Applications

Problem: Large Diameter Pipe Joint Sealing (Manual / Method)

Solutions: Injection Sealing – Pipe Joint/Crack)
Expanding Gasket Placement Technique (EGP) – Joint Crack Seal
DAM Re-gasket Method – Alternate Joint/Crack Seal

Methodology: Each of the designated joints, cracks, lift holes and other defects shall be sealed from the inside surface of the pipe using the materials, applications techniques and methods stated in these specifications. The techniques shall include providing a water-tight seal either by injecting chemical into the soil surrounding the joint or by forming a flexible gasket within the joint annulus as the joint spacing/gap permits.

Results: An effective water seal is created.

Application:

The following is a summary of the work to be performed.

I. Cleaning and preparation of the pipe defect to be repaired.
II. Injection sealing of the pipe joint or pipe defect using one of the following:

- Acrylamide gel
- Acrylic gel
- Urethane gel

In addition, these specifications allow the application of an elastomeric polyurethane resin in combination with other materials to create a satisfactory flexible gasket in the joint annulus.

III. Expanding Gasket Placement Technique (EGP) method of impregnating oil-free jute fiber or open cell backer rod with elastomeric polyurethane.
IV. The "DAM" re-gasket method of applying elastomeric polyurethane resin into the joint annulus, which is held in place by a dam of rapid setting patching material.

I. Pipe Joint/Crack Preparation

Each joint/crack designated by the owner to be sealed shall be properly prepared to ensure the effectiveness of the work.

Preparation shall include the removal of all previous joint sealing materials. Such removal shall be accomplished using chipping hammers, chisels and water pressure cleaning in any combination to achieve satisfactory results. Any remaining sand, silt, etc. which may accumulate on the bottom (invert) of the joint shall be removed prior to chemical sealing.

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If voids are suspected in the sands/soil around the pipe joint to be sealed, then it shall be necessary to fill that void with soil cement or other expansive materials prior to injecting chemical grout. If it is impractical to fill the void, then an internal elastomeric polyurethane gasket shall be applied.

II. Injection Sealing (Pipe Joint/Crack)

After the joint/crack has been properly prepared, injection ports will be drilled into the pipe joint area where infiltration is or has been active. After the injection ports have been drilled, a chemical injection device* shall be placed into the ports and chemical grout shall in injected into the soil surrounding the pipe joint/crack. Injection ports shall be placed around the joint circumference to create a satisfactory seal. "Open" injection ports provide a visual travel route for the placement of the chemical grout by allowing the injected grout to be seen by the operator as it flows around the circumference of the pipe.

Once injection has been completed, the injection device shall be removed and the injection ports shall be cleaned and then filled with rapid setting patching material.

III. Expanding Gasket Placement Technique (EGP)† Joint Crack Seal

When joint openings exceed 1 inch over the "home‡" position, it shall be necessary to use an elastomeric polyurethane resin in conjunction with filler materials to form a gasket seal. This shall be accomplished by impregnating oil-free jute fiber or open cell backer rod with elastomeric polyurethane resin.

This is followed by packing the combined materials between the opening in the joint bell and spigot or the crack in the following manner:

1. Cut the oil-free jute fiber or open cell backer rod in various sizes to meet the dimension requirements of the open joint or crack.

2. Place the oil-free jute fiber or open cell backer rod in a heavy-duty plastic bag or pail.

3. Pour the elastomeric polyurethane resin into the plastic container covering the oil-free jute fiber or open cell backer rod. Allow sufficient time for the oil-free jute fiber or open cell backer rod to be thoroughly saturated with the resin.

4. Wet the surfaces of the joint/crack with water using a hand-spray operation.

5. Place the pre-saturated oil-free jute fiber or open cell backer rod in the joint/crack then lightly tamped into place using wooden dowels, putty knives or other suitable tools.

6. Apply water using a hand sprayer during the tamping process.

7. Apply additional layers of saturated oil-free jute fiber or open cell backer rod in the same fashion as described above until the joint/crack opening is adequately filled

    - Note: **DO NOT** apply layers of the saturated oil-free fiber or open cell backer rod in excess of one inch (1 in.) from the interior joint surface

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* See Link at the end of this document for more information.
† See Link at the end of this document for more information. If requested, Avanti International will supply a brochure describing the expanding gasket placement technique (EGP)
‡ Home Position – placement of the pipe …. (Need more info)

8. Once the new gasket has been put into place, the entire joint/crack surface shall be finished using a rapid setting patching material. The patching material shall be hand-applied and finished with a trowel to existing surface configurations. When completed, the joint/crack surface shall be smooth and flush with adjacent surfaces.

