

rebar splicing length

rebar splicing length is a critical factor in reinforced concrete construction, ensuring structural integrity and load transfer between reinforcing bars. Proper determination of the splicing length is essential to achieve continuity in steel reinforcement, which directly affects the strength and durability of concrete structures. This article explores the concept of rebar splicing length, its significance, types of splices, and the factors influencing the required length. Additionally, it covers relevant codes, calculation methods, and best practices for effective splicing in various construction scenarios. Understanding these aspects helps engineers, contractors, and construction professionals optimize reinforcement detailing and maintain safety standards. The following sections provide a comprehensive overview of rebar splicing length and its practical applications in construction projects.

- Understanding Rebar Splicing Length
- Types of Rebar Splices
- Factors Influencing Rebar Splicing Length
- Codes and Standards for Rebar Splicing Length
- Calculation Methods for Splicing Length
- Best Practices for Rebar Splicing

Understanding Rebar Splicing Length

Rebar splicing length refers to the length over which two reinforcing bars overlap or are connected to ensure effective load transfer and continuity within a concrete member. Since reinforcing bars often come in standard lengths, splicing is necessary to extend reinforcement to the required dimensions of a structure. The splicing length must be sufficient to develop the bars' full strength without slippage or failure under stress. If the splice length is inadequate, it can lead to weak points in the concrete, causing cracks, structural failure, or reduced load-carrying capacity.

Importance of Rebar Splicing Length

The proper rebar splicing length is vital for maintaining the structural performance of concrete elements such as beams, columns, slabs, and walls. Splicing allows for the transmission of tensile forces between bars, contributing to the overall ductility, stability, and safety of the structure. It also facilitates construction by allowing the use of shorter reinforcement bars that are easier to handle and transport while ensuring the necessary structural continuity.

Basic Concept of Development Length

The development length is closely related to rebar splicing length and is defined as the minimum length of rebar embedded or anchored in concrete needed to develop the specified yield strength of the bar. In splicing, the overlapping length of two bars must at least equal the development length to guarantee adequate bonding and force transfer between the bars and the surrounding concrete.

Types of Rebar Splices

Various types of rebar splices are employed in construction, depending on project requirements, structural design, and site conditions. Each splice type offers different advantages and considerations regarding splicing length, mechanical performance, and ease of installation.

Lap Splices

Lap splicing is the most common method, where two bars overlap and are tied together for the required splicing length. This type relies on the concrete bond to transfer stresses between bars. The lap length must be sufficient to develop the full strength of the bars without slippage.

Mechanical Splices

Mechanical splices use couplers or connectors to join two bars mechanically. These splices often require shorter splicing lengths than lap splices because the mechanical connection directly transfers the load. Mechanical splicing is advantageous in congested areas or where lap lengths would be impractical.

Welded Splices

Welded splices involve fusing two reinforcing bars through electric or resistance welding. This method provides a rigid connection with potentially shorter splice lengths but requires careful quality control to avoid weakening the bars. Welded splices are less common due to specialized requirements and potential for heat-affected zone issues.

Factors Influencing Rebar Splicing Length

The determination of the required rebar splicing length depends on multiple factors related to the bar properties, concrete characteristics, and environmental conditions. Understanding these factors is essential for accurate design and compliance with building codes.

Bar Diameter and Grade

The diameter of the reinforcing bar significantly impacts the splice length. Larger diameter bars require longer splice lengths due to the increased surface area and force transfer needs. Similarly, the grade or yield strength of the bar affects the development length, with higher-strength bars typically requiring longer splices.

Concrete Strength

Concrete compressive strength influences the bond between the rebar and the concrete matrix. Higher-strength concrete generally improves bond strength, which can reduce the required splicing length. Conversely, lower-strength concrete demands longer splice lengths to ensure proper force transfer.

Type of Load and Stress Conditions

The nature of loads acting on the concrete member, such as tension, compression, or shear, affects the splicing length requirements. Tensile forces require more careful consideration of splice length to prevent slippage, while compressive forces may have less critical splice length needs.

Environmental and Construction Conditions

Exposure to aggressive environments, corrosion potential, and construction methods can influence the choice of splice length and type. For example, in corrosive environments, mechanical splices with protective coatings may be preferred to extend durability.

