

Watermain Replacement and Connection Procedure

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TS 7.70.01 SCOPE

The work involves the procedure for making watermain replacement and connection to an existing watermain system. Instructions for making a connection are based on the scenarios in Figure 1 and Figure 2.

TS 7.70.02 REFERENCES

Contractors shall be familiar and comply with the following acts, standards, specifications or publications:

Provincial Statute

Ontario Drinking Water Quality Standards
Ontario Regulation 128/04 Certification of Drinking – Water System Operators and Water Quality Analysts
Ontario Regulation 170/03 Drinking Water Systems
Ontario Regulation 248/03 Drinking Water Testing Services
Safe Drinking Water Act, 2002

Ontario Ministry of the Environment and Climate Change

Watermain Disinfection Procedure November 2015

City of Toronto Standard Specifications

TS 7.30 Procedure for Disinfecting Watermains
TS 510 Amendment to OPSS.MUNI 510 – Construction Specification for Removal

City of Toronto Standard Drawings

T-1104.03-3 DCVA Connection Detail for Below Grade Installation during Disinfection
T-1104.03-4 DCVA or RP Connection Detail for Above Grade Installation during Disinfection

American Water Works Association

B300 Hypochlorites
B301 Liquid Chlorine
C651 Disinfecting Water Mains
C655 Field Dechlorination
M20 Water Chlorination Principle and Practice
AWWA RF Development of Disinfection Guidelines for the Installation and Replacement of Water Mains

NSF International

NSF/ANSI Standard 60 Drinking Water Treatment Chemicals – Health Effects

Canadian Standards Association

CSA B64.10 Selection and Installation of Backflow Preventers

TS 7.70.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

Certified Operator means a person who holds a Class I or higher certificate or license issued under requirement of O. Reg. 128/04 and who conducts operational checks of or who adjusts, tests, or evaluates a process that controls the effectiveness or efficiency of a subsystem and includes a person who adjusts or directs the flow, pressure or quality of water within the subsystem, if that person works in a 'distribution subsystem' or a 'distribution and supply subsystem'.

Water Quality Analyst means a person who holds a water quality analyst's certificate issued under section 16 of O. Reg. 128/04 or who holds a conditional water quality analyst's certificate issued under section 17 of O. Reg. 128/04.

Backflow Prevention means the prevention of a reversal of normal flow that could introduce contamination to the potable water supply; accomplished by an air gap or a CSA approved backflow preventer selected, inserted and tested according to CSA B64.10, Selection and Installation of Backflow Preventers.

TS 7.70.04 DESIGN AND SUBMISSION REQUIREMENTS – Not Used

TS 7.70.05 MATERIALS

TS 7.70.05.01 Disinfectants

Use of sodium hypochlorite that meets or exceeds AWWA B300 and is certified against standard ANSI/NSF 60.

TS 7.70.06 EQUIPMENT

TS 7.70.06.01 Chlorine Residual Testing

All chlorine residual field testing shall be performed by using the DPD Drop Dilution Method or High-Range Chlorine Test Kit according to AWWA C651 Appendix A. All test kits shall be calibrated and maintained according to manufacturer's recommendations.

TS 7.70.06.02 Backflow Preventer

All backflow preventers shall be a Reduced Pressure Principle (RP) or Double Check Valve (DCVA) according to CSA B64.10 and AWWA C651. The backflow prevention valve assembly shall be installed according to T-1104.03-3 or T-1104.03-4. The following CSA B64.10 installation conditions shall be followed:

- Minimum clearance between bottom of RP relief valve and the floor: 300 mm
- RP backflow preventers shall not be installed in a below-grade pit or vault
- DCVA backflow preventers shall not be installed in a below-grade pit or vault unless the vault can be maintained in a dry condition (i.e. installation of a sump pump)
- When a DCVA backflow preventer is installed in a below-grade pit or vault, all test cocks on the device shall be plugged using a means that is watertight

The backflow preventer shall be field tested, upon installation and when relocated, in accordance with the applicable requirements specified for each type of device in CSA B64.10. Field tests shall be performed only by a certified tester that has completed and received a valid Cross-Connection Control Specialist (CCCS) certificate by an accredited organization. Test results shall be reported on the designated forms and submitted to the Contract Administrator for recordkeeping and eventually submission to the City along with other contract records.

