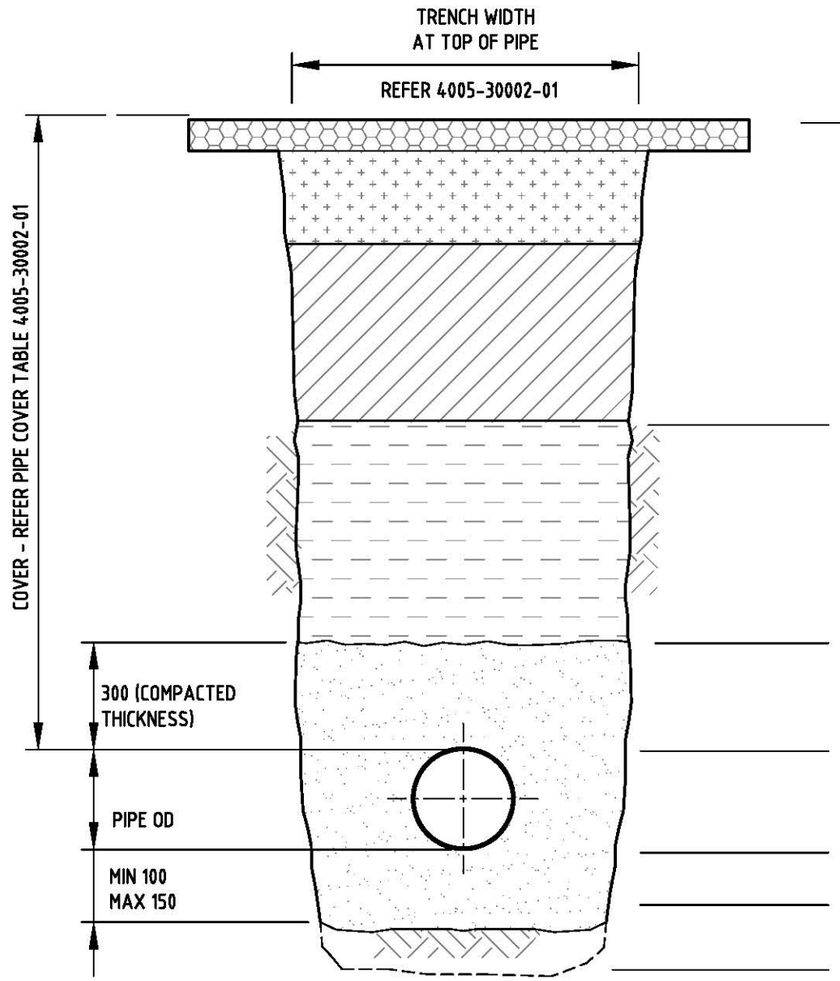
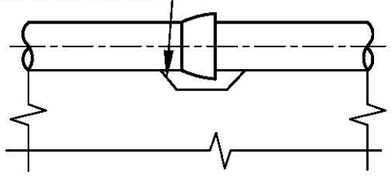



| MATERIAL / COMPACTION | | | |
|---|---|---|---|
| ZONE | | TRAFFICABLE AREAS (ROAD PAVEMENTS & SHOULDERS) | NON-TRAFFICABLE AREAS (EASEMENTS, ETC.) |
| SURFACE ZONE | | REFER TO 4005-30003-03 FOR ROAD PAVEMENT REQUIREMENTS.<br><br>REINSTATE BRICK PAVING, BITUMEN FOOTPATH, ETC. TO MATCH EXISTING. | REINSTATE TOPSOIL WITH GOOD QUALITY TOPSOIL LIGHTLY COMPACTED AND SEEDED, TURFED, ETC. TO MATCH EXISTING MINIMUM 150 mm THICK. |
| TRENCH FILL | | PM2/20 OR SA-C SAND COMPACTED TO 95% MMDD<br><br>OR<br><br>TS4 SAND COMPACTED TO 100% SMDD. | INORGANIC FILL WITH MAXIMUM STONE SIZE OF 75 mm COMPACTED TO 95% SMDD.<br><br>PLACE ALL MATERIALS IN MAXIMUM 200 mm (LOOSE) LAYERS. EACH LAYER TO BE COMPACTED SEPARATELY. |
| PIPE EMBEDMENT FILL | OVERLAY | | |
| | SIDE SUPPORT | TS4 SAND<br><br>REFER TO 4005-30003-02 | TS4 SAND<br><br>REFER TO 4005-30003-02 |
| | BEDDING | | |
| OVER-EXCAVATION BACKFILL | | | |

PROVIDE POCKETS IN BEDDING, AT JOINTS, PRIOR TO LAYING PIPES. FILL VOID DURING PLACEMENT OF EMBEDMENT



PIPE SOCKET BEDDING POCKETS

## NOTES:

1. REFER 4005-30002-01 & 4005-30002-02 FOR GENERAL NOTES.
2. ALL PIPE RISERS (EG. HYDRANT RISERS) SHALL BE SURROUNDED BY A MINIMUM OF 300 mm OF COMPACTED EMBEDMENT MATERIAL EXTENDING UP TO CONCRETE SPACER RING.
3. PM2/20 = 20 mm CLASS 2 PAVEMENT MATERIAL. IT MAY BE EITHER QUARRIED OR RECYCLED. RECYCLED MATERIAL SHALL NOT BE USED WHERE IT WILL BE EXPOSED AT THE SURFACE.
4. MMDD = MODIFIED MAXIMUM DRY DENSITY (AS 1289.5.2.1).
5. SMDD = STANDARD MAXIMUM DRY DENSITY (AS 1289.5.1.1).
6. IF THE TS4 SAND DOES NOT DISPLAY A DEFINED MOISTURE-DENSITY CURVE, (SEE NOTE 1 OF AS 1289.5.5.1 NOTE 1) THEN THE DENSITY INDEX ($I_D$) METHOD (AS 1289.5.6.1) SHALL BE USED FOR COMPACTION CONTROL.
   AN $I_D$ OF 75% SHALL BE TAKEN AS EQUIVALENT TO 95% OF SMDD, AND
   AN $I_D$ OF 80% SHALL BE TAKEN AS EQUIVALENT TO 97% OF SMDD, AND
   AN $I_D$ OF 90% SHALL BE TAKEN AS EQUIVALENT TO 100% OF SMDD.
7. (2) FOR EXISTING BITUMEN, BRICK PAVING, FOOTPATH ETC. IT SHALL BE REINSTATED TO MATCH EXISTING, UNLESS OTHERWISE AUTHORISED.
8. ALL DIMENSIONS ARE IN MILLIMETRES.

REVISION PANEL

| REV | DATE | DRN | DETAILS | APR |
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# SA WATER STANDARD DRAWINGS
# WATER SUPPLY CONSTRUCTION MANUAL
# PIPE EMBEDMENT & TRENCH FILL REQUIREMENT

A3 SHT SIZE | 2 REVISION

TOTAL SHEETS: 7

SUPERSEDES: 01-0008-01 (B1)

DRAWING NUMBER
4005 - 30003 - 01
PREFIX NUMBER SHEET

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 SMDD#.
- 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 SMDD# 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:

- TS4 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% SMDD#.
- ENSURE THE SAND IS PLACED UNDER THE CURVE OF THE PIPE WHILE LAYING.
- HAND TAMPERS OR INTERNAL VIBRATORS SHALL BE USED FOR SAND COMPACTION.

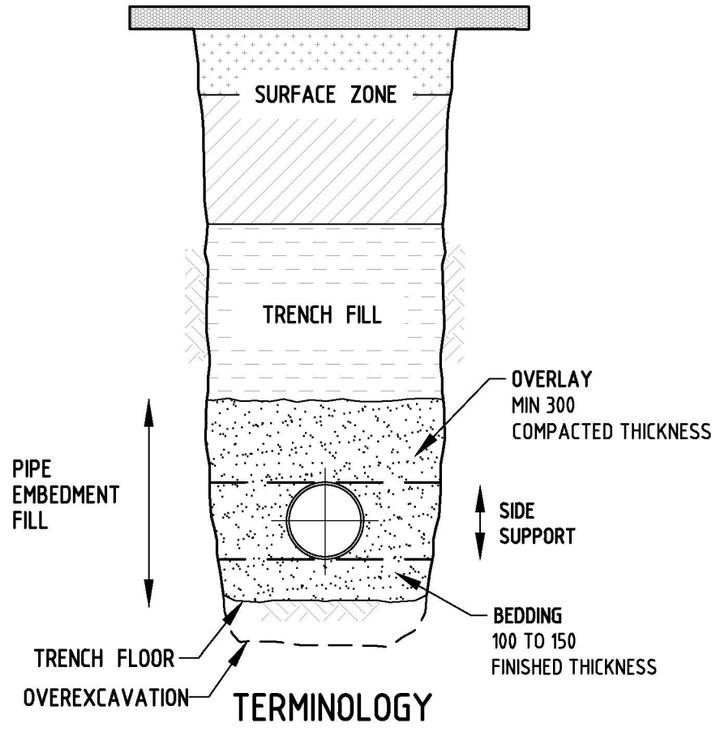
5. COMPACTION:

- 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



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REVISION PANEL

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Government of South Australia

SA Water



# SA WATER STANDARD DRAWINGS
# WATER SUPPLY CONSTRUCTION MANUAL
# INSTALLATION OF WATER SUPPLY PIPES IN ROAD RESERVES AND EASEMENTS USING TS4 SAND

