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# 响应面法及其在混凝土面板堆石坝可靠度分析中的应用

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**摘要** 坝体材料的物理参数和作用于坝体的荷载是随机变量, 坝体的应力和变形呈现出不确定性。因此, 对混凝土面板堆石坝进行可靠度分析是正确、合理的。由于面板堆石坝构造复杂, 堆石材料具有非线性特性, 使得这类结构的可靠度分析十分困难。将可靠度计算的响应面法与面板堆石坝应力分析的有限元法相结合分析混凝土面板的可靠度, 并导出了有关公式。可靠度计算采用二次响应面法, 面板堆石坝应力与变形的计算采用三维非线性有限元法。对一混凝土面板堆石坝, 分析了面板的抗裂和抗压可靠度, 得出了可靠指标的变化规律。与其他可靠度分析方法相比, 该方法在提高计算精度和工作效率方面具有一定的优越性。

**关键词** [水工结构; 混凝土面板堆石坝; 响应面法; 可靠度分析](#)

分类号

## RESPONSE SURFACE METHOD AND ITS APPLICATION IN RELIABILITY ANALYSIS OF CONCRETE-FACED ROCKFILL DAM

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### Abstract

The physical parameters of rockfill materials and the loads on concrete-faced rockfill dam (CFRD) are all random variables. They give rise to the uncertainties of stress and deformation of CFRD. Therefore analyzing the structural reliability of CFRD is necessary and reasonable. Because of the complexities of the structure of CFRD and the nonlinear property of rockfill, it is very difficult to carry out the reliability analysis to this kind of structures. In this paper, the response surface method (RSM) for reliability analyses is adopted to calculate the reliability of CFRD and the corresponding calculation formula are derived. 3D nonlinear finite element method is applied to calculate stress and deformation of CFRD. The two-order RSM is applied to the reliability analyses of CFRD. According to a practical example, the calculation of anti-crack and anti-crash reliability of the face slab are conducted and better results are obtained. Compared with other reliability analysis methods, the proposed method is more precise, efficient and convenient.

**Key words** [hydraulic structure; concrete-faced rockfill dam; response surface method; reliability analysis](#)

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