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Standard Guide for Installing Asbestos-Cement Nonpressure Pipe[1]

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This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This guide covers the methods of installing asbestos-cement (A-C) nonpressure sewer and storm drain pipe and fittings covered by Specification C 428 and Specification C 663 to utilize the material's performance properties to the fullest advantage. Included are recommendations and directives for storing, handling, and transporting pipe, trench excavation, pipe embedment, recommended work practices, assembly and installation, backfill placement, and field testing of installed pipe and fittings in pipelines.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

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

2.2 *ASTM Standards:*

C 428 Specification for Asbestos-Cement Nonpressure Sewer Pipe[2]

C 663 Specification for Asbestos-Cement Storm Drain Pipe[2]

D 1869 Specification for Rubber Rings for Asbestos-Cement Pipe[3]

D 2946 Terminology Relating to Asbestos and Asbestos–Cement Products[2]

2.3 *ANSI Standard:*

C 111 Rubber Gasket Joints for Cast Iron and Ductile Iron Pipe and Fittings[4]

2.4 *Other Standards:*

AASHTO T-99: Method of Test for Moisture-Density Relationships for Soils[5]

AWWA M-16: Work Practice for Asbestos-Cement Pipe[6]

AWWA A21.11: Rubber Gasket Joints for Cast Iron and Ductile Iron, Pipe, and Fittings[6]

OSHA: Construction Standards and Regulations, U.S. Dept. of Labor, Occupational Safety and Health Administration[7]

WPCF FD-5 Manual Practice No. 60 ASCE Manuals and Reports on Engineering Practice[8]

Method T-99 Compaction and Density of Soils[5]

3. Terminology

3.1 *Definitions*—Refer to Terminology D 2946 for additional definitions.

3.1.1 *compacted backfill*—backfill material that has been compacted to a density as specified by the engineer.

3.1.2 *constructor*, *n*—the party that furnishes the work and materials for placement or installation.

3.1.3 *crushing strength*, *n— for pipes*, a property of solid material that indicates its ability to withstand collapse from external, compressive loads.

3.1.4 *engineer*, *n*—the person, firm, corporation or government agency acting for the purchaser as a duly authorized agent in the designing and engineering of the project.

3.1.5 *fitting*, *n—for pipes*, component such as wyes, tees and adaptors for use in laying asbestos-cement pipe, such that, when properly installed, yields an assembly equivalent in serviceability and strength to the pipe sections.

3.1.6 *inspector*, *n—in pipe laying*, an authorized representative of the engineer, or purchaser, assigned to make any inspections of the work performed, including materials and equipment furnished.

3.1.7 *lot*, *n—in asbestos-cement nonpressure sewer pipe*, for pipe sizes 150 mm (6 in.) and smaller, those lengths of pipe

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[2] *Annual Book of ASTM Standards*, Vol 04.05.

[3] *Annual Book of ASTM Standards*, Vol 09.02.

[4] Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

[5] American Association of State Highway and Transportation Officials, 444 N. Capitol St., NW, Ste. 225, Washington, DC 20001.

[6] Available from American Water Works Association, 6666 W. Quincy Ave., Denver, CO 80235.

[7] OSHA Construction Standards and Regulations, available from U.S. Dept. of Labor, Occupational Safety and Health Administration.

[8] Available from Water Pollution Control Federation, 2626 Pennsylvania Ave. NW, Washington, DC 20037.

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of that size, class, and type manufactured during the same work shift. For pipe sizes 200 mm (8 in.) through 525 mm (21 in.), each 300 lengths of pipe or less, of identical size, class, and type manufactured on each machine during a 24-h period. For pipe sizes larger than 525 mm (21 in.) each 300 lengths of pipe or less, of identical size, class, and type manufactured on each machine during a period of consecutive working days not exceeding 7 days.

3.1.8 *lot*, *n—in asbestos-cement storm drain pipe*, for pipe sizes 525 mm (21 in.) in diameter and smaller, each 300 lengths of pipe or less, of identical class and size manufactured on each machine during a 24-h period. For pipe larger than 525 mm (21 in.), each 300 lengths of pipe or less, of identical class and size manufactured on each machine during a period of consecutive working days not exceeding 7 days.

3.1.9 *manufacturer*, *n*—the party that manufactures, fabricates, or produces materials or products.

3.1.10 *package unit*, *n— in pipe laying*, several units of asbestos-cement pipe bound together for the purpose of being transported and, when desired, unloaded at the job site.

3.1.11 *plans and specifications*, *n—in pipe laying*, documents prepared by the engineer or purchaser, or both, stipulating work to be done and materials to be used which, combined with other contract documents and this guide, form the basis for a comprehensive contract between the purchaser and the constructor.

3.1.12 *purchaser*, *n*—the person, company or organization that purchases any materials or work to be performed.

3.1.13 *supplier*, *n*—the party who supplies material or services. A supplier may or may not be the manufacturer.

4. Significance and Use

4.1 This guide is not intended to supply design information nor to assume the responsibility of the engineer in establishing procedures to attain satisfactory performance best suited to individual job conditions. A review of this guide is recommended prior to supplementing it, as appropriate, with the conditions and requirements of the owner and engineer.

5. Material Selection, Acceptance, Storage and Handling

5.1 *Acceptance*:

5.1.1 *Rejection of Damaged or Defective Pipe*—At the time of delivery, all material shall be examined for defects and damage. Any material that is defective or damaged shall be rejected and removed from the job site.

5.1.2 *Replacement of Damaged Pipe*—Material that is supplied by the purchaser and rejected at the point of delivery because of defects or damage shall be replaced by the purchaser. Material that is supplied by the contractor and rejected at the point of delivery because of defects or damage shall be replaced by the constructor. Material damaged after acceptance by the constructor shall be replaced by the constructor.

5.2 *Storage*—Safe storage shall be provided for all 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. Fittings shall be drained and stored in a manner that will keep them from damage by freezing.

5.3 *Handling*—At all times material shall be handled with care to avoid damage. Whether moved by hand, skidways, or hoists, material shall not be dropped, bumped, or allowed to impact on itself.

5.4 *Rehandling*—All materials which are to be supplied by the purchaser shall be claimed at the locations designated in the purchaser's specifications and hauled to and distributed at the work site by the constructor.

5.5 *Unloading at Work Site*—When distributing the material at the work site, it shall be unloaded adjacent to or near the location where it is to be installed.

6. General and Detailed Work to be Performed

6.1 *Alignment and Grade*—All pipe shall be laid to and maintained at the lines and grades required by the purchaser. Fittings shall be installed at the required locations with joints centered and plumb. No deviation shall be made from the required line or grade without the approval of the purchaser or the purchaser's agent.

6.2 *Excavation and Preparation of Trench*:

6.2.1 The trench shall be excavated to the required alignment and depth shown on the purchaser's drawings or as subsequently approved in writing by the purchaser, and only so far in advance of pipe laying as permitted by the purchaser's specifications.

6.2.2 *Excavation Methods*—When necessary to prevent caving, trench excavations shall be sheeted and braced or sloped according to applicable laws and ordinances. When sheeting and bracing are used, the trench width shall not be less than that specified in 6.2.3. As backfill is placed and sheeting is withdrawn, it shall be withdrawn vertically in increments of not more than 0.3 m (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.

6.2.3 *Trench Width*—The trench width shall be ampled to permit the pipe to be laid and jointed properly and the backfill to be placed and compacted as specified by the purchaser. Trenches shall be of such extra width, when required, to permit the convenient placing of timber supports and sheeting and bracing, as well as the handling of specials.

6.2.4 *Trench Preparation*—The trench shall be prepared for the direct placement of the pipe. This preparation includes digging coupling holes in the trench bottom or bedding, or placing properly prepared mounds as specified by the purchaser. (Illustrations of the various bedding conditions are presented in AWWA Standards C 401 and C 403, and also in ANSI Standards C 401 and C 403.)

6.2.5 *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 purchaser. When an unstable subgrade condition is encountered and, in the opinion of the purchaser, 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 purchaser to achieve a satisfactory trench bottom.

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6.2.6 Pipe laid on trench bottom or bedding. Before the pipe is lowered into the trench, the constructor shall:

6.2.6.1 Excavate a coupling hole having sufficient length, width, and depth to permit assembly and provide a minimum clearance of 50 mm (2 in.) below the coupling, and

6.2.6.2 Provide the pipe with continuous support between coupling holes.

NOTE 1—Use of granular material for bedding is recommended as a preferred method of preparing the trench bottom for pipe installation.

6.2.7 *Pipe Laid on Earth Mounds*—Pipe shall be laid on earth mounds of backfill material compacted firmly in place and of a size adequate to hold the pipe in alignment and to maintain a 50 mm (2 in.) minimum clearance from coupling to trench bottom. Each pipe shall be laid on two mounds with the centre of each mound placed approximately one fifth of the pipe length from each end. The trench shall be excavated a minimum of 50 mm (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 50 mm (2 in.) under the pipe barrel. The clearance between the trench bottom and the bottom of the coupling and pipe shall be backfilled properly, using material approved by the purchaser. The material shall be compacted using appropriate equipment to provide a firm and uniform bedding along the entire length of the pipe.

NOTE 2—Earth mounds have been used in some areas with success. However, if this method is to be used, particularly for small pipe sizes, caution should be exercised to ensure that (*1*) proper clearance is maintained between the pipe or coupling and the trench bottom, and (*2*) 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 specified by the purchaser.

7. Laying of Pipe

7.1 *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.

7.2 *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 shall be taken not to reverse the gasket when placing it in the coupling. Each pipe joint shall be sealed with a coupling consisting of an asbestos-cement sleeve and two rubber rings conforming to Specification D 1869 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.

7.3 When pipe-laying is not in progress, the open ends of installed pipe shall be closed to prevent entrance of debris.

7.4 Whenever water is in the pipe trench, enough backfill shall be placed on the pipe to prevent it from floating. Any pipe that has floated shall be removed from the trench and the bedding corrected to conform to 6.2.4. No pipe shall be laid when the weather is unsuitable for proper installation as determined by the purchaser.

7.5 *Closure System*—Closure lengths and closure couplings should be used for tying in asbestos-cement pipe. Closure lengths and closure couplings can span closure distances up to 4 m (13 ft) without any field cutting. They eliminate any possible airborne asbestos fibre exposure, which may result from the field cutting of pipe.

7.6 *Pipe Cutting*—Since the introduction of the closure system, pipe cutting is no longer required in the field. If pipe cutting is done, methods that produce a smooth square cut end, without damage to the pipe, and that do not produce airborne particles, shall be employed. Abrasive discs are prohibited unless they are equipped with local exhaust ventilation and a high efficiency particulate air (HEPA) filter dust collection system.

7.7 *End Preparation*—Whenever it is necessary to cut a length of pipe in the field, the end shall be prepared as follows:

7.7.1 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.

7.7.2 The pipe of machined overall lengths shall be bevelled according to the pipe manufacturer's specifications.

7.8 *Mechanical Joints*—The mechanical joint is a bolted joint of the stuffing box (gland and compressible gasket) type.

7.8.1 In some sizes and classes, an adaptor is required between the asbestos-cement pipe and the mechanical joint.

7.8.2 The joints should conform to the current revision of ANSI C111 or AWWA A21.11 and should be assembled as required in Appendix A, of those standards.

7.9 *Poured Joints*:

7.9.1 The yarning or packing material should be specified by the engineer. It generally consists 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 machined pipe end will not permit the use of a rubber ring.

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

7.9.3 When a single strand of yarning material is used, it should have an overlap at the top of not more than 50 mm (2 in.).

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

7.9.5 Polymer resin-joint bells should provide a space for jointing material of not less than 58 mm (2.2 in.) for pipe of 50

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