IV. "DAM" Re-gasket Method (Alternate Joint/Crack Seal)

When joint/crack openings exceed 1 inch over the "home" position, or when soil injection procedures are impractical, it will be necessary to inject elastomeric polyurethane resin into the joint annulus or crack. Containment of the resin is maintained by a "DAM" of rapid setting patching material in the following manner.

1. Trowel rapid setting patching material into the open joint area circumference or crack length.

2. Place 3/8-inch copper injection tubes beyond the spigot shoulder to the bell joint surface.
   - The tube shall be encapsulated in the patching material.
   - The patching material shall not be allowed to clog the copper injection tube ends/openings
   - The tube end shall not be in direct contact with the bell joint surface.

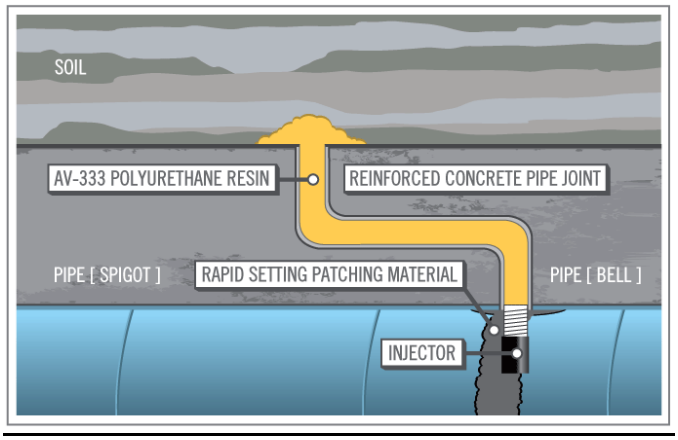
3. Place the 3/8-inch copper injection tubes around the joint circumference to allow free movement of the elastomeric polyurethane resin throughout the joint annulus.

4. If the joint/crack is dry prior to injection, pump water shall into the 3/8-inch copper injection tubes to ensure a "wetted" surface.

5. The applicator shall begin pumping elastomeric polyurethane resin into the 3/8-inch copper injection tubes starting at the bottom invert[§] injection tube. The applicator shall continue pumping until the elastomeric polyurethane resin begins to seep out of the higher injection tubes.

6. Once the elastomeric polyurethane resin has begun to cure, the applicator shall pinch off the active injection tubes and move up to the injection tubes returning the liquid resin. Continue until the top injection tube is completely filled with elastomeric polyurethane resin.

Note: The rapid setting patching material acts as a dam allowing the elastomeric polyurethane resin to seal the portion of the bell and spigot annulus where the gasket would normally be; thus re-gasketing the joint.



[§] Invert of pipe area – Bottom of host pipe

Materials

Acrylamide-Base Chemical Sealant

Formed by the bringing together of three primary chemical constituents:

1. Acrylamide
2. Triethanolamine/CAT-T
3. Ammonium Persulfate

The chemical constituents shall be mixed with water prior to placement. The chemicals shall be mixed to the following minimum standards:

Material	% Total Solution Weight
AV-100 – Acrylamide	10%
AV-101 – Triethanolamine/CAT-T	1 to 2 %
AV-102 – Ammonium Persulfate	1 to 2 %

Gel times shall be controlled from ten seconds to as long as one hour by adjusting the percentage of catalysts used. The group material shall have the following basic properties:

1. Viscosity of approximately one (1) centipoise (cps).
2. The viscosity to remain constant through the induction period.
3. The ability to tolerate dilution and react in moving water.
4. The final reaction shall produce a continuous irreversible impermeable stiff gel.

Acrylic-Base Chemical Sealant

Shall be formed by the bringing together of three primary chemical constituents:

1. Acrylic
2. Triethanolamine/CAT-T
3. Sodium Persulfate

The chemical constituents shall be mixed with water prior to placement. The chemicals shall be mixed to the following minimum standards:

Material	% Total Solution Weight
AV-118 – Acrylic	10%
AV-101 – Triethanolamine/CAT-T	1 to 2 %
AV-103 – Sodium Persulfate	1 to 2 %

Gel times shall be controlled from ten seconds to as long as one hour by adjusting the percentage of catalysts used. The group material shall have the following basic properties:

1. Viscosity of approximately one (1) centipoise.
2. The viscosity to remain constant through the induction period.
3. The ability to tolerate dilution and react in moving water.
4. The final reaction shall produce a continuous irreversible impermeable stiff gel.

