Study on Apparent Quality Control for the Self-compacting Concrete Improved by Infiltrating Formwork Texture

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Abstract. The effects of infiltrating formwork texture on apparent quality of the self-compacting concrete have been investigated by test. Through the test and analysis, it is found that the apparent quality of the component is improved, and the density of the concrete component can also be improved, which is beneficial to improve the durability of concrete.

Introduction

Self-compacting concrete (SCC, also known as non-vibrating concrete) is a kind of concrete with excellent deformability and segregation resistance, was first developed at Japan in 1980[1-3]. It is able to flow under its own weight and can completely fill the formwork even within congested reinforcement. SCC has favorable characteristics such as high fluidity, good segregation resistance and the distinctive self compactibility without any need for vibration during the placing process and so noiseless construction. The unique characteristics of SCC are a rapid rate of concrete placement with very less time. SCC offers a very high level of homogeneity; minimize the concrete void spaces and have uniform concrete strength and also provides the superior level of finishing and durability of structure. SCC also achieves same engineering properties and durability as traditional vibrated concrete[4]. The use of SCC has gained a wider acceptance in recent years.

Infiltrating formwork texture is a kind of application in the construction of new building materials, it can eliminate the concrete surface quality defects in view of bubbles, sand and sand spots such as, the dense surface of concrete, enhance the concrete apparent quality; and can further improve other properties of concrete, such as improving the durability of concrete, improve the wear resistance, frost resistance and surface tensile strength. The application of infiltrating formwork texture has become a new technology to improve the quality of the project. The structure of it is divided into the surface layer, the middle layer and the adhesive layer. Working principle: after pouring the concrete, under internal pressure on the concrete and infiltrating formwork texture capillary effect and vibrating and interaction, the concrete internal bubbles and part of free water to the concrete surface migration, and is discharged through the middle layer of infiltrating formwork texture. Concrete is currently one of the largest amount of construction materials in the world, its durability and surface quality has been the focus of attention in the field of engineering, but a self compacting concrete compacting degree and apparent quality control research is relatively small. In China, infiltrating formwork texture in concrete construction and application research is less, but in Shenzhen Yantian port, Hangzhou Bay Bridge and Sutong Bridge, a small number of large engineering has begun to foreign application of infiltrating formwork texture products, and its application effect is good. Through on the surfaces of the structure with infiltrating formwork texture to improve the surface quality, so as to further improve the self compacting concrete mechanical properties and durability, and increase the surface aesthetic effect, so as to achieve the purpose of water quality of the concrete surface[5-7].
Experimental Study

In order to study the influence of the permeable formwork on the density and apparent quality of self-compacting concrete, two types of contrast tests were carried out, and the two types of tests are shown in Table 1.

<table>
<thead>
<tr>
<th>Experimental types</th>
<th>No use infiltrating formwork texture</th>
<th>Use infiltrating formwork texture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>T1</td>
<td>T2</td>
</tr>
</tbody>
</table>

Infiltrating formwork texture is a kind of application in the construction of the new building materials, the surface of the pore is very small, can ensure that water passes and cement particles and cementitious material were stranded in on the inside of the infiltrating formwork texture of concrete surface, makes the structure of the body surface to form a layer rich in calcium silicate hydrate dense hardened layer, so you can effectively reduce the concrete surface of the honeycomb, surface voids. At the same time, infiltrating formwork texture can improve the maintenance quality of concrete.

Experimental Materials And Basic Mix Ratio

The materials in the experiments are as follows:
1) Cement: Brand Hailuo P.O42.5, apparent density 1.6g/cm3;
2) Mineral admixture: level I fly ash, density 2200kg/m3;
3) Fine aggregate: medium sand, good gradation;
4) Additive: polycarboxylate superplasticizer, sodium gluconate retarder;
5) Water: tap water;
6) Natural coarse aggregate: stone, particle diameter 5~20mm graded broken stone, fine gradation with apparent density 2.45~2.55g/cm3;
7) Recycled coarse aggregate: made by crushing and sieving of demolished concrete, particle diameter 5~20mm with fine gradation.

