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AI and Welding Inspection

Videoscope Advancements

The Role of Ethics in Welding Inspection

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The Critical Need to Train Welders in Welding Inspection

BY J. TROY McMURTREY

In today's highly competitive manufacturing world, the relationship between production and quality departments is pivotal to a company's overall success. Nowhere is this more pronounced than in welding operations, where the quality and integrity of every weld joint can directly impact product safety, customer satisfaction, and a company's reputation. Yet, across industries, friction often arises between production personnel and inspection personnel. This friction can erode trust, delay schedules, and increase costs. One of the most effective ways to reduce or eliminate these barriers and foster collaboration is to ensure production welding personnel receive training in welding inspection.

It is not uncommon for production and quality teams to operate in silos. Welders focus on welding products within the allotted time, while inspectors are tasked with identifying and marking up discontinuities and defects to ensure compliance with product requirements. When welders lack an understanding of inspection criteria, it is easy for divisions to arise. Production personnel may view inspectors as the adversary, a necessary evil of sorts, whose primary role is to nitpick and find fault, rather than as teammates in delivering a high-quality product.

This adversarial mindset is not just detrimental to workplace culture but can have significant operational consequences. Miscommunication leads to rework, scrap, and lost time. Training welders in inspection can empower them with knowledge and a sense of shared responsibility while creating accountability.

When production welders are trained in codes and standards along with the principles and practices of welding inspection, many positive results occur. First, welders gain awareness of the standards and acceptance criteria against which their work will be judged. This awareness allows them to proactively address potential nonconformances before the inspector is requested. Welders equipped with inspection knowledge can self-assess and correct issues in real time, reducing the number of defects and the need for costly rework. If the first-pass yield is measured within your organization, this is the biggest impact you can make to improve that metric.

Second, welders who understand inspection methods, such as visual inspection, nondestructive testing, and documentation requirements, are more likely to appreciate the role of quality assurance. This understanding creates respect for inspectors' expertise and the value they bring to the process. Instead of seeing inspection as an obstacle, welders begin to view it as an essential part of their job and a safeguard for their own craft.

— **continued on page 29**

MISTRAS Awarded NDE Services Contract by Bechtel for Woodside's $17.5 Billion Louisiana LNG Project

Bechtel, an engineering, procurement, construction, and project management company based in Reston, Va., has selected MISTRAS Group, a provider of technology-enabled industrial asset integrity and testing solutions based in Princeton Junction, N.J., to deliver nondestructive examination (NDE) services for the Woodside Louisiana Liquefied Natural Gas (LNG) terminal, a multi-billion-dollar LNG production and export facility under construction in Sulphur, La.

The project, which is permitted up to 27.6 million tonnes per annum of LNG production, is one of the most significant energy infrastructure developments in the world and represents a major investment in U.S. Gulf Coast energy capacity.

MISTRAS will provide a comprehensive suite of NDE services, including radiography, magnetic particle testing, liquid penetrant testing, positive material identification, ultrasonic thickness testing, and leak testing. Certified technicians will perform all work with documented adherence to industry and regulatory standards.

"This award underscores our long-standing expertise in supporting large-scale energy projects," said Gennaro D'Alterio, executive vice president and chief commercial officer, MISTRAS Group. "We are proud to support Bechtel in advancing a project that is vital to the region and global energy markets."

AWS Hosts CWI Nine-Year Seminar

AWS held a Certified Welding Inspector (CWI) nine-year recertification seminar December 7–12, 2025, at its World Headquarters in Miami, Fla. Instructor Jim Greer taught the class. Greer is a Certified Welding Educator (CWE), a Senior Certified Welding Inspector (SCWI), and the president of Techno-Weld Consultants.

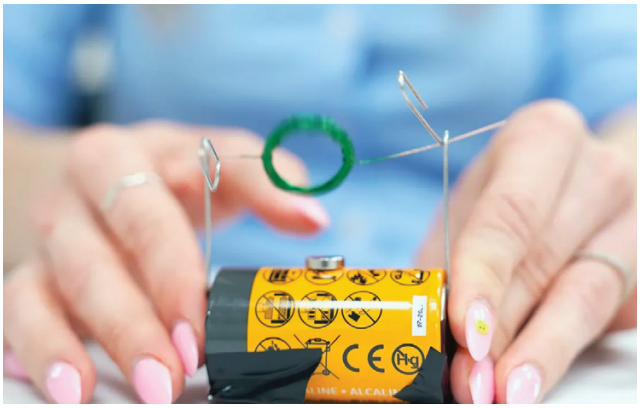
The seminar attendees were Pete Davila, Alvis Hunter, Dave Jenkins, Christopher Johnson, Jamison Marsh, Brian Myers, Gene Powell, Emmy Waldo, and Chester Wojtaszek.

ASNT Foundation Launches Free Classroom Experiments to Inspire the Next Generation of NDT Professionals

The ASNT Foundation, Columbus, Ohio, has unveiled a new series of free, hands-on classroom experiments designed to spark student curiosity in the science of

The participants in the CWI nine-year seminar, along with instructor Jim Greer (fifth from left), posed outside of AWS World Headquarters.

nondestructive testing (NDT). By making the principles of NDT accessible through simple, engaging activities, the initiative supports the organization's broader mission to expand workforce development, build STEM career pathways, and inspire the next generation of NDT professionals.



This experiment teaches students the relationship between electricity and magnetism by building a simple motor. NDT professionals use a similar process to detect flaws in materials.

The experiments, which cover concepts such as sound waves, magnetism, motion, and liquid behavior, use everyday materials like tuning forks, slinkies, straws, and foam balls. Each activity is also available in video format, making it easier for educators and students to see the concepts in action and connect them to NDT applications.

By linking easy-to-follow science experiments to professional applications, the ASNT Foundation is equipping teachers with classroom-ready tools that spark curiosity and STEM learning, introduce students to meaningful technical careers, and build awareness of NDT's critical role in infrastructure, aerospace, energy, and beyond.

"This initiative is about more than classroom fun; it's about planting seeds for the future," said Heather Cowles, executive director of the ASNT Foundation. "By showing students how everyday science connects to careers in nondestructive testing, we're opening doors to rewarding career opportunities and ensuring industries have the skilled professionals they need to continue to thrive."

The classroom experiments build on ASNT's broader workforce initiatives, which encompass advocacy, career pathways, apprenticeships, grassroots outreach, and programs that expand opportunities for learners to discover NDT as a career of impact and purpose. Together, these efforts strengthen the pipeline of future NDT professionals who will ensure safety, reliability, and innovation across industries.

PROtect Buys Trident Pipeline Integrity

PROtect LLC, a provider of safety, reliability, and compliance services based in Wichita, Kans., has acquired Trident Pipeline Integrity LLC. Based in Oklahoma, Trident Pipeline Integrity specializes in advanced ultrasonic testing and corrosion mapping solutions. The acquisition expands PROtect's Pipeline Integrity (PLI) program by incorporating Trident's expertise in advanced nondestructive examination (NDE).

For more than a decade, PROtect's PLI team has supported ultrasonic inspection, corrosion mapping, and pipeline safety initiatives. Adding Trident strengthens that foundation with additional leadership, field experience, and technical capabilities.

"The foundations already in place at PROtect are ideal for Trident's continued growth," said John Clark, co-owner of Trident. "Our team is eager to expand our reach to new clients and contribute our experience to make Trident and PROtect together the premier NDE partner in the industry. We've always prided ourselves on delivering accurate assessments the right way, and this partnership ensures we can continue doing that at an even greater scale."

With Trident's Oklahoma operations complementing PROtect's national presence, the acquisition enhances service delivery across refining, petrochemical, renewable fuels, and energy infrastructure sectors.

Acuren Rebrands as TIC Solutions

Acuren Corp., Hollywood, Fla., has rebranded as TIC Solutions Inc. following its merger with NV5. The combined organization brings decades of expertise in testing, inspection, certification, engineering, consulting, and geospatial services. While the new corporate identity unifies the combined enterprise, Acuren, NV5, and other legacy brands will continue to operate as customer-facing brands, ensuring continuity for clients and employees.

The rebrand reflects the company's growth into a provider of technology-enabled testing, inspection, certification, and compliance services, along with engineering solutions, that support asset and infrastructure integrity. With more than 11,000 employees across over 250 locations, TIC Solutions builds on established strengths in nondestructive examination, industrial rope access, engineering, and geospatial analytics. The new identity emphasizes a continued focus on safety, innovation, and dependable service across industrial, energy, utility, and infrastructure sectors as well as emerging markets such as data centers, aviation, healthcare, and higher education.

"The Acuren name is rooted in decades of industrial and inspection leadership, and the NV5 name brings a longstanding reputation in engineering and geospatial," said Tal Pizzey, chief executive officer of Acuren. "The rebrand reflects our expanded scale and capabilities while maintaining continuity for our customers and employees. We offer a powerful value proposition, delivering inspection and mitigation, consulting engineering, and geospatial services. Acuren and NV5 will remain trusted customer-facing brands, while the rebrand to TIC Solutions unifies the enterprise at the corporate level and positions us to expand our platform in the years ahead."

Motive Adds Norway's Weld Integrity Group to Boost Inspection Capabilities

Motive, based in Banff, Aberdeenshire, Scotland, has acquired Weld Integrity Group, an inspection and testing business headquartered in Norway. The move strengthens Motive's certification and inspection (C&I) capabilities and expands its presence in Norway. The acquisition is expected to add approximately £1 million (about $1.3 million) in annual earnings before interest, taxes, depreciation, and amortization (EBITDA) to Motive Offshore Group.

Under the acquisition, Motive will immediately integrate Weld Integrity's Norwegian operations. The unified expertise of both companies will support a smooth transition and expanded services for all clients. The acquisition significantly expands Motive's in-house C&I services, including additional nondestructive examination (NDE) and inspection capabilities, while opening opportunities in sectors beyond oil and gas, including civil construction and aerospace.

The deal aligns with the company's strategy to diversify its revenue streams and reduce its reliance on oil and gas, aiming for 75% of revenue to come from other sources. It also introduces new NDE capabilities, such as radiographic (x-ray) inspection, enabling Motive to provide a broader range of nonintrusive infrastructure assessments across regions, from the Middle East to the United States. Motive will also acquire Weld Integrity's majority stake in Weld Integrity Oslo and Integrity Heat, which specializes in the heat treatment of welds and materials.

The acquisition brings additional management experience and technical inspection expertise. Weld Integrity Founder and CEO Max Brown will become regional manager for Scandinavia. Motive will also incorporate Weld Integrity's large pool of multidisciplinary local inspectors, adding 20 new inspectors to its workforce and a range of competencies in Norway and globally.

Dave Acton, CEO of Motive Offshore Group, said, "Norway is an exciting, growing market in offshore energy, and Weld Integrity's highly competent local team of inspectors will help us make inroads into this vibrant market while expanding NDT and inspection services to our customers. Our C&I division delivers long-term, recurring revenue by supporting customers in maximizing the efficiency and profitability of their assets. We work collaboratively to reduce risk, enhance quality, and ensure full compliance with relevant standards and regulations."

