NATIONAL FIBER
CEL-PAK INSULATION

Professional Cellulose for Cellulose Professionals

Unvented Cathedral Ceilings and Flat Roof Assemblies

Cellulose insulated, unvented cathedral ceilings and flat roof assemblies have been used successfully for over thirty years in thousands of installations across the United States and Canada. The long term performance and durability of these installations is a function of the insulation's ability to block airflow, its hygroscopic properties, high fiber saturation capacity, and the presence of borate based fire retardants within the cellulose insulation.

Performance oriented building codes, such as Section 106.4 of BOCA, Sections R104.11 of IBC and UBC, and 780 CMR Paragraph 109.3 of the Massachusetts Residential Building Code, allow for "Alternate materials, design and methods of construction" provisions to common building practices.

Air is the primary transport mechanism for moisture and is responsible for the vast majority of moisture related building failures. Cellulose dense packed at high densities (3.5 lbs/cf) is a barrier to warm moist air from the living space below. The hygroscopic nature of the cellulose will disperse any moisture entering the assembly, while the material's high fiber saturation point provides a hygro buffer, protecting the insulation and adjacent materials from liquid water (i.e., condensation), mold and rot. The antimicrobial properties from borate based fire retardants provide additional protection to the assembly.

In contrast, the low density and miniscule fiber saturation capacity of fiberglass insulation offer little resistance to warm moist air moving through or condensing into liquid water within or adjacent to the insulation. Current code provisions requiring poly vapor barriers and venting are designed to help slow down and remove moisture-laden air that flows through fiberglass insulated cathedral ceiling assemblies.

- In the Oak Ridge National Laboratory publication, *Moisture Control Handbook*, under the heading "Should cathedral ceilings be ventilated?" their answer is "Not if that space is tightly packed with insulation."
- Researchers at the University of Illinois studied the effects of attic venting and heat transfer and concluded "…an analysis of the data reveals that the addition of 2-inch thick insulation is considerably more effective at reducing ceiling heat gains than the maximum ventilation rate. When 3 $^{5}/_{8}$ inches is added the effect of ventilation is almost insignificant."
- At the ASHRAE/DOE *Thermal Envelopes Conference* in Clearwater, Florida, an international group of building scientists and contractors concluded that un-vented cathedral ceilings provide better thermal performance and better moisture protection than conventionally vented cathedral ceilings.
- Roofing, Siding & Insulation magazine advocated unvented cathedral ceilings in their magazine, "If properly constructed and sealed to prevent air leakage."
- Princeton University found that cellulose insulation has the lowest air infiltration rates of any commonly used home insulation.

One of the concerns often raised is with the shingle warranty. We are not aware of any warranty invalidated because the unvented cathedral ceiling was packed with cellulose insulation. Studies have proven that excess heat on a roof is a function of roof color and not ventilation.

National Fiber warrants its cellulose insulation in unvented cathedral roof assemblies with rafter depths of 2x10 or greater and having a minimum installed density of 3.5 lbs/cf, when installed by a certified National Fiber contractor.

We recognize that interior moisture conditions can also have a detrimental effect on any insulation system. This warranty does not extend to spaces that have an unusually high interior relative humidity level, such as an indoor, heated pool enclosure.

For further information, please contact our Technical Manager, Bill Hulstrunk, at technical@nationalfiber.com.