



## Generic Grouting Plan and Method Statement for Annulus Filling of the Channeline GRP Structural Lining System.

### I. Scope of Work.

The scope of work is detailed in the Contract Specifications and referenced from the WRc Sewerage Rehabilitation Manual Volume 3, Section 7 Grouting Materials and Manufacturers Installation Specification.

The annulus grouting will be undertaken in three lifts (minimum) to accommodate annulus dimensions and volumes

### II. Site Conditions.

This grouting plan is based upon the grouting equipment being installed at one location close to \_\_\_\_\_ and supplying grout through the installed liner using 1 ½" (37.5mm) grout hoses.

### III. Grout Connections:

This grout plan assumes that 1 ½" (37.5mm) diameter threaded nipples will be installed at approximately 32ft (10m) intervals along the top of the Liner positioned at 1 and 11 o'clock, to allow the grout to be placed evenly on either side of the liner. Each grout nipple connection will be cored (retain the core for re-insertion) and tapped using a Pneumatic Impact Drill. Once tapped. The threaded nipple can be screwed into the hole and a 1 ½" ball valve with camlock fitting attached. (See Figure 1)



Figure 1



Continued.

This plan is based on pumping controlled volumes of grout into the annular space at one location at a time. The controlled volumes of grout shall be calculated for grout sequence at each grout injection location based on the relevant host and liner pipe dimensions involved.

#### IV. Grouting Equipment

Grouting Equipment will consist of (but not limited to) the following items:

- Size 4-6 Progressive Cavity Grout Pump, capable of delivering between 8 – 25 GPM of grout
- 1 ½" Grout Delivery Hoses rated to 500psi, Camlock Fittings
- Grout Valves and connectors equipped with Camlock Fittings
- Pressure Gauges
- Flow Monitor
- Quality Control testing and measuring equipment

#### V. Grout Formulation

This grout plan assumes that the grout material will be delivered via Ready Mix trucks at approximately 4-5 m.

Recommended Grout strength by design types (according to WRc Sewerage Rehabilitation Manual Volume 3, Section 7 Grouting Materials:

Grout Function	Minimum Compressive Strength at 28 days (N/mm <sup>2</sup> )
Type 1	12
Type 2	3
Exterior Void Filling	2



Continued.

NOTE: The grout procedure for Type 2 lining does not assume any bond between the lining and the grout. However, the design procedure for Type 1 lining assumes that a mechanical or adhesive bond, or combination of both, exists to utilize the tensile capability of the lining. While the bond is entirely due to the grout it is recommended that the shear strength of the grout at 28 days should be not less than  $1\text{N/mm}^2$

The grout should be a mixture of Portland cement, Flyash and Water and should contain no aggregate as follows:

High Density Grout (per  $1\text{m}^3/1.3\text{yd}^3$ )

Water – 550 litres (145 us gallons)

Portland cement – 800 kilograms (1763 lbs)

Flyash – 700 kilograms (1544 lbs)

*Disclaimer: The above Mix Design is a recommendation only, it is the contractors responsibility to perform cylinder testing, prior to placement, to confirm that said mix design offers the appropriate 28 day compressive strength, As such, the owner agrees to indemnify and hold Channeline International harmless from and against any loss, liability, damage, claim, cost and expense (including legal fees) however arising, out of any non-performance of the Concrete/Grout as recommended.*

## VI. Testing and Quality Control

Test Cylinders will be cast as the grouting work proceeds for compressive strength testing.

While grouting operations are underway, density tests will be conducted on each batch to monitor and maintain quality control.

## VII. Grouting Pressures

During the initial Stages of Grouting, when there will be no confinement of the grout, pressures within the annulus will be close to zero but no more than 5psi, resulting in gravity head of liquid grout between the lining and host pipe.

During the final stages of grouting when the injected grout is confined between the top of the lining and the top of the host pipe, the maximum allowable grout pressure shall not exceed 7psi.



## VIII. Grouting Procedure

Grouting operation will commence from the downstream end of the lining and progress upstream as pre-determined volumes of grout are dispensed.

The pre-mixed grout will be discharged via the Ready-mix truck chute into the Grout Plant Hopper. Mesh screens will be positioned in the chute to ensure that larger aggregate or lumps are removed from the grout.

The grout will then be pumped through a flow monitor and pre lubricated grout hoses to the point of discharge. A manifold will be used to split the flow of grout into the two grout nipples (see figure 1), to ensure even distribution of the grout.

Once each location has been filled to the predetermined level, the ball valves will be closed and the grout manifold moved to the next location up stream until each grout lift is complete.

Grout levels in the annulus can be checked by lightly tapping (sounding) the GRP liner surface. Following the initial set the grouted sections produce a distinctive tone when tapped. (Note: The Water Research Centre Sewerage Rehabilitation Manual states that up to 20% of voids in the grouted annulus are acceptable).

At all times during the grouting operations, spilled grout debris/water should be cleaned from the inner surface of the GRP liner.

Following the completion of each grout lift the Injection Port ball valve should be opened and cleaned ready for further use.

Repeat the process until the annular space is filled to an acceptable level. Close all grout nipple ball valves until the initial set of the grout is complete (approx 8 hours).

The sequence of grouting lifts and the number and location of the grout/vent/drain holes, can be adjusted as approved by the Channeline Installation Supervisor and or Professional Grouting Engineer.

## IX. Finishing

Once the initial grout set is completed, all grout nipples will be removed and disposed of. The original core pieces will be utilized to fill in the injection port hoses utilizing a two part Structural Epoxy or Methacrylate Construction Adhesive.