

Causes and Countermeasures of Concrete Floor Cracks in Civil Engineering Construction

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Abstract

In the process of building construction, concrete crack is one of the more common problems. All kinds of small cracks in the concrete floor slab are unavoidable and the impact caused by these cracks is limited. However, some large and deep cracks will affect the overall quality of the building, but also bury some safety risks. Therefore, in the actual process of civil engineering construction, it is necessary to make a reasonable analysis of the causes of the formation of cracks, and develop targeted measures to improve each link. This reduces the chance of cracks and ensures the safety of the building.

Keywords

Civil construction; Concrete; Floor cracks; Causes and prevention.

1. Introduction

Concrete is a very common material in civil engineering, in the construction process, cracks in concrete floor is also a relatively common problem. These cracks will affect the overall quality of the building to a certain extent, and also affect the safety of subsequent use. Therefore, in the actual construction engineering, according to the actual situation to analyze the causes of concrete cracks, and combined with the actual situation to develop reasonable and effective prevention measures. This can ensure that the construction process can be reasonable and efficient, in order to reduce the probability of concrete cracks.

2. The Form and Cause of Concrete Floor Cracks in Civil Construction

2.1. Form

2.1.1. Temperature Crack

One of the main reasons for cracks in concrete structures is that there is a relatively large difference between the surface temperature and the internal temperature of the concrete. Such temperature cracks are very common in some large-volume concrete structures. The main reason for the formation is that in the process of concrete hardening, a large amount of heat of hydration will be generated, and this heat of hydration cannot be dissipated immediately. This has led to a continuous increase in the temperature inside the concrete, and the inner shape has become a relatively obvious temperature difference. When the temperature difference reaches a certain level, tensile stress will occur on the surface of the concrete, and when the tensile stress exceeds the tensile strength, cracks will appear.

2.1.2. Construction Cracks

The level of construction technology is also an important reason for cracks in concrete. For example, in the construction process, the concrete vibrates or smashes improperly, or the concrete maintenance work is not in place, which may cause the concrete to crack in the later construction. At the same time, if the mold is removed too early, it will affect the elastic deformation of the floor. As the tensile stress continues to increase, when it reaches its maximum value, the floor slab is likely to break and then become a crack.

2.2. Cause

2.2.1. Material

Cracks in concrete structures are inextricably linked with materials. The reasons for the cracks caused by the material are analyzed from the following aspects.

- ① The type of cement. At present, various high-strength concretes have begun to be continuously used in engineering, which has caused the proportion of cement to continue to increase. High-strength concrete containing a lot of cement will release heat when it sets and hardens. At the same time, the concrete will shrink seriously, and then deform, which will eventually lead to cracks.
- ② Additives. In civil engineering construction, in order to ensure that the project can be delivered on time, some construction parties will add some admixtures to the concrete to promote the rapid hardening of the concrete [1]. Under normal circumstances, admixtures will not affect the quality of concrete, but if admixtures are added to concrete for a long time, it will easily lead to changes in the shrinkage of the concrete itself, and cracks will appear when the concrete shrinks strongly.
- ③ Mix ratio. Concrete is composed of cement, sand, water, and stones. The ratio of water to cement will affect the shrinkage of concrete to a certain extent. In general, the shrinkage is affected by the amount of water and cement. When the amount of water in the concrete is constant, the amount of cement increases positively with the shrinkage; when the water-cement ratio is fixed, the sand ratio increases positively with the concrete.

2.2.2. Design

Insufficient design can also cause cracks in the concrete floor. This is mainly divided into the following situations:

- ① If there is an uneven distribution of the overall structure in the design of the drawing, after the floor slab is built, an imbalance will appear under the action of shear. In the end, structural cracks appeared on the floor due to the imbalance of the structure.
- ② When designing the floor slab, if there is an inappropriate ratio between the height and the thickness, a certain shear force will be generated under the action of gravity, which will eventually lead to cracks in the floor [2].
- ③ If the materials are not selected according to the actual situation, they are only selected according to the design needs. This will lead to a decrease in the strength of the building, increase the weight of the steel bar, and squeeze the silicon structure around the steel bar, which will eventually lead to construction cracks.

2.2.3. Construction Technology

Civil engineering is inseparable from technical support in the actual construction process. The construction level of the construction personnel is also one of the reasons for the cracks in the floor. In the current environment of construction personnel requirements, most of the construction personnel have a relatively low level of education and do not have a comprehensive and correct understanding of the actual construction technology and construction quality. It is precisely because of this lack of comprehensive quality that the

constructors often make some mistakes in the construction, resulting in a decline in the strength of the concrete. For example, during the construction process, the concrete needs to be vibrated to ensure that the concrete can be fully mixed. However, if there are too many vibrating times, aggregate separation will occur, which increases the probability of cracks in the floor.

3. Treatment Measures After Cracks in Concrete Floor

For the retarded soil floor slab that has cracks, it is necessary to select a suitable method for treatment according to the specific form of the crack, the degree of cracking and other actual conditions to ensure the stability of the floor.

3.1. Micro Cracks

For some small cracks that have appeared, it can be repaired by the following steps:

- ① It is necessary to first wash the place where there are cracks on the floor surface with water to wash off the debris and stains on the surface, and to paint and seal the cracks to prepare for the next maintenance work.
- ② Carry out some necessary maintenance work on the cracks, deal with the small cracks in time, prevent the cracks from developing in a large area, and threaten the stability of the entire floor.

