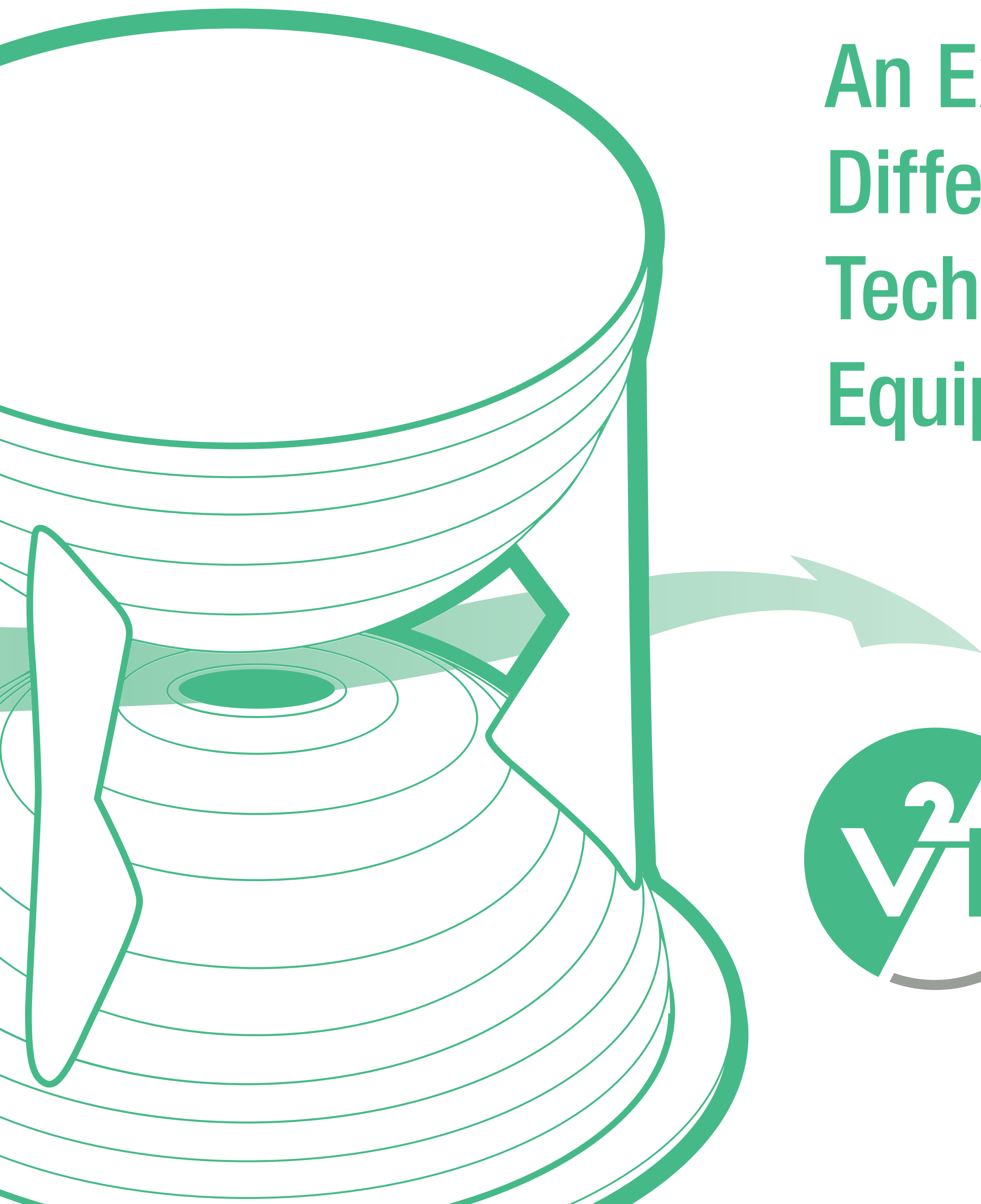
ROOF VENTING

a Past, Present, and Future Approach



An Exploration of Different Venting Technologies & Equipment

V2T roof system

The Venting Needs of Low-Slope Roofs

When it comes to commercial buildings, low-slope roofs have long been the preferred roofing option. This roof design is the most practical option for most commercial buildings due to the relative cost per square foot, and ease of repair or replacement over time.

