Review of existing high-rise shear wall structure appraisal and reinforcement

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Abstract

Among these buildings which need to be appraised and strengthened urgently, there are many high-rise buildings. With the increase of fortification intensity, how to improve the seismic performance of the previous high-rise buildings under the current seismic risk, what measures and countermeasures should be taken to improve the seismic performance of such buildings are the concerns of the government and residents, and also the urgent need of this topic. Solve the problem.

Keywords

Appraisal;reinforce;High rise building.

1. Research background

After the fortification intensity increases, the problems faced by the original and existing buildings are as follows: First, the earthquake action on the buildings will be greatly increased, the bearing capacity of the buildings will be seriously insufficient, and the anti-deformation capacity of the structures will be insufficient. Second, as the intensity increases, the ductility of buildings is insufficient, and the seismic grade of buildings needs to be improved. So whether the original and existing high-rise shear wall structure can achieve the fortification goal, how to improve the seismic performance of buildings before the current seismic risk, what measures and countermeasures should be taken to improve the seismic performance of such buildings, is the concern of the government and residents, but also the problem to be solved.

2. Identification method

The two-stage appraisal method is adopted in the current appraisal standard, which combines the seismic measures with the requirements of seismic checking closely. It shows that the comprehensive seismic capacity of the structure is an organic combination of bearing capacity and deformation capacity.

1) First level appraisal

The first grade appraisal is a comprehensive appraisal based on macro-control and structural appraisal. Its appraisal content is less, the method is simple, easy to grasp and ensure safety.

2) The second level appraisal second level appraisal is mainly based on the aseismic checking calculation and combined with the structural influence. It was identified at the first level.

Carried out on the basis of. When the bearing capacity of the structure is high, some structural requirements can be relaxed appropriately, or when the seismic structure is good, the bearing capacity requirements can be reduced as appropriate.

3. Overview of reinforcement methods

(1) Routine reinforcement method of enlarging cross-section: by enlarging the cross-section area of the original concrete member or adding reinforcement to make the new part and When the original members work together, the bearing capacity and stiffness of the members can be effectively improved, the seismic frequency of the members can be changed, and the safety performance of the members can be improved. The method is simple in construction process, reliable in force and relatively low in reinforcement cost. It can not only improve the flexural and shear resistance of components, but also can be used to repair the damaged section of concrete components to improve their durability, but also need to support formwork, large wet work, long maintenance cycle, to a certain extent reduce the use of building space, and have a greater impact on the surrounding environment. It is applied to beams, plates, columns and other structures and general structures.

The outer section steel method is a strengthening method that the section steel is wrapped with the section steel outside the component, in which the wet method means that the section steel and the component are bonded with the original component by the adhesive such as latex cement and epoxy resin, and the new section steel and the original component work together as a whole. The effective transmission of shear force can not be guaranteed.

Bonding steel reinforcement method: using special bonding agent to bond the steel plate with the original component can make the reinforcement system and the original component form a good whole, uniform force, no stress concentration phenomenon.

Fiber cloth reinforcement of concrete structure: is a new application of external bonded high-performance composite reinforcement method, it uses resin bonding materials to bond carbon fiber sheets to the surface of components, so as to achieve the purpose of strengthening structural components.

(2) Energy dissipation and isolation reinforcement: energy dissipation devices are installed in the lateral force resistant members of the structure, and the energy dissipation devices are used to dissipate the energy input into the structure by the hysteretic deformation or friction caused by the relative velocity or displacement of the energy dissipation components at both ends of the structure, so as to reduce the seismic response of the main structure and achieve seismic resistance. The purpose of it. Energy dissipation and seismic strengthening technology is a reasonable, efficient, safe and economical engineering seismic strengthening method developed rapidly in recent years. The common energy dissipation devices are friction dampers, metal dampers, viscoelastic dampers and viscous dampers.

Seismic isolation and reinforcement technology: it is to set up isolation layer between the foundation and the superstructure of the building or between the superstructure floors. The building will include three parts: the lower structure, the isolation layer and the upper structure. The isolation device is used to extend the natural vibration period of the structure and increase the damping of the structure to reduce the acceleration response of the building. The deformation energy of the structure is mainly assumed by the isolation device, but not by the relative deformation of the structure itself. Therefore, the energy transmitted to the superstructure during the earthquake is very small, so as to isolate the earthquake and reduce the seismic response of the structure.

(3) the new steel reinforcement system is first used in Japan. The strength of steel braced structure is improved moderately, and it has sufficient ductility and energy dissipation capacity. It is especially suitable for strengthening multi-story and high-rise frame or frame-shear structure. The steel support is installed outside the building. The reinforcement work does not affect the internal use of the building, will not cause waste of area, and has good economic and functional effects. Among them, the application of X support is the most common. The addition of seismic wall, including shear wall and wing wall, can effectively reduce the seismic action of frame columns, beams and walls with weak seismic capacity, reduce lateral displacement in horizontal direction, and improve the integrity of the

structure. During the construction process, attention should be paid to solving the problems of the connection between the new wall and the original frame, and how to deal with the foundation when the dead weight of the structure increases greatly after adding the seismic wall.

Mass tuned damper (TMD) is a passive damping control system composed of mass block, spring and damping system. TMD design can adjust the natural frequency of the substructure by changing its mass or stiffness so as to make it close to the basic natural frequency of the main structure. When the earthquake load or wind load comes, the substructure will produce an inertial force acting on the structure opposite to the direction of the structure vibration, so that the vibration response of the main structure will be attenuated and the vibration response of the substructure will be attenuated. Under control.

Buckling restrained brace (BRB) is composed of three parts: core element, restrained element and unbonded layer. The buckling restrained brace has set up restrained members around the brace bars, which prevents the brace bars from buckling under compression, and significantly improves the energy dissipation capacity.

KTB reinforcement method is similar to the attached concrete frame, but the attached frame is not an ordinary reinforced concrete frame, but a self-restoring frame structure composed of precast prestressed concrete beams and columns connected by prestressed connections. From the seismic performance point of view, the external frame uses bonded prestressed high-strength steel strands to tense the precast beam and column members into a whole. The prestressed connection joints can be opened and closed, and the deformation is concentrated in the joint of beam and column members, which can effectively avoid the damage of beam and column members themselves. This kind of prestressed joint can also realize the "flag-shaped" hysteretic curve with both energy dissipation and self-resetting capacity, which is helpful to improve the energy dissipation capacity and functional recovery of existing structures, and perfectly reflects the self-resetting technology.

In addition to the above methods, a comprehensive method can be used to combine the traditional reinforcement method with the new seismic isolation reinforcement method, which fully reflects the innovation of the subject.

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