



THE TOTAL SOURCE

educational sessions

Mitigating Risk in Class C Projects

Alan Goodman, HammerHead Trenchless Equipment



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State of Water & Sewer Distribution

- Encrusted
- Corroded
- Water loss up to 40%
- Under capacity
- Poor water quality



Business Opportunity

- EPA estimates 750 billion dollars over next 20 years
- AWWA estimates 1 trillion dollars over next 20 years
- The open trench method of replacement is becoming more costly and socially unacceptable.



Pipe Bursting: A Solution for Water

- **ORIGINALLY DEVELOPED FOR REPLACEMENT OF PRESSURE PIPES!**

- Method was developed By British Gas and patented in 1980's for gas distribution rehabilitation.
- Success led to potable water crossover.
- More than 60,000,000 feet installed in Europe in last 17 years.



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Pipe Bursting: A Solution for Water

- Pipe bursting without protection sleeve accepted along with pre-chlorination method in early 1990's in the UK.
- Pre-Chlorinated method of pipe bursting is accepted by AWWA in November of 2000.



Project Considerations

- IPBA project classifications
- Site and soil conditions
- Upsizing and depth
- Host pipe material
- Depth of cover/understanding compaction
- Flow characteristics of new pipe installed
- Equipment and tooling selection



IPBA Project Classification

		Degree of Difficulty	Depth of Pipe (ft)	Existing Pipe ID (in)	New Pipe Diameter Comparative to Existing Pipe	Burst Length (ft)	Original Trench Width	Soil Type
IPBA CLASSIFICATION	A	Minimal	<12	2 – 12	Size on Size	0 – 350	Relatively wide trench compared to expander head outside diameter.	Compressible soils outside trench (loose sand, gravel, soft clay).
	B	Moderate	>12 to <18	12 – 18	Single Upsize	350 – 500	Trench width less than 4" wider than the expander head outside diameter.	Moderately compressible soils outside trench (medium dense to dense sand, medium to stiff clay).
	C	Comprehensive	>18 +	20 – 36	Double / Triple Upsize	500 – 1,000	Incompressible soils outside trench.	Constricted trench geometry (width less than or equal to outside diameter of burst head).
	D	Developmental						



Project classifications per IPBA (International Pipe Bursting Association) pipe bursting specification.



