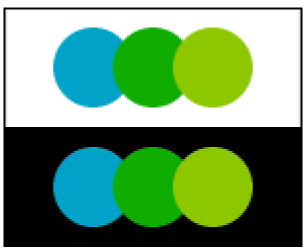


Complementary color scheme

Colors that are opposite each other on the color wheel are considered to be complementary colors (example: red and green).

The high contrast of complementary colors creates a vibrant look especially when used at full saturation. This color scheme must be managed well so it is not jarring.
Complementary color schemes are tricky to use in large doses, but work well when you want something to stand out.
Complementary colors are really bad for text.





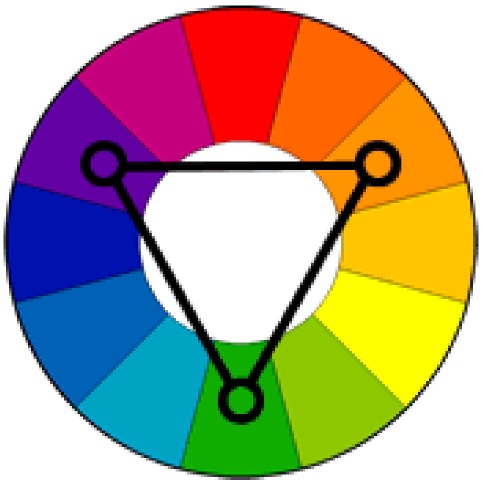
Analogous color scheme

Analogous color schemes use colors that are next to each other on the color wheel. They usually match well and create serene and comfortable designs.

Analogous color schemes are often found in nature and are harmonious and pleasing to the eye.

Make sure you have enough contrast when choosing an analogous color scheme.

Choose one color to dominate, a second to support. The third color is used (along with black, white or gray) as an accent.

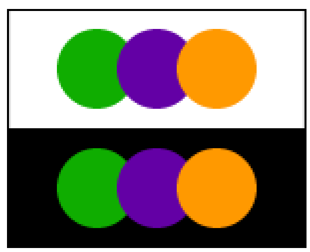


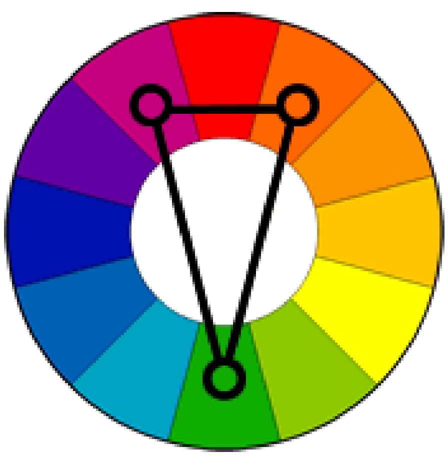
Triadic color scheme

A triadic color scheme uses colors that are evenly spaced around the color wheel.

Triadic color schemes tend to be quite vibrant, even if pale or unsaturated versions of the hues are used.

To use a triadic harmony successfully, the colors should be carefully balanced - let one color dominate and use the two others for accent.



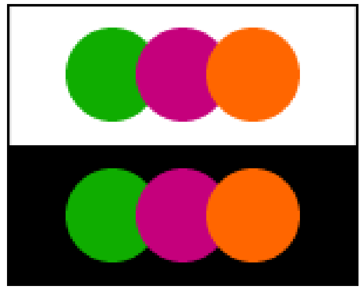


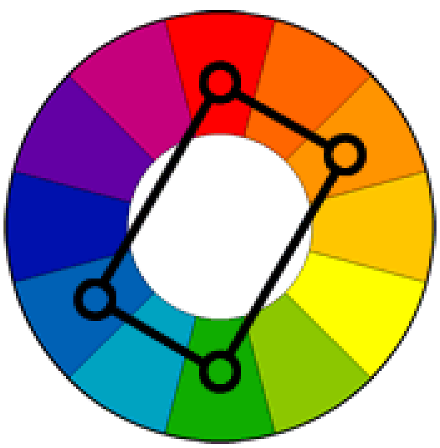
Split-Complementary color scheme

The split-complementary color scheme is a variation of the complementary color scheme. In addition to the base color, it uses the two colors adjacent to its complement.

This color scheme has the same strong visual contrast as the complementary color scheme, but has less tension.

The split-complimentary color scheme is often a good choice for beginners, because it is difficult to mess up.





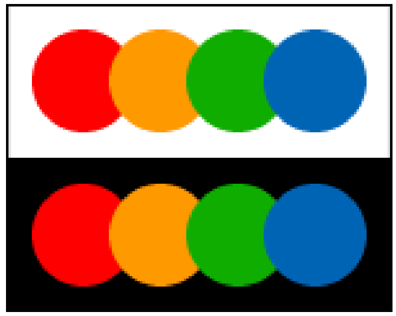
Rectangle (tetradic) color scheme

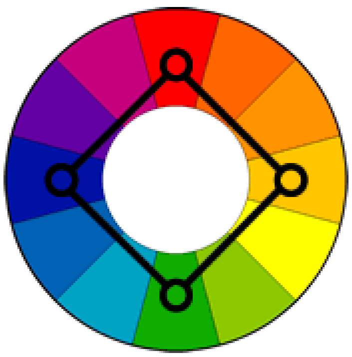
The rectangle or tetradic color scheme uses four colors arranged into two complementary pairs.

This rich color scheme offers plenty of possibilities for variation.

Tetradic color schemes works best if one color is allowed to be dominant.

One should also pay attention to the balance between warm and cool colors in the design.



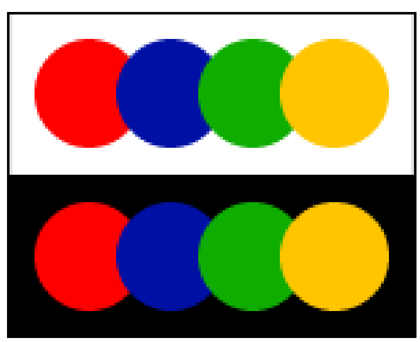


Square color scheme

The square color scheme is similar to the rectangle, but with all four colors spaced evenly around the color circle.

Square color schemes works best if you let one color be dominant.

One should also pay attention to the balance between warm and cool colors in the design.



1.1.2. Finishing requirement:

Nappa- Full grain leather drummed to give a soft and comfortable feel

Suede - Flesh side of leather that is buffed and brushed. Can be made from any of the leathers, has the nap raised by a scaping process to bring up a fine velvet like finish.

Nubuck - Grain or smooth side of leather, buffed with an abrasive action giving a velvety surface finish.

Aniline - Leathers treated with a clear aniline dye and wax finish to allow the color and natural grain pattern to show through. This process gives a very natural appearance to high grade shoes.

Semi aniline - Transparent dyeing with additional fine spraying with pigment color to equalize any irregularities.

Reptiles - The skins of other animals and reptiles are used in minor quantities

Embossed - Raised pattern printed on to full grain or nubuck leather.

Full grain: refer to the care products for Nappa.

Oily - Mainly calf skin, where oil is applied during manufacture.

Oily nubuck- The basic nubuck product with heavy oiling.

Patent, Plastic, Poromerics or "Wet Look" Uppers -Patent leathers have a surface coating of PVC or polyurethane to give a very high gloss finish. The treatment is used for high fashion footwear, but has the disadvantage of reducing the ability of leather to breathe and release perspiration.

Rubbed - Leather that has been buffed with a sealing finish that gives a natural rugged look.

Metallic - Coated leather: a foil is pressed onto leather as in pewter, silver, gold and bronze.

Abilene (AB) - Gleaming elegance in a full grain, Aniline polished durable leather. A pleasing silky surface feel, perfect for quality footwear.

California - full grain aniline leather with a soft delicate handle. California's rich subdued pull-up effect and "classic" right grain appearance creates the ideal look for a wide array of quality footwear products.

Commando Waxy Suede (CW) - heavily oiled suede with a rugged workman-like appearance, ideal for outdoor wear

Crazy Horse: Crazy Horse is an authentic American leather that is "hot stuffed" with oil and waxes in a unique tanning process. With use, these will rise to the surface and develop a rich patina. Also this look effect is long lasting and does not fade.

Crocco (CPT) - This leather has a high polished surface with a firm handle. The true character of this leather is formed by its moderate reptile print, creating an overall look that is "up-to-date and fashion focused."

Cyclone (CYN) - Cyclone is a beautiful drum dyed waxy, "all seasons leather" with rich accentuated pull-up and look-into effect. The proven ability of cyclone to dry quickly and resist water, acids, alkalis and salt makes it a natural for a variety of rugged outdoor footwear as well as fashion forward patterns.

Dirty Dog- snuffed milled aniline leather, lightly oiled to give a subtle pull up effect.

Earthquake- Earthquake is a "rugged" tumbled leather with a touch of wax to enhance the character. To further develop its unique element, the leather has a crunch dyed effect to create a random surface contrasted appearance.

Fine Hair cell- leather with a fine hair cell print.

Glitzy (GTZY) - A leather with a difference - Glitzy has a soft "scrunchy" feel, but its tri-colour reflective finish makes it highly distinctive and "funky."

Greasy - The unique quality of greasy leather is its full grain anility and integral oiling which gives the surface an oily touch, robust nature and attractive appearance.

Greenland - A naturally milled grain leather with a waxy surface and attractive two tone colour surface.

Grizzly- Inspired by the great American outdoors, Grizzly is tumbled and "hot stuffed" for incredible softness yet has a rugged full-grain aggressive appearance; its natural Aniline finish enhances its pebbled look and offers great depth in colour. A tumbled soft leather that has a deep rich quality. A heavy grain and deep depth in color add to the rugged look of this leather.

Harvey (HY) - Full grain waxy with a pull.

High Polish (HPSH) - A corrected grain pigmented leather giving a high gloss and deep sheen.

Illusion Classic- full grain leather with a wonderful luster and waxy feel. Looks like calf, feels like calf - the illusion is reality.

Nappa -Nappa is a super soft leather with a supple handle and smooth matte finish, perfect for all casual and sports wear

New West - New West recreated the rich, natural patina that leather acquires with age. Leather has a distinctive worn look, perfect for all forms of classic footwear, from sandals through to boots.

Nova - Full grain leather shrunken to give a unique texture. Nova's bright finish and tight break makes it ideal for dress casual footwear.

Old Glory (OLG) - Old Glory is a "crisp" hot-stuffed leather that is given a washed out, faded look and a medium luster

Overrun or Overdrive - A natural aniline dyed leather with a dark waxy finish. The leather is dry drummed to create a distressed look enhanced further by the two tone effect of dyes and dark waxes.

Penelope (PNP) - Penelope is a coated suede split, with a slight "classy" pull up appearance and soft supple feel, ideal when adding a diverse streak to footwear.

Picasso – (PSSO) - Picasso has a soft, silky surface feel and a supple handle. The primary feature of this leather is the "zany" random swirled effect incorporating many different colours. This distinct characteristic is created using a unique 'by hand' process ensuring its unique finish.

Pumped (PMP) - Pumped is a nubuck with a fine buffed surface with an added hint of wax to enhance its natural beauty and character.

Sacramento (SCTO)-Sacramento is a supple, easy-handle leather that is offered in two basic colors - brown and black. It is a nice, rich basic

Smooth- A hard wearing and extremely consistent leather with an unblemished finish, available in a wide range of fashionable colors.

Smooth/Patent - A corrected grain leather with a high gloss and deep sheen. These leathers allow us to have some real fun with bright colors.

Soft Gentry Metal- The leather has the same aesthetic qualities as its predecessor "Gentry Metal," being the high-pearlised and smooth surface, but with the improved character of a soft supple feel.

Super buck- The tanning of super buck suede has evolved from the cape butt suede. Dyes are full and solid, complimenting the "round" feel of this classic suede leather. With its built in water resistance it has an extremely tight, solid, hard wearing "nap" and because of its natural tightness, will not readily polish or distort. These properties, therefore, enable Super-buck to be used successfully in practically all construction. Best Shoe Care: Protector Spray and Suede Cleaner.

Super-velour Suede- The tight natural fiber structure creates a compact hard wearing suede leather, which is protected with Scotch Guard in the tannage itself. This protects against virtually all soiling, spills and staining for the life of the footwear, without adversely affecting comfort, softness, color or breathability.

Tango - A naked full grain leather with a very soft, buttery handle and a natural dry appearance.

Trailblazer-Traditional American "outdoor" leather with a mild tumbling effect and tempting soft "plump" handle

Vecchio (VCO) - Full grain aniline oily leather, with a slight subtle pull-up effect incorporating a soft, silky feel.

Veggie or Vegetarian- Non-leather Lorica microfiber. A fabric coated with cellulose PVC which offers the same characteristics as high-quality leather. It is resistant to stretching, abrasion, and is water-repellent and light weight.

Volcano- A "worn" and "distressed" appearance, Volcano is a fine grained oiled "Pull Up" with natural flaws which enhance the overall rugged appearance of this leather..

Vogue (VGE)-Stylish full-grain leather with a classic mellow handle and distinctive "glossy" appearance to enhance the natural grain character. The color palette offers a selection of trendy shades, but also radiates a sense of comfort and simplicity.

Waterproof Grizzly-Ferociously soft as the original "Grizzly," it has now been made Waterproof to provide added protection from all the elements. A tumbled waxy leather with a moderate pull-up effect. The matte finish provides a soft, pre-worn look to compliment all outdoor footwear.

Windfall: A pull-up shrunken full grained leather. Enough pull-up is given to enhance the rich shrunken grain. Ideal for casuals.

1.2.4. Detail of consumable (including environmental requirement)

Shoe linings – May be made leather, polyester, cotton etc. Linings should always have excellent strength, resilience and abrasion resistant, they should be hard to get pilling, should be durable, soft, Eco-friendly, breathable and should have high density, good tensile, abrasion resistance, color fastness etc.

Soles - May be synthetic or made from natural material like leather or rubber. The soles should be highly flexible and shock absorbent. It should be ideal for use in general as well as in different industrial applications. They should have features like good weather resistance, excellent alkali & acid resistance, sturdiness and high strength and should be either bio-degradable or recyclable.

Insoles: Made from either cellulose paper board or fiber insole paper board. The insoles should be Waterproof, Anti-Mildew, Abrasion-Resistant, Wear Resistant and Pro-environment.

Adhesives: The shoe industry demands an impressive array of adhesives due to variations in materials, processes, types of footwear, and seasonal design changes. Equally impressive is the performance demands placed on adhesives in this industry. These include a high degree of bond strength to resist numerous repetitions of bending, straightening, compressing, recovering, rubbing, and friction. The bond strength must also not be affected by rain, snow, wind, ultraviolet light, temperature changes, and whatever other elements to which the shoe will be exposed.

In addition to providing high performance properties and durability, the adhesives and bonding processes that are used in the footwear industry must also offer good early strength and workability for fast and efficient production. The adhesive bond must be invisible or at least aesthetically pleasing to the shoe's design. Also an additional imposing set of requirements has been placed on the shoe manufacturers - formulations and processes must be environmentally friendly and hazard free.

Sports shoes, dress shoes, and sandals are the main shoe types that require adhesives in the assembly process of the footwear manufacturing. The main substrates involved are rubber, coated fabrics, leather, and synthetic plastics and elastomer.

Several adhesives types and an assortment of bonding processes are required in the production of the modern shoe. These are needed to make the various shoe components and to attach the soles, either permanently or temporarily (preparatory to stitching). The various stages of footwear construction where adhesives are used are illustrated in the figure. The use of a specific adhesive depends on the shoe type of construction and its materials.

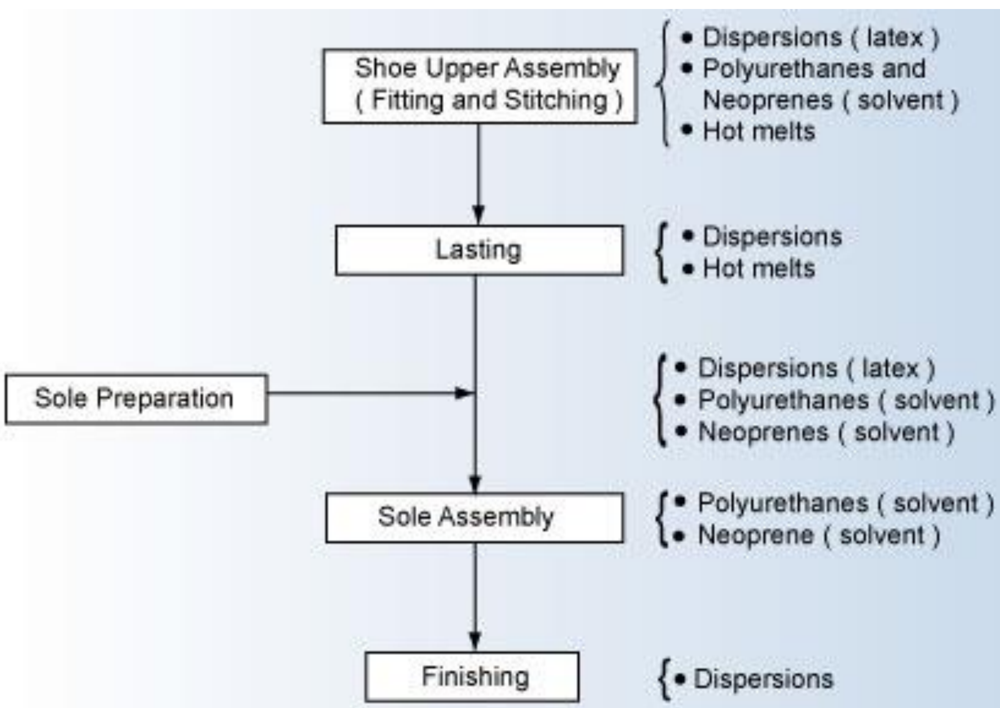


Figure 49 shoe preparation

Adhesives for use in footwear are generally categorized in terms of their suitability to bond different substrates. They are also often categorized by their setting properties (e.g., reactive, hot melt, solvent evaporation, water evaporation) since these will determine the workability of the adhesive joint in certain applications. The table below provides a summary of the adhesives commonly used in shoe manufacture.

Table: - adhesives used for shoe manufacturing

	Solvent-Based Adhesives	**Hot Melt Adhesives**	**Water-Based Adhesives**	**Reactive Adhesives**
Chemical family	Polyurethane, neoprene, styrene butadiene, nitrile	Polyester, polyamide, ethylene vinyl acetate (EVA), styrene butadiene	Polyurethane, natural and synthetic rubber dispersions (neoprene, styrene butadiene), other polymeric dispersions	Polyurethane (2K)
Use	Shoe-upper splicing, sole assembly	Depends on temperature sensitivity of substrate	Lasting, finishing operations, fitting before stitching, sole preparation	Sole assembly, shoe-upper splicing,
Solids content	20-26%	100%	40-55%	100%

Key technical requirements for adhesives in the footwear industry are:

- Precise viscosity control
- Open and setting time
- Correct adhesion / cohesion balance (shear vs. peel strength)
- Good low temperature performance
- Water resistance
- Excellent durability and aging stability
- Adhesion to a variety of dissimilar and difficult to bond substrates

Water-based adhesives that are used in footwear manufacturing are mainly based on polyurethane. These adhesives are more difficult to handle than solvent-based adhesive systems. The parts that are coated with water borne adhesive generally need to be assembled directly after the adhesive application. Other problems with water-based adhesive dispersions include low green strength, poor surface penetration.

Solvent based nitrile, chloroprene, and polyurethane adhesive have the performance and application properties generally required in the footwear industry. The advantages of solvent-based adhesives in footwear include:

- Fast strength development and a high degree of uncured tack enabling fast processing speeds and
- Do not require drying equipment since solvent flash off very rapidly at ambient temperatures.

Environmental regulations and concerns over in-plant safety have encouraged the replacement of these systems with water-based polyurethane, reactive adhesives, and hot melt adhesives. However, solvent-based adhesives still account for the majority of the adhesives used in shoe manufacturing. A trend that is occurring with solvent-based adhesives is the use of toluene-free formulations. These newer formulations meet certain regulations yet provide many of the desirable properties of older solvent-based systems.

Waterborne systems based on polyurethanes have become increasingly important in the footwear industry due to their relatively high level of adhesive performance for a water-based system. However, they still require improvements in strength properties (especially early strength development) and the need for additional moisture resistance for maximum usage. Water-based systems also pose an additional problem with leather substrates because of retention of water by the leather surface.

Solvent less reactive adhesives, such as unsaturated polyester and reactive polyurethanes, have been found to be useful for high volume bonding of footwear components. However, these systems require metering and mixing and application time must be controlled due to the short working life of these systems.

Hot melt adhesive, based primarily on polyamides and polyesters for high shear strength applications and styrene butadiene copolymer for high peel strength applications, are also gaining market volume in footwear. Formulations with moderate melting points and good flow characteristics will find increasing use. Reactive polyurethane hot melts will also find increasing use in the shoe industry because of the inherent fast setting properties and the eventual cross linked, moisture resistant polymer structure offered by these adhesives. The problem with hot melt adhesives is that they require an exact control of process parameters such as temperature and pressure.

Thread: The smallest failure in thread performance results in losses on investments in material, equipment, garment engineering and labour.

Sewing threads are special kinds of yarns that are engineered and designed to pass through a sewing machine rapidly. They form efficient stitches without breaking or becoming distorted during the useful life of the product. The basic function of a thread is to deliver aesthetics and performance in stitches and seams. Colour, luster, fineness / thickness, Hue and shade matching, Colour fastness, Stitch selection and Uniformity of stitch formation are the factors considered while selecting a thread for decorative purposes such as top stitching or embroidery.

'Sew ability' of thread is a term used to describe a sewing thread's performance. A thread with good sew ability is uniform in diameter with a good surface finish. Longitudinal uniformity of thread contributes to uniform strength and reduced friction, as it passes through the stitch forming mechanisms. It also minimizes thread breakages and the associated costs incurred from rethreading machines, repairing stitches and producing inferior quality products.

The parameters that define the superior sew ability of thread are:

- No breakages in high-speed sewing
- Consistent stitch formation
- No skipped stitches
- Evenness, to prevent changes in tension during sewing
- A high level of abrasion resistance

- Sufficient surface smoothness, to pass easily through the machine guides

The threads are of two types

- Natural: The usage of thread made from natural substrates is now minimal in industry applications. However, the most commonly used natural thread is cotton thread.
- Synthetic: Due to the limitations of natural fibers, thread users have turned to threads made from synthetic fibers as they have desirable properties of exceptionally high tenacity, high resistance to abrasion and good resistance to chemicals. They are also not significantly affected by moisture, rot, mildew, insects or bacteria.

Needle: There are majorly two types of needles used in the footwear industry, Round Point needles and the Chisel Point.

The Round Point needles are universal needles, and work well in just about any material, including rubber, vinyl, cloth, leather, etc. A Round Point needle has a sharp point and the cross section of the needle is round.

Round needle

The Chisel Point needles are used specifically for leather. Instead of punching a hole in the material like a round point, it "slices" through the leather. A chisel point needle does not have a sharp point and the cross section of the needle is not round, but arched. This can prevent bottom side "blowout" on dry and hard leathers. Chisel point needles are not recommended for woven fabrics such as nylon halters because it slices the strands of nylon. If a style of sewing requires a short stitch length (10 per inch or more), you should not use a chisel point needle because the material can tear from hole to hole.

Chisel Point needle

Tacks and nails: The tacks and nails are made from high grade au tempered carbon steel or hard drawn bright mild steel wires. The tacks and nails of the following types are used in the footwear manufacturing process.

- Heel Attaching machine tacks
- Heel Attaching Nails
- Side and Seat Lasting Tacks.
- Seat Plates.
- Insole Tacks and Back seam Nails.
- Hand Tacks and Nails.

Eyelets, buckles and fasteners: The Eyelets, buckles, fasteners, D ring are normally made of iron or steel metal and the finishes of these vary according to the requirement in the product.

Toe-puffs and Counters: The characteristic features of the toe-puff and counter should be excellent press resistance, flexibility, and water-resistance. The different types of counters and toe puffs which are available are:

- Heat Activated Thermoplastic Impregnated Fabric or Non-woven Material
- Solvent Activated
- Non·thermoplastic Fibre Board/Leather Board
- Heat Activated Extruded Thermoplastic Filmic materials with or without backer

Dimensional detail

The dimensions of the various materials which go into making of the shoe will depend on the country of export and import, the buyers' specifications and on the purpose for the usage of the footwear.

Performance tolerance

Product performance on the other hand, can be broadly evaluated based on its function, form, and fit. It is well known that fit or product compatibility is necessary for a person to experience comfort, safety and satisfaction during use. However, compatibility is not so well known for all types of interaction between people and equipment. Form has been the dominating factor in the sale of footwear over the last few decades. Even though technology enhancements are thought to improve the functioning of footwear, some of them are simply ornaments to enhance form rather than functional elements that protect people's feet. Given the tremendous flexibility of the foot, it is important that the foot be accommodated in a way that allows a foot to function as "designed". Ergonomics dictates good posture and many other specialized areas such as quality control, perception, and biomechanics can be reasonably well integrated into the design and development of footwear.

