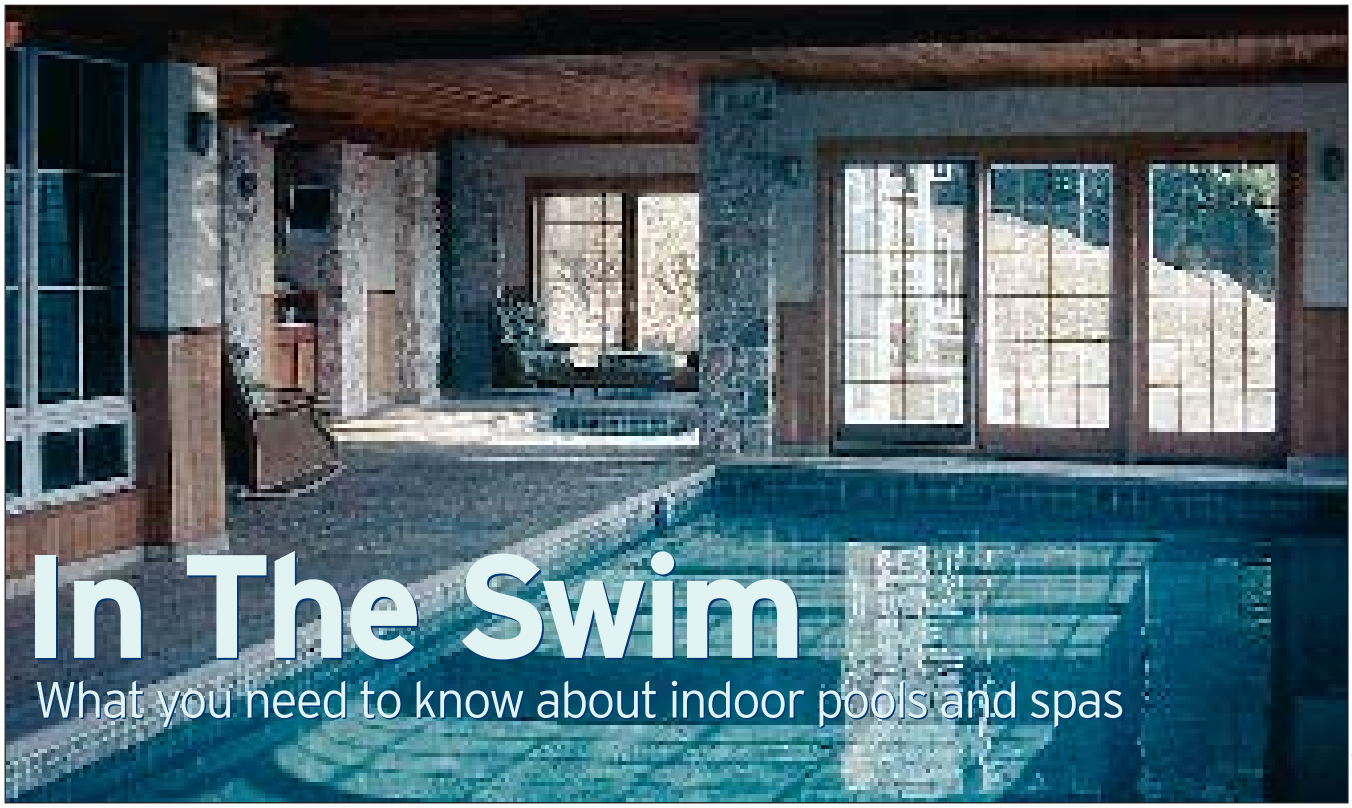

In The Swim

What you need to know about indoor pools and spas

Courtesy Dectron

What makes this room beautiful — expansive windows that let the outside in, exposed wood and a furnished seating area — also poses a potential problem.

BY KIRSTIN PIRES

If you build pools or sell hot tubs, sooner or later you'll come across clients who want their recreational water indoors. One equipment manufacturer reports that the indoor-pools segment is the fastest-growing part of his business.

So how much do you need to know about indoor pools and hot tubs? As a builder, do you build the pool and leave the rest up to the general contractor or the homeowner? Or if you sell a swim spa to clients, do you suggest they add ventilation and leave it at that? Your industry and your clients will thank you for going a step further to make sure the pool or hot tub you sell is located in a room with the appropriate air-handling systems to guarantee years of trouble-free enjoyment.

To provide the best possible service to your clients, you ought to know the basics of indoor water. You may have no intention of getting into the HVAC business, but if you are the general contractor on an indoor pool construction project, you will need to subcontract the HVAC. Or if you are a sub on the job, you'll need to work cooperatively with the HVAC contractor. Or if you sell portable hot tubs, you will want to provide a confident response when someone asks, "Can I put this in my rec room?"

