Tensegrity Structures with Integrated Street Lighting

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As a product and interaction designer Salomé's role is to work with many different specialists and disciplines in Arup. These multidisciplinary projects demand a clear and quick exchange of knowledge and ideas, and a tight integration of products and solutions.

Keywords: *Tensegrity, Lightweight structure, Floating compression, Pre-stress, Integration, Interactive lighting.*
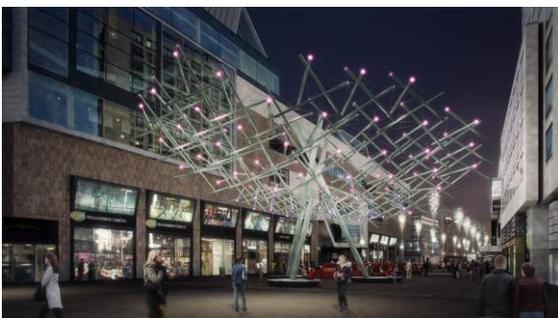
1.   Introduction

The Grote Marktstraat in The Hague is being completely refurbished and the municipality requested a special lighting solution for the street. Arup proposed to develop tensegrity structures with integrated fixtures, providing both functional and aesthetic lighting that respond in a dynamic way to the presence of people on the street.

2.   Content

Arup designed the lighting elements as a tensegrity structure. Tensegrity, or floating compression, is a network of cables that creates a geometry under a certain tension which ensures to position struts in such a way that they do not touch one another. The struts press outwards against nodal points in the tension network. In this way it seems as if the struts are floating. The total plan contains two different tensegrity designs. Both structures are based on the connection of 'tripod' modules: a set of three compression struts within a network of nine cables. The large tensegrity 'chandeliers' are structures where these modules are linked in a horizontal plane. The smaller vertical lighting elements are tensegrity structures where the modules are connected by putting them together in the vertical direction, like building a tower.

Lighting fixtures, providing either white or coloured light, are integrated in the structure. The white light provides static, functional lighting, but the coloured light responds dynamically to the amount of people in the street and their position. This results in an ever changing image, both in colour as in light intensity.

The position and orientation of the tensegrity are crucial elements in ensuring that the lighting is directed to the right places and meets the lighting level requirements of the municipality.

Fig. 1: One of the large tensegrity 'chandeliers'

Integrated lighting fixture

Electrical cabling

Connection structural cables to strut
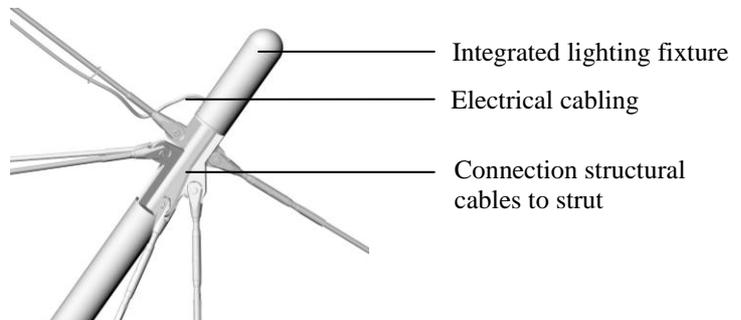
Fig. 2: Integration of the lighting in the tensegrity.

Conclusions

The perceived value of the solution sits in the complete integration of all the different elements. Close cooperation of several Arup teams resulted in a balanced structure with all the electronic hardware being integrated and adapted to the shape. Here, the structure becomes art.