Trade of Metal Fabrication	
Module 5:	Pipe Fabrication
Unit 7:	Pipe Development Unequal Diameter Oblique 'T' Piece
	Phase 2

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Document Release History

Date	Version	Comments
13/02/07	First draft	
13/12/13	SOLAS transfer	

Module 5 – Pipe Fabrication

Unit 7 – Pipe Development Unequal Diameter Oblique 'T' Piece

Duration – 8 Hours

Learning Outcome:

By the end of this unit each apprentice will be able to:

- Fabricate an off-set oblique “T” piece in unequal pipe sections
- Develop intersections in unequal pipe sections
- Align flange square to pipe
- Describe the use of abrasive discs, pickling, descaling
- Calculate density of material
- Calculate approximate length of welded joint
- Identify and describe types of gaskets used in pipe gaskets

Key Learning Points:

Sk Rk D	Development of oblique intersections in unequal pipe sections.
Sk Rk D	Indexing of points.
Sk Rk	Fabricate pipe intersections.
Sk Rk	Alignment of sections and flanges.
Rk	Metal protection - surface preparation.
M	Mensuration - density.
M	Geometry - the circle (proportional area).
Rk	Gaskets and seals (rubber, cord, composite materials, cork, o-rings, rope packing).
P	Communication, teamwork and safety awareness.

Training Resources:

- Drawing equipment
- Template material
- Fabrication workshop and equipment, safety clothing and equipment
- Handouts, notes and technical manuals
- Pipe sections M.S. plate
- Samples of gaskets and seals

Key Learning Points Code:

M = Maths D= Drawing RK = Related Knowledge Sc = Science

P = Personal Skills Sk = Skill H = Hazards

Circles

A circle is a plane figure which is bounded by a curved line called the circumference, which is always the same distance from a fixed point called the centre of the circle. Alternatively we could define a circle by saying that it is the path traced out by a point which moves in a place in such a way that its distance from a fixed point is always constant. This distance from the centre to the circumference is the radius of the circle.

A diameter is a straight line passing through the centre and bounded by the circumference. Clearly the diameter of a circle is twice the radius.

An arc is the name for the part of the circumference between any two points on it.

A chord is a straight line which joins any two points on the circumference.

A segment of a circle is the area which is bounded by a chord and the arc it cuts off.

A sector of a circle is the area which lies between two radii and the arc between them.

A quadrant is the area bounded by two radii which are at right angles to each other and the arc which lies between them. It is a quarter of a circle.

A semi-circle is the area bounded by a diameter and that portion of the circumference which it subtends. As its name implies it is half the area of the circle.