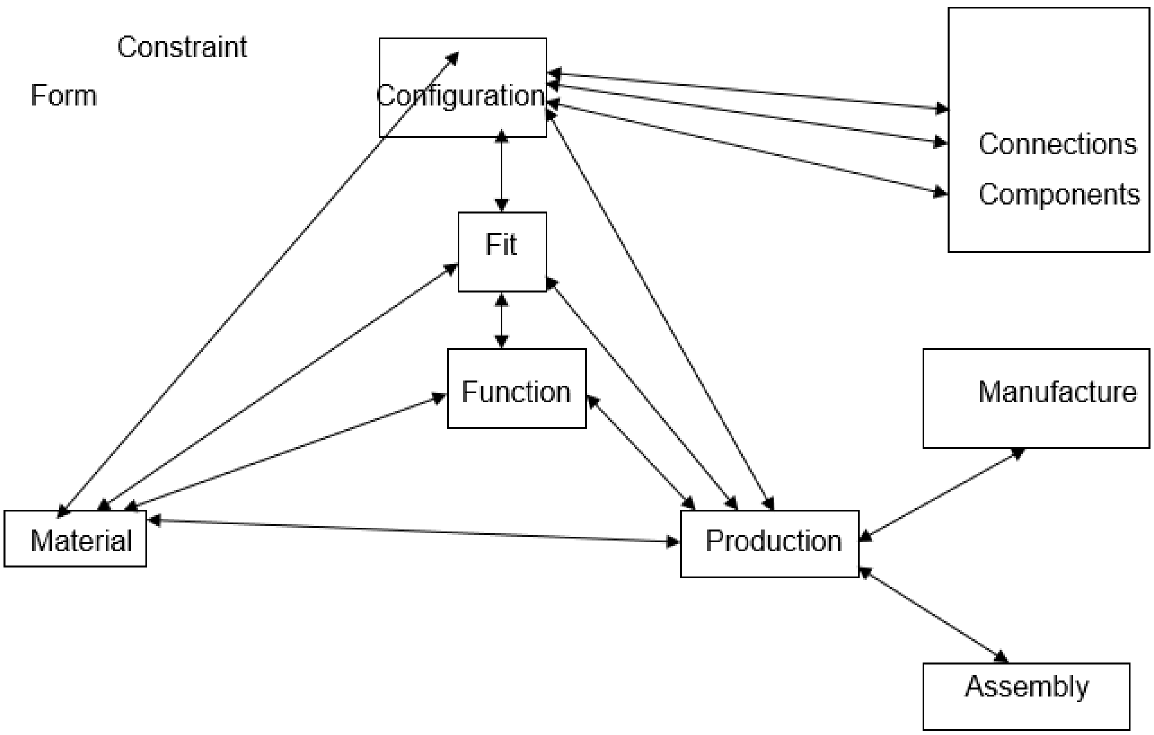


Figure 50 Elements demonstrating the performance tolerance of a product

Fit and sizing: There are different types of fit depending on function. Clinical reports of foot problems such as blistering, chafing, black toes, bunions, pain, and tired feet are quite good evidence of poor fitting shoes. The need for a quality characteristic to evaluate the fit between a person's foot and the footwear he or she wears is of utmost importance for the scientific development of lasts and form improvement of footwear fit.

Many footwear fitters have recommended the following procedure when fitting shoes:

1. Measure and fit shoes at the end of a day rather than at the beginning due to deformation and swelling
2. Fit shoes to the longer foot with a toe clearance of 9 to 12 mm at the longest toe.

Cushioning: During walking, the ground reaction force is approximately 1.25 times the body weight and during running, the ground reaction force can reach levels of 2 to 3 times the body weight. Thus, midsole cushioning is supposed to attenuate or dampen the impact forces acting on the body during usage. Shoe designs attempt to concentrate on stability and cushioning in addition to weight and durability. Good support (that is, stability) may feel uncomfortable to a person while too much cushioning will make activities such as walking and running quite difficult. Most research has concentrated on comparing different shoes or materials rather than comparing the basic physical characteristics of the materials that are used. Cushioning technology is quite varied with manufacturers marketing air soles, pads, pods, gel or fluid soles and so on.
Different physical tolerance parameters that may be related to perceived cushioning. Some of these are:

1. **Compression set**. This is the permanent surface depression when a sample that is compressed to 90% of its thickness and held for 22 hours is released of its load.
2. **Density**. High-density foam is less likely to bottom-out. Footwear manufacturers, generally attempt to specify the cushioning properties using foam density alone.
3. **Hysteresis**. This is the ability of foam to maintain its original characteristics after loading. For a foam, it is measured as the percent of 25% Indentation Force.
4. **Indentation Force Deflection (IFD).** This is a measure of the load bearing capacity or the firmness. IFD is generally measured as 25%IFD and 65% IFD. For example, 25% IFD is the load required to compress say, a 40mm thick test sample to 30 mm thickness.

5. **Resiliency**. Typically, a ball rebound test is used to measure resiliency. A steel ball is dropped from a fixed height on to the sample. The rebound height measured as a percentage of the original height is an indication of resilience. A boardy foam will have low resilience.
6. **Flex Fatigue**. This is a softening or a loss of firmness. Generally measured by repeatedly compressing a foam sample and measuring the change in IFD.
7. **Support Factor** also called the Sac Factor = (65% IFD / 25%IFD). The higher the number, the greater the difference between the surface firmness and the deep-down support.

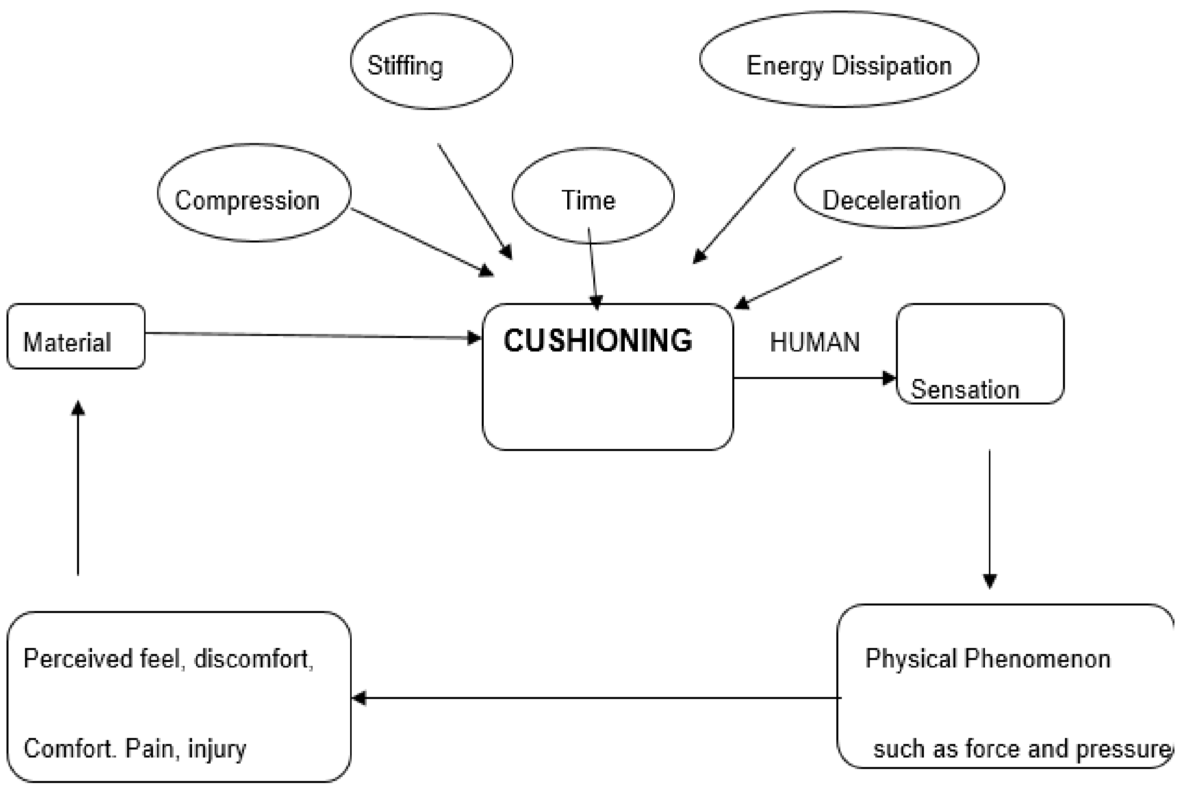


Figure 51 Performance tolerance of cushioning aspect of the product

1.1.3. Identification of alternative material

Artificial leather is a fabric or finish intended to substitute for leather in fields such as footwear, upholstery, clothing, and fabrics, and other uses where a leather-like finish is required but the actual material is cost-prohibitive, unsuitable, or unusable for ethical reasons. Synthetic leathers, at times made from plastics, are often used in clothing and fabrics

The different types of artificial leather are:

a) Poromerics imitation leather: is a breathable leather substitute made from a plastic coating (usually a polyurethane) on a fibrous base layer (typically a polyester).

b) Koskin: is an artificial leather material commonly found in computer laptop cases.

c) Leatherette: is a form of artificial leather, usually made by covering a fabric base with plastic. The fabric can be made of a natural or a synthetic fibre.

d) Biothane: made from a nylon webbing coated with TPU or PVC, designed to look and feel like leather, but is more durable, more cleanable, and more waterproof than leather.

e) Birkibuc: made from acrylic and polyamide felt fibers and intended to imitate nubuck leather.

f) Birko-Flor:, made from acrylic and polyamide felt fibers and intended to imitate patent leather.

g) Cork leather: made from the bark of Cork Oak trees

h) Kydex: an acrylic- it is a PVC alloy

i) Ocean Leather: a leather made from kelp

j) Polyvinyl chloride: Also known as vinyl and PVC

k) Rexine: a British proprietary brand of leather cloth used in vehicle trimming and bookbinding.

l) Vegetan: a name given for one grade of microfiber

m) Alcantara: a substitute for suede leather composed of about 68% polyester and 32% polyurethane giving increased durability and stain resistance and a feel like suede.

Self-Check 1	**Written Test**

Name: _________________________ Date: _______________

Time started: _______________________ Time finished: ____________________

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

Section 1

Fill in the blanks (1X5 Points)

1. Wood and skins are earliest known materials for making ___________.
2. ___________can be used to energize or to cool down.
3. Heating and adding of sulphur to natural rubber is called_______________.
4. Product ___________can be evaluated based on its function and fit.
5. Fabrics made of ____________are carbon-dioxide neutral and naturally decomposable.

Section 2

True & False (1X5 Points)

1. The earlier known shoes were mostly made up of animal skin.

2. Natural rubber is an elastomer that originally was derived from latex.
3. Red, Yellow and Blue are the secondary colors.
4. Poromerics also known as imitation leather.
5. The Chisel Point needles are used specifically for fabric.

Section 3

Short Answers (2X5 Points)

1. What are the different materials used in making of footwear?
2. For what purpose is the color wheel used?
3. Why is artificial leather used?
4. How many types of toe-puff and counters are available?
5. What is the cushioning aspect of footwear?

Information Sheet-2	Required tools

2.1. Material Requirements (BOM)

A bill of materials (sometimes bill of material or BOM) is a list of the raw materials, sub-assemblies, intermediate assemblies, sub-components, parts and the quantities of each needed to manufacture an end product. A BOM may be used for communication between manufacturing partners, or confined to a single manufacturing plant.

A BOM can define products:

1. As they are designed (engineering bill of materials),
2. As they are ordered (sales bill of materials),
3. As they are built (manufacturing bill of materials), or
4. As they are maintained (service bill of materials).

The different types of BOMs depend on the business need and use for which they are intended. In process industries, the BOM is also known as the formula, recipe, or ingredients list. In electronics, the BOM represents the list of components used on the printed wiring board or printed circuit board. Once the design of the circuit is completed, the BOM list is passed on to the layout engineer as well as component engineer who will procure the components required for the design.

An **engineering bill of materials (EBOM)** is a type of bill of materials (BOM) reflecting the product as designed by engineering, referred to as the "as-designed" bill of materials.

The EBOM is not related to modular BOM or configurable BOM (CBOM) concepts, as modular and configurable BOMs are used to reflect selection of items to create saleable end-products.

The EBOM concept aligns to sales BOMs (as sold) and to service BOMs (as changed based on changes due to field service).

This BOM includes all substitute and alternate part numbers, and includes parts that are contained in drawing notes.

A **manufacturing bill of materials (MBOM)**, also referred to as the manufacturing BOM, contains all the parts and assemblies required to build a complete and shippable product.

MBOM is a type of bill of materials (BOM). Unlike engineering bill of materials (EBOM), which is organized with regards to how the product is designed, the MBOM is focused on the parts that are needed to manufacture a product.

The details in an MBOM are good enough to allow it to be used in a Manufacturing Operations Management (MOM) System or Manufacturing Execution System (MES). The MBOM typically contains more information than what is needed to do the MRP (Materials Resources Planning) part of an MPS (Master Production Schedule) in an ERP (Enterprise Resource Planning) system.

2.2. Modular BOMs

In many cases, BOMs are hierarchical in nature with the top level representing the finished product which may be a sub-assembly or a completed item. BOMs that describe the sub-assemblies are referred to as **modular BOMs**. An example of this is used in the automotive industry to list all the components in an assembly line. The structure of the Modular BOM in the automotive industry is System, Line, Tool, Unit and Detail.

The BOM can also be visually represented by a product structure tree, although they are rarely used in the workplace.

2.3. Configurable BOMs

A configurable bill of materials (CBOM) is a form of BOM used by industries that have multiple options and highly configurable products (e.g. telecom systems, autos).

The CBOM is used to dynamically create "end-items" that a company sells. The benefit of using CBOM structure is it reduces the work-effort needed to maintain product structures.

2.4. Bill of Material in the footwear industry

In the footwear industry, with increasingly complex products, shorter lead times, and more advanced and varied product offerings the effective management and control of raw materials takes on a unique importance. Even the simplest product is made up of size dependent and colour dependent components which must be incorporated into an accurate and comprehensive Bill of Materials (BOM).

Bill of materials management is a critical part of the design and manufacture of any product. Accurate management of the BOM eliminates production delays due to missing components. In the footwear industry the product with different sizes and color variations is built using BOM. This BOM is sent to vendors as part of tech pack report for the Production.

In the footwear industry like other industries, the Bill of Material specifies the material to be used by the product in the assembly line. Prior to going in the assembly line, a cost sheet or the bill of material has to be generated which not only gives clarity to the buyer but also to the purchase department, production department and other management personnel concerned with the material consumption and costing in the product.

Bill of Material used in the footwear industry is illustrated below:

The main features containing in the Bill of Material are the following:

Vendor name, vendor code, style name, Brand, Developer, buyer, construction, sample size, order size, colour, gender and all the components used in the product with supplier, rate, norms, material description, cost per pair etc.

This gives clarity and accurate information to all the concerned departments within the footwear factory on the style, material type, cost, supplier etc.

BILL OF MATERIAL

		Status :	Prototype			
Vendor Name :	ETHIO FOOTWEAR	Order Size :	6 to 10			
Vendor Code :		Costing Size :	8	**UPPER COST**	BIRR	94.00
Style Name :	ABEY 2	Sample Size :	8	**TEXTILE COST**	BIRR	19.00
Style # :	ABEY 2	Gender :	Mens	**BOTTOM COST**	BIRR	164.00
Brand :	POLE STAR	Color 1 :	BLACK	**SEWING COST**	BIRR	21.00
Designer :		Color 2:	TAN	**MAKING COST**	BIRR	20.35
Developer :	ABC	Color 3:	XXXX	**PACKING COST**	BIRR	46.50
Buyer :	XYZ	Type :		**UPPER LABOUR**	BIRR	32.00
Construction:	STUCK ON			**BOTTOM LABOUR**	BIRR	13.00
				OVER HEAD	BIRR	20.00
				PROFIT	BIRR	65.00
				TOTAL	**BIRR**	**381.85**

Group Name	Component	Material Description	Substance	Supplier	Uom	Norms	Rate	Cost / Pair
	The material description was mentioned only for reference							
UPPER -1		SYNTHETIC		EFG	METER	7.00	480.00	68.00
UPPER -2								
LINING		SHEEP LEAT (T/R) BLK 0.9MM			METER	7.00	180.00	26.00
COUNTER		COW SPLIT SUEDE 1.1-1.3						
UPPER COST								**94.00**
LINING UPPER		LEATHER LINING .9-1						
LINING UPPER		EVA COATED CLOTH WHT - 135						
LINING UPPER		SELF ADHESIVE WHT COSMO						
SOCKS		LEATHER LINING .9-1						
SOCKS		MOLDED SOCKS LEATHER						
REINF.MISC		NYLON TAPE						5.00
REINF.MISC		FOAM PU 72X36X6MM 40DEN						9.00
REINF.MISC		BLIND EYELET TAPE						5.00
TEXTILE COST								**19.00**
INSOLING BOARD		2MM SHANK BD EUROASIA	2MM	GHI	SHT			14.00
TOE PUFF THERM.		ARS	1MM	GHI	SHT			4.00
COUNTER THERM.		ARS	1.2 MM	GHI	SHT			6.00
OUTSOLE		TPR OUTSOLE		ETHIOCODE	PR			140.00
BOTTOM COST								**164.00**
CEMENT		PU		PU	KG		175	9.00
APPART/POLISH		9215 CREAM		FENICHE	KG		700	12.00
SEWING COST								**21.00**
DÉCOR/RVT/RING	NYLON TAPE SELF ADHESIVE 35M/M				MTR			
THREAD		THRD BYLON TKT -10nylon thread 3 ply		ETHEO	MTR		0.045	1.35
THREAD		THRD BYLON TKT -20		ETHEO	MTR			
NEEDLE		NEEDLE PFFV134PCL110			PC			2.00
SHOE LACE		LACE ROUND COT WAX 80CM BLK		ETHEO	PC		5	5.00
COLOR & SPRAY		ADHESIVES			KG			10.00
FOILS		SCREEN PRINTING			PC		2	2.00
MAKING COST								**20.35**
SHOE BOX			13		SET			13
WRAPPING PAPER			1.5		PC			1.5
STUFFING PAPER			3		PC			3
HANG TAG			1		PC			1
BARCODE LABEL (INNEX BOX LABEL/TAG LABEL)			3		PC			3
CARTON LABEL			2		PC			2
CARTON TAPE			2		PC			2
OUTER CARTON			7		PR			7
PASTING LABOUR								7
FINISHING LABOUR								7
PACKING COST								**46.50**

Self-Check 2	**Written Test**

Name: ________________________ Date: _______________

Time started: ______________________ Time finished: ____________________

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

Section 1

Fill in the blanks **(1X5 Points)**

1. A BOM may be used for ____________ between manufacturing partners.
2. _____________is a form of BOM used by industries that have multiple options and highly configurable products.
3. BOM can also be visually represented by a product _____________.
4. ___________ is also known as the formula, recipe, or ingredients list.
5. **5.** ______________ is called Manufacturing Operations Management

Section 2

True & False **(1X5 Points)**

1. A Bill of Material is also called as BOM.
2. In the footwear industry, the Bill of Material specifies the material to be used by the product in the market.
3. Accurate management of the BOM aids in production delays due to missing components.
4. Modular BOM are rarely used in the workplace.

5. The BOM list is given to the layout engineer and component engineer to procure the components required for the design.

Section 3

Short Answers **(2x5=10 Points)**

1. What is Bill of material?
2. How many types of Bill of Material are there?
3. Why is it necessary to have an effective control on raw materials in the footwear industry?
4. What does the EBOM concept aligns to?
5. What is MBOM?

Information Sheet-3	The appropriateness of prepared tools and equipment

3.1. Material Performance Standard

A material performance standard is a document that provides requirements, specifications, guidelines or characteristics that can be used consistently to ensure that the materials used in the product, end product, processes and services are fit for their purpose.

The performance standard in the materials used in footwear states that they should meet the general requirements of cushion, comfort, fit, ankle support, impact and compression resistance, breathability, traction or grip, as required by the various standard organizations all over the world.

The testing of footwear not only serves as a check that the it has been manufactured to an acceptable performance standard, but also gives the supplier, the retailer and the customer peace of mind that there is a level of quality assurance in place.

These Standards specify the following two things:

A. Test methods from ISO (International Standards Organization) or any other recognized

B. The test specifications from ISO of the performance levels required for the pass/fail criteria of footwear

For the material performance standards, the testing can be carried out in factories which have laboratory facilities or in nationally or internationally recognized / nominated laboratories. The frequency of such tests, critical tests, physical inspections, will depend on the buyer or the manufacturer.

The instructions given for tests and frequency can be as stated in the example below:

- Heel Detachment
- Heel permanent set (deflection) after 40 kg for heels above 40 mm height.

- Function strap and fixings attachments
- Sole Attachment (Sole bonding) - Test of Toe & Heel bond
- Sole Attachment – Peel strength (after ageing of 24 hrs)
- Sole bond test – test should be carried out every hour of production and reviewed.
- Factories are recommended to follow regular single batch testing (1-1000) to ensure maximum quality assurance management, and minimum production issues.
- Test sample size must be varied and cover the size range produced

Some of the performance standards formatted is given below. The tests methods given below, taken from Satra, UK, Bureau of Standards and ISO are given for references only. These test methods change from country to country.

Table 3.1: - **FOOTWEAR MATERIAL PERFORMANCE STANDARDS**

LEATHER – UPPER

PROPERTY	**STANDARD REQUIRED**	**TEST METHODS**
TENSILE STRENGTH	Sports 20 N / mm² (MIN) Others 15 N / mm² (MIN)	BS 3144 / 5 SATRA TM 43
ELONGATION	40 % – 70 %	BS 3144 / 5 SATRA TM 43
TEAR STRENGTH	Sports 80 N (MIN) For the performance athletic sports footwear reqd –70 N Others 40 N (MIN)	BS 3144 / 6 SATRA PM 162
BURSTING STRENGTH	DISTENSION 7 mm (MIN) LOAD 20 Kg (MIN)	BS 3144 / 8 SATRA TM 24
FINISH ADHESION	DRY 2 N / 10 mm WET 1 N / 10 mm	ISO 11644 SATRA TM 402
COLOUR FASTNESS TO WATER SPOTING	NO CHANGE OR MARKING CC 4 (MIN)	ISO 15700 SATRA PM 185
COLOUR FASTNESS TO LIGHT (BWS - 4)	CC 4 (MIN)	IUF 402
FLEXING ENDURANCE FINISHED LEATHER UPPERS	NOT WORSE THAN SLIGHT CRACKING Sports DRY 1,50, 000 FLEXES WET 75,000 FLEXES Others DRY 100,000 FLEXES WET 50,000 FLEXES	BS 3144 / 13 SATRA PM 55

COLOUR FASTNESS TO RUBBING	Nubuck, Suede, Dye finish CC/ST 3 (MIN) Pigmented, Corrected grain CC/ST 4(MIN) DRY 150 RUBS 50 RUBS WET 50 RUBS	ISO 11640 IUF 450 SATRA PM 173
COLOUR FASTNESS TO WATER	CC / ST 3 (MIN)	BS 1006 UK:LD
WATER VAPOUR PERMEABILITY	Sports 0.8 mg / cm² / hour(MIN) Others 0.3 mg / cm² / hour(MIN)	IUP 15 SATRA PM 172

Table 3.2: -**SYNTHETIC UPPER**

PROPERTY	STANDARD REQUIRED	TEST METHODS
TENSILE STRENGTH (min 0.5 sq m sample is required)	PU/PVC WOVEN/NONWOVEN A Direction - 120 N / cm (MIN) B Direction - 100 N / cm (MIN)	SGS IN HOUSE BS 3144 / 5 SATRA TM 43
ELONGATION	PU/PVC WOVEN/NONWOVEN 60 % – 140 %	BS 3144 / 5 SATRA TM 43
TEAR STRENGTH	PU/PVC WOVEN/NONWOVEN ALL - 15 – 50 N	BS 3144 / 6 SATRA PM 162 for leathers SATRA PM 30/ ISO 4674 for synthetic / Fabrics SATRA PM 162
STITCH TEAR STRENGTH	PU/PVC WOVEN/NONWOVEN Thickness 0.7 – 0.9 → 20 N (MIN) Thickness 1.0 – 1.9 → 75 N (MIN) Thickness (Children) 1.0 – 1.9 → 60 N (MIN) For Sports shoes - **5 Kg / cm**	DIN 53331 SATRA PM 30 SATRA PM 33

FINISH ADHESION	DRY 3 N / 10 mm WET 1.5 N / 10 mm	ISO 11644 SATRA TM 402
FLEXING ENDURANCE Bally Flex	NOT WORSE THAN SLIGHT CRACKING Sports DRY 150000 FLEXES WET 75000 FLEXES Others DRY 100,000 FLEXES WET 50,000 FLEXES	NF EN 13512 SATRA PM 55
COLOUR FASTNESS TO RUBBING VESLIC	CC/ST 4 (MIN) DRY 150 RUBS 50 RUBS WET 50 RUBS.	ISO 11640 IUF 450 SATRA PM 173
COLOUR FASTNESS TO WATER	CC / ST 4 (MIN)	BS 1006 UK:LD
COLOUR FASTNESS TO WATER SPOTING	NO CHANGE OR MARKING CC 4 (MIN)	ISO 15700 SATRA PM 185
COLOUR FASTNESS TO LIGHT (BWS - 4)	CC 4 (MIN)	IUF 402

