

## Stitches & Seams Analysis (Ch.14, p. 428~475)

ADM4307 Apparel Manufacturing  
02/02/06  
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## Stitches & Seams Analysis

- Objectives:
  - Define stitch classifications, characteristics, and formation.
  - Identify seam classification, types, and uses.
  - Relate the properties of stitches and seams to production costs, performance, and quality.
  - Examine functions, characteristics, and selection of sewing threads and needles.
  - Examine the relationship between needles, thread, and fabric.
  - Analyze seam appearance and performance.

## Stitches and Seams

- Standards that defined stitches and seams:
  - The United States Federal Stitch and Seam Specification (Federal Standard 751a) in 1965.
  - ASTM D 6193, Standard Related to Stitches and Seams
- Definitions
  - A **Stitch**: is the configuration of the interlacing of sewing thread in a specific repeated unit.
  - A **Seam**: is a line where two or more fabrics are joined.
  - A **Stitching**: consists of a series of stitches embodied in a material for decorative purpose or finishing an edge.
- **Stitch classification** is based on:
  - Structure of the stitch and method of interlacing stitch properties.
- **Stitch properties**:
  - Relate to aesthetics and performance
    - Size, tension and consistency.

## Stitch properties

- **Stitch size** (3 dimensions)
  - **Stitch Length**: Stitches per inch (spi)
    - High spi – short stitches: High quality
      - Potential problems (seam pucker or weaken fabric).
      - Higher spi, the more time and thread, high cost.
    - Low spi – long stitches: Lower quality
      - Problems: Less durable, snagging, abrasion, grin-through
      - Fast, less thread, less cost.
      - Example: men's shirts 22 spi vs. 8 spi
  - **Stitch Width**:
    - Distance between the outermost lines of stitches. (Referred to as gauge, inch)
      - Example: overedge, zigzag, and cover stitches (1/4 inch)
    - Refers to the horizontal span covered in the formation of one stitch.
    - Width dimensions require multiple needles or lateral movement of thread carriers ( needle bars, loopers, and spreaders).
  - **Depth**:
    - Distance between the upper and lower surface of the stitch
      - Example: Blind stitches (Curved needle with lateral movement)

## Thread tension and Stitch consistency

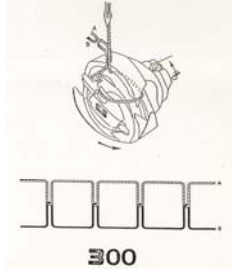
- **Thread tension**
  - Thread tension affects stitch formation in 2 ways:
    - The balance of force on the threads that form the stitch.
    - The degree of compression on the fabric created by the threads as a stitch is formed.
  - Too much tension, a tight thread causes:
    - Seam pucker, uneven stitches, unbalanced stitch formation
    - weak thread, and potentially damaged fabric.
  - Too little tension causes:
    - Excessive looping or loose and uneven stitches.
  - Must have some tension in order for the stitch to form properly.
- **Stitch consistency**
  - The uniformity with which each stitch is formed in a row of stitches.
  - There must be a compatibility of fabric, stitch and seam type, needle, thread, and machine setting.

## Stitch classes

- **Stitch classes** (ASTM D 6193)
  - based on the type of thread formation by a sewing machine
    - Example: a lock stitch machine (300 class)
      - 301 basic lock stitch and zigzag stitches (304 and 308)
  - Six classes of stitch types
    - 100 Single thread chain stitch
    - 200 hand stitch
    - 300 lockstitch (formed with needle thread and bobbin)
    - 400 Multi thread chain stitch (formed with a single looper)
    - 500 Overedge and safety stitch
    - 600 Cover stitch or flat seam stitch

## Class 300- Lockstitch

- Use Lockstitch machines: 2 threads to form a stitch.
  - (Needle thread + Lower thread)
  - A rotary hook catches the needle thread loop as it passes around the bobbin and interlocks the 2 threads.
- Lockstitch machine is good for versatility, but time-consuming and costly for an operator.

