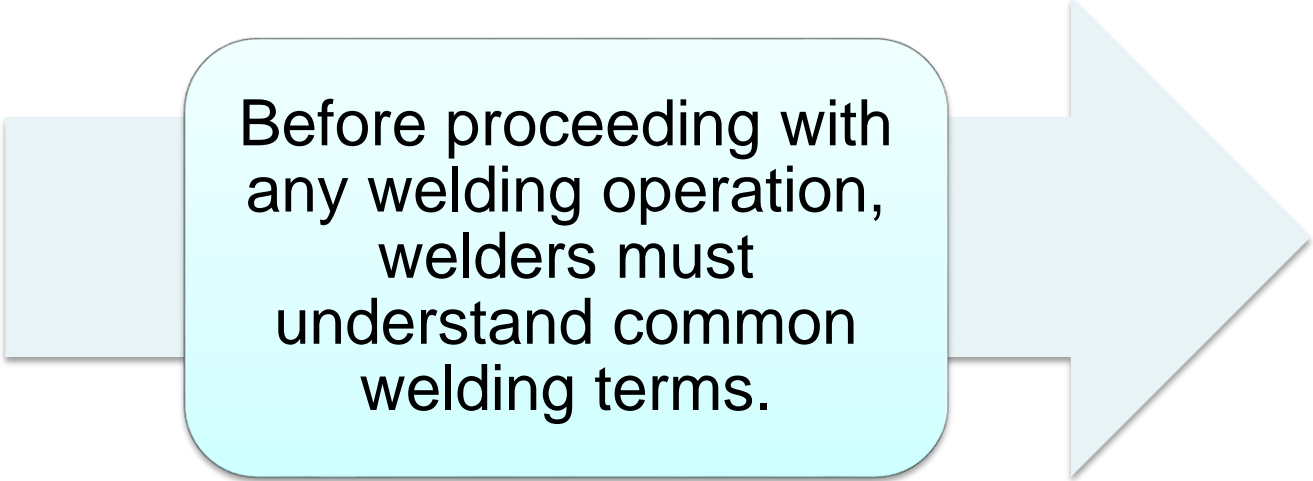


Joint design & Welding terms



Before proceeding with any welding operation, welders must understand common welding terms.

Objectives

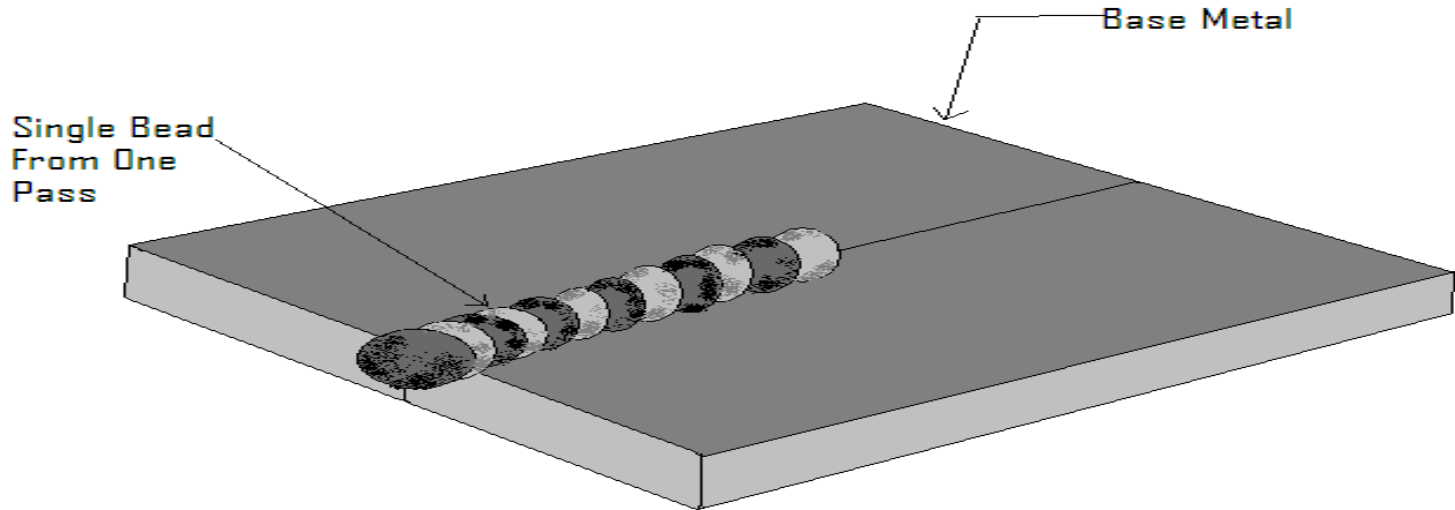
After completing this chapter, the student should be able to:

- List the five major types of joints
- Understand the basics of joint design
- List five major factors related to joint design
- Identify the orientations of welds
- Explain the parts of groove welds
- Explain the parts of fillet welds

Key Terms

- Joint Type
- Weld Types
- Base Metal
- Filler Metal
- Weld Bead
- Weld Pass
- Fillet (F)
- Grooves (G)
- Welding Position
- Joint Dimensions
- Edge preparation
- Face
- Root
- Leg
- Toe
- HAZ
- Throat
- Backing

- The **base metal** is the metal or alloy that is to be welded.



- Filler metal** is the metal deposited in a welded, brazed, or soldered joint during the welding process.
- a **weld bead** is a weld that results from a weld pass.
- a **weld pass** is a single progression of welding along a weld joint.

Joint Design

- The way pieces of metal are put together or aligned with each other
 - Butt joint
 - Lap joint
 - Tee joint
 - Outside corner joint
 - Edge joint