Codes and Standards for Rebar Splicing Length

Design codes and standards provide guidelines and minimum requirements for rebar splicing length to ensure safety and structural integrity. Adherence to these standards is mandatory in most construction projects.

American Concrete Institute (ACI) Guidelines

The ACI 318 Building Code Requirements for Structural Concrete outlines detailed provisions for development and splice lengths. It specifies minimum lap lengths based on bar size, concrete strength, and other factors, ensuring consistent and safe reinforcement detailing.

Other Relevant Standards

Additional standards such as ASTM specifications for reinforcing bars, and local building

codes, may also dictate specific splicing requirements. Engineers must consult these documents to align design and construction practices with regulatory demands.

Calculation Methods for Splicing Length

Calculating the correct rebar splicing length involves formulas and empirical relationships based on material properties and structural conditions. These calculations ensure that the lap length or mechanical splice length meets or exceeds the development length.

Basic Lap Length Formula

The lap splice length (L_{lap}) is typically calculated using the formula:

1. $L_{lap} = k \times L_d$, where L_d is the development length and k is a factor depending on splice type and conditions.
2. The development length L_d depends on bar diameter, yield strength, concrete strength, and coating type.

Adjustments for Conditions

Modifiers may be applied to the basic splicing length to account for factors such as bar coating (epoxy), concrete cover, confinement, and loading conditions. These adjustments ensure the splice remains effective under varying construction scenarios.

Best Practices for Rebar Splicing

Implementing best practices in rebar splicing enhances structural performance and construction efficiency. Proper planning, execution, and inspection are critical components of successful splicing.

Quality Control and Inspection

Regular inspection of splices during construction ensures compliance with design specifications and codes. Inspectors verify correct lap lengths, bar alignment, and tie spacing to prevent future structural issues.

Proper Bar Placement and Tying

Ensuring that bars are properly positioned and securely tied prevents movement during concrete pouring, which could compromise the splice length and bond. Adequate

clearances and cover must be maintained to protect reinforcement from corrosion.

Use of Mechanical Splices Where Appropriate

In congested reinforcement areas or where lap lengths would be excessively long, mechanical splices provide a reliable and space-saving alternative. Selecting certified couplers and following manufacturer instructions is essential for performance.

Documentation and Compliance

Maintaining detailed records of splice locations, types, and lengths supports quality assurance and facilitates future inspections or modifications to the structure.

Summary of Key Points

- Accurate determination of rebar splicing length is essential for structural integrity.
- Splicing length depends on bar size, concrete strength, and loading conditions.
- Types of splices include lap, mechanical, and welded splices, each with specific length requirements.
- Compliance with ACI and other relevant codes ensures safety and durability.
- Best practices include proper placement, inspection, and use of appropriate splice methods.

Frequently Asked Questions

What is the standard rebar splicing length for concrete structures?

The standard rebar splicing length, also known as lap length, typically ranges from 40 to 60 times the diameter of the rebar, depending on factors such as concrete strength, bar diameter, and type of splice used.

How does concrete strength affect the required rebar splicing length?

Higher concrete strength reduces the required rebar splicing length because stronger concrete provides better bond and anchorage between the rebar and the surrounding

material, allowing for shorter lap lengths.

What are the different types of rebar splicing methods and their impact on splice length?

Common rebar splicing methods include lap splices, mechanical couplers, and welded splices. Mechanical couplers generally require shorter splice lengths compared to traditional lap splices, while welded splices provide a continuous connection but must follow strict welding standards.

How do bar diameter and cover influence the rebar splicing length?

Larger bar diameters require longer splicing lengths to ensure adequate bond strength. Additionally, adequate concrete cover is necessary to prevent corrosion and ensure proper load transfer, which indirectly influences the effective splice length.

Are there any code requirements or guidelines for calculating rebar splicing length?

Yes, building codes such as ACI 318, Eurocode 2, and IS 456 provide detailed guidelines and formulas for determining minimum lap splice lengths based on factors like bar size, concrete strength, and type of stress (tension or compression). It is essential to refer to the relevant code for project-specific requirements.

