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锦屏一级水电站f5断层置换硐及其交叉硐段稳定性及支护结构设计研究

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RESEARCH ON STABILITY OF FAULT f5 REPLACEMENT TUNNEL AND ITS INTERSECTION TUNNEL AND DESIGN OF SUPPORTING STRUCTURE IN JINPING I HYDROPOWER STATION

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摘要 参考文献 相关文章

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摘要 f5断层为锦屏一级水电站坝区内规模最大的一条断层，为提高坝肩岩体质量，设置f5－1，f5－2平硐及4条斜井对其进行置换。综合诸多研究成果，对设置置换网格的必要性进行论述。采用三维有限元方法模拟天然地形与地质条件，仿真跟踪置换硐群开挖步序，从应力、变形等多角度评价置换硐整体稳定性，并与监测成果进行对比，分析表明：f5－1和f5－2平硐整体上满足施工期稳定性要求，局部硐段受断层影响支护力不足。对f5－2平硐采取预应力锚杆、钢拱架支护及加厚喷层和提前施作二次衬砌2种补强措施进行数值模拟分析，2种补强措施均能使平硐满足稳定要求，在考虑支护效果、施工等因素下，认为提前施作二次衬砌更为合理；对于平硐与斜井交叉部位，建议在平硐施做完成后对交叉部位前后10 m进行衬砌支护，再对斜井进行开挖，此时衬砌最大压应力不超过6.5 MPa，最大拉应力不超过1.7 MPa；f5－1平硐与5#传力硐交叉部位，建议先对5#传力硐施作衬砌支护，再对部分较薄岩柱固结灌浆，然后再进行平硐施工。数值分析成果为置换硐支护措施的设计提供科学依据，对其他类似工程具有较强的借鉴意义。

关键词： 水利工程 隧硐 数值模拟 破碎岩体 交叉硐段 置换网格 支护结构

Abstract： f5 Fault is the largest fault in the dam area of Jinping I hydropower station。In order to improve the quality of rock mass of dam abutment，adits f5－1，f5－2 and 4 inclined shaft were used to replace the fault f5. Based on the extensive research，the necessity of replacement grid setting was discussed. 3D finite element method was employed to simulate natural topography and geological conditions and excavation. The stability of replacement grid was evaluated by stress and deformation，and compared with measured data. The results show that the adits f5－1and f5－2 meet the stability requirement of the construction period，but supporting force in local tunnel is insufficient. For adit f5－2，two kinds of reinforced measures，prestressed anchor bolt，steel arch centering，thick shotcrete and lining in advance，were adopted，these measures can makes the adit to meet stability requirements. Taking the other factors into consideration，it is believed that lining in advance is more reasonable. For cross parts of adit and inclined shaft，inclined shaft were excavated after lining before and after 10 m of cross parts of adit were completed，the maximum compressive stress of lining is less than 6.5 MPa and the maximum tensile stress is less than 1.7 MPa. For cross parts of adit f5－1 and force transmission tunnel # 5，first proposed in # 5 tunnel applied lining，then consolidation grouting on the thinner rock pillar，last for the construction of the adit. The numerical analysis results provide a scientific basis for the design of lining in replacement tunnel，and has guiding meaning to the other similar projects.

Keywords： hydraulic engineering tunnel numerical simulation broken rock mass intersection tunnels replacement grid supporting structure

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