

# ADDRESSING HOUSTON'S MIDDLE SKILLS JOBS CHALLENGE

A PLAN BY THE GREATER HOUSTON PARTNERSHIP  
REGIONAL WORKFORCE DEVELOPMENT TASK FORCE



APRIL 2014

GREATER HOUSTON PARTNERSHIP

## ABOUT THIS WORK

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The Houston region has experienced incredible growth over the last several years. Led by a resurgence in energy, petrochemicals, manufacturing, life sciences, and construction, the region's economy has been widely acclaimed as a city of opportunity and a great place to do business.

While this is all largely true, leaders from across the business community have identified one of the region's most pressing issues that is critical to our continued success: workforce development. We must develop a qualified employee base properly trained for tomorrow's job needs or face an understaffed economy that will stifle the growth and vitality of our region. We must also ensure that young people in Greater Houston have the skills and opportunities to enter the workforce and build successful careers, raise families and prosper.

To confront this challenge, the Greater Houston Partnership (GHP) launched the Regional Workforce Development Task Force (RWDTF) in the summer of 2013. The task force is composed of 79 members, representing large employers, workforce and economic development, education, and social services. The task force met six times over the course of the last half of 2013 with the intention of formulating a plan to address the challenges over the next five years. The initiative focused on the middle skills segment of the job market. Middle skills occupations are those jobs that require more than a high school diploma but less than a four-year degree.

This plan was developed to serve as a guide for GHP and its partners in the region to create an efficient workforce system that is responsive to employers' needs and that provides high-quality career pathways for workers in the region.

## ABOUT US

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GREATER HOUSTON PARTNERSHIP

The Greater Houston Partnership's mission is to make the Houston region the best place to live, work, and build a business. Over the past 25 years, our membership, comprised of over 2,000 leading companies, has tackled the region's most important issues that impact our community. Houston has enjoyed incredible growth, and the Greater Houston Partnership has played an important role, working to create jobs and advocating for a positive business environment that is conducive to growth and prosperity.

The Greater Houston Partnership serves the 10-county Houston region including Austin, Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, San Jacinto, and Waller counties.



Established in 1995, TIP Strategies, Inc. has worked with communities throughout the country to develop innovative, publicly supported economic development strategies. Our team members have experience with a variety of clients across the United States and internationally.

While our demographic and industry analyses serve as the foundation for our strategic plans, we pride ourselves on our ability to think creatively—we develop a vision that is supported by the data, but not driven by it. Our approach places a premium on well-informed decision making, sound planning practices, and a commitment to the future.

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INTRODUCTION  
AND  
BACKGROUND

# INTRODUCTION & BACKGROUND

The workforce challenge facing the Houston region aligns with conversations happening across the country. These conversations most often focus on the so-called “skills gap” that exists between the skills that employers seek and the skills present in the workforce. While the broad issue of a skills gap is shared across the country, each individual metro region has its own specific challenges to confront.

*The “skills gap” describes the difference between the skills employers seek and the skills workers have.*

## QUANTIFYING THE SKILLS GAP

In their 2011 report “the Skills Gap in US Manufacturing”, Deloitte and the Manufacturing Institute estimate that as many as 600,000 jobs are going unfilled in the US manufacturing sector alone. These job openings remain unfilled because employers cannot find the skills they need. The economic impact of these jobs going unfilled is immense—if those 600,000 jobs were filled, an additional 406,441 jobs would be created, and national GDP would rise a full percent. In addition, the inability to fill these 600,000 jobs translates to over \$68 trillion in exports lost, \$47 trillion in foreign direct investment lost, and \$8 trillion in research and development investments lost. The manufacturing sector, however, is not the only sector facing a skills gap.

In 2013, Manpower, which conducts an annual talent shortage survey, found that 39 percent of US companies were struggling to fill key jobs (Figure 1). The most common hard-to-fill jobs were in the segment of the job market that is considered middle skills—skilled trades, drivers, mechanics, and technicians. The most common reasons cited for the difficulty is the lack of technical and workplace competencies. The lack of available applicants, the wage expectations of applicants, and the lack of experience were also important factors.

**FIGURE 1: MANPOWER 2013 TALENT SHORTAGE SURVEY**  
JOBS THAT ARE HARD TO FILL AND PARTICIPANTS’ VIEW OF REASONS FOR SHORTAGES

TOP 10 HARD-TO-FILL OCCUPATIONS	REASONS GIVEN	% OF RESPONDENTS
Skilled trades	Lack of technical competencies (hard skills)	48%
Sales representatives	Lack of workplace competencies (soft skills)	33%
Drivers	Lack of available applicants/no applicants	32%
IT staff	Looking for more pay than is offered	27%
Accounting & finance staff	Lack of experience	24%
Engineers	Qualifications/certifications - skilled trades	18%
Technicians	Qualifications/certifications - professional	16%
Management/Executives	Professionalism	14%
Mechanics		
Teachers		

Source: ManpowerGroup – 2013 Talent Shortage Survey Research Results

## REASONS FOR THE SKILLS GAP

A number of reasons for the skills gap have been suggested by researchers investigating the issue. These reasons include:

- **Changing Skills.** With heightened automation, changes in technology, and evolving processes, the skills required of the workers have evolved. Mature workers often find themselves without the skill sets to succeed in today's labor market. In addition, training programs are not always as dynamic as the workplace and may not be teaching the skills needed by the employers.
- **Demographics.** The aging of the Baby Boomers has resulted in a wave of retirements that is looming large, particularly in many of the middle skills occupations—machinists, craft trades, utility line men, and many others. The talent pipeline is not currently robust enough to fill the openings left by these retirements.
- **Policies and Priorities.** The focus on four-year degrees may have had the unintended consequence of siphoning students from vocational and technical training.
- **Culture.** Many young people today are not interested in pursuing careers in the occupations that are difficult to fill. In a recent survey by the foundation of the Fabricators & Manufacturers Association, 52 percent of teenagers ages 13 to 17 had little to no interest in manufacturing. Parents and their children often hold negative perceptions of manufacturing and trade jobs. Others are simply unaware of the opportunities in these careers.
- **Field of Study Choice.** Students often choose their field of study based on personal interest, rather than labor market information. This contributes to a mismatch between the supply of and demand for graduates of post-secondary education programs.

These and other reasons contribute to the growing divide between skills employers seek and skills workers have. There is no doubt that the causes of the skills gap are multi-faceted, which means there is not a silver bullet solution for resolving the issue.

## THE HOUSTON REGION'S WORKFORCE CHALLENGES

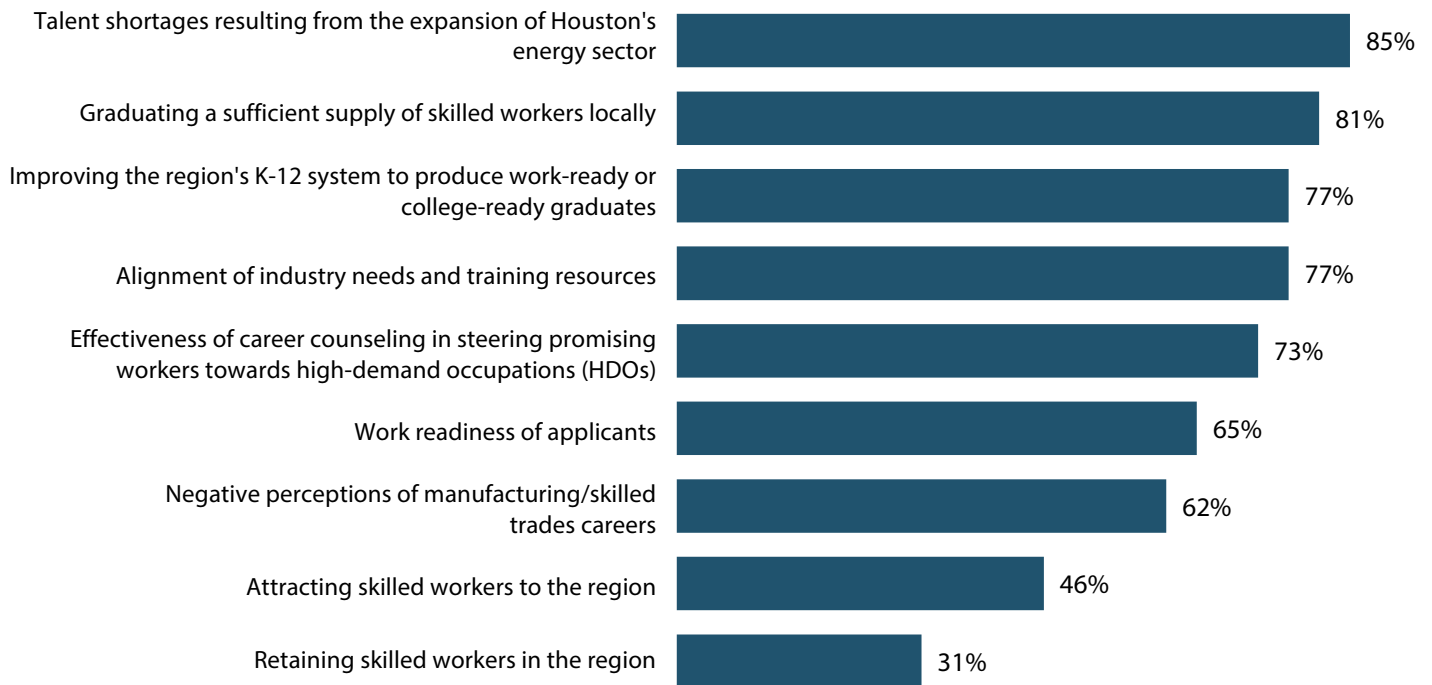
In the Houston region, and along much of the Texas and Louisiana Gulf Coast, these challenges are compounded by the energy boom and the associated investment in the region. The exact figures are unknown, but in the chemical industry alone, the American Chemistry Council estimates over \$55 billion in investment along the Gulf Coast between 2010 and 2020. More recently, the Houston Chronicle reported that more than 120 petrochemical projects have been announced in recent years, an estimated \$80 billion in investment for the US Gulf Coast region. In Houston, the Greater Houston Partnership has identified 41 projects representing investments of \$18 billion to be completed over the next five years.

Reports of skilled worker shortages have already surfaced, and the region is just at the cusp of its explosive growth. In the Energy Sector, oilfields are pulling skilled workers away from the Houston region with the promise of higher wages. This greatly affects the construction and petrochemical sectors where there are concerns that wages, particularly for skilled trades, will rise to unsustainable levels. This shortage of workers will likely hamper the region's ability to operate a safe work environment and even to expand. The lack of workers could also slow projects and even lead to their cancellation, especially when coupled with the rising wages.

The current situation is further complicated by the aging workforce in the region, with a wave of retirements on the horizon. Even in the absence of the new jobs associated with the region's expansion, Greater Houston will need a strong pipeline of talent to fill the shoes of its retiring workforce.

Through a survey of task force participants, the region's specific workforce challenges were further defined (Figure 2). The expansion of the energy sector was confirmed as the top challenge. Other challenges considered important focused on the region's ability to produce a pipeline of talent locally; over 60 percent of the survey participants felt this was a challenge in the region. Attracting workers to the region and retaining talent were also cited but were considered challenges by less than 50 percent of the survey participants.

**FIGURE 2: HOUSTON'S GREATEST WORKFORCE CHALLENGES**  
SHARE OF REGIONAL WORKFORCE DEVELOPMENT TASK FORCE MEMBERS WHO CITED ISSUE AS A CHALLENGE

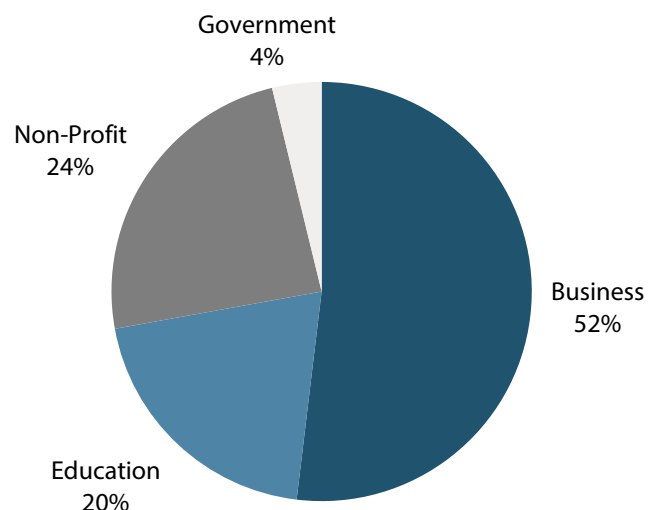


Source: Survey of RWDTF members conducted by TIP Strategies in July 2013

### ABOUT THE RWDTF

In response to input from the business community, the Greater Houston Partnership (GHP) convened the Regional Workforce Development Task Force (RWDTF). The task force is composed of 79 members, including large employers, workforce and economic development, education, and social services. The task force met six times over the course of last half of 2013 with the intention of formulating an action plan to address the challenges over the next five years. The initiative focused in on the middle skills segment of the job market.

**FIGURE 3: RWDTF REPRESENTATION**  
SHARE OF PARTICIPATING ORGANIZATIONS BY TYPE



## THE MIDDLE SKILLS

Middle skills jobs are those that require more than a high school diploma but less than a four-year degree. For the purposes of this project, the definition of middle skills was further refined to include only those jobs requiring a high school diploma and also some degree of training or work experience. This filter was applied to exclude jobs that are relatively low-skilled even though they require a high school diploma.

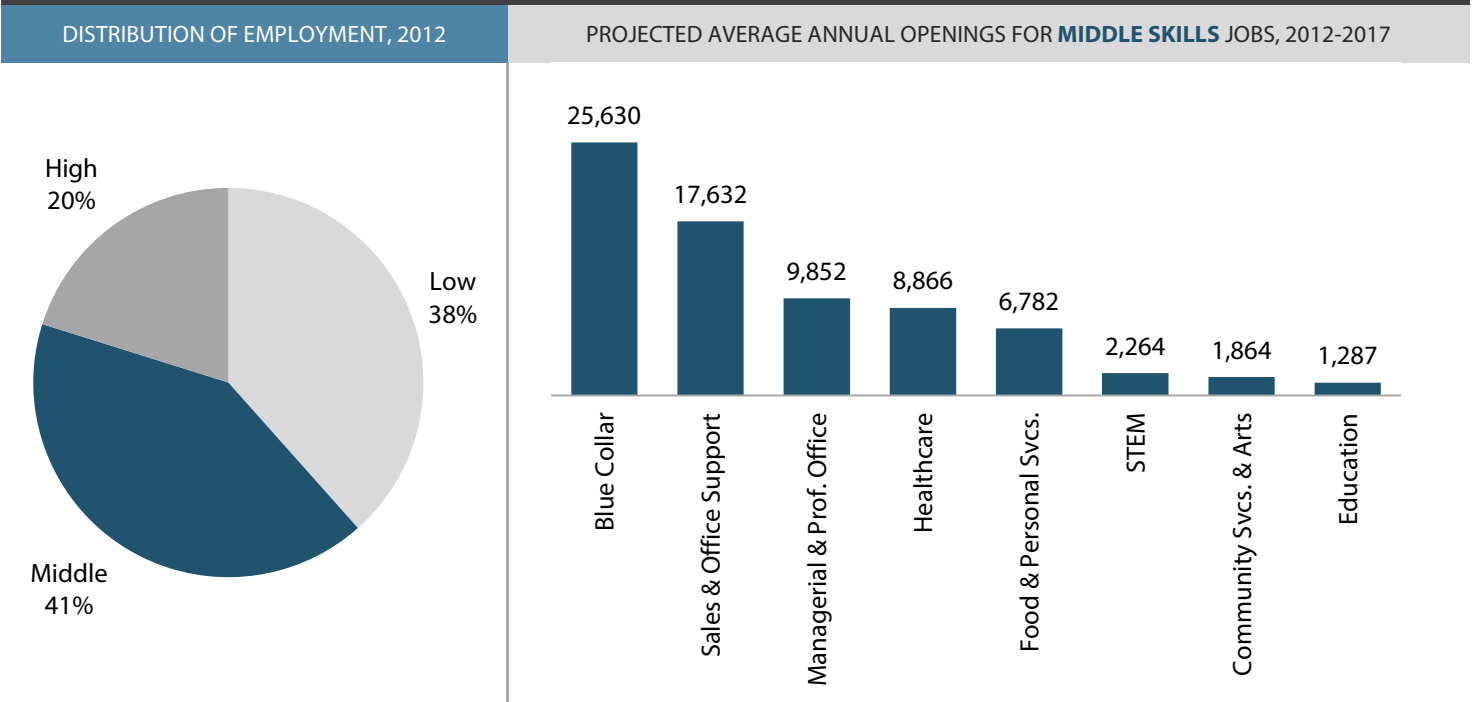
***“Middle skills” jobs require more than a high school diploma but less than a four-year degree***

The task force focused on the middle skills because of the urgency of the issue in this segment, because it was not already a focus of another initiative, and because of the large size of the segment. Of Houston’s 3.6 million jobs, 1.4 million are considered middle skills. This represents 41 percent of all jobs in the Houston region (Figure 4, page 4).

The region’s 1.4 million middle skills jobs are spread across 348 occupations. The largest portion of these—188 occupations—fall into the blue collar category, which includes production, transportation, and construction occupations. The 513,660 jobs in these occupations in 2012 represent almost 35 percent of the region’s middle skills jobs. Sales and office support is the next largest category in terms of employment, representing 25 percent of all jobs. These jobs are spread across 27 occupations. Managerial and professional office jobs represent just over 15 percent of all employment and are distributed across 22 occupations.

In all, the Houston region is expected to have 74,177 openings annually in middle skills occupations between 2012 and 2017. More than one-third of these openings are considered blue collar. Sales and office support is projected to have 17,632 openings, and managerial and professional office occupations are expected to have 9,852 openings (Figure 4).

**FIGURE 4: THE MIDDLE SKILLS PICTURE FOR THE HOUSTON REGION**



Sources: EMSI Complete Employment – 2013.2, US Bureau of Labor Statistics, TIP Strategies, Inc.

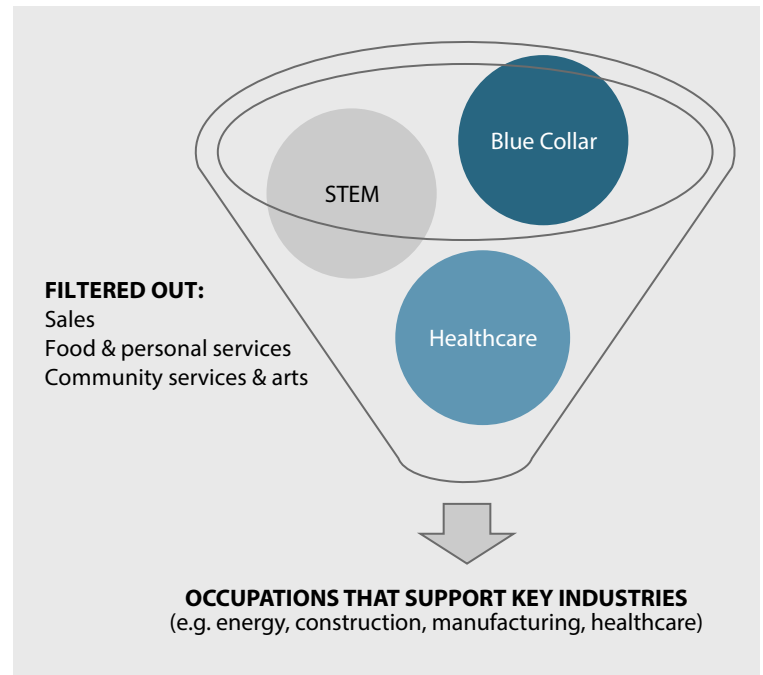
Note: Occupational categories modeled on *Recovery: Job Growth and Education Requirements Through 2020*, Anthony P. Carnevale et al., June 2013; Analysis conducted on the 10-county region served by GHP:

To further focus the initiative, we drew out those occupations that supported Houston’s economic drivers—energy, construction, manufacturing, transportation, and healthcare—and filtered out support industries such as sales, community services, and food and personal services. We then examined the current recruiting environment to determine which occupations are already facing difficult demand and wage conditions. The result was the identification of 53 high-demand occupations (HDOs) that are critical to Houston’s primary sectors (page 7).

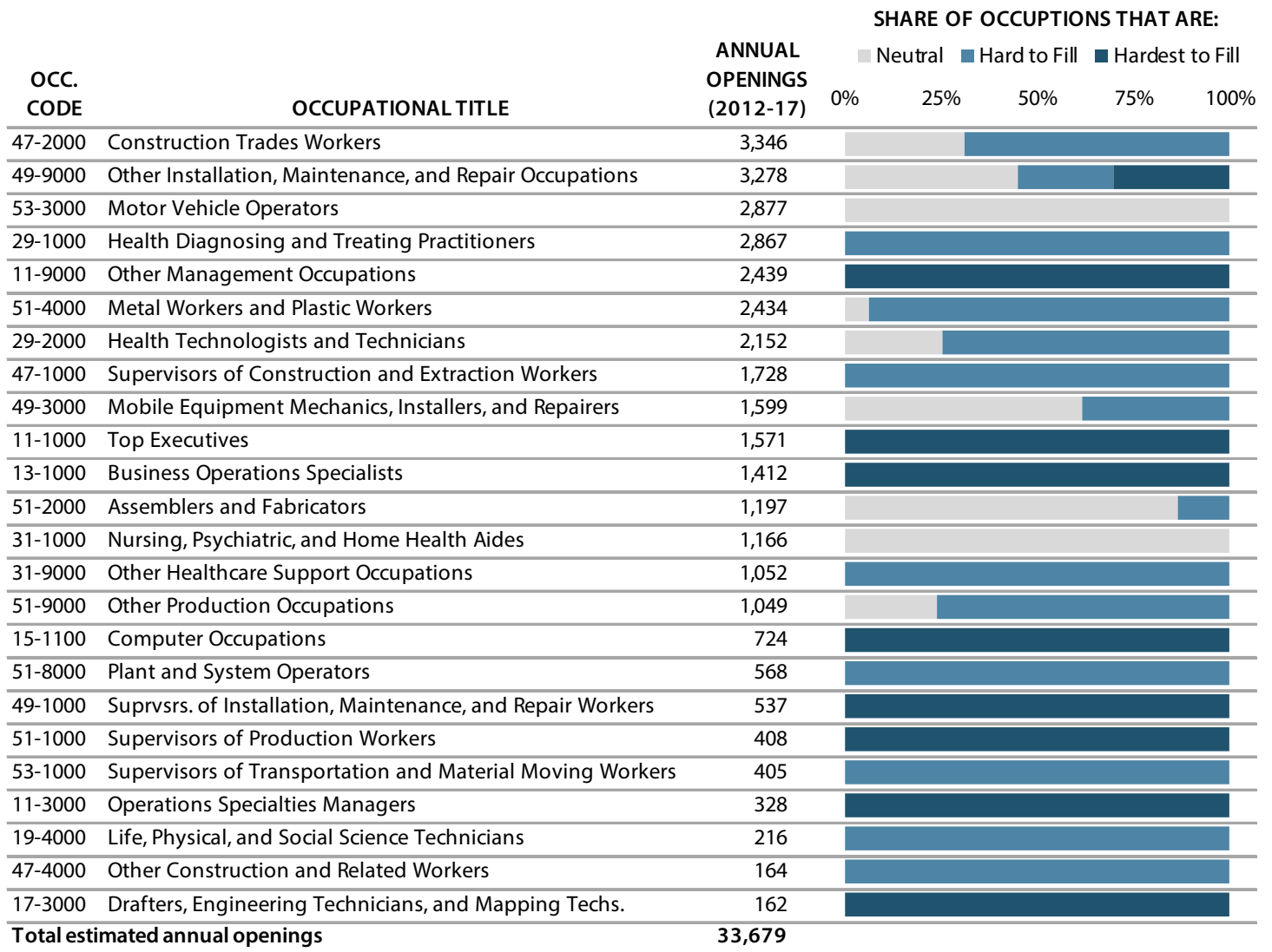
Between 2012 and 2017, more than 33,700 annual openings are projected for the 53 HDOs. Construction trades workers are projected to have the highest number of annual openings with 3,346 openings (Figure 5, page 6). Other installation, maintenance, and repair occupations are projected to have the next highest number of annual openings with 3,278 openings. Drafters, engineering technicians, and mapping technicians have the lowest number of annual openings of the high-demand occupations, with 162 openings. Other construction and related workers have the next lowest number of openings with 164.

Many of the occupations will require work experience. Of the annual openings in the high-demand, middle skills occupations, 31 percent (10,457 openings) require more than one year of work experience. In addition, 17 percent of the occupations are supervisors and managers. Although many of these occupations are classified as entry-level, the actual opening is for the replacement of retiring worker. In 12 of the 53 occupations (22 percent), 25 percent or more of the workers are 55 years of age or older.

While these projections are likely to capture the openings due to retirements, it is unlikely that they will capture the full extent of the Houston region’s expansion. In their database of regional expansions, the Greater Houston Partnership has recorded 41 projects, representing \$17 billion in investment. If these expansion projects follow average staffing patterns for their industry, this could represent up to 6,000 additional openings in middle skills occupations outside of the construction sector. In the construction sector, it has been estimated that the projects around the Ship Channel and Port of Houston alone will demand 110,000 jobs, many of which will be in skilled trades. Needless to say, Houston’s expanding industries will have a notable impact on the regional labor market.



**FIGURE 5: DEMAND & STAFFING ENVIRONMENT FOR MIDDLE SKILLS JOBS IN GREATER HOUSTON AREA**  
ANNUAL OPENINGS (2012-2017) AND INDICATOR OF HIRING DIFFICULTY FOR OCCUPATIONS BY MAJOR GROUP



Source: EMSI Complete Employment – 2013.2

### ABOUT THE STAFFING ENVIRONMENT INDICATOR

EMSI's Talent Market Analyst provides useful indicators of the staffing environment for occupations in the Houston region. A relative wage indicator and a supply/demand indicator were combined to determine hiring difficulty. The relative wage is built around two different statistics—the absolute wage that regional workers in the occupation earn and EMSI's proprietary indicator that considers the expected wage against a regional wage index. The supply/demand indicator is weighted by three different factors. First, it takes into account how concentrated (therefore important) the occupation is in the region. Second, it looks at how that regional concentration has changed over time — whether the occupation is becoming more or less important to the area. Third, it considers the actual change in an occupation's regional workforce. Together, these statistics provide a picture of how the region's supply of and demand for workers play into the staffing environment. This evaluation is ranked by degree of difficulty in hiring. For this work, we focus on the occupations that are neutral, hard-to-fill, and hardest-to-fill.

**FIGURE 6: HIGH DEMAND OCCUPATIONS SUMMARY**

OCC. CODE	OCCUPATIONAL TITLE	ANNUAL OPENINGS (2012-17)	MEDIAN HOURLY EARNINGS	% OF WORKERS AGE 55+	TYPICAL ENTRY-LEVEL REQUIREMENTS			TYPICAL ON-THE-JOB TRAINING (OJT) NEEDED TO ATTAIN	STAFFING ENVIRONMENT
					EDUCATION	RELATED WORK EXPERIENCE	COMPETENCY		
53-3032	Heavy and Tractor-Trailer Truck Drivers	2,877	\$16.97	25%	HS diploma/GED	1 to 5 yrs.	Short-term OJT	Neutral	
29-1111	Registered Nurses	2,867	\$34.83	19%	Associate's	None	None	Hard to Fill	
11-9199	Managers, All Other	2,052	\$25.14	37%	HS diploma/GED	1 to 5 yrs.	None	Hardest to Fill	
47-1011	First-Line Supervisors of Constr. Trades and Extraction Workers	1,728	\$24.31	28%	HS diploma/GED	> 5 years	None	Hard to Fill	
11-1021	General & Operations Managers	1,571	\$46.78	23%	Associate's	1 to 5 yrs.	None	Hardest to Fill	
31-1012	Nursing Aides, Orderlies, and Attendants	1166	\$11.21	19%	Non-degree award	None	None	Neutral	
49-9071	Maintenance and Repair Workers, General	1152	\$16.42	24%	HS diploma/GED	None	Moderate-term OJT	Neutral	
51-4121	Welders, Cutters, Solderers, and Brazers	1,066	\$18.24	16%	HS diploma/GED	< 1 year	Moderate-term OJT	Hard to Fill	
47-2031	Carpenters	1039	\$14.75	18%	HS diploma/GED	None	Apprenticeship	Neutral	
49-9041	Industrial Machinery Mechanics	991	\$23.14	27%	HS diploma/GED	None	Long-term OJT	Hardest to Fill	
29-2061	Licensed Practical and Licensed Vocational Nurses	856	\$21.92	22%	Non-degree award	None	None	Hard to Fill	
47-2111	Electricians	852	\$20.80	16%	HS diploma/GED	None	Apprenticeship	Hard to Fill	
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	799	\$18.54	27%	HS diploma/GED	None	Moderate-term OJT	Hard to Fill	
51-2092	Team Assemblers	784	\$12.01	17%	HS diploma/GED	None	Moderate-term OJT	Neutral	
51-4041	Machinists	773	\$19.12	24%	HS diploma/GED	None	Long-term OJT	Hard to Fill	
47-2073	Operating Engineers and Other Construction Equip. Operators	762	\$17.51	22%	HS diploma/GED	None	Moderate-term OJT	Hard to Fill	
13-1199	Business Operations Specialists, All Other	749	\$35.71	23%	HS diploma/GED	< 1 year	Long-term OJT	Hardest to Fill	
15-1159	Computer Support Specialists	724	\$25.40	19%	Some college/no degr.	None	Moderate-term OJT	Hardest to Fill	
49-3023	Automotive Service Technicians and Mechanics	715	\$15.04	15%	HS diploma/GED	None	Long-term OJT	Neutral	
47-2152	Plumbers, Pipefitters, and Steamfitters	693	\$22.53	15%	HS diploma/GED	None	Apprenticeship	Hard to Fill	
31-9092	Medical Assistants	680	\$14.18	11%	HS diploma/GED	None	Moderate-term OJT	Hard to Fill	
49-3042	Mobile Heavy Equipment Mechanics, Except Engines	611	\$17.42	30%	HS diploma/GED	None	Long-term OJT	Hard to Fill	
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	537	\$29.28	25%	HS diploma/GED	1 to 5 yrs.	None	Hardest to Fill	
13-1023	Purchasing Agents, Except Wholesale, Retail, Farm Products	496	\$30.83	32%	HS diploma/GED	None	Long-term OJT	Hardest to Fill	
51-1011	First-Line Supervisors of Production and Operating Workers	408	\$30.61	22%	Non-degree award	1 to 5 yrs.	None	Hardest to Fill	
11-9021	Construction Managers	387	\$28.27	24%	Associate's	> 5 years	None	Hardest to Fill	
31-9091	Dental Assistants	372	\$14.47	8%	Non-degree award	None	None	Hard to Fill	
49-9021	HVAC and Refrigeration Mechanics and Installers	364	\$19.41	15%	Non-degree award	None	Long-term OJT	Hard to Fill	
29-2052	Pharmacy Technicians	344	\$15.43	10%	HS diploma/GED	None	Moderate-term OJT	Neutral	
11-3011	Administrative Services Managers	328	\$43.15	26%	HS diploma/GED	1 to 5 yrs.	None	Hardest to Fill	
49-9098	Helpers—Installation, Maintenance, and Repair Workers	317	\$11.32	11%	HS diploma/GED	None	Moderate-term OJT	Neutral	
51-8093	Petroleum Pump System Operators, Refinery Ops., and Gaugers	315	\$32.07	24%	HS diploma/GED	None	Long-term OJT	Hard to Fill	
49-9799	Installation, Maintenance, and Repair Workers, All Other	297	\$16.07	26%	HS diploma/GED	None	Moderate-term OJT	Hard to Fill	
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	273	\$19.59	18%	HS diploma/GED	None	Long-term OJT	Neutral	
51-4011	Computer-Controlled Machine Tool Operators, Metal/Plastic	256	\$17.17	15%	HS diploma/GED	None	Moderate-term OJT	Hard to Fill	
51-8091	Chemical Plant and System Operators	253	\$33.08	24%	HS diploma/GED	None	Long-term OJT	Hard to Fill	
51-9399	Production Workers, All Other	250	\$12.40	22%	HS diploma/GED	None	Moderate-term OJT	Neutral	
51-2099	Assemblers and Fabricators, All Other	250	\$12.45	17%	HS diploma/GED	None	Moderate-term OJT	Neutral	
29-2037	Radiologic Technologists and Technicians	236	\$27.40	18%	Associate's	None	None	Hard to Fill	
19-4041	Geological and Petroleum Technicians	216	\$23.84	28%	Associate's	None	Moderate-term OJT	Hard to Fill	
53-1021	First-Line Supvsrs. of Helpers/Laborers/Material Movers, Hand	214	\$22.43	21%	HS diploma/GED	1 to 5 yrs.	None	Hard to Fill	
29-2071	Medical Records and Health Information Technicians	207	\$18.01	20%	Non-degree award	None	None	Hard to Fill	
29-2041	Emergency Medical Technicians and Paramedics	198	\$16.50	9%	Non-degree award	None	None	Neutral	
53-1031	First-Line Supvsrs. of Transp./Material-Moving Workers	191	\$26.73	22%	HS diploma/GED	1 to 5 yrs.	None	Hard to Fill	
51-4034	Lathe and Turning Machine Tool Workers, Metal/Plastic	183	\$15.77	28%	HS diploma/GED	None	Moderate-term OJT	Hard to Fill	
13-1022	Wholesale and Retail Buyers, Except Farm Products	167	\$23.98	27%	HS diploma/GED	None	Long-term OJT	Hardest to Fill	
47-4011	Construction and Building Inspectors	164	\$25.33	37%	HS diploma/GED	> 5 years	Moderate-term OJT	Hard to Fill	
51-2041	Structural Metal Fabricators and Fitters	163	\$16.41	16%	HS diploma/GED	None	Moderate-term OJT	Hard to Fill	
17-3023	Electrical and Electronics Engineering Technicians	162	\$30.41	22%	Associate's	None	None	Hardest to Fill	
49-9051	Electrical Power-Line Installers and Repairers	157	\$25.83	10%	HS diploma/GED	None	Long-term OJT	Hard to Fill	
29-2021	Dental Hygienists	157	\$34.05	12%	Associate's	None	None	Hard to Fill	
51-4031	Cutting, Punching, and Press Machine Workers, Metal/Plastic	156	\$13.16	20%	HS diploma/GED	None	Moderate-term OJT	Neutral	
29-2012	Medical and Clinical Laboratory Technicians	154	\$16.51	18%	Associate's	None	None	Hard to Fill	

Source: EMSI Complete Employment – 2013.2, US Bureau of Labor Statistics. Note: See page 6 for details regarding staffing environment indicator.



## MEETING THE DEMAND

The region can meet this demand by developing its own talent pool or by importing talent from outside of the region. The pool of potential workers in the region will graduate from the region's PK-12 education system or post-secondary institutions or, if adults, from programs that re-train or up-skill incumbent workers or work with individuals to remove or reduce barriers to employment. Workers from outside the region can come from other areas of the US or the world. However, only the for-credit degree completions of post-secondary institutions are measured through a standardized system. For this project, information from the nine regional community colleges was gathered on noncredit programs.

Of the 33,679 estimated annual openings in high-demand middle skills occupations, two-thirds require a high school diploma and on-the-job training or some work experience. Of the 12,000 annual openings that require post-secondary education less than a bachelor's degree, almost 7,000 fall into the health science career cluster. Business management and administration is the next highest in demand followed by manufacturing.

The region produces more than 20,000 graduates in fields related to the HDOs, which is about two times greater than the number of annual openings. The completions in each career cluster, however, are not always proportional to demand. The average number of completions is anywhere from 32 percent to more than 3,000 percent higher than the number of annual openings.

When analyzing the supply of graduates coming out of a region's post-secondary institutions, there are two considerations to note. First, a degree award does not guarantee a graduate will be employed in an occupation directly related to that field of study. Second, talent is mobile, and degrees are portable. A graduate from a regional institution is not geographically bound to the region and may move elsewhere in search of work. For these reasons, a greater number of graduates than job openings provides a degree of cushion in the labor market. However, too much cushion leaves numerous new graduates trained and unable to find work in the region.

