

What makes RCP good candidate for jacking?

Trenchless Technology Technical Benefits

- Longitudinal rigidity
- Inherent strength - withstand jacking forces
- Smooth exterior - reduced friction forces
- Tight tolerance in dimensions/joints
- Variety of joint systems
- Watertight
- Incorporated ports - lubrication/ grout



Trenchless Technology Environmental Benefits

- Reduces disruption
- Natural grade intact
- Reduces damage to services
- Maintains highway integrity
- 90% fewer vehicle movements
- Less spoil hauled away
- Less quarried material trucked
- Reduced air and noise pollution





Trenchless Technology Safety Benefits of RCP

- Safer work zone
- Quicker installation
- Reduced labour input
- Utility strikes minimized



- **Closed System Manholes**

Thrust pit



Shoring

Tunneling Operation:

- Machine
- Soil Type
- Pipe Length
- Material
- Length of drive
- Type of Installation



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Thrust Wall

Trenchless Technology

Jacking Pit



Receiving Pit



Trenchless Technology

Jacking Pit

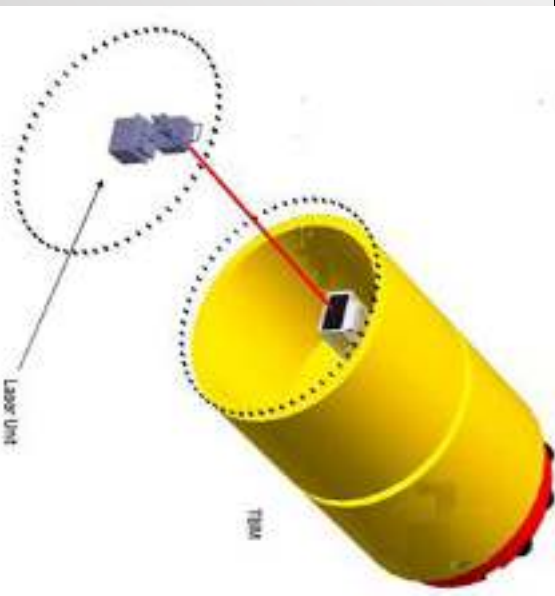


Jacking pit

Receiving pit



Alignment



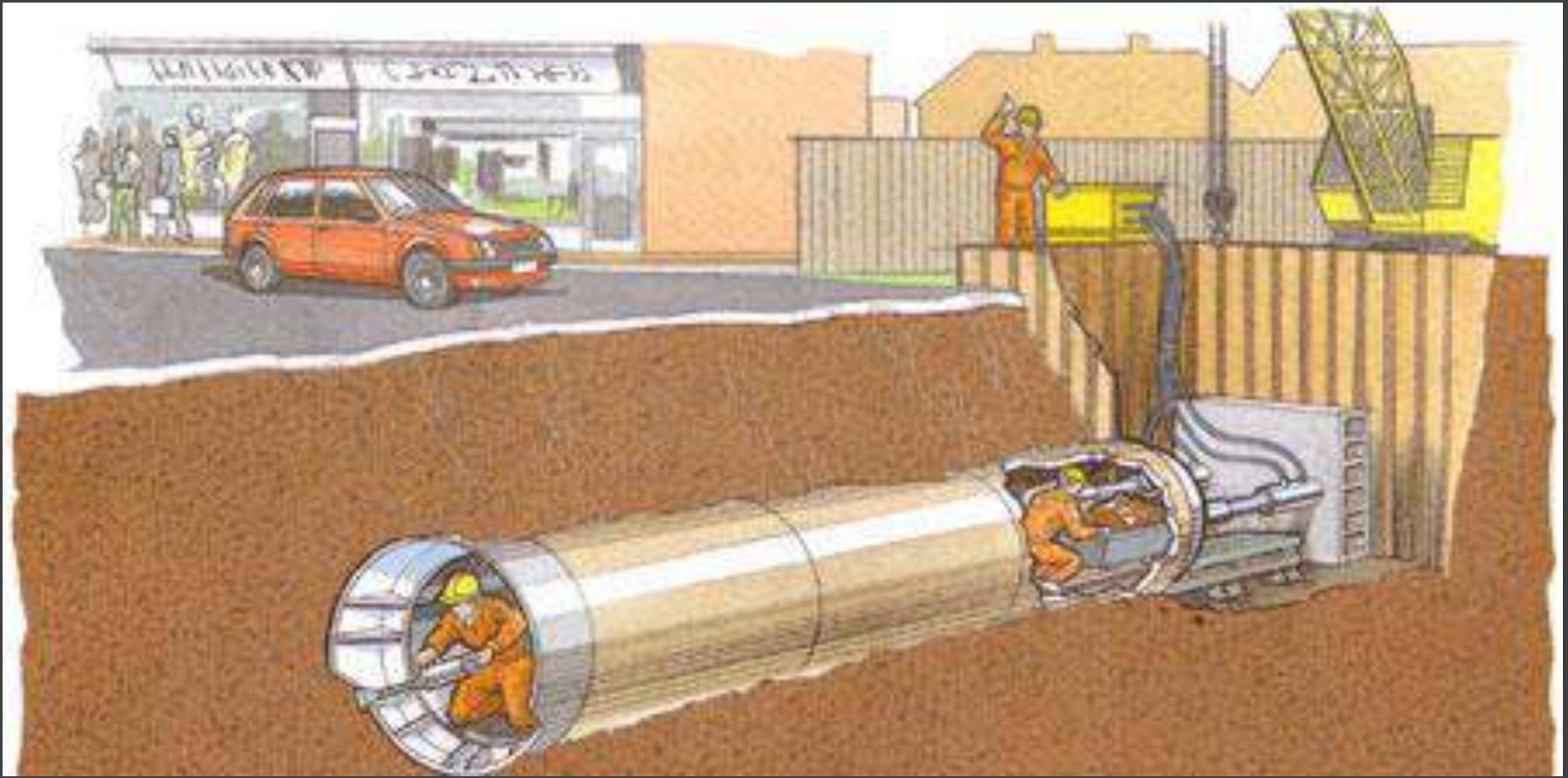
How do you keep it straight?

