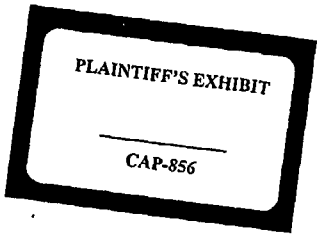

April 7, 1982

File 250-774

Mr. John R. Williams
4005 Chestnut Street
Fairfax, VA 22030

Re: AWWA Standard C603

Dear Mr. Williams:

In response to Robert S. Bryant's letter dated February 4, 1982, I would comment as follows:

1. The note following Section 3.2.6 should perhaps contain the additional comment that the installation methods noted in Section 3.2.5 and 3.2.6 are to be decided by the engineer or owner. (13) PAGE 17

2. I presume that in some fashion Manual M16, "Work Practices for Asbestos Cement Pipe", will be substituted for Section 3.3.3. (14) PAGE 24

3. In Section 3.4, Page 6, the recommended method is "Pulling the machined pipe end, etc". As a practical matter, my suspicion is that a large majority of A.C. pipe is installed by pushing with the use of a 2 by 4 and lever. If my suspicion is correct, then perhaps we should recognize this method with a caution about damage to a spigot end. (15) PAGE 31 & 32

4. In Section 3.5, it might be well to comment that thrust banking shall not block a hydrant drain hole. (16) PAGE 37

5. In Section 3.6, we might comment that dead end shall be provided with a blow-off assembly. (17) PAGE 37

6. In Section 5.1, here again my suspicion is that most installations are completely backfilled prior to any leakage or pressure test. Certainly this is at the risk of the contractor or installer. If my suspicion is correct, perhaps this should be recognized in some fashion.

(26)
See Page 43

Very truly yours,

ILLINOIS-AMERICAN WATER COMPANY

R. W. Greaves
Vice President and Manager

RWG/bls
cc: Robert S. Bryant

Sec. 1.3 References

This standard references the following documents. They form a part of this standard to the extent specified herein. In any case of conflict, the requirements of this standard shall prevail.

AASHTO * T-99
—*Standard Method of Test for Moisture-Density Relationship for Soils*

ANSI A21.11
(AWWA C111)
—*American National Standard for Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings*

ASTM † B29
—*Specifications for Pig Lead*

AWWA C400
—*Standard for Asbestos-Cement Distribution Pipe, 4 in. Through 16 in., for Water and Other Liquids*

AWWA C401
—*Standard Practice for Selection of Asbestos-Cement Distribution Pipe, 4 in. Through 16 in.*

AWWA C402
—*Standard for Asbestos-Cement Transmission Pipe, 18 in. Through 42 in., for Water and Other Liquids*

AWWA C403
—*Standard Practice for the Selection of Asbestos-Cement Transmission and Feeder Main Pipe, Sizes 18 in. Through 42 in.*

AWWA C601
—*Standard for Disinfecting Water Mains*

Section 2—Material Acceptance, Storage, and Handling

Sec. 2.1 Acceptance

At the time of delivery all material shall be examined for defects and damage, and any material that is defective or damaged shall be rejected and removed from the job site.

2.1.1 *Replacement of damaged pipe.* Material that is supplied by the owner and is rejected at the point of delivery because of defects or damage shall be replaced by the owner. Material that is supplied by the contractor and is rejected at the point of delivery because of defects or damage shall be replaced by the contractor. Material damaged subsequent to acceptance by the contractor shall be replaced by the contractor.

Sec. 2.2 Storage

Safe storage shall be provided for material until it has been incorporated into the completed project. The interior of all pipe, couplings, rings, fittings, and other accessories shall be kept free from dirt and other foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage by freezing.

* American Association of State Highway and Transportation Officials, 341 National Press Building, Washington, D.C. 20045.

† American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103.

for the Selection of Asbestos–Cement Transmission and Feeder Main Pipe, Sizes 18-in. Through 42-in.")

3.2.4 *Excavation in poor soil and refilling to grade.* Any part of the trench excavated below grade shall be backfilled to grade with thoroughly compacted material approved by the engineer. When an unstable subgrade condition is encountered and, in the opinion of the engineer, it cannot support the pipe, an additional depth shall be excavated and refilled to pipe foundation grade with crushed stone or other suitable material as required by the engineer to achieve a satisfactory trench bottom.