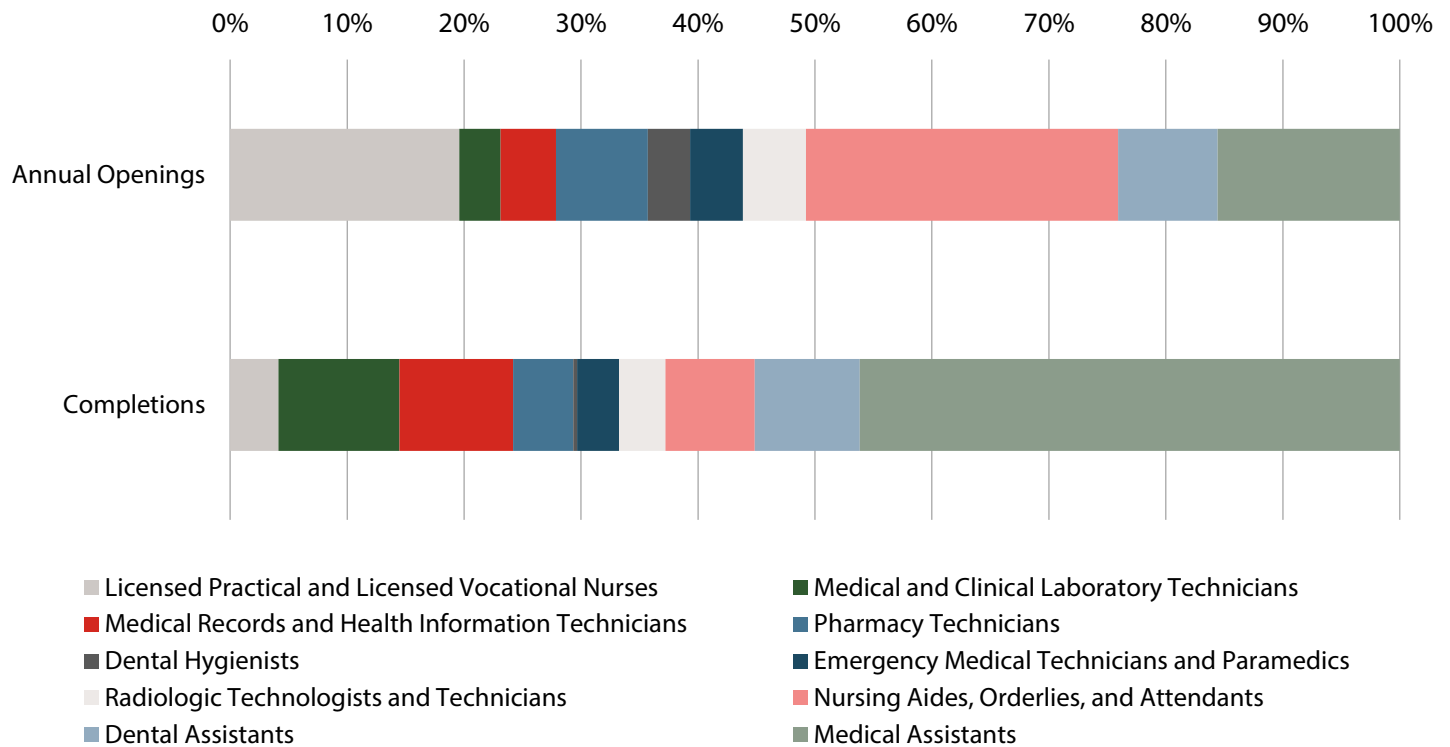
FIGURE 7: SUMMARY OF REGIONAL COMPLETIONS

DOE CAREER CLUSTER	ANNUAL OPENINGS (> HS, < BA)	AVERAGE NONCREDIT COMPLETIONS	AVERAGE CREDIT COMPLETIONS	AVERAGE COMPLETIONS	SUPPLY/ DEMAND BALANCE
Health Science	6,906	2,074	10,101	12,175	+
Business Management & Administration	1,596	321	1,790	2,111	+
Manufacturing	1,423	903	1,155	2,058	+
Architecture & Construction	1,001	318	1,581	1,899	+
Information Technology	724	605	1,130	1,735	+
Transportation, Distribution & Logistics	303	553	1,835	2,388	+
STEM	205	398	1,505	1,903	+
Finance	10	82	297	379	+

Source: TIP Strategies Calculations, EMSI, Bureau of Labor Statistics, NCES, Alvin Community College, Brazosport College, Houston Community College, Lee College, Lone Star College, and San Jacinto College

Within each cluster, the distribution of openings and completions by occupation is also out of balance. This means that there is an oversupply of graduates for some occupations and an undersupply for others. For example, within the health science career cluster, graduates are most likely to be in fields related to health information management, medical billing, and medical assistants. Yet, the fields of LVN, pharmacy tech, dental hygienist, and nursing aides are high in demand but under-represented. On average, there are six times more medical assistant graduates than openings, and four times more health information specialists. Within dental careers, there are over two times more dental assistants than openings but only one-fifth as many dental hygienists as openings.

**FIGURE 8: A CLOSER LOOK—HEALTH SCIENCE CAREER CLUSTER**



Source: TIP Strategies Calculations, EMSI, Bureau of Labor Statistics, NCES, Alvin Community College, Brazosport College, Houston Community College, Lee College, Lone Star College, and San Jacinto College

The comparison of the supply of graduates and the annual openings demonstrates that the region has an adequate supply of graduates. However, the supply of graduates does not appear to be well-aligned with the regional demand for entry-level workers with a post-secondary award. To have a more efficient, demand-driven workforce system, students and training providers need better information about regional employers' hiring needs and skills requirements. In addition, the system needs more and better information from education and training providers to understand the supply of workers in the region.

## REGIONAL WORKFORCE PROGRAMS AND ORGANIZATIONS

The Houston region has an enormous number of intermediaries working simultaneously to develop the region's supply of talent. These include one workforce development board, 9 community colleges, and 68 school districts in the 10-county Greater Houston Region. There are also 66 registered apprenticeship programs. In addition, we identified over 70 organizations that have some kind of workforce program.

Many of these intermediaries have effective and innovative programs that are, in and of themselves, best practices. However, most serve a distinct area of the region or a small portion of the population. There is no forum for these intermediaries to connect and share information. There is also not a comprehensive resource or directory where people can find what intermediaries are available. This fragmentation of the workforce development landscape results in inefficiencies in the regional workforce system. An inventory of these resources is provided in Appendix A, on page 21.

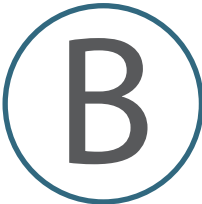
## GAPS

In addition to looking at the demand for and the supply of workers, the task force examined the regional labor market from a systems standpoint. The purpose of this exercise was to identify gaps that led to inefficiencies or resulted in a system that is less responsive to employer's needs. The task force identified four primary gaps. Each gap is described below.



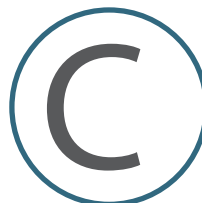
### AWARENESS & PERCEPTION

People are not aware of the career opportunities available in the high-demand middle skills jobs. Often, they hold misperceptions and even negative perceptions of the types of work. Parents and career counselors encourage all students to pursue 4-year degrees in spite of the fact that there are middle skills jobs that provide better compensation than those that require a 4-year degree.



### BASIC SKILLS & EMPLOYABILITY

Job candidates and employees often lack basic skills—both hard and soft. These include basic academics and communications skills as well as knowledge of what it takes to get and keep a job. Employers expressed frustration at the difficulty finding people that could pass a background check, pass a drug test, and show up to work on time. Job candidates expressed concern over the lack of access to transportation, their ability to find a job with no experience (even with training), and how to find work with a “past mistake” on their record.



### COORDINATION

There are hundreds of organizations and institutions in the region that play a role in the workforce development system. In addition, there are many innovative programs and initiatives aimed at addressing a piece of the “skills gap” issue. However, these programs and efforts are not coordinated and connected. Among the benefits of better coordination could be the regionalization of good programs, the dissemination of best practices, the increase in transparency, and the sharing of resources.



### DATA

Training providers, students, and workers need better information from employers on their hiring needs and skills requirements. Training providers, including ISDs and community colleges, need to provide better information on the supply of workers. Having better information will contribute to a more dynamic and responsive system that can provide a talent pipeline to better meet the needs of employers.

## NATIONAL BEST PRACTICES

As part of the background research provided to the RWDTF, TIP Strategies conducted a national survey of workforce development initiatives to identify best practices. In general, TIP identified six trends in workforce development programs. A description of each of these trends follows. Detailed case studies are provided in Appendix B, on page 23.

**SECTOR-LED AND DEMAND-DRIVEN.** Aligning sector strategies and career pathways is essential to a demand-driven system. One of the best ways to do this is by taking a sector-based approach. Organizing around an industry sector provides a better vehicle for employer engagement. Because employers in a sector often share a common set of needs and face a common set of challenges, they are more motivated to work together to reach a solution. This focused approach has also proven to yield positive and significant outcomes for both employers and workers. Examples include the Wisconsin Regional Training Partnership, Louisiana’s Craft Workforce Task Force, and Milwaukee’s Manufacturing Career Partnership.

**NATIONAL PARTNER.** The support of a national partner can quickly ramp up capacity and technical know-how with a proven model. There are many organizations that have developed scalable and transferable models to address common workforce challenges, including the skills gap and skilled labor shortages. Organizations such as ACT, Jobs for the Future (JFF), and the Aspen Institute are three such examples. ACT’s WorkKeys program can help address the basic skills and employability gap. JFF’s Credentials that Work provides a platform for sharing information on how best to incorporate real-time labor analytics into a more demand-driven workforce system. The Aspen Institute’s Skills for the Future provides a model for workforce development that involves training-to-hire and is has proven to be a valuable tool for re-skilling and up-skilling unemployed workers in Chicago. Tech Valley’s 21<sup>st</sup> Century Education and Workforce Development Initiative is another model under development that aims to be transferrable to other communities.

**LONGEVITY.** Creating a sector-led, demand-driven workforce system takes a sustained effort and a sustained funding source. While federal programs have provided sizeable cash infusions to workforce development programs across the nation, the most successful of these programs have found more predictable and reliable funding streams that provide a platform for longevity. Most of the programs that relied solely on federal funding have a limited life span. In a report on best practices for sector strategies, the Aspen Institute found that a foundation for longevity is necessary for successful employer engagement. According the study, “employers report that the reliability of a sector initiative over time is a key element in their decision to work more closely with an organization.”

**BETTER DATA.** Greater detail on occupational demand and skills requirements is a nationally recognized need. The US Department of Labor has established a workforce data quality initiative to look at policies to improve the workforce data system. The Workforce Data Quality Campaign is also a national initiative that is looking to improve the quality and relevancy of education and workforce data systems. Furthermore, many communities and organizations are attempting at improving the data systems in their communities. The Center for Energy Workforce Development and Louisiana’s Craft Workforce Development Task Force are two such initiatives.

**AWARENESS ESSENTIAL.** Awareness campaigns often accompany initiatives to fill the skills gaps. From private companies such as Siemens and GLOBAL FOUNDRIES to initiatives such as Go Build Alabama and Elevate Iowa, building awareness about career opportunities is seen as an essential component of any effort to address a skilled labor shortage. It is commonly accepted that potential workers are not aware of career opportunities in construction and manufacturing and that they often hold misperceptions of what the work is like in these sectors.

**NEW INNOVATION.** Because of the national focus on the skills gap and the scale of the issue in some communities and sectors, there are many new programs and initiatives under development or that have recently been launched. Many of these look promising but they are not yet proven. It is instructive, however, to look at these new programs. Collaborating with them to understand their lessons learned and to leverage their knowledge base could help the GHP initiative accelerate its “time to market.”





# ACTION PLAN

# ACTION PLAN

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To address the challenges associated with the middle skills gap, the RWDTF developed an action plan to be implemented over the next five years. The plan is informed by research on best practices, both internal and external to the region, and structured around the four gaps identified.

## VISION

Establishing a common vision provides direction for the many stakeholders who participate in and contribute to Houston's workforce development system. For this reason, we begin the action plan with a vision statement for the region:

*Greater Houston is an international economic powerhouse with an integrated and competitive workforce system that cultivates a strong pipeline of middle skills talent.*

This vision recognizes the connection between workforce and economic strength. It also recognizes how crucial middle skills talent is to the region's economic drivers.

## GOAL

With this vision in mind, the goal of this workforce initiative becomes clear:

*To ensure a skilled workforce to meet the needs of our employers.*

This statement also implies the better alignment of training and industry and of students' field of study and high demand occupations. Achieving this goal is the cornerstone of a demand-driven workforce system.

## FRAMEWORK OF THE GHP WORKFORCE INITIATIVE

Over the course of the project, the task force developed a framework to create a structure for the action plan. This framework is outlined below.

Four primary tactics were identified to address the systemic gaps recognized by the task force:

1. Raising **awareness** among potential workers of middle skills opportunities to increase enrollment in related programs and increase number of applicants for those positions.
2. Improving the quality of applicants for middle skills jobs through **basic skills and employability** training.
3. **Coordinating** employers, education institutions, as well as training and service providers to create a more efficient and effective system around information sharing and connecting resources.
4. Creating a **data system** that informs and supports decision-making in a demand-driven workforce ecosystem.

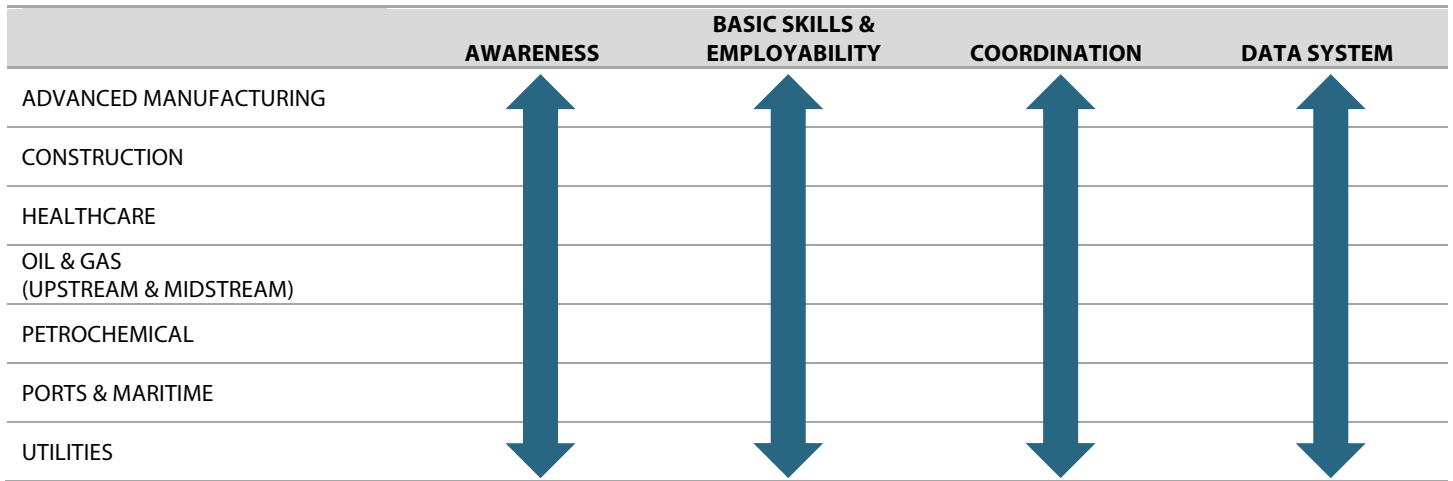
The approach to addressing the middle skills challenge in the Houston region will encompass the following guiding principles:

1. **Employer-Led, Sector-Driven:** GHP will organize the initiative around specific sectors to gauge employers' needs (critical occupations and critical skills), ensure appropriate training resources and capacity, and build awareness of opportunities.
2. **Seamlessly Coordinated:** GHP will serve as a system integrator, making connections between system players and providing valuable information to support decision-making.



**3. Best-in-Class Tools & Programs:** GHP will utilize the most effective tools based on proven models to meet its objectives.

As such, the Action Plan begins with the work of sector councils that will employ the four primary tactics to address the middle skills challenge in each of these key sectors. At the same time, there is a role for a coordinating body that will address issues that cut across the sectors. The actions related to these cross-cutting issues will support the sector-based strategies through a common set of tools and programs.



We will measure our success through the following outcome measures:

*Through a coordinated effort over the next five years, the GHP Workforce Initiative will facilitate the training, certification, and placement of workers in critical middle skills jobs, as defined by the sector councils.*

The sector councils will set out specific goals according to the demand for workers in each critical occupation and the region’s capacity to train workers to fill those occupations.

## STRATEGY 1: SECTOR COUNCILS

*Create sector councils to ensure the critical workforce needs and challenges of each sector are addressed.*

Hiring and training needs vary greatly by industry. Research of best practices for skills gap solutions revealed that the most successful were organized around industry sectors. Sectors rallied around shortages in specific occupations and/or skills. They pulled together resources to better communicate their common needs and to offer solutions. Employers across sectors (e.g., manufacturing and healthcare) may not share common gaps and therefore would be less likely to work together to solve workforce problems. Also, addressing the skills gap by using existing sector organizations (previously organized to address other challenges such as environmental, regulatory, taxation, infrastructure, etc.) can reduce duplication of efforts and be more efficient. Specifically, in the Houston area, there are already sector organizations in construction, energy, maritime, and healthcare.

The purpose of the sector councils is to identify each industry's critical occupations and ensure that the region's training programs and capacity can meet the demand for workers in those critical areas. The sector councils must also support and participate in industry-specific awareness initiatives to generate interest in careers in the critical occupations.

### ACTIONS:

1. Bring together primary decision makers in the Houston region's key industries to assess needs and interest level:
  - a. Advanced Manufacturing
  - b. Construction
  - c. Healthcare
  - d. Oil & Gas (Upstream and Midstream)
  - e. Petrochemical
  - f. Ports & Maritime
  - g. Utilities
2. Identify critical occupations and skills and quantify demand through the employer survey (*See Strategy 5*).
3. For critical occupations and skills that are shared across sectors, create a multi-sectoral group that could engage a wider community of employers.
4. Inventory regional training capacity to meet the needs of those critical occupations through the training provider survey.
5. Determine if relevant curricula are teaching students the critical skills they need.
6. If not, create a working group to develop curricula across institutions according to demand.
7. Identify which occupations could be part of career and technical education, dual credit, or early high school programs and assist in curriculum development.
8. Work with education institutions and training providers to define career pathways related to critical occupations.
9. Serve as the regional business advisory committees for the region's school districts for their career and technical programs and for the implementation of HB-5.
10. Serve as the regional business advisory committees for the region's community colleges for sector-related curricula.
11. Assist in increasing training relevancy and capacity through volunteering, in-kind contributions, and financial contributions where needed.
12. Participate in awareness initiatives to drive students/workers to training programs.
  - a. Create work-based learning opportunities—apprenticeships, internships, job shadowing, career days, plant tours, summer training—for students and adults.
  - b. Participate in the production of videos about critical occupations to ensure relevancy.
  - c. Make presentations to students/career counselors/parents about opportunities.

## STRATEGY 2: AWARENESS CAMPAIGN

*Develop and launch an aggressive campaign to change the awareness and perception of middle-skills career opportunities.*

Perceptions about occupations are often based on outdated information, about the nature of the job, earnings, and career potential. Findings from our industry focus group meetings and input from the task force revealed a lack of good and accessible information available to job seekers about opportunities in middle skills careers. While the information is available (through the workforce board, community colleges and others), it was apparent that many job seekers and students were not making career choices based on this information. Either they did not have access to it (due to inadequate delivery systems), the information presented was not compelling, or the careers available were not of interest no matter what or how the information was presented.

### ACTIONS:

1. Set clear goals and objectives for the awareness campaign with guidance from partners.
2. Build analytics into the campaign design so that effectiveness can be measured and strategies/tactics can be modified to improve results.
3. Brand the initiative, create a consistent message, and develop marketing collateral.
4. Develop an interactive, cloud-based platform for students and workers that will provide information about middle skills careers in a central location and help redefine the perception of careers traditionally considered “blue-collar.” This tool should include the following information:
  - a. Assessment and/or job matching tools to help users identify their strengths and aptitudes and match them with appropriate careers.
  - b. Information on career opportunities such as a description- written and video (e.g., Process Technology), wages, necessary skills and abilities, and job listings. The critical occupations identified by the sector councils should be featured somehow.
  - c. Education and training programs to get into the career pathway, including program cost, scholarship availability, and duration.
  - d. Workforce resources such as training programs, social services, and wrap-around services.
5. Target specific audiences by tailoring the message, tools, and delivery method. The target audiences that should be evaluated are as follows:
  - a. Middle school and high school students
  - b. Community college students—particularly undecided or undeclared
  - c. Adults in workforce system or enrolled in other training program
  - d. High school and college drop-outs
  - e. Veterans separating from service
  - f. Ex-offenders
6. Identify best ways to amplify the campaign through partnerships with employers, training providers, and the community at-large and through channels that maximize reach and exposure. Potential tools and channels include:
  - a. Outreach presentations
  - b. Speakers bureaus
  - c. Train-the-trainer workshops
  - d. Traditional and social media outlets
  - e. Promotional materials (e.g. bookmark, magnet, or pens) that feature the career education tool
  - f. Scholarships for students choosing fields of study relevant to the critical occupations
7. Measure results regularly and report annual progress at the workforce summit (*see Strategy 4, Action 6*).

## STRATEGY 3: BASIC SKILLS & EMPLOYABILITY

*Encourage the adoption of common tools and curricula to assess individuals and provide training to address weaknesses in basic skills and employability.*

Employers, educational institutions, and workforce training organizations all reported challenges in basic skills and employability. Employers cited an abundance of job applicants unable to pass drug screening and having criminal records, making them ineligible for the majority of positions available. Many also cited limitations in soft skills (e.g., basic communication and customer service, attendance, hygiene, and adhering to dress codes) and basic skills such as math, reading, and problem-solving. Education and training providers also report increasing numbers of students requiring remedial help in basic math, and reading.

### ACTIONS:

1. Define what soft skills employers want and use this information to create an archetype of a good employee that could be used as part of the awareness campaign.
2. Define basic hard skills that are common across many of the critical occupations.
3. Engage a working group to evaluate possible common assessment and training tools and choose the most suitable tool(s) to be used across Houston's workforce system. Ensure that employers buy into the value of the tool and the related credential.
4. Roll out a common set of tools to address basic skills, financial literacy, and employability that can be used by Houston's network of training providers and community-based organizations as part of their workforce and financial stability programs.
5. Embed soft skills in curricula in PK-12, community colleges, and other workforce training. Consider creating for-credit or required courses that will reach most students (PK-16) in the region.
6. Provide teachers and instructors with opportunities for externships that would help them better understand what will be required of their students.
7. Create opportunities for hands-on learning (e.g., internships, simulations, etc.) that will teach students and adults soft skills and what is expected of them as employees.

## STRATEGY 4: COORDINATION

*Facilitate connections between stakeholders and the dissemination of information throughout the system.*

There are numerous workforce programs in the greater Houston area, many of which are best practices themselves. But, typical of a large metropolitan area, awareness of these programs is, in many cases, limited to those directly involved. At a minimum, there is a need to share information among multiple players. Ideally, organizations would coordinate efforts to achieve scale, increase transparency, gain efficiency, and improve effectiveness.

### ACTIONS:

1. Create a new coordinating body to oversee the implementation of this action plan. This should include representatives from each sector council, school districts, colleges, workforce development, and community-based organizations. Sub-groups or working groups could be organized around each strategy to create a strong partnership to maximize the effectiveness of each strategy's implementation.
2. Ensure that the initiative is properly resourced, non-duplicative, and realistic in its scope.
3. Serve as liaison between sector councils and education and training providers to:
  - a. Share employers' hiring needs and skills requirements.

- b. Share education and training providers' need for equipment, faculty, and other resources to meet the needs of employers.
- 4. Forge relationships with education (including career and technical education), community-based organizations, workforce, and economic development to stay abreast of initiatives and issues related to middle skills, make connections, and create opportunities for information exchanges.
- 5. Facilitate cross-sector sharing to identify common skills requirements, common needs, and useful tools.
- 6. Facilitate the creative process of generating, developing and communicating new ideas to address the region's workforce challenges.
- 7. Organize an annual workforce summit to feature the survey data and sector profiles and to provide a forum for discussing common challenges.
- 8. Maintain an inventory of workforce programs and organizations and make this accessible to the public and to partners.

## STRATEGY 5: DATA SYSTEM

*Develop tools to collect better demand-side and supply-side data.*

Good decisions require good data. Unfortunately, much of the information used to inform both training and career decisions is based on historical data and does not necessarily reflect what is on the horizon. While collecting data from employers is difficult, it is paramount to better understanding future hiring needs, both quantitative and qualitative. In addition, there is not a system in place to collect information on training and educational capacity, enrollments, and program completions. This absence promotes siloed decision-making on the supply-side. This lack of information on the supply-side also prohibits the consideration of program costs, both to the public and to the student, as part of the evaluation and deliberation of solutions to meet the region's workforce challenges.

### ACTIONS:

#### DEMAND–SIDE: EMPLOYER SURVEY

1. Convene a data working group that includes employers and data experts to serve as a sounding board for structuring a detailed employer survey with built-in incentives to maximize the response rate.
2. With this input, design an employer survey to collect detailed information on employers' hiring needs and skill requirements. This should be a robust online survey.
3. Administer the survey leveraging established channels and employer relationships (industry associations, Houston Business Journal, GHP membership, economic development organizations, local chambers of commerce).

#### SUPPLY–SIDE: TRAINING PROVIDER SURVEY

1. Convene another data working group composed of workforce solutions, community colleges, trade unions, and career and technical education directors to serve as a sounding board for structuring a training provider survey.
2. With this input, design a training provider survey to collect detailed information on program capacity, enrollment, completions, and placement where applicable/possible.
3. Administer the survey.

#### GENERAL

1. Analyze and summarize the data in a report that will be presented at the workforce summit (*see Strategy 4, Action 6*). Use a report card or dashboard format that highlights progress towards sector goals and transparency in supply-side reporting.

## **STRATEGY 6: SUPPLY-SIDE SYNCHRONIZATION**

*Work with education and training providers to establish networks to enable the efficient dissemination of information, sharing of best practices, and strengthening of industry partnerships.*

Strong networks facilitate the exchange of information. Currently, education and training providers in the Houston region are not connected through a region-wide, comprehensive, collaborative network. While individual relationships and smaller networks exist, great efficiency could be gained through the creation of a more seamless system of workforce intermediaries. Most of all, it would simplify the interface with industry as sector councils could use this supply-side network to communicate needs, provide feedback on programs, and volunteer resources to support awareness and basic skills initiatives.

### **ACTIONS:**

- 1.** Solicit further input from education and training providers to complete the inventory of initiatives and programs.
- 2.** Expand the level of cooperation between sector councils, community colleges and ISDs across the region to ensure that curricula are consistent, that credentials are relevant and recognized by industry, and that capacity is “right-sized” to meet the demand for workers in critical middle skills occupations.
- 3.** Establish a working group of workforce development leaders from the community colleges to share best practices, create a common system for collecting data, and find opportunities to strengthen their network.
- 4.** Establish a working group of CTE managers from ISDs to share best practices, create a common system for collecting data, and find opportunities to strengthen their network.
- 5.** Create network of community based organizations to better connect employers with talent/incumbent workers. This network would also facilitate the training, job placement, and wrap-around services aimed at adults with certain barriers to employment.
- 6.** Through the supply-side survey, establish a data system that more accurately reflects regional capacity and production to address the middle skills gap.
- 7.** Work with education and training providers to incorporate work-based learning opportunities, internships, and apprenticeships into courses of study that are related to critical occupations.
- 8.** Work with ISDs to ensure their career counseling and course planning tools (e.g., Naviance or Career Cruising) provide updated, regional information to students through the system on high demand and critical occupations as well as relevant career pathways.

# CONCLUSION

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The Houston region has embarked on a period of unprecedented growth—at a time when employers are already facing shortages in key occupations. The region’s expansion, coupled with the aging of the workforce, is creating the conditions for a perfect storm in the labor market. These challenges will be particularly pronounced in the middle skills segment—those occupations that require more than a high school degree but less than a four-year. Forty-one percent of Houston’s jobs in 2012 were considered middle skills.

To address these challenges, the GHP Regional Workforce Development Task Force developed an action plan that will guide a regional workforce initiative over the next five years. The action plan embraces a structure that is sector-led and employer-driven. It prescribes strategies and actions organized around the four gaps in the regional workforce system—Awareness, Basic Skills & Employability, Coordination, and Data System. The RWDTF agreed that the Greater Houston Partnership would lead the implementation of this action plan.

The success of this initiative, however, is dependent on the widespread participation the region’s workforce development stakeholders. There are multiple avenues for involvement for each stakeholder group. The time is now for the region to come together to address its workforce challenges.

For businesses:

- Join a sector council.
- Participate in the employer survey.
- Create work-based learning opportunities, including workplace tours, internships, apprenticeships, job shadowing, and career days.
- Volunteer, or organize employees to volunteer, to teach or provide instructional support for critical occupations.
- Participate in activities to raise awareness and improve the perception of critical occupations.

For training providers (e.g., community colleges, school districts, Workforce Solutions, community-based organizations):

- Participate in the supply-side survey.
- Collaborate with the sector councils to increase training relevancy.
- Participate in the Workforce Summit.
- Participate in activities to raise awareness and improve the perception of critical occupations.
- Join the corresponding supply-side working group to share information and best practices.
- Provide clients with up-to-date information on high-demand, middle skills occupations.

For more information on how to get involved, contact:

Vice President of Regional Workforce Development  
Greater Houston Partnership  
1200 Smith St #700, Houston, Texas 77002  
Phone: (713) 844-3600





APPENDIX A

**REGIONAL WORKFORCE  
ORGANIZATIONS**

# APPENDIX A–INVENTORY OF REGIONAL WORKFORCE ORGANIZATIONS

The Regional Workforce Development Task Force assembled an inventory of organizations in the Houston region that have workforce development or training programs. While this is not an exhaustive listing of organizations, it does provide a starting point for the development of a comprehensive directory that can be used as a resource for the region.

NP = Non-Profit

I/TA = Industry/Trade Association

E&T = Education & Training

GOV = Government

EWD = Economic and Workforce Development

ORGANIZATION	TYPE	WEBSITE
A+ Challenge	NP	<a href="http://www.houstonaplus.org">www.houstonaplus.org</a>
ACE Mentor Program	NP	<a href="http://www.acementor.org/index.php/about-us/">www.acementor.org/index.php/about-us/</a>
All Kids Alliance: Cradle to Career	NP	<a href="http://www.allkidsalliance.org">www.allkidsalliance.org</a>
Alliance for Multicultural Community Services	NP	<a href="http://www.allianceontheweb.org">www.allianceontheweb.org</a>
Associated Builders and Contractors (Greater Houston Chapter)	I/TA	<a href="http://www.abchouston.org">www.abchouston.org</a>
Associated Chemical Industry of Texas	I/TA	<a href="http://www.acit.org">www.acit.org</a>
Automotive Youth Education Systems (AYES)	NP	<a href="http://www.ayes.org">www.ayes.org</a>
Capital IDEA-Houston	NP	<a href="http://www.capitalideahouston.org">www.capitalideahouston.org</a>
Career and Recovery Resources, Inc.	NP	<a href="http://www.careerandrecovery.org">www.careerandrecovery.org</a>
Cenikor Foundation	NP	<a href="http://www.cenikor.org/workforce-development">www.cenikor.org/workforce-development</a>
Center for Houston's Future	NP	<a href="http://www.centerforhoustonfuture.org/">www.centerforhoustonfuture.org/</a>
Chinese Community Center	NP	<a href="http://www.ccchouston.org/">www.ccchouston.org/</a>
Christian Community Service Center (CCSC)	NP	<a href="http://www.ccschouston.com">www.ccschouston.com</a>
Christo Rey Jesuit Preparatory School of Houston	E&T	<a href="http://www.cristoreyjesuit.org">www.cristoreyjesuit.org</a>
Community Family Centers	NP	<a href="http://www.communityfamilycenters.org">www.communityfamilycenters.org</a>
Construction & Maintenance Education Foundation (CMEF)	NP	<a href="http://www.abchouston.org/en-us/trainingandeducation.aspx">www.abchouston.org/en-us/trainingandeducation.aspx</a>
Construction Career Collaborative (C3)	NP	<a href="http://www.constructioncareercollaborative.org/">www.constructioncareercollaborative.org/</a>
Department of Veteran's Affairs – Houston Regional Office	GOV	<a href="http://www.vba.va.gov/ro/houston/index.htm">www.vba.va.gov/ro/houston/index.htm</a>
East Harris County Manufacturers Association	I/TA	<a href="http://www.ehcma.org/default.aspx">www.ehcma.org/default.aspx</a>
Economic Alliance	EWD	<a href="http://www.allianceportregion.com/">www.allianceportregion.com/</a>
Education Service Center 04	GOV	<a href="http://www.esc4.net/">www.esc4.net/</a>
Exodyne Inc.– Dynamic Educational Systems, Inc.	E&T	<a href="http://www.exodyne.com/desi_home.php">www.exodyne.com/desi_home.php</a>
Federal Reserve Bank of Dallas – Houston Branch	GOV	<a href="http://www.dallasfed.org/houston.cfm">www.dallasfed.org/houston.cfm</a>
Genesys Works	NP	<a href="http://www.genesysworks.org/houston/">www.genesysworks.org/houston/</a>
Goodwill Industries of Houston	NP	<a href="http://www.goodwillhouston.org/index.htm">www.goodwillhouston.org/index.htm</a>
Greater Houston Manufacturing Association	I/TA	<a href="http://www.houston-mfg.com/">www.houston-mfg.com/</a>
Greater Houston Partnership	EWD	<a href="http://www.houston.org/">www.houston.org/</a>
Gulf Coast Trade Center	E&T	<a href="http://www.gctc.us/Welcome.html">www.gctc.us/Welcome.html</a>
Harris County Department of Education – Adult Education	E&T	<a href="http://www.hcde-texas.org/default.aspx?name=AdultEducation">www.hcde-texas.org/default.aspx?name=AdultEducation</a>
Houston Area Safety Council	E&T	<a href="http://www.hasc.com">www.hasc.com</a>
Houston Area Urban League	NP	<a href="http://www.haul.org">www.haul.org</a>
Houston Business Roundtable	I/TA	<a href="http://www.houbrt.com">www.houbrt.com</a>
Houston Energy Council	I/TA	<a href="http://www.houstonenergycouncil.org/">www.houstonenergycouncil.org/</a>

ORGANIZATION	TYPE	WEBSITE
Houston Galveston Area Council	EWD	<a href="http://www.h-gac.com">www.h-gac.com</a>
Houston Public Library	GOV	<a href="http://www.houstonlibrary.org/wecan-works">www.houstonlibrary.org/wecan-works</a>
Houston School of Carpentry	E&T	<a href="http://www.housoc.com/">www.housoc.com/</a>
HR Houston (SHRM Chapter)	I/TA	<a href="http://www.hrhouston.org/">www.hrhouston.org/</a>
Independent Petroleum Association of America	I/TA	<a href="http://www.ipaa.org/">www.ipaa.org/</a>
Industrial Welding Academy	E&T	<a href="http://www.iwatraining.com/">www.iwatraining.com/</a>
Interfaith of the Woodlands	NP	<a href="http://www.woodlandsinterfaith.org/">www.woodlandsinterfaith.org/</a>
Job Training Institute	NP	<a href="http://www.jobtraininginstitute.org/index.html">www.jobtraininginstitute.org/index.html</a>
Jobs for the Future	NP	<a href="http://www.jff.org/">www.jff.org/</a>
Junior Achievement of Southeast Texas	NP	<a href="https://www.juniorachievement.org/web/ja-set/">https://www.juniorachievement.org/web/ja-set/</a>
La Porte-Bayshore Chamber of Commerce	EWD	<a href="http://www.laportechamber.org/">www.laportechamber.org/</a>
Literacy Advance of Houston	NP	<a href="http://www.literacyadvance.org">www.literacyadvance.org</a>
Manufacturing Skills Standards Council	NP	<a href="http://www.msscusa.org">www.msscusa.org</a>
Memorial Assistance Ministries	NP	<a href="http://www.maministries.org">www.maministries.org</a>
Mexican Institute of Greater Houston	NP	<a href="http://www.Mexicaninstitute.org">www.Mexicaninstitute.org</a>
Montgomery County SHRM	I/TA	<a href="http://www.mc-shrm.org/">www.mc-shrm.org/</a>
National Center for Construction Education & Research (NCCER)	NP	<a href="http://www.nccer.org/">www.nccer.org/</a>
Neighborhood Centers Inc.	NP	<a href="http://www.neighborhood-centers.org/en-us/default.aspx">www.neighborhood-centers.org/en-us/default.aspx</a>
New Horizons Computer Learning Centers	E&T	<a href="http://www.newhorizons.com/">www.newhorizons.com/</a>
Northwest Assistance Ministries	NP	<a href="http://www.namonline.org">www.namonline.org</a>
Ocean Corp	E&T	<a href="http://www.oceancorp.com">www.oceancorp.com</a>
Pipe Fitters Local Union 211 – JATC Apprentice School	I/TA	<a href="http://www.pipefitterslocal211.com/jatc-apprentice-school/">www.pipefitterslocal211.com/jatc-apprentice-school/</a>
Professional Career Institute	E&T	<a href="http://www.pcicareer.edu/">www.pcicareer.edu/</a>
Project Lead The Way	NP	<a href="https://www.pltw.org/">https://www.pltw.org/</a>
SER – Jobs For Progress	NP	<a href="http://www.serhouston.org/">www.serhouston.org/</a>
Skills 4 Living	NP	<a href="http://www.skills4living.org/">www.skills4living.org/</a>
SkillsUSA	NP	<a href="http://www.skillsusa.org/">www.skillsusa.org/</a>
Sparc Academy	E&T	<a href="http://www.sparcacademy.com/">www.sparcacademy.com/</a>
Subsea Tieback Foundation	NP	<a href="http://www.subseatiebackfoundation.org">www.subseatiebackfoundation.org</a>
Texas Bay Area SHRM	I/TA	<a href="http://www.bahrma.shrm.org/">www.bahrma.shrm.org/</a>
Texas Chemical Council	I/TA	<a href="http://www.txchemcouncil.com/">www.txchemcouncil.com/</a>
Texas Education Agency	GOV	<a href="http://www.tea.state.tx.us/">www.tea.state.tx.us/</a>
The Ocean Comporation	E&T	<a href="http://www.oceancorp.com/nondestructive_testing_training.html">www.oceancorp.com/nondestructive_testing_training.html</a>
The WorkFaith Connection	NP	<a href="http://www.workfaithconnection.org">www.workfaithconnection.org</a>
United Association of Plumbers and Pipefitters	I/TA	<a href="http://www.pipefitterslocal211.com/">www.pipefitterslocal211.com/</a>
United Way of Greater Houston	NP	<a href="http://www.unitedwayhouston.org/">www.unitedwayhouston.org/</a>
Volunteers of America Texas	NP	<a href="http://www.voatx.org/regions-served/houston">www.voatx.org/regions-served/houston</a>
Wesley Community Center	NP	<a href="http://www.wesleyhousehouston.org">www.wesleyhousehouston.org</a>
Workforce Solutions (Gulf Coast WF Board)	GOV	<a href="http://www.wrksolutions.com/index.html">www.wrksolutions.com/index.html</a>



APPENDIX B  
NATIONAL  
BEST PRACTICES

## APPENDIX B–NATIONAL BEST PRACTICES

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As part of the background research provided to the RWDTF, TIP Strategies conducted a national survey of workforce development initiatives to identify best practices. In general, TIP identified six trends in workforce development programs. A description of each of these trends is on page 11.

