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堆载－电渗联合作用下的耦合固结理论

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Coupling consolidation theory under combined action of load and electro-osmosis

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摘要 该理论考虑了水流和电流的相互作用以及地基中孔隙水压力的发展过程，利用等应变等考虑堆载－电渗联合作用的假设建立了轴对称模型的耦合固结方程，并给出了地基中平均孔压和径向固结度的解析解和工程中常用的电极梅花形排布向轴对称排布转化的方法。最后通过参数分析，研究了电源电压和土体的水力渗透系数对平均孔压消散和径向固结度的影响。结果表明：对于堆载－电渗联合作用而言，电源电压越大越好，电渗渗透系数和水力渗透系数比值合适的范围是102～103。

关键词： 电渗 堆载 耦合固结 等应变 砂井

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Abstract： The coupling consolidation equations for axisymmetric model are established on the basis of the equal strain assumption under the combined action of the load and electro－osmosis. The analytical solutions for average excess pore pressure and radial average degree of consolidation are provided. The present theory considers the interaction between water flows and electrical currents as well as the development of excess pore pressure in the foundation. The method of conversion from hexagonal array of electrodes to axisymmetric array is also provided. Finally, the effect of supply voltage and hydraulic permeability of soil on the dissipation of the excess pore pressure and the radial average degree of consolidation is investigated by use of the method of parametric analysis. For the combined action of load and electro-osmosis, the results show that better consolidation effect can be gained by higher supply voltage, and that the appropriate ratio of electro-osmosis permeability coefficient to hydraulic permeability coefficient ranges from 102 to 103.

Keywords： electro-osmosis   load   coupling consolidation   equal strain   sand drain

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