NON DESTRUCTIVE TESTING
&
ASNT

WELD INSPECTION
&
AWS

What is ASNT?

What is ASNT?

- The American Society for Nondestructive Testing, Inc.

What is ASNT?

- ASNT is the world's largest technical society for nondestructive testing NDT professionals.

What is ASNT?

- Through the organization and membership, they provide a forum for exchange of:
  - NDT technical information
  - NDT educational materials and programs
  - Standards and services for the qualification and certification of NDT personnel.

What is ASNT?

- ASNT promotes the discipline of NDT as a profession and facilitates NDT research and technology applications.

ASNT

- The Society is organized into councils which govern issues related to 1) Technical, Education and Qualification, 2) Research, 3) Section Operations and 4) Certification.

ASNT

- In terms of specific activities, ASNT is the world leader in organizing and sponsoring conferences and meetings pertaining to NDT.

ASNT

- The Society also maintains an extensive publications operation which produces and distributes NDT related books, standards, technical journals, and training materials.

www.asnt.org

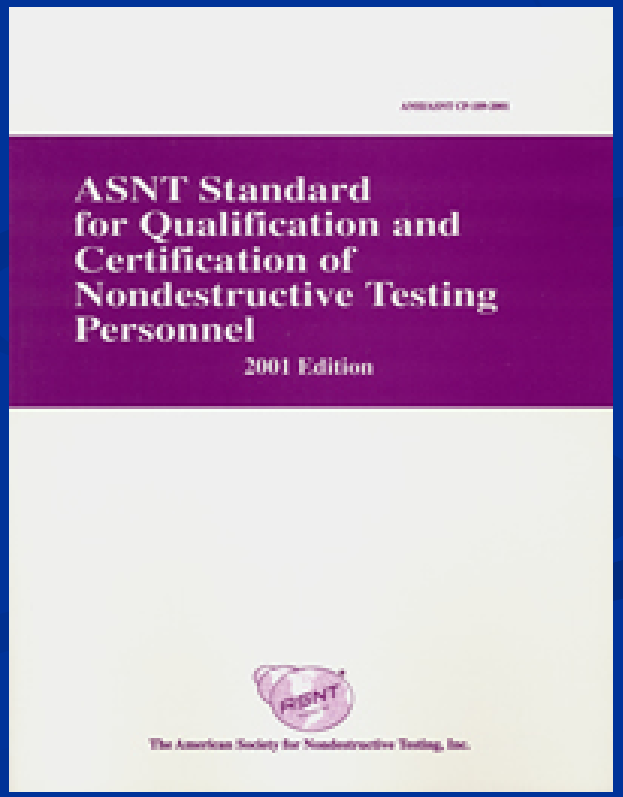
- ASNT's popular Web site draws thousands of visitors each week to obtain comprehensive technical data and important information on Society activities.

Recommended Practice SNT-TC-1A

- Developed and maintained by ASNT, this is ASNT's guideline for NDT personnel qualification.

ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel

- ASNT's standard for NDT personnel qualification.



ASNT Certification/Examinations

- Industrial Radiography Radiation Safety Personnel (IRRSP)
- ASNT NDT Level III
- ACCP Level II and Professional Level III

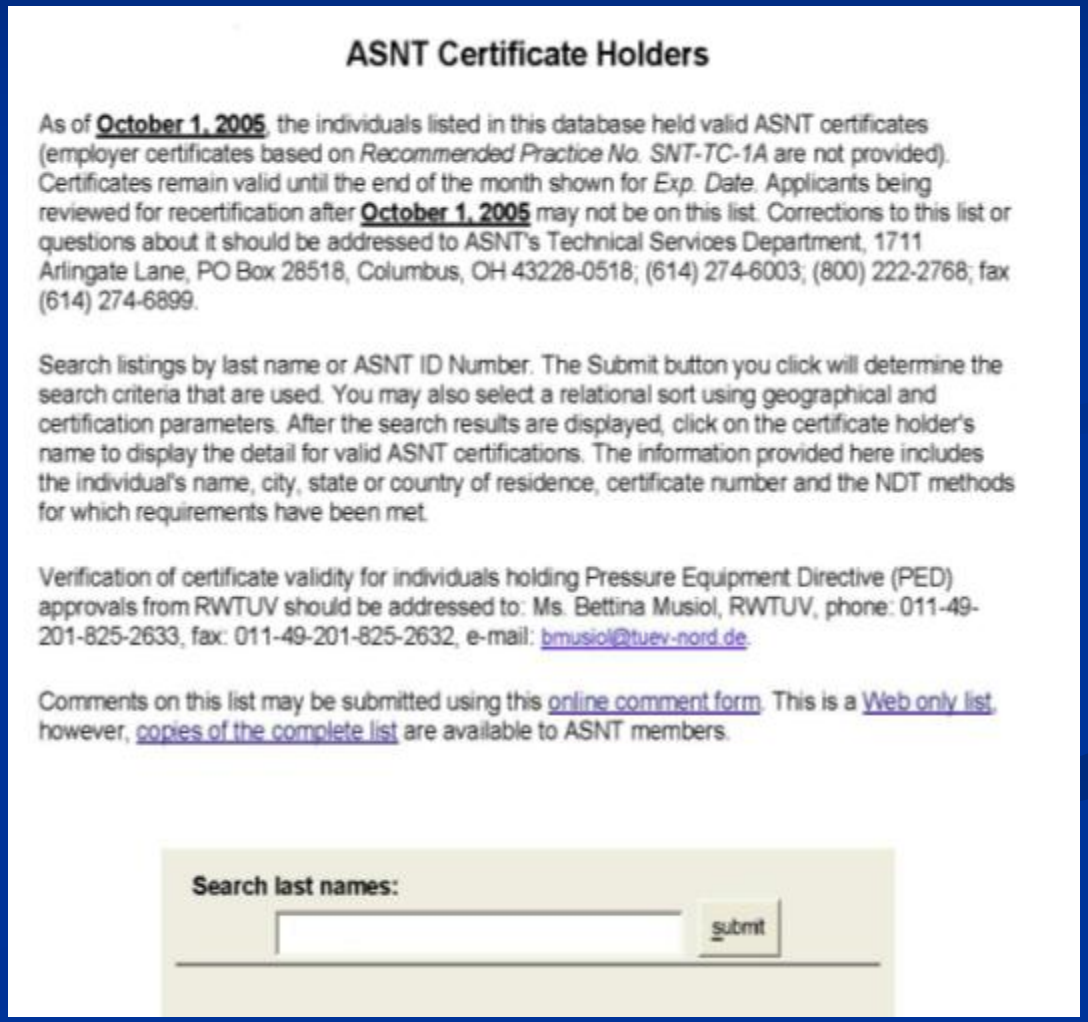
ASNT Certification/Examinations

If a technician is company certified in accordance with SNT-TC-1A, then they are ASNT Certified, RIGHT?

WRONG!!!

ASNT CERTFICATIONS

- http://www.asnt.org/publications/rediref/cert/intro.cfm



ASNT Certificate Holders

As of **October 1, 2005**, the individuals listed in this database held valid ASNT certificates (employer certificates based on *Recommended Practice No. SNT-TC-1A* are not provided). Certificates remain valid until the end of the month shown for *Exp. Date*. Applicants being reviewed for recertification after **October 1, 2005** may not be on this list. Corrections to this list or questions about it should be addressed to ASNT's Technical Services Department, 1711 Arlingate Lane, PO Box 28518, Columbus, OH 43228-0518; (614) 274-6003; (800) 222-2768; fax (614) 274-6899.

Search listings by last name or ASNT ID Number. The Submit button you click will determine the search criteria that are used. You may also select a relational sort using geographical and certification parameters. After the search results are displayed, click on the certificate holder's name to display the detail for valid ASNT certifications. The information provided here includes the individual's name, city, state or country of residence, certificate number and the NDT methods for which requirements have been met.

Verification of certificate validity for individuals holding Pressure Equipment Directive (PED) approvals from RWTUV should be addressed to: Ms. Bettina Musiol, RWTUV, phone: 011-49-201-825-2633, fax: 011-49-201-825-2632, e-mail: bmusiol@tuev-nord.de.

Comments on this list may be submitted using this online comment form. This is a Web only list, however, copies of the complete list are available to ASNT members.

Search last names:

submit

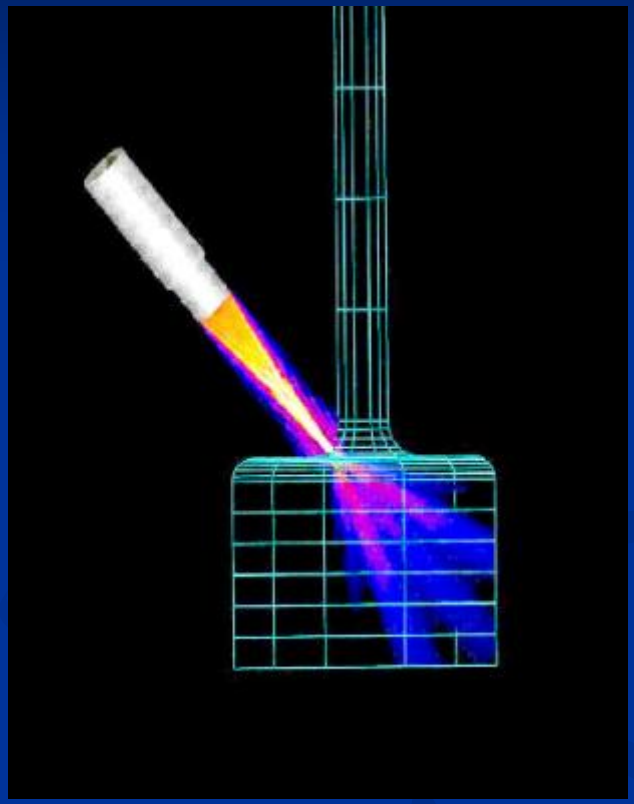
NON DESTRUCTIVE TESTING

What is NDT?

The use of noninvasive techniques to determine the integrity of a material, component or structure

or

quantitatively measure some characteristic of an object.



i.e. Inspect or measure without doing harm.

What is NDT?

- NDT is Non-destructive Testing, also known as NDE (Non-destructive Examination).
- There are many NDT methods and techniques, and here are brief descriptions of the more commonly used ones.
- The object of NDT is to find flaws in the material being tested, and the successful application of the test is largely dependent upon the skill of the operator and the equipment used.

Nondestructive Testing

- NDT are the common initials used.
- Performed by a qualified NDT inspector, following ASNT Practice SNT-TC-1A.
- NDT is the use of technical methods to assess the integrity of components.

Nondestructive Testing

- NDT shall be used to verify the integrity of components which cannot be adequately evaluated by other means.
- The manufacturer shall recommend components to be tested, along with appropriate acceptance criteria.
- Manual shall include locations of components in the ride.

