Fed.MES - MSWE

Technical Seminar

Introduction to UT Method for Welding QA/ QC

(Part-1)

Fed. MES Function Hall & Online

9 May 2026 (Saturday)

(13 :00 To 16:00 Hr)

Presented By: **Engr. Htain Lin Oo P.E. ACPE**

ASNT NDT Level III (ID#241690)

Name: **Engr.Htain Lin Oo P.E.**

- : Former Mechanical Engineer at Locomotive Workshop
- : Former Procurement Manager, Myanma Railways (16 Years)

Academic: -Bachelor Degree (Mechanical)
-Diploma in Management & Administration (D M A)
-Master of Business Administration (M B A)

Position: Founder & Managing Director

Company: United Gamma NDT & Engineering Co., Ltd. (Since 2012)

Professional : Professional Engineer (M. P. E & IMPM) (MEngC.)
: A.CP. E (Mechanical)., ASEAN Engineer Register
: JSG, Fellow of Fed. M E S & Jt Treasurer of M I C E G
: NDT Professional, ASNT NDT Level III (ID#241690)
: NDT Level III (ISO 9712) (IAEA- Tec Doc 628), Welding Assessor
: NDT Level II (CANADA, Worldspec Co.,), Welding Engineer (JWES)

Content:

- Introduction: Quality Requirement
- NDT Definition
- NDT Methods
- Ultrasonic Test (UT) Method
  - Basic Principle of Sound
  - Flaw Detector & Probes
  - Sound Nature & Testing Techniques
  - Calibrations & Reference Blocks
  - Flaw Sizing, Location, & Type

NDT Personnel Qualification & Certification

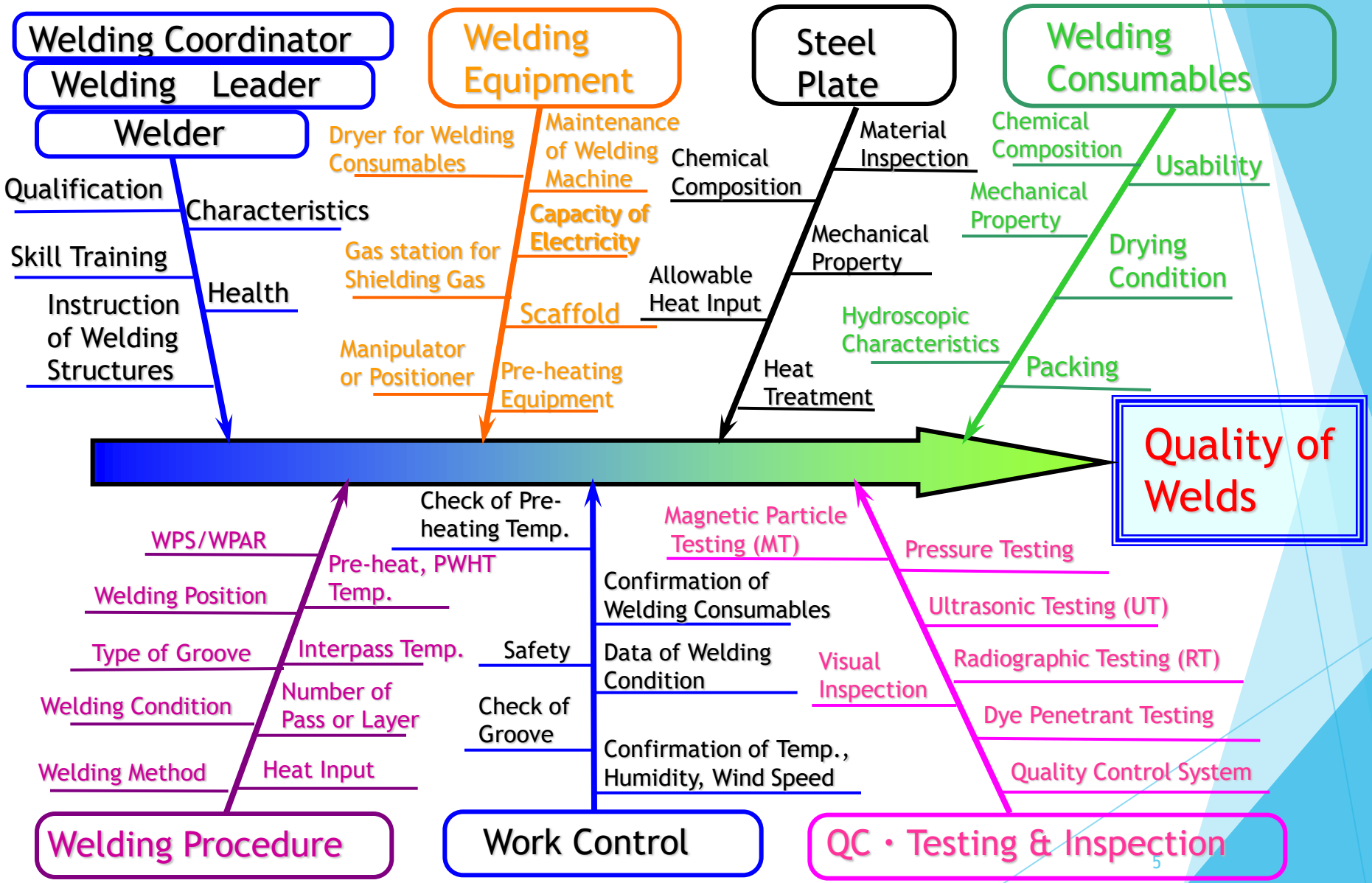
Q & A

Time Taken- 3:00 Hours

1) **Quality Requirement**: ISO 3834 (1994)

- **Quality:** Degree of Fulfilment of Requirement
- Quality Requirements for Fusion Welding of Metallic Materials
- Welding is treated as typically “Special Process”
  - Cannot be fully verified the required quality
  - WPS , Many (Essential) Variables / Parameters
  - Man, Materials, Consumables, Machines,
  - Process, QC, Tests, Records

2) Cause and Effect Diagram for Quality of Weld



2) Non-destructive Testing (NDT) in Industry

NDT Definition

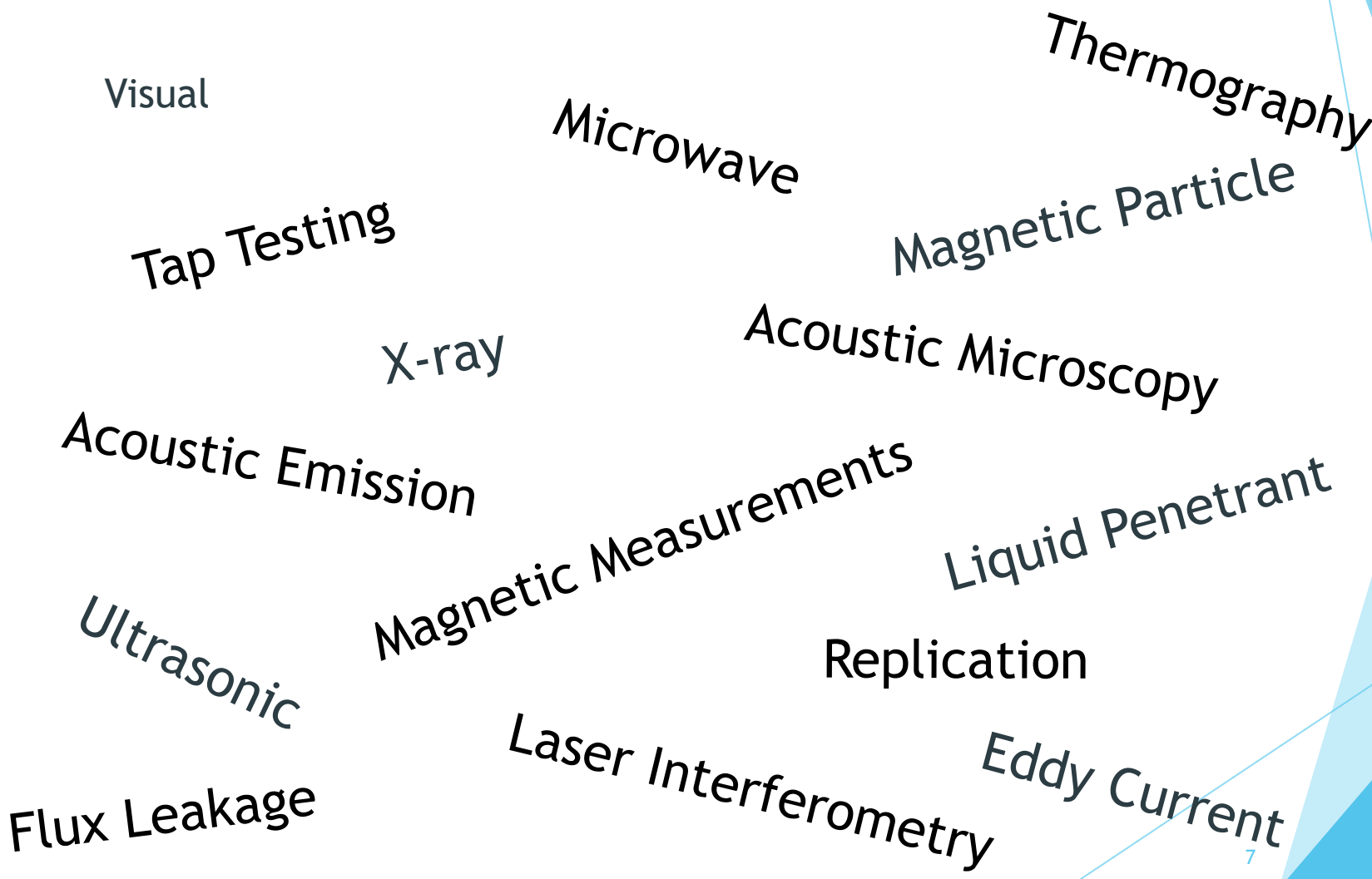
အစမ်းသပ်ခံပစ္စည်းများ၏ မူရင်းဂုဏ်သတ္တိ များ မပျက်စီးစေပဲ၊ ၎င်းတို့၏ အတိုင်းအတာ ၊ ဂုဏ်သတ္တိများ၊ အတွင်း ၊အပြင် အပြစ် အနာအဆာ၊ အက်ကြောင်း စသည်များကို တိုင်းတာ ရှာဖွေစစ်ဆေးသောနည်း

NDT, NDI, NDE

Evaluation: Usefulness, Serviceability

To Prevent Accidents, To Check Maintenance

3) Methods of NDT



3) The Most Common NDT Methods

i. Radiographic Testing Method (RT)

ii. Ultrasonic Testing Method (UT)

iii. Liquid Penetrant Testing Method (PT)

iv. Magnetic Particle Testing Method (MT)

v. Eddy Current Testing Method (ECT)

3) Other NDT Methods

- Visual Testing (VT)
- Leak Testing (LT)
- Strain Testing (ST)
- Acoustic Emission Testing (AE), etc.

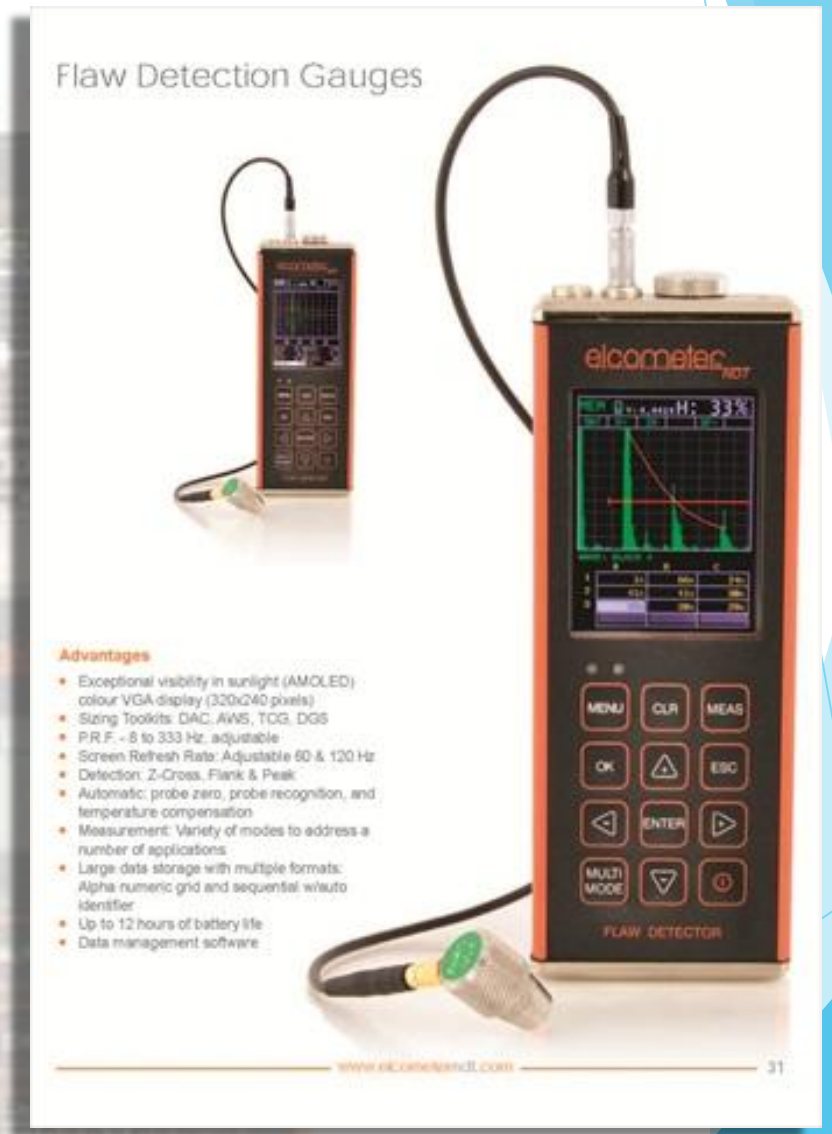
အားလုံးအတွက် အကောင်းဆုံးနည်း တစ်နည်းဆိုသည်မှာ မရှိ

အပြန်အလှန် ဖြည့်ဆည်း စမ်းသပ်သွားခြင်းသည်သာ အကောင်းဆုံး

4) Basic Ultrasonic Testing (UT)

elcometer®

Each gauge is sealed against the elements



4) Basic Principle of Sound

- Mechanical Waves- Transmit into material and reflect from the new surface

Wave Modes- (Common)-

- Longitudinal or Compression Wave Mode (Normal Probe, 90 Degree) (Highest Velocity Value)
- Transverse or Shear Wave Mode (Angle Probe) (Velocity Longitudinal = 1.8 Velosity Shear)
- Surface or Rayleigh Wave Mode (Angle Probe) (Velocity Surface = 9/10 Velocity Shear)
- Lamb or Plate Wave Mode (No Constant Velocity Value)

4) Basic Principle of Sound

Sound Natures

Similar to Light

- Reflect, Transmit, Refract (Bend), Mode Conversion, Diverge, Converge (Lens), Delay Tip (Sound Treatment)
- **Ultrasound**
- Huma Being Hearing Frequencies Range- 20 to 20 kHz
- In UT- 1 to 5 MHz (Manual)
- Up to 100 MHz (Automatic)

4) Basic Principle of Sound

- **Wave Propagation into Materials**

Wave Velocity (V) = Wavelength (λ) x Frequency (f)

Velocity varies Material Density and Elasticity

Acoustic Property Impedence (Z) = Density (δ), Velocity (V)

V & Z values are constant for a given material and given mode respectively. (Table)

- **Velocity (v) = Distance (S)/ Time (T), S = VT**
- **Detect Location of Flaws in UT Method**

Sound Generation

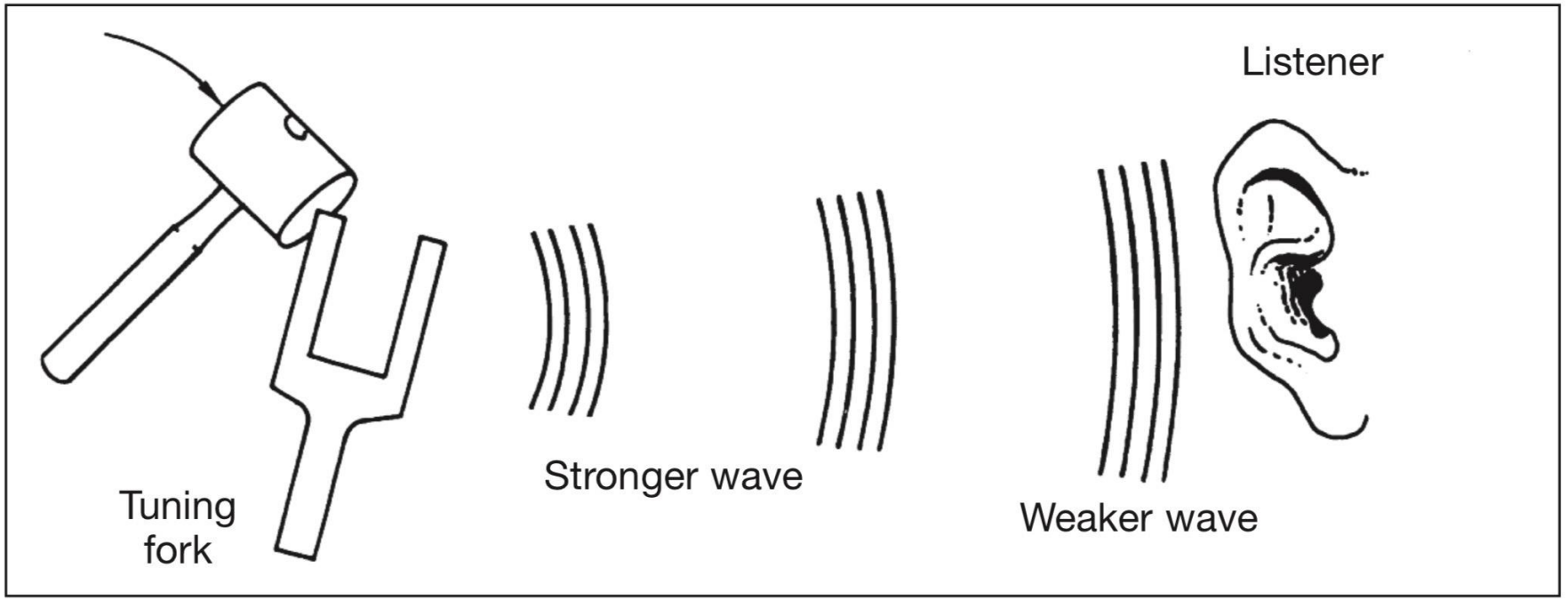


Figure 1: Sound-wave generation.

4) Basic Principle of Sound

- **Sound Generation & Propagation into Materials**

Probe/ Transducer/ Scanning Unit/ Search Unit (Piezoelectric Element/ Crystal)

Two Main Functions of Probes- (P-E)

1) **Injection/ Transmit/ Pulse**
2) **Receive/ Listen/ Echo**

Characteristics of Probe

1) Wave Mode Type
2) Size & Angle
3) Frequency (f)

Sound Propagation into Materials

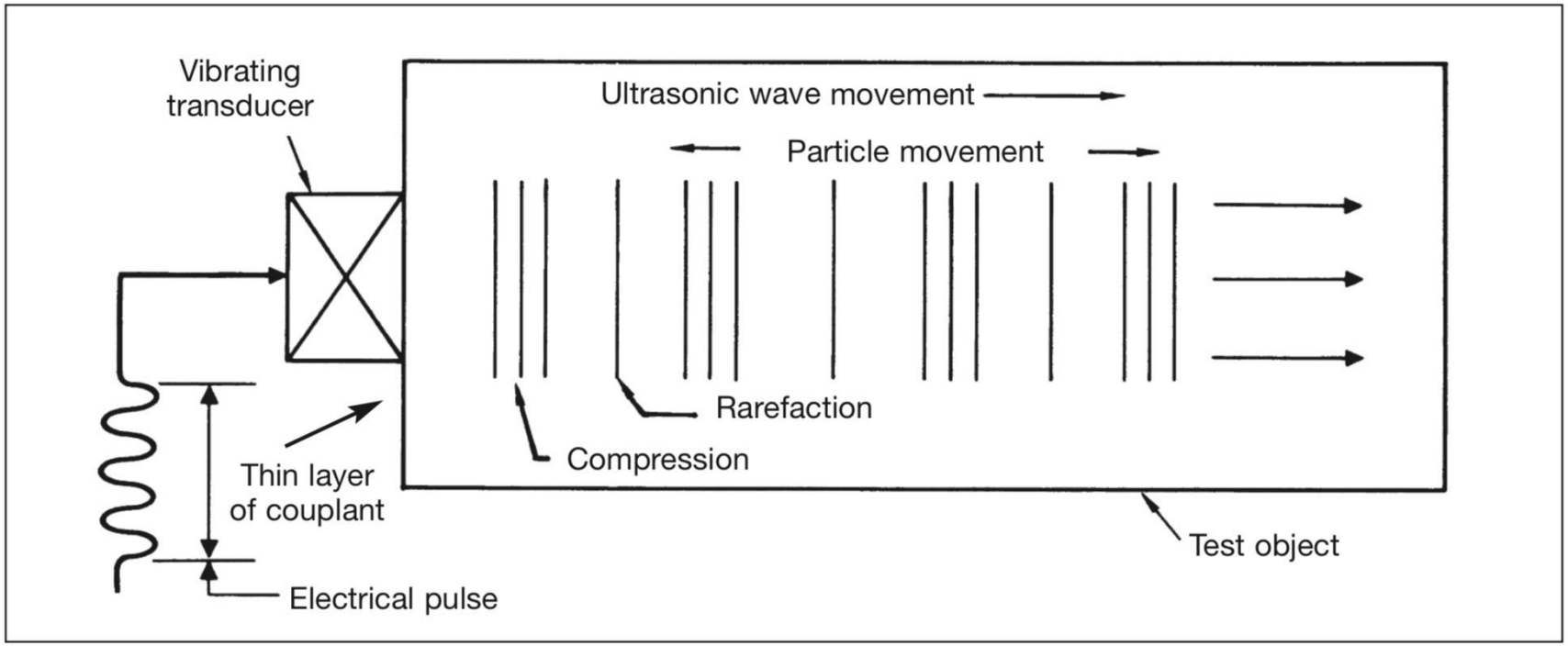


Figure 2: Ultrasonic wave generation.

Longitudinal & Shear Wave Modes

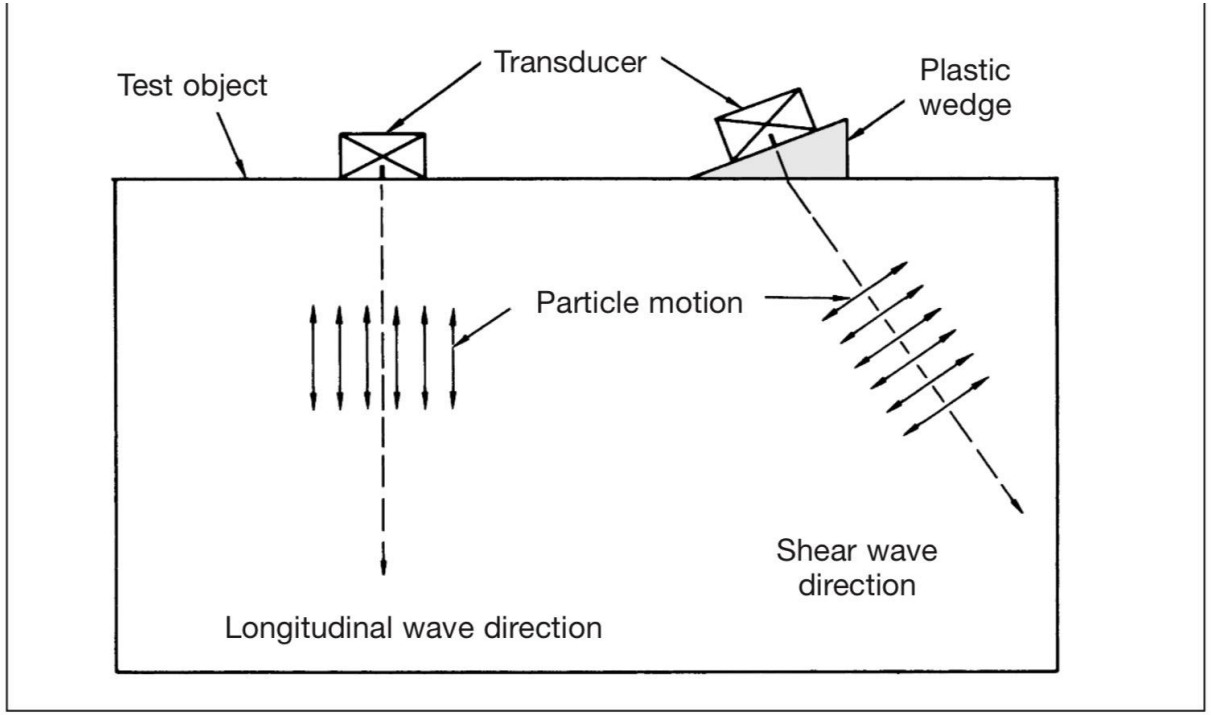


Figure 4: Longitudinal- and shear-wave modes compared.

