QLCI Displacement Chilled Beams

The Ultimate Solution For Classroom HVAC

TROX® TECHNIK

The art of handling air

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The Ultimage Solution For Classroom HVAC

Elementary Classroom Reading Area

Affording our youth a quality education is one of the great challenges of today's world. Designers are not directly involved in educating the leaders of tomorrow but are tasked with supporting the process by producing a comfortable and healthy learning environment. Several ingredients combine to create such an environment:

- Proper ventilation assists in the removal of airborne contaminants and minimizes the risk of disease transmission.
- A comfortable environment minimizes physiological stress and its negative impact on the learning process.
- A suitable acoustical environment allows the transmission of information in an efficient and comfortable manner.

Although the requirements for creating such an environment are well documented, field studies indicate that a great number of schools are vastly under ventilated. This is often caused by maintenance personnel adjusting outside air dampers on the air handling units to compensate for insufficient cooling during periods approaching or exceeding the system's design conditions. Ventilation rates may also be compromised during off-peak periods as variable air volume (VAV) systems reduce their airflow delivery in response to space thermostat requirements.

Commonly used HVAC terminals with integral fans produce classroom noise levels far in excess of those deemed tolerable in office environments. ANSI Standard S12.60 (enacted in 2002) reduces allowable noise levels to facilitate the aforementioned acoustical goals, but has been widely criticized because of the perceived compliance costs.

Costs of compliance with ANSI S12.60 and its requirements, however, should also be weighed against the costs of maintaining status quo. Billions of dollars are spent yearly on special programs and services to supplement the needs of students with slight to moderate hearing impairment. Absenteeism of teachers suffering from respiratory ailments and distress associated with trying to be heard over excessive ambient noise is also a major concern.

High-efficiency school design focuses on the attainment and maintenance of such environmental goals in a sustainable and energy efficient manner. Displacement ventilation is regarded as a key element in high-efficiency design due to its superior contaminant removal capabilities and positive impact on energy efficiency. The United States Green Building Council (USGBC) awards LEED® points for the use of a displacement strategy due to its improvement of indoor air quality. Numerous schools using displacement ventilation have won regional and national awards for energy efficiency and improved indoor environments.

QLCI displacement chilled beams are the key component of a displacement conditioning system that assures the constant volume delivery of outside air (compliant with ASHRAE ventilation requirements) at noise levels compliant with ANSI Standard S12.60.

Displacement systems rely on natural buoyancy for their operation. These outlets discharge low velocity cool (62 to 68°F) air which drops immediately and spreads across the floor, remaining cooler than the ambient air above it. The cool air remains at the floor until it encounters a convective heat source (such as an occupant) whose convective heat transfer draws the conditioned air from the floor. As it rises, it conditions the heat source and removes any gaseous contaminants which are warmer than the ambient air.

Although displacement systems are highly regarded for this contamination removal efficiency, there are issues with their employment which have limited their growth, especially in high humidity environments.

- Displacement cannot be used effectively for heating and thus requires a separate heating system.

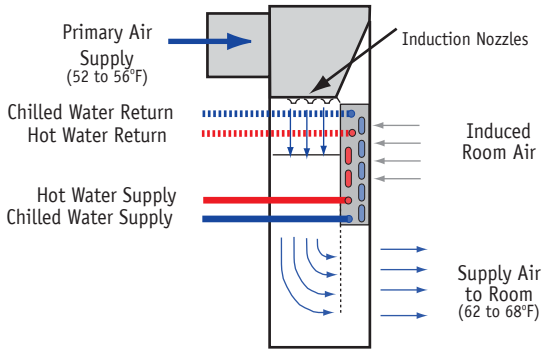

Figure 1: QLCI Cooling Mode Operation

- When used in relatively high humidity areas, outside (and part of any recirculated return) air must be cooled to saturation conditions at 54 to 55°F to remove sufficient moisture to allow it to treat the space latent gain. In order to warm the supply air to a suitable level, a face and bypass (see figure 2) is often employed on the air handling unit, which complicates its design and operation.

Description of operation

QLCI displacement chilled beams are specifically designed for classroom applications.

QLCI terminals (see figure 1) are provided a constant volume flow of conditioned outside air at a conventional (50 to 53°F) supply air temperature. This air is injected through a series of induction nozzles that induce room air (twice the primary air flow rate) through a heat transfer coil integral to the terminal. Here it is reconditioned, mixed with primary air, and delivered to the classroom (at a discharge temperature of 62 to 68°F) in a displacement ventilation manner.

Classroom latent loads as high as 200 BTUH per linear foot of exposure can be satisfied while operating with chilled water temperatures sufficiently high to avoid condensation on the integral terminal cooling coil. Higher latent loads may require that some degree of condensation be employed as a means of removing moisture from the recirculated room air. In any case, QLCI terminals are furnished with a condensate pan which allows easy removal of any moisture collected.

A significant amount of the space heating and cooling is accomplished by the reconditioning of recirculated air, thus space conditioning can usually be achieved at ducted airflow rates at (or near) the space ventilation rate mandated by ASHRAE Standard 62, resulting in the supply of 100% outside air to the classroom.

Classroom contaminants are efficiently removed and exhausted with the entire return airflow at the air handling unit (see figure 3). Although sensible heat recovery may be utilized, no recirculation is employed at the air handling unit, significantly simplifying its design and operation.

Finally, the delivery of such a reduced primary airflow rate (35 to 40% that of conventional mixed air systems) allows significant downsizing of supply air ductwork and air handling units, making the QLCI terminals ideal for retrofit applications as well as new school construction.

QLCI terminals afford designers the opportunity to supply conditioned air to the classroom in compliance with all applicable ventilation and acoustical codes while simplifying system operation and minimizing maintenance costs.

