Sound Transmission of an Exterior Insulated Rainscreen Wall

(via Field Testing and Acoustical Modelling)

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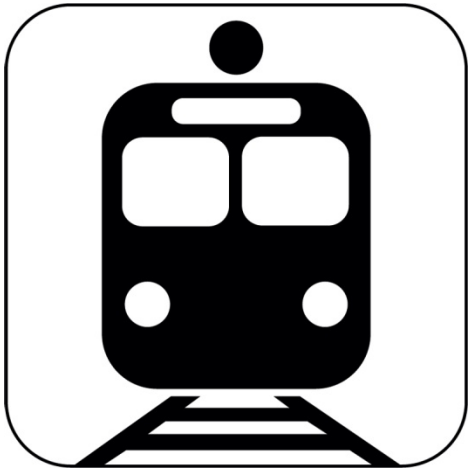
Outline of Presentation

- Introduction
- Field Testing (Intensity Probe)
- Acoustical Modelling (SoundFlow)
- Summary Results and Discussion

Introduction

- Drivers of building envelope design
  - Heat, air, moisture, vapour . . . . . acoustics
- Lack of sound transmission field data, especially for walls
- Consulting industry
  - Letters of assurance (Schedule B – Sound Control)
  - Especially in noisy areas (e.g. bus stops, skytrains, railways)



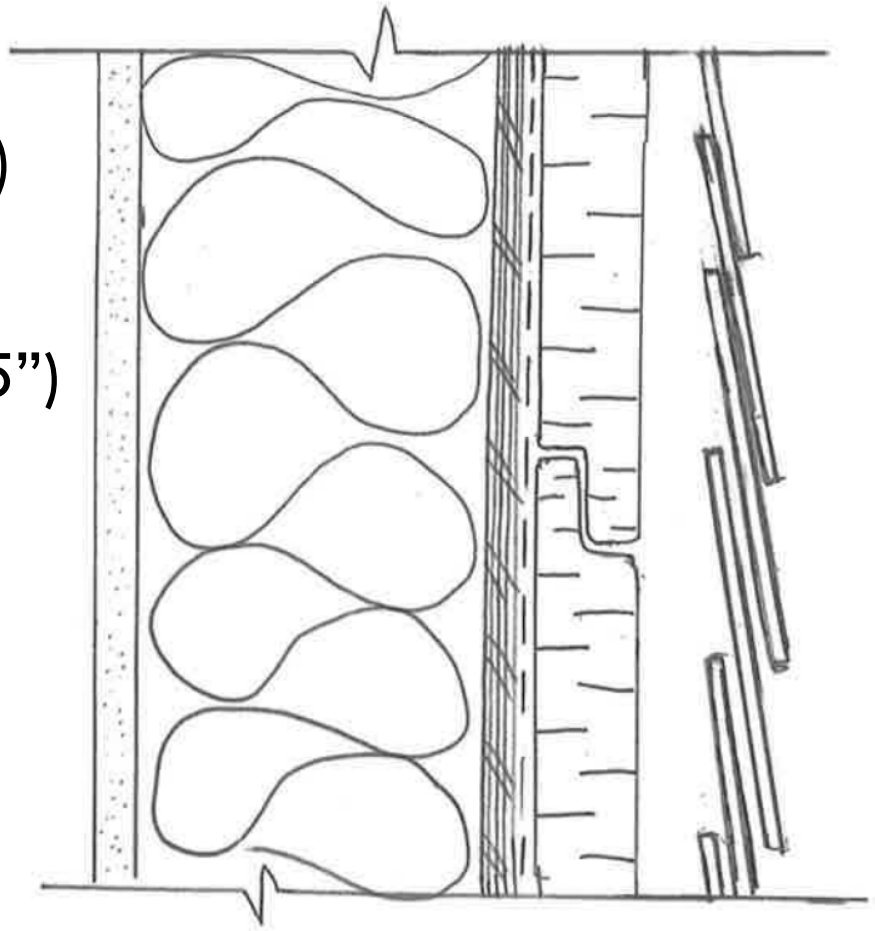
Field Testing

Field Testing

Field Testing

Wall Schedule

- Gypsum wall board (0.5”)
- Fibrebatt insulation (6”)
- PT Plywood sheathing (0.5”)
- Moisture/air barrier
- XPS (1.5”)
- Wood furring (0.5”)
- Cedar shingles (0.5”)



