



“Think Outside the Trench”

NM Rural Water Annual Conference 2010

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Trenchless Installation and Rehabilitation Methods Dramatically Reduce Project Costs

Traditional Open-Cut installation can be:

- Disruptive
- Impractical
- Limiting



Trenchless methods can reduce:

- Project costs
- Business interruption costs
- Political costs



Estimated trenchless technologies
50% of sewer rehabilitation
25% of water line rehabilitation

A systematic Asset Management approach is required

- Minimize Societal Costs
- Minimize Environmental Costs
- Minimize Financial Burden
- Save Water and Resources
- Achieve Infrastructure Sustainability



UGSI Fusible PVC™ Product Advantages

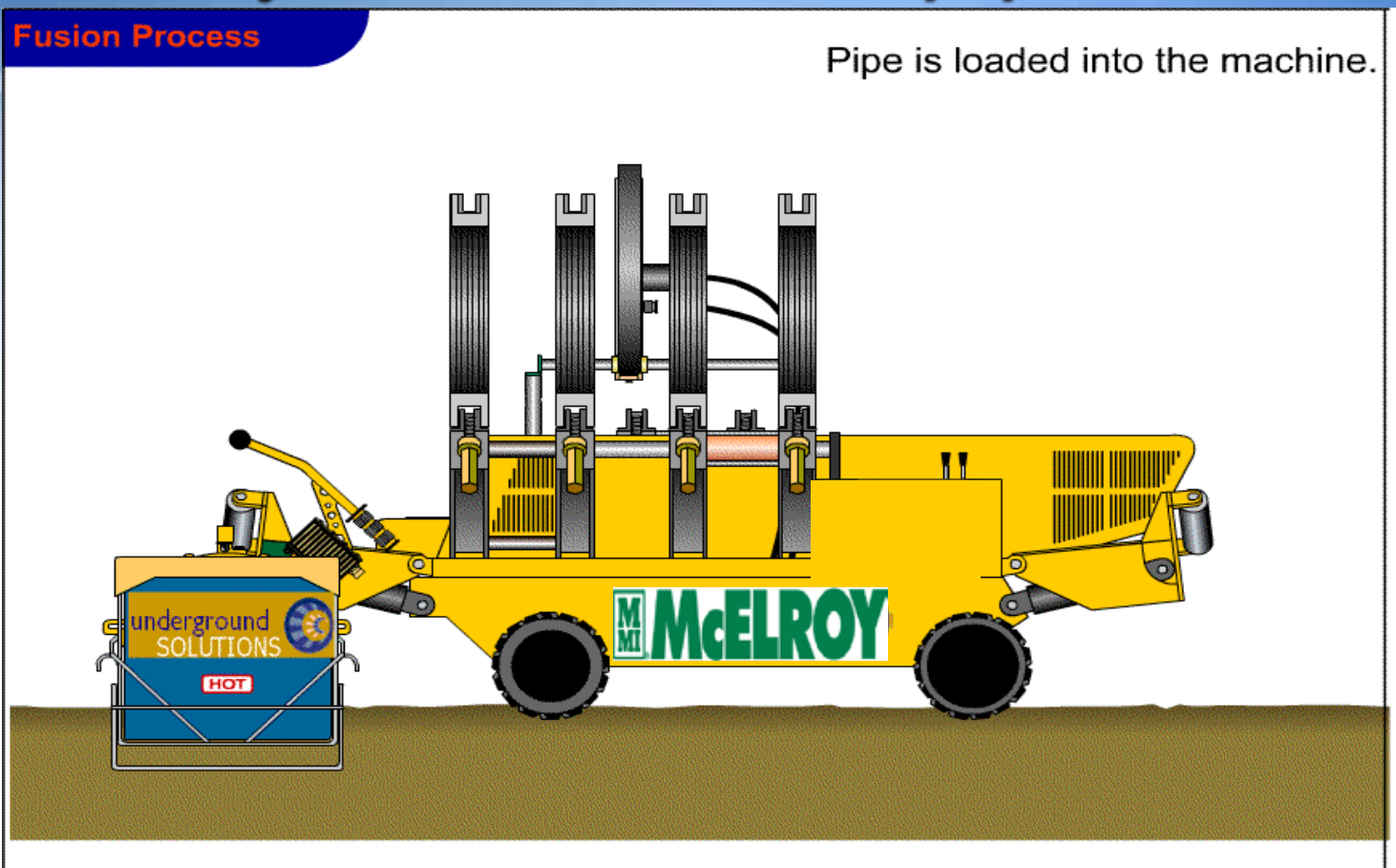


- Engineered for lower-cost trenchless techniques
 - Horizontal Directional Drilling
 - Sliplining
 - Pipe-Bursting
