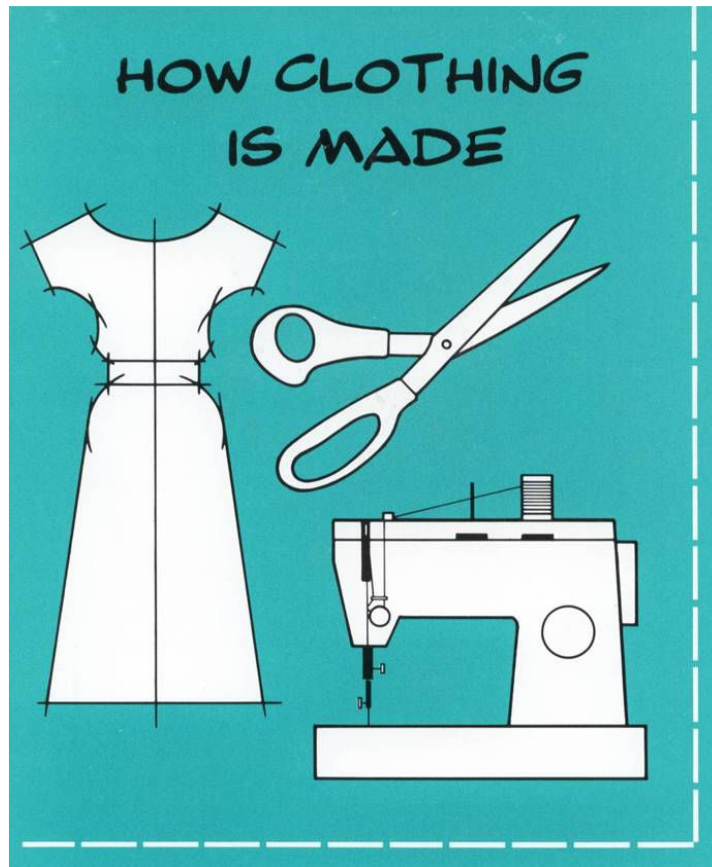


# How Clothing Is Made



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# How Clothing Is Made

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# How Clothing Is Made

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# The Program

## Summary

The average person spends about two thousand dollars a year on clothing and buys over twenty-five items of outerwear. Do massive clothing “factories” churn out garments using high speed assembly lines and robotic sewing machines? Our video crew will take your students behind the scenes at Henry-Lee Apparel Company in Chicago, a family business that makes over five hundred styles a year for six brand lines. Follow each step of garment production from its start as raw fabric to its shipment to a retail outlet.

- Learn how a garment is created, from the first design sketch to the retail store.
- Follow the design process as a sample is created for each adopted style from a handmade pattern.
- Learn about the efficient “cut to order” system that allows Henry-Lee to sell first and mass produce later.
- Discover how the cost of materials, labor, and overhead affect a garment’s pricing.
- Watch how a production pattern is created and graded.
- Learn how manufacturers guarantee the quality of their materials and minimize waste fabric.
- Learn how technology has impacted the manufacture of clothing.
- Learn how garments are assembled and sewn.
- Hear the company president discuss the advantages and drawbacks of overseas garment assembly.

# From Design To Sample Garment

Your closet is full of clothes. But do you know where they came from? Before a garment ends up in your dresser, it needs to be designed, cut from carefully-chosen fabric, sewn together, and shipped to retail stores. Before you can wear a shirt, coat, or skirt, it must pass through the hands of a team of apparel industry professionals who put their skill and labor into its production. To explore the world of garment production, we'll look behind the scenes at Henry Lee and Company, a Chicago-based manufacturer that makes women's clothing under seven brands: Henry-Lee, Henry-Lee Petites, Diane Roberts, Lila Ryan, RTM, 600 West, and Meritage. Henry Lee is a small, family-run business, but their process of designing and manufacturing clothing is much the same as some of the giants of the industry. According to Rob Mann, Henry Lee's president, the company uses its smaller size to its advantage, seeking out niches and underserved areas and meeting their needs with flexibility that larger companies might not be able to achieve.

