STITCHES & SEAMS ANALYSIS (CH.14, P. 428~475)

ADM4307 Apparel Manufacturing
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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.
  - Analysis seam appearance and performance.
STITCHES AND SEAMS

- Standards that defined stitches and seams:
  - 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.
STITCHES

- Stitch classification is based on:
  - Structure of the stitch
  - Method of interlacing stitch properties.

- Stitch properties:
  - Relate to aesthetics and performance
    - Stitch size
      - Stitch length, width, and depth.
    - Thread tension
    - Stitch consistency.
**STITCH PROPERTIES: STITCH SIZE**

- **Stitch Length:**
  - Stitches per inch (spi)
  - High spi
    - Short stitches: High quality
    - Potential problems (seam sucker 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 PROPERTIES: STITCH SIZE**

- **Stitch Width:**
  - Distance between the outermost lines of stitches.
  - Refers to the horizontal span covered in the formation of one stitch.
  - Referred to as gauge, (inch)
    - Example: overedge, zigzag, and cover stitches (1/4 inch)

- **Width dimensions require multiple needles or lateral movement of thread carriers:**
  - Example: needle bars, loopers, or spreaders.

*Figure 14–1 Lower stitch-forming devices.*
STITCH PROPERTIES: STITCH SIZE

- Depth:
  - Distance between the upper and lower surface of the stitch
  - Example:
    Blind stitches (Curved needle with lateral movement)
STITCH CONSISTENCY: THREAD TENSION

- 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.

- 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 weekend 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 CLASSES

- Stitch classes (ASTM D 6193)
  - based on the type of thread formation by a sewing machine
    - Example: a lock stitch machine (300 class)

- 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
  - 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

- The 301 lockstitch
  - (=Plain stitch or Straight stitch)
    - See p. 432, Figure 14-2
    - The least amount of thread.
    - Flattest stitch, reversible.
    - Used for top stitching
    - The tightest and most secure stitch
      - For setting zippers and pockets.
      - The 301 is not for elastic or knit fabrics, or bias seams.
CLASS 300- LOCKSTITCH

- Zigzag lockstitches (304)
  - Examples:
    - Used to sew athletic wear
    - Appliqués, attach lace on lingerie, and faggooting.
    - Decorative stitching.
    - Used to make bar tacks
    - Buttonholes.
CLASS 300- LOCKSTITCH

- Lockstitch blind stitches
  - 306, 313, 314
  - Example uses:
    - For linings, the inside components of waist bands for men’s dress slacks.
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>
- Pulling a loose thread may easily unravel.
- Examples:
  - For closing bags of sugar/ Bar tacks
  - Shirring
  - Buttons
  - Buttonholes
CLASS 100-CHAIN STITCH

- 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.
- Examples:
  - For the hem,
  - Tailored jacket lapels
  - Belt loops of dress slacks.
CLASS 100-CHAIN STITCH

- The 104 chain stitch
- (=Machine saddle stitching)
  - See p. 431, Figure 14-2

- Examples:
  - Decorative stitching on western wear
  - 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
  - = Double-locked chain stitch
    - See p. 433, Figure 14-2
    - See <Sample>
  - Appearance is the same as the 101, but the 401 has a loop formation on the underside and more durable.
  - The chain stitch elongates when extended.
- Example uses:
  - 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.
CLASS 400- MULTITHREAD CHAIN STITCH

- The 402 cording stitch
  - 2 needle threads that produce two parallel rows of stitching on the face of the fabric.

- Examples:
  - Used for stitching permanent creases
CLASS 400- MULTITHREAD CHAIN STITCH

- The 404
- Zigzag chain stitch:
  - More elastic than 401 Two-thread chain stitch.
  - Example uses:
    - Decorative stitching
    - Attaching curtain to the inside of the waist band.
CLASS 400- MULTITHREAD CHAIN STITCH

- The 406 and 407

- Cover stitches:
  - See <Sample>

- Examples:
  - The 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. (e.g. for undergarments).
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

- Odd numbered (501, 503)
  - “Break open” stitches.
  - Example uses:
    - Edge finishes and hems rather than for seams.

