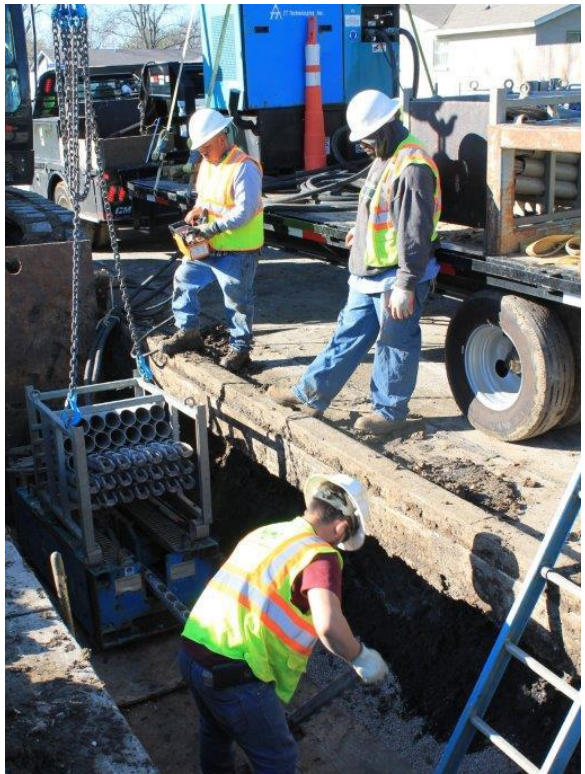
Failing to Flawless in a Day: How Pre-chlorinated Pipe Bursting Invigorates Arlington Water Utilities Main Replacement Program

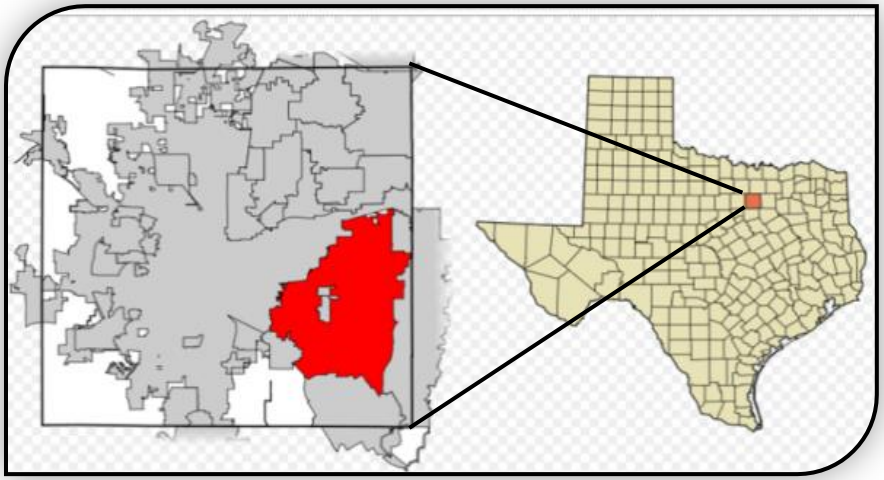


ARLINGTON
THE AMERICAN DREAM CITY

MPC Murphy Pipeline Contractors, Inc.

City of Arlington & Water Main Background

- Population over 370,000 (50th Largest in USA)
- Daily Water Demands 35 MGD to 115 MGD
- 1,425 miles of public water main
  - 588 miles of asbestos cement (AC) mains
- Average 450 water main breaks annually
  - 2015 – 72% of 533 water main breaks were on AC pipe



UNIVERSITY OF TEXAS ARLINGTON

GM

Six Flags

Economics of Water Main Failure

- Water main break with small footprint
- 1-4 connections without water service (under 20 psi)
- 6” or smaller potable water main size
- Adequate isolation valve controls
- Less than 5 foot diameter earth disruption
- Response requires 4 crew members, 2 service trucks, 1 mini excavator, 2 megalug adapters, 4 LF of new pipe
  - 20 crew hours @ $20/hr - $400
  - 10 truck hours @ $75/hr - $750
  - 4 mini excavator hours @ $100 / hr - $400
  - Sod, fill - $200
  - Mega lug adapters - $225
  - Replacement pipe $50

TOTAL = $2,025
Does not include: Water loss, social impact, environmental impact
Cost per LF -$500!