- Mechanical, physical and chemical advantages
 - Longer pull-in lengths with greater reliability
 - Superior resistance to hydrocarbon permeation
 - Favorable OD/ID relationship
- Fully restrained joint
 - No dimensional compromise
 - Gasket free, leak free pipe system
- Uses standard PVC and DIP fittings for connections

Flexibility - Fusible C-900[®], Fusible C-905[®] and PVC[™]



The Underground Solutions® PVC Fusion Process: Utilizes Industry Standard Fusion Equipment



Internal and External Bead Removal is Optional – friction losses are negligible ('C'-factor of 150) and are significantly less than mechanically joined pipe (i.e. for 8" DR18 with 1000gpm in a length of 1000LF, flow loss is 0.173 gpm and a head loss of 0.013 ft) and pipe tensile strength is not impaired (extra material in bead)

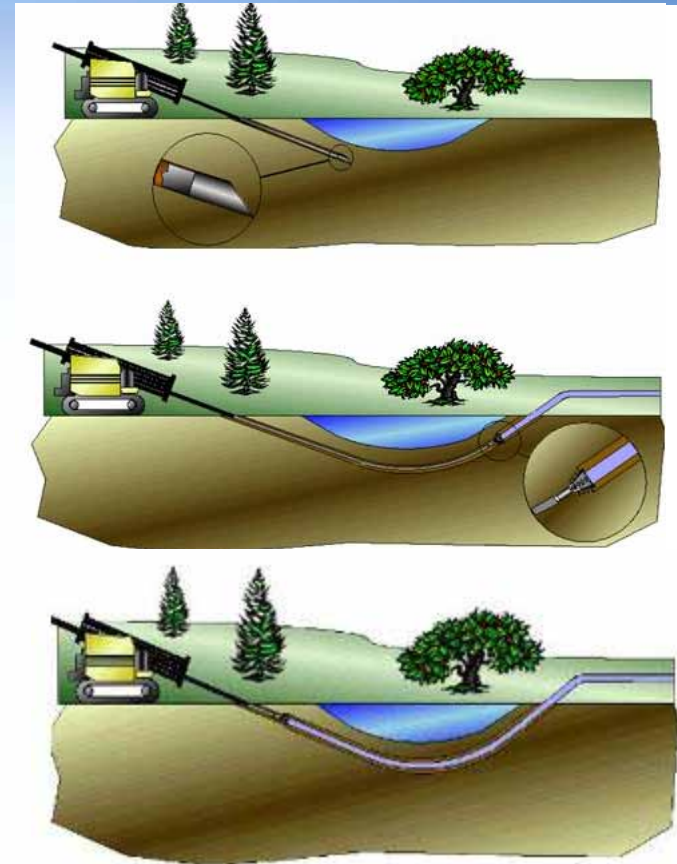
Installations and Current Projects in the Region

