

In comparison with the traditional fixed-base model, the fundamental vibration period of the structure increases and the seismic demand reduces. Reductions in the horizontal acceleration values for design purposes up to 35% have been reached. This leads to more accurate results of structural behavior as well as more economic designs.

- Dynamic soil-structure interaction analysis and vibration analysis of structures

Soil-structure interaction analyses can be performed also due to the action of dynamic non-seismic loads. This way DSE estimates vibrations in structures due the action of vibrating machinery in the same structure or in the neighborhood, due to the action of traffic loads, impact loads or explosions.

- Solution to vibrations in structures

Dynamic vibrations can affect the structure and usually their inhabitants and content. Vibrations can be uncomfortable for the people and can be harmful for sensible equipment. DSE proposes and designs solutions against vibrations in structures. Depending on the vibration load and on the structure to be protected different vibration solutions can be proposed such as energy dissipation systems and structural control systems like base isolation.

- Seismic evaluation of existing structures

Using analytical and experimental procedures, DSE designs the seismic rehabilitation of structures, consisting of: review of the existing conditions, collect information from the structure, simulate the seismic behavior, design and verify the rehabilitation, as well as draft rehabilitation documents.

## Geotechnical Engineering



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# Dinámica de Suelos y Estructuras



## Introduction

Dinámica de Suelos y Estructuras, DSE, is a consulting firm located in San Salvador, El Salvador offering consulting and engineering services in the fields of geotechnical engineering, as well as testing, consulting and engineering services in the fields of soil dynamics and structural dynamics.

## Geotechnical Engineering

We offer geotechnical design solutions for diverse problems from housing and building developments to industrial facilities and roadway works.

DSE offers a systematic approach to the projects to ensure that engineering considerations are satisfied. Site visits, available background data and historical information help us to design a suitable site investigation to fulfill our clients' objectives. Further, field and laboratory studies provide data to identify appropriate design parameters and engineering solutions. We can perform design, supervision and draft contract specifications for geotechnical works.

## Soil Dynamics and Structural Dynamics

Earthquakes, machinery vibration, traffic vibration, and explosions, are dynamic loads that propagate in form of waves through the soils to the structures, forcing the dynamic behavior of soils and structures. DSE offers consulting services to investigate the dynamic behavior of soils and structures as well as solutions to improve their dynamic behavior.

- Seismic behavior of soils and structures

Earthquakes induce an energy release which propagates in form of waves through the earth's crust. The amplitude of the waves attenuates with the traveled distance. However, the travel of seismic waves through soil deposits produces filtering and amplification of the waves, depending on the site characteristics. These amplified waves propagate to the surface and affect soil masses and structures.



superstructure

- Liquefaction and soil improvement

Soil layers composed of uniform fine saturated sands may experience due to earthquakes a sudden and short-term decrease of resistance and a change of phase known as liquefaction. Liquefaction may cause failure of the structures supported. DSE is able to estimate the potential liquefaction of a specific site and to recommend geotechnical and foundation solutions against liquefaction.

- Slope stability analysis and design of earth retaining structures

Seismic waves induce a stress increase in the soils which may cause landslides and failure of structures built on unstable soil masses. DSE performs slope stability analyses and designs accordingly earth retaining structures.



- Seismic hazard analysis

An estimation of ground-shaking hazard at a particular site is performed by DSE through a seismic hazard analysis. A deterministic analysis for a particular site, which considers only some given seismic sources, provides a peak ground acceleration value from an earthquake event with a given magnitude and located at a given distance. On the other side, a probabilistic analysis for a particular site, which considers uncertainties in the geologic and seismologic environment, provides curves describing the probability that a given peak ground acceleration value will be exceeded during a particular period of time.

- Site specific design ground motion

From the probable occurrence earthquake together with the local site amplification DSE can compute a site-specific design ground motion. This way the uncertainties included in a code-based design ground motion are reduced and more economic structure designs are allowed.



- Seismic soil-structure interaction analysis

Traditional seismic analysis of structures supposes a fixed-base structure subjected to the motion of the ground surface. DSE performs structural analysis, using a coupled model of the supporting soil, the foundation and the structure subjected to seismic loads, namely soil-structure interaction analysis.