Commission V
NDT and Quality Assurance of Welded Products
Draft Agenda, Annual Assembly 2026

V-2023-2026

Author: Charles MacLeod

Comments:
Tuesday 13 morning 8:30-12:30 room Mozart 1
Tuesday 13 afternoon 14:00-18:00 room Mozart1

1. Agenda

Tuesday 13/7/2026

08.30	**1. Introduction**		
	1. Welcome and apologies		**MacLeod**
	2. Approval of Agenda	V-2023-2026	
	3. Review of Terms of Reference	**3 Terms of Reference**	Information
	4. Roll Call of Delegates		**MacLeod**
8:45	V-2024-2026 Best Practices in Welding Parameters Monitoring for Enhanced Weld Integrity via Emerging Automated Technologies Authors: alawi.saigh@gmail.com The evolving demands of critical construction applications in the oil and gas sector, necessitate rigorous adherence to welding quality requirements to ensure structural integrity and operational safety. A recent study into welding parameters monitoring practices across projects revealed significant variances in compliance levels, particularly for materials requiring notch toughness testing—such as low-temperature carbon steel (LTCS), stainless steels, high alloy steels, and age-hardened materials. The study proposed a structured matrix for welding parameters monitoring frequency based on material type and thickness, emphasizing the need for more consistent and accurate measurement to prevent material embrittlement and cracking due to improper adherence to welding parameters. Current practices often rely on manual monitoring by quality control inspectors, which proves inefficient and challenging, especially in large-scale projects involving hundreds of welders and thousands of joints. These limitations increase the risk of undetected deviations from Welding Procedure Specifications (WPS), often resulting in costly rework and safety concerns. Recent advancements in automated welding data acquisition systems offer a promising solution. This paper highlights how emerging technologies enable real-time monitoring of critical welding parameters, including voltage, current, and travel speed, leading to accurate, on-the-fly HI calculations. These systems can provide instant alerts when parameters drift outside acceptable ranges, significantly reducing non-compliance risks and rework. Moreover, such systems support the recommendations from the aforementioned study by ensuring that welding parameters for critical materials, where notch toughness is specified, are closely controlled throughout the welding process. This paper presents a synthesis of the study's updated welding parameters monitoring guidelines and the capabilities of current automated welding data acquisition systems. It advocates for the strategic implementation of these technologies in high-risk or high-complexity applications, aligning with the study's recommendations for		

	materials like stainless steels, duplex alloys, and age-hardened materials. The integration of such systems would not only enhance the control of welding processes but also supports the digital transformation of quality assurance workflows, promising improved productivity, compliance, and long-term asset integrity.
9:05	**V-2026 2026 Enhancing Welder Performance Monitoring in Large-Scale Projects through Innovative NDT and Infrastructure Development** **Authors:** abo_sultan_2002@hotmail.com In large-scale industrial projects, ensuring consistent weld quality and effectively monitoring welder performance remain persistent challenges due to the high volume of work, logistical constraints, and the need for rapid and accurate inspection results. For example, in this case study - a large-scale project located in a remote area - the scope of work included a large and complex piping system requiring substantial number of radiographic testing (RT) across a wide range of piping diameters. Therefore, the combination of a large number of RT joints and the remote project's location created substantial challenges for non-destructive testing (NDT) service providers in performing the required radiographic inspections on a weekly basis. Consequently, delays in obtaining RT results limited the ability to accurately monitor welder performance using individual repair rates, which are a key indicator of welding quality. To overcome this challenge, two strategic interventions were deployed: 1) the deployment of advanced NDT technologies, and 2) the enhancement of on-site inspection infrastructure. First, the adoption of advance NDT technologies, such as Digital Radiography (DRT) and portable phased-array ultrasonic testing(PAUT) scanner (i.e., COBRA) significantly improved inspection efficiency. These technologies enabled near real-time inspection results while also minimizing environmental and safety risks associated with conventional radiography.Second, to support these technologies and streamline workflows, the project implemented several infrastructure upgrades, including increasing the number of source pits and RT bunkers distributed throughout the project site. This significantly reduced logistical constraints and facilitated the timely acquisition of NDT results.The implementation of these measures enabled near real-time weld evaluation, improved the monitoring of welder performance, and enhanced overall quality assurance. As a result, the project established a more efficient inspection framework and set a benchmark for quality control in complex, large-scale industrial environments.
9:25	**V-2027-2026 Evaluation of the Suitability and Performance of a High-Dynamic OCT Scanner for Inline Weld Penetration Depth Measurement in Remote Laser Welding** **Author and Presenter:** c.fischer@blackbird-robotics.de Abstract: Remote laser welding has established itself as a key technology for highly precise and productive joining processes in electromobility. The implementation of on-the-fly welding strategies in combination with high-performance motion-control architectures significantly increases productivity and reproducibility. At the same time, the requirements for reliable inline determination of weld penetration depth continue to grow, as it directly determines the mechanical load-bearing capacity and the electrical contact resistance of the joint. Conventional inline monitoring strategies based on process emissions, camera signals, or acoustic measurements provide only an indirect, model-based estimation of weld penetration depth. In particular, when welding aluminum battery components, strong back reflections, fluctuating absorption conditions, and unstable melt pool and keyhole dynamics limit the reliability of these approaches. Optical coherence tomography (OCT), in contrast, enables direct determination of weld penetration depth with high temporal resolution, thereby reducing the dependence on process-induced emission fluctuations. This contribution presents a structured benchmarking approach for evaluating the application suitability of OCT-based inline measurement systems in remote laser welding. The evaluation was conducted using application-relevant key performance indicators, in particular measurement accuracy compared to metallographic reference cross-sections, signal stability at high relative velocities, and robustness against process-induced disturbances such as plasma emissions or focus drift. The results provide a sound classification of system limitations and form the basis for application-specific recommendations for the use of different OCT systems in industrial battery and electromobility component manufacturing.
9:45	**V-2028-2026 Research on Intelligent Welding Manufacturing Methods Guided by Physics-Informed Neural Networks** **Author and Presenter**: 1049305926@qq.com

