

# A WORKFORCE NEEDS ASSESSMENT OF THE ARIZONA CONSTRUCTION TRADES INDUSTRY

February 2005



ARIZONA DEPARTMENT OF COMMERCE  
*Our Job is JOBS!*

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# **A Workforce Needs Assessment of the Arizona Construction Trades Industry**

## **Introduction and Executive Summary**

The growth of the Arizona economy depends directly on the health of the construction trades industry. Although the construction industry is not a “driver” in the classic economic sense, the state’s growth cannot continue without sufficient firms and workers to build homes, commercial buildings, roads, schools, and the many other facilities needed for the rapidly increasing number of Arizona residents and workers. According to the US Census Bureau, nearly one in 11 Arizona jobs is found in the industry so its impact can be felt throughout the economy. ACCRA – a national nonprofit organization based in Arlington, VA, and devoted to researching key regional economic challenges – examined the industry and its workforce in Arizona on behalf of the Arizona Department of Commerce during the summer and fall of 2004.

The study was conducted in response to concerns from state leaders about the perceived shortage of construction workers and the impact that this shortage may be having on the industry’s ability to meet the growing residential and commercial demand for construction. The purpose of this study is to document the state of the industry, its workforce, and its capacity to prepare skilled workers to meet a growing demand.

The first part of this analysis examines the industry and its occupational needs based on existing data. This section describes the industry and its scope, documents its concentration in Maricopa County and other urban centers, provides data about wages and occupational opportunities, and depicts the path that construction workers might take in building a successful career in the industry.

The second part provides a glimpse of the views of company owners, based on a survey of construction trades firms conducted by ACCRA in the late summer and early fall of 2004. The survey provides insights into the hiring practices of construction firms, their commitment to apprenticeships and other forms of training, and the views of firm owners about the challenges that the industry faces.

The third part of the report identifies the training capacity to address those needs and reveals certain gaps in the system. Based on interviews with training providers, this section describes the availability of training and describes the perceptions of trainers who provide services to construction workers and firms, revealing their perspectives on the key issues facing the industry.

The fourth and final part synthesizes the findings from the research and provides suggestions on what might be done to address those gaps. The section reviews the key findings from the research and presents a series of actions

recommended to take advantage of opportunities available to the construction trades in Arizona or addresses the basic challenges facing the industry.

Some of the most critical findings from the research include:

- The Construction Trades grew more rapidly in Arizona than in the US and now employs more than 217,000 workers
- The industry is concentrated in the Phoenix and Tucson metropolitan areas where 84 percent of the construction trades workforce is employed
- The average construction firm employs 15 workers and 95 percent have fewer than 50 employees
- Arizona has a shortage of workers in several 'core' skilled trade occupations, especially carpenters, construction laborers, front-line supervisors, painters, and electricians.
- The fastest growth in demand for construction trades workers is among higher paid occupations although growth among laborers and painters offers entry points with shorter training requirements
- Apprenticeships are key to training skilled construction trades workers
- Apprenticeships require long-term investments (2-5 years) by worker and firm
- Minority workers account for the majority of apprentices in Arizona's construction trades
- Apprenticeship programs (and the construction trades) are bedeviled by high drop-out rates that can affect 40-70 percent of registered apprentices
- Apprentices completing their programs may account for about 33 to 50 percent of the number of qualified workers needed by the construction trades during the next decade
- Apprentices leave their programs due to economic burdens and cultural barriers, the most important of which may be related to job security and alternative employment options

The key policy recommendations made include:

- Target state investments where the shortages are greatest – including first-line supervisors, carpenters, electricians, construction laborers, and painters.
- Improve the image and awareness of careers in construction trades. The goal should be to encourage more young people who are not bound for college to consider construction trades as a career option. The focus of the effort should be on parents and school career counselors as well as high school students.
- Enhance training opportunities in targeted construction trades occupations. The current amount of training being offered is not generating a sufficient supply of skilled construction trades workers. The state should invest in providing additional training in targeted occupations and providing added support for apprentices in those occupations.
- Improve pre-qualification assessments of apprentice applicants. With a 40- to 70-percent drop-out rate, the current pre-qualification activities are not working effectively. The state needs a standardized pre-qualification protocol for each of the apprenticeships that is continuously tested and improved.
- Better match training activities with industry needs. The state should target its efforts to the occupations with the most severe shortage and collaborate with industry to invest in facilities for high school and vocational schools to make apprenticeships more accessible.

- Explore providing advantages to firms using apprentices and journeymen workers. Among the advantages that might be offered include premiums or points for bidders using skilled workers, set-asides within project budgets for training, and streamlined inspections for firms using qualified workers.
- Incorporate management and entrepreneurial training into apprenticeships. To reduce employment turnover and to enhance the success rates of quality firms, apprentices and managers alike need to improve their ability to estimate jobs, motivate people, employ new technologies, and manage their business. One way to improve that leadership is to enhance the skills of today's apprentices on how to manage jobs and people as they develop their career in the construction industry.
- Monitor performance of registered apprentices. The state should develop a system for tracking the performance of registered apprentices, including those that cancel or complete their apprenticeships, to better understand the challenges facing contractors and apprentices. The data will be invaluable for training providers, private firms, and the state in improving the quality of the apprenticeship experience and maximizing apprenticeship recruitment, participation, and completion.

## Construction Trades Industry Trends

Over the past generation, Arizona benefited significantly as the country’s social and economic center of gravity has shifted south and westward. During this period, Arizona became one of the nation’s fastest growing states. Between 1993 and 2003, Arizona’s population grew by 37.3 percent and now exceeds 5.5 million people. Since the 2000 Census, Arizona’s estimated population has increased by 8.8 percent, outpacing every other state except Nevada (which grew at 12.2 percent).

This rapid growth has occurred unevenly throughout the state. Within Arizona, the Phoenix-Mesa-Scottsdale Metropolitan Statistical Area (Phoenix metro area) acts as the primary magnet for growth. During the past decade, the two-county Phoenix metro area grew by 44.2 percent and added nearly 1.1 million people – about 73 percent of the state’s growth.<sup>1</sup> In 1993, the Phoenix metro accounted for 61 percent of Arizona’s total population. By 2003, this number increased to 64 percent of the state’s population.

This rapid growth has profound consequences for all aspects of Arizona’s economy, not the least of which is the ability of the state’s construction trades industry to keep pace. Employment in the construction trades grew at a faster rate than the US overall and grew particularly fast in the Phoenix metro area. Even though average wages for construction occupations still trails the national average, the *gap* between Arizona and US wages has increased since 2000 as wage growth in Arizona’s construction trade occupations lagged that of the US.

This section is organized as follows. It first describes several key characteristics of Arizona’s construction industry and its employment base. Second, the analysis examines the nature and extent of growth among construction firms. Third, the report describes the industry’s wage and occupational structure.

### Industry Overview

Arizona’s construction trades industries currently employ 217,000 people as illustrated in Figure 1. This figure is 88 percent greater than the state’s 1993 employment of 115,176. During that same period, Arizona’s population grew 37 percent, thus the construction trades employment has been increasing at greater than two times the population growth during the past decade.

**Figure 1: Construction Trades Industry Employment,**

	Arizona	United States
Total Employment Construction Industry – 1998	179,673	7,317,514
Total Employment Construction Industry - 2003	216,959	8,248,338
Percent Growth Employment – 1998 to 2003	21%	13%
Projected New Employment 2003-2013	40,034	1,045,000
Projected Average Construction Employment Growth 2003-2013	19%	13%

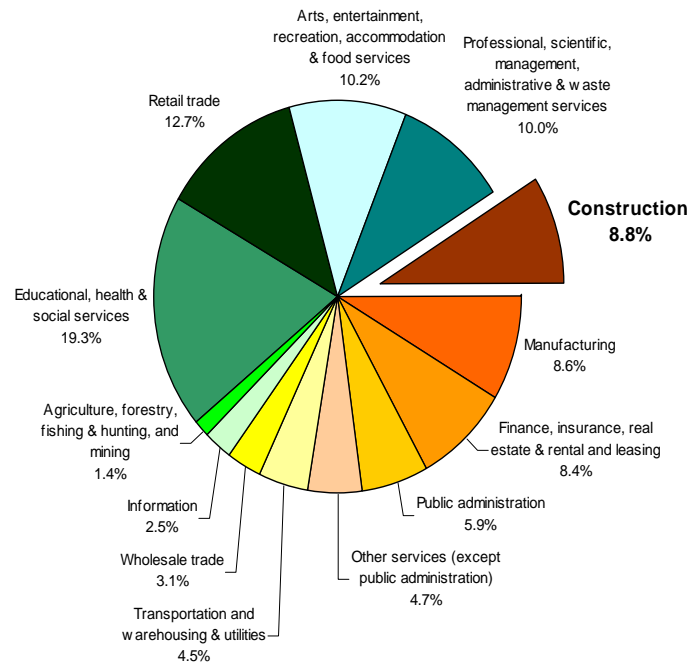
<sup>1</sup> Since 1993, the Phoenix-Mesa-Scottsdale metro area has been composed of Maricopa and Pinal Counties. References to the Phoenix metro area prior to 1993 also include both counties.



Growth in Arizona's construction trades exceeds the national average growth rate by a significant margin. Arizona's trades industries grew by 21 percent in the past five years as compared with the US average of 13 percent. Today, the Census Bureau reports that construction trades employment accounts for almost 9 percent of statewide employment, and thereby making it one of Arizona's largest industries—larger than either manufacturing or financial services.<sup>2</sup> By comparison, the Census Bureau's annual American Community Survey (ACS) estimates that the construction industry accounts for 8.8 percent of 132 million US jobs. Figure 2 compares the size of construction trades to several other industries, including the state's largest sectors of educational, health and social services as well as retail trade.

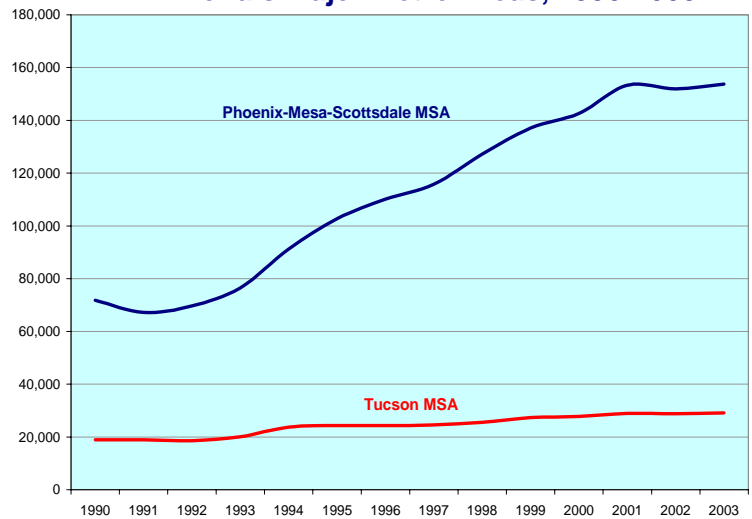
Naturally, the construction trades industry mirrors wider trends in Arizona's recent economic growth. The construction industry has grown since the nadir of the 1991-1992 recession. As Figure 3 shows, the Phoenix metro has led that growth. Employment in the construction trades sector peaked in 2001 as the nation slid into its first recession in more than a decade. The Phoenix

**Figure 2: Arizona Employment by Sector, 2003**



Source: US Census Bureau ACS Estimates 2003

**Figure 3: Construction Trades Employment in Arizona's Major Metro Areas, 1990-2003**



Source: Regional Dynamics

<sup>2</sup> Unless otherwise described, employment estimates and projections were developed using Regional Dynamics econometric model developed by Thomas Tanner, an economist at the Carl Vinson Institute, University of Georgia. The base data set used in developing the estimates is the County Business Patterns (CBP) produced by the US Bureau of the Census. CBP was used because it provides the greatest detail of employment by firm size and it includes all firms that have had an employee at some time during the year. More information about the Regional Dynamics model is available in the paper, "The Regional Dynamics Model: Introductory Technical Information. The model provides a merged input-output and Social Accountability Matrix framework for studying industry-commodity relationships. Data used throughout this study is classified using North American Industrial Classification System (NAICS) industry definitions.

metro serves as the state’s primary growth center and construction is no different. From 1993 to 2003, construction trades employment in the Phoenix-Mesa-Scottsdale MSA grew at an average annual rate of 7.4 percent. The statewide rate was approximately 6.7 percent annually during that same time period. The region’s estimated 153,700<sup>3</sup> workers represent 71 percent of the 217,000 construction trades industry workers across the state.

Although much smaller with 29,200 employees and 13 percent of the total, the Tucson MSA represents the second largest regional concentration of employment in the construction trades industry. However unlike the Phoenix MSA, growth in the Tucson MSA since 1993 proved a bit more moderate and sustainable annual rate of 3.9 percent.

In the state’s smaller communities, construction employment also showed steady growth with Yavapai and Mohave Counties pacing the growth for the state’s less populated counties. Since 1998, Mohave County grew at an average annual rate of 12.0 percent – three times faster than Phoenix during the 1998-2003 time period (but based on a much smaller base employment). This particularly reflects the tremendous growth occurring around Lake Havasu City.

By examining the mix of growth within the construction trades industry, the most significant employment changes have occurred in plumbing, heating, venting and air conditioning (HVAC) contractors, single-family housing construction, drywall, acoustical and insulation contractors and electrical contractors. Since 1993, these four industries combined to create nearly 44,000 new jobs in the state and now employ almost 93,000 construction trades workers (See Figure 4). Over the next ten years, the Arizona economy will likely see the creation of an additional

**Figure 4: Employment within the Construction Trades Industry by North American Industrial Classification (NAICS) Sector**

<b>NAICS Description</b>	<b>AZ 2003 Employment</b>	<b>New Jobs since 1993</b>	<b>Projected Additional Jobs by 2013</b>
Plumbing, Heating, and Air-Conditioning Contractors	25,578	12,052	4,629
Single-family housing construction	23,838	10,944	4,316
Drywall, acoustical & insulation contractors	23,061	10,868	4,155
Electrical Contractors	20,278	9,709	3,690
Carpentry contractors	16,263	7,722	2,933
Concrete Contractors	15,601	6,654	2,822
Commercial & institutional bldg construction	13,919	7,362	2,890
All other special trade contractors	9,900	3,880	1,463
Highway & street construction	8,526	4,528	1,549

<sup>3</sup> These employment figures use estimates from the Regional Dynamics model. As noted earlier, these estimates tend to be higher than Bureau of Labor Statistics estimates as they include proprietorships and workers not participating in the unemployment system.

