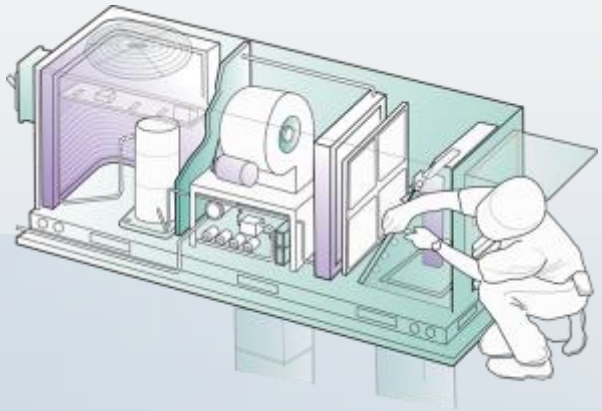
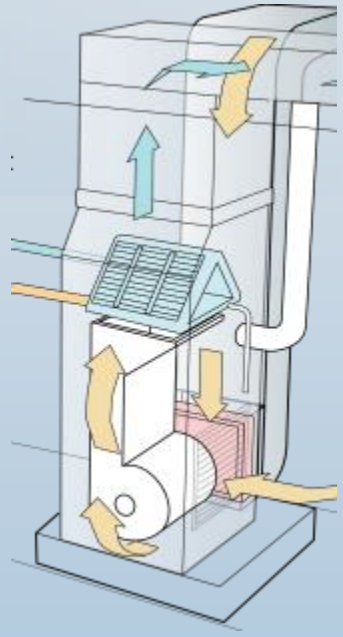
Rob Falke



ASHRAE SPC 221 Overview

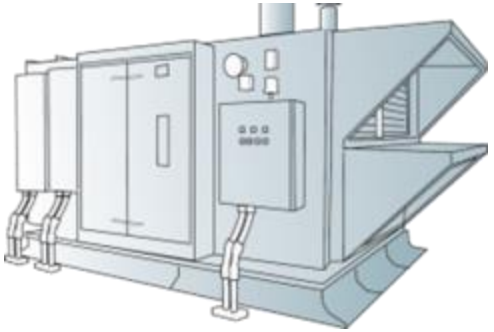
A test method to measure and score the operating performance of an installed constant volume unitary HVAC system.



A Proposed Field Assessment and Test Method Standard

Here to report on the work of ASHRAE SPC 221

- Initial draft completed by the committee
- Preliminary work for this standard was completed by a WHPA working group chaired by Peter Jacobs
- Existing industry test method since 2005
- Field measures and scores Installed HVAC system performance
- The basic test takes from 45 minutes to 1 ½ hours for a trained technician to complete.
- Initial accuracy ± 13%



WHPA CI Efficient Installation Definition and ASHRAE SPC 221 Objective

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 **(a score)** that meets or exceeds a predetermined percent of equipment rated efficiency.*

221 Objective

Create a standard that establishes a field evaluation and test method that will score the operating performance of an installed HVAC system.

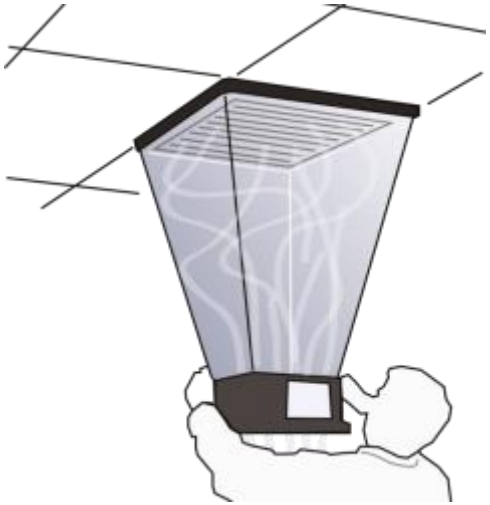
The Need for an Installed System Score

- In the past, we looked to the equipment rated capacity and efficiency to assess a system.
- With this new scoring method, we look to the percent of actual heating or cooling delivered into the occupied space to measure efficiency.
- The message of this test method is that the deteriorating effects of installation and maintenance can be measured.
- We believe measured performance will eventually replace deemed savings and provide a field measured pre and post upgrade baseline from which actual savings can be documented.

