DYNAMIC AND EARTHQUAKE ANALYSIS OF SOME SHEAR WALL STRUCTURES WITH OPENINGS AND WALL DIAPHRAGM FRAMES CONSIDERING THE UNEQUAL SETTLEMENTS EFFECT OF FOUNDATION SOIL

by

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The building structure behaviour under dynamic and seismic loads depends on several factors, among which, the structure conformation, the foundation system and the soil nature. The principles on which are based the dynamic and seismic analyse of some shear-wall structures with openings and frames coupled with diaphragm-walls having foundations as continuously supported beams or general raft-foundation and taking into account the interaction effect are briefly presented.

The analyse is based on the finite element technique, both for the structural system made of diaphragms with openings or wall-diaphragm frames and foundations and for the ground. The soil has been supposed to be homogeneous or non-homogeneous, liniar deformable halfspace, either isotropic or anisotropic. The contact surface between substructure and soil has been divided into sub-ranges (finite elements), on which the pressures have been approximated by means of interpolation polynoms in view of determining the displacements on the soil, then these pressures have been replaced by equivalent nodal forces.

A technique has been introduced to obtain the stiffness matrix of the structural system and the rigidity matrix of the soil. From the conditions of contact between substructure and soil, the global stiffness matrix of structure, substructure and soil has been obtained.

Starting from the motion equations of the system with interaction, the natural frequencies of free oscillations and eigenmodes have been deduced on which bases the seismic forces and then the stress and strain state in the system have been determined.

The interaction effects upon the system behaviour have been marked out by comparing them with the situation when they were ignored. The numerical examples show some alterations, which are not negligible, in the dynamic and seismic behavior of the considered systems. Thus the dynamic characteristics of the structure and the strain and stress state in the system are presenting differences reaching 50% in the two considered cases, with and without interaction. To illustrate soil influence we have considered more cases, and the results show that the characteristics and the mechanical model of the ground are very important for interaction.

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