Additional Resources

1. Rebar Splicing Techniques: Principles and Practices

This book provides a comprehensive overview of the fundamental principles behind rebar splicing in construction. It covers various splicing methods, including lap splicing, mechanical splicing, and welded splicing, emphasizing their applications and limitations. Readers will find detailed diagrams and case studies that illustrate proper splicing lengths and techniques to ensure structural integrity.

2. Structural Concrete Reinforcement: Design and Splicing

Focusing on the reinforcement aspect of structural concrete, this text delves into the design considerations for rebar splicing length and placement. It discusses the impact of splice length on load transfer and durability, supported by relevant codes and standards. Engineers and designers will benefit from the practical guidance on optimizing splice lengths for different structural elements.

3. Concrete Reinforcement and Rebar Splicing Codes Explained

This book simplifies the complex building codes and standards related to rebar splicing lengths. It offers a clear explanation of international and regional guidelines, helping professionals ensure compliance in their projects. The author includes examples of typical splice length calculations and common pitfalls to avoid in the field.

4. Advanced Rebar Splicing: Materials, Methods, and Innovations

Exploring the latest advancements in rebar splicing technology, this book highlights new materials and mechanical connectors that improve splice efficiency. It examines how innovations contribute to reducing splice length requirements while maintaining safety and performance. Ideal for engineers seeking to stay updated with cutting-edge splicing solutions.

5. Practical Guide to Rebar Splicing in Concrete Structures

A hands-on manual for construction professionals, this guide covers step-by-step procedures for determining and implementing appropriate splice lengths. It addresses common challenges encountered on-site and offers troubleshooting tips to avoid splicing errors. The book includes checklists and inspection protocols to ensure quality control.

6. Rebar Splicing Length Calculations and Structural Analysis

This technical reference focuses on the mathematical and structural analysis behind determining splice lengths. It provides formulas, design charts, and examples to assist engineers in calculating splice lengths that meet safety and performance criteria. The book also discusses the relationship between splice length and stress distribution in reinforced concrete.

7. Mechanical Splicing of Reinforcing Bars: Standards and Applications

Dedicated to mechanical splicing methods, this book details the types of mechanical splices available and their impact on required splice lengths. It includes performance testing results and installation guidelines to help practitioners select appropriate splicing systems. The text also compares mechanical splicing with traditional lap splicing in various construction scenarios.

8. Rebar Splice Length Optimization for Sustainable Construction

This book addresses how optimizing splice lengths can contribute to more sustainable and cost-effective concrete structures. It explores techniques to minimize material waste and labor without compromising structural integrity. Case studies demonstrate successful projects where optimized splicing led to environmental and economic benefits.

9. Inspection and Quality Assurance of Rebar Splicing

Focusing on quality control, this book provides detailed procedures for inspecting rebar splices and verifying correct splice lengths on construction sites. It discusses common defects and their causes, as well as corrective measures to ensure compliance with design specifications. The guide is essential for inspectors, contractors, and project managers committed to maintaining high standards.

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Are you tired of guesswork and costly mistakes when it comes to rebar splicing? Do inconsistent splice lengths leave you worried about structural integrity and project delays? Facing confusing building codes and the risk of non-compliance? You need accurate, reliable information you can trust to ensure your projects are safe, compliant, and on budget.

This ebook, "Mastering Rebar Splicing: A Comprehensive Guide to Length, Strength, and Compliance," provides the definitive answer to your rebar splicing challenges. We'll cut through the confusion, providing clear, practical guidance backed by industry standards.

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A detailed comparison of their strengths and weaknesses.

Chapter 3: Calculating Rebar Splice Length: Step-by-step calculations based on relevant building codes (including examples for different grades and applications).

Chapter 4: Building Code Compliance for Rebar Splices: Navigating the complexities of ACI 318 and other relevant standards.

Chapter 5: Best Practices and Quality Control for Rebar Splicing: Ensuring consistent quality and preventing common errors.

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Mastering Rebar Splicing: A Comprehensive Guide to Length, Strength, and Compliance

Introduction: The Importance of Proper Rebar Splicing

Rebar, the steel reinforcement within concrete structures, is critical for providing tensile strength and preventing cracking. However, the continuous length of rebar required for large projects often exceeds the available lengths of commercially produced bars. This necessitates the use of rebar splicing techniques to join individual bars and maintain the structural integrity of the reinforced concrete. Improper splicing can lead to catastrophic structural failures, costly repairs, project delays, and even legal liabilities. Understanding the correct splicing techniques, lengths, and relevant building codes is paramount for ensuring the safety and longevity of any concrete structure. This guide provides a comprehensive overview of rebar splicing, covering various methods, calculations, code compliance, and best practices to ensure your projects meet the highest standards

of quality and safety.

