



SEPTEMBER 2026

THE STATE OF AMERICA'S SKILLED TRADES

A National Report

ALLIANCE FOR AMERICA'S SKILLED TRADES

Supported By

BlackRock

carhartt



Google

Research Leads



Jobs for
the Future



THE
burningglass
INSTITUTE

AT A GLANCE

America's skilled trades are foundational to the United States economy, and demand for this workforce is being reshaped by major investments, technological change, retirements, and shifting regional needs. But meeting that demand is not simply a matter of recruiting more people or creating more training seats.

The State of America's Skilled Trades report establishes a national benchmark for understanding and tracking where the workforce is strong, where it is under pressure, and what it will take to build capacity for the future. The report establishes a consistent definition of the skilled trades, tracks the forces shaping supply and demand across occupations and regions, and identifies where policy, programs, employers, labor, education, and investment can make the greatest difference.

AUTHORS

Molly Blankenship

Associate Vice President, JFF

Maria del Mar Cabiya

Director, JFF

Melissa MacGregor

Director, JFF

Carol Azeez

Senior Manager, JFF

Destiny Washington

Senior Manager, JFF

Ray Barbosa

Senior Analyst, JFF

Max Milder

Director, JFF

John Ladd

Senior Advisor, JFF

Myriam Sullivan

Associate Vice President, JFF

Sara Lamback

Associate Vice President, JFF

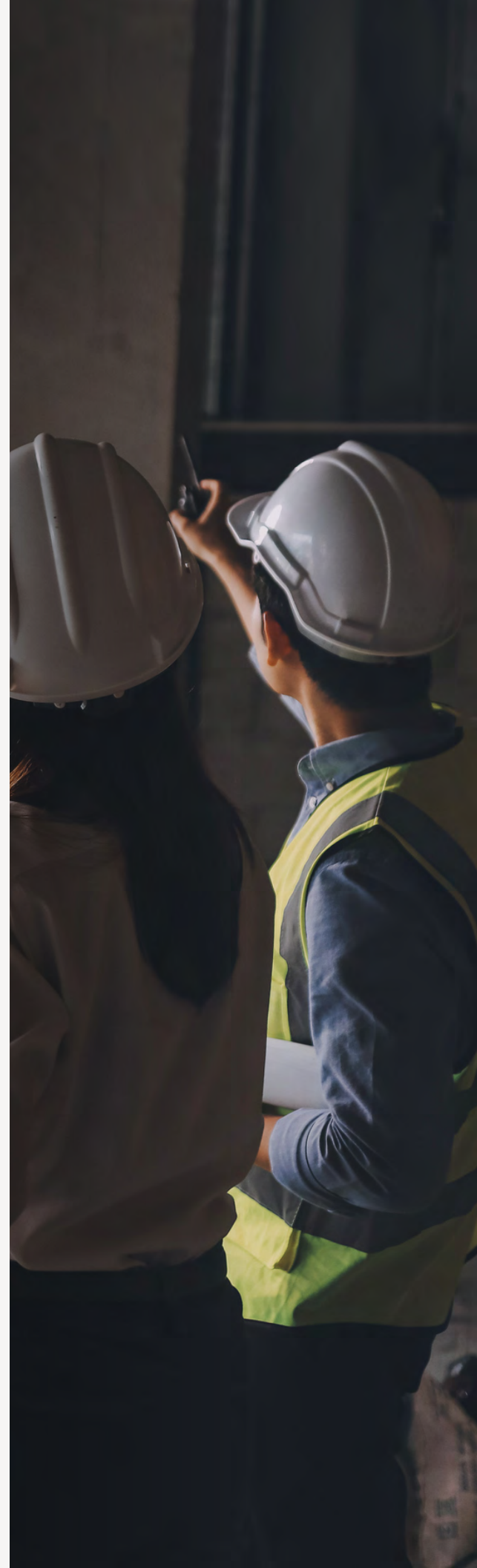


Table of Contents

Executive Summary	4
Foreword	6
Acknowledgments.....	8
Understanding America's Skilled Trades.....	9
Data Snapshot: The State of America's Skilled Trades.....	12
Key Findings.....	15
Occupational Profiles	22
Automotive Service Technicians and Mechanics	24
Carpenters	26
Electricians.....	28
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	30
Industrial Machinery Mechanics, Machinery Maintenance Workers, and Millwrights	32
Plumbers, Pipefitters, and Steamfitters.....	35
Priorities for Strengthening the Skilled Trades Workforce.....	37
Appendix A: Case Studies	44
Newark Electrical JATC	44
Louisiana Green Corps.....	46
Manufacturers Talent Institute (MTI).....	48
Wisconsin Technical College System (WTCS)	50
Helmets to Hardhats (H2H)	52
Cherry Creek Innovation Campus (CCIC).....	54
Appendix B: Methodology, Limitations, and Sources.....	56
Endnotes	61

EXECUTIVE SUMMARY

America's skilled trades workforce is foundational to the nation's economy. More than 18 million people work across skilled trades occupations, and skilled trades workers contributed an estimated \$3.8 trillion to U.S. GDP in 2025.¹ Approximately 1.7 million openings are projected each year through 2035 as employers respond both to job growth and to the need to replace workers who retire, change occupations, or otherwise leave the field.²

Meeting that demand is not simply a matter of recruiting more people or adding training seats. Workforce pressures differ substantially by occupation and place, workers enter the trades through different routes, and significant numbers of people who begin pathways do not ultimately build careers in the field. At the same time, new evidence suggests that respect for skilled trades careers is relatively strong even as guidance about how to enter them remains uneven.

The State of America's Skilled Trades establishes a national benchmark for understanding those dynamics. The report sets out a consistent definition of the skilled trades and examines workforce conditions through six interconnected indicators: navigation, entry, conversion from preparation into employment, retirement and replacement, talent movement, and growth. Together with the [America's Skilled Trades Dashboard](#), the analysis covers 124 occupations across states and regions. The goal is to give employers, labor organizations, education and workforce leaders, policymakers, philanthropists, and other partners a clearer basis for understanding where workforce pressure exists, what is driving it, and what kind of response it may require.

Key Findings

National skilled trades demand is substantial, and current preparation is not keeping pace with growth and replacement needs.

Of the 124 skilled trades occupations, 86 are projected to grow or hold steady, and more than 600,000 net new positions are projected through 2035.³ Employers will need to fill about 1.7 million openings each year.⁴ Nearly one-quarter of skilled trades workers are 55 or older, and across formal pathways that can be consistently measured, roughly 55 people are being prepared for every 100 workers needed nationally.

There is no single skilled trades shortage: Needs differ sharply by occupation and place.

Workforce pressure varies substantially across trades and states, reflecting differences in demand, available workers, training pathways, and local labor-market conditions. The right response therefore depends on the occupation, place, and specific source of the pressure.

Skilled trades workers enter through multiple pathways, but hands-on learning in the workplace is essential.

Postsecondary education, Registered Apprenticeship, employer-led on-the-job training, and direct entry all play important roles. In occupations representing roughly two-thirds of skilled trades employment, work itself is part of the typical route into or preparation for the trade.

Too many potential workers are lost between entering a pathway and building a career in the trades.

Among apprenticeship starters, 48 out of 100 complete and 29 enter a trade occupation within five years of leaving the apprenticeship; among people entering related postsecondary programs, 48 out of 100 complete and 34 go on to work in a skilled trade.⁵ Outcomes vary substantially across programs, showing that attrition is not inevitable.

Perception of the trades is positive, but information and navigation gaps remain.

Eighty-one percent of parents and 71% of teens say they would be proud if they or their teen went to trade school. Ninety-five percent of counselors agree trade school is valuable and a credible post high school option. Yet only 54% often recommend vocational or trade school and only 28% often recommend apprenticeship, pointing to an opportunity to help interested students and families better understand specific careers, pathways, and next steps.⁶

Taken together, these findings point to four priorities for action:



Focus on training program quality and outcomes.



Strengthen and connect the systems that prepare people for skilled trades careers.



Improve career exposure, guidance, and navigation into the skilled trades.



Plan workforce investment around the source, scale, timing, and duration of demand.

The central implication is clear: strengthening the skilled trades workforce requires more than growing the pipeline; it requires making the pathways, systems, guidance, and investments around that workforce work better.

FOREWORD

By Joseph B. Fuller

Professor, Harvard Business School, and Faculty Co-director of the Project on Workforce, Harvard University

The United States has entered a critical chapter for its skilled trades workforce. New investments in infrastructure, advanced manufacturing, energy, transportation, and data centers suggest the demand for skilled trades talent will rise materially. At the same time, experienced workers are retiring, and technologies are reshaping jobs and the skills required to perform them. Those forces are converging faster than our education and workforce systems have historically been able to adapt. Inaction carries significant risks, not only in economic growth lost to delayed projects but also in missed career opportunities for Americans.

This report comes at an important time, bringing clarity to an occupational landscape that is often treated as a monolith but varies significantly by field and region. The skilled trades do not have a single talent pipeline nor do they face a single set of challenges. Recognizing those differences is an important step in driving action and directing resources where they can be most effective—a responsibility employers, educators, intermediaries, policymakers, and philanthropists must share.

Employers are central to the pathways that lead to skilled trades jobs. They define and communicate skill requirements, set hiring needs, build workplace learning opportunities, and provide pathways to employment. They must make concerted efforts to improve signals and strengthen partnerships with education and training providers. Educators, in turn, must expand their guidance and training capacity while building deeper connections with industry. Otherwise, they risk aspiring skilled tradespeople struggling to enter the field, completing training without a clear plan, or abandoning a promising career path.

Our recent Project on Workforce research, *Pivots Without Pathways: Career Navigation in a Fragmented Labor Market*, examined the disconnect between education and employment and its consequences for learners and workers. Too many individuals make consequential career decisions with poor labor market information and limited guidance, resulting in missed job prospects, wasted time, and repeated career transitions that stunt advancement. Many find it difficult to answer even basic questions—from available training programs to skills requirements and average earnings—about jobs in the skilled trades. The skilled trades gap will only worsen if employers, educators, and other stakeholders fail to address these shortcomings.

Today's workforce pressures present a generational opportunity to make skilled trades pathways more navigable and responsive to both business and learners' needs. This report serves as a useful guide to where additional resources are needed, what promising practices deserve further examination, where additional innovation is required, and how progress can be measured going forward. It provides a timely foundation for continued research, investment, and partnership.

Bright spots already exist. Forward-thinking employers are sharing information on wages and advancement opportunities, providing work-based learning and mentorship, guaranteeing interviews, reserving openings for qualified completers, and improving job quality. Education and training providers are building pathways that integrate meaningful experiential learning, industry-recognized credentials, wraparound support, and transferable skills training. The opportunity exists now to build on these examples and catalyze broader collective action.

We cannot afford to miss this moment. The decisions we make now will shape the future of American infrastructure and determine who benefits from future investments. Through sustained collaboration, we can connect more Americans to rewarding careers, strengthen the nation's economic competitiveness, and help communities thrive.



ACKNOWLEDGMENTS

The development of The State of America's Skilled Trades: A National Report was informed by the experience and expertise of more than 200 stakeholders across the skilled trades ecosystem. Jobs for the Future (JFF) engaged employers, labor unions and labor-management partnerships, workforce and community-based organizations, training providers, K-12 and higher education institutions, apprenticeship leaders, industry associations, philanthropy, and local, state, and federal governments.

We are grateful to these partners and practitioners for sharing the insights that helped ground this report in the realities of skilled trades labor markets, training systems, and career pathways across occupations and regions.

We also thank the founding members of Alliance for America's Skilled Trades—BlackRock, Carhartt, Ford Motor Company, and Google—for their leadership,

collaboration, and investment in advancing a stronger and more responsive skilled trades workforce ecosystem.

Their perspectives complement labor market research and analysis led by the Burning Glass Institute, bringing together quantitative data and field expertise to deepen our understanding of workforce supply, demand, job quality, and opportunity.

We are grateful to the Harvard Project on Workforce for its collaboration, expertise, and thoughtful contributions throughout the development of this report.

We also thank the Ad Council Research Institute for providing its new primary research illuminating new insights into what shapes interest and action in a career in the trades among young people, parents, and guidance counselors.

About Alliance for America's Skilled Trades

Alliance for America's Skilled Trades is a coalition of leading American companies committed to closing the nation's skilled trades gap by expanding access to training, apprenticeships, and meaningful career pathways.

About Jobs for the Future

Jobs for the Future (JFF) transforms U.S. education and workforce systems to drive economic success for people, businesses, and communities. We do this by designing solutions, scaling best practices, influencing policy and action, and investing in innovation. www.jff.org

About Burning Glass Institute

The Burning Glass Institute believes everyone deserves meaningful work and the chance to move up. As an independent data laboratory, we generate novel datasets, build the models and benchmarks that reveal what actually drives mobility, and work directly with employers, educators, and communities to turn those findings into practice. burningglassinstitute.org



SECTION 01

UNDERSTANDING AMERICA'S SKILLED TRADES

A Moment of Challenge and Opportunity

More than 18 million people work in skilled trades occupations today, building, operating, maintaining, and repairing the physical systems on which businesses, communities, and households depend. In 2025, skilled trades workers contributed an estimated \$3.8 trillion to U.S. GDP, about 12% of total economic output.^{7 8}

Several forces are reshaping both demand for skilled trades workers and how those workers are prepared. Historic investments in infrastructure, advanced manufacturing, energy, housing, transportation, semiconductors, data centers, and other areas are creating substantial—and often geographically concentrated—demand. At the same time, an aging workforce is increasing replacement needs while also reducing the pool of experienced journeyworkers, supervisors, mentors, and instructors who help prepare the next generation. Technology is changing the tools, equipment, tasks, and skills many occupations require while also creating new demand for the workers who build, install, maintain, and repair technology-intensive infrastructure.

Together, job growth and the need to replace workers who retire or leave the field are projected to generate approximately 1.7 million skilled trades openings each year through 2035.⁹ Meeting this demand will require reaching more potential workers and helping them build lasting careers in the skilled trades. Women currently account for 10.5% of the skilled trades workforce, including 3.6% of construction and extraction workers and 4.0% of installation, maintenance, and repair workers. Racial and ethnic representation also varies across occupations: Black, non-Hispanic workers account for 8.7% of the skilled trades workforce overall and 5.2% in construction and extraction, while Hispanic workers of any race represent 25% overall and 33.3% in construction and extraction. These figures reflect the contributions of today's workforce and opportunities to broaden participation. Connecting more people across demographic groups to training and lasting careers can help employers draw on a larger pool of talent while meeting the needs of industries and communities.