3.2. Large Cracks

For some large cracks in the concrete floor, simple oxidation work can no longer guarantee the stability of the floor. At this time, trenching and filling work is required. The specific operation is to dig the crack into a construction treatment groove along the extension direction of the crack, and then clean the debris in the groove. After cleaning, fill in the groove with cement mortar. It should be noted that after the filling and hardening of the cement mortar, the corresponding maintenance work must be done to ensure that the concrete maintains its due strength.

3.3. Deep Crack

For those concrete floors with deep cracks, if they are not treated in time, this is likely to affect the overall floor structure. Therefore, the strength of the concrete and the overall structure of the building should be ensured at the same time during the restoration. The work can be divided into the following steps:

- ① Reinforce the floor slab first. The floor slab with such cracks is already in a very unstable state. In order to ensure the safety of the overall building, reasonable measures must be taken first. Reinforce the floor slab to prevent various accidents and cause greater losses.
- ② Set up a layer of steel mesh at the position where the crack appears, and pour concrete on the surface of the mesh. After the pouring is completed, the post-poured concrete is reinforced by high-pressure work.

4. Preventive Measures for Cracks in Concrete Floor Slabs During Civil Engineering Construction

4.1. Strengthen Material Management to Ensure That Materials Meet Requirements

Material is an important factor affecting the quality of concrete. During construction, the construction party needs to manage materials reasonably. Implement reasonable management from the three aspects of material introduction, use, and storage to ensure the quality of materials [3]. First of all, the construction party needs to strengthen the connection with

various departments and control the quality of materials in the stage of material procurement. For example, a material procurement team composed of technicians and purchasers can be established to select materials that are cost-effective and whose quality meets actual construction requirements. And it is necessary to ensure that the entire process of material procurement is open and transparent. This will not only improve the quality of the materials, but also avoid corruption among the procurement staff. Secondly, after the material purchase is completed, it needs to be proportioned in accordance with the requirements and in accordance with the specified ratio. And in the process of perfecting the ratio, it is necessary to ensure that the strength of the concrete meets the engineering requirements. Finally, it is necessary to store the temporarily unused materials in a suitable place. This saves engineering costs while ensuring that the materials maintain their original properties and will not affect later use.

4.2. Improve Construction Preparations and Optimize Construction Design Drawings

In the early stage of construction, in order to ensure the smooth progress of the construction, the construction party will generally study and analyze the drawings, and make various preparations according to the drawings to ensure that the subsequent work can be carried out smoothly [4]. The pre-construction preparations can start from the following aspects: First, before the construction, the construction party needs to conduct on-site surveys against the drawings and grasp the geological conditions of the project construction environment in order to select suitable materials for construction. At the same time, the survey can also study the unreasonable places in the drawings to modify and improve them together with the designer to ensure that the drawings truly meet the actual construction requirements [5]. Secondly, the designer should investigate the overall project environment, geographic location, geological conditions, ecological conditions, etc. before designing. Take these into account in the design of the entire concrete project to ensure the rationality of the design. At the same time, after completing the design, it is necessary to actively work with the construction party to find out the shortcomings in the design and make timely changes to avoid cost waste caused by later changes.

4.3. Strengthen Project Construction Management and Improve Construction Technology Level

In order to effectively reduce the occurrence of cracks in the concrete floor, after entering the construction site, the construction personnel need to strictly observe the following measures and use reasonable measures to ensure the rationality of the construction technology.

- ① Carry out construction strictly in accordance with the drawings provided by the builder, and no unauthorized changes to the drawings are allowed. Any detail changes must be discussed with the designer to ensure that they are feasible before proceeding. If there is a problem in the construction, it is necessary to discuss with the person in charge of construction, the builder, and the designer in time to formulate the best plan and then modify it.
- ② When using concrete to pour the floor slab, it is necessary to moisten the formwork with water before pouring, and then formally start pouring, and construct the post-pouring belt in strict accordance with the drawings.
- ③ When the floor slab needs to be cast in place, it is not only necessary to ensure that the concrete has been fully mixed, but also to ensure that the mixing time is appropriate to avoid excessive vibration and aggregate separation, which will affect the quality of the concrete [6].
- ④ After the cast-in-place work is completed, the surface of the concrete should be smoothed, and the maintenance work needs to be carried out correctly. The method is generally to cover the concrete surface with thermal insulation film or plastic film.

- ⑤ Do not remove the mold too early, and ensure that the concrete has sufficient time to solidify and harden, otherwise it will not only be prone to cracks, but also may bury potential safety hazards for subsequent projects [7].
- ⑥ When constructing in a harsh environment, pay special attention to concrete maintenance.

5. Conclusion

The actual safety and reliability of concrete floor slabs are both important factors that affect the quality of the building. Concrete cracks during construction have always been an important factor affecting the quality of floor slabs. Therefore, in actual construction, it is necessary to conduct in-depth analysis and research on the causes of cracks, and formulate reasonable preventive measures. By strengthening construction management, material management, drawing management, etc., the probability of cracks in the floor slab is reduced, so as to ensure the overall structural stability and safety of the building.

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