According to the characteristics of Laboratory of raw materials, through calculation and test, optimization and adjustment after T1 test with the example in Table 2, the mixture performance (as shown in Figure 1) and molding test the mechanical performance of the block (SCC30) can meet the design requirements, but in the molding structure parts and core sample surface are ranging from the size of the pores.

<table>
<thead>
<tr>
<th>Concrete C30 proportion (per 1m3, Unit: kg)</th>
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<tbody>
<tr>
<td>Cement</td>
</tr>
<tr>
<td>362.0</td>
</tr>
</tbody>
</table>

Annotation: dosage of polycarboxylate superplasticizer is 1.0% of binding material, dosage of Retarder is 0.05% of binding material.

![Mixture](image1)
![U box test](image2)
![L box test](image3)
![J ring test](image4)

**Figure 1. Performance test of the mixture**
Test on the Apparent Quality Improvement of Self Compacting Concrete

In order to carry on the contrast experiment research, the goal of improving the apparent quality of the self compacting concrete was realized, and infiltrating formwork texture was prepared.

Test T2 is on the basis of the test T2 using infiltrating formwork texture (model: Bunett, Nanjing yuan Xu engineering materials Co., Ltd. production, specifications for the wide 1m, the general can be reused 3 times).

In the course of the test, the use of infiltrating formwork texture is as follows: first, according to the calculation value to cut the size of the infiltrating formwork texture, in the use of the template to be set aside 5cm infiltrating formwork texture. Secondly, in the template surface and the surrounding spray a thin layer of glue, infiltrating formwork texture laying to the template, which woolly side toward the template, the smooth side toward the concrete, from the center toward both sides, infiltrating formwork texture must be paving and close to the template, and in the die plate on each side must be reserved 5cm, for drainage purposes. Finally, hand tightly infiltrating formwork texture, firmly close to the sides of the template, such as splicing, should be in the spray at the seam enough glue, carefully along the junction of downward pressure, to ensure that the template cloth edge can be neatly connected, and with the template are tightly bonded, as shown in Figure 2 shows.

The apparent mass of the concrete specimens tested by T1 is shown in Figure 3. The apparent mass of the concrete specimen of the test T2 is shown in Figure 4. The apparent mass of the concrete specimen of the test T4 is shown in figure 5.

![Figure 2. Formwork and infiltrating formwork texture.](image1)

![Figure 3. Component of common wood formwork.](image2)

![Figure 4. Structure of the component with infiltrating formwork texture.](image3)

![Figure 5. Comparison of the common wood formwork and the core sample of the infiltrating formwork texture.](image4)

T1 and T2 of test this two kinds of self-compacting concrete component forming coring, coring specimens as shown in Figure 5, from Figure 5 can be found that the two cores of the existence of a little hole in the, but ordinary template formed piece significantly than permeable formwork formed component holes to. The core test specimens were tested for compressive strength, and the results were shown in table 3.

<table>
<thead>
<tr>
<th>Number</th>
<th>Compressive strength (MPa)</th>
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<tbody>
<tr>
<td></td>
<td>Infiltrating formwork texture</td>
</tr>
<tr>
<td>1</td>
<td>43.12</td>
</tr>
<tr>
<td>2</td>
<td>42.67</td>
</tr>
<tr>
<td>3</td>
<td>43.12</td>
</tr>
<tr>
<td>4</td>
<td>43.98</td>
</tr>
<tr>
<td>5</td>
<td>42.65</td>
</tr>
<tr>
<td>6</td>
<td>42.09</td>
</tr>
<tr>
<td>Average value</td>
<td>42.94</td>
</tr>
</tbody>
</table>
Conclusions

From Figure 3 to Figure 5, it can be seen without the use of infiltrating formwork texture, self-compacting concrete molding will produce many holes on the surface; in the case of infiltrating formwork texture, the self-compacting concrete molding table view quality can be obviously improved. Through the table data can also be seen by infiltrating formwork texture forming a core member of compression strength to than ordinary template molding self-compacting concrete high. Therefore, the infiltrating formwork texture of self-compacting concrete can improve the mechanical properties, the compressive strength also increased, to improve self-compacting concrete durability.

Acknowledgements

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References