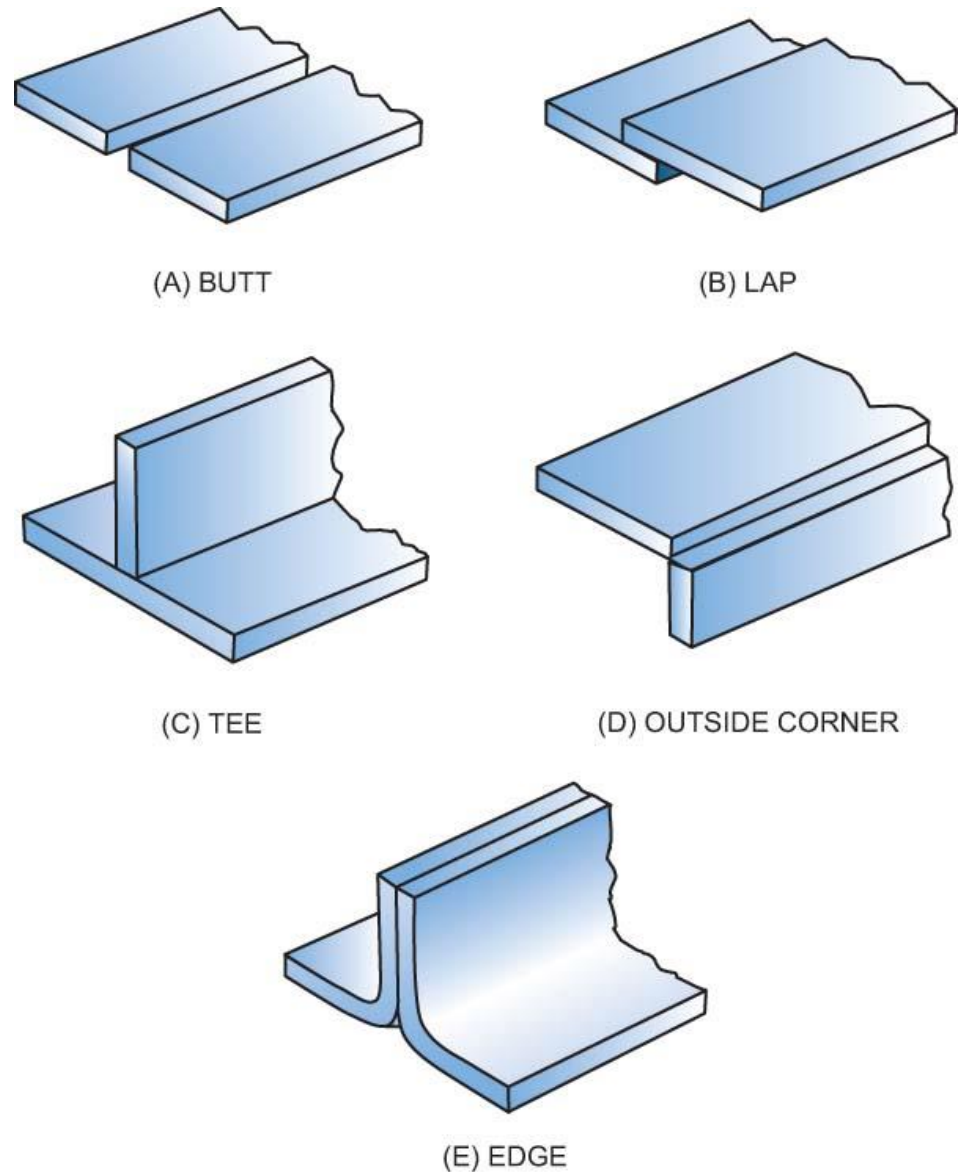


FIGURE 20-1 Types of joints.
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Weld Joint Design (cont'd.)

- Weld- joint
 - Purpose is to join parts together so stresses are distributed

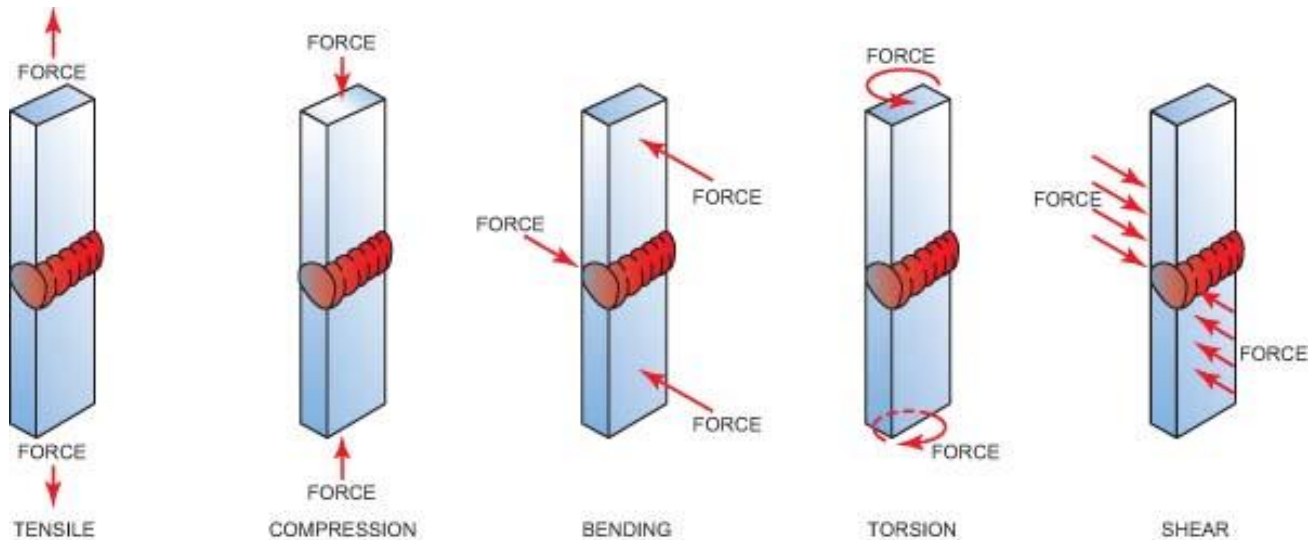


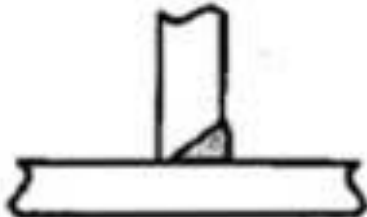
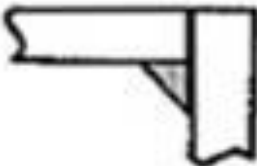
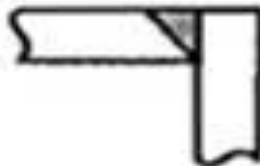
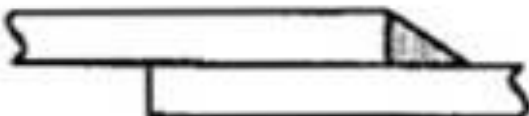


