



AV-202

Multigrout

Technical Manual



DRINKING WATER SYSTEM COMPONENT
ANSI/NSF 61
88NN

www.avantigrout.com

Introduction

AV-202 Multigrout is a chemical grout system of water-soluble hydrophilic polyurethane resin. Multigrout reacts freely with water in a wide range of proportions to form a strong film, gel or foam according to the mix design requirements of the application. This capability makes AV-202 Multigrout ideal for use as a remedial water stop in a wide range of construction applications.

The final product is controlled by the ratio of water to AV-202 Multigrout. For example, a mixture of 1:1 to 1:5 parts Multigrout to water ratio will produce a product with the general properties of a foam. A mixture of 1:7 to 1:10 part Multigrout to water ratio will result in a resilient gel. A mixture of 1:10 to 1:12 parts Multigrout to water ratio will result in a soft gel. The specific physical properties of AV-202 Multigrout, when combined with water in various ratios, are depicted later in this manual.

As the ratio of water to Multigrout increases, the viscosity of the mixture decreases. The nature of a particular application dictates the proper ratio of Multigrout to water - experience is the best teacher for how to choose the correct mixture. An operator must always keep in mind that each application is unique and requires planning. The ideal goal should always be a balance between an initial product viscosity that makes placement effective and easy, and a final product that will accomplish the job at hand.

General Information



Due to the adaptability of AV-202 Multigrout, the product is appropriate for many different waterproofing and sealing problems. It can be injected with a positive displacement pump or mixed with a filler for large cracks or joints and placed by gloved hand or tool stick. The ability to control the physical properties of the final product gives the applicator a tool for a wide variety of grouting programs. For injection placement, the best equipment is a positive displacement pump such as the Graco Airless Sprayer (400 Series and up).

For example, by combining Multigrout with water in a ratio of 1:1 to 1:5 parts Multigrout to water, the resulting foam might be used to fill an abandoned pipe line. With a ratio of 1:10 parts Multigrout to water, the product can be injected into a subsurface structure to seal cracks in concrete. By increasing the water ratio even higher to perhaps a 1:12 ratio of Multigrout to water, the resilient gel can be effectively used as an impermeable barrier for other applications.

General Information *continued.*

AV-202 Multigrout is often used for grouting joints and repairing leaks in large sanitary and storm sewer pipes by forming a flexible gasket or plug in the flowing water path. In its uncured form, AV-202 is a viscous liquid similar in appearance to common honey. When mixed with a small amount of water, however, the grout expands and cures to a tough, flexible, cellular foam that is essentially unaffected by sewer environments.

AV-202 Multigrout has a strong affinity for water. Although normally not required, standard static mixers may be used. Upon curing, the foam can contain many times its own volume of water. The mixture of AV-202 Multigrout and water is initially low in viscosity and can be injected under pressure to seal voids, fissures or cracks. Once the foam has cured, it is resistant to water, thus reducing permeability and forming an effective water shut off system.

When AV-202 Multigrout is mixed with a small amount of water, a reaction proceeds through two stages:

1. Foam stage
2. Cure stage

Both stages of the grout must be understood and controlled to obtain good results. The ambient temperature of the grout is the primary variable that affects Foam and Cure times.

Within 15 to 45 seconds after mixing (at 72°F), depending on mix ratios and the temperature of the grout and mix water, the material will begin to foam. Due to its viscosity, the grout will not readily flow out of the point of placement, i.e., into the pipe or the soil outside of the pipe.

If unrestrained, the material may expand up to six times the original unreacted volume of grout and water. Unrestrained expansion, however, results in a low density foam. A compacted foam is more desirable for most applications and fillers or reinforcements such as oakum may be used to provide acceptable density.

Following the Foam stage is the Cure stage. During the Cure stage, the grout solidifies and forms a cellular foam gasket (reinforced by oakum if it has been added) which can withstand a water pressure test. After placement and the Foam stage, the grout will continue to cure over the next several hours, but will achieve sufficient strength to form a serviceable water barrier within five to ten minutes.

Specific Description of AV-202 Multigrout

AV-202 Multigrout is a hydrophilic polymer. The uncured material is a caramel colored, translucent liquid with a viscosity ranging from 3,200-6,000 centipoise at 72°F. AV-202 contains non-volatile materials constituting almost 100% of its total weight.

When mixed with a specific amount of water, the material can expand six times its original volume and cure to a tough, flexible condition.

Physical Properties of AV-202 Multigrout

The physical properties of monolithic films prepared with Multigrout are summarized as follows:

Table One:

Water : AV-202 Ratio	% AV-202*	Tensile Strength (KG/CM2)	Elongation (%)	Tear Strength (KG/CM2)
12:1	8%	120	100	15
10:1	10%	100	150	18
5:1	20%	46**	600	20

* Concentration by weight of Multigrout in the aqueous solution used to prepare a monolithic film.