But the skilled trades challenge is not simply a shortage of workers. In many occupations and regions, the constraint lies in the system that develops and supports them: whether employers, apprenticeship programs, training providers, instructors, and intermediaries can prepare and connect enough people at the pace demand requires. And the constraint is not the same everywhere. Some trades are growing rapidly; others face large replacement

What Are the Skilled Trades?

Skilled trades workers build, install, operate, maintain, repair, fabricate, or extract the physical materials, products, equipment, systems, and infrastructure the U.S. economy relies on. Across these occupations, two characteristics are common: the work is hands-on and physical, and reaching competency requires meaningful training and preparation.

That preparation may come through Registered Apprenticeship, career and technical education, postsecondary training, on-the-job learning, certification, or some combination of these approaches.

Using these criteria, the report defines 124 occupations spanning construction, installation, maintenance and repair, production, and extraction. This shared definition makes it possible to examine workforce conditions consistently across occupations, states, and over time.

needs. Some regions are absorbing major new investment; elsewhere, the pressure may come from retirement, worker relocation, limited training capacity, or losses between preparation and employment.

That is the problem this report is designed to make visible. The State of America's Skilled Trades and the companion [America's Skilled Trades Dashboard](#) provide a common framework for diagnosing workforce conditions across 124 occupations and across states. Together, they examine six interconnected indicators—navigation, entry, progression from preparation into employment, retirement and replacement, talent movement, and growth—to show not only where workforce pressure exists but also where in the system it is occurring and what kind of response it may require.

By separating these dynamics, the report provides employers, labor organizations, education and workforce leaders, policymakers, and funders with a stronger basis for deciding where to act, what to invest in, and which problems they are actually trying to solve.



Photo Credit: Ford Motor Company



SECTION 02

DATA SNAPSHOT: THE STATE OF AMERICA'S SKILLED TRADES

The State of America's Skilled Trades report and its companion [America's Skilled Trades Dashboard](#) track six interconnected workforce indicators that provide a consistent framework for understanding the health of the skilled trades workforce across occupations and places:

Navigation

Who sees the skilled trades as a viable career option, and what guidance and information shape those choices?

Entry

Are people able to access viable pathways into skilled trades employment?

Conversion

Does preparation translate into completion, related employment, and sustained work in the trade?

Retirement and replacement

Can employers replace both the workers and the expertise leaving the field?

Talent movement

Where is existing skilled trades capacity moving across regions?

Growth

Where and how quickly is additional workforce capacity needed?

The snapshot that follows brings the strongest national evidence across these six indicators into one view. Together, the measures establish a baseline for understanding the skilled trades workforce today and for the findings that follow, which examine what these patterns reveal about where workforce pressure is emerging, what is driving it, and why the answer differs across occupations and places.

Navigation	Eighty-one percent of parents say they would be proud if their child went to trade school; 71% of teens say the same. ¹⁰	Ninety-five percent of school counselors describe trade school as a valuable and credible option, but 54% say they often recommend vocational or trade school and only 28% say they often recommend apprenticeship. ¹¹
Entry	Thirty-five percent of skilled trades employment is in occupations where a postsecondary credential is the typical route into the occupation; 27% is in occupations where Registered Apprenticeship is typical. ¹²	Twenty-six percent of skilled trades employment is in occupations where employer-led on-the-job training is typical, and 13% is in open-entry occupations where substantial occupational preparation is not required before hire. ¹³

Conversion	Of every 100 people who begin a skilled trades apprenticeship, 48 complete the program, and 29 enter a trade occupation within five years of leaving the apprenticeship. ¹⁴	Of every 100 people who begin a related postsecondary program, 48 complete and 34 go on to work in a skilled trade. ¹⁵
Retirement and replacement	Twenty-four percent of skilled trades workers are 55 or older. Only 11% are under 25. ¹⁶	Nine trades are already at least one-third age 55 or older, led by tool and die makers at 48%. ¹⁷
Talent Movement	Texas and North Carolina each receive about 5,000 more skilled trades workers from other states each year than they send, while roughly 9,000 more move from New York than move to it. ¹⁸	About 5,000 workers move from California to Texas annually—the largest single interstate flow in the analysis. ¹⁹
Growth	The trades will need to fill about 1.7 million job openings a year through 2035. ²⁰	Eighty-six of the 124 trades are expected to grow or hold steady through 2035.





Photo Credit: Ford Motor Company

SECTION 03

KEY FINDINGS

Taken together, these six indicators point to five larger findings about the skilled trades workforce. They show why national demand cannot be reduced to a single shortage number, and why expanding the workforce requires understanding where the constraint lies, how workers are developed, and what happens between initial interest and a sustained career in the trade.

National skilled trades demand is substantial, and current preparation is not keeping pace with growth and replacement needs.

The scale of skilled trades demand is easy to underestimate if we look only at job growth. More than 600,000 net new skilled trades positions are projected through 2035, but employers will need to fill approximately 1.7 million openings each year over the same period.²¹ The difference reflects the continuing need to replace workers who retire, change occupations, or otherwise leave the field. Even trades with little or declining net employment growth can therefore generate substantial numbers of openings.

That replacement challenge is compounded by the age of the workforce. Nearly one-quarter of skilled trades workers are age 55 or older, while only 11% are under 25.²² As experienced workers retire, employers and training systems risk losing not only workers but also the journeymen, supervisors, mentors, and instructors who help prepare their successors. Retirement can therefore reduce workforce capacity in two ways at once: by increasing the number of workers who need to be replaced and by shrinking the pool of experienced people available to help develop the next generation.

At the same time, measurable preparation is not keeping pace with projected need. Across formal training pathways that can be consistently counted, roughly 55 people are being prepared for every 100 workers needed nationally.²³ That measure does not capture every route into the skilled trades, particularly occupations in which workers are hired and developed directly by employers. But even with that limitation, it points to a substantial mismatch between the scale of projected workforce demand and the number of workers currently being prepared through established, measurable pathways.

There is no single skilled trades shortage: Needs differ sharply by occupation and place.

The skilled trades workforce is also easy to misunderstand when viewed only through national figures. The national gap does not translate into the same workforce pressure—or solutions—across occupations or places.

Among the six occupations profiled in this report, shortage pressure varies substantially. Each occupation is scored against all 523 occupations on the national Labor Shortage Index; a higher percentile means greater shortage pressure. Automotive service technicians and mechanics rank at the 54th percentile nationally, while electricians rank at the 85th percentile, and industrial machinery mechanics, machinery maintenance workers, and millwrights rank at the 98th percentile. Carpenters; heating, ventilation, and air conditioning (HVAC) mechanics and installers; and plumbers, pipefitters, and steamfitters fall between the 73rd and 75th percentiles.²⁴

Figure 1. Shortage pressures across the six featured occupations

Labor Shortage Index, national percentile among 523 occupations scored

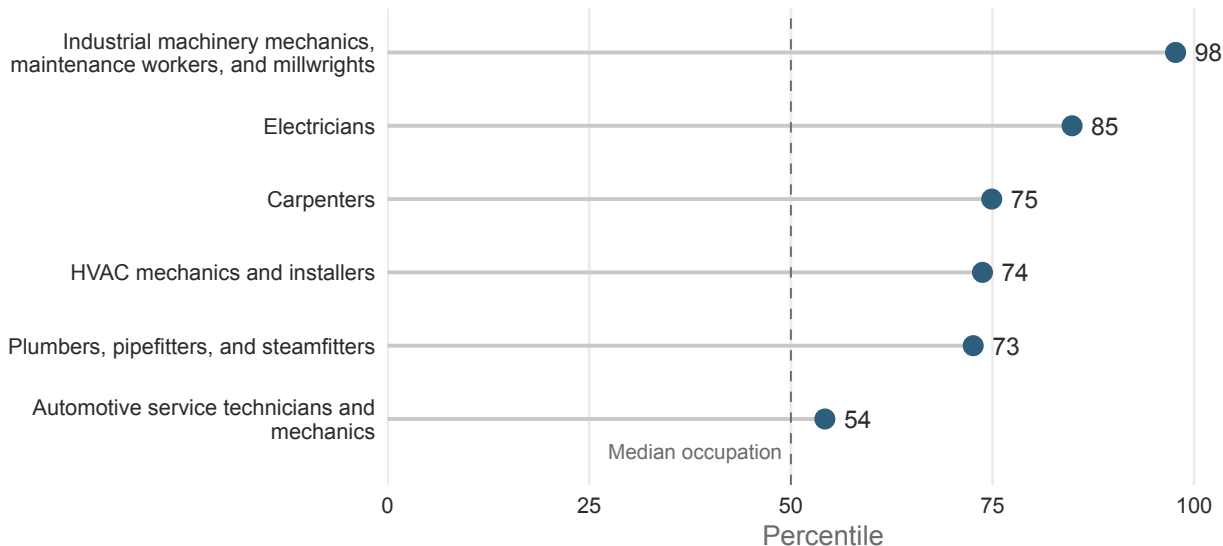


Figure note: The Labor Shortage Index measures structural pressure on filling an occupation based on the following indicators: workforce aging, new entrants, part-time and telework shares, schooling, licensing, exposure to artificial intelligence, and projected employment growth. It is not a count of unfilled jobs; no vacancy or wage data enter it. Percentiles show how that pressure compares with the 523 occupations scored nationally, skilled trades and other occupations alike. A 99th-percentile score means greater shortage pressure than 99% of occupations scored, not that 99% of jobs are unfilled. The industrial machinery profile combines three occupations (industrial machinery mechanics including refractory materials repairers; maintenance workers, machinery; and millwrights) into one.^{25 26 27 28}

Openings and job growth alone do not explain those differences. Automotive service technicians and mechanics are projected to generate approximately 66,000 openings a year and grow 5.0% yet rank near the middle of occupations nationally for shortage pressure. Industrial machinery mechanics and related occupations generate fewer annual openings—approximately 52,000—but are projected to grow 14.4% and rank in the 98th percentile.²⁹ The pressure to fill jobs therefore reflects the relationship between demand and the workforce available to meet it, not simply the number of jobs being created.

The picture also changes significantly by place. Industrial machinery mechanics rank in the 100th percentile for shortage pressure in Ohio and Rhode Island, compared with the 60th percentile in Kentucky. Among plumbers, pipefitters, and steamfitters, shortage pressure ranges from the 90th percentile in Rhode Island to the 35th percentile in North Dakota.³⁰

Talent movement can further reshape those local conditions. Texas and North Carolina each receive roughly 5,000 more skilled trades workers from other states than they send each year, while New York sends roughly 9,000 more than it receives. About 5,000 workers move from California to Texas annually, the largest single interstate flow in the country.³¹

The national skilled trades gap is therefore made up of distinct occupational and regional workforce challenges. Understanding where and how to respond requires looking beyond national demand to the particular occupation, place, and source of workforce pressure.

Skilled trades workers enter through multiple pathways, but hands-on learning in the workplace is essential.

Across the skilled trades occupations with available entry-route data, 35% of employment is in occupations where a postsecondary credential—such as a trade-aligned certificate or associate’s degree—is the typical route into the occupation, 27% where Registered Apprenticeship is typical, 26% where workers typically enter through employer-led on-the-job training, and 13% in open-entry occupations, where workers can begin without substantial occupational preparation before hire.³² The distribution reveals how deeply employment itself is embedded in skilled trades preparation.

Figure 2. Typical routes into skilled trades employment

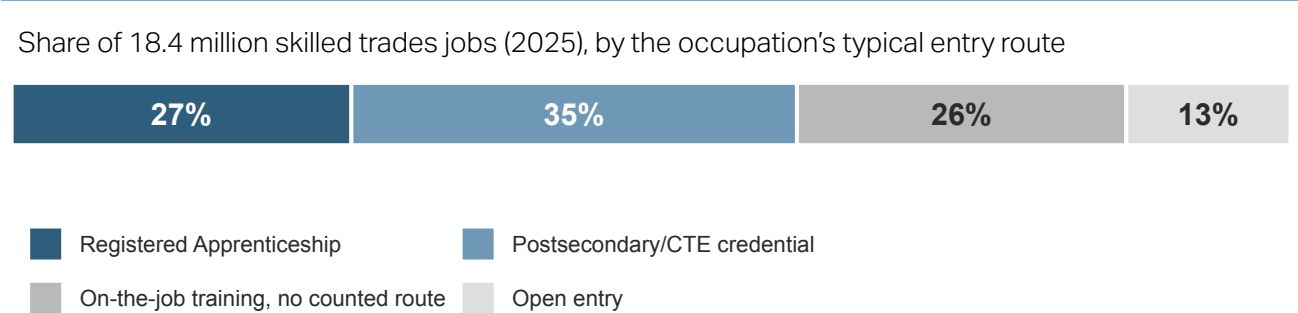


Figure note: Shares represent 2025 employment in occupations for which each route is the typical way into the occupation, under BGI’s classification of the 124 skilled trades occupations; they do not represent the share of individual workers who personally entered through each route. An occupation’s route is assigned by comparing counted training (credentials of at least one year and Registered Apprenticeship completions) with the occupation’s openings. On-the-job training, no counted route, means the national training sources used here count no training route into the occupation; workers typically are hired and trained on the job. Open entry means substantial occupational preparation is not required before hire, although workers may still receive training after they begin. Percentages are rounded and may not sum to 100.

That does not diminish the importance of education and training outside the workplace. At the secondary level, career and technical education (CTE) can provide an important early on-ramp into the trades, giving students exposure to skilled occupations while building foundational academic and technical skills and connecting them to apprenticeship, postsecondary education, and employment. Postsecondary programs provide critical occupational preparation in many trades, while pre-apprenticeship and other bridge programs can help people build skills and connect to further training or employment. Across routes, workers ultimately need opportunities to apply knowledge, use current tools and equipment, and develop competency in real working environments. The strongest pathways connect preparation to work rather than treating the two as separate stages.

Employers Are Part of the Training Infrastructure

Because so much skilled trades preparation occurs through work, employers are not simply consumers of skilled trades talent; they also help develop it. Doing that well requires experienced workers who can supervise and mentor learners, current tools and equipment, sufficient work through which learners can develop a range of competencies, and the time and resources to structure learning while meeting operational demands.