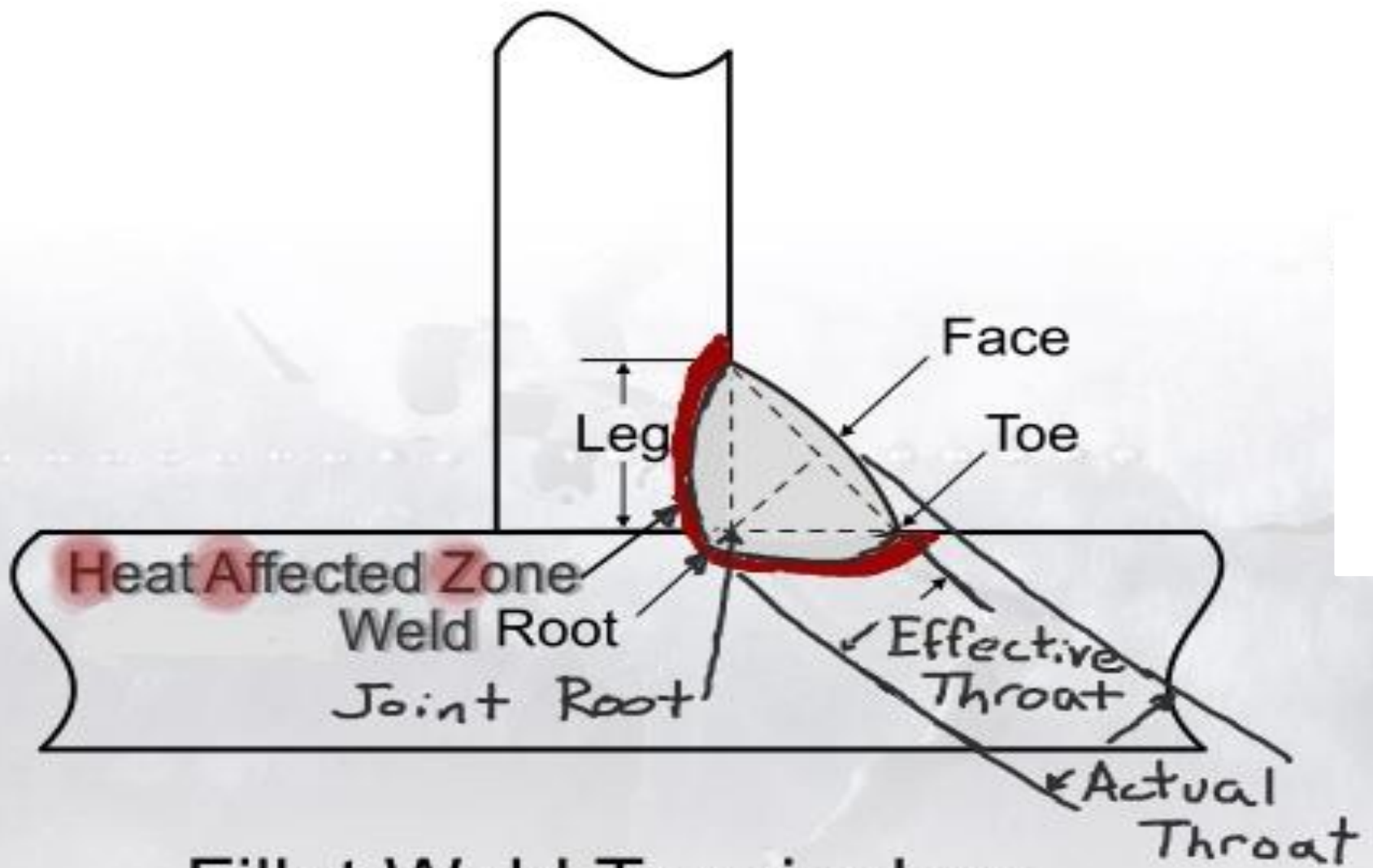
FIGURE 20-5 Forces on a weld.

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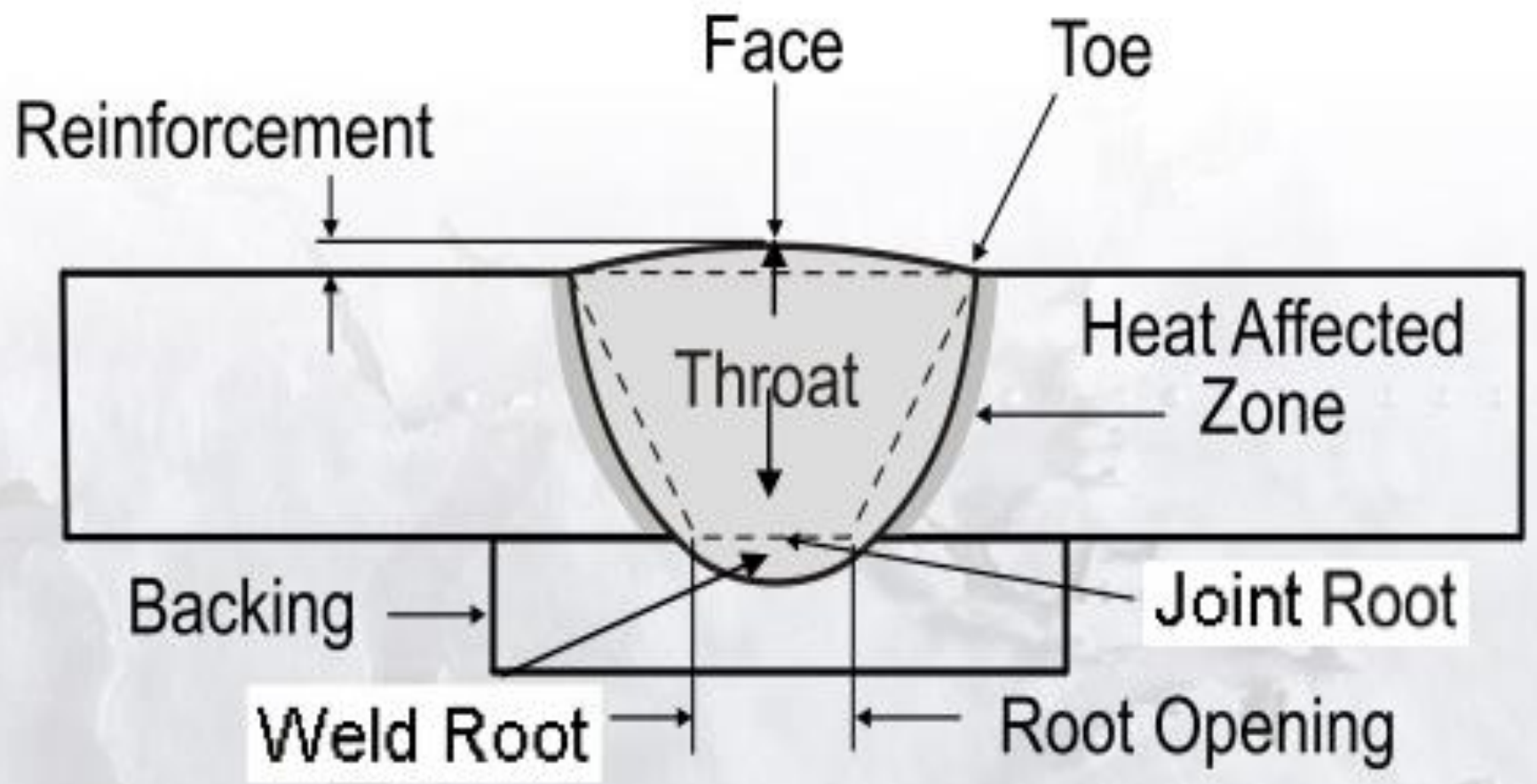
	Fillet	Groove
Butt	N.A.	
Tee		
Corner		
Lap		N.A.

