

THE LOOK OF NOISE POLLUTION...



THE LOOK OF SILENCE™



Graham Acoustical Window Systems

Windows of Substance for the eyes and ears of America.

Graham has always built windows to please the eyes of America. Now we also build windows to protect America's ears. We build acoustical windows that look smart and weather better for buildings of significance built near railways, airports, and highways. The windows are engineered to reduce environmental noise that threatens the inhabitants of buildings and homes.

Whether they're used in classic renovation, new construction, or next to a major airport, Graham intends to make one kind of window: the best for your needs.

The primary source of environmental noise intrusion in both homes and



buildings – is through the windows. Graham Architectural Products is a leader in the battle against noise pollution penetration.

Using the right acoustical windows in educational facilities can mean the difference between disruptive noise and performance-enhancing quiet. Responsible window designs with the knowledge of acoustic principles are known to improve learning and test scores of students. Potential long-term health problems are the other negative effects of elevated noise.

In hotels and condominiums, Graham sound control windows can make the difference between a noisy nightmare and a good night's sleep. Capital outlay for installing acoustical fenestration products has been proven to be cost-effective where hotels are located in noisy areas, thus preventing lost revenues.

Graham's acoustically-rated fenestration products are available in structural aluminum and PVC, in a full spectrum of window styles, STC/OITC ratings, and operating systems.

Graham provides sound solutions for commercial, institutional, and residential noisy environments.

One out of eight Americans suffers some degree of hearing impairment.

We know that continued exposure to noise damages human hearing. The louder the noise, the less time it takes to cause hearing loss.

Noise-induced hearing loss is permanent and incurable – but preventable. Stress is a by-product of living in a noisy environment. A barking dog or the sound of a jet taking off can trigger enough stress in humans to elevate blood pressure and cause muscles to contract. Sustained stress can lead to high blood pressure, ulcers, indigestion, and insomnia.

Noise Pollution: A Decibel Comparison

Normal levels of noise in a home do not cause hearing impairment. Repeated exposure to noise exceeding 85 decibels can cause hearing loss.

Noise Source	Decibels Experienced
A quiet home	20
Normal talking	40
Old urban neighborhood	60
A ringing phone	60
Urban housing (major avenue)	70
An air conditioner	75
Diesel train at 600 ft.	60
Downtown construction noise	80
Street noise	90
Lawn mower	90
Apartment near freeway	90
3/4 mile from major airport	90
Loud music	100
Car horn	110
Subway train	120
Jack hammers	120
Ambulance siren	120
Jet taking off	140



In Chicago: A building encircled by train noise.

Graham Architectural Products has a long history of manufacturing custom acoustical windows for commercial buildings located in major metropolitan areas.

Chicago's Loop is an oval of elevated train tracks, encircling on its South end, the city's busy financial district. The 22 story 175 West Jackson Street Building, across from the Chicago Board of Trade, is right up against the elevated tracks where constant train noise creates a special, screeching challenge for office workers on the lower floors.

Graham installed 4,228 Series 1450 fixed custom aluminum windows in the elegant building, designed in the early 1920's by famous Chicago architect, Daniel Burnham. All windows in the first seven floors are dual glazed acoustical windows with 1-1/2" glazing (38 STC rating) that greatly reduce the penetration of street noise from both surface and elevated rail traffic. The large spacing between the dual sash results in superior noise reduction.



East Boston High School overlooks Logan International Airport.

Graham replaced 362 aluminum double-hung windows and transoms in this 1924 landmark high school facing

constant, penetrating aircraft noise pollution.

The school, located high on a hill overlooking Boston's bustling Logan International Airport, was fitted with Series 2400 double-hung acoustical windows. The special dual sash windows feature 1/4" clear annealed and 1/4" laminated glass. The dual sash construction assures superior sound protection (45 STC) over single-sash windows.

Authentic true-divided-lite glazing and trim are true to the school's original red brick and limestone structure. Sideload sash can be easily removed for cleaning from the inside of the building.

