

Welders

Generative AI barely touches welding, but robotic and cobot cells are taking over repetitive production welds in manufacturing.

EXPOSURE	WINDOW	ADOPTION TODAY	READING
21 Low exposure	7–15 yrs until change lands	Medium	AI assists; the work stays human-led. Exposure is the share of today's work AI can plausibly take on within the window.

§ 01WHAT IS HAPPENING

What is happening to welders

Impact

Text-based AI has almost no role in the physical work of welding, cutting and brazing, and observed usage of generative tools in the occupation is effectively zero. The real automation channel is robotic: fixed robot cells have long handled high-volume welds in automotive and heavy equipment, and collaborative welding robots from Lincoln Electric, Miller and Universal Robots partners now make automation affordable for small fabrication shops. Newer systems from Path Robotics and Novarc use cameras and machine learning to find the seam, set parameters and adapt the weld without a programmer. For the welder, the shift is towards fixture setup, tending and quality checking of robot output, with manual welding concentrated on one-offs, repairs, pipe and field work.

Risk

Low-to-moderate transformation; repetitive production welds automate while skilled manual and field welding stay human.

Occupation-level measures place welders in the lowest official exposure tier, and the score is low because measured generative-AI exposure is low; the editorial adjustment reflects the robotic and cobot welding channel that text-usage measures cannot see. Repetitive, well-fixtured welds on consistent parts are the tasks that automate, and in production shops that is already well under way. Field welding, pipe and structural work, repairs, exotic materials and anything with variable fit-up remain manual because the environment and the parts vary too much for current robots. In a 7-15 year window, the welder's job in manufacturing increasingly means programming and tending cells and inspecting output, while construction, shipyard and maintenance welding changes far less.

Sector readiness

Established in Production, Minimal in the Field

Published adoption ratings for the occupation are medium, driven almost entirely by manufacturing. Automotive, heavy equipment and appliance plants have run robotic welding for decades and are now adding vision-guided and cobot systems; smaller fabricators are adopting cobots as prices fall and welders become harder to hire. Construction, pipeline, shipyard and repair welding remain overwhelmingly manual.

§ 02 POSITION

Where you stand

- i Be the welder who can run the robot cell and still pass the 6G pipe test, because shops need both and few people offer both.
- ii Certify in high-value processes and materials, such as TIG on stainless and aluminium, pipe, pressure vessels and structural codes, where manual skill commands a premium.
- iii Move towards inspection and quality roles, where a welder's eye for defects is applied to robot and human output alike.

§ 03 ACTIONS

6 POINTS

What this means for you

Concrete changes to how the work gets done, in the order you are likely to meet them.

- 01 **Learn the cobot.** Lincoln Cooper, Miller Copilot and UR-based cells are designed for welders, not engineers, to program. A day of training makes you the operator rather than the person displaced.
- 02 **Chase the hard tickets.** Pipe, structural and pressure certifications are the clearest route to work that stays manual and pays well.
- 03 **Think fixtures and fit-up.** Automation only works with consistent parts. Welders who understand fixturing and tolerance become essential to making cells productive.
- 04 **Own quality.** Learn to read weld inspection criteria and use the cameras and monitoring tools that cells produce; defect judgement is where experience still counts.
- 05 **Field work is the hedge.** Construction, maintenance, shipyard and repair welding are far from automation; keep a route into that work open.
- 06 **Use AI for the paperwork.** ChatGPT or Copilot can help draft weld procedure specifications, job records and training notes so you spend less time at the desk.

§ 04 CAUSES

6 DRIVERS

What is pushing this change

- 01 **Collaborative welding robots.** Cobot cells from Lincoln Electric, Miller and Universal Robots partners bring automation to small shops at a price a single welder's wage justifies.
- 02 **Vision-guided autonomous welding.** Path Robotics and similar systems use cameras and machine learning to locate seams and set parameters without manual programming, widening what robots can weld.
- 03 **Welder shortages.** Persistent shortages push fabricators towards automation while keeping demand and wages high for skilled manual welders.
- 04 **Weld monitoring and inspection technology.** Camera systems and data logging from Xiris and others record each weld and flag anomalies, changing how quality is checked.
- 05 **Offsite and modular fabrication.** Moving pipe spools and structural assemblies into shops, where robots can work, reduces the share of welding done in the field.
- 06 **Codes and certification.** Pressure, structural and pipeline codes require qualified welders and inspectors, slowing substitution in regulated work.

Impact by sector

The headline figure is an average. Where you work changes the picture.

