1. **Trench Floor Preparation:**

Ensure that the trench floor is smooth and firm, and within the design trench floor level limits of 100 mm minimum to 150 mm maximum below the bottom of the pipe, prior to placing any bedding.

- If the trench floor is in firm natural soil, and an excavator is being used, it will normally be sufficient to trim it smooth with the excavator bucket.
- If the trench floor is in rock, prior to placing any bedding, backfill between peaks over 30 mm high with sand compacted to 100% of SMODa.
- If the trench floor has been over-excavated below design trench floor level, [prior to placing any bedding], backfill with sand compacted to 100% of SMODa to achieve the design trench floor level.
- Remove loose soil or rock rubble from the floor of the trench.
- If the trench floor wholly or partially consists of very soft clay, loose sand, old or non-engineered fill, or refuse, or has isolated outcrops of rock in it, or has been disturbed by groundwater inflow, specialist geotechnical advice shall be sought.

2. **Bedding Placement:**

Do not compact the bedding - simply rake or screed to grade. Dig out pockets to clear the pipe sockets. Avoid walking down the centre of the bedding during placing or after it has been placed.

3. **Pipe Installation:**

Place the pipe firmly on the bedding, home it, and check that it is in contact with the bedding uniformly along its barrel.

- For small diameter pipes, lift the end of the pipe and visually inspect the contact with the bedding. For larger or heavier pipes, check the contact with the bedding by attempting to pass a hand under the pipe.
- If it is found that the pipe barrel does not have uniform contact with the bedding, pack in additional embedment sand.

4. **Side Support and Overlay Placement and Compaction:**

- TSA sand shall be used as side support and overlay fill material and placed in layers on each side of the pipe. The layer thickness shall not exceed 150 mm or half the pipe diameter, whichever is greater.
- Each layer shall be compacted to 95% SMODa.
- Ensure the sand is placed under the curve of the pipe while laying.
- Hand tampers or internal vibrators shall be used for sand compaction.

5. **Compaction:**

- Compaction of fill materials directly above the pipe shall not commence until the total depth of fill material above the top of pipe is at least 200 mm, and only hand equipment shall be used.
- Heavy vibrating/non-vibrating compaction equipment shall not be used until the minimum cover is 750 mm.

6. **Refer 4005-30002-01 & 4005-30002-02 for general notes.**

7. **All dimensions in millimetres.**

- Refer notes 4 and 5 on 4005-30003-01
NOTES:

1. THIS DRAWING IS TO BE USED FOR ALL PIPE INSTALLATIONS AND REPAIRS WITHIN EXISTING COUNCIL AND DPTI ROADS RESERVES. FOR INSTALLATION IN NEW SUBDIVISIONS PRIOR TO ROAD CONSTRUCTION THE ROAD PAVEMENT WILL BE SPECIFIED BY THE DESIGNER.

2. THE EXISTING ASPHALTIC CONCRETE PAVEMENT SHALL BE SAW CUT AND REMOVED FOR ITS FULL DEPTH AND NOT LESS THAN 100 mm WIDER EACH SIDE THAN THE EXCAVATED TRENCH WIDTH; ALL SURFACES SHALL BE CLEANED OFF AND EMLOSION PRIMED PRIOR TO REINSTATEMENT. ALL ASPHALTIC CONCRETE SHALL BE OBTAINED FROM A DPTI AUTHORIZED SUPPLIER.

3. SPRAY SEAL SPRAYED BITUMINOUS SURFACE SEAL TO MATCH THE EXISTING AND TO BE PLACED ON PRIMER SEAL AS PER CLAUSE 4.4 OF "EIC". THE SPRAY SEAL SHALL EXTEND 100 mm EITHER SIDE OF THE EXCAVATED TRENCH AND THE OUTER EDGE SHALL BE SAW CUT.

4. ASPHALT SURFACING ACID ASPHALTIC CONCRETE WEARING COURSE LIGHT DUTY MIX ON TACK COAT (EG CSR680) APPLIED AT 1.0 l/m².

5. ASPHALT SURFACING ACID ASPHALTIC CONCRETE WEARING COURSE MEDIUM DUTY MIX ON TACK COAT (EG CSR680) APPLIED AT 0.2 TO 0.3 l/m².