## Fabric and design

All clothing must begin with a design. For some manufacturers, this begins with a designer's sketch, but Henry Lee begins by choosing fabrics before any designs are made. The company sends scouts to fashion centers like New York and Paris to discover the latest and greatest fabrics on the market. After collecting fabric swatches, Henry Lee will order larger samples of the best fabrics and send them to designers.

The designers will examine the cut of the fabric, matching it with buttons and trims from inventory and considering what kind of garment it could become. Once the designer has an idea of what she wants to create, she will drape the fabric on a dress form to help visualize the finished garment, drawing a sketch from the draped design. Next, the designer will create a pattern so that the sample sewer can create a finished sample of the garment. There are two ways this pattern can be created: either by pinning muslin fabric pieces on the dress form or by cutting a flat pattern from heavy manila paper.

Creating the pattern can be one of the most difficult parts of designing a garment, and it can take years to learn. Designers are educated in their field, but in addition to what they've learned in the classroom, they need to gain practical experience as well. Most will have an apprenticeship or internship with a clothing company to gain hands-on experience.

## Samples and the production patterns

Once the sample pattern has been created, a skilled sewer will create a full sample of the garment design. The design team will adjust the style and fit of the garment several times, assigning a number to each different adopted style and keep track of what is slated for production. Henry Lee makes about 500 different styles a year.

Next, Henry Lee makes a limited run of sample garments. This sample run is made in a single size, usually an eight or ten, rather than a full range—just enough for sales representatives to show the designs to potential customers. The sales representatives bring the samples to retail stores and catalog marketers, who place orders based on the samples. Henry Lee then **cuts to order**, producing full runs of garments only after orders have been placed. Some other manufacturers **cut to stock**, meaning that they manufacture full runs before any orders have been placed. Cutting to order is better for small companies like Henry Lee—it helps them to ensure that what they make will sell.

Once the orders are placed, the selected styles go into production. A card is attached to each sample that serves as a sort of ID card, detailing the style, trim, size, and fabric, plus other production notes. Once this is done, the production patterns are made from the sample. Some companies do this step by hand, tracing the sample onto paper. Henry Lee uses a high-tech digitized table that allows a technician to trace the key points of the sample on a computer screen. This creates a digital pattern that's easy to adjust. Computers also grade the pattern. The differences between sizes are complex, so each size needs its own pattern. The process of sizing the pattern up or down is called **grading**.

# Pricing And Cutting Costs

## Pricing

Garment pricing is determined by a complex formula that takes into account the cost of raw materials like fabric and supplies, the cost of labor for sewing and cutting, additional expenses like shipping, and the company's general **overhead**—the cost of operating the company, which includes rent, employee salaries, equipment, and the manufacturer's profit. Labor costs are determined very carefully. The company determines an exact number of motions required to create the garment, and assigns a specific amount of time and cost for each motion. For example, for a suit, setting the zipper is estimated at 3.5 minutes, assembling and setting the lining at 14 minutes, and attaching the buttons at 2 minutes. Here's the cost breakdown for a three-piece suit from Henry Lee:

\$31.94	Fabric
\$ 1.27	Trims
\$ .95	Additional Supplies
<b>\$34.16</b>	<b>Total Materials Cost</b>
\$30.00	Labor Costs - The suit takes 55 motions totaling over 130 minutes
\$ 5.15	Labor Costs - Cutting the pattern from the fabric
\$63.31	Company Overhead
\$ 1.02	Miscellaneous Costs
<b>\$99.48</b>	

So the total cost of the suit is \$133.64. This is the **wholesale price**—what the retailer pays to get the suit on the rack in a store. The store may double the wholesale price in order to cover its own expenses and profit to arrive at a **retail price** of \$268.

## Cutting costs

Companies are always looking for ways to cut costs. Lowering the wholesale price can raise the manufacturer's profit margins, but it can also significantly lower the cost to the consumer. Since retailers often double the wholesale price, a dollar saved at the level of production can mean two dollars saved by the consumer. Lowering prices can mean bigger sales, better profits, and happier customers.

