

VAV Terminal Units: Looking Back, Ahead

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July 2015's "Basics of Well-Mixed Room Air Distribution" described how conditioned air moves throughout a space. In this Fundamentals at Work article, we discuss where the conditioned air comes from by exploring the most predominant products in use today: commercial building variable air volume (VAV) terminal units.

In the 1950s and into the 1960s, Houston was considered the most air conditioned city in the United States. Dallas was a close second. The equipment used in those days to air condition commercial office buildings was high velocity, dual duct systems—and bypass multizone systems for large office buildings.

By 1960, 75% of all large buildings were bypass multizone using hot water or electric duct heaters for perimeter heating. So many bypass units were being sold in Houston that it became known as the Houston Multizone. Later, it was called the Texas Multizone. In the 1960s, Dallas contractors began using high velocity induction reheat systems with variable air volume air handlers and full airside economizers.

By the end of the OPEC oil embargo in March 1974, the price of oil had risen from \$3 per barrel to nearly \$12. In response, every industry in the United States made efforts to reduce energy consumption in every process. Houston was in a dilemma; local contractors and

engineers had little experience with VAV and no way to heat individual perimeter zones without the use of reheat.

A consulting engineer, Charlie Chenault, and a mechanical contractor, John McCabe, were determined to design a system that provided maximum flexibility for individual perimeter zones. This was not possible with the multizone units that would use variable volume air handlers to address instantaneous loads rather than total loads (which was not available with the constant volume multizone units, and which was hoped would eliminate the need for reheat). Since at that time there were no known manufacturers of low-pressure, variable air volume all-air systems, they set about designing an all-new operating sequence using a fan to provide heating airflow (*Figure 1* and *Figure 2*).

No pressure independent or electronic controls were available at this time. Pressure independent control means that the device delivers a desired airflow rate

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