A3 SHT SIZE

1 REVISION

TOTAL SHEETS:

SUPERSEDES: 01-0010-01 (B2)

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4005 - 30003 - 02
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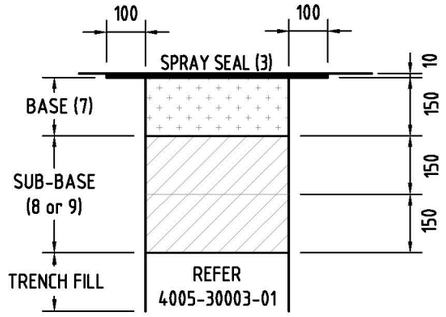
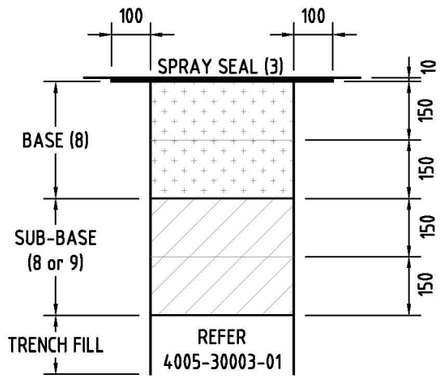


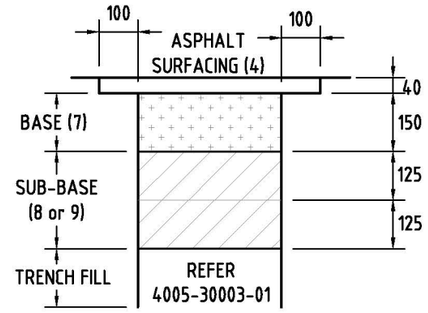

SPRAY SEAL SURFACE
LOW TRAFFIC ROADS WITH AADT (TWO WAY) <10,000 VPD

**FIGURE 1**



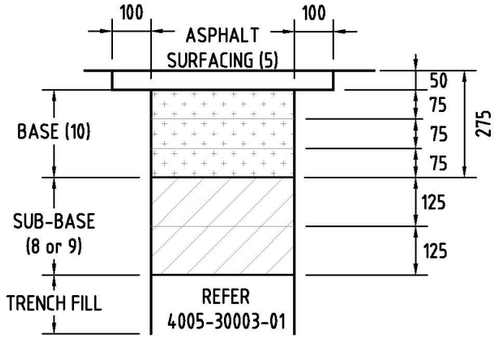

SPRAY SEAL SURFACE
HEAVY TRAFFIC ROADS WITH AADT
(TWO WAY) >10,000 VPD

**FIGURE 2**



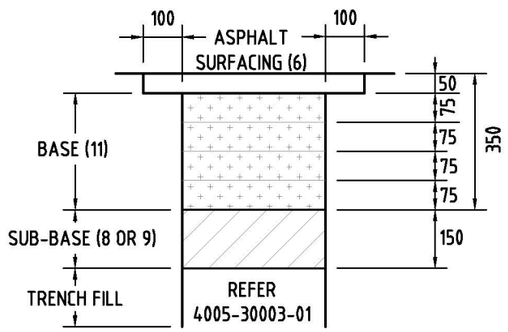

ASPHALT SURFACE
LOW TRAFFIC ROADS WITH AADT (TWO WAY) <2,000 VPD

**FIGURE 3**



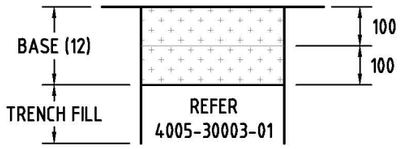

ASPHALT SURFACE
HEAVY TRAFFIC ROADS WITH AADT
(TWO WAY) >2,000 VPD BUT <20,000 VPD

**FIGURE 4**




ASPHALT SURFACE
VERY HEAVY (COMMERCIAL) TRAFFIC ROADS
WITH AADT (TWO WAY) >20,000 VPD

**FIGURE 5**




UNSEALED ROAD PAVEMENTS AND SHOULDERS

**FIGURE 6**


## OR REINSTATE BRICK PAVING ,BITUMEN FOOTPATH, ETC TO MATCH EXISTING

VERGES
ALL TRAFFIC DENSITIES

**FIGURE 7**

## NOTES:

1. THIS DRAWING IS TO BE USED FOR ALL PIPE INSTALLATIONS AND REPAIRS WITHIN EXISTING COUNCIL AND DPTI ROAD 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 EMULSION PRIMED PRIOR TO REINSTATEMENT. ALL ASPHALTIC CONCRETE SHALL BE OBTAINED FROM A DPTI AUTHORISED 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 "CRC". THE SPRAY SEAL SHALL EXTEND 100 mm EITHER SIDE OF THE EXCAVATED TRENCH AND THE OUTER EDGE SHALL BE SAW CUT.
4. ASPHALT SURFACING AC10 ASPHALTIC CONCRETE WEARING COURSE (LIGHT DUTY MIX) ON TACK COAT (EG CRS60) APPLIED AT 1.0 l/m$^2$.
5. ASPHALT SURFACING AC10 ASPHALTIC CONCRETE WEARING COURSE (MEDIUM DUTY MIX) ON TACK COAT (EG CRS60) APPLIED AT 0.2 TO 0.3 l/m$^2$.
6. ASPHALT SURFACING AC10 ASPHALTIC CONCRETE WEARING COURSE (MEDIUM DUTY MIX WITH A35P BITUMEN) ON TACK COAT (EG CRS60) APPLIED AT 0.2 TO 0.3 l/m$^2$.
7. PM1/20 = 20 mm CLASS 1 QUARRIED PAVEMENT MATERIAL (PM1/20QG).
8. PM1/20 = 20 mm CLASS 1 QUARRIED PAVEMENT MATERIAL (PM1/20QG), OR 20 mm CLASS 1 RECYCLED PAVEMENT MATERIAL (PM1/20 RG). - PLACED IN 2 EQUAL LAYERS TO 98% MODIFIED COMPACTION.
9. PM2/20 = 20 mm CLASS 2 QUARRIED PAVEMENT MATERIAL (PM2/20 QG) OR 20 mm CLASS 2 RECYCLED PAVEMENT MATERIAL (PM2/20 RG). - PLACED IN 2 EQUAL LAYERS TO 98% MODIFIED COMPACTION.
10. AC14M - PLACED IN 3 EQUAL LAYERS ON EMULSION PRIME (EG CRS60) APPLIED AT 1.0 l/m$^2$.
11. AC14M - PLACED IN 4 EQUAL LAYERS ON EMULSION PRIME (EG CRS60) APPLIED AT 1.0 L/m$^2$.
12. PM2/20 = 20 mm CLASS 2 QUARRIED PAVEMENT MATERIAL (PM2/20 QG) OR 20 mm CLASS 2 RECYCLED PAVEMENT MATERIAL (PM2/20 RG). - PLACED IN 2 EQUAL LAYERS TO 95% MODIFIED COMPACTION.
13. OG14 - WEARING COURSE (MEDIUM DENSITY MIX) ON 10 mm C170 SPRAY AT 1.8 l/m$^2$ - 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 SAMI.
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 DRAINING, A DENSE MIX SHALL BE USED IN LIEU OF OPEN GRADED.
16. ABBREVIATIONS: AADT = AVERAGE ANNUAL DAILY TRAFFIC; VPD = VEHICLES PER DAY; MMDD = MODIFIED MAXIMUM DRY DENSITY (AS 1289.5.2.1).

