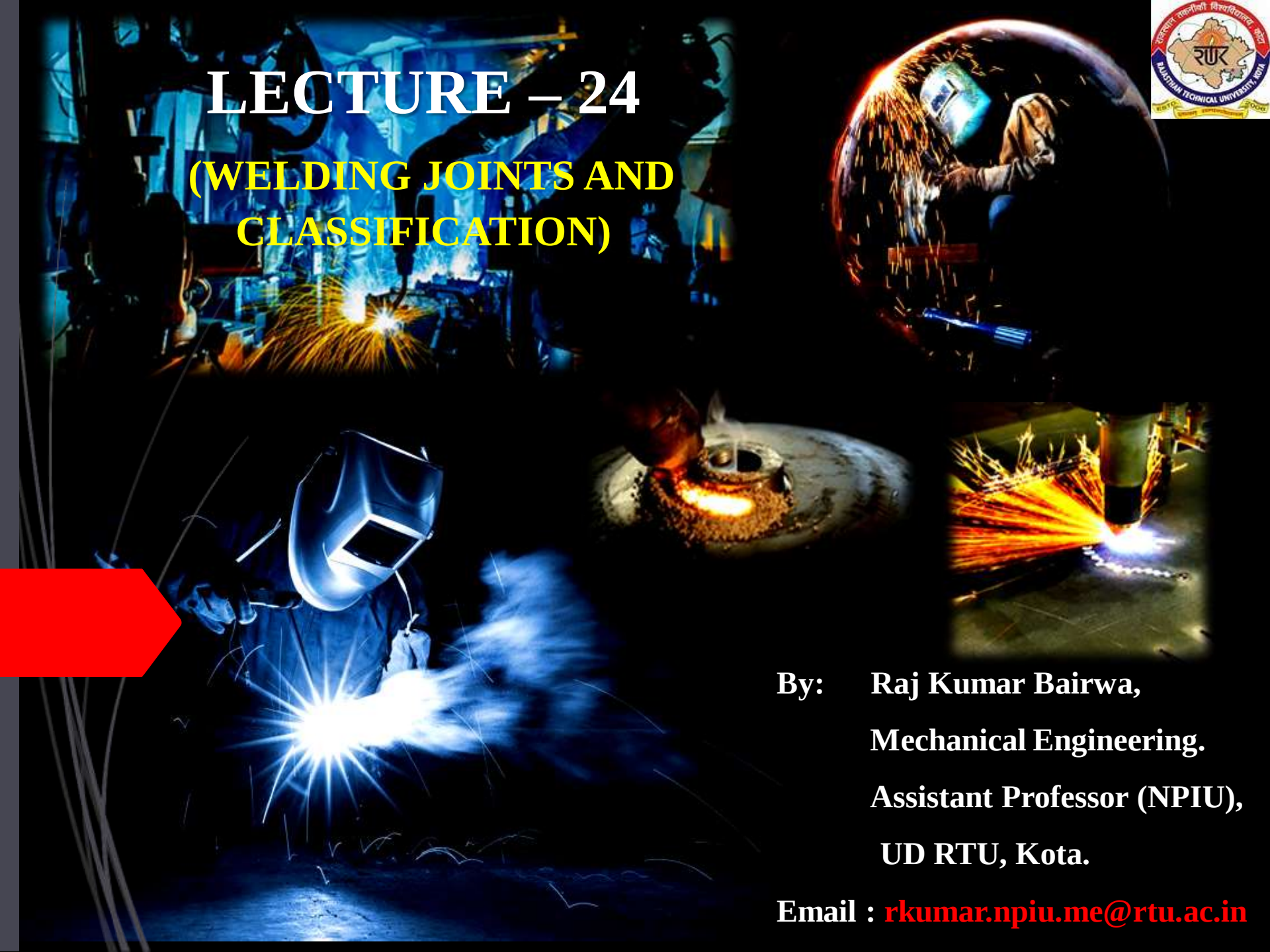


LECTURE – 24

(WELDING JOINTS AND CLASSIFICATION)



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WELDING



❑ DEFINATION :

Welding is a fabrication process whereby two or more parts are fused together by means of heat, pressure or both forming a join as the parts cool. Welding is usually used on metals and thermoplastics but can also be used on wood. The completed welded joint may be referred to as a weldment.