Surface Wave & Mode Conversion

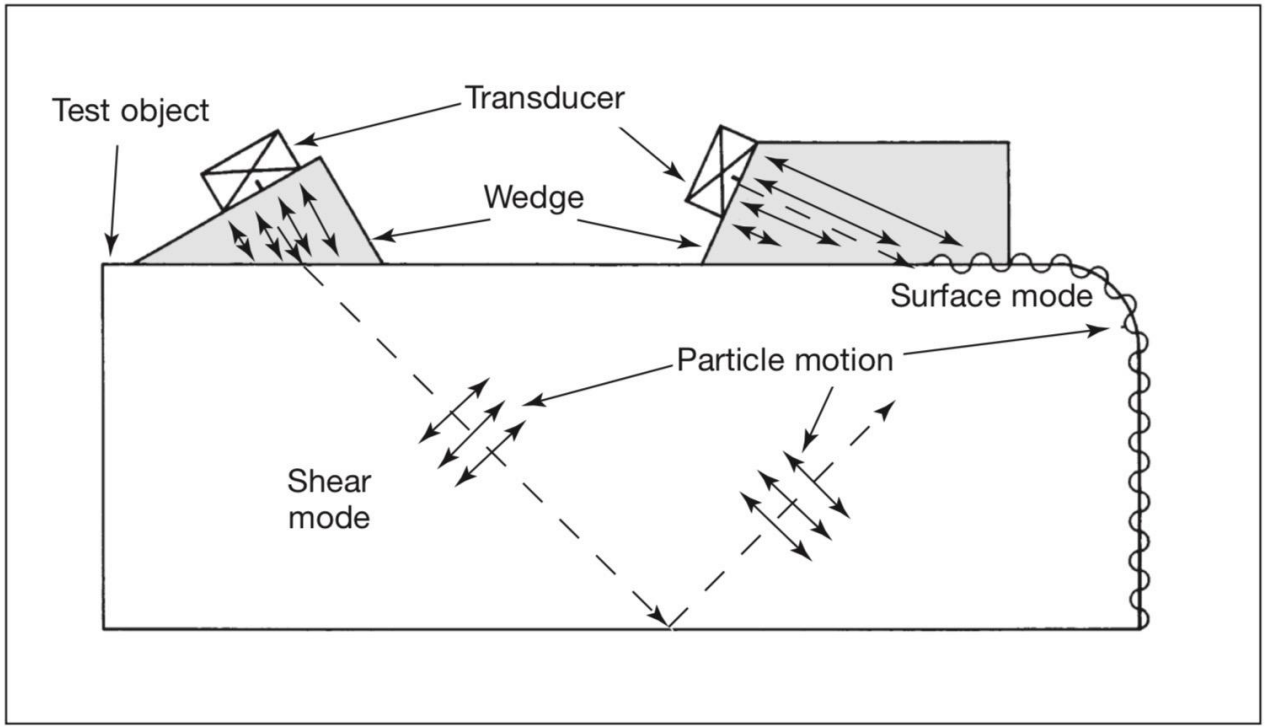


Figure 5: Mode conversion.

Sound Beam Reflection

Basic Principles of Acoustics

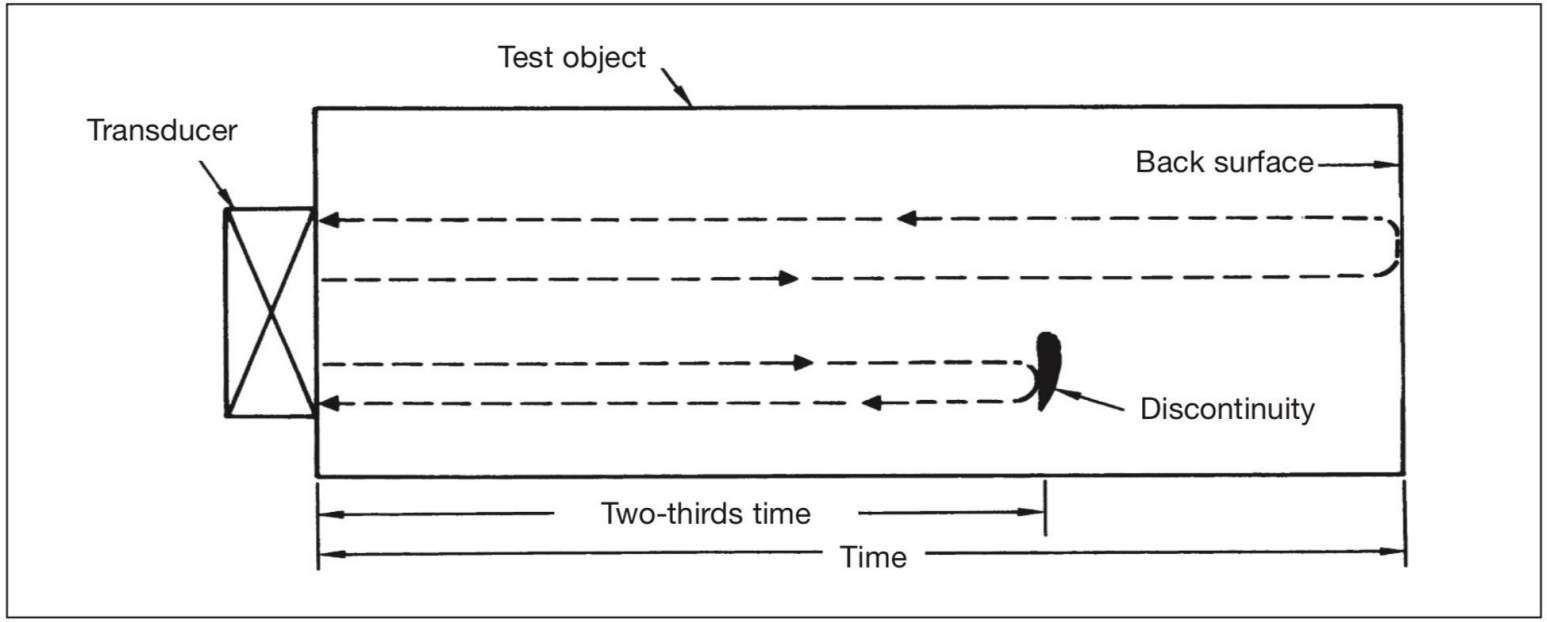


Figure 9: Sound-beam reflection.

Flaw Detector & Probe

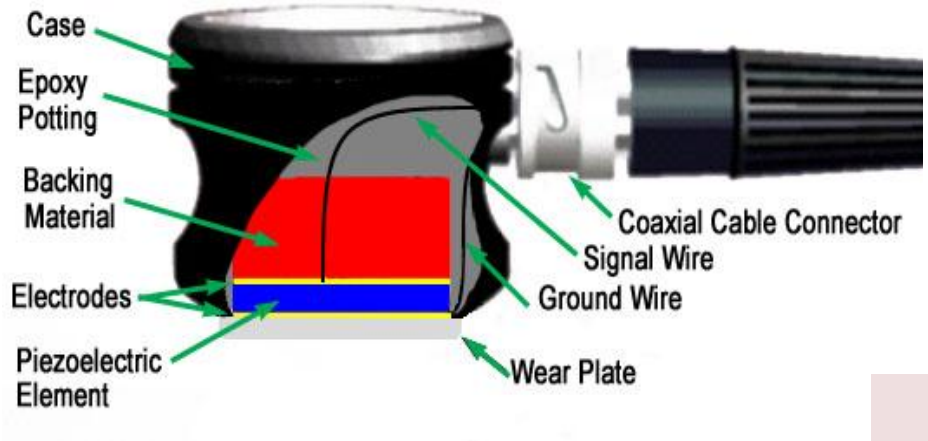
- **Brain & Eye Example**
- **Flaw Detector** – Display = X-axis Vs Y-axis (Distance & Intensity (Size)
- **Probe- Transducer**, Piezoelectric Element,
- 1) Sound Generate (Transmitter), 2) Echo Listen (Receive) (Pulse Echo, P-E)
- Single/ Dual/ Twin / Separate Crystals
- Sound Velocity – Constant Value for a given material Except
- Probe Characteristics- Types , Sizes, Degree, Frequency (1 to 5 MHz for Manual)

Depends on Application of Job (UT)- Selection/ Match (Two Main Applications)

- **Cautions**
  - Near Field Vs Far Field, Dead Zone
  - Coarse Grain Materials & Very Thin Materials (Difficult)

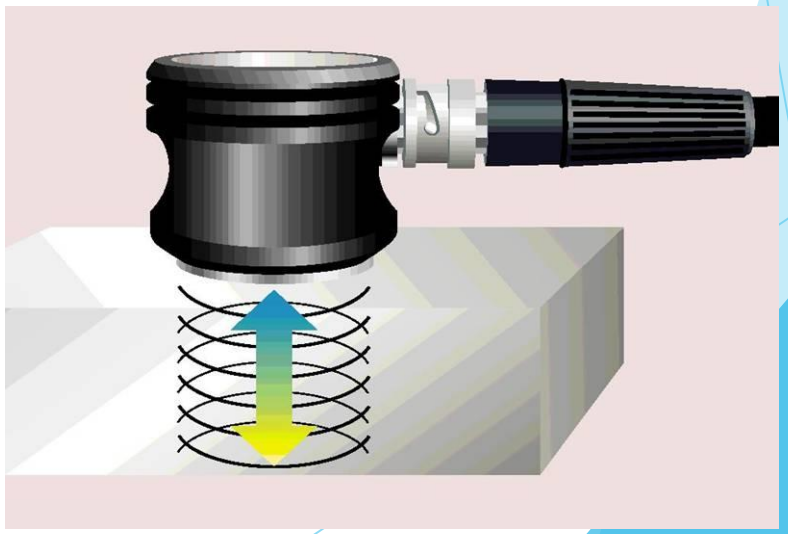
Ultrasound Generation

Ultrasound is generated with a transducer.



A piezoelectric element in the transducer converts electrical energy into mechanical vibrations (sound), and vice versa.

The transducer is capable of both transmitting and receiving sound energy.



Transducers

- Transducers are manufactured in a variety of forms, shapes and sizes for varying applications.
- Transducers are categorized in a number of ways which include:
  - Contact or immersion
  - Single or dual element
  - Normal or angle beam

- In selecting a transducer for a given application, it is important to choose the desired frequency, bandwidth, size, and in some cases focusing which optimizes the inspection capabilities.

Sound Intensity & Fields

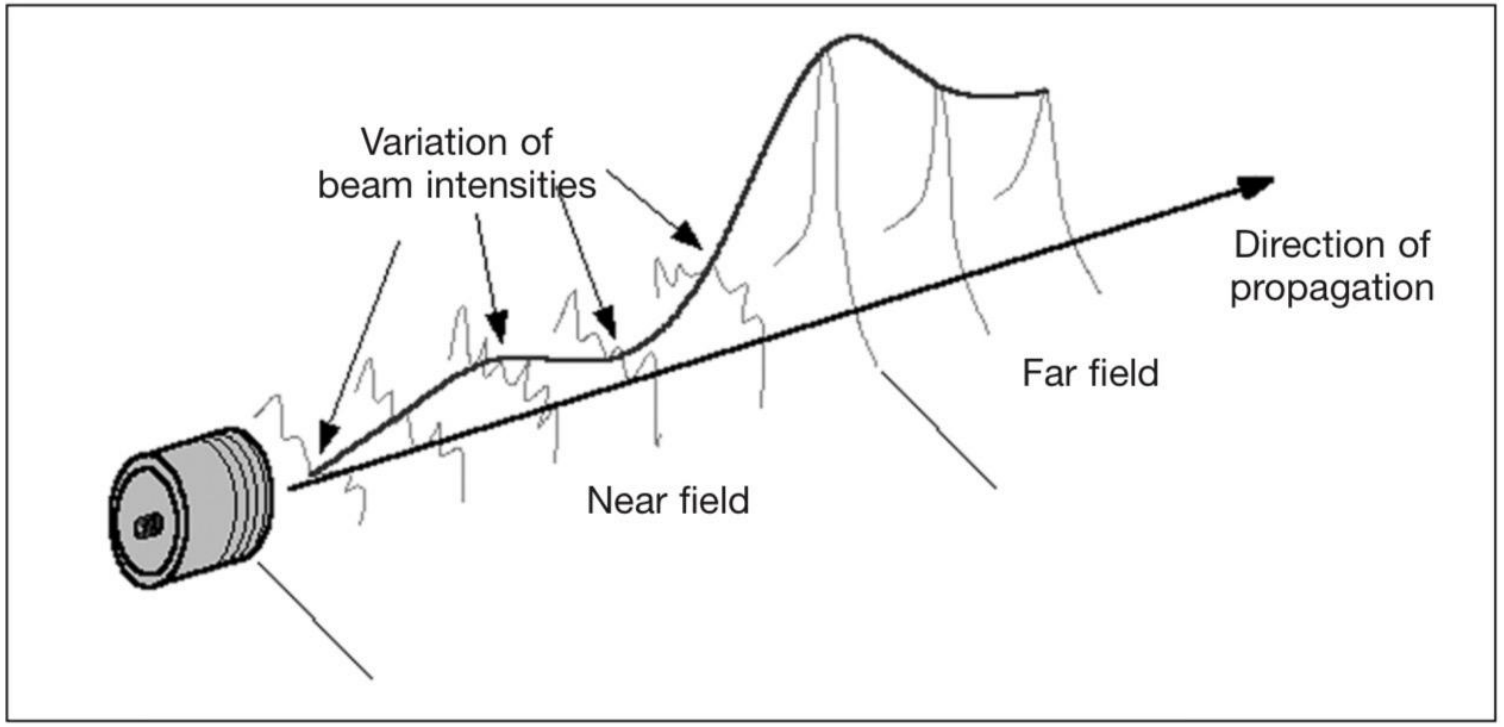


Figure 3: Ultrasonic wave field in front of a disk-shaped transducer.

Near Field & Far Field

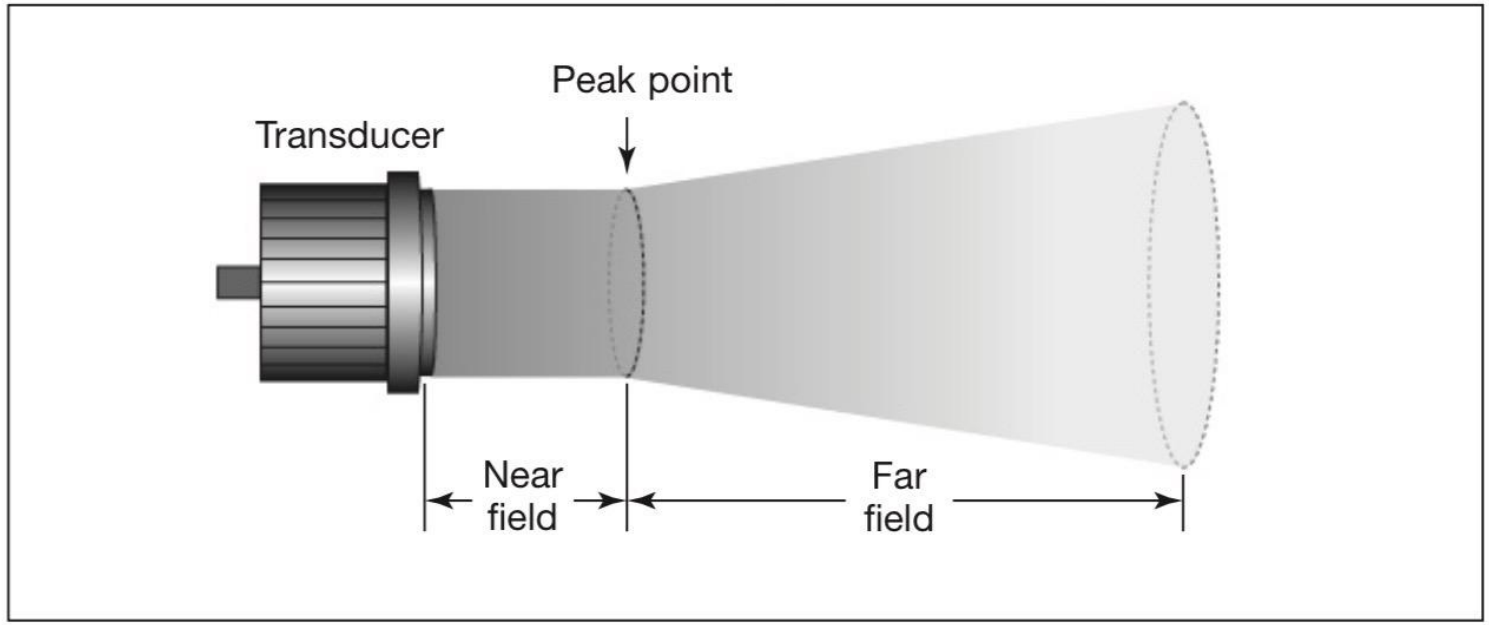


Figure 2: Zones within the ultrasonic beam.

Near Field

Beam Divergence Angle

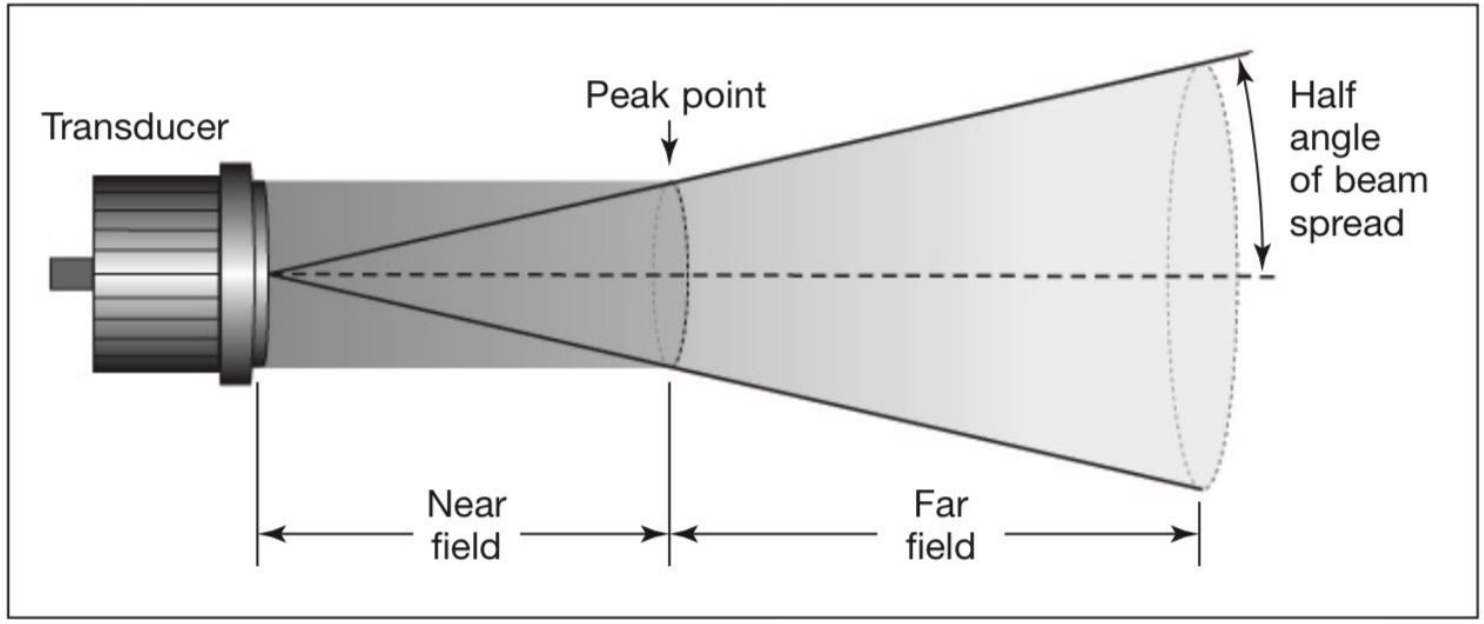


Figure 4: Beam spread computation.

Beam Divergence Angle

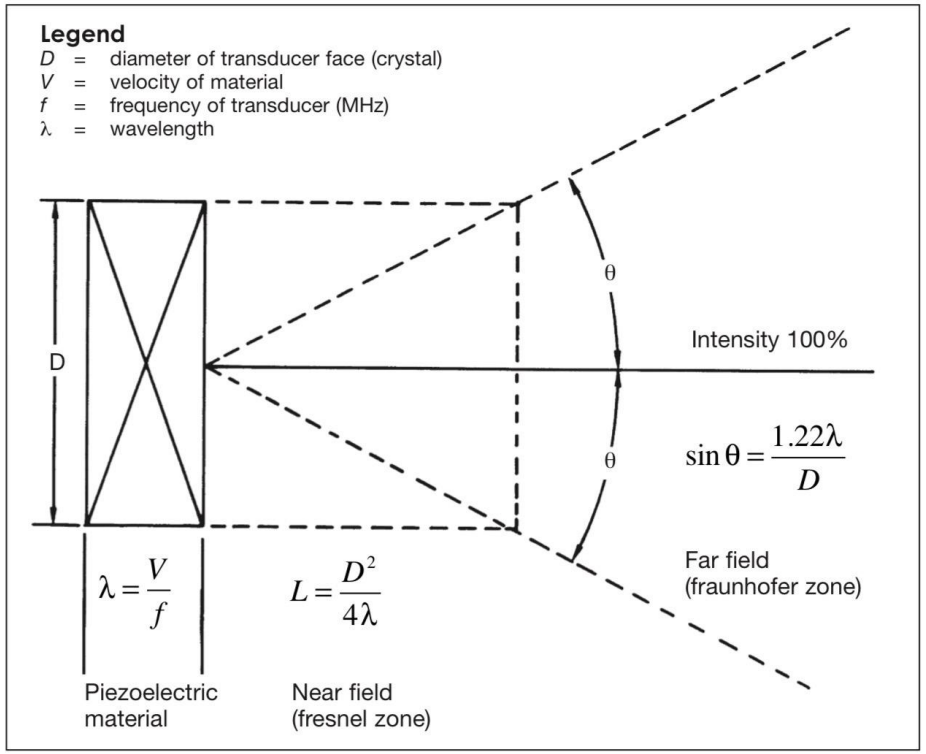


Figure 5: Beam profile.

Multiple Echoes
Sound Energy Attenuation (Absorption & Scatter) Loss

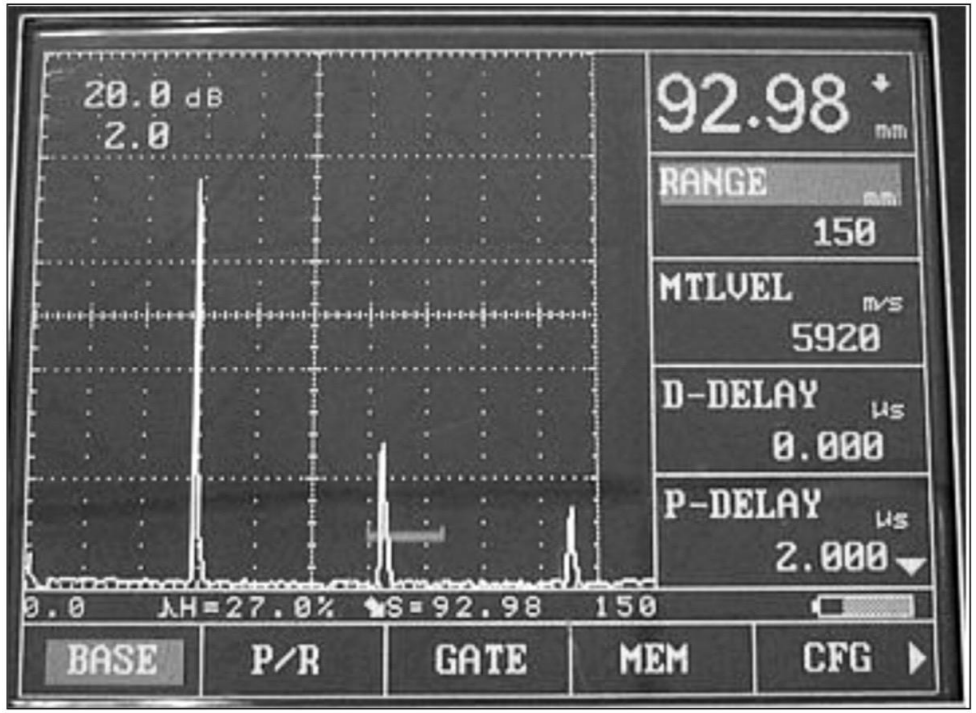


Figure 10: LCD display of an ultrasonic test.

Flaw Detector Display (A – Scan)

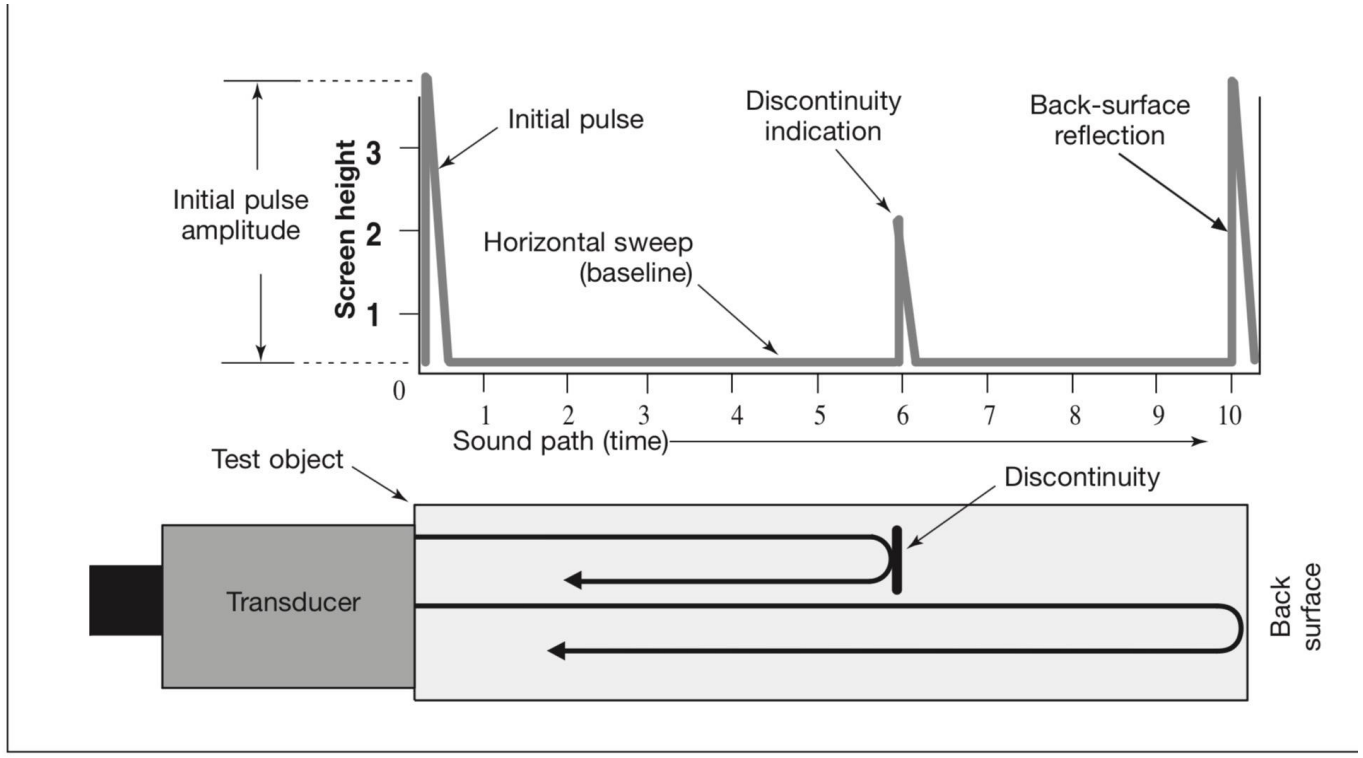


Figure 2: A-scan presentation.