REVISION PANEL

| REV | DATE | DRN | DETAILS | APR |
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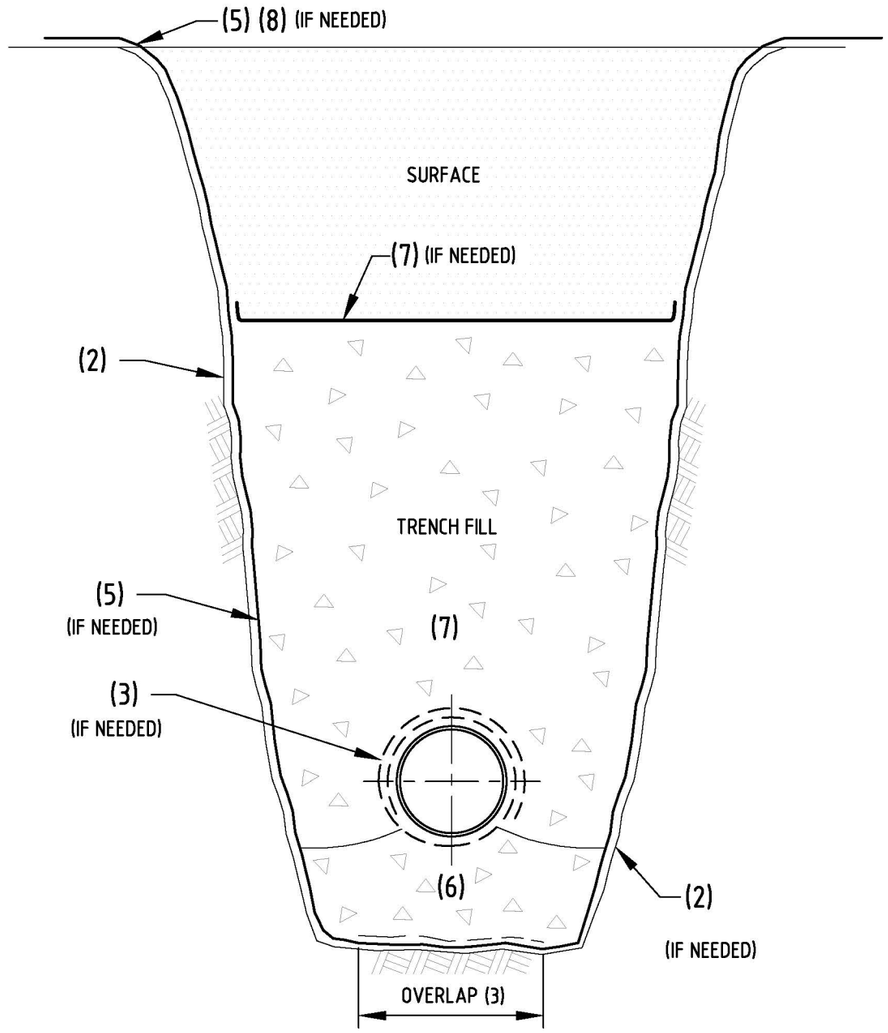
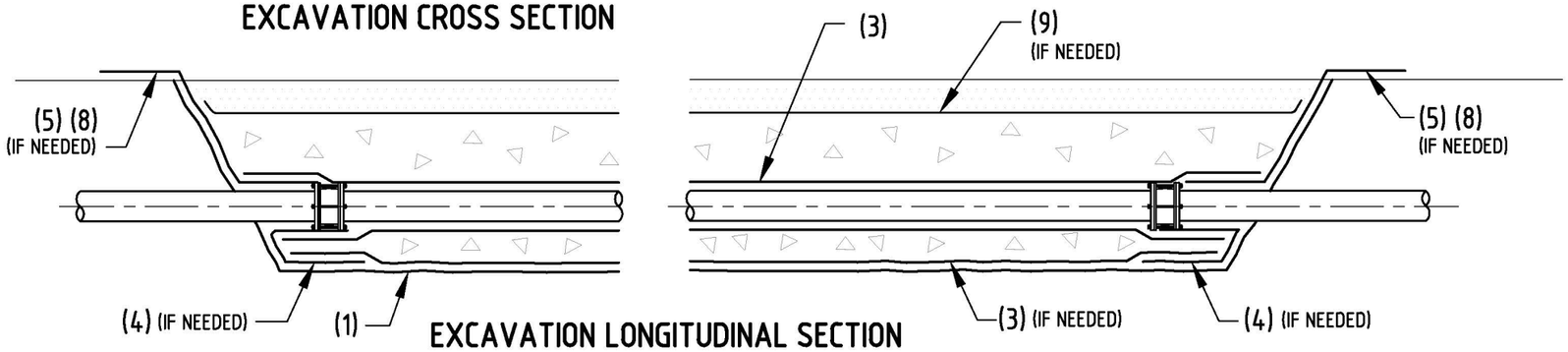
# SA WATER STANDARD DRAWINGS
# WATER SUPPLY CONSTRUCTION MANUAL
# REINSTATEMENT OF ROAD PAVEMENTS, HARD SHOULDERS AND VERGES IN ROAD RESERVES

A3 SHT SIZE | 2 REVISION
TOTAL SHEETS:
SUPERSEDES: **01-0161-01 (B3)**
DRAWING NUMBER
**4005-30003-03**
PREFIX NUMBER SHEET




EXCAVATION CROSS SECTION




EXCAVATION LONGITUDINAL SECTION

## 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 CLEAN 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 DICL PIPE SHALL BE WRAPPED:
   - WITH GEOTEXTILE FABRIC (DICL OVER THE PROTECTIVE SLEEVE).
   - MINIMUM OVERLAP SHALL BE 100 mm.
   - (PE, SINTAKOTE MSCL, 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 IT CAREFULLY AROUND THE PIPE AND EXTEND TO NOT LESS THAN 300 mm OUT ONTO THE FLOOR OF THE EXCAVATION BENEATH THE PIPE.
   - PRESSING THE GEOTEXTILE FABRIC WELL INTO ALL CORNERS OF THE TRENCH. ENSURE NO SAND IS EXPOSED.
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 40mm 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.

REVISION PANEL

| REV | DATE | DRN | DETAILS | APR |
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# SA WATER STANDARD DRAWINGS
# WATER SUPPLY CONSTRUCTION MANUAL
# REINSTATEMENT OF EXCAVATIONS AFTER BURSTS OR OTHER SMALL SCALE REPAIR WORKS

A3 SHT SIZE | 1 REVISION

TOTAL SHEETS:

SUPERSEDES: 01-0162-01 (B4)

DRAWING NUMBER

4005 - 30003 - 04

PREFIX NUMBER SHEET

## 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 (REFER TABLE). 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:
  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).
  THE SPACING BETWEEN JOINTS IS IMPORTANT BECAUSE THE ALLOWABLE BEARING PRESSURE ON ROCK IS USUALLY CONTROLLED BY THE JOINTS IN IT, RATHER THAN THE INHERENT STRENGTH OF A FRAGMENT OF ROCK. JOINTS MAY BE TIGHTLY CLOSED (LIKE HAIRLINE CRACKS), BUT CAN ALSO BE OPEN (FILLED WITH AIR) OR FILLED WITH SOFT CLAY OR OTHER SOIL.

## 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 SOILS:
  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.

| SOIL CLASSIFICATION | | FIELD IDENTIFICATION | AHBP kPa Δ |
|---|---|---|---|
| CLAY SOILS | VERY SOFT | EASILY PENETRATED 40 mm WITH FIST. | < 50 [1] |
| | SOFT | EASILY PENETRATED 40 mm WITH THUMB. | < 50 [1] |
| | FIRM | MODERATE EFFORT NEEDED TO PENETRATE 30 mm WITH THUMB. | < 50 [1] |
| | **STIFF** | **READILY INDENTED WITH THUMB BUT PENETRATED ONLY WITH GREAT EFFORT.** | **50** |
| | **VERY STIFF** | **READILY INDENTED WITH THUMBNAIL.** | **100** |
| | **HARD** | **INDENTED WITH DIFFICULTY BY THUMBNAIL.** | **200** |
| SANDS | LOOSE CLEAN SAND | TAKES FOOTPRINT MORE THAN 10 mm DEEP. | < 50 [1] |
| | **MEDIUM-DENSE CLEAN SAND** | **TAKES FOOTPRINT 3 mm TO 10 mm DEEP.** | **50** |
| | **DENSE CLEAN SAND OR GRAVEL** | **TAKES FOOTPRINT LESS THAN 3 mm DEEP.** | **100** |
| ROCK | **BROKEN OR DECOMPOSED ROCK** | **DIGGABLE. HAMMER BLOW "THUDS". JOINTS (BREAKS IN ROCK) SPACED AT LESS THAN 300 mm APART.** | **100** |
| | **SOUND ROCK** | **NOT DIGGABLE WITH PICK. HAMMER BLOW "RINGS" JOINTS (BREAK IN ROCK) SPACED MORE THAN 300 mm APART.** | **200** |
| UNCOMPACTED FILL DOMESTIC REFUSE | | OBSERVATION AND KNOWLEDGE OF THE SITE HISTORY. | < 50 [1] |

LEGEND:

Δ 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

REVISION PANEL

| REV | DATE | DRN | DETAILS | APR | CURRENT REV AUTHORISED: / SIGNATURE: |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| 1 | 31/03/16 | MS | 2016 STANDARDS REVIEW | TG | |

DESIGN PANEL

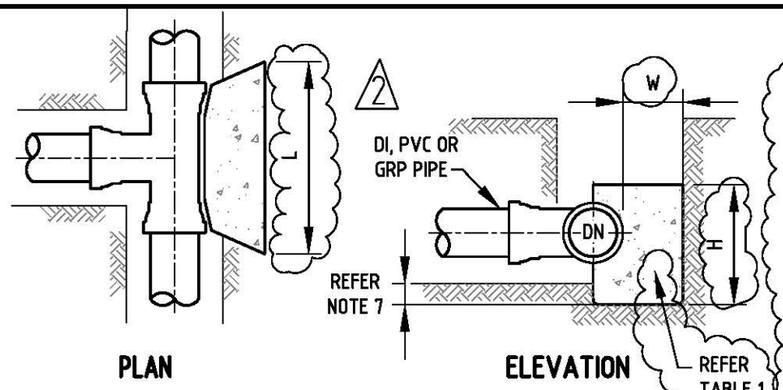
| | | | |
|---|---|---|---|
| DESIGNED: | 28/09/15 RJP | AUTHORISED: | 31/03/16 T.GALEK |
| DRAWN: | 16/11/15 MS | SIGNATURE: | T.Galek |
| REVIEWED: | 21/03/16 TG | | |



