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INDUSTRIAL GARMENT EXPERT



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LEARNER GUIDE

National Vocational Certificate Level 4

Version 1 - April, 2019



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Introduction

Welcome to your Learner's Guide for the Industrial Garment Expert Level-4 "Industrial garment expert". It will help you to complete the program and to go on to complete further study or go straight into employment.

The Industrial Garment Expert program is to engage young people with a program of development that will provide them with the knowledge, skills and understanding to start this career in Pakistan. The program has been developed to address specific issues, such as the national, regional and local trends, markets, the manpower availability within the country, and meeting and exceeding the needs and expectations of their employers / customers.

The main elements of your learner's guide are:

- **Introduction:**
 - This includes a brief description of your guide and guidelines for you to use it effectively
- **Modules:**
 - The modules form the sections in your learner's guide
- **Learning Units:**
 - Learning Units are the main sections within each module
- **Learning outcomes:**
 - Learning outcomes of each learning units are taken from the curriculum document
- **Learning Elements:**
 - This is the main content of your learner's guide with detail of the knowledge and skills (practical activities, projects, assignments, practices etc.) you will require to achieve learning outcomes stated in the curriculum
 - This section will include examples, photographs and illustrations relating to each learning outcome
- **Summary of modules:**
 - This contains the summary of the modules that make up your learner's guide
- **Frequently asked questions:**
 - These have been added to provide further explanation and clarity on some of the difficult concepts and areas. This further helps you in preparing for your assessment.
- **Multiple choice questions for self-test:**

These are provided as an exercise at the end of your learner's guide to help you in preparing for your assessment.

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Module-2

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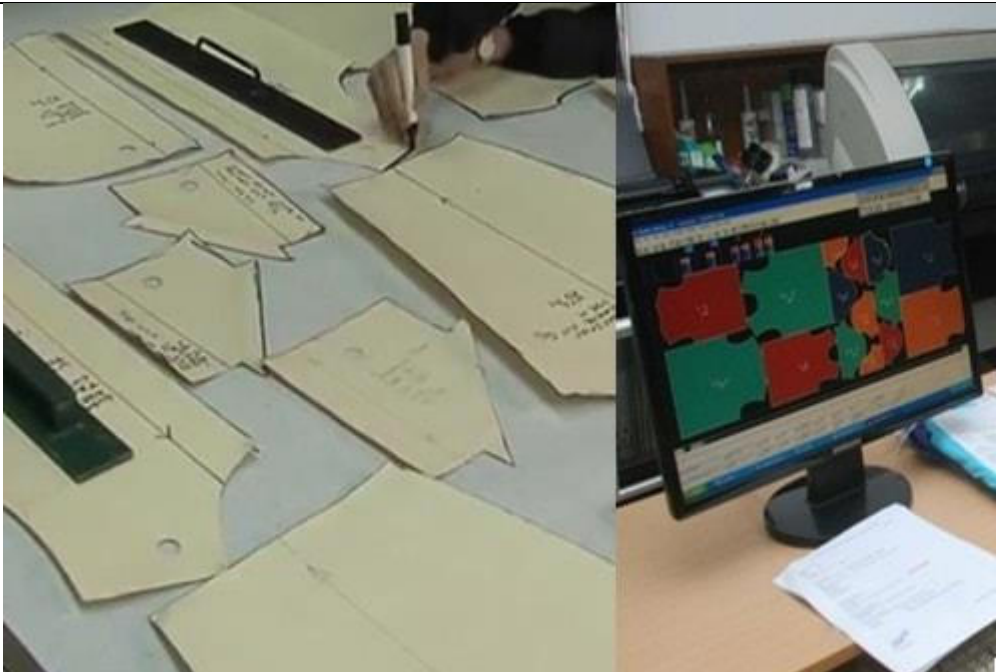
Module 2: Prepare marker for production

Objective of the module: This competency standard is designed to provide skills and knowledge to digitize pattern, grading and create marker for production through CAD/CAM.

Duration: 100 hours **Theory:** 20 hours **Practical:** 80 hours

Learning Unit	Learning Outcomes	Learning Elements	Materials Required
LU1. Interpret spec sheet	The trainee will be able to: Evaluate spec sheet as per requirement. Collect master pattern from sampling department.	Knowledge of spec sheet, identify spec sheet indicators like size chart, requirement of fabric and garment accessories. Types of communications and Communication skills with sampling department for collection of required master pattern as per spec sheet.	Spec sheet Sample garment
LU2. Digitize pattern	The trainee will be able to: Trace-out master pattern as per pattern required. Prepare drill point and notches as per requirement.	Knowledge of digitization, grain line, tracing points, notches and drill points. Methods of fabric layers / spreading and fabric consumption.	Computer Digitizer board
LU3. Perform size findings	The trainee will be able to: Perform grading according to size chart. The trainee will be able to: Review grading pattern to maintain and finalize for marker.	Types and methods of size grading as per spec sheet. Ensure the panel arrangement on marker as per requirement. Knowledge of all necessary pattern pieces for different sizes for a particular style of garments. Communication with supervisor for final approval of marker preparation.	Spec sheet computer

	Contact supervisor to obtain approval for marker preparation.		
LU4. Prepare marker	The trainee will be able to: Analyze pattern and fabric for marking (matching points, report of fabric design) Perform marker according to fabric width. Finalize marker as per size ratio. Control marker and fabric consumption Take marker print on plotter.	Knowledge of grain line, all sizes (S, M, L, XL etc). The importance and knowledge of identification for measurement marker according to fabric width. Knowledge of Marker types and its importance. Knowledge of marker development as per size ratio. Operating procedures to take the print out on plotter. Planning in such a way that fabric wastage would be least. Importance of marker efficiency.	Computer Plotter Paper roll CAD

	Definition of Marker: A marker is commonly done by large thin paper that holds all the size of pattern pieces for a specific style of garments. Marker is the perfect way to reduce fabric wastage. Marker gives actual guide line for completing the flawless or correct fabric cutting. Marker making can be done in both ways like manually and computerized method. Source: https://fashion2apparel.blogspot.com/2017/03/marker-making-methods-apparel.html
Marker making with manual and computerized method	

Objectives of marker making:

There are different objectives of marker making. They are

- By the help of marker making similar size and styles of apparels are gained.
- For bulky production marker is essential.
- Marker making is the guide of fabric cutting.
- It helps to minimize the fabric wastages.
- It save the production time and cost

Methods of marker making in the garment industry:

Marker making is a pre-preparation of fabric cutting during huge amount of **garments production**. In the marker making, different pattern parts are drawn on a big thin paper and to considering fabric width, garments size ration, **fabric fault** and cutting table width, length marker efficiency is depending on.

There are two methods usually used for marker making in the apparel industry. They are

1. Manual method
2. Computerized method.



Manual marker making method:

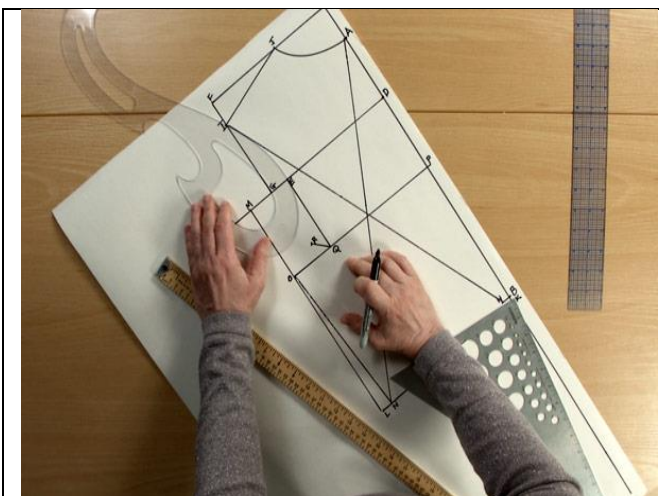
In garments industry, manual market making is the oldest, traditional and typically used method. In this processes pattern maker make the all pattern pieces manually and after that fabrics are spread on cutting table and set up all pattern pieces directly onto the marker paper. Then mark by chalk, pencil or pen.