Nondestructive Testing

- Nondestructive testing asks "Is there something wrong with this material?" Various performance and proof tests, in contrast, ask "Does this component work?"

Nondestructive Testing

- Non-Destructive testing is the collective name given to testing processes applied to components or structures to interrogate their integrity, in such a way as to not prevent the component or structure from being used.

Methods of NDT

Visual

Tap Testing

X-ray

Acoustic Emission

Ultrasonic

Flux Leakage

Microwave

Thermography

Magnetic Particle

Acoustic Microscopy

Magnetic Measurements

Liquid Penetrant

Replication

Laser Interferometry

Eddy Current

Nondestructive Testing

- Non-Destructive Testing can be performed by numerous techniques. The most commonly applied techniques today are:
  - VISUAL TESTING
  - PENETRANT TESTING
  - MAGNETIC PARTICLE TESTING
  - ULTRASONIC TESTING
  - RADIOGRAPHIC TESTING

Visual Testing

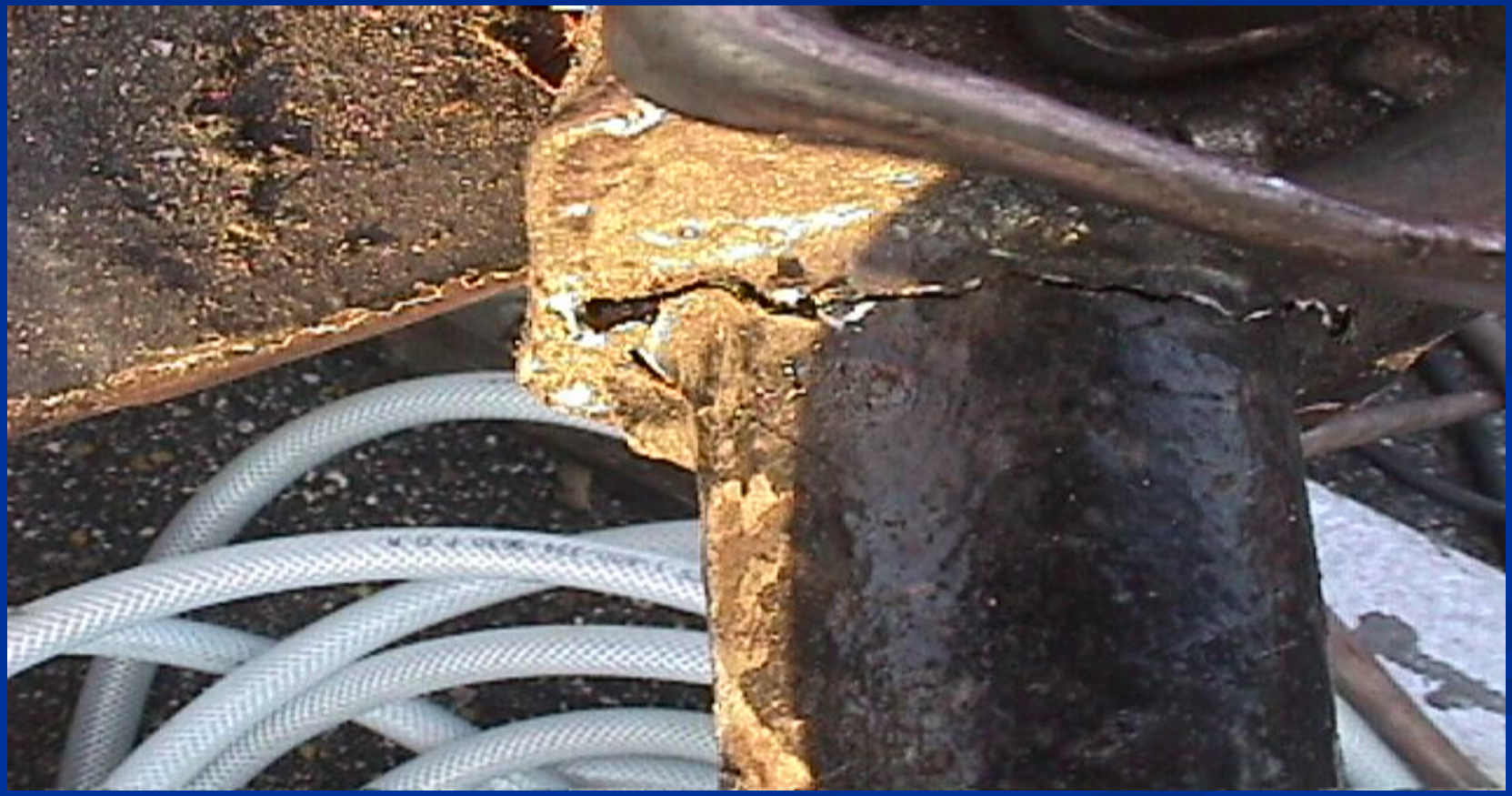
- Also known as Visual Inspection, VT is the one NDT method used extensively to evaluate the condition or the quality of a weld or component. It is easily carried out, inexpensive and usually doesn't require special equipment.

Visual Testing

Visual Testing

Visual Testing

Visual Testing



Visual Testing

Visual Testing

Visual Testing

Visual Testing

Visual Testing

Visual Testing

Dye Penetrant Testing

- Also known as Dye Penetrant Inspection (DPI), Liquid Penetrant Inspection (LPI) or Fluorescent Penetrant Inspection (FPI).

- It is a method that is used to reveal surface breaking flaws by bleedout of a colored or fluorescent dye from the flaw.

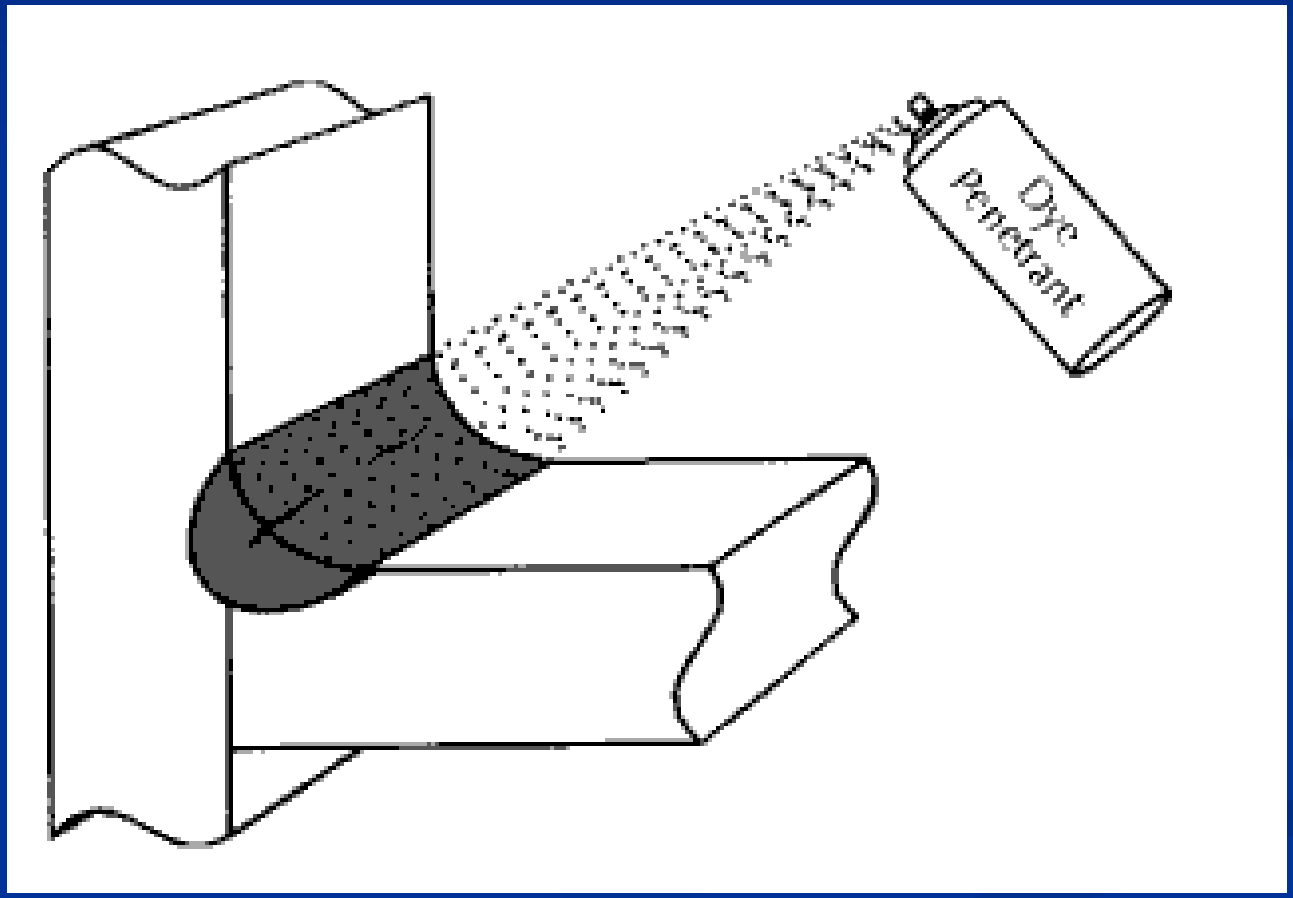
Dye Penetrant Testing

- The technique is based on the ability of a liquid to be drawn into a "clean" surface breaking flaw by capillary action.