Table 3.3: - FABRIC UPPER

PROPERTY	STANDARD REQUIRED	TEST METHODS
COMPOSITION	AS MENTIONED	BS 4407

BREAKING STRENGH	80 N / cm 180 N / 2.54 cm - sports shoes	BS EN ISO 13934 – 2 TM 30
TEAR STRENGTH	30 N (min)	BS EN ISO 13937 – 1
COLOUR FASTNESS TO RUBBING CROCKMETER	ST 4 (MIN) DRY 10 RUBS WET 10 RUBS	ISO 105 X 12 SATRA PM 167
COLOUR FASTNESS TO WATER	CC / ST 4 (MIN)	ISO 105 E 01 SATRA CM 35
COLOUR FASTNESS TO WATER SPOTING	NO CHANGE OR MARKING CC 4 (MIN)	ISO 105 E 07
COLOUR FASTNESS TO LIGHT (BWS - 4)	CC 4 (MIN)	ISO 105 B 02

Table 3.4: -LEATHER LINING

PROPERTY	STANDARD REQUIRED	TEST METHODS
TENSILE STRENGTH	12 N / mm^2 (MIN)	BS 3144 / 5 SATRA TM 43
ELONGATION	40 % – 70 %	BS 3144 / 5 SATRA TM 43
TEAR STRENGTH	30 N (MIN) 3.0 kg.	BS 3144 / 6 SATRA PM 162
ABRASION RESISTANCE	NO HOLES OBSERVED DRY 25,600 REVS WET 12,800 REVS 6400 REVS	EN 344 EN ISO 20344 SATRA PM 31

WATER VAPOUR PERMEABILITY	Sports 0.8 mg / cm² / hour(MIN) Others 0.3 mg / cm² / hour(MIN) **2.0** mg / cm² / hour(MIN) - **For linings**	IUP 15 SATRA PM 172
COLOUR FASTNESS TO RUBBING	CC/ST 3 - 4 (MIN) DRY 150 RUBS 50 RUBS WET 50 RUBS	ISO 11640 IUF 450 SATRA PM 173
COLOUR FASTNESS TO WATER	CC / ST 3 - 4 (MIN)	BS 1006 UK:LD SATRA CM 35
COLOUR FASTNESS TO PERSPIRATION	CC / ST 3 (MIN)	ISO 11641 IUF 426

Table 3.5: - SYNTHETIC LININGS

PROPERTY	STANDARD REQUIRED	TEST METHODS
TENSILE STRENGTH	PU/PVC WOVEN/NONWOVEN A Direction - 120 N / cm (MIN) B Direction - 100 N / cm (MIN) 65.0 N / cm (min) - sports footwear	BS 3144 / 5 SATRA TM 43
ELONGATION	PU/PVC WOVEN/NONWOVEN 60 % – 140 %	BS 3144 / 5 SATRA TM 43

TEAR STRENGTH	PU/PVC WOVEN/NONWOVEN 15 N (MIN)	BS 3144 / 6 SATRA PM 162
ABRASION RESISTANCE	NO HOLES OBSERVED DRY 25,600 REVS WET 12,800 REVS 6400 (min)	EN 344 EN ISO 20344
COLOUR FASTNESS TO RUBBING.	CC/ST 4 (MIN) DRY 150 RUBS 50 RUBS WET 50 RUBS	ISO 11640 IUF 450 SATRA PM 173
COLOUR FASTNESS TO WATER	CC / ST 3- 4 (MIN)	BS 1006 UK:LD SATRA CM 35
COLOUR FASTNESS TO PERSPIRATION	CC / ST 4 (MIN)	ISO 11641 IUF 426

Table 3.6: - FABRIC – LININGS

PROPERTY	STANDARD REQUIRED	TEST METHODS
PILLING RESISTANCE	UPTO 5 HRS NO PILLING FOUND	BS EN ISO 12945 – 1
ABRASION RESISTANCE	NO THREAD BREAK / HOLES OBSERVED DRY 25,600 REVS WET 12,800 REVS	EN 344 EN ISO 20344 SATRA PM 31
COLOUR FASTNESS TO RUBBING CROCKMETER	ST 4 (MIN) DRY 10 RUBS WET 10 RUBS	ISO 105 X 12 SATRA PM 167

COLOUR FASTNESS TO WATER	CC / ST 4 (MIN)	ISO 105 E 01 SATRA CM 35
COLOUR FASTNESS TO PERSPIRATION	CC / ST 3 - 4 (MIN)	ISO 105 E 04

Table 3.7: -SOLING MATERIALS AND UNITS

PROPERTY	STANDARD REQUIRED	TEST METHODS
ABRASION RESISTANCE – SYNTHETIC SOLING	**MAX VOLUME LOSS mm²**	BS 903 : A9 SATRA PM 174
PVC SOLID OR SKIN	200	
RESIN RUBBER	350 (400)	
VULCANISED RUBBER	300	
MICROCELLULAR RUBBER	700 (500)	
SEMI-EXPANDED RUBBER	500	
CREPE RUBBER	300	
LEATHER	400	
BLOWN PVC	500	
DUAL DENSITY PU	FACER TESTED 150 100	
	LOW DENSITY 400	
SOLID TPU & BLENDS	HIGH DENSITY 100	
EVA	POLYESTER TYPE 300	
POLYURETHANE	POLYESTER TYPE (SKIN ON) 500	
THERMOPOLASTIC RUBBER	SOFT 300 (350) HARD 400 (350)	
	MAX 350	

ABRASION RESISTANCE **LTR** **SUEDE SOLING** **SYN.FABRIC SOLING**	NOT WORSE THAN MODERATE WEAR DRY 51,200 REVS WET 12,800 REVS	EN 344 EN ISO 20344 SATRA PM 31
FLEXING ENDURANCE For Resin Rubber – Ross Flex @ room temp For sheet sole - Ross Flex @ room temp For all others – Benawart Flexing **COMPRESSION** For EVA mid sole	MAX CUT GROWTH 6 mm After 150 000 flexes MAX CUT GROWTH 6 mm After 150 000 flexes MAX CUT GROWTH 6 mm After 30 000 flexes Max up to 60%	TM 60 DIN 53543 SATRA PM 161

Table 3.SOLING MATERIALS AND UNITS

PROPERTY	**MINIMUM STANDARD REQUIRED**			**TEST METHODS**
EFFECTIVE THICKNESS OF SOLE WEARING SURFACE	MEN'S mm	WOMEN'S mm	CHILDREN'S mm	BS 903 :A 38 SATRA PM

T.R. 50 – 70 IRHD SOFT GRADE 71 – 95 IRHD HARD GRADE	6.0 5.0	5.0 4.0	6.0 5.0	136
CELLULAR PU	6.0	5.0	6.0	
RESIN RUBBER	4.3	2.7	4.3	
VULCANISED RUBBER	5.0	4.0	5.0	
MICROCELLULAR EVA LOW DENSITY HIGH DENSITY GREATER THAN 0.65G / cm3	8.0 4.3	6.0 2.7	8.0 4.3	
CELLULAR RUBBER MICRO SEMI-EXPANDED	8.0 4.3	6.0 2.7	8.0 4.3	
CELLULAR GRISTLE RUBBER	6.0	5.0	6.0	
SOLE LEATHER STUCK – ON WELTED	3.5 4.0	3.5 4.0	NOT APPLICABLE	
SOLID PVC	5.0	4.0	5.0	

BLOWN PVC	6.0	5.0	6.0	

Table 3.8: - SOLING MATERIALS AND UNITS

PROPERTY	MINIMUM STANDARD REQUIRED	TEST METHODS
HARDNESS THERMOPLASTIC RUBBER UNIT & MOULDED ON	SOFT 50 – 70 IRHD HARD 71 – 95 IRHD	BS 903 : PART A 26: METHOD N CTS/LAB/077
PVC – SOLID ONLY UNIT MOULDED ON	60 – 80 IRHD 55 – 65 IRHD	
RESIN RUBBER	MIN 88 IRHD	
VULCANISED RUBBER	60 – 90 IRHD	
MICROCELLULAR EVA	LOW DENSITY 35 – 55 IRHD HIGH DENSITY MIN 85 IRHD	
MICROCELLULAR RUBBER	MIN 40 IRHD	
SEMI-EXPANDED RUBBER	MIN 90 IRHD	
POLYURETHANE – SKIN ON	50 – 80 IRHD	
SOLID TPU & BLENDS	65 – 75 IRHD	

Table 3.9: - INSOLES

PROPERTY	MINIMUM STANDARD REQUIRED			TEST METHODS
HEEL PIN HOLDING STRENGTH – SEAT BOARD	**Condition**	**WOMEN'S & CHILDREN'S WEAR**		BS 5131 : 4.4 SATRA PM 11
		HEEL HEIGHTS		
		50 mm & above	**Below 50 mm**	
	DRY WET	1080 N 980 N	880 N 780 N	
FLEXING INDEX – FOREPART NON LEATHER LEATHER	WELTED / HEAVY DUTY 3.7 GENERAL / EVERY DAY 3.2 4.2			BS 5131 : 4.2 SATRA PM 3
ABRASION RESISTANCE	NOT WORSE THAN MODERATE WEAR AND MODERATE PILLING DRY 25,600 REVS WET 12,800 REVS			EN 344 EN ISO 20344 SATRA PM 31
COLOUR FASTNESS TO PERSPIRATION LEATHER SYNTHETIC	CC / ST 3 - 4 (MIN) CC / ST 4 (MIN)			ISO 11641 IUF 426
COLOUR FASTNESS TO PERSPIRATION FABRIC	CC / ST 3 - 4 (MIN)			ISO 105 E 04

Table 3.9: - TOE PUFFS

PROPERTY	MINIMUM STANDARD REQUIRED				TEST METHODS
	Very Hard	Hard	Medium	Soft	
INITIAL HARDNESS	Over 130 N	130 – 80 N	80 – 31 N	Less Than 30 N	SATRA PM 61/83
MINIMUM RESILIENCE ALL TYPES OTHER THAN FILMIC	25 %	30 %	40 %	50 %	
FLIMIC TYPES	30 %	40 %	50 %	70 %	
MOISTURE RESISTANCE	65%				
AREA SHAPE RETENTION	INITIAL 60% - 80%* AFTER 10 COLLAPSES 50%				SATRA PM 61/82

Table 3.10: - COUNTER STIFFENERS

PROPERTY	MINIMUM STANDARD REQUIRED				TEST METHODS
	Very Hard	Hard	Medium	soft	
INITIAL HARDNESS	Over 130 N	130 – 80 N	80 – 31 N	Less Than 30 N	
MINIMUM RESILIENCE ALL TYPES OTHER THAN FILMIC	25 %	30 %	40 %	50 %	SATRA PM 61/83
FLIMIC TYPES	30 %	40 %	50 %	70 %	
MOISTURE RESISTANCE	60%				
AREA SHAPE RETENTION	INITIAL 70% AFTER 10 COLLAPSES 60%				SATRA PM 61/82

Table 3.11: - PLASTIC HEELS

PROPERTY	MINIMUM STANDARD REQUIRED	TEST METHODS
FATIGUE RESISTANCE	14,000 BLOWS WITHOUT CRACKING	BS 5131 : 4.9 SATRA PM 21
HEEL PIN HOLDING STRENGTH	80 N / mm	BS 5131 4.4 SATRA PM 96

IMPACT RESISTANCE	5.4 JOULES WITHOUT DAMAGE	BS 5131 : 4.8 SATRA PM 20
PAINT ADHESION	NO REMOVAL	SATRA AM 6

Table 3.12: - SEWING THREADS

PROPERTY	MINIMUM STANDARD REQUIRED	TEST METHODS
ABRASION OF DECORATIVE THREADS	NOT WORSE THAN MODERATE DAMAGE DRY 12,800 CYCLES WET 3,200 CYCLES	EN 344 EN ISO 20344 SATRA PM 31
COLOUR FASTNESS TO WATER	CC / ST 3 - 4 (MIN)	ISO 105 E 04 SATRA CM 35

Table 3.13: - TAPES

PROPERTY	MINIMUM STANDARD REQUIRED	TEST METHODS
BREAKING LOAD	TOPLINE REINFORCING 300 N WOVEN TOPLINE BINDING 200 N PLASTIC COATED TOPLINE 100 N BINDING RE-ENFORCING WIDE TAPES 250 N (STRAPS & BUCKLES)	SATRA PM 106

EXTENSION AT BREAK	TOPLINE REINFORCING 13 % WOVEN TOPLIEN BINDING 13% PLASTIC COATED TOPLINE 17% BINDING	
LOAD AT 5% EXTENSION	TOPLINE REINFORCING 80 N WOVEN TOPLIEN BINDING 50 N	
COLOUR FASTNESS TO WATER TAPES NOT EXPOSED TO HOSIERY TAPES EXPOSED TO HOSIERY	CC / ST 3 - 4 (MIN)	ISO 105 E 04 SATRA PM 35

Table 3.14: - SHOE LACES

PROPERTY	MINIMUM STANDARD REQUIRED	TEST METHODS
BREAKING LOAD	DRY 200 N WET 150 N	BS 5131 : 3.7 SATRA PM 94
LACE TO LACE CARRIER ABRASION	5,000 CYLES	BS 5131 : 3.6 SATRA PM 154
LACE TO LACE ABRASION	5,000 CYLES	BS 5131 : 3.6 SATRA PM 154
TAG RETENTION	150 N	SATRA PM 175

COLOUR FASTNESS TO WATER	CC / ST 3 - 4 (MIN)	ISO 105 E 04 SATRA CM 35

Table 3.15: - SHANKS – METAL TYPES

PROPERTY	**MINIMUM STANDARD REQUIRED**			**TEST METHODS**
FATIGUE RESISTANCE	**WOMEN'S CHILDREN ON HEEL HEIGHTS**			SATRA PM 97
	75 - 99 mm	**50 - 74 mm**	**Less Than 50mm**	
	20,000 CYCLES	8,000 CYCLES	3,000 CYCLES	
STIFFNESS	1200kN-mm^2	800kN-mm^2	400kN-mm^2	BS 5131 : 4.18 SATRA PM 58

Table 3.16: - ELASTIC – TAPES & GUSSETS

PROPERTY	**MINIMUM STANDARD REQUIRED**	**TEST METHODS**
COLOUR FASTNESS TO WATER	CC / ST 3 - 4 (MIN)	ISO 105 E 04 SATRA CM 35
NEEDLE PULLOUT	3.5 N/mm	SATRA PM 33
LIMIT OF USEFULL EXTENSION	90 %	SATRA PM 102

RESISTANCE TO REPEATED EXTENSION TO LIMIT OF USEFULL EXTENSION BEFORE HEAT AGEING AFTER HEAT AGEING @ 70 ° C for 7 days	NOT MORE THAN 10 % RUBBER THREAD BREAKAGE AND NOT MORE THAN SLIGHT VISIBLE DAMAGE AFTER 10000 CYCLES NOT MORE THAN 20 % RUBBER THREAD BREAKAGE AND NOT MORE THAN SLIGHT VISIBLE DAMAGE AFTER 10000 CYCLES	SATRA PM 103

Table 3.17: - BUCKLES, TRIMS & EYELETS

PROPERTY	MINIMUM STANDARD REQUIRED	TEST METHODS
THREE POINT BENDING BUCKLES ONLY	100 N TO BEND 200 N TO BREAK	SATRA PM 141
CORROSION / TARNISHING RESISTANCE METALLIC EYELETS TRIMS & BUCKLES	NOT WORSE THAN SLIGHT CORROSION OR STAINING OF CONTACT MATERIAL	ASTM B 117 ASTM B 117/G 85 SATRA CM 10(2)

NICKEL (<u>Only when metal is in skin contact</u>) NON PLATED OR COATED FINISH PLATED NICKEL FINISH	NO MORE THAN 0.5 microgram's / sq cm / week	BS EN 1811 BS EN 12742

Table 3.18: - UPPER CONSTRUCTION

PROPERTY	MINIMUM STANDARD REQUIRED	TEST METHODS
SEAM STRENGTH	Sports 10 N / mm (MIN) Others 8 N / mm (MIN)	BS 5131 : 5.13 SATRA PM 180
TEAR STRENGTH OF LEATHER UPPER AND REINFORCEMENT	70 N	BS 3144 / 6 SATRA PM 162
STITCH TEAR STRENGTH OF SYNTHETIC UPPER AND REINFORCEMENT	50 N	BS 3144 / 6 SATRA PM 30
RESISTANCE TO STRETCHING AND FLEXING OF SEAMS, STRAPS AND FOLDED STRIPPING	NO SIGNIFICANT DAMAGE AFTER 500 kc	SATRA PM 147

Table 3.19: - UPPER TRIM ATTACHMENT

PROPERTY	MINIMUM STANDARD REQUIRED	TEST METHODS

STRAPS, BUCKLES AND OTHER RELATED ATTACHMENT STRENGTH	250 N (MIN) OTHERS 50 N (MIN)		BS 5131 : 5.11 SATRA PM 181
EYELET ATTACHMENT STRENGTH	120 N 90 N FOR BLIND EYELETS		BS 5131 : 5.15 SATRA PM 150
LACE HOLE OR EYELET STRENGTH	250 N		SGS INHOUSE SATRA CM 149
	Unlined	**Lined**	
TOE PUFF ATTACHMENT STRENGTH	DRY 1.0 N /mm WET 0.6 N /mm	0.5 N/mm 0.3 N/mm	BS 5131 : 1.2 SATRA AM 1
STIFFENER ATTACHMENT STRENGTH	DRY 0.5 N/mm		

Table 3.19: - FOOTWEAR – FINISHED FOOTWEAR ONLY

PROPERTY	MINIMUM STANDARD REQUIRED	TEST METHODS
WHOLE SHOE FLEX TEST	NO SEVERE DAMAGE AFTER 5, 00,000 FLEXES	SATRA PM92

16 POINT BOND STRENGTH *		
WHOLE SHOE		
UNIT & SOLING TYPE - MICR		
/ EVA -		
SIDEWALL / SOLE	Sports 5 N / mm (MIN)	
	4 N mm (min)	
MENS/ WOMEN SHOES	Others 4 N / mm (MIN)	
(CASUAL/ FORMAL)		
	3.5 N/mm	
For Sports Shoe		
Midsole to Upper	3.5 N/ mm (min)	
	3.5 N /mm	
Midsole to Outsole		
PEEL STRENGTH		
Outsole to upper	3.0 N /mm	
	3 N/ mm (min)	BS 5131: 5.4
Outsole to insole	5 N/ mm (min)	
FOR MULTILAYERED SANDALS	32.5 N / mm (min)	
/ FLIP FLOP	N/ mm (min)	
Footbed / Midsole to Outsole	3.5 N /mm	
HALFSOLE SEPARATION	11 kgf (min)	
(In Ladies open sandels)	3.0 N /mm	
BOND STRENGTH	1 kg / cm or	
	10 N / cm 3 N/ mm (min)	
Sole to Insole	3 N/ mm (min)	
FOR CANVAS SHOES		
	2.5 N / mm (min)	
Foxing peeling strength		

SLIP RESISTANCE	DRY & WET 0.40 MIN 1.25 MAX	SATRA TM 144

Table 3.19: - FOOTWEAR – FINISHED FOOTWEAR ONLY

PROPERTY	MINIMUM STANDARD REQUIRED	TEST METHODS
CHROME VI	3 PPM	DIN 53314
FORMALDEHYDE	Adults 75 PPM Children 30 PPM	DIN 53315
AZO	30 PPM	LMBG 82.02
PCP / TeCP	1 PPM	DIN 53313
HEAVY METALS (9 Elements)	Varies compound wise 0.1 to 8 PPM	ISO 105 by AAS

Self-Check 3	Written Test

Name: _________________________ Date: _______________

Time started: ________________________ Time finished: ____________________

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

Section 1

Fill in the blanks **(1X5 Points)**

1. Metallic eyelets should have little or no ___________.
2. ____________ buckles should not have more than 0.5 micrograms/sq.cm.
3. The _____________ of plastic heels is 5.4. Joules without damage.
4. Micro cellular _________ can have both higher and lower density.
5. Material Performance Standards can also be carried out in the ______________.

Section 2

True & False

(1X5 Points)

1. The bond strength of canvas shoe is 4.5.N/mm.
2. The blind eyelet attachment strength is 90N.
3. Colour fastness is one of the attributes of a good quality thread.
4. The moisture resistance of toe-puff is 90%.
5. Sole bonding test means testing of bonds both at toe and heel.

Section 3

Short Answers **(2X5 Points)**

1. What is material performance standard?
2. What does the material performance standard specify?
3. Give the flexing endurance of leather Finished leather?
4. Specify the abrasion resistance of Thermoplastic soling material?
5. What is the fatigue resistance in plastic heels?

Instruction Sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- standard working procedure (SOP) for a particular shoe
- materials, tools and machines for sample making
- a pair of shoe sample as per SOP
- sample shoe quality and identifying faults
- Record and documentation

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Preparing standard working procedure (SOP) for a particular shoe
- Identifying and preparing materials, tools and machines for sample making
- Developing a pair of shoe sample as per SOP
- Inspecting sample shoe quality and identifying faults
- Record and documentation

Learning Activities

11. Read the specific objectives of this Learning Guide.
12. Read the information written in the “Information Sheets 1”.
13. Accomplish the “Self-check 1”. Request the key answer / key to correction from your teacher or you can request your teacher to check it for you.
14. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #2.
15. Read the information written in the “Information Sheet 2”.
16. Accomplish the “Self-check 2”. Again you can request the key answer / key to correction from your teacher or you can request your teacher to check it for you.

17. If your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity # 2.
18. Read the information written in the “Information Sheet 3”.
19. Accomplish the “Self-check 3”. Again you can request the key answer / key to correction from your teacher or you can request your teacher to check it for you.
20. If your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity # 5

.

1.1. What is a Standard Operating Procedure (SOP)?

An SOP is a procedure specific to your operation that describes the activities necessary to complete tasks in accordance with industry regulations, provincial laws or even just your own standards for running your business. Any document that is a "how to" falls into the category of procedures. In a manufacturing environment, the most obvious example of an SOP is the step by step production line procedures used to make products as well train staff.

An SOP, in fact, defines expected practices in all businesses where quality standards exist. SOPs play an important role in your small business.

SOPs are policies, procedures and standards you need in the operations, marketing and administration disciplines within your business to ensure success. These can create:

• efficiencies, and therefore profitability
• consistency and reliability in production and service
• fewer errors in all areas
• a way to resolve conflicts between partners
• a healthy and safe environment
• protection of employers in areas of potential liability and personnel matters
• a roadmap for how to resolve issues – and the removal of emotion from troubleshooting – allowing needed focus on solving the problem
• a first line of defense in any inspection, whether it be by a regulatory body, a partner or potential partner, a client, or a firm conducting due diligence for a possible purchase
• value added to your business should you ever wish to sell it Developing an SOP is about systemizing all of your processes and documenting them.

Every business has a unique market, every entrepreneur has his/her own leadership style, and every industry has its own best practices. No two businesses will have an identical collection of SOPs. Below is a listing of just a few typical SOPs, which you will want to consider writing for your own small business.

Production/Operations

• production line steps

• equipment maintenance, inspection procedures

• new employee training Finance and Administration

• accounts receivable – billing and collections process

• accounts payable process – maximizing cash flow while meeting all payment deadlines Marketing, Sales and Customer Service

• approval of external communications: press releases, social media, advert, etc.

• preparation of sales quotes

• service delivery process, including response times

• warranty, guarantee, refund/exchange policies

• acknowledgment/resolution of complaints, customer comments and suggestions

Employing Staff

• job descriptions

• employee orientation and training

• corrective action and discipline

• performance reviews

• use of Internet and social media for business purposes Legal

• privacy – an explicit privacy policy is required, specifying what information you will collect, why you are collecting it, how it will be used, and how long you will keep the information on file. Ensure that everyone in the organization is only asking for the information they need to do their job.

• accessibility – having accessible locations, goods and services is going to be a legislated right of all Ontarians, with the definition of accessibility going well beyond traditional concepts, like providing wheelchair access washrooms. Companies with fewer than 20 employees are required to create a plan for how they will comply with the Customer Service Standard and then train their employees. Companies with 20 or more employees must also put their plans in writing and report to the government on how the company is doing.

• establish prior to opening; review at least annually

• develop procedures in the language, style and format best for the establishment (your industry/operations knowledge is crucial here)

• write SOPs in clear, concise language so that processes and activities occur as they are suppose to

• the level of detail in SOPs should provide adequate information to keep performance consistent while keeping the procedures from becoming impractical

• keep written SOPs on-site so that they can be used by supervisors and employees

• drafts should be made and tested before an SOP is released for implementation

• the more decision makers, employees and complexity in the business, the more SOPs are required

1.1.1. What is the difference between a process and a standard operating procedure?

Processes and procedures each include step-by-step instructions to help you to correctly perform a specific task. A process usually works at a higher level while a standard operating procedure takes the elements of a high-level process and adds more detail, specific assignments, and workflows to conform with company or industry standards.

You may only need a process when you only need your audience to know what needs to be done to achieve the desired outcome.

