



## **LEED for Homes Approved ID Request: *Acoustic Comfort***

### **Introduction**

The following is an Innovative Design Request (IDR) that has been approved for broader use in for the LEED for Homes program. This credit should not be considered part of the standard LEED for Homes Rating System; any points earned using this IDR must be counted under ID 3 in the LEED for Homes Rating Project Checklist.

The measures in this IDR may not be suitable for all homes. The strategies outlined below should be part of an integrated design process to ensure that the benefits of these strategies are not offset by other concerns (e.g. energy, durability, comfort).

## Approved ID Request: Acoustic Comfort

### Maximum Points: 1

#### Intent

Provide acoustic comfort by minimizing intruding noise in homes located in areas with high exterior noise, and/or in multi-family buildings.

#### Requirements

##### Prerequisites

None.

##### Credits

*Note: This credit is only available for homes located in areas with Day-Night Equivalent sound level (Ldn)  $\geq 60$ ; units in multi-family or mixed-use buildings; or attached, single-family homes. Detached, single-family homes in quiet areas are not eligible to earn this credit. Many cities and counties have noise maps available with Ldn values.*

*These requirements only apply to "acoustically sensitive" rooms, such as bedrooms, dining rooms, living rooms, and studies. ("Acoustically insensitive" rooms include bathrooms, kitchens, and hallways.) Project may also implement the measures throughout the entire home.*

**1.1 Identify Site Noise and Provide Acoustic Comfort** (1 point). Complete all of the following in parts (a), (b), and either (c) or (d).

- a) **Noise investigation.** Conduct an investigation to identify noise sources that will affect acoustic comfort. These sources may include, but are not limited to:
- o Exterior single event sources (e.g., aircraft or trains).
  - o Ambient exterior noise sources (e.g., vehicular traffic and mechanical system systems).
  - o Anticipated interior noise from plumbing and HVAC systems.
  - o Anticipated interior noise from adjacent units in a multi-family building.

*Measurements of the Ldn at the project site are encouraged, but not required.*

- b) **Acoustic approach narrative.** Briefly describe the identified noise sources, and the design approach used to address these sources. The project's acoustical design approach must be at least as stringent as one of the pathways described below in parts c and d. Projects should consider adding measures or increasing the sound ratings for construction(s) as needed for the specific noise sources identified in part a. Include the narrative in the operations and maintenance manual required in AE 1.1.

- c) **Prescriptive noise reduction methods.** Meet parts (i), (ii), and (iii), as appropriate.

- i. Mechanical equipment must meet the following requirements:
- o Continuous ventilation fans shall have a maximum sound rating of 0.7 sones. Intermittent fans shall have a maximum sound rating of 1.5 sones, unless their maximum rated airflow exceeds 400 cfm. HVAC air handlers and remote-mounted fans are exempted, if the fans are mounted outside the habitable spaces, bathrooms, and hallways, and if there is at least 4 feet of ductwork between the fan and the intake grill.

- Meet the following best-practice HVAC installation measures:
  - Ducts are securely attached (no loose connections between sections of ductwork).
  - The fan housing is securely anchored.
  - The damper flap closes fully, with no visible airspaces around the flap.
- ii. Detached, single-family homes must meet all of the following:
  - Must be located in areas with  $L_{dn} \geq 60$ .
  - Exterior walls and roof-ceiling assemblies must have a minimum STC rating of 45.
  - Exterior windows and doors must have a minimum STC rating of 35.
  - All exterior wall penetrations must be sealed with acoustical sealant, and/or otherwise treated for sound control (e.g. lined elbows on vents, lined exterior ducts where feasible).
- iii. Units in multi-family or mixed-use buildings, and attached, single-family homes must meet the following for interior sound control:
  - Party walls must have a minimum STC rating of 55.
  - All wall penetrations must be sealed with acoustical sealant.
  - For units in multi-family or mixed use buildings: Floor/ceiling assemblies must have a minimum STC *and* IIC rating of 55.
  - If the building is in an area with  $L_{dn} \geq 60$ , units must also meet the following for exterior noise control:
    - Exterior walls and roof-ceiling assemblies must have STC ratings of  $\geq 45$ .
    - Exterior windows and doors must have STC ratings of  $\geq 35$ .

