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ABOUT THIS GUIDE

This installation guide contains suggestions and recommendations about handling and installing DECAST Concrete Pressure Pipe (CPP).

Contract specifications take precedence over this guide. DECAST assumes no responsibility or liability for CPP installation by reason of supplying this guide.

GENERAL NOTES

Weights and dimensions listed in this guide are for AWWA C301 standard 6.096 m long, gauge 16 cylinder pipes only.

Pipes up to and including 1500mm diameter are lined prestressed concrete cylinder pipe (LCP) and pipes 1650mm and larger are embedded prestressed concrete cylinder pipe (ECP).

Refer to project shop drawings for more specific information.

Lined CPP C301 (L)

[Diagram of Lined CPP C301 (L) showing STEEL SPIGOT RING, CONCRETE CORE, PRESTRESSING WIRE, MORTAR COATING, STEEL CYLINDER, STEEL BELL RING]

Embedded CPP C301 (E)

[Diagram of Embedded CPP C301 (E) showing STEEL SPIGOT RING, CONCRETE CORE, PRESTRESSING WIRE, MORTAR COATING, STEEL CYLINDER, STEEL BELL RING]
## CPP DIMENSIONS

CPP is manufactured to an American standard in inches. The “nominal” pipe diameter is the closest millimeter diameter after unit conversion.

<table>
<thead>
<tr>
<th>Nominal Pipe Diameter (mm)</th>
<th>Actual Pipe Diameter (in)</th>
<th>Mass of Pipe (kg)</th>
<th>Mass (kg/m)</th>
<th>Pipe Bell O.D. (mm)</th>
<th>Pipe Barrel O.D. (mm)</th>
<th>Pipe I.D. (mm)</th>
<th>Joint Diameter (mm)</th>
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<tbody>
<tr>
<td>400</td>
<td>16</td>
<td>1404</td>
<td>230</td>
<td>572</td>
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<td>1940</td>
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<tr>
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<td>2822</td>
<td>2822</td>
<td>2438</td>
<td>2569</td>
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</table>

The values listed above are for a standard gauge 16 cylinder pipe that is 6.096 m (20 ft) in length. Mass per pipe is provided as a guide only on this table. Mass per pipe can vary based on pipe design.

Please contact us at engineering@decastltd.com with your order number / job name for the actual mass of the pipe for your project.

Pipe bell and pipe barrel O.D indicated are the minimum value and can vary +20mm with an uneven surface.
DECAST CPP is shipped to the job site on DECAST trucks. When the DECAST truck arrives at the job site, the CPP will be on the truck stacked in the configurations shown.

- One pipe configuration
- Two pipe configuration
- Four pipe configuration
- Eight pipe configuration
- Eighteen pipe configuration
- Twenty four pipe configuration
Your shipment may include the following materials:
**Which remain DECAST property**

- Pipe spacer
- Wedge 4”x4” heel
- Wedge 6”x6” heel
- Wedge 8”x8” heel
- Straps
- Steel bunk
- 4”x4” sleeper
- 6”x6” sleeper

<table>
<thead>
<tr>
<th>Nominal Pipe Diameter (mm)</th>
<th>Mass of Pipe (kg)</th>
<th>Standard Truckload</th>
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<tr>
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<tr>
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<td>1800</td>
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</tr>
<tr>
<td>2400</td>
<td>26018</td>
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</table>

* 2 pipes only for flatbed trucks, 1 pipe for others

**Notes:**
- Quantities are for standard pipes only. Quantities may vary depending on pieces being loaded
- Unload rear pipes first
**INSPECTION (BEFORE UNLOADING) & ACCEPTANCE OF DELIVERY**

Each delivery will have a packing slip itemizing the products on the delivery truck.

---

**Packing Slip**

<table>
<thead>
<tr>
<th>SL#</th>
<th>Description</th>
<th>WT (LBS.)</th>
<th>WT (KG)</th>
<th>AMOUNT</th>
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</table>

**Please check your shipment for the following:**

1. Check your packing slip against your order. Notify the DECAST shipping department if there are any discrepancies between the order and the packing slip
2. Check for damage during transit
3. Note any damage on packing slip or missing product before accepting the shipment

Once the shipment has been verified, the packing slip must be signed and returned to the DECAST truck driver.
CPP MARKINGS (OUTSIDE)

Standard pipes have no exterior markings. A coloured stripe is used to identify a nonstandard pipe.

