PROGRAM PROPOSALS FOR PALOMAR COLLEGE

AIR CONDITIONING, HEATING, AND REFRIGERATION TECHNICIAN CERTIFICATE OF ACHEIVEMENT

AIR CONDITIONING, HEATING, AND REFRIGERATION ENTRY EMPLOYMENT READY CERTIFICATE

AIR CONDITIONING, HEATING, AND REFRIGERATION ASSOCIATE OF SCIENCE DEGREE

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Program Rational:

The finding of the San Diego and Imperial Counties Center of Excellent (COE) Report, and at the request of our Advisory Committee partners in order to meet the hiring needs of the HVAC industry, and to act upon their recommendations we need to move forward with these three programs.

Program Description:

Air Conditioning, Heating, and Refrigeration program is designed to provide students with the knowledge, hands-on learning, and the skills required in the in the air conditioning, heating and refrigeration industry. Applications of principles and techniques will include system components and their interrelated functions, safety procedures, tools, and equipment. Instruction, in proper testing and evaluation skills to trouble shoot and perform repairs as required.

Program Goal:

Prepare students for entry level positions in various areas of the HVAC (Heating, Ventilation and Air Conditioning) industry, with the knowledge and skills to install, service, and repair HVAC equipment.

Program Emphasis:

1. Acquaint students with the nature and scope of the HVAC (Heating, Ventilation and Air Conditioning) industry in the United States.

2. Prepare students to work with industry standard equipment, tools and test instruments to evaluate the operation of HVAC equipment.

3. Acquaint students to formulate and plan troubleshooting and repair if HVAC equipment.

4. Acquaint students with the experience of operation, testing and repairing HVAC equipment.

5. Prepare students to enter into the work force and gain employment.

Air Conditioning, Heating, and Refrigeration Technician Certificate of Achievement required courses (16 units):

ARC-101 Air Conditioning and Hearing and Refrigeration: Mechanical

Introduction to basic mechanical theory of air conditioning, heating and refrigeration. Application of principles and techniques to include system components and their interrelated functions, safety procedures, tools, and equipment. (3 units)

ARC-102 Air Conditioning and Hearing and Refrigeration: Electrical

Introduction to the fundamentals and application of electrical theory as related to air conditioning, heating and refrigeration. Study of basic electrical theory, alternating current, electrical controls, motors, schematics, and electrical meters. (3 units)

ARC-103 Air Conditioning and Hearing and Refrigeration: Heating

Applied principles used for the different types of heating systems for personal comfort and general purpose heating. Course topics include gas, electrical and solar heating, reverse refrigeration cycle including, geothermal heat pumps and water source heat pumps. Also, includes the applications of dual fuel heating systems and oil heat. Installation, trouble shooting and appropriate correction action, repair and use of specialty tools is also covered. (3 units)

ARC-105 Refrigeration Recovery

Basic understanding of the United States Environmental Protection Agency regulations as set forth under Section 608 of the Clean Air Act of 1990, which described requirements for recycling ozone-depleting refrigerants. Preparation to take the EPA certification exam, which is administered at the conclusion of the course. (1 unit)

ARC-110 Advanced Air Conditioning and Hearing and Refrigeration

Advanced principles and techniques of air conditioning, heating and refrigeration. EPA regulations and safety requirements; complex control systems; gas furnace combustion and air requirements; and the installation, troubleshooting, repair, and maintenance of residential and small commercial units. (3 units)

ARC-112 Air Conditioning and Hearing and Refrigeration: Automation and Controls

Introduction to applied principles and techniques used in building automation to monitor and control heating, ventilation and air conditioning (HVAC) systems to maintain optional personal comfort, indoor air quality and system efficiency. Course topics include direct digital controls (DDC), programmable controllers, configurable controllers, multi-zone systems, communications protocols, system monitoring and economizers to reduce energy usage. (3 units)

Air Conditioning, Heating, and Refrigeration Entry Employment Ready Certificate of Achievement required courses: (7 units)

ARC-101 Air Conditioning and Hearing and Refrigeration: Mechanical (3 units)

ARC-102 Air Conditioning and Hearing and Refrigeration: Electrical (3 units)

ARC-105 Refrigeration Recovery (1 unit)

Air Conditioning, Heating, and Refrigeration Associate of Science Degree required courses:

ARC-101 Air Conditioning and Hearing and Refrigeration: Mechanical (3 units)

ARC-102 Air Conditioning and Hearing and Refrigeration: Electrical (3 units)

ARC-103 Air Conditioning and Hearing and Refrigeration: Heating (3 units)

ARC-105 Refrigeration Recovery (1 unit)

ARC-110 Advanced Air Conditioning and Hearing and Refrigeration (3 units)

ARC-112 Air Conditioning and Hearing and Refrigeration: Automation and Controls

(3 units)

IT-108 Technical Mathematics (3 units)

Methods and experience in defining and solving mathematical problems in industrial technology. Special emphasis will be given to the application of these basic processes to the solution of the unique mathematical problems encountered in the areas of architecture, automotive, drafting, machine, welding, and woodworking technology.

