Specification

Specification Guidelines for Testing and Sealing Lateral Connections and Lateral Service Lines in Sanitary Sewer Systems

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PREPARATORY PROCEDURES

Cleaning – cleaning of the mainline and lateral connection shall be performed by the contractor to be adequate for seating a lateral packer in the mainline and inserting and seating an inflatable sealing bladder in the lateral. The lateral shall be cleaned of obstructions and roots on the length to be sealed, plus a seating distance of one foot.

- Payment for cleaning shall be per linear foot of mainline from center of manhole to center of manhole and per lateral.

Video tapped CCTV inspections – performed in the mainline from manhole and in each lateral on the length to be sealed plus one foot.

- A pan and tilt camera from the mainline will normally be acceptable for sealing distances of up to 4 feet.
- For longer sealing distances, or when the pan and tilt camera does not provide an acceptable view, a camera pushed or pulled through the lateral shall be used.

A Lateral Connection Data Report shall be originated as the time of the inspection using the form shown in Appendix A. A separate Lateral Connection Data Report form shall be filled out for each lateral with all the required information and produced to the owner's representative.

Protruding Laterals – Services protruding more than 5/8" into the mainline shall be cut back or otherwise removed to avoid interference with the testing and sealing equipment. The cutting of the protruding laterals shall be paid at unit price.

THE LATERAL SEALING PACKERS

The Lateral Sealing Packers are operated from the mainline sewer. They are designed to accommodate various sealing bladders for 4", 5" or 6" diameter laterals, and the different sealing lengths up to 20 feet. The sealing bladder shall have an expandable end bulb. The void area – or grout chamber – of the packer shall be minimal to limit the amount of inefficient grout. A sensing unit located within the void area shall accurately transmit the pressure readouts to the control panel at the grouting truck. The packer must have one connection for the test medium and two connections for the two-component grout. Each connection

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shall have its own port in the grouting chamber and be closed by an adjustable non-dripping check-valve set to open at approximately 20 psi.

TESTING OF LATERALS

The packer and sealing bladder are inflated to isolate the area around the connection and the portion of the lateral to be sealed. After an air pressure of 5 psi is applied into the isolated void, the air supply shut off and the length of time for a pressure drop from 5 psi to 3 psi is measured and recorded. The test is considered positive if the time delay for the pressure drop exceeds 15 seconds. Otherwise the lateral is considered to have failed the test and shall be grouted.

Note: The result of the air test is recorded on the Lateral Connection Data Report form.

The contractor shall provide an above-ground lateral and pipe connection set up for the size and distance to be tested and grouted. The set up shall have two taps with a valve and a gauge at each end of the lateral to simulate leaks. The contractor uses this set up to prove the validity of the air testing and the reliability of the test equipment.

All laterals shall be tested unless it is obvious that they are leaking.

Pricing: Payment for testing laterals shall be at the unit price per lateral for a predetermined testing distance.

A test after sealing will be considered successful only if the inside grout plugging the crevice is removed. The cleaning of residual grout in the mainline and at the connection is easily accomplished with a jet cleaner but is not practicable into the lateral. The contractor may decide to test immediately after sealing for his own sake, but the engineer should require verification after cleaning.

Pumping the grout to refusal*, as long as the proper technique is used, is a test in itself. As a control, the specification shall require that 10% of the sections be cleaned and tested first before payment of the monthly estimate and at the end of the warrantee period.

SEALING OF LATERALS

Chemical grout (Chemical Sealing Materials) shall be in accordance with section 6.1 thru 6.3.3.8 of Standard Practice For Rehabilitation of Sewers Using Chemical Grouting-Designation F2304-03. Laterals which do not pass the air test shall be sealed. The lateral packer remains in position, maintaining the isolated void. A two-component chemical grout sealant is pressure injected through the lateral packer into the isolated void. The grout material is then forced into the soil through leaking joints and pipe defects. The pumping rate and reaction or gel time of 20 seconds is acceptable when using a low void packer.