One way clothing manufacturers cut costs is by using a **marker** when cutting fabric for each garment. Using a computer program, a technician arranges the pattern on the fabric in such a way as to minimize the amount of fabric wasted. The marker is a kind of road map to the fabric that helps the fabric cutter to get the most out of the material. With a marker, the fabric becomes a sort of reverse jigsaw puzzle. The marker is made by a large printer called a **plotter**. It's copied many times, because a new marker is used each time the fabric is cut. With a good marker, 90 to 95% of the fabric is used; Henry Lee strives for at least 80-85%.

Choosing where to manufacture is another place where costs can be cut. Many manufacturers assemble their clothing overseas, where production costs are much lower. In the far East, China, Mexico, Africa, and Southern Europe, clothing manufacturers can create their products with much lower labor and overhead costs. Indeed, the clothing industry was one of the first to go global. However, there are cost drawbacks to overseas production as well. Even though the overall production cost is lower, the finished garments still need to be shipped to the United States. The cheapest way to do this is by boat, but that's a slow method—it can take as much as a month, and in the fast-paced world of fashion that's longer than some manufacturers are willing to wait. Air shipping is significantly more expensive. It's also harder to inspect garments for quality if they're assembled overseas. For these reasons, Henry Lee manufactures its clothing in the United States, and often locally in Chicago. This increases the speed with which they can get their product to their customers and gives Henry Lee more control over the production process.

# Production

## Cutting the fabric

The manufacturer times the ordering of its raw materials so that everything arrives around the same time. For instance, the trim buyer will order all of the buttons, snaps, shoulder pads, interfacing, and anything else that will be sewn on the garment while the pattern is being made. The fabric is inspected on a **roller** machine that shines a bright light on the fabric, allowing a technician to inspect it for tears, spots, printing mistakes, or other flaws. The machine also measures the exact length of the fabric.

The first step in production is to put the fabric through a **spreader**. The spreader creates multiple layers of fabric that can be cut all at once. Thick fabrics can't be cut in as many layers as thin fabrics, but some of the thinnest fabrics are slippery and may slide around if they're folded into too many layers. A heavy fabric may be cut 10-25 layers at a time; a thinner fabric can be cut in as many as 100 layers or more. With a high-tech computerized cutting system, several hundred are possible because the machine uses a vacuum to hold the fabric down and remove any air between the layers while a laser precision-cuts the material.

With patterned fabrics, things can be more complicated. It's important for the patterns or stripes to line up with the pattern, so the cutter may use material from the unused section of the marker and nail the fabric down to the cutting table to hold the fabric in place. Technology has impacted this production step as well—there are computer programs available that automatically match fabric layers and pattern pieces.

Each order is accompanied by a specification sheet or **specs sheet** that gives detailed information about style, fabric, and other production requirements.

## Assembly and shipping

Once the fabric has been cut, the pieces are assembled into finished garments. This can be done in two ways. **Progressive bundling** is a sort of assembly line where each machine operator sews one or two sections before passing it on to another operator. In the second method, called **whole garment**, a single operator sews the entire garment. Once the operators have completed all of the operations on the specs sheet, the clothing is completed and ready to ship.

The shipping department uses **pick tickets** to match the retailers' orders to the now-finished stock. Once the orders are assembled they're moved on a speed rail to the shipping station. The clothing is packed, the pick ticket becomes an invoice, and the orders are shipped out. Finally, the clothing arrives in retail stores for purchase by consumers like you.

Clothing manufacturers work seasons ahead. Today, Henry Lee is choosing fabrics for garments that will be in stores 10 months from now. According to company president Rob Mann, Henry Lee virtually reinvents itself every three months, creating 500 new styles every year. The clothing industry is always looking ahead, creating new styles to match the changing desires of its customers.

