

# **WATER DISTRIBUTION**

## **DIVISION 800**

**CITY OF WILMINGTON**  
**WATER DEPARTMENT**  
**SPECIFICATIONS**

**PLAN APPROVALS**

**CITY OF WILMINGTON**  
**69 N. SOUTH STREET**  
**WILMINGTON, OHIO 45177**

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## **HYDROSTATIC TESTING**

The testing methods described in this section are specific for water-pressure testing. These procedures should not be applied for air-pressure testing because of the serious safety hazards involved.

### **PRESSURE TEST**

After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subject to a hydrostatic pressure of at least 1.5 times the working pressure at the point of testing.

#### **TEST PRESSURE RESTRICTIONS**

Test pressure shall:

1. Not be less than 1.25 times the working pressure at the highest point along the test section.
2. Not exceed pipe or thrust-restraint design pressure.
3. Be of at least 2-hour duration.
4. Not vary by more than 5 psi (0.35 bar) for the duration of the test.
5. Not exceed twice the rated pressure of the valves or hydrants when the pressure boundary of the test section includes closed gate valves or hydrants. Note: Valves shall not be operated in either direction at differential pressure exceeding the rated pressure of the valves when the pressure boundary of the test section includes closed, resilient-seated gate valves or butterfly valves.

**PRESSURIZATION.** Each valved section of pipe shall be filled with water slowly and the specified test pressure, based on the elevation the lowest point of elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the owner. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. It is good practice to allow the system to stabilize at the test pressure before conducting the leakage test.

**AIR REMOVAL.** Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the contractor shall install corporation cocks at such points so that the air can be expelled as the line fills with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged or left in place at the discretion of the owner.

**EXAMINATION.** Any exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damaged or defective pipe, fitting, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound material, and the test shall be repeated until it is satisfactory to the owner.



## LEAKAGE TEST

The leakage test will be conducted concurrently with the pressure test.

**LEAKAGE DEFINED.** Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi (0.35 Bar) of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

**ALLOWABLE LEAKAGE.** No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD}{133,200}P$$

In which L is the allowable leakage, in gallons per hour; S is the length of pipe tested, in feet; D is the nominal diameter of the pipe, in inches; P is the average test pressure during the leakage test, in pounds per square inch gauge. This formula is based on an allowable leakage of 11.65 gpd, per mile per inch nominal diameter at a pressure of 150 psi.

Allowable leakage at various pressures is shown on Table 6.

When testing against closed-metal seated valves, an additional leakage per closed valve of 0.0078 gallon/hour/inch of nominal valve size shall be allowed. When hydrants are in the test section, the test section shall be made against the closed hydrant.

**ACCEPTANCE OF INSTALLATION.** Acceptance shall be determined on the basis of allowable leakage. If any test of pipe laid discloses leakage greater than that specified, the contractor shall, at his own expense, locate and make repairs as necessary until the leakage is within the specified allowance. All visible leaks are to be repaired regardless of the amount of leakage.

**TABLE 6****ALLOWABLE LEAKAGE PER 1000 FT. OF PIPELINE\*-GPH+**

Avg. Test Pressure PSI (Bar)	Nominal Pipe Diameter-inches								
	3	4	6	8	10	12	14	16	18
450 (31)	.48	.64	.95	1.27	1.59	1.91	2.23	2.55	2.87
400 (28)	.45	.60	.90	1.20	1.50	1.80	2.10	2.40	2.70
350 (24)	.42	.56	.84	1.12	1.40	1.69	1.97	2.25	2.63
300 (21)	.39	.52	.78	1.04	1.30	1.56	1.82	2.08	2.34
275 (19)	.37	.50	.75	1.00	1.24	1.49	1.74	1.99	2.24
250 (17)	.36	.47	.71	.95	1.19	1.42	1.66	1.90	2.14
225 (16)	.34	.45	.68	.90	1.13	1.35	1.58	1.80	2.03
200 (14)	.32	.43	.64	.85	1.06	1.28	1.48	1.70	1.91
175 (12)	.30	.40	.59	.80	.99	1.19	1.39	1.59	1.79
150 (10)	.28	.37	.55	.74	.92	1.10	1.29	1.47	1.66
125 ( 9)	.25	.34	.50	.67	.84	1.01	1.18	1.34	1.51
100 ( 7)	.23	.30	.45	.60	.75	.90	1.05	1.20	1.35

\*If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

+To obtain leakage in liters/hour, multiply the values in the table by 3.785.