40,000 new construction trades industries jobs, with the seven largest sectors accounting for nearly 25,500 of those jobs.

Within the areas around Phoenix and Tucson, the largest construction trades include drywall & insulation contractors, carpentry contractors, and concrete contractors. These industries all have high “location quotients” (LQs),<sup>4</sup> a measure of industry concentration. These sectors also represent a large proportion of the construction trades employment in the two metro areas.

The fastest growing firms in the Phoenix Metro are involved in plumbing and HVAC, drywall, acoustical and insulation contracting, and electrical contractors.

**Figure 5: Employment Concentrations for Construction Trades Industry, Phoenix-Mesa-Scottsdale Metro**

Industry	Phoenix MSA Employment	Phoenix MSA LQ	AZ LQ	Difference
Drywall, acoustical & insulation contractors	17,129	3.83	3.53	0.29
Carpentry contractors	14,488	3.30	2.85	0.45
Land Subdivision & Land Dev.	4,137	3.08	2.62	0.46
Concrete Contractors	11,224	2.55	2.43	0.12
Tile, marble, terrazzo & mosaic contractors	1,698	2.29	2.03	0.26
All other special trade contractors	7,206	2.22	2.09	0.13
Masonry & stone contractors	4,838	1.81	1.82	-0.01
Painting and Wall Covering Contractors	5,734	1.75	1.68	0.07
Power, communication transmission line construction	2,826	1.65	1.26	0.39
Roofing, Siding, and Sheet Metal Contractors	5,401	1.47	1.42	0.05

Even so, other industries grew at similar rates during the past 15 years. Much like the Phoenix metro area, Tucson’s leading areas of firm employment growth include Plumbing and HVAC and Drywall. However, building construction—for both single family dwellings and commercial and institutional buildings, also assumed a relatively more prominent place in Tucson than in Phoenix.

Location quotients offer further insight into the nature of construction industry growth, by identifying the industries that are more concentrated within Arizona and its major metro areas than nationwide. The Phoenix area boasts among the highest concentration of contractors, except in masonry and stone contracting (See Figure 5).

**Figure 6: Employment Concentrations for Construction Trades Industry, Tucson Metro**

Industry	Tucson MSA Employment	Tucson MSA LQ	AZ LQ	Difference
Drywall, acoustical & insulation contractors	3,196	3.15	3.53	-0.38
Carpentry contractors	2,104	2.37	2.85	-0.48
Glass & glazing contractors	356	2.23	1.40	0.84
Concrete Contractors	2,198	2.20	2.43	-0.23
All other special trade contractors	1,614	2.20	2.09	0.10
Water Well Drilling Contractors	137	1.82	1.36	0.46
Masonry & stone contractors	1,090	1.80	1.82	-0.02
Tile, marble, terrazzo & mosaic contractors	280	1.67	2.03	-0.37
Painting & Wall Covering Contractors	1,223	1.64	1.68	-0.04
Highway & street construction	1,415	1.52	1.43	0.10

At the same time, the Tucson MSA exhibits a high concentration of employment in several industries (as shown in Figure 6), but it is not as highly concentrated as any of the Phoenix industries, except glass and glazing contractors,

<sup>4</sup> A “location quotient” is a commonly used measure that compares the proportion of an industry’s employment in a certain region relative to the proportion of that industry’s employment nationally. A location quotient of one means that the region’s industry has about as much employment as a proportion of overall employment as the nation has.

water well drilling contractors, and highway and street construction. It is notable that the location quotient measures of concentration for almost every Tucson construction trades industry also trails the location quotient for the State of Arizona. This is true for almost every other region as construction trades industry firms have concentrated in the Phoenix area.

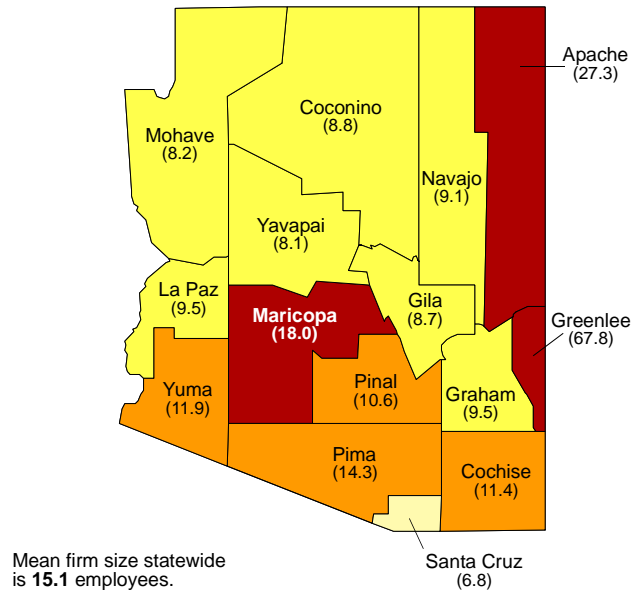
### **Arizona Construction Trades Industry Firms**

The pattern of construction trades industry firms often mirrors the industries' employment patterns. Arizona construction trades industry firms are on average quite small. Based on 2003 estimated employment, the average employment for firms in the state is slightly more than 15 workers. In Maricopa, where more than 8,400 firms operate, the average size is 18 employees per firm, a figure that is 20 percent larger than the state average. Conversely, firms in the rest of the state average about 11 workers, 39 percent smaller than the average Maricopa firm.

As illustrated in Figure 7, anomalies in Apache and Greenlee County exist in the average size of firms because there are so few construction trades firms in those two counties. The average size of trades firms are very small throughout the state, but especially so in fast-growing Mohave County, as well as other northern Arizona counties. This is important because one might expect that these firms may have a greater challenge in finding and/or keeping apprentices as well as competing for larger construction projects.

Since 1993, the number of Arizona construction trades firms increased 61 percent from 8,911 firms in 1993 to 14,406 in 2003. Much like the employment patterns described above, the most significant growth occurred in urban and suburban locations. Not surprisingly, the Phoenix metro contains 60 percent of all the state's construction trades firms. The Tucson and Prescott MSAs are the next most common firm locations, with 14 and 7 percent of the total respectively. The Yuma and Flagstaff MSAs combine for 6 percent of the state's firms. Areas not within one of the state's four metropolitan areas are home to the remaining 13 percent of the state's firms. About than half of those "non-MSA"-located firms can be found in the Lake Havasu City-Kingman Micropolitan area (Mohave County). In fact, Mohave has more construction trades firms than either Yuma or Coconino (Flagstaff) counties.

**Figure 7: Mean Firm Size in Arizona Construction Trades Industry, by County, 2003**



Between 1993 and 2003, the number of firms statewide grew at an average annual rate of 4.7 percent. While some growth occurred on the eastern and western edges of the state, Central Arizona (especially Maricopa County) serves as the primary engine of growth. In addition to Maricopa county, four others—Apache, Yuma, Yavapai and Navajo exceeded the statewide growth rate. Not surprisingly, the Phoenix metro area accounts for 63 percent of all new firms statewide. The small construction market in La Paz County actually experienced a decline in the number of firms (although not a decline in employment). In summary, as is the case when analyzing employment in the industry, the Phoenix metro area dominates the formation of new firms while the Tucson MSA displays steadier growth.

### **Occupations and Wages**

According to occupational employment estimates from the Regional Dynamics econometric model, approximately 240,000 Arizonans worked in the construction trades occupations in 2003. This number is similar to the data reported by the US Bureau of Economic Analysis and about 46 percent more workers than are identified by the Arizona Workforce Informer database. The Informer database includes only workers that participate in the formal employment system, and many construction trades workers are employed on an hourly basis, as independent contractors, or as proprietors. Approximately 130,000 or about 54 percent of this workforce can be found in the five largest trades occupations—carpenters, construction laborers, frontline supervisors, painters, construction and maintenance and electricians. Carpentry is the single most common occupation, as the number of carpenters working in the state has increased 84 percent since 1993. Now, more than 44,000 carpenters work in the state (See Figure 8). Over the next ten years, even a conservative projection of new job growth suggests that the state will require more than 25,000 more people in these five critical occupations. Arizona will require about 6,100 new carpenters, 5,500 construction laborers, 5,400 frontline supervisors, 4,700 painters, and 3,600 electricians. This growth is expected to continue within the context of an already perceived shortage of construction trades workers.

**Figure 8: Arizona Employment by Occupation**

<b>Occupational Title</b>	<b>1993</b>	<b>2003</b>	<b>2013</b>
Carpenters	24,089	44,357	50,504
Construction Laborers	13,437	26,256	31,825
First-Line Supervisors/Managers of Construction Trades and Extraction Workers	13,026	25,456	30,930
Painters, Construction and Maintenance	8,647	17,626	22,298
Electricians	8,279	16,676	20,327
Plumbers, Pipefitters, and Steamfitters	7,301	13,490	15,330
Operating Engineers and Other Construction Equipment Operators	5,602	9,829	10,782
Drywall and Ceiling Tile Installers	4,070	7,565	8,640
Brickmasons and Blockmasons	3,880	7,405	8,697
Sheet Metal Workers	3,071	6,331	7,949

Source: Estimated using the Regional Dynamics econometric model

**Figure 9: Arizona Wages by Occupation, 2003**

<b>Occupation</b>	<b>Entry Wage</b>	<b>Median Wage</b>	<b>Senior Wage</b>
Carpenters	\$19,748	\$31,641	\$47,916
Construction Laborers	\$13,623	\$21,002	\$32,840
First-Line Supervisors/Managers of Trades & Extraction Workers	\$29,912	\$44,735	\$68,572
Painters, Construction & Maintenance	\$18,131	\$25,383	\$36,193
Electricians	\$22,449	\$37,280	\$54,334
Plumbers, Pipefitters, & Steamfitters	\$24,411	\$36,128	\$54,382
Operating Engineers & Other Construction Equipment Operators	\$23,930	\$34,311	\$45,721
Drywall & Ceiling Tile Installers	\$18,641	\$27,969	\$39,403
Brickmasons & Blockmasons	\$20,711	\$34,388	\$45,156
Sheet Metal Workers	\$17,049	\$28,588	\$47,412

*Source: Arizona Workforce Informer*

These occupations represent opportunities for Arizona workers in a variety of wage and skill ranges – but the most acute needs may be in the technical and supervisory roles. The largest employing occupation—carpenters—falls within the medium wage range, offering an average of \$31,641 in annual pay. Entry level wages for apprentice carpenters can start at an average of \$9.50 per hour (or \$19,748 annually). The second largest group—construction laborers—falls within the lower wage range averaging \$21,002 annually. Entry level for this occupation begins at about \$6.55 per hour or \$13,623 annually and the position requires very little training. The third largest occupation—frontline supervisors—are among the highest paid construction trades workers, making an annual average salary of \$44,735. Supervisors and managers start out at \$14.40 per hour (\$29,912).

Wages across Arizona are approximately 93 percent of the national average, but construction wages are lower relative to the US, according to the US Bureau of Labor Statistics' Occupational Employment and Wage estimates. While 2003 US construction wages averaged \$17.79 per hour, Arizona wages averaged only 84 percent or \$14.98 annually. Two years earlier, the gap between US and Arizona wages was slightly lower at 95 percent of the US average for Arizona for all occupations and 85 percent of the US average for construction wages. ACCRA Cost of Living Index data for 2003 suggests that the Arizona cost of living is at about the same level as the US so one might speculate that unless wages rise relative to the US, Arizona will face a continued challenge in attracting skilled trade workers from other parts of the country.

Again not surprisingly, wages paid to workers in the Phoenix metro area offer a modest premium in terms of the wages offered as illustrated in Figure 10.

**Figure 10: Employment and Average Wages for Construction Trades Industry in the Phoenix Metro Area and All Other Arizona Counties by Occupation. 2003**

Occupation Title	Phoenix Metro Area (Maricopa, Pinal Counties)		Rest of Arizona		Difference in Phoenix Wages Relative to Rest of State
	Employment, 2003	Mean Annual Wage, 2003	Employment, 2003	Mean Annual Wage, 2003	
<b>All Construction and Extraction Occupations</b>	<b>170,694</b>	\$31,890	<b>69,924</b>	\$29,471	8.2%
Carpenters	<b>30,483</b>	\$33,940	<b>13,874</b>	\$29,094	16.7%
Construction Laborers	<b>18,206</b>	\$23,240	<b>8,050</b>	\$21,648	7.4%
First-Line Suprvsrs/Mngrs of Construction Trades	<b>17,668</b>	\$50,230	<b>7,788</b>	\$45,121	11.3%
Electricians	<b>12,865</b>	\$39,970	<b>3,811</b>	\$33,335	19.9%
Painters, Construction and Maintenance	<b>12,441</b>	\$27,830	<b>5,185</b>	\$24,932	11.6%
Plumbers, Pipefitters, and Steamfitters	<b>9,665</b>	\$38,990	<b>3,825</b>	\$34,267	13.8%
Operating Engineers and Other Construction Equipment Operators	<b>6,856</b>	\$37,090	<b>2,973</b>	\$32,786	13.1%
Drywall and Ceiling Tile Installers	<b>5,495</b>	\$29,030	<b>2,070</b>	\$27,101	7.1%
Brickmasons and Blockmasons	<b>5,349</b>	\$35,110	<b>2,056</b>	\$33,145	5.9%
Sheet Metal Workers	<b>4,547</b>	\$35,910	<b>1,784</b>	\$29,730	20.8%

