技术类成果

高拱坝抗震关键技术研究

【创新性】

首次开发了以水封钻孔爆破激励整个拱坝－地基－库水系统振动的试验方法，首次获得了国内外最完整的实际大坝动力反应的试验资料，检验了数值分析方法的合理性，显著推动了拱坝抗震学科的科技进步。首次成功量测了库底反射系数 α，提出了淤积库岸岩坡的反射系数 α 值有显著差异从而难以合理取值的观点。首次应用时域显式有限元结合人工透射边界模拟无限介质的波动过程，研究无限地基辐射阻尼、河谷地震动非均匀性以及局部地基软弱材料非线性对拱坝抗震安全的影响。首次进行了带横缝拱坝的振动台大比尺动力模型试验和全面分析计算，加深了对强震时高拱坝横缝非线性动力影响机理的认识，得出了地震作用下坝体横缝张开影响不可忽视的重要结论。

【影响力】

本成果中的《东江拱坝坝体库水地基动力相互作用现场试验研究》和《拱坝动力非线性分析和试验研究及其工程应用》分别获 1997 年度和 1999 年度国家科技进步二等奖。本项目成果对于提高我国高拱坝抗震设计、推动大坝抗震学科发展产生了广泛而深入的影响，对于建立和完善拱坝抗震设计中相关分析方法和模型发挥了重要作用，至今在拱坝抗震设计中得到广泛应用。

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受奖单位：抗震中心

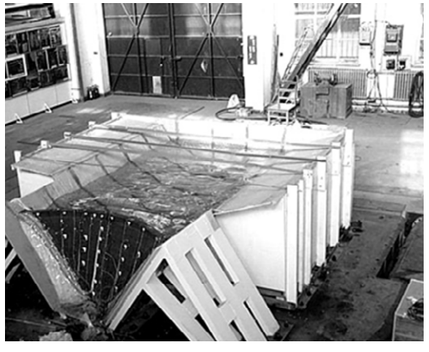
RESEARCH OF KEY ANTI-SEISMIC TECHNOLOGIES FOR HIGH ARCH DAMS

【Innovation】

The project initially developed the test method for the vibration of the whole arch dam-foundation-reservoir water system stimulated by water infusion drilling and blasting, initially obtained the most complete test data at home and abroad for the actual dynamic response of dams, verified the rationality of the numerical analysis method, thus remarkably promoting the scientific and technological progress in the seismic resistance discipline of arch dams. It also measured the bottom reflection coefficient α for the first time, and came up with an idea that it is difficult to determine the reasonable value of the reflection coefficient α of reservoir bank slope with sediment depositions due to significant differences. It initially simulated the volatility process of infinite media, studied the radiation damping of infinite foundation, the non-uniform ground motion of valleys, and the impact of nonlinear weak materials for local foundation on the anti-seismic safety of arch dams with the use of explicit finite elements in the time domain in combination with artificial transmitting boundaries. It also carried out the large-scale shaking table model tests and comprehensive analysis & calculation for arch dams with contraction joints for the first time, which has strengthened the understanding of the nonlinear dynamic influence mechanism for the contraction joints of high arch dams in strong earthquakes, and drawn an important conclusion that the opening of contraction joints of the dam body cannot be ignored under the seismic action.

【Influence】

Among the achievements, the research on the field test of the dynamic interaction among the dam body, reservoir water and foundation of the Dongjiang arch dam and the nonlinear dynamic analysis and experimental research of arch dams and engineering applications won the second prize of the National Science and Technology Progress Award in 1997 and 1999 respectively. The achievements of this project have produced an extensive and far-reaching influence on improving the anti-seismic design of high arch dams and promoting the development of dam seismic sciences in China, played an important role in establishing and improving related analysis methods and models during the seismic design of arch dams, and enjoyed extensive applications in the seismic design of arch dams today.



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Award-winning Unit : Earthquake Engineering Research Center