

New Metal Fabrics Take the Light Side

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Weight and energy are important issues for ecologically benign construction processes. Achieving better performances with less material becomes one of the major goals in the market place.

iO Interdisciplinary Objects is an engineering bureau from Germany that develops and modifies metal wire cloth for the demands of the building industry.

Stainless steel fabrics, for instance, can be used for claddings, suspended ceilings, and various kinds of coverings and partitions. Because large areas can be bridged with these lightweight, and durable materials they suit resource-efficiency in architecture and design. In a similar way to common textiles, metal fabrics are made on special looms. By carefully selecting wire and mesh dimensions a wide range of applications can be covered.

To provide mechanical stability, the fabrics are mounted either onto frames or tensioned between poles or anchors.

Facing the Elements

Metal textiles are suitable to protect against the elements. They can be used similar to plastic netting or canopies usually installed above swimming pools, shopping malls, parking lots and the like.

Light

Shadings made from metal fabrics are not be harmed by sunlight or heat. They are highly reflective and because of their low overall mass do not store much heat to radiate upon the area underneath.

Twisted strips of fabric made from highly reflective wires are used for "light-conveyors". They distribute natural daylight into inner sections of large working spaces. Thus, they improve the areas' overall illumination level without extra electric lighting.

Rain and Wind

A tilted roof above a walkway, for example, made out of fine, dense fabric will prevent rain from dripping directly through.

Marine environments are very windy and the salt-laden humidity is highly corrosive for most materials. Windbreaks and lightweight shading roofs for beach resorts or golf courses, fabricated from special stainless steel alloys are extremely resistant against such chemical attacks.

Sound Attenuation: A Street Tunnel Project in Germany

Metal fabrics have unusual acoustical properties if combined with other materials. At the entrances of a newly constructed street tunnel in Germany, a highly effective noise attenuation (≈ 10 dB) was demanded. Together with the planning architects iO developed a solution based on coarse stainless steel mesh.

On the wedge-shaped side walls of the tunnel's entrance mesh panels (grade 316) were installed. They perform in conjunction with sound absorbing mats made from recycled polyurethane foam. Mesh and mats were mounted separately. First, the absorbing material was anchored directly onto the raw concrete walls. Second, the metal panels which weigh only 6.5 kg per m² are stretched vertically 200 mm apart from the absorbent. The acoustic behavior of the system as a whole is significantly better than that of the foam mats alone.

Additionally, this new type of cladding shows further qualities. If seen side-ways - i.e. the normal perspective of moving car passengers - the mesh panels appear as a closed surface. Because of an open area of approx. 60 % the paneled walls display their dark background if seen from a frontal point of view. Owing to the high reflectivity of stainless steel the overall amount of street lamps necessary to illuminate the sidewalks was reduced by 20%.

Thus, the mesh cladding helps to save investment and energy costs. Because dirt does not stick to the round surface of the wires the panels need less cleansing than flat systems.

Free Standing Walls

Acoustic pollution caused by traffic is annoying, especially in suburban areas. Free standing sound attenuating walls may be a remedy. In addition to systems that use perforated sheet metal iO has developed relatively lightweight, and effective "cushion-modules". These are swelled panels with stainless steel fabrics on either one or both sides. They can be filled with shredded rubber tires or other suitable porous absorbents. A typical element have a thickness of around 150 mm and comes in sizes of 2.50 x 1 m.

Environmental Considerations

Metal fabrics address ecological issues in several ways.

- They are lightweight, thus using less material overall. Tension mounting techniques minimize the weight of supporting substructures.

- Once installed, their extraordinary durability and mechanical strength ensure a long lasting performance.
- As metal fabrics can not burn, and aren't coated with paint or chemicals, in case of a fire, they will not release toxic substances into the environment.
- Atmospheric pollution and UV-radiation will not change the materials' properties and performance. Fabric elements can stay in place for years even in harsh conditions.
- The fabric and its fixtures are usually made of the same type of metal. For recycling disassembly is not necessary because 100 % of the material is re-usable through a metallurgical process.
- In case of material systems for sound attenuation, the absorbents are never bonded to the fabric by glue or other chemicals. Thus, they can be easily separated by mechanical means.
- Maintenance is a key-issue for the longevity of any product. Because of the minimal surface adhesion of stainless steel, paint and dirt will be repelled. Thanks to its mechanical and thermal stability, pressurized steam or water can be applied without deforming or destroying the material.

Résumé

Metal wire cloth have a potential as serious building products. The examples shown depict only a small section of the wide range of promising applications.

iO Metal Fabrics for architecture provide

- 1) solutions that cope with the architects' demands for uniqueness and functionality.
- 2) products that meet the users' expectations about durability, maintenance and cost efficiency.
- 3) contributions to a marketplace that needs ecologically sound concepts for its further development.