If you can answer that question with authority, you may be one of an elite few. "The people who know pool construction don't know ventilation design," says Brian Monk, vice president of sales and marketing for Dectron, a Canadian manufacturer. "The guys who know ventilation design — and that could be the contractor or the consulting engineer or the architect — are used to commercial ventilation design. It is a very different technique when you're handling [an indoor pool]. It's generating huge moisture loads."

There are a few firms out there that have the resources to see the big indoor picture. Omega Pool Structures in Tom's River, N.J., specializes in controllable aquatic environments. Kevin Ruddy, the company's CEO, says his firm is unique because it brings together all the elements required for an indoor pool design. "Our company really specializes in educating our clients on the most efficient and effective way to build and how to control operating costs," he says. "We understand the pool company because if we had to, we could build a pool. We understand the HVAC because we could do that. And we have architects and engineers who we put in the field first so they understand what they're drawing."

While firms like Omega are rare, there's no reason everyone in the industry can't increase their understanding of important components in indoor pool design.

Damp Dilemmas

There are several challenges to overcome when locating a large body of water indoors. Among them are controlling humidity, handling ventilation and selecting finishes.

"The biggest problem, of course, is the humidity," says Monk. "The humidity itself not only causes problems with regards to window sweating, mold and mildew — which is a big problem with indoor air quality — it can also cause problems with the structure itself."

Pat Reynolds concurs: "If you don't control the humidity, you end up with moisture that will condense on surfaces — particularly when they get cold — and that will wreak

havoc on the structures," says the president of PoolPak, a York, Pa., dehumidification equipment manufacturer. "You get peeling paint. Insulation will get saturated. If you don't have a vapor barrier, moisture will actually go right through the wall. In the winter, it will condense in the insulation, in the bricks. That moisture will then freeze and render the insulation totally useless. In the bricks, when it freezes it expands and it will actually crack the bricks."

Sometimes the humidity problem in a poorly designed indoor water environment can be severe. "I've seen some facilities where in the winter the moisture would get so heavy it would condense up in the ceiling and, because the insulation was also poor, it would freeze and you'd actually get icicles on the ceiling," says Reynolds.

Monk has seen extreme examples too. "We saw one application where the windows were sweating to such a degree that the owner, instead of putting in a system that would remove the humidity, put rain gutters inside the room. The guy said, 'Thanks for coming but I think I fixed the problem!' We had a good laugh on that one. And he got an A for creativity," he says.

While water is one of the most efficient and plentiful solvents in the natural world, an indoor pool or spa adds another destructive element. "The other factor, when the humidity isn't controlled, can be the chlorine," says Reynolds. "When you get chloramines in the air along with high humidity, you can have mild hydrochloric acid in the condensate. Now you have an even worse weapon than just moisture, because that acidic condensate will begin to attack steel and create a whole different level of destruction on the building."

In fact, a dramatic example of chlorine stress syndrome made international news in February.

"It makes the stainless steel lose its elasticity so it becomes very brittle," says Reynolds. "So when you load it, instead of just deflecting, it breaks like glass. Last February you might have heard about the pool in Moscow where the roof caved in?" Chlorine stress syndrome is thought to be the cause of the collapse.

Another issue is the potential effect

of the off-gassing on swimmers. Chloramines and possibly other substances evaporate with the water, but because they are heavier than water, they hover at the water's surface, right where swimmers are breathing. "People inhale [chloramines], they can have asthmatic reactions, irritate their eyes. It's just not good," says Reynolds.

Dectron, PoolPak and other manufacturers have developed units that include filters designed to address the fumes and odors that naturally come off the pool and collect in the room if the air isn't properly handled.

While filtration is certainly an important safety feature, in fact, not a lot is known about pool chemical off-gassing rates. But the American Society of Heating, Refrigerating and Air-Conditioning Engineers hopes to change that. The trade association and standards-writing body has funded a research project that will seek to quantify those rates in the indoor-pool environment.

"Designers need information about the pollutants in pools, how they can be eliminated and what effect they have on occupants," said Reinhold Kittler in an ASHRAE press release. Kittler is a member of the ASHRAE technical committee that is sponsoring the project.

Unseen Unclean

Yet another result of faulty air-flow design can be mold and mildew. These unsightly, often smelly life forms need three things to survive: darkness, moisture and a food source — usually dirt. "It's not as dramatic a problem as a lot of the tabloids have made it seem, but it's a problem, there's no question about it," says Monk. He explains that when moisture works its way into a wall, the conditions are right for mold growth. Because it's inside the wall, the homeowner likely will not know it's there until it develops an odor. "That emits itself as a volatile organic compound," says Monk. "Depending on where you are in the country, that mold can lead to some severe health problems." He is quick to point out that maintenance is an important part of the mold equation for an otherwise well-designed system. "If you don't clean the ductwork for 15 years, you have problems," he says.

