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Heating Ventilation & Air Conditioning Occupations

LOS ANGELES COUNTY

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CENTER OF EXCELLENCE

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**ECONOMIC &
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CALIFORNIA'S LONG TERM ENERGY EFFICIENCY STRATEGIC PLAN EMPHASIZES THAT HVAC WILL BE TRANSFORMED TO ENSURE THAT ITS ENERGY PERFORMANCE IS OPTIMAL FOR CALIFORNIA'S CLIMATE¹. ACCORDING TO CALIFORNIA'S EMPLOYMENT DEVELOPMENT DEPARTMENT, THERE ARE OVER 600 ANNUAL JOB OPENINGS IN LOS ANGELES COUNTY FOR THE FOUR HEATING, VENTILATION AND AIR CONDITIONING OCCUPATIONS THAT ARE PROFILED IN THIS RESEARCH STUDY. BY 2014 OVER 20,000 PEOPLE IN LOS ANGELES WILL BE EMPLOYED IN THESE POSITIONS.

Executive Summary

Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration (HVAC/R) occupations are found in multiple industries and employ over 18,000² people in Los Angeles County. According to economy.com, industries where HVAC occupations are prevalent will experience overall employment growth of five to eight percent through 2010. This is considerably higher than the three percent employment growth projected for the County overall, over the same period of time. Employers and recruiters of HVAC occupations have also indicated workforce challenges including:

- An aging workforce, with a relatively large percentage of workers set to retire in the next few years,
- The renewed focus on energy efficiency, which is changing the training and retraining requirements that are needed among new and current HVAC workers, and
- Difficulty finding and recruiting younger workers who are being properly trained and moving into HVAC occupations.

This report is an initial assessment of the workforce development opportunities available for HVAC occupations in Los Angeles. The findings of this study are based on secondary research and executive interviews with employers, educators, and recruiters of HVAC occupations. Unlike traditional industry cluster research, which focuses on a single industry or a group of connected industries, this occupational cluster report focuses on occupations that build, install, sell, maintain and repair HVAC and HVAC/R systems. These occupations will be impacted by California's Long Term Energy Efficiency Strategic Plan published by California's Public Utilities Commission, which calls for stronger partnerships with community colleges in ensuring a properly trained workforce for these occupations.

This report focuses on four HVAC-related occupations: Heating, Air Conditioning & Refrigeration Mechanics and Installers; Sheet Metal Workers; Sales Engineers; and Supervisor and Managers of Mechanics, Installers, and Repairers. Education

¹ The California Public Utilities Commission

² This figure is based on California Employment Development Department's 2004 estimate of the four HVAC occupations profiled in this report.

requirements for these occupations range from as little as 12 months of on-the-job training to a Bachelor's Degree.

HVAC occupations are not connected to a single industry cluster, but are found across varying industry clusters. These include commercial and residential construction, the public sector, and industrial and commercial machinery manufacturing and repair. These occupations are considered to be part of the energy-efficiency employment opportunities that are often discussed when examining the new green economy.

The community colleges in the Los Angeles region have an opportunity to work with HVAC employers, manufacturers, unions, and associations to strengthen their programs, upgrade equipment, and create certifications. This is timely given the recently published, "California's Long Term Energy Efficiency Strategic Plan" by the California Public Utilities Commission, which specifically calls for closer relationships with the community colleges.

Introduction

The California Community Colleges Economic and Workforce Development Program (EWD) has charged the Centers of Excellence with identifying industries and occupations that have unmet employee development needs. Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration (HVAC/R) occupations are experiencing greater demand from employers who indicate difficulty finding qualified applicants.

“America’s Forgotten Middle-Skill Jobs” reports that heating and air conditioning positions grew 21% nationwide over the period from 2000 to 2006. The study identifies HVAC as a key sector where demand is likely to be greater than supply over the next decade and beyond.

In addition, the average retirement age in the HVAC field is 55. Estimates project that the industry could face losing 33% of its present work force of over 18,000 workers in Los Angeles over the next 10 years. Taken together, continued industry growth and pending retirements will create a strong demand for additional HVAC workers over the next decade.

HVAC occupations in Los Angeles County are found in numerous industry clusters with a broad set of employers. Some of these industry clusters include residential and commercial construction, commercial and industrial machinery manufacturing and repair, and the public sector, where large buildings need to be maintained. In this scan, we present:

- An introduction to HVAC occupations and the industries where these occupations exist,
- The important trends within the HVAC industry including new training and educational trends, and developments associated with green buildings,
- Occupational profiles of key HVAC occupations which include descriptions of skill sets and educational requirements for the relevant occupations,
- Employer challenges,
- Community college programs and resources, and
- Recommendations for improving the supply of qualified candidates to the industry.

The four occupations highlighted in this report include HVAC/R Mechanics and Installers; Sheet Metal Workers; Supervisors of Mechanics, Installers, and Repairers; and Sales Engineers.

This report is intended to assist colleges with timely and credible information for the development or redesign of HVAC training and education programs.

Industry Overview

Traditional HVAC systems consume a large amount of energy. In North America, HVAC systems consume over 15 percent of all energy consumed on the Continent³.

In California, demand for residential and small commercial air conditioning alone, causes over 30% of the state's peak power demand in the summer⁴.

Recently, concerns about the increased cost of energy, the aging of commercial and industrial buildings, and the potential impacts of global warming on our demand for air conditioning are all influencing changes in the HVAC industry. Below are some of the trends and emerging issues affecting the HVAC industry and the occupations that are central to it.

HVAC installation, and to a lesser degree, service, are closely aligned with the building industry. As Los Angeles increasingly embraces 'green' buildings and a more environmentally sustainable approach to development, the HVAC industry will continue its active role in meeting the environmental challenges facing the industry.

The Legislative Demand for Energy Efficiency

HVAC systems play a central role in the energy profile of buildings. As the green building movement continues, the need for new HVAC systems that incorporate these energy efficiency objectives becomes more important. HVAC systems alone account for over 15 percent of all energy usage, which explains why they are a major focus of any policy that looks to reduce energy consumption. A component of this is **improvement of technician skills and more stringent certifications to insure proper installation and maintenance**. According to California's Long Term Energy Efficiency Strategic Plan, quality HVAC installation and maintenance is not the norm but the exception. The plan calls for a major transformation in educating consumers on the value of properly installed and maintained systems, while calling on the service industry to improve training and certification to maintain higher standards.

