



# **Western HVAC Performance Alliance CQI Definition of an Efficient Commercial HVAC Installation**

A WHPA Work Product as of December 14, 2016

**Prepared by:**

WHPA Commercial Quality Installation Committee

Committee Chair, Rob Falke (President, National Comfort Institute)

### What is an Efficient Commercial Installation?

WHPA Commercial Installation Committee, November, 2016

The WHPA Executive Committee requested the Commercial Installation Committee publish a performance-based definition of an efficient commercial HVAC system installation. This definition was to apply to packaged and split DX cooling systems from 1.5 to 25 tons.

### Background - Traditional Definition of an Efficient HVAC System

Initial committee discussion focused on traditional HVAC industry definitions of an efficient HVAC System:

- High equipment efficiency ratings.
- Design elements are documented.
- Installed according to manufacturer's instructions: electrical, wire and pipe sizing, refrigerant charge, combustion adjustment, adequate venting requirements, safety controls assuring safe operation.
- Licensing, technician training and acceptable business operations are assured.
- Installed to meet code requirements

However, while each of these principles apply to an efficient installation, the Committee agreed, based on field data received, that these more traditional elements of efficiency may be included but the system installation often operates at a very low efficiency.

If fact, the traditional definition of an efficient installation has little or no documentable evidence quantifying actual installed efficiency at all, except the equipment ratings.

Unfortunately, current industry practices encourage consumers to interpret equipment manufacturer's laboratory efficiency ratings as the installed system efficiency they will be receiving. This inaccuracy must be addressed in the new efficient commercial installation definition.

To summarize: *Highly rated efficient equipment installed safely and to code does not assure an efficient installation.*

### A New Performance-Based Installation Definition

The discussion turned to the committee's field data specification currently being completed. The outcome of this test procedure is an installed system efficiency scoring method that will quantify the level of efficiency earned by the installation process.

This test and calculation method:

- Shifts the focus onto the system efficiency and capacity actually delivered into the building, and off of the equipment rated (potential) efficiency and capacity.
- Compares installed system delivered capacity to bench rated equipment capacity
- Can also be expressed as an installed system field EER with the addition of power measurements.

## Efficient Commercial Installation Definition

***An Efficient Commercial Installation is defined as an HVAC system having the delivered system capacity and efficiency field measured into the building envelope that meets or exceeds a predetermined percent of equipment rated efficiency.***

***Efficient Commercial Installation refers both to the process of field-measuring and documenting the performance of an installed HVAC system; and to the objective of achieving improvements in measured performance. In the case of existing systems, improvements are relative to measured baseline performance. In the case of new systems, improvements are relative to typical levels of performance.***

***The process of field-measuring efficiency is an emerging technology, and details of the definition are still being determined. The WHPA Commercial Installation Field Data Collection Specification will, once complete, define the measurement and calculation process necessary to quantify installed efficiency. As this specification is operationalized, efficiency targets may be developed that various types of installations must achieve to be considered an Efficient Commercial Installation***

## For Consumers and Contractors

For consumer and contractors to define an efficient installation, a ratio representing the field measured system delivered Btu/h into the building compared to the equipment rated Btu/h capacity is to be used.

$$\text{Field Measured Installed System Efficiency Ratio} = \frac{\text{Field Measured Btu/h Delivered into the Building}}{\text{Equipment Rated Btu/h}}$$

*Typical Field Example showing the percent of measured system performance compared to a possible 100% of equipment rated efficiency.*

$$\frac{68,400 \text{ Btu/h System Delivered into Building}}{120,000 \text{ Btu/h Rated Equipment Capacity}} = 57\% \text{ Installed System Efficiency Ratio}$$

## For Energy Regulators and Utilities

Utilities and regulators may define an efficient installation by measuring the Installed System Field EER (Energy Efficiency Ratio.) This version requires additional power measurement as required for more stringent reporting requirements.

$$\text{Field Measured System EER} = \frac{\text{Field Measured Btu/h Delivered into the Building}}{\text{Field Measured System Watts}}$$

### Typical Field System EER Example

$$\frac{120,000 \text{ Btu/h Delivered into the Building}}{20,000 \text{ Watts}} = 6.0 \text{ Field Measured System EER}$$

## Process or Outcome Driven Definition

The CI Committee decided for the sake of simplicity to define an efficient commercial installation by using *an outcome driven description*. The score of the installed system represents a variable outcome by which the installed efficiency of the system can be judged and compared to pre-and post-measured efficiencies, equipment rated efficiencies and comparison to future averages, codes and standards.