Blue stripe
A blue stripe identifies a pipe with a bevel end

Yellow stripe
A yellow stripe on the bell end identifies a restrained bell end

Pink stripe
A pink stripe at an outlet identifies a pipe with an outlet

Steel Cylinders
The steel cylinder inside the pipe is standard 16 gauge. If the gauge is thicker than 16 gauge the pipe is marked on the outside mortar coating with paint patches on the spigot end.
<table>
<thead>
<tr>
<th>U.S. Gauge Number</th>
<th>Steel Sheet Thickness</th>
<th>Marking Colour Code</th>
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<tr>
<td></td>
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</table>
CPP PIPE MARKINGS (INSIDE)

The bell end inner concrete lining of the pipe is stenciled with:

- CSA logo certification
- NSF/ANSI 61 drinking water certification
- Manufacturing Facility (M/F)
- Project Number (P/N) / Job Number (J/N)
- Mark Number (M/N)
- Cast Date (C/D)
- Serial Number (S/N)
- AWWA designation for CPP type
- Inspector’s stamp
MARKINGS ON FITTINGS

Markings on Fittings (Outside)

Fittings are marked to help identify the piece and aid in its installation. Fittings may contain the following markings:

• “L” (long side) and “S” (short side) are marked on the inside core and outside coating at the long and short location of the spigot end of elbows and bevels

• “TOP” is marked at the top location of the inside core and outside coating

• When installing a fitting with a top mark; the marking must be in the 12 o’clock position for proper horizontal and vertical alignment

• Branches or outlet pipe are marked with a pink stripe on the exterior mortar coating at the location of the branch or outlet
Markings on Fittings (Inside bell end)

- CSA logo certification
- NSF/ANSI 61 drinking water certification
- Manufacturing Facility (M/F)
- Project Number (P/N) / Job Number (J/N)
- Mark Number (M/N)
- Cast Date (C/D)
- Serial Number (S/N)
- AWWA designation for CPP type
- Inspector’s stamp

Notes:
1. All Markings shall be located at the bell end unless otherwise specified
2. Beveled pipe shall have “L” (long side) and an “S” (Short Side) marked on exterior coating and the inside core long location at the spigot end
3. The word “TOP” shall be marked at the top location on both the exterior coating and the inside core at the spigot end
4. Pieces manufactured for the province of Quebec shall be identified with the BNQ marking instead of CSA, Drinking water, NSF / ANSI 61 insignia. All other information shall be included. The BNQ marking is shown below
UNLOADING CPP

Contractors are responsible for obtaining proper equipment and to ensure all health and safety laws are obeyed while unloading materials. Care must be taken to not damage the pipe in anyway. Contact the DECAST shipping department immediately if the pipe is damaged.

Unloading Methods

Crane: Use steel cables or slings of sufficient lifting capacity.

Forklift: Forks must be cushioned with rubber or wood to prevent damage to the mortar coating.

DO NOT USE CHAINS

Multi-Tiered Shipments

When unloading; cross timbers must be secured to the trailer side rail on the unloading side. This is necessary to prevent timbers from kicking upwards and dropping the rear pipe off the back side of the trailer.

Shipment Materials

Dunnage and timbers are the property of DECAST and must be returned on the delivery truck. Any dunnage or timbers removed from the trailer will be billed back to the contractor.
ON-SITE STORAGE

DECAST CPP shipments include gaskets, lubricant and the diapers that are used for field grouting of joints. Grout is not included.