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Jacking Equipment



Hand Shield



Trenchless Technology Jacking Equipment

- Manual Excavation

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Shield / Jacking Head



“Mole”



Trenchless Technology

Jacking Equipment



Telescoping digger



Rotating cutter

Mechanical Excavation
Open face shields with mechanical means of excavation

Backacter:

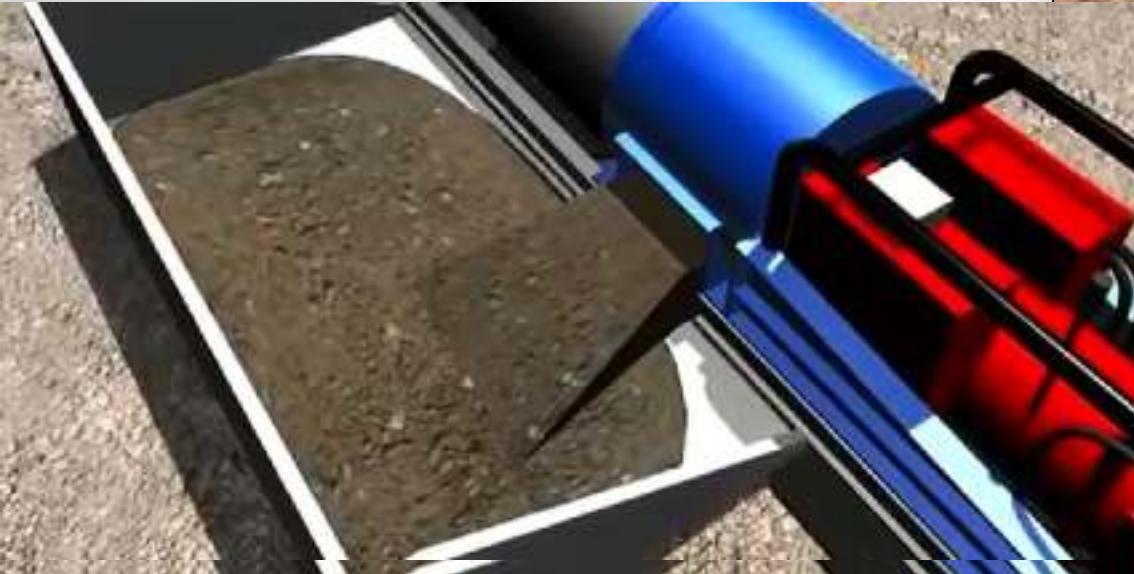
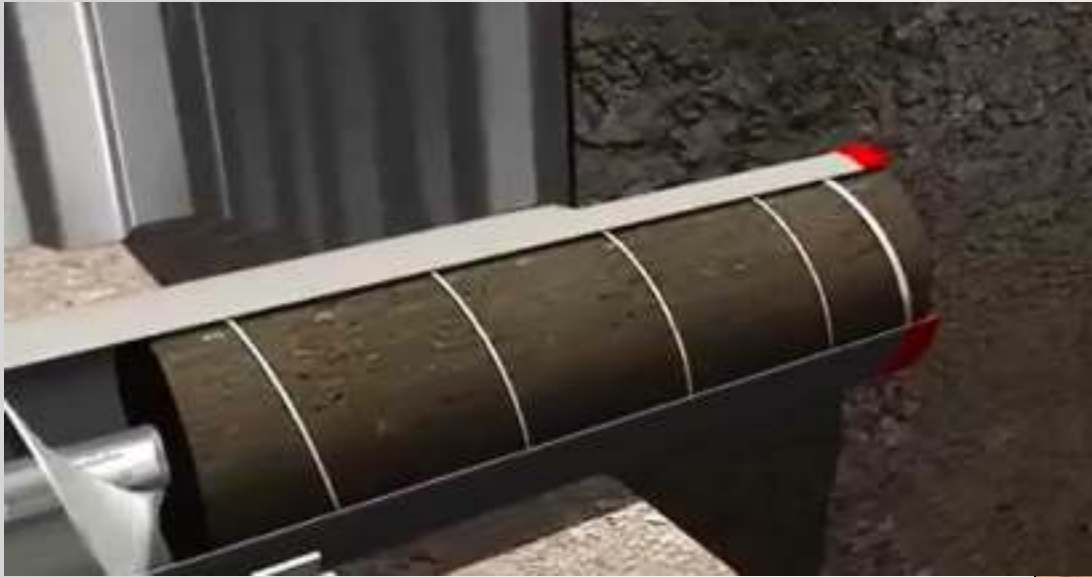
Backacter is more suitable in semi-stable to stable soils up to strong cohesion values.