For 11 programs that were identified, we developed detailed profiles. In each profile, we provide a description of the initiative, the sponsors and funding mechanisms, an overview of the program, and a discussion of any outcomes associated with the initiative.

In addition, we specified how the program could help bridge one of the four gaps identified in the Houston region. The key to the coding of the case studies is below:

### KEY TO CASE STUDY CODING



**AWARENESS:** Potential workers are not aware of the opportunities in the middle skills segment or hold inaccurate perceptions of the jobs.

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**BASIC SKILLS & EMPLOYABILITY:** Many potential workers lack some of the most basic hard and soft skills needed for any middle skills job.

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**COORDINATION:** The landscape of programs and organizations with a focus on workforce is broad and varied, but also fragmented.

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**DATA SYSTEMS:** The lack of accurate, reliable data creates a disconnect between demand and supply.

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## ACT WORKKEYS®

**THE INITIATIVE:** ACT WorkKeys® is a job-skills assessment system that helps employers select, hire, train, develop, and retain a high-performance workforce. WorkKeys assessments use test questions based on situations arising in the everyday work world to measure “real world” skills that employers have determined are critical to job success. The program functions as part of ACT’s Work Readiness System and can lead to earning the National Career Readiness Certificate (NCRC), an industry-recognized, portable, evidence-based credential that attest to essential skills needed for workplace success.

**THE SPONSORS:** In 1959, a professor at the University of Iowa formed American College Testing, which devised tests for students heading for college that focused on practical knowledge rather than cognitive reasoning. The organization, which since 1996 has been formally known simply as ACT, has evolved to include testing and assessment systems for lifelong learning, both in the school and in the workplace. The ACT Work Readiness system has developed standards and benchmarks for a wide variety of occupations that provide precise descriptions of the skills needed to be minimally qualified for a particular job. WorkKeys was developed to accurately determine that current and prospective employees’ skills are aligned with employer skill requirements and that individuals develop the foundational and job-specific skills to ensure success throughout their lifetime.

**THE FUNDING MECHANISMS:** ACT is an independent, non-profit 501(c)(3) organization offering millions of education and career assessment across the country and around the world. The charges for examinations and assessments are established to offset the costs involved in administering them.

**THE PROGRAM:** WorkKeys provides testing and measurement of nine foundational skill measurements:

- Applied Mathematics
- Applied Technology
- Business Writing
- Listening for Understanding
- Locating Information
- Workplace Observation
- Reading for Information
- Teamwork

In addition, four soft-skill assessments can be made:

- Work Discipline: Productivity and dependability
- Teamwork: Tolerance, communication, and attitude
- Customer Service Orientation: Interpersonal skills and perseverance
- Managerial Potential: Persuasion, enthusiasm, and problem-solving

WorkKeys tests are available online, and questions are based on situations encountered in an actual job environment; in many cases, the questions include video or audio segments.

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# WorkKeys®



- WorkKeys is an assessment tool that helps employers evaluate job candidates’ basic skills and helps employees demonstrate their skills.
  - Having a tool that is commonly accepted across a region provides a standardized way of evaluating candidates.
-

Based on scores for the first three foundational skills listed above, Applied Mathematics, Applied Technology, and Business Writing, test-takers may earn NCRC credentials. In the future, the NCRC program will expand through ACT Career Credentials, powered by ACT WorkKeys, to offer certification in other areas.

**THE OUTCOME:** The WorkKeys system is rapidly becoming the nationwide standard for measuring and communicating basic workplace skills. It is currently in use in all 50 states in the U.S. The NCRC, which offers efficient matching of talent with work, means that people find great jobs, employers find skilled workers, and the economy grows and prospers. Since WorkKeys began assessing for NCRC certification in 2006, more than 1.7 million certificates have been issued and more than 40 states have statewide or regional certificate programs.



## AUTOMOTIVE MANUFACTURING TECHNICAL EDUCATION COLLABORATIVE

**THE INITIATIVE:** The Automotive Manufacturing Technical Education Collaborative (AMTEC) is a partnership of community and technical colleges and automotive manufacturing companies located in eight leading automotive manufacturing states. The group met in April 2005 to determine whether a coalition across states could be formed to benefit the development of the future workforce in this sector. In August 2005, they formed the initial founding partnership. The stated mission of the collaborative is to create and sustain an innovative, responsive, and standards-based workforce development system that meets the automotive industry's skill requirements.

**THE SPONSORS:** The idea for AMTEC began at a conference in 2004 in Washington DC, where community and technical college leaders from Michigan, Ohio, Tennessee, and Kentucky saw the need for cooperative efforts across all boundaries—state lines, college boundaries, and competing company interests—to support and improve various automotive manufacturing training programs and services. In 1995, the Kentucky Community and Technical College System (KCTCS) took the lead in obtaining funding from the National Science Foundation (NSF) to establish the initiative. Initially, the partnership included 28 representatives from automotive manufacturing companies and 27 representatives from colleges and technical schools in the four states. As the initiative has taken shape over the ensuing years, the core partnership has grown to leading community and technical colleges and automotive manufacturing companies in 12 leading automotive manufacturing states.

**THE FUNDING MECHANISMS:** Funding came first from the NSF planning grant granted to the KCTCS, which became the fiscal agent and lead partner in the endeavor. Once AMTEC had been firmly established, the planning grant funded operations until an application could be made in October 2008 to the NSF Advanced Technical Education (ATE) program for funding to be a National Center for Excellence for Automotive Manufacturing. Approval for AMTEC to operate as a National Center came in September 2009.

**THE PROGRAM:** Operating as a National Center designed to strengthen the competency and global competitiveness of the automotive manufacturing workforce, AMTEC recognizes the need for uniquely trained workers to support:

- An increasingly flexible and lean manufacturing line with fluctuating customer demands;
- A growing focus on green manufacturing; and
- Rapidly improving technology.

In response to these demands, AMTEC provides the following:

- Industry-led maintenance certification assessments;
- Validated college curricula aligned to industry-led skills standards;
- Shared best practices and education models among colleges and industry partners; and
- Flexible career pathways to fill the unique needs of students, employees, and employers.



- With industry input, AMTEC has created standardized curricula that provide students with the skills they need to succeed in the automotive manufacturing workplace
  - AMTEC is now a national center of excellence with representation from 12 states. The collaborative allows stakeholders to share best practices and disseminate information across the network.
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AMTEC has collected data and resource information to develop career pathway models to take job seekers successfully from secondary to post-secondary to employment. It now makes those models available to all stakeholders. Seminars, workshops, and conferences are held frequently to disseminate information and gather ideas for future efforts. The collaborative has sponsored a number of professional development academies to provide further arenas for networking and in-depth discussions of issues of concern.

**THE OUTCOME:** According to an article in the November 2013 Lane Report, titled “Kentucky paves way for carmaker career training,” the efforts of AMTEC and the National Center have been highly successful. Among the changes that have been praised is developing training centers that replicate the environment of an actual workplace. Toyota Motor Manufacturing Kentucky created one such classroom and has a nearly 100 percent success rate of job placement. This past summer, the program was so effective that it was honored with the National Career Pathways Network’s Career Pathways Partnership Excellence Award. As one AMTEC representative said, “... we are building manufacturers with skill sets that any industry would be happy to have.... There is a lot of national interest in what we’re doing. Colleges don’t want to have to reinvent the wheel if they have something vetted by industry.”

## CENTER FOR ENERGY WORKFORCE DEVELOPMENT

**THE INITIATIVE:** The Center for Energy Workforce Development (CEWD) is a non-profit consortium of electric, natural gas, and nuclear utilities and their associations—Edison Electric Institute, National Rural Electrical Cooperative Association, American Gas Association, and Nuclear Energy Institute. The CEWD’s mission is “to build the alliances, processes, and tools to develop tomorrow’s energy workforce.” It was formed to help utilities work together to develop solutions to the coming workforce shortage in the utility industry and is the first such organization in this industry sector.

**THE SPONSORS:** The CEWD was formed in March 2006 and is teaming with secondary and post-secondary institutions and the workforce system to provide solutions to improve both the qualifications and the diversity of the workforce. It has also partnered with the International Brotherhood of Electrical Workers and the Utility Workers of America, in recognition that the large contingent of workers represented by these unions and the apprenticeship programs that train them constitute critical elements in developing the workforce required to manage tomorrow’s energy needs.

**THE FUNDING MECHANISMS:** Funding comes from members in the partnership—energy companies of all fuel types—whether investor-owned, municipal utilities electric cooperatives, or privately owned energy companies. Support also comes from the workforce system and the Departments of Labor and Energy and other key partners. Alliances exist at national and state levels between and among the CEWD’s members, educational institutions, and other stakeholders.

**THE PROGRAM:** CEWD creates industry solutions in workforce development by identifying, documenting, and distributing best-practice models in workforce planning, career awareness, education, and strategy. Because economic conditions, demographics, and the variation of utility needs from state to state, CEWD relies on regional implementation strategies. Teams comprised of energy companies, workforce development agencies, and educational institutions have been formed regionally and by state to apply these model solutions in given geographic regions. Solutions are prepared in easy-to-adapt template formats to allow modifications by various users. The solutions pertain to four areas:

- **Career awareness:** Branding materials, toolkits, best practices
- **Workforce development and education:** Industry curriculum, solution guides, partnerships with national groups
- **Workforce planning:** Annual member surveys, workforce reports, forecasting and planning tools
- **Member services:** Newsletters, webinars, annual member summit, regional meetings, virtual networking, coordinating state and regional workforce development consortia

**THE OUTCOME:** Over the seven years of its existence, the CEWD has developed an extensive network of members, agencies, and educational institutions, organized regionally and supported with a wide variety of well-designed and easily adaptable resources, such as newsletters, virtual meetings, recruitment tools, and career pathways. It also conducts an annual employer survey that allows it to provide its members with detailed forecasts for the most critical occupations in the industry.



- The program has developed a variety of tools to raise awareness of career opportunities at utilities.
- The CEWD has developed curricula with input from its industry stakeholders to ensure the existence of training programs to meet the industry’s needs.
- Through its network of State Energy Workforce Consortia, the CEWD disseminates tools, and implements regional strategies.
- The CEWD conducts an annual survey of its employer members to create a detailed forecast of the industry’s hiring needs.

## ELEVATE ADVANCED MANUFACTURING

**THE INITIATIVE:** Since manufacturing generates over 18 percent of Iowa's gross domestic product and pays its workers on average nearly \$17,000 more than the average salary for workers in other industries, it is vital to change the outdated image of workers in manufacturing jobs. Elevate Advanced Manufacturing is a multi-pronged marketing and education effort designed to address the growing shortage of skilled workers in the state (by 2018 it is anticipated that Iowa will have a shortfall of 6,672 workers in the advanced manufacturing sector)—and along the way clean up and modernize Iowans' perceptions of manufacturing.

**THE SPONSORS:** In 2013, the Iowa Association of Business (ABI) and the Iowa-Advanced Manufacturing (I-AM) Consortium developed and launched Elevate Advanced Manufacturing. The partnership hopes to promote career and educational pathways in advanced manufacturing. One of the most effective tools of the initiative is the website ([www.elevateiowa.com](http://www.elevateiowa.com)), which provides a self-assessment for potential career pathways, career search tools, and information on training opportunities at Iowa's 15 community colleges.

**THE FUNDING MECHANISMS:** The Consortium is funded by a \$12,951,162 grant from the Department of Labor's Employment and Training Administration, specifically the Trade Adjustment Assistance Community College and Career Training (TAACCCT) Grant Program as part of an I-AM grant.

**THE PROGRAM:** The program relies on the website to make Iowans aware of the opportunities existing in the state. It is designed to provide easy access to the tools for job seekers and also provides a forum for manufacturers to make job seekers aware of potential job opportunities. In addition to the online tools, the Elevate Iowa campaign provides curriculum integration with K-12 schools, through advanced manufacturing tours, speakers, and demonstrations. It will also host statewide events, as for example a booth promoting the American Welding Society at the Iowa State Fair.

A major thrust of the program is to build capacity in the 15 community colleges located in Iowa. The colleges are redesigning and developing curriculum based on industry needs, including buying state-of-the-art equipment to replicate the technology-rich work environment that is now typical in the manufacturing sector. The opportunity to earn portable industry credentials is also being embedded into the educational career pathways.

Elevate Iowa is also playing a key role in the Elevate Advanced Manufacturing campaign, which hopes to make a lasting impact on the economy throughout the state through the combined efforts of industry, education, and government. Key players include Elevate Iowa's sponsors, ABI, the I-AM Consortium, a collaboration of the 15 community colleges, and additional state programs such as the Governor's STEM initiative and Iowa Workforce Development's Job Bank. The campaign mirrors the Elevate Iowa goal: to elevate the perception of advanced manufacturing and to arm Iowans with the skills they need to engage in Iowa's workforce.

**THE OUTCOME:** The initiative is fairly new, but there seems to be consensus that it is adding an important element to the workforce development efforts in the state. Rather than duplicating efforts across the state they are working to align with like-partnerships and efforts to deliver one consistent message.



ELEVATE  
ADVANCED MANUFACTURING



- The initiative's website and efforts at integration into K-12 are good examples of how to change the general perception of middle skills careers.

## GO BUILD ALABAMA

**THE INITIATIVE:** Go Build Alabama is a high-energy campaign designed to inform and educate the citizens of Alabama about the opportunities for great jobs in the construction industry—many of which are not being filled even as demand grows for more. A major thrust of the Go Build campaign is to build recognition that a college degree is not the only path to a successful career. Mike Rowe, creator and host of Discovery Channel's "Dirty Jobs" series and the nation's most visible supporter of skilled labor, serves as spokesperson for the campaign. As he said at the launch of Go Build Alabama on Labor Day 2010, "There are opportunities in Alabama right now that most people don't even know about in construction. These opportunities aren't alternatives to viable careers—they are viable careers."



- The GoBuild campaign is focused on changing the perceptions of construction careers.
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**THE SPONSORS:** In 2009, two Alabama state senators sponsored Act 220 in the legislature, resulting in an additional payroll tax levied on commercial construction companies and the formation of the Alabama Construction Recruitment Institute (ACRI). The primary mandate of the ACRI was to design and implement a program to provide for recruiting to and promoting of training programs and opportunities for new craft trade workers in the construction industry. That program is Go Build Alabama.

**THE FUNDING MECHANISMS:** Funding comes from fees levied on employers of \$150 per \$100,000 of payroll for workers below the foreman or supervisor level. At the present employment levels, that generates about \$1.75 million per year. In addition, Mike Rowe's website also furnishes resources such as scholarships and promotional information for the Go Build campaign. Finally, "labor-neutral" support comes from state chapters of major groups associated with the industry: Associated Builders and Contractors, Association of General Contractors, AFL-CIO, American Subcontractor Association, and Road Builders Association, as well as many others.

**THE PROGRAM:** The challenge is to revitalize the workforce by turning young people on to the importance, possibilities, and respect that can result from a career in construction. Go Build Alabama uses print, online, and radio and television advertising to direct attention to the Go Build Alabama website. The website offers information on the industry outlook, profiles of the various trades, links to training and apprenticeship programs, and a sign-up page offering assistance in navigating entry into the construction industry. Through partnerships with the Alabama chapter of SkillsUSA, ACRI and the Go Build campaign work directly with high schools to bring awareness to students that the skilled trades are not merely an alternative to a four-year degree, but rather lead to well-paying satisfying professions.

**THE OUTCOME:** Auburn University at Montgomery's Center for Business is conducting the first annual external evaluation of program outcomes, which the ACRI will use to build on and refine the program. To date, efforts of the Go Build campaign have been highly successful:

- According to a recent survey, 70 percent of community-college instructors feel students entered their program because of the Go Build Alabama marketing campaign.
- Go Build has connected more than 3,000 displaced workers and young career-seekers with educators and employers through its online career database.

- A recent online article, “Alabama Moves to Deal with Shortage of Apprentices,” stated that there had been 56,000 visits to the Go Build website, with 159,000 page views. 99 percent of the website visitors describe the site as useful or very useful and more than 3,500 individuals have already registered in the career database.
- In 2012, the campaign in Alabama inspired the creation of Go Build Georgia, a similar initiative in a neighboring state, with Mike Rowe promising to work on the other 48: “Look out, Alaska,” he warns.

As the director of the ACRI said, “The Go Build campaign has shown that it can change misperceptions on the part of students and their influencers in relation to construction careers in the construction industry. Perhaps even more important, the program has demonstrated its ability to change attitudes toward construction careers.”

## JFF CREDENTIALS THAT WORK

**THE INITIATIVE:** Launched in 2010, Credentials That Work uses real-time labor market data to align post-secondary educational institutions with local job openings. To do this, the initiative uses innovations in the collection and use of real-time labor market information. Stronger alignment ensures that the credentials earned in community and technical colleges have the highest value for both prospective workers and employers.

**THE SPONSORS:** Credentials That Work is sponsored by Jobs for the Future (JFF), a partnership of school developers and school districts, state and local governments, employer organizations and community colleges. It is funded by these partners, as well as by many public, private, and individual donors. Through the efforts of this large and widespread group, JFF identifies, develops, and promotes education and workforce strategies that expand opportunities for youth and adults who are struggling in today's economy.

**THE FUNDING MECHANISMS:** Funding for Credentials That Work comes from two sources: the Joyce Foundation ([www.joycefdn.org](http://www.joycefdn.org)) and the Lumina Foundation ([www.luminafoundation.org](http://www.luminafoundation.org)).

**THE PROGRAM:** Because real-time labor market information is a relatively recent phenomenon, only now emerging as a tool for use in occupational training programs, few applications for these data have been tested and are being used, though interest is strong. Credentials That Work is surveying and assessing the most promising uses of these technologies (both existing and planned) to:

- Determine what uses may better align post-secondary education offerings with the needs of employers;
- Identify how these applications can augment the value of traditional sources of labor market information; and
- Identify how state policy can encourage the wider use of these technologies.

For example, new intelligence technology developed by Burning Glass Technologies ([www.burning-glass.com](http://www.burning-glass.com)) can aggregate and analyze online job ads and provide a more comprehensive, "real-time" source of information about the hiring and skill needs of local employers. This knowledge, drawn from a larger and more recent pool than has traditionally been possible, improves the understanding of hiring trends, employer demand, and skill requirements. This in turn influences what programs to offer and what to teach in classes so as to better align the graduates of these programs with the current and future workforce demands.

The colleges and organizations currently participating in the Credentials That Work network, most of which started using the technology in September 2011, are:

- The Centers of Excellence (San Jose, CA)
- CONNECT, a southeastern Massachusetts public higher education partnership
- Delaware Technical & Community College Center for Industry Research & Workforce Alignment (CIRWA)



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- The input from the Credentials that Work are used to improve the relevancy of training programs.
  - The Credentials that Work program investigates best practices in the use of real-time labor market information to improve alignment between workforce training and hiring requirements.
-

- Kentucky Community and Technical College System (KCTCS), including all 16 Kentucky colleges
- Various community colleges including Cabrillo College (Aptos, CA), Cerritos College (Norwalk, CA), Bunker Hill Community College (Boston, MA), Harper College (Palatine, IL), LaGuardia Community College (New York, NY), Southern Maine Community College (Portland, ME), and Texas State Technical College (Waco, Marshall, West Texas, and Harlingen, TX)

**THE OUTCOME:** In the future, Credentials That Work will be commissioning research on:

- How real-time labor market information is collected
- How it differs from traditional labor market data
- How it complements existing labor market services (specifically with regard to programs leading to post-secondary credentials)
- How early implementers are using real-time labor market data and systems.



## LOUISIANA'S CRAFT WORKFORCE DEVELOPMENT TASK FORCE

**THE INITIATIVE:** In 2012, the business climate in Louisiana experienced a major upturn, driven in part by the low price of natural gas. As a result, \$60 billion of plant expansions and new plants were announced, and along with that came the need for an estimated 86,300 new crafts workers by 2016. To develop a comprehensive statewide business plan to analyze this growth and to find the most efficient ways to meet these workforce needs, the Louisiana Craft Workforce Development Task Force was launched in March 2013.

**THE SPONSORS:** The task force is a public/private partnership functioning under the auspices of the Louisiana Workforce Commission's Workforce Investment Council (WIC). The initial response to the increasing demand for skilled workers was to reestablish the Craft Workforce Development Board in February 2012. A year later, as the number of stakeholders grew and the geographical scope of the study expanded, the need for a dedicated task force became clear. The task force, which issued its first comprehensive report three months after its initial meeting, consists of a chairman and 24 members and contributors from a variety of impacted groups.

**THE FUNDING MECHANISMS:** The task force is funded by the partners, including the WIC, the Craft Workforce Development Board, and the user groups. Among the latter are: Pelican Chapter of the Associated Builders and Contractors, the Departments of Education, of Public Safety and Corrections, and of Economic Development, the Louisiana Community and Technical College System (LCTCS), the Board of Regents, the AFL-CIO, and Career Compass, an educational non-profit organization dedicated to helping high school students in their post-secondary endeavors.

**THE PROGRAM:** The initial task of the task force has been to perform an in-depth analysis of the workforce situation in Louisiana. In a report presented to the WIC on June 7, 2013, the group provided an analysis of the supply and demand for craft workers, both entry-level and journeymen, examined the sources of that labor, looked at what training is available and what will be needed, and finally how best to recruit the necessary workers and fund their training. Because of the nature of the industry, the 86,300 jobs that will need to be filled comprise 35,000 new workers and 51,300 jobs that will become available through attrition, which is high in this industry, at 20 percent statewide and 14 percent nationally. The report found that, though Louisiana will have the capacity to recruit and train enough entry-level workers to meet the needs through 2016, the industry will face a shortfall of journeymen over a major portion of that period.

**THE OUTCOME:** In addition to the comprehensive report already issued by the task force, there have been a number of other accomplishments, including:

- Standardizing construction training curricula across the state to meet industry specifications.
- Prioritizing high-wage, high-demand craft training at LCTCS campuses statewide.



- The task force has partnered with the Build Your Future program, holds hiring events, and conducts outreach to high school students.
  - The task force has ensured that the curricula are streamlined, accessible, and relevant.
  - The initiative involves a wide range of stakeholders that are active participants in the program who are involved in the implementation of the strategy to address the shortage.
  - The task force forecasted the demand for craft workers using CURT's Construction Market Labor Analyzer. They also estimated the output of related training programs to understand the supply of entry-level workers.
-

- Compressing the training schedule required to achieve industry-based certification, including offering such training in the evenings and on weekends for employed workers.
- Redesigning the LCTCS curriculum to enable eligible craft students to qualify for Pell Grants.
- Enhancing relevant web sites for the LCTCS and the Louisiana Workforce Commission.
- Partnering with the National Center for Construction Education and Research in its Build Your Future program, which creates seamless links to Star Jobs, Louisiana training institutions, and hiring event.
- Preparing and distributing a flyer to high schools to promote interest in craft training as a pathway to higher-paying jobs.

## MANUFACTURING CAREERS PARTNERSHIP

**THE INITIATIVE:** The Manufacturing Careers Partnership (MCP) is a coalition of manufacturers in the metropolitan Milwaukee area who recognized the need for coordination of efforts between manufacturers, educators, and local workforce development agencies. Their goal is to address the serious region-wide lack of skilled workers, particularly welders and machinists. The MCP serves as a pipeline to ensure that programs and initiatives reach the intended audience.

**THE SPONSORS:** The initiative grew out of strategy session held in October 2011, titled “Closing the Manufacturing Skills Gap.” The session was spearheaded by the Metropolitan Milwaukee Association of Commerce (MMAC) in partnership with the Milwaukee 7, and the Waukesha County Business Alliance (WCBA). The MCP’s advisory board now includes 36 members, primarily representatives of local manufacturers but also including the WCBA, several local technical colleges and the Wisconsin Technical College System, and two workforce development agencies.

**THE FUNDING MECHANISMS:** Funding for the MCP comes from the MMAC and the Milwaukee 7, as well as from the members of the partnership.

**THE PROGRAM:** The specific purpose of the MCP is to serve as a clearinghouse for region-wide coordination between its members—manufacturers, K-12 educators, post-secondary institutions, and workforce development agencies—and a qualified and trained pool of workers to fill the needs of the industry over the next few years. To do this, the MCP hopes to:

- Align education, training, and development
- Promote career pathways and outreach
- Improve means of attracting and retaining talent

A pilot project, Welding 101, was developed to accomplish these goals. The goal of Welding 101 is to develop a stream of qualified welding talent who can demonstrate the basic welding skills and technical knowledge required of the industries in need. Local technical colleges have been surveyed to better understand how the current programs are perceived both by the industry and by students. From there, the MCP sought to determine what additional offerings and support will be needed, both in the near-term (the next three years) as well as three to five years out. The target demographics are 18- to 24-year-olds as well as workers who need retraining to re-enter the sector.

Phase 1 of the pilot program, involving primarily technical colleges, is nearing completion; phases 2 and 3, involving workforce investment boards and high schools, are underway.

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The logo for the Metropolitan Milwaukee Association of Commerce (MMAC) features the letters 'MMAC' in a large, bold, serif font. The 'M' and 'A' are dark grey, while the 'M' and 'C' are light grey.

Metropolitan Milwaukee  
Association of Commerce

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- The MCP aims to promote career pathways in the manufacturing sector as well as attract and retain talent.
  - The MCP works with its members to review and revise curricula to ensure that graduates of training programs have the skills employers demand.
  - The Partnership aims to better align education, training, and workforce development
-

**THE OUTCOME:** In May 2013, the MCP delivered a report on the outcomes of Phase 1 of the Welding 101 pilot program. The following actions will need to be taken to accomplish the three bulleted goals above:

- **Alignment:** Confirm the basic skills and technical knowledge that must be exhibited for an entry-level position; identify these competencies in the tech programs; and standardize what is being taught and how it is evaluated in the trainee.
- **Career pathways:** Identify both pathways and manufacturers' access points; provide opportunities along those pathways for outreach by manufacturers; and develop plans to fill any voids discovered in current outreach efforts.
- **Attracting/retaining talent:** Assess manufacturers' current efforts at attracting and retaining talent; identify and promote resources to improve those efforts; and connect those efforts to area schools.

## SKILLS FOR CHICAGOLAND'S FUTURE

**THE INITIATIVE:** Skills for Chicagoland's Future (SCF) is a Chicago-based public-private partnership that provides recruitment, placement, and job training services in Cook County at no cost to the employer or the job seeker. It is designed to close the workforce skills gap, drive business growth, and get unemployed residents of the county back to work

**THE SPONSORS:** In September 2012, Chicago Mayor Rahm Emanuel and Cook County Board President Toni Preckwinkle launched this signature initiative to partner with local employers in Chicago and Cook County to identify their available hiring needs and match them with qualified unemployed job seekers. SCF also accesses and coordinates government funding for customized training, so candidates have the skills necessary to deliver results from their first day on the job.

**THE FUNDING MECHANISMS:** SCF is funded by the City of Chicago, the State of Illinois, the Chicago Cook Workforce Partnership, foundation support, and multiple private sector donations, including a lead corporate gift from JP Morgan Chase Foundation. A recent gift (September 2013) of \$1.6 million from the Chicago Department of Aviation demonstrates how such donations work: in this instance, the money is to be used over the next three years specifically to connect unemployed local residents with job opportunities at companies that contract with O'Hare International Airport. The money comes from damages collected by the department from contractors who have failed to meet the requirement of the Chicago Residency Ordinance, which specifies that penalties collected must be utilized for such worker training programs.

**THE PROGRAM:** SCF's focus is to shrink the skills gap in the Chicago area and help employers find qualified, unemployed job seekers to fill available positions. To accomplish this, says the president and CEO, SCF staffers "develop close relationships with employers, learn their hiring needs and challenges, and put quality, pre-screened candidates directly in front of them quickly and efficiently." Candidates are found as they register online or apply for jobs in the area. SCF then screens them, enters them in a database used for placement consideration, and assists with training and placement efforts to match each candidate to employer need.

In December 2013, SCF organized a roundtable discussion in conjunction with recruiting and outsourcing firm Seaton, one of SCF's partners. U.S. Secretary of Labor Thomas Perez and U.S. Secretary of Commerce Penny Pritzker (formerly chairperson of SCF) were invited guests at the forum, invited to see first-hand the success of the SCF program and hear from a number of partners and board members about the value of a demand-driven approach to workforce development. As one SCF partner said in summing up the meeting, "... the era of 'train and pray' is—or should be—over."

**THE OUTCOME:** Since the September 2012 launch, SCF has helped more than 25 companies fill critical vacancies and has helped placed nearly 400 unemployed candidates into local jobs. For example, Seaton, recently recognized as America's #1 job creator among privately held companies, originally committed to hiring 170 unemployed job seekers through the program; to date, it has exceeded that goal, hiring more than 250. GoHealth, a health-care technology company based in Chicago, has plans to hire 650 employees in the coming year to augment its current staff of 907. As part of this plan, it has committed to hiring at least 200 people through Skills for Chicagoland's Future and has hired 145 unemployed Chicagoans through the initiative so far. These new employees, who have completed a "train-to-hire" program, are working as licensed insurance advisors and sales representatives. The advisors make more than \$16 an hour and take the Illinois health and life insurance exam, with the \$300 exam fee covered by GoHealth and SCF. The sales representatives make \$12 an hour.



- Through its train-to-hire program, SCF enhances the basic skills of the unemployed and bridges the skills gap
- The SCF model emphasizes greater coordination between workforce training and employers

## TECH VALLEY'S 21<sup>ST</sup> CENTURY EDUCATION AND WORKFORCE DEVELOPMENT INITIATIVE

**THE INITIATIVE:** From its major office in upstate New York's Tech Valley, GLOBALFOUNDRIES has designed a "21<sup>st</sup> Century Education and Workforce Development Initiative," which aims to bring together the most innovative practices in a large-scale regional educational laboratory. The goal is to use this platform to develop a vision of tomorrow's educational system. The scalable pilot program focuses on science, technology, engineering, and math, the so-called STEM skills, while at the same time teaching cultural understanding and global awareness and emphasizing both ongoing learning and worker re-training. Most importantly, the initiative serves as a way to "connect the dots" between all the players in this arena: students, teachers, educational institutions, government agencies, and business and industry.

**THE SPONSORS:** GLOBALFOUNDRIES, a division of Advanced Micro Devices (AMD), was created in 2008 to construct and operate a new, state-of-the-art semiconductor facility (known as "Fab 8") in Saratoga County, New York. The facility employs more than 1,200 workers, and plans are already being drawn up for additional facilities. Aware of its own growing needs for trained workers and at the request of the White House, GLOBALFOUNDRIES created a pilot program to increase the emphasis on tech-based learning that could be adapted to educational systems throughout the country.

GLOBALFOUNDRIES has teamed with the Center for Economic Growth (CEG), an organization serving the 11-county Capital Region of the state, to facilitate the initiative. CEG is a private, non-profit membership-based economic and business development organization founded in 1987 and committed to visionary, regional economic expansion. Engaging CEG as facilitator ensures clear lines of communication and equal representation between all stakeholders—educational institutions, businesses, government entities.

**THE FUNDING MECHANISMS:** In addition to support from GLOBALFOUNDRIES itself, CEG provides funding which it receives both from its members and from such agencies as the NYS Foundation for Science, Technology, and Innovation (NYSTAR), the Manufacturing Extension Partnership (MEP), and others dedicated to the success of local manufacturing and technology companies.

**THE PROGRAM:** The initiative aims to promote a more STEM-centered curriculum for students who are not served by high school programs that typically align with four-year universities. Currently, such students drift into the high-school level trade schools provided by the Board of Cooperative Educational Services (BOCES) or leave the educational system entirely. The program covers 13 counties in Upstate New York, encompassing 111 school districts falling within four BOCES regions and includes students from Pre-K through higher education. Components of the vision that guide the initiative, developed by a cross-section of stakeholders, include:

- Promoting and marketing the value of STEM education to younger students, as well as incorporating instruction in critical thinking, problem-solving skills, flexibility in thinking, and respect for cultural diversity



GLOBALFOUNDRIES®



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- Through work-based and technology-based learning tools, the initiative promotes awareness of the importance of STEM education in manufacturing.
  - The initiative promotes the adoption of tech-based learning and enhanced STEM education to increase the regional workforce's basic skills.
  - The initiative disseminates best practices regarding STEM education and promotes program coordination among its community colleges, school districts, and trade schools.
-

- Incorporating tech-focused education to a much greater degree, as well as ramping up the industry-specific curriculum currently being offered by BOCES (further empowering the BOCES programs)
- Increasing awareness of the importance of two-year colleges as a natural fit for developing the workforce needed in the high-tech industries
- Facilitating the path for students pursuing technical degrees at four-year institutions so that curricula are accessible and aligned without lowering standards
- Engaging business, industry, and governmental partners in assisting in the transition to a tech-based learning system on a national scale

**THE OUTCOME:** After three years of work, the Initiative has been officially launched with several events designed to promote the goals of the program. Teacher, student, and business “Ambassadors” have been selected to provide a physical link between the various facilities involved. GLOBALFOUNDRIES has initiated bi-monthly visits to Fab 8 by students and teachers to begin the process of engaging and exciting future workforce members. The teachers’ union, New York State United Teachers, has agreed to provide needed flexibility where possible so as to integrate innovative practices into curricula for trial purposes.

## WRTP'S CENTER OF EXCELLENCE FOR SKILLED TRADES & INDUSTRY

**THE INITIATIVE:** In 2005, the Wisconsin Regional Training Partnership (WRTP) launched the Center of Excellence for Skilled Trades & Industry, a program designed to serve as a clearinghouse to assess, prepare, and place Milwaukee residents into family-supporting jobs in the construction and manufacturing sectors. Since its inception, the Center has facilitated more than 3,000 job placements at an average wage of \$16.43 an hour.

**THE SPONSORS:** The major force behind the initiative is the WRTP, a nonprofit, highly respected workforce intermediary founded in 1992 to identify workforce needs and design training programs to meet those needs. In 2001, the WRTP began to work closely with the Building Industry Group Skilled Trades Employment (BIG STEP), which it developed to assist Milwaukee residents and underrepresented minority groups in accessing registered apprenticeship programs. These two organizations, now known as WRTP/BIG STEP, established the Center to facilitate the training and placement of candidates in high-wage jobs and, at the same time, to focus on increasing diversity in the pool of job-ready candidates.

**THE FUNDING MECHANISMS:** Initially, funding for the WRTP (and by extension the Center of Excellence) came entirely from foundations and public sources. However, as the budget has grown (from \$600,000 in 1998 to around \$2 million in 2006), the private sector now provides the largest portion of the funding (nearly 40 percent in 2006). This has come in large part from the construction industry itself, which has established collective bargaining agreements with nearly every building trade operating in metropolitan Milwaukee to provide \$0.02 per hour of employment for every union worker. The remainder of the funding continues to come from the public sector and philanthropic organizations (36 percent and 25 percent, respectively, in 2006). In 2009, funding from the American Recovery and Reinvestment Act (ARRA) provided the necessary stimulus to keep the Center staffed and functioning and has allowed the formation of two new programs, the first a one-on-one tutorial program and the second a program to set up mentoring systems for new workers.

**THE PROGRAM:** The Center exists as a single location to guide job seekers to and along the appropriate pathways to careers in the industrial sector. These assessment and placement services are also available to workers who have re-entered the workforce due to lay-offs. At the same time, the Center provides services for employers, including arranging structured on-the-job training for incumbent workers, establishing workplace mentoring networks, and providing needs assessments and recruitment strategies. Typically, the program finds out where in the economy the opportunities exist, determines what is needed to train workers to fill the jobs, and then funds the mechanism for preparing and placing workers. Because of this kind of flexibility, with the economy contracting during the recession, the Center (and WRTP/BIG STEP) was able to shift focus from helping disadvantaged workers and job seekers to assisting the increasing population of displaced workers.

**THE OUTCOME:** Several characteristics are considered central to intermediaries: (1) concentration on particular sectors in a local market; (2) a two-pronged customer base—i.e., employers and workforce; (3) an employer-driven program; (4) a focus on family-supporting jobs and clear pathways to them; and (5) strong efforts to develop deep connections within the local community and agencies. The WRTP/BIG STEP program, with the Center of Excellence at its heart, exhibits all these characteristics and has proven highly successful in its efforts. Not only has it placed a large number of workers into high-wage jobs, it has also achieved high marks for increased earnings on the first year of the job (165 percent), a worker retention rate of 70 percent, and an increase in the percentage of black and Latino workers that now mirrors the diversity rate of the community.



- WRTP/BIG STEP offers retention strategies for employers, such as workplace mentoring and positive attendance workshops.
- WRTP/BIG STEP serves as an intermediary connecting employers and workers with support services.
- Employer surveys conducted every two years by WRTP provide information for planning.







APPENDIX C  
INDUSTRY  
PROFILES

## APPENDIX C—INDUSTRY PROFILES

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As the best practices research revealed, sector-based strategies are effective means of addressing workforce challenges in a region. From the Wisconsin Regional Training Partnership to the Center for Energy Workforce Development, initiatives organized around sectors have been able to successfully engage employers, identify common needs, and mobilize resources to implement solutions.

The Greater Houston Partnership will organize councils focused on industry sectors that are its economic drivers. These sector councils will be the vehicles for employer engagement and will interface with the region's workforce training intermediaries, including Workforce Solutions, community colleges, school districts, and the many community-based organizations that offer workforce services.

The priority sector councils that the RWDTF identified are:

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**COMMERCIAL & INDUSTRIAL CONSTRUCTION**

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**OIL & GAS (UPSTREAM & MIDSTREAM)**

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**PETROCHEMICAL**

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**UTILITIES**

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**PORTS & MARITIME**

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**ADVANCED MANUFACTURING (EXCEPT PETROCHEMICAL)**

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**HEALTHCARE**

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The industry profiles that follow provide a base of knowledge and a common language to support the launch of the sector councils. For each sector council, the profiles provide a definition, a sector overview including employment trends, a list of major employers in the region, key middle skills occupations and staffing patterns, age profile of the key occupations, regional education and training programs, and regional initiatives and resources.