3.2.5 *Pipe laid on trench bottom or bedding.* Before the pipe is lowered into the trench,

1. A coupling hole shall be excavated with sufficient length, width, and depth to permit assembly and provide a minimum clearance of 2 in. below the coupling, and

2. The pipe shall be provided with continuous support between coupling holes.

NOTE: Use of approved granular material for bedding is recommended as a preferred method of preparing the trench bottom for pipe installation.

3.2.6 *Pipe laid on earth mounds.* Pipe shall be laid on earth mounds of approved backfill material compacted firmly in place and of a size adequate to hold the pipe in alignment and to maintain a 2-in. minimum clearance from coupling to trench bottom. Each pipe shall be laid on two mounds with the center of each mound placed approximately one fifth of the pipe length from each end. The trench shall be excavated a minimum of 2 in. below the grade of the bottom of the outside diameter of the coupling, and high spots between couplings shall be leveled in order to maintain a minimum of 2 in. under the pipe barrel. The clearance between the trench bottom and the bottom of the coupling and pipe shall be properly backfilled utilizing material approved by the engineer. The material shall be compacted utilizing appropriate equipment to provide a firm and uniform bedding throughout the entire length of the pipe.

NOTE: Earth mounds have been used in some areas with success. However, if this method is to be used, particularly in small sizes, caution should be exercised to ensure (1) that proper clearance is maintained between the pipe or coupling and the trench bottom, and (2) that after pipe placement, the earth beneath the entire length of the pipe including the coupling is properly placed beneath the pipe and is compacted to a uniform density.

Sec. 3.3 Laying of Pipe

3.3.1 *Lowering of pipe and accessories into trench.* Pipe shall not be lowered into the trench until the pipe bed has been brought to grade. All pipe and accessories shall be inspected for defects. Dirt and other foreign matter shall be removed from the interior and the machined ends before lowering into the trench. Pipe and accessories shall be lowered carefully into the trench by hand or with suitable equipment in a manner that will prevent damage to pipe and fittings or injury to the installers. The sealing surfaces of all materials shall be kept clean during installation.

3.3.2 *Pipe joints.* The machined ends of pipe to be jointed, coupling grooves, and rubber rings shall be cleaned immediately before assembly, and assembly shall be made as recommended by the manufacturer. Care

should be taken not to reverse the gasket when placed in the bell. Each pipe joint shall be sealed with a coupling consisting of an asbestos–cement sleeve and two rubber rings or an equivalent coupling or joint of equivalent strength and performance. The pipe joint shall not be deflected either vertically or horizontally beyond the limits recommended by the manufacturer.

3.3.2.1 When pipelaying is not in progress, the open ends of installed pipe shall be closed to prevent entrance of trench water into the line.

3.3.2.2 Whenever water is excluded from the interior of the pipe, enough backfill shall be placed on the pipe to prevent floatation. Any pipe that has floated shall be removed from the trench and the bedding corrected to conform to paragraph 3.2.3. No pipe shall be laid when the weather is unsuitable for proper installation as determined by the engineer.

3.3.3 *Pipe cutting.* Pipe-cutting methods that produce a smooth, square cut end without damage to the pipe and that minimize or eliminate airborne particles shall be employed. Rotating blades, hand saws, or similar materials, when properly used, are acceptable. Abrasive disks are not recommended unless special precautions are taken.

3.3.4 *End preparation.* Whenever it is necessary to cut a length of pipe in the field, the end shall be prepared as follows:

3.3.4.1 The pipe end of random lengths shall be machined by commercially available field lathes designed for this purpose to ensure that the diameter, profile, and roundness meet the pipe manufacturer's specifications. The machined surface on which the compression ring seals shall be smooth and cylindrical to ensure joint integrity.

3.3.4.2 The pipe end of machined overall lengths shall be beveled in accordance with the pipe manufacturer's specifications.

3.3.5 *Length of pipe at fittings and rigid structures.* When rigid joints are formed by caulked materials or by bolts with rubber ring seals, such as at fittings, the length of 8-in. diameter and smaller pipe fitted into the bell of the fittings shall not exceed 3 ft 3 in. and the length of 10-in. diameter and larger pipe shall not exceed 6 ft 6 in. At least one flexible joint shall be used between two adjacent rigid joints. A coupling shall be cast in the wall of rigid structures at the point of entry of pipelines to provide flexibility at the wall. To provide additional flexibility, the pipe at the point of entry shall have a laying length of not more than 6 ft 6 in.