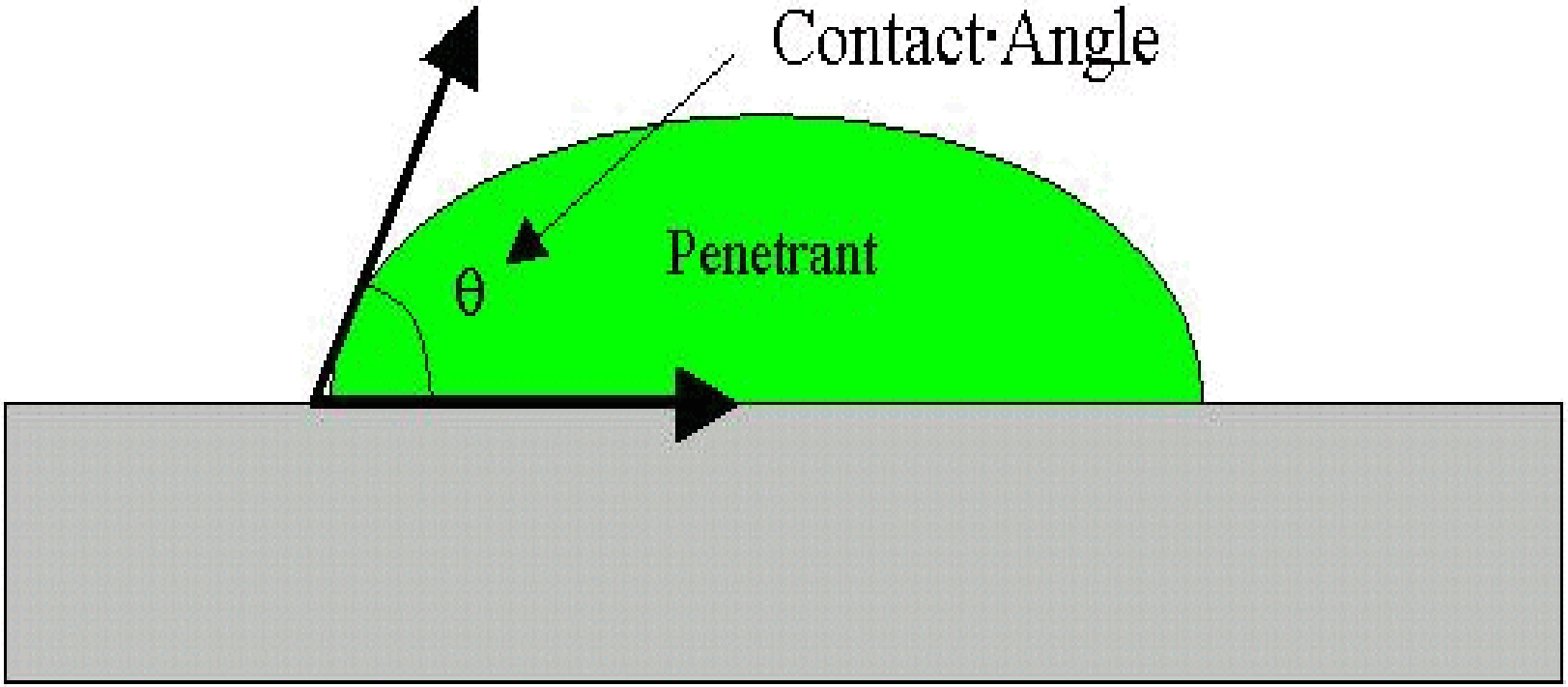
- After a period of penetration time, excess surface penetrant is removed and a developer applied.

- This 'draws' the penetrant from the flaw to reveal its presence

Dye Penetrant Testing



Dye Penetrant Testing



Mag Particle Testing

- Also known as MPI (Magnetic Particle Inspection). It is a method that can be used to find surface and near surface flaws in ferromagnetic materials such as steel and iron.

- The technique uses the principle that magnetic lines of force {flux) will be distorted by the presence of a flaw in a manner that will reveal its presence.

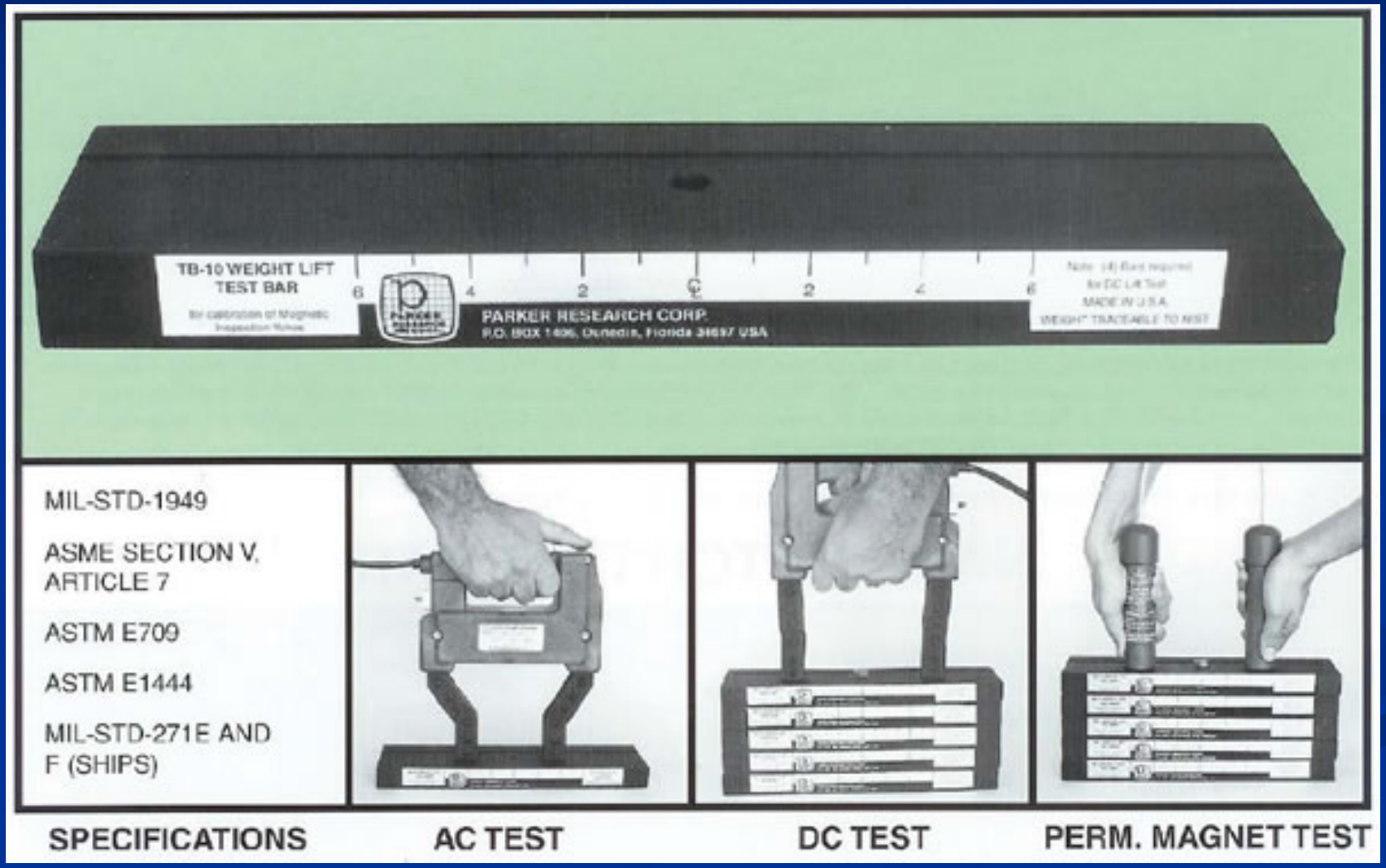
Mag Particle Testing

- The flaw (for example, a crack) is located from the "flux leakage", following the application of fine iron particles to the area under examination.

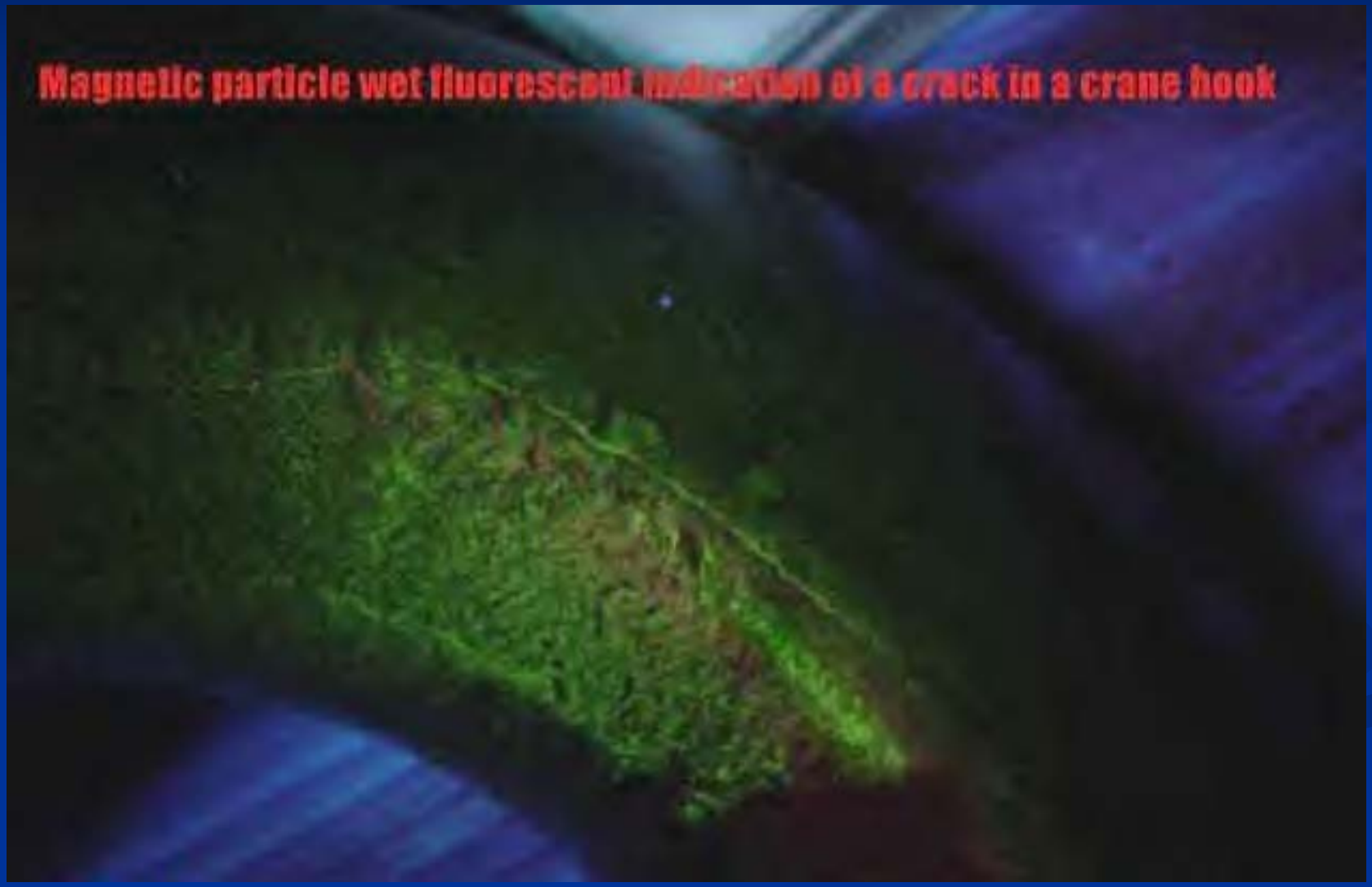
- There are variations in the way the magnetic field is applied, but they are all dependant on the above principle.

