Replacing Asbestos Cement Pipe by Close Tolerance Pipe Slurrification (CTPS)

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What to Expect

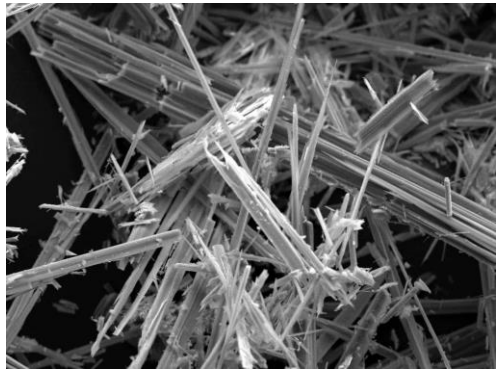
- Background on Asbestos & AC Pipe
- Terms & Regulators
- Potential Solutions for AC Pipe
- Brief History of CTPS
- What is Close Tolerance Pipe Slurrification (CTPS)?
- CTPS Process Overview
- Case History

Background

Asbestos is a naturally occurring mineral used to strengthen building materials

- A naturally occurring mineral used for fire resistance and to strengthen building materials
- Its use dates back 5,000+ years
- Massive increase in utilization during the Industrial Revolution
- Became a known health risk in late 1800's/early 1900's and was widely studied and regulated starting in the 1970's at its peak of use
- Asbestosis, mesothelioma and lung cancer are major health consequences of prolonged exposure to airborne asbestos

Credit: UMass Lowell



Credit: USGS

Credit: asbestos.com

What to Expect

- Estimated 15-18% of pipes in US/Canada are Asbestos Cement
  - ~630,000 miles US
  - ~965,000 km in Canada
- Most common methods for remediation of AC pipe
  - Replacement
  - Reroute
  - Abandon
- Due to health risks & environmental regulations, there exists a huge need for improvements in AC pipe remediation

Credit: Getty Images

Asbestos Regulators

Federal:

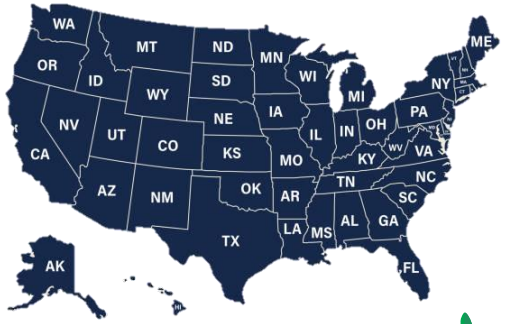
EPA | NESHAP

DEPARTMENT OF TRANSPORTATION · UNITED STATES OF AMERICA

OSHA®

State / Local :

Ex:



Time Line

December 2nd, 1970 – Environmental Protection Agency (EPA) opens the doors.

March 31st, 1971 – EPA Officially Identifies Asbestos as a Hazard

April 6th, 1973 – NESHAP for Asbestos Becomes Law

Terminology

Important Terms:

NESHAP – National Emission Standards for Hazardous Air Pollutants – regulates hazardous air pollutants / air quality (EPA standards - USA)

ACM – Asbestos Containing Material

RACM – **Regulated ACM**: friable or non-friable asbestos material that has been subjected to Sanding, grinding, cutting, or abrading or has been crumbled, pulverized, or reduced to powder in the course of demolition or renovation operations.

Potential Solutions for AC Pipe

Replacement

Dig & Replace (Open Cut)

- EPA Approved
- Pipe completely removed by wet cutting

Abandon in Place (Lay a New Line)

- EPA Approved
- By Default….AC pipe not disturbed

Rehab

CIPP or Slip Lining

- EPA Approved
- Partially removed/Partially not disturbed

What else …?

Why Not Just Pipe Burst AC Pipe?

- Pipe bursting is a great trenchless method for replacing water mains – just not AC water mains (according to the EPA)

- Pipe bursting creates RACM because it is disturbed
  - Friable ACM is not removed and becomes subject to Inactive Waste Disposal Site standards:
    - Deed notation for site after work is complete – Warning in perpetuity
    - Permanent signage & fencing requirements
    - Buried 2’ below ground

Due to this:

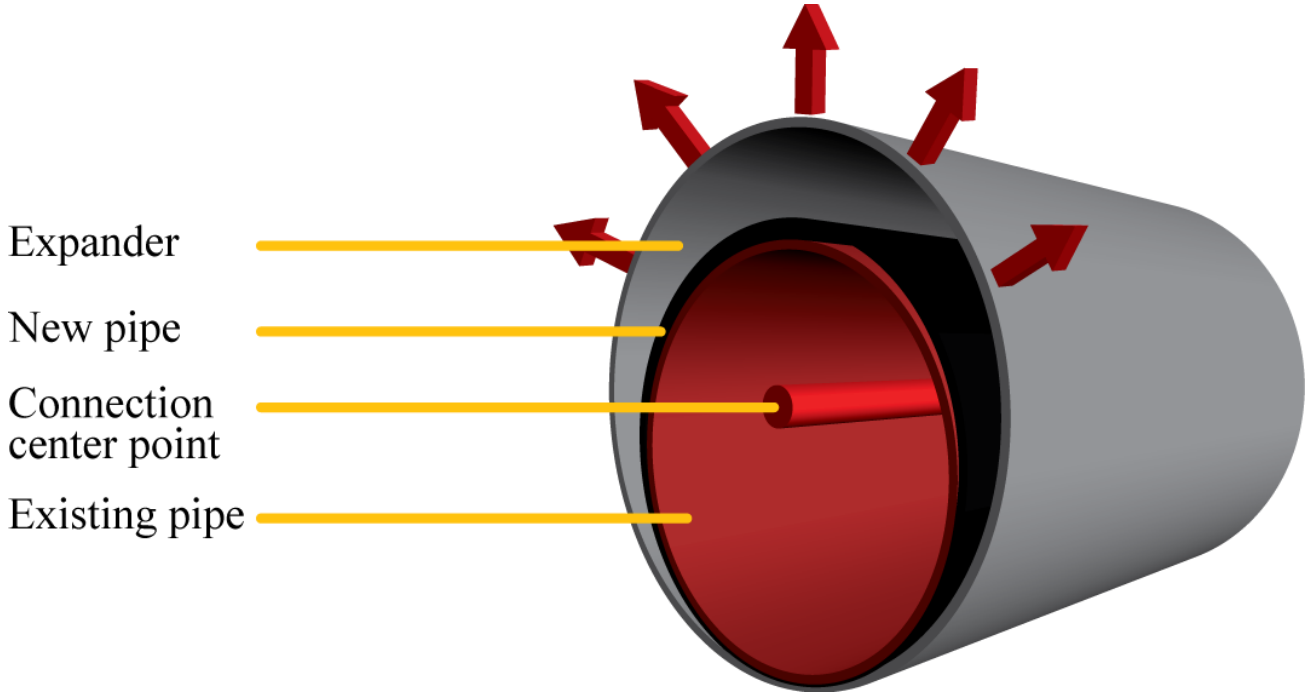
Pipe Bursting is currently not an EPA approved solution for asbestos cement pipe (ACP) and does not fully comply with the ACP NESHAP requirements

History Lesson on AWP

- Pipe Bursting Associations had sought EPA approval through what is known as an Alternative Work Practice (AWP) for years
- Technically, Pipe Bursting creates RACM when left in the ground is an Inactive Hazardous Waste Disposal Site and must meet NESHAP requirements (Deed Notation, Signage, Fencing & Barriers)
- Pipe Bursting needs EPA to give an AWP that releases or alters these requirements – EPA has denied this request for an AWP
- A Pipe Bursting Project in Greenville, SC provided a problem/opportunity to reengage the EPA on a new method called CTPS.

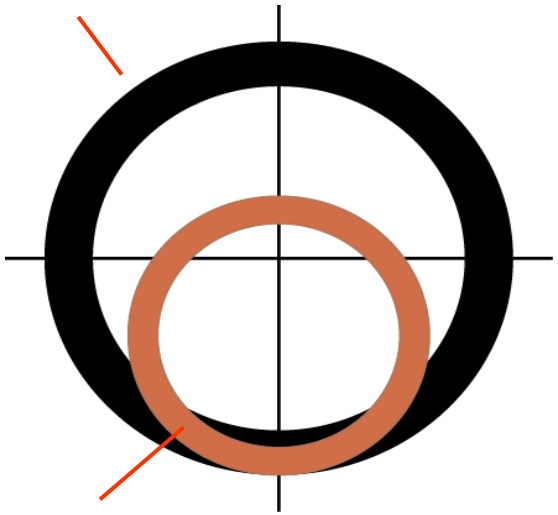
Upsizing – Expansion (where it goes)

Approximately 90% of compaction occurs upwards from the existing line.