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Site Conditions

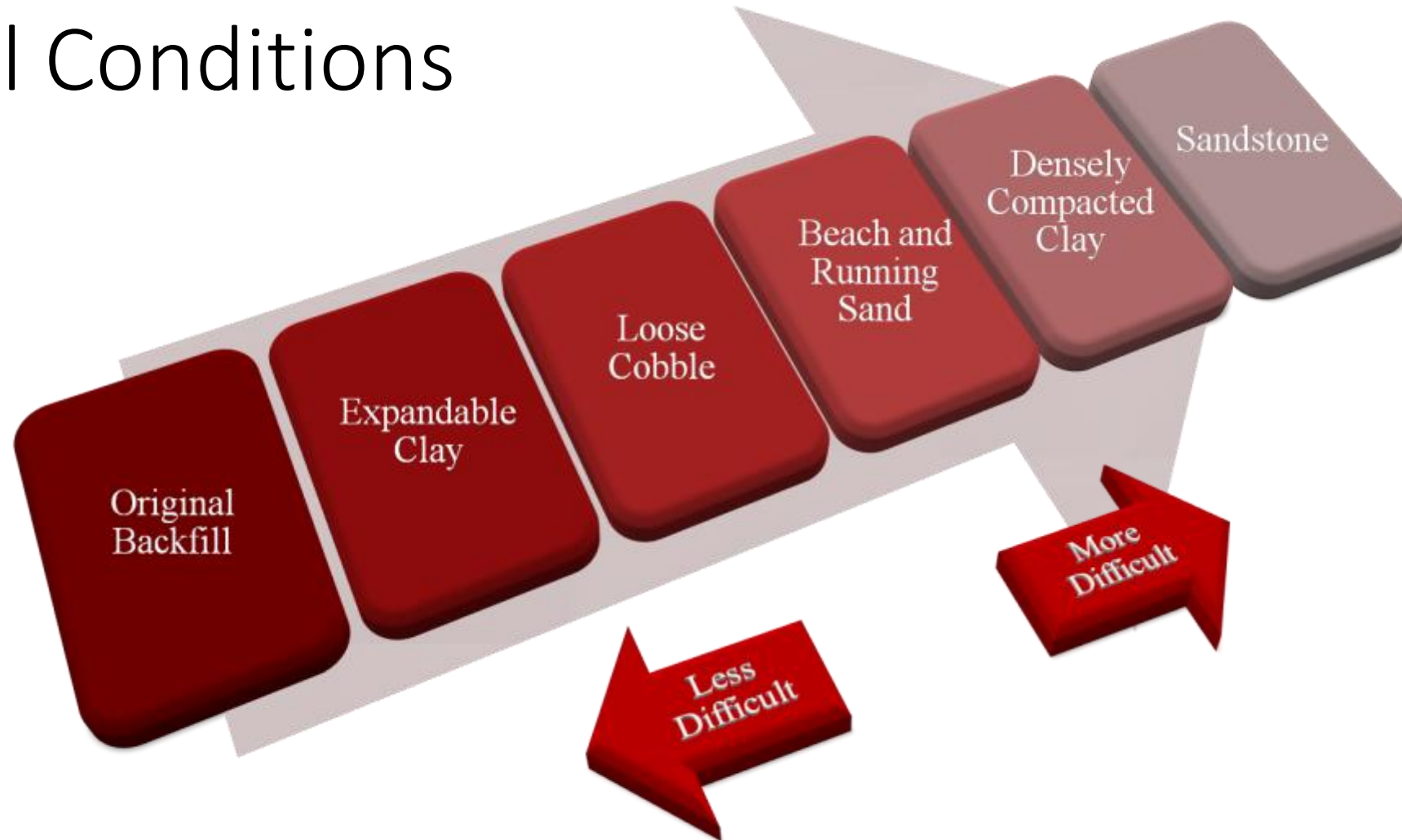
- Depth and original fill of utility
- Surrounding utilities
- Traffic flow patterns
- Temporary service needs



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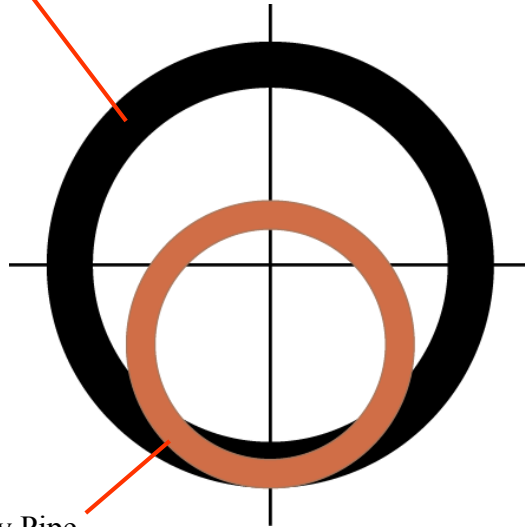
Soil Conditions



What is Your Depth of Cover?

General rule is one (1) foot of cover for every inch of expansion

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

$$\begin{array}{c} \text{Expander} \\ \text{OD} \\ (11.50) \end{array} \begin{array}{c} - \\ = \end{array} \begin{array}{c} \text{Existing} \\ \text{Pipe ID} \\ (5.94) \end{array}$$



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Upsizing – Expansion

(Where the material is displaced to)