## CHLORINATION OF PIPELINE

### **TABLET METHOD:**

Then tablet method consists of placing calcium hypochlorite granules and tablets in the water main as it is being installed and filling the main with potable water when installation is completed.

This method may be used only if the pipes and appurtenances are kept clean and dry during construction.

**PLACING OF HYPOCHLORITE GRANULES.** During construction, calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500 ft. intervals.

**WARNING:** This procedure must not be used on solvent welded plastic or on screwed-joint steel pipe because of the reaction of the joint compounds with the calcium hypochlorite.

**TABLE 1**

Ounces of calcium hypochlorite granules to be placed at the beginning of main and at 500 ft. intervals.

Pipe Diameter (inches)	Calcium Hypochlorite Granules (ounces)
4	0.5
6	1.0
8	2.0
12	4.0
16 and larger	8.0

**PLACING OF CALCIUM HYPOCHLORITE TABLETS:** During construction, 5-g calcium hypochlorite tablets shall be placed in each section of pipe and also one such tablet shall be placed in each hydrant, hydrant branch, and other appurtenance. The number of 5-g tablets required for each pipe section shall be  $0.0012D^2L$  squared L rounded to the next highest integer, where D is the inside pipe diameter in inches, and L is the length of the pipe section in feet. Table 2 shows the number of tablets required for commonly used sizes of pipe. The tablets shall be attached by an adhesive such as Permantex No. 2 or equal. There shall be no adhesive on the tablet except on the broad side attached to the surface of the pipe. Attach all of the tablets inside and at the top of the main, with approximately equal numbers of tablets at each end of a given pipe length. If the tablets are attached before the pipe section is placed in the trench, their position shall be marked on the section so it can be readily determined that the pipe is installed with the tablets at the top.



**TABLE 2**

Number of 5-g Calcium Hypochlorite tablets Required for Dose of 25 mg/l\*

Pipe Diameter (inches)	Length of Pipe Section (feet)				
	13 or less	18	20	30	40
	Number of 5-g Calcium Hypochlorite Tablets				
4	1	1	1	1	1
6	1	1	1	2	2
8	1	2	2	3	4
10	2	3	3	4	5
12	3	4	4	6	7
16	4	6	7	10	13

\* Based on 3.25 g available chlorine per tablet; any portion of tablet rounded to the next highest number.

**FILLING AND CONTACT TIME.** When installation has been completed, the main shall be filled with water at a rate such that the water within the main will flow at a velocity no greater than 1 ft/sec. Precautions shall be taken to assure that air pockets are eliminated. This water shall remain in the pipe for at least 24 hours. If the water temperature is less than 41 degrees F, the water shall remain in the pipe for at least 48 hours. Valves shall be positioned so that the strong chlorine solution in the treated main will not flow into water mains in active service.

### **FINAL FLUSHING**

**CLEARING THE MAIN OF HEAVILY CHLORINATED WATER** After the applicable retention period, heavily chlorinated water should not remain in prolonged contact with pipe. In order to prevent damage to the pipe lining or corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the system or is acceptable for domestic use.

**DISPOSING OF HEAVILY CHLORINATED WATER.** The environment to which the chlorinated water is to be discharged shall be inspected. If there is any question that the chlorinated discharge will cause damage to the environment, then a reducing agent shall be applied to the water to be wasted to neutralize thoroughly the chlorine residual remaining in the water. Where necessary, federal, state, and local regulatory agencies should be contacted to determine special provisions for the disposal of chlorinated water.