That capacity can be especially difficult for smaller and mid-sized employers to build alone. Workforce intermediaries, industry partnerships, apprenticeship sponsors, and other shared models can coordinate instruction and workplace learning, connect employers to participants, manage administrative requirements, and spread training infrastructure across multiple businesses.

LESSONS FROM THE FIELD

Employers As Co-Producers of Talent

At Cherry Creek Innovation Campus, a high school career and technical education campus, employers help design curricula, provide current equipment and technical expertise, and create work-based learning opportunities. By exposing students to skilled careers early and connecting classroom learning to real industry needs, these partnerships help expand the pool of young people who can see—and pursue—a path into the trades.

[Learn more about the program ->](#)

Unions and Labor-Management Partnerships Are Major Training Institutions

Organized labor and joint labor-management organizations play a particularly significant workforce-development role in construction and other unionized trades. Their role extends beyond worker representation: unions and signatory employers jointly operate apprenticeship programs, maintain training centers and equipment, provide technical instruction, establish occupational standards, and connect apprentices to paid, structured work experience. These systems also provide continuing education for experienced workers as technologies, codes, safety requirements, and industry practices change.

The scale of that infrastructure is substantial. North America's Building Trades Unions reports that its affiliated organizations operate approximately 1,900 training centers and invest more than \$3 billion annually in training.³³ In fiscal year 2025, union programs accounted for approximately 69% of active construction apprentices.³⁴ Union

LESSONS FROM THE FIELD

Expand Access to the Opportunities Union Apprenticeships Create

Helmets to Hardhats connects veterans and transitioning service members to the training expertise and career opportunities built by unions and their employer partners. Targeted outreach and personalized navigation help participants enter these established pathways to skilled careers.

[Learn more about the program ->](#)

representation and training structures vary across occupations and regions, but these figures underscore the central role labor-management systems play in developing the construction trades workforce.

The skilled trades workforce is therefore developed through an ecosystem, not a single pipeline. Education and training providers build occupational knowledge and skills; employers provide the settings in which much of that learning is applied and developed; organized labor and labor-management partnerships provide substantial apprenticeship and training infrastructure; and intermediaries help connect and coordinate those pieces. Building more skilled workers requires strengthening that full system, not simply adding more training seats.

Too many potential workers are lost between entering a pathway and building a career in the trades.

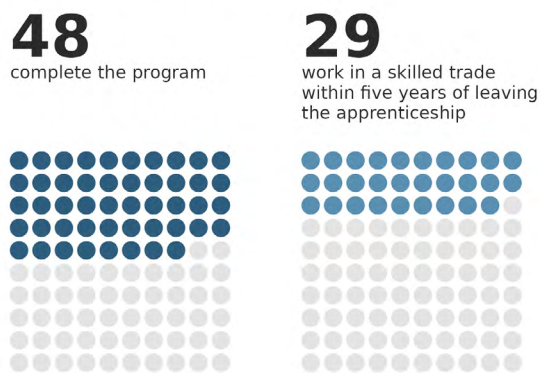
Getting people into skilled trades pathways is only the beginning. New longitudinal analyses show substantial opportunity to help more people move successfully from entering a pathway to completing their preparation and building a career in the trades.

Among people who begin a skilled trades apprenticeship, 48 out of every 100 complete the program, and 29 enter a trade occupation within five years of leaving the apprenticeship. Among people who begin a related postsecondary program, 48 out of every 100 complete, and 34 go on to work in a skilled trade. Across both pathways, the data point to substantial opportunity to improve progression from entry to completion and related employment.³⁵

Figure 3. From pathway entry to skilled employment

Of every 100 people who start each pathway

Registered Apprenticeship



Postsecondary education

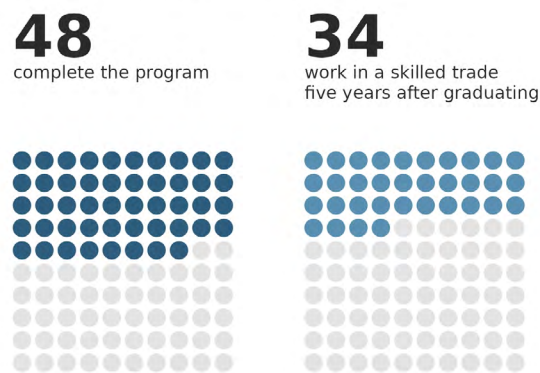


Figure note: Apprenticeship and postsecondary outcomes come from different data sources and methodologies and should not be compared directly. Each sequence illustrates the stages of that pathway from entry through completion and related employment; within each pathway, the stages are measured on different groups of people. For Registered Apprenticeship, the completion rate is completions divided by completions plus cancellations among apprentices scheduled to finish in fiscal years 2021–2024;³⁶ the employment figure follows a separate cohort of apprentices who started in 2016–2022, completers and non-completers alike, and counts those working in any skilled trade within five years of leaving the apprenticeship.³⁷ For postsecondary education, the completion rate covers trade programs at all providers;³⁸ the employment figure multiplies it by the share of sub-baccalaureate trade graduates working in a skilled trade five years after graduating (69.7%, among graduates observed working).³⁹

Outcomes vary substantially across occupations and programs, with some apprenticeship programs reporting completion rates above 90%.⁴⁰ That variation shows that attrition is not inevitable and suggests that stronger program quality can help more participants persist, complete, and move into skilled employment.

The workforce opportunity is therefore not limited to recruiting more people into skilled trades pathways. Helping more of the people who already enter complete their preparation and move into related, sustained employment can itself expand the supply of skilled workers. Measuring success through completion, related employment, retention, and advancement—not enrollment alone—provides a clearer picture of whether pathways are actually preparing people for lasting careers in the trades.

Perception of the trades is positive, but information and navigation gaps remain.

For years, efforts to expand the skilled trades workforce have focused in part on overcoming stigma and changing perceptions of these careers. New national survey research from the Ad Council Research Institute suggests that attitudes may be further along than commonly assumed. Eighty-one percent of parents say they would be proud if their child went to trade school, and 71% of teens say the same. Among school counselors, 95% describe trade school as a valuable and credible option.⁴¹

But positive perceptions are not consistently translating into navigation. Eighty-eight percent of high school counselors say they often recommend a four-year degree, compared with 54% who often recommend trade school and just 28% who often recommend apprenticeship. And 83% of school counselors say that trade school options are not presented to students as often as they should be.⁴²

The perception challenge is therefore changing. Longstanding stigma has not disappeared, but the data suggest the larger opportunity may now be turning growing respect for the trades into greater exposure and clearer navigation. Students and families need to understand not only that skilled trades careers can be valuable but also what occupations are available, how different pathways work, what preparation they require, and where those pathways can lead.

The opportunity is no longer simply to convince people that the trades are worthwhile. It is to help more people who are already open to these careers see and navigate a viable path into them.





SECTION 04

OCCUPATIONAL PROFILES

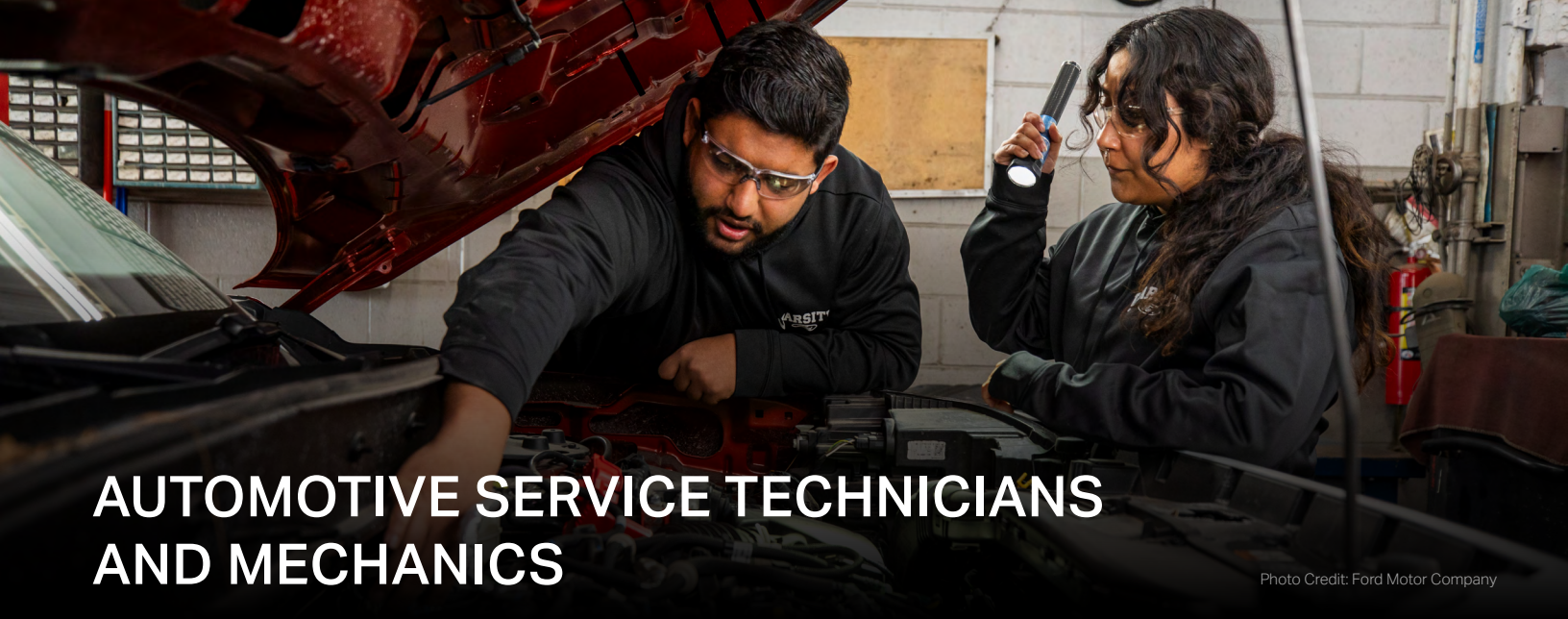
The following six profiles examine how demand, training pathways, and workforce pressures differ across skilled trades occupations. Selected to reflect a range of industries, training models, and labor-market conditions, they illustrate why strengthening the skilled trades requires more than a single national response.

The profiles cover automotive service technicians and mechanics; carpenters; electricians; heating, air conditioning, and refrigeration mechanics and installers; industrial machinery mechanics, machinery maintenance workers, and millwrights; and plumbers, pipefitters, and steamfitters. Where related occupations are analyzed together, the profiles distinguish important differences in the work, demand trends, and pathways into the field.

Each profile looks at what is driving demand, how workers enter and advance, and where the pressure lies. Together, they show how the constraints facing one occupation can look very different from those facing another—from keeping incumbent automotive technicians current as vehicle technology changes to sustaining paid apprenticeship experience in carpentry to expanding training alongside concentrated demand for electricians.

The profiles are illustrative rather than exhaustive. The [America's Skilled Trades Dashboard](#) provides additional national and state-level information on these and other occupations, allowing readers to examine employment, training pathways, projected demand, and workforce conditions in greater detail.





AUTOMOTIVE SERVICE TECHNICIANS AND MECHANICS

Photo Credit: Ford Motor Company

About the Occupation

Automotive service technicians and mechanics inspect, maintain, diagnose, and repair cars and light trucks. They work in dealerships, independent shops, service chains, and fleet operations. Increasingly, mechanical repair intersects with electronic diagnostics, advanced safety systems, and hybrid and electric vehicle technologies.

Drivers of Demand

Automotive repair demand is anchored in the large number of vehicles already on the road. What is changing more quickly is the technical content of the work.

Aging vehicles

As owners keep vehicles longer, technicians maintain and repair systems spanning multiple generations of vehicle technology.

Electronic and advanced safety systems

Cameras, radars, sensors, and other electronic systems have added diagnostic and calibration work to repairs that were once primarily mechanical. Even routine work such as windshield replacement or wheel alignment can now require system calibration.

Electrification

Battery-electric, plug-in hybrid, and conventional hybrid vehicles account for about 21.4 million of roughly 294 million registered light-duty vehicles.⁴³ As they become a larger share of the fleet, battery and high-voltage service is becoming a more routine part of automotive repair.

How Workers Enter and Advance

 Primary pathway	 Program length	 Typical preparation
Postsecondary automotive technology training followed by workplace learning is the predominant route; Registered Apprenticeship and direct employer training provide additional pathways.	Varies by certificate, associate's degree, or apprenticeship, with specialization continuing after entry.	High school education, with automotive CTE, electronics, and mathematics providing useful preparation.
 Training model	 Core skills	 Credentials
Classroom and laboratory instruction combined with supervised shop experience.	Mechanical repair, computerized diagnostics, routine care and maintenance, familiarity with electronic systems and sensors, and customer-service skills.	National Institute for Automotive Service Excellence (ASE) certifications provide a stackable path from entry-level preparation through professional and advanced specialties, including diagnostics, hybrid and electric vehicles, and advanced driver-assistance systems. Manufacturer-sponsored programs provide additional brand-specific training.

Entry pathways are broadly available. Postsecondary automotive programs operate in all 50 states, secondary CTE in 47, and Registered Apprenticeship in 42.⁴⁴

Where the Pressure Is

Entry does not appear to be the occupation's primary constraint. Workers under 25 make up 15.5% of automotive technicians, compared with 11.0% across the skilled trades overall.⁴⁵ The more significant challenge comes after entry, as the technology technicians service continues to change.

Certification is largely voluntary, and about one in five technicians holds a certification or license. Technicians in smaller shops may develop deep expertise in particular repairs or vehicle brands without regular exposure to newer systems. Moving into areas such as EV diagnostics or advanced driver-assistance systems requires current equipment, instruction, and supervised practice that individual shops may struggle to provide on their own.

Keeping pace with that change requires continued access to current equipment, instruction, and supervised practice after entry, not just strong initial preparation.



CARPENTERS

About the Occupation

Carpenters construct, install, and repair building frameworks and related structures. Their work includes framing, concrete forms, cabinetry, and interior finishing, with workers often specializing in structural or finish work.

Drivers of Demand

Carpentry is especially sensitive to the construction cycle because employment rises and falls with the pace of building activity. Changes in the volume and mix of construction therefore affect not only how many carpenters are needed but also which carpentry skills are in demand.

