

- The following standards provide detailed requirements on the design and construction of City West Water, South East Water and Yarra Valley Water gravity sewerage assets.
- The standards encompass drawing, specification and commentary information.
- The standards provide deemed-to-comply solutions, however they will not suit all circumstances or overcome all problems.

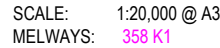
- **Bolded** items are those that would likely be referred to very regularly.
- These tables provide guidance into what standards the mrwa believe to be most relevant to each party within the asset creation process.
- It is however, expected that all parties become familiar with all the requirements.

| DRAWING NO.                                    | DRAWING NAME  | RELEVANCE  |
|--|---|--|
| STANDARDS PRODUCED PRIMARILY FOR DESIGNERS ✓✓✓ |   | ✓✓✓✓✓ If Bold  |
| MRWA-S-100                                     | Design template- notes, schedules & locality plan         | Designs to be produced in compliance with the template                   |
| MRWA-S-101A                                    | Design template- detailed plan                            | Designs to be produced in compliance with the template                   |
| MRWA-S-101B                                    | Design template- building envelopes                       | Designs to be produced in compliance with the template                   |
| MRWA-S-102A                                    | Design template- long section sheet 1                     | Designs to be produced in compliance with the template                   |
| MRWA-S-102B                                    | Design template- long section sheet 2                     | Designs to be produced in compliance with the template                   |
| MRWA-S-102C                                    | Design template- construction details                     | Detailed m.H base and fitting layout                                     |
| MRWA-S-105                                     | <b>Reticulation design</b>                                | <b>Reticulation design process and rules</b>                             |
| MRWA-S-106                                     | <b>Reticulation examples</b>                              | <b>Examples of the design rules being applied</b>                        |
| MRWA-S-107                                     | Pipeline details  | Images of more complex configurations                                    |
| MRWA-S-108                                     | <b>Private property reticulation</b>                      | <b>Requirements of private property sewers</b>                           |
| MRWA-S-109                                     | Road reserve dual reticulation                            | Layout of sewers on both sides of the road                               |
| MRWA-S-110                                     | Road reserve reticulation with road crossings             | Layout of sewers when crossing a road                                    |
| MRWA-S-111                                     | <b>Sewers in undeveloped land easements &amp; offsets</b> | <b>Requirements of easements, offsets and assets in undeveloped land</b> |
| MRWA-S-203                                     | Pipeline structural design- e'e = 3 & 5 mpa               | Suggests when a detailed structural design will be required              |
| MRWA-S-204                                     | Pipeline structural design- e'e = 7 & 10 mpa              | Suggests when a detailed structural design will be required              |
| MRWA-S-209                                     | Sewerage assets around retaining walls                    | Clearance, alignment, cover and structural requirements                  |
| MRWA-S-300                                     | <b>Maintenance structures- general</b>                    | <b>When to I.Ss, M.Ss, M.Cs and M.Hs</b>                                 |
| MRWA-S-301                                     | <b>Property services- general</b>                         | <b>When to use type 1A, 1B, 2, 4A, 4B and I.S property connections</b>   |
| MRWA-S-307                                     | <b>Maintenance hole design- general</b>                   | <b>How to specify M.Hs (ie: complete design schedules and inverts)</b>   |
| MRWA-S-308                                     | <b>Concrete maintenance holes- detailed design</b>        | <b>Requirements of concrete M.H detailed designs (base layout etc)</b>   |
| STANDARDS IMPORTANT TO DESIGNERS ✓✓            |   |  |
| MRWA-S-103                                     | Pipes and jointing  | Commonly used pipe types and sizes nominated                             |
| MRWA-S-104A                                    | Junctions   | Property branch sizing and connection requirements described             |
| MRWA-S-104B                                    | Bends and curves  | Acceptable bends and bend limitations nominated                          |
| MRWA-S-202                                     | Embedment   | Embedment system selection outlined                                      |
| MRWA-S-200                                     | Soil classification                                       | Enables charts in mrwa-s-203 and mrwa-s-204 to be interpreted            |
| MRWA-S-205                                     | Sloping mains and trench drainage                         | Design requirements for sloping mains and trench drainage                |
| MRWA-S-207                                     | Major crossings   | Design requirements for major crossings                                  |
| MRWA-S-403                                     | Water seals   | Design requirements for water seals                                      |
| STANDARDS RELEVANT TO DESIGNERS ✓              |   |  |
| MRWA-S-201                                     | Trenching and trenchfill                                  | Provides minimum cover information                                       |
| MRWA-S-208                                     | Trenchless construction                                   | Design requirements for trenchless construction                          |
| MRWA-S-311                                     | Concrete maintenance holes- internal drops                | Design requirements for internal M.H drops                               |
| MRWA-S-312                                     | Concrete maintenance holes- external drops                | Design requirements for external M.H drops                               |
| MRWA-S-313                                     | Maintenance hole- top construction                        | Cover and top selection (ie: complete M.H schedules)                     |
| MRWA-S-314                                     | Concrete maintenance holes- ancillary items               | Design requirements for landings, step irons and ladders                 |
| MRWA-S-404                                     | Emergency relief structures                               | Design requirements for emergency relief structures                      |

| DRAWING NUMBER | DRAWING NAME                        | RELEVANCE  |
|----------------|-------------------------------------|--|
| MRWA-S-103     | Pipes and jointing                  | Common pipe internal diameters and k factor outlined                   |
| MRWA-S-207     | Major crossings                     | Options and considerations for major crossings outlined                |
| MRWA-S-208     | Trenchless construction             | Limitations of trenchless construction described                       |
| MRWA-S-401     | Sewerage network airflow management | H <sub>2</sub> S risk calculation & vent and water seal rules outlined |

| DRAWING NUMBER                                   | DRAWING NAME                                     | RELEVANCE   |
|--|--|---|
| STANDARDS PRODUCED PRIMARILY FOR CONTRACTORS ✓✓✓ |  | ✓✓✓✓ If Bold  |
| MRWA-S-104A                                      | Junctions  | Junction selection and installation                                   |
| MRWA-S-201                                       | Trenching and trenchfill                         | Trenching and trenchfill  |
| MRWA-S-202                                       | Embedment  | Selection and installation of embedment                               |
| MRWA-S-206                                       | Trench bulkheads and trenchstops                 | Trench bulkheads and trenchstops                                      |
| MRWA-S-301                                       | Riser construction details                       | Materials and installation  |
| MRWA-S-302                                       | Type 1 property connections                      | Pipework configuration and installation                               |
| MRWA-S-303                                       | Type 2 property connections                      | Pipework configuration and installation                               |
| MRWA-S-304                                       | Type 4 property connections                      | Pipework configuration and installation                               |
| MRWA-S-305                                       | Maintenance shafts                               | Product configuration and installation                                |
| MRWA-S-306                                       | Maintenance chambers                             | Product configuration and installation                                |
| MRWA-S-309                                       | Concrete maintenance holes- general construction | Material, finish and construction joints                              |
| MRWA-S-310                                       | Concrete maintenance holes- base construction    | Size, shape and installation  |
| MRWA-S-311                                       | Concrete maintenance holes- internal drops       | Pipework configuration and installation                               |
| MRWA-S-312                                       | Concrete maintenance holes- external drops       | Pipework configuration and installation                               |
| MRWA-S-313                                       | Maintenance hole- top construction               | Flat top M.Hs, conical top M.Hs and covers                            |
| MRWA-S-314                                       | Concrete maintenance holes- ancillary items      | Ladders, step irons, brackets, landings and fasteners                 |
| MRWA-S-400                                       | Insertion into live sewers                       | Installing M.Ss, M.Cs, M.Hs and pipe into live sewers                 |
| MRWA-S-402                                       | Vents  | Components and installation   |
| STANDARDS IMPORTANT TO CONTRACTORS ✓✓            |  |   |
| MRWA-S-103                                       | Pipes and jointing                               | Pipe jointing information provided                                    |
| MRWA-S-104B                                      | Bends and curves                                 | Bend specifications and installation                                  |
| MRWA-S-107                                       | Pipeline details                                 | Images of more complex configurations                                 |
| MRWA-S-111                                       | Sewers in Undeveloped Property                   | Connection and Maintenance Structure construction in undeveloped land |
| MRWA-S-205                                       | Sloping mains and trench drainage                | Sloping mains and trench drainage                                     |
| MRWA-S-207                                       | Major crossings                                  | Major crossings   |
| MRWA-S-208                                       | Trenchless construction                          | Micro-tunneling and hdd requirements for major crossings              |
| MRWA-S-403                                       | Water seals                                      | Pipework configuration and installation                               |
| MRWA-S-403                                       | Water seals                                      | Pipework configuration and installation                               |
| STANDARDS RELEVANT TO CONTRACTORS ✓              |  |   |
| MRWA-S-209                                       | Sewerage assets around retaining walls           | Clearance, alignment and cover requirements                           |

|  |                       |  |          |   |   |           |   |   |              |  |   |  |  |                                   |  |  |  |              |  |  |  |
|--|-----------------------|--|----------|---|---|-----------|---|---|--------------|--|---|--|--|-----------------------------------|--|--|--|--------------|--|--|--|
| ALL DIMENSIONS IN mm UNLESS STATED OTHERWISE |                       |  |          | DESIGNED: R. JAGGER                     |   |           | DATE: 1 JULY 2015                       |   |              | <div><div></div><div></div></div> |   |  |  | MRWA SEWERAGE STANDARDS           |  |  |  | NOT TO SCALE |  |  |  |
|  |                       |  |          | DRAWN: R. JAGGER                        |   |           | DATE: 1 JULY 2015                       |   |              |  |   |  |  | MRWA-S-000                        |  |  |  |              |  |  |  |
|  |                       |  |          | CHECKED: NAME                           |   | DATE      | APPROVED: NAME                          |   | DATE         | <div>Planning</div> <div>✓</div>   |   |  |  |                                   |  |  |  |              |  |  |  |
|  |                       |  |          | <input checked="" type="checkbox"/> CWW | D. MOORE                                | 01/09/15  | <input checked="" type="checkbox"/> CWW | R. CARRUTHERS                           | 01/09/15     |  |   |  |  | <div>Design</div> <div>✓✓✓✓</div> |  |  |  |              |  |  |  |
| 2  | PUBLISHED FIRST ISSUE |  | 01/10/15 | CP / JT / KD / RJ                       | <input checked="" type="checkbox"/> SEW | C. PAXMAN | 01/09/15                                | <input checked="" type="checkbox"/> SEW | D. O'DONOVAN | 01/09/15   | <div>Construction</div> <div>✓✓✓✓</div> |  |  |                                   |  |  |  |              |  |  |  |
| 1  | PRE-PUBLISHED DRAFT   |  | 01/03/15 | CP / JT / KD / RJ                       | <input checked="" type="checkbox"/> YVW | K. DAWSON | 01/09/15                                | <input checked="" type="checkbox"/> YVW | J. TOMASI    | 01/09/15   |   |  |  |                                   |  |  |  |              |  |  |  |
| REV  | DESCRIPTION           |  | DATE     | APPROVED                                | ISSUED 2015                             |           |   | VERSION 1                               |              |  |   |  |  |                                   |  |  |  |              |  |  |  |



| Drawing No. | Sheet No. | Title                            |
|-------------|-----------|----------------------------------|
| XXXXXX-01   | 1         | Locality Plan, Schedules & Notes |
| XXXXXX-02   | 2         | Detail Plan                      |
| XXXXXX-03   | 3         | Detail Plan                      |
| XXXXXX-04   | 4         | Long Section Sheet 1             |
| XXXXXX-05   | 5         | Long Section Sheet 2             |
| XXXXXX-06   | 6         | Construction Details             |



**BEWARE OF UNDERGROUND SERVICES**  
THE LOCATION OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

1. **Magenta** text is example text only and should be written over by the Consultant and is not part of the design template.
2. **Bold blue italics** is instructional text for the Consultant's consideration and should be removed from designs.
3. All design panels shall be at the given scale on A3 sheets.
4. This template describes the minimum requirement. Additional information should be provided as required.
5. With design submissions, the Designer is required to supply the relevant Water Agency with the following;
  - The current copy of the Plan of Subdivision with Building Envelopes indicated.
  - All Geo-technical information collected.
  - Project Specific Backfill Specification(s).
  - Any structural computations.
6. Use other template sheets as required to provide further notes or schedules.
7. Amended sewerage design drawings shall be submitted to the Water Agency with a new version number and a summary phrase in the revision panel footer. The Design amendment can be presented using one or a combination of the following methods:
  - Cross out original text or lines that are no longer included and replaced with revised text or lines;
  - Show text changes in a different colour or font;
  - Show line and drawing changes with a different coloured or different weight line;
  - Surround text or drawing changes in a cloud or bubble.
  - Reference to a Water Agency Audit Report is not acceptable as an amendment description in the revision panel footer.

1. Only contractors accredited by **City West Water (enter the Water Agency)** to **SC1** and **SC7 (enter the categories of work required for this project)** shall be eligible to construct these works.
2. Only products approved and catalogued by the Water Agency shall be used.
3. Works must be to constructed according to the MRWA edition of the WSAA Sewerage code of Australia WSA 02-2014-3.1.
4. The design consultant is responsible for the design and coordination of the works. Any problem arising during construction shall be directed to the consultant.

5. All contours and levels are in metres to the Australian height datum (A.H.D.)
6. All co-ordinates shown are to map grid of Australia (MGA).
7. Chainages shown on detail plans are discontinuous at maintenance structures.  
Chainages shown on long section sheets are continuous.
8. Coordinates are to sewer line intersection point unless otherwise shown.
9. Before commencement of work, the contractor must complete a level check between all TBM's to verify level values.
10. TBM's and control points are to be maintained and protected at all times during construction.  
Should any marks be disturbed, the contractor will immediately notify the consultant to arrange re-instatement at the contractors expense.

11. Number of lots to be sewerod: **48 lots** (*enter number of lots in development design*)
12. All property connections to be DN100 unless otherwise indicated.
13. Properties requiring boundary traps are indicated in the detailed plans. The remainder do not require boundary traps.
14. Branch tie distance shown on detail plan are from approved subdivision survey pegs. Branch ties for future lots are shown as a chainage. (Ch) Distance is from the downstream sewer structure.
15. Invert level of the property connection point is shown opposite the branch position.
16. Where a Spur Branch connects to a shaft, both property connections are considered to be shaft connections

17. In areas subject to earthworks, construction of sewers shall not commence until earthworks has been completed unless written approval has been given by the Water Authority.

18. Embedment shall be Type A (refer MRWA-S-202) unless otherwise specified on the long section. *(specify non standard embedment on the long sections)*

19. Selection and compaction of trench backfill material shall be in accordance with the Water Agency adopted version of MRWA specification no 04-03.
20. Refer to Long Section drawings for backfill requirements.

21. Test results shall be provided to the superintendent prior to practical completion / acceptance of works.
22. The contractor is required to undertake all testing of fill compaction in accordance with the Water Agency adopted version of the MRWA Backfill Specification 04-03.

23. All works on live sewers must be carried out by a water company accredited contractor.
24. All existing sewers must be plugged to stop gas emissions prior to any connections being made to these sewers.
25. To enable connections to live assets or any work on live assets, the contractor shall submit the appropriate forms to the superintendent at least 3 working days prior to any works on live sewers.
26. The contractor is not permitted to break into an existing live pipeline, enter a live sewer or remove the cover to a live maintenance structure unless authorised by the Water Agency.

27. Prior to commencement of works on site, the contractor must ensure that all matters relating to the Occupational Health and Safety Act 2004 and Occupational Health and Safety regulations 2007, have been and will be complied with.

28. The contractor is to give a minimum of two (2) days notice to the superintendent and Water Agency prior to the testing being undertaken. Testing is to be undertaken in the presence of superintendent.

29. The contractor is to keep a copy of the approved cultural heritage management plan on site at all times during works.

*(insert any cultural heritage requirements particular to the project. If non are applicable remove)*

30. On commencement of construction works the contractor must comply with the recommendations of the EPA publication "construction techniques for sediment pollution control" (publication no 275 1991).

31. Prior to the commencement of work, the contractor is to submit a site environmental management plan to Melbourne Water. *(if applicable because Melbourne Water assets or water ways are involved in the project.)*

32. All trees and vegetation are to be protected unless otherwise indicated for removal. The extent of any vegetation removal shall be confirmed on site with the superintendent and local council prior to commencement, and in accordance with any planning permits. Any removal shall be documented.

33. All areas containing creek vegetation, trees and revegetated areas near the construction zone are to be fenced off during the works with secure and highly visible material such as para-webbing fencing.

34. Ensure all machinery, equipment and/or footwear entering the site is weed and pathogen free.

| Maintenance Hole ID | MH Shaft Type (GRP/PP (Plastic) / Concrete) | MH Top Type (Conical/Flat) | Cover Class | Internal Diameter (mm) | Min. Wall Thickness (mm) | Depth to Invert (mm) | Drops     | Ladder (L) Step Irons (S) Landing (Ld) | Corrosion Protection (Coating / PE or PVC Lining) | Shaft Re-inforcement | Comments (Offsets / Details) |
|---------------------|---|----------------------------|-------------|------------------------|--------------------------|----------------------|-----------|--|---|----------------------|------------------------------|
| Ex KCW17            | Concrete                                    | Flat Top                   | D           | 1500                   | -                        | 5660                 | -         | L                                      | PVC   | -                    | Refer M.H. Base Detail       |
| DJB2                | Approved Product                            | -                          | B           | 1200                   | 150                      | 2505                 | 1 x DN100 | L or S                                 | None  | -                    | Refer M.H. Base Detail       |
| DJB3                | Approved Product                            | -                          | B           | 1200                   | 150                      | 3512                 | 1 x DN150 | L or S                                 | None  | -                    | Refer M.H. Base Detail       |
| Ex ROC2-25          | Concrete                                    | -                          | B           | 1050                   | -                        | 3370                 | 1 x DN150 | -                                      | -   | -                    | Connect Ex 150 Stub          |

| Structure Type | Boundary Trap | Water Seals | Syphons |
|----------------|---------------|-------------|---------|
| Quantity       | 0             | 1           | 0       |

| Pipe Size | Pipe Type | Length (m) | Pipe Class | Standard   |
|-----------|-----------|------------|------------|------------|
| DN100     | UPVC-DWV  | 13.4       | SN10       | WSA PS 230 |
| DN150     | UPVC-DWV  | 483.3      | SN8        | WSA PS 230 |
| DN300     | UPVC-DWV  | 171.9      | SN8        | WSA PS 230 |

| Connection Type | Type 1a | Type 1b | Type 2 | Type 4a | Type 4b | Type S | Type 4S | Type B | Type 4B | Jump Up Flexible Couplings, ie: "F" |
|-----------------|---------|---------|--------|---------|---------|--------|---------|--------|---------|-------------------------------------|
| Quantities      | 6       | 4       | 24     | 0       | 2       | 5      | 0       | 1      | 0       | 6                                   |

| Street                      | Gas |      | Water |      | NDW |      | Comms |      | Elec. |      | Lighting |     |
|-----------------------------|-----|------|-------|------|-----|------|-------|------|-------|------|----------|-----|
| Belvedere Crescent (Part 1) | W   | 2.25 | W     | 3.15 | W   | 2.65 | E     | 4.00 | E     | 4.75 | 1.00     | BOK |
| Belvedere Crescent (Part 2) | W   | 2.25 | W     | 3.15 | W   | 2.65 | E     | 1.85 | E     | 2.60 | 1.00     | BOK |
| Belvedere Crescent (E-W)    | S   | 2.25 | S     | 3.15 | S   | 2.65 | N     | 0.50 | N     | 1.25 | 1.00     | BOK |
| Carmine Circuit (N-S)       | E   | 2.25 | E     | 3.15 | E   | 2.65 | W     | 0.50 | W     | 1.25 | 1.00     | BOK |
| Carmine Circuit (E-W)       | N   | 2.25 | N     | 3.15 | N   | 2.65 | S     | 1.85 | S     | 2.60 | 1.00     | BOK |
| Kruse Place                 | S   | 2.00 | S     | 2.90 | S   | 2.40 | N     | 0.50 | N     | 1.25 | 1.00     | BOK |

| Maintenance Structure ID | Type - (IS/MS/MC) | Cover Class | Depth to Invert (mm) | Shaft Connections | Comments/ References (Offsets/Details) |
|--------------------------|-------------------|-------------|----------------------|-------------------|--|
| DJB1                     | MC                | D           | 1778                 | -                 | -                                      |
| DJB4                     | MC                | B           | 3030                 | -                 | -                                      |
| DJB2-1                   | MS                | B           | 1350                 | -                 | -                                      |
| DJB2-2                   | MS                | B           | 1585                 | -                 | -                                      |
| DJB2-2IS                 | IS                | B           | 1444                 | -                 | -                                      |
| DJB3-IS                  | IS                | B           | 1080                 | -                 | -                                      |
| ROC2-43-IS               | IS                | B           | 1740                 | 1 x DN100         |  |
| ROC2-44ISX               | IS                | B           | 1170                 | -                 | -                                      |
| ROC2-44                  | MS                | B           | 1614                 | 1 x DN100         | -                                      |
| ROC2-44ISY               | IS                | B           | 1040                 | -                 | -                                      |
| Ex ROC2-43               | MC                | B           | 2652                 | 1 x DN100         | -                                      |