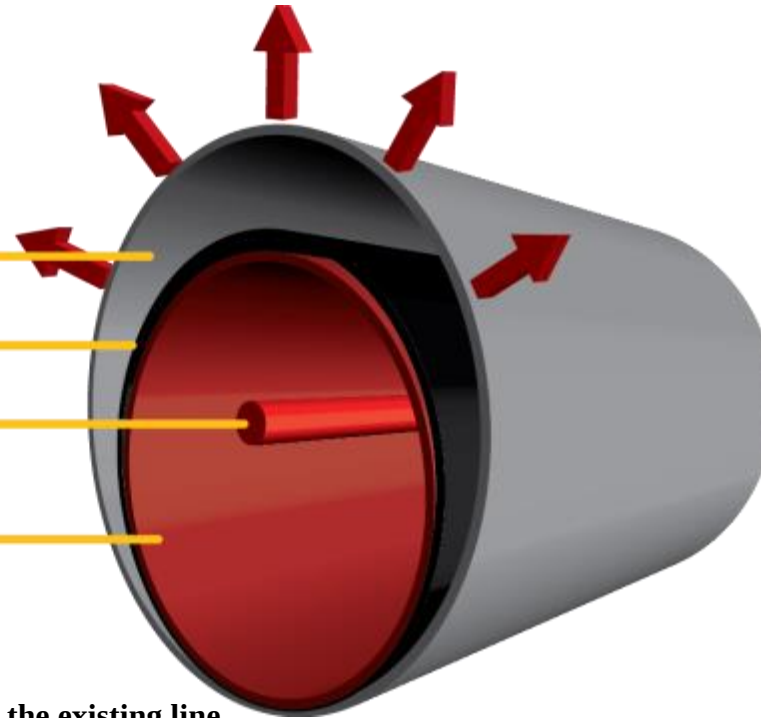
Pipe Bursting:
Typical Compaction

Expander

New pipe

Connection
center point

Existing pipe



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



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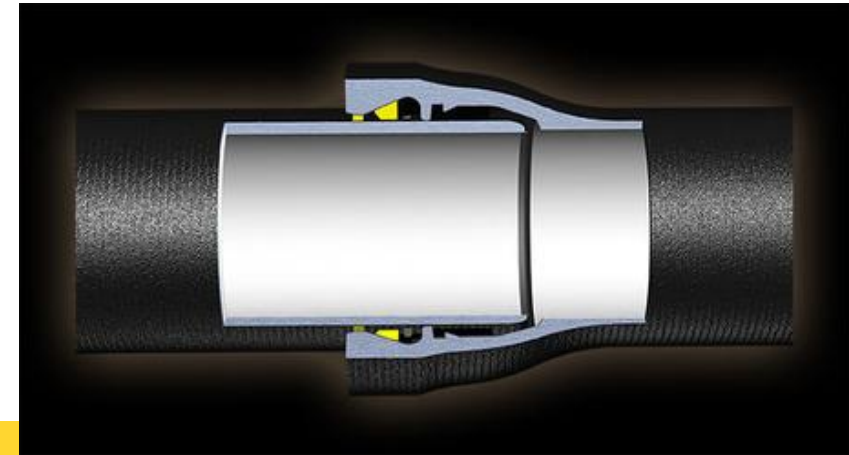
Host Pipe Material?

- Cast Iron
- Clay tile
- Concrete
- Reinforced Concrete
- Asbestos Cement
- Non Fracturable Pipe
 - Ductile Iron – Challenging
 - Steel – Challenging
 - Use Static Machines and Slitters



Installation Pipes

- HDPE
- FPVC
- Restrained Joint PVC
- Restrained Joint Ductile Iron Pipe, Fittings & Service Material
 - RJDIP
 - Class 250 (250 PSI) – Sizes 30" to 36"
 - Class 350 (350 PSI) – 4" to 24"
 - Must be Restrained Joint To Accommodate Pipe Bursting

