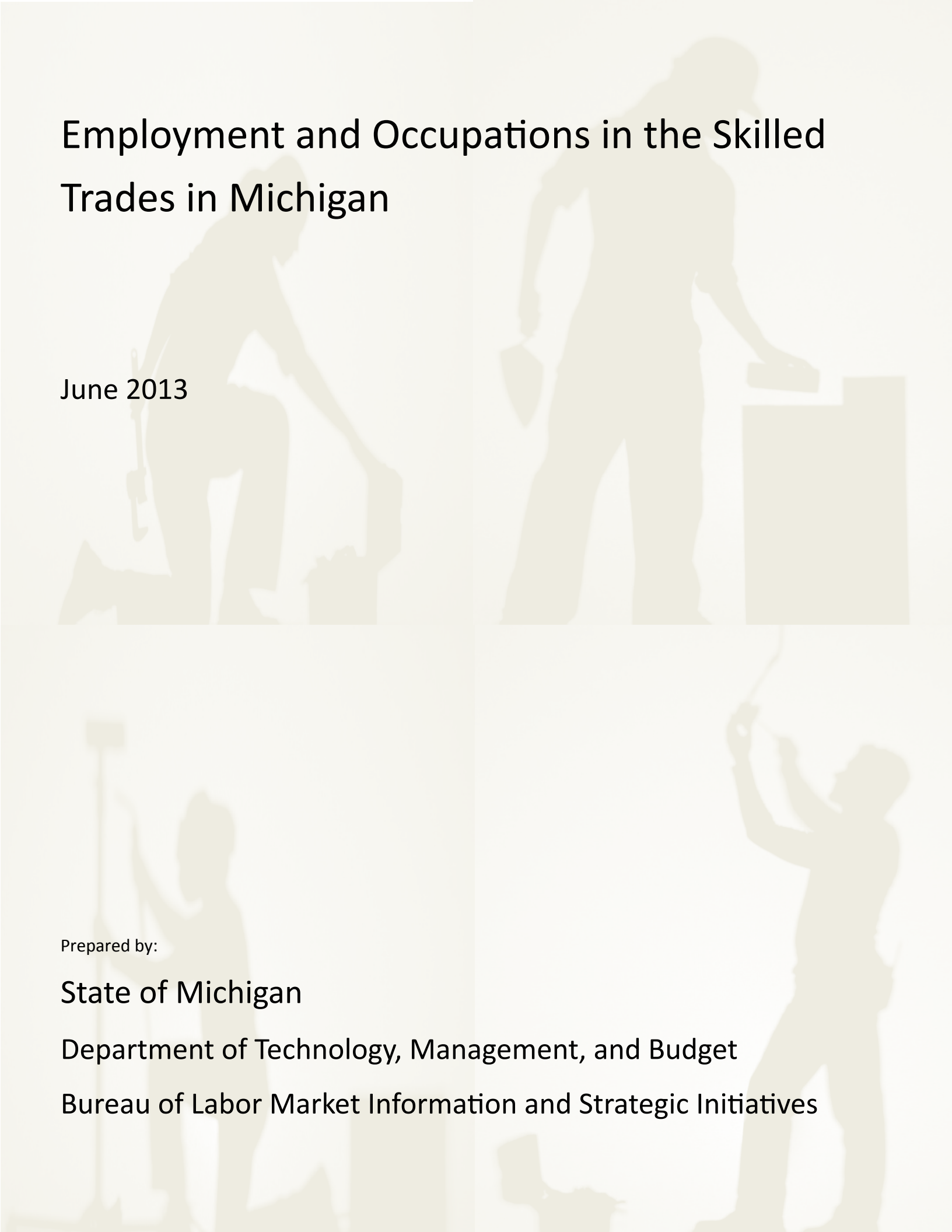


Employment and Occupations in the Skilled Trades in Michigan



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Executive Summary

- ✿ Skilled Trades occupations can be divided into three categories: Skilled Industrial Trades, Skilled Construction Trades, and Skilled Service Trades. (Note: Service Trades are excluded from the analysis in this report, unless noted otherwise.) A list of Skilled Trades occupations, as defined in this study is available in Appendix 1.
- ✿ With nearly 5 percent of statewide employment, Skilled Trades occupations are an important source of jobs in Michigan's economy. While concentrated in Manufacturing and Construction, Skilled Trades workers are employed in many of the state's industries.
- ✿ With median hourly wages around \$21 and ranging from \$13 to \$34, many Skilled Trades occupations pay a solid wage. When compared to average occupational wages, with a median hourly wage of \$16 and a range from \$8 to \$39, the Skilled Trades see a pay advantage at the lower and middle range of the distribution.
- ✿ Today, Skilled Trades workers are in high demand, evidenced by over 5,000 online advertised job vacancies. Moreover, short-term occupational projections call for continued demand in the short-run as Skilled Trades employment is expected to expand by 2.1 percent through 2013.
- ✿ In the long run, demand for some Skilled Trades occupations will slow, primarily due to weak employment outlook in the Manufacturing industry. Nevertheless, continued growth will remain strong for many Skilled Trades titles. Overall, Skilled Trades occupations should grow by 7.4 percent through 2020.

Key Findings:

Employment

In Skilled Trades Occupations: **185,500**

In All Occupations: **3, 918,100**

Skilled Trades Occupations / All Occupations: **4.7%**

Wages Ranges

For Skilled Trades Occupations: **\$13 - \$34 (Median \$21)**

For All Occupations: **\$8 - \$39 (Median \$16)**

Real-Time Online Job Demand

For Skilled Trades: **5,000**

Change, 2012-2013: **+19.9%**

For All Occupations: **136,000**

Change, 2012-2013: **+10.3%**

Skilled Trades Occupations / All Occupations: **3.5%**

Projected Short-Term Growth, 2013

In Skilled Trades: **2.1%**

In All Occupations: **1.3%**

Forecasted Long-Term Growth, 2020

In Skilled Trades: **7.4%**

In All Occupations: **8.5%**

Average Annual Openings, 2010-2020

For Skilled Trades: **5,900**

For All Occupations: **130,000**

Skilled Trades / All Occupations: **4.5%**

Program Completers

Apprenticeships (2012): **1,230**

Apprenticeship Programs (2012): **1,006**

Degrees / Certificates (2011): **3,000**

- ✿ Skilled Trades occupations and the industries in which they are typically employed (Manufacturing and Construction) have historically reported relatively high union membership rates. While union membership in these industries remains above average, union membership has been sliding in recent years and is likely to continue downward as a result of recent legislation in Michigan.
- ✿ Online advertised vacancies and employment projections are measures of labor demand, not labor supply. Therefore, without a supply of qualified workers to satisfy demand, there will be shortages in the labor market. A shortage may result in reduced production and slowed economic growth, and could ultimately lead to firms locating elsewhere.
- ✿ There is a strong correlation between an occupation's required education / training and that occupation's median wage and employment outlook. Skilled Trades occupations that require an apprenticeship or long-term on-the-job training see a median wage of around \$24/hour and expected growth of around 2.3 percent through 2013 compared to Skilled Trades occupations that require moderate-term or short-term on-the-job training, which report a median wage around \$19/hour and anticipated growth of 1.7 percent through 2013.
- ✿ The main programs for Skilled Trades workers are apprenticeship and post-secondary degrees and certificates. In 2012, about 1,230 individuals completed an apprenticeship program, up slightly over recent years, but still lower than prerecession levels. In 2011, over 3,000 individuals completed a degree or certificate in one of three programs most closely related to Skilled Trades occupations.
- ✿ Skilled Trades occupations typically do not require candidates to hold advanced degrees, but typically do require employer-provided moderate-term or long-term on-the-job training or apprenticeships administered through the U.S. Department of Labor.
- ✿ The minimum requirements for Skilled Trades occupations may not realistically reflect the actual requirements in the labor market. An analysis of online job advertisements reveals that most employers are looking for candidates that in one way or another exceed minimum requirements. This is most evident in the context of "related work experience." Over 80 percent of online advertised job vacancies in the Skilled Trades are looking for candidates with significant work experience, with many calling for 2 or more years of related work experience or experience with particular techniques, machines, or software interfaces.
- ✿ There is concern that there is now or soon will be a shortage of Skilled Trades workers in the labor market. To ensure there is an adequate supply of qualified Skilled Trades workers in the labor market, students and jobseekers, employers, training providers, and policy makers all have a role to play.
- ✿ The Bureau of Labor Market Information and Strategic Initiatives plans to update this report. Additional feedback from partners or other stakeholders is invited. If you would like to share your experiences as a Skilled Trades employer, worker, training provider, policy maker, etc., please contact the author of this study, Jason Palmer, at (517) 335-5267 or palmerj2@michigan.gov.