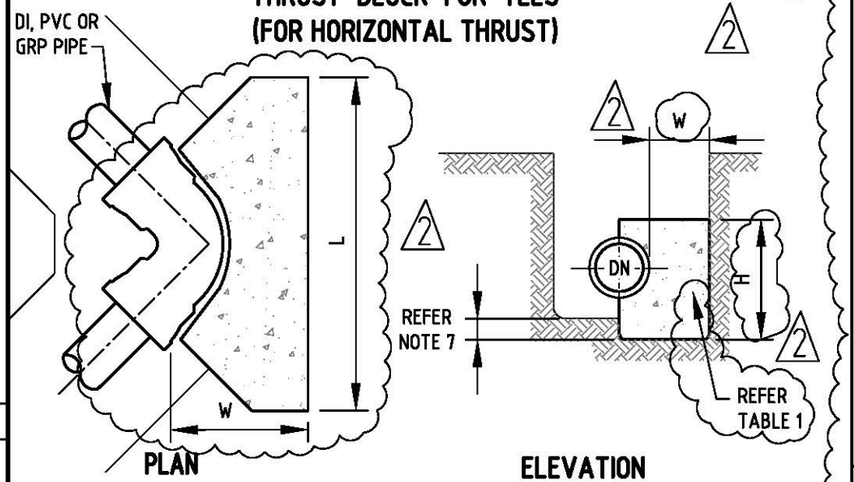
SA WATER STANDARD DRAWINGS
WATER SUPPLY CONSTRUCTION MANUAL

SOIL CLASSIFICATION GUIDELINES

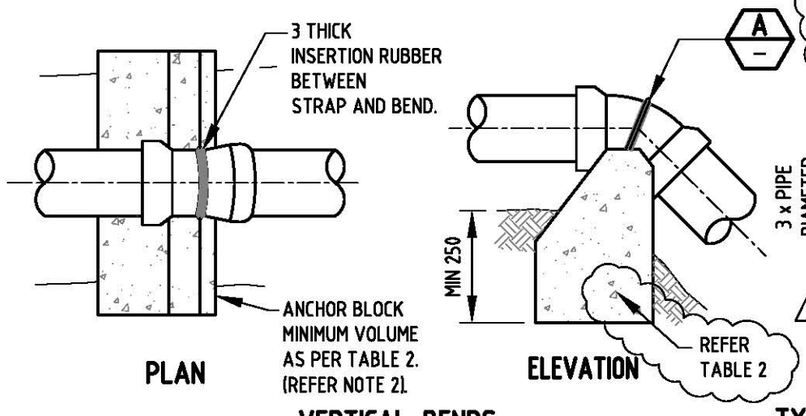
A3 SHT SIZE | 1 REVISION
TOTAL SHEETS:
SUPERSEDES: 02-0292-01 (B5)
DRAWING NUMBER
4005 - 30003 - 05
PREFIX NUMBER SHEET




## THRUST BLOCK FOR TEES (FOR HORIZONTAL THRUST)




## THRUST BLOCK FOR BENDS (FOR HORIZONTAL THRUST)




## VERTICAL BENDS

## TYP STAINLESS STEEL STRAP

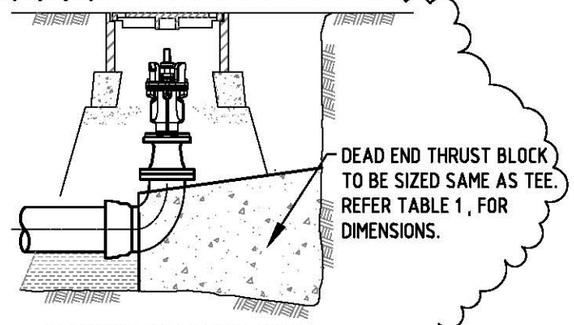
### TABLE 1. HORIZONTAL THRUST SIZING - BENDS AND TEE.

| | | | SOIL CLASSIFICATION REFER 4005-30003-05 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 50 kPa | | | | 100 kPa | | | | 200 kPa | | | |
| ITEM | DN | (DEG.) | MIN. THRUST AREA ($M^2$) | DIMENSIONS L | W | H | MIN. THRUST AREA ($M^2$) | DIMENSIONS L | W | H | MIN. THRUST AREA ($M^2$) | DIMENSIONS L | W | H |
| HOR. BEND | 100 | 11.25 | N | N | 250 | 300 | N | N | 250 | 300 | N | N | 250 | 300 |
| | | 22.5 | 0.16 | 450 | 250 | 400 | N | N | 250 | 300 | N | N | 250 | 300 |
| | | 45 | 0.29 | 650 | 300 | 500 | N | N | 250 | 300 | N | N | 250 | 300 |
| | | 90 | 0.54 | 1250 | 600 | 550 | 0.27 | 850 | 400 | 400 | N | N | 250 | 300 |
| | 150 | 11.25 | 0.16 | 500 | 250 | 350 | N | N | 250 | 400 | N | N | 250 | 350 |
| | | 22.5 | 0.32 | 650 | 300 | 500 | 0.16 | 400 | 250 | 400 | N | N | 250 | 350 |
| | | 45 | 0.61 | 1000 | 500 | 650 | 0.31 | 850 | 400 | 400 | 0.16 | 450 | 250 | 400 |
| | | 90 | 1.12 | 1400 | 700 | 1000 | 0.56 | 1400 | 700 | 500 | 0.29 | 900 | 450 | 400 |
| | 200 | 11.25 | 0.27 | 700 | 350 | 400 | N | N | 350 | 400 | N | N | 250 | 400 |
| | | 22.5 | 0.53 | 1200 | 600 | 500 | 0.27 | 700 | 350 | 400 | 0.10 | 450 | 250 | 400 |
| | | 45 | 1.04 | 1400 | 700 | 800 | 0.53 | 1000 | 500 | 600 | 0.27 | 750 | 350 | 400 |
| | | 90 | 1.92 | 2000 | 1000 | 1200 | 0.96 | 1500 | 750 | 800 | 0.48 | 1200 | 600 | 500 |
| | 250 | 11.25 | 0.42 | 800 | 400 | 550 | 0.21 | 550 | 250 | 450 | N | N | 250 | 450 |
| | | 22.5 | 0.82 | 1000 | 500 | 1000 | 0.42 | 1000 | 500 | 450 | 0.21 | 600 | 300 | 450 |
| | | 45 | 1.58 | 1400 | 700 | 1200 | 0.80 | 1400 | 700 | 600 | 0.40 | 1100 | 550 | 450 |
| | | 90 | 2.91 | 3000 | 1500 | 1250 | 1.46 | 2200 | 1100 | 900 | 0.74 | 1600 | 800 | 600 |
| | 300 | 11.25 | 0.59 | 1000 | 500 | 600 | 0.30 | 800 | 400 | 450 | 0.16 | 450 | 250 | 400 |
| | | 22.5 | 1.17 | 1600 | 800 | 750 | 0.59 | 1000 | 500 | 600 | 0.30 | 800 | 400 | 500 |
| | | 45 | 2.29 | 2000 | 1000 | 1250 | 1.15 | 1500 | 750 | 800 | 0.58 | 1300 | 650 | 800 |
| | | 90 | 4.24 | 4400 | 2200 | 1200 | 2.13 | 2200 | 1100 | 1200 | 1.07 | 1800 | 900 | 600 |
| | 375 | 11.25 | 0.90 | 1200 | 600 | 800 | 0.45 | 800 | 400 | 600 | 0.22 | 600 | 300 | 600 |
| | | 22.5 | 1.79 | 2000 | 1000 | 1000 | 0.90 | 1600 | 800 | 600 | 0.45 | 800 | 400 | 600 |
| | | 45 | 3.49 | 3200 | 1600 | 1200 | 1.74 | 2000 | 1000 | 1000 | 0.88 | 1600 | 800 | 600 |
| | | 90 | 6.45 | 6400 | 3200 | 1250 | 3.23 | 3200 | 1600 | 1250 | 1.61 | 2000 | 1000 | 1000 |
| TEE | 100 | | 0.38 | 1000 | 500 | 400 | 0.19 | 500 | 250 | 400 | N | N | 250 | 300 |
| | 150 | | 0.80 | 1000 | 500 | 800 | 0.40 | 1000 | 500 | 400 | 0.21 | 700 | 350 | 400 |
| | 200 | | 1.36 | 1600 | 800 | 850 | 0.69 | 1000 | 500 | 700 | 0.35 | 900 | 450 | 450 |
| | 250 | | 2.06 | 1800 | 900 | 1200 | 1.04 | 1400 | 700 | 800 | 0.53 | 1100 | 550 | 500 |
| | 300 | | 3.00 | 3000 | 1500 | 1000 | 1.50 | 1500 | 750 | 1000 | 0.75 | 1300 | 650 | 600 |
| | 375 | | 4.56 | 3400 | 1700 | 1250 | 2.29 | 2000 | 1000 | 1150 | 1.15 | 1500 | 750 | 800 |

### TABLE 2. VERTICAL BEND THRUST SIZING

| PIPE DN | CONCRETE VOLUME ($m^3$) 11 ¼° BEND | 22½° BEND | 45° BEND |
|---|---|---|---|
| 100 | 0.15 | 0.3 | 0.55 |
| 150 | 0.35 | 0.65 | 1.2 |
| 200 | 0.6 | 1.15 | 2.15 |
| 250 | 0.95 | 1.8 | 3.35 |
| 300 | 1.35 | 2.6 | 4.8 |
| 375 | 2.05 | 4.05 | 7.45 |

