AWWA STANDARD

for

THREADS FOR UNDERGROUND SERVICE LINE FITTINGS

This "Standard for Threads for Underground Service Line Fittings" is based upon a study of patterns for service line fittings now used widely in the water works field in North America. Should a purchaser wish to standardize his purchases in accordance with the dimensions given herein, he may do so by referring the manufacturer to this document (AWWA C800) and by naming the item or items he wishes to purchase.

Manufacturers are expressly advised that the term "AWWA Standard Threads for Service Line Fittings" can be applied only to fittings which conform to the dimensions herein.

Adopted Jointly by

American Water Works Association
New England Water Works Association

Approved as Standard by AWWA
September 1, 1948, and by NEWWA September 14, 1948. Revised January 17, 1955

AMERICAN WATER WORKS ASSOCIATION
Incorporated
2 Park Avenue, New York, N.Y. 10016

AWWA Standard for

Threads for Underground Service Line Fittings

Section 1-1—General

1.1. The fittings covered by these specifications are those in general use in the water works field for the installation of corporation stops in water mains and the service pipe extending from the main into the customer's premises up to the building stop.

1.2. Unless otherwise specifically directed by the purchaser, the service line fittings shall be of "ounce metal," containing 85 per cent copper and 5 per cent each of tin, lead, and zinc (ASTM B62).

Section 1-2—Description of Threads

Sec. 1-2.1—Drawings

2.1.1. All dimensions of threads shall be in accordance with the details given in Fig. 1-9, which form a part of these specifications.

2.1.2. The profiles shown in drawings are pictorial only, and producer's standards are to be furnished unless otherwise specified by the purchaser.

Sec. 1-2.2—Design Standards

2.2.1. The thread form shall be the same as that used on American National Taper Pipe Threads as approved by the American Standards Association, December 1945, and designated as ASA-B2.1-1945.

2.2.2. All starting threads shall be chamfered in accordance with the manufacturer's standard practice.

2.2.3. Thread forms for all straight threads in copper and lead services (Fig. 2-S) shall be in accordance with American National standards, with tolerances approximating Class 2, and allowances as indicated.

2.2.4. Wherever tapered iron pipe threads are called for, they shall conform to American Standard ASA-B2.1-1945.

2.2.5. A number of other fittings are used in underground water service, such as adapters for changing from lead service to copper service, copper service to iron pipe, and so on. Such fittings shall be furnished with threads made in accordance with the standard established for each service. No separate drawings of these threads are included in this standard.

2.2.6. If the purchaser specifies a wood screw thread on the inlet end of the corporation stop, it shall be made in accordance with the producer's standards.

2.2.7. On corporation stops, any plain extension at the inlet end shall be in addition to the thread length *L* as shown on Fig. 1.

2.2.8. The standard corporation stop thread shown in Fig. 1 is the one most extensively used on the inlet end of the corporation stop in American water works practice.*

2.2.9. In gaging A.W.W.A. standard thread, the thread is within tolerances when the gaging face is within one turn of being flush with the end of the thread.

2.2.10. If the purchaser specifies that the corporation stop furnished shall be finished with a tapered iron pipe thread, this thread shall conform to ASA-B2.1-1945 (as stated in Sec. 1-2.2.4 of these specifications), with the extra thread added at the large end of the corporation stop.

* This thread is commonly known to the trade as the Mueller Thread.

TABLE 1

Standard Corporation Stop Thread

Nominal Size	Threads per inch	Taper per foot	Diameters at Small End			Length *L* (min.)
			Major	Pitch	Minor	
in.		in.	in.	in.	in.	in.
¾	14	1½	1.104	1.047	0.990	1⅛
1	12	1½	1.332	1.265	1.198	1 5/16
1¼	11½	1	1.728	1.658	1.588	1⅜
1½	11½	1	2.004	1.934	1.864	1½
2	11½	1	2.577	2.507	2.437	1 11/16

This thread is for use on the inlet end.