- Albuquerque, NM - Copper/Arno – 14” and 16” DR18 potable water, sliplining
- Albuquerque, NM – 8” DR18 potable water line, river crossing under Rio Grand, HDD
- Santa Fe, NM - Cuatro Villas – 10,000 LF of 12” DR18 and 2,500 LF of 8” potable water, HDD
- Rio Rancho, NM – Well No. 21 – 1,280 LF of 12” potable water, HDD
- Rio Rancho, NM – Black Arroyo – 840’ of 15” sewer line, HDD
- Rio Rancho, NM – Lomas 2D – 120’ of 30” for casing (double containment in dam), slipline
- Laguna – NM – 530’ of 10” DR21 waterline, HDD
- Denver Water - Foothills plant –18” DR25 gravity line, HDD
- River Point (Denver Water/Sheridan), CO – 20” and 12” water, HDD and Slipline under river
- Metropolitan St. Louis Sewer District, MO – 760’ of 16” DR18 and 8” DR18 FM, HDD
- Lee’s Summit, MO - 12,680 LF of 6” DR18 potable water, pipe burst
- Platte City, MO – 360’ of 16” DR18 potable water, slipline under I-29
- Ottawa, KS – 1,600’ of 16” DR18 potable water, HDD under Marais Des Cygnes River
- Prairie Village, KS (Water One) – 480 LF of 6” water line, slipline
- Olathe, KS – 1040 LF of 14” DR25 gravity sewer, pipe bursting
- Broomfield, CO Reuse - Phase I & II – 8,000 LF of 24” and 12” DR18 reuse, HDD & OC
- Stillwater, OK – Brush Creek – 1586 LF of 6’ and 12” DR18 potable water, HDD
- Bixby, OK – 2800 LF of 24” DR21 potable water, HDD under Arkansas River

Typical Horizontal Directional Drilling Process

Horizontal Directional Drilling

- Guided pilot hole is drilled along a bore path
- Drilling fluids are injected into the hole to stabilize and lubricate
- Back reamer is used to enlarge the pilot hole
 - Multiple passes are required to accommodate pipe OD
 - Drilled bore hole is typically enlarged to 1.5 x OD of new pipe
- Joined pipe is pulled back after reaming is completed
- Entire lengths are typically pulled at once with no interruptions and in the same day



Numerous Publications and Guides:
ASCE (MOP No. 108); Horizontal Directional Drilling, Willoughby; ASTM F1962; HDD Consortium – Good Practices Guidelines – 2008; PRCI Manual

Considerations

- Sloped insertion trench of 4-5 feet of length for each foot of depth is advised
- Care taken to prevent drill mud, etc. from entering pipe with capping attachment
- Bend radius of drill stem usually dictates alignment
- No relaxation period required – immediate connections possible
- Higher density of Fusible PVC™ reduces buoyant forces to reduce pull-in forces
- Longer pull-ins – recommend water ballasting and rollers to reduce drag

HDD with Fusible C900[®] – Santa Fe, NM

Horizontal
Directional
Drilling

Cuatro Villas Waterline

- New potable waterline installation
- HDD installation under roadways and narrow right of ways
- 10,000 LF of 12" DR18 Fusible C900[®]
- 2,500 LF of 8" DR18 Fusible C900[®]



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HDD with Fusible C900[®] – Santa Fe, NM

Horizontal
Directional
Drilling

Cuatro Villas Waterline

Fusion process



Fused pipe strands



HDD with Fusible C900[®] – Santa Fe, NM

Horizontal
Directional
Drilling

Cuatro Villas Waterline

Pipe assembly



Pull Head



HDD with Fusible C900[®] – Santa Fe, NM

Horizontal
Directional
Drilling

Cuatro Villas Waterline

Directional drilling rig for HDD



Pipe pull-in



HDD with Fusible C900[®] – Santa Fe, NM

Horizontal
Directional
Drilling

Cuatro Villas Waterline

Design and Construction

- Engineer: Souder, Miller & Associates - Kari Edenfield, P.E.
- General Contractor: Samcon – Kim Oldfield
- HDD Contractors:
 - Kelly Utilities – Mike Ford
 - Global Underground – Darren Knight