Field Testing

Test Procedure

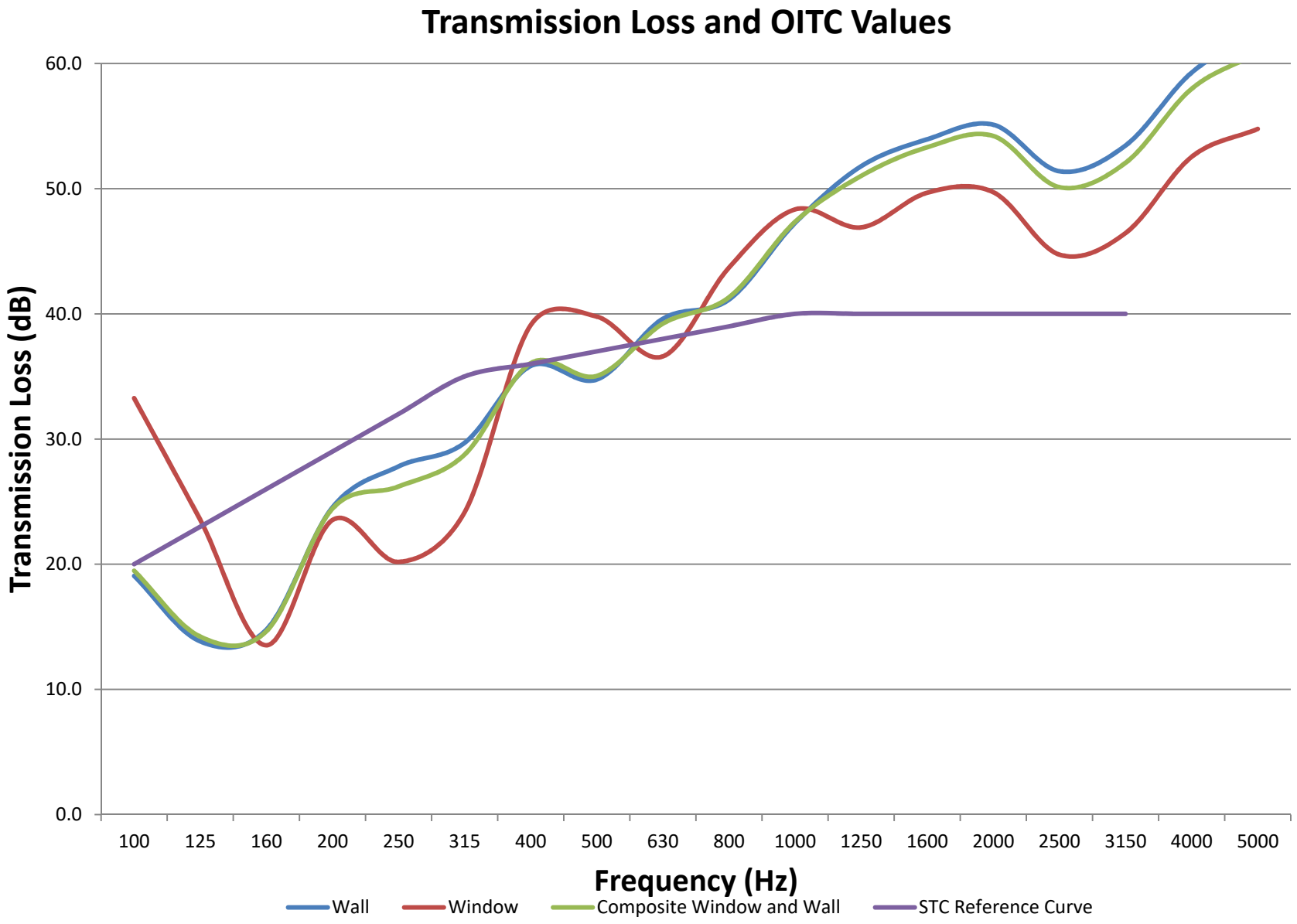
- Temperature and humidity
- Façade dimensions (all areas)
- Background noise
- Set speaker inside room
- Measure sound pressure in room
- Measure sound intensity at wall exterior (discrete locations within a grid)

Equipment

- Omni-directional speaker
- Intensity probe (GRAS)
- Soundbook and Samurai software
- 831 sound meter (Larson Davis)