The CI Committee discussed *a process driven definition* of installed efficiency. This definition would result in a consistent definition that could be applied and be effectively quality assured in the field. Rather than detail the process here, please refer to the *CI Committee Field Data Collection Specification* to review the processes required to measure the installation efficiency of a commercial HVAC system.

## WHPA Work Product Summary

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**DATE:** December 6, 2016

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**INITIATING BODY:** Commercial Quality Installation Committee

**WORK PRODUCT NAME:** Definition of an Efficient Commercial HVAC Installation

**TYPE OF ACTION REQUESTED:**  **VOTE**    **GUIDANCE**    **OTHER:** The initiating body requests that the WHPA Executive Committee review, discuss and vote to adopt the committee work product as a WHPA Work Product to be posted for public availability as per WHPA policy.

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**APPROVAL HISTORY WORKING GROUP:** [Click here to enter text.](#)

**BY CONSENSUS**    **BY VOTE**

**TALLY:** [Click here to enter text.](#)

**DATE:** [Click here to enter text.](#)

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**COMMITTEE:** Commercial Quality Installation Committee

**BY CONSENSUS**    **BY VOTE**

**TALLY:** A committee email vote was conducted from November 11 through November 30. There are eight voting members on this committee. 7 members voted AYE. 0 members voted NAY. 1 member voted to abstain.

AYE votes: Air Tro; Heating and AC; BMI; Lincus-Solaris; NCI; Green Link Mechanical

NAY votes: 0

Abstain votes: Tre'Laine Associates

**DATE:** December 6, 2016

**WORK PRODUCT OBJECTIVES:** Provide a performance-based definition for an efficient commercial HVAC system installation.

**CA ENERGY EFFICIENCY PLAN STRATEGIC GOAL ALIGNMENT:**

GOAL 1    GOAL 2    GOAL 3    GOAL 4

**CEESP HVAC GOAL STRATEGIES:** Quality HVAC installation and maintenance becomes the norm. The marketplace understands and values the performance benefits of quality installation and maintenance.

## WHPA Work Product Summary

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**BENEFITS:** Defining a field measurable method for rating commercial system installation and developing standardized field measurable performance evaluation methods would allow both the end user client and their installation provider with an unbiased means to rate a full system installation. Committee members believed that such a development, when implemented, could have a great impact on how future consumers made equipment and system installation buying decisions based on what was installed/received and not depending primarily on OEM equipment laboratory rated performance. This could also have an impact on how contractors proposed installation projects, one based on an installed performance for a price rather than on just an installed system price.

**OUTSTANDING ISSUES / DEBATES / MINORITY VIEWS:** None.

**POTENTIAL AUDIENCE:** Commercial contractors; national contractor associations; commercial building end users, owners, property and facility managers, supply management buyer professionals, utility program developers, designers, implementers, evaluators.

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**EXECUTIVE COMMITTEE:** At the December 14, 2016, Executive Committee Meeting, the CQI Committee Work Product Summary and “Definition of an Efficiency Commercial HVAC Installation” Report was presented by Committee Chair Rob Falke (NCI).

**BY CONSENSUS**     **BY VOTE**

**MOTION:** At the EC Meeting, Dave Dias (JCEEP) made the motion and Don Tanaka (UA) seconded the motion to approve this Work Product.

**VOTE TALLY:** EC Quorum is eight (8).

9 Aye votes were cast by ACCA, HARDI, AHRI, IHACI, JCEEP, NCI, PG&E, SCE, and UA.

There were no Nay votes.

2 Abstentions by CEC and CPUC.

**FURTHER ACTIONS REQUIRED:** WHPA Staff will ensure the combined Work Product Summary and “Definition of an Efficiency Commercial HVAC Installation” Report is properly posted and distributed in accordance with established marketing protocol for approved WHPA Work Product.

**NEXT STEPS:** The “Definition of an Efficiency Commercial HVAC Installation” Work Product as approved by the Executive Committee will be delivered by WHPA CQI Committee Chair Rob Falke (NCI) to ASHRAE’s SPC 221 Committee at the ASHRAE Winter Meetings January 26, 2017, in Las Vegas.