Policy makers in Washington D.C., Sacramento, and Los Angeles have passed multiple pieces of legislation with the goal of improving energy efficiency and combating global warming. Some examples of this legislation are as follows:

- Energy Policy Act of 2007 and the National Energy Appliance Conservation Act (NAECA) – Provides incentives for energy production and conservation. NAECA will have a direct impact on HVAC. It sets minimum efficiency standards for consumer and commercial machines, including large commercial air conditioners, walk-in refrigerators and freezers as well as commercial heaters.

³ Global Foresight, Inc. 2006 Report on Industry Trends

⁴ California's Public Utilities Commission

- AB 32: The Global Warming Solutions Act of 2006 – This legislation mandates the state of California to reduce its greenhouse gas emissions back below 1990 levels by 2020.
- SB 1: The Million Solar Roofs Bill – Provides funding, incentives, and mandates to increase solar panels throughout the state.
- AB 35: Green Buildings – Requires state buildings to be built to environmental standards such as LEED.
- As part of Mayor Villaraigosa’s Plan to create the “Greenest Big City in America” all new city buildings will be built to LEED standards. The LEED standards require substantially more efficient and integrated HVAC systems than what is typically used in commercial and industrial buildings.

These legislative examples illustrate California’s and Los Angeles’s commitment to reduce greenhouse gases. Given the large role that HVAC plays in a building’s energy consumption, these new energy efficient technologies will be increasingly important for the HVAC industry.

Technology and Training Trends for HVAC

Employers and educators in the HVAC world recognize the importance of the ‘greening’ of the industry. Some components of the green building requirements for HVAC systems (e.g., energy efficiency, integrated energy management systems, and indoor environmental quality monitoring) are already incorporated into some of the HVAC training curriculums in the region. As colleges consider partnerships and standardized certifications, they should consider these components for their curricula.

Some additional changes to HVAC/R technology and training include:

- **Being CFC (chlorofluorocarbons) and HCFC (hydro chlorofluorocarbons) free** – Many older refrigeration systems are being converted to use non-CFC refrigerants, while new systems that are being installed all use coolants that do not harm the atmosphere.
- A focus on **sustainability in the HVAC industry** – Organizations like ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) are committed to advancing the technology that promotes the sustainability of the building industry and HVAC’s role in that industry. This is impacting both the energy efficiency objectives of new HVAC systems, as well as the training needs of technicians.
- **Increasing complexity of diagnostic equipment for HVAC/R systems** – Diagnosing HVAC/R system problems requires computer training and the use of sophisticated software applications. While hands-on training will be important for HVAC/R technicians in the foreseeable future, more and more employers are looking for people that have proficiency with different computer applications as

they are becoming more prevalent in diagnostic work within the HVAC/R industry.

Educators and employers for HVAC occupations communicated the need to work closely with product manufacturers who are developing new HVAC products that monitor indoor air quality, manage energy systems, and provide constant feedback on energy performance measures.

HVAC Occupational Overview

While colleges need to be aware of the on-going changes connected to energy efficiency and increased opportunities for partnerships, they should also recognize that HVAC presents an opportunity for students in Los Angeles County who are looking for careers with excellent employment prospects⁵, relatively low educational pre-requisites, prevailing wages, and strong career pathway opportunities.

New HVAC occupations are growing at an average rate for Los Angeles County with approximately 10 percent growth estimated from 2004 to 2014 according to California's Employment Development Department. However, according to the same data source, there are high levels of job openings for replacement workers. This means that persons looking for work in these occupations will have strong prospects.

Nearly 76 million people (about one-third of all Americans) are baby boomers, many of whom are now approaching retirement. These retirements are expected to create nearly 1 million job openings in Los Angeles County in the next 10 years. A significant portion of these are found in HVAC, where retirement ages tend to be low – about 55. In fact, Los Angeles can expect approximately 33% of the 18,000 workers in HVAC related occupations to retire over the next decade.

This aligns with information acquired from employers and recruiters. Feedback indicated that they are finding some difficulty in recruiting new qualified employees for multiple HVAC positions. There was also concern that there were fewer young replacements for this expected wave of retirements in the next 3 to 5 years.

HVAC occupations can be classified under three generalized industries:

- **HVAC Installation** – this is the industry that is most closely tied to the construction industry and includes those contractors (NAICS: 23822 - Plumbing, Heating, and Air-Conditioning Contractors) that are responsible for installing HVAC/R systems in commercial and industrial buildings and to a lesser degree in the residential home building sector. The HVAC occupations that exist in Installation and Service include Heating, Air Conditioning and Refrigeration Mechanics and Installers; Maintenance and Repair Workers; Sheet Metal Workers; and Sales Engineers.

⁵ According to the BLS, job prospects for Heating, Air-Conditioning, and Refrigeration Mechanics and Installers are excellent (2008 Occupational Outlook Handbook)

- **HVAC Service** – these are the occupations that can be found throughout the economy, especially in those industries that own and maintain commercial or industrial buildings, such as schools and universities, hospitals and federal buildings. There are also HVAC service, repair, and maintenance firms (NAICS: 8113 Commercial and Industrial Machinery and Equipment [except Automotive and Electronic] Repair and Maintenance) that are focused on repairing and servicing current HVAC/R systems.
- **HVAC Manufacturing** – includes firms that are assembling and manufacturing HVAC and HVAC/R systems and parts (NAICS: 3334 - Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Manufacturing). In Los Angeles County, there are slightly fewer than 2,000⁶ people that work in this industry and most of the jobs can be found in production positions such as Team Assemblers, Welders, Cutters, Solderers, and Brazers, as well as Managers and Supervisors of production workers. The occupational profile of the manufacturing industry is very different than the occupations found in installation and service.

Employers in these three areas are found throughout Los Angeles County. Maps of employers in the regions that illustrate employer concentration can be found in Appendix B. Appendix C provides a snapshot of the top ten employers in each of the three industries.

