

# Study on Excavation Sequence of the Underground Caverns in Soft-rock Area

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## ABSTRACT

Soft rock is a complex engineering medium with significant plastic deformation under engineering force. The geological environment of soft-rock area is complex and changeable, and the underground caverns of the hydropower station are various. This results in different cavern excavation sequences that affect the analysis of surrounding rock stability. Different cavern excavation sequences will significantly affect the stress damage and slack deformation control effects during excavation. In this paper, the excavation sequence of the underground caverns of a hydropower station in soft-rock area is simulated. A soft rock layer with uneven thickness appears about 5 m above the top arch of the powerhouse, and a thick soft rock layer exists in the middle and lower parts of the powerhouse. The underground caverns of the hydropower station faces serious stability problems of surrounding rock deformation. The finite element method is used to simulate five excavation schemes. Then we analyzed the differences in stress damage, relaxation deformation, and plastic zone distribution under different excavation schemes. Finally, combined with the construction period and economic benefits, the most suitable excavation plan is given.

## REFERENCES

- [1] Kim YI, Amadei B, and Pan E, "Modeling the effect of water, excavation sequence and rock reinforcement with discontinuous deformation analysis", *Int. J. Rock Mech. Min. Sci.*, Vol. **36**, pp. 949-970, (2007).
- [2] Zhu YH, Shao GJ, and Dong ZG, "Stability analysis about the impact of soft rock to the underground cavern group", *Adv. Mater. Res.*, Vol. **706-708**, pp. 560-564, (2013).