Cutter Boom

More suitable in higher strength soils, and some rock types



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Trenchless Technology

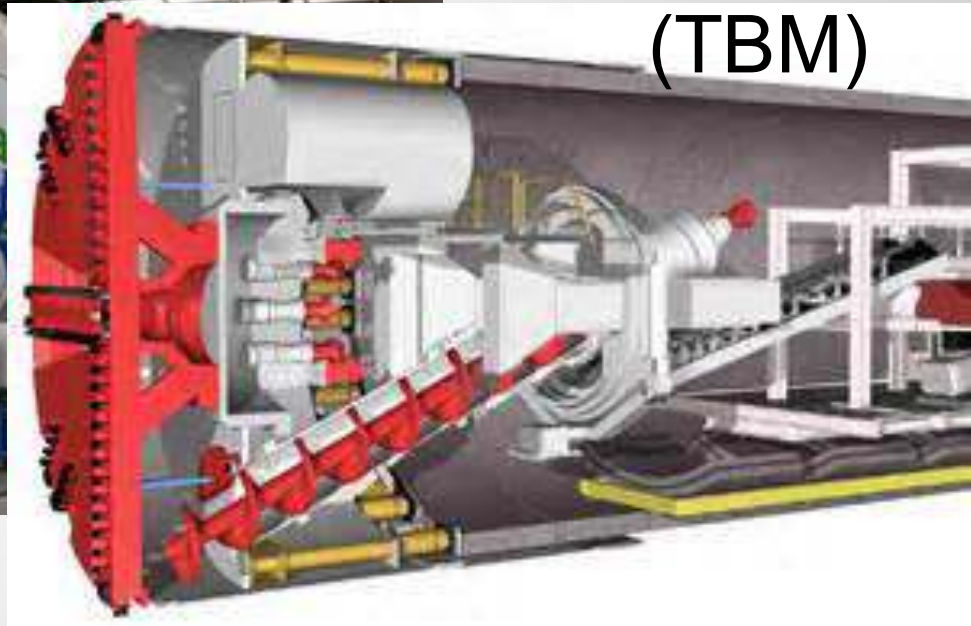
Auger Boring



Trenchless Technology Jacking Equipment



Large Tunnel
Boring
Machine
(TBM)