Residential construction

Single-family permitting fell 7.4% nationally in 2025, while carpenter employment stood at about 670,000—roughly 64,000 below its 2019 level.⁴⁶ Even so, employment is projected to grow about 3.9% over the coming decade, pointing to a market that is cyclical rather than uniformly expanding or contracting.

Shifts in the construction mix

Multifamily permitting rose 5.6% nationally in 2025 even as single-family permitting declined.⁴⁷ A shift between single-family and multifamily construction can also change the mix of framing, formwork, and finishing skills employers need.

Rebuilding and disaster recovery

Major recovery efforts can create sharp, geographically concentrated demand for framing and finish work that does not follow the normal permitting cycle. Timing depends on factors such as insurance, funding, permitting, and site readiness.

How Workers Enter and Advance

 Primary pathways	 Program length	 Typical preparation
Registered Apprenticeship and employer-based on-the-job training are the dominant routes.	Many union apprenticeships last four years, though requirements vary by sponsor and specialty.	A high school diploma or equivalent, with mathematics, CTE, pre-apprenticeship, or construction laborer/helper experience providing useful preparation.
 Training model	 Core skills	 Credentials
Paid, supervised jobsite learning combined with technical instruction in apprenticeship.	Measurement, blueprint reading, materials, construction methods, and safety.	Apprenticeship completion and specialty certifications support advancement. Carpentry itself is rarely licensed; only a small number of states license the occupation.

Entry pathways are broadly available. Registered Apprenticeship and secondary CTE operate in nearly all states, while postsecondary programs are available in 41.⁴⁸ The United Brotherhood of Carpenters supports a national training network through the Carpenters International Training Fund, while nonunion contractors and contractor associations provide additional routes into the occupation.

Where the Pressure Is

For carpenters, the issue is not simply whether training pathways exist. Apprenticeship depends on access to enough paid work, over enough time, and across a broad enough range of tasks to develop full occupational competency.

Weather, project schedules, and delays can interrupt the jobsite hours apprentices need to progress, reducing earnings and slowing completion at the same time. A long assignment on a single project can create the opposite problem: plenty of hours but repeated experience in a narrow set of tasks rather than exposure to the full range of competencies an apprentice needs to develop.

The age profile adds another pressure. Workers under 25 make up 10.5% of carpenters, slightly below the skilled trades benchmark, while 22.4% are 55 or older.⁴⁹ At the same time, the occupation's 6.5% annual separation rate is lower than the 8.4% skilled trades median, suggesting that unusually high turnover among existing workers is not the central issue.⁵⁰

For carpentry, then, the continuity and quality of paid work are part of the training system itself. Coordination across sponsors and contractors can help apprentices keep accumulating hours and develop a broader range of competencies as individual projects start, slow, and end.



ELECTRICIANS

About the Occupation

Electricians install, maintain, and repair the electrical systems that power homes, businesses, industrial facilities, and infrastructure. Residential, commercial, industrial, and utility work share a technical foundation but require specialized experience with different equipment, systems, and safety requirements.

Drivers of Demand

Electricians serve a broad base of construction, maintenance, and repair needs, but much of the new demand is increasingly tied to large capital projects concentrated in particular places and time periods.

Data centers and advanced manufacturing

Large facilities require substantial electrical installation during construction and more specialized controls, instrumentation, and maintenance work once operating.

Energy infrastructure

Grid modernization, generation, and other energy investments create demand for electrical specialties that differ from conventional building construction.

Employment grew about 10% between 2019 and 2025, and projections point to another 9.2% increase over the coming decade.⁵¹

How Workers Enter and Advance

 Primary pathway	 Program length	 Typical preparation
Registered Apprenticeship through union and nonunion programs is the predominant route.	Typically four to five years.	High school diploma or equivalent, with mathematics, physics, electrical or pre-engineering CTE, and pre-apprenticeship providing useful preparation.
 Training model	 Core skills	 Licensing
Paid, progressively skilled work combined with related technical instruction and supervised learning.	Electrical theory, applied mathematics, code knowledge, safety, installation, and troubleshooting.	Requirements vary by state and locality; advancement from apprentice to journey-level and then to master or supervisory roles is often formally structured.

The occupation has substantial training infrastructure. Registered Apprenticeship and secondary CTE operate broadly across the country, while postsecondary programs exist in 48 states. The International Brotherhood of Electrical Workers (IBEW) and its contractor partners report operating nearly 300 U.S. construction training centers with nearly \$200 million in annual investment.⁵² The Electrical Training Alliance, IBEW, and the National Electrical Contractors Association (NECA) provide a national labor-management infrastructure for curricula, instructor development, and apprenticeship, while nonunion employers and contractor associations provide additional pathways.

Where the Pressure Is

Electricians already have well-established entry routes and training infrastructure. The harder issue is getting more apprentices through a long training process.

When several major projects move forward in the same region, they can compete not only for electricians but also for the journeymen, instructors, and supervised jobsite hours needed to train more of them. That means rapid, concentrated growth can put pressure on the training system at the same time employers are trying to expand it.

The overall electrician apprenticeship completion rate is about 44%.⁵³ Providers interviewed for this report frequently identified the first year as a significant point of attrition, as apprentices encounter early starts, changing jobsites, physically demanding work, outdoor conditions, and the realities of a multiyear commitment. Their experience points to the value of realistic exposure before entry, followed by strong mentorship and support once apprentices begin.

Electricians have a somewhat younger age profile than the skilled trades overall: 13.3% are under 25, compared with 11.0% across the skilled trades, while 19.8% are 55 or older.⁵⁴

As large projects accelerate hiring in particular regions, the key question is whether apprenticeship systems can help more entrants reach journey-level while maintaining the experienced workforce needed to teach and supervise them.



HEATING, AIR CONDITIONING, AND REFRIGERATION MECHANICS AND INSTALLERS

About the Occupation

Heating, ventilation, air conditioning, and refrigeration mechanics and installers maintain the systems that control temperature and air quality. Their work spans residential service, commercial refrigeration, building controls, and specialized industrial cooling, with different equipment and expertise required across those settings.

Drivers of Demand

HVAC demand combines new installation with a large base of systems that require ongoing maintenance, repair, and eventual replacement. That makes the occupation less dependent on new construction alone than many other building trades.

Recurring service and replacement

Every system installed creates future maintenance and replacement needs across homes, commercial buildings, health care, food processing, refrigeration, and other settings.

Changing equipment and standards

Heat pumps, newer refrigerants, digital controls, and evolving building standards are changing the skills technicians need to install, diagnose, and maintain equipment. Those changes affect experienced technicians as well as new entrants.

Specialized cooling and controls

Data centers and other technically complex facilities are creating demand for advanced thermal-management and controls expertise beyond conventional building HVAC.

Employment reflects that broader base of demand. HVAC employment grew about 19.8% between 2019 and 2025, from roughly 342,000 to 410,000 workers, and is projected to grow another 10.9% over the coming decade.⁵⁵

How Workers Enter and Advance

 Primary pathway	 Program length	 Typical preparation
Postsecondary or technical-college HVAC training followed by workplace learning is the predominant route, alongside Registered Apprenticeship and direct employer training.	School-based programs typically last six months to two years; apprenticeships span several years.	High school education, with mathematics, physics, and technical coursework providing useful preparation.
 Training model	 Core skills	 Credentials
Classroom and laboratory instruction combined with progressively skilled, supervised work.	Refrigeration, electrical circuits, controls, installation, diagnostics, and safety.	EPA Section 608 certification is required for specified refrigerant work. State and local licensing requirements vary, while industry certifications such as North American Technician Excellence (NATE) can demonstrate technical proficiency and support specialization.

Postsecondary HVAC programs operate in 49 states, and Registered Apprenticeship provides another route into the occupation.⁵⁶ The United Association and the International Association of Sheet Metal, Air, Rail and Transportation Workers (SMART) support apprenticeship and continuing education across relevant piping, refrigeration, sheet-metal, and air-distribution specialties, while nonunion contractors, manufacturers, trade associations, and colleges provide additional pathways. Secondary CTE is less widespread, operating in 37 states.⁵⁷

Where the Pressure Is

For HVAC, the challenge is not simply preparing more new technicians. It is connecting initial training to high-quality workplace learning while also keeping incumbent technicians current as equipment changes.

Contractors carry much of that responsibility: About 68% of HVAC workers were employed by plumbing, heating, and air-conditioning contractors in 2025.⁵⁸ New technicians build proficiency alongside experienced workers, but seasonal peaks, emergency calls, and travel between customer sites can make sustained supervision difficult, especially for smaller contractors.

Continuing education creates a parallel challenge. Heat pumps, newer refrigerants, advanced controls, and other technologies require employers and training providers to continually update equipment, instruction, and technician skills. Secondary CTE is also less widely available than postsecondary HVAC training, limiting early exposure in some places.

Strong transitions from technical training into paid workplace learning matter because technicians develop much of their proficiency on the job. Continued access to updated instruction matters, too, as equipment, refrigerants, and controls keep changing.

A woman with dark hair tied back, wearing a blue short-sleeved button-down shirt, is focused on working on a large, complex industrial machine. She is using a tool, possibly a screwdriver, to adjust a component of the machine. The machine is metallic with various bolts, pipes, and a large circular opening. The background is slightly blurred, showing other industrial equipment.

INDUSTRIAL MACHINERY MECHANICS, MACHINERY MAINTENANCE WORKERS, AND MILLWRIGHTS

About the Occupations

The Bureau of Labor Statistics (BLS) reports industrial machinery mechanics, machinery maintenance workers, and millwrights as separate occupations within the same broader occupational group and discusses them together in the Occupational Outlook Handbook. This report analyzes them together while distinguishing the different work, demand trends, and training pathways within the cluster. Industrial machinery mechanics diagnose and repair breakdowns; machinery maintenance workers inspect, lubricate, and service equipment to prevent failures; and millwrights install, move, and precisely align heavy machinery. Their responsibilities overlap, but the occupations require different preparation and equipment-specific expertise.

Drivers of Demand

New manufacturing facilities, plant modernization, and increasingly automated production create demand across this cluster. But the three occupations are not moving in the same direction.

Industrial machinery mechanic employment grew about 13.5% between 2019 and 2025, from roughly 388,000 to 440,000 workers, and mechanics now account for about four in five workers in the cluster. Over the same period, machinery maintenance employment fell about 17% and millwright employment about 16%. Together, the three occupations grew about 6.5%, masking substantial differences underneath the combined figure.⁵⁹

Automation and plant modernization

Sensors, programmable controls, and increasingly automated equipment are changing maintenance work and increasing the importance of diagnostics, troubleshooting, and repair.

New plant construction and retooling

Advanced manufacturing and other major industrial investments generate project-based demand for millwrights to install, move, and align machinery before facilities begin operating.

Ongoing industrial operations

Once facilities move into operation, demand shifts away from project-based installation toward the diagnostic, repair, and preventive-maintenance work performed primarily by mechanics and maintenance workers.

The differences are expected to continue. Projected employment grows about 17.8% for industrial machinery mechanics over the coming decade, compared with a roughly 2% decline for machinery maintenance workers and little change for millwrights.⁶⁰

How Workers Enter and Advance



Primary pathways

Employer-based training is common for machinery mechanics and maintenance workers; Registered Apprenticeship is the predominant route for millwrights. Technical-college programs provide another route into industrial maintenance.



Program length

Mechanics typically receive at least a year of workplace training; maintenance workers, several months to a year; and millwright apprenticeships generally three to four years.



Typical preparation

High school education, with mathematics and technical coursework providing a foundation. Some mechanics and millwrights complete associate's degree programs in industrial maintenance that may include welding, hydraulics, pneumatics, and mathematics.



Training model

Supervised workplace learning, supplemented by classroom and laboratory instruction through apprenticeship or technical-college programs.



Core skills

Diagnostics and repair for mechanics; preventive maintenance for maintenance workers; and rigging, assembly, and precision alignment for millwrights.



Advancement

Equipment-specific training and supervised experience build proficiency with more complex machinery and systems.

Training structures differ considerably across the three occupations. Millwrights have a well-established apprenticeship infrastructure through the United Brotherhood of Carpenters and signatory industrial contractors. For mechanics and maintenance workers, employers, community and technical colleges, and equipment manufacturers carry more of the training responsibility. Industrial unions including the United Steelworkers, United Auto Workers, and Machinists also represent workers in some facilities.

Where the Pressure Is

The pressures differ across the three occupations. Industrial machinery mechanics—the fastest-growing part of the cluster—rely heavily on employer-based training, while millwrights have a more formalized apprenticeship pathway and a much flatter employment outlook. That means workforce needs and training strategies have to reflect the specific occupation rather than the combined employment picture.

Training is also unusually equipment-intensive. Learning to diagnose faults in modern machinery requires access to current sensors, programmable controllers, drives, automated systems, and experienced workers who can supervise hands-on learning. That equipment is expensive and changes quickly, while the same experienced employees needed to train newer workers are often essential to keeping production running.

Age compounds the challenge. Roughly three in 10 workers across the cluster are 55 or older, while fewer than one in 10 are under 25.⁶¹ Much of the expertise experienced workers hold is specific to particular machinery and operating environments and takes years to develop, making knowledge transfer especially important as workers retire.

For industrial machinery mechanics in particular, growing demand therefore depends heavily on employers' ability to provide current equipment, structured workplace learning, and experienced supervision. Maintenance workers may also need opportunities to build more advanced diagnostic and repair skills as industrial equipment becomes increasingly automated and technically complex.





PLUMBERS, PIPEFITTERS, AND STEAMFITTERS

About the Occupation

Plumbers, pipefitters, and steamfitters install and maintain piping systems, but the work differs substantially by craft. Plumbers typically work on water, waste, and gas systems in buildings; pipefitters install industrial piping carrying chemicals, gases, and other fluids; and steamfitters specialize in systems carrying steam under pressure. BLS classifies them as a single occupation, even though each requires distinct technical knowledge and experience.

Drivers of Demand

Demand comes from residential and commercial construction, maintenance of existing systems, infrastructure renewal, and industrial expansion. The mix matters because different projects call for different piping specialties.

Water infrastructure renewal

The Environmental Protection Agency estimates substantial long-term needs to replace and modernize drinking-water infrastructure, creating work across treatment facilities, distribution systems, service connections, and related piping.⁶²

Energy and industrial projects

Energy facilities and other industrial investments generate demand for specialized pipefitting and process-piping skills during construction and ongoing maintenance.