HDD with FPVC™ – Rio Rancho, NM

Horizontal
Directional
Drilling

Rio Rancho - Black Arroyo Gravity Sewer

- Sewer line installation
- Along arroyo and new housing development
- 840 LF of 15" SDR35 Fusible PVC™, 3 pulls
- Drill grade: 1% - 2%



HDD with FPVC™ – Fenton and Sunset Hills, MO

Horizontal
Directional
Drilling

Client: Metropolitan St. Louis Sewer District

- Force Main relocation from bridge
- HDD installation of new line under Meramec River
- 760' 8" DR18 Fusible C900® force main carrier line
- 760' 16" DR18 Fusible C905® casing line



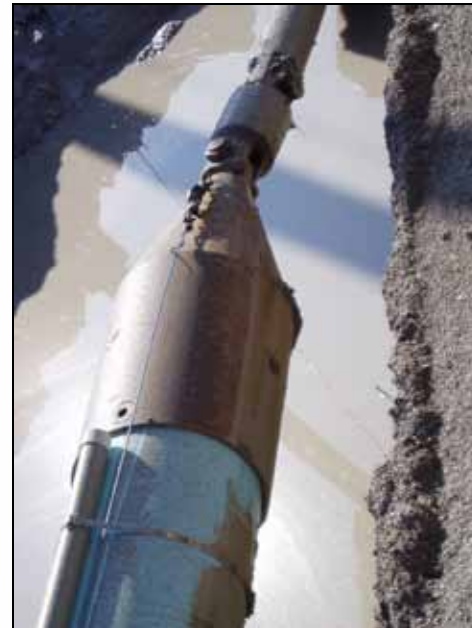
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HDD with Fusible C905[®] for City of Ottawa, KS

Horizontal
Directional
Drilling

Ottawa, KS Waterline

- Potable Water line
- 1600 LF of 16" DR18 Fusible C905[®], single pull
- HDD crossing under Marais Des Cygnes River
- Standard DI connections back to B&S PVC in open cut



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Client: St. John's Water Company Stono River Crossing (Div. IV)

- Project consists of 60,000' of 24" water main in 4 divisions
- 19,000' designed as HDD, including 4,260' under the Stono River
- 4,400' of 24" DR18 Fusible C-905® in single pull



Bellevue Ave – Havana Sanitation District

Horizontal
Directional
Drilling

Client: Havana Sanitation District
Greenwood Village, CO

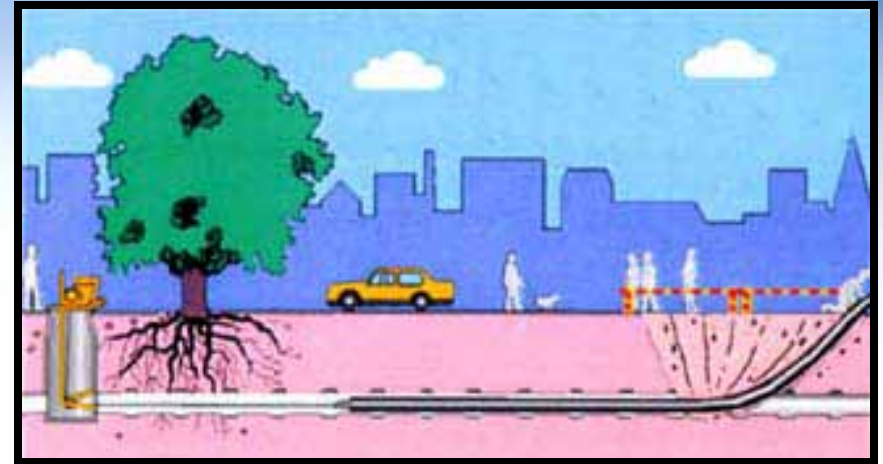
- Sewer forcemain
- Phase I - 2920 LF of 12" DR18 FPVC™
- Phase II - 6680 LF of 12" and 16"
- HDD saved 20% cost over Open Cut