How the System Score is Measured and Calculated

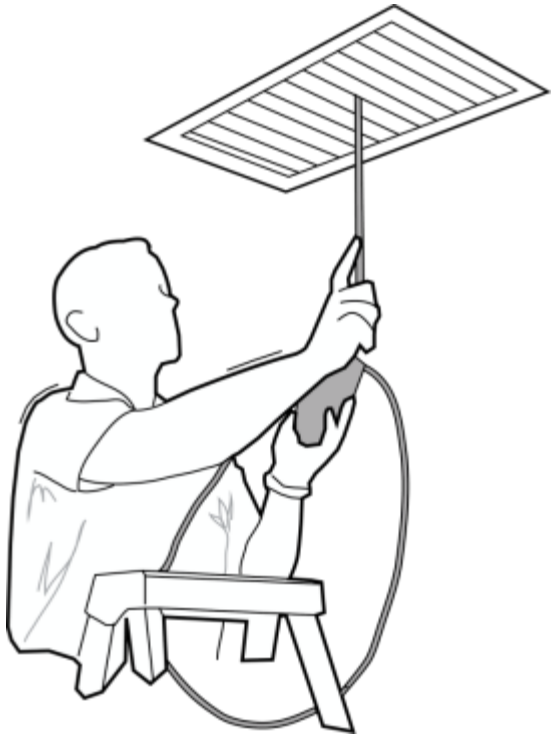
- Step One - An installed HVAC system is brought to full operating capacity.

- Step Two - Airflow is measured into and out of the building



How the System Score is Measured and Calculated

- Step Three - Air temperatures are measured into and out of the building



How the System Score is Measured and Calculated

- Step Four - The delivered Btu of the system into the building is calculated

3840 Cfm x 1.08 x 34.6º = 143,493 Btu

143,494 is the delivered heating Btu from the system into the building.

This is a 200,000 Btu rated output system.

How the System Score is Measured and Calculated

- Step Five - The delivered Btu of the system is divided into rated Btu capacity of the system to determine the percent of system performance.

$$\frac{\textbf{143,493 Btu}}{\textbf{200,000 Btu}} = \textbf{71\%}$$

  - This system is delivering 71% of its rated capacity into the building.
  - If the system only delivered 100,000 Btu into the building, its score would be 50%.

Standards-Based Testing and Calculations Agree with the Performance Approach

ASHRAE 111 Air Balancing Standards

NCI Practical Field Standards Testing and Diagnostics

NBC Air and Water Test and Balance Practical Field Standards

NEBB and AABC Air and Water Balancing Standards

SMACNA Air and Temperature Testing Standards

ASHRAE 152 Efficiency Calculations

ACCA 5 and 6, ACCA/ASHRAE 180 Quality Installation and Maintenance Standards

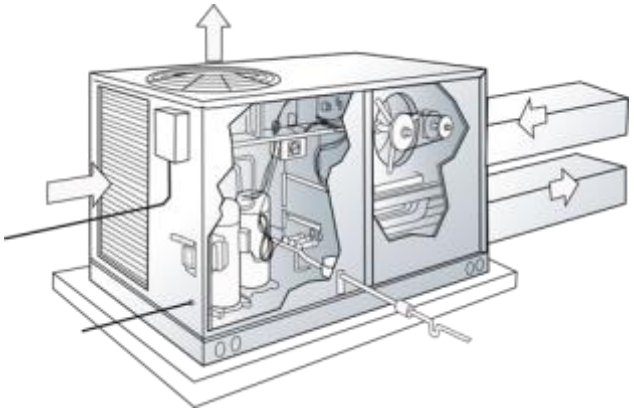
ASHRAE 221P Install HVAC System Scoring Method

What Does Commercial Measured Performance Look Like Before Upgrades?

As Found Field Performance Scores

Installed Equipment Field Performance Score	82%
Installed Duct System Field Performance Score	44%
Installed System Field Performance Score	56%

Once measured, each system is the diagnosed and repaired to Improve its Efficiency Ratings

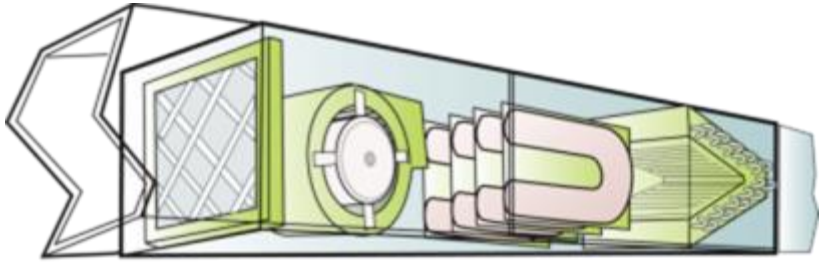


What Does Commercial Measured Performance Look Like After Upgrades?

After Performance Upgrades Were Completed Field Performance Scores

Installed Equipment Field Performance Score	94%
Installed Duct System Field Performance Score	82%
Installed System Field Performance Score	88%

Each system's performance is measured and verified at the completion of the work



Measured Performance Improvements

	As Found	After Upgrade	Improvement
Installed Equipment Field Performance Score	82%	94%	12%
Installed Duct System Field Performance Score	44%	82%	38%
Installed System Field Performance Score	56%	88%	32%