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LEGALLY DEFENSIBLE BEST PRACTICE IN NDT

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This presentation is based on the personal experiences and research of the authors and intended to stimulate discussion in ICNDT. It is of most relevance to NDT in heavy engineering, manufacture, construction and in-service inspection.

ECNDT 2026 – Verona

1. CONTENTS

1. **“Best Practice”** is now ever more important because following “industry best practice” is often a necessary legal defence in contract disputes or accident investigations
   - **important for users and providers of NDT**
2. **Importance of NDT** - Case studies which indicate the importance of NDT and what can happen when NDT is not applied satisfactorily
   - **Collected by an industrial lawyer who specialises in industrial accidents**
3. **NDT Quality Chain and the global NDT infrastructure**
4. **Best Practice**

   including recent results of our research into what someone asking AI for advice will be advised is legally defensible and what is not
5. **Conclusions and Recommendations**

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2.1 Case Studies of when large structures fail

The first 5 cases have been supplied by James MacDonald a lawyer specialising in industrial litigation. Some of these cases the authors have personal involvement.

These cases are cases which became public. The vast majority of litigation cases do not become public.

Findings summarised to concentrate on the NDT aspects.

All are failures that could have been avoided by better NDT

Case 1 - San Bruno Gas Pipeline Explosion, USA (2010)

Case

On 9 September 2010, a 30-inch gas pipeline ruptured in a residential area in San Bruno, USA, killing 8 people and destroying 38 homes. Inadequate quality assurance during a pipeline relocation in 1956 allowed for the installation of a poorly welded pipe section with a visible seam weld flaw

The gas company was found guilty leading to substantial financial penalties and litigation.

Case 1 - San Bruno Gas Pipeline Explosion, USA (2010)

Comment

NDT was not at the time required by the regulations but the court case went against the gas company for essentially for not following best construction practice and undertaking NDT inspection.

Case 2 - Olympic Pipeline Explosion, USA (1999)

Case

A 16-inch fuel pipeline ruptured in Bellingham, USA, killing 3 people. Olympic Pipeline Company had inaccurately evaluated in-line inspection results and decided not to excavate and examine the damaged pipe section.

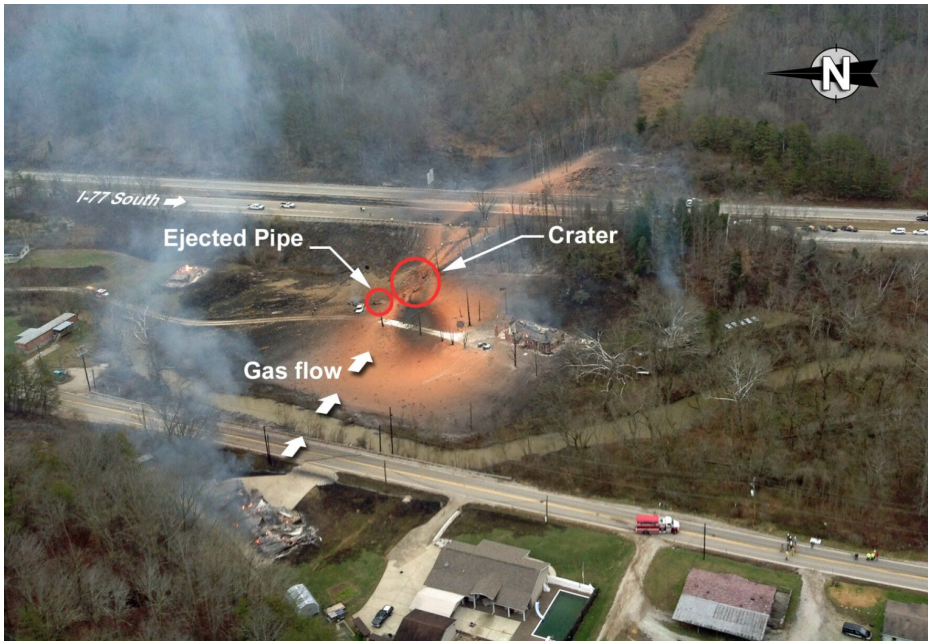
Estimated $58m in property damage and a record $112 million federal criminal and civil settlement, representing the first conviction under the 1979 Hazardous Liquid Pipeline Safety Act.