Remove the irrelevant Water Agency Logos  
or turn off relevant layer  
MRWA-LOGO-CWW  
MRWA-LOGO-SEW  
MRWA-LOGO-YVW  
MRWA-TEXT-OFF



YSQRA WASSIY WATER  
MUNICIPALITY  
PROJECT TITLE

NOTES, SCHEDULES & LOCALITY PLAN

ISSUED FOR  
CONSTRUCTION

SCALE:AS SHOWN @A3

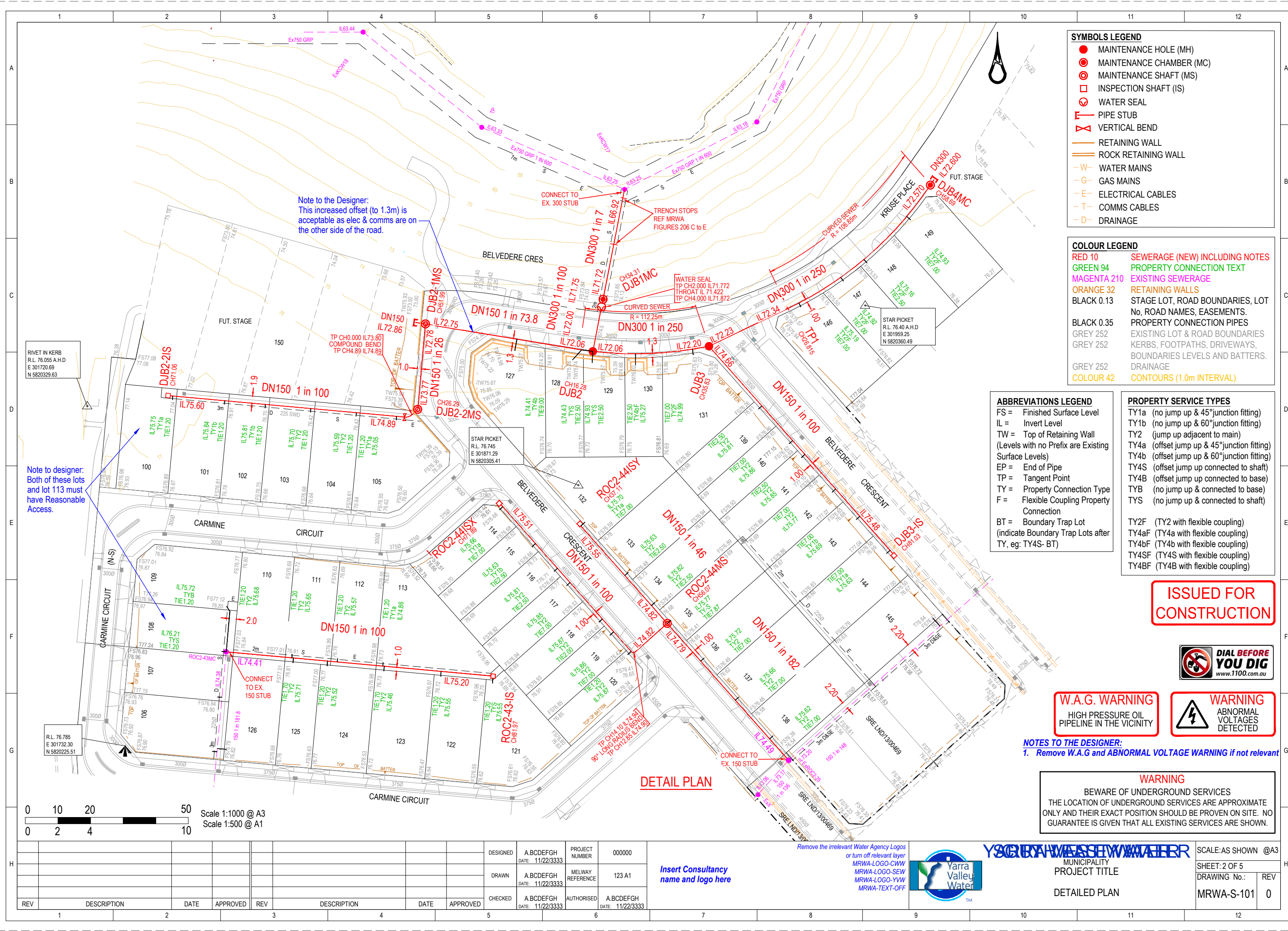
SHEET: 1 OF 5

DRAWING No.:

MDWA 9.1

MRWA-3-10





**SYMBOLS LEGEND**

- MAINTENANCE HOLE (MH)
- MAINTENANCE CHAMBER (MC)
- MAINTENANCE SHAFT (MS)
- INSPECTION SHAFT (IS)
- WATER SEAL
- PIPE STUB
- VERTICAL BEND
- RETAINING WALL
- ROCK RETAINING WALL
- WATER MAINS
- GAS MAINS
- ELECTRICAL CABLES
- COMMS CABLES
- DRAINAGE

**COLOUR LEGEND**

|             |   |
|-------------|---|
| RED 10      | SEWERAGE (NEW) INCLUDING NOTES                              |
| GREEN 94    | PROPERTY CONNECTION TEXT                                    |
| MAGENTA 210 | EXISTING SEWERAGE   |
| ORANGE 32   | RETAINING WALLS   |
| BLACK 0.13  | STAGE LOT, ROAD BOUNDARIES, LOT No, ROAD NAMES, EASEMENTS.  |
| BLACK 0.35  | PROPERTY CONNECTION PIPES                                   |
| GREY 252    | EXISTING LOT & ROAD BOUNDARIES                              |
| GREY 252    | KERBS, FOOTPATHS, DRIVEWAYS, BOUNDARIES LEVELS AND BATTERS. |
| GREY 252    | DRAINAGE  |
| COLOUR 42   | CONTOURS (1.0m INTERVAL)                                    |

**ABBREVIATIONS LEGEND**

FS = Finished Surface Level  
IL = Invert Level  
TW = Top of Retaining Wall  
(Levels with no Prefix are Existing Surface Levels)  
EP = End of Pipe  
TP = Tangent Point  
TY = Property Connection Type  
F = Flexible Coupling Property Connection  
BT = Boundary Trap Lot  
(indicate Boundary Trap Lots after TY, eg: TY4S- BT)

**PROPERTY SERVICE TYPES**

TY1a (no jump up & 45° junction fitting)  
TY1b (no jump up & 60° junction fitting)  
TY2 (jump up adjacent to main)  
TY4a (offset jump up & 45° junction fitting)  
TY4b (offset jump up & 60° junction fitting)  
TY4S (offset jump up connected to shaft)  
TY4B (offset jump up connected to base)  
TYB (no jump up & connected to base)  
TYS (no jump up & connected to shaft)  
TY2F (TY2 with flexible coupling)  
TY4aF (TY4a with flexible coupling)  
TY4bF (TY4b with flexible coupling)  
TY4SF (TY4S with flexible coupling)  
TY4BF (TY4B with flexible coupling)

**ISSUED FOR CONSTRUCTION**



**W.A.G. WARNING**  
HIGH PRESSURE OIL PIPELINE IN THE VICINITY

**WARNING**  
ABNORMAL VOLTAGES DETECTED

**NOTES TO THE DESIGNER:**  
1. Remove W.A.G and ABNORMAL VOLTAGE WARNING if not relevant

**WARNING**  
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|          |            |                  |            |
|----------|------------|------------------|------------|
| DESIGNED | A.BCDEFGH  | PROJECT NUMBER   | 000000     |
| DATE     | 11/22/3333 | MELWAY REFERENCE | 123 A1     |
| DRAWN    | A.BCDEFGH  | AUTHORISED       | A.BCDEFGH  |
| DATE     | 11/22/3333 | DATE             | 11/22/3333 |
| CHECKED  | A.BCDEFGH  |                  |            |
| DATE     | 11/22/3333 |                  |            |

| REV | DESCRIPTION | DATE | APPROVED |
|-----|-------------|------|----------|
| 1   |             |      |          |
| 2   |             |      |          |
| 3   |             |      |          |
| 4   |             |      |          |
| 5   |             |      |          |

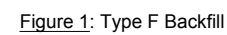
Remove the irrelevant Water Agency Logos or turn off relevant layer  
MRWA-LOGO-CWW  
MRWA-LOGO-SEW  
MRWA-LOGO-YVW  
MRWA-TEXT-OFF

**Yarra Valley Water**

MUNICIPALITY  
PROJECT TITLE  
DETAILED PLAN

SCALE: AS SHOWN @A3  
SHEET: 2 OF 5  
DRAWING No.: MRWA-S-101  
REV 0

- Embedment shall be Type A unless stated otherwise.
- Backfill Type O is ordinary fill, to be selected and installed as per MRWA Backfill Specification 04-03.X (*Consultant to write in the Backfill Specification adopted by the Water Agency*).
- Type F is to be installed as per Figure 1 (*Consultant to write in the Road Owners Requirements for Backfill in the Road Reserve which is not under road pavement into Figure 1*).

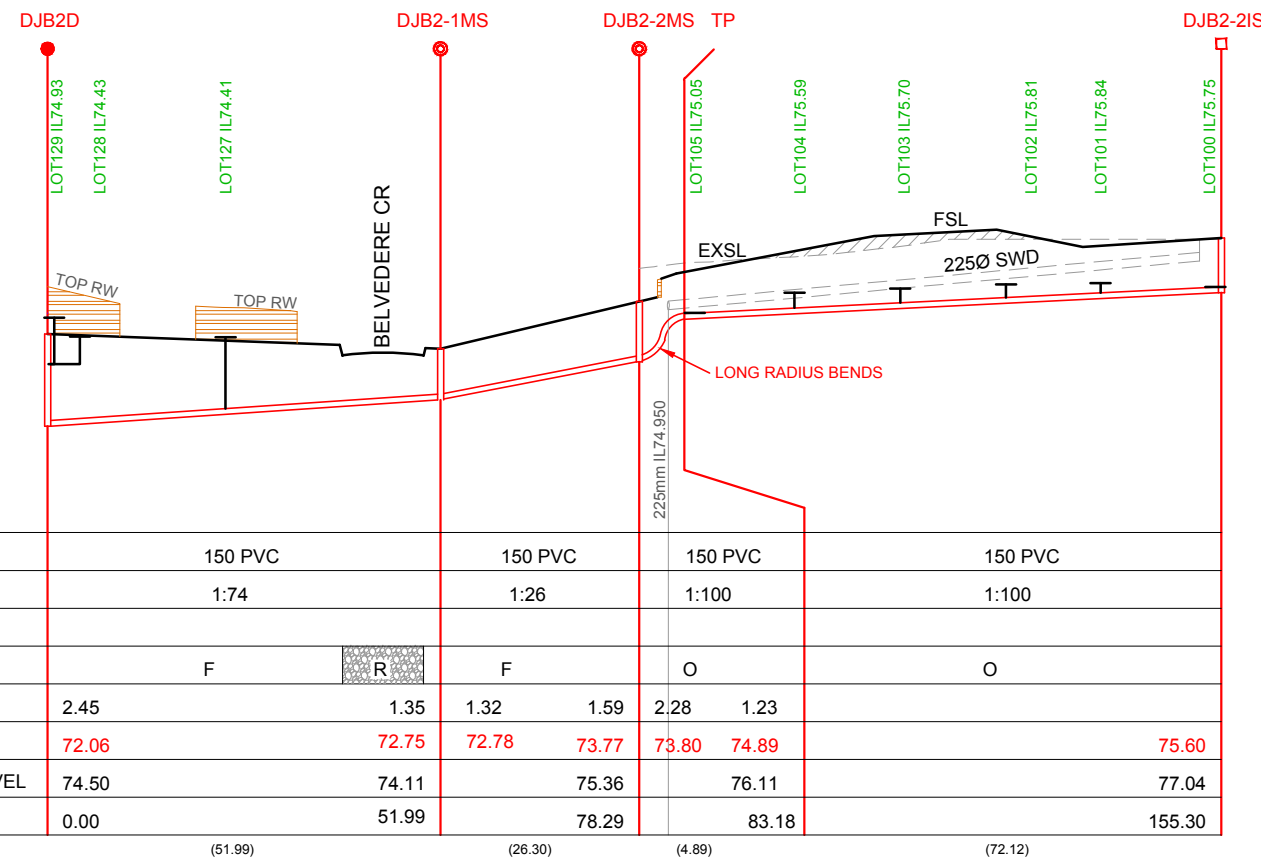


- 
- FSL
- Pavement.  
(by others)
- Material =  
Class 2 FCR
- 600
- Material =  
Class 4 FCR
- Density =  
95%  $R_0$
- If depth < 1.5m  
Material = Class 2  
FCR for full depth

Figure 2: Type R Backfill

*(This information is only required on one of the long section sheets).*


**OTHER NOTES:**  
Provide a 30mm drop through the chase for  
Maintenance Chambers and Shafts.



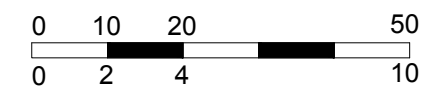
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|------------------------|---------|-------|---------|-------|---------|-------|---------|--------|
| DATUM 68               |         |       |         |       | 222     |       |         |        |
| PIPE DETAILS           | 150 PVC |       | 150 PVC |       | 150 PVC |       | 150 PVC |        |
| GRADE                  | 1:74    |       | 1:26    |       | 1:100   |       | 1:100   |        |
| EMBEDMENT              |         |       |         |       |         |       |         |        |
| BACKFILL TYPE          | F       | R     | F       |       | O       |       | O       |        |
| DEPTH TO INVERT        | 2.45    | 1.35  | 1.32    | 1.59  | 2.28    | 1.23  |         |        |
| INVERT LEVEL           | 72.06   | 72.75 | 72.78   | 73.77 | 73.80   | 74.89 |         | 75.60  |
| FINISHED SURFACE LEVEL | 74.50   | 74.11 |         | 75.36 |         | 76.11 |         | 77.04  |
| CHAINAGE               | 0.00    | 51.99 |         | 78.29 |         | 83.18 |         | 155.30 |
| LENGTH                 | (51.99) |       | (26.30) |       | (4.89)  |       | (72.12) |        |

| COLOUR LEGEND |  |
|---------------|--|
| RED 10        | SEWERAGE (NEW) INCLUDING NOTES                 |
| GREEN 94      | PROPERTY CONNECTION TEXT                       |
| BLACK 0.35    | FINISHED SURFACE,<br>PROPERTY CONNECTION PIPES |
| MAGENTA 210   | EXISTING SEWERAGE                              |
| GREY 252      | DRAINAGE                                       |
| ORANGE 32     | RETAINING WALLS                                |
| GREY 252      | CUT & FILL (EARTHWORKS)                        |

ISSUED FOR  
CONSTRUCTION

FILL SHOWN THUS: 

TENDERS SHOULD BE PREPARED ON THE BASIS THAT EARTHWORKS SHOWN SHADED SHOULD BE COMPLETED PRIOR TO THE COMMENCEMENT OF WORKS.



Scale H 1:1000 V 1:200 @ A3

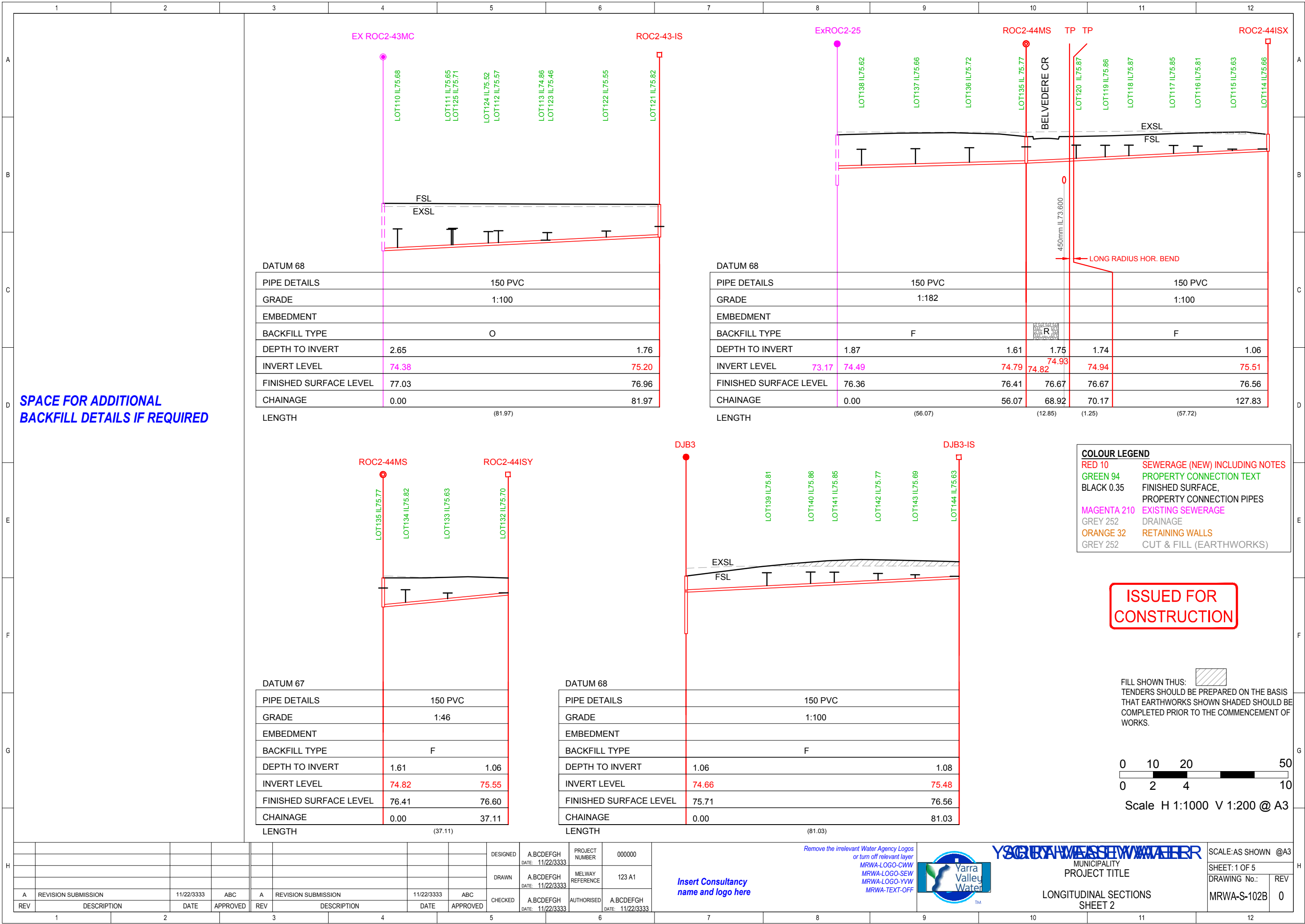
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|-----|---------------------|------------|----------|-----|---------------------|------------|----------|----------|-------------------------------|---------------------|-------------------------------|
|     |                     |            |          |     |                     |            |          | DESIGNED | A.BCDEFGH<br>DATE: 11/22/3333 | PROJECT<br>NUMBER   | 000000                        |
|     |                     |            |          |     |                     |            |          | DRAWN    | A.BCDEFGH<br>DATE: 11/22/3333 | MELWAY<br>REFERENCE | 123 A1                        |
| A   | REVISION SUBMISSION | 11/22/3333 | ABC      | A   | REVISION SUBMISSION | 11/22/3333 | ABC      | CHECKED  | A.BCDEFGH<br>DATE: 11/22/3333 | AUTHORISED          | A.BCDEFGH<br>DATE: 11/22/3333 |
| REV | DESCRIPTION         | DATE       | APPROVED | REV | DESCRIPTION         | DATE       | APPROVED |          |                               |                     |                               |