Computerized marker making method:

Computerized method is the best and most popular method of marker making. Generally it gives higher efficiency. During this marker making method every specific style and part of the patterns are kept in the computer memory and grade rule is also mentioned. To do this marker making, computerized marker paper directly placed on fabric layer. Then the computer makes the marker by its programming techniques. Computer Aided Design (**CAD**) system are used to make marker. Comparison between manual and CAD marker making is huge.

Advantage of manual method: • It is suitable for small production • Investment cost is low. Disadvantage of manual method: • More time is required • High labor cost	Advantage of computerized marker making: • Perfect method for large scale production • Marker efficiency is high • Low fabric wastage • If you want to get marker print out then it possible. • pattern grading could be done by automatically • Low time consumption • This method help to prepare marker quickly Disadvantage of computerized marker making: • High investment cost • Required skilled operator
Pattern: <i>Garment fitness is the 1st priority for every consumer. To get perfect fit of garment, well planned or defect free <u>pattern</u> must be needed. When ornamental designs are apply on the garment, then a perfect pattern should be produced for making this garment. A standard pattern making is the most essential part to the success of ready-to-wear clothing.</i> <i>On the other words, pattern is a hand paper which is made by flowing all the specifications of each and individual components. Actually a pattern is the template from which the parts of a garment are traced onto fabric before being cut out and assembled. Pattern making is the connection of design to production by creating paper templates for all components such as cloth, hemming, fusible etc. which have to be cut for finish a perfect garment. Now <u>CAD software</u> are used to make pattern for better correction.</i>	Types of Pattern Making: <i>There are three types of pattern making methods used in <u>apparel industry</u>. These are in below:-</i> 1. Pattern drafting method 2. Pattern draping method 3. Flat pattern making method Source: https://fashion2apparel.blogspot.com/2017/02/methods-pattern-making-apparel-industry.html



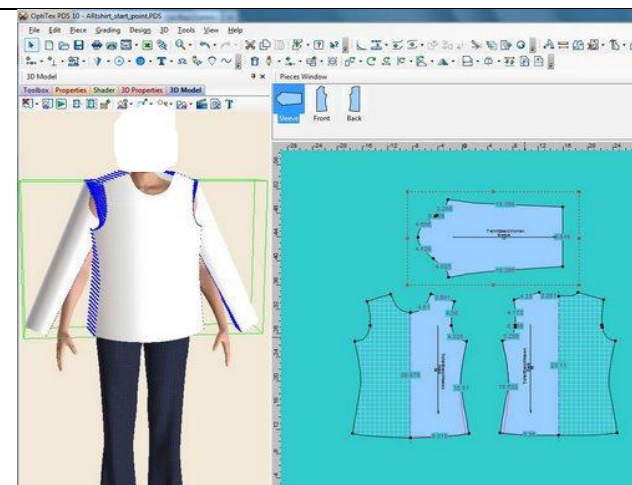
1. Pattern drafting method:

Pattern drafting method is mainly depends on accurate measurements taken on a person, dress or dummy. To complete the pattern, measurements are taken for chest, waist, hip and so on, and ease allowances are marked on paper and construction lines are drawn also. This drafting method is used to made basic, foundation or design patterns. Basic pattern set is the example of drafting method.



2. Pattern draping method:

Pattern draping method is a three-dimensional process of pattern making. In this pattern making method, muslin cloth is used to drape over a Human body or on a mannequin. For making this draping method commonly used muslin, plain weave fabric of unfinished cotton fabric. When a two dimensional (2D) piece of fabric is around on a form of dress or a model, following its shape, creating a three-dimensional (3D) fabric pattern. To get an actual design for finished garment, pattern maker give ease allowances for movement before the garment piece is cut and sewn. This pattern can be marked with pencil lines and the finished muslin pattern can be used repeatedly. But, it is requires more material, more expensive and time consuming than flat paper pattern making method.



3. Flat pattern making method:

Flat paper pattern making method is used to the development of a fitted basic pattern with ease movement and comfort to fit a person or body form. For developing a standard pattern, it is the fastest and most efficient method, so that the basic block is modified to create new and various styles. It is dependent on previously developed patterns. In flat pattern making, the patterns are manipulated by using a slash or pivotal method to create design patterns.

*A sloper is the starting point for flat pattern making or designing. Sloper is types of basic pattern that drafted on specific body measurements and do not attached a seam allowance, comfort ease, or any other design elements. Slopers are manipulated to create different styles of **fashion** garment. In the present day it is mainly draped by Computer aid techniques. To get a good pattern making, accurate measurements are most important.*

Tracing:

Tracing is a technique of art, copying an object or drawing, especially with the use of translucent tracing paper. Tracing is a way of transferring design on the garment section.

Markings and tracings indicate the position of point of construction, design detail, grain lines and center lines. **Pattern markings** on fabric are guides for various means of fitting and **sewing**. It is not only use in clothing sector also use in bespoke tailoring for getting an actual measurement and fit garment. Different types of tracing and marking techniques are used in **apparel industry**. Which techniques are preferable for garment, it is mainly depends on the methods of tracings and transfer markings.

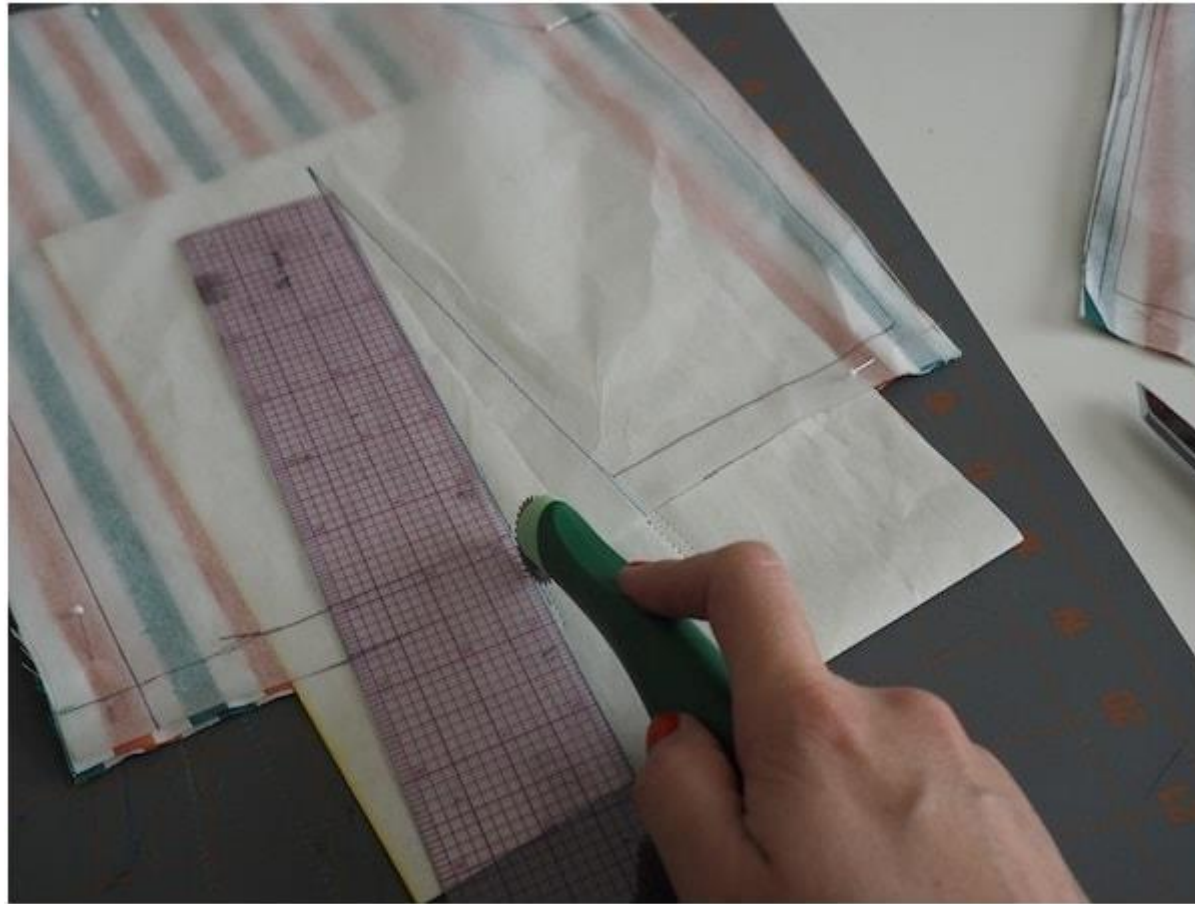


Fig: Tracing and marking on garments

The method of tracings and transfer markings selection depends on:

- Type and weight of fabric
- Color of fabric
- Placement of marking
- Methods of construction
- Methods of fitting
- Methods of production

Types of tracing and marking techniques of garment:

There are six tracing and marking techniques are available for garments. These are

1. Chalked markings
2. Chalked thread
3. Color coding
4. Pin markings
5. Tailors tacks
6. Thread tracing

Source: <https://fashion2apparel.blogspot.com/2017/02/marking-tracing-techniques-garment.html>

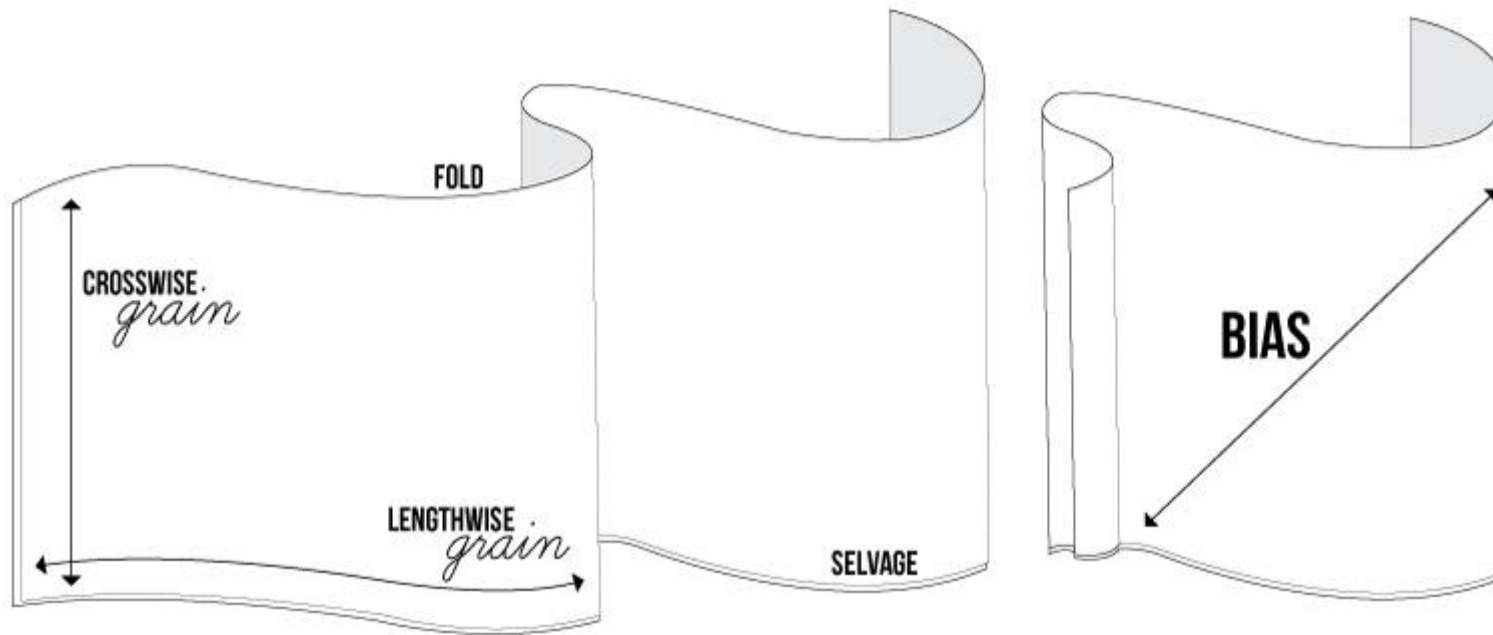


Spreading

Spreading is a preparatory operation for cutting. The main aim of the spreading process is to lay the several fabric plies essential for the production process to the marker length without any tension on the fabric. The lay height depends on order size, fabric characteristic, capacity of the spreader, cutting method and equipment used. The preference of mode of spreading will influence the cost of spreading as well as finished garment quality. The composition of each spread, i.e. the number of plies of each colour is obtained from the cut order plan.



Grainlines



Key terms

Lengthwise grain (straight of grain) The lengthwise grain of the fabric is parallel to the selvage edge of the fabric. The selvage is also known as the warp. Selvage edges are woven tightly.

Crosswise grain (cross grain) The crosswise grain is perpendicular to the lengthwise grain or selvage edge. Cross grain are also known as the weft.

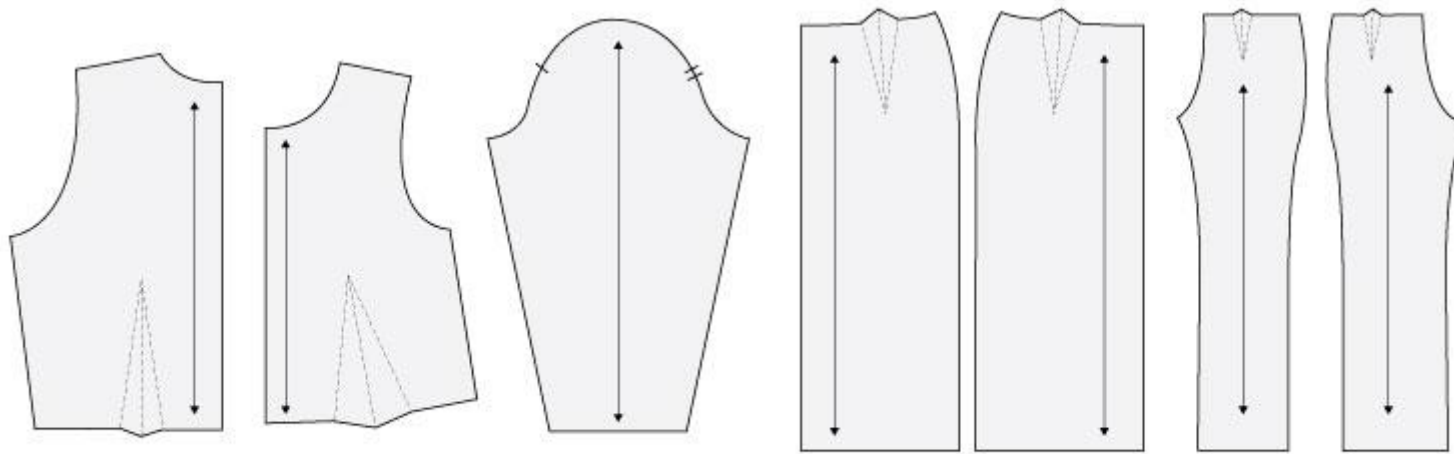
Bias The bias is when the fabric is folded at a 45° angle. Bias cut garments have more stretch and have a graceful drape.

Selvage The narrow, firmly woven, finished bit on the end, or crosswise edges of a woven. The selvages will not fray unless cut.

A closer look into grainlines

Each pattern piece will have a line drawn on it to indicate the grainline. Simply put, it just indicates the direction you will lay the pattern piece on the fabric. The most common grainline that you'll be likely to run across is a vertical line running from top to bottom of the pattern. This line means that your pattern piece should be placed on the lengthwise grain of the fabric.

Another common grainline that is used a lot in commercial sewing patterns is the term **foldline**. Don't let this confuse you...it's the same as the vertical grainline, only the pattern is cut on the fold.



