

Preface

With the rapid development of urban rail transit systems, increasing demands have been placed on the safety, stability, and durability of railway track structures. As a key component connecting rails and sleepers, the fastening system plays an important role in maintaining gauge, transmitting loads, and mitigating vibration and noise. Its mechanical performance directly affects the service condition of track structures and operational safety. Therefore, systematic investigation of the mechanical behavior of fastening systems under train loads is of great engineering significance.

During train operation, railway tracks are subjected to loads arising from wheel – rail interaction, which can be generally categorized into static and dynamic loads. Static loads represent the fundamental loading condition of the track system, while dynamic loads reflect vibration effects induced by factors such as track irregularities and structural characteristics. The mechanical responses of fastening systems under these two types of loading differ significantly. Therefore, separate investigations of static and dynamic behaviors are essential for a comprehensive understanding of fastening system performance.

This book focuses on the widely used e-clip fastening system. Based on a comprehensive review of existing studies and engineering practices, a systematic investigation is conducted. A refined finite element model is developed to simulate the fastening system and its key components. The study examines the mechanical behavior and deformation characteristics under static loading, as well as the vibration response and mechanical performance under dynamic loading. In addition, the vertical, longitudinal, and lateral performance of the fastening system is analyzed. The findings provide useful references for the design and evaluation of fastening systems.

During the preparation of this book, the important theoretical achievements of the National Engineering Research Center for High speed Railway Construction Technology and the MOE Key Laboratory of Engineering Structures of Heavy Haul Railway(Central South University) were referred to and applied, which are gratefully acknowledged.

Due to the limitations of the authors, shortcomings may still exist in this book. Readers' comments and suggestions are sincerely welcomed, and the authors will strive to improve the work in future research.

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