A considerable progress has been made in the design of superstructures whereas the design of foundations still needs much attention. Very little work has been done on such problems perhaps due to complexity of soil structure interaction. As a result, the foundations are designed very conservatively. In soil-structure interaction problems, a very high factor of safety (which is nothing but factor of ignorance) is used. Hence if considerable attention is imparted to the study of behaviour of structure in relation with soil, it will lead to reduction of factor of safety to be adopted in the estimation of bearing capacity and bending moment. In most of the cases, the conventional methods are conservative and in some cases, surprisingly unsafe.

Conventional methods of design of footings or beams assume that the footing or the beam is always in contact with the soil and the contact pressure distribution is linear. However, practically, even concentrically loaded footings may lose contact with the soil, especially when a thin footing is resting on a very hard stratum. The available classical solutions for the analysis of beams based on Winkler's model assume that the soil can take both compression and tension.

The factors determining the contact of the footing with the soil are the plan dimensions, thickness and elastic properties of the material of the footing, modulus of subgrade reaction of the soil supporting it, the column to the footing width ratio and the eccentricity of the loading.

For example, qualitatively it is known that when all other factors remain the same, a thin footing may lose contact whereas a thick footing may have full contact with the soil.

Similarly, a footing supported on rock may lose contact whereas the same footing supported on soft clay may have full contact. However, the critical number, which separates a footing with full contact from that with partial contact, is yet to be established for different conditions. In this thesis, an attempt is made to quantify the factors influencing the footing contact.

Apart from this, conventional method of calculating the bending moment and contact pressure in the footing and beam assumes that the contact pressure is linear and bending moment is independent of the thickness of the footing and modulus of subgrade reaction of the soil supporting it, leading to conservative design and in some cases to unsafe design. Hence, an attempt is made to study the behaviour of beams and plates resting on tensionless Winkler foundation incorporating all the above-mentioned factors. An equation is developed to find critical relative rigidity by multiple linear regression analysis. To verify the results of the numerical methods, some experiments are also conducted to verify the contact length of finite beams, contact area of plates and bending moment at the critical section on the plates