VERTICAL GRAINLINES

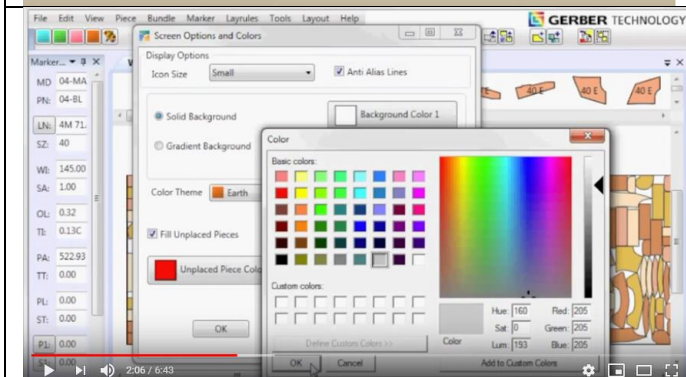
Source: <http://isntthatsew.org/marking-cutting-fabric/>



GERBER TECHNOLOGY

For decades, the world's leading apparel brands have relied on Gerber Technology's innovative AccuMark® software to satisfy their most demanding design and production requirements. Now our dynamic AccuPlan™ and AccuMark 3D modules dramatically boost your productivity and accelerate your time to market.

For a more in-depth look at our Software Solutions, [click here.](https://www.gerbertechnology.com/accumark-pattern-design-software/)
<https://www.gerbertechnology.com/accumark-pattern-design-software/>



AccuMark 8.5 Pattern Design Software from Gerber Technology

For video: <https://www.youtube.com/watch?v=g5M15pzM2k0>

Duration: 00:06:43



FD 54: Marker Making and Cutting

For video: <https://www.youtube.com/watch?v=nmkS8brdWhI&t=326s>

Duration: 00:35:37

Pattern notches

Pattern notches are small marks made on the pattern to ensure that one pattern piece will match up to the pattern next to it. They can be used to show what the value of the seam allowance is, and can also be used as markers along a seam to make sure that the two pieces of fabric will come together correctly when sewn.

When a piece of fabric is first cut out, it has none of the markings that are seen on the pattern.

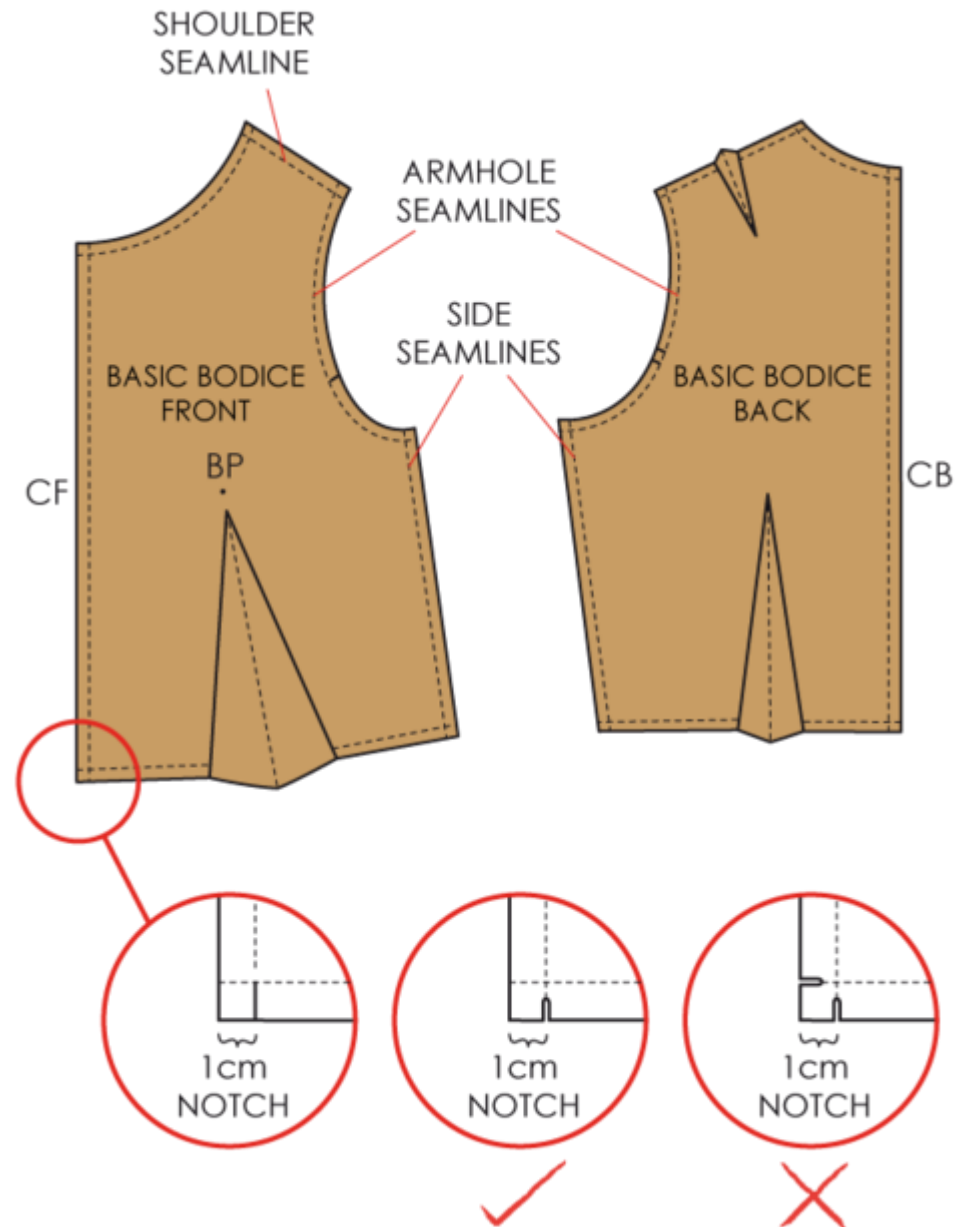
For a machinist to sew these two pieces of fabric together effectively they need to know:

- How much value has been allowed as seam allowance?
- How do the two seams match to each other?

The way that a pattern maker indicates this information to the machinist is through the use of pattern notches.

Pattern notches are small marks made on the pattern to ensure that one pattern piece will match up to the pattern next to it. They can be used to show what the value of the seam allowance is, and can also be used as markers along a seam to make sure that the two pieces of fabric will come together correctly when sewn.

Source: <https://www.thecuttingclass.com/pattern-notches-alexander-wang/>



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Module-3

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Module 3: Manage sewing production

Objective of the module: This competency standard covers the skills and knowledge required to manage sewing production through layout, line balancing and gets production in time.

Duration: 200 hours **Theory:** 40 hours **Practical:** 160 hours

Learning Unit	Learning Outcomes	Learning Elements	Materials Required
LU1. Apply layout	The trainee will be able to: Plan layout for production. Implement Line layout as per operation bulletin (OB).	Knowledge of PPEs,(Personal Protective Equipment) Explanation of safe work environment and safety measures precautions Description of proper use and handling of machine and equipment Knowledge of Operation Bulletin (OB) with all stitching jobs and non-sewing jobs during the construction of garment on production floor. Identification and knowledge of different types of sewing machines and their use	Attachment Folder required machines Computer Calculator Operation Bulletin (OB)
LU2. Prepare line balance	The trainee will be able to: Check WIP (work in process), trims, accessories and fabric on floor as per production target. Analyze efficiency and utilization as per Operation Bulletin (OB).	Knowledge of production plan to utilization of all machines in proper way with concept of Six Sigma. Monitoring men and machine performance according to production targets Comparing actual and calculated targets and calculates efficiency of the machines and workers.	Computer Calculator Marker White Board Stop watch

		Knowledge of RCA (Root Cause Analysis) and its implementations.	
LU3. Monitor production	The trainee will be able to: Assign job as per production planning. Calculate hourly efficiency and compare with target. Perform RCA (Root Cause Analysis) if target is not met. Generate production report as per given format (hourly and daily)	Knowledge of controlling aspects of garments industry to execute the delivery of goods within time frame. Ensuring the use of all resources available for the achievements of targets. Methods of monitoring and points to be monitored including gauges, dials or other indicators to make sure a machine is working properly. Monitoring/Assessing performance of yourself, other individuals, or organizations to make improvements or take corrective action. Understanding the implications of new information for both current and future problem-solving and decision-making. Determining how a system should work and how changes in conditions, operations, and the environment will affect outcomes.	Stop watch Calculator

Production Management System in Apparel Industry:

Production is defined as the step-by-step conversion of one form of material into another through chemical or mechanical process to create or enhance the utility of the product to the user.