Sec. 3.4 Jointing of Pipe to Valves, Hydrants, and Fittings

3.4.1 *General.* Each valve, hydrant, or fitting connected to asbestos–cement pipe shall either be equipped with a bell of an inside diameter large enough to receive the pipe and caulking of at least ¼-in. thickness around the full circumference of the pipe, or shall have a profile that permits a seal to be made between the machined pipe and the bell of the fitting with a rubber ring.

3.4.1.1 Before valves, hydrants, or fittings are laid, all lumps, blisters, and excess coating shall be removed from the bell. The inside of the bell shall then be wire-brushed and both the inside of the bell and the spigot end of the pipe shall be wiped clean and dry. All surfaces to be jointed shall be kept clean until the joints are made.

3.4.2 *Push-on joints.* The push-on joint is a single rubber-gasket joint.

It shall be assembled by positioning a continuous rubber ring gasket in the annular groove in the fitting bell and pulling the machined pipe end into the bell. A lubricant approved by the pipe manufacturer must be used. Care should be taken to ensure obtaining the correct size of gasket for the fitting bell for use with the correct size of asbestos–cement pipe. Cast-iron bell gaskets and asbestos–cement coupling gaskets are not interchangeable. An asbestos–cement coupling gasket shall not be used in a cast-iron fitting bell.

3.4.3 *Mechanical joint.* The mechanical joint is a bolted joint of the stuffing box type. In some sizes and classes, an adaptor is required between the asbestos–cement pipe and the mechanical joint. The joints shall conform to the current revision of ANSI A21.11 (AWWA C111), "Rubber-Gasket Joints for Cast-Iron and Ductile-Iron Pressure Pipe and Fittings," and shall be assembled as required in Appendix A, Notes on Installation of Mechanical Joints, of that standard.

3.4.4 *Poured joints.*

3.4.4.1 The yarning or packing material shall be as specified by the engineer. It shall consist of molded rubber rings. Asbestos rope or treated paper rope may be used only with the approval of the engineer when the space between the bell and spigot will not permit the use of a rubber ring.

3.4.4.2 The yarning material shall be placed around the spigot of the pipe and shall be of proper dimensions to center the spigot in the bell. When the spigot is shoved home, the yarning material shall be driven tightly against the inside base or hub of the bell with suitable yarning tools.

3.4.4.3 When a single strand of yarning material is used, it shall have an overlap at the top of not more than 2 in. When more than a single strand is required for a joint, each strand shall be cut to sufficient length so that the ends will meet without causing overlap. The ends of the strands shall meet on opposite sides of the pipe and not on the top or at the bottom. Successive strands of yarning material shall be driven home separately.

3.4.4.4 Lead-joint bells shall provide a jointing material space of not less than 2¼ in. for pipe of 20 in. diameter and smaller and 2½ in. for pipe 24–42 in. in diameter.

3.4.4.5 Lead for caulking purposes shall meet the current requirements of ASTM B29, "Standard Specifications for Pig Lead, in the Common Desilverized Grade."

Sec. 3.5 Setting of Hydrants, Valves, and Fittings

3.5.1 *General.* Hydrants, valves, and fittings shall be provided and installed as shown on the drawings or as specified in the supplementary specifications. They shall be inspected carefully and cleaned as required in paragraph 3.4.1.1 prior to lowering into the trench.

3.5.2 *Reaction or thrust backing.* A reaction or thrust backing shall be provided at each hydrant, valve, bend, and tee and at reducers or fittings where changes in pipe diameter occur. They shall be centered on the longitudinal axis and extended to solid undisturbed ground. Hydrants may be tied to the water main with rods. The size and shape of the thrust backing or the number and size of the tie rods shall be as shown on the drawings or as specified in the supplementary specifications.

(15) See Page 31
The Spigot end pipe is pushed into the bell pipe or vise versa. The method described here would require JACKS like we used w/ simplex pipe RB

The Lubricating of both the GASKET IN the Cplg & the SPIGOT end of the pipe is CUSTOMARY & I believe, NECESSARY RB (A) See Page 32

Is OKUM ACCEPTABLE? We've ALWAYS used IT. RB

Reaction or thrust backing shall not block the hydrant drain hole. RB (16) See Page 37

Sec. 3.6 Plugging of Dead Ends

Plugs shall be inserted into the bells of all dead-end fittings. Spigot ends of fittings and plain ends of pipe shall be capped. A reaction or thrust backing shall be provided at all dead ends of pipe that are capped or plugged. Capped or plugged outlets to fittings shall be tied to the fittings and shall be restrained according to the fitting manufacturer's recommendations.

