DENSE LOCATION INSTALLATIONS

TRANSPARENT TIMELINES

SAFER WORKING ENVIRONMENTS

NUMEROUS APPLICATIONS

MICROTUNNELING PIPE
MICROTUNNELING

Defined as a non-manned, laser guided, remote controlled, continuous pipe jacking operation

Pipes are jacked (pushed) in sequence from the entry shaft to the exit shaft. This provides continuous support to the excavation face by applying mechanical or fluid pressure to balance groundwater and earth pressures. Support at the excavation face is a key feature of microtunneling, distinguishing it from traditional open shielded pipe jacking.

The microtunnel boring machine (MTBM) is pushed into the earth by hydraulic jacks mounted and aligned in the jacking shaft. Jacks are then retracted and the slurry lines and control cables are disconnected. Pipe or casing is lowered into the shaft and inserted between the jacking frame and the MTBM or previously jacked pipe. The process is repeated until the MTBM reaches the exit shaft.
MICROTUNNELING

Defined as a non-manned, laser guided, remote controlled, continuous pipe jacking operation. Pipes are jacked (pushed) in sequence from the entry shaft to the exit shaft. This provides continuous support to the excavation face by applying mechanical or fluid pressure to balance groundwater and earth pressures. Support at the excavation face is a key feature of microtunneling, distinguishing it from traditional open shielded pipe jacking.

The microtunnel boring machine (MTBM) is pushed into the earth by hydraulic jacks mounted and aligned in the jacking shaft. Jacks are then retracted and the slurry lines and control cables are disconnected. Pipe or casing is lowered into the shaft and inserted between the jacking frame and the MTBM or previously jacked pipe. The process is repeated until the MTBM reaches the exit shaft.

APPLICATIONS

DIRECT PIPE
Stormwater and Sanitary Sewers, Sewer Outfalls, Combined Sewer Overflows (CSOs), Stormwater Management Systems, Sewage Systems

PRIMARY CASINGS
Installed within the microtunnel pipes (primary liner casing): Pressurized Water Transmission Lines, Oil/Fuel Lines, Electrical and Communication Utilities

WATERMAINS
DECAST has enhanced the AWWA C300 pipe design which allows our customers to install single-pass watermains or other high pressure applications

INSTALLATION
- Dense urban locations with crowded underground services
- Areas of contaminated soils
- Most soil types
- High groundwater areas
Reinforced concrete pipes that are designed to CSA A257.2 or ASTM C76.

- Pipes can support an internal pressure of 13.5 PSI, special designs can be provided on request.
- Pipes are designed for specific project conditions.
- Pipes are bell and spigot type, the spigot is concrete cast and the bell is a cast-in epoxy or zinc coated steel ring which design allows the jacking forces to be transmitted over the maximum concrete area of the pipe.
- Special joint designs are watertight to 45 PSI limiting infiltration and exfiltration.
- Includes a butt end joint with a cast-in epoxy coated steel band. The butt end joint design allows the jacking forces to be transmitted over the maximum concrete area of the pipe.
- A compressible packer is necessary to ensure even distribution of the jacking loads. Cast-in epoxy or zinc coated steel collar ensures that there is no lateral displacement of the pipe during the jacking process.
• Pipes that are jacked (pushed) are subjected to both jacking forces and external earth loads. Both of these types of loads need to be considered in the design of the pipe.
• Special design to conform to AWWA C300 is available for different pipe sizes.

<table>
<thead>
<tr>
<th>DECAST PIPE SPECIFICATION</th>
<th>NOMINAL DIAMETER (mm)</th>
<th>INTERNAL DIAMETER (mm)</th>
<th>WALL THICKNESS (mm)</th>
<th>OUTSIDE DIAMETER (mm)</th>
<th>EFFECTIVE PIPE LENGTH (mm)</th>
<th>APPROX. PIPE WEIGHT (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT-600</td>
<td>600</td>
<td>600</td>
<td>84</td>
<td>768</td>
<td>2000</td>
<td>980</td>
</tr>
<tr>
<td>MT-900</td>
<td>900</td>
<td>914</td>
<td>121</td>
<td>1156</td>
<td>2425</td>
<td>2408</td>
</tr>
<tr>
<td>MT-1200</td>
<td>1200</td>
<td>1200</td>
<td>145</td>
<td>1490</td>
<td>3000</td>
<td>4675</td>
</tr>
<tr>
<td>MT-1350</td>
<td>1350</td>
<td>1350</td>
<td>170</td>
<td>1690</td>
<td>3000</td>
<td>6150</td>
</tr>
<tr>
<td>MT-1500</td>
<td>1500</td>
<td>1500</td>
<td>183</td>
<td>1866</td>
<td>3000</td>
<td>7300</td>
</tr>
<tr>
<td>MT-1650</td>
<td>1650</td>
<td>1650</td>
<td>200</td>
<td>2050</td>
<td>3000</td>
<td>9000</td>
</tr>
<tr>
<td>MT-1800</td>
<td>1800</td>
<td>1829</td>
<td>197.5</td>
<td>2224</td>
<td>3000</td>
<td>9500</td>
</tr>
<tr>
<td>MT-2250</td>
<td>2250</td>
<td>2286</td>
<td>235</td>
<td>2756</td>
<td>3000</td>
<td>14100</td>
</tr>
<tr>
<td>MT-2500</td>
<td>2500</td>
<td>2500</td>
<td>240</td>
<td>2980</td>
<td>3000</td>
<td>16500</td>
</tr>
<tr>
<td>MT-2700</td>
<td>2700</td>
<td>2700</td>
<td>280</td>
<td>3260</td>
<td>3000</td>
<td>20000</td>
</tr>
</tbody>
</table>
An intermediate jacking station is a fabricated steel cylinder fitted with hydraulic jacks. Intermediate jacking stations are installed in the pipeline between two interjack pipes, LEAD PIPE and TRAIL PIPE. Interjacks are used on drives in which jacking forces will exceed the maximum allowable jacking force on the pipes, and reduce the forces on the pipe by pushing the pipes in front of the interjack. This means the main jacks only need to push the rear section of pipes.

