C407*G

P R E S S I N G   P R I M E R

By: Bernard N. Kahn
With Excerpts from
"Molding Analysis "
by Prof. Jack Walfish

MOLDING ANALYSIS

In many cases the "PRESSER" is the highest paid employee in the plant! Because in most plants the Presser is paid to fix other people's mistakes. Too many firms think that that a tug or pull in a strategic spot and the application of the pressing device will correct a fault in the garment which was caused by the Operator and/or the Cutter.

This may do in a few cases, but in most instances such expediencies are not effective. One wearing and the garment will revert back to the configuration sewn into it.

Usually the method for correcting (?) the fault in the above example will be left to the Presser him/her self. When the methods are left up to the Pressers we find that, too often, short cuts are taken. The motives for this is that they may believe that they are in business for themselves; the rate of pay on a piece work system may be too low, or too high; the quipment used is not quite what it should be for the job to be done; or just plain carelessness. It mainifests itself in unwanted pocket, flap, or seam outlines; broken buttons or other hardware; discolored and scorched garments; and inadequate production.

Generally, it is a lack of understanding by Management, of the Molding processes and the equipment which is at fault. It takes an analytical approach; understanding of equipment capabilities and limitation; and certainly Method Analysis to decide what machinery is to be purchased and how it is to be used. Absolutely no less an amount of investigation that when choosing Sewing or Cutting machinery.

MOLDING:

Is the use of:	Heat, moisture, pressure, air flow, and time	5 factors of molding
To change:	Shape, form, density or surface structure	4 design elements
To achieve:	Style, utility, and durability	3 goals of molding

1. Preparation - Molding occurs before the first sewing operation begins

   a. Shrinking

      1. London - cold water process - rolled goods are submerged in a vat and then dried in a hot air chamber. (Chenilles take a slightly different treatment called hot water shrinking.)

      2. Sponging - Goods are rolled on a cylinder - steam is shot out from the inside through the cloth - fabric is not distorted as much as in London shrinking. Sponging is done only on wool goods or wool blends.

      3. Decating - Same as sponging but is done with a leader cloth to protect fabric. Done in conjunction with London shrinking to restore surface of cloth.

      4. Free Steaming - Slowest process, but is over a steam box.

      5. Compacting Shrinking - Very similar to free steaming - but fabric is passed through a series of rollers located in the steam box - then thru a hot air chamber. Only done on knitted goods.

   b. Creasing

      1. Pockets, collar bands - actually set shape.

      2. Crease marking - Shape is not actually set, but operators will know where to sew - very similar to scissors press with 2 ridges coming down from head being the only place the fabric will touch.

c. Pleating - This process is used to impart a series of creases in a predetermined pattern. It can be used as a design feature, but it can also be functional. The creases can be used to provide ease in the correct places. There are various types of pleating machines on the market. All of them have one limitation. The pleat must have the same dimension for the whole length.

Another method of pleating is to pre-crease complementary sheets of paper (known as a pattern), placing the garment between these sheets, rolling it tightly, and then placing it into a steam chamber or Autoclave. The pattern is then opened and the garment removed with the pre-determined creases of the pattern imparted to the cloth. In Pattern Pleating the crease does not have to have the same dimension for its entire length and many complicated forms can be made in this manner.

d. Fusing - Bonding of interlining to shell fabric using heat set resin.

1. Three (3) types of fusing materials - woven (most expensive); nonwoven (least expensive); semi-woven (less expensive, more stable than nonwoven).

2. Heat set can be put on fabric in one of three ways:

- Sprayed (cheapest, no particular pattern)
- Printed (cloth passes under roller with dot pattern)
- Sintered - Sprinkled (more control of distribution in than sprayed - most expensive).

3. Fusing temperatures range from 250° F - 450° F. Must always fuse interlinings at a higher temperature than you're going to do your final pressing. 400°-450° is considered normal unless you're working with a very fine fabric.

4. Types of fusing equipment

a. Hand iron
b. Hot head press - electrically heated head - steam heated. Scissors press will generally not generate enough heat. Can sandwich press. Fusible material will be on both sides of shell fabrics layered together.
c. Conveyorized fusing machine - It is best on fusers to have both a top and bottom belt and not just a Teflon pad on the bottom. Conveyorized fuser speeds run from 25 ft. - 40 ft./minute.

5. Problems with fusing

a. Underfusing-overfusing - too little heat - resin doesn't hold to fabric of shell.
b. Too much heat - resin will drip into fabric and fusing will not occur.
c. Possible shrinkage or distortion - i.e. bubbling, bleedthrough.
d. Possible color changes depending on dye and fabric.

2. In process molding (Underpressing) - occurs after cutting and before final sewing operation.

a. Seam Opening (Seam Busting)

1. Molding production equipment

a. Irons

Three basic types of irons:

(1) electric (dry)
(2) steam
(3) steam electric

Use of these three iron tools are in conjunction with a bed buck. This is somewhat similar to an ironing board such as used in the home. These bed bucks can take many shapes and sizes, as we shall soon demonstrate.

Iron temperatures are controlled in various ways.

a. Rheostat

An electrical device that varies the amount of electricity which is supplied to the iron. However, the "switch" is always on. This presents the possibility that there could be a heat build up because of the constant flow. Rheostat are seldom used these days because of this reason.

b. Thermostat

This is a device which measures temperature the same way that a thermometer does. However, it has the additional ability to turn a switch on or off. We pre-set the desired temperature, and when the device reaches this heat the switch controlling the inflow of electricity is activated and the current will be turned off. As the heated device, in this case the iron, cools down the thermostat will activate the switch again. This time the current will be turned on.

c. Steam

The temperature of steam will vary directly with the pressure of the steam. We can therefore place a pressure control valve in the steam supply line. Variation of pressure leading to the iron will control the temperature of the iron.

When using a steam electric iron, the thermostat must be set at a temperature which will keep the steam from condensing the iron. This will prevent the ejection of water through the holes or vents in the sole plate. WAter ejected from the iron can damage the item being pressed.

Flat industrial pressing irons vary in weight and dimensions from approximately 4 lb. to 35 lb., 3" to 6" in width, and 6" to 20" in length. These variations are dictated by the specifics of the pressing operation, the fabric, the dimensions of the area to be pressed, and the specifications of the garment.

The heavier and larger the iron the greater will be the need for an iron support system. These support systems can range from a simple spring to geared systems. This support is necessary to decrease the amount of fatigue and increase the output of the "Presser".

2. Sideseams - done with hand irons or a pressing table
3. Pants - side seam, seat seam, waistband
4. Skirts - side seam, front and back seam, open waistband
5. Shirts - mostly darts
6. Suits -

   a. Jackets - side seams, center back seam
   Sleeves - done after already attached to jacket
   Shoulder seam
   Edge seam - edge of jacket
   Sometimes pocket seam

b. Blocking - usually hats, sometimes bras

1. Blocked before being sent out for final shaping
2. Usually run 2-3 head sizes per block - fabric steamed from inside/then vacuum.
3. Most bras now stitched to form rather than blocked

c. Fusing

1. After pocket is hemmed - interlining may be fused.

3. End of Process Molding

(Final pressing, top pressing)

a. Primary objectives in final pressing

1. Remove manufacturing wrinkles -

   a. manufacturing wrinkles occur mostly from bundling
   b. cleaning and washing wrinkles more difficult to remove

   Two kinds of wrinkles:

   - visible wrinkle (one seen on presentation of garment on hanger)
   - Hidden wrinkle (not readily seen, occur in pocket flaps, linings, etc.)