Flaw Detector Display (B – Scan)

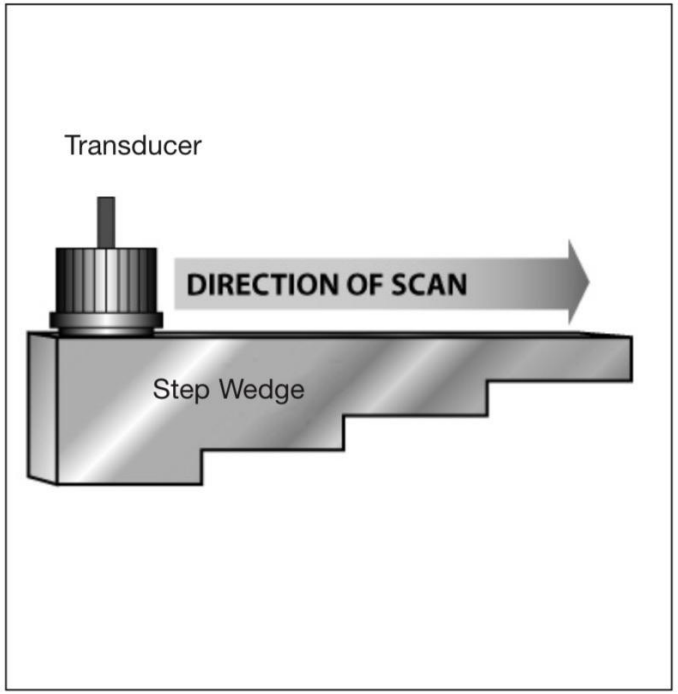


Figure 5: B-scan representation of the four steps of a 1 in. (25.4 mm) step wedge.

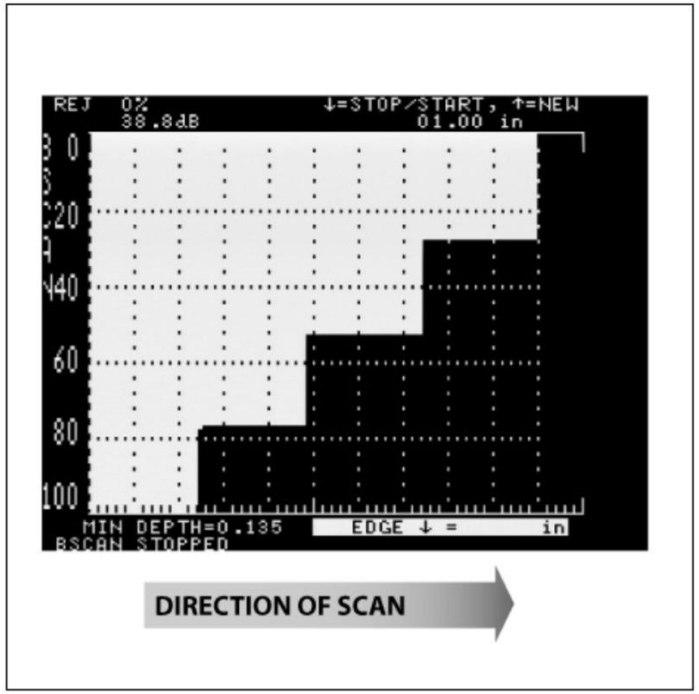


Figure 6: B-scan representation of a manual scan.

Flaw Detector Display (B – Scan)
Cross Sectional View (Test Object)

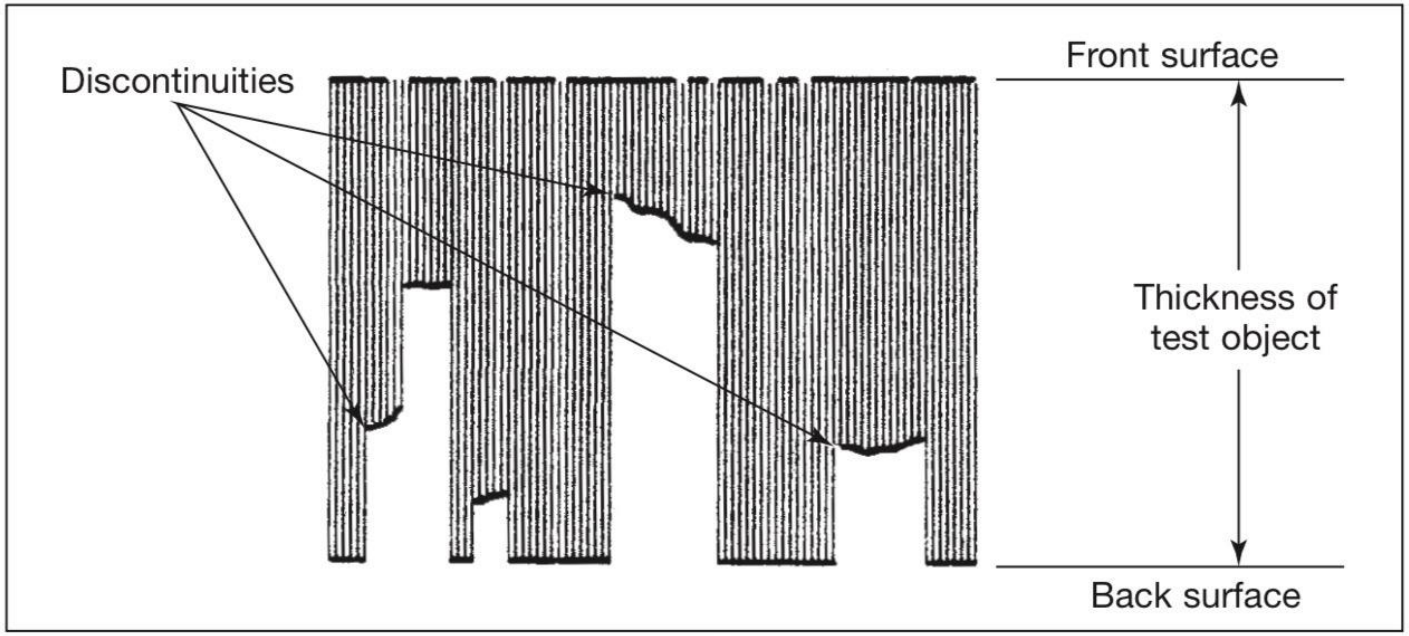


Figure 7: B-scan display of internal discontinuities lying under the scanning path of an ultrasonic transducer.

Flaw Detector Display (C – Scan)
Plan View

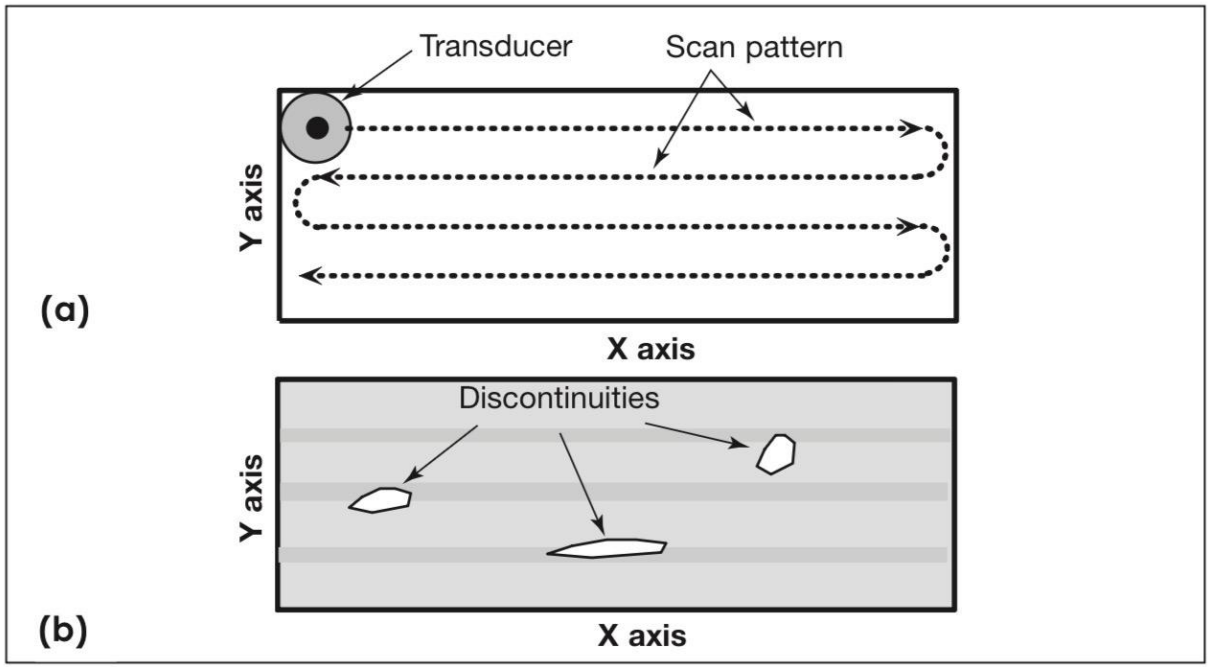


Figure 8: C-scan presentation.

Instrumentation (cont.)

- D-meters or digital thickness gauge instruments provide the user with a digital (numeric) readout.
- They are designed primarily for corrosion/erosion inspection applications.

- Some instruments provide the user with both a digital readout and a display of the signal. A distinct advantage of these units is that they allow the user to evaluate the signal to ensure that the digital measurements are of the desired features.

Flaw Detector Display (A – Scan) Range Horizontal, X -Axis

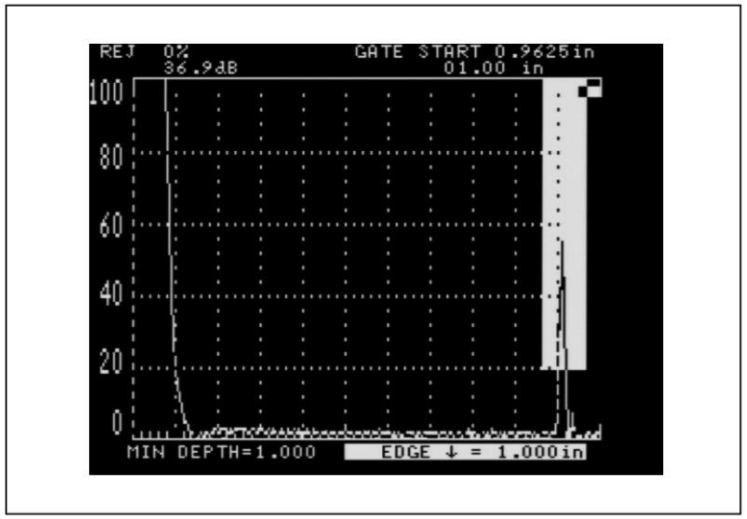


Figure 3: Resulting signal when a transducer is coupled to a 1 in. (25.4 mm) thick mild steel test block.

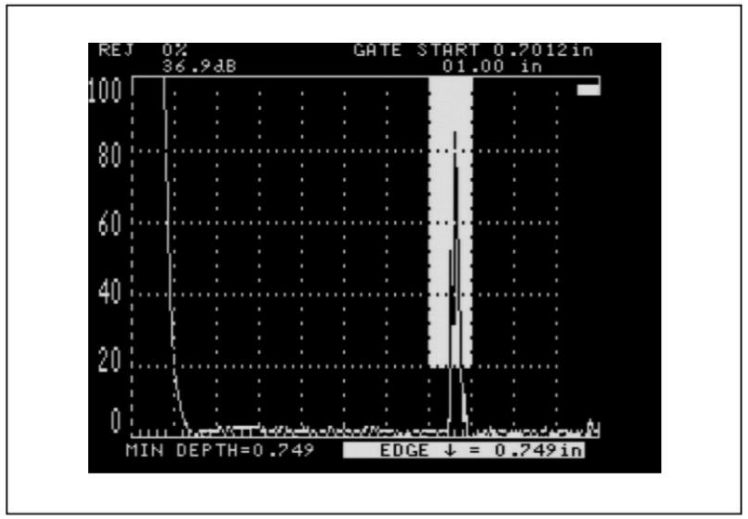


Figure 4: Signal as produced when the same transducer shown in Figure 3 is placed on a 0.75 in. (19 mm) test block made of the same material.

Flaw Detector Display (A – Scan), %FSH
Vertical, Y –Axis (Amount of Energy Received)

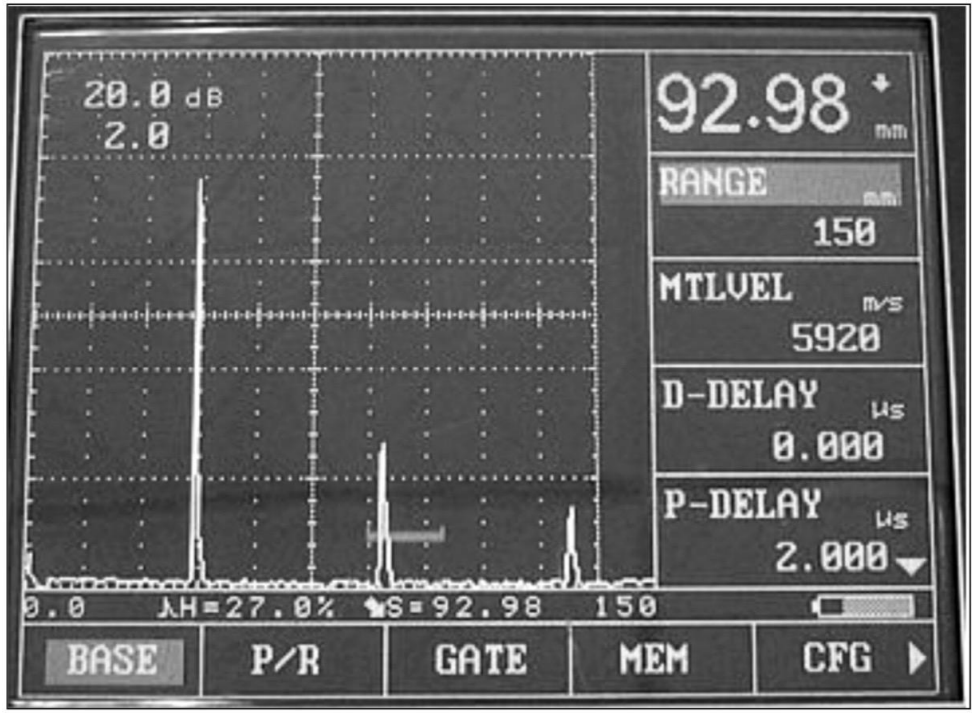


Figure 10: LCD display of an ultrasonic test.

Echo Wave Forms

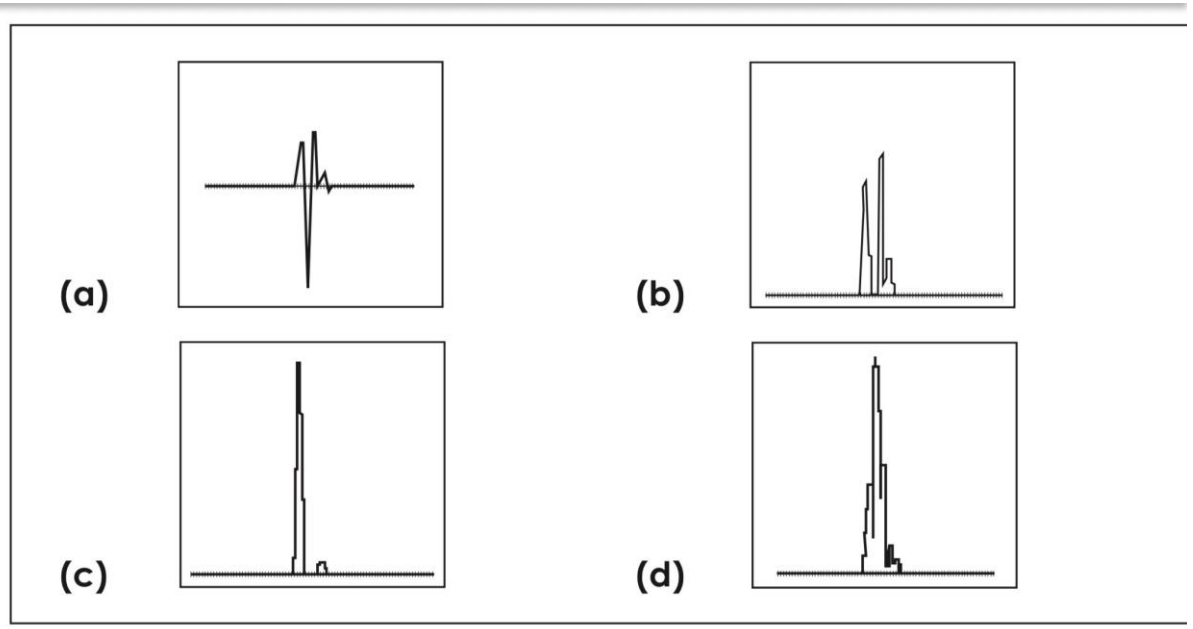


Figure 13: Rectification control displays: (a) radio-frequency waveform (unrectified); (b) half-wave (+) rectified; (c) half-wave (–) rectified, and (d) full-wave rectified.

Application

Two Main Techniques

1) UTM – Ultrasonic Thickness Measurement (Normal Probe)

- Corrosion/ Erosion, Lamination, Internal Flaws Tests

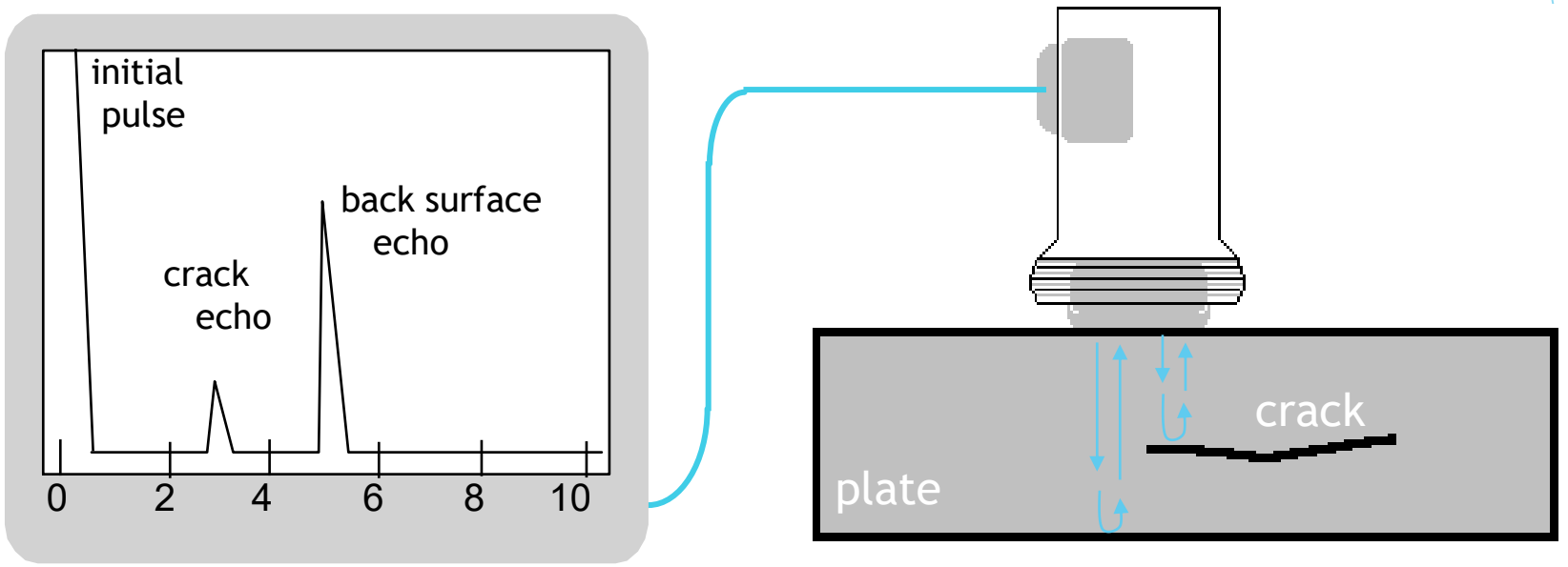
2) Flaw Detection (Angle Probe)

- Welding Flaw Detection, LOP, LOF, Crack, Intrnal Discontinuity

- Contact Vs Immersion Method
- Pulse Echo Vs Through Transmission Method

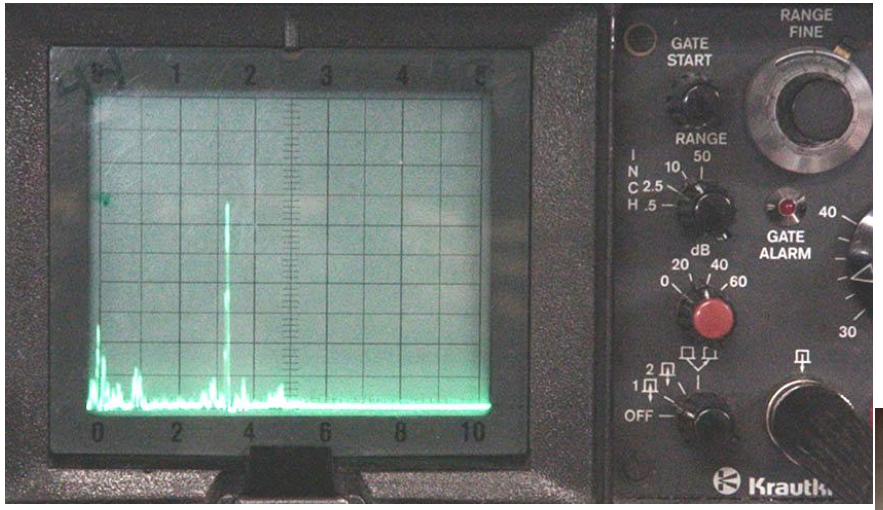
Basic Ultrasonic Testing (UT)

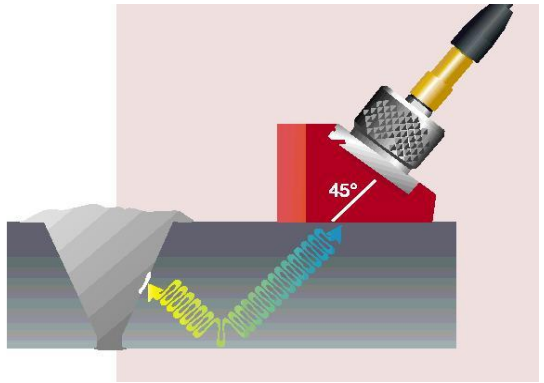
1) Normal Beam Technique (UTM)



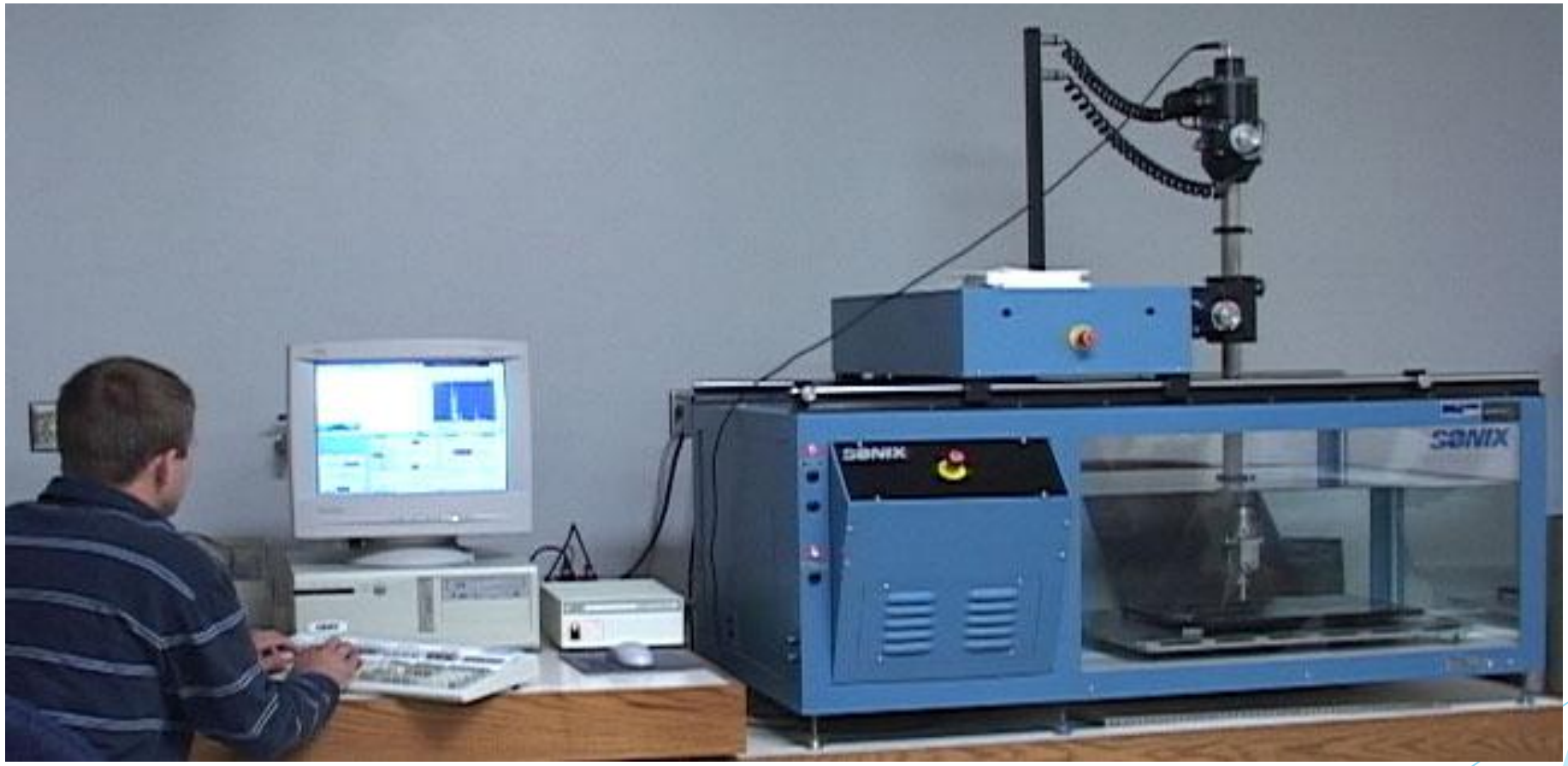
Oscilloscope, or
flaw detector
screen

2) Angle Beam Technique (Welding Flaw Detection)





3) Immersion Test Technique (Automatic)



3) Immersion Test Technique (Automatic)

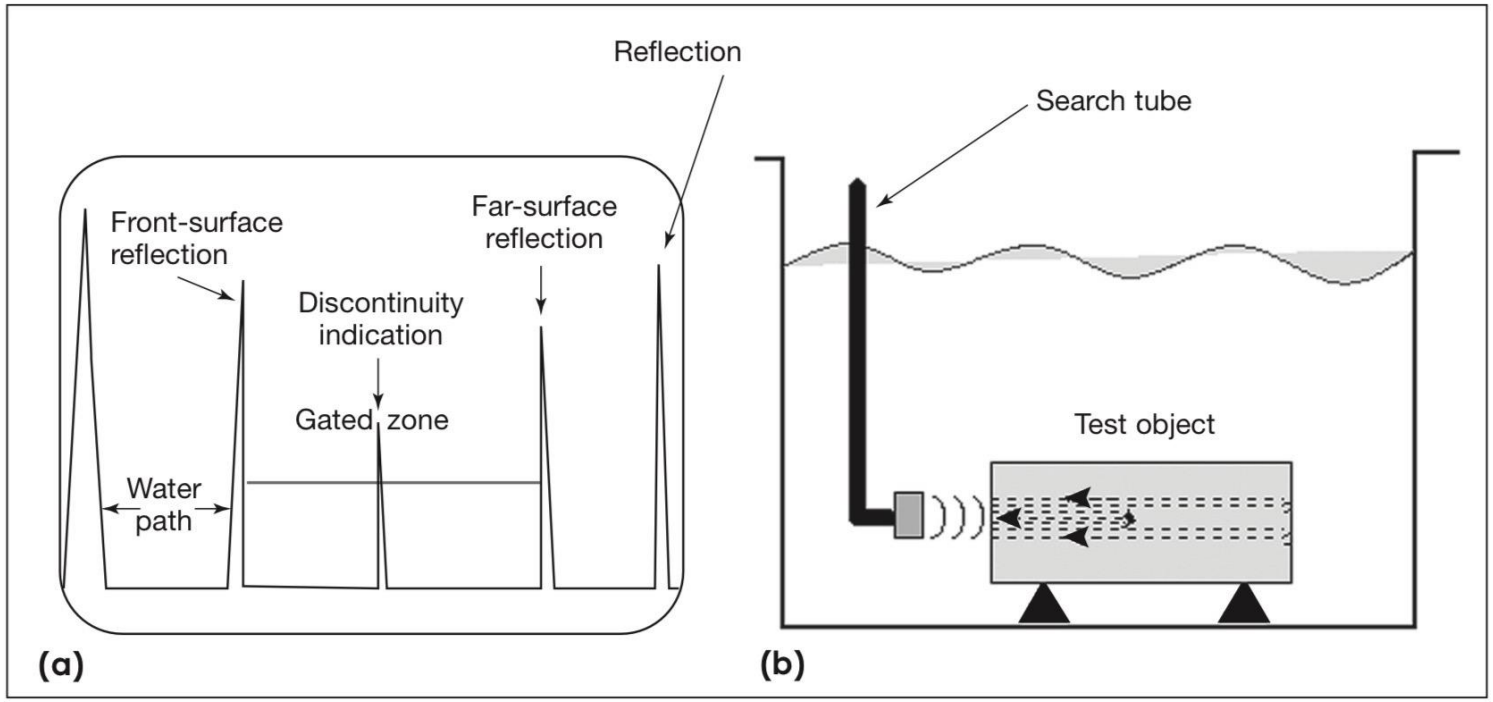


Figure 7: Longitudinal immersion testing: (a) A-scan display; (b) tank.

