

# ULTRASONIC TESTING

## MODULE 6: UT TEST MODES

- ❖ Pulse-echo mode
- ❖ Pitch-catch mode
- ❖ Thru-transmission mode

## MODULE 7: ANGLE BEAM INSPECTIONS - BASICS

- ❖ Selection of Screen Range
- ❖ Measurement of Beam Exit Point
- ❖ Measurement of Refracted Angle
- ❖ Range Calibration using IIW, Rompass and DSC Block
- ❖ Angle Selection for Weld inspection
- ❖ Surface Distance, Skip Distance, Depth, ½ vee and full V Path

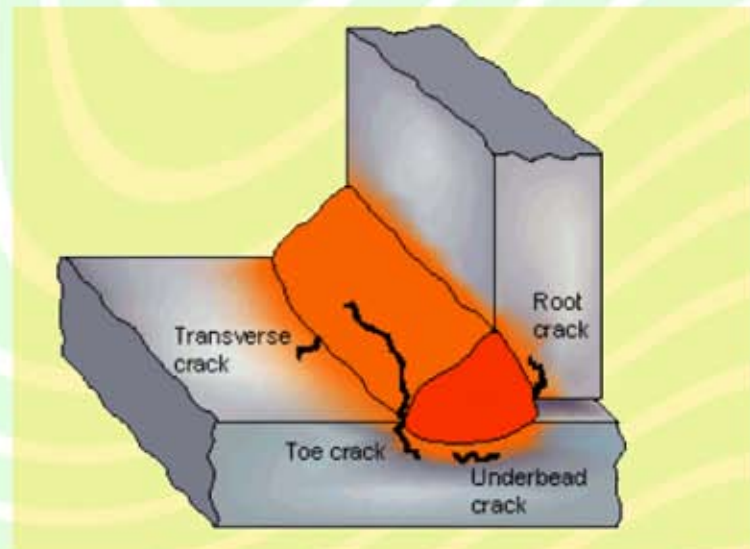


## MODULE 8: ANGLE BEAM INSPECTIONS- DAC AND OTHER ISSUES

- ❖ Sensitivity Calibration: Piping and non-piping calibrations
- ❖ Distance Amplitude Correction (DAC) Curve
- ❖ Weld volume coverage and scan plan
- ❖ High Temp Angle Beam Inspections
- ❖ Discontinuity Length Sizing using 6 dB and 20 dB drop method

## PRATICALS

- ❖ Thickness Measurement and Scanning
- ❖ Backsurface echo technique
- ❖ Flaw detection
- ❖ *Shear Wave Testing on Pipe Samples with embedded weld defects-*
  - a) ID Cracks   b) OD Cracks   c) Slag
  - d) Porosity   e) Lack of Fusion   f) Lack of Penetration



## EXAMINATIONS

Paper - I - General

Paper - II - Specific

Paper - III - Practicals

Candidates must score a minimum of 70 % in each test and a minimum of 80% average for all the three tests.

COURSE  
DURATION

Level - I - 40 hrs.

Level - II - 40 hrs.

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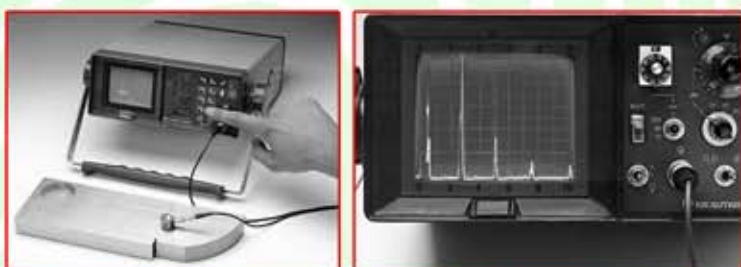
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# ULTRASONIC TESTING

## SCOPE:

This course introduces the basic principles of Ultrasonics and prepares the candidate for:

- a) Straight Beam Inspections
- b) Thickness Measurement
- c) Angle Beam Inspection of Welds
- d) Flaw Detection



## MODULES

### MODULE 1: WAVE MODES

- ❖ Waves - velocity, wavelength and frequency
- ❖ Wave Modes: Longitudinal and Shear waves
- ❖ Velocity of Waves
- ❖ Factors Affecting Velocity - temperature

### MODULE 2: ULTRASONIC TRANSDUCER AND SOUND FIELD ❖ Piezoelectric Crystal

- ❖ Near field concept
- ❖ Beam spread and sound loss
- ❖ Reducing beam spread: frequency and diameter
- ❖ Single and Dual transducers
- ❖ Resolution in flaw detection: frequency and damping
- ❖ Transducer selection: frequency and diameter

### MODULE 3: UT EQUIPMENT

- ❖ Instrument Controls: gain, range, velocity, delay
- ❖ Displays. A-, B- and C-scans
- ❖ Selection of UT equipment for ultrasonic testing
- ❖ UT Equipment demonstration

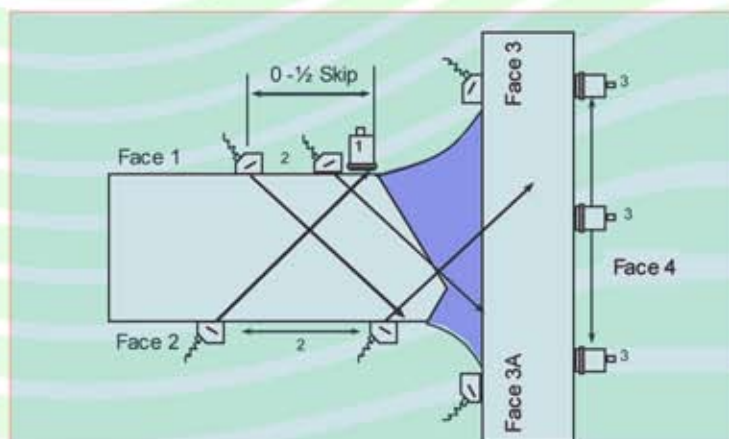


### MODULE 4: REFRACTION AND REFLECTION

- ❖ Reflection and Refraction at interfaces
- ❖ Snell's Law
- ❖ Mode Conversion to shear waves at interfaces
- ❖ Introduction to Angle Beam testing of welds (covered in detail in UT Level II class)

### MODULE 5: FLAW DETECTION - STRAIGHT BEAM

- ❖ Flaw detection, lamination, Corrosion Mapping, Bolts
- ❖ Use of Flat bottom holes for establishing reference
- ❖ Compensating sound loss from beam spread: distance amplitude correction curves (DAC)



#### Note-1:

Scanning Detail:

1. 0° scanning from branch member side.
2. 60°, 70° (minimum) Angle beam scanning from face 1 and 2.
3. 70° - 2MHz probe scanning from face 1, 2, 3, 3A.
4. 0° scanning where accessible from face-4.



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