Economics of Water Main Failure

- Water main break with medium footprint
- ¼ neighborhood 40 connections without water service
- 8”-10” potable water main size
- Substandard isolation valve controls
- 10’-15’ diameter earth disruption
- 5’x25’ road impact
- Significant time before water could be shut off
- Earth erosion
- Landscape damage
- Water damage to 4-6 town homes
- Significant social and environmental damage

Economics of Water Main Failure

- 10 crew members 20 hours = 200 hrs @ $20/hr - $4,000
- 4 service trucks 20 hours = 80 hrs @ $75/hr = $6,000
- 1 backhoe 20 hours = 20 hrs @ $125/hr = $2,500
- 1 vac truck 6 hours = 6 hours @ $25/hr = $750
- 1 loader 10 hours = 10 hours @ $100/hr = $1,000
- Water loss 30 min 2,500 GPM – 75,000 gallons = $300
- Restoration – import backfill, compaction, landscaping, asphalt, curb and gutter - $22,500
- Water damage to 4-6 town homes - $15,000

TOTAL = $52,050
Cost per LF at 15 LF Replaced - $3,470 Per LF!

Economics of Water Main Failure

- Scientific research completed for large diameter water main failures
- Evaluated social, environmental and economic costs
  - Lost product
  - Repair and return to service
  - Travel delay
  - Supply outage and substitution
  - Health risk
  - Property damage

***"Empirical Analysis of Water-Main Failure Consequences" by Kaylan Piratla**

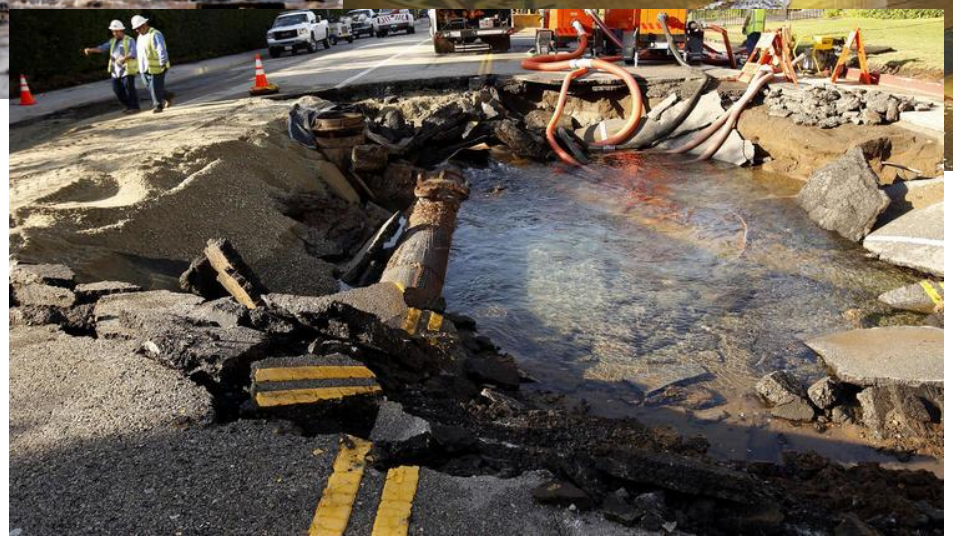
Economics of Water Main Failure

UCLA Campus, Los Angeles, California – 30 inch steel

- 93 year old steel pipe
- Substandard isolation valve controls – 4 hours!
- Flooded athletic fields, underground garages and various walkways on the University of California in Los Angeles.
- 160 firefighters responded and searched 200 cars
- 75,000 GPM = 48 Million Gallons of water lost
- Significantly increased travel delay due to repair time – 238 hours to repair the 30” steel main!

