VIRACON®

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TECH TALK

GLASS AND ELECTRONIC EAVESDROPPING PROTECTION

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This Tech Talk provides information to help you understand the role electromagnetic shielding plays when selecting glass for a building façade.

Introduction

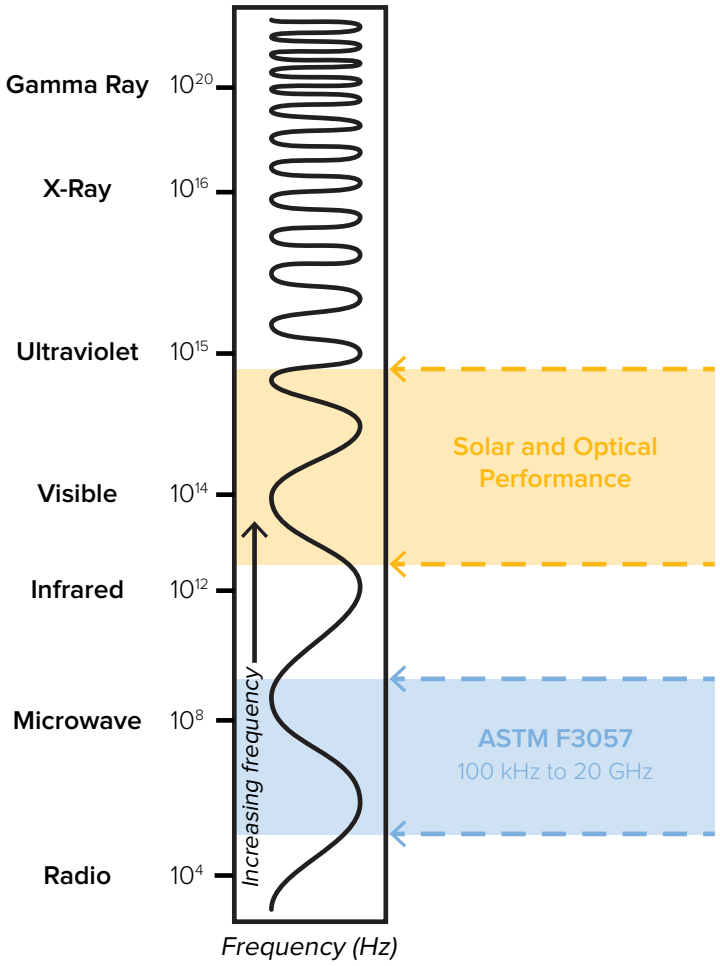
Glass is a key component in building design. The benefits are well understood, including the contribution daylight makes to healthier occupants. Advances in coating technology and other enhancements to fabricated glass have greatly improved the energy efficiency achievable with glass façades.

Utilizing glass for security is often less understood. Laminated glass can provide blast protection and hurricane resistance. Reflective coated glass can act as a one-way mirror to provide visual security. Often the least understood security consideration for glass is electronic eavesdropping protection. Specialty glass can provide protection in buildings where intercepting electronic information, such as cell phone conversations or data being transmitted through wireless networks, is a concern.

ELECTROMAGNETIC SPECTRUM

The electromagnetic spectrum includes frequencies from 3 Hz to 300 EHz and plays an important role in glass selection. The aesthetic and energy performance characteristics of glass are calculated based on performance between the infrared and ultraviolet portions of the spectrum.

When evaluating the security of wirelessly transmitted information, radio and microwaves are analyzed. This is because today's electronic devices typically operate between 100 kHz and 20 GHz. For example, cell phones transmit around 1.9 GHz and wireless networks around 2.4 GHz.



ELECTROMAGNETIC SHIELDING

Shielding effectiveness, or how much of a signal reduction occurs when passing through a medium such as glass, is referred to as attenuation. Attenuation is measured in decibels (dB) and calculated for each individual frequency. The greater the attenuation, the more the signal is weakened, meaning it is less likely for eavesdroppers to retrieve wireless data.

Due to many devices operating in the radio wave portion of the electromagnetic spectrum, the concept of utilizing building materials to block data transmittance is often referred to as Radio Frequency (RF) Shielding.

Glass Product Characteristics

CYBERSHIELD™

Pilkington DATASTOP™ is a glass substrate with a specialized coating specifically engineered to reduce the transmission of certain electromagnetic frequencies. CyberShield by Viracon combines two plies of DATASTOP in a laminated configuration with a pvb interlayer.

THE TEST

The ability of CyberShield to reduce the transmission of certain electromagnetic frequencies has been proven through testing in accordance with ASTM F3057-14 Standard Test Method for Electromagnetic Shielding Effectiveness of Glazings.

9/16” Laminated CyberShield glass was sent to an accredited independent National Security Agency (NSA) approved laboratory for testing. The 36” x 36” unit was constructed with two plies of 1/4” (6mm) DATASTOP laminated with .060” (1.52mm) clear pvb.