Forward: Skilled Trades and Michigan

The Skilled Trades are vital to our state's economy. They play an instrumental role in producing some of our state's most important products. They help build our infrastructure, our homes, and our offices. They work behind the scenes to keep our factories running, our roads and bridges safe, and our homes heated and powered. In Michigan, working in the Skilled Trades has always been a respectable career choice. For generations, workers in the Skilled Trades earned a solid, middle class wage while working in meaningful and enjoyable jobs, all the while contributing significantly to the state's economy. Today, as much as at any other period in our history, our Skilled Trades workers are contributing to our state's economy, playing an important role in its economic recovery and its expansion.

There is concern, however, that there is now or will soon be a critical shortage of adequately trained Skilled Trades workers. Should employers be unable to find qualified workers, the pace of economic growth may be slowed or even halted. Several explanations for a Skilled Trades shortage are cited: Skills mismatches, stagnant wages and benefits, overly specific job requirements, unrealistic expectations, fewer employer-sponsored on-the-job training programs and apprenticeships, and declining interest in Skilled Trades careers among students and jobseekers. Yet, with employment heavily concentrated in Manufacturing and Construction, explaining any market imperfection for the Skilled Trades can be aided by reviewing recent economic history, which includes two recessions, massive job losses, major changes in how and where we work, and altered perceptions of Manufacturing, Construction, and Skilled Trades.

A Rough Decade for Michigan Manufacturing and Construction

In March 2001, the U.S. economy entered a short, but significant recession. This recession came at a time of rapidly advancing technology and increasing global connectivity. The recession, combined with the powerful forces of the Internet and globalization, had a profound and lasting effect on just about every aspect of our society, including our work. Nowhere were the recession's impacts on work more visible than in Manufacturing and Construction, and particularly in Michigan. As manufacturers invested in new technologies requiring workers to have new, upgraded skills, what were once periods of cyclical unemployment were seemingly transformed into structural mismatches in the labor market. This was evidenced by unprecedented job losses between 2000 and 2007. During this period, Michigan saw 280,000 Manufacturing jobs lost, as the industry shed one-third of its employment. Similarly, Construction in Michigan saw jobs drop by 20 percent. One of the hallmarks of this period was a dramatic increase in long-term unemployment, especially among those in lower skill Production occupations. Skilled Trades workers, while slightly more insulated from the recession, were in no way immune from job losses, and during this period, many Skilled Trades workers joined the ranks of the unemployed or became discouraged and gave up looking for work altogether.

Having never recovered from the 2001 recession, Michigan's economy was further weakened by the Great Recession. Beginning in December 2007 and lasting through June 2009, this global recession pushed Michigan Manufacturing lower by an additional 155,000 jobs, as another 1 in 4 workers lost employment in the industry. Over the same period, Construction, an industry intimately connected to the global financial crisis, followed suit dropping 39,000 additional payroll jobs, falling by another 23 percent. For nearly a decade, it seemed that the state's Manufacturing and Construction industries were clinging to life. By the time the dust settled and the U.S. economy finally entered recovery, Michigan had seen total payrolls fall by 806,000, dropping by nearly 20 percent between 2000 and 2009. During this period, most of the damage was seen in Manufacturing, which was virtually cut in half, losing 434,000 jobs and in Construction, which lost 82,000 jobs and saw employment drop by 40 percent.

A Recovery in Manufacturing and Skilled Trades

Due to the length and depth of the economic downturn in Michigan, terms like Manufacturing, Construction, even Skilled Trades, took on a whole new meaning and were associated with job losses and economic recession. In the last few years, this has changed. Now, as much as any time before, these industries and their accompanying Skilled Trades workers are playing an important and increasingly vital role in Michigan's recovery and its future.

According to the National Bureau of Economic Research, the national economic recovery began in June 2009 with the improvement of several macroeconomic variables, including Gross Domestic Product. Since entering recovery in June 2009, Michigan has contributed significantly to the national economic recovery, seeing payrolls grow by 161,000 or 4.2 percent. Importantly, significant gains have been seen in Manufacturing, which recouped 63,000 jobs and expanded by 13.6 percent in just 2 years. Over the same period, Construction has seen jobs advance by 5,700 or 4.5 percent.

Skilled Trades Opportunities in Manufacturing and Construction

As a result of prolonged recession and increased technology, a structural transformation has swept the state's Manufacturing and Construction industries, making work in these industries significantly different than a decade ago. As industry adopted many of the technological advances offered by the previous decades, workers enter highly automated environments using the newest tools and technologies. Today, working in this technologically advanced, changing environment requires workers with significantly different and advanced skill sets. This represents a huge opportunity for current and prospective Skilled Trades workers, who, in many ways, are exactly what is needed in today's labor market. And, these same trends will continue into the future, with less demand for lower skilled Production occupations and more demand in many Skilled Trades occupations. It is critical that the workforce is prepared for these opportunities. This report is intended to contribute to that conversation.

Employment and Earnings in the Skilled Trades

Skilled Trades employment currently measures 185,500 in Michigan, representing just under 5 percent of total statewide occupational employment. The majority of Skilled Trades are employed in Manufacturing and Construction, where Skilled Trades can make up as much as 40 percent of employment in some industry subsectors. Despite this concentration, Skilled Trades positions are found throughout the economy, even in unsuspecting industries like Health Care and Government. Wherever employed, most Skilled Trades workers receive competitive pay, with wages ranging from \$13/hour at the entry level to \$34/hour for experienced workers. And, there are additional perks to many Skilled Trades jobs, including low turnover and a bright outlook.

Skilled Trades Employment

- ✿ Most Skilled Trades employment is concentrated in Manufacturing and Construction. But, within these dominant industries, Skilled Trades are found in virtually every subsector, offering numerous alternatives for qualified jobseekers. For example, Trades like Machinists and Tool and Die Makers report significant employment in Michigan's Transportation Equipment Manufacturing industry, but can be found throughout Manufacturing, with employment in Fabricated Metal Manufacturing, Machinery Manufacturing, and Plastic and Rubber Manufacturing, just to name a few. The same goes for Construction, with Trades employed in all three subsectors: Heavy and Civil Construction, Construction of Buildings, and Specialty Trade Contractors.
- ✿ Although mostly in Manufacturing and Construction, the Skilled Trades provide opportunities throughout the economy. For instance, Wholesale Trade and Health Care are examples of industries with notable Skilled Trades employment, particularly in Installation and Maintenance occupations.

Box 1: Largest Skilled Trades Occupations

General Maintenance and Repair Workers
Employment: 35,050 · Median Wage: \$ 15.86
Machinists
Employment: 27,880 · Median Wage: \$ 19.30
Electricians
Employment: 17,890 · Median Wage: \$ 27.23
Tool and Die Makers
Employment: 12,920 · Median Wage: \$ 23.92
Industrial Machinery Mechanics
Employment: 12,350 · Median Wage: \$ 22.84
Carpenters
Employment: 12,330 · Median Wage: \$ 19.79

Source: BLMISI, Occupational Employment Statistics (OES)

Box 2: Leading Skilled Trades Industries

Transportation Equipment Manufacturing
Older Workers: 17% · Turnover: 4%
Specialty Trade Contractors
Older Workers: 19% · Turnover: 11%
Fabricated Metal Product Manufacturing
Older Workers: 15% · Turnover: 7%
Machinery Manufacturing
Older Workers: 20% · Turnover: 6%
Plastic and Rubber Product Manufacturing
Older Workers: 18% · Turnover: 6%
Construction of Buildings
Older Workers: 21% · Turnover: 10%

Source: BLMISI, Local Employment Dynamics (LED)

- ⚙ Professional and Business Services is another industry with notable Skilled Trades employment, due primarily to the Employment Services sector. And, there is evidence that opportunities in the Skilled Trades may be especially strong in Employment Services. Included in this industry are Temporary Help establishments that supply workers to clients for a limited or fixed period to supplement workforce needs. The anticipated employment growth between 2010 and 2020 for most Skilled Trades is significantly stronger in Employment Services than in *either* Manufacturing or Construction. For example, Machinists are expected to expand nationally by 31,500 positions or 8.5 percent by 2020. Employment Services will be responsible for 1 in 3 of these new positions and will see Machinists grow by an impressive 42 percent, nearly five times faster than the occupation's anticipated cross-industry growth. The outlook is similar for other Skilled Trades occupations in Employment Services. Current online vacancies also reflect the importance of the Employment Services industry. According to The Conference Board's Help Wanted Online Database, about 12 percent of online advertised vacancies for Skilled Trades positions are in Employment Services, making it the industry with the most Skilled Trades vacancies.