Lubrication pipes are identified by black stripes applied to the red/white steel band at the location of the ports. These pipes have lubricating grout socket cast into the pipe at locations shown in the diagram above. Number of lubrication pipes used will vary depending on ground conditions and the choice of the contractor, but generally a lubrication pipe is used every 4th or 5th pipe.
An intermediate jacking station is a fabricated steel cylinder fitted with hydraulic jacks. Intermediate jacking stations are installed in the pipeline between two interjack pipes, LEAD PIPE and TRAIL PIPE.

Interjacks are used on drives in which jacking forces will exceed the maximum allowable jacking force on the pipes, and reduce the forces on the pipe by pushing the pipes in front of the interjack. This means the main jacks only need to push the rear section of pipes.
JOINTING DETAILS

The joint face must be square with the pipe barrel and must be fitted with a suitable packer material so that the jacking forces are evenly distributed across the joint.

An essential feature of microtunneling pipe joints which is different from conventional reinforced concrete pipe bell and spigot joints is that the joint does not extend out of the main barrel of the pipe. The entire joint is contained within the pipe wall thickness.

Many special jacking joints have been developed to handle specific situations. Rubber gasketed ring joints are used wherever watertightness is required. In the majority of microtunneling projects, DECAST has supplied rubber gasketed joints. The gasketed joint is specified with a pressure rating suitable for the magnitude of the jacking force and the required joint deflection.

STRESSES ON PIPE JOINTS

During pipe jacking operations it is necessary to ensure straight alignment of the jacked pipes with the tunnel axis. Straight alignment ensures uniform stress distribution of the jacking force and avoids stress concentrations in localized areas of the joint. Compression rings (cushioning packers) made of plywood, MDF or other low modulus material must be placed between the pipe joints to evenly distribute the jacking force through the jacking frame to the pipe. Cushioning packers reduce load concentrations caused by non-uniform jacking forces.

Pipe joints for intermediate jacking stations (interjacks) have to be specially designed. Provisions must be made for the joint gap to be developed without the joint coming out of alignment, and hydraulic jacks have to be accommodated within the edges of the pipe wall.
MICROTUNNELING DRIVES

LONG DRIVES
- Jacked from the launch shaft, the jacking force increases with the length of the section
- The pipe being pushed from the launch shaft must push all of the pipes in front through the soil
- Interjacks are used to increase microtunneling drive lengths

CURVED DRIVES
- Curved drives are sometimes necessary to avoid conflicts with utilities and structures underground
- Curves can be both horizontal (right-left) and vertical (up-down)
- The minimum radius that pipes of a certain diameter can turn is a microtunneling drive is dependent on the joint system
- Special jointing systems can be designed by DECAST to suit specific requirements

RADIUS OF CURVE
MANUFACTURING & QUALITY ASSURANCE

DECAST reinforced concrete microtunneling pipes are manufactured inside under controlled conditions. Concrete mix designs are developed and the computerized batching system ensures consistency of production.

DECAST holds a prequalification certificate in accordance with the Plant Prequalification Program for the manufacture of reinforced concrete microtunneling pipe of classes 65-D, 100-D, and 140-D in accordance with CSA A257.2, as well as class I to V with ASTM C76. Dimensions of each piece of pipe are verified, pipes are load tested and pipe joints are hydrostatically tested for watertightness.

DECAST product prices and additional information can be found on our website at www.decastltd.com

DECAST will provide quotations for projects on request. DECAST quotations include all products and services that DECAST can provide for a particular project. To request a quotation, contact our sales team at sales@decastltd.com.
DECAST EXPERIENCE

The design of reinforced concrete microtunneling pipe is based on practical experience gained from multiple case studies. Pipe design is challenging due to the on-site variation in transfer of jacking forces to the pipe barrel and pipe joint. Experience of pipe specialists like DECAST who are familiar with microtunneling can make a significant contribution to a project, especially if we are contacted at the earliest possible stage.

The combined field experience of the contractor and the pipe designer/manufacturer has been shown to be the largest cost saver on any project. Each microtunneling project is unique and should be treated as an engineered solution.

QUOTATIONS

DECAST product prices and additional information can be found on our website at www.decastltd.com. DECAST will provide quotations for projects on request. DECAST quotations include all products and services that DECAST can provide for a particular project. To request a quotation, contact our sales team at sales@decastltd.com.