Automotive and heavy equipment manufacturing	Most highly automated; welders here mainly program, tend and maintain cells and handle repairs.
Small fabrication shops	Cobots are arriving fast for repetitive parts; a welder who can run one becomes more valuable, not less.
Construction and structural steel	Field welding remains manual because of variable fit-up, positions and environments; automation is largely confined to shop-fabricated components.
Pipeline, shipbuilding and repair	Low automation; the work is varied and often in confined or outdoor settings, and certified manual welders remain essential.

Skills to build

The skills that keep the human part of this work valuable as the routine part is automated.

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| 01 | Robot and cobot operation. Setting up, teaching and adjusting a welding cell is the skill that keeps manufacturing welders employed; manufacturers offer short courses. |
| 02 | Advanced process certifications. TIG on stainless and aluminium, pipe and pressure-vessel codes mark out work that stays manual and well paid. |
| 03 | Blueprint and weld symbol reading. Interpreting drawings and procedures accurately underpins both manual and automated work. |
| 04 | Weld inspection and quality. Visual inspection and understanding of defect criteria apply to robot output as much as to your own, and lead to inspector roles. |
| 05 | Fixturing and fit-up. Consistent part preparation is what makes automation work; welders who understand it are valued by shops bringing in cells. |
| 06 | Adaptability across settings. Being able to move between shop and field work gives you options as automation advances in production. |

Tools in use

KINDS OF TOOL WORTH KNOWING

- 01**Novarc Spool Welding Robot.** Collaborative robot for pipe spool welding that an operator supervises rather than performs.
- 02**Weld monitoring cameras.** Systems such as Xiris weld cameras record and analyse the arc and pool in real time for quality control.

NAMED TOOLS ALREADY IN USE

Lincoln Electric Cooper cobot	VISIT
Collaborative welding system designed for welders to program by hand-guiding the torch.	
Miller Copilot	VISIT
Cobot welding cell that lets a welder set up and run repetitive welds without robot programming experience.	
Universal Robots welding kits	VISIT
UR cobot arms paired with welding packages from Vectis, Hirebotics and others, common in small fabrication shops.	
Path Robotics	VISIT
Autonomous welding system using cameras and machine learning to find seams and weld without manual programming.	

In practice

Ways people in this role are already using AI, and what they get from it.

Cobot in a small fab shop EXAMPLE 1	HOW	A welder fixtures a batch of brackets, hand-guides the cobot torch along the first part, then lets the cell weld the batch while they prepare the next job.
	GAIN	Several times the throughput on repetitive parts, with the welder freed for complex work.
Autonomous seam finding EXAMPLE 2	HOW	A vision-guided system scans each part, locates the joint and adjusts parameters, so variable parts can be welded without reprogramming.
	GAIN	Extends automation to lower-volume work that fixed robots could not handle.

Weld data logging EXAMPLE 3	HOW	Monitoring systems record parameters and images for every weld in a pressure-vessel job, flagging deviations for the welder and inspector.
	GAIN	Fewer rejected welds and a traceable record for code compliance.

§ 09 CONTEXT

How this role compares

Three neighbouring roles chosen to show the direction of travel.

Machinists and CNC Operators MORE EXPOSED	AI IMPACT	Automated tool-path generation and lights-out machining reduce manual programming and tending.
	WORK MOVES TO	Operators are shifting to multi-machine supervision, programming and quality.
Robotics Engineers DIFFERENT SKILLS, GROWING	AI IMPACT	AI accelerates design and programming while demand for people who build and integrate automation grows.
	WORK MOVES TO	Engineering, software and systems integration in a growing field.
Plumbers COMPLEMENTARY, LESS EXPOSED	AI IMPACT	AI assists with quoting and diagnostics but installation and repair remain hands-on.
	WORK MOVES TO	Licensed trade in varied settings where automation has little reach.

§ 10 VERDICT

Closing judgement

If you weld for a living, the thing to watch is not ChatGPT but the cobot arriving in the next bay. The measured generative-AI exposure for your trade is low and will stay that way, but repetitive production welding is being automated and that trend is clear. The welders who do well are the ones who can set up and program a cell, read a weld procedure, certify in the hard processes and positions, and take on the field and repair work that no robot can reach. Treat the machine as something you run rather than something you compete with.

Evidence and revisions

What the exposure figure rests on, what changed when it was last revised, and the published work cited for this role.

SCORE

21

WINDOW

7-15 years (unchanged)

The 5 October 2026 review held the score.