Magnetic Particle Yoke

MP Yoke Calibration Bar



Mag Particle Testing



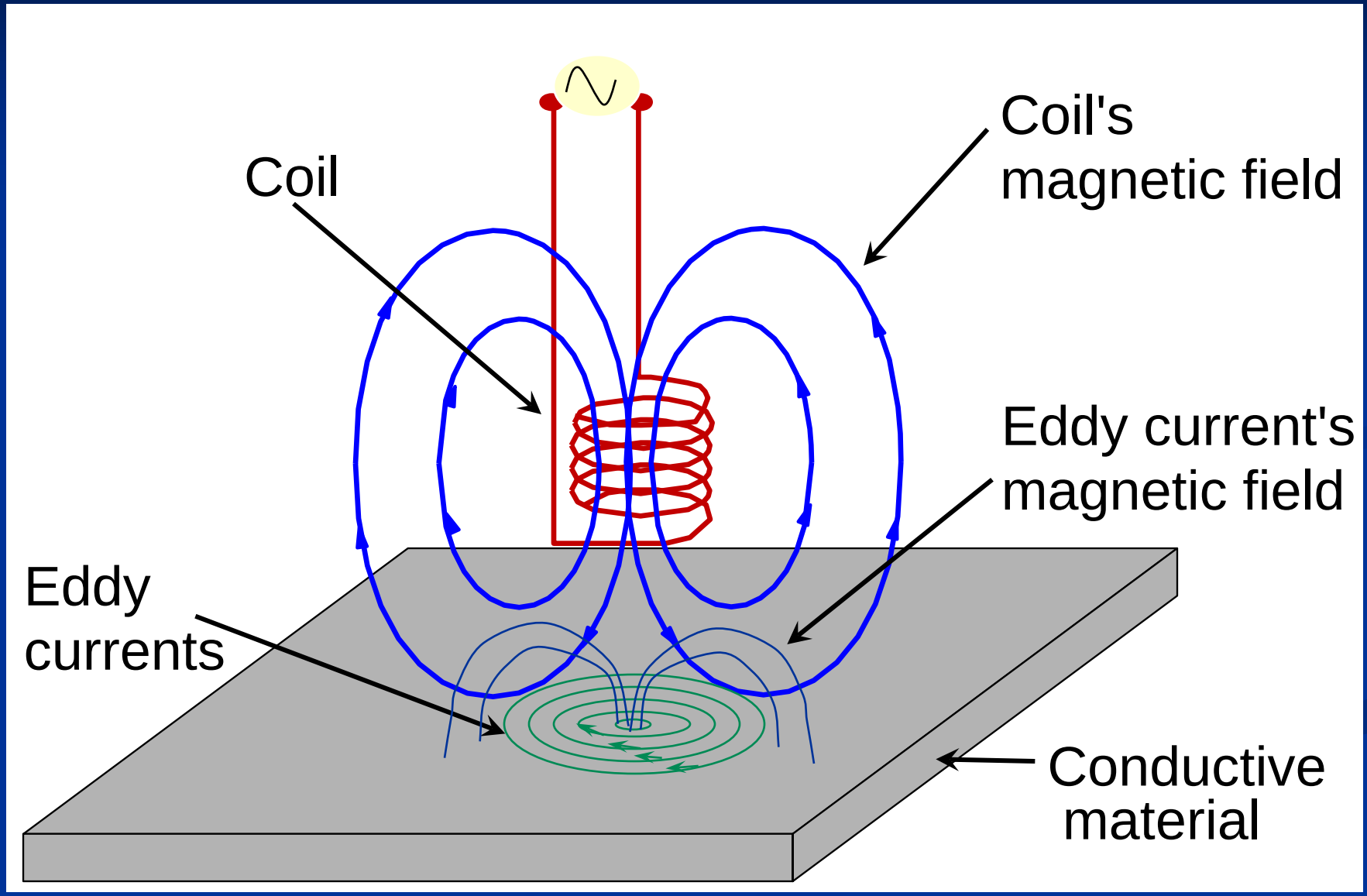
Mag Particle Testing

Mag Particle Testing

Mag Particle Testing

Mag Particle Testing

Eddy Current Testing



Eddy Current Testing

Eddy current testing is particularly well suited for detecting surface cracks but can also be used to make electrical conductivity and coating thickness measurements. Here a small surface probe is scanned over the part surface in an attempt to detect a crack.

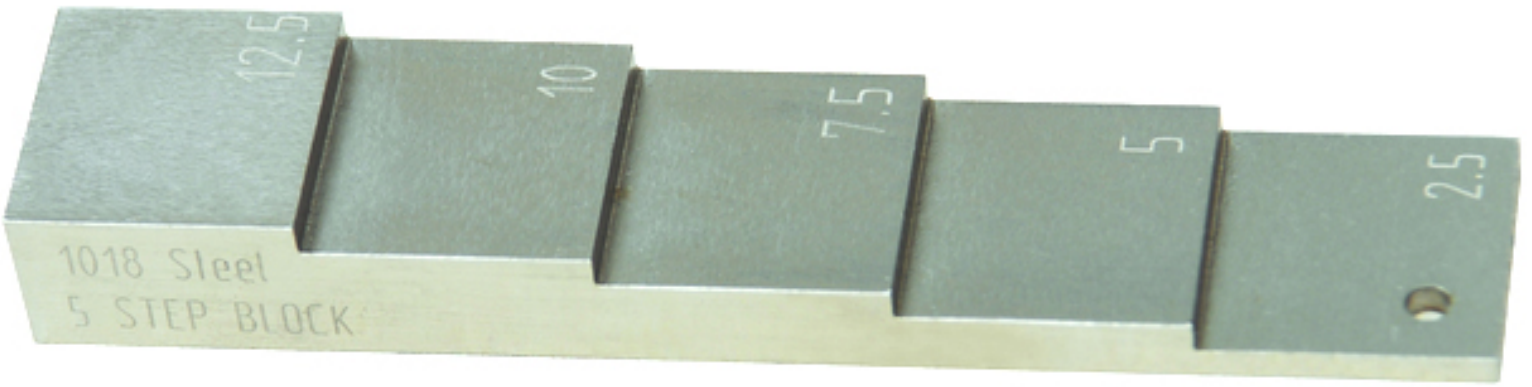
Ultrasonic (UT) Testing

- Ultrasonic inspection uses sound waves of short wavelength and high frequency to detect flaws or measure material thickness.
- It is used to test welds, castings and wrought products, e.g. rolled plate or forgings. Manual and immersion techniques are employed.