Old Host Pipe Is Lined With A Continuous Length Of Smaller Diameter Pipe Pulled Into The Existing Host Pipe

Sliplining

- Provides maximum flow with an independent fully structural solution
- Results in a smaller I.D. than the host pipe
- Process
 - Existing host pipe is cleaned and verified for applicability of sliplining operation
 - New pipe is pulled or pushed into the host pipe
 - Annular space between the host pipe and new sliplined pipe is treated
 - Connections are made to system and appurtenances



Industry Sources and Guides:
TT Technologies, Inc. and Earth Tool Company, LLC – manufacturers of slipline installation equipment

Considerations

Sliplining

- Clean and video inspect to ensure acceptable clearance prior to insertion
- Recommended difference between ID of host pipe and OD of Fusible PVC™ is at least 2"
- Grouting of annular space is advised and Fusible PVC™ resistance to buckling allows for longer grouting operations (1,000ft or longer)
- 10% abrasion of wall thickness is allowable
- Fusion above ground or may be done in the access pit
- Pipe rollers are recommended for longer pulls to reduce drag on pull-in



Sliplining with Fusible with Fusible PVC™

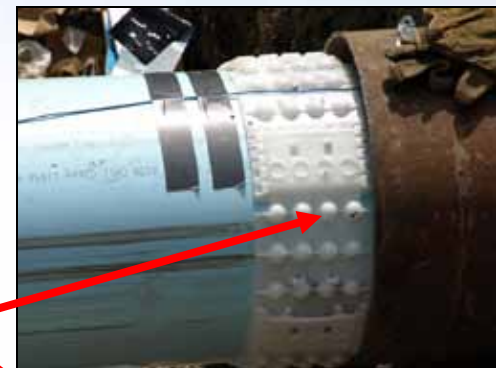
Sliplining

Additional Considerations

- Casing spacers or grouting if needed. Many options.
- Carrier pipe ID for flow capacity.
- Carrier pipe OD versus ID of casing or host pipe.
- Entrance pit lengths



Casing spacers



Sliplining with Fusible C905® in Albuquerque, NM

Sliplining

Client: Albuquerque Bernalillo County Water Utility Authority

- Copper-Arno Street Water Line Rehabilitation
- 2,200 LF of 14" DR18 Fusible C-905®
- 1,760 LF of 16" DR18 Fusible C-905®
- Existing cast iron water main
- Fusible PVC™ maximizes ID for a given OD



Sliplining with Fusible C905® in Albuquerque, NM

Sliplining

Client: Albuquerque Bernalillo County Water Utility Authority

Project Summary:

Fusible PVC™ pull lengths: 5 pulls

Pull lengths: 1,160', 920', 880', 600', and 400'

Pressure Test: 2 hours at 150 psi

Design and Construction

- Engineer: Boyle Engineering - Allan Porter, P.E.
- General Contractor: TLC Plumbing & Utility – Burr Dickinson



Sliplining with Fusible C905® in Rio Rancho, NM

Sliplining

Client: Rio Rancho, NM

- Dam project - double containment required
- 120 LF of 30" DR25 Fusible C-905® for casing
- Fusible C-905® sliplined into steel casing
- Sewer line installed inside Fusible C-905



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Sliplining with Fusible C905® in Rio Rancho, NM