Graham also furnished classic archtop acoustical windows for the school's recent 18,000-sq. ft. gymnasium addition.



Noise protection for homes above San Diego's airport.

The San Diego International Airport Quieter Home Program is a multi-phase residential sound insulation program, involving some 7,000 homes on the hills overlooking the airport, just behind a busy expressway. Many are directly in the flight path for takeoff and landing. Graham Architectural Products has supplied a combination of aluminum and vinyl acoustical windows in over 220 homes to date, achieving STC-40 sound insulation rating (vs. STC-30 for typical IG windows).

While a majority of the acoustical windows are vinyl, Graham also is supplying Series 0980 aluminum sliding doors for airport area homes.

In addition to San Diego, Graham is involved in other FAA/AIP and PFC funded residential noise abatement programs in Chicago, Dallas, and other cities. Graham acoustical windows are also employed in public and private schools, located near airports, in such cities as Boston and Cleveland.



Street noise ended with installation of acoustical windows in luxury downtown co-op.

William Penn House in Philadelphia, PA, a 30-story brick luxury cooperative apartment building, experienced environmental problems including annoying street noise, unwanted solar heat gain, and ultraviolet sun fading the furnishings. In 2002, 1,609 sliding windows and 228 sliding glass doors were replaced with Graham Series 0275 commercial windows and Series 0900 sliding glass doors. The HC-50 rated windows featured a 1-inch insulating glass (IG) unit consisting of a 1/4" low-e coated outboard lite and a 1/4" inboard laminate. Graham Series 0900 doors feature a 1-inch IG unit consisting of a 1/4" tempered low-e outboard lite and a 3/8" inboard laminate. (STC: 39.) Tenants reported an end to street noise and sun-fading problems, better year-round comfort, and lower heating costs.



School meets stringent California requirements.

Mingay Adult School is in the 65

decibel Community Noise Exposure Level (CNEL) surrounding the Burbank-Glendale-Pasadena Airport in California. The school was awarded several grants, including a \$3 million award, part of which was used to insulate the school. Such CNEL contours are used primarily in California, while other parts of the country utilize a Day Night Level (DNL). Both measurement levels assess a 10-decibel penalty for nighttime noise between 10 p.m. and 7 a.m.

The renovated school openings featured a split sash, used to incorporate a 1-inch mini blind between the glass requirement while meeting a mid-40s STC specified requirement. Both internal and applied muntins were utilized for aesthetic enhancement. When installation was completed, field testing per ASTM E99 procedure revealed a 46 STC reading that, when combined with other construction trade specs, assured the 5 decibel reduction, as set forth by the Federal Aviation Administration guidelines.



Kahala Nui senior living facility protected from street noise.

Honolulu, Hawaii, in many ways, evokes visions of paradise. Today even Hawaiian citizens are subjected to environmental noise pollution. That's why Architects Hawaii, Ltd. chose Graham acoustical aluminum windows for its new-construction apartments for seniors. Windows included Graham 0300 Series horizontal sliders, 1200 and 1400 Series fixed lite windows. Graham also provided 0910 Series acoustical sliding doors for the complex.

Choose acoustically rated products.

Sound Control Windows are tested for sound transmission loss and designated a Sound Transmission Class (STC) and an Outdoor-Indoor Transmission Class (OITC).

Typical double hung window configurations with approximate sound ratings:

	STC	OITC
1/8" single glass	24-26	16-20
1/8" X 1/8" IG	31	21-26
1/4" X 1/4" IG	33	23-27
1/4" Lami X 1/4" Lami IG	35-38	25-30
Dual Window	39-50	26-40

Acoustic windows and glazed doors meet Sound Transmission Class and Outdoor-Indoor Transmission Class design requirements based upon noise-generated sources. In addition, lower frequency, longer wave length noises are often factored into the design of acoustical windows.