NOTE:
IN CALCULATING THE CONCRETE VOLUME NO CONTRIBUTION FROM THE PIPELINE SELF WEIGHT HAS BEEN INCLUDED




## PERMANENT DEAD END

## NOTES:

1. REFER 4005-30002-01 TO 4005-30002-04 FOR GENERAL NOTES.
2. THE THRUST AREA OF ALL BLOCKS SHALL BE CAST AGAINST A CLEAN FACE OF UNDISTURBED NATURAL SOIL.
3. THRUST BLOCKS SHALL NOT INTERFERE WITH OTHER SERVICES.
4. REFER 4005-30003-05 FOR SOIL CLASSIFICATION GUIDELINES.
   WHERE SOIL AHBP <50 kPa, THRUST BLOCKS AS SIZED IN THIS DRAWING SHALL NOT BE USED.
   FOR SOIL <50 kPa, A GEOTECHNICAL ASSESSMENT AND INDIVIDUAL DESIGN SHALL BE UNDERTAKEN AND PROVIDED TO THE SA WATER REPRESENTATIVE. (2)
5. THE NOMINAL THRUST AREA 'N' SHALL BE ACHIEVED BY:
   - POURING CONCRETE THE FULL LENGTH OF THE FITTING. (NOT PROTRUDING PAST THE SOCKET).
   - EXTEND FROM THE FLOOR OF THE TRENCH. (DEEPER IF REQUIRED TO ACHIEVE THE REQUIRED THRUST AREA).
   - FINISH APPROXIMATELY 100 mm ABOVE FITTING.
   - PLACE A MEMBRANE AGAINST THE FITTING PRIOR TO PLACEMENT OF CONCRETE. (POLYETHYLENE, PVC OR FELT) (2)
6. BLOCK SIZING IN THIS DRAWING IS BASED UPON A DESIGN PRESSURE OF 1600kPa. PRESSURES OTHER THAN 1600 kPa WILL REQUIRE ADJUSTMENT. THE CALCULATION (RELATIVE TO 1600 kPa VALUE). THE MINIMUM THRUST AREA SHALL BE REDUCED OR INCREASED BY THE RATIO OF THE DESIGN PRESSURES EXCEPT WHERE:
   - MIN THRUST AREA IS <0.1 m , AND
   - 'N' APPEARS IN THE TABLE.
7. AS A MINIMUM, FINISH THE THRUST BLOCK APPROX. 100 ABOVE THE FITTING OR BEARING PAD AND EXTEND TO THE FLOOR OF THE TRENCH OR DEEPER IF NECESSARY TO ACHIEVE THE REQUIRED THRUST AREA. (2)
8. FOR DOWNWARD VERTICAL THRUST, THE ALLOWABLE BEARING PRESSURE FOR VARIOUS SOILS SHALL BE CONSIDERED TWICE THAT FOR HORIZONTAL THRUST SHOWN.
9. IF THE WATER TABLE IS, OR WOULD RISE, CLOSE TO THE SURFACE, DOWNGRADE SOIL CLASSIFICATION TO THE NEXT WEAKEST SOIL CATEGORY DEFINED IN 4005-30003-05. (2)
10. ALL DIMENSIONS IN MILLIMETRES. (2)

### REVISION PANEL

| REV | DATE | DRN | DETAILS | APR |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| 2 | 07/05/18 | RP | TABLES REVISED. OTHER MINOR CHANGES. | |
| 1 | 31/03/16 | MS | 2016 STANDARDS REVIEW | TG |

CURRENT REV 08/08/18
AUTHORISED: T.GALEK
SIGNATURE: T. Galek

### DESIGN PANEL

| | | | |
|---|---|---|---|
| DESIGNED: | 28/09/15 | AUTHORISED: | 31/03/16 |
| | RJP | | T.GALEK |
| DRAWN: | 16/11/15 | SIGNATURE: | |
| | MS | | ORIGINAL SIGNED |
| REVIEWED: | 21/03/16 | | |
| | TG | | |



SA WATER STANDARD DRAWINGS
WATER SUPPLY CONSTRUCTION MANUAL

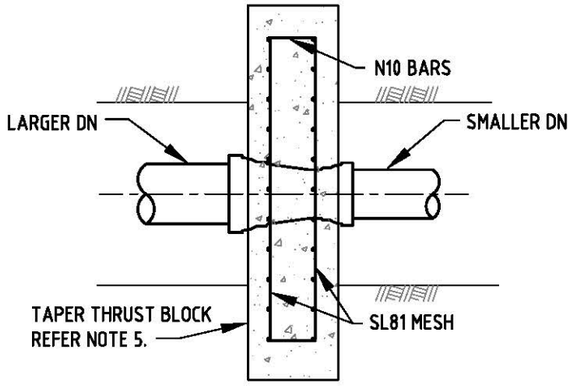
# HORIZONTAL & VERTICAL BENDS, TEES & PERMANENT DEAD END THRUST BLOCK SIZING DETAILS

A3 SHT SIZE | 2 REVISION

TOTAL SHEETS:

SUPERSEDES: 02-0193-01 (B7)

DRAWING NUMBER
4005 - 30003 - 06
PREFIX NUMBER SHEET

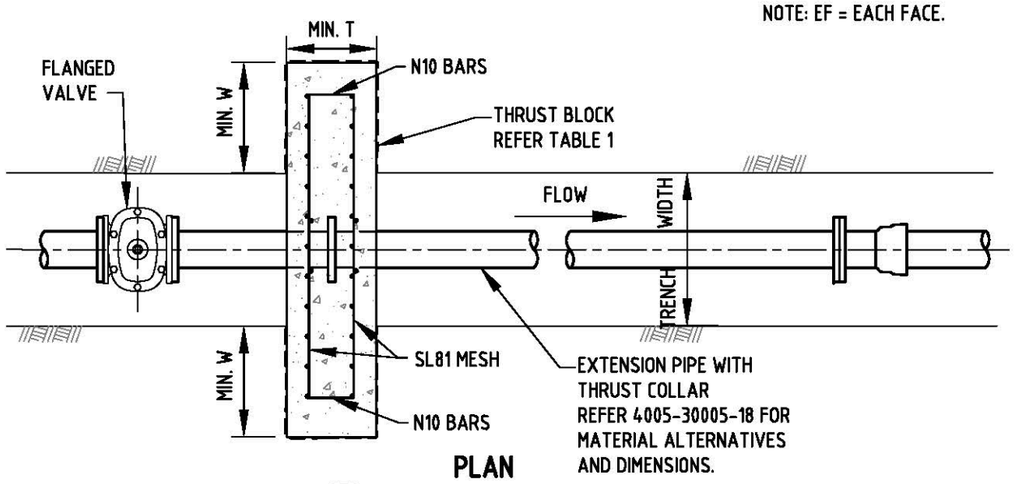



**PLAN**
**TAPER THRUST BLOCK**

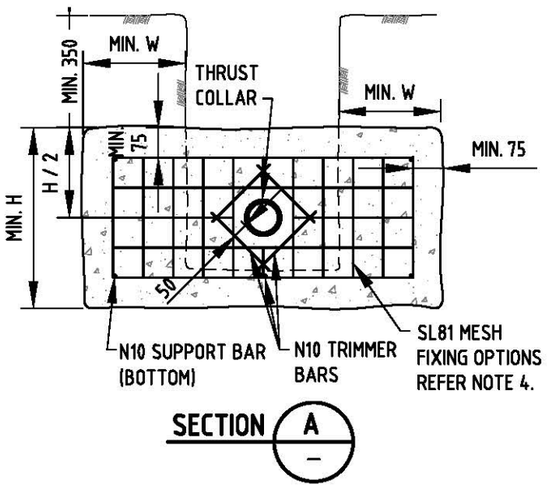
TABLE 1

| DN | < 50 kPa | 50 kPa | | | 100 kPa | | | 200 kPa | | | REINFORCEMENT | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FOR THIS CLASSIFICATION: | DIMENSIONS | | | DIMENSIONS | | | DIMENSIONS | | | | |
| | | W | H | T | W | H | T | W | H | T | FACES | SUPPORTS |
| 100 | 1. A GEOTECHNICAL ASSESSMENT SHALL BE MANDATORY. 2. SPECIFIC BLOCK SIZING SHALL BE DESIGNED BY A STRUCTURAL ENGINEER. REFER NOTE 7. | 300 | 600 | 300 | 300 | 600 | 300 | 300 | 600 | 300 | SL81 MESH EF | N10 BARS T & B/ N10 TRIMMER BARS |
| 150 | | 500 | 700 | 300 | 300 | 650 | 300 | 300 | 650 | 300 | | |
| 200 | | 600 | 1000 | 300 | 400 | 800 | 300 | 300 | 700 | 300 | | |
| 250 | | 800 | 1150 | 300 | 500 | 1050 | 300 | 300 | 800 | 300 | | |

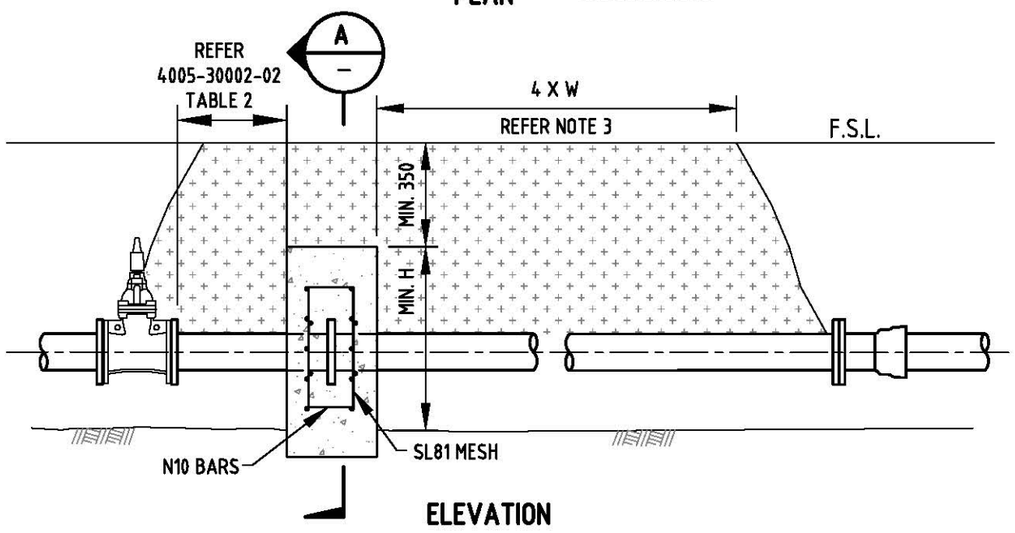
NOTE: EF = EACH FACE.