For example, you don't need an SOP to program a drum machine because there are too many variables. There are no standard drum sounds that you have to use to create a beat. All you need is a step-by-step process describing how to select a time signature, a tempo, and the specific sounds you want to use and how to arrange those sounds in a pattern that sounds good to you. This basic process leaves it up to you to unleash your own creativity.

In an SOP, you also describe what needs to happen for an outcome. In addition, you would include more detailed steps and information such as who, when, and where. Here are a few reasons you may need an SOP:

- To ensure compliance standards are met
- To maximize production requirements
- To ensure the procedure has no adverse impact on the environment
- To ensure safety
- To adhere to a schedule
- To prevent manufacturing failures
- To be used for training

For example, you may need to create an SOP for people who produce release notes. The SOP could include:

- Which information should be included (bug fixes, new features, known issues)
- Which information shouldn't be included (fixes or improvements that are not customer-facing)
- When information should be collected (how many weeks or days before release)
- Who collects the information (writer, product manager, testers)
- Which format to use for the output (HTML, PDF)
- How the review cycle works (when the document is sent for review, who reviews the document, how much time to review, how much time to implement edits)
- Who needs to approve the document (team leads, product owners, senior managers)

1.1.2. The steps for footwear manufacturing are:

Step 1: Designing

In this step, sketches of the shoes are drawn and shoes are designed. Shoe lasts are prepared and a punching tool is used.

Step 2: Stamping

In this step the pieces of leather needed to make the shoes are cut and/or stamped.

Step 3: Sewing

In this step the pieces composing the shaft are sewn together.

Step 4: Die assembling

In this step, all the pieces of the shoes are assembled together to make it a complete product.

Step 5: Shoe room

Finishing touches are added and final quality controls are conducted.

Some materials are used to make the footwear comfortable, to be able to protect from injuries, or to make it look very exquisite. Materials include, plastic, rubber, foams, metallic, wood and leather.

1.1.3. List of some of the machineries used in the industry are:

- Cutting machines
- Pattern making Machine
- Sewing machines
- Bottoming machines
- Finishing machines
- Insole making machines
- Shoe repair machines

Self-Check 03	Written Test

PART-1

FILL IN THE BLANKS (Total marks: 2)

1. All the pieces of the shoes are assembled together to make it a complete product in ________________ step.

PART-2

Answer the following (Total Marks: 2*2=4)

1. Write the accurate steps for footwear manufacturing?
2. Why you need SOP?

PART-3

Say the following questions either true or false (total marks: 1.5*2=3)

1. Any document that is a "how to" falls into the category of procedures.
2. The SOP could include who collects the information.

Answer Sheet

Score = ___________
Rating: ____________

Name: _________________________ Date: _______________

Part I:

Fill in the blanks:

1. _______________

Part II:

Short answer

1____

____

____

2____

____

____

PART III:

True or false

1.

2.

2.1. Materials, tools and machines for sample making

2.4.1. Shoemaking Tools and Materials

The first thing you need to start this process is a shoe last. There are many different lasts.

1. **Pump shoes last with low heel**

Figure 52 pump shoe last

Last is like a dressmaker's dummy, only it's in the shape of a foot. The last determines the shape and size of the shoe. The ones the elves in the fairy tale used were very likely wooden.

Iron lasts were likely for heavy boots or anything requiring a high heel, which went in and out of style as revolts went on. More modern shoe lasts are made of high-density plastic. Computer-aided design works hand in hand (or foot, rather) with the modern shoe last.

How Shoes Last Are Measured?

As it was then as it is now, a flexible measuring tape is the best way to measure a last. There are ten measurements taken on a shoe last. The stick length is measured from the toe to the heel. Ball girth is the circumference of the last measured where the ball of the foot would be. Instep girth is the circumference of the last measure from just behind the ball to the instep. The waist girth is the circumference measured about an inch below the instep. The heel lift and toe spring are respectively measured with the back of last held parallel to the ground. The bottom length is the total length of the sole. The width or the ball, instep, and waist are all measured with a flexible tape.

2. **Masking tape**

Figure 53 masking tape

This is a must-have material that you will use through the entire process and it is the first thing we use.

There is no need for special masking tape, it just needs to be a good quality tape.

We cover the last with masking tape to draw our design on the last, later on, we will transfer this design (masking tape) to cardboard to make our basic pattern.

After you will create your basic pattern, you will move on to create the pattern of your upper and lining. To calculate the seam allowance for upper and lining you will need this tool.

3. Compasses

Figure 54 compass

It is the same compasses as you used in geometry class, at least it has the same function, so if you can’t find the “shoemaker compasses” just use the ordinary one.

As we got our patters ready, the next step is cutting leather. Shoemakers use special knives for it, but you will not fill the difference by using vey quality utility knife.

4. Shoemaking knife

You should have one good shoemaking knife. Good shoemaking knife can be used in many stages of our work. For example, next step before sewing the upper is skiving the edges.

You can also use your shoemaking knife to cut the Vegetable tanned leather, skive the sole and trim the extras when making your stacked heel.

5. Reinforcement tape

Before sewing the upper we must reinforce the top line so it will not stretch during lasting and we need to reinforce the back seam. There are the different width of reinforcement tape but you can start by using the narrow, 4mm reinforcement tape. For the back seam, you can use a piece of thin leather.

6. **Adhesive**

You must have glue for our shoemaking process, so where do you sue it?

- To assemble the upper before sewing
- To attach the upper to the insole
- To attach the sole
- To make our leather stacked heel

There are many different types of this glue, what important is that it must be the glue for leather only. For example Renia or Burge adhesive.

7. **Sewing machine**

There are many advanced and new machines. Such as:

3. Post bed sewing machine
4. Flat bed sewing machine

5. Cylindrical arm sewing machine
6. Zig zag sewing machine etc.

8. Hammer for folding

There are many hammers that you can use, but one is the one you need as a beginner.

It is good for many things.

It uses not only for folding. But also to flat the seams after sewing and to attach the sole.

The trick here is to use the wooden handle to attach the sole evenly.

9. **Pincers for lasting**

In lasting, we need to consider the type of leather that we use. You need to know how to last different shoe models but it is very important to have comfortable pincers.
You should have lasting pincers with a hammer. This way you don't need to use a real hammer when lasting and it is much comfortable and easy to last.

10. Nails

There are two types of nails that you must have.

long nails= 2cm

short nails=0.9 cm

When lasting we use the both types. The long type we use for the front are and they are long so we could bend them. The short nail we place to attach the heel, and we leave them there. Please remember, that you should do it only if you have a steel plate on the bottom of you last.

11. Different types of leather

This is almost the end of shoemaking process and you should prepare and skive your leather sole and also shape it.

Leather will be also used for making your stacked heels and you could learn different techniques how to make heels on and off the last.

Leather can be also used as an alternative to the shank board and texon board when creating insoles.

As you will be using a low heel pump last you can reinforce the arc area of your shoe with a straight piece of vegetable tanned leather. This will be also an alternative for the steel shank, but it should be used only in the low heel last up to 1 cm.

12. Dremel drill

This is a great shoe making tool that you can use along the entire process of making shoes.

3.1. Understanding Shoe sample Making

3.1.1. Standard Operating Procedure

Since the invention of modern day production assembly line by Henry Ford, assembly line is in all types of manufacturing, in footwear too. This modern day manufacturing assembly line is guided by Standard Operating Procedure short for SOP. Standard Operating Procedure in footwear is a series of customized manufacturing steps to put a shoe together based on its design.

During working in footwear design, visiting footwear assembly line, larger part of footwear styles sharing the same basic manufacturing SOP steps even though they are very different in styles, from vulcanized canvas shoes, knitted one piece running shoes, traditional leather shoes, sandals to high tech concept footwear, etc. are realized. However, below steps doesn't apply to one type of footwear, injected footwear, such as Crocs, BIION, Havaianas, etc. which have different manufacturing steps.

Certainly with advanced technologies and machinery are used in footwear manufactory constantly. Things do change for SOP steps. For instance, one piece knitted upper reduces the amount of stitching to be assembled, direct injection footwear reduce upper assembling altogether, a whole 3D printed sole could cut down manufactory time to half and manual labor to zero. However, all these new technologies is to advance or simplify certain areas of footwear manufacturing. The SOP steps are still applicable.

1. Making Shoe Patterns.

Shoe patterns are driven by shoe style, design and technology. Every shoe ever created has its own set of patterns, which gives a shoe its characteristics. These patterns are fundamental disregard shoe styles. Shoe patterns can be created by die-cutting or laser cutting which are the most common in shoe making still. Recently with the advancement in knitting technology, instead of cutting patterns, an entire or parts of patterns are knitted.

2. Bonding of Upper Patterns.

No matter what upper pattern materials as in leather, synthetic, fabric, textile, etc. require a way of bonding them together. The purpose of bonding is to create one complete piece of shoe upper. There are two key methods of bonding shoe patterns together, the most common method since the invention of footwear is stitching through threads. You can find at least one stitched bonding in all shoes, which is at the back of a shoe. There's another type of bonding is using adhesive, pressure and heat, such as lamination, injection, etc.

3. Attaching Last Board to Upper Pattern.

There is one extremely unique hidden piece that is a must-have for shoe making, last board. It is a piece of foot shapes item directly attached to the entire shoe upper. There are only two method of attaching last board to an upper, stitching or gluing. Instantly the many ways of attaching last board to an upper determine the construction of a shoe and its style. You can find out all shoe construction styles here.

4. Lasting to Maintain Shoe Form

Lasting is putting a foot shape object, shoe last, inside of a shoe to keep its form perfect during production. There are several special made machines to keep a shoe in its form. There is one for keeping heel in place, one for shaping toe, one for keeping entire upper sit tightly on last and others.

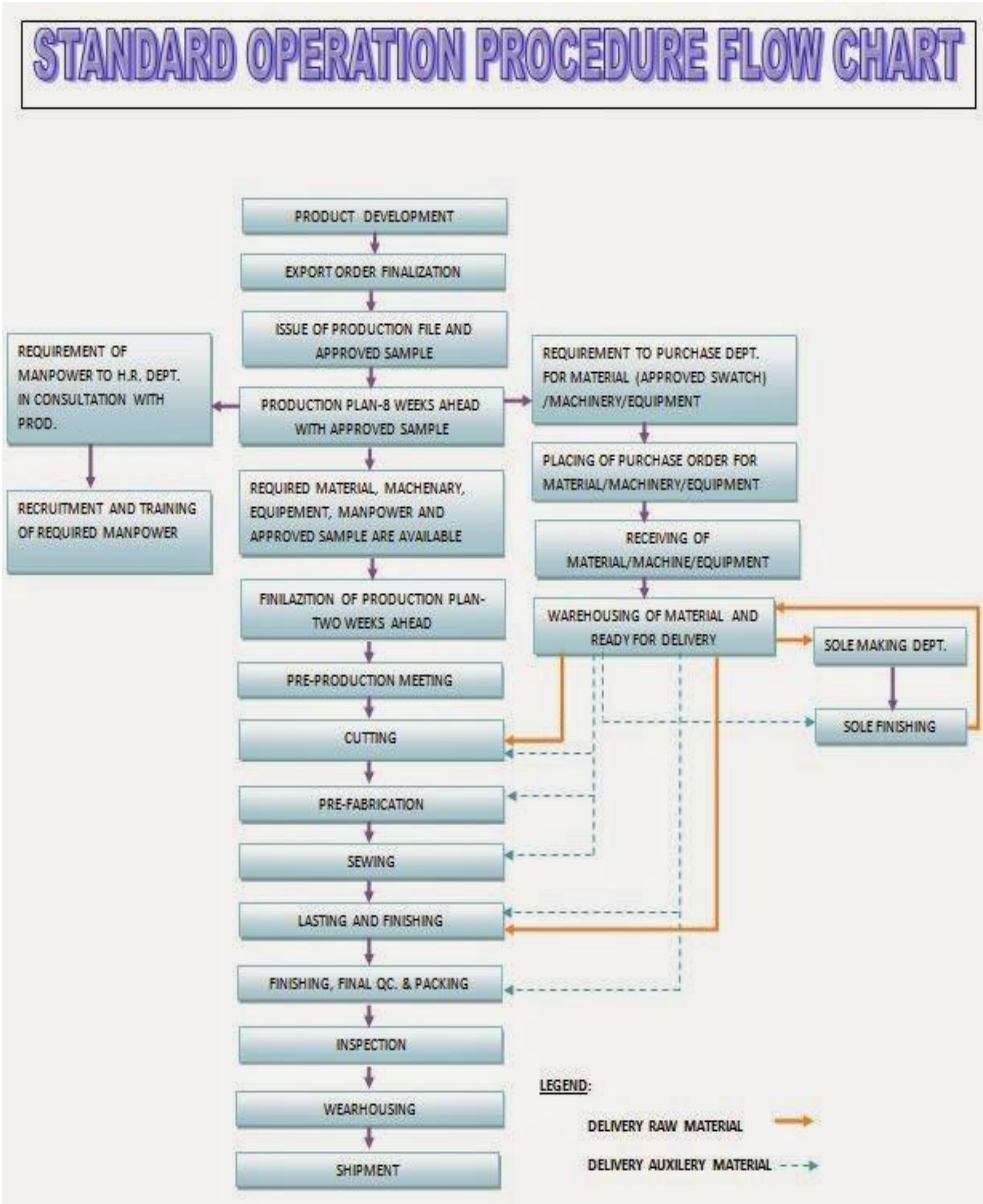
5. Marking Glue Line

Before the bottom is attached to upper, a line of where upper witted in a bottom must be marked. Since most shoe bottoms are in a cupped crate form, meaning a bottom is wrapped around bottom part of upper, where glue must be applied. This marked line indicated where glue application stops.

6. Attaching Bottom to Upper

Once the entire upper is in place perfectly, the bottom is attached. Once again, stitching and cementing are the most used methods. At times both stitching and cementing will

be used at the same time on one shoe, such as hand sewn dress shoes and classic cup sole sneakers. The attachment of bottom to upper most commonly is done with cementing. One layer of adhesive is applied to both bottom and upper (as show above). Another technology driven method is direct injection to create bottom onto an upper to have a better seal and improve on foot control, such as water resistance shoes.
These six steps of assembly procedure are essential to most shoes in the market with the exception of certain unique footwear styles; rain boots, rubber thongs, eva sandals or shoes, etc. which largely reduce the upper pattern cutting and assembling.


STANDARD OPERATION PROCEDURE FLOW CHART
PRODUCT DEVELOPMENT
EXPORT ORDER FINALIZATION
ISSUE OF PRODUCTION FILE AND APPROVED SAMPLE
REQUIREMENT OF MANPOWER TO H.R. DEPT. IN CONSULTATION WITH PROD.
PRODUCTION PLAN-8 WEEKS AHEAD WITH APPROVED SAMPLE
REQUIREMENT TO PURCHASE DEPT. FOR MATERIAL (APPROVED SWATCH) /MACHINERY/EQUIPMENT
PLACING OF PURCHASE ORDER FOR MATERIAL/MACHINERY/EQUIPMENT
RECRUITMENT AND TRAINING OF REQUIRED MANPOWER
REQUIRED MATERIAL, MACHENARY, EQUIPEMENT, MANPOWER AND APPROVED SAMPLE ARE AVAILABLE
RECEIVING OF MATERIAL/MACHINE/EQUIPMENT
FINILAZITION OF PRODUCTION PLAN- TWO WEEKS AHEAD
WAREHOUSING OF MATERIAL AND READY FOR DELIVERY
SOLE MAKING DEPT.
PRE-PRODUCTION MEETING
CUTTING
SOLE FINISHING
PRE-FABRICATION
SEWING
LASTING AND FINISHING
FINISHING, FINAL QC. & PACKING
INSPECTION
LEGEND:
WEARHOUSING
DELIVERY RAW MATERIAL
SHIPMENT
DELIVERY AUXILERY MATERIAL

Product Development Department:

Product development is the core function of any manufacturing company. It is the basic tool to attract customer and eventually to come to a business contract. Initially a designer translates his idea, concept, perception and experience (gathered from his surroundings by visiting fairs, shoe markets, reading magazines, searching online etc.) into a product considering a target group of customers. This initially developed sample under goes many modification through different stages, finally it is perfected by accommodating the suggestions from both the customers and the manufacturers.

Before placing any order to the facility, the Buyer/Customer wants to know whether the factory is capable of producing the styles with the desired quality level or not. The sample shows the ability of exporter to deal with any given styles of shoes .The Buyer/Customer accesses the capability of exporter only with the help of samples. If the samples are good quality, price competitive and time bounded naturally the Buyer/Customers will be willing to place the order to the factory. The future of any style depends on the sample.

So it is very important to understand the sample development process to control quality and cost in the initial stage. Designer plays the vital role in the sampling process as the only person between the Buyer/Customer and the factory who understands the Buyer/Customer specification, technical details, and time line of sampling. The process of the sampling is about the eventual satisfaction of specific needs. Therefore, it is essential that the samples should be made with utmost care.

- **Objectives:**
    - ✓ To create innovative product range to attract potential customers.
    - ✓ It must be competitive in the market.
    - ✓ It can be produced in the existing manufacturing facility.
    - ✓ It should be promptly responsive to the customer.
- **Main Functions:**

- ✓ To innovate a product range that can attract the potential customer to satisfy their desired need.
- ✓ While developing a product following points are considered,
  1. Aesthetics view of the product (Sales appeal to the potential Buyer/Customers).
  2. Technicality of the product.
  3. Cost involvement.
- ✓ To make liaison with the customer and accommodate their suggestion till finalization of the sample.
- ✓ To update their technical knowledge so that they can build maximum comfort in the shoe.
- ✓ To become versatile regarding the shoe material available in the market, their proper application and their cost.
- ✓ To propose and arrange potential equipment's and demonstrate their uses in the factory.
- ✓ To remain updated regarding the manufacturing facility available in the factory.
- ✓ To issue and remain responsible for all types of sample, swatches for material, patterns, knives etc.
- ✓ To follow-up pilot production.
- ✓ As a shoe engineer, to assist in solving any sort of technical / quality problem that may arise during manufacturing.
- ✓ To maintain a lateral relationship with the following dept. such as Planning/ Merchandising, Procurement, Raw material stores, production and Quality assurance team etc.

✓ Before finalization of sample, different steps are followed depending on the Buyer/Customer to Buyer/Customer and style to style. The steps are as follows:

1) Initial Sample
2) Salesman sample

3) Advertisement/Press Sample

4) Fitting Sample

5) Confirmation Sample &

6) Pre-Production /Gold seal Sample

These samples are sent to the Buyer/Customer one after another for approval.

3.1.2. Assessment of sample:

Upon receiving the samples, Buyer/Customers check the sample quality, fitting, finishing etc. and gives the feedback within 5-7 days through e-mail . Feedback from the Buyer/Customer comes in three different forms

1. Accepted,
2. Not accepted or
3. Accepted with comments.

After getting their approval, it proceeds step by step. Sometimes the Buyer/Customer suggests some changes in the prepared sample both in terms of technicality and material. Revised samples are made incorporating those suggestions and get it approved. This process continues till the sample is finally approved. After getting the final approval Buyer/Customer place the final order. And then PD dept. along with the Merchandising dep't prepares a manufacturing sheet stating all the technical details including the material specification and their quantity per pair for doing the costing of the shoe.

Bellow the Product Development Flow chart are given

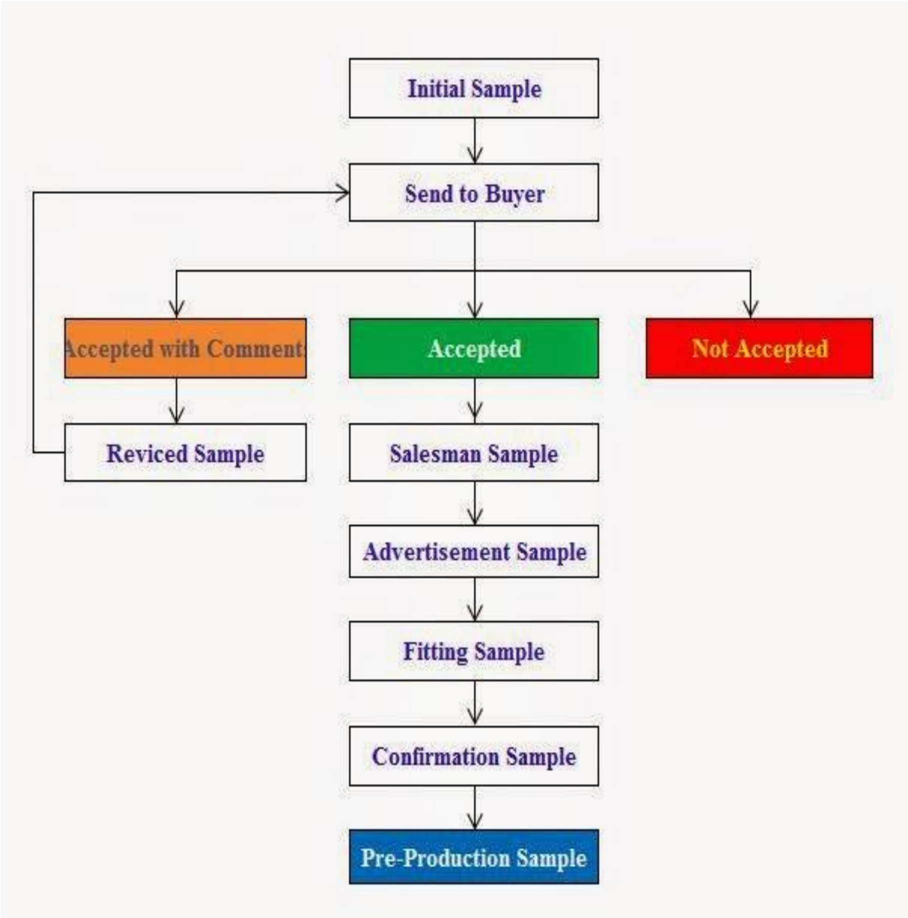


Figure 55 product development flow chart

WORK SPECIFICATION IN THE LASTING AND FINISHING

SL	OPERATIONS	PURPOSE	PRESSURE	TEMPERATURE			TIME
				Condition	Heating	Cooling	
1	Counter Moulding	Flenging & backpart moulding	5 to 7 bar	Rubber Pad	90 to 100c		8 to 10 sec.
				Aluminium Mould	100 t0 110c	0 to 5c	8 to 10 sec.
2	Toe conditioning	To condition the Toe puff & Upper.	5 to 7 bar	Leather	100 t0 110c with Steam		6 t0 8 sec.
				Synthetics	90 to 100 without Steam		6 t0 8 sec.
3	Heat setting	To set the lasted upper on the last properly.		Leather	110 t0 120c with Steam		3 to 4 MNTs
				Synthetics	90 to 110 without Steam		2 to 3 MNTs
4	Roughening	To roughen the surface for better adhesion.		Leather	Emery-36, Wire brush-Medium		
				Synthetics	Use leather,Wire brush-N/A.		
5	Drying after 1st coat Cement	For drying cement			Ambient temperature		2 to 3 MNTs
6	Drying & Heat reactivation.	For drying cement & reactivate the surface for proper adhesion.		**Lasted Upper**			
				Leather	60 to 70c		5 to 6 MNTs
				Synthetic	60 to 65c		5 to 6 MNTs
				Sole			
				PVC	60 to 65c		5 to 6 MNTs
				PU	60 to 65c		5 to 6 MNTs
				TPR	55 to 60c		5 to 6 MNTs
				EVA	55 to 60c		5 to 6 MNTs
				Flash			5 - 7 Sec
7	Sole pressing	To press lasted bottom & sole togather for adhesion.	Side Wall 5 to 6 bar				7 to 8 sec.
			Bottom-30 to 35kg				7 to 8 sec.
8	Chilling	Todepiciate heat from the shoe for better adhesion.			0 to 5c		3 to 4 MTS.

Figure 56 work specification for lasting & finishing

Self-Check 03	Written Test

PART-1

Answer the following (Total Marks: 2*2=4)

1. What is sample making mean?
2. Write the steps of sample assessment.

Answer Sheet

Score = ___________	
Rating: ____________	

Name: _________________________ Date: _______________

Part I:

Short answer

1____

____

____

2____

____

____

4.1. Sample shoe quality and identifying faults

Sample generally means that import taxes weren't paid on the **shoes** since they were not intended for resale. Doesn’t **mean** the **shoe** has been worn. It probably sat in a showroom or was carried around by a rep to show to buyers.

Just as with any manufactured product, shoes suffer from problems that can stem either from their manufacturing, or improper use. On the other hand, you do have control over the issues that arise during manufacturing, which you can minimize or eliminate altogether.

In this article, we will look at six of the most common quality problems that occur during manufacturing of footwear, and the steps you can take to get rid of them.

4.1.1. Eliminate Defects with Testing and Continuous Quality Assurance Inspections

None of the defects listed above can be fixed unless they have first been spotted, which can only be done with a thorough testing and quality assurance inspection process.

The reverse is true: if no one is inspecting your product, they will almost certainly leave the factory with a number of defects, resulting in product returns or even costly recalls.

Here we provide best-in-class physical and chemical laboratory testing for footwear. We test the physical characteristics and chemical composition of shoes to make sure they match the quality you demand and pass all required product safety regulations.

