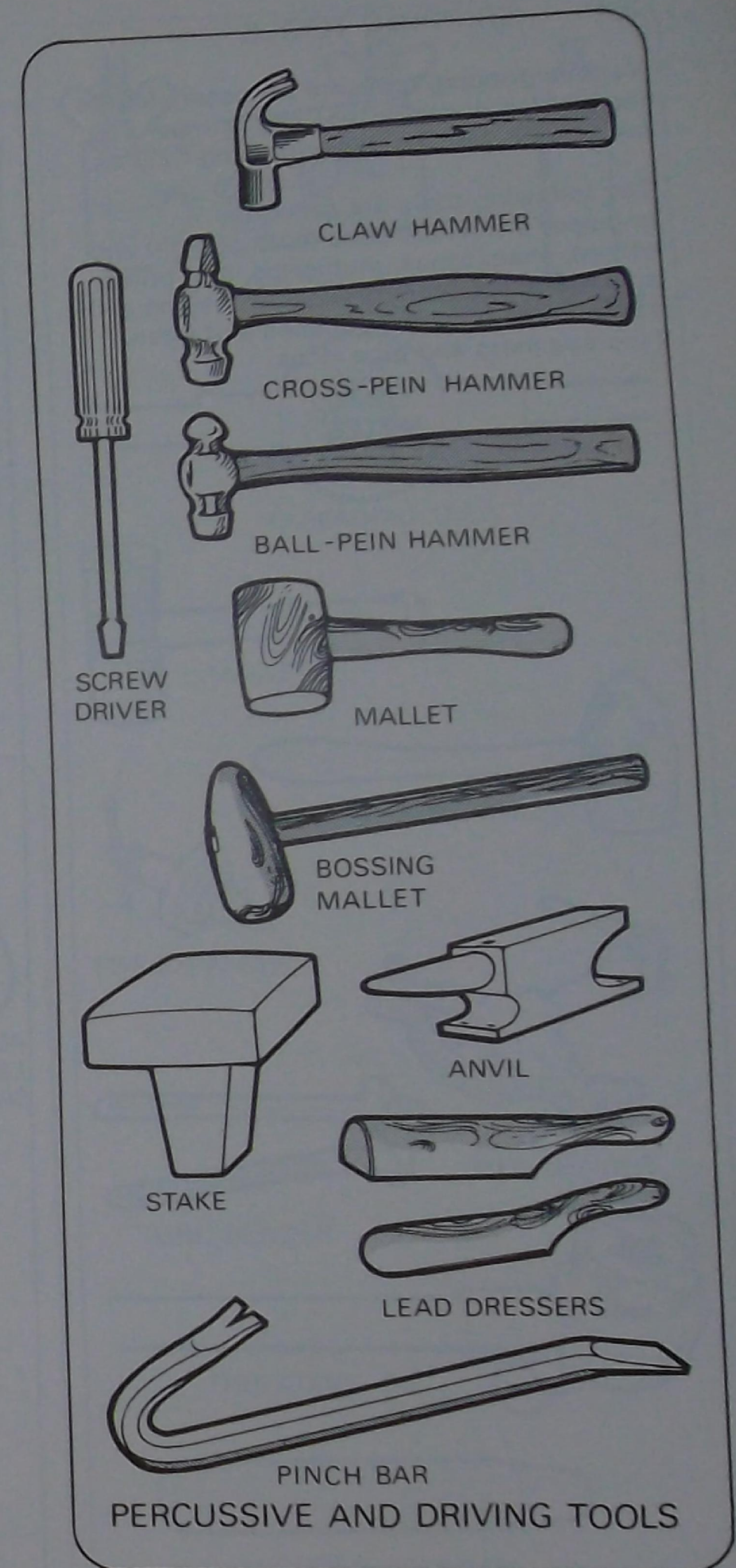


3.3 PERCUSSIVE AND DRIVING TOOLS

These tools are primarily used to drive nails and screws, form materials and to secure fixtures and fittings.

The following tools are required: screwdrivers, hammers of all descriptions, mallets, lead dressers, metal working stakes, anvils and jemmy bar (pinch bar).

NOTES

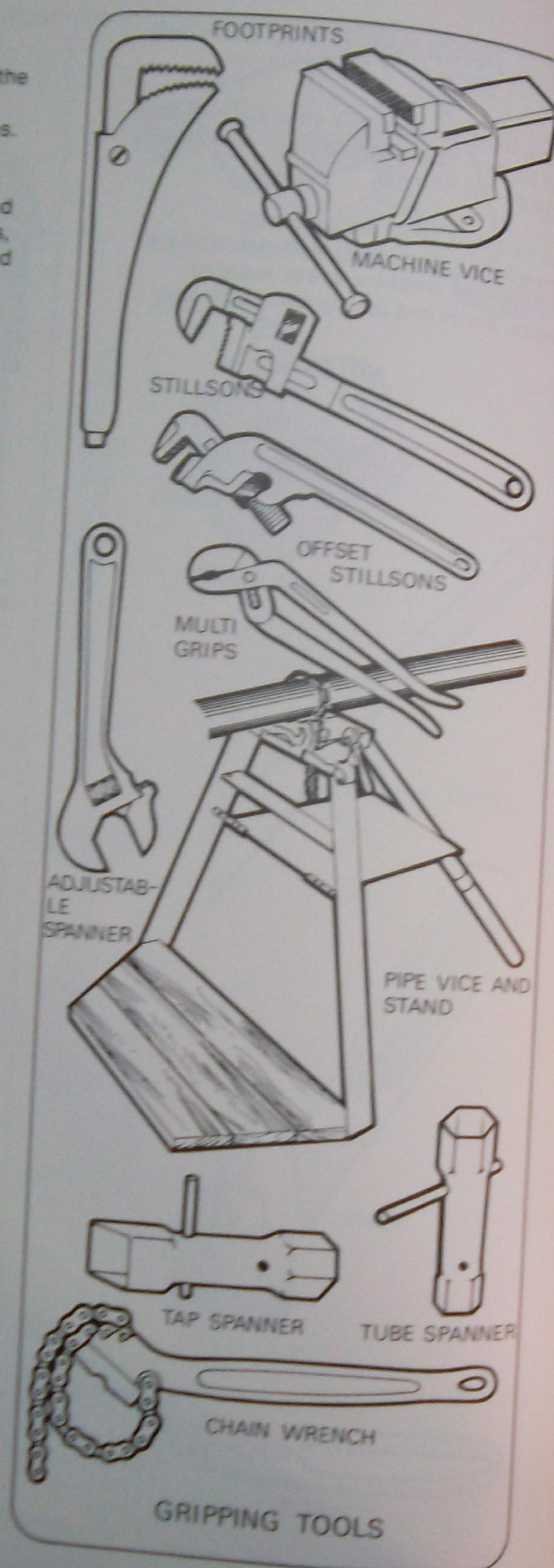


3.4 GRIPPING TOOLS

Various gripping tools are necessary for the installation of pipes, taps and fittings associated with sanitary plumbing fixtures.

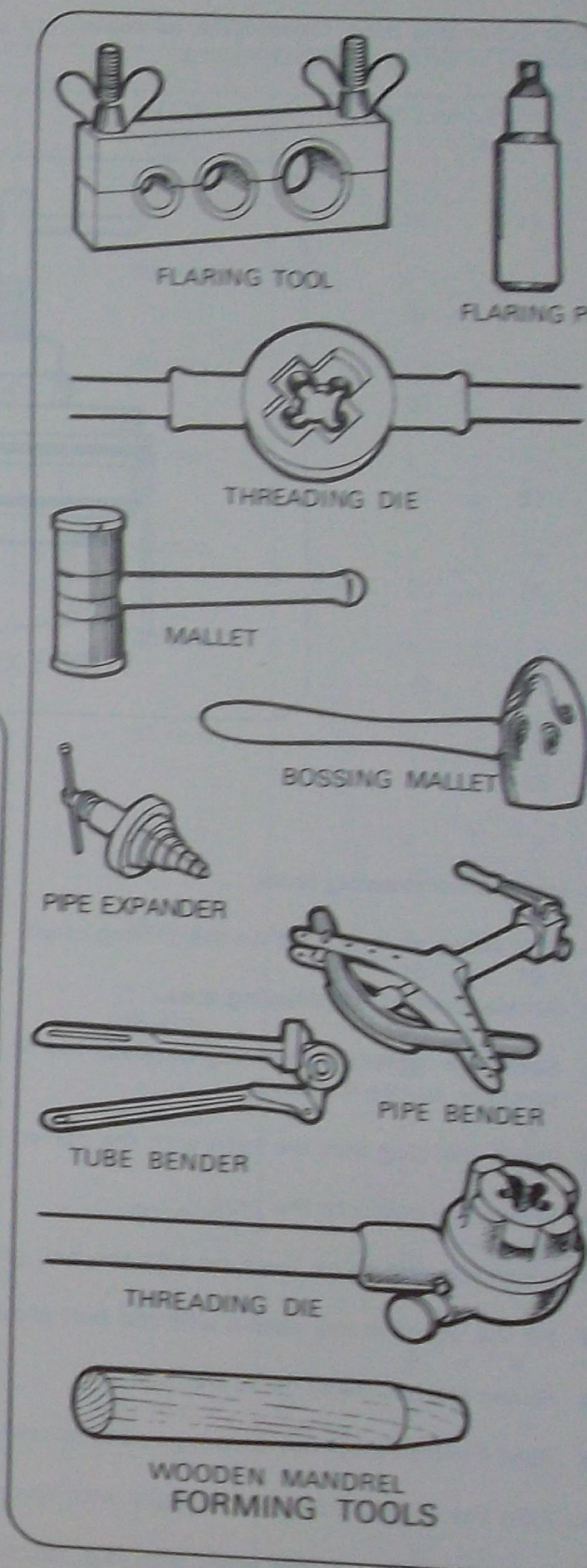
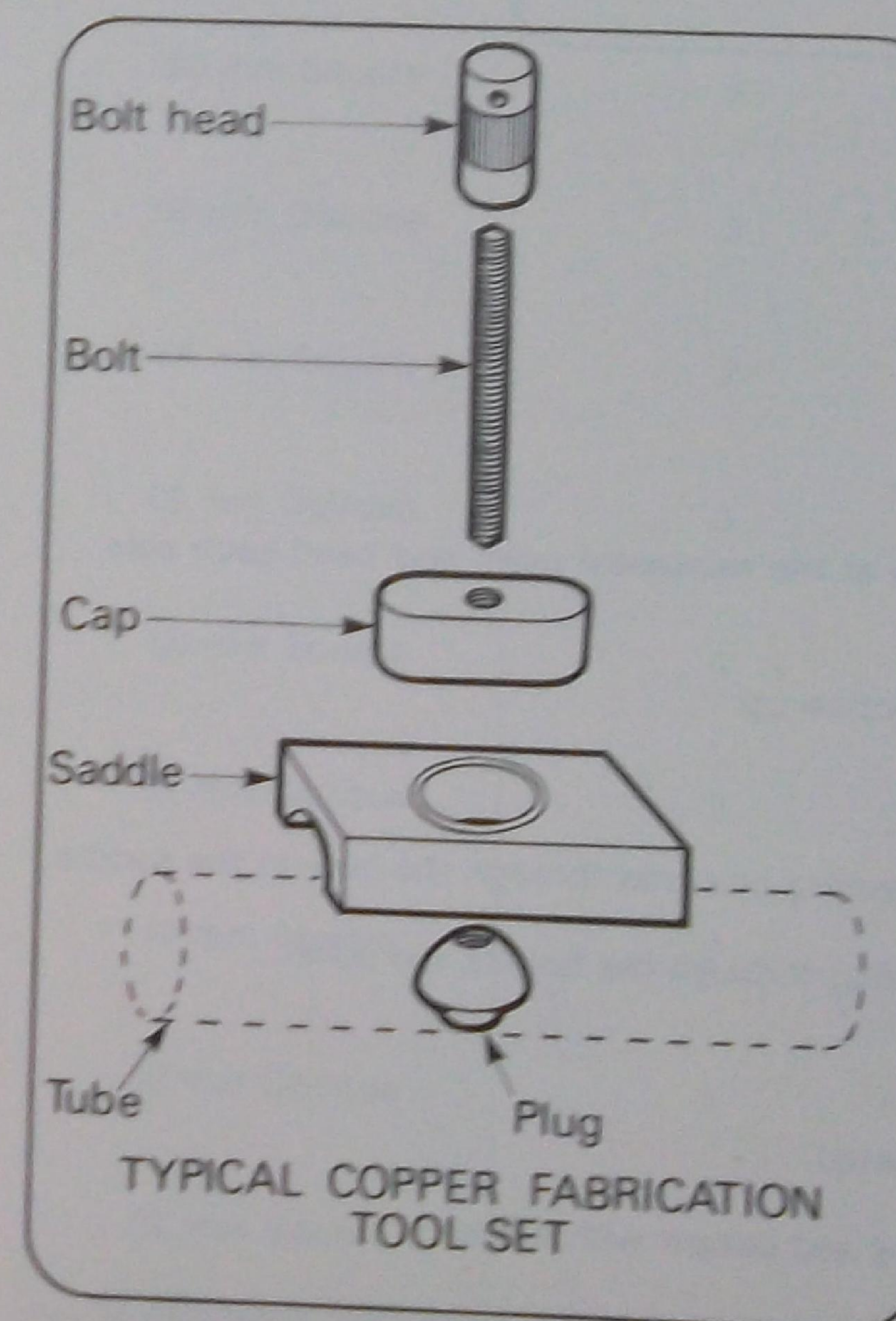
The following tools are essential: engineer's vice, stillsons (both straight and offset), chain tongs, multigrips, foot prints, adjustable spanners of various designs and sizes, pliers of various shapes and sizes, tube spanners and pipe vices.

NOTES

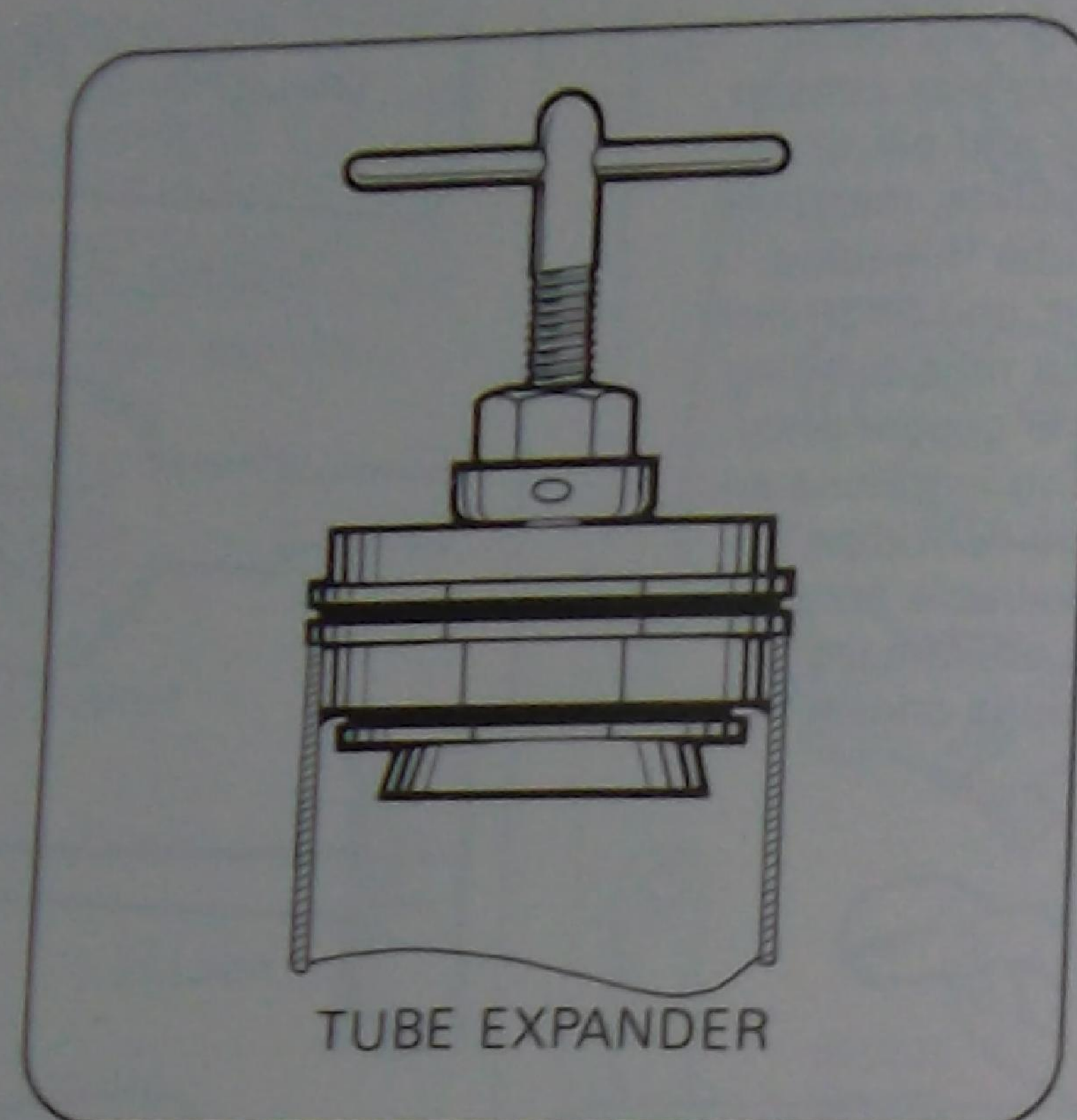


3.5 FORMING TOOLS

The sanitary plumber will require special tools to flare copper tube, to form sheet metal and zinc sheet plus Zincolume, aluminium, stainless steel and to bend pipes and tubes. These tools may consist of a tube-flaring tool (block and pin or an easy-flare tool), bossing mallets, mandrels, rubber mallets, pipe and tube threading dies (ratchet dies 12-25 mm and 25-50 mm) and machines and pipe and tube bending machines. Also, copper and copper alloy fabrication tools for forming junctions and branches in waste, soil and vent pipe installations. These are available for square (90°, 88½°, 85°, etc.) and oblique (45°) branches in the combinations shown in the drilling chart further on.



Tube expanders (steel collet type), as shown, are used to form sockets for straight joints. They are available in single or multiple units.



To use branch drawing tools:

- Drill holes as indicated on the drilling chart.
- Anneal around the drawing area.
- Sever the material remaining between the holes at the narrowest point and bend each side upwards before trimming.
- Insert the plug into the tube with the curved section up.
- Screw the bolt into the plug.
- Place the saddle on the tube with the bolt projecting upwards through the hole in the saddle.
- Fit the cover to the saddle with the bolt projecting through the hole in the cover.
- Screw the bolt-head on to the bolt.
- Turn the bolt until the drawing action is completed.
- Trim the ragged edges of the joint with tinsnips and deburr with a file.
- For a square branch of equal size (e.g. 100 mm x 100 mm), insert a collet-type expander to remove the flats.
- For an oblique branch, re-anneal the opening and with a drift pin, taft back the copper tube to suit the angle required.

DRILLING CHART

Interim table only

JOINT REQUIRED (TYPE OF BRANCH)	NUMBER OF HOLES	HOLE SIZE	DRILLING POINTS mm
150 mm Square	2	50 mm	x 1 x 16 c 16
150 mm Oblique	3	50 mm	x 1 x 82 c 82
125 mm Square	2	45 mm	x 1 x 33 c 33
125 mm Oblique	3	45 mm	x 1 x 67 c 67
100 mm Square	2	40 mm	x 1 x 25 c 25
100 mm Oblique	3	40 mm	x 1 x 48 c 48
80 mm Square	2	32 mm	x 1 x 16 c 16
80 mm Oblique	3	32 mm	x 1 x 35 c 35
65 mm Square	2	25 mm	x 1 x 16 c 16
65 mm Oblique	3	25 mm	x 1 x 28 c 28
50 mm Square	2	19 mm	x 1 x 11 c 11
50 mm Oblique	3	19 mm	x 1 x 22 c 22
40 mm Square	2	13 mm	x 1 x 9 c 9
40 mm Oblique	3	13 mm	x 1 x 17 c 17
32 mm Square	2	11 mm	x 1 x 7 c 7

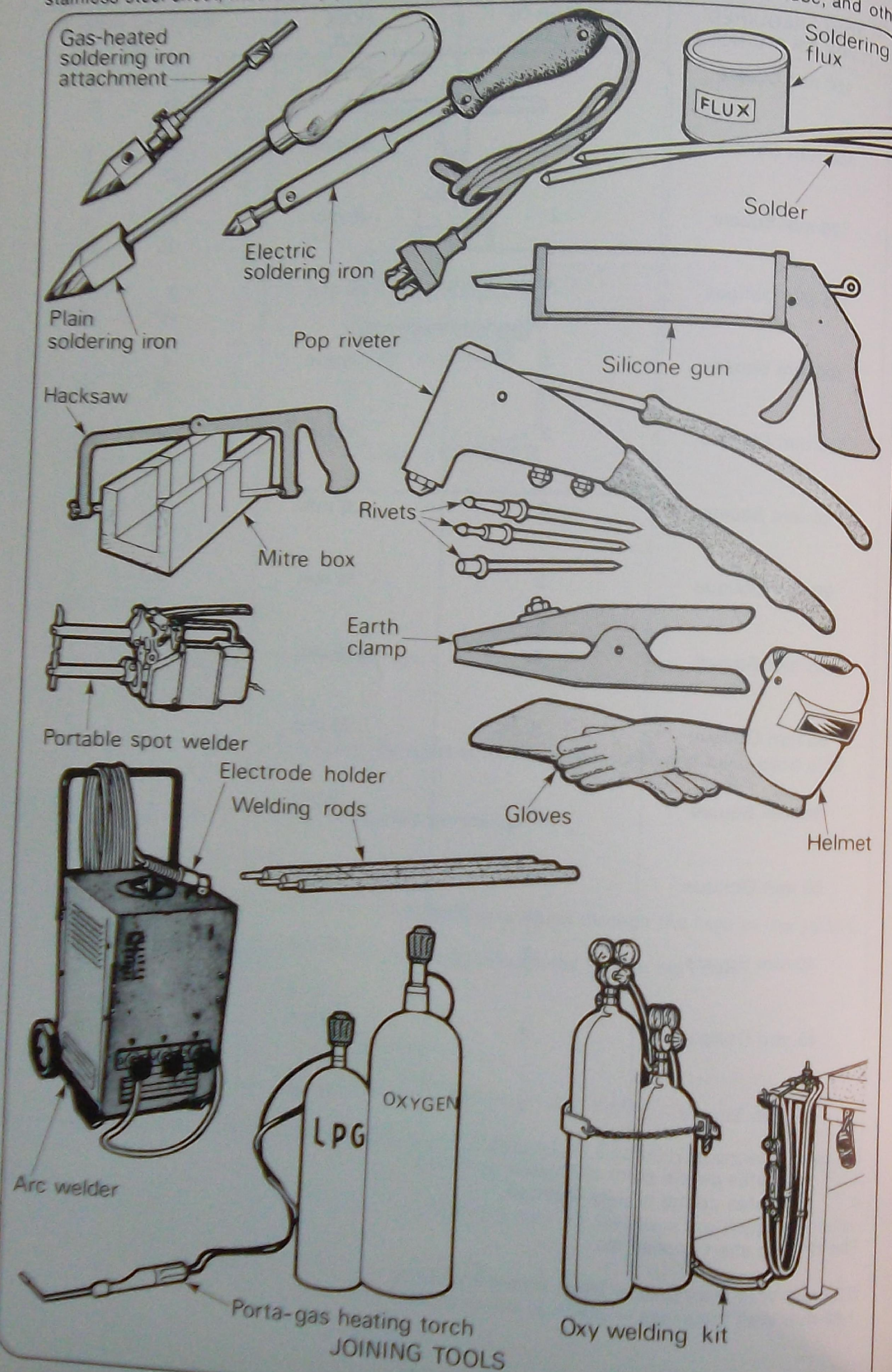
x Indicates centre point of holes to be drilled.
c Indicates centre of joint required.

