

Acoustics with Evergreen

Acoustic features of Evergreen Walls

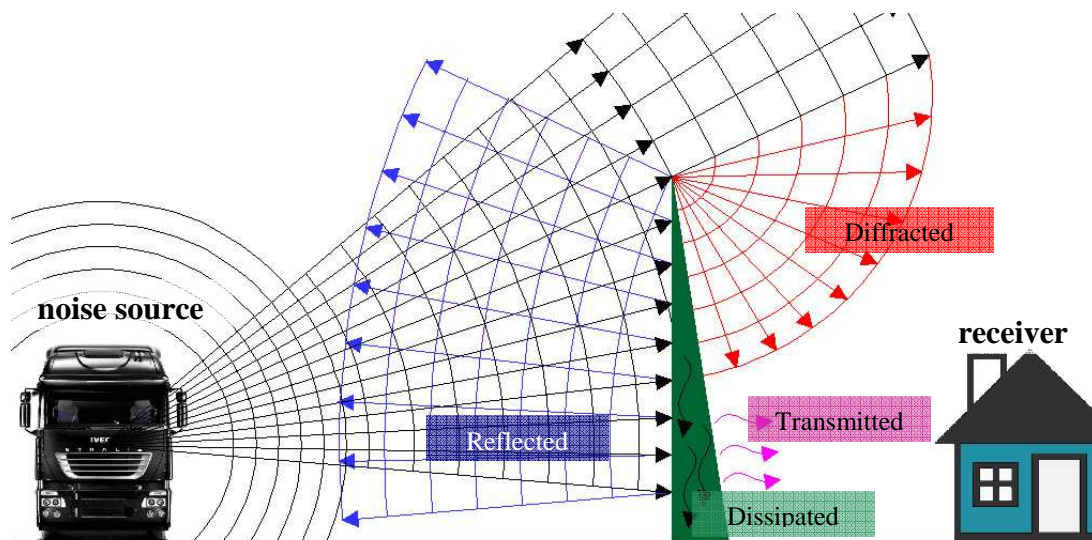
The intrinsic characteristics of Evergreen Walls make them be excellent elements for noise reduction of high energy sound sources such as roadway traffic, railway traffic, factories and productive plants.

Any wall located besides a noise source (such the cars on a street or a train on a railway) provides four combined acoustic effects in respect to the total acoustic energy incident on it:

1. a part of this energy is transmitted through the wall into the external environment;
2. a part is diffracted from the top of the wall and re-directed into the external environment.
3. a part is reflected towards the road;
4. a part is dissipated inside the wall itself.

Translating into equations:

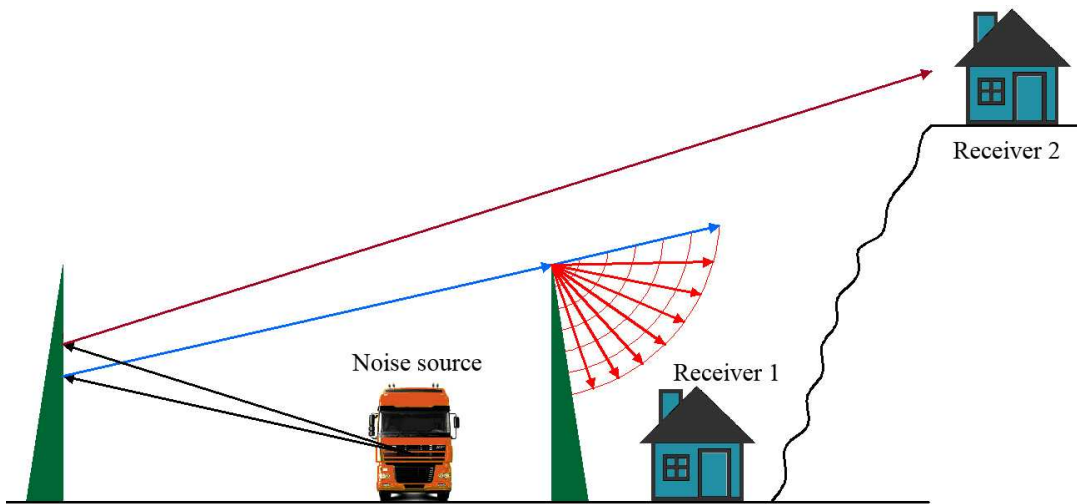
$$E_{incident} = E_{transmitted} + E_{transmitted_by_diffraction} + E_{reflected} + E_{dissipated}$$



The main purpose of an acoustic barrier is to protect the environment from noise coming from high energetic sources of sound.

It happens that if the insulation of a barrier is sufficiently high, the majority of sound immitted into the environment is due to diffraction phenomenon, which results practically a big challenge for any sound mitigation project.

In addition, the introduction of a barrier besides a roadway or a railway has the counter-effect that a certain amount of the incident energy on the barrier is reflected back towards the sound source. This reflection can compromise the comfort of people running that way, especially if multiple reflections occur in a close tunnel. Most important in order to respect noise immission limits, reflected sound can be directed towards an elevated receiver or, in case of facing barriers towards the noise barrier itself with a low incidence angle, thus increasing transmission by diffraction. Reflected energy can also cause serious noise emission problems at the end of a tunnel or at the end of facing barriers, where a large amount of reflected energy is redirected into the external environment.



For any sound barrier, the dreamspace is thus that the most possible amount of energy is dissipated inside it, :

$$E_{incident} = E_{transmitted} + E_{transmitted_by_diffraction} + E_{reflected} + E_{dissipated}$$

So that:

$$E_{incident} \rightarrow E_{dissipated}$$

Evergreen Walls are excellent devices to reach this ambitious target, being able to leverage their intrinsic physical characteristics on acoustics benefits.

All Evergreen products can benefit of the highest insulation class (class B3) reported in the EN 1973-2 standard. The high mass of the elements provide high insulation till the lowest sound frequencies. This characteristic is very useful for the most different noise conditions that can practically occur.

The absorbing earth top present in almost all Evergreen products makes it possible to have a **higher reduction of the diffracted energy respect to more conventional noise barriers** of equal height. In addition, various innovative solutions (most of them patented) can be provided in order to further reduce diffracted energy.

Evergreen products can solve reflection issues with elements capable of very high absorption coefficients. For example, **Evergreen Macro is certified A3 class** in respect to EN 1973-1 standard and provides **high energy absorption in the whole sound spectrum**, from the lowest to the highest frequencies. This characteristic makes this product (and the other Evergreen products) suitable for a broad application range, from highway noise mitigation to sound absorbing tunnels.

Main applications which Evergreen walls can be conveniently used for:

- **Noise barriers for roadway traffic;**
- **Noise barriers for railway traffic;**
- **Noise barriers besides factories and productive plants;**
- **Sound absorbing tunnels.**

Acoustic consultancy provided by Evergreen

Based on the experience of its members and with the support of a net of consultants and Universities, Evergreen can provide the client with a consultancy service in the main areas of civil acoustic engineering, providing a support service to designers and administrations. Evergreen offers also a consulting service to building materials producers for product acoustics innovation.

Examples of services provided:

- traffic noise mitigation projects;
- support to public administrations for environmental acoustic mitigation design;
- insulation design of buildings;
- room acoustics design (conference halls, auditoria, churches, gymnasias, etc.);
- support to designers for materials and finishing choices for improved acoustic performances;
- acoustic innovation support to building elements producers.