Sliplining

Client: Rio Rancho, NM

30" Fusible C-905® inserted into steel casing



Sliplining with Fusible C900® in Prairie Village, KS

Sliplining

Client: WaterOne

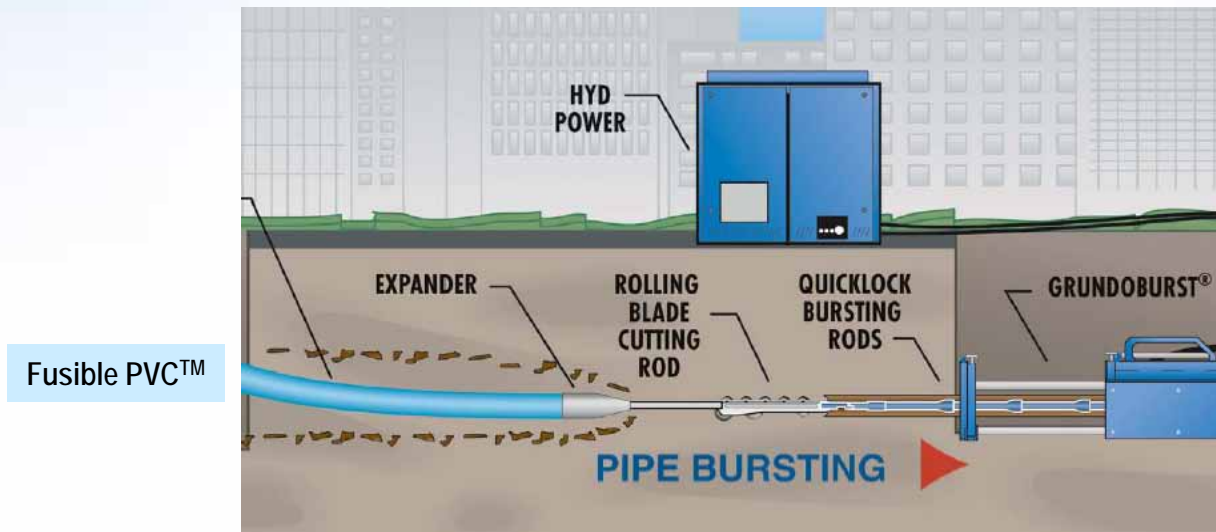
- 480 LF of 6" DR18 Fusible C-900®
- Existing 8" cast iron water main
- Fusible PVC® resistance to hydrocarbons (gas station near by)



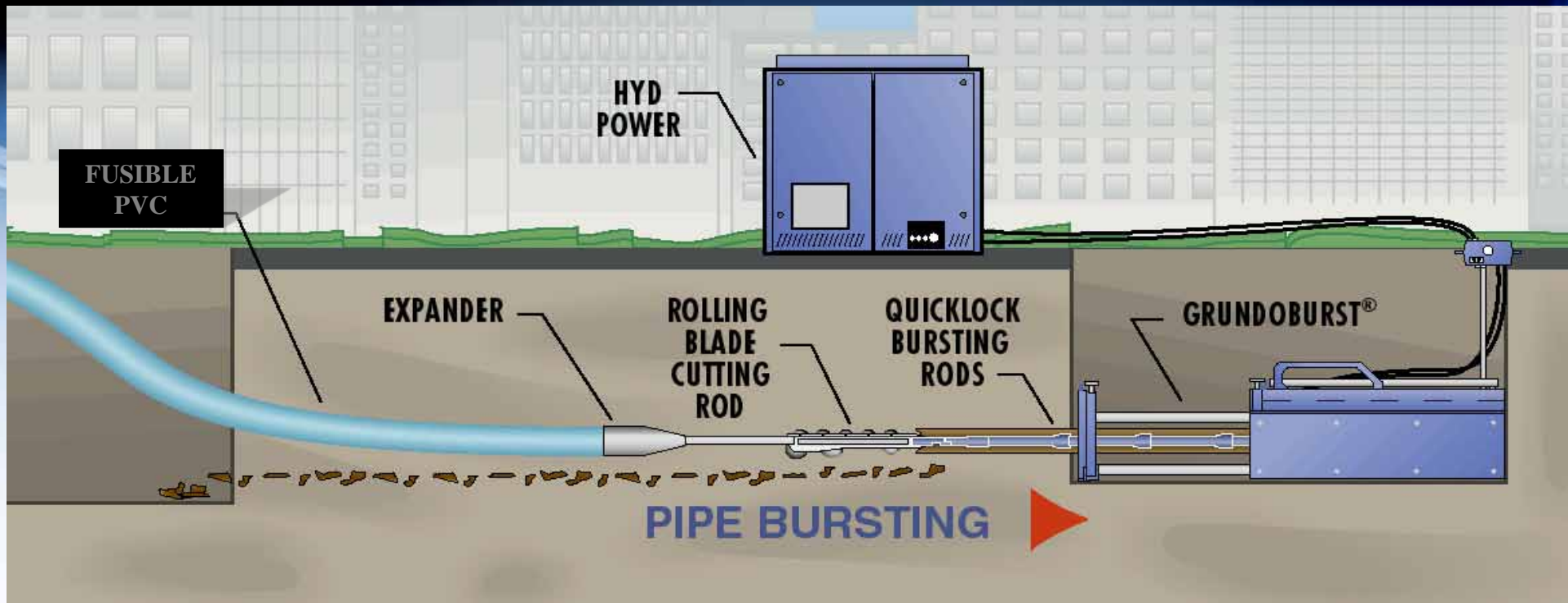
New Pipeline Attached to the Bursting Head and Pulled into the Existing Pipe