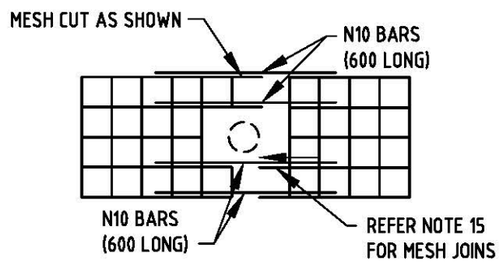

**PLAN**




**SECTION A**




**ELEVATION**




**DETAIL 1**

## GENERAL NOTES:

1. BLOCKS IN TABLE 1 ARE DESIGNED FOR A TEST PRESSURE OF 1600kPa. WHERE THE TEST PRESSURE IS OTHER THAN 1600 kPa, THE ADJUSTED SIZE SHALL BE CONFIRMED BY A STRUCTURAL ENGINEER TO COMPLY WITH THE REQUIRED TEST PRESSURE.
2. THE TOTAL BLOCK WIDTH = TRENCH WIDTH, PLUS 2 X W.
3. PRIOR TO THE PRESSURE TEST THE TRENCH SHALL BE FULLY BACKFILLED OR STRUTTED TO THE SURFACE LEVEL FOR A MINIMUM DISTANCE OF 4 X W DOWNSTREAM OF THE BLOCK.
4. PERMISSIBLE METHODS FOR POSITIONING OF MESH (EACH FACE):
   a. AS A WHOLE PIECE AROUND THE THRUST CONNECTOR PRIOR TO THE THRUST CONNECTOR BEING FITTED.
   b. AS TWO PIECES (WITH OVERLAP) JOINED AND TIED IF THE THRUST CONNECTOR HAS PREVIOUSLY BEEN FITTED. REFER DETAIL 1.
5. FOR A TAPER, THE BLOCK SHALL BE SIZED BASED UPON THE LARGER SIZE PIPE.
6. EXCAVATION WHERE GROUNDWATER IS ENCOUNTERED. IF THE WATERTABLE, IS, OR COULD RISE CLOSE TO THE SURFACE, DOWNGRADE THE SOIL CATEGORY TO A LOWER CLASSIFICATION IN THE TABLE (NEXT COLUMN TO THE LEFT).
7. WHERE A GEOTECHNICAL ASSESSMENT IS REQUIRED, THE REPORT AND DESIGN CALCULATIONS SHALL BE PROVIDED TO THE SA WATER REPRESENTATIVE.
8. WHERE DUCTILE IRON PIPES AND FITTINGS WITH RESTRAINED JOINTS ARE USED, ANCHOR BLOCKS MAY NOT BE REQUIRED. REFER 4005-30003-08 FOR RESTRAINED DUCTILE IRON JOINT SYSTEM.
9. REFER 4005-30002-01 TO 4005-30002-04 FOR GENERAL NOTES.
10. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

## STRUCTURAL NOTES:

11. CONCRETE GRADE SHALL BE N25.
12. CONCRETE SHALL BE VIBRATED DURING PLACEMENT.
13. REINFORCEMENT AS SPECIFIED IN TABLE 1. MINIMUM COVER TO REINFORCEMENT SHALL BE 75.
14. MINIMUM TWO ROWS OF MESH SHALL BE REQUIRED ABOVE AND BELOW PIPE.
15. ALL REINFORCEMENT SHALL BE SECURED IN POSITION. WIRE TIES OF ANNEALED STEEL HAVING A DIAMETER OF NOT LESS THAN 1.2 mm OR WELDING OF STEEL SHALL BE UTILISED. MESH JOINS SHALL BE FIXED AT ALL INTERSECTIONS. SUPPORT BARS FORMING A LAPPED SPLICE SHALL BE FIXED TOGETHER AT THE ENDS IN AT LEAST TWO PLACES.
16. BLOCK CONSTRUCTION SHALL BE:
    - LOCATED CENTRALLY ABOUT THRUST COLLAR AND EXTENDING INTO BOTH SIDES AND FLOOR OF TRENCH.
    - CONCRETE SHALL BE POURED AGAINST SOUND UNDISTURBED FACE OF THE EXCAVATION..

REVISION PANEL

| REV | DATE | DRN | DETAILS | APR |
|---|---|---|---|---|
| | | | | |
| | | | | |
| 3 | 01/05/19 | RP | DRAWING UP TO DN 250 ONLY. MESH REINFORCEMENT | TG |
| 2 | 03/05/18 | RP | TOTAL DRAWING CONTENT REVISED | TG |
| 1 | 31/03/16 | MS | 2016 STANDARDS REVIEW | TG |

CURRENT REV AUTHORISED: T.GALEK
SIGNATURE: T. Galek

DESIGN PANEL

| | | | |
|---|---|---|---|
| DESIGNED: | 28/02/19 | AUTHORISED: | T.GALEK |
| | RJP | | |
| DRAWN: | 28/02/19 | SIGNATURE: | ORIGINAL SIGNED |
| | RP | | |
| REVIEWED: | | | |
| | TG | | |

SA Water



SA WATER STANDARD DRAWINGS
WATER SUPPLY CONSTRUCTION MANUAL

# IN-LINE THRUST BLOCKS ≤ DN 250

A3 SHT SIZE | 3 REVISION
TOTAL SHEETS:
SUPERSEDES:
DRAWING NUMBER
4005-30003-07
PREFIX NUMBER SHEET

## BENDS (REFER NOTE 3)

| DN | HORIZONTAL | | | | VERTICAL | | | | | | DEAD ENDS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | UPWARD THRUST | | | DOWNWARD THRUST | | | |
| | 11 ¼° (m) | 22½° (m) | 45° (m) | 90° (m) | 11 ¼° (m) | 22½° (m) | 45° (m) | 11 ¼° (m) | 22½° (m) | 45° (m) | (m) |
| 100 | 0.8 | 1.6 | 3.4 | 8.1 | 2.4 | 4.9 | 10.2 | 0.8 | 1.6 | 3.4 | 24.7 |
| 150 | 1.1 | 2.2 | 4.6 | 11.2 | 3.4 | 6.9 | 14.4 | 1.1 | 2.2 | 4.6 | 34.7 |
| 200 | 1.4 | 2.8 | 5.9 | 14.2 | 4.4 | 8.8 | 18.4 | 1.4 | 2.8 | 5.9 | 44.4 |
| 250 | 1.6 | 3.1 | 6.5 | 15.8 | 4.9 | 9.8 | 20.5 | 1.6 | 3.1 | 6.5 | 49.4 |
| 300 | 1.8 | 3.7 | 7.7 | 18.5 | 5.8 | 11.7 | 24.4 | 1.8 | 3.7 | 7.7 | 58.9 |

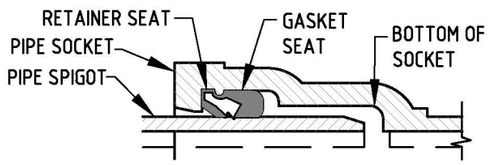
## TEES (REFER NOTE 5)

| MAIN PIPE DN | BRANCH PIPE DN | MIN. DISTANCE BETWEEN JOINTS 'A' 2 m RESTRAINED LENGTH 'B' (m) | 5.5 m RESTRAINED LENGTH 'B' (m) | 11 m RESTRAINED LENGTH 'B' (m) |
|---|---|---|---|---|
| 100 | 100 | 20.6 | 13.4 | 2.2 |
| 150 | 100 | 17.4 | 7.0 | 0.2 |
| | 150 | 30.5 | 23.2 | 11.6 |
| 200 | 100 | 14.8 | 1.1 | 0.2 |
| | 150 | 28.0 | 18.4 | 3.3 |
| | 200 | 40.2 | 32.8 | 21.1 |
| 250 | 100 | 10.6 | 0.2 | 0.2 |
| | 150 | 23.1 | 11.3 | 0.2 |
| | 200 | 34.5 | 25.3 | 10.9 |
| | 250 | 45.1 | 37.6 | 25.8 |
| 300 | 100 | 8.0 | 0.2 | 0.2 |
| | 150 | 20.9 | 6.6 | 0.2 |
| | 200 | 32.2 | 21.2 | 3.8 |
| | 250 | 42.8 | 33.7 | 19.5 |
| | 300 | 54.6 | 46.9 | 34.9 |
| 375 | 100 | REFER TO MANUFACTURER | | |
| | 150 | | | |
| | 200 | | | |
| | 250 | | | |
| | 300 | | | |

