Designation: F3110 – 14 (Reapproved 2024)

Standard Practice for Proper Use of Mechanical Trenchless Point Repair Sleeve with Locking Gear Mechanism for Pipes of Varying Inner Diameter and Offset Joints[1]

This standard is issued under the fixed designation F3110; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice establishes minimum requirements for good practices for the materials and installation of mechanical trenchless repair sleeve with a locking gear mechanism for pipes of varying inner diameter and offset joints in the range of 6 in. to 72 in. (150 mm to 1800 mm).

1.2 This practice applies to storm, potable water, wastewater and industrial pipes, conduits and drainage culverts.

1.3 When the specified materials are used in manufacturing the sleeve and installed in accordance with this practice, the sleeve shall extend over a predetermined length of the host pipe as a continuous, tight fitting, corrosion resistant and verifiable non-leaking pipe repaired using one or more pieces of the repair sleeve mechanism. The maximum internal pressure this sleeve can carry depends on the diameter and the wall thickness, ranging from 10 to 15 bars; the external pressure shall not exceed 1.5 bars.

1.4 All materials in contact with potable water shall be certified to meet NSF/ANSI 61/372.

1.5 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.6 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use. Particular attention is drawn to those safety regulations and requirements involving entering into and working in confined spaces.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A240/A240M Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

A666 Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar

2.2 *NASSCO Guidelines:*[3]

Specifications for Sewer Collection System Rehabilitation

2.3 *European Standard:*[4]

EN 681-1 Elastomeric seals—Materials requirement for pipe joint seals used in water and drainage applications—Part 1: Vulcanized rubber

2.4 *NSF/ANSI Standards:*[5]

NSF/ANSI 61 Drinking water system components

NSF/ANSI 372 Drinking water system components

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *access point, n*—upstream or downstream locations that serve as the point of entry or exit for the point repair of the existing pipe.

3.1.2 *bladder, n*—an apparatus, when pressurized, inflates a tube that presses against the inner pipe walls.

3.1.3 *EPDM rubber, n*—ethylene propylene diene monomer rubber formed to yield wide ranging engineering properties using a synthetic process.

[1] This practice is under the jurisdiction of ASTM Committee F36 on Technology and Underground Utilities and is the direct responsibility of Subcommittee F36.20 on Inspection and Renewal of Water and Wastewater Infrastructure.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from National Association of Sewer Service Companies (NASSCO), 2470 Longstone Lane, Suite M, Marriottsville, MD 21104, http://www.nassco.org.

[4] Available from European Committee for Standardization (CEN), Avenue Marnix 17, B-1000, Brussels, Belgium, http://www.cen.eu.

[5] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

3.1.4 *finished thickness, n*—the finished sleeve thickness after installation.

3.1.5 *hydrophilic, n*—a material that is moisture activated with expansion characteristics of 5 to 8 times its original thickness.

3.1.6 *locking gear, n*—gears that alter the diameter of the sleeve that can be locked to retain a desired diameter for the sleeve when put into service.

3.1.7 *NBR, n*—nitrile butadiene rubber.

3.1.8 *offset joints, n*—joints with defects from the inner bore area not aligning perfectly.

3.1.9 *packer, n*—an inflatable bladder device on wheels that transports a sleeve through the pipe and further inflates/expands for final sleeve installation.

3.1.10 *point repair, n*—repair of a local defect without relining damaged pipe, conduit or culvert from one manhole to the next.

3.1.11 *resin, n*—synthetic fluid that hardens to become a solid when cured by steam, heat, ultraviolet light or under ambient conditions.

3.1.12 *serial installation, n*—using more than one sleeve to perform point repair.

3.1.13 *single installation, n*—using a single sleeve to perform point repair.

3.1.14 *sleeve, n*—tubular shaped component of various length, diameter and wall thickness.

4. Significance and Use

4.1 This practice is for use by design engineers, specifiers, regulatory agencies, owners, installers, and inspection organizations who are involved in the rehabilitation of pipes through the use of a Mechanical Trenchless Point Repair Sleeve with a Locking Gear Mechanism for Pipes of Varying Inner Diameter and Offset Joints within a damaged existing pipe.

