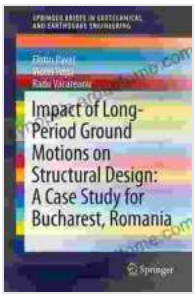
Impact Of Long Period Ground Motions On Structural Design

Earthquakes, a natural hazard that has the potential to cause widespread destruction, pose significant challenges to structural engineers and architects. The design of structures to withstand the forces generated by earthquakes requires a deep understanding of the earthquake ground motions and their effects on buildings and infrastructure.

One of the key factors that influence the seismic response of structures is the frequency content of the ground motions. Long period ground motions, which have a relatively low frequency and long duration, can be particularly damaging to structures with natural periods that are close to the predominant period of the ground motions.



Impact of Long-Period Ground Motions on Structural Design: A Case Study for Bucharest, Romania (SpringerBriefs in Geotechnical and Earthquake Engineering) by David Darling

4.9 out of 5

Language	: English
File size	: 5512 KB
Text-to-Speech	: Enabled
Screen Reader	: Supported
Enhanced typesetting	: Enabled
Word Wise	: Enabled
Print length	: 143 pages

This book provides a comprehensive overview of the impact of long period ground motions on structural design. It covers a wide range of topics, including:

- The characteristics of long period ground motions
- The effects of long period ground motions on structures
- The design of structures to resist long period ground motions

li>Case studies of structures that have been damaged by long period ground motions

The Characteristics of Long Period Ground Motions

Long period ground motions are typically generated by large earthquakes with a magnitude of 7.0 or greater. They have a relatively low frequency, typically between 0.1 and 1.0 Hz, and a long duration, which can last for several minutes.

The frequency content of ground motions is an important factor that influences the seismic response of structures. Structures with natural periods that are close to the predominant period of the ground motions will experience higher levels of shaking and are more likely to be damaged.

The Effects of Long Period Ground Motions on Structures

Long period ground motions can have a variety of effects on structures, including:

- Resonance: When the natural period of a structure matches the predominant period of the ground motions, the structure will

experience resonance, which can lead to large amplifications of the structural response.

- Overturning: Long period ground motions can cause structures to overturn, particularly if the structure has a high center of gravity.
- Pounding: Long period ground motions can cause adjacent structures to collide with each other, which can lead to significant damage.
- Soil-structure interaction: Long period ground motions can interact with the soil surrounding a structure, which can lead to changes in the ground motions and the structural response.

The Design of Structures to Resist Long Period Ground Motions

There are a number of ways to design structures to resist the effects of long period ground motions, including:

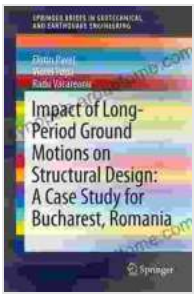
- Increasing the stiffness of the structure: This can be done by using stronger materials, increasing the cross-sectional area of the structural members, or adding bracing.
- Damping the structure: Damping devices can be used to absorb energy from the ground motions and reduce the structural response.
- Isolating the structure from the ground: Base isolation systems can be used to isolate the structure from the ground motions, which can reduce the amount of energy that is transferred to the structure.

Case Studies of Structures that have been Damaged by Long Period Ground Motions

There have been several notable cases of structures that have been damaged by long period ground motions, including:

- 1985 Mexico City earthquake: This earthquake caused widespread damage to buildings in Mexico City, many of which were damaged by long period ground motions.
- 1994 Northridge earthquake: This earthquake caused significant damage to buildings in the Los Angeles area, many of which were damaged by long period ground motions.
- 2011 Tohoku earthquake: This earthquake caused widespread damage to buildings in Japan, many of which were damaged by long period ground motions.

Long period ground motions are a significant threat to structures, and it is important for structural engineers and architects to understand the effects of these ground motions and to design structures to resist them. This book provides a comprehensive overview of the impact of long period ground motions on structural design, and it is an essential resource for anyone involved in the design of earthquake-resistant structures.



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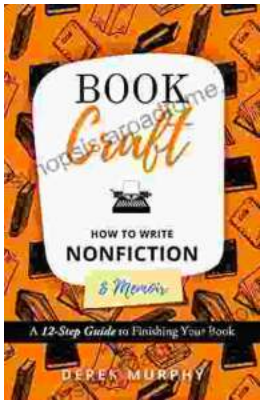

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