Production management is a process of **planning**, organizing, directing, and controlling the activities of the production function.

Objectives of production management:

The objectives of the production management is stated as:

To produce goods or services of right quality and quantity at the predetermined time and pre-established cost.



Fig: Production management in apparel industry

Thus the objective of production management is related in:

1. Right quality,
2. Right quantity,
3. Predetermined time and
4. Pre-established cost (manufacturing cost)

Functions of production department in garment industry:

The activities of production department in apparel industry can be grouped into two broad categories:

1. The activities which convert the available capital into physical resources required for production.
2. The activities that convert the physical resources into sellable goods and services.

In carrying out the above activities, the production department must fulfill the following activities:

- Production of goods at the right time and in sufficient quantity to meet the demand.
- Production of goods at minimum possible cost.
- Production of goods of **acceptable quality**.

Thus, the functions of production personnel are:

- Forecasting the demand for the products and using the forecast to determine the requirements of various factors of productions.
- Arranging for the procurement of required factors of production.
- Arranging for the services such as maintenance, store keeping, material handling, **inspection** and **quality control** etc. which are required to attain the targeted level of production.
- Effective utilization of the factors of production and service facilities available to produce the product.

Production management framework in apparel industry:

The division of production management functions into 5P's (product, plant, program, process and people) will provide useful conceptual framework for the various activities performed by production or operations manager.

Following are the Five P's:

1. Product:

Product is the link between production and marketing. It is not enough that a customer requires product but garment factory must be capable of producing the product. As per the product policy of the organization an agreement is reached between the various functions on the following aspects of the product:

- Performance
- Quality and reliability
- Aesthetics and ergonomics
- Quantity and selling price
- Delivery schedule

To arrive at the above, the external and the internal factors which affects the various aspects such as market needs, existing culture and legal constrains and the environmental demands should be given due consideration. Thus the major policy decision regarding variety of product mix is going to affect the production system.

2. Plant:

The plant accounts for major investment. The plant should match the needs of the product, market, the worker and the organization. The plant is concerned with:

- Design and layout of buildings and offices
- Reliability, performance, maintenance of equipment
- Safety of operation
- The financial constrains

3. Processes:

There are always a number of alternative methods of creating a product. But it is required to select the one best method which attains the objectives.

In deciding about the process, it is necessary to examine the following factors:

- Available capacity
- Manpower skills available
- Type of production
- **Plant layout**
- Safety
- Maintenance required
- Manufacturing costs

4. Program:

The program here refers to the time table and sequence of production. Thus the program prepares schedules for:

- Purchasing
- Transforming
- Maintenance
- Cash
- Storage & Transport

5. People:

Production depends upon the people. The people vary in their attitudes, skill and expectations from the work. Thus to make best use of available human resource, it is required to have a good match between people and job which may lead to job satisfaction. The production manager should be involved in issues like:

- Wages/salary administration
- Conditions of work/safety
- Motivation
- Training of employees

Thus production management encompasses these 5 P's overlapping each other to attain the goal.

Source: <https://fashion2apparel.blogspot.com/2017/04/production-management-system-apparel.html>

How to Make an Operation Bulletin for a Garment?

An Operation Bulletin is one of the primary IE tools. An OB helps to set a production line with the correct number of machines and manpower. To make it easy for learners I have explained OB making process step by step. Prior to using these steps for making an OB, you need to know [how to determine operation SMV](#), calculation of [machine requirement](#) and how to make operation breakdown of a garment.

Step #1: Prepare an OB format.

You need a computer with a spreadsheet (Excel sheet) to make this format and to do calculations quickly. In the image at the bottom, I have shown one sample operation bulletin. You can copy this format for your use or make one yourself. On the header add details like style#, Buyer, Order Qty. etc.

Add formula to the cells for auto calculation when you feed SMVs. The formula for each column has been given in the following steps. Cells highlighted with gray colors are set with formula. A basic operation bulletin contains the following information.

- Daily working hours
- Target output per day or per hour
- Total SMV (Sewing SMV and Non-sewing SMV)
- OB prepared by (Name of the Engineer)
- Job code
- Operation description
- Machine description
- SMV @ 100% Efficiency

- SMV @ target efficiency%
- Calculated production per hour
- Name of the Folder and attachment if used
- Calculated no. of machines
- Actual no. of machines
- Estimated production per unit hours
- Any remarks
- Machine summary list

Step #2: Collect correct Sample

Once you have OB format ready collect your style (reference sample). When you collect a sample from sampling room or merchants make sure that you got approved sample, or you have to do rework later.

Step #3: Make operation breakdown for the sample

Look into garment construction in details. To have better understanding first break garment into parts (like a collar, front, back etc.). Then list down operations in your notebook according to the section you made. Once you have listed all operations cross-check with garment again and visualize that if all operations are done as per your list you will get an exactly complete garment as per your sample garment. Now enter operations in your format (computer spreadsheet) as per sequence to be performed in line.

Step #4: Define machine for each operation

Based on seam type used in a style you may need to use different types of sewing machines for different operations and manual workstations. Select one machine and enter into the sheet against each operation. Also, enter name and description of attachments or folder or guides if needed for an operation.

Step #5: Enter SMVs for each operation

This step is the most critical in term of how you get SMVs, right? You have to find SMVs by conducting time study or existing database. Mention source of SMV (time study or MTM2 database). You can convert SMVs in based on your target line efficiency%. It is optional. In the following example, SMV is shown at 100% efficiency and also converted SMVs into Target efficiency (i.e. 60%). Refer to the formula.

$$\text{SMV at Target Efficiency} = \text{SMV @ 100\% efficiency} / \text{Target efficiency\%}$$

Step #6: Calculate calculated production per hour

Calculate production per hour at target efficiency%. In the following example, I have shown it at 100% and Target efficiency (60%). Formula used -

$$\text{Calculated Production/Hour @ target efficiency} = 60 / \text{Operation SMV @ target Efficiency}$$

Step #7: Calculate number of machines

To make a garment as per your target you need to install a sufficient number of sewing machines. You will get fraction number of machines (with decimal) in this calculation. In the next column add a number of machines manually round figure for machine numbers. Combine two operations in a single machine where possible, i.e. required machine no. is less or equal to half.

$$\text{Calculated Machine number} = (\text{SMV @ target efficiency} * \text{Hourly production target} / 60)$$

Or

$$\text{Calculated Machine number} = (\text{SMV @ target efficiency} * \text{Daily production target} / \text{Total minutes in a shift day})$$

You can also use pitch time for the calculation of calculated machine number. Formula:

Calculated Machine number = operation SMV / Pitch.

Step #8: Calculate estimated production per hour

It is calculated according to the machine assigned to each operation. It may be different for few operations than calculated production per hour (step #6) as you set machine numbers to round up value. Formula used -

Estimated Production/Hour = (No. of machine assigned * Hourly target qty.)/Calculated no. of machines

Step #9: Calculate Machine Summary

At the bottom of the OB add one table for machine summary. This table will help you to quickly find how many actual machines are required for each machine types. In this table add formula to calculate machine summary automatically when you enter the number of machines. See following sample OB sheet.

Your Operation Bulletin is ready.