6. ASPHALT SURFACING ACID ASPHALTIC CONCRETE WEARING COURSE MEDIUM DUTY MIX WITH 3SP BITUMEN ON TACK COAT (EG CSR680) APPLIED AT 0.2 TO 0.3 l/m².

7. PMD/20 = 20 mm CLASS 1 QUARRIED PAVEMENT MATERIAL (PM/20/Q).

8. PMD/20 = 20 mm CLASS 1 QUARRIED PAVEMENT MATERIAL (PM/20/Q), OR 20 mm CLASS 1 RECYCLED PAVEMENT MATERIAL (PM/20/RQ). - PLACED IN 2 EQUAL LAYERS TO 98% MODIFIED COMPACTION.

9. PMD/20 = 20 mm CLASS 2 QUARRIED PAVEMENT MATERIAL (PM/20/QG) OR 20 mm CLASS 2 RECYCLED PAVEMENT MATERIAL (PM/20/RG). - PLACED IN 2 EQUAL LAYERS TO 95% MODIFIED COMPACTION.

10. AC74M = PLACED IN 3 EQUAL LAYERS ON EMLOSION PRIME (EG CSR680) APPLIED AT 1.0 l/m².

11. AC74M = PLACED IN 3 EQUAL LAYERS ON EMLOSION PRIME (EG CSR680) APPLIED AT 1.0 l/m².

12. PMD/20 = 20 mm CLASS 2 QUARRIED PAVEMENT MATERIAL (PM/20/QG) OR 20 mm CLASS 2 RECYCLED PAVEMENT MATERIAL (PM/20/RG). - PLACED IN 2 EQUAL LAYERS TO 93% MODIFIED COMPACTION.

13. 100% WEARING COURSE MEDIUM DENSITY MOO ON 10 mm C100 SPRAY AT 1.8 l/m² - WHERE AN EXISTING OPEN GRADE SURFACING LAYER IS TO BE REPLACED. THE LAYER THICKNESS SHALL MATCH EXISTING AT BOTH TOP OF EXISTING SURFACE AND SPRAY SEAL WITH BOTTOM SAM.

14. FOR ASPHALT LAYERS, A TACK COAT SHALL BE EVENLY APPLIED TO THE BASE AND SIDES OF THE EXCAVATION. A TACK COAT IS NOT REQUIRED BETWEEN INDIVIDUAL ASPHALT LAYERS IF A HOT BOND IS ACHIEVED.

15. WHERE THERE IS AN EXISTING OPEN GRADE SURFACING LAYER GREATER THAN 5 YEARS OLD OR IT IS NO LONGER DRAWING, A DENSE MIX SHALL BE USED IN LIEU OF OPEN GRADE.

16. ABBREVIATIONS: AADT = AVERAGE DAILY TRAFFIC, VPD = VEHICLES PER DAY, MOO = MODIFIED MAXIMUM DRY DENSITY AS 1295.2.2.

SA WATER STANDARD DRAWINGS
WATER SUPPLY CONSTRUCTION MANUAL
REINSTATEMENT OF ROAD PAVEMENTS,
HARD SHOULDERS AND VERGES IN ROAD RESERVES

DRAWING NUMBER
4005-30003-03

SUPERSEDES: 01-016-01(B)3
NOTES:

1. APPROVED MATERIALS:
   - TS4 SAND. REFER 4005-30003-01.
   - SA10-7 SCREENINGS.
   - GEOTEXTILE FILTER FABRIC SHALL BE MEDIUM WEIGHT NON-WOVEN NEEDLE PUNCHED.

   TRENCH CLEAR UP:

2. PRIOR TO BACKFILL:
   - TRIM THE SIDES, ENDS AND FLOOR OF THE EXCAVATION.
   - REMOVE ALL MUD AND LOOSE DEBRIS FROM THE FLOOR.
   - IT IS NOT NECESSARY TO REMOVE ALL WATER.

   WHERE SCREENINGS ARE UTILISED,

3. ALL EXISTING OR NEW PVC AND DIO PIPE SHALL BE WRAPPED:
   - WITH GEOTEXTILE FABRIC IDLE OVER THE PROTECTIVE SLEEVE.
   - MINIMUM OVERLAP SHALL BE 100 mm.
   - IF, SINTAKTE MECL, AC OR CAST IRON PIPES DO NOT REQUIRE WRAPPING.