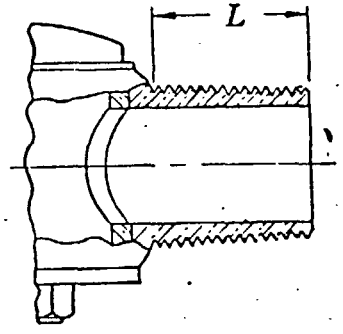

FIG. 1. Standard Corporation Stop Thread

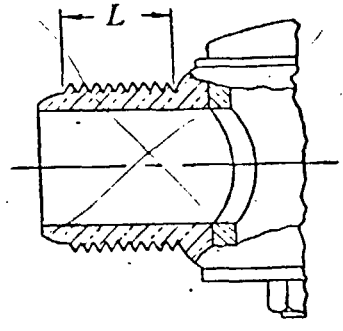

FIG. 2. Fitting Thread for Use With Flared Copper Service Tubes, Type K

TABLE 2

Filling Thread for Use With Flared Copper Service Tubes, Type K

Nominal Size	Threads per inch	Major		Pitch		Minor Diam. (max.)	Length *L* (min.)
		Diam.	Tol.	Diam.	Tol.		
in.		in.	in.	in.	in.	in.	in.
¾	14	1.259	−0.010	1.213	−0.006	1.171	⅜
1	11½	1.593	−0.015	1.536	−0.008	1.486	½
1¼	11½	2.055	−0.015	1.998	−0.008	1.948	1
1½	11½	2.465	−0.015	2.408	−0.008	2.358	1 1/16
2	11½	3.185	−0.015	3.128	−0.008	3.078	1 5/16

External thread is designed for the external coupling threads of corporation stops, curb stops and adapters for use with flared copper service tubes, Type K.

Internal driving thread shall be provided in copper service corporation stops only when so specified. Such threads shall conform to Fig. 8.

TABLE 3

Coupling Nut for Use With Flared Copper Service Tubes, Type K

Nominal Size	Threads per inch	Major Diam. (min.)	Pitch		Minor		Length *L* (min.)
			Diam.	Tol.	Diam.	Tol.	
in.		in.	in.	in.	in.	in.	in.
¾	14	1.266	1.220	+0.006	1.189	+0.008	⅜
1	11½	1.603	1.546	+0.008	1.509	+0.010	½
1¼	11½	2.065	2.008	+0.008	1.971	+0.010	1
1½	11½	2.475	2.418	+0.008	2.381	+0.010	1 1/16
2	11½	3.195	3.138	+0.008	3.101	+0.010	1 5/16

This thread is designed for all internal threads in fittings for use with flared copper service tubes, Type K.

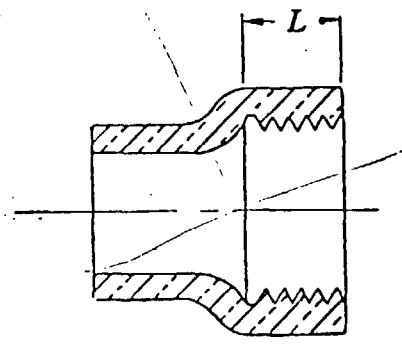

FIG. 3. Coupling Nut for Use With Flared Copper Service Tubes, Type K

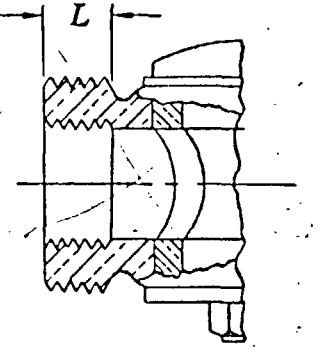

FIG. 4. Fitting Thread for Use With Extra Strong Lead Flanged Pipe

TABLE 4

Filling Thread for Use With Extra Strong Lead Flanged Pipe

Nominal Size	Threads per inch	Major		Pitch		Minor Diam. (max.)	Length *L* (min.)
		Diam.	Tol.	Diam.	Tol.		
in.		in.	in.	in.	in.	in.	in.
¾	12	1.843	−0.015	1.789	−0.008	1.741	⅜
1	12	2.158	−0.015	2.104	−0.008	2.056	9/16
1¼	10	2.526	−0.015	2.461	−0.011	2.403	⅝
1½	10	2.794	−0.015	2.729	−0.011	2.671	11/16
2	10	3.357	−0.015	3.292	−0.011	3.234	¾

External thread is designed for corporation stops, curb stops, and fittings used with extra strong lead flanged pipe.

Internal thread for driving is for corporation stops only and shall conform to Fig. 8.

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AWWA STANDARD

FOR

INSTALLATION OF ASBESTOS-CEMENT PRESSURE PIPE

1 - GENERAL

1.1 Scope

This standard covers the installation of water pipe lines of asbestos-cement pressure pipe with cast-iron and/or other fittings and appurtenances. For specific projects a thorough review of this standard is recommended for the purpose of supplementing this standard with provisions for special requirements not included herein. These requirements should be incorporated in the contract requirements.

1.2 Definitions

Under this standard, the following definitions shall apply:

1.2.1 "Compacted backfill" shall be job excavated material not frozen and free from debris, organic matter, rocks and stones, or such granular bedding material that the engineer may require. It shall be placed in not more than 6-in. layers and compacted to not less than 90 percent standard density as defined in AASHO T99.

1.2.2 Drawings: The drawings prepared by the owner to show the location and details for the construction of the pipeline and appurtenances.

1.2.3 Supplementary Specifications: The Supplementary Specifications prepared by the Owner to define which of the alternate materials and procedures provided in the standard apply, and to provide for conditions materials, procedures, etc., not covered by this standard.

2 - MATERIALS OF CONSTRUCTION

2.1 Responsibility for Material

REVISED

2.1.1 Acceptance of Material. When the owner supplies the material, he shall assume responsibility for it from the time he or his representatives accepts it from the carrier at the point of delivery until it is turned over to the contractor. When the contractor supplies the material, he shall assume responsibility for it from the time he or his representatives accepts it from the carrier. All such material shall be examined, and material defective in manufacture or damaged (or both) shall be rejected at the time and place of delivery.

2.1.2 Replacement of Damaged Pipe.

Material supplied by the owner which material is not accepted from the carrier at the point of delivery because of damage shall be replaced by the owner. Material supplied by the contractor which is not accepted at the point of delivery because of damage shall be replaced by the contractor. Material damaged subsequent to acceptance by the Contractor shall be replaced at the Contractors expense.

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

2.2 Handling of Material

2.2.1 ~~Hauling.~~ Rehandling. All materials to be supplied by the owner shall be picked up at the locations designated in the Supplementary Specifications and

required by the engineer.

3 - GENERAL AND DETAILED WORK TO BE PERFORMED

3.1 Alignment and Grade

All pipe shall be laid to and maintained at the required lines and grades. Fittings, valves, air vents and hydrants shall be installed at the required locations with joints centered, spigots home, and valve and hydrant stems plumb. No deviation shall be made from the required line or grade without approval from the engineer or his representative.

3.2 Excavation and Preparation of Trench

3.2.1 General. The trench shall be dug to the required alignment and depth shown on the drawings or as subsequently approved, in writing by the engineer, and only so far in advance of pipelaying as permitted by the Supplementary Specifications.

3.2.2 Excavation Methods. Where necessary to prevent caving, trench excavations in soils such as sand, gravel, and sandy soil shall be adequately sheeted and braced in accordance with local ordinances, where applicable. Where sheeting and bracing are used, the trench width shall not be less than that specified in Sec. 3.2.3. As backfill is placed and sheeting is withdrawn, it shall be withdrawn in increments of not more than 1 ft., and the void left by the withdrawn sheeting shall be filled and compacted before withdrawing the next increment. All excavated material shall be piled in a manner that will not endanger the work or obstruct sidewalks and driveways. Gutters shall be kept clear or other provisions made for surface drainage.

3.2.3 Width. The trench width at the ground surface may vary with, and depend upon, its depth and the nature of the ground encountered. The minimum clear width of unsheeted or sheeted trench measured at the horizontal diameter of the pipe shall be 18 in., or 1 ft. greater than the outside diameter of the barrel of the pipe, whichever is greater.

3.2.4 Preparation of Trench Bottom. As directed by [illegible], pipe shall be laid directly on the trench bottom or on earth mounds.

3.2.4.1 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.

3.2.4.2 Pipe Laid on Trench Bottom. Pipe shall be laid directly on a trench bottom containing coupling holes and shaped to provide continuous contact with the pipe between coupling holes. Before the pipe is lowered into the trench: (1) a coupling hole shall be dug with sufficient length, width, and depth to permit assembly and provide a minimum clearance of 2 in. between coupling and undisturbed trench bottom; and (2) the trench bottom between coupling holes shall be made flat and graded so as to provide continuous contact of the trench bottom with the pipe.

3.2.4.3 Pipe Laid on Earth Mounds. Pipe shall be laid on earth mounds of a size adequate to hold the pipe in alignment and to maintain a 2-in. minimum clearance from coupling to undisturbed trench bottom. Earth mounds shall be approved backfill material tamped in place. Each pipe shall be laid on two mounds with 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 OD of the couplings, and high spots between couplings shall be leveled so as to maintain a minimum of 2 in. under the pipe barrel. The earth mounds shall be tamped firmly in place and raised to a height

hauled to and distributed at the site.

Material shall at all times by handled with care to avoid damage. Whether moved by hand, skidways, or hoists, material shall not be dropped or bumped or allowed to impact on itself.

2.2.2 Unloading at Site of Work. In distributing the material at the site of the work, it shall be unloaded adjacent to or near the location where it is to be installed.

3.2.4.3 Pipe Laid on Earth Mounds. - Cont'd

that will withstand and provide a minimum clearance of 2 in. between the trench bottom and the pipe and coupling after placement of the pipe.

3.3 Laying of Pipe

3.3.1 Lowering of Pipe and Accessories into Trench. All pipe and accessories shall be inspected for defects, Foreign matter or dirt shall be removed from the interior and machined ends before lowering into the trench. All pipe and accessories shall be carefully lowered 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 and after laying.

3.3.2 Pipe Joints. The machined ends of pipe to be jointed, the 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.

When pipelaying is not in progress, the open ends of installed pipe shall be closed to prevent entrance of trench water into the line. Whenever water is excluded from the interior of the pipe, enough backfill shall be placed on the pipe to prevent floating. Any pipe that has floated shall be removed from the trench and the bedding corrected to conform to Sec. 3.2.4. No pipe shall be laid when the weather is unsuitable for proper installation as determined by the engineer.

3.4.1 General. - Cont'd

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 wiped clean and dry. All surfaces to be joined 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 is assembled by the positioning of a rubber ring gasket in an annular recess in the fitting bell and the forcing of the machined end pipe into the recess~~. It is 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. ~~THE PIPE MANUFACTURE~~ An approved A LUBRICANT APPROVED BY THE PIPE MANUFACTURER MUST BE APPROVED saponified lubricant must be used. The gasket and annular recess are designed, sized and shaped so that the gasket is locked in place against displacement. Care should be taken to insure obtaining the correct size gasket for the fitting bell for use with the correct size asbestos-cement pipe. The fitting 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".

3.4.3 Mechanical Joint. The mechanical joint is a bolted joint of the suffing box type. Each joint shall consist of (1) a bell, cast integrally with the fitting and provided with an exterior flange having bolt holes or slots, and a socket with an annular recess for the sealing gasket and the plain end of the pipe; (2) a sealing gasket; (3) a follower gland with bolt holes matching those in the fitting; and (4) tee-head bolts and hexagonal nuts. 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".

3.4.4 Poured Joints.

3.4.4.1 Yarning or Packing Material. Yarning or Packing Material shall be of rubber material. Asbestos rope or treated paper rope may be used only with the approval of the Owner when the space between the bell and spigot will not permit the use of a rubber ring. Jute or Oakum packing shall not be used.

3.4.4.2 Placing of Yarning Material. 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.

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.

3.4.4.3 Depth of Jointing Materials. For lead joints, a space not less than 2-½ in. shall be left uncalked in the bell of the pipe of 20 in. diameter and smaller; 2-½ in. for pipe 24 - 36 in.

3.4.4.4 Joint Material. Only lead, meeting the following specification, shall be used for poured joints. Lead for calking purposes shall contain no less than 99.73 percent pure lead. Impurities shall not exceed the following percentages: arsenic, antimony, and tin (together), 0.015; copper, 0.08; zinc, 0.002; iron, 0.002; bismuth, 0.25; and silver, 0.02. The producer's name or identification mark shall be clearly cast or stamped on each bar of lead. The melting pot used to heat lead shall be kept near the joint to be poured. The lead shall be brought to the proper temperature at which a rapid change of color appears when the lead is stirred, and at which a continuous solid lead joint is insured. Befor the lead is poured, all scum shall be removed. The joint runner shall fit snugly against the face of the bell and the outside of the pipe, and shall be dammed with clay at the pouring gate to provide for filling

3.3.3 Length of Pipe at Fittings and Rigid Structures.

joints at fittings are formed, such as at fittings, by calked materials, or by bolts with rubber ring seals, the length of 6 in. diameter and smaller pipe fitted into the bell of the fittings shall not exceed 3 ft. 3 in. and the length of ~~8~~ 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.

3.4 Jointing of Pipe to Fitting.

3.4.1 General. Each valve, hydrant, or fitting connected to asbestos-cement pipe shall either be equipped with a bell with an inside diameter large enough to receive the pipe and calking of at least ½-in. thickness around the full circumference of the pipe, or have a profile that permits a seal to be made between the machined pipe and the bell of the fitting with a rubber ring.

3.4.4.4 Joint Materials. - Cont'd.

the joint even with the top of the bell. Each joint shall be made with one pour to provide a continuous solid joint with the joint space completely filled.

After the lead joints have cooled to the temperature of the pipe, they shall be calked by competent workers with pneumatic or hand tools. The calking shall be thoroughly compacted to make the joints watertight without overstraining the bells.

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 carefully inspected and cleaned as required in Sec. 3.4.1 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, tee, and at reducers or fittings where changes in pipe diameters occur. They shall be centered on the longitudinal axis and poured to solid undisturbed ground. Hydrants may be tied to the water main pipe 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.

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 manufacturers recommendations.

4. PRESSURE AND LEAKAGE TESTS

4.1. General

Sufficient backfill shall be placed prior to filling with water and field testing to prevent lifting of the pipe. When local conditions require that the trenches be backfilled immediately after the pipe has been laid, the testing may be carried out after backfilling has been completed but not before placement of permanent surface.

At least 36 hours shall elapse after the last concrete thrust or reaction backing has been cast with high-early-strength cement, and at least 7 days shall elapse after the last concrete thrust or reaction backing has been cast with standard cement.

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

4.2. Test Pressures

Unless otherwise specified, the test pressure shall be double the operating pressure gradient at the lowest elevation of the system or the class designation of the pipe plus 50psi, whichever is the lesser. The duration of the test shall be 2 hours unless otherwise specified.

4.3. Procedure

The following procedure is based on the assumption that the pressure and leakage tests will be performed at the same time. Separate tests may be made if desired. If separate tests are made, the pressure test shall be made first, the duration of the pressure test may be reduced to 1 hour, and the test pressure for the leakage test may be reduced to the maximum working pressure that will occur on that portion of the line. After the pipe-line has been laid it shall be filled with water for a minimum of 24 hours before being subjected to the hydrostatic pressure test. Each section of the pipeline shall be slowly filled with water and all air expelled by means of taps at points of highest elevation. 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 carefully examined.

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.

4.4 Allowable Leakage

No pipe installation will be accepted if the leakage for the section of line tested is more than the rate of leakage specified in Table 1. In determining the number of couplings, consideration shall 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 rerun until the leakage is within the permitted allowance.

Table 1

Allowable Leakage per 100 Couplings*

Pipe Diameter in.	Test Pressure at Lowest Point in Line-psi						
	50	75	100	125	150	200	225
	Leakage - gph **						
4	0.71	0.87	1.00	1.02	1.23	1.42	1.51
6	1.06	1.29	1.51	1.68	1.84	2.12	2.25
8	1.42	1.72	2.00	2.24	2.45	2.84	3.00
10	1.77	2.15	2.50	2.79	3.07	3.54	3.75
12	2.12	2.58	3.00	3.35	3.68	4.24	4.52
14	2.48	3.01	3.50	3.91	4.28	4.96	5.26
16	2.83	3.44	4.01	4.47	4.89	5.68	6.00
18	3.18	3.87	4.52	5.02	5.52	6.37	6.75
20	3.54	4.30	5.00	5.58	6.12	7.08	7.51
24	4.24	5.16	6.00	6.69	7.34	8.50	9.01
30	5.30	6.45	7.51	8.37	9.18	10.62	11.26
36	6.37	7.75	9.01	10.07	11.02	12.74	13.50

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

** based on: $gph = \frac{ND\sqrt{P}}{3700}$

Where: N = number of joints in the line tested
D = nominal diameter of the pipe
P = average test pressure during test

5.1 Backfilling

5.1.1 Backfilling Procedure Before Tests. Backfill material approved by the Engineer shall be free of any frozen lumps or rock 1½" or larger in size or lumps of clay, large stones, boulders, or other unsuitable substances such as debris, etc. The backfill shall be deposited in the trench uniformly at both sides of the pipeline for the full width of the trench up to the horizontal diameter of the pipeline. This backfill material shall be tamped in layers 6 in. thick after compaction and shall be sufficiently damp to permit thorough compaction under and on each side of the pipe to provide support free from voids.

If visual inspection during the hydrostatic tests is not required, the pipe and joints shall be backfilled as specified above and a cushion of material hand placed over the pipe and joints to an average depth of 12 inches for all sizes of pipe. 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 inches over the top of 8 inch diameter and smaller pipe, and 24 inches over larger pipe. In no case shall material with a diameter in excess of 1-½ inches be placed in the trench in the first 12 inches above the pipe.

5.1.2 Backfill Procedure After Tests. On completion of pressure and leakage tests, exposed couplings shall be covered and backfill hand placed to a depth of 12 inches above the top of the pipe and couplings. The balance of backfill shall contain no stones more than 6 inches in their largest dimension, and the backfill mixture not be used for disposal of refuse. Trenches under pavements and sidewalks shall be backfilled to a compaction density of 90 percent, as determined by

5.1.2 Backfill Procedure After [illegible] - Cont'd

the American Association of State Highway Officials Method T99 for Compaction and Density of Soils. The balance of the backfill for other trenches and trenches not in a right of way may be backfilled without tamping 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.

6 - DISINFECTION

Before the pipeline is placed in 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."

They dont have anything in here about tapping A/C Pipe..

Draft

AWWA STANDARD

FOR

INSTALLATION OF ASBESTOS-CEMENT PRESSURE PIPE

1 - GENERAL

1.1 Scope

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Under this standard, the following definitions shall apply:

1.2.1 "Compacted backfill" shall be job excavated material not frozen and free from debris, organic matter, rocks and stones, or such granular bedding material that the engineer may require. It shall be placed in not more than 6-in. layers and compacted to not less than 90 percent standard density as defined in AASHO T99.

1.2.2 Drawings: The drawings prepared by the owner to show the location and details for the construction of the pipeline and appurtenances.

1.2.3 Supplementary Specifications: The Supplementary Specifications prepared by the Owner to define which of the alternate materials and procedures provided in the standard apply, and to provide for conditions materials, procedures, etc., not covered by this standard.

2 - MATERIALS OF CONSTRUCTION

2.1 Responsibility for Material

REVISED

2.1.1 Acceptance of Material. When the owner supplies the material, he shall assume responsibility for it from the time he or his representatives accepts it from the carrier at the point of delivery until it is turned over to the contractor. When the contractor supplies the material, he shall assume responsibility for it from the time he or his representatives accepts it from the carrier. All such material shall be examined, and material defective in manufacture or damaged (or both) shall be rejected at the time and place of delivery.

2.1.2 Replacement of Damaged Pipe.

Material supplied by the owner which material is not accepted from the carrier at the point of delivery because of damage shall be replaced by the owner. Material supplied by the contractor which is not accepted at the point of delivery because of damage shall be replaced by the contractor. Material damaged subsequent to acceptance by the Contractor shall be replaced at the Contractors expense.

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

2.2 Handling of Material

2.2.1 ~~Hauling.~~ Rehandling. All materials to be supplied by the owner shall be picked up at the locations designated in the Supplementary Specifications and

hauled to and distributed at the site.

Material shall at all times by handled with care to avoid damage. Whether moved by hand, skidways, or hoists, material shall not be dropped or bumped or allowed to impact on itself.

2.2.2 Unloading at Site of Work. In distributing the material at the site of the work, it shall be unloaded adjacent to or near the location where it is to be installed.

required by the engineer.

3 - GENERAL AND DETAILED WORK TO BE PERFORMED

3.1 Alignment and Grade

All pipe shall be laid to and maintained at the required lines and grades. Fittings, valves, air vents and hydrants shall be installed at the required locations with joints centered, spigots home, and valve and hydrant stems plumb. No deviation shall be made from the required line or grade without approval from the engineer or his representative.

3.2 Excavation and Preparation of Trench

3.2.1 General. The trench shall be dug to the required alignment and depth shown on the drawings or as subsequently approved, in writing by the engineer, and only so far in advance of pipelaying as permitted by the Supplementary Specifications.

3.2.2 Excavation Methods. Where necessary to prevent caving, trench excavations in soils such as sand, gravel, and sandy soil shall be adequately sheeted and braced in accordance with local ordinances, where applicable. Where sheeting and bracing are used, the trench width shall not be less than that specified in Sec. 3.2.3. As backfill is placed and sheeting is withdrawn, it shall be withdrawn in increments of not more than 1 ft., and the void left by the withdrawn sheeting shall be filled and compacted before withdrawing the next increment. All excavated material shall be piled in a manner that will not endanger the work or obstruct sidewalks and driveways. Gutters shall be kept clear or other provisions made for surface drainage.

3.2.3 Width. The trench width at the ground surface may vary with, and depend upon, its depth and the nature of the ground encountered. The minimum clear width of unsheeted or sheeted trench measured at the horizontal diameter of the pipe shall be 18 in., or 1 ft. greater than the outside diameter of the barrel of the pipe, whichever is greater.

3.2.4 Preparation of Trench Bottom. As directed by the Engineer, the pipe shall be laid directly on the trench bottom or on earth mounds.

3.2.4.1 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.

3.2.4.2 Pipe Laid on Trench Bottom. Pipe shall be laid directly on a trench bottom containing coupling holes and shaped to provide continuous contact with the pipe between coupling holes. Before the pipe is lowered into the trench: (1) a coupling hole shall be dug with sufficient length, width, and depth to permit assembly and provide a minimum clearance of 2 in. between coupling and undisturbed trench bottom; and (2) the trench bottom between coupling holes shall be made flat and graded so as to provide continuous contact of the trench bottom with the pipe.

3.2.4.3 Pipe Laid on Earth Mounds. Pipe shall be laid on earth mounds of a size adequate to hold the pipe in alignment and to maintain a 2-in. minimum clearance from coupling to undisturbed trench bottom. Earth mounds shall be approved backfill material tamped in place. Each pipe shall be laid on two mounds with 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 OD of the couplings, and high spots between couplings shall be leveled so as to maintain a minimum of 2 in. under the pipe barrel. The earth mounds shall be tamped firmly in place and raised to a height

3.2.4.3 Pipe Laid on Earth Mounds. - Cont'd

that will withstand and provide a minimum clearance of 2 in. between the trench bottom and the pipe and coupling after placement of the pipe.

3.3 Laying of Pipe

3.3.1 Lowering of Pipe and Accessories into Trench. All pipe and accessories shall be inspected for defects. Foreign matter or dirt shall be removed from the interior and machined ends before lowering into the trench. All pipe and accessories shall be carefully lowered 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 and after laying.

3.3.2 Pipe Joints. The machined ends of pipe to be jointed, the 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.

When pipelaying is not in progress, the open ends of installed pipe shall be closed to prevent entrance of trench water into the line. Whenever water is excluded from the interior of the pipe, enough backfill shall be placed on the pipe to prevent floating. Any pipe that has floated shall be removed from the trench and the bedding corrected to conform to Sec. 3.2.4. No pipe shall be laid when the weather is unsuitable for proper installation as determined by the engineer.

3.3.3 Length of Pipe at Fittings and Rigid Structures. When rigid joints at fittings are formed, such as at fittings, by calked materials, or by bolts with rubber ring seals, the length of 6 in. diameter and smaller pipe fitted into the bell of the fittings shall not exceed 3 ft. 3 in. and the length of ~~8~~ 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.

3.4 Jointing of Pipe to Fitting.

3.4.1 General. Each valve, hydrant, or fitting connected to asbestos-cement pipe shall either be equipped with a bell with an inside diameter large enough to receive the pipe and calking of at least ¼-in. thickness around the full circumference of the pipe, or 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 General. - Cont'd

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 wiped clean and dry. All surfaces to be joined 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 is assembled by the positioning of a rubber ring gasket in an annular recess in the fitting bell and the forcing of the machined end pipe into the recess~~. It is 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. ~~The Pipe Manufacturer~~ An approved saponified lubricant must be used. A LUBRICANT APPROVED BY THE PIPE MANUFACTOR MUST BE APPROVED The gasket and annular recess are designed, sized and shaped so that the gasket is locked in place against displacement. Care should be taken to insure obtaining the correct size gasket for the fitting bell for use with the correct size asbestos-cement pipe. The fitting 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".

3.4.3 Mechanical Joint. The mechanical joint is a bolted joint of the suffing box type. Each joint shall consist of (1) a bell, cast integrally with the fitting and provided with an exterior flange having bolt holes or slots, and a socket with an annular recess for the sealing gasket and the plain end of the pipe; (2) a sealing gasket; (3) a follower gland with bolt holes matching those in the fitting; and (4) tee-head bolts and hexagonal nuts. 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".

3.4.4 Poured Joints

3.4.4.1 Yarning or Packing Material. Yarning or Packing Material shall be of rubber material. Asbestos rope or treated paper rope may be used only with the approval of the Owner when the space between the bell and spigot will not permit the use of a rubber ring. Jute or Oakum packing shall not be used.

3.4.4.2 Placing of Yarning Material. 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.

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.

3.4.4.3 Depth of Jointing Materials. For lead joints, a space not less than 2-½ in. shall be left uncalked in the bell of the pipe of 20 in. diameter and smaller; 2-½ in. for pipe 24 - 36 in.

3.4.4.4 Joint Material. Only lead, meeting the following specification, shall be used for poured joints. Lead for calking purposes shall contain no less than 99.73 percent pure lead. Impurities shall not exceed the following percentages: arsenic, antimony, and tin (together), 0.015; copper, 0.08; zinc, 0.002; iron, 0.002; bismuth, 0.25; and silver, 0.02. The producer's name or identification mark shall be clearly cast or stamped on each bar of lead. The melting pot used to heat lead shall be kept near the joint to be poured. The lead shall be brought to the proper temperature at which a rapid change of color appears when the lead is stirred, and at which a continuous solid lead joint is insured. Befor the lead is poured, all scum shall be removed. The joint runner shall fit snugly against the face of the bell and the outside of the pipe, and shall be dammed with clay at the pouring gate to provide for filling

3.4.4.4 Joint Material. - Cont'd.

the joint even with the top of the bell. Each joint shall be made with one pour to provide a continuous solid joint with the joint space completely filled.

After the lead joints have cooled to the temperature of the pipe, they shall be calked by competent workers with pneumatic or hand tools. The calking shall be thoroughly compacted to make the joints watertight without overstraining the bells.

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 carefully inspected and cleaned as required in Sec. 3.4.1 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, tee, and at reducers or fittings where changes in pipe diameters occur. They shall be centered on the longitudinal axis and poured to solid undisturbed ground. Hydrants may be tied to the water main pipe 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.

