Abstract of Doctoral Thesis

Title : Study on new calculation method of the distribution of ground contact pressure based on interaction between rigid foundation and base ground

うえだ　けんぞう

Ueda Kenzo

This study proposes an easy method for calculating the contact pressure distri-bution in the bottom of foundations in order to facilitate optimum design of foundations used in all types of civil and building structures. The foundations are supposed to have horizontal symmetry about the central axis and have a shape made up of rectangular combinations. Conventional methods require the repetition of complex calculations, but with the new proposed method, the contact pressure distribution can be calculated easily, even for quite complex foundation bottom shapes.

The followings are the outline of this paper.

The chapter 1 shows the background, the nessesity, the roles, the aims and the outline of this paper.

The chapter 2 shows at first the outline of conventional design method on evaluation of contact pressure distribution, and points out its problems such as the case that the method considers sometime the non-existing tension force between foundation bottom and base ground. Next new estimation method of contact pressure distribution is formulated based on the modified design method for flat bottom foundations in order to improve the conventional method. The new design method was applied to some actual foundations and the validity and the applicability of the new method was clarified.

The chapter 3 deals with a new calculation method of contact pressure distribution and displacement under irregular shaped rigid foundations considering elasto-plastic behavior of ground. Generally speaking, uneven displacement including partial gap of the basement of spread foundation by the effect of dynamic interaction becomes a severe issue when earthquake occurs, that is lateral large force must be considered in design. Although conventional methods assume an ideal fixed or pin-structured mechanical bearing on the contact surface between foundation and base ground and require troublesome iteration, the proposed calculation method in this paper is based on a rocking-sway model which is a mechanical system of one degree of freedom and is easily applicable to rather complicated shape foundations. Moreover three dimensional FEM is carried out for a single rectangular shape foundation, and the

reliability of the proposed method is evaluated by the comparison with the analytical results.

The chapter 4 deals with a rational design method of contact pressure distribution and displacement at the bottom of faulting footings on slope. The faulting footings are well used for effective enlargement of development area, but the design of faulting footings is sometimes problematic. It was shown that the new proposed method for flat footings in the chapter 2 was applicable to the cases of faulting footings by carrying out some numerical simulations based on new design method for some concrete structures of faulting footings.

The chapter 5 shows the conclusions of this paper.