## **BACTERIOLOGICAL TESTS**

### **STANDARD CONDITIONS**

After final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from every 1200 ft. (366m) of the new water main, plus one set from each branch. All samples shall be tested for bacteriological quality in accordance with "Standard Methods for the Examination of Water and Wastewater", and shall show the absence of coliform organisms. A standard heterotrophic plate count may be required at the option of the purchaser (or purchaser's representative.)

### **SPECIAL CONDITIONS**

If trench water has entered the new main during construction or, if in the opinion of the purchaser (or purchaser's representative), excessive quantities of dirt or debris have entered the new main, bacteriological samples shall be taken at intervals of approximately 200 ft. (601m) and shall be identified by location. Samples shall be taken of water that has stood in the new main for at least 16 hrs. after final flushing has been completed.

### **SAMPLING PROCEDURES**

Samples for bacteriological analysis shall be collected in sterile bottles treated with Sodium Thiosulfate as required by "Standard Methods for the Examination of Water and Wastewater". No hose or fire hydrants shall be used in the collection of samples. A corporation cock may be installed in the main with a copper-tube gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed and retained for future use.



## **CHLORINATION PROCEDURE**

### **SLUG METHOD**

The slug method consists of placing the Calcium Hypochlorite Granules in the main during the construction, completely filling the main to eliminate all air pockets, flushing the main to remove particulates, and slowly flow through the main a slug of water dosed with chlorine to a concentration of 100 mg/l. The slow flow ensures that all parts of the main and its appurtenances will be exposed to the highly chlorinated water for a period of not less than 3 hours.

### **PLACING HYPOCHLORITE GRANULES**

Same as tablet method on page 4.

### **CHLORINATING THE MAIN**

1. Same as tablet method on page 4.
2. At a point not more than 10 feet downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a rate such that the water will have not less than 100 mg/l free chlorine. To ensure that this concentration is provided, the chlorine concentration should be measured at regular intervals. The chlorine shall be applied continuously and for a period to develop a solid column, or "slug", of chlorinated water that will, as it moves through the main, expose all interior surfaces to a concentration of approximately 100 mg/l for at least 3 hours.
3. The free chlorine residual shall be measured in the slug as it moves through the main. If at any time it drops below 50 mg/l, the flow shall be stopped, chlorination equipment shall be relocated at the heads of the slug, and as flow is resumed, chlorine shall be applied to resume the free chlorine in the slug to not less than 100 mg/l.
4. As the chlorinated water flows past fittings and valves, related valves and hydrants shall be operated so as to disinfect appurtenances and pipe branches.

## **DISINFECTION PROCEDURES WHEN CUTTING INTO OR REPAIRING EXISTING MAINS**

The following procedures apply when mains are wholly or partially dewatered. After the appropriate procedures have been completed, the main may be returned to service prior to completion of bacteriological testing in order to minimize the time customers are out of water. Leaks or breaks that are repaired with clamping devices while the mains remain full of pressurized water (greater than 20 psi) present little danger of contamination and require no disinfection.

### **TRENCH TREATMENT**

When an old main is opened, either by accident or by design, the excavation will likely be wet and may be badly contaminated from nearby sewers. Liberal quantities of hypochlorite applied to open trench areas will lessen the danger from such pollution. Tablets have the advantage in such a situation because they dissolve slowly and continue to release hypochlorite as water is pumped from the excavation.

### **SWABBING WITH HYPOCHLORITE SOLUTION**

The interiors of all pipe and fittings (particularly) couplings and sleeves used in making the repair shall be swabbed or sprayed with 1 percent hypochlorite solution before they are installed.

### **FLUSHING**

Thorough flushing is the most practical means of removing contamination introduced during repairs. If valve and hydrant locations permit, flushing toward the work location from both directions is recommended. Flushing shall be started as soon as the repairs are completed and shall continue until discolored water is eliminated.

### **SLUG CHLORINATION**

Where practical, in addition to the procedures above, a section of main in which the break is located shall be isolated, all service connections shut off, and the section flushed and chlorinated as described under the slug method, except that the dose may be increased to as much as 300 mg/l and the contact time reduced to as little as 15 minutes. After chlorination, flushing shall be resumed and continued until discolored water is eliminated and the water is free of noticeable chlorine odor.