United Aero Group Brings NDE Capabilities In-House with New Lab

United Aero Group is now operating a new Federal Aviation Administration-certified nondestructive examination (NDE) laboratory at its Enterprise, Ala., facility.

By bringing critical NDE capabilities in-house, the company has significantly reduced turnaround times and enhanced process control across a range of helicopter and fixed-wing platforms. The lab supports components from GE, Sikorsky, Honeywell, and Bell, among others, helping customers achieve faster inspections and single-source maintenance, repair, and operations efficiency.

The lab's current capabilities include liquid penetrant inspection, magnetic particle inspection, eddy current inspection, and ultrasonic testing.

U.S. Navy-Funded Advanced Manufacturing Classes Offered at Community College of Philadelphia

Through a U.S. Navy-funded partnership with BlueForge Alliance, new advanced manufacturing classes at the Community College of Philadelphia (CCP), Philadelphia, Pa., are officially underway, with students able to choose between nondestructive testing and Naval welding classes. The next nondestructive testing classes begin April 6.

The programs will provide skills essential for the Naval shipbuilding industry. They will increase the Philadelphia-based talent pipeline that produces professional welders, nondestructive examination professionals, CNC machinists, and other critical workers needed in America's maritime industrial base.

"As classes begin under this exciting new partnership, we look forward to seeing our students start rewarding careers in advanced manufacturing," said Dr. Alycia Marshall, interim president of CCP. "This expansion will create new opportunities for Philadelphia residents, offering meaningful jobs that support families and build strong communities. Philadelphia has a proud history as a city of skilled workers, and with the support of the U.S. Navy and our partners at BlueForge Alliance, CCP is proud to help grow and strengthen our workforce."

The two new programs are part of the Advanced Manufacturing Education Improvement Project, which was established through a partnership between the U.S. Navy, BlueForge Alliance, and CCP. Classes for both programs are taught at the College's Career and Advanced Technology Center in West Philadelphia. The facility underwent special construction to prepare for the new programs.

CCP offers Nondestructive Testing and Naval Welding as noncredit, advanced technical programs, providing students with education and training for careers in manufacturing and maritime industries.

The new programs offer hundreds of hours of hands-on experience, helping students develop and refine their skills in the classroom while preparing them for careers. Learners can earn professional certifications in as little as four and a half months.

The school reports that this program is the first collegiate nondestructive testing program in the City of Philadelphia, and the Naval Welding program will be the first in the country to integrate SILICON's Rapid Arc Welding technology into hands-on student training. The college invites anyone interested to apply for the upcoming spring semester, which begins in March. Scholarships will be available. Learn more at *ccp.edu/navy*.

BY DERRICK HAMILTON

Field Judgment in the Age of AI

What has not changed yet, what has, and what will

The world of industrial inspection is entering a new phase, one defined not by tools or trade alone but by how we think, assess, and adapt. Artificial intelligence (AI) is no longer a concept on the horizon; it is a reality. It is here, operating alongside inspectors in real time.

This article is an account drawn from active field experience. And what's clear is this: The most significant risk with AI isn't technical failure. It's human overconfidence, the temptation to outsource judgment, and the false belief that rapid answers equal accurate ones.

What Has Not Changed Yet

Despite the influx of new tools, the foundational responsibilities of inspection remain unchanged.

Inspectors are still expected to do the following:

- Recognize when a seemingly compliant condition hides future failure
- Interpret the dynamics of a crew or process beyond what's on paper
- Take full responsibility for final calls, recommendations, and outcomes

AI can assist, but it does not carry liability. It does not interpret risk nuance, and it does not sign reports. Accountability — legal, ethical, and practical — remains firmly in human hands.

What Has Changed

While the weight of judgment hasn't shifted, the process leading up to it has undergone changes.

AI now supports inspectors in ways previously unavailable:

- Retrieving code citations in seconds
- Assisting with structured report language
- Cross-referencing logic against standards such as the National Board Inspection Code (NBIC), jurisdictional standards, and standards from organizations such as the ASME, API, and AWS
- Organizing inspection findings with higher speed and consistency

What once required books, calls, or manual searches can now be addressed on-site within moments, accelerating accuracy and documentation quality under pressure.

What Will Change

The next phase is about how people use AI. A growing concern is that emerging users are relying on AI to do their thinking, not support it. This presents in subtle ways:

- Accepting the first AI-generated response without validation
- Trusting summaries over reading the source context
- Letting the system structure conclusions instead of using it to refine one's own

The risk extends beyond potentially inaccurate AI outputs. The real danger is that humans disengage, and if left unchecked, this disengagement will erode the very foundation of good inspection work: situational awareness, critical reasoning, and long-term accountability.

The Way Forward

The future of field judgment relies on augmentation over automation.

Inspectors who will excel are those who do the following:

- Maintain full ownership of their decisions
- Leverage AI for clarity, not certainty
- Stay grounded in the codes, practices, and reasoning that define their discipline

AI can pull documentation, suggest structure, and assist with logic. But only a trained, accountable human can apply that information with the judgment required by real-world conditions. Mastery of this new dynamic is the path forward. IT

DERRICK HAMILTON (*derrickhamil@gmail.com*) is boiler inspector at Arise Boiler Inspection & Insurance Company Risk Retention Group, Brecksville, Ohio. He is an AWS CWI, a National Board of Boiler and Pressure Vessel Inspector (NBBI), an Association for Materials Protection and Performance (AMPP) Coating Inspector, and an American Petroleum Institute (API) Welding Inspection and Metallurgy Professional, Pipeline Inspector, and Piping Inspector.

Bendable Digital Radiography Detector Enhances Inspection Efficiency

The INDUSTREX HPX-ARC 1043 PH bendable digital radiography (DR) detector conforms to various object shapes and quickly delivers high-resolution images. Its 98-µm pixel pitch enables detailed image capture for better defect recognition and code compliance. Bendable DR technology allows for simplified setup, faster image acquisition, reduced radiation dose, and immediate image processing compared to traditional film or computed radiography (CR). The detector can transition from a flat position to a curvature as small as a 4-in. diameter, enabling imaging in challenging geometries without the need for film, chemical processing, or imaging plates. With dimensions of 4 × 17 in. and a slim profile, the detector can capture images over and around components, even in confined spaces. It is field tested and housed in a flexible enclosure rated to Ingress Protection Code IP67, offering resistance to water, liquids, and dust. Immediate image availability allows technicians to verify image quality indicators and radiographic compliance at the weld. This capability supports timely reshots and repair markings before proceeding to subsequent inspection points. The detector operates with INDUSTREX Digital Viewing Software, a unified platform for both CR and DR inspections. The software is designed for ease of use, helping reduce operator training requirements and equipment onboarding time.

Carestream NDT
carestream.com/NDT

Report Highlights Automated Ultrasonic Testing Market Global Trends and Growth Drivers

The *Automated Ultrasonic Testing Market* report analyzes global demand for nondestructive examination solutions in safety-critical industries and outlines key factors driving adoption. Market projections indicate growth from $3.5 billion in 2025 to $5.8 billion by 2032, reflecting a compound annual growth rate of 7.5% during the forecast period (2025–2032). The report identifies phased array ultrasonic testing (PAUT) as the leading technology segment due to its precision and versatility. Oil and gas and aerospace remain dominant end-user sectors, while power generation and manufacturing show increasing adoption. Regional analysis highlights North America as the largest market and Asia-Pacific as the fastest-growing region, supported by industrialization and infrastructure development. The report includes detailed sections on market segmentation by technique and industry, regional insights, growth drivers, restraints, and emerging opportunities such as AI-driven defect recognition and portable AUT solutions. Company profiles and competitive landscape analysis provide additional context for stakeholders seeking strategic guidance.

Persistence Market Research
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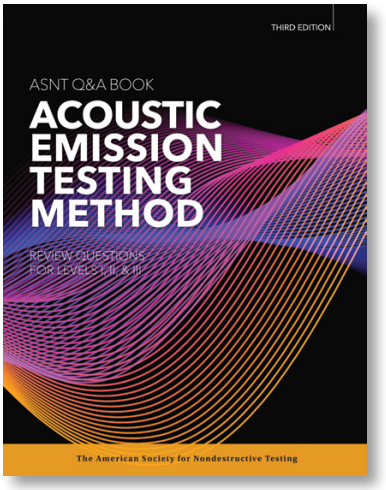


Book Assesses Certification Candidates' Knowledge of Acoustic Emissions Testing

The *ASNT Q&A Book: Acoustic Emission Testing*, third ed., prepares individuals for ASNT acoustic emission (AE) examinations. The third edition features 150 multiple-choice questions that cover the Level I, II, and III AE training outlines from the 2024 edition of CP-105, *ASNT Standard Topical Outlines for Qualification of Nondestructive Testing Personnel*. This edition includes new and revised questions, updated references, and a format that mirrors the current ASNT exam style — four unique answer choices per question — to help candidates test their knowledge and strengthen exam readiness.

ASNT
asnt.org

Modular Overhead LED UV-A Inspection Lamp Provides Flexible Illumination

The Profusion LED UV-A inspection lamp delivers controlled ultraviolet light for fluorescent penetrant inspection and magnetic particle inspection in stationary nondestructive examination environments. Each lamp module produces a 10-in. diameter of UV-A intensity above 1000 µW/cm² at 15 in. An integral filter limits visible light to less than 20 lux at 15 in. and less than 5 lux at 36 in. Each module contains a single LED emitter with a built-in static-electric discharge circuit. The lamp's electrical components are sealed and passively cooled within an engineered finned housing manufactured from military-grade aluminum. Rated IP68, the enclosure allows the lamp to perform in all environments regardless of ambient conditions. The lamp's modular design supports customizable configurations, ranging from a single lamp to arrays of seven or more, enabling adaptable booth lighting solutions for different inspection requirements. Each module operates on a low-voltage input of 24 V and connects to a power supply rated for 100–240 V AC. Individual modules measure 11.88 in. high by 7.75 in. wide and weigh 3.08 lb, excluding mounting hardware, combining durability with ease of integration.

REL Inc.
relinc.com

CWI CORNER
BY RACHEL BHEECHAM

Meet Dave Lynnes

Learn about a veteran welder's career journey from opening his welding schools to becoming a CWI

Dave Lynnes was looking for a potential career path; instead, he discovered a lifelong passion for welding that has led to a rich life centered around the craft. That passion had grown into a family legacy, three welding schools, and a nearly 40-year career that encompasses years of hard work and dedication.

Family Legacy

Lynnes' career in welding seemed almost inevitable. He was inspired by his father, a welder, to take welding classes in high school. Early class work focused on basic techniques. It wasn't until his senior year, when his class built a dock, that he fell in love with welding.

"The dock sparked my passion for welding . . . I was hooked," he said.