TOTAL = $36,100,000
Cost per LF at 75 LF Replaced - $481,333 per LF!!

Economics of WM Failure - UCLA



Program Overview

- Manage the city's infrastructure assets in the most proactive, efficient way possible
- Replace high maintenance AC water mains
- Utilize Trenchless Technology where feasible
- Utilize in-house design

2016 Pilot: Pre-chlorinated Pipe bursting to replace AC water mains in residential neighborhoods

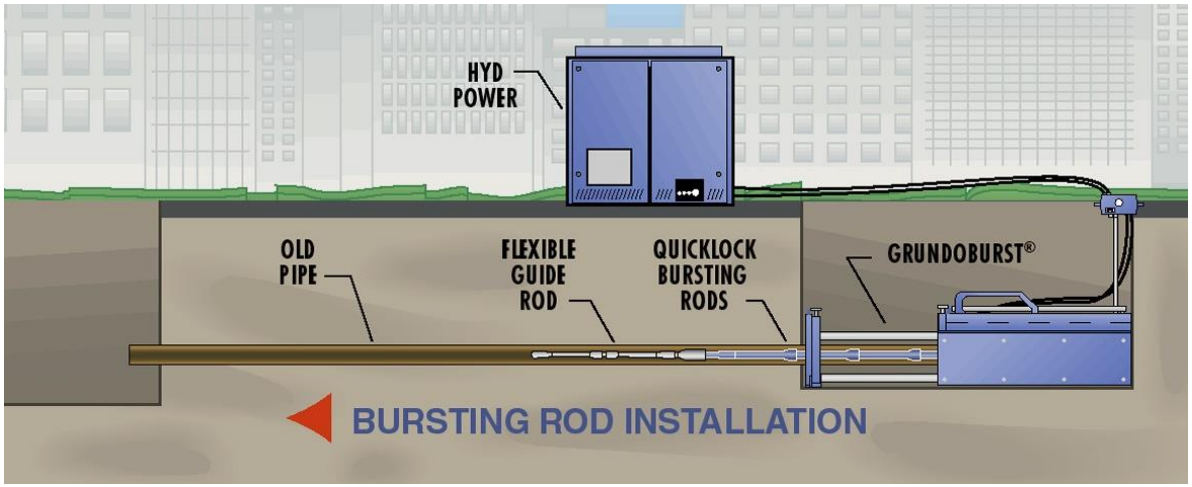
- 13,125 feet of 6-inch AC replaced with 8-inch HDPE
- Cost effective
- Reduce customer impact
- Utilize HDPE pipe

Fusing & Pre-chlorination of HDPE

- Staging area located away from burst locations to minimize site impact
- Butt fusion is used to connect pipe sections to corresponding burst lengths
- Pressure testing
- Lines capped and disinfected with hypochlorite solution of at least 25 mg/L
- Two consecutive days of samples, taken 24 hours apart

