Rock Slope Stabilization Utilizing Polyurethane Grout
Project Overview

**Project ID:** PRA-GWMP 4(1), 5(1)

**Location:** George Washington Memorial Parkway, Washington, DC

**Owner:** Federal Highway Administration

**Engineer:** Schnabel Engineering North

**General Contractor:** Sagres Construction Corp.

**Subcontractor:** Coastal Drilling East, LLC
Rock Fall Event

On December 13, 2002 a rockfall event occurred on a 240 ft long slope adjacent to the northbound lane of the GWMP in Arlington County VA.

Initial cleanup / stabilization consisted of mechanical scaling and removal of fallen boulders, and placement of concrete barrier
Recommendations

Polyurethane Resin (PUR) Grout
Advantages:
- Aesthetic Appeal
- Grout penetration
- Characteristics of PUR
- Reduction of pore volume of rock
- Bonding capabilities
- Forming a water barrier
- Quick set time

Rock Anchors
Advantages:
- Use is well established
- Engineering behavior is well understood
- Tensioned rock anchors can be verified
- Estimated less cost
Recommendations

Polyurethane Resin (PUR) Grout
Disadvantages:
- Production and design standards have not been established
- PUR grout is more costly than cement grout
- Temperature constraints for grout installation
- Longevity of the grout

Rock Anchors
Disadvantages:
- Exposed plate and nut
- Bond between grout and rock may weaken and deteriorate over time
To retain as much of the natural esthetic look of the rock wall, PUR grouting was chosen as the stabilization technique. With potential spot rock bolting of larger rocks that may destabilize the rock wall further is removed through scaling.
Job Description

- Hand Scaling
- Drilling Grout Holes
- Injection of PUR Grout
- Spot Rock Bolting
- Drilling Drain Holes
- Installing PVC in Drain Holes
Project Challenges

Location:

Courtesy of National Park Service
Project Challenges

Environmental:
Project Challenges

Access:
Project Challenges

Rock Wall:
Hand Scaling
Grout Hole Layout
Grout Hole Layout
Drilling Grout Holes
Injection of Polyurethane Resin (PUR) Grout – STI 70-0.30

Characteristics:
- Dual component, high density, early strength, ground control grout

Uses:
- Ground control in mining and civil applications where early strength is critical to halt ground & strata movement and arrest deterioration of critical zones

Advantages:
- Provides instantaneous effect, will inject into the finest of fractures, can be rapidly deployed as a system, provides enormous strength
Injection of PUR
Spot Rock Bolting
Spot Rock Bolting
Spot Rock Bolting
Drain Holes
Drain Holes

Typ 3-inchØ Drainage Hole

2-inchØ (Min), Schedule 80, Slotted PVC Drainage Pipe Installed in Drain Hole

End Cap

5°

Grout 8" of Annulus

Rock Face

Typical Drain Detail
Drain Holes
Conclusion