Welding Process

- Major effect on selection of joint design
 - Each welding process has characteristics that affect its performance
 - Some processes are easily used in any position
 - Others may be restricted to one or more positions
 - Rate of travel, penetration, deposition rate, and heat input also affect welds



Fillet Weld Terminology



Groove Weld Terminology

Edge Preparation

- Faying surface
 - Metal's surface melted during welding process
 - Edge preparation: faying surface is shaped before welding to increase weld strength
- Reasons for preparing the faying surfaces
 - Codes and standards
 - Metals
 - Deeper weld penetration
 - Smooth appearance
 - Increased strength

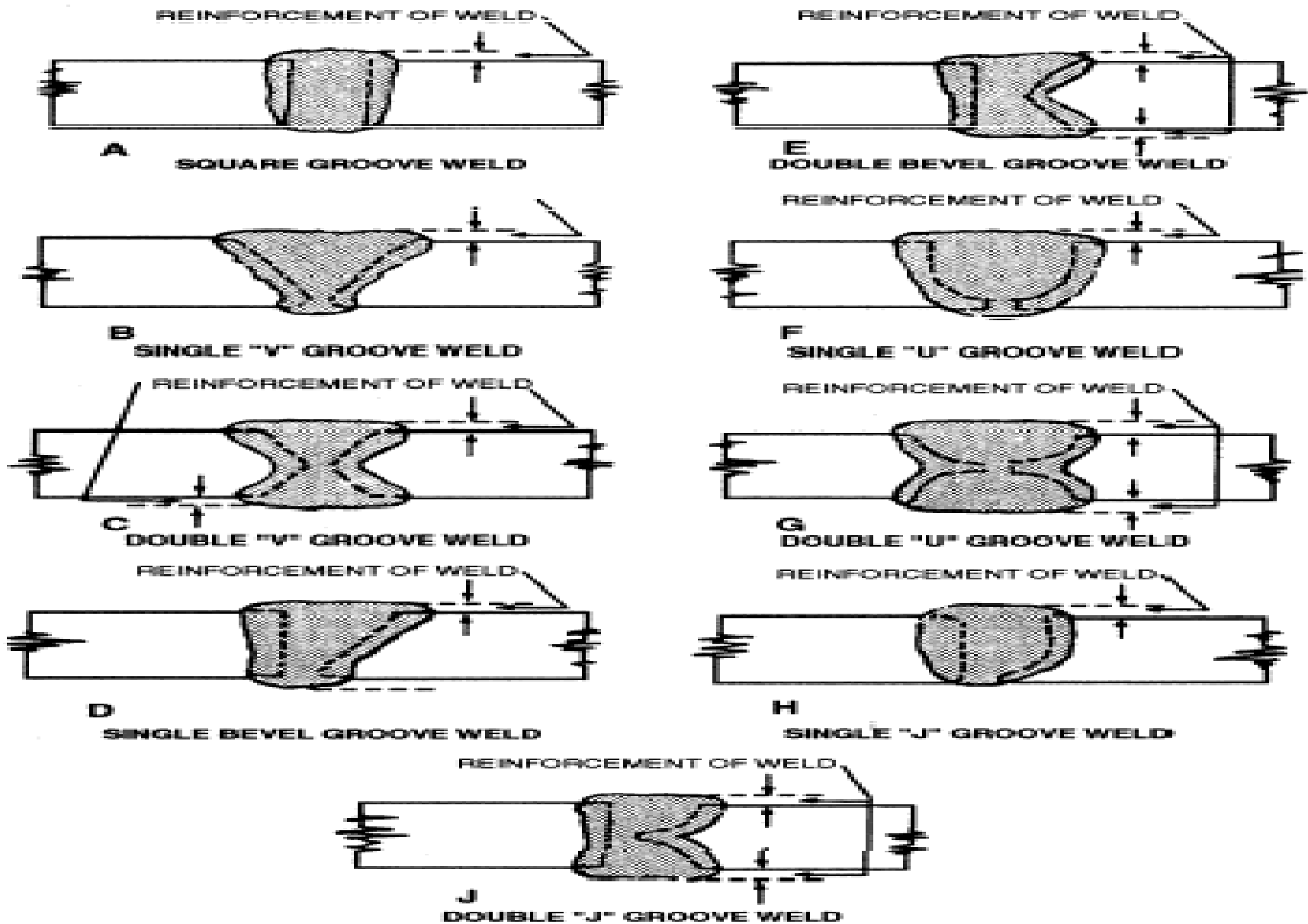


Figure 7-17.—Butt joints in the flat position.

Joint Dimensions-

The depth and/ or angle of the preparation and the joint spacing can be changed to make the weld

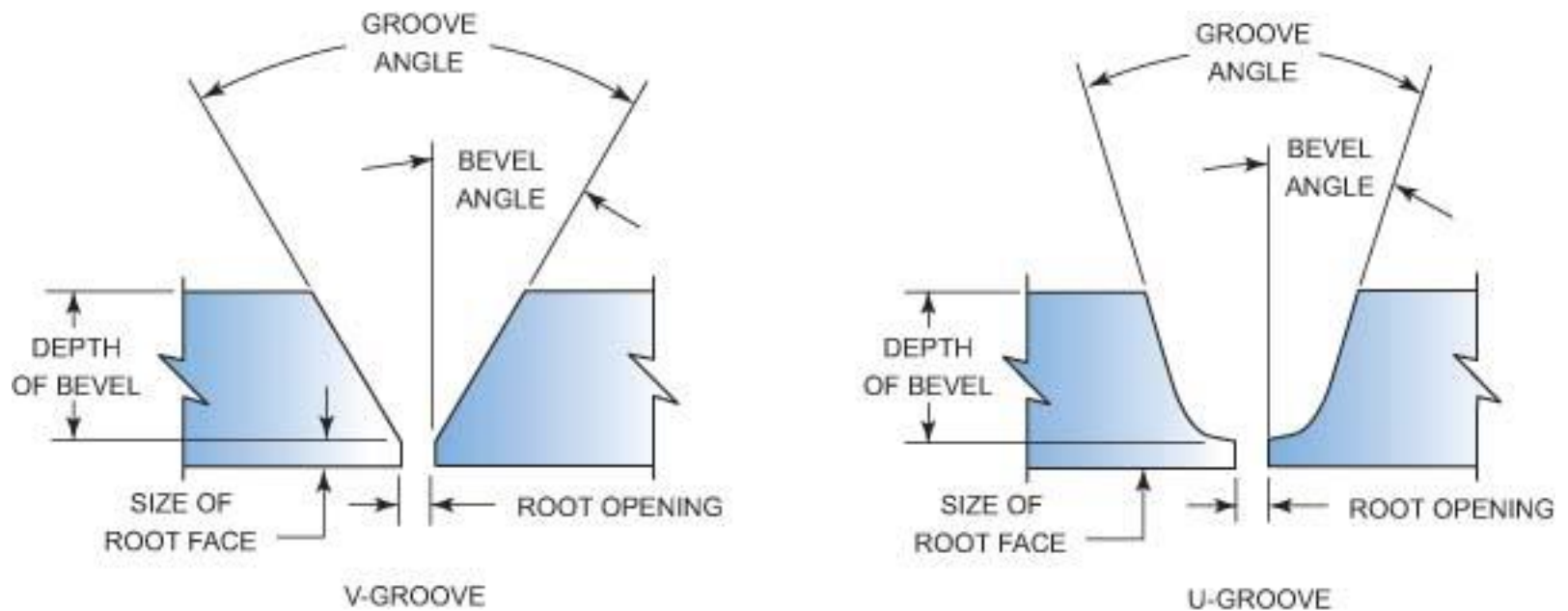


FIGURE 20-8 Groove joint terminology.