Getting The Air There

Indoor humidity is affected by the interaction of available moisture; ventilation of the space; air temperature; surface area, temperature and turbulence of the water; and temperature of the walls and windows. Clearly, a dehumidifier is a necessary piece of equipment. But it can't do the job by itself.

"So much comes back to the air-handling side of the equation before you even start to talk about the dehumidifier," says Reynolds. Ultimately, a dehumidification system will be chosen for the pool or spa room, but it is best specified after considering a host of conditions. Reynolds says proper design includes vapor barriers, proper insulation, thermal-pane windows with thermal breaks, and proper air-

flow design, depending on the climate of the site. "If this isn't done right, it doesn't matter what you've got in the mechanical room," he notes.

Monk adds: "You have to make sure you design the air handler to handle the load, *and* you have to make sure that you distribute the air properly," he says. "Every pool is different, the geometry is different, so you have to be able to adapt the design to that."

Proper distribution starts with delivering warm, dry air (from the dehumidifier) to cold, damp spots. "Windows are the places you'll have condensation forming first," says Reynolds. "So we say distribute the air around the perimeter and be sure that the air is blowing on the windows. Don't forget the skylight, it's also a candidate for condensation."

Throughout the design process, efficiency should be a priority. "Are you going to put the ducts below the floor where they'll blow upward, or at the ceiling where they'll blow down?" asks Reynolds. "Warm air rises, so let that work for you. If you're blowing air down, you have to blow harder to get that air all the way down to the floor."

Top manufacturers understand that customers' satisfaction with their product depends a great deal on other parts of the system. Because of this, they've done an excellent job of providing resources for builders, homeowners, engineers — anyone who wants to know about designing an indoor water environment.

"We have training for all our sales reps, and we spend as much time talking about air distribution as we do talking about how our product works," says Monk. "Then they can work with the contractors and owners to help them design the right installation." A wealth of information is also

Why Do The Windows Fog Up, Anyway?

It's the dew point, silly!

For a given amount of relative humidity, the ***dew point*** is the temperature at which the water vapor in the air will phase into liquid form, causing condensation on surfaces. Warm air can hold a larger amount of vapor than can cold air. When air cools, it holds less vapor, and the excess vapor condenses into moisture droplets. In the atmosphere, that's how rain forms. In the pool room, that means wet walls and fogged-up windows.

Saturation point is another way of expressing this relationship. At a given temperature, the relative humidity at which condensation forms is called the saturation point.

So when designers are configuring an indoor pool, they need to be able to control the relative humidity and the air temperature to maintain a combination of dew point and saturation point that keeps the water safely in the air, not on walls and windows. *—KP*

available at company Web sites and ASHRAE's Web site.

Because most homeowners won't want to limit activity in the pool or lower the water and air temperatures in the pool room in order to reduce humidity, using a cover when the pool is not in use is another way they can improve efficiency and limit evaporation and humidity.

"If people put a pool cover on, it dramatically changes the calculations," says Ty Koren of Therma-Stor in Madison, Wis. "But most people don't want to bother with that detail. At a commercial level, it may be impractical and they typically solve the problem by over-ventilating and under-dehumidifying."

Multi-tasking Machines

The dehumidification industry has come a long way in the past 20 years. Add computerization and automation to the basic technology, and the result is air systems that monitor themselves and run only when necessary. PoolPak's newest units can call or e-mail when there's a problem and publish their own vital statistics on the Internet. This means ease of use, lowered operating costs and a safe, healthy indoor air environment.

Heat recapture is a feature on some dehumidification units that can save energy and reduce operation costs. Reynolds describes a PoolPak unit that can redirect heat from the dehumidification process to heat the air or the pool water, or just discharge it to the outdoors, depending on what sensors determine is needed. "Our job is to package all this so that the homeowner just sets, for example, the air at 82, humidity at 55 and water at 80. Then they just walk off and it's all automatic," he says.

Steamy Spas

Homeowners probably locate hot tubs indoors more often than they do pools. Because a hot tub is so much smaller than a pool, it's tempting to think it won't require special HVAC design. "Hot tubs are actually worse because they're kept at higher temperatures and there's turbulence, too," says Monk.

While a hot tub retailer clearly does not want to discourage a sale, or suggest equipment that will cut into the buyer's hot tub budget, he also doesn't want a client to come back angry because the hot tub caused humidity problems in his house.

"The key things would be to discuss with the clients where they will locate it within the home," says Monk. He suggests asking about the finishes in the room; is the sheetrock moisture resistant like that used in bathrooms? How is that room ventilated? "If they have a problem with ventilation, they may want to look at a small unit that can be rolled into the space and only turned on when the hot tub is running," he says.

Indoor pools are a cross-trade undertaking. For most professionals, it doesn't make sense to become expert in each of the required areas. But even if you don't know how to do it all, you can know how to get it all done.