



CECI Spotlight on Displacement Ventilation

Displacement Ventilation (DV) for classrooms has been a hot topic in recent months in K-12 circles. It has been presented at CASH conferences and green building conferences as a sustainable, high performance HVAC system. We at Capital Engineering Consultants Inc. have designed and commissioned several DV systems, and are currently involved in a significant research project with PIER*. The project involves working closely with major HVAC equipment manufacturers to develop a small packaged rooftop air conditioning unit that is suitable for TDV for classrooms. Early testing shows that packaged equipment can be built and applied to this application and we are expecting production units to be available soon. This is exciting news, as DV may dramatically change the way we design HVAC systems for classrooms!

Traditional HVAC systems deliver supply air to the space overhead, mixing the supply air with room air to deliver a uniform temperature throughout the room's volume. Since all the air in the room is mixed, contaminants and fresh air are mixed. Displacement ventilation differs in that the clean, fresh supply air is delivered at floor level at very low velocity, 'flooding' the lower occupied zone of the room while 'displacing' the existing contaminated air vertically toward the ceiling through stratification where it is either exhausted or returned to the unit and cleaned and freshened with outside air. This approach relies on the heat sources in the room such as bodies, computers, etc. to create the upward momentum for the air through buoyancy, and cools these bodies and equipment by natural convection. It also passes the fresh air directly through the breathing zone, enhancing ventilation effectiveness. The other major difference between traditional mixing systems and DV systems is the delivered supply air temperature. During cooling, DV systems deliver air roughly 10 degrees warmer than mixing systems, which is significant in terms of cooling energy. It takes considerably less electrical energy to cool air to 65 degrees than to 55 degrees.

In addition to the energy and indoor air quality benefits described above, noise levels in the classroom are substantially improved over conventional delivery systems. Because overhead mixing systems rely on the energy from the air stream exiting the diffusers to create the 'mixing', they are inherently noisy and difficult to achieve acceptable levels in a teaching environment. DV on the other hand is specifically designed to distribute at low velocity and low energy, thus resulting in very low, almost imperceptible noise levels.

With studies showing increased student and teacher performance when indoor environmental quality (IEQ) is improved, Displacement Ventilation with its low noise and excellent ventilation effectiveness holds a lot of promise as a better way to condition classrooms in California. We at CECI look forward to staying on the forefront of significant approaches such as DV to bring our clients the best value in HVAC design.

* PIER- Public Interest Energy Research, California Energy Commission

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