Case 2 - Olympic Pipeline Explosion, USA (1999)

Comment

In this case inadequate initial inspection and follow-on uncertain inspection results were not acted upon.

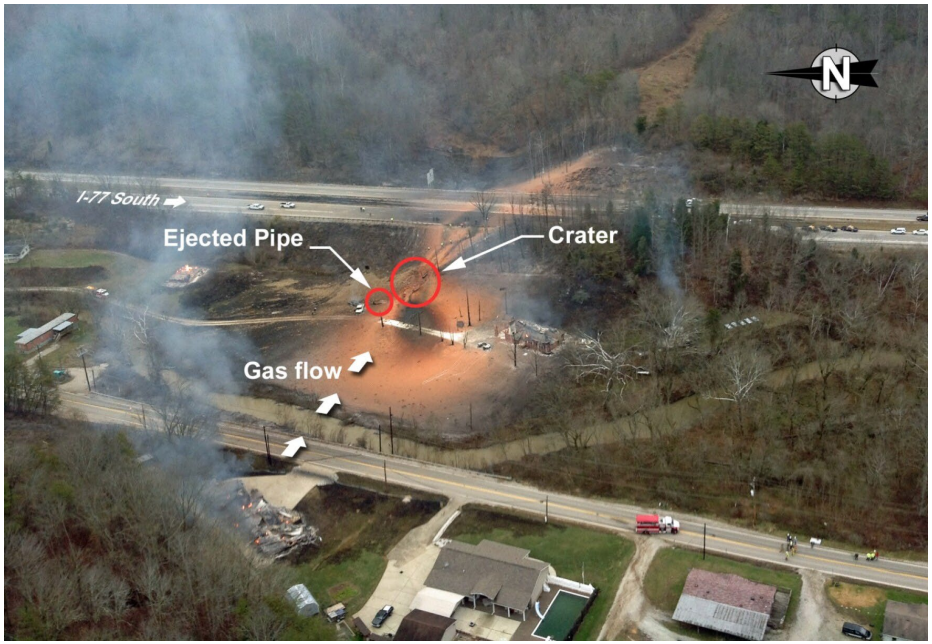
Case 3 - Columbia Gas Pipeline Rupture, USA (2012)



Case

On 11 December 2012, a buried 20-inch gas pipeline ruptured near an interstate highway near Sissonville, USA. Consequent fire damage destroyed 3 houses, and several others were damaged.
External corrosion caused the rupture.
Repair costs were estimated to be around $2.9m, with a further $5m for required system upgrades.

Case 3 - Columbia Gas Pipeline Rupture, USA (2012)



Comment

NDT was not mandatory but the subsequent costs for the pipeline owner were probably much higher than the cost of an inspection.

Case 4 - Alexander L. Kielland Platform Capsize, Norway (1980)

Case

On 27 March 1980, a Norwegian semi-submersible drilling rig capsized in the Ekofisk field in the North Sea, killing 123 people.

The collapse was attributed to a fatigue crack in one of the rig's six bracings, traceable to a fillet weld joining a non-load-bearing hydrophone support. Lamellar tearing and cold cracks in the groove weld had been present since construction in 1976.

Case 4 - Alexander L. Kielland Platform Capsize, Norway (1980)

Comment

- Now quality control procedures have been tightened to examine all structural welds, load bearing or not.
- The Alexander Kielland had a sister platform. This platform stayed in service with annual sample NDT inspections to the highest industry standards.
- These inspections were required by the UK HSE and used NDT personnel qualified to ISO 9712 and ISO 17024 certification to a scheme which was and is an ICNDT MRA registered scheme [3]. This was a requirement of the UK HSE.
- Later, the Quality Assurance was raised further by **requiring** the NDT inspection procedure and the NDT technicians to be subject to human factor reliability assessment.

i.e. Industry best practice was mandated by the regulator.

