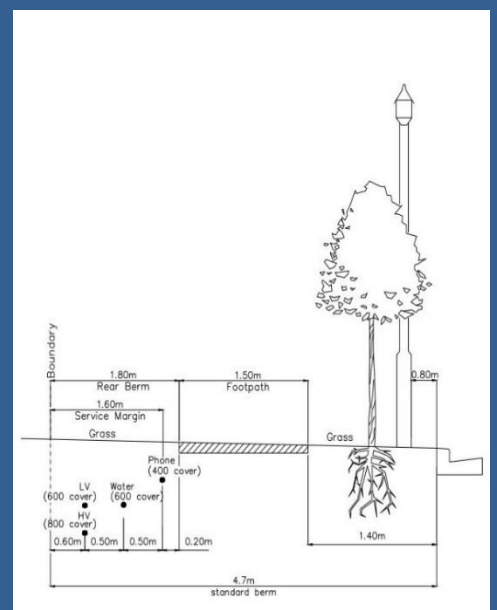
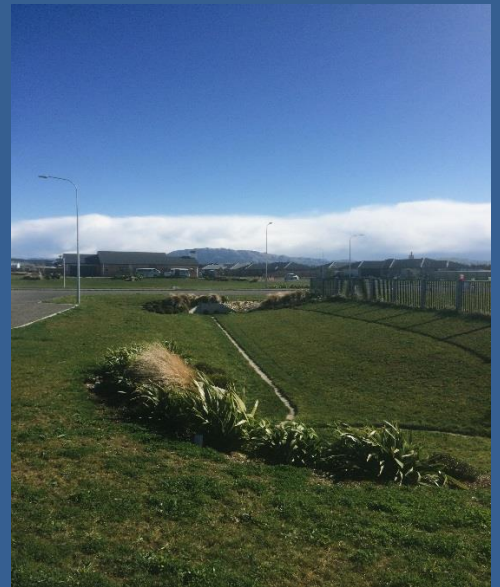


Hurunui District Council

Development Engineering Standard 2017



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DOCUMENT HISTORY

2017 version (original)

Document written/compiled by Tony Kelly, Consultant Consents Engineer, with technical input from and peer reviews by Hurunui District Council engineering/building/planning staff. Drawings adapted with permission from Waimakariri District Council and Christchurch City Council. Document presented to and adopted by Hurunui District Council's Infrastructure Committee on 17 August 2017.

1 GENERAL

1.A Minimum requirements

- 1.A.1 Land being developed shall be suitable for its intended use, and adequate provision shall be made for roads, vehicular access, stormwater drainage, wastewater disposal, water supply, landscaping, street lighting, and electricity and telecommunications servicing.
- 1.A.2 Sufficient provision shall be made for likely effects of damage by erosion, falling debris, subsidence, slippage, or inundation from any source.
- 1.A.3 The developer shall appoint a single representative with suitable qualifications who shall be responsible for liaising with Council, submitting information required for consent, preparing engineering plans, monitoring and supervising construction works, and certifying the works and as-built information.
- 1.A.4 Some information required for resource consent, such as infrastructure modelling and cost sharing, shall be discussed with and agreed in principle with Council before application is made for resource consent.
- 1.A.5 Resource consent shall be obtained, engineering plans that adequately specify the works and materials shall be prepared and approved, and any other required consents and approvals shall be obtained before construction commences.
- 1.A.6 Works shall be constructed in compliance with the consent and the approved plans and documents or approved amendments thereto. A geotechnical completion report shall be submitted where appropriate, and as-built plans and completion documentation shall be prepared and certified by the developer's representative.
- 1.A.7 Engineering signoff will be issued by Council on fulfilment of the consent requirements, to enable the relevant consent completion certificate to be issued prior to the relevant land uses being commenced.

1.B Means of compliance

1.B.1 Introduction to this document

- 1.B.1.1 This document provides developers with a means of compliance when designing and constructing development works required to meet engineering-related resource consent conditions.

Parts of this document may also be applied to non-resource consent related works involving the modification, upgrading or installation of existing or new Council infrastructure.

Note 1.B.1.1 Developers are welcome to propose design and construction alternatives to this document for Council's consideration and possible approval. When seeking alternatives or design details

not already in this document, developers are advised to firstly refer to the Waimakariri District Council Engineering Code of Practice, the Christchurch City Council Civil Engineering Infrastructure Design Standard, the Christchurch City Council Construction Standard Specification, and NZS 4404:2010 Land Development and Subdivision Infrastructure.

1.B.1.2 Related documents which should be read in conjunction with this document are as follows:

1. Hurunui District Plan (current and relevant versions);
2. Amberley Infrastructure Strategy;
3. Hurunui Walking and Cycling Strategy;
4. Hurunui Speed Limits Bylaw;
5. Hurunui Public Places Bylaw;
6. Hurunui Road Naming and Numbering Policy;
7. Amberley Global Stormwater Discharge Consent;
8. Amberley Stormwater Management Plan;
9. Hurunui Three Waters Services Bylaw;
10. Proposed Hurunui Tree Management Policy; and
11. Hurunui Fees and Charges Schedule.

1.B.1.3 Other helpful related documents are as follows:

1. Waimakariri District Council Engineering Code of Practice;
2. Christchurch City Council Infrastructure Design Standard;
3. Christchurch City Council Construction Standard Specification;
4. NZS 4404:2010 Land development and subdivision infrastructure;
5. NZS 4431:1989 Earth fill for residential development;
6. AS/NZS1158:2005 Lighting for roads and public spaces;
7. PAS 4509:2008 NZ Fire Service firefighting water supplies;
8. Drinking-water Standards for New Zealand 2005 (Revised 2008);
9. Austroads Guides to Road Design;
10. TNZ P/3: 1995 Specification for first coat sealing;
11. NZTA Pedestrian planning and design guide; and
12. NZTA Land Transport Rule (Traffic Control Devices) 2004.

Note 1.B.1.2-3 These are not comprehensive lists of the documents which developers may need to read. When reading these or any documents, developers should ensure the most up-to-date versions are used.

1.B.1.4 In general, where there are conflicting requirements, documents shall have precedence in the following order:

1. Hurunui District Plan (current and relevant versions);
2. The development's resource consent;
3. The development's approved engineering drawings and documents; and
4. This document.

1.B.1.5 This document has been put together in good faith to assist developers, consultants and contractors. Anyone using it should still gather and consider information from other sources. Hurunui District Council and those involved in putting this document together accept no liability for consequences arising from its use.

Many of the drawings included in this document have been sourced with permission from Waimakariri District Council and Christchurch City Council. Those Councils, and those involved in putting the source drawings together, accept no liability for consequences arising from the use of this document and its drawings.

Suggestions to improve this document are welcome and should be emailed to consentsengineer@hurunui.govt.nz.

1.B.2 Developer's personnel

1.B.2.1 The developer shall appoint a single developer's representative who shall be responsible for liaising with Council, submitting information required for consent, preparing engineering plans, monitoring and supervising construction works, and certifying the works and as-built information. The developer's representative shall be suitably qualified and experienced and hold the relevant insurances.

The developer's representative shall be available for site meetings within two working days of being so requested by Council, except in the case of emergencies when an immediate response may be required.

1.B.2.2 The developer's contractors and sub-contractors shall be suitably qualified and experienced, hold the relevant insurances, and comply with all relevant health and safety legislation and requirements.

1.B.2.3 Geotechnical investigation and completion reports shall be prepared by a qualified and experienced geotechnical engineer, or a Chartered Professional Engineer who has been assessed by IPENZ as being competent in the practice area of geotechnical engineering and/or engineering geology, and who holds the relevant insurances.

1.B.2.4 Drainage lines less than 40m in length within site boundaries may be certified by a registered drainlayer.

1.B.3 Resource consent application

Note 1.B.3 It is essential that enough engineering information is provided to demonstrate that the development is feasible. The applicant is advised to liaise with Council in the pre-application period to confirm minimum engineering information requirements.

1.B.3.1 Engineering documentation

The following engineering information is to be considered and if necessary actioned and/or agreed with Council before any application is made for resource consent, and

confirmation of the subsequent actions or agreements shall be provided to support the application:

1. For urban on-demand water supply areas where new public water reticulation is proposed, confirmation that network supply water modelling has been carried out by Council (under separate application to Council's Three Waters team) and that water is available and firefighting requirements can be met;
2. For urban restricted water supply areas where new public water reticulation is proposed, confirmation that network water modelling has been carried out by Council (under separate application to Council's Three Waters team) and that water is available;
3. For rural areas where new water connections and/or reallocation of existing water units is proposed, a schematic drawing showing the existing and proposed restrictor, pipework and tank layouts, and confirmation that network water modelling has been carried out by Council (under separate application to Council's Three Waters team) and that water units are available and/or transferrable;
4. Where specialised new infrastructure (such as stormwater ponds, wastewater pump stations, wastewater pressure mains or water reservoirs) is proposed to be vested in Council, confirmation that pre-application liaison with Council has been carried out;
5. Where any other resource consents have been or are proposed to be obtained by the developer and handed over to Council, confirmation that pre-application liaison with Council has been carried out;
6. Where some sharing of costs with Council is requested by the developer or required as part of development or financial contributions, confirmation that pre-application liaison with Council has been carried out, a schedule of costs for the relevant works, and an assessment of Council's share; and
7. Where development or financial contributions are required but the developer proposes an alternative arrangement, confirmation that pre-application liaison with Council has been carried out and that Council has confirmed the feasibility of the handover proposal.

Note 1.B.3.1 Council can collect Development Contributions from developers under the Local Government Act 2002. These can be contributions of land or money towards the cost of upgrading existing or providing new infrastructure to cater for future growth in the area.

Council can collect Financial Contributions from developers under the Resource Management Act 1991 through Hurunui District Plan rules. These are designed to mitigate adverse effects of a particular development as identified in the Hurunui District Plan.

The following engineering information is required to support any application for resource consent:

8. For urban on-demand water supply areas where new public water reticulation is proposed, confirmation that internal water modelling has been carried out and that firefighting requirements can be met;
9. For urban restricted water supply areas where new public water reticulation is proposed, confirmation that internal water modelling has been carried out;
10. For rural areas where private water schemes are proposed, a schematic drawing showing existing and proposed pipework and tank layouts, and a report from a suitably qualified person confirming that adequate volumes of potable water are available and that each lot can be supplied;
11. Copies of any other resource consents granted in respect of the subdivision or development including any associated approved plans and documents;
12. Preliminary design and construction documents including drawings and calculations for earthworks, roading and access, stormwater, wastewater, water supply, network utility services and street lighting, and landscaping;
13. A geotechnical investigation report if required or requested by Council as per 2.A.2;
14. Where new roads are proposed, three suggested names for each proposed road;
15. Where new named right of ways are proposed, three suggested names for each proposed right of way;
16. Road pavement design information detailing investigation methods (to be included as part of the geotechnical investigation report where one is being prepared), design assumptions and calculations;
17. Where on-site stormwater disposal is proposed in urban areas, a soakage report detailing ground soakage rates and ground water levels (to be included as part of the geotechnical investigation report where one is being prepared);
18. For urban areas, a stormwater management plan demonstrating compliance with any global stormwater discharge consent held by Council for that area, or alternatively a stormwater management plan accompanied by confirmation from Environment Canterbury that the proposed stormwater disposal system is a permitted activity or that resource consent has been obtained for it;
19. Where on-site wastewater disposal is proposed, a wastewater report confirming that on-site wastewater disposal is feasible, or alternatively confirmation from Environment Canterbury that on-site wastewater disposal is a permitted activity (to be included as part of the geotechnical investigation report where one is being prepared);
20. Where existing private drains are proposed to become common private drains or public drains, a condition assessment report including CCTV footage and pipe grades; and
21. Where street lighting is proposed, a street lighting design report.

1.B.3.2

Drawings

Drawings shall adequately show the works and materials and shall include:

1. A locality plan;
2. Staging plans showing each stage separately;
3. Topographical plans showing existing spot heights and features;
4. Earthworks plans including existing and proposed contours, cut/fill isopach lines, site cross-sections, and sub-soil drains;
5. Sediment and erosion control plans;
6. Roading plans including long-sections, typical and detailed cross-sections, contours at intersections and cul de sacs, marking, signage, parking bays, right of ways and vehicle crossings;
7. Drainage and water plans including long-sections, structures and fittings, invert/lid/ground levels, and overland flowpaths;
8. Proposed easements in favour of Council (these are usually required over all existing and proposed public pipes and features, and shall be generally be a minimum of 3m wide except within right of ways where they shall be the entire width of the right of way);
9. Utilities services plans including layout and ducting, and streetlights;
10. Standard detail drawings;
11. Specific detail drawings and structural drawings if required; and
12. Landscaping and planting plans.

Coordinates shall be in terms of NZTM and levels shall be in terms of NZGD Lyttelton 1937.

Drawings shall be clear and legible and on A3 sheets at a suitable scale. Each sheet shall have a unique identifying title and number. Drawing sets shall include a cover sheet and drawing register list detailing sheet titles and numbers, and any revisions made.

Drawings submitted electronically shall be in A3 printable .pdf format.

1.B.4

Network utility agreements

The developer of all new subdivisions or developments incorporating roads for vesting in Council shall enter into financial agreements with the relevant network utility operators to ensure provision is made for the underground reticulation of all power lines, telephone services and road lighting, unless agreed otherwise by Council.

Note 1.B.4 *Arrangements with the relevant network utility operators should be made as early as possible to avoid delays with design, construction and certification.*

1.B.5 Engineering approval

Where required by consent conditions the following engineering information shall be provided to support any application for engineering approval prior to the commencement of works:

1. Final detailed design and construction documentation and drawings including a specification and incorporating any relevant consent conditions and additions, amendments or clarifications to the information in 1.B.3;
2. A quality management plan setting out construction and materials testing methodologies and inspection frequencies;
3. A road safety audit as set out in section 3.2.7 of *NZS 4404:2010 Land Development and Subdivision Infrastructure*;
4. For urban areas where new public water reticulation including rider mains is proposed and where modelling has not already been carried out as per 1.B.3, confirmation that water modelling has been carried out by Council (under separate application to Council's Three Waters team) and that water is available;
5. For urban on-demand water supply areas where new public water reticulation is proposed, confirmation that internal water modelling has been carried out and that firefighting requirements can be met;
6. For urban restricted water supply areas where new public water reticulation is proposed, confirmation that internal water modelling has been carried out;
7. A design certificate in the form of Schedule 1A (as per Appendix 1); and
8. Any other information required by the consent conditions.

Approval of engineering plans and documentation will be given in writing via email. A copy of the stamped approved plans and the resource consent shall be kept on site during the course of the works.

1.B.6 Construction

1.B.6.1 Plan amendments

Any deviation from the requirements of the approved engineering plans which may be necessary to meet particular circumstances shall be referred to Council for specific approval. A field amendment may be agreed to, or alternatively an amended design may be requested in which case the drawing register shall be updated and a new stamped plan showing the amended design will be issued.

Note 1.B.6.1 Significant changes to approved plans may require the developer to obtain a variation to the resource consent.

1.B.6.2 Supervision and meetings

It is the developer's responsibility both directly and through the developer's representative to ensure that all physical construction work carried out directly or

by contractors or subcontractors is in compliance with the resource consent and approved documentation and plans.

The developer's representative shall provide Council with such information as may be reasonably requested such as test results, site inspection records and forward works programs.

For larger or more complex developments, regular meeting times may be specifically agreed between the developer's representative and Council. Meeting minutes shall be taken by the developer's representative and circulated to attending parties afterward.

1.B.6.3 Emergencies

If, during construction works or the subsequent maintenance period, any situation arises whereby the security of the public, public or private property, or the operation of any public facility is endangered, Council may instruct the developer's representative to arrange and carry out such remedial works required to remove the danger. Any work so ordered shall be at the developer's expense. In the event that Council is unable to contact the developer's representative, Council may arrange for remedial works to be carried out at the developer's expense.

1.B.6.4 Fencing and signs

Temporary fencing or barriers shall be erected by the developer to protect the general public, particularly children, from all hazardous areas in the development including stockpiles, excavations and ponds. Signs shall be erected warning of the hazards and danger in the area.

1.B.6.5 Works Access Permits

A Works Access Permit is required for any works involving excavation in an existing road reserve, and shall be obtained by the developer before commencing work.

The permit can be obtained by applying for corridor access approval from Council via the beforeUdig service, online at beforeUdig.co.nz or by phone at 0800 248 344. A site location and traffic management plan is required as part of this process.

All traffic management measures shall comply with the relevant requirements.

1.B.6.6 Testing and inspections

The developer's representative shall ensure that the minimum levels of testing and inspections as set out in this document, as well as any other testing and inspections required by the consent conditions and the quality management plan, is carried out. This includes ensuring all materials are fit for purpose.

Any work requiring testing by or in the presence of Council shall be pre-tested and proved satisfactory to the developer's representative before a request is made to Council for official testing.

Final inspections and maintenance inspections requiring the presence of Council shall be pre-inspected by the developer's representative, and a list of non-compliances drawn up, before a request is made to Council for official inspection.