- Welding: permanent joining of two materials, usually metals, by coalescence.
- Coalescence results in atoms of the materials being joined to form common crystal structures.
- Coalescence induced by a combination of temperature, pressure and metallurgical conditions



COMMON JOINT CONFIGURATIONS IN WELDING

■ Butt Joint :

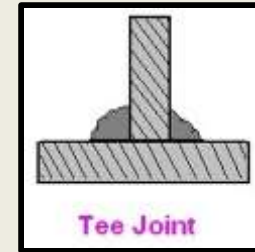
A connection between the ends or edges of two parts making an angle to one another of $135-180^\circ$ inclusive in the region of the joint.



Butt Joint

■ T- Joint :

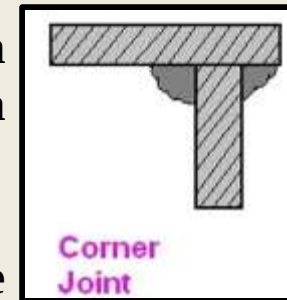
A connection between the end or edge of one part and the face of the other part, the parts making an angle to one another of more than 5° up to and including 90° in the region of the joint.



Tee Joint

■ Corner Joint :

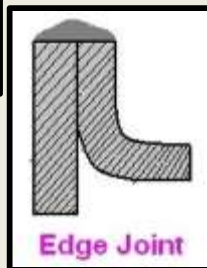
A connection between the ends or edges of two parts making an angle to one another of more than 30° but less than 135° in the region of the joint.



Corner Joint

■ Edge Joint :

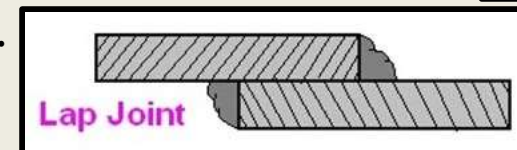
A connection between the edges of two parts making an angle to one another of 0 to 30° inclusive in the region of the joint.



Edge Joint

■ Lap Joint :

A connection between two overlapping parts making an angle to one another of $0-5^\circ$ inclusive in the region of the weld or welds.