The pump capacity must be sufficient to initially fill up the isolated void before the gelling of the two component grout. After filling up the isolated void, the pumping rate should be adjusted to bring up and

* Pumping grout until the joint cannot accept additional material while maintaining a constant pressure

maintain back pressure of 8 psi into the isolated void at the mainline level. When the time for a drop of pressure of 8 psi to 6 psi exceeds 20 seconds without pumping, the sealing is considered successful. However, when the effective quantity of grout pumped exceeds one gallon per foot of sealing distance plus 3 gallons, it should be suspected that there is unseen caves or honeycomb structures outside of the pipe. The applicator shall try to build grout dams by repetitively pumping and curing the grout until the area is dammed off and the refusal pressure of 8 psi is obtained.

- To avoid plugging the crevices from the inside, the pump stroke interval shall be shorter than the gel time.

The engineer representative may determine that the grout consumption is too high and stop subsequent attempts to seal a lateral.

Pricing: The unit price to seal a lateral and the effective grout pumped will be paid even if attempts to seal a lateral were not effectively grouted.

Note: The effective volume of grout pumped is recorded on the lateral data sheet.

Effective Volume of Grout – To ensure a proper amount of grout is being pumped into the joint, the volume of the void space of the packer must be subtracted from the total volume of grout pumped at the joint. The effective volume of grout is the total volume pumped less the void volume of the packer chamber. The volume of the packer chamber is measured in the above ground lateral and the pipe connection set by simulating the actual sealing, using water only, and measuring the quantity of water necessary to fill up the void area.

- IMPORTANT: If the total volume of gel is less than or equal to the void space of the packer, NO GEL HAS BEEN INJECTED INTO THE JOINT.
- The “gel” time shall be 10 seconds longer than the time required by the pumps to fill the inside packer void and AT NO TIME shall the “gel” time be less than 20 seconds, unless approved by the engineer. This applies to both lo-void and high-void packers.

The amount of chemical per pump stroke should be measured at regular intervals and the number of pump strokes can be used to measure the amount of chemical delivered to each lateral.

Pricing: The payment for sealing laterals shall be at the unit price per each lateral plus the cost per gallon of the effective volume of grout pumped.

Note: The cost of the grout is a small percentage of the total cost when compared to the cost of the manpower and equipment required to seal a joint.

- The expectancy of the repair is DIRECTLY PROPORTIONAL TO THE EFFECTIVE VOLUME OF GROUT PUMPED.
- The payment of the grout as a separate item (vs. grouting per joint payment) removes the incentive to pump less than the effective volume of grout per joint.

FLOW VERIFICATION

It is the responsibility of the contractor to verify that the sealing of laterals did not restrain the flow, and to remove any grout which would significantly restrain the flow. Lateral flow shall be verified after the sealing of each lateral.

With the lateral being view with the pan and tilt camera, an attempt is made to obtain a water flush by the occupant. If the flow seems abnormal, it is assumed that the building sewer is blocked with grout and must be cleared. If a water flush can not be obtained and if no other full proof verification technique is used, the contractor shall inspect the lateral 3 feet further than the sealing distance.

- The contractor remains responsible for checking and cleaning the lateral even if his verification is accepted by the engineer.
- (Optional) The Contractor shall attach to the door of each home or building for which laterals have been grouted, a notification to the occupant stating that the lateral servicing this listed address was grouted on this particular date and if any blockage of sanitary flow occurs, the occupant should call the Contractor. The Contractor shall supply these notification forms.

QUALITY CONTROL BEFORE MONTHLY PAYMENT

Before payment of the monthly estimates, the engineer will select sections representing approximately 10% of the quantity of the sealed laterals. The selected sections shall be cleaned of residual grout with a hydraulic jet cleaner and the sealed laterals shall be air tested and resealed if necessary. If the failure rate exceeds 10%, an additional retest area of equivalent size shall be selected in which the sealed laterals shall be tested.

- Additional testing will continue until a failure rate of less than 10% is met.
- If 25% of work is tested and fails to meet the 10% requirement, the contractor shall have to test and reseal the totality of the work.
- Laterals failing the test shall be resealed at the contractor’s expense.

