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Height of caved zone in weathered rock mass overlying the subsurface coal mines

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Roof caving over abandoned subsurface mines may result in sinkhole subsidence of the ground surface. Therefore, the potential height of the caved zone over underground workings at shallow depth is one of the most important parameters to be understood for engineering constructions on the overlying ground surface. At shallow depth (up to 80m), rocks of the collapsed roof are weak and porous due to the influence of near-surface weathering. Weathered rock layers do not restrain bedding separation and collapse upon caving of immediate roof. Drilling tests and mechanical laboratory tests were performed to establish the relation between the height of caved zones and the physical characteristics of weathered overburden. An empirical model is developed to determine the height of a caved zone in weathered porous rock mass over shallow, underground workings. Bulking factor controlled caving model was used to calculate the height of caved zone over underground workings at shallow depth. The model shows that the decrease in uniaxial compressive strength of the immediate roof and the increase in average porosity of rock layers over the immediate roof lead to an increase in the ratio between the height of caved zones and the height of underground coal workings. It is suggested that the bulking of the weathered immediate roof is insufficient to arrest caving over underground workings and therefore the significance of the rock mass overlying the immediate roof in formation of caved zones is increased. It is established that in the weathered rocks a ratio of 4.1-11.3 exists between the height of the caved zone and the height of the underground coal workings, whereas in strong rocks this ratio is 1.6-4.