A minimum of two working days' notice shall be given to Council for tests and inspections.

All Council inspections will be charged for in accordance with Council's Fees and Charges Schedule.

1.B.6.7 Health and safety

The developer and the developer's representatives and contractors shall be responsible for meeting all relevant health and safety requirements. However Council may at any time comment on health and safety matters, and if necessary request that development works be temporarily halted if it considers that the works are being carried out in an unsafe manner, particularly where the works are being carried out within a road reserve or on other Council land.

1.C Acceptance

1.C.1 Documentation

Where required by the consent conditions the following documentation shall be provided with application for engineering clearance:

1. A status list of conditions outlining how each condition has been met;
2. Completion certificates in the form of Schedules 1B and 1C (as per Appendices 2 and 3);
3. As-built drawings (and associated attribute data in accordance with any relevant national standards) including the information set out in Schedule 1D (as per Appendix 4), in A3 hard copy or A3 printable .pdf format, and in electronic format (eg .dwg, .dxf or .shp files, preferably as email attachments) (coordinates shall be in terms of NZTM and levels shall be in terms of NZGD Lyttelton 1937);
4. A geotechnical completion report including Schedule 2A certification (as per Appendix 5);
5. Evidence that all testing and inspections required by this document, the quality management plan and the consent conditions has been carried out, and that the results comply. All test results shall be accompanied by comment on the results and conclusions;
6. CCTV inspection data and reports on all new public wastewater and stormwater mains;
7. Operations and maintenance manuals, and/or maintenance plans;

8. Road safety audit results;
9. Road surfacing quality assurance records;
10. RAMM inventory data in the specified format (for larger subdivisions, liaison with Council's Roading team will be required to confirm acceptable data format requirements);
11. Evidence that power and telecom services to be taken over by network utility operators have been installed to their standards and that each lot has been serviced if required by a consent condition (for subdivisions, this shall be in the form of certification from the network utility operator concerned, referring to the subdivision and to each lot by number);
12. A report from a suitably qualified person demonstrating that private water supplies serving more than one lot meet the requirements set out in the *Drinking-water Standards for New Zealand 2005 (Revised 2008)* and providing a full description of the water supply. Where treatment of the supply is required the report must identify a preferred treatment option;
13. A statement from a suitably qualified person confirming that where a private supply meets the criteria for a Community Drinking Water Supply as determined in the *Drinking-water Standards for New Zealand 2005 (Revised 2008)*, the supply has been registered with the Ministry of Health;
14. A detailed schedule of prices showing the value of constructed infrastructure assets to be vested in Council, and the value of any associated maintenance bonds; and
15. Any other documentation required by the consent conditions.

Note 1.C.1 Council will process completion documentation as quickly as possible, however delays will occur where incomplete or inaccurate information has been supplied by the developer.

1.C.2 Bonds

A maintenance bond shall be provided to Council if required by a consent condition, based on the value of works as detailed in the schedule provided under 1.C.1 as follows (all amounts exclude GST):

- 5% of the first \$200,000; and
- 2.5% of any amount over \$200,000;

to a maximum bond amount of \$200,000.

Bonds for uncompleted works will not usually be approved by Council, and shall be subject to specific application and approval.

1.C.3 Maintenance

The maintenance period for all infrastructure to vest in Council excluding stormwater ponds will usually be one year from the date of Council acceptance (for subdivisions this will be the date of issue of the s224 certificate). For stormwater

detention ponds to vest in Council the maintenance period will usually be two years or until a specified percentage of lots have been built on as set out in the consent conditions.

During the maintenance period the developer shall maintain the infrastructure and landscaping and be responsible for repairing all defects and damage to the infrastructure and landscaping, however caused.

1.C.4 Accuracy and defects

Council's receipt and acceptance of as-built plans and certification does not absolve the person who provided the information of responsibility for its accuracy. In the event of a connection not being found where shown on the as-built plans, Council will contact the certifier and give the certifier two working days to resolve the situation. If the information is found to be incorrect Council may arrange to have another connection installed and charge the certifier accordingly.

When public drainage and watermain systems are completed and live, the operation becomes physically the responsibility of the Council although the developer remains financially responsible for any hidden workmanship or materials defects on works covered by the Schedule 1C completion certificate provided as per 1.C.1.

2 GEOTECHNICAL

2.A Minimum requirements

- 2.A.1 Each lot shall contain a building site suitable for the types of building appropriate to the zoning of the land.
- 2.A.2 A geotechnical investigation report shall be provided with any resource consent application where filling over 300mm is proposed, where uncontrolled fills, steep slopes or obvious geotechnical hazards exist, where large trees are being removed or redundant septic tanks are being backfilled within road reserve or buildable lot areas, where ground stability and strength needs to be assessed to enable construction of infrastructure and building platforms, or where otherwise requested by Council.
- 2.A.3 The geotechnical investigation report shall consider all aspects of the proposed design and identify any lots or building sites with specific geotechnical requirements.
- 2.A.4 Lots or building sites with specific geotechnical requirements may be approved subject to restrictions and recommendations which shall be registered on the lot titles by way of a consent notice.
- 2.A.5 For subdivisions where a geotechnical investigation report has been provided, a geotechnical completion report shall be provided on completion of the works. In cases where no earthworks have been carried out the geotechnical investigation report may also comprise the geotechnical completion report.
- 2.A.6 The geotechnical completion report shall include all test results as required by the geotechnical investigation report, the quality management plan or the consent conditions, and as-built drawings showing the extent of earthworks and subsoil drains and the location of any no-build areas or areas requiring specific foundation design.
- 2.A.7 All geotechnical investigation and completion reports shall be prepared by a qualified and experienced person as described in 1.B.2.3.
- 2.A.8 In some instances Council may require geotechnical reports to be peer reviewed. Such peer reviews will be at the developer's expense.

2.B Means of compliance

Sections 2.1-2.3 and 2.5 of *NZS 4404:2010 Land Development and Subdivision Infrastructure* set out investigation, design and construction recommendations for earthworks and geotechnical requirements. Section 2.6 of *NZS 4404:2010* sets out the geotechnical completion report and as-built requirements.

2.C

Acceptance

The minimum level of construction testing for earthworks shall be fill compaction testing, which shall be carried out as per the requirements set out in the geotechnical investigation report, the quality management plan or the consent conditions, and certified by the developer's geotechnical engineer.

Prior to signoff, the developer's representative shall have supplied to Council the documentation and as-builts as per 1.C.1.

3 ROADS

3.A Minimum requirements

- 3.A.1 The road network shall provide vehicle access to each lot and building site, link to the existing road network, and be able to accommodate the predicted volume and type of vehicle movements associated with the development.
- 3.A.2 The design life of all road pavements shall be 50 years.
- 3.A.3 Road design shall consider road hierarchy, use by vehicles, pedestrians and cyclists, and drainage and infrastructure functions.
- 3.A.4 Where the upgrading of an existing road is required as part of a resource consent, contributions and/or cost sharing shall apply as per District Plan requirements. Where such upgrading involves sharing construction costs with Council, liaison shall be carried out with Council before application is made for consent, and a schedule of costs and assessment of Council's share shall be provided with the consent application.
- 3.A.5 The developer shall arrange and carry out a road safety audit if required by Council.
- 3.A.6 The developer shall ensure that all relevant traffic management requirements are met and that Works Access Permits are obtained for all works in existing road reserves.

3.B Means of compliance

3.B.1 Road widths

3.B.1.1 Unless otherwise approved, road widths shall be as follows:

1. Minimum legal widths for all road reserves shall be 20m, except for:
 - strategic and arterial roads in urban areas, where the width shall be 20m or the carriageway width plus 10m, whichever is greater;
 - local road cul de sacs less than 150m long in urban residential areas, which may have a reduced width of 15m.

Legal widths shall be wide enough to cater for all design features such as swales and landscaping without compromising the minimum berm layout widths as per drawings R01 and R02.

2. Minimum carriageway widths shall be
 - 12m for urban business and industrial roads;
 - 11m for urban collector roads and urban local roads more than 200m in length;
 - 9m for urban local roads less than 200m in length;

- 6m for urban local cul de sacs less than 150m in length in non-business and industrial areas, if a dedicated parking bay area is provided; and
- 6.5m for rural roads.

3. Minimum metal shoulder widths on all roads without kerbs shall be 0.5m-1.0m each side as per drawing R03 depending on the type and location of road. Council will give guidance on this.

3.B.1.2 Footpaths shall be 1.5m wide unless in a business area or in situations such as schools or parks where Council may require wider footpaths.

A minimum of one footpath shall be provided on all urban roads, preferably on the western or southern side of the road. Council may require two footpaths on any road, such as on linking local roads and collector roads, in business areas, and in any situations such as schools or parks where Council considers two footpaths to be necessary.

In some circumstances Council may also require footpaths in rural areas.

3.B.2 Geometric design

3.B.2.1 Gradient lengths should be as long as possible with vertical curves provided where necessary. Where the gradient change exceeds 1% the minimum curve length shall be 30m, except in the case of cul de sacs where the minimum curve length shall be 20m.

The maximum longitudinal grade of local roads in urban areas shall be 12.5%. For all other roads the maximum longitudinal grade shall be 10% unless approved otherwise by Council.

The minimum longitudinal grade of kerb and channel shall be 0.5%, parallel on both sides of the road except on transitions into superelevation.

Gradients at intersections shall be specifically designed in accordance with *Austroads* design guides for all rural roads and for urban roads where the speed limit is more than 50 km/h.

3.B.2.2 Crossfalls shall normally be 3% for sealed urban roads and 4% for sealed rural roads in both directions from the crown. However when widening an existing carriageway, crossfalls may vary from 2%-4% for urban roads, and up to 5% for rural roads.

Unsealed rural road crossfalls shall be 5%-6%. Transitions from sealed to unsealed roads shall be taken up in a 20m transition section of the sealed carriageway.

Turning circles and cul de sacs shall be designed to avoid excessive differential levels between the crown and the edge of seal. Where asphaltic concrete is used,

minimum turning circle and cul de sac crossfalls shall be 2%. Where an off-centre cul de sac head is used, the crown shall be offset to create symmetrical crossfalls.

Superelevation shall be specifically designed in accordance with *Austroroads* design guides for all rural roads and for urban roads where the speed limit is more than 50 km/h.

- 3.B.2.3 Minimum curve radii shall be designed to reflect intended road use and anticipated traffic speeds. Widening may be required on curves with a tight radius or where heavy vehicles are likely.

Intersections on local business and industrial roads shall have an inside kerb radius of 12m-15m. Intersections on other local roads shall have an inside kerb radius of 5m-7m.

Cul de sac dimensions shall be as per drawing R22.

- 3.B.2.4 Standard berm formation and position of services shall be as per drawings R01 and R02. Footpath crossfall should be 2%, with a range of 1%-3% permitted where approved by Council. Grassed and planted berms shall have a crossfall of 2%-6% unless approved otherwise.

Where berms are not required to cater for pedestrians, mowable grassed batters with a maximum crossfall of 25% (1 in 4) may be used. In all cases the top edge of any fill or the toe of any cut adjacent to the road shall have a crossfall of 2%-6% extending a minimum of 300mm beyond the outside edge of the footpath or, where there is no footpath, the back of the kerb or carriageway shoulder.

New cut or fill faces shall be stabilised with suitable approved vegetation or retained if required by the geotechnical investigation report or the consent conditions. Retaining walls which support road reserve shall be located entirely within the road reserve. Retaining walls which support adjoining land shall be located entirely within the adjoining land unless approved otherwise by Council.

Grassed berms shall be constructed as per 7.B.6.

- 3.B.2.5 Road (and public space) lighting shall meet the requirements of *AS/NZS1158:2005 Lighting for roads and public spaces* and Council's Design Standard for Lighting for Roads and Public Spaces.

- 3.B.2.6 Road marking and signage shall meet the requirements of the *Land Transport Rule (Traffic Control Devices) 2004* and associated sign specification, and the *NZTA Pedestrian planning and design guide*.

Road name signs shall be as per Appendix 6. Where named right of ways have been approved, right of way name signs shall have the words "private access" in place of the words "no exit".

3.B.3 Pavements

3.B.3.1 All roads shall be designed with a 50 year life and in accordance with *Austrroads* guidelines. Flexible pavements shall be used unless approved otherwise by Council.

Minimum pavement depths for cul de sacs and right of ways shall be 100mm AP40 on 150mm AP65. Minimum pavement depths on local roads other than cul de sacs shall be 100mm AP40 on 200mm AP65.

3.B.3.2 For non-business and industrial local roads and right of ways where the existence of non-granular subgrade materials makes testing with a scalar penetrometer feasible, pavement design and construction may be carried out using the charts as per drawings R05 and R06, with pavement layer depths increased accordingly following testing if required.

3.B.3.3 Where subgrades need improving, the recommended method is undercutting and replacing with higher quality material such as GAP65, placed and compacted in 200mm layers.

Use of river or pit run for subgrade improvements is subject to specific Council approval. Such material will only be approved if its larger particles are not excessively sized and it contains sufficient broken faces and fines.

Other granular material may be acceptable to Council as undercut replacement material provided that a satisfactory compaction standard can be set and achieved by the contractor, as set out in the quality management plan.

Subgrade stabilisation is subject to specific design and approval. The minimum stabilisation depth after compaction shall be 200mm.

3.B.3.4 Where wet or soft areas are encountered at or below subgrade level, or if required by the geotechnical investigation report, subsoil drainage generally as per drawing R04 shall be provided to suitable outlets. Extensive areas requiring drainage shall be subject to specific design with input from the developer's geotechnical engineer. In such areas consideration should be given to the use of a suitable geotextile cloth.

Subsoil drains beneath kerb lines shall connect to a suitable outlet such as a sump or open drain.

3.B.3.5 Completed subgrade and subbase surfaces shall be within -25mm to +5mm of design levels at any point, maintained smooth and compact and with adequate drainage.

Completed basecourse surfaces shall not hold water and shall generally be within -5mm to +15mm of design levels, and vary by no more than 15mm from a 3m straight edge.

Where chip seal is to be used against concrete channel edges, the completed basecourse level shall be flush with the lip of channel. Where asphaltic concrete is to

be used, the completed basecourse level shall be such that the finished asphaltic concrete surface will be 5mm higher than the lip of channel.

3.B.4 Kerbs and sumps

3.B.4.1 Unless directed otherwise by Council, kerbs and channels shall be provided on all roads in urban areas as per drawings R07-R11, except in Residential 3 zones where roads may be unkerbed but shall have mountable kerbs and channels at all intersections as per drawing R12.

Mountable kerbs at rural intersections shall be provided generally as per drawing R12 where required by Council.

Prior to final acceptance the effectiveness of channels may be tested by flooding the channel. Any ponding of water in the channel shall render the work unacceptable.

For urban developments with new kerbs the developer shall provide and set survey benchmarks into the kerbs at the time of pouring as directed by Council.

3.B.4.2 Where required as part of a designed stormwater system, sumps shall be located in roads as follows:

1. With a maximum channel run of 90m;
2. On the high side of intersections, located at the kerblines tangent point;
3. At changes of gradients or direction in the channel (e.g. at an intersection where both channels fall towards the intersection and where superelevation is required);
4. Clear of vehicle crossings and pram crossings;
5. Where practical, new sumps shall be located in the middle third of an adjacent lot's frontage to allow for vehicle crossing construction. New vehicle crossings shall be located clear of existing sumps or the existing sump relocated at the developer's expense;
6. A double sump to minimise the risk of ponding shall be provided at cul de sac ends where there is a low point, and at the lowest point in sag vertical curves for all roads.

Sumps shall be constructed as per drawings D06-D08. Where a standard sump does not meet intake capacity requirements, an alternative specific design shall be required.

Sump outlets shall have a minimum diameter of 150mm. Sumps connecting to soak pits or swales shall be fitted with a submerged outlet as per drawing D09.

3.B.4.3 Secondary stormwater flowpaths shall be provided from all low points along the road.

3.B.5 Footpaths

Footpaths shall be constructed as per drawing R26 and shall be concrete unless approved otherwise by Council.

For safety reasons footpaths should not abut the kerb on roads unless approved by Council.

Where the footpath location meanders between abutting a kerb and being adjacent to a front berm, the meander alignment shall be as per drawing R28.

Where one footpath is being provided in a cul de sac, the footpath shall extend around the cul de sac head to the parallel kerb tangent point on the opposite side, where it shall terminate with a pram crossing.

Where a footpath abutting a kerb has been approved around a cul de sac head in an industrial or business area, the footpath shall be strengthened to have 150mm concrete with central mesh on a 100mm AP65 base.

3.B.6 Pram crossings

Pram crossings including tactile pavers where directed by Council shall be provided at all road intersections, and at other locations where required to enable logical and safe movement of pedestrians.

Pram crossings shall be constructed generally as per drawing R27 with no “bullnose” in the channel, ie with no abrupt change in level through the kerb and channel portion of the crossing. For pram crossings on straight sections of footpath where the path abuts the kerb, Council may require localised footpath widening.