Table 1 shows current and estimated employment for the three industries with the most HVAC occupational employment. Note that the overall estimated employment growth for Los Angeles County from 2006 to 2010 is approximately 3.0 percent⁷. All three HVAC industries, according to Economy.com, will have employment growth that is stronger than the region's overall employment growth for this period.

Table 1: Current & Estimated Jobs and Wages in Los Angeles by HVAC Industry⁸

Industries with HVAC Occupations	2006			2006 to 2010	
	Current Employment	Current Establishments	Avg. Annual Wages	Employment Growth (%)	Employment Growth (#)
Installation (NAICS 23822)	18,547	1,805	\$44,569	7.9%	1,463
Service (NAICS 8113)	5,384	491	\$44,633	4.8%	258
Manufacturing (NAICS 3334)	1,854	53	\$42,273	5.2%	96

The demand for HVAC occupations, particularly in installation and service, is increasing as new buildings are developed and commercial and industrial buildings are getting older and require more service and maintenance of their HVAC systems. The industry is also incorporating new technologies that use more complex energy management systems, place a greater emphasis on technologies that constantly assess IEQ (Indoor

⁶ Source: Economy.com 2007 Los Angeles Employment Forecast

⁷ Source: Economy.com Los Angeles 4 Digit NAICS Forecast (2007)

⁸ Source: 2006 data - California Regional Economy, Los Angeles County, 2006 to 2010 data - Economy.com Los Angeles 4 Digit NAICS Forecast (2007)

Environmental Quality), and monitor where occupants are in a building while maintaining indoor temperatures accordingly. Most importantly, new regulations are going to require new and existing workers to possess certifications exhibiting high levels of HVAC technician competence.

Occupational Profiles

The secondary research component of this study focused on demand occupations that require training and understanding of HVAC and HVAC/R systems. To be selected for inclusion, the occupations had to meet at least one of the following criteria: high employment in the region, above average growth, or easily served by community college-level education and training programs. The following four occupations were identified through secondary research and interviews with industry leaders as the key jobs needed within HVAC and HVAC/R that are accessible to community college students:

- Heating, Air Conditioning & Refrigeration Mechanics and Installers (SOC 49-9021)
- Sheet Metal Workers (SOC 47-2211)
- Supervisor and Managers of Mechanics, Installers, and Repairers (SOC 49-1011)
- Sales Engineers (SOC 41-9031)

Table 2 shows estimated current employment for the four occupations that were studied, the number of expected openings from growth, and the annual wage by occupation for both entry-level and experienced workers. Note that employment figures are not specific to the HVAC industry but to the occupation itself.

Table 2: Estimated New Jobs and Median Annual Wage in Los Angeles by Occupation⁹

Occupation	Estimated 2004 Employment	Estimate 2014 Employment	Openings from Growth	Wages ¹⁰	
				Type	Annual
HVAC/R Mechanics & Installers	3,110	3,440	330	Entry	\$29,600
				Experienced	\$58,600
Sheet Metal Workers	2,810	2,990	180	Entry	\$29,900
				Experienced	\$66,100
Supervisors of Mechanics, Installers & Repairers	10,770	11,830	1,060	Entry	\$44,900
				Experienced	\$73,900
Sales Engineers	1,810	2,040	230	Entry	\$69,600

⁹ Source: California Labor Market Information – Data Library: CA EDD

¹⁰ Median Annual Wage as estimated by CA EDD, entry = 25th quartile and Experienced = 75th percentile.

				Experienced	\$105,500
Totals	18,500	20,300	1,800		

Heating, Air Conditioning & Refrigeration Mechanics and Installers¹¹ (SOC 49-9021) – This position is focused on installing, servicing, and/or repairing heating, air conditioning and refrigeration systems in residences and commercial establishments. This position requires an understanding of:

- Engineering and Technology - Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.
- Mechanical expertise - Knowledge of machines and tools, including their designs, uses, repair, and maintenance.
- Design - Knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models.

Sheet Metal Workers (SOC 47-2211) - This position is focused on installing, fabricating and repairing sheet metal products and equipment, such as ducts, control boxes, drainpipes, and furnace casings. This position requires an understanding of:

- Building and Construction - Knowledge of materials, methods, and the tools involved in the construction or repair of houses, buildings, or other structures.
- Mathematics - Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.
- Mechanical expertise - Knowledge of machines and tools, including their designs, uses, repair, and maintenance.

Supervisors and Managers of Mechanics, Installers, and Repairers (SOC 49-1011) This position is focused on managing, coordinating and supervising the work of mechanics, installers and repairers. This position requires an understanding of:

- Mechanical expertise - Knowledge of machines and tools, including their designs, uses, repair, and maintenance.
- Administration and Management - Knowledge of business and management principles involved in strategic planning, resource allocation, human resources modeling, leadership technique, production methods, and coordination of people and resources.

¹¹ General information on occupations is taken from O*net, California Occupational Guides and the CareerOneStop. The bullets are taken from the CareerOneStop for each occupation.

- Customer and Personal Service - Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction.

Sales Engineers (SOC 41-9031) – This position is focused on selling and estimating HVAC products and projects. The position requires a comprehensive understanding of the HVAC industry as well as an understanding of:

- Customer and Personal Service - Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction.
- Sales and Marketing - Knowledge of principles and methods for showing, promoting, and selling products or services. This includes marketing strategy and tactics, product demonstration, sales techniques, and sales control systems.
- Engineering and Technology - Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.

Career Pathways

There are several different career pathways in the HVAC industry; many have been well established by the unions in Southern California. The initial entry-level position is typically as a trainee that is learning to be either an installation or service technician. In the unions, apprenticeships typically last five years before individuals move up to journeymen. After an individual has developed sufficient industry expertise, he or she has the opportunity to move into sales, as a sales representative or cost estimator, or to assume a management role as a supervisor or project manager.