Lap Joint



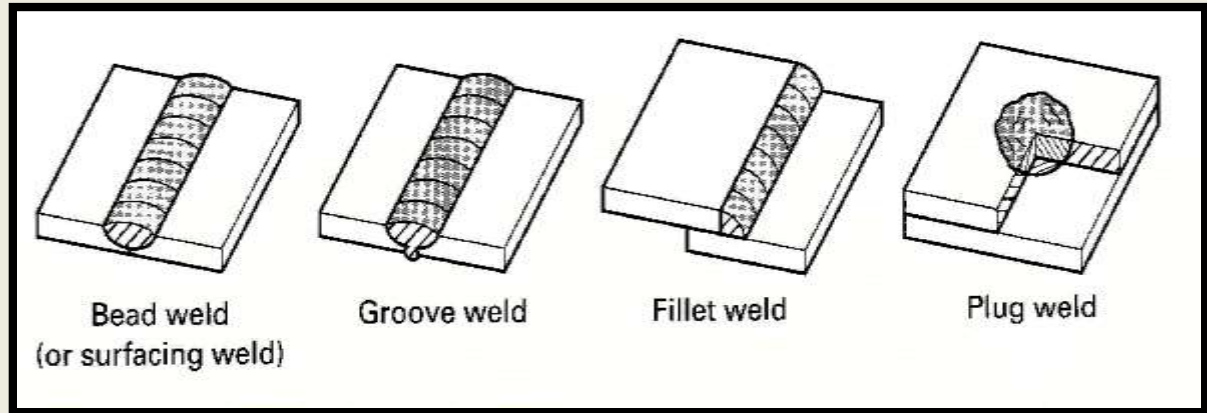
WELDING



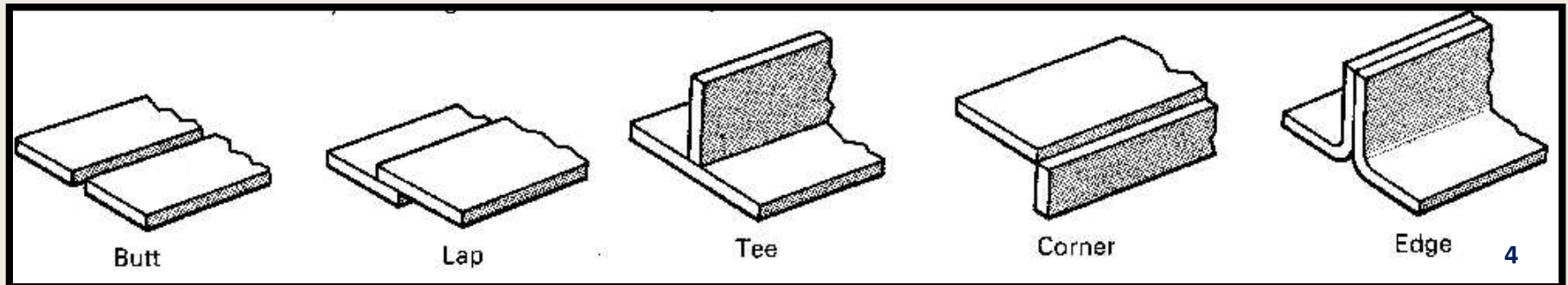
High quality weld requires:

- Source of heat and/or pressure
- Means to protect/clean metals to be joined
- Methods to avoid detrimental metallurgical changes

Types of joints :



Types of Fusion welds :