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 manufacturers recommendations.

4. PRESSURE AND LEAKAGE TESTS

4.1. General

Sufficient backfill shall be placed prior to filling with water and field testing to prevent lifting of the pipe. When local conditions require that the trenches be backfilled immediately after the pipe has been laid, the testing may be carried out after backfilling has been completed but not before placement of permanent surface.

At least 36 hours shall elapse after the last concrete thrust or reaction backing has been cast with high-early-strength cement, and at least 7 days shall elapse after the last concrete thrust or reaction backing has been cast with standard cement.

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

4.2. Test Pressures

Unless otherwise specified, the test pressure shall be double the operating pressure gradient at the lowest elevation of the system or the class designation of the pipe plus 50psi, whichever is the lesser. The duration of the test shall be 2 hours unless otherwise specified.

4.3. Procedure

The following procedure is based on the assumption that the pressure and leakage tests will be performed at the same time. Separate tests may be made if desired. If separate tests are made, the pressure test shall be made first, the duration of the pressure test may be reduced to 1 hour, and the test pressure for the leakage test may be reduced to the maximum working pressure that will occur on that portion of the line. After the pipe-line has been laid it shall be filled with water for a minimum of 24 hours before being subjected to the hydrostatic pressure test. Each section of the pipeline shall be slowly filled with water and all air expelled by means of taps at points of highest elevation. 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 carefully examined.

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.

4.4 Allowable Leakage

No pipe installation will be accepted if the leakage for the section of line tested is more than the rate of leakage specified in Table 1. In determining the number of couplings, consideration shall 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 rerun until the leakage is within the permitted allowance.

Table 1

Allowable Leakage per 100 Couplings*

Pipe Diameter in.	Test Pressure at Lowest Point in Line-psi						
	50	75	100	125	150	200	225
	Leakage - gph **						
4	0.71	0.87	1.00	1.02	1.23	1.42	1.51
6	1.06	1.29	1.51	1.68	1.84	2.12	2.25
8	1.42	1.72	2.00	2.24	2.45	2.84	3.00
10	1.77	2.15	2.50	2.79	3.07	3.54	3.75
12	2.12	2.58	3.00	3.35	3.68	4.24	4.52
14	2.48	3.01	3.50	3.91	4.28	4.96	5.26
16	2.83	3.44	4.01	4.47	4.89	5.68	6.00
18	3.18	3.87	4.52	5.02	5.52	6.37	6.75
20	3.54	4.30	5.00	5.58	6.12	7.08	7.51
24	4.24	5.16	6.00	6.69	7.34	8.50	9.01
30	5.30	6.45	7.51	8.37	9.18	10.62	11.26
36	6.37	7.75	9.01	10.07	11.02	12.74	13.50

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

** based on: $gph = \frac{ND\sqrt{P}}{3700}$

Where: N = number of joints in the line tested
D = nominal diameter of the pipe
P = average test pressure during test

5.1 Backfilling

5.1.1 Backfilling Procedure Before Tests. Backfill material approved by the Engineer shall be free of any frozen lumps or rock 1½" or larger in size or lumps of clay, large stones, boulders, or other unsuitable substances such as debris, etc. The backfill shall be deposited in the trench uniformly at both sides of the pipeline for the full width of the trench up to the horizontal diameter of the pipeline. This backfill material shall be tamped in layers 6 in. thick after compaction and shall be sufficiently damp to permit thorough compaction under and on each side of the pipe to provide support free from voids.

If visual inspection during the hydrostatic tests is not required, the pipe and joints shall be backfilled as specified above and a cushion of material hand placed over the pipe and joints to an average depth of 12 inches for all sizes of pipe. 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 inches over the top of 8 inch diameter and smaller pipe, and 24 inches over larger pipe. In no case shall material with a diameter in excess of 1-½ inches be placed in the trench in the first 12 inches above the pipe.

5.1.2 Backfill Procedure After Tests. On completion of pressure and leakage tests, exposed couplings shall be covered and backfill hand placed to a depth of 12 inches above the top of the pipe and couplings. The balance of backfill shall contain no stones more than 6 inches in their largest dimension, and the backfill mixture not be used for disposal of refuse. Trenches under pavements and sidewalks shall be backfilled to a compaction density of 90 percent, as determined by

5.1.2 Backfill Procedure After Tests. - Cont'd

the American Association of State Highway Officials Method T99 for Compaction and Density of Soils. The balance of the backfill for other trenches and trenches not in a right of way may be backfilled without tamping 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.

6 - DISINFECTION

Before the pipeline is placed in 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."