Source: <https://www.onlineclothingstudy.com/2012/08/how-to-make-operation-bulletin-for.html>

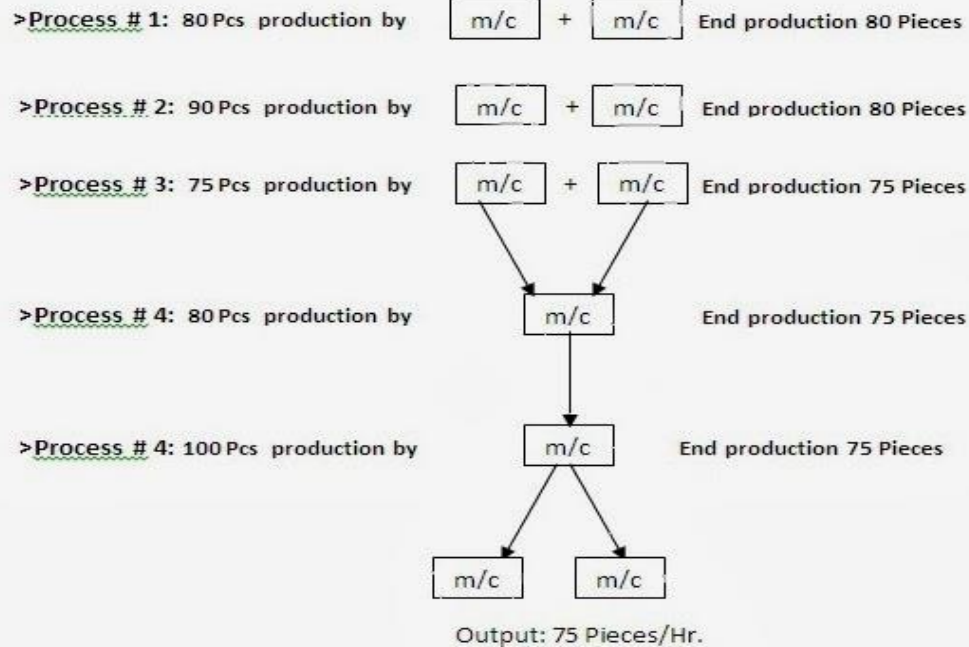
Image 1: Sample Operation Bulletin Sheet

OPERATION BULLETIN

STYLE	#35427	STYLE DESC.	SHIRT	BUYER	GAP							
TARGET EFF%	60%	OPR. SMV	25.238	ORDER QTY.	50000							
SHIFT MINS	480	NON-OPR SMV	5.71	OS PREPARED ON	4-Sep-12							
TARGET/DAY	400	TOTAL SMV	30.948	OS PREPARED BY	Rajesh							
Seq. #	Job Code	Operation Description	Machine Desc.	SMV @ 100%	calculated prodn / Hr. @ 100%	SMV @ 60%	calculated prodn / Hr. @ 60%	Folders & Attachments	No. of Calculated M/C @ 60%	No. of operator allocated	Prod./hr @ 60%	REMARKS
		Collar Making										
1	110	Mark Lining	Manual	0.24	255	0.39	153		0.3	1	153	
2	120	Collar run-stitch	SNLS w/ cutter	0.73	82	1.22	49		1.0	1	49	
3	130	Collar turn & iron	Turning M/c	0.33	181	0.55	109		0.5	1	109	
4	140	Collar top-stitch	DNLS	0.52	115	0.87	69		0.7	1	69	
5	150	Collar Band Hem	SNLS	0.53	113	0.89	68		0.7	1	68	
41	735	Collar Attach	SNLS	0.95	63	1.58	38		1.3	1	38	
42	740	Collar Close & insert label	SNLS w/ UBT	0.78	77	1.30	46		1.1	1	46	
43	745	Cuff attach & close	SNLS w/ UBT	1.38	43	2.30	26		1.9	2	52	
44	750	Bottom Hem	SNLS w/ UBT	0.93	65	1.54	39	Folder	1.3	1	39	
45	755	Button Hole - Pike & Collar	BH m/c	0.50	120	0.83	72		0.7	1	72	
46	760	Button Attach	Buttoning m/c	0.50	120	0.83	72		0.7	1	72	
		TOTAL SMV		30.95		51.58			42.98	48.00		

M/c Desc.	SMV @ 100%	Calculated M/C No. @ 60%	Actual M/C No. @ 60%
SNLS	11.13	15.5	18.0
DNLS	2.07	2.9	3.0
SNLS w/ UBT	7.98	11.1	8.0
FOA	0.84	1.2	1.0
STOL	0.00	0.0	0.0
3TOL	0.00	0.0	0.0
SNLS w/ cutter	1.53	2.1	2.0
BH m/c	0.50	0.7	1.0
Buttoning m/c	0.50	0.7	1.0
Turning M/c	0.68	0.9	2.0
MANUAL	4.06	5.6	9.0
Iron Table	1.65	2.3	3.0
TOTAL :	30.95	42.98	48.00

Machine layout for balancing production.



Line Balancing

Line Balancing is leveling the workload across all processes in a cell or value stream to remove bottlenecks and excess capacity. A constraint slows the process down and results in waiting for downstream operations and excess capacity results in waiting and absorption of fixed costs.

It is the allocation of [sewing machine](#), according to style and design of the garments. It depends on what types of garments we have to produce. It is done to increasing [productivity](#).

When you consider mass production, garments are produced in lines or set of machines instead of single machine. A line may be assembly line, modular line or section, a line set with online finishing and packing. A line includes multiple work stations with varied work contents. Production per hour is varied depending on work content (standard minutes of particular task/operation), allocation of total manpower to a particular operation, operator skill level and machine capacity. Operation with lowest production per hour is called as bottleneck operation for that line.

For more valuable information please visit:

<https://textilelearner.blogspot.com/2013/09/line-balancing-in-apparel-production.html>

Sewing Defects Solve with Root Causes and Corrective Actions

Reducing sewing defect is the key task for garments quality management and it is one of the challenging jobs. This article is all about solving sewing defects/faults. Here I have listed total 15 defects of garments, root causes and corrective action to reduce them. After reading this article hopefully, you will be able to know how it is possible to reduce Sewing Defects Solve with Root Causes.

Sewing Defects Solve with Root Causes

Corrective Actions of Sewing Defects

ROOT CAUSE OF SEWING DEFECTS

- Machinery
- Manpower
- Mother-nature
- Method
- Materials
- Measurement

- => Broken stitches
- => High-low
- => Puckering
- => Oil / stain / dirt / rust/spot
- => Fullness
- => Stitches skipped
- => Incorrect operation
- => Untrimmed threads
- => Crooked
- => Shining mark
- => Poor repair
- => Hole
- => Washing effect poor
- => Off shade
- => Puckering

For more information please visit: <http://ordnur.com/sewing/sewing-defects-solve-with-root-causes/>

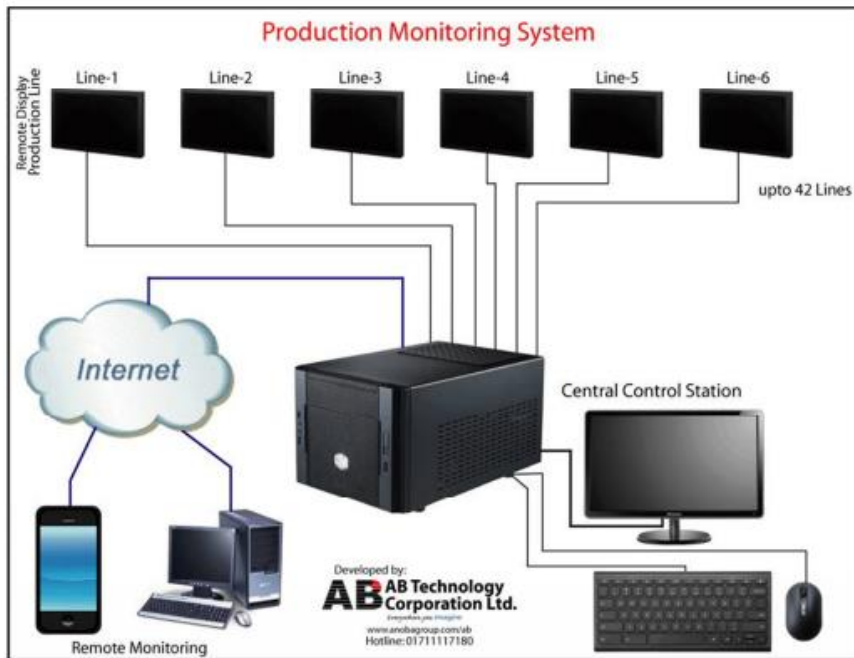
Garments Production Monitoring System

In a garment factory, production manager's day starts with production reports. Production manager enters to factory floor with questions such as -

- How many garments are made last production day by each line? Compare actual production with production target given to the floor in-charge and line supervisors.
- What were the issues for low productions? Why too much quality issues?
- Who is responsible for not achieving yesterday's target?

Production managers get answers of their question in reports with data. In this industry, line supervisors are very smart to tell you numbers to show good line performance and hide their shortfall. So, instead of discussion and verbal reports most of the managers believe on Anoson Garments Production Monitoring System.