Industry Employment Dynamics

- ⚙ In Michigan, about 19.1 percent of all workers are "older workers," aged 55 and older. Once considered an aging industry, Manufacturing has become considerably younger in recent years. Among the factors contributing to this demographic shift were retirements of older workers in the state's Manufacturing industry, generally, and buy-outs and early retirements in the state's auto industry, specifically. Today, most Manufacturing industries with substantial Skilled Trades employment report an age distribution similar to the statewide average, with older workers responsible for between 15 and 20 percent of total industry employment. Similar age distributions are seen in Construction, where the share of workers 55 and older ranges from 19 to 22 percent. Yet, many anecdotes from particularly vocal firms suggest that there may be an impending shortage in the Skilled Trades due to especially high concentrations of older workers employed in various Skilled Trades positions at some establishments. (Box 2)
- ⚙ One of the hallmarks of Manufacturing industries with substantial Skilled Trades employment is relatively low turnover, suggesting more stability for workers and employers alike. On average, turnover measures 9.1 percent, meaning that in a given quarter, 9 in 100 jobs are vacated and filled. Reporting especially low turnover is Transportation Equipment Manufacturing (where turnover is half the average rate) as well as Machinery Manufacturing and Chemical Manufacturing. There are several reasons for lower than average turnover in these industries, including high union membership, high recruiting and training costs, as well as good wages and high job satisfaction. Turnover can be considerably higher than average in seasonal industries, including Construction. In Construction, turnover ranges from a below average 8 percent in Heavy and Civil Construction to 10 percent and 11 percent in Construction of Buildings and Special Trade Contractors, respectively. (Box 2)

Wages

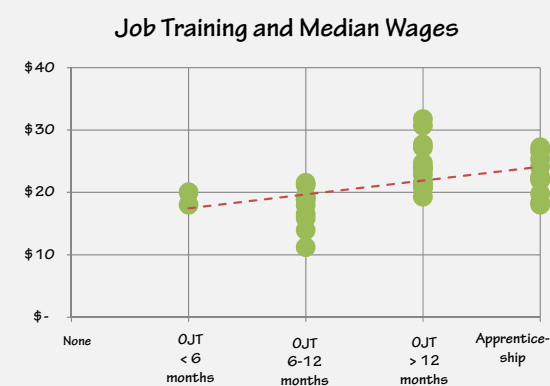
- ✿ The hourly wages for Skilled Trades occupations range from \$13 to \$34, with a median hourly wage over \$21. This compares favorably to average occupational wages, which range from \$8 to \$39, with a median of around \$16.
- ✿ The pay advantage for Skilled Trades is most pronounced at the entry and middle levels of the wage distribution. At the higher level of the distribution, the pay advantage for the Skilled Trades is lower, due primarily to the influence that highly-paid Management and Professional occupations have on the high end of the earnings spectrum. Indeed, these occupations offer higher wages than *most* occupations in the economy, not just the Skilled Trades.
- ✿ Within the Skilled Trades, those occupations requiring higher levels of formal education as well as those requiring longer periods of on-the-job training are associated with a higher wage. (Box 3)
- ✿ One reason for higher wages in Skilled Trades occupations is higher union membership in Manufacturing and Construction. In recent years, a decline in union membership has added downward pressure on wages in these industries. In 2012, union membership continued its downward trend, measuring just 16.6 percent of wage and salary workers (compared to over 25 percent in 1990). Moreover, Michigan became the 24th Right to Work state (under Section 14(b) of the Taft-Hartley Act) with the passage of Public Acts 348 and 349, which may lead to even lower union membership in coming years.

Box 3: Learn More, Earn More – Evidence from the Skilled Trades . . .

The old saying “the more you learn, the more you earn” certainly applies to the Skilled Trades. But, in the Skilled Trades, learning often means applied or technical training and not necessarily degrees and certificates. Typically, this training is accomplished through employer-provided on-the-job training or through apprenticeships, which combine work experience and formal training to prepare workers for particular jobs, or “Trades.”

So what is the relationship between learning and earning in the Skilled Trades? First, the Skilled Trades occupations that require an associate’s degree or a postsecondary or vocational certificate are among the highest paid occupations in the group.

Second and more evident is the strong correlation between longer periods of on-the-job training required for a Skilled Trade and that Trade’s earnings. For example, the median hourly wage for Skilled Trades occupations requiring moderate-term or short-term on-the-job training is \$19 compared to around \$24 for those requiring long-term on-the-job training and apprenticeships. The relationship between an occupation’s required job training and that occupation’s median wages is graphed below.



Box 4: Online Job Postings, Occupational Wages, and the “Skills Gap”

There has been debate about whether or not a “skills gap” exists for Skilled Trades workers. The arguments go like this: One side claims that there are not enough adequately trained Skilled Trades workers in the labor market. The other side responds that there are plenty of Skilled Trades workers in the labor market, but that employers are not offering a competitive wage or are being unrealistic in their requirements. As with most debates, there is merit to both arguments:

Beyond anecdotes, there is some quantifiable evidence that employers are having a difficult time finding qualified Skilled Trades workers. An analysis of online advertised job postings shows that while 3 in 4 vacancies in the Trades are filled (or, otherwise removed) within 60 days of posting, just over 10 percent remain active for 120 days or longer. In many cases, long-running ads can signal that an employer is having difficulty finding the right candidate to fill the vacancy. The Skilled Trades with the most long-running ads include: Machinists, Welders, Electricians, and Tool and Die Makers. More telling, however, are the Skilled Trades with the highest share of total advertisements that are long-running. These include some usual suspects like Tool and Die Makers and Welders, but also include occupations like Carpenters, Millwrights, and Electrical and Electronics Repairers, where long-running ads account for nearly 20 percent of total postings. Indeed, many of these same Trades are frequently mentioned during conversations about the “skills gap.” While most long-running ads seek candidates with some combination of experience and training, these requirements do not seem altogether unrealistic.

But, some say they *are* unrealistic, especially considering the offered wage. An analysis of several Skilled Trades occupations shows that wages for the Trades have remained relatively flat in recent years. According to data from the Bureau of Labor Statistics, the median wages for Welders and Tool and Die Makers inched lower between 2006 and 2012. For Welders, wages were down from \$17.12 in 2006 to \$16.53 in 2012. For Tool and Die Makers, wages slid from \$24.69 in 2006 to \$23.92 in 2012. Some argue that flat wages in a period of shortage is inconsistent with classical economic theory, which would suggest that, in response to a real shortage in the labor market, wages should rise to provide an incentive for qualified workers to compete for the jobs and for unqualified workers to invest in the skills and training necessary to become competitive for the jobs. (It should be noted, however, that for methodological reasons the Bureau of Labor Statistics cautions against using occupational wage data to compare changes in wages over time.) To the extent that occupational wage data are a reliable indicator of labor supply and demand, there are several factors that may help explain flat wages for Skilled Trades occupations including lower union membership, changing industry distribution of employment, and retirements at the senior or advanced level of the pay scale and hiring at the entry or novice-level of the pay scale, just to name a few.

Employment: The Role of Training and Education

- ⚙ While there is debate over the “skills gap,” there is no argument concerning the importance of education and training for those interested in the Skilled Trades. Just as there is a positive correlation between higher levels of training / education and higher wages, there is a correlation between education / training and employment outlook. By 2020, Skilled Trades occupations that require larger investments in on-the-job training and education will see the most employment growth and provide more opportunities for jobseekers.

Job Requirements and Readiness

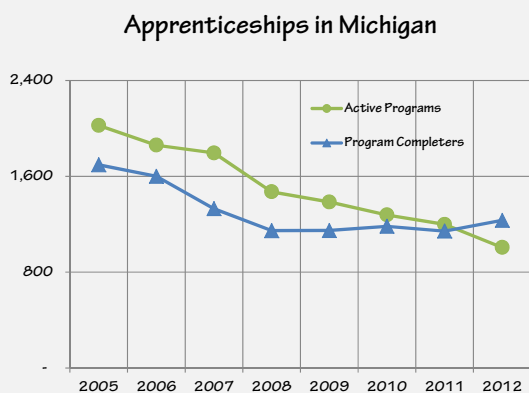
With an emphasis on practical and applied training, Skilled Trades occupations are associated with lower levels of *formal* education but more than compensate by requiring significant investments in on-the-job training, often satisfied through long-term, employer-sponsored training programs or through apprenticeship programs administered by the U.S. Department of Labor. This section reviews the minimum requirements for most Skilled Trades occupations, with sections on on-the-job training and apprenticeships, formal education, and experience. Also discussed throughout are qualitative insights into job requirements for the Skilled Trades.

The Skilled Trades Model

✿ Generally, workers enter Skilled Trades occupations through some significant commitment to on-the-job training or an apprenticeship. Therefore, most Skilled Trades positions do not require successful candidates to hold advanced degrees or certificates. This model has offered an attractive alternative for people who, for any number of reasons, elect not to pursue a four-year degree. But, Skilled Trades occupations should not be confused with low skill or easy jobs. On the contrary, considering only minimum requirements, workers in the Skilled Trades will need to demonstrate competency through often rigorous on-the-job training and by acquiring skills and knowledge in difficult areas like mathematics and complex problem solving.

