

BENTOGROUT[®]

BENTONITE INJECTION GROUT FOR REMEDIAL WATERPROOFING

DESCRIPTION

BentogROUT is a high-solids grout consisting of a proprietary blend of bentonite and polymers formulated for sealing water leaks in existing below ground structures. BentogROUT is pumped in a fluid state adjacent to the exterior of the structure where it sets to be a solid material forming a waterproofing membrane around the structure. BentogROUT can be used to seal leaks in concrete, masonry block, brick and stone foundations.

Installation is fast and easy:

Simply mix BentogROUT with water and pump. Once applied, it solidifies and expands slightly to form a waterproofing membrane. It can be pumped from above ground outside the structure without excavating or from the interior of the structure through drilled holes in the walls or floors. Limited jobsite space is required for injection.

Unlike many remedial waterproofing products that are applied as a surface

treatment to the interior of the foundation, BentogROUT is applied to the exterior of the building where it stops the water before it can penetrate the structure and further corrode the reinforcing steel. BentogROUT's thick membrane covers the exterior surface of the structure, filling voids in the adjacent soil and bridging over small cracks in the concrete. BentogROUT also has the ability to self-seal if the structure settles, and therefore its performance is not limited by future hairline cracking in the concrete.

BentogROUT does not shrink or dry out in sub-surface soil formations and is not affected by freeze/thaw cycling. It remains flexible, maintains a putty-like consistency over time, and retains a swell potential to seal itself off. Since BentogROUT primarily consists of natural minerals it is friendly to the environment and will last the life of the structure.

REMEDIAL WATERPROOFING FOR BELOW GROUND STRUCTURES:

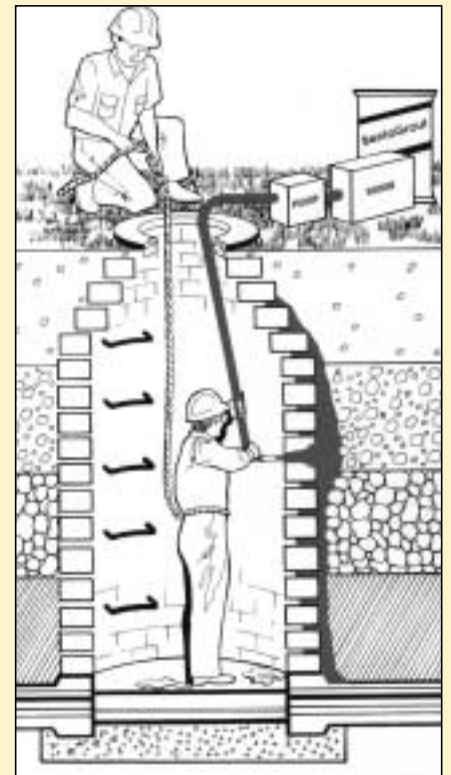
BASEMENTS

MANHOLES

FOUNDATION SLABS

TUNNELS

STEEL SHEET PILING



BentogROUT being injected to seal a below-ground utility manhole.



PREPARATION

Prior to applying BentogROUT, locate and mark all below-ground electrical, sewer and mechanical service lines prior to injection operations. A successful operation requires the installation to occur without mechanical failure of the grout mixing/pumping equipment. Ensure that all required materials are available and in working condition prior to beginning the application. If pumping from the interior of the building, drilling operations should be completed prior to mixing.

Injection Head: The contractor will need to fabricate an injection head to connect the pump hose to the injection pipe. Two examples of injection heads are pictured below. FIGURE 1 illustrates an injection head assembly with two hose connections—one for the grout and the other for a drilling medium (water or air). FIGURE 2 illustrates an injection head assembly with only a grout line connection. The injection head will also serve as a leverage device in assisting the applicator in inserting the injection pipe into the soil substrate.

Mix Water: Use only clean water. BentogROUT mixes best in cool water with a pH between 8 and 10. High temperature water can accelerate the set-up time of the grout.

Mixing Equipment: Use mixing equipment capable of producing continuous shear and agitation. Progressive cavity pumps with vertical paddle and horizontal ribbon blender type mixers are recommended. It is not recommended to use a piston style pump due to the high spikes in back-pressure generated. **CAUTION:** Pumping any material under pressure can cause lifting or movement of adjacent structures. CETCO® recommend the use of a Chemgrout Model CG-555 grout mixer or equivalent. The trailer mounted CG-555 includes a grout pump and mixer with a self-contained gasoline/hydraulic power unit.

Pumping Pressures: BentogROUT is typically pumped at pressures of 1.38-5.51 bar (20-80 psi), but due to jobsite variables actual pumping pressure will vary.