1. Gaskets should be stored in a cool place away from heat, sunlight, gasoline or other materials that can damage rubber

2. Joint lubricants should be stored according to the manufacturer's instructions. If freezing conditions are expected, keep indoors

3. If freezing conditions are expected, the CPP must be set on wooden skids off the ground to avoid damaging the mortar coating
SHOP DRAWINGS

DECAST provides sealed (stamped) shop drawings for all CPP projects. Installers must ensure they are using the latest revision of the shop drawings obtained from the project manager. Installers must refer to the shop drawings for the following information:

• Lists of all pipes and fittings
• Laying direction, sequence and alignment of pipeline
• Any special installation instructions
HANDLING AND LAYING

When handling CPP, care must be taken to avoid damaging the outer mortar coating, the ends, or the inner concrete lining.

- Trenches must be excavated to sufficient depths to provide required bedding
- Trenches must be wide enough for diaper installation and inspection
- Trench bottoms must be prepared as shown in project drawings
- Pipes and fittings have been designed to install and operating conditions specified in project contract documents. These conditions should not be modified without consulting the DECAST engineering department

All pipes, fittings, etc. shall be lowered into the trench using suitable pipe-laying equipment.

- Pipe must not be rolled, skidded, or dumped into the trench
- Laying equipment must have sufficient lifting capacity and stability

Pipes are to be laid with the bell ends facing the direction in which the pipe laying proceeds.
JOINTS

1) Standard Bell and Spigot Joints
Bell and spigot joints are the standard joint configuration for CPP. The spigot ring is steel and has a rectangular recess that holds a circular rubber O-ring gasket.

2) Restrained Joints
CPP is available with restrained joints to avoid the need to construct thrust blocks. CPP can be restrained to resist the thrust forces caused by changes in direction or dead ends. Restrained joints on CPP are designed by DECAST.

2.1 SNAP RING Joint
2.2 Harness Clamp Joint
2.3 Welded Joint
2.1 SNAP RING Joint
The SNAP RING joint is a restrained jointing system. The joint is made by tightening a bolt on the outside to employ a snap-ring to secure the spigot and bell against separation.

The SNAP RING bell requires a full site inspection prior to assembly
1) The hardware of the SNAP RING must be expanded fully. The bolt must be straight and the u-nut must be in the correct position and undamaged
2) The SNAP RING insert must be seated within the insert groove and be flush or below the surface of the bell as shown in picture #2

3) The Snap Ring Clip (also called the steel skid plate) will sit flat as it bridges the gap in the insert. It will take the shape of the Bell as the gasket pushes past it. **ANY DEFORMATION OR DAMAGE TO THE SNAP RING BELL, INSERT OR ITS HARDWARE MUST BE CORRECTED PRIOR TO INSTALLING JOINT**
4) Shown below: SNAP RING hardware not closed and joint not homed

![Image of SNAP RING hardware not closed and joint not homed]

5) Shown below: SNAP RING hardware closed and spigot engaged

![Image of SNAP RING hardware closed and spigot engaged]
2.2 Harness Clamp Joint

Harness joints are used as a mechanical means of transmitting longitudinal thrust across the joints. Often used at locations where there is the potential for future connection and also where the application dictates a higher pressure, for example at a bulkhead. The two-part harness clamp is positioned around the joint and secured by tightening drawbolts on each side.
2.3 Welded Joint

There are many different possibilities of welded joints. Depending on the pipe design and diameter welding can be done from the inside or the outside. Consult DECAST engineering for more information.

**Notes:**
- All joints must be protected from corrosion with a grout filled diaper
- Internally welded joints must be internally grouted as well
PREPARING PIPE ENDS FOR BELL AND SPIGOT JOINTING

To ensure a proper, watertight joint, the following steps must be taken prior to jointing.

1. Clean the bell and spigot of the pipe to remove all dirt and foreign materials

2. Apply lubricant to the spigot groove

3. Apply lubricant to the inside of the bell
4. Place the lubricated gasket in the gasket groove of the entire spigot ring. When the gasket is in place, insert a smooth rod or a screwdriver between the gasket and spigot ring and run the screwdriver/rod around the entire circumference of the spigot ring to ensure that the gasket is stretched evenly around the spigot. This usually takes 2 to 3 rotations to accomplish.