Advanced manufacturing

Semiconductor, pharmaceutical, and other advanced manufacturing facilities rely on specialized piping systems that may require high-purity, high-pressure, or otherwise production-specific expertise.

Employment grew about 5.2% between 2019 and 2025, from roughly 443,000 to 466,000 workers, with another 6.8% growth projected over the coming decade.⁶³

How Workers Enter and Advance

 Primary pathway	 Program length	 Typical preparation
Registered Apprenticeship through union and nonunion sponsors.	Typically four to five years of paid, progressively skilled work combined with technical instruction.	High school diploma or equivalent, with mathematics, science, CTE, and pre-apprenticeship providing useful preparation.
 Training model	 Core skills	 Licensing and credentials
Paid, supervised workplace learning combined with classroom technical instruction.	Blueprint reading, mathematics, codes, installation, joining methods, testing, and troubleshooting.	Most states and some localities license plumbers. Requirements for pipefitters, steamfitters, and specialized work vary by jurisdiction and assignment.

Registered Apprenticeship and secondary CTE are broadly available, and postsecondary programs operate in 43 states.⁶⁴ The United Association and signatory contractors support a national network of joint apprenticeship and training programs for plumbers, pipefitters, steamfitters, sprinkler fitters, and related specialties. Nonunion contractors, employers, and community and technical colleges provide additional routes into the occupation.

Where the Pressure Is

The challenge in this occupation is not simply producing more workers. It is ensuring that workers gain the right supervised experience for the craft and specialty employers actually need—and can carry those qualifications across projects and jurisdictions.

Licensing requirements vary in required hours, examinations, continuing education, and reciprocity. In some places, licensing authority extends to counties or municipalities, meaning requirements can differ even within a state. That can complicate both training design and worker mobility.

Specialization creates another constraint. Hours accumulated in residential plumbing do not automatically qualify someone for industrial process piping, and experience in one part of the combined occupation may not transfer fully to another. Apprentices therefore need sustained access to work that develops the specific competencies required in their craft. Industrial project cycles can make that harder when work starts, ends, or shifts across locations.

That distinction matters as infrastructure, energy, and advanced manufacturing investments create new demand. A region may have a substantial number of workers within the broad occupational category and still lack enough people with the particular licensing, supervised experience, or piping specialty a project requires. For plumbers, pipefitters, and steamfitters, the match between training, qualification, and the work itself is as important as the overall size of the pipeline.



SECTION 05

PRIORITIES FOR STRENGTHENING THE SKILLED TRADES WORKFORCE

The findings in this report point to a set of priorities for employers, labor organizations, education and training providers, workforce organizations, state and local governments, philanthropy, and other partners. They are not intended as an exhaustive workforce agenda. Instead, they focus on where this analysis suggests the greatest opportunities are to make pathways work better and respond more effectively to workforce needs.

The goal is not simply to fill openings. It is to help more people enter strong pathways, complete them, and build lasting careers while meeting the needs of industries and communities. That means paying more attention to what happens after enrollment, strengthening the connections among the institutions that prepare workers, making pathways easier to navigate, and matching workforce investments to the actual source and timing of demand.

Many employers, labor organizations, education and training providers, and community partners are already working to broaden participation in the skilled trades through career exposure, pre-apprenticeship, mentorship, and practical supports. The Manufacturers Talent Institute's Real Life Rosies® program, featured in this report, offers one example, connecting women to advanced manufacturing careers through training, direct entry into apprenticeship, and supportive services. Building the workforce the nation needs will require sustaining these efforts and making continued progress in expanding participation across gender, racial, and ethnic groups. Success means helping more people enter the trades, complete their preparation, and remain and advance in the field.



Focus on Training Program Quality and Outcomes

Recruitment and enrollment matter, but they are incomplete measures of success. The more important question is what happens after someone enters a pathway: whether they persist, complete their preparation, move into related work, and remain and advance in the field. The variation in completion and employment outcomes across programs suggests that these results are not predetermined and program quality matters.

Strong pathways combine high-quality instruction, current equipment, effective supervision and mentorship, and early support when participants begin to struggle. They also recognize that practical barriers can determine whether someone completes. Transportation, child care, tools and work clothing, housing instability, or an unexpected expense can interrupt an otherwise successful pathway. Supportive services should therefore be treated as part of pathway design where they are needed, not as an add-on.

The connection to employment matters just as much. Employers can strengthen pathways through paid work-based learning and concrete routes from preparation into hiring. And success should ultimately be measured against outcomes that matter to workers as well as employers, including related employment, earnings, retention, advancement, and whether pathways lead to jobs people can build careers in.

LESSONS FROM THE FIELD

Support Persistence, Not Just Participation

Louisiana Green Corps combines paid field experience and technical training with mental health services, career coaching, and practical supports, illustrating how addressing barriers during training and the transition to employment can help participants stay connected to a pathway and to work.

[Learn more about the program ->](#)

Priorities for action

Strengthen program quality and completion.

Invest in current instruction and equipment, structured onboarding, effective supervision and mentorship, progress monitoring, and early intervention; and learn from programs achieving stronger outcomes.

Build supportive services into pathway design.

Address transportation, child care, tools and work clothing, housing instability, and short-term financial barriers where they interfere with persistence.

Connect preparation to employment.

Engage employers early around paid work-based learning and concrete pathways into hiring.

Measure outcomes that matter.

Track completion, related employment, earnings, retention, and advancement, not enrollment or credential attainment alone.





Strengthen and connect the systems that prepare people for skilled trades careers

Preparing people for skilled trades careers requires more than adding training programs or classroom seats. It depends on instructors with current expertise, modern equipment, experienced workers who can supervise and mentor, employers able to provide workplace learning, and real opportunities to apply and develop skills.

Those pieces have to work together. More training seats without enough instructors or equipment can strain program quality. Training without access to workplace learning can leave participants without the experience employers require. And even strong education or training programs can fall short when they are disconnected from the next stage of a person's pathway.

That makes coordination part of the work itself. Secondary CTE should lead clearly into apprenticeship, postsecondary preparation, or employment. Pre-apprenticeship should connect to a meaningful next step. Postsecondary programs should have strong employer connections. Apprenticeship depends on employers, labor-management partnerships, instructors, journeyworkers, and sustained access to work.

Strong regional approaches bring these pieces together rather than asking individual programs or employers to solve workforce needs on their own. Intermediaries and shared infrastructure can be especially valuable for smaller employers that lack the staff or expertise to operate training programs independently. Where effective pathways already exist, the better strategy may be to strengthen them and broaden access rather than create parallel programs.

LESSONS FROM THE FIELD

Connect Statewide Infrastructure to Regional Workforce Needs

Wisconsin's 16 technical college districts use a common statewide system to support apprenticeship, employer-designed training, and pathways beginning in high school. Individual colleges tailor programs to regional industries, while the state tracks whether graduates move into related employment.

[Learn more about the program ->](#)

LESSONS FROM THE FIELD

Make Apprenticeship Easier for Employers to Offer

The Manufacturers Talent Institute, the talent development organization of the Manufacturers Association of Central New York (MACNY), helps employers establish and manage Registered Apprenticeship programs by providing shared administrative and technical support. As a group sponsor and intermediary, MACNY allows employers—particularly smaller manufacturers—to participate in apprenticeship without having to build and manage the full infrastructure on their own.

[Learn more about the program ->](#)

Priorities for action

Strengthen connections across pathways.

Improve transitions among CTE, pre-apprenticeship, postsecondary education, Registered Apprenticeship, work-based learning, and employment so people can move through pathways without unnecessary gaps or dead ends.

Align the institutions that make pathways work.

Coordinate employers, labor organizations, education and training providers, workforce organizations, community partners, and public agencies around shared occupational and regional needs.

Invest in the people and tools training depends on.

Use flexible teaching and mentoring models that make it easier for experienced tradespeople to contribute while remaining connected to industry and modernize facilities, equipment, technology, and curricula.

Make it easier for employers to train.

Use intermediaries, technical assistance, and shared infrastructure to help employers—particularly small and mid-sized businesses—provide high-quality workplace learning.

Expand effective existing pathways before creating new ones.

Broaden access to high-quality pathways already in place before investing in new or parallel programs.





Improve career exposure, guidance, and navigation into the skilled trades.

The data suggest that the challenge is not simply convincing students and families that skilled trades careers are worthwhile. Interest and respect are already relatively strong; the bigger opportunity is helping people understand the specific careers available, how to enter them, and where different pathways can lead. Counselors and parents are especially important because they help shape which options young people see as realistic and worth pursuing.

Counselors need practical, current information about specific occupations and the different ways people enter them, including CTE, postsecondary education, Registered Apprenticeship, and direct entry through work. Parents and students need similarly concrete information about what the work involves, preparation requirements, costs and paid training opportunities, wages, working conditions, and opportunities for advancement. The goal should be to make skilled trades pathways as understandable and actionable as more familiar education and career routes.

Early exposure matters, too, particularly when it gives people a realistic view of the work and connects directly to a next step. Career exploration, job shadowing, CTE, youth apprenticeship, and pre-apprenticeship can help people identify occupations that fit their interests and goals, but they are most valuable when participants know how to move from that experience into further preparation, apprenticeship, or employment.

Priorities for action

Equip counselors to recommend specific skilled trades pathways.

Give counselors current information on local apprenticeship, CTE, and postsecondary programs—including entry requirements, costs, paid training opportunities, outcomes, and whom to contact—so they can point students toward an actual next step.

Put skilled trades pathways into standard postsecondary advising.

Present apprenticeship, technical education, and other skilled trades routes alongside two- and four-year college options in career planning, counseling materials, application timelines, career fairs, and family communications.

Give families program-level information they can use to weigh options.

Make it easy for parents and students to compare specific pathways based on cost, duration, whether participants earn while learning, employment and earnings outcomes, working conditions, and opportunities for advancement.

Make the handoff from interest to opportunity easier.

Create clearer ways for counselors, students, and families to connect directly with apprenticeship sponsors, employers, CTE programs, technical colleges, and other local providers when someone expresses interest.



Plan workforce investment around the source, scale, timing, and duration of demand.

Large numbers of openings can reflect rapid growth, replacement needs as workers leave or retire, or some combination of the two. The appropriate response also depends on the occupation and place: how workers are typically prepared, how long that preparation takes, what licensing or credential requirements apply, what role employers and labor play, and what existing pathways and resources are already in place.

Timing matters as much as scale. Major investments in infrastructure, manufacturing, energy, transportation, data centers, and other industries can create intense demand for particular trades in particular places. Many skilled trades pathways take years to complete, so waiting until employers are ready to hire can leave too little time to prepare people or expand the pathways they will need. Workforce planning should begin while major economic investments are being structured, not after workforce needs become urgent.

Demand should also be considered across projects and over time. Several investments moving forward in the same region may draw on the same workers, instructors, journeymen, and training resources while also competing with ongoing needs in housing, maintenance, existing industries, and other parts of the local economy. And a project that requires a large construction workforce during buildout may require a much smaller or different workforce once it moves into operation.

Planning for those shifts means looking beyond the immediate hiring need. Workforce investments should align preparation with realistic project timelines, help people build skills that remain valuable across employers and projects, and strengthen pathways and training resources that can continue serving workers, employers, and communities after a particular demand surge has passed.

Priorities for action

Diagnose the demand and the constraint before investing.

Distinguish growth from replacement needs, temporary peaks from sustained demand, and the specific occupational or regional barriers limiting the supply of qualified workers.

Build workforce planning into major economic investments from the start.

Assess occupational needs, preparation timelines, and existing pathways while investments are being structured, and secure commitments from employers, developers, and public partners to support apprenticeship, training, work-based learning, and other workforce needs.

Plan across projects and industries.

Identify where multiple investments will draw on the same occupations and training resources and account for the effects of new demand on existing employers and community needs.

Invest for durability.

Prioritize transferable skills and training resources that can serve workers and employers across projects and remain valuable as technologies, industries, and regional demand change.

APPENDIX A

Case Studies

NEWARK ELECTRICAL
JOINT APPRENTICESHIP &
TRAINING COMMITTEE

Newark Electrical JATC

At A Glance

Location/Region	Serves six counties within Central Ohio.
Population Served	The Newark Electrical JATC serves high school students through pre-apprenticeship, as well as jobseekers, career changers, and incumbent workers pursuing electrical apprenticeship training and career advancement.
Number of People Served	550 pre-apprentices since 2024. Approximately 1,700 apprentices since 2022, with recent requests to train 2,000 workers in six months to work on emerging infrastructure projects in the Central Ohio region.
Occupation(s)	Electrical.
Pathway /Model	Pre-apprenticeship, apprenticeship.
Key Partners	Newark Electrical JATC has developed a broad network of 33 high school partnerships, alongside multiple community and workforce pipelines that connect jobseekers and other prospective applicants to the apprenticeship.

The Program



The Newark Electrical Joint Apprenticeship Training Committee (JATC), affiliated with IBEW-NECA, is one of 270 IBEW-NECA JATCs nationwide. The Central Ohio training program prepares electricians through classroom instruction, hands-on training, and paid work experience. As massive data center and critical infrastructure projects drive unprecedented demand for electricians in the Central Ohio region, the JATC has seen its apprentice population surge from approximately 95 to nearly 1,200 in four years, adding 60–80 new apprentices each month.

To accommodate this growth, Newark Electrical JATC recently invested in a 90,000-square-foot training facility, more than six times the size of its former space.

Yet demand continues to outpace capacity, underscoring the scale of the region's workforce challenge.

Newark Electrical JATC has also redesigned its training model to strengthen retention and completion. It replaced its traditional year-based curriculum with specialized instructional blocks and front-loaded orientation and soft skills training, recognizing that soft skills are among the hardest skills to teach and that technical proficiency must be paired with communication, professionalism, and job-site readiness. This approach has helped close the apprentice

leak, with approximately 90% of apprentices retained through their first year and attrition falling to roughly 5% thereafter.

Finally, partnerships with 33 local high schools create an accelerated on-ramp into apprenticeship. Through these partnerships, students can complete the equivalent of the first year of electrical apprenticeship curriculum during school hours, including a virtual reality lab that simulates real-world working conditions. Students who continue into Newark Electrical JATC's apprenticeship then receive gap training to bridge foundational skills with apprenticeship expectations, helping ensure they are prepared for the program's rigor and positioned for successful progression.