After graduating from high school, he worked for a manufacturing company, gaining experience in wire welding. Lynnes was hungry to learn more. He took night classes at a technical school, which allowed him to fully experience all the opportunities available in the welding industry. He soon committed to a nine-month welding program, during which he applied and was accepted to the Pipefitter's apprenticeship program.

Lynnes spent five years studying under the apprenticeship program, a lengthy feat he embraced head-on. Once finished with the program, he taught pipe welding to apprentices for seven years, while continuing to work in the field for the next 20 years.

"Teaching allowed me to share my knowledge and skills with the next generation of pipe welders," he said.

"The dock sparked my passion for welding . . . I was hooked."

Dave Lynnes (left) with his students.

The December 2025 graduating welding class.

“Teaching allowed me to share my knowledge and skills with the next generation of welders.”

Teaching Others

His early passion for sharing his knowledge made his next career move, opening a welding school, a natural decision.

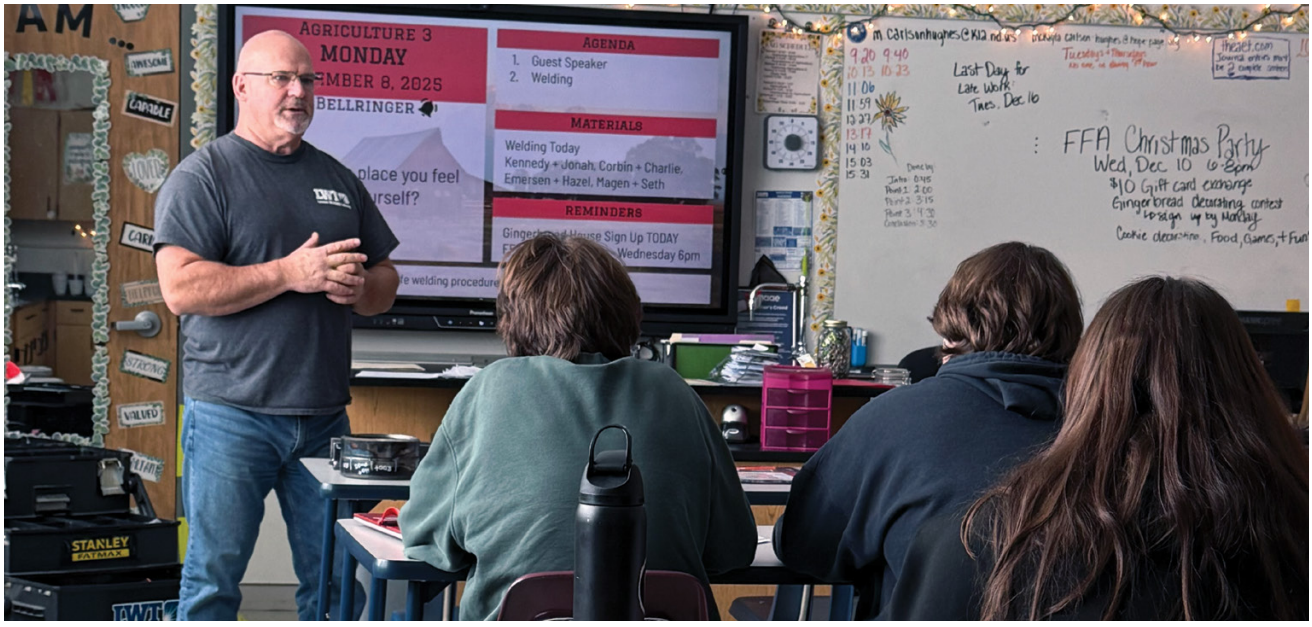
“After years in the field, I wanted to give back and share what I’d learned,” he said. Opening a school allowed him to do just that. He launched his first welding school in Fargo, N.Dak., in 2006. It is an AWS Accredited Test Facility site, with four Certified Welding Inspectors (CWIs) on staff. They offer procedure qualification record testing, welder qualifications, welding procedure specifications, tensile pulls, and bend tests.

The success of his welding school was immediate and four short years later, he expanded to a second location in Bismarck, N.Dak. His third school in New Hope, Minn., was opened two years ago.

“The transition from fieldwork to running a school was challenging at first. Running a business requires a different skill set, but it’s been incredibly rewarding to see students succeed,” Lynnes said. The schools allow him the opportunity to share his passion and experience with students, helping them develop skills that can transform their lives. His welding schools have been a great success, with students traveling from across the country to study under Lynnes.

Lynnes’ welding schools are designed to provide students with the knowledge and expertise needed to become highly skilled welders. His schools offer intimate class sizes, where students can learn on either a full-time or part-time schedule to become skilled welders from the start.


Lynnes (center) alongside twin sons Adam and Nathan.



Lynnes speaking with local high school students about the field.

An example of his work in teaching future welders can be found within his own family, as both his sons have followed in the family footsteps to become third-generation welders. His son, Adam, began teaching at their Fargo location over a decade ago and now serves as director of education, whereas his son, Nathan, works as a quality control supervisor for TrueNorth Steel in Fargo. Lynnes and his sons are all CWIs, a signifier that welding has truly become a family passion.

Lynnes became a CWI because he wanted to expand his knowledge in welding and add another feather to his cap. He took the AWS – CWI course, but had no idea it would help him to become a better welder. Lynnes calls it one of the best decisions he's made in his welding career.

"Teaching my sons has been a proud and fulfilling experience. Watching them develop their skills and carry on the family tradition is something I'll always cherish," Lynnes said. And his thirst for sharing his skills expands beyond his welding schools.

Giving Back to the Community

Lynnes is active in both his local and national welding communities. He's been an active AWS member since 1993 and has served in every officer position within his Section, including six years as District director.

"AWS has been instrumental in my career — providing networking opportunities, fostering professional growth, and cultivating lifelong friendships. Early on, those connections helped me find jobs, and today, they support our schools through events and meetings."

Outside of his professional life, Lynnes gives back to the community by hosting competitions and working with various youth organizations, including Scouting America (formerly known as the Boy Scouts of America) and local high schools, to help introduce welding to the next generation and spark interest in the trades. He also participates in local career fairs and community workshops to promote welding as a valuable skill.

Looking Ahead

When speaking of his future, retirement is not yet on his radar. Lynnes is excited to see how emerging technologies, such as AI-driven welding systems, will continue to shape the future of the trade.

"Modern equipment is more precise, efficient, and safer than ever before. Automation, robotics, and improved safety features have transformed the way we work," he said.

He also has plans to continue growing his schools and advancing welding education. "My focus is on developing programs that meet industry needs and inspire the next generation of welders," he added. Lynnes would encourage anyone to take a welding class or attend a workshop to get hands-on experience.

"Welding is a skill that opens doors to many opportunities, and even if you don't pursue it as a career, the knowledge can be useful in countless ways. Be curious, stay persistent, and don't be afraid to learn from mistakes — they're part of the process."

RACHEL BHEECHAM (*rbheecham@aws.org*) is the assistant editor of *Inspection Trends*.

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Welding Coordination and QA Endorsement

Enhancing weld quality standards through specialized skills: a summary of the AWS WCQA endorsement

The Welding Coordination and Quality Assurance (WCQA) endorsement validates your specialized knowledge in welding quality assurance and coordination, positioning you as a valuable asset to organizations seeking to optimize their welding quality processes.

AWS QC1, *Specification for AWS Certification of Welding Inspectors*, allows endorsements to be added to the Certified Welding Inspector (CWI) and Senior Certified Welding Inspector (SCWI) certifications. Endorsements indicate additional knowledge, skill, or ability documented in writing and added to an individual's certification credential(s).

This endorsement satisfies one of the four required endorsements leading to SCWI certification, which are Welder Performance Qualifier, Welding Procedure Qualifier, WCQA, and Nondestructive Examination Coordination.

The WCQA endorsement meets a portion of the requirements for SWI Alternative Qualification in AWS B5.1:2013 AMD1, *Specification for the Qualification of Welding Inspectors*, and Alternative Certification for the SCWI in QC1.

The inspector who seeks the WCQA endorsement should be assessed for the following capabilities:

- An understanding of the definition of welding coordination, knowledge of welding coordinator tasks in a company, and the ability to assist companies in meeting the requirements of International Organization for Standardization (ISO) 14731, *Welding coordination — Tasks and responsibilities*.
- An understanding of the basic elements necessary to establish a welding quality assurance program, the principles of being an auditor and auditee, and the major features of the most common welding quality assurance programs (i.e., ASME, AISC, ISO, and AWS programs).
- The ability to advise a manufacturer on how to conduct the basic elements of manufacturing a welded product, including estimation, design, qualification, throughput, and process improvement.

Domain	Subdomain	Percent of Questions on Examination
Domain 01 Welding Quality Assurance and Welding Coordination	0101 Technical Elements	**40%**
	0102 Administrative Elements	
	0103 Welding Coordination	
	0104 Inspection and Testing	
	0105 Welding Program Assessment	
Domain 02 Welding Quality Programs	0201 AWS B5.17 and AWS Certified Fabricator Program	**30%**
	0202 AWS QC47 Accreditation of Welder Test Facilities (ATFs)	
	0203 ISO 3834 Quality Requirements for Fusion Welding of Metallic Materials	
	0204 ASME Boiler and Pressure Vessel General Requirements	
	0205 Quality Rules of National Board Inspection Codes	
	0206 Quality Rules for API Q1	
	0207 Quality Rules for Nadcap	
Domain 03 Auditing	0301 Principles of Conformity Assessments	**30%**
	0302 Audit Processes	
	0303 Audit Documentation	
	0304 Audit Closure	
	Total	**100%**

Table 1 — Test specifications are shown.

Initial Certification or 9-Year Recertification Eligibility

For existing CWIs, successful completion of this endorsement satisfies the examination requirements for a 9-year recertification, provided that the endorsement is taken during the immediate 9-year period.

IMPORTANT: For new candidates to the CWI program, this examination is not an option for initial certification. This is not a CWI Part C Codebook exam and thus does not meet the requirements of Clause 6.2.1 of the AWS B5.1:2013 AMD1, nor does it follow the guidelines of Clause 7.1.

Training and Examination Requirements

This endorsement has no mandatory training requirements. Candidates are encouraged to attend an AWS seminar or conduct self-study to become familiar with the exam information.

Candidates who hold CWI or SCWI credentials and who wish to take this examination to add as an endorsement to their AWS credentials must be current in their AWS certification status.

Successful candidates must correctly answer 70% of the questions to receive this endorsement.

Test Specifications

Test specifications are a breakdown of exam content areas along with the proportion of the exam devoted to each content area — Table 1.

Informative References for Self Education

The following is a list of informative reference books (in their latest editions) to assist those wishing to learn and understand the major welding quality assurance programs used in industry today.