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Case 5 - Kew Recreation Centre structural steel collapse (2022, Melbourne Australia)

Case

A welded connection on the GT1 truss failed and a section of the partially erected Kew Recreational Centre collapsed

An investigation found the truss was not fabricated in accordance with design requirements.

Case 5 - Kew Recreation Centre structural steel collapse (2022, Melbourne Australia)

- WorkSafe (the Australian workplace safety regulator) alleged ADCO failed to reduce the risk to health and safety by ensuring that before the truss was erected, a competent person reviewed the documents and verified in writing that:
  - Full strength butt welds were subject to non-destructive testing including both visual and ultrasonic during fabrication.
  - Welding inspection reports for the truss were in line with the design drawings and fabrication requirements.

Comment

Although the case was not specifically an NDT issue the Australian authorities required that a “Competent Person”, reviewed the inspection reports.

Case 6 – Personal Insight as an Expert Witness Experience

Case **Wind turbine?pic? Country ? When?**

My client was being sued for hundreds of millions of pounds sterling for a set of structures they considered to be below standard due to the quality of the welds. I cannot go into detail as the case did not become public.

Comment

There were two key factors in the case relevant to this paper:

- Received/delivered quality of welds after being subject to routine industry standard NDT considered normal on similar structures.
- Quality of NDT certification.

Case 6 – Personal Insight as an Expert Witness Experience

Conclusions

- The legal case found that the initial inspection was undertaken by NDT personnel with inadequate certification for the tasks.
- The client initially requested a full in-situ re-inspection of the structures. A best practice re-inspection was commenced on a large sample of the structures.
- The re-inspection required best practice techniques applied by technicians with best practice certification and training.
- The best practice techniques and technicians were provided at the instigation of the construction company with oversight by expert witnesses from both the client and the construction company. The re-inspection cost the construction company millions of pounds.
- The contract did not call up industry best practice but did quote normal construction and NDT standards.

2.2 UK Health and Safety Executive (UKHSE) Report in 2024 "When Welding Goes Wrong"

- HSE analysed 47 industrial accidents involving welding and examined the control of welding and NDT inspections

- Across 47 industrial accidents involving welding:
  - 49% resulted in complete structural collapse
  - 21% caused injuries
  - 11% resulted in fatalities

These statistics generated by UK HSE highlight just how critical effective NDT is in preventing catastrophic outcomes.

- Defects which caused failures were
  - Volumetric flaws missed by radiography or UT
  - Early-stage fatigue cracks not detected by NDT

- Failures of the NDT process
  - Incorrect selection of NDT method
  - Poor interpretation of indications
  - Lack of competence, poor oversight, and inconsistent application of procedures were repeatedly identified as root causes.

3. Quality In NDT – the Quality Chain and global NDT infrastructure

- Quality in NDT depends on a whole chain of steps which can be represented as a "Quality Chain"
- All the links in the chain are important and if any are missing or broken NDT quality will be reduced

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3. Global NDT Quality Infrastructure

- Actions necessary to achieve NDT quality have been recognised in the growth of a global NDT Quality infrastructure
- ICNDT has been a leader in this since the 1960's with a focus on personnel training and certification
- ISO standards play a key role, the ICNDT Guide puts them in context

