Air Distribution

Why is Controlling Humidity Important?

A high level of humidity in an indoor pool enclosure affects both the comfort and health of the occupants. The moisture suspended in the air condenses on cooler surfaces adding to maintenance costs. Chloramines in the condensate are corrosive and will severely attack metallic surfaces.

A PoolPak® Environmental Control System is the best method for removing unwanted moisture. It continually monitors the enclosure space and water temperatures, outside temperature and humidity levels then automatically maintains the conditions to the predetermined set points. A PoolPak® dehumidifier will reduce operating costs by recycling the heat recovered during the dehumidification phase back to the pool water or air space.

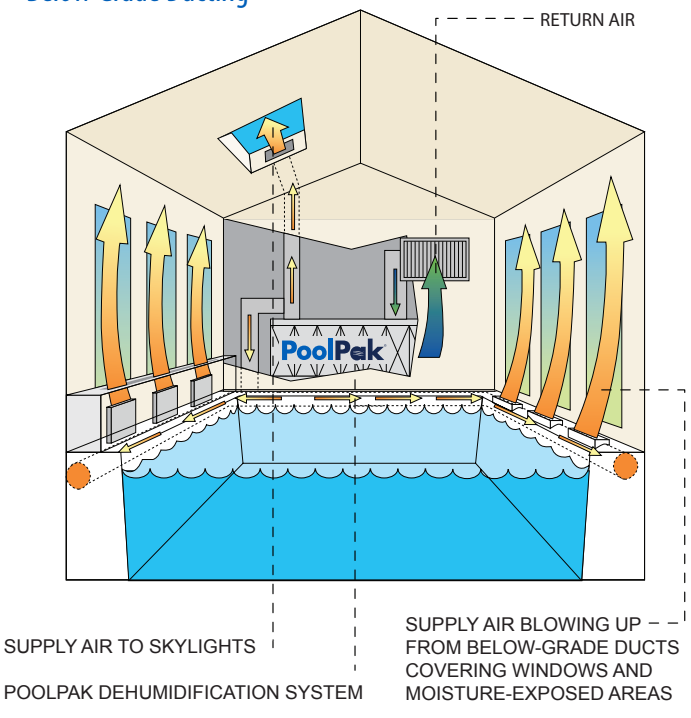
But even a high performance dehumidifier like the PoolPak® cannot maintain ideal conditions if the air distribution system is designed improperly. The objective of an air distribution system within an indoor pool facility is to maximize airflow of warm, dry supply air over any surface that is prone to condensing temperatures, including all walls, windows and skylights.

Careful consideration must be given to the location of supply air ducts, the location of the air return grill, use of moisture barriers and door/window insulation values. By combining the proven results of a PoolPak® system along with good duct design, you can be assured of maintaining a safe and pleasant environment for many years.