# Review

- All clothing starts with a design. Some companies begin with sketches, others, like Henry Lee, choose fabrics before having designers sketch ideas.
- First, the designer will create a sample pattern from draped fabric on a dress form. This pattern is used to create sample garments.
- The sample garments are shown to retail stores, who place orders based on them. Henry Lee then cuts to order. Other companies cut to stock, meaning they produce runs of garments before retail stores have placed their orders.
- The samples are used to create a production pattern. Each size needs its own pattern, and the process of sizing the pattern up or down is called grading.
- A garment is priced based on a complex formula that takes into consideration the costs of labor, materials, and the company's overhead—expenses like rent and salaries. These costs are added together to determine the wholesale price, what the manufacturer will charge retail stores.
- The manufacturer can cut costs by using a marker, a paper guide that minimizes the fabric wasted in cutting, and using a spreader to allow several layers of fabric to be cut at one time.
- Many manufacturers assemble their clothing overseas and have the completed garments shipped to the United States. This is cheaper than domestic production, but the shipping can be costly and slow.
- The pieces of the garment are assembled in one of two ways. In progressive bundling, each machine operator on the assembly line sews one or two pieces of the garment and passes it down the line to the next operator. In whole garment assembly, each operator assembles the complete garment.
- Once assembled, the garments are sent to the shipping department and out to retail stores.

## Interactive Elements

### Questions For Discussion

1. Discuss the ways in which technology has helped the clothing industry. What technologies have helped clothing manufacturers to produce higher quality products for less money?

*Computer design programs, high-tech cutting machinery like spreaders and laser cutters, and roller machines for inspecting fabric have all had a big impact on the speed with which companies are able to produce clothing. Telecommunications have also helped companies to communicate with overseas assembly plants.*

2. Discuss the pros and cons of overseas production.

*Producing clothing overseas is less expensive, but shipping assembled garments can be both costly and slow. Domestic production has higher labor costs, but much faster turnaround. Companies that produce clothing domestically can be ahead of the curve, which is important in the fashion industry.*

3. Many designers start by sketching ideas, but Henry Lee's designers look at fabric swatches before they begin to sketch designs. Where do you think the design process should begin?

*Starting with a sketch from the designer's mind allows unlimited freedom, but beginning with the fabric gives the designer a concrete, realistic sense of what the end product will be. There's a lot to be said for both techniques!*

4. The video describes two systems of production planning—cutting to stock, in which garments are produced before retail stores have placed orders, and cutting to order, in which nothing is produced until stores have ordered garments. Which of these would you choose if you were running a small clothing manufacturer? Would you use a different method if your company were a larger organization?

*Cutting to order helps smaller companies because it lessens the financial risk of creating an entire production run of a garment. Larger companies have greater resources at their disposal, and so the potential benefits of having their product in the stores sooner outweighs the risk of overproducing a garment.*

# How Clothing Is Made

## Evaluation/Testing

### Fill-In-The-Blank

Fill in the blanks with the correct words from the bank at the bottom of the page.

All clothing starts with a design. First, the designer will create a sample pattern from draped fabric on a dress form. This pattern is used to create \_\_\_\_\_ garments, which are shown to retail stores. Some companies \_\_\_\_\_, holding off production until retail stores have placed orders. Other companies \_\_\_\_\_, meaning they produce full runs of garments before retail stores have placed their orders. The samples are used to create a production pattern. Each size needs its own pattern, and the process of sizing the pattern up or down is called \_\_\_\_\_. A garment is priced based on a complex formula that takes into consideration the costs of labor, materials, and the company's \_\_\_\_\_—expenses like rent and salaries. These costs are added together to determine the \_\_\_\_\_ price, what the manufacturer will charge \_\_\_\_\_ stores. The manufacturer can cut costs by using a \_\_\_\_\_, a paper guide that minimizes the fabric wasted in cutting, and using a \_\_\_\_\_ to allow several layers of fabric to be cut at one time. The pieces of the garment are assembled in one of two ways. In \_\_\_\_\_, each machine operator on the assembly line sews one or two pieces of the garment and passes it down the line to the next operator. In \_\_\_\_\_ assembly, each operator assembles the complete garment. Once assembled, the garments are sent to the shipping department and out to retail stores.

#### **Word Bank:**

cut to order  
cut to stock  
grading  
marker  
overhead  
progressive bundling  
retail  
sample  
spreader  
whole garment  
wholesale

# How Clothing Is Made

## Fill-In-The-Blank Answer Key

Fill in the blanks with the correct words from the bank at the bottom of the page.