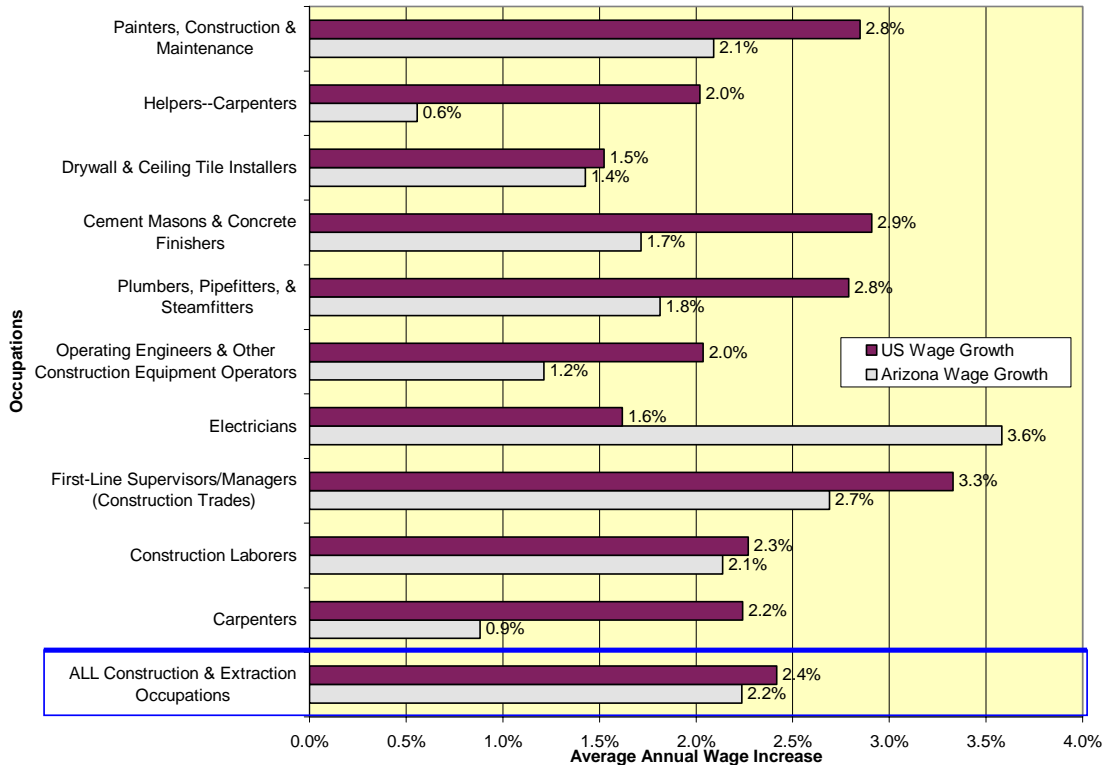
Source: Employment data from Regional Dynamics econometric model, 2003 estimates; and Wages from the US Bureau of Labor Statistics Occupational Employment Statistics, November 2003 estimates

Construction trades workers in Maricopa and Pinal Counties earn an average of 8.2 percent more than firms located elsewhere in the state. The differences are most distinct for sheet metal workers, electricians, carpenters, plumbers, and operating engineers. The wages for these occupations range from 13 to nearly 21 percent higher than the rest of the state. At the same time, average wages for several occupations including carpet installers and masonry helpers are lower in the Phoenix metro area, reflecting a perceived abundance of unskilled labor.

As shown in Figure 11, average wages have grown slower in Arizona than in the US average since 2000. Wages grew slower for 9 of the state's 10 largest construction trade occupations. Only wages for electricians grew faster than the state. One would expect that demand for these skilled positions and a perceived shortage of workers would have combined to drive up these occupations' wages relative to the rest of the country.

For individual workers, the average annual wage increases are less important than increases earned as a result of their experience in the construction trades. Based on data provided earlier in Figure 9, it is clear that most of the occupations provide significant wage increases based on experience. Senior wages average 2.3 times that of entry level wages with the largest increases occurring for sheet

**Figure 11: Average Annual Growth in Wages for Arizona and the US by Occupation, 2000-2003**



Source: Arizona Workforce Informer and US Bureau of Labor Statistics Occupational Employment Statistics, 2000-2003.

metal workers, carpenters, electricians, construction laborers, and first-line supervisors. Even painters and operating engineers – the two occupations with the smallest increases related to experience – can expect an average increase of almost double the entry level salary for more experienced workers.

As Figure 12 illustrates, frontline supervisors, elevator installers and repairers, boilermakers, building inspectors, and electricians earn the highest wages among the construction trades occupations. While the mean average wage for Arizona’s construction trades occupations is only 84 percent of the national average wage, nine of the top 10 occupations pay at a rate above 85 percent. Among the ten highest paid occupations, brick masons pay at 80.9 percent of the national average. Paperhangers and hazardous materials removal workers tend to earn slightly more than the national average for their occupations.

Among the lower paying occupations, the six construction trades ‘helper’ occupations trail other occupations in terms of pay with salaries between \$16,900 and \$21,900 ((See Figure 13). These wages equate to \$8.13 per hour for roofer helpers and \$10.50 per hour for plumber helpers. Wages for masonry and roofer helpers are especially low, paying 72 and 77 percent respectively of their occupation’s national average wage. The relatively low pay for these occupations, especially at the entry level may explain much of why Arizona faces a challenge in attracting workers at the entry-level of the construction trades



**Figure 12: Arizona's Highest Paying Construction Paying Occupations,**

Occupational Title	Mean Arizona Annual Wage, 2003	Mean US Annual Wage, 2003	Arizona Wage as a Percentage of US
<b>Construction &amp; Extraction Occupations</b>	<b>\$ 31,158</b>	<b>\$ 37,003</b>	<b>84.2%</b>
First-Line Supervisors/Managers of Construction Trades & Extraction Workers	\$ 48,568	\$ 52,666	<b>92.2%</b>
Elevator Installers & Repairers	\$ 47,486	\$ 55,744	<b>85.2%</b>
Boilermakers	\$ 42,910	\$ 44,200	<b>97.1%</b>
Construction & Building Inspectors	\$ 42,640	\$ 44,907	<b>95.0%</b>
Electricians	\$ 37,856	\$ 44,283	<b>85.5%</b>
Plumbers, Pipefitters, & Steamfitters	\$ 37,315	\$ 43,618	<b>85.6%</b>
Paperhangers	\$ 36,670	\$ 34,507	<b>106.3%</b>
Hazardous Materials Removal Workers	\$ 36,400	\$ 36,338	<b>100.2%</b>
Operating Engineers & Other Construction Equipment Operators	\$ 35,152	\$ 38,418	<b>91.5%</b>
Brickmasons & Blockmasons	\$ 34,674	\$ 42,848	<b>80.9%</b>
Structural Iron & Steel Workers	\$ 33,779	\$ 43,243	<b>78.1%</b>
Sheet Metal Workers	\$ 33,280	\$ 38,334	<b>86.8%</b>
Carpenters	\$ 32,739	\$ 37,523	<b>87.3%</b>
Cement Masons & Concrete Finishers	\$ 32,365	\$ 33,800	<b>95.8%</b>
Paving, Surfacing, & Tamping Equipment Operators	\$ 32,094	\$ 32,635	<b>98.3%</b>
Reinforcing Iron & Rebar Workers	\$ 31,595	\$ 40,539	<b>77.9%</b>
Floor Layers, Except Carpet, Wood, & Hard Tiles	\$ 31,450	\$ 35,339	<b>89.0%</b>

Source: Arizona Workforce Informer and the US Bureau of Labor Statistics Occupational Employment Statistics, 2003

occupations. Only septic tank and sewer pipe cleaners or quarry rock splitters earn an average wage in Arizona that is nearly as much others in their occupation elsewhere in the US.

These data provide the foundation for constructing a career lattice for the Arizona construction trades industry. Figure 14 presents an example of how the various 'core' trades occupations inter-relate. The lattice was developed based on data generated through the O\*Net dictionary of occupations and those deemed to be most closely related by the nature of their requirements for skills, knowledge, and abilities. The Bureau of Labor Statistics (BLS) established these categories to classify experiential occupations that do not require any college education<sup>5</sup>.

Within the lattice these occupations are sorted primarily by their training requirements. Jobs requiring short-term on-the-job training (OJT) are ones where less than one month of training suffices. Moderate-term OJT is assumed to last more than one month, but shorter than a year. Long-term OJT necessitates more than one year of training. Jobs calling for work experience in a related occupation require a higher level of accumulated skills and experience than those in the long-term OJT category.

<sup>5</sup> For a more detailed discussion of these categories see pages 1-2 of the report available at: [http://www.workforce.az.gov/admin/uploadedPublications/1373\\_optd.pdf](http://www.workforce.az.gov/admin/uploadedPublications/1373_optd.pdf)

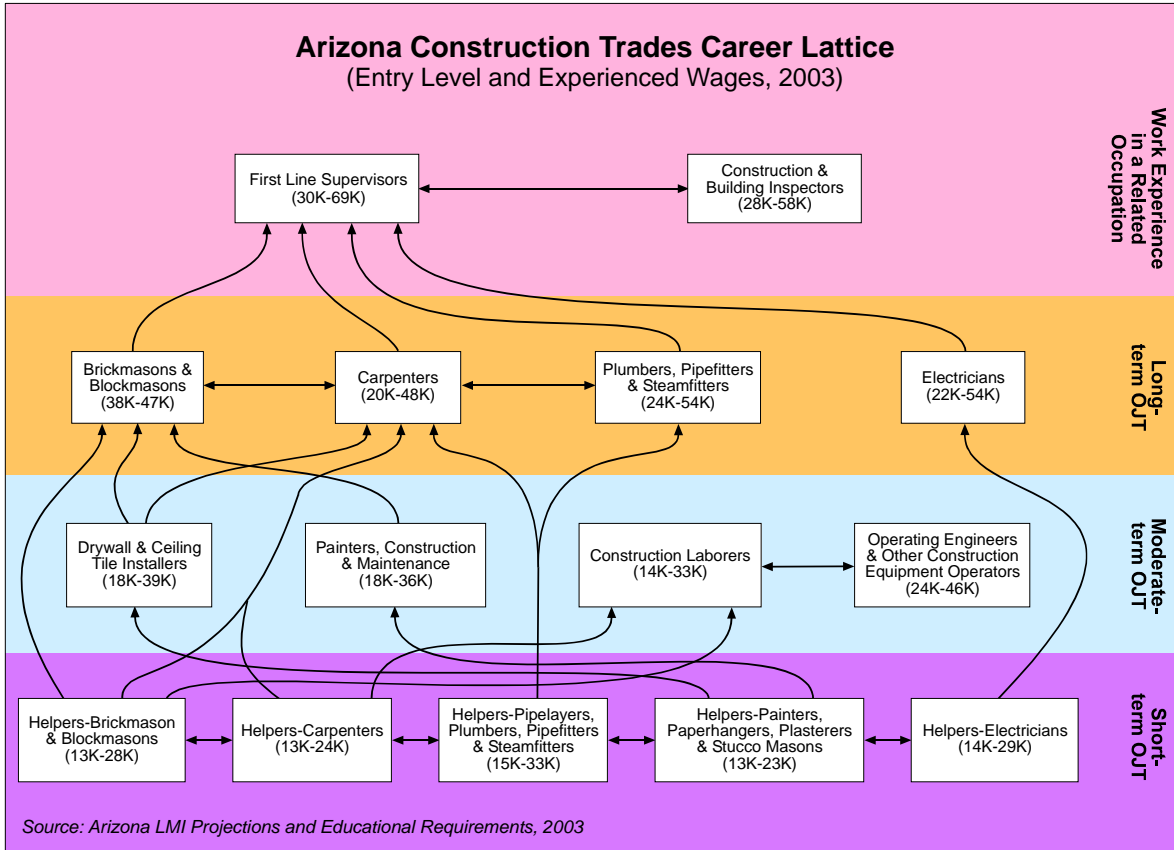
**Figure 13: Arizona’s Lowest Paying Construction Occupations, 2003**

Occupational Title	Mean Arizona Annual Wage, 2003	Mean US Annual Wage, 2003	Arizona Wage as a Percentage of US
<b>Construction &amp; Extraction Occupations</b>	<b>\$ 31,158</b>	<b>\$ 37,003</b>	<b>84.2%</b>
Helpers--Roofers	\$ 16,910	\$ 21,882	77.3%
Helpers--Painters, Paperhangers, Plasterers, & Stucco Masons	\$ 18,803	\$ 22,110	85.0%
Helpers--Carpenters	\$ 19,552	\$ 22,901	85.4%
Helpers--Brickmasons, Blockmasons, Stonemasons, & Tile & Marble Setters	\$ 19,656	\$ 27,352	71.9%
Helpers--Electricians	\$ 21,445	\$ 24,898	86.1%
Helpers--Pipelayers, Plumbers, Pipefitters, & Steamfitters	\$ 21,819	\$ 24,045	90.7%
Terrazzo Workers & Finishers	\$ 22,589	\$ 31,242	72.3%
Construction Laborers	\$ 22,755	\$ 28,808	79.0%
Segmental Pavers	\$ 22,880	\$ 28,434	80.5%
Fence Erectors	\$ 23,546	\$ 25,563	92.1%
Glaziers	\$ 24,128	\$ 36,296	66.5%
Helpers--Extraction Workers	\$ 25,147	\$ 27,768	90.6%
Pipelayers	\$ 25,771	\$ 32,115	80.2%
Rock Splitters, Quarry	\$ 26,624	\$ 27,726	96.0%
Insulation Workers	\$ 26,894	\$ 34,424	78.1%
Highway Maintenance Workers	\$ 26,998	\$ 29,994	90.0%
Painters, Construction & Maintenance	\$ 27,040	\$ 32,219	83.9%
Drywall & Ceiling Tile Installers	\$ 28,558	\$ 37,232	76.7%
Roofers	\$ 28,683	\$ 33,592	85.4%
Plasterers & Stucco Masons	\$ 28,954	\$ 36,109	80.2%
Stonemasons	\$ 29,640	\$ 36,254	81.8%
Tapers	\$ 29,661	\$ 40,851	72.6%
Septic Tank Servicers/Sewer Pipe Cleaners	\$ 30,701	\$ 30,805	99.7%
Carpet Installers	\$ 30,888	\$ 35,381	87.3%
Tile & Marble Setters	\$ 30,930	\$ 37,502	82.5%

Source: *Arizona Workforce Informer and the US Bureau of Labor Statistics Occupational Employment Statistics, 2003*

By examining the relationships between these core occupations, several key findings emerged. First, several trades present more opportunities for people to move laterally between different occupations while the electrician occupation appears to be much more specialized. Higher wages for experienced people within similar levels of training perhaps reflects the value of this specialization. Second, occupations like construction laborer and operating engineer have clear ceilings without linking those skills to other technical specialties. At the same time, workers entering occupations like drywall & ceiling tile installers are able to use their skills and abilities to move across occupations more readily (such as shifting into brick and block masonry or carpentry) than construction laborers. Third, the occupations in greatest demand—first line supervisors, painters, construction & maintenance, carpenters and construction laborers, lie at the core of skilled construction trades occupations. The future of the construction trades depends on a steady stream of workers moving into these occupations.

