Improvements over undermined areas have resulted in a variety of serious problems including structural damage, swails in rods, and damage to utilities. Although catastrophic failures have occurred, normally deterioration of the roof of the mine and subsequent surface subsidence takes place over many years.

DEVELOPMENT

Development of the surface areas over abandoned mines is becoming financially more feasible because the prime sites have already been developed. The cost to stabilize the mine is determined by a number of factors and may be as simple as installing settlement monitors.

METHODS

Stabilization of undermined areas can be performed with several techniques. The most common method is bulk filling of the void. This is performed by drilling from the surface with 3 to 6 inch diameter holes that intercept the mine. Mine maps can be useful in determining the locations for drilling that give the best opportunity to intercept the mined out areas. If an isolated portion of the void is to be filled, bulkheads are constructed with a lower slump mix placed in openings. The remainder of the void is filled with high slump, low strength grout. If the mine is flooded, it may be necessary to control the water displaced by the grout.

Another common method is construction of grout columns in the mine. In areas where the mine is open, low slump grout is pumped into the mine. As the column builds, the injection pipe is withdrawn until it is even with the ceiling. The volume of grout injected is determined by the height of the mine, the desired surface area contact with the roof and the natural angle of repose of the grout.

If the mine is highly rubbelized, it is necessary to have a grout that is fluid enough to penetrate the rubble. The grout must also be able to stack up in open areas. This is accomplished by varying the viscosity of the grout with thixotropic admixtures injected at the well head. Injection pressure is closely monitored to determine the amount of injection needed.