# ACOUSTICS + BUILDING ENVELOPE DESIGN

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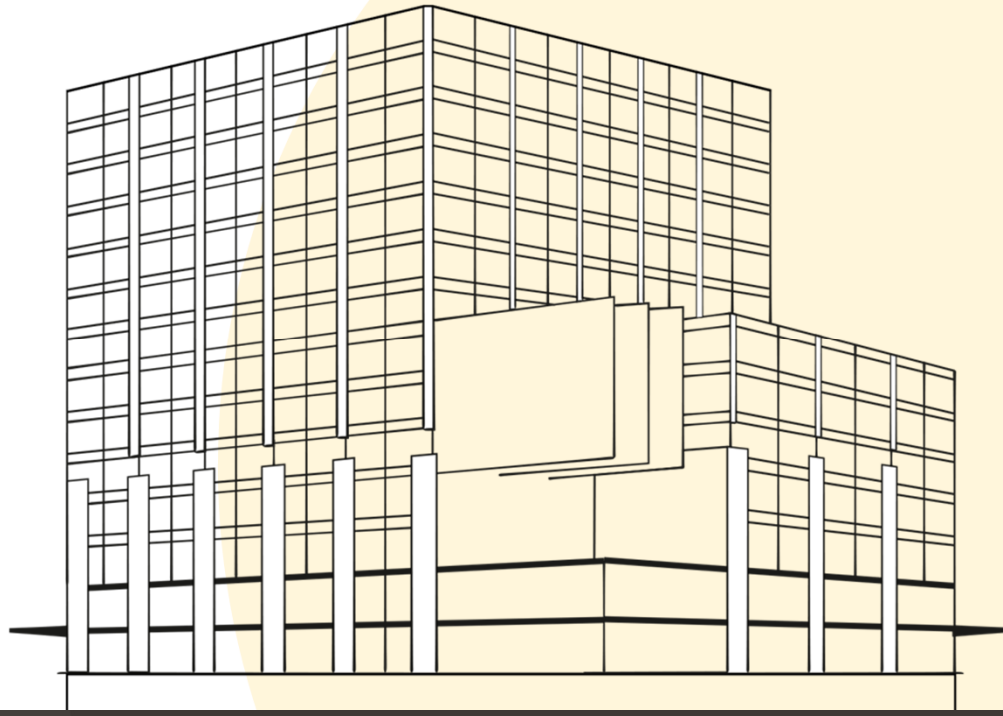

# Overview

Let's talk design phase decisions.

**What are some of the building envelope challenges and solutions to provide dwellings with acceptable noise levels?**

- Acoustical design warrant
- Process of evaluating environmental noise for new dwellings in noise-exposed areas
- Myth busting
- Case studies

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# I’ve got 99 problems, is noise really one?

The Financial Post

Third Section — Current paid circulation about 125,000 copies — May 27, 1967 — Pages 23-36

**Sound levels in every man's life**

**Your world is getting noisier day by day—and no apparent way to stop it**

Proven health conditions include:

- CARDIOVASCULAR DISEASE
- COGNITIVE IMPAIRMENT
- ANNOYANCE
- HEARING IMPAIRMENT & TINNITUS
- EFFECTS ON SLEEP

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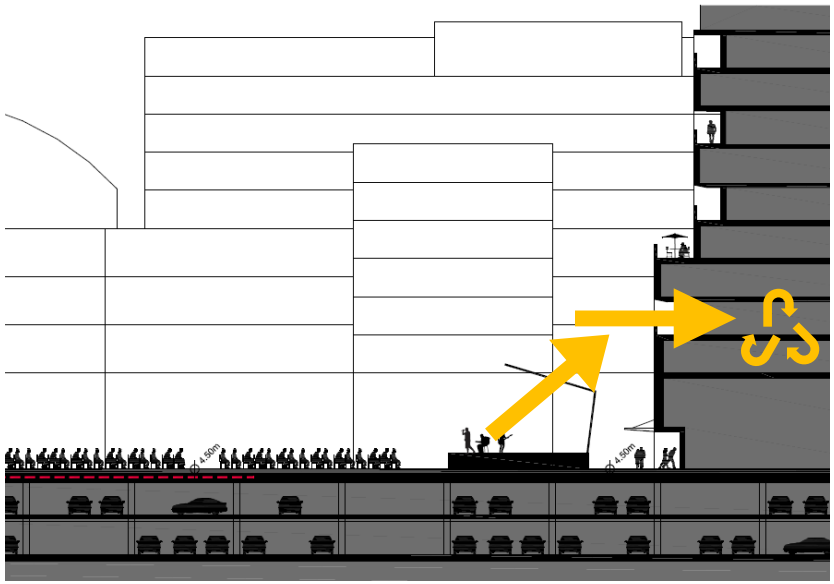
# How does noise get regulated here?