- AISC, *Standard for Certification Programs*
- ASME, BPV-GUI-03 Issue 1, Rev. 2, *Boiler and Pressure Vessel Certificates of Authorization and the Certification Mark*
- ASME, *Reference Requirements for ASME NQA-1 Certification*
- API Spec Q1, *Quality Management System Requirements for Organizations Providing Products for the Petroleum and Natural Gas Industry*
- American Society for Quality (ASQ) Certified Quality Auditor (CQA) Body of Knowledge
- ASQ, *Quality Resources: Auditing*
- ASQ, *Quality Auditor Certification CQA Pamphlet*
- AWS, *Introduction to Quality Assurance in Welding*
- AWS B2.1/B2.1M, *Specification for Welding Procedure and Performance Qualification*
- AWS B5.17, *Specification for the Qualification of Welding Fabricators*
- AWS QC17, *Specification for AWS Accreditation of Certified Welding Fabricators*
- AWS QC47, *Specification for AWS Certification of Welders and Accreditation of Test Facilities*
- AWS, *Welding Handbook,* Volume 1
- AWS, *Welding Quality Assurance and Inspection Manual*
- Institute for Nuclear Power Operations (INPO), *Engineering Program Guide: Welding Program*
- ISO 14731, *Welding coordination — Tasks and responsibilities*
- ISO 15607, *Specification and qualification of welding procedures for metallic materials — General rules*
- ISO 19011, *Guidelines for auditing management systems*
- ISO 3834-1, *Quality requirements for fusion welding of metallic materials, Part 1: Criteria for the selection of the appropriate level of quality requirements*
- ISO 3834-2, *Quality requirements for fusion welding of metallic materials, Part 2: Comprehensive quality requirements*
- ISO 3834-3, *Quality requirements for fusion welding of metallic materials, Part 3: Standard quality requirements*
- ISO 9001, *Quality management systems — Requirements*
- National Aerospace and Defense Contractors Accreditation Program (NADCAP), *Supplier Support Committee Handbook*
- National Board of Boiler and Pressure Vessel Inspectors (NBBI), NB-57, *The National Board and ASME Guide*
- NBBI, *National Board Inspection Code*

Exam Delivery and CBT Exam Timing Information

The examination is a computer-based test (CBT) delivered at a Prometric testing center.

The overall seat time allotted is 166 minutes (2 hours and 46 minutes) from check-in to check-out at the test center. The time that can be used to answer questions is 150 minutes (2½ hours).

Sufficient information to answer the question will be provided at the stem of the question; consulting a reference standard will not be necessary.

Endorsement Renewal and Professional Development Hours

This endorsement does not require any renewal. It will automatically be renewed at each CWI renewal or recertification. The endorsement will continue to be listed in an approved manner.

Candidates who complete pre-exam training to prepare for the Welding Coordination and Quality Assurance endorsement examination may gain professional development hours (PDHs) in accordance with QC1, clause 16.5.

SCWI Maintenance Structure

The SCWI maintenance structure aligns with the AWS QC1:2016-AMD1 requirements. Under QC1 Clauses 15 and 16, SCWIs must complete renewals at the three-year and six-year marks and undergo complete recertification in the ninth year of their certification cycle.

To renew, as per QC1:2016-AMD1, Clause 15, the SCWI will need to attest that they have had no period of continuous work inactivity exceeding two years in activities described in AWS B5.1 during the previous three years of certification.

To recertify, per QC1:2016-AMD1, Clause 16, SCWIs may recertify using one of three flexible pathways:

- Complete a committee-approved endorsement at any time within the nine-year period.
- Accumulate the required PDHs.
- Attend an AWS 9-Year Recertification Seminar before their certification expiration date.

Discover the Value of CWI/SCWI Endorsements

AWS CWI and SCWI endorsements represent a pinnacle of achievement for inspectors seeking to deepen their knowledge, skills, and abilities and add to their credentials in the welding industry.

These specialized credentials symbolize your commitment to excellence and continuous learning and serve a strategic purpose for CWI and SCWI recertification.

In addition to the WCQA endorsement, the other 13 endorsements AWS currently offers are as follows:

Welder Performance Qualifier

(required for initial SCWI certification)

Showcase your knowledge, skill, and ability to conduct welder performance qualification tests.

Welding Procedure Qualifier

(required for initial SCWI certification)

Showcase your knowledge of developing and qualifying welding procedures.

Nondestructive Examination Coordination

(required for initial SCWI certification)

Demonstrate an understanding of nondestructive examination (NDE) qualification and certification programs, core NDE testing methods, and key NDE coordination components and activities.

D1.1 Structural Steel

Demonstrate your knowledge in structural steel welding, covering material and design, fabrication, inspection, and qualification in the industry.

D1.2 Structural Aluminum

Demonstrate your knowledge in aluminum welding, covering material and design, fabrication, inspection, and qualification.

D1.5 Bridge Welding

Showcase your knowledge of bridge welding standards, including material and design, fabrication, inspection, and qualification.

D15.1 Railroad Welding

Demonstrate your expertise in welding railroad cars and locomotives, covering material and design, fabrication, inspection, and qualification.

D17.1 Aerospace Welding

Demonstrate your knowledge in aerospace welding, encompassing the specific requirements and standards for materials, design, fabrication, and inspection within the aerospace industry.

ASME *BPVC*, Section IX, Power B31.1 and Process B31.3 Piping

Showcase your proficiency in welding power and process piping systems, aligning with the rigorous standards of ASME codes.

API 1104 Pipeline Welding

Demonstrate your knowledge in pipeline welding, covering material and design, fabrication, inspection, and qualification in the industry.

This credential enhances your professional value, positioning you as a crucial asset to companies in the pipeline industry. Invest in career advancement and elevate your welding credentials with the API 1104 endorsement.

Magnetic Particle Testing of Welds

Demonstrate your knowledge in conducting magnetic particle testing of welds.

Penetrant Testing (PT Type II – Method C)

This endorsement signifies proficiency using the solvent-removable method for visible penetrant testing of welds on ferrous and nonferrous materials.

ISO Welding Standards

Demonstrate your knowledge of ISO welding standards, including material and design, fabrication, inspection, and qualification.

For more information about these endorsements, visit *aws.org/certification-and-education,* or contact the AWS Certification Department at (800) 443-9353 or *aws.org/contact-us*.

INSPECTION INSIGHTS

A summary of selected AWS Weld Wednesday podcast episodes hosted by Jason Becker. Visit ***weld.ng/podcasts*** for more episodes.

Visual Inspection and Quality Control in Welding: Insights from Brent Boling

Explore the critical aspects of welding inspection and quality control and the importance of training and mentorship

A seasoned welding inspector and industry veteran with decades of experience, Brent Boling engaged in a thoughtful conversation with host Jason Becker. Boling is quality assurance manager for Cives Steel Co., South-West Division, El Mirage, Ariz. He's an AWS Certified Welding Inspector (CWI) with an AWS Bolting Endorsement, the first vice chair of the B1 Methods of Inspection Committee, and a member of the B1.10, B1.11, and *Welding Inspection Handbook* subcommittees. Boling is also a founding member of the organizing committee for the Inspections Expo and Conference (IEC) and second vice chair of the AWS Arizona Section. He's the author of several *Inspection Trends* articles and a regular speaker at IEC and FABTECH.

Boling's welding journey began during his junior high years when a neighbor repaired a tractor transmission case for his family. This sparked an interest that continued through high school and eventually became his career path. Like many successful welders, Boling credits his development to the guidance of a mentor.

"I think mentors have been the biggest benefit in my career," he noted, emphasizing how crucial guidance from experienced professionals has been throughout his career.

Boling describes himself as an "information sponge," having read AWS's *Welding Handbooks* cover to cover multiple times. This self-directed learning, combined with guidance from mentors and formal education, shaped his expertise in the field.

JASON BECKER is an AWS CWI and Certified Welding Educator and owner and operator of Weld Works Training Center in Orlando, Fla.

The Welding Community

One of the highlights of their discussion was the tight-knit nature of the welding community. Despite working in a massive industry, welding professionals frequently encounter familiar faces at conferences, seminars, and expos. This sense of community allows for what Becker called "nerding out on welding" — detailed, technical discussions that might baffle outsiders but are invaluable for professional development.

Common Misconceptions and Misinformation

A significant challenge in the welding industry is the prevalence of misinformation. Boling highlighted how misinterpreted information can lead to improper practices: "There's a lot of misinformation or misinterpreted information out there, and you've got to ask the right people the right questions to make sure you get to the bottom of what you're trying to find out about the work that you're doing."

For example, many believe that welders can only use a slag hammer and a wire brush during qualification tests; however, this requirement only

exists in one specific code: AWS D1.5, *Bridge Welding Code*.

Welding Codes and Standards

The conversation touched on the complexity of navigating various welding codes, including the family of AWS D1 structural steel codes as well as the American Society of Mechanical Engineers (ASME), American Petroleum Institute (API), International Organization for Standardization (ISO), Department of Transportation (DOT), and location-specific regulations. Boling shared an anecdote about inspections for the Wilshire Grand Center in Los Angeles, where inspectors needed knowledge of city, county, state, International Building Code (IBC); American Institute of Steel Construction (AISC), D1.1, *Structural Welding Code — Steel*, D1.3, *Structural Welding Code — Sheet Steel*, D1.4, *Structural Welding Code — Steel Reinforcing Bars*, and D1.8, *Structural Welding Code — Seismic Supplement* codes.

Becker mentioned his own misconception about start-and-stop requirements for welder performance qualifications, highlighting how even experienced professionals can misunderstand code requirements without proper research.

Transition to Inspection

After years of hands-on welding experience, Boling moved into quality control and inspection. This transition began with quality control (QC) work in Portland, Ore., and eventually led to earning his CWI certification in 2008.

One of Boling's mentors, Kenny Greene (owner of Warrior to Inspector NDE school and Canyon Testing, Flagstaff, Ariz.), played a crucial role in this transition by offering him inspection work. During these early inspection assignments, Boling furthered his education by reading the ANSI/AISC 360, *Specification for Structural Steel Buildings* specification cover-to-cover, which helped him understand the reasoning behind many welding requirements.

Common Welding Discontinuities

When asked about the most common discontinuities he encounters during inspections, Boling identified undersized welds, undercut, and overlap. He also mentioned issues with welders working outside their qualifications, such as using processes for which they aren't certified or performing groove welds when they are only qualified for fillet welds.

Electrode Storage and Handling

Boling emphasized the importance of rod ovens and proper storage conditions, even in Arizona's dry climate: "Everybody goes, 'Oh, well, this is Arizona. We don't have to worry about that rod getting wet.' Okay, let me show you something . . ."

He described how monsoon conditions can affect electrodes left out overnight, leading to hydrogen cracking and other weld issues. For smaller operations, Boling recommends purchasing smaller quantities (10-lb "pop tops" rather than 50-lb tins) and using rod ovens to minimize waste.

Welder Certification and Verification

Boling discussed his approach to welder certification and verification on job sites. He takes photos of welders during qualification tests and includes them in their certification documents. He also stressed that companies should qualify their own welders rather than relying solely on outside certifications: "Even if they got certified through an AWS Accredited Test Facility [ATF] and they're on AWS's national registry, they're still going to take my test."