Chapter 1: Understanding Rebar Grades and Their Impact on Splice Length

Rebar is produced in various grades, each with different yield strengths. The yield strength directly influences the required splice length. Higher-grade rebar, possessing greater tensile strength, requires shorter splice lengths for the same load-bearing capacity compared to lower-grade rebar. Common rebar grades include Grade 40, Grade 60, and Grade 75, with the number representing the minimum yield strength in ksi (kips per square inch). For instance, Grade 60 rebar has a minimum yield strength of 60,000 psi. The higher the yield strength, the greater the ability to resist deformation under stress, allowing for shorter splice lengths while maintaining structural integrity. Ignoring the grade of rebar during splice length calculations can lead to significantly weakened connections, potentially resulting in structural failure. This chapter will delve into the specifics of various rebar grades and their respective influence on the necessary splice length, providing tables and examples for clarity.

Chapter 2: Common Rebar Splicing Methods: Lap Splices, Mechanical Splices, and Welded Splices

Several methods exist for splicing rebar, each with its own advantages and disadvantages:

Lap Splices: This is the most common and simplest method, involving overlapping two bars by a specified length. The effectiveness of a lap splice relies on the bond strength between the rebar and the surrounding concrete. The lap length is critically dependent on the rebar grade, bar diameter, concrete strength, and the stress level in the rebar.

Mechanical Splices: These employ couplers or threaded bars to connect rebar ends. Mechanical splices are generally stronger and provide a more precise connection than lap splices, but they're also more expensive and require specialized equipment. Various types of couplers exist, each designed for specific bar diameters and stress levels.

Welded Splices: Welding provides the strongest connection, but requires specialized equipment and skilled welders. Welding parameters must be carefully controlled to avoid weakening the rebar through overheating or improper fusion. Welded splices are often preferred for high-stress applications, but the additional costs and specialized expertise must be considered.

This chapter will detail the nuances of each method, including installation procedures, strengths, weaknesses, and suitability for various applications. Illustrated examples will help clarify the techniques and aid in selecting the appropriate method for a given project.

Chapter 3: Calculating Rebar Splice Length: Step-by-Step Calculations Based on Relevant Building Codes

Calculating the appropriate rebar splice length is crucial for ensuring structural integrity. This chapter will provide step-by-step instructions for calculating splice lengths based on relevant building codes, primarily ACI 318 (Building Code Requirements for Structural Concrete). Calculations will vary based on the rebar grade, bar diameter, concrete strength, type of splice (lap, mechanical, or welded), and the stress level in the rebar. The chapter will include numerous examples to illustrate the calculation process for various scenarios. We will also address the use of different code references and how regional variations in codes might influence the required splice length. Tables and charts will summarize commonly used splice length values for different bar sizes and grades to make the process easier and faster.

Chapter 4: Building Code Compliance for Rebar Splices: Navigating the Complexities of ACI 318 and Other Relevant Standards

Compliance with relevant building codes is non-negotiable. This chapter provides a detailed overview of the pertinent sections of ACI 318 and other applicable standards relating to rebar splicing. We will clarify the requirements for different splice types, detailing the limitations and considerations for each. Understanding the specific code requirements is critical to avoid costly rework, delays, and potential legal ramifications. This section will also touch on regional variations in codes and how to determine the appropriate regulations for your project's location.

Chapter 5: Best Practices and Quality Control for Rebar Splicing: Ensuring Consistent Quality and Preventing Common Errors

This chapter emphasizes best practices for ensuring consistent quality and preventing common errors in rebar splicing. This includes proper handling and storage of rebar to prevent damage, accurate measurement and marking of splice lengths, meticulous installation, and thorough visual inspection to identify defects. Implementing a robust quality control program will significantly reduce the risk of errors and ensure the long-term structural integrity of the reinforced concrete structure. The chapter will provide a checklist for inspectors and a guide to common quality control measures.