They do however come with a unique set of challenges which must be addressed to ensure proper performance.

- Low-slope roofs must be properly maintained to avoid problems related to ponding, debris, attachments, and leaks.
- Even with good warranties and proper maintenance, low-slope roofs will need to be replaced, and this comes at a significant cost.
- Because of aerodynamics, low-slope roofs must be designed to resist forces created by the wind, which are constantly trying to pull the roof off of the building.

Vented roof systems exist because they can be extremely effective at helping property owners mitigate these forces.

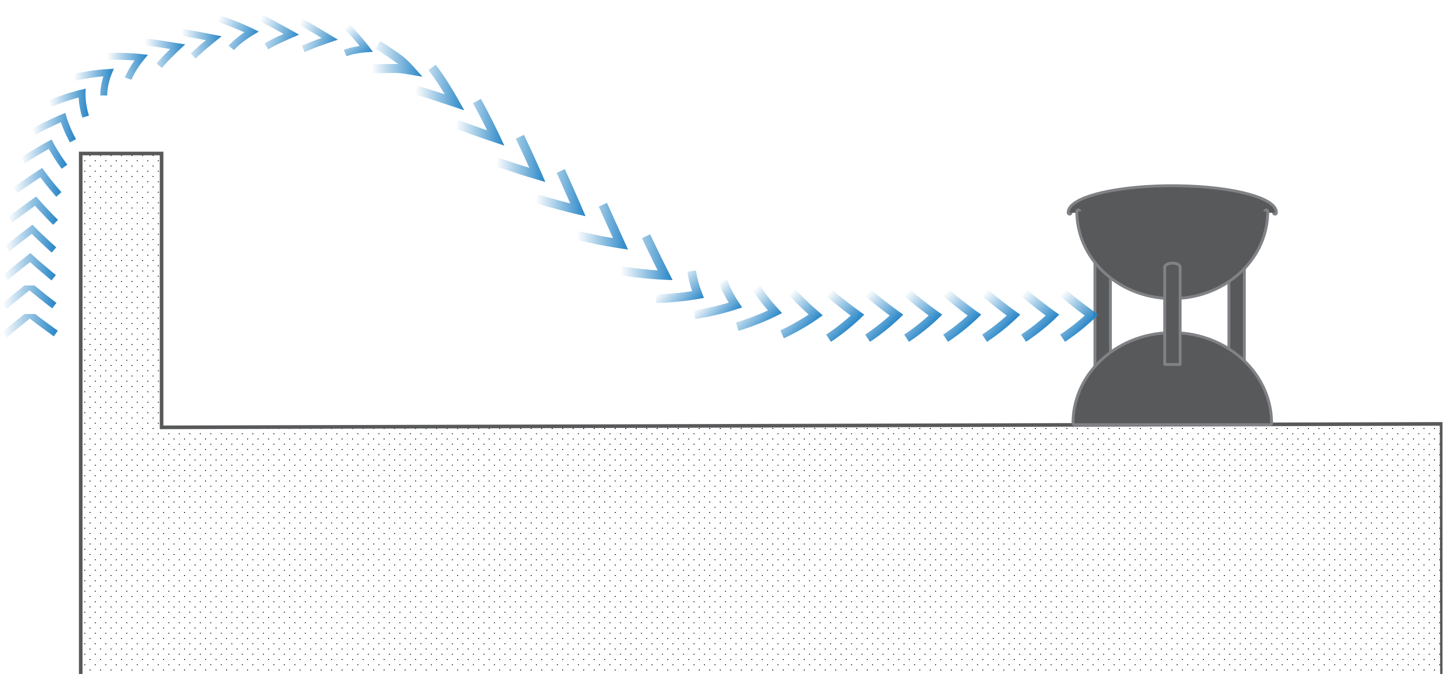
Why?

It's a matter a physics… and a concept called "lift."