4) Ultrasonic Testing (UT)

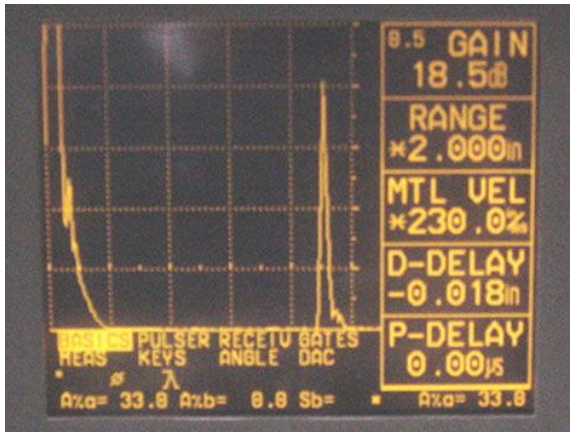
- Human Hearing Range Frequency (20Hz to 20kHz)
- Manual UT (1 to 5 MHz)
- Pulse- Echo **(P-E Method)**
- **Categories**
  - Normal Beam Technique – Thickness Measurement (UTM) Vs
  - Angle Beam Technique - Flaw Detection (Welding)
  - Contact Technique
  - Immersion Technique
  - P-E Vs Through Transmission Technique

-

Transducers = Piezoelectric Elements

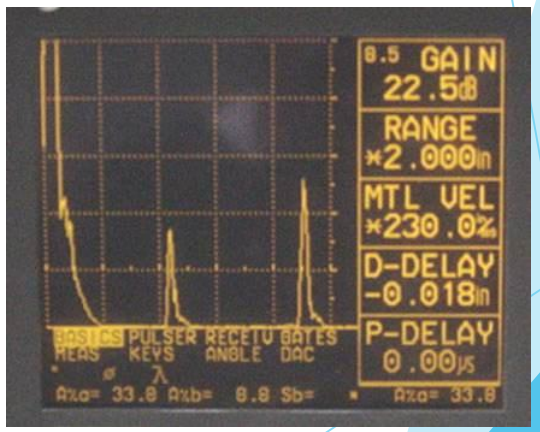
Single / Twin, Dual Transducers

Test Techniques - Pulse-Echo (cont.)



Digital display showing signal generated from sound reflecting off back surface.

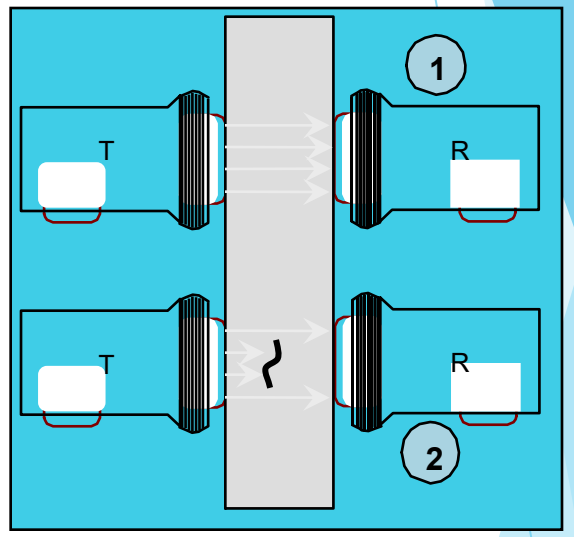
Digital display showing the presence of a reflector midway through material, with lower amplitude back surface reflector.

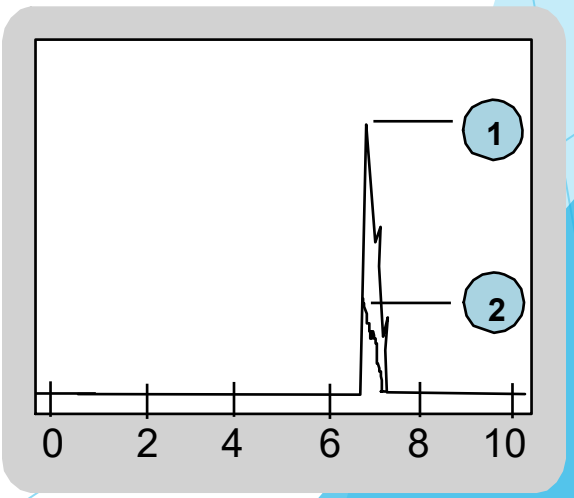


The pulse-echo technique allows testing when access to only one side of the material is possible, and it allows the location of reflectors to be precisely determined.

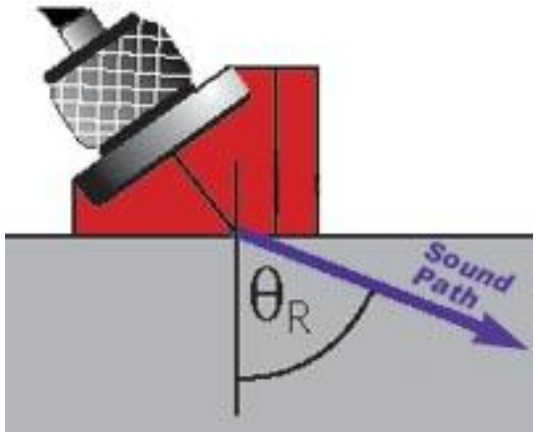
Test Techniques – Through-Transmission

- Two transducers located on opposing sides of the test specimen are used. One transducer acts as a transmitter, the other as a receiver.
- Discontinuities in the sound path will result in a partial or total loss of sound being transmitted and be indicated by a decrease in the received signal amplitude.
- Through transmission is useful in detecting discontinuities that are not good reflectors, and when signal strength is weak. It does not provide depth information.





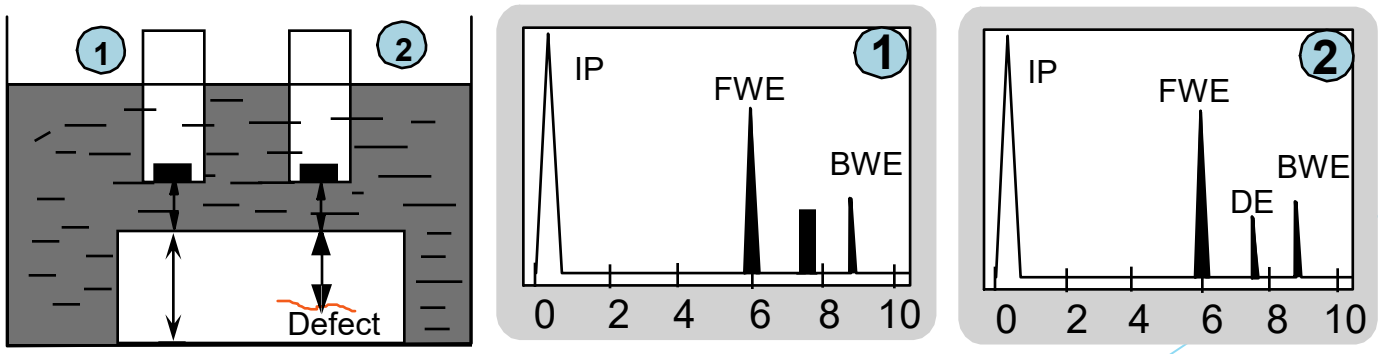
Test Techniques – Normal and Angle Beam



- In normal beam testing, the sound beam is introduced into the test article at 90 degree to the surface.
- In angle beam testing, the sound beam is introduced into the test article at some angle other than 90.
- The choice between normal and angle beam inspection usually depends on two considerations:
  - The orientation of the feature of interest – the sound should be directed to produce the largest reflection from the feature.
  - Obstructions on the surface of the part that must be worked around.

Test Techniques – Contact Vs Immersion

- To get useful levels of sound energy into a material, the air between the transducer and the test article must be removed. This is referred to as coupling.
- In contact testing (shown on the previous slides) a couplant such as water, oil or a gel is applied between the transducer and the part.
- In immersion testing, the part and the transducer are place in a water bath. This arrangement allows better movement of the transducer while maintaining consistent coupling.
- With immersion testing, an echo from the front surface of the part is seen in the signal but otherwise signal interpretation is the same for the two techniques.



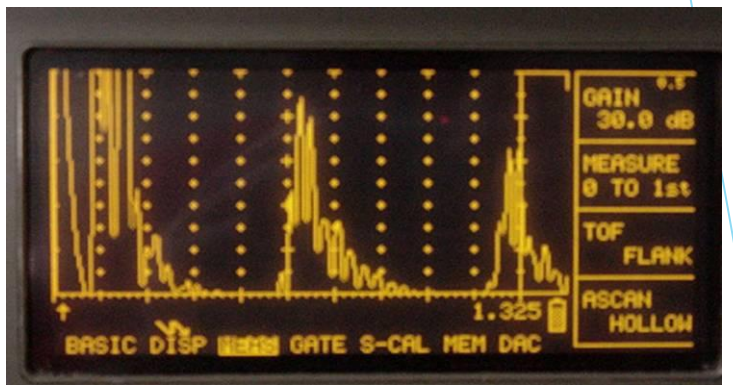
IP = Initial Pulse
FWE = Front Wall Echo
DE = Defect Echo
BWE = Back Wall Echo

Thickness Gauging

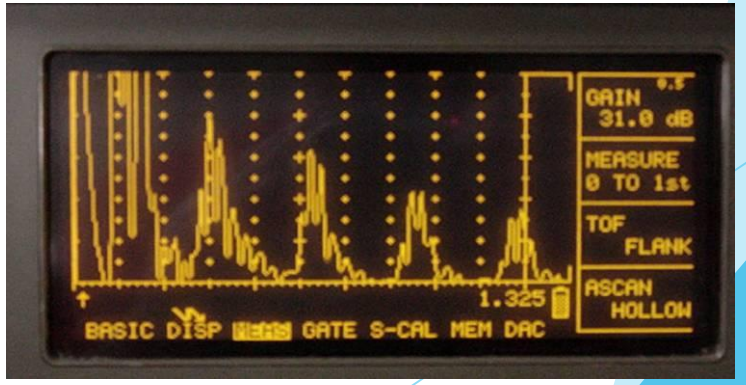
- Ultrasonic thickness gauging is routinely utilized in the petrochemical and utility industries to determine various degrees of corrosion/erosion.
- Applications include piping systems, storage and containment facilities, and pressure vessels.

Flaw Detection - Delaminations

Contact, pulse-echo inspection for delaminations on 36” rolled beam.



Signal showing multiple back surface echoes in an unflawed area.



Additional echoes indicate delaminations in the member

UT (Contd-)

- **Screen Display**
  - Horizontal **(Range)** = Beam Path Length/ Distance (BPD)
  - Vertical **(FSH %)** = Received (Return) Sound Intensity

  JIS Z 3060 – UT for Ferritic Steels

  Probe Frequency Selection

  BPD < 100mm = 5MHz

  100< BPD< 150 = 5MHz or 2MHz

  BPD >150mm = 2 MHz

  Probe Angle (45, 60, 70 Deg) (Complement of V Angle)

  Calibration Blocks/ Reference Blocks

  Advance (Prior) Information

Flaw Detector Display (A – Scan),

X- Axis Vs Y – Axis

X= Time or Distance, Y = Return Signal Strength

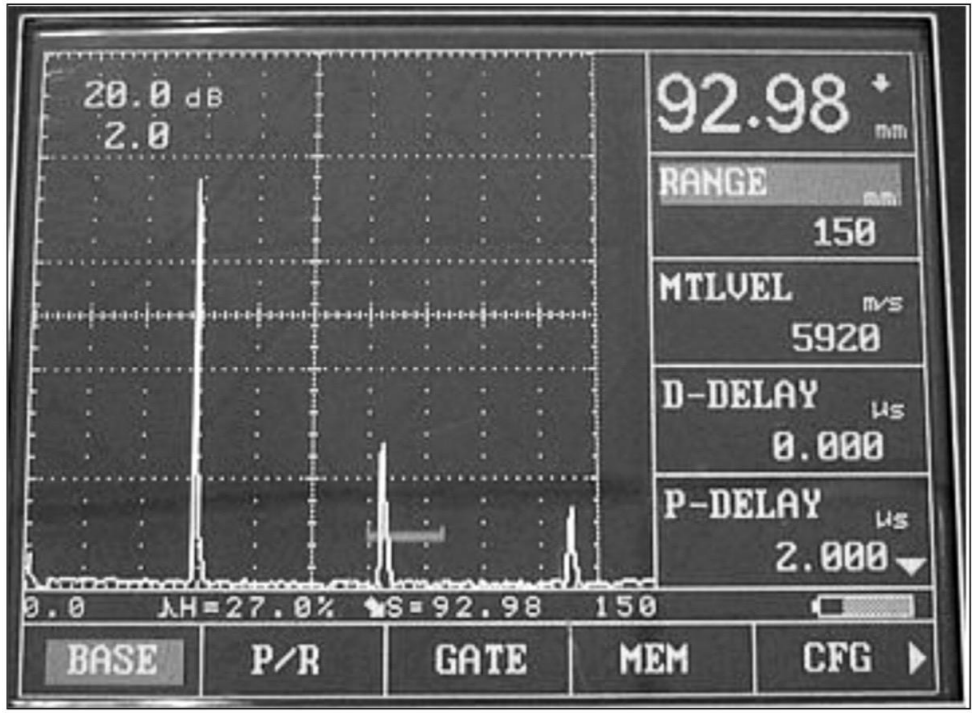


Figure 10: LCD display of an ultrasonic test.

UT Inspection

- **Equipment Setting (Calibration)**
- **Scanning / Searching the Flaws**
- **Beam Path Length Calculation**
- **Targeting to the Intended Areas & Flaw Orientations**

UT System Quality- Resolution (Separate Ability & Sensitivity (How Small)

- **Flaw Detection Interpretation**

1) Type
2) Location
3) Sizes

- Evaluate with Acceptance Criteria (Accept/ Reject) Ref- Standards
- Reports

UT Inspection

- **Calibration: Comparing & Adjusting with the Known Values**
- **Calibration Blocks & Reference Blocks**

By many Institutions for relevant Applications

(ASME, AWS, API, IIW,DIN,JIS-Z,, etc.,)

(3) Characteristics of Calibration Blocks

- 1) Zero Tolerance (+/- 0.0)
- 2) Zero Defects Except Man Mades (Artificial Defects)
- 3) Known Values (Dimensions)

Claibration Blocks & Reference Blocks

IIW V 1 Block & V 2 Blocks

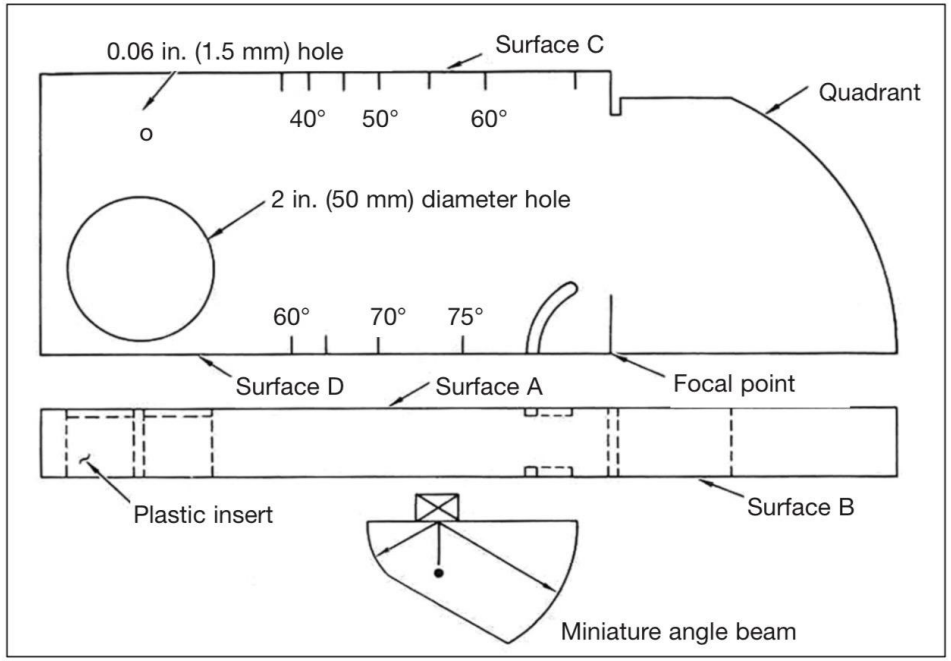


Figure 18: Special reference blocks.

Welding Inspection By UT
Calibrations of UT System

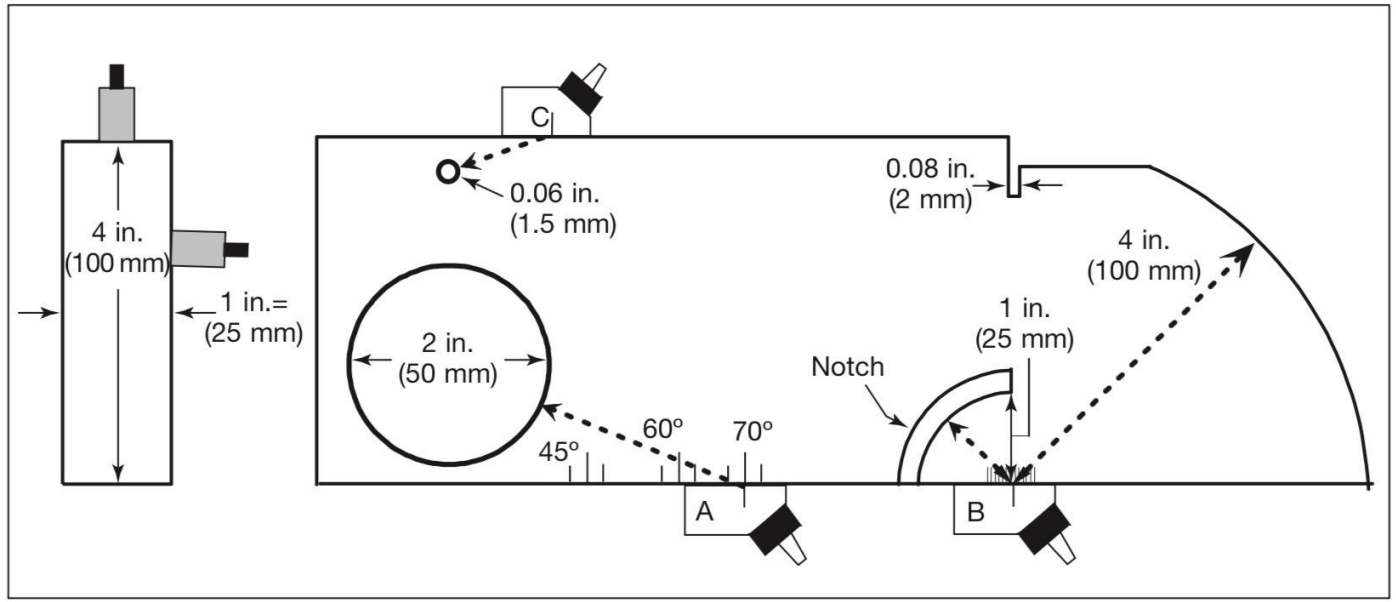


Figure 11: Type 1 IIW block.

DAC Curve For Flaw Sizing (Sensitivity)

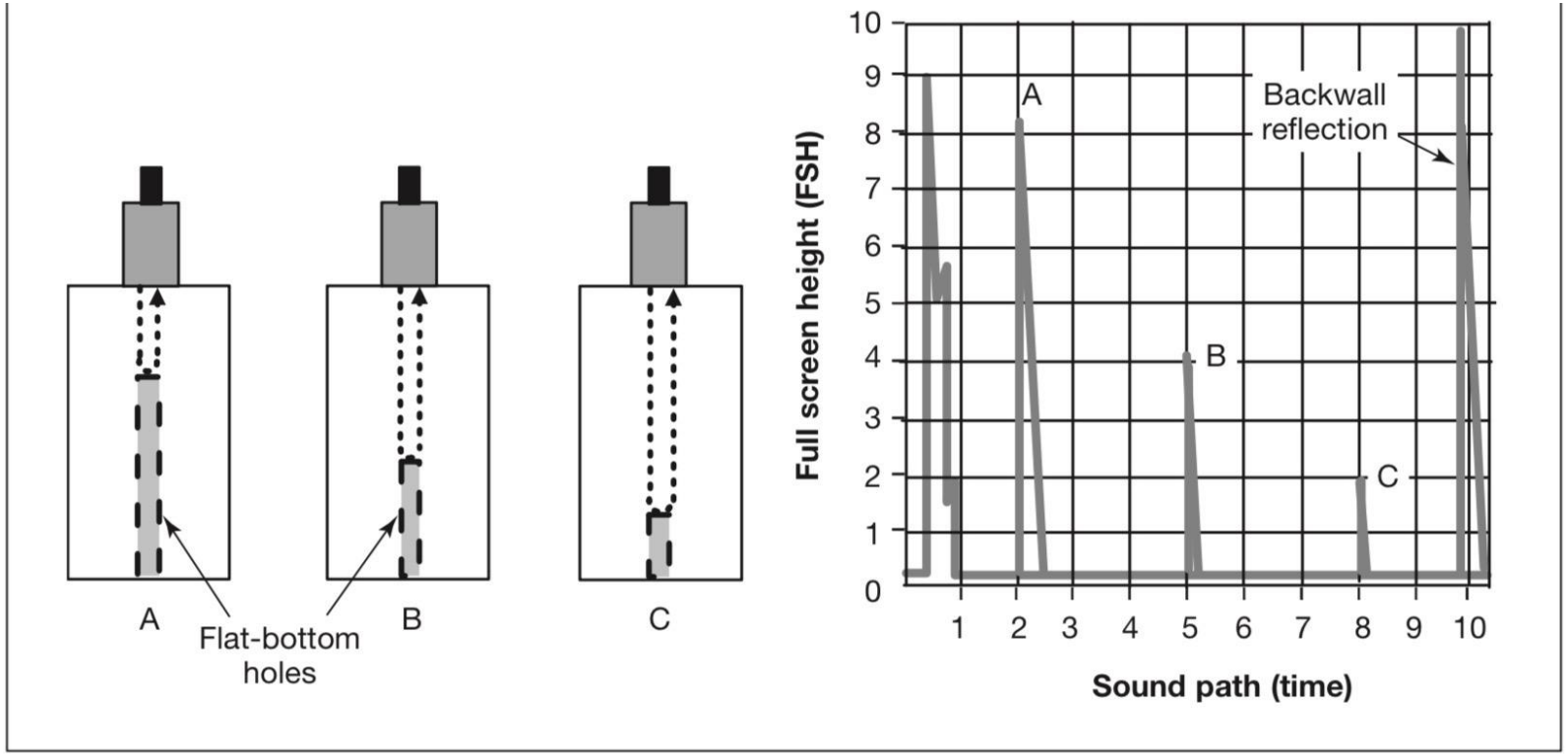
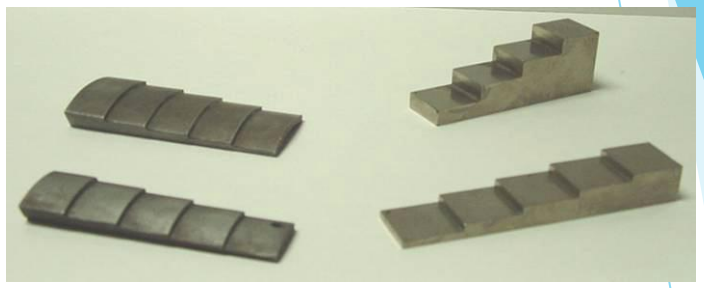


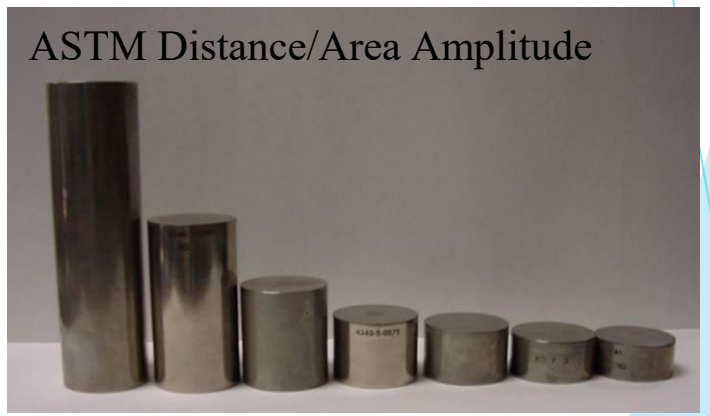
Figure 4: Distance-amplitude blocks.