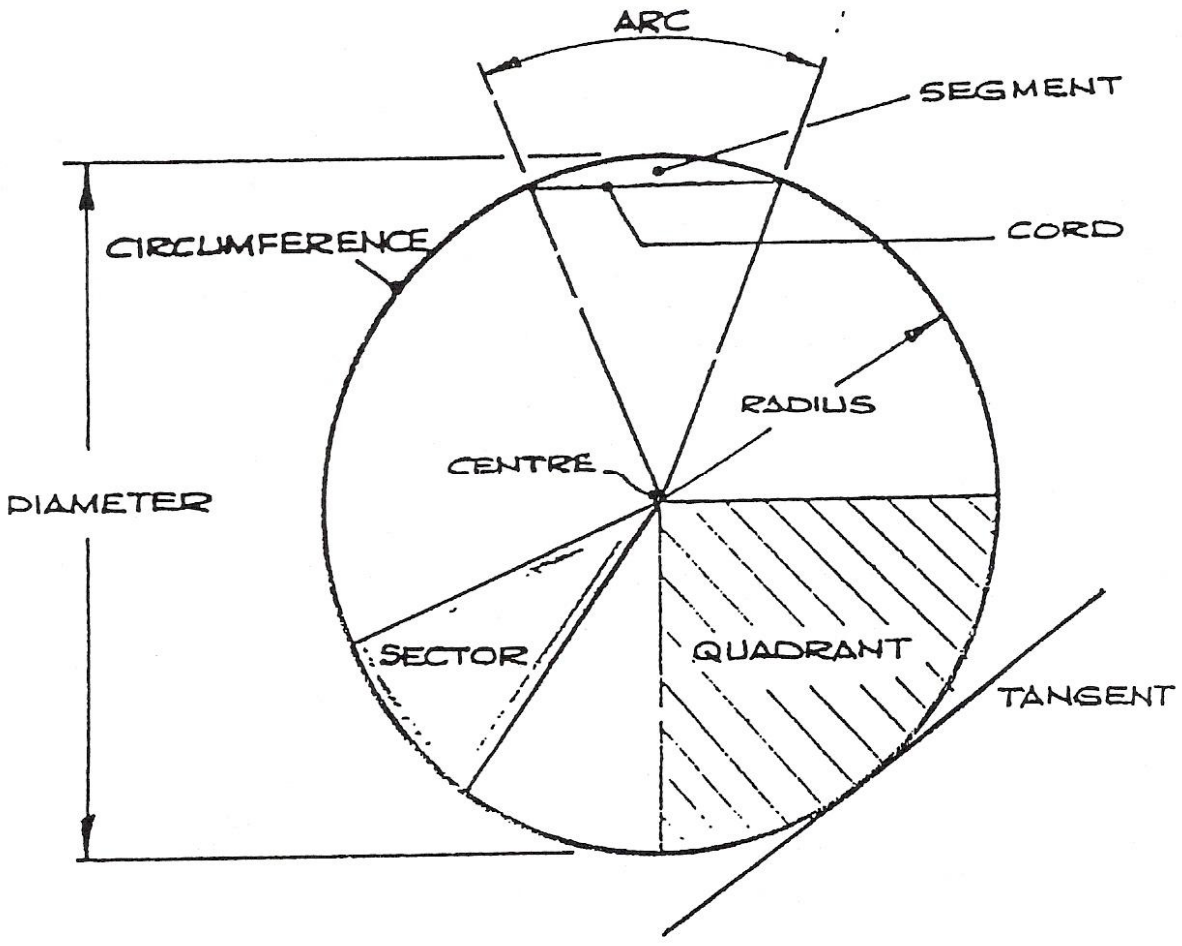


Figure 1 - Circles

Oblique Intersections & Unequal Pipe Sections

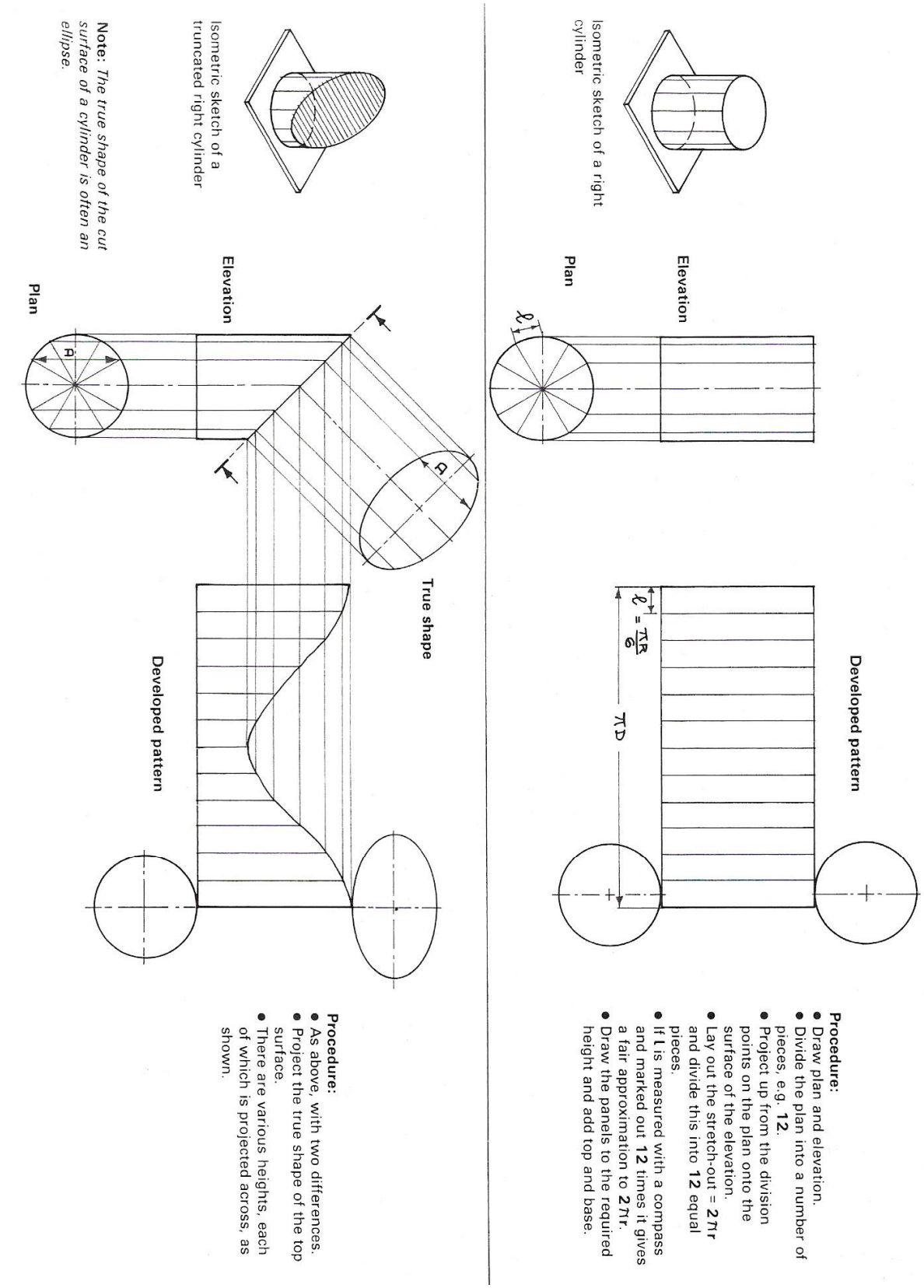


Figure 2 - Right Cylinders

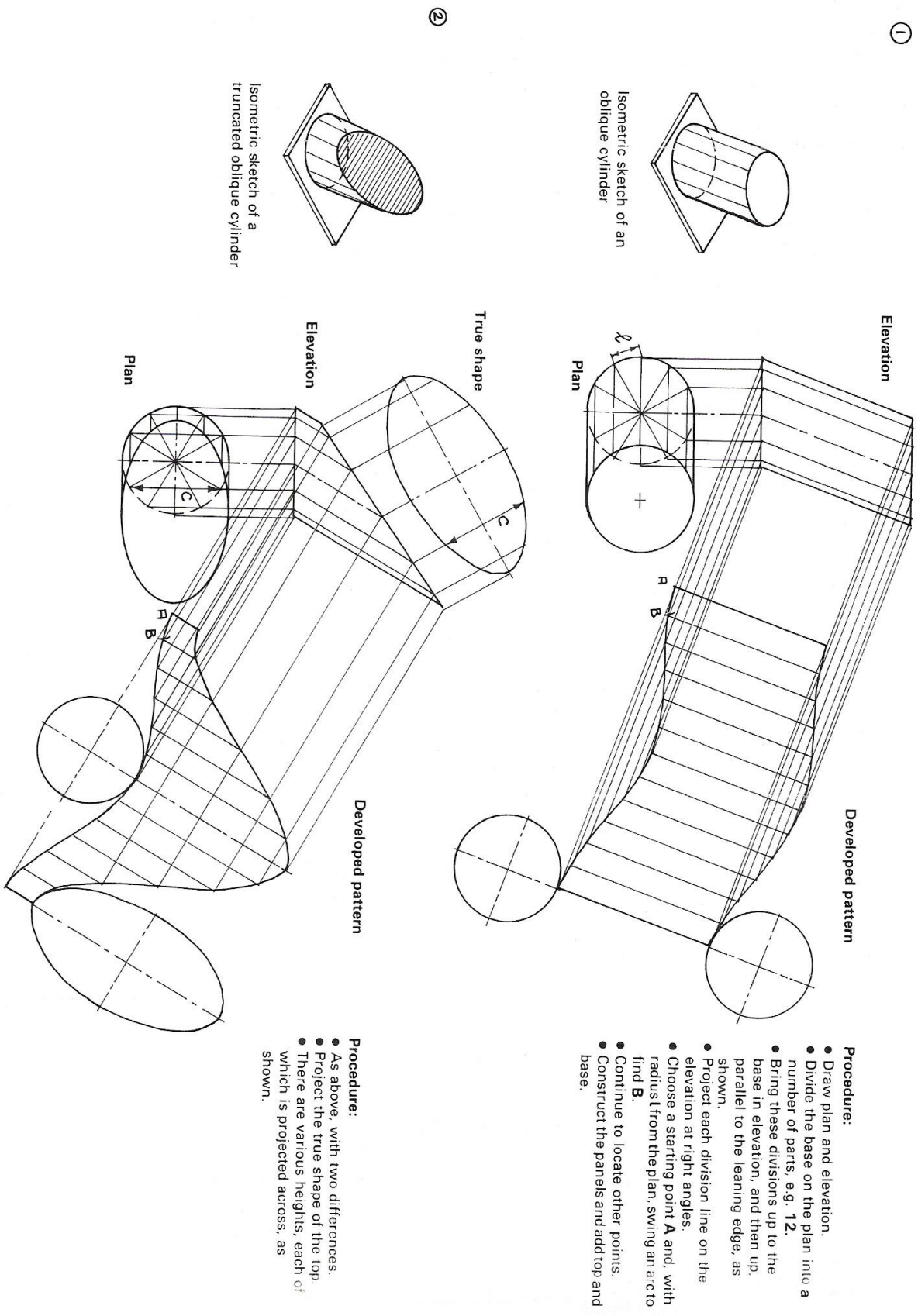


Figure 3 - Oblique Cylinders

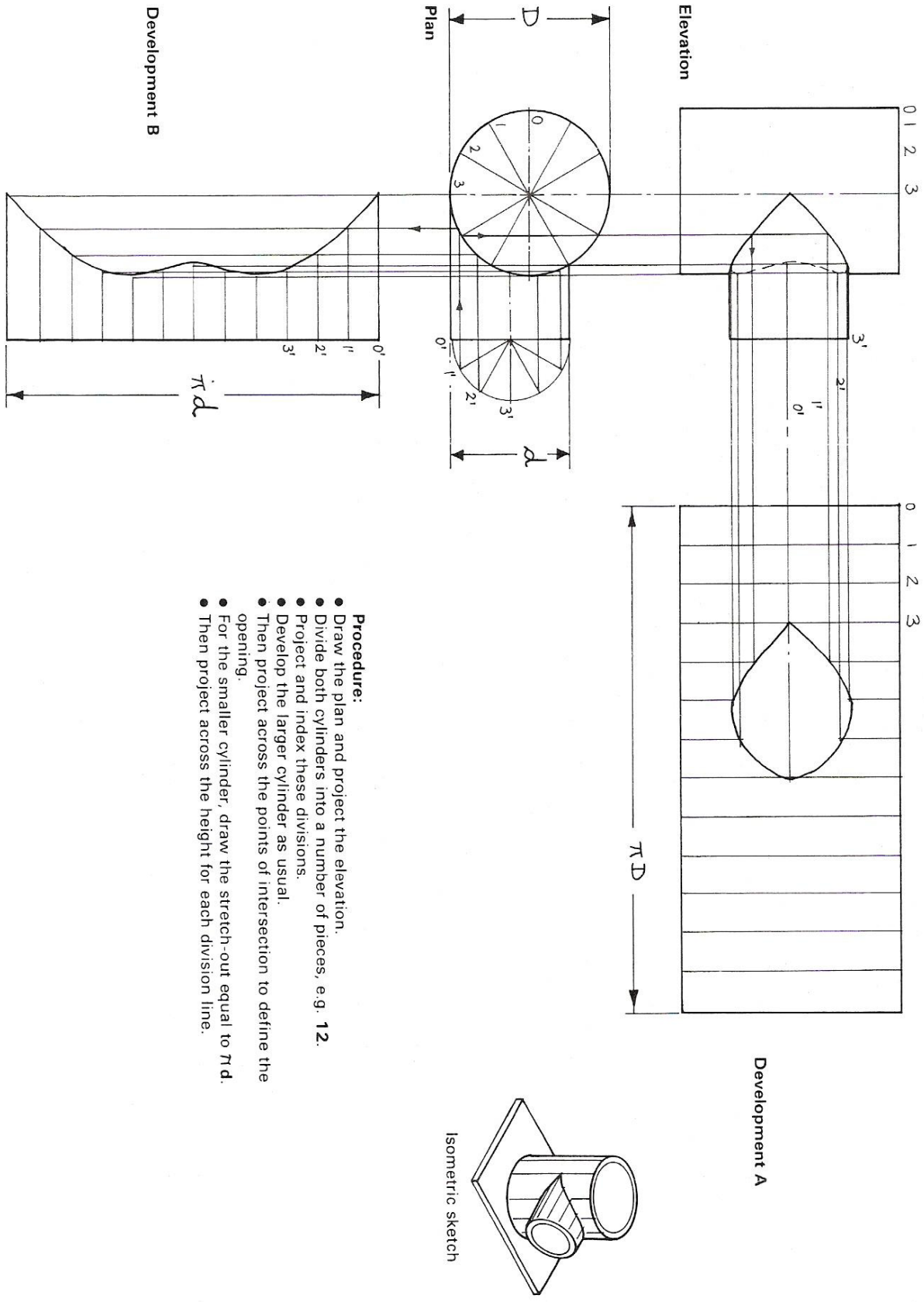