- Even numbered stitch types (502, 504)
  - 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.
- The 505
  - Box edge stitch
  - For Serging.
The 512 and 514
Mock safety stitches
- For seaming knits and woven.
- 4 threads
  - (2 needle threads, 2 looper threads).
- The 514: Stronger and more elastic and chains off better than 512.
CLASS 500-OVEREDGE STITCH

- The 515, 516, 519
- Safety stitches
  - Combination of an overage stitch and a 401 chain stitch.
- Example uses:
  - Shirts, jackets, blouses, and jeans
CLASS 500-OVEREDGE STITCH

- The 521:
  - Excellent elasticity and strength for seaming hosiery.
CLASS 600- COVER STITCH

- Stitch class 600 Cover stitch
- (= Flat-lock or flat seam stitches)
  - 2 or more needle loops, inter-looping on the underside, and interlocking on the upper side.
- Machines are fast and efficient.
CLASS 600- COVER STITCH

- The 602, 605, and 607
  - Strong, elastic stitches to cover raw edges and prevent raveling.
  - Example uses:
    - knits and lingerie
    - The 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 or 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.

- **BSc:**
  - 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 font of blouse.
SPECIFICATIONS FOR STITCHES AND SEAMS

- An example of a specification
  - 401 LSc-2:
    - The seam class (Example: Lapped Seam)
    - The type of seam
    - Identifies the stitch class and type
      (Example: two thread chain stitch)
    - 2 independent rows of stitches
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)
LAB: STITCH AND SEAM ANALYSIS
### Operation Breakdown

Determines the sequence of Assembly (list of steps)

<table>
<thead>
<tr>
<th>Operation</th>
<th>Steps</th>
<th>Style No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hem pocket</td>
<td>301 EFb</td>
</tr>
<tr>
<td>2</td>
<td>Attach pocket to shirt front</td>
<td>301 LSd</td>
</tr>
<tr>
<td>3</td>
<td>Stitch pencil pocket</td>
<td>301 LSb1</td>
</tr>
</tbody>
</table>

**Mac1427f**

- Yoke 2 (pocket piece and thread)
### Final Assembly (shirts)
- Attach yoke to shirt back and fronts
- Attach collar band to shirt neck
- Attach sleeves to shirt body
- Sew side seams
- Lapped seams 401 LSc
- Single needle tailoring 401 LSaw
- Stitch hem
- Stitch buttonholes
- Attach button
- Trim threads
- Form pressed

### Final Assembly (Pants)
- Side seam
- Attach Zipper
- Inseam
- Crotch seams
- Stitch Hem
- Waist band

### Analysis of Finished Garment
- Match buttons and thread to fabric
- Commercial match
- Uniform stitches and no seam puckers on topstitching collar, cuffs, pocket; 16 spi.
- No differential shrinkage
- Salable appeal to young men

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**Figure 5-2 (continued)**
Part 6 of the Garment Analysis and Style Specification Worksheet
CHARACTERISTICS OF THREADS

- Fiber content
  - Cotton thread vs. Synthetic fibers
  - Example: comparison of cotton and polyester threads (See p. 458)

- Thread structure
  - Spun yarns vs. Filament thread

- Twist
  - S twist vs. Z twist
  - S twist thread tends to untwist during stitch formation.

- Ply

- Color matching

- Finishes
  - e.g. mercerized cotton threads increase strength, luster, and dye-ability.

- Thread size
  - Ticket number (T) or Tex system.
    - Based on the gram weight of 1,000 meters of un-dyed sewing thread.
THREAD SIZE AND NEEDLE SIZE

- Relationships between thread and needle size (See p. 461)
  - The finer threads require smaller needle eyes and finer needles.
  - Examples:
    - For the fabric 2 to 4 oz, thread size (T16 to T 24).
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.
NEXT CLASS...