Figure 14: Arizona Construction Trades Career Lattice



## **A View From Construction Trades Firms**

During the summer and early fall of 2004, ACCRA conducted a survey of firms in the construction trades. The survey of nearly 1,500 construction trades firms across the state succeeded in generating responses from approximately 230 employers (or about 15 percent). The purpose of the survey was to assess the labor force needs of the construction trades industry. The firms surveyed were identified from the Reference USA business listing of firms with at least 20 employees and were categorized as a construction trade using one or more of several standard North American Industrial Classification System (NAICS) codes (i.e., NAICS codes 236, 237, and 238).

Questions in the survey covered three main areas: contractor type and employment composition, hiring practices and training practices. The results of the survey reveal several key points. First, almost half the firms indicated that they had not been hiring during the past two years, but many more plan to hire in the coming six months. The construction trades are heavily dominated by 25 to 39 year-old workers, and only a small proportion of the workforce receives a salary (and the related benefits). Finally, most companies are seeking workers with experience and skills, but only a few support apprenticeship programs to ensure that their existing workers have adequate skills.

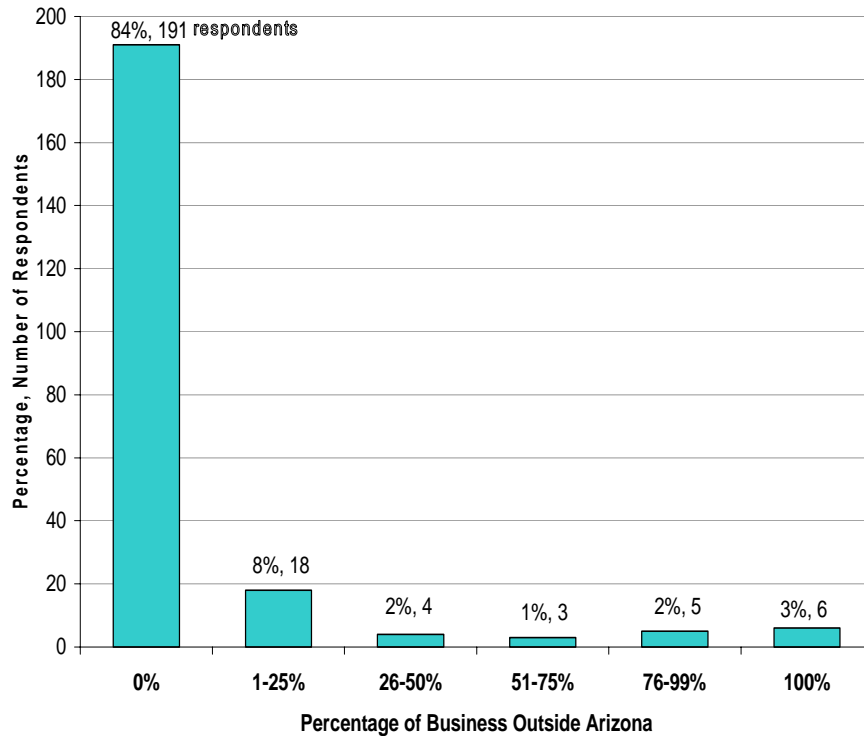
### ***Overview of Construction Trades Firms***

Because ACCRA used a size cut-off of 20 employees in selecting the sample to be surveyed, one should expect certain biases in the results. For instance, by definition of the sample selection, most firms employed more than 15 persons, the average size of Arizona construction trades firms. Not surprisingly, most of the firms have been in business for a while, with the vast majority being established between 1971 and 1989. The firms included in the survey therefore were much more mature than might be expected and have a longer-term experience in working in the industry. Thus, one might also expect that they have a more thorough appreciation for the importance of training and apprenticeships than the average construction trades firm.

Because of the large population and economic base, most of the firms were located in and performed work in Maricopa County. About 58 percent were located in Maricopa and another 19 percent of the firms surveyed were located in Pima County.

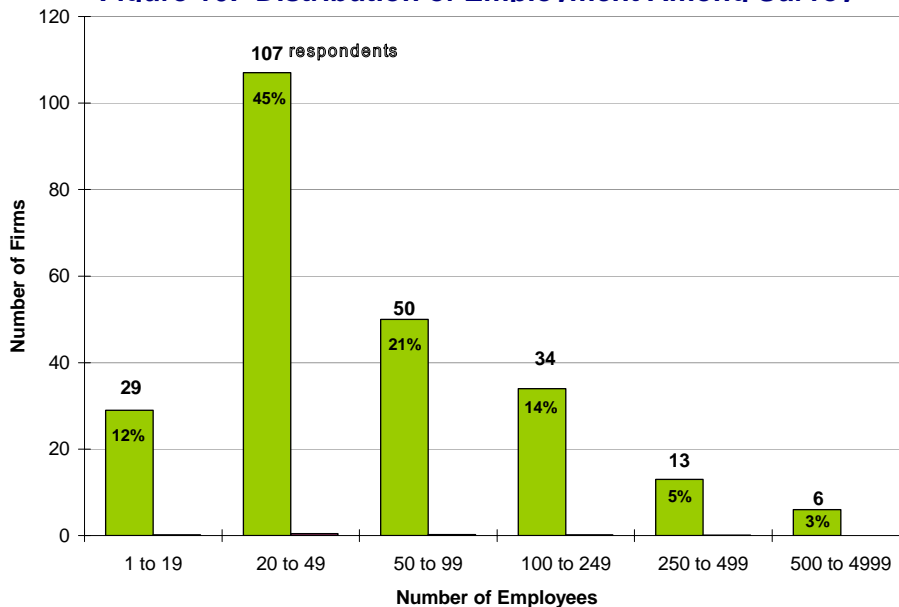
Two-thirds of the firms indicated that they did work in Maricopa and more than half worked in Pinal and Pima Counties – even though many were not located in these areas (See Figure 15). The respondents were focused almost exclusively on serving the Arizona construction needs although as many as 36 of the respondents (or 16 percent) do business outside the state. Six percent of the firms do most of their business outside the state.

**Figure 15: Proportion of Construction Activity Earned Outside of Arizona**



The construction trades industry is clearly dominated by small firms. Ironically, even though the sample selected for survey was identified because they had 20 or more workers, about 1 in 8 of the firms reported having fewer than 20. In addition, in the development of the sample, another 12,600 firms were identified (but not surveyed) with fewer than 20 employees. Of the surveyed firms, 57 percent reported fewer than 50 employees. Any strategies aimed at improving the workforce must take into consideration the importance of these smaller firms

**Figure 16: Distribution of Employment Among Survey**



to the employment base of the construction trades industry.

The respondents represented 19 different industries – with 69 percent in one of six industries: Plumbing, Heating, and Air-Conditioning Contractors; New Single-Family Housing Construction Contractors; Poured Concrete Foundation and Structure Contractors; Electrical Contractors; Drywall and Insulation Contractors; and Other Finishing Contractors (See Figure 17). These responding firms represent a mix of contractors that are similar to the overall mix of contracting firms in the state, suggesting that the sample of responding firms are representative of the universe of construction trades firms employing more than 20 people.

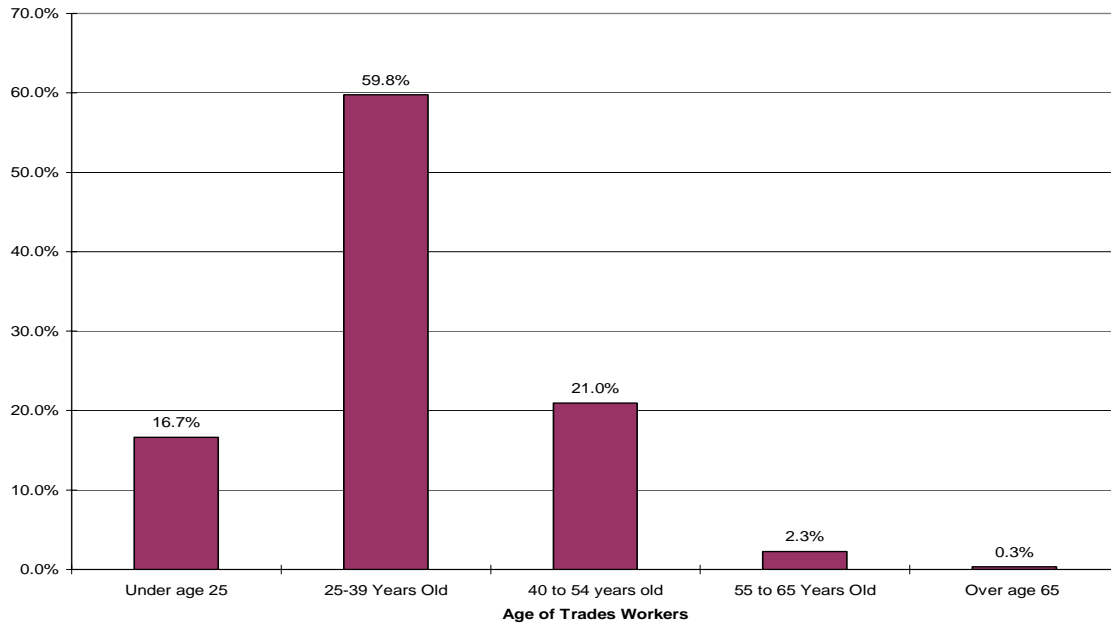
<b>Figure 17: NAICS Code Composition of Respondent Firms</b>		
<b>NAICS Description</b>	<b>Number of Firms</b>	<b>Percent</b>
Plumbing, Heating, and Air-Conditioning Contractors	43	<b>19%</b>
New Single-Family Housing Construction	35	<b>15%</b>
Poured Concrete Foundation and Structure Contractors	20	<b>9%</b>
Electrical Contractors	20	<b>9%</b>
Drywall and Insulation Contractors	19	<b>8%</b>

### **Construction Trades Workforce Characteristics**

The survey asked respondents to indicate what proportion of their firms were paid on a salary basis as compared with being paid on an hourly basis. The respondents indicated that on average nearly 9 of 10 workers (87%) were paid on an hourly basis. Not coincidentally, about 9 of 10 construction trades employees (87 percent) are trades workers with the remaining 13 percent serving in administrative roles. The important distinction is that hourly workers (primarily construction trades workers) rarely receive fringe benefits that serve as important retention tools, especially when they work for small construction trades firms.

Because so few construction trades jobs offer benefits and because the work requires manual, outdoor labor, the industry has a challenge in retaining experienced workers. As shown in Figure 18, the average age of construction trades workers is relatively low. Most workers are between 25-39 years of age. Less than three percent of the workers in the trades are over age 55, and few firms appear to be worried about looming retirements. In fact, only 43 percent of the firms expect any of their employees to retire in the next three years, and about 9 percent of firms expect more than five of their workers to retire during the next three years.

**Figure 18: Age of Construction Trades Workers**



Labor turnover is a tremendously important issue in the construction trades industry. While the average size firm in the survey is nearly 80 trade workers (much larger than the overall average of 15 people), the respondents reported a significant turnover rate. During the past six months, the responding firms reported hiring an average of 23 workers per firm. That means that 28 percent of the average respondent's workforce had been on the job with their firm for six months or less. Furthermore, these firms reported hiring an average of 101 persons during the past two years, representing 122 percent of the average firm's workforce. This suggests that the average firm sees an almost complete turnover of workers every 20 months. It should not be surprising then that an apprenticeship program lasting more than two years is well beyond the firm's expected return on investment from an employee.

A number of firms indicated that unskilled and semi-skilled workers are generally easy to find; however, finding skilled workers is a more significant challenge. Most firms have minimal requirements for taking employees. For instance, nine of ten firms require less than two years experience for entry level jobs. The greatest need for workers, according to survey respondents, is for positions that require experience and training. These occupations include Concrete Finishers, Plumbers, HVAC techs, Electricians and Carpenters. Many of these positions are difficult to fill, especially Concrete Finishers, Plumbers, HVAC techs, and Electricians. In addition, the respondents also indicated that finding Heavy Equipment Operators and Foremen were also challenging.

Many of these technical positions require at least three to five years of experience and frequently, firms would like these workers to have more experience. Figure 19 shows the distribution of experience required for entry level, technical and supervisory positions.

