



Review on Flow Characteristic and Pumpability Prediction of Pumping Concrete

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Abstract

Pumping is the most commonly used construction method for modern concrete transportation and pouring. This paper summarizes the theoretical and experimental research results on the flow behavior characteristics and pumpability prediction of pumped concrete. The formation mechanism of lubrication layer based on shear induced particle migration theory is introduced, and the distribution of concrete shear rate and flow rate in the pipeline is analysed. This paper discussed three prediction methods of concrete pumpability, including empirical judgment, coil test and pumping resistance calculation. Thus, the cognition of concrete pumping process can be improved and reference for engineering and technical personnel in pumping construction can also be provided.

Keywords: concrete; pumping; lubrication layer; velocity distribution; pumpability.

1 Introduction

Pumping has gradually become the main construction method of modern concrete transportation and pouring since the first use of pumping in the United States in the 1930s. According to statistics^[1], in 2020, the output of ready mixed concrete in China has reached 2.94 billion m³, and most of the ready mixed concrete is transported and poured by pumping. Pumping technology directly affects the quality of concrete construction. At the same time, with the

development of Chinese construction industry, lightweight, long-span and other construction objectives require concrete to have high strength and high constructability, which puts forward new requirements for pumping technology. For example, Guangzhou Chow Tai Fook financial center project requires that C80 high-strength concrete be pumped into the 530m high shear wall^[2], and the complex double-layer rigid steel plate shear wall requires that the concrete has low shrinkage and self-leveling characteristics.