Pilot Credit 24: Acoustics

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Applicable Rating Systems

This credit is available for pilot testing by the following LEED project types:

- New Construction
- Commercial Interiors

Intent

To provide workspaces and classrooms that promote occupants' well-being, productivity, and communications through effective acoustic design.

Requirements

For all occupied spaces, meet the following requirements as applicable to the space:

- room noise levels
- sound isolation performance of constructions,
- limiting reverberation time and reverberant noise buildup
- paging, masking and sound reinforcement systems

Projects that cannot meet sections of the requirements due to limited scope of work or historic preservation requirements must meet at least 3 of the above sections and submit a detailed description justifying design decisions.

Room Noise Levels

Room noise levels from building mechanical systems shall fall within the sound level ranges shown in either the 2011 ASHRAE Handbook, HVAC Applications, Chapter 48, Table 1, or the AHRI Standard 885-2008, Table 15, or local equivalent.

Measurements for room sound levels shall be measured using a sound level meter that conforms to ANSI S1.4 for type 1 (precision) or type 2 (general purpose) sound measurement instrumentation, or local equivalent.

Comply with design criteria for HVAC noise levels in regularly occupied spaces resulting from the sound transmission paths listed in Table 6 in the ASHRAE 2011 Applications Handbook or AHRI Standard 885-2008, or local equivalent.

Sound Isolation

In lieu of a building code, meet the following composite Sound Transmission Class (STC_C)ratings:

Adjacency Combinations[1]		**STC_C**
Residence (within a multi-family residence) or Hotel/Motel Room	Residence or Hotel/Motel Room	55
Residence or Hotel/Motel Room	Common Hallway/Stairway	50
Residence or Hotel/Motel Room	Retail	60
Retail	Retail	50
Standard Office	Standard Office	45
Executive Office	Executive Office	50
Conference Room	Conference Room	50
Office/Conference Room	Hallway/Stairway	50
Mechanical Equipment Room	Occupied Area	60

As applicable, use the following table to estimate the composite STC rating (STC_C) of interior partitions.

Weaker element (% wall area)	**STC of door or window**	**Interior Partition**		
		(1) layer 5/8" (16 mm) GWB each side, metal stud (STC 40)	(1) layer 5/8" (16 mm) GWB each side, metal stud with insulation (STC 45)	(2) layers 5/8" (16 mm) GWB each side, metal stud with insulation (STC 50)
Open door (10%)	0	10	10	10
Open door (20%)	0	7	7	7
Un-gasketed door (10%)	20	30	30	30
Un-gasketed door (20%)	20	27	27	27
1/8" (3 mm) glazing	26	35	36	36

[1] The sound isolation ratings are considered the composite sound isolation performance values associated with the demising constructions, whether they are the floor/ceiling or wall partitions. Details such as the ceiling plenum conditions, windows, doors, penetrations through the constructions, etc. shall be addressed to provide this composite sound isolation rating. The values will provide Normal speech privacy (except at corridor walls with doors), assuming a background sound level of at least 30 dBA in the receiving room and "conversational" voice level of 60 dBA at three feet. The values will provide confidential speech privacy if the sum of the composite STC and A-weighted background noise level total is at least 75. For "raised" and "loud" voice levels, add 5 to 10 dBA to the total, respectively.
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(10%)				
1/8" (3 mm) glazing (20%)	26	33	33	33
Gasketed door or ¼" (6mm) glazing (20%)	30	37	39	40
Gasketed door or ¼" (6 mm) glazing (10%)	30	35	36	37
¼" (6 mm) laminated glazing (10%)	35	39	42	44
¼" (6 mm) laminated glazing (20%)	35	39	40	41
Acoustically rated STC-45 door or insulating glazing with 4" (100 mm) airspace (10%)	45	40	45	50
Acoustically rated STC-45 door or insulating glazing with 4" (100 mm) airspace (20%)	45	40	45	49

