Stability analysis for underground limestone mine openings in Korea

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Underground Limestone Mine Site Characterization

The use of underground openings for various purposes is expanding in Korea, and one of such applications is for the carbon capture and storage(CCS) sites. An experimental program has also begun focusing on the carbon resources recycling technologies through the joint efforts among research institutes and universities. Hence, development of the suitable limestone mine site characterization system is one of the major concerns for field engineers. Engineering performance of the fractured rockmass is mainly controlled by the hydrogeological conditions, which significantly affects the overall stability of the underground mine openings.

Approaches of This Study

Prediction of the groundwater inflow requires a detailed knowledge of the geologic conditions. The effect of the water pressure should be considered to assess the stability of underground openings, in terms of the factor of safety and the yield zone size within the rockmass. Some numerical codes were adopted to construct the hydrogeologic model of a undeground limestone mine, and the rate of groundwater inflow and resulting porewater pressure distribution were estimated. Finally, three-dimensional stability of the mine openings was analyzed using the effective stress developed within the rock mass. Figure 1 shows that the factor of safety decreases as the width of the opening increases. The yield zone size also increases with the opening width, but the intact rock strength given in the UCS does not affect the stability significantly.

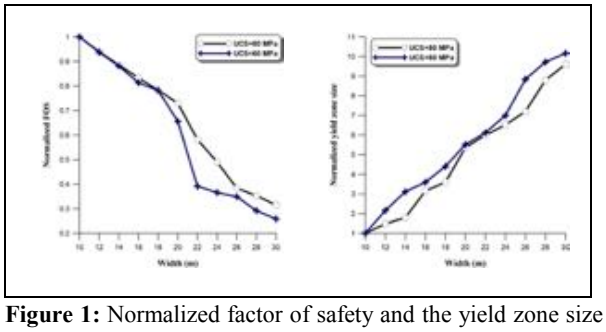

Figure 1: Normalized factor of safety and the yield zone size with varying opening width.