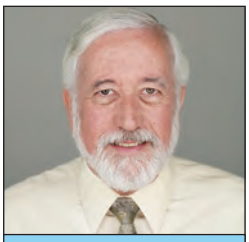
MECHANICAL CODE DISCUSSION

Indoor Pools and Spas — Ventilation Systems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GREETINGS! IT WAS WONDERFUL seeing many of you at the 2022 RMGA Education Summit this past Wednesday. I appreciate the opportunity to serve on the Board and within the association with so many dear friends.

The day following the Summit, I recently received a disturbing phone call from a building inspector, performing a final inspection on a large custom home with an indoor attached swimming pool. He shared how at plan review; the builder requested a deferred submittal as the mechanical design for the pool room was not complete. Those with experience working in a building department know a deferred submittal is rarely submitted unless later in the building process, there is a threat of a stop work on the project. In this case, the deferred submittal did not happen, the pool room is finished, with several mini-split heat pumps installed, but without mechanical ventilation. Why do I find this disturbing? Because I've investigated several cases where total structural rebuilding of pool rooms was required due to water damage. Notice the black mold and OSB failure due to the excessive inside the pool area on the left side of the photo. The condensation due to high humidity and poor insulation practices saturated the OSB, resulting in large sections of stone literally falling off the wall.

As indoor pools are infrequently installed in homes, inspectors, general and HVAC contractors typically have no idea what to do or understand the serious issues which will occur. Additionally, the IRC does not address pool ventilation in the mechanical chapters.

Where do we go when the code does not appear to address a condition such as this? Referring to the scope of the mechanical chapters in the IRC:

M1301.1 Scope. *The provisions of this chapter shall*

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govern the installation of mechanical systems not specifically covered in other chapters applicable to mechanical systems. Installations of mechanical appliances, equipment and systems not addressed by this code shall comply with the applicable provisions of the International Mechanical Code and the International Fuel Gas Code.

According to IMC Table 403.3.1.1, swimming pools and surrounding deck areas require 0.48 CFM of outdoor airflow per square foot of area in the *breathing zone.* A *breathing zone* calculation will often require an adjustment to increase the ventilation air based on the supply air and return/exhaust air terminal locations. Confusing? Simply put, the ventilation systems work best where airflow sweeps through the occupiable space, reaching all occupants and flushing out contaminants. Please see *IMC 403.3.1.1.1.2 - Zone air distribution effectiveness* for details on these adjustments.

Let's consider a 1000 square foot pool room with an 80% air distribution effectiveness:

1000 ft^2 X 0.48 ÷ 0.80 = 600 CFM of outside ventilation

Please consider the following:

1. The code basically requires an exhaust and makeup air system, with no recirculation of air into other areas of the home, for the purposes of controlling moisture and chemical fumes (where chorine or similar water treatments are used). In our climate, replacing exhausted air with dry outside air works well.
2. There is an exception allowing a reduced volume of ventilation air if an engineered dehumidification system is used. In humid climates, a refrigerated dehumidification system is mandatory.
3. With any system, the pressure inside an attached pool room must be maintained at a slightly negative pressure with respect to the home. If 600 CFM of outside ventilation air is supplied to the pool room without a slightly larger exhaust rate, creating a negative pressure in the pool room, moisture will move into the home.
4. In our climate, the ventilation air obviously must be tempered, as 10- or 20-degree makeup/ventilation air introduced into a pool space will not be acceptable.
5. As makeup air systems and dehumidification systems consume a significant quantity of energy, the energy code generally requires the exhaust/makeup air system use heat recovery ventilation in indoor pool applications. Several manufacturers produce HRVs, specifically for pool rooms.
6. The design professional and builder must carefully consider building and insulation strategies, typically including the use of closed cell foam products, ensuring the wall and roof cavities remain above dewpoint.

My experience with pool rooms in my years in HVAC included installation of two exhaust/makeup air systems, 3 or 4 large capacity dehumidification systems, and several dozen HRV systems. In my experience, the HRVs far outperform the other systems in humidity controls and operated at one-tenth the operating expense. I suggest you study and consider HRV in any dehumidification application. A word of caution; if you lack experience and knowledge with these applications, I strongly recommend involving an engineer experienced in these systems.

Please remember your questions and comments on this and other subjects are welcome. — Brent ■