**Figure 19: Years of Practical Experience Required of New Trades**

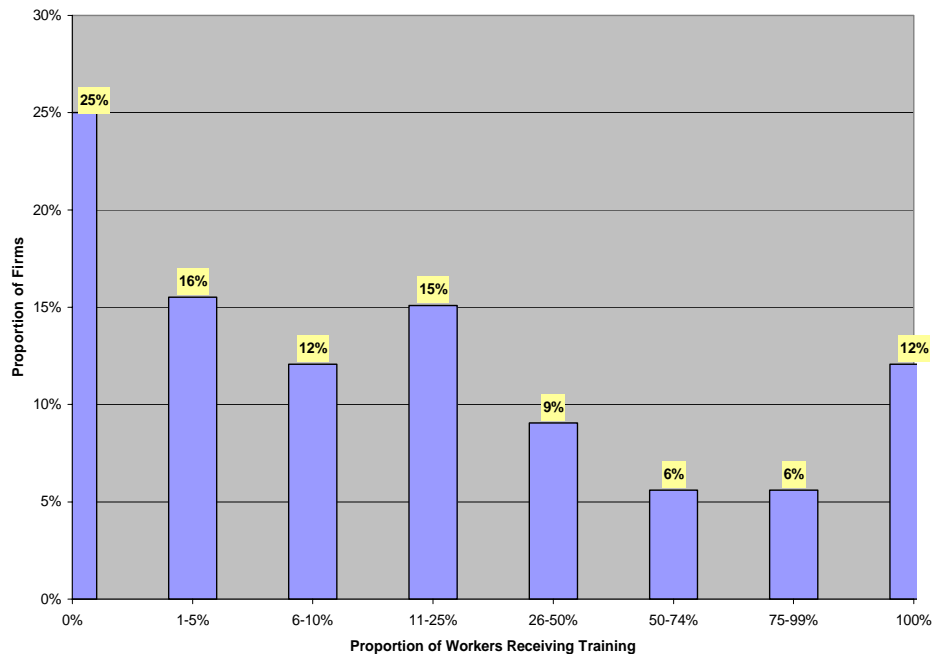
Average Years Experience:	0-2	3-5	6-10	Over 10	No Answer	Total
For Entry Level Positions	88%	5%	--	--	7%	100%
For Technical or Specialist Positions	31%	60%	3%	--	6%	100%
For Supervisory Positions	9%	45%	37%	3%	6%	100%

For entry level workers, firms are asking for an average of 8 months of past work experience. For technical or specialist positions, workers need to have an average of at least 3 years experience. For supervisory jobs, firms are seeking an average of six years of experience. Clearly, the high turnover rates in the profession can exacerbate the ability to find people with adequate work experience, and it also reinforces the point that some firms make that they frequently do not directly benefit from supporting workers who are participating in apprenticeship programs.

### Training Activities and Needs

About one in four workers employed by respondent firms have been involved in some form of training during the past two years, and about one firm of every eight reports that all of their employees have completed some form of training. Unfortunately, many construction trades firms have employees who have had little or no exposure to training opportunities. More than one in four (26 percent) report that none of their workers have participated in training during the past two years. An additional 40 percent of the respondent firms report that less than 20 percent of their workers have participated in training programs.

**Figure 20: Percentage of Workforce Completing a Training Program During the Past Two Years?**

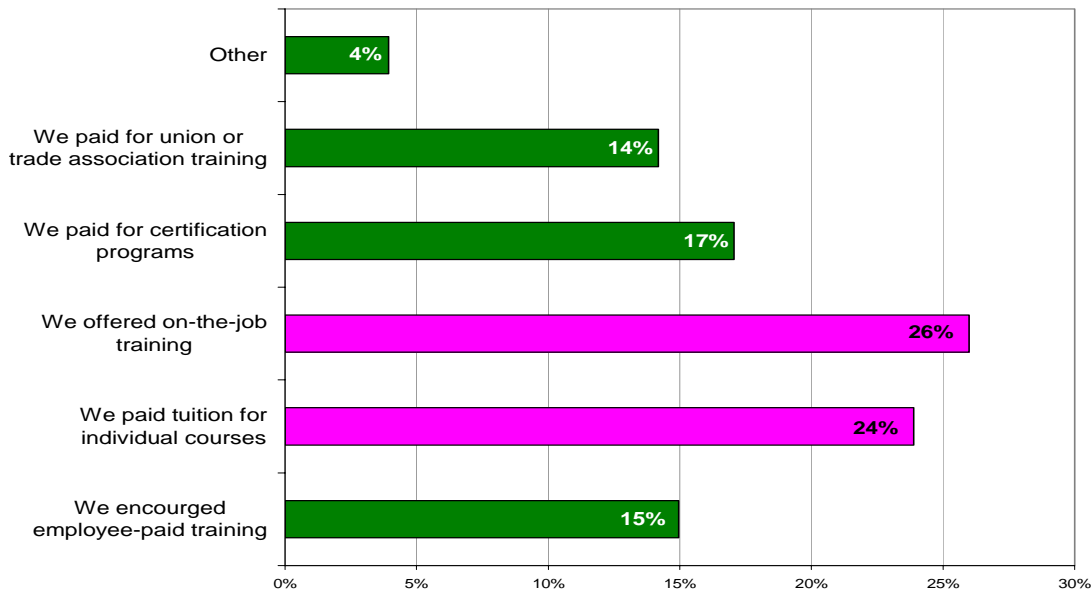




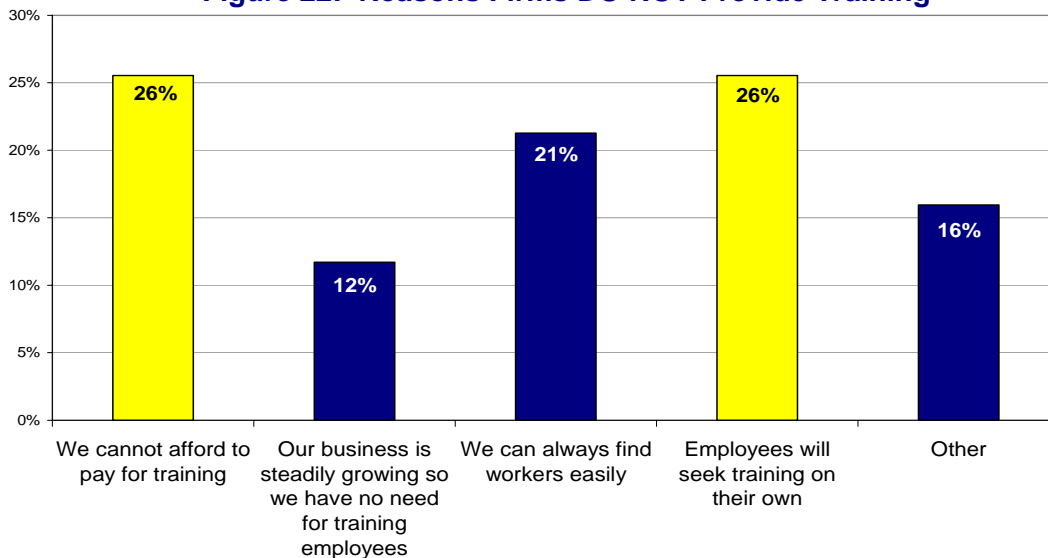
Of the firms responding, nearly three of five (59 percent) indicated that they provide access to training programs for their employees. The most frequent type of program is on-the-job training or reimbursement of training for courses or certifications (See Figure 21). Among these respondents, contractors suggest that high schools and community colleges need to take a more active role in training. These contractors are also seeking ways to reduce the cost of their training or increasing the public financial support for it while keeping government involvement as limited as possible.

The remaining 41 percent of firms offer no formal training for their employees. Of this group, about one in four firms (26 percent) expect that their workers will seek training if they are motivated to do so. As Figure 22 illustrates, another one in

**Figure 21: How Companies Support Employee Training**



**Figure 22: Reasons Firms DO NOT Provide Training**



four firms (26 percent) maintains that they cannot afford to provide training, and 21 percent believe that they can find workers without offering training as a benefit. These contractors tend to want to see free or affordable training classes offered that are more flexible, reflecting the time commitments required by workers who are needed on the job. They also tend to use immigrant workers more frequently and are concerned about helping those workers gain legal working permits and accessing English language training.

### ***General Observations and Key Issues Identified***

In general, two critical obstacles combine to constrain the number of available certified technical specialists. First, as one respondent so succinctly maintains, “if we train them, they leave for more money.” Construction trades firms are finding that they have a difficult time keeping their skilled workers so they opt not to invest in unskilled workers. Not surprisingly, the entire industry is facing a shortage of skilled workers because firms are not achieving a return on their investment in up-grading the skills of construction trades workers. Second, many firms expect their technical specialists to come to them already trained for the job that they must accomplish. Without apprenticeship opportunities, the number of skilled specialists is limited, creating a “Catch 22” for Arizona’s construction trades industries. Without apprenticeship opportunities, there are no specialists. Without technical specialists, the firms cannot find the skilled workers they need.

The respondents suggested that part of the solution is to increase the awareness about construction trades opportunities, especially in the high schools. At the same time, the high schools are expected to influence the basic attitudes of future workers as well as offer much-needed vocational training. Several noted that Mexican immigrants were an important part of the industry’s workforce and more needed to be done to support their efforts to enhance their English language skills as well as achieve working permits (as guest workers) and/or acquiring residency permits as legal aliens. Part of this support also involves offering more bi-lingual education.

Other respondents noted that improved training content is required. Several respondents noted that limited attention is paid to commercial construction while focus is paid almost exclusively to residential construction techniques. In addition, respondents noted a need for more technical training in certain individual trades (such as carpentry). Surprisingly, contractors suggested that the state should improve the quality of certification for workers and enforce stricter licensing requirements for contractors in order to improve the quality of the state’s construction trades workforce. Some firms suggested that training that was more realistic in terms of the time commitment required would increase participation rates among apprentices. Also, respondents suggested that increased state financial assistance or other training-related incentives would increase involvement by firms and workers alike.

Several firms suggested that training gaps exist in developing flexible workers who can contribute across different trades. Some rued the lack of available low-cost technical training in areas such as blue-print reading. Some companies

believe that the only way to improve the quality of workers in the construction trades is to enhance the pay scale and increase the availability of training opportunities to encourage the most motivated workers to apply for jobs and to retain the best employees.

## **Inventory of Training Providers**

The continuous job growth in the construction industry over the last decade has resulted in what many firms describe as a severe shortage of skilled laborers. A number of industry groups and researchers have been warning about persistent labor shortages in skilled trades for years. According to a study by the Construction Industry Institute, 75 percent of contractors are experiencing labor shortages that cost tremendous time and money for owners and contractors. A 2002 study done by Associated General Contractors shows that more than 80 percent of their survey respondents identified skilled labor shortages as their most significant challenges over the next five years.<sup>6</sup> In 1999, the National Center for Construction Education and Research (NCCER) reported that more than 90 percent of national construction firms reported shortages of skilled labor, and over 85 percent of those surveyed said that their current workforce is not as skilled as it should be in today's market. In addition, the US Department of Labor estimates that the construction industry needs to attract 240,000 workers each year to replace those retiring or leaving for other industry jobs in order to allow some growth in its capacity.<sup>7</sup> These astonishing statistics reinforce the key point that many experts and policy makers believe the greatest challenges facing the construction trades industry is to attract and retain skilled craftspersons.

The problem of skilled labor shortages in the US construction industry can be attributed to a combination of various economic and technological changes that have impacted the industry for a number of years. An aging workforce, changes in vocational education and technology, a shift toward open shop job training and craft education combined have supplemented the poor image of the construction trades as key factors in the challenge. These issues have driven away the industry's skilled craftspeople as well as steered younger people to careers other than the construction trades.<sup>8</sup>

In Arizona, this labor shortage is further exacerbated by predictions that the state will need another 8,000 construction workers this year alone to keep up with the building demand.<sup>9</sup> The presumption being made by many is that losses are due to an aging of the workforce, but the ACCRA's analysis suggests that the more motivated workers have access to other career opportunities and are leaving the

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<sup>6</sup> Dean T. Kashiwagi and Scott Massner. Solving the Construction Craftperson Skill Shortage Problem Through Construction Undergraduate and Graduate Education. ASC Proceedings of the 38<sup>th</sup> Annual Conference, April 11-13, 2002, pp.165-176.

<sup>7</sup> Kathleen Garrity. "No Easy Solutions to Construction Labor Shortage." Seattle Daily Journal of Commerce online edition, March 8, 1999. The article is available on-line: <http://www.djc.com/special/construct99/10050580.htm>.

<sup>8</sup> Abdol R. Chini, Brisbane H. Brown, and Eric G. Drummond. Causes of the Construction Skilled Labor Shortage and Proposed Solutions. ASC Proceedings of the 35<sup>th</sup> Annual Conference, April 7-10, 1999, pp. 187-196.

<sup>9</sup> Becky Pallack, "Skilled Workers Scare: Construction Trades Suffer as Few Replace Aging Baby Boomers", in Arizona Daily Star, published on February 1, 2004.

industry because of relatively lower pay, job instability, and the time required to move into higher wage skilled occupations within the trades industry. ACCRA's estimate of need is slightly lower than other predictions because it is projecting somewhat slower growth rates. However, even using conservative estimates, Arizona will require 40,000 additional construction workers by 2013 on top of the gap that already exists. The development of a cadre of professional skilled craftspersons relies on years of apprenticeships and additional working experience in the field building on formal training or education in the respective trades. Quite simply, ACCRA finds that construction trades workers are apparently not staying in the occupations long enough to gain that experience and education.

ACCRA interviewed a number of training and apprenticeship providers in September and October 2004 to assess whether the state has the current capacity to address the critical needs, especially in some of the key occupations such as carpentry, front-line supervisors, electricians, painters, and construction laborers. The interviewees offered apprenticeships and other training programs through trade unions, trade associations, non-bargain (i.e., non-union) local employers, and community colleges. The Arizona Department of Commerce has 55 construction trades apprenticeship and training providers -- 43 registered apprenticeship programs, 11 community colleges, and one trade school.

ACCRA interviewed 40 percent of the programs (or 22 training and apprenticeship programs – see below) to ensure the information gathered evenly

**Figure 23: Interview**

### **Trade Unions**

- Arizona State Carpenters JA & TC
- Phoenix Pipe Fitting Trades Joint Apprenticeship Committee
- Phoenix Drywall Tapers and Finishers JATC
- Phoenix Bricklaying & Tile Setting JA& TC
- Globe-Miami Electrical JATC
- Tucson Electrical JATC

### **Non-union Trade Associations**

- Arizona Builders Alliance (AZ Chapter, Associated Builders and Contractors)
- Arizona Masonry Contractors Association
- Arizona Laborers' Apprenticeship Program
- Arizona Concrete Contractors Association
- Arizona Plumbing, Heating and Cooling Contractors Association
- Arizona Operating Engineers
- Granite Construction Company
- Independent Electrical Contractors of

### **Non-union Private Employer-provided Training**

- Interstate Mechanical Corp (IMCOR)
- Empire Precision Machining
- Tri City Mechanical

### **Community College Construction Programs**

- Arizona Western College
- Gateway Community College, Apprenticeship Program
- Gateway Community College, Business & Industry Division
- Mohave Community College
- Pima Community College

represented the level of training currently underway by different training groups. The interviews were designed to collect data on program type, program activity, the number of apprenticeship or training enrollment and completers, participants' backgrounds, training costs, the role of the private sector in developing training programs, challenges faced by training providers, and recommendations for the state's workforce development policy. Among the questions asked:

- Do the current training and educational opportunities provided in Arizona address the urgent need of skilled craftspeople?
- How do the apprenticeship and training programs generate required skilled laborers for the future need of the construction industry?