The drilling chart applies to:

2.03 mm Wall thickness — joints 80 mm and above.
1.63 mm Wall thickness — joints 32 mm to 65 mm.

3.6 JOINING TOOLS

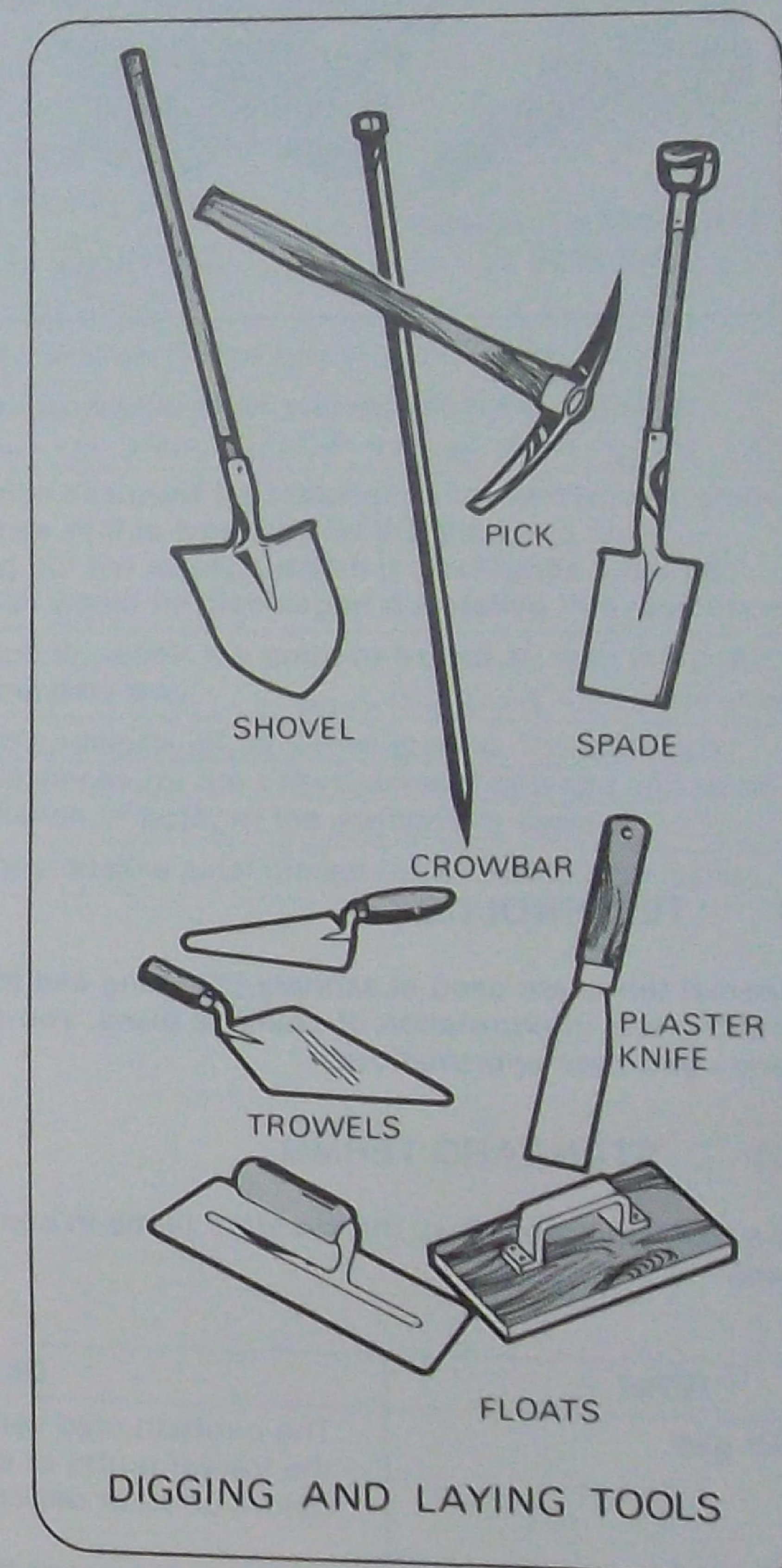
For joining materials such as galvanised sheet steel, Zincalume sheet, copper, aluminium, stainless steel sheet, mild steel pipe, plate and angle, UPVC pipe, brass and copper tube, and others.

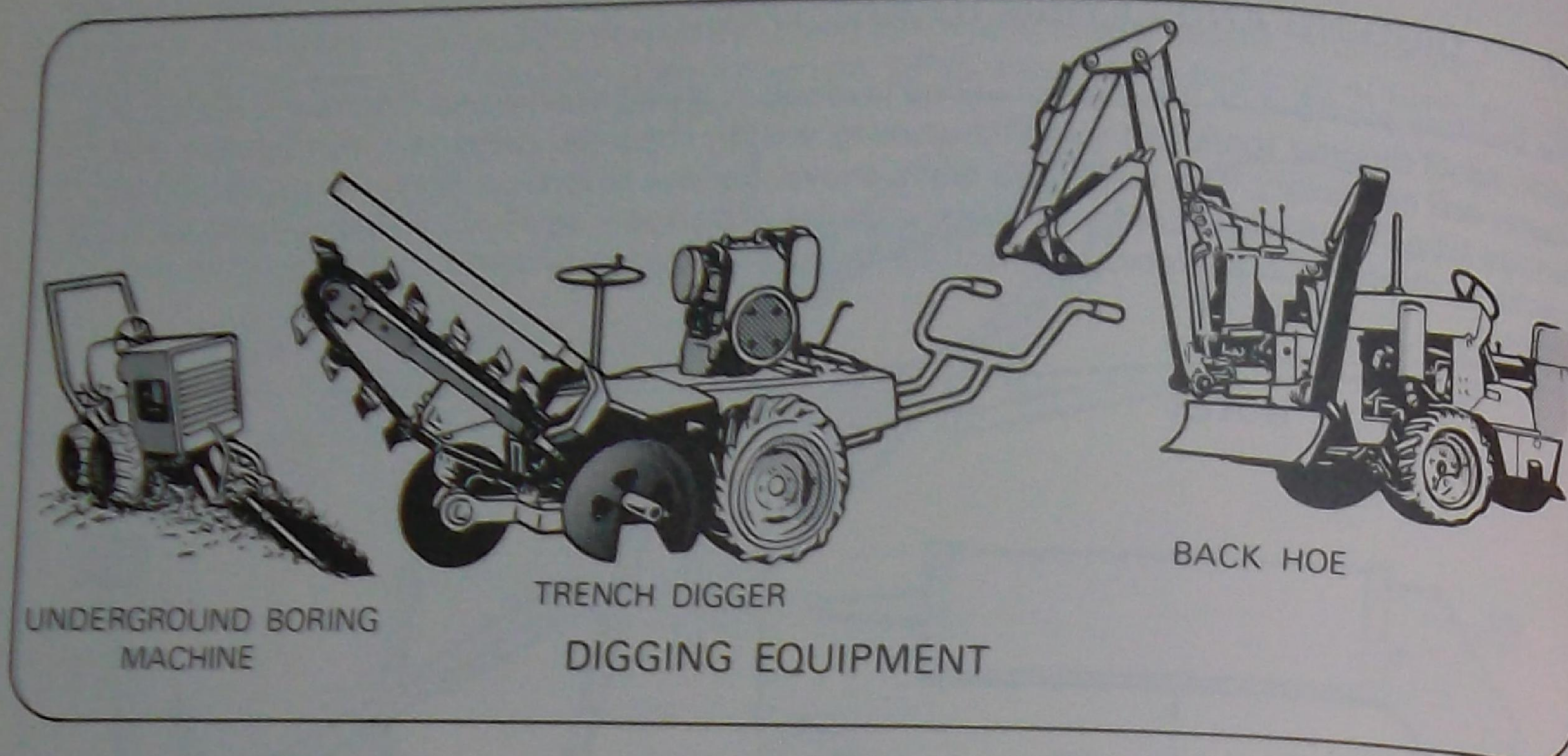


3.7 DIGGING AND LAYING TOOLS

The sanitary plumber or the drainer will be involved in laying sewers and stormwater drains. A basic kit of digging tools and tools for working mortar, concrete, epoxy jointing materials and plaster are necessary. The essentials are: a shovel (various shapes), a spade, a crowbar, a pick, various types of trowels, concrete floats, spatulas and plaster small tools, underground boring machine, ditch-witch or trenching machine for special applications and larger jobs. (See next page).

NOTES





4 TERMINOLOGY

Special terms are used in sanitary plumbing and their use has been standardised to simplify the drafting and interpretation of drainage plans. You should acquire a clear understanding of these terms and their abbreviations.

4.1 STANDARD TERMS

The following table lists the standard terms in common use and gives a brief definition of each term.

TERM	DEFINITION
Air gap	The unobstructed vertical distance through free atmosphere between the lowest outlet of a pipe or fitting, discharging fluid to a tank, fixture or other device, and: <ol style="list-style-type: none"> the spill level of the receptacle for those with piped overflows; or the overflow level of the receptacle for those without piped overflows.
Approved	Means approved by the appropriate authority.
Authority	The authority which is empowered by statute to exercise jurisdiction over the installation of plumbing and drainage works.
Boundary trap	A trap used to prevent the passage of gases from the sewer to the drain.

TERM	DEFINITION
Branch drain	Any branch off a main property connection drain.
Branch pipe	A discharge pipe to which two or more fixture traps are connected at any one floor level.
Branch vent	A graded vent at any one floor level interconnecting two (2) or more individual trap vents or group vents.
Combined drain (Property connection drain)	A drain used to collect and convey sewage or trade wastes from more than one property.
Commercial type	Means other than domestic type.
Cross vent	A vent interconnecting a stack and its relief vent.
Diameter	The nominal diameter of the bore of a pipe. A straight-line measurement passing through the centre of a circle from one edge of the circle to its opposite edge.
Discharge pipe	Any pipe for the conveyance of sewage or trade waste.
Disconnecter gully	A trap used to ventilate waste pipes and isolate them from the drain. <i>waste pipe ventilator & 1 drain & 2 trap</i>
Domestic type	A fixture or appliance designed for installation in residential homes. A fixture or appliance of this type may be installed in a non-residential building but the sewage which it discharges must be similar to that which would be discharged if installed in a residence.
Downstream vent	An opening in a pipe to permit the entry or exit of air into the drain and used with a boundary trap. <i>drain is 19 cm of 63 cm pipe opening</i>
Drain	A line of pipes, laid underground, or above ground, including all fittings and appurtenances for the conveyance of sewage and trade waste, or a combination of both, to the Authority's sewer.
Expansion joint	A joint which permits relative axial movement of the jointed parts.

*sewerage up to
Authority sewer h.
100-200 mm
pipe / 662/160 mm gully*

TERM	DEFINITION
Fitting	Any component used or intended to be used in a sanitary plumbing installation other than a fixture or a pipe.
Fixture	A device, the use or operation of which results in a discharge into the sanitary plumbing installation.
Fixture discharge pipe	The discharge pipe to which the single fixture trap is connected.
Fixture unit	A unit of measure based on the rate of discharge, time of operation and frequency of use of a fixture that expresses the hydraulic load imposed by that fixture on the sanitary plumbing installation.
Fixture unit rating	The system loading value in fixture units assigned to a fixture.
Flash	To cover the joint between two surfaces with a strip or sleeve of impervious material. (strips/sleeve to join surfaces of different materials)
Flashing	Means the approved impervious material used to flash a joint.
Flat	Means a portion of a building as a separate dwelling.
Floorwaste	Grated inlet within a graded floor intended to drain the floor.
Floorwaste gully (Pallazi trap)	A waste fitting assembly, incorporating a water-seal, installed to admit to the sewerage system waste water spillage on floors and the discharge of certain waste fixtures. (water seal from waste fitting assembly waste fixture discharge)
Fully vented system	A system of plumbing with provision for the separate ventilation of every fixture trap connected other than to a floorwaste gully and of the trap of every floorwaste gully. (floorwaste gully not fixture trap separate ventilation system)
Fully vented system (Modified)	A system of plumbing differing from a fully vented system in that the traps of any group of two or more fixtures, or floorwaste gullies, discharging to the same branch pipe, are vented in common by one or more group vents connected to such a pipe.

TERM	DEFINITION
Grade	The angle of inclination expressed as the ratio of unit rise to horizontal distance.
Graded pipe	A pipe installed on a flatter grade than 1:1, but not horizontal.
Ground	The surface of the earth, soil or rock which conforms to the established finished grade at a special location after all excavations have been thoroughly back-filled or otherwise closed and after all surface treatment at said location has been completed.
Ground vent	A drainage vent terminating close to ground level.
Group vent	A vent connected to a branch to which discharge pipes of fixtures, not provided with a trap vent, are connected. (discharge pipe fixture group vent)
Header vent	A vent interconnecting the tops of two or more relief vents or stack vents.
Hot discharge	A discharge at a temperature of 50°C or more.
Indirectly connected	Means the fixture, or group of fixtures, discharging through a tundish or gully.
Inspection opening	An access opening in a pipe or fitting sealed with a removable plug or cover, used as an access for purposes of inspection or maintenance and testing where so provided in drains.
Invert	The lowest point of the internal surface of a pipe or channel at any cross-section. (Invert)
Long bend	A pipe bend greater than 45°, having a centre line radius of curvature equal to or greater than 1.5 times its internal diameter. For the purpose of this book, a 45° bend, or less, with a lesser radius of curvature is considered equivalent to a long bend. (R > 1.5 x internal diameter)
Nominal size	The size of pipes and fittings in accordance with the relevant Australian standard.
Offset	The pipe and fittings used to provide continuity between pipes whose axes are parallel but not in line.

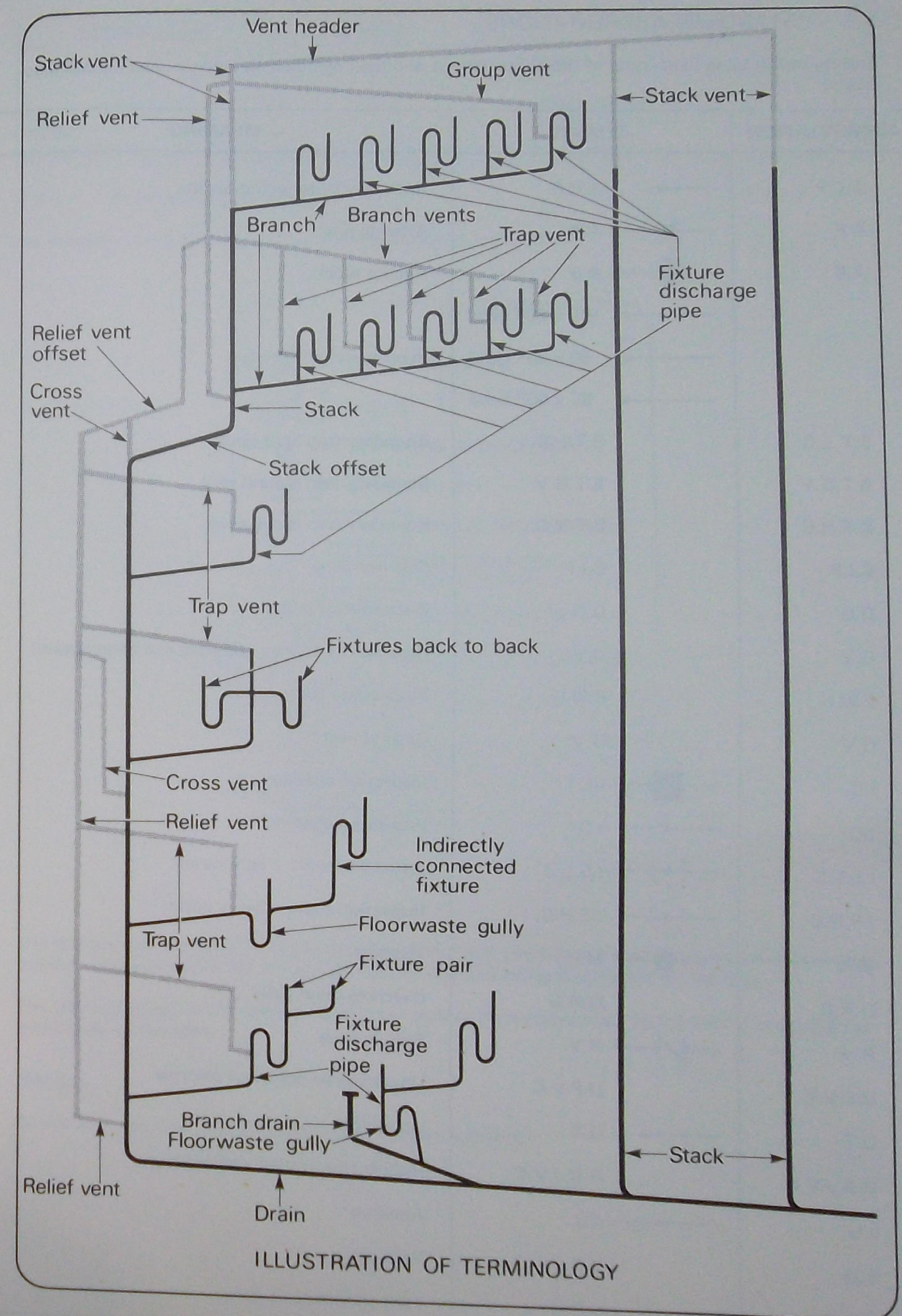
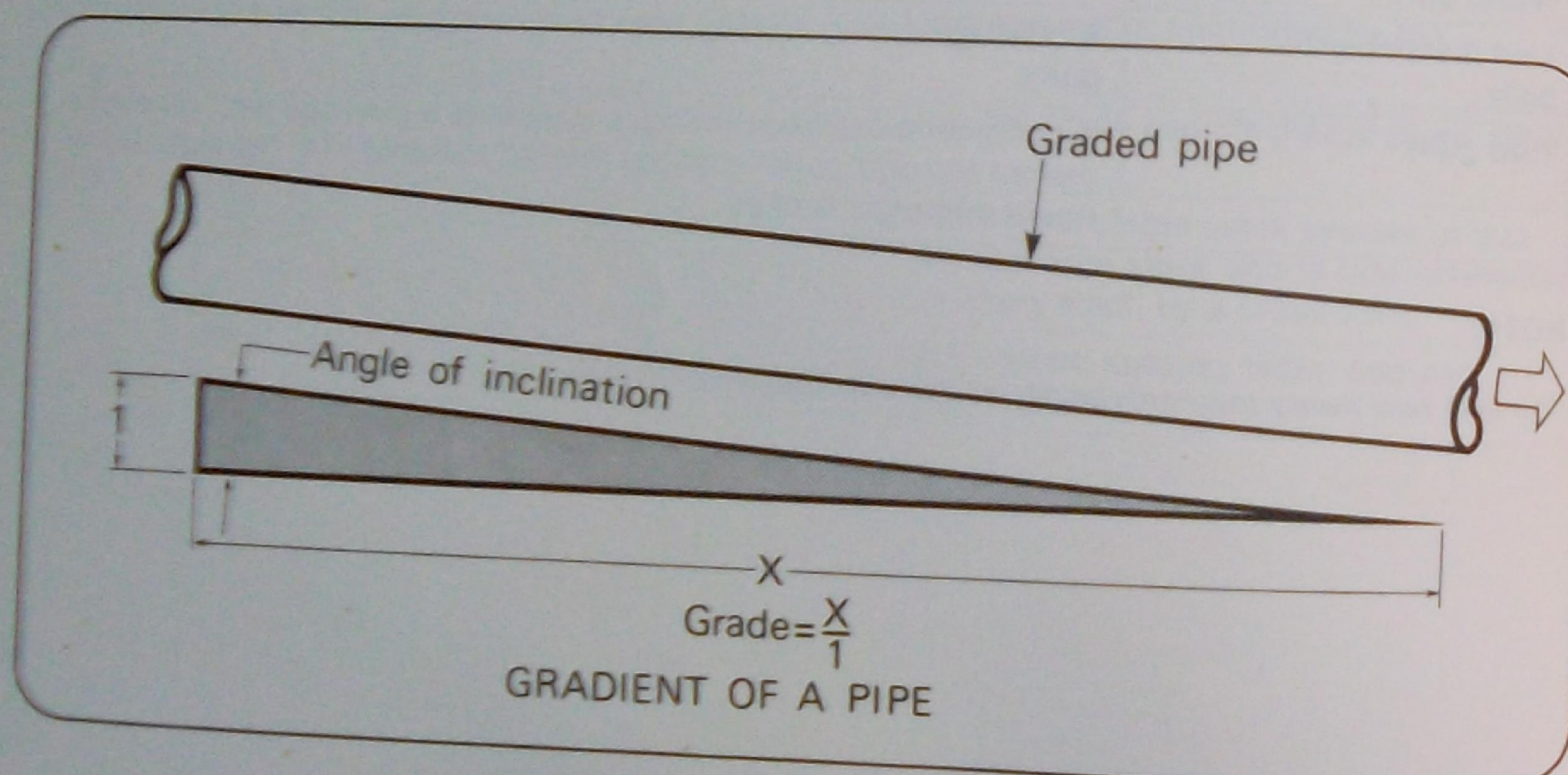
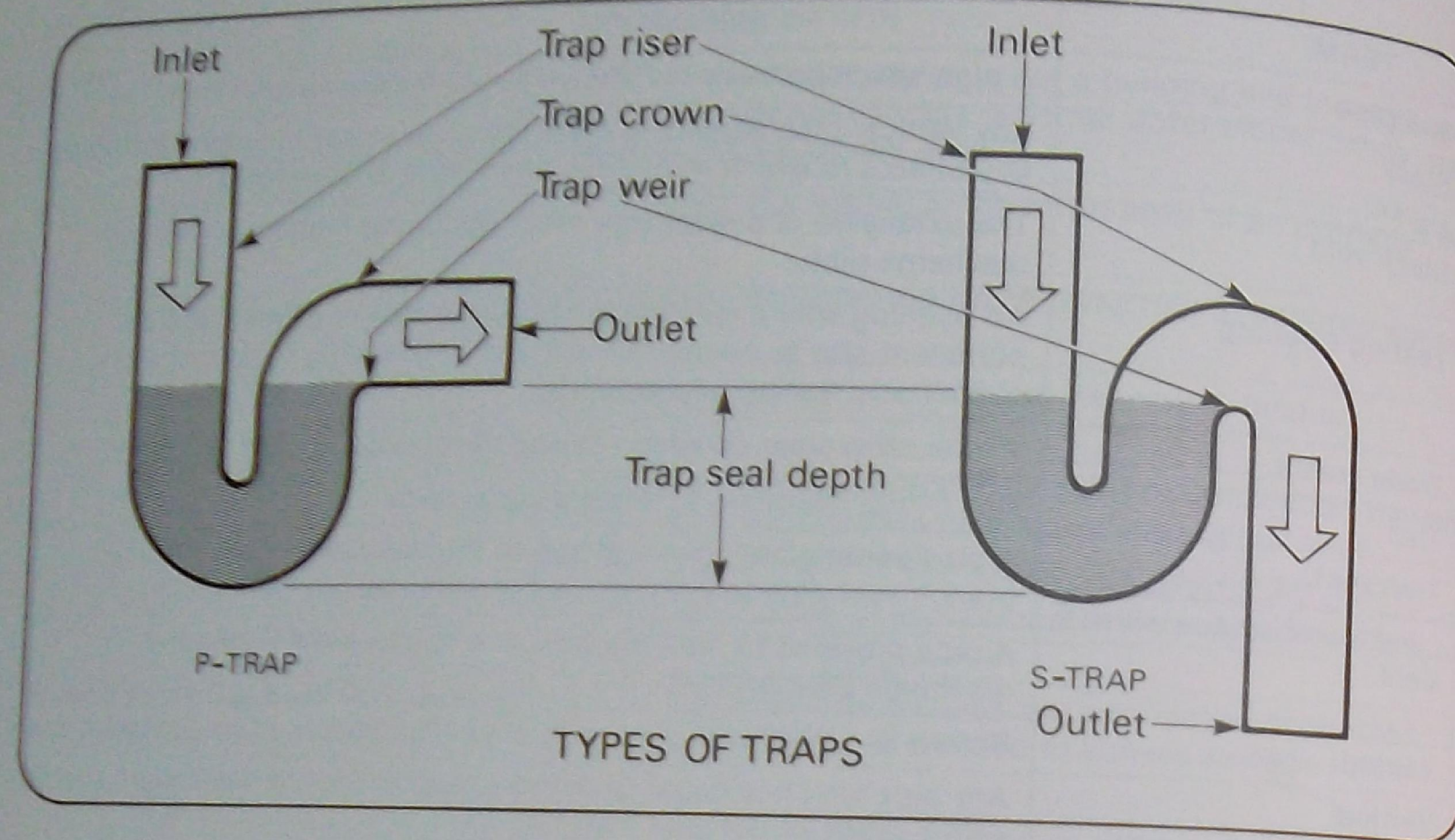
offset