## **SAMPLING**

Bacteriological samples shall be taken after repairs are completed to provide a record for determining the procedure's effectiveness. If the direction of flow is unknown, samples shall be taken on each side of the main break. If positive bacteriological samples are recorded, the situation shall be evaluated by a qualified engineer who can determine corrective action, and daily sampling shall be continued until two consecutive negative samples are recorded.

## **SPECIAL PROCEDURE FOR CAULKED TAPPING SLEEVES**

Before a tapping sleeve is installed, the exterior of the main to be tapped shall be thoroughly cleaned, and the interior surface of the sleeve shall be lightly dusted with calcium hypochlorite powder.

Tapping sleeves are used to avoid shutting down the main to be tapped. After the tap is made, it is impossible to disinfect the annulus without shutting down the main and removing the sleeve. The space between the tapping sleeve and the tapped pipe is normally  $\frac{1}{2}$ ", more or less, so that as little as 100 mg of calcium hypochlorite powder per square ft. will provide a chlorine concentration of over 50 mg/l.



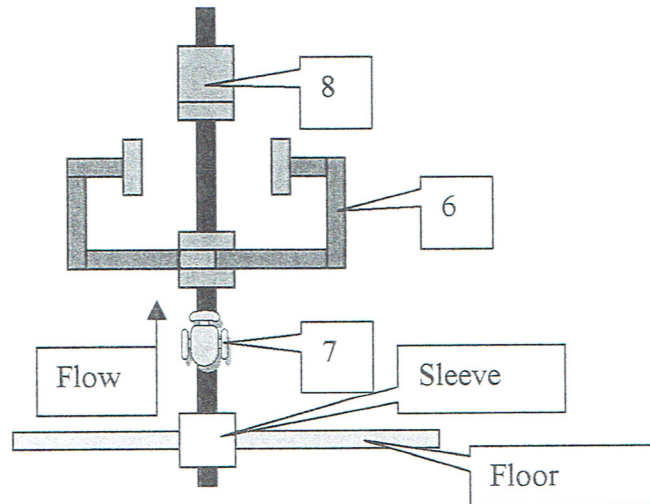
The chart provided gives the required dosage of 65% available chlorine (granular or tablets) to achieve 50 mg/l when disinfecting new water mains. The required dosage is given in ounces of HTH.

TABLE OF DISINFECTION OF WATER MAINS WITH 65% AVAILABLE HTH*							
	2"	4"	6"	8"	10"	12"	16"
50'	.084 oz	.335	.753	1.34	2.09	3.01	5.36
100'	.167	.670	1.506	2.68	4.18	6.02	10.72
150'	.252	1.117	2.259	4.02	6.27	9.03	16.08
200'	.336	1.340	3.012	5.36	8.36	12.04	21.44
250'	.420	1.675	3.765	6.70	10.45	15.05	26.80
300'	5.04	2.010	4.518	8.04	12.54	18.06	32.16
350'	.588	2.345	5.271	9.38	14.63	21.07	37.52
400'	.672	2.680	6.024	10.72	16.72	24.08	42.88
450'	.756	3.015	6.777	12.06	18.81	27.09	48.24
500'	.840	3.350	7.530	13.40	20.90	30.10	53.60
550'	.924	3.685	8.283	14.74	22.99	33.11	58.96
600'	1.008	4.020	9.036	16.08	25.08	36.12	64.32
650'	1.092	4.355	9.789	17.42	27.17	38.13	69.68
700'	1.176	4.690	10.542	18.76	29.26	42.14	75.04
750'	1.260	5.025	11.295	20.10	31.35	45.15	80.40
800'	1.344	5.360	12.048	21.44	33.44	48.16	85.76
850'	1.428	5.695	12.801	22.78	35.53	51.17	91.12
900'	1.512	6.030	13.554	24.12	37.62	54.18	96.48
950'	1.596	6.365	14.307	25.46	39.71	57.19	101.84
1000'	1.680	6.700	15.060	26.80	41.80	60.20	107.20
*First-find the diameter of pipe to be disinfected. Second-find the number of feet of pipe to be disinfected. Third-the answer is given in numbers of ounces required of 65% available HTH.							

