Summary of Anchoring Performance at High Temperature

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Abstract

It is of great significance to study the fire resistance of anchoring performance. At present, a number of anchoring performance fire tests have been carried out abroad, and more research results have been obtained. After the heating and cooling processes, the mechanical properties of steel and concrete and two the bonding performance of the person is seriously affected. Based on the principle of bonding and anchoring of steel and concrete, the main factors affecting different anchoring properties at high temperature are analyzed, and some problems are proposed.

Keywords

Under high temperature; Anchoring performance; Adhesion.

1. Introduction

In recent years, the number of fires and fire losses in China have been on the rise. Under fire, the change of properties of steel and concrete affects the mechanical properties of reinforced concrete structures. Under the action of high temperature, it not only changes the internal force and deformation state of the structure, but also forms a non-uniform temperature field and makes the material properties of the structure itself. Degeneration and damage occur. Bonding between steel and concrete is a complex interaction between steel and surrounding concrete, through which the stress between the two and the coordinated deformation are transmitted. Under the action of high temperature, the bond anchoring property between steel and concrete will be seriously affected and weakened.

2. Anchoring Principle

The bond between concrete and steel bars refers to the interaction between the steel bars and the surrounding concrete. It mainly includes the bonding of the length of the steel bars and the anchoring of the steel bars. For the deformed steel bars, the bite force is due to the intercalation of the deformed steel bars. And produced. Although there are also bonding forces and frictional forces, the bonding force of the deformed steel bars mainly comes from the mechanical bite of the protruding ribs on the steel surface and the concrete. The transverse ribs of the deformed steel bar are pressed against the concrete like a wedge, which produces a large mechanical bite force. The mechanical bite of deformed steel and concrete changes the way the interaction between steel and concrete [1].

3. Survey of Research on Anchoring Performance at High Temperature

In 2017, Wang Chaoyang [2] and others studied the effect of temperature on the bonding properties of steel and concrete. By making 30 standard cube test pieces, 8 temperature field test pieces and 15 center pull test pieces, the room temperature was completed(20 °C), 100 °C, 200 °C, 400 °C, 600 °C, standard cubic test block compression test and tensile crack test, drawn test piece temperature field test and center pull test. The effects of high temperature on the compressive strength and tensile strength of concrete were analyzed. According to the results

of temperature field test, a simple high-temperature central drawing test method was proposed. Based on this, the bonding properties of steel and concrete under high temperature were studied. Degradation law. Based on the Harajli model, considering the influence of temperature on bond strength, peak slip and failure mode of the specimen, a bond-slip constitutive model of steel and concrete at high temperature was proposed. The test results show that: the strength of concrete, the bond strength between steel and concrete decreases with temperature, but the steep drop occurs at 100 °C. The bond strength between steel and concrete at high temperature changes with concrete tensile strength. The strength is similar. Finally, the bond-slip constitutive model of steel bar and concrete under high temperature is proposed, and the applicability of the model is verified.

In 2018, Hao Pei [3] and others studied resin anchoring materials play an irreplaceable role in coal mine roadway support and structural reinforcement, but at high temperatures, it will pyrolyze and affect the anchoring properties of materials. Through the theoretical analysis, numerical simulation and laboratory experiments, the anchoring mechanism of the material and the effect of high temperature on the anchoring properties of the resin anchoring material were studied. The research shows that the anchoring force increases with the increase of temperature at 20 °C ~ 200 °C, reaches the maximum at about 200 °C, and increases by about 40% compared with the normal temperature. After that, as the temperature continues to rise, the resin anchor The vertical displacement is obviously increased, and the anchoring force of the anchoring material is significantly reduced until it is completely destroyed. Under the same external load, the stress state of the anchor is different in different temperature environments.

In 2015, Wei Kangjie [4] studied the bearing capacity performance of chemical anchors under fire in terms of anchor bolt brand, fire time, buried depth and anchor bolt type. The main conclusions are as follows: the chemical anchoring brand, the screw material and the anchoring rubber type have little influence on the temperature. The buried depth has a great influence on the fire resistance of the chemical anchor: 85mm buried after 120min The remaining bearing capacity of deep chemical anchor bolts is 10%, and the bearing capacity of 110mm buried depth is 30%; the difference of thermal conductivity of screw material has little effect on the residual bearing capacity; the type of anchoring rubber has certain influence on the bearing capacity of fire; different brands of chemical anchors The difference in fire bearing capacity is significant, the difference is between 20% and 70%; the fire resistance of different types of anchor bolts is significantly different. The bearing capacity of the anchor bolts after fire is greatly reduced, and the bolt stiffness is greatly reduced. The special inverted cone and expanded anchors maintain good stiffness and bearing capacity; the finite element software ABAQUS is used to simulate the 120min process, and the simulated values agree well with the experimental values. The simulation method used in this paper can be used. Better temperature field distribution for simulating chemical anchors under fire.

In 2015, su xuegui [5] and others analyzed the mesoscopic structure and mechanical properties of resin anchorage materials under high temperature, and the pyrolysis characteristics of resin anchorage materials under high temperature would directly affect the mechanical properties of the materials. The characteristics of pore structure evolution and mechanical properties of resin anchorage materials during heating (20 ~ 600 ℃) were analyzed by means of CT, electron microscope and high temperature mechanical properties test. (1) CT analysis shows that: the average gray scale of anchorage material is 5 at room temperature after curing. 68; the average grayscale decays by 20 at 350 ~ 500 ℃. The number of pore groups increased by 47 %. The pore group size increased by 201. 5%; the attenuation coefficient of organic matter in resin is0.016 3 ~ 0.037 3. The high-temperature pyrolysis of materials in this area directly leads to the increase of pores. (2) SEM scanning showed that the anchorage material became dense with the full curing reaction of resin at 20 ~ 200 ℃, and the resin decomposition and carbonization intensified after 350 ℃, and the anchorage material became loose. (3) high temperature

mechanical experiment shows: at 200 ℃, the anchorage material strength reaches the peak value, 32% higher than the normal temperature; At 350 ℃, the intensity attenuates significantly, and at 600 ℃, the intensity attenuates 98% compared with normal temperature.

4. Conclusion

High temperature has a great influence on the adhesion of concrete and steel bars, especially to the strength of concrete. When the water content in the test piece is large, the free water in the concrete cannot evaporate, resulting in cracks inside the heat-expanded concrete. The adhesion to steel bars is greatly reduced, and different moisture contents have different effects on the adhesion. The melting point of the resin is relatively low, so that the resin anchoring material fails at a certain temperature. At high temperatures, the greater the anchoring depth, the less the effect on the cohesive force. The fire resistance of different types of chemical anchors is significantly different. The bearing capacity of the anchor bolts after fire and the stiffness of the bolts are greatly reduced. The common chemical anchors are second, and the special inverted cone and bottom anchors are better. Stiffness and bearing capacity.

5. Outlook

After many experts and scholars have studied and improved the anchoring in recent years, various forms of anchoring have appeared, and their effects are getting better and better. The application range in buildings is also wider and wider, but there are still some problems that need to be continued. In-depth study. Defects caused by various reasons have a great influence on the fire resistance of the components. The concrete is not vibrated, which reduces the adhesion and reduces the fire resistance. Anchoring of resin materials is not easy to use in buildings with high temperatures. Subsequent improvements can be made in terms of fire resistance and increased load carrying capacity. In addition, the skilled workers are unskilled in operation and have a certain impact on the quality of the test pieces. It is necessary to implement relevant training as soon as possible.

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