Upsizing from 6” to 8”

8” DIPS Burst Head
Expander OD – 11.50”



6” Clay Pipe
Existing Pipe ID – 5.94”

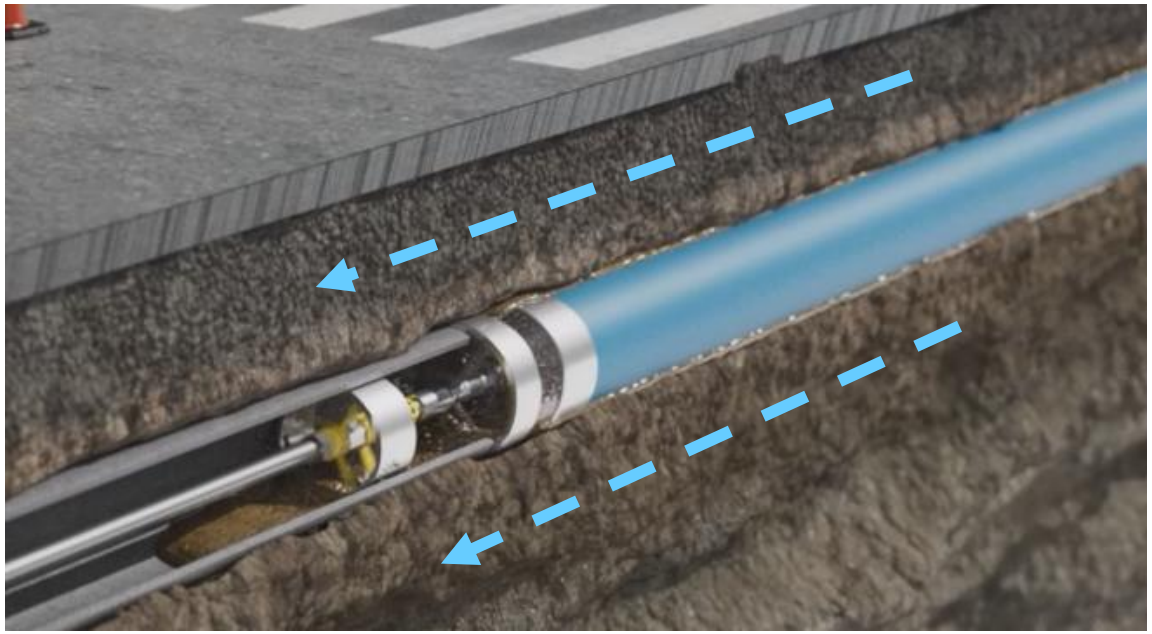
Note: any compaction recedes over time. The deeper the line, the less chance of surface disruption

Shallow Pipe Bursting in Greenville, SC Turns to CTPS

- 7500 LF of 6” to 8” Pipe Bursting
  - 1 to 2’ of Cover
  - Under Carports, Concrete Slabs, and Decks
  - Near Foundations
  - Soil Displacement with So Little Cover Would Cause Damage to Carports, Slabs, Decks, & Foundations
  - Adapted Close Tolerance Horizontal Directional Drilling (CTHDD) to Avoid Creating Pipe Float
  - CTPS was Born

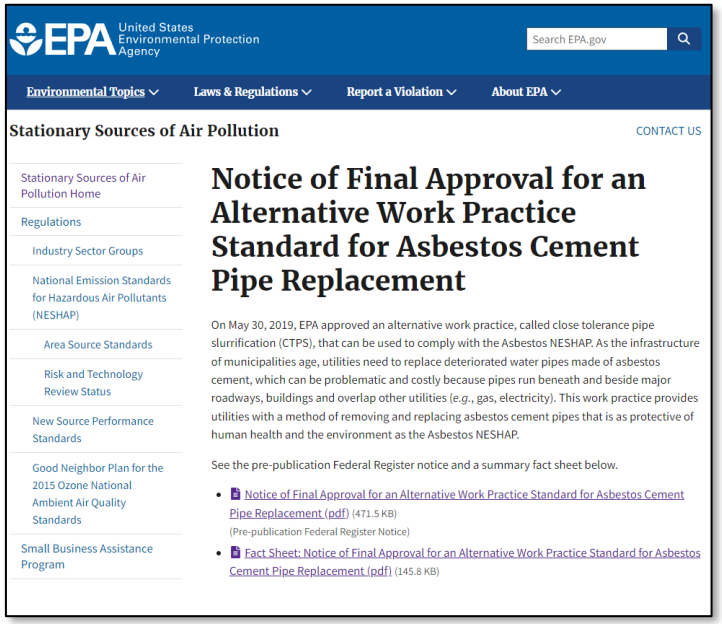
What is Close Tolerance Pipe Slurrification?