Box 5: Apprenticeship Programs and Completers ...

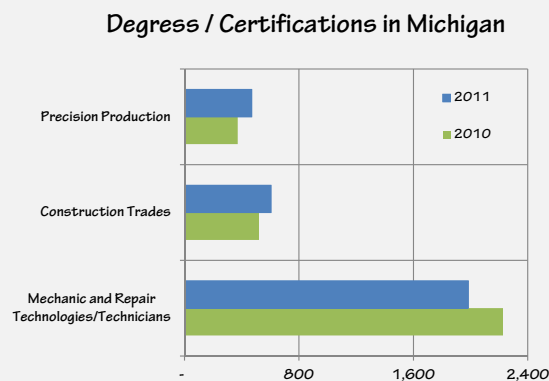
In 2012, just over 1,230 individuals completed an apprenticeship through one of Michigan's 1,006 active apprenticeship programs. Since 2005, the number of active programs in the state has been cut in half, while completers slid to a low of 1,143 in 2011 before rebounding somewhat to current levels.



Source: U.S. Department of Labor, Office of Apprenticeships.

Box 6: Degree / Certificate Programs and Completers ...

Over 3,000 individuals completed a degree or a certificate through Michigan's universities, community colleges or other training providers in 2011. Leading programs were Vehicle Maintenance and Repair, Precision Metal Working, HVACR Maintenance, and Electrical and Power Transmission.



Source: National Center for Education Statistics.

- ✿ Importantly, *minimum* requirements for entry into most Skilled Trades occupations may not realistically reflect the actual requirements in today's labor market as some employers may have additional requirements. And, there is evidence to support that most employers are looking for candidates with, in one way or another, something beyond minimum requirements. According to a content analysis of 150 online advertised job vacancies for three Skilled Trades occupations, most ads (83 percent) are seeking experienced workers. Additionally, about 1 in 3 ads are seeking candidates with a combination of a degree or certification and related work experience. Surprisingly, very few ads (4 percent) explicitly state that the employer is seeking entry-level Skilled Trades workers and is "willing to train." (Box 7)
- ✿ Analyzing online advertised job vacancies can also help identify certifications and skills that are currently in demand in the labor market. Among the most commonly advertised skills and certifications in the Skilled Trades are Preventative Maintenance, Quality Control, and LEAN Manufacturing. These qualifications give insight into the flexible and increasingly incorporated role Skilled Trades workers play in today's organizations. In addition, employers are seeking workers with knowledge of or certification in Occupational Safety and Health standards and Environmental Protection standards, reflecting today's regulatory environment. (Box 9)

On-the-Job Training and Apprenticeships

- ✿ On-the-job training and apprenticeships are a key requirement and an important component of Skilled Trades positions. In fact, virtually all Skilled Trade occupations require significant on-the-job training. About 2 in 3 Skilled Trades require long-term on-the-job training or an apprenticeship. An apprenticeship is defined as "a formal relationship between a worker and a sponsor that consists of a combination of on-the-job training and related occupation-specific technical instruction in which the worker learns the practical and theoretical aspects of an occupation." Long-term on-the-job training is defined as "more than 12 months of on-the-job training or, alternatively, combined work experience and formal classroom instruction" designed to develop skills to attain competency in an occupation. The remaining third of Skilled Trades occupations require moderate-term on-the-job training, defined as between 1 and 12 months of combined on-the-job experience and informal training. Only in rare circumstances do Skilled Trades occupations require less than moderate-term on-the-job training.
- ✿ In the past, Skilled Trade occupations were almost synonymous with apprenticeships. This is not the case today. In fact, apprenticeships are much broader than Skilled Trades. According to the U.S. Department of Labor, there are more than 500 apprenticeshipable job titles, with many related to occupations well-beyond the scope of any definition of Skilled Trades, no matter how inclusive. Nevertheless, most Skilled Trades occupations boast well-established apprenticeships programs, and, apprenticeships are *required* for some Skilled Trades occupations, namely Electricians, Carpenters, Plumbers, Pipefitters, and Steamfitters, and Sheet Metal Workers. (Box 5)

Formal Education

- ✿ Because most Skilled Trades do not require formal education, only a handful of related training programs are recognized in education statistics. The most relevant programs for the Trades are concentrated in three categories: Construction Trades, Mechanic and Repair Technologies, and Precision Production. In 2011 there were 3,060 program completers in these programs with the majority completing programs through one of Michigan's Community Colleges. (Box 6)
- ✿ When formal education *is* required, most often candidates are expected to hold a post-secondary vocational certificate or, occasionally, an Associate's degree. Very rarely do candidates need a Bachelor's degree to work in the Skilled Trades.

Related Work Experience

- ✿ Technically, most Skilled Trades do not require candidates to have related work experience to enter the occupation. However, there is evidence that many employers are seeking candidates that do, indeed, have previous work experience – sometimes, significant and specific experience. An analysis of online advertised job vacancies for Machinists, Welders, and Tool and Die makers reveals that for most openings, employers are seeking candidates with related work experience. And, often employers are looking for quite specific experience. For all three Skilled Trades, many current ads suggest that candidates need experience not only in the particular Trade, but also working with specific machines, tools, software, or materials. (Box 7)

Box 7: What Employers Are (Really) Looking for in Skilled Trades . . .

Content analysis can be used to identify themes from the text of online job advertisements, providing a deeper understanding of just who employers are really looking for to fill their Skilled Trades vacancies. Below are the results of a content analysis of 50 randomly selected job postings in each of three major Skilled Trades occupations.

Machinists (N=50)

- ✿ 80 percent of current online job advertisements are seeking Machinists with experience. Required experience ranges from 1 year to 8 years of related experience, with many vacancies asking for 5 years. Only two vacancies were at the entry level and explicitly stated that the employer would provide on-the-job training.
- ✿ Common qualifications included experience with CAD/CAM (GibbsCam, MasterCam, and SuperCam software), G code, M code, and experience on Bridgeport, Mazak, Allen Bradley, and other machines.

Welders (N=50)

- ✿ Experience is required for most (82 percent) analyzed ads for Welders. Experience requirements range from 1 year to 5 or more years, with most ads calling for 2 or more years.
- ✿ Common welding skills sought include: Flux-Core Arc Welding, Gas Metal Arc Welding (MIG), Gas Tungsten Arc Welding (TIG), and Shielded Metal Arc Welding. Other commonly listed qualifications included reading blueprints and schematics as well as working with highly specialized materials.

Tool and Die Makers (N=50)

- ✿ Again, most job ads are seeking candidates with significant training and experience. 87 percent of current ads require some experience, with many calling for 5 or more years of specific experience.
- ✿ In addition, 1 in 4 ads explicitly state that a journeyman card or certificate is required. Remarkably, some ads (12 percent) are looking for candidates with both a journeyman card or certificate *and* more than 5 years of experience.

Source: Bureau of Labor Market Information and Strategic Initiatives / The Conference Board, Help Wanted Online

Current and Projected Demand

This section examines the need for Skilled Trades workers at three important points in time: (1) current, or “real time” demand; (2) forecasted short-term demand; and (3) forecasted long-term demand. First, real-time data reveals the current demand for workers in the Skilled Trades. This information is most useful for identifying which Skilled Trades are in demand right now in Michigan. Similarly, short-term projections paint a picture of occupational demand in the Skilled Trades through 2013. Finally, long-term projections provide insight into the Skilled Trades that are expected to see the most employment growth through 2020 as well as those that will generate many openings as a result of an aging workforce.

Real-Time Demand

- ✿ According to The Conference Board’s Help Wanted Online Database, there are currently 5,000 Skilled Trades positions advertised online in Michigan. Reflecting increased demand for the Skilled Trades, online postings rose 19.9 percent since 2012 and have more than doubled since the end of the recession in June 2009. Over the year, demand for Skilled Trades occupations has outpaced average growth, which measured around 10 percent.
- ✿ The Skilled Trades with the most online advertised vacancies include: General Maintenance Workers, Machinists, Welders, Carpenters, Electricians, Industrial Machinery Mechanics, and Tool and Die Makers. With the notable exception of Machinists and Brickmasons, most Skilled Trades occupations report increased vacancies over the year. **(Box 8)**

Box 8: In-Demand Skilled Trades Occupations . . .

General Maintenance and Repair Workers

1,820 ads · +32 Percent

Machinists

660 ads · -11 percent

Welders, Cutters, and Welder Fitters

400 ads · +19 percent

Electricians

330 ads · +11 percent

Industrial Machinery Mechanics

300 ads · +17 percent

Tool and Die Makers

200 ads · +37 percent

Source: The Conference Board, Help Wanted Online Database

Box 9: In-Demand Certifications and Skills in the Skilled Trades . . .