3.B.7 Vehicle crossings

Note 3.B.7 A Works Access Permit shall be obtained before commencing any vehicle crossing works within existing road reserves. The permit can be obtained by applying for corridor access approval from Council via the **beforeUdig** service, online at beforeUdig.co.nz or by phone at 0800 248 344. Provision of a site location plan and traffic management plan is required as part of this process.

For non-resource consent related vehicle crossing works:

- A Works Access Permit is required prior to commencement of works as per the above;
- A preconstruction meeting is required prior to commencement of works – contact the Consents Engineer on 03 314 8816 or at consentsengineer@hurunui.govt.nz;
- Vehicle crossings associated with new building works should be dug out and metalled before the site scrape is carried out and before any building works commence; and

- *Council inspections are required when the crossing has been dug out, and prior to final surfacing – contact the Consents Engineer on 03 314 8816 or at consentsengineer@hurunui.govt.nz.*

3.B.7.1 Vehicle crossings shall be provided if their positions are known at the time of subdivision, otherwise they may be deferred to building stage subject to Council approval. Crossings deferred to building stage and subject to specific design or location requirements may need to be registered on the title by way of a consent notice.

Vehicle crossings shall intersect the carriageway at an angle of 60°-90° and shall be located clear of road side features such as sumps, valves, street trees, street lights and pram crossings. At Council's discretion such roadside features may be relocated or strengthened at the developer's expense to allow construction of a new vehicle crossing.

Vehicle crossings shall be designed to enable a 90th percentile car to use them without grounding any part of the vehicle. They shall have a grade no steeper than 12.5% (1 in 8) within the first 6m from the road carriageway.

3.B.7.2 Visibility and locations of vehicle crossings shall be as per drawings R23 and R24.

3.B.7.3 Vehicle crossings serving lots in areas where no firefighting hydrants are available shall be a minimum of 4m wide at the boundary to allow for access by fire appliances.

Gates across rural vehicle crossings shall be set a minimum of 6m from the edge of the road carriageway.

3.B.7.4 Urban vehicle crossings shall be surfaced with asphaltic concrete, or, where no kerb and channel exists, asphaltic concrete or chip seal.

Other surfacing is subject to specific Council approval and may include paving stones or concrete.

Urban crossings adjoining roads with kerb and channel shall be constructed as per drawing R13. Where the crossing serves a right of way, additional kerb and channel strengthening shall be provided as per drawing R07. Where the crossing serves a business or industrial site, additional kerb and channel strengthening shall be provided as per drawing R14, and the depth of the crossing's AP65 layer shall be increased to a minimum of 200mm.

Urban crossings adjoining roads with no kerb and channel shall be constructed as per drawing R15.

Where new crossings pass through an existing footpath, the footpath shall be saw cut 300mm wider than the crossing on each side as per drawing R17, and removed and rebuilt as part of the crossing.

Rural crossings shall be constructed as per drawing R18. If the road is sealed the crossing shall be surfaced with chip seal or asphaltic concrete a minimum distance of 6m from the road carriageway. If the crossing slopes up away from the road, the crossing shall be surfaced a minimum distance of 10m from the edge of the road carriageway.

Where an asphaltic concrete vehicle crossing abuts a sealed carriageway, the carriageway shall be saw cut at the join so that the asphaltic concrete can be keyed in.

Where concrete crossings have been approved, these shall be 150mm concrete on 50mm AP20 for residential sites, and 150mm concrete with central mesh on 100mm AP40 for business or industrial sites. For concrete crossings abutting a sealed carriageway where no kerb and channel exists, a 300mm wide asphaltic concrete strip shall be provided between the concrete and the carriageway, with the carriageway being saw cut at the join so that the asphaltic concrete can be keyed in.

3.B.7.5 Where roadside drainage is provided by a swale or table drain with maximum side slope grades of 6.5%, vehicle crossings may be constructed to pass through the swale or table drain. For swales with subsoil drains, the portion of the crossing traversing the swale shall be constructed as per drawing R16.

Culverted crossings across swales shall be constructed as per drawing R17. Culverted crossings across table drains and open drains shall be constructed as per drawings R15 or R18.

Vehicle crossing culvert diameters shall be as per the drawings or as otherwise designed or directed by Council. Minimum diameters shall be 150mm in urban areas and 300mm in rural areas.

Acceptable vehicle crossing culvert materials include uPVC (minimum SN16), polypropylene "Stormboss", or RCRRJ (minimum class 3). Crossing culverts shall be installed in accordance with good pipe laying practice as per 4.B.6 and the manufacturer's bedding and minimum cover recommendations. Where the recommended minimum cover cannot be achieved, additional pipe protection shall be provided as per drawing D14.

In all cases care shall be taken to ensure that vehicle crossings do not hold or impede the flow of stormwater. Any ponding of water on the crossing or in the swale, table drain or drainage ditch adjacent to the crossing shall render the work unacceptable.

Note 3.B.7.5 Polypropylene pipes marketed as "Farmboss" will not generally be accepted as vehicle crossing culverts because minimum cover requirements for these pipes are usually unable to be met.

3.B.7.6 All vehicle crossings sloping up away from the road shall be provided with control measures as necessary to prevent runoff of stormwater and debris into the road reserve.

All crossings sloping down away from the road shall be shaped to prevent runoff of road stormwater and debris onto private land.

3.B.7.7 Where a new vehicle crossing has been installed to a lot, any redundant crossings shall be removed at Council's discretion and the berm and road edge reinstated.

3.B.8 Surfacing

3.B.8.1 The minimum surfacing requirement is a two-coat grade 4 and 6 wet lock chip seal for urban roads and a two-coat grade 3 and 5 wet lock chip seal for rural roads.

For asphalt roads a membrane seal using asphaltic binder or emulsion and grade 5 chip shall be laid prior to surfacing with asphaltic concrete as per the approved design.

In cul de sac heads the minimum surfacing requirement is a 30mm layer of paver-laid AC10 asphaltic concrete laid over a grade 5 chip seal.

Use of pavers is subject to specific Council approval.

Council may require the application of weed inhibiting treatments such as herbicidal sprays or granules prior to surfacing.

Roads which are to remain unsealed shall be prepared to sealing standard and lightly covered with AP20 as a running course.

3.B.8.2 Chip sealing operations shall not be carried out when the shade air temperature above the pavement is less than 10°C.

First coat sealing shall generally be carried out in accordance with *TNZ P/3: 1995 Specification for first coat sealing*, with an appropriately reduced rate of chip application to allow for application of the second coat.

Prior to surfacing the pavement shall be swept clean and shall present a tight, uniform, stone mosaic surface.

Basecourse surface level tolerances against concrete channel edges shall be as per 3.B.3.5. Where chip seal is used against concrete channel edges, the chip seal shall overlap the channel by 25mm.

In all cases sealing contractors shall follow best practice guidelines to ensure kerbs and channels are sufficiently clear of swept debris at the time of sealing, and protected from overspray. Untidy work and unsightly excessive overspray shall render the work unacceptable.

For new roads the developer's representative shall retain a copy of all surfacing quality assurance records, to be submitted to Council with the application for engineering clearance.

3.B.9 Right of ways

3.B.9.1 Legal right of way widths shall be wide enough to allow for access and provision of all necessary services and stormwater controls.

Right of ways shall be as per drawing R19 and as follows:

1. For 2-4 lots, the minimum legal width shall be 5.5m and the minimum carriageway width shall be 4m;
2. For 5-6 lots, the minimum legal width shall be 7m and the minimum carriageway width shall be 5.5m; and
3. For 5-6 lots in urban areas, a turning head shall be provided as per drawing R20.

Service trenches in right of ways shall be located clear of pavements and swales. Drawing R21 shows an acceptable service trench design.

3.B.9.2 For right of ways more than 75m long in urban areas, and more than 150m long in rural areas, reduced carriageway widths to a minimum of 4m may be approved by Council subject to the provision of additional passing bays. Passing bays shall have a 5.5m wide carriageway over a minimum length of 15m, located with adequate visibility between them and at maximum spacings of 50m in urban areas and 100m in rural areas.

3.B.9.3 Single crossfalls of 2%-4% are permitted.

Gradients shall be measured on the inside radius of any curve, and shall generally be a maximum of 20% (1 in 5), although 22.5% (1 in 4.5) is permitted over straight sections up to 20m long. Gradients steeper or over longer sections are subject to specific Council approval, and the affected section shall be surfaced with chip seal or asphaltic concrete.

3.B.9.4 All right of ways in urban areas shall be surfaced with chip seal or asphaltic concrete. In rural areas right of ways adjoining sealed roads shall be surfaced for a minimum of 20m from the road boundary.

3.B.9.5 All right of ways shall be provided with stormwater controls as for roads. In urban areas, right of ways sloping towards the road shall be provided with a sump adjacent to the road boundary and discharging to a suitable outlet.

Secondary flowpaths shall also be considered.

3.B.10 Access tracks

Council may require access to be provided to or around Council assets such as stormwater ponds and water tanks, as follows:

1. Grassed access tracks: Shall have a crossfall of 3%-5% and consist of a minimum of 200mm AP65 on a firm subgrade, 3m wide and covered with a 75mm layer of topsoil as per 7.B.6; and
2. All-weather access tracks: Shall have a crossfall of 3%-5% and consist of a minimum of 250mm AP65 on a firm subgrade, 3m wide.

Alternative access track solutions such as gobi blocks or similar will be considered and are subject to specific Council approval. In all cases stormwater control shall be considered and allowed for.

3.C Acceptance

3.C.1 Testing

The minimum level of testing shall be as follows:

- 3.C.1.1 Clegg impact testing: Shall be carried out prior to surfacing on subbase metal under kerbs and channels, on basecourse metal under footpaths, right of ways and vehicle crossings, and on basecourse metal under roads alongside channels and other key areas where requested by Council. Readings shall be taken at maximum 10m spacings, and shall comply with the following criteria:
1. Subbase metal under kerbs and channels, and basecourse under vehicle crossings, right of ways and under roads shall have a minimum impact value of 32; and
 2. Basecourse metal under footpaths shall have a minimum impact value of 25.
- 3.C.1.2 Nuclear densometer testing: Shall be carried out on subbase and basecourse metal on strategic and arterial roads, all business and industrial roads and right of ways, and any other road or pavement Council considers likely to be subjected to heavier than usual traffic loads due to the development's location or land use. Readings shall be taken in both lanes at maximum 20m spacings, and shall have a minimum dry density of 2150 kg/m³.
- 3.C.1.3 Benkelman Beam testing: Shall be carried out on all roads, and on right of ways if required by consent condition, prior to surfacing. Readings shall be taken in the wheel path in both lanes at maximum 10m spacings or as otherwise requested by Council, and shall comply with the following criteria:
1. Strategic and arterial roads, all business and industrial roads and right of ways, and any other road Council considers likely to be subjected to heavier than usual traffic loads due to the development's location or land use, shall have a maximum deflection of 1.2mm and a maximum average deflection of 1mm;

2. Collector roads and local roads excluding cul de sacs shall have a maximum deflection of 1.5mm and a maximum average deflection of 1.25mm; and
3. Cul de sacs and right of ways shall have a maximum deflection of 1.8mm and a maximum average deflection of 1.5mm.

3.C.2 Inspections

The minimum level of Council inspections shall be as follows:

1. Subgrade – roads, right of ways, vehicle crossings, footpaths and access tracks:
 - following excavation and trimming of undercuts/digouts/drainage if undertaken
 - following trimming, including stringing if no other shape/level controls have been allowed for in quality management plan
2. Sub-base – roads, right of ways and access tracks:
 - following compaction and trimming
3. Kerb and channel:
 - following placement and compaction of sub-base
 - following boxing and reinforcing preparation of strengthening at vehicle crossings if undertaken
4. Basecourse – roads, right of ways, vehicle crossings and footpaths:
 - following compaction and trimming, including stringing if no other shape/level controls have been allowed for in quality management plan
 - immediately prior to surfacing.

3.C.3 Signoff

Prior to acceptance of the completed roads, the developer's representative shall have supplied to Council the completion documentation and as-builts referred to in 1.C.1.

4 STORMWATER

4.A Minimum requirements

- 4.A.1 The stormwater system shall serve the entire upstream catchment for the land use likely to prevail during the economic life of the system.
- 4.A.2 The design life shall be 80 years although some components such as soak pits may require earlier maintenance or replacement.
- 4.A.3 Secondary overland flowpaths shall be provided to cater for runoff resulting from 2% annual exceedence probability rainfall events.
- 4.A.4 Subdivisions shall be designed and constructed with a stormwater system that allows for the discharge of stormwater from roads and lots in an approved manner. Construction of individual on-site storage or soakage systems may be deferred to the time of building by way of a consent notice registered on the lot titles if it can be demonstrated that installation of the systems is feasible.
- 4.A.5 A stormwater management plan shall be provided with any resource consent application for development within urban stormwater management areas.
- 4.A.6 Stormwater management plans shall consider all aspects of the proposed design and demonstrate how compliance with urban global stormwater discharge consents held by Council will be achieved.
- 4.A.7 For urban areas where Council does not hold a global stormwater discharge consent, the developer shall check with Environment Canterbury whether a separate discharge consent is required, and obtain a discharge consent if necessary.
- 4.A.8 The developer shall ensure that all relevant consents are obtained, that traffic management requirements are met and that Works Access Permits are obtained for all works in existing road reserves.

4.B Means of compliance

4.B.1 Design storms and surface runoff

- 4.B.1.1 Stormwater systems in urban areas where Council holds a global stormwater discharge consent shall comply with the requirements of that consent, unless a separate resource consent or confirmation of permitted activity status has been obtained for the system from Environment Canterbury.

Note 4.B.1.1 Council holds a global stormwater discharge consent for Amberley (Environment Canterbury reference CRC082988, available on Hurunui District Council's and Environment Canterbury's websites), and as at March 2017 is in the process of obtaining a global stormwater discharge consent for Hanmer Springs. Council reserves the right to charge developers a fee for basing their design on global stormwater discharge consent requirements.

4.B.1.2 Stormwater systems shall cope with minimum annual exceedence probability (AEP) rainfall events as follows:

- Rural local road culverts and primary systems in urban areas, 10% AEP;
- Secondary overland flowpaths, and primary systems in urban areas where no secondary overland flowpath is available, 2% AEP; and
- Rural non-local road culverts and all bridges, 1% AEP.

Rainfall event durations of up to and including 24 hours shall be considered for each family of events with the same AEP.

4.B.1.3 All habitable building sites adjacent to a secondary flowpath shall be constructed to have a minimum of 300mm freeboard above the flowpath's 2% AEP flood level. All habitable building sites adjacent to a natural open channel system shall be constructed to have a minimum of 300mm freeboard above the channel's 1% AEP flood level.

Note 4.B.1.3 Minimum floor levels may be set by consent notice where necessary. The requirements of section E1 of the Building Code and any District Plan Flood Assessment Zone rules will also apply.

4.B.1.4 Design rainfall intensities shall be as per NIWA's High Intensity Rainfall System V3, available online at hirds.niwa.co.nz. To allow for climate change, add 16% to the output intensities instead of inputting projected temperature changes.

4.B.1.5 The primary piped system shall be designed to cater for the peak flow without surcharge, using a Colebrook-White roughness coefficient $k=1.5$ for pipes up to and including 300mm diameter and $k=0.6$ for pipes larger than 300mm diameter.

4.B.1.6 Runoff volumes shall be calculated taking likely impervious areas based on the proposed land use activity into account, using runoff coefficient values as follows:

| Surface type | C value |
|--|--------------------|
| <i>Roofs</i> | <i>0.90</i> |
| <i>Chip seal, concrete, and asphaltic concrete pavements</i> | <i>0.85</i> |
| <i>Bare impermeable clay with no runoff control</i> | <i>0.70</i> |
| <i>Bare uncultivated soil with medium soakage</i> | <i>0.60</i> |
| <i>Unsealed metalled pavements</i> | <i>0.50</i> |
| <i>Bush, pasture and berms on poor draining soils</i> | <i>0.30</i> |
| <i>Bush, pasture and berms on good draining soils</i> | <i>0.20</i> |
| | |
| Ground slope | C amendment |
| <i>0%-5%</i> | <i>-0.05</i> |
| <i>5%-10%</i> | <i>0</i> |
| <i>10%-20%</i> | <i>+0.05</i> |
| <i>>20%</i> | <i>+0.10</i> |

For urban business and industrial lots, the minimum C value shall be 0.80. For urban residential lots excluding Residential 3, the minimum C value shall be 0.65.

4.B.2 Low impact design

4.B.2.1 Detention ponds and wetlands

Detention ponds and wetlands shall be specifically designed and comply with the requirements of any relevant discharge consents. Where created as part of a subdivision they shall be located on land owned by or to be vested in Council. Any investigations shall be incorporated into the geotechnical investigation report where one exists.

Permanent means of access to ponds and wetlands on Council land by maintenance vehicles and excavators shall be provided. Such tracks shall be as per 3.B.10 and may require provision of a vehicle crossing as per 3.B.7.

4.B.2.2 Soak pits

Where soak pits are proposed, it shall be the developer's responsibility to carry out an investigation to ensure sufficient soakage is available and to confirm ground water levels. This investigation shall be incorporated into the geotechnical investigation report where one exists.