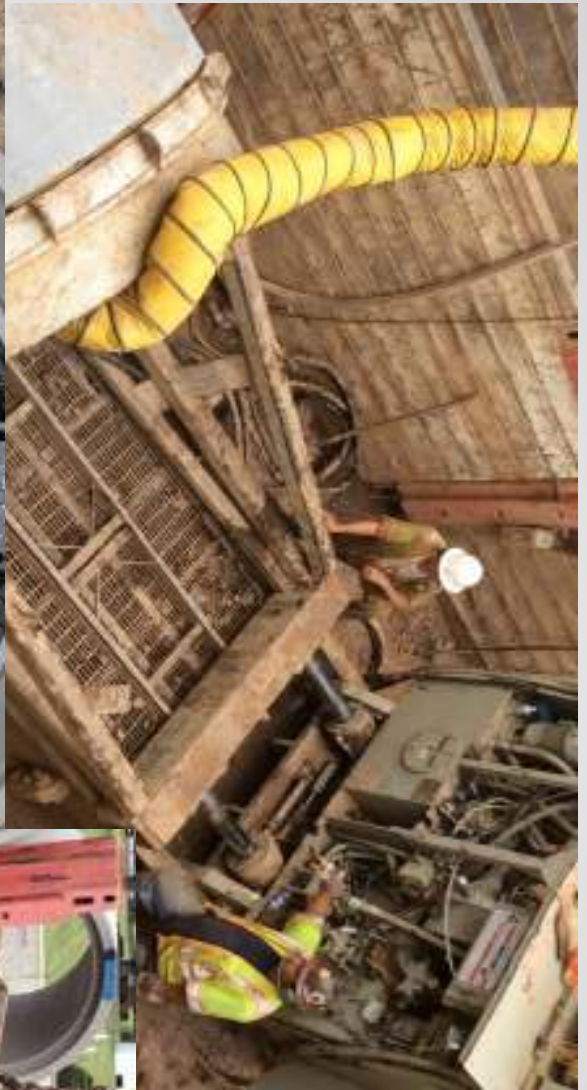
Tunnel Boring Machines (TBM)

