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THE STRENGTH OF STEEL WINDOWS

by Matthew Fuller

Steel windows and doors grace innumerable schools and universities across the United States. Their strength, longevity, and versatility make these products ideal for public and high-traffic areas. As our world changes and new building codes, policies, and guidelines are established to help preserve our planet and natural resources, steel windows and doors offer sustainable solutions to create healthy indoor environments for students and educators.

Daylighting

One of the ten concepts of the WELL Building Standard®—a science-based roadmap for creating and certifying spaces that advance human health and well-being—is light. The standards promote enhanced daylight access to minimize disruption to the body's circadian rhythm which, in turn, improves energy, mood, alertness, and cognition. Integrating natural light into indoor environments also provides individuals with a connection to outdoor spaces through window views.

The biological rhythm of circadian clock genes is stimulated and regulated by the wavelengths of light received by people's eyes. Light at short wavelengths increases alertness by suppressing melatonin production. Unfortunately, most electric lighting offers much less light at this wavelength than daylight. Using the full spectrum of natural daylight to illuminate schools thus helps students' bodies regulate melatonin and reinforce circadian wellness. Numerous studies have shown that classrooms optimized with natural daylight improve students' academic performance.

Additionally, using natural interior daylight as a primary light source can significantly reduce energy consumption and help reduce global carbon emissions. Connecting building occupants with the outdoors, reinforcing circadian rhythms, and reducing the use of electric lighting by introducing daylight into interior spaces are integral components to earning credits toward LEED® certification from the U.S. Green Building Council.

Steel windows are an ideal choice for school planners looking to design lighting that supports students' alertness, mood, and cognitive function. The inherent strength of steel allows for substantially larger windows, letting more natural daylight to fill a room. Solid, hot-rolled steel also offers extremely narrow frame width to maximize glass area within the opening, as well as a much shallower frame depth, letting occupants see more when viewing at an angle.

Steel doors and windows can also be used to create common workspaces, such as computer labs and fitness rooms, that allow natural light to flow deeper into interior areas. Interior glass divisions foster a larger and more open feeling, combining the lofty ideal of the open floor plan with the functional purpose of separate and transitional spaces without blocking natural light. Glass divisions also serve to create unique



focal points and showcase collections such as art galleries and library collections.

Ventilation

According to the U.S. Environmental Protection Agency, adequate outdoor air ventilation is shown to improve students' ability to perform, raise test scores, and reduce airborne transmission of infection. EPA studies of exposure to air pollutants indicate that indoor levels of pollutants may be two to five times higher than outdoor levels. Good indoor air quality management includes the introduction and distribution of outdoor air.

For schools, major health risk factors include microbial concentrations in the air as well as dampness and mold in the building at large. Outdoor air ventilation is important for the maintenance of acceptable temperature and relative humidity. Adequate outdoor air alleviates dampness and mold conditions which can, in turn, relieve asthma symptoms and absenteeism.

The WELL Building Standard also advocates for operable windows to increase the supply of high-quality outdoor air and promote a connection to the outdoor environment by encouraging building occupants to open windows when outdoor air quality is acceptable. A significant lesson learned during the Covid-19 pandemic is that Air Changes per Hour (ACH)

are extremely important to the health and wellbeing of building occupants. In a 30x30-foot classroom occupied by twenty-five students, the air should be replaced at least every fifteen minutes, which equals an ACH of four. Simply opening windows is an easy way to improve ventilation. Researchers at Harvard University have found that opening the windows in a room just six inches can result in an ACH of five or more with clean, outdoor air.

The versatility of steel offers a variety of window operating types such as casement, sliding, and awning windows, as well as human safety features well-suited to classroom applications. Despite the stiff ruggedness often associated with steel, steel windows offer a surprisingly easy interaction with smooth, graceful movement at the touch of a finger. Moreover, steel windows and doors will not rack or distort with age and hardware will not loosen over time.

Energy Efficiency

Steel has better natural insulating capability compared to other metals, conducting heat and cold at one-fifth the rate of aluminum. Aluminum products require a thermal break just to match the natural thermal performance of steel. The minimal frame dimensions of steel windows and doors further lesson thermal transfer by reducing surface exposure.

Architects may still specify a thermal break despite the natural thermal properties of steel. It is important to understand that adding a typical thermal break into any metal frame results in dramatically weakening the material because a traditional thermal break splits the frame into interior and exterior pieces, reconnecting them with a weaker insulating material. An advanced alternative solution called Thermal Evolution™ technology is available from Hope's Windows, Inc.; this product ensures that the solid steel profiles remain solid for the full depth of the frame, thus maintaining the structural integrity of the steel.

These properties and features, together with modern advancements in glazing, result in exceptional thermal performance and condensation resistance for steel windows and doors.

Environmental Responsibility and Green Construction

Steel sets the standard for performance excellence. Steel windows and doors offer sustainable

solutions to create healthy indoor educational environments while preserving our planet and natural resources. Steel windows and doors are energy efficient and impervious to air and water infiltration, crafted from recycled steel, and finished with environmentally-friendly coatings. These strong and extremely durable windows and doors achieve unparalleled life cycle value and assist building owners and architects seeking LEED® certification from the U.S. Green Building Council.

Steel is the most recycled material in the United States. Each year, the steel industry saves enough energy through recycling to power eighteen million homes—one-fifth of the nation's households. Campus designers should choose high-quality steel windows and doors that are made with hot-rolled frame profiles made of 100% recycled steel. The strength and durability of solid, hot-rolled steel windows and doors consistently outperform wood, aluminum and vinyl products. With their proven ability to last for a century or longer, steel windows and

doors provide an unparalleled life cycle value.

The most advanced pretreatment and finishing processes available for steel are lead-free, contain zero hazardous air pollutants (HAPs), and have ultra-low volatile organic compounds (VOC), resulting in an earth-friendly product with unlimited color options and long-term protection against corrosion and abrasion. Steel finishing processes exceed the most rigorous testing standards and are carefully scrutinized to ensure that products will perform, both aesthetically and functionally, for decades to come and with extremely low maintenance requirements.



ABOUT THE AUTHOR: Matthew

Fuller is the National Sales Manager and LEED Green Associate at Hope's Windows, Inc., the largest domestic manufacturer of luxury steel and bronze windows and doors. Matt has worked in the custom steel window and door industry for 15 years.

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