## ADVANCED MANUFACTURING (EXCEPT PETROCHEMICAL)

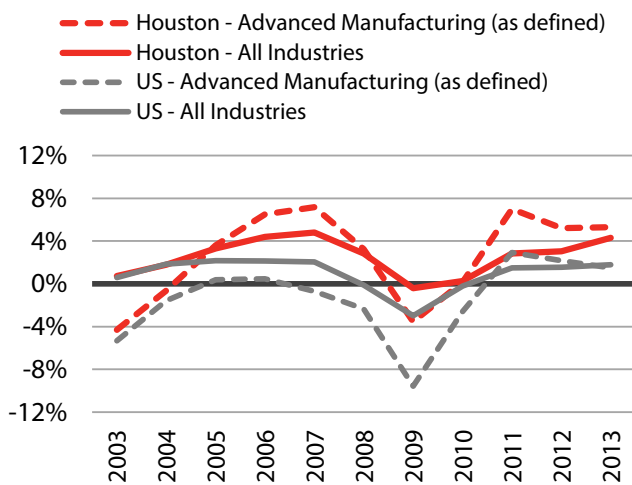


**GROWTH TRENDS:** Beyond the manufacturing activities encompassed within the Petrochemical and Ports & Maritime sectors, there are a number of

other manufacturing industries that merit attention from a workforce perspective (see *sector definition* ►). Within the broad manufacturing sector, emphasis should be placed on industries that are likely to employ advanced manufacturing processes, as these typically have higher wage levels. These industries also tend to have relatively high levels of capital investment and R&D expenditures. Although this approach cannot speak to the advanced manufacturing capacity of individual companies, it does suggest industries where these companies are likely to be found.

Employment growth in the identified NAICS codes in the 10-county Houston region has consistently outpaced these same industries at the national level. Like most industries, employment levels in advanced manufacturing declined steeply during the recession, the result of the near-global collapse of consumer markets. However, job growth in Houston rebounded quickly, returning to pre-recession growth rates by 2011.

**FIGURE 9: EMPLOYMENT TRENDS**  
% CHANGE FROM PRIOR YEAR, 2003-2013



Source: EMSI Complete Employment – 2013.2



**SECTOR DEFINITION:** The Manufacturing sector comprises establishments engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products. Advanced Manufacturing industries were identified based on an index created by TIP Strategies which scores industries on a variety of factors, including capital investment, R&D expenditures, and wages. Industries with a score of 0.80 or higher are considered likely to employ at least moderately advanced manufacturing processes. Manufacturing industries covered elsewhere in these profiles, as well as those with less than 500 jobs in the 10-county region in 2013, were excluded.

### NAICS CODE & DESCRIPTION

3344	Semiconductor/other electronic component mfg.	4.00
3254	Pharmaceutical and medicine manufacturing	2.92
3345	Navigational/measuring/control instruments mfg.	2.30
3361	Motor vehicle manufacturing	2.26
3363	Motor vehicle parts manufacturing	2.06
3341	Computer and peripheral equipment mfg.	1.93
3342	Communications equipment manufacturing	1.90
3364	Aerospace product and parts manufacturing	1.89
3391	Medical equipment and supplies manufacturing	1.22
3256	Soap, cleaning compound, and toiletries mfg.	1.19
3331	Agriculture, constr., and mining machinery mfg.	1.17
3336	Engine, turbine, and power transmission equip. mfg.	0.96
3339	Other general purpose machinery manufacturing	0.93
3311	Iron and steel mills and ferroalloy manufacturing	0.88
3399	Other miscellaneous manufacturing	0.85
3121	Beverage manufacturing	0.84
3255	Paint, coating, and adhesive manufacturing	0.83
3332	Industrial machinery manufacturing	0.82
3314	Nonferrous metal (except aluminum) prod./processing	0.81
3334	HVAC and commercial refrigeration equip. mfg.	0.80

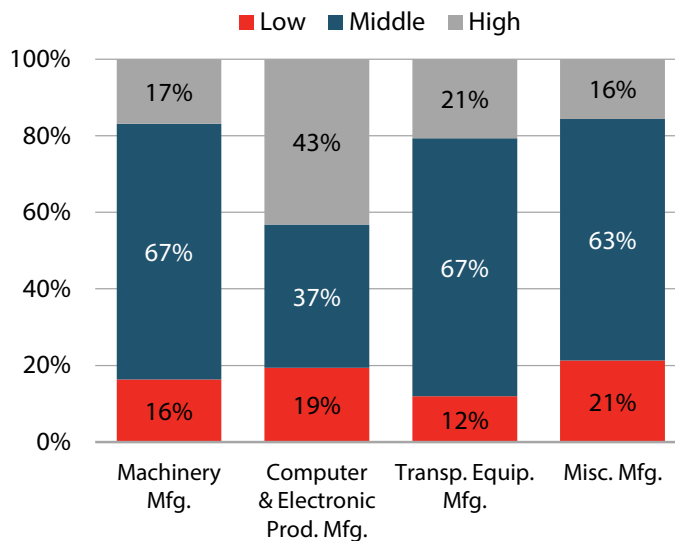


## ADVANCED MANUFACTURING (EXCEPT PETROCHEMICAL) (CONTINUED)

**MAJOR EMPLOYERS:** Many of the region’s largest manufacturers in terms of employment are connected to the Oil and Gas or Petrochemical sectors. Figure 11, below, shows 10 of the region’s largest manufacturers, excluding those linked to oil and gas exploration or chemical manufacturing, based on a list of the top 25 manufacturers identified by the *Houston Business Journal*.

**MIDDLE SKILLS:** Middle skills workers are critical to Advanced Manufacturing, accounting for as much as two-thirds of employment in some of the associated subsectors. Production Workers (categorized under SOC 51-0000) perform a range of activities, including machining, molding, painting, coating, and assembly, to create and transform parts used in the manufacturing process. Supervisors of Production Workers, as well as quality control workers, are typically middle skills positions. Computer & Electronic Product Manufacturing requires a broader mix of skill levels as these industries typically include highly technical engineering positions, as well as workers primarily engaged in the assembly of electronic components.

**FIGURE 10: SECTOR SKILLS**  
DISTRIBUTION OF SKILLS WITHIN SUBSECTORS



Source: EMSI Complete Employment – 2013.2. For this analysis, middle skills are defined as those requiring at least a high school diploma (with some level of training or work experience) but less than a four-year degree.

**FIGURE 11: LARGEST HOUSTON-AREA MANUFACTURING FIRMS**  
RANKED BY NUMBER OF LOCAL EMPLOYEES, EXCLUDING PETROCHEMICALS AND OIL & GAS RELATED MANUFACTURING

COMPANY	INDUSTRY	NUMBER OF EMPLOYEES LOCAL/TOTAL	TOTAL 2012 GROSS REV. (IN BILLIONS)
1 Hewlett-Packard Co.	Technology company	6,000/331,800	\$120.36
2 Duco Inc.	Flexible pipe	2,500/34,000	—
3 Oracle	Computer hardware and software	1,800/125,000	—
4 Toshiba International Corp.	Manufacturing	1,500/1,950	\$1.1
5 Pentair	Water, fluid, thermal management equipment	1,300/30,000	—
6 Emerson Process Management	Provider of process controls and automation technologies	1,000/34,000	—
7 Frito-Lay North America	Food and beverage, consumer goods	931/49,000	—
8 NCI Building Systems	Steel coating, components and building systems	871/4,150	—
9 Igloo Products Group	Manufacturing	800/900	—
10 Mitsubishi Caterpillar Forklift America	Forklift and lift truck manufacturing	689/1,065	—

Source: Houston Business Journal, 2014 Book of Lists.



## ADVANCED MANUFACTURING (EXCEPT PETROCHEMICAL) (CONTINUED)

**KEY OCCUPATIONS:** Team Assemblers (SOC 51-2902) are an essential part of the manufacturing process and one of the HDOs identified as part of this work. This position typically performs a variety of functions related to the assembly of a specific component or product, rather than being assigned to perform a specific tasks. They are the largest single occupation across each of the four subsectors analyzed in Figure 12, ranging from 4 percent of total employment in Computer and Electronic Products Manufacturing to 14 percent of Transportation Equipment Manufacturing Workers.

Other middle skills occupations that are prominent across multiple sectors include Quality Control Inspectors (SOC 51-9061). These workers examine products and materials for defects or deviations from specifications. This position is becoming increasingly skilled as manufacturers rely on more automated techniques, which require workers to operate and program sophisticated equipment and software applications. Other cross-cutting occupations include Machinists (SOC 51-4041), Welders (SOC 51-4121), Front-Line Supervisors (51-1011), and Management positions (SOC 11-1021).

**FIGURE 12: KEY MIDDLE SKILLS OCCUPATIONS FOR SELECTED ADVANCED MANUFACTURING SUBSECTORS**  
25 LARGEST BASED ON NATIONAL STAFFING PATTERNS, WITH HIGH DEMAND OCCUPATIONS (HDOs ►) INDICATED

HDOs	SOC CODE & DESCRIPTION	COMPUTER AND ELECTRONIC PRODUCT MFG.				TRANSP. EQUIPMENT MFG.	MISC. MFG.
		MACHINERY MFG.	COMPUTER AND ELECTRONIC PRODUCT MFG.	COMPUTER AND ELECTRONIC PRODUCT MFG.	COMPUTER AND ELECTRONIC PRODUCT MFG.	TRANSP. EQUIPMENT MFG.	MISC. MFG.
OCCUPATION'S SHARE OF TOTAL EMPLOYMENT IN SPECIFIED INDUSTRY ►							
►	51-2092 Team Assemblers	10.62	4.09	13.95	11.53		
►	51-4041 Machinists	6.59	1.25	3.38	1.98		
►	51-4121 Welders, Cutters, Solderers, and Brazers	4.92	0.61	3.24	0.62		
►	51-1011 First-Line Supervisors of Production and Operating Workers	3.31	1.86	2.94	3.58		
►	51-4011 Computer-Controlled Machine Tool Operators, Metal and Plastic	2.48	0.70	1.71	0.97		
►	51-9061 Inspectors, Testers, Sorters, Samplers, and Weighers	2.30	2.77	3.12	2.63		
	41-4012 Sales Reps., Wholesale and Mfg., Except Tech. and Scientific Products	2.30	0.97	0.75	2.42		
	51-4111 Tool and Die Makers	2.10	0.09	1.38	0.36		
►	11-1021 General and Operations Managers	1.92	2.03	1.15	2.17		
►	51-4031 Cutting, Punching, and Press Machine Workers, Metal and Plastic	1.77	0.48	1.63	1.12		
►	49-9041 Industrial Machinery Mechanics	1.57	0.37	1.07	0.25		
	51-4081 Multiple Machine Tool Workers, Metal and Plastic	1.34	0.15	1.19	0.89		
►	49-9071 Maintenance and Repair Workers, General	1.30	0.67	1.17	1.25		
	51-4033 Grinding, Lapping, and Buffing Machine Tool Workers, Metal and Plastic	1.24	0.05	0.58	0.81		
►	13-1023 Purchasing Agents, Except Wholesale, Retail, and Farm Products	1.23	1.46	1.34	0.79		
►	51-2099 Assemblers and Fabricators, All Other	1.17	0.57	3.40	3.07		
	43-3031 Bookkeeping, Accounting, and Auditing Clerks	1.09	0.85	0.48	1.39		
►	51-2041 Structural Metal Fabricators and Fitters	1.08	0.01	0.70	0.94		
	51-4122 Welding, Soldering, and Brazing Machine Workers	1.06	0.06	0.98	0.25		
	43-5061 Production, Planning, and Expediting Clerks	0.99	1.08	1.24	0.88		
	51-4072 Molding, Coremaking, and Casting Machine Workers, Metal and Plastic	0.90	0.57	0.71	1.64		
►	51-9199 Production Workers, All Other	0.73	0.36	0.86	1.41		
	17-3026 Industrial Engineering Technicians	0.57	1.41	0.78	0.58		
►	17-3023 Electrical and Electronics Engineering Technicians	0.48	3.43	0.22	0.10		
	51-9081 Dental Laboratory Technicians				5.22		

Source: EMSI Complete Employment – 2013.2; US Bureau of Labor Statistics; TIP Strategies. Top-five occupations are shaded for each subsector.  
Note: Methodology for assigning skill levels and designating HDOs (high demand occupations) is outlined on page 5.



## ADVANCED MANUFACTURING (EXCEPT PETROCHEMICAL) (CONTINUED)

**STAFFING:** As shown previously, Team Assemblers are a critical middle skills occupation for manufacturers. Our analysis of the regional staffing environment suggests that this occupation is in tight supply relative to its role in the region, although wages have not increased commensurately. By contrast, supervisors and CNC machinists are in high demand and are seeing wages rise in response. As with other sectors, the aging of the manufacturing workforce remains a challenge. This situation is most severe among Tool and Die Makers, with roughly one in three workers in the occupation aged 55 years and over. Purchasing Agents and Bookkeeping positions face similar challenges.

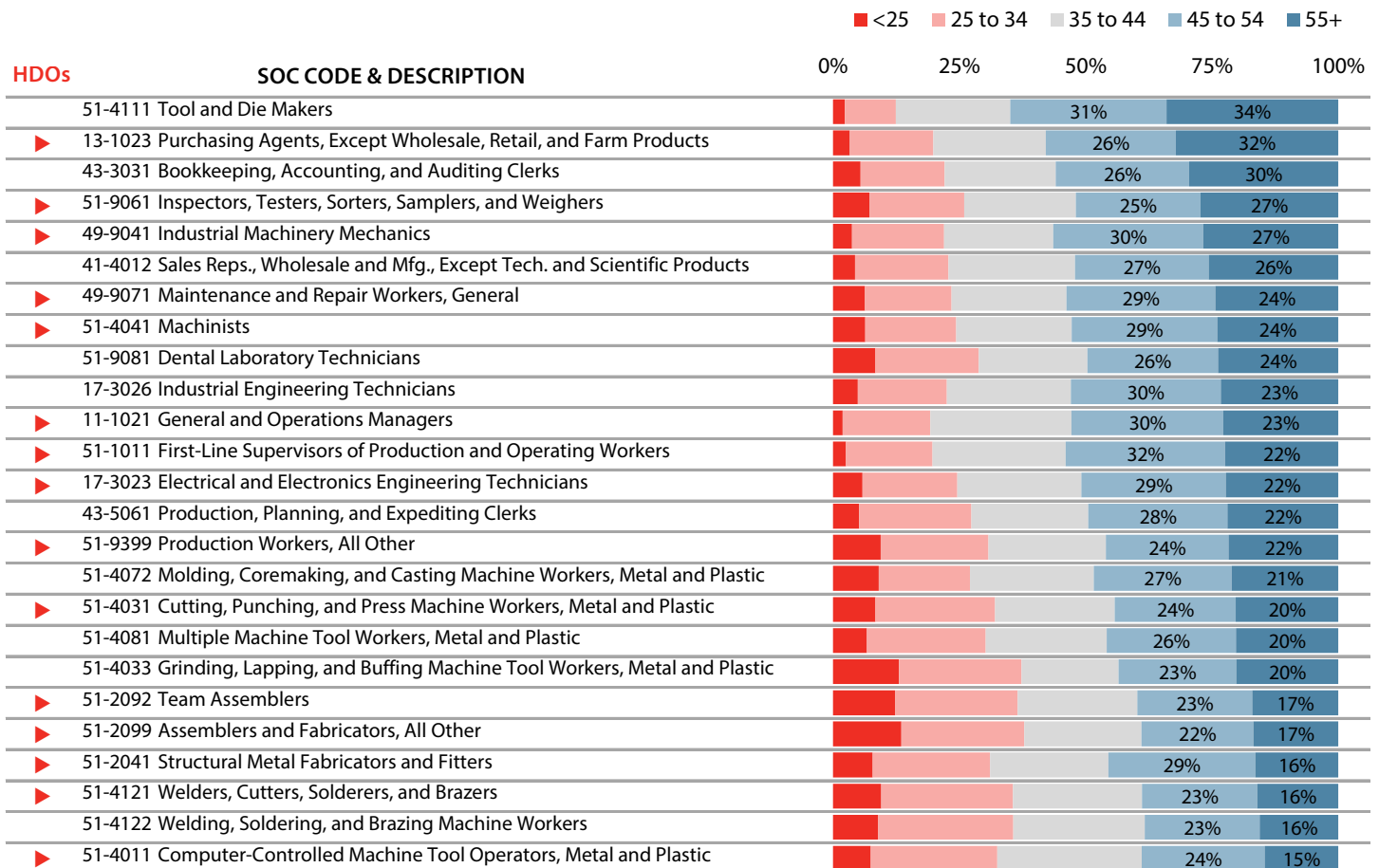
**FIGURE 13: STAFFING ENVIRONMENT FOR SELECT HOUSTON-AREA HIGH-DEMAND OCCUPATIONS**

**LEGEND:** ● Unfavorable ● Neutral ● Favorable

OCCUPATIONS	SUPPLY/ DEMAND	WAGE ENVIRONMENT
Team Assemblers	●	●
Machinists	●	●
Supervisors of Production Workers	●	●
Maintenance and Repair Workers	●	●
CNC Machine Tool Operators	●	●

Source: EMSI. See page 6 for details on the staffing environment analysis. Unfavorable signifies that demand or wages have risen more rapidly than expected. Favorable signifies that demand or wages have risen in line with national trends.

**FIGURE 14: AGE DISTRIBUTION OF WORKERS IN KEY MIDDLE SKILLS OCCUPATIONS ESTIMATED SHARE OF TOTAL EMPLOYMENT BY AGE GROUP, RANKED BY SHARE OF WORKERS AGE 55 YEARS AND OLDER**



Source: EMSI Complete Employment – 2013.2; US Bureau of Labor Statistics; TIP Strategies. Methodology for designating HDOs (high demand occupations) is outlined on page 5.





## ADVANCED MANUFACTURING (EXCEPT PETROCHEMICAL) (CONTINUED)

**EDUCATION & TRAINING:** Welding programs (CIP 48.0508) top the list of **for-credit** degrees and awards related to Manufacturing issued at regional institutions, with an average of nearly 400 completions annually during the two-year period analyzed. However, like the other sectors profiled so far, training for many of the occupations utilized during the production process is not typically undertaken as part of an academic degree program.

The region has an array of relevant **noncredit** offerings, with most schools featuring some level of training in manual machining or Computer Numeric Control (CNC) machining and welding. San Jacinto College's Non-Destructive Testing (NDT) technology program and Sheet Metal program prepare workers for general manufacturing environments, as well as those connected to energy and maritime.

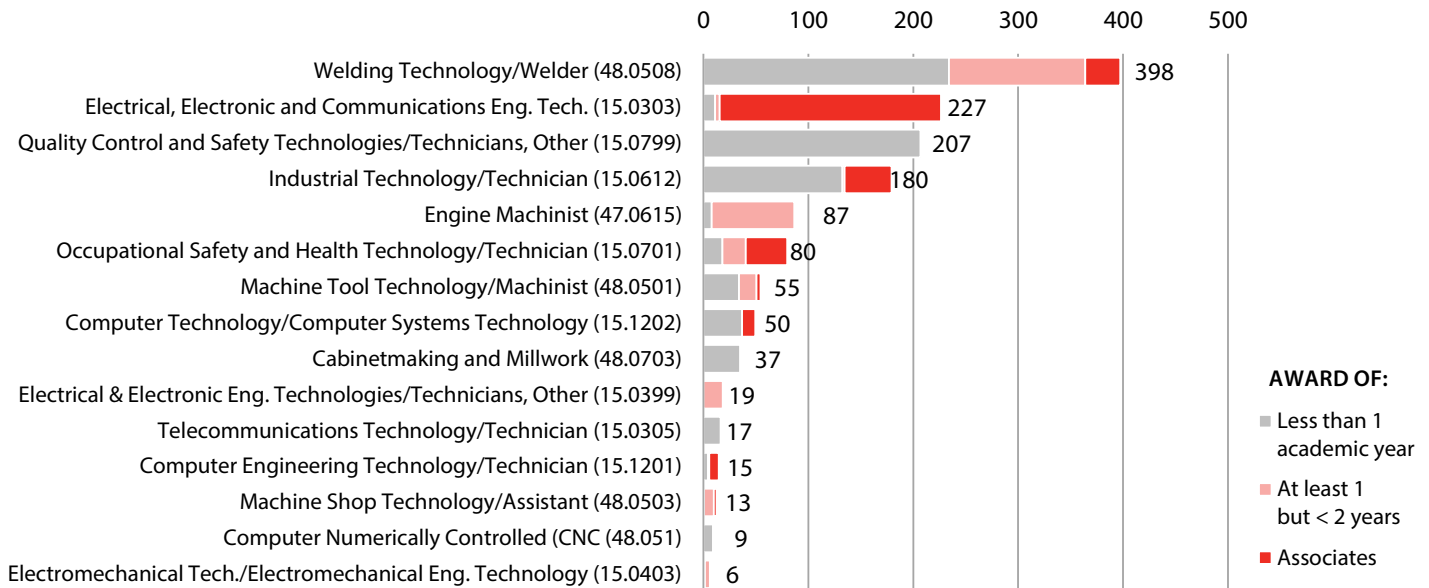
**FIGURE 15: SELECTED NONCREDIT OFFERINGS**  
MARKETABLE SKILLS ACHIEVEMENT AWARDS OFFERED IN RELATED FIELDS

**GULF COAST AREA COMMUNITY COLLEGES**

	Alvin Comm. College	Brazosport College	College of the Mainland	Galveston College	Houston Comm. College	Lee College	Lone Star College	San Jacinto College	Wharton Co. Jr. College
Machining/CNC	●		●			●	●	●	●
Industrial Maintenance			●						
Non-Destructive Testing Tech.								●	
Sheet Metal								●	
Welding	●		●		●	●	●	●	
Engineering Technician			●				●		

Source: Colleges. Data were requested from Galveston College but not received by the time of analysis. Data reflect only noncredit Marketable Skills Achievement (MSA) awards (i.e., workforce education programs consisting of 144-359 contact hours) and may not encompass all relevant activities at each college.

**FIGURE 16: EDUCATION & TRAINING COMPLETED IN RELEVANT FIELDS OF STUDY (CIP CODES)**  
TWO-YEAR AVERAGE OF AWARDS & DEGREES CONFERRED **FOR CREDIT** BY SELECTED HOUSTON-AREA INSTITUTIONS



Source: National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) surveys. Note: IPEDS data include only schools eligible to participate in federal financial aid programs. Figures represent an **average** of awards and degrees conferred at indicated levels during academic years 2011 (July 1, 2010 through June 30, 2011) and 2012 (July 1, 2011 through June 30, 2012) by public and private institutions in the 10-county Houston metropolitan area.



## ADVANCED MANUFACTURING (EXCEPT PETROCHEMICAL) (CONTINUED)

**REGIONAL INITIATIVES & RESOURCES:** The **Manufacturing Skill Standards Council** (MSSC) is an industry-led training, assessment, and certification organization focused on the core technical competencies needed by the nation's frontline production and material handling workers. MSSC certifications allow entry-level and incumbent workers to demonstrate their ability to meet industry-defined and federally endorsed national skill standards. Houston Community College recently expanded its AAS in manufacturing to include **MSSC's Certified Production Technician** (CPT) certificate. Both the CPT and the existing Certified Logistics Technician (CLT) certifications are approved by the Veterans Administration, which allows veterans to pay for training through the GI Bill. [www.msscusa.org/](http://www.msscusa.org/)

The **Lone Star Energy & Manufacturing Institute** (Lone Star EMI) collaborates with Lone Star Corporate College and the six LSC campuses to provide hands-on, competency-based technical training to businesses with employees currently working or seeking a career in the oil and gas, alternative energy, or mechanized (automated) production industries. The program operates a state-of-the-art facility at Lone Star's University Park campus, with instructors drawn from PetroEd®, Oracle, the University of Houston, and other regional and national institutions. <http://www.LoneStar.edu/EMI>

The **Automotive Youth Education Systems** (AYES) is a national "school-to-career" program that has been active in Houston for 13 years. AYES is a partnership among auto manufacturers, dealers, and selected high school/vocational schools designed to prepare students to pursue automotive careers. In addition to taking required academic courses, the program offers classroom/laboratory courses in basic automotive technology, collision repair and refinishing, or diesel technology, culminating in a 320-hour internship. Local participating companies include Mustang Caterpillar, which provides job shadowing opportunities through AYES. According to the national website, the program is active at three Houston-area colleges and 21 school districts. [www.ayes.org](http://www.ayes.org)

The Texas Workforce Commission's **Skills Development Fund** assists businesses and trade unions by financing the design and implementation of customized job training projects. This fund successfully merges business needs and local customized training opportunities into a winning formula to increase the skill levels and wages of the Texas workforce. Applicants in the Gulf Coast region received more than \$45 million in funding from the program between 1996 and 2012, according to the TWC's 2012 annual report on the fund.

[www.twc.state.tx.us/svcs/funds/sdfannrpt12.pdf](http://www.twc.state.tx.us/svcs/funds/sdfannrpt12.pdf)

Relevant industry and trade associations include:

- **East Harris County Manufacturers Association** (see description on page 75).
- The **Greater Houston Manufacturing Association** provides resources (including continuing education), facilitates networking opportunities, and advocates on behalf of area manufacturing professionals. The organization also hosts the **Gulf Coast Medical Device Manufacturers Group**. [www.houston-mfg.com](http://www.houston-mfg.com)



# COMMERCIAL & INDUSTRIAL CONSTRUCTION



**GROWTH TRENDS:** The Commercial & Industrial Construction sector (*as defined* ▶), accounted for slightly more than 200,000 jobs in 2013. Construction

employment is closely linked with economic conditions, making it highly volatile relative to many other sectors (Figure 17). The nature of the energy industry means Houston’s employment situation often runs counter to the national picture. For example, a decline in oil prices in the first part of the last decade translated into a slowdown in construction for the region while the US experienced an uptick. Likewise, rising energy costs seen in the middle of the decade fueled employment in the sector in Houston, while sharp declines were seen nationally. The end of the decade was marked by global recession and extreme tightening of credit, both of which had a dramatic impact on construction jobs. More recently, record low energy costs and an abundance of chemical feedstocks—resulting from increased use of technologies such as fracking—have spurred massive levels of business investment in the region. Although not captured in employment projections, these projects are expected to dramatically increase demand for construction workers during the next three to five years.



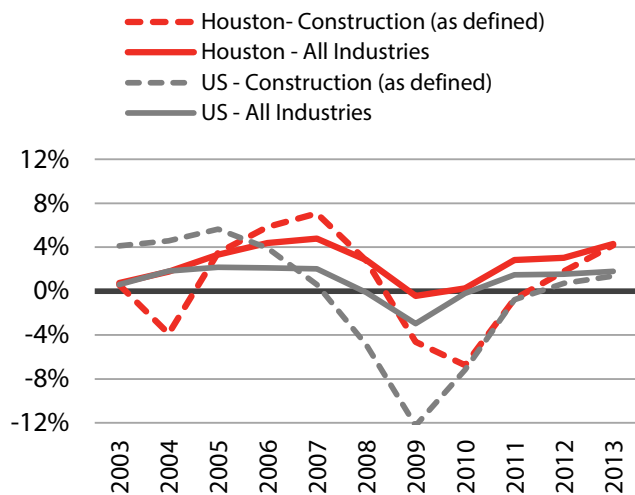
**SECTOR DEFINITION:** The Construction sector comprises establishments primarily engaged in the construction of buildings or engineering projects (e.g., highways and utility systems). Establishments primarily engaged in the preparation of sites for new construction and establishments primarily engaged in subdividing land for sale as building sites also are included in this sector.

For this work, **the sector has been narrowed to only those subsectors associated with commercial and industrial construction activities** to better isolate the middle skills needs resulting from recent business investments in the region.

## NAICS CODE & DESCRIPTION

2361	Residential Building Construction
▶ 2362	Nonresidential Building Construction
2371	Utility System Construction
2372	Land Subdivision
2373	Highway, Street, and Bridge Construction
2379	Other Heavy and Civil Engineering Construction
▶ 2381	Foundation, Structure, & Building Exterior
▶ 2382	Building Equipment Contractors
▶ 2383	Building Finishing Contractors
▶ 2389	Other Specialty Trade Contractors`

**FIGURE 17: EMPLOYMENT TRENDS**  
% CHANGE FROM PRIOR YEAR, 2003-2013



Source: EMSI Complete Employment – 2013.2

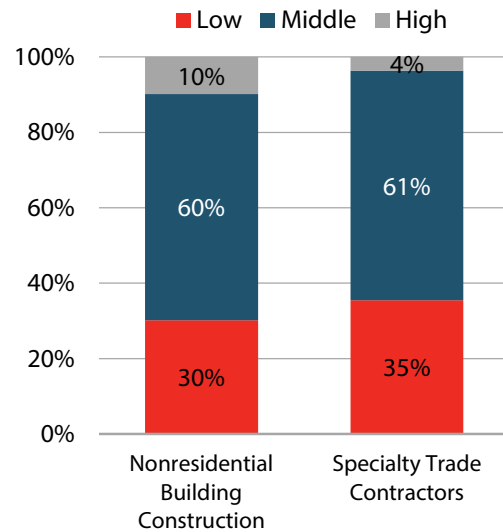


## COMMERCIAL & INDUSTRIAL CONSTRUCTION (CONTINUED)

**MAJOR EMPLOYERS:** An annual ranking of contractors and specialty contractors in Texas and Louisiana prepared by *Engineering News Record* reveals that Houston is home to some of the region's largest contractors (Figure 19). With more than \$1 billion in revenue in 2012 S&B Engineers and Constructors ranked fourth overall in the region.

**MIDDLE SKILLS:** Middle skills occupations are critical to the success of the region's Construction sector. These occupations comprise roughly 60 percent of total employment in each of the nonresidential subsectors analyzed (Figure 18). Middle skills construction occupations include Carpenters, Construction Managers, and skilled tradespeople, such as Plumbers and Electricians. Many of these occupations are among the largest in terms of the percentage they comprise of total employment (see Figure 20, next page).

**FIGURE 18: SECTOR SKILLS**  
DISTRIBUTION OF SKILLS WITHIN SUBSECTORS



Source: EMSI Complete Employment – 2013.2. For this analysis, middle skills are defined as those requiring at least a high school diploma (with some level of training or work experience), but less than a four-year degree.

**FIGURE 19: COMMERCIAL & INDUSTRIAL CONSTRUCTION MAJOR EMPLOYERS**

HOUSTON AREA'S LARGEST CONTRACTORS/SPECIALTY CONTRACTORS (BY ESTIMATED ANNUAL REVENUE AT HOME AND ABROAD IN 2012)

2013 ENR RANK	COMPANY	MARKET SECTORS (PERCENT OF REVENUE)	REGIONAL REV. 2012 (\$MILLIONS)
<b>TOP CONTRACTORS</b>			
4	S&B Engineers and Constructors Ltd.	Petroleum (100%)	\$1,044.45
6	Webber LLC	Transportation (100%)	\$735.00
7	David E. Harvey Builders Inc.	General Building (70%); Interiors (30%)	\$690.10
9	Gilbane Building Co.	General Building (90%); Interiors (10%)	\$652.42
10	Manhattan Construction Group	General Building (88%); Transportation (12%)	\$535.64
<b>TOP SPECIALTY CONTRACTORS</b>			
6	Orion Marine Group Inc.	Marine Construction (100%)	\$292.04
7	Baker Concrete Construction Inc.	Concrete (100%)	\$221.54
8	Keystone Concrete Placement	Concrete (95%); Sitework/Excavation/Fndtn (3%); Plumbing (1%)	\$207.00
9	Fisk Electric Co.	Electrical (100%)	\$202.44
13	Team Industrial Services Inc.	Industrial Services (100%)	\$166.60

Source: *Engineering News Record*, "Texas & Louisiana Top Contractors" (August 19, 2013), and "Texas & Louisiana Top Specialty Contractors" (October 14, 2013). 2013 rankings are based on construction contracting-specific revenue compiled from annual surveys and reflect ranking in Texas/Louisiana region.



## COMMERCIAL & INDUSTRIAL CONSTRUCTION (CONTINUED)

**KEY OCCUPATIONS:** Figure 20 shows which middle skills occupations are typically employed by each subsector based on staffing patterns compiled by the US Bureau of Labor Statistics. Carpenters are the largest occupation employed by nonresidential building construction firms, accounting for nearly 17 percent of the total workforce for this subsector. For specialty trade contractors, Electricians are the largest single middle skills occupation, comprising one out of every 10 employees (or roughly 10 percent of the total).

Other middle skills occupations that represent a large share of total employment in construction include First-Line Supervisors, Construction Managers, and Plumbers. In addition to those mentioned, a number of the high-demand occupations (HDOs) identified as part of this planning process are among the top-25 middle skills occupations employed in nonresidential building construction and specialty trade contractors. Examples include Welders, general industrial Maintenance Workers, and Truck Drivers.

**FIGURE 20: KEY MIDDLE SKILLS OCCUPATIONS FOR SELECTED COMMERCIAL & IND. CONSTRUCTION SUBSECTORS**  
25 LARGEST BASED ON NATIONAL STAFFING PATTERNS, WITH HIGH DEMAND OCCUPATIONS (HDOs ▶) INDICATED

↓ SOC CODE & DESCRIPTION		SPECIALTY TRADE CONTRACTORS	NONRESIDENTIAL BUILDING CONSTRUCTION
HDOs	OCCUPATION'S SHARE OF TOTAL EMPLOYMENT IN SPECIFIED INDUSTRY →		
▶	47-2111 Electricians	10.31	1.20
▶	47-2152 Plumbers, Pipefitters, and Steamfitters	6.74	2.48
▶	49-9021 Heating, Air Conditioning, and Refrigeration Mechanics and Installers	4.78	0.07
▶	47-2031 Carpenters	4.69	16.50
▶	47-1011 First-Line Supervisors of Construction Trades and Extraction Workers	4.49	11.02
▶	47-2073 Operating Engineers and Other Construction Equipment Operators	2.54	2.05
▶	11-1021 General and Operations Managers	2.30	2.97
	47-2211 Sheet Metal Workers	2.23	0.51
	43-3031 Bookkeeping, Accounting, and Auditing Clerks	1.91	1.75
▶	11-9021 Construction Managers	1.74	7.97
	47-2021 Brickmasons and Blockmasons	1.35	0.64
▶	53-3032 Heavy and Tractor-Trailer Truck Drivers	1.26	0.58
	41-4012 Sales Reps., Wholesale and Mfg., Except Tech. and Scientific Products	1.10	0.34
	47-2121 Glaziers	0.89	
	47-2221 Structural Iron and Steel Workers	0.86	2.00
	49-2022 Telecommunications Equip. Installers and Repairers, Except Line Installers	0.75	
▶	49-1011 First-Line Supervisors of Mechanics, Installers, and Repairers	0.72	0.26
	47-2132 Insulation Workers, Mechanical	0.70	0.12
	49-9052 Telecommunications Line Installers and Repairers	0.65	
▶	51-4121 Welders, Cutters, Solderers, and Brazers	0.55	1.18
▶	49-9098 Helpers--Installation, Maintenance, and Repair Workers	0.53	0.19
	43-1011 First-Line Supervisors of Office and Administrative Support Workers	0.50	0.53
▶	49-9071 Maintenance and Repair Workers, General	0.40	0.79
	43-6011 Executive Secretaries and Executive Administrative Assistants	0.38	0.83
	49-9044 Millwrights	0.36	0.79

Source: EMSI Complete Employment – 2013.2; US Bureau of Labor Statistics; TIP Strategies. Top-five occupations are shaded for each subsector.

Note: Methodology for assigning skill levels and designating HDOs (high demand occupations) is outlined on page 5.



## COMMERCIAL & INDUSTRIAL CONSTRUCTION (CONTINUED)

**STAFFING:** Like many “blue collar” industries, the construction workforce is aging. For 11 of the key middle skills occupations shown in Figure 22, at least one-half of the workforce is 45 years or older. Although a number of these occupations require little preparation for entry-level work, the loss of an experienced workforce will create challenges as employers seek to replace workers exiting the labor force while also hiring to meet new demand. These challenges are compounded by the fact that a number of key occupations in the sector are identified as currently “hard to fill” in terms of the staffing environment in the Houston area. (See page 6 for details on the staffing environment analysis.)