Calibration Standards (cont.)

Thickness calibration standards may be flat or curved for pipe and tubing applications, consisting of simple variations in material thickness.

Distance/Area Amplitude standards utilize flat bottom holes or side drilled holes to establish known reflector size with changes in sound path form the entry surface.

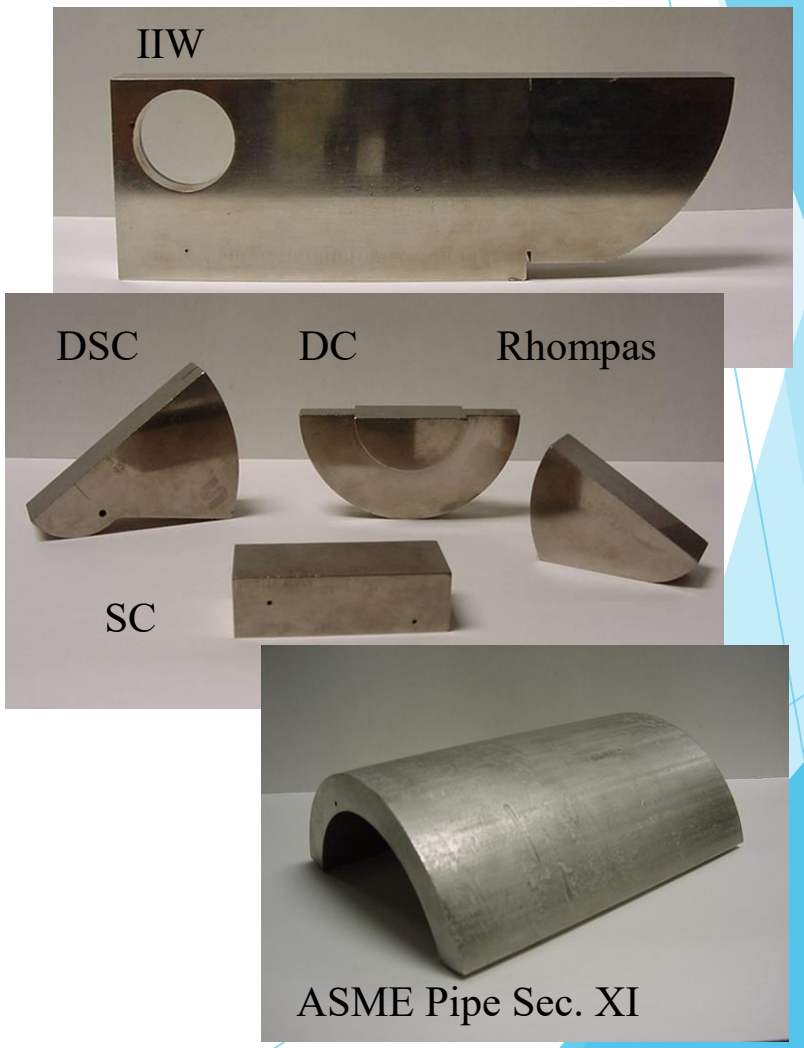




Calibration Standards (cont.)

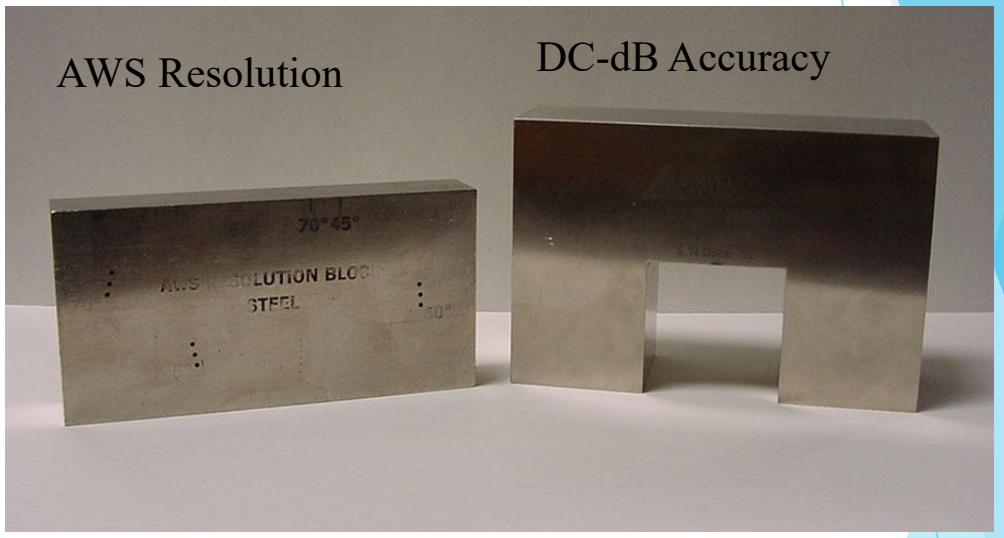
There are also calibration standards for use in angle beam inspections when flaws are not parallel to entry surface.

These standards utilized side drilled holes, notches, and geometric configuration to establish time distance and amplitude relationships.



Qualification Standards

Qualification standards differ from calibration standards in that their use is for purposes of varying proper equipment operation and qualification of equipment use for specific codes and standards.



Flaw Detection / Scanning (LOF)
Beam Path Length (Sound)

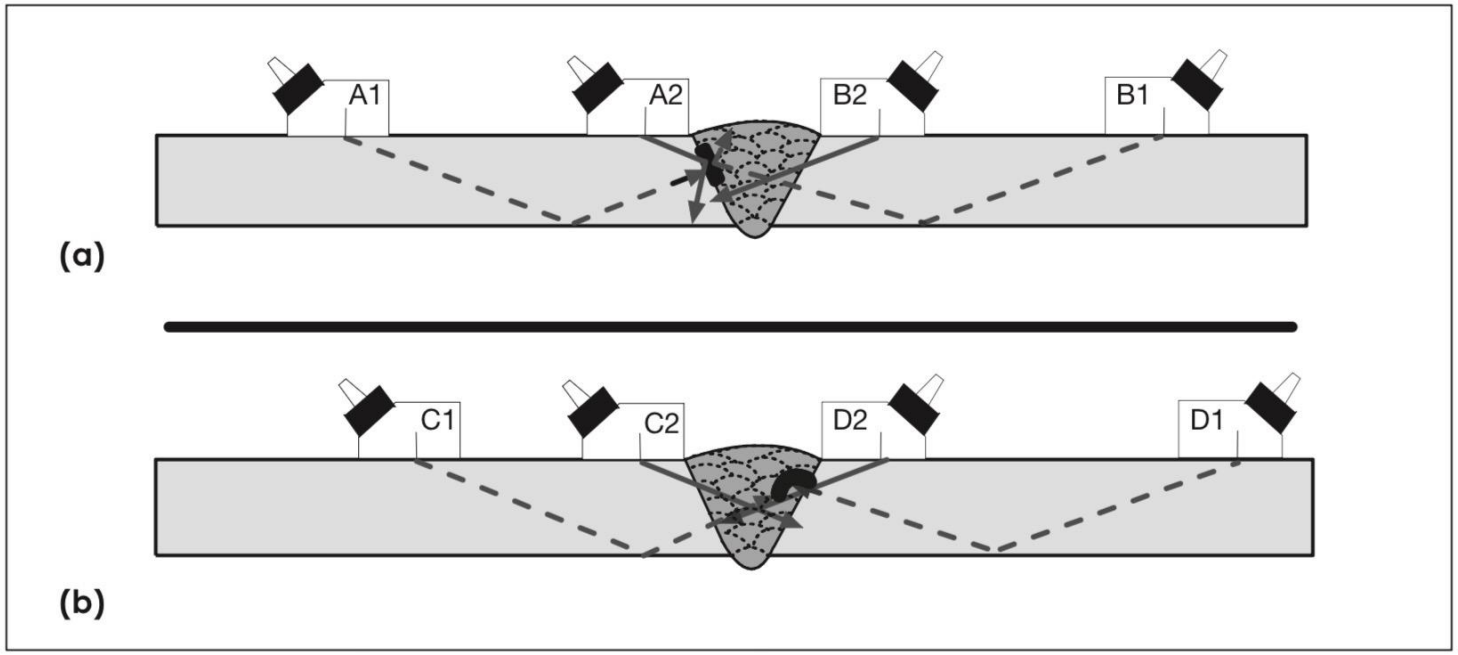
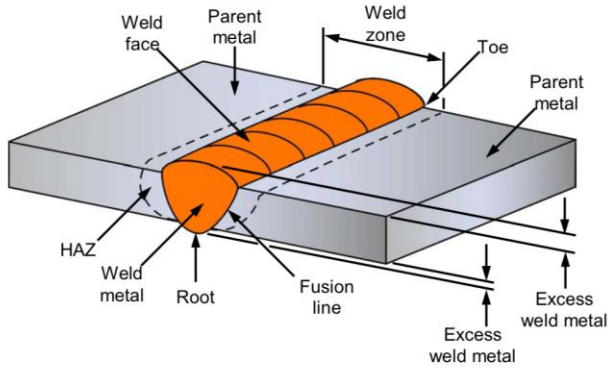


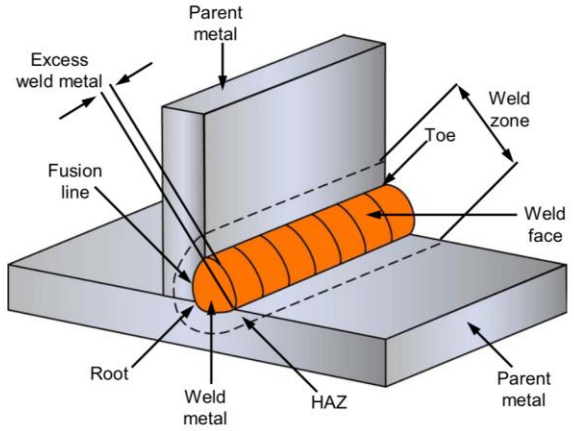
Figure 20: Lack of fusion: (a) sidewall; (b) interbead.

