

Talking About the Causes of Massive Concrete Cracks and Prevention

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Abstract. In many of today's major projects, such as high-rise buildings and bridge, with its structure mostly by massive concrete structures. But the operation was found through the practice of conservation in the construction process, the massive concrete often cracks phenomenon, often cracks too large it will affect the mechanical properties of the structure, resulting in very serious consequences. So study how to control such a large volume of concrete there is such a dangerous crack this problem is vital. This paper analyzes the causes of the large volume of concrete cracks and introduced its current prevention and treatment of specific measures, be an explanation by a specific case, draw an important role in the development of large-scale structure of massive concrete crack prevention.

Keywords: Massive concrete; crack; structure; temperature control; conservation.

1. Foreword

The so-called massive concrete is the smallest geometric dimensions greater than one meter of concrete structures, concrete or those caused by chemical action due to internal material inside and outside the concrete temperature difference leads to shrinkage of concrete, causing cracks in the concrete harmful called massive concrete. [1]

In many of today's major projects, such as high-rise buildings and bridge, with its concrete mostly composed of large volume. But the operation was found through the practice of conservation in the construction process, the crack phenomenon often occurs too often crack will affect the structure and mechanical properties of large, causing very serious consequences. So how to prevent such a large volume of concrete so dangerous cracks appear in this issue is vital.

2. Cause of mass concrete cracks analysis [2]

Causes massive concrete cracks can be broadly divided into the following two categories:

2.1 Internal and external temperature difference

When were pouring concrete construction, the outside temperature changes of this impact is very large, when the outside temperature changes due to relatively large, at this time of massive concrete pouring temperature as the outside air temperature change, in general, outside the temperature is high, the pouring temperature is high, while the water surface of concrete structures will be distributed accordingly quickly, thus leading to the degree of inconsistency within and outside the gradual shrinkage of concrete cracks. Sometimes due to sudden change in weather reasons, resulting in rapidly increasing the temperature difference between inner and outer layers of concrete, such cases should take measures and methods of temperature control, to avoid this kind of concrete due to temperature stress caused by the temperature difference between inside and outside, leading to the destruction of massive concrete cracks. [3]

2.2 Contraction of the concrete

Since the chemical reaction occurs inside the concrete in the pouring process, after initial pour of concrete will shrink, and cause it to produce concrete shrinkage cracks, so that the occurrence of massive concrete crack damaged, mainly due to the contraction of the concrete caused by evaporation of moisture inside eventually resulting in the occurrence of cracks.

3. Prevention of mass concrete cracks

Factors leading to the destruction of concrete cracks there are many, the main consideration of the type of cement, mix concrete, pouring concrete measures and concrete in the conservation stage of the temperature difference between inside and outside control. [4]

3.1 In the choice of raw materials

As we all know tend to produce concrete shrinkage cracks in the early stages of construction, hardening occurs at this stage concrete, concrete cement hydration reaction with water, resulting in the concrete part of the volume is reduced. Thus water-cement ratio, aggregate and cement fineness thickness of concrete and other factors will affect the concrete cracks. [5]

3.2 In the pouring of concrete measures

For mass concrete placement scheme, except that each pouring concrete at the time to maintain continuity, but also for pouring concrete is covered with tamping each treatment, in addition to the full study should be the size of the concrete structure, where joint action of the embedded steel pipes and put-density and other factors. Develop a comprehensive layered pouring concrete raft foundation under this project the amount of concrete and concrete square single party volume.

3.3 The temperature difference between inside and outside the control measures in the concrete curing stage[6]

Must be fully taken into account in the massive concrete pouring temperature of the element of conservation, and timely control of their doing. When making temperature control to ensure that the concrete strength can be effectively increased, but also the need to fully consider the role of people in this part, the use of an appropriate artificial deformation caused by temperature control to prevent cracking of the concrete. [7]

According to the actual situation, decide what kind of temperature control methods to ensure the concrete inside and outside temperature is less than 20 °C, the phenomenon of concrete to prevent cracks. Construction process should be based on the temperature, the thickness of concrete, combined with temperature concrete, plastic film - conservation methods sacks covered by the specific results of calculation and temperature adjustment at any time. As the cracks in the concrete to prevent critical work, we must attach great importance to the conservation work of the large volume of concrete.

4. Mass Concrete Crack Control Case Study

In Kunming City Area affordable housing project as an example, the project net of approximately 216.49 acres of land, with a total construction area of about 680892.83m², housing up to 34 layers, total height 99.4m, and 34 layers based. Its main base using pile - raft foundation raft foundation thickness was greater than or equal to 1m, raft foundation concrete grade C40 impermeability of concrete strength, impermeability grade P8.