Remove the irrelevant Water Agency Logos  
or turn off relevant layers  
MRWA-LOGO-CWW  
MRWA-LOGO-SEW  
MRWA-LOGO-YVW  
MRWA-TEXT-OFF



YSCUBA-WASSEWATER  
MUNICIPALITY  
PROJECT TITLE  
LONGITUDINAL SECTIONS  
SHEET 1

|                     |     |   |
|---------------------|-----|---|
| SCALE: AS SHOWN @A3 |     | H |
| SHEET: 3 OF 5       |     |   |
| DRAWING No.:        | REV |   |
| MRWA-S-102A         | 0   |   |



SPACE FOR ADDITIONAL  
BACKFILL DETAILS IF REQUIRED

|          |            |            |                  |
|----------|------------|------------|------------------|
| DESIGNED | A.BCDEFGH  | PROJECT    | 000000           |
| DATE:    | 11/22/3333 | NUMBER     |                  |
| DRAWN    | A.BCDEFGH  | MELWAY     | 123 A1           |
| DATE:    | 11/22/3333 | REFERENCE  |                  |
| CHECKED  | A.BCDEFGH  | AUTHORISED | A.BCDEFGH        |
| DATE:    | 11/22/3333 |            | DATE: 11/22/3333 |

Insert Consultancy  
name and logo here

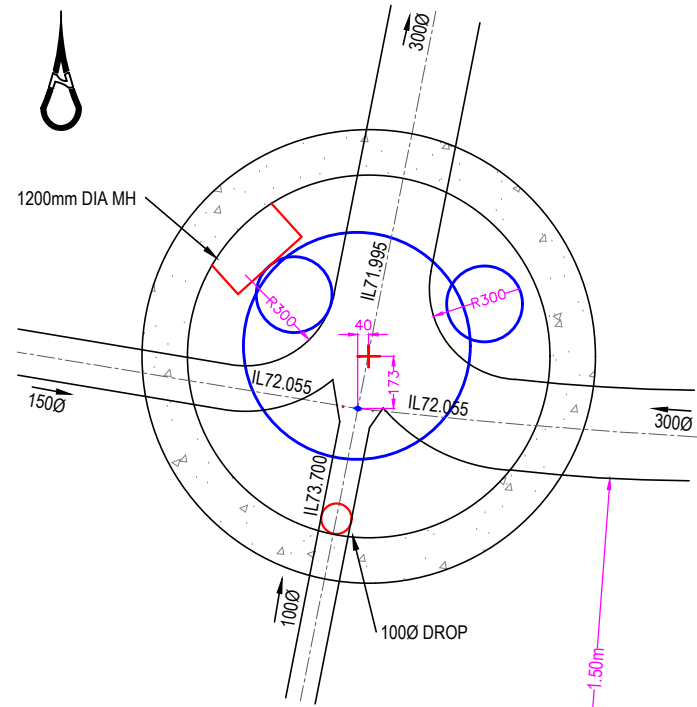
Remove the irrelevant Water Agency Logos  
or turn off relevant layer  
MRWA-LOGO-CWW  
MRWA-LOGO-SEW  
MRWA-LOGO-YVW  
MRWA-TEXT-OFF



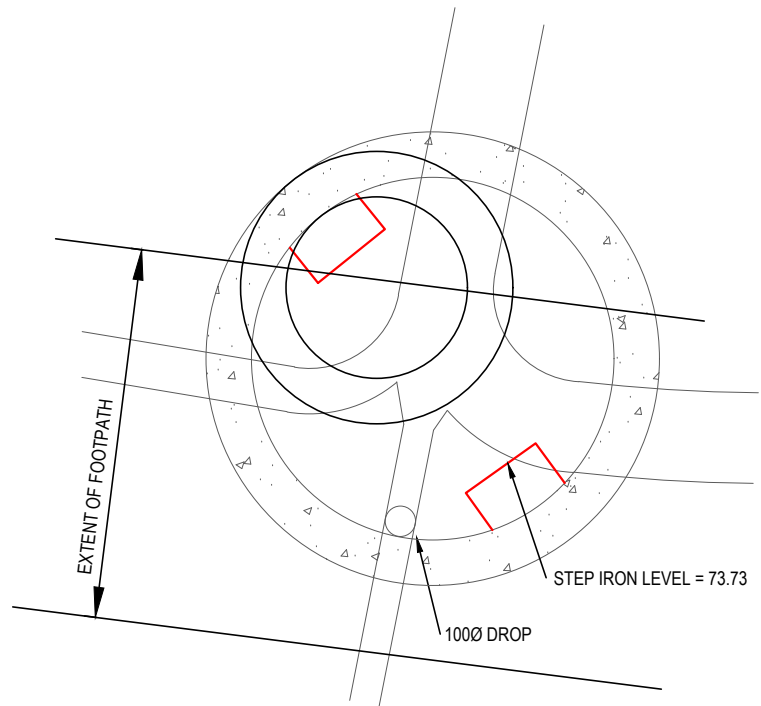
YSCORAWASSERWATER  
MUNICIPALITY  
PROJECT TITLE  
LONGITUDINAL SECTIONS  
SHEET 2

SCALE: AS SHOWN @A3  
SHEET: 1 OF 5  
DRAWING No.:  
MRWA-S-102B  
REV  
0

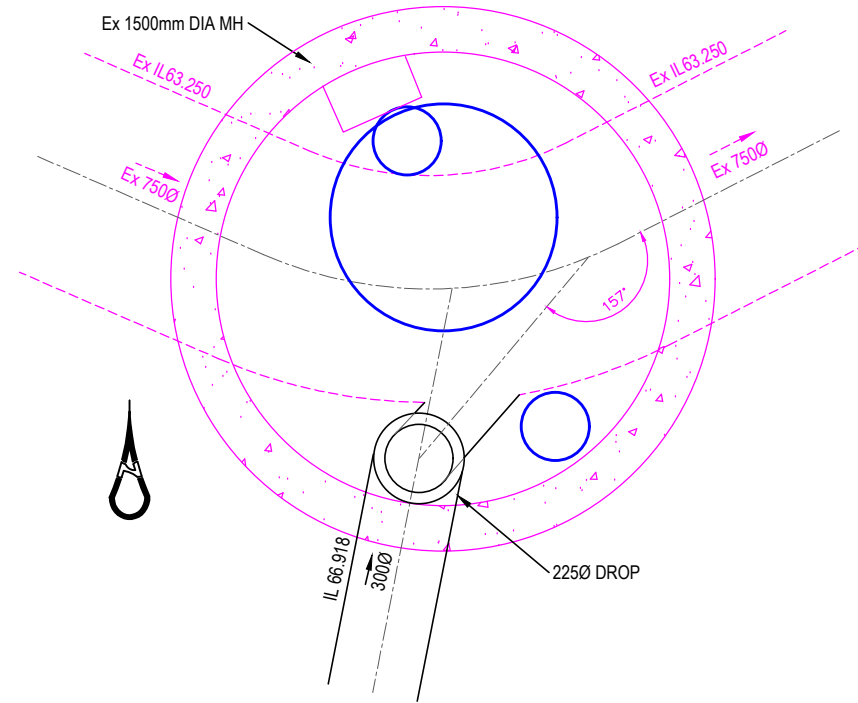




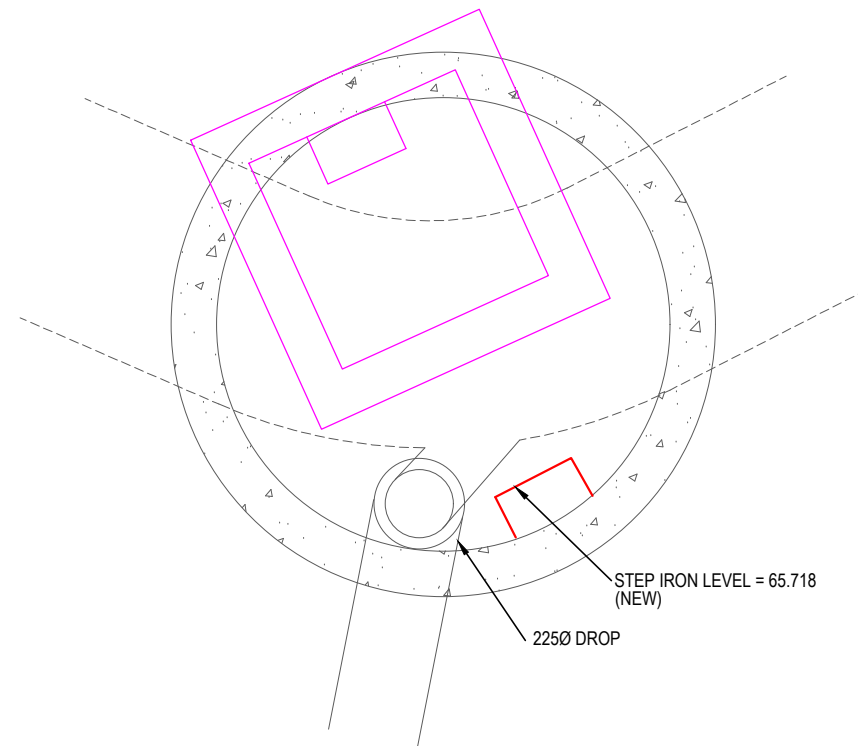
**MAINTENANCE HOLE DJB2D BASE ARRANGEMENT**  
SCALE 1:25 @ A3



**MAINTENANCE HOLE DJB2D COVERS & FITTINGS ARRANGEMENT**  
SCALE 1:25 @ A3



**Ex MAINTENANCE HOLE KCW17  
BASE ARRANGEMENT**  
SCALE 1:25 @ A3



**Ex MAINTENANCE HOLE KCW17  
COVERS & FITTINGS ARRANGEMENT**  
SCALE 1:25 @ A3

|     |             |      |          |     |             |      |          |          |       |            |  |  |  |  |  |
|-----|-------------|------|----------|-----|-------------|------|----------|----------|-------|------------|--|--|--|--|--|
|     |             |      |          |     |             |      |          | DESIGNED | DATE: | PROJECT    |  |  |  |  |  |
|     |             |      |          |     |             |      |          | DRAWN    | DATE: | MELWAY     |  |  |  |  |  |
|     |             |      |          |     |             |      |          | CHECKED  | DATE: | AUTHORISED |  |  |  |  |  |
| REV | DESCRIPTION | DATE | APPROVED | REV | DESCRIPTION | DATE | APPROVED |          |       |            |  |  |  |  |  |
| 1   |             |      |          | 3   |             |      |          |          |       |            |  |  |  |  |  |
| 2   |             |      |          | 4   |             |      |          |          |       |            |  |  |  |  |  |
| 3   |             |      |          | 5   |             |      |          |          |       |            |  |  |  |  |  |
| 4   |             |      |          | 6   |             |      |          |          |       |            |  |  |  |  |  |
| 5   |             |      |          | 7   |             |      |          |          |       |            |  |  |  |  |  |
| 6   |             |      |          | 8   |             |      |          |          |       |            |  |  |  |  |  |
| 7   |             |      |          | 9   |             |      |          |          |       |            |  |  |  |  |  |
| 8   |             |      |          | 10  |             |      |          |          |       |            |  |  |  |  |  |
| 9   |             |      |          | 11  |             |      |          |          |       |            |  |  |  |  |  |
| 10  |             |      |          | 12  |             |      |          |          |       |            |  |  |  |  |  |

Remove the irrelevant Water Agency Logos  
or turn off relevant layer  
MRWA-LOGO-CWW  
MRWA-LOGO-SEW  
MRWA-LOGO-YVW  
MRWA-TEXT-OFF



**YARRA VALLEY WATER**  
MUNICIPALITY  
PROJECT TITLE  
CONSTRUCTION DETAILS

SCALE: HOR @A3  
SHEET: 3 of 3  
DRAWING No.: REV  
MRWA-S-1020

TABLE 103-A: ACCEPTABLE PIPE SYSTEMS

| NOMINAL DIAMETER   | 100 <sup>E.A</sup> | 150                | 225                | 300                | 350  | 375                | 400  | 450  | 500  | 525  | 600  | 675  | 700  | 750           | 800           | 900 | 1000 |
|--|--------------------|--------------------|--------------------|--------------------|------|--------------------|------|------|------|------|------|------|------|---------------|---------------|-----|------|
| MINIMUM GRADE (%) <sup>I</sup>                                       | 1.7                | 0.55               | 0.33               | 0.25               | 0.20 | 0.17               | 0.16 | 0.14 | 0.13 | 0.12 | 0.10 | 0.08 | 0.08 | REFER NOTE I. |               |     |      |
| MINIMUM GRADE <sup>I</sup>   | 1 in               | 60                 | 180                | 300                | 400  | 500                | 590  | 625  | 715  | 770  | 830  | 1000 | 1180 | 1250          | REFER NOTE I. |     |      |
| PVC OUTSIDE DIAMETER (OD)  | 110                | 160                | 250                | 315                |      | 400                |      |      |      |      |      |      |      |               |               |     |      |
| PVC PLAIN WALL INSIDE DIAMETER (ID)                                  | 102 <sup>E.B</sup> | 150 <sup>E.B</sup> | 234 <sup>E.B</sup> | 294 <sup>E.B</sup> |      | 353                |      |      |      |      |      |      |      |               |               |     |      |
| PVC SANDWICH WALL INSIDE DIAMETER (ID)                               | 98                 | 150                | 215                | 285                |      | 356 <sup>E.C</sup> |      |      |      |      |      |      |      |               |               |     |      |
| PVC SOLVENT CEMENT JOINTED PIPE ACCEPTABLE                           | ✓                  | ✓                  | ✓                  |                    |      |                    |      |      |      |      |      |      |      |               |               |     |      |
| PVC RUBBER RING JOINTS ACCEPTABLE                                    |                    | ✓                  | ✓                  | ✓                  |      | ✓                  |      |      |      |      |      |      |      |               |               |     |      |
| PP OUTSIDE DIAMETER (OD)   |                    |                    | 259                | 344                |      | 428                |      | 514  |      | 600  | 682  |      |      |               |               |     |      |
| PP (ID)  |                    |                    | 225                | 300                |      | 373                |      | 447  |      | 522  | 596  |      |      |               |               |     |      |
| PE (PN8, SDR21) OUTSIDE DIAMETER (OD) <sup>F</sup>                   | 110                | 160                | 250                | 315                | 400  |                    | 450  | 500  | 560  |      |      |      |      |               |               |     |      |
| PE (PN8, SDR21) INSIDE DIAMETER (ID) <sup>F</sup>                    | 99                 | 145                | 226                | 285                | 362  |                    | 407  | 452  | 506  |      |      |      |      |               |               |     |      |
| GRP (AS3571- Table 5 Amended) OUTSIDE DIAMETER (OD) <sup>G</sup>     |                    |                    |                    | 345                |      | 426                |      | 507  |      | 587  | 667  | 747  |      | 826           |               | 923 | 1025 |
| GRP (AS3571- Table 5 Amended) SN10 INSIDE DIAMETER (ID) <sup>G</sup> |                    |                    |                    | 328                |      | 409                |      | 487  |      | 564  | 641  | 718  |      | 794           |               | 887 | 985  |
| GRP (ISO10467- Table 5 & 6) OUTSIDE DIAMETER (OD) <sup>G</sup>       |                    |                    |                    | 324                | 376  |                    | 427  |      | 530  |      | 616  |      | 718  |               | 820           | 924 | 1026 |
| GRP (ISO10467- Table 5 & 6) SN10 INSIDE DIAMETER (ID) <sup>G</sup>   |                    |                    |                    | 308                | 358  |                    | 407  |      | 505  |      | 587  |      | 685  |               | 783           | 882 | 980  |

NOTES Regarding Table103-A:

- A. All sewer systems tabulated above are suitable for residential, commercial & industrial sewage collection.
- B. All sewer systems tabulated above can be considered to have a roughness co-efficient (Ks) of 1.5mm.
- C. Standard lengths for sewer gravity pipe is 3m or 6m.
- D. Minimum SN classes:  
D.A. DN100 gravity sewer pipe SN (min) = SN 10,000 (N/m/m) which is equivalent to SN 10 (kN/m/m).  
D.B. > DN100 gravity sewer pipe SN (min) = 8,000 (N/m/m) which is equivalent to SN 8 (kN/m/m).  
D.C. PN8 SDR21 PE100 pipe SN (min) = 3,700 (N/m/m) which is equivalent to SN 3.7 (kN/m/m)
- E. PVC (Poly Vinyl Chloride) DWV pipelines:  
E.A. DN100 pipelines are only acceptable for use in the construction of property services (refer Table 104-A) or spur branches.  
E.B. Plain wall PVC is generally used for only DN375.  
E.C. Sandwich wall PVC is generally used in sizes DN100, DN150, DN225 & DN300. Plain wall PVC should be specified when a higher degree of toughness is required.
- F. PE (Poly ethylene) pipelines:  
F.A. Shall be PE100 or better and plain black.  
F.B. Require Water Agency approval.  
Typically this will only be granted where the advantages of PE are required, eg: where high impact resistance, increased flexibility or long run trenchless construction is required.  
F.C. Where practicable, grade for on grade PE pipe (ie: not including syphons) shall > be 1 in 150.  
Flatter grades require Water Agency approval.  
F.D. All PE sewers shall be butt welded where practicable.  
F.E. Butt weld joints shall be de-beaded internally after welding.  
F.F. Where PE gravity sewer pipe is gouged to > 20% of its wall thickness, it shall be rejected.  
F.G. SN rating of SDR21 PE100 PE pipe shall be calculated as follows:  
 $SN = (E_{2y} \times 10^6) / 12(SDR21)^3$        $E_{2y} = 350 \text{ MPa}$  (2 year modulus for PE100)  
eg: for PN8 SDR21 PE1000 pipe, SN = 3,700 N/m/m  
Structural limits for pe pipe shall be calculated accordingly.
- F.H. SDR21 PE100 pipe is capable of withstanding significantly less vertical load than other acceptable pipelines.
- F.I. PE lined concrete, vitrified clay, Polycrrete, ductile iron and steel sewers require approval of the Water Agency.
- G. GRP (Glass Reinforced Polymer) pipelines:  
G.A. Where GRP jacking pipe is proposed. Refer to MRWA-S-208 for guidance on calculating the required SN rating of jacking pipe.  
G.B. Where sewage or the ground is known to contain organic solvents, vinyl ester GRP with Viton or Nitrile rubber ring joints shall be used.  
PVC DWV and PP pipe is generally not suitable in such cases (depending on the concentration & type pf solvent).
- H. The maximum grade shall be that for which the velocity of flow is 3.0 m/s at PDWF. (refer MRWA-S-205 for details)
- I. Minimum grade depends on flow (number of connections). The minimum grade quoted in Table 103-A assumes a significant number of connections.  
Refer to Table 5.6 in the code text for the minimum grade required as it varies with the number of connections.  
The minimum grades quoted for > DN300 sewers are indicative only. Shear stress of 1.6 Pa shall be achieved at PDWF.  
Where the proposed grade is close to or greater than the minimum grade tabulated in Table 103-A, the minimum grade shall be determined by a hydraulic specialist (degree qualified engineer who has completed open channel hydraulics training) in consultation with the Water Agency.  
Hydraulic computations shall be provided to the Water Agency as part of the design submission.