TERM	DEFINITION
Outbuilding	Any structure or installation which is not a building and includes any verandah, carport, detached garage, external water closet, fence, wall, bathing, wading and swimming pool.
Overflow level	The level of the rim of a fixture, or the invert level of an overflow pipe.
Polluted area	Means an area used for purposes which gives rise to polluted waste discharge.
Property	Includes any house, building, outbuilding, tenement, land or premises.
Relief vent	A vent branching from a stack below the point of connection thereto of the lowest fixture and reconnecting above the highest vent connection. <i>(lowest fixture), highest vent on main vent</i>
Rim	Means the edge of a fixture or appliance at which spillage occurs when filled to excess. <i>rim edge</i>
Sanitary plumbing installation	An assembly of pipes, fittings, fixtures and appliances connected thereto and used or intended to be used to convey sewage to the sewerage system.
Sewage	Means any waterborne human excrement or urine or waste water.
Sewer	Any conduit or pipe controlled by the Sewerage Authority and which conveys sewage or trade waste.
Sewerage system	Means all the sewers and sewerage works controlled by the Authority.
Single-stack system	A system of plumbing in which the stack and discharge pipes serve also as vent pipes.
Single-stack system (Modified)	A system of plumbing differing from a single-stack system in that a relief vent is provided in the discharge stack and is interconnected with it at alternate floors, or at every floor, by a cross vent.
Soil fixture	A water-closet pan, urinal, slop hopper, autopsy table, bed-pan washer or a sanitary napkin disposal unit.

TERM	DEFINITION
Soil pipe	A pipe which conveys the discharge from a soil fixture.
Stack	Any vertical pipe extending more than one storey in height, including any offsets to which more than one fixture is connected.
Stack vent	The extension of a discharge stack above the highest connected discharge pipe.
Testing opening	An opening with a removable cover in a pipe or a fitting and of sufficient size to permit the installation of a plug for use in the hydrostatic testing of a pipeline.
Trade waste	Waste other than domestic sewage and as defined by the Authority.
Trap	Any fitting designed to retain a water-seal.
Trap vent	A pipe venting an individual trap to the open air or to a main or branch vent pipe to prevent loss of water-seal in the trap. <i>Trap vent to open air (or) branch vent pipe</i>
Vent	A pipe provided to limit the pressure fluctuations within the discharge pipe system. <i>Discharge pipe to open air</i>
Vented	Refers to a discharge pipe with a vent connected at its upstream end. <i>Discharge pipe to open air</i>
Vertical	Any pipe which is equal to or more than 45° to the horizontal. A pipe with a grade of not less than 1:1.
Waste fixture	Any fixture other than a soil fixture.
Waste pipe	A pipe which conveys the discharge from waste fixtures only.
Yard disconnector gully	A drainage fitting serving both as a yard gully and as a disconnector gully.
Yard gully	A composite drainage fitting, comprising a drainage trap, riser pipe, dished top and outlet grating, located externally for the disposal of liquid domestic wastes.












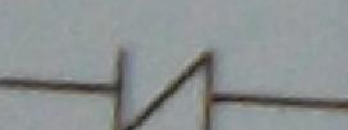


NOTE:

The last two items may only apply to certain Australian States.



4.2 STANDARD ABBREVIATIONS

The following table lists some of the abbreviations and their symbols commonly used on drainage plans:

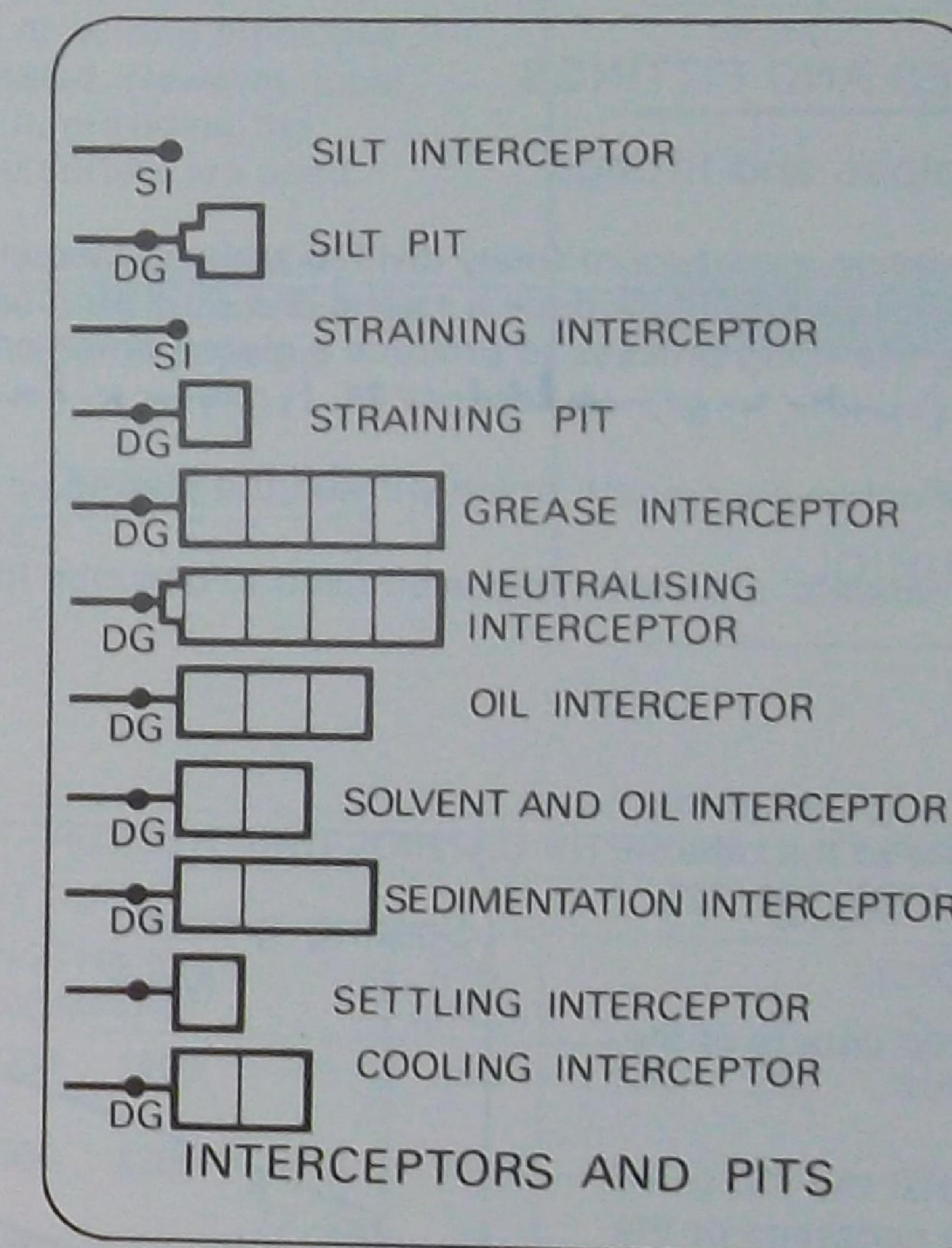
ABBREVIATION	SYMBOL	MEANING
A.C.P	 A.C.P	Authority's connection point
A.P	 A.P	Altering pipe
A.B	 A.B	Anchor block
	 100 x 90° bend	Bend graded to vertical
	 80 x 90° bend	
	 65 x 90° bend	
B.T.L.C	B.T.L.C	Boundary trap light cover
B.T.G.V	B.T.G.V	Boundary trap ground vent
B.T.H.C	B.T.H.C	Boundary trap heavy cover
C.I.P	C.I.P	Cast iron pipe
D.G	D.G	Disconnecter gully
D.V	D.V	Drainage vent (both upstream and downstream)
F.W.G	F.W.G	Floor waste gully
G.V	G.V	Ground vent
I.C	 I.C	Inspection chamber
I.O	 I.O	Inspection opening
I.S.L.C	 I.S.L.C	Inspection shaft — light cover
I.S.H.C	 I.S.H.C	Inspection shaft — heavy cover
M.H	 M.H	Manhole
O.R.G	O.R.G	Overflow relief gully
R.V	 R.V	Reflux valve
U.P.V.C	U.P.V.C	Unplasticised polyvinyl chloride
U.T	 U.T	Urinal trap
R.R.J.V.C	R.R.J.V.C	Rubber ring jointed vitrified clay
J.U	 J.U	Jump up
Y.G	Y.G	Yard gully
Y.D.G	Y.D.G	Yard disconnector gully

ABBREVIATION	SYMBOL	MEANING
S.V.	S.V.	Stack vent
W.C.	W.C.	Water closet

NOTE:
Check with the local authorities about abbreviations used in your area.

4.2.1 Interceptors and pits

On drawings, fully label the type of interceptor to be installed.



The line-work and lettering of symbols should be clear, precise and readily understood as to the position and purpose of the fittings and the appliances being positioned on the plan.

The size and shape of the symbol to be used should be proportionate to the fitting or appliance positioned on the plan.

NOTE:

Check with the local authority about interceptors and pits.

5 GENERAL DRAINAGE

House drainage fittings are made from a variety of materials. Some of these materials are no longer used, but they will often be encountered during modification or repair of existing drainage systems.

The principal materials used in drainage work are:

- vitrified clay (VC)
- cast iron (CI)
- unplasticised polyvinyl chloride (UPVC)

5.1 DRAINAGE PIPES AND FITTINGS

5.1.1 Vitrified clay pipes and fittings

VC fittings are made by moulding a mixture of finely divided and selected clay and water. The casting is then dried and fired in a kiln to produce a strong and rigid structure. In the past, salt was added to the kiln during the firing process to produce a glazed finish on the surface of the fittings. *(VC fittings of clay & water are moulded & fired in a kiln & glazed & dried & fired)*

Modern moulding processes achieve a smooth finish without the glazing.

The terms 'stoneware' and 'ceramic' are sometimes also used to describe these fittings.

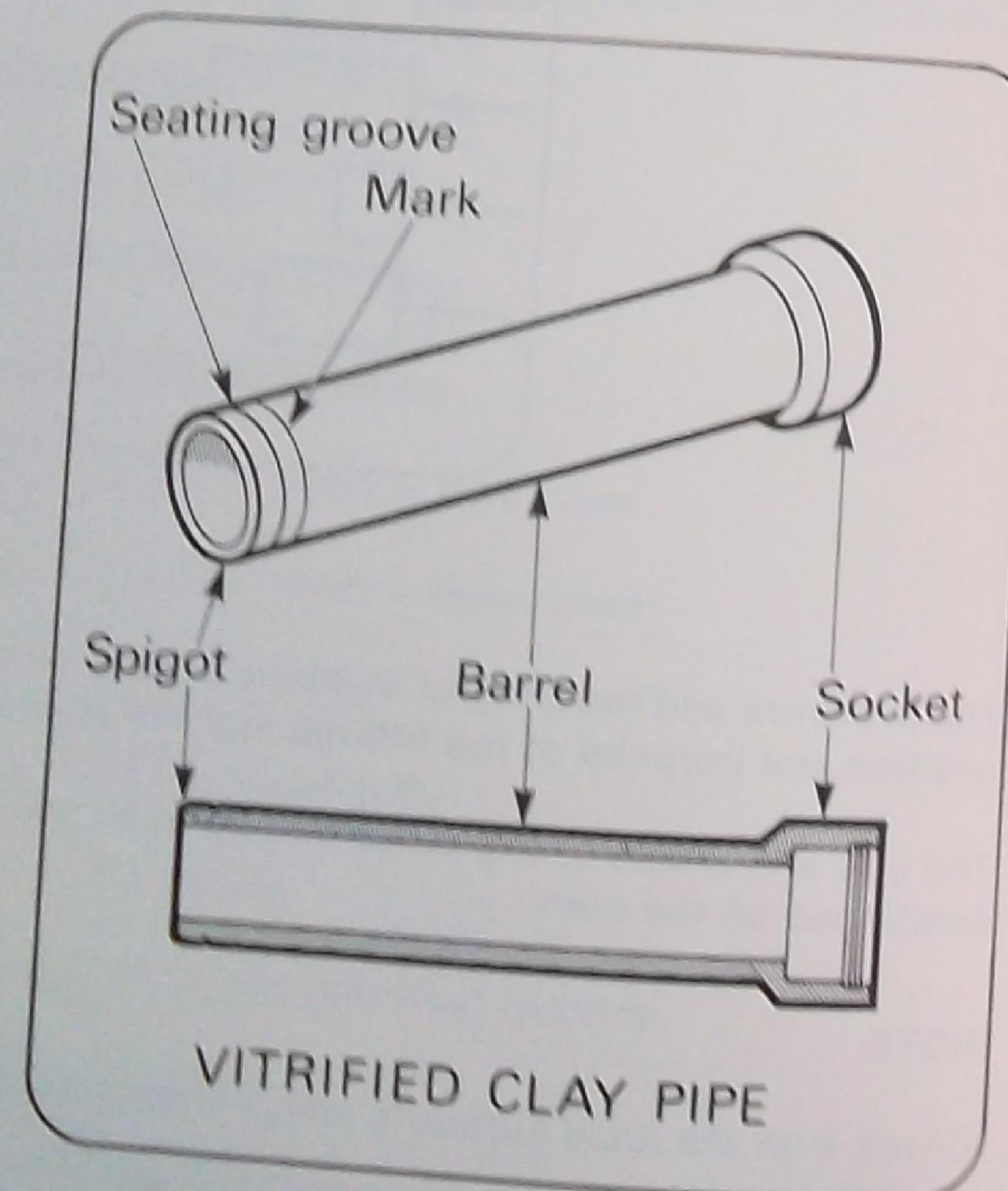
5.1.2 VC pipes

VC pipes are moulded with a socket at one end of the barrel and a spigot at the other. Standard diameter sizes are: 100, 150, 225, and upwards to 600-750 mm.

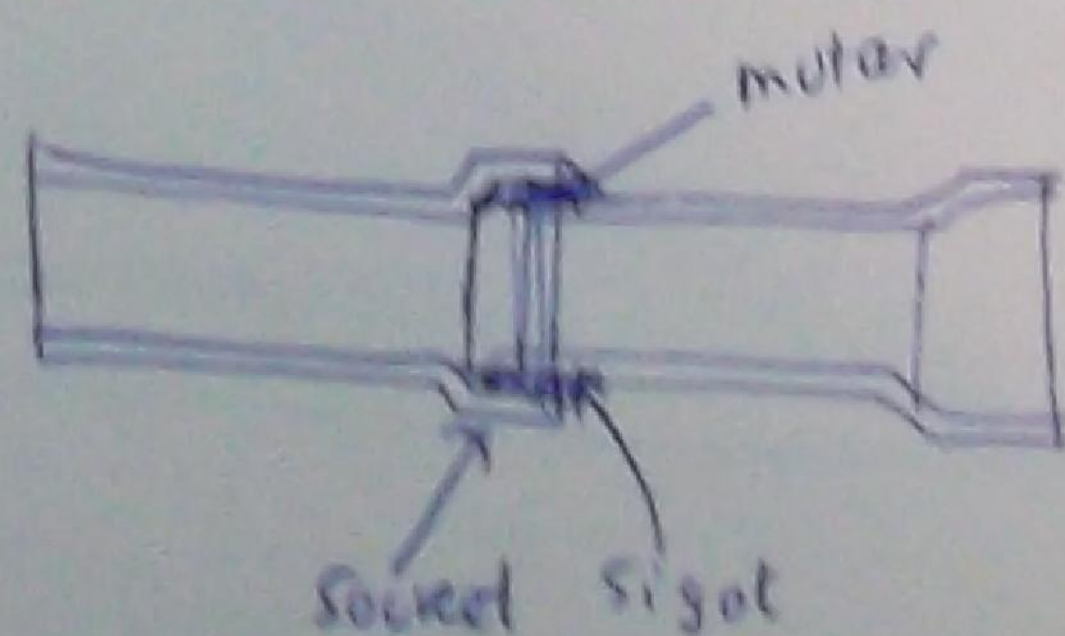
The distinctive constructional details of the pipes are:

- an internal, recessed lip at the top of the socket to locate the neoprene or the rubber sealing ring during the assembly process of the joint.
- a single-ring groove at the end of the spigot to locate the neoprene or rubber ring seal properly in the sealing joint.
- a single, shallow groove marking on the barrel, a short distance from the spigot seal groove to serve as an indicator.

The joint is correctly assembled when this indicator lines up with the inside edge of the socket end.



