

山东东明黄河标准化堤防裂缝成因数值分析

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摘要 采取淤背方式加固黄河下游堤防时, 山东东明一期标准化堤防多处出现纵向裂缝, 严重危及黄河大堤安全。放淤固堤对堤身的影响非常复杂, 相关研究成果较少, 目前尚无此类裂缝成因的定量研究成果, 因而难以从根本上进行防治。通过开展典型堤段试验, 利用非饱和渗流、非饱和流-固耦合、湿化变形、有限元分析等理论与方法, 模拟标准化堤防的施工过程, 并进行多种特定工况分析, 探讨堤防裂缝的形成机制及其主要影响因素。研究成果表明, 计算结果能反映堤身裂缝的扩展过程, 并与实际情况相符; 大堤开裂的主要原因为背河侧放淤、淤背施工过快、湿化变形、排水不畅、堤顶堆载、车辆作用等。该成果可供标准化堤防及类似工程的裂缝防治时参考。

关键词 [水工结构工程](#); [黄河](#); [标准化堤防](#); [裂缝](#); [淤背](#); [有限单元法](#)

分类号

NUMERICAL ANALYSIS OF FORMING MECHANISM OF CRACK IN STANDARDIZATION DIKE ON YELLOW RIVER IN DONGMING OF SHANDONG PROVINCE

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Abstract

In the course of building the downstream standardization dike in Yellow River, the method of reinforcing dike with silt was adopted. By far, longitudinal cracks appear in the first stage project in Dongming of Shandong Province, which would endanger the safety of dike. It has huge complex impacts on dike body to reinforce dike with silt, and little study is carried out. There are no quantitative results about the forming cause of crack, so it is very difficult to prevent and deal with radically. By experiment on typical dike section, and theories and methods such as unsaturated seepage, liquid-solid coupling, soak deformation, finite element analysis and so on used to simulate the process of construction, the forming mechanism is analyzed and the main factors are discussed by analyzing several special working conditions. Study shows that the cracking course of dike body can be reflected by simulation; and the results are in accord with the fact. The main factors are reinforcing dike with silt, construction in high speed, soak deformation, poor drainage, stacking load at the tip of dike, impact of vehicle and so on. The results can provide references to building the standardization dike and similar projects.

Key words [hydraulic structure engineering](#); [the Yellow](#)

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[River; standardization dike; crack; reinforcing dike with silt; finite element method](#)

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