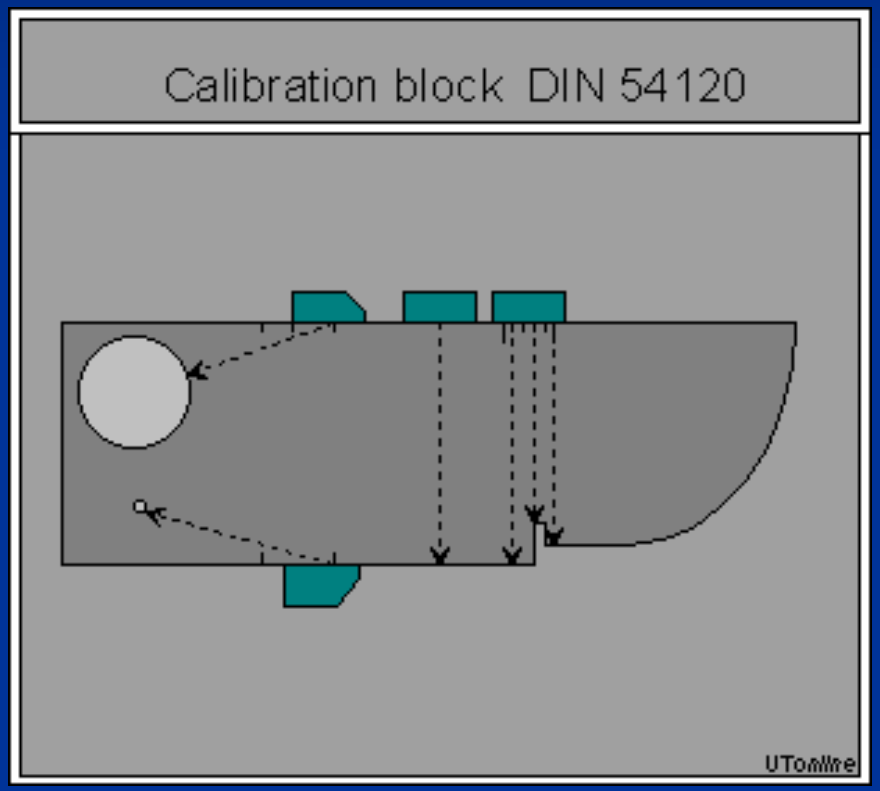
UT Test Instrument

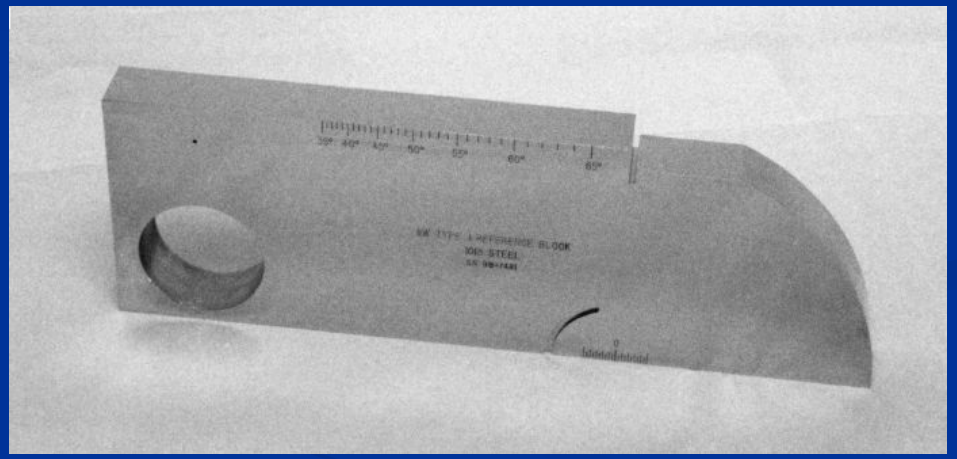
UT Transducers

Calibration Block

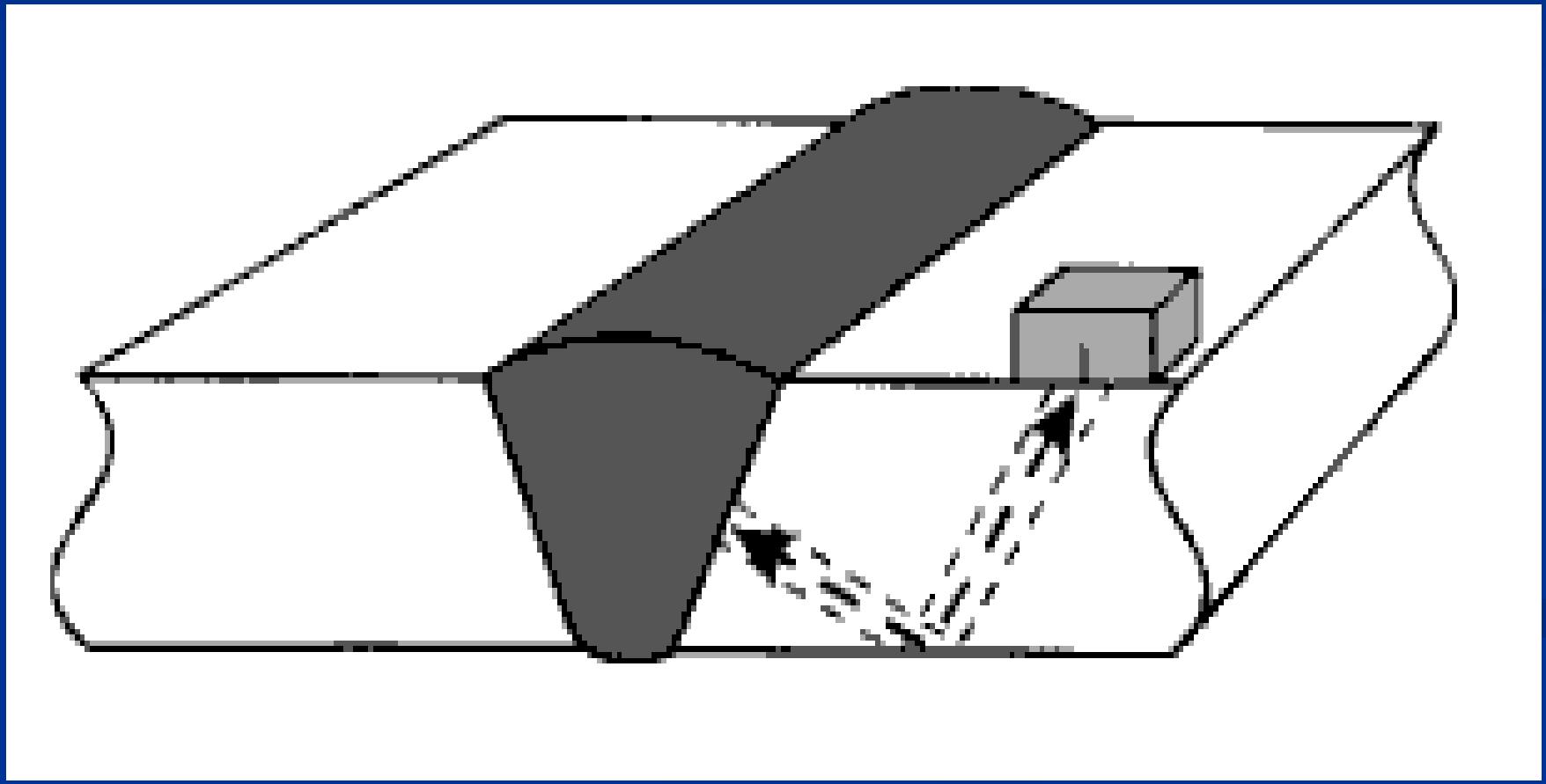


Calibration Block





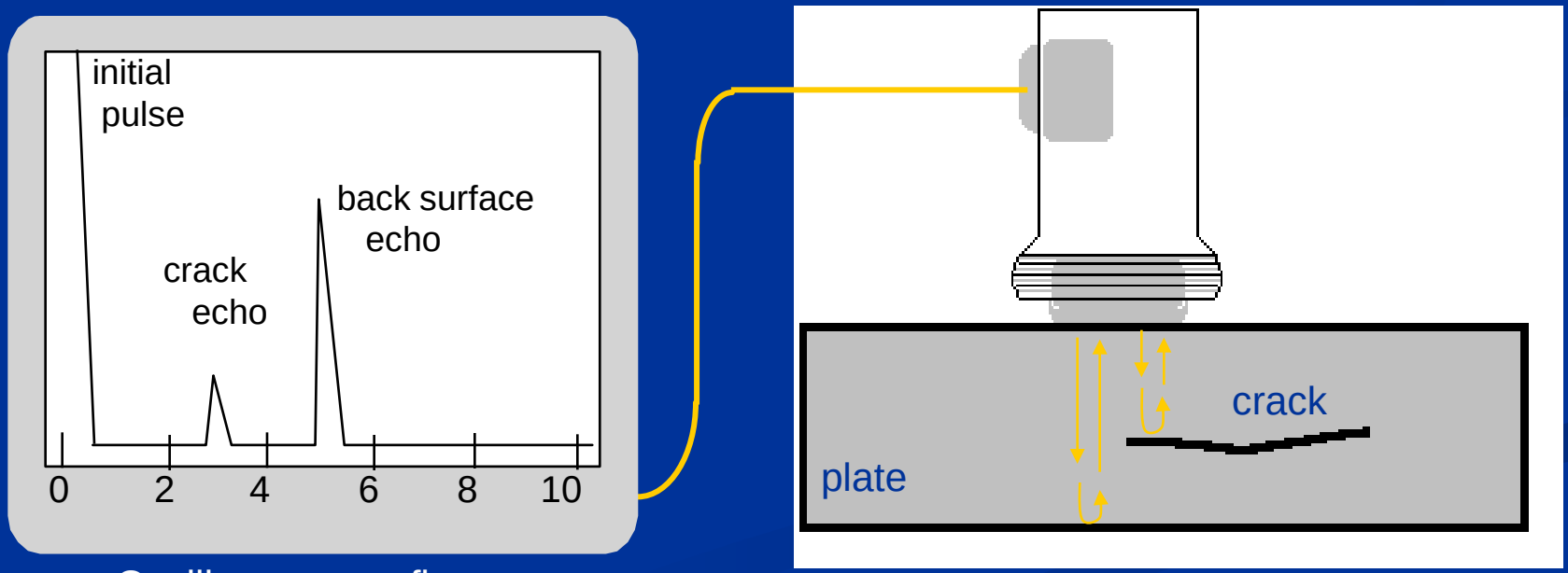
Ultrasonic Testing



Ultrasonic Inspection (Pulse-Echo)

High frequency sound waves are introduced into a material and they are reflected back from surfaces or flaws.

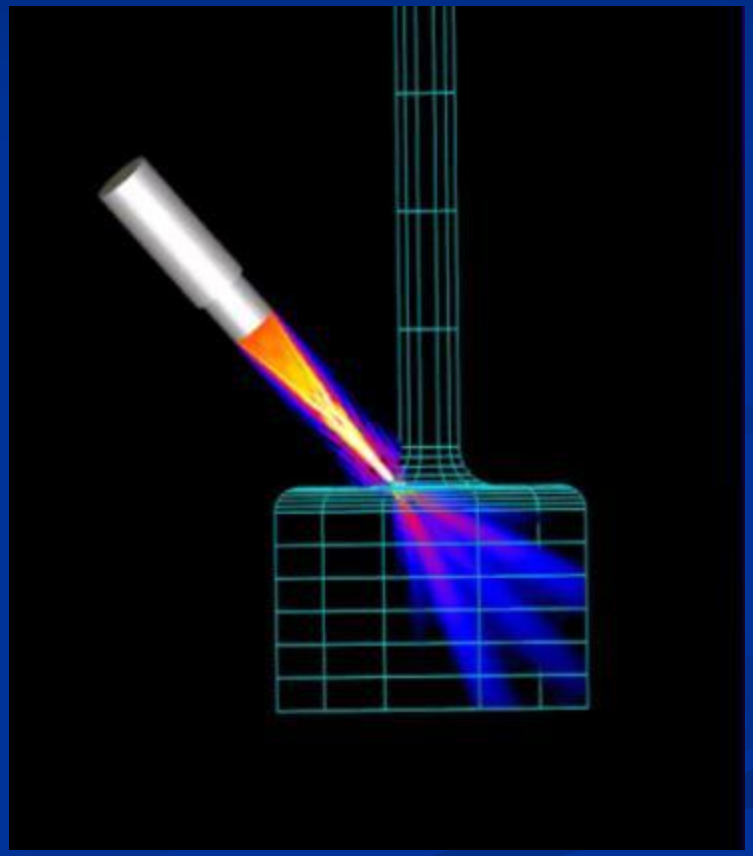
Reflected sound energy is displayed versus time, and inspector can visualize a cross section of the specimen showing the depth of features that reflect sound.



Oscilloscope, or flaw detector screen

Ultrasonic Imaging

High resolution images can be produced by plotting signal strength or time-of-flight using a computer-controlled scanning system.



Ultrasonic Imaging

High resolution images can be produced by plotting signal strength or time-of-flight using a computer-controlled scanning system.

Gray scale image produced using the sound reflected from the front surface of the coin

Gray scale image produced using the sound reflected from the back surface of the coin (inspected from “heads” side)