## INSIDE METER SETTING

1. Remote wire for water meter to be installed by builder or contractor. The Water Department will furnish wire.
2. Wire will be installed from meter location to the outside readout box on the front or front side corner of the house, 54" above finished grade of the ground. Leave 2' of excess wire at the outside of wall. Leave enough excess wire at the location inside to reach meter.
3. On multiple settings, install all wires in the same hole going to outside of building. All wires will be a continuous run, with no splices.
4. Water Department will set meter after installation passes inspection.
5. Install in accordance with drawing below.
6. Kornerhorn meter setting.
7. Locking ball valve.
8. Dual Check Valve.
9. Meter cannot be over 4 feet off the floor.
10. Glue joint plastic pipe ahead of water meter is not acceptable.
11. We recommend putting in an expansion tank between water heater and check valve, this will allow for expansion of the water after it is heated and your water heater will last longer.

FORD	KORNERHORN SETTING
METER -5/8"	CH88-133-B11-333W-HHC11-333
METER-3/4"	CH88-333-B11-333W-HHC11-333
METER-1"	CH-88-444-B11-444W-HHC11-444
MCDONALD	KORNERHORN SETTING
METER-5/8"	40-1MM33-6101W 3/4-11-3FE33
METER-3/4"	40-3MM33-6101W 3/4-11-3FE33
METER-1"	40-4MM44-6101W 1-11-3FE33



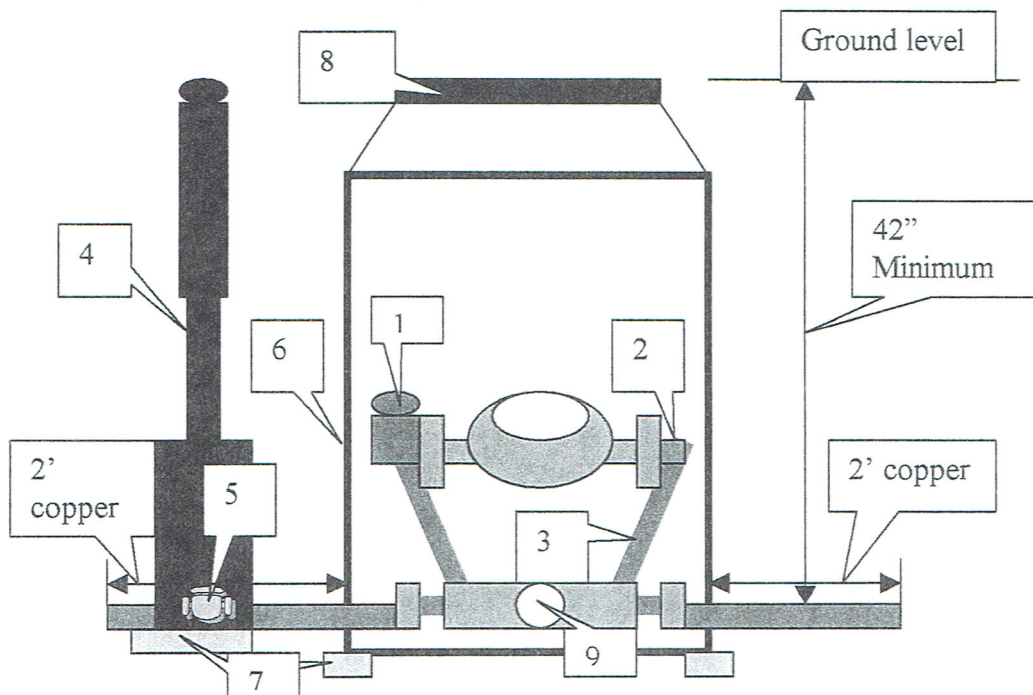


## OUTSIDE METER SETTING

1. Locking valve on the inlet side of the copper setter.
2. Dual check valve on the outlet side of copper setter.
3. Ford copper setter or equal. (See drawing).
4. Cast Iron, 2-½ inch, adjustable, screw-type curb box.
5. Curb stop turns 90 degrees on/off and set on cap block.
6. Meter tile plastic.
7. Brick or stone blocking.
8. Lid and cover cast iron Ford Type C or equal.
9. Insert ½ inch pipe into hole for stability. Pipe should not interfere with meter tile.
10. The City prior to backfilling shall inspect all piping from water main to building.
11. We recommend installing an expansion tank on the water line right before the water heater, this will extend the life of the water heater.

