A Short Course on
Floor Stability in Underground Coal Mines – The Illinois Basin Experience

Owing to a unique depositional feature called the cyclothem, all major mineable coal seams in the Illinois Basin have weak underclay material as their immediate floor. The physico-mechanical properties of the underclay are such that most often the underclay forms the weakest link in the long-term stability of a mine opening. Consequently, pillar design in the Basin is almost always governed by the strength of the floor rather than by the traditional coal strength. In this short course, a brief overview of the geology of the Basin will be provided to highlight the depositional conditions under which the underclays were formed. The results from the analysis of an exhaustive database of laboratory properties will be presented to highlight the differences of the engineering nature of underclays between different parts of the Basin. The largest database of in-situ plate test results ever compiled from the Basin will be discussed to examine the adequacy of current floor strength estimation models and related new developments. Also, the applicability of Vesic's bearing capacity model to predict floor conditions will be discussed with the help of a large database of actual stable and unstable floor cases from different parts of the Basin. The attendees will also be exposed to new developments on the application of advanced nonlinear numerical models to calculate floor bearing capacity under complex floor conditions. Finally, research on floor stability under "perimeter" mined pillars will be presented. Towards the end of the course, practical examples will be presented to demonstrate the application of the concepts covered in the course.

Most of the material to be covered in this course has been developed from research done over the past five years and thus represents the latest state-of-the-art on the subject. The contents of the course are designed to cover both theoretical and practical aspects of floor stability. The course is designed for mine managers, practicing engineers, regulators, permitting personnel and consultants, but enough material is included to appeal to researchers and academicians as well.