Preventative Maintenance

240 ads

LEAN Manufacturing

170 ads

Occupational Safety and Health

180 ads

Quality Control

150 ads

Electrical Systems

170 ads

Environmental Protection Standards

150 ads

Source: The Conference Board, Help Wanted Online Database

- ✿ The industries advertising Skilled Trades vacancies are dominated by Employment Services, which is responsible for 1 in 8 vacancies in the Trades. Additional industries with considerable demand include Manufacturing and Construction, as well as Professional, Scientific, and Technical Services.
- ✿ Combined, Skilled Trades occupations represent just 3.5 percent of all online advertised vacancies, lower than their representative share of total employment in the state's economy (4.7 percent). A partial explanation for this relatively low representation is that establishments employing Skilled Trades workers do not always use online job boards to recruit and hire workers, instead many rely on other tools and practices.
- ✿ Service Trades are also well represented on online job boards. Heavily advertised Service Trades include: Medical Assistants, Medical Secretaries, Automotive Service Technicians and Mechanics, and Diesel Engine Specialists. (Skilled Service Trades online advertised vacancies are not calculated in totals for this section.)

Short-Term Employment Outlook

- ✿ According to short-term employment projections, Skilled Trades occupations are expected to see above average growth. Through 2013, employment in the Skilled Trades is likely to expand by 2.1 percent, compared to 1.3 percent growth expected overall. Continued gains in Skilled Trades occupations are predicated on the strong performance Manufacturing and Construction have had during the recent recovery. Manufacturing, which has in many ways led Michigan's economic recovery, has added 63,000 jobs, growing by 13.6 percent between 2010 and 2012. Likewise, Construction has seen payrolls improve by 5,700 or 4.5 percent.
- ✿ As both industries continue to expand, jobseekers should see opportunities in many Skilled Trades occupations. The Skilled Trades occupations expected to generate the most openings in 2013 include Machinists, Electricians, Welders, and Industrial Machinery Mechanics.

Long-Term Employment Outlook

- ✿ Long-term occupational projections call for employment in Skilled Trades to grow by 7.6 percent through 2020, just under the anticipated average growth of 8.5 percent. During this period, over 4,000 annual openings are expected in the Skilled Trades, with about 1 in 4 vacancies resulting from growth and 3 in 4 coming from the need to replace existing workers.
- ✿ Less optimistic long-term outlook is based largely on industry forecasts, which call for employment in the Manufacturing sector overall to inch lower by 1.5 percent through 2020. Nevertheless, Michigan's auto industry is expected to remain stable and the Construction industry is expected to increase by an above-average 10.9 percent. As a result, opportunities for Skilled Trades workers should be relatively strong in these and their related industries. Importantly, even within these industries, there remains a correlation between higher levels of education and training and a positive job outlook. Indeed, most demand in these industries should be seen for workers in Professional and Technical occupations, as well as some Skilled Trades titles.

- ✿ Among the Skilled Trades expected to see the most growth and the most openings are Industrial Machinery Mechanics, Heating, Air Conditioning, and Refrigeration Mechanics and Installers, Brickmasons and Blockmasons, Carpenters, Plumbers, Pipefitters, and Steamfitters, and Operating Engineers.
- ✿ Occupational projections are less than optimistic on several Skilled Trades including Millwrights (-15.5 percent), Metal Model Makers (-7.6 percent), Patternmakers (-7.5 percent), Tool Grinders, Filers, and Sharpeners (-5.7 percent), and Tool and Die Makers (-4.3 percent). Most of these occupations are concentrated in Manufacturing, and falling employment in these occupations is again consistent with forecasted job declines in the industry. Generally, these declines should be realized mainly through attrition, as few retiring workers will be replaced.
- ✿ In Manufacturing and Construction, the Skilled Trades should compare favorably to some non-Skilled Trades occupations. Various Operator and Tender job titles are expected to see double-digit employment declines through 2020 compared to generally positive outlook in many Skilled Trades occupations. This trend confirms the importance of education and job training, which are each becoming increasingly important in virtually all industries. In few industries is this clearer than in Manufacturing and Construction as both are rapidly changing and requiring workers to have new, considerably upgraded skills.
- ✿ In recent decades, offshore outsourcing has contributed to the loss of Manufacturing jobs, primarily in Production occupations, but also in Skilled Trades jobs. Despite globalization's impact on American jobs to date, there is evidence that some U.S. firms are beginning to "reshore" some of their Manufacturing jobs. (Box 10)

Box 10: Manufacturing and Offshore Outsourcing: An Optimistic View . . .

Globalization and offshore outsourcing may not claim as many American Manufacturing jobs in the next decade as they did during the previous two decades, this according to a special report on outsourcing and offshoring in *The Economist*. The report highlights several firms that have moved some Manufacturing jobs back to the U.S. from abroad, a practice called "reshoring."

Among the reasons cited for reshoring some Manufacturing jobs include: rising labor costs and regulations abroad, the cost of shipping goods half way across the world, concerns over intellectual property rights, and political pressure and public relations.

Today, "the best argument for locating activities overseas is to be close to fast-growing new markets," the special report notes. And, this demand will only grow stronger. Therefore, it will not be unheard of for U.S. firms to continue to employ Manufacturing workers abroad, but they will do so to produce goods and services for the target market.

We should not expect to see all the Manufacturing jobs return, however. According to *The Economist*, "manufacturing work will often come back only when it has been partly automated." As a result, fewer workers will be needed, yet highly skilled workers, among them, the Skilled Trades, will be even more important.

Ultimately, an employer's "decision on where to locate will increasingly be driven by where they can find the skilled workers they need."

Source: The Economist. 2013. "Special Report: Outsourcing and Offshoring." *The Economist*, January 19, 2013.

- ✿ It is critical to note that employment projections are an indication only of labor demand. If there are not enough workers to fill expected vacancies, employers will see positions remain open or will have to look elsewhere for talent. If growing demand for Skilled Trades workers is met by a workforce lacking the education, training, and skills that employers need, significant gaps or mismatches can be expected. Several factors may contribute to the lack of qualified Skilled Trades workers in the future, including a lack of interest in Skilled Trades careers from students and jobseekers, insufficient or inadequate training programs for Skilled Trades workers, or more attractive alternatives for jobseekers in other occupations and in other industries.
- ✿ Veterans have been identified as one group that may be especially well qualified for Skilled Trades positions, especially given the overlap between their military training and some of the requirements necessary for entry into Skilled Trades occupations. (Box 11)

Box 11: Veterans and the Skilled Trades

In 2012, the veteran unemployment rate in Michigan measured 7.9 percent, well above the 7.0 percent rate recorded for veterans nationally. With about 22,000 unemployed veterans, and more on the sidelines, connecting veterans with job opportunities is a priority for policy makers in Michigan. And, Skilled Trades occupations may present an especially attractive option.

Transitioning into any civilian career can present numerous challenges for veterans. For Skilled Trades occupations, there are at least two major hurdles for veterans. First, many veterans have military training and experience that is the same or substantially similar to an apprenticeship, a vocational training program, or on-the-job training, yet this training is not recognized by many state licensing authorities. As a result, some veterans are forced to start their job training from scratch. Second, connecting veterans to Skilled Trades opportunities that are related or similar to their military training and experiences can require significant coordination between the veteran, training providers, and prospective employers. This can be a daunting undertaking, often requiring support from various organizations and institutions.

Fortunately, veterans are not alone. There have been both legislative and organizational efforts to support veterans transitioning into Skilled Trades positions. For example, on April 8, 2013 Georgia Governor Nathan Deal signed into law House Bill 188, the Veterans Licensure Bill. “In an effort to facilitate the transition back to the civilian workforce, the legislation will help to expedite the licensure process for select in-demand occupations for Georgia’s returning veterans,” according to Governor Deal’s office. Additionally, groups like Helmets to Hardhats (which helps connect military service members with skilled training and quality career opportunities in the construction industry) and Get Skills to Work (which joins major manufacturers and educators to prepare and place veterans in long-term careers in advanced manufacturing jobs) are working with veterans, businesses, educators, and policy makers to help veterans find good jobs, often in the Skilled Trades.

In Michigan, the Veteran’s Service Division of the Workforce Development Agency is currently working with the State Department of Licensing and Regulatory Affairs for the credentialing and licensing of military veterans through several proposed bills (Public Acts 339, 379, 380, Public Act 419, and Public Act 472). Additionally, the Veteran’s Service Division regularly hosts job fairs specifically targeting veterans, often highlighting employers with vacancies in the Skilled Trades.

Conclusion

After nearly a decade of job declines, Manufacturing and Construction appear to be at the forefront of Michigan's economic recovery. As a result, many Skilled Trades occupations are in high demand today, and the trend is expected to continue for many Skilled Trades titles. However, there is concern that this demand will be slowed by a shortage of qualified Skilled Trades workers. This report has identified some areas that may contribute to this shortage, including: a lack of interest in the Skilled Trades from students and jobseekers, jobseekers with outdated or non-transferable skills, flat wages in Skilled Trades occupations, and high expectations from employers, coupled with fewer employer-provided on-the-job training programs or employer-sponsored apprenticeship programs.