	Abstract: In the field of efficient intelligent welding, real-time monitoring and state prediction of dynamic weld pool behavior remain critical and challenging tasks. Current industrial practice heavily relies on the empirical judgment of skilled operators. The penetration state is typically assessed by analyzing the height of the backside bead or the width of the backside weld pool, and is classified into three typical modes: incomplete penetration, complete penetration, and partial penetration. Different processes and material requirements necessitate precise discrimination and application of these three states. To overcome the high error rate inherent in manual judgment, this study constructs a neural network architecture driven jointly by data-driven and physics-informed losses, aiming to achieve accurate prediction of backside weld pool width and thereby reliably determine the penetration state. The core value of the Physics-Informed Neural Network lies in its ability to transition artificial intelligence from understanding symbolic information such as text to making judgments based on physical laws and performing practical operations. As we move from the era of "intelligence" to the era of "embodied intelligence," the Physics-Informed Neural Network is emerging as an indispensable revolutionary methodology. It equips robots with the capability to autonomously perceive physical laws and dynamically adjust model parameters, thereby enabling genuine exploration of and active adaptation to the physical world. This Physics-Informed Neural Network incorporates the governing physical equations describing weld pool dynamics (such as heat conduction and fluid dynamics equations) as residual loss terms into the loss function, thereby constraining the prediction results to adhere to fundamental physical principles. Concurrently, this study employs a transfer learning strategy, where model parameters of a ResNet pre-trained on a large-scale dataset are fine-tuned and transferred to a new model, enhancing both the accuracy and generalization capability of penetration state prediction. Comparative analysis reveals that although the method solely based on multi-source heterogeneous data fusion holds a slight advantage in prediction accuracy, the proposed data-physics dual-driven method demonstrates significant superiority in model interpretability. Addressing the critical issue of severe data accuracy deficiency in welding process state prediction, for instance, during high-speed robotic welding, thousands of image frames per second along with a large volume of accompanying text-label data can be acquired, which readily leads to significant errors in text labels and varying degrees of distortion in image data. Such inaccuracies present in multi-modal data like current and images fundamentally constitute a typical inaccurate label learning problem. For the text-label data, this study designs a physics-informed adversarial reconstruction method (PhysicAR-GAN). This method leverages the iterative training mechanism of Generative Adversarial Networks to accurately reconstruct textual data containing substantial errors under the constraints of physical laws. For image data compromised by noise and detail loss, an image super-resolution reconstruction strategy is applied to enhance the large-scale image dataset, restoring clear details and textures, thereby systematically achieving accurate reconstruction of multi-modal inaccurate datasets. Experiments are conducted using 13,000 accurately reconstructed label-image pairs for model training. The predictive performance of this model is compared against a benchmark model trained using only 1,300 original precise labels. Combined with multi-angle ablation experiments, the findings robustly validate the critical role of the proposed data reconstruction strategy in achieving precise measurements. Furthermore, to further enhance predictive performance and multi-modal data processing capability, a Graph Neural Network is introduced atop the Physics-Informed Neural Network. In the double-electrode gas metal arc welding (DE-GMAW) process, the bypass current must be maintained at a constant operating state (stabilized around 120 A). However, due to the dynamically changing distance between the bypass and main arcs, the circuit resistance fluctuates with variations in the tungsten electrode separation. To maintain a constant bypass current, the voltage must be adjusted in real-time based on the changing electrode distance to achieve constant current control. Guided by the Physics-Informed Neural Network-driven method, the predictions already align well with physical laws. Building on this foundation, this pap
10:15	**Break (30 minutes**)
10:45	**V-2029-2026 Practical Innovations, Applications, and Strategies for Inspections and NDT** **Author and Presenter**: nairn.barnes@gmail.com The various key inspection and Non-Destructive Testing (NDT) techniques are undergoing continuous advancements and research to improve their effectiveness and efficiency. While these advancements are vital to the inspection and NDT industry, they can take time to gain widespread relevancy in industry due to high capital cost and the need for vetting and training prior to implementation. Inspection and NDT companies such as Apave provide services to a wide variety of industries and customers. To offer the best