Chart 1: HVAC Career Levels

Advanced Level

Bachelor Degree or proven technical skills that can be demonstrated through industry experience

<p>Sales Engineer / Estimator \$21 to \$52/hour</p>

<p>Manager / Supervisor of Installers and Service Technicians \$19 to \$43/hour</p>

Mid Level

Associate Degree or equivalent training and experience

<p>Installation Technician - Journeyman \$16 to \$39/hour</p>	<p>Service Technician - Journeyman \$16 to \$39/hour</p>	<p>Sheet Metal Worker - Journeyman \$15 to \$36/hour</p>
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Entry Level

High school diploma and appropriate educational pre-requisites

<p>Installation Technician – Apprentice / Trainee \$10 to \$16/hour</p>	<p>Service Technician – Apprentice / Trainee \$10 to \$16/hour</p>	<p>Sheet Metal Worker – Apprentice / Trainee \$9 to \$15/hour</p>
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Employer Needs and Challenges

Employers in the HVAC industry indicated three important challenges:

1. A relatively high portion of HVAC workers are older and will retire in the near future. A recruiter for the HVAC industry indicated that even under a flat employment scenario, where little to no new jobs are added, HVAC recruiters will keep busy replacing individuals who are leaving the industry.
2. The pipeline of young workers is not as strong as it once was. Based on discussions with industry experts, unions are the most engaged in recruiting new talent. They indicated that they have more than enough work to keep recruiting new people for the foreseeable future. Non-union employers indicated similar needs in terms of recruiting and developing new workers.
3. HVAC equipment is changing and can require new skill sets for technicians in both servicing and repairing the products. Industry experts indicated that smaller firms may have a greater challenge as they try to keep their workers up-to-date on multiple new products that are coming into the HVAC arena. Unions indicated that they are working closely with HVAC manufacturers to ensure they understand any and all changes in HVAC equipment.

Training and Education Programs

Los Angeles is home to a variety of training opportunities for individuals seeking careers in the field. Community colleges, as well as private and public trade and vocational schools, offer degrees and certificates in HVAC and related programs in refrigeration and air conditioning mechanics.

Los Angeles Trade Technical College, Mt. San Antonio College, El Camino College, Citrus College, and Antelope Valley College are the six Los Angeles community colleges that offer certificates and degrees in the field. More information on these programs can be found in Appendix D.

Brownson Technical College and WyoTech are two private vocational schools located in Anaheim and Long Beach respectively. They also offer HVAC focused training.

Laney College is a well established program in Oakland, California that provides helpful links and resources. Visit their website for more information on their HVAC and renewable energy programs.

Appendix D provides more information on the above mentioned programs along with their websites.

Unions also play an important role in HVAC occupations; they are cited by a leading HVAC recruiter¹² as one of the primary trainers and educators of individuals looking to move into HVAC occupations. There are three apprenticeship programs offered by the Los Angeles Building and Trade Councils which impact the HVAC/R occupations. They include air conditioning and refrigeration (which is taught out of downtown Los Angeles), plumbing and piping (which is taught out of Compton), and the sheet metal workers apprentice program (taught out of the City of Industry). Contacts for these programs are presented in Appendix E.

The United Association (UA) and the Mechanical Service Contractors of America (MSCA) provides the 5 STAR Training program and the UA Star Certification which is a nationally recognized technician certification program. They also recently developed the Green Awareness Training and Certification Program which is a joint effort between the UA, HVAC Excellence, the Green Mechanical Council and Ferris State University.

They also offer opportunities for community college partnerships. Students can earn community college credit through their local community college and work toward an Associate degree in HVAC/R Technology. More information can be found at <http://5starcareers.com/> and Appendix E.

In fact, multiple organizations offer certification in HVAC. Community colleges have an opportunity to partner with those offering the highest quality certifications to ensure students will have strong employment prospects. This was an important aspect emphasized by the California Public Utilities Commission.

¹² Karen Mattonen, President of Advanced Career Solutions, a leading recruiter for HVAC jobs.

HVAC has numerous associations and supportive organizations that can be of assistance to community colleges. A list of associations and resources can be found in Appendix F.

Conclusion and Recommendations

Numerous reports identify the HVAC industry as one with an increasing demand for individuals as many existing employees prepare for retirement. Los Angeles can expect approximately 33% of the 18,000 individuals working in HVAC related occupations to retire over the next decade. This would translate into close to 6,000 openings.

Occupations in the field pay well and offer opportunities for advancement. The strong connection of HVAC to the green movement provides additional opportunities with retrofits. While skills are evolving as technology becomes increasingly sophisticated, this is not the biggest effect that the green movement is having on this area. Rather, **there will be increased attention on the quality of skills of those installing and maintaining HVAC systems.** The goal is to ensure HVAC systems are performing at optimum levels. Colleges have an opportunity to strengthen partnerships with employers, manufacturers, and associations and align themselves with long-term energy strategies that seek to update college facilities, support instructors, and recruit students.

The California Public Utilities Commission has adopted several “Big, Bold Energy Efficiency Strategies” and one of these is to “reshape residential and small commercial HVAC to ensure optimal equipment performance.” Its goal is to improve efficiency in the HVAC sector by 50% by 2020 and 75% by 2030. Much of this translates into high quality certifications (such as North American Technician Excellence) for employers/employees and possible utility incentives to customers who use contractors branded with these certifications. The community colleges have an opportunity to work closely with the CPUC, these above mentioned organizations, and the unions to ensure trainees are receiving the highest quality training and to assist the goal of improving energy efficiency in the HVAC sector by 50% by 2020.

The colleges can also assist in the creation of a pipeline of workers for successful careers in HVAC. Below are a few additional recommendations.

1. Work with Unions to develop a short-term program to provide those individuals the pre-requisite education they need before entering an HVAC apprenticeship program. The key pre-requisites to entering the PIPE apprenticeship program are a high-school diploma, and algebra and geometry courses. A program could be designed to meet these pre-requisites in a six to twelve week tailored program. Alternative delivery methods such as contract education or continuing education could also be considered.

The unions are also becoming more flexible and waiving certain requirements in individuals who can show they have the training necessary to go to the next level. Thus, community colleges will have expanded opportunities for partnerships with the unions and existing community college students.