- An EPA approved alternative to pipe bursting for asbestos cement pipe.
  - Cuts & removes pipe + soil, rather than displacing pipe + soil
- Trenchless technology - uses HDD equipment & bentonite drill mud
- Combines drill mud & AC pipe and turns them into a slurry that can be pulled to pits and hauled away for disposal
- Technical Envelope – 4” to 24” AC pipe



Alternative Work Practice

- In 2019, the EPA approved CTPS as an Alternative Work Practice (AWP)
  - Considered an equivalent to Dig & Replace
- EPA determined CTPS also creates Asbestos Containing Material (ACM)
  - However, ACM is removed and/or encapsulated



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Alternative Work Practice

1. Access Pit Excavation
2. Rod Installation
3. Guide Head & Back Reamer Installation
4. Asbestos Slurry & Pipe Installation
5. Vacuum & Haul Off
6. Pipe Reconnection & Restoration
    - Service reconnects
    - End connections & tie-ins

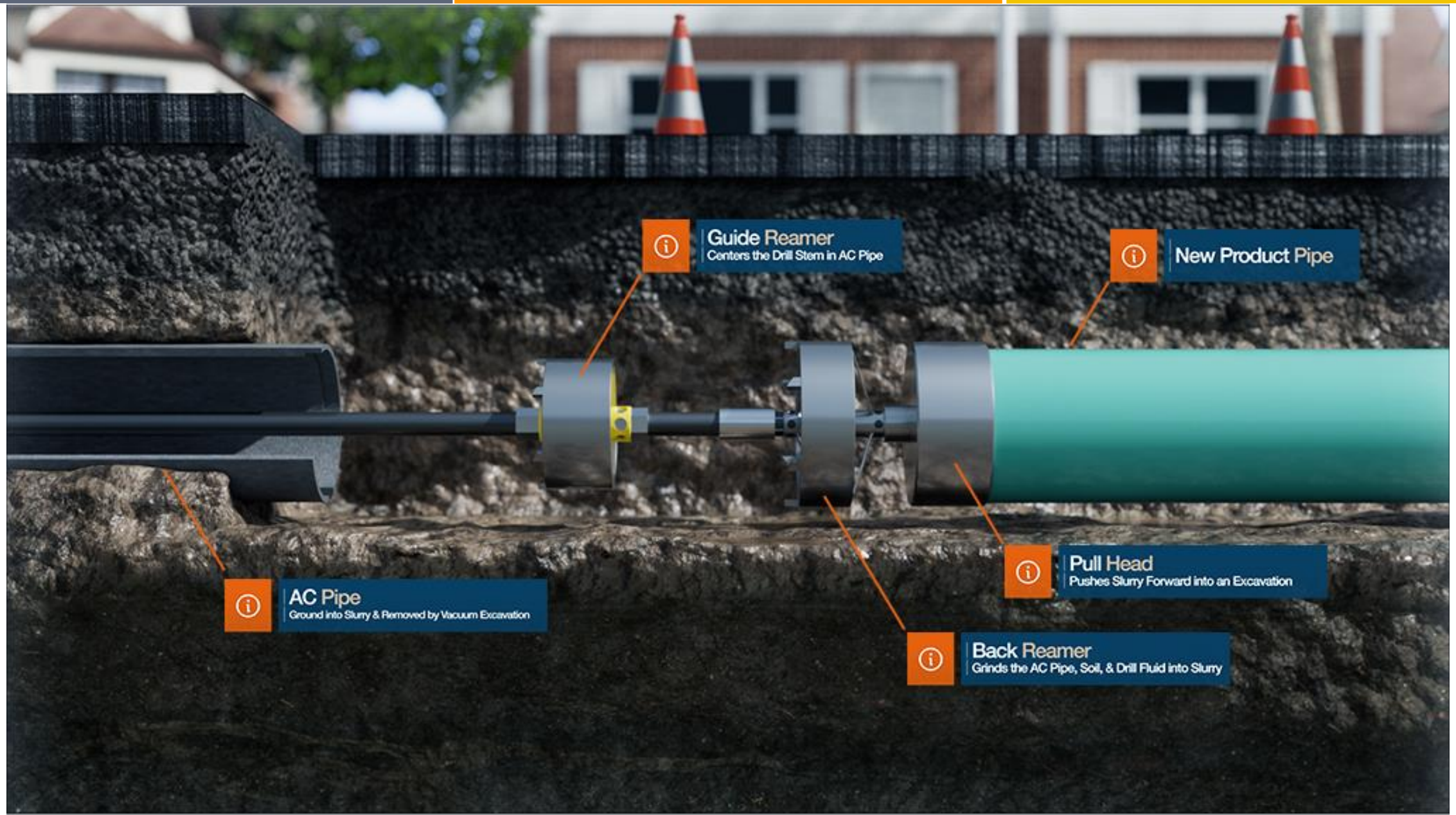
Access Pits

- Access pits are dug at each end of the installation
- Trenchless, not “pit-less”
- Smaller, intermediate excavations at valves, tees, wyes and service connections

Rod Installation

- Drilling rod is pushed through pipe from one pit to the other
- Once rod is in place at the starting pit, CTPS assembly components and the new pipe are attached
- This assembly is then pulled from starting pit to receiving pit during the CTPS process.