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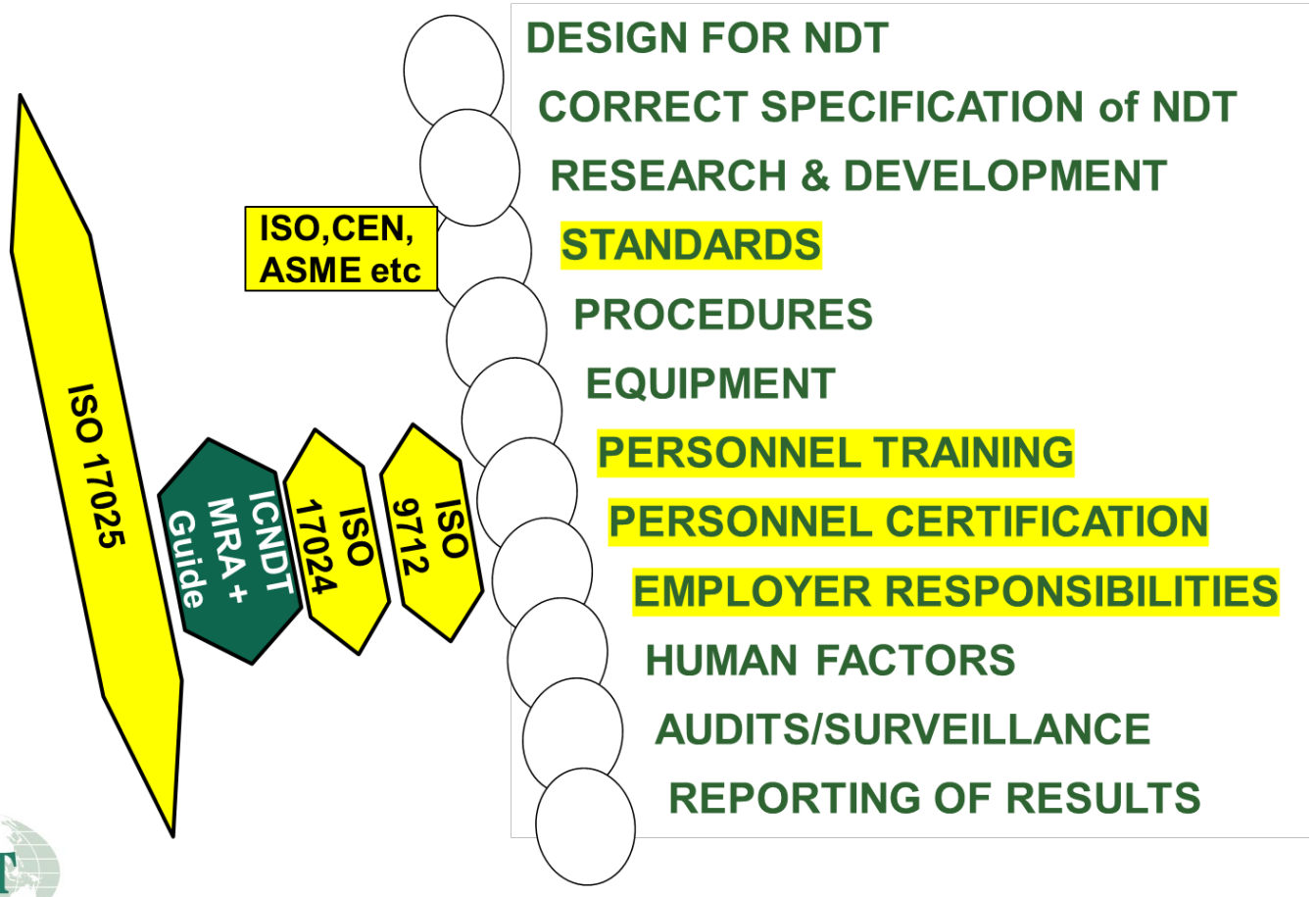
Global NDT Quality Infrastructure

- Best practice requires NDT to be carried out by methods which comply with relevant standards by personnel who are trained and certified in accordance with International Standard ISO 9712 by a PCB which complies with ISO 17024
- Compliance with ISO 17024 is best demonstrated by Accreditation



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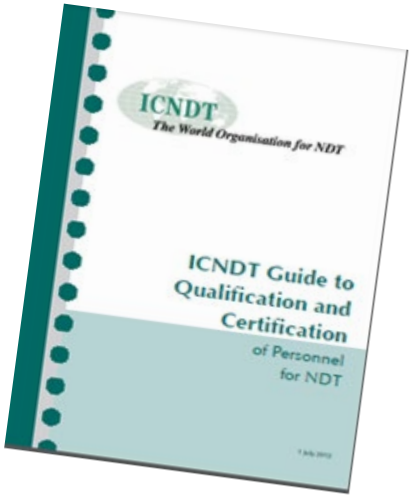
Global NDT Quality Infrastructure

QUESTION TO MICROSOFT COPILOT AI: Does best practice using ISO 9712 certified personnel require using a certification body which is accredited by an accreditation body that is recognised internationally?