2. Work closely with product manufacturers to understand changes in equipment and incorporate those into the curriculum. Seek partnerships that result in having access to the latest equipment for training students. Educators and employers for HVAC occupations communicated the need to work closely with product manufacturers who are developing new HVAC products that monitor indoor air quality, manage energy systems, and provide constant feedback on energy performance measures. The colleges can develop a collaborative relationship with HVAC/R equipment manufacturers to understand any and all changes to HVAC equipment and the skills and tools needed to install, service and repair these products. This information should be incorporated into the coursework for HVAC students. Further, partner with equipment manufacturers to provide access to latest equipment for students to work on in labs and classes.
3. Consider integrating existing certifications when looking at regional approaches to training. The North American Technician Excellence Inc. (NATE) is the leading certification program for individuals who are looking for more advanced certifications in the HVAC/R industry. The colleges should consider working with NATE to offer programs that prepare students for these certifications. This is also very important given the long term strategic plan for energy efficiency. The colleges could also consider becoming a proctor for the NATE certifying tests, if they are not already. This would offer additional partnership opportunities as well as an opportunity to connect with students. These certifications could allow individuals with experience in the industry to develop their own business within the HVAC/R industry and help provide opportunities for entrepreneurs in HVAC/R.

The National Environmental Balancing Bureau (NEBB) also provides certification. It is an international certification association for firms that perform testing, adjusting, and balancing (TAB) of heating, ventilating and air conditioning systems. TAB is an important area that should be considered and will become increasingly important as performance continues to be emphasized. More information can be found at NEBB or the Testing Adjusting Balancing Bureau (TABB). See the “Key Organizations and Associations” section of the report for contacts and websites.

4. Colleges should leverage the existing resources and partnerships available to strengthen programs and be sure they are connected to the latest technology. They can also leverage programs to increase FTES at home by partnering with such programs as the UA’s 5 STAR Training program that was referenced in the body of the report.
5. Colleges should create and strengthen linkages with high schools and middle schools to build a pipeline of young workers. Articulation agreements should be established and students should be exposed to career opportunities in HVAC.

6. Colleges should also work with adult schools and their local Workforce Investment Boards to assist adults interested in the field or transitioning from other industries.
7. Lastly, due to the stringent regulations and changes being implemented in connection to energy efficiency, existing HVAC contractors may need additional skills or information to remain compliant and competitive. They may also be interested in expanding their skills to provide customers with a broader array of services. Contract education opportunities exist for the colleges in this area.

Finally, additional employer research could be conducted to better understand the training and skills needs of small, medium-sized, and large employers. The current findings of this study are based on labor market information and executive interviews with several industry experts. More exploration could also be done regarding entrepreneurial opportunities in this field.

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Appendix A: How to Utilize this Report

About the Centers of Excellence

The Centers of Excellence (COE), in partnership with business and industry, deliver regional workforce research customized for community college decision making and resource development. This information has proven valuable to colleges in beginning, revising, or updating economic development and Career Technical Education (CTE) programs, strengthening grant applications, assisting in the accreditation process, and in supporting strategic planning efforts.

The Centers of Excellence are part of the California Community College's Economic and Workforce Development Network. The Centers aspire to be the premier source of regional economic and workforce information and insight for California's community colleges.

More information about the Centers of Excellence is available at www.coecc.net

How to Use This Report

This report is designed to provide current industry data to:

Define potential strategic opportunities relative to an industry's emerging trends and workforce needs;

Influence and inform local college program planning and resource development;

Promote a future-oriented and market responsive way of thinking among stakeholders; and, Assist faculty, Economic Development and CTE administrators, and Community and Contract Education programs in connecting with industry partners.

The information in this report has been validated by employers and also includes a listing of what programs are already being offered by colleges to address those workforce needs. In some instances, the labor market information and industry validation will suggest that colleges might not want to begin or add programs, thereby avoiding needless replication and low enrollments.