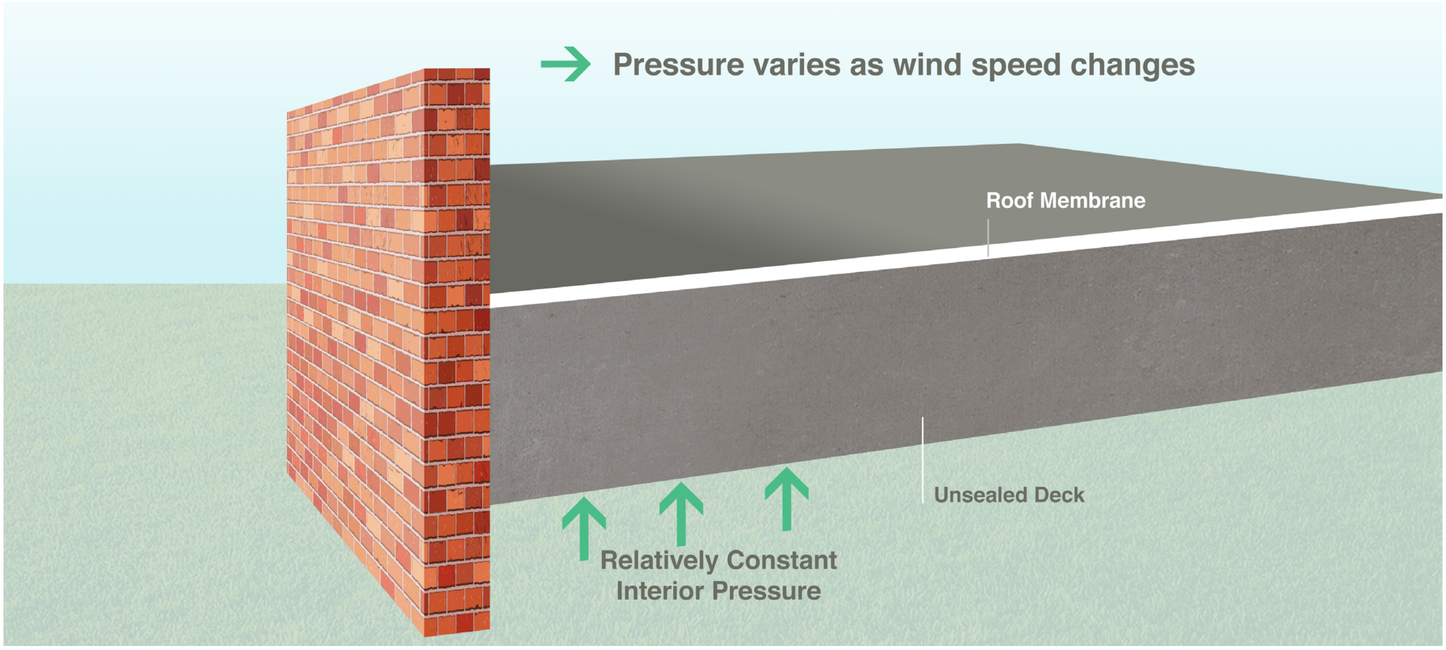
LIFT – IT'S NOT JUST FOR AIRPLANES

Normally when you hear the word "lift" used in a physics sense, it is related to the wings of aircraft. Lift is the effect that occurs when air pressure above a surface is less than air pressure below it. If you've ever held your hand out a car window and felt the way it seems to almost magically float upward – then you've already encountered lift. The same concept not only holds true for airplane wings but also to for certain kinds of roofs.

When air hits an angled roof, it passes over the surface creating a certain pounds per square inch (psi) level of force. This force is variable as the speed of the wind changes, getting progressively lighter and lighter as speeds go higher.