2. Correct or minimize sewing errors - ex. puckering - sideseam or tightly sewn seam.

3. Correct or minimize cutting errors - fabric not cut on grain - on bias - for ex. pants legs.

4. Create a style or form - take 2 dimensional fabric and get 3 dimensions (to conform to human body).

b. Most common method - scissor pressing for medium to heavy weight fabric

Scissor Presses

There are two major parts of a Buck Press:

1. The bottom buck or casting. Also known as the Bed Buck

The bed buck can vary in size and shape of perimeter. They can also vary in the depth of contour. This contour is different from what is found in the buck used for iron pressing, which is usually much flatter. The iron buck is flat because the iron tool sole is flat and must be supported. As we shall see contour is much more important in Buck Pressing, because the Complementary Press head is an exact inversion of the bed buck. However, a bed buck need not be contoured. There are very many pressing operations which do require a flat bed buck surface, particularly with knit goods, which would have a great tendency to stretch on a contoured surface.

Bed bucks may have piping of steam, and a system for steam ejection. It may also have no system for steam ejection, but will almost always have a system to vacuum the moisture deposited by steam, to help dry the garment.

Bed bucks are padded, for several reasons:

- To absorb the pressure of the head or moveable buck. The padding is resilent and will prevent such pressure from leaving marks from flaps or buttons, etc.
- It helps to diffuse the steam that is ejected with high velocity which prevents spotting of the cloth.

- Shine due to mechanical pressure can be decreased or eliminated with the correct type of padding.

2. The head buck, or moveable buck, or Ram buck.

   As previously mentioned, the head buck is an exact inversion in shape and contour to the bed buck. It is the link which supplies the mechanical pressure, through a linkage system, which could be manually/foot operated, or in the more modern presses, air operated.

   The head buck is padded for the same reasons as were mentioned above for the bed buck.

   With the advent of air operated presses, has come the use of timers, and valving which has enabled one operator to service a battery or presses. This has given the capacity for more production, with no decrease in quality.

   By automatically cyling the steps of the pressing operation (steam, bake vacuum, open and close the head buck), we are no longer dependent upon these cycles being judged by a person. The time cycles are not subject to human error and most likely we have results which are better in quality.

c. In ladies wear, we compensate for fashion changes by using more manual methods - simplify rather than specialize - not so much a problem with men's suit houses.

d. Different types of scissor presses used in final pressing:

   1. Sleeve block
   2. Body pressing - front and back
   3. Side pressing
   4. Chest and waist suppression (for styling)
   5. Toppers and leggers

      a. Toppers - crotch to waistband on pants also (sometimes) skirts are more often done with hand irons.
      b. Leggers - pants legs (carousels do tow pants legs at once). Oval legger - women's slacks to eliminate buckling in the thigh area

e. Hand Iron Final Pressing

   1. Utility iron (flat, wide)
   2. Oval table
   3. Set up can be iron at either end (trolley setup)
   4. Pressing Table - some have sleeve bucks on swing arm
   5. Mostly internal vacuum (were formerly traditionally external)
   6. Rectangular table - garments pressed flat from front to back

f. Steaming - remove wrinkles without mechanical pressure

   1. Used for light to medium weight goods
   2. Force steam and heated air in and around garment
   3. Garment is usually hanging on hanger or some kind of form during this process - weight of garment also helps to get out wrinkles.
   4. Steam tunnel sometimes used in conunction with bagging machine (particularly in distribution center).
   5. Touch-up pressing (stiff parts - collar, cuff, placket, hem) can be done before - temp. of touch-up pressing should be 10°-15°F higher than steaming.

g. Quality

1. Identification of Adverse Quality

a. Scorching
b. Shine
c. Impressions
d. Distortion
e. Puckering
f. Creasing
g. Non-Flat seam
h. Crooked Seam

2. Causes and Remedy of Adverse Quality

a. Scorching

- Cause: excessive dry heat
- Remedy: low wet heat

b. Shine - Glaring

Causes: excessive pressure

- Hard padding
- Oversteaming

Remedy: proper pressure

- Moderate padding
- Proper steaming

c. Impressions

Causes: excessive pressure

- Hard padding
- Oversteaming

Remedy: proper pressure

- Moderate padding
- Proper steaming

d. Distortion

Causes: pulling garment

- Pulling fabric
- High temperature

Remedy: lifting garment

- Proper hand tension
- Correct temperature

e. Puckering

Causes: incorrect temperature

- Pulling garment
- Excessive steam

Remedy: correct temperature

- Lifting garment
- Proper steam

f. Creasing

Causes:

- Incorrect garment alignment
- Insufficient pressure
- Incomplete crease

Remedy:

- Resteam to remove old crease
- Correct garment alighment

g. Non-Flat seam

Causes: insufficient pressure

- Not following stitch line
- Insufficient steam and heat
- Improper or poor padding

Remedy:

- Correct pressure, padding, steam
- Follow stitch line

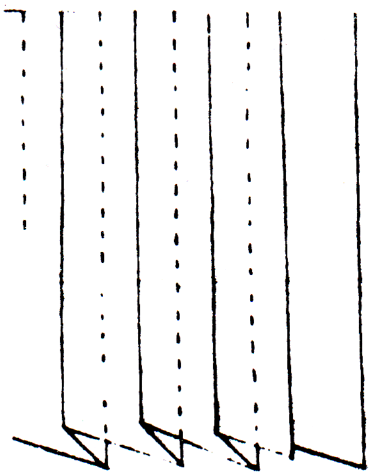
h. Crooked seam

Causes:

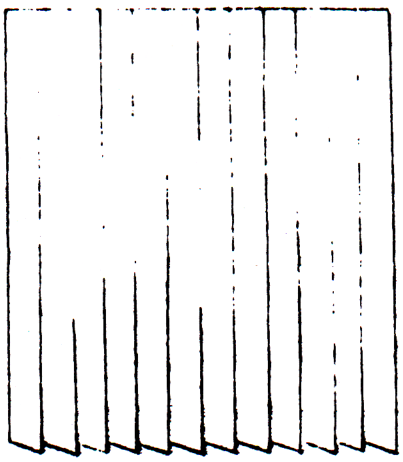
- Improper seam alignment
- Pulling or not holding material properly

Remedy:

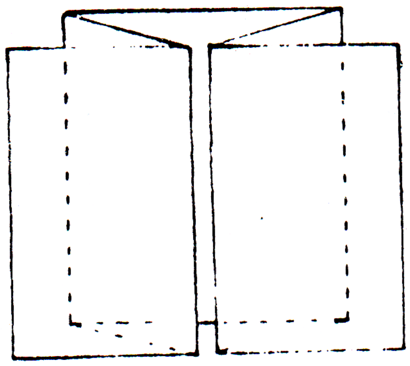
- Correct seam alignment
- Open seam without tension



