

A Showroom with a *Mesh Structure* in Roppongi, Tokyo: Design and Construction

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Abstract

The Roppongi 7-Chome Project is a small-scale showroom building that is being planned for construction in Roppongi, Tokyo. Our design concept, which is based on an image of future life, is a building that is composed of translucent walls and roofs. We have specifically sought to create a new spatial effect using wall panels of translucent aluminum filled with fine holes that produce a gradated pattern by gradually changing the hole layout, as shown in Fig. 1

With this concept in mind, we created the space using a structural system called a *mesh structure*. The mesh structure consists of panels made of steel flat bars formed into a lattice shape (Fig. 1 and Fig. 2). The mesh structure is similar to a reinforced concrete boxed-shape wall structure or cross-laminated timber (CLT) panel, in that it can also be constructed as a wall element for building construction. However, for the mesh structure, the projected area of the wall element is much smaller than the previously-mentioned methods; therefore, our design concept can be implemented.

The panels are prefabricated to a size that is easily transportable and are bolted together on-site. They are braced to ensure planar rigidity and to reinforce the flat bars against buckling. We performed topology optimization for the brace layout considering fabrication constraints, ensuring the brace layout within the mesh structure could be automated while still reflecting the designer's ideas. This method allows detailed structural design to be completed quickly once the basic architectural design is finished.

Because factory-produced panels are susceptible to deviations caused by factors such as welding distortion, a 10 mm clearance at the joint between each mesh structure panel is provided. A filler plate can then be inserted between the panels when they are bolted together.

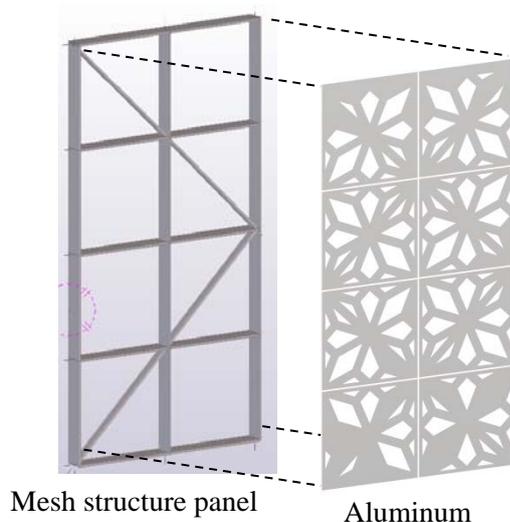


Figure 1: Conceptual diagram



Figure 2: Mesh structure panel after fabrication