Study Objectives
1. Better understand the propagation properties of the chamber through qualitative and quantitative analysis.
2. Obtain accurate reverberation times and absorption coefficients for both ‘Send’ and ‘Receive’ rooms.
3. Isolate the transmission loss (TL) of the specimen per the ASTM E-90 standard for airborne sound transmission loss.
4. Optimize testing methodology based on collected data to achieve the highest accuracy possible.
5. Utilize the new testing procedures to compare the RWTL chamber TL values and approximate STC ratings with data generated from a certified facility.

The Real World Transmission Loss Chamber (RWTL): A Work In Progress

Abstract #: 3aEDa2

Authors:
Jay Bliefnick
Student: Columbia College Chicago
Andrew Hulva
Student: Columbia College Chicago
Dr. Dominique Chéenne
Professor: Columbia College Chicago

Columbia COLLEGE CHICAGO

The RWTL chamber was designed to demonstrate the testing procedures associated with the calculation of sound transmission class (STC) ratings, and illustrate common construction & testing issues (in the ‘Real World’) that can lead to erroneous TL values.

The RWTL chamber produces data that is viable for educational purposes, but it is not intended to replace certified laboratory environments.

Features of the RWTL Chamber:
- Either side can be used as ‘Send’ or ‘Receive’.
- The noise floor of the ‘Receive’ side can be adjusted using various recorded noises.
- Each side contains 4 microphones that can be positioned at will.
- A custom-designed software interface allows for fully automated data acquisition & analysis processes.

Testing Methods

- 24 microphone positions were implemented (8 per test at 3 discrete heights).
- 3 unique speaker configurations (generating pink noise) in each chamber were determined to influence the source orientation.
- Source room was reversed to identify the effects of absorption on system performance.
- A high TL ‘plug’ (shown installed below) was used in all tests to isolate the rooms.

20 full room tests — Totaling > 20,000 data points

Reverberation Time Calculations
- The reverberation times of each room were determined using the ARTA™ energy decay calculator.
- The absorption coefficients were extrapolated according to the ASTM C-423 standard.
- These values were used to compensate for absorption in the receiving room using the following formula:

\[
TL = NR - 10 \times \log\left(\frac{\text{Total Receive Absorption}}{\text{Total Wall Area}}\right)
\]

Putty: There is nothing ‘silly’ about it....
- All prior tests in the RWTL had been conducted solely using high-compression clamps (seen below) against a necropore seal.
- To improve the room isolation, mastic (in this instance plumber’s putty) was applied liberally to the seal between the specimen and the conversion frame.
- The additional procedure added < 5 minutes to the test time, but drastically improved performance.

Conclusions

Recommended testing methodology alterations:
1. Speakers: Should be facing the corners opposite to the common wall at a distance of 30” with heights staggered at 48” and 70”.
2. Microphones: Should be located a minimum distance of 18” from any reflective surface and outside of the median elevation plane of the speakers.
3. Equalization needed to flatten the send response: +6 dB @ 1.82 kHz (Q=2.5) and +5 dB @ 290 Hz (Q=5)
4. Absorption: Should be accounted for on the ‘Receive’ side using the calculated coefficients and NR formula.
5. Mastic: Should be used to form a proper seal between specimen, conversion frame, and perimeter frame.
6. Specimen TL: The percentage area of the specimen should be compensated for in the final TL calculations.

Acknowledgements
We would like to thank Dr. Dominique Chéenne for the opportunity to conduct this study, as well as Dr. Lauren Rossow and Brett Johnson for their guidance throughout. The RWTL and the Kinetics-in-a-Box technology was previously presented by Eric McGowan and Scott Hulven at ICA 2013 (ApAA6).

References

Contact Information
Jay.Bliefnick@loop.colum.edu — Jay.Bliefnick.com
Andrew.Hulva@loop.colum.edu — HulvaAcoustics.com
DrCheenne@colum.edu