Research on Durability Design of Concrete Structure in Building Engineering Based on Computer Technology

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Abstract. With the continuous progress of The Times and the rapid development of society, great changes have taken place in the way people live, study and work at present. Due to the continuous improvement of people's living standards, people now have higher and higher requirements for their living environment. People are not only satisfied with the food and clothing they used to have, but also pay more attention to the pursuit of spiritual homes. In our country, the computer technology and the construction industry have always been the focus of our national attention, because they are closely related to the lives of ordinary people. In the construction of the concrete structure is an indispensable building material in the construction process, based on the status of the concrete structure in the construction process, the relevant work technology researchers on the concrete structure of a series of characteristics have been related to the development of the function of the continuous exploration and analysis.

Keywords: Waste Stone Powder, Concrete Structure, Performance, Impact

1. Introduction

The computer technology and construction industry in our country have always been the key industries of our country. The development of computer technology and construction industry has greatly promoted the economic development of other industries in our country. Related technology researchers in the concrete structure mixed with waste stone powder and slag powder and powder ash found that the concrete structure of the frost resistance, anti sulfate erosion, as well as anti shrinkage and anti chloride ion permeability have a very obvious impact \cite{1,2}. Based on such effects on concrete structure, related technology research personnel through to the waste stone powder dosage in the concrete structure to continuously explore, found that adding suitable amount of the waste stone powder, slag powder and the powder ore ash can significantly improve the frost resistance of concrete structures, the sulfate attack resistance, and the shrink resistance and resistance to chloride ion permeability. In this paper, from the actual situation, combined with the concrete structure construction process in the construction process of our country in recent years, conducted in-depth research and analysis, hoping to provide some help for the development of our country's construction industry \cite{3}.

2. The concrete structure used in the construction process
The demand for concrete is very high. According to previous statistics, in 2016, the amount of stone material produced by our country's building boards has reached an astonishing 1.08 billion square meters [4]. But in the process of production, can produce a large number of stone material waste, the waste if not reasonable processing, so will cause a great economic resources waste, according to statistics, our country in each of the production of 20 square meters of stone material, can produce a tonne of waste stone powder, the generation of the waste stone powder can give us very serious impact on the living environment and river, are shown in figure 1 below:

![Concrete used in buildings](image)

**Figure 1.** Concrete used in buildings

With the increasing of waste stone powder production in our country, the relevant technology researchers come gradually abandoned stone in architecture of application, through a long period of time to explore, the researchers found that adding the right amount of waste stone powder in concrete structure can effectively improve the frost resistance of concrete structures, the sulfate attack resistance, and the shrink resistance and resistance to chloride ion permeability, the study found that not only solves the environmental pollution of the waste stone powder, but also effectively solves the problems of resource waste. Because of the waste stone powder in concrete structure of the application of time soon, a lot of practical problems work technical personnel all has not been effectively resolved, based on this situation, this article emphatically to add waste stone powder in concrete structure after the durability of the concrete structure study, through the experiment in which proportion to join after waste stone powder, can let the durability of the concrete structure to achieve the best effect [5].

3. Test part

3.1. Test raw materials
The raw materials used in the test mainly include ordinary Portland cement, mineral powder slag, fly ash, river sand continuous graded gravel, polycarboxylic acid superplasticizer, tap water, marble powder, and granite powder [6].

3.2. Test methods
This test mainly includes concrete frost resistance test, concrete shrinkage test, and concrete chloride ion penetration test sulfate erosion test:Using 40 mm x 40 mm x 160 mm mortar specimen, specimen molding down after 1 d, put in water raise box after curing 28 d, soaking specimens in the mass fraction of 5% NaSO4 solution in solution before specimen surface over 20 mm, the container mouth open and placed in (20 ± 2) °C environment, solution pH value control at around 7, to the stipulated age observation specimen appearance change, weighing quality and strength test.
3.3. **Objectives of the trial**

This experiment establishes the computer model, studies the granite waste stone powder, the marble waste stone powder and the concrete application measurable variable, the latent variable, carries on the research to the ordinary concrete durable performance, the shrinkage resistance performance, the cold resistance performance. The relationship between the measurable variables and the latent variables of the measurement reaction is analyzed, and the application performance of concrete is explored in groups according to different matching ratios, and the relationship between the concrete performance and the variables is analyzed [7].