It was mounted in an opening between two rooms so no signal could escape except through the opening where the glass was installed. One room had a signal generator and the other had a receiver. Multiple signals were generated and received to determine the attenuation from 100 kHz to 20 GHz.

RESULTS

The ASTM Standard defines three frequency ranges within the portion of the electromagnetic spectrum tested. When selecting glass to provide electronic eavesdropping protection it is typical to review and compare results in the range from 100 MHz to 20 GHz. The average attenuation (dB) of CyberShield in this range was 37.7. The results, including attenuation from 100 kHz to 20 GHz, are available upon request.

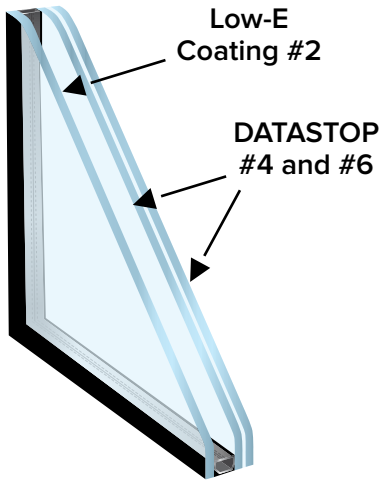
It is important to note that ASTM F3057 was released in 2014. Prior to the ASTM publication, CyberShield was tested using IEEE 299-2006 Standard Method for Measuring the Effectiveness of Electromagnetic Shielding Enclosures. The IEEE test covered a narrower frequency range (100 MHz to 18 GHz) but provided similar results. The average attenuation of CyberShield in the IEEE test was 36.7.

In comparison, an uncoated laminated glass unit tested in accordance with the IEEE standard resulted in an average attenuation of 3.2. This result validates the significant improvement in protection that can be achieved by utilizing CyberShield.

Due to its proven anti-eavesdropping characteristics, CyberShield has been identified as one of only two approved products within the Federal Bureau of Investigation’s Nationwide Program of Requirements for New Field Office Construction.

DESIGN FLEXIBILITY

CyberShield offers extraordinary design flexibility. Any typical glass color and low-e coating, selected to meet the building’s aesthetic and solar requirements, can be constructed into an insulating laminated glass unit with CyberShield situated as the interior laminate.



This 1-5/16” configuration increases attenuation, thus providing a higher level of electronic eavesdropping protection than CyberShield alone.

	Average Attenuation 100 MHz to 20 GHz
9/16” Laminated CyberShield™	37.7
1-5/16” VE1-2M Insulating Laminated CyberShield™	48.8
1-5/16” VUE1-50 Insulating Laminated CyberShield™	49.3

The interior CyberShield laminate is available in three thicknesses: 7/16", 9/16" and 13/16". With its high light transmittance of 72%, the 9/16" CyberShield laminate provides a virtually unnoticeable visual difference between an insulating laminated unit with an uncoated inboard and a unit with a CyberShield inboard.

In addition, CyberShield enhances the U-Value and Solar Heat Gain Coefficient (SHGC) for optimal solar performance. The following chart provides a couple of examples with a low-e coating on the #2 surface.

Configuration	1-5/16" Insulating Laminated			
Coating #2	VUE1-50*		VE1-2M	
Inboard Laminate	Uncoated	CyberShield	Uncoated	CyberShield
VLT	46%	40%	67%	58%
U-Value (winter)	0.29	0.23	0.29	0.23
U-Value (summer)	0.25	0.20	0.26	0.20
SHGC	0.25	0.22	0.37	0.33

**VUE1-50 also meets the <1% IR transmittance requirement needed for some projects.*

A silk-screen or DigitalDistinctions design can also be added to the #2 surface for enhanced solar performance or desired aesthetic attributes.

ADDED BENEFITS

When using laminated glass for its electromagnetic shielding properties it is important to understand the added benefits it offers. Laminated glass provides enhanced sound control, ultraviolet protection and blast resistance, all with a ten year warranty.

INSTALLATION

The DATASTOP coating utilized in CyberShield does not require edge deletion needed with low-e coatings. It extends to the edge of the glass, creating a complete barrier when installed with conductive gaskets or conductive silicone.

The proper installation of electromagnetic shielding glass is extremely important. Any gaps in the system will cause a waveguide where electronic information can escape. To ensure maximum attenuation, the entire perimeter of the coated interior glass surface must be conductively connected to the metal frame around the window. This grounds the coated glass surface to the building's exoskeleton, essentially creating a Faraday cage.

When comparing electromagnetic shielding glass, it is important to ensure the entire glass surface will be conductive. If the surface is not conductive or if the conductivity is removed through edge deletion or cutback, a waveguide will be created and the desired protection will not be achieved.

Conclusion

Building design involves reviewing and managing environmental factors such as weather, sound and light. When developing these building requirements, it is important to consider 'Is it necessary to protect information electronically stored in this building?' If the answer is yes, glass with electronic eavesdropping protection should be included in the specification.