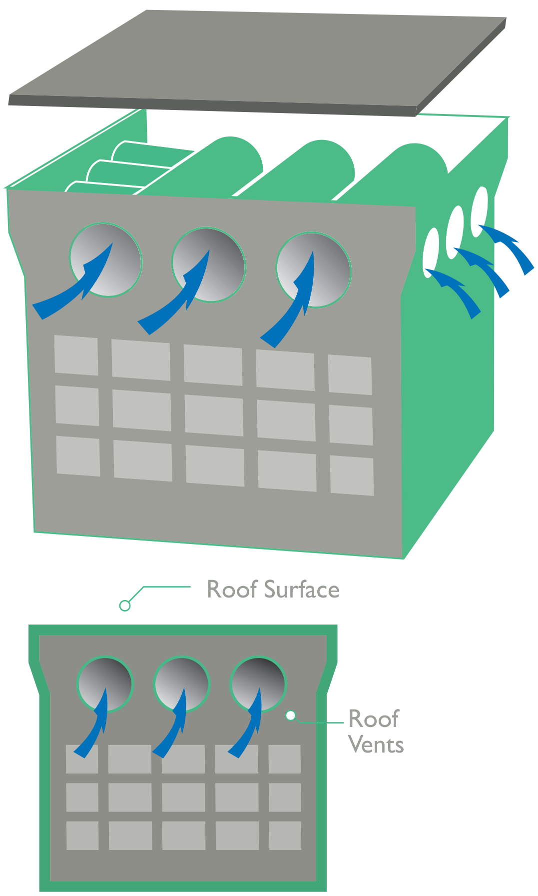


The thing to keep in mind is that as the winds and conditions outside may change, the air indoors typically does not. So quite often, a pressure differential exists, and since moving air exerts less pressure than still air, it's almost always lift that's acting to pull roofing structures and membranes up and away from buildings.



How Vents Eliminate Lift

No matter what shape they take, all vents for low-slope roofs are designed to correct the issue caused by the differential in pressure above and below the roof surface. This technology has changed over time.
For instance, in the 1930s, one popular method was the roof-under-roof approach.



It was a simple, yet effective solution. Air passed above and below the main roofing surface at close to equal speeds as there were no obstacles slowing the wind above or below enough to make a meaningful differential in pressure or lift.

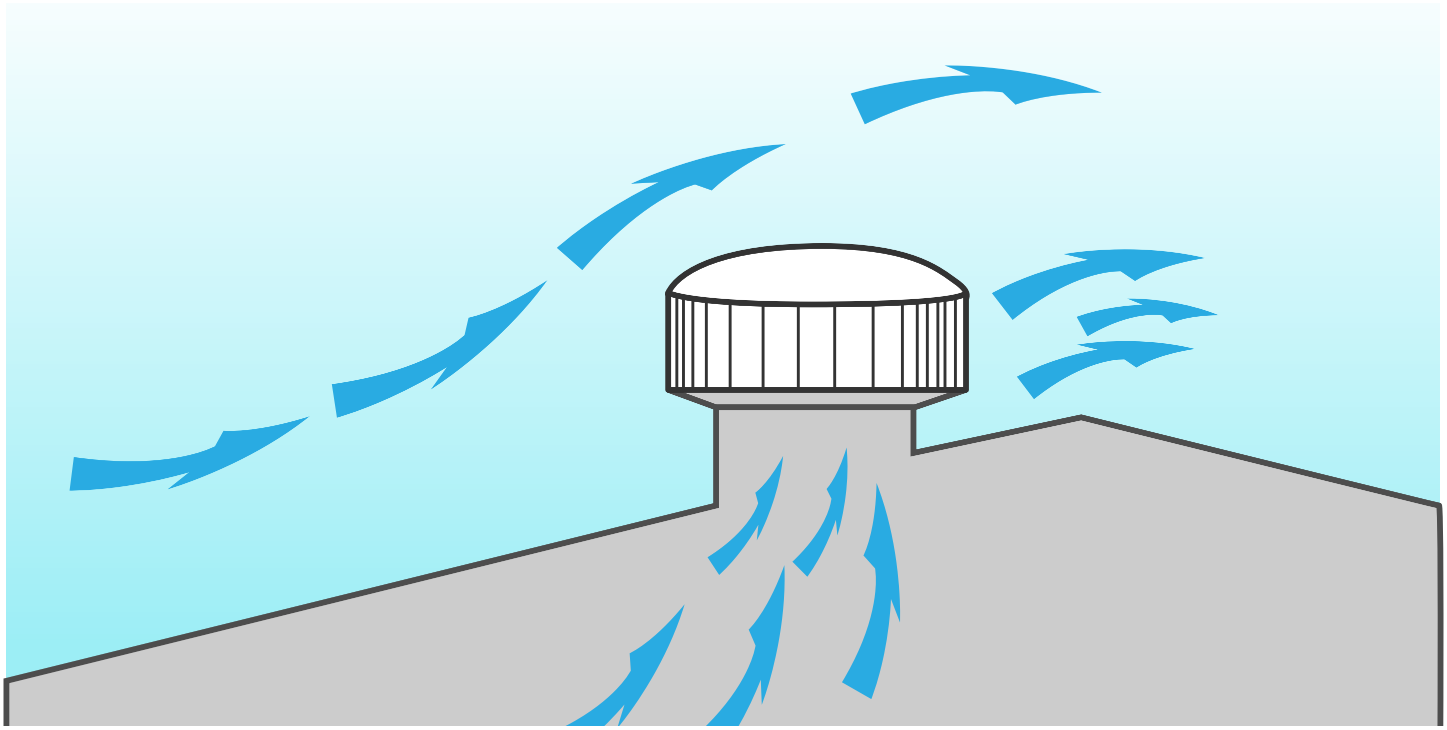
What's more, once roofing membranes (in those days built up roofs were typically tar and paper) were placed, they could be done so almost with no attachments or penetrations that could become weak points for water to infiltrate.