Weld Joint Inspection

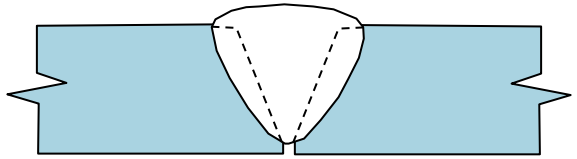
10:51 Sat 9 May

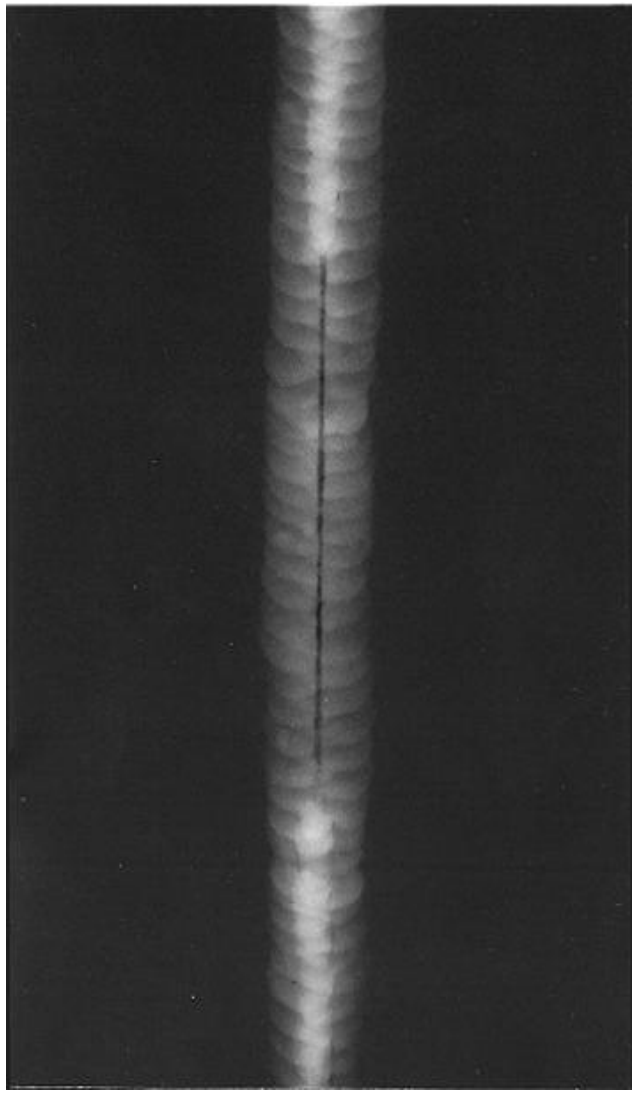
80%



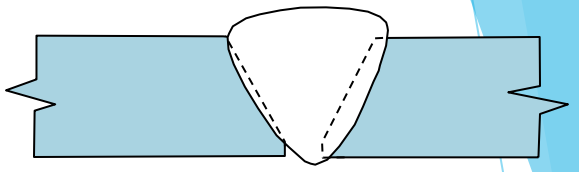


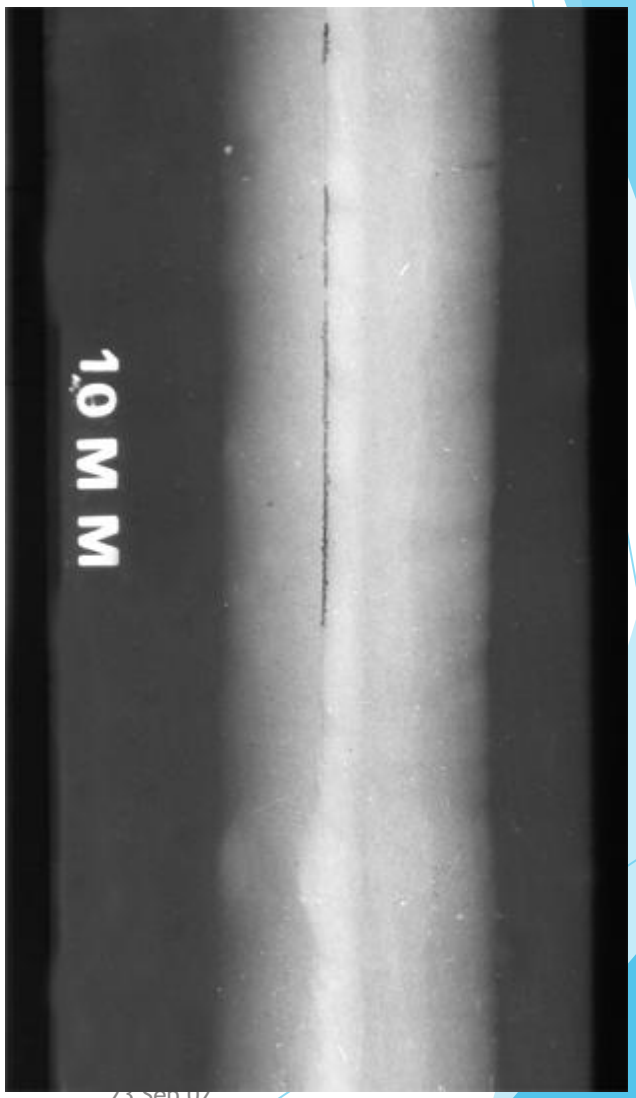
2.4 WELD PREPARATION



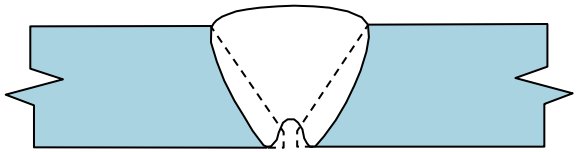


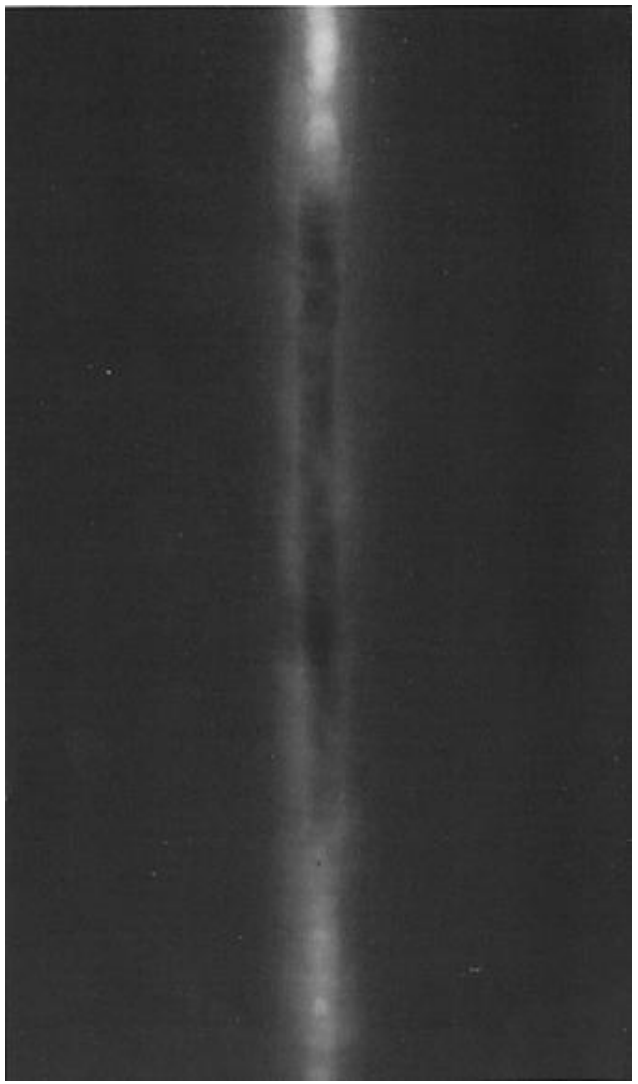
Lack of root penetration



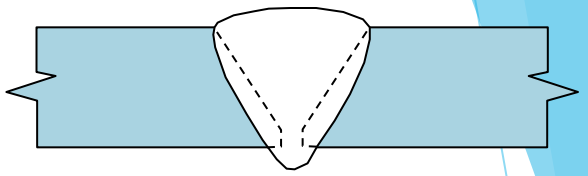


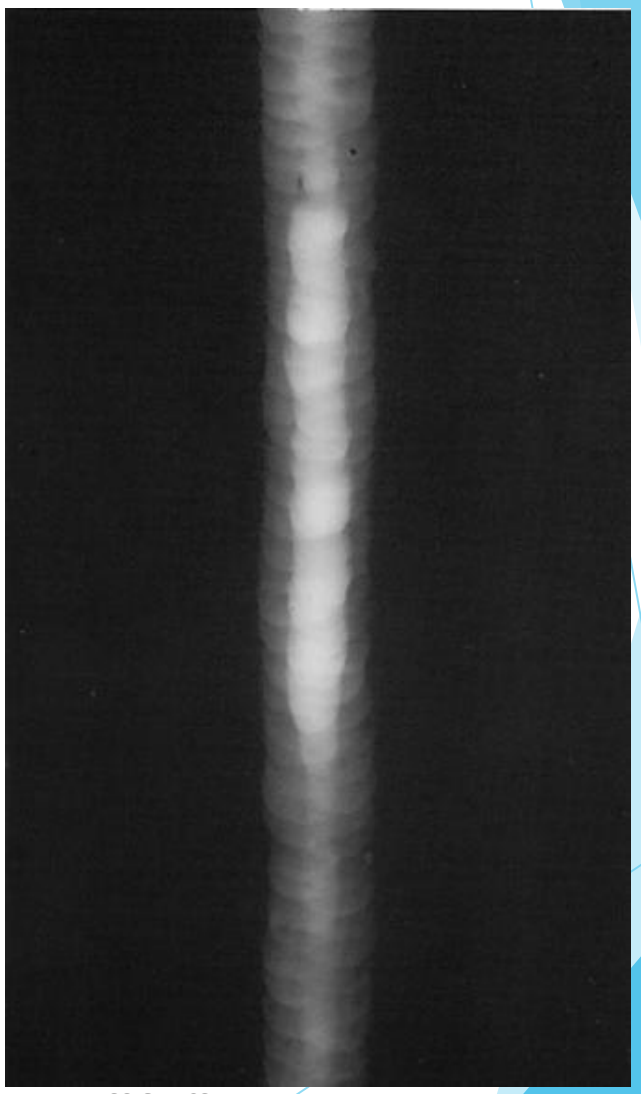
Lack of root fusion



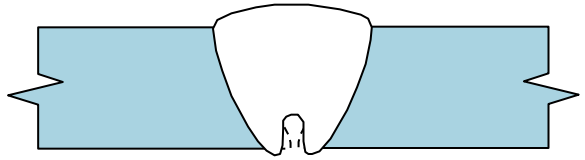


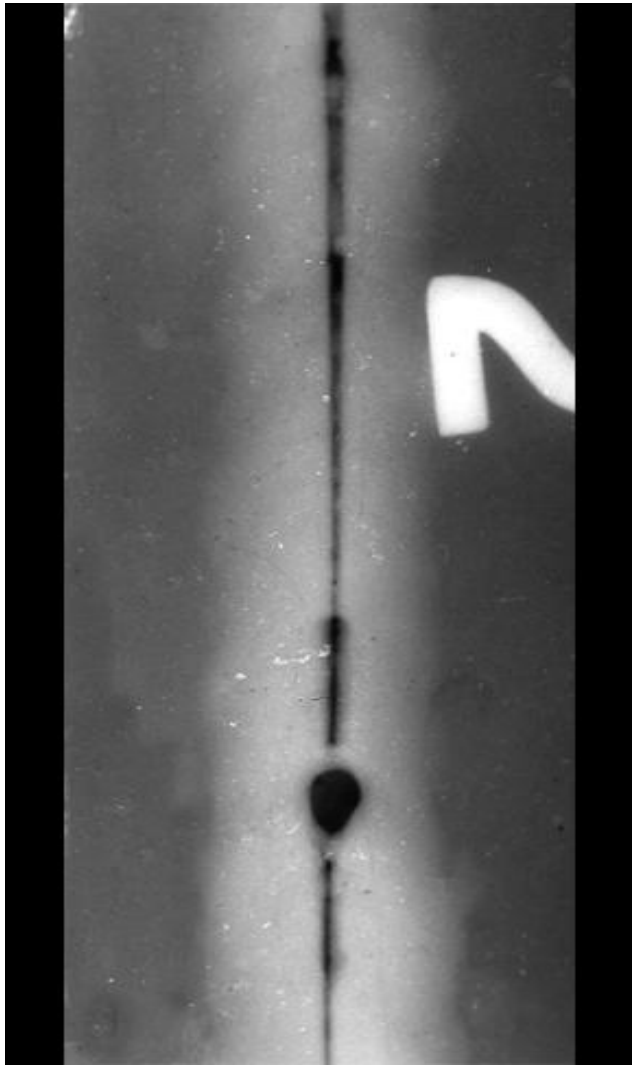
Concave root



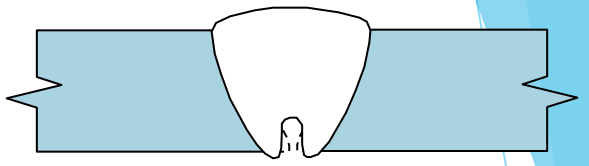


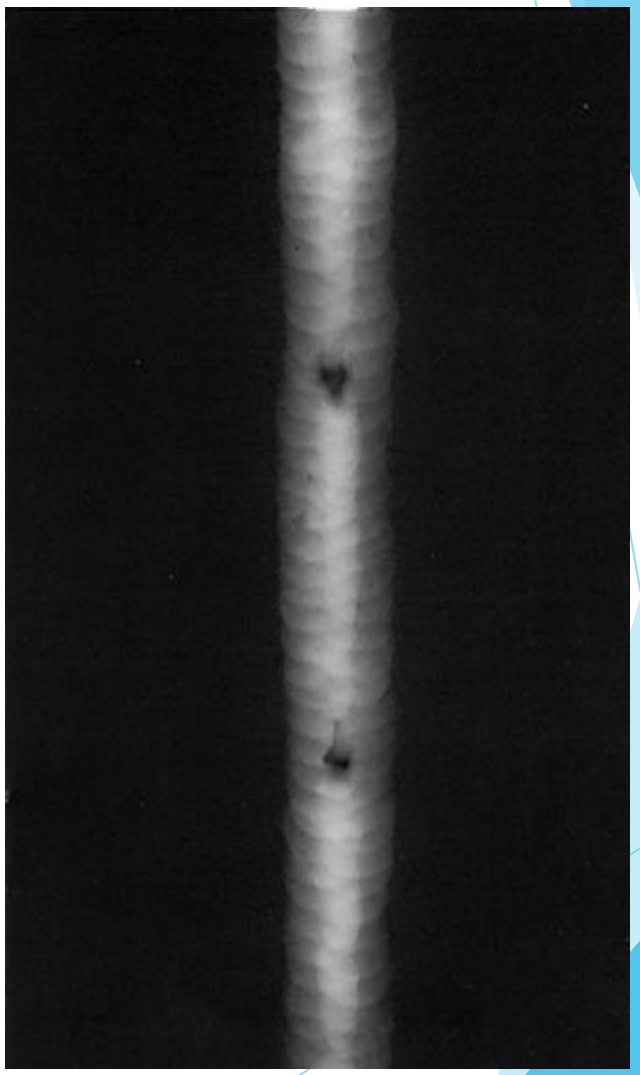
Excessive root penetration



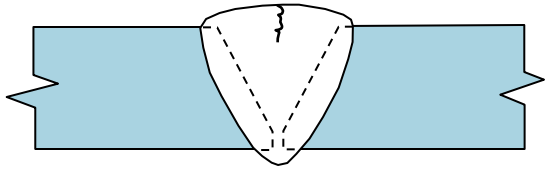


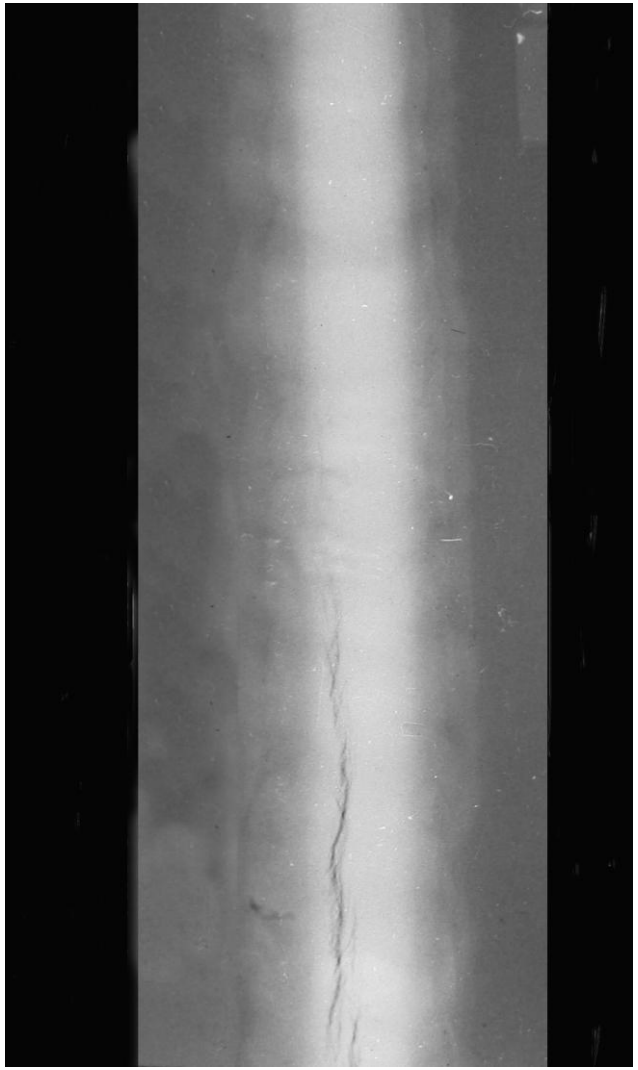
Burn through + LORP



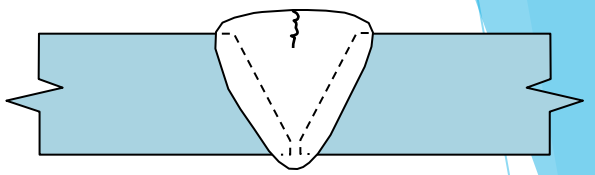


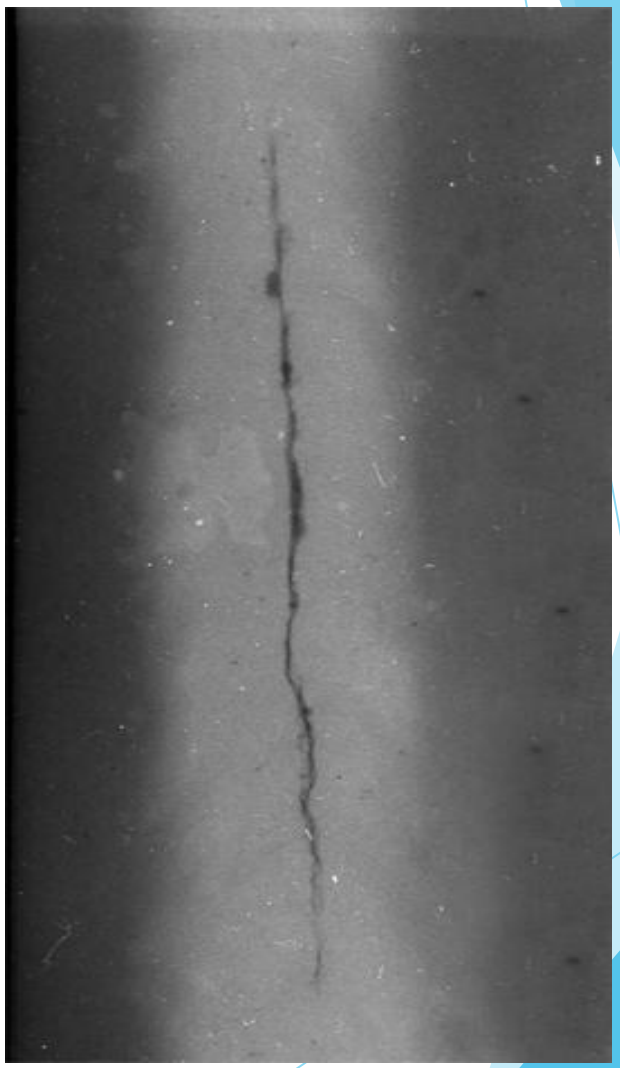
Burn through



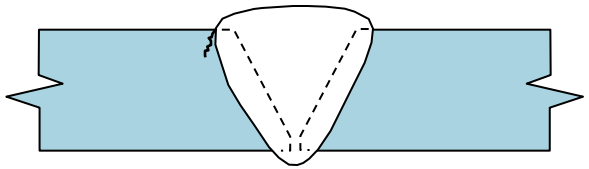


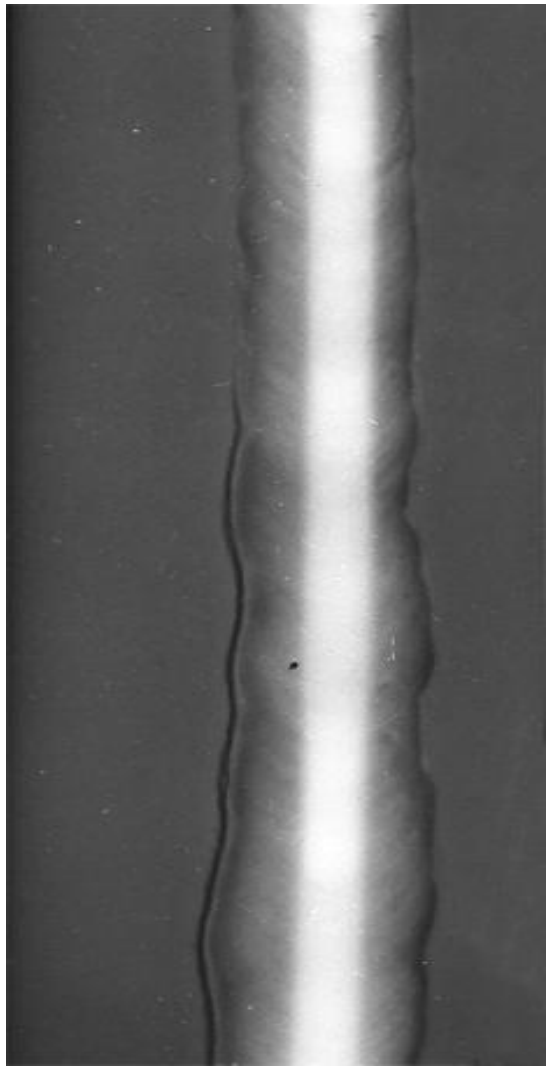
Longitudinal crack



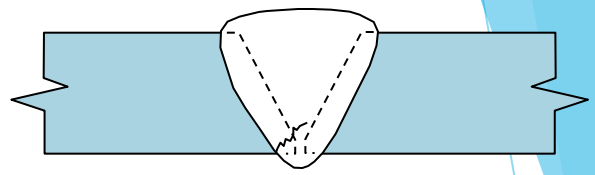


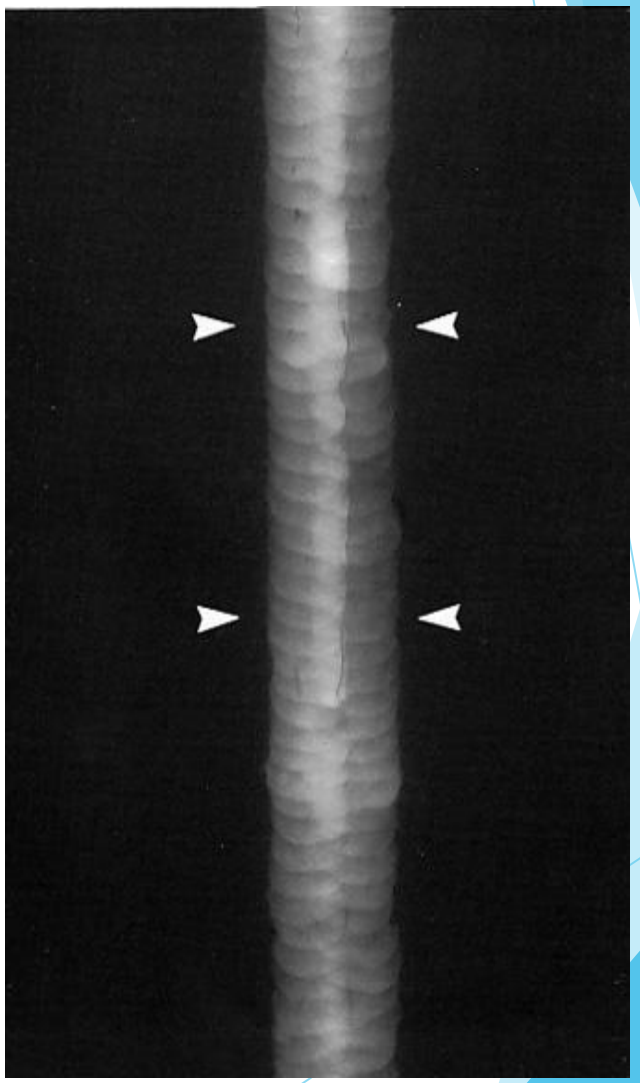
Longitudinal crack



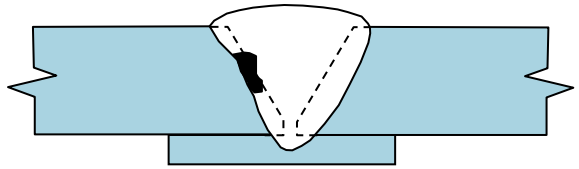


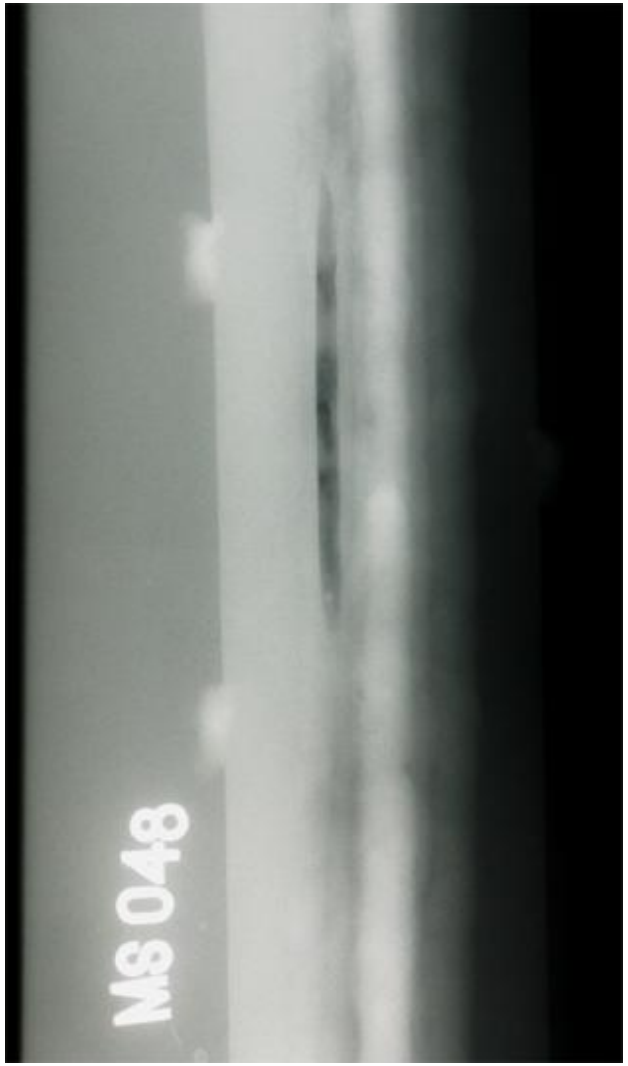
HAZ crack



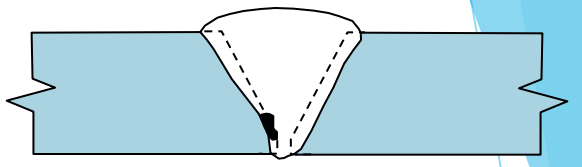


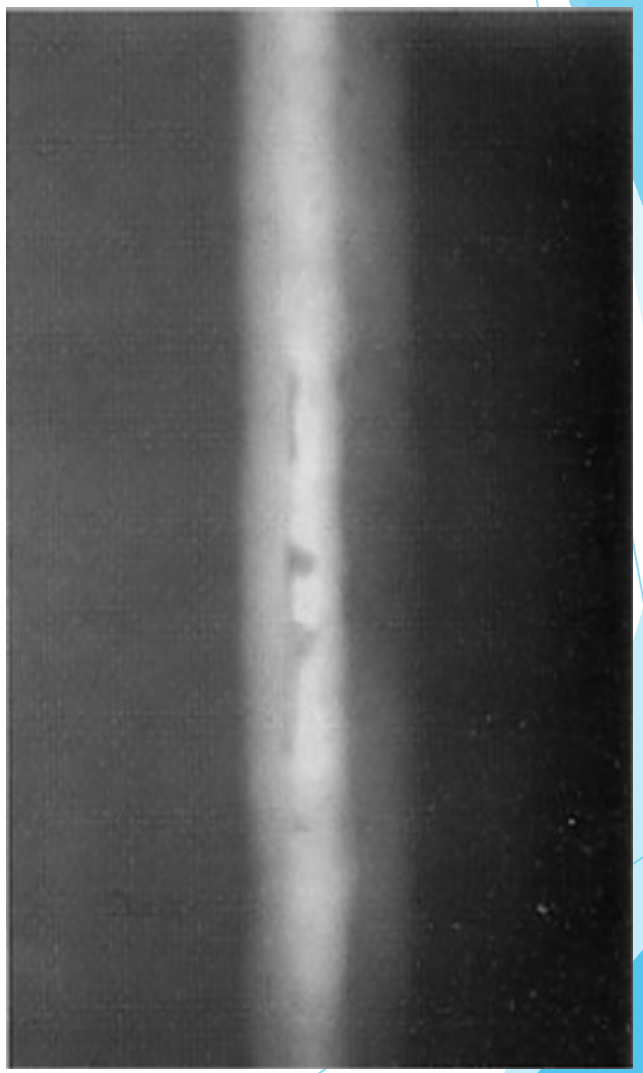
Root crack



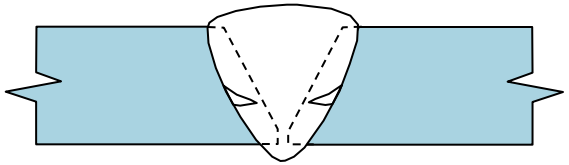


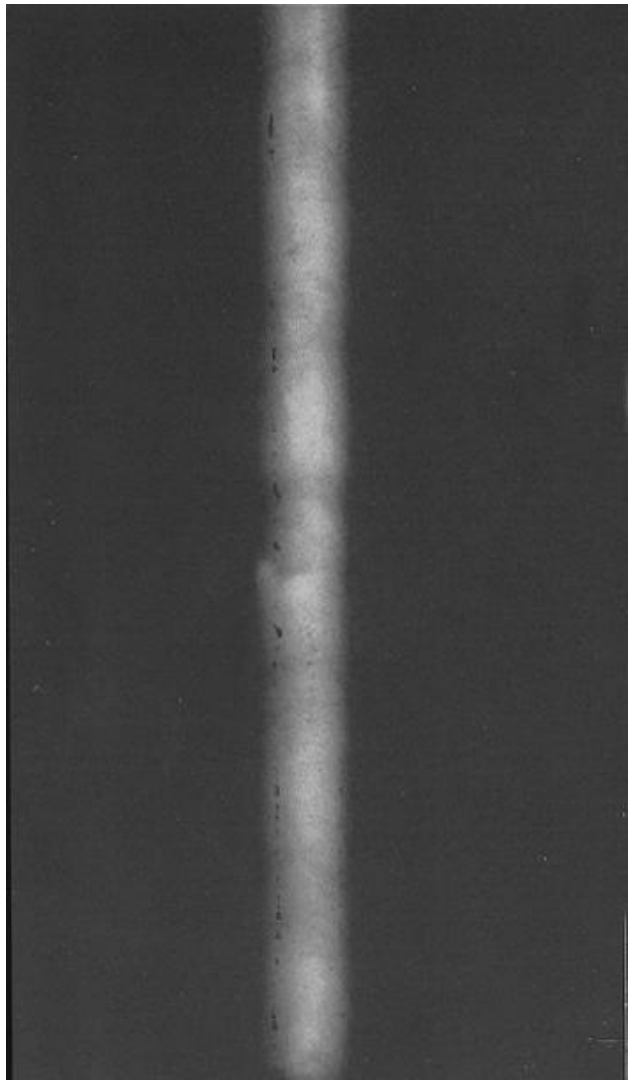
Lack of side wall fusion with slag



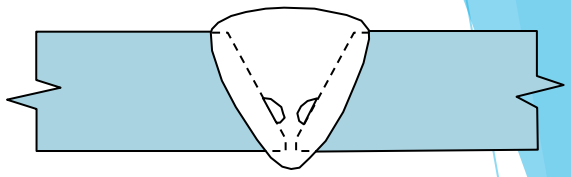


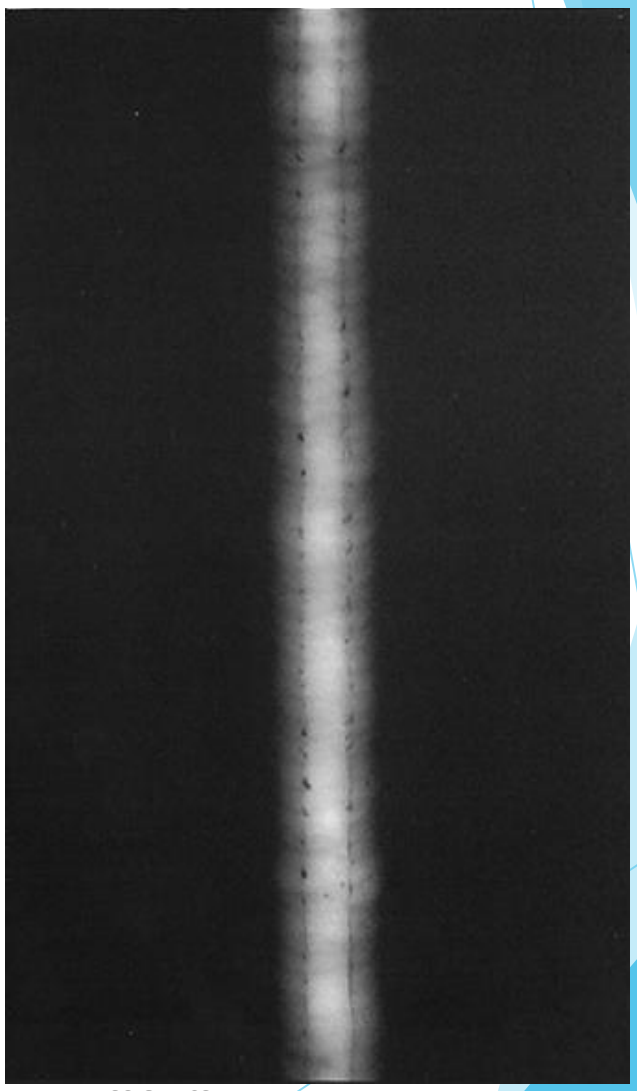
Lack of side wall fusion with slag



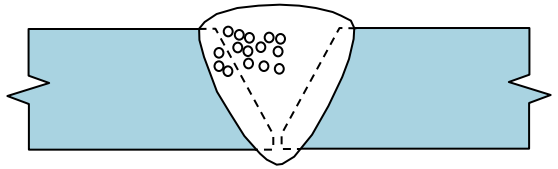


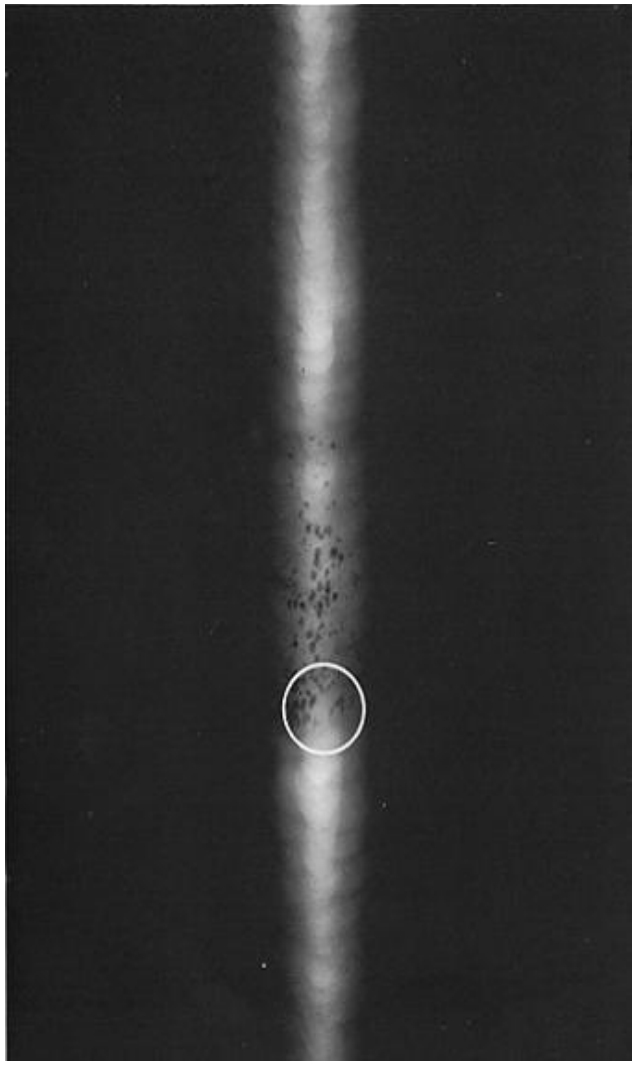
Lack of interpass fusion



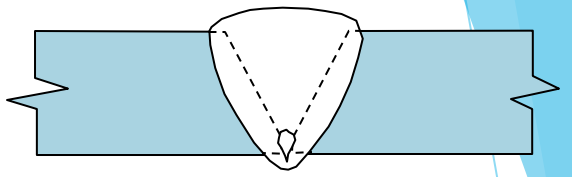


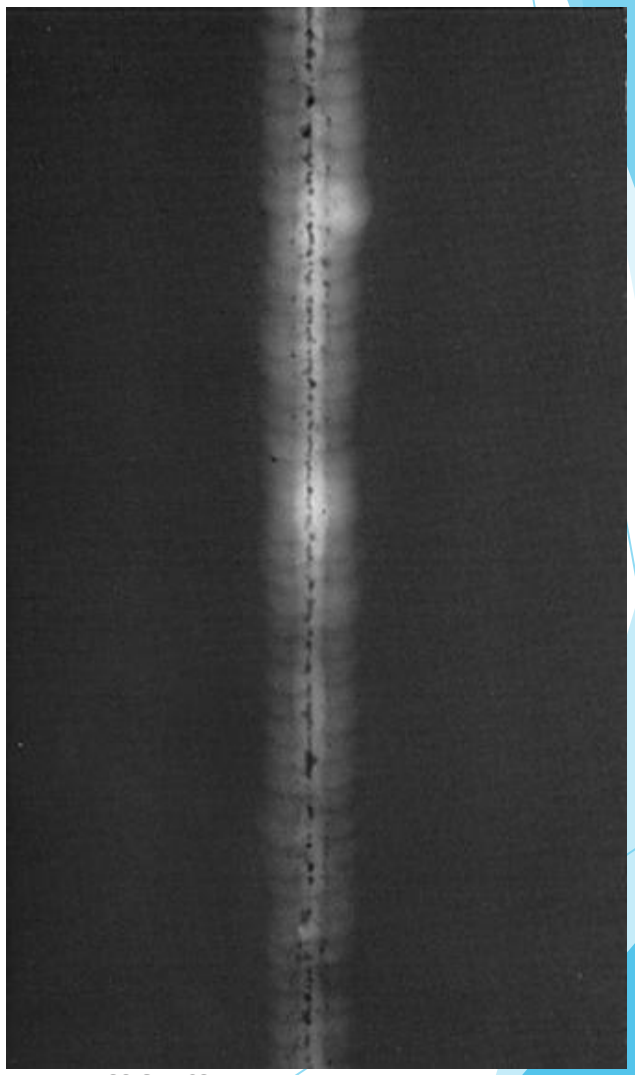
Lack of side wall fusion



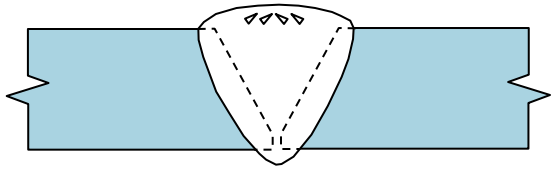


