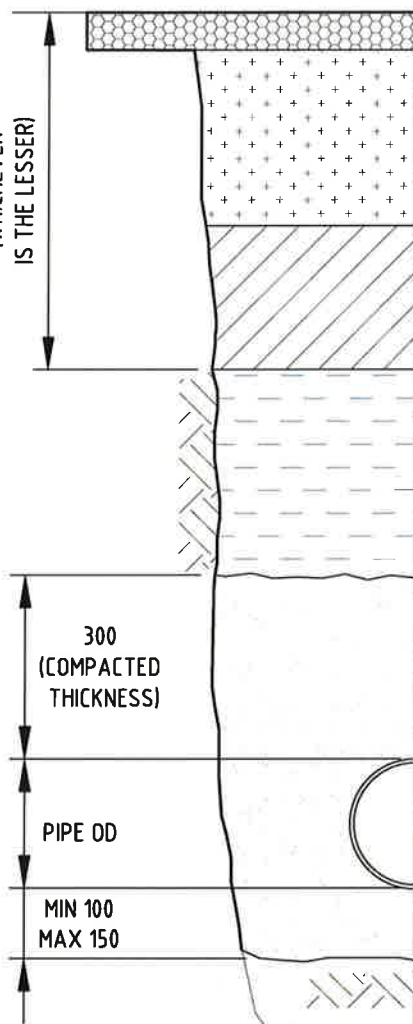


TRAFFICABLE AREAS ROAD PAVEMENTS & SHOULDER

800 OR
TOP OF OVERLAY
(WHICHEVER
IS THE LESSER)



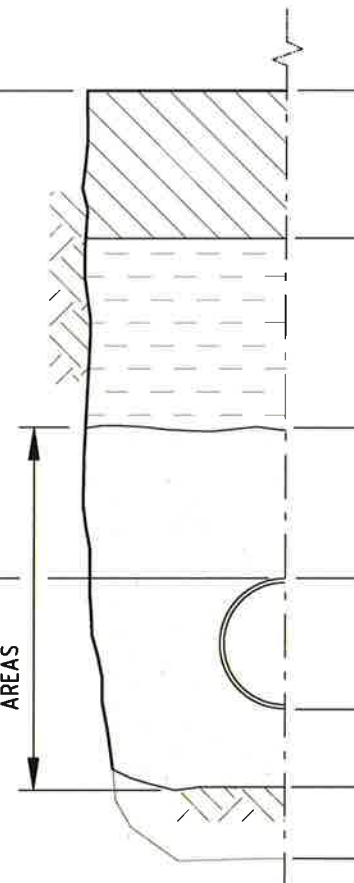
| ZONE | | MATERIAL / COMPACTION |
|---------------------|--------------------------|--|
| | | REFER 4005-20003-03 FOR ROAD PAVEMENT REQUIREMENTS. REINSTATE BRICK PAVING, BITUMEN FOOTPATH, ETC. TO MATCH EXISTING. |
| TRENCH FILL | | PM2/20 OR SA-C SAND COMPACTED TO 95% MMDD OR TS4 SAND COMPACTED TO 100% SMDD. |
| PIPE EMBEDMENT FILL | OVERLAY | SCREENINGS, OR ALTERNATIVELY 7, 10, OR 14 mm SINGLE SIZE AGGREGATE FOR GRAVITY SEWERS. REFER 4005-20003-02. |
| | SIDE SUPPORT | TS4 SAND FOR PRESSURE SEWERS. REFER WSCM 4005-30003-02. |
| | BEDDING | |
| | OVER-EXCAVATION BACKFILL | |

TRENCH WIDTH

| NOMINAL PIPE DN | TRENCH WIDTH MEASURED AT TOP OF PIPE (BETWEEN FACES OF SHORING IF USED) | |
|-----------------|---|---------|
| | MINIMUM | MAXIMUM |
| 150 | 600 | 800 |
| 250 | 600 | 900 |
| 300 | 600 | 1000 |

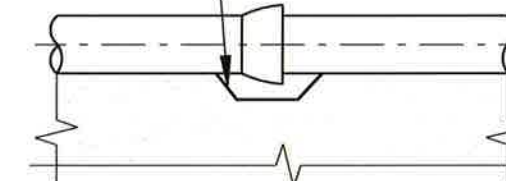
NON-TRAFFICABLE AREAS EASEMENTS, ETC.