	possible service, having the most advanced technologies is required in many fields but is not always possible. The goal of this presentation is to communicate the current cutting-edge technologies and strategies for inspection and NDT that have direct applications in industrial applications. Some of the strategies being discussed utilize long-existing technologies that are being applied in a novel manner.The technologies to be discussed include Virtual Monoenergetic Imaging (VMI) in Material Loss Estimator (MLE) and in-motion Radiographic Testing (RT) for the wind industry, close-proximity RT and Phased-Array Ultrasonic Testing (PAUT) for information shots during thick-wall welds, various PAUT technological advancements with industrial relevance, Corrosion, Erosion Monitoring System (CEMS) for real-time wall thickness measurement in plants, robotic NDT solutions for the nuclear industry, AI applications for predicting Corrosion Under Insulation (CUI), and robotics laser ablation solutions.
11:05	**V-2030-2026 Advances in non-destructive testing for the detection of fusion defects during the welding process** **Author and Presenter**: guillaume.pors@cetim.fr The assembly of metal parts using welding processes requires post-production inspections to ensure the integrity of the weld seams. The implementation of an 'in-process' inspection capable of adjusting or halting the process in the event of a deviation allows for reduced downtime of components, improved assembly quality, and greater reliability of welding processes. The thermal phenomena encountered during welding make it relevant to monitor the radiant flux during the process. Passive infrared thermography is a non-destructive testing method that involves using a thermal camera to capture the radiant flux naturally emitted by the part under examination. The resulting image, known as a thermogram, can then reveal an abnormal variation in the radiative flux and highlight an indication of discontinuity. This variation may depend on two physical phenomena: an optical phenomenon and a thermal phenomenon. The application of this technology to welds during the process is not common. Initial studies, presented at COFREND 2023, have already demonstrated the potential of the non-destructive testing method using passive infrared thermography, particularly its adaptability to different welding processes and joint configurations, as well as its sensitivity in detecting created discontinuities.This presentation outlines the progress made in this area: further research into the MAG welding process using new joint configurations, and the study WAAM technology (MAG process) conducted over the last few years. The results of these studies and the progress made are presented, covering the sensitivity of detection of discontinuities, the analysis of this data, and the obstacles encountered or improvements made. In addition, application examples will be presented on the detection of lack of penetration in a fillet joint using MAG and TIG welding, employing phased array ultrasonic and eddy current testing methods. The configurations tested, as well as the results obtained using all these methods (infrared thermography, phased array ultrasonics and eddy currents), will be illustrated.
11:25	**V-2031-2026 Generative Virtual Metrology: A Physics-Informed AI Framework for Non Destructive Microstructural Reconstruction of Three-Sheet RSW Joints** **Author and Presenter:**ahmad.aminzadeh@uwaterloo.ca Quality assurance in resistance spot welding (RSW) of advanced high-strength steels (AHSS) traditionally relies on destructive metallography, a process that limits sampling frequencies and delays feedback. To address this bottleneck, this study proposes a generative artificial intelligence framework for non-destructive, real-time virtual metallography. By leveraging real-time sensing and deep learning, we introduce a conditional denoising diffusion probabilistic model (DDPM) that translates multivariate dynamic process telemetry directly into synthetic, high-fidelity microstructural cross-sections. The architecture utilizes a physics-aware bidirectional long short-term memory (LSTM) encoder with attention pooling to map the complex thermodynamic history of the weld. Evaluated on experimental RSW data from a three-sheet AHSS stack-up, the framework accurately reconstructs macroscopic weld geometry and fusion boundaries across multiple interfaces, achieving a high structural similarity index (SSIM) of 0.957 and a perceptual realism (LPIPS) score of 0.320. While the stochastic nature of microstructural phase transformations inherently limits exact pixel-level matching of internal grain noise (resulting in F1 scores of 0.138–0.228), the model's attention mechanism successfully isolates critical thermodynamic events, such as the dynamic resistance peak. Ultimately, this approach provides a robust foundation for "virtual metallography" in Industry 4.0 environments, ensuring structural integrity and enabling automated, inline quality control for next-generation intelligent manufacturing systems.