Industry Involvement

Both Becker and Boling emphasized the importance of involvement with industry organizations, notably AWS. Boling served as Arizona Section chairman for approximately five years and actively participates in several other committees, as mentioned in the introduction.

They discussed the challenges of participation, including the time and financial costs for small business owners. Despite these challenges, Boling strongly advocated involvement: "I encourage as many smaller business owners as possible to get involved in committee work. We need more CWIs and more people from the working community on a lot of our committees."

Continuous Learning

A recurring theme throughout the conversation was the importance of continuous learning. As Boling noted, "You can't stop learning in this industry because about the time you think you've got it down, they go in and they change something." Becker added that there's no such thing as a "master welder" because the field is too vast for anyone to know everything, and codes and practices continually evolve.

Conclusion

Welding inspection and quality control are far more than technical checklists — they represent a commitment to safety, precision, and continuous improvement. Boling's insights underscored the vital role of mentorship, rigorous training, and adherence to evolving codes and standards in shaping competent professionals. From understanding the nuances of electrode storage to navigating complex regulatory frameworks, success in this field requires curiosity and a commitment to lifelong learning. As Boling reminded us, the welding industry thrives on collaboration and the sharing of knowledge. Those who stay engaged — whether through committees, certifications, or community involvement — help elevate the entire profession. In an industry where change is constant, the best welders and inspectors are those who continually ask questions and strive to learn. IT

FEATURE

AI and the Inspector's Eye:

A New Partnership, Not a Replacement

Drones equipped with sophisticated imaging and sensing technology, such as infrared and hydrocarbon sensors, are improving inspection capabilities.

How artificial intelligence can enhance human judgment in welding inspection

BY CALVIN E. PEPPER

Imagine an inspector on an offshore platform. The year is 2030, and a drone navigates a structure called the *flare boom* to detect structural anomalies. The drone utilizes sensors that process terabytes of data, which are sent to a small console. Within seconds, the onboard artificial intelligence (AI) flags a faint irregularity in the main structure — an anomaly pattern in an attachment supporting tons of steel and positioning the flare outboard and safely away from crew quarters and processing equipment. The inspector leans forward to study the readout and smiles. It's not a crack; it's just surface reflection from moisture collecting in a weep hole caught in the early morning sunlight. The AI saw everything. The human understood what mattered.

This moment captures the essence of the future of inspections. AI will not replace inspectors — it will empower them to be even more effective than they might otherwise be. The beating heart of inspection has and will continue to be human judgment: the ability to weigh evidence, understand context, and protect people and infrastructure. In the coming decade, AI will serve as an aid, not a threat. AI will be the precision tool that magnifies the inspector's reach, accuracy, and value.

Inspection Is Evolutionary

From the early days of inspection, the practice has evolved as new technologies allowed for better preparation and more effective inspections. In the early days of my journey, we used hand tools, flashlights, and experience. We kept notes in worn notebooks and carried an unsettling feeling about something called ultrasonic testing (UT) — an obvious scam that would never be generally accepted by industry.

Just as radiographic testing (RT) and UT didn't end visual inspection, they redefined what *seeing* meant. Phased array ultrasonic testing (PAUT) and acoustic emission testing (AET) further expanded the inspector's ability to see the internals of complex structures and focus on interpreting and assessing rather than simply locating.

These innovations caused the inspector to learn new skills in waveform interpretation and validation.

AI is simply the next evolution of the same continuum. The cloud-based algorithms and machine learning systems now being introduced aren't a new species of worker; they're the next generation of tools. They expand the capabilities of experienced inspectors and increase their value to ownership.

Fear and Reality

Fear of replacement has been with us since the earliest development of automation. AI can now recognize weld defects in radiographs, identify corrosion from drone images, and even predict failure before it occurs in specific systems. The difference is that automation in inspection is not the same as autonomy. AI lacks a fundamental aspect: contextual understanding.

AI can detect an anomaly, but it cannot determine if that anomaly is relevant. It doesn't understand the service environment, the design basis, or the consequences of failure. It doesn't know when to shut down the process or when to request secondary verification. That kind of judgment — ethical, situational, and deeply human — remains the inspector's responsibility.

In practical terms, AI is most powerful when it handles the tedious and repetitive aspects of the job, such as sifting through thousands of images, comparing signals, and identifying statistical outliers. By automating data collection and initial analysis, AI enables the inspector to focus on interpretation, decision-making, and communication. Within such a system, the inspector handles tasks that require experience, intuition, and accountability.

Imagine the fatigue of manually reviewing hundreds of radiographic images during a 10-hour shift. Now imagine having AI prescreen those images and highlighting just the 3% or so that may require closer examination. The inspector is still in charge but is now armed with time, clarity, and focus.

The Hybrid Inspection Team

Soon, we can imagine a seamless collaboration between humans and intelligent systems. A possible workflow is illustrated in Fig. 1.

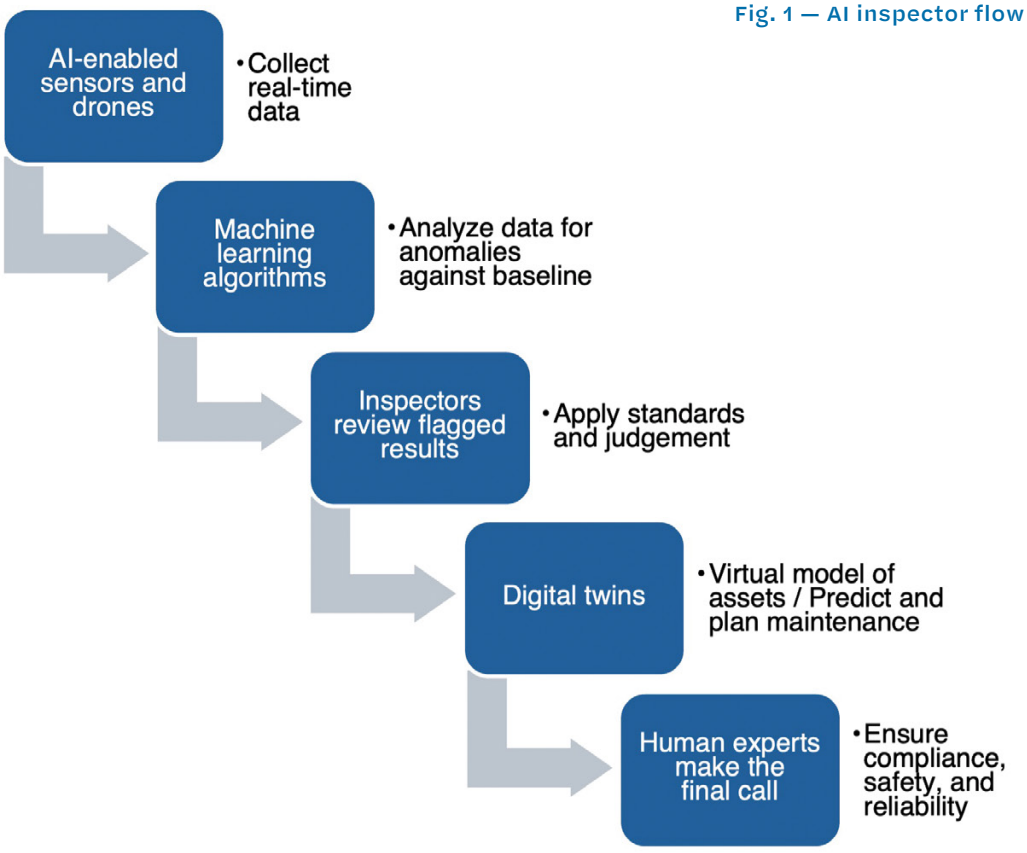

Fig. 1 — AI inspector flow diagram.

In this model, the inspector isn't just a technician. The inspector becomes the decision-maker, a risk manager, a data interpreter. The work becomes more analytical, less repetitive, and ultimately more impactful. The inspector's role evolves from finding flaws to ensuring integrity. This partnership is already visible in industries ranging from aerospace to energy. AI systems are already assisting inspectors in visual inspections, corrosion mapping, pipeline integrity testing, and tank farm leak detection and mitigation. Yet even the most advanced models require continuous validation and oversight. When an algorithm flags a potential defect, it's the certified inspector — trained and certified under standards such as AWS QC1, *Specification for AWS Certification of Welding Inspectors*, or ASNT Recommended Practice SNT-TC-1A, *Personnel Qualification and Certification in Nondestructive Testing* — who confirms the finding, interprets its significance, and signs the report.

Training and Certification in the AI Era

For the partnership to be effective, training must evolve in tandem with the technology. Tomorrow's inspectors will need a blend of traditional nondestructive examination skills and new digital competencies. Understanding how AI works, its capabilities, and its limitations (not necessarily how to code) will become a core professional skill.

Future training programs will likely emphasize the following elements:

- Data literacy
- AI-assisted imaging
- System validation
- Cross-disciplinary collaboration

Standards organizations are already adapting. AWS, ASNT, ISO, and other standards-writing bodies have committees exploring frameworks to ensure that AI tools used in inspection meet rigorous reliability and traceability requirements. The subsequent revision cycles may include guidelines for AI-assisted inspection verification, clarifying that human oversight remains mandatory in all automated systems and processes.

Ethics and Trust

AI systems can be incredibly efficient, but they are only as ethical as the humans who guide them. In inspection, trust is everything. We like to say, "Your reputation is the most valuable thing you own, so don't ever sell it." What we really mean is that your ability to instill trust is your most important trait. Once lost, trust is almost impossible to recover.

Trust and integrity are traits that no machine can replicate. An inspector's professional judgment is built not just on pattern recognition but on principles of safety, honesty, and accountability. These are what separate the trusted inspector from the tool.

The inspector's ability to explain how AI produces its results to clients, regulators, and the public will rely on their understanding of both its capabilities and limitations. Transparency will become the key to confidence in AI-assisted inspections.

The Inspector as Guardian of Insight

The inspector of the 2030s and 2040s will be less about wielding measuring devices and more about wielding insight. Inspectors will become the integrity managers of the day, interpreting streams of data, verifying AI assessments, and advising maintenance and engineering teams on risk and reliability.

A field inspector may be accountable for a swarm of autonomous drones performing visual and ultrasonic scans, UV and IR data collection systems, and airborne vapor detectors, all sent to a data dashboard. The drones may make confined space entry a rare occurrence by entering and assessing internal equipment, materials, or hazards. It will be the inspector's task to interpret the data, order further testing or repairs, and report these findings more safely, efficiently, and with greater informedness.

That's not to say that hands-on inspections will disappear; instead, they will evolve. Manual verification, tactical inspection, and field judgment will remain vital elements of the inspector's role. This suggests that as automation expands, the moments requiring direct human evaluation will become more significant, not less.

The Future Is Human and Intelligent

AI will change inspection as a profession — it won't erase it. It will redefine what we consider excellence. Inspectors who embrace these new tools while upholding the ethical standards of AWS and ASNT certification programs will be more valuable to the industry than ever.