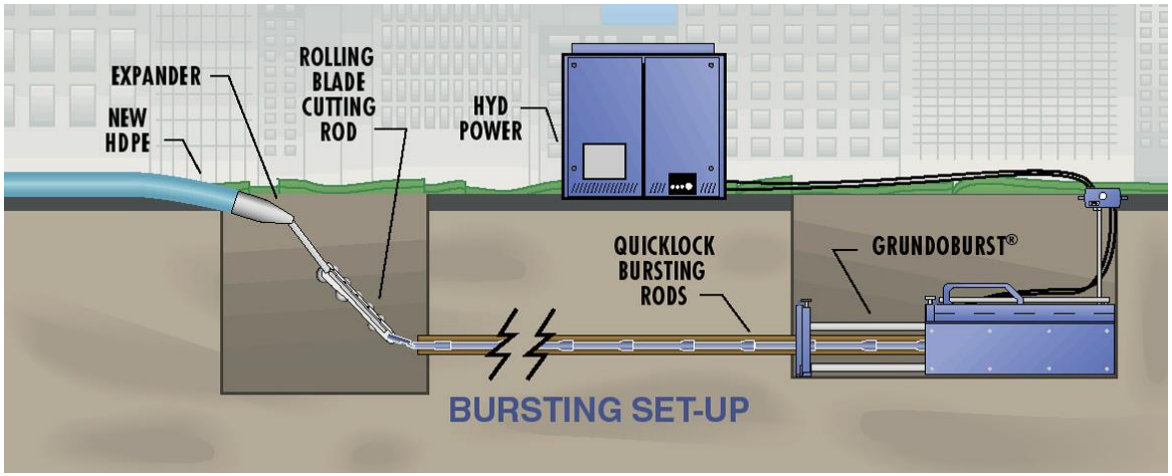
Pipe Bursting Operations 8:00 AM

- Entry and exit pits excavated 4’ x 12’
- Service connections pits 3’ x 3’
- 8:00 AM – Decommission Main
- Bursting equipment is set in pit and rods are shuttled through host pipe



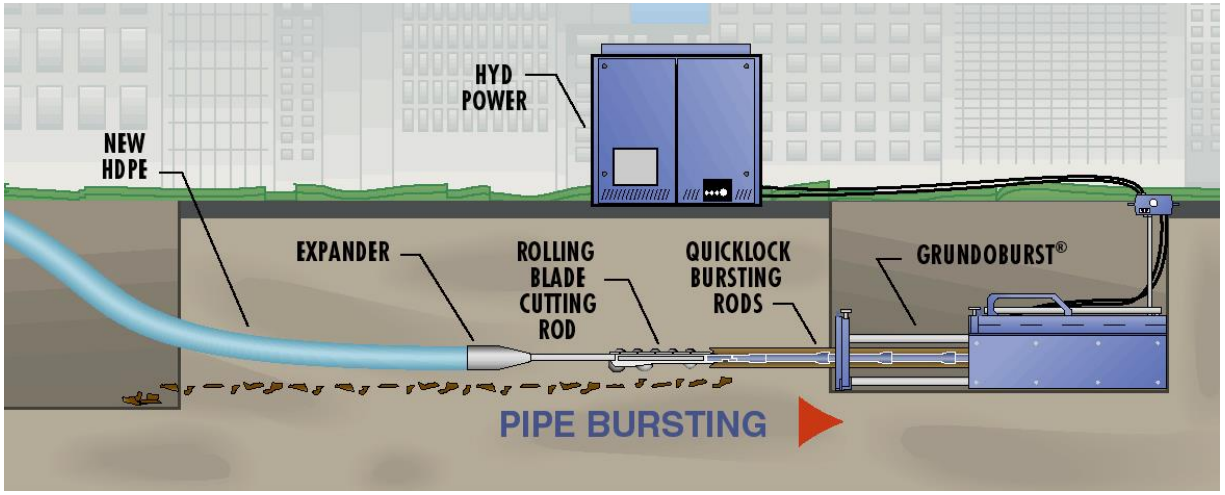
Pipe Bursting Operations 10:30 AM

- 10:30 AM – Bursting head (or ductile slitter) and expander are attached to the rods which have reached the entry pit
- Pre-chlorinated and sealed HDPE pipe attached to the expander
- Pull back begins



Pipe Bursting Operations Noon

- Rods are removed from the exit pit as pipe is pulled into place
- Noon – New pipe is installed