Figure 4 - Two Connecting Pipes

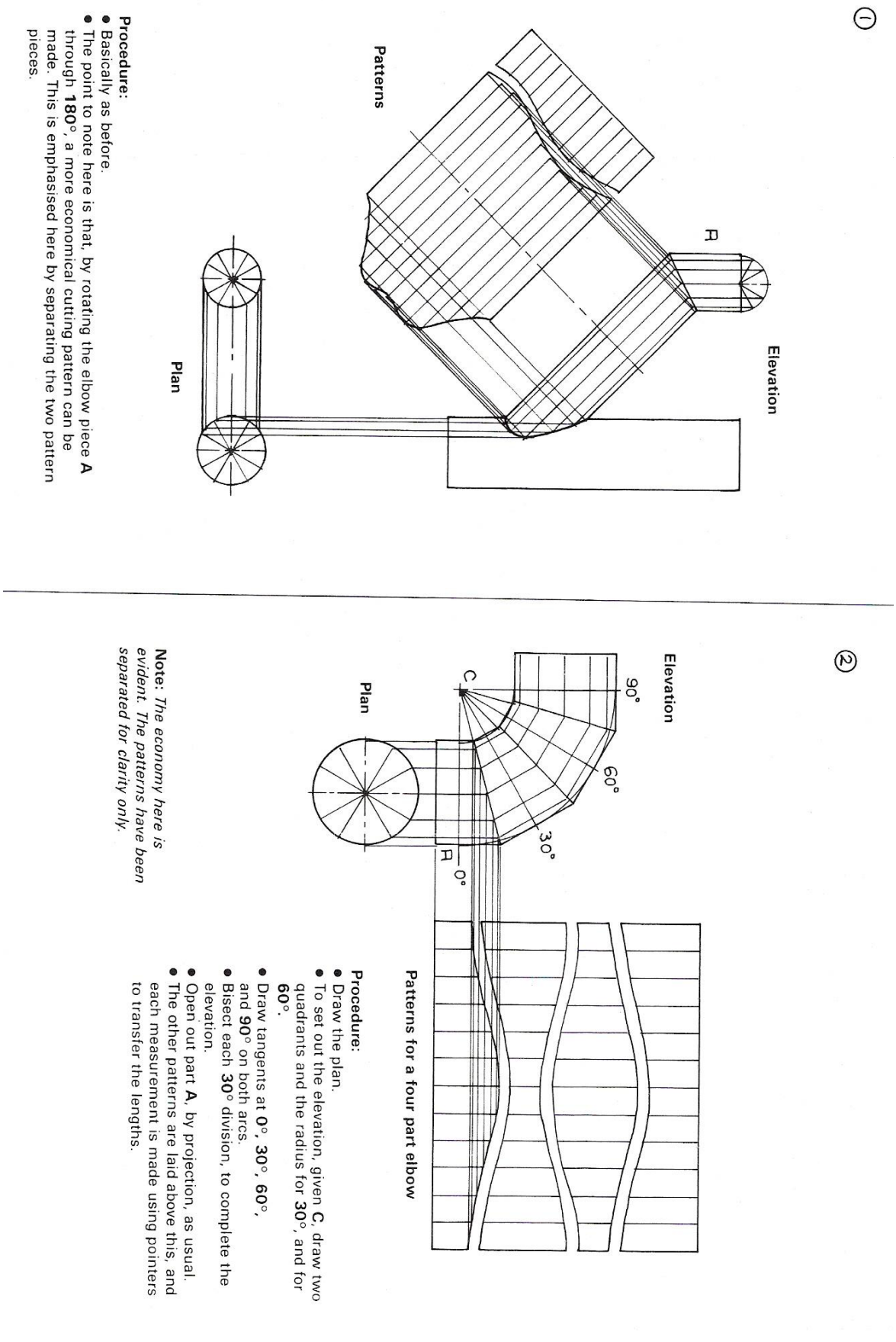


Figure 5 - Elbow Joints

Gaskets & Seals: Pipe Intersections

Pipes and Fittings

Figure 6 shows exploded views of straight pipe line assemblies showing both the standard and spherical design of end connections.

Pipes and fittings have conical shape or buttress ends with standard flat face or, if required, the ends are spherically ground.

The system ranges from 15 mm to 600 mm bore and fittings are designed to meet all conditions of piping layout within the limits of the allowable pressure/temperature conditions including straight pipes up to 3 metres long.