As AI handles the data, the inspector will handle the truth. Those of us who have toiled in inspection most of our professional lives understand that it was never about the tools — it was always about trust. AI delivers the data, but inspection, like craftsmanship, is human work.

CALVIN E. PEPPER (*cpepper1946@gmail.com*) is an AWS CWI (past SCWI), ASNT VT Level II, CQA (ASQ), MS nuclear engineer, and Certified Galvanizing Inspector (AGA). He is an AWS Life Member, a CWI Lifetime Achievement Award recipient, past chair of the AWS Q&C and *Welding Handbook* Committees, and past District 9 director.

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BY JAVONTE WOODSON

How Videoscope Technology Is Transforming Weld Inspection

Enhancing weld quality and integrity through advanced remote visual inspection

In industries where reliability and precision are non-negotiable, the ability to inspect internal components without dismantling equipment has become a defining advantage. Videoscope inspections have moved from being a specialized convenience to a foundational pillar of modern asset integrity and maintenance strategies. Advanced videoscopes provide real-time visibility into welds, internal surfaces, and confined systems, allowing teams to detect issues early to streamline repairs and reduce costly downtime. From verifying critical weld quality inside pressure vessels to inspecting turbine blades deep within power-generation systems, videoscopes allow technicians to navigate confined curved spaces and intricate mechanical assemblies with ease. They are essential in aerospace for engine bore and turbine inspections, in oil and gas for refinery and pipeline integrity checks, in automotive manufacturing for drivetrain and casting evaluations, and in pharmaceuticals and food production, where hygienic equipment must be validated without contamination. Whether uncovering corrosion, identifying foreign object debris, confirming machining tolerances, or assessing internal coatings and cleanliness, videoscopes bring clarity where failure is not an option.

Remote Visual Inspection in Industrial Applications

In the energy and process industries, videoscopes enable inspectors to navigate deep inside pipelines and process piping to verify weld root quality, detect undercut or slag inclusions, and monitor corrosion without disrupting operations, providing inspectors with a valuable advantage in critical fluid and gas transport systems.

In power generation and industrial steam industries, videoscopes provide clear access to boiler tubes, pressure vessel welds, and confined drum spaces. This enables early detection of creep cracking, heat-affected zone degradation, and

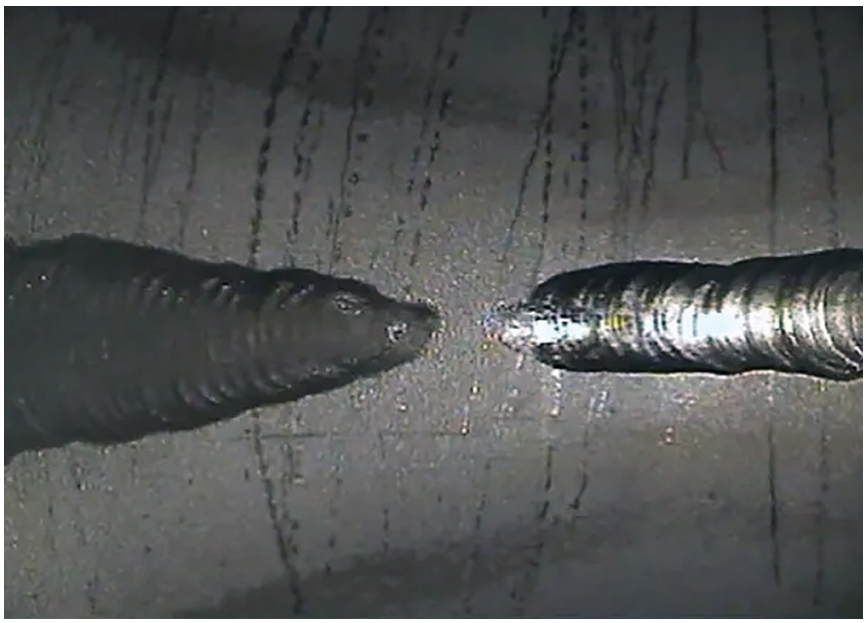


Fig. 1 — Videoscope inspection of a weld in stainless steel pipe showing incomplete joint penetration.

pitting caused by extreme temperature and pressure cycles.

In the automotive industry, borescopes are used to detect foreign object damage or residual machining and casting debris. Casting debris, such as sand, metal chips, or polishing media, inside precision components must be addressed, as even small contaminants can lead to major failures. Leftover sand from casting can erode internal surfaces and clog lubrication passages. Metallic debris may score bearings, gall moving parts, or initiate wear patterns that shorten component life. A single loose particle can disrupt flow, jam mechanisms, or cause catastrophic breakdowns in high-performance assemblies, such as turbine engines, hydraulic systems, fuel control units, and precision valves.

In the pharmaceutical industry, weld quality assurance and control (QA/QC) play a vital role in maintaining the integrity of drug manufacturing facilities. Videoscope articulation helps inspectors as process piping systems often contain thousands of welds and joints located in hard-to-reach areas. A single defective weld can lead to corrosion, leaks, or contamination, jeopardizing the entire system. Pharmaceutical plants also inspect for various types of defects in weld roots, including undercut, incomplete joint penetration, and burn-through — Fig. 1. Preventing contamination within medication production lines is a central objective of good manufacturing practices. Compliance with good manufacturing practices is essential for the pharmaceutical industry to ensure that products are safe, consistent, and free from improper mixtures or impurities. These standards require rigorous equipment maintenance, with videoscopes at the center.

In the aviation industry, videoscopes play a vital role in examining high-precision welds within turbine engines, combustors, and exhaust assemblies. Borescope inspections are beneficial in inspecting weld cracks in components and fuel pipes of turbine engines. Identifying microcracks, oxidation, or foreign object damage is crucial for maintaining airworthiness and ensuring flight safety. Across all these environments, videoscopes allow maintenance teams and quality professionals to ensure reliability, minimize downtime, and safeguard critical assets.

Fig. 2 — Evident IPLEX™ One insertion tube showing its articulation capability.

Challenges of Remote Visual Weld Inspections

Videoscope weld inspections present several practical challenges that can affect inspection efficiency. The confined nature of weld joints inside piping, vessels, and machinery can limit probe maneuverability and viewing angles, making full-weld coverage difficult and increasing the chance of missed indications. Glare or low-light conditions inside metallic reflective surfaces can obscure fine surface defects while small-diameter scopes may sacrifice resolution, making microcracks or subtle porosity harder to distinguish.

Image interpretation remains highly dependent on operator skill and experience; inconsistent technique or insufficient training can lead to variability in results. Additionally, internal contamination such as oil residue, debris, or moisture can smudge the lens or distort visuals. Internal contamination can interrupt workflow and lead to frequent cleaning.

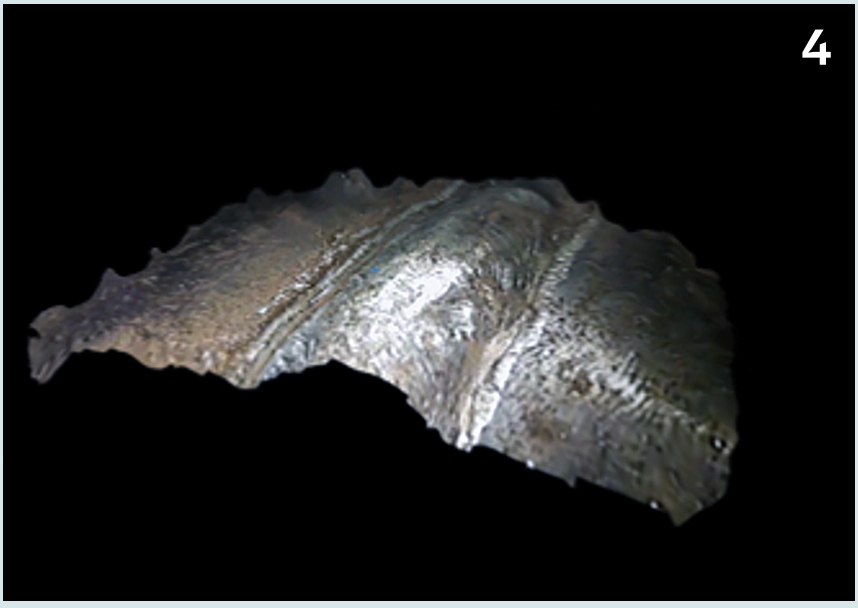
Solutions for Remote Visual Weld Inspections

The challenges of confined access, lighting variability, and operator consistency in internal weld inspections are significantly reduced with the use of advanced videoscopes. These instruments, featuring ultra-slim insertion tubes and highly maneuverable articulation, enable inspectors to access and view complex weld geometries with greater ease, ensuring more comprehensive weld coverage in tight piping and vessel environments. Advanced laser diode illumination with intelligent exposure control minimizes glare and shadowing on reflective weld surfaces while high-resolution imaging and digital zoom help reveal small cracks, porosity, and subtle surface irregularities that might otherwise be overlooked.

Today's advanced videoscope technology includes intuitive user interfaces, guided workflows, and image processing functions that support consistent techniques and reduce operator-dependent variability — making accurate interpretation more achievable across skill levels. Meanwhile, videoscopes' rugged, field-ready design and replaceable distal end protect optics from contamination, helping to maintain

Fig. 3 — Pipe weld videoscope image.

Fig. 4 — 3DAssist™ software 3D model of Fig. 3 for QA/QC analysis.



clarity throughout the job. With these capabilities, advanced videoscopes can enhance weld visibility, improve inspection efficiency, and increase confidence in results.

Some of the essential videoscope tools advancing weld inspection are as follows:

High-Performance Videoscopes

Having a high-performance videoscope is the number one need for remote visual inspection and weld inspection. Breakthrough optics and measurement technologies are designed to improve clarity and precision when inspecting critical welds and joints. Typical insertion tube diameters include 4 mm (0.16 in.) and 6 mm (0.24 in.), with lengths up to 10 m (32.8 ft).

Optical Tip Adapters and Insertion Tubes Tailored for Welds

A range of interchangeable optical tip adapters (forward/viewing and side/viewing) is available to suit weld inspections of pipes, joints, and surfaces. The ability to choose the direction of view (forward vs. side) is crucial in weld inspection: For example, side-viewing adapters enable the examination of the weld toe, the weld root, undercut, or internal joint surfaces. Having an insertion tube with excellent articulation is also key for maneuvering the videoscope to the inspection target weld — Fig. 2.

Measurement and Modeling Tools

Measurement and modeling tools help inspectors do their job much more easily. New videoscope technology supports advanced software features that enable 3D modeling from a single optical path. For example, the Swoptix Multiview technology enables inspectors to instantly switch between near/far focus and direct/side view focus without removing the scope — Fig. 3. This reduces the time required to inspect a weld and minimizes wear on tips/adapters. Single-screen measurement or 3D Stereo Swoptix measurement (for 4-mm- and 6-mm-diameter insertion tubes) allows weld defect sizing and comparatives. These measurement capabilities enable the evaluation of weld defects (such as cracks, porosity, and undercut), not only identifying them but also quantifying them for QA/QC — Fig. 4.