Exposure Index v2. Inputs: task applicability 15/100 (Microsoft AI applicability score 0.07 for Welders, cutters, solderers, and brazers); observed usage 0/100 (Anthropic observed exposure 0.00); official exposure tier 10/100 (BLS: low); labour-market trajectory not yet mapped for this occupation, so its weight was spread across the other inputs; published adoption rating 40/100 (medium adoption). Weighted base 14.7. Editorial adjustment +6: Robotic and cobot welding cells are standard in manufacturing; physical automation not seen by text-usage measures. Final score 21. New report: the window of 7-15 years is set from the score band.

HOW THE FIGURE IS BUILT (EXPOSURE INDEX V2)

Task applicability — Microsoft Research, AI applicability score	15 × 39%	5.8
Observed usage — Anthropic Economic Index, observed exposure	0 × 22%	0.0
Official exposure tier — US BLS AI-exposure category	10 × 22%	2.2
Labour-market trajectory — US BLS projected employment change 2025–35	not measured	—
Published adoption rating — This report’s adoption level	40 × 17%	6.7
Weighted base		14.7
Editorial adjustment: Robotic and cobot welding cells are standard in manufacturing; physical automation not seen by text-usage measures.		+6
Exposure score		21

MEASURES BEHIND THE SCORE

US Bureau of Labor Statistics · *Employment Projections 2025–35 and AI Exposure Categories* (27 August 2026)
AI-exposure tier: Low. Projected employment change not yet mapped for this occupation. Matched to Welders, cutters, solderers, and brazers.

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Microsoft Research · *Working with AI: Measuring the Applicability of Generative AI to Occupations* (10 July 2025)
AI applicability score 0.07 for SOC 51-4121; scaled to 15/100 as the task-applicability input.

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Anthropic · *Anthropic Economic Index report: Cadences* (26 June 2026)
Observed exposure 0.00 for SOC 51-4121; scaled to 0/100 as the observed-usage input.

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UK Department for Science, Innovation and Technology · *Assessment of AI capabilities and the impact on the UK labour market* (28 January 2026)

UK context: around 70% of UK workers are in occupations with tasks AI could perform or enhance, above the US average; a one-standard-deviation rise in exposure was associated with a 3.9% fall in UK job postings.

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<https://www.careerguard.ai/sources>

§ 12 APPENDIX

Method and sources

Each report was written from a large body of published research. The exposure score itself is computed, not written: it is the CareerGuard Exposure Index, a weighted average of occupation-level measures from the US Bureau of Labor Statistics (AI-exposure classification and 2025–35 projections), Microsoft Research (AI applicability scores) and Anthropic (observed exposure), together with the adoption rating published on the report. The organisations and publications below are the standing literature behind the narrative sections. Every source, with dates, licences and archived copies where we are permitted to hold them, is catalogued in the research library.

Exposure Index v2 (October 2026). Each input is scaled to 0–100 and weighted: task applicability 35% (Microsoft AI applicability score ÷ 0.5), observed usage 20% (Anthropic observed exposure ÷ 0.75), official exposure tier 20% (BLS very high = 100, high = 70, moderate = 40, low = 10), labour-market trajectory 10% ($50 - 2.5 \times \text{projected \% employment change}$), published adoption rating 15% (very high = 85, high = 70, medium-high = 55, medium = 40, low-medium = 25, low = 10). Inputs not measured for an occupation are dropped and the remaining weights renormalised. An editorial adjustment of at most ± 12 points is allowed only for automation channels the measures cannot see (robotics, self-service, machine vision, medical imaging, RPA/OCR, generative video) and is always logged with its reason. Scores are whole numbers, not rounded to five. The change window shifts one notch (a year at each end) per ten points of movement.

I GLOBAL AND MACROECONOMIC IMPACT OF AI ON WORK

World Economic Forum

The Future of Jobs Report series — Employer survey of expected job growth and decline, skill shifts and technology adoption (2020, 2023 and 2025 editions); *Artificial Intelligence and the Future of Entry-Level Work* (2026).

AI governance and transformation reports — Frameworks on ethical AI, talent strategy and industry transformation.

McKinsey Global Institute

AI, Automation and the Future of Work series — Research quantifying automation potential by task, sector and demographic, from "Jobs Lost, Jobs Gained" to "Agents, robots, and us" (2025).

Industry-specific reports — Financial services, healthcare, manufacturing and others.

PwC

Global AI Jobs Barometer — Annual analysis of job postings and productivity by AI exposure (2024–2026 editions).