Field testing of soakage may be carried out as follows:

1. Bore test holes of 100mm to 150mm diameter to the depth of the proposed soak pit. Record the ground profile as excavation proceeds. Locate the ground water level if possible and assess the likely change in this during winter conditions and/or wet weather.
2. Fill the hole with water and maintain full for at least 4 hours (unless the soakage is so great that the hole completely drains in a short time).
3. Fill the hole with water to within 750mm of ground level and record the drop in water level against time until the hole is almost empty or over 4 hours, whichever is the shortest.
4. Plot the drop in water level against time on a graph, and determine the soakage rate in mm/hr from the minimum slope of the curve. If there is a marked decrease in soakage rate as the hole becomes nearly empty, the lower rates may be discarded and a value closer to the average can be adopted.

Soak pits shall be designed as follows:

| Location | AEP | Duration |
|---|------------|-----------------|
| <i>Lots in urban stormwater management areas with no downstream attenuation*</i> | 2% | 1 hr |
| <i>Lots in stormwater management areas with downstream attenuation*, and in all other urban areas</i> | 10% | 1 hr |
| <i>Roads and right of ways in all urban and rural areas</i> | 10% | 10 min |
| <i>Lots in rural areas</i> | 20% | 1 hr |

* "Downstream attenuation" means an approved stormwater management pond.

All soak pits shall be located to allow for overflow from up to a 2% AEP event.

Drawing D26 shows acceptable soak pit solutions.

Soak pits draining trafficable surfaces or swales shall be fed via an approved pre-entry submerged outlet sump as per drawing D09.

All soak pit lids shall be secure and child-proof.

In rural areas roadside soak pits without pre-entry sumps may be approved subject to Council approval. All rural roadside soak pits shall be marked adjacent to the boundary with a blue plastic marker post.

N4.B.2.2 Building Code E1/VM1 contains useful information for assessing soakage rates and sizing soak pits.

4.B.2.3 **Raingardens**

Raingardens shall be specifically designed. They shall only be sited on private land and as such they are not suitable for draining roads.

Drawing D27 shows an acceptable private raingarden solution.

4.B.2.4 **Rainwater tanks**

Above-ground and in-ground rainwater storage tanks shall be specifically designed and shall only be sited on private land. Dual purpose rainwater tanks which allow for watering gardens and the like are encouraged, however these shall be sized and configured so that the required detention storage capacity and outflow is not compromised.

Drawing D28 shows an acceptable dual purpose rainwater tank solution.

4.B.2.5 **Swales**

Where swales are proposed for roads or right of ways, additional width shall be provided in the legal road or right of way if necessary to accommodate the swales.

Each swale shall cater for a maximum catchment size of 4 hectares, and shall be sized to cater for a minimum of a 10% AEP rainfall event with a maximum flow velocity of 1.5 m/s unless provided with erosion protection.

Longitudinal grades should be 1.5%-5%. For grades of less than 1.5% a swale subsoil drain shall be provided as per drawing R04. Grades steeper than 5% will not be approved in road reserves, and where approved in right of ways the swale shall have timber or rock check dams or similar provided at 10m maximum spacings to impede water flows.

Side gradients shall be 2%-25%. Where unculverted vehicle crossings across the swale are proposed, side gradients shall be no steeper than 6.5%.

4.B.3 Drainage layout

4.B.3.1 Primary drainage

Primary drainage pipelines to vest in Council shall be capable of serving the upstream catchment and have a minimum internal diameter of 225mm.

Pipelines shall be laid to a constant grade and line between access manholes located at each change of direction, grade and pipe size or class. Manhole spacings shall not exceed 90m for pipe sizes up to 1500mm diameter, above which spacings may extend to 150m. Each branch line shall join the main line at a manhole.

Pipelines in roads and rights of way should be located in the carriageway adjacent to the kerb or shoulder.

Pipelines in berms shall have a minimum cover from finished ground level of 900mm and pipelines in roads, rights of way and other trafficable areas shall have a minimum cover of 1.2m, as per Appendix 9. Where this cover cannot be achieved in roads, right of ways and other trafficable areas, additional protection shall be provided as per drawing D14.

4.B.3.2 Secondary flowpaths

Overland flowpaths should be along the road network. Where required to cross private land they should be aligned alongside boundaries where possible and protected by easements in favour of Council.

4.B.4 Pipe systems

Drainage systems constructed of the following pipe materials will be accepted:

- a) uPVC SN8 or SN16;
- b) RCRRJ class 2, 3 or 4;

- c) PE 80B or 100B;
- d) Ductile iron (subject to specific approval); and
- e) Concrete lined steel (subject to specific approval).

For uPVC or RCRRJ, SN8 and class 2 respectively are acceptable in berms. The minimum pipe class under roads, right of ways, vehicle crossings or other trafficable areas shall be SN16 or class 3 respectively. See also Appendix 9.

All fittings and service connections shall be factory fabricated of similar material to the proposed system chosen.

All joints on pipes and fittings less than 1050mm in diameter shall be factory made spigot and socket flexible type joints.

All rubber ring jointed pipes shall be laid with their sockets at the uphill end.

PE pipes shall have butt fusion joints joining pipes of similar material, diameter and wall thickness, carried out by qualified operators to the manufacturer's recommendations.

4.B.5 Manholes

4.B.5.1 Manholes shall be laid out on all drainage lines in accordance with 4.B.3.1 and at the end of all terminal lines greater than 40m in length.

A 225mm diameter branch line less than 40m long and with no more than three service connections may be terminated with a top entry sump as per drawing D07.

4.B.5.2 Manholes shall be 1050mm diameter or larger precast concrete with factory fitted bases as per drawing D01, with hinged ductile iron lids. Square manholes and lids are subject to specific Council approval.

All manholes in roads, right of ways and other trafficable areas shall be fitted with heavy duty lids.

Minimum internal invert falls through manholes for pipes of the same size shall be as follows:

1. For an inlet to outlet deflection angle of 0-30 degrees, 30mm;
2. For 30-60 degrees, 50mm; and
3. For 60-90 degrees, 80mm.

For pipes of different diameters the soffit level of the smaller inlet pipe shall be level with or higher than the soffit level of the larger outlet pipe.

Manholes shall be benched as per drawings D01 and D02. Benching for lines entering a manhole from the side shall join the main line at an angle of no more than 45 degrees, with a minimum inside radius of 1.5x the incoming pipe diameter.

A maximum of three invert connections (in addition to the through line) shall be allowed into a standard 1050mm diameter manhole.

Laterals and branch pipelines may enter a manhole at an inlet to outlet deflection angle of more than 90 degrees provided that the connection is not at invert level and the manhole is deep enough to allow the incoming pipe to cascade into the manhole without benching.

All manholes with a depth exceeding 1.2m shall be fitted with step irons, orientated within the manhole so that they are not above the inlet and outlet pipes.

Manhole corbels and pipe jointing shall be constructed as per drawings D04 and D10-D13.

Pipelines up to 675mm diameter and joining manholes at invert level shall not extend inside the internal manhole wall for a distance of more than 70mm (measured at the pipe's vertical centreline). Pipes joining manholes above invert level as cascading droppers shall not extend inside the internal manhole wall for a distance of more than 20mm (measured at the pipe's vertical centreline).

4.B.5.3 Manhole diameters shall be increased beyond 1050mm to allow for reduced access space where:

- a) more than three invert connections or two internal drop connections (in addition to the through line) are to be installed;
- b) achieving a benching inside radius of 1.5x the incoming pipe diameter requires it; or
- c) the manhole is more than 4.5m deep.

Such manholes shall be subject to specific design and approval.

4.B.6 **Bedding and protection**

All drainage lines shall be designed and constructed to withstand the loads they will likely be subject to during the lifetime of the system. Specific bedding and protection shall be considered for pipes subject to special loadings such as traffic, tree roots and buildings. Drawing D14 shows acceptable pipe protection solutions.

All open cut drainage lines shall be thoroughly bedded, haunched and backfilled as per drawings D15 and D16.

For drainage lines and laterals laid in soft ground, trenches shall be undercut as per drawing D17 to a minimum depth of 300mm or as directed by the geotechnical engineer or Council.

Pipes shall be laid to line and grade and uniformly bedded along their entire length. For concrete and PVC pipes care shall be taken to ensure the pipe barrel does not rest on ridges or span from joint to joint.

For drainage lines and laterals laid at grades between 10%-20%, the bedding and surround material shall be of low grade 5 MPa concrete with interruptions at each pipe joint, or alternatively water stops shall be provided at 12m spacings as per drawing D18. For lines exceeding 20% grade, water stops shall be provided at 6m spacings.

Backfilling to subgrade level in roads, right of ways, vehicle crossings, carparks and private driveways shall be with hardfill, placed and compacted in 200mm maximum layers. AP65 will be acceptable as hardfill backfill. Use of river or pit run for subgrade improvements is subject to specific Council approval, and will only be approved if its larger particles are not excessively sized and it contains sufficient broken faces and fines. Other granular material may also be approved by Council provided that a satisfactory compaction standard can be set and achieved by the contractor, as set out in the quality management plan.

Backfilling of open cut drainage in berms and other non-pavement areas may be with in-situ trench excavation material relaid and compacted in 200mm maximum layers, provided that the material is of a suitable type and moisture content for such use.

Backfilling shall be carried out as soon as possible after pipe laying.

Where trenching is carried out in existing pavements or berms, reinstatement at the surface shall be as per drawing D22. Reinstatement of trenches in footpaths shall require the full width of footpath to be reconstructed.

The minimum clearance between any two crossing pipelines shall be 300mm. Clearance less than this shall be subject to specific design and approval.

4.B.7 Service connections

Unless approved otherwise by Council service connection laterals shall be a minimum of 100mm for individual lots, and 150mm for industrial lots or connections serving two or three dwellings or premises.

Laterals shall be capable of serving the proposed building area, and shall be brought a minimum of 1m inside the main area of lot and to within 1.2m of the final ground surface. The end shall be capped and its position marked with a blue marker stake.

Laterals shall be laid true to line and, where connecting to a reticulated line, graded at right angles to the main line. They shall be located so as not to compromise available building areas or access opportunities. To achieve this the lateral should generally be located centrally on the road frontage or adjacent to one of the side boundaries.

Lateral connections to plastic pipes shall be made with a factory-made junction where possible as per drawing D19. Lateral connections to concrete pipes of 225mm

diameter or larger may be made directly to the pipe as per drawing D20. Under no circumstances shall connections intrude inside the main pipe barrel and impede flows.

Where manholes are conveniently located, connections shall be directed to the manhole where possible.

Lateral connections to kerbs shall be via an inspection box and kerb entry adaptor as per drawings D23 and D24. Where laterals are larger than 100mm, two kerb entry adaptors from the inspection box shall be provided.

Lateral connection directly to swales or drainage basins which are normally dry are permitted where approved on the engineering drawings, and shall be via a formed outlet protected with a concrete surround generally as per drawing D29. Where high stormwater exit velocities are anticipated the connection to the swale or pond shall be via a bubble-up sump as per drawing D08 or similar to prevent erosion.

4.C Acceptance

4.C.1 Testing

The minimum level of testing for stormwater systems shall be as follows:

- 4.C.1.1 Backfill compaction testing: On pipelines in road, right of way, vehicle crossing, carpark and private driveway pavements, as follows:
1. Nuclear densometer testing shall be carried out on hardfill under strategic and arterial roads, all business and industrial roads and right of ways, and any other pavement Council considers likely to be subjected to heavier than usual traffic loads due to the proposed development. Readings shall be taken at maximum 10m spacings on each 200mm layer, and shall have a minimum dry density of 2050 kg/m³. Where approved by Council the initial complying nuclear densometer readings may be calibrated against clegg hammer readings, and the clegg hammer may then be used in place of the densometer for the remainder of the testing provided that the same backfill material with approximately the same moisture content continues to be used.
 2. For hardfill backfill in areas other than the above, a clegg hammer alone may be used. The test spacings shall be as per above, and the backfill layers shall have a minimum impact value of 25.
 3. Where material other than AP65, pit run or river run has been approved for use as hardfill backfill, compaction testing shall be carried out as per the requirements set out for that material in the quality management plan, or as otherwise approved by Council.
- 4.C.1.2 Low pressure air testing of uPVC pipelines: As per Appendix 8.

Note 4.C.1.2 To enable early identification of any issues it is recommended that the contractor carries out preliminary pressure tests on sections of line before completing backfilling.

4.C.2 Inspections

The minimum level of Council inspections shall be as follows:

1. Pipework: following laying of each section of pipe, prior to backfilling; and
2. Manholes: following pouring of corbels, prior to backfilling.

4.C.3 Signoff

Prior to acceptance of the completed stormwater systems, the developer's representative shall have supplied to Council the completion documentation and as-builts referred to in in 1.C.1.

5 WASTEWATER

5.A Minimum requirements

- 5.A.1 The wastewater system shall serve the entire upstream catchment for the land use likely to prevail during the economic life of the system. Where required the system shall be designed and built to include pumped flow to and from adjacent areas.
- 5.A.2 The design life shall be 80 years.
- 5.A.3 Unless otherwise approved subdivisions shall be provided with a piped wastewater system that provides an adequate connection to each building site, residential or business unit, tenancy or allotment, and provides a suitable outlet to an approved means of wastewater disposal.
- 5.A.4 For areas where a wastewater system has not been installed and is not required by Council, individual on-site ground disposal systems will be approved subject to a report confirming site ground suitability and/or confirmation from Environment Canterbury that the activity is permitted or consented. Where lot areas are 4 hectares or more, no such report or confirmation is required.
- 5.A.5 Where the proposed development cannot be adequately serviced by a gravity system a pressure sewer system with individual private pump units, or alternatively a public pump station system, will be considered provided that it is designed and located to service the entire upstream catchment.
- 5.A.6 The wastewater system shall be designed to prevent stormwater entry into the system.
- 5.A.7 The developer shall ensure that all relevant consents are obtained, that traffic management requirements are met and that Works Access Permits are obtained for all works in existing road reserves.

5.B Means of compliance

5.B.1 Design flows

- 5.B.1.1 Residential wastewater systems shall cope with a peak wet weather domestic flow without surcharge of 4 times the average dry weather flow of 250 litres/person/day, for an anticipated population density of 2.7 persons/dwelling over the 80 year design life.

For business and industrial systems, actual anticipated peak wet weather flows shall be used where known, otherwise the following shall be used:

- For light water usage, 0.4 litres/second/hectare;
- For medium water usage, 0.7 litres/second/hectare ; and

- For heavy water usage, 1.3 litres/second/hectare.

5.B.1.2 The design flow shall be based on a Colebrook-White roughness coefficient $k=1.5$ for pipes up to and including 300mm diameter and $k=0.6$ for pipes larger than 300mm diameter, with peak wet weather velocities between 0.65m/s and 3m/s.

Minimum grades for public lines shall be as follows:

- For 150mm diameter, 0.55%, except on the last section of line at the head of the catchment where the minimum grade shall be 1% unless approved otherwise by Council and the line is to be extended in future;
- For 225mm diameter, 0.33%; and
- For 300mm diameter, 0.25%.

All lines shall be assumed to flow a minimum of half full.

5.B.2 Pumped systems

Pumped systems shall be subject to specific design and approval, and liaison with Council shall be carried out before application is made for resource consent.

Council's preferred pumped systems are pressure systems with boundary connection kits as per drawing D30 installed at the time of subdivision, and privately-owned and maintained reticulation and pumps such as Ecoflow E/One units installed on the lots at the time of building, with the requirement for such private systems registered on the lot titles by way of a consent notice.

Flushing points shall be provided in accessible chambers at the end of all 50mm diameter pressure mains as per drawing D31. Unless approved otherwise by Council odour control shall be provided where pressure systems connect to gravity mains.

5.B.3 Trade waste

The specific provision for trade waste disposal within business and industrial developments does not need to be addressed at subdivision development stage, however the impact of any anticipated trade waste shall be considered in the design. Any subsequent request for trade waste approval for a specific site or activity will be subject to specific Council approval in accordance with the requirements of Council's Three Waters Services Bylaw.

Note 5.B.3 As at September 2017 Council's Three Waters Services Bylaw is still in draft form.

5.B.4 Drainage layout

The wastewater reticulation system shall consist of pipelines with a minimum internal diameter of 150mm laid to a true grade and line between access manholes located at each change of direction, grade and pipe size or class. Manhole spacings shall not exceed 90m for pipe sizes up to 225mm, above which spacings may extend to 120m. Each branch line shall join the main line at a manhole.

Public wastewater mains may be permitted or required by Council in urban right of ways. Where a right of way is serviced by a public wastewater main, the entire right of way shall be covered by an easement in favour of Council to allow continued accessibility of the main and manholes for operation and maintenance.

Gravity pipelines in roads and right of ways should be located centrally in the carriageway. Around road curves manhole spacings shall be reduced as required to maintain a minimum offset from pipe to kerb face or seal edge of 2m unless otherwise approved by Council.

Pressure pipelines in roads and right of ways shall be located in the shoulder (where no kerb exists), or the front berm beside the footpath.