Dead ends shall be provided w/ a blow off assembly — RG

(17)

See Page 37

Section 4—Pressure and Leakage Tests

Sec. 4.1 General

The field pressure and leakage tests should be conducted on each section as soon as possible after the following requirements have been met.

4.1.1 *Backfilling.* Backfill sufficient to prevent the lifting of the pipe shall be placed prior to filling with water and field testing. When local conditions require that the trenches be backfilled immediately after the pipe has been laid, the testing may be conducted after backfilling has been completed and before placement of permanent surface.

4.1.2 *Concrete curing time.* Before testing, or as specified by the engineer, at least 36 hr shall elapse after the last concrete thrust or reaction backing has been cast with high-early-strength cement, and at least seven days shall elapse after the last concrete thrust or reaction backing has been cast with standard cement.

Sec. 4.2 Test Pressure

Unless otherwise specified, the test pressure for distribution pipe (AWWA C400, sizes 4 in. through 16 in.) shall be double the operating pressure at the lowest elevation of the system or the class designation of the pipe plus 50 psi, whichever is less. The test pressure for transmission pipe (AWWA C402, sizes 18 in. through 42 in.) shall be the design pressure (operating pressure plus surge) times 1½.

Sec. 4.3 Procedure

The following procedure is based on the assumption that the pressure and leakage tests will be performed at the same time. The total time for the combined pressure and leakage tests for each section shall be a minimum of 2 hr unless otherwise specified. If separate tests are made, the pressure test shall be made first. The duration of the pressure test shall be a minimum of 1 hr. The duration of the leakage test shall be a minimum of 4 hr. The pressure of the leakage test may be reduced to 150 per cent of the maximum working pressure that will occur on that portion of the line or shall equal the test pressure (Sec. 4.2), whichever is less.

4.3.1 *Filling.* After the pipeline has been laid it shall be filled with water for a minimum of 24 hr before being subjected to the hydrostatic pressure test. Each section of the pipeline shall be filled slowly with water and all air expelled by means of taps at points of highest elevation.

TABLE 1

*Allowable Leakage per 100 Couplings**

Pipe Diameter *in.*	Average Test Pressure at Lowest Point in Line—*psi*								
	50	75	100	125	150	175	200	225	250
	Leakage—*gal/hr*								
4	0.71	0.87	1.00	1.12	1.23	1.32	1.42	1.51	1.58
6	1.06	1.29	1.51	1.68	1.84	1.98	2.12	2.25	2.37
8	1.42	1.72	2.00	2.24	2.45	2.64	2.84	3.00	3.16
10	1.77	2.15	2.50	2.79	3.07	3.40	3.54	3.75	3.95
12	2.12	2.58	3.00	3.35	3.68	3.96	4.24	4.52	4.74
14	2.48	3.01	3.50	3.91	4.28	4.62	4.96	5.26	5.50
16	2.83	3.44	4.01	4.47	4.89	5.27	5.68	6.00	6.32
18	3.18	3.87	4.52	5.02	5.52	5.93	6.37	6.75	7.11
20	3.54	4.30	5.00	5.58	6.12	6.58	7.08	7.51	7.90
21	3.73	4.54	5.24	5.88	6.40	6.92	7.42	7.86	8.28
24	4.24	5.16	6.00	6.69	7.34	7.91	8.50	9.01	9.47
27	4.77	5.83	6.74	7.56	8.23	8.90	9.54	10.12	10.66
30	5.30	6.45	7.51	8.37	9.18	9.88	10.62	11.26	11.84
33	5.83	7.13	8.24	9.25	10.06	10.88	11.67	12.36	13.02
36	6.37	7.75	9.01	10.07	11.02	11.88	12.74	13.50	14.22
39	6.88	8.42	9.74	10.83	11.90	12.96	13.79	14.61	15.40
42	7.42	9.08	10.48	11.78	12.82	13.85	14.86	15.74	16.58

* The data are based on 150 psi and represent a leakage of approximately 30 gpd per mile of pipe per in. of pipe diameter for pipe in 13-ft lengths.

4.3.2 *Pressurization.* The specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the engineer. The test pressure shall be maintained for the specified time during which all exposed pipe, couplings, fittings, valves, and hydrants shall be examined carefully.

4.3.3 *Cracked or defective elements.* All cracked or defective elements shall be removed and replaced and the test repeated until all visible leakage has been stopped and the requirements of Sec. 4.4 have been met.