Slurry – Air Pressure

Positive Earth Pressure

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Spoil Removal



Guided cart
Wheel barrow

Trenchless Technology Box Jacking

- Hand mined
- Open faced
- Little ability to affect direction



Trenchless Technology

Box Jacking



Trenchless Technology

Box Jacking



Trenchless Technology

Box Jacking





Trenchless Technology

Box Jacking

Trenchless Technology

Box Jacking

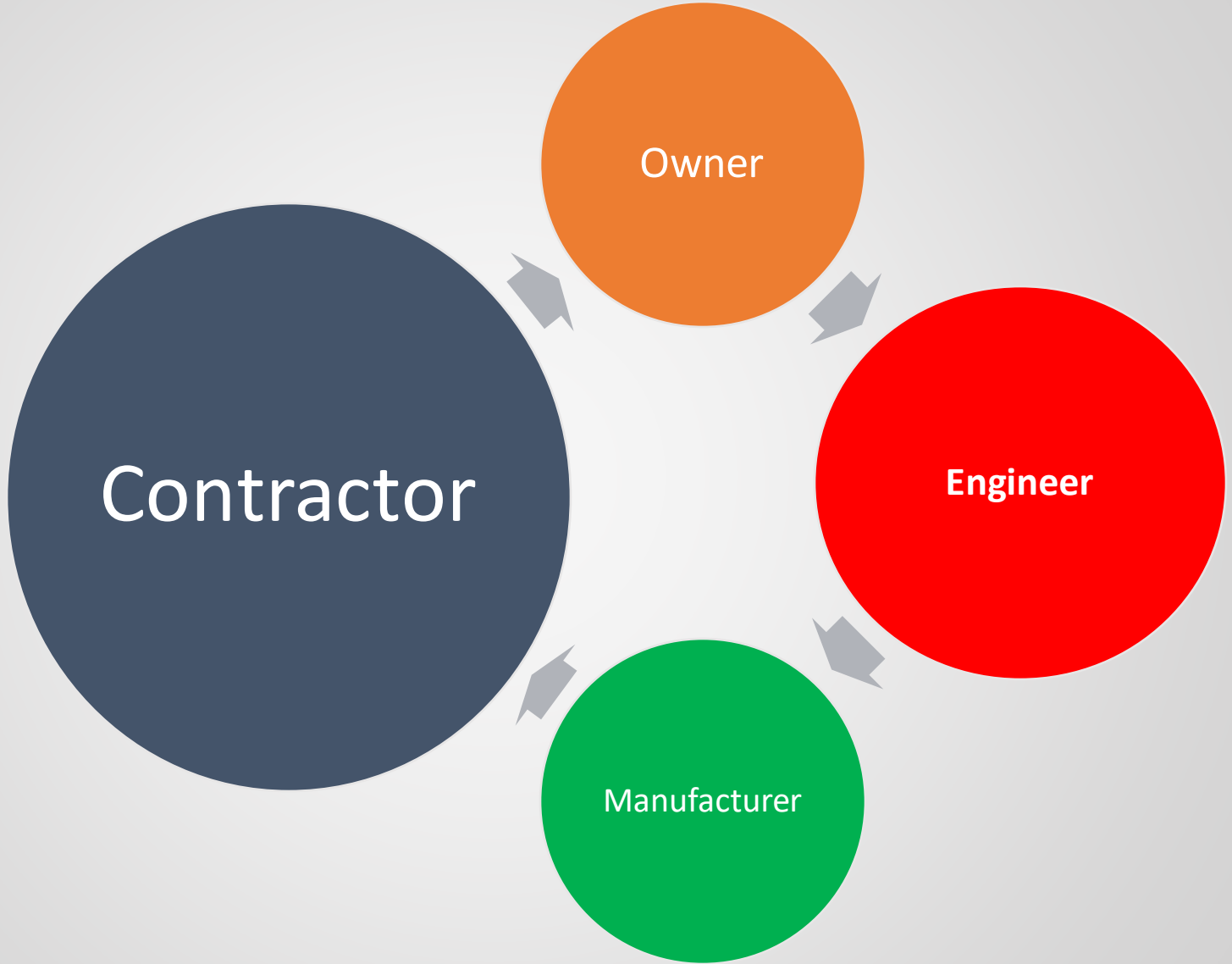


Cushioning



- Lead Shield





Trenchless Technology Roles

- **Owner**
 - Jacking Pipe is the best solution
 - Relay to Design Engineer
- **Engineer**
 - Pipe diameter and shape
 - Length of push
 - Project limits
- **Producer**
 - Manufactures Pipe to specification's
 - Provides TOTAL Jacking Forces
 - Smooth uniform outside diameter



Trenchless Technology

Roles

Contractor

- Jacking Pit Design
- Selects the Method of Excavation/Equipment
- Selects the Jacking Equipment
- Schedule of Operations and Safety Aspects
- Dewatering Plan
- Lubrication Type (Method) & Coatings
- Cushioning Materials
- Intermediate Jacking Stations

Trenchless Technology Design Considerations



Trenchless Technology Design Considerations



Site Investigation



Identify potential obstructions

Cobbles or Boulders

Fill materials

Mixed faces

Wood - fibrous

Hard zones

Water

Trenchless Technology Design Considerations

Soils



Which Soil is Better for Jacking?

Cohesive

Non Cohesive

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Jacking Forces

Transverse Forces

Loads – Live, Dead, Earth & Fluid



Axial Forces

Jacking Forces

Soil Properties

Jacking Equipment

Lubrication





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Cushioning Material

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Cushioning Material



Cushioning Material

Recommended – Plywood/Particle Board

Not Recommended – Rope/Rubber Hose

Not Recommended – Wood Blocks
(only small loads)