How can this report help?

- ✿ As for students and jobseekers, the findings from this report might help to dispel some of the common misperceptions about careers in the Skilled Trades. Students and jobseekers can use this report to learn more about a potential career in the Skilled Trades.
- ✿ Some employers may recognize that their wages have remained relatively flat in recent years. Some employers may wish to review their wages and compare them with state or national averages using data from the Bureau of Labor Statistics or other organizations.
- ✿ After reviewing the report, some recruiters may wish to revisit their job requirements and expectations for Skilled Trades titles. Some may even find that they are seeking an unlikely candidate, and may find it beneficial to hire otherwise qualified candidates and invest in them through a customized on-the-job training program.

Box 12: Common Misperceptions of Skilled Trades Occupations. . .

There is No Demand for Skilled Trades Workers

False! The Skilled Trades represent exactly the types of skills that employers are demanding. As a result, Skilled Trades workers see noteworthy demand today and will see solid demand through 2013. In the long-term, those in Skilled Trades careers requiring more education / training should see many opportunities from new positions or from replacing existing workers.

Skilled Trades Are Low-Paying

False! With most Skilled Trades occupations paying between \$13/hour and \$34/hour, the category reports an above average median wage. Moreover, Skilled Trades careers enjoy more autonomy than some other Manufacturing and Construction jobs and many are associated with lower turnover and a bright employment outlook.

Skilled Trades Careers are Low Skill

False! On the contrary, most Skilled Trades occupations require rigorous long-term on-the-job training as well as an understanding of mathematics and complex problem solving. In addition, many employers are seeking candidates with qualifications beyond the minimum requirements, including degrees or certifications and highly specialized knowledge.

Skilled Trades Are Dirty and Dangerous

False! With increased technology, Manufacturing and Construction jobs have become very safe and considerably cleaner. In addition, most Skilled Trades occupations are relatively active, which may help reduce the risks associated with sedentary desk jobs, which include heart disease and diabetes.

Methodology

There is not one standard list of Skilled Trades occupations today. In fact, a review of recent literature indicates that there are nearly as many definitions as there are studies. In defining Skilled Trades, some studies include many occupations while others consider only a tight band of occupations. From a labor market information perspective, this can be problematic as more inclusive lists can inflate relevant labor statistics about the Skilled Trades at the same time that more discerning lists can understate the data. In the end, there are a lot of numbers floating around; most are likely accurate, but they are often measuring different things.

Therefore, one of the primary goals of this study is to propose a list of Skilled Trades occupations that can be used for this paper *and* that can also be critiqued and enhanced by other subject matter experts. This list should be as adaptable as it is flexible. That is, this definition should be able to be used by those interested in Construction as easily as those interested in Manufacturing. As employment in old Skilled Trades occupations dwindle, new and emerging Skilled Trades occupations need to be identified and added to the list. Therefore, this list should be reviewed regularly for its economic and practical relevance. This review should be done not by this Bureau alone, but should draw on the expertise of our partners in industry, labor, workforce development, and economic development.

A thoughtful research plan was created to help develop the initial list of Skilled Trades occupations for this study. Incorporating quantitative analysis and qualitative methods, this research plan included four stages: data collection, collaboration, data analysis, and final review. Each stage is described, in turn, below:

Data Collection

- ✿ The data collection process started with the 2010 Standard Occupational Classification (SOC) System, which includes occupational codes and job titles for over 800 detailed occupations.
- ✿ These occupations were then merged with the updated system codes for education and training developed by the Bureau of Labor Statistics Office of Employment and Unemployment Statistics. These codes added “minimum requirements” for occupations, with information on education, related work experience, and on-the-job training and apprenticeships.
- ✿ Licensing information from the State of Michigan Department of Licensing and Regulatory Affairs was added, identifying the licensing requirements, if any, for occupations. Many occupations are regulated by federal, state, or local governments. Regulation of occupations is most commonly seen in the form of licenses. In Michigan, this regulation is carried out by the Michigan Department of Licensing and Regulatory Affairs.
- ✿ Information from the U.S. Department of Labor was added to identify the occupations that corresponded to established apprenticeship programs.

- ✿ Finally, traditional and real-time labor market information was added to the list of occupations. This information included: occupational employment and wage data and short-term and long-term occupational employment projections from the Bureau of Labor Market Information and Strategic Initiatives and real-time online advertised job vacancy information from The Conference Board's Help Wanted Online Database.

Collaboration – (Qualitative)

- ✿ The list of job titles was then circulated to colleagues in the State of Michigan and partners in the research community. We encouraged participants to review the list of job titles and identify the occupations that were, from their prospective "Skilled Trades." Based on this feedback, occupations were classified into "Skilled Trades" and "non-Skilled Trades." The list was then recirculated and additional comment solicited. Specifically, participants were asked to identify any obvious omissions (occupations that they understood or believed to be skilled trades that were not indicated as such) or any unnecessary inclusions (occupations that they believed not to be skilled trades but that were indicated as such).
- ✿ To elicit additional input, a snowballing technique was used, and participants were encouraged to share the list of job titles with businesses, labor organizations, or any other interested party. The review period was held open from January through February 2013. By early April 2013, all feedback was received and incorporated. There were a total of 7 organizations that participated in our review: 3 labor organizations; 2 state agencies; and 2 outside research organizations.
- ✿ While deference was given to participant recommendations for Skilled Trades occupations, all additions or subtractions were corroborated through targeted literature reviews, concentrating primarily on publications from state or federal agencies and from trade associations. If further justification was found in the literature, or if there was a lack of contradictory evidence, the proposals were incorporated.

Analysis – (Quantitative)

- ✿ Skilled Trades occupations were compared to non-Skilled Trades occupations using two statistical techniques, Chi-Square analysis and Wilcoxon Rank Sum analysis. Chi-Squared analysis was used to test Skilled Trades and non-Skilled Trades for association with the dichotomous variables of licensing and apprenticeship and Wilcoxon Rank Sum was used to test for association between Skilled Trades and non-Skilled Trades occupations with the ordinal variables of education, training, and experience. Each variable was tested independently.
- ✿ Once statistically significant differences were identified, the original list of occupations was revisited. Occupations that were categorized as non-Skilled Trades that were statistically similar to Skilled Trades occupations were reviewed. Likewise, occupations that were categorized as Skilled Trades that were statistically similar to non-Skilled Trades were also reviewed.

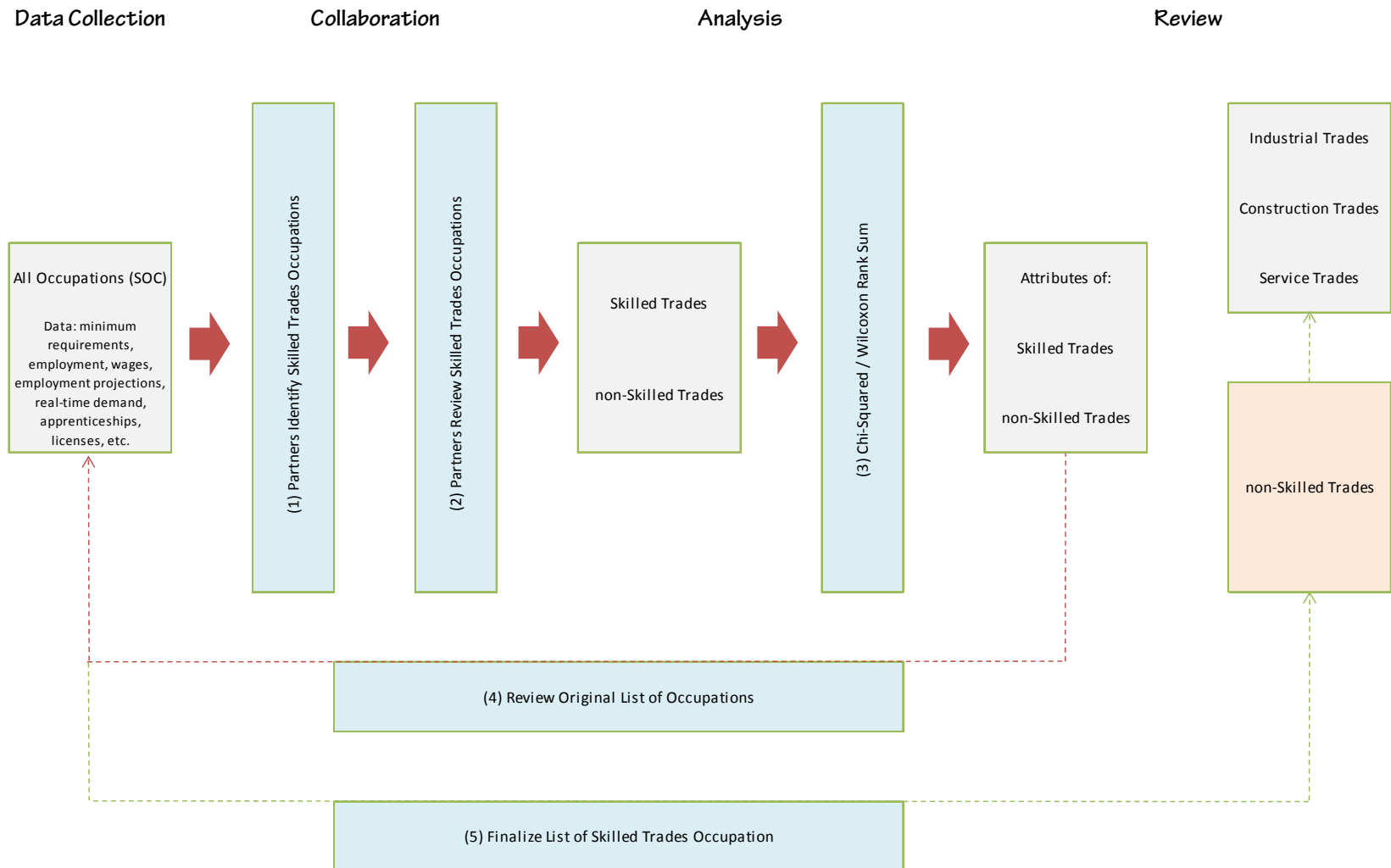
- ✿ Finally, occupations were divided into three categories according to the industry with the most occupational employment for the particular Skilled Trade. The three industries were Manufacturing, Construction, and all Service Providing industries with each corresponding to one of three categories of Skilled Trades occupations: “Skilled Industrial Trades,” “Skilled Construction Trades,” and “Skilled Service Trades.”