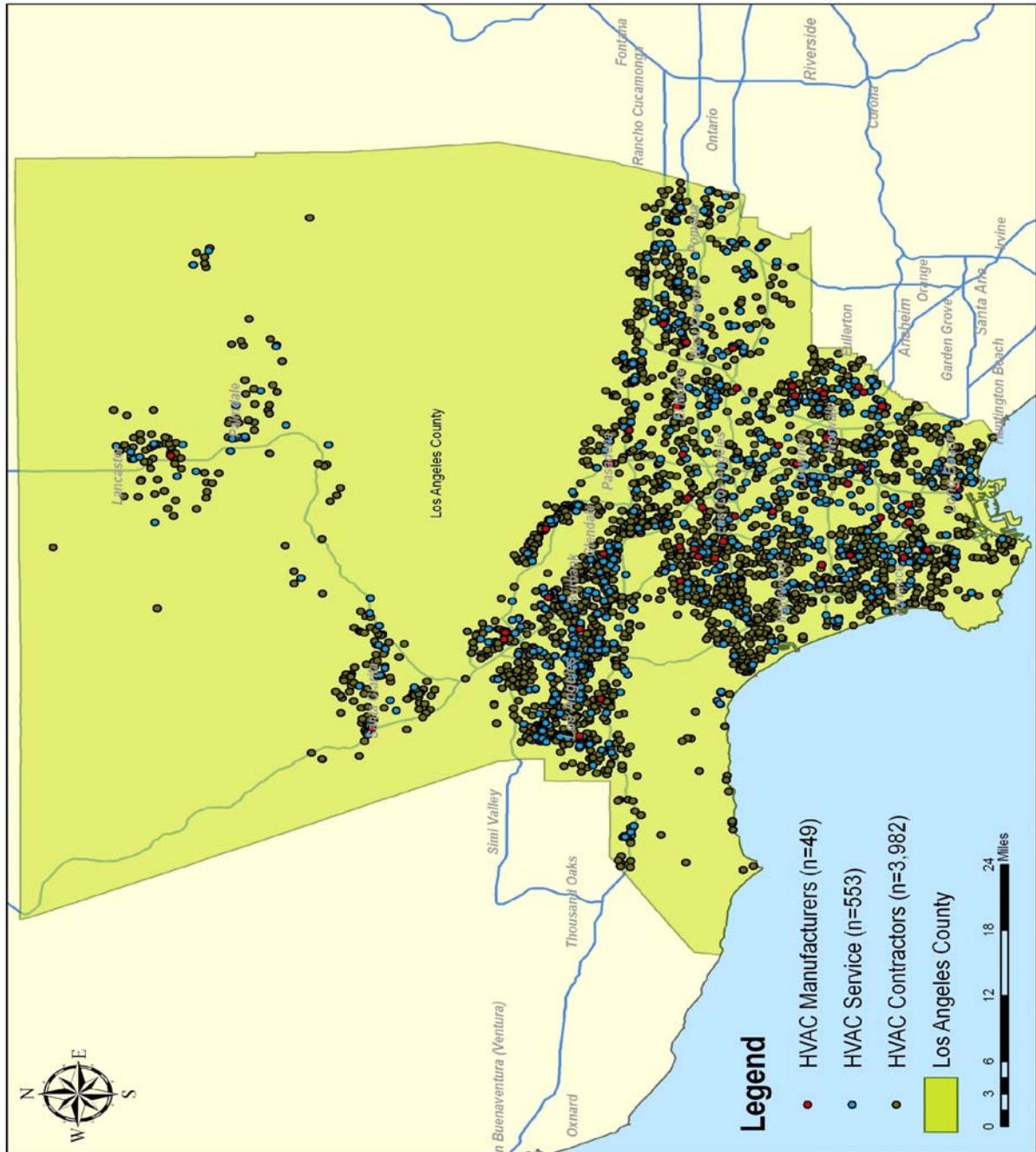
Important Disclaimer

All representations included in this report have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. Efforts have been made to qualify and validate the accuracy of the data and the reported findings; however, neither the Centers of Excellence, COE host District or California Community Colleges Chancellor's Office are responsible for applications or decisions made by recipient community colleges or their representatives based upon components or recommendations contained in this study.

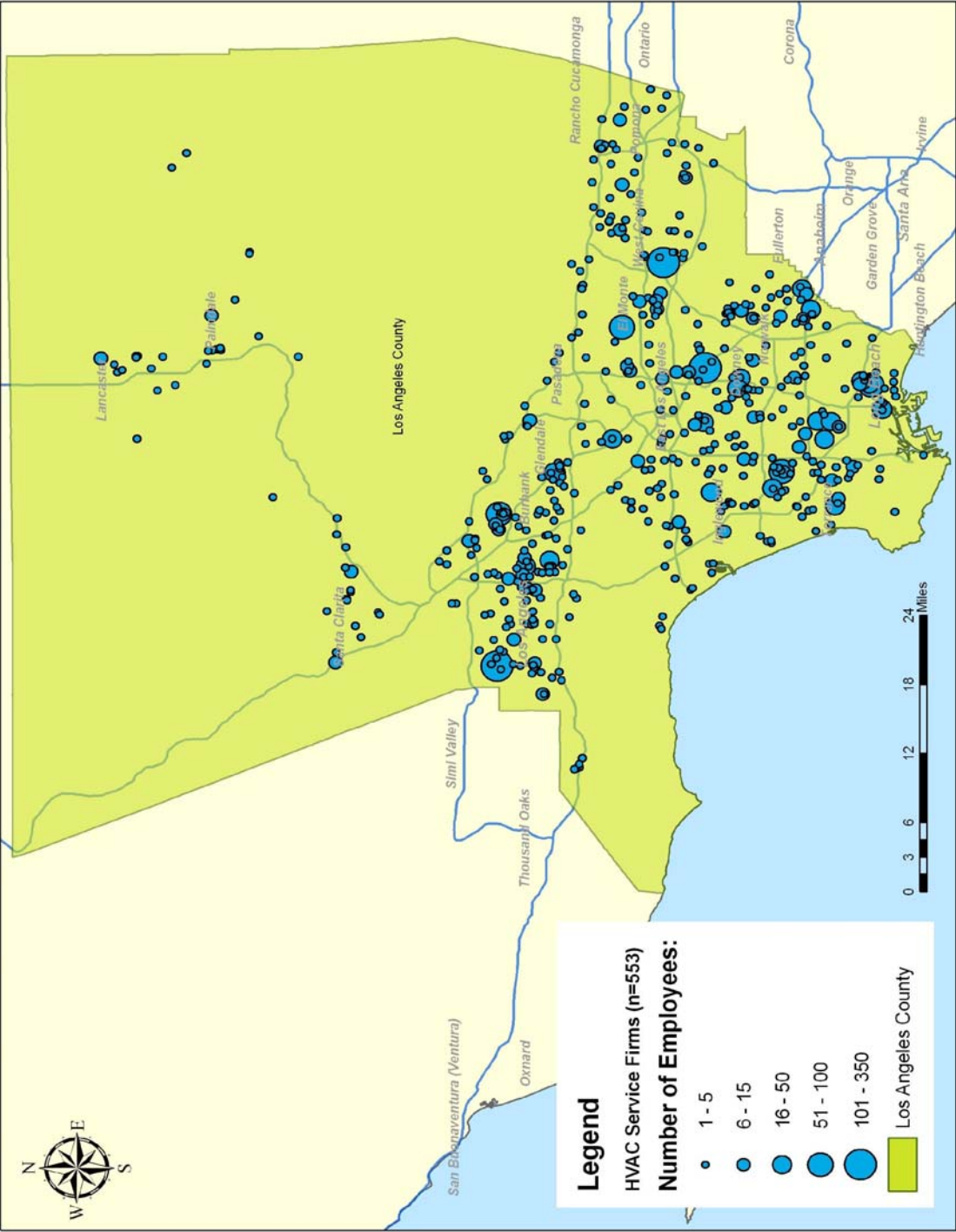
Appendix B: Employer Locations

Below are several maps illustrating employer presence throughout Los Angeles County. The first map demonstrates overall employer distribution while the three following maps show the concentration within the specific industries employing HVAC occupations.

Heating, Ventilation and Air-Conditioning Businesses in Los Angeles County, 2007



Commercial and Industrial Machinery and Equipment Repair and Maintenance
(NAICS 811310) in LA County, 2007



Appendix C: Top Ten Employer Lists

The following lists identify the top ten employers within each of the specific HVAC industry areas in Los Angeles County.