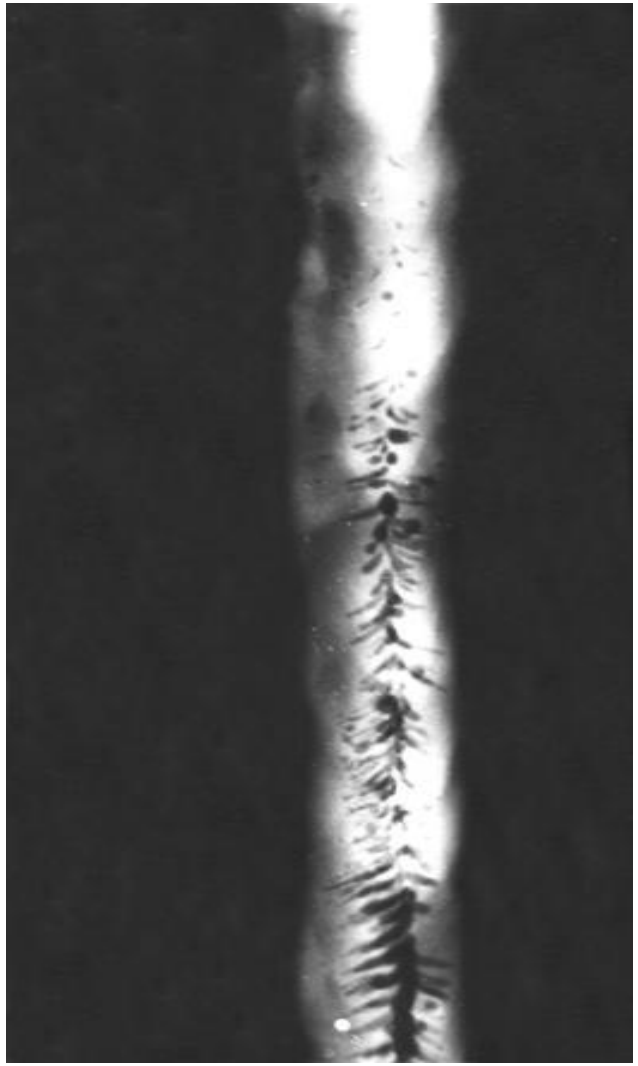
Cluster porosity



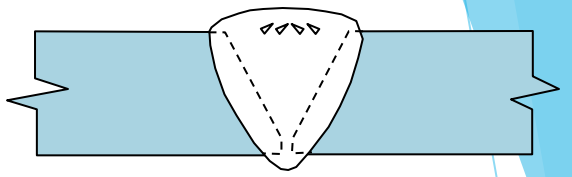


Root pass aligned porosity

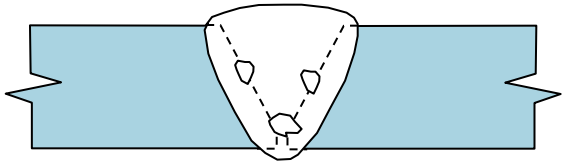


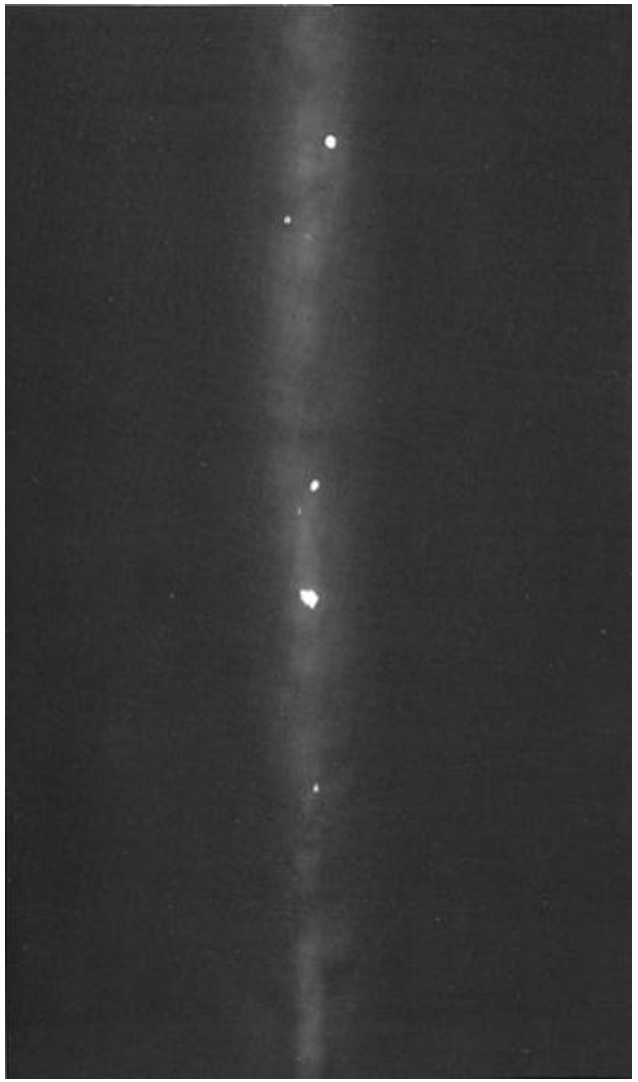


Herring bone porosity

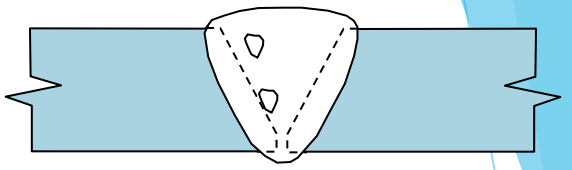


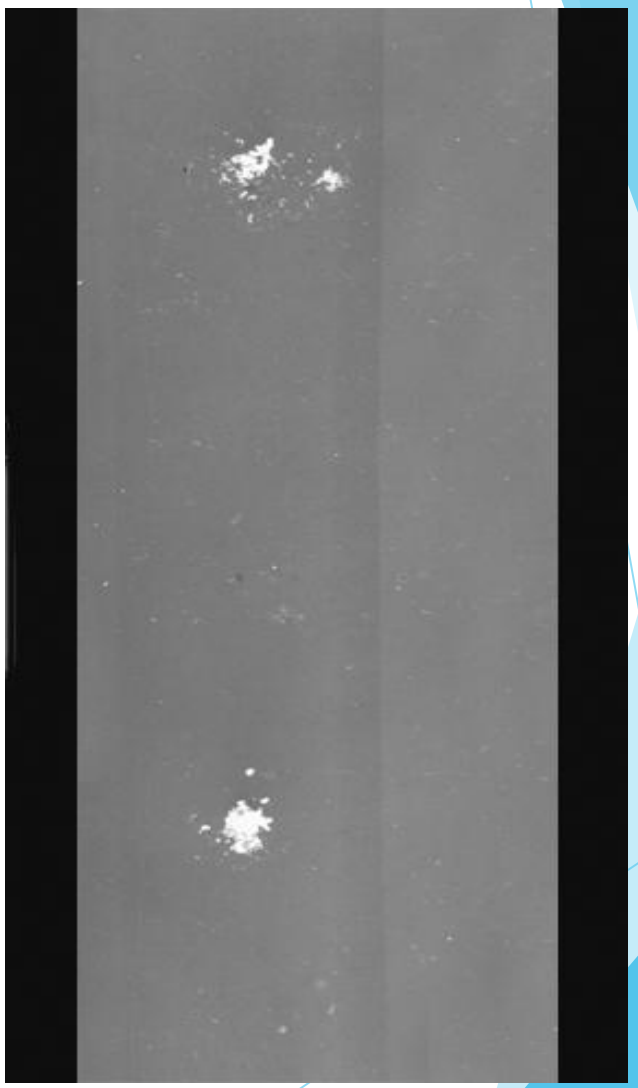
Herring bone porosity





Tungsten inclusions





Copper inclusions

Scanning Patterns (Welding Test)

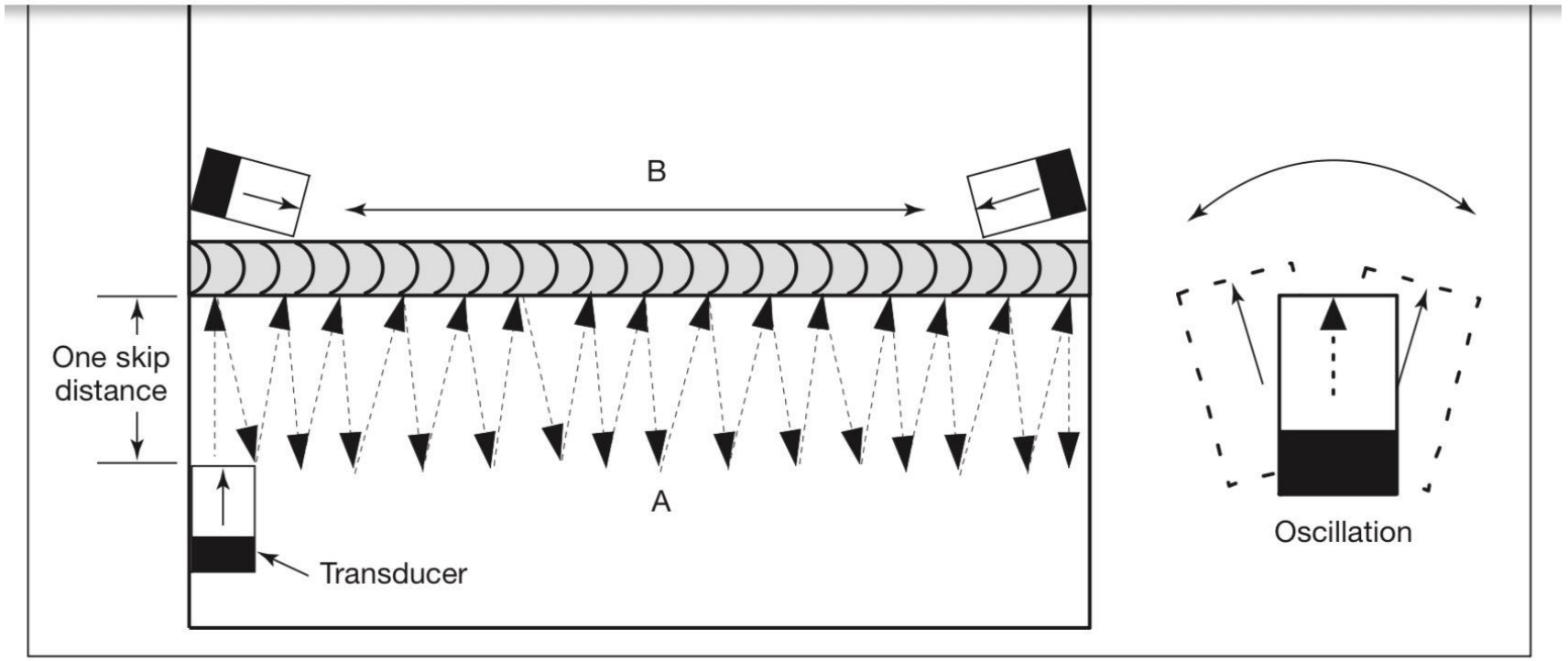


Figure 16: Angle-beam scan patterns for welds.

Flaw Detection / Scanning (Porosity)

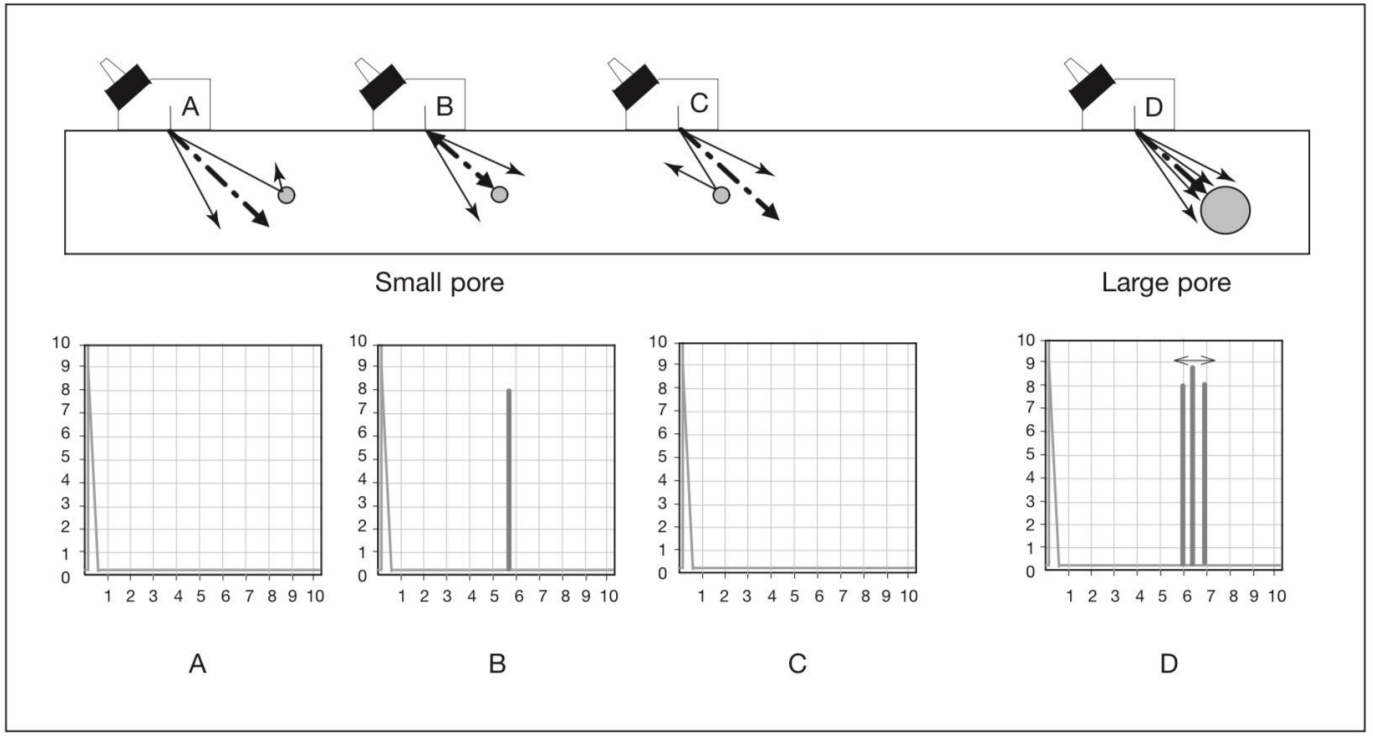


Figure 21: Porosity.

Flaw Detection / Scanning
Cluster Porosity & Slag Inclusions

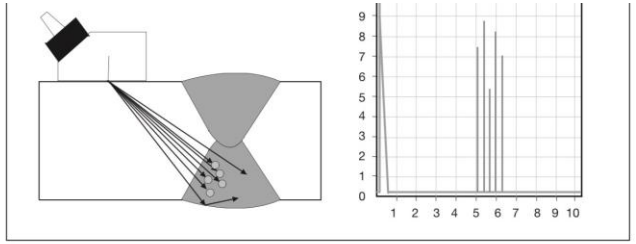


Figure 22: Cluster porosity.

Slag Inclusions

Slag inclusions come in two forms:

- **Solid slag** – left from a previous weld pass.
- **Molten slag** – trapped when the weld metal solidifies before the slag floats to the surface of the weld.

Both slag types are shown in the weld cross-section in Figure 23.

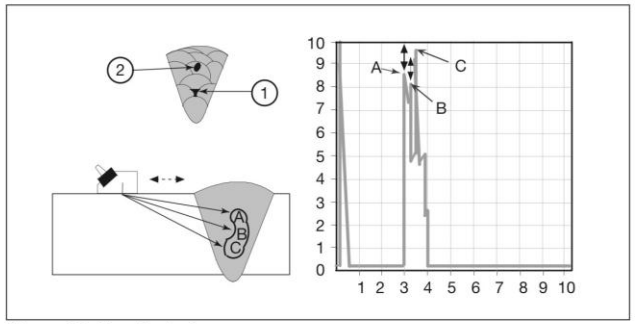


Figure 23: Slag inclusions.

False / Non-Relevant Indications

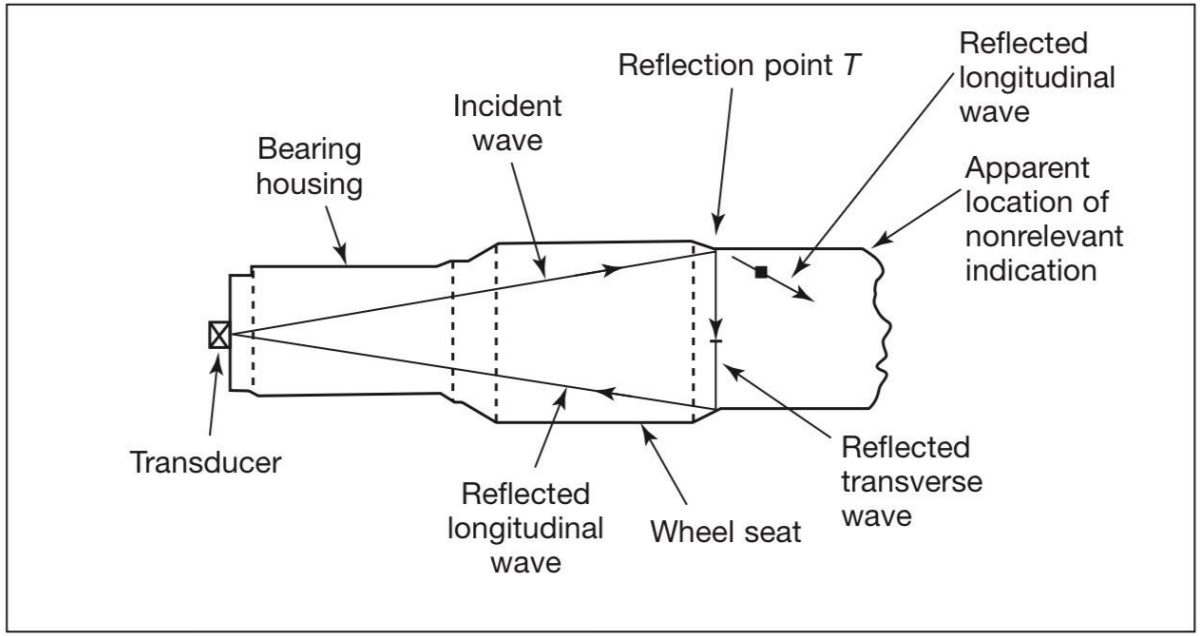


Figure 12: Typical false echo path caused by a reflected transverse wave at the axle fillet and a reflected longitudinal wave on the opposite side.

Acceptance Standards

Reference- ASME BPVC Section V, B 31. Series Pipings

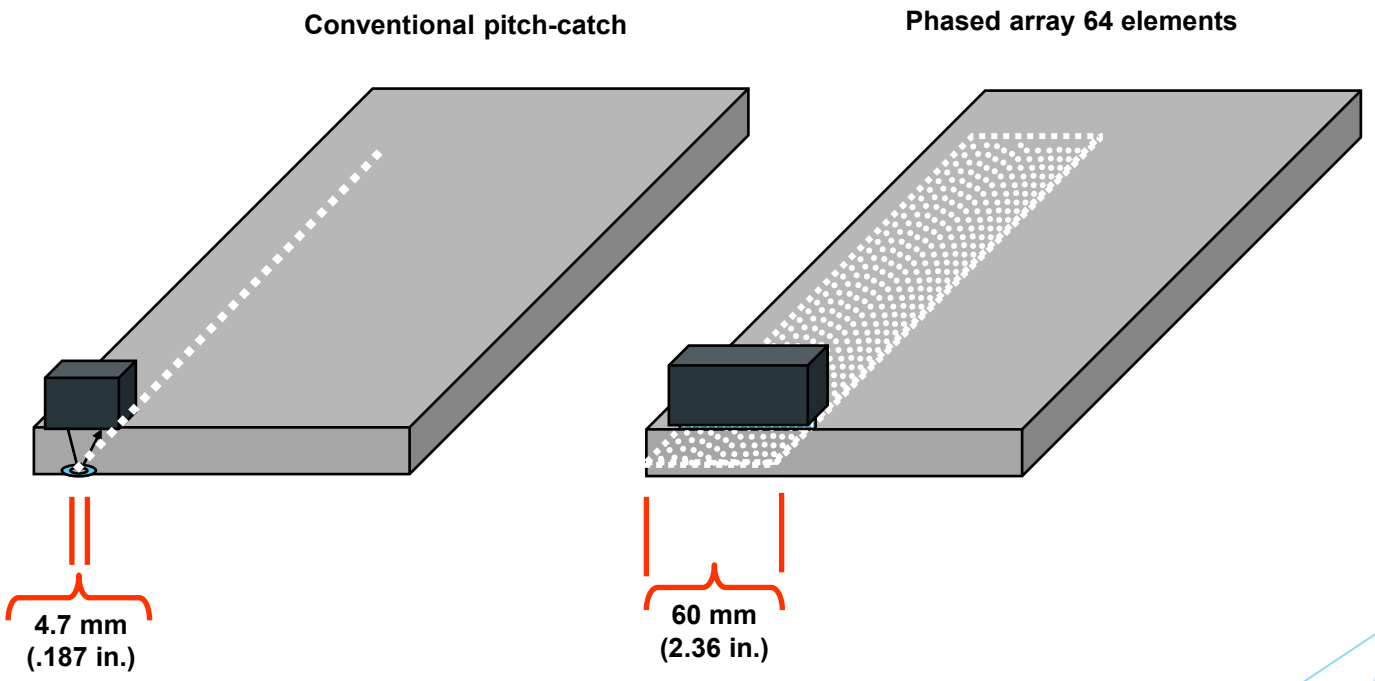
AWS D 1.1 Series, API Series- Tanks- Pipelines, Etc.,

- **Discontinuity Vs Defect**
- **Flaw**
- **Imperfection**
- **Indication**

- **Every defect is rejected as over limit and comes from flaw.**
- **Every flaw cannot be defect.**
- Evaluate with Accept/ Reject Criteria

Advance Method: Phased Array UT (PAUT)

