

## Request for Proposal

### Topic: Time Dependent Pumpable Roof Support Assessment

**Background:** Pumpable roof supports have proven to be effective support technologies and offer advantages in terms of installation particularly in difficult to access areas such as longwall bleeder entries. There are two basic types of pumpable support material: 1) CSA-based grout and 2) a Portland cement/flyash based grout. The Portland cement/flyash based grout is by far the more commonly used material currently. However, the Portland cement/flyash based grout severely deteriorates to an unconsolidated rubble rendering the support much weaker within hours of being exposed to air while the CSA grout is impervious to air exposure. The primary question is to what degree does air penetrate the containment bag, naturally or through breaks, in actual use to cause any deterioration of support capability over time. Secondly, what changes might be made to minimize or alleviate this potential air degradation problem.



Figure 1. Pumpable material exposed to air for 24 hours. (On right specimen size is 7 x 12 inches and 2 in lab core on left).

**Project Goals:** Determine the impact of air exposure or other time dependent issues to pumpable support performance constructed from Portland cement/flyash based grout.

**Scope or Work:** The submitter has flexibility to tailor the proposed scope of work to meet the project goals, but the following requirements must be met.

#### Phase 1 – Scale of Problem Assessment

- Conduct a survey/inspection on pumpable support installations to determine the following:
  - Prevalence of Portland cement/flyash based supports.

- Functional service life of pumpable support applications for longwall tailgates, gateroad bleeder, and district area (multiple panel) bleeders.
- Determine/estimated percentage and severity of bags with rips or tears.
- Reports of premature support failure or signs of support deterioration.
- Prepare assessment report on the likely severity of factors that can contribute to time dependent failures of pumpable support installations, and associated safety impact.

#### Phase 2 – Laboratory Experimental Testing

- Develop experimental plan to evaluate progression of air through a pumpable support canvas material used for the support construction or similar surrogate material.
- Conduct testing on small-scale laboratory samples of pumpable support (Portland cement/flyash) material wrapped in pumpable support canvas or surrogate protective material.
- Determine the zone of influence or depth of penetration of the air damage as a function of time for pumpable support material wrapped in the type of canvas material used in support construction.

#### Phase 3 – Large (Full) Scale Testing

- If laboratory testing suggests air is capable of penetrating the support canvas material, then develop experimental plan to evaluate the degradation of load behavior and capacity for aged full-scale specimens. Such testing can be done utilizing the NIOSH Mine Roof Simulator unless an acceptable alternative with full-scale loading capabilities is located and beneficial.
- Prepare necessary number of test specimens and conduct full-scale testing of pumpable support technologies to investigate time dependent factors in accordance with experimental test plan.
- Evaluate results and draw conclusions regarding potential impact on support performance and potential safety impacts.
- If investigation finds concerning impacts on time dependent performance, then propose appropriate guidelines for support application limitation and provide recommendations to mitigate or remove the problem from a support design perspective.

**Funding Plan:** The project will be funding in phases according to the Scope of Work with funding for subsequent phase dependent on a successful outcome in the previous phase.

**Submission Requirements:** The submitter is required to submit a proposal not to exceed 20 pages in length to provide documentation of how the scope will be accomplished, the project team and its experiences, a detailed budget to support the project costs and a project timeline. Proposals with advanced planning or more detail with how the scope of work will be accomplished will be rated higher than those lacking detail.

#### **Evaluation Criteria:**

- (50%) Knowledge of pumpable support material chemistry and physical properties

- (30%) Mining experience related to pumpable support application and performance
- (20%) Cost and timeline validation