Pipelines in berms shall have a minimum cover from finished ground level of 900mm and pipelines in roads, rights of way and other trafficable areas shall have a minimum cover of 1.2m, as per Appendix 9. Where this cover cannot be achieved in roads, right of ways and other trafficable areas, additional protection shall be provided as per drawing D14.

5.B.5 Pipe systems

Drainage systems constructed of the following pipe materials will be accepted:

- a) uPVC SN8 or SN16;
- b) PE 80B or 100;
- c) Ceramic (subject to specific approval);
- d) Ductile iron (subject to specific approval); and
- e) Concrete or plastic lined steel (subject to specific approval).

For uPVC the minimum pipe class under roads, right of ways or other trafficable areas shall be SN16. See also Appendix 9.

Pumped mains shall have a minimum pressure rating of PN16.

All fittings and service connections shall be factory fabricated of similar material to the proposed system chosen.

All joints on pipes and fittings shall be factory made spigot and socket flexible type joints.

All rubber ring jointed pipes shall be laid with their sockets at the uphill end.

PE pipes shall have butt fusion joints joining pipes of similar material, diameter and wall thickness, carried out by suitably qualified operators to the manufacturer's recommendations.

Installation of pipes by trenchless technology shall be subject to specific design and approval.

5.B.6 Manholes

5.B.6.1 Manholes shall be laid out on all drainage lines in accordance with 5.B.4 and at the end of all terminating lines greater than 40m in length.

150mm diameter branch lines less than 40m long and with no more than three service connections may be terminated with a blank cap adjoining the last lateral.

150mm diameter branch lines more than 40m long and ending within private property may be terminated with a 600mm diameter inspection chamber as per drawing D05, provided that the chamber's depth is 900mm or less.

5.B.6.2 Manholes shall be 1050mm diameter or larger precast concrete with factory fitted bases as per drawing D01, with hinged ductile iron lids. Square manholes and lids are subject to specific Council approval.

Note 5.B.6.2 Manholes constructed from lightweight plastic materials such as supplied by Australasia Moulding Ltd (www.australasiamoulding.co.nz) may be utilised subject to Council approval.

All manholes in roads, right of ways and other trafficable areas shall be fitted with heavy duty lids.

Vented manholes shall be provided generally at every second manhole, avoiding areas of turbulence such as junctions and angles where possible.

Minimum internal invert falls through manholes for pipes of the same size shall be as follows:

1. For an inlet to outlet deflection angle of 0-30 degrees, 30mm;
2. For 30-60 degrees, 50mm; and
3. For 60-90 degrees, 80mm.

For pipes of different diameters the soffit level of the smaller inlet pipe shall be level with or higher than the soffit level of the larger outlet pipe.

Manholes shall be benched as per drawings D01 and D02. Benching for lines entering a manhole from the side shall join the main line at an angle of no more than 45 degrees, and shall be benched with a minimum inside radius of 1.5x the incoming pipe diameter.

Internal manhole channels in wastewater manholes shall be formed using half pipes unless approved otherwise by Council.

A maximum of three invert connections or two internal drop connections (in addition to the through line) shall be allowed into a standard 1050mm diameter manhole.

Branch line drop connections shall be avoided where possible and are subject to specific Council approval. Where internal drop connections are approved, branch lines may enter a manhole at an inlet to outlet deflection angle of more than 90 degrees. Internal drop connections shall be as per drawing D03.

All manholes with a depth exceeding 1.2m shall be fitted with step irons.

Manhole corbels and pipe jointing shall be constructed as per drawings D04 and D10-D13.

Pipelines joining manholes at invert level shall not extend inside the internal manhole wall for a distance of more than 50mm (measured at the pipe's vertical centreline).

5.B.6.3 Manhole diameters shall be increased beyond 1050mm to allow for reduced access space where:

- a) more than three invert connections or two internal drop connections (in addition to the through line) are to be installed;
- b) achieving a benching inside radius of 1.5x the incoming pipe diameter requires it; or
- c) the manhole is more than 4.5m deep.

Such manholes shall be subject to specific design and approval.

5.B.7 Bedding and protection

All drainage lines shall be designed and constructed to withstand the loads they will likely be subject to during the lifetime of the system. Specific bedding and protection shall be considered for pipes subject to special loadings such as traffic, tree roots and buildings. Drawing D14 shows acceptable pipe protection solutions.

All open cut drainage lines shall be thoroughly bedded, haunched and backfilled as per drawings D15 and D16. Sand may be used for bedding and haunching pressure pipes.

For drainage lines and laterals laid in soft ground, trenches shall be undercut as per drawing D17 to a minimum depth of 300mm or as directed by the geotechnical engineer or Council.

Pipes shall be laid to line and grade and uniformly bedded along their entire length. For PVC pipes care shall be taken to ensure the pipe barrel does not rest on ridges or span from joint to joint.

For drainage lines and laterals laid at grades between 10%-20%, the bedding and surround material shall be of low grade 5 MPa concrete with interruptions at each pipe joint, or alternatively water stops shall be provided at pipe joints at 12m spacings as per drawing D18. For lines exceeding 20% grade, water stops shall be provided at pipe joints at 6m spacings.

Backfilling to subgrade level in roads, right of ways, vehicle crossings, carparks and private driveways shall be with hardfill, placed and compacted in 200mm maximum layers. AP65 will be acceptable as hardfill backfill. Use of river or pit run for subgrade improvements is subject to specific Council approval, and will only be approved if its larger particles are not excessively sized and it contains sufficient broken faces and fines. Other granular material may also be approved by Council provided that a satisfactory compaction standard can be set and achieved by the contractor, as set out in the quality management plan.

Backfilling of open cut drainage in berms and other non-pavement areas may be with in-situ trench excavation material relaid and compacted in 200mm maximum layers, provided that the material is of a suitable type and moisture content for such use.

Backfilling shall be carried out as soon as possible after pipe laying.

Where trenching is carried out in existing pavements or berms, reinstatement of the surface shall be as per drawing D22. Reinstatement of trenches in footpaths shall require the full width of footpath to be resurfaced.

The minimum clearance between any two crossing pipelines shall be 300mm. Clearance less than this shall be subject to specific design and approval.

5.B.8 Service connections

Unless approved otherwise by Council, gravity service connection laterals shall be a minimum of 100mm for individual residential or business lots, and 150mm for industrial lots or connections serving two or three dwellings or premises.

Gravity laterals shall be capable of serving the proposed building area, and shall be brought a minimum of 1m inside the main area of the lot and to within 1.2m of the final ground surface. The end shall be capped and its position marked with a red marker stake.

Minimum gradients shall be 1.65% for 100mm diameter property laterals and 1.2% for 150mm diameter property laterals.

Laterals shall be laid true to line and graded at right angles to the main line. They shall be located so as not to compromise available building areas or access opportunities. To achieve this the lateral should generally be located centrally on the road frontage or adjacent to one of the side boundaries.

Lateral connections to wastewater mains shall be made with factory-made junctions where possible as per drawings D19 and D21. Under no circumstances shall connections to mains intrude inside the main pipe barrel and impede flows.

Where manholes are conveniently located, connections shall be directed to the manhole where possible. Such connections shall be at the manhole invert level.

Note 5.B.8 *Installation of an inspection chamber will be required inside the property boundary at building stage. The developer should consider this at the time of subdivision and consult with Council's Three Waters team.*

5.B.9 Common private drains

Where new lots are being created and an existing wastewater lateral exists, the existing lateral may be accepted as a common private drain to serve up to 3 lots provided that:

- a) the lateral has a minimum grade of 1:100;
- b) the lateral is in good condition, as ascertained by CCTV inspection;
and
- c) an inspection chamber as per drawing D05 (where depth to invert is 900mm or less) or manhole (where depth to invert is more than 900mm) is installed at the head of the lateral where the individual lot laterals diverge. Where open formed benching is used, minimum internal invert falls shall be as per 5.B.6.2.

Note 5.B.9 *Easements or body corporate agreements may be required for common drains depending on the reticulation layout and proposed land use.*

5.C Acceptance

5.C.1 Testing

The minimum level of testing for wastewater systems shall be as follows:

5.C.1.1 Backfill compaction testing: On pipelines in road, right of way, vehicle crossing, carpark and private driveway pavements, as follows:

1. Nuclear densometer testing shall be carried out on hardfill under strategic and arterial roads, all business and industrial roads and right of ways, and any other pavement Council considers likely to be subjected to heavier than usual traffic loads due to the proposed development. Readings shall be taken at maximum 10m spacings on each 200mm layer, and shall have a

minimum dry density of 2050 kg/m³. Where approved by Council the initial complying nuclear densometer readings may be calibrated against clegg hammer readings, and the clegg hammer may then be used in place of the densometer for the remainder of the testing provided that the same backfill material with approximately the same moisture content continues to be used.

2. For hardfill backfill in areas other than the above, a clegg hammer alone may be used. The test spacings shall be as per above, and the backfill layers shall have a minimum impact value of 25.
3. Where material other than AP65, pit run or river run has been approved for use as hardfill backfill, compaction testing shall be carried out as per the requirements set out for that material in the quality management plan, or as otherwise approved by Council.

5.C.1.2 Low pressure air testing of uPVC pipes: As per Appendix 8.

5.C.1.3 Pressure wastewater pipes: Testing shall be carried out by suitably experienced personnel and in accordance with the development's quality management plan.

Note 5.C.1.3 To enable early identification of any issues it is recommended that the contractor carries out preliminary pressure tests on sections of line before backfilling.

5.C.1.4 Manhole testing (as directed by Council):

Lids: A moat 300mm below the riser-lid joint shall be dug around the manhole. The moat and lid shall then be flooded with water to just below the top of the iron frame and the water level maintained for 1 hour, during which time no water shall be observed entering the manhole.

Risers and joints: The manhole inlets and outlets shall be plugged and the manhole completely filled with water and left to soak for 4 hours, with the water level being topped up as required. The water loss shall then be measured every hour for 8 hours, and the average water loss over the 8 hours shall be no more than 0.3 litres per 1m diameter per 1m depth per hour. The manhole shall then be drained and left for an hour, after which time no water shall be observed entering the manhole through any joint.

5.C.2 Inspections

The minimum level of Council inspections shall be as follows:

1. Pipework: following laying of each section of pipe, prior to backfilling; and
2. Manholes: following pouring of concrete corbels, prior to backfilling.

5.C.3 Connection to existing network

Connection of new wastewater reticulation to the existing public network shall be only carried out by, or under the supervision of, Council's Three Waters team. A minimum of three working days' notice shall be given, although more notice may be required to allow shutdown notices to be issued if necessary. Such shutdown notices shall be delivered by the contractor to addresses as advised by Council.

New reticulation will not be connected to the existing system until successful pressure testing has been carried out as per 5.C.1.

5.C.4

Signoff

Prior to acceptance of the completed wastewater systems, the developer's representative shall have supplied to Council the completion documentation and as-builts referred to in 1.C.1.

6 WATER

6.A Minimum requirements

- 6.A.1 The water supply system shall serve the entire supply area for the land use likely to prevail during the economic life of the system.
- 6.A.2 The design life shall be 80 years.
- 6.A.3 Subdivisions in urban on-demand water supply areas shall be provided with a piped water supply system adequate for firefighting purposes, together with adequate domestic, business or industrial capacity as required.
- 6.A.4 Subdivisions in all restricted water supply areas shall be provided with a piped water supply system capable of providing pressures in accordance with Council's requirements. Each lot shall be provided with a tank with capacity for at least three day's supply, and additional firefighting capacity if required.
- 6.A.5 Subdivisions in urban on-demand water supply areas involving the construction of new roads, or where otherwise directed by Council, shall be subject to network modelling before application is made for resource consent.
- 6.A.6 Subdivisions in all restricted water supply areas shall be subject to network modelling, including assessment of new or reallocated water unit requirements, before application is made for resource consent.
- 6.A.7 Isolated small developments in rural areas may be adequately serviced by individual privately-owned bores where an adequate aquifer exists and can be shown to be capable of providing sufficient quantities of potable water. Privately-owned bores supplying more than one lot are subject to specific Council approval.
- 6.A.8 The developer shall ensure that all relevant consents are obtained, that traffic management requirements are met and that Works Access Permits are obtained for all works in existing road reserves.

6.B Means of compliance

6.B.1 Modelling

Water network modelling is required for all developments involving the laying of new public water mains, and for all urban and rural developments in restricted supply areas where new lot connections or where new water units or reallocation of existing water units is proposed.

External network modelling will be carried out by Council's Three Waters team on receipt of the appropriate application form and preliminary reticulation layout plan, unless approved otherwise. All external modelling shall be carried out before

application is made for resource consent as per 1.B.3, and the results supplied with the consent application.

Internal water modelling shall be carried out by the applicant before application is made for consent to confirm that any firefighting requirements can be met, and the results shall be supplied with the consent application, or with the engineering plans following granting of the consent if approved by Council.

6.B.2 Flows

6.B.2.1 The following shall be used for design purposes in the Amberley, Culverden, Hanmer Springs, Hawarden, Leithfield Beach, Waiau, Waipara and Waikari urban on-demand supply areas:

- Residential – a peak hourly flow of 0.1 litres/second/lot;
- Business/industrial – use actual figures if known, otherwise a peak hourly flow of 1.0 litres/second/hectare;
- Fire flow plus 50% of peak hourly flow, with a minimum residual pressure of 100 kPa at hydrants, a minimum combined flow from any two hydrants of 25 litres/second, and a minimum flow from any single hydrant of 30 litres/second; and
- Peak hourly domestic flow with a minimum residual pressure of 300 kPa and a minimum flow of 20 litres/second at lot lateral connections.

6.B.2.2 The following shall be used for design purposes in the Rotherham urban restricted supply area:

- Residential – a minimum of 1000 litres/day/lot;
- Business/industrial – use actual figures if known, otherwise a minimum of 1000 litres/day/lot;
- Fire flow plus 50% of peak hourly flow, with a minimum residual pressure of 100 kPa at hydrants, a minimum combined flow from any two hydrants of 25 litres/second, and a minimum flow from any single hydrant of 30 litres/second; and
- A minimum pressure of 200 KPa at restricted lot lateral connections.

6.B.2.3 The following shall be used for design purposes in the Amberley Beach, Leithfield and Cheviot urban restricted supply areas:

- Residential – a minimum of 1800 litres/day/lot;
- Business/industrial – use actual figures if known, otherwise a minimum of 1800 litres/day/lot;
- Fire flow plus 50% of peak hourly flow, with a minimum residual pressure of 100 kPa at hydrants, a minimum combined flow from any

- two hydrants of 25 litres/second, and a minimum flow from any single hydrant of 30 litres/second; and
- A minimum pressure of 200 KPa at restricted lot lateral connections.

6.B.2.4 The following shall be used for design purposes in the Amuri Plains and Balmoral rural restricted supply areas:

- Lots less than 0.41 hectares – a minimum of 1000 litres/day/lot; and
- A minimum pressure of 200 KPa at restricted lot lateral connections.

6.B.2.5 The following shall be used for design purposes in the Ashley, Blythe, Cheviot, Hanmer Springs, Hawarden Waikari, Hurunui No. 1, Kaiwara, Lower Waitohi, Parnassus, Peaks, Upper Waitohi, Waiau and Waipara rural restricted supply areas:

- Lots less than 0.41 hectares – a minimum of 1800 litres/day/lot; and
- A minimum pressure of 200 KPa at restricted lot lateral connections.

6.B.3 Reticulation layout

6.B.3.1 In restricted urban areas and rural areas the layout of mains and hydrants shall be in accordance with Council's requirements set out in the modelling results, consent conditions or engineering approvals.

6.B.3.2 In urban on-demand areas the layout of watermains shall provide for the efficient provision of fire protection and individual connections to all lots.

A principal firefighting main fitted with hydrants shall be laid on one side of all roads. To supply lots on the other side of the road, a rider main shall be laid on that side.

In business and industrial areas and on some main roads two principal mains shall be laid, one on each side of the road, as directed by Council. Duplicate principal or rider mains may be required where lot service connections are not permitted from a trunk main.

Watermains shall normally be laid continually from one street intersection to the next, being supplied with water at each end without being cross-connected to the main on the other side of the street between those points. Layout configurations as per drawings W01-W03 shall be used at intersections. Rider mains on cul de sac streets shall extend on from the end of the principal main, around the head of the cul de sac and down the street to the next street intersection, as per drawing W01.

The reticulation design shall take into account continued accessibility of the watermains and hydrants for operation and maintenance.

6.B.3.3 Watermains in berms shall have a minimum cover from finished ground level of 600mm and watermains in roads, rights of way and other trafficable areas shall have a minimum cover of 700mm, as per Appendix 9. Where this cover cannot be achieved in roads, right of ways and other trafficable areas, additional protection shall be specifically designed and approved by Council.

Maximum watermain cover shall be 1000mm unless approved otherwise by Council.

6.B.3.4 Watermains in urban areas shall generally be located in the rear berm area 1.1m from, and parallel to, the legal boundary, as per drawings R01 and R02.