The following section will describe the interview findings.

### ***Types of Industry Apprenticeship & Training Programs***

Unique to many other industries, the construction industry offers training primarily through apprenticeships. Based on data from the National Registered Apprenticeship System, a database administered by the Office of Apprenticeship Training, Employer and Labor Services (OATELS) in the US Department of Labor, more than 60% of 280,220 registered apprentices in 2003 from 31 participating states were in construction trades-related programs. Of the construction workers receiving training, 21% were minorities and 3% were women.<sup>10</sup> In Arizona, more than 1,600 (or 85%) of new apprentices were registered in construction trades programs in FY2004, according to the data reported by the Arizona Department of Commerce.<sup>11</sup> Among those newly registered construction apprentices, 51% were minorities and 3.6% were women.

Of course, workers enter many construction jobs with no formal classroom training after high school. Workers starting immediately after high school can enter the construction trades occupations as laborers, helpers or apprentices. For those who come with the background of technical or vocational schools, they typically progress at a somewhat faster pace than workers who have only a high school degree because the technical or vocational program graduates already have had some of the necessary courses in mathematics or mechanical drawing that help them succeed in higher skill trades occupations. Through the apprenticeship or employer-provided training, entry-level workers can enhance

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<sup>10</sup> The data reported in the Registered Apprenticeship Information System in FY2003 only cover about 57% of a total of 488,927 apprentices registered with the Office of Apprenticeship Training, Employer and Labor Services. The 57% of total registered apprentices represents 31 states participating in the database, including 23 states whose apprenticeship programs are federally administered and eight State Apprenticeship Councils (Arizona, Florida, Kansas, Kentucky, Montana, Nevada, Ohio, Pennsylvania, and Rhode Island). The remaining 19 states, along with The District of Columbia, Puerto Rico, and Virgin Islands do not voluntarily provide the number of apprentices by industry, occupation and program type.

<sup>11</sup> The data provided by the Arizona Commerce Department represents FY2004 information only. Data prior to FY2004 is unavailable. As of October 15, 2004, the total number of newly registered apprentices in Arizona for all industries in FY2004 was 1,874. Among them, 1,610 apprentices were registered in construction trades, representing 86% of total registered apprentices.

their skills by working with more experienced workers and moving on to perform more highly skilled occupations. These apprenticeships and other training also typically require classroom training in math and drafting.

With additional education and training, skilled craft workers can also advance to supervisor or superintendent positions through more advanced training and apprenticeship programs. Participating in apprentice training allows young people who have no experiences in construction to learn the specific trade skills. The benefit to the firm, industry, and customers is that these workers have the credentials and capability to complete quality construction work.

In Arizona, the apprenticeship and specific craft training in construction trades can be obtained through several channels, similar to the apprenticeship structure that prevails in the rest of the country. The most common type of apprentice training is sponsored jointly by trade unions and unionized contractors (referred to as Joint Apprenticeship and Training Committees or JATCs). These apprenticeship programs are typically developed as part of a collective bargaining agreement, and they are frequently governed by committees with joint representatives from both labor and management. The funding for these apprenticeships is typically negotiated within the collective bargaining agreement.

“Union” apprenticeship programs in construction trades have a long history of leading apprentice and specific trade training in the United States. A recent study reports that in 36 states for which data is available, union apprenticeship programs enrolled approximately 73 percent of new construction apprentices between 1989 and 1995.<sup>12</sup> Even in Arizona where union membership in the construction industry is not as concentrated, nearly 40 percent of the 43 registered construction apprenticeship programs are supported by construction industry unions.

These apprenticeship programs provide a wide range of construction trades and safety training for electrical work, carpentry, boiler making, general construction, drywall installation, bricklaying, painting, plumbing, pipefitting and refrigeration, sheet metal, and other trades. Apprentice participation in the union apprenticeship programs is limited to contractors who are union members.

The second type of apprentice training program is provided by non-union, or “non-bargain,” “non-joint,” or “open-shop” organizations. These non-union apprenticeship programs are governed unilaterally with individual employers or contractor associations controlling and administering the apprentice training. Of the state’s 43 registered apprenticeships, approximately 20 percent are provided through contractor associations. Examples of contractor associations providing such apprenticeship opportunities include the Arizona Builders Alliance, Arizona chapter of Associated General Contractors, Arizona Masonry Contractors Association, Arizona Plumbing, Heating & Cooling Contractors Association, and Independent Electrical Contractors of Southern Arizona. The electrical, plumbing

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<sup>12</sup> Cihan Bilginsoy, “Apprenticeship Training in the U.S. Construction Industry,” University of Utah, Department of Economics. September 1998.

and carpentry trades are the most common crafts offered through the non-union apprenticeship program providers. For some association apprenticeships, contractors must be members of that specific trade association. Apprentices who participate in this type of training are frequently limited because firms must first recruit a worker to participate and then sponsor their enrollment. Some of these programs, such as the Arizona Builders Alliance, offer to enroll any firm willing to pay the training fees for the apprenticeship program.

The other type of non-union apprenticeship program is frequently offered through private individual employers in which the firms train their own employees by designating experienced workers to mentor those new employees with specialized skills to meet the company's needs. Of the state's 43 registered apprenticeship programs in construction, 40 percent are considered "in-house" or "closed" apprenticeship programs created for individual firms. Companies that provide their own apprenticeships are primarily large contractors that are in the business of building construction, highway and tunnel construction, and specialty trades in carpentry, plumbing and electrical work.

In addition to apprentice training, local community colleges and vocational schools also provide other venues for people who are interested in entering construction or upgrading their skills by taking courses related to building and construction trades. Several community colleges within the state offer apprentice training, mostly working with union or non-union training providers to allow their students to gain on-the-job training to complement formal classroom instruction. Gateway and Pima Community Colleges, for example, have established partnerships with many local union or non-union apprenticeship programs that provide specific craft training in construction trades.

In these cases, the community colleges provide classroom-related training, either on or off campus while the trade unions or contractor associations conduct on-the-job training as well as tracking the working hours completed by apprentices for certification. For instance, Gateway Community College has 14 apprentice training programs partnered with the unions, and nine additional programs implemented in collaboration with non-union groups.

### ***Training Contents and Requirements***

By definition, an apprenticeship represents a combination of on-the-job training and related instruction in which workers learn the practical and theoretical aspects of a highly skilled occupation. The Office of Apprenticeship Training, Employer and Labor Services (OATELS)<sup>13</sup> in the US Department of Labor set quality standards for all apprenticeship programs registered with the federal government. It requires that all registered apprenticeships include at least one year (2,000 work hours) of on-the-job training and at least 144 hours of formal

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<sup>13</sup> The Office of Apprenticeship Training, Employer and Labor Services was created in a consolidation of programs offered by the former Bureau of Apprenticeship Training at the US Department of Labor.



instruction. Apprentices completing the apprenticeship programs registered with federal and/or state governments will receive a certificate upon the completion of training. A federally registered apprenticeship is recognized across the nation and can be used in getting a journeyman's card in any participating state.

Construction apprenticeships generally take two to five years to complete, depending on the occupation. Among the six union apprenticeship programs interviewed, the apprenticeship requires five years for electricians, four years for carpenters, sheet metal workers and millwright workers, and three years for painters, drywall tapers, and bricklayers. For a general construction laborer, the apprenticeships generally require only two years to fulfill the requirements. Furthermore, if the apprentice receives a certificate from the state and/or the US Department of Labor for completing the training, he or she can also receive a journeyman card from their respective national union organizations, such as International Brotherhood of Painters and Allied Trades, United Brotherhood of Carpenters and Jointer of America, United Association of Plumbers. With a journeyman's card, a worker can find work anywhere in the nation in that particular occupation.

For those registered non-union apprenticeships in Arizona, the length of apprentice training is similar to what the union groups have provided, except for electricians. For example, Arizona Builders Alliance and Independent Electrical Contractors of Southern Arizona both offer a four-year apprentice training for skilled electricians while the union-organized JATC in Tucson and Globe-Miami requires a five-year training to become a skilled electrician. Similarly, the completers graduating from non-union apprenticeship programs can also receive a certificate issued by the state and/or their community college partner as well as journeyman card that is recognized nationally.

Many non-union apprentice training programs in Arizona adopted the guidelines and curriculum developed by the National Center for Construction Education and Research (NCCER) to administer their training activity. An on-going national debate centers on whether non-union contractors and their associations can effectively devise, fund and implement training programs that will produce a reliable supply of skilled construction workers.<sup>14</sup> Some argue that because non-union programs are smaller in size and lack the longevity of union programs that they are not as effective and the resulting workers are not as qualified. ACCRA's research findings confirmed that, in general, union-organized apprenticeships offer more extensive apprenticeship programs and a broader set of skills than do non-union training providers. Also, the size of the training program provided through the union, in terms of the number of enrolled apprentices, is larger than non-union apprenticeship programs. For instance the number of enrollees ranged from 17 in a rural JATC program to 642 in the Arizona state carpenters JATC. The tremendous demand for carpenters has resulted in that occupation having the largest number of registered union apprenticeships followed by pipe

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<sup>14</sup> William J. Londrigan and Joseph B. Wise, *Apprentice Training in Kentucky: A Comparison of Union and Non-Union Programs in the Building Trades*, 1997

fitters, plumbers, electricians, and drywall tapers. The non-union apprenticeship programs concentrate their efforts mostly on training electricians, carpenters, and operating engineers.

Though many apprenticeship programs have adopted a philosophy of 100 percent acceptance to the programs, they still must place some minimum requirements on eligible applicants to ensure people are truly interested in construction trades. In general, the minimum requirements for acceptance into an apprenticeship requires that an applicant (1) be at least 17 or 18 years old, (2) have a valid driver's license, (3) have a high school diploma or GED certificate, and (4) be physically capable of performing the work of the trade to be learned. Some training providers set stricter requirements by asking applicants to provide proof of eligibility of work in the United States as appropriate to federal laws or requiring applicants to take an entrance examination on their reading or math skills. Several providers enforce zero-tolerance drug policies by requiring applicants to pass a drug test and by conducting periodic drug testing to ensure the safety and health of apprentices for their member contractors.

For union-organized apprentice training, the policies can be slightly more stringent. Often time applicants are brought into the apprenticeship program on "as needed" basis. The number of applicants brought in depends on the work available at the time. Some training providers adopt a policy of "pre-apprenticeship" to ensure that applicants are suitable for construction careers. For example, Arizona Carpenter JATC adopts a maximum of six months of pre-apprenticeship experience before an applicant can advance into the regular apprenticeship program. The pre-apprentice participant can advance into the regular program at any time if an employer requests the advancement during the six-month pre-apprentice period. These programs also offer high school students an opportunity for exposure to apprenticeship training even before their graduation. For instance, Arizona Builders Alliance's Youth Apprenticeship program provides certain 10<sup>th</sup> and 11<sup>th</sup> grade students with work-site learning experience before their high school graduation.

### ***Participants' Background***

Workers participate in apprentice training with fundamentally different goals. Some come to training to upgrade their skills for better quality of life, while some are simply looking for a job and the apprenticeship is the avenue that provides them with an entry-level position in the construction industry. According to many apprenticeship training providers, about two-thirds of new apprentices trained to become cement masons, bricklayers, drywall installers and tapers, carpenters, and sheet metal workers already have some experience in construction. By participating in apprentice training, these experienced laborers and helpers hope to upgrade their skills and create a career pathway aimed at increasing their wages.

As for those seeking entry-level jobs, the majority are registered in occupations such as electricians, plumbing, heating and cooling, and mechanical workers. For example, Tucson Electrical JATC indicates that 90 percent of their

apprentices are looking for an entry-level position in the construction industry. Of the new apprentices in Arizona Plumbing, Heating & Cooling Contractors Association, 70 percent have no previous experience in construction and hope to get a job through the apprentice training.

Due to the state's proximity to Mexico and with more than 250,000 Native Americans living in Arizona, anecdotal information suggests that the number of minority workers working in the construction industry is quite large. No data is currently available that breaks down the occupational mix by ethnicity (although Local Employment Dynamics data soon to be available from the US Census will provide that information in the near future). However, recent data released by the Arizona Department of Commerce show that, as of October 2004, minority ethnic groups (i.e., Hispanics, American Indians, Black/African Americans, Asians and Native Hawaiians) account for 51% of the total 1,610 newly registered apprentices and 51% of the total 2,606 active registered apprentices in 2004. This demonstrates that more than half of current workers in construction training are minorities. Though all of apprentice trainings are conducted in English, some interviewees indicated that many of their instructors are bilingual, and bilingual education is critical for many Hispanic apprentices who might otherwise have difficulty learning the specific trades. Estimates from training providers suggest that most minority apprentices (60-75 percent) are participating in apprenticeships for drywall tapers and finishers, brick masons, cement masons, and carpenters.

### ***Training Costs***

In many cases, construction contractors or business owners make their investment in apprenticeships with hope to attract and retain high quality workers. Frequently, firms pay for training costs in part or in its entirety. Of course, they also pay a wage to apprentices working for them.

The case of who pays for training tuition is quite different for each individual training provider. For some providers, the training costs are covered entirely by firms while some require students to pay for training expenses. In some cases, employers pay for tuition up-front, but then deduct the training fees from the apprentice's salary. Other contractors ask apprentices to pay for the tuition upfront, and then reimburse them based on their performance during the training.

For union apprenticeship programs, employers typically pay 100 percent of the training costs while only a few non-union training providers require contractors to pay for the entire training tuition. The cost of training tuition varies from training providers, as well as from the kind of construction trades being trained. For 2004, the tuition reported by various service providers ranged from \$400 to \$900 per semester, excluding the registration fees and book expenses. For example, the tuition for the Arizona Masonry Contractors Association was reported as \$500 per semester, while Arizona Builders Alliance charged \$700 for each semester in 2004. In Arizona Plumbing, Heating & Cooling Contractors Association, the tuition for training in plumbing was about \$450, for heating & cooling was about \$500. For electrical training, tuition ranged from \$500 to \$900.