Attributes of Skilled Trades Occupations (Findings from Quantitative Analysis)

The results of the quantitative analysis show that Skilled Trades occupations and non-Skilled Trades occupations are significantly different in their association with required education, required training, availability of registered apprenticeship programs through the U.S. Department of Labor and licensing requirements through the Michigan Department of Licensing and Regulatory Affairs. The two categories were not dissimilar in terms of work experience.

- ✿ **Required Education** – The difference in required education for Skilled Trades and non-Skilled Trades occupations was statistically significant. Very small shares of Skilled Trades occupations require less than a high school diploma (9.6 percent for Skilled Trades compared to 13.5 percent for non-Skilled Trades) and none required Master’s degrees or professional / doctoral training (compared to 4.4 percent and 3.5 percent for non-Skilled Trades). Instead, the majority of Skilled Trades occupations required a high school diploma (67.7 percent compared to 45.6 percent for non-Skilled Trades) or vocational training (16.1 percent compared to 4.4 percent for non-Skilled Trades). Bachelor’s degrees were associated with non-Skilled Trades occupations (21.9 percent compared to just 1.6 percent for Skilled Trades).
- ✿ **Required Training** – The difference in require job training for Skilled Trades and non-Skilled Trades occupations was statistically significant. Skilled Trades occupations are associated with apprenticeships (19.6 percent compared to 0.31 percent for non-Skilled Trades) and long-term on-the-job training (33.9 percent compared to 7.2 percent for non-Skilled Trades). Short-term on the job training is associated with non-Skilled Trades occupations (25.7 percent compared to 3.2 percent for Skilled Trades). Internships and residencies are exclusive to non-Skilled Trades occupations (3.5 percent compared to 0.0 percent for Skilled Trades).
- ✿ **Related Work Experience** – The difference in related work experience for Skilled Trades occupations and non-Skilled Trades occupations was not statistically significant.
- ✿ **Apprenticeships** – The difference in the availability of apprenticeship programs through the U.S. Department of Labor for Skilled Trades occupations and non-Skilled Trades occupations was statistically significant. Skilled Trades occupations were associated with available apprenticeships (87.1 percent compared to 36.5 percent for non-Skilled Trades.)
- ✿ **Licenses** – The possibility of licensing requirements through the Michigan Department of Licensing and Regulatory Affairs for Skilled Trades occupations and non-Skilled Trades occupations was statistically significant. Skilled Trades occupations were associated with potential licensing requirements (32.3 percent compared to 12.7 percent for non-Skilled Trades.)

Research Plan



Skilled Trades Occupations**Appendix 1**

	SOC	Occupation Title
Skilled Industrial Trades	47-2011	Boilermakers
	47-2111	Electricians
	47-2152	Plumbers, Pipefitters, and Steamfitters
	49-2095	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay
	49-9041	Industrial Machinery Mechanics
	49-9043	Maintenance Workers, Machinery
	49-9044	Millwrights
	49-9069	Precision Instrument and Equipment Repairers, All Other
	49-9071	General Maintenance and Repair Workers
	49-9096	Riggers
	51-4012	CNC Machine Tool Programmers
	51-4041	Machinists
	51-4061	Model Makers, Metal and Plastic
	51-4062	Patternmakers, Metal and Plastic
	51-4111	Tool and Die Makers
	51-4121	Welders, Cutters, Solderers, and Brazers
	51-4194	Tool Grinders, Filers, and Sharpeners
	51-7011	Cabinetmakers and Bench Carpenters
	51-7031	Model Makers, Wood
	51-7032	Patternmakers, Wood
	51-8021	Stationary Engineers and Boiler Operators
	51-8031	Water and Wastewater Treatment Plant and System Operators

	SOC	Occupation Title
Skilled Construction Trades	47-2011	Boilermakers*
	47-2021	Brickmasons and Blockmasons
	47-2031	Carpenters
	47-2044	Tile and Marble Setters
	47-2051	Cement Masons and Concrete Finishers
	47-2053	Terrazzo Workers and Finishers
	47-2073	Operating Engineers and Other Construction Equipment Operators
	47-2111	Electricians*
	47-2121	Glaziers
	47-2132	Insulation Workers, Mechanical
	47-2141	Painters, Construction and Maintenance
	47-2151	Pipelayers
	47-2152	Plumbers, Pipefitters, and Steamfitters*
	47-2161	Plasterers and Stucco Masons
	47-2211	Sheet Metal Workers
	47-2221	Structural Iron and Steel Workers
	47-4021	Elevator Installers and Repairers
	49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers
	49-9096	Riggers*
	53-7021	Crane and Tower Operators

*Primary Category for Skilled Trade

	SOC	Occupation Title
Skilled Service Trades	29-2021	Dental Hygienists
	29-2041	Emergency Medical Technicians and Paramedics
	29-2057	Ophthalmic Medical Technicians
	31-9091	Dental Assistants
	31-9092	Medical Assistants
	31-9094	Medical Transcriptionists
	31-9097	Phlebotomists
	35-1011	Chefs and Head Cooks
	39-4031	Morticians, Undertakers, and Funeral Directors
	39-5012	Hairdressers, Hairstylists, and Cosmetologists
	39-5092	Manicurists and Pedicurists
	43-6012	Legal Secretaries
	43-6013	Medical Secretaries
	49-3021	Automotive Body and Related Repairers
	49-3023	Automotive Service Technicians and Mechanics
	49-3031	Bus and Truck Mechanics and Diesel Engine Specialists
	49-3041	Farm Equipment Mechanics and Service Technicians
	51-3011	Bakers
	51-6041	Shoe and Leather Workers and Repairers
	51-9071	Jewelers and Precious Stone and Metal Workers
	51-9081	Dental Laboratory Technicians
	51-9082	Medical Appliance Technicians
	53-2012	Commercial Pilots

Select Industrial Trades

Appendix 2

In Michigan, employment in the Skilled Industrial Trades measures 114,120 and comprises about 60 percent of total Skilled Trades positions. Primarily employed in Manufacturing, job titles in the Skilled Industrial Trades range from Production occupations like Machinists and Tool and Die Makers to Maintenance occupations like Industrial Machinery Mechanics.

The five occupations highlighted below represent over half of total employment in the Skilled Industrial Trades. Highlighted below are: Machinists (24 percent), Tool and Die Makers (11 percent), Industrial Machinery Mechanics (11 percent), Welders (9 percent), and Machinery Maintenance Workers (3 percent).

Machinists (51-4041)

- ✿ Set up and operate a variety of machine tools to produce precision parts and instruments. Includes precision instrument makers who fabricate, modify, or repair mechanical instruments. May also fabricate and modify parts to make or repair machine tools or maintain industrial machines, applying knowledge of mechanics, mathematics, metal properties, layout, and machining procedures.
- ✿ Sample of reported job titles: Gear Machinist, Journeyman Machinist, Machine Operator, Machine Repair Person, Machinist, Maintenance Machinist, Maintenance Specialist, Production Machinist, Set-Up Machinist, Tool Room Machinist.