This project requires a large volume of concrete raft foundation of integrity is very high, so as to prevent the occurrence of massive concrete cracks is controlled in the following aspects in the construction process.

4.1 Staff organization

Because this project requires concrete pouring basement fully stratified according to avoid lien construction joints, concrete pouring continuously in order to be considered, must be reasonable to accelerate the construction schedule, but had to improve project quality, ensure safety in production, the quality control of the construction process , safety supervision, and management of the whole construction process were reasonable arrangement. [8]

Meanwhile, in order to ensure the quality of construction of mass concrete, will be concrete vibrators, leveling work and reinforcement of care, templates reinforcement work with reasonable operating personnel, conducted a two-shift schedule for construction of the project team personnel, to ensure that concrete construction continuity, quality assurance.

4.2 Select the number of pump

Taking into account the thickness of the project raft 1000mm-1600mm, while overall stratification method requires the use of placement, each having a thickness of about 350mm. Raft foundation single area of 650m² ~ 920m².

Using the formula $F \leq Q \times T / H$ is calculated to obtain the required number of truck. [9]

Where: F- structure plane area (m²);

H- Pouring concrete layer thickness (m), under normal circumstances ≤ 0.4 m, for pumping concrete ≤ 0.6 m;

Q- Pouring concrete volume (m³ / h ·units.);

T- Pouring concrete from the beginning to the continuation of the initial setting time (hours), which is equal to the initial set time minus the concrete transport time of the concrete.

4.3 Pouring concrete pouring process and order

Concrete pouring process. The project carried out pouring of concrete raft foundation process: Book concrete→Concrete mixer, concrete supply station stirring scene slump test, concrete strength test block, impermeability test block production→ Transportation of concrete→ Concrete pump feeding of concrete slump testing→→On-site production of concrete strength test block→ Concrete Pumping→ Cotton material→ Pouring massive concrete layered, layered vibrators→ Do flat concrete surface finishing, cleaning→ Pump and concrete delivery pipe cleaning→ Massive concrete insulation and conservation.

Concreting of the order. At the time of the raft foundation concrete is poured, it must be layered pouring from the short side direction to the longitudinal direction. Pouring first set of wells, gullies, elevator shafts, etc. carried out from the bottom, first pouring floor section, wait until the floor to get the tap, and then poured the side walls, and finally pouring raft foundation; facades, interior pools and other dead part of the turn on the hose, to be where the raft foundation concrete pouring tap, then pouring.

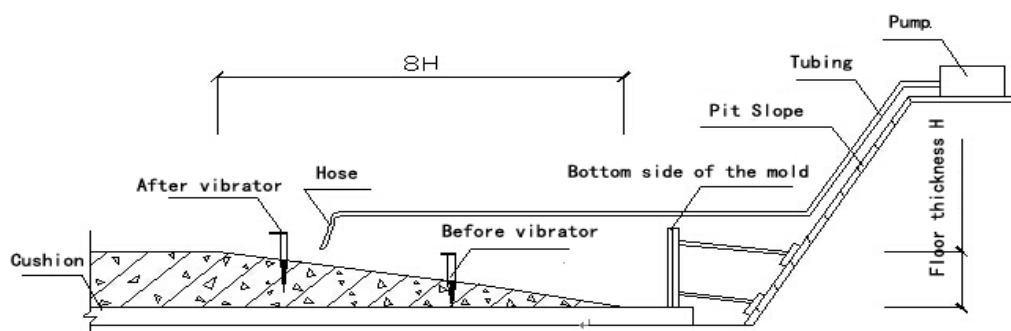


Figure.1 Raft foundation pouring schematic

4.4 Concrete vibrator treatment [10]

On handling concrete vibrator, this project uses flat vibrators, vibrator inserted in two ways, first using the plug-in vibrator vibrated concrete pouring before the start, when pouring into the top layer, the switch to flat vibrator vibrated in the longitudinal and transverse once, through such stones vibrated concrete surface will flatten, dense, in order to ensure that the effect of concrete vibrators.

4.5 Altitude Control

Using the reinforced steel frame Stand arrangement marks the first elevation control to control the thickness and elevation of the concrete pouring, while doing the usual, timely elevation for review.

5. Summary

This paper analyzes the causes of the large volume of concrete cracks and introduced its current prevention and treatment of specific measures, be an explanation by a specific case, in today's rapidly large concrete structure, how to combat this massive concrete crack this problem inevitable. Must take full account of the many factors that affect a large volume of concrete cracks, the main

consideration in the type of cement concrete materials, as well as measures than concrete pouring concrete cooperation, taking into account the conservation stage of internal and external factors such as temperature control of concrete to prevent cracks in massive concrete generation, ensure the stability of the concrete mass and structure. [11]

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