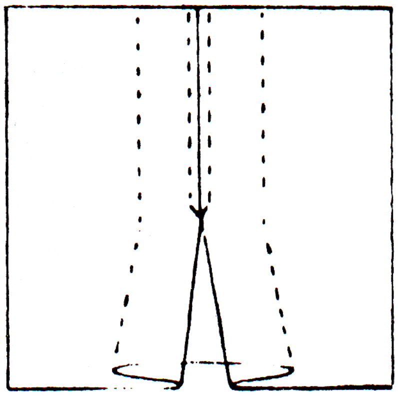
Side Pleat—Diagram Formation



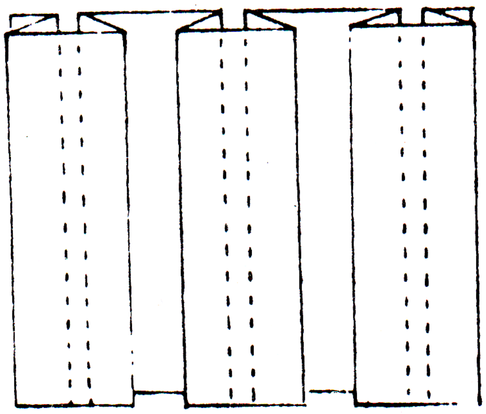
Side Pleat



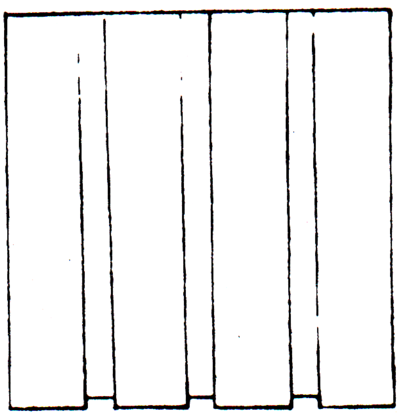
Formation of Inverted Pleat
same as Box Pleat



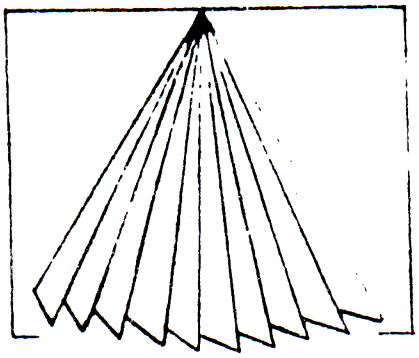
Inverted Pleat



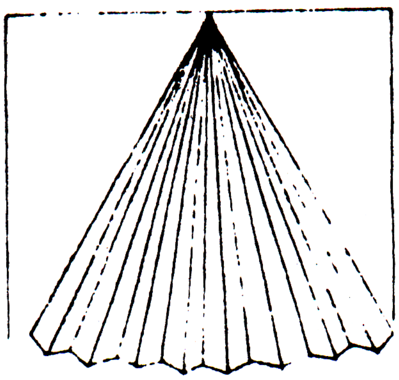
Formation of Box Pleat (not stitched)



Box Pleat



Fan Pleat



Sunburst Pleat

AAMA BULLETIN
Publication of the AAMA Technical Advisory Committee

This Bulletin has been prepared and edited by the Apparel Quality Committee and the Technical Advisory Committee of the American Apparel Manufacturers Association in a joint effort.

Based on the earlier work of the Apparel Research Foundation and fulfilling the continual need for technical information on the subject of fusibles and their operations in the apparel industry, the Apparel Quality Committee has up-dated the material and sought the assistance of the TAC in bringing this information to the industry in a form that is readily readable and useable both in the board room and at the fusing line.

Glossary Of Fusible Interlining Terminology

Adhesive System—Type of adhesive resin (i.e. polyethylene, polyamide, polyester, polyvinyl chloride, etc.) that is applied to the substrate. The resin can be applied in the following manner: sintered (sprinkled), printed, or sprayed, or as a cohesive web.

Bond Strength—The strength of the bond between the fusible and the shell fabric. Many fusible suppliers rate this in terms of the force (in ounces or pounds) necessary to separate a one-inch or two-inch wide strip of fused materials.

Bubbling—An imperfect fuse resulting in the fusible not adhering to the garment section over the entire area of the fabric, usually caused by uneven temperatures or pressures, or by under or over fusing, or non-compatible shrinkage between fusible material and shell fabric.

Cohesive Web—A "spider-web" structure of random laid fusible resin filament normally used for bonding two fabrics together. It is also used on other materials which can not be pre-coated as a regular fusible.

Color Change—A temporary or permanent change in color of a fabric caused by the action of heat on certain types of dyes.

Compatible Shrinkage—The matching of shrinkage in both the fusible interlining and the shell or outer fabric.

Conveyorized Fusing Machine—Fusing machine with motorized conveyor for transporting work to/and from the fusing station.

Cooling Station—Area of a conveyorized fusing machine where vacuum or cool air is directed at the fused garment parts for rapid cooling.

Cooling Time—The time necessary for the adhesive to cool and set.

Delamination—Complete breakdown of the bond between the fusible interlining and the shell or outer fabric.

Double Buck—Describes handling system used on some fusing machines. The double buck systems allow two operators to alternately use the same pressing/fusing area by having two moveable bucks which can be moved alternately under the fusing head or outside the head to a loading position.

Double Conveyor—The double conveyor system improves the production rate of the single conveyor by adding a separate loading conveyor. During the automation sequence, all three loads are moved onto the fusing section of the conveyor and are successively processed. In the meantime, the operators independently reload without interruption.

Double Sided Fusible Interlining—A specially designed interlining coated on both sides with fusible resins.

Dry Cleanability—Performance of fused garment parts after dry cleaning.

Dwell Time—Duration of time that fusible, the interlining, and the shell or outer fabric remains under specified heat and pressure of the fusing zone.

Floating Chest Piece—A construction found in the chest area of men's fused clothing made with fusible front interlining and a non-fusible material as the chest piece.

Fully Fused Front—Use of a fusible interfacing over the whole forepart of men's or women's coats.

Fusible Chest Piece—A fusible interfacing with softness, resilience and bulk used to give shape in the chest area of a garment.

Fusible Interfacing or Interlining—Specially prepared fabric of woven or non-woven substrate that has been printed, sprayed or sintered with fusible adhesive.

Fusing—The bonding of a specially prepared interfacing material to a garment section by the application of heat and pressure.

Fusing Cycle Time—The complete time for the fusing operation including loading time, steam cycling if required and fusing time as noted above; (time alloted for vacuum cooling and unloading).

Fusing Machine—Specially designed machine with instruments for controlling time, temperature and pressure. Used to fuse interlinings to shell fabrics.

Fusing Pressure—Pressure exerted by the head on the buck during fusing; expressed in lbs. per sq. inch.

Fusing Temperature—Temperature of the fusing machine head, selected as the appropriate setting for good adhesion between fusible interlinings and shell or outer fabrics.

Fuse Line Temperature—Temperature between shell fabric and fusible at time of fusing.

Fusing Time—Time that the head remains closed in the buck, controlled by a timer usually stipulated by a fusible supplier as being required for the proper fusing of the interfacing to the shell fabric.

Hand or Handle—A term used to describe degree of drape, stiffness or softness obtained after fusing to outer shell material.

Laminating—Combining two or more fabrics in full width.

One-Sided Fusing System—Adhesive coated only to one surface.

Over Fusing—Excessive heat, time or pressure used during the fusing cycle.

Peel Strength—Bond strength between fusible interlining and the shell or outer fabric. This is rated in terms of force (ounces) required to separate a one-inch wide strip of fused materials or pounds per two-inch wide strip.

Peel Test—Peel tests are used to determine bond strength by the force required to separate a one-inch, or two-inch wide strip of fused materials. These tests should be carried out at two points immediately after fusing and cooling; and again, after washing and/or dry cleaning for a positive test of bond strength.

Pressing Area—Area of fusing head (and buck) contact usually expressed as width (in inches) times length (in inches) and reported as square inches).

Press Buck—The bottom section of a press on to which fabric and fusible are laid.

Press Cover—An anti-stick fabric used to cover the metal head of a press and prevent the build-up of particles of resin and pieces of fibre, thread, etc.

Press Head—Top section of a fusing press containing heating system.

Press Padding—Layers of silicone rubber, cotton felt or similar suitable materials used to cover the press buck and insure uniformity of pressure.