4. DISTURBANCE TO THE EXISTING SAND EMBEDMENT OR TRENCH FILL SHALL BE MINIMISED BY:
   - DRAPING A GEOTEXTILE FABRIC DOWN THE ENDS OF THE EXCAVATION.
   - LAPPING IF CAREFULLY AROUND THE PIPE AND EXTEND TO NOT LESS THAN 300 mm OUT ONTO THE FLOOR OF THE EXCAVATION BEYOND THE PIPE.
   - PRESSING THE GEOTEXTILE FABRIC WELL INTO ALL CORNERS OF THE TRENCH. ENSURE NO SAND IS EJECTED.

5. WHERE THE FLOOR OR WALLS OF THE EXCAVATION CONSIST OF SAND OR VERY SOFT CLAY:
   - DRAPE GEOTEXTILE FABRIC DOWN THE WALLS AND ACROSS THE FLOOR OF THE EXCAVATION
   - PRESS THE GEOTEXTILE FABRIC WELL INTO ALL CORNERS OF THE TRENCH.
   - OVERLAP SHALL BE MINIMUM 300 mm

6. PLACE SCREENINGS ON THE FLOOR OF THE EXCAVATION UP TO THE LEVEL OF THE UNDERSIDE OF THE PIPE.
   - COMPACT BY WALKING IN, PUSHING THE SCREENINGS HARD UNDER THE BOTTOM OF THE PIPE.

7. FILL THE TRENCH:
   - IN EASEMENT OR NON-TRAFFICABLE AREAS, TO THE UNDERSIDE OF THE SURFACE ZONE, REFER 4005-30003-01.
   - IF THE EXISTING SOIL AT THIS LEVEL IS SAND, SILT AND CLAY, A LAYER OF GEOTEXTILE SHALL BE PLACED OVER THE SCREENINGS.
   - IN ROAD OR TRAFFICABLE AREAS TO THE UNDERSIDE OF THE BASE COURSE. REFER 4005-30003-03.
   - FOR BOTH ALTERNATIVES COMPACT THE TOP OF THE SCREENINGS WITH NOT LESS THAN THREE PASSES OF A VIBRATING PLATE COMPACTOR.
   - IF REQUIRED, THE SCREENINGS MAY BE BROUGHT UP TO WITHIN 40 mm OF THE SURFACE AND A TEMPORARY SURFACE OF RECYCLED ASPHALT PLACED.

8. FOLD ANY FLAPS OF GEOTEXTILE FROM (4) OR (5) BACK OVER THE TOP OF THE SCREENINGS.

9. REFER 4005-30002-01 & 4005-30002-02 FOR GENERAL NOTES.
1. GENERAL NOTES:
- This drawing provides guidance for identification and classification of soils to enable confirmation of the thrust block / anchor block sizing.
- The allowable horizontal bearing pressure value shown on this drawing shall be applied to tables depicted on other drawings from the 4005-30003 series.

2. TESTING:
- TESTING AREA PREPARATION:
  Conduct all native soil identification tests on a freshly exposed, damp, hand-trimmed area of the trench wall in the pipe zone. Take care that the soil in the exposed test area is not compacted or loosened during trench excavation.
  If the soil in the trench floor and wall is very dry at the time the trench is opened then flood the test area and allow time for the water to be absorbed by the soil before it is trimmed and tested.

- CLAY SOILS:
  Clay soils are best tested in the wall of the trench. The fist, the thumb or the thumbnail are used to determine the consistency (strength) of the clay (refer table.)

- CLEAN SAND SOILS:
  Clean sand soils are best tested in the floor of the trench by pushing with the whole body weight on one foot. The depth of the depression left by the boot is related to the density of the sand. Take care to ensure that the sand in the trench floor was not compacted or loosened during the excavation of the trench or the trimming of the test area.

- ROCK:
  Rock types are identified by examination of intact rock from the test area and should be described in detail. The recommended field identification tests for rock rely on observing the ease with which the rock can be dug with a pick, and estimating the spacing of the joints in the rock. Joints are commonly called cracks or breaks.

3. IDENTIFICATION:
- CLAY SOIL:
  A lump of clay soil will be difficult to break when dry. It will be sticky and need some effort to mould with the fingers when wet. Clay will not wash off easily. Individual clay particles cannot be seen by the naked eye.