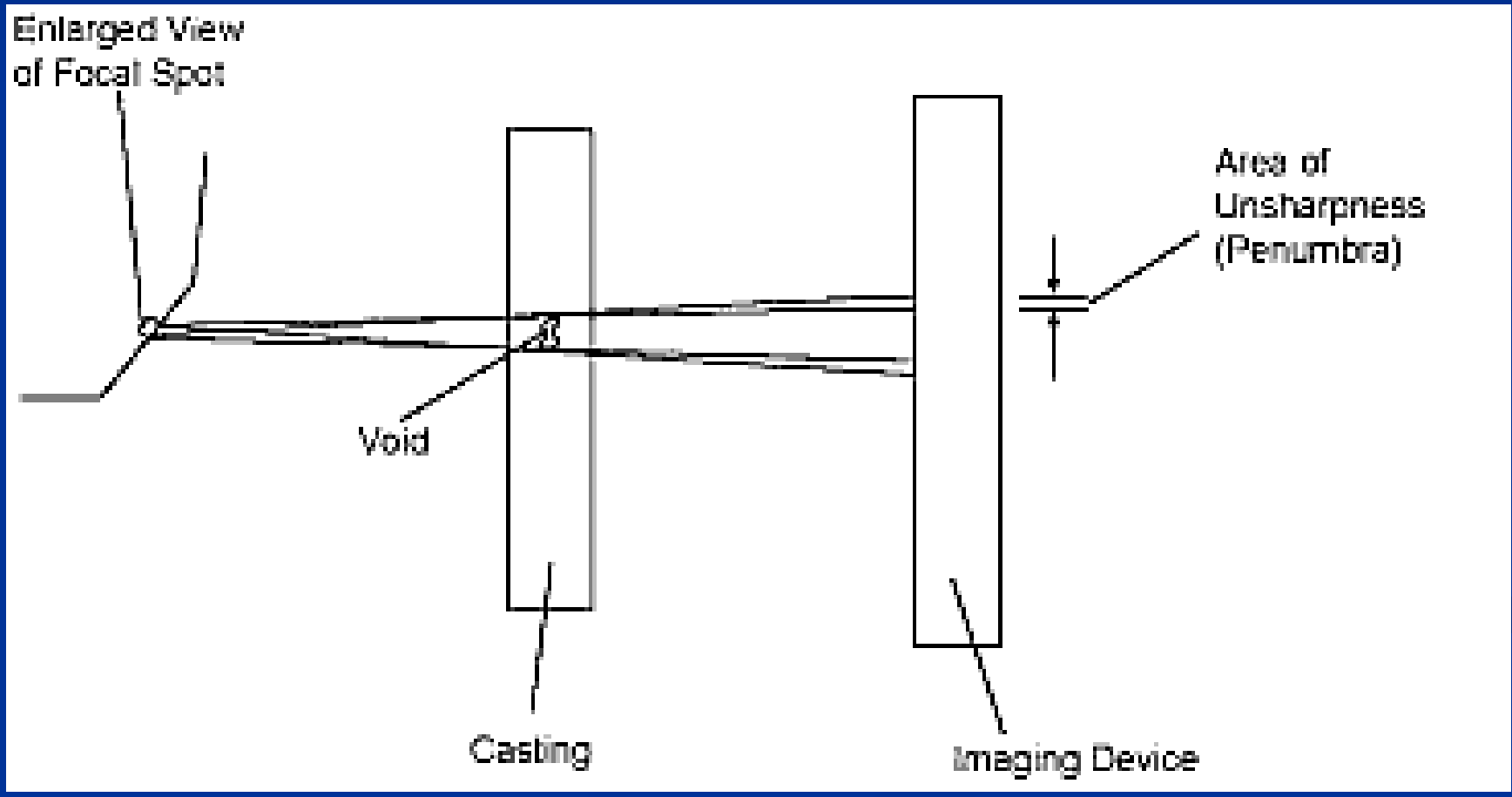
Radiographic (X-Ray) Testing

- Also known as x-radiography and gamma radiography.
- X-rays are produced by high voltage x-ray machines, whereas gamma rays are produced from radioactive isotopes such as Iridium 192 and Cobalt 60.

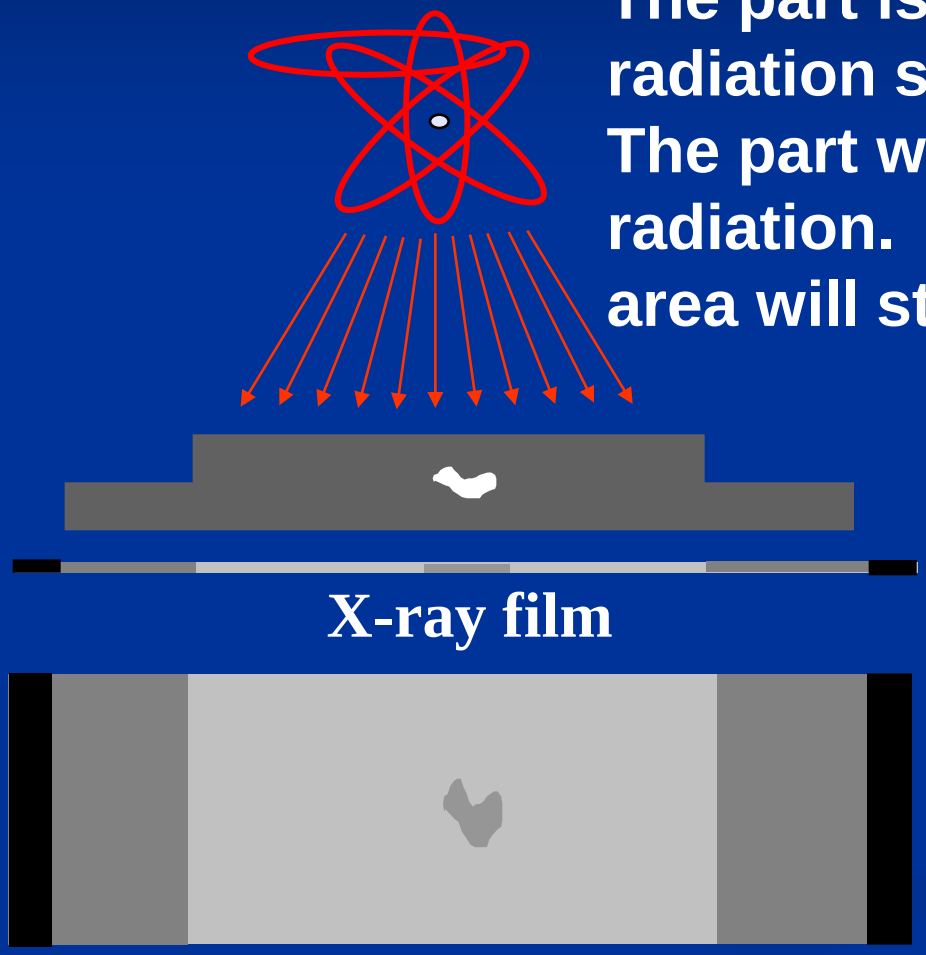
Radiographic (X-Ray) Testing

- The x-ray or gamma rays are placed close to the material to be inspected and they pass through the material and are then captured on film.
- This film is then processed and the image is obtained as a series of grey shades between black and white.
- Gamma sources have the advantage of portability which makes them ideal for use in site working.

Radiographic Testing (X-Ray)



Film Radiography



Top view of developed film

The part is placed between the radiation source and a piece of film. The part will stop some of the radiation. Thicker and more dense area will stop more of the radiation.

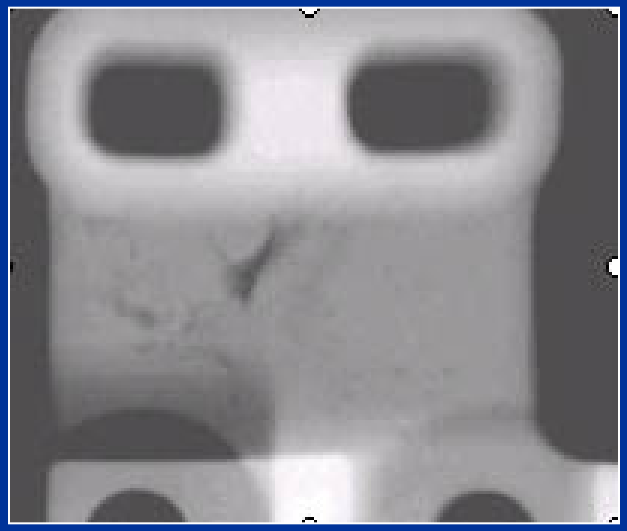
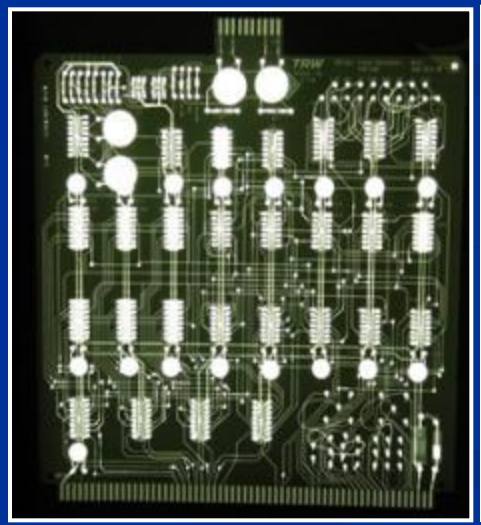
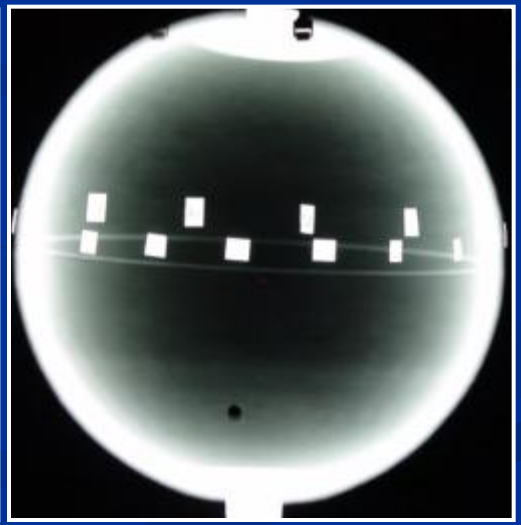
The film darkness (density) will vary with the amount of radiation reaching the film through the test object.

= less exposure

= more exposure

Radiographic Images



Nondestructive Testing

- Nondestructive testing is not confined to crack detection.
- Other discontinuities include porosity, wall thinning from corrosion and many sorts of disbonds.

Nondestructive Testing

- Since the 1920s, nondestructive testing has developed from a laboratory curiosity to an indispensable tool of production.
- No longer is visual examination the principal means of determining quality.

Nondestructive Testing

- Nondestructive tests in great variety are in worldwide use to detect variations in structure, minute changes in surface finish, the presence of cracks or other physical discontinuities, to measure the thickness of materials and coatings and to determine other characteristics of industrial products.

Nondestructive Testing

- The demands and expectations of the public for greater safety are apparent everywhere.
- Review the record of the courts in granting higher and higher awards to injured persons.

NDT METHODS

- Each method can be completely characterized in terms of five principal factors:
  1. energy source or medium used to probe the test object (such as X-rays, ultrasonic waves or thermal radiation);
  2. nature of the signals, image or signature resulting from interaction with the test object (attenuation of X-rays or reflection of ultrasound, for example);
  3. means of detecting or sensing resulting signals (photo emulsion, piezoelectric crystal or inductance coil);

NDT METHODS

- Each method can be completely characterized in terms of five principal factors:
  4. method of indicating or recording signals (meter deflection, oscilloscope trace or radiograph); and
  5. basis for interpreting the results (direct or indirect indication, qualitative or quantitative, and pertinent dependencies).

Nondestructive Testing

- The objective of each test method is to provide information about the following material parameters:
  1. discontinuities (such as cracks, voids, inclusions, delaminations);
  2. structure or malstructure (including crystalline structure, grain size, segregation, misalignm

Nondestructive Testing

- The objective of each test method is to provide information about the following material parameters:

3. dimensions and metrology (thickness, diameter, gap size, discontinuity size);
4. physical and mechanical properties

Nondestructive Testing

- The objective of each test method is to provide information about the following material parameters:

5. composition and chemical analysis (alloy identification, impurities, elemental distributions);

Nondestructive Testing

- The objective of each test method is to provide information about the following material parameters:
  - stress and dynamic response (residual stress, crack growth, wear, vibration); and
  - signature analysis (image content, frequency spectrum, field configuration).

REVIEW TIME!!!

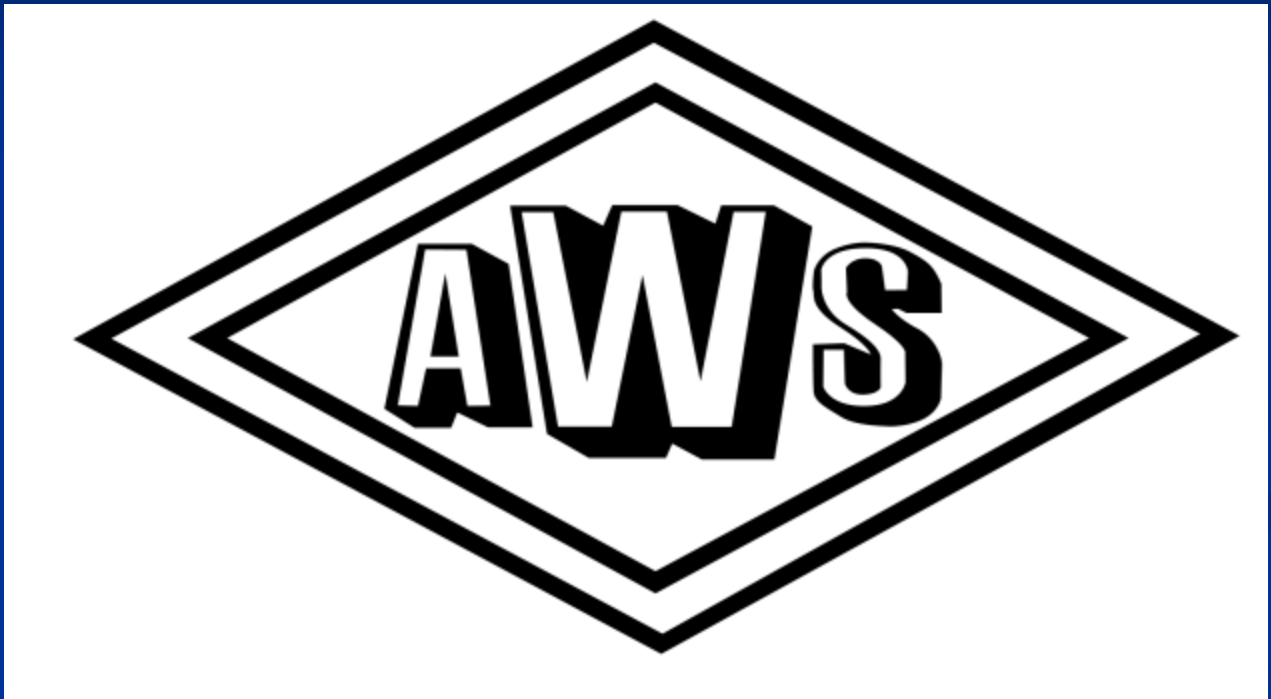
- WHAT ARE THE SIX MOST COMMON METHODS OF NDT?

Six Most Common NDT Methods

- Visual
- Liquid Penetrant
- Magnetic
- Ultrasonic
- Eddy Current
- X-ray

WELD INSPECTION
&
AWS

AWS



AWS

AMERICAN WELDING SOCIETY

AWS

- The American Welding Society (AWS) was founded in 1919 as a multifaceted, nonprofit organization with a goal to advance the science, technology and application of welding and related joining disciplines. From factory floor to high-rise construction, from military weaponry to home products, AWS continues to lead the way in supporting welding education and technology development to ensure a strong, competitive and exciting way of life for all Americans.

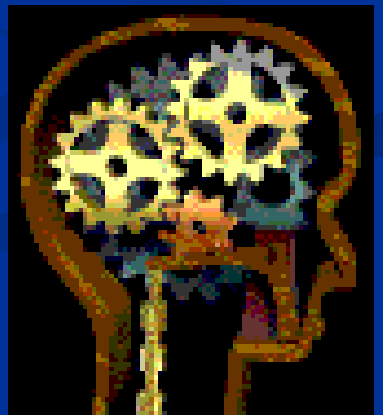
AWS

- AWS Mission Statement

- The mission of the American Welding Society is to advance the science, technology and application of welding and allied joining and cutting processes, including brazing, soldering and thermal spraying.

AWS

- AWS has over 50,000 members world wide
- AWS publishes magazines, codes and reference books dedicated to the industry
- AWS produces the D1.1 Structural Welding Code – Steel



AWS

- AWS offers many different certification programs including:
  - Certified Welder
  - Certified Welding Inspector (CWI)

AWS

A certified welder is a certified welder, is a certified welder, is a certified welder, is a certified welder, is a certified welder, RIGHT?

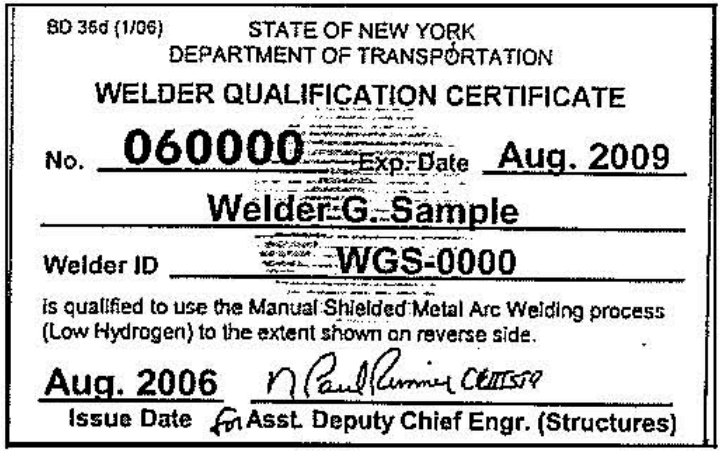
WRONG!!

AWS

- The Certified Welder program is a performance-based program with no prerequisite courses or certifications required. Final certification will provide "transferrable" credentials that you may take with you wherever you go.

AWS

- Understanding Welder Certification Cards



BD 36d (1/06) STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION

WELDER QUALIFICATION CERTIFICATE

No. 060000 Exp. Date Aug. 2009

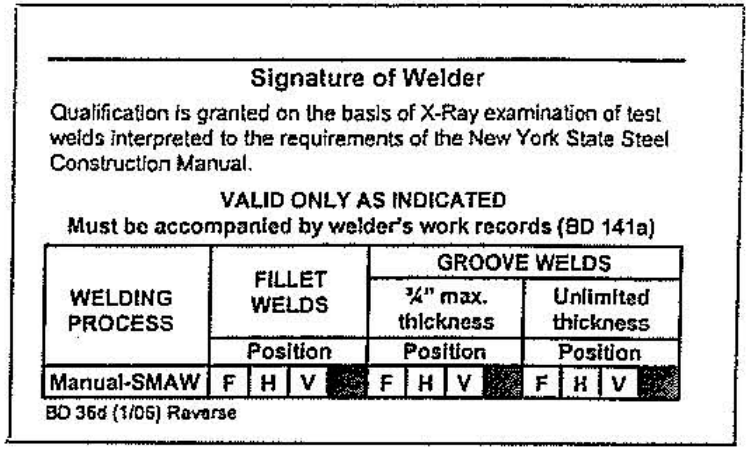
Welder G. Sample

Welder ID WGS-0000

is qualified to use the Manual Shielded Metal Arc Welding process (Low Hydrogen) to the extent shown on reverse side.

Aug. 2006 for Asst. Deputy Chief Engr. (Structures)

Issue Date



Signature of Welder

Qualification is granted on the basis of X-Ray examination of test welds interpreted to the requirements of the New York State Steel Construction Manual.

VALID ONLY AS INDICATED

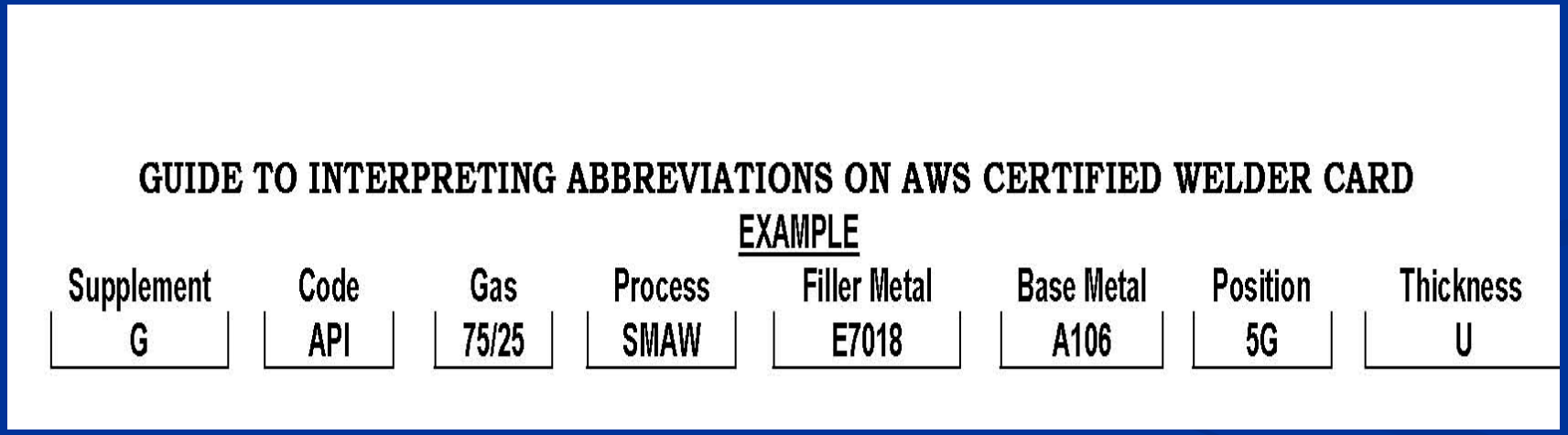
Must be accompanied by welder's work records (BD 141a)

WELDING PROCESS	FILLET WELDS				GROOVE WELDS							
					¾" max. thickness				Unlimited thickness			
	Position				Position				Position			
Manual-SMAW	F	H	V		F	H	V		F	H	V	

BD 36d (1/06) Reverse

AWS

- Understanding Welder Certification Cards



GUIDE TO INTERPRETING ABBREVIATIONS ON AWS CERTIFIED WELDER CARD

EXAMPLE

Supplement	Code	Gas	Process	Filler Metal	Base Metal	Position	Thickness
G	API	75/25	SMAW	E7018	A106	5G	U

AWS

- Understanding Welder Certification Cards
  - SUPPLEMENT

GUIDE TO INTERPRETING ABBREVIATIONS ON AWS CERTIFIED WELDER CARD

EXAMPLE

Supplement	Code	Gas	Process	Filler Metal	Base Metal	Position	Thickness
G	API	75/25	SMAW	E7018	A106	5G	U

