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FORWARD-  
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HVAC?

# TAKING CONTROL

Modern HVAC systems overcome limitations and help revolutionize interiors.

By Judi Ketteler

Oddly enough, when BHP Architecture's Cincinnati office expanded into a new space, the heating, ventilation and air conditioning (HVAC) systems led to groundbreaking design.

Because the 25,000-square-foot loft-style space contained no ductwork, BHP designers employed raised-floor technology. Twelve inches separate the visible floor from the true floor, and the void

acts as the gateway to BHP's electrical, data communications and heating/cooling systems. A Web-based, direct digital control system monitors 20 temperature control zones, tracking every element of the system, so that the temperature never wavers from 72 degrees.

Without costly duct work, BHP kept the character of the space – including the high ceilings braced

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by century-old columns and river-front views from just about anywhere you stand – because the design relied on the under-floor channels. HVAC sometimes poses greater problems than possibilities for cutting-edge design, but today's technology actually aids designers who want to push the envelope.

"From an ergonomic standpoint, the raised-floor system provides a very adaptable solution. The design of the heating and cooling system is in line with the current thinking in sustainable design principles, with the air coming from the floor instead of the ceiling," says Patrick Donnelly, AIA, MCRH, a Principal at BHDP.

#### CREATIVE MECHANICS

Of course, sustainable design in the workplace is nothing new, but approaching HVAC with aesthetics in mind still is a cutting-edge idea – one interior designers must discuss with mechanical engineers early in the design process, says Corky Binggeli, ASID, author of *Building Systems for Interior Designers* (2002, John Wiley & Sons). "It's critical to establish a relationship with the mechanical engineer," she says,

and that means getting a look at mechanical drawings and understanding exactly where the mechanical systems will be located. "If the architect, contractor and engineer all know that you care about HVAC and are knowledgeable, you have a much better chance of being included in discussions."

Preserving the character of a space while accounting for the HVAC system requires creative thinking from the entire team, especially when working in historic preservation, says architect Robert Vail Cole, AIA, Director of Historic Preservation for New York-based Swanke Hayden Connell Architects. When restoring the nearly century-old San Francisco City Hall, Cole realized that running standard ductwork through the building was impossible, especially on the third floor, where the ceilings were flush against the beams. The solution was to use a series of heat pumps serviced by smaller ducts that are easier to incorporate into hidden spaces. "We didn't have to lower any ceilings or invasively impact the interior of the space," Cole says. But had he not been involved in the project from day one, that solution may not have been possible.

#### FRESH AIR

It's more time-consuming to be involved in the mechanical process from the start, but absolutely necessary to produce cutting-edge design, says Janice Stevenor Dale, FIIDA, CID, President of JSDA Inc., Los Angeles. When Dale designed the office for Bluekite.com, an Irvine, Calif.-based software company, she started with raw space. "The greatest challenge was that the creative plan was environmentally minded, with no exterior offices and broad daylighting and views for all employees," she says. The client wanted an edgy design that matched the company's future-oriented mission, which employs a blue kite as the central design theme.

Because the main loop, or air passage, already was in place, Dale first had to evaluate the space, the air flow and the mechanical systems. Instead of lowering the ceiling, she exposed the ductwork, wrapping it in gray insulation, which made it more efficient while creating a softer, billowy look. Then she installed floating ceiling platforms, independently hung in curvilinear shapes. "The connection to air was very

important in the design of space," she says. "The wavelike curve of the floating platforms is very much about air flow."

More than any other trend, green design is pushing HVAC to the next level, according to David L. Grumman, an Engineer and Chairman and founder with Grumman/Butkus Associates in Evanston, Ill., and editor of the American Society of Heating, Refrigerating and Air-Conditioning Engineers' *GreenGuide*. Variable volume systems, which change the quantity of blowing air depending on need at any one time, are increasingly popular, as are carbon-dioxide-based demand control ventilation systems that assure proper ventilation through carbon dioxide sensing (as the carbon dioxide concentration level rises, the system knows to pump in more fresh air). Many builders are experimenting with thermal energy storage or night precooling, which is ideal for climates with cool nights and warm, dry days. The key with green design, Grumman says, is that all members of the design team work in sync.

