



U S G R O U T C O R P O R A T I O N

# ULTRAFINE CEMENTITIOUS GROUT

APS 3 $\mu$

MICROFRACTURES AT THE WASTE ISOLATION PILOT PLANT REPOSITORY FILLED WITH **US GROUT** ULTRAFINE.

PRODUCERS OF  
Ultrafine Pozzolan  
Cementitious Grouts



[www.usgrout.com](http://www.usgrout.com)

IN EXCLUSIVE PARTNERSHIP WITH



**AVANTI**

Control groundwater. Stabilize soil.  
Stop leaks. **Permanently.**

[www.avantigrout.com/cement](http://www.avantigrout.com/cement)



# ULTRAFINE Cementitious Grouts

- Stabilize and strengthen soil and sand
- Seal seepage in mines, dams and tunnels
- Fortify waste containment
- Squeeze-grout and rehabilitate oil and gas wells
- Form low-permeability grout curtains

*Unique among all cementitious grouts produced in the world today, US Grouts are made with the same pumice-based pozzolan the Romans used over 2000 years ago. As proven by the Pantheon and many ancient Roman structures standing strong after two millennia, US Grout's patented pumice-pozzolan based cement provides unequalled longevity. Developed by the U.S. Department of Energy, the aptly named US Grout produces Ultrafine products equal or superior to any ultrafine grout available in the marketplace.*

## A Superior Grout

### SOURCED, REFINED, AND PRODUCED IN THE U.S.

All products are sourced, refined, and produced in the United States. They are supplied and supported by industry recognized grouting expert Avanti International. US Grout products are the professional choice for those critical grouting applications where only a superior, high-performance grout will do.

- US Grout's SD product is ready to mix and pump without additional admixtures.
- Customized blends are available.
- Competitively priced; stable North American supply.
- Stringent quality control and modern plant facilities ensure uniformity.
- Expert technical support; international distribution network.
- Ultrafine grouts will penetrate smaller fractures and finer-grained soils.
- Low internal cohesion means greater penetration and lower drilling costs.
- Composed of non-hazardous materials.

## Permeation Grouting

An extensive, large scale permeation test proved that US Grout Ultrafine can pass through, and completely grout, a silty sand with a hydraulic conductivity as low as  $5 \times 10^{-2}$  centimeters/second. The hydraulic conductivity of the grouted mass was reduced to  $1 \times 10^{-7}$  centimeters/ second.

## Particle Size Information

Particle size and internal cohesion, *not viscosity*, determine a grout's ability to penetrate extremely small openings. 90% of the particles in Ultrafine grout are smaller than 8 microns and average 3 microns.\*

## Breathe Easy

Our cementitious grouts are composed of non-hazardous components and are safe to handle and use. Our type SD is also Certified by NSF International as conforming to the requirements of NSF/ANSI Standard 61—Drinking Water System Components—Health Effects.

## Grout Characteristics

### POZZOLANIC GROUTS ARE ENGINEERED FOR:

- Improved resistance to chemical attack due to lower alkalinity and very low hydraulic conductivity.
- Wide range of water to cement ratios.
- Little or no bleed at recommended water-to-grout ratios.
- Two-plus hours of injectability.
- Rheology and set time adjustable with various admixtures.
- Enhanced strength and decreased permeability.
- Volume stability, less than 0.1% linear shrinkage.
- Water soluble lime and alkalinity are greatly reduced.
- Extremely low hydraulic conductivity/permeability.
- A low heat of hydration resulting in higher resistance to thermal contraction cracking.
- Brine tolerant; applications in and around salt water.

## TWO FORMULATIONS AVAILABLE

### ULTRAFINE STANDARD (SD)

A uniquely formulated cementitious grout that combines ultrafine particle size (average 3 micron) to go where others can't, and a pozzolanic charge for enduring strength and density.

### ULTRAFINE VX

A uniquely formulated cementitious grout that combines ultrafine particle size (average 3 micron), a pozzolanic charge for enduring strength and density, and allows for a variable dosage rate of USG Super (liquid or dry) for job-specific needs.

\*These sizes were determined by the Micro Meretics company, using their sedigraph.

## Hollywood Metro Tunnel

US Grout Ultrafine was the product of choice to seal the Hollywood Metro Tunnel against water inflow and prevent settlement of the surface.

## Waste Isolation Pilot Plant (WIPP)

US Grout Ultrafine was developed specifically to seal the extremely small fractures (often as small as 6 microns) around repository openings that compromised the seal of the storage tunnels more than 2000 feet below ground.

## Soil Stabilization Project

To support a 9-story hotel, engineers required the compressive strength of the sandy soil be increased to a minimum of 250 psi. After using US Grout Ultrafine, the soil's compressive strength was over 800 psi in less than two weeks.