STC RATINGS

Sound Transmission Class is a single number, representing an acoustically rated window's sound attenuating ability. The higher the number, the more sound

filtered. The rating assesses airborne transmission performance between frequencies on the low end of 125 hertz to 4,000 hertz; on the high end, per ASTM International standards, ASTM E 413. These STC ratings do not address low-frequency sound transfer. Separate consideration must be given to low frequency generated noise sources.

OITC RATINGS

Outdoor-Indoor Transmission Class provides a single-number rating that can be used for comparing the sound isolation performance of building façade elements. The rating has been devised to calculate the ability to reduce the perceived loudness of ground and air transportation noise transmitted into buildings. The ASTM E 1332-90 standard establishes a single-number rating by defining the spectrum of ground and air transportation noise. This spectrum is used with sound transmission-loss data, measured in a laboratory, using the ASTM E 90 method; and a mathematical relationship, given in the standard, to calculate the OITC rating. The OITC ratings are usually 5 to 10 decibels lower than STC ratings due

to calculation differences between ASTM methods E 1332 and E 413.

Both STC and OITC ratings are product-specific. Using either of the above standards, only fenestration products with laboratory certified reports should be specified and used, due to variable specific product considerations such as air infiltration, framing material, weather-stripping, glass, assembly, and hardware.

Acoustically-rated products include double- and single-hung, sliding, fixed, awning, hopper, and casement windows; and sliding and terrace swing doors. Standard products generally have single or insulating glass sashes. STC ranges from high 20s to 40, depending on the window configuration. Split or dual window products generally have ratings from high 30s to 50-plus. STC ratings are still the industry benchmark. Since STC rating requirements are found in more than 80 percent of all specifications, it remains the industry benchmark.

AAMA 1801-97

Measures the sound transmission loss of a window, door, or glazed product. The Sound Transmission Class (STC) and Outdoor-Indoor Transmission Class (OITC) are generated from the tested product. Air infiltration (ASTM E 283) and operating force (ASTM E 1017) are an integral part of the test results and are tested when the acoustic test is performed.

Graham Acoustical Windows

Aluminum	Frame Depth	AAMA Rating	STC*
2400 Double Hung			
2422B	4-1/2"	H-DW-C55/HC55	37-45
S2422B	5" - 6"	H-DW-C55/HC55	39-46
2500/2575 Double Hung Side Load			
2500/2575	4-1/2"	H-AW50	32-37
2275/2075 Single Hung Side Load			
2275	4"	H-AW45	31-36
2075	3-1/4"	H-AW45/70	32-37
3475 DH/SH Tilt			
	4"	H-AW50	30-35
0300/0375 Horizontal Single Slide			
	3-1/4"	HS-AW40	33-38
0200/0275 Single Hung Slide Load			
	4"	HS-HC50	29-36
1250 Fixed Simulated DH			
	4"	F-AW110	36
1100 Fixed			
1101V	4-1/2"	F-DW-C65/HC40	38-45
S110V	5" - 6"	F-DW-C65/HC40	38-48
0400 Slider			
0432B	4-1/2"	HS-DW-C45/HC40	38-48
S0432B	5" - 6"	HS-DW-C45/HC40	38-45

Aluminum	Frame Depth	AAMA Rating	STC*
6500 Casement/Projected/Fixed			
6500GL	2-1/4"	C/AP/F-HC110	38-43
6800 Casement/Projected/Fixed			
6858H	3-1/2"	C/AP/F-AW70	29-47
2500 Double Hung			
25N22B	9"	H-DW-HC45**	47
2200 Double Hung			
2255B	8-1/2"	H-DW-HC50	31-47
0800 Sliding Glass Door			
0811C	4"	SGD-C35	33-38
Vinyl	Frame Depth	AAMA Rating	STC*
V-3900 Double Hung	4-1/2"	H-DW-LC50	41-44
V-1100 Fixed	4-1/2"	F-DW-C105	42-44
V-0400 Slider	4-1/2"	HS-DW-LC40	41-44
V-6900 Casement/Projected	4-1/2"	C-AW75	38-45
V-0800 SGD	6"	SGD-HC50	35-38

*STC range due to varying glazing options **Estimated



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