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Metal Thickness

- Metal becomes thicker
 - Joint design must change
- Welding on thick plate or pipe
 - Groove is often needed to get 100% penetration
- Plates that are thicker than 3/8 inch
 - May be grooved inside and outside of joint
- Plates may be:
 - Grooved and welded
 - Welded on one side, back gouged, and welded

Metal Type

- Some metals have specific problems
 - Thermal expansion, crack sensitivity, or distortion,
- Joint design must help control these problems
 - Example: magnesium is very susceptible to postweld stresses
 - U-groove works best for thick sections

Welding Position

- American Welding Society Plate
 - Divided plate welding into four basic positions for grooves (G) and fillet (F) welds
 - Flat 1G or 1F
 - Horizontal 2G or 2F
 - Vertical 3G or 3F
 - Overhead 4G or 4F

WELD JOINTS AND POSITIONS

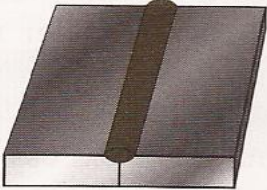
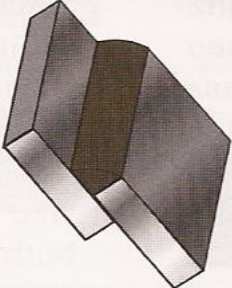
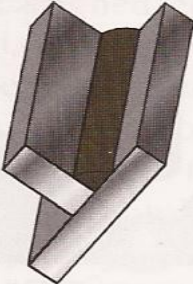

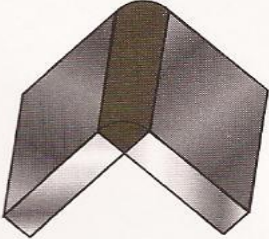
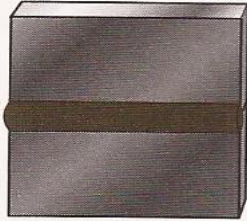
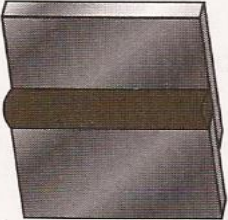
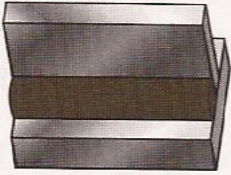
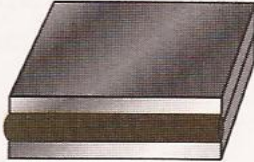
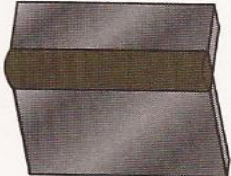
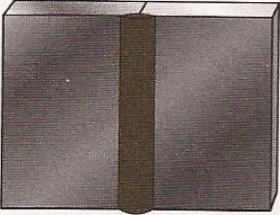
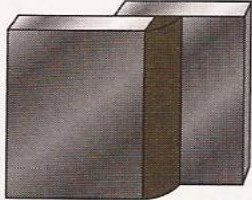
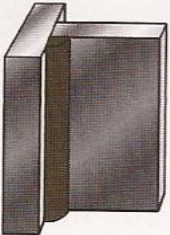

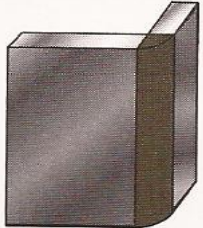
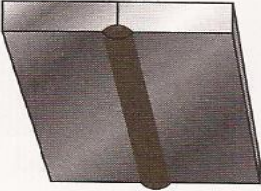
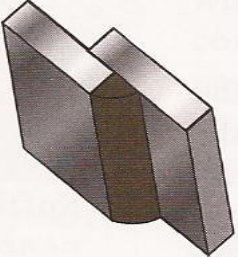
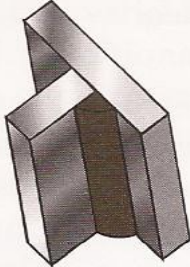

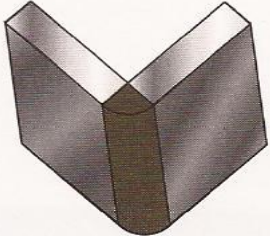
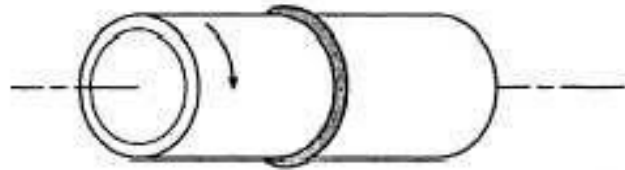
BUTT	LAP	T	EDGE	CORNER
<p>FLAT (1G) or (1F)</p> 				
<p>HORIZONTAL (2G) or (2F)</p> 				
<p>VERTICAL (3G) or (3F)</p> 				
<p>OVERHEAD (4G) or (4F)</p> 				

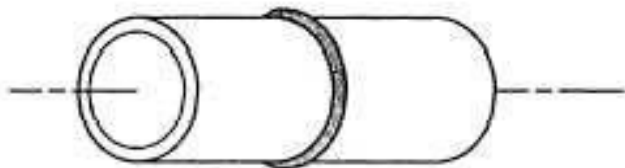
Figure 3-13. The four common welding positions are flat, horizontal, vertical, and overhead.

Welding Position (cont'd.)

- American Welding Society Pipe
 - Divided pipe welding into five basic positions



