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8. SUMMARY

Proceeding from the consideration that no physical reality is due to the conception of surface-tension, an explanation of surface- and capillary phenomena which is independent from this conception has been tried in the above explanations. As far as therewith the liquid is concerned itself no alteration of quantative relations takes place, and therefore the explanations differ only in methodical respect from the usual contemplation. But an effect of the described interpretation upon the coacting solid substances, especially upon the solid phase in coherent soil exists also in quantitative respect.

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SUB-SECTION I d

STRESS-STRAIN RELATIONS; CONSOLIDATION

I d 9 DEFORMATIONS AND STRESSES IN THE MEDUUMS WITH INTERNAL FRICTION

J. MANDEL

SUMMARY OF THE FRENCH REPORT.

The author strives to state precisely the basis of the computations about stress distribution in the ground.

1°. Through a water containing soil loads are transmitted, partly by the water, partly by the contacts between solid elements. In order to put this fact into a mathematically convenient form, the author defines a statistical contact stress on each surface element. The whole stress-tensor is now the sum of the statistical stress tensor (contact tensor) and the hydraulic tensor. The deformations of the medium (settlings, slidings, breakings) depend not on the whole tensor but on the contact tensor. The well known effects of capillary underpressures or hydrodynamic actions are derived from the equilibrium equations for the contact tensors.

2°. May we compute the small deformations of a soil under a load, as if elastic deformations were concerned? This is right when the 3 main stressses given by such a computation are of the same sign. When it is not the case, we may indeed state linear relations between main stresses and main strains, but we must assume that the coefficient relating to the effect of a stress under a strain depends on the sign of this stress. Thus we are induced to consider 4 coefficients instead of the 2 usual coefficients of elasticity (E: modulus of settling , E': modulus of swelling, ν and ν' : corresponding Poisson's ratios). On that basis, the author gives the solution for the problem of the equilibrium around a hole in the form of a circular cylinder (wells, tunnels).

3°. The previous considerations are applied to the problem of the settling of clayish masses. The author precisely states the question of immediate settling by proving the proposition, valid for plane problems: In a homogeneous or not homogeneous medium, to which in a point M coefficients E, E', ν , ν' belong, immediate stresses and strains are the same as if the medium were perfectly elastic and had in M the coefficients :

$$\nu_0 = 0{,}5 \qquad E_0 = \frac{3}{4}\left(\frac{E}{1+\nu} + \frac{E'}{1+\nu'}\right)$$

The fact that E' is much greater than E explains that the immediate deformation is much smaller than the deformation we should compute by using the theory of elasticity if employing the modulus of settling E (instead of E_0) associated with the Poisson's ratio $\nu_0 = 0{,}5$.

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