

2022 COMPARISON OF THE ACOUSTIC DESIGN REQUIREMENTS OF LEED, WELL AND GREEN GLOBES

Jessie Roy *¹

¹RWDI Consulting Engineers and Scientists, Calgary, Alberta, Canada.

1 Introduction

The LEED, Green Globes, and WELL building rating systems have undergone substantial updates in the last five years, which include revisions to the options associated with acoustics. Some of these updates were made to address continued low occupant satisfaction with acoustic performance, and low interest in the pursuit of the acoustic-related certification options, due to challenges with achieving the requirements. This paper summarizes the changes in the acoustic requirements in the latest versions of these systems, how those changes address some of the common challenges with past versions and highlights key design considerations for achieving the new requirements.

2 Discussion

2.1 LEED (Version 4.1) ^[1]

In the update to LEED version 4.1, the Building Design and Construction (BD+C) Acoustic Performance credit was modified in an attempt « to encourage more projects to consider acoustic performance during design » ^[1]. The structure of the credit was changed to allow projects to achieve one point by complying with two of the performance requirement categories: HVAC Background Noise, Sound Transmission or Reverberation Time, and an exemplary performance point if the requirements in all three categories were met. This change addresses a challenging aspect of the previous version which was that every acoustic requirement had to be met in order to earn one point.

The HVAC Background Noise and Reverberation Time requirements of the credit are generally the same as in Version 4. For projects with large spaces, meeting the reverberation time targets may be difficult as the requirements are independent of room volume.

The Sound Transmission requirements have been updated to make the credit relevant to a wider range of projects and addresses an issue with the requirement between offices or conference rooms and corridors in Version 4, as that requirement was frequently a barrier to the pursuit of the acoustic credit. The new requirement is composite sound transmission class rating (STC_c) 35 for adjacencies between private spaces and hallways, which is still likely to require acoustic door seals, but is possible to achieve with typical wall, glazing, and door constructions.

In addition, sound reinforcement systems are no longer discussed in the credit and sound masking system requirements have been integrated into the sound transmission requirements, allowing projects with a sound masking sys-

tem to have sound insulation targets 5 points lower than projects without masking.

2.2 Green Globes (New Construction 2021) ^[2]

In the 2021 update to the Green Globes rating system the acoustic section was completely redone. It is now broken into three topic areas: Noise Limits and Masking Sound Level, Acoustic Insulation and Vibration Isolation, and Reverberation Time or Ceiling Noise Reduction Coefficient.

In Green Globes, points are earned by answering questions. There are no longer any acoustic questions about prescriptive measures; all questions are now performance requirements. This new format necessitates that an acoustical consultant be involved in the project to answer the questions in the acoustic section. The system still allows for most questions to be evaluated independently (i.e., not achieving a question does not preclude the project from attempting the next question), allowing for a maximum number of points from acoustics to be available.

The acoustics section is structured to encourage the design team to set acoustic targets, complete a theoretical assessment, and then validate performance with measurements post-construction. To achieve the maximum number of points, it is important that an acoustical consultant is involved early in the project, at a time when it is still possible to integrate their recommendations into the mechanical design, and that post-construction measurements are included in the project budget and schedule. For many of the multi-point questions, the number of points achieved by the project are determined from the percentage of spaces that achieve the requirements (both for theoretical assessments, and post-construction measurements).

With the 2021 update, a newer set of standards are referenced, and separate options are provided for education and healthcare projects. Most notably the metric for evaluating background noise has changed from Room Criterion (RC) to Noise Criterion (NC) or A-weighted overall sound level (dBA) and C-weighted overall sound level (dBC), addressing previous difficulties with theoretically assessing RC ratings.

2.3 WELL (Version 2, 2022 Q2) ^[3]

In the update to WELL Version 2, 'Sound' was elevated to one of the ten concepts that the features of WELL (called preconditions and optimizations) are organized into, recognizing its importance to occupant comfort.

The requirements of the Sound Mapping precondition, which is required for all certified projects, have been considerably relaxed. Identification of loud and quiet zones is still required, but instead of mandatory limits on noise intru-

* jessie.roy@rwdi.com

sion and mechanical background noise levels, a plan or report outlining existing conditions, recommended solutions, and timeline for implementation, is required.

In Version 2, exterior noise intrusion and mechanical noise are assessed together under the Maximum Noise Level optimization. Project performance is evaluated based on measurements of average and maximum sound pressure levels (dBA and dBC) against two levels of performance (tier I and tier II). Although simple to measure, this approach is more complex to model. It is important to note that spaces with operable windows must be measured with windows open, and that tolerances (+4 dB for average and +9 dB for maximum) are permitted for evaluating measured compliance against the thresholds in this feature.