Polyurethane Gel Chemical Sealant

A moisture curing, hydrophilic urethane liquid that is designed to be mixed with water as applied through pumping equipment.

Polyurethane gel chemical sealant shall be AV-350 MultiGel and shall meet the following requirements.

Appearance	Green Liquid
Solids content	80%
Viscosity (ASTM D1638)	600 – 1200 CPS
Flash point	1° F

AV-350 MultiGel is controlled by the reaction with water and the properties of the cured product. Therefore the reaction is determined by the mix ratio.

The mix ratio should be in the range of 5:1 to 9:1 ratios (water: AV-350 MultiGel).

Note: Temperature of the mix water shall not exceed 80° F.

Elastomeric Polyurethane Resin (Foam)

Designed to control water and seal cracks in concrete. Elastomeric Polyurethane Resin expands when it comes in contact with water and quickly forms a flexible closed cell polyurethane foam seal.

Elastomeric polyurethane resin shall be AV-333 or AV-310 and meet the following requirements.

Uncured foam		
	AV-333 Injectaflex	**AV-310 Hydro Sealant**
Appearance	Light amber	Light yellow
Solids content	82-88%	85%
Viscosity	300-600 CPS	650 – 800 CPS @ 70° F
Flash point	25° F	275° F

Cured foam		
	AV-333 Injectaflex	**AV-310 Hydro Sealant**
Tensile strength	100 – 120 psi	380 psi
Elongation	750 – 850%	400%
Shrinkage	< 2%	10%

Oil-Free Jute Fiber

Shall conform to Federal Specification HH-P-117 as furnished by Avanti International FIBROTITE. AV-219 FIBROTITE shall be manufactured from thoroughly carded jute fiber and free from extraneous matter. It shall be furnished in rope form with 8 strands having a twist of approximately 1.25 turns per foot.

Open Cell Round Backer Rod

Furnished in sizes ranging from 5/8" diameter to 2" diameter and shall meet the requirements of AV-215 resin rod as provided by Avanti International. AV-219 resin rod may be used in conjunction with AV-219 or as an alternate material to AV-219 FIBROTITE.

Rapid Setting High Early Strength Patching Material

Shall be equal to Quadex Hyper Form one component patching material and shall have the following requirements:

Typical Performance Data		
Compression Strength	Freeze-Thaw Durability	Setting Times
Testing Method: ASTM C109	Testing Method: ASTM C666	Testing Method: Gillmore ASTM C266
1 hour = 4170 psi 28 day = 7000 psi Flexural Strength PSI 28 day = 1110 psi	300 Cycles with no weight loss	Initial Set: 15 – 18 minutes Final Set: 22 – 25 minutes

Application

A. Prepare surface to be patched by removing all loose concrete by using an air or electric hammer
B. Sandblast or water blast surface to clean away all contaminants, such as oil, chemicals, or dust
C. Air-blast with oil-free compressed air to remove all water or loose sand

Links:

Tech Data Sheet – AV-100 Acrylamide
Tech Data Sheet – AV-101 Triethanolamine/CAT-T
Tech Data Sheet – AV-102 Ammonium Persulfate
Tech Data Sheet – AV-103 Sodium Persulfate
Tech Data Sheet – AV-118 Acrylic
Tech Data Sheet – AV-202 Multigrout Foam
Tech Data Sheet – AV-215 Resin Rod
Tech Data Sheet – AV-219 Oakum
Tech Data Sheet – AV-310 HydroSealant
Tech Data Sheet – AV-333 Injectaflex
Tech Data Sheet – AV-350 MultiGel
Tech Data Sheet – Open Cell Backer Rod

MSDS Sheet for AV-100

MSDS Sheet for AV-101
MSDS Sheet for AV-102
MSDS Sheet for AV-103
MSDS Sheet for AV-118
MSDS Sheet for AV-202
MSDS Sheet for AV-215
MSDS Sheet for AV-219
MSDS Sheet for AV-310
MSDS Sheet for AV-333
MSDS Sheet for AV-350

Avanti International's EGP Technique Brochure
Chemical Grout Injection Devices
Federal Specification HH-P-117