The problem, of course, was that moisture, debris, animals, collapsed vents, and other issues made this style of vent more problematic than the problem it solved. But time marched on…

By the 1980s, one-way roof vents and turbine vents became the new commercial standards. These both were a dramatic step forward from predecessors that did not address moisture and the very real need to waterproof and weatherproof roof materials.

Used in combination with more flexible roofing membranes, these designs allowed for vents to capitalize on naturally-occurring conditions to help secure the roof.

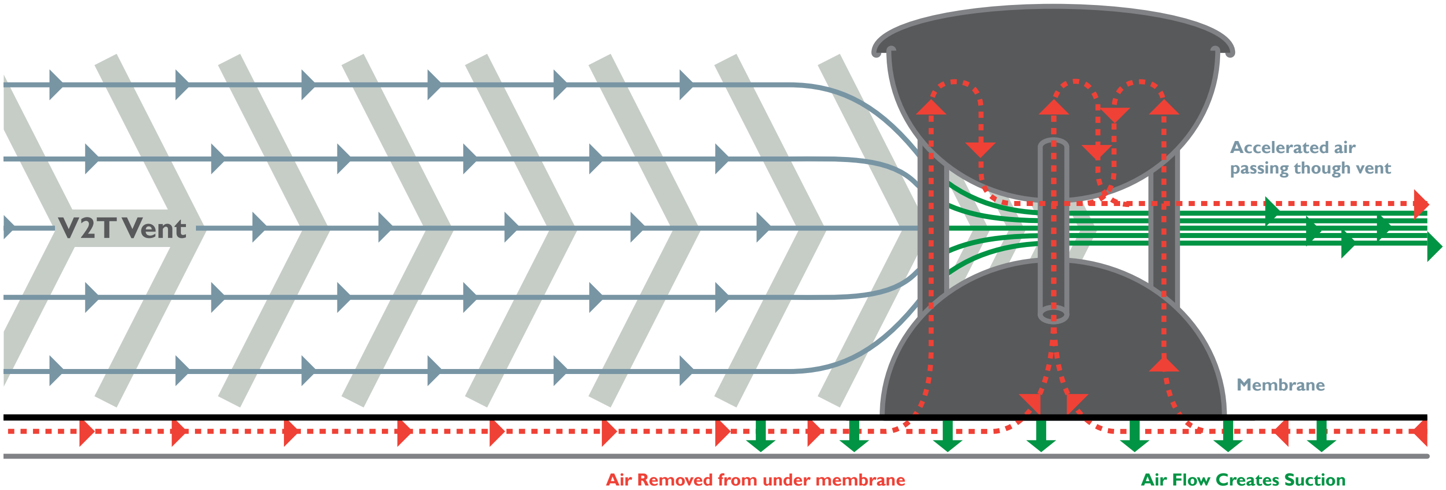
As air blew across roofs, it would naturally create a vortex that lowered the pressure above a one-way vent, allowing higher-pressure air to flow out and equalize forces on both sides of the roof. The unique one-way opening mechanism prevented in-flows of air or moisture that could damage the roof. Turbine vents, through spinning, transfer the wind into mechanical energy that physically blows the air out of the roof… much like a fan, but without the need for electronics or batteries to power it.