MINIMUM PIPE COVER 750
REFER TRAFFICABLE AREAS



| ZONE | | MATERIAL / COMPACTION |
|---------------------|--------------------------|--|
| SURFACE ZONE | | REINSTATE TOPSOIL WITH GOOD QUALITY TOPSOIL LIGHTLY COMPACTED AND SEEDED, TURFED, ETC. TO MATCH EXISTING MINIMUM 150mm THICK |
| TRENCH FILL | | INORGANIC FILL WITH MAXIMUM STONE SIZE OF 75 mm COMPACTED TO 95% SMDD. PLACE ALL MATERIALS IN MAXIMUM 200 mm (LOOSE) LAYERS. EACH LAYER TO BE COMPACTED SEPARATELY. |
| PIPE EMBEDMENT FILL | OVERLAY | REFER TRAFFICABLE AREAS. |
| | SIDE SUPPORT | |
| | 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:

- REFER 4005-20002-01 TO 4005-20002-03 FOR GENERAL NOTES.
- 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.
- MMDD = MODIFIED MAXIMUM DRY DENSITY (AS 1289.5.2.1).
- SMDD = STANDARD MAXIMUM DRY DENSITY (AS 1289.5.1.1).
- WHERE THE SAND IS USED, IF THE SAND DOES NOT DISPLAY A DEFINED MOISTURE-DENSITY CURVE, (REFER AS1289.5.5.1, NOTE 1) THEN THE DENSITY INDEX (ID) METHOD (AS 1289.5.6.1) SHALL BE USED FOR COMPACTION CONTROL.
AN ID OF 75% SHALL BE TAKEN AS EQUIVALENT TO 95% SMDD AND
AN ID OF 90% SHALL BE TAKEN AS EQUIVALENT TO 100% SMDD.
- ALL DIMENSIONS IN MILLIMETRES.

REVISION PANEL

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

DESIGN PANEL

| | |
|--------------------|----------------------|
| DESIGNED: 03/08/15 | AUTHORISED: 31/03/16 |
| RJP | T.GALEK |
| DRAWN: 25/09/15 | SIGNATURE: |
| MS | |
| REVIEWED: 21/03/16 | |
| TG | |



SA Water

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SA WATER STANDARD DRAWINGS SEWER CONSTRUCTION MANUAL PIPE EMBEDMENT & TRENCH FILL REQUIREMENTS

A3
SHT SIZE

1
REVISION

TOTAL SHEETS:

SUPERSEDES: 02-0296-01 (G1)