Anoson Garments Production Monitoring System v1.0



Source: <http://www.abtcl.com/downloads/Production%20Monitoring%20System.pdf>

Videos:

	RFID TECHNOLOGY IN APPAREL INDUSTRY https://www.youtube.com/watch?v=xpgzSng087c Duration: 00:04:09
	Production process https://www.youtube.com/watch?v=OngDNbMhNOQ Duration: 00:05:56
	Improve Operator Efficiency - Manufacturing https://www.youtube.com/watch?v=Z61Uii5K2j8 Duration: 00:02:27

INDUSTRIAL GARMENT EXPERT



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Module-4

LEARNER GUIDE

National Vocational Certificate Level 4

Version 1 - April, 2019

Module 4: Manage quality during production.

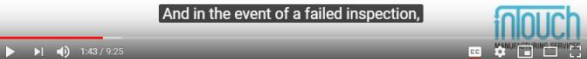
Objective of the module: This competency standard covers the skills and knowledge required to perform quality parameters for maintaining the production in time. It also covers clock wise inspection, identify defects and generate AQL reports.

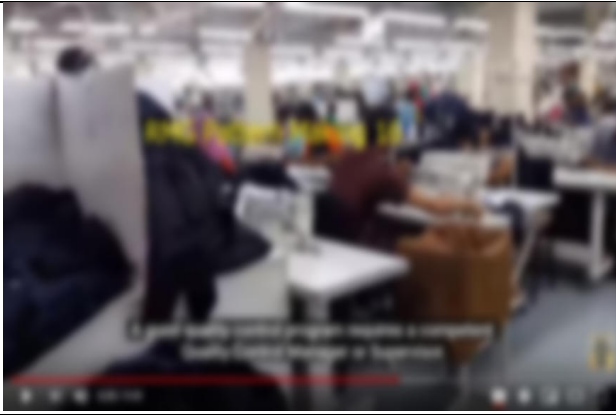
Duration: 140 hours **Theory:** 28 hours **Practical:** 116 hours

Learning Unit	Learning Outcomes	Learning Elements	Materials Required
LU1. Perform clockwise inspection.	The trainee will be able to: Apply clockwise inspection as per approved sample. Identify and segregate defects for each operator's performance. Calculate DHU (Defects Hundred Unit) as per industry standards. Generate report for finalize clockwise inspection.	Understanding and advantages of clock wise inspection techniques, Also discuss the disadvantages of not following clockwise inspection. Analyze the defects as per requirements and segregate defected product for evaluating the individual's performance Knowledge of technique about DHU (Defects Hundred Units) as per industry requirements Preparing the report of clockwise inspection for finalization	Arrow stickers Checking Table Calculator DHU Format
LU2. Maintain Acceptable Quality Level (AQL)	The trainee will be able to: Follow Acceptable Quality Level (AQL) as per requirement. Identify lot for inspection. Rework if inspection of lot has failed.	Ensuring the lot selection by using AQL chart for inspection Knowledge of garment zone (A,B,C) Knowledge of classification of defects (major, minor and critical) Types of Acceptable Quality Level (AQL) which may differ from buyer to buyer or product to product.	AQL Chart Inspection Report Format Calculator Computer Camera Barcode Reader Reference sample

	Generate AQL Report.	Importance of re-inspection and factors involved i=during re-inspection if lot is failed. Creating of detailed report of Acceptable Quality Level	
LU3. Verify product measurement and weight	The trainee will be able to: Measure product as per spec sheet. Weigh product as per requirement. Select size set as per requirement. Generate report on company's standard format.	Knowledge of measurement and weight of product. Knowledge of sample size and types to calculate weight / size of the product. Understanding the techniques to verify the product measurement and weight. Generating report on company's standard format.	Measuring Tape Weighing scale
LU4. Apply Traffic Light System	The trainee will be able to: Inspect seven samples randomly from product lot to maintain quality as per standards. Identify and report problem to supervisor as per SOP. Generate report as per requirement.	Knowledge of traffic light System at garment industry. Knowledge of sewing defects and their possible remedies. Understanding the differences between inspection tools in garment industry with importance of traffic light system. Importance and usage of three different types of color cards used for traffic light system inspection. Creating report for this system and calculate the working efficiency.	Flag (Yellow, Red, Green) Computer TLS Format

Videos:

 A close-up video showing a person's hands inspecting a blue and yellow garment, likely a shirt, for defects. The video player interface at the bottom shows a progress bar at 0:15 / 1:40.	Clock Wise Inspection https://www.youtube.com/watch?v=Q6iggHZWFEM&t=2s Duration: 00:01:40
 A video showing a person standing at a table, inspecting a white garment. The table is covered with various items, including a yellow bag and some papers. The video player interface at the bottom shows a progress bar at 4:16 / 6:00.	Garments Inspection Method https://www.youtube.com/watch?v=jOYh5oP4-IQ Duration: 00:06:00
AQL = Acceptable Quality Limit  A video player interface showing a progress bar at 1:43 / 9:25. A subtitle at the bottom reads "And in the event of a failed inspection,". The logo "inouch" is visible in the bottom right corner.	How to Use the AQL Table for Product Sampling and Inspection https://www.youtube.com/watch?v=Va3MUdVU1GA Duration: 00:09:25



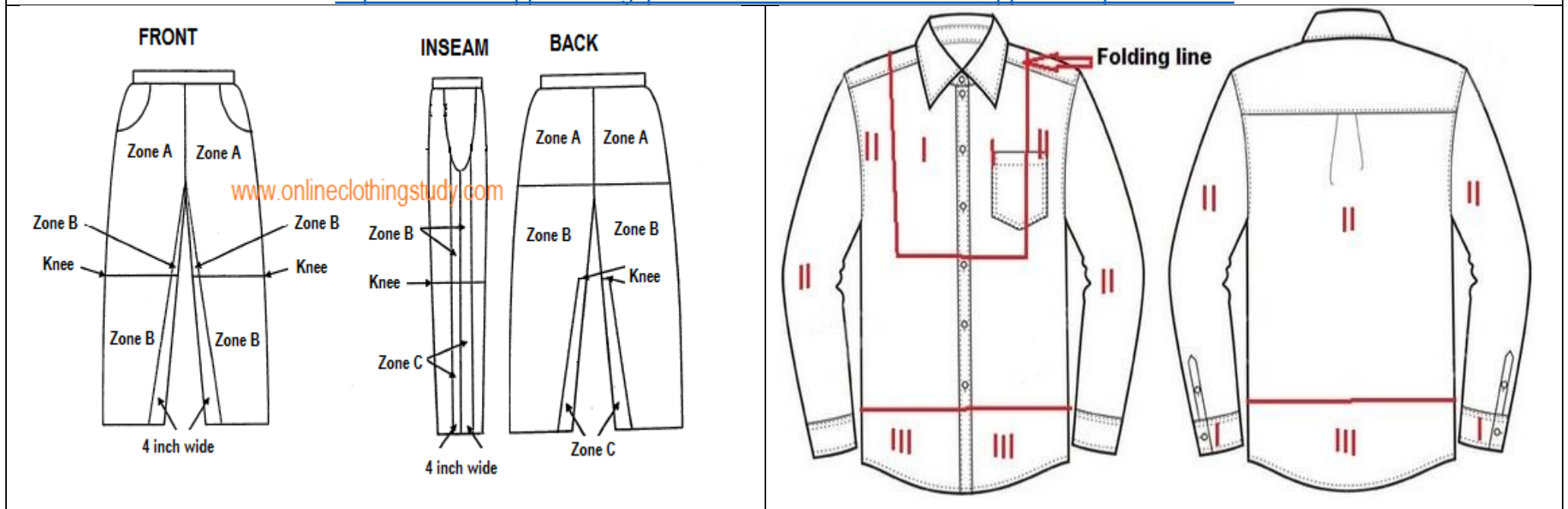
Quality control Guide Line | [DETAILED] In-process quality guide line

<https://www.youtube.com/watch?v=wlwJdlhdnB0>

Duration: 00:09:49

Classification of Defects Zone in Apparel during Visual Inspection

<https://fashion2apparel.blogspot.com/2017/01/defects-zone-apparel-inspection.html>



