Discussion on Forming Reason of Concrete Cracks

Zhineng Tong
Jiangxi Science & Technology Normal University China

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Abstract. Fracture is a kind of effect of common reinforced concrete structure, concrete structure crack is the most common in the industry, is difficult to avoid the phenomenon of cracks, heavy then endanger the safety of the structure, and the use of the normal concrete light will influence the housing life. This paper classifies the cracks from different angles, and the forming reason of crack analysis.

1、Preface

Concrete crack is a common problems in building engineering, is a common phenomenon, a large number of engineering practice and modern science concerning the strength of concrete meso studies have shown that structures of crack is inevitable, it is a kind of material properties. Therefore, the scientific treatment of the crack problem is based on the study on the classification, crack, take effective measures, will be the degree of harmful cracks control in the allowed range. The following views on the causes of concrete cracks and control about us, and analyzes the causes and preventive measures and treatment technology of concrete crack.

2、Crack Formation Reason

Many forms and types of cracks, the ultimate solution to the problem of the crack in concrete, still need from the formation causes of cracks in concrete. The causes of the correct judgment and analysis of concrete crack is the most effective way to effectively control and reduce the concrete cracks.

2.1、The design factors
2.1.1 Design of structure in the mutant member section cracks caused by the stress concentration generated.
2.1.2 Design of prestressed cracks caused by improper component, component (eccentric, stress is too large).
2.1.3 The design structure of reinforced configuration too little or too thick cracks caused by (such as wall panels, floor).
2.1.4 The design does not adequately consider the shrinkage deformation of concrete member.
2.1.5 High grade of concrete used in design, caused by an excessive amount of shrinkage with ash, adverse.

2.2 Material factors
2.2.1 The aggregate volume of mud, resulting in the shrinkage of concrete increases. Aggregate gradation is harmful or take a gap graded inappropriate, likely to cause shrinkage of concrete increases, induced crack.
2.2.2 Commercial pumping concrete to prevent pipe blockage, selection of aggregate size small. Aggregate size is fine, needle plate more concrete content, ash content, per cubic with water increased, increasing the amount of shrinkage.
2.2.3 Admixture of concrete admixture, the improper selection, improper or content, serious increase in shrinkage of concrete.
2.2.4 Cement variety reasons, Portland blast furnace slag cement shrinkage than ordinary portland cement, fly ash cement shrinkage of high shrinkage value smaller, quick hardening cement contraction.
2.2.5 Grade of cement and concrete strength grade causes contraction, the higher the grade of cement, the fineness the thinner, early strength is higher greatly influenced on concrete cracking. The designed strength grade of concrete is higher, the brittleness of concrete is bigger, more easy to crack.

2.3 Concrete mix ratio factor
2.3.1 The design grade of cement or improper selection of varieties.
2.3.2 Mix ratio of water cement ratio is too large.
2.3.3 The more the amount per cubic cement, water is high, for the performance of cement slurry volume is large, the slump is greater, the greater the shrinkage.
2.3.4 Design of mixture ratio of sand ratio, water cement ratio caused by improper selection of concrete workability deviation, leading to the concrete from the mission, bleeding, bad water retention, increase the shrinkage value.
2.3.5 Mix design of concrete expansion admixture dosage improper selection.

2.4 Construction and site maintenance factor
2.4.1 On the spot pouring concrete, vibrated or inserted properly, the leakage of vibration, vibration or vibration rods withdrawn too quickly, will affect the compactness and homogeneity of concrete, induced crack.
2.4.2 High altitude pouring concrete, the wind speed is too high, the scorching sun exposure, concrete shrinkage value.
2.4.3 For large volume concrete project, the lack of two finishing, easy to produce surface shrinkage crack.
2.4.4 Large volume concrete pouring, the hydration calculations are not allowed, on-site concrete cooling and insulation work is not in place, causing internal concrete temperature is too high or the internal and external temperature difference is too large, the temperature cracks of concrete.
2.4.5 Site conservation measures are not in place, the early shrinkage cracks of concrete caused by dehydration.
2.4.6 Site template removal is undeserved, cause cracks or early form removal formwork.
2.4.7 Site prestress tensioning improper (ultra Zhang, eccentric), causes the concrete tensile cracks.
2.5 The use of reason (external factor)
2.5.1 The building foundation uneven settlement, settlement cracks.
2.5.2 The use of super negative load.
2.5.3 Not appropriate decoration, random removal of walls or hole, causing cracks.
2.5.4 The impact of the surrounding environment, acid, alkali, salt erosion of the structures, causing cracks.
2.5.5 Accident, fire, mild earthquake caused the cracks of structures.