The Sound Barriers and Reverberation Time optimizations have been restructured to allow points for design, as well as verifying performance. The reverberation time requirement for open plan offices have been removed, which resolves a common issue that projects encountered with WELL Version 1. The overlap in the requirements of the Reverberation Time and Sound Reducing Surfaces optimizations, potentially allows a project to earn points under both optimizations for the same sound absorptive materials depending on the location of the materials.

The Minimum Background Sound optimization requires sound masking in a wider range of spaces than in WELL version 1, but the limits are the same. There is also an additional point available for achieving this optimization in combination with the Sound Barriers and Sound Reducing Surfaces optimizations.

Lastly, there are three new beta features in Version 2: Impact Noise Management, Enhanced Audio Devices and Hearing Health Conservation. The Impact Noise feature offers points for designing floor-ceiling assemblies to reduce impact noise and verifying the performance. The Enhanced Audio feature is focused on devices that support speech intelligibility, and organizational policies around their use. The Hearing Health Conservation feature outlines requirements for organizations' hearing conservation programs, including the provision of hearing protection and audiometric testing.

3 Comparison

The background sound, sound insulation and reverberation time (RT60) requirements of the LEED BD+C credit, Green Globes, and WELL systems are compared in Tables 1 to 3.

Table 1: Comparison of Average Background Sound Limits

Building Rating System:	LEED v4.1	Green Globes 2021	WELL v2 (Q2 2022) Tier I	WELL v2 (Q2 2022) Tier II
Space Type	dBA/dBC	dBA/dBC	dBA/dBC	dBA/dBC
Areas for conferencing, learning, or speaking (conference room)	35/60	35/60	40/60	35/55
Enclosed areas for concentration (private offices)	35/60	35/60	45/65	40/60
Open areas for concentration (open plan offices)	45/65	45/65	50/70	45/65
Areas with machinery and appliances used by occupants (e.g., testing/research labs, dining, etc.)	55/75	55/75	55/75	50/70

Table 2: Comparison of Sound Insulation Requirements

Building Rating System:		LEED v4.1	Green Globes 2021	WELL v2 (Q2 2022)
Adjacency Combination		STCc / NIC	STCc	STC / NIC
Private Office	Private Office	45 / 40	45	50 / 45
Private Office	Open Office	45 / 40	45	45 / 40
Private Office	Corridor	35 / 30	40/30*	40 / 35
Conference Room	Private Office	50 / 45	50	55 / 50
Mechanical equipment room	Occupied Area	60 / 55	60	60 / 55

*Green Globes references IgCC2018 which allows for 5-point reduction in target for walls between spaces and corridors, and a 15-point reduction for walls with doors that open to corridors

Table 3: Comparison of Reverberation Time Requirements

Building Rating System:	LEED v4	Green Globes 2021	WELL v2(Q2 2022)
Space Type	RT60 at 500, 1000 & 2000 Hz (s)	RT60 at 500, 1000 & 2000 Hz (s)	RT60 at 500 and 1000 Hz (s)
Executive or private office	< 0.6	≤0.6	N/A*
Conference/ Teleconference room	< 0.6	≤0.6	≤0.6 for V < 10,000ft³ 0.5 ≤ RT60 ≤ 0.8 for 10,000ft³ ≤ V ≤ 20,000ft³ 0.6 ≤ RT60 ≤ 1.0 for V > 20,000ft³
Open-plan office with sound masking	0.8	≤0.6	N/A**
Areas with machinery and appliances used by occupants	< 1.0	≤1.0	≤1.0

*Offices are not a space type listed in the Reverberation Time feature

**Per WELL FAQ#275 open plan offices are purposefully excluded from the reverberation time feature because they "can fluctuate greatly across the floor plate of open offices, making reverberation time difficult to quantify and design. Furthermore, there is not yet strong evidence that links higher reverberation times in open offices to adverse conditions for occupants."^[4]

As can be seen in Tables 1 and 2, the background sound and sound insulation requirements of the systems are similar, mostly within 5 dB or points. Whereas there are fundamental differences in how the systems approach reverberation time for offices and conference rooms.

4 Conclusion

Substantial modifications have been made to all the systems discussed to make it easier for projects to earn points towards certification for considering the acoustic comfort of occupants in their design. All the systems now have a mechanism for projects to earn points when the design partially complies with requirements, recognizing the importance of incorporating any measures that are feasible. The shift to awarding points for both design and post-construction measurements may incentivize projects to conduct post-construction measurements more often, helping to identify deficiencies prior to occupancy.

References

- [1] US Green Building Council. LEED v4.1 Building Design and Construction, Getting started guide for beta participants. Jan. 2019.
- [2] Green Building Initiative. Green Globes New Construction 2021 Technical Reference Manual. Version 1.0. February 2022.
- [3] International WELL Building Institute. The WELL Building Standard v2 with 2022 Q2 Addenda. June 2022.
- [4] International WELL Building Institute. WELL v2 Feature S04 FAQ. 2022. <https://v2.wellcertified.com/en/wellv2/sound/feature/2>