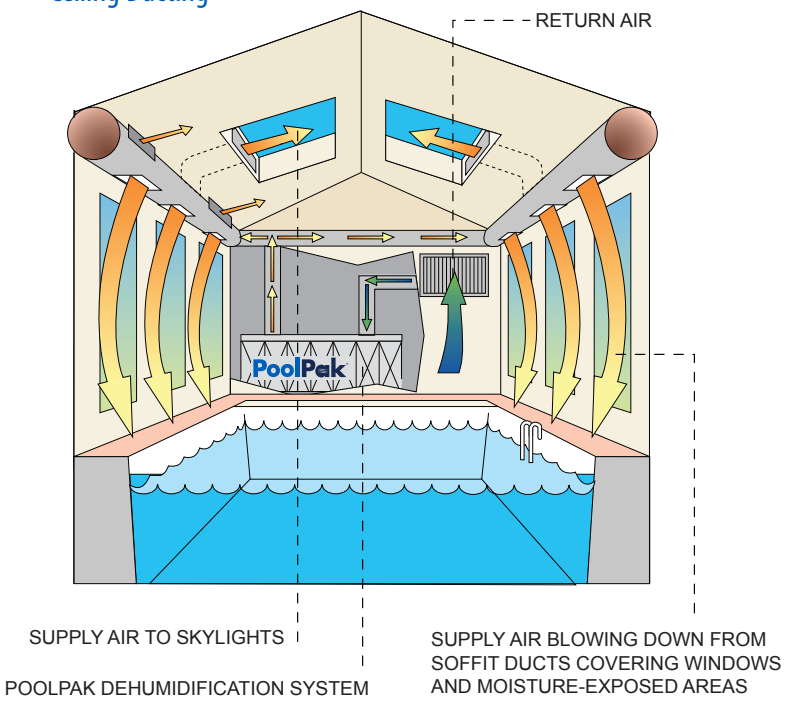
Below Grade Ducting

Below grade ducting takes advantage of warm air's natural tendency to rise. As the warm, dry supply air rises; it picks up moisture for return to the dehumidification system. Wall "washing" with air reduces the incidence of cool dead air spaces that may form on the windows or walls. This cooler air will migrate down the wall and across the floor resulting in bather discomfort as it reaches the pool's edge.

Below Grade Ducting



Ceiling Ducting



For low set windows and sliding glass doors, the supply air should be ducted below grade around the inside perimeter of the enclosure. The ducts should be constructed of PVC piping, PVC-coated, galvanized steel piping or similar material that will not corrode. Linear slot diffusers must be located in such a way as to blanket the glass surfaces and outside walls with warm, dry air.

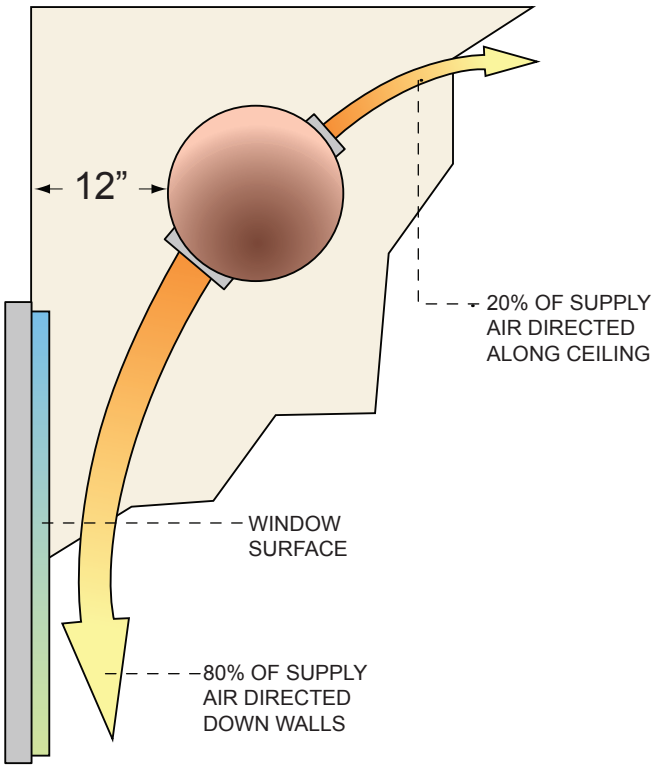
Ceiling Ducting

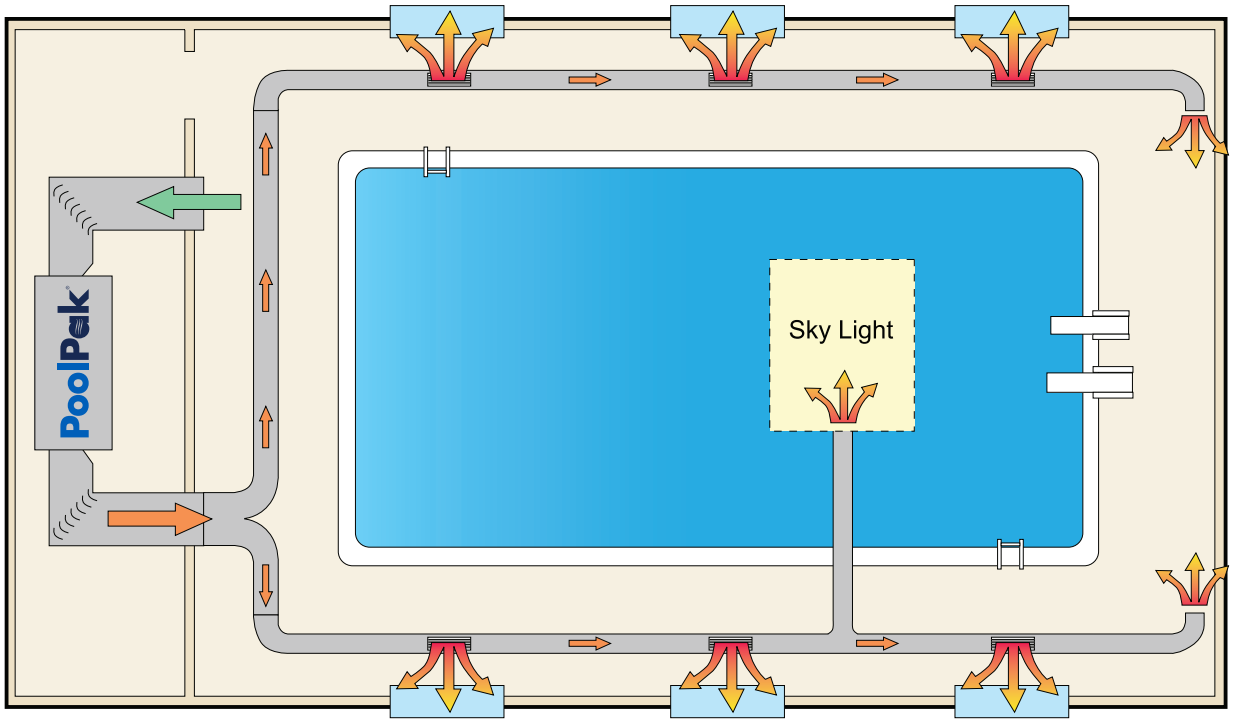
With ceiling ducting, the supply air grill must be located close to the windows, preferably within twelve inches from the surface to sufficiently wash the cold glass with an even blanket of air. Most of the supply air (80%) should be directed down the walls. The remaining supply air (20%) should be directed along the ceiling to break up any stratifications and stagnation occurring near the ceiling.