Chapter 6: Troubleshooting Common Rebar Splicing Problems: Solutions to Frequently Encountered Issues and Their Preventative Measures

This chapter addresses common problems encountered during rebar splicing and provides solutions and preventative measures. These may include issues such as inadequate lap lengths, improper alignment of bars, damaged rebar, and poor concrete placement around splices. By understanding the causes of these problems, we can implement preventative strategies and effectively address issues if they arise.

Conclusion: Summary and Key Takeaways for Safe and Compliant Rebar Splicing

This ebook has provided a comprehensive guide to understanding and implementing safe and compliant rebar splicing techniques. Remember, adherence to building codes, proper calculations, and diligent quality control are crucial for ensuring the structural integrity and longevity of your projects. By mastering these concepts, you'll minimize risks, improve project efficiency, and contribute to the construction of safe and reliable structures.

FAQs

1. What is the minimum lap splice length for Grade 60 rebar? The minimum lap splice length depends on several factors including the bar diameter, concrete strength, and the stress level in the rebar. Refer to ACI 318 or other applicable building codes for specific calculations.
2. Can I use different grades of rebar in the same splice? Generally, no. Mixing rebar grades within a single splice is not recommended and can compromise the structural integrity of the connection.
3. What are the advantages of mechanical splices over lap splices? Mechanical splices offer greater strength and more consistent performance compared to lap splices. They are also less sensitive to the quality of concrete placement. However, they are typically more expensive.
4. How do I ensure proper concrete coverage around rebar splices? Adequate concrete coverage is essential for proper bond strength. Ensure proper consolidation of concrete around the splices to eliminate voids and ensure complete embedment.
5. What are the common causes of rebar splice failures? Common causes include inadequate lap length, poor concrete placement, damaged rebar, and improper installation techniques.

6. Are welded splices always stronger than lap splices? Yes, when correctly executed, welded splices are generally stronger than lap splices. However, they require specialized equipment and skilled welders.
7. What is the role of the concrete strength in determining the splice length? Stronger concrete provides better bond between the rebar and concrete, allowing for shorter splice lengths.
8. What are the implications of using incorrect splice lengths? Incorrect splice lengths can lead to weakened connections, structural failure, and potential safety hazards.
9. Where can I find more detailed information on rebar splicing? Consult ACI 318 and other applicable building codes and standards.

Related Articles:

1. ACI 318 Code Requirements for Rebar Splices: A detailed explanation of the relevant sections of ACI 318 related to rebar splicing.
2. Types of Rebar Couplers: An overview of different types of mechanical couplers, their applications, and advantages.
3. Effect of Concrete Strength on Rebar Splice Length: An in-depth analysis of the relationship between concrete compressive strength and required splice length.
4. Rebar Splice Inspection and Quality Control: Best practices for inspecting and ensuring the quality of rebar splices.
5. Common Mistakes in Rebar Splicing and How to Avoid Them: A guide to avoiding common errors during rebar splicing installation.
6. Calculating Rebar Lap Splice Length: A Practical Guide: Step-by-step calculations for determining the necessary lap splice length for various rebar grades and diameters.
7. Comparing Rebar Splicing Methods: Lap, Mechanical, and Welded: A comparison of the strengths, weaknesses, and suitability of different rebar splicing methods.
8. Rebar Splice Design for Seismic Zones: Special considerations for designing rebar splices in seismically active regions.
9. Troubleshooting Rebar Splice Problems: A Comprehensive Guide: Solutions to common problems encountered during rebar splicing, including causes and preventative measures.