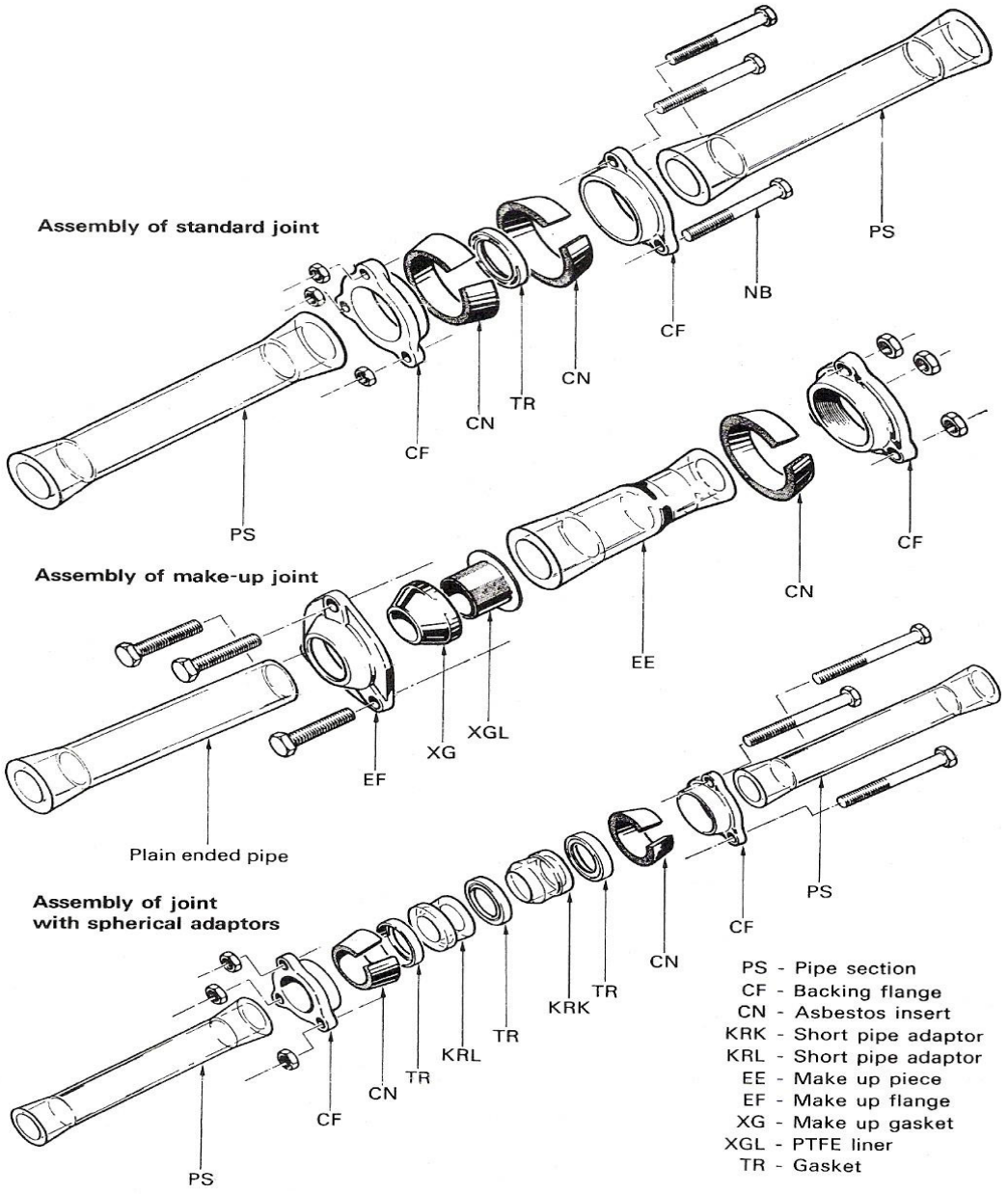


Figure 6 - Glass Pipe Assemblies

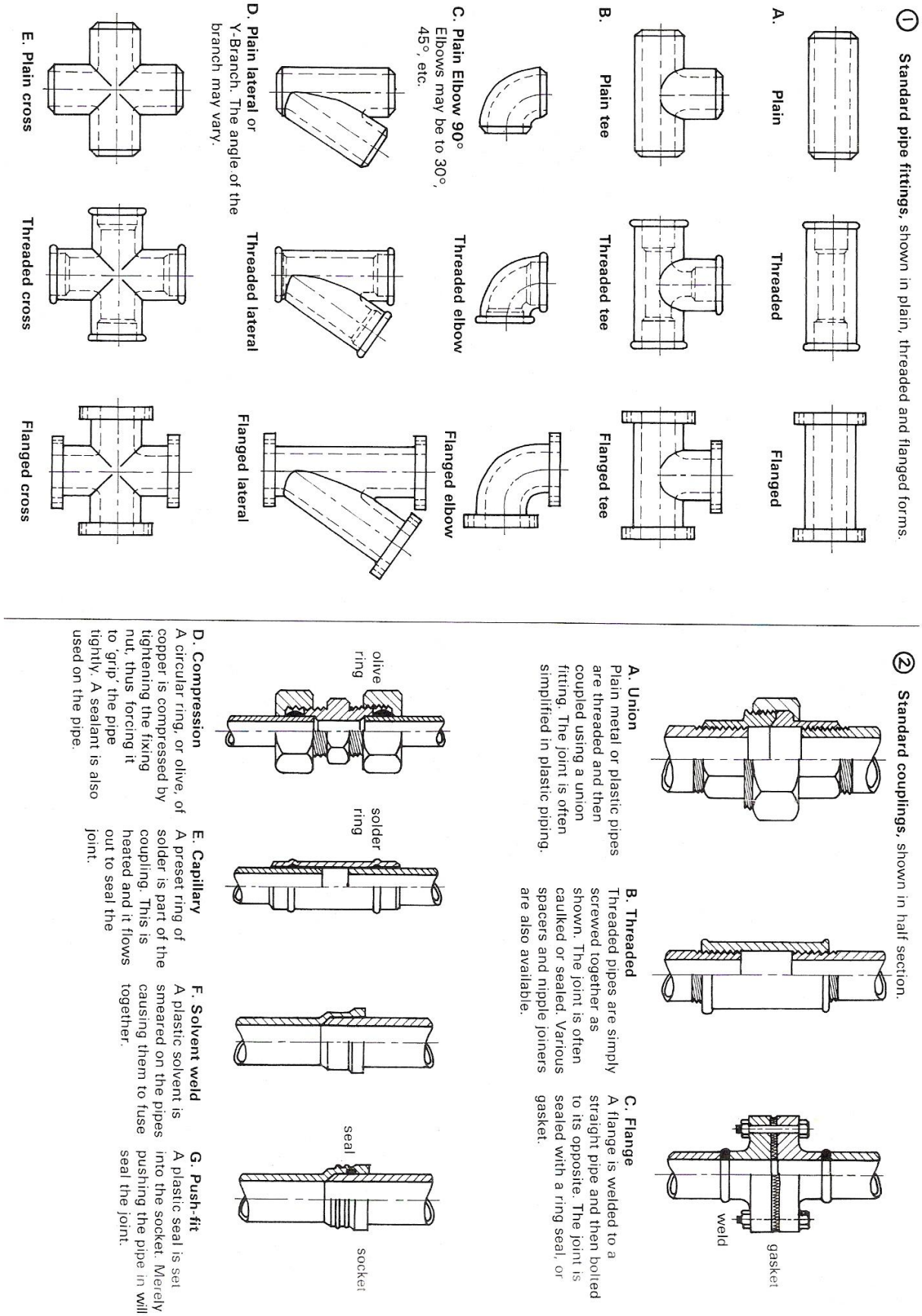
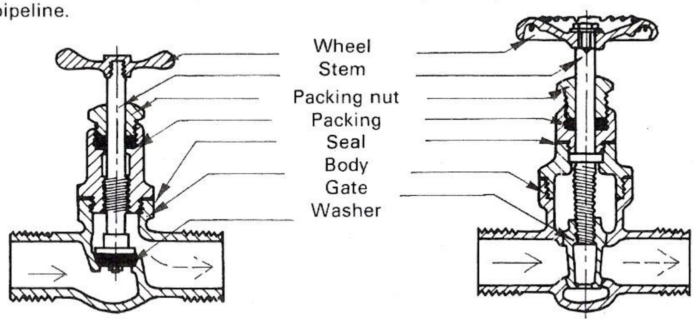