What the Field Can Learn

Newark Electrical JATC demonstrates how a training provider can innovate to keep pace with growing demand for electricians while maintaining a strong focus on apprentice retention and completion. The model shows that expanding capacity requires more than increasing enrollment or investing in larger facilities; it also requires redesigning training around the points where apprentices are most likely to struggle or leave.

The model addresses a key weakness in the skilled trades pipeline: the fragmented transition from K–12 education into training and employment. Rather than leaving students to navigate this transition independently, Newark Electrical JATC builds a structured pathway with clear milestones and supports. Front-loading orientation and soft-skills training, specialized instructional blocks, and gap training help apprentices understand expectations and build the skills needed to progress. With approximately 90% of apprentices retained through the first year and attrition falling to roughly 5% thereafter, Newark Electrical JATC illustrates the importance of pairing investments in recruitment and training capacity with intentional program design and supports that help apprentices persist and complete.

At A Glance

Location/Region	New Orleans, Louisiana.
Population Served	Opportunity youth, young people disconnected from school and work.
Number of People Served	82 members served in 2025.
Occupation(s)	Construction, solar installation, stormwater management.
Pathway /Model	Pre-apprenticeship.
Key Partners	Greater New Orleans Foundation, City of New Orleans.

The Program

Louisiana Green Corps is a New Orleans-based nonprofit that prepares residents ages 18–35 for careers in construction, stormwater management, and other sectors through its Construction and Conservation Corps (CCC). Its 16-week, full-time model combines classroom instruction, hands-on community projects, and paid field experience in areas such as urban forestry, solar installation, and weatherization. Participants earn weekly training stipends and industry-recognized credentials, including NABTU MC3, OSHA 10, Center for Watershed Protection Clean Water Certificate, and forklift operation, along with career coaching, financial literacy, and job-placement support.

The model primarily serves opportunity youth and adults from low-income backgrounds, including many participants facing unstable housing, transportation barriers, trauma, or prior justice system involvement. Participants enter through high school counselors, word of mouth, courts, community organizations, and employer referrals. An initial assessment and one-on-one meeting identify interests and support needs; the program generally does not screen people out unless their interests or readiness are misaligned. Participants are paid up to \$7,500 total during the training program, allowing them to support themselves while enrolled full-time. During the cohort, participants receive academic instruction, mental health support, case management, and assistance with transportation and child care. Each participant then completes a paid internship with an employer partner matched to their interests and receives placement support and follow-up for at least a year. A phase-two option allows graduates to return for additional training and stackable credentials.

What makes Louisiana Green Corps distinctive is its integration of paid learning, environmental resilience, and intensive wraparound support. Ninety-one percent of program completers are placed in employment, with 86% retained six months later.

What the Field Can Learn



Louisiana Green Corps demonstrates the value of service as a workforce strategy. Service-based experiences allow participants to contribute to visible community priorities while gaining career exposure, developing technical and employability skills, earning credentials, and building a record of paid work experience. For young people and others who may not yet have a clear connection to a career pathway, service can provide a supported bridge into training and employment—connecting purpose and community contribution with tangible opportunities for economic advancement.

Many prospective workers face transportation and housing instability, child care needs, trauma, justice system involvement, or employer requirements that can make training and employment difficult to sustain. The program addresses these barriers by treating wraparound support as core workforce infrastructure. Mental health services, case management, academic

instruction, financial-literacy coaching, child care, paid training, and post-placement follow-up are integrated into the pathway rather than offered as optional add-ons. This helps participants persist, build confidence, and connect training to longer-term employment. Employers can learn to address practical barriers and offer clearer on-ramps for candidates who are not yet “job ready.” Funders and policymakers should support the full cost of retention, not only enrollment. Unions and training providers can strengthen access by coordinating supports, adapting screening practices, and measuring success through placement, retention, and advancement.

At A Glance

Location/Region	Syracuse, New York. MTI's employer network spans manufacturers statewide across New York.
Population Served	Students, jobseekers, career changers, and incumbent workers. Real Life Rosies® direct-entry pre-apprenticeship program serves women only.
Number of People Served	497 pre-apprentices since 2023; 350-plus Registered Apprentices, and 60-plus employers participating in the Registered Apprenticeship program since 2022; 2,200+ students per year provided career exploration experiences.
Occupation(s)	28-plus occupations across manufacturing and related trades.
Pathway /Model	End-to-end talent pipeline. Supports career exploration and pre-apprenticeship and acts as a group sponsor for a Registered Apprenticeship.
Key Partners	Mohawk Valley Community College, Monroe Community College, Onondaga Community College, SUNY Empire, State University of New York, New York State Department of Labor, Empire State Development, MACNY membership, Syracuse City School District, and employers including Wolfspeed, Micron, and GlobalFoundries.

The Program

The Manufacturers Talent Institute (MTI) is MACNY's talent development organization and supports manufacturers across New York state in building and sustaining workforce pathways. Working through a statewide network representing more than 5,400 manufacturers and businesses, MTI connects career exploration, pre-apprenticeship, and Registered Apprenticeship (RA) into an end-to-end talent pipeline serving students, jobseekers, career changers, and incumbent workers.



MACNY serves as a Registered Apprenticeship group sponsor, with MTI acting as the intermediary that provides employers with the administrative and technical support needed to establish and manage apprenticeship programs. Employers retain a central role in shaping training to meet workforce needs without building the full administrative infrastructure themselves. Since 2022, the model has supported more than 350 Registered Apprentices across more than 60 employers and 28 occupations, including industrial maintenance mechanic, millwright, pipefitter, and electromechanical technician.

MTI also creates multiple on-ramps into manufacturing careers for different populations. Its K–12 strategy provides more than 2,200 middle and high school students annually with career exploration experiences, including plant tours, hands-on activities, job shadows, and internships. Advance 2 Apprenticeship® is a free, direct-entry pre-apprenticeship program that prepares adult learners for high-demand careers in advanced manufacturing. Real Life Rosies® provides women with a direct-entry pathway into advanced manufacturing and the trades, combining training with supports designed to help participants enter and succeed in the field. Together, these strategies demonstrate how MTI tailors career exposure, preparation, and access to the needs of distinct populations.

What the Field Can Learn

MTI illustrates two priorities for strengthening the skilled trades workforce: positioning industry as a co-creator of training and building multiple on-ramps to careers. As an industry association and group sponsor, MTI aggregates employer demand, designs apprenticeships around shared workforce needs, and manages responsibilities that can prevent individual manufacturers, particularly smaller firms, from adopting Registered Apprenticeship. Its statewide network creates the infrastructure to expand apprenticeship across employers and occupations while keeping industry at the center.

MTI also recognizes that no single front door leads into manufacturing. Partnerships with the Syracuse City School District and other K–12 systems introduce students to careers through early exposure and work-based learning. Real Life Rosies® creates a specialized on-ramp for women by combining training and direct entry into apprenticeship with child care, transportation, technology, and other supports. Together, these strategies show how long-term cross-sector partnerships, shared apprenticeship infrastructure, and population-specific pathways can convert interest into training and training into sustained employment.

At A Glance

Location/Region	Wisconsin; statewide, delivered through 16 public technical college districts.
Population Served	Broad population across Wisconsin with several campuses drawing heavily from high school and dual-enrollment students. WTCS serves employers and unions as well.
Number of People Served	~290,000 students among all 16 colleges.
Occupation(s)	Welders, machinists / mechatronics technicians, truck drivers, supply chain managers, agricultural technologists, engineering technologists, roadway and highway maintenance workers, HVAC technicians, automotive technicians, carpenters, electricians, plumbers, amongst others.
Pathway/Model	Technical college system overseeing 16 local units of education. Multi-stakeholder Registered Apprenticeship, employer-customized contract training at all 16 colleges, dual credit and youth apprenticeship opportunities for high school students, associate degrees, one- and two-year technical diplomas, pathway certificates, tuition-free GED/ HSED education, and fire service training—everything WTCS does is built around regional employer needs.
Key Partners	WI Department of Workforce Development—Bureau of Apprenticeship Standards (apprenticeship), Department of Public Instruction, local industry, community-based organizations, K–12 school districts.

The Program

Wisconsin Technical College System (WTCS) takes a mature, multi-stakeholder approach to preparing workers across all career paths in demand by Wisconsin employers. Its 16 public technical colleges offer more than 500 programs awarding two-year associate's degrees, one- and two-year technical diplomas, short-term technical diplomas, certificates, and related education for apprenticeships. The system is the major provider of customized instruction and technical assistance for Wisconsin employers, and with nearly 290,000 people enrolling in a technical college each year, it is the largest higher education system in the state.

WTCS is the coordinating and oversight body for its 16 public technical college districts. Employers in the state connect with the state's Department of Workforce Development—Bureau of Apprenticeship Standards to hire apprentices, many of whom receive their related education at a local technical college.

As the largest higher education system in Wisconsin, WTCS colleges work closely with employers in their respective districts to ensure their college provides training and education that will lead to gainful employment in the area. Every program the colleges begin must show there are employers in the district that have a need for those employees.



Employers also serve on advisory committees for every program, and if there is no longer a need for a program due to changes in the local labor market, programs are discontinued. This shared structure gives individual colleges room to innovate.

In addition to providing training and education in skilled trades and all other career areas of need to employers, WTCS colleges offer adult education services such as literacy education, English as a second language, and GED/HSED education for

students who are without a high school diploma. These services, along with fire service training, are offered free of tuition by state mandate.

Chippewa Valley Technical College (CVTC) has built an especially broad trades portfolio. It operates Wisconsin's only technical-college-sponsored roadway maintenance apprenticeship, offers pre-apprenticeships in welding, machine tooling, and mechatronics, and uses mobile welding labs to bring training directly to employers. CVTC was also recently announced as a finalist for the 2027 Aspen Prize for Community College Excellence, one of the nation's most prestigious community colleges honors. Notably, three Wisconsin technical colleges were semifinalists, and Southwest Wisconsin Technical College was named the 2025 Aspen Prize winner.

WTCS colleges also have strong connections to youth. CVTC established three regional training hubs aligned with K–12 school districts in Bloomer, Osseo, and St. Croix Central. Lakeshore Technical College manages the Sheboygan Area Youth Apprenticeship Consortium across 13 high school districts, spanning manufacturing, construction, IT, and health science. Madison College provides related instruction for the South Central Wisconsin Youth Apprenticeship Program, which reaches 42 high school districts, has 83 occupations, and includes more than 100 employer partners.

Participants can enter a traditional Registered Apprenticeship, employer-designed contract-training, or high school-rooted pre-apprenticeship through the same technical college infrastructure, helping create continuity across pathways and portability of credentials.

What the Field Can Learn

Wisconsin offers a compelling example of what happens when skilled trades education is treated as core economic infrastructure. Employers help shape programs and curriculum, while the state tracks whether graduates find work related to their training. The results provide evidence that the approach is working. Among 2025 graduates in the labor force, 92% were employed within six months, and 81% worked in fields related to their education. In WTCS's 2026 employer survey, 97% of employers reported satisfaction with graduates' education.

For the broader skilled trades field, Wisconsin demonstrates the value of making training capacity a shared responsibility and measuring success against workforce outcomes. Employers have a meaningful role in defining skills and validating programs, colleges have mechanisms to adapt training to regional needs, and the state can see whether those investments translate into employment. This gives policymakers and funders something particularly valuable: a system that can connect workforce investment, employer demand, training delivery, and results.



Helmets to Hardhats (H2H)

At A Glance

Location/Region	National.
Population Served	Transitioning active-duty military service members, veterans, National Guard members, and reservists.
Number of People Served	More than 70,000 registrations over the past five years; nearly 23,000 projected for 2026; 3,104 Known Successful Transitions in 2025, averaging more than 3,000 a year since 2022.
Occupation(s)	Through approximately 3,000 local unions across 15 building trades and their signatory contractors, H2H supports career pathways in occupations including electricians, plumbers and pipefitters, operating engineers, ironworkers, laborers, carpenters, sheet metal workers, HVAC, welders, painters, insulators, elevator constructors, and other Registered Apprenticeship programs.
Pathway/Model	Connects transitioning military members to construction careers primarily through federally registered union apprenticeship programs, which offer earn-while-you-learn pathways, nationally recognized credentials, and access to GI Bill benefits. H2H also connects participants with employers for salaried roles.
Key Partners	Fifteen international building trades unions; NABTU; The Association of Union Constructors (TAUC); Joint Apprenticeship and Training Committees and local unions; more than 82,000 signatory contractors; more than 1,900 training centers; Department of Labor Veterans' Employment and Training Service (DOL VETS), DoW SkillBridge, Army P3, National Guard Association of the United States and Enlisted Association of the National Guard of the United States, and Hiring Our Heroes; Tennessee Valley Authority; and Constellation Energy.

The Program

Helmets to Hardhats (H2H) is a national workforce intermediary that connects transitioning active-duty service members, veterans, National Guard members, and reservists to Registered Apprenticeship, work-based learning opportunities, and employment in the unionized construction trades. Created by the Center for Military Recruitment, Assessment, and Veterans' Employment, a joint labor-management 501(c)(3), it began operating in 2002. Its network reaches all 50 states through approximately 3,000 local unions across 15 building trades and more than 82,000 contractors. H2H has recorded nearly 65,000 reported successful transitions into construction careers since 2003.

H2H does not run training. It specializes exclusively in the military community, identifying qualified candidates, educating them on career options, connecting them to local apprenticeship programs and employers, and helping them overcome barriers to entry. Its closed job board is central to that model: only union apprenticeship programs



and signatory contractors may advertise openings, which ensures career seekers receive accurate information from trusted partners and centralizes demand in one place. Regional managers guide participants through the next steps in the application process, reducing friction for both candidates and apprenticeship programs and improving placement quality and alignment to a chosen craft. In 2025, H2H participated in or coordinated 699 outreach events nationwide.

Most participants enter with no construction experience.

Those whose military occupational specialty transfers may qualify for direct-entry agreements that grant credit for prior training, while experienced veterans may be placed into management, safety, estimating, and other salaried roles with union contractors. H2H also shows participants how to use GI Bill benefits to supplement apprentice wages during the earn-while-you-learn period and refers candidates to industry-recognized pre-apprenticeship, where appropriate.