*For design and application information on QLCI classroom displacement chilled beams, visit our website at **www.troxusa.com** or contact us at (770) 569-1433.*

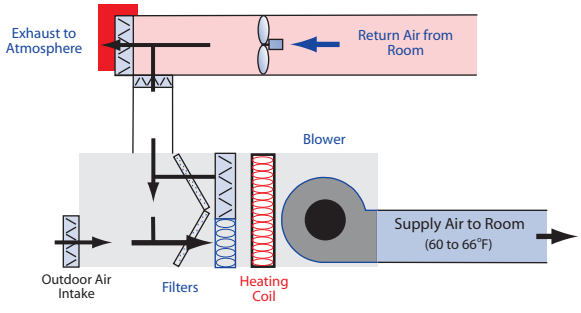

Figure 2: AHU Configuration for All-Air System

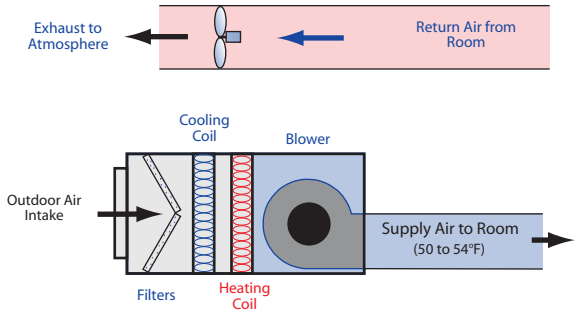

Figure 3: AHU Configuration for Displacement Chilled Beam

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The Ultimate Solution for Classroom HVAC

More than just cooling

Guaranteed Space Ventilation

Compliant With ANSI S12.60

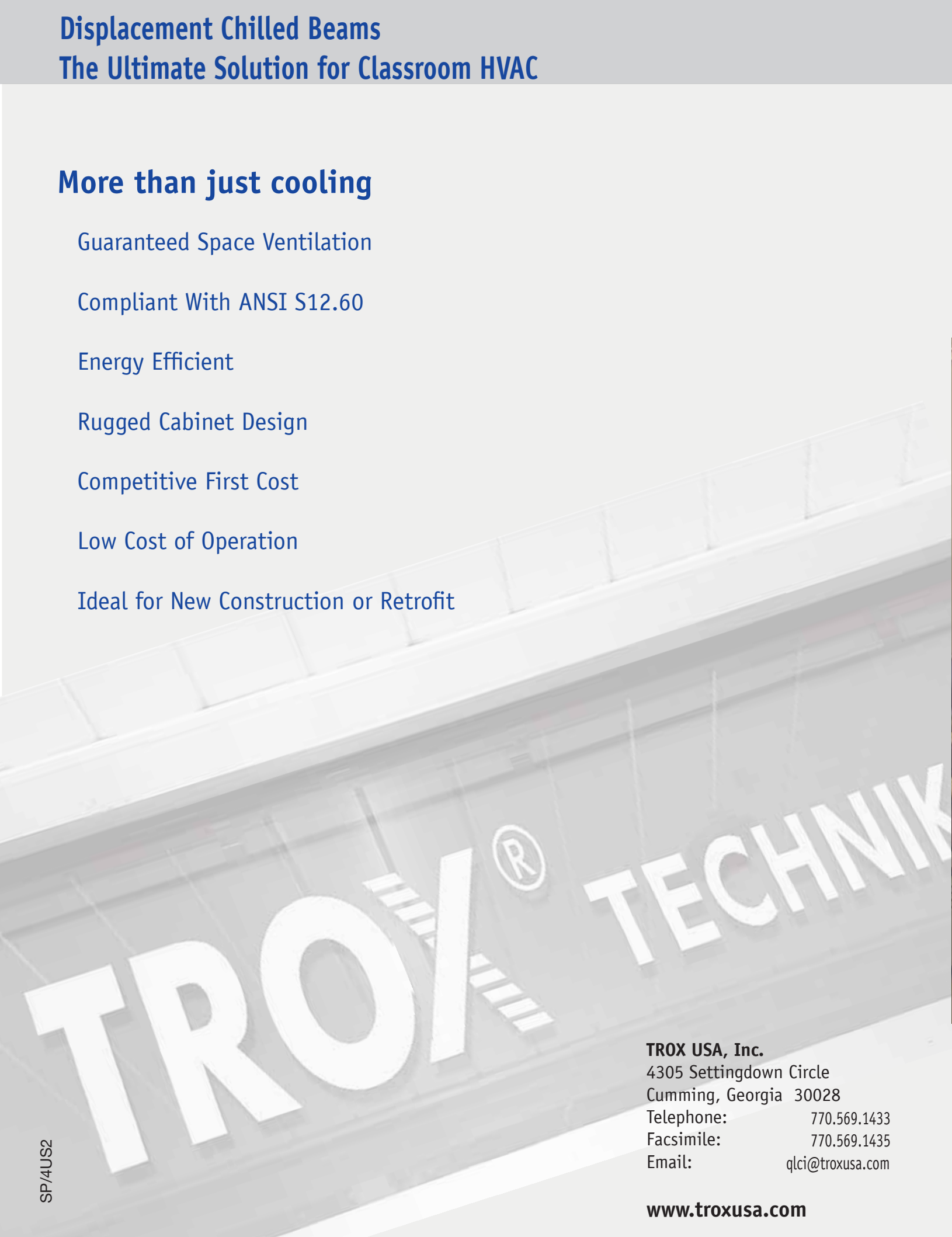
Energy Efficient

Rugged Cabinet Design

Competitive First Cost

Low Cost of Operation

Ideal for New Construction or Retrofit



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