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Horizontal Directional Drilling (HDD) with DI Pipe

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"To the man who only has a hammer in the tool kit, every problem looks like a nail."

Abraham Maslow

Pipe-on-Supports

Fittings

Ball and Socket Joint

Subaqueous Crossings

Kansas City, Missouri

Why DIP for HDD?

- Strength for installation & operating loads
- Flexible restrained joints
- Hydraulic advantages
- Installation options (assembled-line & cartridge)
- Locating pipe
- No effect with temperature change/ creep
- No inventory/ training issues
- Pipe wall impermeable to VOC's
- Proven Longevity

Pre-construction Planning

- Preliminary Studies
  - Landscape along proposed route - Video
  - Existing utilities and structures
  - Sub-surface explorations
- Legal Acquisitions
  - Right of Way Permits
  - Permits for removal of trees, shrubs
  - Environmental Permits
- Public Relations
  - Keep property owners informed and up to date
  - Plan for proper storage of materials, equipment, etc.

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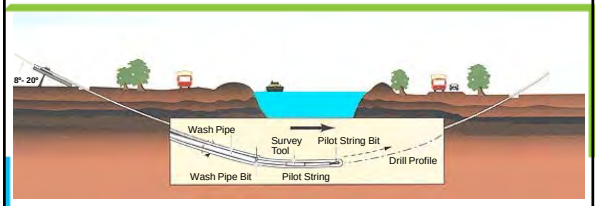
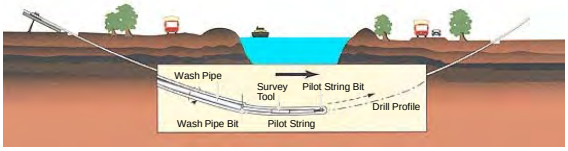
Pilot Hole



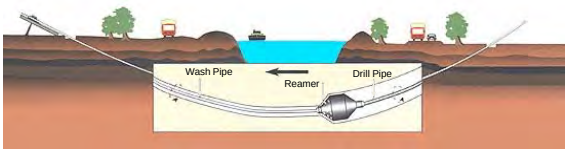
- Set-up Workspace & Equipment
  - Survey route and establish entry and exit pit locations
  - Set-up drill-rig, power-pack, mud system and navigation system

Pilot Hole



- Drill Pilot Hole
  - Various steerable drill heads used based on soil type
  - Walk-over or wire-line type navigation used during drilling

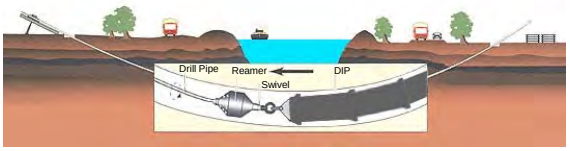
Preream



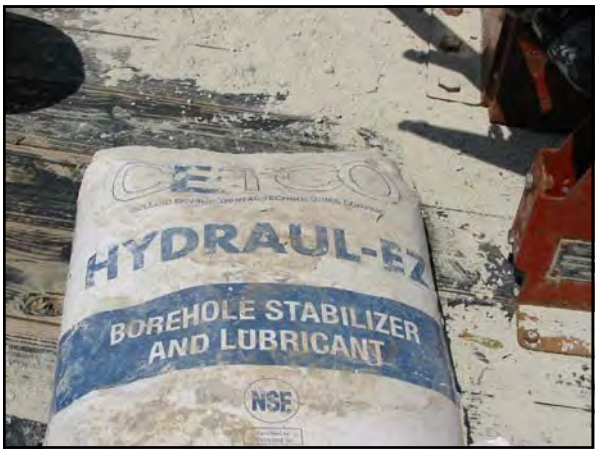
- Typically required for larger pipe diameters
- Hole diameter 1-1/2 times the product pipe diameter

19-inch Back Reamer

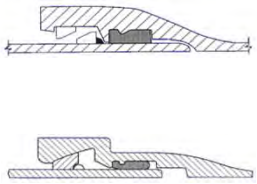
Pullback



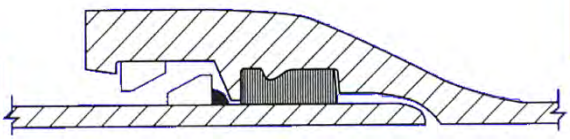
- Installation of product pipe
- Reamer may be used ahead of pipe to maintain clear hole opening
- Drilling fluid (mud slurry) used to lubricate product pipe