Figure 7 - Pipe Fittings and Couplings

① **Valves**

- Valves are used to stop or limit the flow of a liquid, or gas, in a pipeline.



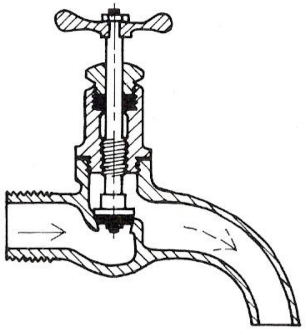
Globe valve

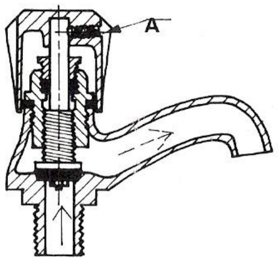
- Globe valves have an almost spherical body. The stem may be vertical or at an angle.
- These valves are good for the close regulation of flow but also tend to lower the pressure of a system.

Gate valve

- Here a gate is either turned or made to rise and so blocks or opens the pipeline.
- Gate valves are only used in cold low pressure systems.

② **Taps** • Taps are used to drain off a liquid from a pipeline.





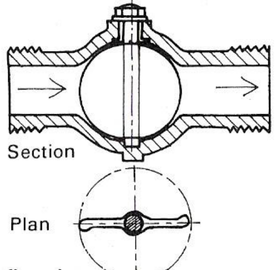
Globe tap

- The principle is similar to that of the globe valve above.
- Regulation is easy and accurate. However, as the water has to swirl around the bends, some pressure is lost.

Pillar tap

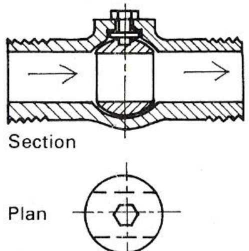
- This is similar to a globe tap. However here the water enters vertically, which simplifies the plumbing arrangements.
- Notice also the alternative cap, which is fixed to the stem with the grubscrew **A**.

③ **Various valves** • There are dozens of variations on the basic valve design. Two well known variations are shown here.



Butterfly valve

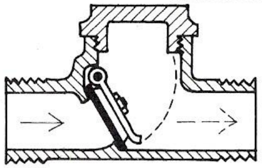
- This is sometimes known as a choke valve from its use in carburettors.



Ball valve

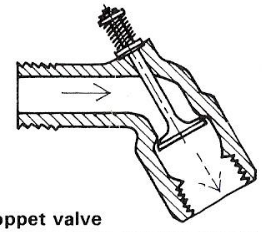
- A bearing is drilled and can be turned to limit or to cut off the supply.

④ **Safety valves** • Valves can be designed to work within limits and to react to increases in pressure, or heat, or counterflow.



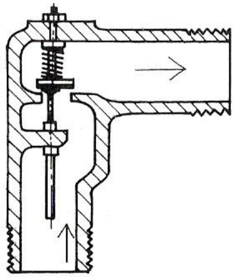
Swing valve

- This is a non-return valve. Pressure is allowed in one direction only. A flow in the other direction closes the valve. Used in gas pipes.



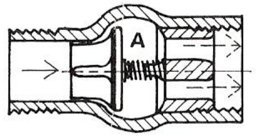
Poppet valve

- This controls the flow and is also a non-return valve. The valve can be opened by the flow or worked by a cam, as in car engines.



Thermostatic valve

- The rod **A** extends with a rise in temperature and pushes the valve **B** to release the flow.



Feed check valve

- A variant of the spring valve. Here the flow is limited or checked by the gap **A**, which is adjustable.

