



# Understanding Window Testing's Big Three: Air, Water, and Uniform Load



Most people simply look through a window to the view on the other side, rather than looking at the window to inspect it and consider its performance, or even how it protects a home or business from the elements.

However, as a homeowner or a business owner who pays the energy bills, a contractor that installs the windows, or a supplier that sells them, it is something you must consider. High-performance window systems provide a host of benefits from longevity to sustainability to energy efficiency.

In the window industry, there are three major tests that determine a window's performance: Air infiltration, water resistance, and uniform load performance. With different tests and a variety of standards to meet, confusion can arise about relevant standards and which window system performance tests are most important.

For easier understanding, the three core window tests can be related to different sports. And if you are playing the game, don't you want to win?



*At Deceuninck, we are dedicated to high-performance windows, which means making sure anything that goes out of our doors is tested to the highest performance standard.*

Jon Hauberg • Director of Product Research and Development



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## Testing Air Infiltration — Low Score Wins

The air infiltration test established by the Fenestration & Glazing Industry Alliance (FGIA) is best likened to a round of golf.

Just like golf, where you want to sink the ball into the hole in the least number of strokes possible, the goal is a low air infiltration test score.

The FGIA defines air infiltration as air coming into a building around windows, doors, skylights, electrical outlets, walls, floors, and the roof as a result of differences in a building's internal and external air pressure.

Typically, an air infiltration test is the first one that a window system undergoes. This is because if the system fails the air infiltration test, it doesn't possess the performance attributes necessary for a real-world installation, making additional water and structural tests irrelevant.

To pass the air infiltration test, no more than 0.3 cubic feet per minute of air may pass through a window system under standard pressure conditions – which is a 25 mph (or 1.75 psf) wind load against the window.

“Put simply, if the window's air infiltration test is under 0.3 cubic feet per minute, you're in the game to move forward with testing for water resistance and uniform load,” said Jon Hauberg, director of product research and development at Deceuninck North America. “Deceuninck has several high-performing operating window systems that test as low as 0.06 to 0.10 for air infiltration – and all of our window systems score at 0.2 or less.”



The “league average” for water resistance across the industry is 2.86 psf. Deceuninck operating window systems exceed water resistance standards for pressures ranging from 3.75 psf to 12 psf.

## Hitting A Homerun with Water Resistance Testing

Testing a window system’s water resistance is a lot like a game of baseball – the most runs wins. A “rainout” only occurs when water leaks into the interior. And like a prolonged rainstorm at the ballpark, the game is over at that point.

In this instance, runs equals pounds per square foot (psf). Like baseball, when manufacturers are testing their windows for water resistance, they want to have the most “runs” per game.

The water resistance test is similar to the air infiltration test with the addition of a spray rack that continuously applies water to a window system. The test begins at a baseline of 32 mph winds applied to the exterior side of the window system and steadily increases from there. Negative pressures are also applied to the interior in an attempt to pull water through the window.

In the water resistance test, windows are exposed to 8 inches of simulated rain per square foot per hour. This exceeds any rate of rainfall ever recorded in a

natural storm, according to the FGIA. That is, if a window is deemed compliant, it should be more than suitable for any real-world application with regard to rain and water resistance.

The “league average” for water resistance across the industry is 2.86 psf tested at 32 mph winds.

“Deceuninck operating window systems exceed water resistance standards for pressures ranging from 3.75 psf to 12 psf,” Hauberg said. “For context, 2.86 psf is equivalent to 33 mph winds, while 12 psf equals 69 mph winds – a significant difference that can lend long-term performance benefits to the structure and its owners in real-world scenarios.”

Once the water resistance test is conducted and the window system passes, it moves to the third test: Uniform load, which tests structural performance.



## High-Scoring Uniform Load Tests

Think basketball when considering uniform load testing – it is fast-paced and a high-scoring game. In this analogy, wind equals points per game, and the objective is to break the backboard with pressurized static wind dunks.

What does a high score look like?

The test starts at 94 mph because the minimum resistance requirement for windows in the United States is 22.5 psf, which is equivalent to 94 mph winds.

Uniform load tests measure the structural integrity of the window system

with static pressure that is 10 times higher than the water resistance test.

If it were a basketball game, the test would incorporate progressively bigger and stronger players to “dunk” at increments of 7.5 psf until wind speeds exceed well over 200 mph.

The uniform load test demonstrates that a window will remain intact and undamaged in the midst of significant wind loads on a structure.

## Performance Rating — Where Do You Net Out?

Once these three tests are conducted, manufacturers can determine their window system's performance rating.

"The air infiltration test – given it is under 0.3 – gets you in the game," said Hauberg. "Then the overall performance rating of your window system is the lower number from either the water resistance or uniform load tests."

It is important for manufacturers to share with customers the overall

performance ratings of their windows, including results that consider all three tests.

"A window may perform to a design pressure of 100, but if its water resistance comes in at 30, the overall performance rating is still only 30," Hauberg said. "It is important for manufacturers to provide clarity and be transparent about the overall performance rating."



### Deceuninck's Expert Testing for the Win

Building owners and homeowners need to focus on the overall window performance, not just one test.

"At Deceuninck, we are dedicated to high-performance windows, which means making sure anything that goes out of our doors is tested to the highest performance standard. That is a commitment we have made to ourselves and our customers," said Hauberg.

Deceuninck's dedicated testing lab features two, in-house test walls that a team of expert engineers deploy to understand how the company's products and innovations stack up before undergoing official industry testing.

In addition, Deceuninck's extrusion tool room allows the organization to modify the window systems on the fly to ensure optimal performance.

Educating customers is another key component.

Hauberg added: "We understand that some of our customers don't necessarily test windows every day. We feel that it is our responsibility and valuable to our customers to educate them on window testing. This allows them to truly understand the performance capabilities of the Deceuninck window system they are purchasing or installing."

## Rule of Three

All window manufacturers need to have their products tested to the latest FGIA standards and to the three most important window tests: Air resistance, water infiltration, and uniform load.

All three make a difference in determining whether a product is fit to be installed on your building. Testing to FGIA standards ensures that the consumer is getting a window system

that will perform as expected for building type and climate.

Understanding the testing standards and how to accurately report results is vital – and crucial for industry accountability. Doing so allows new buildings to have cutting-edge performance and occupant safety – a winning combination regardless of the sports analogy.

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