TS 7.70.07 CONSTRUCTION

TS 7.70.07.01 New Watermain System

- 1** Pressure test, flush, swab and disinfect the new watermain according to TS 7.30. Pressure testing and disinfection of new watermains shall be in isolation from the existing water distribution system.
- 2** Service connections larger than 50 mm in diameter shall be installed to street line with a street line valve.
- 3** Service connection 100 mm in diameter and greater shall be pressure tested, flushed, chlorinated and water sampled as part of the watermain system.
- 4** Contractor shall use a portable field test kit to check for residual chlorine and turbidity according to TS 7.70.06.01, herein. If the sample passes, then the two consecutive sampling procedures can begin.
 - The residual chlorine should be better or equivalent to the incoming water.
 - Turbidity should be less than < 1 nephelometric turbidity units (NTU). Engineering & Construction Services division Contract Administrator to discuss with Toronto Water operations representative to accept if non-health related.
- 5** Take two consecutive samples at sampling stations S1, S2, S3, S4 and S5 as shown on Figure 1 and according to TS 7.30 *Procedure for Disinfecting Watermains*.
- 6** If samples pass at all five sampling stations, then the new watermain can be connected to the existing watermains.
- 7** All valves which are part of the isolated section of new watermain shall remain closed until Toronto Water takes one bacteriological sample from the filler spool piece has passed. Toronto Water shall notify the Contract Administrator with an e-mail message that the sample results indicate a pass and provide notice to all customers affected by the water being turned off. Contractor shall request valving 2 Working Days in advance. After valving is scheduled, Toronto Water can then begin to open the valves.
- 8** The new watermain pipe permitted to be dewatered is from the isolation valve on the new watermain to the connection point on the existing watermain which shall be less than 6 m in distance. An exception to the above is allowed when making a connection to the source feeder watermain according to section 7.70.07.03 and illustrated in Figure 2.
- 9** After a minimum of two branch connections to side streets are connected, the Contractor can begin reconnecting all existing water services from the existing live watermain to the newly installed watermain.

TS 7.70.07.02 Connecting to Branch Connections

The following is a typical procedure for the connection of a replacement watermain to an existing watermain on street B as shown in Figure 1.

- 1** Toronto Water to close valves, V_C, V_D and V_J on the existing watermain system.
- 2** Toronto Water to open fire hydrant on street B so as to depressurize existing watermain system.
- 3** Toronto Water to close valve V_E.
- 4** Contractor to cut into watermain pipe before valve V_E, that is to say the left side of valve V_E on Figure 1 and install mechanical cap on existing water main. As a result, the existing watermain will be dewatered. Contractor shall install a 25 mm corporation stop and new 25 mm copper sampling pipe to grade at the mechanical cap location. This sampling point will allow Toronto Water to take one water sample. Cut into watermain pipe following disinfection procedure according to AWWA C651. Contract Administrator shall ensure functions are directly supervised by a Certified Operator. Contractor to pump out water and ensure all discharge water in excavation is below open ends of existing pipes.
- 5** Valve V_3 is to remain closed. Contractor shall ensure valve V_3 is properly restrained. Contractor to remove blow-off used as a sampling point S_2 for the two bacteriological samples.
- 6** If the filler piece of watermain pipe—pipe B—is less than 6 m, manually swab and disinfect filler piece of watermain according to AWWA C651, Section 4.10. If length of filler piece of watermain pipe is greater than 6 m, then standard disinfection methods apply.
- 7** Contractor to install filler piece of watermain pipe between valve V_3 and V_E.
- 8** Contractor to install new 25 mm corporation stop and new 25 mm copper sampling pipe to grade with blow-off on watermain pipe between V_3 and V_E.
- 9** Toronto Water to open valve ATV_1 and then open valve V_3.
- 10** Toronto Water to flush main in one direction—V_3 to V_E—through new 25 mm copper sampling pipe.
- 11** Toronto Water to open valve V_C, V_D and V_J. Valve V_E to remain closed.
- 12** Toronto Water to take one bacteriological water sample from the new copper sampling pipe. Toronto Water to close valve V_3. Toronto Water shall notify the ECS Contract Administrator whether the water sample results passed. ECS Contract Administrator to advise Contractor of sample results. For water samples with passing results, Toronto Water to advise ECS Contract Administrator when Contractor can proceed with removal of 25 mm copper sampling pipe and backfilling of access pit. Proceed to Step 14.
- 13** If water sample fails, Toronto Water to reopen valve V_3, and Contractor to flush main in one direction—V_3 to V_E—through new 25 mm copper sampling pipe. Go back to Step 12.
- 14** Toronto Water to reopen valve V_3 and Toronto Water to reopen valve V_E after pipe segment water sample has passed.
- 15** Existing valve V_E will remain in place in an open position. Existing valve box shall be removed or existing valve chamber to be broken down one metre below subgrade according to TS 510.