TABLE 103-B: PVC DWV WITNESS MARK & CHAMFER DIMENSIONS

| NOMINAL DIAMETER               | 100 | 150     | 225 | 300            | 375 | 450   | 525 | 600 |
|--------------------------------|-----|---------|-----|----------------|-----|-------|-----|-----|
| PVC-DWV WITNESS MARK (X)       | 84  | 96      | 120 | 130            | 140 | N / A |     |     |
| PVC-DWV CHAMFER LENGTH (Y)     | 11  | 13      | 20  | 20             | 25  | N / A |     |     |
| POLYPROPYLENE WITNESS MARK (X) | N/A | 6TH RIB |     | TOP OF 5TH RIB |     |       |     |     |

- Witness mark on polypropylene pipe shall be a white line around the circumference.
- Polypropylene pipe does not require a chamfer on the spigot end.
- Sewerpro PP rubber ring to be located in 1st trough from end of pipe.
- Sewermax PP rubber ring to be located in 2nd trough from end of pipe.
- Pipe spigots shall be inserted until the witness mark is within 5mm of the socket end while remaining visible.

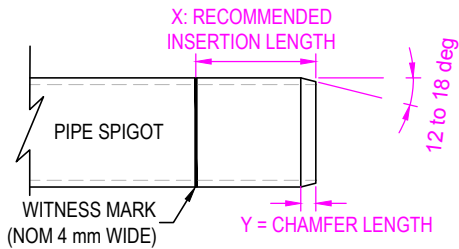


FIGURE 103-A: SOCKET JOINT REQUIREMENTS

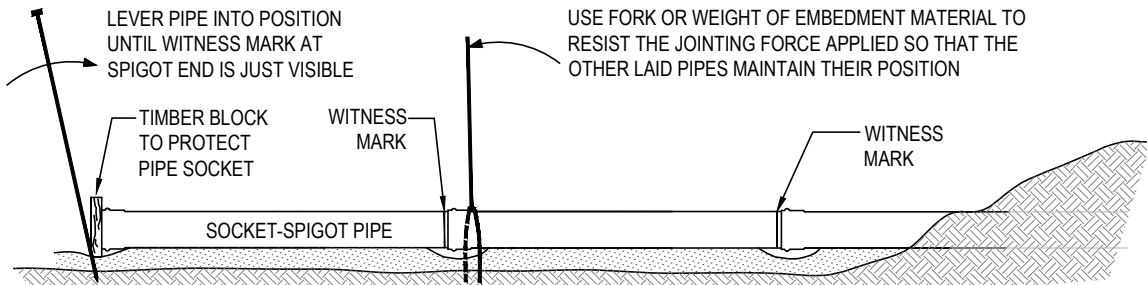


FIGURE 103-B: SOCKET - SPIGOT PIPE INSTALLATION REQUIREMENTS

Pipe Installation:

1. Lay pipes in accordance with the manufacturer's instructions.
2. Undertake trenching as per MRWA-S-201.
3. Refer to the design to establish the required embedment system and determine a suitable approved embedment material (refer MRWA-S-202).
4. Place underlay, ensuring that embedment material is scalloped out from beneath collars so that the pipe can be supported evenly along its entire length.
5. Check roundness of pipe to ensure it is within limits. If out-of-roundness is noticeable but minimal, orientate larger pipe diameter in the vertical plane.  
Reject any pipe which is significantly out-of-round.
6. Laid pipes shall be held in position by placing sufficient embedment material over each pipe before inserting the next pipe, or alternatively:  
Use a fork as per Figure 103-B to hold the laid pipe in position while the next pipe is inserted.
7. If rubber ring joint (RRJ) pipe:
  - 7.1. Prepare any cut spigot end by cutting the pipe square, chamfering and applying a witness mark as per table 103-B and Figure 103-A.
  - 7.2. Clean the pipe or fitting socket and spigot end making sure that both are free from foreign material and swarf.
  - 7.3. Fit the rubber ring into / onto the groove if not already done so.
  - 7.4. Ensure rubber ring is evenly fitted by running fingers around its full circumference.
  - 7.5. Apply manufacturer approved jointing lubricant liberally inside the socket and end of spigot.
  - 7.6. Accurately align new pipe length with the installed pipe and insert leading edge of spigot into socket mouth.
  - 7.7. Apply an even jointing force by thrusting a crow-bar on a timber bridging piece protecting the end of the socket as per Figure 103-B.
  - 7.8. Push spigot home to witness mark.
8. If solvent cement joint (SCJ):
  - 8.1. Prepare any cut spigot ends by cutting the pipe square and de-burring inside and outside edges with a knife, file, reamer or sandpaper.  
Apply witness mark as per Table 103-B and Figure 103-A.
  - 8.2. Clean the pipe or fitting socket and spigot end making sure that both are free from foreign material.
  - 8.3. Apply priming fluid to contact surfaces with a lint free cotton cloth.
  - 8.4. Coat socket and then spigot end (to witness mark) with a thin uniform coating of solvent cement.  
Ensure that too much solvent cement is not used such that there will be a pool of cement when joined (this will weaken the pipe).
  - 8.5. Quickly but accurately align new pipe length with the installed pipe and insert leading edge of spigot into socket mouth.
  - 8.6. Apply an even jointing force by thrusting a crow-bar on a timber bridging piece protecting the end of the socket as per Figure 103-B.
  - 8.7. Push spigot home to witness mark and twist a 1/4 turn.
  - 8.8. Hold pressure for 30 seconds.
  - 8.9. Wipe off any excess solvent from inside (if possible) and outside of joint.
  - 8.10. Do not disturb the joint for 5 minutes to avoid breaking the initial bond.
9. Place side support and haunch pipe to ensure that the underside of the pipe is fully supported with compacted embedment material.  
Refer MRWA-S-201 and 202 for details.
10. Place and compact overlay embedment material to the required depth.
11. Backfill trench as per the MRWA backfill specification.

ALL DIMENSIONS IN mm UNLESS STATED OTHERWISE

|   |           |                   |   |               |          |
|---|-----------|-------------------|---|---------------|----------|
| DESIGNED: R. JAGGER                     |           | DATE: 1 JULY 2015 |   |               |          |
| DRAWN: R. JAGGER                        |           | DATE: 1 JULY 2015 |   |               |          |
| CHECKED:                                | NAME      | DATE              | APPROVED:                               | NAME          | DATE     |
| <input checked="" type="checkbox"/> CWW | D. MOORE  | 01/09/15          | <input checked="" type="checkbox"/> CWW | R. CARRUTHERS | 01/09/15 |
| <input checked="" type="checkbox"/> SEW | C. PAXMAN | 01/09/15          | <input checked="" type="checkbox"/> SEW | D. O'DONOVAN  | 01/09/15 |
| <input checked="" type="checkbox"/> YVW | K. DAWSON | 01/09/15          | <input checked="" type="checkbox"/> YVW | J. TOMASI     | 01/09/15 |
| ISSUED 2015                             |           |                   | VERSION 1                               |               |          |

MELBOURNE RETAIL WATER AGENCIES



MRWA SEWERAGE STANDARDS

NOT TO SCALE

PIPE AND JOINT DETAILS

MRWA-S-103

| Planning | Design | Construction |
|----------|--------|--------------|
| ✓        | ✓✓     | ✓✓           |



TABLE 104-A: PROPERTY CONNECTION ARRANGEMENTS

| NUMBER RES UNITS               | 1 or 2                      | 3 to 10                      | 11 to 30                             | 31 to 65                       | 66 to 320                       |
|--------------------------------|-----------------------------|------------------------------|--------------------------------------|--------------------------------|---------------------------------|
| IND / COMM LAND SIZE           | < 1,000 m <sup>2</sup>      | 1,001 to 5,000m <sup>2</sup> | 5,001 to 15,000m <sup>2</sup>        | 15,001 to 30,000m <sup>2</sup> | 30,001 to 150,000m <sup>2</sup> |
| PROPERTY CONNECTION SIZE       | DN100                       |                              | DN150                                |                                | DN225                           |
| MIN DISCHARGE SEWER LINE       | DN100                       | ≥DN150                       | ≥DN150                               |                                | ≥DN225                          |
| WATER AGENCY                   | ALL                         |                              | CWW or YVW                           | SEW                            | CWW or YVW                      |
| ON GRADE CONNECTION TYPE (MIN) | OB (TYPE 1 CONNECTION)      |                              | MC <sup>7</sup>                      | MS <sup>7</sup>                | MH <sup>7</sup>                 |
| DROP CONNECTION TYPE (MIN)     | OB (TYPE 2 OR 4 CONNECTION) |                              | MH (WITH INTERNAL DROP) <sup>7</sup> |                                |                                 |

NOTES Regarding Table 104-A:

- Units in this context refers to equivalent tenements (ie: houses, units or flats) connected to a common property connection (ie: body corporate).
- Whether a new connection can connect to an existing sewer will depend on the number and size of upstream connections and the capacity of the sewer (Refer Table 5.6 from the code). The "Discharge Sewer Line Size" nominated above is a Minimum.
- As described in MRWA-S-300, it may be acceptable to the water agency if a maintenance structure is increased in size beyond the minimum.
- Refer to MRWA-S-400 for details of how to connect to an existing network.
- OB connections (as per Table 104-B) shall only be to sewer lines ≤DN450 in size and < 4.0m deep.
- Where the private sanitary drain (constructed by the plumber under AS3500) is larger than the water agency's property connection, plumber to install a reducer on private sanitary drain to transition from the larger to smaller pipe.
- Where these properties have a calculated connection point level >1m above the base invert level, they shall connect to a MH shaft. Otherwise, the connection point level shall be set at the base invert level plus 1 in 60 rise over the length of the property connection.

TABLE 104-B: PROPERTY CONNECTION JUNCTION FITTINGS

| HOST PIPE      | TYPE              | CONNECTION FITTING TYPE  | HOST NOMINAL DIAMETER |     |     |     |     |     |     |     |
|----------------|-------------------|--|-----------------------|-----|-----|-----|-----|-----|-----|-----|
|                |                   |  | 100                   | 150 | 225 | 300 | 375 | 450 | 525 | 600 |
| PVC DWV        | DRY               | PVC DWV 45° JUNCTION (OB) - IN LINE FITTING                                      | →                     | →   | →   | →   | →   | →   | →   | →   |
| PP             | DRY               | PVC, PP, GRP 45° JUNCTION (OB) - IN LINE   | →                     | →   | →   | →   | →   | →   | →   | →   |
| GRP            | DRY               | GRP FABRICATED 45° JUNCTION (OB)- IN LINE  | →                     | →   | →   | →   | →   | →   | →   | →   |
| PE             | DRY or LIVE SEWER | ELECTROFUSION SADDLE JUNCTION <sup>4</sup>                                       | →                     | →   | →   | →   | →   | →   | →   | →   |
| PVC DWV        | LIVE SEWER        | STAINLESS STEEL 45° JUNCTION CLAMP (OB), or DWV SCJ SADDLE JUNCTION              | →                     | →   | →   | →   | →   | →   | →   | →   |
| PP, VC or CONC | LIVE SEWER        | STAINLESS STEEL 45° JUNCTION CLAMP (OB)  | →                     | →   | →   | →   | →   | →   | →   | →   |
| GRP            | LIVE SEWER        | STAINLESS STEEL 45° JUNCTION CLAMP (OB), or GRP 45° SADDLE JUNCTION FOR GRP PIPE | →                     | →   | →   | →   | →   | →   | →   | →   |

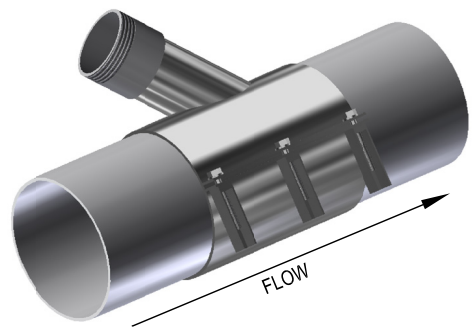


FIGURE 104-B: SS JUNCTION CLAMP

Clamp / Saddle Junctions:

- Do not install when the depth of flow in sewer is > a third of pipe Ø.
- All connections to live sewers are to be done under confined space entry conditions.
- Comply the manufacturer's installation instructions.

- Determine the correct type and method of attachment of the saddle / clamp.
  - If SS clamp, PE saddle, GRP saddle or PVC saddle for PVC DWV pipe; ensure clamp matches OD of pipe.
  - If PVC saddle on a PVC lined sewer (refer Figure 104-D): connections to PVC sewer linings will require a PVC saddle sized specifically for the lining.
- Excavate pipe and determine the optimum orientation of the junction.
- Support the pipe so that it does not sag when the hole is cut.
- If a saddle is going on to a pipe lining, clear a length of host pipe away from the liner equal to the saddle length plus no more than 200mm in either side so that the saddle can be attached to the liner.
- Place the rubber mat from clamp (if SS clamp type) or the saddle junction over the pipe, orientating the junction correctly.

The branch offtake is to be set as close to 45° as possible with at least 2% grade.

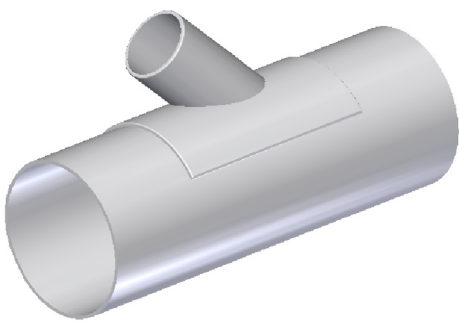


FIGURE 104-C: PVC SADDLE JUNCTION

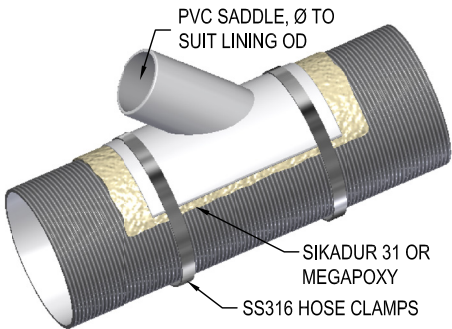


FIGURE 104-D: PVC SADDLE JUNCTION ON SEWER LINING

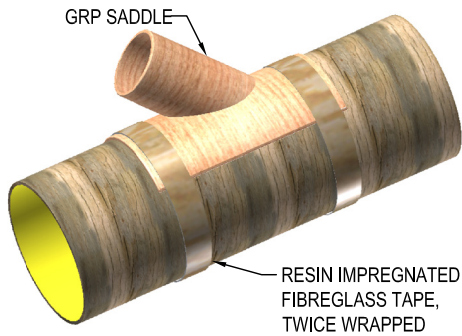


FIGURE 104-E: GRP SADDLE JUNCTION ON GRP PIPE



FIGURE 104-F: PE ELECTROFUSION SADDLE JUNCTION ON PE PIPE

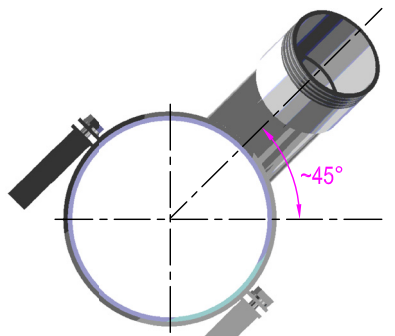


FIGURE 104-G: JUNCTION ALIGNMENT

- If the hole is to be cut before fixing the saddle, mark the outline of the hole, remove the mat or saddle and oversize the outline of the hole by 5mm using a paint marker. Cut out the hole (using saber, hole or air saw), ensuring that all cut out material, swarf and jagged edges are removed.
- Clean the pipe / clamp mat / saddle surfaces. Rotary peel bonding area of the pipe if PE pipe junction.
- Place clamp or saddle correctly over hole so that no outside pipe surface is visible when looking through the offtake opening. Mark the outline of the base (if a saddle). Remove the saddle.
- Apply bonding agent (if saddle) to pipe outside and saddle inside surfaces (unless PE pipe or SS clamp).
  - If PVC saddle on a PVC sewer lining; liberally apply (5 thick) Sikadur 31 or Megapoxy to both surfaces.
  - If GRP saddle, mix and apply resin (same as host main- polyester or vinyl ester).
  - If PVC saddle on PVC DWV pipe, apply solvent cement as outlined in the pipe installation instructions in MRWA-S-103.
- If PE saddle, ensure bonding surfaces are completely free of any contaminants and thoroughly wipe surfaces with an approved hygienic wipe.

- Place clamp or saddle correctly over hole so that no outside pipe surface is visible when looking through the offtake opening.
- Hold the clamp / saddle firmly in place:
  - If SS clamp; bolt halves together and tighten firmly.
  - If PVC saddle on a PVC sewer lining; fit and fasten SS hose clamps (from Deks industries) around the circumference of the liner on each side of the liner. Tighten until bonding agent oozes from edges of saddle.
  - If PVC saddle on PVC DWV pipe, hold saddle firmly on pipe for 15 sec and do not disturb for 5 min.
  - If GRP saddle, wrap resin impregnated fibreglass tape three times circumferentially around saddle and branch, on both sides of the branch.
  - If PE saddle, carry out electrofusion in accordance with manufacturers instructions.
- Clean off any excess bonding agent from the inside surface of the pipe.
- If the hole is to be cut after fixing the saddle, cut out the hole (using hole saw), ensuring that all cut out material, swarf and jagged edges are removed.
- Remove pipe supports, place embedment and backfill.

Where junction is to be a Type 2 (jump up), support the junction as per Figure 301-C.

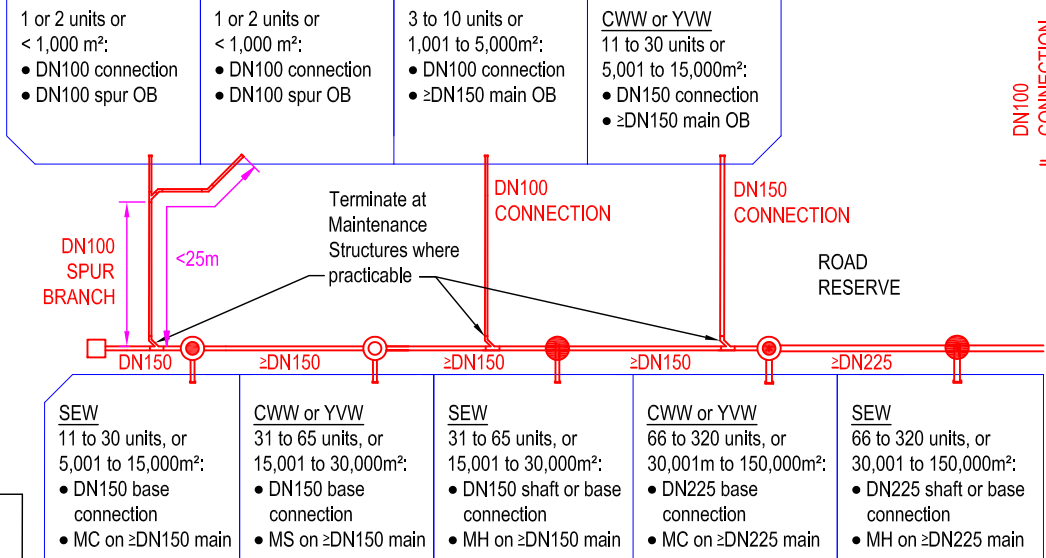


FIGURE 104-A: EXAMPLES OF PROPERTY CONNECTION ARRANGEMENTS

NOTES Regarding Table 104-B:

- Denotes that only DN100 branches are available.
- Denotes that DN100 and DN150 branches are acceptable and available.
- ≥DN225 branch offtakes are not acceptable.
- All junction fittings are to connect at 45° to the upstream line.
- For PE Electrofusion saddles, use 45° wastewater EF saddles where available. Otherwise use 90° large bore EF branch saddles. Weld PE to PVC adaptor to the saddle junction offtake to connect PVC DWV property connection pipework.