## ***Curriculum Development***

For those training providers interviewed, all reported bringing local private contractors into the process of developing or refining their training curriculum and courses as well as in asking for their feedback on training activities. Apprentice training programs offered through non-union trade associations mostly follow curriculum guidelines developed by the National Center for Construction Education and Research.

The non-union training providers typically establish an apprenticeship committee consisting of private contractors from related construction sectors. Some providers may also include instructors and the company's owners as members of the committee. The committee meets regularly to discuss and review training materials and issues. For some of the private employer-provided training programs, the training curriculum and materials are developed in-house with input by the company's president and senior managers.

As for the union-organized apprenticeship programs, they generally use the curriculum and materials developed by their respective national organizations as their training guidelines. However, they will often incorporate materials specifically related to regional and local codes for the needs of individual areas. These programs normally have a management committee consisting of an even number of workers and managers to discuss training issues.

## ***Challenges for Training Providers***

Success for apprentice training is measured based on the number of qualified workers completing their training and successfully acquiring careers in the construction industry. However, the current training and educational opportunities provided in Arizona cannot adequately address the urgent need for skilled craftspeople. Data provided on apprenticeship programs suggest that the number of qualified workers completing their apprenticeships is well short of the pace needed to meet current and future demand for skilled construction workers. For instance, the four largest apprenticeship training providers in Arizona graduated about 150 electricians and 110 carpenters in 2003. Based on ACCRA's research, the state will need about 360 new electricians and 600 new carpenters annually for the next ten years. Thus, labor shortages for skilled electricians and carpenters will continue into the future and may well become worse.

The problem is a bit more complicated than not having enough training opportunities. The challenge for apprenticeship training providers is that many workers begin the apprenticeship training, but then drop out when they find a job opportunity that pays more money. Small hourly wage increases can attract workers to move from one job to another. Some programs reported that as many as 70 percent of apprentices drop out of training during the first year of the apprenticeship, and many frequently cited first-year drop out rates of 40 to 70 percent. Training providers struggling with retention are seeking creative ways to

boost attendance and maintain worker interest in apprenticeship training programs.

The reasons for apprentices to leave the training programs are many. Some apprentices leave their training because of the financial burden. Although apprentices earn partial salary while they are in training, quite a few apprentices simply cannot afford to pay for training costs and living expenses at the same time. Some were discouraged by the long-term commitment required by most of apprenticeship training. After completing a few courses, they move on to other jobs with better pay than the wages that they earn through the apprenticeship.

Some apprentices have discovered that they merely prefer to work in a field other than construction. For example, the weather conditions in Arizona can mean relatively harsh outdoor conditions, especially during the summer months. One training coordinator pointed out that apprentices who are not formally educated about the economic value of training (and its contribution to their future career), tend to drop out. The education helps apprentices to make informed decisions about their career options. To prevent the participants from dropping out, some apprenticeship coordinators invest time in communicating the value of these training programs through one-on-one meetings and informal lunch sessions with apprentices. Such interaction can increase the level of engagement each apprentice has in the training process. Another strategy used to address the issue of high drop-out rates is to profile those people who have left the apprenticeship training programs. These profiles help the organization to determine what types of applicants are most likely to stay in training once they have begun the apprenticeship process.

Another significant challenge facing apprenticeship training providers is finding qualified workers to participate in the apprenticeships. Some trainers lament that the introduction of Arizona's Instrument to Measure Standards (AIMS), a standards-based test used in determining student progress toward high school graduation, will further limit access for many potential apprentices who achieve certificates of high school completion, but who do not meet the minimum requirements to graduate from high school. The AIMS standards-based test is used to measure student progress in mastering required minimum skill levels in reading, writing and mathematics. Since many programs require workers to graduate from high school as a pre-requisite for acceptance into an apprenticeship program, many minority workers and, certainly, all high school dropouts will have access to fewer apprenticeship training opportunities. Thus, these groups will continue to account for much of the day laborer or helper workforce serving the construction trades industry.

In addition, the challenge of hard outdoor work and the visibility of a large share of the workforce that is unskilled, low-paid day labor have both contributed to a negative image for the construction industry. This image discourages many parents and career counselors at high schools to encourage students to explore construction trades as a career option. According to one interviewee, "Not every high school kid should and can go to a four-year college. Many entry-level positions in construction trades don't require a college degree, and many

companies are willing to pay for continued training if they are hired. People should recognize that construction work is hard physical work, but it comes with good pay.”

To reach out to high school students, most training providers have initiated recruiting efforts through word of mouth, placing ads in local media, and participating in the local school’s career events. Several have conducted outreach designed specifically to target Hispanic and Native American workers.

Training providers commonly cite one final challenge that is directly tied to the issue of limited resources. Many of the programs are operating at full capacity and resources limit them from growing further. Several training providers noted that, without additional financial support, they cannot expand to meet the need for more apprentices interested in entering the training programs nor can they add the staff needed to administer and manage these programs. With limited resources, training programs are also unable to purchase up-to-date training equipment. Many providers maintain that, with more adequate public funding or grants, they could conduct apprentice training in a more effective manner.

## **Findings and Recommendations**

The above analysis of not only the trends in the construction trades industry and occupations, but also the perceptions of construction firms and training providers about the industry and key occupations offers a comprehensive assessment of the construction trades industry and its workforce. The purpose of this section is to synthesize this information and identify the most important findings as well as the implications for state policy action. The following section lists those key findings and then identifies a series of policy recommendations that should be implemented in the State. The ultimate goal is to improve the quality of the work completed by construction trades firms, ameliorate the worker shortage facing those firms, and most importantly create new opportunities for workers to develop a family sustaining career in the construction trades industry.

### **Findings**

Over the last decade, the construction trades industry has grown rapidly, but the incredible need for skilled workers has created a threat to the long-term viability of the industry. Without immediate action, the current shortage of skilled trades professionals will be exacerbated and could constrain the state's overall economic growth. Some of the most important findings regarding the industry are summarized as follows:

#### **Growth in the Construction Trades Has Outstripped National Growth**

Over the last decade, a 21 percent increase in Arizona's construction trades employment has far surpassed the national average of 13 percent. With 217,000 people currently employed in construction trades, 43 percent (93,000) work for four kinds of contractors: plumbing and heating & air-conditioning, single-family housing construction, drywall insulation, or electrical. The trades are expected to grow by 40,000 new jobs by 2013, with the seven largest sectors accounting for 25,500 of those jobs.

#### **Many Small Firms, Concentration of Firms in Maricopa County**

The increase of construction trades employment over the last decade mirrors the rapid growth in the number of Arizona construction firms. Since 1993, the number of construction firms has increased more than 60 percent, and most of the growth occurred in major metropolitan areas. Nearly three quarters (74 percent) of construction firms are located in either the Phoenix or Tucson metro areas. The number of firms statewide grew at an annual rate of 4.7 percent, and the fastest growth of new firms is seen in Maricopa, Yuma and Yavapai counties. The Phoenix metro area (Maricopa and Pinal Counties), in particular, has been the engine for the state's growth in construction employment and new firm formation, consisting of more than 61% of all construction firms and 78% of overall construction jobs. However, the average size of construction firms is rather small – averaging 15 workers per company (although 20 percent larger on average in Maricopa and about 25 percent smaller in other counties). The small company size illustrates that many construction trades firms are run by

entrepreneurs and this opportunity represent an important part of the path to career success in the industry, especially in large, competitive, opportunity-laden marketplaces such as Phoenix.

### **Greatest Shortage in ‘Core’ Skilled Construction Trades Occupations**

The fastest growing number of construction workers in Arizona between 1993 and 2003 was seen in carpenters, construction laborers, front-line supervisors, painters, and electricians. This growth pattern is projected to continue through the next decade – at a slightly more modest pace. Currently, Arizona has 130,000 workers in these five largest occupations (representing 60 percent of the workforce). If the construction trades industry continues growing in the future as projected, the state will need at least 20,000 more carpenters, laborers, painters, frontline supervisors, and electricians by 2013. These five occupations represent the ‘core’ of specialized workers in the construction trades industry, reflecting the varied level of skill requirements in the construction career lattice. The future demand for these different skilled workers not only requires a steady stream of people moving into these entry-level occupations, but also requires opportunities to encourage lower skilled workers to advance to higher paying, more specialized construction trades occupations.

### **Fastest Growth Occurring in Higher Wage Skilled Occupations**

The fastest growing construction jobs include higher wage, skilled occupations such as supervisors and electricians. Front-line supervisors receive the highest pay among all construction trades occupations, reaching an average annual salary of \$48,568 in Arizona. Yet, the salary paid to construction supervisors and most other construction trades workers is about 84 percent of the national average so it is unlikely that Arizona will attract workers unless they are willing to move to the state to earn less than they would in other places. As for electricians, the average salary is about \$37,856 per year in Arizona, ranked fifth in terms of the highest paid construction trades occupations but 16 percent below the national average. Carpenters, the skill in the greatest demand, ranked 13<sup>th</sup> in average wage at \$32,739, and paid approximately 87 percent of the national average for carpenters. Likewise, fast-growing entry-level jobs also paid well below the national average with most Arizona helper occupations paying an average of 72 to 91 percent of the national average for their occupations.

### **Apprenticeships are Key to a Skilled Construction Workforce**

The development of professional construction skills relies on years of apprenticeship training and work experience in the respective trades. The nature of construction work is becoming more complex and technologically advanced so skilled workers and successful apprentices are increasingly critical. The construction trades occupations represent nearly 80 percent of all Arizona’s registered apprentices in 2004.

People who are interested in apprentice training can find opportunities through union or non-union apprenticeship programs. Many of these programs have



established partnerships with local community colleges that allow apprentices to take additional college courses for further advancement as they develop their skills. In general, the union apprenticeship programs offer a wider range of construction trades training, while the non-union programs tend to concentrate on the occupations with largest need – electrical, plumbing and carpentry trades.

Union apprenticeship programs also tend to be larger in terms of the number of participating apprentices than non-union programs. Overall, more apprentices are trained by the union apprenticeship programs than the non-union ones. Once completing the requirements of classroom instruction and on-the-job training, apprentices receive a certificate and journeyman card that allow them to work anywhere in the state, throughout the US, and even in some foreign countries.

### **Apprenticeships Require Long-Term Investments by Worker and Firm**

Apprenticeship programs generally take two to five years to complete, depending on the craft. The most important element of any apprenticeship is the on-the-job training component, thus successful apprentices depend on the availability of consistent, long-term work provided by the contractor as well as a relatively long-term commitment from the worker to complete the apprenticeship.

Consequently, apprenticeships may be limited based on the need of each contractor and the availability of qualified apprentices. Matching worker interested in an apprenticeship to a contractor willing to invest the time and energy in mentoring an apprentice represents an important challenge.

Most of the training providers indicated that they set minimum standards for apprenticeship applicants. The standards require that the applicant demonstrate that he or she is sufficiently mature and capable of performing the technical work of his or her trade. It also requires strong support from an employer who will provide the apprentice with adequate hours of paid work. In addition, many programs require applicants to be (and remain) drug-free throughout the training. Several training providers noted that this final requirement – while valid to ensure safety at job sites – precludes a substantial number of potential applicants.

To ensure that the apprentice is committed to his or her profession, some training providers have adopted a policy of “pre-apprenticeship” training to ensure the apprentices are best suited for their respective programs. An example of this type of program is the Pre-Apprenticeship Training Program for Highway Construction Careers sponsored by the Arizona Department of Transportation and the Arizona Department of Commerce Apprenticeship Office. The six-week full-day pre-employment training class in highway construction provides opportunities for employers to find qualified workers as well as for applicants to choose the specific trade that best suits their interest. Currently, this program is mostly designed for recruiting women and minority workers into the highway construction careers. However, it provides a potential model for other pre-apprenticeship initiatives.

## **A Larger Share of Minority Workers in the Apprentice Training**

Due to the state's proximity to Mexico and its large number of Native American residents, the proportion of workers from minority ethnic groups is quite large and this is reflected in the apprentice training programs. As of October 2004, according to the Arizona Department of Commerce, 51 percent of the 1,610 newly registered apprentices and 51 percent of the 2,606 active registered apprentices were from one or more minority groups, including Hispanics, American Indians, Black/African Americans, Asians and Native Hawaiians. Not surprisingly, most of the apprentices dropping out of the training are also from minority groups with nearly 55% of registered minority apprentices canceling their training in 2004.

With a large share of the apprentices from minority groups – especially participation from groups speaking English as their second language -- language and cultural barriers appear to hinder workers' continuous engagement in construction projects. In addition, many workers are economically disadvantaged and have limited access to transportation to different worksites, particularly in rural areas. Language, transportation, economic, and cultural barriers inhibit minority workers from getting or keeping a job, especially lower paying apprenticeship jobs. In other cases, these barriers make job-hopping for modest wage increases a necessity. These factors, in turn, reduce the likelihood that these workers will accumulate the necessary skills and experience to advance along a career path within one or more of the construction trades.

## **High Drop-out Rate in Apprenticeship Programs**

One of the most important issues facing the apprenticeship programs is the high proportion of participants who drop out in the first year – estimated at 40 to 70 percent by various training providers. The reasons for dropping out of the apprenticeship programs are many, including the financial burden, requirements for military service, inability to make long-term (i.e., more than one month at a time) commitments, the weather conditions in Arizona, and many other reasons. It is a constant challenge for training providers to motivate apprentices to go to school while working full-time for a long period of time. If apprentices do not have a long-term personal vision of the value that the apprenticeship offers toward future career advancement, they appear to be more likely to drop out from the training.

Apprenticeship programs require a tremendous investment of time and resources from both employer and employee, and a high drop-out rate means a substantial portion of the investment in the program may be lost to the construction trades. As the apprenticeship program is the essential and exclusive method for training qualified construction workers, the high apprenticeship drop-out rate inhibits the continuous supply of qualified workers, and therefore has inevitably aggravated the skilled labor shortage. To keep up with the growing demand for workers, many contractors or construction companies must settle for hiring semi-qualified or unskilled day laborers or helpers to complete their work on time. This further inhibits the development of qualified apprentices as these job assignments are

frequently going to individuals who are not engaged in related apprenticeship training or the contractor experiences delays because he or she cannot handle the volume of work that the firm has scheduled.