- BC Building Code?
- WELL and LEED v4?
- Municipal bylaws (rezoning, development and/or building permit phases)
- Calculations assume closed windows
  - Ventilation conflict?
  - Thermal comfort conflict?

# How does outdoor noise get indoors?

**ENVIRONMENTAL NOISE**

- Noise emission from sources
- Outdoor sound propagation
- Noise exposure at each façade



**NOISE TRANSMISSION INTO BUILDING**

- Reduction by Building Envelope elements
  - Windows
  - Doors
  - Openings
  - Walls
  - Roof

**NOISE RADIATION INSIDE BUILDING**

- Room Effect

* Calculations should be performed in accordance with ISO 12354-3!

*


## Let's correct some myths!

✗ Laminated glass has the same acoustical performance as tempered safety glass.

✓ Laminated glass **is** acoustically superior to tempered safety glass.

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Let's correct some myths!

✗ Gas-filled glazing units are better than air-filled glazing units.

✓ Gas-filled glazing units perform acoustically better at some frequencies and worse at other frequencies when compared to air filled… but on average there is no improvement for traffic noise isolation.

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# Let's correct some myths!

✗ Triple-glazing is better than double glazing.

✓ Triple-glazing **can be worse** than double glazing with the same total glass weight and the same overall frame depth.

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## Let's correct some myths!

✗ Doubling the insulation in a wall cavity will give you 3 extra STC points.

✓ Doubling the insulation in a wall cavity **does not always improve the result**.

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Let's correct some myths!

✗ Increasing insulation density improves sound isolation.

✓ Increasing insulation density is not a big deal.

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## Let's correct some myths!

X Styrofoam is a useful acoustical product.

✓ EPS/XPS **are not** acoustical products. They do not absorb sound, they do not block sound.

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BUSTED!

# Let's correct some myths!

X

A row of empty beer bottles can substitute for batt insulation in a wall cavity.

✓

Empty beer bottles are not good sound absorbers.

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CASE STUDY # 1

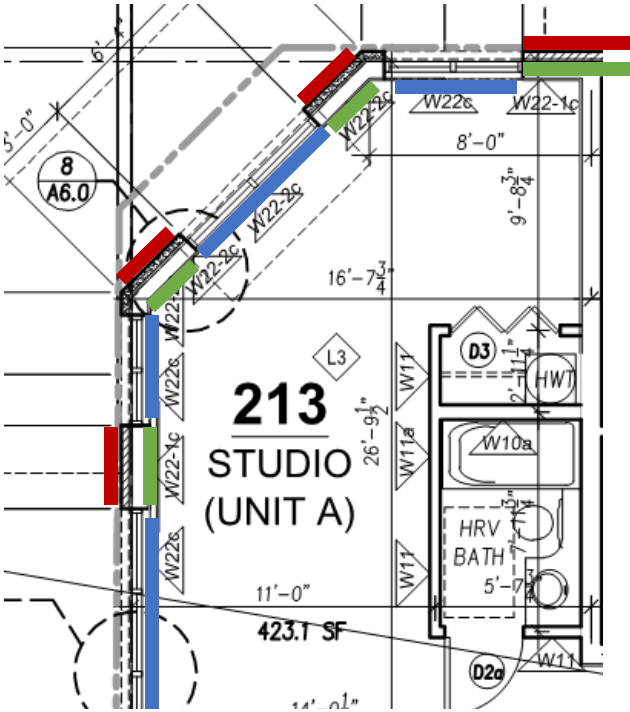
# Crazy noisy site

ORIGINAL DESIGN

- Standard vinyl frame 3-13-3 windows
- 19 mm brick veneer / ½" plywood / 2x6 with glass-fibre insulation / ½" GWB

