

新疆吐鲁番地区坎儿井的破坏特性研究

Damage properties of Karez in Turpan of Xinjiang Uygur Autonomous Region

中文关键词: [坎儿井](#) [黄土力学试验](#) [数值分析](#) [破坏机理](#)

英文关键词: [Karez](#) [loess mechanical tests](#) [numerical analysis](#) [damage mechanism](#)

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中文摘要:

为了搞清坎儿井的破坏机理。通过现场调查,并结合饱和及非饱和黄土在冻融和非冻融条件下的三轴压缩试验、三轴等压试验和弹性模量试验,揭示了饱和及非饱和黄土在冻融条件下的强度变形规律;通过非饱和土弹塑性有限元计算,分析了坎儿井竖井和暗渠的破坏特性。在这些综合研究的基础上得出了坎儿井的破坏机理。受季节的影响,冬季冻胀破坏土体结构,土层在融化时,使土层侧墙水平变形和等效塑性应变增大。随着季节周而复始的变化,坎儿井竖井部位和暗渠出口部位的洞壁土体从底脚开始剥落破坏,然后随塑性区的扩展而发展成块状剥落破坏,最后形成大面积坍塌破坏。

英文摘要:

In order to rehabilitate the damaged karezs and to prevent this kind of project from destruction the laws of the strength and deformation of saturated and unsaturated loess under freeze-thaw and non-freeze-thaw conditions were studied by on-site investigation and combining with the triaxial compression tests, the isotropic compression tests and the elastic module tests to find out the failure mechanism. In the mean time, the failure characteristics of the shafts and culverts of the karezs were numerically simulated by using elasto-plastic finite element method. Based on these studies, the karez failure mechanism was revealed. Following the changing of season the temperature and humidity in karezs varied cyclically in a year, the soil structure experienced the frost heave in winter and the side walls of culverts subjected to the increases of deformation and plastic strain during melting as temperature rose. Under this cyclic action, the damaged area in the shafts and at the lower parts of the side walls occurred and gradually flakes away as the plastic area expanded, which finally resulted in failure. The measures for preventing from failure are also proposed.

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