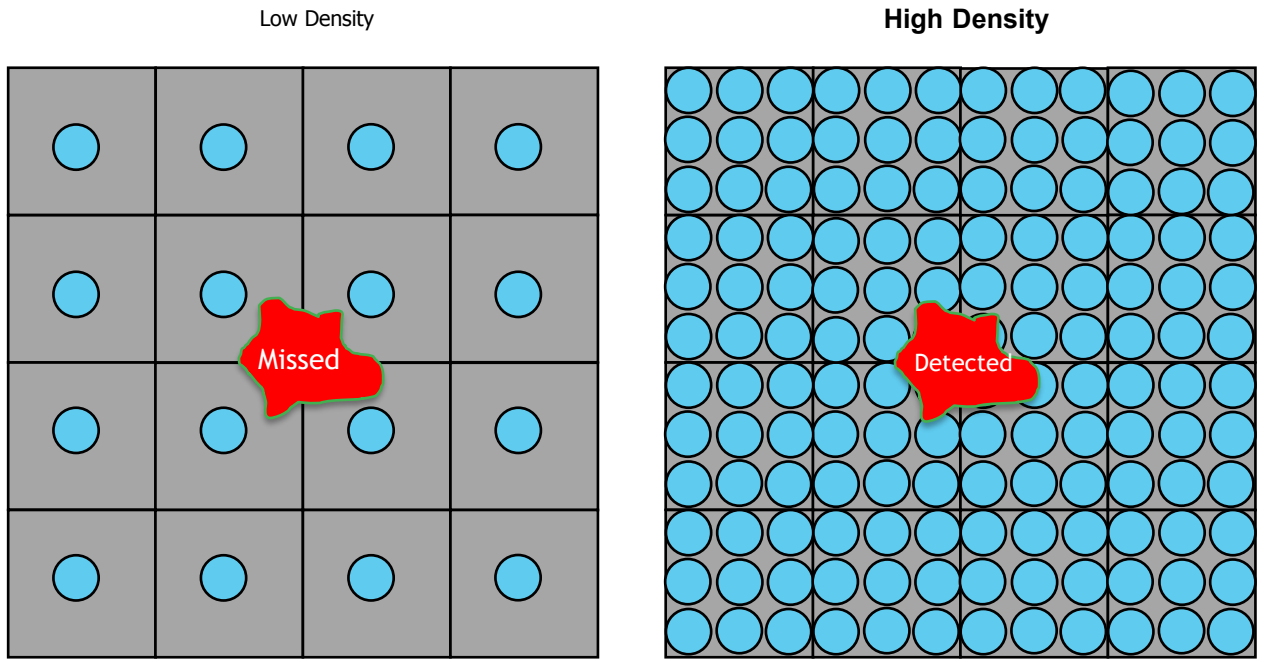
Large Effective Beam



12 × more coverage with a phased array probe

PAUT

Data Point Density



- **Added value inspection $$$**
- **Greater probability of detection**

PAUT

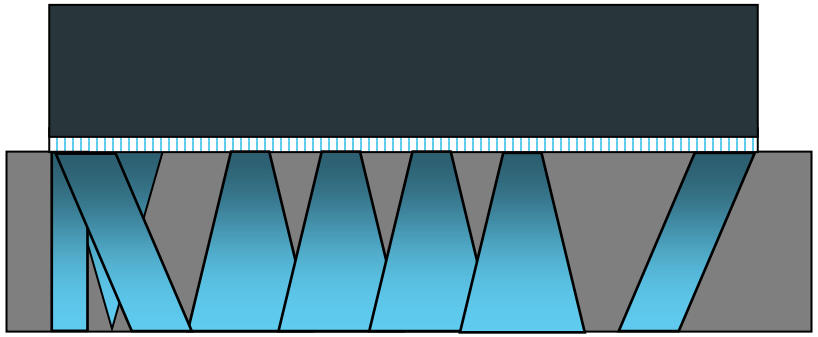
Multiple Beam Configurations

Focused

Nonfocused

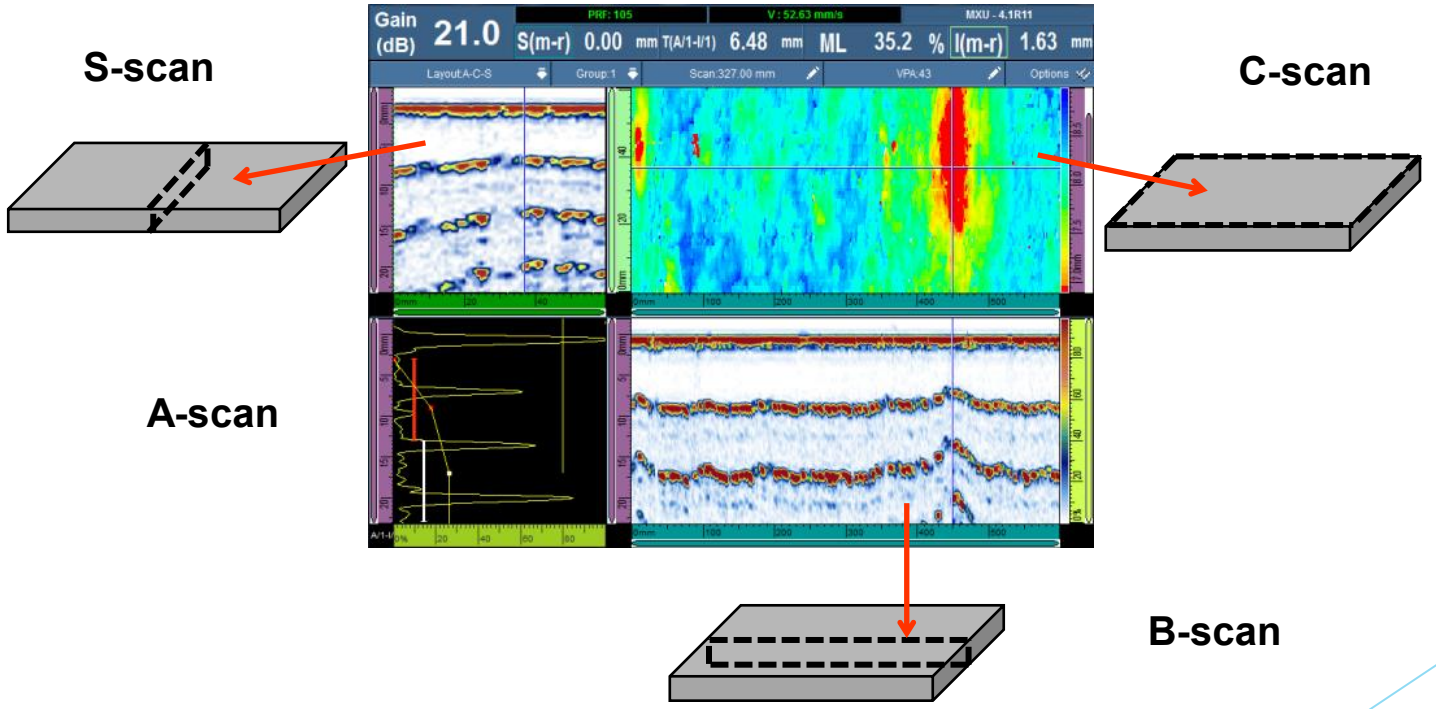
Angle beam

Sectorial

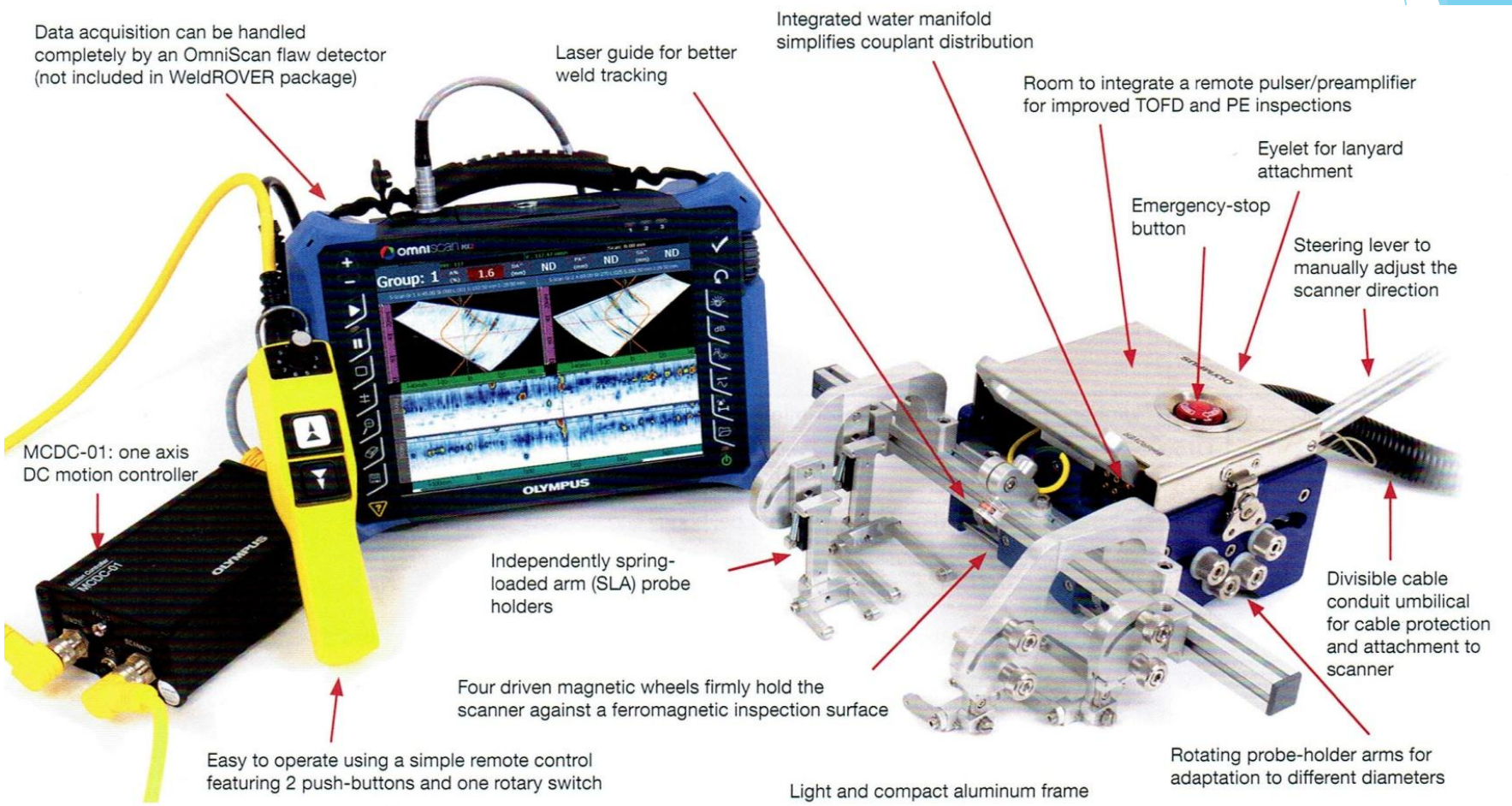


PAUT

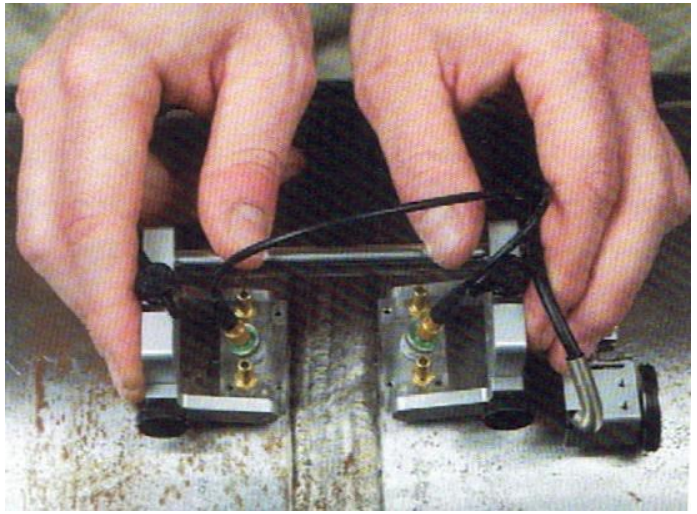
Views while Scanning

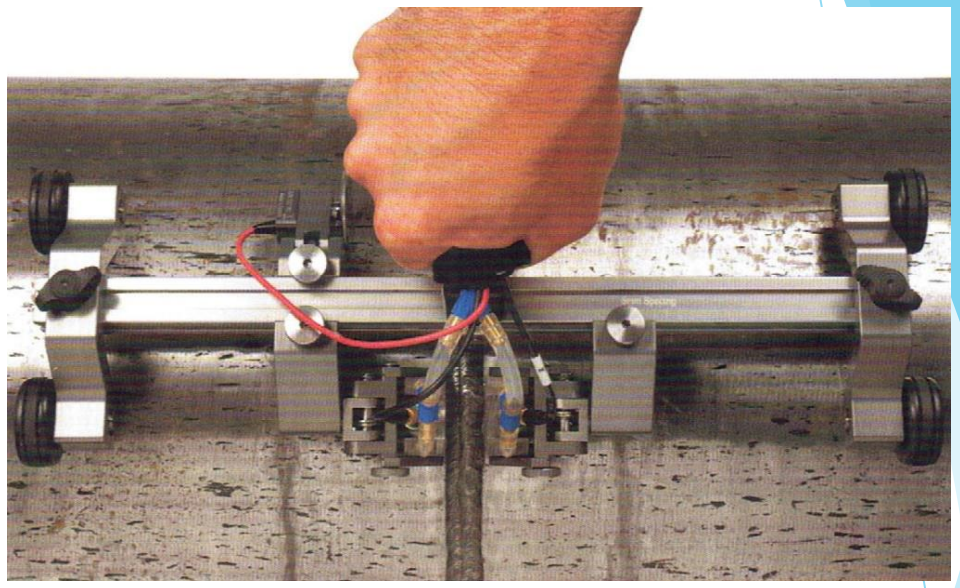


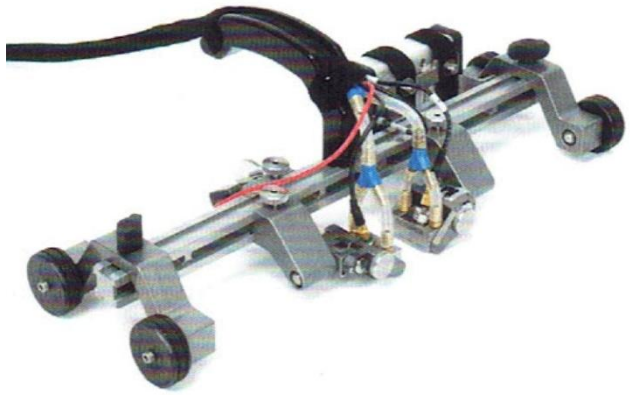
PAUT

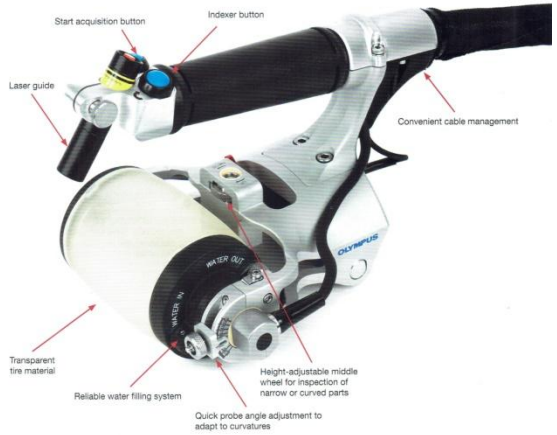

Data acquisition can be handled completely by an OmniScan flaw detector (not included in WeldROVER package)
Laser guide for better weld tracking
Integrated water manifold simplifies couplant distribution
Room to integrate a remote pulser/preamplifier for improved TOFD and PE inspections
Eyelet for lanyard attachment
Emergency-stop button
Steering lever to manually adjust the scanner direction
MCDC-01: one axis DC motion controller
Independently spring-loaded arm (SLA) probe holders
Divisible cable conduit umbilical for cable protection and attachment to scanner
Four driven magnetic wheels firmly hold the scanner against a ferromagnetic inspection surface
Easy to operate using a simple remote control featuring 2 push-buttons and one rotary switch
Light and compact aluminum frame
Rotating probe-holder arms for adaptation to different diameters
OLYMPUS

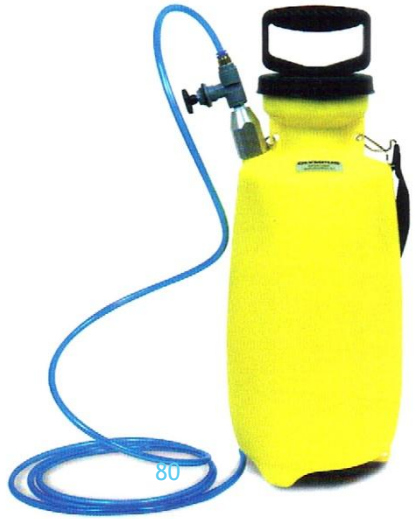
PAUT





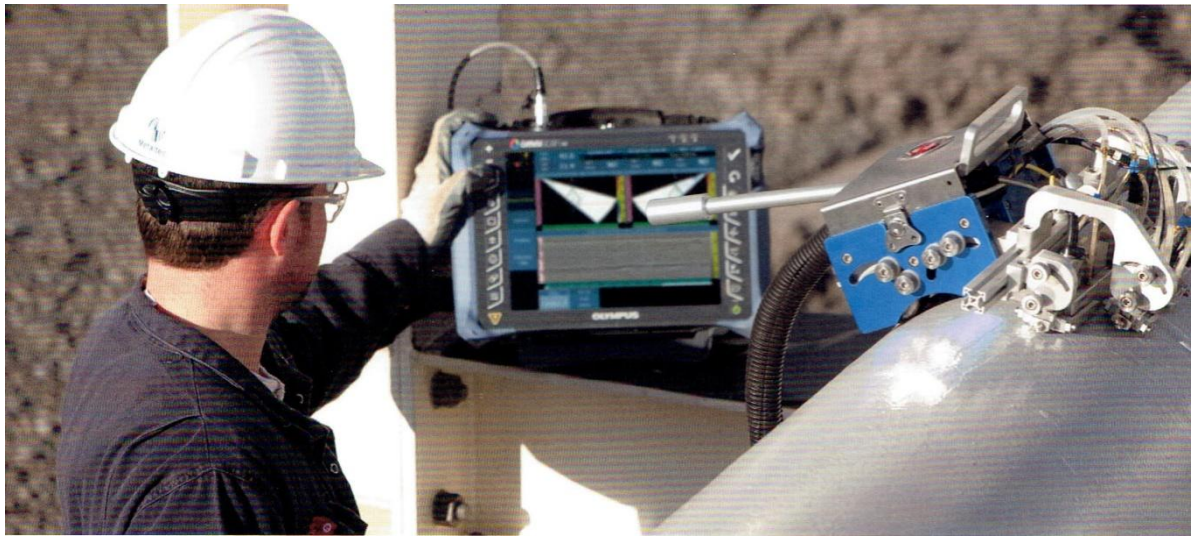


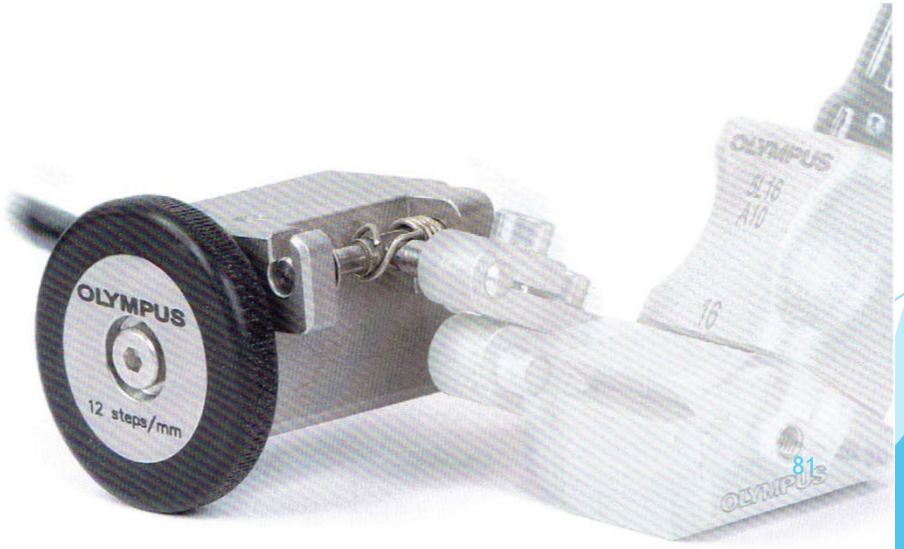




WTR-SPRAYER-8L

PAUT



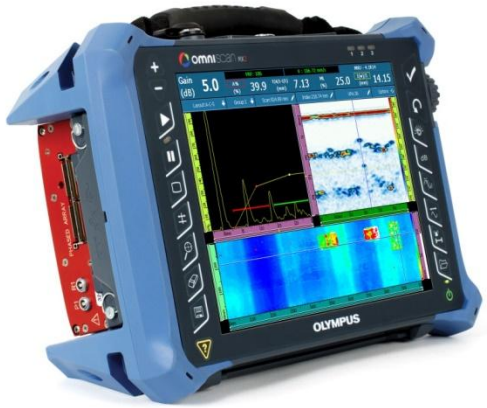


PAUT

OmniScan Series of Flaw Detectors

The OmniScan is the market reference for phased array corrosion inspection.

- 2-axis encoders for raster scans
- Simple setup and calibration wizards
- Full high-resolution A-scan storage



- **MX2**
  - Modular for changing needs
  - Drivable with TomoView for bigger file size (up to 2 GB data file)
  - Bigger screen

- **SX**
  - All the features needed for most corrosion inspection applications
  - More affordable
  - Smaller and lighter for more portability

UT At Steam Boiler Drum Shell Weld Seam UTM & Flaw Detection (Angle Technique)

UT Cement Plant Rotary Kiln Weld Seams

CNG Pipeline Weld Joints Inspection (UT)

Internal Flaw Detection of Solid Shaft (UTM)

Steam Tubes Wall Thickness Measurement (UTM) Yearly done for Life Expectency Estimation

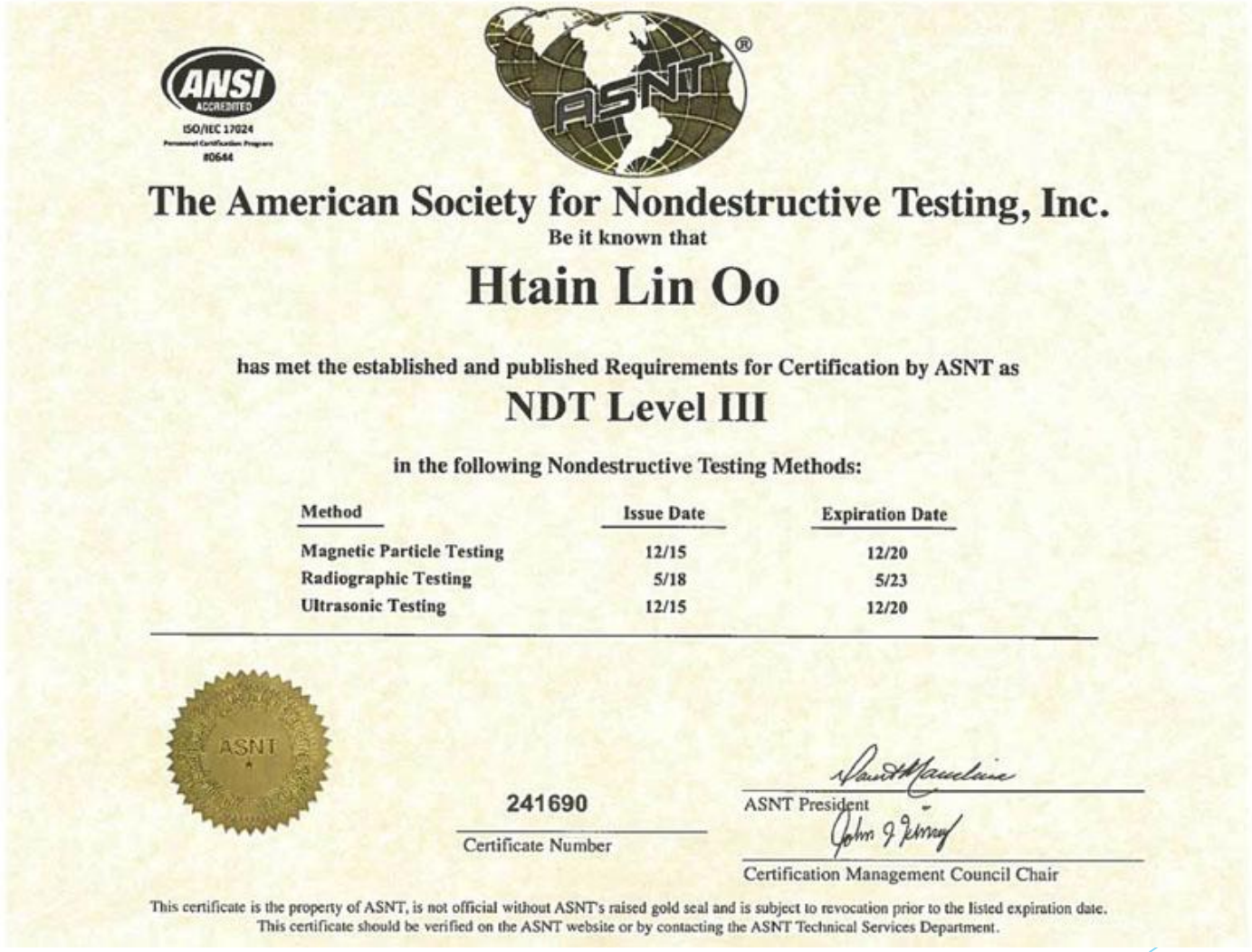
Crew Change Terminal (Barge & Piles) (NDT)

UT Weld Inspection of Butt Weld on Dock Piles

5) Qualification & Certification of NDT Personnel

- ASNT –SNT- TC-1 A
- ISO 9712
- EN 473
  - Education
  - Industrial Experience
  - Training Hours
  - Examinations & Gradings (Written & Practical)
  - Certification
- Employer & NDT Level III

Qualification & Certification of NDT Personnel
ASNT Vs ASNT–SNT-TC-1A Vs NDT



ANSI ACCREDITED ISO/IEC 17024 Personnel Certification Program 0644

ASNT

The American Society for Nondestructive Testing, Inc.

Be it known that

Htain Lin Oo

has met the established and published Requirements for Certification by ASNT as

NDT Level III

in the following Nondestructive Testing Methods:

Method	Issue Date	Expiration Date
Magnetic Particle Testing	12/15	12/20
Radiographic Testing	5/18	5/23
Ultrasonic Testing	12/15	12/20

ASNT

241690

Certificate Number

ASNT President

Certification Management Council Chair

This certificate is the property of ASNT, is not official without ASNT's raised gold seal and is subject to revocation prior to the listed expiration date.
This certificate should be verified on the ASNT website or by contacting the ASNT Technical Services Department.

Qualification & Certification of NDT Personnel (ASNT)

- **NDT Methods**- (15) Methods, (28) Techniques
- **NDT Certificate Levels-** Trainee, Level-I, II (Limited), II, III,
  - Representative - for Exams and Grading Purpose
- **NDT Level I**
  - Able to set up NDT Equipment
  - Perform the tests
  - Record and clarify the results of the tests
  - Report the results

Qualification & Certification of NDT Personnel (ASNT)

- **NDT Level II**
  - Able to select the test methods
  - Translate the NDT Codes, Standards, Spec & Procedures
  - Interpret and Evaluate results
  - Prepare NDT Instructions and Supervisor Tasks
  - Report the results of NDT tests

Qualification & Certification of NDT Personnel (ASNT)

- **NDT Level III**
  - **Responsible for NDT Operations (Certified Methods)**
  - Approving the Procedures and Establishing & Approving NDT Methods/ Techniques
  - Interpreting the Codes, Standards, Spec & Procedures
  - Interpret and Evaluate results
  - Familiarity with Other NDT Methods
  - Training & Examining NDT Level I & II personnel certificates

Basic Ultrasonic Testing (UT)

- **UT ၏ အကျိုး၊ အားသာချက် (Advantage)**
  - အလွန်ထူသော ပစ္စည်းများကိုပင် တိုင်းတာစစ်ဆေးနိုင်ခြင်း
  - မျက်နှာပြင် တစ်ဘက်သာ ရရှိယုံ ဖြင့် စမ်းသပ် ဆောင်ရွက်နိုင်ခြင်း
  - Plannar defects များကို ထိရောက်စွာ စမ်းသပ်နိုင်ခြင်း
  - Defect ၏ Location ကိုအတိအကျ ပြသနိုင်ခြင်း

Basic Ultrasonic Testing (UT)

- UT ၏ အပြစ်၊ အားနည်းချက် (Limitation)
  - High Capital Cost
  - Skill Operator လိုအပ်ခြင်း
  - Interpretation ပြုလုပ်ရန် ခက်ခဲခြင်း
  - Couplant လိုအပ်ခြင်း
  - Coarse Grain Materials များကို စမ်းသပ်ရန် ခက်ခဲခြင်း

Conclusion

- QA, QC System များဖေါ်ဆောင်ရာတွင် NDT Methods များသည် လုံခြုံ စိတ်ချရရေးအတွက် မဖြစ်မနေ လိုက်နာ အသုံးပြုလာခြင်း
- ကုန်ကျစရိတ် သက်သာစွာဖြင့် စစ်ဆေးနိုင်ခြင်း၊ ပြန်လည် ပြင်ဆင်နိုင်ခြင်း၊
- မစစ်ဆေးမီသဖြင့် ပျက်စီးသည့်ကုန်ကျစရိတ်နှင့် စစ်ဆေးသည့် ကုန်ကျစရိတ် များစွာကွာခြားခြင်း၊
- အချိန်၊ရေရှည်ဖြစ်မှု၊ စွမ်းအင်၊ပတ်ဝန်းကျင်လုံခြုံစိတ်ချရမှု အလုပ်ရှုပ်မှု များစွာသက်သာခြင်း

THANKS FOR YOUR KIND ATTENTION

email- uhtainlinoo@unitedgamma-ndt.com

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Questions & Answers

MSWE

The Myanmar Society of Welding Engineering