

## Summary

This study identifies gaps between the Residential Quality Installation (QI) and Quality Maintenance (QM) education and training needs of the HVAC workforce and the industry's current education and training practices. It also identifies actionable recommendations to address those gaps.

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## Use of this Document

*This document identifies gaps in HVAC training and education for residential service providers, and makes recommendations for improvements.*

*It is based on an official [WHPA Work Product](#) of January 15, 2014, titled “Residential QI/QM Working Group Gaps.” This Work Product was developed by the WHPA Residential QI/QM Working Group (Workforce Education & Training Committee).*

*This document, and also the WHPA Work Product, may be used in part or whole at no charge. Attribution to the Western HVAC Performance Alliance is requested.*

*We would also ask that you inform the WHPA through [info@performancealliance.org](mailto:info@performancealliance.org) if you have made use of either document, so that we can inform and encourage the hundreds of volunteers who donate their time to providing expert HVAC advice in order to support energy efficiency objectives.*

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## Training and Education Gaps and Recommendations—Residential HVAC

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## Background

The Residential QI/QM Working Group was launched in September 2011 to focus on identifying gaps between the needs of the HVAC workforce with respect to quality installation and quality maintenance and the industry's current education and training practices. The Working Group also worked to identify actionable recommendations to address those gaps. The driving question was, “What or where are the gaps between where we are today and where we need to be by 2020 and how can we fill those gaps?” This report summarizes the Residential QI/QM Working Group findings and is organized into six sections, each addressing an identified gap in quality installation and/or quality maintenance:

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### **Gap 1: Ensuring Correct Installation/Maintenance**

- We have a need for installers and technicians to understand and follow recommended service and installation instructions from the manufacturers and/or recommendations from the WHPA WE&T Committee.
- Consumers and HVAC technicians need to know how to evaluate that the system has been properly installed and/or maintained. (The ANSI/ACCA Standard QI/QM documents have forms for the customer and technicians as required by the code in Title 24.)

### **Recommendations**

1. Require procedures for Quality Installation per ANSI/ACCA Standard 5 for all newly installed systems. These procedures are to include new construction and new installs in existing buildings.
2. Require procedures for Quality Maintenance per ANSI/ACCA Standard 4. Require all “Tune-ups” that are performed by a C-20 contractor and/or their technicians to use these standards.
3. Require all technicians working for a C-20 contractor to use CEC-approved refrigerant charge testing procedures any time the refrigerant is tested.
4. Require proper installation of the filter drier in the liquid line be installed near the evaporator coil to prevent clogging of the TXV or metering device.
5. Require that the evaporator coil, condenser coil, and blower wheel be cleaned before adjusting the refrigerant charge on the air conditioning system.
6. Set up a statewide policy or guideline for inspection of HVAC systems. At this time, codes may be interpreted differently from city to city, and some cities may have local codes in addition to the uniform building codes. Building inspectors need to increase their knowledge and understanding of code changes in the HVAC industry.
7. Provide training on standards for building inspectors.
8. Provide consumer education on what is needed to properly install and service an HVAC system.
9. Ensure contractors and technicians are following all manufacturers recommendations for installation, commissioning, and operation.

## **Gap 2: Training and Support for Installers and Technicians**

- There is a need to require training, mentoring, and technical support to perform HVAC installation and service work.
- There is a need for training on the correct installation of TXV (thermal expansion valve) sensing bulbs, diagnostics of non-condensable materials, and restrictions in the refrigeration system.