VC pipe diagram

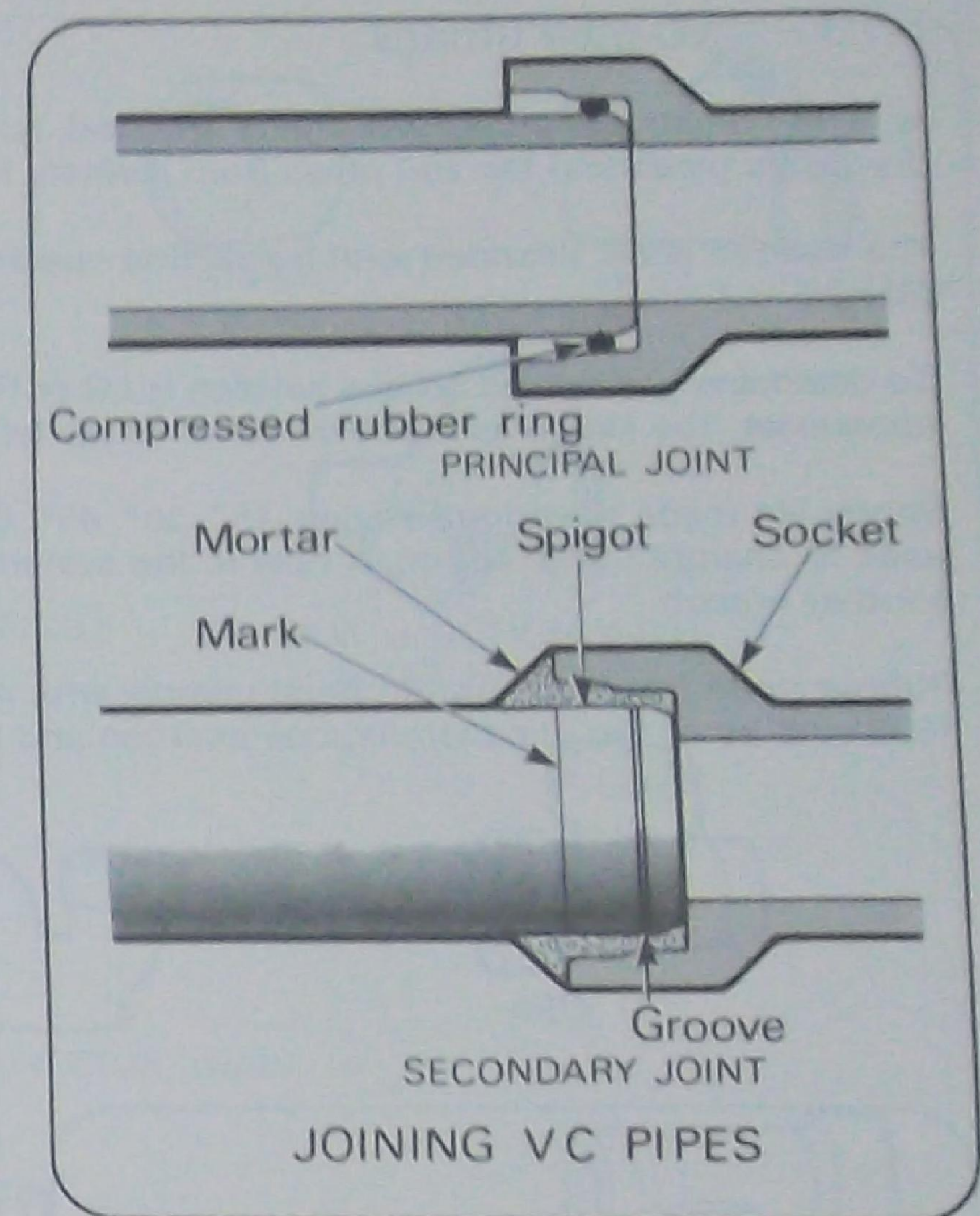


Such a joint is flexible and is able to adjust to the movements of the soil without breaking, as was the case with the old type of rigid, mortar-sealed joint in sewer drains. Mortar jointing is still used in special circumstances and as may be approved by the local Authorities.

Because of the range in pipe lengths now available, the practice of cutting pipes has practically been eliminated. However, local Authorities may allow it, providing the compression-type snap cutters are used.

Where it is allowed to cut pipes to size, special fittings must be used to join the cut pipe to the system to which it is being coupled.

The table below lists the range of rubber ring, vitrified clay pipes.



RUBBER RING JOINTED VITRIFIED CLAY PIPES											
STRAIGHT PIPES						SHORT PIPES					
DIA. (mm)	LENGTHS (mm) (NOMINAL)					DIA. (mm)	LENGTHS (mm) (NOMINAL)				
100	600	1000	1200	—	—	100	130	200	250	300	400 450
150	600	1000	1200	—	—	150	130	200	250	300	400 450
225	600	1000	—	1500	—	225	150	—	—	300	— 450
300											
450											
525	600	to			1500						
600											

NOTE:

Special pipes are also available for a variety of applications: some have inspection openings made in the barrel, some have double sockets or double spigots; others have different diameters at each end for use as tapered altering pipes for connection of reduced diameter sizes of pipes to increased diameter ones, or vice versa.

5.1.3 VC pipe fittings

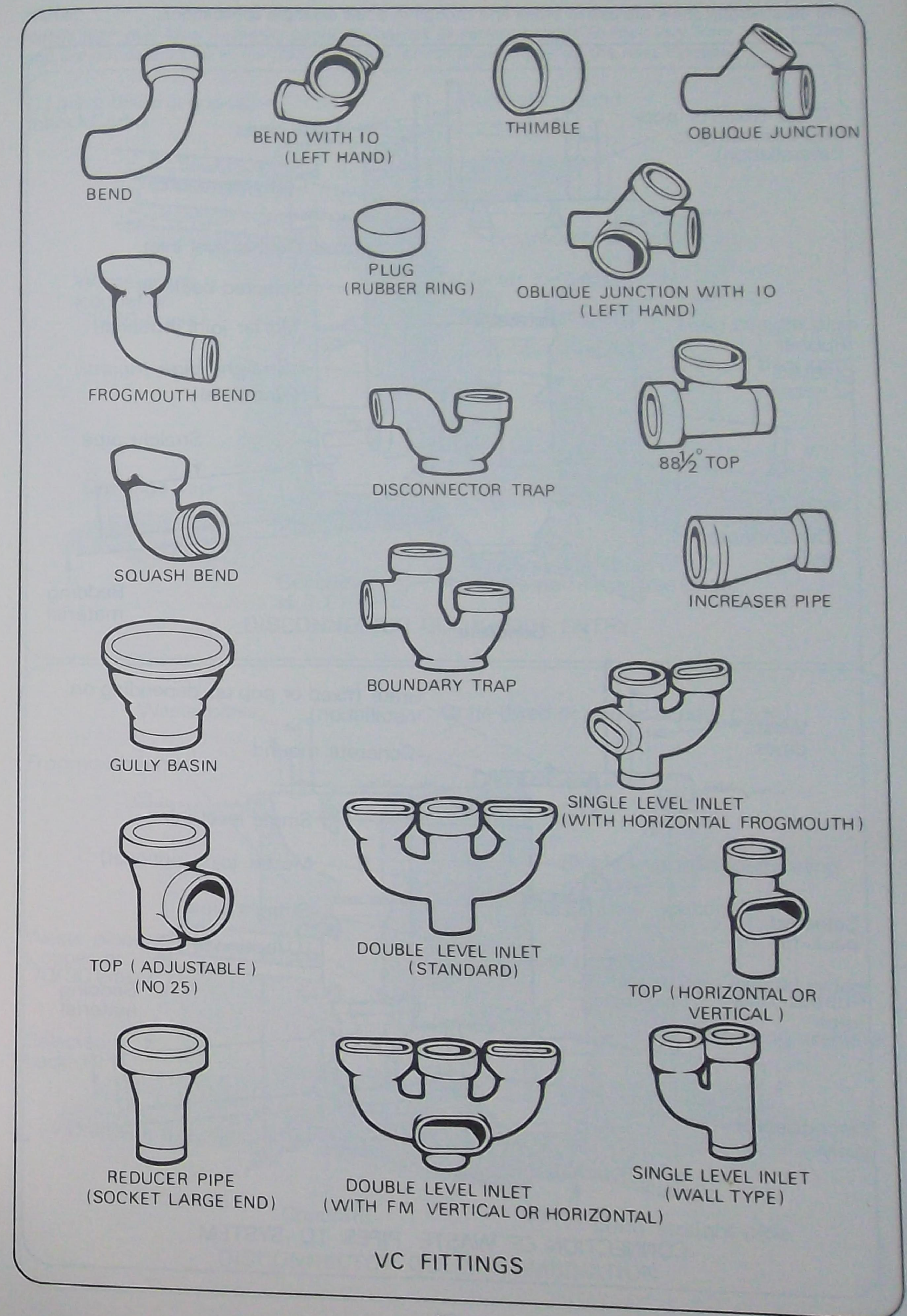
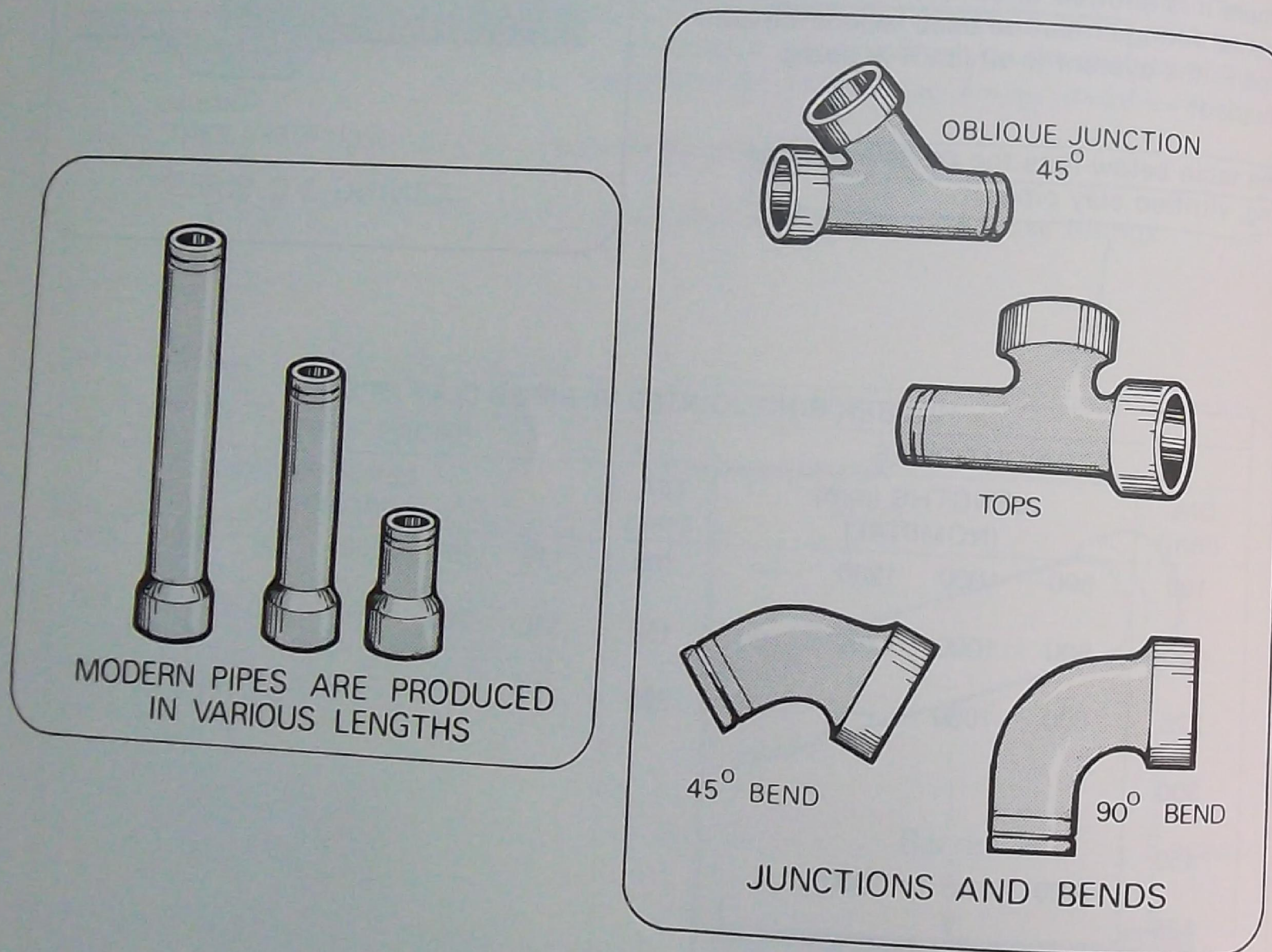
In laying drains, junctions and bends are used, as well as special fittings, to link up to the waste discharge pipes and the soil pipes from sanitary fixtures. Junctions may be oblique or square.

The oblique ones, provided with inspection openings (IO), can be either left-hand (LH) or right-hand (RH).

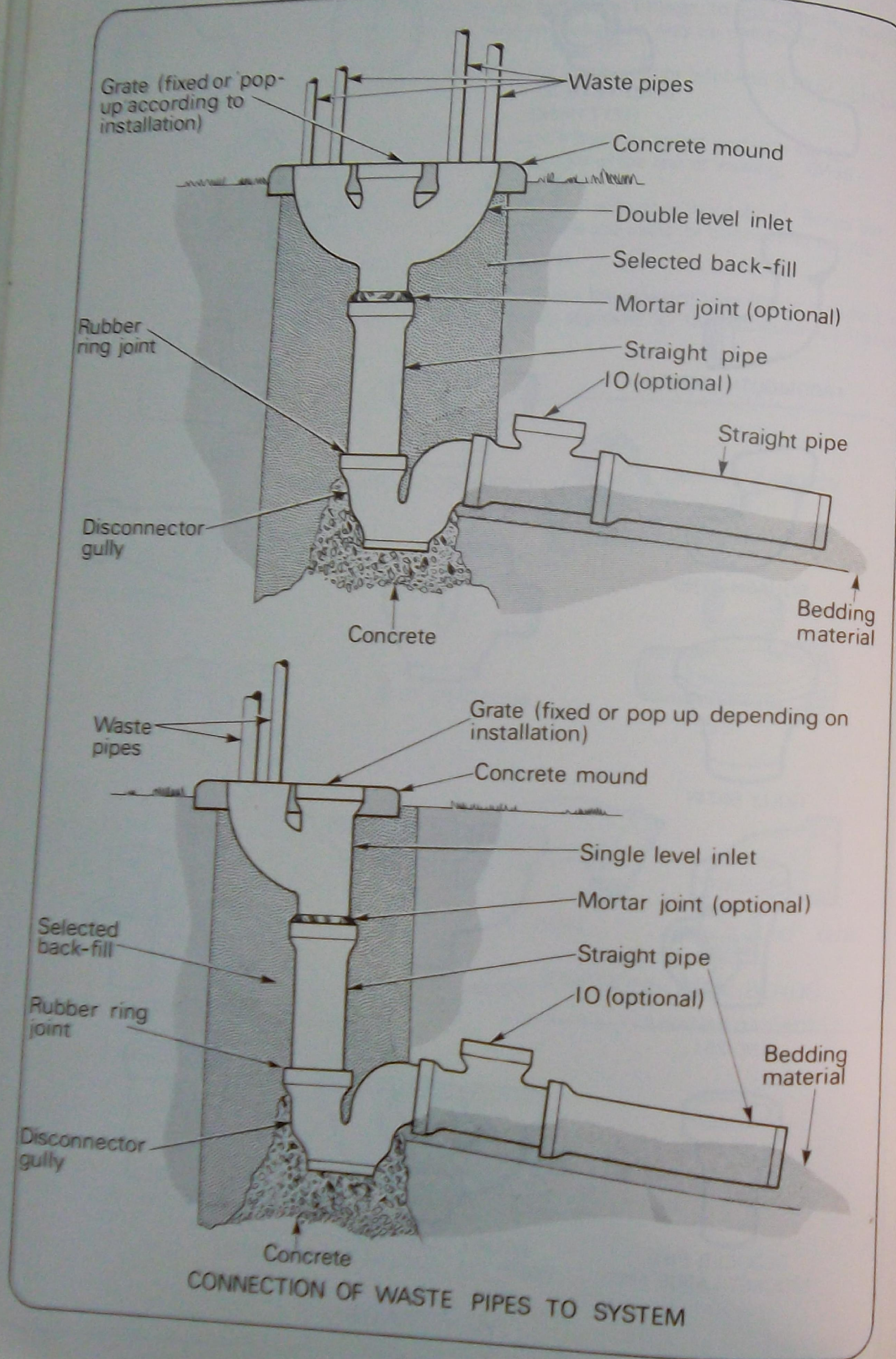
To determine whether an oblique junction is LH or RH, view it from the spigot end with the IO uppermost. The side branch is then either on the left or the right of the line of viewing.

Bends are made to various angles: 15°, 30°, 45°, 60°, 75°, 90° with or without an IO. Bends are used to change the direction of flow in the system. Junctions are used for connecting up into another branch.

Rubber rings used for jointing must comply with AS 1646 and the relevant pipe fitting standard, AS 1693, and be of the dimensions, composition and hardness approved for the particular application.

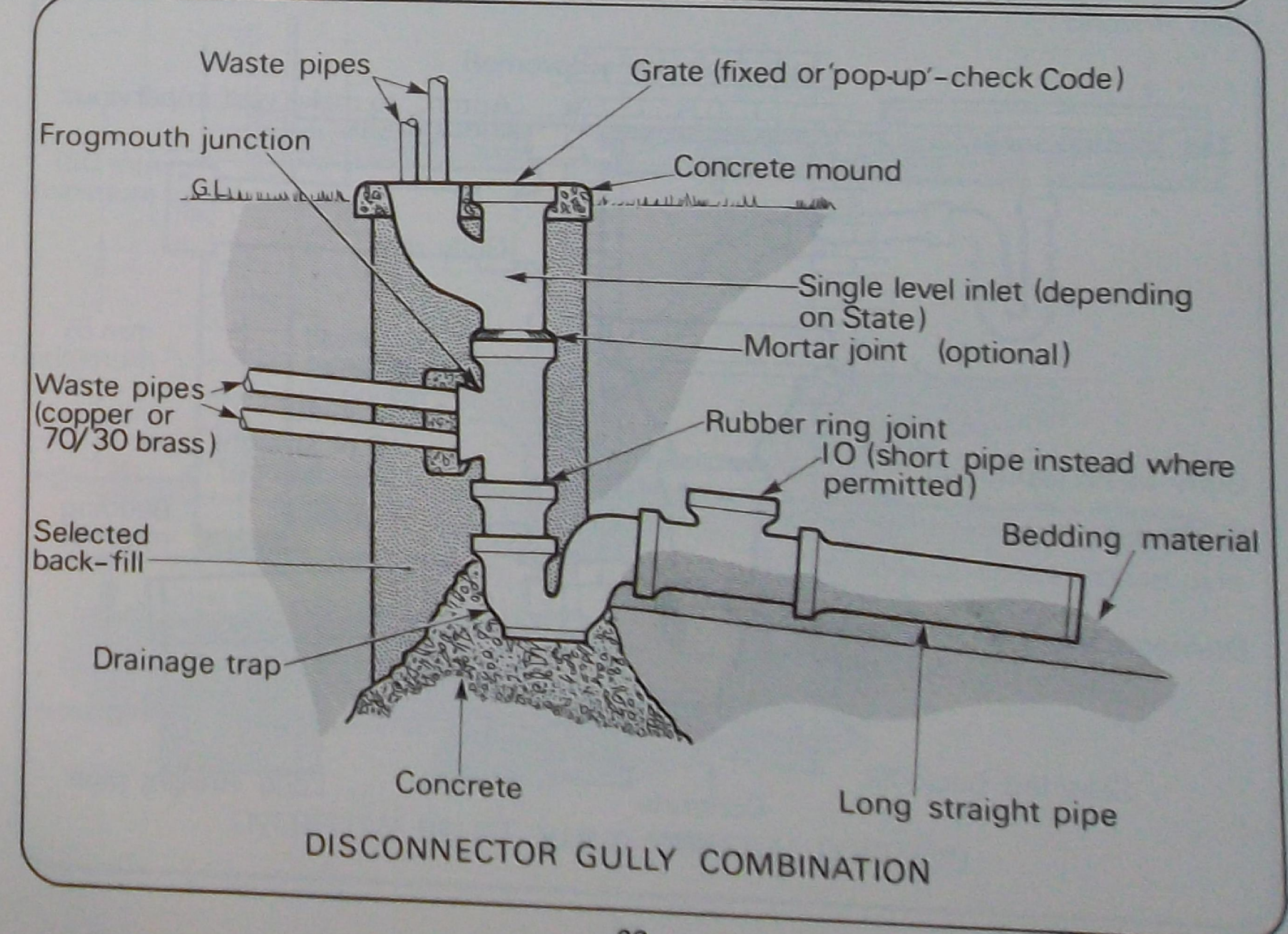
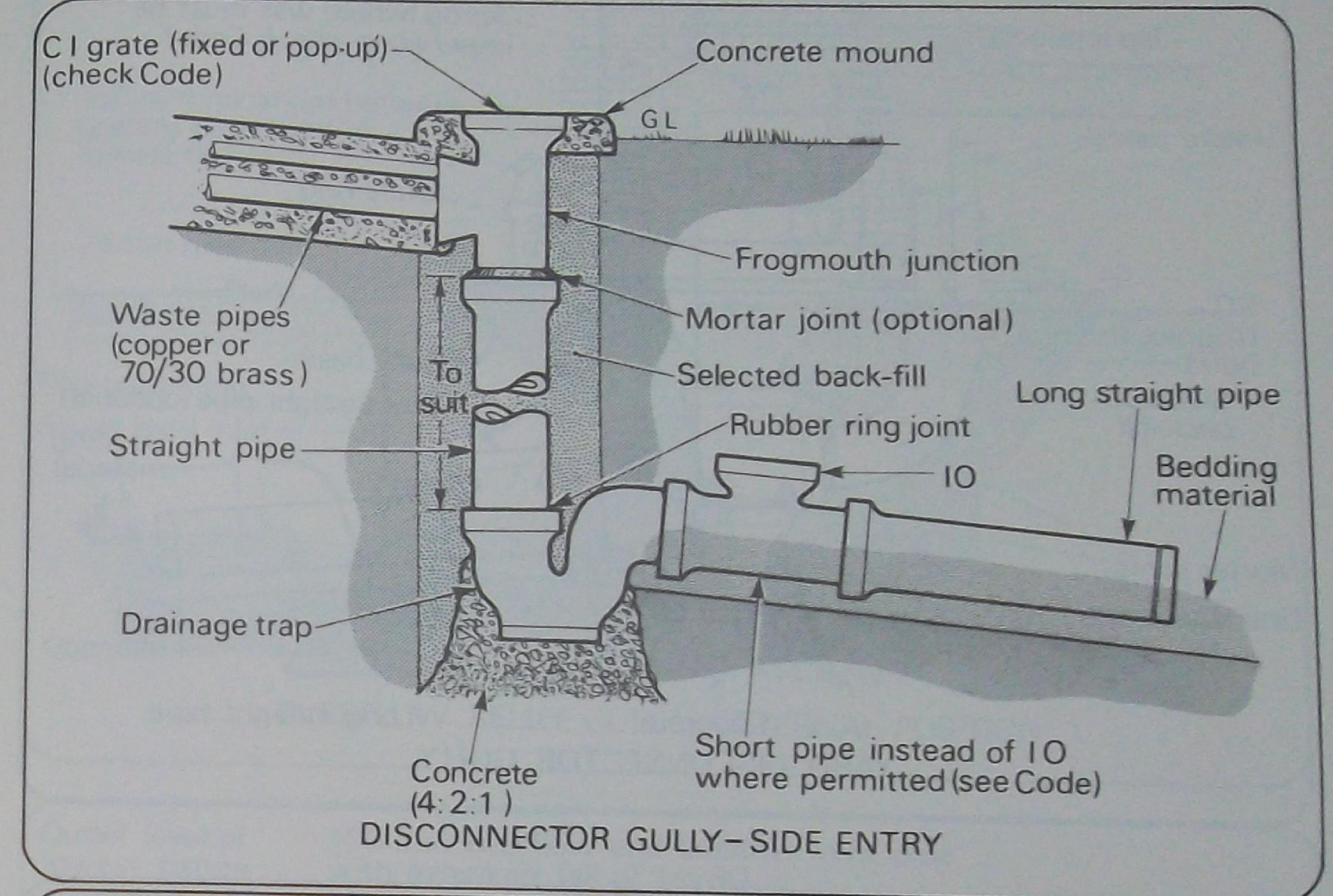


