Acoustic Performance

From LEED:

BD& C for Schools IEQ P3

Requirements:

Design classrooms and other core learning spaces to include sufficient sound-absorptive finishes for compliance with the reverberation time requirements as specified in ANSI Standard S12.60-2002, Acoustical Performance Criteria, Design Requirements and Guidelines for Schools. AND

CASE 1 – Classrooms and Core Learning spaces < 20,000 Cubic Feet

Option 1:

Confirm that 100% of all ceiling areas (excluding lights, diffusers and grilles) in all classrooms and core learning spaces are finished with a material that has a Noise Reduction Coefficient (NRC) of .70 or higher.

Option 2:

Confirm that the total area of acoustical wall panels, ceiling finishes and other sound-absorbent finishes equals or exceeds the total ceiling area of the room (excluding lights, diffusers, and grilles). Materials must have an NRC of .70 or higher to be included in the calculation.

Case 2 – Classrooms and Core Learning spaces > 20,000 Cubic Feet

Confirm that through calculations described in ANSI Standard S12.60-2002 that all classrooms and core learning spaces greater than or equal to 20,000 Cubic Feet are designed to have a reverberation time of 1.5 seconds or less.

4. Implementation:

Reverberation
An appropriate reverberation time can be confirmed in the design phase through calculation, or it can be achieved prescriptively by using sufficient quantities of materials with a specified noise reduction coefficient (NRC).

Sound Transmission
Specific sound transmission performance is not required for compliance with this prerequisite. For information on sound transmission, see IEQ Credit 9, Enhanced Acoustical Performance.

Avanti Products Contribution:

Avanti, in their supplied acoustic chart, lists their product's Rw numbers which measure sound transmission reduction. Rw is roughly a measurement of how much sound, in decibels, is restricted from passing through a surface. This prerequisite is looking for sound absorption information not sound transmission reduction ratings. For both reverberation time measurements and minimum Noise Reduction Coefficient ratings for sound-absorbent finishes, LEED requires (NRC) statistics. NRC is a type of sound absorption measurement, averaged over specific frequencies. Sound absorption measurements describe the percentage of incident sound that reflects back into a room (e.g. a surface with a NRC of .5 will at an average frequency reflect back half of the sound incident upon it). Unfortunately, Rw and NRC statistics can be a bit counteractive, as one is focused on keeping sound in, Rw, while the other is concerned with making sure it doesn't stay in, NRC. Though a high Rw value means a high level of sound absorption and not just reflection back into the room, Avanti's partition would have to be tested to determine exact absorptive properties like NRC. An RT60 Test is necessary to calculate reverberation time and an NRC test is necessary to measure NRC ratings. As it seems unlikely that Avanti's products will contribute very much to this prerequisite, these tests are an unnecessary expense and should not be undertaken.

From LEED:

IEQ Credit 9 for New Construction Schools: Enhanced Acoustical Performance

Requirements:

Sound Transmission

Design the building shell, classroom partitions and other core learning space partitions to meet the Sound Transmission Class (STC) requirements of ANSI Standard S12.60-2002, Acoustical Performance Criteria, Design Requirements and Guidelines for Schools, except windows, which must meet an STC rating of at least 35.

AND

Background Noise

Reduce background noise level to 40dBA or less from heating, ventilating, and air conditioning (HVAC) systems in classrooms and other core learning spaces.

Below are two tables form ANSI Standard S12.60-2002 which describe the minimum STC measurements required for this credit.

Adjacent Space Type	Minimum STC Rating
Other Classrooms	50
Outdoors	50
Bathrooms	53
Corridor	45
Offices, Conference Rooms	45
Music Rooms	60
Mechanical Equipment Room	60
Cafeteria, Gym, Natatorium	60

Table 1. STC Requirements for Core Class Room Assemblies from ANSI Standard S12.60-2002

Receiving ancillary Learning space	Corridor, staircase, common use and public use toilet and bathing room	Music room	Office or conference room	Outdoors	Mechanical equipment room, cafeteria, gymnasium or indoor swimming pool
Corridor	45	60	45	45	55
Music Room	60	60	60	45	60
Office or Conference Room	45	60	45	45	60

Table 2. Minimum STC ratings recommended for single or composite wall, floor-ceiling and roof-ceiling assemblies separating an ancillary space from an adjacent space from ANSI Standard S12.60-2002

Other requirements:

1. Entry doors into classrooms and other core learning spaces: STC 30

Definitions:

Sound Transmission Class (STC): is a single number rating for the acoustic attenuation (reduction) of airborne sound passing through a partition or any other building element such as a wall, roof or door as measured in an acoustical testing laboratory following accepted industry practice. A higher STC rating provides more sound attenuation through a partition.

Rw values: Rw describes the airborne sound insulating power of a building element. It is a laboratory measured value. It can apply to walls, ceiling/floors, ceiling/roofs, doors, or windows. The higher the number, the greater the sound insulating power of the building element. For example, an increase in the Rw of a wall by 10 points will reduce the perceived loudness of sound passing through the wall by about half. It generally varies from STC values by less to 1% due a different frequency range that is used during testing.

Avanti Products Contribution:

Type of Glazing	Rw (db) Values
Single glazed 10mm(3/8″) CTF	35
Single glazed 12mm(1/2″) CTF	35
Double Glazed 10mm(3/8″) CTF	42
Double Glazed 10mm(3/8″) CTF/ 10.8mm(3/8″) Laminated	45
Double Glazed 12mm(1/2″) CTF/ 10.8mm(3/8″) Laminated	47
Twin Glazed 10mm(3/8″) CTF/ 10mm(3/8″) CTF with 112mm(5″) Air Cap	49
Twin Glazed 12mm(1/2″) CTF/ 10mm(1/2″) CTF with 112mm(5″) Air Cap	49

Table 3. Rw values for Avanti products

We consulted with an outside acoustical authority on the compatibility of Rw and STC values to confirm that they are very similar.

Qualifying Glazing for spaces

The yellow highlighted glazings in Table 3 meet the yellow highlighted space types in Table 1 and 2. The glazings include:

- Double Glazed Laminated finishes
- Twin Glazed finishes.

The space types include:

- For spaces adjacent to classrooms (Table 1)
  - Corridors
  - Offices
  - Conference rooms.
- For ancillary classrooms which have adjacent spaces (Table 2)
  - Corridors adjacent to (corridors, conference rooms, outdoors)
  - Music Rooms adjacent to (outdoors)
  - Office or Conference Room adjacent to (corridor, office, or outdoors)

All finishes qualify for entry doors into classrooms. This applies to Avanti's glass pivot doors and the glass sliding doors.

Conclusion:

For the sound transmission segment of IEQ c9, in some applications, Avanti products will help a project qualify for this LEED credit. Highlighted in Table 1 and 2 are all the space descriptions that some of Avanti's glazings qualify for (highlighted in Table 3). Avanti's products will help reduce HVAC noise in learning spaces, helping projects qualify for the background noise segment of IEQ c9. Any HVAC noise located outside a classroom utilizing Avanti double or twin glazed products will be reduced to below the 40dBa requirement. Beyond LEED, Avanti products focus on reducing sound transmission and not sound absorption and thus marketing should be geared towards this aspect. Sound absorption will be difficult for any glass product as it will tend to be a much better reflector than absorber (part of glass properties).