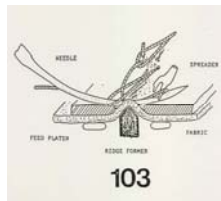


## Class 300- Lockstitch

- 301 lockstitch (=plain stitch or straight stitch)
  - See p. 432, Figure 14-2, and [see <Sample>](#)
  - The least amount of thread.
  - Flattest stitch and Reversible.
    - Used for top stitching (e.g. collar and cuff edges and fronts of jackets)
  - The tightest and most secure stitch
    - For setting zippers and pockets.
    - The 301 is not for elastic or knit fabrics, or bias seams that are expected to stretch.
- Zigzag lockstitches (304, 308, 315)
  - The 304: Used to sew athletic wear and appliqués, attach lace on lingerie, and faggoting (decorative stitching).
  - Used to make bar tacks, buttonholes.
- Lockstitch blindstitches (306, 313, 314)
  - Example uses: For linings, the inside components of waist bands for men's dress slacks.

## Class 100-Chain stitch

- The class 100 chain stitches,
  - with the assistance of spreader, are formed when 1 or more needle threads pass through the fabric and form a loop on the underside of the fabric.
  - No lower thread!
    - Single thread chain stitch is an intra-looping formation.
    - Loop formation allows good elongation and stretch and makes unraveling easy.

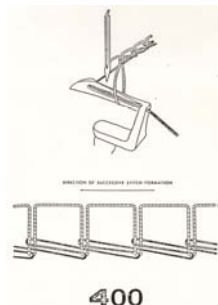


## Class 100-Chain stitch

- The 101 chain stitch
  - (see p. 431, Figure 14-2) [See <Sample>](#)
  - For closing bags of sugar, shirring, buttons, and buttonholes, bar tacks,
  - Pulling a loose thread may easily unravel.
- The 103 chain stitch (Blind stitch machine)
  - [See <Sample>](#)
  - A types of blind stitches formed by curved needle, single needle thread, and spreader to form the loops.
  - For the hem, tailored jacket lapels, and belt loops of dress slacks.
- The 104 chain stitch (Machine saddle stitching)
  - Example uses: Decorative stitching on western wear or pleated skirts.

## Class 400- Multithread chain stitch

- Stitch class 400 (Multithread chain stitch) required 1 or more needle threads that form loops as they pass through the fabric and inter-loop with the looper thread on the underside.
- Compare to the 100 class,
  - The 400 class is more durable and used extensively on apparel.
  - The 400 class use upper needle thread and a looper to carry the lower thread.

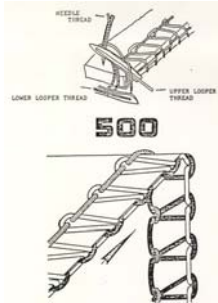


## Class 400- Multithread chain stitch

- The 401 (two-thread chain stitch, or double-locked chain stitch)
  - See p. 433, Figure 14-2, and [See <Sample>](#)
  - Appearance is the same as the 101 (single thread chain stitch), but the 401 has a loop formation on the underside and More durable.
  - Example uses:
    - The chain stitch elongates when extended. Good for setting elastic in waist bands or decorative stitching on belts.
    - Parallel rows of stitches for lapped side seams of woven shirts and jeans.
- The 402 (Cording stitch):
  - Used for stitching permanent creases
  - 2 needle threads that produce two parallel rows of stitching on the face of the fabric.
- The 404 (zigzag chain stitch):
  - More elastic than 401.
  - Example uses: decorative stitching, attaching curtain to the inside of the waist band.
- The 406 and 407 (Cover stitches): [See <Sample>](#)
  - Example uses: The stitch type 406 is used to form hems on knit garments, necklines of T-shirts, and attach bindings on men's briefs.
  - The 407 is similar except 3 needle threads and has more stretch. (for undergarments).

## Class 500-Overedge stitch

- The 500 overedge stitch (=Overedge, overlock, serge, overcast, or merrow)
  - Overedge machines trim the edge of fabric and form stitches over the cut edge.
  - A pair of knives and 3 stitch forming devices; a needle to carry the thread through the fabric, a looper or spreader to carry the thread from the needle to the edge of the material on the bottom, and a looper or spreader to carry thread up and over the edge of the material on the top.
  - High thread users and stretch.
  - Chain off the stitching, (continuously run after the fabric)

