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# Linear Spring Constants of Soil for Pile Groups for the Nuclear Power Plants

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## Abstract

The nuclear power plants are very massive and stiff structures. For such structure when founded on soft layered soil mass, the soil-structure interaction (SSI) has significant influence to the seismic response. Most of the existing nuclear power plants in India are constructed on rock which may not have the requirement of seismic soil-structure interaction analysis but some of the upcoming nuclear power plants will be founded on the alluvial soil necessitating to consider SSI. The pile foundation will be appropriate for nuclear power plants and high-rise buildings in the soft soil conditions and subjected to earthquake loading because of its effectiveness in load distribution to soil. In this research, simplified linear spring constants of soil are proposed to simulate the behavior of pile group foundation. These springs shall take care of pile-soil-pile interaction i.e. group effect. The pile group is modeled as an embedded beam element with the finite element discretization. In order to verify the validity of the proposed linear spring constants, computed response (in terms of Bending Moment, Shear Force and Deflection) is compared with the published results, where the soil is modelled as a continuum using the Finite Element Method. The good agreement achieved shows that the proposed method provides a simple and useful tool for engineering design of pile groups.

**Keywords:** Bending, deflection, Finite element method, Nuclear power plants, Pile group, Spring constant