ANSWER: *Yes — when an organisation claims to follow* ***best practice using ISO 9712-certified NDT personnel****, that best practice does assume the certification body is accredited by an internationally recognised accreditation body. This isn't written as a legal requirement inside ISO 9712 itself, but it* ***is the globally accepted interpretation*** *of how ISO 9712 is supposed to be applied.*

ICNDT Guide to Qualification and Certification of Personnel for NDT



Makes several key recommendations relating to quality of NDT
NDT quality:

- **Recommendations to users of central third-party certification**

  Recommends use of ISO 9712 by a Certification Body accredited to ISO 17024.
  Reminds readers that Certification Bodies registered under the ICNDT MRA will meet this requirement.
  Provides information on the ICNDT Multilateral Recognition Agreement

- **Recommends regulators, users and auditors of NDT operations** should insist that employers of NDT personnel properly fulfil their responsibilities to authorise personnel to work after first confirming that their employees are adequately trained, experienced and qualified.

QUESTION TO MICROSOFT COPILOT AI: What is the role of the ICNDT Guide?

ANSWER: *The Guide is not a standard — it is a* ***global best-practice manual*** *that ensures ISO 9712 is applied consistently across countries.*

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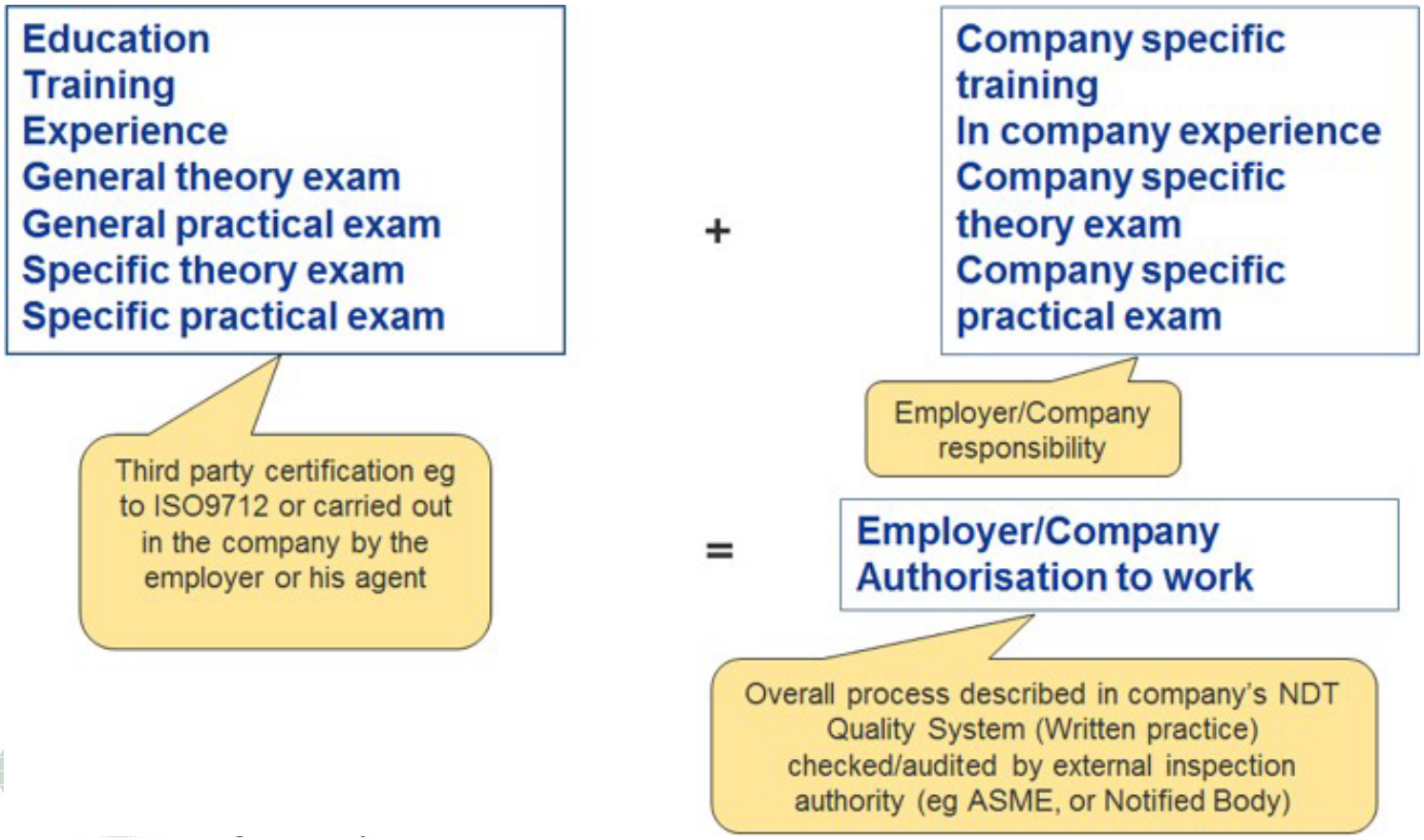
Responsibility of the Employer