Variables may include:

- amount of water added to dry grout
- pump hose diameter and length
- resistance at hose-head
- substrate material and compaction

For example, in large void areas the pumping pressure may only be 0.69 bar (10 psi) but as soon as back pressures form, that pressure may spike to 6.89-13.78 bar (100-200 psi). Watch the pumping pressure closely while installing BentogROUT, and back off as it increases. Additionally, a crew member may be stationed inside the structure to monitor the injection. This is especially important with masonry block foundations.

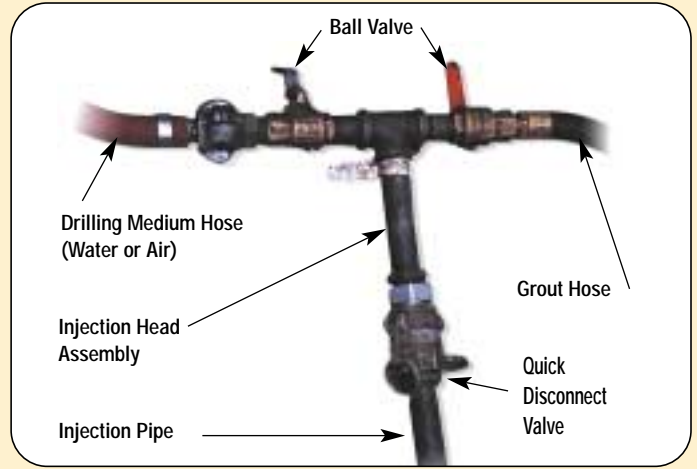


FIGURE 1 — Dual Connection Injection Head Assembly

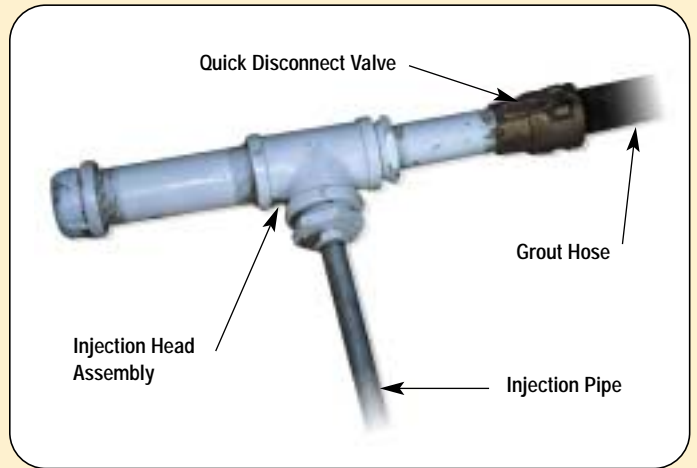


FIGURE 2 — Single Connection Injection Head Assembly



Chemgrout CG-555 trailer mounted pump with mixer.

Pump Hose: A 32 mm diameter pump hose with a minimum 13.78 bar (200 psi) pressure rating is recommended. The pump hose should be as short as possible without adversely limiting operations. The longer the hose and the more turn it makes, the greater the pumping pressure decrease at the injection head.

INSTALLATION

Mixing Instructions: Add 46 litres of fresh water to a motorised mixer and then add a single 20 kg bag of dry BentogROUT to the water. Thoroughly mix for approximately 3-5 minutes until oatmeal consistency.

BentogROUT remains pumpable and placeable for 45 minutes after being mixed. After mixing, if pumping is stopped or suspended, disconnect pump hose with quick disconnect valve at pump head and place end of hose over pump hopper to recycle grout during suspended period. Do not allow mixed grout to stand in hose. It will set up and clog the hose.

Coverage Rate: Typical installation thickness of BentogROUT is 12 mm or greater. Coverage rates will be affected by injection depth, void areas, soil compaction, material waste, etc. A 20 kg bag of BentogROUT yields 0.05 m³ of grout. Estimating a 12 mm thick coverage rate without any void spaces, a 20 kg bag should cover approximately 4.6 square metres. Actual results will vary with each project.

Surface Injection from Exterior of Building

Use 10-18 mm diameter heavy wall steel pipe as injection pipe for BentogROUT placement. Cut the pipe tip at a 45° angle to aid in sinking of the injection pipe. A single pipe can be repeatedly inserted and removed, or numerous pipes can be inserted and then all injected through in sequence.

Insert injection pipe as close as possible to the foundation wall at 0.6 m centred to the top of the footing or the desired depth. Use a tile rod or long drill bit to start the first few feet of the injection hole. With a Dual Connection Injection Head, use pressurised air or water jetting to assist in the process of sinking the pipe (FIGURE 1). With a Single Connection Injection Head, use the grout as a drilling medium to assist with sinking the pipe (FIGURE 2). For deep depths it may be necessary to use scaffolding to operate from when first inserting a long pipe.

