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**A STUDY OF SOIL-STRUCTURE INTERACTION FOR
ENHANCED EARTHQUAKE PREPAREDNESS**

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ABSTRACT

Soil-structure interaction (SSI) plays a critical role in enhancing earthquake preparedness, as it affects how buildings and structures respond to seismic activity. When an earthquake occurs, the motion of the ground interacts with the structure above, altering the distribution of forces and deformation. SSI involves the dynamic exchange of energy between the soil and the structure, influenced by factors such as soil type, foundation design, and structural characteristics. Understanding these interactions is essential for designing resilient structures that can withstand seismic forces. Traditional building codes often treat soil and structures as separate entities, leading to potential underestimation of seismic demands. However, incorporating SSI into earthquake-resistant design enables engineers to anticipate the amplified effects of ground motion, resulting in more accurate predictions of structural behavior. Techniques such as base isolation, soil improvement, and advanced foundation designs can be employed to mitigate adverse SSI effects, reducing building damage and enhancing safety. Furthermore, numerical modeling and experimental studies of SSI contribute to the development of performance-based design approaches, making earthquake preparedness more robust. By accounting for SSI, engineers can improve the resilience of infrastructure, ultimately safeguarding lives and minimizing economic losses in seismic-prone regions.