Guide Head & Back Reamer Installation

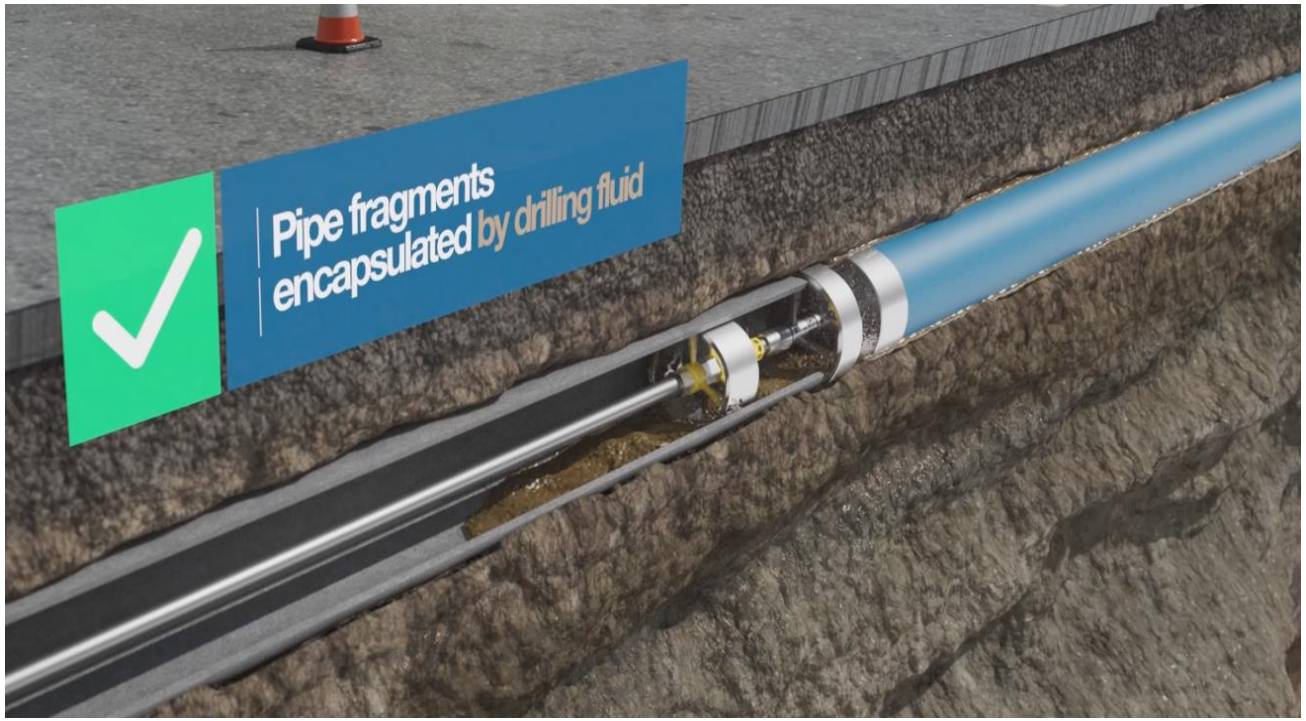


New Pipe Installation

- Cutting head spins at 240 RPMs to wet-cut the asbestos cement as unit is pulled through the pipe
- Bentonite drilling fluid is introduced at the cutting head, creating the wet-cutting environment
- Cutting head slurrifies AC pipe and ½” of soil around the pipe – “close tolerance”
- AC pipe and drilling fluid combines to form a slurry

New Pipe Installation

- AC pipe fragments are encapsulated in the slurry
- Pull head forces slurry through the pipe like a squeegee to the pipe end/pit
- Assembly pulls FPVC© into place simultaneously during the process