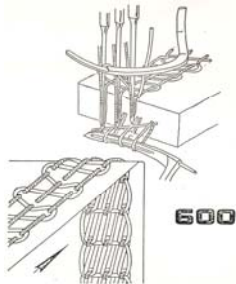


## Class 500-Overedge stitch

- The odd numbered 501, 503, 505, 521 are "break open" stitches.
  - Example uses: Edge finishes and hems rather than for seams.
- Even numbered stitch types (502, 504, 512, 514)
  - Much tighter needle thread, hold 2 layer fabrics at actual seam line.
- The 503, 504 and 505 for serging. <see sample>
  - The 503 (1 needle, 1 looper thread) for blind hemming and serging, hems on T-shirts, and serging the seams of dress slacks.
  - The 504 (1 needle, 2 looper threads) seams for knit garments, the most common.
    - and 505 (box edge stitch) for serging.
- The 512 and 514 (Mock safety stitches) for seaming knits and woven.
  - 4 thread (2 needle threads, 2 looper threads).
- Safety stitches (515, 516, 519)
  - Combination of an overage stitch and a 401 chain stitch.
    - Example uses: shirts, jackets, blouses, and jeans
- The 521:
  - Excellent elasticity and strength for seaming hosiery.

## Class 600- Cover stitch

- Stitch class 600 Cover stitch (flat-lock or flat seam stitches).
  - Example uses: knits and lingerie Machines are fast and efficient.
  - 2 or more needle loops, inter-looping on the underside, and interlocking on the upper side.
  - 602 and 605 are strong, elastic stitches to cover raw edges and prevent raveling.
  - 607 for infant's panties.



## Seam dimensions

- Seams (3 dimensions)
  - Seam length, width, and depth
  - Affect garment quality, performance, and costs.
- Seam length:
  - Is the total distance covered by a continuous series of stitches. (e.g. shoulder seam)
  - Seam length is a factor in determining stitch types.
- Seam width:
  - Width of a seam allowance
    - Measured from the cut edge of fabric to the main line of stitches.
    - Wider seam allowances may increase cost.
  - The seam heading of a top stitched seam.
    - The distance from the folded edge of the top ply to the first line of stitches.
    - A header reduces the strain on the cut edge of fabrics and makes the seam stronger.
- Seam depth:
  - Is the thickness or flatness of a seam, which are major factors in appearance and comfort of a garment.

## Seam classes (ASTM D 6193)

- ASTM D 6193 standard practice for stitches and seams
  - 4 seam classes and 2 stitching classes (See p. 442, Table 14-1)
- Line drawings of seam types
  - (See p. 443, Table 14-3).
  - Line drawings represent cross sections of a seam.
    - Each long line: a piece of fabric.
    - The short lines: penetration of the needle and lines of stitches.
    - Curve lines: a connecting thread between two lines of stitching. (Example: EFd: Edge finish, serging)

SSa (Side Seams of skirts)

EFd (Edge finish, serging)

## Superimposed seam (SS)

- Superimposed seam (SS) class
  - Joining 2 or more pieces fabric with seam allowance edges even.
  - Stitches: Sewn with a lock stitch, chain stitch, overedge stitch, or safety stitch.
  - Examples: Side seams
- SSa:
  - Side seams
- SSb:
  - Finishing belt ends, attaching elastic to waistline
- SSc:
  - Ends of waistbands on jeans
- SSd:
  - Seaming, but not widely used.
- SSe:
  - Collars or cuffs, seamed and topstitched.

## Lapped seam (LS) class

- Lapped seam (LS)
  - 2 or more pieces of fabric joined by overlapping at the needle.
  - Some are used to reduce the amount of bulk; others for durability, or appearance.
  - Stitches: lockstitch or chain stitch (NOT an overedge stitch)
  - Examples: attaching front bands to shirts, setting pockets, and sewing side seams of quality dress shirts, side seams or inseams of jeans, etc.
- LSa:
  - Vinyl and leathers
- LSB:
  - Attaching curtain to waistband of men's dress slacks.
- LSc:
  - Side seams of dress shirts and jeans
- LSd:
  - Attaching patch pockets and overlay yokes.
- LSe:
  - Attaching yokes

## Bound seam (BS) class

- Bound seam (BS)
  - One piece of fabric or binding.
  - Stitches: Lockstitch, chain stitch, or cover stitch (NOT an overedge stitch).
  - Examples: To finish edges of garments, necklines, short, sleeve on T-shirts, sleeveless tank tops with binding.
- BSa:
  - Edges bound with ribbon or braid
- BSb:
  - T-shirt necklines or sleeve edges with knot trim.
- BSd:
  - Neckline or front edges bound with bias-woven material.
- BSd:
  - Seaming and binding
- BSe:
  - Seaming and binding