Figure 8 - Valves

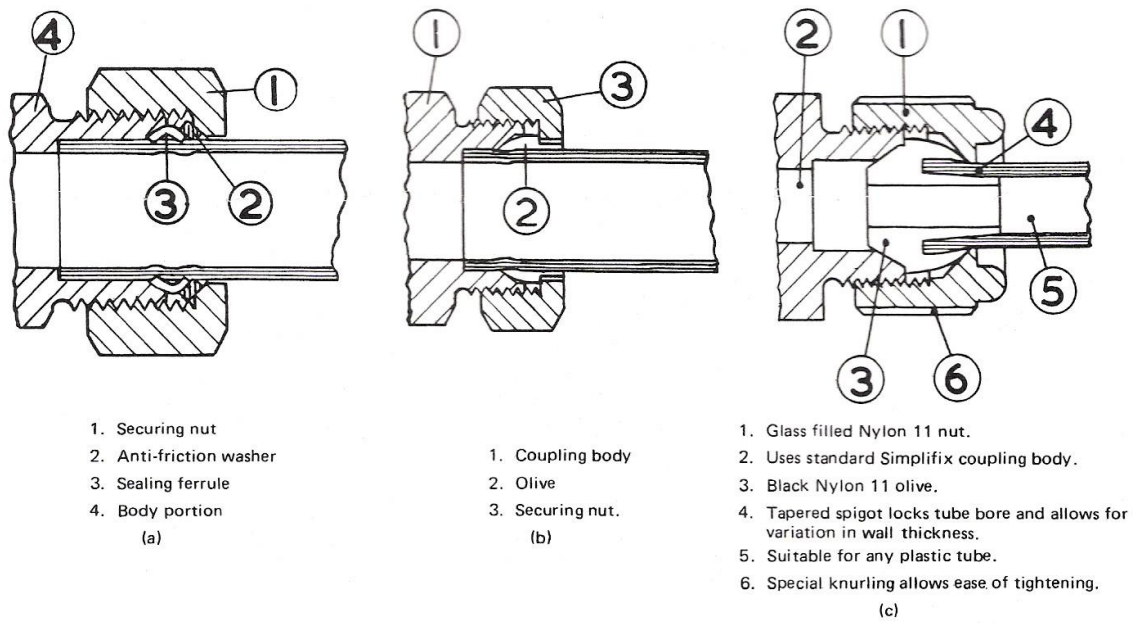
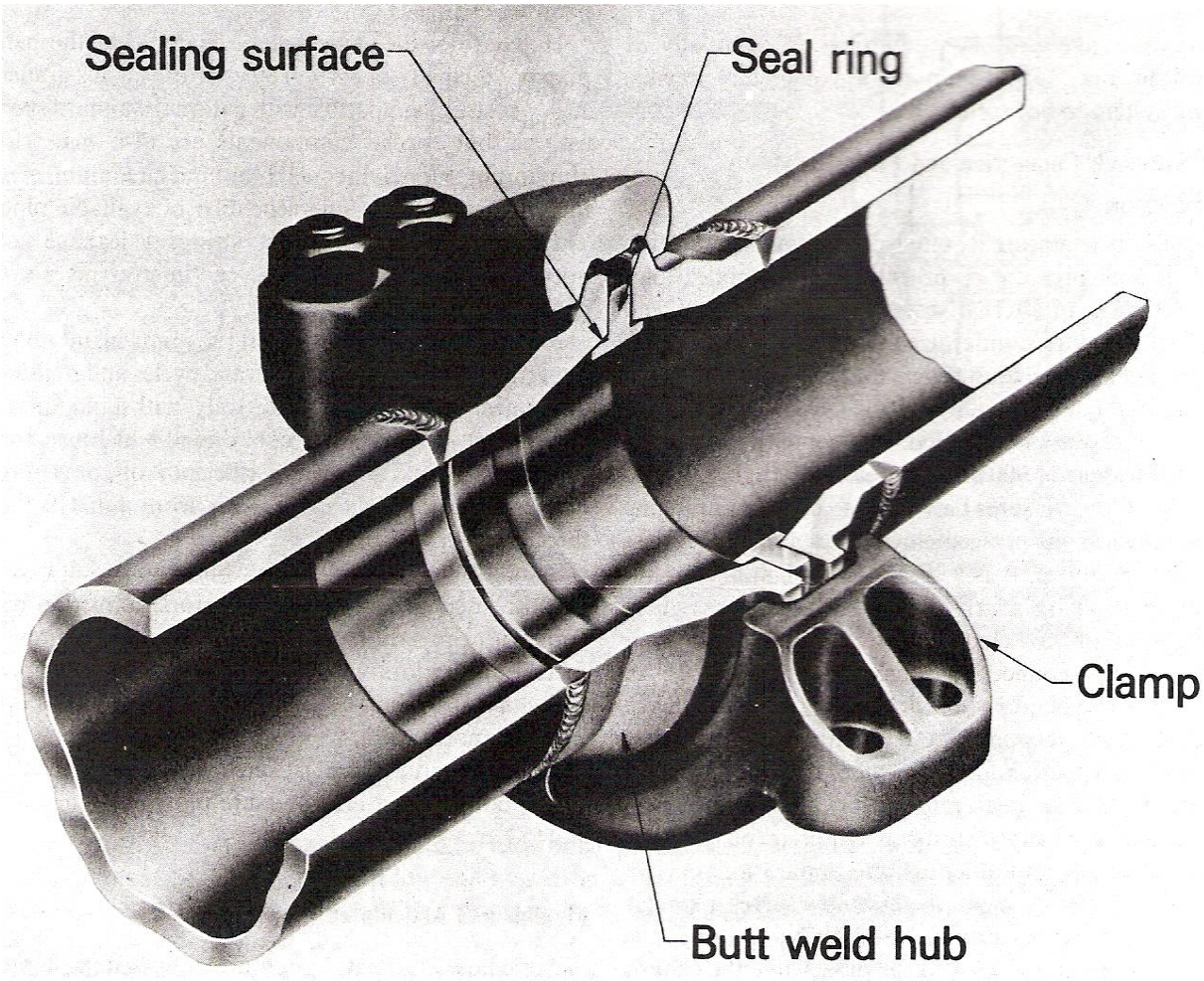


Figure 9 - Compression Joints

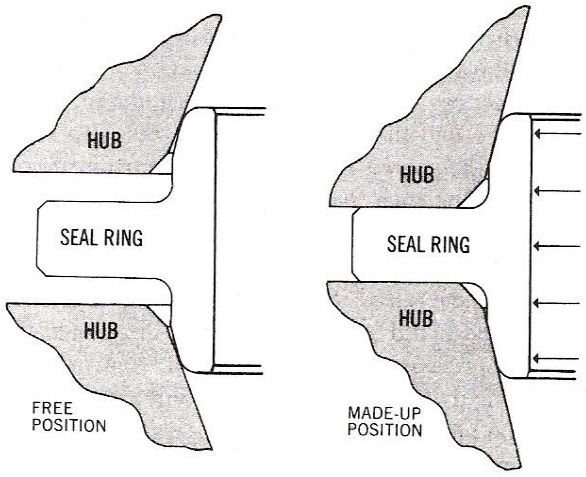
The coupling was originally applied to copper tube of preferred semi-hard condition, but satisfactory joints can also be made on fully hardened tube. For fully annealed copper tube the coupling should be used only for applications where the pressure is low and where the joints are not required to be broken and re-made frequently.

