Ultrasonic Leak Detection
Leak Testing Windows and the Building Envelope
Ultrasonic Leak Detection Theory

Ultrasonic leak detection has been used in a variety of industries. One common use in industrial applications is the detection of leaks in a piping network. Pressurized gases escaping through small leaks produce an inaudible sound that can be detected by an instrument calibrated for ultra high frequency sounds. This sound is then amplified and translated into an audible signal.

“Basically an ultrasonic hiss is generated prior to the teapot whistling”
Water, wind and noise leaks are a substantial concern for the automotive manufacturers. Ultrasonic leak testing has been used extensively within this industry. One approach to this testing requires the placement of an ultrasonic generator inside or outside of the car to create an ultrasonic noise. Using a calibrated instrument the windows and body of the car are then tested for leaks. The ultrasonic waves create a pressure on the surface and can travel thru an opening as small as 0.01 of an inch.
In a similar way a test can be conducted on the windows and building envelope (assembly). Similar to the automotive example, an ultrasonic sound generator is placed on one side of the assembly, the sound waves create a sound pressure, and a calibrated instrument on the opposite side records leaks through the assembly.
Air Leakage Contributes To Moisture Migration

Only 1/3 quart of water vapor is transmitted through a 4- by 8-foot sheet of gypsum board during a typical heating season (left). But with a 1-square-inch open gap (right), more than 30 quarts of water vapor will be transmitted.
The ultra-sonic detector picks up any gaps, holes or deficiencies on the glazing seals of windows, the assembly of the window frame, flashing, and on the perimeter sealant. These are the areas of a window which most air and water leaks occur on the window assembly. This testing can be used without disturbing the construction activity.
**ASTM E 1105 Window Testing Involves:**

- Setting up a water spray at the exterior of the window
- Applying a pressure on the interior of the window
- Visually identifying any water leaks

**Ultrasonic Window Testing Involves:**

- Applying an ultrasonic noise generator (speaker) on the exterior or interior of the window. This generates ultrasonic sound pressure.
- Similar to the pressurized pipe application, a calibrated receiver can then audibly detect the leak location(s).
Method for the Use of Ultrasonic Leak Detection on Windows and the Building Envelope

1. An ultrasonic leak test is conducted on all windows installed.

2. Windows/Doors are marked with arrows indicating the possible areas of leakage.

3. Windows/Doors with the most amount of possible deficiencies are determined.

4. Contractor corrects deficiencies.

5. The higher deficiency marked windows/doors are then given the ASTM E1105 water infiltration test as per the AAMA testing method.
Advantages of Ultrasonic Leak Testing

**Advantages**
- More Windows/Doors can be tested on site
- Less set up required than water testing
- Less destructive than water testing
- Testing can be conducted in sequence with the installation.
- More cost efficient and time savings in correcting deficiencies.
- Suitable to cold weather testing
- Setup on multiple stories can be conducted without boom lifts
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- Over 25 years in the Construction Industry.
- Conducts quality assurance inspections and quality control testing on the building envelope.
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