### **Gap Between Available Qualified Workers and Industry Needs**

Using conservative estimates, Arizona will require more than 25,000 new carpenters, construction laborers, frontline supervisors, painters, and electricians in the next decade. At the current rate of apprenticeship completions, the state will train slightly more than one-third that number. The data currently being reported by training providers reflects a huge gap between the demand for qualified workers and the number completing the programs. Given that about half of current apprentices drop out of the program in the first year, the issue does not appear to be one of training capacity, but rather one of improving the completion rates of current applicants.

The focus by many providers has been on increasing the flow of applications to increase the number of participants in apprenticeship programs. However, many training providers state unequivocally that they cannot increase the size of their programs without more resources – from state subsidies or tuition income. The challenge may well be how to enhance completion rates of those participating or how to “weed out” apprentice applicants more effectively who are unlikely to complete their apprenticeship program.

### **Security of Apprenticeship Jobs**

One of the contributors to apprenticeship drop-outs is the lack of continuous work in the apprentice's craft. The issue of job security for apprentices is a critical challenge for many training providers; especially non-union trade associations responsible for helping apprentices find work through their member contractors. Apprentices may need to work on several different projects or work with different contractors during the training period. Often, training providers will assist apprentices in finding work in order to continue their on-the-job training, but from time to time apprentices may face the problem of searching for work on their own and taking whatever job they can find at the time (which may or may not be in their chosen trade due to financial burdens or the lack of immediately available, accessible work). In addition, the majority of apprenticeship training programs normally offer intensive training on one specific construction trade. The selected skills trained through apprenticeship programs may limit worker opportunities on certain types of construction projects.

To address this issue, a different model may be required by training providers. This new model would involve encouraging apprentices to learn across trades in the early parts of the apprenticeship training period. Then, they can focus on more specific trades in the later years of training.

This issue is less apparent for those apprenticeship training activities conducted through private employers, as their apprentices are hired as regular workers first before entering the apprenticeship training. These apprentices apparently are less likely to face the problem of constant changes in employers, and they

generally have a greater opportunity to learn a more comprehensive set of skills related to the company's overall work. For most apprentices, however, job insecurity can discourage workers from remaining in the program and lead them to search for work that will provide better benefits and security. In the end, the investment made in the apprenticeship training by the state, the training providers, the employers/contractors, and the workers themselves may be wasted if workers end up leaving the construction related career in the middle of their apprenticeship program.

### **Policy Recommendations**

Arizona's construction trades industry is facing a significant gap in the number of skilled workers that will be available as compared with the number of apprentices completing their training. Of course, some of this disparity will be met by immigration of skilled workers from elsewhere, but pay for skilled trades in Arizona is relatively low compared with other places and it is unlikely that immigration alone will fill the void. This gap is critical for the state because construction delays can affect growth in every sector of the economy.

The state needs to take immediate action to address the challenges facing the construction trades industry and their supporting training communities. A comprehensive workforce policy that aims at promoting construction trades and addressing the current and future needs in construction trades is necessary. Following are several recommendations that will address some of the fundamental issues facing the industry:

### **Target State Investments Where the Shortages Are Greatest**

This research suggests that the state needs an additional 40,000 construction trades workers during the next decade, of which nearly two-thirds are in one of several occupations – carpenters, first-line supervisors, electricians, painters, and construction laborers. The state should support investment in training facilities in high schools and vocational schools associated with these targeted skill areas.

- The state should focus its limited resources on expanding the capacity of the state to meet critical shortages expected in carpentry, electrical, painting, first-line supervising, and flexible construction laborers.
- The state should focus efforts on encouraging high school students, entry-level workers, and apprentices to move into these target occupations.

### **Improve the Image and Awareness of Careers in Construction Trades**

One of the foremost actions the state can do is to raise the awareness of the construction trades industry by improving the availability of information about jobs and career opportunities in construction trades. This might involve a three-pronged approach.

- The initial goal should be to encourage more young people who are not bound for college to consider construction trades as a career option. The focus of the effort should be on influencing the opinions of parents and school career

- counselors as well as high school students. Many young adults have a negative image of the construction trades because they view it as low-wage and low-skill. Likewise, few parents or career counselors fully recognize the career opportunities associated with the trades.
- The Arizona Department of Commerce may need to assist more apprenticeship programs in proactively recruiting students who are motivated to choose a career in construction trades. Many apprenticeship programs are reactive, allowing open enrollment for anyone who expresses an interest. Few of these applicants are motivated by gaining a career opportunity. Instead, many are more interested in apprenticeships as a short-term avenue for gaining a job. Since the apprenticeship program represents a significant investment for the company, the state, and the individual, it is incumbent that apprenticeship slots be reserved for those most motivated to complete the program.
  - Given the public policy interest in offering opportunities for minorities and women and the willingness of minorities and women to participate in apprenticeships, continued efforts should be targeted to encouraging women, Hispanic, and Native American apprentices. The images associated with these advertisements should demonstrate the participation of minorities currently working in the trades or participating in apprenticeships. The increased number of women and minorities in the construction trade also provide additional stream of laborers that can help reduce the pressure of the labor shortages in the construction industry.

### **Enhance Training Opportunities in Targeted Trades Occupations**

The current amount of training being offered is not generating a sufficient supply of skilled construction trades workers. Consequently, the state should enhance current investments by provide more training opportunities for people who are interested in exploring construction jobs as their future career options. The shortage is apparently most severe among carpenters, first-line supervisors (foremen), electricians, painters, and construction laborers. These should be the targets for increased state investment in apprenticeships.

Several options might be employed to enhance the current training efforts implemented by the state:

- Encourage and support high schools to provide more opportunities for non-college bound students to take vocational classes related to the trades in order to prepare them for entering the construction industry as a career option. Students who have the aptitude and interest in certain trades should be encouraged to participate in expanded Youth Apprenticeship programs that are linked to local employer or union apprenticeship programs. Furthermore, the state should advocate vocational training as a high school requirement for non-college bound students to provide broader exposure to knowledge and skills related to the construction trades, especially in the target occupations.
- Provide more funding for “apprenticeship financial aid” (to supplement tuition or wages) to allow the apprentice to attend full-time training courses. This will help apprentices to learn the required skills in a shorter period of time and allow them to work full-time for the industry without as much of a classroom commitment during work days.
- Increase bilingual apprenticeship opportunities to assist more Hispanic workers in gaining the necessary knowledge and skills through training. These

- apprenticeships may also be supplemented with English as a Second Language (ESL) training to provide workers with the skills they need to compete.
- Streamline application procedures for public funding programs aimed at addressing these issues to encourage non-profit training providers to target their resources to retention and attraction of apprentices, especially in target occupations.

### **Improve Pre-qualification of Apprentice Applicants**

Many training programs are open for people who have no construction experience or prior commitment to the construction trades. Several apprenticeship program managers have developed pre-screening tools as a way to limit participation to those most likely to complete the program. However, with a 40 to 70 percent drop-out rate, this process is apparently not as effective as possible. Furthermore, firms and training providers alike are investing substantial dollars in participants who may ultimately leave the construction trades occupations altogether. To use these training resources more wisely, it is incumbent upon the Arizona Department of Commerce, as the coordinator for the state's apprenticeship registration, to help in devising a more effective pre-screening process. Certainly, one cannot expect to eliminate apprenticeship drop-outs. Many of the drop-outs may remain in the trades and contribute their knowledge to the industry even if they do not complete the apprenticeship. However, effective pre-screening tools developed for each of the construction trades might help to reduce the number of drop-outs, identify counseling and support needs, as well as prevent those who are not truly interested in construction trades occupations from taking valuable apprenticeship slots from others more interested in a career in the field.

As part of this effort to develop more effective pre-qualification assessments, the state should implement a study of the current drop-outs and coordinate a more standardized statewide pre-screening process that is unique to each of the occupations. This research – while not focused on drop-outs as a specific concern – found that economic burdens, time constraints, and a number of other issues contribute to drop-outs. Further research could categorize the drop-outs in a more refined way and result in a pre-qualification assessment tool and provide guidance on how to use such a pre-screening tool. The pre-screening might not be able to capture all of these pressures, but it might be useful in weeding out those whose interests are more suitable to other careers before state and private training funds are invested.

This recommendation includes three important elements:

- The state should research characteristics of successful apprentices as well as drop-outs to ascertain key characteristics that should be examined in pre-screening interviews. The purpose of the study would be to understand the root causes for drop-out and identify characteristics of drop-outs that could be used in assessing applicants.
- The state should develop a pre-screening interview process that it would require publicly funded apprenticeship program managers to use. The results of the assessments would be maintained as part of a statewide tracking database

- linked to apprentice registrations that would be used for further research and continuous improvement of the interview instrument.
- Implementing this pre-screening process may require an additional investment up-front in apprenticeship administration costs as a component of state support for existing or new apprenticeship programs. The expected reduction of costs associated with fewer drop-outs will likely more than make up for the increased administrative cost. In fact, the goal is to increase the number of completed apprenticeships with the same level of spending by reducing the amount invested in those who eventually drop-out of their apprenticeship.

### **Explore Providing Advantages to Firms Using Apprentices and Journeymen Workers**

To promote apprenticeship programs and encourage industry support for apprenticeship training, the state should provide advantages to companies using apprentices and workers who earn certificates or journeyman cards. Companies using well trained workers are more likely to be committed to quality work.

- Contractors bidding on public projects should receive a premium or points for using journeymen or apprentices on those projects.
- A proportion of public contract funds should be set aside to invest in encouraging participation in apprenticeships or in supporting tuition or wages for current apprentices.
- The state should work with local building inspectors to encourage streamlined inspections on projects in which contractors document that they have used appropriately trained supervisors, journeymen, and apprentices as the primary workers on the project.
- The state should negotiate with construction bonding firms to determine whether a substantial reduction in insurance premiums can be achieved for firms that used trained apprentices.

### **Incorporate Management and Entrepreneurial Training into Construction Trades Apprenticeship Training**

The construction trades industry has a tremendously high turnover rate in employment. ACCRA's survey found that the average contractor turns over its entire workforce every 20 months. Although no specific research was conducted on the reason for this high turnover rate, one might speculate that pay that is relatively low as compared with other occupations, poor job security, and inadequately trained supervisors all may contribute to this turnover rate. One area that could be influenced is in improving the quality of the leadership in the industry. One way to improve that leadership is to enhance the skills of today's apprentices on how to manage jobs and people as they develop their career in the construction industry.

Furthermore, one of the most significant gaps cited in the available workforce is the shortage of properly trained first-line supervisors (or foremen). These supervisors have a tremendous impact on the construction trades workforce since one of the most important reasons typically cited for an individual leaving his or her job is that individual's relationship with the boss. On a job-site, the supervisor is the boss, and he or she should have the skills to motivate

employees and manage the work. Typically, supervisors get their jobs because they are competent technically, but they may not necessarily have the skills to manage people.

A second factor is the substantial increase in the number of construction firms and the relatively small size of most firms. Many construction trades people are creating their own firms as a conscious part of their career path, but they seldom have the formal training in how to manage a business. They may have only limited skills in estimating job costs or in administering a payroll. These are skills that can be learned. For minority workers, in particular, entrepreneurship may be an invaluable way to take control of their own destiny and manage their career as a small business owner or independent contractor.

To address the challenges that these two management-related issues raise, the state should take several actions:

- Incorporate more management training into the apprenticeship program, especially for occupations in which the technician may be managing apprentices, laborers, or helpers. Effective management may reduce the drop-out rate by apprentices and help to reduce the high turnover rate that burdens many contractors.
- Create a “management” apprenticeship in which technicians are put into “assistant management training” aimed at developing competent and respected first-line supervisors, both from a technical perspective (as in the supervisor learns about trades not within his or her area of expertise) as well as providing management experience.
- Provide entrepreneurial training that helps technicians and first-line supervisors understand the elements of running a business, including how to estimate jobs, administer payrolls, manage cash flow, make investment decisions, and choose good employees.
- Provide a “construction trades extension service” program to provide on-going support to firm managers. The purpose of the service is to increase awareness about and use of the latest in building materials technologies or methods for improving efficiency and quality in construction.

### **Monitor Performance Measures on the Registered Apprentices**

The overall success of the state’s construction trades apprenticeship training is measured by the number of qualified workers completing their training. The state and/or private employers can benefit greatly by better leveraging their respective investments in training and maximizing the number of registered apprentices who complete their apprenticeship.

The State registers apprentices but it does not have an on-going system for tracking registered apprentices to document their career path and their employment and wage status. This information should be available for both graduating apprentices as well as drop-outs. By tracking apprenticeship graduates and their change in wages, it would be possible to make a stronger case for the value of the apprenticeship training to workers and companies alike. By tracking drop-outs, training providers would also have better information about whether individuals are remaining in construction trades (and thus need



additional support to reduce the drop-out rate) or are changing careers (and thus need to be identified during the pre-apprenticeship assessments).

The specific actions that need to be taken include:

- The state needs to invest in an apprenticeship participation tracking system that can be easily utilized for policy and training purposes.
- The data from this tracking system must be managed and reported to all stakeholders frequently (at least annually).

## **Conclusions**

The Arizona Construction Trades Industry provides the foundation for economic growth in the state. It has grown rapidly and contractors indicate that they can find unskilled workers readily in large part because of contributions by the immigrant population and minority residents. The industry is facing a severe labor shortage, especially among several higher skilled occupations – first-line supervisors, carpenters, and electricians. The workforce is feeling the strain even among some semi-skilled occupations such as painters/maintenance workers and construction laborers.

To address this skill shortage, Arizona must invest in its apprenticeship system to fix some structural issues. High drop-out rates are a symptom that apprenticeships are not meeting the needs of prospective workers – either pay is too low or the training timeline is too long. The answers to these issues are long-term as state construction trades wages continue to rise in many of these professions relative to the national average. However, the barriers for unskilled workers – particularly minority workers – may be difficult to overcome without significant reforms in the apprenticeship program. The ultimate goal must be to ensure that qualified Arizona workers are available to take the family sustaining job opportunities offered among the skilled construction trades crafts.

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