

Production Manual for the
Steenbeek Foot Abduction Brace

SFAB



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A. General Information about the SFAB.

What is the SFAB.

The SFAB is a device to maintain the extreme foot abduction (70 degrees) in children with treated clubfeet. The SFAB forms an integral part of the Ponseti Method of Clubfoot Treatment, which targets new born babies with clubfeet. Correction of the clubfoot is achieved by applying serial casts of plaster of Paris (p.o.p), in combination with a minor surgical procedure (percutaneous tendo achilles tenotomy for 90% of the babies) under local anaesthesia. The SFAB is necessary to maintain this correction.

SFAB's are in most cases re-usable for other children with treated Clubfeet.

Achieve correction by Ponseti cast applications.
Maintain correction with the SFAB.

How to use the SFAB.

On the day that the last p.o.p cast is removed, when the foot/feet are completely corrected, the SFAB has to be fitted. It then has to be worn full time for three months. That is day and night except for bathing. After these 3 months, the SFAB has to be worn at night only, until the child is 3 – 4 years old.

Very important: Fit the SFAB the same day as the last p.o.p. cast is removed, to prevent recurrence of the deformity.

How to measure for the correct SFAB.

In general the real length of the foot sole of the baby in centimeters corresponds with the size of the SFAB needed. Do not add a centimeter as an allowance for growth. The patterns (see the last pages of this Manual) already have an allowance. For the smallest sizes see the below table.

Real length of the foot in cm	Brace size
6.5 to 7.5 cm	6
7.5 to 8 cm	7
8 cm	8
9 cm	9
10 cm	10
11 cm	11
12 cm	12
13 cm	13
14 cm	14

For a unilateral clubfoot.

The SFAB has to be adjusted when the baby has a clubfoot on one side only. In that situation the Abduction Bar should be bend, close to the shoe on the normal side, to only 30-40 degrees external rotation.

B. The different components of the SFAB.

IMPORTANT:

The patterns for all the components of the SFAB are at the back in this manual. If printed, please make sure that the grid has 1 x 1cm squares in order to have the correct size of the patterns.

The Outer Sole

The outersole is made out of 6 mm plywood. The design is made as an outlast.

Tools needed: (Mechanics) vice
Wood (hand) saw or electrical jigsaw
Wood rasp (and/or router machine)
Sand paper

Procedure: Trace left and right design on a piece of 6mm plywood.
Cut out with hand saw, shape and smoothen with rasp and sand paper.

See patterns for all sizes at the back of this manual

The InSole

The Insole has two parts:

1. Thin card board.
2. Sock lining (rexine).

The insole is made out of thin corrugated cardboard. Exactly the same pattern as the outersole. The cardboard insole is later on covered (glued) with one layer of rexine.

Tools needed: Scissors.

Procedure: Trace pattern on thin cardboard
Cut out card board
Trace pattern of rexine
Cut out rexine

See patterns for all sizes at the back of this manual

The Upper Leather

The Upper Leather has four components:

1. The upper leather, medial and lateral part.
2. The heel counter
3. The heel strap
4. The tongue

Ad 1. The upper leather.

Trace the pattern of the medial and lateral side of the upper leather (fig. 2) and mark the holes for the shoe lace and the stitch-line for the tongue (the small holes in fig 3). The medial and lateral parts are symmetrical.

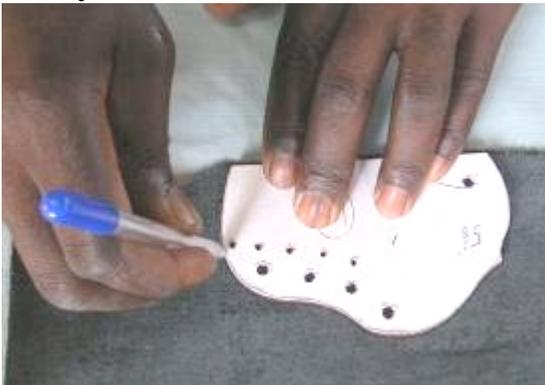


Fig 2



Fig 3

Please make sure that you trace the pattern very accurately especially at the posterior side for the heel cup. Do not take a short-cut with your pen, scissors or while sewing. Follow the rounding of the heel cup precisely. Keep that round shape!!



Fig 4

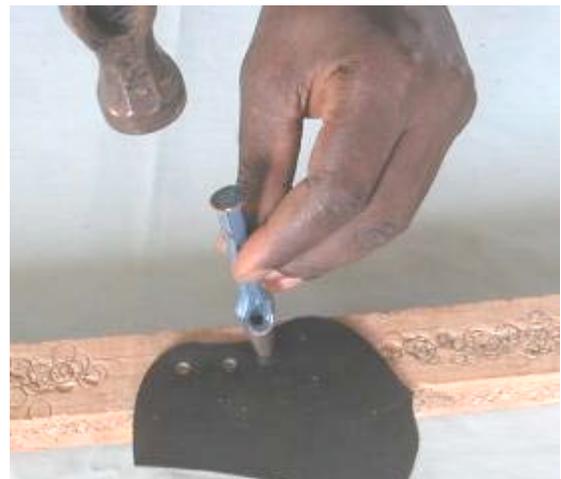


Fig 5

Then cut out using a pair of scissors (fig 4).
Punch 6 mm holes for the shoelace (fig 5) .

Ad 2. The heel counter.

Trace the pattern on leather lining or thin leather and cut out.
Skive the top edges ↙ ↘ , but not the bottom part

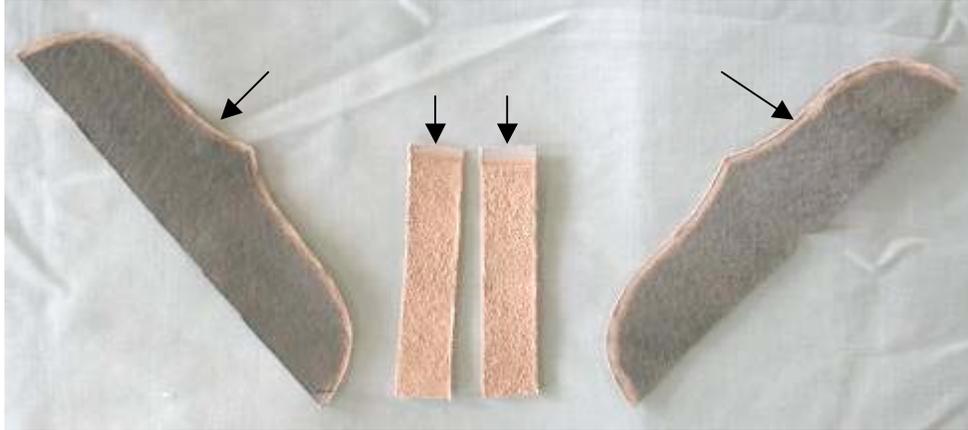


Fig 6

Roughen the outside part of the leather if “thin leather” was used. This will later be glued on the inside of the upper leather (fig 7).

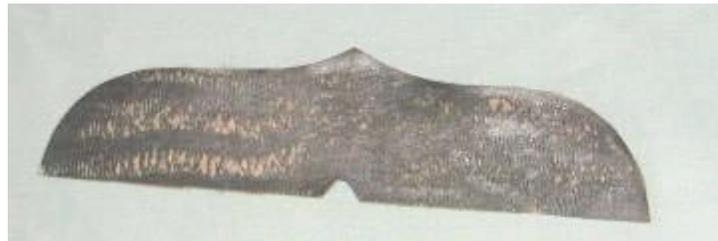


Fig
7

Ad 3. The heel strap.

Trace the pattern of the heel strap and cut out.
Skive top end ↓ (fig 6).

Ad 4. The tongue.

Trace pattern of tongue on leather lining or goat skin and cut out.

See patterns for all sizes at the back of this manual

The Abduction Bar

The abduction bar has two parts:

1. A piece of 6mm or 7mm metal (mild steel) rod / round bar
2. Two pieces of flat metal sheet of 1.5 – 2 mm thickness

Ad 1. The 6 or better 7 mm (= preferable) metal rod.

The length of the metal rod differs according to the shoe size of the SFAB. Cut the correct length of the rod with a hack saw as specified in the table below (table 1). This will ensure that, after assembling the SFAB, the distance from one shoe heel to the other shoe heel, is about the same as the distance between the (lateral side of the) shoulders (deltoids) of the child.

Size of Shoe	Length of metal rod
6	9½ inch
7	10 inch
8	10½ inch
9	11 inch
10	11½ inch
11	12 inch
12	12½ inch
13	13 inch
14	14 inch

Table 1.

Ad 2. Metal plates.

The size of the two metal plates is for all the SFAB's the same. Use flat metal sheet of thickness 1.5 – 2 mm. Cut pieces of 2" x ¾".

Drill a 5 mm hole at the each end of the plates, 1 ¼" apart.

(Use a 3 mm thick metal plate as a template/jig).

Position both metal plates at an angle of 45 degrees external rotation at each end of the 6 mm rod, whereby the tip of the rod is positioned in the middle of the plate. Weld both plates to the rod. (fig 8)



Fig 8

Bend the metal rod just before the metal plates, so that the metal plates are now at an angle of 70 degrees abduction in relation to the 6 mm rod. (Make a template/jig for this purpose as well, see fig 9).



Fig 9

Lastly, bend the bar in the frontal plane (fig 10 & 11)



Fig 10



Fig 11

Note: when the child has a clubfoot only on one side, the abduction bar should be bend to the normal 30-40 degrees external rotation for the normal foot.

C. Procedure Of Assembling.

All the parts of the SFAB are now ready. To assemble the SFAB, start with the upper leather.

Upper leather

Put the medial and lateral parts of upper leather on top of each other so that they exactly match. Stitch the posterior (heel) edges together, leaving 2 mm at the heel side. Use a sewing machine. **Follow exactly the curve of the heel part** (fig 12). Moisten the stitched part lightly, open the two parts and carefully hammer the seam from outside over a smooth piece of metal (e.g. the triple iron), so that it becomes slightly flat (see fig. 13).



Fig. 12



Fig. 13

Heel strap

To fix the heel strap, first apply glue over the seam on the outside as well as the top 1 cm on the inside of the upper leather. Also apply glue on the heel strap and let it dry.



Fig. 14.



Fig 15



Fig 16

Attach the heel strap to the upper leather and fold the skived top part of the heel strap onto the inside of the upper leather (see fig. 17 & 18).



Fig 17



Fig 18

Mould the posterior part and emphasize the rounding of the heel cup.

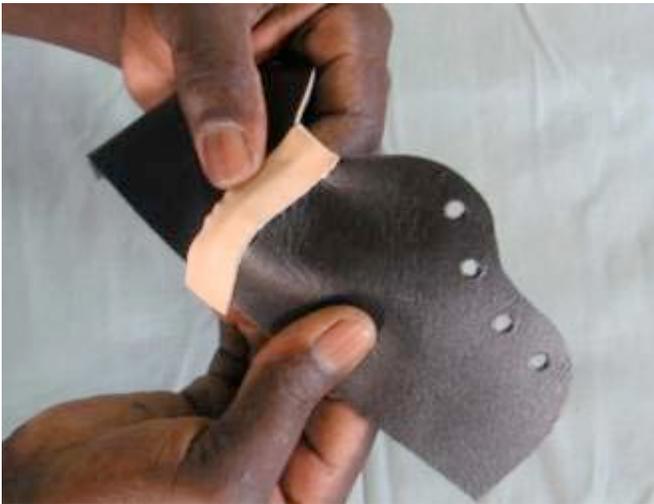


Fig 19

Hammer gently from the inside (fig 20).



Fig. 20



Fig. 21

Turn the upper inside out and stitch the edges of the heel strap to the upper leather (fig 21 & 22).



Fig. 22

Heel counter

Use the pattern of the heel counter and mark it with a pen on the inside of the upper leather, 1 cm from the base of the upper leather (see fig. 23 & 24).

Apply glue on the roughened outside part of the heel counter and on the marked inside (heel) part of the upper leather (see fig. 25 & 26). Let it dry.



Fig. 23.



Fig. 24.



Fig. 25.



Fig. 26.

Attach heel counter to the inside of the upper leather leaving 1cm from the base of the upper leather. First fold the heel counter and press it well **in** (emphasize the heel rounding) the seam of the upper leather (see fig 27).

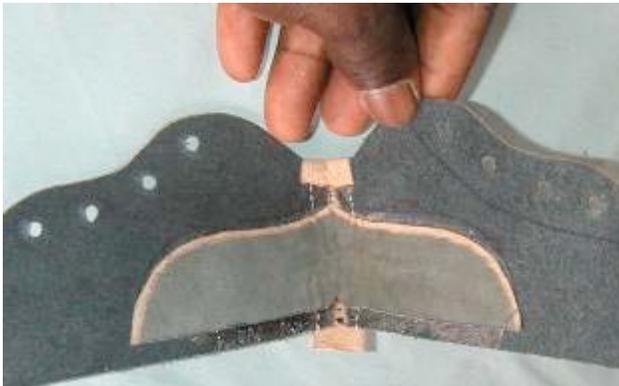


Fig. 27.



Fig. 28.

Hammer gently from the inside to get a firm bonding (see fig 28).
Stitch the upper edges of the heel counter (from the inside) onto the upper leather (fig 30).



Fig.29



Fig.30

Tongue

Apply glue on the long edge of the tongue and on the stitch line (lower part) of the medial upper leather (fig 30).

Attach the tongue. Stitch the tongue on the inside of the medial upper leather, BUT NOT HIGHER THAN THE 3RD SHOELACE HOLE FROM DISTAL (see arrow fig 30).



Fig.31

Inspection hole

Punch a hole of about 1 cm diameter in the heel counter on the medial side, that is located 2 cm from the posterior seam and 8mm above the base of the heel counter piece (see fig. 32). This inspection hole will help the mother to confirm that the heel of the baby's foot is correctly positioned in the brace.



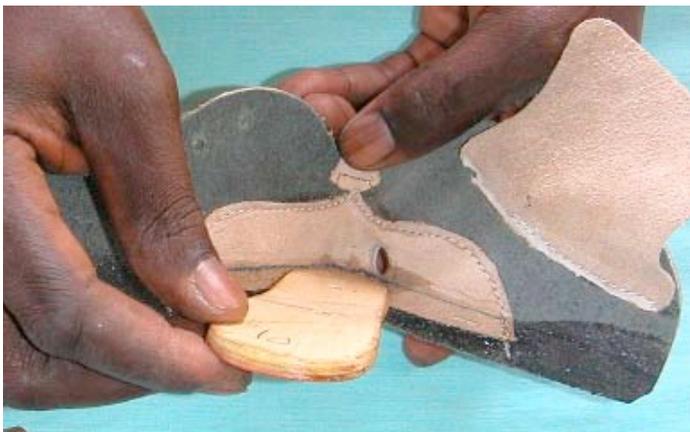
Fig. 32

Fix upper leather to outersole

Apply glue on the outside (=thickness) of the plywood outersole and on the inside of the upper leather, following the heel counter basis. Let it dry.

Attach both, starting in the middle of the heel counter/seam so that it

matches exactly with the middle of the "heel" of the outersole. So, the outersole is attached onto/on top of .. (not below) the base of the original heel counter pattern (see fig. 33). Note that there is still about 1cm leather of the upper leather free as a "lasting allowance" (fig 35).



Apply glue on the outside edge of the outersole and on the leather that was left over as lasting allowance. Let it dry and connect both parts by folding the leather onto the plywood. Hammer gently to get good bonding (see fig. 36 & 37).

Fig 36.





Fig.37.

TIP: Shape the end of a piece of timber in such a way that it fits in the shoe, especially in the heel. Let this piece of timber rest on the floor and put the brace over it. Hammer gently. It will now work as a triple iron/pronge (fig 37).

Use a rasp or grinder to roughen the leather.



Fig.38.

Fix Abduction Bar

Position both shoes on the Abduction Bar. The Abduction Bar is already bend in such a way that both shoes will be in 70 degrees abduction.

Drill two 5 mm holes in the outsole to match the holes of the metal plates of the Abduction Bar (see below). To identify the place where to drill, position the (template) metal plate 1/2 inch from the posterior edge of the outsole, whereby the plate follows the middle line of the outsole.



Fig.39.

Use pop rivets/blind rivets (4.8mm thickness and 13mm long) to connect the shoes to the Abduction Bar. A lazy tongs riveter is the easiest to use for this work (see fig. 39 & 40).



Fig 40

Fix Insole

Apply glue on cardboard insole and on the outsole (plywood) inside the shoe. Let it dry. Attach the cardboard insole firmly. The insole now covers the rivets (see figs. 41).

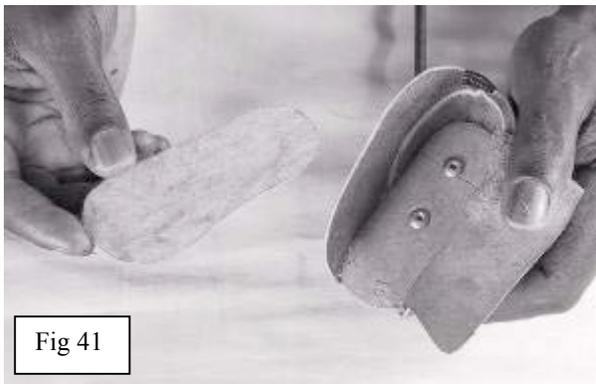


Fig 41

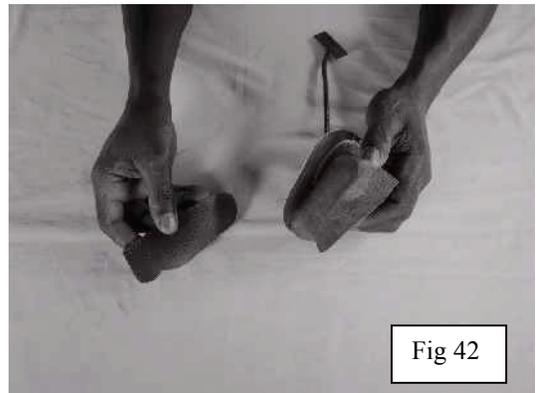


Fig 42

Apply glue again on the sock lining and on the cardboard insole inside the shoe. Let it dry. Attach firmly (see fig 42 & 43).

Apply glue on the toe part of the sock lining that is left over on the toe-side and on the bottom toe part (soil side) of the outsole. Let it dry. Fold toe part of sock lining around

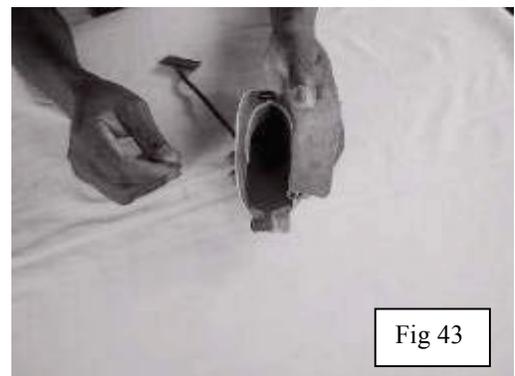


Fig 43



Fig.44

the toe part of the outersole, cut excess off and attach firmly (see fig. 44).



Fig.45

Cover the sole of the SFAB

The plywood sole of the shoe, including the blind rivets, should now be covered. Almost any type of clean scrap material can be used for that, like pieces of old (thoroughly cleaned) bicycle tyres, leather off cuts, insole material, etc (see fig 45).

Finally.

- ✓ Do the same with the opposite side.
- ✓ Put shoelaces in each side.
- ✓ Bend the 6 mm Abduction Bar in the middle so that both shoes are in 10 – 15 degrees dorsiflexion.

The SFAB is now finished.



D. Patterns for the SFAB parts.

The following pages contain all the patterns (real sizes) of the different parts of the SFAB, from size 6 to size 13.

Use a carbon paper to copy the patterns on strong but thin cardboard, tin or plastic. Use those for your day to day work.

Do not cut the patterns out of this Manual.

The design of the Upper Leather is made in such a way, that at the posterior side, where the leather touches the achilles tendon, the heel leather is not higher than the level of the ankle joint.

MISUNDERSTANDING !!

It is a general misunderstanding that a **strong, above ankle, heel leather** will prevent the child from pulling up the heel. When the heel leather ends distal from the anatomical ankle joint, the patient will not be able to pull up his heel without help/holding the shoe (see fig 46 below). However, if the heel leather is increased in size and it reaches above the ankle joint, it will create a point of fixation proximal from the anatomical ankle joint. This occurs when during plantar flexion the heel leather presses against the posterior side of the lower leg proximal from the ankle. This point of contact between the posterior side of the leg and the heel leather will now act as a fulcrum. It now allows the patient to pull up the heel when attempting to plantarflex (see fig 47 below).

Therefore, if you notice that the child is able to pull the heel out of the brace, do not increase the height of the heel/ankle leather, but make it lower at the posterior side !

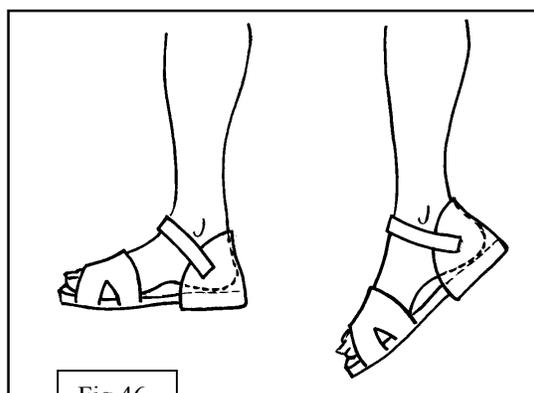


Fig 46

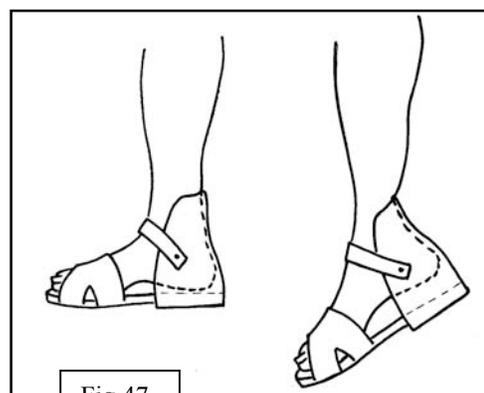


Fig 47

Instructions for Parents how to use the Steenbeek Foot Abduction Brace (SFAB).

1. FIT THE SFAB THE SAME DAY AS THE LAST P.O.P. CAST IS REMOVED !!
2. Loosen the shoelaces or remove them completely.
3. First fit the most difficult foot, i.e. the affected side if the child had only one clubfoot. When both feet were affected, first fit the foot that seems to be the least flexible.
4. Gently push the foot up/dorsiflex the foot as much as possible. Hold it in that position with one hand and then push the foot (heel first) in the SFAB. Close the tongue of the shoe and check whether the heel is still in the correct position by looking through the inspection hole. Keep the foot in position with the same hand and lace the shoe with the other hand.
5. Now fit the other foot in the same way.
6. THE CHILD NEEDS TO WEAR THE SFAB FULL TIME, THAT IS DAY AND NIGHT, FOR A PERIOD OF THREE MONTHS. AFTER THESE THREE MONTHS, CONTINUE USING THE SFAB AT NIGHT UNTIL THE CHILD IS 3 TO 4 YEARS OLD.
7. When the child cries more than usual, check the feet for red spots or blisters. In that case the SFAB might be getting too small for the child.
8. When the child is about to outgrow the SFAB go back to the clinic/workshop for a bigger size.

The following pages have the patterns for all parts for sizes of SFAB's.

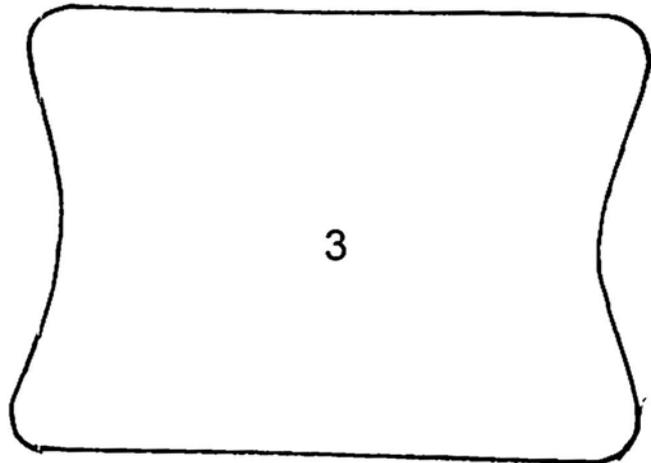
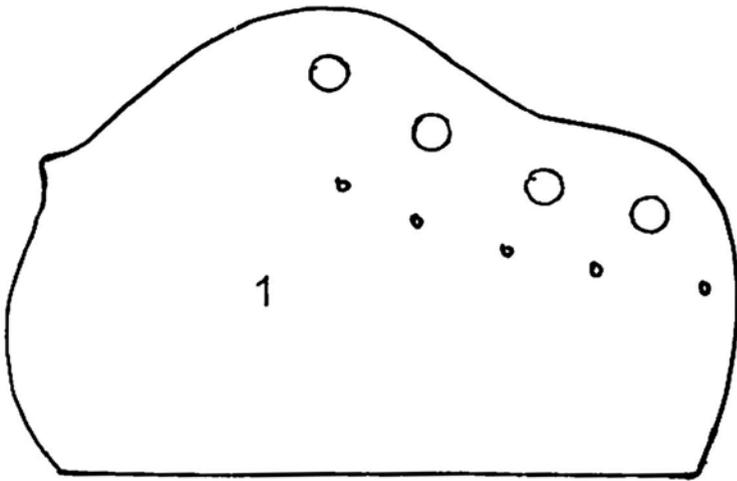
IMPORTANT

Please set your printer in such a way that the templates/patterns are printed the actual size. The 1 x 1 cm division should be exactly that measurement on the final print.

1 cm

Size **6** SFAB patterns

TYPE I



1 = upper leather

2 = heel strap

3 = tongue

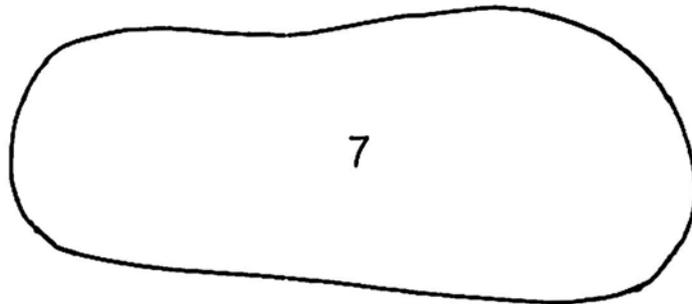
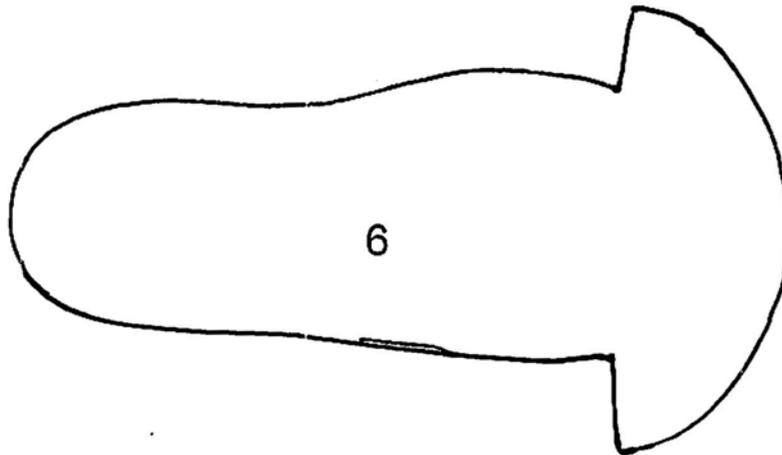
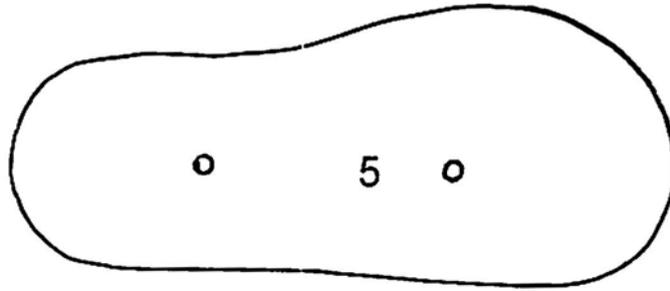
4 = heel counter

SM
03/2009

1 cm

Size **6** SFAB patterns

TYPE I



5 = outersole (plywood)

6 = sock lining

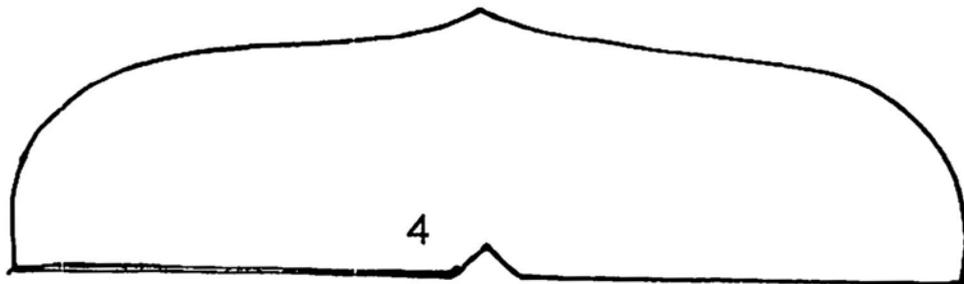
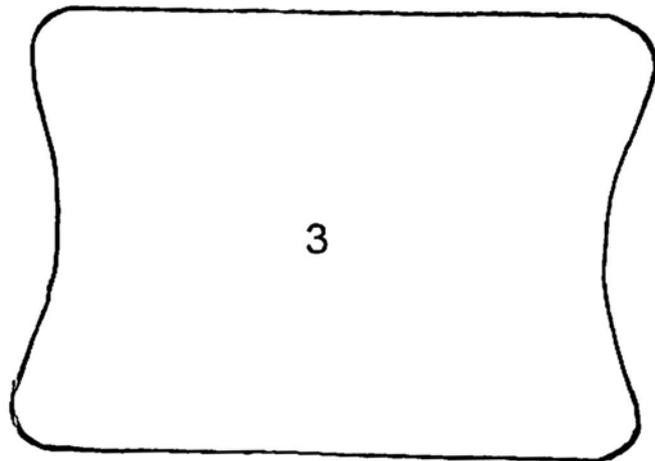
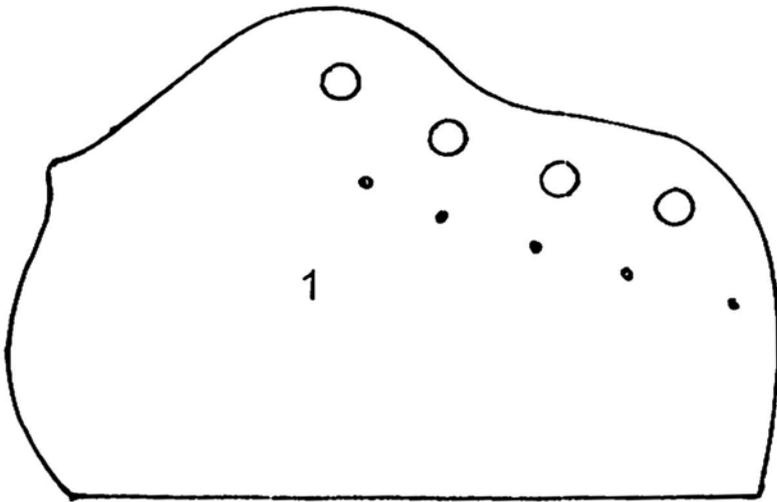
7 = sole (rubber)

HP
03/2009

1 cm

Size **7** SFAB patterns

TYPE I



1 = upper leather

2 = heel strap

3 = tongue

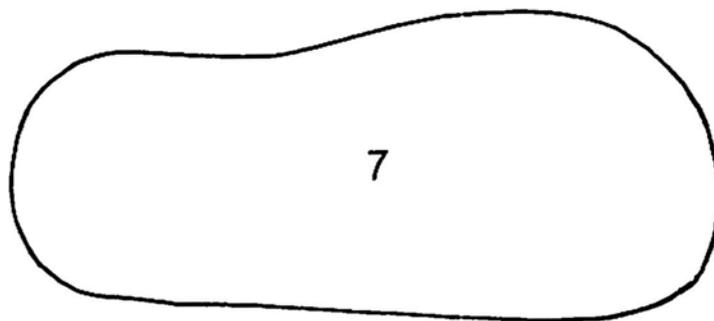
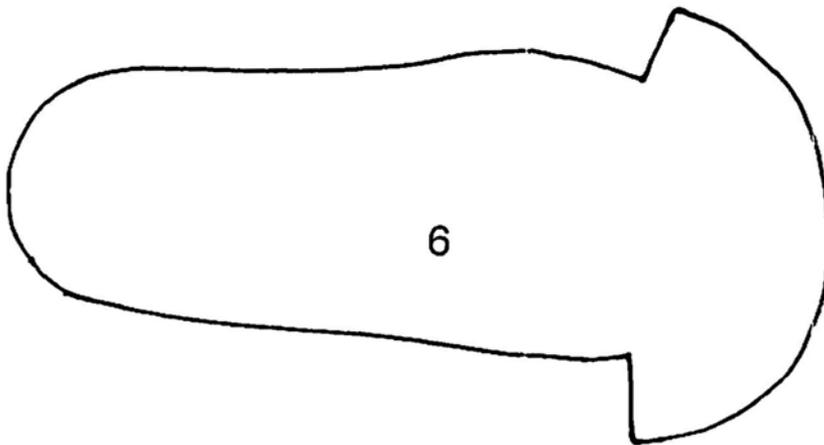
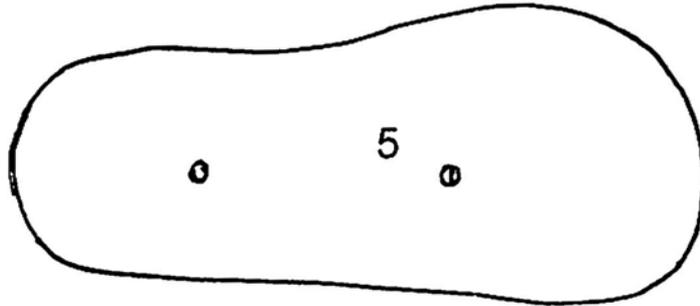
4 = heel counter

LM
03/2009

1 cm

Size **7** SFAB patterns

TYPE I



5 = outersole (plywood)

6 = sock lining

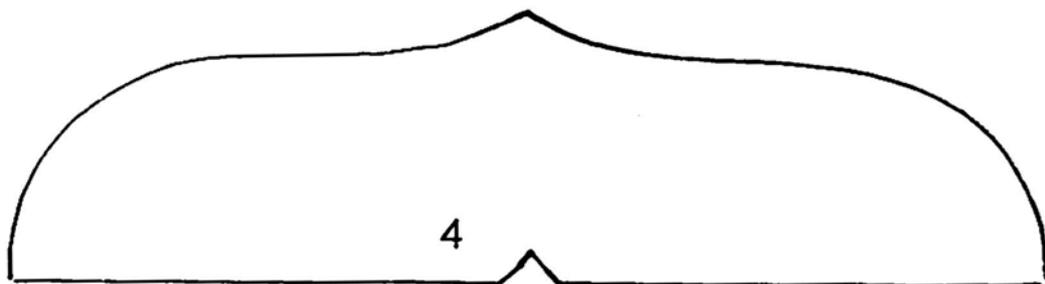
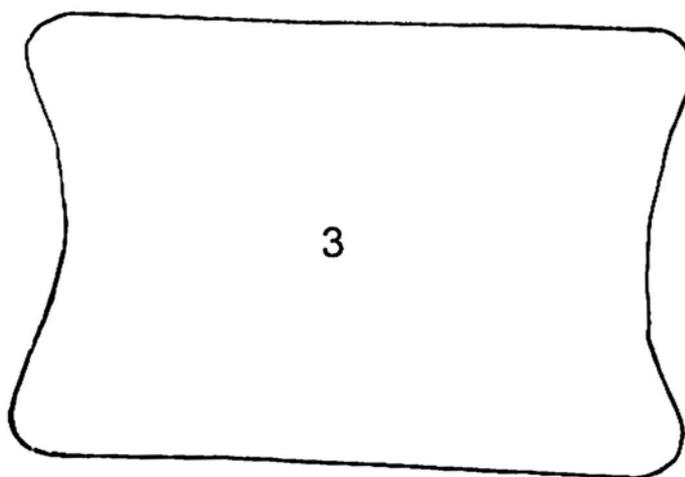
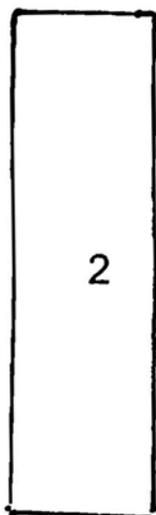
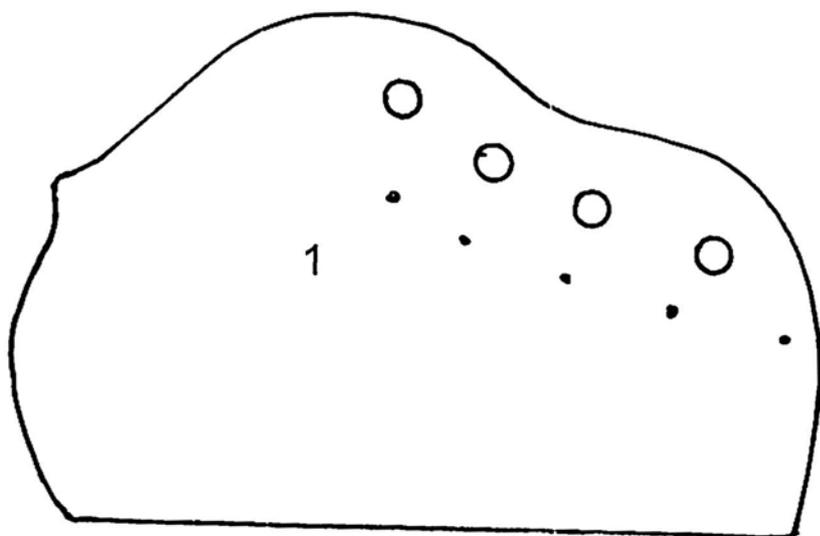
7 = sole (rubber)

MSM
03/2009

1 cm

Size **8** SFAB patterns

TYPE I



1 = upper leather

2 = heel strap

3 = tongue

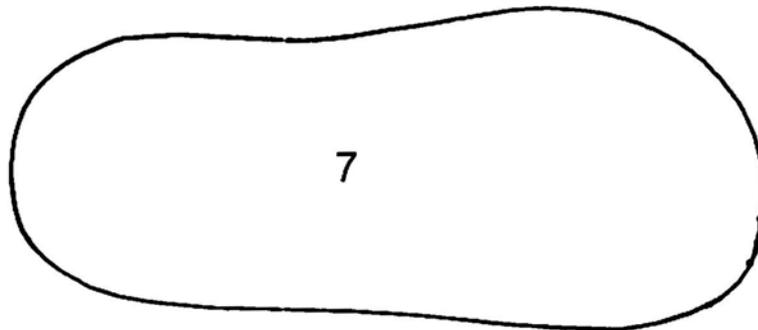
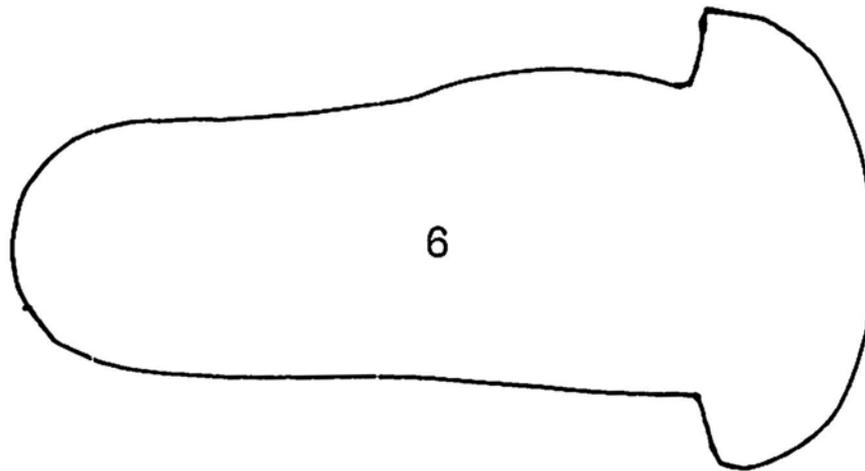
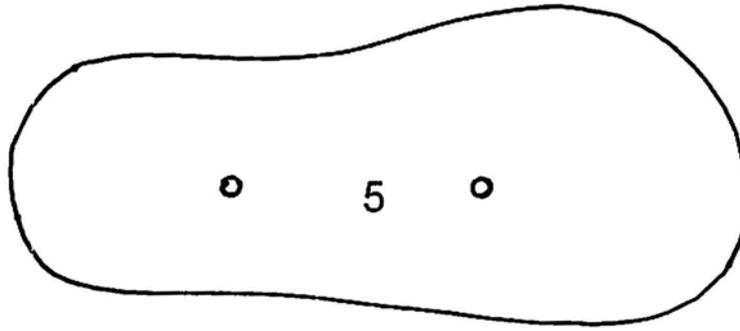
4 = heel counter

HP
03/2009

1 cm

Size **8** SFAB patterns

TYPE I



5 = outersole (plywood)

6 = sock lining

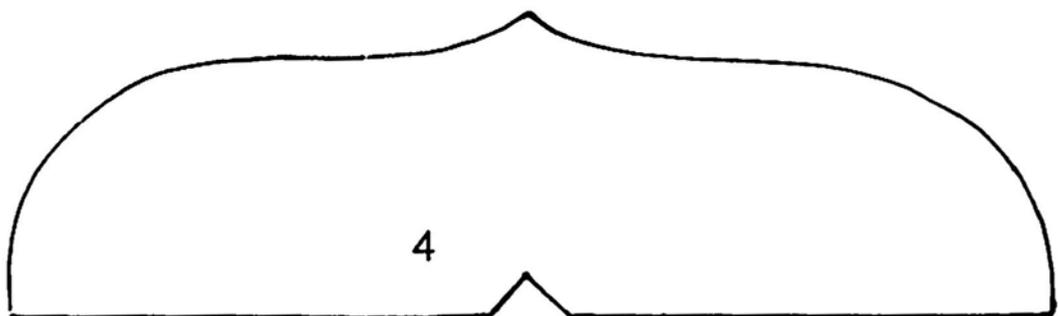
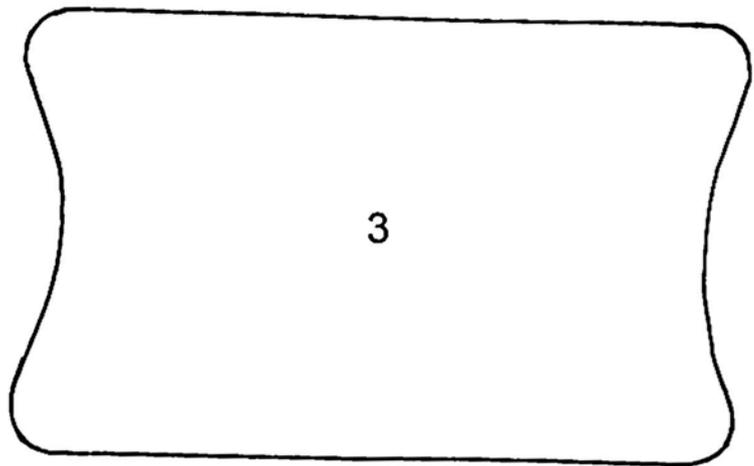
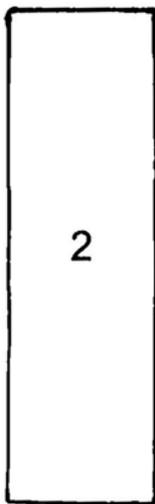
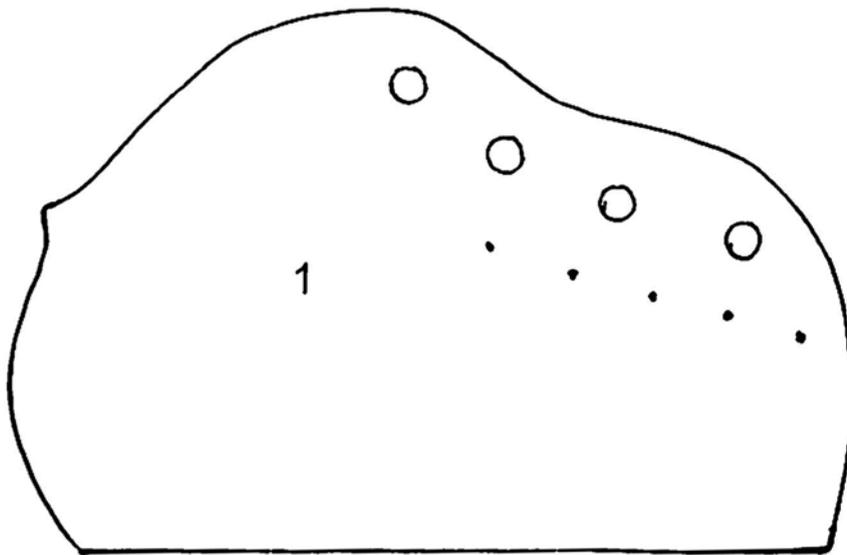
7 = sole (rubber)

HF
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1 cm

Size **9** SFAB patterns

TYPE I



1 = upper leather

2 = heel strap

3 = tongue

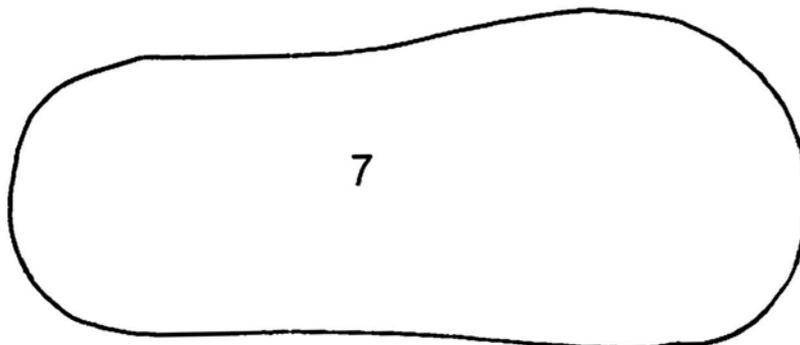
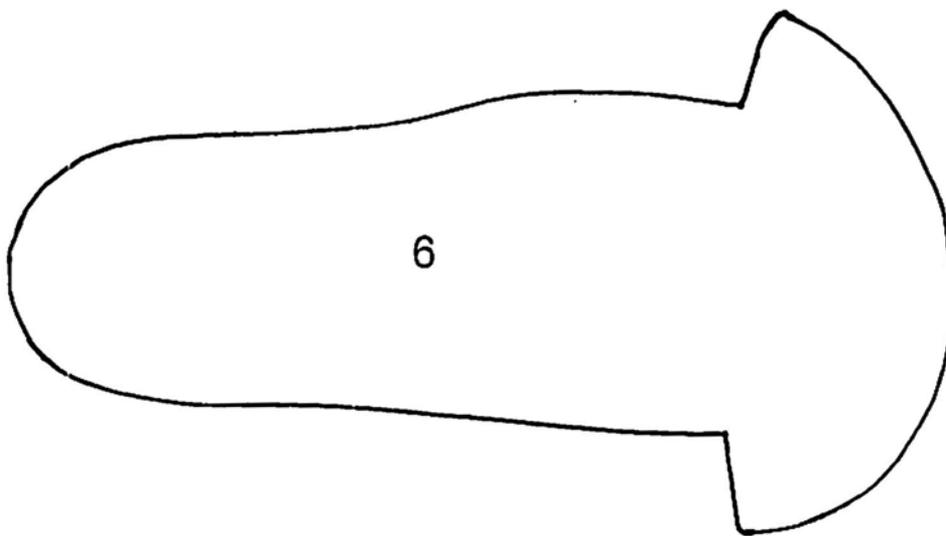
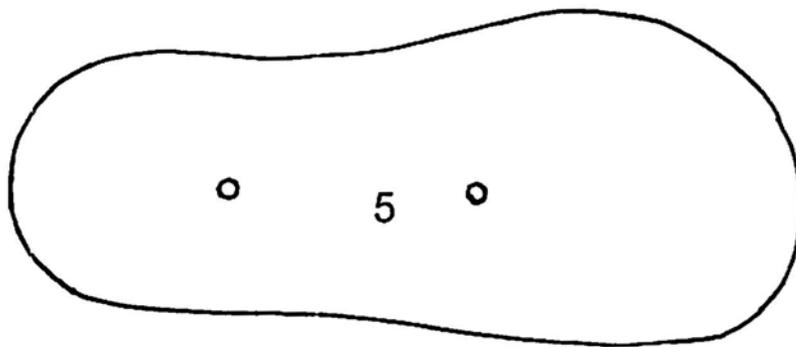
4 = heel counter

SM
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1 cm

Size **9** SFAB patterns

TYPE I



5 = outersole (plywood)

6 = sock lining

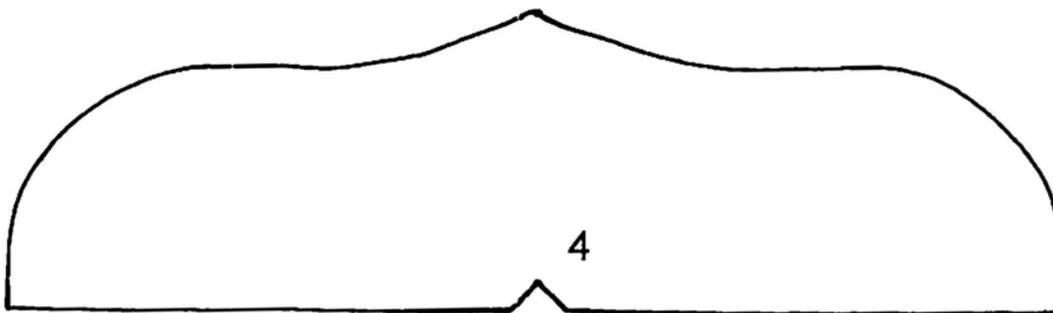
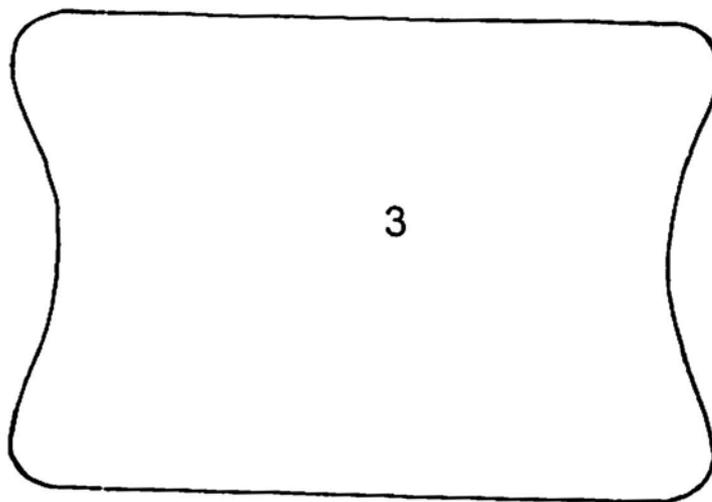
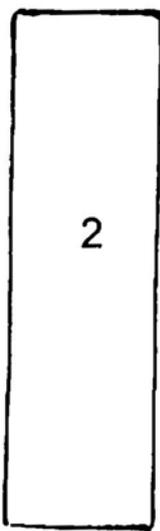
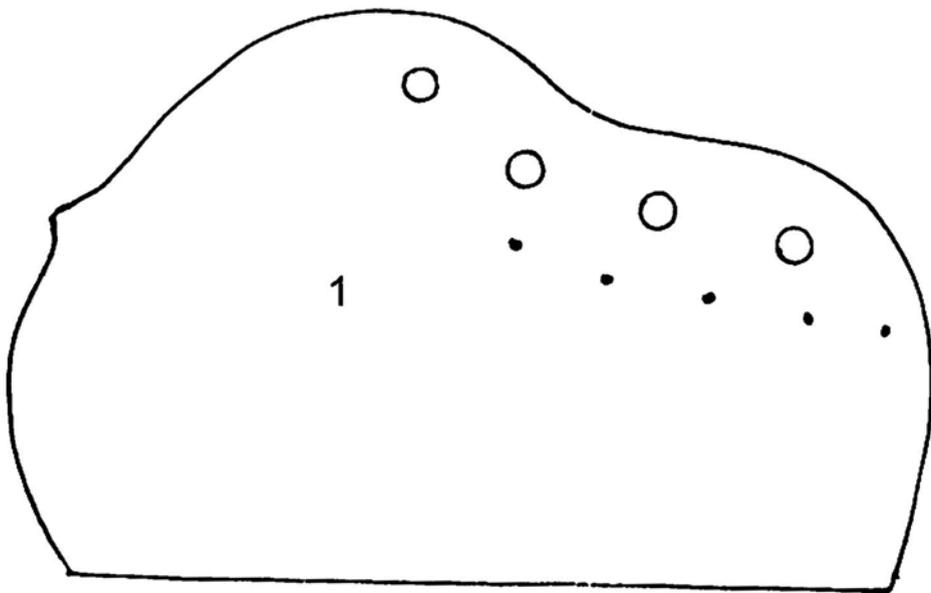
7 = sole (rubber)

SM
03/2009

1 cm

Size **10** SFAB patterns

TYPE I



1 = upper leather

2 = heel strap

3 = tongue

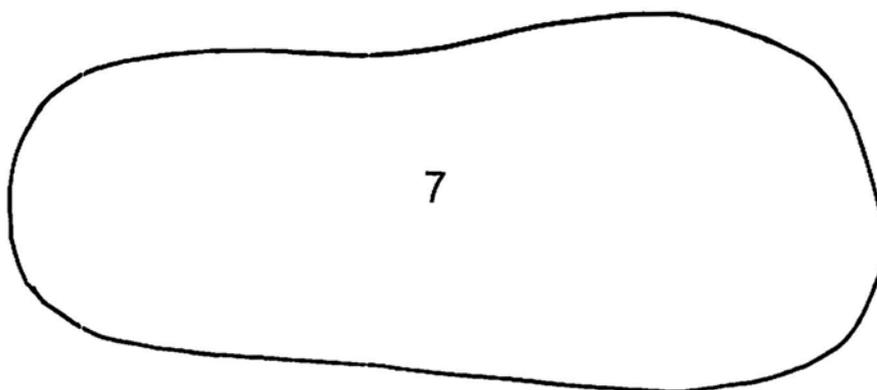
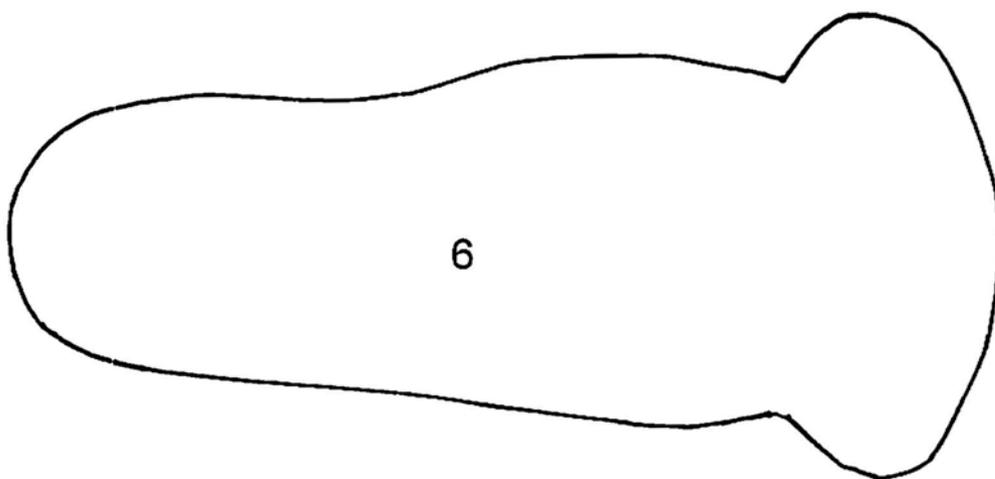
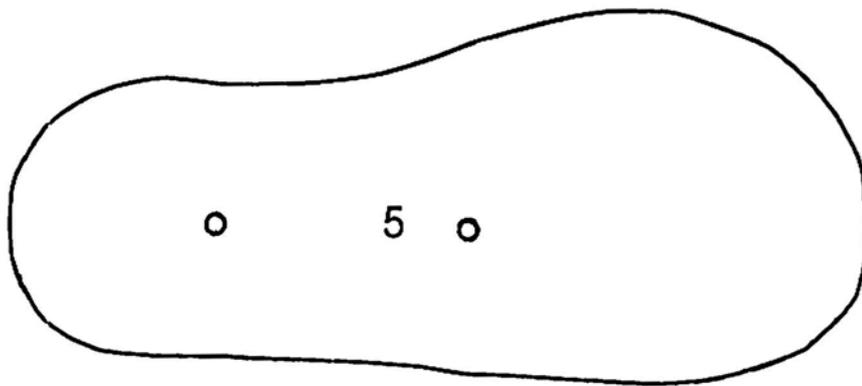
4 = heel counter

SM
03/2009

1 cm

Size **10** SFAB patterns

TYPE I



5 = outersole (plywood)

6 = sock lining

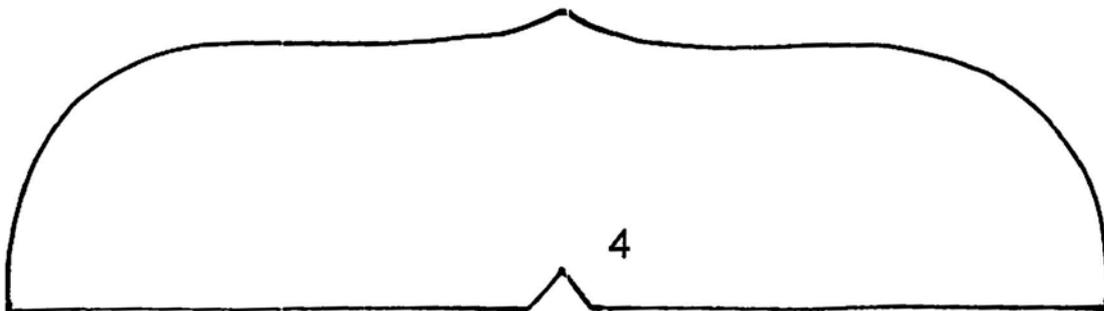
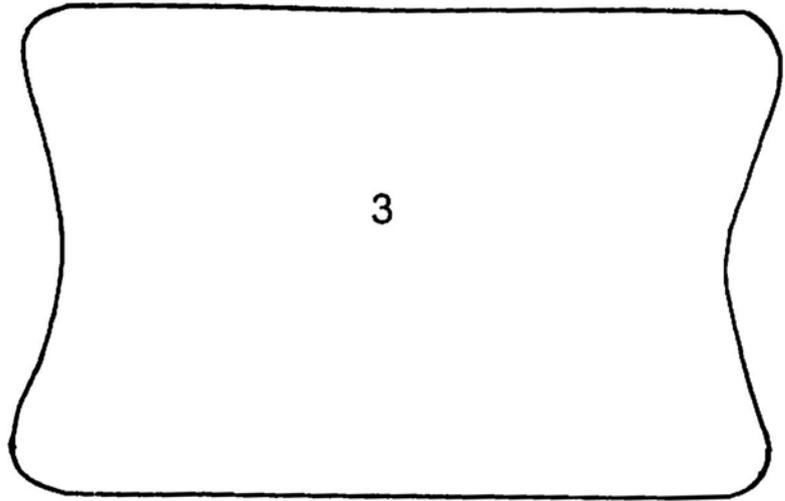
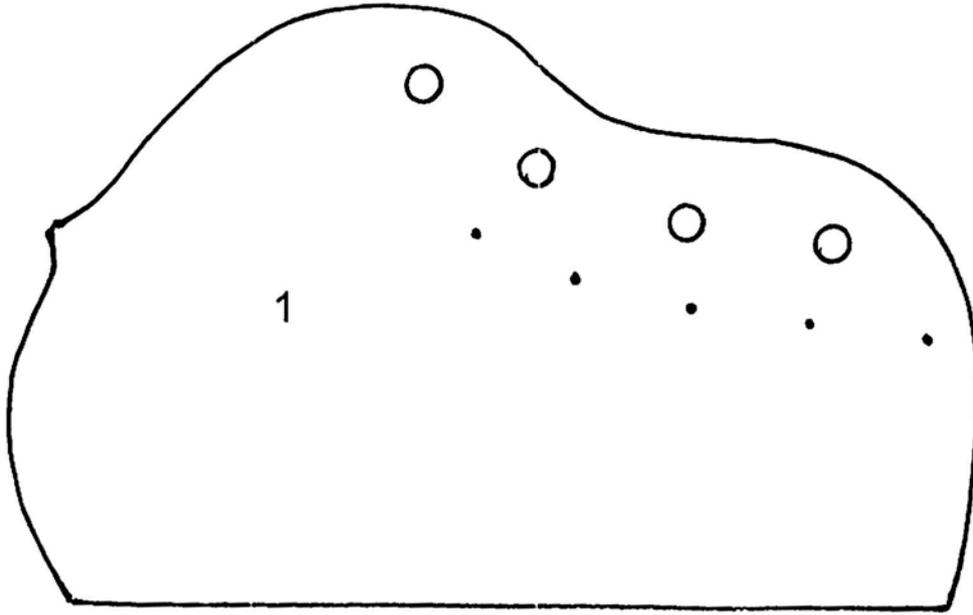
7 = sole (rubber)

SM
03/2009

1 cm

Size **11** SFAB patterns

TYPE I



1 = upper leather

2 = heel strap

3 = tongue

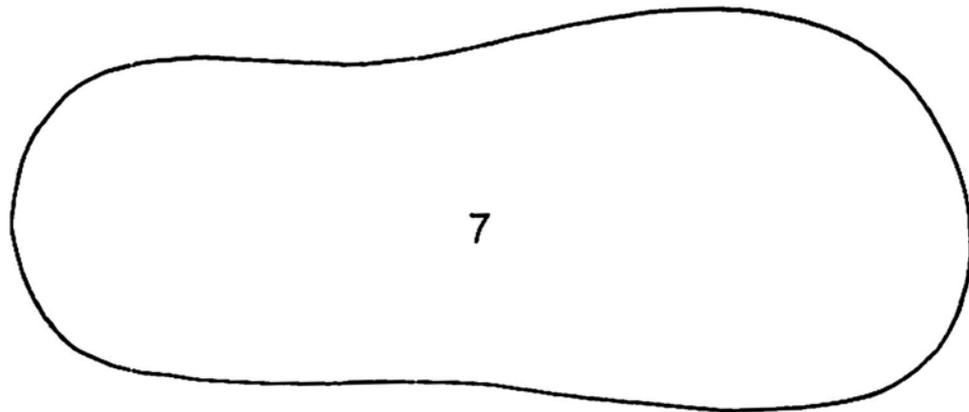
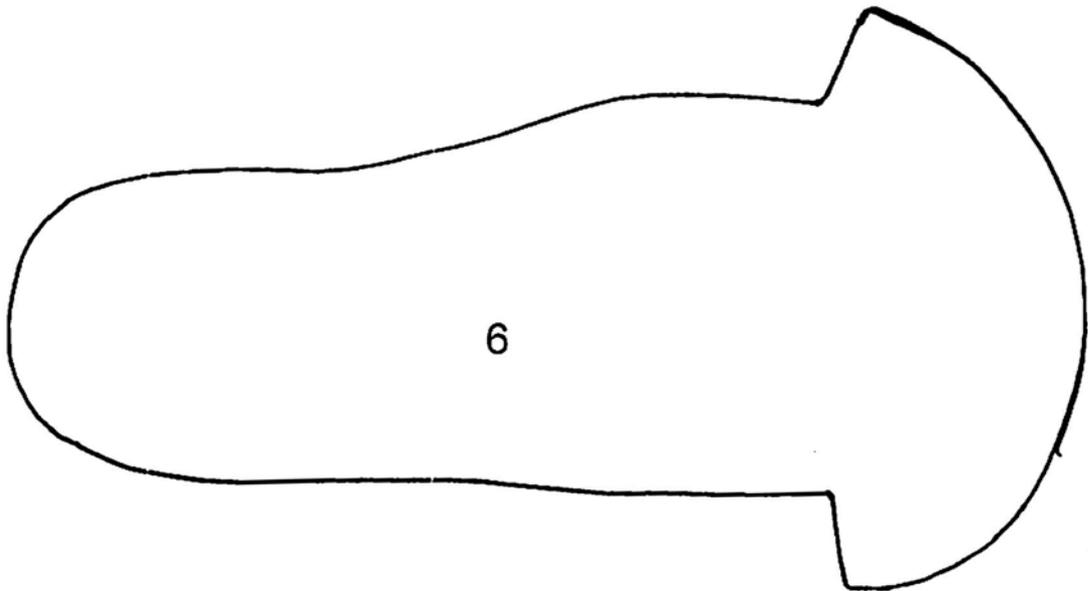
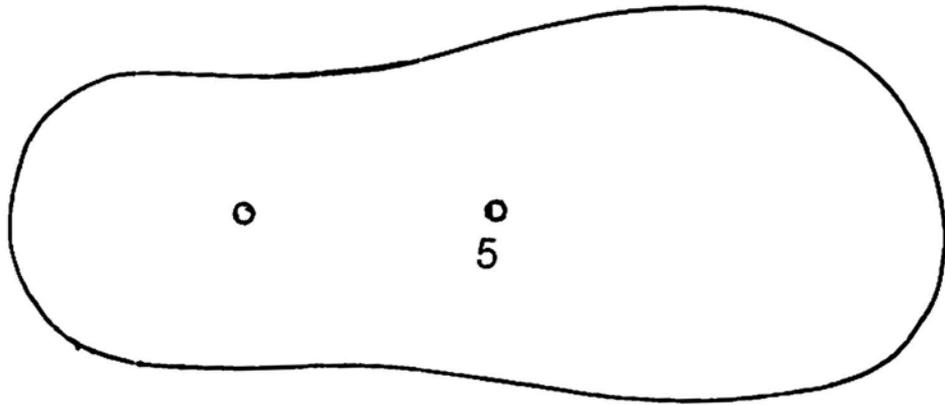
4 = heel counter

HM
03/2009

1 cm

Size **11** SFAB patterns

TYPE I



5 = outersole (plywood)

6 = sock lining

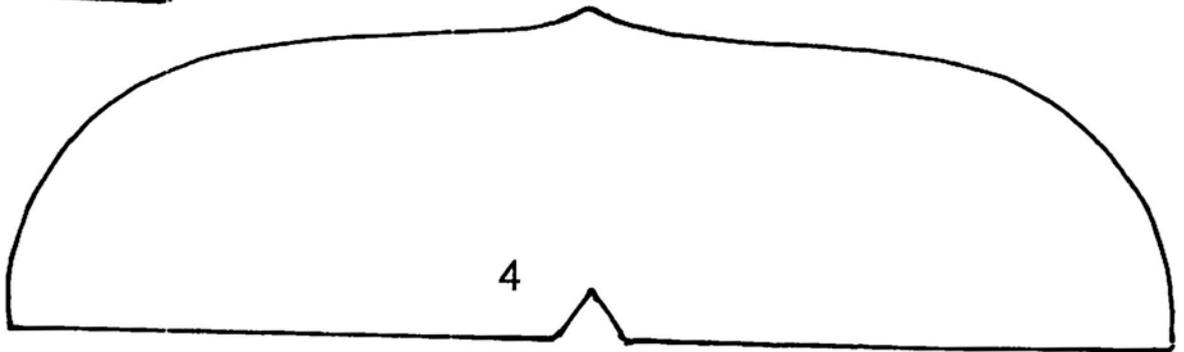
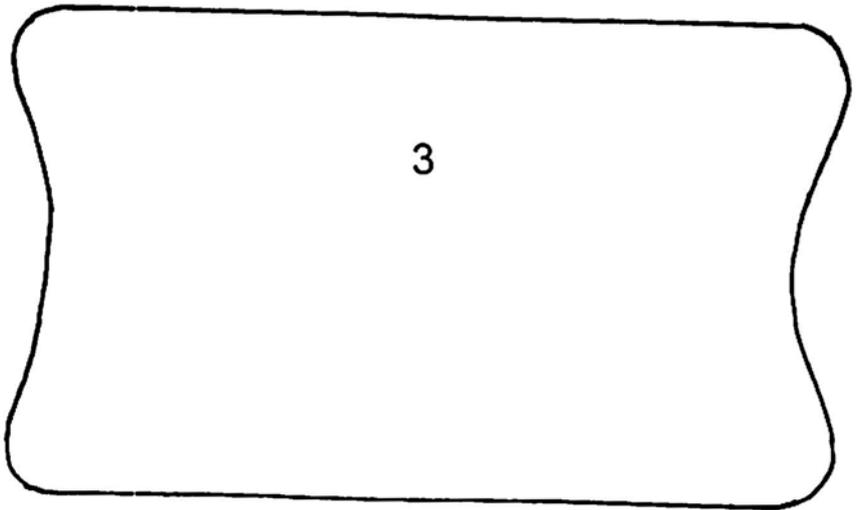
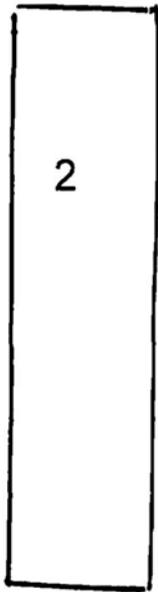
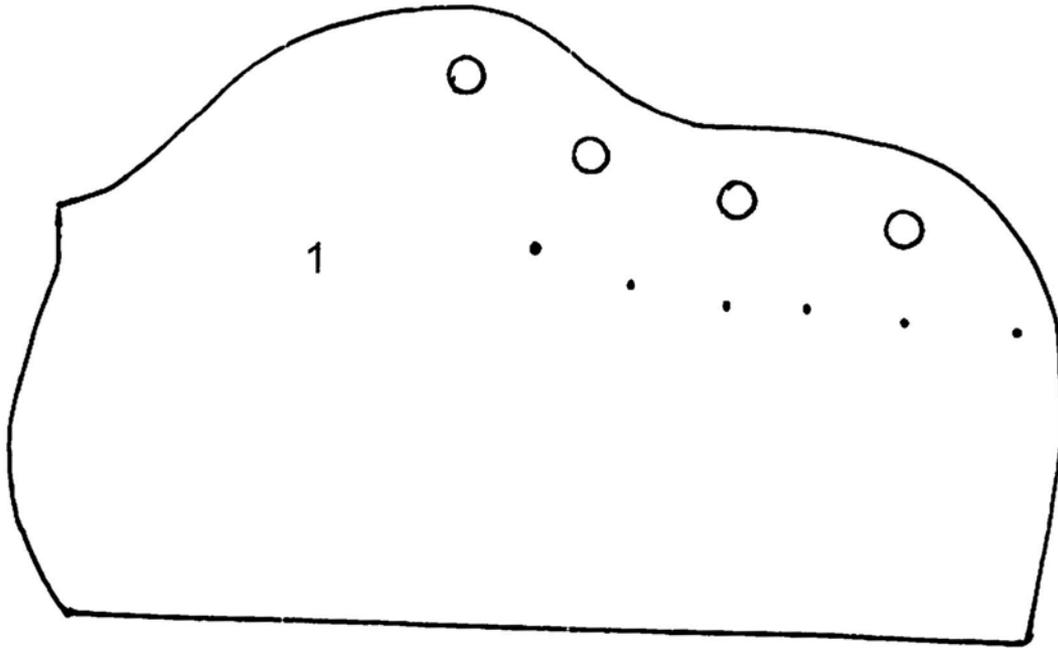
7 = sole (rubber)

HP
03/2009

1 cm

Size **12** SFAB patterns

TYPE I



1 = upper leather

2 = heel strap

3 = tongue

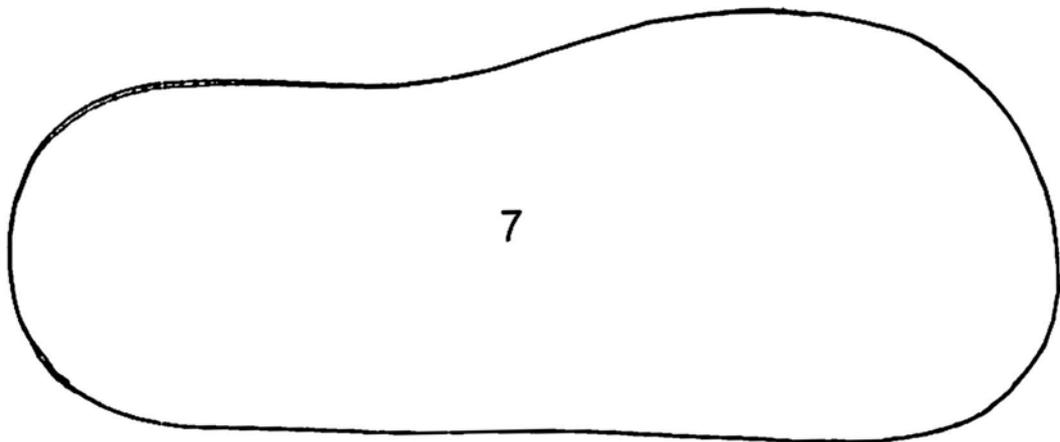
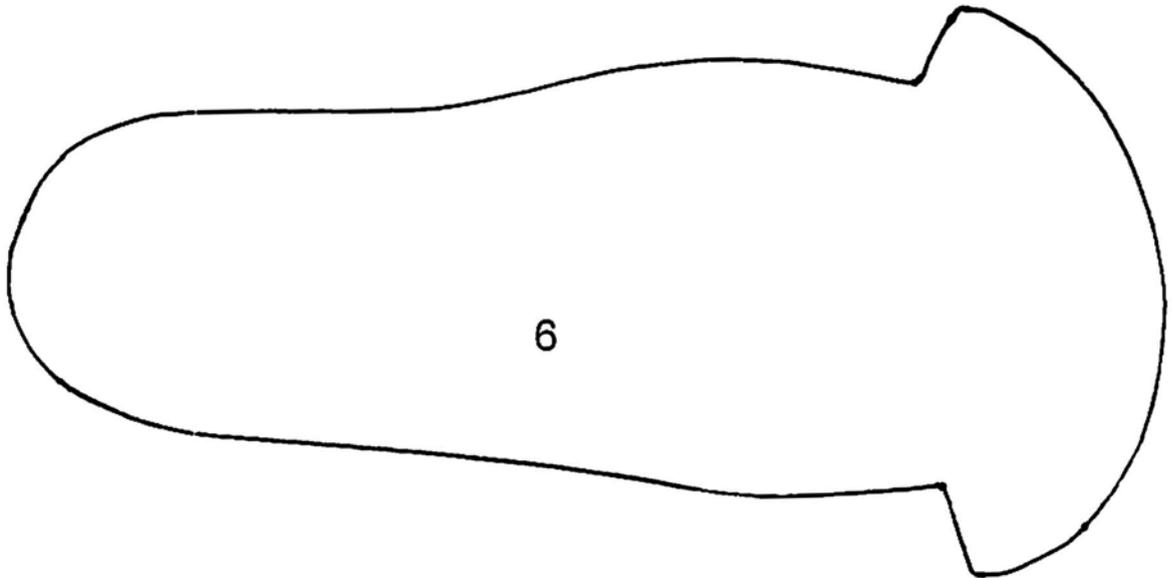
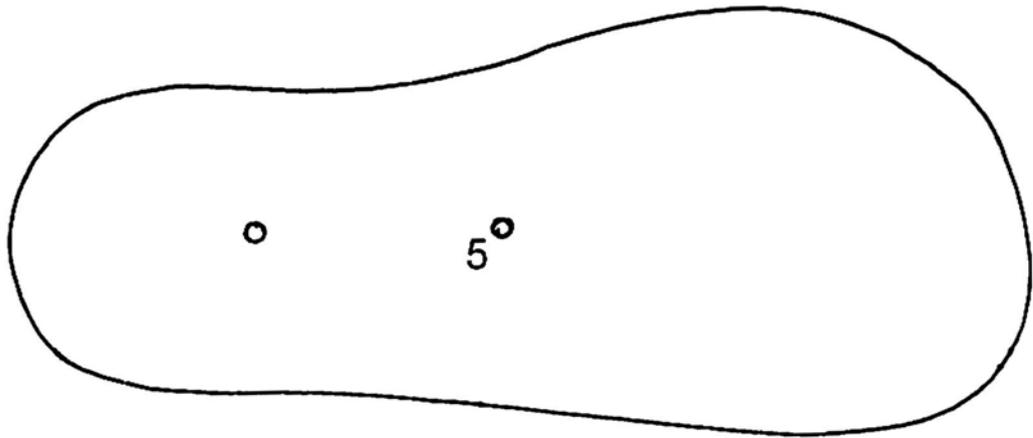
4 = heel counter

HP
03/2009

1 cm

Size **12** SFAB patterns

TYPE I



5 = outersole (plywood)

6 = sock lining

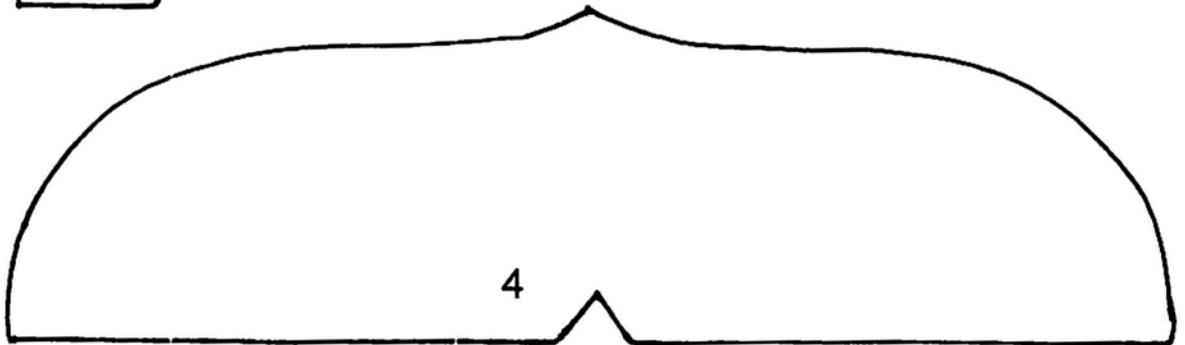
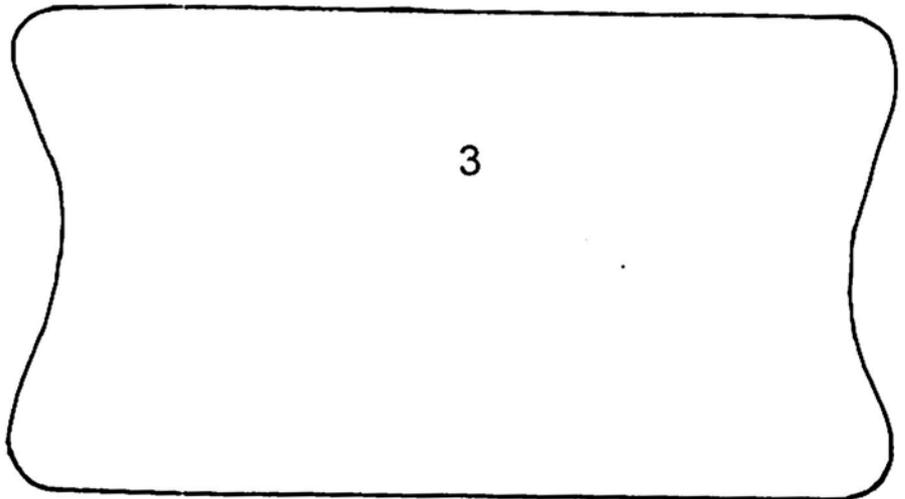
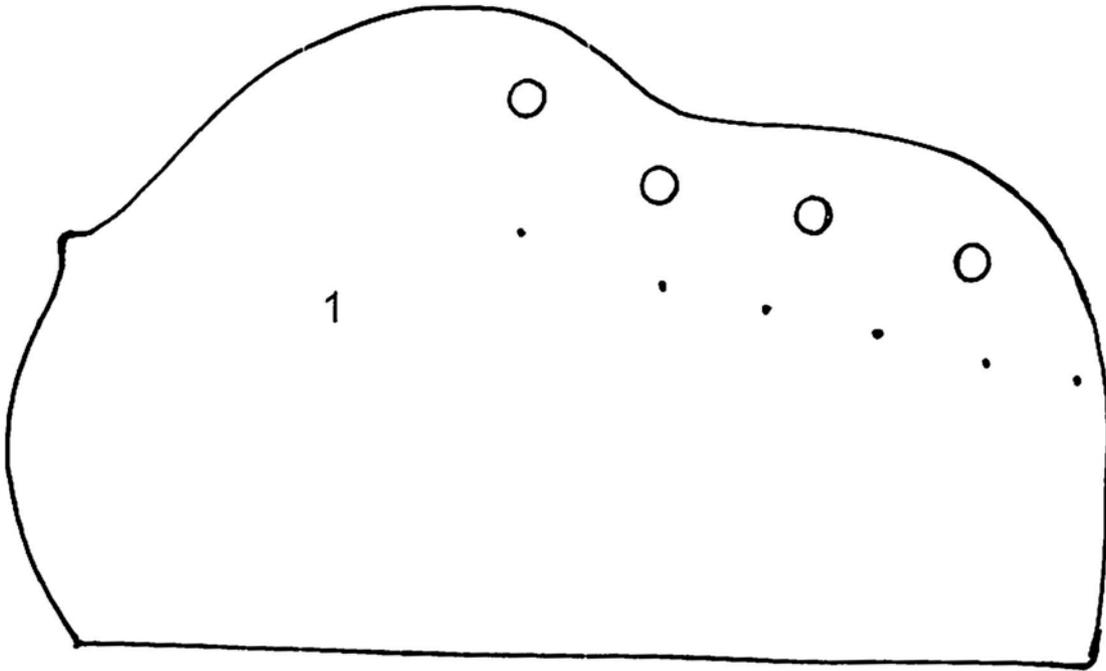
7 = sole (rubber)

LSA
03/2009

1 cm

Size **13** SFAB patterns

TYPE I



1 = upper leather

2 = heel strap

3 = tongue

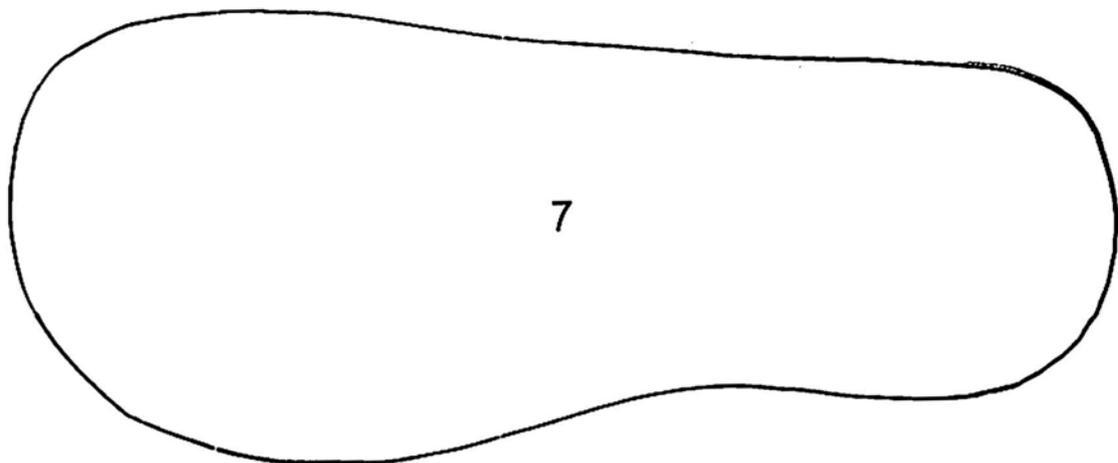
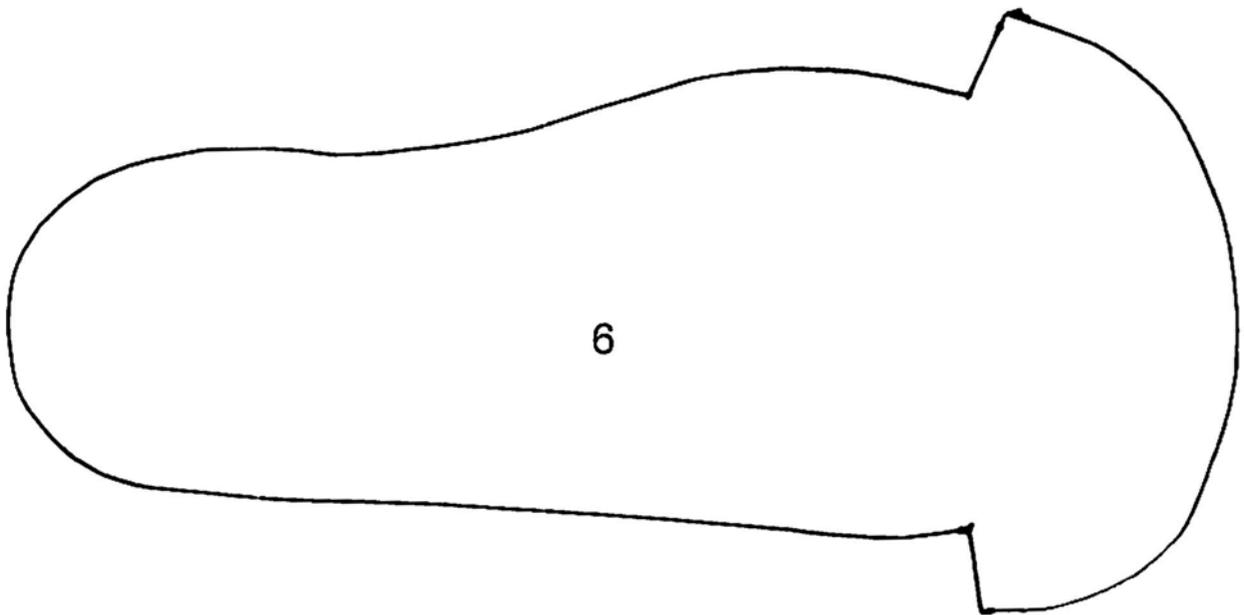
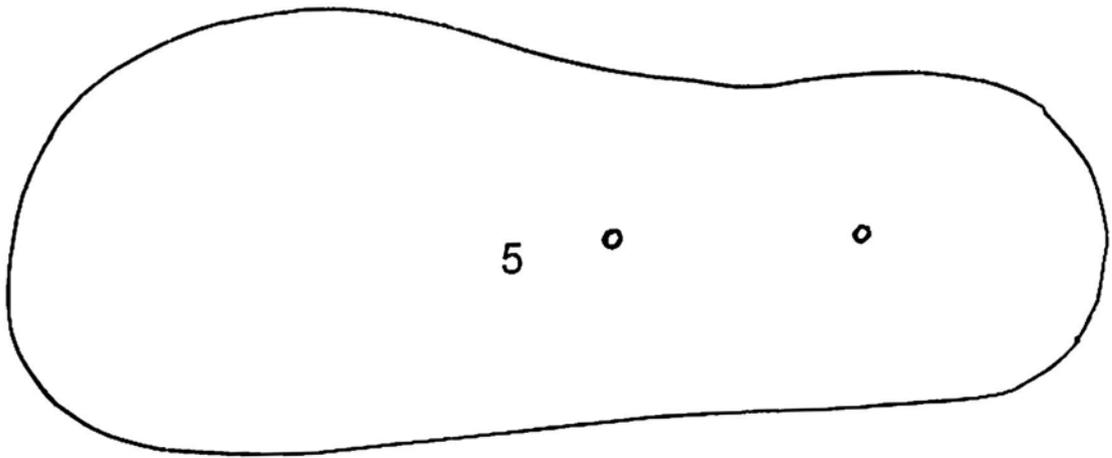
4 = heel counter

SM
03/2009

1 cm

Size **13** SFAB patterns

TYPE I



5 = outersole (plywood)

6 = sock lining

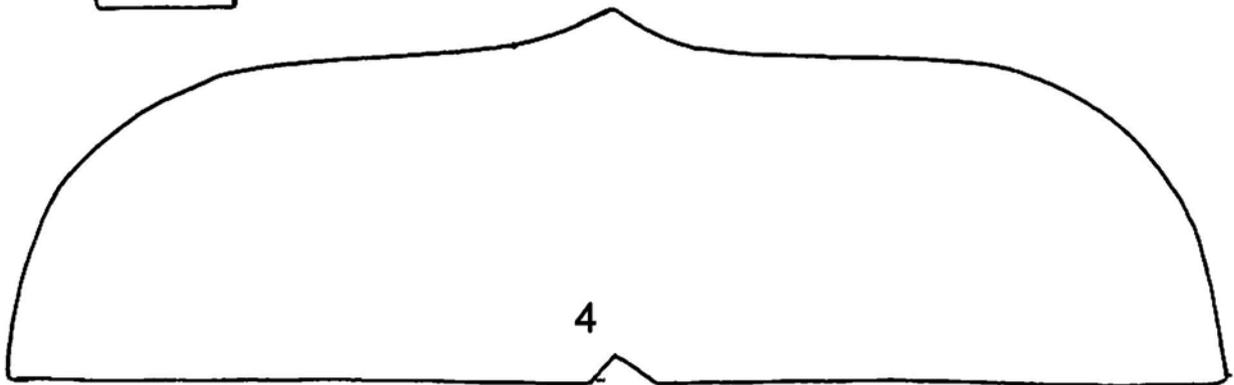
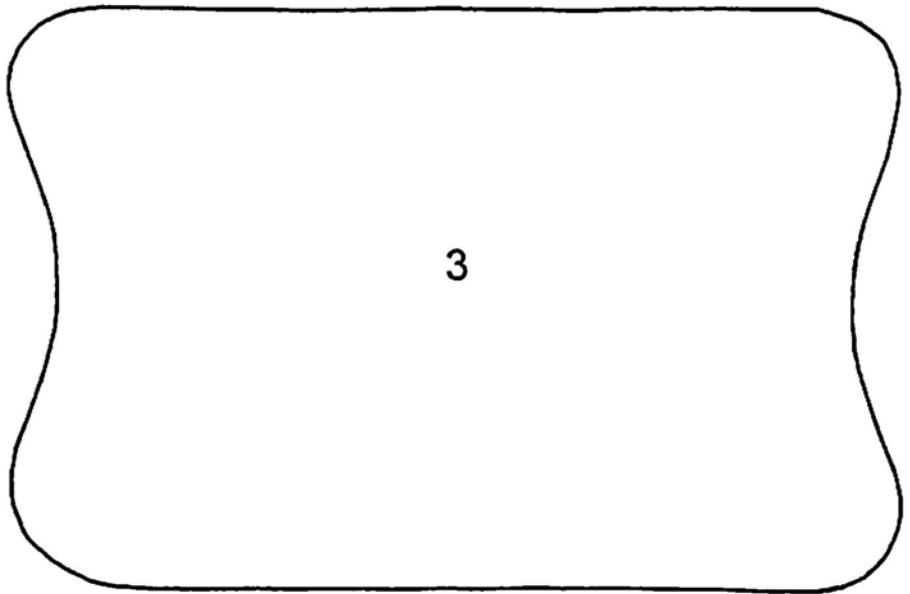
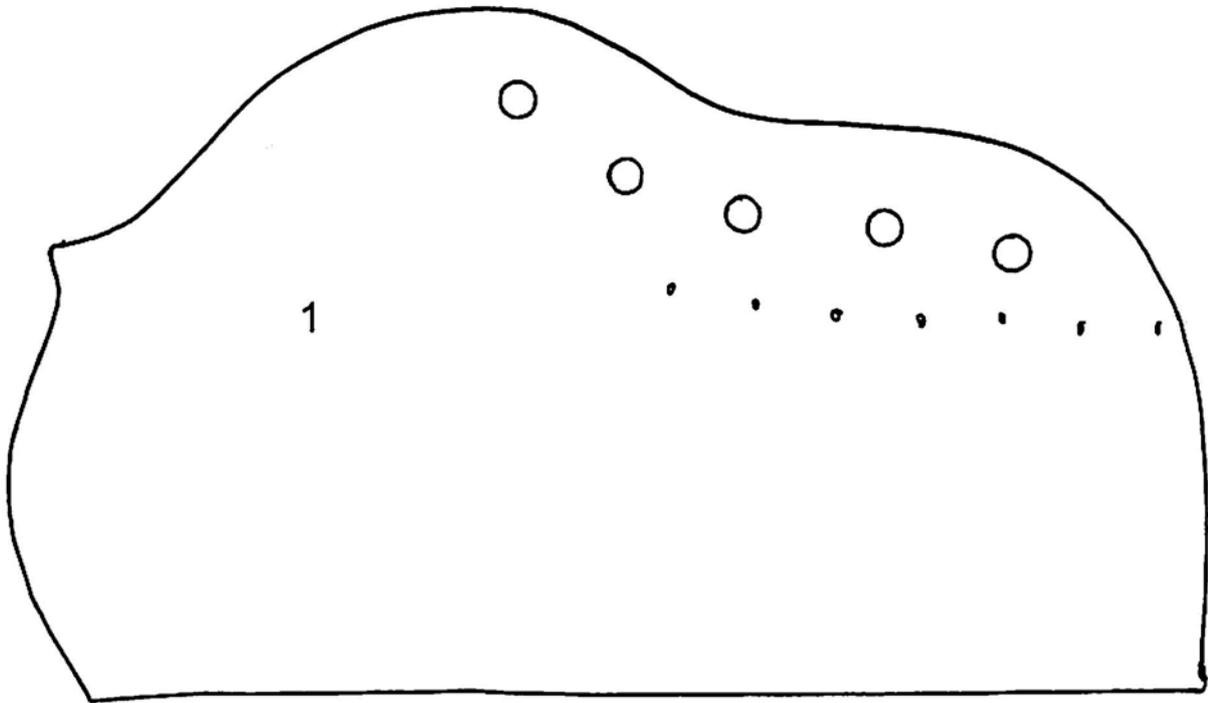
7 = sole (rubber)

HP
03/2009

1 cm

Size **14** SFAB patterns

TYPE I



1 = upper leather

2 = heel strap

3 = tongue

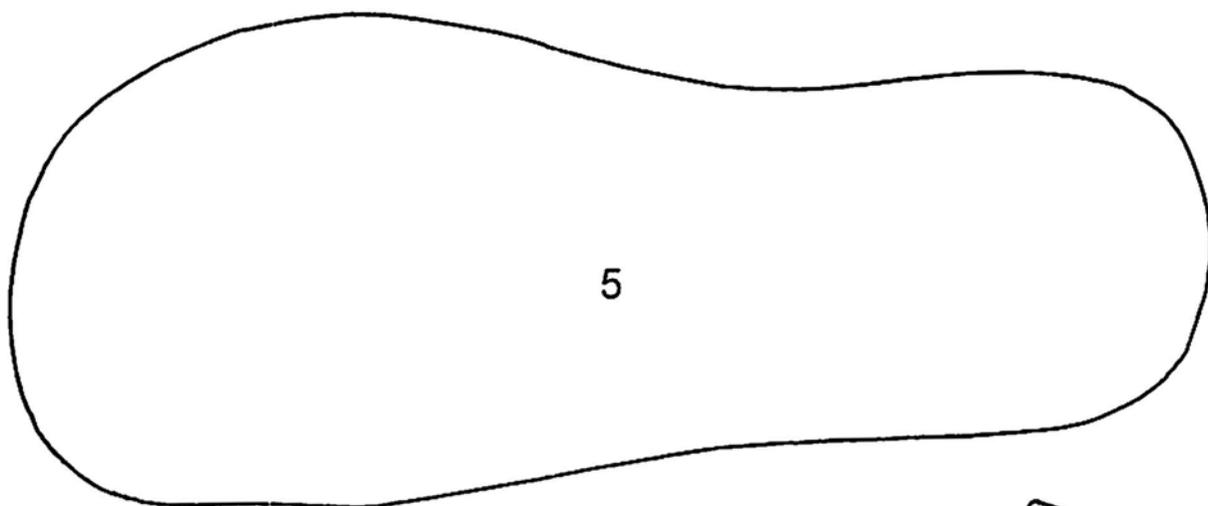
4 = heel counter

SM
03/2009

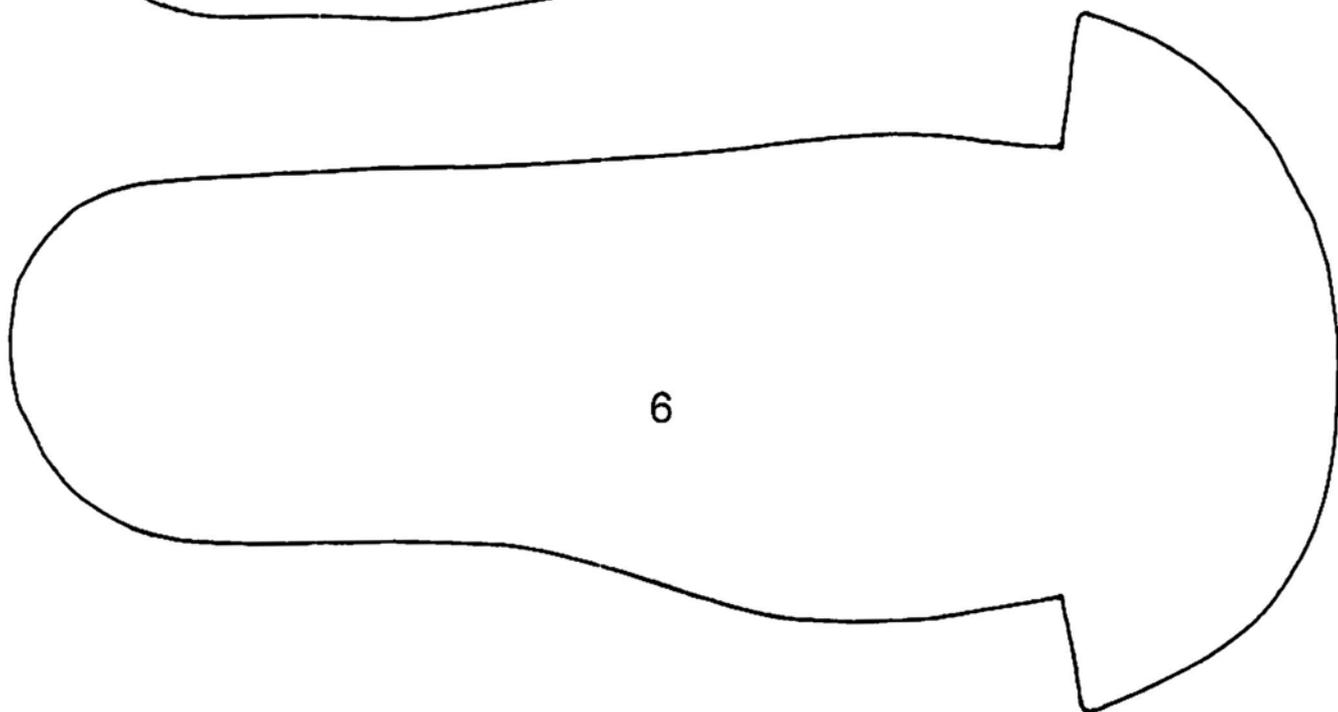
1 cm

Size **14** SFAB patterns

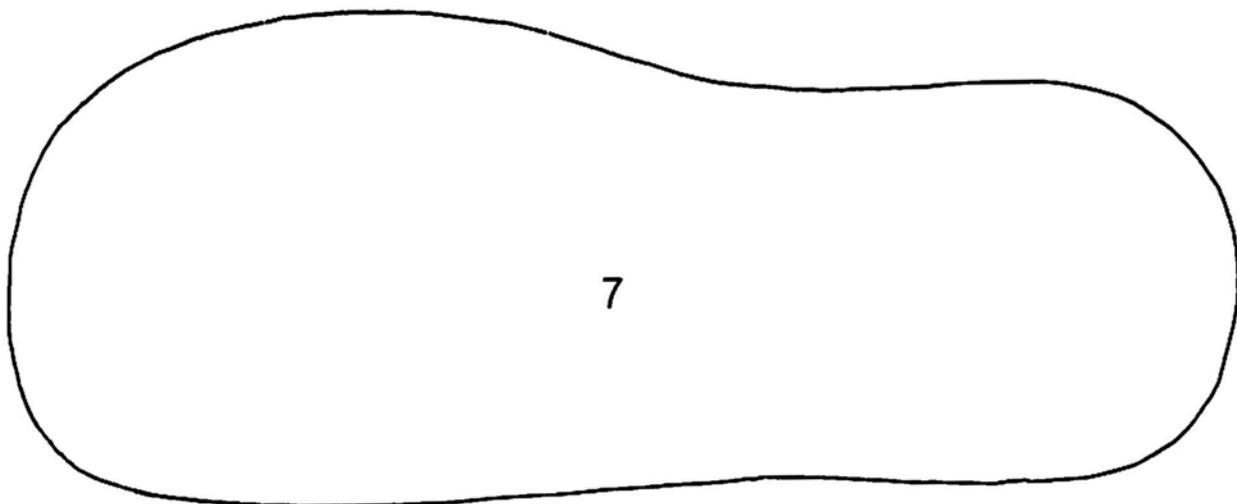
TYPE I



5



6



7

5 = outersole (plywood)

6 = sock lining

7 = sole (rubber)

SP
03/2009

The Steenbeek Foot Abduction Brace (SFAB) is a device to maintain the extreme foot abduction (70 degrees) in children with treated clubfeet. The SFAB forms an integral part of the Ponseti Method of Clubfoot treatment, which targets new-born babies with Clubfeet.

Correction of the Clubfoot is achieved by applying serial casts of p.o.p., in combination with a minor surgical procedure (percutaneous tendo achilles tenotomy for 90% of the babies) under local anaesthesia. The SFAB is necessary to maintain this correction.

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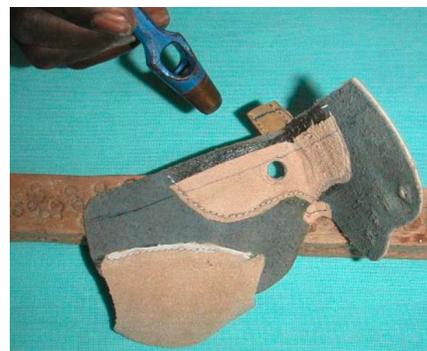
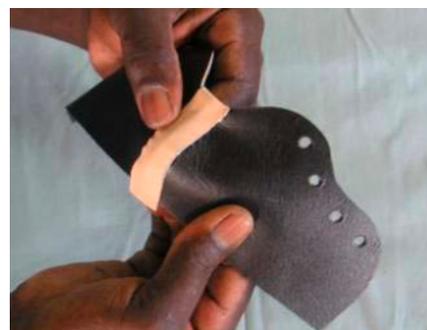
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