IT-115 Industrial Safety (2 units)

Prepares the student to enter the workforce in an awareness of safety. Includes a history and overview; laws and regulations; assessment, prevention, and controls; and the management of health and safety issues.

Weld 160 Metal Layout for Fabrication (3 units)

Provides students with knowledge of basic layout, fit up, fabrication, and safe operation of shop equipment. Parallel line, radial line, and triangulation layout will be taught. Students will work from drawings or sketches to prepare, form, or cut multiple parts for assembly.

Math 60 Intermediate Algebra (4 units)

Graphic, numeric, analytic and applied perspectives on topics including linear, quadratic, exponential and logarithmic functions, exponents and radicals, linear and nonlinear systems of equations and inequalities.

Associate Degree District Requirements

Occupational Demand

In 2016, there were 9,974 HVAC related jobs in San Diego and Imperial Counties that typically require a community college degree or less. Looking forward to 2021, the labor market demand for HVAC occupations in the region is projected to grow by 12% (Growth of 1,165 jobs). There will be 850 open positions due to retirements or other replacement factors in the in the next five years.

Occupation	2016 Jobs	2021 Jobs	5-Yr Change	5-Yr % Change	5-year Openings	Annual Openings
Plumbers, Pipefitters, and Steamfitters	4,538	5,111	573	13%	898	180
First-line Supervisors of Mechanics, Installers and Repairers	3,265	3,469	204	6%	543	109
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	2,171	2,559	388	18%	574	115
Total	9,974	11,139	1,165	12%	2,015	403

Table 1 Employment (Outlook for HVAC Occupy	stions (San Diego &	Imperial Counties)
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Table 2. Wages for HVAC Occupations (San Diego & Imperial Counties)

Occupation	County	10 th percentile	25 th percentile	Median Wage	75 th percentile	90 th percentile
Plumbers, Pipefitters, and	San Diego	\$15.32	\$20.00	\$26.22	\$32.53	\$43.06
Steamfitters	Imperial	\$15.96	\$17.37	\$20.08	\$23.87	\$29.53
First-line Supervisors of Mechanics Installers and	San Diego	\$19.36	\$24.19	\$31.41	\$37.12	\$47.30
Repairers	Imperial	\$15.92	\$21.35	\$33.30	\$47.11	\$58.56
Heating, Air Conditioning, and Refrigeration Mechanics and	San Diego	\$14.91	\$20.68	\$26.26	\$30.20	\$36.40
Installers	Imperial	\$14.89	\$19.18	\$24.87	\$28.78	\$32.58

Job Postings in San Diego & Imperial Counties

To identify job postings related to HVAC occupations, the SOC codes listed in above were used. In 2016 there were 1,480 job postings related to HVAC occupations, indicating high demand for this group of occupations. Table 3 shows the number of job postings associated with each SOC code.

Table 3. Number of Job Postings by Occupation in 2016 (San Diego & Imperial Counties)

Occupation	San Diego	Imperial
First-line Supervisors of Mechanics, Installers and Repairers	685	11
Plumbers, Pipefitters and Steamfitters	392	1
Heating, Air Conditioning and Refrigeration Mechanics and Installers	383	8

The most common job title in the employer job postings was plumber (240 job postings). See Table 4.

Table 4. Top Job Titles (San Diego & Imperial Counties)

Common Title	2016 Job Postings
Plumber	240
Maintenance Supervisor	181
Pipefitter	106
HVAC Technician	88
Maintenance Manager	54

Industry Concentration

Table 5 below shows the distribution of HVAC jobs among industries. The industry with the highest number of HVAC jobs is Plumbing, Heating and Air Conditioning Contractors (4,961 jobs in 2016).

Table 5. Industries hiring HVAC related occupations (San Diego & Imperial Counties)

Industry	Jobs in Industry (2016)	% in Industry (2016)
Plumbing, Heating and Air Conditioning Contractors	4,961	49.7%
Local Government, Excluding Education and Hospitals	409	4.1%
Ship Building and Repairing	279	2.8%
Natural Gas Distribution	264	2.6%

Skill and Certifications

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Skill	2016 Job Postings	Certification	2016 Job Postings
Repair	714	Environmental Protection Agency Certification	65
HVAC	421	Security Clearance	59
Plumbing	397	HVAC Technician Certification (e.g., EPA 608)	38
Supervisory Skills	253	Refrigeration Technician Certification (e.g., CFC Type 2)	26
Inspection	250	Occupational Safety and Health Administration Certification	16

Approximately 61 percent of job advertisements studied did not list a degree level. Of those postings that list the requirement, 78 percent are looking for HVAC workers who have a high school diploma (or equivalent), some vocational school education, or an associate degree.

COE Recommendation

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Total annual demand is estimated to be about 400 job openings. Total annual supply is unclear as only one-fifth of the awards (100) are credit awards and the purpose and depth of instruction of the non-credit awards is not clear from the available data. Since HVAC technicians are required to have at minimum a Postsecondary Certificate, it is our recommendation not to count non-credit awards as part of annual supply. With that, there might be a shortage of HVAC technicians in the region and more completers are needed to meet employer demand for credentialed workers.