Pipe Bursting

- Utilizes existing host pipe corridor to install a new pipeline
- Fragments or splits the host pipe and pulls a new pipeline into its place.



Numerous Publications and Guides:
ASCE MOP No. 112; Guidelines for Pipe Bursting, TTC Technical Report; Pipe Bursting Good Practices Manual, NASTT; TT Technologies, Hammerhead – manufacturers of pipe bursting equipment



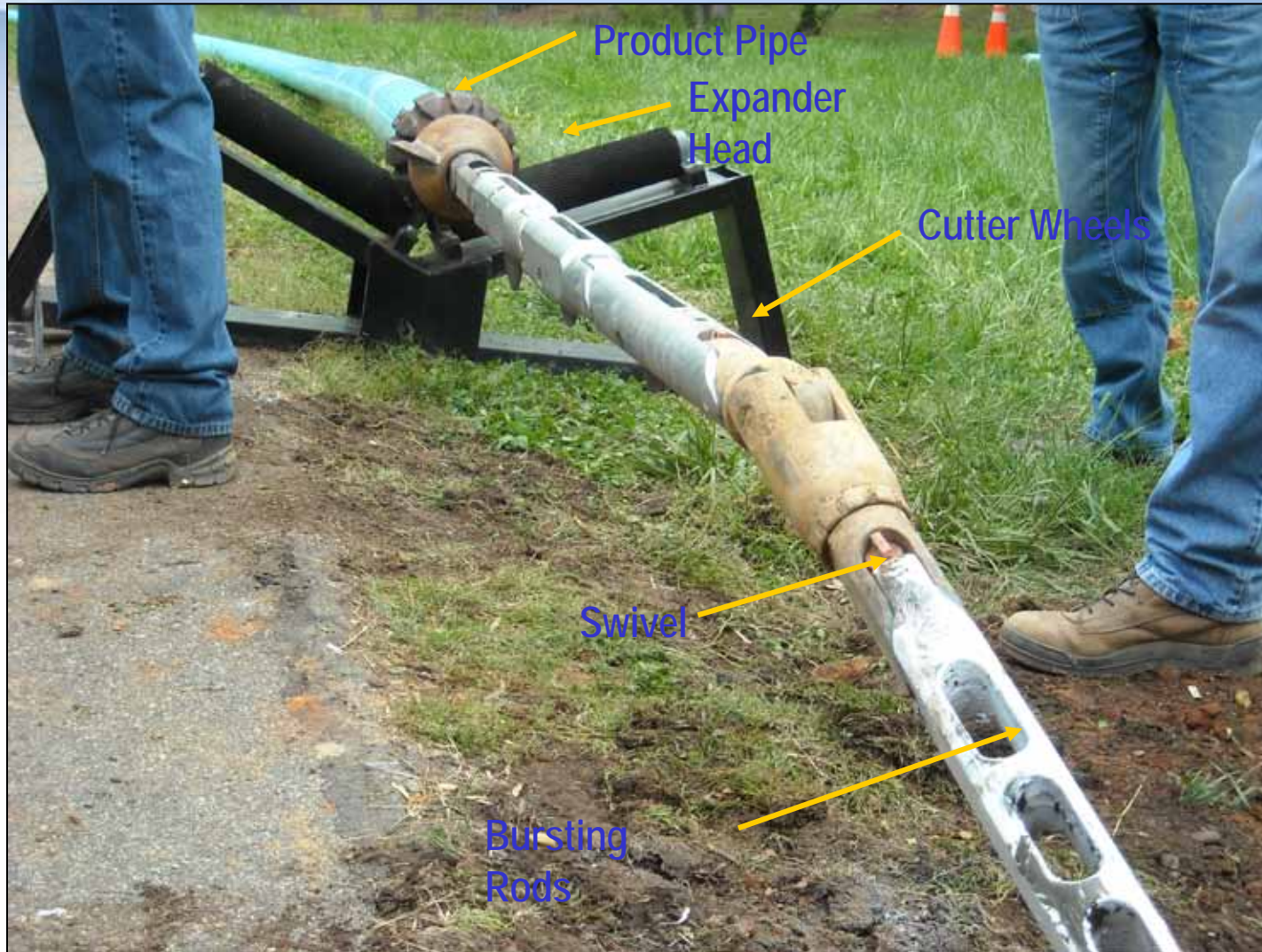
Pipe Burst Process

- Burst head is pulled through existing line - fracturing or cutting the pipe
- Fractured or split pipe is pushed into the surrounding soil by an expansion head
- New pipe is pulled in immediately behind the burst head
- Connections are made to existing system and appurtenances
- Results in same or larger I.D. (upsizing) as old pipe
- Typically done in 300 - 500' increments (~1 hour pull-back)

Pipe Bursting Head with Cutting Wheels



Pipe Burst connections



Pipe
Bursting

Pipe Bursting Video

Pipe Bursting Ductile Iron Pipe Video



Pipe Bursting with Fusible C-900[®] for Lee's Summit, MO

Pipe Bursting

Static Hydraulic

Considerations for PB

- Material of existing pipe line
- Pipe staging and fusion area
- Pipe layout room above ground
- Pit locations and lengths
- Depth of line
- Number of connections



Pipe Bursting with Fusible C-900[®] for Lee's Summit, MO

Pipe Bursting

Client: City of Lee's Summit

Static Hydraulic