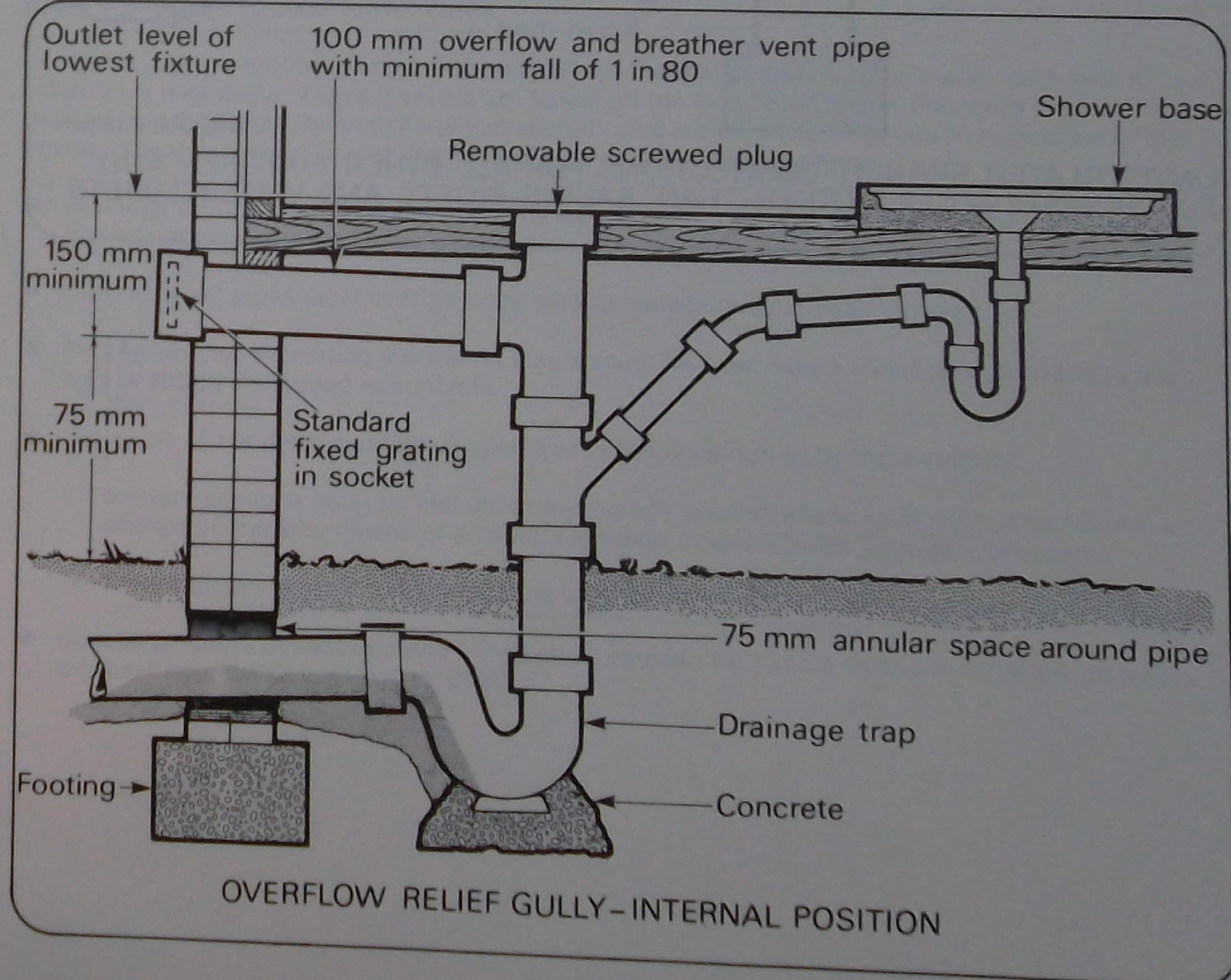
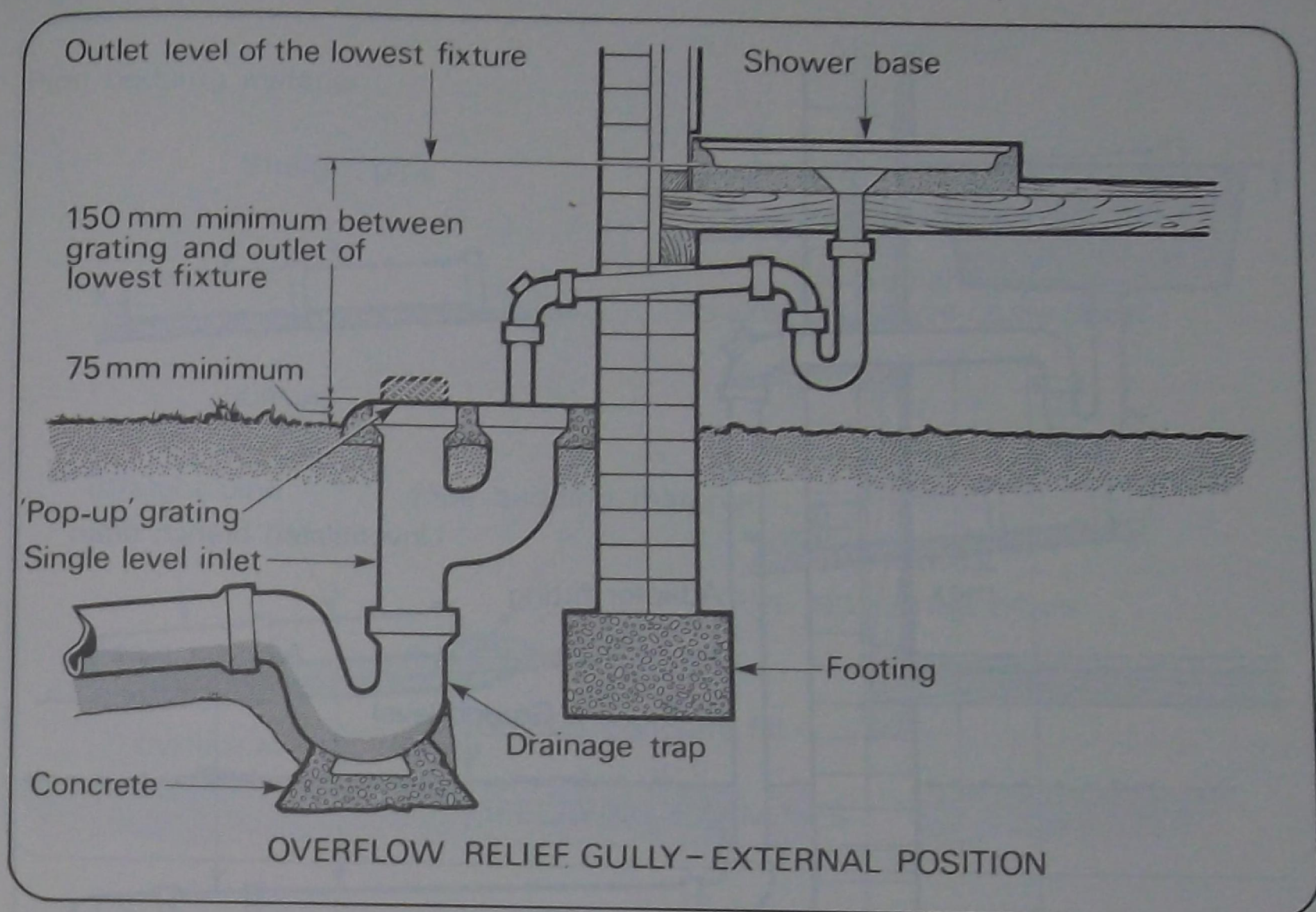
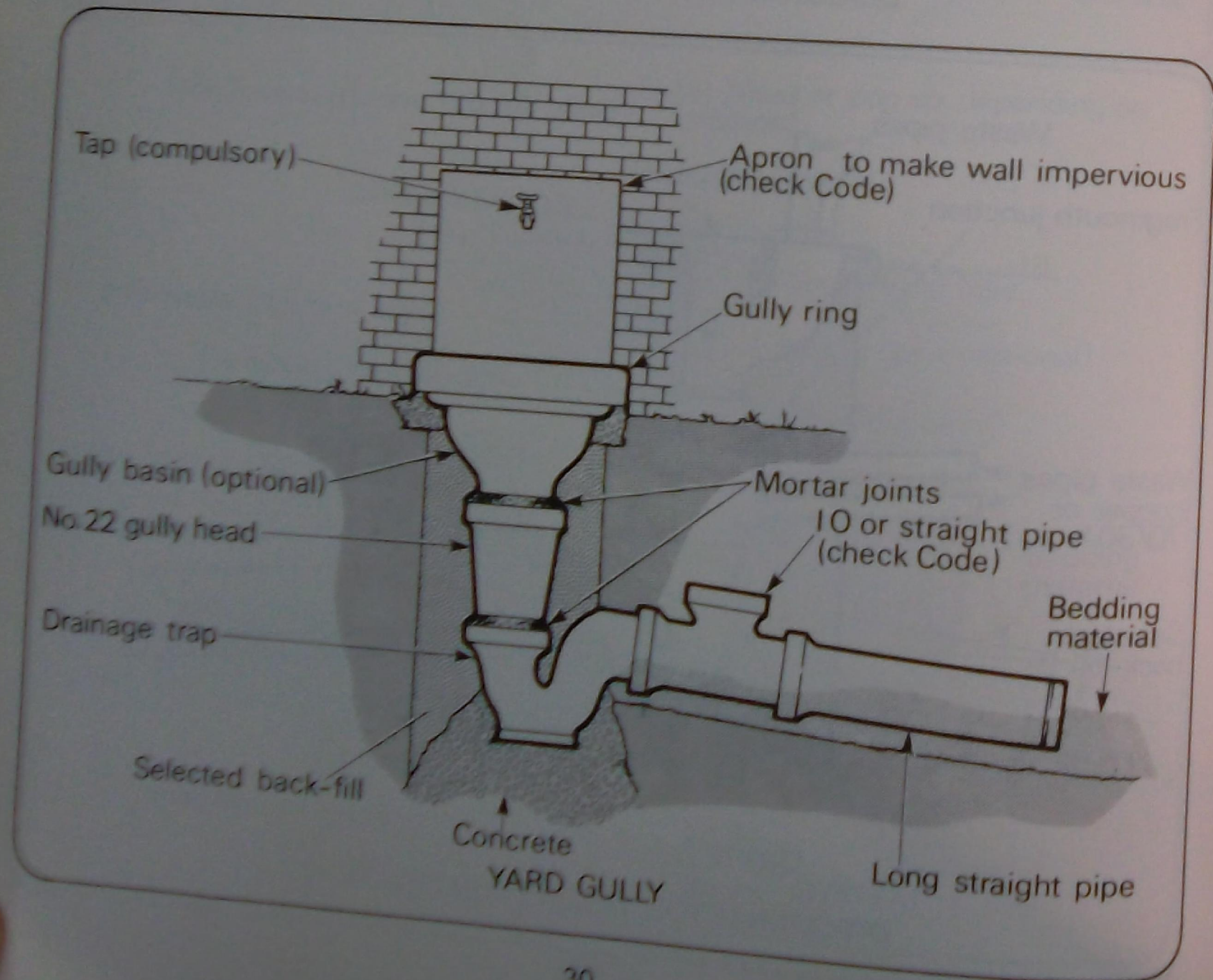
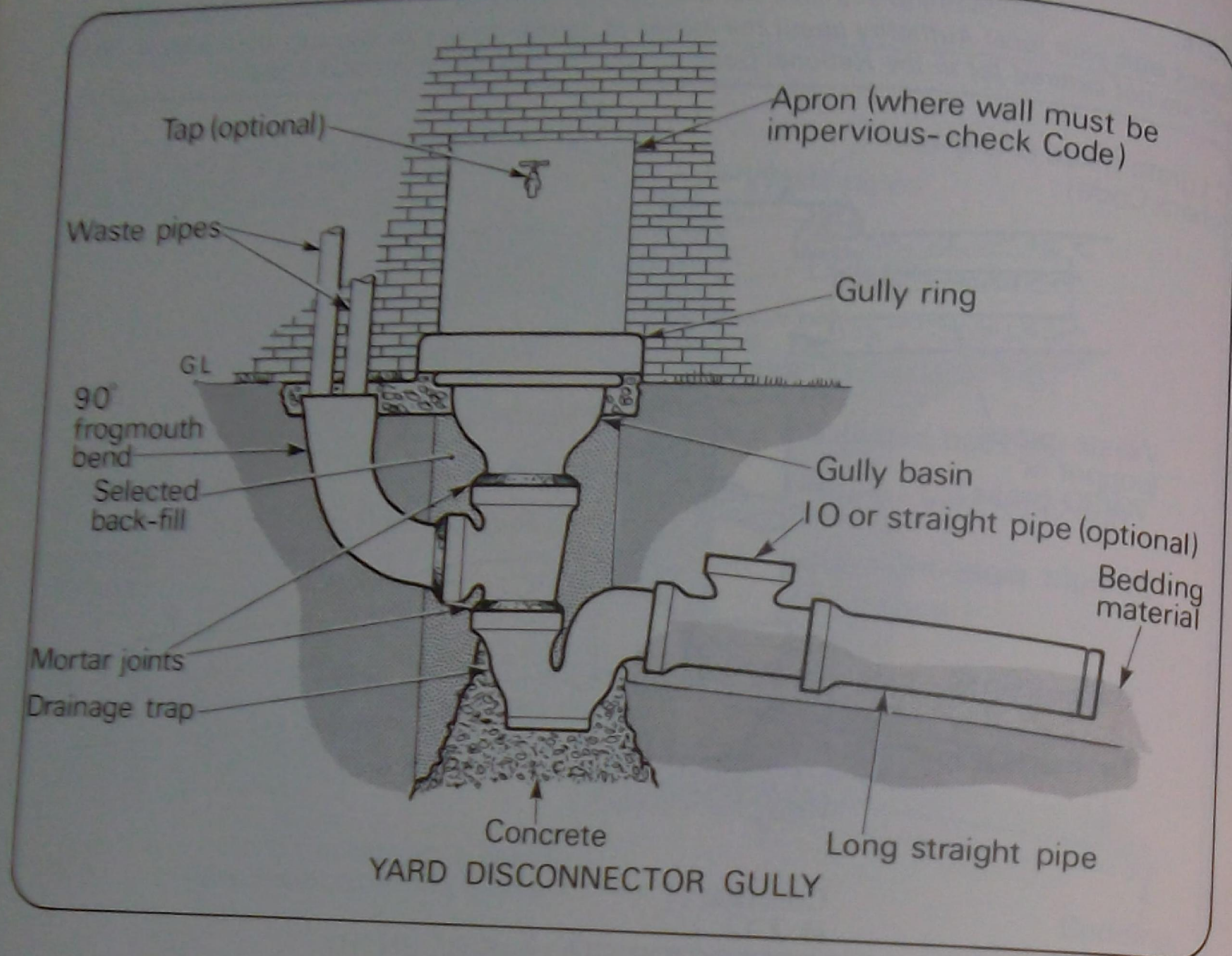
The illustrations show the use of pipes and fittings in a few example applications.



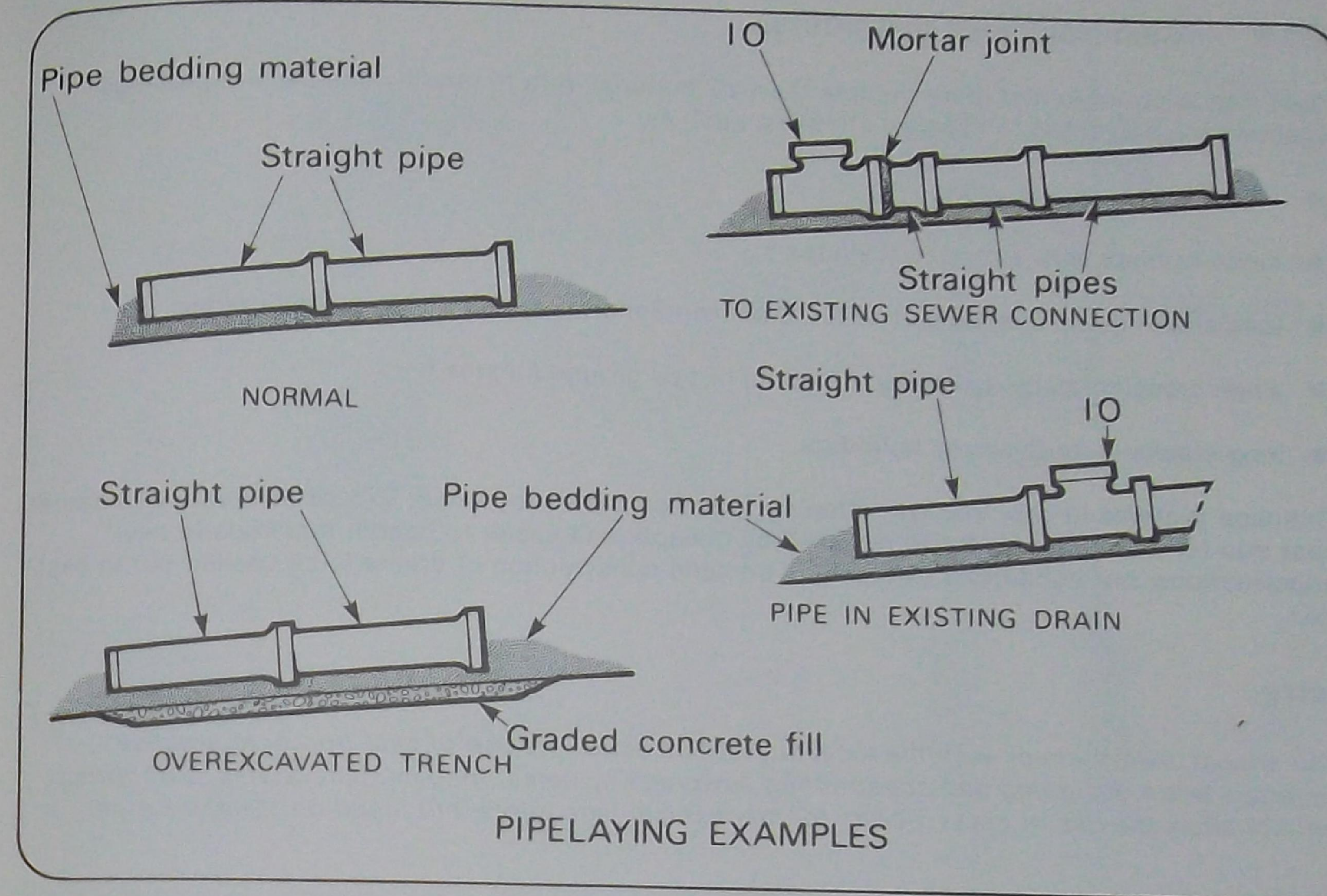
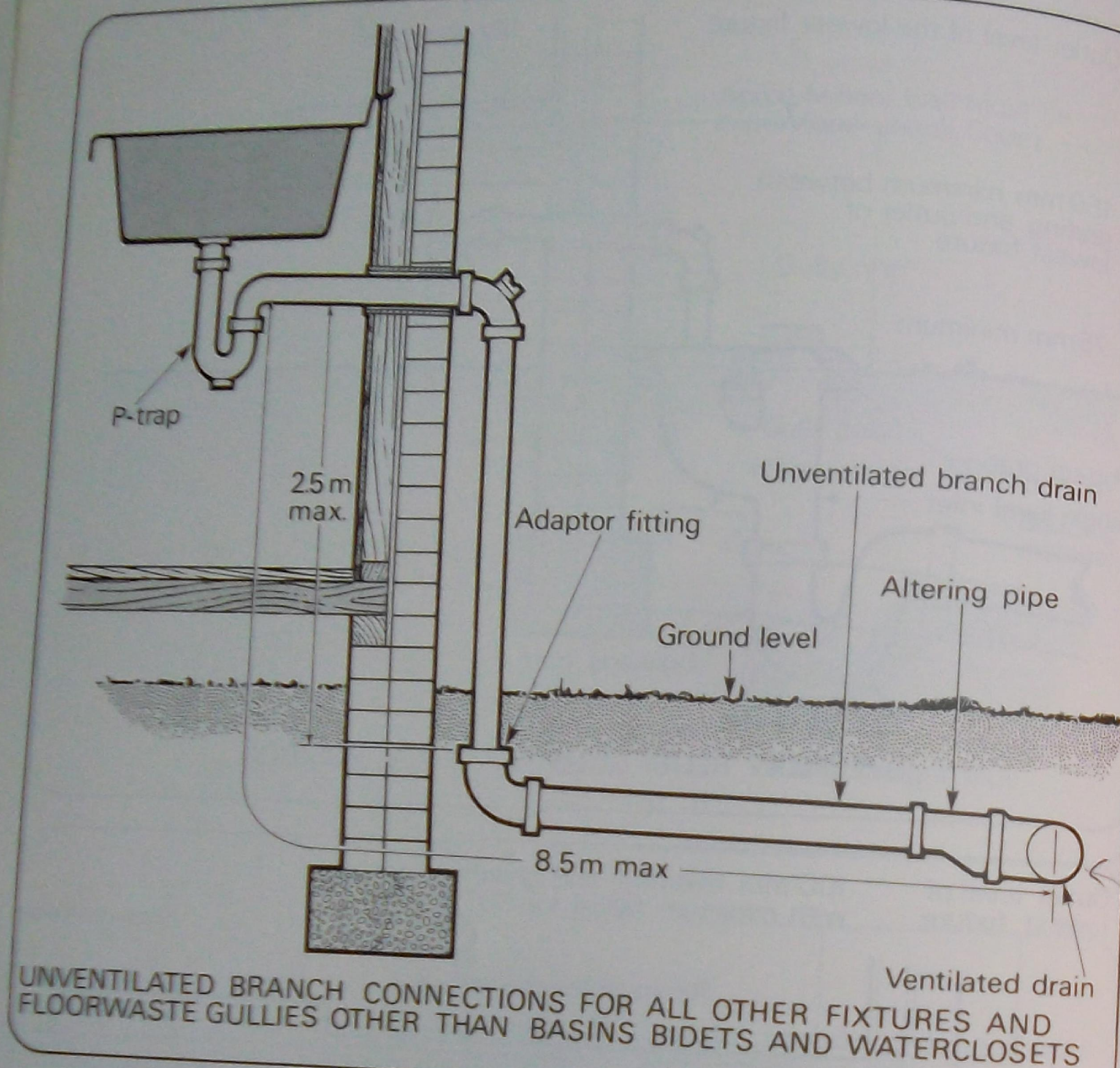
NOTE:

Check with your local Authority about the names of certain fittings as they vary from State to State and are not catered for in the National Code for the illustrations on the next 7 pages.