RESTRAINT LENGTH OF TEE BRANCH IS NOT PROPORTIONAL TO PRESSURE AND MUST BE CALCULATED FOR EACH INTERNAL PRESSURE SITUATION

## TAPERS (REFER NOTE 6)

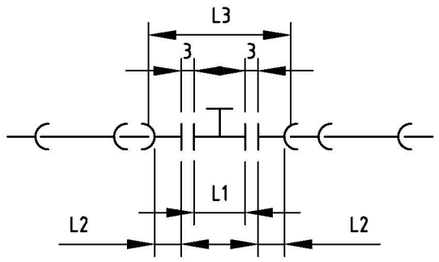
| LARGE PIPE DN | SMALL PIPE DN | MIN. LENGTH OF SMALL PIPE FOR ONE RESTRAINT (m) | MIN. LENGTH OF LARGE PIPE FOR FULL RESTRAINT (m) |
|---|---|---|---|
| 150 | 100 | 25.8 | 18.2 |
| 200 | 100 | 59.1 | 32.2 |
| 200 | 150 | 24.0 | 18.6 |
| 250 | 100 | 91.0 | 40.4 |
| 250 | 150 | 48.2 | 30.5 |
| 250 | 200 | 20.6 | 16.9 |
| 300 | 100 | 137.6 | 51.6 |
| 300 | 150 | 81.3 | 43.4 |
| 300 | 200 | 46.7 | 32.3 |
| 300 | 250 | 21.8 | 18.4 |
| 375 | 100 | REFER TO MANUFACTURER | |
| 375 | 150 | | |
| 375 | 200 | | |
| 375 | 250 | | |
| 375 | 300 | | |



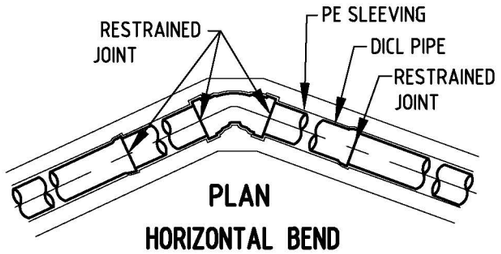

RESTRAINED JOINT SYSTEM

## RESTRAINED CUT-IN

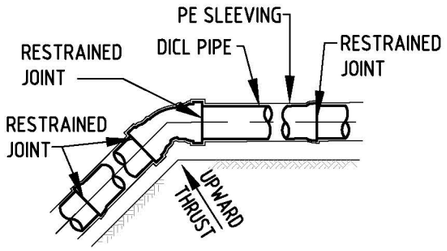
| DN | INSERT L1 | CONNECTOR L2 | OVERALL L3 |
|---|---|---|---|
| 100 | 356 | 110 | 582 |
| 150 | 406 | 135 | 682 |
| 200 | 484 | 135 | 760 |
| 250 | 534 | 155 | 850 |
| 300 | 610 | 170 | 956 |
| 375 | REFER TO MANUFACTURER | | |



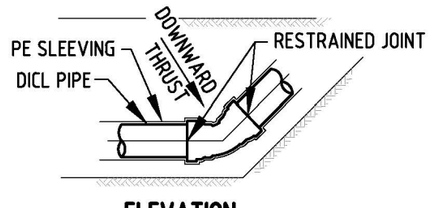

RESTRAINED CUT-IN



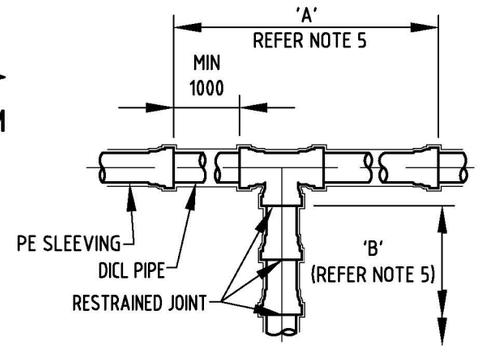

PLAN
HORIZONTAL BEND




ELEVATION
VERTICAL BEND - UPWARD THRUST




ELEVATION
VERTICAL BEND - DOWNWARD THRUST




PLAN
HORIZONTAL TEE

## NOTES:

1. REFER 4005-30002-01 & 4005-30002-02 FOR GENERAL NOTES.
2. ALL RESTRAINED LENGTHS ARE APPLICABLE FOR BURIED PIPELINES ONLY.
3. THE LENGTH OF RESTRAINT REQUIRED IS THE AMOUNT OF PIPELINE THAT MUST BE RESTRAINED EITHER SIDE OF THE FITTING, INCLUDING THE FITTING JOINTS.
4. IF THE DESIGNATED RESTRAINED LENGTH FOR A FITTING ENCROACHES, OR OVERLAPS THE DESIGNATED RESTRAINED LENGTH FOR ANOTHER FITTING, SPECIAL CONSIDERATION IS REQUIRED. IN THIS CASE REFER TO MANUFACTURER OR DESIGNER.
5. THE LENGTH OF RESTRAINT REQUIRED FOR TEES APPLIES TO 'B' (BRANCH) ONLY.
   THE MINIMUM DISTANCE 'A' BETWEEN JOINTS IS THE MINIMUM DISTANCE BETWEEN THE NEAREST UNRESTRAINED JOINT EITHER SIDE OF THE TEE, NOT INCLUDING THE TEE. RESTRAINT IS NOT REQUIRED IN THE MAIN LINE SOCKETS OR MECHANICAL COUPLINGS, UNLESS ENCROACHING (REFER NOTE 4).
6. FOR TAPERS, IF THE MINIMUM LENGTH OF THE ADJACENT SMALL PIPE SIZE OCCURS, WITHOUT ENCROACHING ANOTHER FITTING'S RESTRAINT, THEN ONLY ONE RESTRAINED JOINT IS REQUIRED IN THE LARGE SOCKET OF THE TAPER.
   IF THE MINIMUM LENGTH OF SMALL PIPE DOES NOT OCCUR THEN, FULL RESTRAINT IS REQUIRED.
7. TREAT FLUSHING BENDS AS A DEAD END.
8. 90 DEGREE VERTICAL BENDS REQUIRE SPECIAL DESIGN. REFER 4005-30003-06.
9. PLACE MARKING TAPE FOR IDENTIFICATION OF RESTRAINED SECTIONS OF THE PIPELINE ALONG THE TOP OF THE RESTRAINED 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 INSCRIPTION: 'WARNING - RESTRAINED PIPELINE - USE RESTRAINED FITTINGS ONLY'.
10. WHEN MAINTAINING OR CUTTING RESTRAINED SECTIONS OF PIPELINE IT IS REQUIREMENT THAT EFFECTIVE LENGTHS OF FITTINGS BE MEASURED ON SITE TO CONFIRM THEIR COMPLIANCE WITH THIS DRAWING.
11. RESTRAINED JOINTS MAY BE ASSUMED TO ACT THE SAME AS A FLANGED JOINT.
12. WHERE THE RESTRAINED JOINTING SYSTEM IS USED THE SPECIALLY MARKED "RESTRAINED JOINT SYSTEM" MARKING TAPE SHALL BE USED.
13. LENGTH SPECIFIED ON THE DRAWING IS NOT APPROPRIATE 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.
14. THE MINIMUM OF PIPELINE REQUIRED TO BE RESTRAINED IS CALCULATED FROM THE PIPE DIAMETER, FITTING TYPE, STANDARD TRENCH CONDITIONS AND A PIPELINE PRESSURE OF 122 m.
15. HYDRANT TEES AND OTHER NON-THRUST BEARING FITTINGS DO NOT REQUIRE RESTRAINT.
16. FOR DETAILED CALCULATIONS, REFER TO: THRUST RESTRAINT DESIGN FOR DUCTILE IRON PIPE BY DIPRA.
17. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.

## ASSEMBLY:

A. JOINTING SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
B. RESTRAINT VIA LOCKING GASKETS SHALL ONLY TO 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 RESTRAINED JOINT GASKETS.