All clothing starts with a design. First, the designer will create a sample pattern from draped fabric on a dress form. This pattern is used to create [sample](#) garments, which are shown to retail stores. Some companies [cut to order](#), holding off production until retail stores have placed orders. Other companies [cut to stock](#), meaning they produce full runs of garments before retail stores have placed their orders. The samples are used to create a production pattern. Each size needs its own pattern, and the process of sizing the pattern up or down is called [grading](#). A garment is priced based on a complex formula that takes into consideration the costs of labor, materials, and the company's [overhead](#)—expenses like rent and salaries. These costs are added together to determine the [wholesale](#) price, what the manufacturer will charge [retail](#) stores. The manufacturer can cut costs by using a [marker](#), a paper guide that minimizes the fabric wasted in cutting, and using a [spreader](#) to allow several layers of fabric to be cut at one time. The pieces of the garment are assembled in one of two ways. In [progressive bundling](#), each machine operator on the assembly line sews one or two pieces of the garment and passes it down the line to the next operator. In [whole garment](#) assembly, each operator assembles the complete garment. Once assembled, the garments are sent to the shipping department and out to retail stores.

# How Clothing Is Made

## Multiple Choice Worksheet

Circle the best available answer for each of the following:

- 1) The price that a retail store charges the consumer is called the:
  - a) wholesale price
  - b) labor cost
  - c) overhead
  - d) retail price
- 2) A manufacturer that produces its garments before retail stores have placed their orders is:
  - a) using progressive bundling
  - b) cutting its costs
  - c) cutting to order
  - d) cutting to stock
- 3) A paper guide that minimizes the amount of fabric wasted in cutting is called a:
  - a) spreader
  - b) roller
  - c) marker
  - d) digitized table
- 4) A designer's salary is part of the:
  - a) labor cost
  - b) overhead
  - c) materials cost
  - d) retailer's markup
- 5) A good marker will allow the cutter to waste only \_\_\_\_\_ percent of the fabric.
  - a) 0
  - b) 1-2
  - c) 5-10
  - d) 25-30
- 6) This machine shines a bright light on fabric to help a technician look for flaws or tears.
  - a) spreader
  - b) roller
  - c) marker
  - d) digitized table
- 7) Henry Lee begins their design process by:
  - a) choosing fabric
  - b) creating a sample
  - c) taking orders
  - d) drawing a design
- 8) A spreader can fold a thick, heavy fabric in \_\_\_\_\_ layers.
  - a) 1-5
  - b) 10-25
  - c) about 100
  - d) several hundred
- 9) Manufacturing clothing overseas is \_\_\_\_\_ than manufacturing them domestically.
  - a) cheaper but slower
  - b) cheaper and faster
  - c) more expensive and slower
  - d) more expensive but faster
- 10) Labor costs are determined by breaking the assembly of a garment into a set number of:
  - a) progressions
  - b) trims
  - c) swatches
  - d) motions

# How Clothing Is Made

## Multiple Choice Worksheet Answer Key

Circle the best available answer for each of the following:

- 1) The price that a retail store charges the consumer is called the:
  - a) wholesale price
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  - a) progressions
  - b) trims
  - c) swatches
  - d) motions**

# How Clothing Is Made

## Quiz

Match the words in the first column to the best available answer in the second column.

- |       |  |                         |
|-------|--|-------------------------|
| _____ | A paper guide that minimizes the amount of fabric wasted in cutting  | 1) cut to stock         |
| _____ | What a garment manufacturer charges a retail store for their product   | 2) overhead             |
| _____ | An assembly system in which each machine operator sews an entire garment   | 3) wholesale cost       |
| _____ | A machine that folds fabric into multiple layers that can be cut all at once   | 4) progressive bundling |
| _____ | System used by manufacturers that assemble their garments before retail stores place orders  | 5) cut to order         |
| _____ | System used by manufacturers that wait until retail stores have placed their orders before producing any garments                  | 6) whole garment        |
| _____ | The expenses a manufacturer incurs in running their business, including rent, salaries, and other miscellaneous expenses           | 7) marker               |
| _____ | An assembly system in which each machine operator sews one or two pieces of the garment before passing it off to the next operator | 8) spreader             |

# How Clothing Is Made

## Quiz Answer Key

Match the words in the first column to the best available answer in the second column.