11:45	**V-2031-2026 - From Weld Manufacture to Structure-Informed Inspection: Automated TIG Mock-Up Production and Welding Simulation** **Author and Presenter**: georg.klenk@mpa.uni-stuttgart.de Advanced ultrasonic inspection of austenitic multi-pass welds remains limited by a fundamental modelling assumption used in many state-of-the-art imaging approaches: sound propagation is commonly treated as isotropic and spatially uniform. In austenitic welds, however, this assumption is not valid. The local crystallographic orientation of the grains, together with the propagation direction, affects wave speed and beam path, which can lead to localization errors, reduced focusing quality and lower signal-to-noise ratios during inspection. The iWeld project addresses this technological gap through a workflow in which welding simulation is used to generate a microstructure-informed digital twin of the weld as the basis for structure-informed ultrasonic inspection. A representative thick-section austenitic pipe weld was therefore manufactured as a dedicated mock-up under automated TIG/GTAW conditions at MPA Stuttgart. The weld configuration was derived from an industrial safety-injection weld, while the manufacturing route was adapted to the selected austenitic base material and filler metal. Robotic torch handling, controlled pipe rotation and mechanized wire feeding were combined with a pass-wise welding procedure in order to establish reproducible conditions and a well-defined manufacturing history under realistic inspection-relevant boundary conditions. Particular emphasis was placed on the generation of a traceable experimental basis for the simulation and validation workflow. The welding process was instrumented using thermal imaging, thermocouple measurements, electrical process monitoring, wire-feed measurement and complementary optical recordings. In parallel, a structured pass identification and documentation concept was implemented so that individual weld passes could be correlated with process parameters, thermal histories, image data and subsequent section-based observations. This creates the data basis required to define, parameterize and interpret the welding simulation in a physically meaningful way. Predictive welding simulation represents an essential element of this workflow because practical field application cannot rely on destructive crystallographic characterization of the weld. A Transweld-based simulation route incorporating Cellular Automaton–Finite Element (CAFE) modelling is therefore used to predict weld bead evolution and dendritic orientation maps that can be transferred to ultrasonic modelling tools. In this way, simulation provides the microstructure-informed description required for structure-informed NDT in cases where full experimental mapping of the weld is not feasible. Metallographic investigations and EBSD on selected sections serve to assess the realism and validity of the simulated weld structure. Selected mock-up sections were additionally prepared with artificial reflectors and notch-type defects to support the subsequent validation of advanced phased-array and FMC/TFM inspection concepts. The resulting workflow shows how controlled mock-up production, comprehensive process documentation, predictive welding simulation and targeted experimental validation can be combined to provide the foundation for more reliable ultrasonic inspection of austenitic welded components in safety-relevant applications, particularly in the energy sector.
12:05	**V-2031-2026 EN: 15085 SERIES - ELEVEN CORNERSTONES FOR IMPLEMENTION OF EN 15085 IN PRODUCTION WELDING OF RAILWAY VEHICLES AND ITS COMPONENTS** **Author and Presenter**: javed.afaque@eqcindia.co.in From the beginning of transportation by rail, quality assurance in welding in the field of railways in Germany has been performed by Deutsche Reichsbahn (DR), Deutsche Bundesbahn (DB) up to Deutsche Bahn AG (DB AG) of today (Since 1994). The importance of welding stems from the structure of the product and the stringent demands resulting from the high transportation loads and speeds. EN 15085 series of standards originated in 1997 and was elaborated in CEN TC 256/WG 31 with the considerable contribution of DIN, Germany. The five parts of EN 15085 were published in January 2008 and introduced by the Germany Railway Authority with a transitional period until the end of 2010. Later sixth part of EN 15085 (Maintenance welding requirements) was released in 2022 replacing erstwhile DIN version of the document. Certification of the welding shops according to EN 15085-2 was binding from April 1, 2008, with the series of standards EN 15085 superseding DIN 6700 series. Welding on rail vehicles requires particular specialist expertise. Companies that carry out welding work on rail vehicles and vehicle components, must have their suitability verified according to DIN EN 15085-2

