

# KNOWLEDGE - BASED EXPERT SYSTEM FOR CONSIDERING SOIL - STRUCTURE INTERACTION EFFECTS IN THE DESIGN OF R/C BUILDINGS

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**Abstract.** *It is generally accepted that foundation soil conditions may modify the dynamic characteristics and the subsequent seismic response of structures. Extensive research performed in this field has revealed that, depending on the earthquake and soil characteristics, as well as on the relative structure-foundation-soil flexibility, neglecting the role played by the foundation subsoil may lead to unconservative design under certain circumstances, despite the common perception that Soil-Structure-Interaction (SSI) has a beneficial effect on the structural response. This paper is therefore concerned with the description of a Knowledge-Based Expert System (KBES) aiming to assist both the qualitative and the quantitative assessment of the significance of SSI effects during the seismic design process. Based on expert judgment, state-of-the-art scientific publications and seismic code provisions the modular System interacts with the user and decides whether SSI effects should be accounted for in the design, while it provides the appropriate dynamic stiffness matrices required for the finite element representation of the problem.*

## 1 INTRODUCTION

In engineering practice, during seismic design of R/C buildings, Soil-Structure-Interaction (SSI) effects are often treated as a beneficial phenomenon on the basis of the perception that amount of seismic forces that the structure will be subjected to, will be eventually reduced due to both the anticipated period elongation of the building and the energy dissipation that results from the wave radiation and hysteretic damping at the soil-foundation interface. As a result, with the exception of structures of particular importance, buildings are most commonly considered and designed as fully fixed at their base, hence still ignoring what is nowadays widely accepted after decades of extensive research: that the foundation is flexible, dissipates energy and interacts with the surrounding soil and the superstructure, in such a way that it filters seismic motion (kinematic interaction) while it is subjected to inertial forces generated