Basin, max 6m Drainage.



5.1.4 Some fundamental rules

Depending on the Authority and the locality where the installation is to be made, variations to some rules may occur. These manuals are based on the Australian Model Plumbing Code — Sanitary and Drainage. Some generally accepted rules are listed here for you to remember in the course of learning about or working on drainage and plumbing systems.

- Drainage fittings must bear the Authority's proper approval and test marks which should be placed uppermost when laying the drains.
- Cutting of VC pipes must only be done with compression-type snap cutters.
- Short pipes not exceeding 600 mm in length must be used where connection is made to any pipe or fitting embedded in concrete.
- The grade of the drain must be as specified in the drawings or by the Authority.
 - Straight sections must be laid on an even grade, except where local Authorities permit a change in grade by means of a vertical jump-up or an included jump-up (row-over).
 - The minimum grade of drains must be 1:60 for 100 mm drains and 1:80 for 150 mm drains.
- Special adaptors of cast iron and UPVC must be used for joining drains of different materials, e.g. cast iron to VC, cast iron to UPVC.

5.1.5 Cast iron pipes and fittings

Cast iron is stronger and more durable than VC material. It is frequently used where drainage systems are subjected to external stresses, such as:

- under roadways and drives;
- close to trees with strong root systems;
- long-shafts (jump-ups) as part of the drain ventilation system in deep-seated drains;
- when crossing made-up ground (filled in) or bad ground (unsteady);
- long stacks in multi-storey buildings.

Drainage systems in cast iron will often be found on older properties. Except as mentioned earlier, cast iron for drains is now being replaced by cheaper and easier to handle materials in new constructions, but conditions exist which demand construction of drains to be carried out in cast iron.

NOTE:

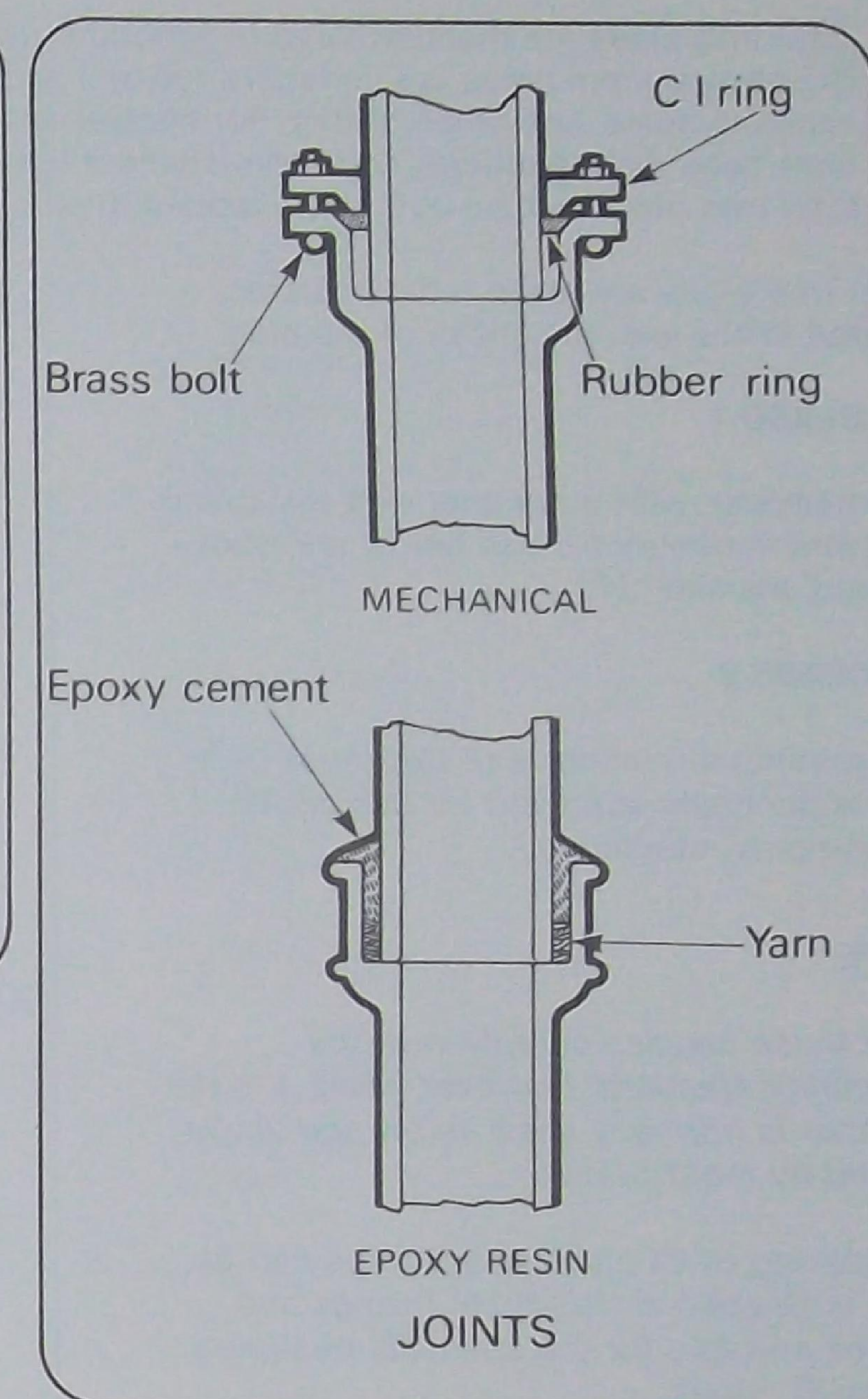
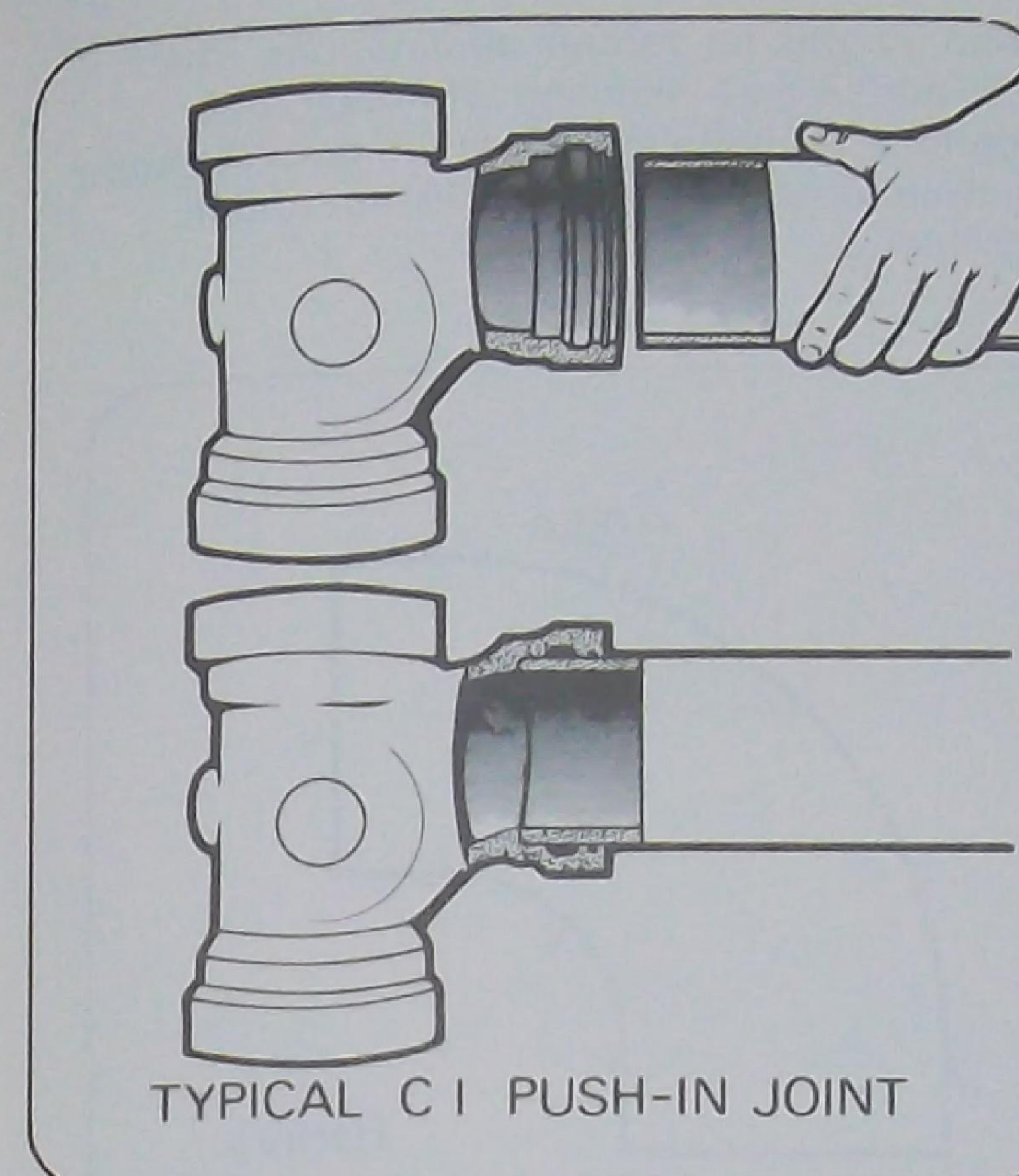
You should always check with the local authorities about the use of cast iron or alternative materials when designing and constructing sewerage systems. Also in some States, authorities will not allow the use of brass T-bolts for mechanical-type joints, but insist on stainless steel.

5.1.6 Cast iron pipes

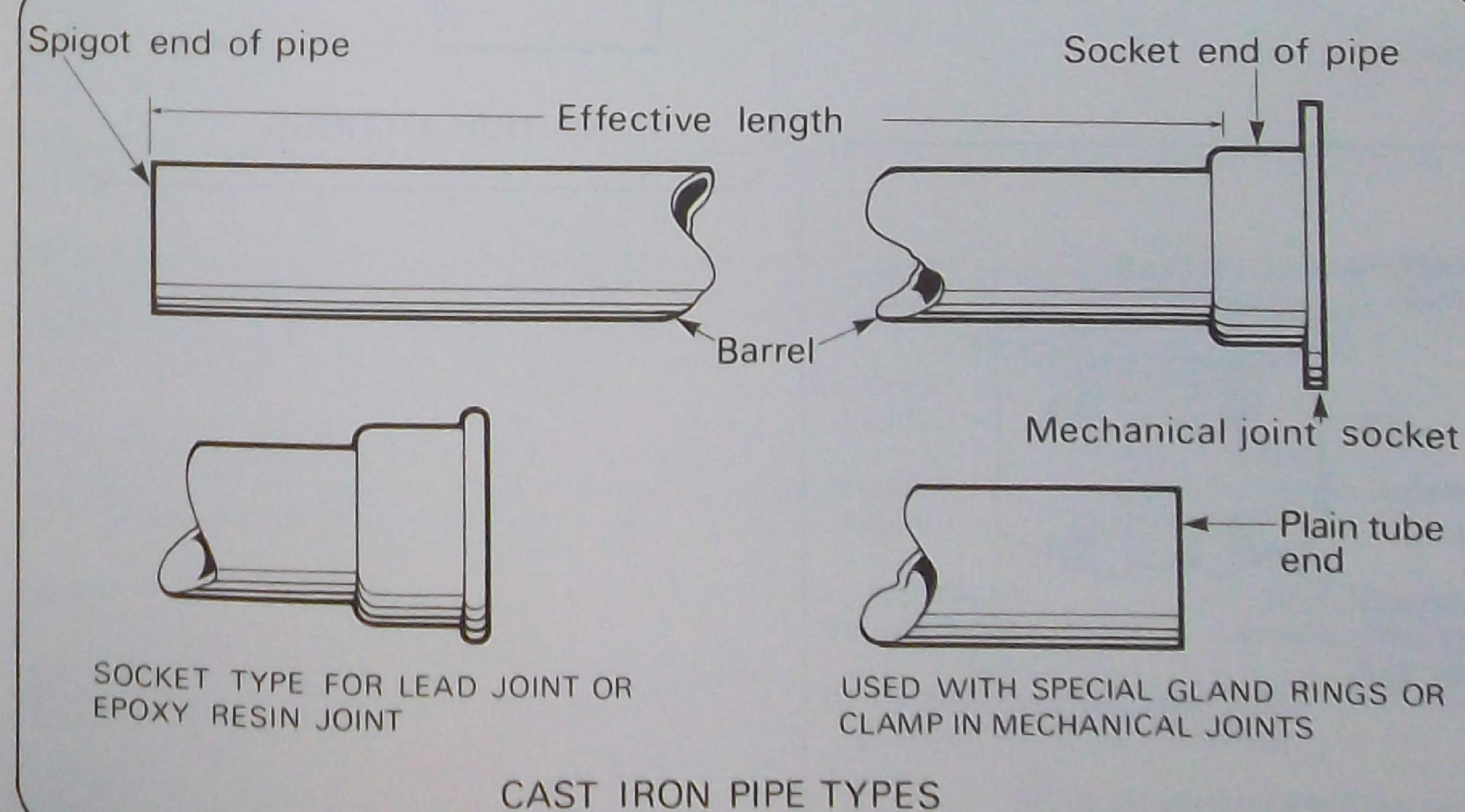
Cast iron pipes used in the past, and installed up to a few years ago, were formed with a spigot at one end and a socket at the other. Modern pipes like the old ones, range in lengths from 300 mm to 3 m and are jointed mainly by mechanical-type joints instead of by lead joints. However, lead-caulked type pipe is still available on request but is seldom used today. A push-in type joint is also available and approved by most States' Authorities.

Modern cast iron pipes are manufactured to Australian Standards and are available in four different types.

- The push-in joint, approved by most Australian Authorities, is assembled in a similar way to a cast iron water-main-type joint. It is also simple to join the cast iron to UPVC and to copper as well as to 70/30 brass, using the correct type of neoprene sealing rings.



- the mechanical joint socket type, with an integrally cast flange.
- the lead joint socket type suitable for lead or epoxy resin compound jointing.
- the plain type used with gland rings or with clamps which provide for the insertion of rubber rings and bolts to make an airtight and watertight seal. Connecting two such pipes is also done with slip sockets.



- Cast iron pipes are manufactured in various sizes and lengths for various applications. The drainage system pipes are generally 100 mm and 150 mm in bore diameter. However, this varies in some Australian States. For special applications, as large as 300 mm in bore diameter have been manufactured. As previously mentioned, their lengths vary from 300 mm to 3 m. Cast iron pipes can be cut, sawn, tapped, filed or drilled.

Cast iron pipes are made in two classes, related to the wall thickness of the pipe.

• CLASS 1

The heaviest, with a nominal wall thickness of 6 mm minimum for use below and above ground, marked: 'H'.