- CLEAN SAND SOIL:
  The individual grains of sand will be visible to the eye. A lump of clean sand, if it can be picked up at all, will crumble with very little effort. Clean sand washes off easily.

<table>
<thead>
<tr>
<th>SOIL CLASSIFICATION</th>
<th>FIELD IDENTIFICATION</th>
<th>AHBP kPa Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERY SOFT</td>
<td>EASILY PENETRATED 40 mm WITH FIST.</td>
<td>&gt; 50 1</td>
</tr>
<tr>
<td>SOFT</td>
<td>EASILY PENETRATED 40 mm WITH THUMB.</td>
<td>&gt; 50 1</td>
</tr>
<tr>
<td>FIRM</td>
<td>MODERATE EFFORT NEEDED TO PENETRATE 30 mm WITH THUMB.</td>
<td>&gt; 50 1</td>
</tr>
<tr>
<td>STIFF</td>
<td>READILY INDENTED WITH THUMB BUT PENETRATED ONLY WITH GREAT EFFORT.</td>
<td>50 1</td>
</tr>
<tr>
<td>VERY STIFF</td>
<td>READILY INDENTED WITH THUMB.</td>
<td>100 1</td>
</tr>
<tr>
<td>HARD</td>
<td>INDENTED WITH DIFFICULTY BY THUMB.</td>
<td>200 1</td>
</tr>
<tr>
<td>LOOSE CLEAN SAND</td>
<td>TAKES FOOTPRINT MORE THAN 10 mm DEEP.</td>
<td>&gt; 50 1</td>
</tr>
<tr>
<td>MEDIUM-DENSE CLEAN SAND</td>
<td>TAKES FOOTPRINT 3 mm TO 10 mm DEEP.</td>
<td>50 1</td>
</tr>
<tr>
<td>DENSE CLEAN SAND OR GRAVEL</td>
<td>TAKES FOOTPRINT LESS THAN 3 mm DEEP.</td>
<td>100 1</td>
</tr>
<tr>
<td>BROKEN OR DECOMPOSED ROCK</td>
<td>DIGGABLE, HAMMER BLOW “THUDS”. JOINTS BREAK IN ROCK SPACED AT LESS THAN 300 mm APART.</td>
<td>100 1</td>
</tr>
<tr>
<td>SOUND ROCK</td>
<td>NOT DIGGABLE WITH PICK, HAMMER BLOW “RINGS”. JOINTS (BREAK IN ROCK) SPACED MORE THAN 300 mm APART.</td>
<td>200 1</td>
</tr>
<tr>
<td>UNCOMPACTED FILL DOMESTIC REFUSE</td>
<td>OBSERVATION AND KNOWLEDGE OF THE SITE HISTORY.</td>
<td>&gt; 50 1</td>
</tr>
</tbody>
</table>

**LEGEND:**

△ AHBP kPa = ALLOWABLE HORIZONTAL BEARING PRESSURE.
- 10 mm MOVEMENT
- CENTRE OF THRUST 800mm BELOW THE NATURAL SURFACE LEVEL
- HIGH WATER TABLE

1 SPECIAL GEOTECHNICAL ASSESSMENT REQUIRED
### BENDS (REFER NOTE 3)

<table>
<thead>
<tr>
<th>DN</th>
<th>HORIZONTAL</th>
<th>VERTICAL</th>
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</thead>
<tbody>
<tr>
<td>11 ¾</td>
<td>22 ½</td>
<td>45</td>
</tr>
<tr>
<td>150</td>
<td>1.1</td>
<td>2.1</td>
</tr>
<tr>
<td>200</td>
<td>1.3</td>
<td>2.4</td>
</tr>
<tr>
<td>250</td>
<td>1.5</td>
<td>2.6</td>
</tr>
<tr>
<td>300</td>
<td>1.6</td>
<td>2.8</td>
</tr>
</tbody>
</table>