We can also provide a continuous inspection service for your entire production process: from initial batch to packaging and shipping. After all, designed production processes are useless unless make sure workers are actually following them.

Shoes aren’t made to last forever. Even well-made pairs will eventually show signs of wear and tear with constant use.

But that doesn't always mean the customer is to blame for any wear and tear or other problems with shoes they might buy. Often it's the manufacturer that's responsible for managing quality defects in shoes so that customers are satisfied with the finished product.

Just as footwear manufacturers typically use a lot of cutting and sewing during production, those that manufacture footwear often use some very similar production processes. And although shoes are typically made with more robust materials, such as firm leather, rubber and plastics, they're vulnerable to similar product defects.

There are some common quality defects that are unique to shoes.

4.1.2. HOW TO CLASSIFY QUALITY DEFECTS IN SHOES

Before we get into the top common quality defects in shoes, it's helpful to understand how quality control professionals typically classify and sort defects by severity. Quality defects for shoes are generally sorted into one of the following three categories:

1. Defects that fail to meet mandatory regulations or pose a hazard to the user are typically classified as "critical defects".
2. Defects that render the footwear unacceptable by affecting appearance, durability and salability are called "major defects". A major defect found on a shoe is likely to result in a customer returning the pair.
3. Defects that are lower than the desired quality standard but are not likely to result in customer dissatisfaction, product return or complaints are called "minor defects".

- Shoes zoning for defect classification

Most shoes can be divided into two zones, "Zone 1" and "Zone 2". Zone 1 is generally the most important area in terms of visual appeal because it's the area most apparent to the customer or wearer. Zone 2 is less important because it includes areas of the shoe that are less obvious to the customer or wearer.

Any defect found in Zone 1 that isn't critical is more noticeable and more likely to be considered a major defect. The same defect found in Zone 2 is more likely to be classified as a minor defect.

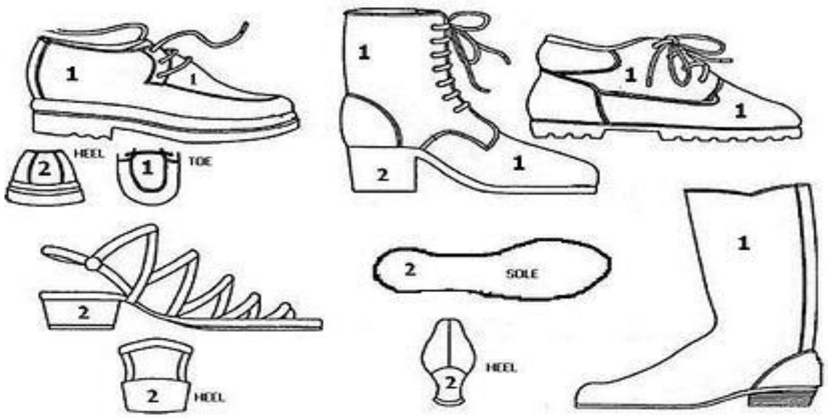


Figure 57 shoe zone classification

1. EXCESS GLUE, WAX OR OIL

Excess glue, wax or oil marks are among the most common quality defects found in shoes. These types of residue are especially common because:

- Most shoe production facilities use adhesives and other chemicals during production and
- Factory workers are less likely to protect against or remedy issues like excess glue, wax or oil when rushing to complete an order, which is often the case for most factories.

Figure 58 excess glue

Glue, wax or oil residue can often be cleaned off without difficulty. But if this defect is evident in the finished product, it can be very unsightly to customers and possibly render a shoe unsellable. Excess glue/wax/oil marks are often found in both zone 1 and 2 areas.

- **Preventing excess glue, wax and oil**

Shoes are often left with material residue because of the chemicals or adhesives they're exposed to during manufacturing. But there are some simple ways of preventing this quality defect from remaining on the finished goods, namely:

- Make sure factory workers aren't using too much glue or other chemicals during production and
- Any excess material left on the shoes after production should be wiped away prior to packaging

There's no reason why you can't greatly reduce or eliminate the occurrence of this quality defect because it's relatively easy to remedy after the fact**.**

2. DEGUMMING OR WEAK CEMENTING

Usually evident on shoes with rubber soles, such as sneakers, degumming or weak cementing happens when there is insufficient adhesive used when applying the sole to the upper part of the shoe. This defect is usually found between the join lines of zones 1 and 2. Generally, however, the problem is considered a Zone 1 defect and a major defect.

- **Preventing degumming or weak cementing**

It's important to make sure that the factory manufacturing the footwear is using the correct type of adhesive**.** But the more common cause for weak cementing or degumming is not enough adhesive applied between shoe components. Make sure workers are using enough adhesive but not too much**.** You'll often find excess adhesive apparent around the seal if too much adhesive was used during binding.

3. ABRASION MARKS

Abrasion marks are a type of quality defect in shoes that normally appear in Zone 1 areas. These are often considered more serious when found on leather shoes or those with a glossy surface because they’re more obvious.

Abrasion marks are usually caused by poor handling by factory workers during the production process.

- **Addressing abrasion marks found on shoes**

If you’re an importer finding abrasion marks on a significant number of pieces in an order, there are a few factors that you should investigate, such as:

- Are factory workers handling the product roughly? Are they wearing gloves while working?
- Are the shoes subject to a lot of unnecessary moving between work stations?
- Does the packaging provide enough protection to prevent abrasions during transit?

Abrasions are not always easy to spot. That’s why having a golden sample with you or a third-party inspection company while checking shoes is extremely useful because it can provide a helpful contrast between what is acceptable and what is not.

4. ASYMMETRY IN SHOES

In line with other soft lines products, asymmetry can be an issue where different components of shoes do not line up as they should. Some examples of asymmetry commonly found on a shoe or pair of shoes are:

Figure 59 asymmetry in shoe

- Where the sole of the shoe does not line up with the body from a front, rear or side view;
- Where certain parts of the shoe aren't straight, such as the tongue; and
- Where part of one shoe is higher or lower than the same part of its counterpart in a pair (often called "hi-low")

Asymmetry in shoes is often related to issues with the cutting or fitting of the components.

➢ **Finding asymmetry in shoes**

Issues with shoe symmetry should be addressed with the manufacturer. The best way to find asymmetry in shoes is to place them side by side or back to back**.** Essentially, you need to determine whether or not the shoes reflect each other in terms of height, width, color and so on. For example, if you place shoes back to back, you need to observe that the height of the heel is the same on each one, otherwise you have a defect.

5. INCORRECT SIZING

Most standard shoe sizing tools last for a while. It's possible, however, that due to an error during the production process, the shoe was labelled and packaged with the incorrect size. This should be considered a major defect because shoes that don't match specifications for size are likely going to be unsellable.

➢ **Preventing incorrect shoe sizing**

It's unusual to find shoe sizing inconsistent due to production processes. Incorrect sizing is usually a result of the way the finished shoes are sorted and packaged**.** Naturally, shoe sizing discrepancies are more common in factories that are disorganized. And often all that's needed to prevent incorrect sizing is better procedures for handling, packaging and storing the finished product. Taking a look at a factory's warehouse and packaging areas can tell you a lot about the likelihood of incorrect sizing.

6. PROTRUDING NAIL OR SHARP POINT

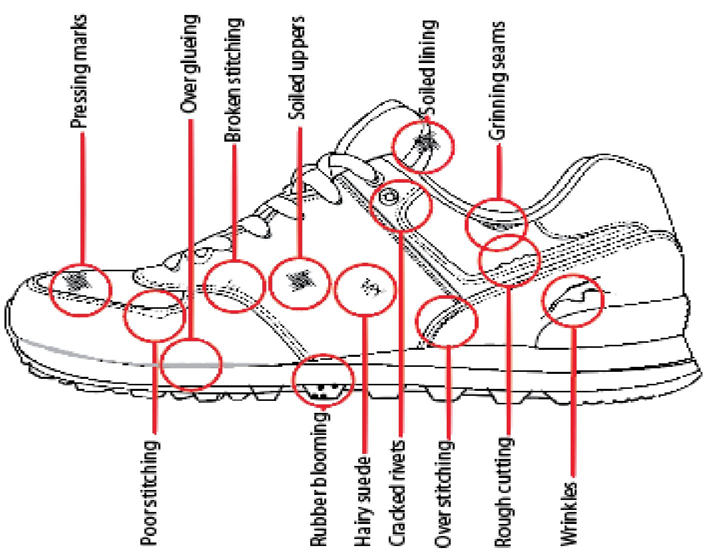
A protruding nail or sharp point is among the least common quality defects in shoes on our list. As with the previous defect, this is not a visual defect, so it does not apply to zones 1 or 2.

Some shoes, especially those made of leather, have nails to bind the sole of the shoes to its upper part during production. If these nails are not properly pressed down, they can protrude into the insole, creating a sharp point that could hurt the consumer. In other cases, a needle might be mistakenly left in a shoe.

- **Preventing nails or sharp points in shoes**

As with footwear factories, footwear factories should and generally are equipped with metal detectors. After production is complete, workers set the units on a belt that runs through the machine to look for needles or other sharps that might have been left by mistake.

Factories should also have QC staff examining shoes off the line for signs of sharp points that could be harmful to the end-consumer. If sharp points are found in your order or shoes, the factory needs to investigate which process is responsible and eliminate the cause.



Self-Check 03	**Written Test**

PART-1

Answer the following (Total Marks: 5*2=10)

1. How to classify quality defects in shoes?
2. Describe shoe zoning of shoe classification.

Answer Sheet

Score = ___________

Rating: ____________

Name: _________________________ Date: _______________

Part I:

Short answer

1____

____

____

2____

____

____

Information Sheet- 5	**RECORD AND DOCUMENTATION**

5.1. Introduction to Documents & Records Role in quality management system

The management of documents and records is one of the 12 essential elements of the quality system. The management system addresses both use and maintenance of documents and records. A major goal of keeping documents and records is to find information whenever it is needed.

5.1.1. Documents and records;

What are the differences?

- Documents provide written information about policies, processes, and procedures. Characteristics of documents are that they:

• communicate information to all persons who need it, including staff, users, and management personnel;

• need to be updated or maintained;

• must be changed when a policy, process, or procedure changes;

• establish formats for recording and reporting information by the use of standardized forms. Once the forms are used to record information, they become records. Some examples of documents include a quality manual, standard operating procedures (SOP), and job aids.

- Records are the collected information produced by the laboratory in the process of performing and reporting a test.

Characteristics if records

Characteristics of records are that they:

• need to be easily retrieved or accessed;

• contain information that is permanent, and does not require updating.

Some examples of records include: completed forms, charts, sample logs, quality control information, and reports. Information is the major product for documents and records.

Documents include all the written policies, processes, and procedures of the sample. In order to develop documents, it is important to understand each of these elements and how they relate.

What is a policy?

A policy is “a documented statement of overall intentions and direction defined by those in the organization and endorsed by management.” Policies give broad and general direction to the quality system. They:

• tell “what to do”, in a broad and general way;

• include a statement of the organizational mission, goals, and purpose;

• serve as the framework for the quality system, and should always be specified in the quality manual.

What is a process?

Processes are the steps involved in carrying out quality policies. It defines as a “set of interrelated or interacting activities that transform inputs into outputs. Another way of thinking about a process is as “how it happens”. Processes can generally be represented in a flow chart, with a series of steps to indicate how events should occur over a period of time.

What are procedures?

Procedures are the specific activities of a process. It is easily described as the performance of a test. A procedure tells “how to do it”, and shows the step-by-step instructions that laboratory staff should meticulously follow for each activity.

The term Standard Operating Procedure (SOP) is often used to indicate these detailed instructions on how to do it. Job aids, or work instructions, are shortened versions of SOPs that can be posted at the bench for easy reference on performing a procedure. They are meant to supplement, not replace, the SOPs.

Why documents important?

Documents are the essential guidelines for all of the laboratory operations. Some of the important documents should have include:

• Quality Manual—this is the overall guiding document for the quality system and provides the framework for its design and implementation.

• Standard Operating Procedures (SOP)—SOP contain step-by-step written instructions for each procedure performed in the production. These instructions are essential to ensure that all procedures are performed consistently by everyone in the sample production.

• Reference materials—Good reference materials are needed in order to find scientific and clinical information about defect, working methods, and procedures. Sometimes, there are difficult interpretive issues, for which references or textbooks will be needed.

Documents are the communicators of the quality system. All policies, processes, and procedures must be written, so that everyone will know the proper procedures and can carry them out. Verbal instructions alone may not be heard, may be misunderstood, are quickly forgotten, and are difficult to follow.

5.1.2. What makes a good document?

Documents communicate what is done in production. Good documents are:

• written clearly and concisely; it is better to avoid wordy, unnecessary explanations in the documents;

• written in a user-friendly style; it might be helpful to use a standard outline so the general structure will be familiar to staff and easily used by new personnel;

• written so as to be explicit and accurate reflecting all implemented measures, responsibilities, and programs;

• maintained to ensure that it is always up-to-date.

Accessibility: - The documents needed in the work process must be accessible to all staff. Persons managing samples should have the procedures for sample management directly available to them. Testing personnel will need the SOPs in a convenient place, and perhaps a job aid posted in clear view of the work space where testing is performed. The testing personnel need immediate access to quality control charts and trouble-shooting instructions for equipment. All staff must have access to safety manuals.

Document Control: - Purpose of document control Documents, by definition, require updating. A system must be established for managing them so that current versions are always available. A document control system provides procedures for formatting and maintaining documents and should:

• assure that the most current version of any document is the one that is in use;

• ensure the availability and ease of use when a document is needed;

• provide for the appropriate archiving of documents when they need to be replaced.

Elements of document control: A document control system provides a method for formatting documents so that they are easily managed, and sets up processes for maintaining the inventory of documents.

• a uniform format that includes a numbering system, to include a method for identifying the version (date) of the document;

• a process for formal approval of each new document, a distribution plan or list, and a procedure for updating and revising documents;

• a master log or inventory of all documents of the laboratory;

• a process to ensure that the documents are available to all who need them, including users outside the working place;

• a method for archiving documents that become outdated but need to be kept for future reference.

Controlled documents: All documents that are produced by and/or used in the laboratory must be included in the control system. Some important examples include:

• Standard Operating Procedures (SOP)—It is essential to have all SOPs up-to-date, showing the procedures that are in current use. Also, when work instructions or job aids are used, they must exactly match the SOPs for the tasks described.

• texts, articles, and books that are part of the documents referenced;

• documents of external origin, such as instrument service manuals, regulations and standards, and new references (that may change over time).

Establishing a document numbering system can be a difficult and time-consuming process.

• **Approval, distribution, and revision process**—Control of documents requires that they be reviewed on a regular basis, with revision as needed, followed by approval and distribution to those who need them. Policies for the approval, distribution, and revision of documents should be clearly established as a part of the Documents and Records policy.

• Master log—this will allow the person responsible for document control to know exactly what is in circulation, and where copies can be found. The log should be kept up-to-date at all times.

• Accessibility—the document control plan must provide a process for assuring that relevant versions of documents are available at the point of use. This may include provision for having current sample collection information available outside the laboratory if collection is performed in other places such as hospital wards or physician offices.

• System for archiving—Remember that archiving old versions of documents will be very important. It is frequently necessary to refer to older versions of documents when researching a problem, or when reviewing quality practices. As a part of the distribution process, it will be necessary to collect all old versions of the documents for archiving/destruction.

Overview of Records Importance of records should be complete, legible and carefully maintained, as they are used for many purposes, such as:

• Continuous monitoring—without access to all the data collected as a part of a quality system process, continuous monitoring cannot be accomplished;

• tracking of samples—well-kept records allow for tracking of samples throughout the entire testing process; this is essential for troubleshooting, looking for sources of error in testing, and investigating identified errors;

• evaluating problems—well-kept equipment records will allow for thorough evaluation of any problems that arise;

• Management—good records serve as a very important management tool.

Never change a record. If new information needs to be added to a record, it should be noted as an addition, with a date, and signature or initials.

5.1.3. Storing Documents and Records

Where to keep documents and records Storage must be given careful consideration, as the main goal of documentation is finding the information when it is needed. Using a paper system. It is important to consider the following when using a paper system for records.

• Permanence—paper records must last for as long as needed. This should be ensured by binding pages together, or using a bound book (log register). Pages should be numbered for easy access, and permanent ink used.

• Accessibility—paper systems should be designed so that information can be easily retrieved whenever needed.

• Security—documents and records must be kept in a secure place. Security considerations include maintaining patient confidentiality. Care should be taken to keep documents safe from any environmental hazards such as spills. Consider how records can be protected in the event of fires, floods, or other possibilities.

• Traceability—it should be possible to trace a sample throughout all processes in the laboratory, and later to be able to see who collected the sample, who ran the test, and what the quality control results were for the test run including issuing of the report. This is important in the event there are questions or problems about any reported laboratory result. All records should be signed, dated, and reviewed to ensure that this traceability throughout the laboratory has been maintained.

Using an electronic system: Electronic systems have essentially the same requirements as paper systems. However, the methods for meeting these requirements will be different when using computers. The following are factors to consider.

• Permanence—backup systems in case the main system fails are essential. Additionally, regular maintenance of the computer system will help to reduce system failures and loss of data.

• Security—it is sometimes more difficult to assure confidentiality with a computer system, as many people may have access to the data.

• Traceability—electronic record systems should be designed in a way that allows for tracing the specimen throughout the entire process in the laboratory. Six months after performing an examination, it should be possible to look at the records and determine who collected the specimen and who ran the test.

5.1.4. Safety equipment record sheet

Safety equipment record sheet is the basic requirements of the environment health and safety system, for the recording of the each safety equipment is priority for the maintain, inspecting, used and sustain in daily routine works for human health and safety, records are maintain as below:

1. Type of safety equipment as below:

- Safety Shoes
- Safety Helmet
- Safety Goggles
- Safety Hand Gloves (Cotton Jeans)
- Safety Hand Gloves (Leather)
- Safety Hand Gloves (Latex)
- Safety Hand Gloves (11 KV)
- Safety Belt
- Ear Plug
- Nose Mask
- Face Shield / Welding helmet
- Gum Boots
- Special Welding Gloves & Glass Set

1. Application – As above all the safety equipment are used by the human body and area / location / works etc... Need to mention to identify, monitoring and tracking of the safety equipment and its requirements.
2. Quantity – as per working area / type of the hazardous activities / location requirements / material process requirements depend the how much peoples are

directly touching with the materials or process, quantity of safety equipments are distributes in line with.

3. Location – Location need to mention very clear.
4. At machine / equipment – name of the machine or equipment where the safety equipment are used.

SAFETY EQUIPMENT RECORD SHEET

Format No.:

Sr. No.	Type of Safety Equipment	Application	Quantity	Location	At Machine / Equipment
01	Safety Shoes				
02	Safety Helmet				
03	Safety Goggles				
04	Safety Hand Gloves (Cotton Jeans)				
05	Safety Hand Gloves (Leather)				
06	Safety Hand Gloves (Latex)				
07	Safety Hand Gloves (11 KV)				
08	Safety Belt				
09	Ear Plug				
10	Nose Mask				
11	Face Shield / Welding helmet				
12	Gum Boots				
13	Special Welding Gloves & Glass Set				
14					
15					

Record Holder Name:

Record Holder Signature   Date of last Update:

Figure 60 safety equipment record sheet

Self-Check 03	Written Test

PART-1

FILL IN THE BLANKS (Total marks: 2)

1. ________________ provide written information about policies, processes, and procedures

PART-2

Answer the following (Total Marks: 2*2=4)

2. List 5 types of safety equipments.
3. What is continuous monitoring?

Answer Sheet

Score = ___________
Rating: ____________

Name: _________________________ Date: _______________

Part I:

Fill in the blanks:

1. _______________

Part II:

Short answer

1____
____
____

2____
____
____

.

Instruction Sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Existing resources, machines, production techniques and scheduling arrangements
- Pilot production for selected size as per the specification
- Potential requirements for change

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Examine existing resources, machines, production techniques and scheduling arrangements
- Carry out pilot production for selected size as per the specification
- Identify and document any potential requirements for change

Learning Activities

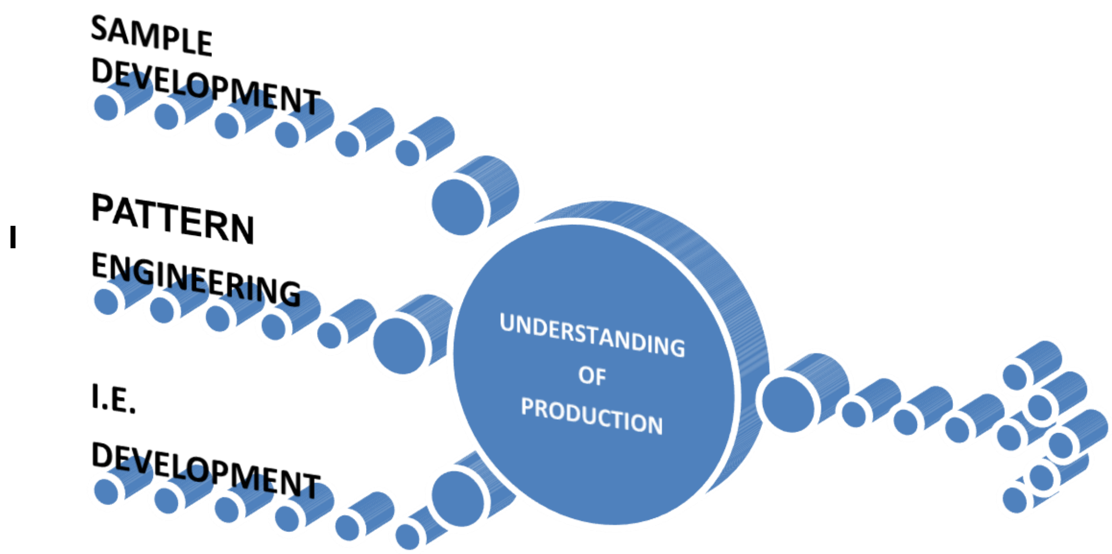
21. Read the specific objectives of this Learning Guide.
22. Read the information written in the "Information Sheets 1".
23. Accomplish the "Self-check 1". Request the key answer / key to correction from your teacher or you can request your teacher to check it for you.
24. If you earned a satisfactory evaluation proceed to "Information Sheet 2". However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #2.
25. Read the information written in the "Information Sheet 2".
26. Accomplish the "Self-check 2". Again you can request the key answer / key to correction from your teacher or you can request your teacher to check it for you.

27. If your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity # 2.

Information Sheet- 1	**Existing resources, machines, production techniques and scheduling arrangements**

1.1. UNDERSTANDING OF PRODUCTION

Understanding of production is based on the Sample development, Pattern Engineering and Industrial Engineering. These all together give the information about the:- sampling technique, materials, accuracy of patterns, pattern engineering, sequence of operations, machine requirements, No of skilled, semi-skilled & un-skilled workers and the final productivity. To collect the information about the production, we have to go through the following flow-chart.



1.1.1. Sample Development

Sample development provides all the information about product, by which we can conclude the details for production. Following information we get by sample Tech packs:-

- Size & Fit
- Pattern Information
- Materials Used

- Manufacturing Processes

For sample development following specifications are required, on basis of that the development section starts its workings.

Sample Details

Model Information	
Model No.	Court 384212
Last	cdlst 2
Mould No.	D554-XX3
Size run	2 to 8 +½ UK
Date	

Figure 61 sample details

1.1.2. Understanding about production

By Model size details the development department is able to know the appearance, model size, materials etc. After that they prepare their strategies.