Thicker is Better

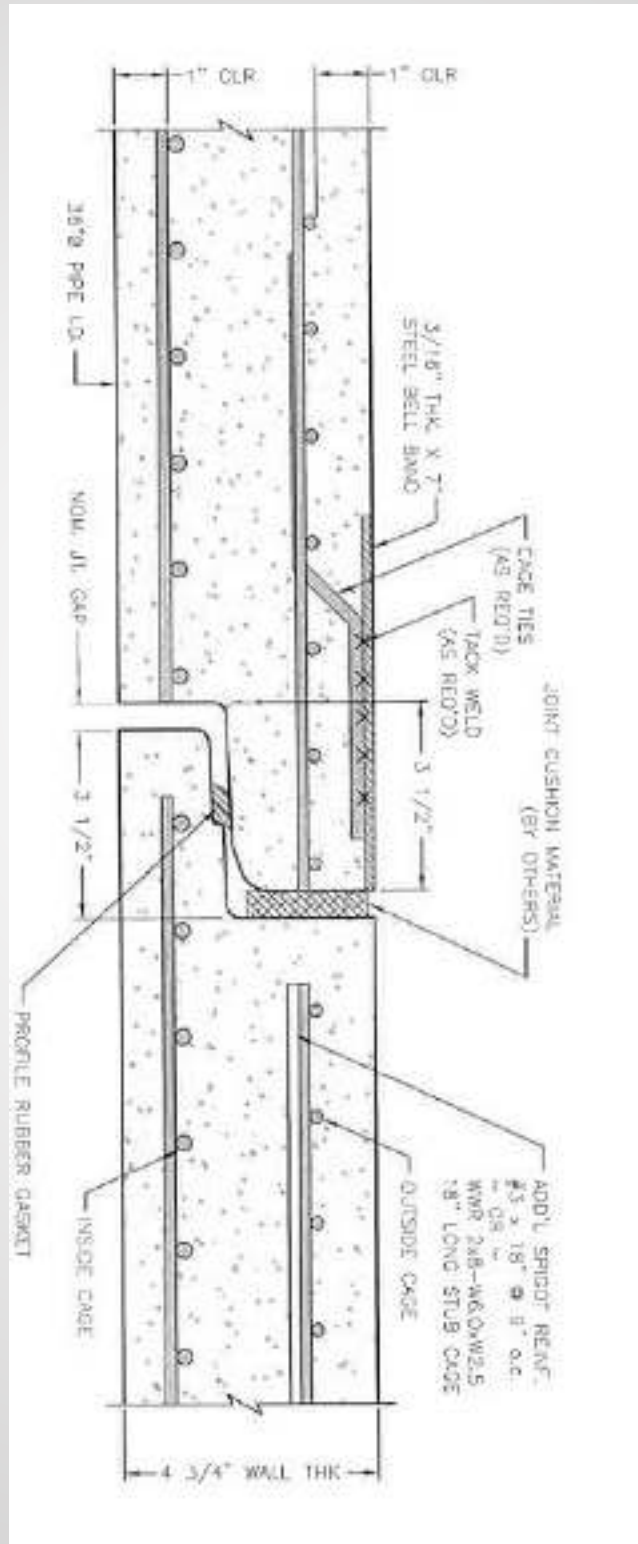
5/8" to 3/4" is Good

1/2" is Considered Minimum

Check Joint Design for Compatibility

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Joint Types



36"Ø x 4 3/4" WALL JACKED R.C.P. JT & REINF. DETAIL
DRICAST / FBPF RG / AASHTO M170 - CLASS IV

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Overbore



Design Considerations

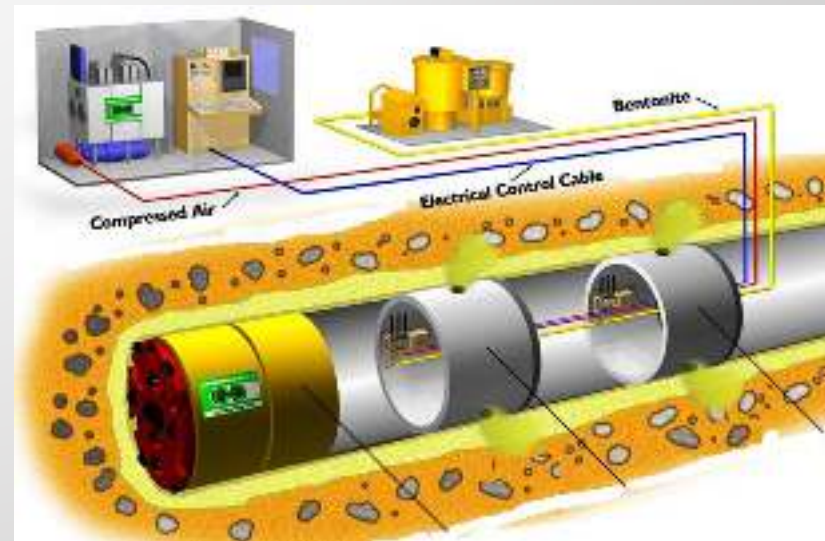
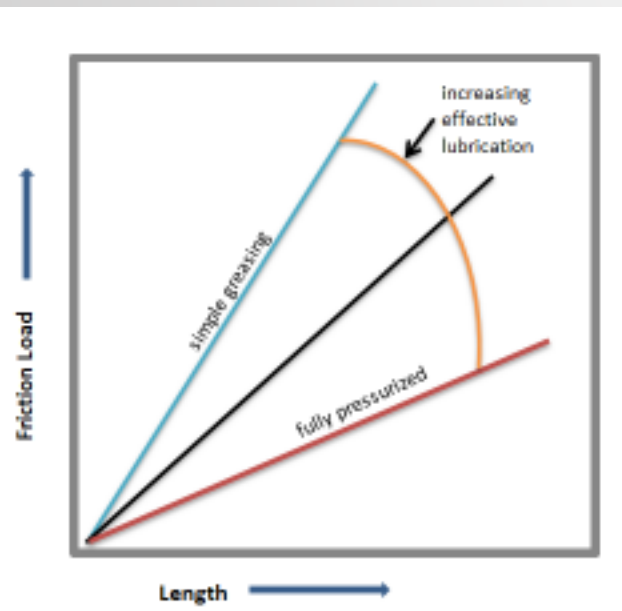
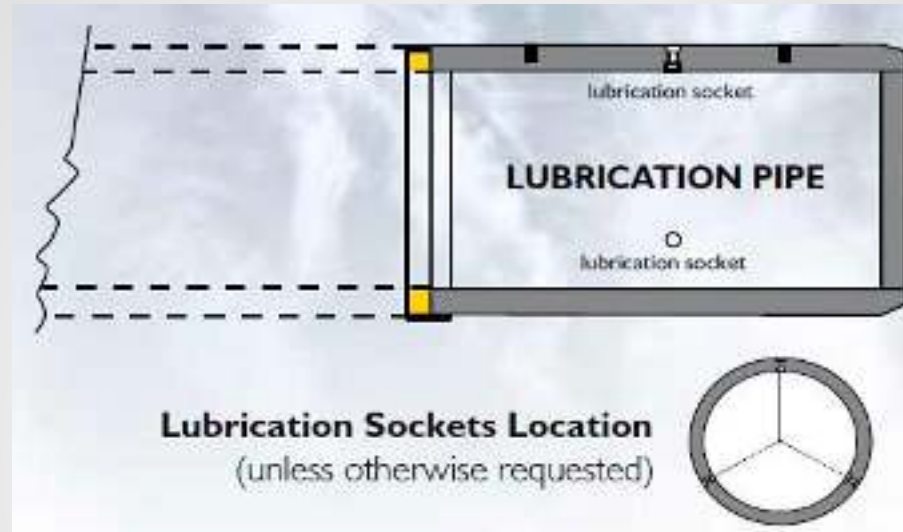
Over Excavation (Settlement) Under Excavation (Heave)