After sinking the injection pipe to the desired depth, pump grout until it extrudes at ground level or substantial back pressure is achieved. **CAUTION:** Be careful not to inject grout into sub-surface drainage tile. Continue to pump grout while slowly removing injection pipe. Then move to adjacent injection point and continue process.

Interior Injection through Slab or Wall

Drill 15-18 mm diameter holes through the structure where grout injection is planned. A minimum of two holes should be drilled—one for grout injection and the other for pressure release. Insert PVC pipe nipples into the drilled holes to provide a means of connecting a pump hose for injection. Pump BentogROUT through the predrilled holes until grout begins to come out of adjacent hole(s) or substantial backpressure is achieved. For wall injections, begin grout injection at the lowest point on the wall and then work upwards.

CAUTION: Pumping grout under pressure can cause lifting or movement of the structure. After grout injection, a pipe cap can be installed on the nipple to temporarily seal off the hole. Then move to adjacent injection point and continue process. After completing the grout work, remove the pipe nipple and plug hole with a non-shrink hydraulic cement patch product.

An alternative interior injection method is to use a Single Connection Injection Head (FIGURE 2) with a short 200 mm heavy wall steel injection pipe for BentogROUT placement. Injection pipe tip may require a rubber gasket to provide a tight seal for pump operations.

Clean-Up: Clean application tools and mixing equipment with water immediately after use. Remove any access grout from ground surface. **CAUTION:** Mixed grout is slippery.

Precautions: It is mandatory that the user take the following precautionary measures to protect workers and the public. Avoid inhalation of powder dust. Ensure adequate ventilation. Avoid contact with eyes. Wear protective eye gear at all times. Flush eyes with water if contact occurs. Additional precautions, safety information and first aid treatments are contained on the EC Safety Data Sheets.

Limitations: BentogROUT is not designed to bridge cracks or gaps larger than 3 mm. Interior surface cracks greater than 3 mm should be surface sealed with cement-based patching material to prevent grout extrusion into the structure. BentogROUT is not designed as a structural patch, nor is it recommended for above ground applications or those that do not provide proper confinement. BentogROUT is not suitable for sealing expansion joints.

Save on reconstruction costs, BENTOGROUT will significantly extend the life of your existing installations



PROPER PUMP CAPABILITY

BentogROUT is applied to below ground structure using a 120A moyno pump.



INTERIOR THROUGH WALL APPLICATION

BentogROUT is injected to the exterior of a manhole through pre-drilled holes using a short injection wand.



EXTERIOR WALL APPLICATION

Inject BentogROUT along the exterior of a foundation wall at 600 mm on centre.



STRUCTURAL SLAB APPLICATION

Inject BentogROUT under an existing slab to provide waterproofing and fill void areas.

TECHNICAL DATA

Description: BentogROUT is a high-solids grout designed for remedial waterproofing of below-ground structures such as basements, manholes, foundation slabs, tunnels and steel sheet-piling.

Characteristics:

- Remains flexible, with ability to self-heal.
- Resistant to freeze / thaw cycling.
- Maintains a tight seal, preventing water ingress.
- Lasts the life of the structure.

Mixing & Application: BentogROUT requires a continuous shear and agitation mixer and a progressive cavity pump, which is capable of pressures from 0.69-5.51 bar (10-80 psi) with possible back pressure spikes of 13.78 bar (200 psi).

Add one 20 kg bag of BentogROUT to 46 litres of freshwater and thoroughly mix for 3-5 minutes until oatmeal consistency is achieved. This mix will remain workable for 45 minutes.

CAUTION: Do not allow mixed BentogROUT to stand in the hoses as it will set and block the hoses.

Typical Properties:

Dry Material Prior to Mixing

Bulk Density	900 kg/m ³
Specific Gravity	2.5 gm/cm ³
Bonded Moisture	12%

Final Set Material

Permeability	5.2 x 10 ⁻⁸ cm/sec
Mud Weight	10.2 lbs/gal
Cone Penetrometer	44 mm
Yield per Bag	0.05 m ³

Packaging:

20 kg plastic bags, 50 bags per pallet. Bags have a handle for ease and safe handling. All pallets are plastic-wrapped.

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The information contained herein supersedes all previous versions printed prior to August 2002, and is believed to be accurate and reliable. CETCO makes no warranty of any kind and accepts no responsibility for the results obtained through application of this information. CETCO reserves the right to update information without notice.

Birch House, Scotts Quays, Birkenhead, Merseyside CH41 1FB
tel +44 (0)151 606 5900 fax +44 (0)151 606 4687
www.cetco.com