REVISION PANEL

| REV | DATE | DRN | DETAILS | APR |
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| 1 | 31/03/16 | MS | 2016 STANDARDS REVIEW | TG |

CURRENT REV
AUTHORISED:
SIGNATURE:

DESIGN PANEL

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|---|---|---|---|
| DESIGNED: | 28/09/15 | AUTHORISED: | 31/03/16 |
| | RJP | | T.GALEK |
| DRAWN: | 16/11/15 | SIGNATURE: | |
| | MS | | |
| REVIEWED: | 21/03/16 | | |
| | TG | | |

Government of South Australia
SA Water



SA WATER STANDARD DRAWINGS
WATER SUPPLY CONSTRUCTION MANUAL

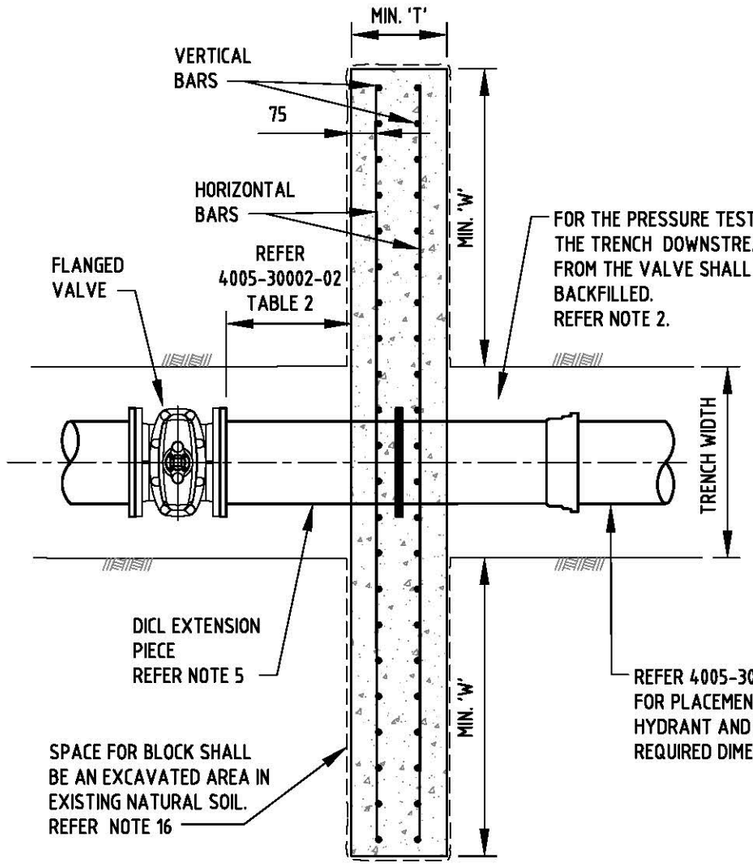
# RESTRAINED DUCTILE IRON JOINT SYSTEM

A3 SHT SIZE | 1 REVISION
TOTAL SHEETS:
SUPERSEDES: 02-0295-01 (B9)
DRAWING NUMBER
4005 - 30003 - 08
PREFIX NUMBER SHEET

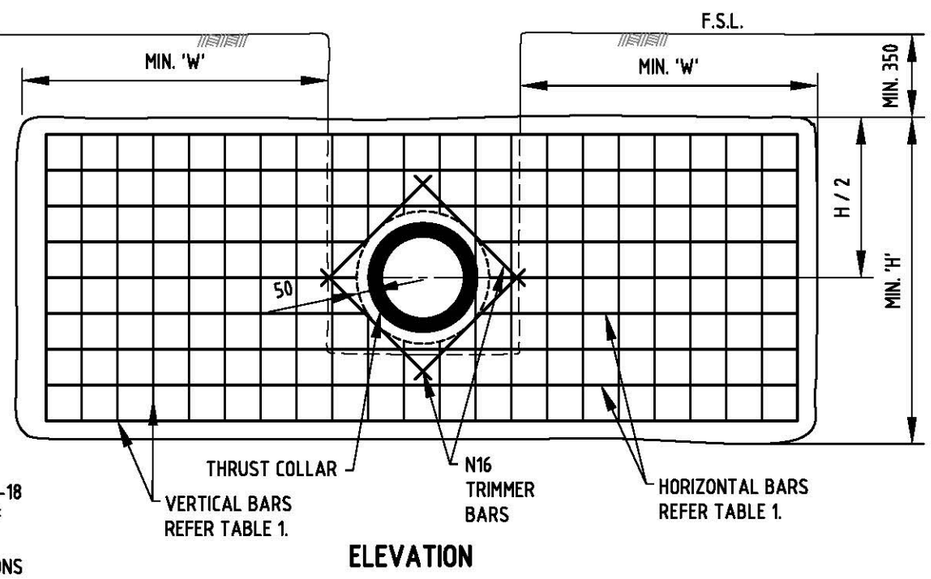
TABLE 1

| SOIL CLASSIFICATIONS (AHPB) - REFER 4005-30003-05 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DN | < 50 kPa | 50 kPa | | | 100 kPa | | | 200 kPa | | | REINFORCEMENT | |
| | FOR THIS CLASSIFICATION: | DIMENSIONS | | | DIMENSIONS | | | DIMENSIONS | | | | |
| | 1. A GEOTECHNICAL ASSESSMENT SHALL BE MANDATORY. | W | H | T | W | H | T | W | H | T | HOR. | VERT. |
| 300 | 2. SPECIFIC BLOCK SIZING SHALL BE DESIGNED BY A STRUCTURAL ENGINEER. | 1250 | 1350 | 400 | 600 | 1150 | 350 | 400 | 1100 | 350 | N16-150 EF | N12-150 EF |
| 375 | REFER NOTE 7. | 1400 | 1500 | 400 | 950 | 1150 | 400 | 500 | 1100 | 400 | N16-150 EF | N12-150 EF |

NOTE: EF = EACH FACE.




PLAN




ELEVATION

## GENERAL NOTES:

1. BLOCKS IN TABLE 1 ARE DESIGNED FOR A TEST PRESSURE OF 1600kPa. WHERE THE TEST PRESSURE IS OTHER THAN 1600 kPa, THE ADJUSTED SIZE SHALL BE CONFIRMED BY A STRUCTURAL ENGINEER TO COMPLY WITH THE REQUIRED TEST PRESSURE.
2. PRIOR TO THE PRESSURE TEST THE TRENCH SHALL BE FULLY BACKFILLED OR STRUTTED TO THE SURFACE LEVEL FOR A MINIMUM DISTANCE OF 4 X W DOWNSTREAM OF THE BLOCK.
3. THE TOTAL BLOCK WIDTH = TRENCH WIDTH, PLUS 2 X W.
4. FOR A TAPER, THE BLOCK SHALL BE SIZED BASED UPON THE LARGER SIZE PIPE.
5. THE EXTENSION PIECE SHALL BE DICL. MINIMUM LENGTH 1500.
6. EXCAVATION WHERE GROUNDWATER IS ENCOUNTERED. IF THE WATERTABLE, IS, OR COULD RISE CLOSE TO THE SURFACE, DOWNGRADE THE SOIL CATEGORY TO A LOWER CLASSIFICATION IN THE TABLE (E.G. 100 kPa TO 50 kPa, 50 kPa SHALL REQUIRE A GEOTECHNICAL ASSESSMENT).
7. WHERE A GEOTECHNICAL ASSESSMENT IS REQUIRED, THE REPORT AND DESIGN CALCULATIONS SHALL BE PROVIDED TO THE SA WATER REPRESENTATIVE.
8. WHERE DUCTILE IRON PIPES AND FITTINGS WITH RESTRAINED JOINTS ARE USED, ANCHOR BLOCKS MAY NOT BE REQUIRED. REFER 4005-30003-08 FOR RESTRAINED DUCTILE IRON JOINT SYSTEM.
9. REFER 4005-30002-01 TO 4005-30002-04 FOR GENERAL NOTES.
10. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

## STRUCTURAL NOTES:

11. CONCRETE GRADE SHALL BE N25.
12. CONCRETE SHALL BE VIBRATED DURING PLACEMENT.
13. REINFORCEMENT SHALL BE AS SPECIFIED IN TABLE 1. MINIMUM COVER TO REINFORCEMENT SHALL BE 75.
14. MINIMUM TWO ROWS OF BARS SHALL BE REQUIRED ABOVE AND BELOW PIPE.
15. ALL REINFORCEMENT SHALL BE SECURED IN POSITION BY TIE WIRES OF ANNEALED STEEL HAVING A DIAMETER OF NOT LESS THAN 1.2 mm. JOINS SHALL BE TIED AT ALL INTERSECTIONS. TRIMMER BARS FORMING A LAPPED SPLICE SHALL BE WIRED TO THE H &V BARS IN AT LEAST TWO PLACES.
16. BLOCK CONSTRUCTION SHALL BE:
    - LOCATED CENTRALLY ABOUT THRUST COLLAR AND EXTENDING INTO BOTH SIDES AND FLOOR OF TRENCH.
    - CONCRETE SHALL BE POURED AGAINST SOUND UNDISTURBED FACE OF THE EXCAVATION.
    - CONCRETE SHALL BE CLEAR OF ALL BOLTS, NUTS AND PIPE JOINTS.

REVISION PANEL

| REV | DATE | DRN | DETAILS | APR |
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| 1 | 01/05/19 | RP | NEW DRAWING. | TG |

CURRENT REV AUTHORISED:

SIGNATURE:

DESIGN PANEL

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|---|---|---|---|
| DESIGNED: | 28/03/19 RJP | AUTHORISED: | 02/05/19 T.GALEK |
| DRAWN: | 28/03/19 RP | SIGNATURE: | T. Galek |
| REVIEWED: | 29/04/19 TG | | |



SA WATER STANDARD DRAWINGS
WATER SUPPLY CONSTRUCTION MANUAL

IN-LINE THRUST BLOCKS
DN 300 & DN 375

A3 SHT SIZE | 1 REVISION

TOTAL SHEETS:

SUPERSEDES: 4005-30003-07 (PARTIALLY)

DRAWING NUMBER
4005-30003-09
PREFIX NUMBER SHEET