

Building Science Graduate Program: Master of Applied Science Thesis SOUND LIVING IN VANCOUVER'S LANEWAY HOUSING By: Rosa Lin, MASc. Candidate Supervisor: Dr. Maureen Connelly, MAIBC

Abstract

In a context of increasing urban density and noise levels, laneway housing (LWH) is a compact housing form at risk of multiple noise issues due to factors related to its small form and siting in the unique acoustical environment of Vancouver's laneways (LW). Currently, Vancouver's LWH Guidelines do not specify acoustical requirements for laneway housing.

This thesis investigated whether or not four case study laneways and six laneway houses (LWH) in Vancouver meet CMHC Noise Criteria for residential health. The results confirmed noise problems and quantified the magnitude and led to recommendations for improving acoustical environmental quality in LWH.

Acoustical Issues

LANEWAY ENVIRONMENT

Laneways can exhibit urban canyon effects due to narrow form and reflective built surfaces that amplify noise generated by unique laneway functions and outside transportation.



LWH: HIGH EXPOSURE TO NOISE SOURCES

LWHs are close to lane and road traffic noises, especially on corner lots and/or in convenient high-transportation areas. Outdoor living and open windows are at risk with excessive noise load on the building envelope.



LWH: SMALL FORM & LOW INSULATION

Small space, low sound absorption, high fenestration/ façade ratio, open layout, bedroom and patio on noisy sides, and lightweight building materials (e.g. EPS SIPs), etc. lead to inadequate noise insulation for health.







Methods

Case studies: 4 laneways and 6 laneway houses Methods: ASTM standardized field tests and three industry models to evaluate acoustical viability of the laneway environment and of LWH construction.

LANEWAY SOUND PROPAGATION Field measurement



Odeon Models



Showing 1 of 4 case study laneway models

CMHC Traffic Noise Model

- Predicts road traffic noise levels through laneways and outside all LWH facades
- 2. Determines unique insulation requirement for each facade
- 3. Estimates acoustical insulation rating of envelope components

FAÇADE SOUND INSULATION Field Measurement by ASTM E966



LWH Model using AFMG Soundflow + NRC Laboratory Test Data (windows)









CMHC Traffic Noise Model & Criteria Compliance









Odeon Model Validation

FAÇADE SOUND INSULATION Empirical Results by Field Tests

LWH Model Results

Findings

- criteria.

Laneways and LWHs need better acoustical design and construction for occupant health.



Recommendations



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Acoustical issues of laneways and LWH were confirmed and quantified:

1. Half or more of laneways and LWHs tested and modelled exhibit noise conditions that do NOT meet CMHC

2. LWHs traits listed in "Acoustical Issues" contribute to inadequate façade insulation under excessive noise load.

3. Laneways exhibiting urban canyon effects are 2-4 times louder than low density, highly vegetated laneways.

4. Weaknesses and improvements were identified in using modelling tools for LW and LWH design applications.

REGULATORY ACTION:

1. Specify acoustical criteria and reference COV SoundSmart strategies in LWH Guidelines and LWH Design Guide.

2. Require use of predictive noise models and encourage acoustical awareness in the design process.

3. Increase laneway vegetation and use absorptive ground cover such as grasscrete paving.

RESIDENT ACTION:

1. Improve windows.

2. Implement green walls and high mass enclosures.

3. Furnish rooms in ways that improve noise insulation.