What the Field Can Learn

H2H demonstrates that recruiting workers into the skilled trades requires more than generating interest; prospective workers need clear on-ramps to training at the moment they make career decisions. The model works because it meets people at a moment of transition, reaching service members through installation transition offices, SkillBridge, and Guard and Reserve networks. Interest in the trades turns into entry when someone is reached at the point of decision with a concrete next step and a person to help them take it.

H2H also shows that recruitment and navigation can be organized as a shared service rather than a task each local program handles alone. By coordinating across military programs, unions, employers, and apprenticeship providers, H2H connects participants to existing training while helping them translate prior experience and identify the preparation appropriate to their needs. The model illustrates the value of investing in population-specific on-ramps, recognizing transferable skills, and using trusted intermediaries to connect workers with high-quality pathways.

At A Glance

Location/Region	Centennial, Colorado; serves the Cherry Creek School District and the greater Denver region.
Population Served	Cherry Creek School District students in grades 10–12, including students preparing for college, employment, or military service and those still exploring their postsecondary direction. CCIC seeks to reach students historically underserved in career-connected education.
Number of People Served	Approximately 2,400 students across CCIC in 2026–27, with another 300 on the waitlist. The Infrastructure Engineering, Transportation, and Advanced Manufacturing pathways serve approximately 741 students annually.
Occupation(s)	Infrastructure Engineering Pathway: carpenters, electricians, plumbers, HVAC technicians, building maintenance technicians, construction supervisors, and related engineering and management roles. Transportation Pathway: automotive technicians and aircraft mechanics. Advanced Manufacturing Pathway: machinists, computer numerical control (CNC) operators and programmers, industrial maintenance and mechatronics technicians, robotics and automation technicians, and manufacturing engineers.
Pathway/Model	Sequenced high school career and technical education pathways combining academic and technical instruction, college credit, industry credentials, hands-on learning, and connections to work-based learning, employment, and apprenticeship.
Key Partners	Associated General Contractors of Colorado, Colorado Village Collaborative, Home Builders Institute, Arapahoe Community College, Discount Tire, Snap-on, ASE Education Foundation, Reata Engineering & Machine Works, Mikron Automation, Community College of Denver, and Metropolitan State University of Denver.

The Program

Cherry Creek Innovation Campus (CCIC) is a centralized career and technical education campus where Cherry Creek School District students prepare for college and skilled careers while earning high school credit. Every pathway integrates academic and college credit, industry-recognized credentials, and hands-on learning shaped by employers. Across the pathways, 25% of students transition directly into related careers, and about 75% continue on to college.

The **Infrastructure Engineering Pathway** introduces students to construction math, blueprint reading, framing, electrical wiring, plumbing, HVAC, drywall, and finishing. Advanced coursework, developed with the Associated General Contractors of Denver, prepares students for residential and commercial construction and trades apprenticeships. Students can earn OSHA-10 and Home Builders Institute pre-apprenticeship credentials.



Partnerships with Registered Apprenticeship programs in electricity, HVAC, plumbing, heavy equipment, welding, ironwork, and masonry provide graduates with direct entry and advanced standing.

Transportation Pathway students prepare for automotive and aviation careers. Automotive students learn diagnostics, repair, and preventative maintenance while earning Snap-on and ASE credentials and manufacturer-specific training. Aviation students can pursue Federal Aviation Administration credentials for aircraft maintenance and drone operation. Transportation partners provide work-based learning and employment opportunities.

Advanced Manufacturing Pathway students develop skills in machining, CNC programming, additive manufacturing, robotics, electronics, programmable logic controllers, and industrial maintenance. Available credentials include certifications from SOLIDWORKS, Haas, Stratasys, the National Institute for Metalworking Skills, and the Smart Automation Certification Alliance. Partnerships with Mikron, Reata, Visser, Precision, Stolle Machinery, and Ouroboros Space and Defense connect students to work-based learning and entry-level employment, with 25% of students transitioning directly into related careers and 75% continuing into college.

What the Field Can Learn

CCIC demonstrates how high schools can make skilled trades preparation part of a rigorous college-and-career strategy, moving beyond an either-or choice between postsecondary education and workforce preparation. Across infrastructure engineering, transportation, and advanced manufacturing, students earn academic and college credit, industry credentials, and hands-on experience using equipment and standards shaped by employers.

Engaging students early provides meaningful career exposure and work experience while helping them make informed decisions about which pathways to pursue. It also gives them a head start on credentials that can support entry into apprenticeships, employment, or postsecondary education and contribute to long-term advancement.

The model also demonstrates the importance of employers as co-producers of modern CTE. By helping design curricula, supplying current equipment and technical expertise, and creating work-based learning opportunities, employers invest directly in building the workforce they need. For funders and policymakers, CCIC illustrates how investments in CTE modernization can connect education more deliberately to evolving regional industries and careers.

APPENDIX B

Methodology, Limitations, and Sources

Qualitative Data

The report draws on insights from more than 200 interviews conducted over the past two years with stakeholders across the skilled trades ecosystem, including training providers, labor unions and other union organizations, colleges and other postsecondary institutions, workforce intermediaries, and national associations. These conversations provided context on how skilled trades pathways operate in practice, including the conditions that shape access, participation, completion, transition to employment, and advancement. Qualitative findings complement the quantitative analysis by surfacing stakeholder perspectives, implementation experiences, and examples of promising approaches.

The preceding research identified case studies and selected them to illustrate programs that demonstrate strong impact, operate at compelling scale, or represent emerging innovation. They are intended to provide concrete examples of how organizations and partnerships are responding to workforce challenges rather than to serve as representative estimates of the field or independent impact evaluations.

Quantitative Data

Data sources

Employment and earnings

Employment and wage estimates come from the U.S. Bureau of Labor Statistics Occupational Employment and Wage Statistics (OEWS), using May estimates from 2019 through 2025 at the state-by-occupation level. When the OEWS program suppresses a state-by-occupation estimate for confidentiality, the estimate is also omitted from this analysis.

Who performs the work

Information on the characteristics of workers comes from five-year American Community Survey (ACS) averages for 2020 through 2024, accessed through IPUMS. Measures include age, gender, part-time work, and interstate movement.

Occupational demand

Demand estimates use the 2024–2034 round of state occupational projections. When a state did not publish a projection for a particular occupation, the analysis applies the national projection allocation. We define demand as openings net of transfers—that is, the number of positions a training pipeline would need to help fill after accounting for workers moving between occupations. National openings and growth figures use BLS’s 2025–2035 national projections.

Training pipeline

The analysis draws on several sources to describe the potential training pipeline:

Postsecondary completions are from the Integrated Postsecondary Education Data System (IPEDS) for the 2024 academic year.

The share of graduates working in a trade is measured in Burning Glass Institute (BGI) career history data for 2010–2018 graduates, five years after graduation, and applied to 2022–2024 completions.

Post-completion earnings come from the federal College Scorecard

High school career and technical education participation comes from federal Perkins reporting for the 2023–24 program year.

Registered Apprenticeship counts come from the Registered Apprenticeship Partners Information Database System (RAPIDS) for federal fiscal year 2025. Apprenticeship conversion is based on a cohort that began between 2016 and 2022 and was followed through May 2026.

Skills

Skills data come from BGI job postings collected from 2021 through 2025. Skills profiles are included for the 54 trades with sufficient posting volume to support reliable estimates.

Perceptions, influences, and navigation of the trades

Perceptions, influences, and navigation into the trades are measured using the Ad Council's ACRI national survey fielded in July 2026. The sample includes 3,009 teenagers, 2,501 parents, and 202 school counselors. These results are national by design and are not intended to represent individual states or occupations.

Interpreting the training pipeline

The education-to-trade pipeline presented in this analysis combines administrative and survey systems that do not follow the same individuals over time. High school CTE participation comes from Perkins reporting, postsecondary completions from IPEDS institution cohorts, apprenticeship participation from federal registration records, and employment in a trade from BGI career-history data. Each source covers a different population and time period.

No existing national dataset follows a single group of students from high school CTE through college, apprenticeship, and employment in a trade. Accordingly, the analysis does not present these measures as a tracked, end-to-end cohort. Instead, each stage is labeled with its source, and high school CTE is presented as contextual information rather than as a formal stage in the pipeline. The college pathway should be interpreted as an arithmetic illustration based on observed rates, not as the progression of a single cohort. Registered Apprenticeship is the partial exception: the five-year employment figure follows one cohort of 2016–2022 starters; completion rates come from Department of Labor completion cohorts.

Combining data across geographies and occupations

Counts and levels are summed across the relevant geographies and occupations. Rates and shares are recalculated from the summed numerators and denominators rather than averaged from published rates. Where averages are used, they are employment-weighted.

Aggregates are calculated from 5,292 underlying state-by-occupation records, which ensures that group totals remain consistent with their component records. Program counts are the deliberate exception: They are distinct counts because a single program may prepare participants for multiple trades.

Typical routes into the trades

Each occupation is assigned one of four entry-route classes developed by BGI, using counted training supply (from Registered Apprenticeships and postsecondary credential programs) and entry routes observed from BGI's career history dataset.

- **Registered Apprenticeship (33 occupations):** A formal earn-while-learning pathway documented through federal apprenticeship records.
- **College or CTE credential (36 occupations):** Counted training explains a meaningful share of annual entry, and most of it comes through postsecondary credentials.
- **Open entry (five occupations):** Individuals can generally begin the work without a required credential or formal training pathway. Assemblers are an example.
- **On-the-job training, with no counted route (50 occupations):** Training occurs primarily at work or through prior experience in related jobs. The national training sources used here count no training route into these occupations.

These categories describe the most common pathway, not the only possible pathway into an occupation. Twenty-two occupations are identified as having meaningfully mixed entry patterns.

Shortage index and appropriate comparisons

BGI's Labor Shortage Index evaluates each trade against every occupation ranked in the same geography, trades and other occupations alike. A high rank means higher shortage risk relative to the other occupations in that state. The associated ranks and percentiles are reported wherever the index is available.

The occupation-level index is not designed to support comparisons of raw scores across states.

State supply and demand indexes

The two state indexes are each calculated as the weighted mean of block scores, each block the mean of its components' percentile ranks. They are ordinal measures: scores represent relative position, not quantities. As a result, they indicate relative pressure but do not, on their own, establish that a state has a shortage—or that it does not.

Demand pressure combines four measures. The first is how many new workers the state's trades need each year relative to the workers already in them, from the state's own employment projections. The second is trade employment growth between 2019 and 2025, averaged across two federal sources, the Occupational Employment and Wage Statistics survey and the Quarterly Census of Employment and Wages. The third is how far the state's trade employment is concentrated in occupations projected to need many new workers across the other states: a state whose trades are also in demand elsewhere competes with other states for the same workers. The fourth is real wage growth across the state's trades, holding the mix of trades fixed so that the figure reflects within-occupation wage growth rather than a shift in which trades the state employs. The last three are not individually discussed in this report. None is a clean indicator on its own: realized growth rests on two imperfect sources, the mix measure is a composition effect, and wage growth is the least precisely measured of the four and so carries half weight. Ranked together, they check the projections from different directions and give a fuller picture of demand growth than any one would alone. All four are measures of growth: the demand index is the growth indicator at state level.

Supply position combines counted entrants and active apprentices relative to the trade workforce; completion in college programs and apprenticeships, and the share of graduates who work in a trade; the age of the trade workforce, where an older workforce counts against the state; and trade workers moving in from other states beyond the state's general migration. These are the entry, conversion, retirement and replacement, and talent movement indicators at state level; perception is measured nationally and does not enter either index.

Relative position places each state by its rank on the two indexes at once. A state at least five rank places above the median on demand pressure and at least five below it on supply position is classed as facing high demand with low supply; a state at least five places on the favorable side of either index is not; the remaining states are borderline. Nine states fall in the first class, eight are borderline, and 34 are neither. The comparison is relative and ordinal: it shows which states face more demand pressure with a weaker supply position than others and says nothing about the magnitude of any shortage.

The America's Skilled Trades Dashboard shows each state's relative position and the two indexes, with the parts that make them up, on the state pages. The trade-in-state pages show the Labor Shortage Index for that occupation; the two state indexes are state-level measures and have no trade-in-state version.

Missing and limited data

When OEWS withholds a state-by-occupation estimate because of confidentiality or data-quality concerns, the estimate is omitted here as well. The relevant page identifies the limitation and directs readers to the next available level of aggregation when a group total is published there.

ACS-based measures retain their delivered reliability grades. When the underlying sample is assigned the lowest reliability grade, headline estimates remain available, but detailed survey-derived measures are omitted and accompanied by a note. This approach allows aggregates to remain available even when some underlying components are too limited to report separately.

| What this analysis does not measure

The number of missing workers

The analysis reports pipeline coverage as a ratio and does not convert that ratio into an estimated number of unfilled jobs. Such a conversion would require assuming that labor markets do not adjust through changes in wages, substitution among workers or technologies, or changes in how work is defined.

Causal explanations

The index components are associated with shortage risk, but the analysis does not establish that any individual factor causes shortages.

Perceptions below the national level

The perception survey was fielded nationally and can be analyzed by demographic characteristics and region. It does not provide valid state- or occupation-level estimates, and none are implied here.

Vacancies

Opening estimates come from occupational projections rather than job-posting counts. Job postings can overstate the number of available vacancies because of duplicate postings, evergreen requisitions, and listings for positions that employers are not actively filling.

Metropolitan areas

The analysis is presented at the national and state levels. Metropolitan-level estimates are outside the scope of this edition and are not treated as a missing component that should be inferred or imputed.

State-specific conversion rates

Conversion is measured nationally by trade group. The state-level version functions as a coverage diagnostic rather than a state performance measure. Career-history records underrepresent union programs, which train approximately two-thirds of registered trade apprentices. For that reason, states are not ranked on apprenticeship conversion.

Entry that leaves no administrative record

Many people enter the trades through work itself rather than through a counted training program. Apprenticeship participation and college completions are valid measures of documented pathways, but they do not capture entry that leaves no administrative trace. That limitation should be considered when interpreting every entry measure in the analysis.