6.B.3.5 Public watermains, including fire mains with hydrants, may be permitted or required by Council in urban right of ways more than 80m in length and serving more than three lots, and in rural right of ways more than 500m in length and serving more than three lots.

Where a right of way is serviced by a public watermain, the entire right of way shall be covered by an easement in favour of Council to allow continued accessibility to the mains and hydrants for operation and maintenance.

6.B.4 Principal mains

6.B.4.1 Principal mains in roads or right of ways fitted with fire hydrants shall be 100mm dia or larger, and shall be PVC or PE with a minimum pressure rating of PN12 unless otherwise approved.

Pipe types and pressure ratings for pumped or trunk mains, or for principal mains in out-of-the ordinary situations (e.g., under wide roads, near petrol stations, in industrial areas), shall be specifically agreed with Council. Further guidance on pipe material selection in such cases is given in Appendix 7.

Principal main PVC fittings shall be rubber ring jointed. HDPE and MDPE (where approved) fittings shall be reinforced plastic compression type.

6.B.4.2 The minimum radius on which PVC pipes can be installed on a curve is as follows:

- for 100mm dia, 30m;
- for 150mm dia, 45m; and
- for 200mm dia, 60m.

When laid in a curve the maximum deflection at any joint shall be 1.5° (equating to a 150mm offset over a 6m length), and the joint shall be braced against the outside trench walls with a kerb block or similar.

All rubber ring jointed pipes shall be laid with their sockets at the uphill end.

6.B.4.3 PE pipes shall have butt fusion joints joining pipes of similar material, diameter and wall thickness, carried out by qualified operators to the manufacturer's recommendations.

Adjacent fittings shall be flanged and bolted together to form a single unit. Stand-alone fittings shall be socket-jointed where possible to avoid the use of gibaults.

Gibaults may be used for cutting into an existing pipe. Where the pipe length between two gibaults is 1m or less, each gibault shall be braced against the trench walls with kerb blocks or similar to prevent sideways movement within the trench.

6.B.4.4 All hydrants and fittings shall have a pressure rating of at least PN16. Flanges, gibaults, large bore tees, reducers and tapping bands shall be protected with a thermally bonded epoxy or nylon coating.

6.B.4.5 Installation of pipes by trenchless technology shall be subject to specific design and approval.

6.B.5 Rider mains

Rider mains shall have an internal diameter of 50mm.

Rider mains shall be PE80B with minimum pressure rating of PN12.5. Rider mains under kerbs, carriageways and vehicle crossings within roads and right of ways shall be laid in 100mm dia uPVC ducts rated SN16 or higher.

Double end feed rider mains may serve up to 25 lots. Single end feed rider mains should be avoided where possible, but where unavoidable they may serve up to 10 lots from a public road and up to six lots from a right of way and shall terminate with a flushing point as per drawing W13.

The layout and valve positions of rider mains shall suit the flushing of the rider main through the nearest hydrant. Where this is not possible a flushing point shall be provided.

Rider main joints shall be reinforced plastic compression types. Connections of rider mains to principal mains shall be as per drawings W11 and W12.

6.B.6 Bedding and protection

All open cut watermains shall be thoroughly bedded, haunched and surrounded in their own trench where possible as per drawing W05.

For watermains laid in soft ground, trenches shall be undercut as per drawing D17 to a minimum depth of 300mm or as directed by the geotechnical engineer or Council.

Pipes shall be generally laid to line and grade and uniformly bedded along their entire length. The maximum acceptable out of alignment tolerance is 50mm on

straights and 100mm on bends. For PVC pipes care shall be taken to ensure the pipe barrel does not rest on ridges or span from joint to joint.

The entry of clay, bedding, runoff and other foreign material into the pipeline shall be avoided by the use of end caps and diligence during construction. All rubber ring jointed pipes and fittings shall be joined using a lubricant containing an anti-bacterial agent suitable for potable water use.

Thrust blocks as per drawings W06-W08 shall be installed at all points where an unbalanced thrust occurs. Thrust blocks shall be poured or placed perpendicular to the angle of thrust and against undisturbed ground. For poured in-situ blocks, all concrete shall be a minimum of 17.5 MPa at 28 days and shall not encase the fitting. Precast thrust blocks shall only be used for pipes of 200mm dia or less with a maximum operating pressure of 700 kPa, and where the minimum surface area in contact with the undisturbed trench wall is 0.18m².

Where watermains have been laid in proximity to other services, the other services shall be routed over or under the thrust block or ducted through it as necessary.

For watermains laid at grades between 10%-20%, water stops shall be provided at pipe joints at 12m spacings as per drawing D18. For any lines exceeding 20% grade, water stops shall be provided at pipe joints at 6m spacings.

An approved metallic detection tape shall be laid along the pipe alignment at all road crossings and wherever Council has approved the laying of watermains in a non-standard berm location.

Backfilling to subgrade level in roads, right of ways, vehicle crossings, carparks and private driveways shall be with hardfill, placed and compacted in 200mm maximum layers. AP65 will be acceptable as hardfill backfill. Use of river or pit run for subgrade improvements is subject to specific Council approval, and will only be approved if its larger particles are not excessively sized and it contains sufficient broken faces and fines. Other granular material may also be approved by Council provided that a satisfactory compaction standard can be set and achieved by the contractor, as set out in the quality management plan.

Backfilling in berms and other non-pavement areas may be with in-situ trench excavation material relaid and compacted in 200mm maximum layers, provided that the material is of a suitable type and moisture content for such use.

Backfilling shall be carried out as soon as possible after pipe laying.

Other installation methods including trenchless technology such as thrusting or mole ploughing will be subject to specific approval. In all cases the manufacturer's recommendations for pipe storage, handling, protection and laying techniques shall be followed.

Where trenching is carried out in existing pavements or berms, reinstatement of the surface shall be as per drawing D22. Reinstatement of trenches in footpaths shall require the full width of footpath to be resurfaced.

The minimum clearance between any two crossing pipelines shall be 300mm. Clearance less than this shall be subject to specific design and approval.

6.B.7 Hydrants

All principal mains in urban on-demand and restricted supply areas shall be provided with in-ground hydrants for firefighting, air release and maintenance purposes. Hydrants shall be clear of parking areas and readily accessible to fire trucks.

Hydrants shall be spaced a maximum of 135m apart in residential areas, a maximum of 90m apart in business/industrial areas and a maximum of 35m from the end of a no-exit street or cul de sac.

Hydrants shall be located adjacent to the entrance of right of ways longer than 60m unless a hydrant has been provided within the right of way as per 6.B.3.5, and within 1.5m of the end of all principal mains on a dead end unless approved otherwise.

Hydrants shall be mounted on an approved socketed hydrant tee with risers as required as per drawing W09. The base of the hydrant tee shall be supported on a kerb block or similar, and the top of the hydrant spindle shall be within 100mm-300mm of the finished ground level.

Hydrants shall be provided with a surface box set at the same slope as, and no more than 10mm above, the finished ground level as per drawings W09 and W10. The box lid shall be painted yellow and the box shall be set on precast concrete sections in such a way as to prevent the transfer of loads to the watermain.

The location of hydrants shall be indicated adjacent to the hydrant by marking a solid yellow thermoplastic triangle on the road close to the centreline and pointing towards the hydrant, and a yellow "FH" marker abutting the road reserve boundary.

6.B.8 Valves

Valves shall be provided on all public watermains to enable isolation of sections of the reticulation for connections, repairs and maintenance purposes.

The maximum spacing between valves shall be 500m. Sluice valves on principal mains and gate valves on rider mains shall be located at intersections and around cul de sac heads as per drawings W01-W03, and in such a way that any section of reticulation can be isolated by turning off no more than five valves and without cutting supply to more than 50 properties.

Valves shall be provided with a surface box set at the same slope as, and no more than 10mm above, the finished ground level, with a vertical section of 150mm dia

PVC ducting extending from the valve bonnet to within 150mm below the finished ground level as per drawings W09 and W10. The box shall be set on a precast concrete section and the box and PVC duct shall be installed in such a way as to prevent the transfer of loads to the watermain.

Special purpose valves may be required by Council and will be subject to specific design and approval. Scour valves and air valves should be used on high and low points of watermains where hydrants are not proposed and where releasing water or air from the pipes is considered necessary. Pressure reducing valves shall be installed within a drainable concrete manhole or chamber with a trafficable lid.

Where a kerb exists, the location of valves shall be indicated adjacent to the valve by sawcutting a "V" across the top of the kerb and painting an 80mm wide blue strip upon it. Where no kerb exists a white "V" marker shall be installed abutting the road reserve boundary.

6.B.9 Service connections

Unless approved otherwise by Council, all lot service connection laterals shall be 20mm dia blue PE80B pipe extending a minimum of 1m inside the lot boundary.

Connections to mains shall be made with a gun metal tapping band, aligned from the side of the main where possible rather than the top.

Lot connections along road frontages in urban areas shall generally be located in pairs 1.5m apart adjacent to alternating common lot boundaries, staggered to avoid clashing with power and telecommunication connection positions as per drawing W04.

Meter boxes for lots serviced from public watermains within roads or right of ways shall be positioned within the road reserve or right of way reserve with their lids offset 300mm from the lot boundary as per drawing W14.

Meter boxes for lots serviced via right of ways from public watermains in roads shall be positioned in the road reserve adjacent to the right of way, with their lids offset 300mm outside the lot boundary. Multiple meter boxes may be used. The relevant lot or tank number, or alternatively a lot or tank layout diagram, shall be annotated on the underside of the meter box lids or on a tag around the 20mm line within the boxes.

All meter boxes shall be located clear of trafficable areas, unless specifically approved by Council and installed or upgraded to heavy duty trafficable standard.

Meter boxes and connection set ups shall be as per drawing W14. All in-ground boxes shall be DRA40 type boxes with a blue lid, fitted with a heavy duty lid and supported with kerb blocks or similar under their bases where they are likely to be driven over. All box lids shall be flush with finished ground level.

For new subdivisions, meters and restrictors are not required to be installed at construction subdivision stage. Instead these fittings shall be blanked off.

Single service connections passing under kerbs, carriageways and vehicle crossings within private right of ways shall be laid in 50mm dia uPVC ducts rated SN16 or higher. Multiple service connections passing under kerbs, carriageways and vehicle crossings within private right of ways shall be laid in 100mm dia uPVC ducts rated SN16 or higher.

Developments requiring private firefighting connections or service laterals larger than 20mm dia shall be subject to specific approval.

Where a kerb exists, the location of service connections shall be indicated adjacent to the meter box by sawcutting a line across the top of the kerb and painting an 80mm wide blue strip upon it.

Note 6.B.9 *DRA40 meter boxes are made by Draper Enterprises, online at www.draperenterprises.co.nz.*

6.B.10 **Tanks**

Water storage tanks to be vested in Council on Council-owned or private land shall be subject to specific design and approval. Permanent means of access shall be provided. Such tracks shall be all-weather as per 3.B.10 and may require provision of a vehicle crossing as per 3.B.7.

Private water storage tanks required to meet consent conditions shall be sized at least in accordance with the consent conditions, and sited and installed in accordance with the tank manufacturer's recommendations.

Note 6.B.10 *Where hydrants are not available, PAS 4509:2008 NZ Fire Service Firefighting Water Supplies recommends that additional static water storage is provided for firefighting purposes, with an appropriate fitting at the base of the tank and 4m wide all-weather access to the tank (see also 3.B.7.3 and 3.B.10). If the future land use or building type is known at the time of development, the developer should consider this in the design and construction.*

6.B.11 **Private water supplies**

Where a private water supply is proposed to serve two or more lots, the developer shall demonstrate at the time of applying for consent that sufficient potable water is available to each lot and can be protected with legal agreements and/or easements as required. Such supplies shall have a minimum sustainable yield of 900 litres per lot per day and be able to comply on a continuing basis with the guidelines specified in *Drinking-water Standards for New Zealand 2005 (Revised 2008)* (DWSNZ). Where the supply meets the criteria for a Community Drinking Water Supply as determined in the DWSNZ, the supply shall be registered with the Ministry of Health.

Note 6.B.11 *Council's Environmental Health Officer can provide guidance on implementation of private water supplies.*

6.C Acceptance

6.C.1 Testing

The minimum level of testing for water systems shall be as follows:

- 6.C.1.1 Backfill compaction testing on pipelines in road, right of way, vehicle crossing, carpark and private driveway pavements, and where new principal or trunk mains have been laid in existing road berms, as follows:
1. Nuclear densometer testing shall be carried out on hardfill under strategic and arterial roads, all business and industrial roads and right of ways, and any other pavement Council considers likely to be subjected to heavier than usual traffic loads due to the proposed development. Readings shall be taken at no more than 10m spacings on each 200mm layer, and shall have a minimum dry density of 2050 kg/m³. Where approved by Council the initial complying nuclear densometer readings may be calibrated against clegg hammer readings, and the clegg hammer may then be used in place of the densometer for the remainder of the testing provided that the same backfill material with approximately the same moisture content continues to be used.
 2. For hardfill backfill in areas other than the above, a clegg hammer alone may be used. The test intervals shall be as per above, and the backfill layers shall have a minimum impact value of 25.
 3. Where material other than AP65, pit run or river run has been approved for use as hardfill backfill, compaction testing shall be carried out as per the requirements set out for that material in the quality management plan, or as otherwise approved by Council.
 4. Where excavated material has been approved for use as backfill on new principal or trunk water mains in existing road berms, compaction testing shall be carried out as per the requirements set out for that material in the quality management plan, or as otherwise approved by Council.
- 6.C.1.2 Hydrostatic pressure testing of non-PE water pipes: Shall be carried out by suitably experienced personnel and in accordance with the development's quality management plan. Appendix 8 contains guidelines for constant and rebound pressure testing. Council's Three Waters team will provide guidance on specified test pressure requirements.

Note 6.C.1 To enable early identification of any issues it is recommended that the contractor carries out preliminary pressure tests on sections of line before completing backfilling.

6.C.2 Sterilisation

Sterilisation by chlorination shall be carried out by a suitably qualified person on all new public watermains following backfilling and successful pressure testing, and prior to connection to the existing public water network.

Mains shall be chlorinated by filling with a free available chlorine solution in clean water such that a chlorine level of 30 ppm is reached. The solution shall be left in the line for at least 24 hours, after which time the residual chlorine shall be no less than 10 ppm.

The watermain shall then be flushed to a Council-approved discharge point until no more than 0.5 ppm residual chlorine exists.

6.C.3 Inspections

The minimum level of Council inspections shall be as follows:

1. Pipework: following laying of each section of pipe and fittings, prior to backfilling; and
2. Thrust blocks: following pouring of concrete or placement, prior to backfilling.

6.C.4 Connection to existing network

Connection of new water reticulation to the existing public network shall only be carried out by, or under the supervision of, Council Three Waters team. A minimum of three working days' notice shall be given, although more notice may be required to allow shutdown notices to be issued if necessary. Such shutdown notices shall be delivered by the contractor to addresses as advised by Council.

New reticulation will not be connected to the existing system until successful pressure testing and chlorination has been carried out as per 6.C.1 and 6.C.2.

6.C.5 Signoff

Prior to acceptance of the completed water systems, the developer's representative shall have supplied to Council the completion documentation and as-builts referred to in 1.C.1.

7 LANDSCAPING & NETWORK UTILITIES

7.A Minimum requirements

- 7.A.1 The developer of all new developments incorporating roads for vesting in Council shall enter into financial agreements with the relevant network utility operators to ensure provision is made for the underground reticulation of all power lines, telephone services and lighting unless agreed otherwise by Council.
- 7.A.2 Each lot in urban subdivision developments shall be provided with a power and telecommunications connection which meets the requirements of, and is able to be certified by, the relevant network utilities operator.
- 7.A.3 Lighting on roads and in public spaces shall be installed in accordance with the approved lighting plans.
- 7.A.4 Landscaping shall be installed in accordance with the approved landscaping plans.

7.B Means of compliance

- 7.B.1 The developer shall upgrade or install all landscaping, lighting and network utilities features and infrastructure in accordance with the approved plans and the requirements of the relevant network utilities operators.
- 7.B.2 All cables shall be installed, ducted as necessary, and backfilled to the relevant network utilities operator's requirements.

Backfilling to subgrade level in road, right of way, vehicle crossing, carpark and private driveway pavements shall be with hardfill placed and compacted in 200mm maximum layers. AP65 will be acceptable as hardfill backfill. Pit run or river run may be approved by Council provided that it contains sufficient fines and broken faces and its larger particles are not excessively sized. Other granular material may also be acceptable to Council provided that a satisfactory compaction standard can be set and achieved by the contractor.

Backfilling in berms and other non-pavement areas may be with in-situ trench excavation material relaid and compacted in 200mm maximum layers, provided that the material is of a suitable type and moisture content for such use.

Where trenching is carried out in existing pavements or berms, reinstatement of the surface shall be as per drawing D22. Reinstatement of trenches in footpaths shall require the full width of footpath to be resurfaced.

Note 7.B.2 Arrangements with the relevant network utility operators should be made as early as possible to avoid delays with design, construction and certification.

- 7.B.3 Power and telecommunication connections for lots with road frontages shall generally be located in pairs adjacent to alternating common lot boundaries,

staggered to avoid clashing with water lateral connection positions as per drawing W04.