It is a central tenet of ISO 9712 that the employer has overall responsibility for the results of NDT operations and is fully responsible for the authorisation of their staff to work. In practice, this should include checking that the NDT tasks to be carried out are within the scope of the individual's certification (sector, method, level and their recent experience) and, if they are not, additional company job-specific training and/or examinations.



Responsibility of the Employer

***QUESTION TO MICROSOFT COPILOT AI: What is the role of the* employer in ISO 9712 Certification?**

ANSWER : *Employers must ensure that NDT personnel only perform tasks that fall within the scope of their ISO 9712 certification. This is achieved through documented verification of certification, formal written authorisations, competence matrices, job-specific checks, and appropriate supervision.*

This employer-controlled authorisation process is essential for legally defensible best practice. Even when NDT is performed to EN standards, the work is not legally defensible unless the technician's certification is accredited and their authorisation matches the scope of the task.

ICNDT MULTILATERAL RECOGNITION AGREEMENT (MRA)

44 National Societies, members of ICNDT

(Argentine, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, China, China Taiwan, Colombia, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, India, Iran, Israel, Italy, Japan, Kazakhstan, Malaysia, Mexico, Morocco, Netherlands, New Zealand, Poland, Portugal, Romania, Serbia, Singapore, South Africa, South Korea, Spain, Switzerland, Turkey, Ukraine, UK and Uzbekistan)

have signed the ICNDT MRA and *thereby agreed to promote the recognition and acceptance of the certification* awarded by *the Personnel Certification Bodies (PCBs) which are registered with ICNDT*, currently 18:

(IRAM Argentina, ABENDE Brazil, APC Czech Republic, ChSNDT China, SNTCT China Taiwan, Inspectserfionti Finland, Sector Cert Germany, NCB ISNT India, KPCN Korea, Skills Development Malaysia, IMENDE Mexico, UDT-Cert Poland, RELACRE Portugal, SAIW South Africa, NDTSS Singapore, CBNDT Sri Lanka, PCN BINDT UK, TWI Certification UK)

Registration by ICNDT requires the PCB to be nominated by an ICNDT member, to be accredited by an IAF (now GACI) recognised Accreditation Body to ISO 17024, supplemented by ICNDT conformity assessment where necessary.

QUESTION TO MICROSOFT COPILOT AI: What is the role of the ICNDT Multilateral Agreement?