5. Coat the gasket with a 1 mm layer of lubricant.

Notes:

- Lubricant is supplied by DECAST
- To ensure a water tight joint, install gaskets immediately before laying the pipe
- Do not pre-install gaskets on pipes ahead of the installation crew, the lubrication will dry out
- In winter conditions, the bell and spigot must be preheated before lubrication and connection.
BRINGING PIPES TOGETHER TO FORM A JOINT

The following diagram shows three possible methods of bringing pipe together to form joints: lifting cables, come-along with lifting cables and hydraulic puller.

Lifting Cables

Come-along with lifting cables

Hydraulic Puller

The handling method is the responsibility of the installation contractor. Care must be taken to avoid any damage to the pipe, specifically to the joint rings and mortar coating.

Follow these steps to join pipes

1. Ensure that a space approximately 200 mm deep and 400 mm wide is excavated in the ground under the jointing area to facilitate grouting of the joint with the diaper

2. Carefully maneuver the new pipe to be added so that the nose of the spigot end is aligned into the flare of the bell end of the previously installed pipe. This is necessary so that the spigot will enter the bell end squarely. If the new pipe is properly aligned, it will slide into the pipe bell smoothly

3. Pipe must be suspended by cable or sling during jointing

4. If any dirt touches the lubricated spigot and bell before they are assembled, they must be cleaned and re-lubricated

5. It is the contractor’s responsibility to ensure the gaskets are correctly placed. Feeler gauges are available from DECAST upon request. Contact your DECAST service representative for direction on using a feeler gauge to check gaskets after jointing pipes
JOINT DEFLECTIONS

- If joint deflections are required for slight grade or line changes, they must be made after the pipes have been joined and before grouting.
- After the joint is squarely in place, the pipe can be deflected within the limits shown in the following deflection tables.
- Restrained joints must be fastened before they are deflected. Deflection limits for restrained joints are shown on the next page.

Joint Deflection of CPP with Standard Bell and Spigot Joints

<table>
<thead>
<tr>
<th>Nominal Pipe Diameter (mm)</th>
<th>Max. Joint Opening (mm)</th>
<th>Max. Deflection Angle</th>
<th>Max. Offset for Std. Length (mm)</th>
<th>Min. Curve Radius for Std. Length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>44</td>
<td>5° - 24'</td>
<td>574</td>
<td>64</td>
</tr>
<tr>
<td>450</td>
<td>44</td>
<td>4° - 49'</td>
<td>512</td>
<td>72</td>
</tr>
<tr>
<td>500</td>
<td>44</td>
<td>4° - 21'</td>
<td>462</td>
<td>80</td>
</tr>
<tr>
<td>600</td>
<td>44</td>
<td>3° - 38'</td>
<td>387</td>
<td>95</td>
</tr>
<tr>
<td>750</td>
<td>44</td>
<td>2° - 55'</td>
<td>311</td>
<td>119</td>
</tr>
<tr>
<td>900</td>
<td>44</td>
<td>2° - 26'</td>
<td>259</td>
<td>142</td>
</tr>
<tr>
<td>1050</td>
<td>44</td>
<td>2° - 7'</td>
<td>225</td>
<td>164</td>
</tr>
<tr>
<td>1200</td>
<td>44</td>
<td>1° - 51'</td>
<td>197</td>
<td>188</td>
</tr>
<tr>
<td>1350</td>
<td>41</td>
<td>1° - 30'</td>
<td>160</td>
<td>231</td>
</tr>
<tr>
<td>1500</td>
<td>44</td>
<td>1° - 27'</td>
<td>155</td>
<td>238</td>
</tr>
<tr>
<td>1650</td>
<td>28</td>
<td>0° - 55'</td>
<td>98</td>
<td>380</td>
</tr>
<tr>
<td>1800</td>
<td>31</td>
<td>0° - 56'</td>
<td>99</td>
<td>373</td>
</tr>
<tr>
<td>1950</td>
<td>35</td>
<td>0° - 57'</td>
<td>102</td>
<td>367</td>
</tr>
<tr>
<td>2100</td>
<td>31</td>
<td>0° - 48'</td>
<td>85</td>
<td>432</td>
</tr>
<tr>
<td>2250</td>
<td>41</td>
<td>0° - 59'</td>
<td>105</td>
<td>358</td>
</tr>
<tr>
<td>2400</td>
<td>41</td>
<td>0° - 55'</td>
<td>98</td>
<td>380</td>
</tr>
</tbody>
</table>