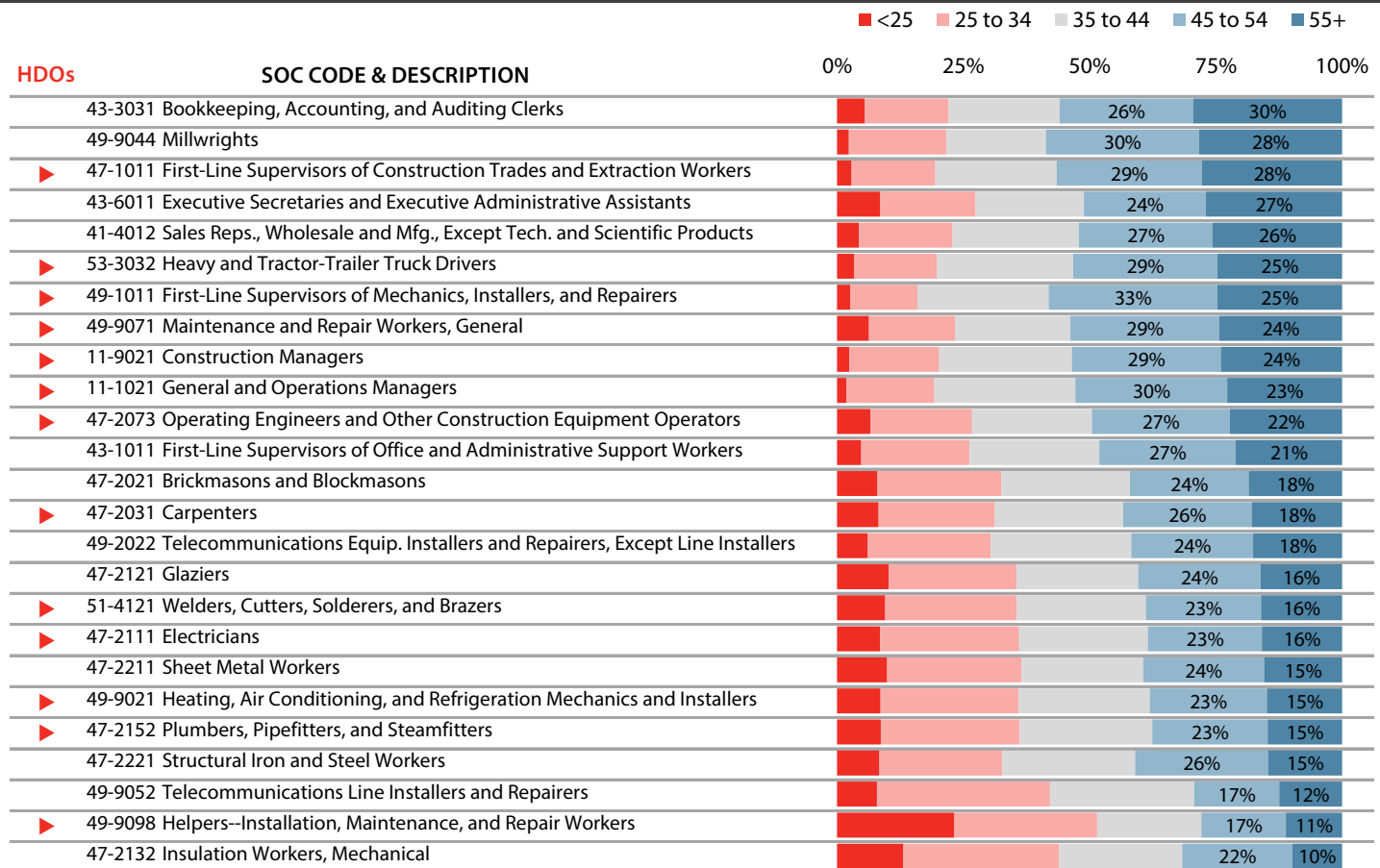
**FIGURE 21: STAFFING ENVIRONMENT FOR SELECT HOUSTON-AREA HIGH-DEMAND OCCUPATIONS**

**LEGEND:** ● Unfavorable ● Neutral ● Favorable

OCCUPATIONS	SUPPLY/ DEMAND	WAGE ENVIRONMENT
General and Operations Managers	●	●
Welders, Cutters, Solderers, & Brazers	●	●
Plumbers, Pipefitters, & Steamfitters	●	●
Electricians	●	●
Construction Managers	●	●

Source: EMSI. See page 6 for details on the staffing environment analysis. Unfavorable signifies that demand or wages have risen more rapidly than expected. Favorable signifies that demand or wages have risen in line with national trends.

**FIGURE 22: AGE DISTRIBUTION OF WORKERS IN KEY MIDDLE SKILLS OCCUPATIONS ESTIMATED SHARE OF TOTAL EMPLOYMENT BY AGE GROUP, RANKED BY SHARE OF WORKERS AGE 55 YEARS AND OLDER**



Source: EMSI Complete Employment – 2013.2; US Bureau of Labor Statistics; TIP Strategies. Methodology for designating HDOs (high demand occupations) is outlined on page 5.



## COMMERCIAL & INDUSTRIAL CONSTRUCTION (CONTINUED)

**EDUCATION & TRAINING:** The nonresidential Construction sector is part of the Architecture & Construction career cluster identified by the US Department of Education. An analysis of degrees and awards conferred **for credit** by higher education institutions in the 10-county Houston area in this cluster points to a relatively small supply of trained graduates to meet demand in this field (Figure 24).

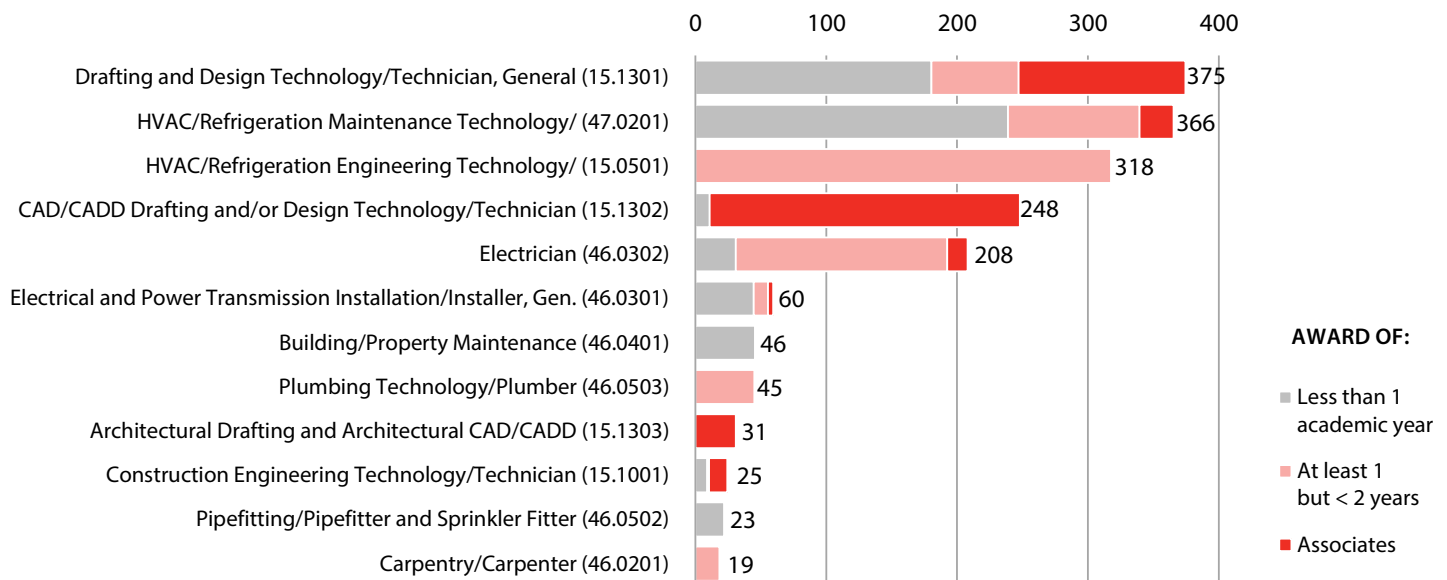
However, like many middle skills occupations, construction jobs may require only graduation from a certificate program (noncredit), on-the-job training, or apprenticeships. Figure 23 provides an indication of the types of noncredit training available in the area.

**FIGURE 23: SELECTED NONCREDIT OFFERINGS**  
MARKETABLE SKILLS ACHIEVEMENT AWARDS OFFERED IN RELATED FIELDS

	GULF COAST AREA COMMUNITY COLLEGES								
	Alvin Comm. College	Brazosport College	College of the Mainland	Galveston College	Houston Comm. College	Lee College	Lone Star College	San Jacinto College	Wharton Co.-Jr. College
Electrical & Power Transmission Installation/Installers			●			●			
HVAC & Refrigeration Engineering Technology/Tech.			●		●			●	
Pipefitting			●			●		●	
Painter & Wall Coverer						●			
Drafting/CAD/CADD	●		●			●	●	●	
Welding	●		●		●	●	●	●	

Source: Colleges. Data were requested from Galveston College but not received by the time of analysis. Data reflect only noncredit Marketable Skills Achievement (MSA) awards (i.e., workforce education programs consisting of 144-359 contact hours) and may not encompass all relevant activities at each college.

**FIGURE 24: EDUCATION & TRAINING COMPLETED IN RELEVANT FIELDS OF STUDY (CIP CODES)**  
TWO-YEAR AVERAGE OF AWARDS & DEGREES CONFERRED **FOR CREDIT** BY SELECTED HOUSTON-AREA INSTITUTIONS



Source: National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) surveys. Note: IPEDS data include only schools eligible to participate in federal financial aid programs. Figures represent an **average** of awards and degrees conferred at indicated levels during academic years 2011 (July 1, 2010 through June 30, 2011) and 2012 (July 1, 2011 through June 30, 2012) by public and private institutions in the 10-county Houston metropolitan area.



## COMMERCIAL & INDUSTRIAL CONSTRUCTION (CONTINUED)

**REGIONAL INITIATIVES & RESOURCES:** Several industry organizations have made creating and maintaining a sustainable workforce a key focus in their strategic initiatives. Those initiatives include:

Associated General Contractors (AGC), Houston Chapter – The centerpiece strategy of AGC Houston was the creation of the **Construction Career Collaborative (C3)**. C3, recently classified by the IRS as a 501(c) 3 organization, is a voluntary alliance of owners, contractors, specialty contractors and industry related trade organizations working to address the growth of a sustainable workforce for the construction industry in Houston. The goal of the initiative is to encourage users of construction services (owners, architects and developers) and construction employers to commit to specific standards aimed at creating a career path within the industry.

The initiative's three areas of focus are: financial security (including hourly pay with overtime, payment of unemployment taxes and social security contributions, and the provision of workers' compensation insurance), safety training, and craft training. [www.agchouston.org](http://www.agchouston.org)  
[www.constructioncareercollaborative.org/](http://www.constructioncareercollaborative.org/)

The Greater Houston Chapter of Associated Builders and Contractors initiatives include:

- The **Construction & Maintenance Education Foundation (CMEF)** serves the workforce development needs of the contractor community through programs ranging from craft and safety training to management and leadership instruction. CMEF is accredited by the National Center for Construction Education and Research (NCCER), and uses the nationally standardized NCCER curriculum. [www.abchouston.org/CMEF.aspx](http://www.abchouston.org/CMEF.aspx)
- Formed in 2006 as a joint effort between Associated Builders and Contractors (ABC), Construction & Maintenance Education Foundation (CMEF) and Houston Business Roundtable (HBR), the **Construction Careers Youth Committee** promotes and supports construction workforce

education at public schools.

[www.abchouston.org/CMEF/Construction\\_Careers\\_Initiative.aspx](http://www.abchouston.org/CMEF/Construction_Careers_Initiative.aspx)

**The Houston Area Urban League** provides clients with job readiness and job search services. Occupation skills training is provided through National Center for Construction Education and Research (NCCER) Basic Apprentice Trades Construction training and certification. Upon training completion and certification, job placement assistance and support services are provided. [www.haul.org](http://www.haul.org)

The **ACE Mentor Program** informs high school students about career opportunities in ACE fields (architecture, construction, and engineering) and provides opportunities to interact with ACE professionals. Student teams work directly with professionals as they design hypothetical projects, tour local construction sites, and visit local offices of ACE firms. Many students form positive relationships with industry professionals who can provide important references for obtaining college admissions, scholarships, internships and full-time employment. The program is in its sixth year in the Houston area and is offered through ACE Houston. [www.acementor.org/index.php/affiliates/texas/houston/about-us/](http://www.acementor.org/index.php/affiliates/texas/houston/about-us/)



PHOTO CREDIT: GOING UP! [WWW.GOINGUPCITY.BLOGSPOT.COM](http://WWW.GOINGUPCITY.BLOGSPOT.COM)





## COMMERCIAL & INDUSTRIAL CONSTRUCTION (CONTINUED)

### REGIONAL INITIATIVES & RESOURCES (CONTINUED):

**SkillsUSA**, formerly known as VICA (Vocational Industrial Clubs of America), is a national nonprofit organization serving teachers and high school and college students who are preparing for careers in trade, technical, and skilled-service occupations, including health occupations

**Capital IDEA-Houston** provides community college education and case management services for low-income participants desiring to improve their family economic situation. It is an academic sponsorship program for low-income adults wanting to get into a great career but unable to pay for the necessary training. The program focuses on professional trades (such as electrician, HVAC, welding, plant operator, engineering technology, instrument and control technician) and healthcare occupations. [www.capitalideahouston.org](http://www.capitalideahouston.org)

**SER-Jobs for Progress** offers a variety of training programs in construction and skilled trades including welding, forklift operation, weatherization, energy analyst, HVAC technician, and NCCER's multi-level core construction training. Founded in 1965 through the combined efforts of the League of United Latin American Citizens (LULAC), the GI Forum, and the Department of the Navy, SER began as a volunteer job bank for Hispanic Veterans and is now a nationwide network of 42 affiliates operating in over 200 offices. [www.serhouston.org/](http://www.serhouston.org/)

**Pipe Fitters Local Union 211-JATC Apprentice School** offers training in pipefitter, welding and HVAC service to qualified candidates. Apprentices receive compensation during their five-year apprenticeship. Upon successful completion, an apprentice can become a journeyman and obtain top-scale pay.

[www.pipefitterslocal211.com/jatc-apprentice-school/](http://www.pipefitterslocal211.com/jatc-apprentice-school/)

The **Houston Electrical Training Center** provides an apprenticeship and education program for individuals desiring a career in the electrical construction industry. The program is registered with the US Department of Labor. The Training Center also offers various courses to journeyman electricians, to teledata technicians, and to others who have not yet reached journeyman level.

In all, there are 16 joint **apprenticeship programs** offered for construction trades in the Houston area. A listing of these and other programs can be found at: [www.doleta.gov/oa/](http://www.doleta.gov/oa/)

Other relevant trade and industry associations include:

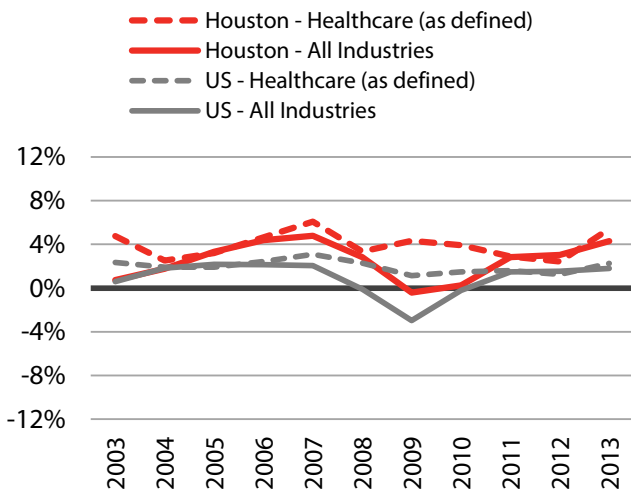
- The **American Subcontractors Association—Houston Chapter** advocates for legislative reform and provides educational opportunities for the subcontracting community. [www.asahouston.org/](http://www.asahouston.org/)
- **Independent Electrical Contractors (IEC) Texas Gulf Coast Chapter** represents more than 2,000 journeyman electricians, associates, and engineers in the Houston area. <http://www.iectxgulfcoast.org/>

## HEALTHCARE



**GROWTH TRENDS:** Healthcare continues to be an important part of the Houston-area economy. In 2013, the sector (as defined ►) employed nearly 300,000 workers in the 10-county metropolitan area. Employment in this sector is closely tied to population growth and, as such, tends to be far less volatile than some of the others sectors profiled. This effect can be seen in Figure 25 which shows that Houston-area job growth in Healthcare increased steadily throughout the recession, outperforming national growth trends in the sector and total employment across industries in the region. The region's continued population growth, coupled with an improving national economic picture, a rebound in commercial real estate lending, and implementation of the Affordable Care Act, have translated into a surge of healthcare-related investments. Recent projects include a number of medical office buildings, as well as the expansion of several of the region's largest healthcare systems, including major construction projects planned for Houston Methodist, Memorial Hermann, and Texas Children's Hospital.

**FIGURE 25: EMPLOYMENT TRENDS**  
% CHANGE FROM PRIOR YEAR, 2003-2013



Source: EMSI Complete Employment – 2013.2



**SECTOR DEFINITION:** This sector includes establishments providing medical care on both an outpatient basis (through practitioners' offices, diagnostic clinics, and home health services) and inpatient basis (via general and specialty hospitals), as well as those providing residential care (which combines healthcare and social assistance). For this work, the distribution and sales of health-related products, including biological, botanical, and pharmaceutical products intended for internal and external consumption are also included.

### NAICS CODE & DESCRIPTION

4242	Drugs and druggists' sundries merchant wholesalers
4461	Health and personal care stores
6211	Offices of physicians
6212	Offices of dentists
6213	Offices of other health practitioners
6214	Outpatient care centers
6215	Medical and diagnostic laboratories
6216	Home health care services
6219	Other ambulatory health care services
6221	General medical and surgical hospitals
6222	Psychiatric and substance abuse hospitals
6223	Specialty (except psychiatric/substance abuse) hospitals
6231	Nursing care facilities
6232	Residential mental retardation, mental health, and substance abuse facilities

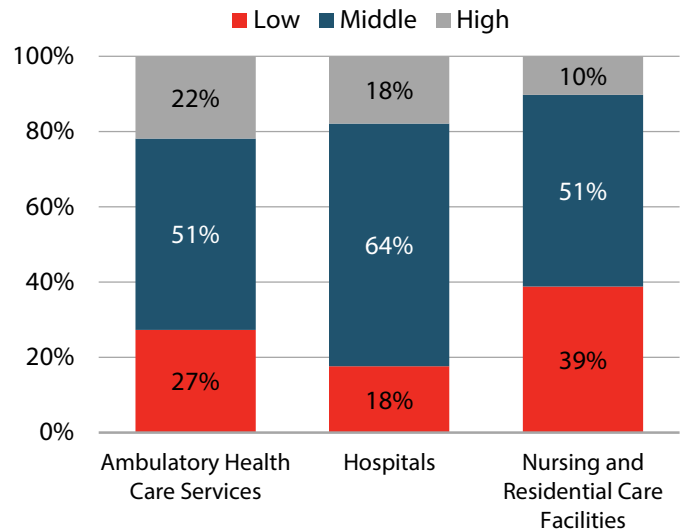


## HEALTHCARE (CONTINUED)

**MAJOR EMPLOYERS:** At the heart of Houston’s medical success story is the Texas Medical Center, considered to be the largest medical center in the world. This massive complex includes 54 organizations employing more than 100,000 people and serving more than 7 million patients annually. In addition, the Houston region is home to a number of major healthcare systems, the largest of which (ranked by number of licensed beds) are shown in Figure 27.

**MIDDLE SKILLS:** Healthcare industries are typically defined based on the educational degree held by the practitioners included in the industry (e.g., doctors, surgeons, chiropractors, dentists). Yet, the bulk of employment in this sector is comprised of middle skills workers. In fact, these occupations represent more than one-half of total employment across all the major subsectors for healthcare. The share of middle skills workers is highest in hospital settings where they account for nearly two out of every three jobs (64 percent).

**FIGURE 26: SECTOR SKILLS**  
DISTRIBUTION OF SKILLS WITHIN SUBSECTORS



Source: EMSI Complete Employment – 2013.2. For this analysis, middle skills are defined as those requiring at least a high school diploma (with some level of training or work experience), but less than a four-year degree.

**FIGURE 27: LARGEST HOUSTON-AREA HEALTHCARE SYSTEMS**  
RANKED BY NUMBER OF LICENSED BEDS IN THE HOUSTON AREA

HEALTHCARE SYSTEMS	# LICENSED BEDS IN HOUSTON AREA	# HOSPITALS IN HOUSTON/IN SYSTEM	HQ LOCATION/YEAR FOUNDED/OWNER OR PARENT COMPANY
1 Memorial Hermann Healthcare System	3,768	11 / 11	Houston / 1907 / Nonprofit
2 HCA Gulf Coast Division	2,549	9 / 162	Nashville, TN / 1988 / Hospital Corp. of America Inc.
3 Houston Methodist	2,139	5 / 5	Houston / 1919 / Nonprofit
4 St. Luke’s Episcopal Health System	1,301	6 / 6	Houston / 1954/ Episcopal Diocese of Texas
5 Tenet Healthcare Corp.	1,120	4 / 49	Dallas / 1973 / Tenet Healthcare
6 Kindred Healthcare Inc.	1,103	15 / 131	Louisville, KY / 1991 / Kindred Healthcare Inc.
7 Harris Health System*	963	3 / 3	Houston / 1966 / Harris County
8 St. Joseph Medical Center	792	2 / 22	Franklin, TN / 1887 / Physician partnership
9 Texas Children’s Hospital	648	3 / 3	Houston / 1954 / Nonprofit
10 UT Medical Branch Health System	631	1 / 1	Houston / 1941 / The University of Texas System

Source: Houston Business Journal, 2014 Book of Lists. \*Formerly Harris County Hospital District.



## HEALTHCARE (CONTINUED)

**KEY OCCUPATIONS:** As might be expected, Registered Nurses (RNs) and Licensed Vocational Nurses (LVNs) comprise a significant share of healthcare workers. RNs and LVNs combined make up nearly one-third (31.1 percent) of total employment in the Hospitals subsector. Nursing Assistants are also an essential part of staffing for hospitals, but the position plays a much more significant role in residential settings where they represent one in four jobs (25.8 percent). When RNs and LVNs are added in, the share that nursing comprises of total employment in nursing and residential care facilities rises to 40 percent. Beyond nursing positions, the only middle skills occupations that fall into the top-25 key occupations for this subsector are Maintenance Workers and Residential Advisors. The latter occupation is typically responsible for ordering supplies and determining and arranging needed maintenance and repairs. Secretarial and Assisting positions take on a more prominent role among Ambulatory Healthcare Service Providers, a subsector which includes services offered on an outpatient basis, such as doctors' offices, laboratories, and diagnostic centers.

**FIGURE 28: KEY MIDDLE SKILLS OCCUPATIONS FOR SELECTED HEALTHCARE SUBSECTORS**  
25 LARGEST BASED ON NATIONAL STAFFING PATTERNS, WITH HIGH DEMAND OCCUPATIONS (HDOs ►) INDICATED

HDOs	↓ SOC CODE & DESCRIPTION		AMBULATORY HEALTH CARE SERVICES		HOSPITALS		NURSING AND RESIDENTIAL CARE FACILITIES	
	OCCUPATION'S SHARE OF TOTAL EMPLOYMENT IN SPECIFIED INDUSTRY →							
►	29-1141	Registered Nurses	7.30		28.64		5.78	
►	31-9092	Medical Assistants	6.89		1.36		0.36	
	43-6013	Medical Secretaries	5.40		2.46		0.23	
►	31-9091	Dental Assistants	4.55		0.04			
►	29-2061	Licensed Practical and Licensed Vocational Nurses	3.08		2.48		8.46	
►	29-2021	Dental Hygienists	2.96		0.01		0.00	
	43-1011	First-Line Supervisors of Office and Administrative Support Workers	2.10		0.79		0.38	
►	29-2041	Emergency Medical Technicians and Paramedics	1.87		0.69		0.01	
►	31-1014	Nursing Assistants	1.56		6.51		25.81	
►	29-2034	Radiologic Technologists	1.04		2.08			
►	29-2012	Medical and Clinical Laboratory Technicians	1.02		1.25		0.03	
►	29-2071	Medical Records and Health Information Technicians	0.93		1.28		0.52	
	31-9097	Phlebotomists	0.89		0.72			
►	11-1021	General and Operations Managers	0.71		0.31		0.76	
	31-2021	Physical Therapist Assistants	0.63		0.33		0.27	
	29-2099	Health Technologists and Technicians, All Other	0.55		0.74			
	29-2055	Surgical Technologists	0.41		1.20			
	21-1011	Substance Abuse and Behavioral Disorder Counselors	0.37		0.15		0.61	
	29-2032	Diagnostic Medical Sonographers	0.34		0.61			
	29-2031	Cardiovascular Technologists and Technicians	0.16		0.68			
►	29-2052	Pharmacy Technicians	0.16		1.04		0.02	
►	49-9071	Maintenance and Repair Workers, General	0.13		0.65		1.36	
	29-1126	Respiratory Therapists	0.12		1.67		0.15	
	29-2053	Psychiatric Technicians	0.05		0.66		0.19	
	39-9041	Residential Advisors	0.02		0.02		1.27	

Source: EMSI Complete Employment – 2013.2; US Bureau of Labor Statistics; TIP Strategies. Top-five occupations are shaded for each subsector.

Note: Methodology for assigning skill levels and designating HDOs (high demand occupations) is outlined on page 5



## HEALTHCARE (CONTINUED)

**STAFFING:** The staffing environment analysis suggests that demand is fairly balanced for RNs in the region. However, this may be a reflection of the mismatch between educational requirements and employer preference (see next page). Occupations in short supply include LVNs, medical records technicians, and pharmacy technicians. The aging of Texas nursing workforce has been a topic of concern for several years. According to an April 2013 report by the federal Health Resources and Services Administration, more than 1 million RNs will reach retirement age within the next 10 to 15 years. Shortages are predicted to be felt most keenly in the southern and western US.

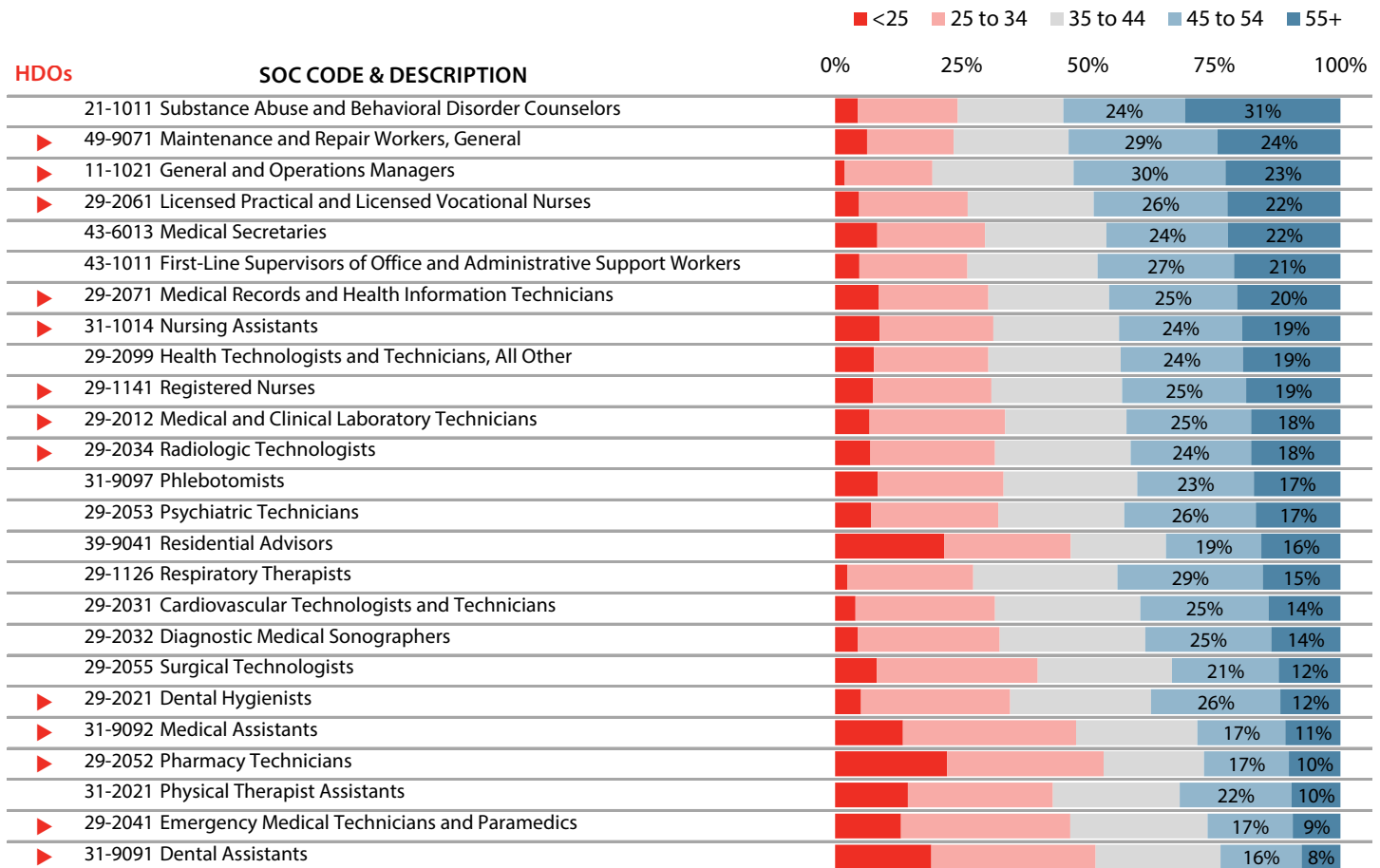
**FIGURE 29: STAFFING ENVIRONMENT FOR SELECT HOUSTON-AREA HIGH-DEMAND OCCUPATIONS**

**LEGEND:** ● Unfavorable ● Neutral ● Favorable

OCCUPATIONS	SUPPLY/ DEMAND	WAGE ENVIRONMENT
Licensed Practical/Vocational Nurses	● Unfavorable	● Neutral
Registered Nurses	● Neutral	● Unfavorable
Medical Records/Health Info. Techs.	● Unfavorable	● Neutral
Dental Hygienists	● Neutral	● Neutral
Pharmacy Technicians	● Unfavorable	● Favorable

Source: EMSI. See page 6 for details on the staffing environment analysis. Unfavorable signifies that demand or wages have risen more rapidly than expected. Favorable signifies that demand or wages have risen in line with national trends.

**FIGURE 30: AGE DISTRIBUTION OF WORKERS IN KEY MIDDLE SKILLS OCCUPATIONS ESTIMATED SHARE OF TOTAL EMPLOYMENT BY AGE GROUP, RANKED BY SHARE OF WORKERS AGE 55 YEARS AND OLDER**



Source: EMSI Complete Employment – 2013.2; US Bureau of Labor Statistics; TIP Strategies. Methodology for designating HDOs (high demand occupations) is outlined on page 5.



## HEALTHCARE (CONTINUED)

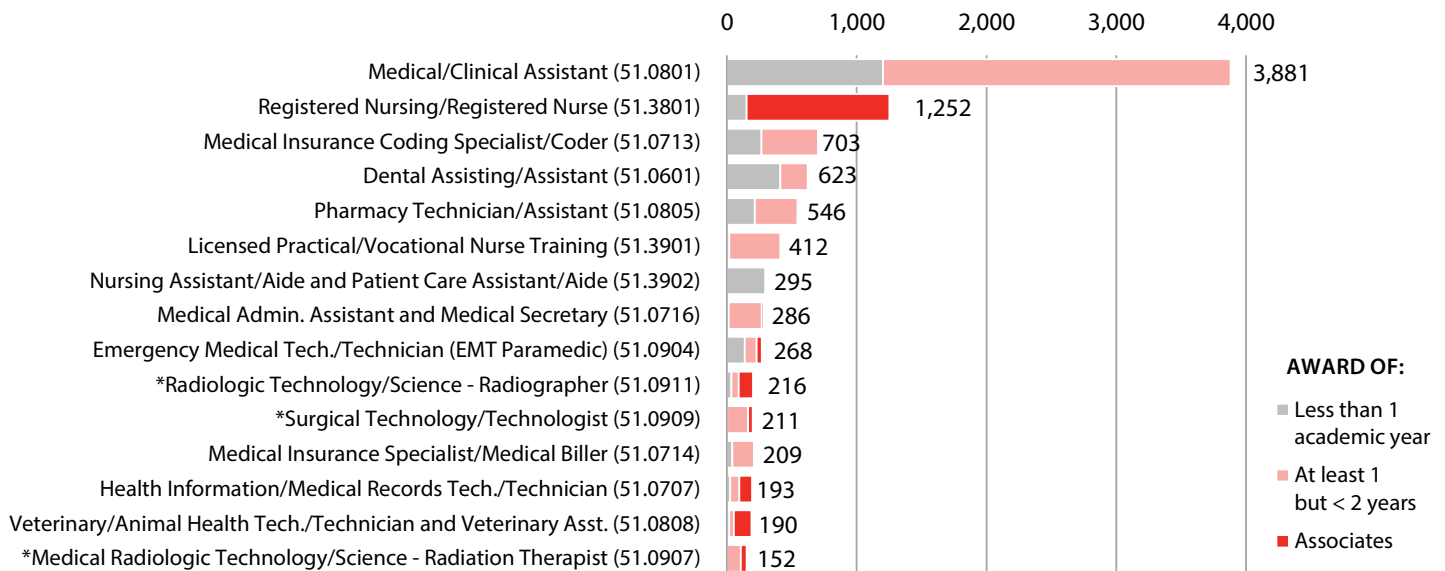
**EDUCATION & TRAINING:** Among the awards and degrees conferred **for credit** in Healthcare-related fields of study, Medical Assisting was by far the region's largest category of awards with an average of more than 3,800 completions each year. Registered Nursing completions that fall within the middle skills definition (i.e., less than a bachelor's degree) were a distant second, averaging just over 1,200 degrees and awards annually. Obtaining an associate degree fulfills the educational requirement for becoming a Registered Nurse. However, employers are increasingly looking to hire nurses with advanced degrees. This preference makes it even more difficult to gauge the gap between the number of graduates and employer demand. A wide range of **noncredit** training is available in the region for a number of the key occupations.

**FIGURE 31: SELECTED NONCREDIT OFFERINGS**  
MARKETABLE SKILLS ACHIEVEMENT AWARDS OFFERED IN RELATED FIELDS

GULF COAST AREA COMMUNITY COLLEGES									
	Alvin Comm. College	Brazosport College	College of the Mainland	Galveston College	Houston Comm. College	Lee College	Lone Star College	San Jacinto College	Wharton Co. Jr. College
Certified Nursing Aide/Assistant	●	●					●	●	
Dental Assistant	●	●	●			●	●		●
Electrocardiograph Tech./Monitor		●	●		●	●	●		
Phlebotomy Tech./Phlebotomist	●	●	●		●	●	●	●	●
Pharmacy Technician		●				●			●
EMT/Paramedic	●		●			●			●

Source: Colleges. Data were requested from Galveston College but not received by the time of analysis. Data reflect only noncredit Marketable Skills Achievement (MSA) awards (i.e., workforce education programs consisting of 144-359 contact hours) and may not encompass all relevant activities at each college.

**FIGURE 32: EDUCATION & TRAINING COMPLETED IN RELEVANT FIELDS OF STUDY (CIP CODES)**  
TWO-YEAR AVERAGE OF AWARDS & DEGREES CONFERRED **FOR CREDIT** BY SELECTED HOUSTON-AREA INSTITUTIONS



Source: National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) surveys. Note: IPEDS data include only schools eligible to participate in federal financial aid programs. Figures represent an **average** of awards and degrees conferred at indicated levels during academic years 2011 (July 1, 2010 through June 30, 2011) and 2012 (July 1, 2011 through June 30, 2012) by public and private institutions in the 10-county Houston metropolitan area. \*Totals for these CIP codes include a small number of awards designated as "Award of at least 2 but less than 4 academic years."



## HEALTHCARE (CONTINUED)

**REGIONAL INITIATIVES & RESOURCES:** Administered by the Texas Workforce Commission, the **College Credit for Heroes** program seeks to award college credit to veterans and active service members for their military experience and training, in order to help veterans and service members expedite their entry into the workforce. Participating community colleges conduct Prior Learning Assessments (PLA) to determine the amount of college credit that can be awarded. Although the program prepares people for a range of careers, allied health programs are emphasized. Four Houston-area community colleges currently participate in the program.

[www.collegecreditforheroes.org/?q=about/us](http://www.collegecreditforheroes.org/?q=about/us)

Five Houston-area community colleges are among the 19 Texas schools that are part of **Accelerate Texas: Advancing Adult Students into Careers**. Funded by the Texas Higher Education Coordinating Board as part of the state's "Closing the Gaps" initiative, the program is intended to advance lower-skilled adult learners into high-demand occupations, including healthcare. The creation of integrated career pathways is a central aspect of the program. These pathways address basic skills and language deficiencies by aligning and contextualizing adult basic education, English as a Second Language, and GED preparation to particular career and technical training programs. Jobs For the Future (JFF) provides technical assistance, policy support, and strategic advice and communications to the initiative.

[www.jff.org/sites/default/files/u3/ATXoverview-101713.pdf](http://www.jff.org/sites/default/files/u3/ATXoverview-101713.pdf)

The **Workforce Solutions Health Services Steering Committee** oversees a variety of activities to develop more collaborative relationships between business and education. The Committee has helped to (1) increase the capacity of local schools to graduate nurses; (2) increase the supply of RNs by training current hospital employees to become nurses; and (3) understand the critical importance of a good work environment in attracting and retaining nurses. The committee is comprised of

senior executives from area hospitals, health systems, and academic institutions, as well as representatives of the Greater Houston Partnership.

[www.wrksolutions.com/employer/healthservices.html#hssc](http://www.wrksolutions.com/employer/healthservices.html#hssc)

The **Futures Academy** is a dual enrollment model that enables students at seven Houston Independent School District (HISD) campuses to fulfill high school graduation requirements while simultaneously earning industry certifications, college credits, and Associate of Science degrees by August after their senior year. The program is a partnership between HISD, Houston Community College, and industry. Courses are taught by college professors utilizing a blend of face-to-face and online instruction. The program is designed to prepare students for additional postsecondary training or employment in some of Houston's most important industries, including medicine, shipping, energy manufacturing, and computer technology.

[www.houstonisd.org/Page/60413](http://www.houstonisd.org/Page/60413)

**Capital IDEA-Houston** is a workforce development program providing community college education and case management services for low-income participants. The objective is to provide the financial and emotion support required to move participants into living-wage careers, including those in the medical, oil and gas, and high tech sectors. Partners in the program include Houston Community College and the Lone Star College System.