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| 3  | UPDATED TABLE 104-A & NEW FIGURE 104-A | 01/05/16 | RJ / CP / JT      | ✓ CWW               | D. MOORE  | 01/09/15 |  | ✓ CWW             | R. CARRUTHERS | 01/09/15 |  |
| 2  | PUBLISHED FIRST ISSUE                  | 01/10/15 | CP / JT / KD / RJ | ✓ SEW               | C. PAXMAN | 01/09/15 |  | ✓ SEW             | D. O'DONOVAN  | 01/09/15 |  |
| 1  | PRE-PUBLISHED DRAFT                    | 01/03/15 | CP / JT / KD / RJ | ✓ YVW               | K. DAWSON | 01/09/15 |  | ✓ YVW             | J. TOMASI     | 01/09/15 |  |
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MRWA SEWERAGE STANDARDS

PROPERTY JUNCTION ARRANGEMENTS

NOT TO SCALE

MRWA-S-104A

| Planning | Design | Construction |
|----------|--------|--------------|
|          | ✓      | ✓            |



# BENDS

TABLE 104-C: BEND REQUIREMENTS AND LIMITATIONS (Reticulation and Branch Sewers)

| PIPE TYPE                   | BEND TYPE TO BE USED   | MAX NUMBER OF BENDS ALLOWED | MAX ANGLE OF A HORIZONTAL BEND | MAX ANGLE OF A VERTICAL BEND | MAX CUMULATIVE ANGLE IN SEWER LINE <sup>5</sup> |
|-----------------------------|--|-----------------------------|--------------------------------|------------------------------|---|
| DN100 PVC DWV SPUR BRANCHES | PLAIN BENDS ONLY AVAILABLE                                   | 3                           | 45°                            | 45°                          | 135°  |
| DN150 & DN225 PVC           | >1000 RADIUS   | 3 <sup>3</sup>              | 90°                            | 22.5° <sup>7</sup>           | 135°  |
| DN300 & DN375 PVC           | LONG RADIUS BENDS CURRENTLY NOT AVAILABLE- BENDS NOT ALLOWED |                             |                                |                              |   |
| PP (DN150 or DN225)         | GRP SEGMENTED BEND (MIN R = 2.5 x Ø)                         | 3 <sup>3</sup>              | 90°                            | 22.5° <sup>7</sup>           | 90°   |
| PP (≥DN300)                 | GRP SEGMENTED BEND (MIN R = 2.5 x Ø)                         | 1 <sup>3</sup>              | 45°                            | NOT ALLOWED <sup>3</sup>     | 45°   |
| GRP REFER TABLE 104-D       | GRP SEGMENTED BEND (MIN R = 2.5 x Ø)                         | 1 <sup>3</sup>              | 45°                            | NOT ALLOWED <sup>3</sup>     | 45°   |
| PE (PN8, SDR21, ≤DN280)     | COLD BENT PIPE (MIN R = 35 x Ø)                              | 3 CURVES <sup>3</sup>       | 90°                            | 22.5° <sup>7</sup>           | 135°  |
| PE (PN8, SDR21, ≥DN315)     | COLD BENT PIPE (MIN R = 35 x Ø)                              | 1 CURVE <sup>3</sup>        | 45°                            | NOT ALLOWED <sup>3</sup>     | 45°   |

## NOTES Regarding Table 104-C:

- Bend radius is to the centre line of the bend.
- Where long radius PVC DWV bends are cut, they will require an end adaptor to convert the curved spigot end to something straight that can be joined. This adaptor may have either a straight socket or straight spigot end connection. Long radius PVC DWV bends when used whole will not require these adaptors as they are formed with straight sockets and/or spigots at both ends.
- Four vertical bends / curves of up to 22.5° are allowed in a sewer line when a siphon or water seal is to be constructed.
- Bends oriented to achieve both a horizontal and vertical angular deflection are acceptable in ≤DN225 pipe provided maximum angular requirements are met.
- The maximum cumulative angle in sewer line is the addition of all bends between one end of the sewer line and the other.
- eg: if there was one 30° horizontal and two 45° vertical bends in a PVC DN225 line, the total cumulative bend would be 120° which would be permitted. Any 45° deflection at the termination of a sewer line (ie: an OB) shall also be included in this calculation.
- The X, Y and Z co-ordinates of all intersections of straight pipes, bends and maintenance structures shall be "picked up" and recorded in the As Constructed information.
- Vertical bends are restricted to 22.5° as the maximum incline that some maintenance equipment can climb is about 25°. Where a sewer line can be maintained from both upstream and downstream via a maintenance structure, this 22.5° bend restriction may be increased on approval of the Water Agency.
- Indicate on the design plans the deflection angle of all bends which are **not** long radius PVC DWV bends.

TABLE 104-D: GRP BEND REQUIREMENTS

| BEND ANGLE   | 11.25° | 15°  | 22.5°  | 30°  | 45°    | 60° * | 90° * |
|--------------|--------|------|--------|------|--------|-------|-------|
| MITRE ANGLE  | 5.63°  | 7.5° | 11.25° | 7.5° | 11.25° | 10°   | 9°    |
| NO. SEGMENTS | 2      | 2    | 2      | 3    | 3      | 4     | 6     |

\* 60° and 90° GRP bends require approval from the Water Agency.

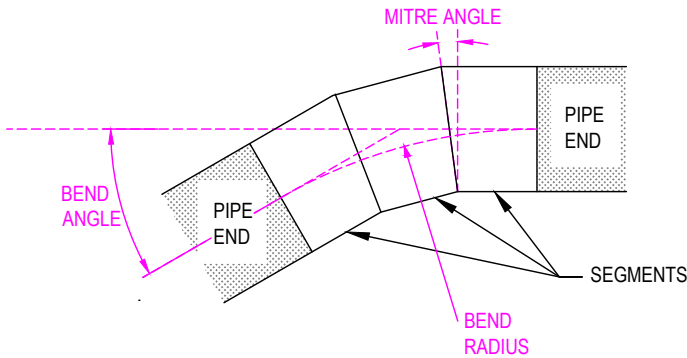


FIGURE 104-G: EXAMPLE GRP BEND

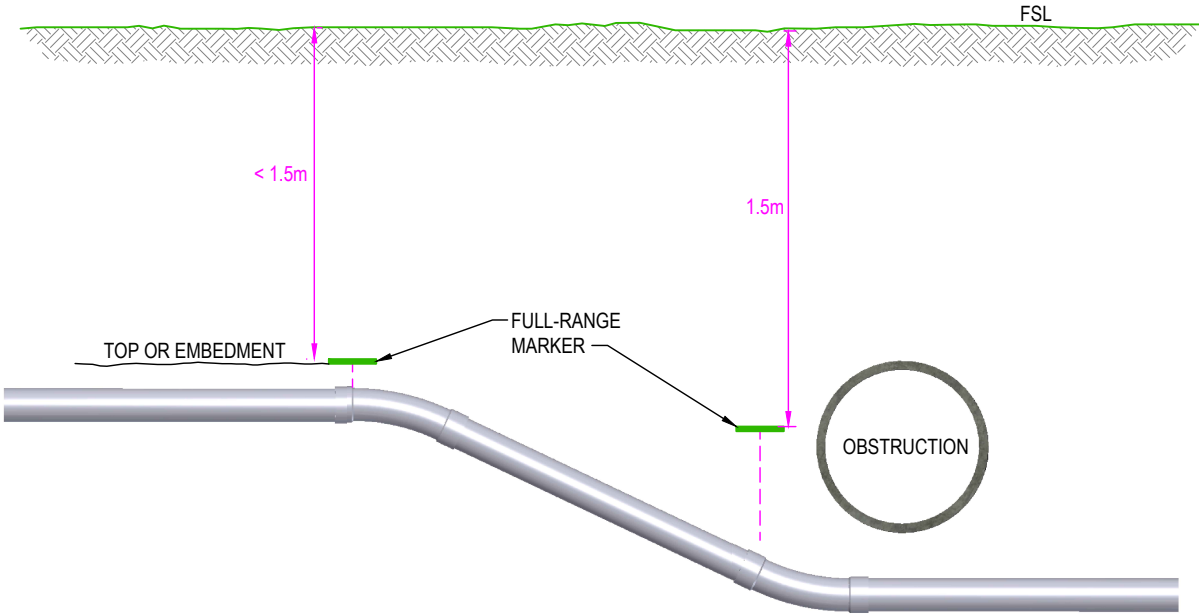


FIGURE 104-H: MARKER PLACEMENT ABOVE BENDS (ELEVATION)

## NOTES Regarding Sewer Markers:

- Markers are required above all bends which are not connected directly to maintenance structures.
- Markers shall be installed directly above the upstream end of the bend.
- If multiple bends are joined to make one larger bend, this shall be considered to be one bend. Only one marker would be required in this case.
- Markers shall be green and specific to marking wastewater infrastructure.
- Markers shall be full depth and capable of marking to at least 2.4m depth.
- Markers need not be programmable.
- Ensure that markers are installed flat.
- Locate markers at the shallower of:
  - Top of embedment, or
  - 1.5m deep.

## Construction and As Constructed Information for Compound or Multiple Connected Bends:

The designer may specify only the chainage and invert of the ends of straight or curved pipe. Use bends to bridge between these stipulated pipe ends, ensuring:

- Compliance to Table 104-C,
- That the minimum possible number of bends are used,
- That bridging pipework meets minimum grade requirements,
- That minimum clearances from other services are maintained,
- That Type B cement stabilised (although cement can be added and mixed on site) embedment is used, and
- Where fixed angle bends are used (ie: GRP bends) and the pipe ends cannot be exactly met, use minor deflections in the straight pipe as per Tables 104-E, F & G to obtain minor additional deflection.
- "Pick up" the location of all ends of pipe which are greater than 2m in length.

# CURVED SEWERS (BENDING OF PIPE &/OR DEFLECTION AT PIPE JOINTS)

TABLE 104-E: PVC / PP PIPELINE MIN RADIUS OF CURVATURE

| DN            | 150 | 225 | 300 | 375 | 450 | 525 | 600 |
|---------------|-----|-----|-----|-----|-----|-----|-----|
| PVC MIN R (m) | 24  | 38  | 172 | 172 | NA  | NA  | NA  |
| PP MIN R (m)  | 172 |     |     |     |     |     |     |

## NOTES Regarding Curves Requirements:

- Curvature is only permitted in the horizontal plane.
- Changes to jointing type shall be noted in the As Constructed record.
- Should a different pipe material be required to provide a smaller radius curve (ie: GRP), the entire sewer line from maintenance structure to maintenance structure shall be changed to that pipe material.
- Marker discs are required at the beginning and end of all curves as per Figure 104-F.

TABLE 104-F: PE PIPELINE MIN RADIUS OF CURVATURE

| DN           | 180 | 280 | 315 | 355  | 400 | 500  | 560  |
|--------------|-----|-----|-----|------|-----|------|------|
| PE MIN R (m) | 6.3 | 9.8 | 11  | 12.4 | 14  | 17.5 | 19.6 |

TABLE 104-G: GRP PIPELINE MIN RADIUS OF CURVATURE

| DN RANGE       | TYPICAL MAX JOINT ANGLE <sup>6</sup> | 3 m PIPE | 6 m PIPE | 12 m PIPE |
|----------------|--------------------------------------|----------|----------|-----------|
| DN300 to DN450 | 3.0°                                 | 57       | 115      | 230       |
| DN525 to DN900 | 2.0°                                 | 86       | 172      | 344       |
| DN1000 to 1800 | 1.0°                                 | 172      | 344      | 688       |

## NOTES Regarding Radius of Curvature:

Minimum Radius is as follows:

- Curved DN150 and DN225 PVC DWV sewers shall be SCJ in 3m or 6m lengths. Curvature shall be achieved by bending the pipe, ensuring that the pipe is bent by hand around curved objects (not around stakes or pegs). Min R(m) = 150 x Pipe Ø (DN (m)) (as per AS/NZS 2032 section 5.3.11).
- Curved ≥DN300 PVC DWV sewers shall be RRJ in 3m lengths. It is assumed that larger DWV pipe cannot be bent by hand and that there is no safe way to curve the pipe with machine assistance. It is therefore assumed that all deflection must occur at the rubber ring joints.

PVC DWV joints are not specifically deigned to provide deflection, but must successfully pass a 2° deflection test. Until further research can be undertaken, it is assumed a 1° deflection is safe and can be applied to DWV RRJs (refer note 7 for method of calculation).

- PE (PN8, SDR21)- Min R(m) = 35 x Pipe Ø (DN in m)
- PP & GRP pipe shall not be bent.
- PP has a maximum 1° deflection at each joint.
- GRP joint deflections as per Table 104-G.
- GRP RRJ deflections depend on the manufacturer.
- GRP, PP and ≥DN300 PVC DWV radius calculation as follows:
$$\text{Min Radius (m)} = \frac{L (m)}{2 \times \tan (\theta / 2)}$$
Where L= pipe length and θ= joint deflection.

| ALL DIMENSIONS IN mm UNLESS STATED OTHERWISE |                       |          |                   | DESIGNED: R. JAGGER                     |           |          | DATE: 1 JULY 2015                       |               |          |
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| 2  | PUBLISHED FIRST ISSUE | 01/10/15 | CP / JT / KD / RJ | <input checked="" type="checkbox"/> SEW | C. PAXMAN | 01/09/15 | <input checked="" type="checkbox"/> SEW | D. O'DONOVAN  | 01/09/15 |
| 1  | PRE-PUBLISHED DRAFT   | 01/03/15 | CP / JT / KD / RJ | <input checked="" type="checkbox"/> YVW | K. DAWSON | 01/09/15 | <input checked="" type="checkbox"/> YVW | J. TOMASI     | 01/09/15 |
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## MRWA SEWERAGE STANDARDS

## BENDS AND CURVED SEWERS

## NOT TO SCALE

## MRWA-S-104B

| Planning | Design | Construction |
|----------|--------|--------------|
|          | ✓✓     | ✓✓           |

REFER SECTION 5.2.4 OF THE CODE.

**TABLE 105-A: FACTORS SUPPORTING ALIGNMENT OPTIONS** (Generally locate with the following order of preference)



**TABLE 105-B: KEY PRINCIPLES AFFECTING SEWER DESIGN DECISIONS**



### TABLE 105-C: SEWER LINE REQUIREMENTS & LIMITATIONS

**NOTES Regarding Table 105-C:**

1. Add maintenance structures as stipulated in Table 105-C and in compliance with maximum spacing requirements (refer Table 300-B), ensuring that the number of structures is minimised.
2. Sewer line: "any sewer between two junctions or between the end of a pipe and a junction. It may be straight or contain bends".
3. A spur branch is a sewer which collects two property connections. It commences from the junction of the 2 connections and ends at the junction with the reticulation sewer.
4. If the longest property connection plus spur branch is longer than 25m, the spur branch shall transition to become a Reticulation Sewer.
5. DN150 and DN225 sewers are defined as reticulation sewers. Branch sewers are those  $\geq$ DN300 in diameter. Branch sewers require maintenance structures at both ends. Connection of properties directly to sewers  $\geq$ DN500 in diameter requires water agency approval.

### TABLE 105-D: DROP OPTIONS, LIMITATIONS AND PREFERENCES

**NOTES Regarding Table 105-D:**

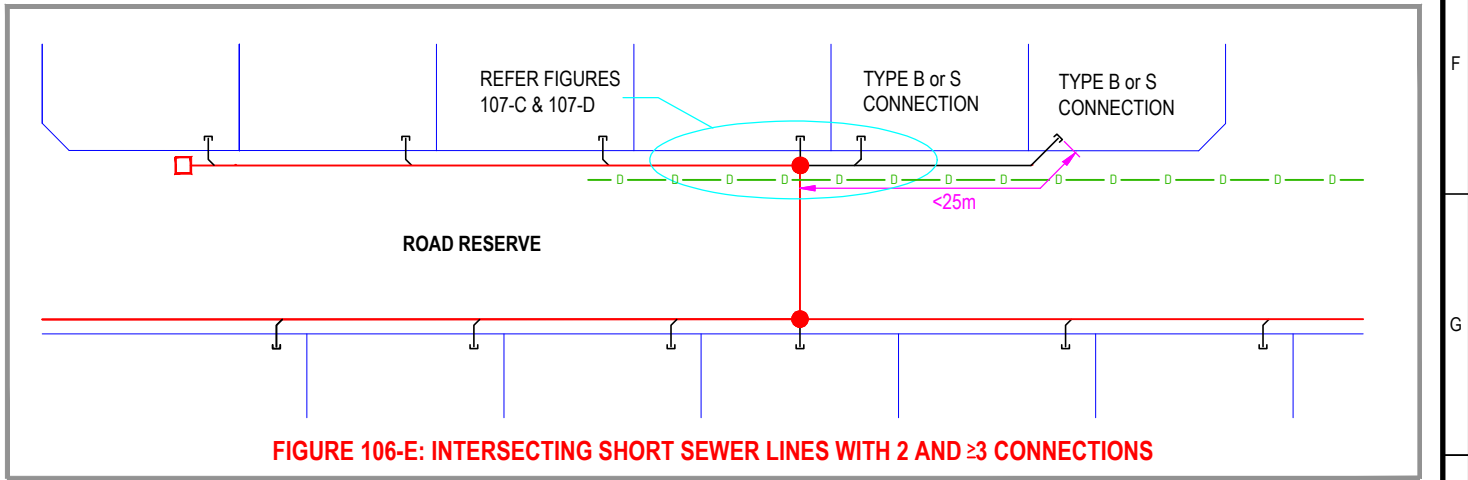
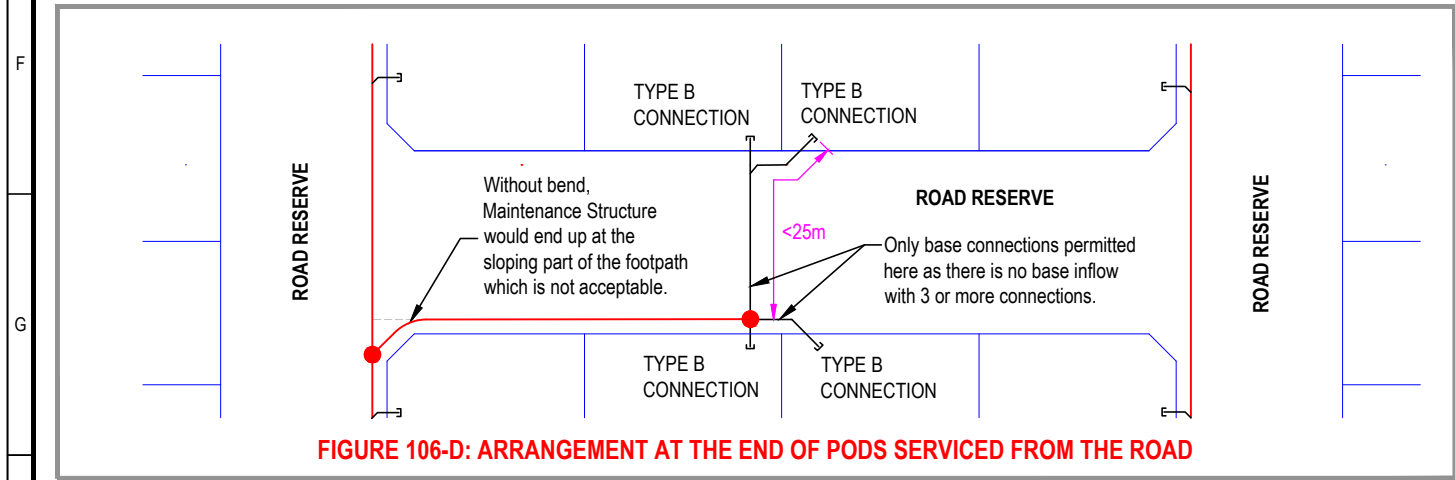
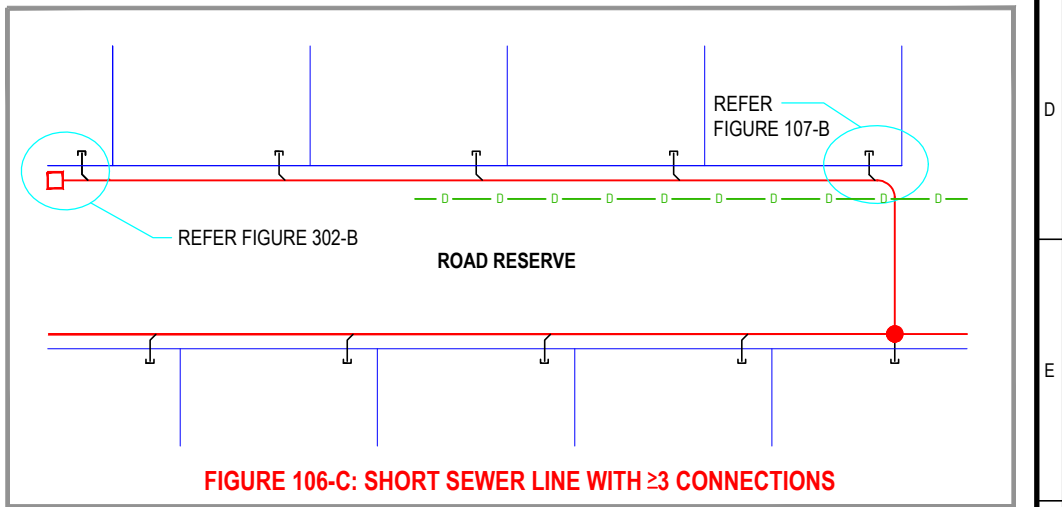
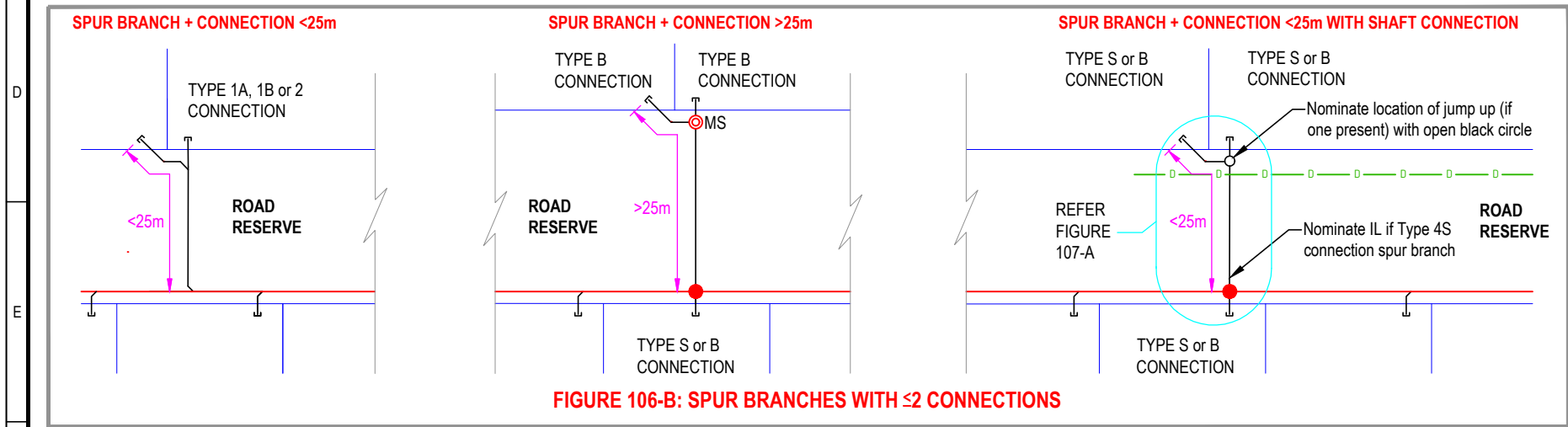
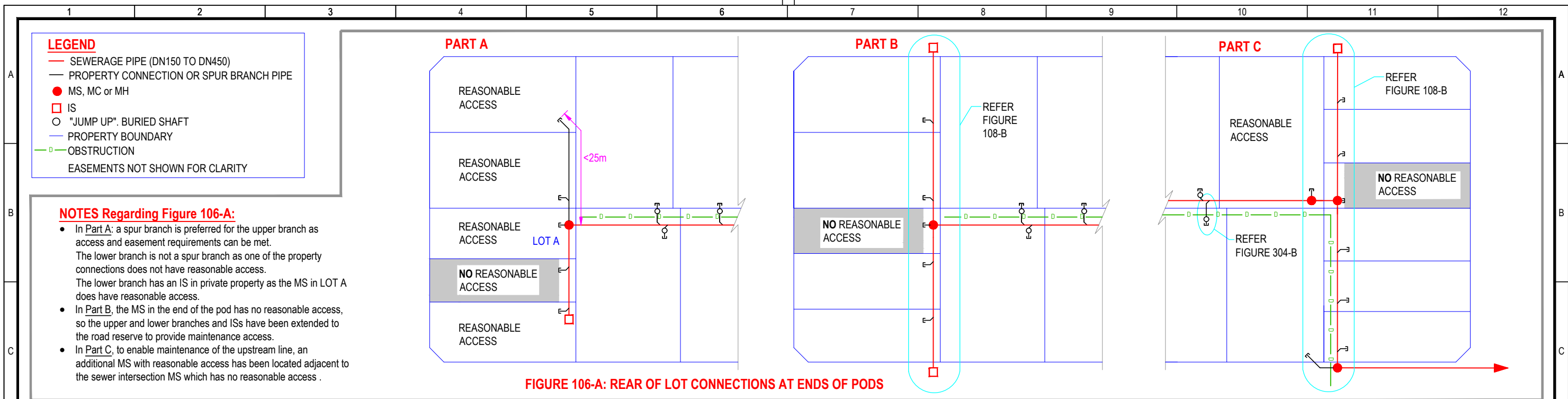
Optimum means of achieving a drop depends on:

- Location, type and cost of a suitable maintenance structure.  
 where a maintenance structure is required for another reason, it often provides the optimum means of achieving a drop in invert.  
 To construct one especially for the drop (particularly if it is a M.H) may be more expensive than using bends or grading the sewer more steeply.
- Turbulence Risks. Turbulence through Maintenance Structure drops into smaller sewers (<DN375) provides beneficial oxygenation.  
 Turbulence through maintenance structure drops into larger sewers (>DN450) increases the level of H<sub>2</sub>S gas release.

- c. Ground conditions. Hard rock, unstable or water charged ground will increase construction cost at depth, reducing the preference for grading out the drop.
- d. Location of an obstruction(s). Vertical deflections (using 2 bends) can be constructed:
  - d.a. With a deflection in the downstream line (refer Figures 107-B). This is the preferred option where it is feasible.
  - d.b. With deflections in all lines upstream of a junction (refer Figure 107-D). This maybe required where an obstruction is close by.

|  |  |  |  |   |  |          |  |   |  |   |  |   |  |   |  |           |  |          |  |
|--|--|--|--|---|--|----------|--|---|--|---|--|---|--|---|--|-----------|--|----------|--|
| ALL DIMENSIONS IN mm UNLESS STATED OTHERWISE |  |  |  | DESIGNED: R. JAGGER                     |  |          |  | DATE: 1 JULY 2015                       |  |   |  | <div>  <div> <div>MELBOURNE RETAIL WATER AGENCIES</div> <div>    </div> </div> </div> |  |   |  |           |  |          |  |
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|  |  |  |  | CHECKED: NAME                           |  | DATE     |  | APPROVED: NAME                          |  | DATE                                    |  | <div> <div>MRWA SEWERAGE STANDARDS</div> <div>RETICULATION DESIGN</div> </div>  |  |   |  |           |  |          |  |
|  |  |  |  | <input checked="" type="checkbox"/> CWW |  | D. MOORE |  | <input checked="" type="checkbox"/> CWW |  | R. CARRUTHERS                           |  |   |  |   |  | 01/09/15  |  |          |  |
| 3  |  |  |  | UPDATED TABLE 105-C & D                 |  | 1/06/16  |  | RJ / CP / JT                            |  | <input checked="" type="checkbox"/> SEW |  |   |  |   |  | C. PAXMAN |  | 01/09/15 |  |
| 2  |  |  |  | PUBLISHED FIRST ISSUE                   |  | 01/10/15 |  | CP / JT / KD / RJ                       |  | <input checked="" type="checkbox"/> YVW |  |   |  |   |  | K. DAWSON |  | 01/09/15 |  |
| 11   |  |  |  | PRE-PUBLISHED DRAFT                     |  | 01/03/15 |  | CP / JT / KD / RJ                       |  | <input checked="" type="checkbox"/> YVW |  | J. TOMASI   |  | 01/09/15  |  |           |  |          |  |
| REV  |  |  |  | DESCRIPTION                             |  | DATE     |  | APPROVED                                |  | ISSUED 2015                             |  | VERSION 1   |  | <div> <div>MRWA-S-105</div> <div> <div>Planning</div> <div>Design</div> <div>Construction</div> </div> </div> |  |           |  |          |  |








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|--|--|--|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|--------------|--|--|---|--|--|---|--|--|----|--|--|----|--|--|----|--|--|
| ALL DIMENSIONS IN mm UNLESS STATED OTHERWISE       |  |  |  | DESIGNED: R. JAGGER  |  |  | DATE: 1 JULY 2015  |  |  | <div>MELBOURNE RETAIL WATER AGENCIES</div> <div>CityWest Water™</div> <div>South East Water</div> <div>Yarra Valley Water</div> |  |  | MRWA SEWERAGE STANDARDS   |  |  | NOT TO SCALE   |  |  |              |  |  |   |  |  |   |  |  |    |  |  |    |  |  |    |  |  |
|  |  |  |  | DRAWN: R. JAGGER   |  |  | DATE: 1 JULY 2015  |  |  |  |  |  | MRWA-S-106  |  |  |  |  |  |              |  |  |   |  |  |   |  |  |    |  |  |    |  |  |    |  |  |
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| 3 ALTERED FIGURES 106 A & D 1/06/16 RJ / CP / JT   |  |  |  | <input checked="" type="checkbox"/> CWW D. MOORE 01/09/15  |  |  | <input checked="" type="checkbox"/> CWW R. CARRUTHERS 01/09/15 |  |  | RETICULATION EXAMPLES  |  |  | <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> |  |  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |  |  |              |  |  |   |  |  |   |  |  |    |  |  |    |  |  |    |  |  |
| 2 PUBLISHED FIRST ISSUE 01/10/15 CP / JT / KD / RJ |  |  |  | <input checked="" type="checkbox"/> SEW C. PAXMAN 01/09/15 |  |  | <input checked="" type="checkbox"/> SEW D. O'DONOVAN 01/09/15  |  |  |  |  |  |   |  |  |  |  |  |              |  |  |   |  |  |   |  |  |    |  |  |    |  |  |    |  |  |
| 1 PRE-PUBLISHED DRAFT 01/03/15 CP / JT / KD / RJ   |  |  |  | <input checked="" type="checkbox"/> YVW K. DAWSON 01/09/15 |  |  | <input checked="" type="checkbox"/> YVW J. TOMASI 01/09/15     |  |  |  |  |  |   |  |  |  |  |  |              |  |  |   |  |  |   |  |  |    |  |  |    |  |  |    |  |  |
| REV DESCRIPTION DATE APPROVED                      |  |  |  | ISSUED 2015  |  |  | VERSION 1  |  |  |  |  |  |   |  |  |  |  |  |              |  |  |   |  |  |   |  |  |    |  |  |    |  |  |    |  |  |
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TABLE 107-A: COMPONENTS

| ITEM | DESCRIPTION              | MATERIAL          | NOTES   |
|------|--------------------------|-------------------|---|
| A    | RETICULATION PIPE        | TYPICALLY PVC DWV | REFER MRWA-S-103                                      |
| B    | LONG RADIUS BEND         | PVC DWV, SCJ      | REFER MRWA-S-104B                                     |
| C    | OBLIQUE JUNCTION         | PVC DWV           | REFER MRWA-S-104A                                     |
| D    | REDUCER                  | PVC DWV           | TYPICALLY M-F, SIZE TO MATCH RETICULATION PIPE        |
| E    | MAINTENANCE SHAFT BASE   | PVC / PP / PE     | REFER MRWA-S-305                                      |
| F    | MS SHAFT                 | PVC DWV / PP      | REFER MRWA-S-305                                      |
| G    | 30 deg BEND              | PVC DWV, SCJ      | TYPICALLY F-F, SIZE TO MATCH PROPERTY CONNECTION PIPE |
| H    | 60 deg BEND              | PVC DWV, SCJ      | TYPICALLY M-F, SIZE TO MATCH PROPERTY CONNECTION PIPE |
| I    | PROPERTY CONNECTION PIPE | PVC DWV, SCJ      | SIZE AS PER TABLE 104-A                               |
| J    | INSPECTION OPENING (IO)  | PVC DWV, SCJ      | MARKS END OF WATER AGENCY ASSET                       |
| K    | 45 deg BEND, F-F         | PVC DWV, SCJ      | TYPICALLY F-F, SIZE TO MATCH PROPERTY CONNECTION PIPE |
| L    | 45 deg BEND, M-F         | PVC DWV, SCJ      | TYPICALLY M-F, SIZE TO MATCH PROPERTY CONNECTION PIPE |
| M    | 88 deg SWEEP TEE         | PVC DWV, SCJ      | TYPICALLY M-F, SIZE TO MATCH PROPERTY CONNECTION PIPE |
| N    | SPUR BRANCH PIPE         | PVC DWV, SCJ      | DN100 PIPE AS PER TABLE 105-C                         |
| O    | MS SHAFT CONNECTOR       | PVC DWV, SCJ      | REFER MRWA-S-305                                      |
| P    | MS BASE INFLOW PLUGS     |                   | REFER MRWA-S-305                                      |

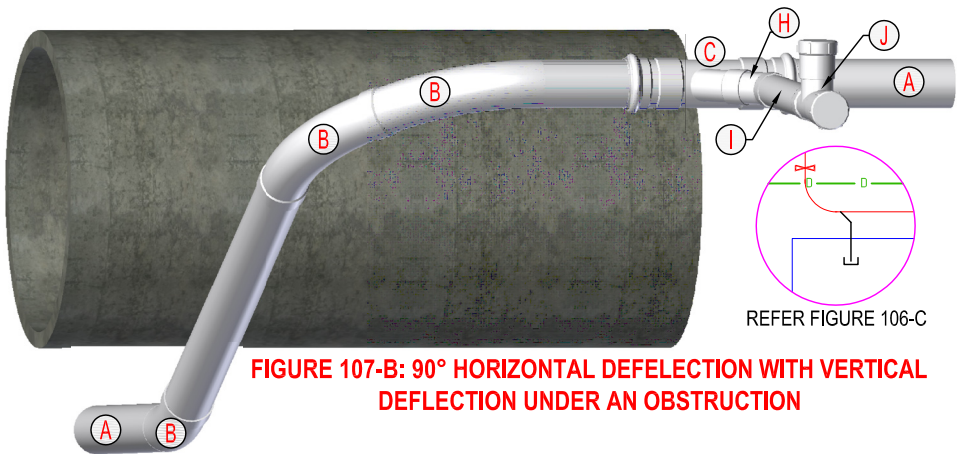


FIGURE 107-B: 90° HORIZONTAL DEFECTION WITH VERTICAL DEFECTION UNDER AN OBSTRUCTION

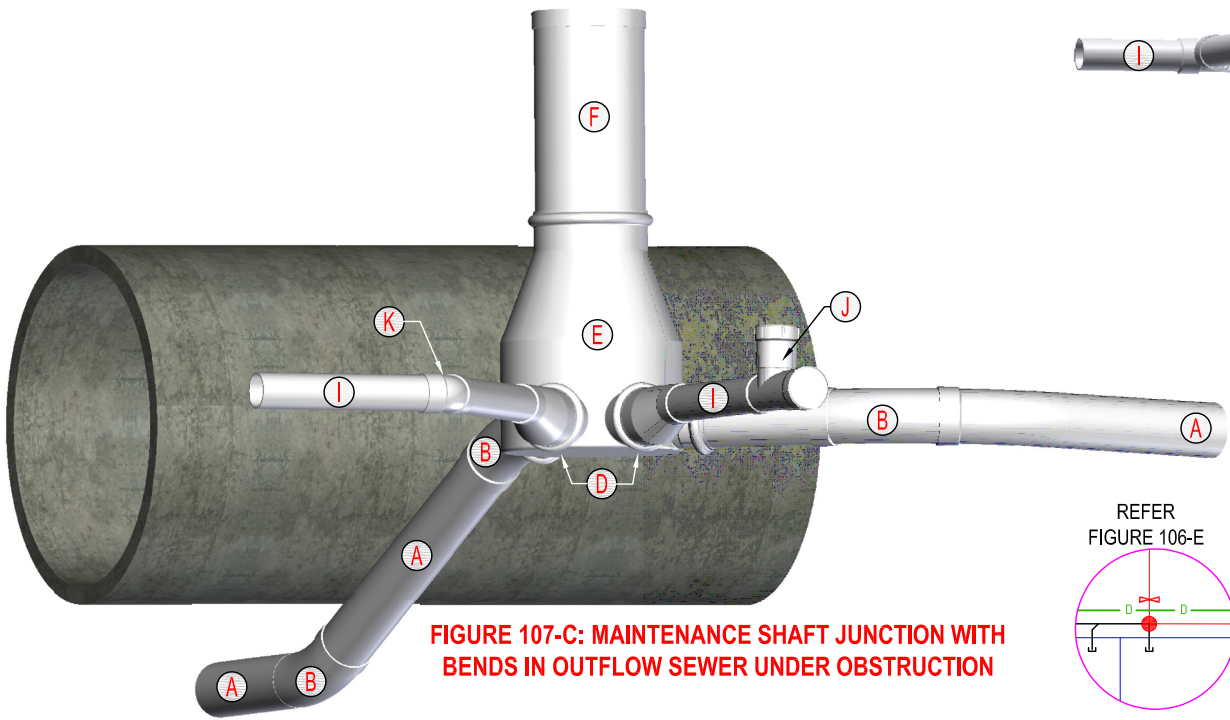


FIGURE 107-C: MAINTENANCE SHAFT JUNCTION WITH BENDS IN OUTFLOW SEWER UNDER OBSTRUCTION

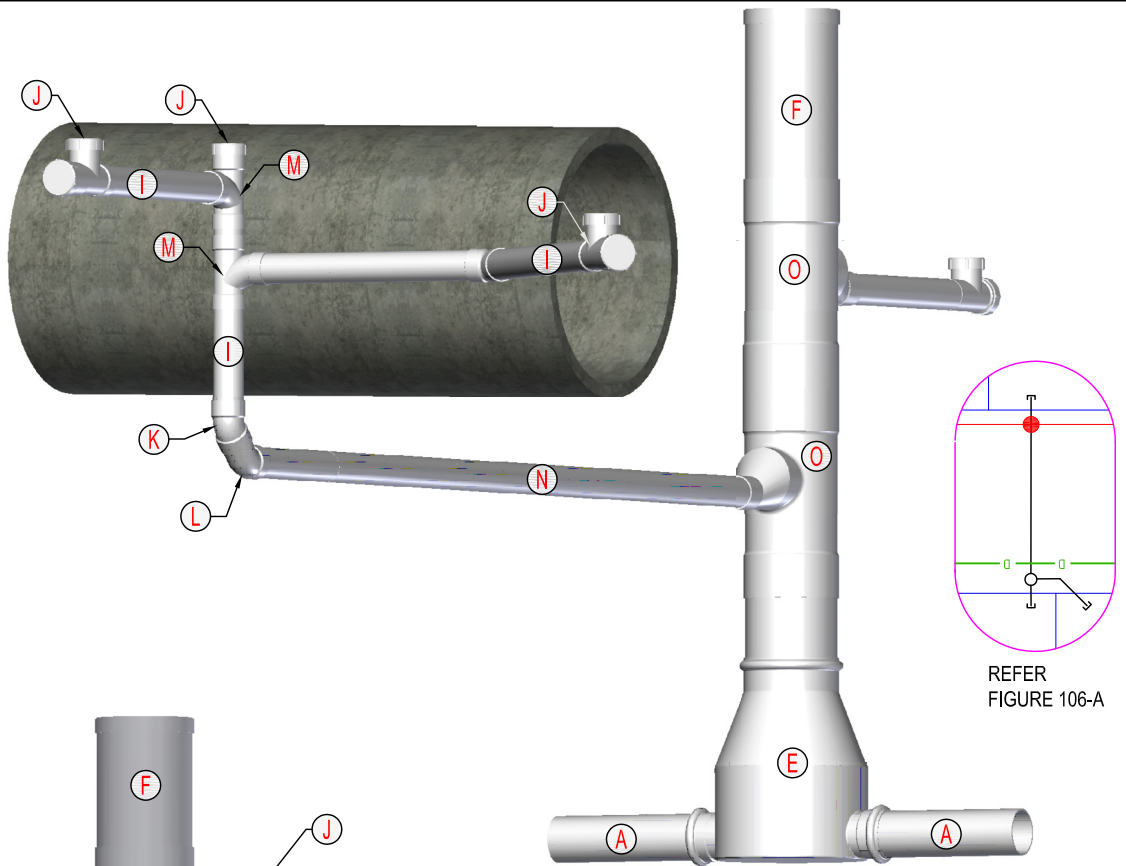


FIGURE 107-A: SPUR BRANCH WITH OFFSET DROP SHAFT CONNECTION (TYPE S)