	(earlier DIN 6700-2). The certificate is considered verified only if the certificate has been issued by a notified body. The directive ensures the uniform procedure and is binding for notified bodies and manufacturers *This article lays down eleven (11) key cornerstones for ensuring effective development and implementation of welding systems in accordance with EN 15085 series and subsequent certification of the manufacturer.*
12:30	**Lunch**
14:00	**V-2031-2026 In-Process Ultrasonic Inspection of Submerged Arc Narrow-Gap Welding** **Author and Presenter**: ewan.nicolson@strath.ac.uk Non-Destructive Testing (NDT) is a crucial step in the manufacturing process of high-value welded components. However, this is typically performed late in the welding process, creating a disconnect between production and inspection that can lead to significant rework and scheduling delays. Conventional inspection methods require components to cool before evaluation, meaning that defects identified at this stage necessitate costly repair involving material removal, reheating, and rewelding. Work conducted by the University of Strathclyde has demonstrated a world's first in-process ultrasonic weld inspection technique, that integrates NDT directly into the welding process itself. This approach enables early detection of process and structural defects, improving production efficiency and schedule reliability. The work presented here outlines a method for ultrasonic in-process inspection specific to submerged arc welded (SAW) narrow-groove weld components, targeting the detection of slag inclusions flaws. This is a common consequence of poor inter-pass cleaning, or trapped due to lack-of-sidewall fusion. An in-process inspection method utilising two robotically deployed ultrasonic roller probes has been designed and deployed during welding, overcoming challenges associated with high-temperatures, thermal gradients, inability to use liquid coupling, and exposure to electrically noisy environments. The technique has been validated on heavy-gauge circumferential non-alloy steel welds representative of nuclear pressure vessel manufacture, demonstrating reliable in-process detection of slag inclusions.
14:20	**V-2031-2026 Deep learning for weld defect segmentation in X-ray images of copper tube soldering structures** **Author and Presenter**: dzchi@hit.edu.cn In the X-ray digital images of small-diameter copper tube soldering structures, the significant variations in defect size, morphology, and contrast make automatic defect recognition challenging. To address this problem, this study proposes MKANUNet, an improved TransUNet-based defect segmentation model, designed for segmenting lack of penetration defects in X-ray images of copper tube welds. First, the ResNet module in the encoder part of the baseline TransUNet model is replaced with a Res2Net module combined with the SimAM attention mechanism, enhancing the model's ability to extract multi-scale features and capture local defect details in complex backgrounds. Second, leveraging the strengths of the Kolmogorov–Arnold Networks (KANs), the KAN–Transformer module is proposed to improve the model's ability to process complex data by using learnable activation functions at the network's edges. Experimental results on a constructed dataset of 496 X-ray images show that, compared to the baseline TransUNet model, M-KANUNet achieves improvements of 1.84% in intersection over union (IoU), 1.24% in recall (R), and 2.29% in precision (P), demonstrating higher reliability. Additionally, the frames per second(FPS) of M-KANUNet increases by 10 f/s, and the number of model parameters is reduced by 79.87M.
14:40	**V-2031-2026 Multi-Method Non-Destructive Evaluation of Steel-Copper Functionally Graded Materials Fabricated via Twin-Wire Arc Additive Manufacturing** **Author and Presenter**: jaydin@metu.edu.tr Wire Arc Additive Manufacturing (WAAM) is increasingly utilized for fabricating Functionally Graded Materials (FGMs), such as steel-to-copper structures, which combine high mechanical strength with excellent thermal and electrical conductivity. However, managing the Fe-Cu interface remains a critical challenge due to the risk of brittle intermetallic compound (IMC) formation, porosity, and thermal mismatches. In this study, steel-copper FGM components were successfully fabricated using a custom-built, continuous twin-wire WAAM system designed to eliminate process latency and control interlayer cooling rates. To comprehensively evaluate the structural integrity and map the material transition, a multi-modal Non-Destructive Testing (NDT) framework was implemented. Multi-frequency Eddy Current