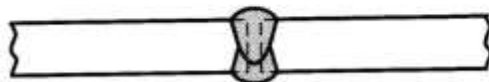


EXAMPLES OF WELDED JOINTS

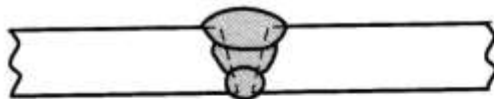
Butt joints



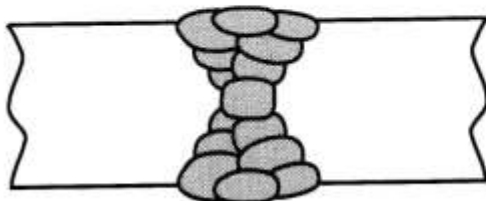
Single-pass square-groove butt joint



Double-pass square-groove butt joint

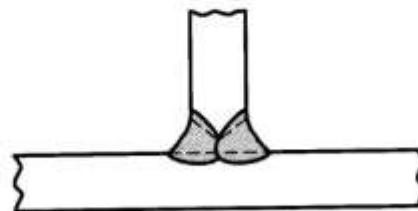


Single V-groove butt joint

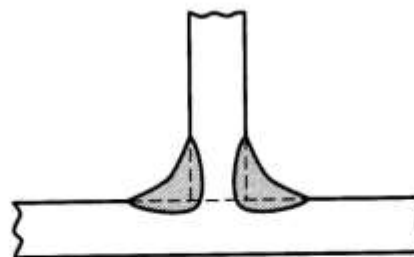


Double V-groove butt joint

T joints

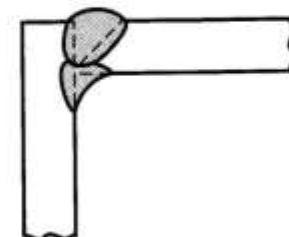


Double bevel-groove T joint

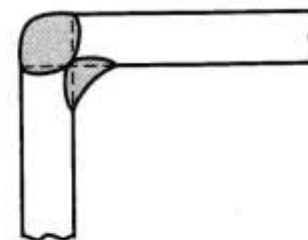


Two-fillet T joint

Corner joints



Single bevel-groove corner joint



Two fillet corner joint



WELDING FEATURES

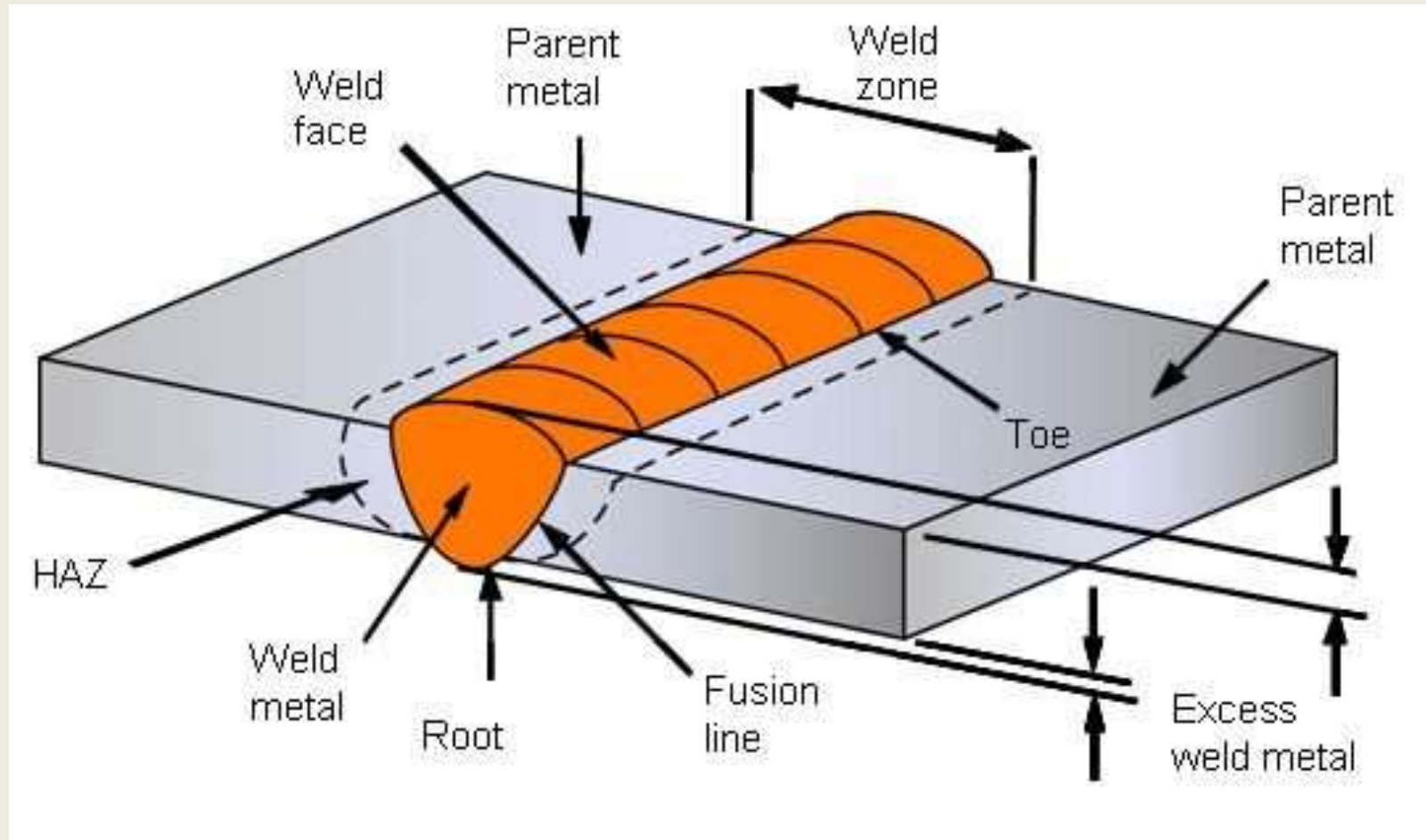


Figure : Butt weld



WELDING FEATURES

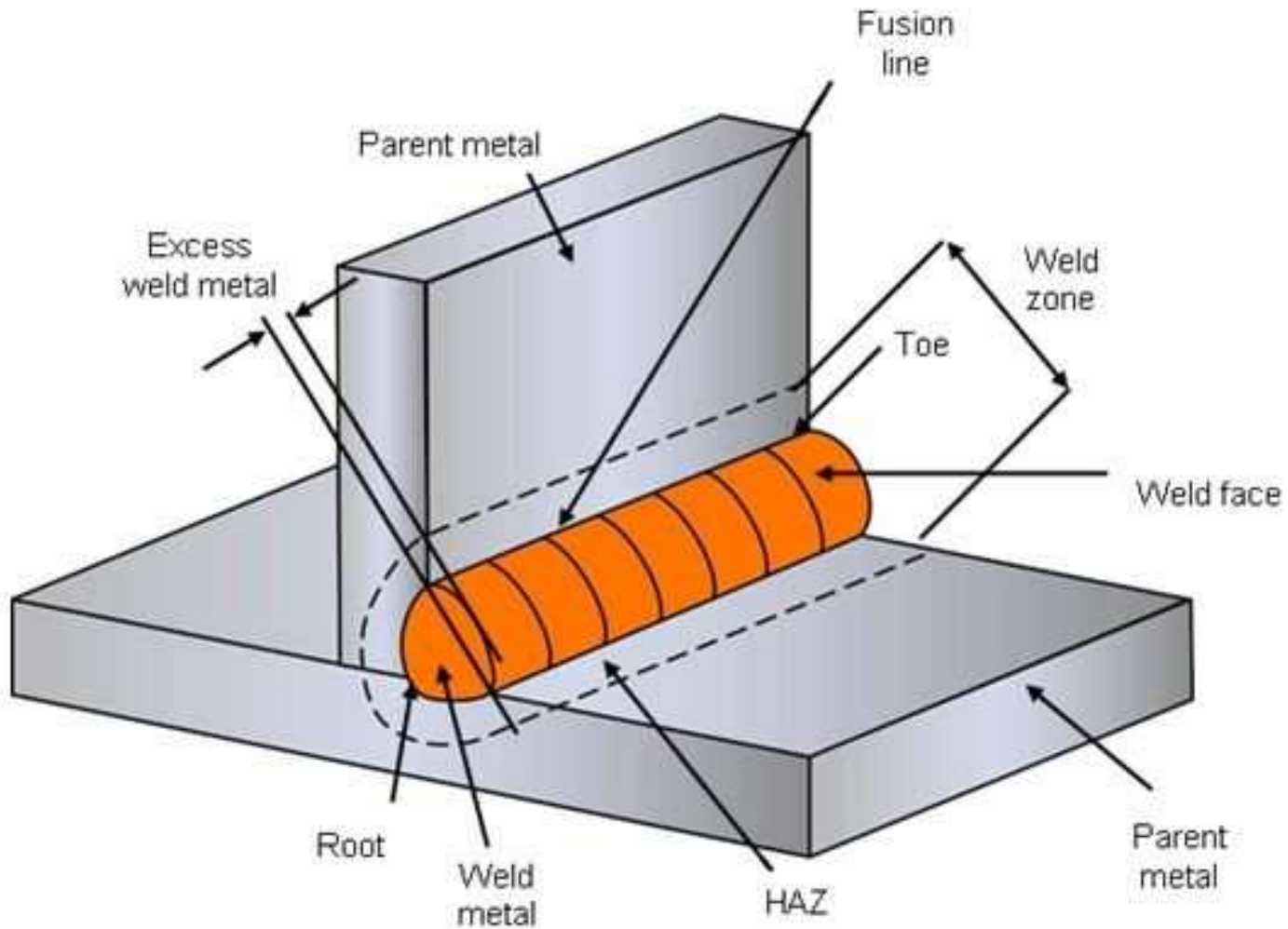


Figure : Fillet weld



WELDING TERMINOLOGY



- 1) **Parent Metal:** Metal to be joined or surfaced by welding, braze welding or brazing.
- 2) **Filler Metal :** Metal added during welding, braze welding, brazing or surfacing.
- 3) **Weld Metal :** All metal melted during the making of a weld and retained in the weld.
- 4) **Heat Affected Zone (HAZ) :** The part of the parent metal metallurgically affected by the weld or thermal cutting heat, but not melted.
- 5) **Fusion Line :** Boundary between the weld metal and the HAZ in a fusion weld.
This is a non-standard term for weld junction.
- 6) **Weld Zone :** Zone containing the weld metal and the HAZ.
- 7) **Weld Face :** The surface of a fusion weld exposed on the side from which the weld has been made.
- 8) **Weld Root :** Zone on the side of the first run furthest from the welder.



WELDING TERMINOLOGY



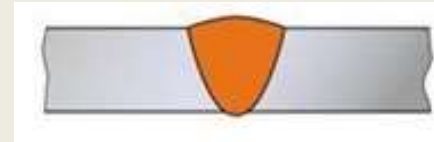
9) **Weld Toe** : Boundary between a weld face and the parent metal or between runs. This is a very important feature of a weld since toes are points of high stress concentration and often they are initiation points for different types of cracks (eg fatigue cracks, cold cracks). In order to reduce the stress concentration, toes must blend smoothly into the parent metal surface.

10) **Excess Weld Metal** : Weld metal lying outside the plane joining the toes. Other non-standard terms for this feature: reinforcement, overfill.