Pressure Indicator—A gauge located on the fusing machine indicating the squeeze pressure between the head and the buck when the machine head is closed.

Pressure Uniformity—Refers to even distribution of pressure throughout the fusing area.

Printed Adhesive—Refers to the method of applying adhesive resins, usually in the shape of a dot. The number of dots per square inch varies according to the pattern used.

Pyrometer—A portable measuring device for sensing the temperature at various points on the fuser head.

Resin Contamination—The spoiling of a garment or garment part by resin particles from a dirty press head.

Self-Cleaning Head—An automatic device fitted to some fusing machines for cleaning the head after each fusing cycle.

Shuttle Tray—Lightweight frame with open weave cloth stretched over it used for manually transferring garment parts to/and from the fusing machine.

Single Buck—Standard press configuration with no handling system. Used for low production and lab work.

Sintered Fusible—A specially designed interlining with fusible resins scientifically sprinkled onto the interlining in predetermined amounts.

Stay Tape—A bias or straight cut strip of fusible used to give control and stability in particular parts of garments, e.g. along the shoulder, neck, or armhole.

Strike Back or Back Bleed—The appearance of adhesive material on the non-adhesive side of the fusible following fusing. Strike back causes sticking of sections and accumulation of adhesives on the head of the fuser.

Strike Through or Bleed Through—Appearance of adhesive on the outer face of the fabric being fused. Usually caused by too long a fusing time, too high a fusing temperature or pressure.

Substrate—Material to which adhesive is coated, printed or sprayed. This material should have good shape retention characteristics by itself, be washable and dry cleanable. The adhesive is only the means of fastening interfacing in place. The substrate should be compatible with the shell fabric.

Temperature Differential—Difference between highest and lowest temperatures on head for a given temperature setting measured over surface and over time.

Thermopapers—An inexpensive paper strip thermometer for a permanent record of obtained temperatures.

Under Fusing—Insufficient heat, time or pressure applied to the fusible interfacing so that the adhesive is not activated and does not adhere to the shell fabric.

Wet Recovery—A test completely saturating fusible interfacing in water to check the degree of recovery of the material to its natural flat position after being crushed while wet.

Guidelines For
Dos And Don'ts For Fusible Interlinings

The information contained in this section is presented for easy reference and can be duplicated for display in offices or production facilities.

The Fusing Department

Note: This guideline assumes that the fusing machines in use are satisfactory for your operations and application.

DO:

1. Appoint a properly trained and educated manager.
2. Check temperature, pressure and timing cycles each morning, noon and mid-afternoon and at critical fabric changes.
3. Check for consistent temperature and pressure across the fusing head. This can be done with use of temperature papers spaced six inches apart. Bond consistency can be checked by peeling a full width strip of fabric and noting the change, if any, of the bond across the width.
4. Install bond strength testing procedures utilizing an appropriate scale to measure force of pull. A simple fish scale can be used if more sophisticated methods are not available.

   These tests should be done at the same intervals as your checks for temperature, pressure and time cycles. Results should be reviewed by the Quality Control Dept. on a daily basis and test swatches should be labeled as to time of test and test results for temperature, pressure and time cycles.
5. Evaluate fusible parts for defects such as: color change, surface appearance and hand. This should be done at regular intervals, set up by the Quality Control Dept.
6. Utilize temperature papers to establish correct fuse-line temperature. (This is the temperature between the shell fabric and the fusible product at the time of fusing.)
7. Recheck fuse-line temperature if any change in time cycle has been made. (Temperature can compensate for cycle time sometimes, but not always.)
8. Maintain adequate supply of essential spare parts for the fusing equipment and associated supplies.
9. Use paper carriers when fusing lightweight shell fabrics. (Recheck fuse-line temperatures when doing this.)
10. Check for special finishes on shell fabrics that may call for fusing machine adjustments or changes of other conditions.
11. Let freshly fused parts cool before further processing.
12. Cut fusible interlining parts smaller than shell fabric parts to prevent contamination of fusing machine surfaces.

DON'T:

1. Assume that all fabrics will react the same way with the same fusible interlining.
2. Alter the fusible interlining recommendations of your supplier without first consulting him or doing extensive testing yourself.
3. Subject fusing machines to external conditions that would have a negative effect on their operation and desired results, i.e., placement near open doors, windows or with fans or air-conditioning causing variation in operating conditions.
4. Attempt to fuse new shell fabrics before consulting with your fusible supplier for his recommendations on fusing cycles, temperature, etc.
5. Assume that fusing machine indicators are correct. Always check fuse-line temperatures with temperature papers.
6. Increase the speed of the conveyor or reduce the time cycle of fusing to increase production. Such changes can affect the bond and your quality.
7. Tie fused parts bundles tightly, especially while temperatures are elevated just after fusing.

Guidelines For
Dos And Don'ts For Fusible Interlinings

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The Quality Control Department

Note: The key to a successful fusing operation depends on cooperation between the Quality Control Dept., the Fusing Dept., the Production Control Dept., and the Design Dept. The establishment of proper controls before the fact will prevent mistakes after the fact.

DO:

1. Test for the compatibility of the shell fabric with the fusible interlining for these factors:
   a. Thermal shrinkage and wash shrinkage.
   b. Bond strength.
   c. Hand.
   d. Surface appearance *before* and *after* fusing, dry cleaning and washing.
   e. Color changes.
2. Utilize production equipment and operators whenever possible, or correlate the results obtained between production equipment and Quality Control equipment.

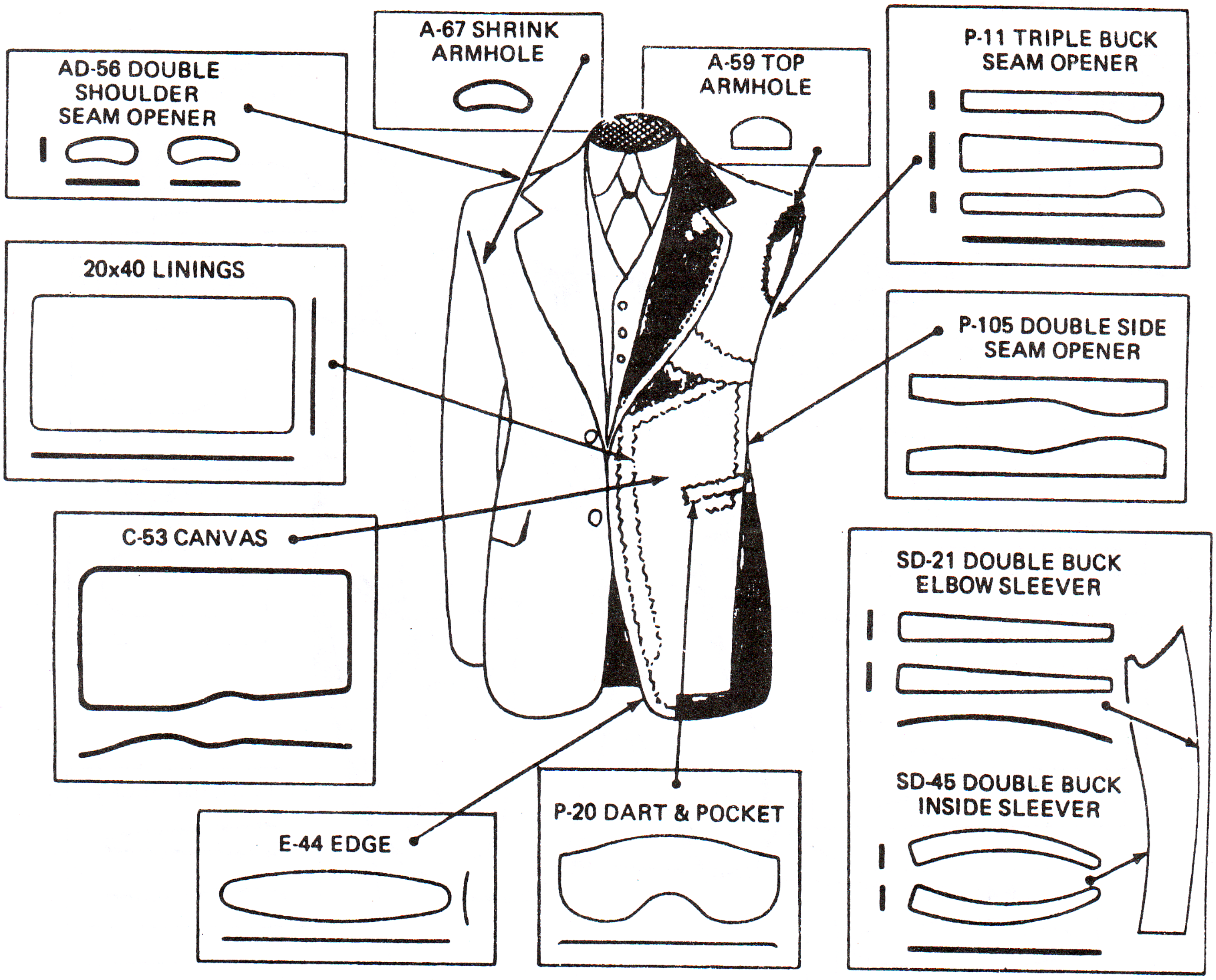
   Resolve who will set procedures—the Quality Control Dept. or the Production Dept.!
3. Evaluate production parts after a minimum of three (3) washing or dry cleaning tests.
4. Monitor quality control reports daily and make necessary recommendations.
5. Institute impromptu random sampling of production parts testing to insure adherence to standards.