Minimum cover for power in berms shall be 600mm for low voltage and 800mm for high voltage. Minimum cover for telecommunications in berms shall be 400mm.

Minimum cover for power and telecommunications in roads shall be 600mm, laid in SN16 ducts. See also Appendix 9.

- 7.B.4 Street tree species shall generally be as per Appendix 10, selected with consideration of their mature height, crown diameter and trunk diameter. Trees to be planted within stormwater control areas such as swales shall be evergreen species.

The target spacing for street trees should be approximately one tree every 20m on at least one side of the road. Trees shall generally be placed in the front berm as per drawing R01, or within swales on the road-ward side slope. They shall be located centrally to lot frontages where possible, clear of road intersections, signs, lights, pipes and other infrastructure, and generally as per drawing L01.

Planting and staking of trees shall be as per drawing L02. Planting pits within 3m of underground pipes, structures or other infrastructure shall be provided with a suitable root guard or root directing liner.

All new trees and planting on land being vested in Council shall be irrigated and otherwise cared for during the maintenance period by the developer.

- 7.B.5 Bark mulching or gravelling of large areas of landscape gardens is subject to specific Council approval and will not be approved in or near stormwater control features such as swales or soak pits.

- 7.B.6 Grassed areas shall consist of screened topsoil lightly compacted and raked to a minimum depth of 75mm. The topsoil shall be free of clods, stones and other debris. The areas shall be spread with a suitable grass seed mix, and the developer shall water and maintain the areas to achieve adequate grass strike and during the maintenance period.

- 7.B.7 Landscaping features such as entrance walls and signs shall be located entirely within private land to be maintained by the land owner or occupier. They will generally not be accepted on road reserves except where specifically approved by Council and permitted by way of a Licence to Occupy.

7.C Acceptance

Prior to signoff, the developer's representative shall have supplied to Council the documentation and as-builts as per 1.C.1.

APPENDIX 1

Schedule 1A – Design Certificate – Land Development/Subdivision

SCHEDULE 1A

DESIGN CERTIFICATE – LAND DEVELOPMENT/SUBDIVISION

ISSUED BY:.....
(Approved certifier firm/suitably qualified design professional)

TO:
(Developer/owner)

TO BE SUPPLIED TO:.....
(Territorial authority)

FOR:
(Description of land development/subdivision)

AT:.....
.....
(Address)

..... has been engaged by
(Consultant/designer) *(Developer/owner)*

to provide..... services for the land development and/or subdivision described above.

I..... have the qualifications and experience relevant to this project as set out herein and have designed the land development/subdivision and confirm that the design is to current engineering practice, and that I believe on reasonable grounds that it satisfies all relevant resource consent conditions, all relevant(insert name of authority) requirements and applicable codes and standards.

I / My practice holds professional indemnity insurance to the amount of \$.....and includes run-off cover.

..... *Date*
(Signature of approved certifier on behalf of the approved certifier firm)

.....
(Name, title, and professional qualifications)

NOTE – This statement shall only be relied upon by the territorial authority named above. Liability under this statement accrues to the approved certifier firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the territorial authority on this land development/subdivision, whether in contract, tort, or otherwise (including negligence), is limited to the sum of \$..... (insert)

APPENDIX 2

**Schedule 1B – Contractor’s Certificate upon Completion of Land
Development/Subdivision**

SCHEDULE 1B
CONTRACTOR'S CERTIFICATE UPON COMPLETION OF LAND DEVELOPMENT/SUBDIVISION

ISSUED BY:.....
(Contractor)

TO:.....
(Principal)

TO BE SUPPLIED TO:.....
(Territorial authority)

FOR:.....
(Description of land development/subdivision)

AT:.....
.....
(Address)

..... has contracted to
(Contractor) *(Principal)*

to carry out and complete certain land development and/or subdivision construction in accordance with a contract, titled Contract No. for ('the contract').

I a duly authorised representative of
(Duly authorised agent) *(Contractor)*

hereby certify that has carried out and completed
(Contractor)

the construction, other than those outstanding works listed below, in accordance with the contract and in accordance with approved engineering drawings and specifications.

..... Date

(Signature of authorised agent on behalf of)
.....
(Contractor)

.....
(Address)

Outstanding works

.....
.....
.....

APPENDIX 3

**Schedule 1C –Certification upon Completion of Land
Development/Subdivision**

SCHEDULE 1C

CERTIFICATION UPON COMPLETION OF LAND DEVELOPMENT/SUBDIVISION

ISSUED BY:.....
(Approved certifier firm)

TO:
(Developer/owner)

TO BE SUPPLIED TO:.....
(Territorial authority)

FOR:
(Description of land development/subdivision)

AT:.....
.....
(Address)

..... has been engaged by
(Consultant/designer) *(Developer/owner)*

to provide construction observation review and certification services for the above subdivision which is described in the specification and shown on the drawings numbered

..... approved by.....
(Territorial authority)

I have sighted the consent and conditions of subdivision
(Territorial authority)

and the approved specification and drawings.

On the basis of periodic reviews of the construction and information supplied by the contractor in the course of the construction, I believe on reasonable grounds that the infrastructure other than those outstanding works listed below, is complete and has been constructed in accordance with:

- (a) The approved engineering drawings and specifications and any approved amendments;
- (b) The Council's Engineering Standards; and
- (c) The manufacturer's instructions

..... Date
(Signature of approved certifier on behalf of the approved certifier firm)

.....
(Name, title, and professional qualifications)

NOTE – This statement shall only be relied upon by the territorial authority named above. Liability under this statement accrues to the approved certifier firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the territorial authority in relation to this land development/ subdivision, whether in contract, tort, or otherwise (including negligence), is limited to the sum of \$..... (insert).

Outstanding works

.....

Copyright waived

APPENDIX 4

Schedule 1D – As-built Plans

SCHEDULE 1D
AS-BUILT PLANS

Information given on as-built drawings, whether submitted electronically or as paper plans, shall include but shall not be limited to:

- (a) Stormwater and wastewater reticulation – including the coordinated positions of manholes, manhole inverts, inverts of pipes and lid levels, measurements to house connections, and laterals and their length and position. Positions of connections and laterals shall be both coordinated and referenced to adjacent manhole lids and boundary pegs. All levels shall be in terms of datum approved by the TA;
- (b) Stormwater management devices – as-built plans for low impact stormwater management devices and non-reticulated components;
- (c) Flood and secondary flow information, flood water levels and the extent of any overland secondary flows shall be shown where these have been obtained or derived during the design;
- (d) Water reticulation – including the position of mains, location of hydrants, valves, tees, reducers, connections, tobies, water meters, and specials. All features shall be accurately dimensioned, coordinated, and referenced so that they can be accurately relocated in the field;
- (e) Ducts – measurements to ducts installed by the developer for utilities;
- (f) Labelling of pipes and ducts to cover diameter, pipe material and class, year laid, jointing type;
- (g) Road names where available – as approved by the TA;
- (h) Coordinates and levels of all utility surface features to be taken over by the TA, including tobies, and water meters;
- (i) The coordinates of at least two points on each plan in terms of an appropriate geodetic or cadastral datum and the origin of the plan level datum;
- (j) Geotechnical completion report and as-built drawings as detailed in 2.6.1 and 2.6.2 of NZS 4404:2010. As-built surface contours covering all areas of disturbed and cut/fill ground;
- (k) Road construction, including location, structural details, and details of road marking, signals, lighting, and signs, landscape features, seating, and other amenities and features;
- (l) Road pavement and surfacing information;
- (m) Landscape features, seating, and other amenities and features.

APPENDIX 5

**Schedule 2A – Statement of Professional Opinion on Suitability of Land for
Building Construction**

SCHEDULE 2A

STATEMENT OF PROFESSIONAL OPINION ON SUITABILITY OF LAND FOR BUILDING CONSTRUCTION

Development

Developer

Location

I of
(Full name) (Name and address of firm)

Hereby confirm that:

1. I am a geo-professional as defined in clause 1.2.2 of NZS 4404:2010 and was retained by the developer as the geo-professional on the above development.
2. The extent of my preliminary investigations are described in my Report(s) number, dated, and the conclusions and recommendations of that/those document(s) have been re-evaluated in the preparation of this report. The extent of my inspections during construction, and the results of all tests and/or re-evaluations carried out are as described in my geotechnical completion report dated
3. In my professional opinion, not to be construed as a guarantee, I consider that (delete as appropriate):
 - (a) The earth fills shown on the attached Plan No..... have been placed in compliance with the requirements of the Council and my specification.
 - (b) The completed works take into account land slope and foundation stability considerations, subject to the appended foundation recommendations and earthworks restrictions, (which should be read in conjunction with the appended final site contour plan).
 - (c) Subject to 3(a) and 3(b) of this Schedule, the original ground not affected by filling is suitable for the erection of buildings designed according to NZS 3604 provided that:
 - (i)
 - (ii)
 - (d) Subject to 3(a) and 3(b) of this Schedule, the filled ground is suitable for the erection of buildings designed according to NZS 3604 provided that:
 - (i)
 - (ii)
 - (e) The original ground not affected by filling and the filled ground are not subject to erosion, subsidence, or slippage in accordance with the provisions of section 106 of the Resource Management Act 1991 provided that:
 - (i)
 - (ii)

NOTE – These subclauses may be deleted or added to as appropriate, to include such considerations as expansive soils where excluded from NZS 3604, and site seismic characteristics as covered in clause 3.1.3 of NZS 1170.5.

4. This professional opinion is furnished to the TA and the developer for their purposes alone on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection of any building.
5. This certificate shall be read in conjunction with my geotechnical report referred to in clause 2 above and shall not be copied or reproduced except in conjunction with the full geotechnical completion report.

Signed

Date

.....
.....
.....

(Name, title, and professional qualifications)








Copyright waived

APPENDIX 6

Street name blades


HURUNUI

Street Name Blade Summary

| Diagram | Description | Depth | Sign Code |
|---|--|-------|---------------|
|  | Side Mounted Local Road | 200mm | SNP-S004-A |
|  | Side Mounted State Highways | 250mm | SNP-S004-B |
|  | Side Mounted Additional Text Local Road | 200mm | SNP-S004-C |
|  | Side Mounted Additional Text State Highway | 250mm | SNP-S004-D |
|  | Side Mounted HanmerSprings Accomodation D/S and S/S | 150mm | SNP-S004-E |
|  | IG12 Single Ended Side Mounted | 225mm | IG-SNP-S004-F |
|  | IG12 Double Ended Centre Mounted | 225mm | IG-SNP-S004-G |

Customer: FH Hurunui

HURUNUI

| | |
|---|---|
|  | Notes: Side Mounted Local Roads Single sided / Double sided |
|---|---|

Legend

Letter Style: Series C, Uppercase

Letter Height: 100mm

Condensing: None

Chevron: None

Logo: None

Colour: White

Reflectivity: ENG

Background

Reflectivity: ENG

Colour: Blue EC

Extrusion

Blade Depth: 200mm

Type: "T" Section Aluminium

Blade Lengths: Determined by text


Ends: Flat

Colour: Mill Finish

Mounting: SFXSNBKT01

Customer: FH Hurunui

HURUNUI

| | |
|---|---|
|  | Notes: Side Mounted State Highway Single sided / Double sided |
|---|---|

Legend

Letter Style: Series C, Uppercase

Letter Height: 125mm

Condensing: None

Chevron: None

Logo: None

Colour: White

Reflectivity: ENG

Background

Reflectivity: ENG

Colour: Blue EC

Extrusion

Blade Depth: 250mm

Type: "I" Section Aluminium

Blade Lengths: Determined by text


Ends: Flat

Colour: Mill Finish

Mounting: SFXSNBKT01

Customer: FH Hurunui

HURUNUI

| | |
|---|---|
|  | Notes: Side Mounted Additional Text Local Road Single sided / Double sided |
|---|---|

Legend

Letter Style: Series C, Uppercase

Letter Height: 100mm
No's & NO EXIT's: 60mm

Condensing: None

Chevron: None

Logo: None

Colour: White

Reflectivity: ENG

Background

Reflectivity: ENG

Colour: Blue EC

Extrusion

Blade Depth: 200mm

Type: "I" Section Aluminium

Blade Lengths: Determined by text

Ends: Flat


Colour: Mill Finish

Mounting: SFXSNBKT01

NOTE: For approved named private right of ways, the supplementary text shall read "PRIVATE ACCESS" not "NO EXIT"

Customer: FH Hurunui

HURUNUI

| | |
|---|--|
|  | Notes: Side Mounted Additional Text State Highway Single sided / Double sided |
|---|--|

Legend

Letter Style: Series C, Uppercase

Letter Height: 125mm
No's & NO EXIT's: 70mm

Condensing: None

Chevron: None

Logo: None

Colour: White

Reflectivity: ENG

Background

Reflectivity: ENG

Colour: Blue EC

Extrusion

Blade Depth: 250mm

Type: "I" Section Aluminium

Blade Lengths: Determined by text

Ends: Flat

Colour: Mill Finish

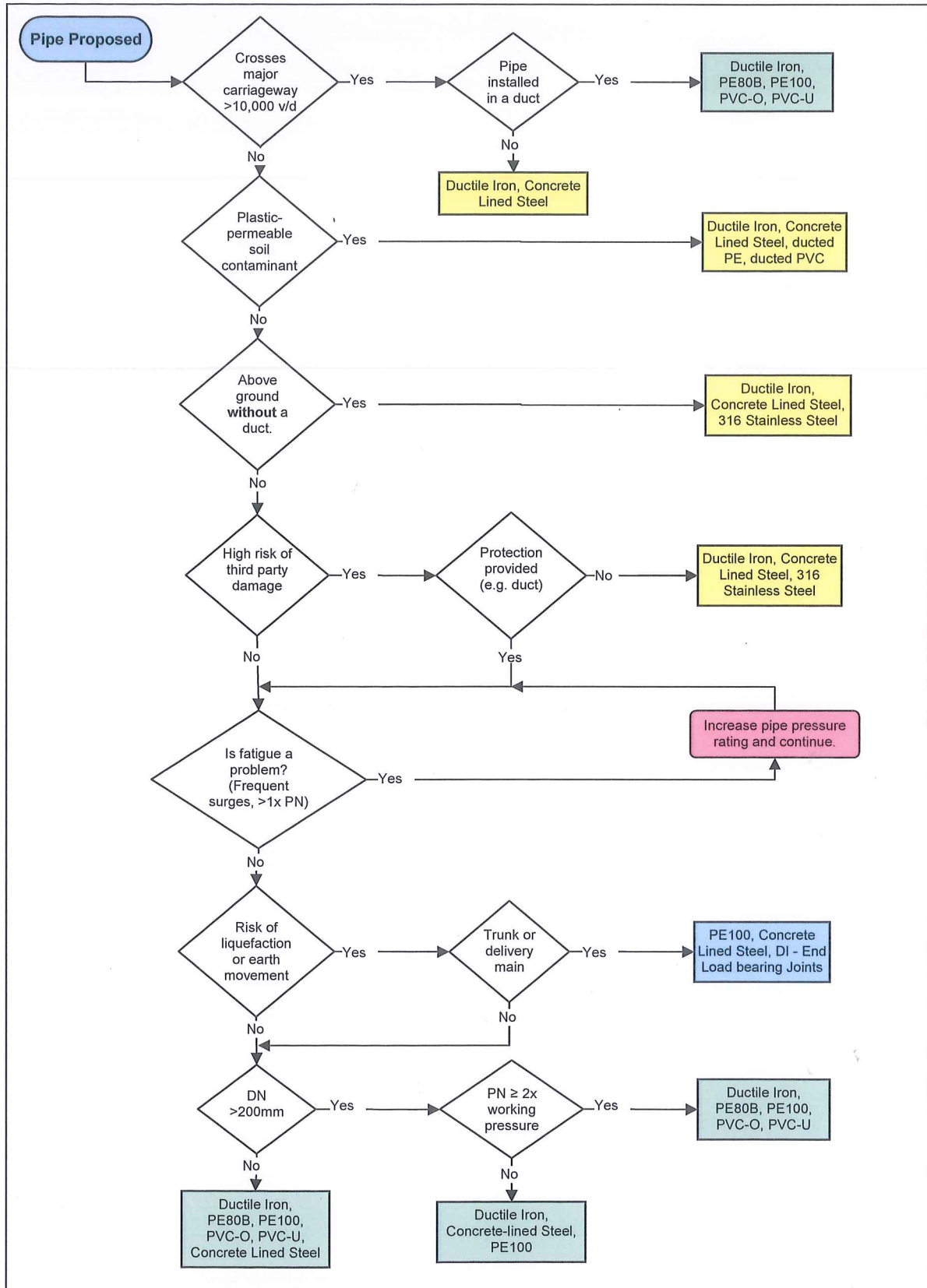
Mounting: SFXSNBKT01

NOTE: For approved named right of ways, supplementary text shall read "PRIVATE ACCESS" not "NO EXIT"

APPENDIX 7

Water pipe material selection

Pipe Material Selection (Water – Pressure)



APPENDIX 8
Pipeline testing

Appendix 8 - Pipeline testing

1 Low pressure pipeline air testing

This test is suitable for uPVC wastewater and stormwater pipelines up to DN 375mm.