Material & Patterns Information

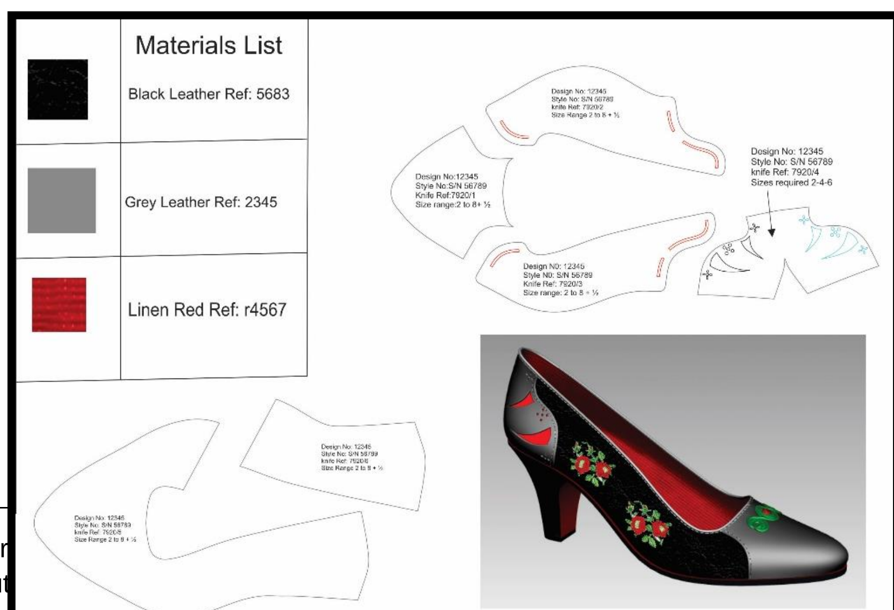


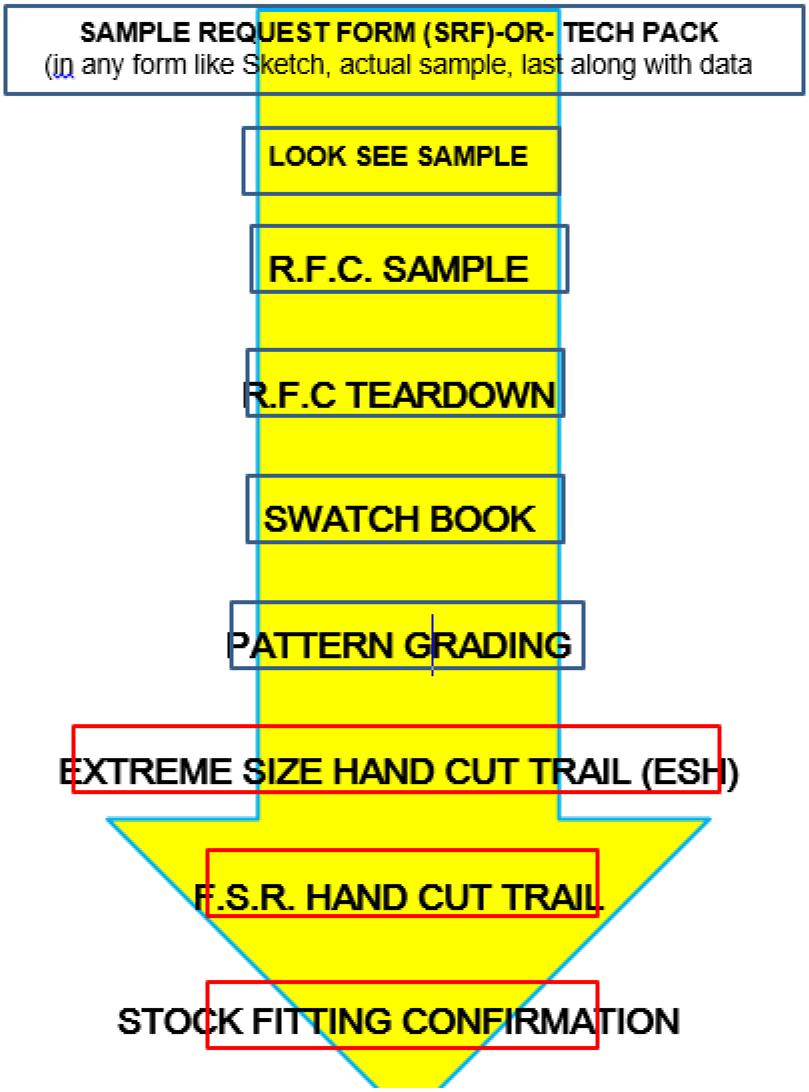
Figure 62 material & pattern information

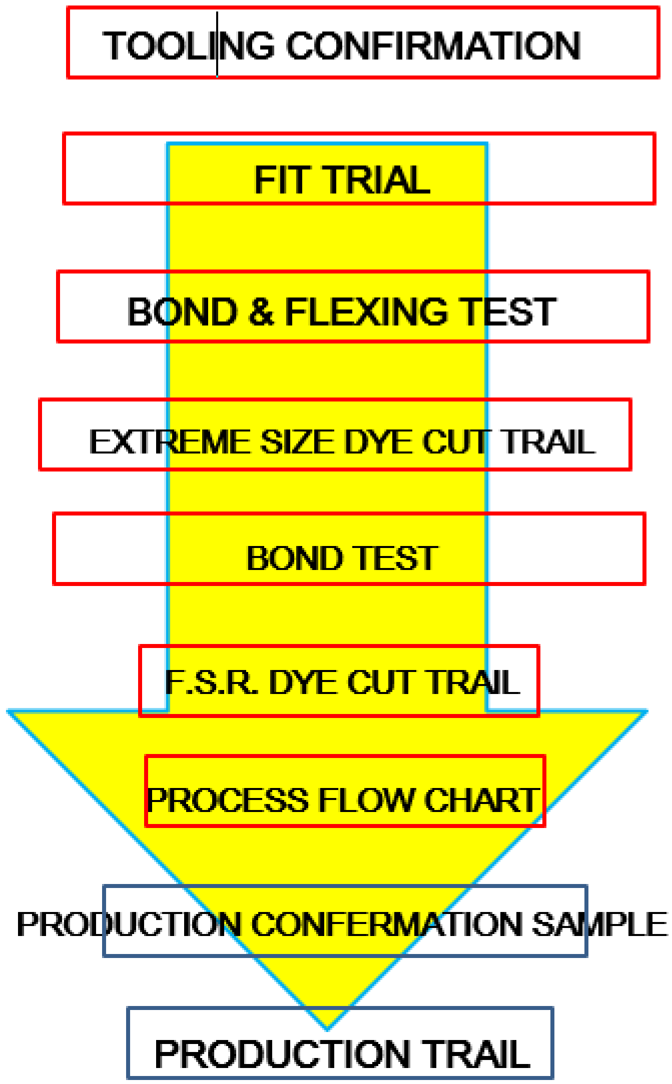
1.1.3. Understanding about production

By this specification the designer is able to know the material and basic pattern information. Also with help of this he develops his first samples as well prepares the tentative industrial engineering, which has been confirmed at the time of Pattern engineering and Production Trial.

1.1.4. Pattern Engineering

In this procedures the model size patterns are verified and after confirmation the designers proceed for Pattern Grading, Full size-run Trials, Dies &Moulds development as well the I.E. Confirmation. The following flow chart will guide you to understand the sequence and procedures of the Pattern Engineering.


SAMPLE REQUEST FORM (SRF)-OR- TECH PACK
(in any form like Sketch, actual sample, last along with data
LOOK SEE SAMPLE
R.F.C. SAMPLE
R.F.C TEARDOWN
SWATCH BOOK
PATTERN GRADING
EXTREME SIZE HAND CUT TRAIL (ESH)
F.S.R. HAND CUT TRAIL
STOCK FITTING CONFIRMATION



1.2. Understanding about production

Basically Patterns Engineering is sequence of trials, during that the team go through lots of requirements, operations and quality check, which provides the platform to analysis pre-production understandings.

1.2.1. Industrial Engineering

Industrial engineering is basically a phenomenon by which we find the information about the followings:-

1. Sequence of operations
2. Machine Details
3. Workers' information (skilled, semi-skilled or un-skilled)
4. Total no. of workers
5. Per day productivity etc.

- Following is an example of I.E. Format of Jogger Sport shoe, go through it and analyze the points.

Table 5.1. IE format

TENTATIVE I. E. Art.- RBC-013 (JOGGER)

WORKER	process no	operating flow	MACHINE DETAILS	FEED TYPE
		Operations		
Helper	**1**	marking on toe mesh	**MANUALLY**	
Helper	**2**	marking on qtr. Mesh	**MANUALLY**	
Helper	**3**	marking on foxing mesh	**MANUALLY**	
Helper	**4**	marking on yellow toe u/l	**MANUALLY**	

Helper	**5**	marking on silver toe u/l	**MANUALLY**	
Helper	**6**	marking on yellow qtr. u/l	**MANUALLY**	
Helper	**7**	marking on silver qtr. u/l	**MANUALLY**	
Helper	**8**	marking on foxing ctr. u/l	**MANUALLY**	
Stitcher	**9**	stitch bond zig-zag	**FLAT BED ZIG-ZAG M/C**	**DOG FEED**
Stitcher	**10**	toe & qtr. Mesh zig-zag	**FLAT BED ZIG-ZAG M/C**	**DOG FEED**
Stitcher	**11**	both qtr. Zig-zag	**FLAT BED ZIG-ZAG M/C**	**DOG FEED**
Stitcher	**12**	foxing mesh zig-zag	**FLAT BED ZIG-ZAG M/C**	**DOG FEED**
Helper	**13**	super tuff attaching	**MANULLY**	
Helper	**14**	cementing on silver toe u/l	**CEMENTING M/C**	
Helper	**15**	cementing on yellow toe u/l	**CEMENTING M/C**	
Helper	**16**	hammering on silver toe u/l	**MANULLY**	
Helper	**17**	hammering on yellow toe u/l	**MANULLY**	
Stitcher	**18**	stitching on silver toe u/l	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
Stitcher	**19**	stitching on yellow toe u/l	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
Stitcher	**20**	stitch bond zig-zag	**FLAT BED ZIG-ZAG M/C**	**DOG FEED TYPE**
Helper	**21**	stitchbond adhesion	**MANULLY**	**8250**
Helper	**22**	stitchbond hammering	**MANULLY**	
Helper	**23**	gimping piece cementing	**CEMENTING M/C**	
Helper	**24**	gimping piece attaching & hammering	**MANULLY**	

Stitcher	25	gimping piece stitching	SINGLE NEEDLE POST BED M/C	ROLLAR FEED TYPE
Helper	26	punching and eyeleting at qtr.	PUNCHING M/C	
Helper	27	whole qtr. Cementing	CEMENTING M/C	
Helper	28	whole qtr. Hammering	MANULLY	
Stitcher	29	whole qtr. Stitching	SINGLE NEEDLE POST BED M/C	ROLLAR FEED TYPE
Helper	30	u/l eyestay facing cementing	CEMENTING M/C	
Helper	31	u/l eyestay facing hammering	MANULLY	
Stitcher	32	u/l eyestay facing stitching	SINGLE NEEDLE POST BED M/C	ROLLAR FEED TYPE
Helper	33	ctr. Yellow u/l cementing	CEMENTING M/C	
Helper	34	ctr. Yellow u/l hammering	MANULLY	
Stitcher	35	ctr. Yellow u/l stitching	SINGLE NEEDLE POST BED M/C	ROLLAR FEED TYPE
Helper	36	silver foxing cementing	CEMENTING M/C	
Helper	37	silver foxing hammering	MANULLY	
Stitcher	38	silver foxing stitching	SINGLE NEEDLE POST BED M/C	ROLLAR FEED TYPE
Helper	39	ctr. Cementing	CEMENTING M/C	
Helper	40	ctr. Hammering	MANULLY	
Stitcher	41	ctr. Stitching	DOUBLE NEEDLE POST BED M/C	ROLLAR FEED TYPE
Helper	42	toe cap cementing		SPRING STITCHING
Stitcher	43	toe cap attaching & stitching	DOUBLE NEEDLE POST BED M/C	ROLLAR FEED TYPE
Helper	44	loop cementing and attaching	MANULLY	8250
Helper	45	eyestay cementing	CEMENTING M/C	8250

Helper	**46**	eyestay hammering	**MANULLY**	
Stitcher	**47**	eyestay stitching	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
Helper	**48**	collar eva cementing	**CEMENTING M/C**	
Helper	**49**	collar eva attaching	**MANULLY**	
Stitcher	**50**	collar lining stitching	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
Helper	**51**	collar foam cementing	**CEMENTING M/C SPRAY**	
Helper	**52**	collar foam attaching	**MANULLY**	
Helper	**53**	collar lining folding manually	**MANULLY**	
Helper	**54**	collar lining folding by hook	**MANULLY**	
Stitcher	**55**	eyestay final stitch	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
Stitcher	**56**	foam decoration stitch	**SINGLE NEEDLE POST BED M/C**	**DOG FEED TYPE**
Stitcher	**57**	tongue upper & lining seam	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
Helper	**58**	foam inserting in tongue	**MANULLY**	
Helper	**59**	tongue reversing	**MANULLY**	
Stitcher	**60**	tongue locking stitch	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
Helper	**61**	tongue trimming	**MANULLY**	
Helper	**62**	loop attaching	**MANULLY**	
Stitcher	**63**	tongue stithing	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
Stitcher	**64**	Rounding	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**

Stitcher	**65**	counterstiffner putting and stitching.	**SINGLE NEEDLE POST BED M/C**	**ROLLAR FEED TYPE**
	66	eyelet punching	**PUNCHING M/C**	

1.5. Man power

A per the above sequence the following man power is required:-

INDEX

	SKILLED WORKER	**7**
	SEMI SKILLED WORKER	**13**
	UNISKILLED WORKER 'A'	**13**
	UN-SKILLED WORKER 'B'	**14**
	TOTAL	**47**

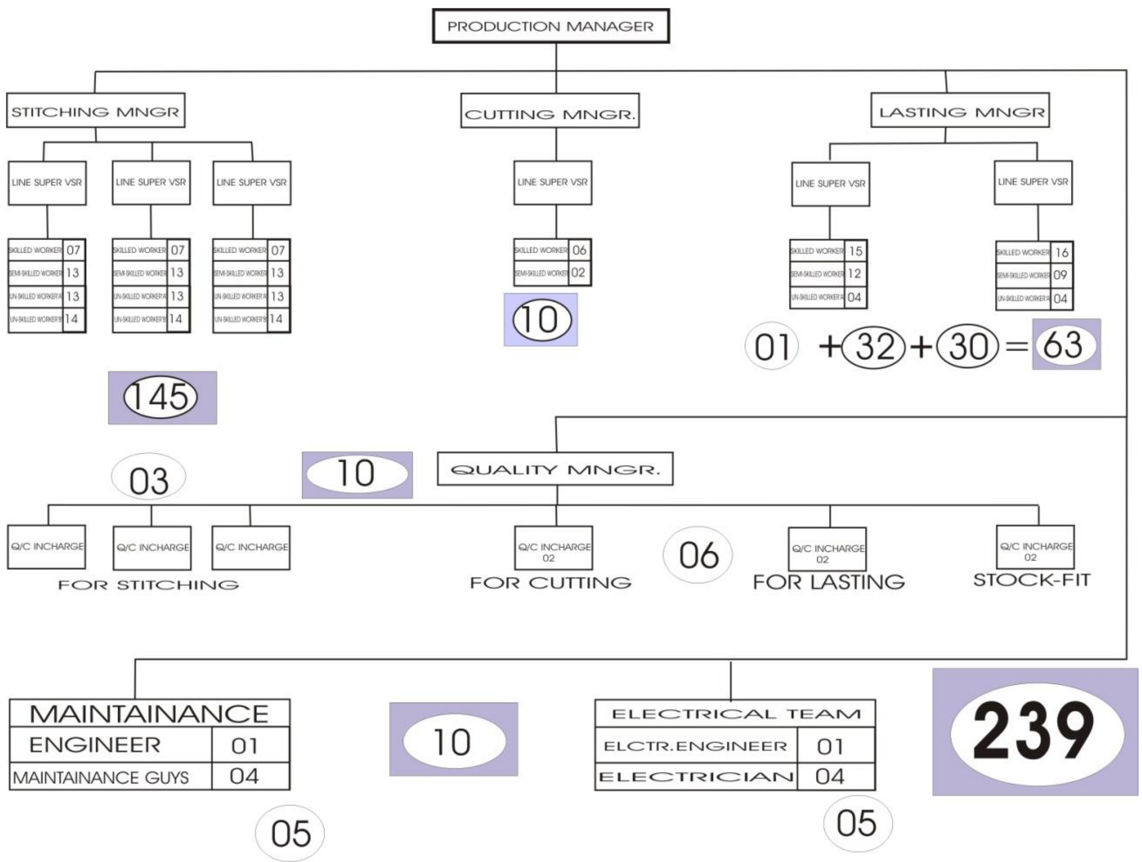
1.6. Machines

A per the above sequence the following are the requirements of the machine required for stitching department:-

INDEX

SINGLE NEEDLE POST BED	**ROLLAR TYPE**	**8**
SINGLE NEEDLE POST BED M/C	**DOG FEED**	**1**
FLAT BED ZIG-ZAG M/C	**DOG FEED**	**1**
EYELET PUNCHING M/C	**PULLY**	**1**
	TOTAL	**11**

As per the above I.E. the following manpower would be required for 1000 pairs of Joggers production per day.



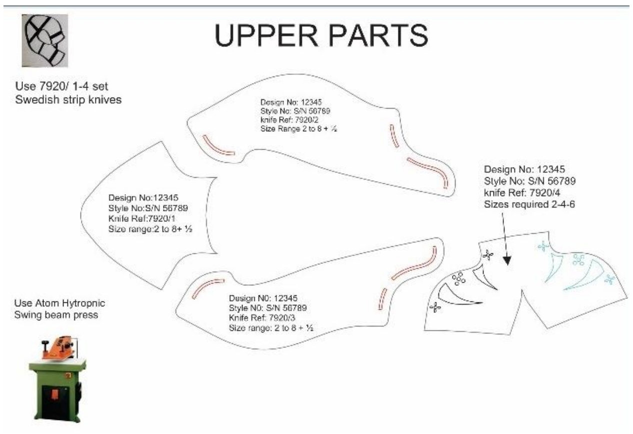
The production requirement is directly proportional to the Design. If due to some reason the design changes the requirements of production is automatically changed**.**

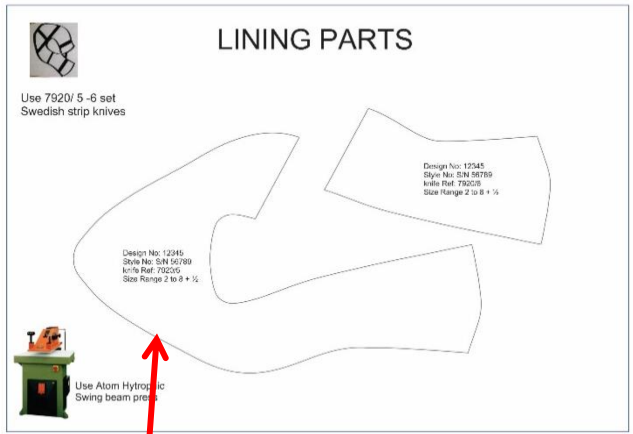
Production Changes Directly proportional to Design Changes

Following the production flow chart is given, by analyzing you can understand that when alter the design the production technique will also change.

Production Flow Chart

Cutting Section

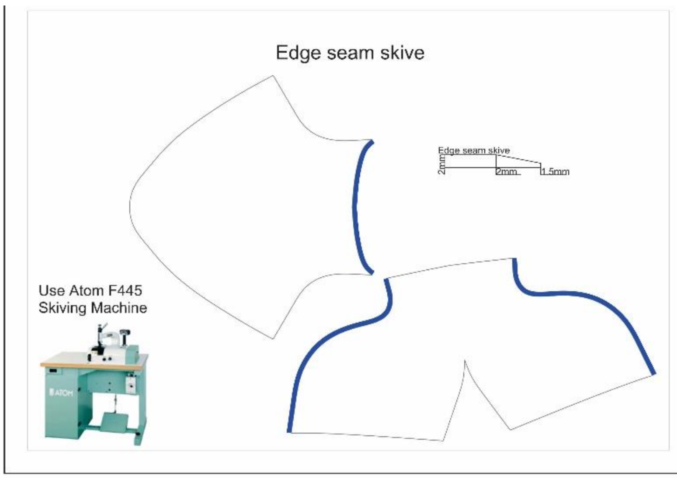


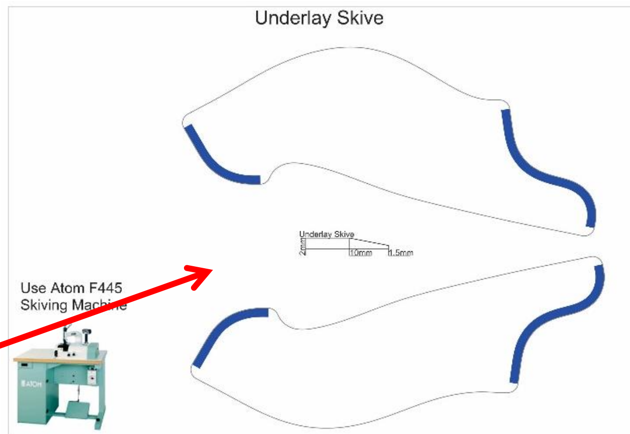


If the upper design is changed the material & cutting technique is also changed.

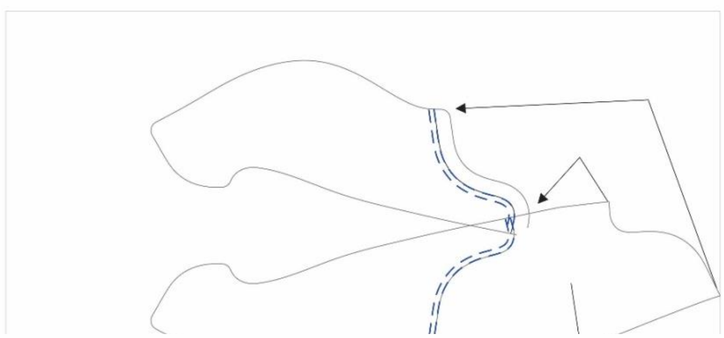
Preparation Section

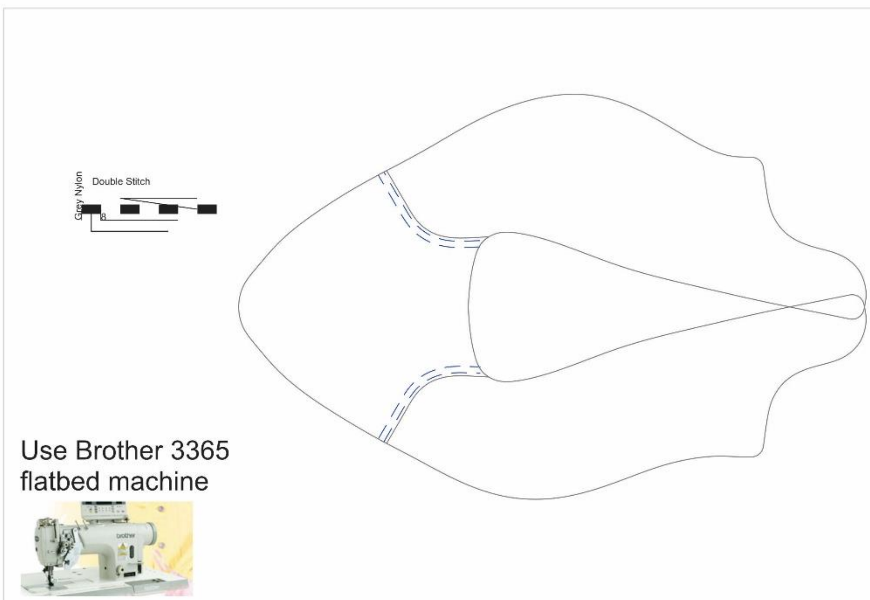
Skiving will change, after changing the design.

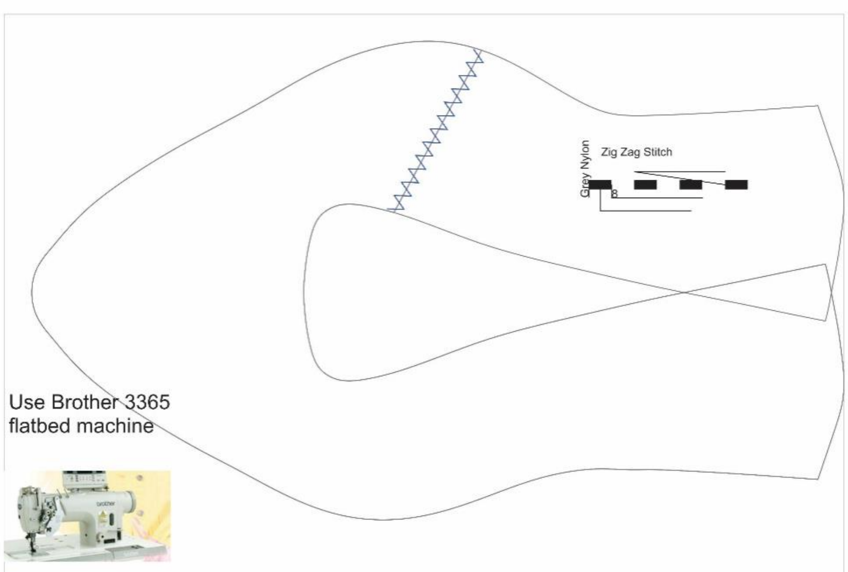




Stitching Section




Grey Nylon
Double Stitch
8
Use Brother 3365
flatbed machine


Grey Nylon
Zig Zag Stitch
8
Use Brother 3365
flatbed machine

1.6. PRODUCTION OPERATIONAL PLANNING AND SCHEDULING

Production planning indicates operations to be performed & there sequence, specifies the machine tool for each indicated operation shows the necessary tooling for each indicated operation, gives manufacturing data such as speeds & feeds, indicates time & stop watch studies, & incorporates sometimes the specifications of skill for each operation. The document which incorporates this vital information is otherwise called process sheet or route sheet to be followed in the production floor.

Information required for the production process sheet:

1. **Scheduling**-

   Scheduling cell can obtained set up time & processing time for each operation to prepare load chart & scheduling chart.

2. **Material movement:**

   Supervisor& dispatch clerk- where the jobs has to be sent for next operation.

3. **Cost reduction & cost control**-

   Process sheet gives the sequence in which tooling are required this can be arranged prior to the starting of the operation. This reduces the set up time & thereby reduces labor cost & overhead.

4. **Costing-**

   Pre-production& post production cost.

