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EXECUTIVE CORNER

Internal Mechanical Systems Can Effect Water Incursion and Bring On Lawsuits

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The truth about introducing outside air to a residence: With the condo boom 'on,' how are you protecting yourself against water incursion law suits?

Is it possible to protect against water incursion lawsuits? The current wisdom regarding water incursion is to seal the exterior of a building as tightly as possible. Water-proofing consultants, as well as energy code gurus, have us paying special attention to the details of construction joints, as well as penetrations to the building skin, which should be designed to withstand rain and wind forces. The missing element in this has been the need to track internal pressures due to ventilation systems and their impact on the integrity of the building's skin. The resulting potential for damage and/or litigation is a subject that needs to be addressed by developers, builders, designers, and sub-contractors alike.

The Washington State Ventilation and Indoor Air Quality Code (Seattle Mechanical Code Section 406) provides advice on how to introduce and exhaust air from a residence. "Whole house ventilation" is achieved via two basic methods. The first method is the use of a "whole house vent fan" (supply, exhaust, or heat recovery unit) in conjunction with "individual room air inlets". The second method is via "integration with central forced air" systems, ducting outside air through a furnace, heat pump or fan-coil device. In the "whole house vent fan" approach, an exhaust fan is usually preferred since a dedicated supply fan or heat recovery unit adds cost and complexity. The code calls for an operable "individual room air inlet" in each habitable room with a minimum inlet size of four square inches (or 10 cubic feet per minute). Note that even though operable windows are required by the Building Code, they do not satisfy the Vent Code's inlet requirement.

The same code also calls for additional "source specific" exhaust in bathrooms, kitchens, and utility rooms. Bathrooms are typically exhausted at a rate of 50-60 cubic feet per minute (cfm), range hoods at anywhere from 250 to 600 cfm, and dryers at 125-250 cfm. Laundry (Utility) Room exhaust must also be provided at 50 cfm minimum. Often the Utility Room exhaust fan is chosen as the "whole house vent fan". Designers must then decide how much of the above can occur at a given time, or averaged over an hour to arrive at a diversified value.

The first method outlined above makes the assumption that the "individual room air inlets" provide the "make-up air" for the various exhaust devices. In reality, a mismatch occurs between the 10 or 20 cfm (Studio or 1 bedroom) capability of the air inlets, and just one of the exhaust devices. Even though other sources of air come in the form of building joints and window cracks, calculations suggest that leakage through all cracks amounts to only about 15 cfm for "tight" construction. Air from a corridor supply system typically amounts to another 15 cfm per unit. All together, room air inlets, leakage, and corridor system air create about 50 cfm of "make-up air", just enough to cover one room in the residence. The result, in the overwhelming majority of residential projects, is a combination of reduced exhaust performance and an increase of negative pressure within the space.

Building skin, although predominantly affected by weather, is also affected to some degree by the air pressures induced by the mechanical systems. The mismatch in supply and exhaust, especially at dinnertime, when multiple range hoods running, can induce a negative pressure of between 0.05 and 0.25 inches of water gauge. It is widely suspected that the negative pressures due to ventilation systems assist weather-driven water incursion under these circumstances. This has been the focus in multiple lawsuits by condo owners against condo developers.

Options to solve this problem include larger inlets within the window frames (flip vents), or through-the-wall acoustical "periscope" type inlets. Residences with air conditioning or a forced air furnace should give serious consideration to utilizing the "integration with forced air systems" path, which can provide adequate make-up air in through a furnace, heat pump or fan coil. This method has the added benefit of mixing the outside air with return air prior to reaching the occupants. A very small percentage of projects have incorporated a more costly, yet most effective, dedicated ducted system for make-up air. Recently, some projects have chosen a dedicated make-up air system sized only for a diversified amount of make-up air, holding the installation cost down. Designers are also beginning to question the wisdom of high air flow range hoods.

Design and construction teams need to work together in developing a strategy for residential ventilation. Having a strategy that limits negative pressure will go a long way in protecting you in the case of litigation. <<