DI Restrained Joints for HDD



DI Restrained Joints for HDD



Gasket Materials Available for DIP

Description	Max. Service Temp. (°F)		Common Uses
	Push-on Joint	Mechanical Joint	
SBR (Styrene Butadiene)	150°	120°	Fresh Water, Sea Water Sanitary Sewage
EPDM (Ethylene Propylene Diene Monomer)	250°	225°	Fresh Water, Sea Water Sanitary Sewage Elevated Temperatures
Nitrile (NBR) (Acrylonitrile Butadiene)	150°	120°	Hydrocarbons Fats, Oils, Greases, Chemicals
Neoprene® (CR) (Polychloroprene)	200°	200°	Fresh Water, Sea Water Sanitary Sewage
Viton®, Fluorel® (FKM) (Fluorocarbon)	300°	225°	Hydrocarbons Acids, Vegetable Oils Petroleum Products, Elevated Temperatures

Consult pipe manufacturers for pertinent recommendations.

Assembled-Line Method (String-out Method)

Cincinnati, Ohio

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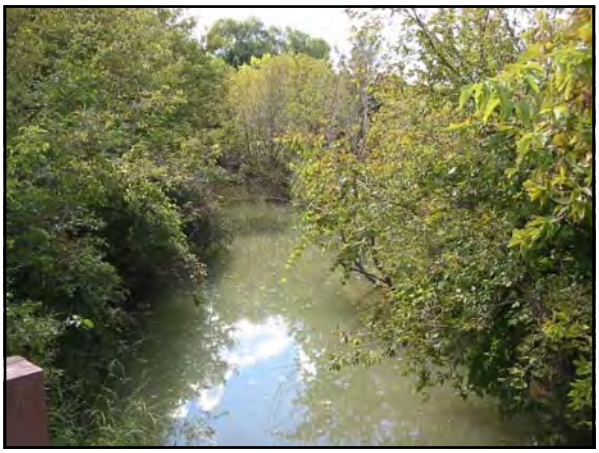
Horizontal Directional Drill Project with 12-inch, Polyethylene Encased Ductile Iron Pipe

Valparaiso, Indiana

September 20, 2001

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Valparaiso, IN
(220 feet of 12-inch)
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Normal, Illinois
Barwood Dr. to Norbloom Rd May, 2002
Bloomington, Illinois
Normal, Illinois

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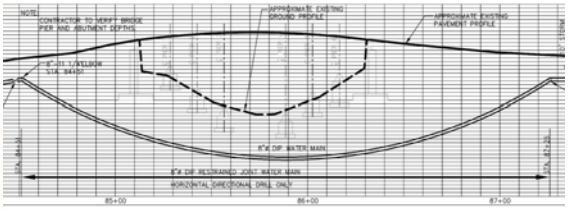
HDD Project with 340 feet of 8-inch, RJ DI Pipe Camelback Bridge

Normal, IL
July, 2003

Minimum Allowable Radius of Curve



TOWN OF NORMAL, ILLINOIS
MAPLEWOOD WATER LINE
REPLACEMENT

Minimum Allowable Radius of Curve

Maximum Allowable Joint Deflection (degrees)	Minimum Allowable Radius of Curve - 18 ft pipe (feet)	Minimum Allowable Radius of Curve - 20 ft pipe (feet)
3.00	340	380
3.25	317	352
3.50	295	330
3.75	275	305
4.00	258	285
4.25	243	270
4.50	229	255
4.75	217	241
5.00	205	230

field report

Ductile iron pipe goes a different direction—Is that Normal?

Field Report - Journal April 2006

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"The polyethylene encasement used in the HDD installations was intact at every excavation point, and we had 30 excavations of pulled pipe for installation of taps, fire hydrants, and valves. So there's no question of the polywrap making it though the pull."

Steve Gerdes – Water Director, Normal

MAXIMUM END PULL

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TABLE 1 - PULLING FORCE

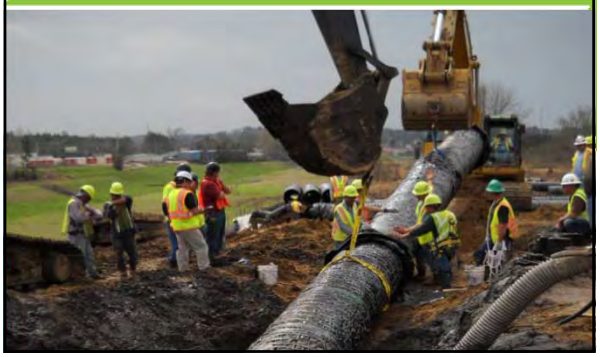
Pipe Size (inches)	Max. Pulling Force (lbs.)
4	8,143
6	16,827
8	28,947
10	43,546
12	61,581
14	82,734
16	107,004
18	134,391
20	164,896
24	235,256