- 12,000 LF of 6" Fusible C-900[®] for potable water
- 4" and 6" existing cast iron and ductile iron lines being replaced
- Standard DI connections at tie-ins



Pipe Bursting with Fusible C-900[®] for Lee's Summit, MO

Pipe
Bursting

Client: City of Lee's Summit

Static Hydraulic

Reasons Lee's Summit decided on pipe bursting:

- Reduce public impact
 - Driveways and landscaping not torn up
 - Roads and driveways not blocked for extended periods of time.
- Right of Ways crowded, better to use space of existing line
- No abandoned lines left in ground to take up more space



Company Confidential

Pipe Bursting with Fusible C-905[®] – Olathe, KS

Pipe
Bursting

Client: City of Olathe, KS

Static Hydraulic

- 1,040 LF of 14" DR25 Fusible C-905[®] for gravity sewer
- Existing 10" clay line upsized to 14" for additional capacity
- 3 pulls (400', 320', 280')



Trenchless Installation and Rehabilitation Methods Dramatically Reduce Project Costs

Hard Project Costs are Potentially Reduced by 20-40% through use of Trenchless Methods

- Traditional Open-Cut installation methods can be:
 - Disruptive
 - Impractical
 - Limiting
- Trenchless methods can reduce:
 - Project costs
 - Business interruption costs
 - Political costs
- Estimated trenchless technologies
 - 50% of sewer rehabilitation
 - 25% of water line rehabilitation



Questions?

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