Study On Stability of Single-Layer Aluminum Alloy Structure and Shear Capacity of Joints

Yueqiang Zhang

College of Civil Engineering, Tongji University, Shanghai, China

Architecture Design & Research Institute of Tongji University, Shanghai, China

Jiemin Ding, Zheng Zhang

Architecture Design & Research Institute of Tongji University, Shanghai, China

Contact:52zyq@tjad.cn

Abstract

The Chongming comprehensive training hall adopts a single-layer aluminum alloy spherical shell structure with a rise span ratio of 1 / 9, which is a small rise span ratio structure. Through the selection of structural system, this paper introduces the composition of single-layer reticulated shell structure, the relationship between structure and architectural modeling, indoor space and architectural lighting. Combined with the small rise span ratio structure, the elastic and elastic-plastic ultimate bearing capacity of aluminum alloy reticulated shell is studied. It is suggested that only the elastic-plastic ultimate bearing capacity of aluminum alloy reticulated shell should be checked, and the ultimate load factor should be 2.0. The failure mode and ultimate shear capacity of the joints are obtained by shear capacity test.

Keywords: single layer aluminum alloy spherical shell; small rise span ratio; elastoplastic ultimate bearing capacity; plate joint; shear capacity.

1   Introduction

The Shanghai Chongming Sports Training Bases is located in Chenjia Town, Chongming District. For the comprehensive training stadium, its roof adopts a 5m rise spherical shell structure with aluminum and steel. The roof size is 45m x 48m with a rise span ratio between 1/9 to 1/10, which is close to the preferable arch axis. For the natatorium, its roof adopts a single-layer 4.5m rise cylindrical shell structure with aluminum. The size of the roof is 45m x 48m with 1/9 rise-span ratio. The single-layer reticulated aluminum alloy shell structure is adopted for all roofs. (Fig.1 and Fig.2).
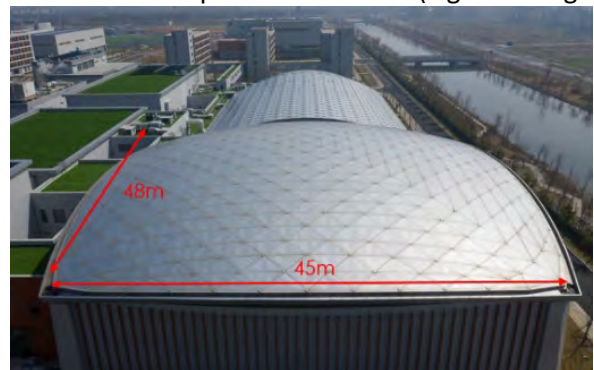

Figure 1. Building dimensions