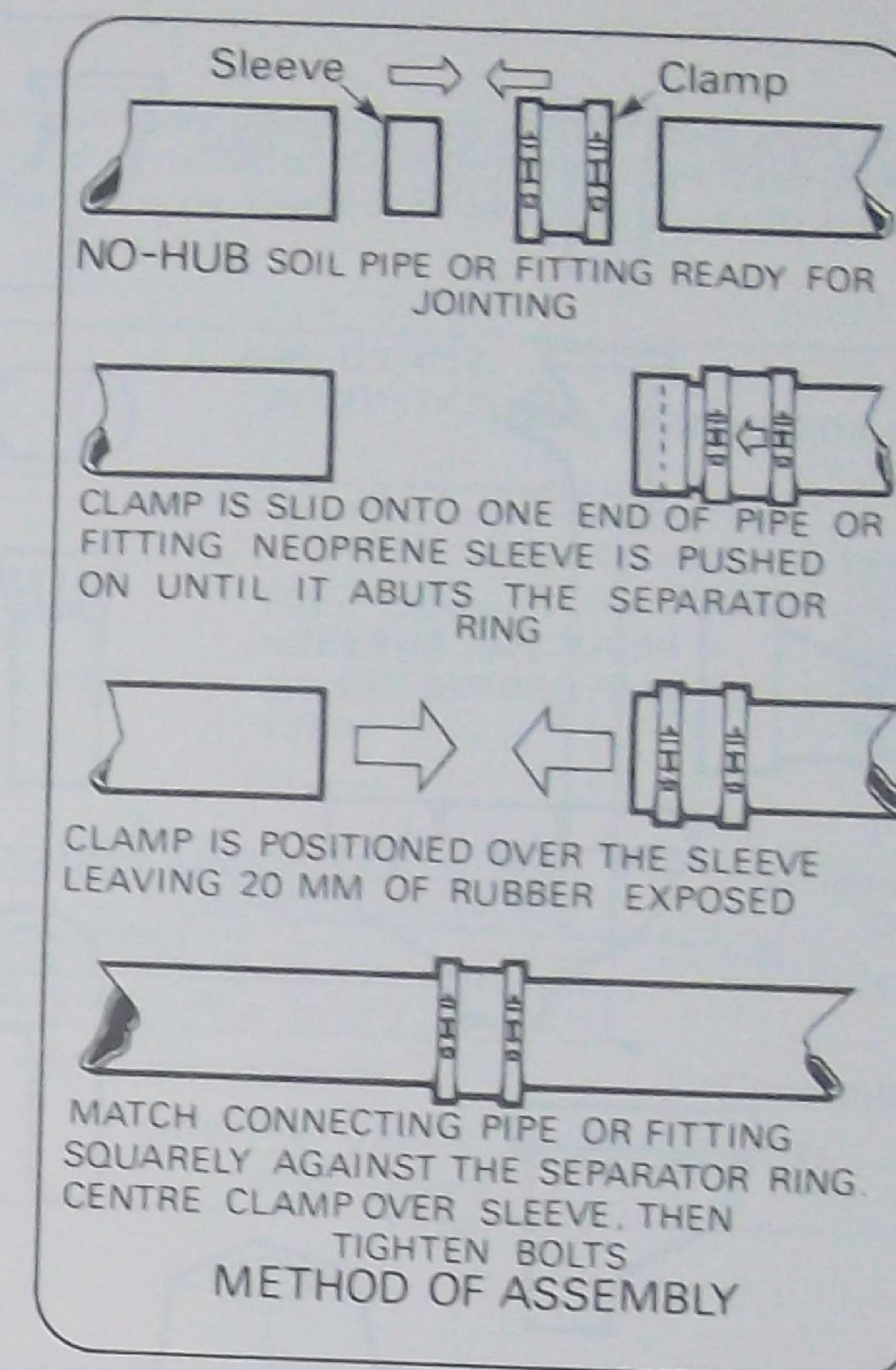
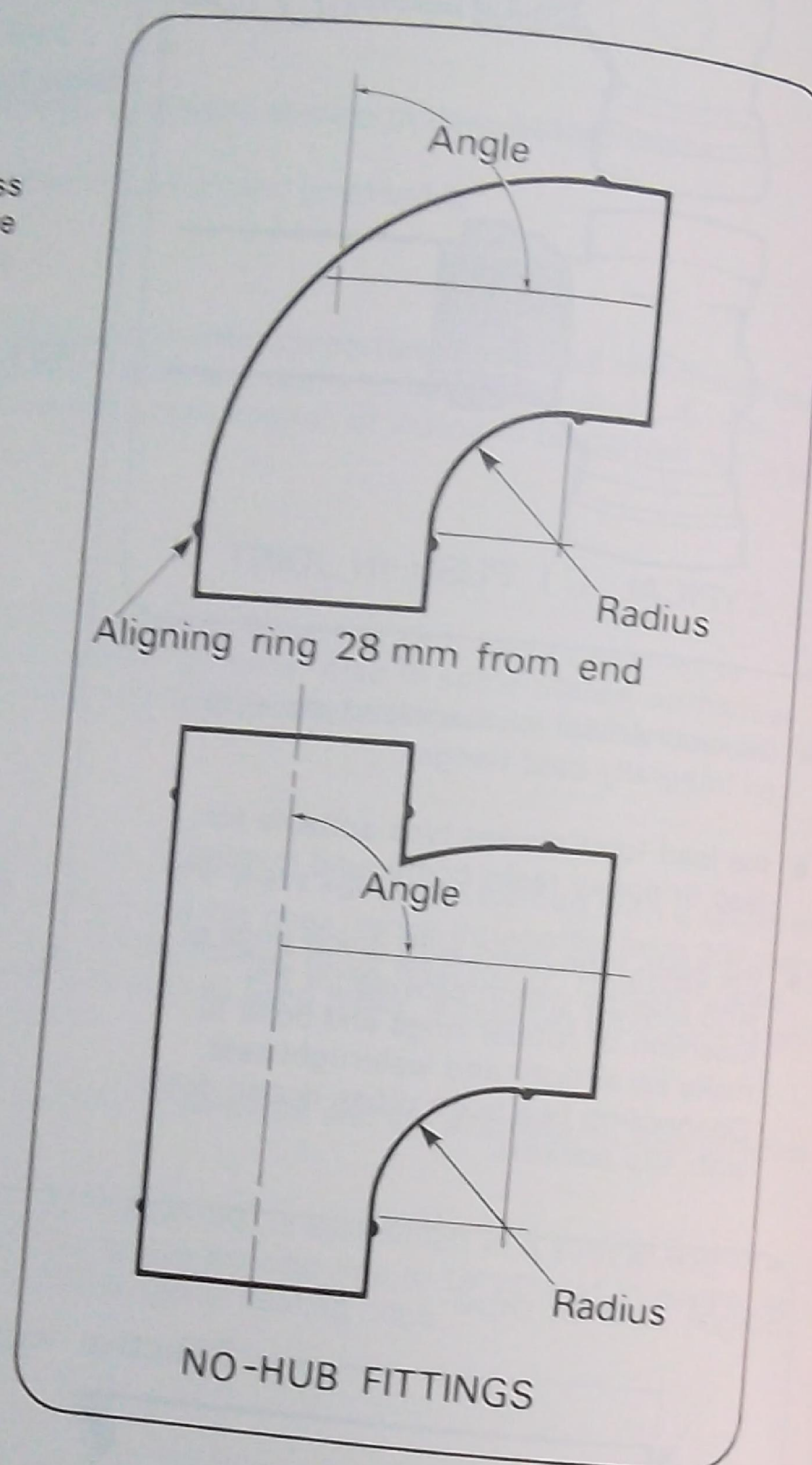
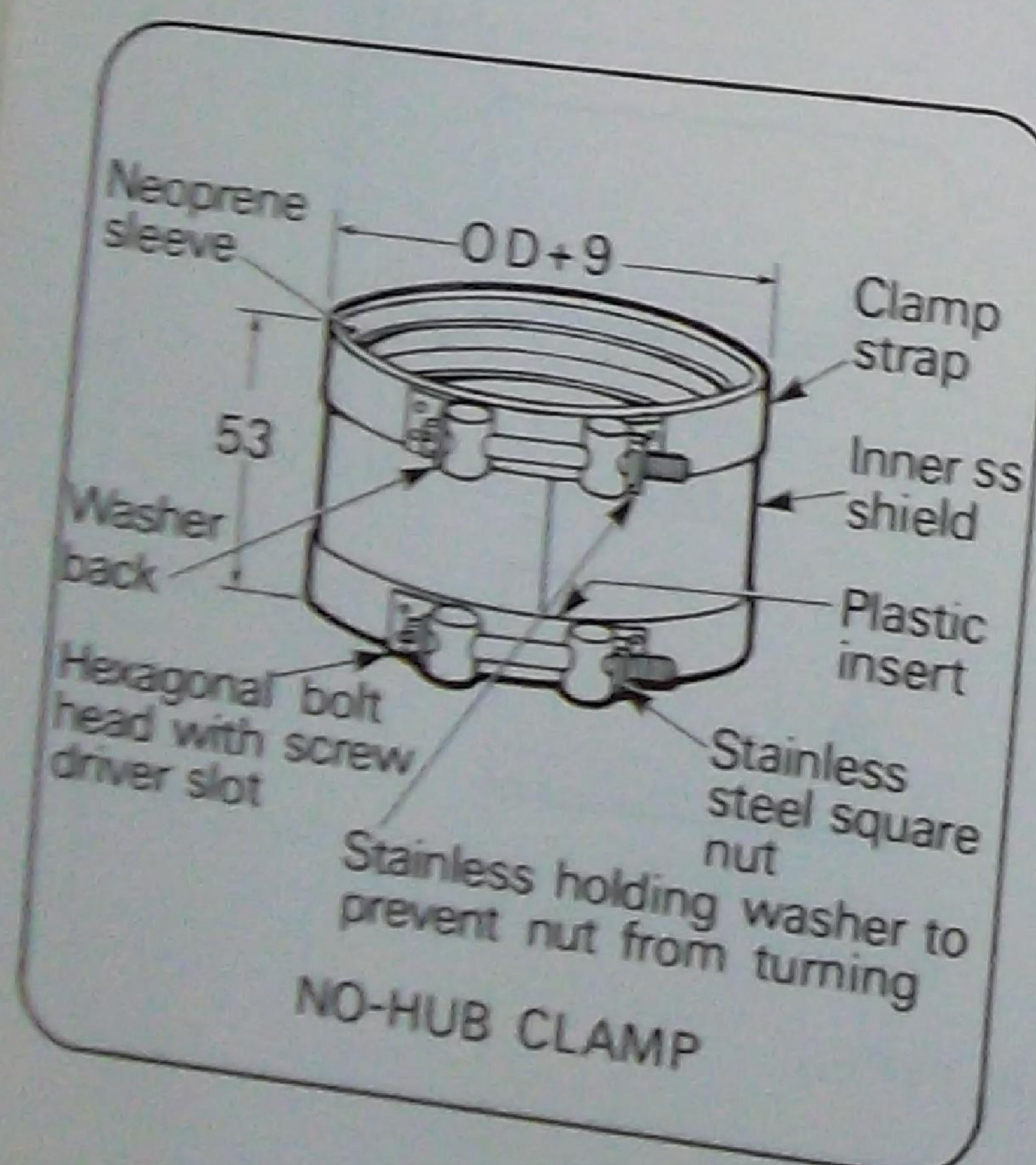
• CLASS 2

The minimum nominal wall thickness of 5 mm is generally approved for use above ground only, marked: 'L'.

NOTE:

Both these classes comply with the Australian standard. However, class 1 is the one that is normally used below and above ground by most States.

The joining of CI pipes and fittings can be done with special 'NO-HUB' fittings and clamps suitable for the specially designed 'NO-HUB' pipes.



5.1.7 Cast iron fittings

The necessary fittings used in a drainage system such as bends, junctions, inlets and vents are available, as well as many special fittings. In addition, most covers and gratings for drainage systems are made from cast iron to Australian standards and comply with the relevant authorities' testing standards.

There is also another form of cast iron soil waste and vent system which is prefabricated by the manufacturers.

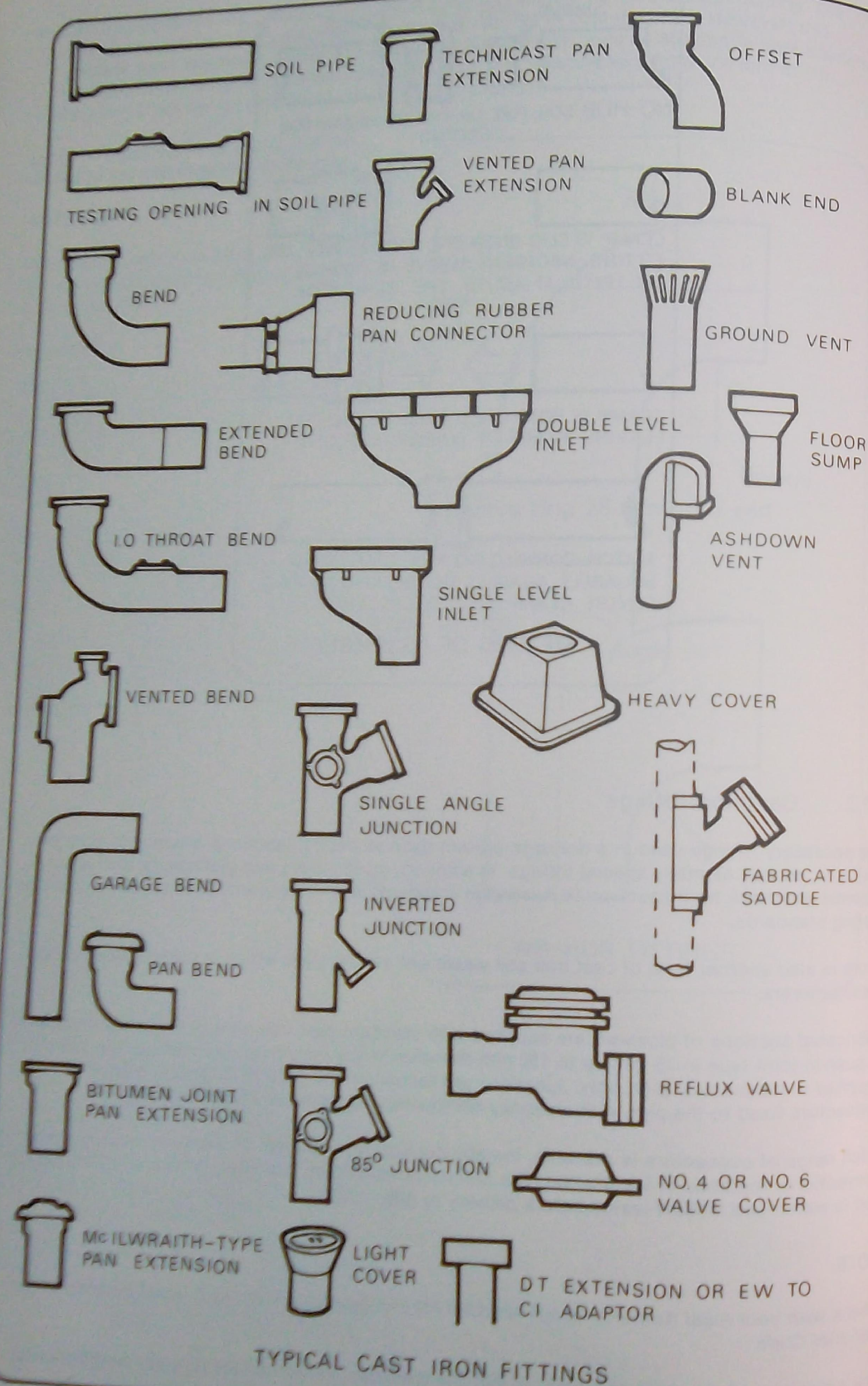
Fabricated sections of pipework are supplied with standard cast iron pipe in either mechanical or in push-in joint type in 75 mm up to 150 mm diameter in any length up to 3 metres. The 225 mm is supplied in mechanical joint only. Junctions are formed on the pipe by means of branch connectors fixed to the pipe with an epoxy compound and stainless steel bands.

A full range of connectors is available, thereby duplicating the range of standard junctions used in conventional methods of installation. The prefabricated system is entirely produced at the factory and is water- and MMBW-tested before delivery to site.

NOTE:

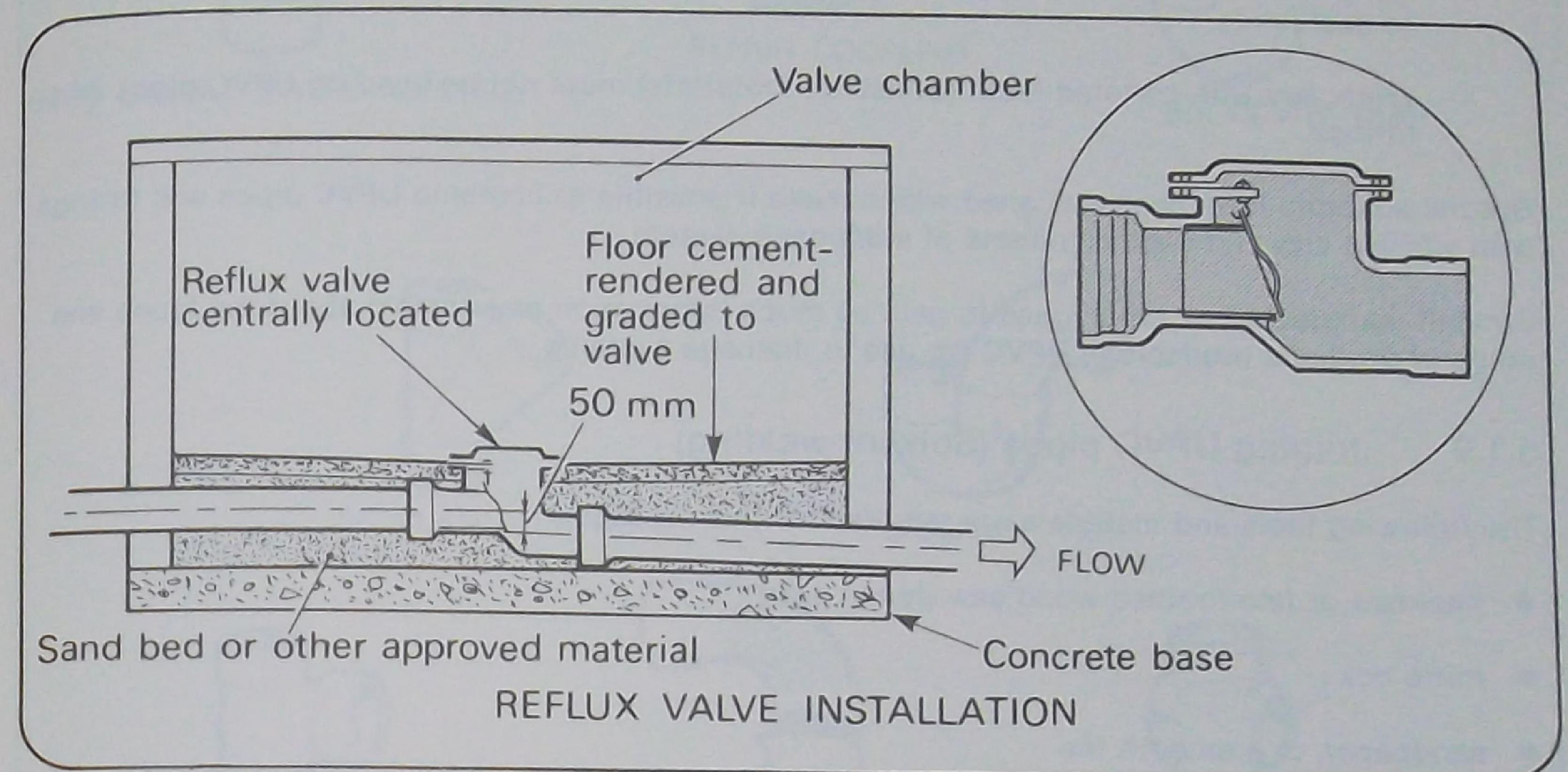
Check with your local Authority about approval for this type of system as it is not covered in the National Code.

The advantage of this type of system is that the branches, as well as the IO's can be positioned anywhere.



NOTE:

The names of cast iron pipes and fittings shown apply in most areas in Australia, but some may not be known as such and identified differently. The National Code makes no provision for possible variations in terminology. Check with your local Authority for clarification.



NOTE:

This reflux valve and chamber must be installed where an overflow relief gully cannot be provided on a house or property drainage installation, or where otherwise specified by the appropriate authority. It may be installed without the pit, provided it is in an accessible position and approved by the Authority. A ball-type reflux valve is also available.

5.1.8 Unplasticised polyvinyl chloride fittings UPVC 2, 20, 25, 32, 40, 50, 63, 75, 90, 110, 125, 150, 175, 200, 225, 250, 275, 300, 325, 350, 375, 400, 450, 500, 550, 600, 650, 700, 750, 800, 850, 900, 950, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900, 2000, 2100, 2200, 2300, 2400, 2500, 2600, 2700, 2800, 2900, 3000, 3100, 3200, 3300, 3400, 3500, 3600, 3700, 3800, 3900, 4000, 4100, 4200, 4300, 4400, 4500, 4600, 4700, 4800, 4900, 5000, 5100, 5200, 5300, 5400, 5500, 5600, 5700, 5800, 5900, 6000, 6100, 6200, 6300, 6400, 6500, 6600, 6700, 6800, 6900, 7000, 7100, 7200, 7300, 7400, 7500, 7600, 7700, 7800, 7900, 8000, 8100, 8200, 8300, 8400, 8500, 8600, 8700, 8800, 8900, 9000, 9100, 9200, 9300, 9400, 9500, 9600, 9700, 9800, 9900, 10000

Polyvinyl chloride (PVC) is a thermoplastic material now being widely used in the production pipes and fittings of all kinds.

The following properties make PVC economical to install and maintain:

- easy to mould, cut and join
- light and durable
- resistant to chemical attack
- flexible
- compatible with other fitting materials

UPVC pipes and fittings may be joined in various ways.

- With solvent cement, usually for small size fittings.
- With rubber sealing rings fitted in a groove in a spigot for larger pipes and fittings and for those systems subjected to some pressure, usually water-mains and large water services.

- By means of threaded joints.
 - For these, the thread is moulded during manufacture because, UPVC being notch sensitive, thread cutting as done in metals, is not possible on UPVC.
 - No hemp, sealing paste or solvent is used in such joints; only PTFE (polytetrafluoroethylene) tape is used as the sealant. Neoprene sealing rings are also used to seal joints.
 - Wrenches with serrated teeth (Stillsons, footprints) must not be used on UPVC pipes and fittings.

Special adaptors have been designed which make it possible to combine UPVC pipes and fittings with vitrified clay and cast iron items of a drainage system.

Consult manufacturers' catalogues to gain as much information as possible about the types and range of products available in UPVC for use in drainage systems.

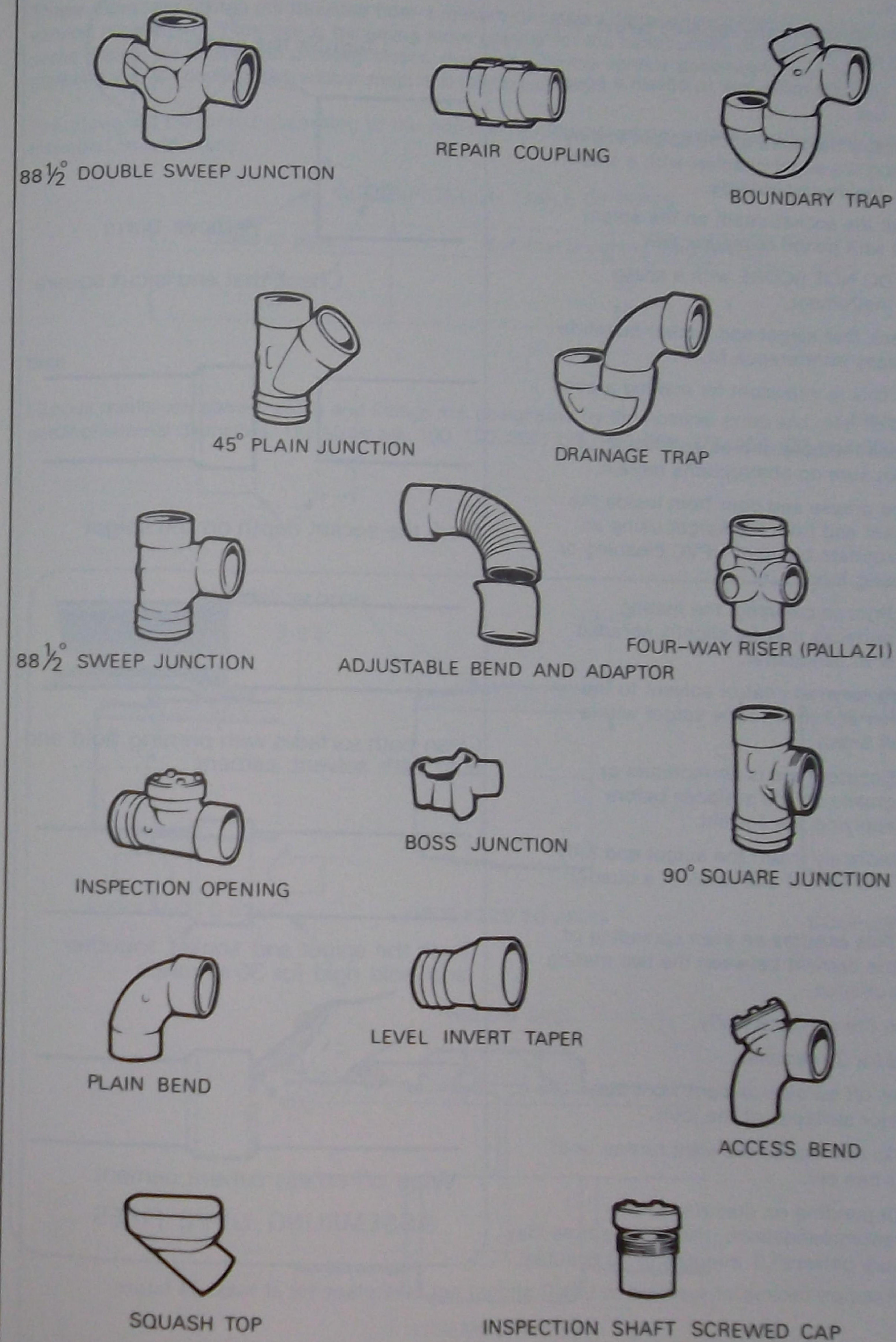
5.1.9 Joining UPVC pipes (Solvent welding)

The following tools and materials are required for this process:

- hacksaw or fine-toothed wood saw (tenon saw)
- mitre box
- sandpaper, or a smooth file
- marker pen or pencil
- UPVC cleaning fluid
- UPVC solvent cement
- small paint brush

NOTE:

UPVC piping must be manufactured to the Australian Standard. UPVC fittings must be tested to standards approved by the Sewer and Drainage Authority and bear its approval stamp.