Field Testing

Field Testing



Field Testing

Comparison with Laboratory Testing (IRC/NRC Report)

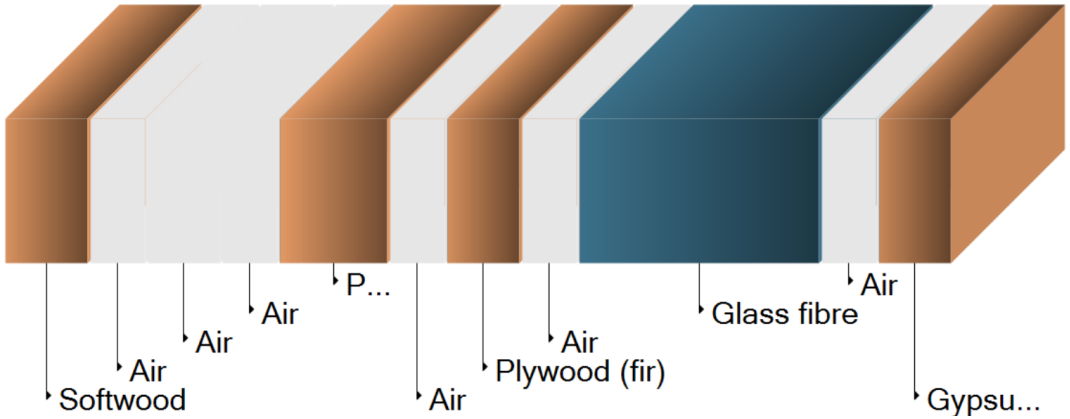
Wall Type	OITC	STC
Face-sealed, vinyl clad	25	37
Rainscreen, vinyl clad	25	37
Face-sealed, vinyl clad (exterior insulated - 1" rigid fibre)	25	37
Face-sealed, vinyl clad (exterior insulated - 1" EPS)	26	37
Facade Specimen - rainscreen, cedar clad, 1.5" XPS	**26**	**36**
Face-sealed, vinyl clad (additional GWB)	27	39
Face-sealed, EIFS clad	27	38
Face-sealed, stucco clad	29	40

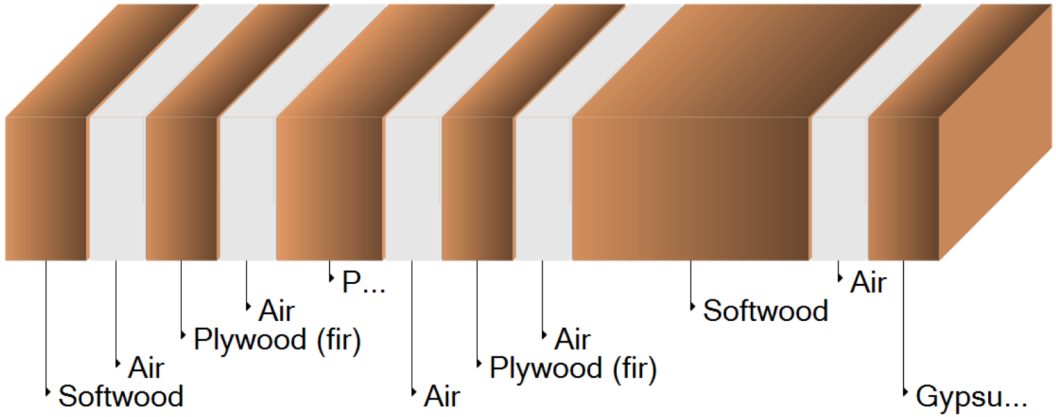
** Other OITCs and STCs are taken from the IRC/NRC Internal Report, October 2000, Bradley and Birta (similar stud size and spacings to test wall)*

Acoustic Modelling

SoundFlow software

- Simulation software for calculating the absorption, reflection, and transmission of sound by multi-layer structures
- Assumptions
  - Properties
  - Areas
  - Air gaps
  - A/V barrier