 2+ 7 pieces checked by each operator If 2, or more faults found out of 7 pieces, stop production and take immediate action 1 If 1 fault found out of 7 pieces check another 7 pieces. If OK, proceed 0 If 0 faults found out of 7 pieces. Continue production	What Is Traffic Light System <i>Traffic light system is the most effective inspection tool to reduce defect generation at source.</i> This is a random inspection system. Traffic light system is more effective in controlling shop floor quality than other quality tools because of its visual communication. At the same time it measure operators performance level in quality. No operators like to be presented themselves as lower quality makers. They concentrate on quality aspect during stitching garments. Inline checking system will alert operators in concentrating their job. If less number of defective seam is made, less the time will be lost in repairing it. It also helps in other way. May be at the start of the style an operator do not understand the specification, an interaction with quality inspector will make an operator clear about the quality requirement. Traffic Light System is designed to flag the problem at source and allow immediate corrective action rather than all potentially defective product to continue to be manufactured.
https://www.slideshare.net/Spartanking1/traffic-light-system-51415698	https://www.fibre2fashion.com/industry-article/6990/traffic-light-system-a-visual-quality-control-tool



AQL Random Sampling Inspection:

The AQL random sampling inspection was derived from the mathematical theory of probability and is based on the sampling scheme defined in military standard 105D (MIL -STD - 105D).

This method constitutes taking random sample from a lot of merchandise, inspecting them and depending on the quality of the sample inspected, determining whether the entire lot is acceptable or not. The MIL - STD - 105D (also BS 6001, ISO 2859, DIN 40080) provides the sampling plans; and these determine the number of samples of be inspected in lot size, in addition to indicating and the acceptable quality level (AQL) which represents the maximum number of defects per hundred units that, for the purpose of the sampling inspection can be considered satisfactory as a process average. Details at: <https://www.fibre2fashion.com/industry-article/3731/various-methods-of-inspection-systems-for-apparels>

Also visit for AQL: <https://textilelearner.blogspot.com/2013/07/acceptable-quality-level-aql-in-apparel.html>

What is DHU? How to measure DHU?

There are two common quality measures used in garment manufacturing

- Number of defects and
- Number of defective garments found in inspected garments

To understand DHU, first, you have to know the term 'defects' in garments and 'defective garment'. To many people, these two terms are not completely clear. The terms defect and defective have been explained [here](#).

In garment production processes, quality checking stations are set for stopping defects at the source and stopping defective garment passing to the following processes. Normally, checking is done for raw materials, partially stitched garments, stitched garments and finished garments by quality checkers.

In checking, quality checker detects defects in garments and separate defective garments from good pieces. Where there is established quality system, quality checker records the total number of defects found in the garments checked by her/him in a day and also she/he records the number of defective garments where those defects are found. Quality checking records are summarized and the result is presented in DHU.

What is DHU?

DHU stands for **Defect per Hundred Units**. It means a number of defects found or detected per 100 garments. This is also known as DPHU (Defects Per Hundred Units).

DHU value is calculated using the following formula.

$$\text{Defects per hundred units} = (\text{Total defects found} * 100) / \text{Total garments inspected}$$

An example: Assume that a finishing checker checked 250 garments in a day. Checker found 20 defective garments and he recorded 35 defects in those defective pieces. What is the DHU of finishing the process?

Solution: By using the above formula DHU of the finishing goods is

$$= (35 * 100 / 250)$$

$$= 14$$

How to measure DHU?

To measure DHU of any process, one needs to record a number of total pieces checked and the number of total defects is detected in the inspected garments. It is a number of defects, not the defective garments. One defective garment may have more than one defects. Like a checker found broken stitch, a hole and raw edges in a shirt. Here checker found one defective shirt but the defective shirt contains 3 defects.

Once you have a record of the following information of a lot you can measure DHU of that lot using the above formula.

1. Total pieces inspected
2. Total defects found in those inspected pieces

The following table can be used for data capturing during the garment inspection.

Quality Inspection Format				
(Use tally mark for data recording)				
	Number of defects found	Number of pass garments	Number of defective garment	Total pieces checked
Hour -1	### ///	25	5	30
Hour -2	### /	20	6	26
Hour -3				
Hour -4				
Hour -5				
Hour -6				
Hour -7				
Hour -8				
Total	14	45	11	56
DHU =25 (14*100)/56		DHU = (100 X Total defects found / No of pieces inspected)		

Source: <https://www.onlineclothingstudy.com/2013/10/what-is-dhu-how-to-measure-dhu.html>

Objective with specific Aims

- Identifying a set of defects occur in the production system.
- Evaluating the major defects by statistical analysis.
- Obtaining sigma level of the current state of the quality.
- Finding the background causes of the major defects.
- Proposing the appropriate tool to reduce the defect rate.

2

Six Sigma Approach for Industrial Quality Improvement and Defect Elimination

<https://www.slideshare.net/MdInjamamulHaque/six-sigma-approach-for-industrial-quality-improvement-and-defect-elimination>

26 slides

Summary of the module:

Module Title and Aim	Learning Units	Timeframe of modules
Module : Prepare marker for production Aim: This competency standard is designed to provide skills and knowledge to digitize pattern, grading and create marker for production through CAD/CAM.	LU1: Interpret spec sheet LU2: Digitize pattern LU3: Perform size findings LU4: Prepare marker	100
Module : Manage sewing production Aim: This competency standard covers the skills and knowledge required to manage sewing production through layout, line balancing and get production in time.	LU1: Apply layout LU2: Prepare line balance LU3: Monitor production	200

Module Title and Aim	Learning Units	Timeframe of modules
Module : Manage quality during production Aim: This competency standard covers the skills and knowledge required to perform quality parameters for maintaining the production in time. It also covers clock wise inspection, identify defects and generate AQL reports.	LU1: Perform clockwise inspection. LU2: Maintain Acceptable Quality Level (AQL) LU3: Verify product measurement and weight LU4: Apply Traffic Light System	140

Test Yourself (Multiple Choice Questions)

Question/	Candidate's answer
1. Define grain line?	
2. Describe size grading?	
3. Define types of pattern design?	
4. Enlist marker types??	
5. Explain operating procedures to take the print out on plotter?	

Question/	Candidate's answer
6. Enlist tools requires for marker preparation for production?	
7. Define importance of wastage during design a maker for production?	
8. Define methods of spreading?	
9. Define drill point and notches?	
10. To digitize a pattern you place it on a) Plotter b) Computer c) digitizing board Table	
11. Name the means of managing production	Layout plan Line balancing Operation bulletin WIP report

Question/	Candidate's answer
12. To monitor production you will a) Prepare OB b) Make pattern c) Design a sample garment d) Refer to production planning chart.	
13. SAM is a) Style and material b) Standard allowed minute c) Standard apparel manufacturing d) Stitching and monitoring	
14. How will you find out about defect percentage?	Through root cause analysis DHU check Defects per hundred unit
15. What is lean manufacturing...	To remove cluster
16. What is traffic light system?	
17. Explain Industrial engineering in garment production.	IE application in production Industrial engineering will Chart out the work

Question/	Candidate's answer
18. Define six sigma concept	a set of management techniques intended to improve business processes by greatly reducing the probability that an error or defect will occur.
19. Name 3 main fabric defects	
20. What is the importance of first aid box why it should be available on floor?	
21. What is meant by AQL?	Acceptable quality level
22. How do you calculate DHU?	Defects per hundred units, $\text{DHU} = \frac{\text{Total \# of defects} \times 100}{\text{Total \# of pieces checked}}$
23. What are the means of verifying a product	Check the product against sample / requirement

Question/	Candidate's answer
24. Efficiency is calculated on a) Daily basis b) Weekly basis c) Monthly basis d) Hourly basis.	Hourly basis
25. Name any THREE types of sewing machine in production line.	Single needle lock stitch Double needle lock stitch Feed of the arm machine
26. What are the key measures to make environment safe?	
27. RCA stand for?	Root Cause Analysis
28. WIP is stand for?	Work IN Process
29. SAM is stands for?	Standard Allowed Minute

Question/	Candidate's answer
30. What is the purpose of OB?	OB is prepared for line balancing.