Sec. 4.4 Allowable Leakage

No pipe installation will be accepted if the leakage for the section of line that is tested is more than the rate of leakage specified in Table 1. In determining the number of couplings, consideration should be given to allow for the additional number of joints if the pipe is less than 13 ft. If the test leakage in any section is greater than permitted, the leakage shall be located, repaired, and the test performed until the leakage is within the permitted allowance.

Section 5—Backfilling

Sec. 5.1 Backfill Procedure Before Tests

Backfill material approved by the engineer shall be free of any frozen lumps, rock that is 1½ in. or larger in size, and lumps of clay, large stones, boulders, or other unsuitable substances such as debris. The backfill shall be deposited in the trench up to the horizontal diameter of the pipeline in 6-in. thick compacted layers and shall be sufficiently damp to permit thorough compaction under and on each side of the pipe to provide support that is free from voids.

5.1.1 *Visual inspection not required.* If visual inspection during the hydrostatic tests is not required, then the pipe and joints shall be backfilled as specified previously and a cushion of material hand-placed over the pipe and joints to an average depth of 12 in. for all sizes of pipe.

5.1.2 *Visual inspection required.* If the joints are to be exposed during the test, additional backfill material shall be hand-placed between the joints in order to hold the line securely during the test. The average depth of material in this instance shall be 12 in. over the top of 8-in. diameter and smaller pipe, and 24 in. over larger pipe. In no case shall material with a diameter in excess of 1½ in. be placed in the trench in the first 12 in. above the pipe.

Sec. 5.2 Backfill Procedure After Tests

Upon completion of pressure and leakage tests, exposed couplings shall be covered and backfill hand-placed to a depth of 12 in. above the top of the pipe and couplings. The balance of backfill shall not contain stones that are more than 6 in. in their largest dimension, and the backfill mixture shall not be used for disposal of refuse. Trenches under pavements and sidewalks shall be backfilled to a compaction density of 90 per cent as determined by the American Association of State Highway and Transportation Officials Method T99 for compaction and density of soils. The balance of the backfill for other trenches and those trenches not in a right of way may be backfilled by machine without compaction unless otherwise specified in the supplementary specifications. Additional backfill material shall be supplied, if needed, to completely backfill the trenches or to fill depressions caused by subsequent settlement.

Section 6—Disinfection

Before the pipeline is placed into service, all new water systems, extensions to existing systems, valved sections of extension, replacements in the existing system, and any exposed section of the existing system shall be disinfected in accordance with AWWA C601, "Disinfection of Water Mains."

Sec. 1.2.1.

Delete "it shall be placed in not more than 6-in. layers". A Definition should describe what a word means and not the method. Secondly, there may well be a method for greater than 6-in. layers that will get the required results more economically.

(1) PAGE 5

Sec. 2.3

Delete "or allowed to impact on itself". Or change "itself" to other materials.

(18) PAGE 7

Sec. 2.3.3

Add to this section "Moving pipe and material should be held to a minimum to reduce the possibility of damage.

(18) PAGE 7

Sec. 3.2.3

Delete reference to illustrations of various beddings in AWWA C401 and AWWA C403 because:

(21) PAGE 21

1. By inference it is recommending the procedures illustrated in these standards.

2. C401 and C403 require 95% compaction and C603 does not.

(24)

Sec. 3.4.4.4

The meaning of this section is unclear. Should be rewritten. Jointing material space of 2¾ or 2½ in. seems excessive. ??? RBS

This comment has not YET been added to the installation guide RBS 4/26/83

The following might be better:

"Lead-joint bells shall provide a jointing material space between the pipe and bell of not less than 5/8 in. for pipe of 20 in. diameter and smaller and 3/4 in. for pipe 24-42 in. in diameter."

Sec. 4.2

Define (Operating pressure plus surge) HOW??

Sec. 4.3.1

Add after 24 hrs. the following "at operating pressure". The reason for this change is that it will force most of the air out of the couplings and make testing easier and safer.

(20) PAGE 42

Sec. 4.4

Should an allowance for leakage be considered for fittings as well as for short lengths? Leakage allowance is based on NUMBER OF COUPLINGS. THIS INCLUDES FITTING & SHORT LENGTH

Sec. 5.1.1

Delete "hand-placed". Or add "when the backfill material is suitable, the 12 in. cushion may be placed with an angle blade if the fill is not allowed to drop directly on the pipe."

(19) PAGE 38