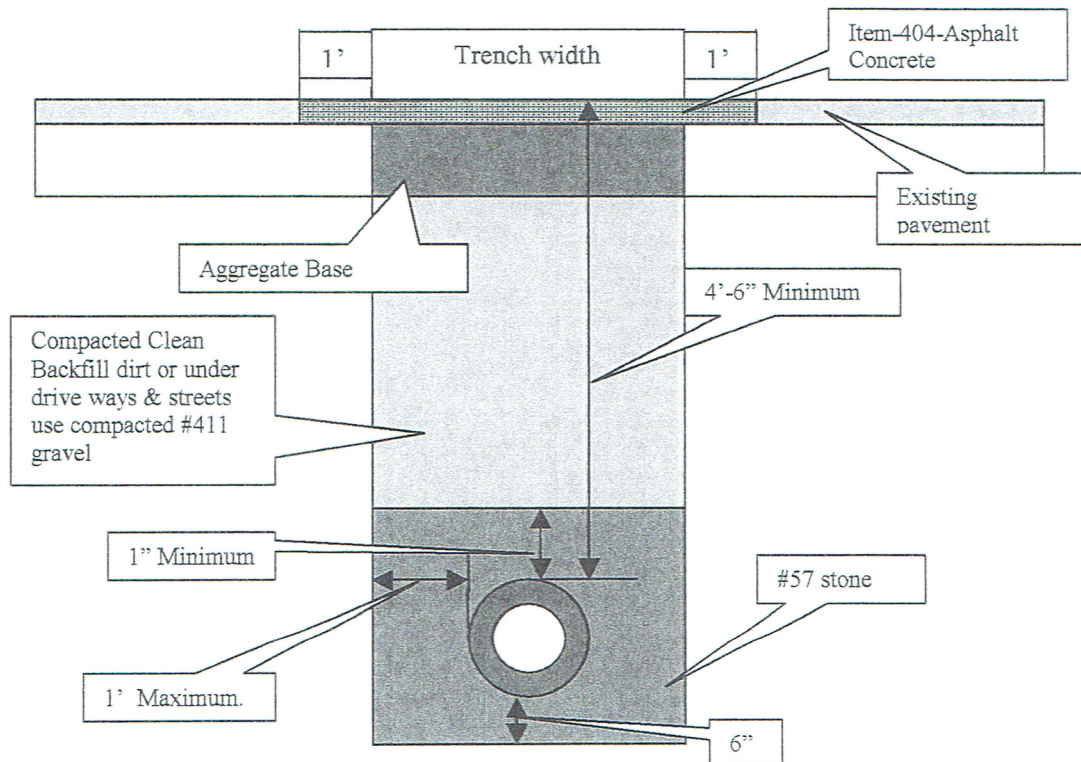
<b>FORD COPPERSETTER SETTING</b>	
5/8"- METER	VBHH71-21W-44-83-G
3/4"- METER	VBHH73-21W-44-33-G
1"- METER	VBHH74-21W-44-44-G