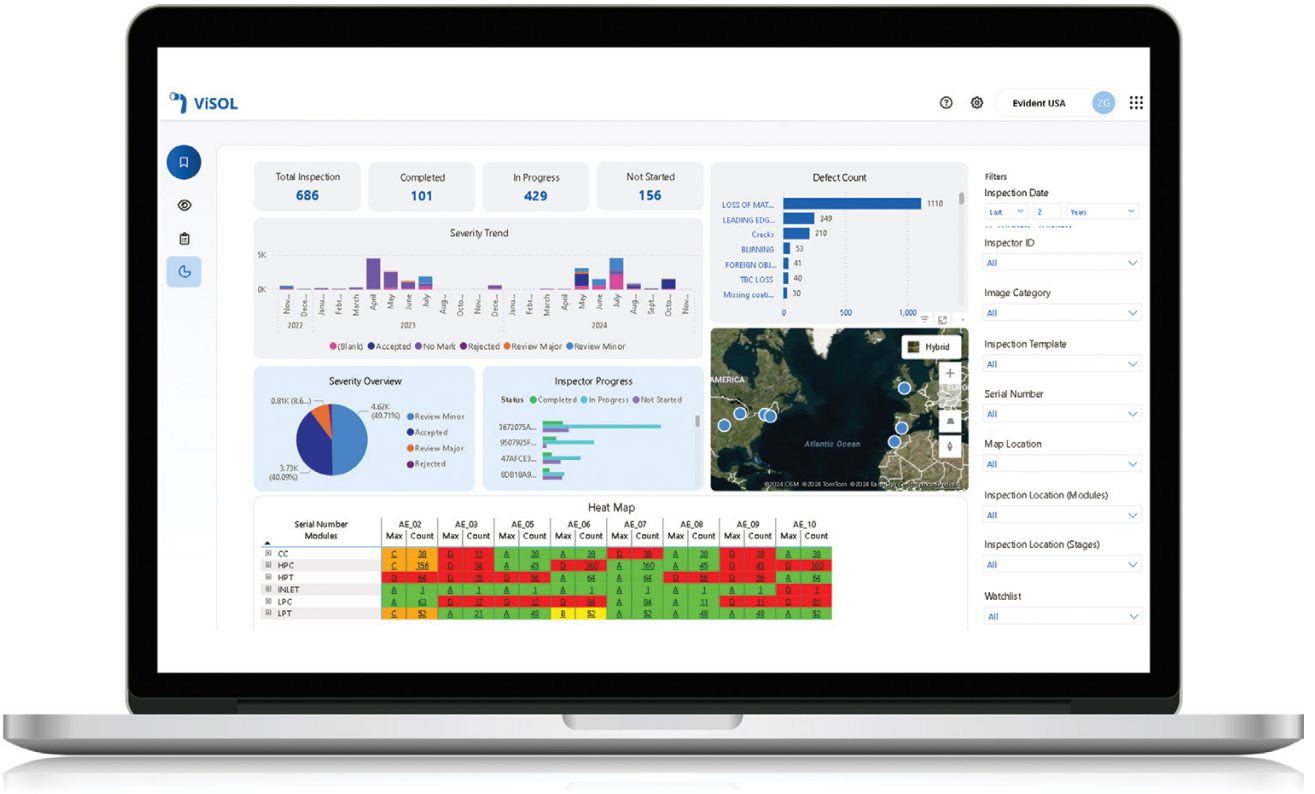


Fig. 5 — The ViSOL™ software dashboard displays insights and trends, enabling the user to visualize and interact with inspection data dynamically.

Workflow and Reporting Integration

Videoscope systems are also designed not only for imaging but for integrated workflows as well. Cloud workflow software facilitates data capture, remeasurement, and collaboration among stakeholders — Fig. 5.

In weld inspections, it is important to have consistent data capture, reporting, traceability, and documentation. Users can also gain insights and reveal trends, as well as dynamically visualize and interact with inspection data, including inspection KPIs, severity overview, severity trend, defect count, heat map, asset locations, and inspector progress.

Flexible Form Factor and Rugged Design

Inspecting welds often means accessing awkward, elevated, or confined spaces. Advanced videoscopes are designed to be smaller, lighter, and more portable. Wireless operation is supported in some configurations, which can enhance ease of use in challenging access environments. The rugged design of today's videoscopes also helps make the tool reliable during field inspections of welds in harsh environments. Different form factors also help the inspector decide which form will be more comfortable for the inspection.

Conclusion

As industries continue to push the limits of performance and precision, videoscope inspection stands as a critical enabler of reliability. Precision optics, versatile tip adapters, intuitive handling, accurate measurement capabilities, and integrated reporting tools help companies analyze their welds effectively. These elements together transform inspection from a reactive task into a proactive quality assurance process. From welds hidden deep within pharmaceutical piping to turbine blades in high-temperature environments, modern videoscopes allow technicians to see more, measure more, and document more with confidence. Aligning visibility and accuracy turns asset integrity from assumption into assurance. IT

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FEATURE

BY AMANDA YOUNG

The Role of Ethics:
Lessons Learned at Every Stage

Maneuvering ethical dilemmas in the welding inspection career

As someone who's spent years in the welding and nondestructive examination field, I've seen my responsibilities evolve dramatically. When I began my career as a technician, my days were filled with hands-on testing and applying procedures precisely as taught. At that stage, topics like business negotiations and ethics were distant concerns. My focus was on delivering the technical services I'd been trained for.

Everything shifted once I found myself leading an organization, responsible not just for hands-on work but for shaping the company's direction and culture. Suddenly, questions of negotiation, accountability, and professional values were no longer theoretical. They were woven into the everyday fabric of my job.

If there's one lesson that's stuck with me — forged through the advice of wise mentors and my own mistakes — it's that integrity must guide every decision. One mentor told me, "Never leave your integrity behind, no matter how tough the day." That phrase comes to mind whenever I face challenging moments. For welding inspectors, no matter your role or the company you represent, doing the job isn't just about ticking boxes. It's about knowing you're upholding your own ethical standards.

Navigating Ethical Crossroads

Welding inspectors stand at a busy intersection where production, safety, quality, and client expectations all converge. We answer to multiple parties: our employer, our client, regulatory agencies, and, ultimately, the communities relying on what we inspect. In the real world, ethical choices rarely come with clear signage.

The dilemmas often arrive quietly. Maybe it's being asked to sign off on a weld that's "close enough." Maybe you're under that familiar pressure to rush, cutting steps to meet a looming deadline. Other times, you might be working with a project manager whose priorities are constantly shifting — quality today, production tomorrow, safety always, but rarely all three aligned.

Throughout the welding profession, organizations talk about values like quality, safety, and productivity. However, anyone who has managed a project knows that those priorities are fluid, shifting in response to deadlines, budgets, or client demands. For inspectors, the key is never losing sight of what matters most: the safety and quality that underpin every project. When outside pressures threaten to muddle your focus, it's up to you to maintain your standards.

When Your Ethics and Your Employer's Priorities Don't Match

You may notice subtle signs. Sometimes, it's a supervisor asking you to "just keep things moving." It could be leaving out a step or signing your name to paperwork for work you didn't actually review. Maybe there's a bonus tied to hitting a deadline — the kind that makes you want to take a shortcut.

In those moments, professionalism means communicating — calmly, respectfully, and with solid reasoning. Explain why skipping a step isn't worth the risk and how it could backfire in the long run. Framing your position around the shared goal (a successful, safe, compliant project) helps build trust and understanding even if tempers flare.

Reputation: The Legacy of Your Choices

The welding world is smaller than we often realize. Your reputation follows you — sometimes louder than you

expect. Word spreads quickly about who stands firm on quality and ethics, even under pressure. It's not an easy path, but once people know you're unwavering, they're less likely to ask you to compromise.

The flip side, of course, is that one bad decision can cause lasting damage. In industries like ours, built on safety and trust, there's rarely a second chance after a serious ethical lapse.

Leading by Example

As I moved into management, it became clear that building an ethical team doesn't happen by accident. It takes intention — training staff not just in technical detail but in the "why" behind our standards. Open communication is essential. Staff need to know they'll be heard and supported, especially when raising issues or making hard calls, even if that means slowing down production or costing the company money.

Final and Most Important Lesson: Owning Mistakes

No one gets it right every time. I've made errors in judgment, missed details, and learned hard lessons on the job. The true mark of professionalism is owning those mistakes the moment they're found. Be honest with yourself, your team, and your client. Fix what you can, learn from what went wrong, and move forward with greater understanding.

In fact, I've found that admitting a mistake (and fixing it) often earns more respect than pretending to be perfect. Colleagues and clients place greater trust in inspectors who they know are transparent, accountable, and committed to improvement. Every error is a chance to get better — if you let it be.

Conclusion

Welding inspection is much more than a technical endeavor. Our decisions impact not only immediate project outcomes but also the safety, reputation, and well-being of entire communities. Our role demands integrity in every action, frankness in every communication, and humility in responding to setbacks. The work isn't always easy, but done well — and done ethically — it leaves an enduring legacy of trust. If there's one guiding principle for inspectors at any stage, it's this: Let your integrity be your strongest asset, and let accountability be the light that guides the path forward. IT

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EDITORIAL IT

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Training in welding inspection also creates a common language for production and quality teams. When both groups share an understanding of the criteria and rationale behind inspection decisions, discussions become more productive and less combative. Welders can ask informed questions, propose solutions, and participate meaningfully in root cause analyses when defects are found. Inspectors, in turn, can offer guidance and feedback that is more likely to be received constructively.

The result is a collaborative culture where both production and quality are aligned toward a common goal: delivering safe, reliable products that meet or exceed expectations. This alignment reduces the "us versus them" mentality and replaces it with a spirit of teamwork.

Organizations that invest in inspector training for their welders see measurable improvements in quality metrics, project schedules, and employee morale. By reducing the number of rejected welds and minimizing rework, companies save time and money. Welders gain professional growth opportunities and a sense of pride in their work while inspectors feel supported rather than isolated.

Perhaps most importantly, customers benefit from products that are built right the first time. In the long run, this approach strengthens the company's reputation and competitive edge.

The divide of "us versus them" is neither necessary nor impossible to overcome. By providing production personnel with training in welding inspection, organizations can foster mutual understanding, enhance communication, and cultivate a collaborative environment where quality is everyone's responsibility. This investment in people and knowledge pays dividends in quality, efficiency, and workplace harmony — benefits no organization can afford to overlook. IT

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In the aerospace industry, cadmium coating is a key method to protect metal components — particularly landing gear, fasteners, and high-strength steel components — against environmental elements.