Toronto Water to confirm valve V_E is in the open position. In the event of failing water sample results, Contactor to coordinate with Toronto Water for operation of valve V_3 for any additional sampling.

- 16** Valves V_C and V_D to remain in the open position.

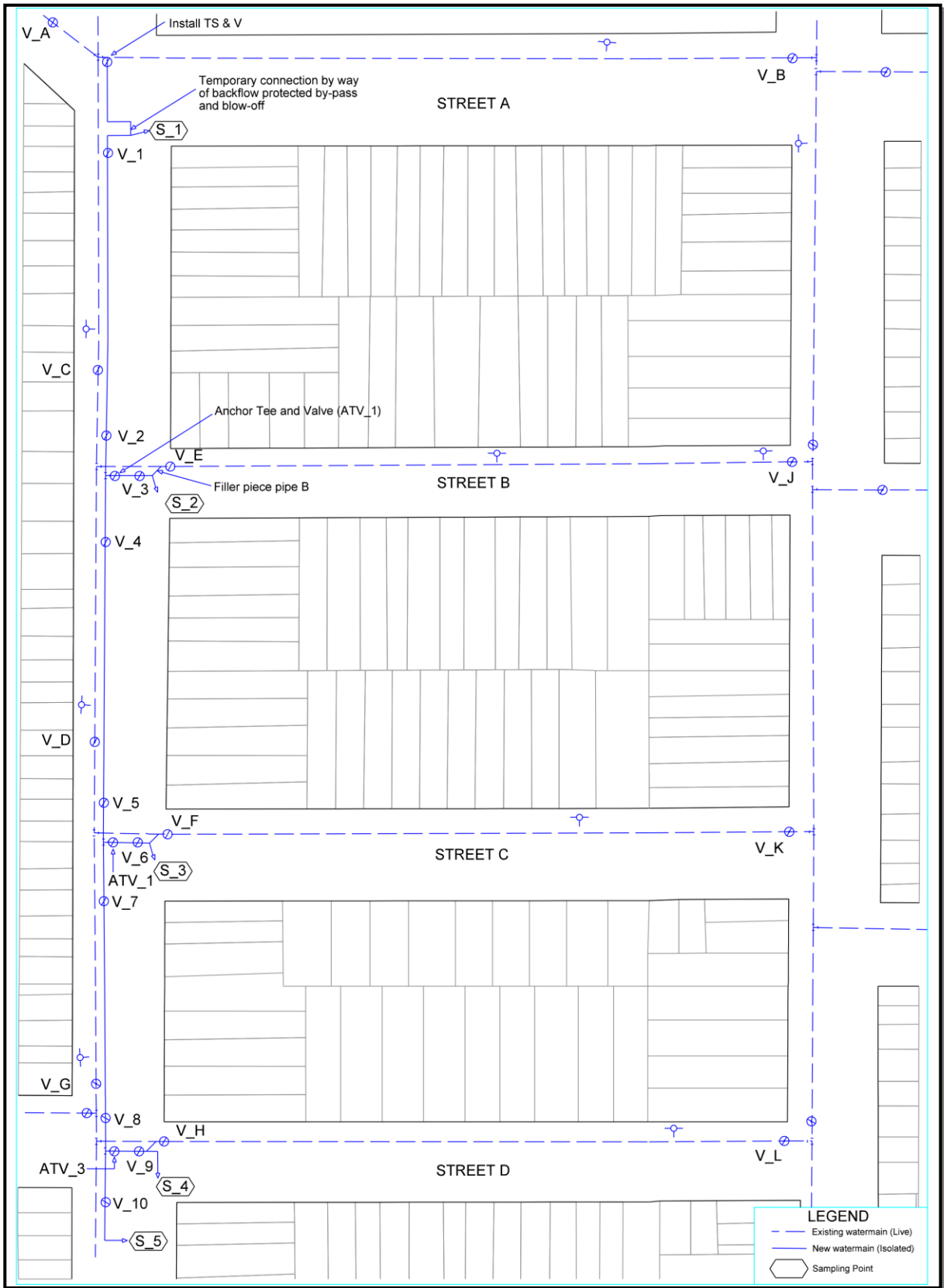


Figure 1: Scenario one – connecting to branch connections

TS 7.70.07.03 Connecting to Source Feeder Watermain with Backflow Protected Bypass

Procedure for connecting a new watermain system to an existing watermain system with a bypass with a backflow preventer. For this example the connection will be for a permanent connection on street A as shown on Figure 2.

- 1** Toronto Water staff to close valves V_A, V_B and V_C on the existing watermain system.
- 2** Toronto Water's Certified Operator to close TS&V only on new watermain system. The Contractor to close valve V_1 and release pressure in the main by partially opening blow-off through the temporary bypass to avoid blowing out valve V_1. Ensure valve V_1 is properly restrained to avoid blowing-out and injuring a worker.
- 3** Toronto Water to depressurize existing watermain through fire hydrant on street A. If there is no fire hydrant between the valves, Contractor shall tap in a blow-off on the existing watermain.
- 4** Pump out excess water from trench.
- 5** Remove temporary backflow preventer, valve assembly and blow-off connection. There is a possibility a short length of watermain pipe greater than 6 m will need to be dewatered between the TS&V and new isolation valve.
- 6** If the filler piece of watermain pipe is less than 6 m, manually swab and disinfect filler piece of watermain according to AWWA C651, Section 4.10. If length of filler piece of watermain pipe is greater than 6 m, then standard disinfection methods apply.
- 7** Contractor to install filler piece of watermain pipe between TS&V and valve V_1
- 8** Contractor to install new 25 mm corporation stop and new 25 mm copper sampling pipe to grade with blow-off on watermain filler piece.