<b>MCDONALD COPPERSETTER SETTING</b>	
5/8" METER	21-121WDTT33
3/4" METER	21-321WDTT33
1" METER	21-421WDTT33



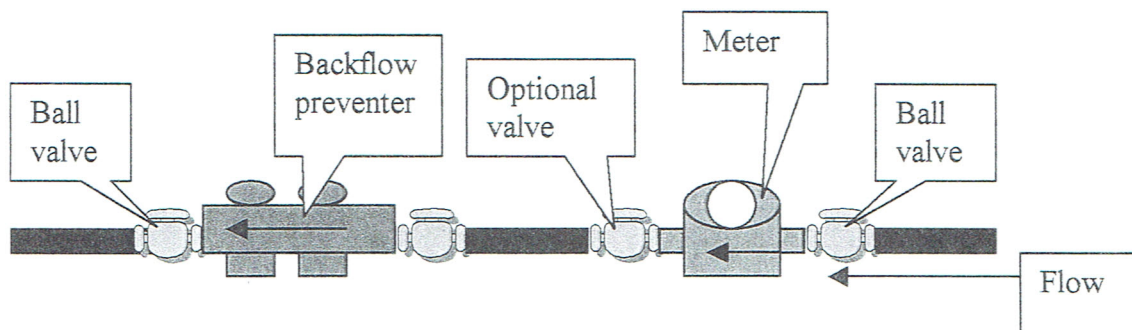
## WATER MAIN INSTALLATION

1. Main depth shall be a minimum of 4 feet-6 inches after final grade.
2. Main depth is not to exceed 60 inches after final grade with out approval of Water Department.
3. Main shall be C900 Class 18 or Class 50 Ductile Iron.
4. Where C900 PVC is used, a tracer wire shall be installed with the pipe. Every 300 feet **the tracer wire is to be run up in the valve boxes and coiled under the lid.**
5. Main and all appurtenances shall be disinfected according to chlorinating procedures.
6. A hydrostatic test shall be performed in the presence of City personnel.
7. The main will be approved after satisfactorily passing two bacteriological analyses, 24 hours apart, performed by the City Water Department.
8. All **water main trenches** have to be **inspected** by City personnel **prior to back filling.**
9. All mains shall be bedded in 6 inches of # 57 and 1 foot above pipe, then back-filled with dirt except where it travels under sidewalks and streets.
10. Every 300 feet of water main installed shall have an earthen dam built.
11. Under sidewalks or streets, trench shall be filled with 411.02 compacted every 4 inches.
12. Granular material used around any water service lines or fittings shall contain **no lime.**
13. All gate valves will be mechanical joint, resilient seat, and open left, and be installed every 800 feet.
14. All water main extensions shall be run to the far end of the property line.



## Backflow Preventer Setting

1. All backflow preventers shall be approved by the City of Wilmington Water Department prior to installation.
2. The City shall have access to devices at all times.
3. Devices shall be installed so they are accessible for testing and inspection.
4. The device cannot be more than four feet off the floor.
5. All devices will be tested at the time of installation and every twelve months thereafter.
6. All tests will be performed by testers certified by the Ohio Department of Health.
7. There shall be expansion tanks for thermal expansion on all systems where there are backflow preventers installed.
8. There shall be no bypasses installed around any backflow preventer devices.
9. No galvanized fittings are to be used only copper or brass.
10. If a reduced pressure backflow preventer is required then a pit setting cannot be used, it must be installed inside a heated building.
11. All backflow preventer devices shall be installed in the horizontal position.





**BACKFLOW PREVENTION INFORMATION**  
**LIST OF APPROVED BACKFLOW PREVENTION DEVICES**

**Dual Check**

Cash Acme-----Bf-1  
Conbraco-----40-300  
Watts-----7  
Wilkins-----700

**Double Check Valve Assemblies**

Ames-----2000B, 2000CIV, 2000-DC, 2000-G-DC, 2000-DCA, 2000-G-DCA, 2000 SE  
Conbraco-----40-100, 40-103, 40-104, 40-105, 40-107, 40-108  
Febco-----805Y, 805YD, 850  
Watts-----007, 709, 774  
Wilkins-----550 DC, 950 XL, 350

**Double Detector Check**

Ames -----3000 SE, 3000SS, 3000-DCDC  
Febco-----806YD, 856, 876  
Watts-----709 DCDA, 774DCDA, 774XDCDA  
Wilkins-----350DA, 350DAG, 450DA, 450DAG, 950DAG

**Reduced Pressure Principle Assemblies**

Ames-----4000  
Conbraco-----40-200  
Febco-----825 Y, 825 YA, 860, 880,  
Watts-----009, 909  
Wilkins-----575 RP, 975 XL

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