The unfortunate downside to these vent styles were in their complexity. One-way vents could fail through rust or debris blockage, and turbines contain axels and other moving parts that must function properly in order to perform as expected. A lodged twig in the fins, a rusted or jammed axle, or other mechanical failure is all it takes to negatively impact a turbine vent. There's also the issue that the wind must be blowing with enough force to move the vent structure – which typically isn't much for a perfectly working vent, but can become problematic when vents aren't properly maintained.

To withstand constant winds and weather, the metal constructions can be quite large and heavy. This requires multiple attachment points, and at times even guide wires to ensure the turbine doesn't fall over. Each penetration of the roof structure is a chance for moisture or air to get inside the building.

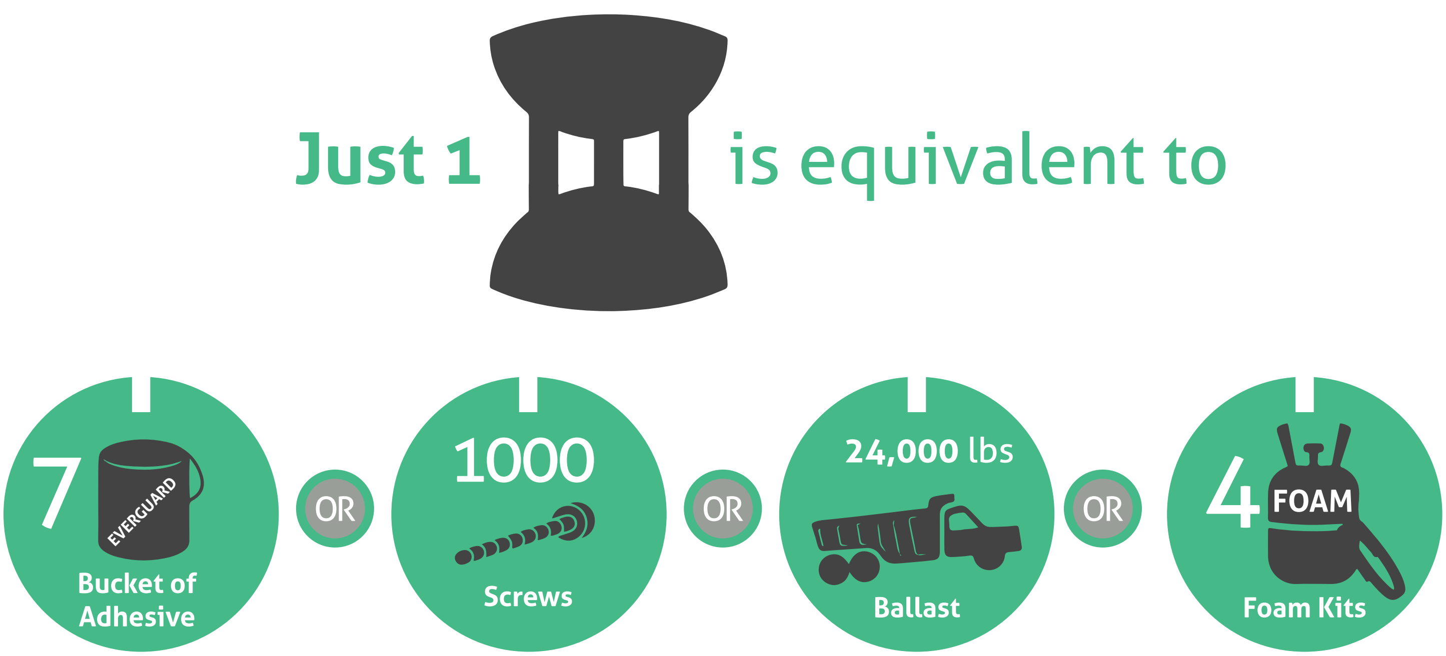
In 2005, the next revolution in roof venting came along – The V2T Vent. This design built upon the successes of previous roof vent solutions and combined them into an all-new vent style that delivered superior performance with fewer draw backs.



