Tendon Distribution Optimization Method of Prestressed Concrete Bridges Based on Consistent Safety Degree of Stress Index

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Abstract

The traditional tendon distribution method of prestressed concrete bridges is mainly based on trial calculation. The existing optimization research of structure and tendon distribution mostly takes the least material consumption or total economy as the optimization goal, but the stress of the structure may not be reasonable. Therefore, considering the rationality of structural stress, the optimization method has a large research space. This paper puts forward the tendon distribution optimization method for the prestressed concrete bridge. This method takes the principle that the safety degree of stress indexes at different positions of the whole bridge is as consistent as possible. On the premise of meeting the codes and construction feasibility, this method realizes the optimization of the amount of prestressed steel tendons in the bridge. Finally, a three-span continuous bridge is used as the optimization example to verify the rationality and feasibility of the method.

Keywords: prestressed concrete bridges; tendon distribution optimization; consistent safety degree; stress index.

1 Introduction

Reinforced concrete(RC) structure is composed of reinforcement and concrete according to certain principles. The strength advantages of the two materials are brought into full play in this structure, which has the advantages of good durability, fire resistance and integrity. However, the self-weight is large and the crack resistance is poor in this structure. In order to further develop RC structure and improve its crack resistance, it is necessary to overcome the defect of poor tensile resistance of concrete. The use of prestress can solve this problem, resulting in prestressed concrete structure. Before the external load is applied to the structure, apply pressure on the concrete, in which tensile stress will be produced under the external load. In this way, it needs to overcome the pre applied compressive stress before the concrete can be tensioned. The pre applied compressive stress can reduce or even offset the tensile stress

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