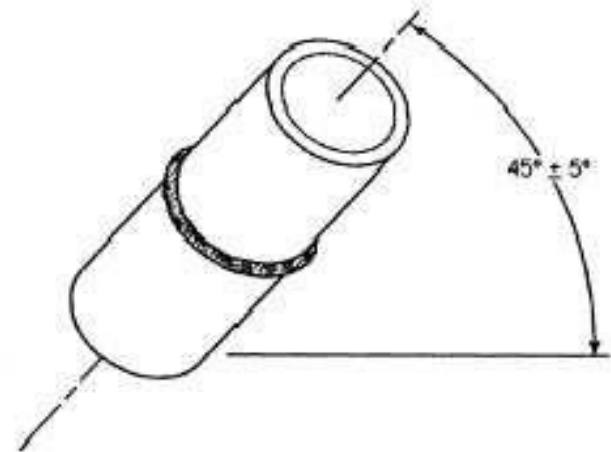
1G HORIZONTAL ROLLED POSITION



5G HORIZONTAL FIXED POSITION



2G VERTICAL POSITION

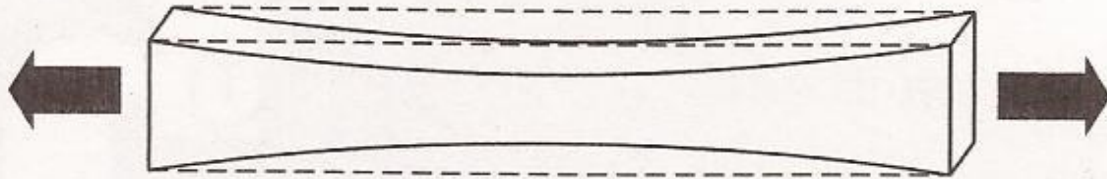


6G INCLINED POSITION

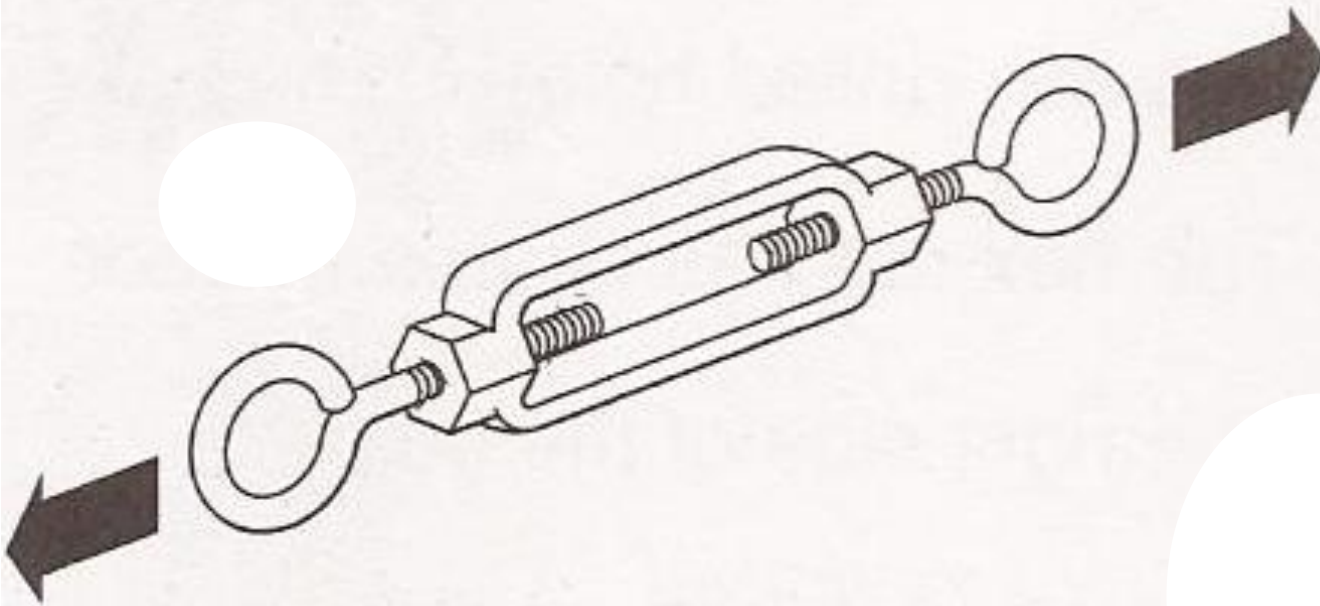
Just what type of joint is best suited for a particular job depends on many factors...

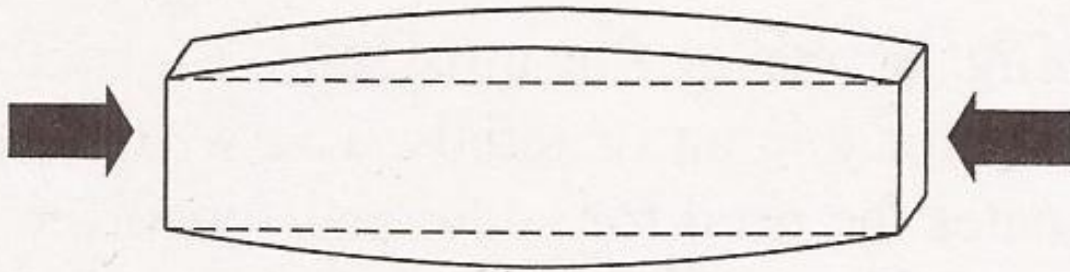
In general there are five basic considerations:

1. Whether a load is in tension or in compression and if bending, fatigue, or an impact will be encountered.
2. How a load is applied: steady, sudden, or variable.
3. Direction of the load as applied to the joint.
4. Thickness of the load as applied to the joint.
5. Cost of preparing the joint.