DON'T:

1. Allow any deviation in production procedures *or* malfunctions of equipment to undermine the continuation of good quality control.

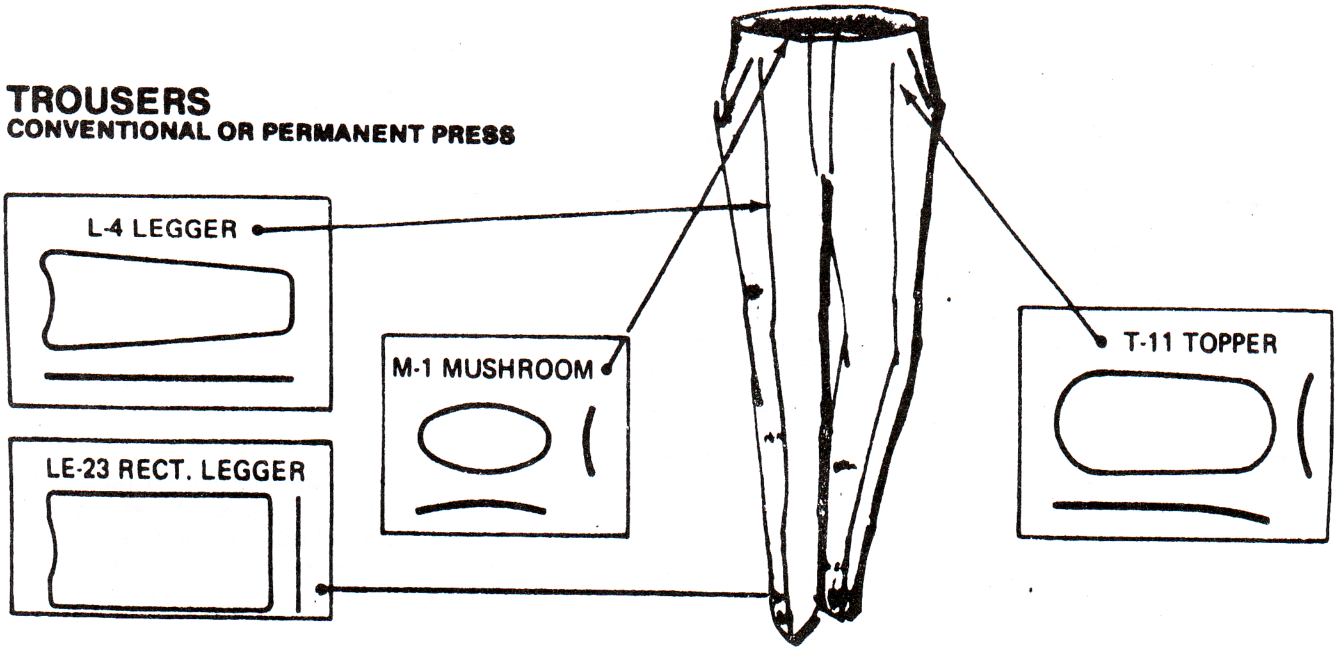
UNDERPRESSING OPERATIONS

PRESSING

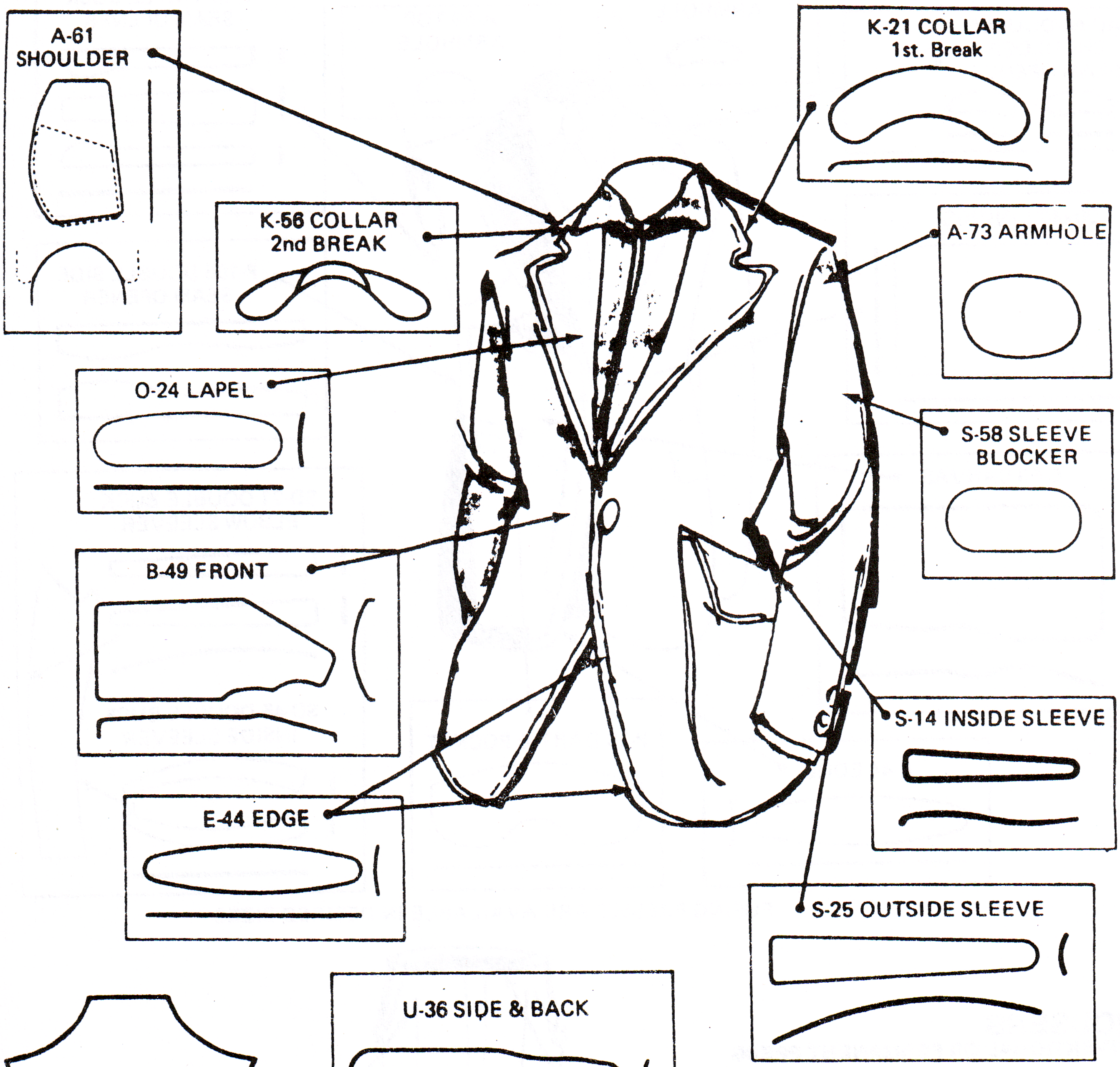


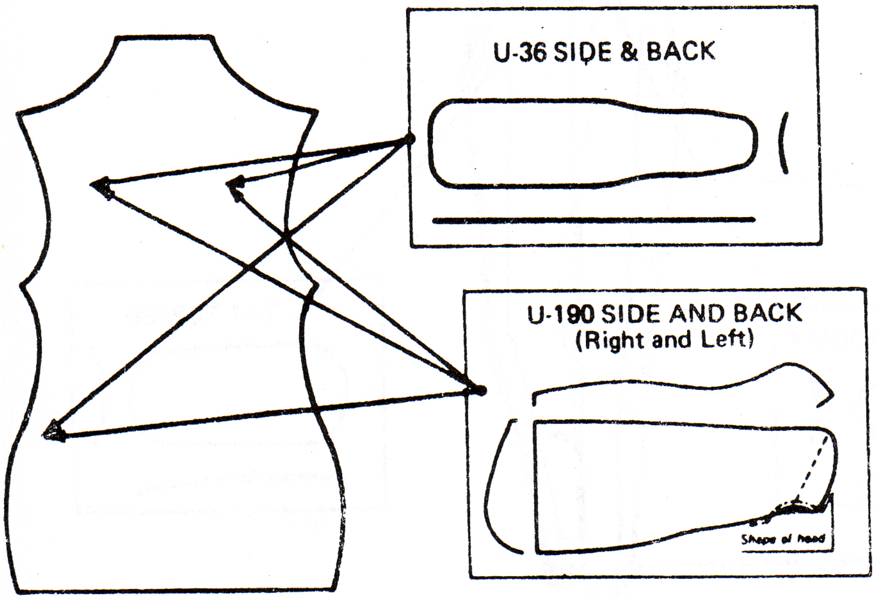
FUSING PRESSES ARE AVAILABLE IN DESIRED SIZES

TROUSERS
CONVENTIONAL OR PERMANENT PRESS



OFF-PRESSING OPERATIONS





Model numbers shown are most popular for current operations. Other shapes are available for your individual requirements.
All presses are available in Foot, Air, Automatic and Semi-Automatic models.

PRESSING

MEASUREMENT CHARTS

U.S. & EQUIVALENT METRIC SIZES FOR MAJOR PRODUCT CATEGORIES

MEN'S WEAR

1. Men's sportswear (coats, suits, overcoats, pants, sweaters)

U.S. Size	Inch	Great Britain Size	Continent Size
Small	34	34	44
Medium	36	36	46
	38	38	48
Large	40	40	50
Extra Large	42	42	52
	44	44	54
	46	46	56
	48	48	58

2. Men's shirts (based on neck measurements)

U.S.		Great Britain Size		Continent
Size	Inch	cm	Inch	cm
	12	30-31	12	30-31
	12½	32	12½	32
	13	33	13	33
	13½	34-35	13½	34-35
Small	14	36	14	36
	14½	37	14½	37
Medium	15	38	15	38
	15½	39-40	15½	39-40
Large	16	41	16	41
	16½	42	16½	42
X-Large	17	43	17	43
	17½	44-45	17½	44-45
XX-Large	18	46	18	46
	18½		18½	

3. Men's underwear

U.S. Size	Great Britain Size	Continent Size
Small	34	5
Medium	36	6
	38	7
Large	40	8
X-Large	44	10

CHILDREN'S WEAR

Age	Height cm	Height inch	U.S. Boy's Size	U.S. Girl's Size	Great Britain Size	Continent Size
1	80	32	1	2	80	80
1½	86	34			86	86
2	92	36	2	3	92	92
3	98	38	3	4	98	98
4	104	40	4	5	104	104
5	110	43	5	6	110	110
6	116	45	6	6x	116	116
7	122	48	8	7	122	122
8	128	50		8	128	128
9	134	53	10	10	134	134
10	140	55			140	140
11	146	58	12	12	146	146
12	152	60			152	152
13	159	62	14	14	158	158
14	164	64			164	164

4. Blouses, Sweaters and Cardigans

U.S. Size	Great Britain Size	Continent Size
10	32	38
12	34	40
14	36	42
16	38	44
18	40	46
20	42	48
22	44	50
24	46	52

5. Stockings - Hosiery