## Flat seam (FS) class

- Flat seam (FS):
  - Sewing together two butted pieces of fabric, not overlapping
  - Stitches: wide 600 class (Cover stitches)
  - Examples: sweatshirts, lingerie, and long underwear.
- FSA:
  - Raglan seams of sweatshirts.
- FSb:
  - Sweatshirts and underwear.
- FSc:
  - Seams of support garments
- FSd:
  - Sweatshirts and underwear
- FSe:
  - Sweatshirts and underwear

## Stitching classes (EF)

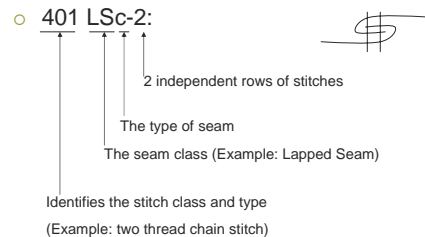
- Edge Finishing (EF)
  - Single piece of fabric. (may be folded in a variety of ways).
  - Stitching encompasses a cut edge or provides a finish for a single ply of fabric with a folded-edge.
- EFa:
  - Single-fold hem
- EFb:
  - Double-fold hem
- EFc:
  - T-shirt hem
- EFd:
  - Edge finish, serging
- EFe:
  - Ornamental edge finish

## Stitching classes (OS)

- Ornamental stitching (OS)
  - Single piece of fabric. (may be folded in a variety of ways).
  - Examples: For decorative purpose. Jeans pockets, embroidered logos, etc.
- OSa:
  - Decorative sitting on jean pockets
- OSb:
  - Decorative stitching with cording insert
- OSC:
  - Raised stitching without cording insert for backs of gloves.
- OSd:
  - Raised stitching, cording between 2 plies of material
- OSe:
  - Pin tucks on front of blouse.

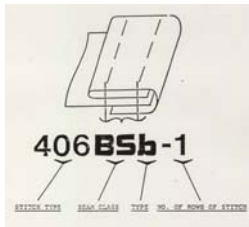
## Specifications for stitches and seams

### An example of a specification

- 401 LSc-2:
 

## Specifications for stitches and seams

- An example of a specification



Example:  
Stitch type: 406 Cover seaming stitch (see p. 433)  
Seam class: BS (Bound seam)

## Seam appearance

- Seam appearance
  - Drapeability of a seam.
  - Consistent stitch and seam formation
  - Seam flatness
    - Seam pucker: Just after sewing or after laundry.
      - Feed pucker:
        - Is caused by the resistance or drag of the presser foot on the top ply. If the fabric on the bottom is fed more rapidly than the top ply, the bottom fabric puckers.
      - Tension pucker:
        - Is caused by too much tension on the sewing thread.
        - Tight tension settings on upper or lower thread.
      - Displacement pucker or jamming
        - Occur when More stitch per inch (spi), higher count fabrics, finer fabrics, and thicker sewing thread.
        - Solution: Finer thread and a smaller needle, using fewer spi.
    - Moisture pucker:
      - may occur with final steaming or pressing.

## Seam performance

- Seam performance (properties) related to fabric characteristics, selection of stitch and seam types, thread type and size and density of stitches (spi).
- Seam properties
  - Seam elasticity (2 factors)
    - Elongation
    - Recovery (the return of the seam to its original length)
    - Example: Swimsuit (seam elasticity for the fabric)
  - Strength:
    - Determined by resistance to pulling force and abrasion.
  - Flexibility:
    - Affects the drapeability, comfort and abrasion resistance of apparel.

## Seam problems

- Distortion:
  - Caused by Incorrect handling, incorrect machine settings, poor machine maintenance, incorrect needle and thread type and sizes.
- Skipped stitches:
  - Related to the size of the needle size. If the eye is too large, there is a loss of thread control.
- Seam grin:
  - Occur with a low stitch count, insufficient tension on threads, or improper stitch and seam selection.
- Thread breakage:
  - Caused by needle heat, insufficient ply security, incompatibility of needle thread, and fabric, and defective machine or adjustments.
- Slippage:
  - Occurs in fabric that have filament yarns, low thread count, or unbalanced weaves.
- Yarn severance (or needle cutting)- the breakage of fabric yarns.
- Common seam problems and their causes : See p. 472, Table 14-5