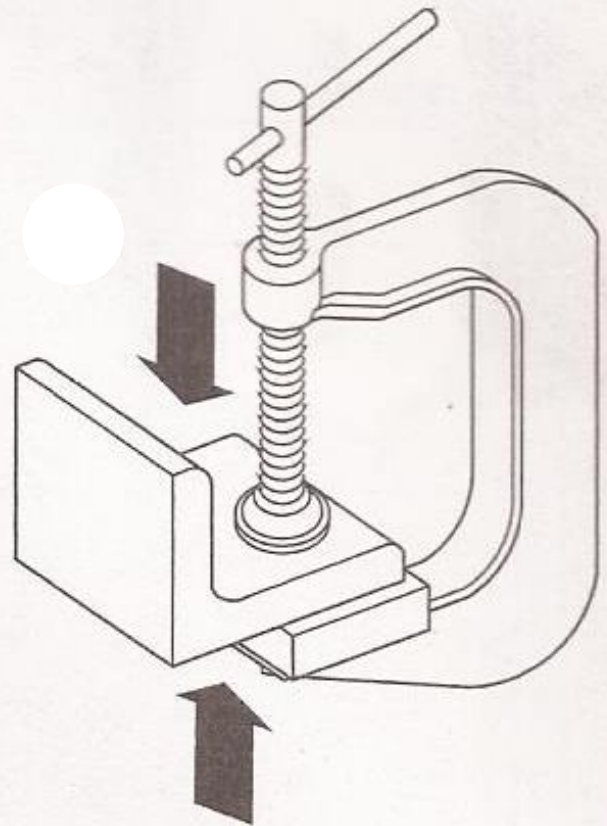


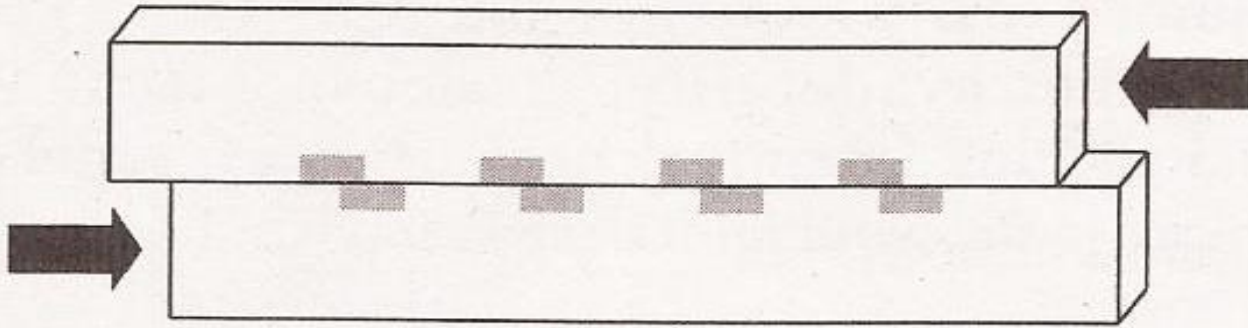
TENSILE



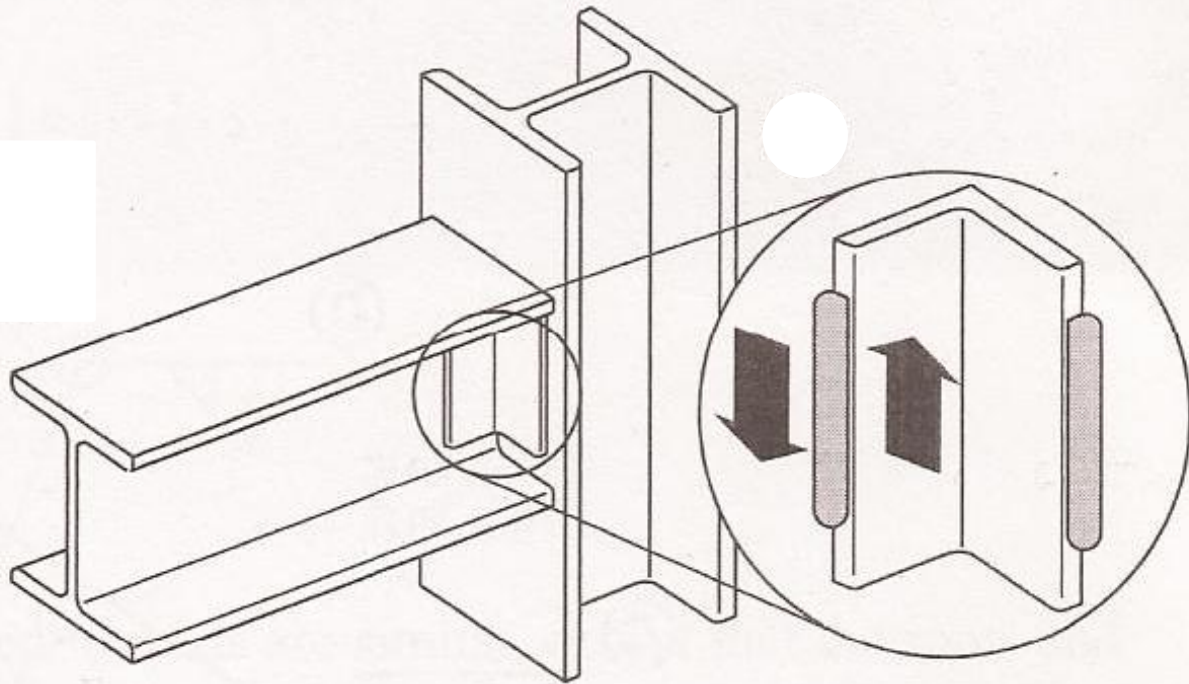


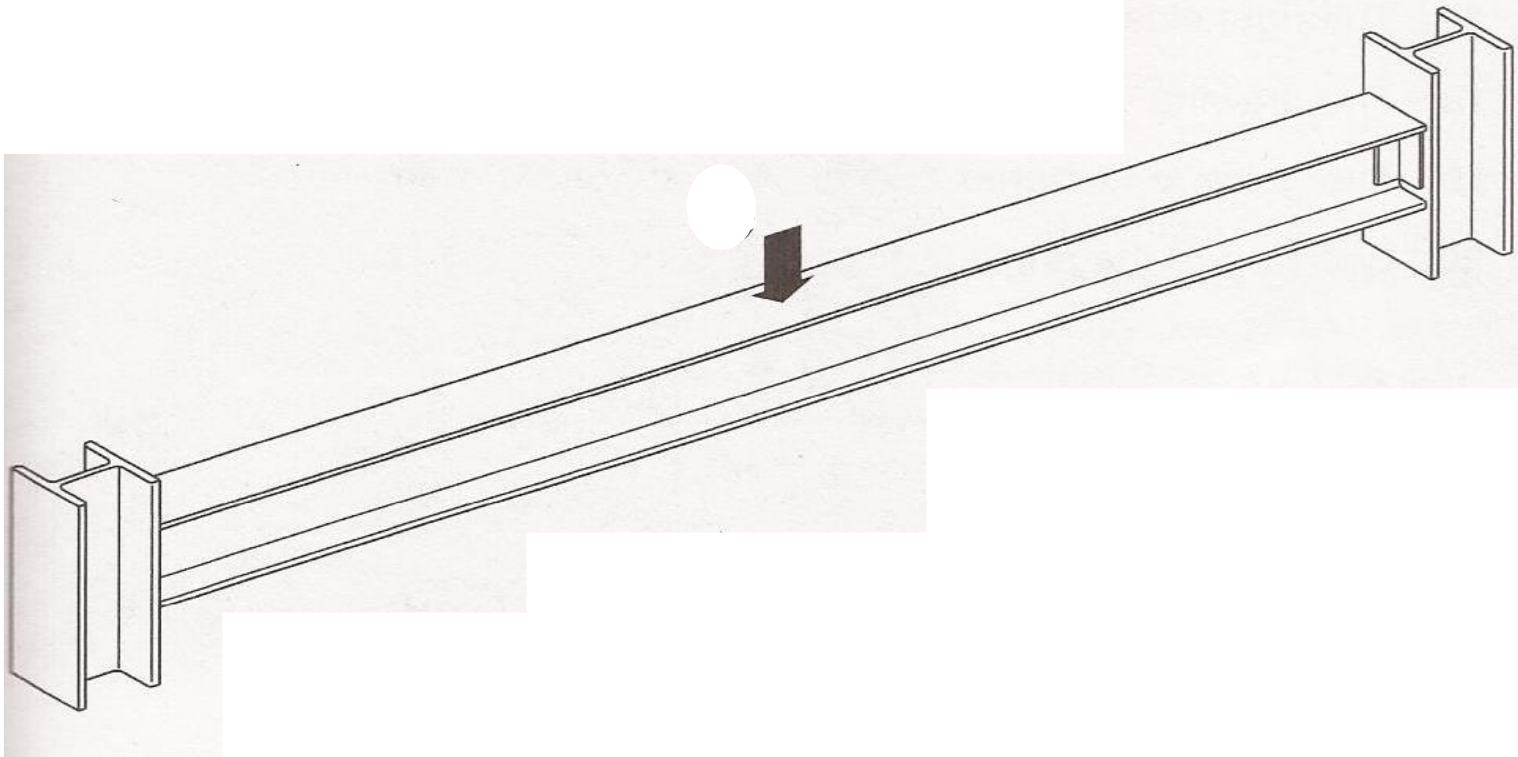
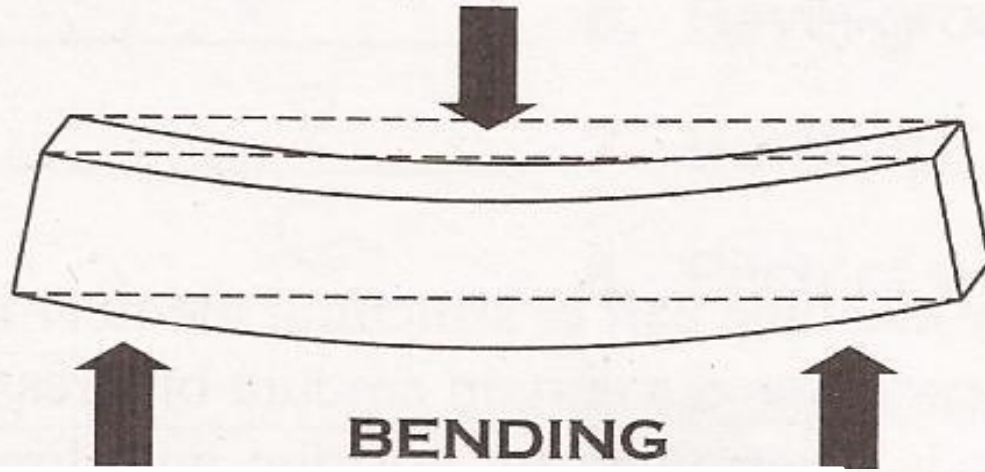
COMPRESSIVE