Note:
- Standard pipe length is 6.096 m (20 ft)
- Joint deflections may vary based on joint geometry. All joint deflections should be verified with the specified value on the shop drawings.
### Joint Deflection of CPP with Mechanical Retained Joints

<table>
<thead>
<tr>
<th>Nominal Pipe Diameter (mm)</th>
<th>Max. Joint Opening (mm)</th>
<th>Max. Deflection Angle</th>
<th>Max. Offset for Std. Length (mm)</th>
<th>Min. Curve Radius for Std. Length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>13</td>
<td>1 ° - 32 '</td>
<td>164</td>
<td>225</td>
</tr>
<tr>
<td>450</td>
<td>13</td>
<td>1 ° - 22 '</td>
<td>146</td>
<td>253</td>
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<tr>
<td>500</td>
<td>13</td>
<td>1 ° - 14 '</td>
<td>132</td>
<td>280</td>
</tr>
<tr>
<td>600</td>
<td>13</td>
<td>1 ° - 2 '</td>
<td>110</td>
<td>335</td>
</tr>
<tr>
<td>750</td>
<td>13</td>
<td>0 ° - 50 '</td>
<td>88</td>
<td>417</td>
</tr>
<tr>
<td>900</td>
<td>13</td>
<td>0 ° - 41 '</td>
<td>74</td>
<td>499</td>
</tr>
<tr>
<td>1050</td>
<td>13</td>
<td>0 ° - 36 '</td>
<td>64</td>
<td>576</td>
</tr>
<tr>
<td>1200</td>
<td>13</td>
<td>0 ° - 31 '</td>
<td>56</td>
<td>668</td>
</tr>
<tr>
<td>1350</td>
<td>13</td>
<td>0 ° - 27 '</td>
<td>49</td>
<td>751</td>
</tr>
<tr>
<td>1500</td>
<td>13</td>
<td>0 ° - 25 '</td>
<td>44</td>
<td>833</td>
</tr>
<tr>
<td>1650</td>
<td>13</td>
<td>0 ° - 24 '</td>
<td>43</td>
<td>854</td>
</tr>
<tr>
<td>1800</td>
<td>13</td>
<td>0 ° - 22 '</td>
<td>39</td>
<td>932</td>
</tr>
<tr>
<td>1950</td>
<td>13</td>
<td>0 ° - 20 '</td>
<td>36</td>
<td>1005</td>
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<tr>
<td>2100</td>
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<td>0 ° - 19 '</td>
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</tr>
<tr>
<td>2250</td>
<td>13</td>
<td>0 ° - 18 '</td>
<td>32</td>
<td>1156</td>
</tr>
<tr>
<td>2400</td>
<td>13</td>
<td>0 ° - 16 '</td>
<td>30</td>
<td>1232</td>
</tr>
</tbody>
</table>

**Note:**
- Standard pipe length is 6.096 m (20 ft)
- Joint deflections may vary based on joint geometry. All joint deflections should be verified with the specified value on the shop drawings

![Curve Radius Diagram](image)
SNAP RING Retrained Joints

1. With the snap ring in its expanded position insert the spigot of the adjoining pipe into the bell as previously described

2. After the pipe is pushed in completely, loosen the interior nut

3. The joint is assembled squarely and the insert is tightened only enough to prevent the pipe from pulling apart during deflection

4. Once the pipe has been deflected the required amount, the insert can be tightened to the extent of the bolt travel. Hand tightening is all that is required, do not force the bolt

5. Make grade/line adjustments as indicated on the shop drawings

6. Grout the joint following the procedure on the previous page
Harness Clamp Restrained Joints

Position the bottom half of the harness clamp under the joint prior to placing of the adjoining pipe