3. Measures to Control the Cracks

3.1 Design measures
3.1.1 Should handle member resistance and discharge relationship in architectural design. The so-called anti is in the structure of constraint condition, no deformation enough leeway, powerful measures to prevent the cracks is taken, and the so-called put is structure is completely free deformation without constraint condition, has taken enough measures during deformation space.

The designer should flexibly use the anti - put combines the design principles, or against, or to put the main mainly. To choose the structure scheme and the use of materials.
3.1.2 Try to avoid the structure section mutation of stress concentration in the design should. As a result of structure or model reasons and not to, should give full consideration to adopt measures to strengthen.
3.1.3 The active use of shrinkage compensating concrete technology, the common concrete cracks, a considerable portion are caused by shrinkage of concrete. To solve the crack due to shrinkage, can be mixed in concrete expansion agent to compensate the concrete shrinkage, practice has proved, the effect is very good.
3.1.4 Pay attention to the structural reinforcement, in structural design, the designer should pay attention to the structural reinforcement configuration, especially in floor, wall and thin member should pay more attention to the number and the diameter of the structural reinforcement selection.

3.2. Compared with the selection of material and the concrete measures
3.2.1 Select the appropriate strength grade of concrete and cement varieties, grades according to the structural requirements, try to avoid using the early strength of cement with high.
3.2.2 Selection of excellent material, Ishihara graded sand, mud content should conform to the standard.
3.2.3 The active use of admixtures and concrete admixture. The mixture and admixture can obviously to reduce the dosage of cement, reduce work performance, improve the hydration heat of concrete and reduce the cost of concrete action.
3.2.4 Correctly grasp the concrete shrinkage compensation technique using the method. The expansion of different expansion effect agents should be sufficient to account for different varieties, different content to play, should be through a number of tests to determine the optimal expansion admixture.
3.2.5 Ratio design technician should go deep into the construction site with, on the basis of the construction site pouring process, the operation level of member section, etc., a reasonable choice of a good concrete slump, in the field of sand, Ishihara material quality, timely adjust the construction mixing ratio, the maintenance work of help improve component.

3.3 Site operation measures
3.3.1 Pouring work: pouring, vibrating bouquet to quickly put to slowly pull out, according to the different concrete slump correctly grasp the vibrating time, avoid excessive vibration or leakage of vibration, should advocate the use of two times, two times the vibrating finishing technology, to eliminate the concrete internal bleeding, moisture and air bubble.
3.3.2 Concrete curing: in concrete crack prevention, early maintenance work on the fresh concrete is very important. In order to ensure the concrete may be less shrinkage as early in the. The main component is moist curing control, for large volume concrete, conditional should adopt water or water conservation.
3.3.3 Concrete cooling and insulation work: for large volume concrete, construction should fully consider the cement hydration heat problem. Take the necessary cooling measures (buried heat radiating holes, water discharge heat), avoid the hydration heat peak appeared, reduce the peak. Pouring forming, should take the necessary storage heat preservation measures, surface covering film, wet sacks of maintenance, to prevent the temperature difference inside and outside temperature crack of concrete caused by excessive.
3.3.4 Avoid rain or strong wind in watered concrete.
3.3.5 To the underground structure concrete, early backfill, favorable to reduce cracks.
3.3.6 The summer should pay attention to the concrete pouring temperature, low temperature, and low temperature maintenance adopted into the mold.

To sum up, for the control of concrete crack is a comprehensive problem, need to go through with the design, supervision, construction and other aspects of the use of party.

4. Conclusion

Crack is a common phenomenon in the concrete structure, it not only can reduce the building impervious ability, influence building use function, but also can cause corrosion of the reinforcing bar, concrete carbonization, reduce the durability of materials, influence the bearing capacity of the building, but through the above analysis of concrete crack forms, causes control means, unknown, as long as in strict accordance with the requirements of design, material and construction standard, should be able to greatly reduce the possibility of concrete cracks, improve the quality of concrete. We still need to seriously study the concrete cracks, the distinction of construction cracks, a more
reasonable method to deal with all kinds of concrete, to ensure the safety of buildings and components, stable work.

References