Overbore Annulus

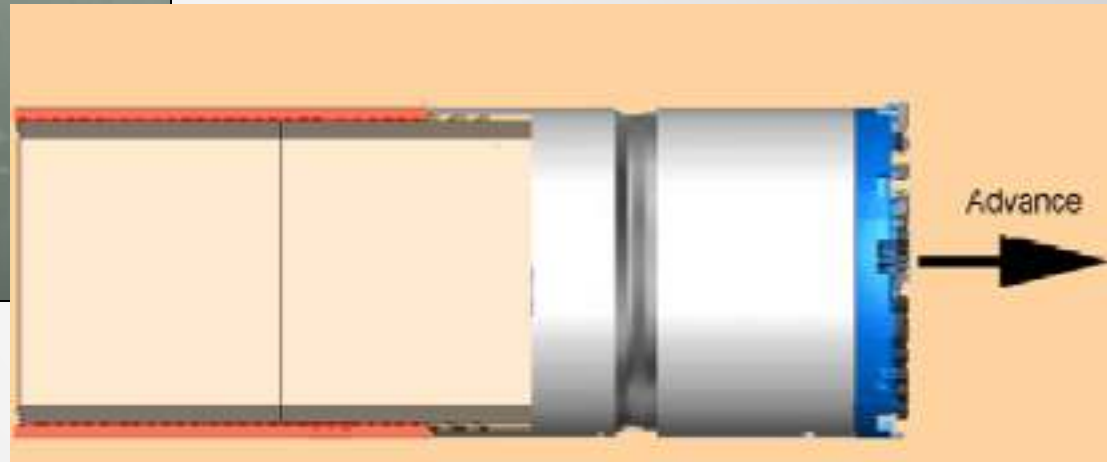
Less than 36" Diameter (.5")

36" Diameter and greater (1")

- Lubrication
- Water – Bentonite - Polymer



•Grouting



Placement

Place in Overbore Annulus
Through Ports or at Shield
Grouting can prestablize soils

Prevent ground movement and surface settlement

•Coatings



Exterior Placement

Pre applied – Resin Based Compounds

Applied on Site – Applied as pipe passes through jacking pit
(polymer compounds with water)



The First Use of Tunneling Method with Reinforced Concrete Jacking Pipe in DelDOT's History