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rebar splicing length: Seismic Design, Assessment and Retrofitting of Concrete Buildings Michael N. Fardis, 2009-07-25 Reflecting the historic first European seismic code, this professional book focuses on seismic design, assessment and retrofitting of concrete buildings, with thorough reference to, and application of, EN-Eurocode 8. Following the publication of EN-Eurocode 8 in 2004-05, 30 countries are now introducing this European standard for seismic design, for application in parallel with existing national standards (till March 2010) and exclusively after that. Eurocode 8 is also expected to influence standards in countries outside Europe, or at the least, to be applied there for important facilities. Owing to the increasing awareness of the threat posed by existing buildings substandard and deficient buildings and the lack of national or international standards for assessment and retrofitting, its impact in that field is expected to be major. Written by the lead person in the development of the EN-Eurocode 8, the present handbook explains the principles and rationale of seismic design according to modern codes and provides thorough guidance for the conceptual seismic design of concrete buildings and their foundations. It examines the experimental behaviour of concrete members under cyclic loading and modelling for design and analysis purposes; it develops the essentials of linear or nonlinear seismic analysis for the purposes of design, assessment and retrofitting (especially using Eurocode 8); and gives detailed guidance for modelling concrete buildings at the member and at the system level. Moreover, readers gain access to overviews of provisions of Eurocode 8, plus an understanding for them on the basis of the simple models of the element behaviour presented in the book. Also examined are the modern trends in performance- and displacement-based seismic assessment of existing buildings, comparing the relevant provisions of Eurocode 8 with those of new US prestandards, and details of the most

common and popular seismic retrofitting techniques for concrete buildings and guidance for retrofitting strategies at the system level. Comprehensive walk-through examples of detailed design elucidate the application of Eurocode 8 to common situations in practical design. Examples and case studies of seismic assessment and retrofitting of a few real buildings are also presented. From the reviews: This is a massive book that has no equal in the published literature, as far as the reviewer knows. It is dense and comprehensive and leaves nothing to chance. It is certainly taxing on the reader and the potential user, but without it, use of Eurocode 8 will be that much more difficult. In short, this is a must-read book for researchers and practitioners in Europe, and of use to readers outside of Europe too. This book will remain an indispensable backup to Eurocode 8 and its existing Designers' Guide to EN 1998-1 and EN 1998-5 (published in 2005), for many years to come. Congratulations to the author for a very well planned scope and contents, and for a flawless execution of the plan. AMR S. ELNASHAI The book is an impressive source of information to understand the response of reinforced concrete buildings under seismic loads with the ultimate goal of presenting and explaining the state of the art of seismic design. Underlying the contents of the book is the in-depth knowledge of the author in this field and in particular his extremely important contribution to the development of the European Design Standard EN 1998 - Eurocode 8: Design of structures for earthquake resistance. However, although Eurocode 8 is at the core of the book, many comparisons are made to other design practices, namely from the US and from Japan, thus enriching the contents and interest of the book. EDUARDO C. CARVALHO

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rebar splicing length: *Transient Electromagnetic-Thermal Nondestructive Testing* Yunze He, Bin Gao, Ali Sophian, Ruizhen Yang, 2017-05-25 Transient Electromagnetic-Thermal Nondestructive

Testing: Pulsed Eddy Current and Transient Eddy Current Thermography covers three key areas of theories, methods and applications, primarily the multi-physics field, including eddy current, heat conduction and Infrared radiation for defect evaluation, lateral heat conduction, which is analyzed to detect parallel cracks, and longitudinal heat conduction, which is analyzed to detect depth defect, or that which is beyond skin depth. In addition, the book explores methods, such as time domain, frequency domain and logarithm domain, also comparing A-scan , B-scan and C-scan. Sections on defect identification, classification and quantification are covered, as are advanced algorithms, principal components analysis (PCA), independent components analysis (ICA) and support vector machine (SVM). The book uses a lot of experimental studies on multi-layer aluminum structures, honeycomb structure, CFRP in the aerospace field, and steel and coating in the marine rail and transportation fields. - Presents two kinds of transient NDT testing, from theory and methodology, to applications - Includes time domain frequency domain and logarithm domain, which are all analyzed - Introduces A-scan , B-scan and C-scan, which are compared - Provides experimental studies for real damages, including corrosion and blister in steel, stress in aluminum, impact and delamination in CFRP laminates and RCF cracks are abundant

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overview Special moment frames Special structural walls Gravity framing Diaphragms and collectors Foundations

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detailing. Detailed design and construction features are covered for earthquake resistant design of reinforced concrete as well as confined and reinforced masonry structures. The book also provides the methodology for assessment of seismic forces on basement walls and pile foundations. It provides a practical approach to design and detailing of soft storeys, short columns, vulnerable staircases and many other components. The book bridges the gap between design and construction. Plenty of worked illustrative examples are provided to aid learning. This book will be of value to upper undergraduate and graduate students taking courses on seismic design of structures.

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