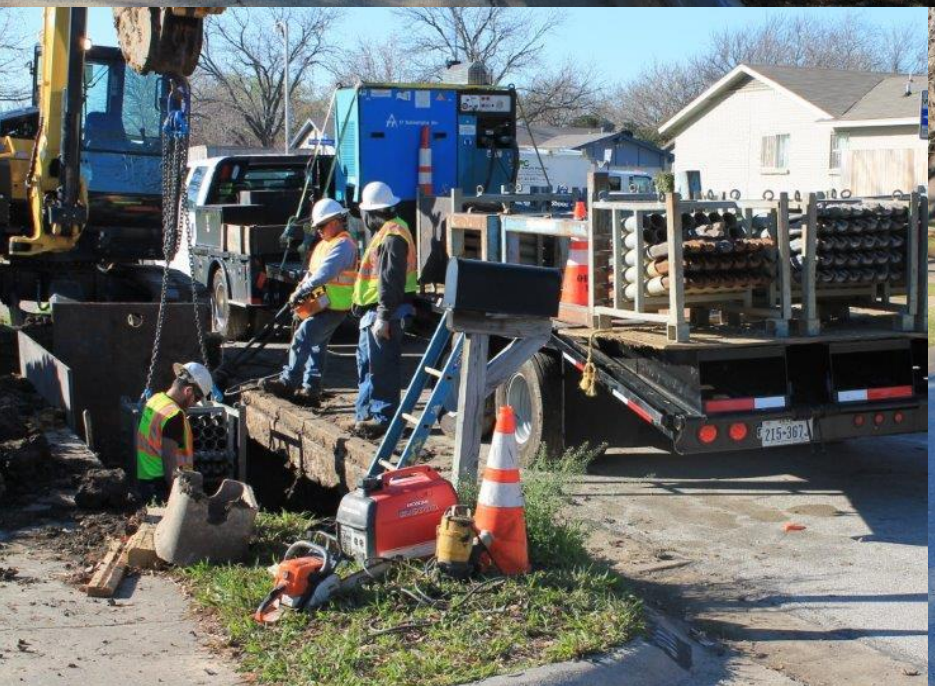
Pipe Bursting Operations Noon to 3:00 PM

- Noon to 3:00 PM – Connections made
- Ductile Irion fittings, mega lugs, stainless steel inserts, mechanical service saddles

Pipe Bursting Operations 3:00 PM

- 3:00 PM – Post Chlorination Process
- Hypo-chlorus solution sprayed on all connections
- Super-chlorinate new pipeline with slug of chlorine to 300ppm
- 4:00 PM – New main back live


3205




ROAD
CLOSED

Pipe Bursting Results

- Engineering costs reduced by 94.6% due to following existing utility path and using as-builts
- Construction costs reduced by 36% vs. open cut
- HDPE pipe provides 100 year plus new design life with zero allowance for water loss with fused joints
- Production rate of 300 – 600 feet per day with project completed 44% faster vs. open cut
- Crew visible to each area for one day
- Surgical excavations along project with a reduction in restoration of 87% vs. open cut
- Compact equipment
- Sensitive areas of neighborhoods not impacted
- Zero change orders
- Social costs reduced as intersections remained open, no streets were closed and all residents had full access to homes

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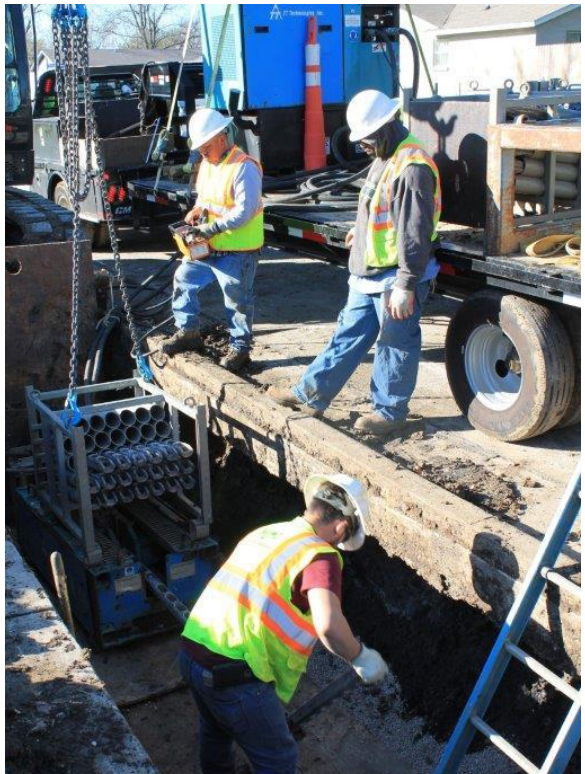

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