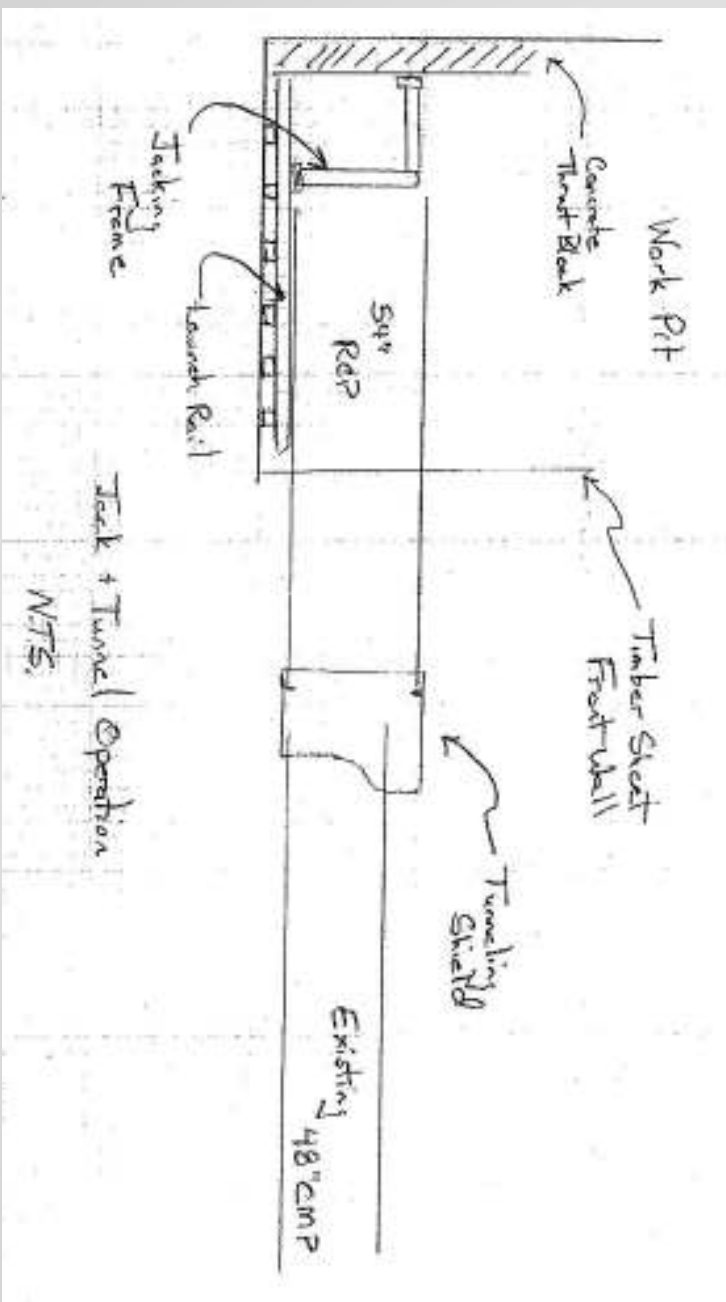


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- 54 inch reinforced concrete pipe culvert under Route 4
- Concrete Pipe with steel bands and grouting ports to withstand the anticipated 400,000 lb. jacking load.



Trenchless Technology



pipe replaced with jacking pipe.

Value Engineering Proposal

- **Value Engineering Proposal Submitted by Contractor**
- **Jack & Tunnel Method Proposed In Lieu of Open Cut**
- **Advantages**
 - **Cost Savings - \$126,330**
 - **Reduced M.O.T. and No Lane Shifts**
 - **Increased Work Zone Safety**
 - **No Supporting of Existing Utilities Required**
 - **Same Contract Duration (75 Days)**
- **Trenchless Technology**





Before - Existing 48"
C.M.P. Pipe

- After – 54" R.C. Pipe



Project Completion

- Trenchless Technology



Why Consider Accelerated Precast Construction?

APC Improves

- Site Constructability
- Total Project Delivery Time
- Protect the Environment
- Material Quality and Product Durability
- Improved Work-zone safety for the traveling public & contractor personnel

APC Reduces

- Traffic Impacts
- Onsite Construction Time
- Weather-related Time Delays

APC Can Minimize

- Environmental Impacts
- Impacts to Existing Road Alignment
- Utility Relocations and ROW Take



Where to go for More Information

AmeriTexPipe.com

Texas.ConcretePipe.org

rreichert@ameritexpipe.com