Study on Mechanical Property of Reticulated Shell Structure Canopy Considering Elevated-effect of Viaduct in High-speed Rail Station

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Abstract

Some high-speed rail stations use reinforced concrete reticulated shell as its canopy structure in China. This structure has advantages of beautiful shape, large span and convenient maintenance. This paper mainly studies the influence of the viaduct structure on mechanical property of reticulated shell structure upper, and establishes the overall finite element model of station including the viaduct and canopy structure. The study results show that due to the relatively large structural stiffness of the viaduct, it can select a separate model of the canopy from the whole station structure to analysis, and can meet the safety requirements of the canopy structure.

Key words: reticulated shell structure; viaduct; elevated effect; rise-span ratio; double-columns.

1. Introduction

Reticulated shell structure belongs to curved space grid structure, which has the multiple advantages of simple construction in beam structure and reliable force of thin shell structure. It can cover relatively large span and has rich and colorful modeling, and can be played freely according to the architect's creative intention. It is deeply favored by architects.

Built in 1957, the Little Sports Palace in Rome (Figure 1) has a spherical dome on its roof and a circular plane diameter of 60 meters. It is famous for its beautiful dome ceiling modeling around the world. The Auditorium of Tongji University was built in 1962 (Figure 2), which is an assembly integrated concrete reticulated shell structure. The hall is 40 meters wide and 56 meters long. The diamond-shaped structure grid in the arched roof is completely exposed, which is very rhythmic, achieve the result by different methods of the Little Sports Palace in Rome.

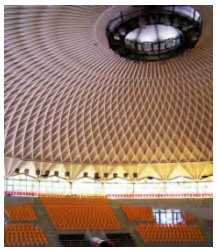

Figure 1. The Dome of Little Sports Palace in Rome
Figure 2. The Auditorium of Toni University

Reticulated shell structure is also widely used in high-speed railway station. For example, the waiting hall roof of Tianjinxi Station built in 2011 (Figure 3) adopted cylindrical single-layer oblique steel

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