5. **Method of working-**

   Method study Manpower& machines requirement, Shop efficiency

1.7. INPUTS TO PROCESS PLANNING

1. Components & assembly drawing
2. Machine capacity charts-Limitations of the machine available.

Following details can be obtained:

a) Operations possible.
b) Maximum & minimum dimensions
c) Maximum tool travel

d) Maximum depth to cut (size of the tools that can be allocated)
e) Accuracy
f) Available speeds & feeds.

3. Standard elemental time data-

To compute standard time & set up time for different operations this is required for to prepare alternative process

4. Cutting speed & feed chart
5. Available tooling

1.7. FACTORS INFLUENCING PROCESS PLANNING

1. **ORDER QUANTITY & JOB LIFE-** The bigger the job quantity, more refined & more economical the process be. The requirement be for SPM or special purpose of tools, medium quantity will require batch type of production system on general purpose machines- Use of break-even analysis.
2. **DELIVERY DATES OF COMPONENTS & PRODUCTS:-** To select the manufacturing process & the machine tools that could provide the required quantity on time.
3. **PROCESS CAPABILITY OF THE MACHINES**-

Tolerances. The knowledge of process capability of the machines enables the process engineer to compare it with the design tolerances & thereby make the selection of the right machines

4. **SKILL OF THE AVAILABLE MAN POWER:**

   To determine the needs of the additional man power etc.

5. **MATERIAL FROM WHICH THE PART IS MADE**:

   To select the process parameter such as:

a. Finishing
b. Cutting
c. Stitching & handling instructions
d. Use of reinforcements etc.

6. **ORIGINATING PROCESS OF RAW MATERIAL**-
   Selection of machining process. Any special process required to be carried out
7. **FINISH OF THE PRODUCT**
8. **ACCURACY REQUIRED-**Selection of inspection stages.

1.8. STEPS IN PROCESS PLANNING

4. STUDY OF THE COMPONENTS DRAWING-
   Important features which may influence the selection of machining process.
2. ORIGINATING PROCESS OF MATERIALS
3. PROCESS DETAILS
4. DESIRED FINISHES
5. LIST OF SURFACES TO BE MACHINED- Types of operations
6. COMBINING SURFACES TO BE MACHINED IN TO BASICOPERATIONS- Basic operations.
7. FIXING OF SEQUENCE OF OPERATION: The process engineer should begin his process with the qualifying operations route it through critical operations & secondary operations, carry it through prequalifying operation sending it up with auxiliary operation.

a. **QUALIFYING OPERATIONS**- are those operations which are performed to establish locating or clamping surfaces prior to the machining of critical surfaces.

b. **Critical Operations:**
   Are those operations which are performed to achieve some unique characteristics on or from some surface of the work piece? Critical surface are those surface:

1. Which are identified through closer tolerances, or
2. Are used as base line dimensioning
3. Good surface finish
4. Locating surface for other operations.

C. Secondary operations: Are those operations which are performed to finish the part in the normal sequence of the processing part. Secondary operations are generally to provider wider tolerances. Such operations are performed before the critical operations.

D. Pre-qualifying Operations: are those operations generally followed by another set of secondary operations or critical operations

E. Auxiliary operations: are those operations which are performed either to verify the operations or supplements to the previous operations- Inspections, final corrections, cleaning etc.

1.8.1. INSPECTION

Inspection should be carried out on the component before they are transferred to another section, these are known as stage inspection.'

1. Prior to an operation after whose completion no rework on the parts can be performed- Critical Operation Inspection.
2. Inspection shall be conducted prior to the costlier operation- Key operation inspection.
3. Inspection shall be conducted prior to an operation which tends to conceal the defects of the previous operation- Functional inspection.
4. Inspection shall be conducted prior to the transfer of the components to the finished goods inventory.- Final inspection

1.9. METHOD OF DESIGNING OPERATIONS

Designating an operation refers to the numbering of operations so that each operation will have an official number to be used for all records & controls throughout the plant. Different methods are available for numbering are:

1. To use numeral 1 for first operation, 2 for second & so on.
2. To use numeral 10 for first operation, 20 for second operation & so on.
3. To reserve permanent number for standard operations so that standard operations are having standard numbers-

Standardization Discontinuation of number-

A number rendered unused (when operation is discontinued). & should not be used in one route sheet. This is important for two reasons:

1. If discontinued operation is reinstalled later the same number is available.
2. It avoids the confusion on shop floor.

1.9.1. FIXING IN PROCESS DIMENSIONS & TOLERENCES

Fixation of dimensions & tolerances for alternative operation. This has to be fixed in such a way that final accuracy is achieved.

1. Calculate stock available for removal.
2. Establish material removed during each operation.
3. Preparation of hand sketches & incorporating in process dimensions.

1.9.2. ROUTE SHEET

This is final stage of process planning. Following information is usually given:

1. Identification data such as part name, number, and product to indicate what the part is & what assembly or product is in.
2. Material specification
3. Operation & sequence
4. Machine tools for each operations including numbers & locations
5. Cutting tools, jigs & fixtures etc.
6. Speed, feed, depth of cuts etc.
7. Skill of labor
8. Set up time & standard time for each operations
9. Skill of labor
10. Part sketch along with tolerances.

Self-Check	**Written Test**

Name: ___________________________ **Date:** ________________

(Total marks:-10)

Instructions: Write all your answers in the provided answer sheet on page**.**

Directions: Fill in the blanks:- (2X5=10marks)

1. Sample development, Pattern Engineering & I.E. are required for--------
2. Production change is directly proportional to----------
3. Pattern Trial, Swatch book, Grading, Test are different steps of ----------.
4. Changing the design, the -----------------is also changed.
5. -----------is very important, to get the idea about the production.

2.1. What is pilot production?

Pilot production is a manufacturing or engineering production line set up during development, to test new methods, processes, and systems.

2.1.1. Pilot Production: Process

Pilot manufacturing is the process for products that will be tested in trials or pilot markets before transitioning to full-scale production.

This pilot manufacturing process includes: product design, process FMEA, material part design, material selection, design transfer to manufacturing, prototyping, validation and verification (assembly, testing, tooling and fixtures, equipment validations so that industrial fans and other equipment can fully operate, experiments, packaging, sterilization, accelerated age studies and transit testing).

Pilot Production: Finding the Right Fit

Pilot manufacturing is a crucial step in full-scale product and device/machine manufacturing. If the customer's product is successful in a pilot market or trial, it will likely transition to full- scale production. But if the machines has flaws that are revealed during the Pilot Manufacturing phase, the footwear machines may need to be reworked. Reworking footwear device/ machines takes more time and more money. This is why customers need to find a device manufacturing company that takes seriously the integrity of this process.

The goal of the Pilot Production phase is to successfully transfer the product design into manufacturing specifications for full scale production, and to validate and document the manufacturing processes for the developed product. A small scale batch of a footwear product produced in preparation for a full-scale batch. Pilot scale batches help researchers develop techniques that will be required to create much larger batches needed for trials and, later, manufacturing of approved products.

In the Pilot Production phase, the product is at a point where the product is well defined. The client knows what it works like and looks like. The product is also robust and includes a full feature set. Pilot Production can also be referred to as Design Verification (DV) prototypes or Pre-Production prototypes.

- **Pilot Prototypes**: Pilot prototypes are built in the factory that will make the final product using the full suite of production tooling. The design is stable and has the complete feature set. Pilot prototypes are often used to fine-tune the supply chain and the production process. They also provide confidence that the product is ready to be mass produced.
- **Validation Testing:** Pilot Prototypes will undergo a full suite of Validation Testing to harden the design for consumer release. Validation Testing also works out the kinks in the test tools and processes.

2.1.2. Purpose of Pilot run

Purpose of pilot run is to check production techniques and quality requirement. Pilot run pieces are thoroughly checked by factory quality department at every stage of production. Based on the pilot run result bulk production is planned. Through pilot run process, production team learns about the critical operations in the styles, identify potential bottleneck operations. Based on their learning in pilot production run they prepare themselves for bulk production.

Just after pilot run factory loads bulk production.

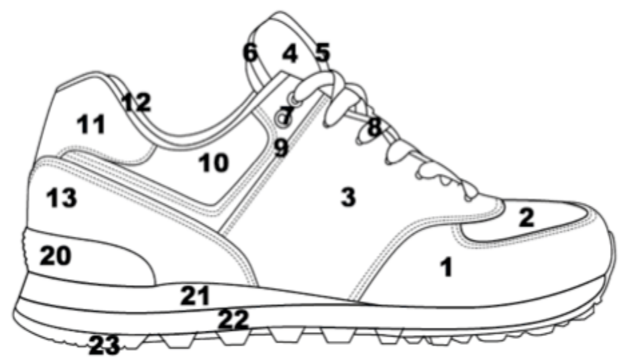
There are many other benefits than the above. Like, cross checking the estimated raw material requirement for leather, fabrics and threads. Re-planning of additional processes requirement maintain minimum WIP in the production line.

- Points to be considered while making pilot run
  - ✓ Pilot must be processed in the production line instead of sampling section

- ✓ All sizes and all colors are included in the pilot quantity (factory may cut jump sizes instead of all sizes)
- ✓ If pilot run is requested by buyer, quality of the pilot run pieces may be checked by buyer QA
- ✓ Pilot run pieces are included in bulk quantity in finishing and are sent with the shipment (if there is no variation than the buyer quality specification)

Spec Sheet-Basic.xlsx

Project Name:	Sneaker Factory Jogger
Factory:	Houjie #1
Prototype ID:	MSK069
Season:	Spring 2018
Division:	Running
Color Description:	WHITE / GREY / BLACK
Country of Origin:	China
Construction:	Cold Cement Cement
Gender/Size:	M'S9#
SizeRun:	5-14
Last Code:	SUX-6000
O/S Code:	LF_204
Status:	PHOTO



	Component Type	Component Specification	Color	Ref	Supplier	Notes
	UPPER					
1	Toe Top / Mudguard	1.2mm PU Duratec (WR) Emboss#BS1	White		Nan-Ya	
2	Vamp	MESH + 4MMKF329+24GT/C	White		Cosmo HK	
	Vamp Lining	Cambrelle	Black		Local	
3	Quanter/Eyerow	1.2mm PU Duratec (WR) Emboss#BS1	White		Nan-Ya	
	Quarter logo	TPR Logo Stiched on	Red		Local	
4	Tongue	MESH+4MMKF329+24GT/C	Cool Grey 2 c		Cosmo HK	
5	Tongue Logo	Embroidery "text" logo	White		Local	
6	Tongue Lining	Visa Terry + 4MMKF329+24GT/C	Black		Local	
	Tongue Foam	20mm KFF PU foam	NA		Local	
7	Lace Eyelet	8mm Steel	Red		Dae-Sung	
8	Shoe Lace	8mm Oval	Red		Pahio	
9	Collar Underlay	1.2mm PU Duratec (WR) Emboss#BS1	White		Cosmo HK	
10	Collar Panel	MESH+4MMKF329+24GT/C	White		Cosmo HK	
11	Heel Logo	Embroidery "text" logo	White		Local	
12	Heel Lining	Visa Terry + 4MMKF329+24GT/C	NA		Cosmo HK	
13	Heel Counter	1.2mm PU Duratec (WR) Emboss#BS1	NA		Nan-Ya	
	Internal Heel Counter	Texon .4mm	NA		Texon	
	Internal Toe Puff	Texon .2mm	NA		Texon	
	Eyerow Reinforcement	Super Tuff	NA		Local	
	Upper Thread	bonded nylon 6 250D 3 Ply	Matching		Coats or A&E	
	OUTSOLE UNIT					
20	Heel Counter	Injection Plastic Red	Red		Xie-Xie Injection	
21	Midsole Wedge Top	Hot Press EVA Asker "C" 45-50	Grey 2c		Local	
22	Midsole Wedge Bottom	Hot Press EVA Asker "C" 55-60	White		Local	
23	Outsole	#1-44 NBS400 Shore "A" 65 +or-3 SG 1.1 +1.4	Black		CW Pressing	
	Insole Strobal	Texon T28	White		Texon	
	Footbed	Cold Pressed EVA Asker "C" 45 Standard Open Mold	Black		Local	
	Foobed Skin	SAMPLE MESH+4MMKF329+24GT/C	White		Cosmo HK	
	Foobed Logo	Screen Print Logo "Text" 45mm x 25MM	Black / Red		Local	
	Cement	Water based PU	Clear		Nom-Pou	
	PACKING					
	Inner Box	2016 Box art E-Flue - White Back PVC skin	Red		Lai-Wah	
	Out Carton	Brown	Brown		Local	
	Tongue label	3cm x 3cm White + Black Screen + Weld	Black		Local	
	EEC label	2cm x 2cm White + Black Print	Black / White		Local	
	HangTag	4-Color Print	Color		Lai-Wah	
	Tag pin	White	White		Local	
	Poly bag		Clear		Local	
	Wrap Tissue	10 gram 2 sheets	White		Local	
	Toe Tissue	10 gram 2 sheets	White		Local	

Sample Spec SHeet

Self-Check 03	Written Test

PART-1

Answer the following (Total Marks: 2*2=4)

1. What is pilot production mean?
2. What Points to be considered while making pilot run?

Answer Sheet

Score = ___________
Rating: ____________

Name: _________________________ Date: _______________

Part I:

Short answer

1____

____

____

2____

____

____

Information Sheet- 3	Potential requirements for change

3.1. What is requirements for change?

Requirements change is an inevitable software development activity and can occur due to changes in user requirements, increased understanding of the stakeholders' needs, customer organizational re-structure, and availability of new technologies.

A change management solution can play a key role in helping organizations establish a stable, consistent IT environment. Building this type of setup hinges on having a change management solution in place that complements broad IT service management plans and provides the control, communication tools and governance companies need when handling change operations.

Finding a good change management solution depends on knowing exactly what you're looking for in a solution. Some things you should be looking for in a change management system include:

1. Smooth Approval Processes

Approval status issues play a key role in ensuring smooth change operations. You need to have the right approval checks in place as change requests are moved between different workflow stages. A good change management solution will feature global approval status checks to send requests in a logical way, but also give you the option to create a custom approval script to automate authorizations.

2. Process Automation

Change success depends on being able to move processes from one user to another without delay, disruption or confusion. This can be difficult if you are depending on your IT or support workers to document what has been completed and send the workflow on to the next user. Automating these processes can ensure smooth operations and maximize efficiency.

3. Governance Tools

A good change management solution will feature built-in checks and balances that helps users understand not just what they need to do, but how and when they need to do it. For example, managers can create reminders about regulatory rules when some change processes are enacted. These simple tools can play a key role in keeping operations running with proper oversight that minimizes error.

1. **Data Access**

Users handling change operations can work more effectively when they have the right data at their disposal. Effective data visualization tools play a vital role in helping users handle change operations intelligently and efficiently.

5. CAB Functionality

Tools that support the creation and implementation of a change advisory board help integrate business and technology goals into change operations. A CAB brings together IT and corporate users to develop long-term change strategies, respond quickly to unexpected change requests and prioritize tasks to maximize value.

3.1.1. Minimize Requirements Changes by Solving the Right Problem

The first way is that we understand the problem that are solving and make sure the solving problems are the right one. Step 2 is defining the change objectives, and step 3 is defining the scope.

3.1.2. Minimize Requirements Changes by Reviewing and Validating Your Requirements

The second tip is to think about your review and your validation processes. Do you have all the right people in the room in that process? Are you walking through the requirements in such a way that your stakeholders can truly understand what they mean and how they're going to impact them and their business?

Often, we might, historically, have a long list of functional requirements or, in current day, have a long list of user stories. So, you're like reviewing these individual pieces one at a time.

Thinking about how to include more analytical models and more visual models is why we do process models, use cases, wireframes, process diagrams, and entity relationship diagrams, context diagrams showing how the system is going to work, and helping people see their role in that system is a more useful way of doing that validation. When you're getting the requirements approved, people know what they're approving and how that's going to impact them.

3.1.3. Minimize Requirements Changes by Communicating Implications of Change

The third tip that is to be clear about the implications of change and what it means to actually approve requirements. There's always going to be room for some change in projects, but clearly identifying what the cost of that change is.

Somebody is going to go build this. If you want them to build it again, it's going to be another sprint, which will either delay other requirements that you have, or it's going to add costs to the project. Making sure that kind of message is getting in front of the people that actually are in charge of the costs, or are in charge of the scope and so they understand the implications of what change means from that forward.

3.2. 10 Tips to Manage a Change in Priorities

While it's important to keep work on schedule, it can be overwhelming when you're assigned new priorities on top of the deadlines you're already rushing to meet.

So how do you handle a change in priorities without compromising the flow of your change initiatives and projects? You can make it easier by following these 10 tips:

1. Analyze the change strategy:

This involves asking a few questions that will bring the entire change strategy into focus, starting with "The Why":

- Why are we changing, and what exactly is driving it?
- How does the change align with the organization's overall objectives?

- Who initiated the change, and what's their vision for the organization once the change is completed?

2. **Assess the tasks' priority**:

Now that you know more about the change, you can begin to analyze on a deeper level. For example, determine if it's critical, important, or nice to have. Also, is it important to one person, but a simple a nice-to-have for others?

Keeping an open line of communication with your manager and team will help guide you. It's worth taking the time to ask, and they'll appreciate your interest and concern. Also, asking questions now will save time and do-overs, down the road.

3. **Organize your current tasks**:

Have a good look at your current list of initiatives. Before you shift priorities, determine what the impact will be on either the scope of work, schedule, or budget, in addition to the hours needed to complete each task. Not everything can be a priority, so move less-critical tasks to a lower place on the list.

4. **Be open to change**:

It might sound trite, but the idea of being open to change needs reinforcing. When disruptions in priorities happen – and trust me, they WILL – you have a choice to either embrace it or be closed off. It's always better to accept the challenge and step into it.

It's okay to be a little skeptical at first and your initial reaction may be negative – I'm famous for that! But once I get my questions and concerns answered, I step into the change quite easily. So will you!

5. **Focus on what you can control**: As David Rock notes in his book *Your Brain at Work*, when priorities change you should focus on which portions of your work you can

control. You'll stay productive by knowing exactly what you have influence and control over so you don't waste time on work that is out of your control.

6. **Manage your energy**: Everyone is different. Some people have their high-energy time first thing in the morning. Others have theirs around lunch. Still others peak later in the day. Find out during which time of day you do your best work, and schedule your more challenging priorities at that time.

7. **Ask for help**: Reach out to the person you report to if you need help prioritizing your tasks. Seeking out direction isn't a show of weakness, but rather demonstrates that you're thinking at a strategic level and not just completing tasks.

8. **Follow-up**: Once you've re-shifted your priorities, follow-up with the person making the changes and get approval on your new priority list.

9. **Manage expectations:** It means managing expectations of both others and yourself.

10. **Encourage information sharing**: Determine if there are common elements you could use from one initiative and transfer to another.

Talk with internal, external, formal or informal networks. Managing priorities takes skill, patience, discipline, and the willingness to be flexible and adaptable. By knowing when to ask for help when you're unsure what to prioritize or de-prioritize, you'll be able to differentiate between daily vs. important vs. urgent tasks.

3.3. 7 Rs of Change Management

Seven Rs of Change Management is a checklist of important points that need to be considered while raising a change request. This compiled list of 7 Rs helps to minimize change rejection at the point of change logging. The checklist comprises seven simple questions, which are as follows:

- Who **RAISED** the change request?
- The **REASON** behind the change?
- **RETURN** required from the change?
- **RISKS** involved in the requested change?
- Who is **RESPONSIBLE** for the create, test and implement the change?
- **RESOURCES** required to deliver the change?
- **RELATIONSHIP** between suggested change and other changes?

Here are some important questions related to change management:

1. Who raised the change?

With so many entry points, sources and stakeholders to request a change, it became important to get an answer to this question. The best way to address authorization of change is to design a system to record all changes. This system of records will assist you during audits.

2. What is the reason for the change?

The answer to this question can prevent changes with high risk and minimum business benefit. Regardless of the type of change, all major changes should be passed through an agreed-upon portfolio analysis criteria. This will ensure prioritization of changes.

3. What return is expected from the change?

Before implementing any changes, it is important to understand the return from the change to define the priority.

4. Risks involved in the change?

All changes involve risk. Some risks can be avoided, and some have to be accepted. While accepting or rejecting a change request, consider the risk of not making a change as well. No one can guess the exact amount of risk involved in change but can figure out the approximate degree of forethought before making changes.

5. Resources required to deliver the change?

The requirement and availability of infrastructure assets and human resource to implement a change. While accepting change, consider its impact on other projects. The change should not impact other projects.

6. Who is responsible for the create, test and implement the change?

The people managing the development should be able to answer this question. The responsibilities should be traceable, actionable and enforceable across the change and release management.

7. Relationship between suggested change and other changes?

The relationship between changes needs to be determined across functional boundaries. Failing to do so can cause a delay in meeting timeline.

Before implementing any change, getting answers to these questions offers many benefits. Apart from calculating the risk associated with the change, these questions offer a great way to find out the effectiveness of your change-management process.

Self-Check 03	Written Test

PART-1

Say true or false (Total marks: 2)

1. Finding a good change management solution depends on knowing probably what you're looking for in a solution.

PART-2

Answer the following (Total Marks: 2*5=10)

1. What is the reason for change?
2. What are the 7Rs for changing management?

Answer Sheet

Score = ___________
Rating: ____________

Name: _________________________ Date: _______________

Part I:

Fill in the blanks:

2. _______________

Part II:

Short answer

1____

____

____

2____

____

____

LG #30	LO #6 Maintain Records

Instruction Sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Records to use in production
- Records to use as input for production planning
- Necessary reports

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Organize and maintain records to use in production
- Organize and maintain records to use as input for production planning
- Prepare necessary reports

Learning Activities

3. Read the specific objectives of this Learning Guide.
4. Read the information written in the “Information Sheets 1”.
5. Accomplish the “Self-check 1”. Request the key answer / key to correction from your teacher or you can request your teacher to check it for you.
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #2.
7. Read the information written in the “Information Sheet 2”.
8. Accomplish the “Self-check 2”. Again you can request the key answer / key to correction from your teacher or you can request your teacher to check it for you.
9. If your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity # 2.
10. Read the information written in the “Information Sheet 3”.

11. Accomplish the “Self-check 2”. Again you can request the key answer / key to correction from your teacher or you can request your teacher to check it for you.
12. If your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity # 5.

Information Sheet-1	RECORDS TO USE IN PRODUCTION

1.1. PRODUCTION RECORDS:

Quantitative records of all finished and packed production, issues for sales and balances of different types of products produced by the company shall be maintained. The cost of all finished and packed production shall be kept in detail for each type of product or in the form of control accounts provided the value of the balances according to such control accounts are reconciled periodically at least once in a year with the value of the quantities shown in the quantitative account maintained for each type of products.

Name of the Company...

Name and address of the Factory

....

Statement showing cost of Production of Footwear for the year ended

....

1. Name of the footwear..
2. Type..
3. Type of packing...
4. Design No...

Unit Current Year Previous Year

5. Installed capacity
6. Batch size...
7. Number of batches produced
8. 8. Total production (pairs).

9. Capacity Utilization (Percentage).

S.no	Particulars	Unit	Qty.	Rate Per unit (Rs)	Amt. (Rs)	Cost / Unit	
						Current Year (Rs)	Previous Year (Rs)
1	2	3	4	5	6	7	8

A.I. Material Cost

(Each item to be specified) a) Imported

1. Upper
2. Bottom 3. etc.

b) Indigenous purchased

1. Upper
2. Bottom 3. etc.

c) Own manufactured

(As per proforma Cl)

1. Upper
2. Bottom etc.

d) Less wastage:

1. Upper
2. Bottom

A.2. other raw material (major materials cost to be specified) a) Imported

1.
2. etc.

b) Indigenous

1.
2. etc.

Total material Cost

B. 1. CONVERSION COST

Pre-fitting

Variable

Fixed

2. Lasting/Assembling/Sole Attaching Variable

Fixed

3. Bottom finishing

Variable

Fixed

4. Polishing & finishing

Variable

Fixed

5. Royalty, if any

Variable

Fixed

6. Etc. etc. (to be specified)

Total Conversion Cost

C. OTHER EXPENSIEE

1. Inspection

Variable

Fixed

2. Quality Control

Variable

Fixed

3. Labeling

Variable

Fixed

4. R&D

   Variable Fixed

5. Packing

   Variable

   Fixed

6. Other works overheads

   Variable

   Fixed

7. Administration overheads Variable

   Fixed

8. Others (to be specified)

   Variable

   Fixed

   Total Other Expenses

D. 1. Total cost (A+B+C)

2. Adjustment for opening & closing work in progress
3. Adjustment for cost variances
   a) Raw material
   b) Conversion cost
   c) Other expenses
   d) Total
4. a) Total Cost of Production transferred for sales :

c) Specify the product

Note:

1. This proforma shall be prepared for each type and size of padding.
2. Separate statement shall be prepared as above for export padding.
3. Bonus to employees other than incentive bonus, provision for statutory gratuity or actual payment of the same during the period and interest charges on borrowings including debenture shall be shown in proforma D, E & F only.
4. Item No. D. 3 is applicable for companies following standard costing system.
5. The cost of raw material shall be based on actual consumption for each size and type of footwear.
6. The basis on which realizable value is determined for the by-products shall be clearly indicated in the cost records.
7. Abnormal losses, if any shall be indicated both in quantity and value in a separate statement.
8. The apportionment of common overhead expenses to the various Products in the case of multi product units shall be equitable.
9. Intermediates transferred from one process to the next process shall be at actual cost.
10. The cost of other raw materials such as PVC Granules, fabric, lining leather or fabric and polish etc. shall be separately specified in item No. A2.
11. Cost Centers are illustrative only.
12. The Cost of captive consumption of leather should be taken from Proforma C-3.

