Identification of serious quality problems with a residential floor reinforcement

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Keywords: Floor; Quality problems; Identification; Reinforcement method

Abstract: The problems and solutions encountered after the serious quality problems of the floor slabs are introduced. Through quality appraisal, effective measures are taken in a targeted manner, and the slab is reinforced by different methods for several different situations, and the shearing effect of the post-cast slab is well solved by adopting a new reinforcement method. In view of the design problems that should be paid attention to in strengthening floor slabs, some suggestions are put forward for reference in similar engineering designs.

Project Overview

The project is a residential building located in Weifang, Shandong Province. It has 34 floors above ground and 3 underground floors. The original structure adopts frame-shear structure and the foundation is pile foundation. The three-unit, three-story residential owner of the house found that there was a sand trap in the concrete of the roof of the living room floor. After the part was dug, the concrete aggregate and cement were found to be less and the sand content was large. The material has actually become a mortar, and the material is loose and the strength is low, as shown in Figure 1.

![Figure 1. Structural Plane Layout](image_url)

The original design plate of this part has a concrete strength grade of C40 and a plate thickness of 150 mm. It is a double-layer two-way reinforcement. The bottom reinforcement is 8@100, the negative reinforcement is 8@150, and the thickness of the protective layer of the steel is 15mm.
Quality Appraisal Results

The rebound method is used to detect the concrete compressive strength of the living room roof. According to the Technical Regulations for Testing Concrete Compressive Strength by The spacing of steel bars is 130~152mm, the thickness of concrete protection layer is 25~33mm, the diameter of steel bars is 7.5~7.6mm, the diameter of steel bars, the thickness of floor slab and the thickness of protective layer meet the requirements of current regulations. Rebound Method (JGJ/T23-2011), a total of 10 test areas are arranged on the floor, according to the concrete pumping provided by the entrusting party. Agent test report, the strength conversion value of the component test area is checked according to the pumping concrete;

The concrete core sample was subjected to compression test, and the partial concrete strength conversion value was 19.2 MPa ~ 38.4 MPa, which did not meet the original design strength requirements.

A line pipe is partially exposed on the site.

Floor Review Calculation

Calculate the load value: according to the original design and construction drawings of the project; the section size of the component and the strength of the concrete, according to the actual identification results on the site, the floor is fixed by three sides, and the simple calculation is simplified. See Figure 2

![Figure 2 Calculation sketch](image)

After calculation, the living room roof (1~4/D~G axis) reinforcement meets the requirements of national regulations;

Problem Analysis

According to the actual detection and calculation analysis, the defect is mainly caused by the lax control of the construction process and the irregular operation. During the construction, the template is not wet enough, the bracket is not strict, the slurry is leaking or the vibration is insufficient, the bubbles are discharged and the tamping is not well cured.
**Floor Reinforcement Treatment Plan**

Firstly, the slabs of the reserved parts are effectively supported, and the areas that meet the concrete strength requirements, C30, and the areas that do not meet the concrete strength requirements, C30;

The concrete in the original floor slab does not meet the requirements of the concrete strength grade C30 and the concrete thickness of the culled part. The concrete in the original slab remains retained and rusted. The reinforcement part is shown in Figure 3:

![Figure 3](image)

The defective part of the living room roof is recast by C40 expanded concrete. The deviation of the line tube on the living room board and the repairing part are combined with the reinforcement at the same time.

In order to ensure the reliability of the joints of the new and old concrete, and ensure the reliable transmission of the force, the loose concrete is removed at the intersection of the new and old concrete, and the interface agent is applied, and the original concrete surface is stepped (Fig. 4).

![Figure 4](image)
Key node design

Shearing problems between the joints of new cast slabs and shear walls:
In order to solve the shear resistance of the newly poured floor slab, the grooved steel pin is made every half meter in the shear wall part, as shown in Figure 5.

![Figure 5.](image)

The practice of connecting the new cast slab to the concrete beam:
The local concrete of the top of the original frame beam is dug, and the newly poured floor slab is anchored into the frame beam (see Figure 6). The anchoring of the floor slab reinforcement also solves the shearing at the intersection of the newly poured slab and the original frame beam.

![Figure 6.](image)
Practice of pipeline exposure:
First, re-adjust the exposed pipelines in the slab to the middle part of the slab, and cut off the loose concrete at the edges, then recast the C40 expanded concrete, as shown in Figure 7.

Treatment of the circular core hole:
The steel bar at the coring part has been cut off, so use short steel bars first.
The slab reinforcement is reinforced by a welded joint, and then the edge is reinforced.
Part of the concrete surface is cut, the original steel bars are retained, and the C40 is recast.
Expanded concrete, see Figure 8.

Summary
Through the identification of the slabs with serious quality problems, this project proposes a novel reinforcement scheme and effectively treats the key parts. The reinforced floor slab achieves a good reinforcement effect. It provides a good reinforcement method for concrete members that have recurred this quality problem in the future.

References


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