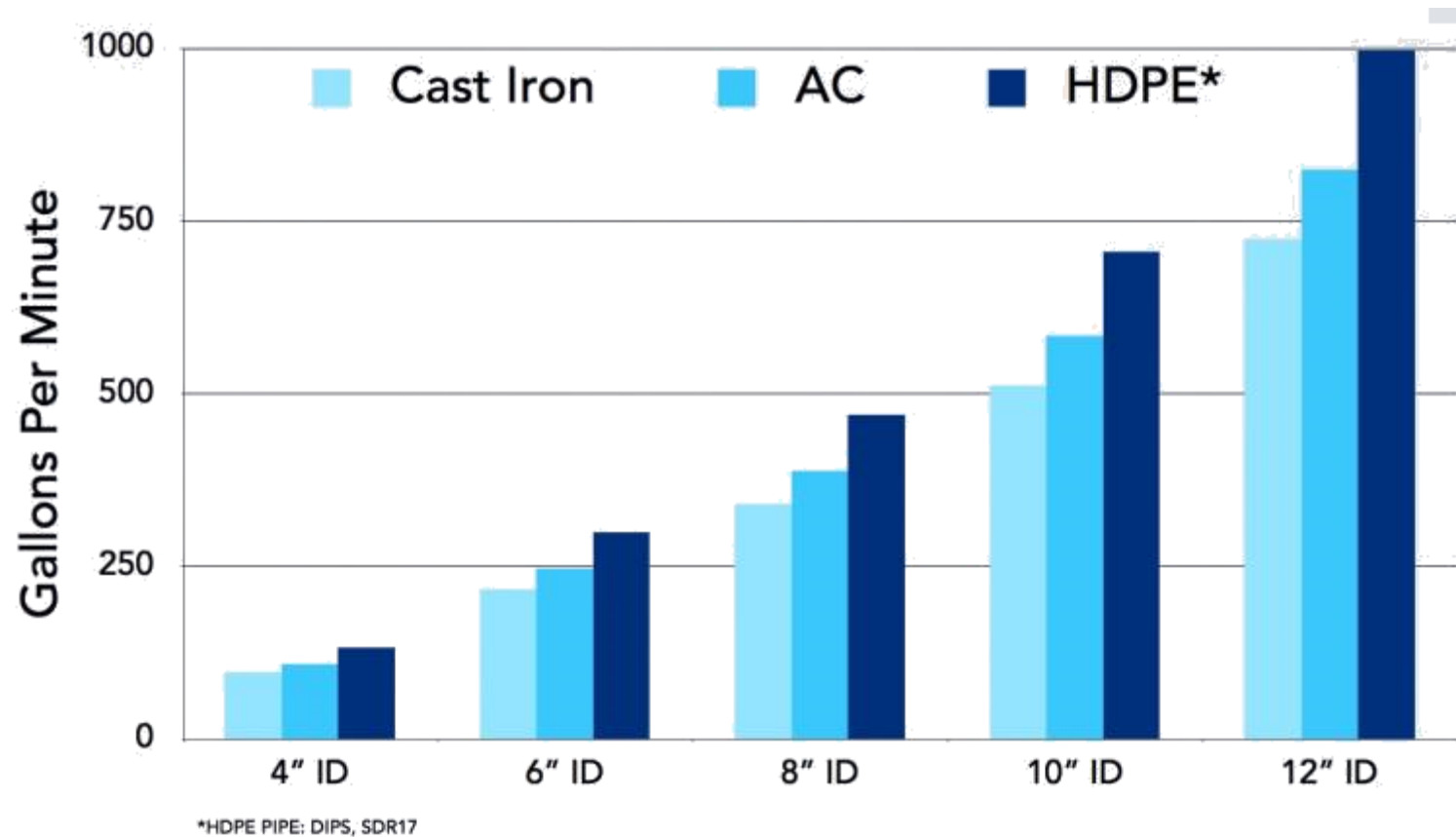


FLOW COMPARISONS: HDPE

Cast Iron Pipe	AC Pipe	New DIPS HDPE SDR17 pipe
4" ID = 96 gpm	4" ID = 109 gpm	4" = 132 gpm; 6" = 299 gpm
6" ID = 217 gpm	6" ID = 247 gpm	6" = 300 gpm; 8" = 469 gpm
8" ID = 340 gpm	8" ID = 388 gpm	8" = 469 gpm; 10" = 706 gpm
10" ID = 511 gpm	10" ID = 583 gpm	10" = 706 gpm; 12" = 997 gpm
12" ID = 723 gpm	12" ID = 824 gpm	12" = 997 gpm



FLOW COMPARISONS: HDPE



Equipment & Tooling Selection

- Static pull machines
- Static pull equipment is most common for water projects.
- No-contamination of the new Fusible PVC pipe or HDPE.
- High tonnage static pull back force machines are available from 30 to 300 tons.
- Tooling selected based on host pipe and/or repair section materials.