Format for Recording Footwear Factory Information

(A separate sheet should be completed for each enterprise)

Name of the Footwear Factory: ______ _________________

 Address:

- Postal Address: P.O. Box City/Town __ Country __
- Telephone: Fixed Line: __ Mobile ___Fax ___________
- E-mail: _______ ______ Website _________________
- Contact Person: Name: _____ Tel. ________ E-mail

 Year of Establishment: ____________ _________________

 Ownership Type: _____ ____________ _________________

 Production Capacity

Product Type*	Installed Production Capacity/Day	Actual Production/Day	Remark

 Other Services/Activities:

 Membership

- Chamber of Commerce: ____

- Sectorial Association:

  ____

 Manpower:

Total: ____________________ Male _________________ Female _______________

Self-Check 03	Written Test

PART-1

FILL IN THE BLANKS (Total marks: 2)

3. Performa shall be prepared for each size & type of ________________

Answer Sheet

Score = ___________

Rating: ____________

Name: _________________________ Date: _______________

Part I:

Fill in the blanks:

3.1. _______________

After taking decisions about the type of business, its location, layout etc. the entrepreneur steps into the shoe of production manager and attempts to apply managerial principles to the production function in an enterprise. Production is a process whereby raw material is converted into semi-finished products and thereby adds to the value of utility of products, which can be measured as the difference between the value of inputs and value of outputs.

Production function encompasses the activities of procurement, allocation and utilization of resources. The main objective of production function is to produce the goods and services demanded by the customers in the most efficient and economical way. Therefore efficient management of the production function is of utmost importance in order to achieve this objective.

2.1. Production Planning and Control

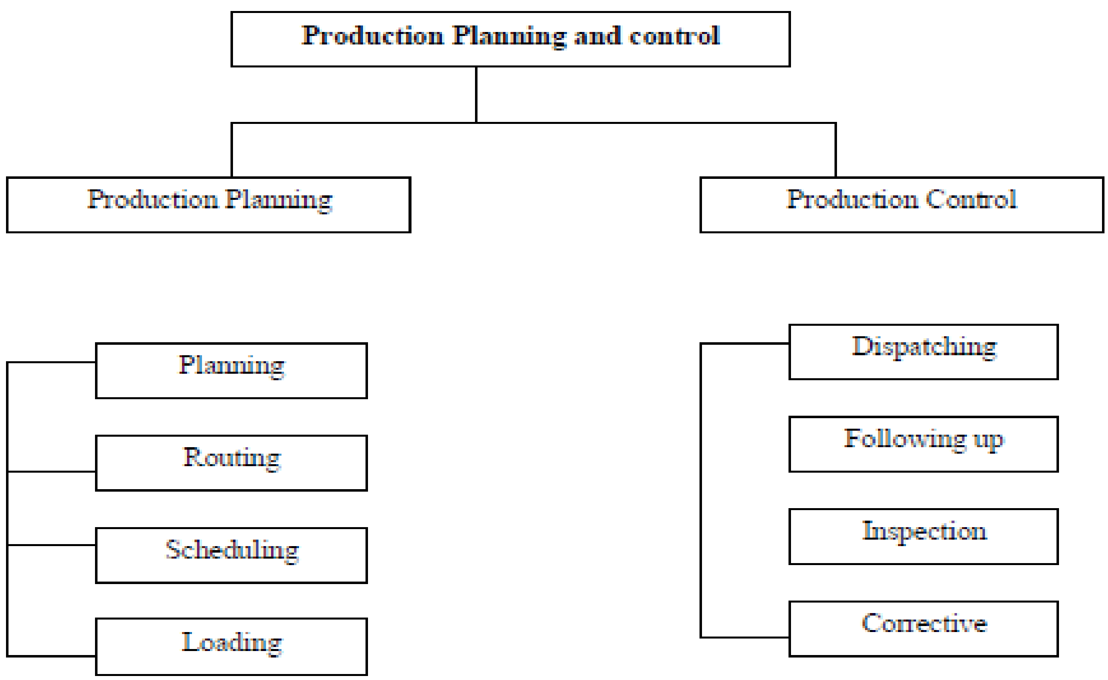
In any manufacturing enterprise production is the driving force to which most other functions react. This is particularly true with inventories; they exist because of the needs of production. In this chapter the relationship of production planning and control to work-in-process inventories is stressed.

2.1.1. Objectives of Production Planning Control

The ultimate objective of production planning and control, like that of all other manufacturing controls, is to contribute to the profits of the enterprise. As with inventory management and control, this is accomplished by keeping the customers satisfied through the meeting of delivery schedules. Specific objectives of production planning and control are to establish routes and schedules for work that will ensure the optimum utilization of materials, workers, and machines and to provide the means for ensuring the operation of the plant in accordance with these plans.

2.4.2. Production Planning and Control Functions

All of the four basic phases of control of manufacture are easily identified in production planning and control. The plan for the processing of materials through the plant is established by the functions of process planning, loading, and scheduling. The function of dispatching puts the plan into effect; that is, operations are started in accordance with the plant. Actual performance is then compared to the planned performance, and, when required, corrective action is taken. In some instances re-planning is necessary to ensure the effective utilization of the manufacturing facilities and personnel. Let us examine more closely each of these functions.



2.4.3. Process Planning (Routing)

The determination of where each operation on a component part, subassembly, or assembly is to be performed results in a route for the movement of a manufacturing lot through the factory. Prior determination of these routes is the job of the manufacturing engineering function.

Loading

Once the route has been established, the work required can be loaded against the selected

Machine or workstation. The total time required to perform the operation is computed by Multiplying the unit operation times given on the standard process sheet by the number of parts to be processed. This total time is then added to the work already planned for the workstation.

This is the function of loading, and it results in a tabulated list or chart showing the planned utilization of the machines or workstations in the plant.

2.4.4. Scheduling

Scheduling is the last of the planning functions. It determines when an operation is to be Performed, or when work is to be completed; the difference lies in the detail of the scheduling procedure. In a centralized control situation - where all process planning, loading, and scheduling for the plant are done in a central office- the details of the schedule may specify the starting and finishing time for an operation. On the other hand, the central schedule may simply give a completion time for the work in a given department.

2.4.5. Combining Functions

While it is easy to define “where” as process planning, “how much work” as loading, and “when as scheduling, in actual operations these three functions are often combined and performed concurrently. How far in advance routes, loads, and schedules should be established always presents an interesting problem. Obviously, it is desirable that a minimum of changes be made after schedules are established. This objective can be approached if the amount of work scheduled for the factory or department is equal to or slightly greater than the manufacturing cycle. For optimum control, it should never be less than the manufacturing cycle.

2.4.6. Dispatching

Authorizing the start of an operation on the shop floor is the function of dispatching. This Function may be centralized or decentralized. Again using our machine-shop example, the

Departmental dispatcher would authorize the start of each of the three machine operations – three dispatch actions based on the foreman's routing and scheduling of the work through his department. This is decentralized dispatching.

2.4.7. Reporting or Follow – up

The manufacturing activity of a plant is said to be "in control" when the actual performance is within the objectives of the planned performance. When jobs are started and completed on schedule, there should be very little, if any, concern about the meeting of commitments.

Optimum operation of the plant, however, is attained only if the original plan has been carefully prepared to utilize the manufacturing facilities fully and effectively.

2.4.8. Corrective Action

This is the keystone of any production planning and control activity. A plant in which all Manufacturing activity runs on schedule in all probability is not being scheduled to its optimum productive capacity. With an optimum schedule, manufacturing delays are the rule, not the exception.

2.4.9. Re-planning

Re-planning is not corrective action. Re-planning revise routes, loads, and schedules; a new plan is developed. In manufacturing this is often required. Changes in market conditions, manufacturing methods, or many other factors affecting the plant will often indicate that a new manufacturing plan is needed.

2.5. Factors Affecting Production Planning and Control

The factors that affect the application of production planning and control to manufacturing are the same as the factors we have already discussed that affect inventory management and control. Let us briefly review these in relation to production planning and control.

Type of Product

Again, it is the complexity of the product that is important, not what the product is, except as this may in turn relate to the market being served. Production control procedures are much more complex and involve many more records in the manufacture of large steam turbine generator sets or locomotives to customer orders then in the production of large quantities of a standard product involving only a few component parts, such as electric blankets, steam irons, or similar small appliances.

Type of Manufacturing

This is probably the most influential factor in the control situation. For a large continuous Manufacturing plant producing a standard product, we have already indicated that the routing was included in the planning of the plant layout.

2.6. Production Planning and Control Procedures

A detailed discussion of all the techniques and procedures of production planning and control is beyond the scope of this book; many complete text books exist on the subject. We have already indicated that planning and control practices will vary widely from plant to plant. Further the many ways in which of the functions might be carried out in practice were indicated earlier in this chapter.

Though no production control function can be entirely eliminated, the least control that results in effective operation of the factory is the best control. It must be remembered that production planning and control systems should be tools of management. The objective is not an elaborate and detailed system of controls and records, but rather, the optimum operation of the plant for maximum profits.

2.7. Production planning records

Because production planning and control places an emphasis on the control of work-in-process, the system will in effect tie together all previous records and forms developed in all planning for the manufacture of the product.

2.7.1. Market forecast

The market forecast is discussed its value to production planning and control is that it will indicate future trends in demand for manufactured product. Work shift policies, plans for an increase or decrease in manufacturing activity, or possible plant expansions may often be

Based upon the market forecasts and in turn affect the planning of the production planning and control group.

2.7.2. Sales Order

This is the second of the five classes of orders. It is a rewrite of the customer' order specifying what has been purchased – product and quantity and authorizing shipment of the goods to the customer. Multiple copies are prepared and all interested functions are furnished a copy. Sales orders may be written by marketing, inventory control, or production control.

2.7.3. Stock Order

This third class of order is not always used. In the preceding paragraph we indicated how it may be used after sales order accumulate to an economical manufacturing lot. It is, of course, the principal order when manufacturing to stock. It will authorize production in anticipation of future sales.

2.7.4. Shop Order

This fourth class of order deals with the manufacture of component parts. Customer orders, sales orders, and stock orders are for the finished product. In the preceding chapters we discussed how, by product explosion, the requirements are established for component parts to build assembled products.

2.8. Standard Process sheet

This form is prepared by process engineering and it is the source of basic data as to the type of machine to be used, the time required for processing and the sequence of operations in the manufacture of the product. Routing and scheduling of shop orders, as well as loading of workstations in advance of scheduling, depend on up-to-date standard process sheets being available to the production planning and control group.

2.9. Engineering Specifications

Blueprints and bills of materials are used by production planning and control when they become a component part of the packaged instructions issued to the shop through the control office. One good planning procedure is to accumulate all necessary data for a shop order in a single package the standard process sheet, the blueprint, the bill of material (if an assembly operation is involved), the route sheet, and possibly the schedule for the production of the order.

Route Sheet

This is the form on which the route of a shop order is indicated. In practice, this form is generally combined with one of the other forms in the system. For example, the shop order, the standard process sheet, and the route sheet are often one piece of paper-usually called the shop order or the manufacturing order.

Load Charts

These charts are prepared to show the productive capacity that has been "sold" – and at the same time the available productive capacity. These charts may be prepared for each workstation or machine in the plant, or they may be for groups of machines or departments.

Job Tickets

This is the fifth and last type of order in a manufacturing situation. Job tickets authorize the

Performance of individual operations in the manufacturing process.

2.10. Project Planning Methods

The production planning and control methods discussed thus far in this chapter deal primarily with the production of consumer or industrial products which could be considered to fall within the area of “repetitive manufacturing”. The products to be produced are often manufactured in quantities of more than one, and their total processing time can be measured in hours, or at most, days.

The best –known methods that have been developed are CPM (for Critical Path Method) and PERT (for Program Evaluation and Review Technique). The original PERT technique is now considered, more accurately, PERT TIME, whereas a later development is known as PERT COST.

From the optimistic, most likely, and pessimistic times, the expected elapsed time can be obtained by statistical techniques. The relationship of the three estimates to the expected elapsed time is given by the formula

Where a = optimistic time

b = pessimistic time

m = most likely time

It can be seen from the formula that the most likely time estimate is given four times as much weight as the optimistic and pessimistic estimates when computing the expected time.

Systems Analysis

As with other manufacturing control systems and procedures, production planning, and control lends itself to modern mechanization techniques such as machine accounting and use of computers. Careful study of the control system through procedure analysis will indicate the savings that may be effected by the utilization of modern equipment. These savings may be in the clerical help required in the administration of the system or in the advantages of quick compilation of data, which in turn results in up-to-date control data.

1.10. Production Planning and Control Organization

It should be obvious that there is no single pattern for the organization of the production planning and control activity. In many small plants the routing, loading, and scheduling functions may be included in the duties of the operating line; the shop manager, superintended, and foremen. But it is difficult to combine day-to-day work with adequate planning, and as a result it is often more feasible to break away the production planning and control functions and assign them to qualified specialists. These groups should be organized as staff sections normally reporting to the top manufacturing executive.

1.11. Centralized Production Planning and Control

Centralization or decentralization of duties of the production control staff depends upon the Design of the production planning and control system. In a completely centralized setup, determination of shipping promises; analysis of sales, stock, and shop orders; preparation of, load charts, and schedule charts; and dispatching of work to the shop complete with job.

Tickets and all other necessary paper would be accomplished by a central production planning and control unit. In addition, as work is completed, a careful analysis of the actual performance would be made, and if corrective action were required, it would be initiated by this group.

1.12. Decentralized Production Planning and Control

We have discussed at great length that no matter how general the planning may be in a central office, the plan must eventually be developed into a detailed plan on the shop floor. Some companies are now endeavoring to make each foreman a manager of his own departmental operation. In these cases the foreman is furnished with a complete staff for the production planning and control of the activities in the department.

Planning Phase

We have already indicated in some details the duties involved in the production planning phase. Working from the basic data mentioned earlier, the personnel in this part of the activity routes and load and schedule charts.

Control Phase

The completed job ticket, or its equivalent, is the key to this phase of the production planning and control system. It is the means of reporting back from the shop floor that indicates that a job is completed; or if daily job tickets are turned in, the daily progress of a job can be determined.

Relation to Other Functions

Good relationships with all the other functions in the enterprise are essential to effective production planning and control. Full cooperation with the marketing group is necessary, Particularly in view of the importance of market conditions and the goodwill of customers. Both product engineering and process engineering must keep production planning and control informed as to their plans to avoid the manufacture of goods either to incorrect specifications or by an improper method.

Measurement of Effectiveness

In determining the effectiveness of a production planning and control system, there are quite a few problems. The key criterion might well be whether or not shipping promises are being kept –the percentage of the order shipped on time. This, however, would not be a true criterion if excessive overtime of expediting costs were involved in getting any of these orders shipped.

The cost of the control system in relation to the value of goods shipped is another possibility. Again, however, this may not be sound: if markets slump, a bad ratio will develop. Many good production planning and control systems have been discontinued because of “high costs” under these conditions- and have never revived after business picket up.

In a study of benefits and costs of computerized production planning and control systems,

Schroeder et al. list the following performance criteria by which production planning and control systems might be judged:

1. Inventory turnover
2. Delivery lead time
3. Percent of time meeting delivery promises
4. Percent of orders requiring “splits” because of unavailable material.
5. Number of expeditors
6. Average unit cost

Self-Check 2	Written Test

Part-1

1. ANSWER THE FOLLOWING (Total Marks 5*2=10)

1. What do you understand by Reporting/Follow up?
2. What is meant by Standard Process sheet?
3. What is meant by Job Tickets?
4. What is meant by sales order record in production planning?
5. What is known as Load Charts?

Information Sheet-3	**NECESSARY REPORTS**

3.1. Documentation: - Two basic types of documentation

Products Documentation

- Information needed for the on-going maintenance and operation of the Product
- Structured for the technical Products professional
- Examples: technical diagrams, flowcharts, management structures, etc.

User documentation

- Easy to read (step by step) instructions for using the application Product
- Structured for non-Products professional

3.2. WHY IS DOCUMENTATION IMPORTANT?

Products Documentation

- Maintenance staff must learn Product
- The original Products developers are usually not the Products maintenance staff (they move to other new development projects)
- To ensure continuity of Products development after original developers leave the company
- To facilitate the incorporation of new aspects into the Product (e.g., adding to the original models) by Products development staff

User documentation

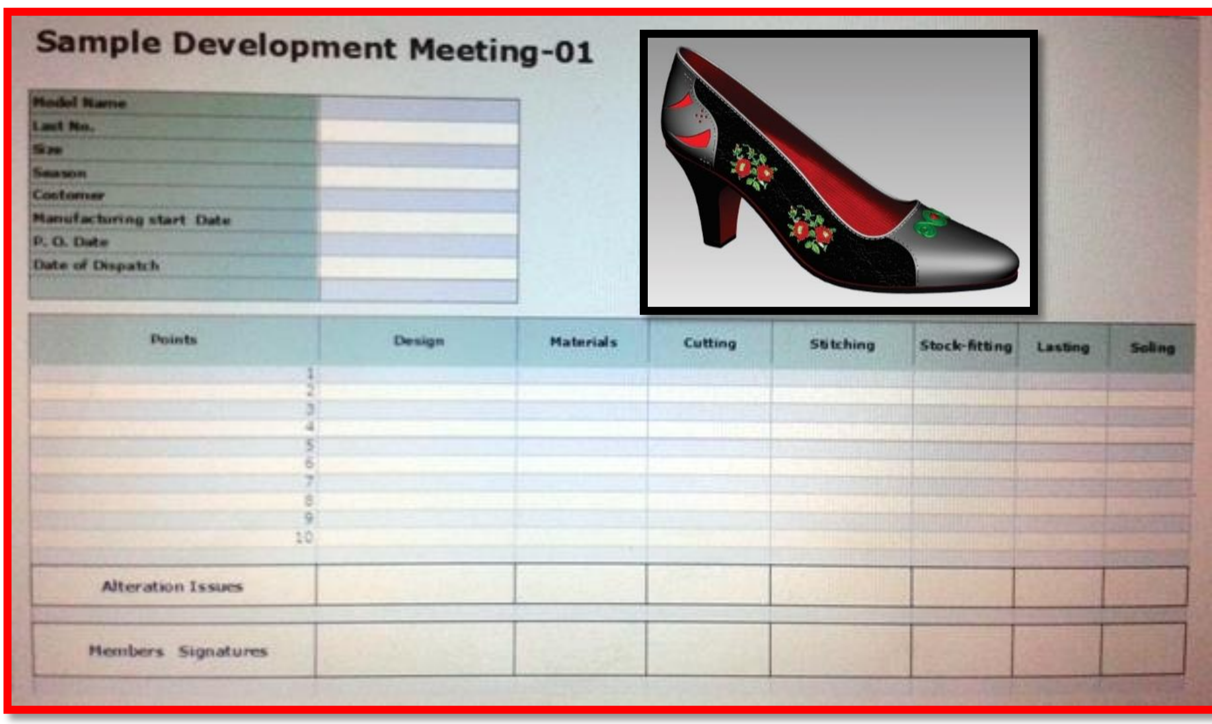
- to reduce the number of problem telephone calls that the developer receives from customers
- to minimize the amount of the new Product training needed

Best way to documenting the Production change is to maintain the report after every meeting like- development, pattern engineering and production trial reports.

Following are the format of reports by which we can collect the details of every sample related issues, Pattern Engineering changes and other important decisions taken by the team unanimously.

Documentation at Sample Development Stage

During sampling of the product, lots of issues come like-patterns modification, colours changing, and material changing sometimes making process changing. The format will include the data regarding all the issues and also the suggestion, which help to modify the production techniques.



Sample Development Meeting-01

Model Name	
Last No.	
Size	
Season	
Costomer	
Manufacturing start Date	
P. O. Date	
Date of Dispatch	

Points	Design	Materials	Cutting	Stitching	Stock-fitting	Lasting	Soling
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
Alteration Issues							
Members Signatures							

Format of Documenting Production Change (Development Stage)

Documentation Pattern Engineering

The format will include the data regarding all the issues and also the suggestion of patterns alterations, tooling requirements etc. which help to modify the production techniques.

Pattern Engineering Meeting-02

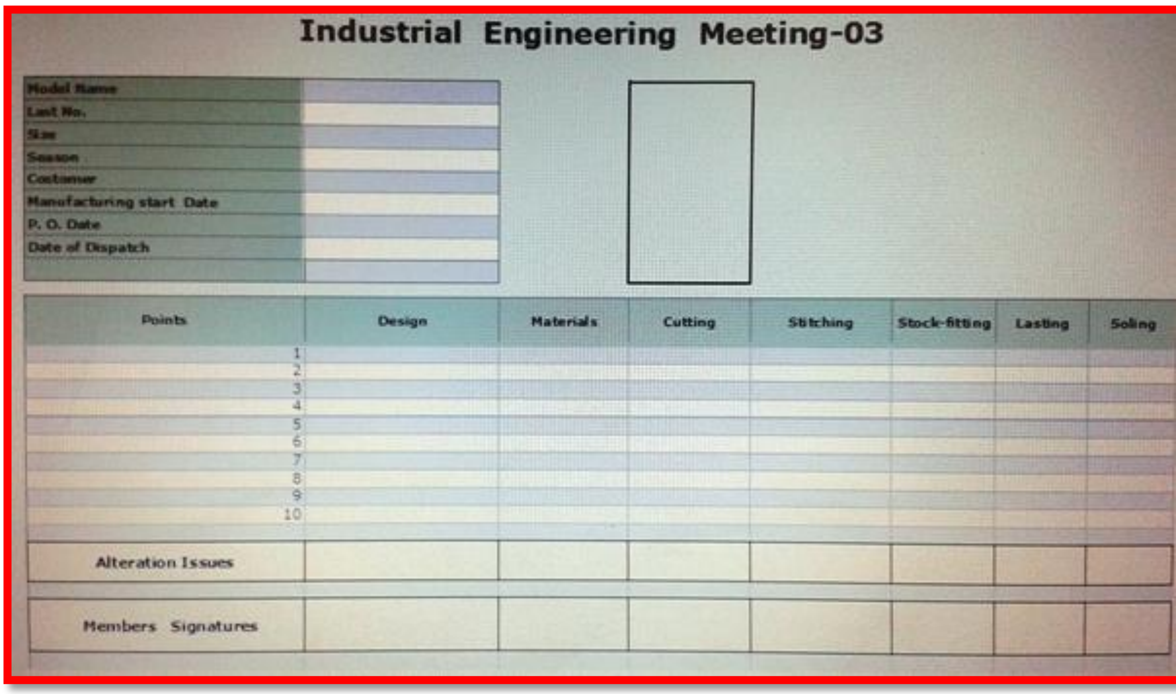
Model Name	
Last No.	
Size	
Season	
Costomer	
Manufacturing start Date	
P. O. Date	
Date of Dispatch	

Points	Design	Materials	Cutting	Stitching	Stock-fitting	Lasting	Soling
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
Alteration Issues							
Members Signatures							

Pattern Engineering Report Format

Documentation During Industrial Engineering

The Industrial engineering format provides data of man-power requirements; types of machine required for the production, line balancing and output no. pairs.



Industrial Engineering Meeting-03

Model Name	
Last No.	
Size	
Season	
Customer	
Manufacturing start Date	
P. O. Date	
Date of Dispatch	

Points	Design	Materials	Cutting	Stitching	Stock-fitting	Lasting	Soling
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
Alteration Issues							
Members Signatures							

Industrial Engineering Report Format

Production Trial Documentation

Production trial Report will give the final document for the production strategies.

Production Trial Meeting-04

Model Name	
Last No.	
Size	
Season	
Customer	
Manufacturing start Date	
P. O. Date	
Date of Dispatch	

Points	Design	Materials	Cutting	Stitching	Stock fitting	Lasting	Soling
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
Alteration Issues							
Members Signatures							

Industrial Engineering Report Format

After analyzing all the reports the Process Flow Chart is prepared. On the basis of that different department follow the operations as well as take necessary steps if requires.

Self-Check 03	Written Test

PART-1

FILL IN THE BLANKS (Total marks: 2)

4. The document to be followed in the production floor which incorporates this vital information is otherwise called ________________

PART-2

Answer the following (Total Marks: 2*2=4)

5. Write the information required for record updating in production process sheet?
6. Write the information required for record updating rout sheet in production process?

Answer Sheet

Score = ___________
Rating: ____________

Name: _________________________ Date: _______________

Part I:

Fill in the blanks:

1. _______________

Part II:

Short answer

1____

____

____

2____

____

____

Note: Satisfactory rating = 4 points and above

Unsatisfactory rating = below 4 points

You can ask you teacher to correct your answer

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