ANSWER

- ***In short, the ICNDT MRA is the mechanism that turns ISO 9712 from a standard into a globally recognised, trusted certification system.***
- ***ICNDT MRA + accredited ISO 9712 certification provides the strongest global legal defensibility.***

CURRENT BEST PRACTICE

QUESTION TO AI: What is legally accepted as best practice in execution of NDT of welds?

ANSWER:

Legally accepted best practice for executing NDT on welds is defined through a combination of ***regulatory requirements***, ***national and international standards***, *and* ***industry expectations for competence and procedure control***.

What regulators and industry treat as "legally accepted best practice"

Across the UK, EU, Middle East, Asia, and many other regions:

- ***Regulators expect ISO 9712 certification to come from an accredited CB.*** *(Example: UKAS accreditation for PCN; COFRAC for COFREND; SCC for CGSB; JAS-ANZ for AINDT.)*
- ***Major codes and clients require accredited certification*** *for contract compliance (PED, ASME-aligned projects, nuclear, aerospace, oil & gas).*
- ***Courts and insurers treat accredited certification as the benchmark*** *for competence if an incident occurs.*

Bottom line

Best practice using ISO 9712-certified personnel ***does require*** *that the certification body be accredited by an internationally recognised accreditation body. Without this accreditation, the certification may be considered* ***non-compliant***, ***non-credible***, *or* ***legally indefensible*** *in many jurisdictions.*

REPEAT KEY ANSWERS FROM MICROSOFT COPILOT AI RESEARCH

- Legally accepted best practice for executing NDT on welds is defined through a combination of regulatory requirements, national and international standards, and industry expectations for competence and procedure control.

- Best practice using ISO 9712-certified personnel does require that the certification body be accredited by an internationally recognised accreditation body. Without this accreditation, the certification may be considered non-compliant, non-credible, or legally indefensible in many jurisdictions.

- The ICNDT MRA is the mechanism that turns ISO 9712 from a standard into a globally recognised, trusted certification system.

- ICNDT MRA + accredited ISO 9712 certification provides the strongest global legal defensibility.

- This employer-controlled authorisation process is essential for legally defensible best practice. .....the work is not legally defensible unless the technician's certification is accredited and their authorisation matches the scope of the task.

Recommendations and Discussion Points 1

1. PCBs which are registered by ICNDT MRA (Schedule 2) should advertise this more vigorously so that this “gold standard” of Best Practice becomes more widely known as the best legally defensible practice

2. PCBs that are not registered with ICNDT but already operate to high standards should seek registration as a differentiator against less diligent PCBs

3. ICNDT should promote the MRA more vigorously, via new communication routes that will be visible to regulators and users of NDT.

4. Users of NDT services should check whether NDT technicians are certificated by a PCB which is an ICNDT Schedule 2 member.

5. Regulators and Suppliers of NDT services should check whether a PCB has cleared any major non-conformances prior to accreditation.

Recommendations and Discussion Points 2

The review of the global NDT infrastructure versus the full quality chain has highlighted that ICNDT ought to *broaden* its activities (and its Guides?) to cover the full Quality Chain.

Recommendations and Discussion Points 3

The review of the global NDT infrastructure versus the full quality chain has highlighted that ICNDT ought to widen its activities (and its Guides?) to cover the full Quality Chain.

In particular:

- ICNDT should seek to promote and improve ISO 17025 accreditation of NDT operations
- ICNDT should provide more guidance on Performance Demonstration/Inspection Qualification
- ICNDT should provide advice on Human Factors which effect the practical real-world application of any inspection procedure.
  - factors which can degrade the effectiveness of the NDT technician include: working excessive hours, working in confined spaces, restricted lighting, working in excessive heat or cold, clarity and ease of applying NDT procedures and work instructions
- ISO 9712 should add responsibility for Human Factors to the responsibilities of the employer

Acknowledgements

- Thank you for your attention
- We are happy to take questions and comments
- The ppt slides will be available on the ICNDT website
- We acknowledge James MacDonald a Senior Associate, Ashurst and Perkins Coie, Melbourne Australia for the provision of the case studies listed in section 2 of this paper.