1. HVAC Contractors

- NAICS 238220 Plumbing, heating, and Air-Conditioning Contractors

#	Company Name	City	Phone #
1	A D DEAL PLUMBING & HEATING IN	Los Angeles	562-949-7800
2	GTK SVC CO	Van Nuys	818-781-2297
3	J B PLUMBING	San Dimas	909-592-8487
4	MR ROOTER	Sun Valley	N/A
5	AMERICAN BENEFIT PLAN ADMIN	Covina	626-732-2151
6	TRI-VALLEY MECHANICAL INC	Canyon Country	661-251-9092
7	JOHNSON CONTROLS INC	Whittier	562-698-8301
8	RESCUE ROOTER	Santa Monica	310-827-1553
9	WESTERN ALLIED CORP	Santa Fe Springs	562-941-3243
10	TRANE COMMERCIAL SYSTEMS	Rowland Heights	626-913-7123

Source: InfoUSA, Inc. 2007 through ESRI, Inc.

2. HVAC Service Businesses

- NAICS 811310 Commercial and Industrial Machinery and Equipment Repair and Maintenance

#	Company Name	City	Phone #
1	PRECISION WIRE PRODUCTS INC	City of Commerce	323-890-9100
2	CLASSIC DISTRIBUTING	City of Industry	626-934-3700
3	SANYO FISHER SVC CO	Chatsworth	818-717-2755
4	ONYX INDUSTRIAL SVC	Signal Hill	562-981-6364
5	SAHAR INDUSTRIES	Gardena	310-515-1477
6	TUR-BO JET PRODUCTS CO	Rosemead	626-285-1294
7	HONEYWELL	Sun Valley	818-768-7075
8	ULTRAGRAPHICS	Burbank	818-295-3994
9	PERIPHERAL SUPPORT INC	Carson	310-609-1250
10	DRESSER-RAND CO	Rancho Dominguez	310-223-0600

Source: InfoUSA, Inc. 2007 through ESRI, Inc.

3. HVAC Manufacturing Businesses

- NAICS 333411 Air Purification Equipment Manufacturing
- NAICS 333412 Industrial and Commercial Fan and Blower Manufacturing
- NAICS 333414 Heating Equipment (except Warm Air Furnaces) Manufacturing
- NAICS 333415 Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing

#	Company Name	City	Phone #
1	GREEN CHOICE	Los Angeles	N/A
2	THERMAL EQUIPMENT CORP	Torrance	310-328-6600
3	CALIFORNIA FLEX CORP	San Fernando	818-361-1169
4	OMNI TEMP REFRIGERATION	Downey	562-923-9660
5	M W SAUSSE & CO	Valencia	661-257-3311
6	TORO AIRE	Compton	310-632-6000
7	DMG CORP	Whittier	562-692-1277
8	DURO-DYNE OF CALIFORNIA INC	Santa Fe Springs	562-926-1774
9	TECHNICAL HEATERS INC	San Fernando	818-365-9435
10	TELLKAMP SYSTEMS INC	Santa Fe Springs	562-802-1621

Source: InfoUSA, Inc. 2007 through ESRI, Inc.

Appendix D: Community College Programs and Training Providers

Community College Programs: Los Angeles County

Top Code 0946.00

Environmental Control Technology (HVAC)

Assembly, installation, operation, maintenance, and repair of air conditioning, heating, and refrigeration systems.

College	Program Description	Contact
Antelope Valley	Antelope Valley offers an associate in science degree in air conditioning and refrigeration. Students may also choose to obtain certificates in either air conditioning or refrigeration. However, a combination in both areas is recommended.	Margaret Drake, Dean Technical Education Antelope Valley College 3041 West Avenue K, Lancaster, California 93536 661-722-6327 mdrake@avc.edu
Citrus	Citrus offers both a Certificate of Achievement and an Associate in Science in Heating and Air Conditioning.	Kim Holland, Director 1000 Foothill Blvd Glendora, CA 91747 626-963-0323 kholland@citruscollege.edu
El Camino	El Camino offers an Associate in Science and a Certificate of Achievement. Courses include options in the Air Conditioning or Air Conditioning and Refrigeration Electric Controls or Heating, Ventilation, and Air Conditioning (HVAC) and Refrigeration or Refrigeration.	Mr. Thomas Jackson, Dean 16007 Crenshaw Blvd Torrance, CA 90506 Tjackson@elcamino.edu 310-532-3670
Long Beach	Long Beach offers a Career Certificate and/or Associate in Science. The certificate is a one to two-year program in which the student must complete the required units in the HVACR program.	Patrick Heeb, Chair 4901 East Carson Street Long Beach, CA 90808 562-938-3057 pheeb@lbcc.edu
Los Angeles Trade Technical	Los Angeles Trade offers a Skills Certificate in Fundamentals of Refrigeration	William D. Elarton, Chairman CDM Construction, Design & Manufacturing

	and Air Conditioning and an Associate degree.	400 West Washington Blvd Los Angeles, CA 90015 213-763-3701 213-763-5394 fax
Mt SAC	Mt. San Antonio College offers a certificate and an Associate of Science Degree in Air Conditioning and Refrigeration Technology.	Sarah Daum, Dean 1100 N. Grand Avenue, Walnut, CA 91789 909-594-5611 sdaum@mtsac.edu

Additional training programs include Brownson Technical College and WyoTech. These are private vocational schools.

Brownson Technical College

1110 Technology Circle, Suite D
Anaheim, CA 92805
Phone: 714-774-9443
<http://brownsontechnical.findcollege.net/g.cfm>

WyoTech

2161 Technology Place
Long Beach CA, 90810
Phone: (562) 624-9530
www.wyotech.edu

Laney College is located in Oakland California and has a well established program that provides links and resources. Visit their website for more information on their HVAC and renewable energy programs.

Laney College

900 Fallon Street,
Oakland, CA 94607
(510) 834-5740
[http://laney.peralta.edu/apps/comm.asp?\\$1=30151](http://laney.peralta.edu/apps/comm.asp?$1=30151)

Appendix E: Apprenticeship Programs

There are three apprenticeship programs offered by the Los Angeles Building and Trade Councils which impact the HVAC/R occupations. They include air conditioning and refrigeration (which is taught out of downtown Los Angeles), plumbing and piping (which is taught out of Compton), and the sheet metal workers apprentice program (taught out of the City of Industry).