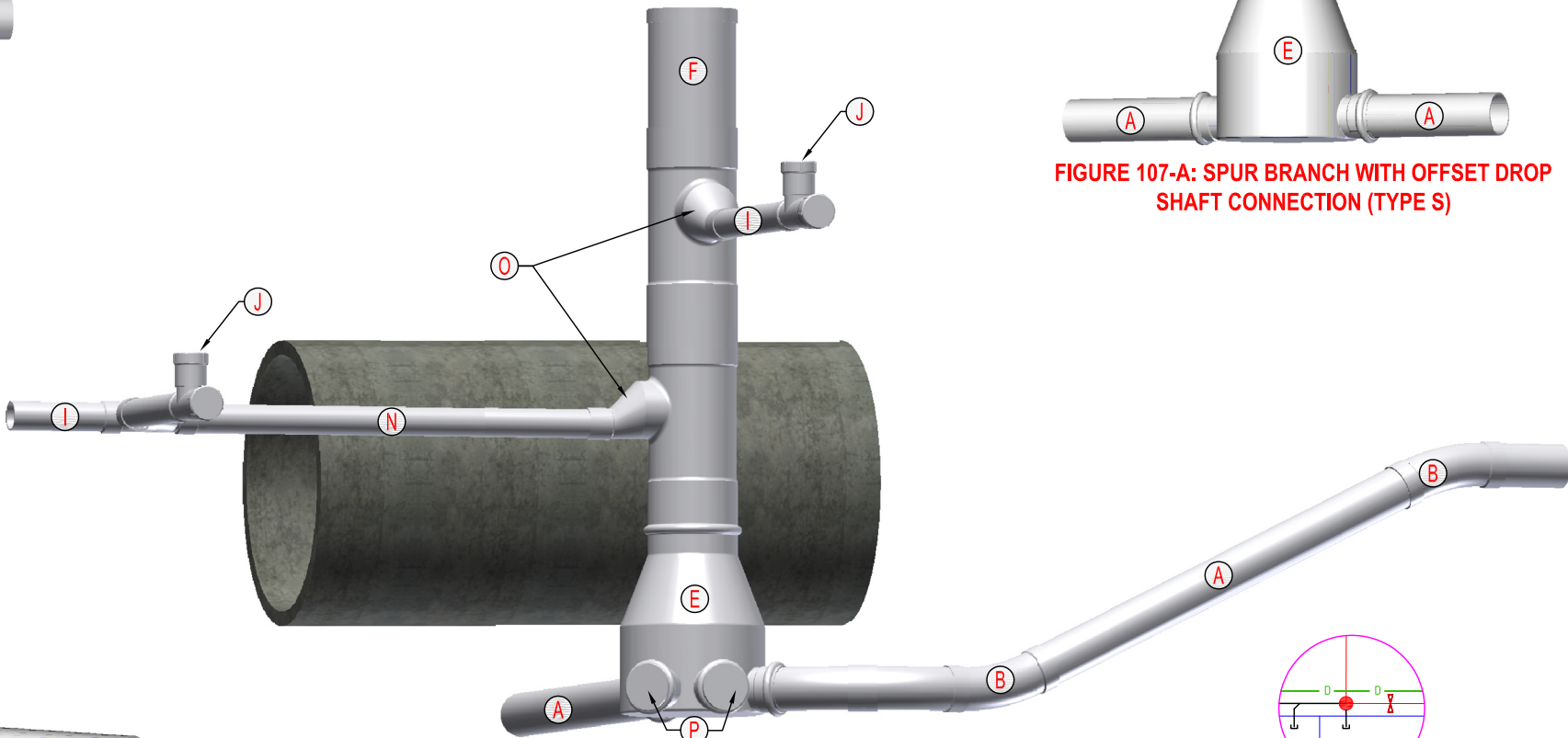


FIGURE 107-D: PROPERTY & SPUR BRANCH SHAFT CONNECTIONS (TYPE S) WITH VERTICAL DEFECTION IN RETICULATION SEWER TO CONNECT TO BASE OF MS

ALL DIMENSIONS IN mm UNLESS STATED OTHERWISE

|   |           |           |   |                   |          |
|---|-----------|-----------|---|-------------------|----------|
| DESIGNED:                               |           | R. JAGGER |   | DATE: 1 JULY 2015 |          |
| DRAWN:                                  |           | R. JAGGER |   | DATE: 1 JULY 2015 |          |
| CHECKED:                                | NAME      | DATE      | APPROVED:                               | NAME              | DATE     |
| <input checked="" type="checkbox"/> CWW | D. MOORE  | 01/09/15  | <input checked="" type="checkbox"/> CWW | R. CARRUTHERS     | 01/09/15 |
| <input checked="" type="checkbox"/> SEW | C. PAXMAN | 01/09/15  | <input checked="" type="checkbox"/> SEW | D. O'DONOVAN      | 01/09/15 |
| <input checked="" type="checkbox"/> YVW | K. DAWSON | 01/09/15  | <input checked="" type="checkbox"/> YVW | J. TOMASI         | 01/09/15 |
| ISSUED 2015                             |           |           | VERSION 1                               |                   |          |

MELBOURNE RETAIL WATER AGENCIES



MRWA SEWERAGE STANDARDS

NOT TO SCALE

PIPELINE DETAILS

MRWA-S-107

| Planning | Design | Construction |
|----------|--------|--------------|
|          | ✓      | ✓            |



1. Locate sewers parallel to the property boundary.
2. Sewers along side or front boundaries require Water Agency approval.
3. Sewers shall not be located along more than one boundary of a lot.
4. Sewers servicing industrial / commercial lots shall be located in public land unless it is impracticable to do otherwise.  
Water Agency approval is required to locate these sewers in private property.
5. Sewer shall be < 4m deep
6. Sewer shall be  $\leq$  DN225 in size
7. Maintenance structures within private property shall be reduced as much as is practicable while conforming to the maintenance structure rules in standard MRWA-S-300.
8. MHs are not permitted within private property for CWW and YVW.

Sewers (including property connections) in the rear of private property shall have reasonable access (refer section 5.2.4 of the Code).

Some level of exemption to this requirement may be granted, provided that rear connected lots without reasonable access:

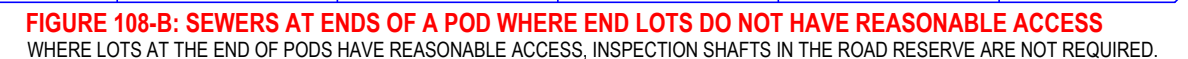
- have a clear cost advantage to be serviced in this way.
- are indicated on the design submission to the Water Agency.
- are not excessive within any 'pod of lots'.
- have neighbouring lot(s) with reasonable access.
- do not have a maintenance structure.

|                              |          |
|------------------------------|----------|
| PROPERTY CONNECTION LOCATION | SIDE TIE |
| ALL REAR CONNECTIONS         | > 1.2m   |

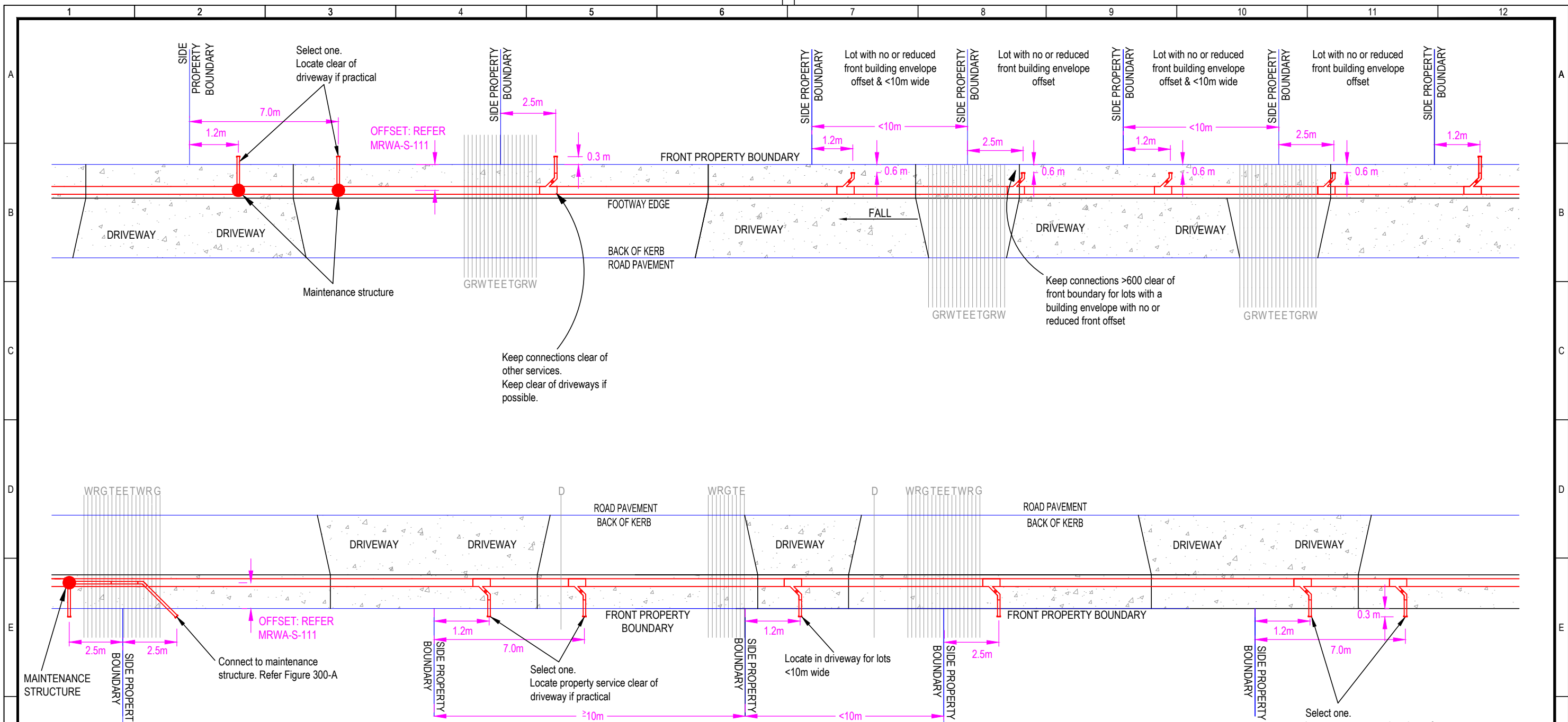
  

|  |  |
|--|--|
| LOCATION OF EASEMENT                   | POINT OF CONNECTION OFFSET                 |
| NO EASEMENT IN LOT BEING CONNECTED     | 300 INSIDE PROPERTY BOUNDARY               |
| EASEMENT EXISTS IN LOT BEING CONNECTED | TERMINATE AT EDGE OF EASEMENT <sup>1</sup> |

\* Property connections shall terminate at the edge of the easement irrespective of whether it is a sewerage, drainage or sewerage plus drainage easement.



|  |  |  |  |   |  |                   |                   |                |  |   |  |               |  |  |  |  |  |              |  |  |  |
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| ALL DIMENSIONS in mm UNLESS STATED OTHERWISE |  |  |  | DESIGNED: R. JAGGER                     |  |                   | DATE: 1 JULY 2015 |                |  | <div>MELBOURNE RETAIL WATER AGENCIES</div> <div></div> <div></div> |  |               |  | MRWA SEWERAGE STANDARDS  |  |  |  | NOT TO SCALE |  |  |  |
|  |  |  |  | DRAWN: R. JAGGER                        |  |                   | DATE: 1 JULY 2015 |                |  |   |  |               |  | <div>MRWA-S-108</div> <div><div>Planning</div><div>Design</div><div>Construction</div></div> |  |  |  |              |  |  |  |
|  |  |  |  | CHECKED: NAME                           |  | DATE              |                   | APPROVED: NAME |  | DATE  |  |               |  |  |  |  |  |              |  |  |  |
|  |  |  |  | <input checked="" type="checkbox"/> CWW |  | D. MOORE          |                   | 01/09/15       |  | <input checked="" type="checkbox"/> CWW   |  | R. CARRUTHERS |  | 01/09/15   |  |  |  |              |  |  |  |
|  |  |  |  | <input checked="" type="checkbox"/> SEW |  | C. PAXMAN         |                   | 01/09/15       |  | <input checked="" type="checkbox"/> SEW   |  | D. O'DONOVAN  |  | 01/09/15   |  |  |  |              |  |  |  |
|  |  |  |  | <input checked="" type="checkbox"/> YVW |  | K. DAWSON         |                   | 01/09/15       |  | <input checked="" type="checkbox"/> YVW   |  | J. TOMASI     |  | 01/09/15   |  |  |  |              |  |  |  |
| 2 PUBLISHED FIRST ISSUE                      |  |  |  | 01/10/15                                |  | CP / JT / KD / RJ |                   | ISSUED 2015    |  |   |  | VERSION 1     |  |  |  |  |  |              |  |  |  |
| 1 PRE-PUBLISHED DRAFT                        |  |  |  | 01/03/15                                |  | CP / JT / KD / RJ |                   |                |  |   |  |               |  |  |  |  |  |              |  |  |  |
| REV DESCRIPTION                              |  |  |  | DATE                                    |  | APPROVED          |                   |                |  |   |  |               |  |  |  |  |  |              |  |  |  |



**FIGURE 109-A: DUAL RETICULATION SEWERS IN THE ROAD RESERVE**

**NOTES:**

- Dual reticulation sewers are more cost effective (than multiple road crossings) where:
  - The road reserve is wider,
  - The frontage of lots is small,
  - There are deep obstructions which would lead to road crossing sewers needing to be deepened.
- Locate retic / branch sewer mains under the footpath / nature strip, and
  - Locate as close to the center of the nature strip as practicable,
  - Maintain minimum clearances of sewers and maintenance structures from other services in accordance with section 5.4.5.2 of the code, and
  - Maintain at least the minimum offset from the front property boundary.
- Ensure maintenance structure covers are contained entirely within the footpath pavement or nature strip if practicable.
- Sewerage mains aligned (parallel) and under the road pavement are only allowed if there is insufficient available space under the footpath / nature strip.

**TABLE 109-A: POINT OF CONNECTION TIES AND FRONT OFFSETS**

| PROPERTY CONNECTION LOCATION                                 |                  | SIDE TIE   |
|--|------------------|--|
| DRIVEWAY SIDE OF LOT AND TYPE 1A, 4A OR B CONNECTION, or     | LOT IS <10m WIDE | 1.2m (FROM DRIVEWAY SIDE BOUNDARY)                 |
| DRIVEWAY SIDE OF LOT AND TYPE 1B, 2, 4B OR S CONNECTION, and | LOT IS ≥10m WIDE | 7m (FROM DRIVEWAY SIDE BOUNDARY)                   |
| ADJACENT TO SIDE BOUNDARY AWAY FROM DRIVEWAY                 |                  | 2.5m (FROM SIDE BOUNDARY NOT ADJACENT TO DRIVEWAY) |

| BUILDING ENVELOPE                   | FRONT OFFSET                 |
|-------------------------------------|------------------------------|
| BUILDING ENVELOPE FRONT OFFSET > 1m | 300 INSIDE PROPERTY BOUNDARY |
| BUILDING ENVELOPE FRONT OFFSET ≤ 1m | 600 INSIDE ROAD RESERVE      |

**NOTES Regarding Point of Connection Ties and Front Offsets:**

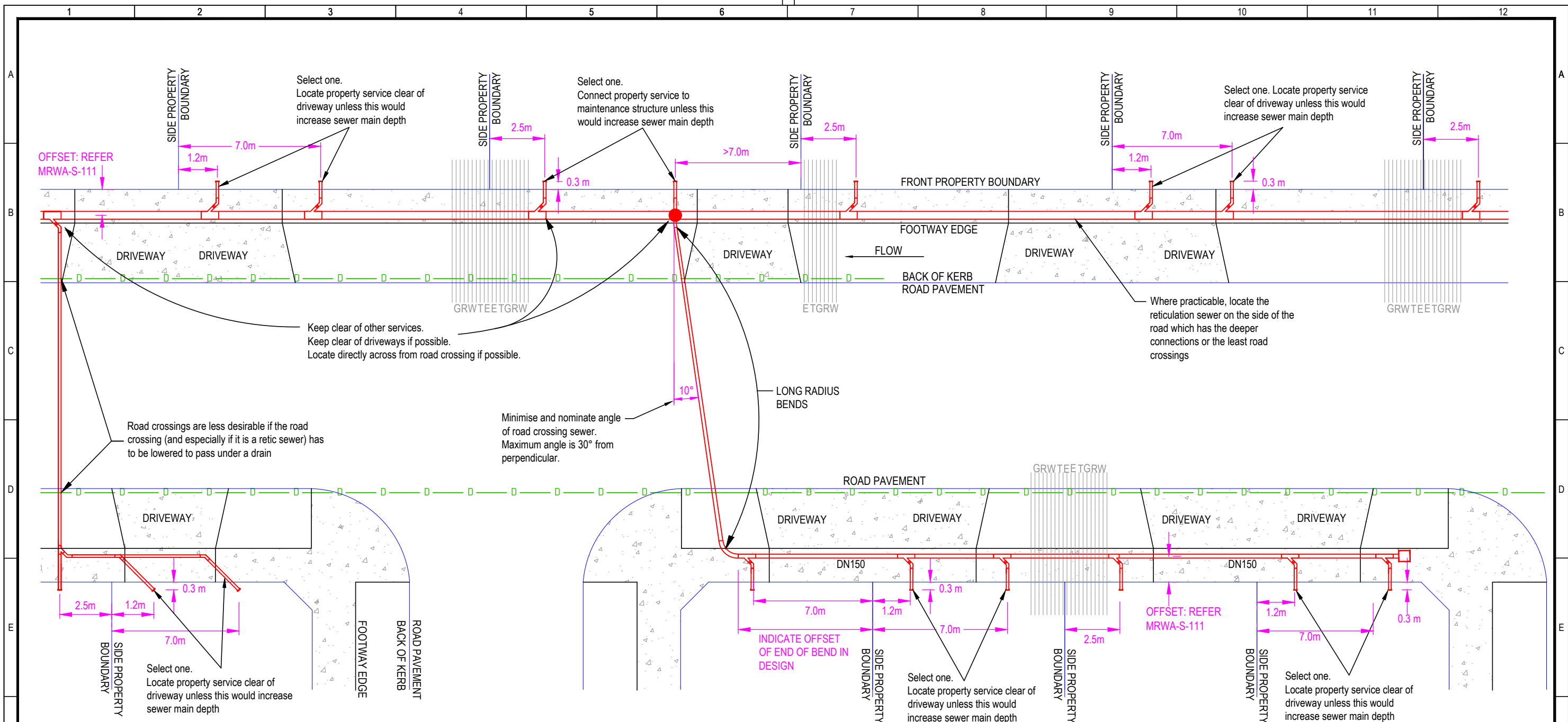
- It is assumed drainage services are at 5.5m from side boundaries. A 7m sewerage service tie therefore provides adequate clearance between the drain and sewerage services.
- Where building envelope front offsets are ≤1m from the front boundary and the property connection is finished 600 inside the road reserve boundary, the inspection opening at the end of the service is to be brought to surface and capped with a ductile iron trafficable cover.
- For CWW, the developer may elect to install privately owned house drain plumbing (to AS/NZS 3500) to the road reserve boundary (or beyond) to prevent the future need for pavement to be excavated. This short section of private plumbing may be completed without receiving PIC from the Water Agency.