## BREATHE EASY

Whether we're living, working or playing, we rely on HVAC systems to keep the air we breathe up to indoor air quality standards. But a lot factors into HVAC choices, and standards depend on the building application, indoor pollutants and the regional climate.

In the United States, associations such as the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) have indoor air quality and ventilation standards. Buildings must "breathe," or allow outdoor air into spaces to ensure proper ventilation.

To control microorganisms such as mold, keep the relative humidity below 60 percent, ASHRAE recommends. It's also important to understand how mold develops and how HVAC systems need to respond in different parts of the world. "In a nutshell, what works in cold climates will not necessarily work in hot and humid climates," says Dianne Griffiths, a Mechanical Engineer with Steven Winter Associates in Norwalk, Conn. "With the hysteria over mold, we do not want to make matters worse by misunderstanding the hows and whys of mechanical ventilation."

#### ASHRAE STANDARDS

##### 62-1999: Ventilation for Acceptable Indoor Air Quality | COMMERCIAL BUILDINGS

- Recommendations for how many people should be allowed into a space (people per 1,000 square feet) and cubic feet per meter (CFM) of air for each person.
- CFM ranges from 15 for reception areas to as much as 60 for smoking lounges.

##### 55-1992: Thermal Environmental Conditions for Human Occupancy | RESIDENTIAL BUILDINGS

- Factors that influence thermal comfort and the perception of thermal conditions, including temperature, radiation, humidity, air movement, vertical and horizontal temperature differences, temperature drift, personal activity and clothing.
- Acceptable temperature and humidity ratings for winter and summer.

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#### TOGETHERNESS


A unified team concept is behind Hellmuth, Obata + Kassabaum Inc.’s (HOK) award-winning design of the San Mateo County (Calif.) Forensic Laboratory, named one of The American Institute of Architects’ Top 10 Green Projects of 2003. The goal was to create a bright, calming space, with plenty of natural light and operable windows for natural ventilation, says Alan Bright, AIA, HOK San Francisco’s Project Designer. The design also aimed to marry the building’s highly technical interior program with the external impact of the sloped site in the San Mateo Hills.

Although exposed ductwork is common in other applications, it’s relatively rare in lab settings. HOK’s design team decided to expose and express everything. In doing so, designers created a highly organized grid pattern, says HOK Project Manager Lynn Filar. “We wanted to create a clean, clear path for routing supply and exhaust, and we were very conscious of the overlaying grid.” The team also used spiral-shaped round diffusers to demark a consistent 9.5-foot ceiling plane. In addition to using a photovoltaic array to create electricity, designers ensured natural light pours in from every angle.

#### SIGHT UNSEEN

HVAC must blend seamlessly with a space’s interior in residential design, says Leslie Saul, IIDA, AIA, of Cambridge, Mass.-based Leslie Saul & Associates. Though immensely popular, large open spaces such as great rooms prove to be design challenges. “The main question is: How do we cool these big rooms everyone wants?” Saul says.

In the Maxwell House, a family home in Massachusetts, Saul solved this challenge by using the art of concealment. The great room used a radiant heat floor – a popular means of heating residential spaces in the Northeast – but that didn’t solve the air-conditioning issue. Saul hid small, cool-air ducts within two television cabinets on each side of the fireplace. “The ducts actually go through the ceiling of the cabinets,” she says. “That way, the air hits the room mid-level in the living space versus coming from the floor.”

Whether working on residential or commercial projects, the key for designers is to educate themselves about HVAC as much as possible, Saul says. “Don’t be intimidated by HVAC. Ask questions, and find out if something can be moved. It’s all a negotiation.” 

## GLOBAL CLIMATE

Issues such as natural ventilation and light are priorities in Europe, says Robert Fry, Principal with the London office of Swanke Hayden Connell Architects. Operable windows, for example, still are preferred in many developments.

In general, buildings are smaller, high-rises aren’t as tall, and many buildings have simpler HVAC systems, often with less sophisticated controls, he says. Air conditioning, for example, never is assumed. “Whether or not a building needs air conditioning is still a question in the client’s mind in Europe,” Fry says. “In the States, it’s a given.”

Designers and mechanical engineers try to take a “big picture” approach when dealing with HVAC, and issues such as natural ventilation and sustainability have much higher profiles as the environment is more carefully considered. “It extends from the raw materials chosen or the inherent energy required to create products to the long-term performance and cost of running a building,” Fry says.