The turbine vents of the 1980s were on to something with the concept of moving air – but it wasn't quite hitting the mark. What if it was a low-wind day? V2T's answer was to employ the Venturi principle to create a vacuum effect.

The Venturi principle states that air forced through a smaller opening will move at a greater speed than the surrounding air as it passes through that opening. In doing so, that air moving at speed creates a vacuum effect to draw air and moisture out from the roof and lock down roofing membranes. No fans, no fins, just the wind itself working against lift.

Next came the challenge of reliable performance over time, with less need (or cost) for maintenance. Again – V2T went for simplicity. The streamlined lightweight design of V2T vents doesn't require heavy ballast or thousands of anchors and screws… just a few well-sealed V2T vents, laid out in a cooperative grid pattern that creates an anchor framework secured by the Venturi Principle.



Can It Really Be THAT Simple?

One of the most common perceptions people have when encountering the V2T Vent is that this simple vent can't possibly be that effective. Well – that's the great thing about technology – looks can be deceiving. After all – think of your mobile phone. It's definitely much more streamlined than a standard analog phone, it's got a camera, video recorder, voice recorder, and even a mini computer inside it… and we don't see that device as less effective just because it has fewer external design features. That's because science works at every level, large or small, and applying scientific principles in innovative ways is how progress is made.

All the same, V2T was rigorously tested to prove its performance even in tough wind and weather conditions. To establish performance parameters of this breakthrough technology, a prototype of the V2T Roof System was tested in the high speed wind tunnel at Virginia Tech.

Additionally, V2T was tested at a NASA facility at Langley Air Force Base, the Insurance Institute for Business & Home Safety (IBHS) and the Underwriters Laboratory (UL Certified), among others, and has been tested to withstand wind speeds of up to 150 MPH.

NASA Wind Tunnel:
The NASA Full Scale Tunnel at Langley Air Force Base where V2T was tested in a full-scale roof mock-up. These wind tests confirmed that the V2T Technology held the roof membrane in place with wind speeds approaching category 1 hurricane force winds.

Underwriters Laboratory (UL):
The V2T Roof System is UL Certified with up-lift certification at 195 psf negative pressure. V2T achieved the maximum level on UL's static chamber test equipment – 278 pounds per square foot – without failure.

FM Global:
V2T installations typically achieve a safety factor ranging from 2.5 to above 6 and can be designed for coastal regions to meet and exceed any required safety factors. This surpasses the required FM Global safety factor of 2. However, FM Approvals does not test the V2T Roof System because they only test fully adhered (mechanically attached) roofs.

Insurance Institute for Business & Home Safety (IBHS):
Testing was completed at the IBHS testing facility in South Carolina. V2T was installed and tested in their open jet wind tunnel with speeds up to 140 mph. Wind generation is produced by 105 (350 horsepower) vane axial fans independently controlled to produce real world open country flow and turbulence conditions. The results proved the power of the vent to hold the membrane in place in hurricane force winds. You can find the full IBHS report on the V2T website, **www.V2TRoofSystem.com**.

Finally — a roof that functioned well and delivered cost savings on installation and maintenance.
With V2T, flat- and low-slope roofs have stepped into the future… and so can you.

The Revolution in Low-Slope Roofing Technology Has Arrived.

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