Identify potential issues

- Previous Repairs to Existing Water Lines
 - Unknown Repair Locations – No Problem
 - CCTV Typically Not Required
 - Cutter Technology Solves Most of These Issues Including Tees & Sleeves
- Bend Radius Of Existing Pipe
 - Rods Can Accommodate Horizontal & Vertical Bends That Can Be Installed by Deflecting Bells
 - Rods Cannot Accommodate Horizontal & Vertical Bends Made By Fittings



Specify Temporary Bypass or Prechlorination

- Temporary Bypass System

- Advantages

- Customer Service Disruption Is Minimized – Almost Nil
 - Once Temporary System Is In Place, Service is Assured During Any and All Delays That Occur During The Pipe Bursting Process (Reduces Pressure To Finish By A Certain Time)

- Disadvantages

- Cost
 - Potential Tampering
 - Working/Living around
 - Temporary Bypass System

- Temporary Bypass System

- Provides The Least Amount
 - of Service Disruption

- Materials

- 2" HDPE or 2" Restrained Joint PVC

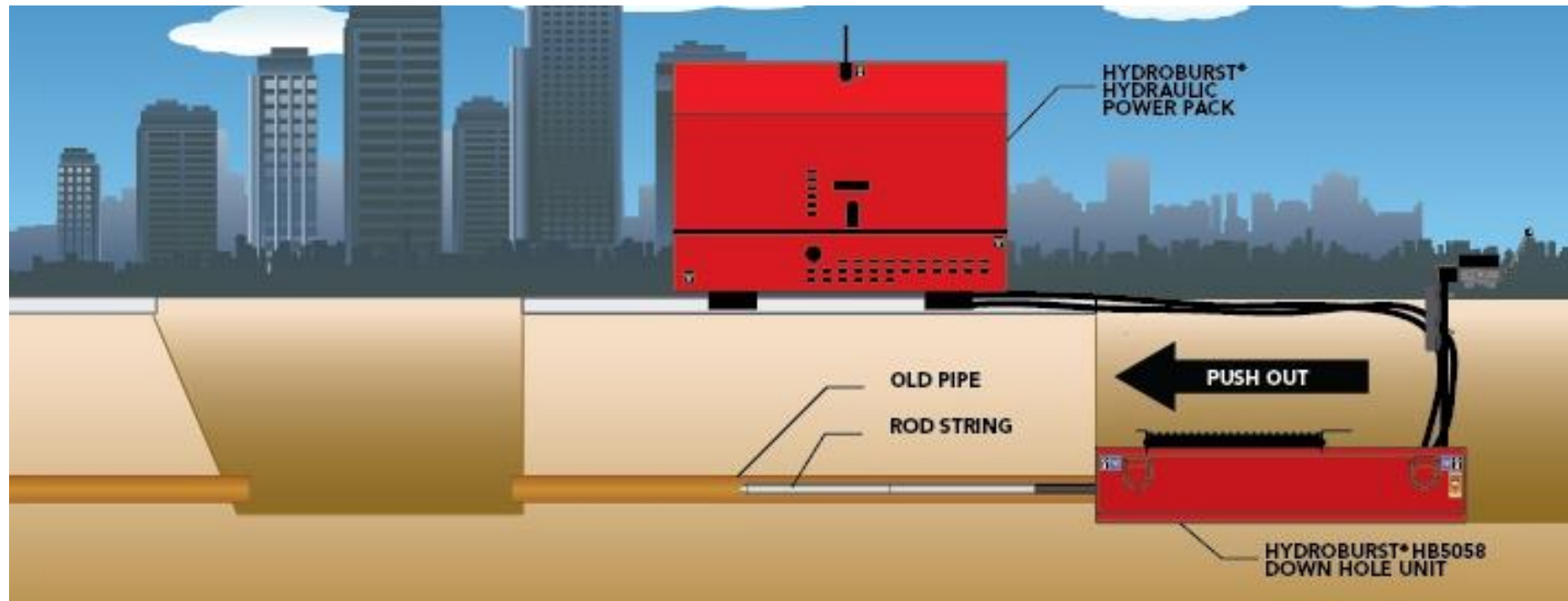


Specify Temporary Bypass vs. Prechlorination

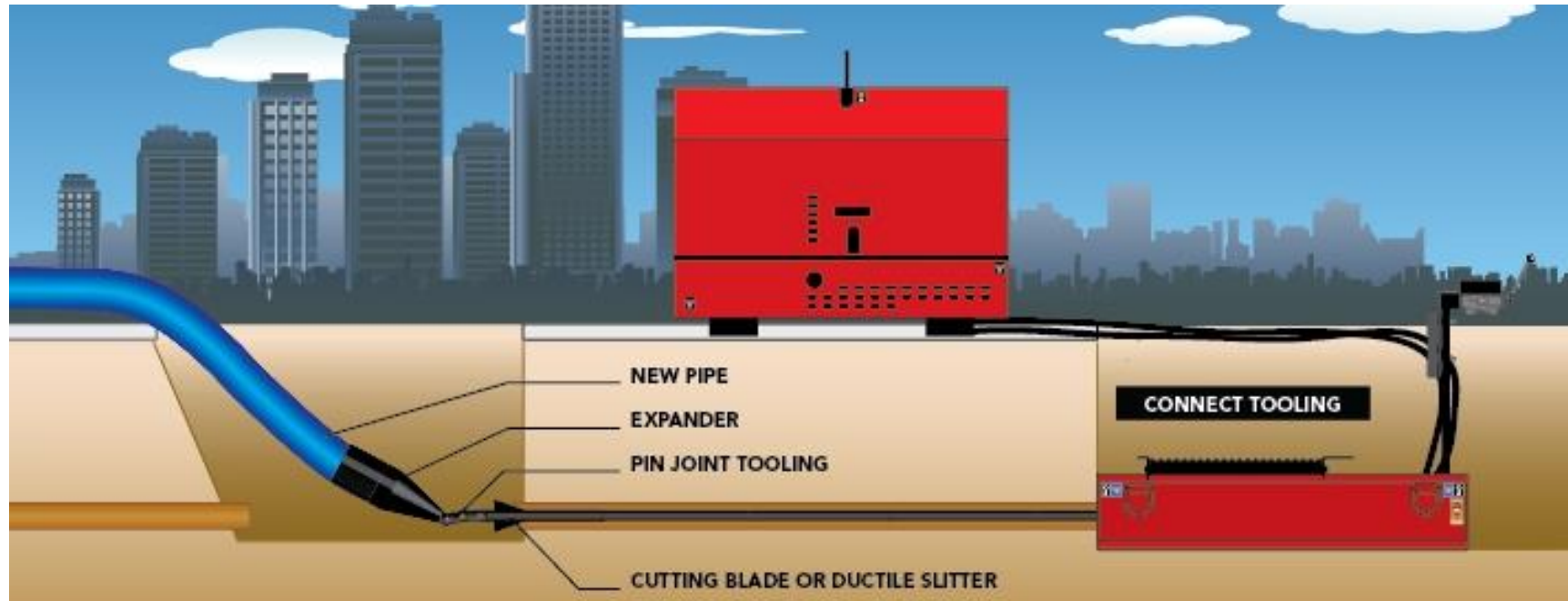
- Pre-Chlorination
 - Advantages
 - No Working/Living around Temporary Bypass System
 - Cost
 - Disadvantages
 - Customers Have No Service Until Pipe Bursting Process Is Complete and Services Reconnected – 6-10 Hours
 - Without Temporary System Is In Place, Service is Not Assured During Any and All Delays That Occur During The Pipe Bursting Process (Increases Pressure To Finish By A Certain Time)