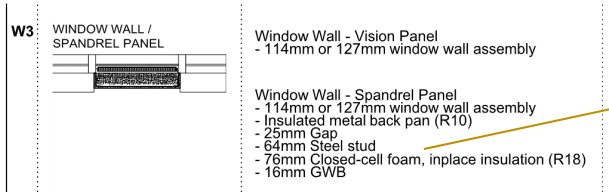
UPGRADED DESIGN

- Secondary windows
- 89 mm brick
- 3 layers 5/8" Type X GWB

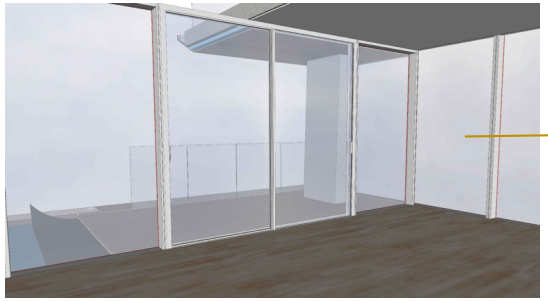


CASE STUDY # 2

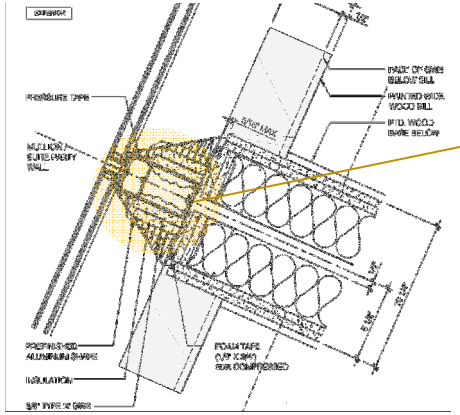
# High-rise mixed-use developmen t




Change to open-cell foam or batt



Large panes have 2-3 point reduction in performance



Provide noise control at mullion/party wall junction to reduce noise transfer between interior units

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CASE STUDY # 3

# Heritage retrofit

- Limited options in heritage situations
- Poorly sealed single-glazed 3 mm windows
- Weatherstripping alone would improve by 5 dBA
- Change to 4-13-4 or a single 7 mm laminated light would make road traffic noise half as loud

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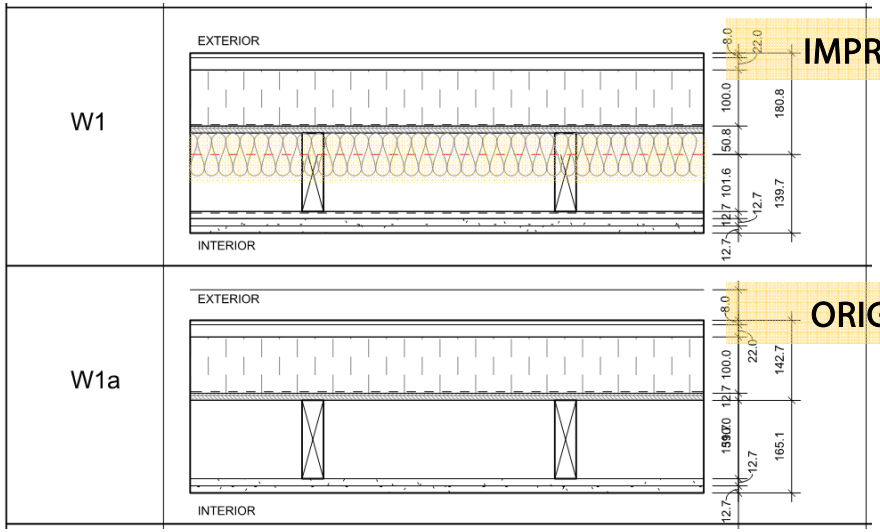
CASE STUDY # 4

# No insulation in cavity




IMPROVED WALL

ORIGINAL WALL

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# Summary

- Environmental noise studies are important in noisy areas
- Make sure studies follow ISO 12354
- There are many sound isolation myths
- Windows are weakest sound path – practical upgrades can be difficult in low-rise developments
- Avoid empty (and closed-cell insulation) wall cavities in noisy areas

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# Thank You!

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