** A foam film is obtained when concentration is higher than 20%, (less than five parts water to one part Multigrout).

Chemical Properties

During the initial reaction stage of Multigrout with water, amines and carbon dioxide are generated by a reaction with water injected with the grout pump at the site of the leak to be sealed. The resultant amines react quickly with an isocyanate group to form compounds with a three-dimensional structure. These compounds form a foam which is insoluble in water.

Table Two:

Chemical Properties	
Flash Point	>212°F (100°C)
Corrosiveness	Non-corrosive
Reactivity	Reacts readily with water

Instructions for Using AV-202 Multigrout

Although AV-202 Multigrout is a relatively thick material, it is easily handled with commercially available positive displacement pumps. AV-202 Multigrout is designed to cure with water and may absorb large amounts into the reaction mass. The ratio of water to Multigrout needed depends upon the application.

The relationship between temperature and viscosity of Multigrout (prior to mixture with water) is illustrated in Table Three.

Table Three:

Temperature		Viscosity
F°	C°	CPS
104	40	500
95	35	1,000
86	30	2,500
77	25	3,500
68	20	5,500
59	15	9,000
50	10	14,000

The relationship between ratio of Multigrout to water and the properties of the resultant material is in Table Four.

Table Four:

% Multigrout Total Volume	Ratio Range Water : Multigrout	General Properties
50% to 20%	1:1 to 5:1	Foam
12% to 9%	7:1 to 10:1	Expansive Gel
6% to 5%	12:1	Soft Gel

Cure time is defined as the time interval from initial mixing of AV-202 to the point where the blend's viscosity is too high for gravity flow.

Cure time is controlled primarily by two factors:

1. Water temperature
2. Water : AV-202 ratio

Lower water temperatures and higher water to AV-202 ratios give longer foam and "tack free" times. Cure times may also vary slightly with the age of the AV-202 and chemical content of the water.

Table Five depicts the relationship between cure time and concentration of Multigrout with cure time measured at three temperatures in the aqueous solution.

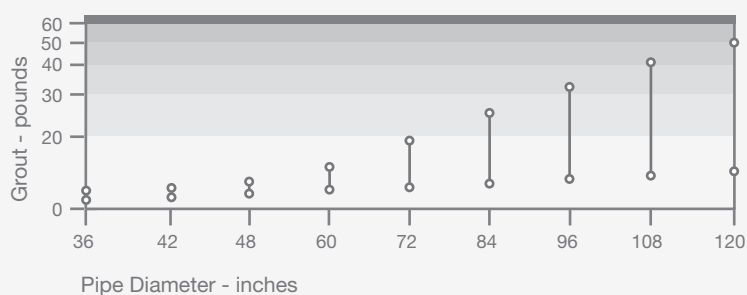
Table Five:

Water: AV-202	Temperature - Degrees - F		
	68°	80°	86°
	Set Time in Minutes		
2:1	1.00	0.50	0.35
5:1	1.50	1.00	0.90
8:1	2.05	1.50	1.25
10:1	2.75	2.00	1.40
12:1	3.30	2.50	1.80

Table Six illustrates the relationship between foam time and concentration of Multigrout. Foam time was measured at 78° F temperature in the aqueous solution.

Instructions continued.**Table Six:**

AV-202 : Water Ratio	Foam Time in Minutes at 78°F
10:1	18.00
9:1	14.25
8:1	11.00
6:1	8.00
4:1	4.25
2:1	2.50
1:1	1.50

Estimating AV-202 Application Requirements**Figure 1:** Amount of AV-202 Multigrout required for large diameter pipes.

Note: Refer to Avanti International's Large Diameter Pipe Sealing Specification – [available online at www.avantigrout.com](http://www.avantigrout.com).

The amount of AV-202 Multigrout required to rehabilitate or repair concrete pipe joints of various diameters is shown in Figure 1. These estimates are based on actual field experience, but may vary slightly in smaller diameter pipes and substantially in larger diameter pipes.

Some factors which may affect the amount of AV-202 required are:

1. Original gasketing materials remaining in the joint
2. Open or off-set condition of the joint
3. Severity of infiltration or exfiltration at the joint
4. Type and condition of grouting equipment to be used
5. Application method used

In joints, the primary factor influencing the amount of AV-202 Multigrout required to seal a joint is the size of the joint gap. The amount of AV-202 required will be less if old joint compounds still partially fill the joint. As a rough rule of thumb, one fluid ounce of AV-202 will be required per linear inch of joint having a gap of one inch between the bell and spigot.

Estimating AV-202 Application Req. continued.

Actual examination of joint conditions, coupled with considerable experience, is necessary to accurately estimate grout amounts. This is particularly true for sealing large diameter pipe joints as shown in Figure 1. In some instances, special equipment and techniques can be used to reduce material amounts required without affecting the quality of the seal. Project planners are strongly encouraged to consult with Avanti when preparing material cost estimates.

Note: These figures are intended only as a guide.