- 9** Toronto Water to open fire hydrant on street A.
- 10** Toronto Water to open valve V_A.
- 11** Toronto Water's certified operator to open TS&V and flush main in one direction—TS&V to V_1.
- 12** Toronto Water to take one bacteriological water sample from the new copper sampling pipe. Toronto Water's certified operator to close TS&V. Toronto Water shall notify the ECS Contract Administrator whether the water sample results passed. ECS Contract Administrator to advise Contractor of sample results. For water samples with passing results, Toronto Water to advise ECS Contract Administrator when Contractor can proceed with removal of 25 mm copper sampling pipe and backfilling of access pit. Proceed to Step 14.
- 13** If water sample fails, Toronto Water's Certified Operator to reopen valve TS&V and flush main in one direction through new 25 mm copper sampling pipe. Go back to Step 12.
- 14** After a minimum of two branch connections to side streets are connected, the Contractor can begin reconnecting all existing water services from the existing live watermain to the newly installed watermain.

Note 1: Toronto Water shall collect one water sample while the excavation is open and notify the Engineering & Construction Services division Contract Administrator whether water sample results passed. ECS Contract Administrator to advise Contractor of sample results. For water samples with passing results, Toronto Water to advise Contract Administrator when Contractor can proceed with removal of 25 mm copper sampling pipe and backfilling of the access pit.

Note 2: As a good practice, valves V_1 and V_B should remain closed while valve V_A is left open until acceptable disinfection results are obtained. If there are any existing water services between valves V_A to V_1 or V_B to V_1 or both, the valves should remain closed except for valve V_B until acceptable disinfection test results are confirmed. Only open more than one valve at an intersection, if there is a water supply issue for the area.