Vacuum & Haul Off

- The slurry is forced through the host pipe, accumulating in the pit
- Asbestos is contained & encapsulated in slurry
- Slurry is pumped and hauled away for disposal
- Trace amounts of asbestos fiber are encapsulated in skim coat around the new pipe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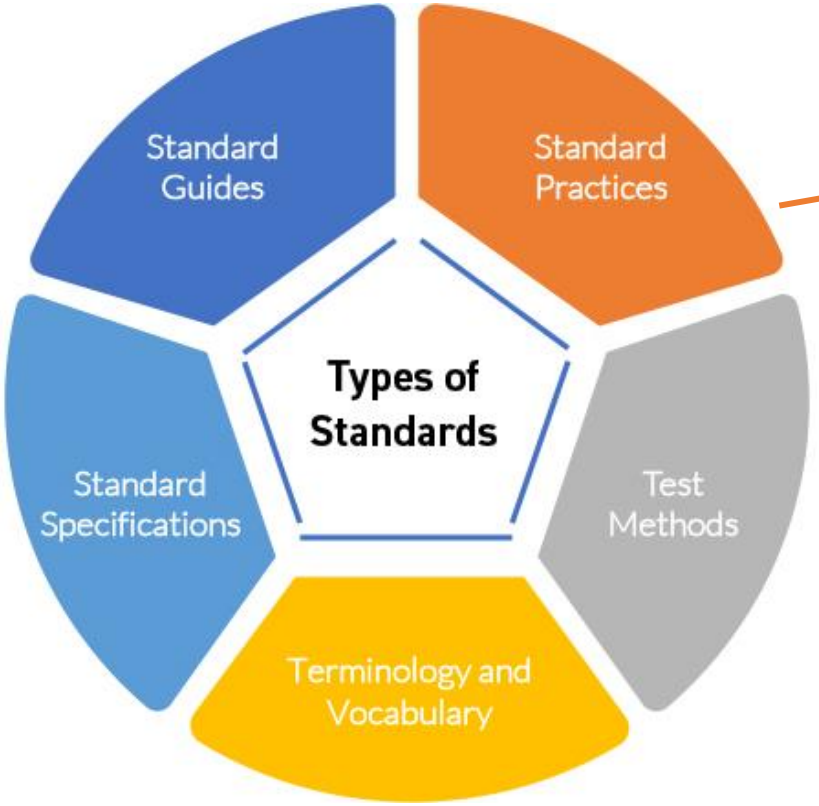
ASTM Standard



- ASTM Standards have a few types.
- F3632-23 for CTPS is an ASTM of Standard Practice established in 2023

- Committee F36 – Technology and Underground Utilities
- Subcommittee F36.20 – Inspection and Renewal of Water and Wastewater Infrastructure

ASTM F3632-23

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.

Designation: F3632 – 23

Standard Practice for
Close Tolerance Pipe Slurrification (CTPS) Method to Replace, Rehabilitate, and Repair Existing Buried Asbestos Cement (AC) Pipe Systems[1]

This standard is issued under the fixed designation F3632; 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 covers the requirements and test methods of an EPA-approved alternative work practice (AWP) for the replacing of an Asbestos Cement (AC) pipe by the Close Tolerance Pipe Slurrification Method in accordance with said EPA CTPS AWP issued on June 10, 2019. This process utilizes a patented method (US 10,557,587 B2)[2] and other specially designed tools designed to work with the EPA regulations surrounding AC pipe work. Specifically, the special (patented) back reaming tool (US 8,365,841 B2)[2] delivers the required bentonite-based fluid to maintain a wet cutting environment which is an important requirement for cutting Asbestos Cement Material (ACM). The sizing of the cutting head is set at 0.25 in. in diameter greater than the replacement pipe's outside diameter to facilitate the removal of the ACM. This close tolerance sizing creates a scenario where the new pipe, along with the injection of the drill fluid, will allow the slurry to flow and subsequently expel at pre-determined pit locations. The slurry containing the ACM is then removed from the site and properly disposed of. Any remaining trace amounts of asbestos fiber in the ground are encapsulated in a skim cout of the slurry remaining around the new pipe, the skim coat having the consistency of a lightweight concrete material commonly known as excavatable flowable fill.

1.2 *Units*—The values stated in SI units are to be regarded as the standard. No other units of measurement are included in this standard.

1.3 *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.*

1.4 *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:*

D1600 Terminology for Abbreviated Terms Relating to Plastics

D2657 Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings

D3035 Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter

F412 Terminology Relating to Plastic Piping Systems

F1417 Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air

F2164 Practice for Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure

F2620 Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings

2.2 *AWWA Standards:*

AWWA C605 Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings

AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)

AWWA C906 Polyethylene (PE) Pressure Pipe and Fittings, 4IN. Through 65 IN. (100 MM Through 1,650 MM), for Waterworks

AWWA Manual of Practice M23 PVC Pipe – PVC Pipe - Design and Installation

2.3 *Plastic Pipe Institute (PPI):*

Plastic Pipe Institute's Handbook of PE Pipe Design of PE Piping Systems

[1] This test method 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.
Current edition approved June 1, 2023. Published July 2023. DOI: 10.1520/F3632-23.

[2] The methods (created by Dimitroff, Tod R.) US 10,557,587 B2 and US 8,365,841 B2 are covered by a patent. Interested parties are invited to submit information regarding the identification of an alternative(s) to this patented item to the ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.