[www.capitalideahouston.org/](http://www.capitalideahouston.org/)



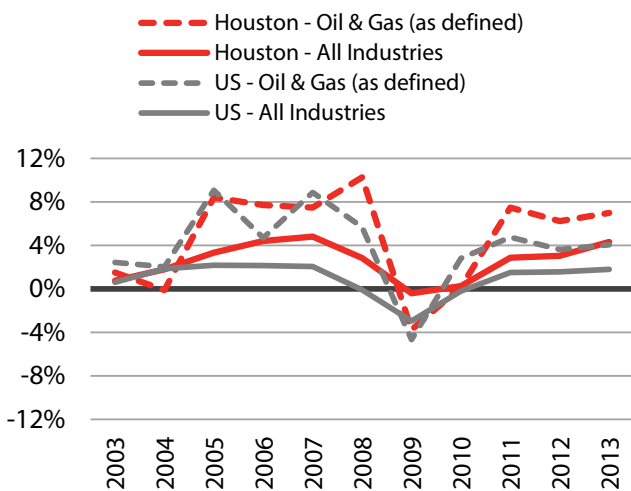
## OIL & GAS (UPSTREAM & MIDSTREAM)



**GROWTH TRENDS:** The Oil & Gas sector (as defined ►) employed nearly 300,000 workers in the 10-county Houston metropolitan area in 2013. Employment

growth in the sector significantly outpaced the region as a whole through much of the 2000s and outperformed job growth nationally in the Oil & Gas sector as well. Houston-area job gains averaged 6 percent annually for this sector in the years leading up to the recession, compared with just under 2 percent annual employment growth for all industries nationally. This period of rapid growth was followed by steep job losses as global consumption dropped off dramatically in 2009 and 2010. The slowdown had a crippling impact, as it affected both the consumption of energy and the use of petrochemicals as feedstocks for manufacturing. Employment growth rates for the industry have rebounded significantly and are nearing pre-recession levels. Massive energy and petrochemical investment in the region is expected to continue to fuel demand for workers in this sector over the next several years.

**FIGURE 33: EMPLOYMENT TRENDS**  
% CHANGE FROM PRIOR YEAR, 2003-2013



Source: EMSI Complete Employment – 2013.2



PHOTO CREDIT: FLCELLOGUY VIA WIKIPEDIA

**SECTOR DEFINITION:** For this work, the oil & gas sector is defined as the *upstream* and *midstream* portions of the industry. Upstream activities include searching for potential underground or underwater crude oil and natural gas fields, drilling of exploratory wells, and the subsequent drilling and operation of wells that recover and bring the crude oil and/or raw natural gas to the surface. This segment of the industry is also commonly referred to as Exploration and Production (E&P). The midstream segment focuses on the transportation, storage, wholesale, and marketing of crude or refined petroleum products. For this analysis, we have included related professional services in architecture and engineering, as well as scientific and technical consulting. The manufacture of petrochemicals is addressed separately (see page 70).

### NAICS CODE & DESCRIPTION

2111	Oil and gas extraction
2131	Support activities for mining
4247	Petroleum/petroleum products merchant wholesalers
4860	Pipeline transportation
5413	Architectural, engineering, and related services
5416	Mgmt., scientific, and technical consulting services



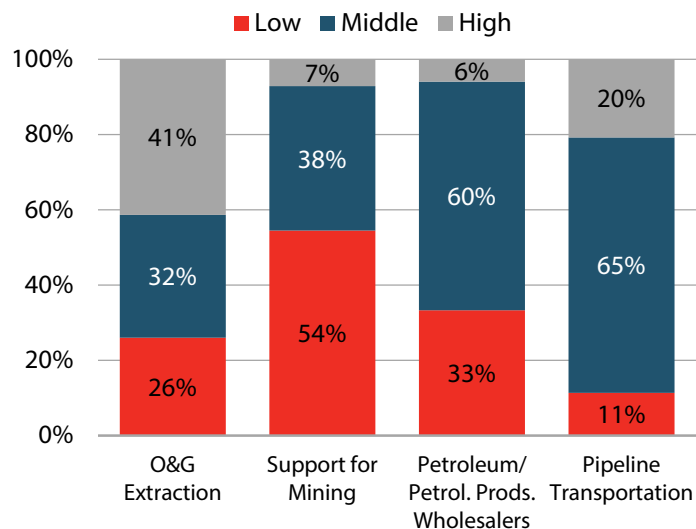


## OIL & GAS (UPSTREAM & MIDSTREAM) (CONTINUED)

**MAJOR EMPLOYERS:** The Houston region has developed a dense network of suppliers to the Oil and Gas industry. The region's 10 largest oilfield equipment supply and services companies, ranked by total gross revenue in 2012, are provided in Figure 35.

**MIDDLE SKILLS:** Within the major subsectors, middle skills occupations account for at least one-third of all employment. Extraction industries employ a larger share of high-skilled engineering positions, with two out of every five occupations (41 percent) typically requiring at least a four-year degree. By contrast, low-skilled workers account for more than one-half (54 percent) of total employment among firms engaged in support activities, which include drilling, taking core samples, and well surveying. Reliance on middle skills is higher among the midstream segments of the industry, which focus on transportation, wholesaling, and marketing. Middle skills occupations account for nearly two-thirds of total employment in these subsectors.

**FIGURE 34: SECTOR SKILLS**  
DISTRIBUTION OF SKILLS WITHIN SUBSECTORS



Source: EMSI Complete Employment – 2013.2. For this analysis, middle skills are defined as those requiring at least a high school diploma (with some level of training or work experience) but less than a four-year degree.

**FIGURE 35: LARGEST HOUSTON-AREA OILFIELD EQUIPMENT SUPPLY & SERVICES COMPANIES**  
RANKED BY 2012 TOTAL GROSS REVENUES

COMPANY	EXAMPLES OF SERVICE/PRODUCTS	NUMBER OF HOUSTON-AREA EMPLOYEES	TOTAL 2012 GROSS REV. (IN BILLIONS)
1 Schlumberger Ltd.	Oilfield services company	8,400	\$42.15
2 ABB Inc.	Electrical; motors & drives; flow computers; process, automation & safety	580	\$40.2
3 Halliburton Co.	Provider of products and services to the energy industry	7,787	\$28.5
4 Baker Hughes Inc.	Oil and gas equipment services	8,000	\$21.36
5 National Oilwell Varco Inc.	Design, manufacture, and sale of O&G systems and components	13,784	\$20.04
6 Weatherford Intl. Ltd.	Support for drilling, evaluation, completion, production and intervention	3,762	\$15.21
7 Transocean	Offshore contract drilling focusing on deepwater and harsh environments	18,400\$	\$9.2
8 Cameron Intl. Corp.	Oil and gas equipment services	27,000\$	\$8.5
9 Aker Solutions	Engineering, drilling, well intervention, subsea equipment	850	\$7.74
10 Nabors Industries Ltd.	Land drilling, land well servicing, workover contractor	27,500	\$6.99

Source: Houston Business Journal, 2014 Book of Lists.



## OIL & GAS (UPSTREAM & MIDSTREAM) (CONTINUED)

**KEY OCCUPATIONS:** The four subsectors analyzed rely heavily on a number of common middle skills occupations, although the distribution of these occupations varies from one group to another. Nearly two thirds of the top occupations identified (16 out of 25), were also identified as HDOs, the highest share of HDOs among the profiled sectors. Petroleum and Refinery Operators (SOC-51-8093) were among the leading occupations for each subsector, however, they play a critical role in the pipeline transportation subsector, accounting for nearly 16 percent of total employment.

Truck Drivers (SOC 53-3032) are also essential to the industry and are among the top-five most common occupations for three out of the four subsectors. In the wholesaling subsector, they comprise roughly one-quarter of total employment. Other HDOs that are common across multiple subsectors include General Management positions (SOC 11-1021) and Industrial Machinery Mechanics (SOC 49-9041). First-line supervisors of the various categories of workers are also among the top occupations. These positions provide an important line of communication between workers and upper management. As such, they are often the means by which operating procedures, safety standards, and company policies are communicated and enforced.

**FIGURE 36: KEY MIDDLE SKILLS OCCUPATIONS FOR SELECTED OIL & GAS SUBSECTORS**  
25 LARGEST BASED ON NATIONAL STAFFING PATTERNS, WITH HIGH DEMAND OCCUPATIONS (HDOs ►) INDICATED

HDOs	SOC CODE & DESCRIPTION	OIL AND GAS EXTRACTION	SUPPORT ACTIVITIES FOR MINING	PIPELINE TRANSPORTATION	PETROLEUM/PETROL. PRODS. WHOLESALERS
►	51-8093 Petroleum Pump System Operators, Refinery Operators, and Gaugers	3.09	0.60	15.83	1.56
►	11-1021 General and Operations Managers	2.97	2.32	2.40	3.79
►	13-1199 Business Operations Specialists, All Other	2.66	0.39	1.74	0.53
►	47-1011 First-Line Supervisors of Construction Trades and Extraction Workers	2.53	5.10	0.40	
	43-3031 Bookkeeping, Accounting, and Auditing Clerks	2.15	1.31	0.61	4.48
	43-6011 Executive Secretaries and Executive Administrative Assistants	2.13	0.48	1.14	0.59
►	19-4041 Geological and Petroleum Technicians	1.63	1.23	0.45	0.00
►	51-1011 First-Line Supervisors of Production and Operating Workers	1.12	0.49	3.93	0.34
	17-3029 Engineering Technicians, Except Drafters, All Other	1.02	0.14	0.26	
►	49-9041 Industrial Machinery Mechanics	0.87	1.76	7.67	0.43
	43-1011 First-Line Supervisors of Office and Administrative Support Workers	0.82	0.47	0.48	1.36
	51-8092 Gas Plant Operators	0.67	0.07	8.48	0.00
►	49-9071 Maintenance and Repair Workers, General	0.60	1.08	0.78	2.48
►	53-3032 Heavy and Tractor-Trailer Truck Drivers	0.58	5.47	2.88	24.20
►	53-1031 First-Line Sprvsrs. of Transp./Material-Moving Machine/Vehicle Ops.	0.50	0.57	0.36	1.67
►	49-1011 First-Line Supervisors of Mechanics, Installers, and Repairers	0.38	0.46	1.41	0.45
	41-4012 Sales Reps. Wholesale and Mfg., Except Tech. and Scientific Products	0.27	0.50	0.50	8.88
►	51-4121 Welders, Cutters, Solderers, and Brazers	0.27	1.36	0.74	
	49-9012 Control and Valve Installers and Repairers, Except Mechanical Door	0.25	0.03	2.55	0.10
►	51-9061 Inspectors, Testers, Sorters, Samplers, and Weighers	0.25	0.83	0.80	0.16
►	47-2073 Operating Engineers and Other Construction Equipment Operators	0.24	2.06	0.32	
►	17-3023 Electrical and Electronics Engineering Technicians	0.14	0.26	1.43	
	47-5099 Extraction Workers, All Other	0.14	1.32		
►	47-2152 Plumbers, Pipefitters, and Steamfitters	0.05	0.42	1.92	0.08
	43-5032 Dispatchers, Except Police, Fire, and Ambulance	0.02	0.41	0.10	1.26

Source: EMSI Complete Employment – 2013.2; US Bureau of Labor Statistics; TIP Strategies. Top-five occupations are shaded for each subsector.

Note: Methodology for assigning skill levels and designating HDOs (high demand occupations) is outlined on page 5.



## OIL & GAS (UPSTREAM & MIDSTREAM) (CONTINUED)

**STAFFING:** Wage rates for many of the sector’s key occupations are rising relative to expected levels, and the supply of workers, relative to the occupation’s concentration in the region, has made hiring difficult. Like many of the region’s other economic drivers, the sector is also facing a major demographic shift. For the majority of the key occupations—17 of the 25 positions shown in Figure 38—50 percent or more of the workforce is 45 years or older. Petroleum Pump System/Refinery Operators (SOC 51-8093) face the most severe challenge with 60 percent of the workforce estimated to be 45 years old or more. This position represents a significant share of employment in some subsectors as shown in Figure 36 (page 65).

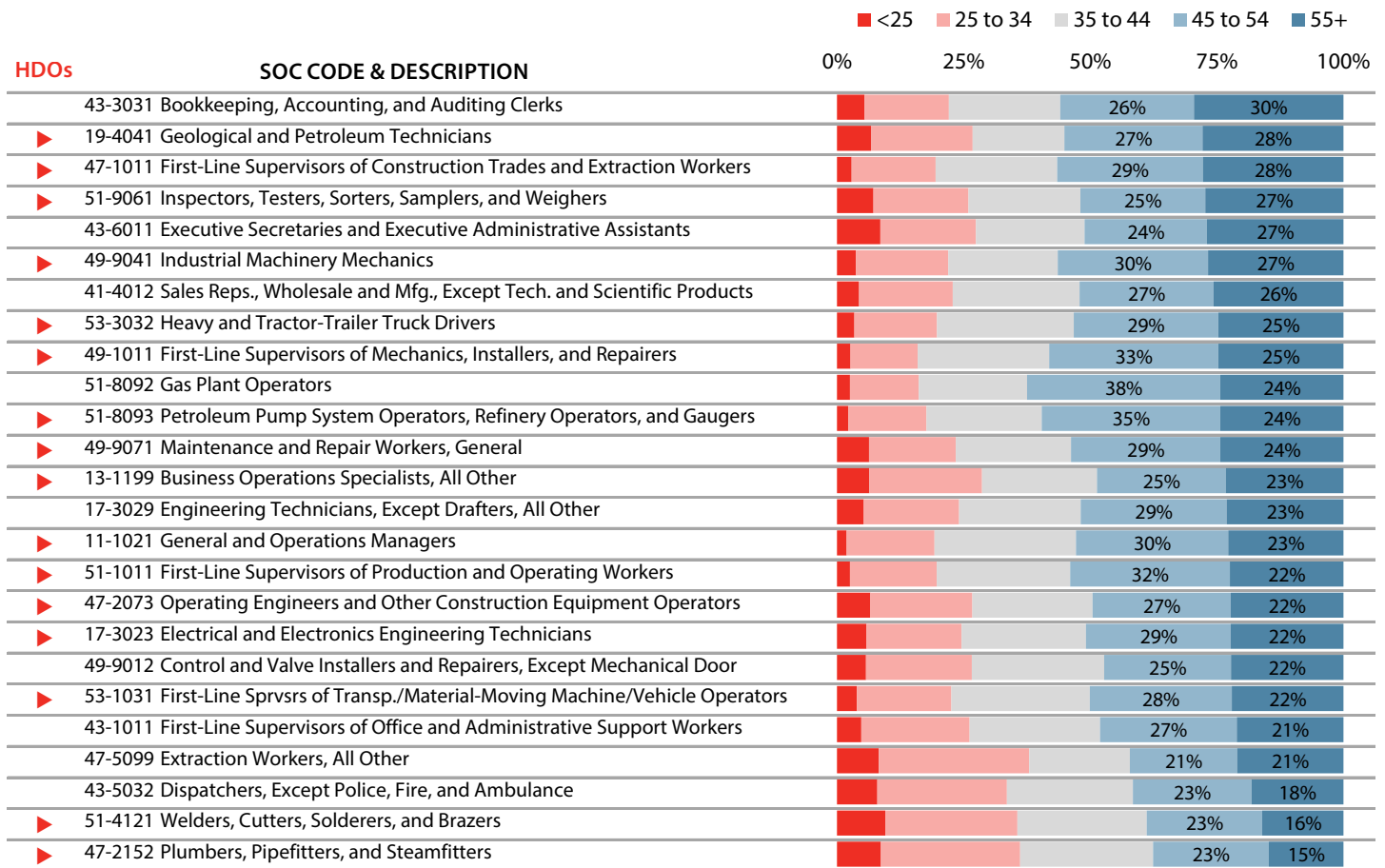
**FIGURE 37: STAFFING ENVIRONMENT FOR SELECT HOUSTON-AREA HIGH-DEMAND OCCUPATIONS**

**LEGEND:** ● Unfavorable ● Neutral ● Favorable

OCCUPATIONS	SUPPLY/ DEMAND	WAGE ENVIRONMENT
Geologic & Petroleum Technicians	● Unfavorable	● Unfavorable
Heavy & Tractor-Trailer Truck Drivers	● Unfavorable	● Favorable
Petroleum Pump/Refinery Operators	● Unfavorable	● Unfavorable
Supervisors of Extraction Workers	● Neutral	● Unfavorable
Engineering Techs (Except Drafters)	● Unfavorable	● Unfavorable

Source: EMSI. See page 6 for details on the staffing environment analysis. Unfavorable signifies that demand or wages have risen more rapidly than expected. Favorable signifies that demand or wages have risen in line with national trends.

**FIGURE 38: AGE DISTRIBUTION OF WORKERS IN KEY MIDDLE SKILLS OCCUPATIONS ESTIMATED SHARE OF TOTAL EMPLOYMENT BY AGE GROUP, RANKED BY SHARE OF WORKERS AGE 55 YEARS AND OLDER**



Source: EMSI Complete Employment – 2013.2; US Bureau of Labor Statistics; TIP Strategies. Methodology for designating HDOs (high demand occupations) is outlined on page 5.



## OIL & GAS (UPSTREAM & MIDSTREAM) (CONTINUED)

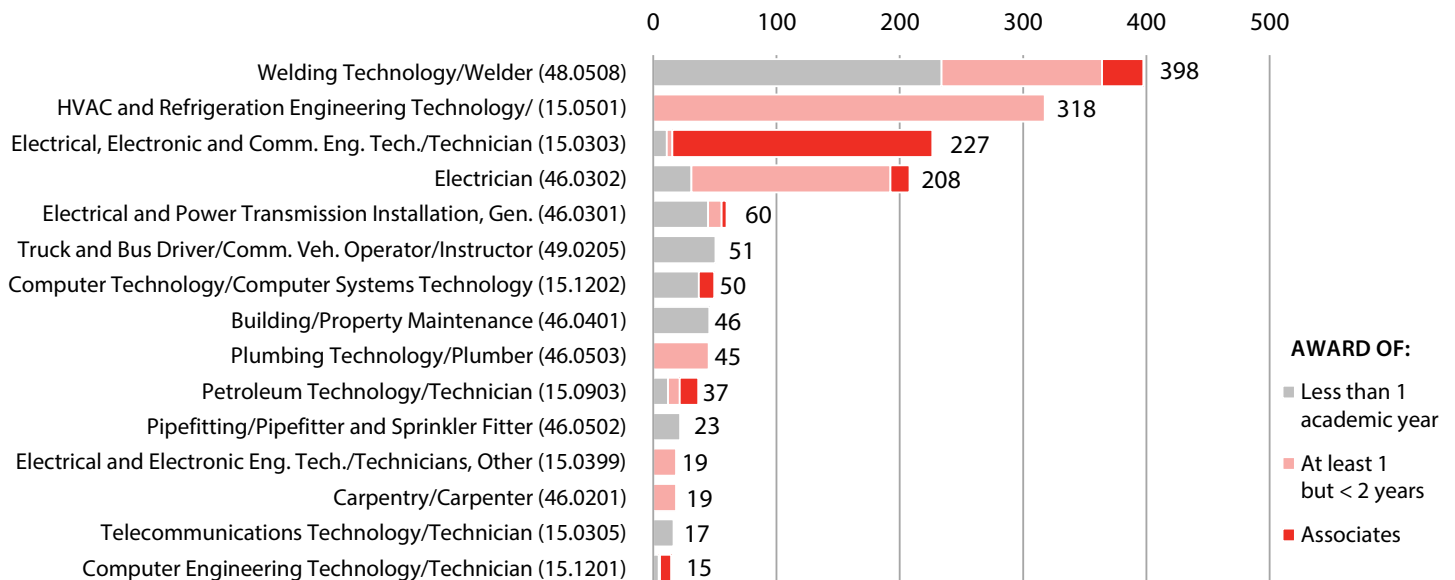
**EDUCATION & TRAINING:** An analysis of the fields of study connected to key middle skills occupations for the Oil and Gas sector is provided in Figure 40. Of the programs identified, welding was the most common in terms of awards conferred **for-credit**. There were, on average, nearly 400 awards and degrees conferred annually for the past two years. More than one-half of these were made at the short-term certificate level (i.e., awards of less than one academic year). On the **noncredit** side, College of the Mainland offers training to prepare workers for petroleum technician and related occupations. In addition, many schools, like Lone Star College's Energy and Manufacturing Institute, offer customized training for businesses.

**FIGURE 39: SELECTED NONCREDIT OFFERINGS**  
MARKETABLE SKILLS ACHIEVEMENT AWARDS OFFERED IN RELATED FIELDS

GULF COAST AREA COMMUNITY COLLEGES									
	Alvin Comm. College	Brazosport College	College of the Mainland	Galveston College	Houston Comm. College	Lee College	Lone Star College	San Jacinto College	Wharton Co. Jr. College
Petroleum Tech. /Technician			●						
Energy Mgmt./Systems Tech.						●			
Heavy Equip. Operator						●			●
Process/Instrumentation Tech.			●			●		●	
Non-Destructive Testing Tech.								●	
Commercial Truck Driving	●				●		●	●	

Source: Colleges. Data were requested from Galveston College but not received by the time of analysis. Data reflect only noncredit Marketable Skills Achievement (MSA) awards (i.e., workforce education programs consisting of 144-359 contact hours) and may not encompass all relevant activities at each college.

**FIGURE 40: EDUCATION & TRAINING COMPLETED IN RELEVANT FIELDS OF STUDY (CIP CODES)**  
TWO-YEAR AVERAGE OF AWARDS & DEGREES CONFERRED **FOR CREDIT** BY SELECTED HOUSTON-AREA INSTITUTIONS



Source: National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) surveys. Note: IPEDS data include only schools eligible to participate in federal financial aid programs. Figures represent an **average** of awards and degrees conferred at indicated levels during academic years 2011 (July 1, 2010 through June 30, 2011) and 2012 (July 1, 2011 through June 30, 2012) by public and private institutions in the 10-county Houston metropolitan area.



## OIL & GAS (UPSTREAM & MIDSTREAM) (CONTINUED)

**REGIONAL INITIATIVES & RESOURCES:** The **Lone Star Energy & Manufacturing Institute** (Lone Star EMI) collaborates with Lone Star Corporate College and the six LSC campuses to provide hands-on, competency-based technical training to businesses with employees currently working or seeking a career in the oil and gas, alternative energy, or mechanized (automated) production industries. The program operates a state-of-the-art facility at Lone Star's University Park campus, with instructors drawn from PetroEd®, Oracle, the University of Houston, and other regional and national institutions. [www.LoneStar.edu/EMI](http://www.LoneStar.edu/EMI)

Houston ISD, in collaboration with the Independent Petroleum Association of America (IPAA), operates three **IPAA Petroleum Academies** at Milby and Westside High Schools and the Young Women's College Preparatory Academy. In addition, the **Energy Institute High School**, a brand new full magnet Houston ISD school located in the Heights, is the first in the nation with a school-wide theme of energy, with areas of focus along three pathways: geosciences, alternative energy, and offshore technology.

The **Greater Houston Energy Collaborative** is an economic development cluster council consisting of an overall leadership committee and subcommittees on marketing, cluster development, work force development, and energy policy. Goals of the initiative, which are parts of the Greater Houston Partnership's overall energy strategy, include: (1) strengthening Houston's role as a premier energy hub; (2) expanding Houston's energy portfolio through cluster development initiatives; (3) building the energy work force of the future; and (4) promoting a balanced energy policy framework.

[www.houstonenergyfuture.com/energy-collaborative/](http://www.houstonenergyfuture.com/energy-collaborative/)

The **Houston Technology Center** is the largest technology business incubator and accelerator in Texas, advancing the commercialization of emerging technology companies in the greater Houston area in specific sectors, including energy. [www.houstontech.org/](http://www.houstontech.org/)

Houston-based oilfield services company, Schlumberger, has funded a number of initiatives designed to increase the supply of workers in the energy and petrochemical sector. For example, the **Schlumberger Pre-College Summer Institute** is a Schlumberger-led initiative in partnership with Houston ISD, University of Houston, Harris County and City of Houston parks departments, and Baylor College. It is a four-week educational summer enrichment camp to introduce inner-city eighth-grade students to science and technology, wellness, careers in engineering, and college-bound culture. In addition to high school students, Schlumberger also targets training and outreach efforts to military veterans.

The mission of the **Subsea Tieback Foundation** is to inform, educate, and introduce careers in the offshore and subsea disciplines of the oil and gas industry. The foundation has a dedicated education committee that conducts STEM outreach and **SEATIGER** exhibitions. SEATIGER, which stands for Subsea Exhibit Able to Integrate Grade-level Expectations with ROVs, is a two-semester program that connects college students with subsea engineers and other industry professionals to define, engineer, and manufacture their own remotely operated vehicle (ROV). The foundation also administers the **Subsea Tieback Scholarship Fund**.

[www.subseatiebackfoundation.org/](http://www.subseatiebackfoundation.org/)



PHOTO CREDIT: PORT OF HOUSTON AUTHORITY



## OIL & GAS (UPSTREAM & MIDSTREAM) (CONTINUED)

### REGIONAL INITIATIVES & RESOURCES (CONTINUED):

**GeoFORCE Texas** is an experiential outreach program that prepares students from minority-serving high schools in rural South Texas and inner-city Houston to pursue higher education in geosciences and STEM fields. Sponsored by the Jackson School of Geosciences at the University of Texas, the program offers geologic field trips in the state and other parts of the country and exposure to university professors and research scientists through the Summer Academy and the Young Geoscientist Field Course at no cost for accepted students. [www.jsg.utexas.edu/geoforce/](http://www.jsg.utexas.edu/geoforce/)

The **Fluor Welder Training** program offers pre-employment welder training at its Greenville, South Carolina and Houston locations. A Fortune 500 company, Fluor performs engineering and construction work within the petroleum industry.

[www.fluor.com/careers/craft/craft\\_training/Pages/welder\\_training.aspx](http://www.fluor.com/careers/craft/craft_training/Pages/welder_training.aspx)

Relevant industry and trade associations include:

- The **Independent Petroleum Association of America** (IPAA) represents thousands of independent oil and natural gas producers and service companies. [www.ipaa.org/](http://www.ipaa.org/)

- The **Houston Energy Council** (HEC) serves as a common communication point for energy professional organizations in Houston. Each organization accepted for membership in the HEC is allowed two representatives on the council. [www.houstonenergycouncil.org/](http://www.houstonenergycouncil.org/)
- **Young Professionals in Energy** (YPE Houston) aims to facilitate the advancement of young professionals in the global energy industry. [www.ypenenergy.org/ypehouston/](http://www.ypenenergy.org/ypehouston/)
- The **Houston Business Roundtable** (HBR) membership consists primarily of refining, chemical, and energy companies. HBR and the Houston Area Safety Council host the Annual Safety Excellence Awards Banquet which honors contractors in the Houston/Gulf Coast for outstanding safety performance. [www.houbrt.com/](http://www.houbrt.com/)

# PETROCHEMICALS



**GROWTH TRENDS:** The Petrochemicals sector (as defined ►) employed nearly 59,000 workers in the 10-county Houston metropolitan area in 2013. Employment growth in the sector (in percentage terms) has consistently lagged the region and the US for much of the last decade. Taken as a whole, Petrochemical employment in the Houston area has outperformed the sector at the national level, though the trend masks high levels of employment volatility within individual industries in the region.

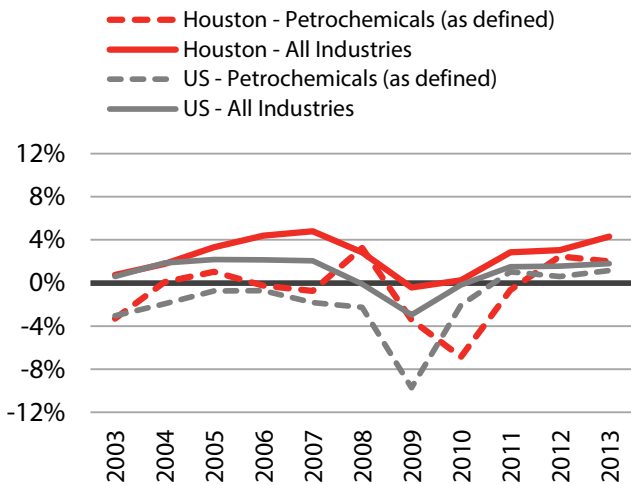
Like many sectors, Petrochemical employment declined sharply at the end of the last decade in response to the global economic crisis, as demand for manufacturing feedstocks declined precipitously. However, Houston’s largest overall employment declines occurred in 2010, one year after the nation’s steepest losses. Employment growth rates for Petrochemicals have rebounded significantly but remain below overall employment levels in terms of percentage gains. Explosive job growth is projected for this sector, with more than 120 petrochemical construction projects valued at \$80 billion announced for the US Gulf Coast region in the coming years, according to a recent *Houston Chronicle* article (9/5/2013 “Exxon Mobil: Natural gas will overtake coal in world’s energy mix”).



**SECTOR DEFINITION:** For this work, the Petrochemicals sector is defined to include establishments engaged in the transformation of crude petroleum into usable products. This definition includes petroleum refineries, as well as establishments that further process refined petroleum and coal products into other products, such as asphalt coatings and petroleum lubricating oils.

In addition, the sector is defined to include establishments engaged in the manufacture of basic chemicals using processes such as cracking and distillation, as well as a broad array of chemical manufacturing, including synthetic resins, plastics, rubber, and agricultural chemicals. Establishments involved in the wholesale distribution of chemicals and allied products are also included for purposes of this analysis.

**FIGURE 41: EMPLOYMENT TRENDS**  
% CHANGE FROM PRIOR YEAR, 2003-2013



Source: EMSI Complete Employment – 2013.2

## NAICS CODE & DESCRIPTION

- 3241 Petroleum and coal products manufacturing
- 3251 Basic chemical manufacturing
- 3252 Resin, synthetic rubber, & artificial synthetic fibers mfg.
- 3253 Pesticide, fertilizer, and other agricultural chemical mfg.
- 3259 Other chemical product and preparation manufacturing
- 3261 Plastics product manufacturing
- 4246 Chemical and allied products merchant wholesalers

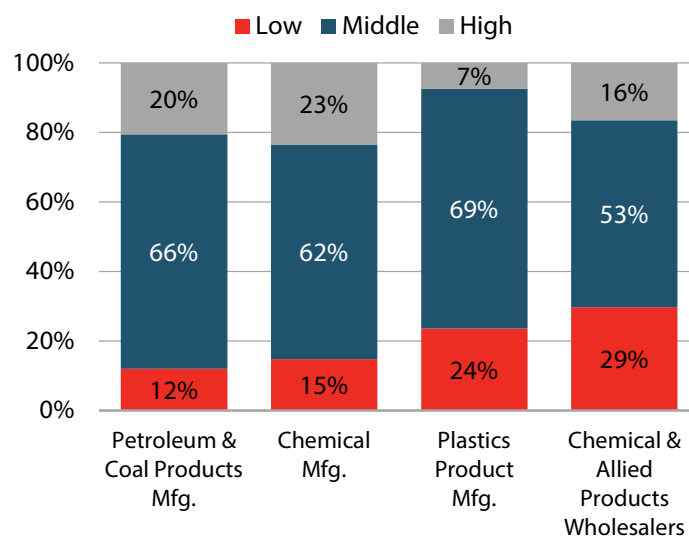


## PETROCHEMICALS (CONTINUED)

**MAJOR EMPLOYERS:** The Houston region is the site of substantial operations for many of the world’s largest oil refining and Petrochemical companies, as illustrated in Figure 43. In addition to widely known names, such as Dow Chemical, BASF, Exxon Mobil, BP, and Chevron, Houston had more than 1,100 establishments within the identified industries in 2012.

**MIDDLE SKILLS:** Middle skills occupations account for a significant share of total employment across all of the major petrochemical subsectors. Reliance on middle skills is highest among the manufacturing industries, with middle skills workers accounting for roughly two-thirds of employment in these three subsectors: Petroleum & Coal Products Manufacturing, Chemical Manufacturing, and Plastics Products Manufacturing. For Merchant Wholesalers, this figure drops to slightly more than one-half.

**FIGURE 42: SECTOR SKILLS**  
DISTRIBUTION OF SKILLS WITHIN SUBSECTORS



Source: EMSI Complete Employment – 2013.2. For this analysis, middle skills are defined as those requiring at least a high school diploma (with some level of training or work experience) but less than a four-year degree.

**FIGURE 43: SELECTED HOUSTON-AREA PETROCHEMICAL & REFINING EMPLOYERS**

COMPANY	INDUSTRY	NUMBER OF EMPLOYEES LOCAL/TOTAL	TOTAL 2012 GROSS REV. (IN BILLIONS)
BASF Corp.	Chemicals	1,262 / 110,000	€72.13
BP America	Oil and gas refining	7,000 / 85,000	\$388.
Chevron Corp.	Oil and gas refining, petrochemicals (Chevron Phillips Chemical Co.)	7,000 / 61,900	\$231
Citgo Petroleum Corp.	Petroleum refining	940 / 4,000	—
Dow Chemical Co.	Chemicals	6,052 / 54,000	\$56.8
Eastman Chemical	Plastic resin and synthetic fiber manufacturing	911 / —	—
Exxon Mobil Corp.	Oil and gas refining	13,200 / 76,900	\$482.3
Krones, Inc	Chemical wholesaler	7,300 / 7,300	—
LyondellBasell Industries	Chemicals, plastics, and refining	4,000 / 13,500	\$45.35
Marathon Oil Company	Petroleum refining	900 / 3,000	—
Shell Oil Co.	Oil and gas refining, petrochemicals	3,000 / 87,000	\$467.15

Source: Houston Business Journal, 2014 Book of Lists, Hoovers.com, TIP Strategies research. €Figures reported in euros. Approximate value in US\$ at time of publication= \$98.81 billion





## PETROCHEMICALS (CONTINUED)

**KEY OCCUPATIONS:** The four subsectors analyzed rely on a number of middle skills occupations, although the distribution of these occupations varies from one industry group to another. As would be expected, each subsector has a number of production occupations in common that are associated with the blending and processing of chemicals, including Mixing and Blending Machine Workers (SOC 51-9023), Packing And Filling Machine Workers (SOC 51-9111), and Chemical Equipment Operators and Tenders (SOC 51-9011).

Fourteen of the 25 key middle skills occupations are among the HDOs identified as part of the planning process. Of these, Pump System and Refinery Operators (SOC-51-8093) are the most concentrated, accounting for nearly one in five jobs (18.5 percent) associated with the manufacture of petroleum and coal products. Other heavily concentrated occupations include Sales Representatives (SOC 41-4012), which are common to all four subsectors, but represent 16 percent of total employment among wholesalers. Likewise, Moldmaking and Casting Workers (SOC 51-4072) are found in three of the four subsectors, but account for one in 10 jobs in plastics products manufacturing (10.1 percent).

**FIGURE 44: KEY MIDDLE SKILLS OCCUPATIONS FOR SELECTED PETROCHEMICALS SUBSECTORS**  
25 LARGEST BASED ON NATIONAL STAFFING PATTERNS, WITH HIGH DEMAND OCCUPATIONS (HDOs ►) INDICATED

HDOs	↓ SOC CODE & DESCRIPTION	PETROCHEMICALS SUBSECTORS			
		CHEMICAL MFG.	PETROLEUM AND COAL PRODUCTS MFG.	PLASTICS PRODUCT MFG.	ALLIED PRODUCTS MERCHANT WHOLESALERS
	51-9023 Mixing and Blending Machine Setters, Operators, and Tenders	6.95	3.45	0.71	1.26
	51-9111 Packaging and Filling Machine Operators and Tenders	6.20	1.54	2.77	1.83
	51-9011 Chemical Equipment Operators and Tenders	5.77	1.27	0.43	0.84
►	51-8091 Chemical Plant and System Operators	4.48	1.14		0.09
►	51-1011 First-Line Supervisors of Production and Operating Workers	3.93	5.14	4.41	1.18
►	51-9061 Inspectors, Testers, Sorters, Samplers, and Weighers	2.81	1.23	3.83	0.72
►	49-9071 Maintenance and Repair Workers, General	2.44	1.48	2.23	1.16
►	49-9041 Industrial Machinery Mechanics	2.33	3.56	1.73	0.61
	19-4031 Chemical Technicians	2.29	1.42	0.06	0.60
►	11-1021 General and Operations Managers	1.90	1.45	1.66	4.16
►	51-2092 Team Assemblers	1.88	1.94	6.06	1.48
	41-4012 Sales Reps. Wholesale and Mfg., Except Tech. and Scientific Products	1.52	1.21	2.12	16.03
►	51-9199 Production Workers, All Other	1.27	0.55	1.02	0.40
	43-5061 Production, Planning, and Expediting Clerks	1.06	0.53	0.77	0.48
►	53-3032 Heavy and Tractor-Trailer Truck Drivers	1.02	2.24	0.66	6.64
	51-9041 Extruding, Forming, Pressing, and Compacting Machine Workers	0.97		1.48	
	43-3031 Bookkeeping, Accounting, and Auditing Clerks	0.93	0.78	0.73	2.19
►	13-1199 Business Operations Specialists, All Other	0.92	1.38	0.14	0.68
	51-4021 Extruding and Drawing Machine Workers, Metal and Plastic	0.75		5.80	0.11
►	13-1023 Purchasing Agents, Except Wholesale, Retail, and Farm Products	0.75	0.87	0.63	0.24
►	49-1011 First-Line Supervisors of Mechanics, Installers, and Repairers	0.66	1.14	0.46	0.21
	43-1011 First-Line Supervisors of Office and Administrative Support Workers	0.56	0.51	0.53	1.52
	51-4072 Molding, Coremaking, and Casting Machine Workers, Metal and Pla	0.19		10.12	0.12
►	51-8093 Petroleum Pump System Operators, Refinery Operators, and Gauger	0.18	18.47		0.20
►	51-4031 Cutting, Punching, and Press Machine Workers, Metal and Plastic	0.04		2.75	0.34

Source: EMSI Complete Employment – 2013.2; US Bureau of Labor Statistics; TIP Strategies. Top-five occupations are shaded for each subsector.

Note: Methodology for assigning skill levels and designating HDOs (high demand occupations) is outlined on page 5.



## PETROCHEMICALS (CONTINUED)

**STAFFING:** In addition to demand generated by the expansion of existing petrochemical producers and new investments drawn to the region, the industry will be faced with the replacement of an array of workers that are expected to age out of the workforce. For 20 of the top 25 key middle skills occupations, at least one in five workers (20 percent or more) is estimated to be 55 years or older. For many of these 20 occupations, this figure is closer to one in four workers (25 percent or more). The staffing environment for many petrochemical occupations is already less than favorable. The situation is likely to deteriorate further as the demand for workers continues to rise driven by new investment and replacement needs.