TABLE 2 - DEFLECTION

Pipe Size (inches)	Max Deflection (degree)	Pipe Size (inches)	Max Deflection (degree)
4	5	14	3-½
6	5	16	3-½
8	5	18	3
10	5	20	2-½
12	5	24	2-½

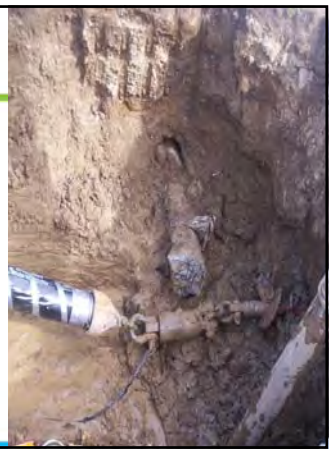
Carmel, Indiana
(40 feet of 12-inch)

Meridian, MS



Pittsfield Twp, MI

30,000 feet - 8inch



North American Society for Trenchless Technology (NASTT)
No-Dig Show 2012

Nashville, TN
March 11-15, 2012

Paper A-1-05

COMBINING TWO TRENCHLESS TECHNOLOGIES INTO AN 8 MILE WATER MAIN REPLACEMENT/REHABILITATION PROJECT

Damien R. Wetzel, P.E.[1], and Craig A. Lyon[2]

[1] Stantec, Ann Arbor, MI
[2] Pittsfield Charter Township, Ann Arbor, MI

ABSTRACT: Pittsfield Charter Township is a 37,000 resident community outside the City of Ann Arbor, Michigan. In the 1960's, water service was provided to 600 parcels in the Washtenaw Heights Subdivision via cast iron water main. In less than 50 years, the water main deteriorated to a level that resulted in frequent breaks. The Washtenaw Heights Subdivision is a well established neighborhood with mature trees along the entire road right-of-way. The Township conducted pipeline locating, subsurface utility engineering, and condition assessment prior to any alternative analysis. Once the existing conditions were fully understood, alternative analysis was conducted between replacement and rehabilitation of the water main. Alternatives analyzed were open cut, pipe bursting, horizontal directional drilling, slip lining and cured in place lining, including analysis of multiple materials in each

5. CONSLUSION AND LESSONS LEARNED

By October 2010 over 30,000 feet of 8-inch ductile iron pipe was installed using HDD and over 10,000 feet of 12-inch water main was rehabilitated using CIPP. All the water main installed for this project was tested and accepted by November 2010.

At completion of the project the top three Township priorities were met. Considering safety was the number one priority; Township employees, Stantec staff and both contractors had zero lost time injuries (LTI) on the project. By avoiding long trenches and reducing construction traffic in the roads, typically associated with open cut excavation, many hazards were removed from the construction site. The second Township priority of tree preservation was accomplished by only removing only six trees on a project with tree lined streets; the community was extremely satisfied with the minimal impact to the existing trees and environment. The amount of road restoration costs saved by CIPP and HDD saved the Township an estimated $600,000, not to mention the constructability issues associated with open cutting a corridor congested with multiple utilities.

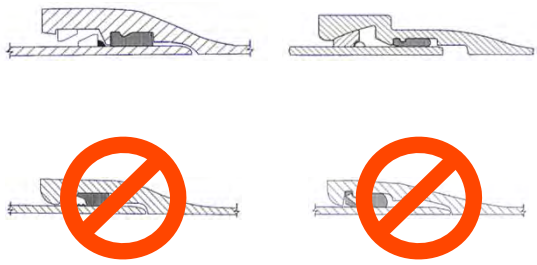
One of the primary concerns at the beginning of the project was to ensure that the polyethylene encasement made it through HDD process. While excavating the new water main to install 550 taps our concerns were put to rest when not a single instance was observed where the polyethylene encasement had been pulled or torn from the pipe, confirming that when properly installed, polyethylene encasement is a reliable measure for corrosion protection in HDD applications.

Paper A-1-05-7

San Marcos, Texas

1,200' – 30"

DI Restrained Joints for HDD



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THE RIGHT DECISION