## **Recommendations**

1. Require specific training for workers performing HVAC work. For example, require completion of a state-approved apprenticeship, trade school, community college, or online training program. Classroom instruction needs to be followed by practical hands-on training working with equipment, in the field, if possible, or training at a manufacture or distributor site. There is a need for 40-60% hands-on training in a shop environment and/or in the field.
2. Require all HVAC technicians to be licensed by the State of California with at least one industry recognized technical certification with the goal of standardized technician certification by 2016. Separate licensing would be given in each of the following categories: residential, light-commercial, and commercial. **THE WORKING GROUP RECOMMENDS** that further discussion be held on other potential elements of the licensing, such as years of experience in providing HVAC system service, installation, and maintenance.
3. After providing proper documentation of qualification for licensing, a technician will be required to successfully pass a state administered proficiency exam.
4. The State should be required to assemble HVAC Industry Stakeholder groups, such as the Western HVAC Performance Alliance, with participation by organizations such as but not limited to ACCA, RSES, SMACNA, HVAC Excellence, IHACI, United Association, Sheet Metal Air Rail and Transportation Workers, etc.
5. Technicians licensed by the State should have 8 hours of continuing education classes annually. These classes will cover advanced technical processes and code compliance updates.
6. If the C-20 license holder is listed as “Sole Owner” and is the technician performing the work, he/she should be required to re-test every 3 to 5 years, as with the technician exam. Currently, “Sole Owner” C-20 license holders are never required to re-test.
7. The C-20 exam should include questions on proper installation and maintenance procedures. Require continuing education requirements for the license holder to keep up to date with changes in the industry with respect to energy, installation, and service.
8. Require the correct refrigerant charge be verified in the A/C system. It is recommended that the refrigerant charge procedure in Title 24 be reviewed, with further research. Additionally, any time split system or an air conditioning system is installed and/or the package unit is opened, whether used for residential or commercial, we recommended that a new liquid line drier be installed.

## Training and Education Gaps and Recommendations— Residential HVAC

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### **Gap 3: Increased Air Flow**

- We have a need to increase and verify the airflow on existing systems, especially on the return- air side of the system.

#### **Recommendations**

1. When replacing the furnace or air handler on existing duct systems, require that the return air duct be sized for the correct CFM (cubic feet per minute) per a recognized third party accrediting organization like ANSI, ISO, ASTM, etc.
2. Require that the return air plenum at the furnace or intake grill be at least 18 to 24 inches in length so as not to restrict the air flow through the equipment and/or filter.

### **Gap 4: Refrigerant System Recovery and Evacuation Procedures**

- We need to make sure that recovery and evacuation (per CEC Title 24) procedures are followed for recovery and evacuation of systems in order to perform proper diagnostics and keep contaminants out of the refrigeration system, per CEC Title 24 and Federal EPA 608.

#### **Recommendations**

1. Require that evacuation of refrigerant system be triple evacuated and pulled down to 500 microns and held for 5 to 20 minutes to achieve the correct vacuum. Documentation of properly measured evacuation should be required in the CEC Title 24.
2. Require procedures for proper maintenance and operation on a vacuum pump. Documentation of proper vacuum pump maintenance should be required in CEC Title 24.

### **Gap 5: Accuracy of Thermometers and Gauges**

- There is a need to look into the accuracy of the thermometers and gauges used for taking readings on the refrigeration system. Currently there is no standard for which thermometers or gauges can be used.

#### **Recommendations**

1. Develop standards for manufactures to meet the requirements of the California Energy Commission Title 24 Building Energy Efficiency Standards (ASHRAE SPC 41). This will ensure that thermometers and gauges are accurate when manufactured.
2. Thermometers and gauges should be certified for their accuracy for the application for which they are used. THE WORKING GROUP RECOMMENDS that further discussion be held to discuss who should be the certifying body/bodies and to what standards and how often they should be certified.

## **Gap 6: Low Percentage of Permitted HVAC Work**

- Permits are only pulled on 10% of the HVAC systems that are replaced. The number of permits pulled for add-on and replacement systems needs to be increased.

## **Recommendations**

1. Set up a statewide policy or guideline for inspection of HVAC systems. At this time codes may be interpreted differently from city to city and some cities and counties may have local codes in addition to the uniform mechanical building codes. Building inspectors need to increase their knowledge and understanding of code changes in the HVAC industry.
2. Provide training on standards for building inspectors, contractors, technicians, salespeople, and third-party verifiers.
3. Increase customer education on the importance of permitting to support quality installation.
4. Establish permit compliance benchmarks including a timeline for completing the benchmarks in support of statewide compliance goals in accordance with priority Goal #4, “Quantifying Rates of Permit Compliance and Energy Savings Impacts” for the WHPA Council of Advisors.