	testing was utilized to detect phase changes, monitor compositional variations, and identify surface discontinuities across the graded zone. Furthermore, ultrasonic longitudinal sound velocity measurements were conducted to evaluate the gradual change in acoustic properties, correlating the velocity variations with the microstructural transition from the steel to the copper rich zones. Finally, Radiographic Testing (RT) was employed to inspect internal volumetric defects, such as lack of fusion and localized porosity, particularly at the critical interfacial layers. The findings demonstrate that integrating Eddy Current, ultrasonic velocity mapping, and RT provides a robust and complementary methodology for assessing the quality, layer continuity, and phase distribution of advanced bi-metallic WAAM components.		
15:00	**V-2031-2026 Technical and Integrity Failure Analysis of Internal Defects in Cast ASTM A352 LCC Tee Strainers for LPG Service** **Author and Presenter**: Meshal.ashrah@aramco.com This technical paper presents a comprehensive failure analysis of twenty-nine (29) cast ASTM A352 LCC Tee-type pipeline strainers intended for propane and butane service in a high-pressure oil and gas facility. The investigation was prompted by the discovery of internal discontinuities during post-weld radiographic testing (RT) of the initial installation units. A multi-tiered diagnostic approach—incorporating 100% volumetric Non-Destructive Examination (NDE), macrographic etching, and optical microstructural characterization—revealed that the strainer neck sections were not integrally cast but were instead joined via unauthorized and undisclosed weld fabrications. These concealed joints exhibited critical defects, including planar cracks, laminations, and incomplete fusion, which posed a significant risk of brittle fracture during hydrostatic testing and operational service. The findings underscore the necessity of stringent vendor pre-qualification and the enforcement of mandatory NDE hold points for safety-critical pressure-retaining components.		
15:20	**V-C Sub-Commission Updates** **Working Group C-V-A** **Working Group C-V-C** **Working Group C-V-D** **Working Group C-V-E** **Working Group C-V-F**		
15:45	**Break (30 minutes)**		
16.15	**Commission Business**		
	1. Updates to Terms of Reference 2. Intermediate Meeting(s) 3. Resolutions and Actions 4. Closing Remarks by the Convenor		
	5. Address by the incoming Chair of V		
16:45	**10. Adjournment**		**Motion required**

2. Commission Leadership

V	**NDT and Quality Assurance of Welded Products**	CH	Charles MacLeod	*charles.macleod@strath.ac.uk*
		VCH		
V-A	Radiographic-based weld inspection techniques	CH	Uwe ZSCHERPEL	uwez@bam.de

V-C	Ultrasonic-based weld inspection technique	CH	Channa NAGESWARAN	channa.nageswaran@twi.co.uk
V-D	Structural health monitoring	CH	Bastien CHAPUIS	bastien.chapuis@cea.fr
V-E	Weld inspection based on electric, magnetic, and optical techniques	CH	Casper WASSINK	C.H.P.Wassink@gasunie.nl
V-F	NDT-Reliability including simulation of NDT techniques	CH	Pierre CALMON	pierre.calmon@cea.fr