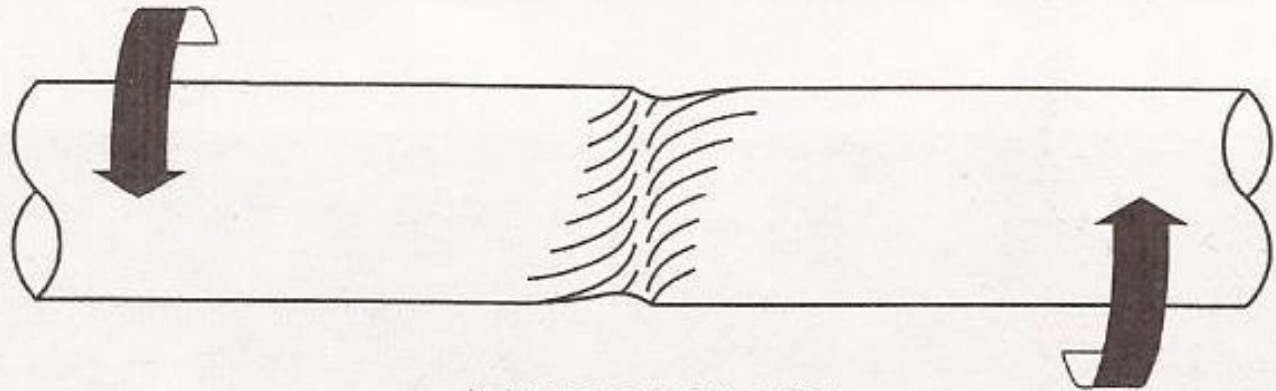




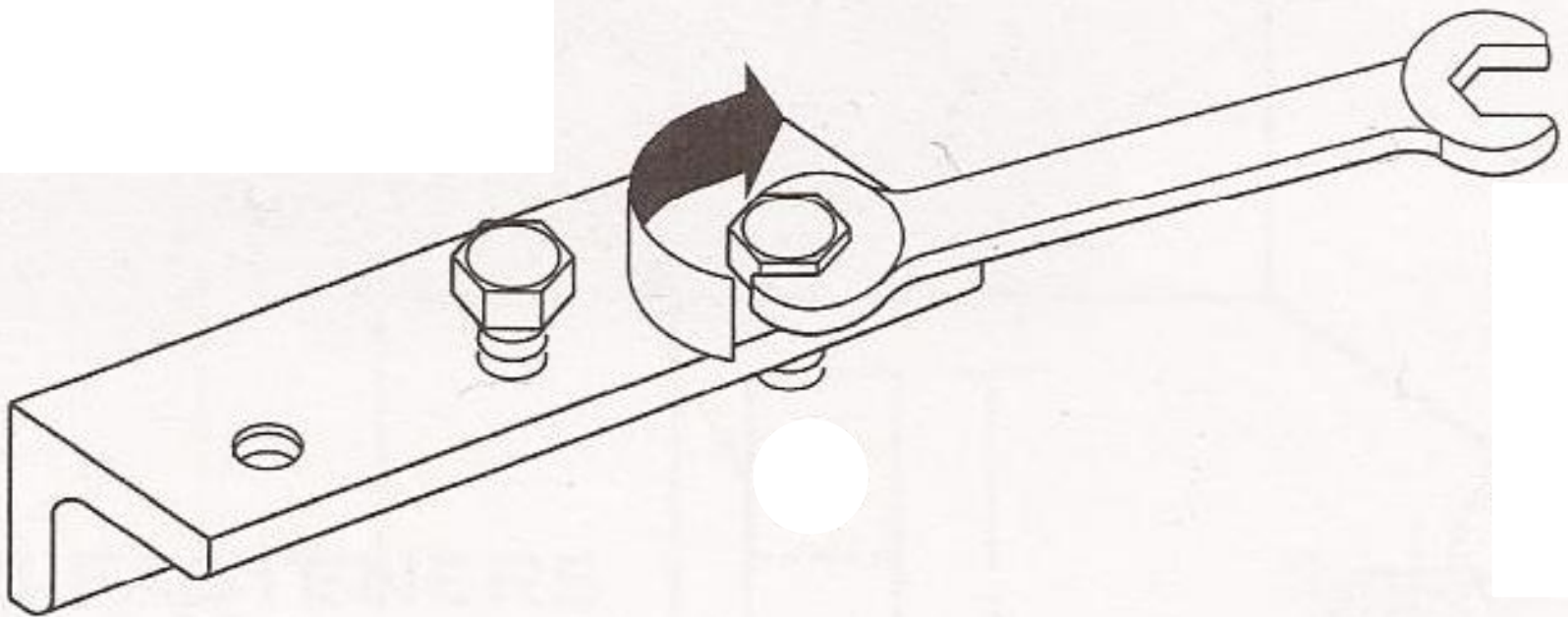
SHEARING







TORSIONAL



Summary

- Understanding the physics of joint design
 - Essential for the welder
 - Welders will be asked to make changes in structures as part of a modification or repair.