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**Standard Practice for
Close Tolerance Pipe Slurrification (CTPS) Method to Replace, Rehabilitate, and Repair Existing Buried Asbestos Cement (AC) Pipe Systems[1]**

- Highlights – 1
- Highlights – 2
- Highlights – 3
- Etc…

Project Profile – Sunrise, FL

Water Main

- 6” Pipe Burst w/Fusible PVC® – 22,970 LF
- 8” Pipe Burst w/Fusible PVC® – 8,595 LF

Wanted to Add Force Main – Submitted

Force Main

- 6” Pipe Burst w/Fusible PVC® – 2,560 LF
- 8” Pipe Burst w/Fusible PVC® – 1,456 LF
- 10” Pipe Burst w/Fusible PVC® – 2,864 LF

Total: 38,445 LF

Project Profile – Sunrise, FL

Water Main

- 6” CTPS w/Fusible PVC® – 22,970 LF
- 8” CTPS w/Fusible PVC® – 8,595 LF

Force Main

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- 8” CTPS w/Fusible PVC® – 1,456 LF
- 10” CTPS w/Fusible PVC® – 2,864 LF

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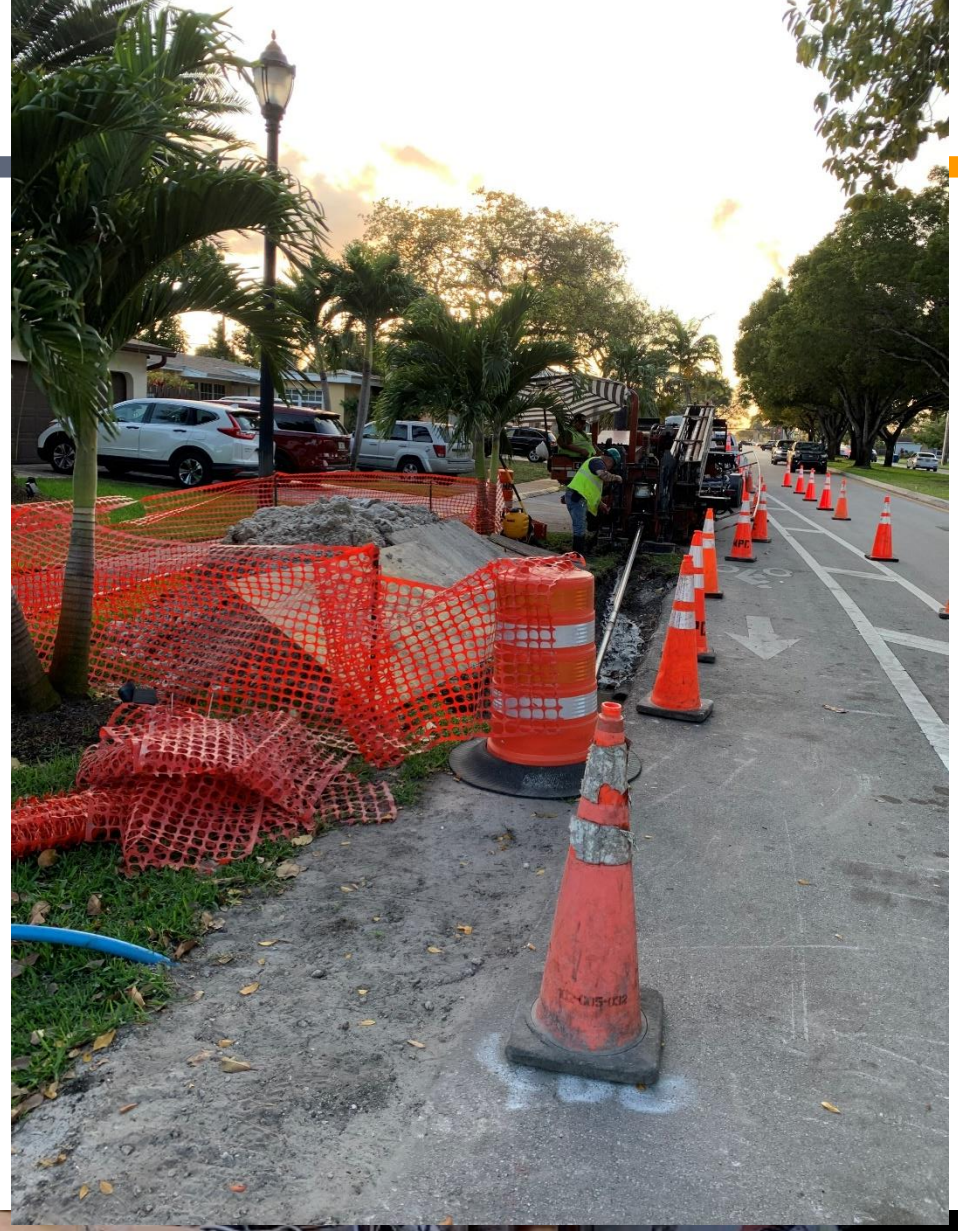