Upskilling Hopes and Fears survey — Employee perceptions and readiness.

Microsoft Research and Anthropic

Working with AI (2025); *Anthropic Economic Index* (2025–2026) — Occupation-level usage data from Copilot and Claude conversations, the two observed-usage measures behind the 2026 revision.

Stanford Digital Economy Lab and Stanford HAI

Canaries in the Coal Mine? (2025–2026); AI Index Report (annual) — Payroll evidence on early-career employment in exposed occupations; annual measurement of AI capability, investment and adoption.

Deloitte

Human Capital Trends series — Workforce, talent and HR technology trends.

Tech Trends series — Emerging technologies and their business implications.

Accenture

Technology Vision series — Forward-looking analysis of emerging technology, with emphasis on AI.

Fjord Trends — Design, innovation and human experience in a digital world.

Boston Consulting Group

AI/ML insights and industry solutions — "The AI Revolution in the Workplace" and related research.

EY

AI and workforce reports — Adoption, talent strategy and ethics.

IBM Institute for Business Value

AI and automation studies — Business models, workforce evolution and leadership.

OECD

AI Policy Observatory — International data and policy on AI, labour markets and skills.

Employment Outlook — Labour-market trends including technological impact (2023–2026 editions).

International Labour Organization

Generative AI and Jobs: A Refined Global Index of Occupational Exposure (2025) — Task-level exposure gradients for every ISCO occupation; successor to the 2023 global index.

International Monetary Fund

Staff Discussion Notes on AI and work (2024, 2026) — Complementarity framing: where AI augments and where it substitutes.

UK Department for Science, Innovation and Technology

Assessment of AI capabilities and the impact on the UK labour market (2026) — UK occupational exposure and job-posting evidence.

Brookings Institution

AI and automation research — Economic and social implications, displacement and skills.

Yale Budget Lab and Goldman Sachs Research

Tracking the Impact of AI on the Labor Market; AI and the US labour market (2026) — Aggregate labour-market monitoring; macro displacement estimates.

Oxford University (Oxford Martin School)

The Future of Employment — Frey & Osborne and subsequent research on susceptibility to automation.

MIT Technology Review

AI & Work — Reporting on AI research and its implications for industries and jobs.

Gartner

Hype Cycle for Artificial Intelligence — Maturity and adoption of AI technologies.

Future of Work reports — Workplace models and talent strategy.

U.S. Bureau of Labor Statistics

Employment Projections 2025–35; AI Exposure Categories; Occupational Outlook Handbook — Ten-year employment projections and, from the 2025 cycle, an AI-exposure tier for every detailed occupation.

Indeed Hiring Lab

AI at Work Report (2025) and posting-market updates — Skill-level transformation estimates and job-posting trends by occupation.

II CORE AI AND MACHINE-LEARNING RESEARCH

OpenAI

Research papers, blog and API documentation — Large language models, generative AI, safety and societal impact.

Google DeepMind

Research papers and blog — Reinforcement learning, AI for science, AGI and ethics.

Meta AI

Research papers and blog — Large language models, computer vision, AI for social good.

Hugging Face

Transformers library and model hub — Open-source state-of-the-art NLP models.

TensorFlow and PyTorch

Documentation and community forums — Core frameworks illustrating practical capability.

arXiv

cs.AI, cs.LG, cs.CV, cs.CL — Pre-print research.

NeurIPS and ICML

Conference proceedings — Top-tier academic research.

ACM and IEEE

Journals and proceedings — ACM Computing Surveys; IEEE Transactions on AI.

Kaggle

Datasets and competition solutions — Applied machine learning on real-world problems.

The Alan Turing Institute

Research and reports — Responsible and applied AI.

III ETHICAL AND RESPONSIBLE AI DEPLOYMENT

NIST

AI Risk Management Framework — Voluntary framework for managing AI risk.

European Commission

AI Act — Risk-tiered legal framework for AI.

Ethics Guidelines for Trustworthy AI — Principles for responsible development.

Partnership on AI

Research and best practice — Responsible AI development.

AI Now Institute

Annual reports — Social implications: power, inequality, rights.

ACM FAccT

Proceedings — Fairness, accountability and transparency.

Data & Society

Publications — Social implications of data-centric technology.

WIPO

Conversation on IP and AI — Intellectual-property implications of AI.

IEEE Global Initiative on Ethics of AI/IS

Ethically Aligned Design — Recommendations for ethical AI design.

Center for AI and Digital Policy

Policy briefs — Accountable AI policy.

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