*The project was a permeation grouting success that has been repeated hundreds of times around the world in varied soil types and conditions.*

## Strategic Petroleum Reserve (SPR)

US Grout Ultrafine was used to successfully seal fractures in salt dome caverns that house a large part of the Strategic Petroleum Reserve.

## Lake Mead Intake Tunnel #2

US Grout Ultrafine was used in Lake Mead Intake Tunnel #2 to successfully control the water inflow, enabling an on-time completion of the project.

### ULTRAFINE GROUTS: TYPE SD & TYPE VX

#### DRY

PROPERTY	TYPICAL RESULTS	STANDARDS AND CONDITIONS
----------	-----------------	--------------------------

#### TYPE SD

Dispersant in grout 1% by weight of dry grout

#### TYPE VX

Dispersant in grout 0.125% by weight of dry grout

#### COMMON DATA

Color	Cement gray	Visual
Particle Size	d <sub>90</sub> < 8 microns (average 3.0 microns)	SediGraph 5100
Surface Area	15,110 cm <sup>2</sup> /gram	ASTM C-204 (Blaine Fineness)
Dry Loose Unit Weight	0.497 grams/cc	
Dry Density (Specific Gravity)	2.70 grams/cm <sup>3</sup>	ASTM C-188
Dry Weight/ Wet Volume	1.01 kg/liter	

#### WET

PROPERTY	TYPICAL RESULTS	STANDARDS AND CONDITIONS
----------	-----------------	--------------------------

#### TYPE VX

With the addition of 0.9% USG Super Liquid or 0.5% USG Super Dry



#### COMMON DATA

Water/Grout	0.8/1 by weight of dry grout *	
Wet Density	1.50 - 1.52 grams/cc *	API RP 13B-1; ASTM 4380 (Specific Gravity)
Initial Viscosity	35 - 60 seconds *	API RP 13B-1 (Marsh Cone) D6910
Internal Cohesion	1.22 Pascals *	Lombardi Plate
Initial Gelation	2.0 - 5.0 hours *	Wally Baker Shear Value
Final Gelation	4.5 - 7.0 hours *	Wally Baker Shear Value
Initial Vicat Needle Set	8 - 10 hours *	ASTM C-191 (Vicat Needle)
Final Vicat Needle Set	9 - 11 hours *	ASTM C-191 (Vicat Needle)
Period of Workability	2.5 - 5.0 hours *	
Compressive Strength	>1000 psi @ 7 days *	ASTM C 39/C 39M
Shrinkage	-0.0260%	ASTM C-490, C-596, C-157
Bleeding	0.50%	ASTM C-940
Hydrational Heat	31° C	Adiabatic Chamber
Pressure Filtration	0.100 - 0.103 minutes	API Filter Press
Permeability	1x10E <sup>-14</sup> cm/second	Custom Equipment at Atomic Energy of Canada
Sulfate Resistant	Resistant to sulfate attack	Use Type V Cement

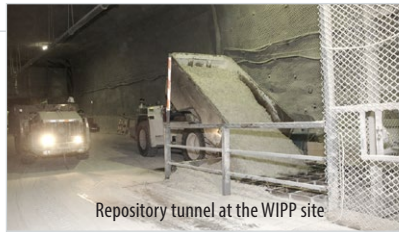


MIXING INSTRUCTIONS can be found at  
[usgrout.com/grout-mixing-instructions.html](http://usgrout.com/grout-mixing-instructions.html)

The characteristics itemized above are for a water/cement ratio of 0.8/1 by weight. Those items with an asterisk (\*) can be adjusted as required by the application.



