Long-term Performance of Large Longyou Caverns Manually Carved in Argillaceous Siltstone Ground

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The Longyou rock caverns were carved about 2000 years ago at shallow depths in argillaceous siltstone in Longyou county of Zhejiang Province, eastern China. They have large spans and locate at extreme shallow-buried depths. The group of more than 24 caverns can be divided into two sub-groups according to their portal entrances. As shown in Figure 1, the first sub-group has a vertical portal entrance and the second has a horizontal portal entrance. Field investigation results indicate that the first sub-group has much better long-term performance that the second sub-group. The first sub-group has at least ten large rock caverns of complete stable and integrity. All the second sub-group have failed and their roofs are collapsed. The totally different long-term performance of the two sub-group caverns can be due to the facts that the vertical portal entrance can make the cavern fully infilled with water while the horizontal portal entrance can only make the cavern partially infilled with water. The full water infilling in the first sub-group can protect the rock caverns in stable and integral conditions. The partial water infilling in the second sub-group cannot prevent the rock cavern roof rocks from collapse by gravity.

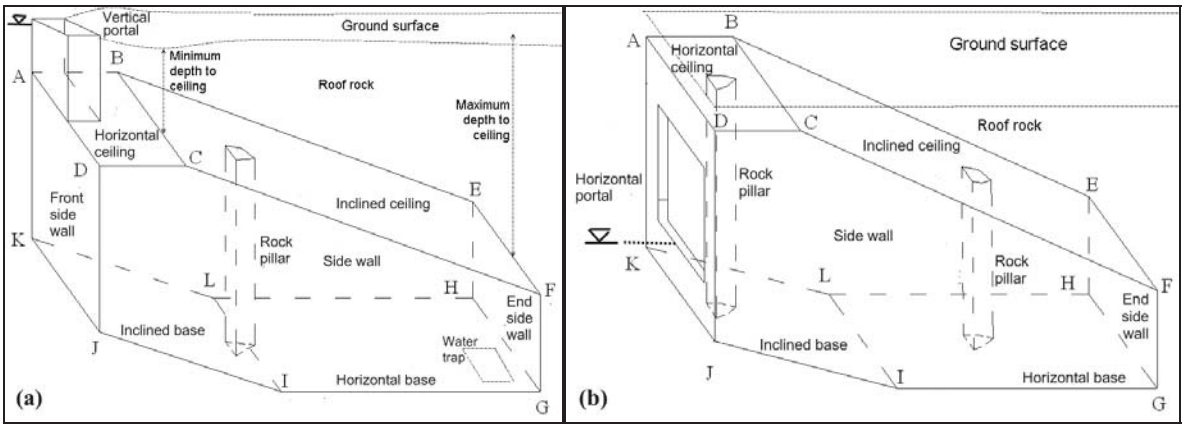

Figure 1. Two types of Longyou caverns: (a) vertical portal entrance; (b) horizontal portal entrance.

Acknowledgements

The NSFC grant (No. 41372336) is acknowledged.

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