Limiting Reverberation Time and Reverberant Noise Buildup

Meet the reverberation time requirements in the following table, adapted from Table 9.1 in the Performance Measurement Protocols for Commercial Buildings[2]:

Room Types	Applications	T60 (sec)
Apartments and condominiums		< 0.6
Hotels/Motels	Individual rooms or suites	< 0.6
	Meeting/banquets rooms	< 0.8
Office Buildings	Executive and private offices	< 0.6
	Conference rooms	< 0.6
	Teleconference rooms	<0.6
	Open-plan offices without sound masking	< 0.8
	Open-plan offices with sound	0.8

[2] Adapted from ASHRAE (2007d), ASA (2008), ANSI (2002), and CEN (2007)

	masking	
Courtrooms	Unamplified speech	< 0.7
	Amplified speech	< 1.0
Performing Arts Spaces	Drama theaters, concert and recital halls	varies by application
Laboratories	Testing/research with minimal speech communication	< 1.0
	Extensive phone use and speech communication	< 0.6
Churches, Mosque, Synagogue	General assembly with critical music programs	varies by application
Libraries		< 1.0
Indoor Stadiums, Gymnasiums	Gymnasiums and natatoriums	< 2.0
	Large seating-capacity spaces with speech amplification	< 1.5
Classrooms		<0.6

Paging, Masking and Sound Reinforcement Systems

Sound Reinforcement

1. All large conference rooms and auditoria seating more than 50 persons shall consider sound reinforcement and AV playback capabilities, depending on their use. If it is determined that these systems are not required, the design team must submit a detailed description justifying their design decisions.
2. Sound reinforcement system shall achieve a minimum Speech Transmission Index (STI) of 0.60 or a Common Intelligibility Scale (CIS) rating 0.77 at representative points within the area of coverage to provide acceptable intelligibility from the system.
3. Performance of the system shall achieve:

- 70 dBA minimum sound level
- Maintain sound level coverage within +/- 3 dB at the 2000 Hz octave band throughout the space.

4. Upgraded sound isolation shall be considered for acoustically-sensitive spaces that are adjacent to spaces with sound reinforcement systems.

Masking Systems

For projects that use masking systems, meet the following:

1. Systems shall be designed for levels that do not exceed 48 dBA.
2. Loudspeaker coverage shall provide uniformity of +/- 2 dBA
3. Suitable spectra shall be designed to effectively mask speech spectra[3].

[3] "Masking speech in open-plan offices with simulated ventilation Noise: Noise level and spectral composition Effects on Acoustical Satisfaction", Veitch, J.A. Bradley, J.S.; Legault, L.M. Norcross, S., and Svec, J.M. IRC – IR – 846, National Resource Council Canada, April 2002.

Credit Submittals
General:

1. Register for Pilot Credit(s) here.
2. Register a username at LEEDuser.com, and participate in online forum
3. Submit feedback survey; supply PDF of your survey/confirmation of completion with credit documentation

Credit Specific:

Room noise level calculations (NC, RC(N) or dBA).
Sound isolation assessment (STC_C).
Speech privacy analysis.
RT calculations, and Discussion of sound absorbing materials used in the project.
Sound reinforcement or masking system description

Additional Questions

1. The goal of this credit is to provide the optimal acoustical environment for occupants in a space; how did the sound isolation needs analysis change the design of your space?

2. Are there parts of the analysis that you opted not to address? If so, why?

Background Information

This pilot credit is based upon the LEED for Schools Enhanced Acoustical Design credit, and has been developed in order to meet the market need for guidance around acoustical design in the office and new construction setting.

Changes

Changes made 2/18/2011:

- Added word to requirements to correct typo: *"**Describe** efforts to limit reverberation time by considering"*

Changes made for 2nd Public Comment (08/01/2011):

- Expanded criteria for each section
- New referenced standards

Changes made for 3rd Public Comment (03/01/2012):

- Copyedited language
- Removed Speech Privacy requirements