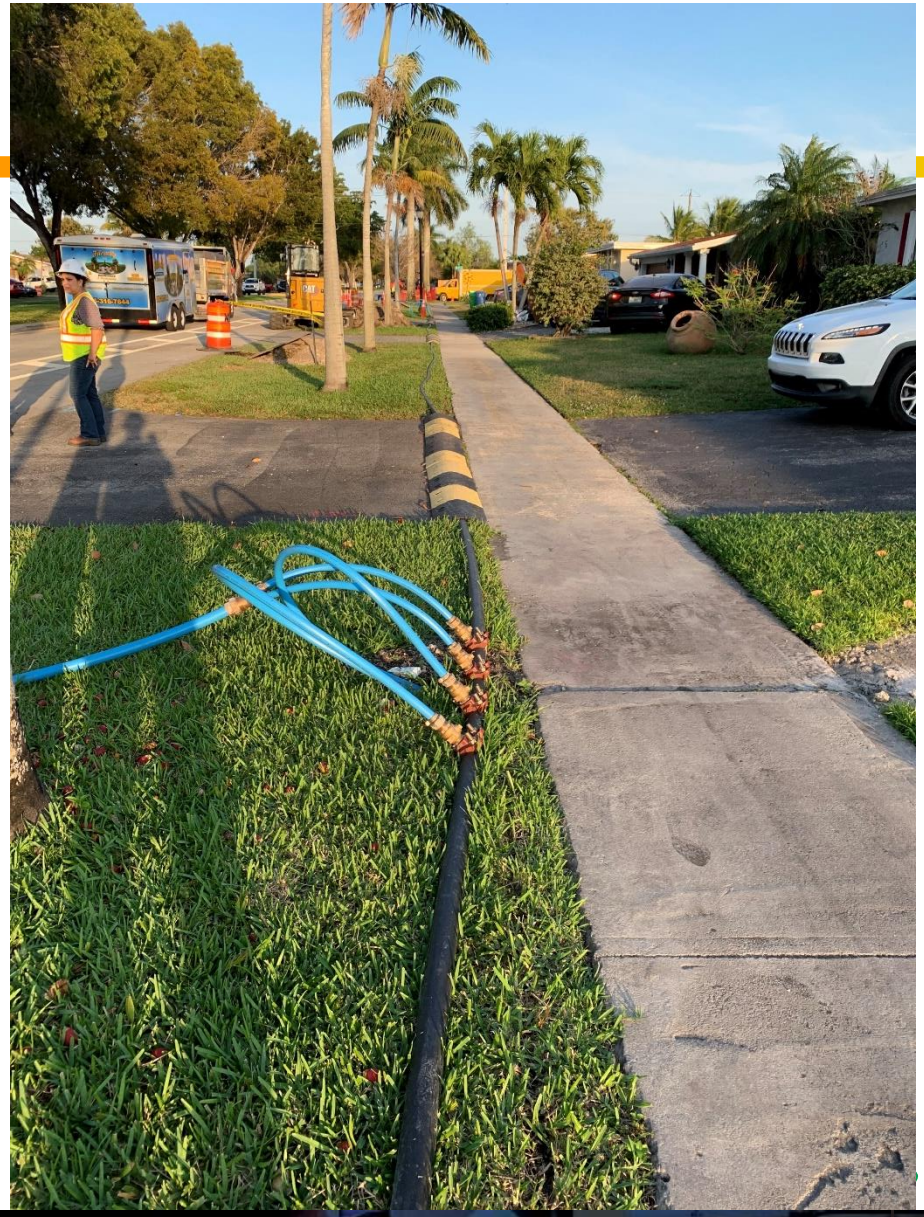
Project Profile – Sunrise Florida

Project Profile – Sunrise, FL





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CTPS Advantages

- Complies with EPA/NESHAP regulations
- Environmental advantages over pipe bursting of AC pipes
- Cost advantages over open cut construction
- Less disruption than remove/replace/re-route – trenchless technology!
- New utility easements not necessary – uses existing alignment
- Removes existing AC pipe, instead of abandoning / leaving asbestos in place

In Closing

- CTPS is not only an EPA approved Alternative Work Practice for AC pipe remediation, but it does so trenchlessly
- CTPS provides flexibility in pipe types for trenchless install
- Serious consideration should be given to CTPS as an alternate on dig & replace / re-routing AC pipe projects

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