AWS Supplements

C	Sheet Metal Welding (AWS D9.1)
F	Chemical Plant and Petroleum Piping (ASME B31.3 and Sec. IX)
G	Generic Supplement (Company-furnished WPS and acceptance criteria)

AWS

- Understanding Welder Certification Cards
  - CODE

GUIDE TO INTERPRETING ABBREVIATIONS ON AWS CERTIFIED WELDER CARD

EXAMPLE

Supplement	Code	Gas	Process	Filler Metal	Base Metal	Position	Thickness
G	API	75/25	SMAW	E7018	A106	5G	U

Codes	*(For Supplement G only, reference appropriate acceptance criteria.)*
B2.1	AWS B2.1, *Standard for Welding Procedure and Performance Qualification*
D1.1	AWS D1.1, *Structural Welding Code Steel*
D1.2	AWS D1. 2, *Structural Welding Code - Aluminum*
D1.5	*AWS D1.5, Bridge Welding Code*
D9.1	*AWS D9.1, Sheet Metal Welding Code*
ASME IX	ASME Section IX, *Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators*
D15.1	AWS D15.1, *Railroad Welding Specification - Cars and Locomotives*
API	API 1104, *Welding of Pipelines and Related Facilities*
CUST	*Other customer may be used as indicated on the employer supplied WPS*

AWS

- Understanding Welder Certification Cards
  - GAS

GUIDE TO INTERPRETING ABBREVIATIONS ON AWS CERTIFIED WELDER CARD

EXAMPLE

Supplement	Code	Gas	Process	Filler Metal	Base Metal	Position	Thickness
G	API	75/25	SMAW	E7018	A106	5G	U

Gas	
AR	Argon
HE	Helium
Ar/CO_2	Argon/Carbon Dioxide
CO_2	Carbon Dioxide

AWS

- Understanding Welder Certification Cards
  - PROCESS

GUIDE TO INTERPRETING ABBREVIATIONS ON AWS CERTIFIED WELDER CARD

EXAMPLE

Supplement	Code	Gas	Process	Filler Metal	Base Metal	Position	Thickness
G	API	75/25	SMAW	E7018	A106	5G	U

Processes

SMAW	Shielded Metal Arc Welding (SMAW)
GMAW	Gas Metal Arc Welding (GMAW)
GMAW-S	Gas Metal Arc Welding - Short Circuit
FCAW	Flux Cored Arc Welding (FCAW)
GTAW	Gas Tungsten Arc Welding (GTAW)
SAW	Submerged Arc Welding (SAW)
BZ	Brazing

Common Welding Methods

- SMAW
  - Shielded Metal Arc Welding (Stick Welding)
- GMAW
  - Gas Metal Arc Welding (MIG)
- GTAW
  - Gas Tungsten Arc Welding (TIG)

AWS

- Understanding Welder Certification Cards
  - FILLER METAL

GUIDE TO INTERPRETING ABBREVIATIONS ON AWS CERTIFIED WELDER CARD

EXAMPLE

Supplement	Code	Gas	Process	Filler Metal	Base Metal	Position	Thickness
G	API	75/25	SMAW	E7018	A106	5G	U

Filler Metal ***(AWS CLASSIFICATION)***

ER309-L
E7018-A1L
ER70S-2
E71T-1

AWS

- Understanding Welder Certification Cards
  - BASE METAL

GUIDE TO INTERPRETING ABBREVIATIONS ON AWS CERTIFIED WELDER CARD

EXAMPLE

Supplement	Code	Gas	Process	Filler Metal	Base Metal	Position	Thickness
G	API	75/25	SMAW	E7018	A106	5G	U

Base Metal

AXXX	ASTM Designations (i.e., A36)
M	Material Numbers from B2
SAXXX	(SA106, SA105, SA304L, etc.)
PX	(P1, P8, P44, etc.)

AWS

- Understanding Welder Certification Cards
  - POSITIONS

GUIDE TO INTERPRETING ABBREVIATIONS ON AWS CERTIFIED WELDER CARD

EXAMPLE

Supplement	Code	Gas	Process	Filler Metal	Base Metal	Position	Thickness
G	API	75/25	SMAW	E7018	A106	5G	U

Position	
1G	Groove Weld, Flat
2G	Groove Weld, Horizontal
3G	Groove Weld, Vertical
4G	Groove Weld, Overhead
5G	Groove Weld, (Pipe) Vertical
6G	Groove Weld, (Pipe) 45° Vertical
1F	Fillet Weld, Flat
2F	Fillet Weld, Horizontal
3F	Fillet Weld, Vertical
4F	Fillet Weld, Overhead
V	Vertical Progression Up
D	Vertical Progression Down
A	All

AWS

- Understanding Welder Certification Cards
  - THICKNESS

GUIDE TO INTERPRETING ABBREVIATIONS ON AWS CERTIFIED WELDER CARD

EXAMPLE

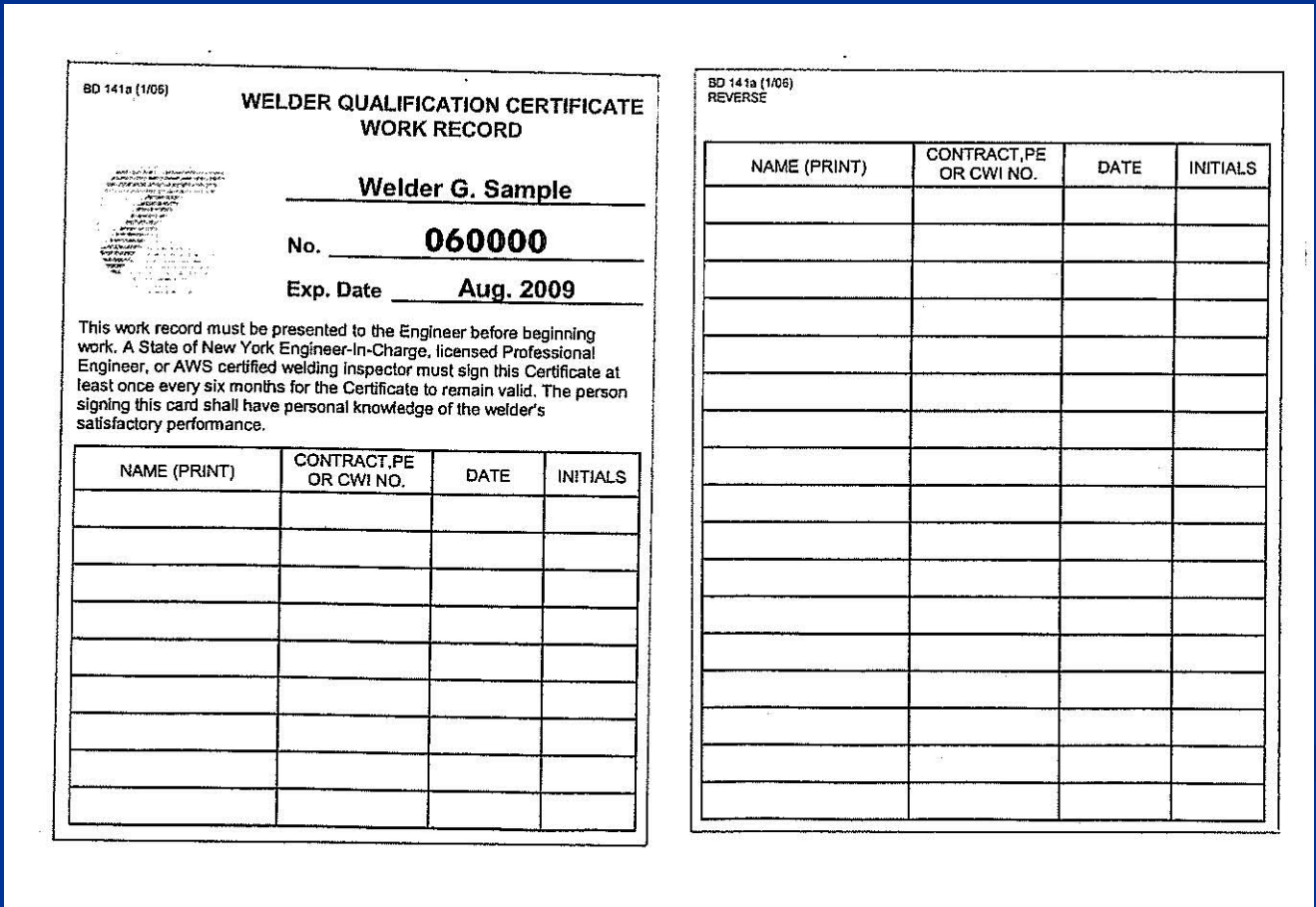
Supplement	Code	Gas	Process	Filler Metal	Base Metal	Position	Thickness
G	API	75/25	SMAW	E7018	A106	5G	U

Thickness

U	Unlimited (1/8" to Unlimited)
L	Limited
xx-xx	Range in sheet gauges (i.e., 11 - 18)
x/x	Thickness in fractions of an inch (i.e., 3/8")
SCH	Schedule listing for pipe thickness (Sch 40)
WB	With backing
WOB	Without backing

- Understanding Welder Certification Cards
  - EXPIRATION DATE
  - An AWS welder certification remains valid as long as the certified welder submits their certification maintenance forms every six months as required by the Code of Acceptance that governed their test.
  - As long as the certified welder can verify (employer must sign the form) that they are still performing the same welding as they were originally tested for, the certification remains in effect. But the certification records must be maintained and sent to AWS

AWS
Welder Qualification Certification Maintenance Record



BD 141a (1/06)

WELDER QUALIFICATION CERTIFICATE
WORK RECORD

Welder G. Sample

No. 060000

Exp. Date Aug. 2009

This work record must be presented to the Engineer before beginning work. A State of New York Engineer-In-Charge, licensed Professional Engineer, or AWS certified welding inspector must sign this Certificate at least once every six months for the Certificate to remain valid. The person signing this card shall have personal knowledge of the welder's satisfactory performance.

NAME (PRINT)	CONTRACT,PE OR CWI NO.	DATE	INITIALS

BD 141a (1/06)
REVERSE

NAME (PRINT)	CONTRACT,PE OR CWI NO.	DATE	INITIALS

AWS WELDING PROCEDURE

- The AWS definition for a welding procedure is "the detailed methods and practices including all joint welding procedures involved in the production of a weldment."
- The joint welding procedure mentioned includes "the materials, detailed methods and practices employed in the welding of a particular joint."

AWS WELDING PROCEDURE

- A welding procedure is used to make a record of all of the different elements, variables, and factors that are involved in producing a specific weld or weldment. Welding procedures should be written whenever it is necessary to:
- Maintain dimensions by controlling distortion
- Reduce residual or locked up stresses
- Minimize detrimental metallurgical changes
- Consistently build a weldment the same way
- Comply with certain specifications and codes.