1. Assemble the bell and spigot joints as previously described

2. Position the top half of the harness clamp over the joint

3. Assemble joint by tightening the two bolts only enough to prevent the pipe from pulling apart during deflection

4. Once the pipe is deflected to the appropriate angle tighten the bolts and grout as usual

5. Make grade/line adjustments as indicated on the shop drawings

6. Grout the joint following the procedure on the previous page

Welded Restrained Joints

Several welded configurations are available. Consult the layout drawings of your project for specific information, or consult DECAST engineering department
PROTECTING THE JOINTS WITH A MORTAR COLLAR

1. Ensure a 200 mm deep and 400 mm wide space exists under the joint to guarantee grout surrounds the full circumference of the joint.

2. Place the supplied grout band also known as the “diaper” around the full circumference of the joint so that it straddles the joint recess. Tighten the straps. Fill diapers prior to backfilling.

3. Mix 3 parts of sand to 1 part of cement with enough water to make a free-flowing grout. Ensure that the same type of cement that was used in the pipe coating is used in the grout, as per contract specification.

4. Pour the grout into the diaper on one side until the mortar circles the pipe and appears on the other side. Continue pouring the grout on the other side until the diaper is full. Ensure the grout is rodded or agitated on both sides of the pipe alternately to settle the grout and fill all voids.

5. Use stiffer mix at the top and trowel the gap at the top of the diaper, ensuring that the entire joint is covered with 25mm of grout.

Diaper is placed around the joint and straps are tightened
Grout is poured into the diaper into one side and then the other until the diaper is completely full

Mortar the Inside of the Joint

At the discretion of the owner, for the inside joint recess of the CPP pipeline, typically 1500mm diameter and larger, use a ratio of 3:1 (sand to cement) and enough water to make a mix that can easily be troweled. Point the inner joint recess and strike off the surface smooth with the inside of the pipe.
Fittings allow for variations and adaptability from the straight course of a pipeline. Grade and line changes are implemented using fittings. Fittings are custom-made to size and configuration based on the pipeline design. Fittings are connected to concrete pressure pipe in the same way as joints for straight pipe.
CLOSURES

Closures are used to connect installed pipeline sections. They are designed and manufactured to the exact dimensions required. Contact your DECAST representative for assistance on field measurements of closures. Complicated geometry may require surveying equipment.
Closure sections are used when a new pipeline is connected to an existing pipeline, or when a connection is required after an isolated pressure test. To manufacture the closure section, DECAST requires the exact dimensions of the closure length.

If access to the pipe joints is available, the closure should be measured as per the diagram below. If the bulkheads cannot be removed or if complete excavation is not possible, DECAST Technical Services can instruct the survey crews on how to acquire the necessary dimensions. DECAST will manufacture the closure to fit the existing opening. The closure may be installed with a coupling or a split welding sleeve.

Closures can be manufactured for restrained or non-restrained areas of the pipeline.

Note:
For complex geometries, survey equipment provided by the contractor may be required to take specific measurements.
BACKFILLING

Bedding materials, and trench details are specified in contract documents and must be followed to ensure the pipe will perform as designed over time.

The exterior mortar coating on CPP provides protection for the prestressing wire and steel cylinder in the pipe so it is necessary to ensure that large rocks and debris are removed prior to backfilling to avoid damage to the exterior of the pipe.
DECAST FIELD SERVICES

On-Site Welding
DECAST provides on-site welding services. DECAST welders are Canadian Welding Bureau (CWB) certified. Personnel and equipment can also be provided for confined space entry.

Live Tapping
Outlets in pipe are needed for various reasons and when the location of outlets cannot be predetermined, it is necessary to tap into existing pressure lines. DECAST provides a full service field solution for pressure tapping for concrete pressure pipe and other pipe materials.
Consultation on Connection to Existing Pipes / Existing Infrastructure Rehabilitation

Determining the appropriate connection methods to existing pipes requires situation assessment, knowledge of pipe materials, engineering analysis and implementation. DECAST provides a complete solution from consultation through to implementation.

Contact DECAST at cppservices@decastltd.com for a quotation.