QUALITY ASSURANCE

The work of the contractor shall be warranted for a period of 12 months following substantial completion. At a time[†] agreed to by the engineer, the contractor shall perform a videotaped CCTV inspection of the sewer mainlines with a pan and tilt camera. The contractor shall note the continuous flow of all the laterals and visible infiltrations from the sealed portions of the laterals.

- Any previously sealed portions of the laterals showing infiltration shall be resealed at the contractor’s expense.

[†] Approximately 12 months after initial sealing, and preferably during a period of high groundwater

PAYMENT FOR SEALING

Payment for sealing laterals shall be at the unit price per lateral for a predetermined sealing distance PLUS the cost per gallon of the EFFECTIVE grout pumped.

The long term efficiency of sealing laterals by injection of chemical grout into the soil outside the leaking joints or other defects will be good only if enough grout is pumped into the soil. The grout left inside the pipe is not useful. The quantity of grout necessary to create the more permanent water barrier can not be accurately predicted. It directly depends on the number and size of the leaks, the soil granulometry and the size of the voids around the pipe. In relined pipes it also depends on the size of the annulus between the liner and the host pipe.

The cost of the grout is not so important in the overall sealing cost and shall not be a limiting factor. Payment by the gallon of effective grout should be an incentive to pump enough grout.

- The only possible measurement of a satisfactory seal is the pumping to an agreed upon refusal pressure.

Soil particles might have been washed in by the infiltrating water, forming large caves or honeycomb structures which are unseen. When such conditions happen or when the grout flows outside the pipe from one crevice to another before gelling, the grout consumption must be limited by repetitively pumping and curing the grout until the area is dammed off. This technique is referred to as “Icing the void”.

For a general estimate of the required effective quantity of grout per lateral, use 3 gallons for the connection itself plus one gallon per foot of lateral to be sealed. This rule of thumb can also be used to decide when it is appropriate to stop the continuous pumping and start the “Icing the Void” technique.

Note: When using the “Icing the Void” technique, the applicator must avoid plugging the crevice from the inside before building up a durable impermeable wall or ring outside the pipe. To accomplish this, the intervals between the pump strokes shall be shorter than the gel time.

LATERAL CONNECTION DATA REPORT

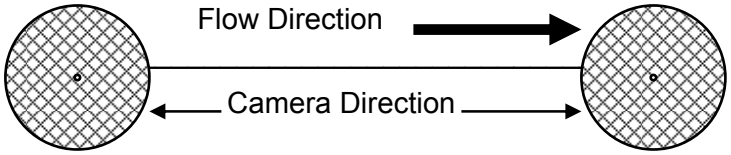
Job # _____ City _____

Street _____ Date of Inspection _____ / ____ / ____

Inspector _____ Operator _____

A. **Location of Lateral Connection**: # _____ of _____

Manhole #: _____



Manhole #: _____

Footage (from center of MH)	Street Address of Building Sewer	Clockwise Reference	Angle to the main

B. **Description**

Mainline pipe diameter: _____ Mainline pipe material: VCP Other _____

Lateral pipe diameter: _____ Mainline pipe material: VCP Other _____

Comments: _____

C. **Condition of Lateral**

Protruding: _____ inches Roots: _____ Debris: _____ inches

Comments: _____

D. **Infiltration/Inflow**

Before sealing Date _____ / _____ / _____ Percent (%) of the diameter _____

After sealing Date _____ / _____ / _____ Percent (%) of the diameter _____

Comments: _____

E. **Feasibility of sealing the required length** (_____ Feet)

Seating of the packer in the mainline: _____ Inversion & seating of the lateral plug: _____

Comments: _____

F. **Corrections required to render sealing possible** Cost: _____

Description: _____

Comments & Owner's Decision: _____

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G. **Air test date:** _____ / _____ / _____ Result: _____

H. **Sealing Date**: _____ / _____ / _____ Grout Type: _____ Amount: _____

Grouting pressure at refusal (psi) _____ Gel time: _____ (seconds)

List of Additives: _____ Qty of Grout Approved for payment: _____ (US Gal)

Comments: _____

I. **Control Test Date**: _____ /_____ / _____ Result: _____

Comments: _____

J. **Follow up**

_____

_____

_____

_____

_____

_____

K. Illustration (not required)