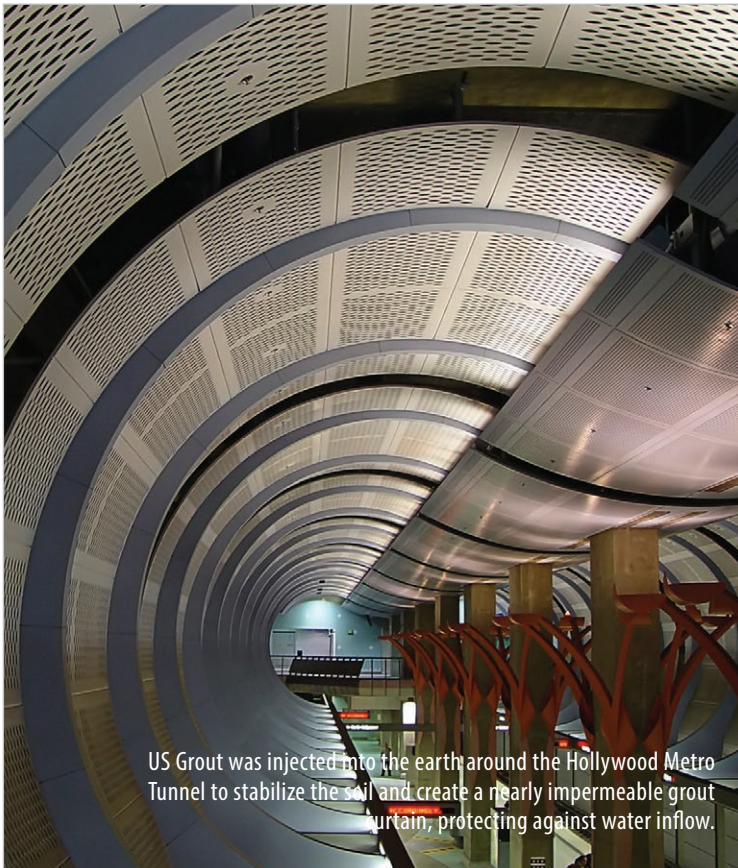
Sandia National Laboratories developed this ultrafine cementitious grout specifically for the stress microfractures in the deep repository tunnel openings at the U.S. Department of Energy's Waste Isolation Pilot Plant (WIPP). Sandia then secured a patent and transferred the manufacturing process, under license, to U.S. Grout, LLC. US Grout produces the finely-ground mixture of



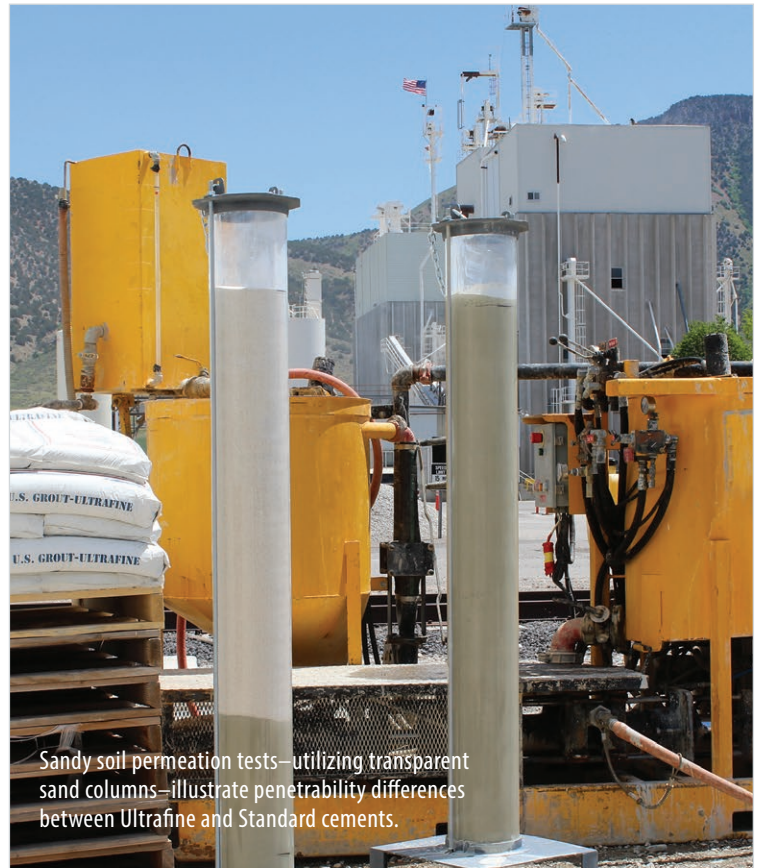
Portland cement, pumice, and superplasticizer in a state-of-the-art, computer-controlled manufacturing plant. **Avanti International** manages demand and ships world-wide, providing customer service, objective professional advice on product selection, material estimates, and the caliber of world-class technical support that only comes from 40+ years of experience.

MANUFACTURED BY **US GROUT** • SUPPLIED & SUPPORTED BY **AVANTI INTERNATIONAL**

DEVELOPED BY THE **U.S. DEPARTMENT OF ENERGY**



US Grout was injected into the earth around the Hollywood Metro Tunnel to stabilize the soil and create a nearly impermeable grout curtain, protecting against water inflow.



Sandy soil permeation tests—utilizing transparent sand columns—illustrate penetrability differences between Ultrafine and Standard cements.

100% American made and American sourced, Ultrafine Cementitious Grouts are available in palletted bags, super sacks, and bulk pneumatics. Technical support is provided world-wide and available 24/7 by Avanti International.



**AVANTI**

Control groundwater.  
Stabilize soil.  
Stop leaks. **Permanently.**

822 BAY STAR BLVD., WEBSTER, TEXAS 77598

**FOR SALES OR INFORMATION**

Contact: (800) 877.2570 or (281) 486.5600

[www.avantigrout.com/cement](http://www.avantigrout.com/cement)

