# Determination of Mixing Principles of Precast Reinforced Concrete Structures with Hybrid Connections Based on Elastic Displacement Control of Small Earthquake

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## Abstract

Precast reinforced concrete structures have the advantages of easy control of component quality, high construction efficiency,small environmental impact and economy in manpower.However, precast buildings are generally used in low-intensity areas due to limited overall stiffness, and the seismic performance under large earthquakes is weaker than cast-in-place structures. China is also a country with frequent earthquakes. It is especially important to study the response of precast reinforced concrete structures under earthquakes.In this paper,precast connections and cast-in-place connections are used to mix and cross reasonably in the height and plane (not in the same joint) of structure to form a new type of structure of high-rise precast reinforced concrete frame structure with hybrid connections. This type of structure can not only rely on the strength of cast-in-place reinforced concrete joints to ensure the rigidity and damping, but also make full use of the designability of the assembled joints.In this paper, we use plane frame model with the semi-rigid joints to derive the expression of the limit value of the stiffness coefficient of the semi-rigid joints when the single-layer structure reaches the elastic maximum interlayer displacement angle limit. At the same time, the calculation program of multi-layer model is obtained by MATLAB programming, and then the variation law of interlayer displacement angle with semi-rigid coefficient is obtained. And the expression of the limit value of the stiffness coefficient of the semi-rigid joints required when the structure reaches the elastic layer interlayer displacement angle limit is obtained by numerical regression.Finally, the ETABS is used to model space frame structures, and the elastic response of different arrangements and stiffness values of semi-rigid joints is compared to obtain the preliminary mixing principles of precast reinforced concrete structures with hybrid connections. The results show that the elastic response of structures with the semi-rigid joints is better when the semi-rigid joints are arranged evenly along the height. The influence of the arrangement of the semi-rigid joints in the plane on the elastic response of the structure has a large relationship with the number of semi-rigid joints, but has little relationship with the arrangement position of the semi-rigid joints in the plane.This paper also gives the expression of the range of the stiffness of semi-rigid joints when the interlayer displacement angle of the plane frame reaches the elastic stage limit, which provides a initial estimate for the stiffness of precast reinforced concrete structures with hybrid connections.

Key words：precast reinforced concrete structure，semi-rigid joints，mixing principles，interlayer displacement angle，small earthquake.