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SITE EFFECTS IN THE EUROCODE 8

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ABSTRACT

Eurocode 8 (EC 8)- *Design provisions for earthquake resistance of structures* - has been drawn up, like the other eight Structural Eurocodes, under a contract with the European Commission, and has until 1998 the status of a European "Prestandard". It was completed in 1995, and consists of five Parts which, in addition to buildings and structural materials, contain specific provisions relevant to bridges, towers and chimneys, tanks, silos and pipelines, as well as specific provisions relevant to foundations, retaining stuctures and geotechnical aspects (Part 5).

Site effects are mainly dealt with in Part 1-1 - *General rules, seismic actions and general requirements* - and in Part 5. The former contains an important section on ground conditions which, on the basis of appropriate data and investigations, requires that the subsoil profile at the construction site be assigned to one of three general classes, i.e. A (rock of any kind and stiff deposits), B (deep alluvium) and C (soft sites) for the purpose of selecting the design spectrum. The profile is characterised by a qualitative description and by the indicative intervals of the S-wave velocity v_s values portrayed in the figure, mostly based on *in situ* measurements from some tens of Italian strong-motion sites. The spectral shapes associated with the different soil classes are consistent with observed smoothed spectral envelopes. Special consideration is given to the case of: (*a*) thin (5m to 20m) surficial alluvium layers underlain by much stiffer materials of class A, that are prone to strong amplification at relatively low periods of vibration, and are affected by a 40% increase in spectral ordinates unless a special study is performed, and (*b*) thick layers of cohesive materials with high plasticity index, for which a special study is required to determine the design spectrum. A soil parameter S also appears as a multiplicative coefficient in the design spectrum expression, to take into account nonlinear soil response effects. A value S=1 is presently recommended pending firmer evidence of nonlinearity from field data. Site effects tied to sharp impedance contrasts between cosecutive soil layers are also taken into account in Part 5, in the verification of kinematic actions generated in piles by wave propagation.
EC 8 also provides for the use of topographic amplification effects in connection with the stability verification of slopes belonging to predominantly 2-D irregularities, such as long ridges and cliffs with height >30 m. For slope angles >15° amplification factors typically between 1,2 and 1,6 are recommended depending on the slope angle and the presence of a looser surface layer more than 5 m thick. The values of the amplification coefficients are derived from numerical analyses of simple 2-D geometries. The surface-related nature of topographic effects is explicitely recognised, so that they can be neglected for deep-seated landslides.