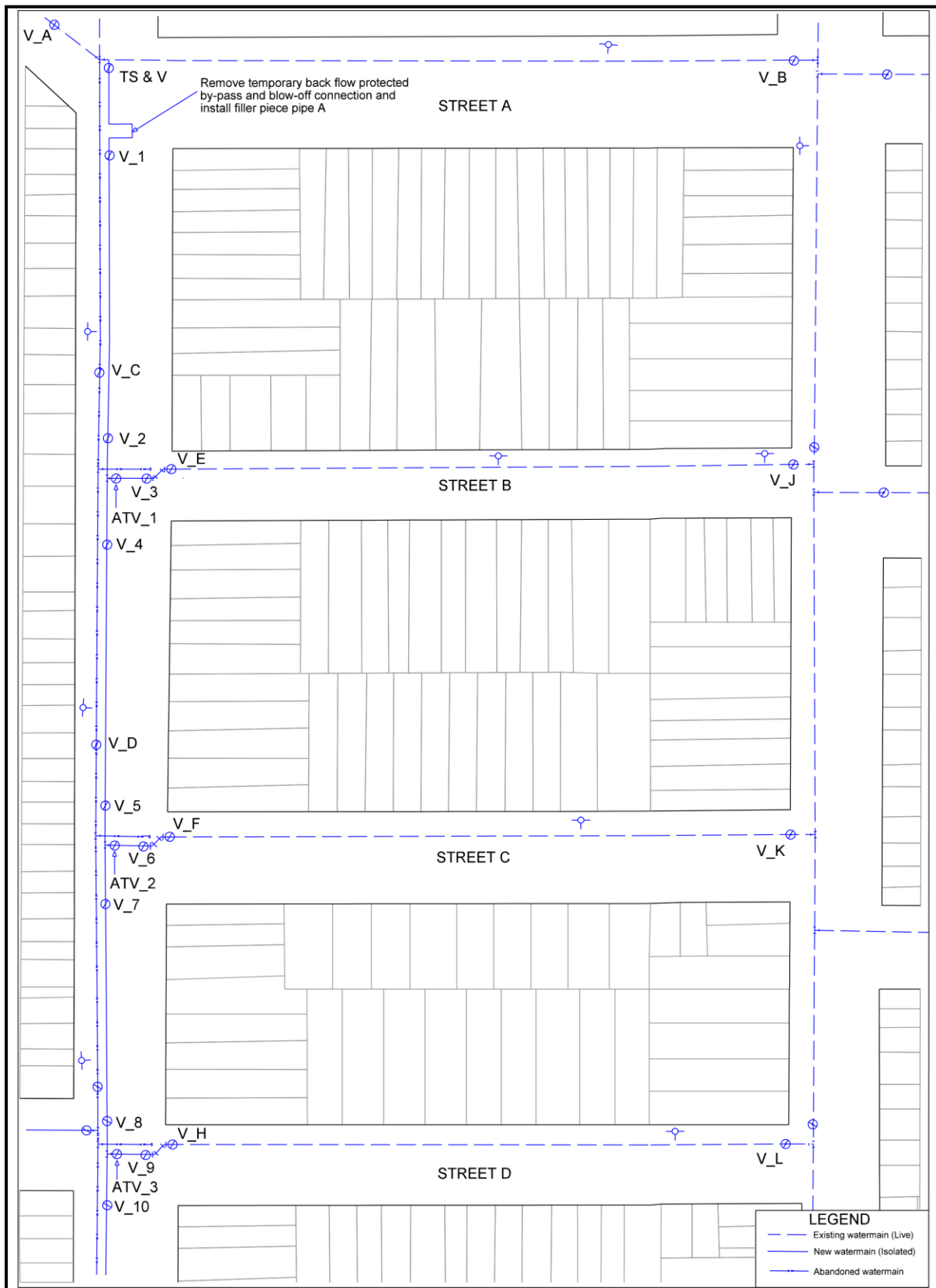


Figure 2: Scenario two – connecting to source feeder watermain

TS 7.70.08 QUALITY ASSURANCE – Not Used

TS 7.70.09 MEASUREMENT FOR PAYMENT

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the Contract Documents.

TS 7.70.10 BASIS FOR PAYMENT

Payment at the Contract Price for the above shall be full compensation for all labour, Equipment and Material to do the work.