Application of AV-202 Multigrout**The EGP Technique**

The Expanded Gasket Placement Technique (EGP) is the process where jute strips (oakum) soaked in AV-202 are packed into joints of large diameter pipes to achieve a very effective seal. For further information concerning EGP, consult the Avanti EGP brochure, which can be downloaded from the Avanti website at www.avantigrout.com.

The V-PAT Technique for Sealing Joints and Cracks

The Variable Pressure Application Technique (V-PAT) can be used to inject AV-202 Multigrout resin in both cracks and expansion joints. The methods used for these two water control problems are somewhat different, but the basic steps are the same. The procedures for sealing cracks and joints by the V-PAT technique can be downloaded from the Avanti website at www.avantigrout.com.

Cleanup Procedures**Cleaning**

Most day to day cleanup and purging of non-hydrated grout (liquid AV-202 that has not been exposed to water or moisture) from pumps, fittings, and hoses can be accomplished with the use of AV-208 Technical Grade Acetone. Although acetone is preferred, MEK or other solvents can be used. When using solvents for cleanup, extinguish all sources of ignition in the area and observe proper precautionary measures for handling such materials. If small component parts must be cleaned of cured grout, it is best to disassemble and soak them in a 100% solution of AV-222 Cleaner - always use polyethylene plastic or steel containers for soaking.

Normally an overnight soak will dissolve most deposits and sufficiently soften them for easy removal.

To clean the entire grouting system, follow this two-step procedure:

1. Flush grout from system with AV-208 Technical Grade Acetone. Pump through hoses until acetone runs clean. **DO NOT REUSE.**
2. Remove the suction tube from the acetone and cycle the pump until all the acetone is cleared from the grout line.

Cleanup Procedures continued.

Safety During Cleanup

Acetone is flammable and the precautions necessary for any flammable material should be followed. Since grout compound which comes into contact with clothing cannot be removed, rain gear or disposable coveralls are highly recommended. Hats or hoods help keep the material from dripping into the hair during overhead application.

Handling and Storage of AV-202 Multigrout

Care must be taken in handling and storage of AV-202 Multigrout. The material is sensitive to moisture and moderately sensitive to high storage temperatures. Optimum storage is 45-95°F under fairly dry conditions. Once a container has been opened, the useful life of the material is reduced.

AV-202 has limited stability in pumps and hoses, and should not be allowed to stand in equipment. The possibility of moisture contamination is high. The equipment should be flushed with a suitable solvent (Acetone) as soon as practical after use.

Safety Procedures

Please refer to the Avanti AV-202 Multigrout SDS Sheet for complete safety procedures.

Available online at www.avantigrout.com.

Exposure

Appropriate Engineering Controls: Ensure adequate ventilation, especially in confined areas. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Ensure all national/local regulations are observed.

Environmental Exposure Controls: Do not allow the product to be released into the environment.



Personal Protective Equipment

Respiratory: Use a NIOSH-approved respirator or self-contained breathing apparatus whenever exposure may exceed established Occupational Exposure Limits.

Hand Protection: Wear chemical resistant protective gloves.

Eye Protection: Wear chemical goggles or safety glasses.

Skin and Body Protection: Wear suitable protective clothing.

Consumer Controls: Do not eat, drink or smoke during use.

Ventilation

Ensure adequate ventilation, especially in confined areas. In case of inadequate ventilation wear respiratory protection. The type of respiratory protection selected must comply with the requirements set forth in OSHA's Respiratory Protection Standard (29 CFR 1910.134) or regional standards. For additional details, see Section 8 of the SDS.

AV-202-LV and AV-202-NTP

AV-202-LV

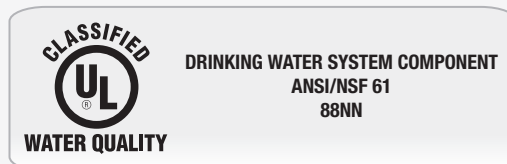
AV-202-LV is the low viscosity version of the original AV-202 Multigrout. Its viscosity is 650-800 cP compared to AV-202's viscosity of 3,200 - 6,000 cP. Multigrout LV is designed for applications where the flexibility and variability of AV-202 is desired, but better penetration is needed from a lower viscosity chemistry. This product is not certified for potable water use.

AV-202-NTP

AV-202-NTP has a viscosity equivalent to the original AV-202 Multigrout, but is not certified for potable water use.



UL Water Product Certification for AV-202



ANSI/NSF Standard 61 encompasses products that come in contact with drinking water and/or drinking water treatment chemicals.

Products covered by this standard include:

1. Pipes and related products
2. Barrier materials, i.e., coatings, linings
3. Joining and sealing materials i.e., adhesives, gaskets

Warranty Statement

The data, information and statements contained herein are believed to be reliable, but are not construed as a warranty or representation for which Avanti International assumes any legal responsibility. Since field conditions vary widely, users must undertake sufficient verification and testing to determine the suitability of any product or process mentioned in this or any other written material from Avanti for their own particular use.

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