

# Study on the key issues of the wheel-spoke shaped pretension structure system

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## Abstract

The wheel-spoke shaped pretension structure which is one of the architects' favorite structure types has the advantages of reasonable stress, beautiful design, and it can fit with the architectural aesthetics smoothly. Through studying on the geometrical parameters of the wheel-spoke shaped pretension structure, we find out the rational ratio range of compression ring outside to the tension ring inside. In order to improve the structures' bearing performance, we also bring out the idea that the structural boundary can be misaligned with the architectural boundary. Besides, we find that the support column in the place of the compression ring outside can improve structural stiffness, and we analysis the column's influence to the structural bearing performance. At last, by studying the suspended column's influence to the structural bearing performance and architectural sight line, we figure out the suspended column's rational height.

**Keywords:** The wheel-spoke shaped pretension structure; geometric shape; height difference of saddle; support column; suspended column.

## 1 Introduction

The wheel-spoke shaped pretension structure which is one of the architects' favorite structure types has the advantages of reasonable stress, beautiful design, and it can fit with the architectural aesthetics smoothly. The structure is from the bicycle wheel. The inner pull ring and the outer

pressure ring are connected by radial cables, forming a self-balancing system. The structure has formed two basic systems, inner concave and outer convex, in the development process. The two systems are not only different in shapes, but also the force performance of the structure<sup>1-7</sup>.