Contacts

Tom Newbro, Director of Training
Don Dietiker, Training Coordinator
Air Conditioning & Refrigeration J.A.C.
2220 South Hill
Los Angeles, CA 90007
(213) 747-0291

Mike Layton, Exec. Dir/Coordinator
So. Cal. Plumbing & Piping Ind. J.A.C
18931 Laurel Park Road
Compton, CA 90020
(310) 604-0892

Lance Clark, Administrator
Sheet Metal J.A.T.C.
633 N. Baldwin Park Blvd.
City of Industry, CA 91746
(626) 968-3340

The United Association (UA) and the Mechanical Service Contractors of America (MSCA) provides the 5 STAR Training program and the UA Star Certification which is a nationally recognized technician certification program. They also offer opportunities for community college partnerships. Students can earn community college credit through their local community college and work toward an Associate degree in HVACR Technology. More information can be found at <http://5starcareers.com/>.

They also recently developed the Green Awareness Training and Certification Program which is a joint effort between the UA, HVAC Excellence, the Green Mechanical Council and Ferris State University.

The MSCA now provides GreenStar Certification to companies/contractors who promote sustainability throughout their entire organization, from employee training and education to the products and services that they offer customers. Questions about this program can be addressed to Barbara Dolim at (301) 869-5800 or bdolim@mcaa.org.

Appendix F: Associations and Resources

Below are some additional associations, organizations and certification providers who support the HVAC industry.

Air Conditioning Contractors of America (ACCA)

2800 Shirlington Road, Suite 300
Arlington, VA 22206
703-575-4477

ACCA is a group of over 4,000 air conditioning contractors who work together to improve the industry, promote good practices, and keep homes and buildings safe, clean and comfortable.

<http://www.acca.org/acca/>

American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) – Southern California Chapter

Southern California Chapter of ASHRAE
P.O.Box 80133
San Marino, CA 91118

ASHRAE sets standards used by both industry and governmental agencies through its standards committees. It establishes technical committees to support the Standards and publish guides.

<http://www.ashrae-socal.org/about.asp>

Council of Air-Conditioning and Refrigeration Educators (CARE)

Greg Goater, President
[ggoater@isaacheating.com/](mailto:ggoater@isaacheating.com)
888-655-4822

The Council of Air Conditioning and Refrigeration Educators is an organization dedicated to HVACR instruction with industry support. The CARE organization is comprised of HVACR instructors, administrators, and other HVACR industry personnel from across the United States.

<http://www.carehvacr.org/>

Institute of Heating and Air Conditioning Industries, Inc. (IHACI)

454 W. Broadway
Glendale, CA 91204
[ihaci@ihaci.org/](mailto:ihaci@ihaci.org)
818-551-1555

The Institute of Heating and Air Conditioning Industries, Inc, is a non-profit trade association of contractors, manufacturers, distributors, utility firms, and related businesses actively engaged in the heating, ventilation, air conditioning, refrigeration, and sheet metal industries.

<http://www.ihaci.org/>

North American Technician Excellence - NATE

4100 North Fairfax Drive #210
Arlington, VA 22203
877-420-NATE
703-276-7247

NATE, North American Technician Excellence Inc., is an independent, third-party certification body for HVAC/R technicians. NATE-approved testing organizations throughout the U.S. and Canada offer NATE tests. Candidates can earn installation and/or service certification in five specialty areas: air-conditioning, air distribution, heat pumps, gas heating & oil heating.

<http://www.natex.org/index.asp>

The National Environmental Balancing Bureau (NEBB)

NEBB-Southern California
Bill Blackstone-Chapter Coordinator
c/o SMACNA of Los Angeles
12070 Telegraph Rd., Suite 350
Santa Fe Springs, CA 90670
[kwashington@smacna-la.org/](mailto:kwashington@smacna-la.org)
562-777-9192

The National Environmental Balancing Bureau (NEBB) is the premier international certification for firms that perform testing adjusting and balancing of heating ventilating and air conditioning systems in addition to building system commissioning, sound and vibration measurement, retro-commissioning, fume hood testing, and clean room performing certification.

<http://www.nebb.org/>

Plumbing –Heating-Cooling Contractors of California (PHCC)

Stephen J. Lehtonen,
4153 Northgate Blvd.Ste 6
Sacramento, California 95834-1249
[slehtonen@aol.com/](mailto:slehtonen@aol.com)
916-925-7390

PHCC promotes the advancement, education and training of the industry, for the protection of the environment and the health, safety, and comfort of society.

<http://www.caphcc.org/>

Piping Industry Progress and Education Trust Fund (PIPE)

Tom Morton
HVAC Recruiter
501 Shatto Place, Suite 200
Los Angeles, CA 90020
800-457-7473 ext 231

P .I.P .E. is a professional trade association committed to upholding the highest standards of performance in the plumbing and pipefitting industry. It assists contractor

members and their unionized trades in construction services and products through education, public relations, legislation and resource information.

www.pipe.org/

Refrigeration Service Engineers Society (RSES)

Chapter Contact: JF Townsend

general@rses.org

562-927-8139

RSES provides technical examination programs and training courses for service professionals working on heating, ventilation, air conditioning and refrigeration systems across the nation.

<http://rses.org/main/index.cfm/>

Sheet Metal & Air Conditioning Contractors' National Association Los Angeles Chapter (SMACNA-LA)

12070 Telegraph Road, Suite 350

Sante Fe Springs, CA 90670-3771

562-944-6345

SMACNA-LA has a 60-year history of developing and instituting standards within the industry that are utilized and recognized worldwide by the construction and design communities. They maintain harmonious relationships between members and disseminate information concerning all aspects of the Sheet Metal and Air Conditioning Contracting Industry.

www.smacna-la.org

Testing Adjusting Balancing Bureau (TABB)

601 North Fairfax Street

Suite 250

Alexandria, VA 22314

703-299-5646

The Testing, Adjusting and Balancing Bureau (TABB) was developed by the National Energy Management Institute Committee (NEMIC), a not-for-profit corporation sponsored by the Sheet Metal Workers' International Association (SMWIA) and the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA). TABB runs the TAB (testing, adjusting and balancing) certification program, which ensures that HVAC systems operate at the highest standards and with the greatest efficiency and effectiveness at every stage of an indoor environmental retrofit - or to new building specification.

<http://www.tabbcertified.org/>