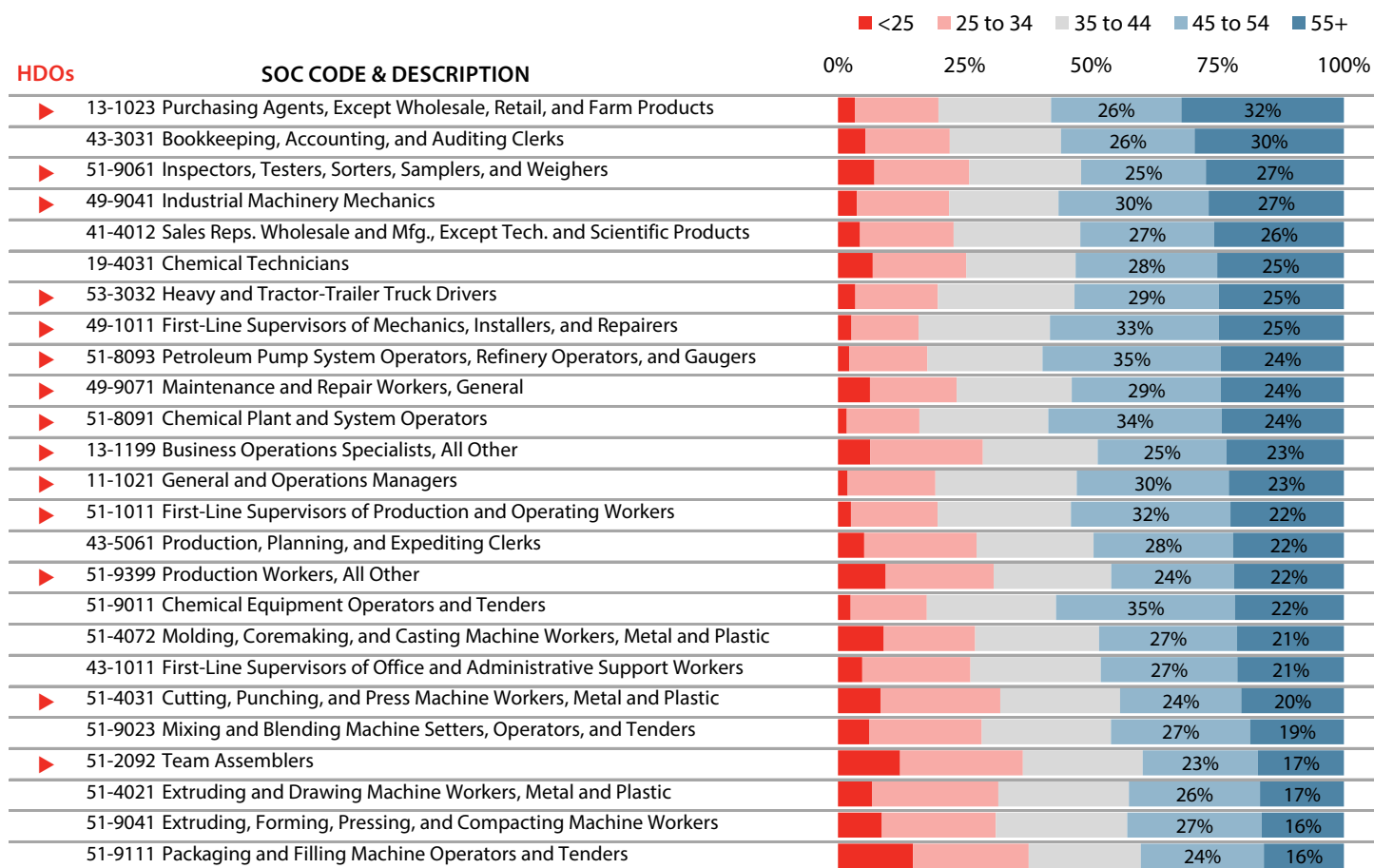
**FIGURE 45: STAFFING ENVIRONMENT FOR SELECT HOUSTON-AREA HIGH-DEMAND OCCUPATIONS**

**LEGEND:** ● Unfavorable ● Neutral ● Favorable

OCCUPATIONS	SUPPLY/ DEMAND	WAGE ENVIRONMENT
Chemical Plant and System Operators	● Neutral	● Unfavorable
Industrial Machinery Mechanics	● Unfavorable	● Unfavorable
Cutting, Punching, & Press Machine	● Favorable	● Unfavorable
Chemical Technicians	● Unfavorable	● Unfavorable
Business Operation Specialists	● Unfavorable	● Unfavorable

Source: EMSI. See page 6 for details on the staffing environment analysis. Unfavorable signifies that demand or wages have risen more rapidly than expected. Favorable signifies that demand or wages have risen in line with national trends.

**FIGURE 46: AGE DISTRIBUTION OF WORKERS IN KEY MIDDLE SKILLS OCCUPATIONS ESTIMATED SHARE OF TOTAL EMPLOYMENT BY AGE GROUP, RANKED BY SHARE OF WORKERS AGE 55 YEARS AND OLDER**



Source: EMSI Complete Employment – 2013.2; US Bureau of Labor Statistics; TIP Strategies. Methodology for designating HDOs (high demand occupations) is outlined on page 5.



## PETROCHEMICALS (CONTINUED)

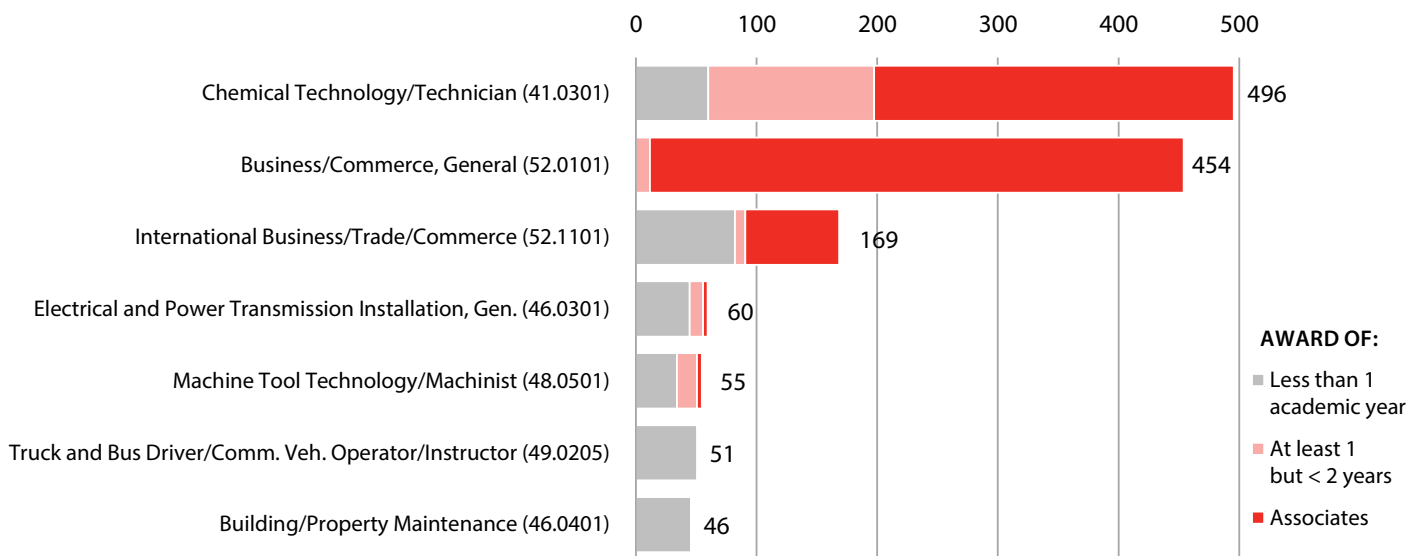
**EDUCATION & TRAINING:** Completions related to chemical technology were the most common in terms of the region’s **for-credit** offerings, with an average of nearly 500 awards and degrees conferred annually for the past two years by public and private institutions that report completions data to the National Center for Education Statistics. More than one-half of these were awarded at the 2-year associate’s level. Business-related programs of study, which prepare students for careers in a variety of management occupations, were the next largest category of for-credit awards. On the **noncredit** side, training in process technology and related areas is offered at several of the local community colleges including Lee College’s ExxonMobil Process Technology Program.

**FIGURE 47: SELECTED NONCREDIT OFFERINGS**  
MARKETABLE SKILLS ACHIEVEMENT AWARDS OFFERED IN RELATED FIELDS

GULF COAST AREA COMMUNITY COLLEGES									
	Alvin Comm. College	Brazosport College	College of the Mainland	Galveston College	Houston Comm. College	Lee College	Lone Star College	San Jacinto College	Wharton Co. Jr. College
Process/Instrumentation Tech.			●			●		●	
Chemical Tech./Technician			●						
Petroleum Tech./Technician			●						
Non-Destructive Testing Tech.								●	
Commercial Truck Driving	●				●		●	●	

Source: Colleges. Data were requested from Galveston College but not received by the time of analysis. Data reflect only noncredit Marketable Skills Achievement (MSA) awards (i.e., workforce education programs consisting of 144-359 contact hours) and may not encompass all relevant activities at each college.

**FIGURE 48: EDUCATION & TRAINING COMPLETED IN RELEVANT FIELDS OF STUDY (CIP CODES)**  
TWO-YEAR AVERAGE OF AWARDS & DEGREES CONFERRED **FOR CREDIT** BY SELECTED HOUSTON-AREA INSTITUTIONS



Source: National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) surveys. Note: IPEDS data include only schools eligible to participate in federal financial aid programs. Figures represent an **average** of awards and degrees conferred at indicated levels during academic years 2011 (July 1, 2010 through June 30, 2011) and 2012 (July 1, 2011 through June 30, 2012) by public and private institutions in the 10-county Houston metropolitan area.



## PETROCHEMICALS (CONTINUED)

**REGIONAL INITIATIVES & RESOURCES:** The **Community College Petrochemical Initiative** is a collaborative effort designed to address the training needs of the industry. As part of this \$500,000 grant, the nine community colleges are partnering to address the training of new workers to support the petrochemical industry.

[www.houstonnaturalgas.com/homepage.php](http://www.houstonnaturalgas.com/homepage.php)

The **Lone Star Energy & Manufacturing Institute (Lone Star EMI)** collaborates with Lone Star Corporate College and the six LSC campuses to provide hands-on, competency-based technical training to businesses with employees currently working or seeking a career in the oil and gas, alternative energy, or mechanized (automated) production industries. The program operates a state-of-the-art facility at Lone Star's University Park campus, with instructors drawn from PetroEd®, Oracle, the University of Houston, and other regional and national institutions.

[www.LoneStar.edu/EMI](http://www.LoneStar.edu/EMI)

The **East Harris County Manufacturers Association** is an alliance of more than 125 chemical manufacturers, refiners and supporting distribution facilities employing more than 33,000 people throughout East Harris County. Member companies contribute about \$12 billion annually to the local economy through taxes, payrolls, purchases and capital expenditures. The association's Workforce Development Committee focuses on competency development of new and incumbent operators and maintenance crafts. In addition, the committee promotes industry awareness by informing students and educators at all levels about the profession.

[www.ehcma.org/](http://www.ehcma.org/)

The **Houston Area Safety Council** administers safety training required by major refineries in the Houston area. Created in 1990, the nonprofit has provided more than 6 million units of training. Membership in HASC is comprised of more than 2700 contractor companies and over 350 owners from the greater Houston Industrial Complex and beyond.

[www.hasc.com/site/](http://www.hasc.com/site/)

Houston ISD, in collaboration with the Independent Petroleum Association of America (IPAA), operates three **IPAA Petroleum Academies** at Milby and Westside High Schools and the Young Women's College Preparatory Academy. In addition, the **Energy Institute High School**, a brand new full magnet Houston ISD school located in the Heights, is the first in the nation with a school-wide theme of energy, with areas of focus along three pathways: geosciences, alternative energy, and offshore technology.

[www.ipaa.org/education/academies/](http://www.ipaa.org/education/academies/)

Relevant industry and trade associations include:

- The **Texas Chemical Council (TCC)** is a statewide trade association of chemical manufacturing facilities in Texas. TCC's 68 member companies provide employment and career opportunities for more than 74,000 Texans at over 200 separate facilities across the state. Their combined economic activity sustains nearly a half-million jobs for Texans.
- [www.txchemcouncil.com/](http://www.txchemcouncil.com/)
- The **Associated Chemical Industry of Texas** represents both large and small businesses including chemical manufacturers, suppliers, contractors, and a variety of service companies that are vital to the Texas chemical industry.
- [www.acit.org/](http://www.acit.org/)



## PORTS & MARITIME



**GROWTH TRENDS:** Industries connected to the Ports & Maritime sector (*as defined* ▶) accounted for more than 150,000 jobs in the 10-county region in 2013. According to a

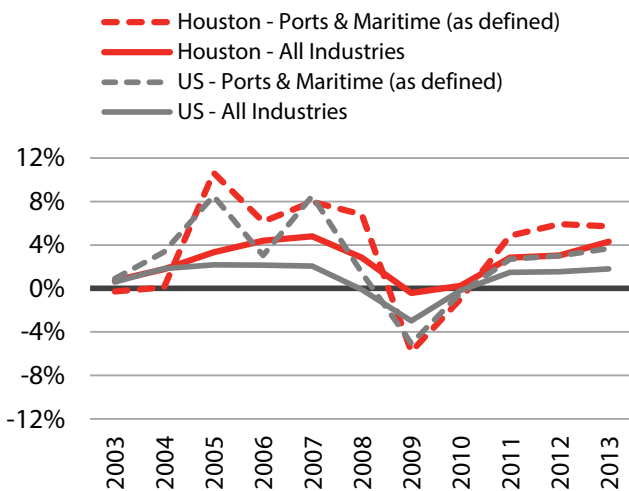
May 2012 study of the port’s economic impact prepared for the Port of Houston Authority (POHA), marine cargo activity at the public and private marine terminals located along the Houston Ship Channel is responsible for nearly 54,000 direct jobs. Of these, 37 percent (roughly 19,800 jobs) are directly employed at Port of Houston facilities. Activities encompassed in the POHA analysis include railroad and trucking, cargo handling and vessel operating, legal and business services, and tenant companies that rely on shipments of materials and products via the port for their operations.

Activity at the Port of Houston is closely tied to the energy and petrochemical industries. According to the POHA impact analysis, petroleum and other bulk liquids account for more than 27,000 jobs at the port. The recession’s impact—which dramatically curbed demand for energy and petrochemicals—can be seen in the sharp drop in employment in the ports & maritime sector. After seeing annual growth rates around 8 percent between 2005 and 2008, employment plunged in 2009, experiencing a single-year loss of 6 percent.



**SECTOR DEFINITION:** This sector includes establishments engaged in the transportation of passengers and cargo using ships, barges, and boats. Scenic and sightseeing water transportation services are excluded. Support activities for water transportation are also included, such as (1) operating ports, harbors, or canals; (2) providing stevedoring and other marine cargo handling services; (3) providing navigational services to shipping; (4) providing marine salvaging; and (5) providing other support activities for water transportation. For this work, the sector has been expanded to include establishments primarily engaged in operating shipyards or boat yards (which perform both manufacturing and repair services), as well as related professional and technical services.

**FIGURE 49: EMPLOYMENT TRENDS**  
% CHANGE FROM PRIOR YEAR, 2003-2013



Source: EMSI Complete Employment – 2013.2

### NAICS CODE & DESCRIPTION

- 3324 Boiler, tank, and shipping container manufacturing
- 3366 Ship and boat building (*includes repairing*)
- 4831 Deep sea, coastal, and Great Lakes water transportation
- 4832 Inland water transportation
- 4883 Support activities for water transportation
- 5413 Architectural, engineering, and related services
- Management, scientific, and technical consulting
- 5416 services

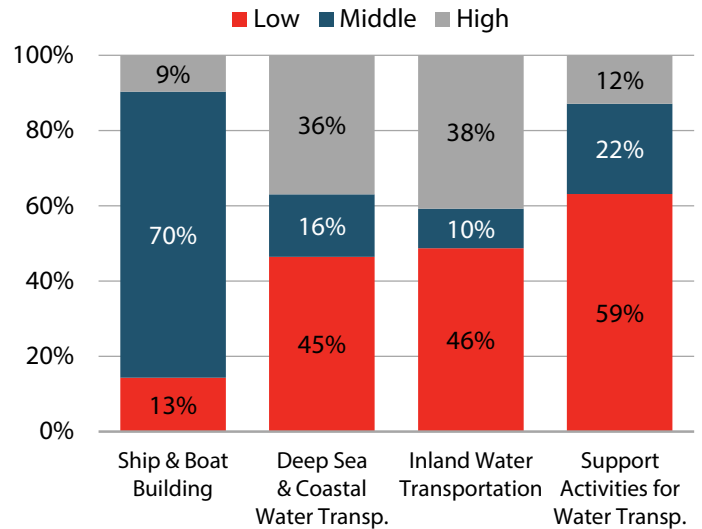


## PORTS & MARITIME (CONTINUED)

**MAJOR EMPLOYERS:** The Port of Houston connects the region to a broad base of employers. Along with the Port’s many tenants and users—more than 150 companies have operations along the Houston Ship Channel—the movement of cargo involves a range of companies including crane and terminal operators, tug and towboat companies, third-party logistics services, and trucking companies and rail operators.

**MIDDLE SKILLS:** Middle skills comprise a significant share of shipyard workers, accounting for 70 percent of total employment in these industries. This distribution reflects the type of work performed at these facilities, which includes both repairing and manufacturing of ships and boats. Water transportation industries and related support activities employ a large share of low-skilled workers, including a range of positions involved in loading and unloading cargo for which only minimal education and training are required. However, middle skills occupations play pivotal roles within the sector; examples include welders, mechanics, maintenance workers, and inspectors.

**FIGURE 50: SECTOR SKILLS**  
DISTRIBUTION OF SKILLS WITHIN SUBSECTORS



Source: EMSI Complete Employment – 2013.2. For this analysis, middle skills are defined as those requiring at least a high school diploma (with some level of training or work experience) but less than a four-year degree.

**FIGURE 51: SELECTED PORTS & MARITIME EMPLOYERS**  
RANKED BY EMPLOYMENT

COMPANY	LINE OF BUSINESS	LOCAL EMPLOYEES	REVENUE (\$US MILLIONS)
Eagle Maritime Services Inc.	Deep sea domestic transportation of freight	500	\$52.9
Jacintoport International LLC	Marine cargo handling	450	\$44.8
Gulf Stream Marine, Inc.	Marine cargo handling	417	\$71
Shippers Stevedoring Co	Marine cargo handling	250	\$29.6
Bludworth Marine, LLC	Shipbuilding and repairing	220	\$31.9
Sterling Group Partners III, LP	Fabricated plate work (boiler shop)	153	\$16.1
Kirby Inland Marine, LP	Water transportation of freight	150	\$328
Pasadena Tank Corporation	Fabricated plate work (boiler shop)	140	\$21.3
C T Stevedoring Inc.	Marine cargo handling	99	\$12.1
SeaRiver Maritime Financial Holdings Inc.	Water transportation of freight	98	\$63.1
Smith-Hamm, Inc.	Shipbuilding and repairing	85	\$11.3
Houston Mooring Company, Inc.	Towing and tugboat service	72	\$7.5
West Gulf Marine, Ltd	Shipbuilding and repairing	70	\$10.2
Vopak Terminal Savannah Inc.	Marine cargo handling	70	\$10
Hard's Marine Service, LTD.	Boatbuilding and repairing	66	\$6.8

Source: Hoovers



## PORTS & MARITIME (CONTINUED)

**KEY OCCUPATIONS:** Port-related activity cuts across a number of middle skills occupations. Ship and boat building (which includes repair services) tends to employ a range of skilled trade workers. Middle skills jobs in this subsector are similar to many occupations employed in the construction industry, such as Pipefitters, Electricians, and Carpenters, as well as production workers typically found in manufacturing facilities, including Layout Workers, Team Assemblers, and Machinists. Welders account for one in 10 positions.

By contrast, water transportation services are more heavily reliant on low-skilled jobs as shown in Figure 50 (page 77). Middle skills needs for these industries tend to concentrate in supervisory and management positions. Maintenance Workers, Front-Line Supervisors, and General and Operations Managers are key positions across all four subsectors analyzed.

**FIGURE 52: KEY MIDDLE SKILLS OCCUPATIONS FOR SELECTED PORTS & MARITIME SUBSECTORS**  
25 LARGEST BASED ON NATIONAL STAFFING PATTERNS, WITH HIGH DEMAND OCCUPATIONS (HDOs ►) INDICATED

HDOs	SOC CODE & DESCRIPTION	SHIP AND BOAT BUILDING	DEEP SEA, COASTAL, AND GREAT LAKES WATER	INLAND WATER TRANSP.	SUPPORT ACTIVITIES FOR WATER TRANSP.
►	51-4121 Welders, Cutters, Solderers, and Brazers	10.66	0.20	0.56	1.41
►	51-1011 First-Line Supervisors of Production and Operating Workers	4.66			0.60
►	47-2152 Plumbers, Pipefitters, and Steamfitters	4.58			0.28
	51-4192 Layout Workers, Metal and Plastic	4.50			
►	47-2111 Electricians	4.12	0.18	0.27	0.07
	51-2091 Fiberglass Laminators and Fabricators	3.67			
►	47-2031 Carpenters	3.08			0.21
►	51-2092 Team Assemblers	2.98			
►	51-4041 Machinists	2.74			0.06
	17-3013 Mechanical Drafters	2.30			
►	51-2041 Structural Metal Fabricators and Fitters	2.25			0.11
	43-5061 Production, Planning, and Expediting Clerks	2.04	0.51		0.14
	51-9122 Painters, Transportation Equipment	1.85			0.17
	47-2211 Sheet Metal Workers	1.44			
►	49-9071 Maintenance and Repair Workers, General	1.39	0.69	1.40	2.34
►	51-9061 Inspectors, Testers, Sorters, Samplers, and Weighers	1.22			0.76
►	11-1021 General and Operations Managers	1.16	2.58	1.94	1.65
►	13-1023 Purchasing Agents, Except Wholesale, Retail, and Farm Products	1.08	0.49	0.42	0.16
►	49-9041 Industrial Machinery Mechanics	0.69			1.37
	43-1011 First-Line Supervisors of Office and Administrative Support Workers	0.44	1.33	0.52	
	43-6011 Executive Secretaries and Executive Administrative Assistants	0.30	1.23	0.24	0.31
►	53-1031 First-Line Sprvsrs. of Transp./Material-Moving Machine/Vehicle Ops.	0.10	0.74	1.11	2.77
►	53-1021 First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand	0.10	0.26		1.67
	43-5032 Dispatchers, Except Police, Fire, and Ambulance		0.21	1.02	1.07
	11-3071 Transportation, Storage, and Distribution Managers		0.98	0.46	0.63

Source: EMSI Complete Employment – 2013.2; US Bureau of Labor Statistics; TIP Strategies. Top-five occupations are shaded for each subsector.

Note: Methodology for assigning skill levels and designating HDOs (high demand occupations) is outlined on page 5.



## PORTS & MARITIME (CONTINUED)

**STAFFING:** A look at selected middle skills occupations related to the Ports & Maritime sector suggests supply is not well matched with demand. Of the occupations profiled, wage rates are above expected levels for Purchasing Agents and Front-Line Supervisors of Transportation Workers (Figure 53). Among the 25 leading middle skills occupations, Purchasing Agents have the highest share of older workers, with roughly one out of every three workers in the occupation (32 percent) estimated to be 55 years and over. For 11 of the key occupations, including Purchasing Agents, Industrial Machinery Mechanics, and Maintenance Workers, more than one-half of their workforces are 45 years or older (Figure 54).

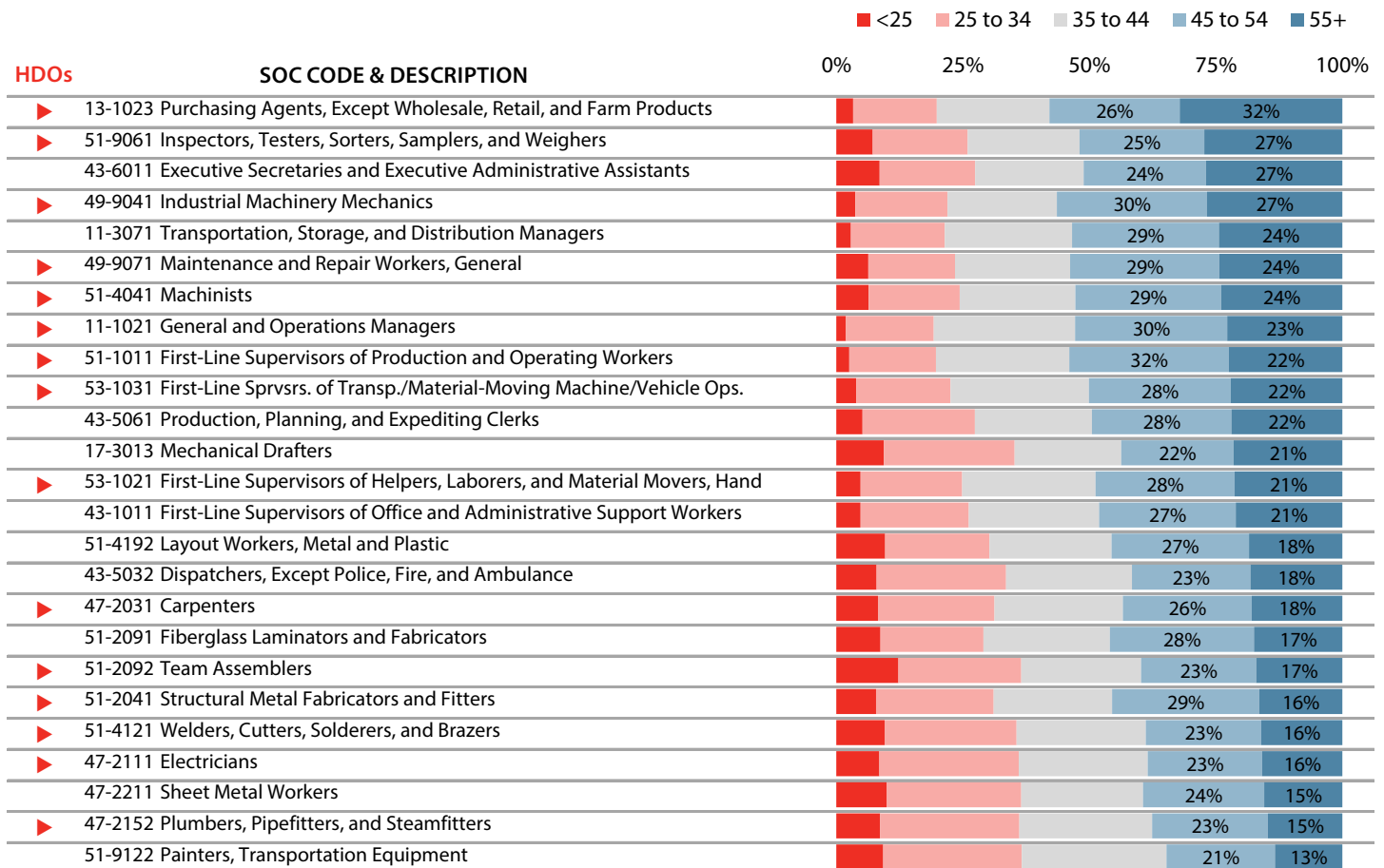
**FIGURE 53: STAFFING ENVIRONMENT FOR SELECT HOUSTON-AREA HIGH DEMAND OCCUPATIONS**

**LEGEND:** ● Unfavorable ● Neutral ● Favorable

OCCUPATIONS	SUPPLY/ DEMAND	WAGE ENVIRONMENT
Purchasing Agents	●	●
Inspectors, Testers, and Weighers	●	●
Supervisors of Material Movers, Hand	●	●
Sprvsrs. of Transp. Equip. Operators	●	●
Structural Metal Fabricators & Fitters	●	●

Source: EMSI. See page 6 for details on the staffing environment analysis. Unfavorable signifies that demand or wages have risen more rapidly than expected. Favorable signifies that demand or wages have risen in line with national trends.

**FIGURE 54: AGE DISTRIBUTION OF WORKERS IN KEY MIDDLE SKILLS OCCUPATIONS ESTIMATED SHARE OF TOTAL EMPLOYMENT BY AGE GROUP, RANKED BY SHARE OF WORKERS AGE 55 YEARS AND OLDER**



Source: EMSI Complete Employment – 2013.2; US Bureau of Labor Statistics; TIP Strategies. Methodology for designating HDOs (high demand occupations) is outlined on page 5.





## PORTS & MARITIME (CONTINUED)

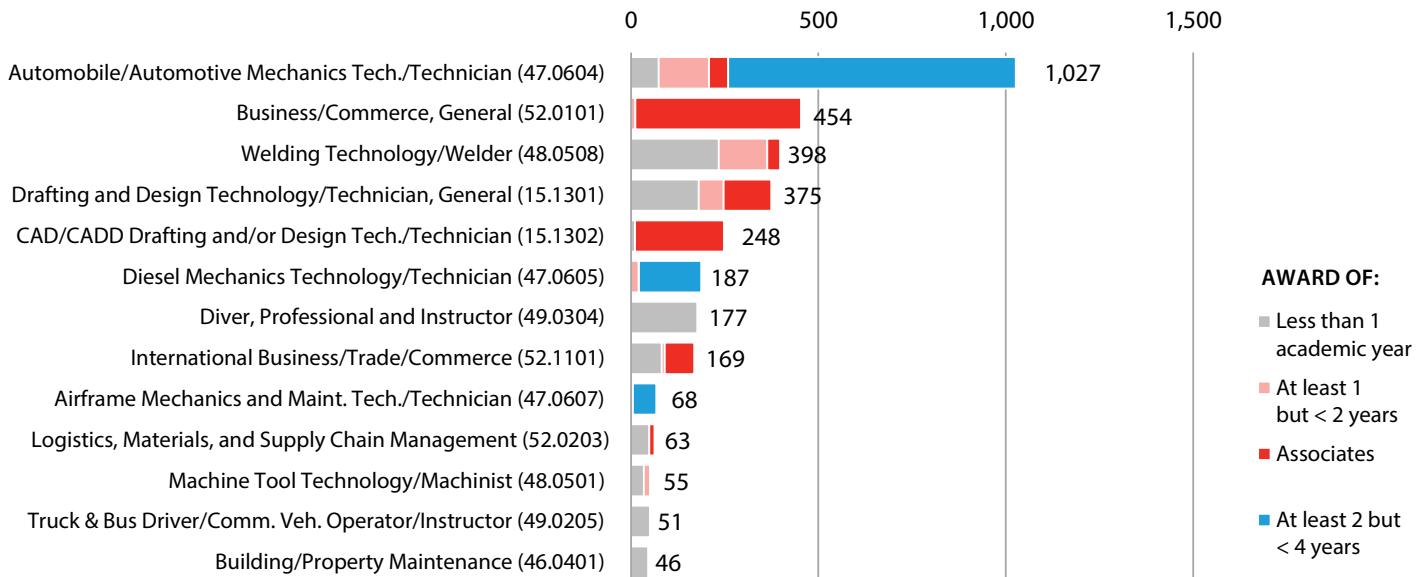
**EDUCATION & TRAINING:** Starting with the fall semester of 2012, San Jacinto College began offering an Associate of Applied Science in Maritime Technology, the state's first **for-credit** maritime program. This program is not reflected in the data analyzed for this report, which was based on awards and degrees conferred for credit during a two-year period ending in July 2012. San Jacinto College has offered a wide range of marine certification courses on a **noncredit** basis since 2010. Several other institutions offer noncredit training in related fields, including Logistics and Supply Chain Management and ISO Quality. The largest number of for-credit awards in transportation and distribution related fields of study were conferred in Automotive Repair (CIP 47.0604), with an average of slightly more than 1,000 degrees awarded each year.

**FIGURE 55: SELECTED NONCREDIT OFFERINGS**  
MARKETABLE SKILLS ACHIEVEMENT AWARDS OFFERED IN RELATED FIELDS

GULF COAST AREA COMMUNITY COLLEGES									
	Alvin Comm. College	Brazosport College	College of the Mainland	Galveston College	Houston Comm. College	Lee College	Lone Star College	San Jacinto College	Wharton Co.-Jr. College
Maritime								●	
Logistics/Supply Chain Mgmt.							●		●
ISO Quality Auditor								●	
Management/Supervision						●	●	●	●
Purchasing/Procurement/Contracts						●			●
Heavy Equip. Operator/Forklift						●	●		●

Source: Colleges. Data were requested from Galveston College but not received by the time of analysis. Data reflect only noncredit Marketable Skills Achievement (MSA) awards (i.e., workforce education programs consisting of 144-359 contact hours) and may not encompass all relevant activities at each college.

**FIGURE 56: EDUCATION & TRAINING COMPLETED IN RELEVANT FIELDS OF STUDY (CIP CODES)**  
TWO-YEAR AVERAGE OF AWARDS & DEGREES CONFERRED **FOR CREDIT** BY SELECTED HOUSTON-AREA INSTITUTIONS



Source: National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) surveys. Note: IPEDS data include only schools eligible to participate in federal financial aid programs. Figures represent an **average** of awards and degrees conferred at indicated levels during academic years 2011 (July 1, 2010 through June 30, 2011) and 2012 (July 1, 2011 through June 30, 2012) by public and private institutions in the 10-county Houston metropolitan area.



## PORTS & MARITIME (CONTINUED)

**REGIONAL INITIATIVES & RESOURCES:** Many of the initiatives and resources listed in the Oil & Gas and Petrochemicals profiles overlap with this sector, as these industries comprise a significant share of port-related activity.

**San Jacinto College's (SJC) Maritime Program** offers US Coast Guard-approved and internationally recognized STCW (Standards for Training, Certification and Watchkeeping) maritime training to prepare those already working or intending to work aboard vessels ranging from small tugboats to the largest oil tankers. The program has grown rapidly since its inception in 2010. In addition to a broad array of noncredit programs, SJC added an Associate Degree in Maritime Technology in the fall of 2012, which will combine USCG and STCW approved maritime training with the college-level academics required of a two-year college degree. The college is also constructing a new Maritime Technology and Training Center which will be located in the Bayport Terminal Facility in the Port of Houston. The complex is currently projected to open in September of 2015. [www.sanjac.edu/maritime](http://www.sanjac.edu/maritime)

The **Economic Alliance of the Houston Port Region** provides professional economic development services on behalf of 16 communities surrounding the 25-mile Houston Ship Channel, working closely with a range of allies including the Greater Houston Partnership, East Harris County Manufacturers Association, CenterPoint Energy, the Office of the Governor's Economic Development and Tourism Division, and San Jacinto College. The Economic Alliance's Workforce Development Committee is composed of companies, school districts, and community colleges and is charged with (1) coordinating programs and stakeholders; (2) raising awareness among students, teachers, counselors, and parents about career opportunities; and (3) maintaining and communicating the inventory of careers available and the qualifications and requirements for employability. Other initiatives include the 2007 creation of the San Jacinto Texas Historic District and preparation

and implementation of Project Stars, an urban revitalization plan designed to enhance the image of member communities. [www.allianceportregion.com/](http://www.allianceportregion.com/)

The **East Harris County Manufacturers Association** is an alliance of more than 125 chemical manufacturers, refiners and supporting distribution facilities employing more than 33,000 people throughout East Harris County. Member companies contribute about \$12 billion annually to the local economy through taxes, payrolls, purchases and capital expenditures. The association's Workforce Development Committee focuses on competency development of new and incumbent operators and maintenance crafts. In addition, the committee promotes industry awareness by informing students and educators at all levels about the profession. [www.ehcma.org/](http://www.ehcma.org/)

The **Futures Academy** is a dual enrollment model that enables students at seven Houston Independent School District (HISD) campuses to fulfill high school graduation requirements while simultaneously earning industry certifications, college credits, and Associate of Science degrees by August after their senior year. The program is a partnership between HISD, Houston Community College, and industry. Courses are taught by college professors utilizing a blend of face-to-face and online instruction. The program is designed to prepare students for additional postsecondary training or employment in some of Houston's most important industries, including medicine, shipping, energy manufacturing, and computer technology. [www.houstonisd.org/Page/60413](http://www.houstonisd.org/Page/60413)



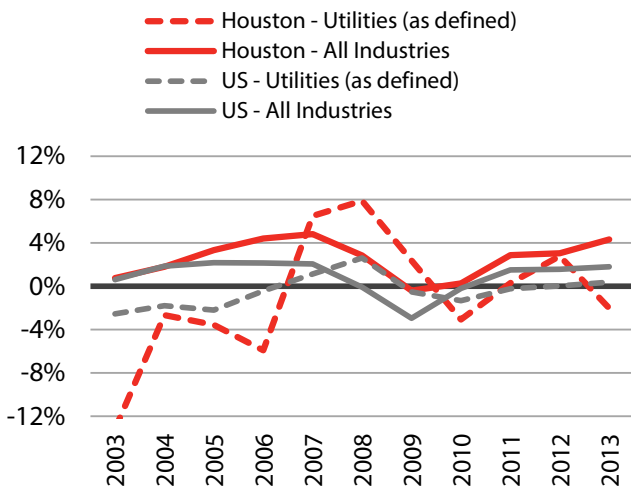
# UTILITIES



**GROWTH TRENDS:** The Utilities sector (as defined ►) employed nearly 15,000 workers in the 10-county Houston metropolitan area in 2013. Utilities employment in the region has been highly volatile, relative to the nation, with periods of steep declines followed by sharp upticks throughout the past decade. The region’s Utilities employment declined sharply beginning in 2008 in response to the economic downturn. Like the Petrochemical sector, however, the trough for Houston came in 2010 with a 3 percent drop in employment levels between 2009 and 2010.

Of the two major utilities subsectors—Electric Power and Natural Gas Distribution—employment in Natural Gas Distribution has been the more volatile. Dramatic employment shifts in the early part of the decade were likely linked to supply shortages, with the subsector losing nearly one-third of total employment in the Houston area between 2002 and 2003. While tight supplies and high prices might typically be expected to trigger production increases, concerns about the start of military action in Iraq, coupled with several warmer-than-average winters, resulted in a drop in residential and commercial consumption, which translated into production declines.