Note: the term reinforcement, although commonly used, is inappropriate because any excess weld metal over and above the surface of the parent metal does not make the joint stronger. In fact, the thickness considered when designing a welded component is the design throat thickness, which does not include the excess weld metal.

11) **Run (pass)** : The metal melted or deposited during one passage of an electrode, torch or blowpipe.

12) **Layer** : Stratum of weld metal consisting of one or more runs.



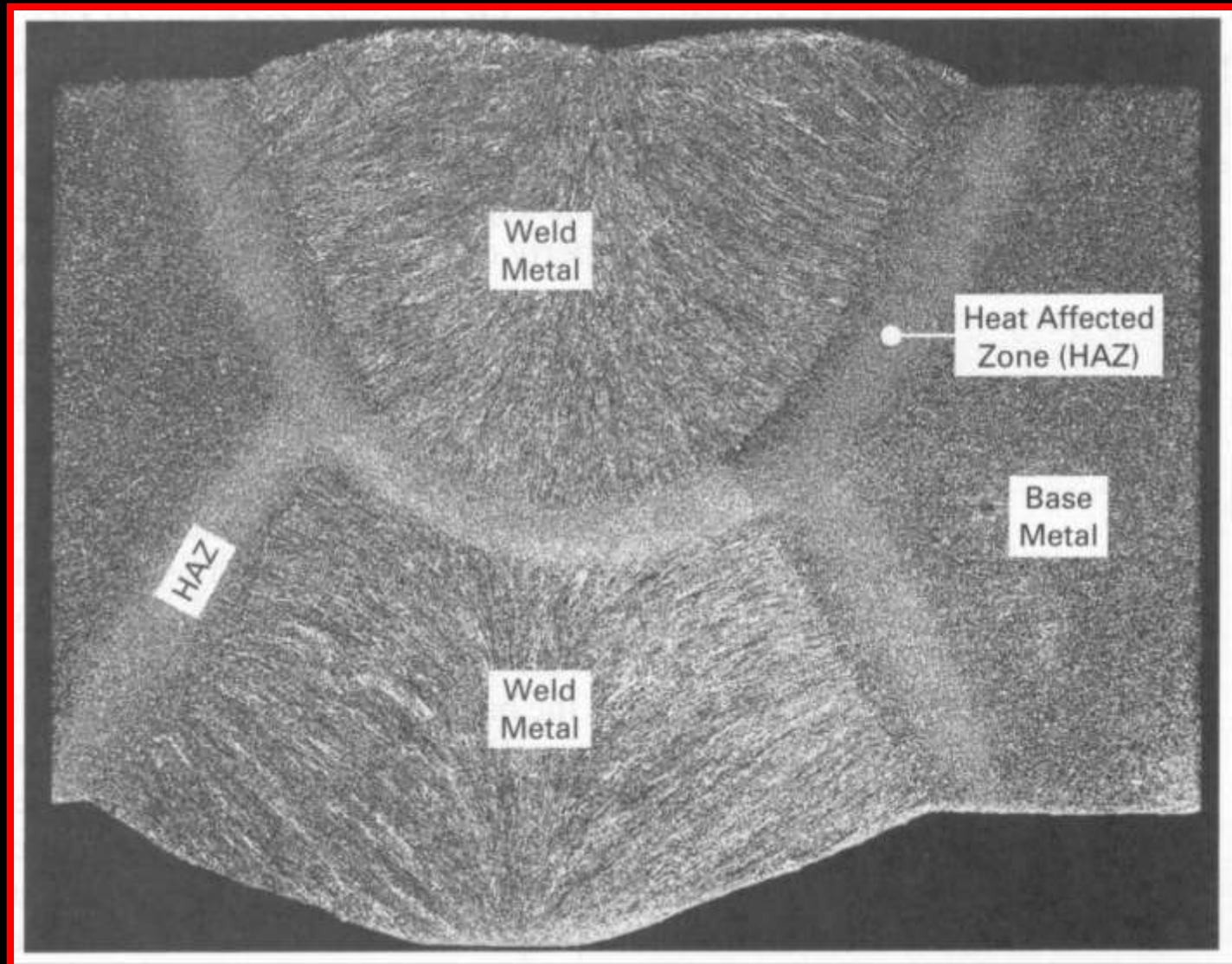
Single run weld



Multi run weld



TYPICAL WELD MICROSTRUCTURE





CLASSIFICATION OF WELDING PROCESSES