**LEGEND**

- PROPERTY CONNECTION PIPEWORK
- RETICULATION MAIN PIPEWORK
- MAINTENANCE STRUCTURE
- PROPERTY BOUNDARY
- SRGTETWRG SERVICE CONNECTIONS

|  |  |  |  |                     |  |                   |  |  |  |           |  |   |  |   |  |               |  |          |  |   |  |    |  |    |  |    |  |
|--|--|--|--|---------------------|--|-------------------|--|--|--|-----------|--|---|--|---|--|---------------|--|----------|--|---|--|----|--|----|--|----|--|
| ALL DIMENSIONS IN mm UNLESS STATED OTHERWISE |  |  |  | DESIGNED: R. JAGGER |  | DATE: 1 JULY 2015 |  | <div>MELBOURNE RETAIL WATER AGENCIES</div> <div><div>City West Water™</div><div>South East Water</div><div>Yarra Valley Water</div></div> |  |           |  | MRWA SEWERAGE STANDARDS   |  |   |  | NOT TO SCALE  |  |          |  |   |  |    |  |    |  |    |  |
|  |  |  |  | DRAWN: R. JAGGER    |  | DATE: 1 JULY 2015 |  |  |  |           |  | ROAD RESERVE SEWERAGE SERVICING<br>DUAL RETICULATION ARRANGEMENTS |  |   |  | MRWA-S-109    |  |          |  |   |  |    |  |    |  |    |  |
|  |  |  |  | CHECKED: NAME       |  | DATE              |  | APPROVED: NAME   |  | DATE      |  |   |  |   |  |               |  |          |  |   |  |    |  |    |  |    |  |
| 3 ALTERED TIES                               |  |  |  | 01/04/17            |  | CP / RJ / DD      |  | <input checked="" type="checkbox"/> CWW  |  | D. MOORE  |  | 01/09/15  |  | <input checked="" type="checkbox"/> CWW |  | R. CARRUTHERS |  | 01/09/15 |  |   |  |    |  |    |  |    |  |
| 2 PUBLISHED FIRST ISSUE                      |  |  |  | 01/10/15            |  | CP / JT / KD / RJ |  | <input checked="" type="checkbox"/> SEW  |  | C. PAXMAN |  | 01/09/15  |  | <input checked="" type="checkbox"/> SEW |  | D. O'DONOVAN  |  | 01/09/15 |  |   |  |    |  |    |  |    |  |
| 1 PRE-PUBLISHED DRAFT                        |  |  |  | 01/03/15            |  | CP / JT / KD / RJ |  | <input checked="" type="checkbox"/> YVW  |  | K. DAWSON |  | 01/09/15  |  | <input checked="" type="checkbox"/> YVW |  | J. TOMASI     |  | 01/09/15 |  |   |  |    |  |    |  |    |  |
| REV DESCRIPTION                              |  |  |  | DATE                |  | APPROVED          |  | ISSUED 2017  |  |           |  | VERSION 2   |  |   |  |               |  |          |  |   |  |    |  |    |  |    |  |
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**FIGURE 110-A: RETICULATION SEWERS WITH ROAD CROSSINGS**

- NOTES:**
- Road crossing sewers are more cost effective (than sewerage mains on both sides of the road) where:
    - The road reserve is narrow,
    - The frontage of lots is large,
    - There are few problems with deep obstructions which would lead to the road crossing sewers needing to be deepened.
  - Locate retic / branch sewer mains under the footpath / nature strip, and
    - Locate as close to the center of the nature strip as practicable,
    - Maintain minimum clearances of sewers and maintenance structures from other services in accordance with section 5.4.5.2 of the code, and
    - Maintain at least the minimum offset from the front property boundary.
  - Locate reticulation sewer on the side of the road which has the deeper connections and/or the least road crossings.
  - Ensure maintenance structure covers are contained entirely within the footpath pavement or nature strip if practicable.
  - Sewerage mains aligned (parallel) and under the road pavement are only allowed if there is insufficient available space under the footpath / nature strip.
  - Construct sewers within the dimensional tolerances described in section 22 of the code.

**TABLE 110-A: POINT OF CONNECTION TIES AND FRONT OFFSETS**

| PROPERTY CONNECTION LOCATION  |                  | SIDE TIE   |
|---|------------------|--|
| DRIVEWAY SIDE OF LOT AND TYPE 1A, 4A OR B CONNECTION, <b>or</b>     | LOT IS <10m WIDE | 1.2m (FROM DRIVEWAY SIDE BOUNDARY)                 |
| DRIVEWAY SIDE OF LOT AND TYPE 1B, 2, 4B OR S CONNECTION, <b>and</b> | LOT IS ≥10M WIDE | 7m (FROM DRIVEWAY SIDE BOUNDARY)                   |
| ADJACENT TO SIDE BOUNDARY AWAY FROM DRIVEWAY                        |                  | 2.5m (FROM SIDE BOUNDARY NOT ADJACENT TO DRIVEWAY) |

| BUILDING ENVELOPE                   | FRONT OFFSET                 |
|-------------------------------------|------------------------------|
| BUILDING ENVELOPE FRONT OFFSET > 1m | 300 INSIDE PROPERTY BOUNDARY |
| BUILDING ENVELOPE FRONT OFFSET ≤ 1m | 600 INSIDE ROAD RESERVE      |

- NOTES Regarding Point of Connection Ties and Front Offsets:**
- It is assumed drainage services are at 5.5m from side boundaries. A 7m sewerage service tie therefore provides adequate clearance between the drain and sewerage services.
  - Where building envelope front offsets are ≤1m from the front boundary and the property connection is finished 600 inside the road reserve boundary, the inspection opening at the end of the service is to be brought to surface and capped with a ductile iron trafficable cover.
  - For CWW, the developer may elect to install privately owned house drain plumbing (to AS/NZS 3500) to the road reserve boundary (or beyond) to prevent the future need for pavement to be excavated. This short section of private plumbing may be completed without receiving PIC from the Water Agency.

**LEGEND**

- PROPERTY CONNECTION PIPEWORK
- RETICULATION MAIN PIPEWORK
- MAINTENANCE STRUCTURE
- INSPECTION SHAFT
- PROPERTY BOUNDARY
- POTENTIAL OBSTRUCTION
- SERVICE CONNECTIONS

|  |  |          |                   |                     |           |                   |              |
|--|--|----------|-------------------|---------------------|-----------|-------------------|--------------|
| ALL DIMENSIONS IN mm UNLESS STATED OTHERWISE |  |          |                   | DESIGNED: R. JAGGER |           | DATE: 1 JULY 2015 |              |
|  |  |          |                   | DRAWN: R. JAGGER    |           | DATE: 1 JULY 2015 |              |
| 4  | ALTERED TIES                           | 1/04/17  | CP / RJ / DD      | CHECKED: NAME       | DATE      | APPROVED: NAME    | DATE         |
| 3  | IS AT END OF LONGER RD CROSSING BRANCH | 1/6/16   | RJ / CP / JT      | ☑ CWW               | D. MOORE  | 01/09/15          | ☑ CWW        |
| 2  | PUBLISHED FIRST ISSUE                  | 01/10/15 | CP / JT / KD / RJ | ☑ SEW               | C. PAXMAN | 01/09/15          | D. O'DONOVAN |
| 1  | PRE-PUBLISHED DRAFT                    | 01/03/15 | CP / JT / KD / RJ | ☑ YVW               | K. DAWSON | 01/09/15          | J. TOMASI    |
| REV  | DESCRIPTION                            | DATE     | APPROVED          | ISSUED 2015         |           | VERSION 1         |              |

MELBOURNE RETAIL WATER AGENCIES

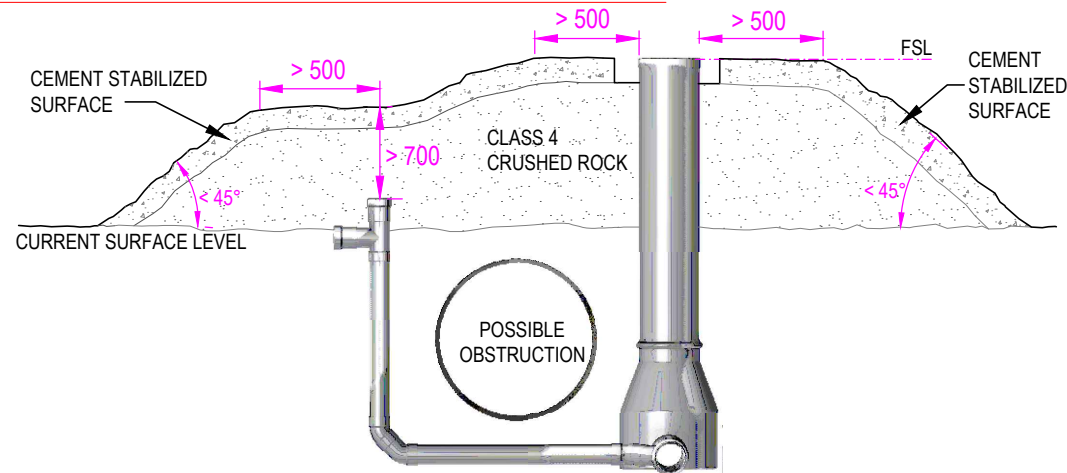
**CityWest Water™**

**South East Water**

**Yarra Valley Water**

|                                 |        |              |              |        |              |
|---------------------------------|--------|--------------|--------------|--------|--------------|
| MRWA SEWERAGE STANDARDS         |        |              | NOT TO SCALE |        |              |
| ROAD RESERVE SEWERAGE SERVICING |        |              | MRWA-S-110   |        |              |
| Planning                        | Design | Construction | Planning     | Design | Construction |
|                                 | ✓✓✓    | ✓✓           |              | ✓✓✓    | ✓✓           |

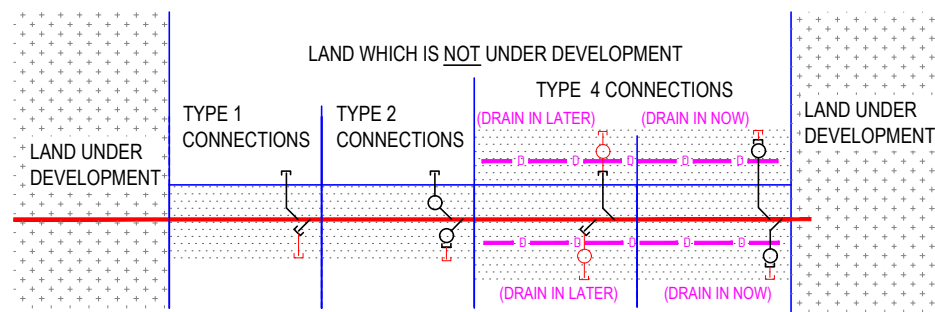
## SEWERAGE MAINS IN AREAS NOT UNDER DEVELOPMENT



**FIGURE 111-A: PROTECTIVE EMBANKMENT WHERE PLACEMENT OF FILL IS DELAYED (non trafficable area)**

### NOTES Regarding Figure 111-A:

- Maintenance shafts constructed prior to fill being placed shall be constructed to the final surface level.
- Sewerage components shall then be protected with an embankment which:
  - Fully surrounds any maintenance structures to a minimum 500 around the top of the shaft.
  - Grades down to the existing ground level at no more than 45° angle from the 500 radius bench.
  - Provides a minimum 700 cover over all sewerage components.
  - Is Cement Stabilised. Use premixed material or sprinkle and then fork cement through the top 300 layer, using 2kg cement per m<sup>2</sup> of surface.



**FIGURE 111-B: PROPERTY CONNECTIONS FOR FUTURE DEVELOPMENT**

**TABLE 111-A: PROPERTY CONNECTION INITIAL AND FINAL CONSTRUCTION STEPS**

| TYPE                    | CONNECTION SIDE | INITIAL CONSTRUCTION (BLACK)            | FINAL CONSTRUCTION (RED) <sup>c</sup>                                   |
|-------------------------|-----------------|---|---|
| TYPE 1                  | SEWER SIDE      | O.B JUNCTION + CAP                      | EXTEND TO EASEMENT BOUNDARY + CAP                                       |
| TYPE 1                  | OTHER SIDE      | EXTEND 300 PAST PROPERTY BOUNDARY + CAP | CCTV ONLY   |
| TYPE 2                  | SEWER SIDE      | INSTALL JUMP UP + CAP (NO RUN IN)       | EXTEND TO EASEMENT BOUNDARY + CAP                                       |
| TYPE 2                  | OTHER SIDE      | EXTEND 300 PAST PROPERTY BOUNDARY + CAP | CCTV ONLY   |
| TYPE 4 (DRAIN IN LATER) | SEWER SIDE      | O.B JUNCTION + CAP                      | EXTEND PAST DRAIN + INSTALL JUMP UP + EXTEND TO EASEMENT BOUNDARY + CAP |
| TYPE 4 (DRAIN IN LATER) | OTHER SIDE      | EXTEND TO PROPERTY BOUNDARY + CAP       | EXTEND PAST DRAIN + INSTALL JUMP UP + EXTEND TO EASEMENT BOUNDARY + CAP |
| TYPE 4 (DRAIN IN NOW)   | SEWER SIDE      | INSTALL JUMP UP + CAP (NO RUN IN)       | EXTEND TO EASEMENT BOUNDARY + CAP                                       |
| TYPE 4 (DRAIN IN NOW)   | OTHER SIDE      | INSTALL JUMP UP + CAP (NO RUN IN)       | EXTEND TO EASEMENT BOUNDARY + CAP                                       |

### NOTES Regarding Marker Posts Requirements:

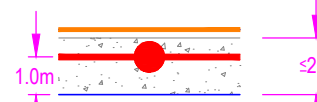
- Install marker posts adjacent to all maintenance structures and at the upstream ends of horizontal bends in undeveloped land.
- Refer figure 403-c for details.

### NOTES Re Future Property Connections:

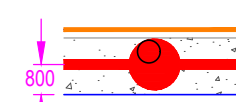
- If there is no plan or draft plan of subdivision- do not include property connections in undeveloped land.
- If there is a plan or draft plan of subdivision, designate lot control levels and property connection types for the lots to be developed at a later stage.
- When final construction of property connections has been completed, CCTV the entire length of all property connections. Correct any damage found and re-CCTV. Provide final CCTV footage to the Water Agency as part of the As Constructed records.

**TABLE 111-B: FRONT BOUNDARY MIN OFFSETS**

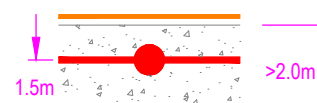
| SEWERAGE ASSETS      | ≤2.0m TO EDGE OF FOOTPATH | >2.0m TO EDGE OF FOOTPATH |
|----------------------|---------------------------|---------------------------|
| SEWER + IS, MS or MC | 1.0m                      | 1.5m                      |
| SEWER + M.H          | 800mm                     | 1.3m                      |



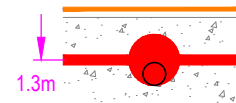
**FIGURE 111-C1: OFFSET FOR SEWER + MS OR MC & ≤2.0m TO EDGE OF FOOTPATH**



**FIGURE 111-C2: OFFSET FOR SEWER + MH (≤1200Ø) & ≤2.0m TO EDGE OF FOOTPATH**



**FIGURE 111-C3: OFFSET FOR SEWER + MS OR MC & >2.0m TO EDGE OF FOOTPATH**



**FIGURE 111-C4: OFFSET FOR SEWER + MH (≤1200Ø) & >2.0m TO EDGE OF FOOTPATH**

### LEGEND

|  |                   |  |                    |
|--|-------------------|--|--------------------|
|  | EASEMENT AREA     |  | MH COVER AND FRAME |
|  | PROPERTY BOUNDARY |  | SEWER MH           |
|  | SEWER MS or MC    |  | DRAIN              |
|  | COMMS             |  | DRAINAGE PIT       |

### NOTES Regarding Offsets in the Road Reserve:

- The provided offsets are relevant where MHs are ≤1200Ø. Where a MH is larger, inc offsets by half the increase in Ø above 1200.
- Communications conduits will require an increased offset where MHs > 1200Ø are required.
- Locate cover and frame within footpath and on the side of the MH indicated.
- These offsets shall apply whether there is a retaining wall near the front boundary or not.
- These offsets take precedence over minimum clearance requirements.

**TABLE 111-C: REAR BOUNDARY EASEMENTS & OFFSETS**

| EASEMENT ASSETS                      | EASEMENT WIDTH | SEWER OFFSET |
|--------------------------------------|----------------|--------------|
| SEWER + IS                           | 2.0m           | 1.0m         |
| SEWER + MS, MC, MH*                  | 2.5m           | 1.3m         |
| IF SEWER CLOSER TO PROPERTY BOUNDARY |                |              |
| SEWER + IS + DRAIN                   | 2.5m           | 0.9m         |
| SEWER + IS + DRAINAGE PIT            | 3.0m           | 1.1m         |
| SEWER + MS, MC + DRAIN               | 3.0m           | 1.3m         |
| SEWER + MH* + DRAIN                  | 3.0m           | 1.1m         |
| IF DRAIN CLOSER TO PROPERTY BOUNDARY |                |              |
| SEWER + IS + DRAIN                   | 2.5m           | 1.6m         |
| SEWER + DRAINAGE PIT                 | 3.0m           | 1.9m         |
| SEWER + MS, MC + DRAIN               | 3.0m           | 1.8m         |
| SEWER + MH* + DRAIN                  | 3.0m           | 2.0m         |

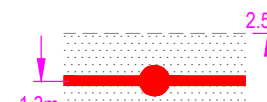
\* MHs in Private Property are not allowed for CWW and YVW.

### NOTES Regarding All Offsets:

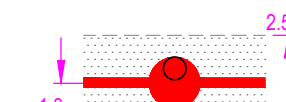
- The key priorities used to determine the offsets are as follows:
  - Maintain minimum clearance between drains and sewers (300 between pipes, 150 between a structure and pipe).
  - Locate assets centrally in the easement.
- Drainage pits and sewer maintenance structures shall have a minimum longitudinal clearance of 500.
- The provided offsets are relevant where Sewers ≤DN225 and Drains ≤DN300. Where either pipe is larger than this, the offsets should be evenly adjusted while ensuring that minimum clearance between pipes / structures is maintained.
- These offsets take precedence over property boundary and retaining wall minimum clearance requirements.
- The nominated rear offsets are valid when there is a retaining wall at the rear boundary, provided the sewer is constructed prior to construction of the retaining wall.
- Apply the "worst case" easement and offsets for the entire easement (eg: if there is a MH + Drain + Sewer, apply Figure 111-D11 for the entire easement).
- Where these offsets cannot be adopted and the Drainage authority's requirements also met, consult with the Water Agency and Drainage authority to achieve a compromise.



**FIGURE 111-D1: OFFSET SEWER ONLY**



**FIGURE 111-D2: OFFSET SEWER + MS, MC**



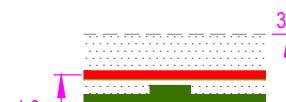
**FIGURE 111-D3: OFFSET SEWER + MH (SEW only)**



**FIGURE 111-D4: OFFSET DRAIN + SEWER**



**FIGURE 111-D5: OFFSET SEWER + DRAIN**



**FIGURE 111-D6: OFFSET DRAINAGE PIT + SEWER**



**FIGURE 111-D7: OFFSET SEWER + DRAINAGE PIT**



**FIGURE 111-D8: OFFSET SEWER + MS, MC + DRAIN**



**FIGURE 111-D9: OFFSET DRAIN + MS, MC + SEWER**



**FIGURE 111-D10: OFFSET SEWER + M.H + DRAIN (SEW only)**



**FIGURE 111-D11: OFFSET DRAIN + M.H + SEWER (SEW only)**

ALL DIMENSIONS IN mm UNLESS STATED OTHERWISE

DESIGNED: R. JAGGER

DATE: 1 JULY 2015

DRAWN: R. JAGGER

DATE: 1 JULY 2015

CHECKED: NAME DATE

APPROVED: NAME DATE

☒ CWW

☒ CWW

☒ SEW

☒ SEW

☒ YVW

☒ YVW

ISSUED 2015

VERSION 1

MELBOURNE RETAIL WATER AGENCIES



MRWA SEWERAGE STANDARDS

SEWERS IN UNDEVELOPED PROPERTY  
AND  
EASEMENTS AND OFFSETS

NOT TO SCALE

MRWA-S-111

| Planning                            | Design                              | Construction                        |
|-------------------------------------|-------------------------------------|-------------------------------------|
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |