



BASIC TRAINING MANUAL

12-2

ROOF PLUMBING

Spouting and Guttering

NATIONAL BUILDING AND CONSTRUCTION
INDUSTRY TRAINING COUNCIL

DEPARTMENT OF EMPLOYMENT, EDUCATION AND TRAINING



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12-2

ROOF PLUMBING

Spouting and Guttering

This manual was produced as the result of the need expressed for the production of up-to-date and comprehensive manuals on the aspect of roof plumbing.

The topics of this manual were compiled by Mr. R. Verity of RMIT in consultation with a working panel appointed by the National Building and Construction Industry Training Committee who approved this publication on behalf of the National Training Council.

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The manual was prepared by the Manuals Unit of the Industry Training Services Branch of the Department of Employment and Youth Affairs (DEYA).

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The editor was Mr. J. R. M. Jentzema.

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CONTENTS

	Preface	v
	Instructions to Trainee	vi
	Symbols	vii
1	Introduction	1
2	Eaves gutters	2
2.1	Types of eaves gutters	3
2.2	Mitres for eaves gutters	4
2.3	Making a spouting mitre	5
2.3.1	Making an external 90° mitre	7
2.3.2	Making an internal 90° mitre	9
2.3.3	Making an external angle — Aluminium quad	10
2.3.4	Making an internal angle — Aluminium quad	10
2.3.5	Making an external angle — Ace Nu-Line concealed gutter	12
2.3.6	Making an internal angle — Ace Nu-Line concealed gutter	13
2.3.7	Making internal and external angles — Ace Nu-Line fascia gutter	13
2.3.8	Making external and internal mitres in square, straight-fronted eaves gutters	14
2.3.9	Making internal and external angles in PVC spouting	14
2.3.10	Making internal and external angles in AC spouting	14
2.3.11	Cast iron internal and external spouting angles	15
2.3.12	The external obtuse angle mitre	16
2.3.13	The internal obtuse angle mitre	17
2.4	Stop ends	17
2.4.1	Making a plain stop end (using scrap material)	18
2.4.2	Making a plain stop end (using the spouting itself)	18
2.4.3	Making other plain stop ends	19
2.4.4	Making a stop end in Nu-Line, Mini-Line spouting	19
2.4.5	Stop ends in aluminium quad spouting	20
2.4.6	Making a return stop end	20
2.4.7	Return stop end in aluminium and Zinalume quad	21
2.4.8	Return stop end in asbestos cement spouting	21
2.4.9	Return stop end in PVC spouting	21
2.4.10	Return stop end in Trimline, Sheerline or Stramit spouting	21
2.5	Spouting outlets	22
2.5.1	Making the spouting outlet	24
2.5.2	Prefabricated spouting outlets	25
2.5.3	Fitting zinc alloy diecast spouting outlets	26
2.5.4	Fitting pressed aluminium outlets	26
2.5.5	Fitting moulded PVC outlets	27
2.5.6	Fitting asbestos cement outlets into position	27
2.5.7	Fitting cast iron spouting outlets into position	28
2.6	Joining lengths of spouting	29
2.6.1	Other materials	29
2.6.2	Joining aluminium spouting	29
2.6.3	Joining Nu-Line or Mini-Line spouting	31
2.6.4	Joining Sheerline or Trimline	31
2.6.5	Joining cast iron spouting	32
2.7	Holding spouting in position	34
2.7.1	Spacing of brackets and straps	36
2.8	Fixing spouting in position	36
2.8.1	Marking a fall line on the fascia	36

2.8.2	Fixing eaves gutters around a building roof	38
2.8.3	Slip joints	39
2.8.4	Preparing a slip joint	39
2.8.5	Concealed eaves gutter	40
2.9	Expansion joints	40
2.9.1	Expansion joint in quad spouting	40
Revision Questions		41
3	Roof gutters	
3.1	Types of roof gutters	42
3.2	Shapes of roof gutters	42
3.2.1	Nail proofing of box gutters	44
3.2.3	Tapering gutters	47
3.2.4	Valley gutters	48
3.2.5	Chimney gutters	48
3.3	Materials for roof gutters	50
3.3.1	Recommended material thicknesses	53
3.3.2	Fall in roof gutters	53
3.4	Making roof gutters	54
3.4.1	Measuring roof gutters	54
3.4.2	Setting out sheets	55
3.4.3	Shaping the sheets	55
3.4.4	Aligning the gutters	57
3.4.5	Aligning several lengths	57
3.4.6	Aligning two lengths at a time	59
3.4.7	Joining roof gutters	59
3.4.8	Welding PVC	62
3.4.9	Cementing of PVC gutters	63
3.5	Fixing roof gutters in position	66
3.6	Slip joints	67
3.7	Stop ends	67
3.7.1	Making a stop end for box gutters	68
3.7.2	Making a stop end for irregular-shaped gutters	70
3.8	Turn downs	71
3.8.1	Making a turn down	71
3.9	Expansion and contraction	72
3.9.1	Metals expand equally in all directions	73
3.9.2	Metals do not expand equally	73
3.9.3	The force of expansion	73
3.9.4	The forces of expansion and contraction are equal	73
3.9.5	Measuring the expansion	74
3.9.6	Expansion in roof gutters	74
3.9.7	Making an expansion joint	75
Revision Questions		76
Notes for the instructor		76
User comments		

PREFACE

This manual forms part of a series on basic roof plumbing skills, specifically designed as practical training aids for apprentices in this trade.

It is based on a general syllabus content that exists for courses in the plumbing and roofing trades.

Each manual is self-contained and is intended as an instructional guide in on- or off-the-job training situations. It may be used by instructors, or by trainees for self-teaching and private study purposes.

The aim of the manual is to help the trainee to develop a particular skill to the stage where it can be applied productively on the job.

Ideally the manual should be used as part of a course of instruction involving:

- demonstrations of practical skills by instructors, experienced tradesmen or operators;
- planned and supervised practice in handling the tools or machines involved;
- instruction in related theory and workshop technology.

Some notes for the instructor to assist in planning systematic training on the job are included.

The manuals, or the topics they cover, may be used in any order convenient to the learning needs of the trainee.

As much as was possible to ascertain, most of the important fields have been covered. In special circumstances, it is expected that instructors and trainers will provide trainees with the specific additional information to comply with any local conditions which are at variance with the contents of this manual, where this may be the case.

USER COMMENT SHEET

Please use the sheet following page 79 to let the Training Publication Unit know your assessment of the quality of the material contained in the manual and what future training material should be produced.

INSTRUCTIONS TO TRAINEE

This manual is a teaching aid to help you develop mechanical skills you need in your job. It is best used on the job where you can handle any tools or equipment.

You should follow the general directions given by the person training you. To reach the required standard of skill, you must pay particular attention to your instructors' explanations and demonstrations. Supervised practice is essential.

Practice means making repeated efforts to improve your level of skill. Study is making an effort to learn. Every advance in skill depends on study and practice. You will make most progress by co-operating actively in the training arranged for you.

When you are told to study all or part of this manual, try and use a definite plan of study. The following plan is effective.

SURVEY: Read quickly through the headings as you turn the pages. Glance at the drawings. Get an overall view before you read.

QUESTION: Ask yourself: What do I know? What do I need to know? How will this manual help me to learn?

READ: Read right through each section carefully. Be thorough but do not dawdle. Reading quickly will help you concentrate.

DO: Use all your senses in learning. Getting the "feel" of any tool or equipment is essential in learning to use it. Follow the instructions given to you.

REVIEW: Shut the manual. Try to remember the main points of the section. Check to make sure that you are right. Revise points on which you are doubtful; often if necessary.

One way of fixing important instructions in your mind is to repeat them over and over.

Careful study of and practice in the various trade skills treated in this manual will help you develop them to work safely and productively.

SYMBOLS

The symbols shown are used in illustrations in these manuals.

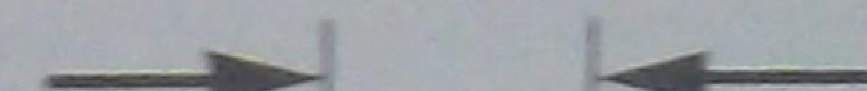
GENERAL:



Position of item named



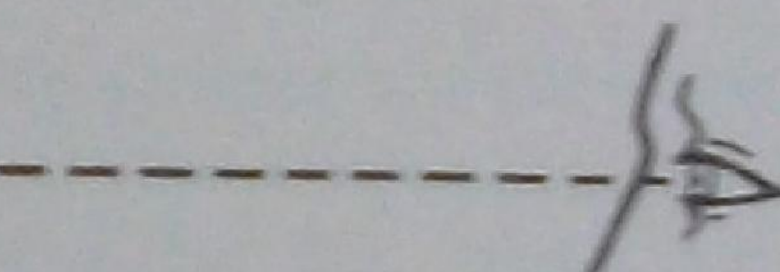
Position of surface named



Limits of movement, item or angle



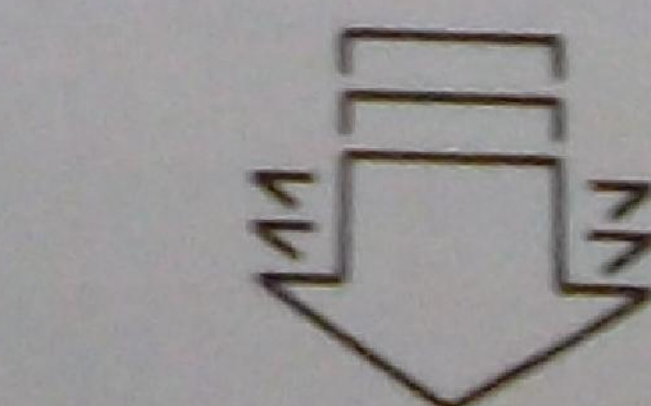
Detail shown enlarged and more clearly



Point or item to be watched



Sound to be listened for

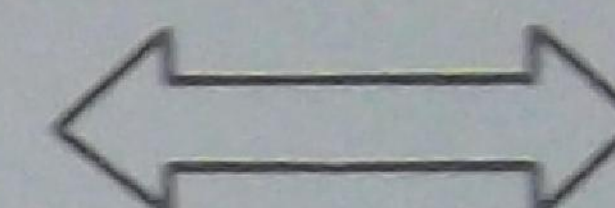


Thrust direction

MOVEMENT ALLOWED OR PRODUCED:



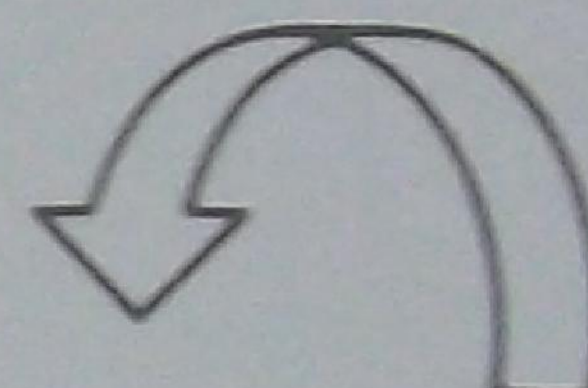
One way



Two way



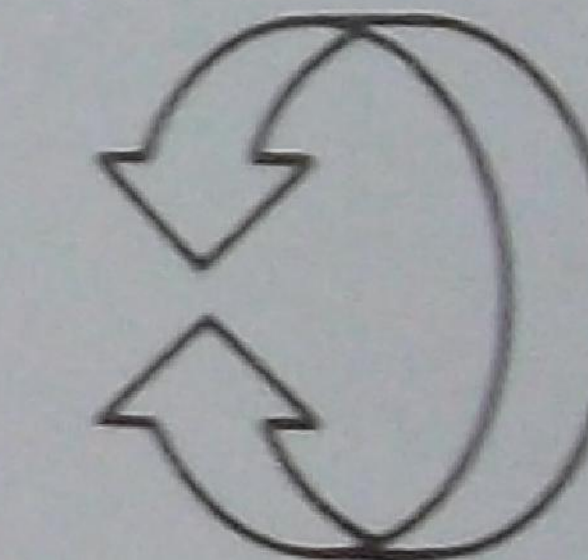
or



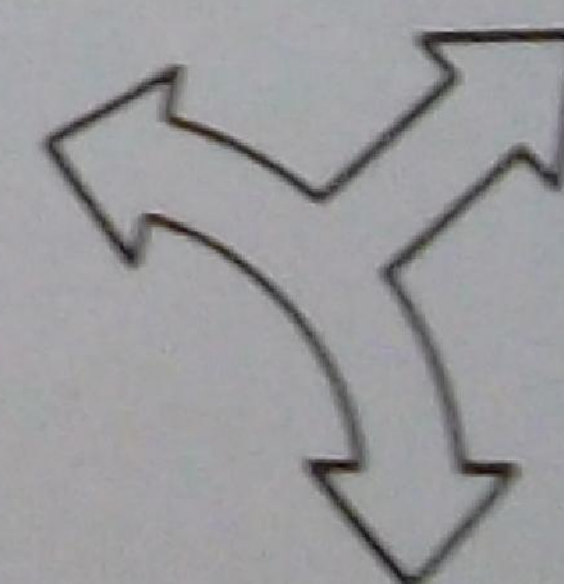
One-way turn



or



Two-way turn



Combined movement

NOTE: Movement and no movement symbols may be combined.

NO MOVEMENT ALLOWED OR PRODUCED:



One way



Two way



or



One-way turn



Four way

1 INTRODUCTION

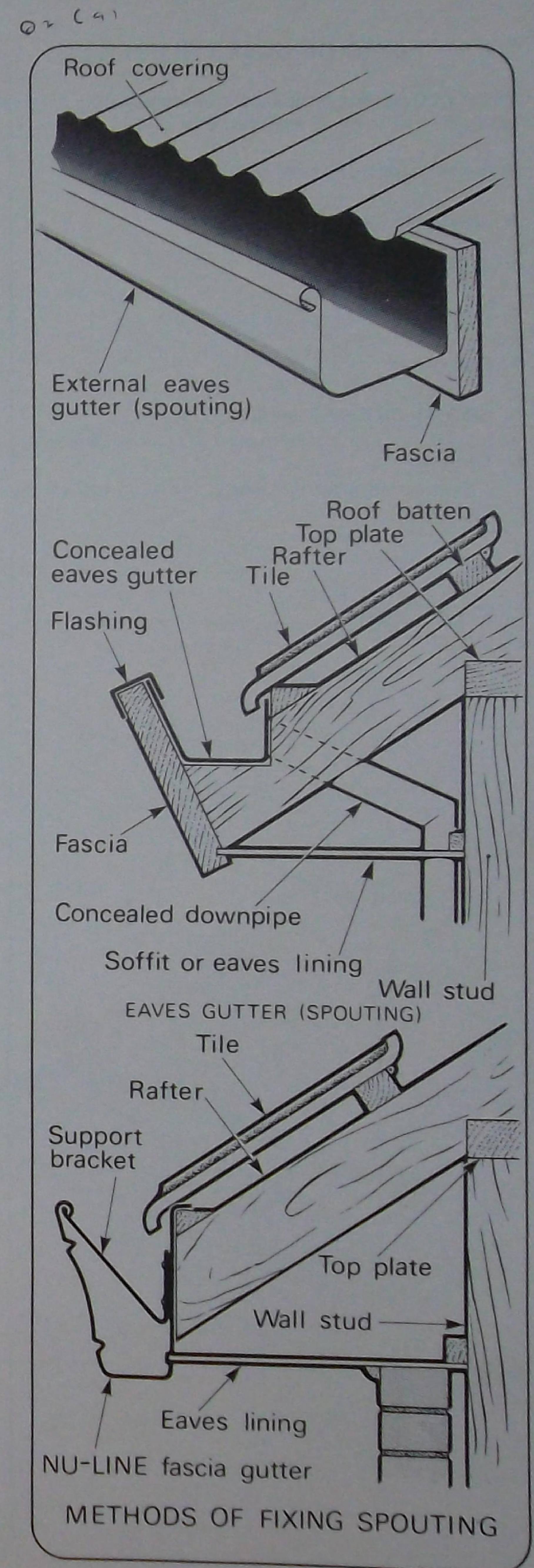
This manual is the second in a series, dealing with modern-day roof plumbing requirements. It includes the use of skills, procedures and materials for less-common roof plumbing applications, such as the plumber may face for the repair, maintenance and alterations to roofs of older buildings. This manual specifically covers the making, installation and joining of eaves gutters and roof gutters.

2 EAVES GUTTERS

Eaves gutters are provided to collect rain-water from the eaves of a building and to convey it to the downpipes. They also protect the walls of a building and the ground around and beneath it from water damage or erosion.

Eaves gutters are also known as 'spouting' and can be:

- galvanised or zinc annealed steel sheet
- copper
- Zincolume
- asbestos cement
- PVC
- aluminium
- cast iron (seldom used today)
- stainless steel (special request)

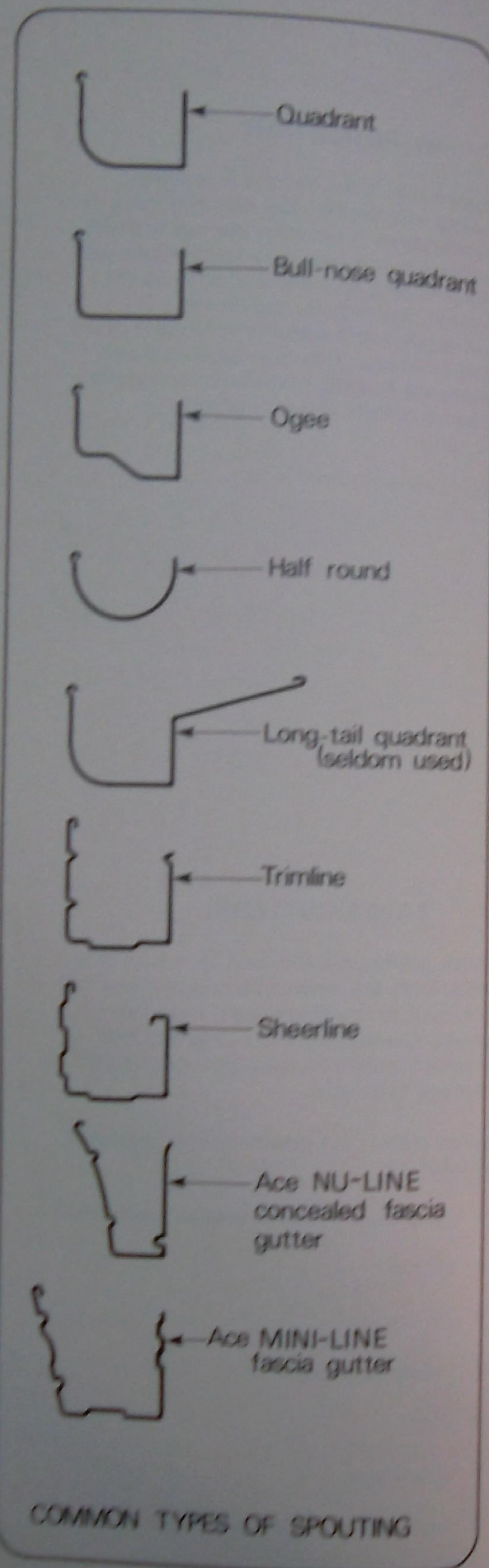


2.1 TYPES OF EAVES GUTTERS

Eaves gutters are produced in a variety of types to suit varying architectural styles.

Common types of eaves gutters are:

- quadrant (quad)
- bull-nose quadrant
- ogee
- half round
- long-tail quadrant (seldom used)
- Trimline
- Sheerline
- Ace Nu-line
- Ace Mini-line



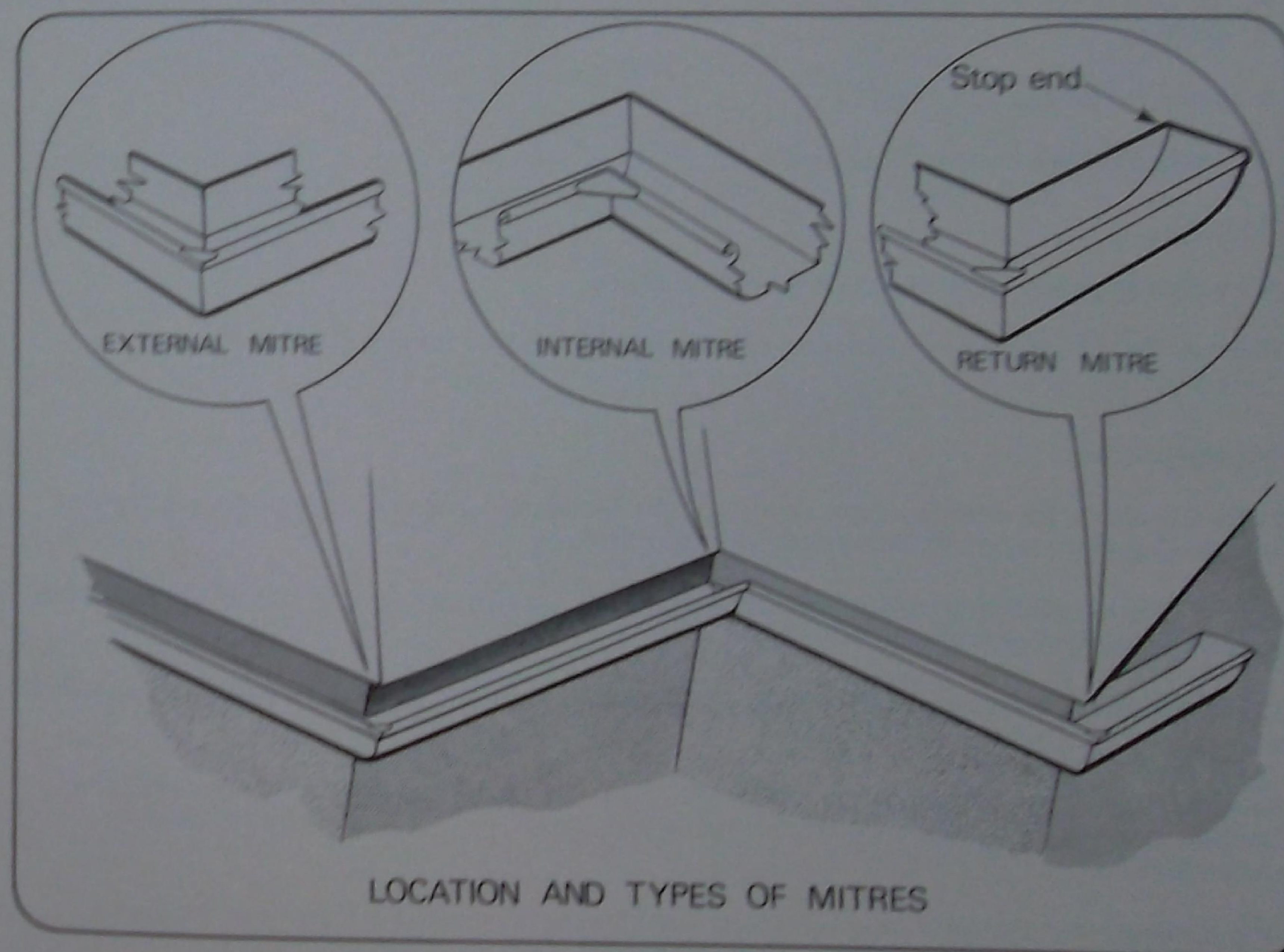
2.2 MITRES FOR EAVES GUTTERS

Mitres, or angle joints, are used when the gutter must pass around the corner of a building.

There are three types of mitres:

- external;
 - for external corners or varying angles.
- internal;
 - for internal corners or varying degrees.
- return stop end;
 - this is an angle fitted with a stop end for finishing around a barge board.

Mitres may be obtained as stock items or be made by the plumber. They can be right angled, obtuse or acute angled.



2.3 MAKING A SPOUTING MITRE

To make an internal or external mitre angle in various types of spouting, you require:

- a hacksaw
- tinsnips (LH and RH)
- a soldering iron
- solder
- flux and flux brush
- a scribe or a pencil
- a bevel (gauge)
- a ruler or a tape measure
- a hammer
- a hand or an electric drill
- drill bits
- a pop riveter and pop rivets
- a sealant gun and silicone sealant
- pliers
- a strip of galvanised steel sheet to make a profile

Refer to 'Roof Plumbing — 1', section 7.5 on the tools required for making downpipe mitres.

General joining

In the joining of the different types of metals, the solderable ones may be done by riveting and soldering or by riveting combined with a silicone sealant.

Copper may be silver brazed, but this may weaken the material. It may also be soft soldered with solder of high tin content.

The non-solderable metals, e.g. Zinalume and aluminium should be joined with rivets and silicone sealant.

Asbestos cement eaves gutters are joined with galvanised bolts and nuts with galvanised and bituminous washers, as well as a bituminous sealing compound, or other approved sealing compounds.

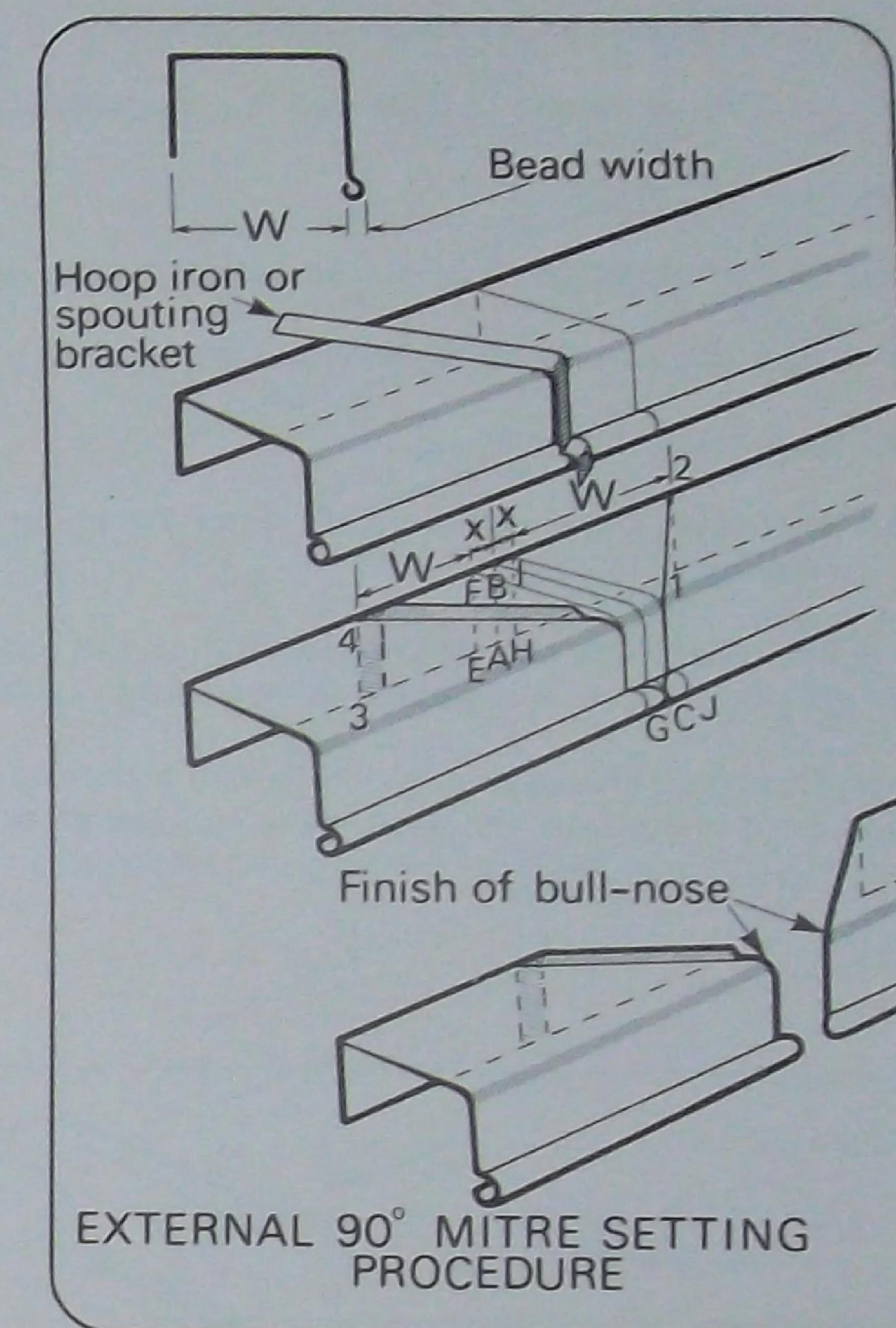
PVC spouting is joined with rigid box girder-like fittings that incorporate spring-action gutter securing clips and neoprene seals.

See: Australian Standard CA 44-1969 for further information on asbestos cement roofing practices.

2.3.1 Making an external 90° mitre Standard quad spouting

To make an external 90° mitre:

- Check that the bead is straight and the front of the spouting square to the sole.
- Measure the width of the spouting and the width of the bead.
- Place the spouting, bead downward, on the bench.
- Using a strip of galvanised steel sheet, bent to fit the shape of the spouting, a straightened spouting bracket or a square, scribe a line square across the bottom of the spouting and down the back and front of the spouting. (Line ABC as shown).
- Measure a short distance (e.g. 15 mm, or equal to the bead width) on either side of this centre line and scribe lines EFG, and HIJ parallel to the line ABC.
- From points F and I, measure the width (W) of the spouting, along the back edge of the spouting to points 2 and 4.
- From points 2 and 4, scribe lines at right angles to the back lower edge of the spouting to points 1 and 3 respectively.
- From point 2, scribe a line using the metal strip or the spouting bracket across the bottom of the spouting and down the front of the spouting, through point J to point C.
- Repeat the same procedure from point 4 through point G to point C.
- Mark off the allowance for the laps on one of the sections of spouting.
 - This lapping depends on which way the fall of spouting will be. As shown, a 20 mm lap (shaded section) is marked on the back and also on the bottom of the spouting.
- Cut through the bead with a hacksaw to the finish of the bull-nose.
 - Cutting this section through with a hacksaw prevents distortion of the bead and allows a neat joint when fitting.
- Cut back and bottom sections out with tin snips, using both left- and right-handed snips as required.
- Turn out the 20 mm lap on the back at right angles.



- This enables the lap to fit into and around the end of the other mitred section.
- The lap on the bottom also fits inside the bottom of the other mitred section.

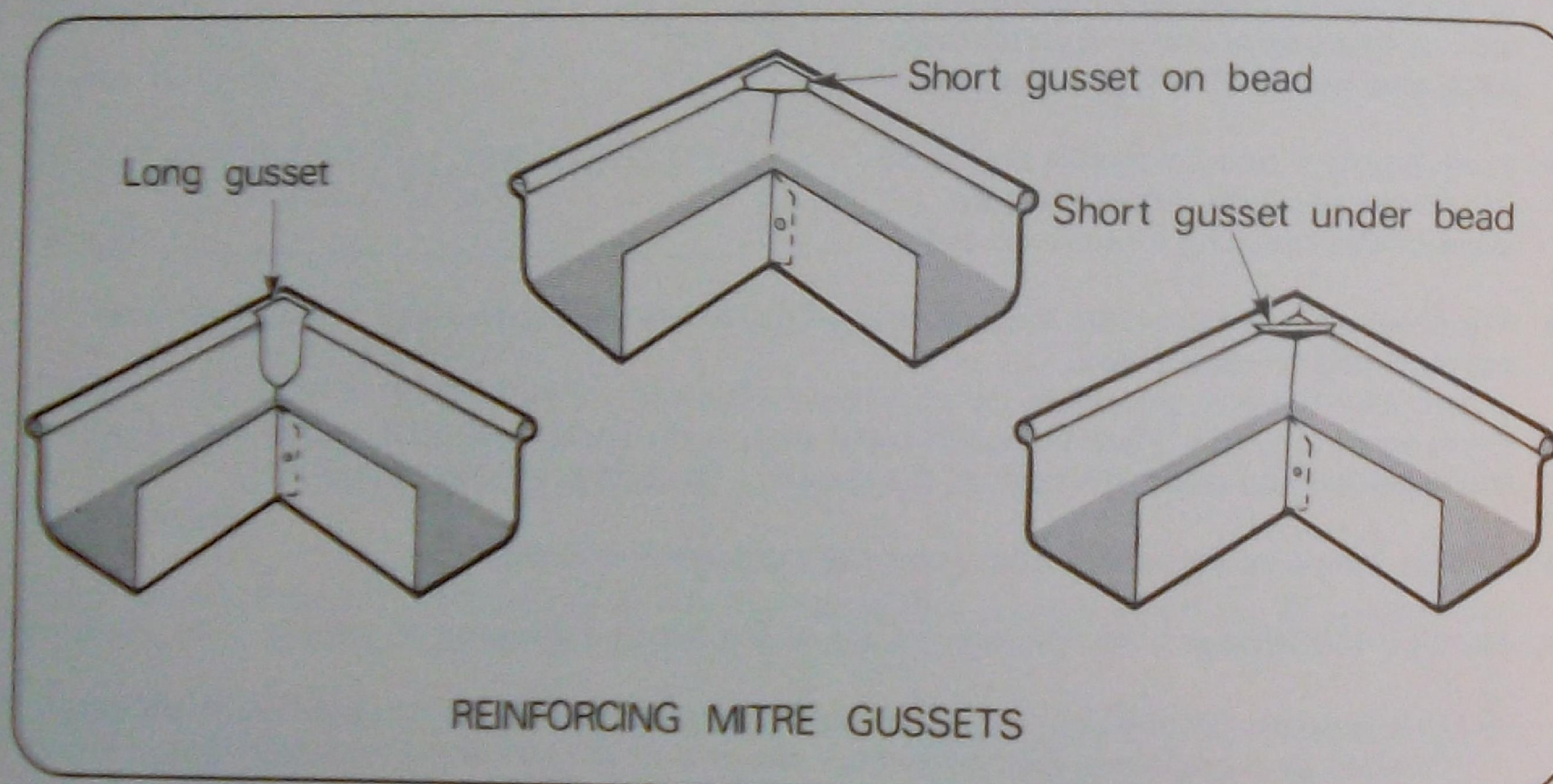
NOTE:

The 20 mm lap at the back can be turned out during the assembling of the mitred joint.

- Place the 2 sections together at right angles.
- Tack solder the joint.
- Drill, rivet (as per section 5.6.2, 'Roof Plumbing 1'), and fully solder the joint, making sure it is watertight.

A gusset should be placed into position on the bead and fully soldered to ensure full strength of the spouting angle. This gusset is made from a piece of cut off.

The illustration shows a long gusset and a short gusset. The short gusset is much preferred because it is not only easier to make and install, but also because it does not pose the problem of trapping flux inside like the long gusset does and which can lead to premature corrosion of the joint.



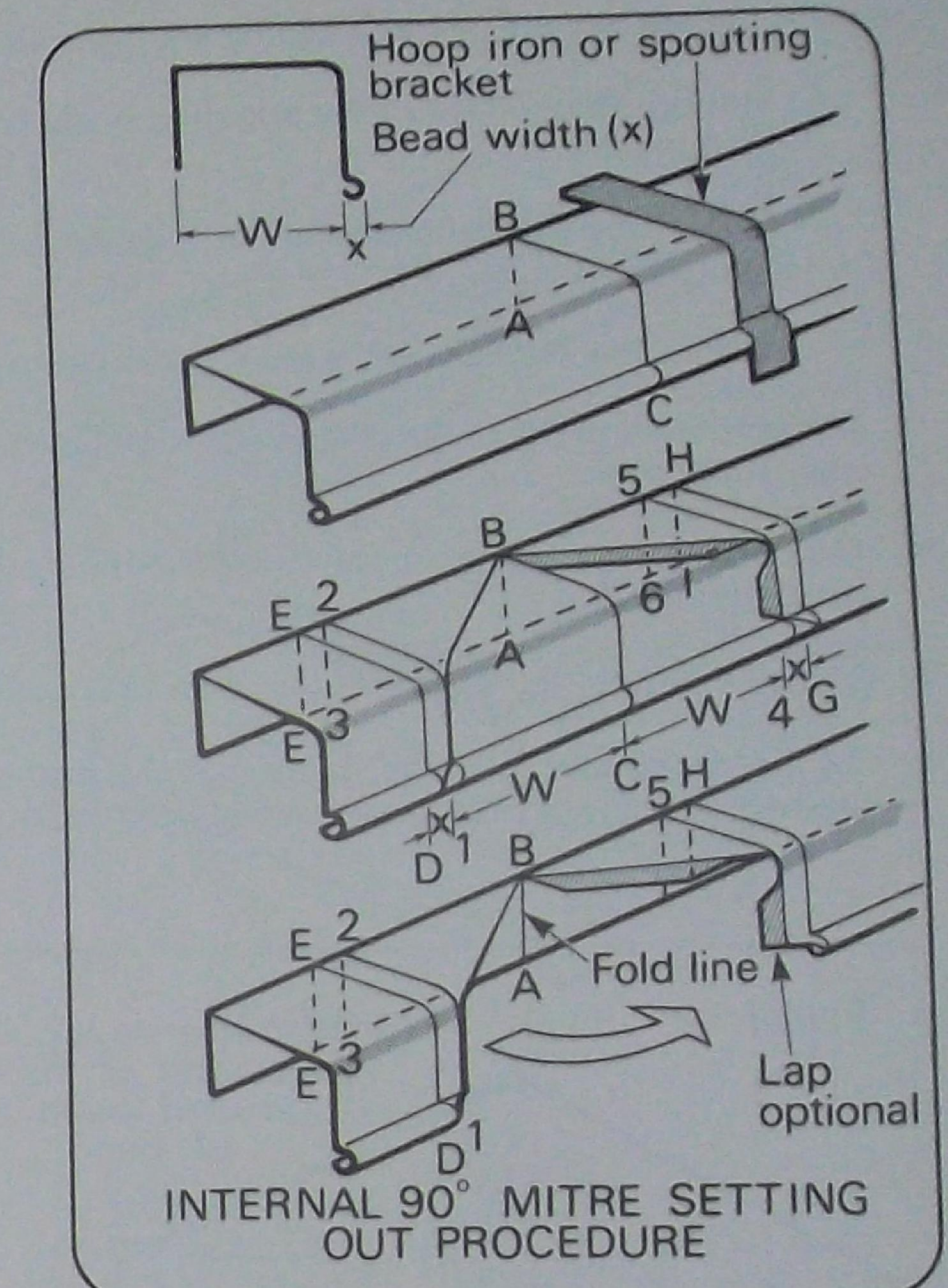
NOTE:

Ask your instructor to show alternative ways for the setting out and construction of mitred angles and gussets.

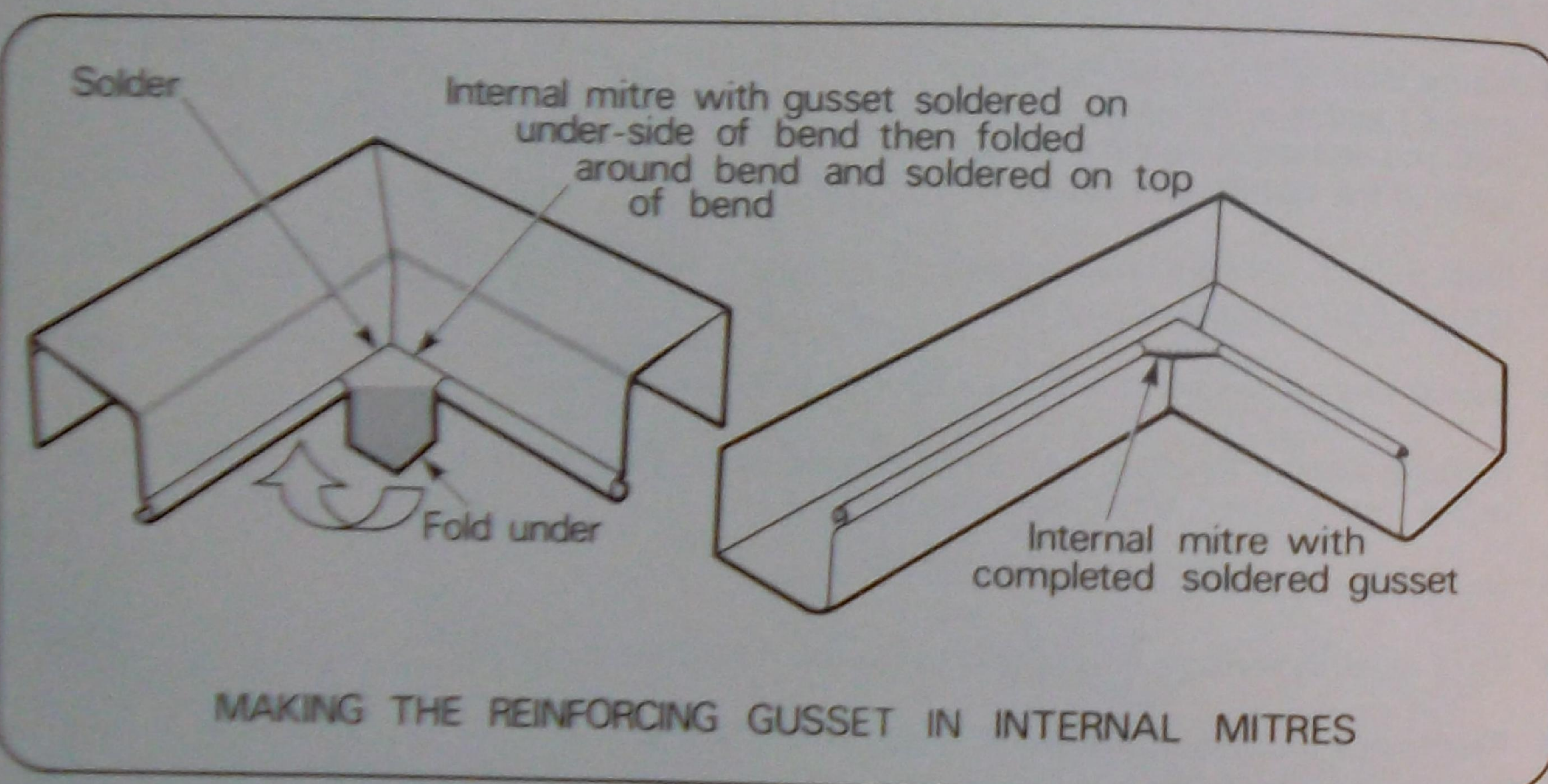
2.3.2 Making an internal 90° mitre Standard quad spouting

To make an internal 90° mitre:

- Check that the bead is straight and the front of the spouting square to the sole.
- Measure the width of the spouting and the width of the bead.
- Place the spouting, bead downward, on the bench.
- Using a strip of galvanised steel sheet, bent to fit the shape of the spouting, a straightened spouting bracket or a square, scribe a line square across the bottom of the spouting and down the back and front of the spouting (line ABC as shown).
- On the bead of the spouting, mark points 1 and 4 on either side of the line ABC and at a distance equal to the width of the spouting.
- From point 1, scribe a line parallel to the line ABC to points 2 and 3.
- Repeat this procedure from point 4 through to points 5 and 6.
- Measure a short distance: e.g. 15 mm or equal to the bead width, along the bead away from the centre from points 1 and 4 respectively.
- Mark points D and G.
- From point D, scribe a line parallel to the line 1-2-3 making the line DEF.
- Repeat this process from point G, making the line GHI.
- From point B, scribe a line at 45° across the bottom of the spouting and down the front of the spouting to point 1 and do the same to point 4.
- Continue at the same angle from point 1 through to point D and also from point 4 through to point G.
- Mark off the allowance for the lap on the end of one section.
 - This lapping depends on which way the fall of spouting will be.
 - As shown, a 20 mm lap is marked on the bottom of the spouting and an optional one on the front, if required.
- Cut through the bead with a hacksaw to the finish of the bull-nose.
 - Cutting this section with a hacksaw prevents distortion of the bead and allows a neat joint when fitting.



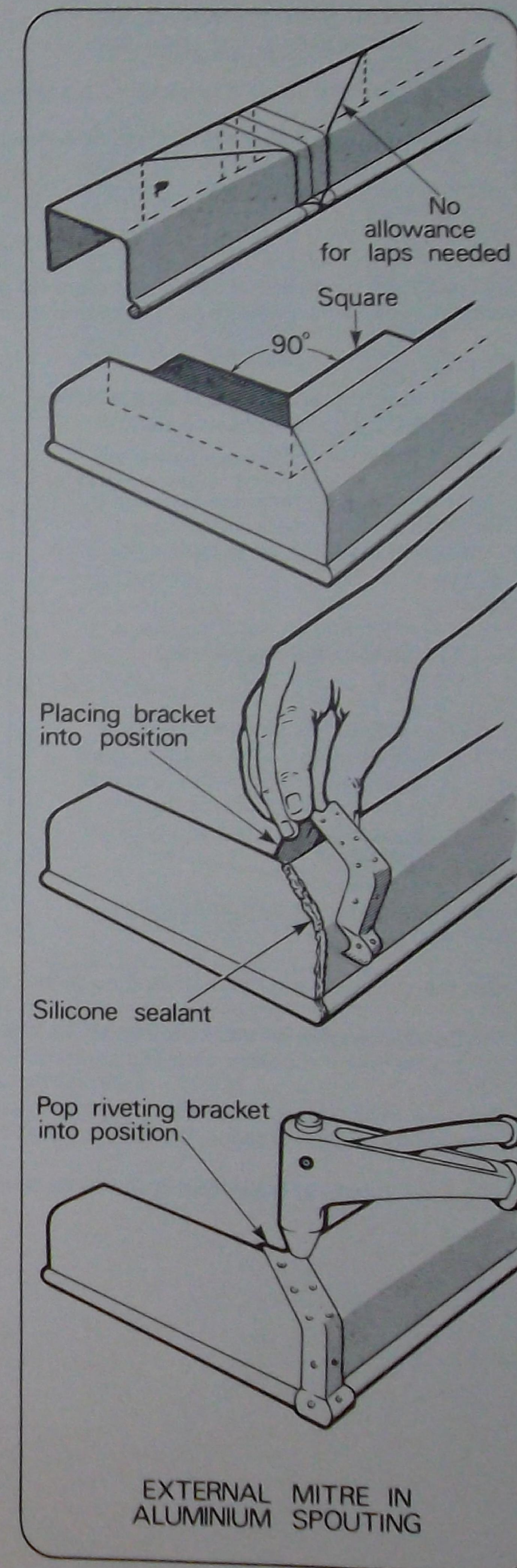
- Cut out the bottom of the spouting with tinsnips, using both left- and right-handed snips.
 - The lap on the front of the spouting is optional and not always needed, but making it gives a stronger joint.
 - For an internal angle, do not cut the back of the spouting along line AB. This is a folding line.
 - Line up the sections accurately, otherwise a gap will result in the front of the spouting.
- Fold on the line AB to 90° angle, making sure the laps are on the inside and that the beads fit neatly together.
- Tack solder the internal angle whilst making sure the angle remains at 90° until the solder tacks solidify.
- Rivet the bottom lap and front lap, then fully solder the spouting angle.
- Cut a short gusset from the waste material of the mitre and solder to the top and bottom of the bead after wrapping the gusset around the bead.



2.3.3 Making an external angle (mitre) Aluminium quad spouting

The procedure for marking out and cutting is exactly the same as explained in section 2.3.1, except that no allowance for laps is required. A prefabricated bracket is used in making the joint.

- Place the two sections of spouting together to form a 90° angle on the bench, the bead facing downward, as shown.
- Liberally coat the ends of each section of spouting to be joined with silicone sealant.
- Firmly place the predrilled outside angle bracket into position.
- Drill the spouting through the bracket holes.
- Rivet bracket and spouting into position to form a 90° watertight external angle.
- Wipe off all excess silicone sealant.



2.3.4 Making an internal angle Aluminium quad spouting

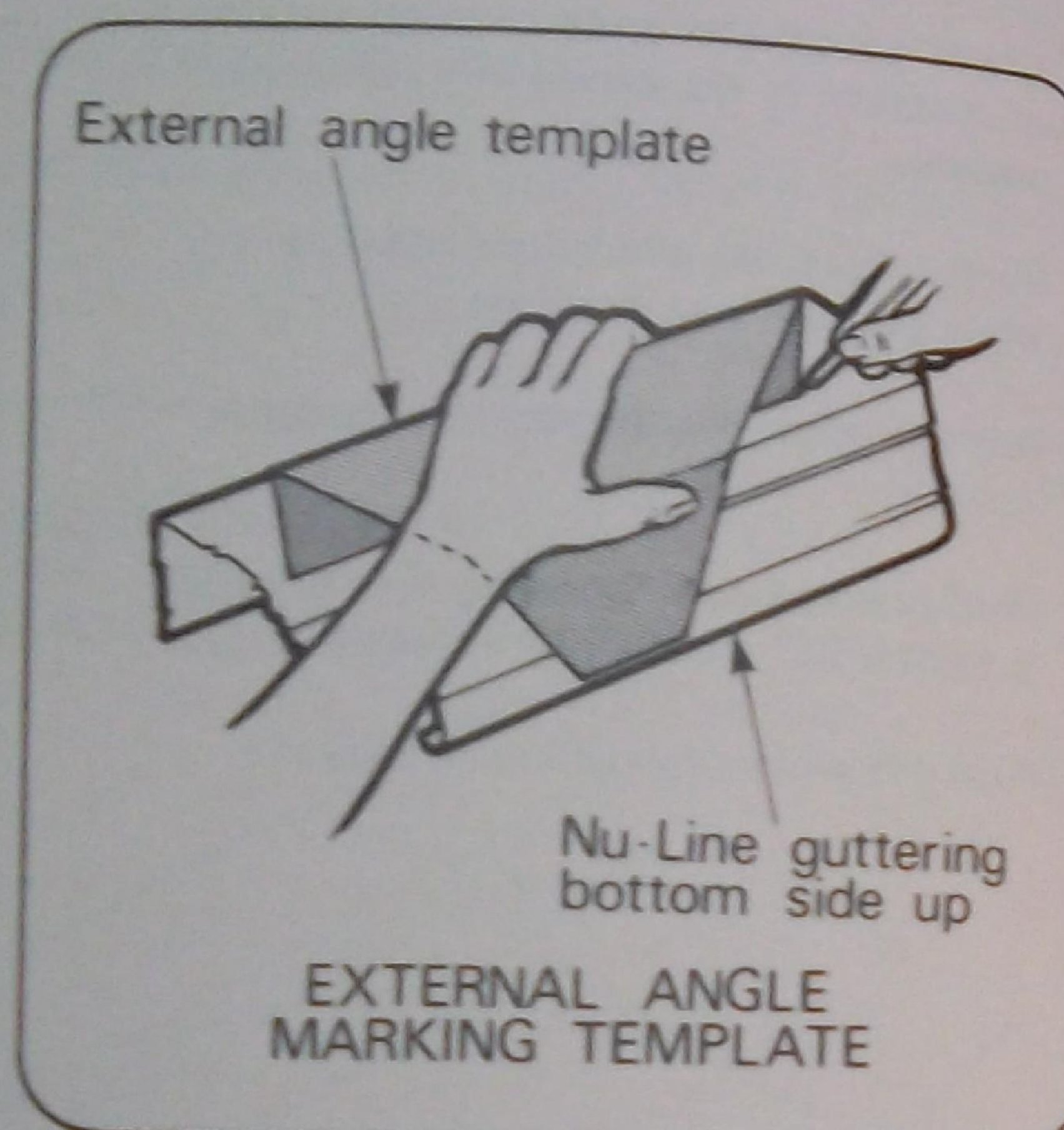
- Follow the steps detailed in section 2.3.2 for marking out and cutting.
 - No allowance for laps is made here, but the back of the spouting is cut through.
- Follow steps in section 2.3.3 to complete the joint using the proper bracket.

NOTE:

If you strike any problems, ask your instructor for guidance or refer to manufacturer's instructions detailed in their sales literature (e.g. 'Comalco Aluminium Gutters and Downpipes').

2.3.5 Making an external angle ACE Nu-Line concealed fascia gutter

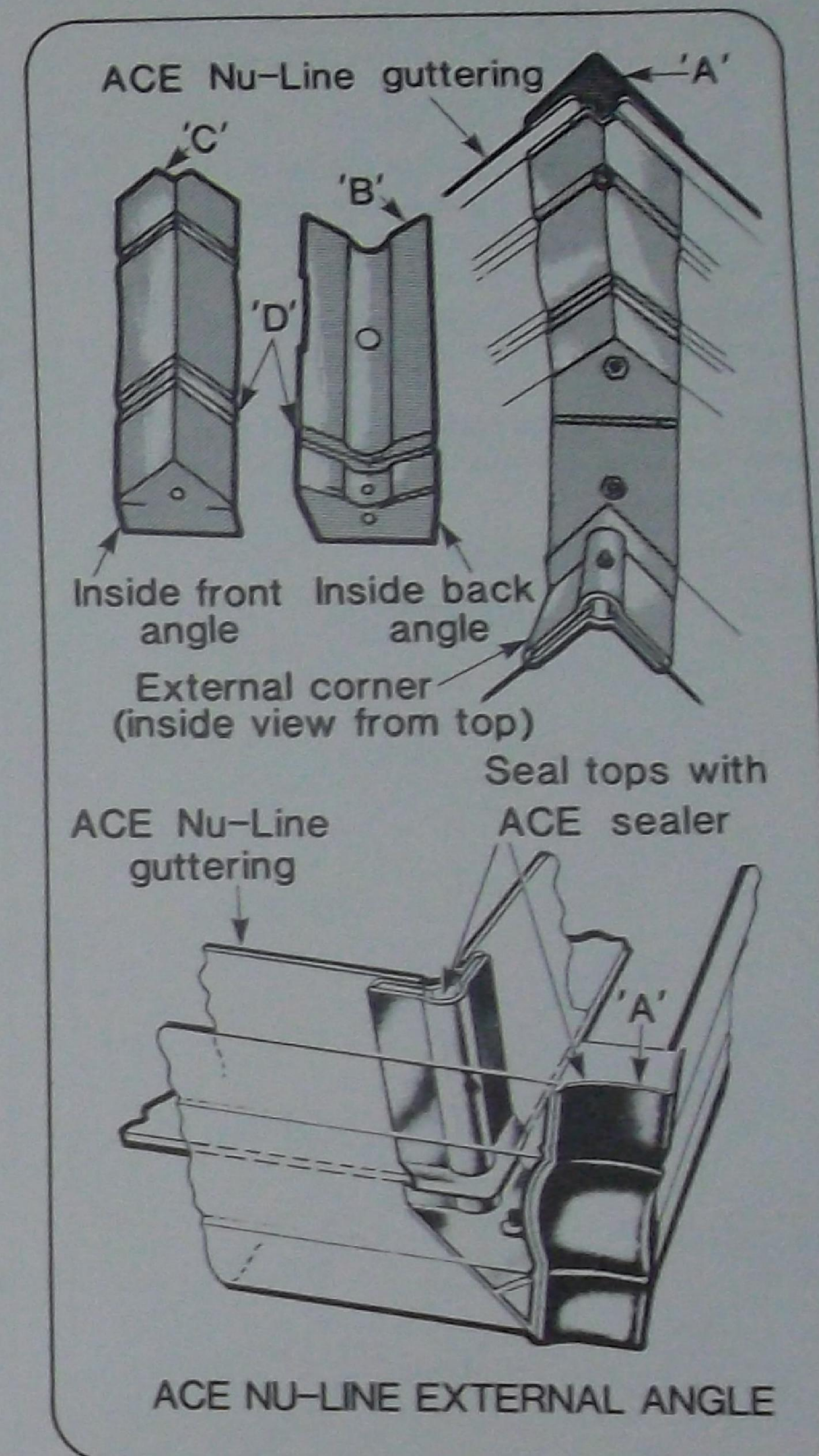
- Using the marking template supplied by the manufacturer, mark the cutting outlines of the mitre on the gutter, as shown.
 - If the template is not available, a 45° bevel gauge can be used instead.
- Mark across the bottom of the gutter at 45°, then sighting over the square from vertically above, mark along the line of the square on the front and back of the gutter.



Consult your instructor for further details on this method.

- Cut the mitres on the required lengths before assembling.
 - Cut the lengths on both ends about 12 mm shorter than required to allow for screws or brackets and for expansion and contraction.
- Before joining, thoroughly clean all dirt and residue from both inside and outside the gutter mitres over an area at least 70-100 mm wide.
- Align the 2 parts of the mitres at 90° to each other.

- Dismantle the external feature angle bracket and clean the under surface of sections B and C, also the upper surface of section A. See illustration.
- Fit sections A, B and C without any silicone sealant to the spouting mitre to make sure the mitre cuts fit properly in the brackets.
- Remove the brackets.
- Evenly spread the silicone sealant on both left- and right-hand sides of the inside surface of section A and on the under surfaces of sections B and C.
 - Make sure to fill the recess soffit channel D completely.
- Place section A up around the underside of the Nu-Line gutter, and while holding it in position, replace section B.
- Screw on nut and setscrew firmly.
- Replace section C and firmly tighten all nuts and screws.



- Remove all excess silicone sealant and use it to cover openings around nuts and setscrews.
- Fill the gap between section B and section C completely.
- Fill top front and top back as shown in the illustration.
- Clean off all silicone sealant from the outside of angles and gutter pieces.

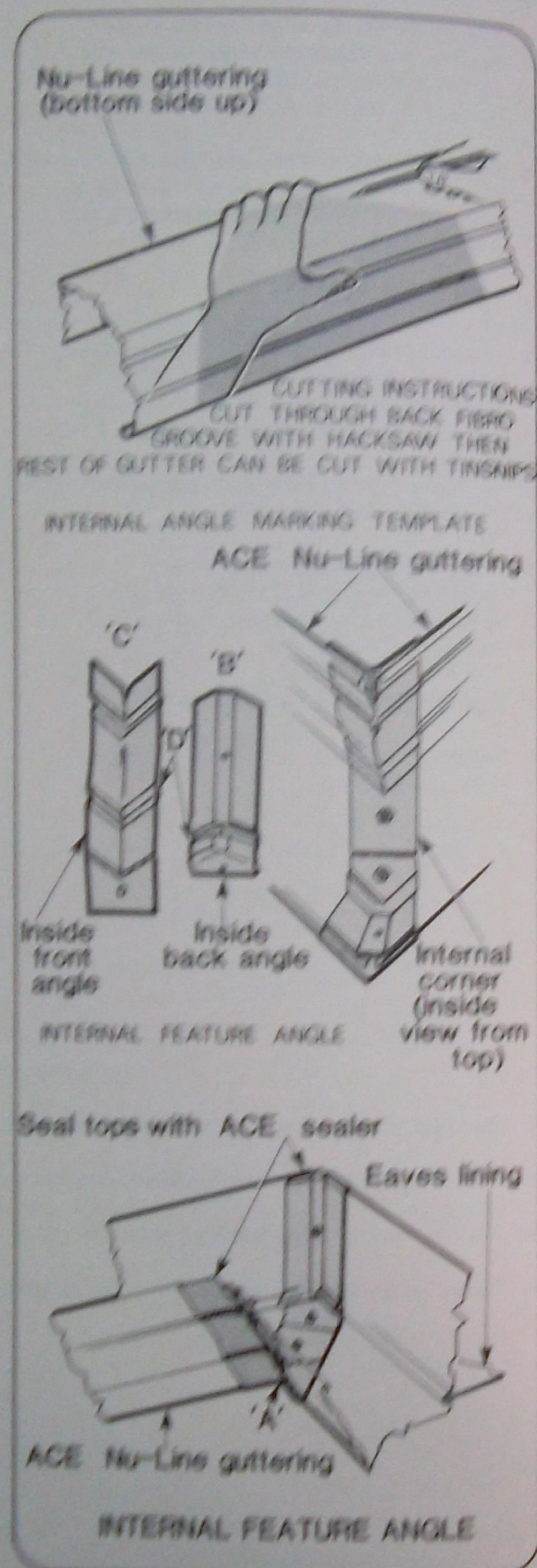
2.3.6 Making an internal angle ACE Nu-Line concealed fascia gutter

- Repeat the procedure explained in section 2.3.5, but use the internal angle marking template instead.

The application of sealant and fastenings remains the same as before.

The internal feature angle bracket pieces and the finished internal angle are shown in the illustration.

NOTES



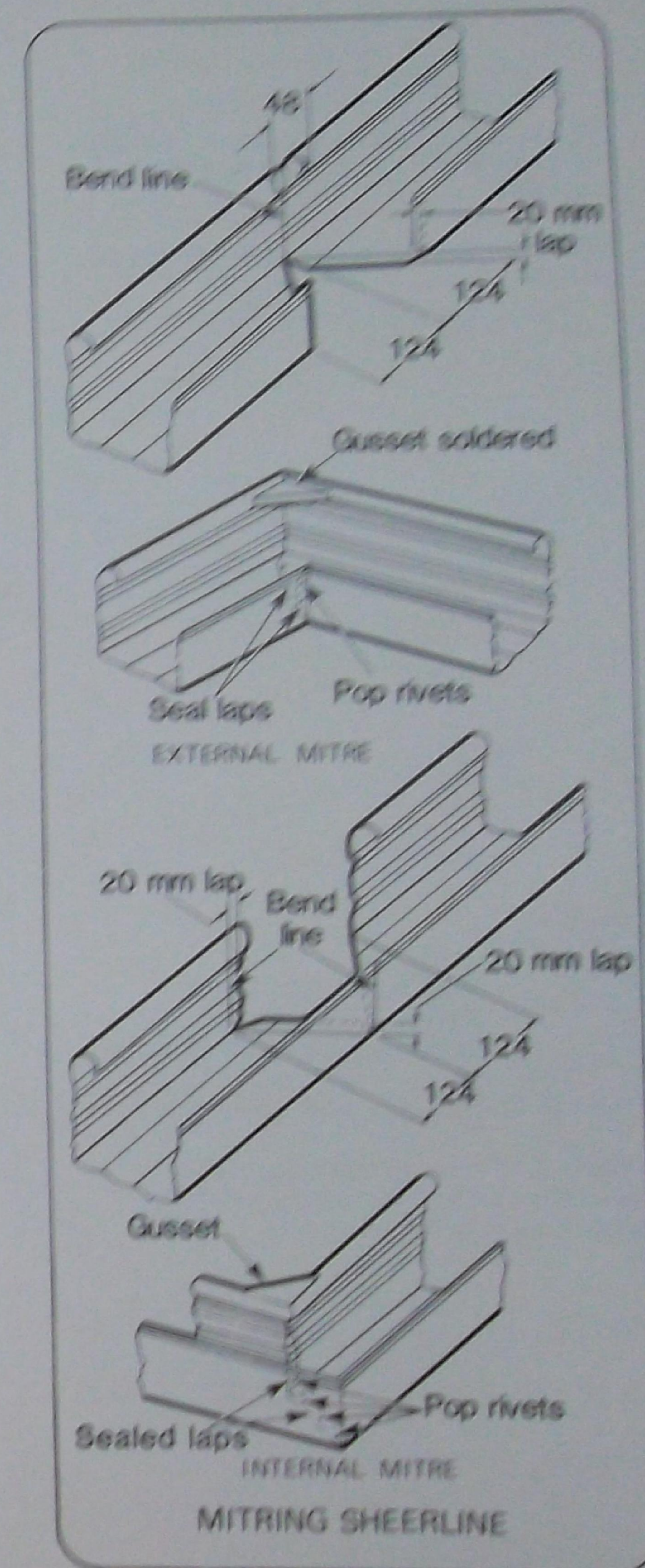
2.3.7 Making internal and external angles ACE Nu-Line fascia gutter

The procedure for this is the same as for Nu-Line, except that the profile of the gutter is slightly different.

2.3.8 Making external and internal mitres in square, straight-fronted eaves gutters

This covers those such as Trimline, Sheerline and the profiles manufactured by Stramit Industries as illustrated in detail opposite.

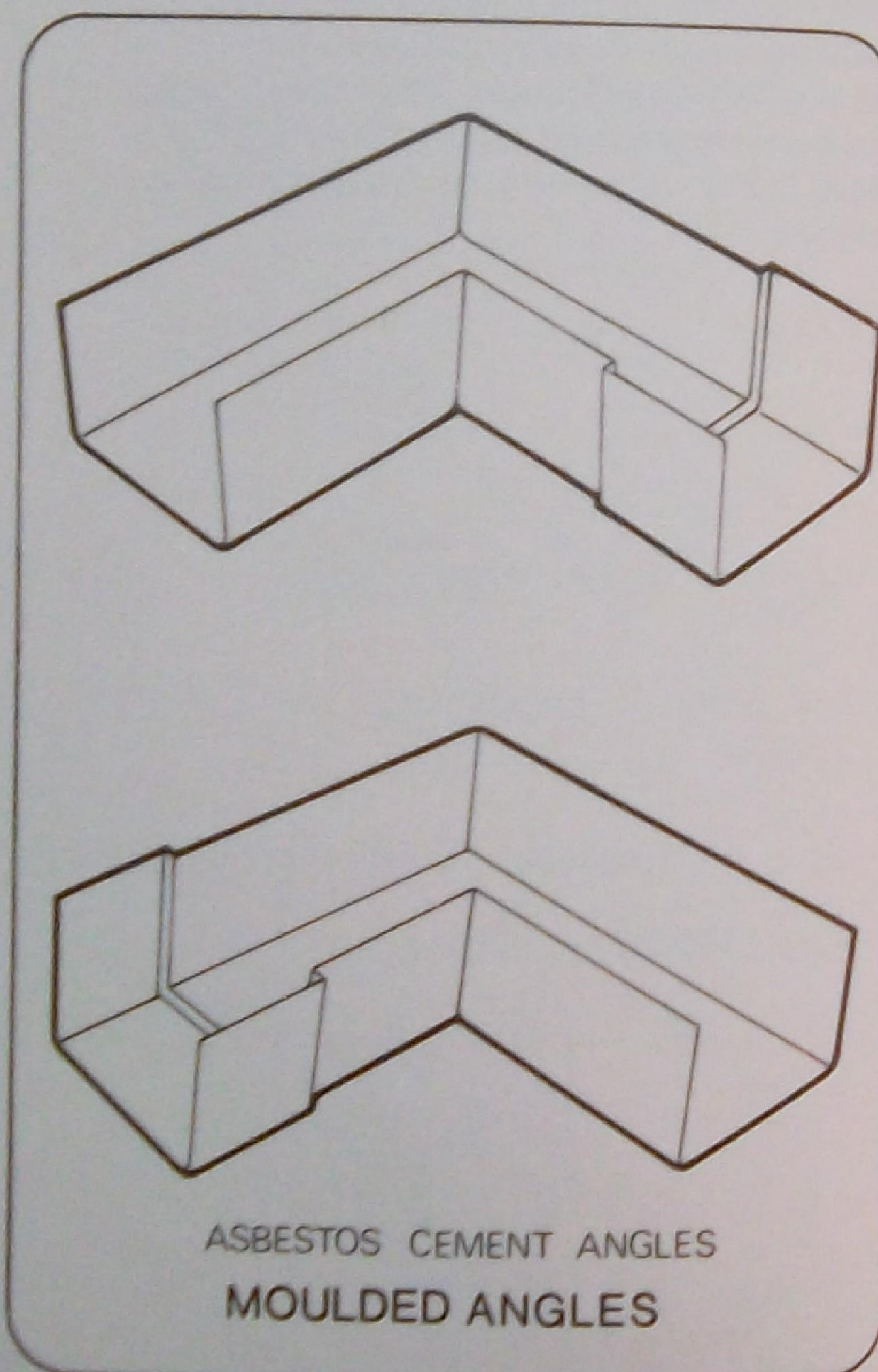
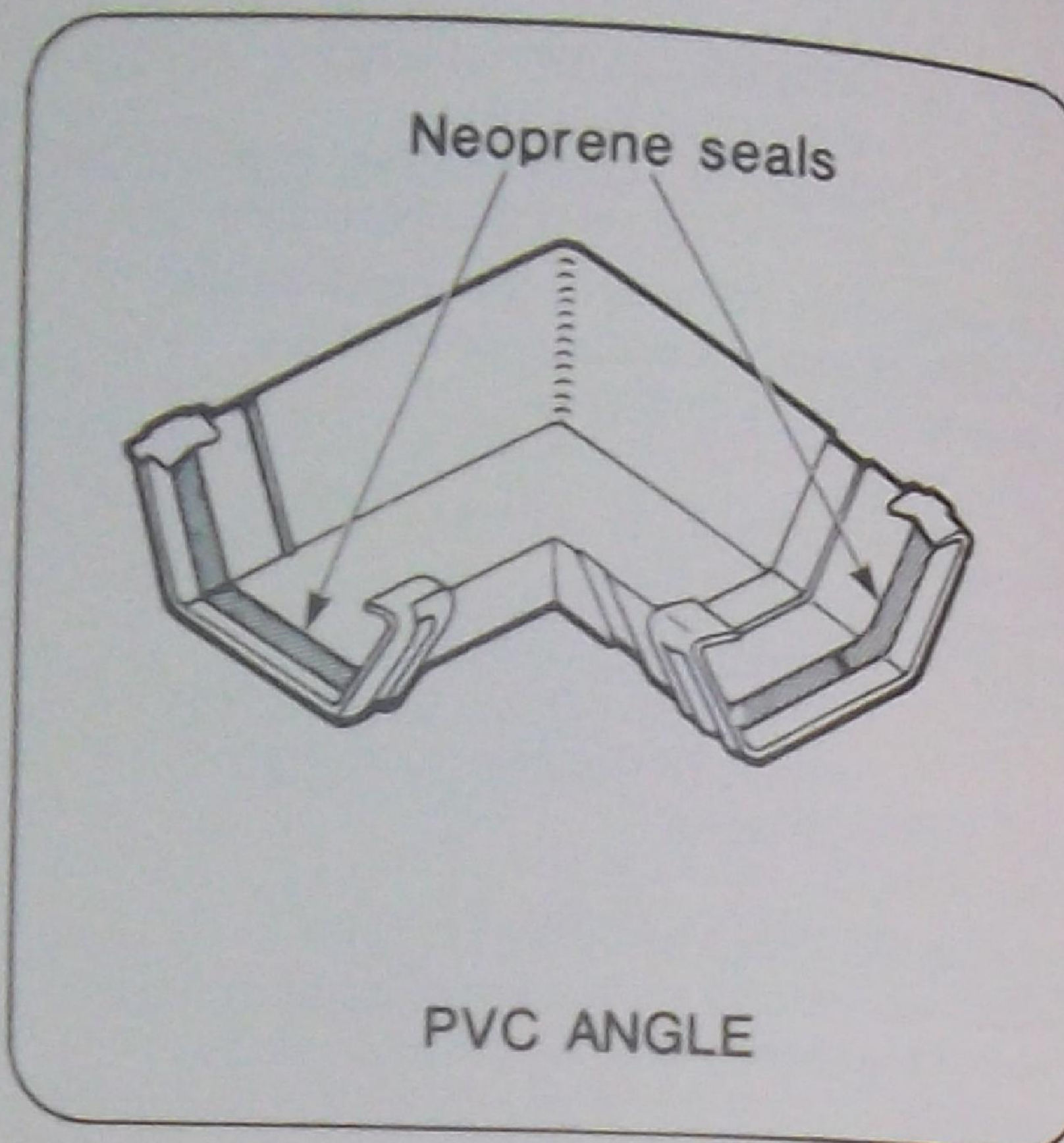
One difference in the making of angles is that because of the straight front, an external angle does not have to be completely cut through. The front may be bent to the required angle, providing the bead is cut out to enable the angle to be formed.



2.3.9 Making internal and external angles in PVC spouting

This is done by fitting moulded angles both for internal and external mitres as shown opposite.

They are available in two forms, namely 90° and 45°.



2.3.10 Making internal and external angles in asbestos cement spouting

Refer to ASA-CA44 — 1969 for details.

This is also done by means of moulded asbestos cement internal and external angles, as illustrated opposite.

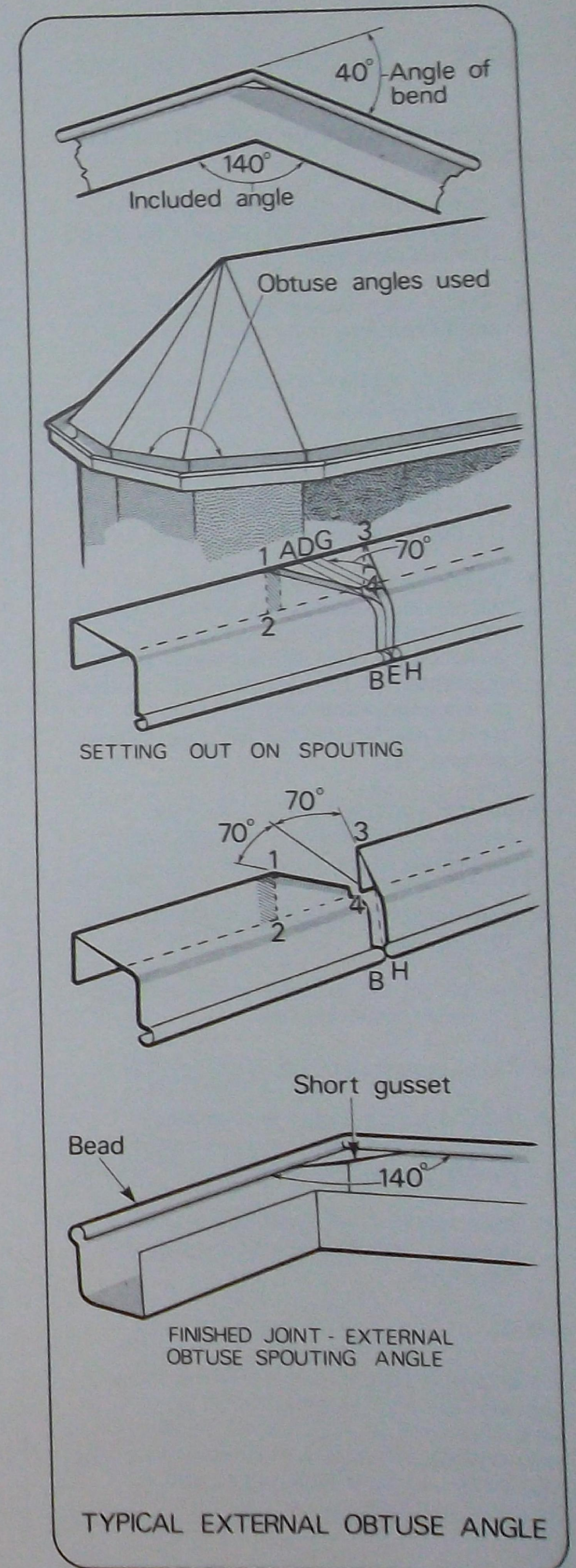
2.3.11 Cast iron internal and external spouting angles

These are made by pouring molten metal into moulds of the required shape of the angles.

2.3.12 The external obtuse angle mitre

To make an external obtuse angle in quad spouting:

- Draw a full size plan of the angle required, showing the angle of bend and the included angle, as shown.
- Place a length of spouting, bead downward, on the bench and scribe three parallel lines square across the bottom of the spouting.
 - The distance between the lines is about the same as the width of the bead.
 - These lines are shown as AB, DE, GH, in the illustration.
- Set a bevel gauge to half the included angle.
 - If the included angle is 140°, set the bevel at 70°.
- Place the bevel on the bottom of the spouting.
- Scribe lines from B and H running at 70° to the bead. (Lines B-1 and H-3).
- Scribe 2 lines squarely down the back of the spouting from points 1 to 2 and from points 3 to 4.
- Scribe a 20 mm lap along the line 1-2 and the adjacent half of the line 1-B on the bottom of the spouting. These laps are shown as shaded portions.
- Cut the spouting along the line H-3-4 and on the line B-1-2, allowing for the lap, as shown.
- Cut the bead carefully with a hacksaw.
- Cut a gusset from the discarded piece.
- Rivet and solder the two sections of spouting together, followed by soldering the short gusset to the bead.
- Wash and clean off excess flux.



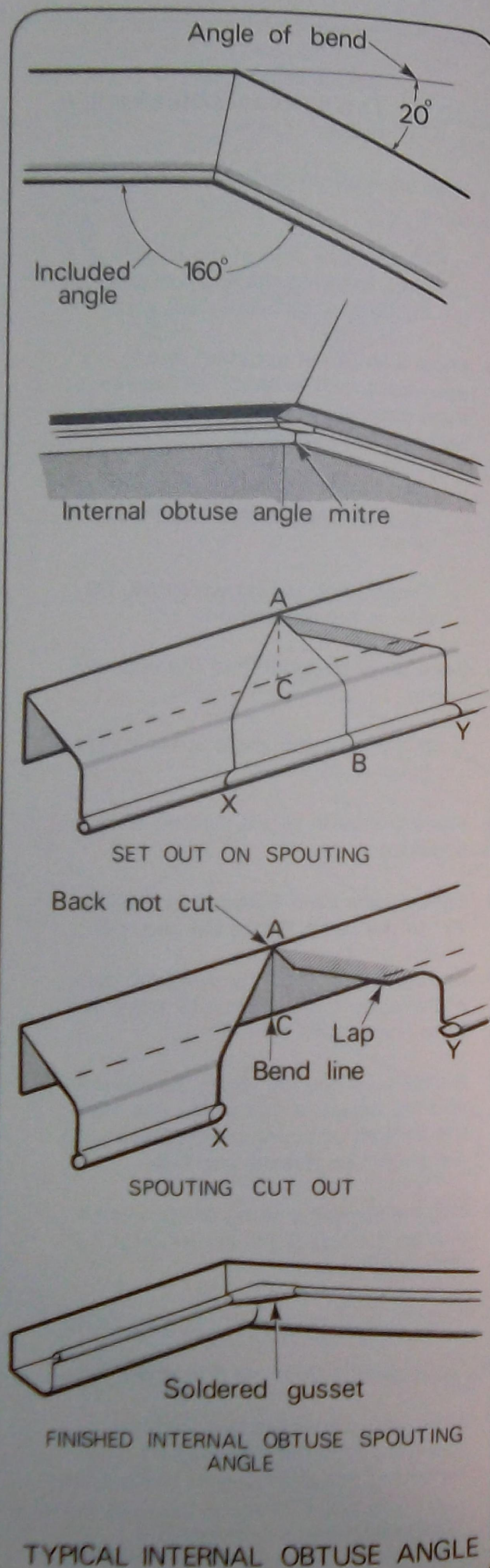
2.3.13 The internal obtuse angle mitre

To make an internal obtuse angle in quad spouting:

- Draw a full size plan of the angle required, showing the angle of bend and the included angle.
- Scribe a line square across the bottom of the spouting (Line AB).
- From A, scribe a line down the back of the spouting to C.
- Set a bevel at half the included angle.
 - If the included angle is 160° , then set the bevel at 80° .
- Using the bevel and a piece of galvanised strip, bent to fit the shape of the spouting (or use a flattened out spouting bracket), scribe 2 lines across the bottom of the spouting from point A to the bead, running at 80° to the central marking on the spouting. (Lines AX and AY).
- Scribe a 20 mm lap along half the length of the line AY from A to the beginning of the bull-nose.
- Cut along the lines AX and AY, allowing for the lap.
 - Do not cut the back of the spouting on an internal mitre.
- Cut a gusset from the discarded piece.
- Bend the spouting to the required angle, making sure the lap is on the inside.
- Tack solder, rivet, finish solder the complete joint and solder the gusset into place.

NOTE:

Discuss with your instructor the making of obtuse internal or external angles in spoutings such as: NU-Line, Mini-Line or in non-solderable metals, e.g. Zinalume, aluminium and such spouting as, Stramit, Sheerline and Trimline.



Check with the appropriate manufacturers about obtuse spouting angles in PVC, asbestos cement, cast iron and others, because if the order is warranted, special angles can be manufactured at extra cost.

2.4 STOP ENDS

Stop ends are used to close a run of spouting.

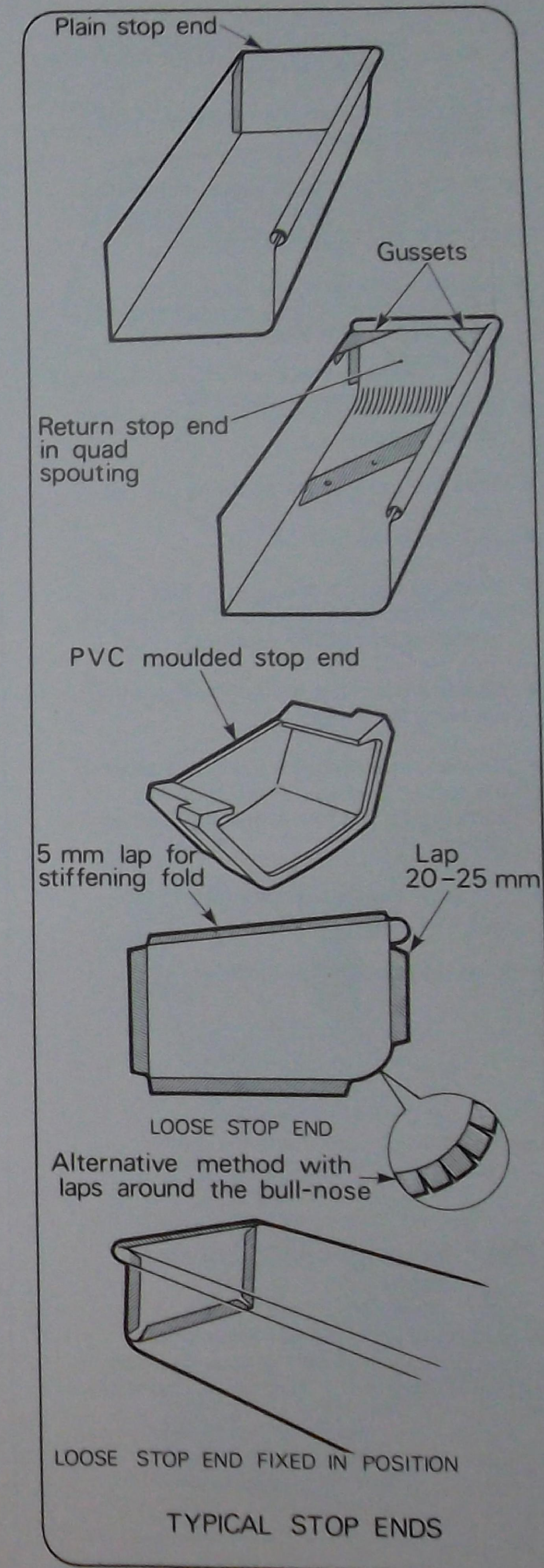
There are several types.

- Plain stop end.
 - In quad spouting, it is used where the end of the spouting abuts a barge board or other building member.
- Return stop end.
 - In quad spouting, it is used where the end of the spouting is in a conspicuous position.
- A moulded stop end.
 - It can be used in both positions.
 - These stop ends are mostly installed to spoutings such as: PVC, asbestos cement, cast iron.

2.4.1 Making a plain stop end (using scrap material)

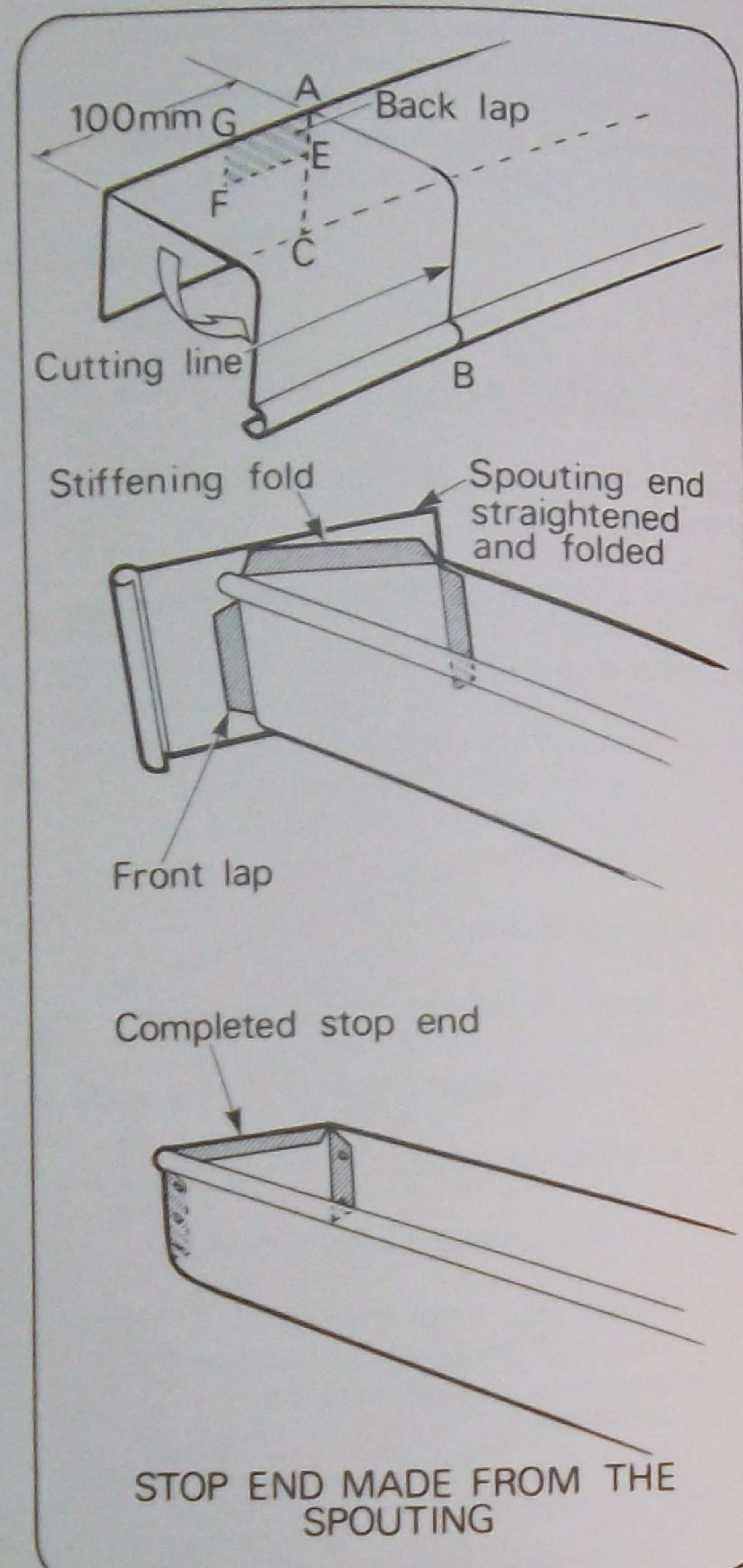
To make a plain stop end in quad spouting:

- Place a piece of sheet metal, made of the same type as that used for the spouting, over the end of the spouting.
- Scribe the shape of the spouting onto the metal.
 - Allow for laps on the back, bottom and front of the stop end (see illustration).
- Fold the laps in at right angles so that they will fit inside the spouting for riveting and soldering later on.



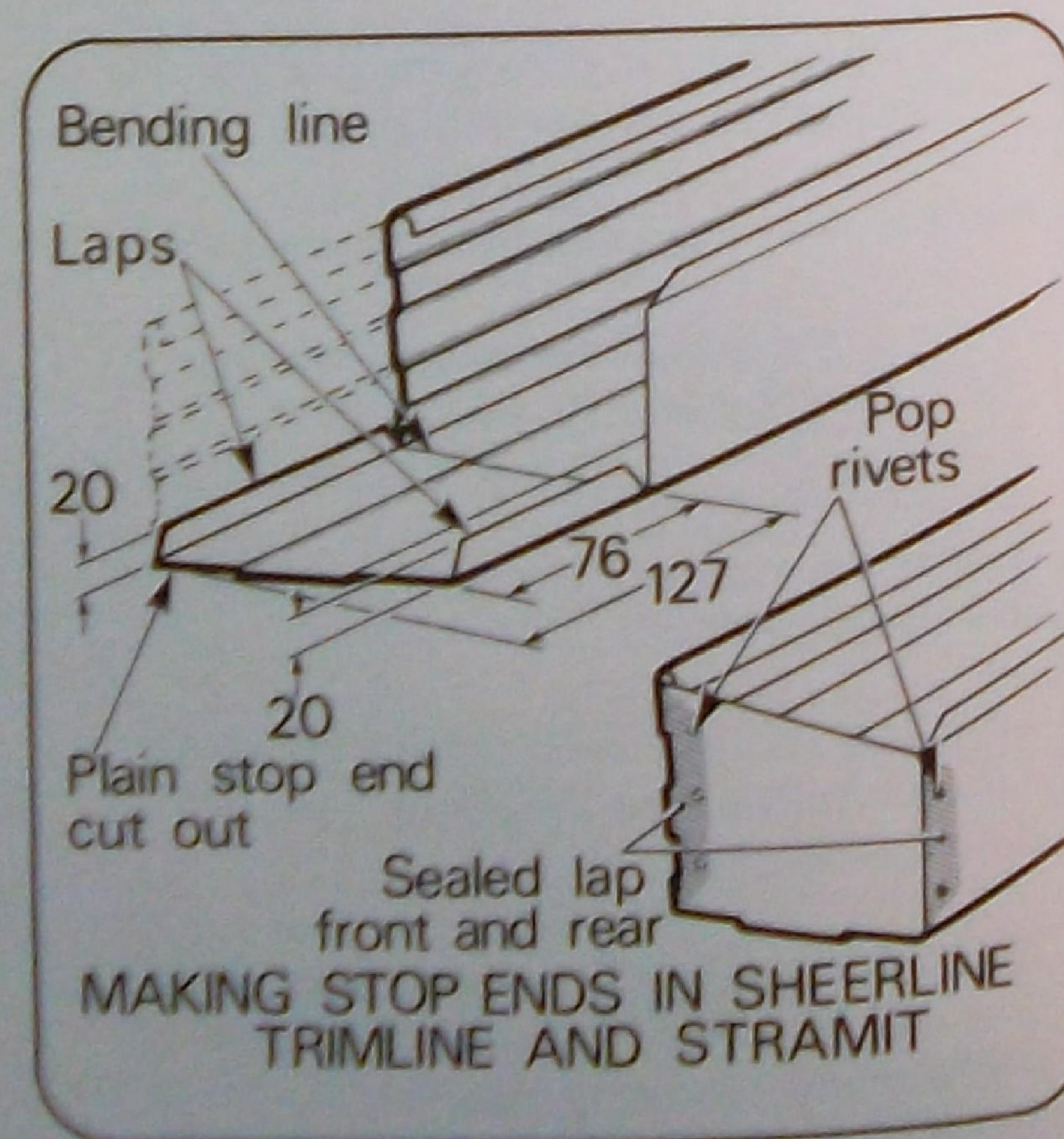
2.4.2 Making a plain stop end in quad spouting (using the spouting itself)

- Measure 100 mm from the end of the spouting to point A.
- Scribe a line at right angles across the bottom of the spouting from point A to point B on the bead.
- Scribe a line down the back of the spouting from point A to point C at right angles to the bottom of the spouting.
- Cut with a hacksaw from B to the back of the bull-nose.
- Fold the front of the spouting out flat.
- Cut along the line CA.
- Fold the section of spouting that is to be the stop end upwards at right angles to the bottom of the spouting.
- Scribe around the front of the spouting, allowing for the lap.
- Scribe a line from the top of the bead to the top of the back of the spouting, allowing for a 5 mm stiffening fold, as shown.
- Cut away the waste material and fold laps into position.
- Rivet into position and solder.



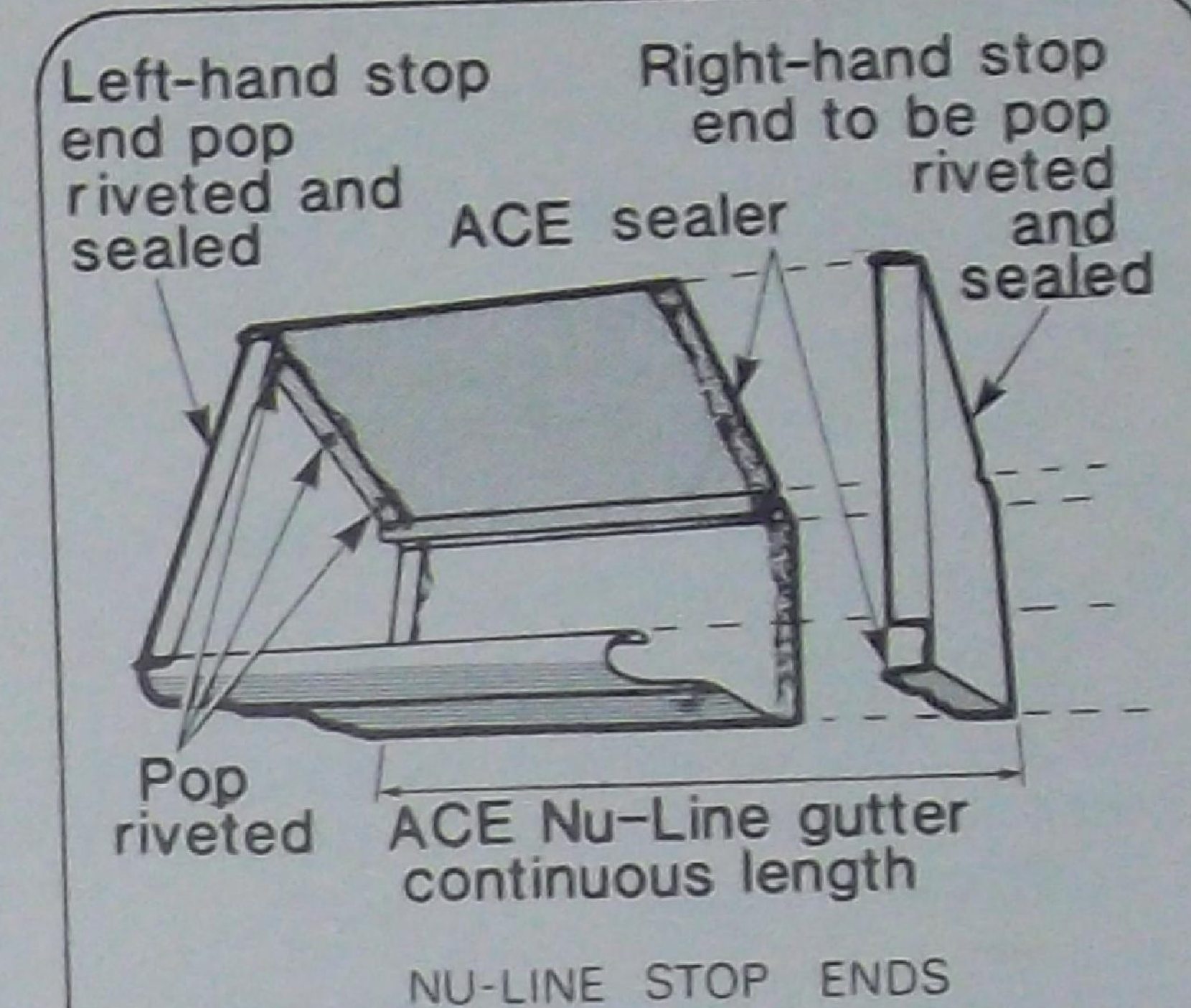
2.4.3 Making other plain stop ends

The procedure to follow for Sheerline, Trimline or Stramit spouting (eaves gutter) is shown clearly in the illustration opposite.



2.4.4 Making a stop end in Nu-Line, Mini-Line spouting and fascia gutter

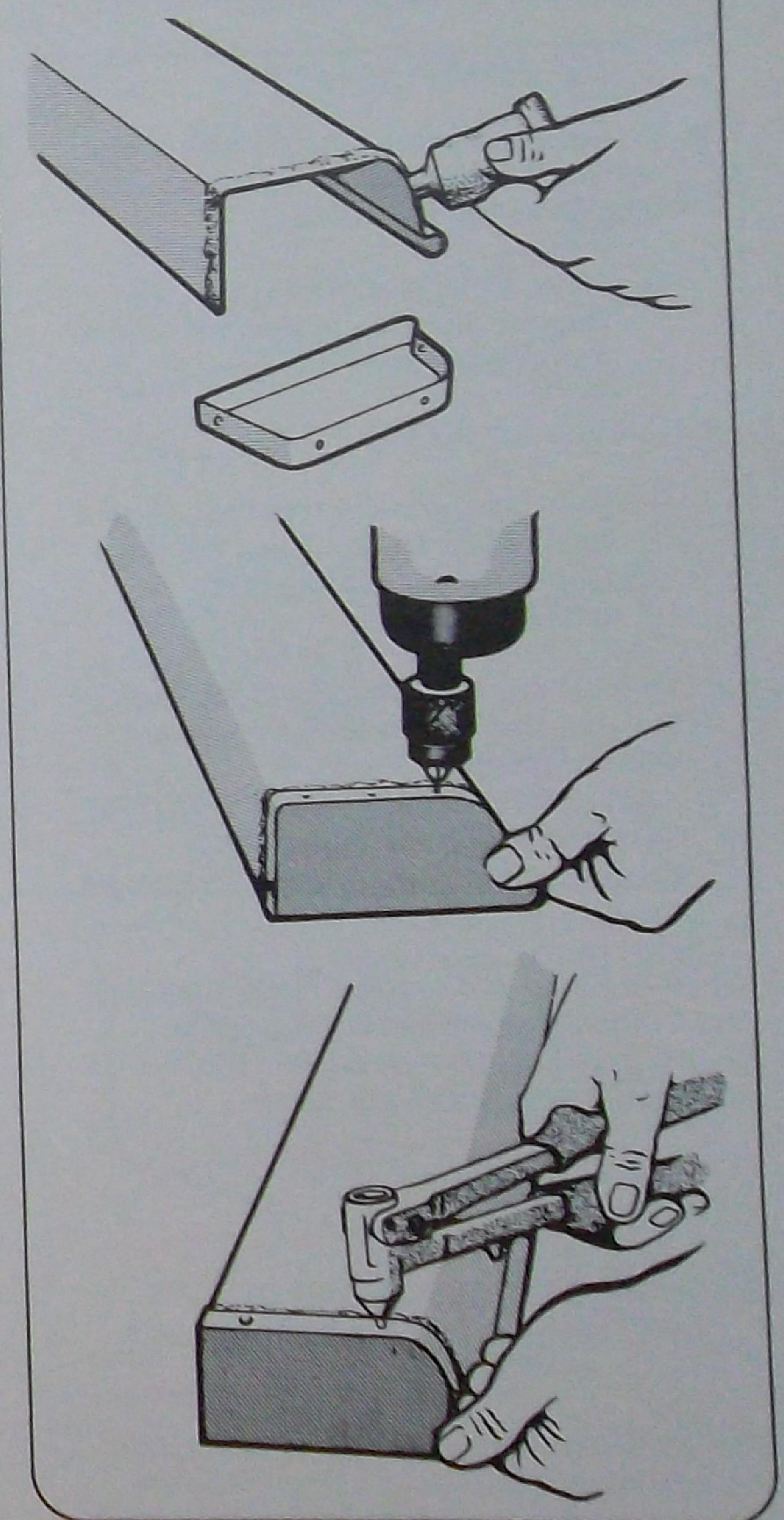
The stop ends for these are made by the manufacturer for left- and right-handed application and ready for riveting and sealing into position. Fix as per illustration or as detailed in manufacturer's instructions.



2.4.5 Stop ends in aluminium quad spouting

These stop ends are pressed out of aluminium sheet and are supplied by the manufacturer, ready for use.

- Use the size and type of pop rivet recommended by the manufacturer.
- Apply sealant around the outside of the spouting.
- Fit the stop end.
- Rivet into position as shown.
- Cover all rivets with sealant and wipe off any excess sealant.



2.4.6 Making a return stop end

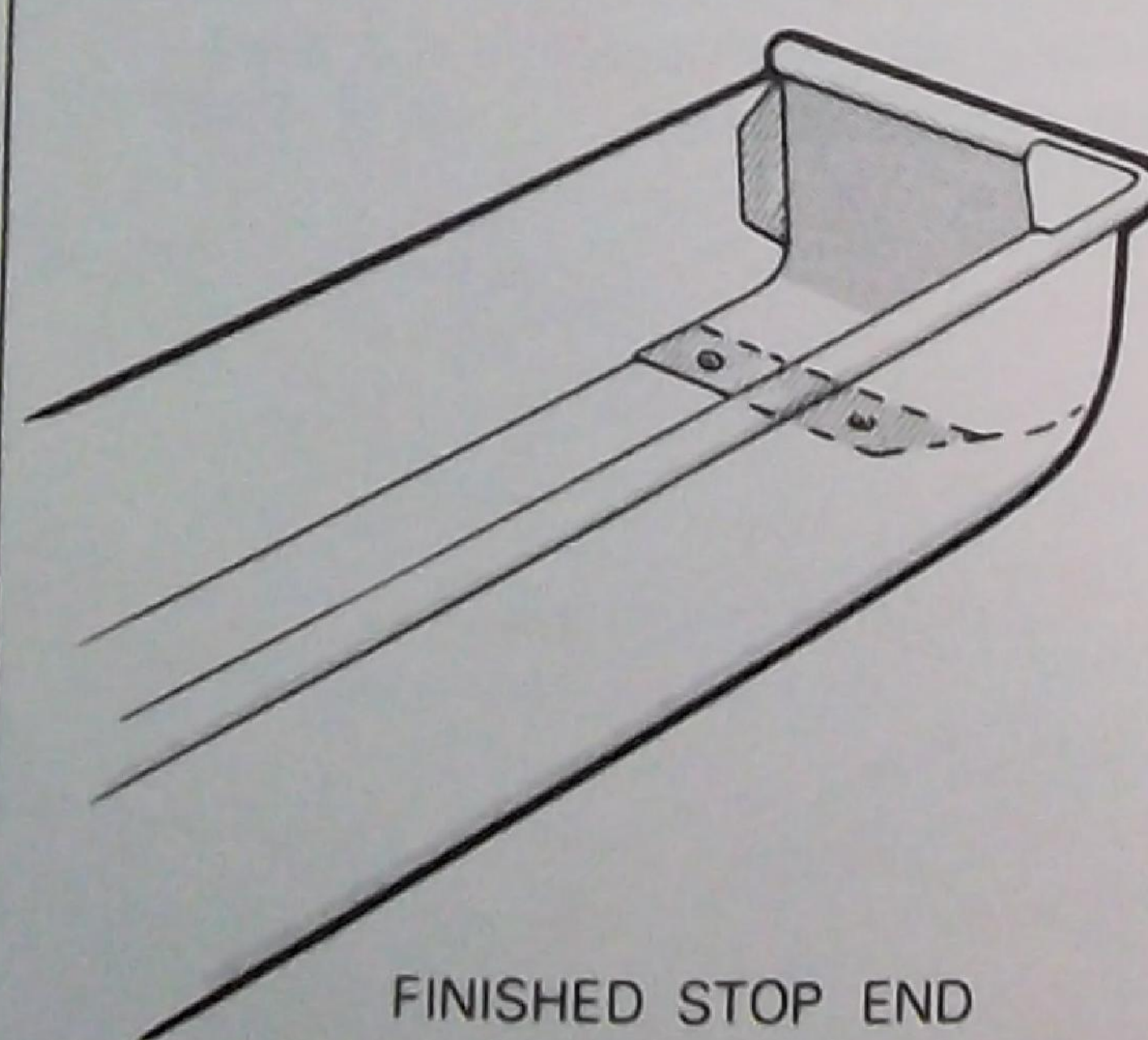
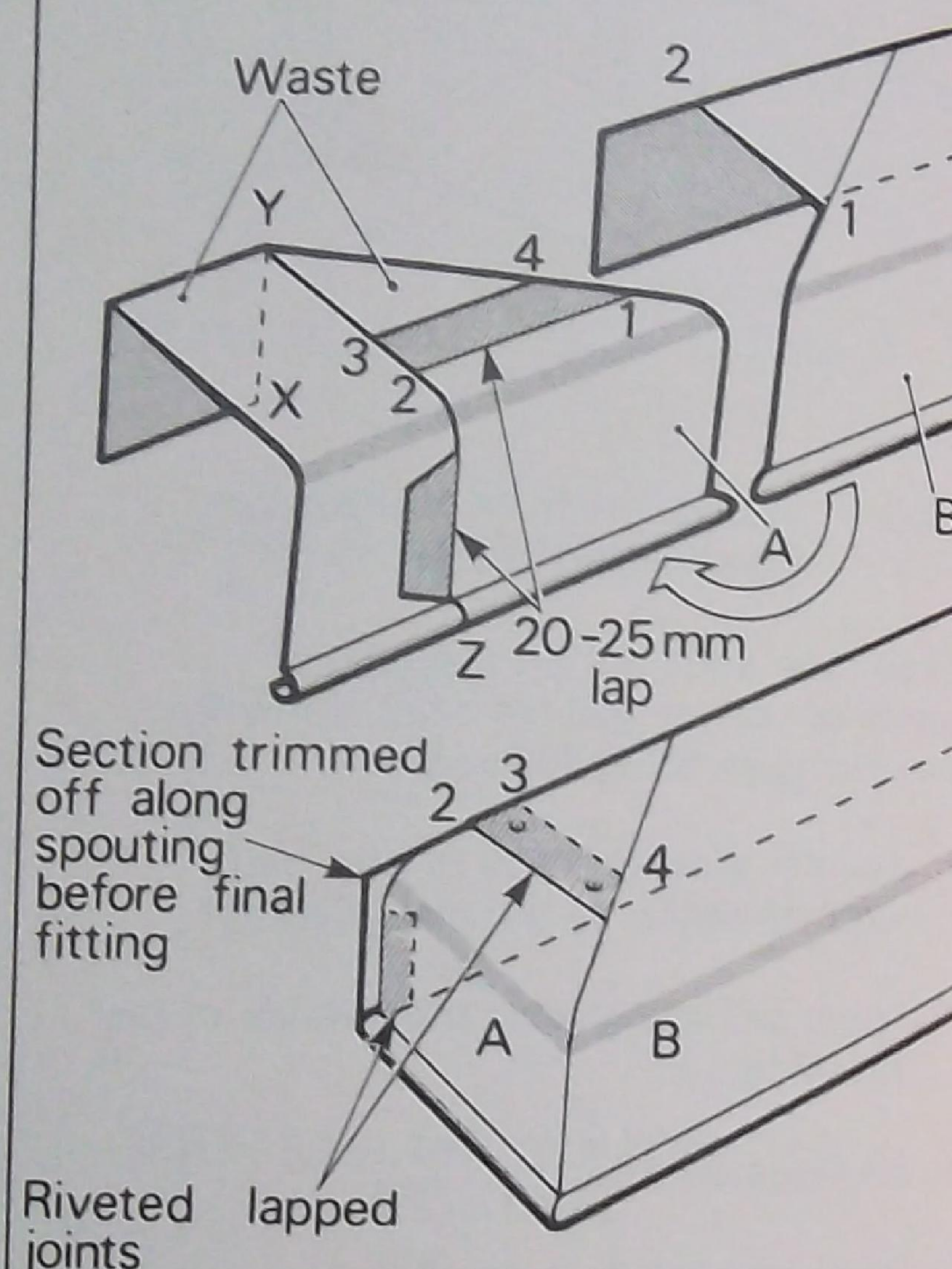
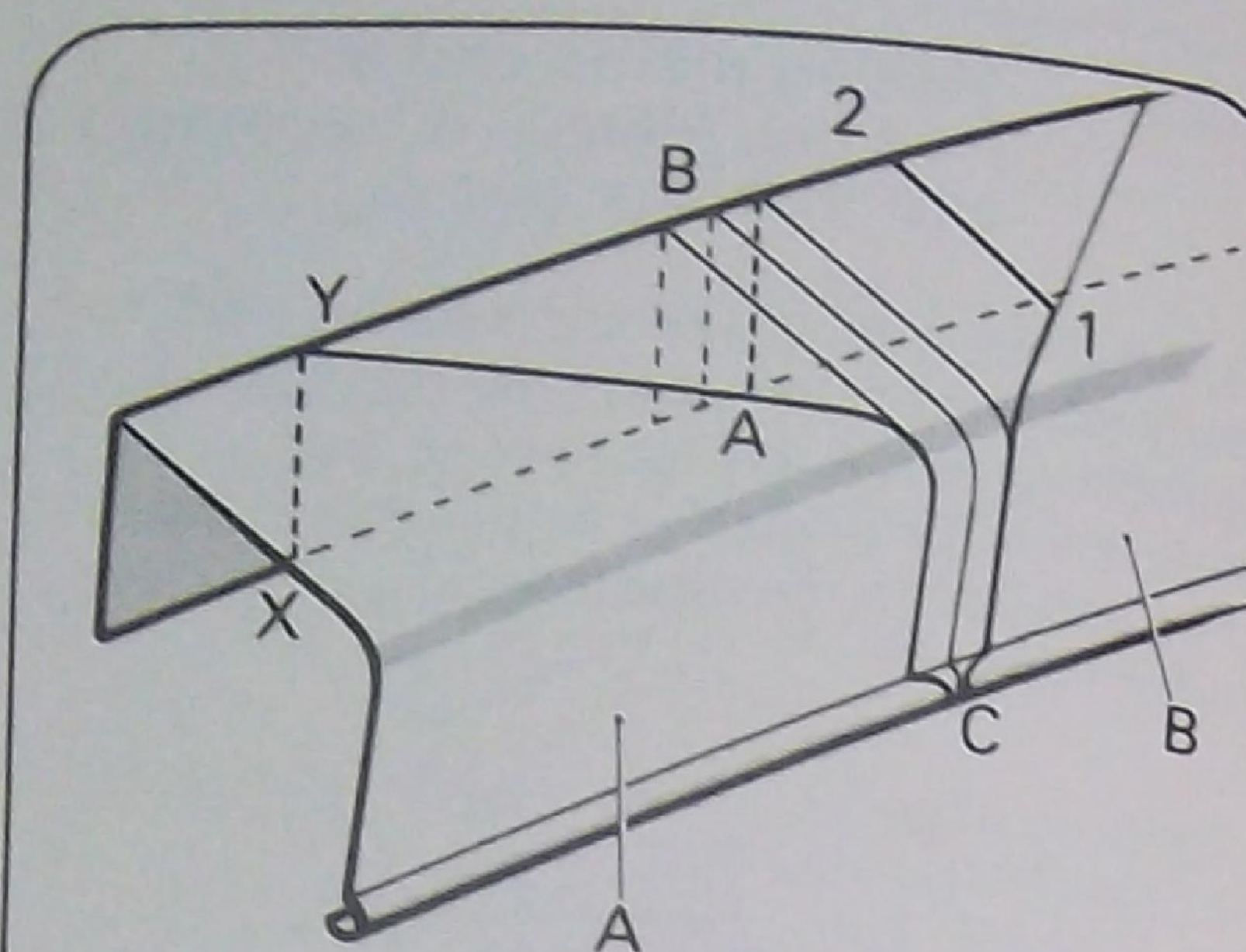
To make a return stop end in quad spouting using a piece of spouting cut off:

- Mark out the spouting as for an external 90° angle and so that the line ABC marks the position of the stop end.
 - The line ABC is at 90° to the back of the spouting.
- Scribe a line from the end of the bull-nose at point 1, parallel to the line BC, back across the bottom of the spouting to point 2.
- Cut along the lines shown in the cut-off piece and on the spouting.
 - Use hacksaw and snips.
- Scribe a line across the bottom of the spouting from point Y to point Z, parallel to the line ABC.
 - Allow for a 20-25 mm lap on the front of the spouting before cutting through the line XYZ.
- Cut through the line 3-4.
 - To fit the sections together, allow a lap of 20-25 mm between the lines 1-2 and 3-4 for riveting and soldering.
- Trim off the projection from the back of the spouting before the sections are fitted together.
- Rivet and solder the joints and strengthen the corners with gussets, as shown.

When the stop end is to be made from the end of the spouting proper, cut out as shown in the diagram opposite. The rest of the procedure remains the same.

2.4.7 Return stop end in aluminium and Zincalume quad

The same setting-out principles apply, but the sealing of the joint is completed with rivets and silicone sealant instead of being soldered.



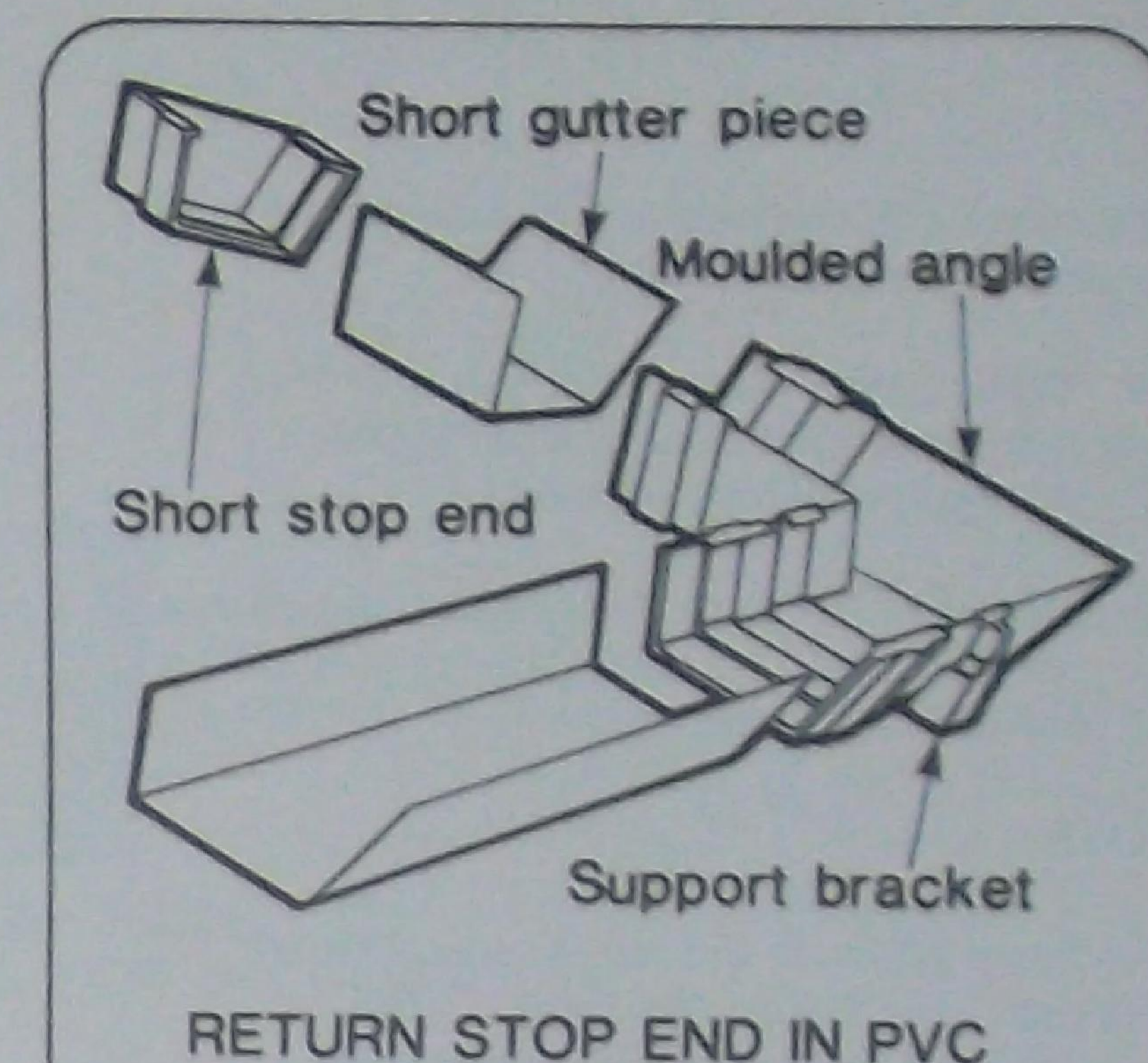
MAKING A RETURN STOP END

2.4.8 Return stop end in asbestos cement spouting

If a return stop end is required in asbestos cement fascia gutter, or spouting, use a moulded external angle fitted with a moulded stop end. Refer AS CA44 - 1969.

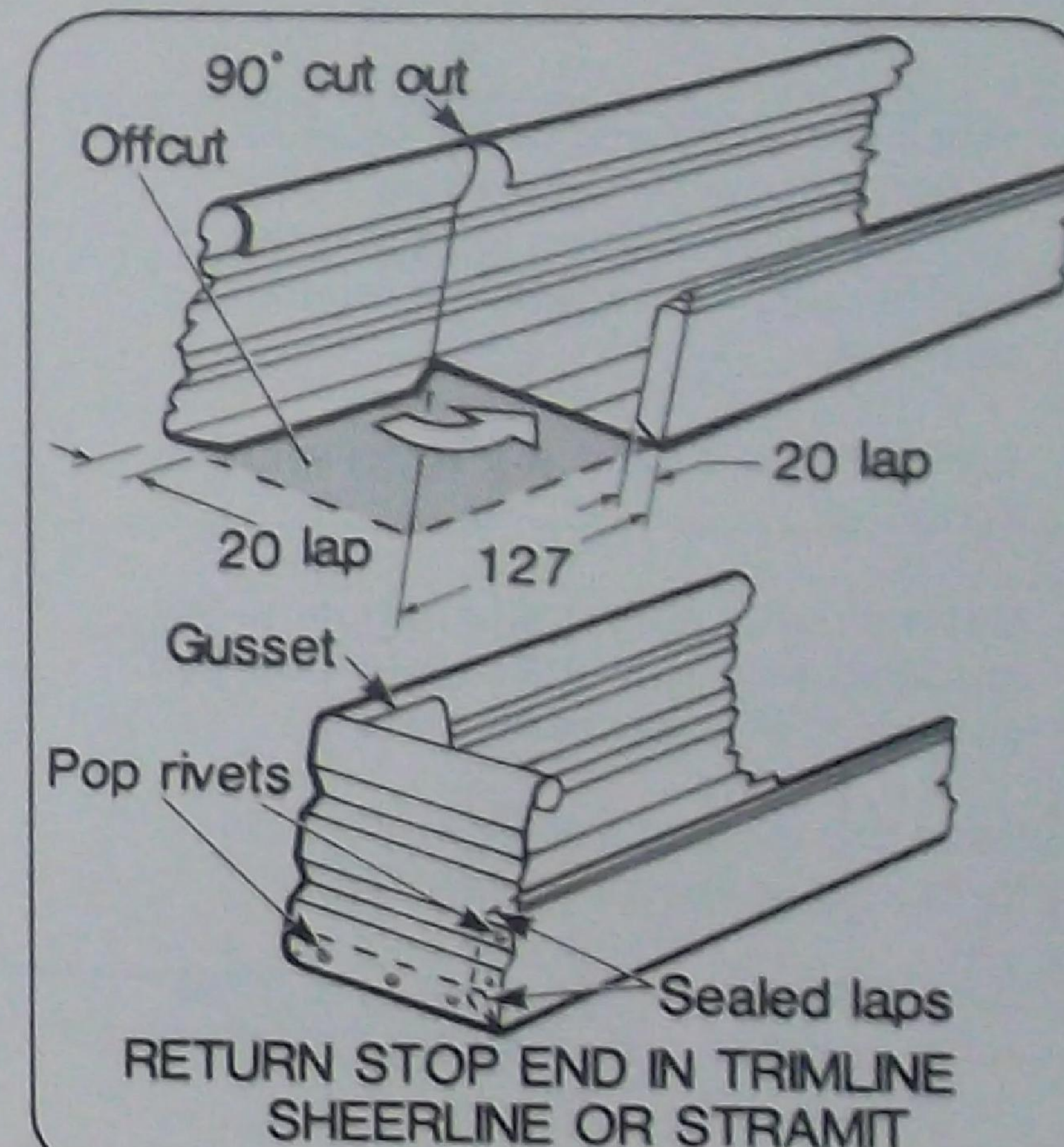
2.4.9 Return stop end in PVC spouting

If a return stop end is required in PVC spouting, a moulded external angle, a short piece of spouting (if required) and a moulded stop end are used, as shown.



2.4.10 Return stop end in Trimline, Sheerline or Stramit spouting

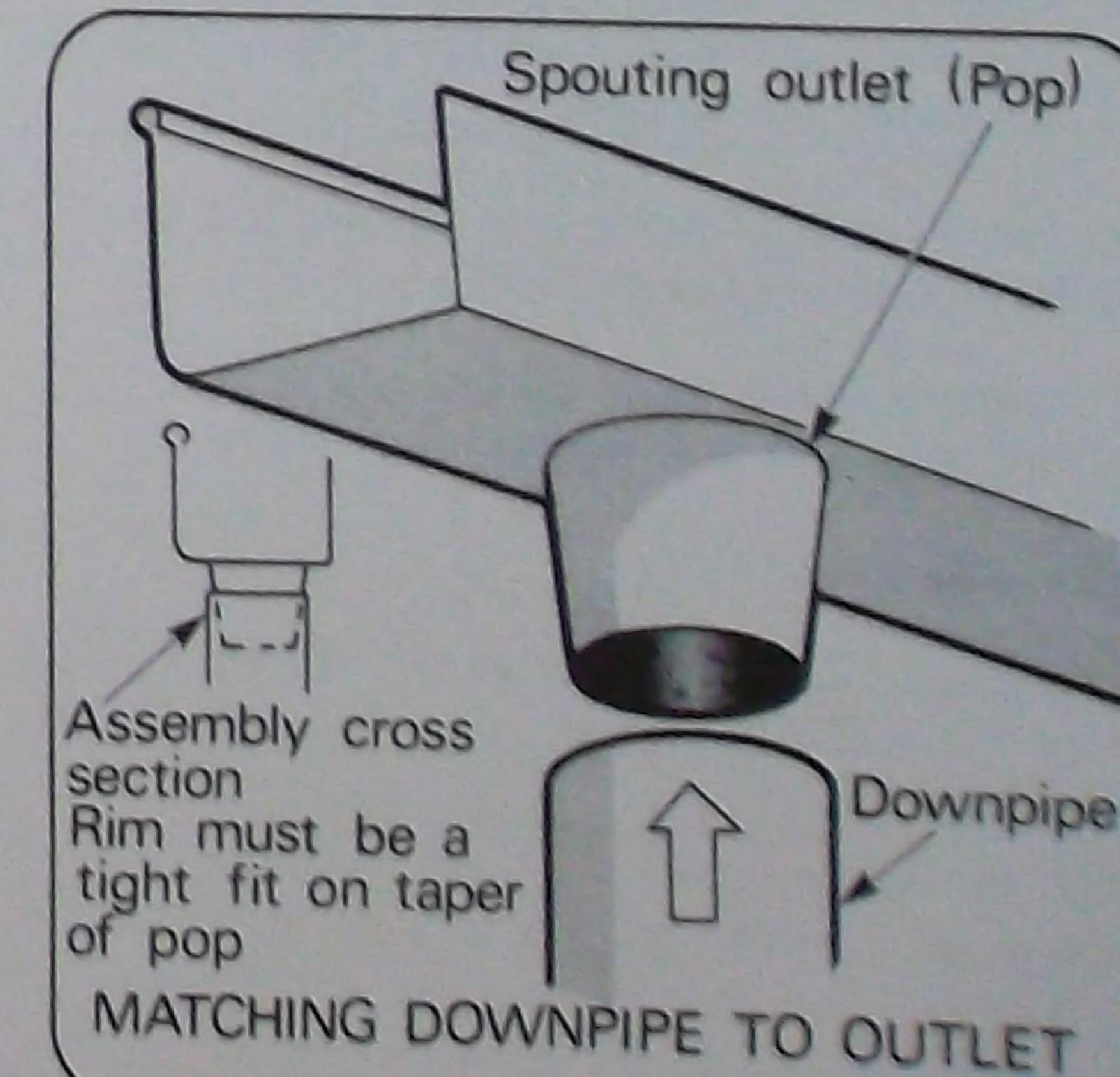
The procedure is clearly shown in the illustrations opposite. The sealing is done by riveting and soldering, or if the material is non-solderable, a silicone sealant is used.



2.5 SPOUTING OUTLETS

Spouting outlets are pieces of tapered tubing which connect a length of spouting to a downpipe.

The spouting outlet is also called a 'pop'.



2.5.1 Making the spouting outlet

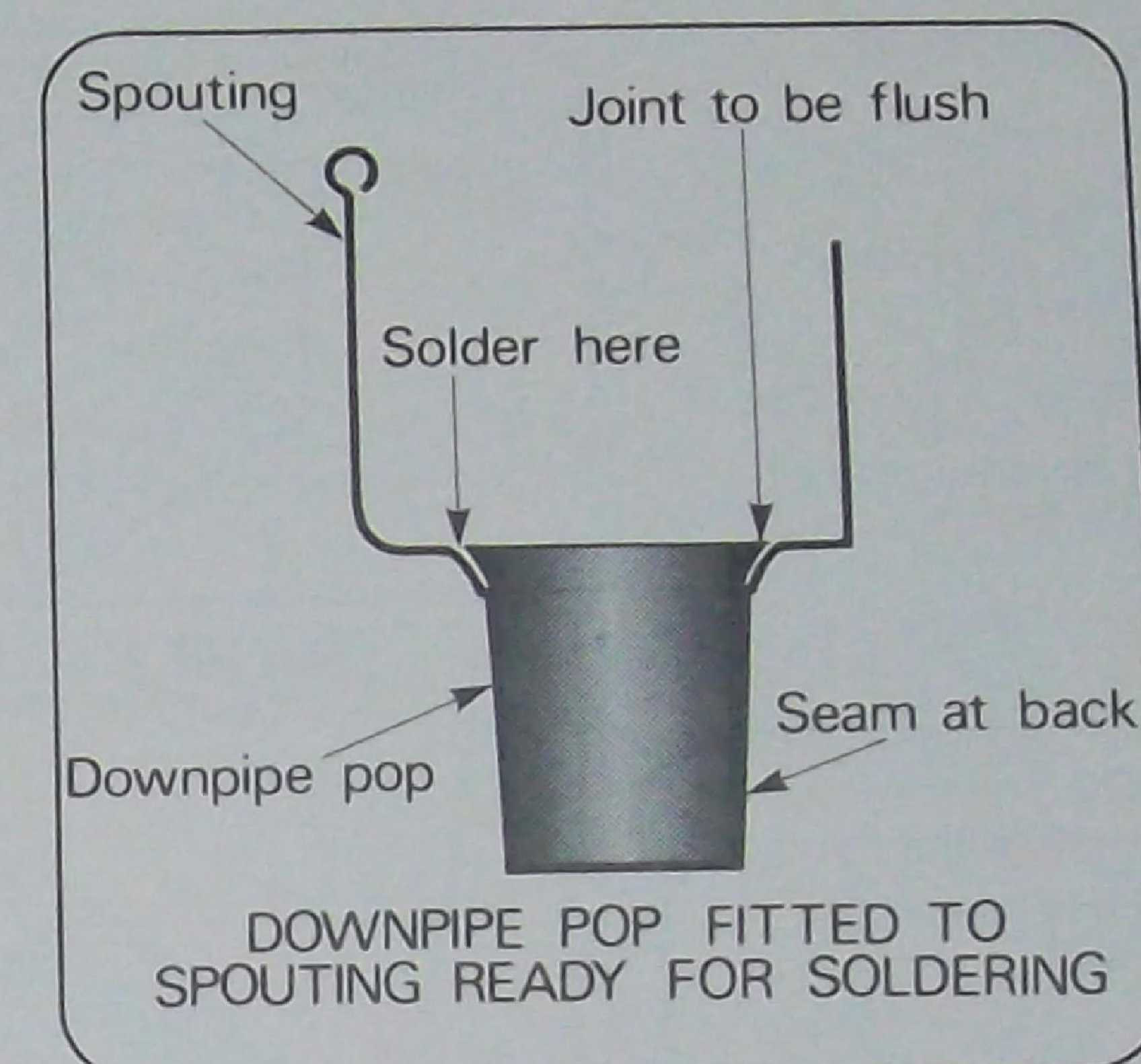
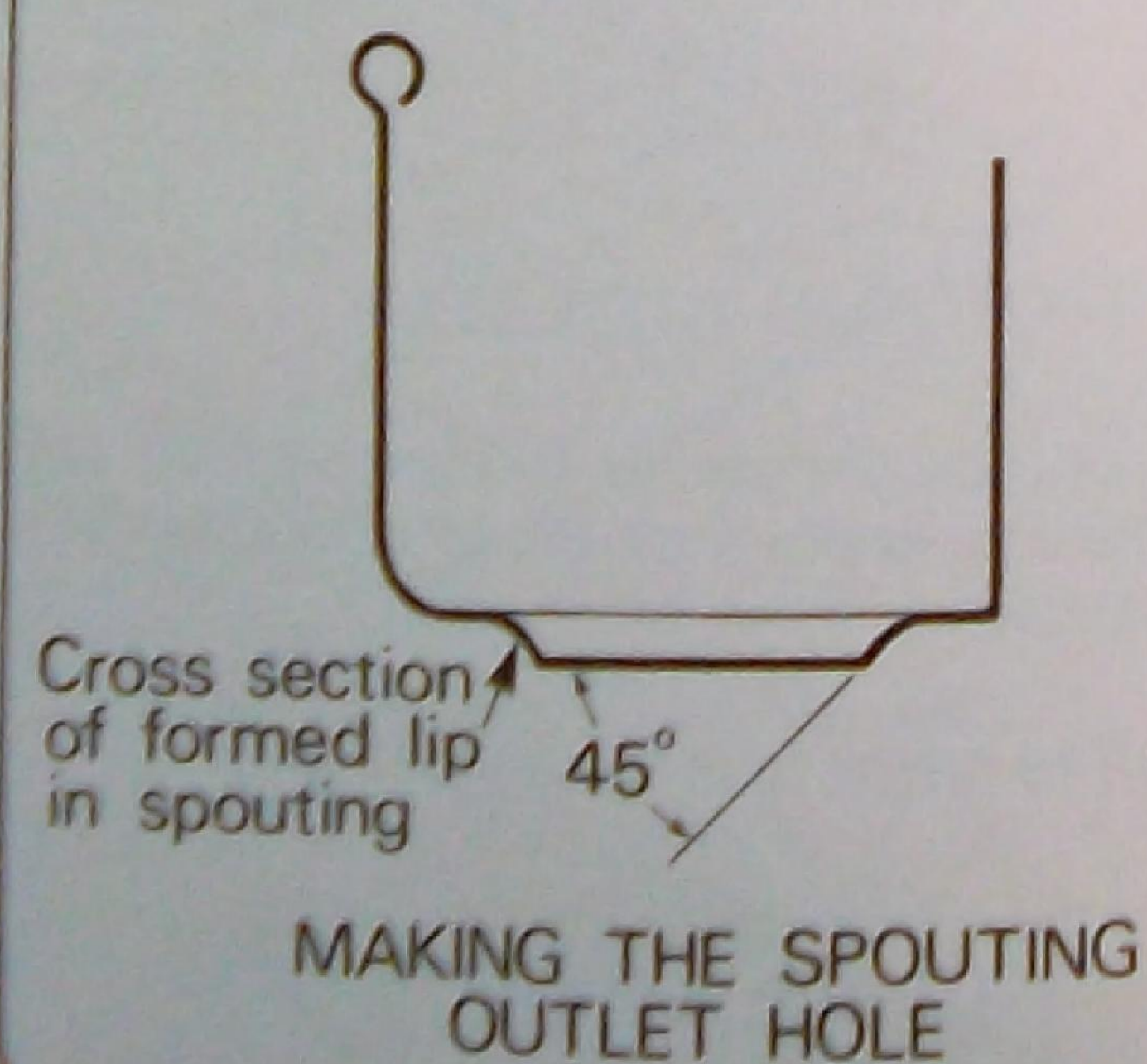
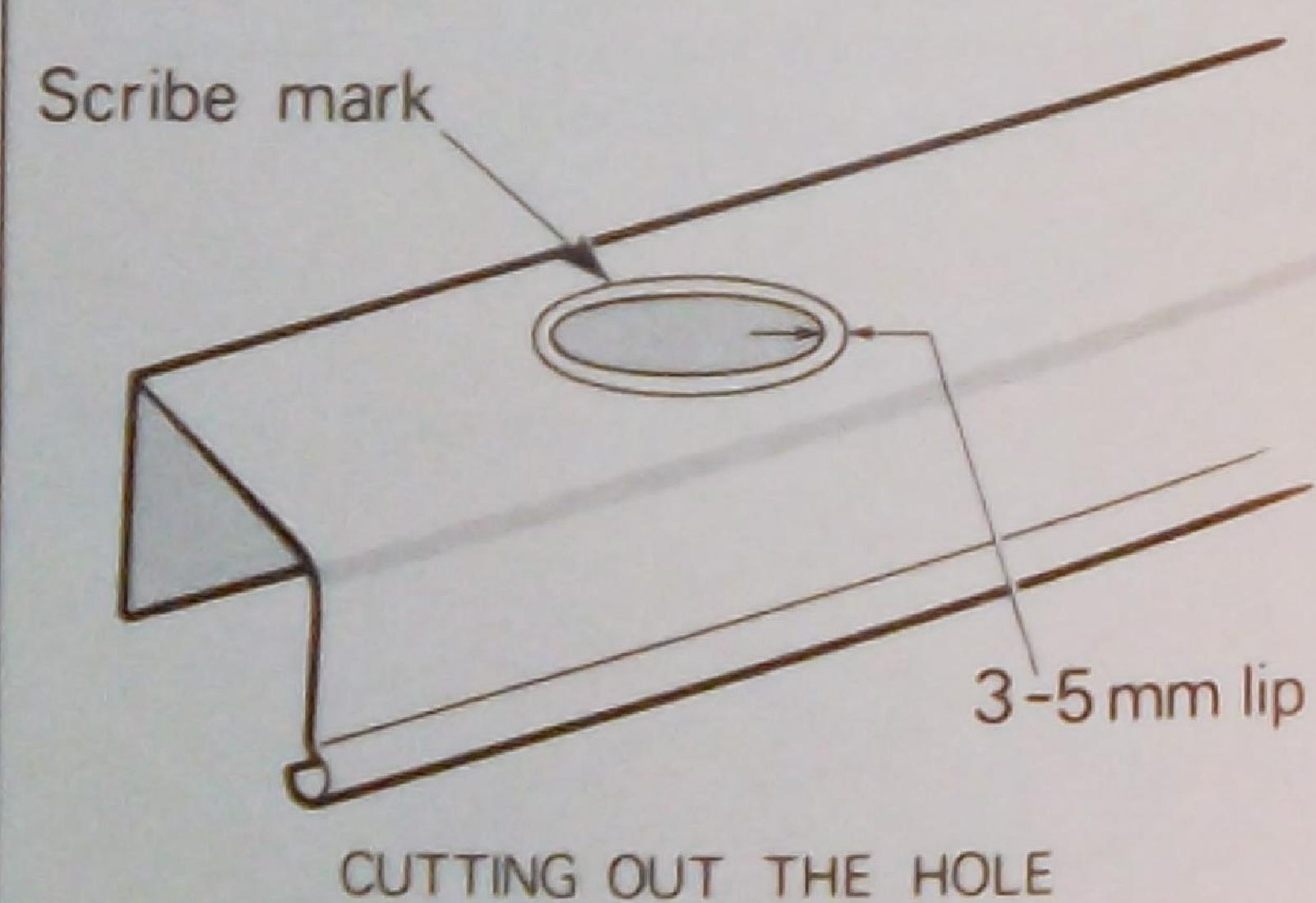
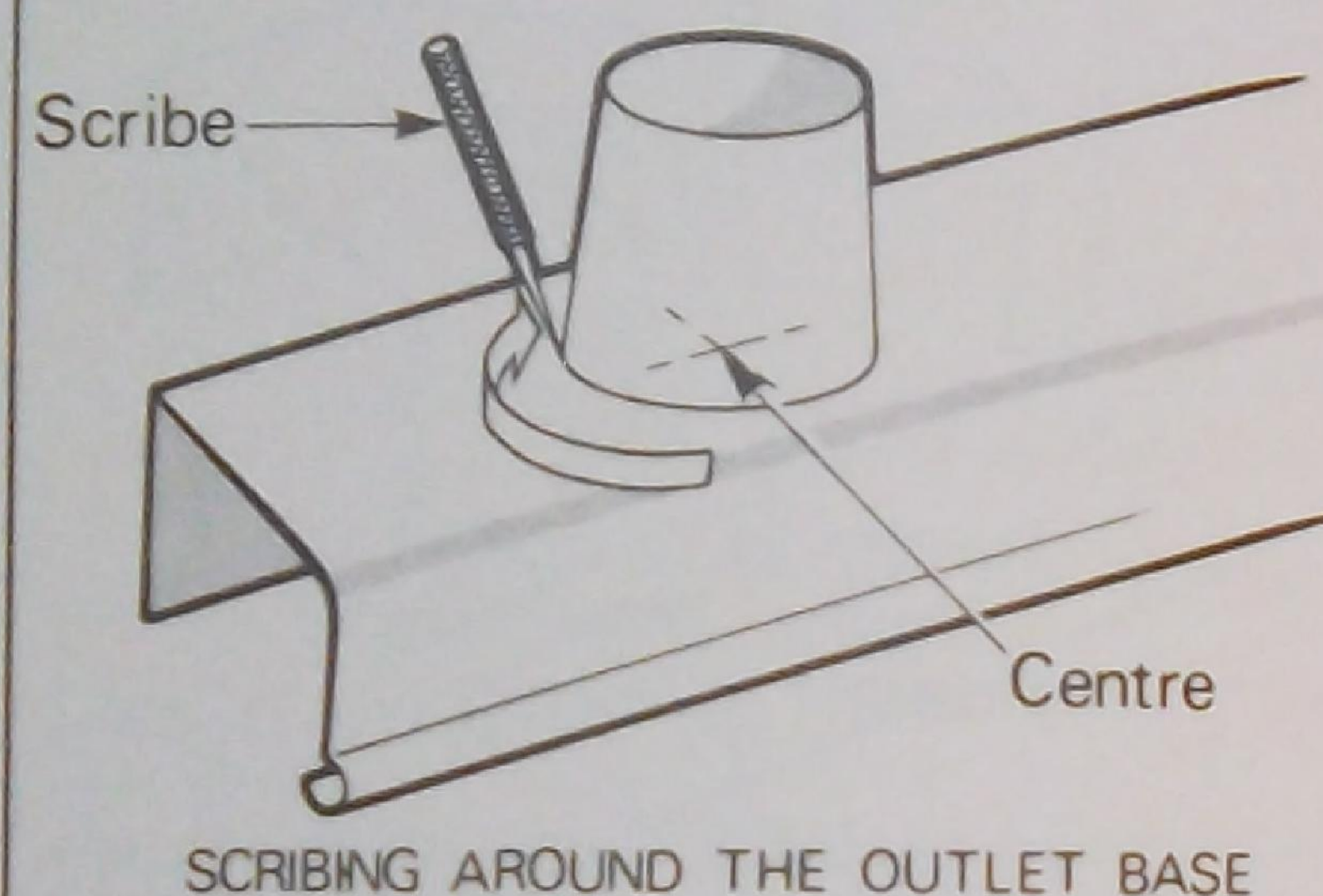
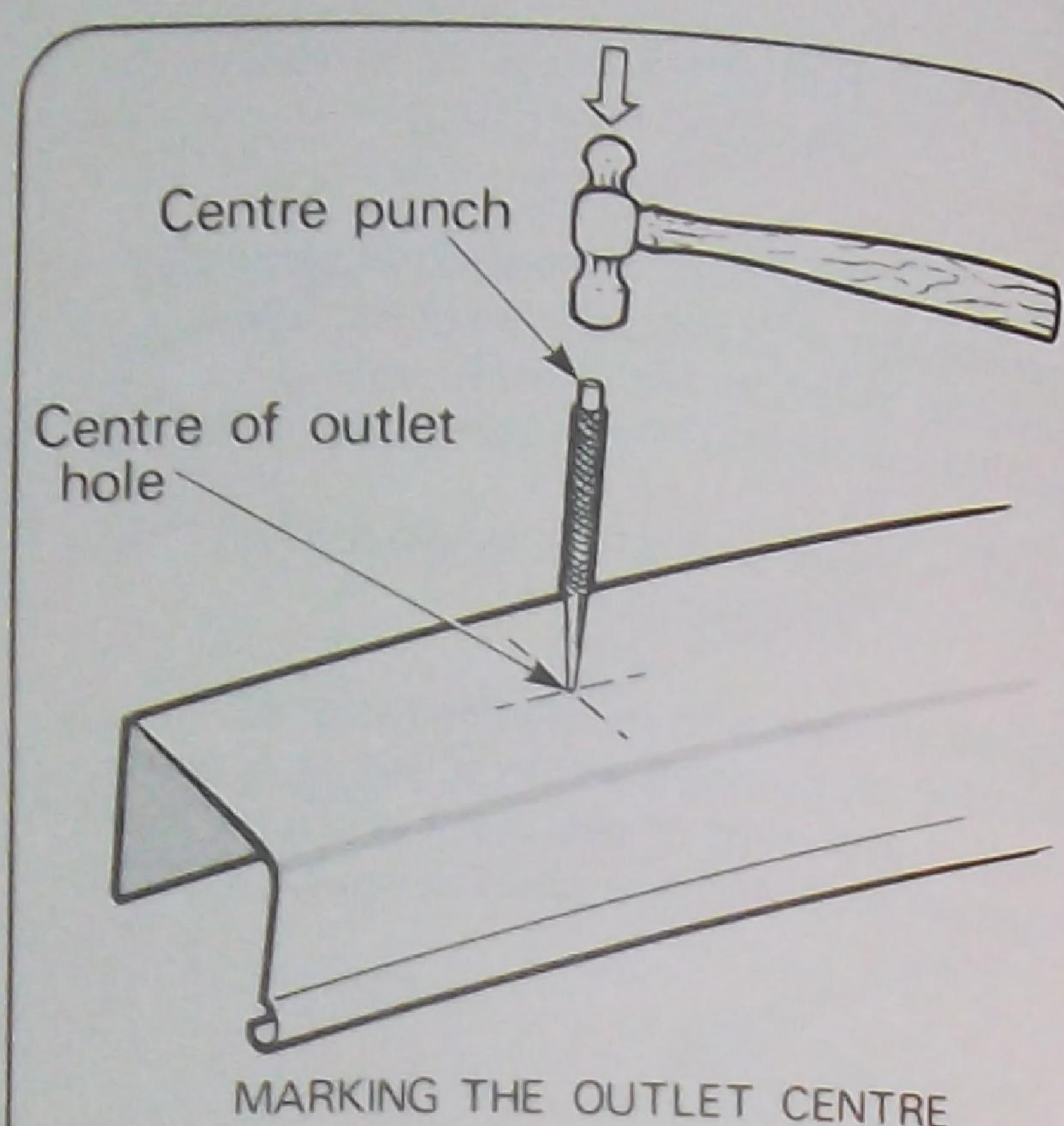
To make the connection between an eaves gutter and a downpipe:

- Select, or make, a downpipe which makes a tight slip joint with the downpipe being installed.
- Mark the bottom of the spouting with a centre punch to show the centre of the outlet hole to be cut.

NOTE:

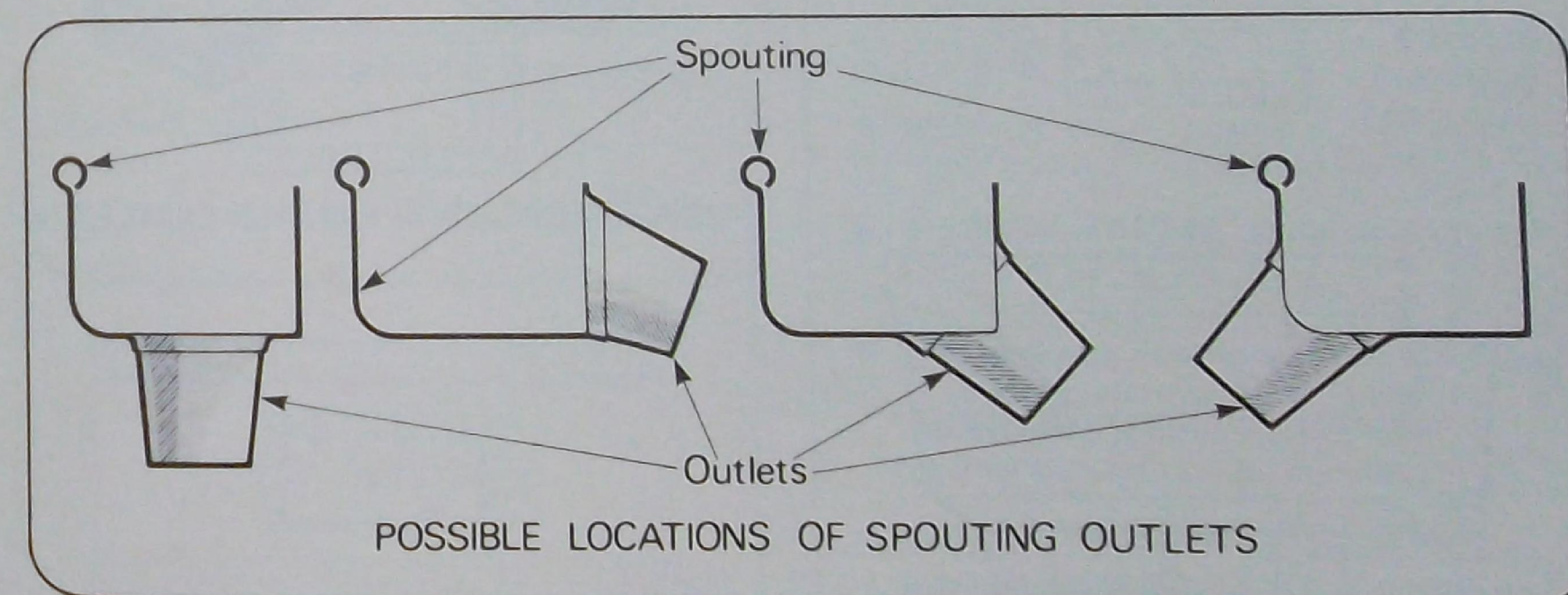
The back edge of the outlet must be as near as possible to the back of the spouting where practical applications permit.

- Place the larger end of the tapered outlet, or pop, on the bottom of the spouting and position it so that the centre punch mark lies in a central position.
- Scribe a line around the outlet on the spouting.
- Cut a circular hole in the bottom of the spouting with a radius between 3-5 mm smaller than the scribed mark.
- Bend the edge of the hole outwards to form a lip at approximately 45°.
— The handle of the snips or a cross-pein hammer may be used to swage the lip out.
- Turn out the top of the pop to match the angle of the lip that has been formed in the spouting.
- Place the pop in the hole so that it fits tightly and is set vertically.
- Make sure the seam on the pop is at the back and that the pop is straight.
- Solder in position.
- Clean all excess flux from the surface of the metal.



Apply all the same principles for making and installing a square or rectangular pop, providing spouting and pop are of solderable material.

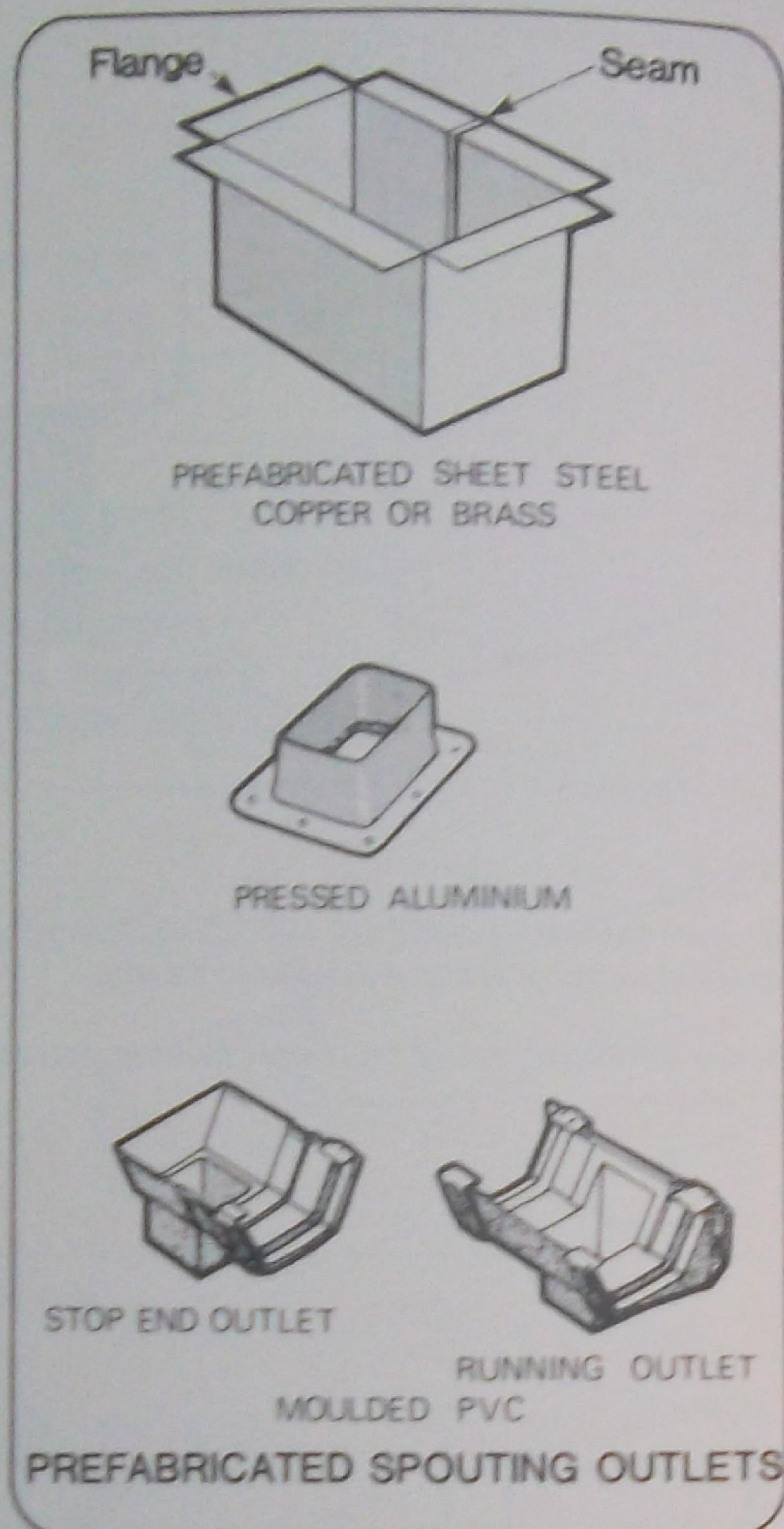
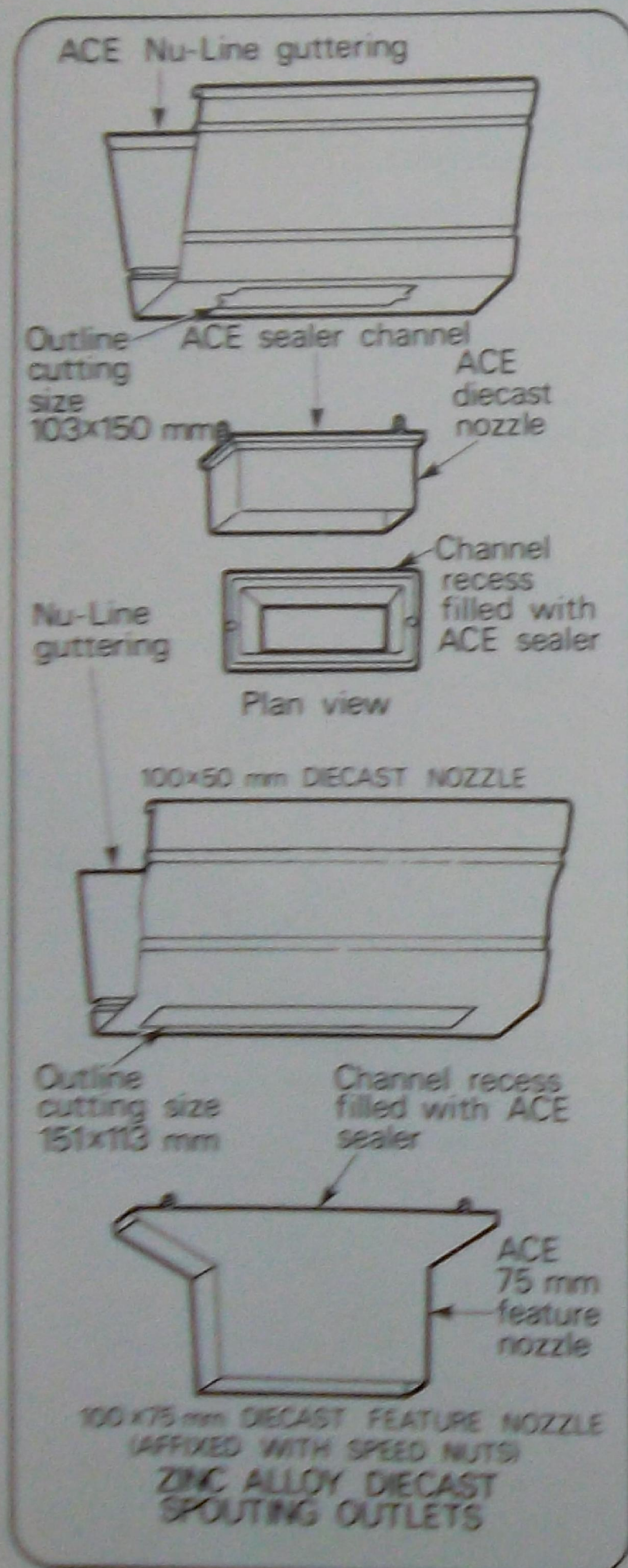
Similar principles apply for the preparation and making of angled outlets which can be fixed in at any angle.



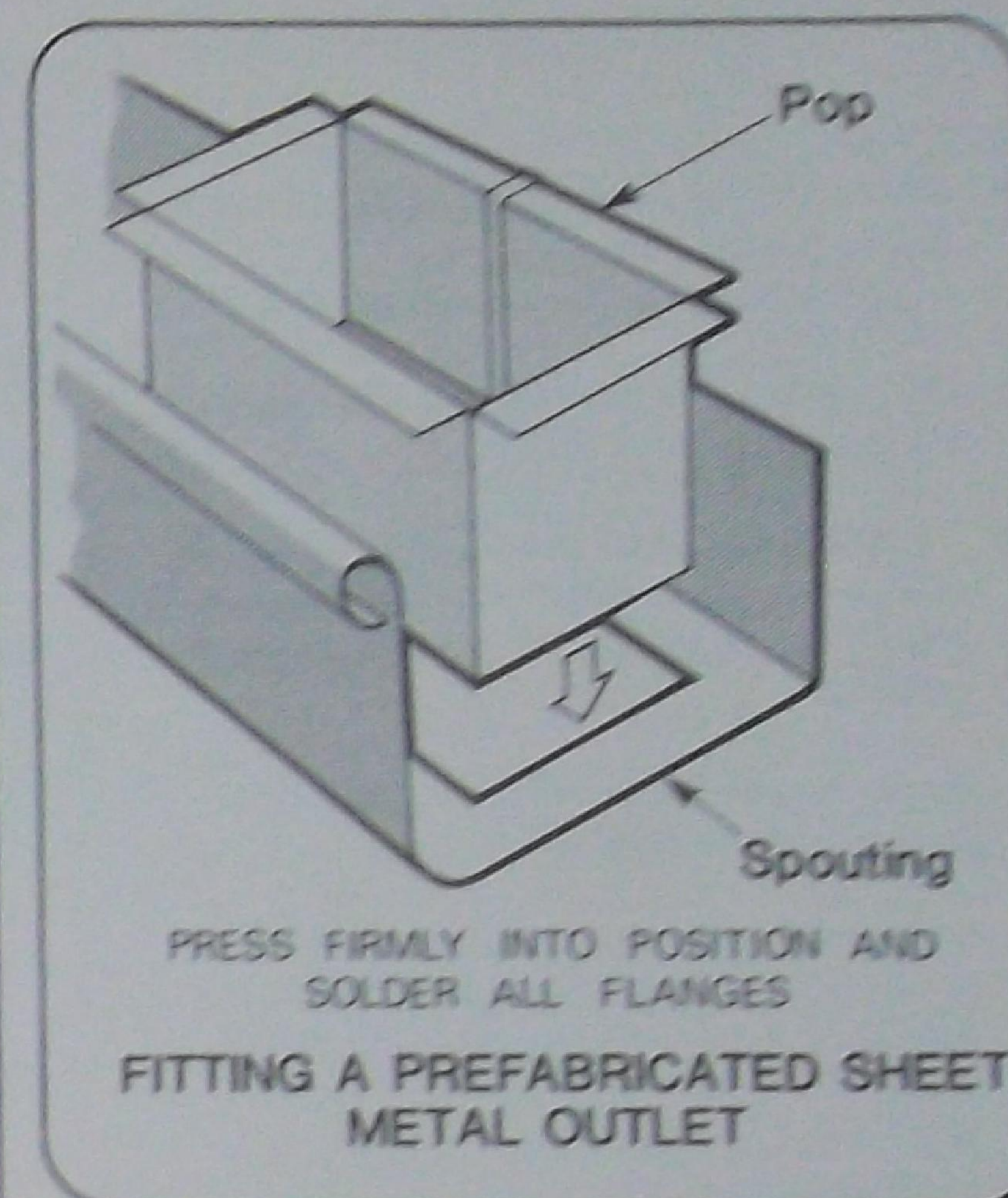
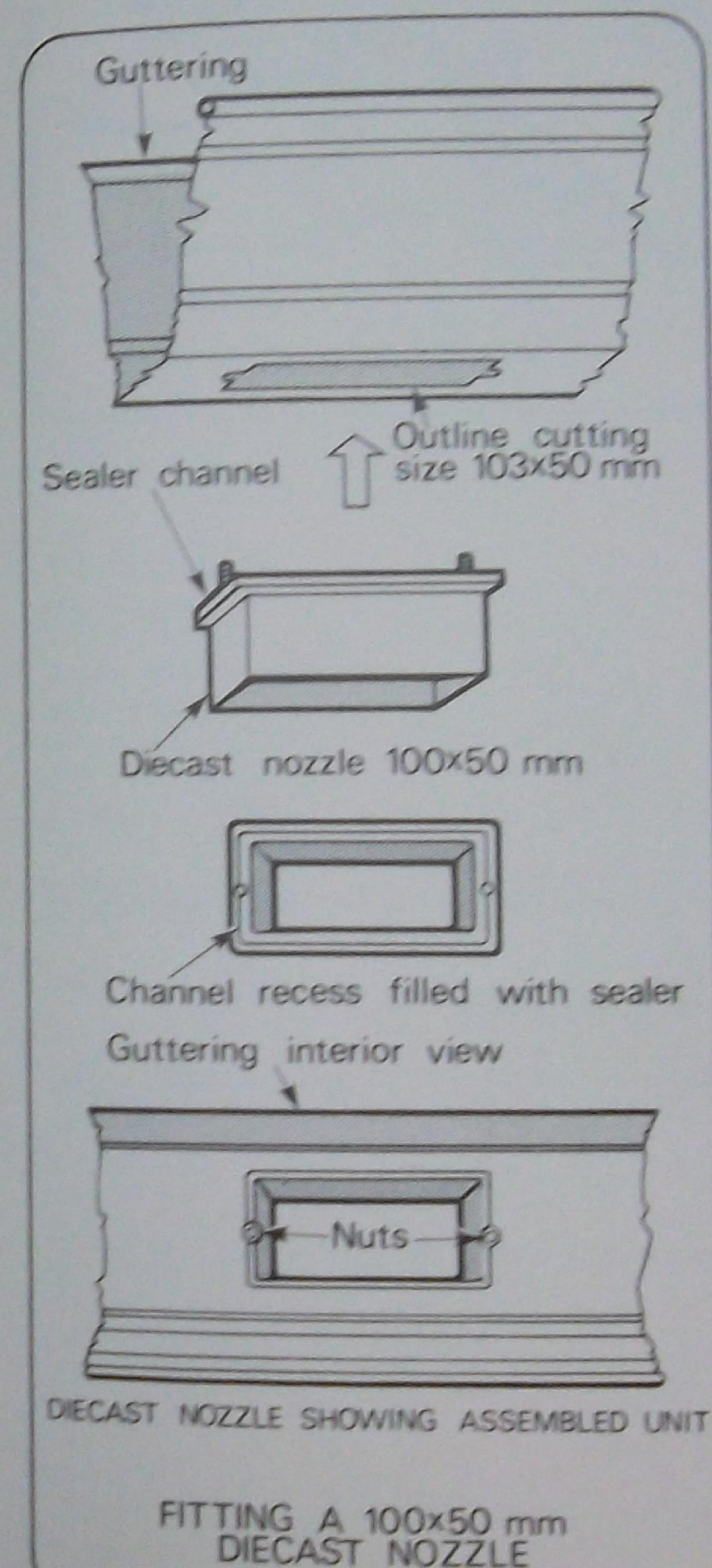
2.5.2 Prefabricated spouting outlets

Flanged spouting outlets may be prefabricated in sheet form of galvanised steel or copper, also cast from e.g. aluminium and cast iron.

Moulded PVC and asbestos cement outlets are also manufactured to suit the spoutings.



To fit a prefabricated solderable spouting outlet, cut a hole in the bottom of the spouting, making sure that the outlet sides will be a tight fit and that the pop is in a vertical position before soldering into position.



2.5.3 Fitting zinc alloy diecast spouting outlets

- Cut out a 100 x 50 mm hole plus two 6 mm V's to allow threaded studs to protrude into the spouting.
- Clean the sealant groove in the diecast outlet and around the cut outs.
- Fill the groove to about the channel level with silicone sealant.
- Fit the outlet, making sure the studs are protruding into the spouting and that the groove fits squarely and hard against the base of the spouting.
- Place the nuts on the studs and tighten with the manufacturer's spanner.
- Clean off excess sealant with damp cloth.

NOTE:

ACE feature fittings are zinc alloy diecast and there is no chemical reaction when they are fitted to galvanised steel or aluminium gutters.

Consult the manufacturer or your instructor for extra information.

2.5.4 Fitting pressed aluminium outlets

- Mark out the size of the hole to be cut in the gutter according to manufacturer's recommendations.
- Cut out the material along the marked lines using small tin snips.
- Turn the edges of the hole downwards with a suitable hammer or with pliers so that it forms a neat fit into the spouting outlet.
- Apply sealant around the hole on the bottom of the spouting.
- Place the outlet into position and drill holes in the spouting, using the outlet flange holes as a template and guide.
- Pop rivet the outlet into position with aluminium rivets.
- Seal off the rivets with sealant.
- Wipe off all excess sealant.



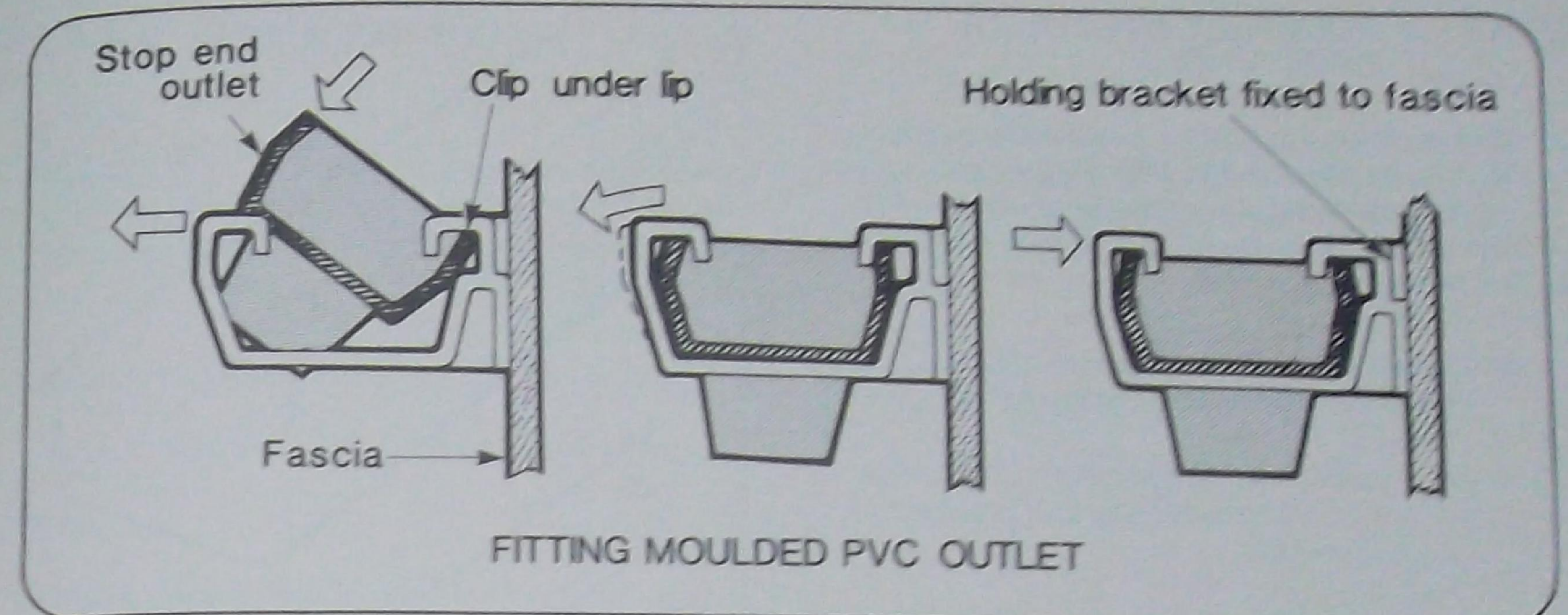
2.5.5 Fitting moulded PVC outlets

PVC outlets are part of an end stop or of a piece of PVC spouting that fits into matching clips, as illustrated.

- Place the back edge of the fitting under the rear lip of the holding clip.
- Spring the front portion of the holding clip forward whilst keeping pressure on the back edge of the spouting.
- Position the spouting fitting on the seal.
- Keep finger pressure on the inside front of the spouting and snap the holding clip over the front edge of the spouting.

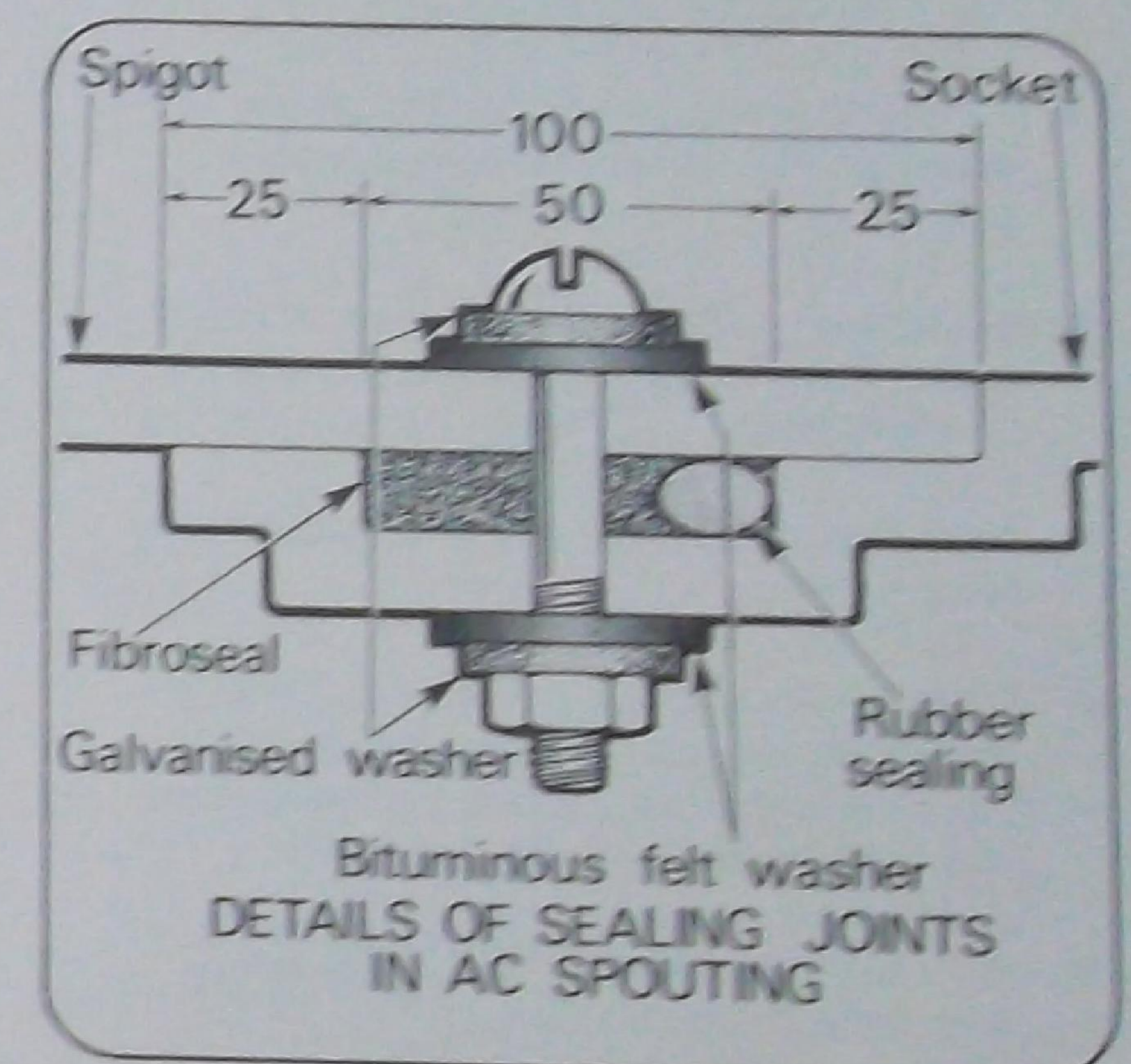
NOTE:

A distinct click will indicate correct fitting of the holding clip.



2.5.6 Fitting asbestos cement outlets into position

The method of fitting an asbestos cement spouting outlet into position is illustrated. It is the same method for fixing spouting joints, which is by means of fibrosec or other recommended jointing compounds placed in the recess provided in the socket end, plus a rubber sealing strip. The spigot end is placed into position and bolted together with galvanised nuts and bolts, washers and bituminous felt washers. Refer to AS CA44-1969.

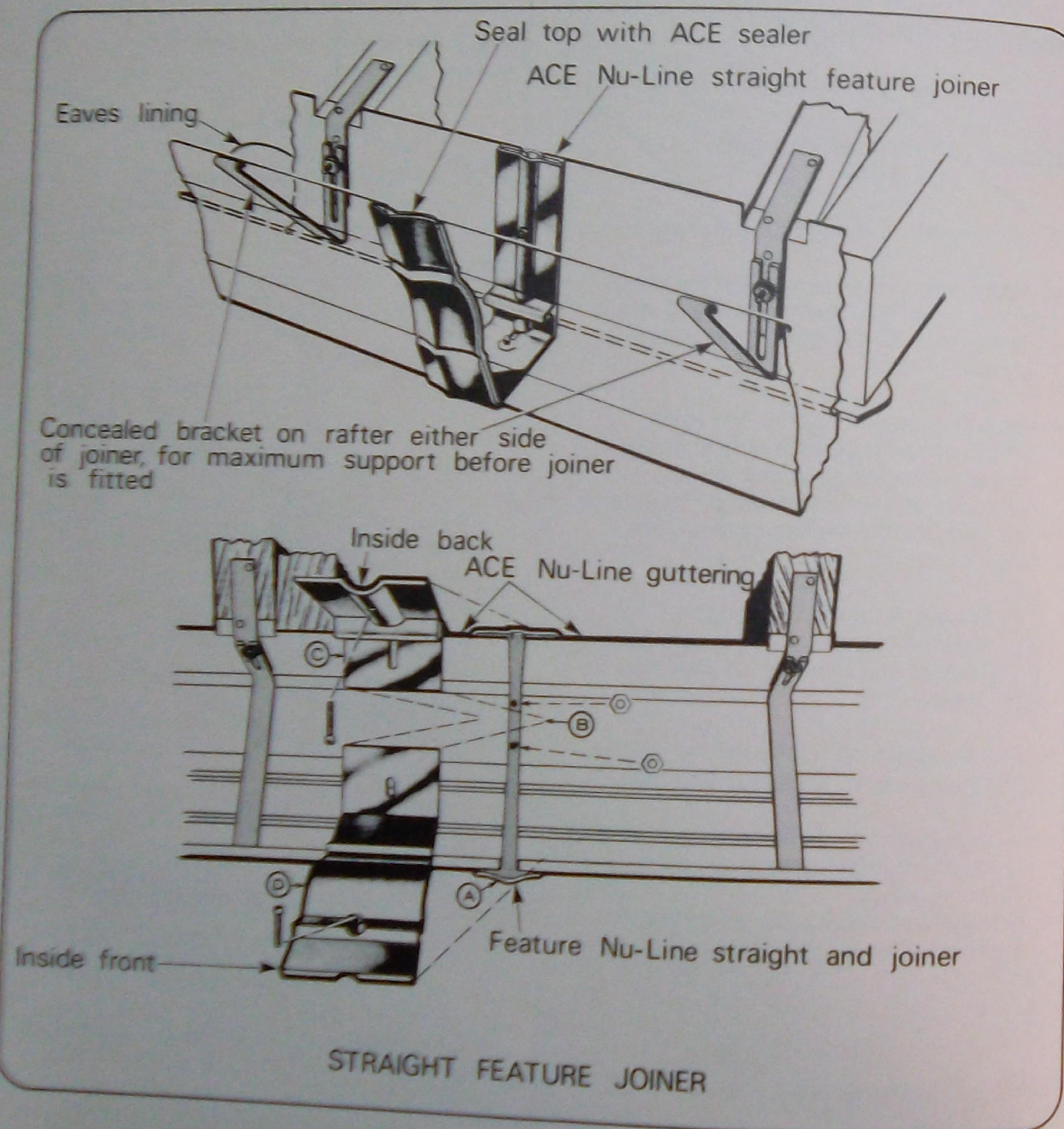


2.5.7 Fitting cast iron spouting outlets into position

This is done in a similar way as for asbestos cement. It involves mixing up a two-part epoxy resin compound used as a jointing medium, placing it in the faucet or socket end, and spreading it evenly all over. The spigot end is then placed into position, the two items pressed firmly together, then bolted together with galvanised nuts, bolts and washers through the holes provided for this.

Be sure to clean off any excess epoxy resin jointing compound before it sets hard and causes an obstruction in the spouting.

- Fix a concealed bracket to the ends of the rafters that are on either side of the joint.
- Dismantle the joiner and clean the under-side of sections 'C' and 'D' and the upper-side of section 'A'.
- Fit the joiner to the spouting and make sure it fits correctly.
- Apply sealer, evenly spread, to the upper surface of section A and firmly push it up into position on the gutter outer surface.
- Apply sealer to the back of section C making sure the recess soffit channel is completely filled with sealer.



- Firmly press section C into position, inside the gutter and against the back.
- Screw on nut and setscrew.
- Repeat the process with section D, then firmly tighten all nuts and setscrews.
- Remove all excess sealer and use it to cover all openings and to seal around nuts and setscrews. Also seal the joint between C and D.
- Fill the tops of front and back of joiner with sealer.
- Clean any excess sealer from the outside of the gutter.

NOTE:

The same method applies to the fixing of Mini-Line, but the shape of the joiners is different to suit the Mini-Line profile.

2.6.4 Joining Sheerline or Trimline

The joining of the Sheerline or the Trimline profiles is illustrated opposite.

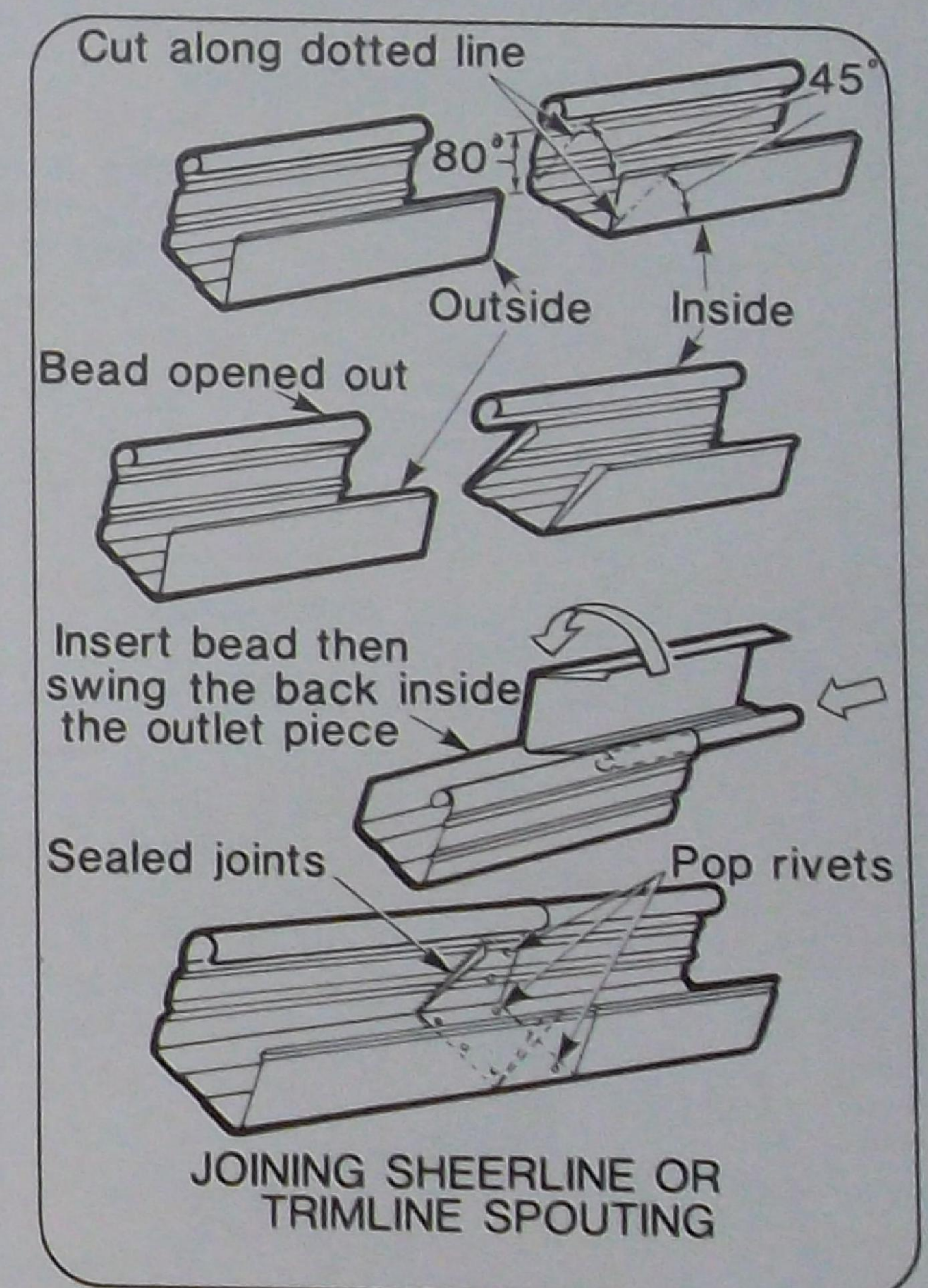
The joints are riveted and soldered in a similar manner as that for quad spouting.

The front and the back are cut back at approximately 45° and the edges turned in at right angles to allow for soldering in position.

If soldering is done on the bench where the spouting may be rotated, the edges need not be cut back.

If the spouting is in Colourbond finish, the joining must be done with rivets and sealant.

Check the manufacturer's instructions or ask your instructor for further information on these products.



2.6.5 Joining cast iron spouting

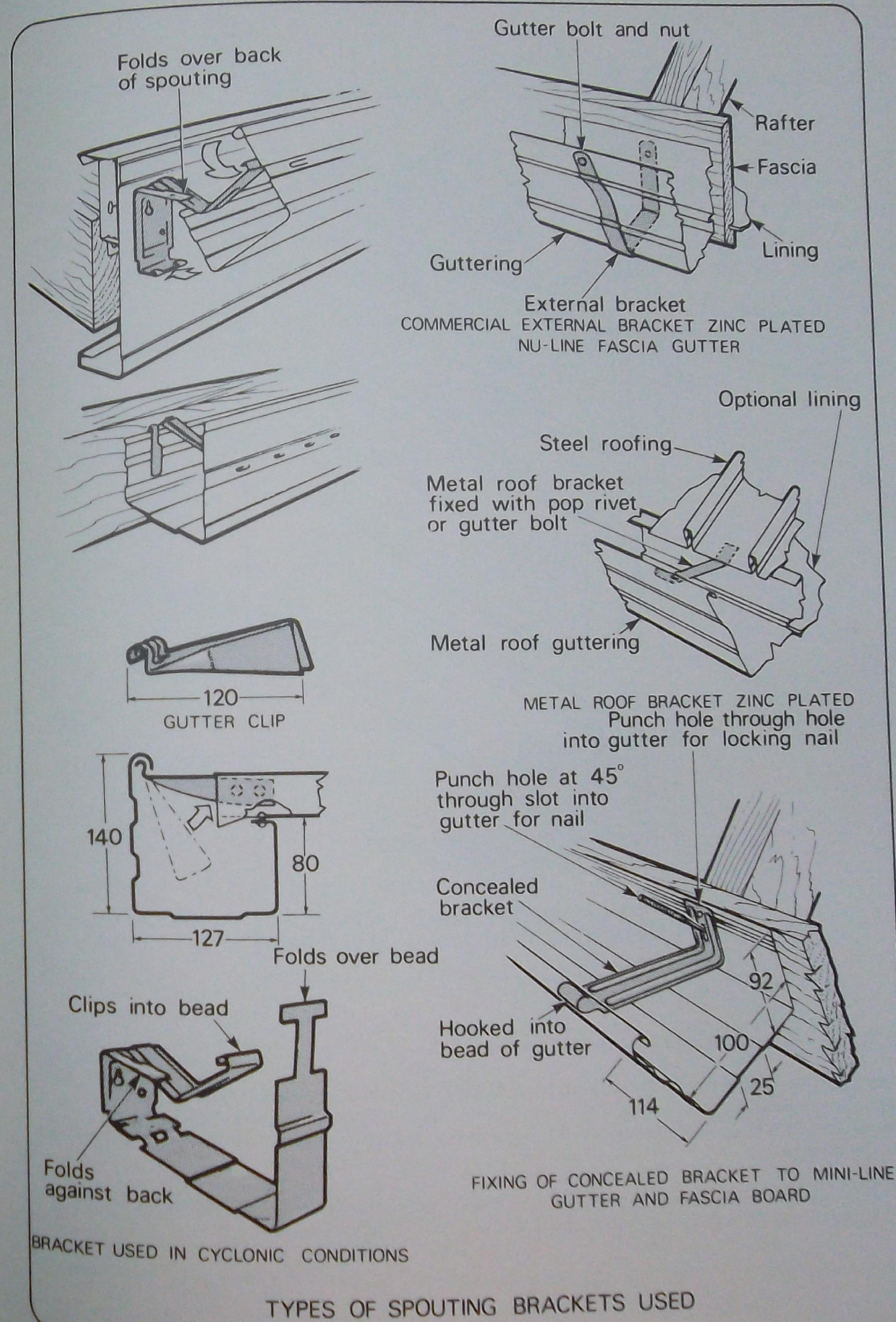
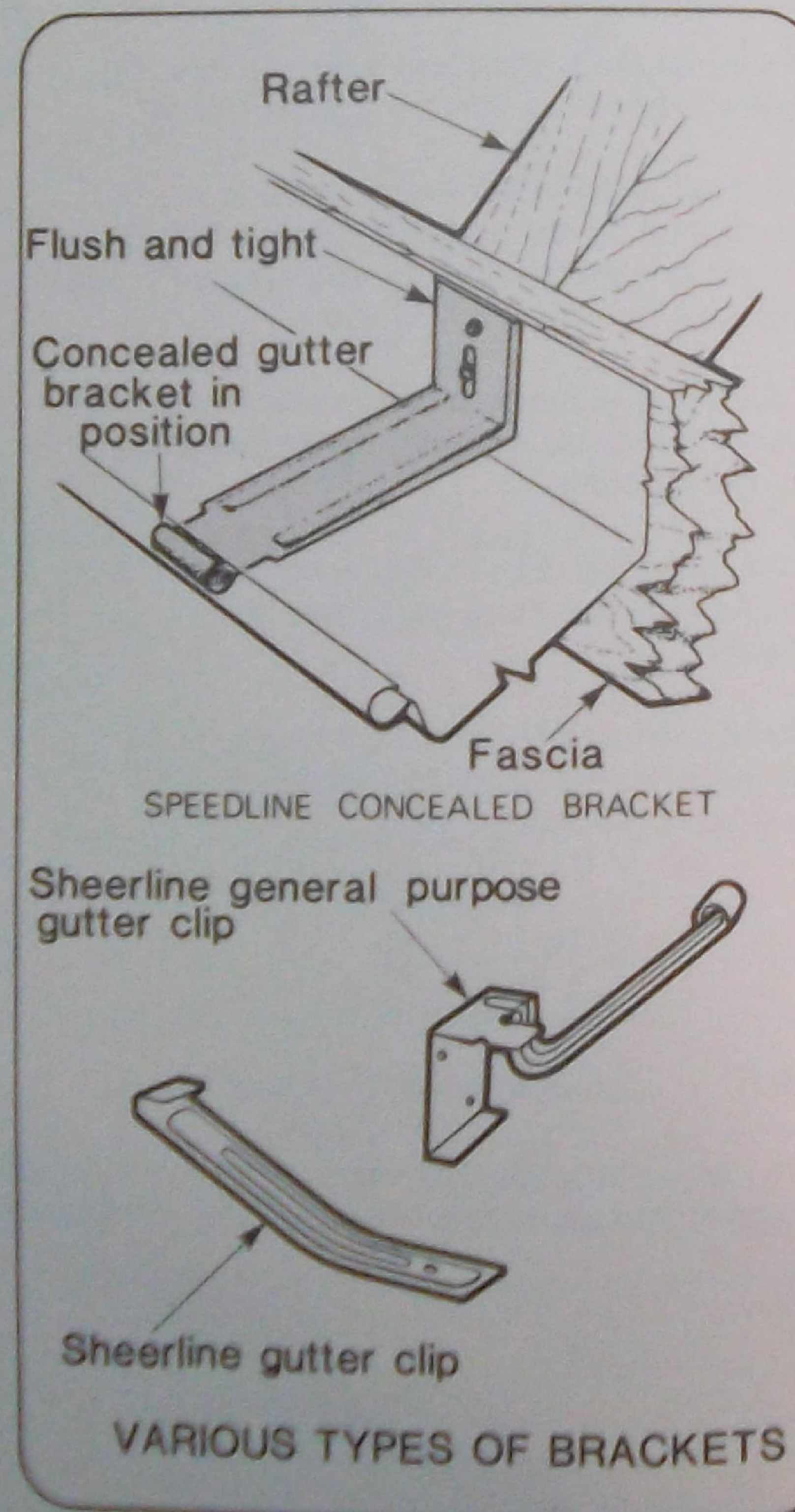
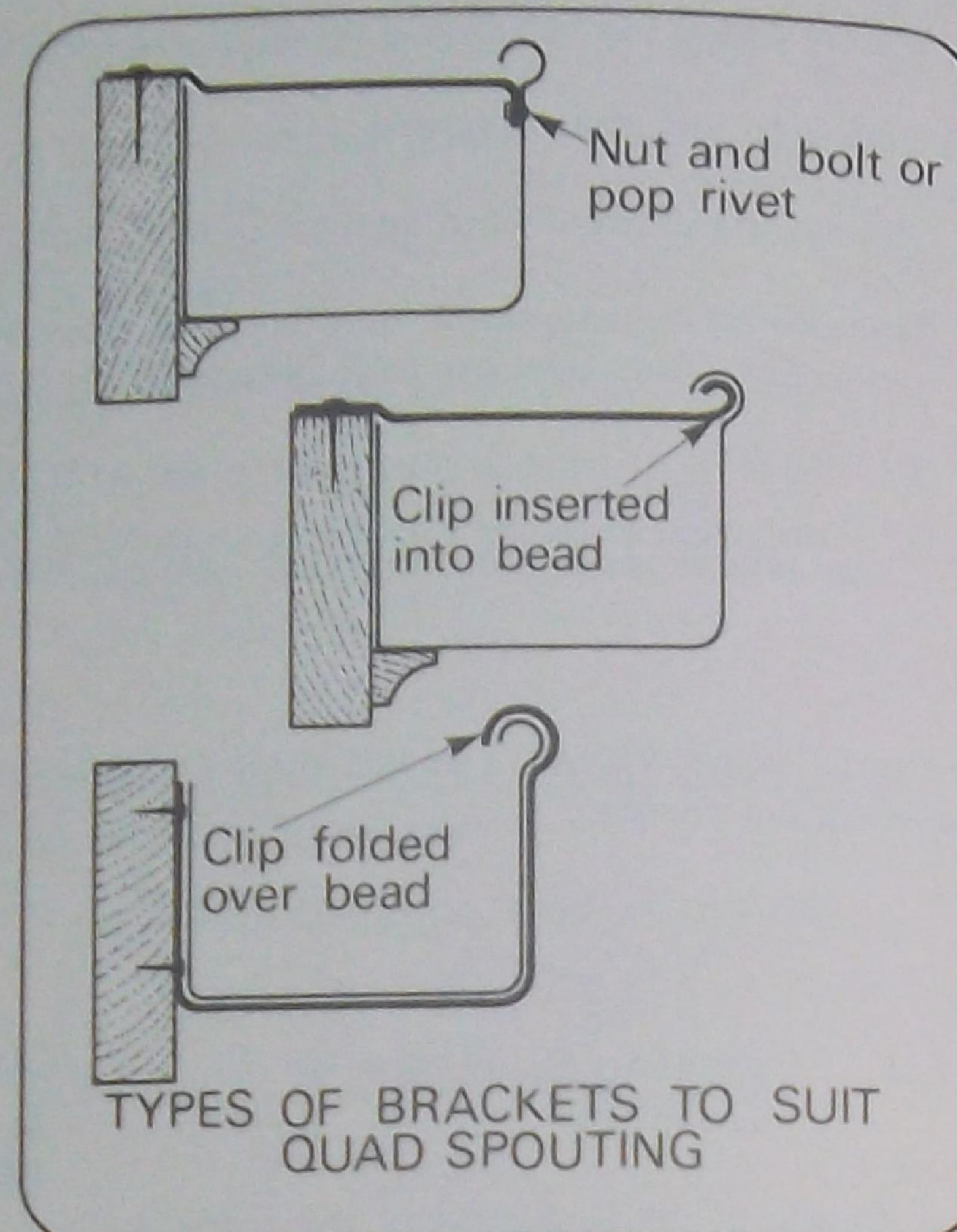
The joining procedure is very similar to that used for asbestos cement. The lengths are bolted together, but an epoxy resin two-part joining compound is used to make the joints watertight.

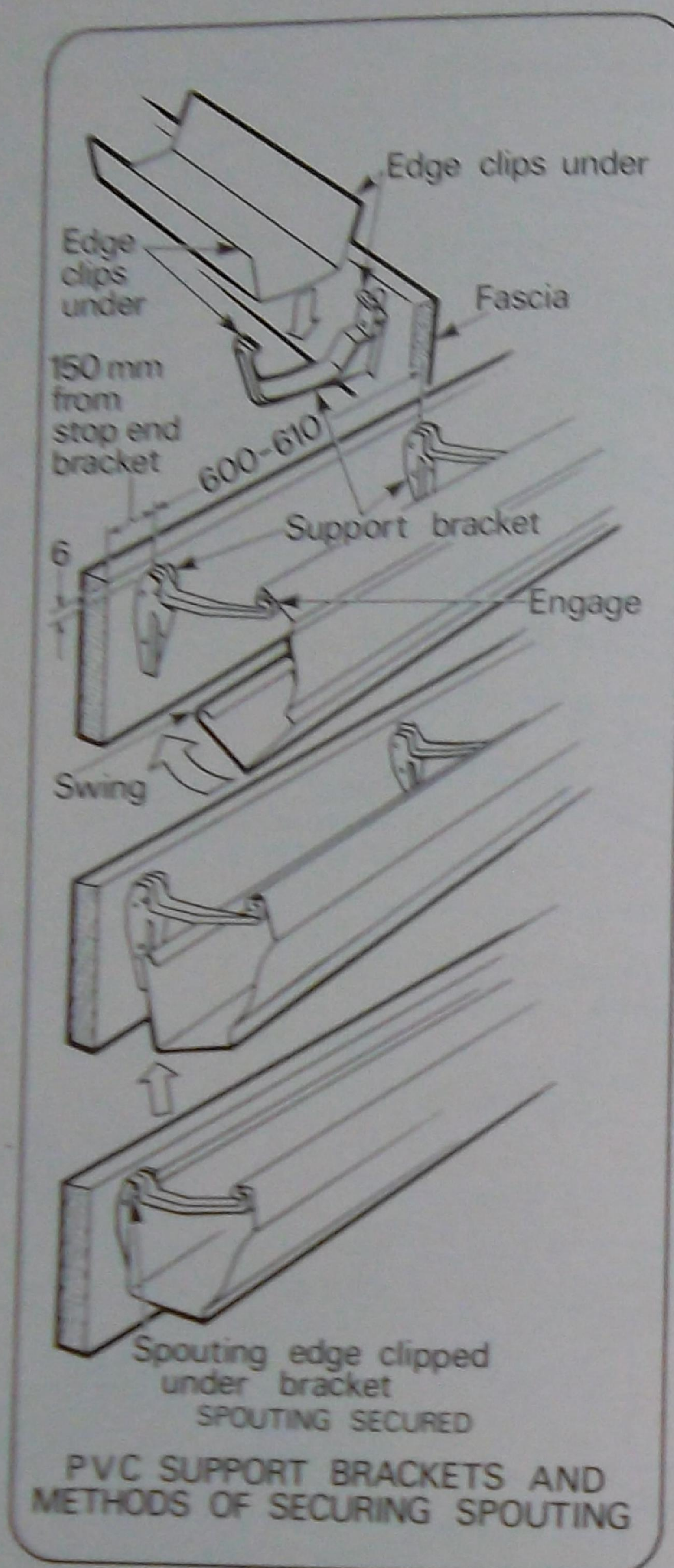
2.7 HOLDING SPOUTING IN POSITION

Spouting may be held in position by brackets screwed or nailed to the rafter ends or to the fascia. The brackets pass either under or over the spouting and are secured to its beading by clips or bolts. Other types of brackets support the spouting from the inside.

The illustrations show brackets to support various types of eaves gutters, such as:

- quad spouting in either galvanised steel, aluminium, copper or Zincalume;
- the Brownbuilt and Stramit makes of fascia gutter, e.g. Trimline, etc.;
- Nu-Line and Mini-Line fascia gutters;
- various types of PVC spouting brackets for the different profiles and makes of PVC spouting.

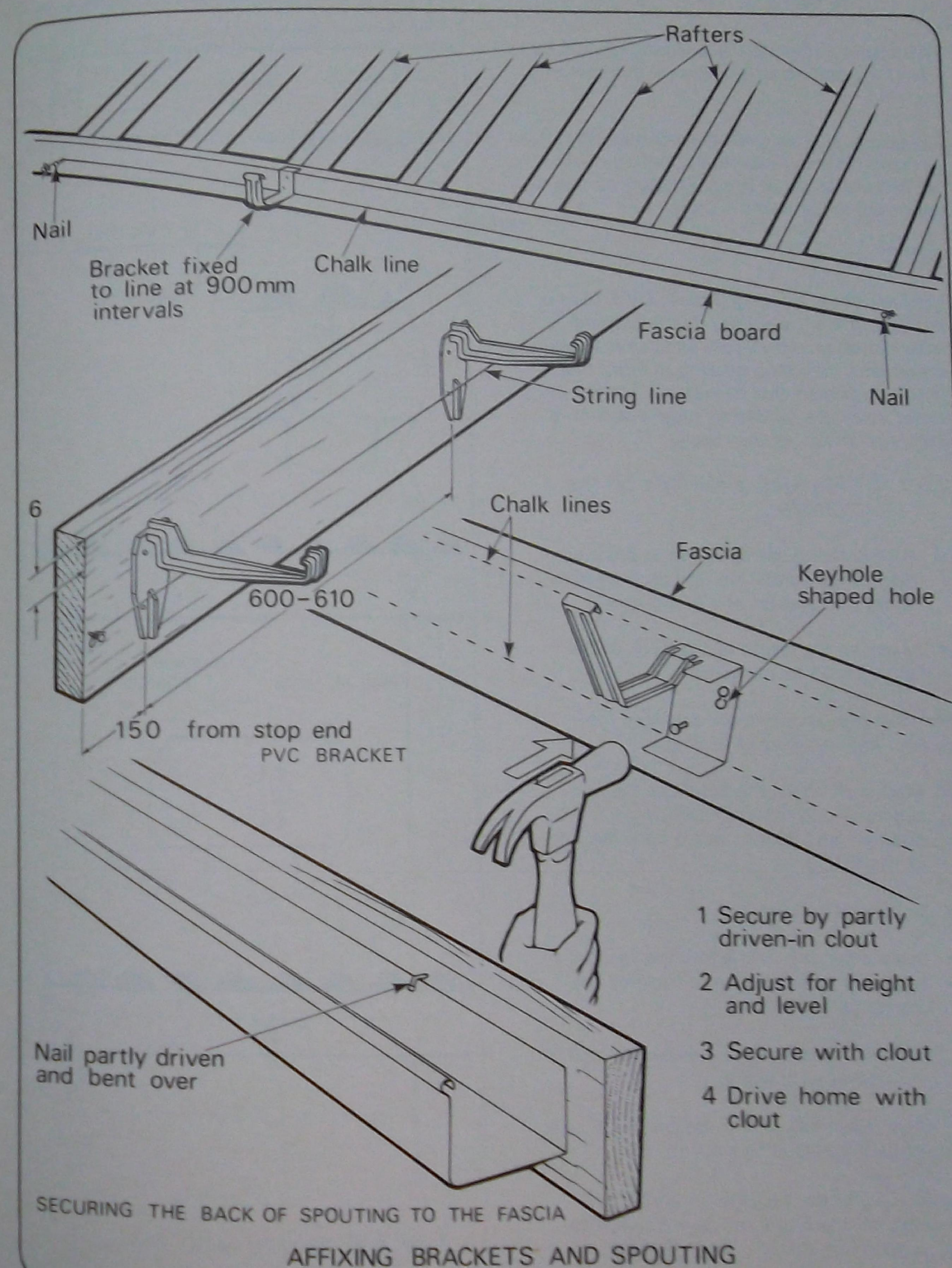




2.7.1 Spacing of brackets and straps

The usual spacing for brackets and straps is 900 mm for galvanised steel sheet, copper, Zincalume, asbestos cement, cast iron and aluminium spouting. Some local regulations or manufacturer's specifications, on the other hand, may lay down different dimensions. These must be adhered to.

The brackets for PVC spouting are usually spaced at approximately 600 mm centres or in accordance with the manufacturer's specifications, as the case may be.



2.8 FIXING SPOUTING IN POSITION

Whenever possible, the spouting should be fixed in position before the roofing material is laid.

To ensure the water collected in the spouting drains away, the spouting should be set with a fall of approximately 12 mm in 3000 mm towards the outlet.

NOTE:

This is only a 'working' figure. On a 12 m or more length of spouting, this fall would result in an unsightly job. The fall is usually much less than this, bearing in mind that it is the downpipe that carries the volume of water away. Be guided by local conditions and regulations as they apply.

2.8.1 Marking a fall line on the fascia

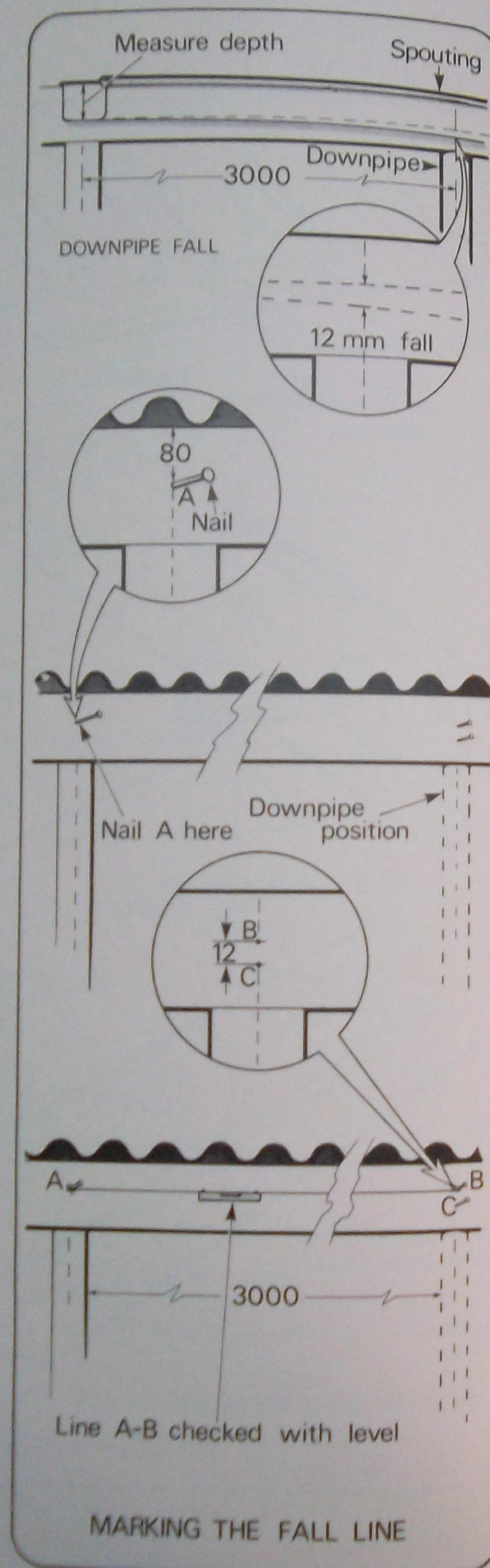
- Before fixing the spouting in position, mark an accurate fall line on the fascia, usually by means of a string line.
- Measure the depth of the back of the spouting to be installed.

For example, suppose the depth of the back of the spouting is 80 mm.

- Mark a point on the fascia at the opposite end from the downpipe position and 80 mm down from the top of the fascia.
- Drive in a nail (Nail A).
- Drive a second nail B into the fascia, 3000 mm from nail A and towards the downpipe position.
- Use a line level to ensure that nail B is level with nail A.
- Mark a point C, 12 mm below nail B and relocate nail B at this point.

The line AC is the fall line on which the spouting will be fixed and give a fall of 12 mm in 3000 mm (equals a 1 in 250 fall).

- Attach a chalked line to A and move to the outlet end of the fascia.



- Stretch the line taut, and sighting along it, rest it on C, keeping the line straight.
- Mark the position of the end of the string and nail in another nail at that point, then fasten the chalk line to it making sure it is taut.
- Remove nail C, then 'snap' the line to produce the fall line for the whole spouting.

NOTE:

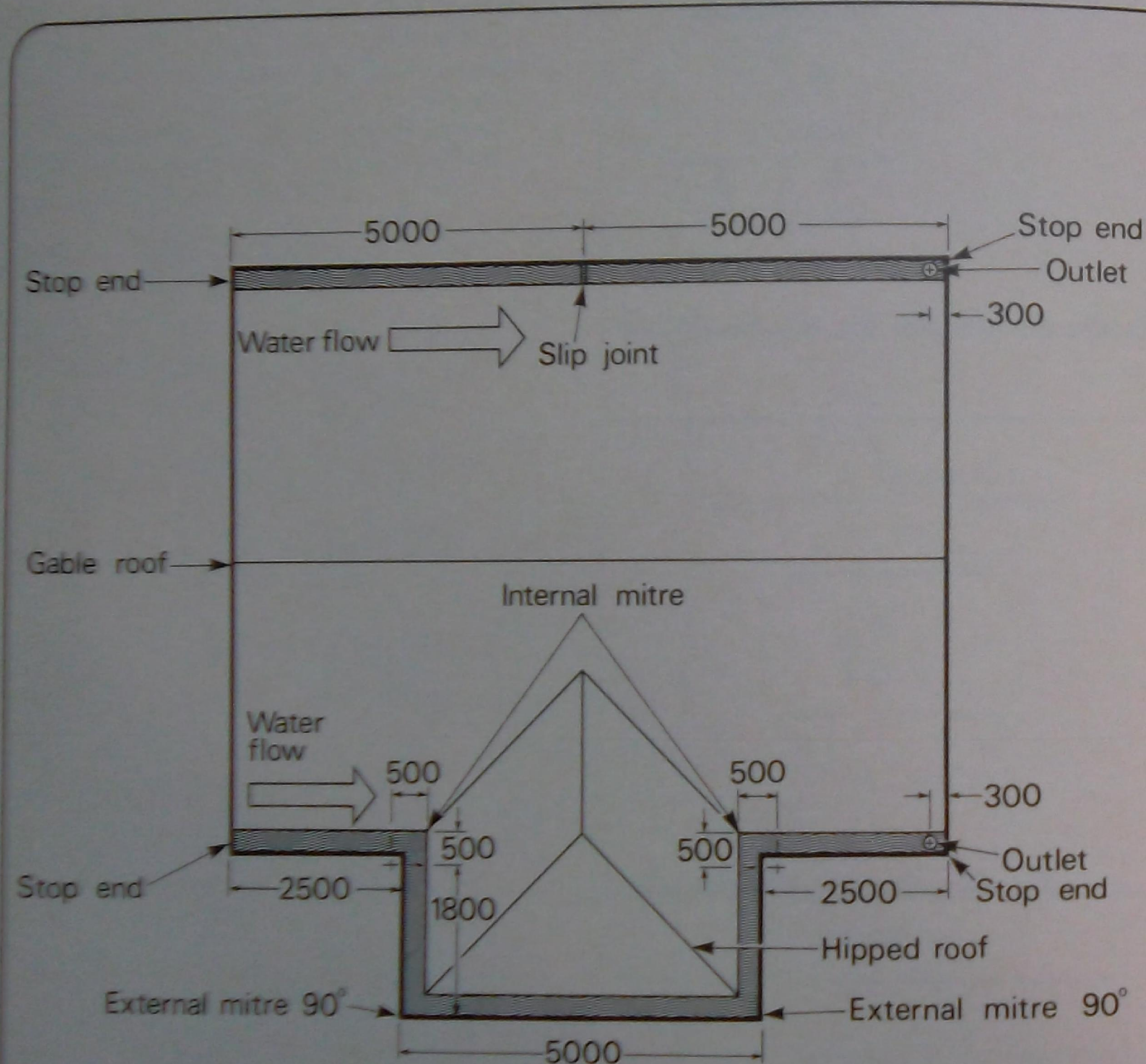
When using asbestos cement spouting the fall may be 1 in 480 (AS CA44-1969).

NOTES

2.8.2 Fixing eaves gutters around a building roof

To fix eaves gutters:

- Mark the fall line, as described, on the fascia all around the building where spouting is required.
- Measure around the building and mark, on a simple sketched plan, the lengths of spouting required, the types and angles of the mitres and the position of downpipe outlets.
- Make up the lengths of spouting, the angles and the outlets.
- Fix the necessary brackets at 900 mm intervals along the fall line (string line) on the fascia.



MARKING A PLAN OF SPOUTING, MITRES AND OUTLETS FOR A COMPOSITE ROOF

NOTE:

Check the intervals required for PVC brackets.

- Place the lengths of spouting, fitted with angles and downpipe pops, into the brackets.
- Check the position of the outlets to make sure they line up with the location of the stormwater drains.
- Place the remaining lengths of spouting into the brackets.
- Secure the back of the spouting (where necessary) by nails driven into the fascia and turned down to form a clip.
 - This allows for expansion and contraction.
 - Do not drive the nails through the back of the spouting.

2.8.3 Slip joints

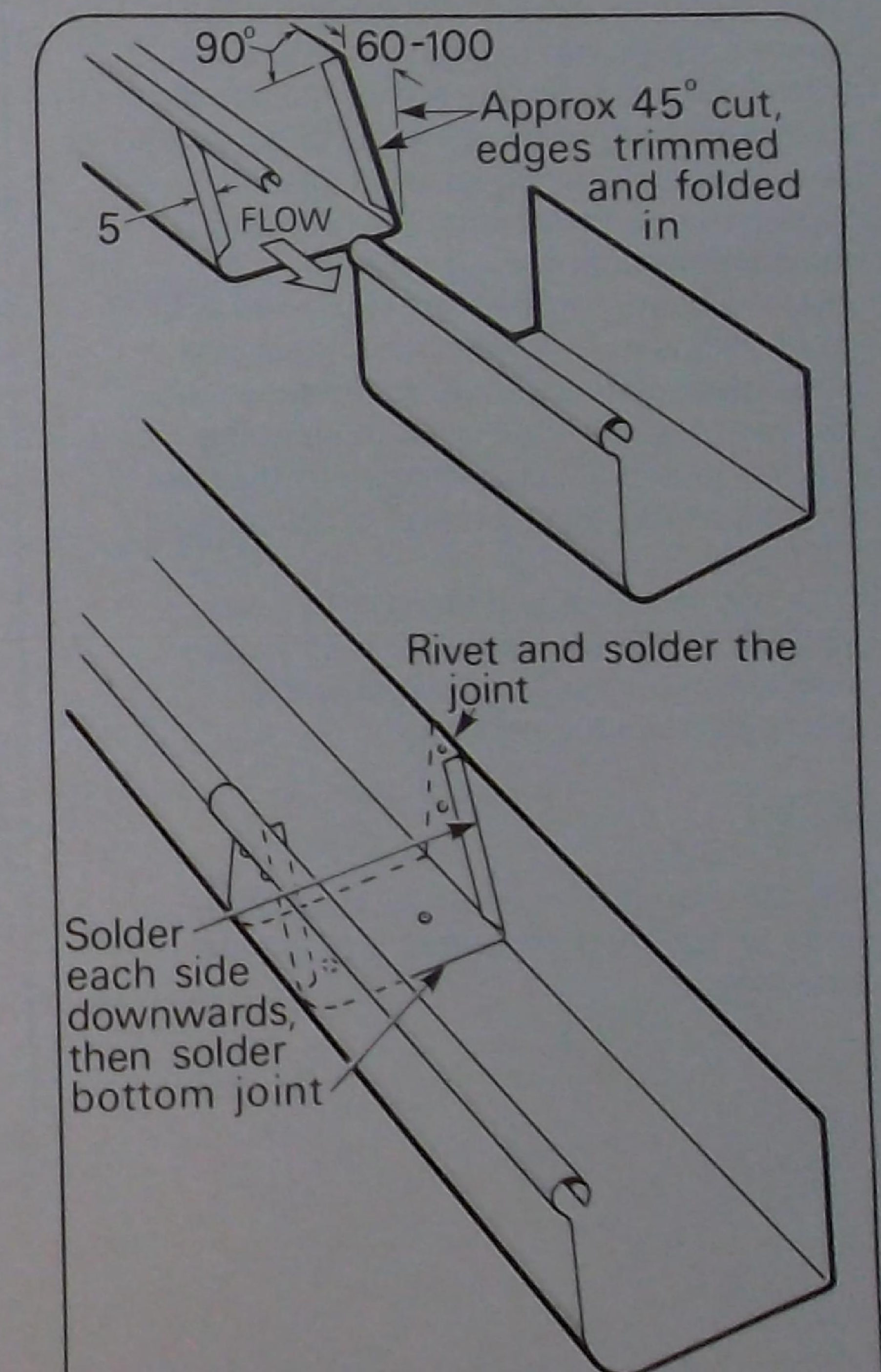
Slip joints are made between lengths of spouting after they have been positioned in place.

Slip joints are necessary when placing long runs of spouting which would be unmanageable if joined on the bench into one length.

2.8.4 Preparing a slip joint

To make a slip joint:

- Cut the lengths of spouting to be joined and allow for an overlap at the joint of approximately 60-100 mm.
- Cut the front and back of the inner length of spouting at an angle of approximately 45°.
- Fold a lap of about 5 mm on these cut edges in at 90° to make soldering easier.
- Join the back of the spouting with rivets, making sure to keep them near the top edge of the spouting.
- Likewise join the front with rivets just below the bead.
- Rivet the remainder of the bottom of the joint with a row of rivets.
- Solder the front and back angled laps, then sweat solder the inside of the joint across the bottom, making sure that all rivets are soldered.
- Wipe all excess flux with a wet rag.



MAKING A SLIP JOINT

Slip joint in unsolderable material

This joint is done in exactly the same way as a normal spouting joint. Refer to section 2.6.2.

2.8.5 Concealed eaves gutter

Eaves gutters are sometimes concealed behind the fascia. The gutter is laid in a recessed section of the rafter. The angles and the straight joints are completed in the same manner as described for the other types of eaves gutter. The differences are that a cover flashing, or capping, is fixed over the top edge of the fascia and over the top front edge of the eaves gutter, and also in a lot of cases, the downpipe is connected to the back of the gutter instead of to the bottom. This allows the graded section of downpipe to be hidden in the eaves.

2.9 EXPANSION JOINTS

Eaves gutter length should not exceed 20 m in length without provision for expansion joints. When exceeding 20 m in length, the spouting length should be broken with expansion joints, allowing not less than 25 mm on each side of such a joint for expansion. The whole joint should be flashed. However, for aluminium spouting, the maximum length should be reduced to 12 m because aluminium expands far more than steel.

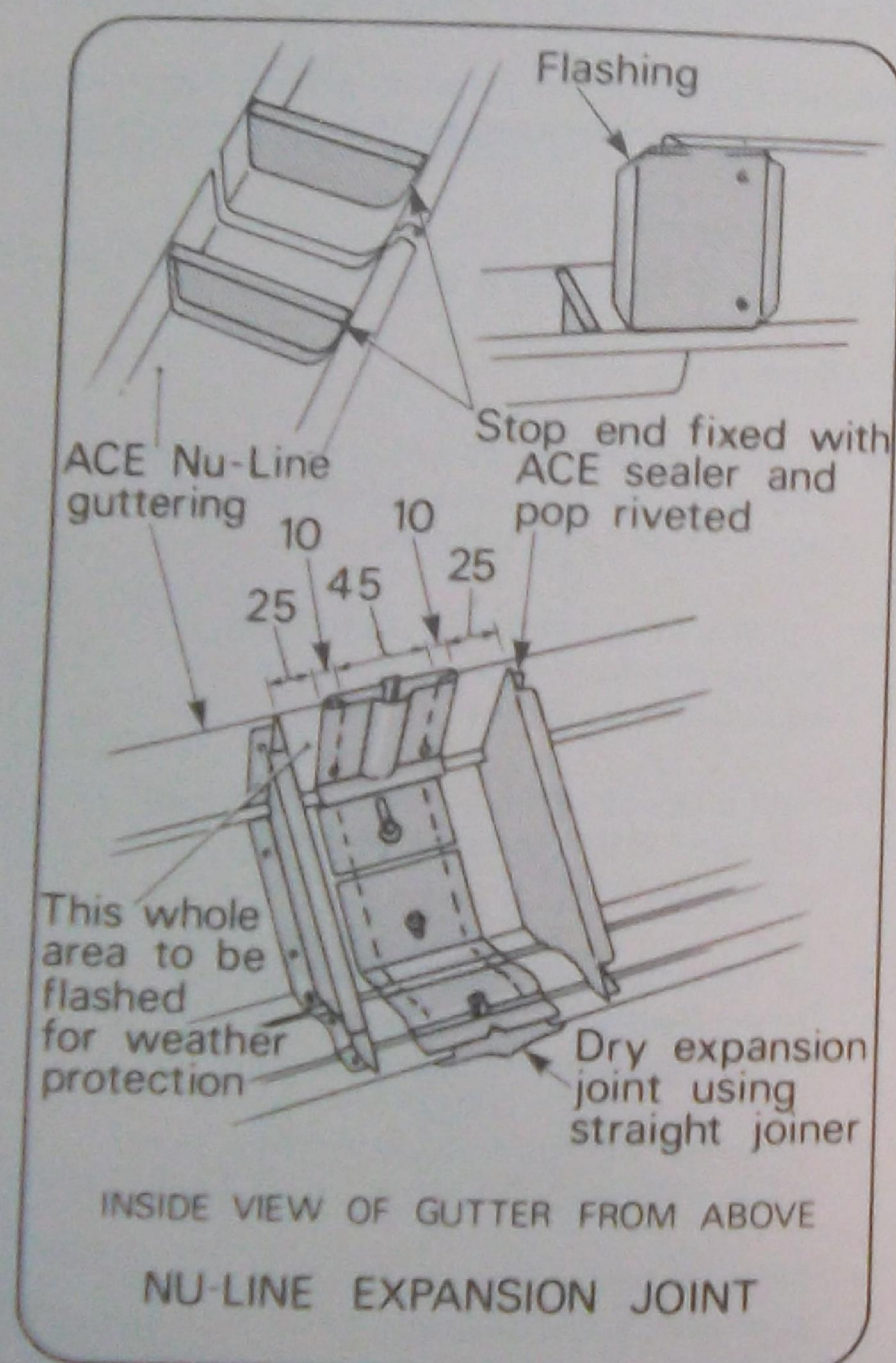
2.9.1 Expansion joint in quad spouting

Stop ends are placed in the ends of the spouting adjacent to each other at about 25 mm to 50 mm from the end of the spouting and sealed either by soldering or by means of a sealant. The two ends are placed together, one inside the other allowing movement either way. A cover plate is made, placed over the two stop ends and fixed to one only, to allow for movement. This cover plate prevents water collecting between the two stop ends. A spouting bracket is usually placed close to the joint to support the outer section of spouting.

With the spouting becoming effectively blocked by the stop ends, it is obviously necessary to provide an outlet and a downpipe for each section.

NOTE:

The same principles apply to most other types of spouting of various profiles and materials.



REVISION QUESTIONS

1. What is the function of an eaves gutter?
2. Name five materials used in the manufacture of eaves gutters.
3. Sketch five common types of eaves gutters in profile.
4. Describe the procedure for making a 90° external angle in an eaves gutter (galvanised quad spouting). Use sketches to illustrate.
5. Describe the procedure for making a 90° internal angle in Nu-Line eaves gutter (galvanised steel sheet).
6. An obtuse-angled mitre has an angle of bend of 35°. What is the included angle?
7. How is a return stop end made in a length of aluminium spouting (quad)?
8. Describe the procedure for making a spouting outlet in galvanised quad spouting.
9. Describe the procedure for joining two lengths of:
 - (a) galvanised steel sheet spouting
 - (b) aluminium spouting
 - (c) Mini-Line spouting
 - (d) asbestos cement eaves gutter
10. Briefly describe three ways of fixing spouting.
11. At what intervals should supports for spouting be spaced for:
 - (a) Metal spouting?
 - (b) PVC spouting?
12. Describe the procedure for fixing eaves gutter around a roof.
13. What is a slip joint and where is it installed?

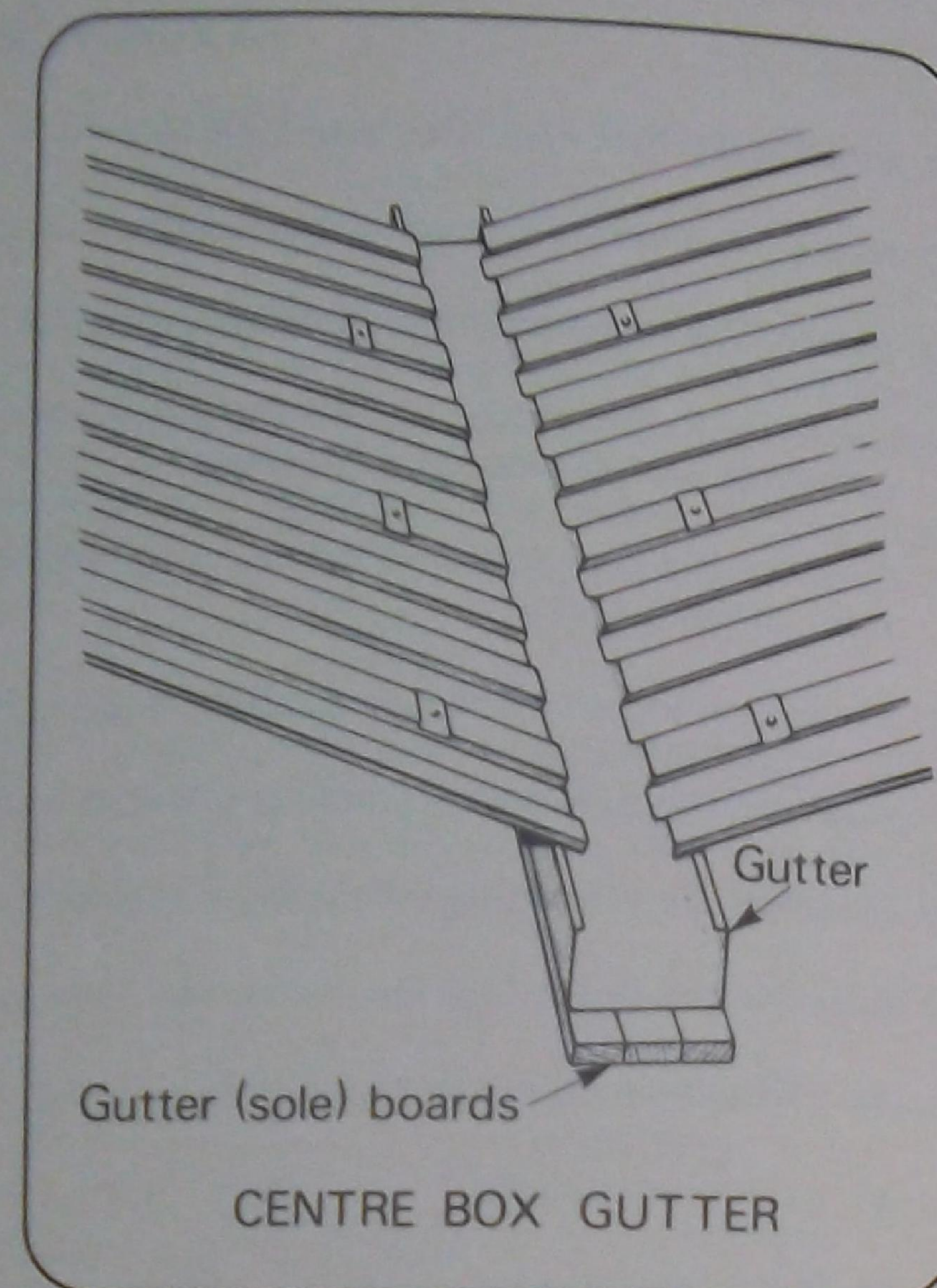
3 ROOF GUTTERS

Roof gutters are channels which collect and carry away water from roofs.

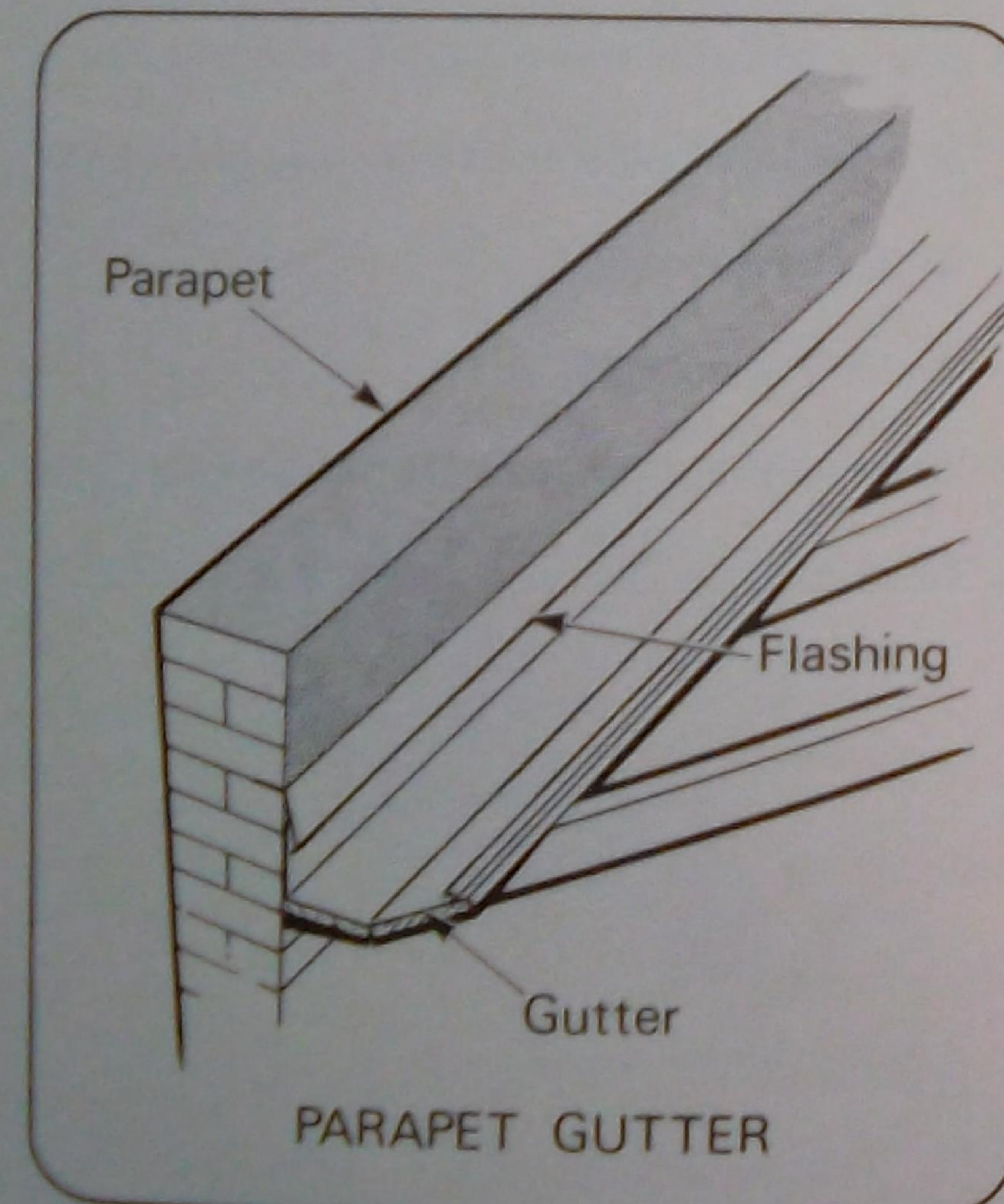
3.1 TYPES OF ROOF GUTTERS

There are four basic types of roof gutters.

- Centre gutters.
 - Either in square or half-round section. They are installed at the base of two roof areas which discharge along a common line.



- Parapet gutters.
 - Either box parapet or tapering parapet. They are placed at the base of a roof which abuts a wall.

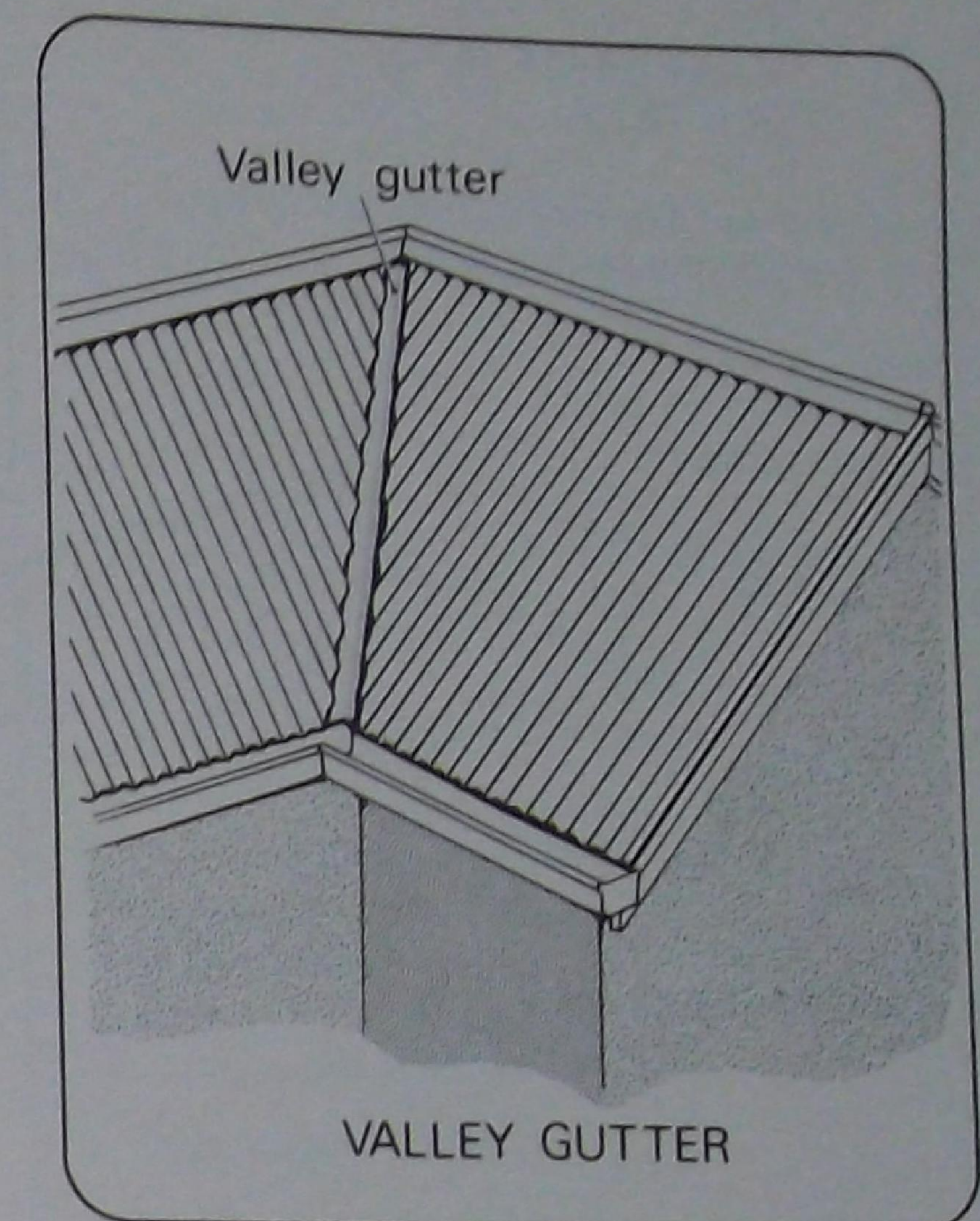


- Valley gutters.

— These are V-shaped and are located at the intersection of two sloping roofs in what is known as 'the valley'.

- Chimney gutters.

— These also can be V-shaped or flat bottomed with a lear. They are installed at the rear of chimneys or of large ducts that pass through the roof (see page 44).



NOTES

3.2 SHAPES OF ROOF GUTTERS

Various shapes of roof gutters are used in roof plumbing. See illustration.

They are:

- the box gutter

- the tapering gutter

- the half-round gutter

- the V-shaped gutter

3.2.1 Box gutters

Box gutters have the same base width throughout their length. The shallower end, which is the one away from the outlet, must be not less than 75 mm deep. It is best to make them with the bottom approximately 25 mm narrower than the space provided (or than the gutter board) to allow freedom of movement. These gutters can be purchased in continuous lengths to suit the job and transport facilities available. This eliminates end laps which can become trouble spots through corrosion.

