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Rob Nijssse, born 1953, received his civil engineering degree from the University of Delft, NL. He works for the Consultants Company ABT, Arnhem, NL, and from 2007 he became Professor at the University of Delft, NL. His main area of research is related to the structural engineering of glass.

Summary

Glass is more and more accepted as a structural material. Glass floors and especially glass facades are widely used in modern architecture. In this paper the translation of other structural elements like beams, bridges and even columns into an all glass structural element is discussed and illustrated by experimental applications. Prototypes of these all glass structural elements are tested on structural integrity in the laboratory of the University of Delft (NL).

Keywords: glass, structure, beams, columns, curved glass facades.

1. Introduction

Glass is a fascinating material: it combines transparency with a potential high bearing capacity and, most striking, is waterproof! However the material behaviour under tensile loading is dangerous; it is linear elastic but at breaking it loses its cohesion completely. A structure built up from single layer plates of glass is therefore an unsafe structure, if one part fails the complete structure will collapse. We have to make safe structures and that is why structural glass is always laminated, that is built up of various layers, at least two but preferably three or more.

1.1 Glass cable stayed structures

For the more spectacular structures like cable stayed structures we can only dream like in this science fiction version of the future city bridge.

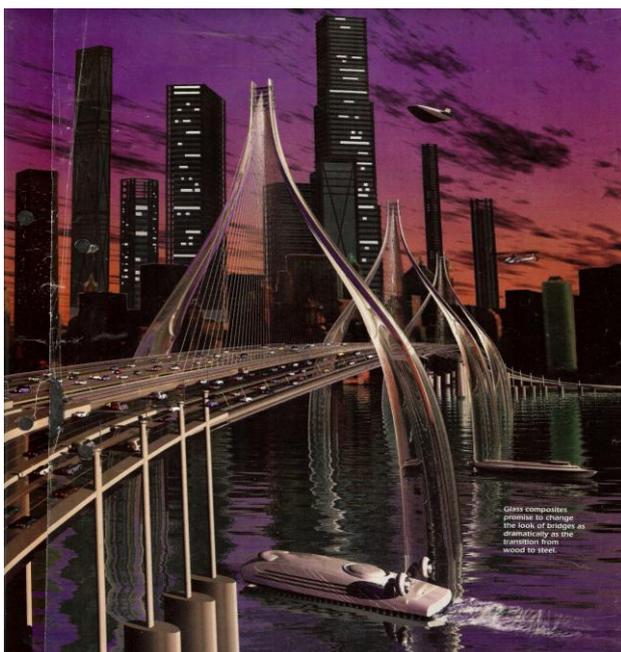


Fig. 1, A science fiction traffic bridge with glass pylons



2. Glass columns

Although some experimental glass columns in the shape of + (cross) or a flat panel are already made, the, in my opinion, first real glass columns has to be built yet. A real column should have a large vertical bearing capacity, have a good buckling or torsional resistance and should certainly be robust. Tests on H-columns are described.

3. Curved glass panels in facades.

Confronted with a serious question of the architectural firm OMA to make structural proposals with at least as possible steel elements for a big window; 12 X 25 meter in the Casa da Musica Theatre in Porto (Portugal). Finally we choose corrugated glass panels.

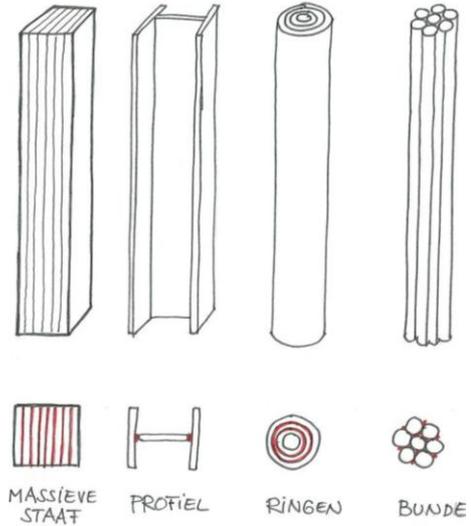


Fig. 3 The corrugated glass facade of the Taipei Theatre.