4.2 This practice applies to the following types of defects in pipe that can be repaired: longitudinal, radial and circumferential cracks, fragmentation, leaking joints, displacement or joint misalignment, closing or sealing unused laterals, corrosion, spalling, wear, leaks in the barrel of the pipe, deformation in the pipe and root penetration. There are no limitations on the diameters of the laterals that can be sealed. The degree of deformation that can be repaired is dependent on the minimum and maximum diameters for which the sleeve is applicable as listed in the tables of dimensions shown in Appendix X1 but shall never exceed 5 %.

4.3 This practice applies to pipes made of vitrified clay, concrete, reinforced concrete, plastics, glass reinforced plastics, cast iron, ductile iron and steel for both pressure and non-pressure applications.

4.4 In this practice, no issues of snagging waste or build-up of sludge or sediment have been recorded to date; the performance of this sleeve, however, depends on many factors; therefore, past operational records may not include all possible future conditions under which the user may install these sleeves.

4.5 The suitability of the technology covered in this practice for a particular application shall be jointly decided by the authority, the engineer and the installer.

5. Essential Components Forming the Sleeve and Their Functions

5.1 *Stainless Steel Sleeve:*

5.1.1 *Flared End*—The flared end faces the direction of flow and improves the hydrodynamics, prevents solids from depositing, and increases jetting resistance, (1) in Fig. 1 and Fig. 3. Flared ends are not used, however, for potable water applications.

5.1.2 *Metal Overlap*—The steel sleeve is rolled up smaller than its nominal diameter. The overlap is what is left over for expanding to the pipe wall, (2) in Fig. 1.

5.1.3 *Toothed Strip*—The locks that keep the sleeve expanded run along the toothed strip, (3) in Fig. 1.

5.1.4 *Lock*—The lock is a small set of gears that only moves in one direction, thus keeping the sleeve expanded, (4) in Fig. 1 and Fig. 3. The locking gears are also shown in Fig. 4. There are three gears per lock. Six gears per sleeve (two locks per sleeve). Two of the gears in the lock ride in the corresponding "teeth" in the sleeve. The third gear is the lock. It allows the other two gears to only move in a forward direction. All three gears are shielded by a cover. The gears and the shield are all of the same material as the rest of the sleeve. Therefore, all components of the sleeve offer the same design life. Furthermore, the gears are protected by a cover to prevent snagging of waste, or buildup of sludge or sediment.

5.1.5 *Adhesive Tape*—The tapes are put on at the factory to protect the sleeve during transport and prevent it from unrolling, (5) in Fig. 1.

5.2 *Rubber Seal:*

5.2.1 *Circumferential Seals*—The actual seal is formed by the circumferential seals compressed against the host pipe. The damaged section must always be between the sealing knobs, (6) in Fig. 2 and Fig. 3.

5.2.2 *Trimming Line*—There is a trimming line marked in the rubber jacket. It shows the installer where to cut off the projecting rubber end (when a single sleeve is installed), (7) in Fig. 2.

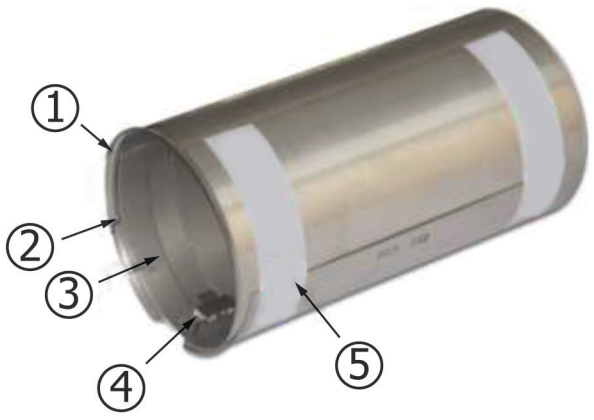

FIG. 1 Stainless Steel Sleeve