- |                         |  |
|-------------------------|--|
| 7) marker               | A paper guide that minimizes the amount of fabric wasted in cutting  |
| 3) wholesale cost       | What a garment manufacturer charges a retail store for their product   |
| 6) whole garment        | An assembly system in which each machine operator sews an entire garment   |
| 8) spreader             | A machine that folds fabric into multiple layers that can be cut all at once   |
| 1) cut to stock         | System used by manufacturers that assemble their garments before retail stores place orders  |
| 5) cut to order         | System used by manufacturers that wait until retail stores have placed their orders before producing any garments                  |
| 2) overhead             | The expenses a manufacturer incurs in running their business, including rent, salaries, and other miscellaneous expenses           |
| 4) progressive bundling | An assembly system in which each machine operator sews one or two pieces of the garment before passing it off to the next operator |

# Glossary

<b>Cut to order</b>	System used by manufacturers that wait until retail stores have placed their orders before producing any garments.
<b>Cut to stock</b>	System used by manufacturers that assemble their garments before retail stores place orders.
<b>Grading</b>	The process of sizing a pattern up or down.
<b>Marker</b>	A paper guide that minimizes the amount of fabric wasted in cutting.
<b>Overhead</b>	The expenses a manufacturer incurs in running their business, including rent, salaries, and other miscellaneous expenses.
<b>Pick ticket</b>	Order lists used by a shipping department to assemble and fill orders for individual retail stores.
<b>Plotter</b>	A large-format printer used for printing markers.
<b>Progressive bundling</b>	An assembly system in which each machine operator sews one or two pieces of the garment before passing it off to the next operator.
<b>Retail price</b>	What a retail store charges consumers for a garment.
<b>Roller</b>	A machine that shines a bright light on fabric so that a technician can easily identify tears, spots, and flaws.
<b>Specsheet</b>	A sheet accompanying a retail store's order that gives detailed information about style, fabric, and other production requirements.
<b>Spreader</b>	A machine that folds fabric into multiple layers that can be cut all at once.
<b>Whole garment</b>	An assembly system in which each machine operator sews an entire garment.
<b>Wholesale price</b>	What a garment manufacturer charges a retail store for their product.

# For More Information...

## Print resources

Frederick H. Abernathy, John T. Dunlop, Janice H. Hammond, and David Weil. ***A Stitch in Time: Lean Retailing and the Transformation of Manufacturing: Lessons from the Apparel and Textile Industries***. New York : Oxford University Press, 1999.

The apparel and textile industries have always been at the mercy of rapidly changing styles and fickle customers. As a result, businesses often are forced to forecast sales and order from suppliers with scant information about demand, leading to stock shortages, high inventories, and costly markdowns. Technological advances in the 1980s paved the way for a new concept—lean retailing.

David Birnbaum. ***Birnbaum's Global Guide To Winning the Great Garment War***. Hong Kong: Third Horizon Press, 2000.

A classic on garment costing, and the ultimate book for all garment industry professionals. Ideal for buyers, suppliers, manufacturers and those working to develop an apparel export industry.

Ruth E. Glock, and Grace I. Kunz. ***Apparel Manufacturing: Sewn Product Analysis (4<sup>th</sup> Edition)***. Upper Saddle River, NJ : Pearson/Prentice Hall, 2005.

This comprehensive text provides in-depth coverage of all facets of the apparel manufacturing process in the global industry. The coverage considers product development from the analysis phase through product standards, specifications and design phases.

Sue Pekarsky Gary and Connie Ulasewicz. ***Made in America: The Business of Apparel and Sewn Products Manufacturing (3<sup>rd</sup> Edition)***. Sebastopol, CA: GarmentoSpeak, 1998.

An excellent how-to book, containing a wealth of information, for apparel (and related industries) designer/manufacturers.

## Online resources

**The American Apparel and Footwear Association:** <http://www.apparelandfootwear.org/>

A national trade organization representing manufacturers and retailers of apparel, footwear, and other sewn products.

**American Apparel Producers' Network:** <http://www.aapnetwork.net/>

An association of companies who produce apparel worldwide for the American market.

**The Fashion Group International:** <http://www.fgi.org>

A professional association dedicated to promoting educational programs and public service activities related to fashion and design. Open to students.