ENDNOTES

- 1 BGI analysis of “GDP by Industry,” U.S. Bureau of Economic Analysis, accessed August 12, 2026, <https://www.bea.gov/data/gdp/gdp-industry>; “May 2025 National Industry-Specific Occupational Employment and Wage Estimates,” U.S. Bureau of Labor Statistics, accessed August 12, 2026, <https://www.bls.gov/oes/2025/may/oessrci.htm>.
- 2 “May 2025 State Occupational Employment and Wage Estimates,” U.S. Bureau of Labor Statistics, Occupational Employment and Wage Statistics, accessed September 23, 2026, <https://www.bls.gov/oes/2025/may/oessrcst.htm>; “Occupational Projections and Worker Characteristics,” U.S. Bureau of Labor Statistics, Employment Projections, 2025–2035, accessed September 23, 2026, <https://www.bls.gov/emp/tables/occupational-projections-and-characteristics.htm>.
- 3 BGI analysis of “Table 1.2 Occupational Projections, 2025–35, and Worker Characteristics, 2025,” Employment Projections, U.S. Bureau of Labor Statistics, accessed September 22, 2026, <https://www.bls.gov/emp/tables/occupational-projections-and-characteristics.htm>.
- 4 “May 2025 State Occupational Employment and Wage Estimates;” “Occupational Projections and Worker Characteristics.”
- 5 BGI analysis of “Apprentice Completion Rate Analysis;” “IPEDS Outcome Measures,” 2023 release-year window; and Burning Glass Institute career-history data, apprenticeship-conversion cohort started 2016–2022 and followed through May 2026.
- 6 Ad Council Research Institute, “Ford ACRI Trades Research Quantitative Report: Presentation Deck,” July 2026.
- 7 “May 2025 State Occupational Employment and Wage Estimates,” U.S. Bureau of Labor Statistics, Occupational Employment and Wage Statistics, accessed September 23, 2026, <https://www.bls.gov/oes/2025/may/oessrcst.htm>; aggregate calculated by BGI across the 124-occupation skilled trades universe.
- 8 “GDP by Industry,” U.S. Bureau of Economic Analysis, accessed September 23, 2026, <https://www.bea.gov/data/gdp/gdp-industry>; “May 2025 National Industry-Specific Occupational Employment and Wage Estimates,” U.S. Bureau of Labor Statistics, accessed September 23, 2026, <https://www.bls.gov/oes/2025/may/oessrci.htm>.
- 9 “May 2025 State Occupational Employment and Wage Estimates,” U.S. Bureau of Labor Statistics, Occupational Employment and Wage Statistics, accessed September 23, 2026, <https://www.bls.gov/oes/2025/may/oessrcst.htm>; “Occupational Projections and Worker Characteristics.”
- 10 Ad Council Research Institute, “Ford ACRI,” July 2026; survey fielded June 22–July 8, 2026, among 3,009 high school students, 2,501 parents, and 202 school counselors.
- 11 Ad Council Research Institute, “Ford ACRI.”
- 12 “May 2025 State Occupational Employment and Wage Estimates;” “Table 1.10 Occupational Separations and

Openings, Projected 2024–34,” Employment Projections, U.S. Bureau of Labor Statistics; “Data Center,” National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), accessed September 23, 2026, <https://www.nces.ed.gov/ipeds/datacenter/>; “Data and Statistics,” U.S. Department of Labor, Apprenticeship.gov, accessed September 23, 2026, <https://www.apprenticeship.gov/data-and-statistics>. BGI-derived entry-route classification and route-share calculation.

13 BGI analysis of “May 2025 State Occupational Employment and Wage Estimates;” “Table 1.10 Occupational Separations and Openings, Projected 2024–34,” Employment Projections, U.S. Bureau of Labor Statistics; National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Data Center; and U.S. Department of Labor, [Apprenticeship.gov](https://www.apprenticeship.gov), “Data and Statistics.” Entry-route classification and employment-weighted route-share calculation by Burning Glass Institute, 2026.

14 “Apprentice Completion Rate Analysis (BETA),” U.S. Department of Labor, Apprenticeship.gov, accessed July 13, 2026, <https://www.apprenticeship.gov/data-and-statistics/completion-rate-analysis>; “IPEDS Outcome Measures,” National Center for Education Statistics, 2023 release-year window; and Burning Glass Institute career-history data, apprenticeship-conversion cohort started 2016–2022 and followed through May 2026.

15 “IPEDS Outcome Measures.”

16 BGI analysis of U.S. Census Bureau, American Community Survey, 2020–2024 5-year Public Use Microdata Sample, via IPUMS USA, Version 16.0 (2025).

17 BGI analysis of U.S. Census Bureau, American Community Survey, 2020–2024.

18 BGI Analysis of U.S. Census Bureau, American Community Survey, 2020–2024.

19 U.S. Census Bureau, American Community Survey, 2020–2024.

20 BGI analysis of U.S. Bureau of Labor Statistics, “Occupational Projections and Worker Characteristics,” Employment Projections, 2025–2035.

21 “May 2025 State Occupational Employment;” “Occupational Projections and Worker Characteristics.”

22 BGI analysis of U.S. Census Bureau, American Community Survey 2020–2024.

23 “May 2025 State Occupational Employment and Wage Estimates;” “Long-Term Occupational Projections, 2024–2034,” Projections Managing Partnership; “Table 1.10 Occupational Separations and Openings, Projected 2024–34,” Employment Projections, U.S. Bureau of Labor Statistics; Integrated Postsecondary Education Data System (IPEDS), Completions, National Center for Education Statistics; “Data and Statistics.”

24 BGI analysis of U.S. Bureau of Labor Statistics, “State Long-Term Occupational Projections, 2024–2034;” U.S. Census Bureau, “American Community Survey 2020–2024 5-Year Public Use Microdata Sample;” U.S. Census Bureau, “Current Population Survey Basic Monthly Files, June 2023–June 2026;” and Edward W. Felten, Manav Raj, and Robert Seamans, “Occupational, Industry, and Geographic Exposure to Artificial Intelligence: A Novel Dataset and Its Potential Uses,” *Strategic Management Journal* 42, no. 12 (2021): 2195–2217.

- 25 U.S. Census Bureau, American Community Survey 2020–2024 5-year Public Use Microdata Sample, from Steven Ruggles, Sarah Flood, Matthew Sobek, Daniel Backman, Grace Cooper, Julia A. Rivera Drew, Stephanie Richards, Renae Rodgers, Jonathan Schroeder, and Kari C.W. Williams, IPUMS USA: Version 16.0 (Minneapolis, Minnesota: IPUMS, 2025), <https://doi.org/10.18128/D010.V16.0>
- 26 U.S. Census Bureau and U.S. Bureau of Labor Statistics, Current Population Survey, June 2023–June 2026, from Sarah Flood, Miriam King, Renae Rodgers, Steven Ruggles, J. Robert Warren, Daniel Backman, Etienne Breton, Grace Cooper, Julia A. Rivera Drew, Stephanie Richards, David Van Riper, and Kari C.W. Williams, IPUMS CPS: Version 13.0 [dataset] (Minneapolis, Minnesota: IPUMS, 2025), <https://doi.org/10.18128/D030.V13.0>
- 27 “Long-Term Occupational Projections, 2024–2034,” Projections Managing Partnership, <https://projectionscentral.org>
- 28 Edward Felten, Manav Raj, and Robert Seamans, “Occupational, Industry, and Geographic Exposure to Artificial Intelligence: A Novel Dataset and Its Potential Uses,” *Strategic Management Journal* 42, no. 12 (2021): 2195–2217, <https://doi.org/10.1002/smj.3286>
- 29 BGI Analysis of U.S. Bureau of Labor Statistics, “Employment Projections and Worker Characteristics, 2025–2035,” including Table 1.2.
- 30 BGI Analysis of U.S. Census Bureau, American Community Survey 2020–2024; U.S. state long-term occupational projections, 2024–2034; U.S. Bureau of Labor Statistics, “Current Population Survey” basic monthly files, June 2023–June 2026
- 31 U.S. Census Bureau, American Community Survey, 2020–2024.
- 32 BGI analysis of “May 2025 State Occupational Employment and Wage Estimates;” “Table 1.10 Occupational Separations and Openings, Projected 2024–34,” Employment Projections, U.S. Bureau of Labor Statistics; National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Data Center; “Data and Statistics.”
- 33 North America’s Building Trades Unions (NABTU), NABTU, BlackRock, and AI Infrastructure Partnership Launch Strategic Collaboration to Support America’s Infrastructure Workforce (Washington, DC: NABTU, August 10, 2026), https://nabtu.org/press_releases/blackrockpartnershipaip/.
- 34 Karen Gardiner, Daniel Kuehn, Pamela Loprest, and Stephanie Petrov, *The Implementation of Registered and Unregistered Apprenticeship: Evidence from the Scaling Apprenticeship and Closing the Skills Gap Grants* (Washington, DC: Urban Institute, prepared for the U.S. Department of Labor, Chief Evaluation Office, September 2025), 38n31, https://www.dol.gov/sites/dolgov/files/OASP/evaluation/CEO-library/The_Implementation_of_Registered_and_Unregistered_Apprenticeship.pdf.
- 35 BGI analysis of “Apprentice Completion Rate Analysis;” “IPEDS Outcome Measures,” 2023 release-year window; and Burning Glass Institute career-history data, apprenticeship-conversion cohort started 2016–2022 and followed through May 2026.

- 36 "Apprentice Completion Rate Analysis (BETA)," U.S. Department of Labor, Apprenticeship.gov, accessed July 13, 2026, <https://www.apprenticeship.gov/data-and-statistics/completion-rate-analysis>
- 37 Burning Glass Institute (BGI) career history data
- 38 "Integrated Postsecondary Education Data System (IPEDS)", Outcome Measures, National Center for Education Statistics, U.S. Department of Education, <https://nces.ed.gov/ipeds/>
- 39 "Integrated Postsecondary Education Data System (IPEDS)", Outcome Measures, National Center for Education Statistics, U.S. Department of Education, <https://nces.ed.gov/ipeds/>; Burning Glass Institute (BGI) career history data
- 40 "Apprentice Completion Rate Analysis (BETA)," U.S. Department of Labor, Apprenticeship.gov, <https://www.apprenticeship.gov/data-and-statistics/completion-rate-analysis>.
- 41 Ad Council Research Institute, "Ford ACRI."
- 42 Ad Council Research Institute, "Ford ACRI."
- 43 "Vehicle Registration Counts by State," U.S. Department of Energy, Office of Critical Minerals and Energy Innovation, accessed September 15, 2026, <https://afdc.energy.gov/vehicle-registration>.
- 44 BGI analysis of National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS); state CTE program listings and Perkins V reporting; and U.S. Department of Labor, Registered Apprenticeship Partners Information Database System (RAPIDS), 2026.
- 45 BGI analysis of U.S. Census Bureau, American Community Survey 5-Year Public Use Microdata Sample, 2020–2024
- 46 "Single-Family Permits End 2025 on a Soft Note," National Association of Home Builders, accessed September 14, 2026, <https://eyeonhousing.org/2026/03/single-family-permits-end-2025-on-a-soft-note/>; and "May 2025 State Occupational Employment and Wage Estimates."
- 47 "Single-Family Permits," <https://eyeonhousing.org/2026/03/single-family-permits-end-2025-on-a-soft-note/>.
- 48 BGI analysis of National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS); state CTE program listings and Perkins V reporting; and U.S. Department of Labor, Registered Apprenticeship Partners Information Database System (RAPIDS), 2026.
- 49 BGI analysis of U.S. Census Bureau, American Community Survey 2020–2024 5-Year Public Use Microdata Sample
- 50 BGI analysis of U.S. Bureau of Labor Statistics, Employment Projections and Worker Characteristics, 2025–2035, Table 1.10
- 51 BGI analysis of U.S. Bureau of Labor Statistics, Occupational Employment and Wage Statistics (May 2019 and May 2025 estimates) and Employment Projections and Worker Characteristics, 2025–2035

- 52 "The Union Difference," International Brotherhood of Electrical Workers, accessed September 15, 2026, <https://ibewgov.org/wp-content/uploads/2024/09/Recruitment-Flyer.pdf>.
- 53 JFF analysis of U.S. Department of Labor RAPIDS data, 2011–2024.
- 54 BGI analysis of U.S. Census Bureau, American Community Survey 5-Year Public Use Microdata Sample, 2020–2024.
- 55 BGI analysis of U.S. Bureau of Labor Statistics, Occupational Employment and Wage Statistics (May 2019 and May 2025 estimates) and Employment Projections, 2025–2035
- 56 BGI analysis of National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS); state CTE program listings and Perkins V reporting; and U.S. Department of Labor, Registered Apprenticeship Partners Information Database System (RAPIDS), 2026.
- 57 U.S. Department of Education, Perkins V state reporting; state secondary CTE program listings; Burning Glass Institute cross-state analysis, 2026.
- 58 U.S. Bureau of Labor Statistics, "Heating, Air Conditioning, and Refrigeration Mechanics and Installers," Occupational Outlook Handbook, Work Environment, 2025 employment data, last modified August 27, 2026 (<https://www.bls.gov/ooh/Installation-Maintenance-and-Repair/Heating-air-conditioning-and-refrigeration-mechanics-and-installers.htm#tab-3>).
- 59 BGI analysis of U.S. Bureau of Labor Statistics, Occupational Employment and Wage Statistics (May 2019 and May 2025 estimates).
- 60 BGI analysis of U.S. Bureau of Labor Statistics, Employment Projections, 2025–2035.
- 61 BGI analysis of U.S. Census Bureau, American Community Survey 2020–2024.
- 62 "7th Drinking Water Infrastructure Needs Survey and Assessment April 2023," Environmental Protection Agency, accessed September 15, 2026, https://www.epa.gov/system/files/documents/2023-04/Final_DWINSAs%20Public%20Factsheet%204.4.23.pdf?utm.
- 63 BGI analysis of "Occupational Employment and Wage Statistics" (May 2019 and May 2025 state estimates) and "Employment Projections, 2025–2035."
- 64 "Completions C," U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), accessed September 23, 2026, <https://nces.ed.gov/ipeds/survey-components/>, 2024 data release; "2020 CIP–SOC Crosswalk," National Center for Education Statistics, accessed September 23, 2026, <https://nces.ed.gov/ipeds/cipcode/post3.aspx?y=56>; "Registered Apprenticeship Partners Information Data System (RAPIDS 2.0)," U.S. Department of Labor, Employment and Training Administration, accessed 2026; and state CTE program listings and Perkins V Consolidated Annual Reports, accessed 2026.

ALLIANCE FOR AMERICA'S SKILLED TRADES

BlackRock

carhartt 



Google