Machinists

Employment

- In Michigan: **27,900**
- In Manufacturing: **75%**
- Hourly Wage: **\$11 - \$31**

Demand

- Current Vacancies: **650**
- Expected Growth (2020): **6%**
- Annual Openings: **540**

Minimum Requirements

- Education: **High School**
- Training: **Long-Term OJT**
- Experience: **None**

Tool and Die Maker (51-4111)

- ✿ Analyze specifications, lay out metal stock, set up and operate machine tools, and fit and assemble parts to make and repair dies, cutting tools, jigs, fixtures, gauges, and machinists' hand tools.
- ✿ Sample of reported job titles: Aircraft Tool Maker, Carbide Tool Die Maker, Die Maker, Jig and Fixture Builder, Jig and Fixture Repairer, Tool Repairer, Tool and Die Machinist, Tool and Die Maker, Toolmaker, Trim Die Maker.

Tool and Die Makers

Employment

- In Michigan: **12,920**
- In Manufacturing: **96%**
- Hourly Wage: **\$16 - \$34**

Demand

- Current Vacancies: **175**
- Expected Growth (2020): **-4.3%**
- Annual Openings: **55 (Replacement)**

Minimum Requirements

- Education: **High School**
- Training: **Long-Term OJT**
- Experience: **None**

Industrial Machinery Mechanic (49-9041)

- ✿ Repair, install, adjust, or maintain industrial production and processing machinery or refinery and pipeline distribution systems.
- ✿ Sample of reported job titles: Maintenance Mechanic, Maintenance Technician, Mechanic, Engineering Technician, Master Mechanic, Industrial Machinery Mechanic, Machine Adjuster, Overhauled, Industrial Electrician, Industrial Mechanic.

Industrial Machinery Mechanics

Employment

- In Michigan: **12,350**
- In Manufacturing: **54%**
- Hourly Wage: **\$15 - \$33**

Demand

- Current Vacancies: **300**
- Expected Growth (2020): **17.8**
- Annual Openings: **400**

Minimum Requirements

- Education: **High School**
- Training: **Long-Term OJT**
- Experience: **None**

Welders, Cutters, Solderers, and Brazers (51-4121)

- ✿ Use hand-welding or flame-cutting equipment to weld or join metal components or to fill holes, indentations, or seams of fabricated metal products.
- ✿ Sample of reported job titles: Aluminum Welder, Fabrication Welder, Fabricator, Fitter/Welder, Maintenance Welder, Mig Welder, Sub Arc Operator, Welder, Welder-Fitter, Welder/Fabricator.

Welders

Employment

- In Michigan: **10,700**
- In Manufacturing: **60%**
- Hourly Wage: **\$11 - \$27**

Demand

- Current Vacancies: **400**
- Expected Growth (2020): **8.4**
- Annual Openings: **350**

Minimum Requirements

- Education: **High School**
- Training: **Moderate-Term OJT**
- Experience: **Less than 1 year**

Machinery Maintenance Workers (49-9043)

- ✿ Lubricate machinery, change parts, or perform other routine machinery maintenance.
- ✿ Sample of reported job titles: Maintenance Technician, Mechanic, Maintenance Mechanic, Machine Repairer, Maintainer, Maintenance Worker, Industrial Maintenance Millwright, Oiler, Maintenance Electrician, Maintenance Machinist.

Machinery Maintenance Workers

Employment

- In Michigan: **3,500**
- In Manufacturing: **54%**
- Hourly Wage: **\$11 - \$27**

Demand

- Current Vacancies: **5**
- Expected Growth (2020): **0%**
- Annual Openings: **38 (Replacement)**

Minimum Requirements

- Education: **High School**
- Training: **Moderate-Term OJT**
- Experience: **None**

Select Construction Trades

Appendix 3

Representing over 1 in 3 total Skilled Trades positions, employment in the Skilled Construction Trades measures 71,400. Primarily employed in the Construction industry, job titles in the Skilled Construction Trades include Construction occupations like Electricians and Carpenters as well as Installation occupations like HVAC Mechanics and Installers.

The five occupations highlighted below represent three quarters of total employment in Skilled Construction Trades. Highlighted below are: Electricians (25 percent), Carpenters (17 percent), Plumbers, Pipefitters, and Steamfitters (15 percent), Operating Engineers (10 percent), and Heating, Air Conditioning, and Refrigeration Mechanics and Installers (9 percent).

Electricians (47-2111)

- ✿ Install, maintain, and repair electrical wiring, equipment, and fixtures. Ensure that work is in accordance with relevant codes. May install or service street lights, intercom systems, or electrical control systems.
- ✿ Sample of reported job titles: Electrician, Maintenance Electrician, Journeyman Electrician, Inside Wireman, Control Electrician, Electrician Technician, Industrial Electrician, Journeyman Wireman

Electricians

Employment

- In Michigan: **17,900**
- In Construction: **66%**
- Hourly Wage: **\$15 - \$36**

Demand

- Current Vacancies: **330**
- Expected Growth (2020): **6.0%**
- Annual Openings: **547**

Minimum Requirements

- Education: **High School**
- Training: **Apprenticeship**
- Experience: **None**

Carpenters (47-2031)

- ✿ Construct, erect, install, or repair structures and fixtures made of wood, such as concrete forms; building frameworks, including partitions, joists, studding, and rafters; and wood stairways, window and door frames, and hardwood floors. May also install cabinets, siding, drywall and batt or roll insulation. Includes brattice builders who build doors or brattices (ventilation walls or partitions) in underground passageways.
- ✿ Sample of reported job titles: Carpenter, Lead Carpenter, Assembler, Finish Carpenter, Construction Worker, Custom Stair Builder, Installer, Production Worker, Trim Carpenter, Concrete Carpenter.

Carpenters

Employment

- In Michigan: **12,330**
- In Construction: **49%**
- Hourly Wage: **\$12 - \$31**

Demand

- Current Vacancies: **300**
- Expected Growth (2020): **8.9%**
- Annual Openings: **472**

Minimum Requirements

- Education: **High School**
- Training: **Apprenticeship**
- Experience: **None**

Plumbers, Pipefitters, and Steamfitters (47-2152)

- ✿ Operate one or several types of power construction equipment, such as motor graders, bulldozers, scrapers, compressors, pumps, derricks, shovels, tractors, or front-end loaders to excavate, move, and grade earth, erect structures, or pour concrete or other hard surface pavement. May repair and maintain equipment in addition to other duties.
- ✿ Sample of reported job titles: Back Hoe Operator, Engineering Equipment Operator, Equipment Operator, Heavy Equipment Operator, Loader Operator, Motor Grader Operator, Operating Engineer, Track Hoe Operator.

Plumbers

Employment

- In Michigan: **10,610**
- In Construction: **68%**
- Hourly Wage: **\$13 - \$35**

Demand

- Current Vacancies: **150**
- Expected Growth (2020): **8.9%**
- Annual Openings: **405**

Minimum Requirements

- Education: **High School**
- Training: **Apprenticeship**
- Experience: **None**

Operating Engineers (47-2073)

- ✿ Operate one or several types of power construction equipment, such as motor graders, bulldozers, scrapers, compressors, pumps, derricks, shovels, tractors, or front-end loaders to excavate, move, and grade earth, erect structures, or pour concrete or other hard surface pavement. May repair and maintain equipment in addition to other duties.
- ✿ Sample of reported job titles: Back Hoe Operator, Engineering Equipment Operator, Equipment Operator, Heavy Equipment Operator, Loader Operator, Motor Grader Operator, Operating Engineer, Track Hoe Operator.

Operating Engineers

Employment

- In Michigan: **7,110**
- In Construction: **56%**
- Hourly Wage: **\$15 - \$32**

Demand

- Current Vacancies: **55**
- Expected Growth (2020): **11.8%**
- Annual Openings: **257**

Minimum Requirements

- Education: **High School**
- Training: **Moderate-Term OJT**
- Experience: **None**

Heating, Air Conditioning, and Refrigeration Mechanics and Installers (49-9021)

- ✿ Install or repair heating, central air conditioning, or refrigeration systems, including oil burners, hot-air furnaces, and heating stoves.
- ✿ Sample of reported job titles: Heating, Ventilation, Air Conditioning Service Technician (HVAC Service Technicians), HVAC Technician, HVAC Installer, AC Tech, HVAC Specialist, HVAC Mechanic.

HVAC Mechanics and Installers

Employment

- In Michigan: **6,140**
- In Construction: **55%**
- Hourly Wage: **\$14 - \$33**

Demand

- Current Vacancies: **200**
- Expected Growth (2020): **18.7%**
- Annual Openings: **226**

Minimum Requirements

- Education: **Some College**
- Training: **Long-Term OJT**
- Experience: **None**