Preliminary Analysis of Crack Control in Building Structures: Postprint

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Abstract

With the advancement of construction technology, concrete members have become the predominant form of building structures. However, most concrete members typically operate in a cracked state, and the causes of crack formation are multifarious. Therefore, classifying cracks according to their origins and implementing rational crack control are of paramount importance for the safety of building structures and the public's production and livelihood.

With the extensive application of reinforced concrete members in buildings and the widespread adoption of ready-mixed concrete, the probability of crack occurrence in structures has increased, attracting heightened attention. The factors contributing to cracks in structural members are complex, involving material properties, environmental temperature fluctuations, as well as challenges in architectural design, construction, and service conditions. The inherent structural characteristics of construction materials during concrete placement also predispose members to cracking. In practice, the incidence of concrete cracking during construction is considerable. While a substantial proportion of cracks may not significantly impair structural load-bearing capacity or normal serviceability, their presence can jeopardize overall structural integrity, safety, and durability, cause severe steel reinforcement corrosion, and constitute a primary hidden danger for stress concentration during the building's service life. Consequently, comprehensive measures must be implemented to minimize crack formation or confine cracks within the permissible limits specified in engineering design. This paper will discuss the classification and causative factors of concrete cracks, elaborate on crack control methodologies from various perspectives, and propose several commonly adopted crack control measures.

Full Text

A Preliminary Analysis of Crack Control in Building Structures

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Abstract

With the advancement of construction technology, concrete members have become the predominant structural form in buildings. However, most conventional concrete members operate in a cracked state, and the causes of crack formation are multifaceted. Consequently, classifying cracks based on their origins and implementing appropriate control measures are of paramount importance for structural safety and public welfare.

The extensive use of reinforced concrete components in buildings, together with the widespread adoption of ready-mixed concrete, has elevated the incidence of cracking, attracting increasing attention from the engineering community. Crack formation in structural members arises from complex factors, including material properties, environmental temperature fluctuations, as well as challenges in structural design, construction practices, and service conditions. The inherent nature of concrete as a construction material predisposes members to cracking. In practice, the probability of crack development in concrete construction is considerable. Although many cracks do not substantially impair structural load-bearing capacity or normal serviceability, their presence can jeopardize overall integrity, long-term durability, and safety. Cracks also induce severe corrosion of reinforcing steel and create critical stress concentration zones during the service life of structures. Therefore, comprehensive measures across all phases are necessary to minimize crack occurrence or maintain cracks within allowable limits specified in design.

This paper investigates the classification and causes of concrete cracks, elaborates on control methodologies from various perspectives, and presents several commonly adopted crack control measures.

Keywords: Construction Engineering; Crack Causes; Preventive Measures; Treatment Methods

Note: Figure translations are in progress. See original paper for figures.