GLASS AND ELECTRONIC EAVESDROPPING PROTECTION

VIRACON TECH TALK

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

GLASS AND ELECTRONIC EAVESDROPPING PROTECTION

INTRODUCTION

Glass is a key building design component. The benefits are well understood, including the contribution daylight makes to healthier occupants. Advances in coating technology and other fabricated glass enhancements 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 where intercepting electronic information, such as phone conversations or data transmission through wireless networks, is a concern.

Electromagnetic Spectrum

The electromagnetic spectrum includes frequencies from 3 Hz to 300 EHz. The aesthetic and energy performance characteristics of glass are calculated based on performance between the infrared and ultraviolet portions of the spectrum (Figure 1).

The security of wirelessly transmitted information is evaluated in the radio and microwave portion because today's electronic devices operate between 100 kHz and 20 GHz. For example, wireless networks typically use 2.4 GHz or 5 GHz.

Electromagnetic Shielding

Shielding effectiveness, the amount of signal reduction 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 the many devices operating in the radio wave portion of the spectrum, utilizing building materials to block data transmittance is often referred to as radio frequency (RF) shielding.

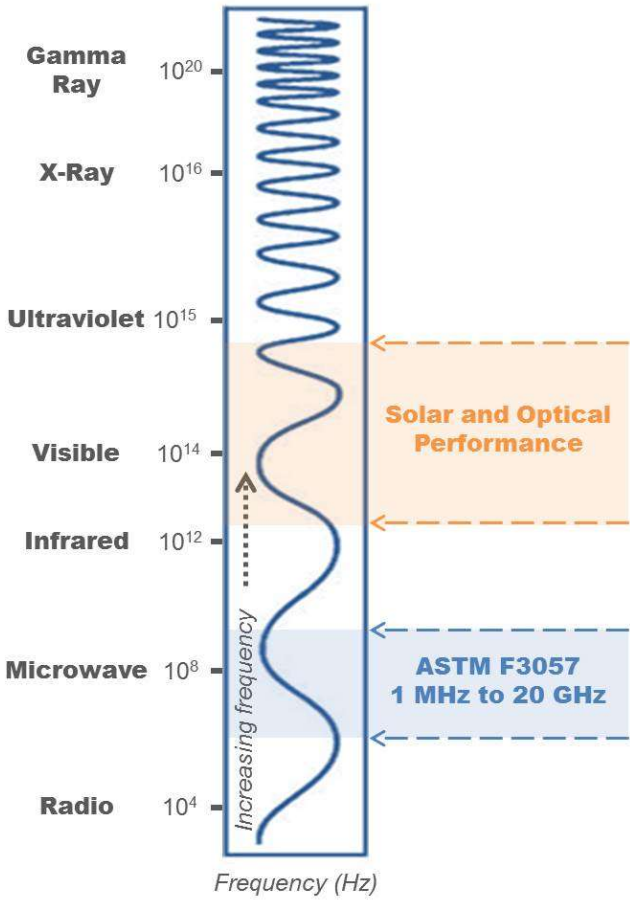

FIGURE 1: ELECTROMAGNETIC SPECTRUM

TESTING EFFECTIVENESS

CyberShield™

Pilkington DATASTOP™ is a coated glass substrate 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 ability of CyberShield to reduce the transmission of certain electromagnetic frequencies has been proven through testing in accordance with the 2014 and 2016 versions of ASTM F3057 Standard Test Method for Electromagnetic Shielding Effectiveness of Glazings.

The Test

Various glass units, all incorporating two plies of 1/4" (6mm) DATASTOP laminated with .060" (1.52mm) clear PVB, were tested by an accredited independent National Security Agency (NSA) approved laboratory. Each unit was tested independently by mounting it in an opening between two rooms. One room had a signal generator and the other had a receiver. Multiple signals were generated and received to measure the attenuation through each glass unit from 100 kHz to 20 GHz.

Results

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.

ASTM F3057 was first 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

The glass color and low-e coating selected to meet the building's aesthetic and solar requirements can be combined into an insulating laminated glass unit with CyberShield situated as the interior laminate (Figure 2).

The interior CyberShield laminate is available 7/16", 9/16" and 13/16". With 72% light transmittance, the 9/16" CyberShield laminate is virtually unnoticeable when used as the inboard of an insulating laminated unit.

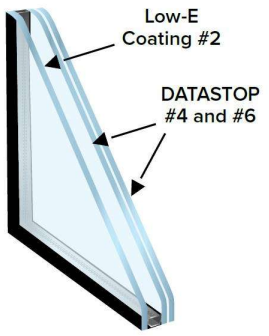

FIGURE 2: INSULATING LAMINATED CYBERSHIELD

This 1-5/16” insulating laminated configuration increases average attenuation from 100 MHz to 20 GHz, providing a higher level of electronic eavesdropping protection than 9/16” CyberShield alone (Figure 3).

In the insulating laminated configuration, CyberShield also enhances the U-Value and Solar Heat Gain Coefficient (SHGC) without significantly impacting Visible Light Transmittance (Figure 4).

FIGURE 3: ATTENUATION OF UNITS WITH CYBERSHIELD

2nd Surface Low-E Coating	Inboard Laminate	Visible Light Transmittance	Summer U-Value	SHGC
VE1-2M	Uncoated	67%	0.29	0.37
VE1-2M	CyberShield	58%	0.23	0.33
VUE1-50	Uncoated	46%	0.29	0.25
VUE1-50	CyberShield	40%	0.23	0.22

FIGURE 4: 1-5/16” INSULATING LAMINATED PERFORMANCE DATA

Laminated glass provides the added benefits of enhanced sound control, ultraviolet protection and blast resistance.

Infrared Transmittance

Some projects that require electromagnetic shielding also require low transmittance in the infrared (IR) portion of the spectrum. This is often included in architectural glass specifications as a requirement for the glass to have <1% IR transmittance. 1-5/16” VUE1-50 Insulating Laminated with a CyberShield inboard is one example of a product that can meet the IR requirement.

Additional Viracon products are currently being testing with an NSA approved laboratory for compliance with the U.S. Department of State’s Bureau of Overseas Buildings Operations specification for RF and IR shielding. Contact us for additional information.

Forced Entry / Ballistic Resistant (FE/BR)

In high-security applications, it is necessary to combine CyberShield’s electronic eavesdroppoing protection with glass that provides protection from forced entry and ballistics. Viracon’s FE/BR is a triple insulating glass-clad polycarbonate laminate that has been tested as part of a complete glazing system to U.S. Department of State Forced Entry/Ballistic Resistant Test Method SD-STD-01.01 RV.G.

INSTALLATION

The DATASTOP coating utilized in CyberShield does not require edge deletion. DATASTOP 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, consider whether it is necessary to protect information electronically stored in the building. If the answer is yes, glass with electronic eavesdropping protection should be included in the specification.

VIRACON®

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