DRAWING NUMBER

4005-20003-01
PREFIX NUMBER SHEET

1. **GEOTECHNICAL INVESTIGATION:**
 - WHERE THE SOIL CLASSIFICATION IS SAND OR SOFT CLAY OR WHERE GROUNDWATER IS PRESENT A GEOTECHNICAL INVESTIGATION SHALL BE PERFORMED PRIOR TO COMMENCEMENT OF CONSTRUCTION TO DETERMINE THE GROUND CONDITIONS ALONG THE PROPOSED ROUTE OF THE SEWER.
 - ANY GROUNDWATER SHALL BE CONTROLLED BEFORE AND/OR DURING EXCAVATION AND PIPE LAYING.
 - THE GEOTECHNICAL INVESTIGATION SHALL EXTEND TO MIN 1 m BELOW PROPOSED TRENCH FLOOR LEVEL.
 - TEST PITS ARE USUALLY SIMPLER AND MAY PROVIDE BETTER INFORMATION THAN TRIAL HOLES. IN SOME AREAS A VISUAL INSPECTION BY AN EXPERIENCED PERSON MIGHT SUFFICE.
 - SCREENINGS SHALL NOT BE PLACED DIRECTLY ON OR AGAINST THE SAND OR SOFT CLAY. THE SCREENINGS SHALL BE SEPARATED FROM THE SOIL BY A LAYER OF GEOTEXTILE.
2. **GROUNDWATER CONTROL:**
 - ALL GROUNDWATER INFLOW SHALL BE CONTROLLED PRIOR TO PLACING ANY BEDDING MATERIAL.
 - WHERE WATER IS ENTERING THE TRENCH SLOWLY, A GEOTEXTILE-WRAPPED GRAVEL DRAIN ON THE TRENCH FLOOR MAY BE SUFFICIENT. IF SO, OVER-EXCAVATE THE TRENCH FLOOR BY 100 mm, PLACE GEOTEXTILE ON THE FLOOR AND UP THE SIDES, FILL TO A DEPTH OF 100 mm WITH SCREENINGS, WRAP THE GEOTEXTILE OVER THE SCREENINGS, AND DRAIN TOWARDS A PUMP SUMP IN THE TRENCH. DRAINAGE TO THE SUMP MAY BE ASSISTED BY INCLUDING AN AGRICULTURAL DRAINAGE PIPE IN THE SCREENINGS (REFER FIGURE 2).
 - WHERE THE STABILITY OF A TRENCH IS LIKELY TO BE COMPROMISED, OR WHERE THE INFLOW CANNOT BE CONTROLLED, WELLPOINT DEWATERING MAY BE REQUIRED. THE WELLPOINT SYSTEM SHALL LOWER THE GROUNDWATER TO BELOW THE FLOOR OF THE TRENCH.
 - DEWATERING SYSTEM(S) SHALL OPERATE UNTIL SUCH TIME AS THERE IS NO DANGER OF FLOTATION OF THE NEWLY LAID PIPES AND THE TRENCH HAS BEEN BACKFILLED TO NOT LESS THAN 150 mm ABOVE NORMAL GROUNDWATER LEVEL.
3. **TRENCH FLOOR PREPARATION:**
 - THE DESIGN TRENCH FLOOR LEVEL LIMITS SHALL BE MIN 100 mm TO MAX 150 mm BELOW THE BOTTOM OF THE PIPE.
 - ANY OVER-EXCAVATION SHALL BE MADE GOOD BY INCREASING THE THICKNESS OF THE BEDDING SCREENINGS, NOT BY USE OF ANY OTHER MATERIALS.
 - IF THE TRENCH FLOOR IS:
 - WHOLLY IN ROCK IT MAY BE LEFT IRREGULAR AND THE BEDDING MAY PLACED DIRECTLY ON IT.
 - IN FIRM, STIFF OR HARD CLAY SOIL. TRIM IT SMOOTH. REMOVE ALL LOOSE MATERIAL AND PLACE THE BEDDING SCREENINGS DIRECTLY ON IT.
 - IN SOFT CLAY SOIL OR SAND. PLACE A LAYER OF GEOTEXTILE ACROSS THE FLOOR AND UP THE WALLS TO EMBEDMENT LEVEL (REFER FIGURE 2).
 - WHOLLY OR PARTIALLY VERY SOFT CLAY, OLD FILL REFUSE, OR HAS IRREGULAR OUTCROPS OF ROCK IN IT, OR HAS BEEN DISTURBED BY GROUNDWATER INFLOW. THE CONTRACTOR SHALL SEEK SPECIALIST GEOTECHNICAL ADVICE TO ENSURE ZERO POST INSTALLATION TOTAL AND/OR DIFFERENTIAL SETTLEMENT.
 - IF A SEWER IS TO BE LAID IN OR BELOW NEW FILL, THE CONTRACTOR SHALL SEEK SPECIALIST GEOTECHNICAL ADVICE FOR THE DESIGN OF THE FILL. DESIGN THE FILL TO ENSURE ZERO POST-INSTALLATION SETTLEMENT OF THE SEWER. LAY THE SEWER IN A TRENCH DUG INTO THE FILL AFTER THE FILL HAS BEEN BROUGHT UP TO NOT LESS THAN 500 mm ABOVE THE TOP OF THE SEWER.
4. **BEDDING PLACEMENT:**
 - SIMPLY PLACE THE BEDDING SCREENINGS ON THE PREPARED TRENCH FLOOR (REFER 3) AND RAKE TO GRADE. ADDITIONAL COMPACTION IS NOT NECESSARY.
5. **PIPE INSTALLATION:**
 - WHERE PIPE SOCKETS ARE LOCATED, EXCAVATE POCKETS IN THE BEDDING TO CLEAR THE SOCKET.
 - HOME THE PIPE AND ENSURE THAT THE PIPE IS SUPPORTED UNIFORMLY ALONG ITS BARREL BY ATTEMPTING TO PASS A HAND UNDER THE PIPE.
 - IF VOIDS ARE PRESENT, REMOVE THE PIPE AND REGRADE THE BEDDING. ALTERNATIVELY HAND-PACK ADDITIONAL SCREENINGS UNDER THE PIPE.
6. **SIDE SUPPORT AND OVERLAY PLACEMENT AND COMPACTION:**
 - REMOVE OR RAISE SHORING BEFORE PLACING ANY SIDE SUPPORT OR OVERLAY SCREENINGS.
 - PLACE AND COMPACT THE SIDE-SUPPORT AND OVERLAY SCREENINGS USING A METHOD THAT ENSURES THE REDUCTION OF THE INTERNAL VERTICAL DIAMETER OF THE PIPE IS NOT MORE THAN 3% AT THE END OF INSTALLATION (IE AFTER THE TRENCH HAS BEEN BACKFILLED TO THE SURFACE). NOTE THAT CAREFULLY BRINGING UP THE SCREENINGS UNIFORMLY ON BOTH SIDES OF THE PIPE IN ONE SMOOTH OPERATION WILL NORMALLY ACHIEVE THIS WITHOUT THE NEED FOR ADDITIONAL MECHANICAL COMPACTION. SCREENINGS SHOULD ACHIEVE ID 70% COMPACTION AS PER AS 1289.5.6.1.
 - WHERE COMPACTION IS REQUIRED, USE HAND TAMPERS OR INTERNAL VIBRATORS. THE LIFT THICKNESS SHALL NOT EXCEED 150 mm OR HALF THE PIPE DIAMETER, WHICHEVER IS GREATER.
 - THE MINIMUM FINISHED THICKNESS OF THE OVERLAY IS 300 mm.
 - WHERE SAND IS TO BE USED AS TRENCH FILL ABOVE THE OVERLAY, PLACE A LAYER OF GEOTEXTILE OVER THE SCREENINGS AND MIN 150 mm UP THE TRENCH WALLS (REFER FIGURE 2).
7. **GEOTEXTILE:**
 - A MEDIUM-WEIGHT, NON-WOVEN, NEEDLE-PUNCHED FILTER FABRIC SHALL BE USED, EG. BIDIM A24 OR EQUIVALENT.
8.
 - FOR SCREENING & SAND REQUIREMENTS REFER 4005-20003-01.
 - REFER 4005-20002-01 TO 4005-20002-03 FOR GENERAL NOTES.

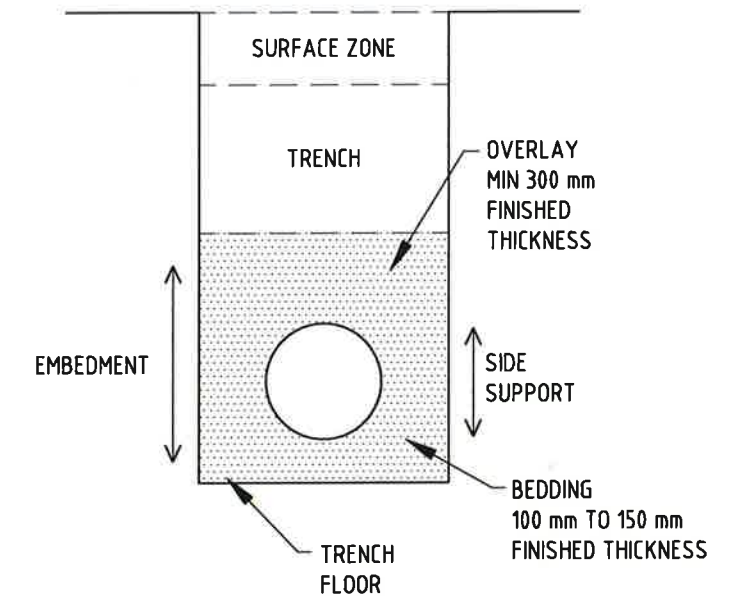


FIGURE 1:
TERMINOLOGY

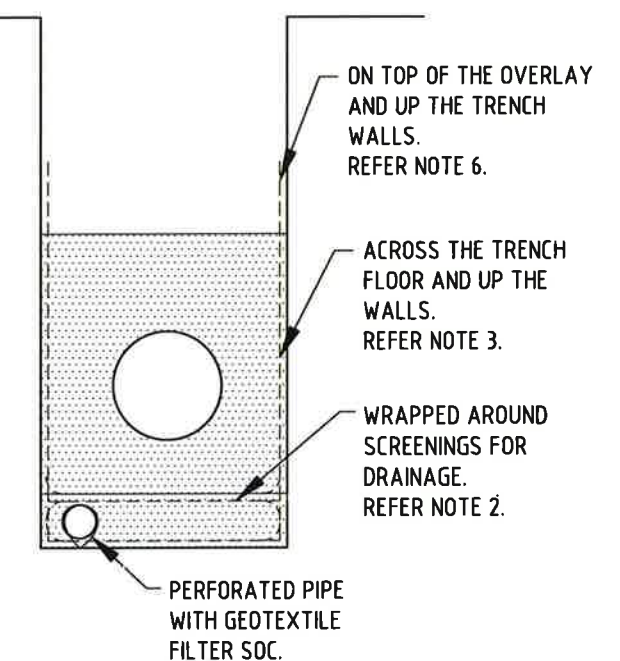
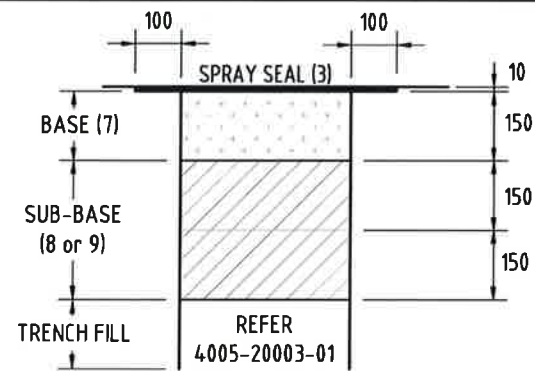


FIGURE 2:
POSSIBLE GEOTEXTILE LOCATIONS

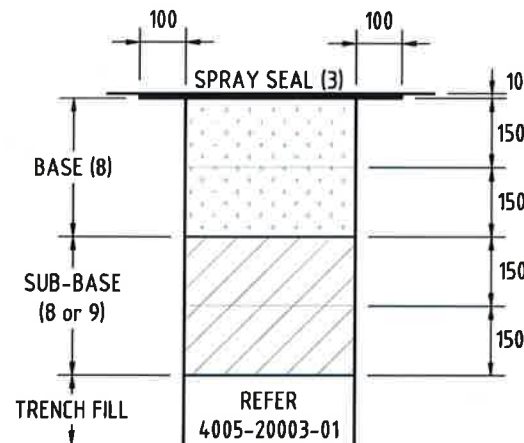
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|----------------|----------|-----|-----------------------|-----|--------------|--------------------|-----------------------------------|--|----------|----------|
| REV | DATE | DRN | DETAILS | APR | CURRENT REV | AUTHORISED: | SEWER CONSTRUCTION MANUAL | | SHT SIZE | REVISION |
| | | | | | | DESIGNED: 03/08/15 | TRENCH EXCAVATION & EMBEDMENT | | | |
| | | | | | | RJP | POOR SOIL CONDITIONS | | | |
| | | | | | | DRAWN: 25/09/15 | REQUIRING GEOTECHNICAL EVALUATION | | | |
| | | | | | | MS | | | | |
| | | | | | | REVIEWED: 21/03/16 | | | | |
| | | | | | | TG | | | | |
| 1 | 31/03/16 | MS | 2016 STANDARDS REVIEW | TG | | | | | | |

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|--|--|-----------------------------------|--|----------|----------|
| SA Water | | SA WATER STANDARD DRAWINGS | | A3 | 1 |
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| WATER CORPORATION | | POOR SOIL CONDITIONS | | | |
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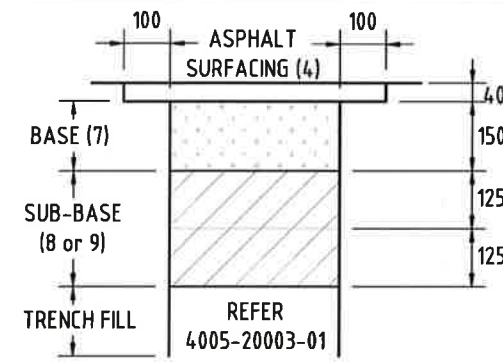
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| TOTAL SHEETS: | | 4005-20003-02 |
| SUPERSEDES: 02-0156-01 (G2) | | |
| DRAWING NUMBER | | |
| PREFIX | NUMBER | SHEET |



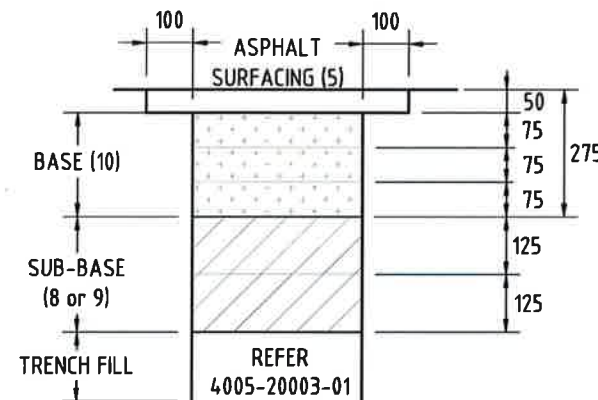
SPRAY SEAL SURFACE
LOW TRAFFIC ROADS WITH AADT (TWO WAY) <10,000 VPD
FIGURE 1



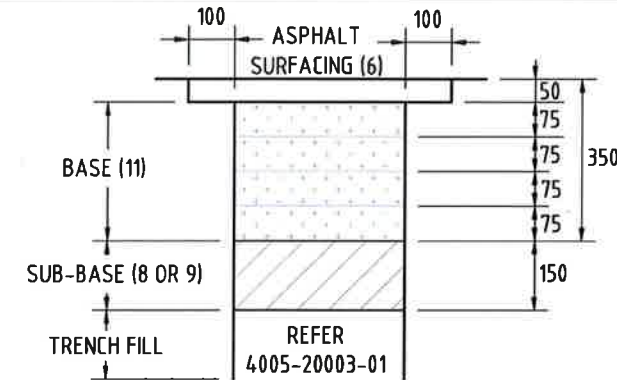
SPRAY SEAL SURFACE
HEAVY TRAFFIC ROADS WITH AADT
(TWO WAY) >10,000 VPD
FIGURE 2



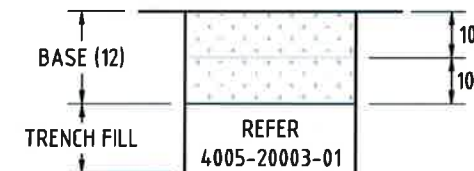
ASPHALT SURFACE
LOW TRAFFIC ROADS WITH AADT (TWO WAY) <2,000 VPD
FIGURE 3



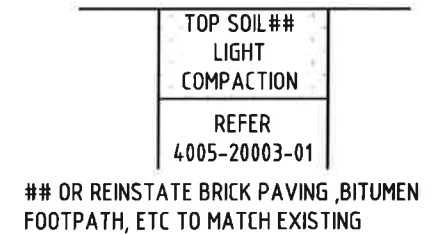
ASPHALT SURFACE
HEAVY TRAFFIC ROADS WITH AADT
(TWO WAY) >2,000 VPD BUT <20,000 VPD
FIGURE 4



ASPHALT SURFACE
VERY HEAVY (COMMERCIAL) TRAFFIC ROADS
WITH AADT (TWO WAY) >20,000 VPD
FIGURE 5



UNSEALED ROAD PAVEMENTS AND SHOULDERS
FIGURE 6



VERGES
ALL TRAFFIC DENSITIES
FIGURE 7

NOTES:

- 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.
- 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.
- 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.
- ASPHALT SURFACING AC10 ASPHALTIC CONCRETE WEARING COURSE (LIGHT DUTY MIX) ON TACK COAT (EG CRS60) APPLIED AT 1.0 l/m².
- ASPHALT SURFACING AC10 ASPHALTIC CONCRETE WEARING COURSE (MEDIUM DUTY MIX) ON TACK COAT (EG CRS60) APPLIED AT 0.2 TO 0.3 l/m².
- 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/m².
- PM1/20 = 20 mm CLASS 1 QUARRIED PAVEMENT MATERIAL (PM1/20QG).
- PM1/20 = 20 mm CLASS 1 QUARRIED PAVEMENT MATERIAL (PM1/20QG), OR 20 mm CLASS 1 RECYCLED PAVEMENT MATERIAL (PM1/20RG). - PLACED IN 2 EQUAL LAYERS TO 98% MODIFIED COMPACTION.

- 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.
- AC14M - PLACED IN 3 EQUAL LAYERS ON EMULSION PRIME (EG CRS60) APPLIED AT 1.0 l/m².
- AC14M - PLACED IN 4 EQUAL LAYERS ON EMULSION PRIME (EG CRS60) APPLIED AT 1.0 l/m².
- 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.
- OG14 - WEARING COURSE (MEDIUM DENSITY MIX) ON 10 mm C170 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 SAME.
- 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.
- 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.
- ABBREVIATIONS: AADT = AVERAGE ANNUAL DAILY TRAFFIC; VPD = VEHICLES PER DAY; MMDD = MODIFIED MAXIMUM DRY DENSITY (AS 1289.5.2.1).

| REVISION PANEL | | | | | DESIGN PANEL | | | SA WATER STANDARD DRAWINGS | | | A3 | 2 |
|----------------|----------|-----|-----------------------|-----|----------------------|--------------------|----------------------|--|---|-----------------------------|----------|-------|
| REV | DATE | DRN | DETAILS | APR | CURRENT REV 26/04/16 | DESIGNED: 03/08/15 | AUTHORISED: 30/03/16 | SA Water | SEWER CONSTRUCTION MANUAL | SHT SIZE | REVISION | |
| | | | | | | RJP | T.GALEK | <p>This drawing is the property of the SOUTH AUSTRALIAN WATER CORPORATION and shall not be copied or modified in part or in whole without authorization.</p> | REINSTATEMENT OF ROAD PAVEMENTS, HARD SHOULDERS AND VERGES IN ROAD RESERVES | TOTAL SHEETS: | | |
| | | | | | | DRAWN: 25/09/15 | SIGNATURE: | | | SUPERSEDES: 02-0157-01 (G3) | | |
| | | | | | | MS | | | | DRAWING NUMBER | | |
| 2 | 26/04/16 | MS | NOTES CHANGED | MA | | REVIEWED: 21/03/16 | ORIGINAL SIGNED | | | 4005-20003-03 | | |
| 1 | 31/03/16 | MS | 2016 STANDARDS REVIEW | TG | | | | | | PREFIX | NUMBER | SHEET |