Push out rod



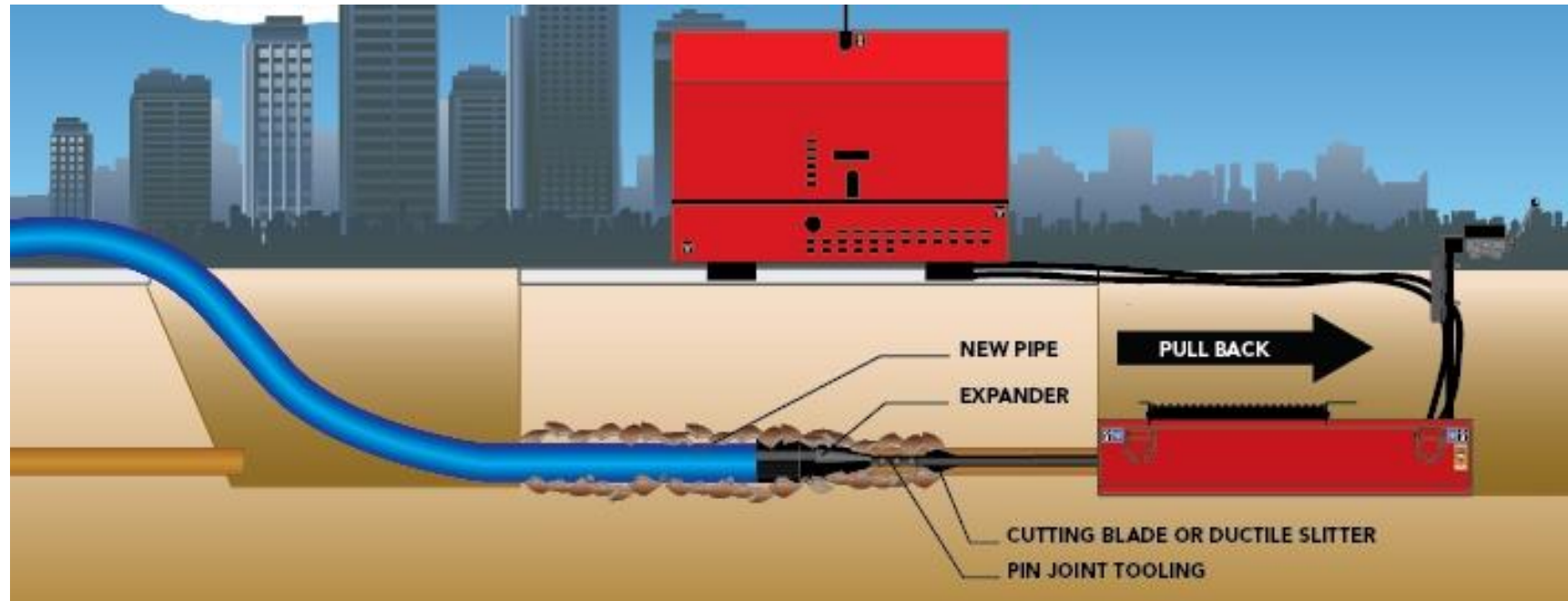
Attach tooling and pipe



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Pull back



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Pre-chlorination Method using HDPE



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Pipe Bursting with Pre-chlorination Method using Fusible PVC



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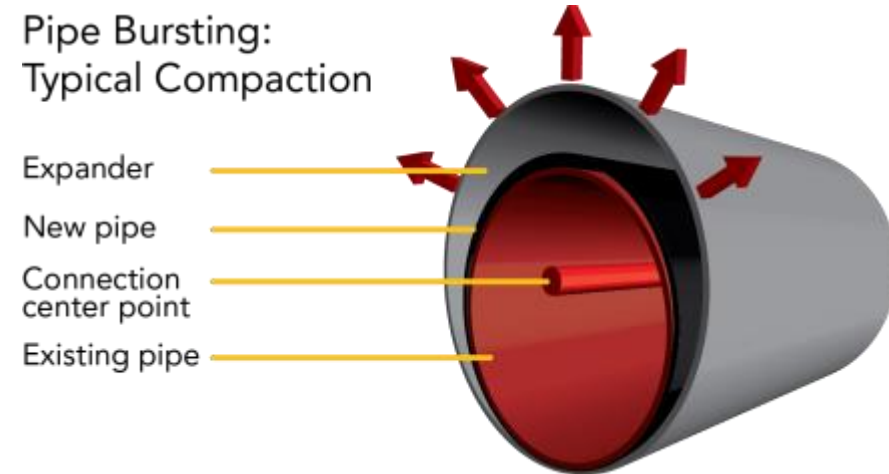
Pipe Bursting / Pre-chlorination