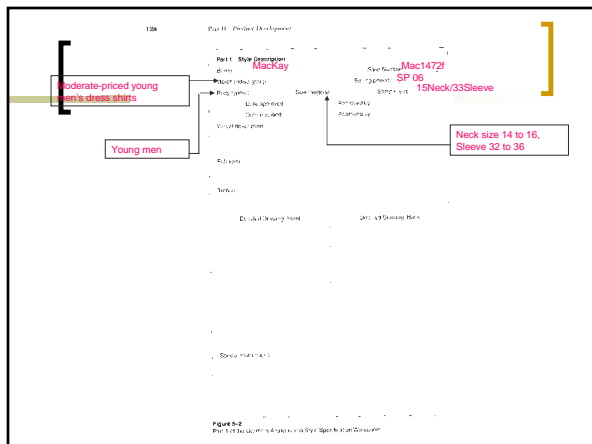
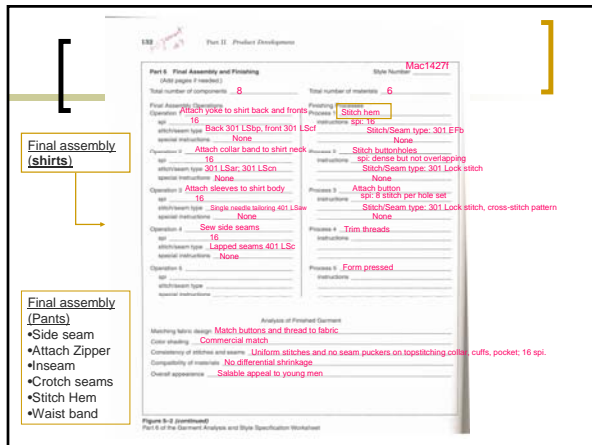
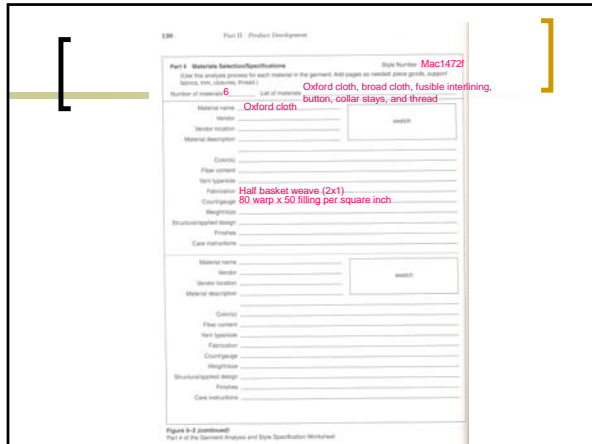


Figure 9-2 Part 11 of the garment analysis and style specification worksheet

The screenshot shows a 'Garment Analysis and Style Specification Worksheet'. It is divided into several sections:
 

- Part 2: Positioning Strategy:** A table with columns for Functional, Duration, Intended Use/Quality, Research, and Budget/Price, and rows for Mac1472f, Mac1472f, Mac1472f, Mac1472f, and Mac1472f.
- Part 3: Naming and Fit:** Includes a table for 'Size Ranges by Gender and Body Type' with columns for children, students, adults, and men's/boys. It also has a section for 'Fit Indicators for range selected above' with fields for height, chest, waist, and weight.
- Part 4: Identification:** Includes fields for 'General body size' and 'Amount of fabric stretch'.



## Next Class

- About student's offensive/ threatening behavior to the Instructor:
  - If you show any offensive or threatening behavior toward to me concerning your grade, you will not be allowed to come to this class. In the final, Your grade will remain as "Incomplete" or "F". (This involves all students, including Seniors!)
- Assignment #2 (Garment analysis)
  - If you'd like to redo, you may resubmit by this Thursday (02/09/ 06).
  - Perfect work: 100 = A+
  - Good understanding, only 1 mistake or missing information 90 = A
  - 2-3 minor mistakes or missing information 80=B.
  - If you did not follow instructions in the syllabus, 70= C.
  - Any shared garments or team work, you will lose 50 points.
- Assignment #3 (Stitch and seam analysis):
  - Read assignment instructions in the Syllabus. You will have time for doing your assignment #3 after lecture this Thursday..
- Assignment # 1 (2/9):
  - Abby Lane
  - Brittany Zorn