U.S. Size	Great Britain Size	Continent Size
8	8	0
8½	8½	1
9	9	2
9½	9½	3
10	10	4
10½	10½	5
11	11	6

6. Lingerie and Intimate Apparel (bras and corselettes)

U.S. Size	Great Britain Size	Continent Size
30	65	65
32	70	70
34	75	75
36	80	80
38	85	85
40	90	90
42	95	95
44	100	100
46	105	105
48	110	110

7. Elastic Girdles, Roll-ons and Pantie Girdles

U. S. Size	Great Britain Size	Continent Size
23-24	60	60
25-26	65	65
27-28	70	70
29-30	75	75
31-32	80	80
33-34	85	85
35-36	90	90
37-38	95	95
39-40	100	100
41-42	105	105

MISSES' AND WOMEN'S WEAR

1. Junior Sizes (coats, skirts, suits, pants, dresses)

U.S. Size	Great Britain Size	Continent Size
3		
5	7	
7	9	34
9	11	36
11	13	38
13	15	40
15	17	42
17		44

MEASUREMENT CHARTS

U.S. & EQUIVALENT METRIC SIZES FOR MAJOR PRODUCT CATEGORIES

MISSES' AND WOMEN'S WEAR CONT.

2. Misses Sizes (coats, suits, skirts, pants, dresses)

U.S. Size	Great Britain Size	Continent Size
6		34
8		36
10	32	38
12	33	40
14	35	42
16	36	44
18	38	46
20	39	48

3. Women's Sizes (coats, suits, skirts, pants, dresses)

U.S. Size	Great Britain Size	Continent Size
	34	
36	36	44
38	38	46
40	40	48
42	42	50
44	44	52
46	46	

HOSIERY

NAHM sizing standard for men's, women's and children's hosiery.
Sizes of men's, women's and children's knee-high and shorter hosiery shall be defined by the body measurement given in Table I.
The sizes defined in Table 1 are composites of averages. When a consumer's individual measurements are not identical to all nine measurements provided in the table, a choice must be made. The following guides are given to assist in making that choice:
Foot length alone is the most reliable indicator of reasonable fit for knee-high and shorter hosiery. When an individual's foot length measures between two given hoisery sizes, the larger-sized hosiery should be selected.
The nine measurements given for each size are used in the construction of sizing forms. Hosiery manufacturers test their products on such forms, as they represent the true surface dimensions of feet and legs of each designated size.