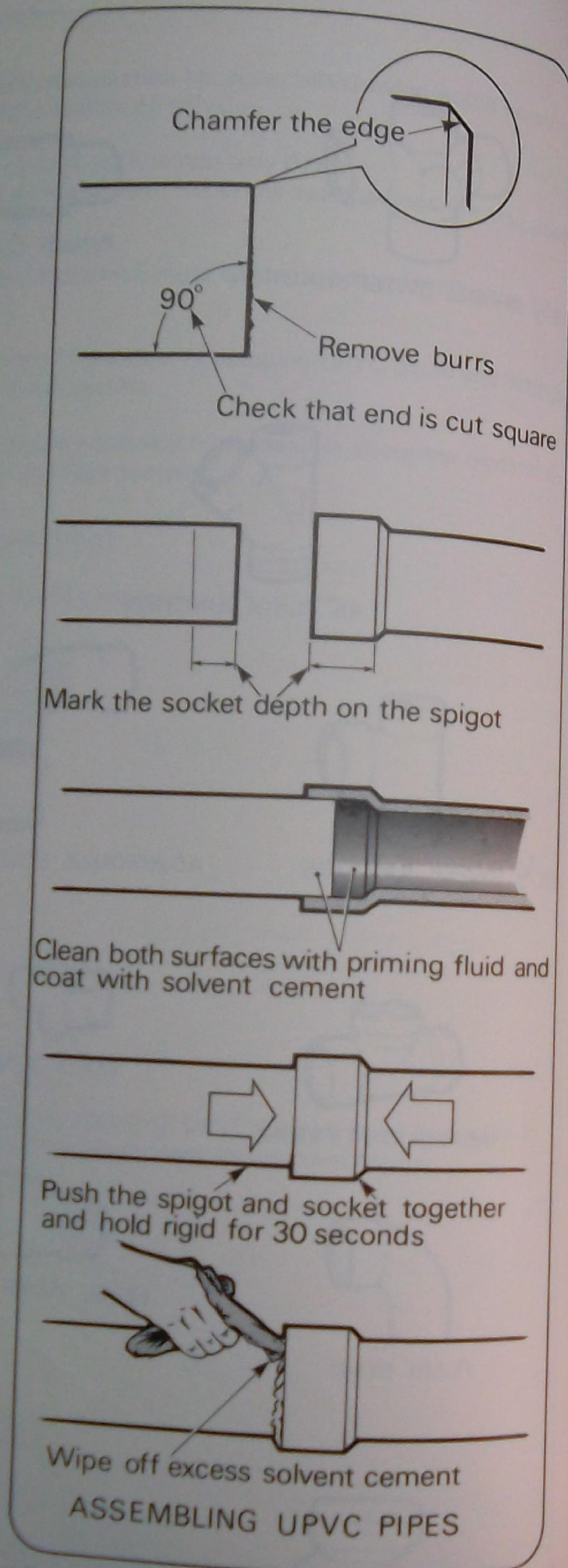
ASSORTMENT OF UPVC DRAINAGE FITTINGS

Solvent welding of UPVC pipes is done as follows:

- Cut the pipe to the required length with the saw.
 - Use the mitre box to obtain a square cut.
- Remove the burrs at the spigot end by giving it a slight chamfer with a smooth file, inside and outside.
- Mark the socket depth on the spigot end with pencil or marker pen.
 - DO NOT SCORE with a sharp instrument.
- Check that spigot and socket match to an easy interference fit.
 - This is important for making a good joint.
- Check the bore of pipe and fitting to make sure no obstructions remain.
- Wipe grease and dust from inside the socket and from the spigot using an appropriate brand of UPVC cleaning or priming fluid.
 - Prior to cleaning, the mating surfaces may be slightly abraded with sandpaper.
- Apply an even coat of solvent to the socket and then to the spigot with a small brush.
 - Ensure there is no moisture or grease on the surfaces before applying the solvent.
- Immediately insert the spigot end fully into the socket and rotate it a quarter turn.
 - This ensures an even spreading of the cement between the two mating surfaces.
- Align the parts carefully.
- Hold for 30 seconds.
- Clean off surplus cement from the exterior surfaces of the joint.
 - Do not handle the joint further until it has set.
 - Depending on manufacturer's recommendations, this setting time may vary between 3 minutes to 30 minutes.
 - Pressure testing of systems in UPVC should not take place for at least 24 hours.

NOTE:

The solvent cement is not a filler. It is important for the joint to be an interference fit. The brush used to apply the cement will harden when not in use or when immersed in the cement. It can be cleaned and softened with acetone.



5.1.10 Fibrous reinforced cement pipes and fittings

These pipes and fittings are moulded from a mixture of cement, fibrous reinforced fibres and water to varying proportions. Their use is becoming more popular for the construction of main sewers, and in some States, for house and property drains, depending on the various authorities. Each pipe is supplied with a coupling, two rubber rings and jointing lubricant.

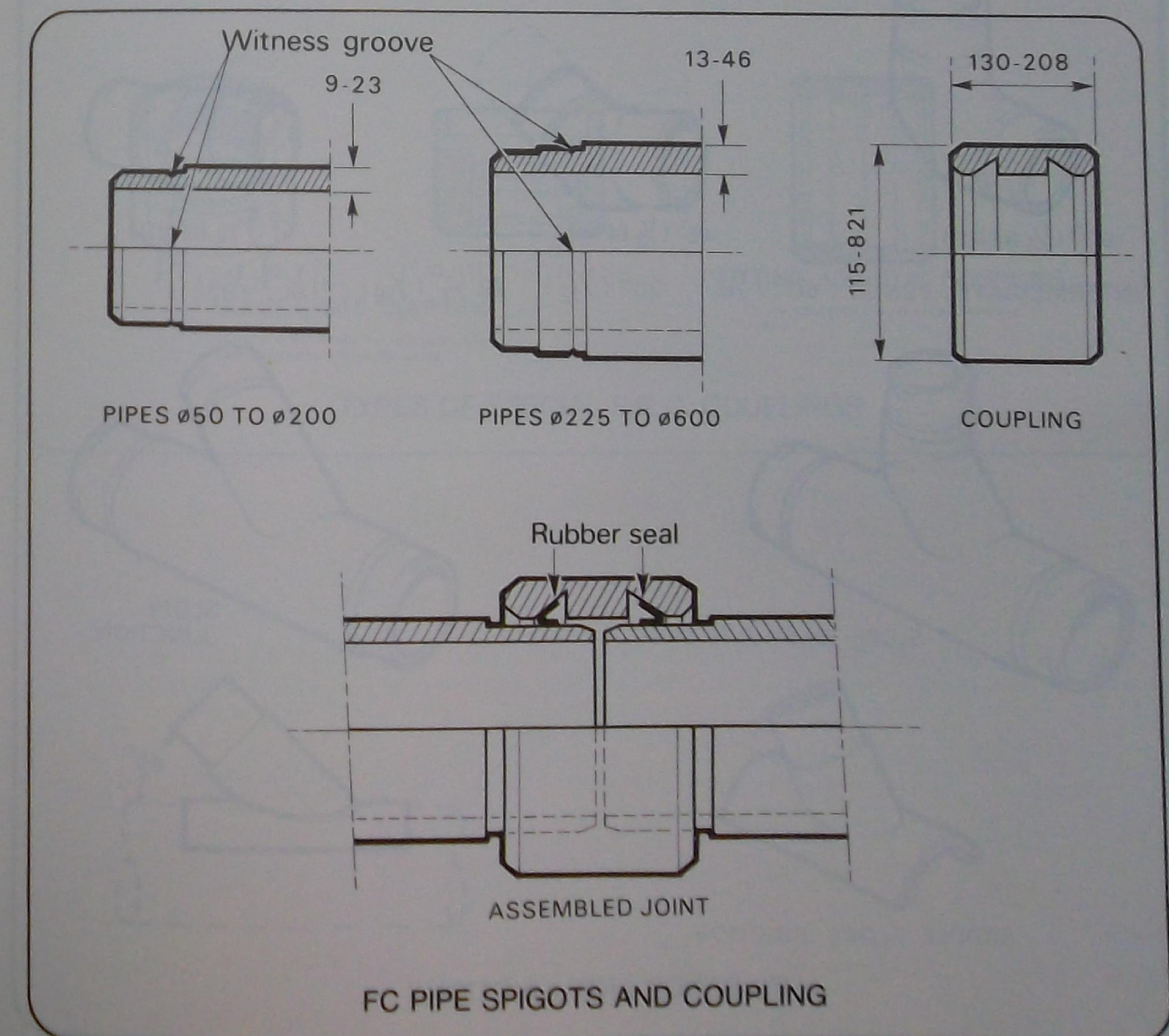
The pipes are classified according to the nominal crushing load per metre length which they are intended to withstand.

CLASSIFICATION TABLE OF PIPES

Class of pipe	Nominal crushing load (kN/m)
35	35
50	50

Size

Fibrous reinforced cement pipes and fittings are designated by the nominal sizes and refer to the nominal internal diameters. The sizes are: 100, 150, 200, 225, 250, 300, 375, 450, 525 and 600 mm.

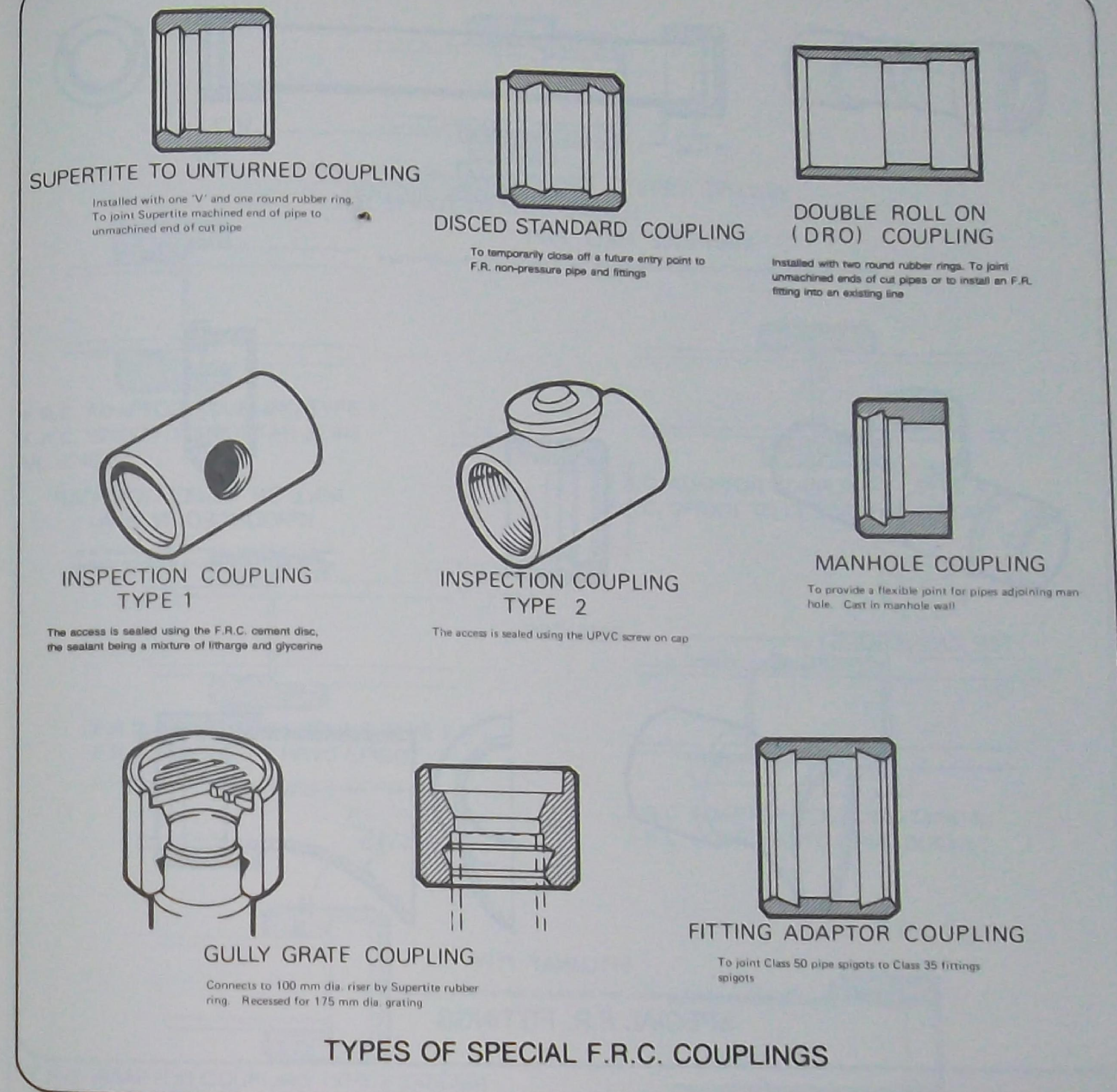
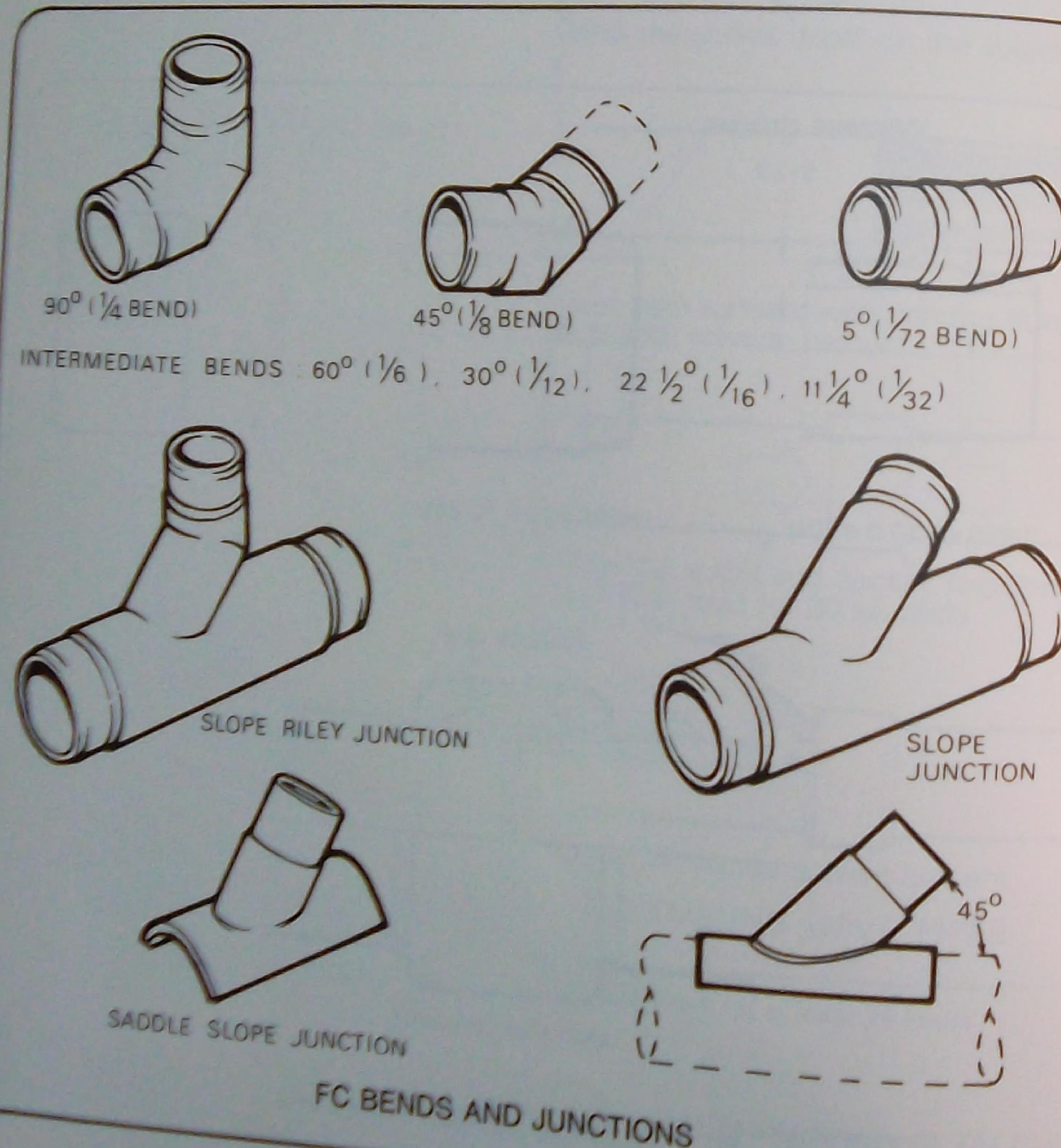


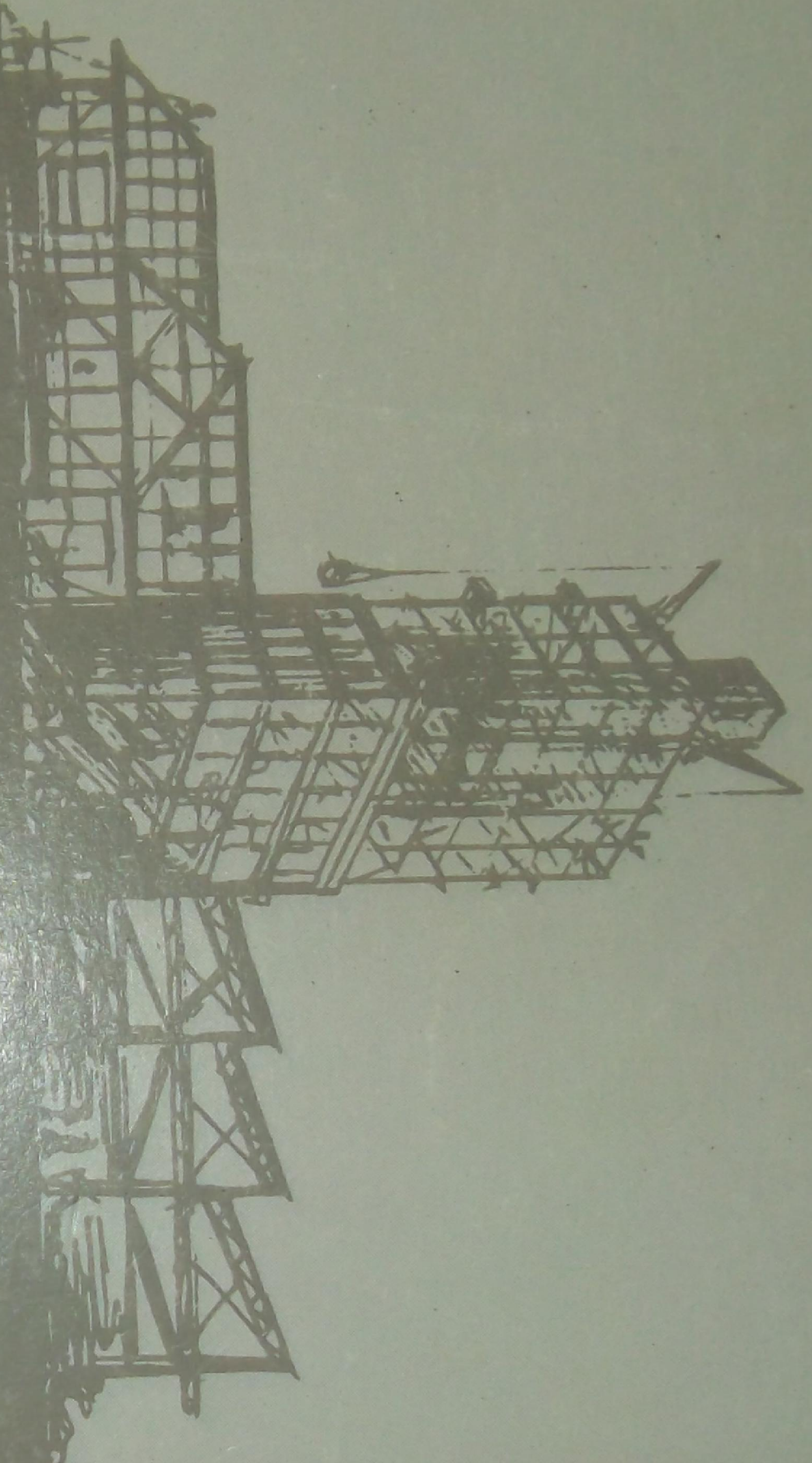
The finish on the pipes is such that they can be cut, drilled and tapped. They are also marked clearly with the class of pipe and size. The standard length of pipe is 4 m (± 10 mm) and is tested to a pressure of 350 kPa without showing any leakage, sweating or other defect. This also applies to all pipe couplings.

5.1.11 Fittings

The fittings are manufactured from the same material as the pipes and have similar qualities, although they are hydrostatically tested to a pressure of 250 kPa. The fittings must comply with the dimensional requirements of the pipes. Fittings may be built as individual fittings, e.g. junction, bend, inspection opening or they may be built-up from suitable lengths of straight pipe, e.g. junctions. The inside bore must have a flush finish and the joint made with an epoxy resin or other material approved by the manufacturer.

Fittings with machined ends are for use with fibrous reinforced cement non-pressure pipes. They can be jointed to Supertite machined ends of pipes with Supertite couplings, or to unmachined barrels of pipes with Supertite to Unturned couplings. They can also be jointed to Adcol sockets of stormwater drain pipes.





BASIC TRAINING MANUAL

10-2

Sanitary Plumbing

Drainage Pipes and Vents

NATIONAL BUILDING AND CONSTRUCTION
INDUSTRY TRAINING COMMITTEE



BASIC TRAINING MANUAL

10-2

Drainage Pipes and Vents

This manual has been produced as the result of the need to update existing manuals in line with the revised National Plumbing Code and to have comprehensive manuals on the aspects of plumbing available for trainees in the trade.

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 have approved this publication on behalf of the National Training Council.

The panel consisted of:

Mr. J. Rutherford	— (Chairman) Plumbers and Gasfitters Employees' Union.
Mr. L. Fraser	— TAFE
Mr. R. Kelly	— Lecturer — State College of Victoria (Hawthorn), seconded from the Technical Division, Department of Education (Vic.).
Mr. J. Park	— Melbourne and Metropolitan Board of Works.
Mr. A. Quick	— Quick Contracting Pty Ltd, representing employers.
Mr. J. R. M. Jentzema	— Department of Employment and Industrial Relations.

The manual was prepared by the Manuals Unit of the Industry Training Services Branch of the Department of Employment and Industrial Relations.

The advice and valuable contributions given to the successful production of this publication by the panel are gratefully acknowledged.

EDITOR: Mr. J. R. M. Jentzema.

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