OR

- d) **Performance-based compliance requirements.** Meet parts (i) and (ii), as appropriate.
- i. Detached, single-family homes located in an area with  $L_{dn} \geq 60$ ; attached, single-family homes; and each unit in a multi-family or mixed-use building must meet all of the following:
    - The maximum background noise level in the home or unit due to exterior noise sources cannot exceed 40 dBA, based on the peak hour  $L_{eq}$ .
    - The maximum ( $L_{eq}$ ) A-weighted steady background level from the combination of HVAC systems, lighting, and other building services operating simultaneously shall not exceed 40 dBA.
    - For verification, the levels must be met in the acoustically sensitive room that is considered the worst case condition.
  - ii. Units in multi-family or mixed-use buildings, and attached, single-family homes must meet the following additional requirements:
    - Party walls must have a minimum NIC rating of 50.
    - For units in a multi-family or mixed-use building: Floor-ceiling assemblies must have a minimum NIC *and* FIIC rating of 50.

## Verification and Submittals

### Builder / Project Team:

- Present product literature, labels, or other documentation demonstrating that the appropriate sound ratings have been met.
- If part (d) is followed: Provide documentation that the performance-based requirements have been met.
- Include the acoustics approach narrative in the operations and maintenance manual.

### Green Rater:

- Verify that the project is eligible to earn this approved ID credit.
- Verify that the acoustic approach narrative is in the operations and maintenance manual.
- For part (c), visually verify (using product literature, labels, etc.) that the products installed meet the appropriate sound ratings.
- For part (c), visually verify that the best management practices for installation of the HVAC system have been met.
- For part (d), visually verify documentation that shows the performance criteria have been met.
- For part (d), visually verify (using product literature, labels, etc.) that the products installed meet the appropriate sound ratings.

## Additional Information

### Appendix I. Sound Terminology and Noise Metrics

*Decibels (dB)* - Sound is measured in decibels (dB, or dBA if based on a certain sound frequency). The dB is a logarithmic scale, and each 10 dB is about twice as loud to the human ear. For example, 30 dB is about half as loud as 40 dB. Airborne noises vibrate through air. Structural noises, such as footsteps, vibrate through a structure.

*Day-Night Equivalent Sound Level (Ldn)* - The Ldn takes the average sound level during the day (7 am – 10 pm) and during the night (10 pm – 7 am). These values are combined, using a logarithmic formula, for the Ldn. This is a commonly used metric for assessing exterior noise levels.

*Sound Transmission Class (STC)* - This value describes how well a partition (such as a wall) reduces airborne sound, particularly speech. The STC number roughly approximates how many dB will be reduced by the partition. For example, a sound with 80 dB is reduced to about 50 dB when it crosses a 30 STP partition. The STC of a partition is found in the laboratory by measuring sound pressure levels on either side of the partition to find the transmission loss across it. Determined by ASTM E90.

*Noise Isolation Class (NIC)* – NIC is similar to STC, but the NIC is determined in the field.

*Impact Insulation Class (IIC)* - The IIC value describes the ability of a partition to block structure-borne noise. It describes how much an impact noise (e.g., a footstep) is reduced through a floor-ceiling assembly. The IIC is determined in the laboratory with a tapping machine. Determined by ASTM 492.

*Field Impact Insulation Class (FIIC)* - FIIC is similar to IIC, but the FIIC is determined in the field.

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*Equivalent Continuous Noise Level (Leq)* - Leq is a measure of the average sound pressure level over a given time.

## Resources & References

### References

Lilly, Jerry G. "[Recent Advances in Acoustical Glazing](#)". Sound and Vibration. Feb 2004.

International Building Code (IBC) 2000, Section 1206.

[http://books.google.com/books?id=b5ElzENp3E0C&pg=PA225&lpg=PA225&dq=ibc+2000+section+1206&source=web&ots=KT21uxeW\\_X&sig=WLfDbuBzbZd\\_pQQg9P\\_26t4KEJ8&hl=en&sa=X&oi=book\\_result&resnum=4&ct=result](http://books.google.com/books?id=b5ElzENp3E0C&pg=PA225&lpg=PA225&dq=ibc+2000+section+1206&source=web&ots=KT21uxeW_X&sig=WLfDbuBzbZd_pQQg9P_26t4KEJ8&hl=en&sa=X&oi=book_result&resnum=4&ct=result)

HUD. Noise Control Manual for Residential Buildings.

[http://books.google.com/books?id=ymZFY316YQcC&pg=PA119&lpg=PA119&dq=hud+guide+to+airborne+impact+structure+noise+control&source=web&ots=ihuqDte-3h&sig=-qDGw7fSbQ7PY\\_EaRKlv\\_VzyJXQ&hl=en&sa=X&oi=book\\_result&resnum=4&ct=result#PPA3.M1](http://books.google.com/books?id=ymZFY316YQcC&pg=PA119&lpg=PA119&dq=hud+guide+to+airborne+impact+structure+noise+control&source=web&ots=ihuqDte-3h&sig=-qDGw7fSbQ7PY_EaRKlv_VzyJXQ&hl=en&sa=X&oi=book_result&resnum=4&ct=result#PPA3.M1)