4. **Analysis of test results**

4.1. **Measure the relationship between measurable variables and latent variables of the reaction**

The response relationship of the computer model measured in this paper can be summarized as follows: the load coefficients of quota quantity, intertemporal reserve system, state support intensity and concrete quota allocation mode on policy factors are 0.639, 0.368, 0.357 and 0.305 respectively. Have an impact, and the impact has a gradually diminishing trend; The load coefficients of wind speed, precipitation, days of extreme cold temperature and temperature range on climate change were 0.456, 0.437, 0.424 and 0.38, respectively. Have an impact, and the impact has a gradually diminishing trend; The load coefficients of concrete actual application maturity, heterogeneous environment, EU concrete performance, futures performance, stock price index and the number of concrete actual application participants on actual application environment are 0.624, 0.53, 0.473, 0.413, 0.332 and 0.302, respectively. All have an impact, and the impact has a gradually diminishing trend. The load coefficients of waste stone powder and fossil fuel on concrete performance are 0.636, 0.467, 0.42 and 0.237, respectively. It is found that the first three have obvious influence on concrete performance, while the influence of electricity price on concrete performance is weak and not obvious [8].

4.2. **Waste stone powder has obvious influence on concrete performance**

Climate change is the most difficult of all factors to measure and predict. But it is the most widespread factor. When the climate changes, the practical application should first make the adjustment response; At the same time, the government may issue some policies to mitigate the negative effects of climate
change. In fact, the related climate change may also make the supply and demand of concrete have a certain change, resulting in the change of concrete performance.

![Concrete Structure Diagram]

**Figure 3.** Analysis of a concrete structure based on computer technology

Some policy and customary factors, such as the state's support for enterprises and the way concrete is allocated, will have less impact than the actual application of concrete. If companies have fewer allocations, they have to fill them with clean concrete, such as natural gas. The turbulent environment of practical application has a great influence on the balance of supply and demand of concrete, and also affects its performance [9].

### 4.3. The performance of concrete reflects its relationship with various variables

Based on the analysis of computer technology, we find that the direct influence path coefficients of climate change, policy factors, practical application environment and concrete performance on concrete application performance are 0.287, 0.318, 0.370 and 0.167, respectively. If only from the perspective of a direct impact, policy factors and practical application effects on the performance of concrete is bigger, the climate change and concrete performance is low, according to the structure of the model path for the application of concrete performance can measure latent variables influence coefficient, and further calculates the impact of climate change and policy factors and concrete performance of chengdu, therefore, can be thought of waste stone powder is one of the main factors influencing the performance of concrete application, climate change and the latent variables are factors that influence the performance of the concrete aspects, although has some impact, but very few [10].

### 5. Conclusion

With the continuous improvement of people's living standards, people now have higher and higher requirements for their living environment. China's computer technology and construction industry have also been the focus of national attention. In construction of concrete structure, it is essential to building materials in the process of construction, based on the concrete structure in the position in the construction process, in this article, through exploring, waste stone powder is one of the main factors influencing the application performance of concrete, at the same time related to climate change may also make the supply and demand of concrete has some changes, so as to make the change of concrete performance.

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References

[1] Zhang, Feng K. Research on Durability Design of Concrete Structure under Chloride Environment [J]. Advanced Materials Research, 2014, 926-930:623-626.
[2] Jin L B, Xiong X L. Environment-Based on Experimental Design of Concrete Structures [J]. Advanced Materials Research, 2011, 163-167:3143-3149.
[3] JIN, Wei-liang, ZHANG, et al. Fire's effect on chloride ingress related durability of concrete structure [J]. Journal of Zhejiang University(Science A:An International Applied Physics & Engineering Journal), 2007, 05(No.306):3-9.
[4] Yoon C W, Seo J W, Lee S S, et al. Study on the slip resistance of embo-spray coating of urethane-based floor material [J]. Ksce Journal of Civil Engineering, 2016, 21(1):1-9.
[5] Sun K, Ni X , Liu P, et al. The Design and Research of High-Rise Building Reinforced Concrete Structure Based on BIM [J]. IOP Conference Series: Earth and Environmental Science, 2020, 440(2):022075 (5pp).
[6] Samer M. Towards the implementation of the Green Building concept in agricultural buildings: A literature review [J]. Agricultural Engineering International : The CIGR e-journal, 2013, 15(2):25-46.
[7] Gyuyong, Kim, Gyeongcheol, et al. Durability Design of Concrete Structure Based on Carbonation [J]. Magazine of the Korea Concrete Institute, 2015.
[8] Luo D , Wang Y, Niu D . Durability Environmental Regionalization for Concrete Structures [J]. Mathematical Problems in Engineering, 2013,(2013-12-29), 2013, 2013(pt.17):1-11.
[9] Roorkee I. G.D. Ransinchung R.N. Department of Civil Engineering,IIT Roorkee Index [J].
[10] Fu C, Wu L. Research on computer-aided analysis and design system for high-rise building steel structure [J]. Revista de la Facultad de Ingenieria, 2017, 32(13):183-188.