Table 1. Wearer's standard foot and leg dimensions in inches for hosiery sizes.

MALE AND FEMALE

Size:	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½
Foot length	2.50	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	
Foot girth	7.2	8.1	9.1	10.1	11.1	12.1	13.0	14.0	15.2	16.3	17.3	18.4
Ball girth	3.6	4.2	4.5	4.8	5.1	5.4	5.7	5.9	6.2	6.5	6.8	7.1
Heel girth	4.6	5.1	5.6	6.1	6.6	7.1	7.6	8.1	8.6	9.1	9.7	10.3
Min. leg girth	4.4	4.6	4.9	5.1	5.3	5.6	5.8	6.1	6.3	6.5	6.9	7.2
Calf girth	5.6	5.9	6.3	6.6	7.0	7.3	7.7	8.0	8.4	9.1	9.9	10.6
Knee girth	6.2	6.5	6.9	7.3	7.7	8.1	8.4	8.8	9.2	9.6	10.0	10.3
Calf height	2.9	3.5	4.1	4.7	5.4	6.0	6.6	7.2	7.8	8.6	9.4	10.2
Knee height	4.7	5.6	6.4	7.2	8.1	8.9	9.7	10.5	11.4	12.2	13.0	13.9

MALE AND FEMALE

Size	9	9½	10	10½	11	11½	12	13	14
Foot length	8.5	9.0	9.4	9.8	10.2	10.7	11.0	11.4	11.9
Foot girth	19.5	20.6	21.6	22.4	23.2	24.0	24.8	25.8	26.9
Ball girth	7.4	7.7	8.0	8.3	8.6	8.9	9.1	9.4	9.8
Heel girth	10.9	11.6	12.1	12.6	13.1	13.5	14.0	14.5	15.2
Min. leg girth	7.6	8.0	8.4	8.6	8.9	9.2	9.5	9.9	10.2
MALE:									
Calf girth	11.2	11.9	12.6	13.1	13.6	14.2	14.7	15.3	16.0
Knee girth	10.7	11.4	11.9	12.4	12.9	13.4	13.9	14.4	15.1
Calf height	10.9	11.6	12.3	12.9	13.5	14.1	14.6	15.3	16.1
Knee height	14.7	15.5	16.2	17.0	17.8	18.6	19.4	20.3	21.3
FEMALE:									
Calf girth	11.5	12.3	13.0	13.6	14.2	14.8	15.4		
Knee girth	11.1	11.8	12.4	13.0	13.5	14.0	14.6		
Calf height	11.2	12.0	12.8	13.4	14.0	14.7	15.3		
Knee height	14.9	15.9	17.0	17.9	18.9	19.8	20.7		

MEASUREMENT CHARTS

METRIC CONVERSION CHARTS

To Convert	Into	Multiply By
LENGTH		
Inches	Millimeters	25.4
Inches	Meters	0.0254
Inches	Centimeters	2.540
Feet	Meters	0.3048
Feet	Centimeters	30.48
Yards	Meters	0.9144
Miles	Kilometers	1.6093
Millimeters	Inches	.03937
Centimeters	Inches	.3937
Meters	Yards	1.0936
Meters	Feet	3.2808
Meters	Inches	39.37
Kilometers	Miles	0.6214
TEMPERATURE		
Fahren.	Celsius	5/9 (F-32)
Celsius	Fahren.	9/5 (C^o) + 32
MASS		
Ounces	Grams	28.3495
Pounds	Kilograms	0.4535
Pounds	Grams	453.592
Short Tons	Metrictons	0.9
Short Tons	Kilograms	907.1847
Long Tons	Kilograms	1016.047
Grams	Ounces	0.0353
Kilograms	Pounds	2.2046
Metrictons	Short Tons	1.1

To Convert	Into	Multiply By
AREA		
$Inches^2$	$Centimeters^2$	6.452
$Inches^2$	$Millimeters^2$	645.2
$Feet^2$	$Meters^2$	0.0929
$Feet^2$	$Centimeters^2$	929.0
$Yards^2$	$Meters^2$	0.8361
$Miles^2$	$Kilometers^2$	2.6
$Acres^2$	$Hectares^2$	.04
$Centimeter^2$	$Inches^2$	.1550
$Meters^2$	$Yards^2$	1.1960
$Meters^2$	$Feet^2$	10.7639
$Kilometers^2$	$Miles^2$	0.4
$Hectares^2$	$Acres^2$	2.5
LIQUID VOLUME		
Ounces	Milliliters	29.5735
Pints	Liters	0.47
Quarts	Liters	.9463
Gallons	Liters	3.7854
Milliliters	Ounces	.0338
Liters	Pints	2.1
Liters	Quarts	1.0567
Liters	Gallons	0.2642

CONVERSION TABLE GAUGE/INCHES/DECIMAL/METRIC

Gauge	Inches	Decimal	MM
1	1/64	0.01562	.40
2	1/32	0.03125	.79
3	3/64	0.04688	1.19
4	1/16	0.06250	1.59
5	5/64	0.07812	1.98
6	3/32	0.09375	2.38
7	7/64	0.10938	2.78
8	1/8	0.12500	3.17
9	9/64	0.14062	3.57
10	5/32	0.15625	3.97
11	11/64	0.17188	4.37
12	3/16	0.18750	4.76
13	13/64	0.20312	5.16
14	7/32	0.21875	5.56
16	1/4	0.25000	6.35
18	9/32	0.28125	7.14
20	5/16	0.31250	7.94

Gauge	Inches	Decimal	MM
21	21/64	0.32812	8.33
22	11/32	0.34375	8.73
24	3/8	0.37500	9.52
26	13/32	0.40625	10.32
28	7/16	0.43750	11.11
30	15/32	0.46875	11.91
32	1/2	0.50000	12.70
34	17/32	0.53125	13.49
36	9/16	0.56250	14.29
40	5/8	0.62500	15.87
44	11/16	0.68750	17.46
48	3/4	0.75000	19.05
52	13/16	0.81250	20.64
56	7/8	0.87500	22.22
60	15/16	0.93750	23.81
64	1	1.00000	25.40
72	1 1/8		28.56
80	1 1/4		31.74
88	1 3/8		34.91

Gauge	Inches	Decimal	MM
96	1 1/2		38.09
104	1 5/8		41.27
112	1 3/4		44.45
120	1 7/8		47.62
128	2		50.80
136	2 1/8		53.97
144	2 1/4		57.15
152	2 3/8		60.32
160	2 1/2		63.50
168	2 5/8		66.67
176	2 3/4		69.85
184	2 7/8		73.02
192	3		76.20
208	3 1/4		82.55
224	3 1/2		88.90
240	3 3/4		95.25
256	4		101.60

ELECTRICAL DATA

MAX SAFE CAPACITY OF TYPES S AND SJ RUBBER

Wire Of 3 Or Less Current Carrying Wires At 85 Degree F

Size	18	16	14	12	10
Current	7	10	15	20	25

ELECTRICAL MEASUREMENTS

One Horse Power Equals Approximately 750 Watts

Single Phase Power (Watts) = Volt X Amp X Power Factor

Three Phase Power (Watts) = Line To Line Voltage X Line Amps X 1.7 X Power Factor

= Line To Line Voltage X Line Current X 1.7 x Power Factor

MEASUREMENTS

STEAM DATA

1 Boiler Horsepower (BHP) = 345 Lbs. of steam at 212° F. Per Hour
= 33,475 B.T.U.
1 B.T.U. = The amount of heat required to raise one pound of water 1° F.