3. Terms of Reference

IIW Annual Report 2024

Commission V oversees international standardization activities related to non-destructive testing (NDT) and evaluation of welded structures, with specialist groups focusing on radiographic, ultrasonic, electric/magnetic/optical, and reliability aspects. NDT plays a crucial role in ensuring the integrity of components, especially in detecting material defects and assessing mechanical conditions without causing damage. The commission emphasizes adapting to advancements in NDT techniques, with a current focus on preparing a new edition of the Ultrasonic Handbook for austenitic materials. The transition from film-based radiography to digital detectors, led by sub-commission CV-A, highlights the importance of standardization in technological shifts. The trend in NDT is moving towards 3D imaging inspection, supported by methods like total focusing method (TFM), with Commission V experts contributing to ISO standards in this area. Additionally, the commission addresses structural health monitoring (SHM) and is involved in revising standards like ISO 18211 for Guided Wave Testing.

Terms of Reference (V-1981-2023)

1. Scope and objectives

Commission V offers a platform for international experts for the dissemination, transfer, and exchange of state-of-the-art knowledge on Nondestructive Testing and structural health monitoring of welded products. The overall aim of these activities is to assure and improve the actual state of knowledge to meet industrial and societal requirements, to reduce the risk of catastrophic failure of components, and thus contribute to a higher level of safety in technical systems. These objectives are achieved by

a. the discussion of the use of new developments in physics, chemistry and engineering in NDT applications
b. the transfer of relevant new scientific knowledge into the development of new testing methods
c. the multidisciplinary cooperation with other IIW commissions to enhance the mutual understanding between design, fracture mechanics, and NDT
d. the cooperation with further national and international NDT-societies and the community to coordinate activities
e. the preparation of industrial standards, where rules on how to apply a method are still missing
f. publishing the results in scientific peer-reviewed articles (such as Welding in the World) or other publications.

This is achieved through a number of Commission, sub-commission, and Working Group meetings, conducted worldwide, where actual research results are presented and discussed.

2. Key Objectives and deliverables

Key objectives of Commission V are:

- Attract high-impact NDT and SHM experts to participate in Commission V meetings.
- Initiate new working groups to improve the level of current technological knowledge.
- Initiate joint sessions to improve the level of current technological knowledge between different disciplines.
- Draw up new international standards and Best Practice Documents.
- Support the publication of high-quality manuscripts in Welding in the World
- Support the participation of young professionals in Commission V activities.
- Attract new members from industry

4. List of Delegates assigned Voting Rights for Commission V Business

The persons listed below are currently listed as the voting DELEGATES to Commission V, with the responsibility and sole right to vote on behalf of their National Delegation on specific business items. These items include:

- Election of the Chair of C-V
- Recommendations to forward a paper to be considered for publication in Welding in the World
- Decisions regarding initiation, revision, or approval of ISO standards under the jurisdiction of C-V

Updates to this list, including changes in the voting Delegate or the addition of a Delegate for those where no Delegate is shown, are to be handled by the Representative for the Responsible Member Society, with direct communication with the IIW Secretariat. See https://iiwelding.org/iiw-members/ for the name and contact of the Representative to submit, to the Secretariat, any additions, deletions, or corrections to this list.

The current list is based upon previous C-V meetings where Delegates had been assigned to C-V. If your Country is not listed below, contact your Representative to have both your Country and the Delegate's name added.

DELEGATE NAME	COUNTRY	DELEGATE NAME	COUNTRY
David LAKE	AUSTRALIA		REPUBLIC OF KOREA
Norbert ENZINGER	AUSTRIA		ROMANIA
Staf HUYSMANS	BELGIUM		SERBIA
Narin BARNES	CANADA	Lubos HEGEDUS	SLOVAKIA
Dezhi MA	CHINA	Milos JOVANOVIC	SLOVENIA
	CROATIA	Fernando MAÑAS ARTECHE	SPAIN
	CZECH REPUBLIC		SWEDEN
	DENMARK	Daniela GRUTTER	SWITZERLAND
Kai RUOTSALAINEN	FINLAND		THAILAND
	FRANCE		THE NETHERLANDS
	GERMANY	Ugur GUROL	TURKEY
	HUNGARY	Channa NAGESWARAN	UK
Rituraj BOSE	INDIA	Peng (Edward) WANG	USA
Stefano BOTTA	ITALY		
	JAPAN		
	PORTUGAL		