BY JORGE T. REYNA

Cadmium Application on Welds for Enhanced Corrosion Protection

Why cadmium coating on welds remains a critical defense against corrosion in harsh environments

If you've ever inspected a weld exposed to salty air, acidic fumes, or a marine environment, you know that corrosion doesn't play fair. It starts slow, hidden beneath a layer of oxide, and before you know it, that perfect weld is under attack. One of the tools we have to fight back — often used today in critical sectors like aerospace and defense — is cadmium coating.

You might have heard of it. Perhaps you've seen it on fasteners or connectors with a distinct dull silver appearance. But what about welds? Can you cadmize a weld? Should you? The short answer is yes — and in some cases, it's the most recommended solution.

Why Cadmium on Welds?

Welds are not just any surface. They're heat affected, structurally complex, and often exposed to harsh conditions. And when they connect dissimilar metals, such as stainless steel to carbon steel, the risk of galvanic corrosion increases drastically. That's where cadmium coating shines: It acts as a sacrificial layer, corroding first to protect the weld underneath.

Standards such as Society of Automotive Engineers (SAE International) Material Specification AMSQQP416, *Plating, Cadmium (Electrodeposited)*, and American Society for Testing and Materials (ASTM) B766, *Standard Specification for Electrodeposited Coatings of Cadmium*, already permit cadmium coating on welded areas, provided it's applied correctly. This isn't a process to improvise. It requires proper preparation, precise application, and thorough postprocess inspection. However, when done well, it adds years to the structure's life.

How's It Applied?

There are three main ways to apply cadmium:

1. Electroplating: This is the most common method. A cadmium layer is deposited using an electrical current in a controlled bath. You can control thickness (usually 5–25 microns) and finish (as plated, clear chromate, or yellow chromate).

2. Diffusion Coating: Cadmium powder is applied, and the part is heated to 300°–450°C so the coating diffuses into the surface. This is ideal for hard-to-reach areas, such as weld roots or inside fillets.

3. Thermal Spraying: Molten cadmium is sprayed onto the surface. This technique is not as precise but valuable for repairs and large-scale applications.

Regardless of the method, one thing is non-negotiable: surface prep. A weld must be clean, dry, and free of slag or grease. This typically involves abrasive blasting (non-ferrous), chemical degreasing, or a combination of both. Before coating, inspection is crucial. I always recommend checking with liquid penetrant (ASTM E165, *Standard Practice for Liquid Penetrant Testing for General Industry*) or radiography (ASTM E1742, *Standard Practice for Radiographic Examination*) to rule out cracks or porosity that might be hidden in the weld.

What Should You Inspect?

After cadmizing a weld, here's what we look for:

- **Visual:** Is the coating uniform? Are there areas missing or signs of peeling?
- **Thickness:** Use eddy current testing (ASTM B499, *Standard Test Method for Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals*) or magnetic pull-off testing (ASTM B530, *Standard Test Method for Measurement of Coating Thicknesses by the Magnetic Method: Electrodeposited Nickel Coatings on Magnetic and Nonmagnetic Substrates*) to verify that it meets the specification.
- **Adhesion:** If it doesn't stick, it's useless. Perform a cross-cut tape test (ASTM D3359, *Standard Test Methods for Rating Adhesion by Tape Test*) and ensure it holds.

For components in extreme environments, I prefer to take it a step further: salt spray testing (ASTM B117, *Standard Practice for Operating Salt Spray [Fog] Apparatus*) or even porosity analysis under a microscope can reveal the true durability of that coating.

Why It Still Matters

Cadmium has received a bad reputation due to its environmental concerns. As a result, it's being replaced in some industries. However, in critical components — especially those where galvanic corrosion poses a serious risk — nothing protects like cadmium. It's not just about resisting rust; it's about maintaining the integrity of a weld that can't be allowed to fail. Additionally, cadmium offers several benefits: It lubricates threads, resists mild wear, and conducts electricity effectively. That's why you still see it in aircraft, military gear, and offshore structures.

In my years working as an inspector and instructor across industries and countries, I've learned this: A good weld isn't enough. If you leave it unprotected in the wrong environment, you're just giving corrosion a head start. Cadmium coating — when done correctly — adds that extra layer of defense that turns a vulnerable joint into a long-term asset.

Is cadmium on welds still worth considering? Absolutely. But like anything in our trade, it's all about doing it right: Follow the standards, prepare the surface, inspect with care, and trust the science behind it.

And above all, remember what we protect today is what keeps structures safe tomorrow. IT

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THE ANSWER IS

BY ALBERT J. MOORE JR.

Q I was hoping you could offer some suggestions regarding a few concerns I have with my job. I feel overwhelmed by having too little time to attend to all the tasks I am expected to perform, as well as by performing tasks for which I feel unqualified. As a Certified Welding Inspector, I wear several hats. I perform inspections of welds, dimensional checks of machined parts, paint inspections, welder qualification, and I write welding procedure specifications for the company. My concerns are threefold. One is that I don't feel I have the proper training and experience to complete all the tasks assigned to me. Second, I simply don't feel I have the time necessary to perform all my tasks in a thorough manner. Last, am I violating any ethical principles?

A Thanks for asking my opinion. Actually, this is a common problem among Certified Welding Inspectors (CWIs). As CWIs, we are qualified to perform visual examinations of welds. That is the scope of what we are certified to do. Other job functions such as dimensional inspections, paint inspections, performing other nondestructive examination (NDE) methods, or metallurgical examinations are beyond the scope of the CWI certification.

In some cases, additional certification may be required depending on the customer's requirements. These requirements may be spelled out in the project specifications, purchase order, or applicable fabrication standard. For example, AWS D1.1, *Structural Welding Code — Steel*, and other structural welding codes reference ASNT SNT-TC-1A, *Personnel Qualification and Certification in Nondestructive Testing*, for the qualification and certification of personnel performing NDE other than visual testing. In the case of coatings, NACE may be referenced by the project specification.

The extent of a CWI's involvement in qualifying welders and procedures is addressed in QC1, *Specification for AWS Certification of Welding Inspectors*. The CWI is expected to witness the performance qualification testing and properly document it using the welder performance test record (WPTR). Likewise, the CWI is expected to be capable of witnessing and recording welding parameters and test data on the welding procedure qualification record (WPQR). However, the CWI is not expected to write production WPSs or determine qualification testing without additional training. That being said, there's nothing in QC1 that states that a CWI cannot develop a WPS. Many CWIs write prequalified WPSs as part of their routine duties, but they generally have several years of experience working with someone that taught them the ropes. It can be considered unethical to develop a WPS if the CWI is uncomfortable doing so. For example, developing a WPS for a complex repair for base metals the CWI is unfamiliar with borders on unethical due to the potential risk to people and property.

AWS offers endorsements and seminars that provide instructions on how to document a WPS, qualify a welder, and record test results under an AWS Accredited Test Facility (ATF). Other organizations offer similar seminars on the subject of developing WPSs. Employers may be willing to cover these costs, and the training hours can be used toward your 9-year recertification.

The Code of Ethics states that CWIs should not perform tasks for which they are not qualified. However, it doesn't go into detail the required qualifications. That being said, it is between you and your employer to determine whether you are qualified to perform a task. If additional training is needed, consider taking courses offered by community colleges. A course that aligns with one of the job responsibilities can be used toward professional development hours requirements needed for your 9-year recertification. If you want to write better inspection reports, take a class in technical writing. If you are a CWI, but don't have a strong background in welding, take a welding class at a local vocational school. Do you need to tweak your math skills? Take a class in algebra, geometry, or trigonometry. Do you need to learn about coatings? Take a seminar offered by the Association for Materials Protection and Performance (AMPP).

Lack of sufficient time to perform inspections in a thorough, competent manner can be a gray area. Once you sign an inspection report, you own it. If an inspection is not thorough or performed in a competent manner, both the inspector and employer bear the consequences. If something fails, it's your name on the report and it's your reputation that is at risk. There is a risk of financial liability for your employer if something you inspected fails once it is placed into service.

If you don't have time to inspect each weld and resort to random spot inspections, the report must clearly state what was inspected and what was not. Be very exact, right down to the specific fitting, joint number, etc. Reporting a full inspection when a random spot inspection was performed is unethical and fraudulent.

AWS D1.1 requires inspection of all welds. The code differentiates between the contractor's inspector, who is responsible for quality control, and the owner's inspector, who is responsible for quality assurance. The individual responsible for quality control is expected to inspect every weld. The individual responsible for quality assurance is responsible for ensuring the contractor's inspector

is doing a proper job of inspecting all welds.

If the contractor's inspector isn't given the time or help needed to inspect all welds, the inspector must take action to change the situation. Remember, it is not the contractor that is charged with violating the code of ethic, it is the party certified by AWS: the CWI. AWS can revoke a CWI credential for cause. If a CWI falsifies inspection reports, the client may file charges and the Ethics Committee may suspend or revoke the CWI credential.

On a project, an inspector performing the visual examination was less than thorough. A fitting was tack welded to the column shaft, but the weld was never completed. During erection, the tack welds failed and the girder fell, throwing ironworkers to the ground and injuring another ironworker. I would find it difficult to live with knowing I was responsible for those injuries. The inspector was not a CWI, but it is doubtful that individual continued working as an inspector.

Mistakes happen, but we must strive to perform our work competently to minimize the likelihood that unacceptable work is overlooked or mistakenly accepted.

CWIs are expected to be honest and to act with integrity. The strong reputation of the CWI Program, as defined by QC1, has been earned and is evident by CWIs who have refused to succumb to pressure to accept subpar welds and who have performed their duties unflinchingly. People who buckle under pressure by contractors or owners do not typically last long in this profession.

CWIs have earned the trust of their clients by honestly reporting the conditions observed and by not altering reports to make them more palatable to contractors. It isn't always easy. Contractors want a clean bill of health to keep work moving. Fabricators want to meet schedules and ship product. Owners want their parts or buildings completed. The pressure to "buy off" subpar work can be immense. The CWI must stand their ground and resist the temptation to "just make them happy."

The reports filed by the CWI are trusted to be thorough and accurate. One client once told me, "Al, I might not like what you have to say, but I know what you say is your honest conviction, and I can take that to the bank."

Unfortunately, a CWI may have to walk away from a job rather than succumb to pressure from a manager trying to coerce the inspector to accept material or welds that do not meet the standard. Once an inspector's honesty is compromised, their reputation and career as a CWI is likely destroyed.

Our community is relatively small, and an inspector's reputation arrives on the job site before they do. You must do what is necessary to protect that reputation. If that means walking away from a job, so be it. You can always find another job, but it takes years to build a reputation that can be destroyed in a single moment of indiscretion.

When it comes to the CWI Code of Ethics, it ultimately comes down to doing what is right, what is honest, and what is morally correct. If an activity makes you uncomfortable, or if you would prefer others not know about it, it is likely a violation of the code of conduct. You can't go wrong by doing the right thing, taking pride in what you do, and refusing to be swayed into doing something you believe is wrong.

The fact that you are asking these questions is a good sign that you are on the right track. If your gut tells you something isn't right, it probably isn't. Trust your instincts. IT

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