**NOTES:**
1. REFER 4005-30002-01 & 4005-30002-02 FOR GENERAL NOTES.
2. ALL RESTRANDED LENGTHS ARE APPLICABLE FOR BURIED PIPELINES ONLY.
3. THE LENGTH OF RESTRAINT REQUIRED IS THE AMOUNT OF PIPELINE THAT MUST BE RESTRANDED EITHER SIDE OF THE FITTING, INCLUDING THE FITTING JOINTS.
4. IF THE DESIGNATED RESTRANDED LENGTH FOR A FITTING ENDCAP OR OVERLAPS THE DESIGNATED RESTRANDED LENGTH FOR ANOTHER FITTING, SPECIAL CONSIDERATION IS REQUIRED. IN THIS CASE REFER TO MANUFACTURER OR DESIGNER.
6. FOR TAPERS, IF THE MINIMUM LENGTH OF THE ADJACENT SMALL PIPE SIZE OCCURS, WITHOUT ENCODINGANOTHER FITTING’S RESTRAINT, THEN ONLY ONE RESTRANDED JOINT IS REQUIRED IN THE LARGE SOCKET OF THE TAPER.
7. IF THE MINIMUM LENGTH OF SMALL PIPE DOES NOT OCCUR THEN, FULL RESTRAINT IS REQUIRED.
8. TREAT FLUSHING BENDS AS A DEAD END.
9. 90° DEGREE VERTICAL BENDS REQUIRE SPECIAL DESIGN (REFER 4005-30003-06).
10. PLACE MARKING TAPE FOR IDENTIFICATION OF RESTRANDED SECTIONS OF THE PIPELINE ALONG THE TOP OF THE RESTRANDED PIPE LENGTHS AND FASTEN TO THE PIPE AT NOT LESS THAN 3 m CENTRES. MARKING TAPE TO BE PINK COLOURED POLYETHYLENE TAPE APPROXIMATELY 100 WIDE, WITH THE INSRIPTION: ‘WARNING - RESTRANDED PIPE - USE RESTRAIN FITTINGS ONLY’.
11. WHEN MAINTAINING OR CUTTING RESTRAIN FITTINGS OF PIPELINES IT IS RECOMMENDED THAT EFFECTIVE LENGTHS OF FITTINGS BE MEASURED ON SITE TO CONFIRM THEIR COMPLIANCE WITH THIS DRAWING.
12. RESTRAIN JOINTS MAY BE ASSUMED TO ACT AS A FLANGE JOINT.
13. WHERE THE RESTRANDED JOINTING SYSTEM IS USED THE USUALLY MARKED ‘RESTRANDED JOINT SYSTEM’ MARKING TAPE SHALL BE USED.
14. LENGTH SPECIFIED ON THE DRAWING IS NOT APPLICABLE FOR VERY SOFT, SOFT OR FIRM CLAY, LOOSE CLEAN SAND, UNCOMPACTED FILL OR REFUSE (REFER 4005-30003-05). A GEOTECHNICAL ASSESSMENT AND INDIVIDUAL DESIGN SHALL BE UNDERTAKEN FOR THESE SOILS.
15. THE MINIMUM OF PIPELINE REQUIRED TO BE RESTRANDED IS CALCULATED FROM THE PIPE DIAMETER, FITTING TYPE, STANDARD TRENCH CONDITIONS AND A PIPELINE PRESSURE OF 122 m.
16. HYDRANT TEES AND OTHER NON-THRUST BEARING FITTINGS DO NOT REQUIRE RESTRAINT.
17. FOR DETAILED CALCULATIONS, REFER TO THRUST RESTRAINT DESIGN FOR DUCTILE IRON PIPE BY DIPRA.
18. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.

### ASSEMBLY:
A. JOINTING SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
B. RESTRANDED VIA LOCKING GASKETS SHALL ONLY BE USED WITH DI PIPES AND FITTINGS FEATURING THE AUTHORISED SOCKET PROFILE. DO NOT USE WITH OTHER DI SOCKET PROFILES OR OTHER PIPE MATERIALS.
C. IF MAXIMUM JOINT DEFLECTION IS DESIRED, PUSH THE SPIGOT TO THE FIRST WITNESS MARK ONLY AND THEN DEFLECT THE JOINT. THE JOINT WILL NOT DEFLECT AFTER INSERTING THE SPIGOT ALL THE WAY HOME.

### DISASSEMBLY:
A. JOINTS TO BE DISASSEMBLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
B. DO NOT REUSE RESTRAIN JOINT GASKETS.