Skylights

Where skylights are present, it is best to utilize supply ductwork to wash the glass with warm, dry air. Another method to deal with skylights is to install ceiling fans, running in reverse to draw up the warm air against the glass surface. This method has proved effective in reducing condensate but it is not as reliable as direct ducting.

Soffit Detail





Perimeter Distribution – supply air around surfaces prone to condensation

Structural Considerations

Vapor Barriers

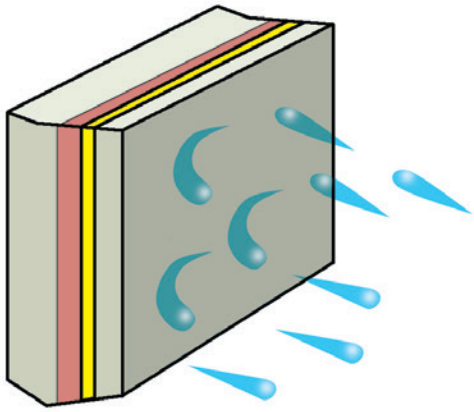
Moisture migration is caused when moist air in the interior of a pool structure is allowed to flow through the walls because there is no barrier or obstruction to its flow. As the outside temperature decreases, the dew point will be reached within the wall. The moisture within the migrating air will impregnate the insulation and the wall and condense within the wall structure resulting in a decrease in R-value from the wet insulation and a loss of structural integrity.

Vapor barriers should be installed on all outside walls immediately behind the interior wall surface. The dew point must be reached on the cold side of the vapor barrier where moisture is not present. Always seal barrier joints along joints at switches and receptacles to prevent localized moisture migration.

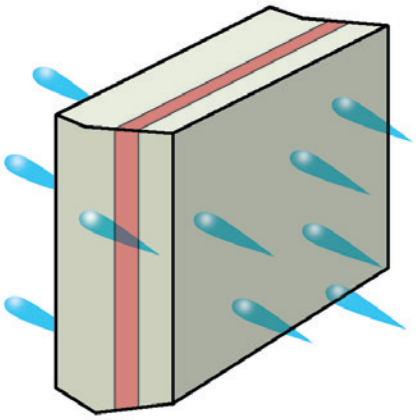
Windows and Glass Doors

Windows and glass doors exposed to outside air should have the highest R-value available. Double and triple glass panels are best, and they should be insulated or sealed in vinyl clad frames wherever possible. Window frames must have thermal breaks and be sealed to adjacent walls and insulated with a non-porous insulating material. Insulate around studs, not just between them, and at outside walls to prevent heat migration.

Vapor Barriers

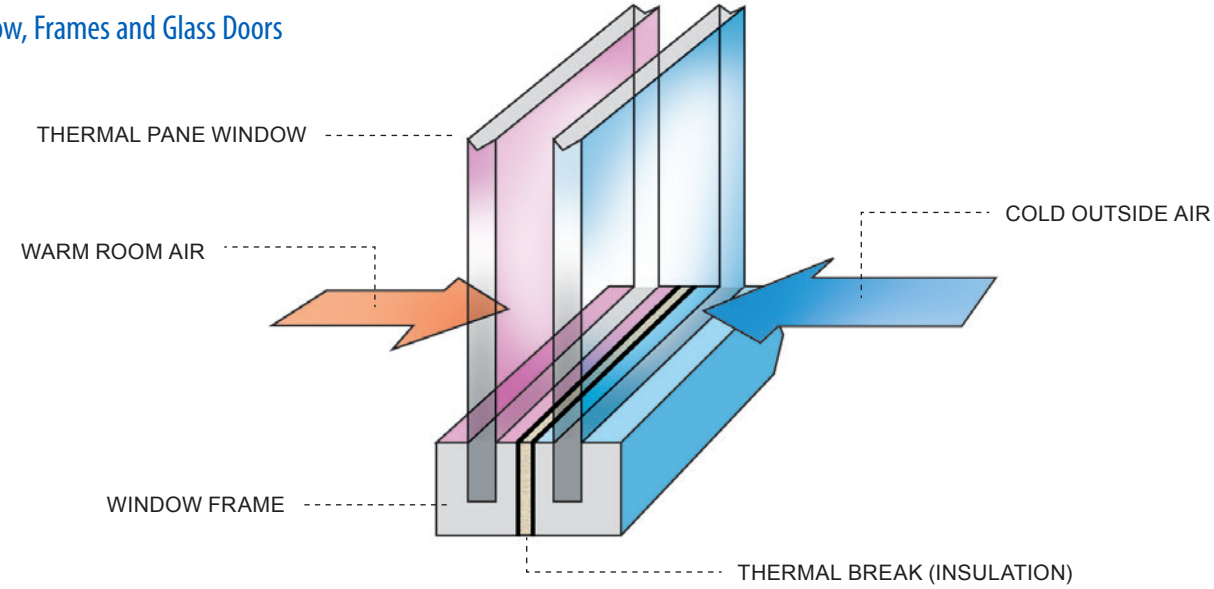


Wall with vapor barrier



Wall without vapor barrier

Window, Frames and Glass Doors



Environmental Control of Spectator Areas in Natatoriums

Large indoor pools and natatoriums designed for competition generally require seating for spectators. Seating is generally situated in one area for ease in temperature and humidity control. Incorrect environmental control equipment and inadequate air distribution often results in spectator discomfort from high temperatures and humidity.

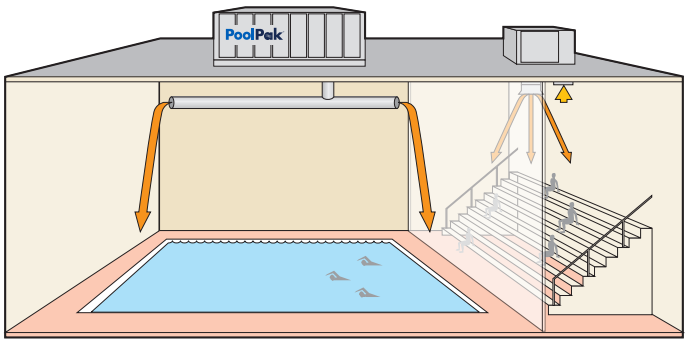
There are generally three ways to condition natatorium spectator areas. They are variations of isolating or including the spectator areas with the pool environment and with or without a dedicated spectator HVAC system. The results can vary greatly as well as the cost to implement and operate the systems.

Isolating the Spectator Area

The pool room is divided into two independent zones: the pool zone and an isolated spectator zone. The pool zone requires a dehumidification system for bather comfort while the spectator area is separated by a glass wall with its own HVAC system.

This solution guarantees comfort conditions for the spectators regardless of the conditions in the natatorium. This is the most expensive in regards to design and engineering costs and is used occasionally.

Isolated Area

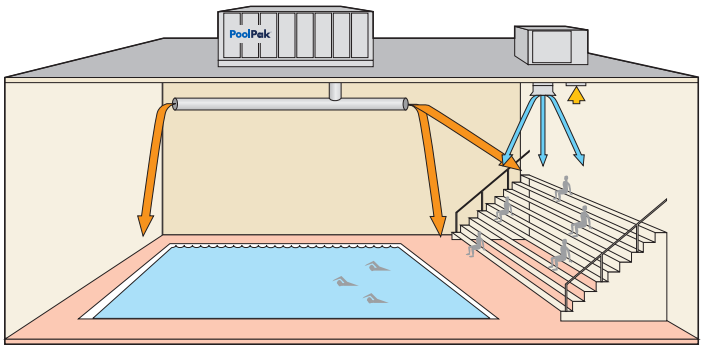


Single Zone Pool and Spectator Area with Independent Temperature/Humidity Equipment

The second method includes the spectator area within the pool room while maintaining an independent pool dehumidification system along with a dedicated outside air system (DOAS) for the spectator section. This system is generally slightly less expensive than isolation but with some operational difficulties.

The spectator DOAS is run only during meets and is run about 10° F cooler than the swim space. The cooler air generated from the DOAS system in the spectator area often causes condensation buildup on ceiling areas near diffusers because of moisture migration. These chloramine-laden compounds later corrode any metal surfaces they come in contact.

Independent Temperature/Humidity Equipment

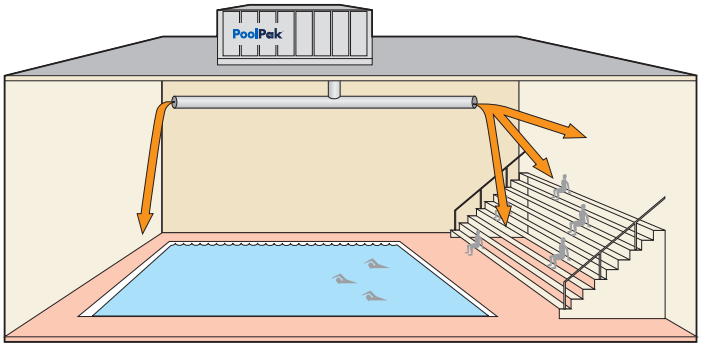


Single Zone Pool and Spectator Area with HVAC Source

The most popular method of managing spectator comfort within the pool environment is the use of a single source dehumidification system with proper air distribution. Diffusers are aimed at the spectators so they feel the driest supply air blowing across their bodies and the evaporative cooling effect from the supply air. This method has the lowest cost and the highest success rate.

This system is effective in part because the evaporation rate is lower during competitive meets when there are fewer people in the pool. The lower evaporation rate offers excess cooling capacity for the benefit of the spectators during meets. To be effective, the return grills must be placed on a wall opposite from where the spectators are sitting to prevent the humid return air from coming in contact with the spectators.

HVAC Source



Pool Air Distribution Considerations

Position the return inlet(s) so that all of the moist, warm air flows efficiently back to the dehumidification system, eliminating dead areas where air stagnation can occur. In most instances, a single return duct is ideal in a pool area. The desirable location for the return will be at a point high enough to capture the warm, humid air that naturally rises. In a pool, this is about 10 to 15 feet above the floor.

Airflow should never be directed over a pool surface because the airflow will cause discomfort for bathers as they exit the pool. Airflow over or too near the pool will speed evaporation and limit the effectiveness of the dehumidification system. The greater the air velocity, the greater the evaporation rate.

Avoid short cycling where warm, dry supply air is prematurely recycled back to the dehumidifier before collecting moisture. It is caused when the location of the return duct is too close or directly inline with the supply duct.

Surface areas that collect water from the pool create an additional load on the dehumidification equipment. Avoid the use of absorbent deck coverings such as carpet within the pool area and limit wet deck areas by installing adequate drainage and reducing deck over spray.

Maintain a slight negative pressure of 0.05 to 0.15 in. of water column in the pool area relative to surrounding spaces to prevent moisture and chlorine odors from migrating to other areas of the building.

With more than 45 years of experience in indoor pool dehumidification equipment manufacturing, PoolPak® International is the most well-known brand in the industry. Our people and products work daily to improve the quality and comfort of indoor pool environments. PoolPak® dehumidification solutions include a variety of heating, ventilation, and air conditioning systems, in addition to an industry-leading PoolPak® support network. For more information, please visit www.PoolPak.com.

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DEHUMIDIFICATION THAT WORKS

3491 Industrial Drive
York, Pennsylvania 17402 USA
800-959-7725 Fax 717-757-5085