Pressure (Sea Level) Vs. Saturated Steam Temperature

0PSI	212°F	60PSI	307°F
5PSI	227°F	70PSI	316°F
10PSI	239°F	80PSI	324°F
20PSI	259°F	90PSI	331°F
30PSI	273°F	100PSI	338°F
40PSI	287°F	125PSI	353°F
50PSI	298°F	150PSI	360°F

Suggested Steam Line And Trap Sizes

Presses	Line	Trap	Presses	Line	Trap
1-2	1/2"	3/4"	7-10	1-1/4"	1"
3-4	3/4"	3/4"	11-14	1-1/2"	1-1/4"
5-6	1"	1"	15-25	2"	1-1/2"

Average Steam Usages in Boiler Horse Power

Item	Lbs. Steam	Level B.H.P.
Spotting Board	43.13	1.25
Finishing Board	51.75	1.50
Pants Topper	43.13	*1.25
42" to 48" Utility Press	51.75	*1.50
42" to 48" Legger Press	51.75	*1.50
Knitwear Press	138.00	4.00
Garment Finisher	103.50	3.00
Free Steam Iron	11.39	.33
Micro Steam Iron	8.62	.25

With Steam Vacuum Add 1/2 H.P. or 17.25 Lbs. Per Hr.
For Permanent Press Add 1/2 H.P. To Above.

COMPRESSED AIR DATA

Recommended Air Usages

DESCRIPTION	PSI RANGE	CFM
Air Gun	70 - 100	2.50
Hydraulic Lift	145 - 175	5.25
Paint Spray Gun	40 - 80	8.50
Vacuum Cleaner	120 - 150	6.50
Air Shear	40 - 60	.35
Air Chopper	40 - 60	.35
Collar Former	80	.35
Sleeve Press	80	.26 Per Cycle
Cuff & Collar Press	80	.42 Per Cycle
Topper Press	80	.26 Per Cycle
42" Utility Press	80	.42 Per Cycle
52" Utility Press	80	.76 Per Cycle
Legger Press	80	.76 Per Cycle
Flat Press	80	.72 Per Cycle

Compressor Horse Power Selection Chart

Compressor P.S.I. Cut In	Compressor P.S.I. Cut Out	Continuous Total C.F.M.		Suggested Horse Power
80	100	Up to	2.0	1/2
80	100	Up to	3.0	3/4
80	100	Up to	4.2	1
80	100	4.0	6.4	1-1/2
80	100	5.9	8.7	2
80	100	7.7	13.2	3
80	100	10.3	20.0	5
80	100	20.0	29.2	7-1/2
80	100	29.0	40.0	10
80	100	40.0	60.0	15
80	100	60.0	80.0	20

PIPE SIZES FOR COMPRESSED AIR AT 100 PSI

Volume Air CFM	Lengths of Pipe in Feet 25'	50'	75'	100'	150'
1-15	1/2"	1/2"	1/2"	1/2"	1/2"
15-20	1/2"	1/2"	1/2"	1/2"	3/4"
30	1/2"	1/2"	3/4"	3/4"	3/4"
40-50	3/4"	3/4"	3/4"	3/4"	3/4"

Flow Of Free Air - C.F.M.

Gauge Press Lbs.	Orifice Size 1/16"	1/8"	1/4"
50	3.64	14.5	58.2
60	4.20	16.8	67.0
70	4.76	19.0	76.0
80	5.32	21.2	85.0
100	6.45	25.8	103.0
120	7.58	30.2	121.0
140	8.68	34.5	138.0

MEASUREMENT CHARTS

LINE AMPERAGE REQUIREMENTS

SINGLE PHASE

KW	120V	208V	240V	277V
.05	4.2	2.5	2.1	1.9
.75	6.3	3.7	3.2	2.8
1	8.4	4.9	4.2	3.7
2	16.7	9.7	8.4	7.3
3	25.0	14.5	12.5	10.9
4	33.4	19.3	16.7	14.5
5	41.7	24.1	21.0	18.1
6	50.00	28.9	25.2	21.7
7.5	62.5	36.1	31.3	27.1
10	83.4	48.1	41.7	36.2
12	100.00	57.7	50.0	43.4
15	125.0	72.2	62.5	54.2
.20	166.7	96.2	83.4	72.3
25	208.4	120.2	104.2	90.3
30	250.0	144.3	125.0	108.4
50	416.7	240.4	208.4	180.6
75	625.0	360.6	312.5	270.8
100	833.4	380.8	416.7	361.1

THREE PHASE

	208V	240V	440V	280V
1	2.8	2.5	1.4	1.3
2	5.6	4.9	2.7	2.5
3	8.4	7.3	4.0	3.7
4	11.2	9.7	5.3	4.9
5	13.9	12.1	6.6	6.1
6	16.8	14.5	7.9	7.3
7.5	20.9	18.1	9.9	9.1
10	27.8	24.1	13.2	12.1
12	33.4	29.0	15.8	14.5
15	41.7	36.2	19.7	18.1
20	55.6	48.2	26.3	24.1
25	69.5	60.3	32.9	30.2
30	83.4	72.3	39.4	36.2
50	139.0	120.5	65.7	60.3
75	208.5	180.7	98.5	90.4
100	278.0	240.9	131.4	120.5

*FOR INTERMEDIATE VALUES NOT SHOWN ON CHART ADD VALUES TOGETHER

To obtain desired No. (Ex. 30kW + 7.5 kW = 37.5 kw ampe-
rage
For 208V would be 144.3 + 36.1 = 180.4)

Note: Add 25% to determine total line amperage required.

BOILER H.P. REQUIREMENT CHART

	QUANTITY OF EQUIPMENT																			
KIND OF EQUIPMENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Standard Press	1-1/2	3	4-1/2	6	7-1/2	7-1/2	8-3/4	10	11-1/4	12-1/2	13-3/4	15	16	17	18	19	20	21	22	23
Knitwear Press and Steam Table	3	6	9	12	15	15	15	16	18	20	22	24	26	28	30	32	34	36	38	40
Fusing Press	2-3	5	7-1/2	10	12-1/2	12-1/2	14	16	18	20										
Iron	2-3	1/2	3/4	1	1-1/4	1-1/2	1-3/4	2	2-1/4	2-1/2	2-3/4	3	3-1/4	3-1/2	3-3/4	4	4-1/4	4-1/2	4-3/4	5
Steam Heated Board	1/4	1/2	3/4	1	1-1/4	1-/2	1-3/4	2	2-1/4	2-1/2	2-3/4	3	3-1/4	3-1/2	3-3/4	4	4-1/4	4-1/2	4-3/4	5
Steam & Vac-uum Board w/ Bottom Steam (Upsteam)	1-/4 1-1/2	2-1/2	3-3/4	5	6-1/4	6-1/4	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Puff Iron	1/2	1	1-1/2	2	2-1/2	3	3-1/2	4	4-1/2	5										
Steam Air Topper	3/4	1-1/2	2-1/4	3	3-3/4	4-1/2	5-1/4	6	6-3/4	7-1/2										
Form Finisher	2-1/4 2-1/2	4		6	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
Vacuum Spotting Board	1-1/4	2-1/2	3-3/4	5	6-1/4															