- A preferred method of water line rehabilitation
 - Follows path of the existing utility (reduces potential for 3rd party utility damage)
 - Easement issues and line separation limitations are reduced - the existing utility path is used
 - Reduce excavation costs by up to 85%
 - Able to increase the pipe diameter
 - Production: Install up to 400' of pipe in under 2 hours
 - Pre-chlorination save cost and disruption of installing temporary services
 - FL- No permitting required for bursting: Classed as a line repair



Project Considerations (UK)

- Preferred pipe material - Fusible PVC & HDPE.
- Upsizing used only when required
 - Bursting specifications limited to 1 upsize
 - Avoid surface heave and 3rd party utility damage
 - HDPE Pipe
 - Electro-fusion couplers for mains and service connections



Water Main Problems

- Received complaints regarding potable water clarity and low pressure concerns
- Cast iron water main breaks
- New service line installations required
- Limited working space, easement issues, and heavy traffic
- Expense of open cut not a feasible option
- Congested utility infrastructure



Network Modelling / Project Design

- Flow requirements: HDPE / Fusible PVC Slip-line or Burst?
- Site investigation
 - Pothole main and confirm main depth, location and material
 - Review proximity to other utilities
- Sampling Investigations
 - Downstream Series Sampling:-
 - 1 Source
 - 50 Address (>50µg/litre)
 - (>20µg/litre more than source)
 - Pre and Post Renovation Sampling:-
 - 10 Source
 - 10 Address (>50µg/litre)
 - (>20µg/litre more than source)



Customer Notification

- Customers are notified of mains replacement project by door hanger outlining the project scope
- Hanger is provided to home owner 48 hours prior to work being performed on their line section
- Approximately 15 to 20 homes will be off water from 8:00 am to 3:00 pm on the day of pipe bursting operations
- Construction crew will be moved onward the following day



Pre-Chlorinating Procedures

- Liverpool Depot Coil Pre-chlorinating Operations
 - Chlorinated Water is filled into the HDPE pipe coils and left for 24 hours then flushed and a sample taken.



Fuse On Adapters



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Pre-Chlorinating Procedures:

- Lengths of Main Above and Below Ground Pre-chlorinating Operations
 - Very similar to coil pre-chlorinating procedure
 - Source of water from on-site hydrant
 - All hoses used in operation are pre-chlorinated
 - Mobile dosage unit is used
 - Inputs the required chloros in to the main
 - De-chlorinates the water prior to discharge to sanitary sewer
 - Each length requires a 12 hour dosage period prior to laboratory sample being taken
 - Results are received next day via fax prior to being put into commission



Construction Activities



Excavate launch, reception and service pits.



Cut existing cast-iron main, install cap end and secure. Re-establish supply to existing main.



Construction Activities



Position rig into launch and reception pit and pay out rod. (avg. 45 minutes to payout 350' of rod)



Guide rod enters reception pit.



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Construction Activities



Pull back until bursting blade arrives at reception pit. (This takes an average of 45 – 60 minutes for 350')

Connect pulling head to fusible PVC or HDPE pipe. Bursting blade and expander to pulling rods.



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Construction Activities

- Undertake swabbing exercise
- Purge air out of new HDPE main through Installed ferrule at pipe end
- Connect cap-end control and pressure test pipe.
- Take bacteriological sample
- Turn water back on



Construction Activities



Install necessary branches, valves and hydrants.



Pneumatic piercing tools used for installing new services.



Construction Activities



Install electro-fusion saddles for service connections.



Backfill excavation and permanently re-instate.



Case Studies



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Job Summary

- Project Owner: City of Monterrey, CA
- Project was in an established neighborhood.
- 900 lf of existing 4" CI Pipe with 6" IPS Pipe utilizing the method of pipe bursting.
- Repair Couplers were excavated and removed prior to burst.
- Crossed 3 – 2" Fiber Ducts that were potholed and removed
- 4' Depth with Clay Material.



Open cut 4" CI Pipe
was not an option.



Excavation of Entry Pit.



Entry Pit with Pipe Pilot
splitting CI Pipe.

Dealing with Fiber Utilities



HB 125 Static Machine Pit

Spreading out
the load.



Crossing other utilities
Pothole for expansion.





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QUESTIONS?

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