Urban Acoustics

Week 5 Tutorial
Conceptual questions

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Where innovation starts

Conceptual questions

1. In road construction, dense asphalt is more sound absorptive than porous asphalt.

Conceptual questions

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Answer

Wrong. Porous materials absorb more than dense materials since sound gets absorbed through the pores (sound waves are converted to heat due to visco-thermal effects).

Conceptual questions

2. Propagation-based abatement is the best way to address noise problems.

Conceptual questions

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Answer

- Wrong. The most effective noise control and regulation measures are those that target a reduction in noise emitted at the source

Conceptual questions

3. Auto-transmission produces less noise compared to manual transmission in vehicles.

Conceptual questions

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Answer

- Right. Automatic gearing systems for vehicles promote gradual transitions between gears at relatively low RPMs.

Conceptual questions

4. The primary objective of rail grinding is to improve the acoustic absorption of the tracks.

Conceptual questions

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Answer:

False. The primary purpose of rail grinding is to prevent rail defects and fatigue cracks.

Conceptual questions

5. The most commonly used method for mitigating noise from railway sources is to improve the rolling stock (brakes and wheels).

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Answer :

True. Composite brake technology instead of iron-cast brakes and optimized wheels is the most common approach for noise reduction. Countries like Germany, Switzerland, and Czech republic are already doing this in their railway fleet.

Conceptual questions

6. Geometry and orientation of buildings are the only most important factors building designers should keep in mind when it comes to noise abatement measures.

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Answer

Wrong. Room layout should ensure that rooms associated with less noise-sensitive activities (e.g. kitchens, bathrooms, utility and storage rooms) are placed towards the noise source (i.e. a road or rail line) while rooms that house more noise-sensitive activities, such as bedrooms for sleeping and the living room for relaxation, are located away from the noise source.

Also: vegetation on the roof or the walls to increase noise scattering and absorption.

Conceptual questions

7. The height of a noise barrier plays an important role in the effectiveness of the barrier.

Conceptual questions

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Answer

True. The effectiveness of a noise barrier is governed by the path length difference (the amount by which the top of barrier cuts the line of sight between the source and receiver), provided the sound transmitted through the barrier is minimal.

Conceptual questions

8. Noise barriers are most effective when the barrier is of the same height throughout its length.

Conceptual questions

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Answer

- Wrong. Variations in height is designed to create destructive interference effects that will reduce noise propagation over the barrier, i.e., the jagged edge causes a reduction in coherence of the diffracted signal being transmitted as compared to a conventional straight edge barrier.

Conceptual questions

9. Noise barriers could afford to have breaks in them if there is sufficient overlaps between two adjacent sections.

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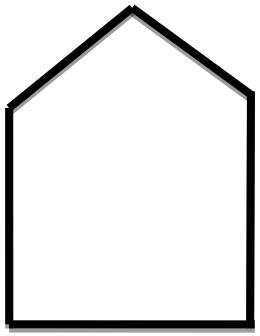
Answer

- True. These sections of barrier should ideally be finished with sound absorbing material and the overlap should be at least four times the opening width.

Conceptual questions

10.



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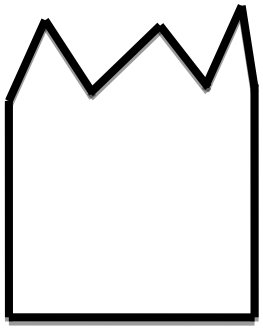

b)

Buildings a) and b) have different roof shapes; b) is more effective for noise reduction than a)

Conceptual questions

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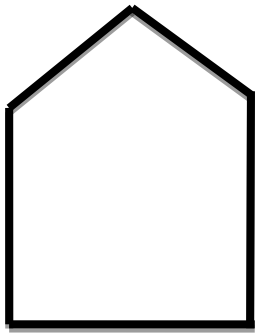

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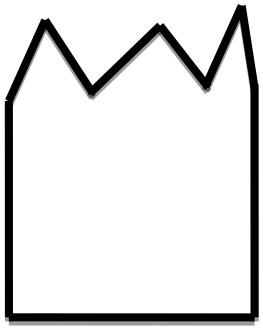

b)

Buildings a) and b) have different roof shapes; b) is more effective for noise reduction than a)

Answer

True. b) causes more diffraction than a), and noise is thus scattered in all directions and loses coherence.

Conceptual questions

11. The reduction of noise through the ground effects is only through absorption.

Conceptual questions

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Answer:

Wrong. The ground also induces destructive interference, and, if non-flat, scatters energy in all directions.

Conceptual questions

12. Noise barriers that don’t block the line of sight between the source and the receiver are useful in terms of noise reduction.

Conceptual questions

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Answer

True. Low height barriers are common in cities and can have good absorption properties. E.g: green low-height barriers.

Conceptual questions

13. Green treatments on buildings (e.g., green facades, courtyards or terraces) are more effective for noise abatement than closely-packed trees on a street.

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Answer

- True. A cluster of trees can only reduce the noise level by 2 dB whereas green treatments on buildings can reduce it by 4.5 dB. A 15m vegetation belt of 1.5m height can reduce the noise levels by 6dB (see lecture), although it is not very convenient for a street…

Conceptual questions

14. Noise barriers are most effective closer to the source than at a distance from the source, or near the receiver.

Conceptual questions

14. Noise barriers are most effective closer to the source than at a distance from the source, or near the receiver.

Answer

- True. Barriers are most effective close to the source or receiver, and must thus be placed as close as possible to the source or receiver.

Conceptual questions

15. The effect of the ground on noise abatement is also caused by diffraction.

Conceptual questions

15. The effect of the ground on noise abatement is also caused by diffraction.

Answer

- True. Brick lattices can be built alongside roads to decrease the coherence of the sound field (noise scattering). Helmholtz resonators can also be used for sound absorption.

Questions?

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