In the past few years the use of nylon and other types of plastic tubing has increased considerably, mainly as a requirement against corrosion, and the coupling is also applied to semi-rigid plastics and nylon tubing, to soft plastics and to glass tube.

Type of Coupling	Size Range	Maximum Pressure	Remarks
Figure 9(a) for metal tube	1/8 in. (3mm) to 2 in. (50mm) outside diameter in 16 sizes	Hyd. 210 bar to 35 bar Pneum. 70 bar to 11 bar	Pressures according to tube size and based on working temperatures of 30°C
Figure 9(b) for nylon tube	1/8 in. (3mm) to 3/4 in. (19mm) outside diameter in 8 sizes	42 bar to 14 bar	Up to 60°C and according to size (can be used up to 100°C for intermittent use)
Figure 9(c) for soft plastics and glass	1/8 in. (3mm) to 1/2 in. (12.5mm) bore in 5 sizes	Up to 7 bar (5 bar for 1/2 in size)	Ethylene-vinyl acetate tube, maximum temperature 60°C



(*a*)



(*b*)

Figure 10 - Graylock Assembly

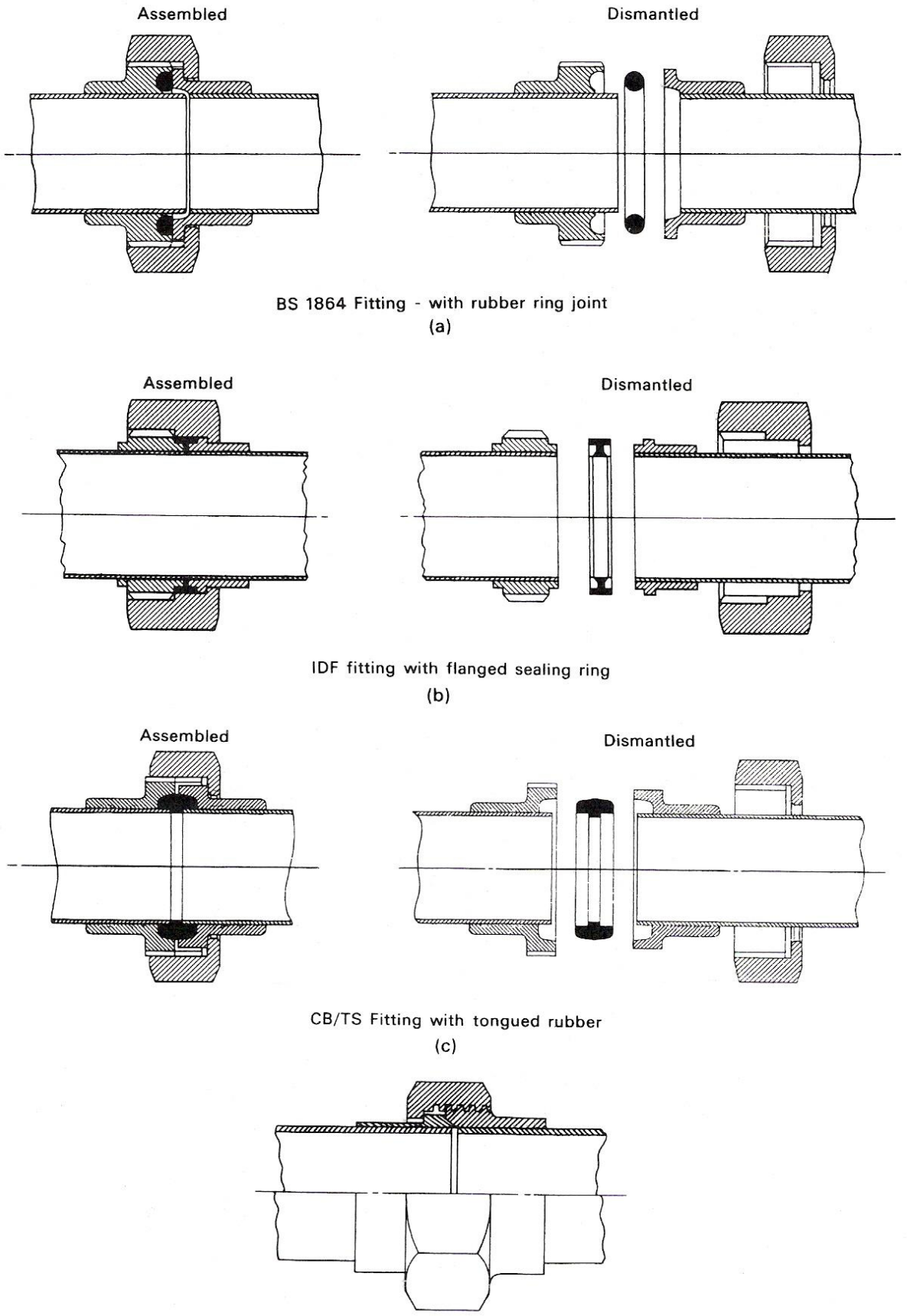


Figure 11 - Standard Joints for Hygienic Piping

Figure 12 - Articulated Marine Loading Arm

Self Assessment

Questions on Background Notes – Module 5.Unit 7

No Suggested Questions and Answers.

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