**FIGURE 57: EMPLOYMENT TRENDS**  
% CHANGE FROM PRIOR YEAR, 2003-2013



Source: EMSI Complete Employment – 2013.2



**SECTOR DEFINITION:** For this work, the Utilities sector includes establishments primarily engaged in generating, transmitting, and/or distributing electric power, and those engaged in the distribution of natural gas.

Establishments engaged in the generation, transmission, and distribution of electric power may perform one or more of the following activities: (1) operating generation facilities that produce electric energy; (2) operating transmission systems that convey the electricity from the generation facility to the distribution system; and (3) operating distribution systems that convey electric power received from the generation facility or the transmission system to the final consumer.

Natural Gas distribution activities include: (1) establishments primarily engaged in operating gas distribution systems (e.g., mains, meters); (2) establishments known as gas marketers that buy gas from the well and sell it to a distribution system; (3) establishments known as gas brokers or agents that arrange the sale of gas over gas distribution systems operated by others; and (4) establishments primarily engaged in transmitting and distributing gas to final consumers.

## NAICS CODE & DESCRIPTION

2211 Electric power generation, transmission, and distribution

2212 Natural gas distribution

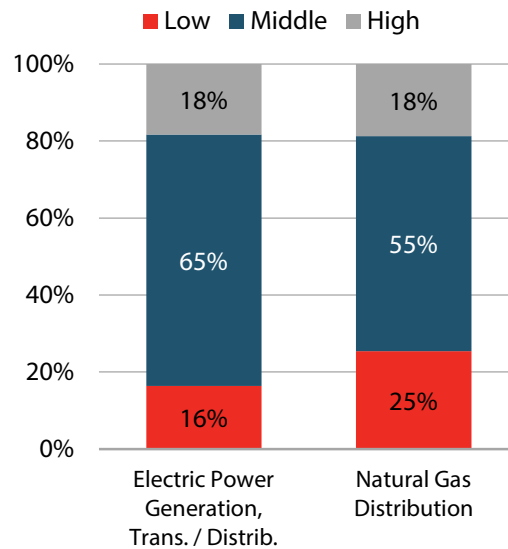


## UTILITIES (CONTINUED)

**MAJOR EMPLOYERS:** Given the massive energy industry and the presence of retail electric competition in the region, the Houston area boasts a number of utility-related companies. A list of selected firms is provided in Figure 59.

**MIDDLE SKILLS:** Middle skills occupations account for at least one-half of all employment in the utilities sector. Within the natural gas distribution subsector, middle skills workers comprise one out of every two jobs. For the electric power subsector, the number of middle skills positions is closer to two out of three. Higher skilled positions—those requiring a four-year degree or above—comprise less than 20 percent of each subsector. Lower skilled workers are slightly more common in the natural gas distribution subsector, accounting for one-fourth of total employment (25 percent) versus 16 percent in the electric power subsector.

**FIGURE 58: SECTOR SKILLS DISTRIBUTION OF SKILLS WITHIN SUBSECTORS**



Source: EMSI Complete Employment – 2013.2. For this analysis, middle skills are defined as those requiring at least a high school diploma (with some level of training or work experience), but less than a four-year degree.

**FIGURE 59: SELECTED HOUSTON-AREA UTILITY-RELATED FIRMS COMPANIES ASSOCIATED WITH THE GENERATION, TRANSMISSION, AND DISTRIBUTION OF ELECTRIC POWER OR NATURAL GAS**

COMPANY	INDUSTRY	EMPLOYMENT CATEGORY
Biztel Holdings LLC	Retail electric (Spark Energy)	100-499
Calpine	Electric utility	100-499
CenterPoint Energy	Retail electric service provider (Houston area); natural gas sales and distribution	1,000+
Dynegy	Wholesale power, capacity and ancillary services	100-499
Exelon Energy	Power generator serving 47 states, retail services to be rebranded as Constellation Energy	100-499
Gexa Energy	Retail electric provider	100-499
Kinder-Morgan	Transportation, storage, and distribution of natural gas (through acquisition of El Paso)	100-499
Northern Border Pipeline	Natural gas transportation, general p'ship owned by TC Pipelines and ONEOK Partners	100-499
NRG Energy	Diverse power generation (solar, wind, fossil, nuclear) and retail electric provider (incl., Reliant)	1,000+
Pacific Gas & Electric Co.	Combination natural gas and electric utility provider	100-499
Panhandle Energy	Supplier of energy (natural gas) to utility and industrial users, owned by Southern Union	500-999
Southern Union Co.	Transportation, storage and distribution of natural gas, owned by Energy Transfer Partners	500-999

Source: Texas Workforce Commission (employment categories), company websites, TIP Strategies research



## UTILITIES (CONTINUED)

**KEY OCCUPATIONS:** Although the two utilities subsectors share a number of common middle skills occupations, the concentration of individual occupations differs. As might be expected, occupations associated with the installation and repair of electrical grid are prevalent within the electric power subsector. Electric Power-Line Installers and Repairers (SOC 49-9051) are the most concentrated, accounting for nearly 15 percent of total employment in the electric power subsector, as well as roughly 3 percent of natural gas distribution workers.

Occupations related to the maintenance and repair of pipelines represent a greater share of total employment in the natural gas subsector. Control and Valve Installers and Repairers (SOC 49-9012) are the most frequently found occupation in the subsector representing slightly more than 7 percent of the workforce, followed by Plumbers, Pipefitters, and Steamfitters (SOC 47-2152), which account for almost 5 percent of total employment.

**FIGURE 60: KEY MIDDLE SKILLS OCCUPATIONS FOR SELECTED UTILITIES SUBSECTORS**  
25 LARGEST BASED ON NATIONAL STAFFING PATTERNS, WITH HIGH DEMAND OCCUPATIONS (HDOs ►) INDICATED

HDOs	SOC CODE & DESCRIPTION	OCCUPATION'S SHARE OF TOTAL EMPLOYMENT IN SPECIFIED INDUSTRY ►	
		ELECTRIC POWER GENERATION, TRANSMISSION AND DISTRIBUTION	NATURAL GAS DISTRIBUTION
►	49-9051 Electrical Power-Line Installers and Repairers	14.45	3.21
	51-8013 Power Plant Operators	7.55	0.75
	49-2095 Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	4.15	0.39
►	49-1011 First-Line Supervisors of Mechanics, Installers, and Repairers	3.51	2.49
►	51-1011 First-Line Supervisors of Production and Operating Workers	2.42	1.20
	49-9012 Control and Valve Installers and Repairers, Except Mechanical Door	2.07	7.26
►	49-9041 Industrial Machinery Mechanics	2.01	2.22
►	11-1021 General and Operations Managers	1.94	1.83
►	17-3023 Electrical and Electronics Engineering Technicians	1.72	0.41
►	47-2111 Electricians	1.71	0.58
	51-8012 Power Distributors and Dispatchers	1.69	0.39
	51-8011 Nuclear Power Reactor Operators	1.49	
	43-1011 First-Line Supervisors of Office and Administrative Support Workers	1.46	1.75
►	49-9071 Maintenance and Repair Workers, General	1.42	1.19
►	13-1199 Business Operations Specialists, All Other	1.25	1.80
	19-4051 Nuclear Technicians	1.02	
	43-6011 Executive Secretaries and Executive Administrative Assistants	1.00	0.96
	43-3031 Bookkeeping, Accounting, and Auditing Clerks	0.86	0.90
	43-5032 Dispatchers, Except Police, Fire, and Ambulance	0.62	0.97
►	47-2073 Operating Engineers and Other Construction Equipment Operators	0.55	1.07
	43-3011 Bill and Account Collectors	0.47	0.86
►	47-1011 First-Line Supervisors of Construction Trades and Extraction Workers	0.46	1.28
	51-8092 Gas Plant Operators	0.31	3.88
►	47-2152 Plumbers, Pipefitters, and Steamfitters	0.30	4.81
	41-4012 Sales Reps. Wholesale and Mfg., Except Tech. and Scientific Products	0.23	1.20

Source: EMSI Complete Employment – 2013.2; US Bureau of Labor Statistics; TIP Strategies. Top-five occupations are shaded for each subsector.

Note: Methodology for assigning skill levels and designating HDOs (high demand occupations) is outlined on page 5.



## UTILITIES (CONTINUED)

**STAFFING:** Within the Utilities sector, a number of the key middle skills occupations are aging, including many supervisory and operating positions. For example, more than 60 percent of the region’s Gas Plant Operators (three out of five workers) is estimated to be at least 45 years old, with one quarter of the occupation’s workforce aged 55 years or over. First-Line Supervisors of the various categories of workers (Construction and Extraction, Installation and Repair, and Production and Operating) will also begin to face a wave of retirements in the coming decade. The staffing environment analysis points to increasing wage pressures for some of the sector’s key positions.

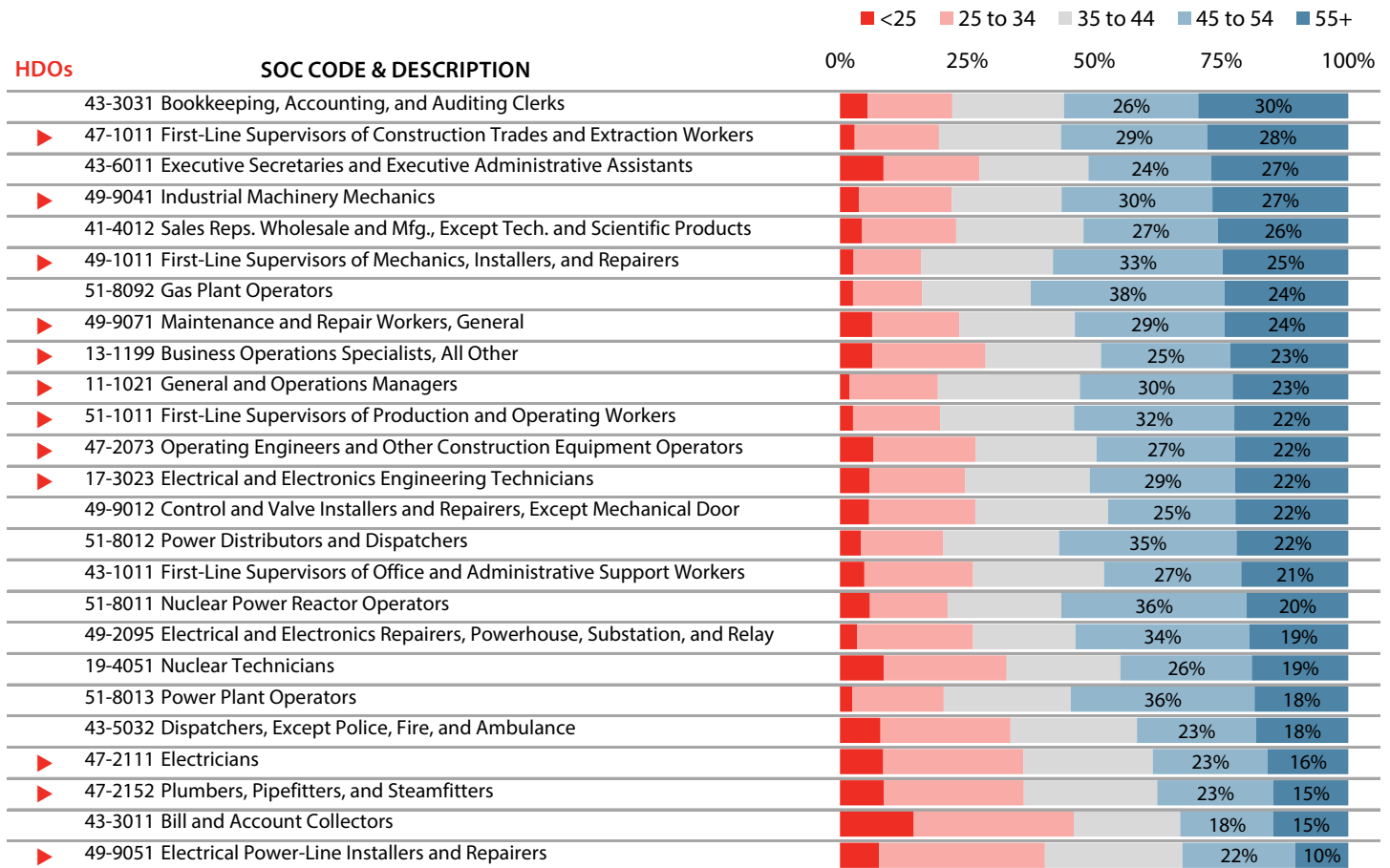
**FIGURE 61: STAFFING ENVIRONMENT FOR SELECT HOUSTON-AREA HIGH-DEMAND OCCUPATIONS**

**LEGEND:** ● Unfavorable ● Neutral ● Favorable

OCCUPATIONS	SUPPLY/ DEMAND	WAGE ENVIRONMENT
Electrical/Electronic Eng. Technicians	● Unfavorable	● Unfavorable
Operating Eng./Constr. Equip. Operators	● Favorable	● Unfavorable
Power Line Installers/Repairers	● Neutral	● Neutral
Supv of Mechanics/Installers/Repairers	● Unfavorable	● Unfavorable
Power Plant Operators	● Neutral	● Unfavorable

Source: EMSI. See page 6 for details on the staffing environment analysis. Unfavorable signifies that demand or wages have risen more rapidly than expected. Favorable signifies that demand or wages have risen in line with national trends.

**FIGURE 62: AGE DISTRIBUTION OF WORKERS IN KEY MIDDLE SKILLS OCCUPATIONS ESTIMATED SHARE OF TOTAL EMPLOYMENT BY AGE GROUP, RANKED BY SHARE OF WORKERS AGE 55 YEARS AND OLDER**



Source: EMSI Complete Employment – 2013.2; US Bureau of Labor Statistics; TIP Strategies. Methodology for designating HDOs (high demand occupations) is outlined on page 5.



## UTILITIES (CONTINUED)

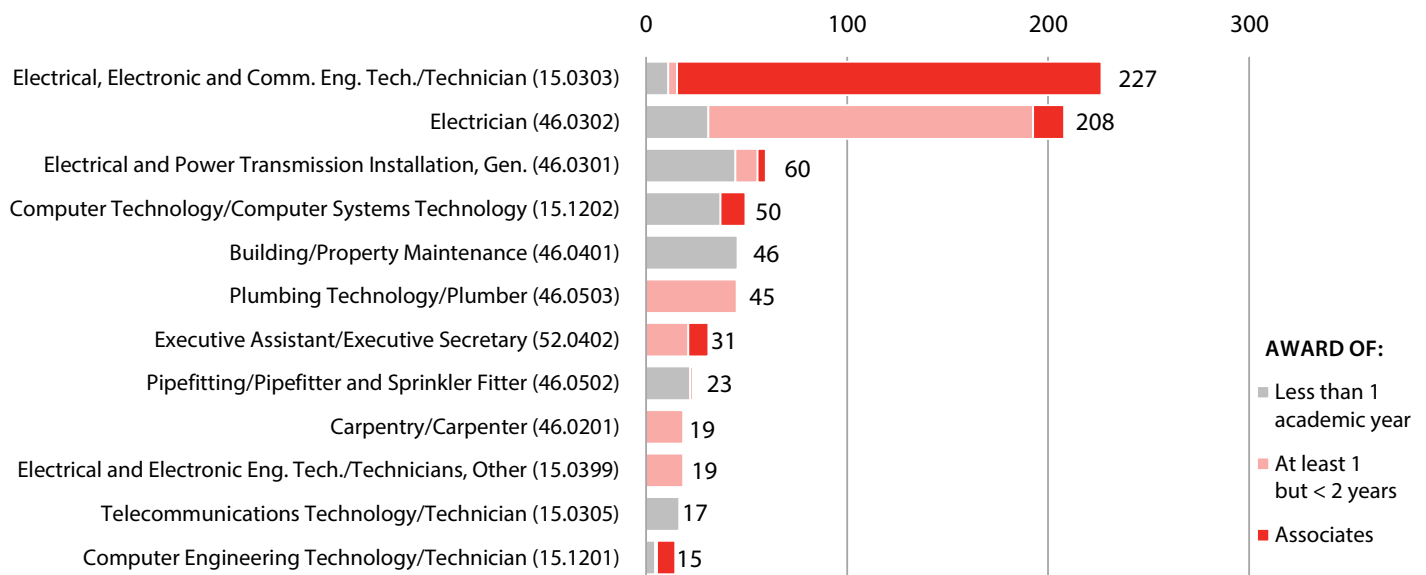
**EDUCATION & TRAINING:** The largest number of **for credit** awards made in fields of study related to key occupations for the Utility sector was in CIP 15.0303. Programs included in this category prepare individuals to apply basic engineering principles and technical skills in support of Electrical, Electronics and Communication Engineers. Regional institutions that report to NCES awarded an average of 227 degrees in this field of study during the past two years. The number of for credit awards in CIP 46.0301, which prepares students for careers in the installation of electrical systems and associated transmission lines is relatively small, averaging just 60 completions annually during the period analyzed. However, training in this field is offered on a **noncredit** basis by Lee College and College of the Mainland. Lee College also offers noncredit training in Energy Management and Systems Technology.

**FIGURE 63: SELECTED NONCREDIT OFFERINGS**  
MARKETABLE SKILLS ACHIEVEMENT AWARDS OFFERED IN RELATED FIELDS

GULF COAST AREA COMMUNITY COLLEGES									
	Alvin Comm. College	Brazosport College	College of the Mainland	Galveston College	Houston Comm. College	Lee College	Lone Star College	San Jacinto College	Wharton Co. Jr. College
Energy Mgmt./Systems Tech.						●			
Electrical & Power Transmission Installation/Installers			●			●			
Commercial Truck Driving	●				●		●	●	
Pipefitting			●			●		●	

Source: Colleges. Data were requested from Galveston College but not received by the time of analysis. Data reflect only noncredit Marketable Skills Achievement (MSA) awards (i.e., workforce education programs consisting of 144-359 contact hours) and may not encompass all relevant activities at each college.

**FIGURE 64: EDUCATION & TRAINING COMPLETED IN RELEVANT FIELDS OF STUDY (CIP CODES)**  
TWO-YEAR AVERAGE OF AWARDS & DEGREES CONFERRED **FOR CREDIT** BY SELECTED HOUSTON-AREA INSTITUTIONS



Source: National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) surveys. Note: IPEDS data include only schools eligible to participate in federal financial aid programs. Figures represent an **average** of awards and degrees conferred at indicated levels during academic years 2011 (July 1, 2010 through June 30, 2011) and 2012 (July 1, 2011 through June 30, 2012) by public and private institutions in the 10-county Houston metropolitan area.



## UTILITIES (CONTINUED)

**REGIONAL INITIATIVES & RESOURCES:** The **Lone Star Energy & Manufacturing Institute** (Lone Star EMI) collaborates with Lone Star Corporate College and the six LSC campuses to provide hands-on, competency-based technical training to businesses with employees currently working or seeking a career in the oil and gas, alternative energy, or mechanized (automated) production industries. The program operates a state-of-the-art facility at Lone Star's University Park campus, with instructors drawn from PetroEd®, Oracle, the University of Houston, and other regional and national institutions.

[www.LoneStar.edu/EMI](http://www.LoneStar.edu/EMI)

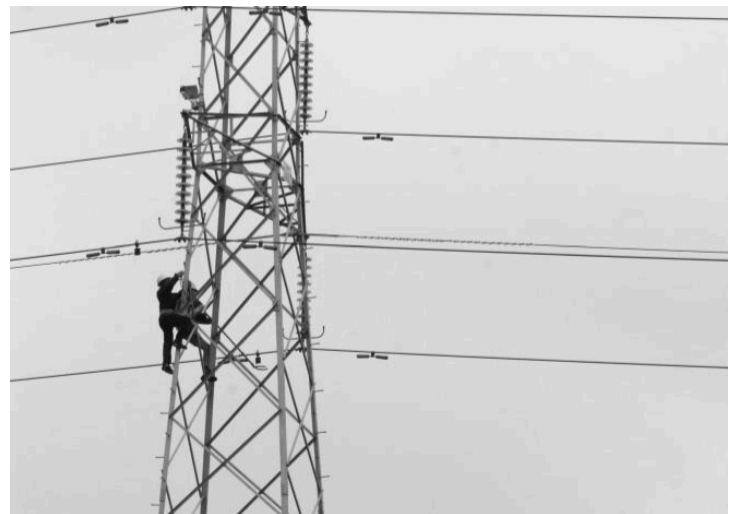
The **Energy Institute High School** is a brand new full magnet Houston ISD school located in the Heights. The school is the first in the nation with a school-wide theme of energy, with areas of focus along three pathways: geosciences, alternative energy, and offshore technology. [www.houstonisd.org/site/default.aspx?domainid=644](http://www.houstonisd.org/site/default.aspx?domainid=644)

The **Greater Houston Energy Collaborative** is an economic development cluster council consisting of an overall leadership committee and subcommittees on marketing, cluster development, work force development, and energy policy. Goals of the initiative, which are parts of the Greater Houston Partnership's overall energy strategy, include: (1) strengthening Houston's role as a premier energy hub; (2) expanding Houston's energy portfolio through cluster development initiatives; (3) building the energy work force of the future; and (4) promoting a balanced energy policy framework.

[www.houstonenergyfuture.com/energy-collaborative/](http://www.houstonenergyfuture.com/energy-collaborative/)

Relevant industry and trade associations include:

- The **Houston Energy Council (HEC)** serves as a common communication point for energy professional organizations in Houston. Each organization accepted for membership in the HEC is allowed two representatives on the council. [www.houstonenergycouncil.org/](http://www.houstonenergycouncil.org/)
- The **Houston Business Roundtable (HBR)** membership consists primarily of refining, chemical, and energy companies. HBR and the Houston Area Safety Council host the Annual Safety Excellence Awards Banquet which honors contractors in the Houston/Gulf Coast for outstanding safety performance. [www.houbrt.com/](http://www.houbrt.com/)
- **Young Professionals in Energy (YPE Houston)** aims to facilitate the advancement of young professionals in the global energy industry. [www.ypenenergy.org/ypehouston/](http://www.ypenenergy.org/ypehouston/)









APPENDIX D  
DATA SOURCES

# APPENDIX D—DATA SOURCES

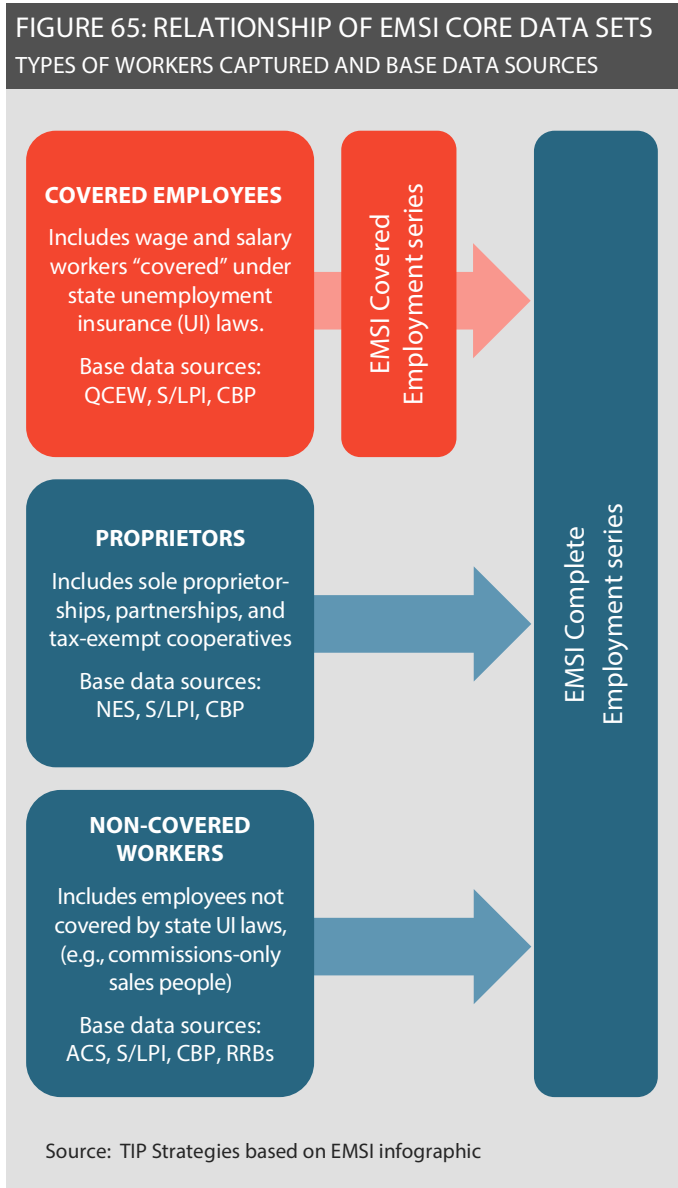
## EMSI

The occupational data presented in this report were prepared using EMSI’s Complete Employment series. EMSI gathers and integrates economic, labor market, demographic, and education data from over 90 government and private-sector sources, creating a comprehensive and current database that includes both published data and detailed estimates with full coverage of the US.

The company’s core data consists of jobs (historical and projected) and earnings (current year) by industry and occupation for every ZIP code and county in the US. EMSI data are annual averages of jobs (not workers); full- and part-time jobs are counted equally.

EMSI produces industry and occupation datasets with two different types of coverage. Coverage refers to the types of jobs counted.

- **EMSI Covered:** This dataset primarily counts “payroll” jobs that are covered by unemployment insurance (UI); the primary source is the Quarterly Census of Employment and Wages (QCEW). But EMSI also includes some jobs excluded from QCEW, such as railroad jobs (which have their own UI program), all wage and salary agriculture jobs, and military. These additional categories are based on figures from State and Local Area Personal Income (S/LPI) reports produced by the Commerce Department’s Bureau of Economic Analysis (BEA), and state and county railroad retirement boards (RRBs). Data from the Census-produced County Business Patterns (CBP) are also used.
- **EMSI Complete:** This dataset includes all jobs in EMSI Covered, plus additional types of noncovered jobs, such as the self-employed (proprietors), commissions-only salespeople, and various types of non-UI-covered wage and salary workers. Major sources of self-employment data include Nonemployer Statistics (NES), the American Community Survey (ACS), and the S/LPI



The relationship between EMSI Covered Employment and EMSI Complete Employment is diagrammed in Figure 65.

For each data set, EMSI creates long-term, 10-year industry projections starting from the current year. These projections are based on a combination of the following:

- Recent trends in all industries for every local geography,
- National industry projections produced by the US Bureau of Labor Statistics (BLS),
- State and sub-state regional projections produced by individual states.

The company’s methodology is designed to capture the expertise embodied in federal and state agencies. However, since official projections produced through the state-federal partnership typically have a base year that lags 2-3 years behind the current year, EMSI projections are also informed by the most recent data and trends available.

The first step in the process is to track recent local trends using a linear regression function. Taking into account the previous base data from 15, 10, and 5 years prior to the base year, EMSI’s analysts plot a line as a function of year and employment. This line is dampened (flattened) to smooth out the effects of any volatility. Once this is done, state and local government industries (as well as the US Postal Service) are projected based on the growth or decline of local economies rather than projected through linear regression. Federal government and military, however, are projected through linear regression at the national level and their growth rate is then applied to the states and counties. Next, EMSI adjusts the projections for all counties so they sum to state- and national-level numbers.

After these initial projections are completed, EMSI’s analysts begin a series of controls and adjustments to other data sources. The first of these is an adjustment to the BLS staffing patterns. Essentially the company’s projected national growth rate is changed to match the growth rate of the BLS numbers. This adjusts the curve up or down while staying as close to our projected values as possible. Following this, county and state-level projections are adjusted to the state-produced state and sub-state regional projections. County values are controlled to the regional data and state projections are controlled to the reported state data. Once these adjustments and controls are completed, the final state-level numbers are aggregated to determine the final national projections. This causes EMSI data to match state projections very closely, but it also means EMSI projections can stray from the national projections.

The company has incorporated workforce demographics in the latest release of its analytical tools. This data is drawn from the relatively new Local Employment Household Dynamics series produced through a partnership of several federal agencies led by the US Census Bureau. One of its primary data sources, Quarterly Workforce Indicators, provides the basis for EMSI’s estimates of occupations by age and gender.

**FIGURE 66: PRIMARY INDUSTRY/OCCUPATION DATA SOURCES**  
MAJOR SOURCES USED FOR EMSI’S 2013.2 DATA RELEASE

DATA SOURCE	ABBRV.	AGENCY	VERSION USED*
State Personal Income	SPI	BEA	2011
Local Area Personal Income	LPI	BEA	2010
Industry Economic Accounts	IEA	BEA	2002-2011
American Community Survey	ACS	Census	2005-2011
County Business Patterns	CBP	Census	2010
ZIP Code Business Patterns	ZBP	Census	2010
Nonemployer Statistics	NES	Census	2010
Quarterly Census of Employment and Wages	QCEW	BLS	2012 Q3
Current Employment Statistics	CES	BLS	Feb. 2013
Natl. Employment Projections (Industry Occupation Matrix)	EP	BLS	2010-2020
Occupational Employment Statistics	OES	BLS	2011
Railroad Retirement Board Tables, State/County	RRB	RRB	2012/2011
Equifax Business Data		Equifax	2013 Q1
Long-term state industry projections		Individual states	varies by state
LEHD/Quarterly Workforce Indicators	QWI	Census	varies by state

Source: EMSI data release notes \* Indicates release date, not data reference period

## CLASSIFICATION SYSTEMS

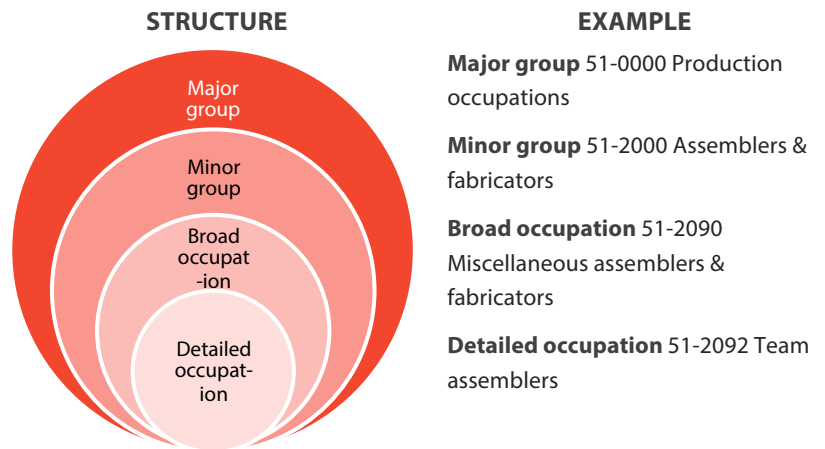
Much of the analysis presented in this report relies on three separate classification systems: A brief overview of each is presented below.

The **Standard Occupational Classification (SOC)** system is used by federal statistical agencies to classify workers into categories for the purpose of collecting, calculating, or disseminating data. This system groups all occupations in which work is performed for pay or profit according to the type of work performed and, in some cases, on the skills, education, or training needed to perform the work at a competent level. Under the 2010 SOC system, workers are classified into one of 840 detailed occupations, which are combined to form 461 broad occupations, 97 minor groups, and 23 major groups.

The **North American Industry Classification System (NAICS)** (NAICS, pronounced Nakes) was developed under the direction and guidance of the Office of Management and Budget (OMB) as the standard for use by Federal statistical agencies in classifying business establishments for the collection, tabulation, presentation, and analysis of statistical data describing the US economy. The classification system was developed jointly with government agencies in Canada and Mexico to allow for a high level of comparability in business statistics among the North American countries.

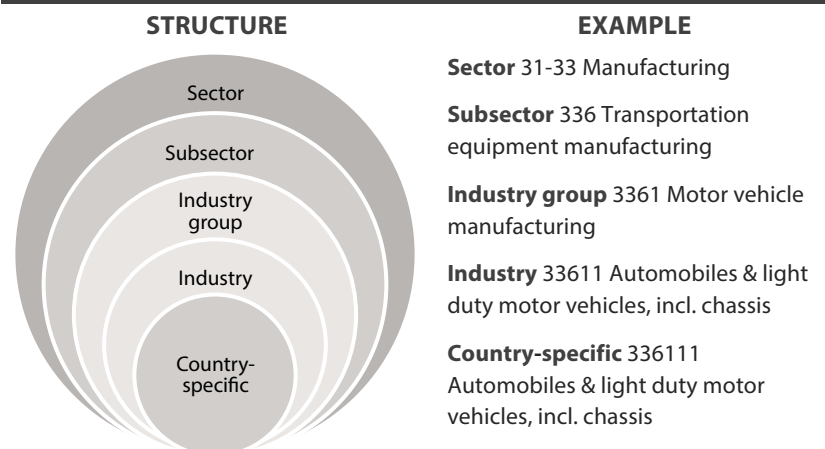
The version of NAICS currently in wide use was released in 2007 and classifies industries into 20 sectors based on production processes. These sectors are broken into subsectors, industry groups, and individual industries. An additional level of detail is provided to accommodate industry codes specific to the three countries. The classification system is updated every five years. The 2012 NAICS structure was finalized in August 2011. Federal statistical agencies were directed to begin using the new system for data published for reference years beginning on or after January 1, 2012.

FIGURE 67: STANDARD OCCUPATIONAL CLASSIFICATION (SOC)



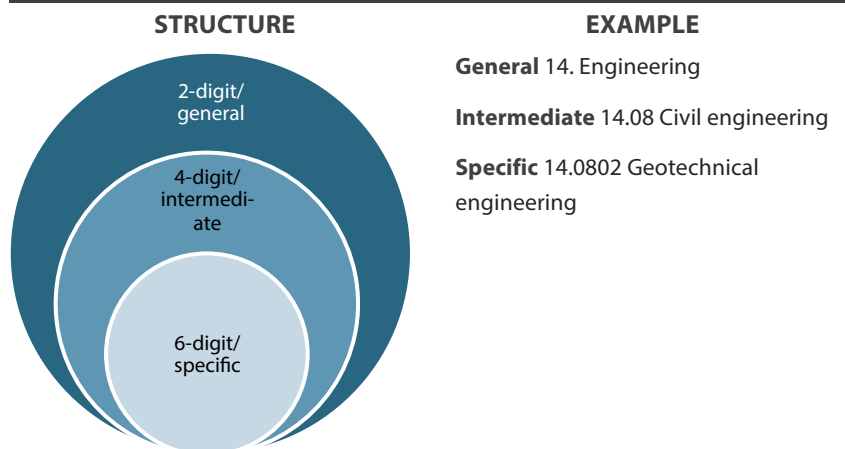
Source: US Bureau of Labor Statistics; TIP Strategies

FIGURE 68: NORTH AMERICAN INDUSTRIAL CLASSIFICATION (NAICS)



Source: US Census Bureau; TIP Strategies

FIGURE 69: CLASSIFICATION OF INSTRUCTIONAL PROGRAMS (CIP)



Source: National Center for Education Statistics; TIP Strategies

The **Classification of Instructional Programs** (CIP) is the accepted federal government statistical standard on instructional program classifications. Developed in 1980 by the National Center for Education Statistics, the CIP is used by state agencies, national associations, academic institutions, and employment counseling services for collecting, reporting, and analyzing instructional program data.

The CIP titles and program descriptions are intended to be generic categories into which program completions data can be placed, and are not exact duplicates of specific major or field of study titles used by individual institutions. The vast majority of CIP titles correspond to academic and occupational instructional programs offered for credit at the postsecondary level. These programs result in recognized completion points and awards, including degrees, certificates, and other formal awards. The CIP also includes other types of instructional programs, such as residency programs in various dental, medical, podiatric, and veterinary specialties that may lead to advanced professional certification; personal improvement and leisure programs; and instructional programs that lead to diplomas and certificates at the secondary level only.

## POSTSECONDARY COMPLETIONS

To help illustrate the availability of postsecondary offerings in the area, TIP compiled data for all institutions in the 10-county region that participate in the National Center for Education Statistic's Integrated Postsecondary Data System (IPEDS). The results of this analysis are presented as part of the sector profiles starting on page 43.

The following points are pertinent to understanding this analysis.

- **Completions data.** Under the Higher Education Act of 1965, every college, university, and vocational or technical institution that participates in federal financial student aid programs (such as Pell grants or federally backed student loans) is required to report data on enrollments, program completions, graduation rates, faculty and staff, finances, institutional prices, and student financial aid. These data are collected through a system of interrelated surveys conducted annually by the US Department of Education's National Center for Education Statistics (NCES). Data are made available to researchers through IPEDS. Each fall, institutions are required to report data on the number of awards conferred by program (at the 6-digit CIP code) , by level (associate, bachelor's, master's, doctorate, certificates), and by the race
- **Approach.** Completions data for all participating public and private institutions in the 10-county Houston metropolitan area were downloaded from the IPEDS Data Center. Data for academic years 2011 (July 1, 2010 through June 30, 2011) and 2012 (July 1, 2011 through June 30, 2012) were compiled by Classification of Instructional Programs (CIP) code and averaged across the two-year period to smooth out any fluctuations. Using a crosswalk obtained from the National Crosswalk Service Center, we matched individual middle skills occupations in each cluster against completions data for all relevant CIP codes.
- **Limitations.** This analysis has several technical limitations. First, because of the large number of occupations analyzed, we relied on data from a federal survey that aggregates self-reported data. This approach had the advantage of providing uniform and consistent data across educational institutions but is only as good as the quality of information input into the system. Second, the analysis relies on the use of a crosswalk to link occupations (SOC codes) with programs of study (CIP codes). This is an imperfect tool as it may not capture the actual relationship between an individual's educational course work and their intended occupation.

Finally, the published data does not include non-credit awards. Depending on the occupation, this can affect the ability to gain a full picture of the supply of graduates. To help understand the scope of noncredit offerings in the region, we requested noncredit completions data from each of the nine public community colleges serving the

region. Eight of the nine schools provided some information on noncredit awards, however, the nature of the responses varied widely, with some providing enrollment data only. As a result, the analysis should be viewed as a starting point for discussion.





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Prepared by:

