



Tech Note # 111

Pool Design Turnover Rates

Keywords: Pool, Airflow, Turnover rate, Breathing zone

Introduction

In pool rooms there are several different air volumes that concerns a design engineer. This technical note to define the terms and provide a short guidance to their importance in the design of an adequately dehumidifier indoor pool facility.

The terms are:

- Outside air ventilation turnover rate
- Room turnover rate

ASHRAE 62.1 is a minimum ventilation air standard. It is basically dealing with the amount of outside air that is required to be introduced into a building. ASHRAE 62.1 does not specifically define outside air turnover rates. By definition, outside air ventilation turn overrate is calculated by dividing into 60 the ratio of room volume divided by the volume of ventilation air.

$$60 / \text{room volume (cu. ft) / ventilation air (cfm)}$$

However, if you apply the ventilation rate to most typical pool facilities, one would calculate an air turnover rate of about 0.7 to 1.2 times per hour.

In section 5.6 of the 2011 ASHRAE Handbook, it mentions air changeover rates. This section states: *“Where mechanical dehumidification is provided, air delivery rates should be established to maintain appropriate conditions of temperature and humidity.”* Section 5-9 page 24 of the ACCA manual for designing pools goes one step further to define this as *“Air Turnover Rate: One air turnover rate occurs when all the space air is replaced with supply air in one hour”*. ASHRAE Handbook sets a requirement of 4 to 8 air changes per hour. While the minimum is 4, some state building codes require a minimum of 6.

The Breathing zone only deals with the amount of ventilation air not air turnover/changeover rates. One of the major reasons for a minimum changeover rate is to protect the building. If you are only concerned about the breathing zone than the high moisture near the ceiling will create condensation. This will encourage mold growth, deterioration of the building and possible rain effect in the building.

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On another note the Breathing Zone as defined by ASHRAE is “The region within an occupied space between a plane 3 and 72” above the floor and more than 2 feet from the wall or fixed air conditioning equipment.” This is certainly much less than the 10 feet the engineer had mentioned.

I have attached a paper that was written by Titus that discusses heating and cooling large volume spaces. They talk about using stratification at 15 feet above the floor to properly heat or cool a large volume space. The problem with this in a pool environment is that you are dealing with a high humidity level that creates a lot of other issues that cannot be ignored in this situation.