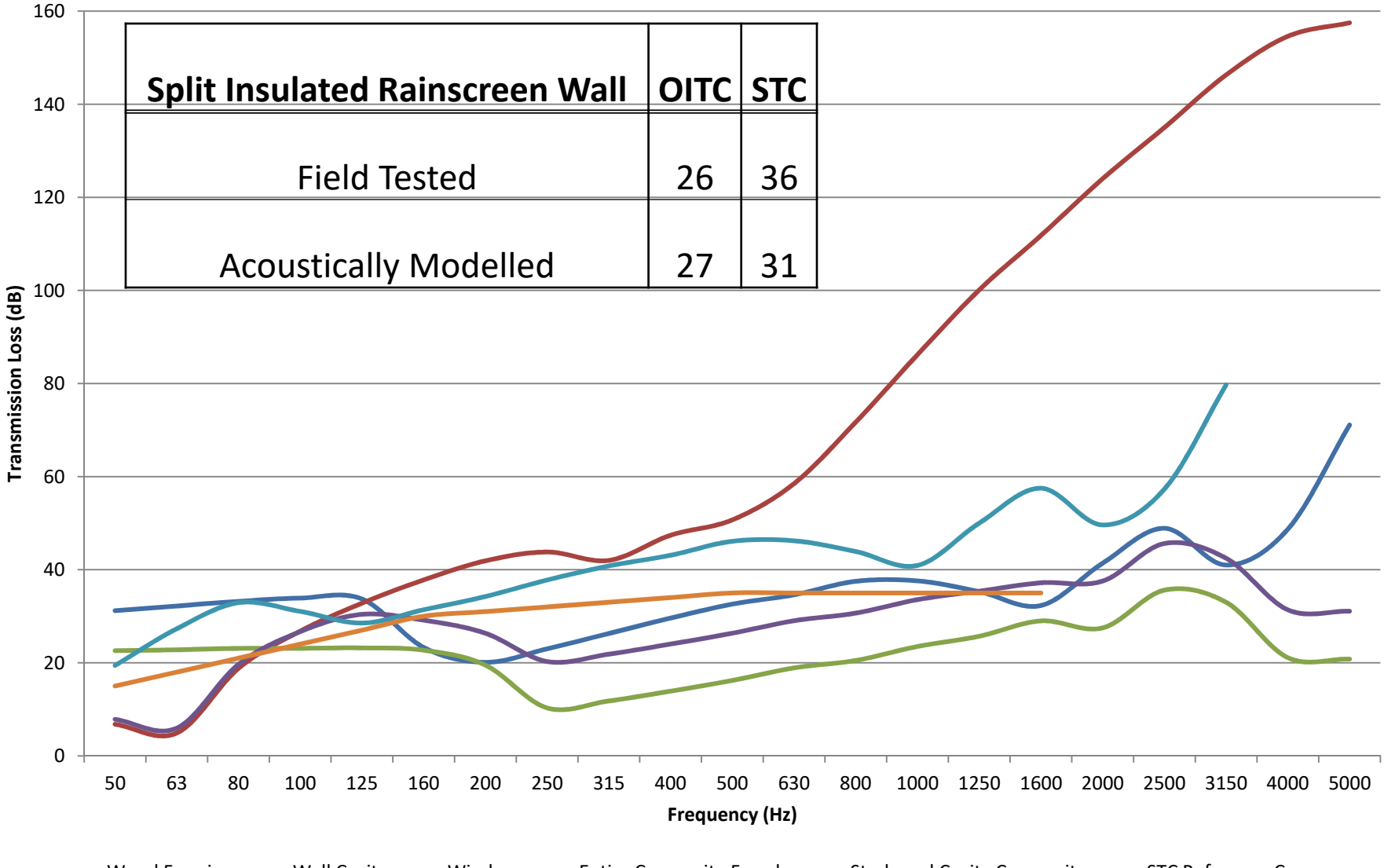




Acoustic Modelling

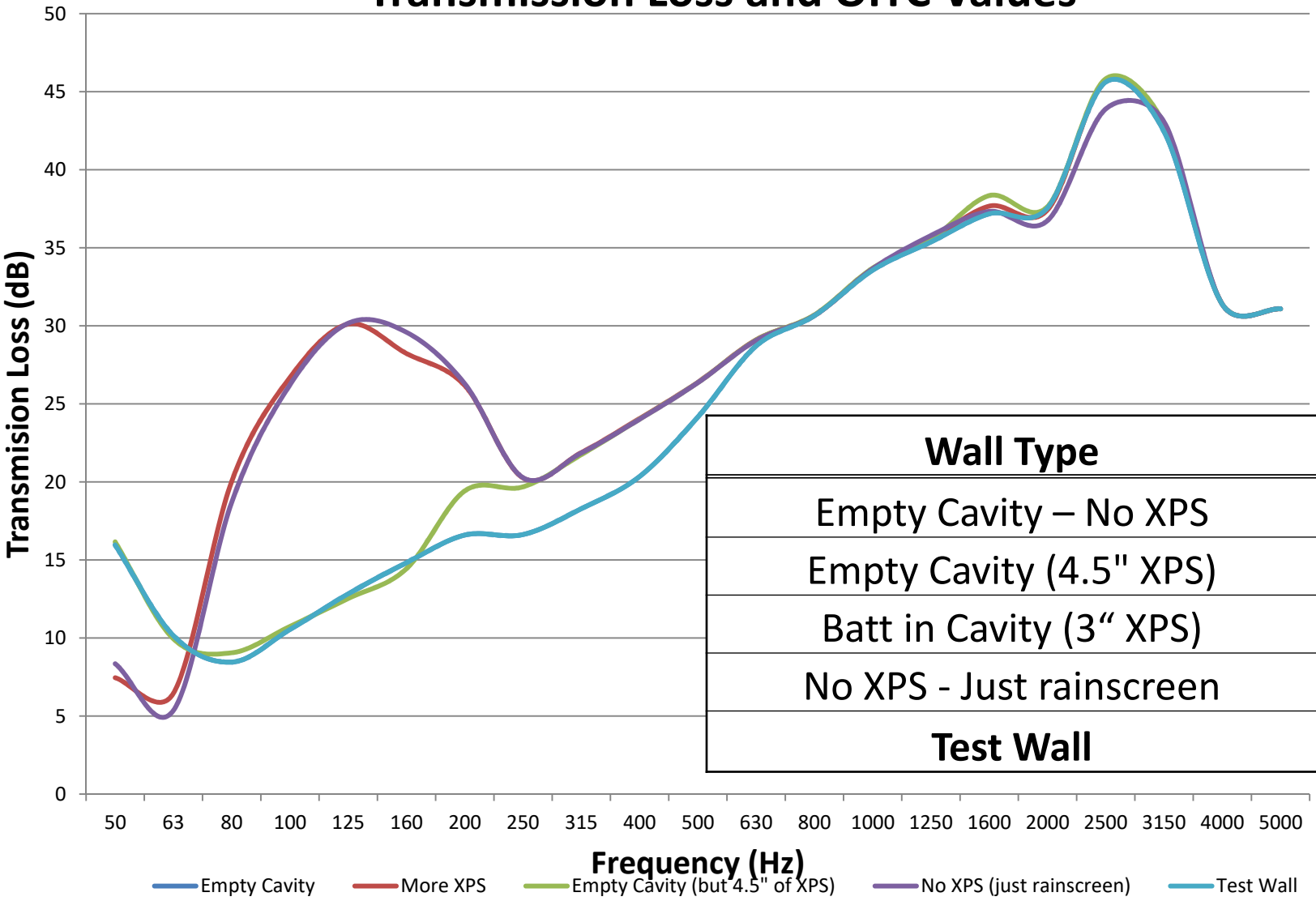
Transmission Loss of Test Wall

Split Insulated Rainscreen Wall	OITC	STC
Field Tested	26	36
Acoustically Modelled	27	31



Acoustic Modelling

Transmission Loss and OITC Values



Wall Type	OITC	STC
Empty Cavity – No XPS	20	29
Empty Cavity (4.5" XPS)	21	30
Batt in Cavity (3“ XPS)	27	31
No XPS - Just rainscreen	27	31
Test Wall	**27**	**31**

Summary of Results and Discussion

Based on Field and Laboratory Testing

- Test Façade
  - Great wall for heat, air, moisture and vapour, but not so great on sound insulation
  - Windows - better at most lower frequencies
  - Wall - better at most higher frequencies
- Exterior Wall Design
  - What's best for traditional/current BE design is not always best for sound insulation
  - Stucco does well for acoustics but . . .
  - Rainscreening doesn't help with acoustics
  - Exterior insulation had little effect
  - Adding GWB can be a cheap and easy way to improve sound insulation

Summary of Results and Discussion

Based on Acoustical Modelling

- OITCs are possible to compare and correlate
- Removing batt insulation is detrimental (even if you add exterior insulation); keep some sound absorbing material in the cavity (min 50 mm); split insulation is optimal
- Adding/doubling exterior thermal insulation (rigid) improves very little sound insulation