Table 1 shows the minimum test time in minutes, using a starting test pressure of 25-30 kPa. Tests shall be acceptable when the gauged pressure is no more than 7 kPa less than the pressure at the start of the test for the time interval shown after shut-off of the air supply.

Table 1 - Low pressure air testing

Minimum test period (in minutes) for an allowable 7 kPa pressure drop

| DN | Test pipe length | | | | |
|-------|------------------|------|------|------|------|
| | 50m | 100m | 150m | 200m | 250m |
| 100mm | 2 | 2 | 2 | 2 | 3 |
| 150mm | 3 | 3 | 3 | 5 | 6 |
| 225mm | 4 | 5 | 8 | 10 | 13 |
| 300mm | 6 | 9 | 14 | 18 | 23 |
| 375mm | 7 | 14 | 22 | 29 | 36 |

Procedure

1. Slowly pump air into the line until a pressure of 25-30 kPa is reached. (Where the pipeline is below the water table this pressure shall be increased to achieve a differential pressure of 25 kPa.)
2. Maintain the pressure for at least 3 minutes while checking for leaks and adding more air if required.
3. When the pressure is constant and no leaks have been detected, shut off the air supply and record the starting pressure.

Acceptance

The test length shall be acceptable if the pressure holds or drops less than 7 kPa below the starting pressure after the minimum test period set out in table 1.

2 Pressure pipeline hydrostatic testing

All pressure testing shall be carried out by suitably experienced personnel and in accordance with the approved quality management plan where one exists.

Hydrostatic pressure testing requires selecting an appropriate configuration of method, pressure, and length of test section. Test parameters and details shall be determined with due consideration to the following:

- a) Pipe material;
- b) Pipe diameter;
- c) Test pipe length;
- d) Test duration;
- e) Magnitude of test pressure and rate of pressurisation;
- f) Presence of air in the pipeline;
- g) Time required for saturation of porous liners;
- h) Potential movement of pipeline thrust restraints;
- i) Design pressure for thrust and anchor supports;
- j) Accuracy of test equipment;
- k) Ambient temperature changes during testing;
- l) Presence of leaks in equipment used for testing or equipment attachment points (such as sealing plugs);
- m) Potential for leaks in the pipeline.

It is advisable to begin testing early in the pipeline installation to confirm adequacy of laying procedures and, where appropriate, to increase the length tested progressively as experience is gained.

Compressed air testing shall not be permitted for pressure pipelines.

Selection of test pressure

The **specified test pressure** at any point in the pipeline shall be not less than the design pressure, and not more than 25% above the rated pressure of any pipeline component. Council's Three Waters team can provide guidance on this.

Selection of test lengths

The pipeline length tested shall be either the whole, or a section (capable of being isolated), of the pipeline depending on the length and diameter, the availability of water, and the spacing between sectioning valves or blank ends.

The pipeline shall be divided into test sections such that:

- a) The hydrostatic test pressure at any point in the pipeline is no more than 1.25 times the rated pressure of any pipe or fittings and no less than the design pressure at the highest point of the pipe;
- b) Test sections shall not exceed 1000m and shall be limited to pipe of the same material. Consideration shall be given to the pressure loading time at the maximum filling rate (see below) in determining the test length; and
- c) Water is available for the test together with facilities for its disposal after the test.

Test sections be done as short as possible to reduce efforts during fault finding should a test length fail to pass the test. Test lengths of 250m to 500m are typically considered as practical.

Long test sections may incorporate a large number of flanged joints which should be checked for leakage. The longer the test section the harder it is to locate a leak or discriminate between leaks and other factors such as the absorption of air into solution under pressure.

Pre-test procedure

The pre-test procedure is as follows:

- a) All required temporary and permanent thrust blocks, or other pipeline thrust-resisting methods, including integral joint-restraint systems, shall be in place, and all concrete shall be adequately cured (normally a minimum of 7 days);
- b) Blank flanges or caps shall be installed at the beginning and end of the test section. Testing shall not take place against closed valves. Mechanical ends that are not end load resistant shall be temporarily strutted or anchored, to withstand the test pressures without movement;

NOTE - Temporary supports should not be removed until the pipeline has been depressurised. All test personnel should be informed of the loading limits on temporary fittings and supports.

- c) Where practicable, all bolted joints shall be left exposed to allow for re-tensioning during or after testing;
- d) Compacted embedment and fill material shall be placed to leave all joints, service connections and ball valves exposed wherever possible;
- e) For PE pipelines, the pressurising time shall not exceed 45 minutes (the pressurising time affects the duration of the PE pipeline test);
- f) Test equipment shall be placed in position and checked for satisfactory operation;
- g) The pump shall be of adequate size to raise and maintain the test pressure;
- h) Two calibrated test gauges shall be used to cross check gauge accuracy;
- i) Slowly fill the test length of pipeline with water, preferably from the lowest point, ensuring air is vented at the high point valves. Allow a 6 to 24-hour period (24 hours is preferred) for the temperature of the test length and the test water to stabilise and for dissolved air to exit the system. The recommended rate of filling shall be based on a flow velocity of 0.05 m/s, calculated from the following equation:

$$Q_f \leq 12.5\pi D^2$$

where Q_f = filling rate (litres/sec)
 D = pipe diameter (m)

The slow rate of 0.05 m/s avoids air entrainment when the filling water is cascading through downward gradients along the pipeline. The period of stabilisation will depend on pipe dimensions, length, material, longitudinal profile, and air exit points. For cement-mortar lined pipe, the pipeline shall be filled at least 24 hours before the commencement of the test, to allow the lining to become saturated.

A firm foam swab may be used ahead of the fill water to assist air removal especially where the pipeline undulates. Extract the swab at a high-point wash-out.

Typical pressure test equipment and location are shown in figures 1 and 2.

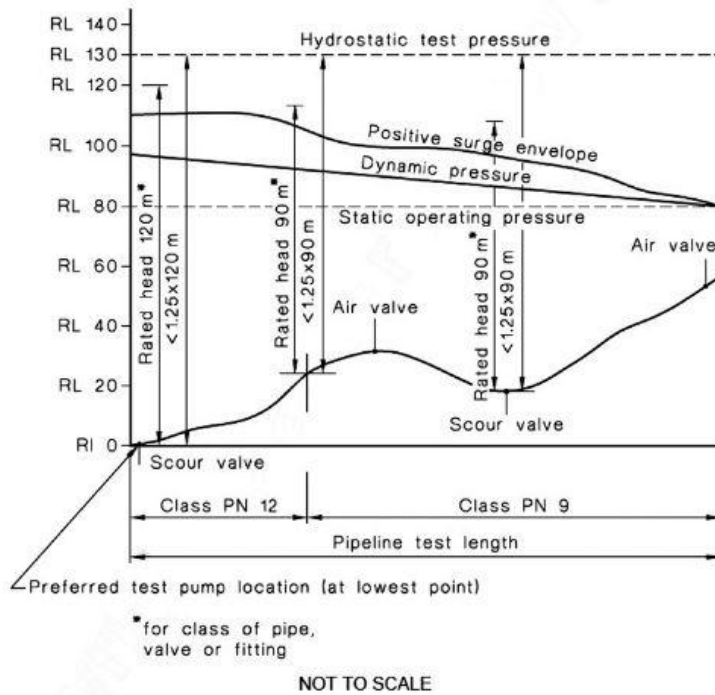


Figure 1 – Typical pressure pipeline under field hydrostatic test

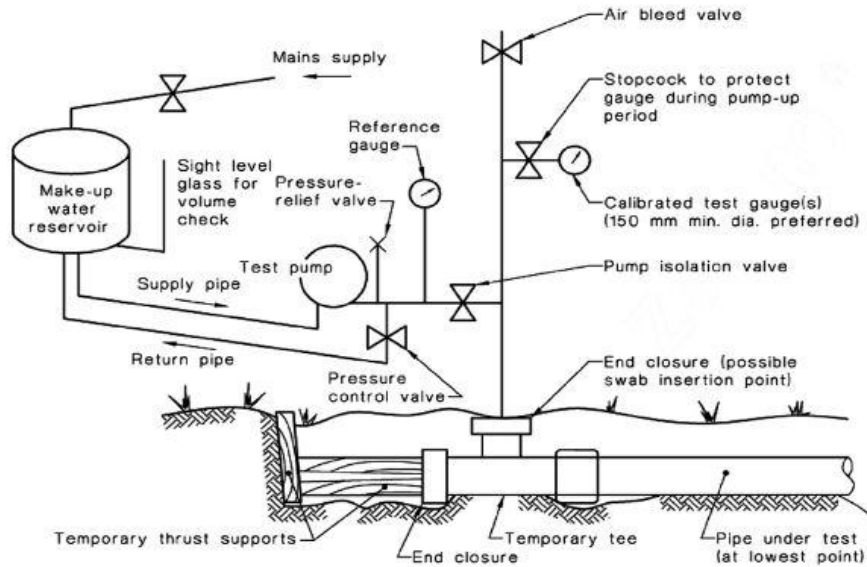


Figure 2 – Typical field pressure test equipment layout

Post-test procedure

After testing, pipelines shall be depressurised slowly. All air venting facilities shall be open when emptying pipelines. The test water shall be drained to an approved outlet and all connection points shall be reinstated.

2.1 Constant pressure test (water lost method)

This test is applicable for PVC, DI, GRP, and steel pipelines.

Procedure

The procedure shall be as follows:

- a) Close all valves apart from the test pump input and pressurise the test length to the specified test pressure;
- a) Apply and then maintain the test pressure by the addition of measured and recorded quantities of make-up water at regular intervals over a period, in the range of 1 hour to 12 hours;
- b) Where pressure measurements are not made at the lowest part of the test length, make an allowance for the static head between the lowest point of the pipeline and the point of measurement.

The quantity of make-up water necessary to maintain the test pressure shall comply with the following equation:

$$Q \leq 0.14 LDH$$

Where Q = allowable make-up water (litres/hour)

L = test pipe length (km)

D = nominal diameter of test pipe (m)

H = average test head over test pipe length (m)

The make-up water is not a leakage allowance, but is an allowance to cover the effects of the test head forcing small quantities of entrapped air into solution. Normally the test should last for a minimum of 2 hours and be concluded within 5-8 hours. The make-up water requirement should reduce with time as air goes into solution. Where, after 12 hours the make-up water still exceeds the allowable limit, testing shall cease and the cause of loss shall be investigated.

Acceptance

The test length shall be acceptable where there is no failure of any thrust block, pipe, fitting, joint, or any other pipeline component, where there is no physical leakage, and where the quantity of make-up water necessary to maintain the test pressure complies with the above.

2.2 Rebound pressure test

This test is applicable for PE pipelines up to DN 200. The maximum test length shall be 250m to allow rapid pressure reduction when bleeding the system for the rebound test.

The test rig shall be a recently calibrated pressure transducer, data logger, and check pressure gauge that has a dial of at least 100mm diameter and a pressure range that places the specified test pressure in the range of 35%-70% of the gauge's full scale. The transducer and the check gauge shall read within 5% of each other.

Procedure

1. Prepare the pipeline in accordance with the pre-test procedure above;
2. Make sure that all air is expelled before commencing with the test and that no air is introduced into the section being tested;
3. Maintain the specified test pressure for 30 minutes by additional pumping as required;
4. Check for obvious leaks;
5. After 30 minutes at the specified test pressure, reduce the pressure rapidly (< 5 minutes) by bleeding water from the system, to a nominal pressure of 20 kPa at the test gauge;

6. Close the control valve and isolate the test section;
7. Record pressure gauge readings at 5 minute intervals for 1 hour after isolation.

Acceptance

The test length shall be acceptable if there is no failure of any thrust block or pipe and associated fittings, if there is no physical leakage, and if the pressure rises and then remains static or slightly increases during the 1 hour period.

If the pressure does not rise, or rises and then falls, the test is a fail.

APPENDIX 9

Pipe types and minimum covers in road berms and pavements




















Appendix 9: Pipe types and minimum covers in road berms and pavements

| | Location | Minimum pipe type | Minimum cover |
|------------|-----------|-------------------------------|---------------|
| Stormwater | Berms | uPVC SN8, RCRRJ class 2 | 900mm |
| | Pavements | uPVC SN16, RCRRJ class 3 or 4 | 1200mm |
| Wastewater | Berms | uPVC SN8 | 900mm |
| | Pavements | uPVC SN16, PE in SN16 duct | 1200mm |
| Water | Berms | All | 600mm |
| | Roads | DN100 + | 700mm |
| | Roads | DN<100, in SN16 duct | 700mm |
| Power | Berms, LV | | 600mm |
| | Berms, HV | | 800mm |
| | Pavements | in SN16 duct | 600mm |
| Telecom | Berms | | 400mm |
| | Pavements | in SN16 duct | 600mm |

APPENDIX 10

Recommended tree species

STREET TREE SPECIES LIST





| Botanical Name | Common name | Mature height | Power lines | Narrow berm | Wide berm | Wet soil | Drought tolerant | High wind | Description |
|---|-------------------------|---------------|---|---|---|---|--|---|--|
| <i>Acer rubrum</i> 'Columnare' 'Armstrong' 'Bowhall' | Red maple | 12m | | |  |  | | | Red foliage, columnar habit, deciduous |
| <i>Acer rubrum x freemanii</i> 'Jeffers red' | Freeman maple | 15m | | |  | | | | Medium sized tree. Brilliant red foliage in autumn. Deciduous. |
| <i>Carpinus betulus</i> 'Fastigata' | Upright hornbeam | 10m | |  |  | | | | Upright form. Proven species for streets, very hardy. Deciduous. |
| <i>Fagus sylvatica</i> 'Dawyck Green' 'Dawyck Purple' | Upright beech | 8m | |  |  | | | | Upright, columnar form. Excellent street tree. Deciduous |
| <i>Fraxinus excelsior</i> 'Purple Spire' | Purple ash | 8m | | |  | | | | Upright form. Autumn tones of orange and purple. Deciduous. |
| <i>Ginkgo biloba</i> 'Fastigata' (male only) | Upright maidenhair tree | 8m | | |  | | | | Upright form, deciduous. Yellow foliage in spring. |
| <i>Liriodendron tulipifera</i> 'Fastigiatum' | Tulip tree | 8m | | |  | | | | Narrow and erect form. Deciduous. |
| <i>Malus ioensis</i> 'Plena' | Bechtel Crab apple. | 2m |  | |  | | | | Pink blossoms in late spring. Summer foliage is very decorative. Deciduous. |
| <i>Sorbus aria</i> 'Lutescens' | Silver whitebeam | 10m | | |  | | |  | Hardy and compact tree with bold. Upright growth, deciduous. |
| <i>Pyrus calleryana</i> 'Candelabra' | Ornamental pear | 10m | | |  | | |  | Upright narrow habit. Hardy and tolerant of both dry and wet. |
| <i>Quercus robur</i> 'Fastigata' | Upright English oak | 15m+ | | |  | | |  | A columnar form, vigorous grower. Can hold its brown leaves over winter. Deciduous. Hardy. |
| <i>Quercus rubra</i> 'Akaterere' | Upright red oak | 15m+ | | |  | | | | A vigorous, broadly-spreading tree. Large leaves red & brown in autumn. Bitter acorns. Deciduous. Hardy. |
| <i>Ulmus lobel</i> | Upright elm | 15m | | |  | |  |  | Hardy upright columnar form. Autumn foliage brilliant gold. Deciduous. |

* Please note that trees listed in the Street Tree Species List are also suitable for parks and reserves.






PARKS AND RESERVES SPECIES LIST*

| Botanical Name | Common name | Mature height | Drought tolerant | Wind tolerant | Suitable Hanmer Springs | Deciduous | Evergreen | Description |
|--|-------------------------|---------------|---|---|---|--|---|---|
| <i>Abies pinsapo</i> | Spanish fir | 15m | |  |  | |  | Short stubby needles on an attractive tree. Cold hardy. |
| <i>Acer rubrum</i> cultivars | Red maple | 12m | | | |  | | Red foliage, columnar habit. |
| <i>Acer platanoides</i> 'Nigrum' | Purple Norway maple | 20m | | | |  | | Columnar, vigorous-growing tree. Leaves dark purple, turning red in autumn. Hardy. |
| <i>Araucaria heterophylla</i> | Norfolk Island Pine | 30m | | | | |  | Upright conical growth. Not tolerant of harsh frost or wet feet. |
| <i>Betula utilis</i> 'Jacquemontii' | Sweet birch | 8m | | |  |  | | White bark and neat erect habit. Dark green leaves. Attractive and very hardy. |
| <i>Cedrus atlantica</i> 'Glauca' | Blue atlas cedar | |  | |  | |  | Upright conical tree with blue foliage. Hardy |
| <i>Cornus</i> 'Eddie's White Wonder | White flowering dogwood | 4m | | |  |  | | Upright tree with creamy white flowers in spring. Autumn shades of brilliant oranges, reds and crimson colours. |
| <i>Crataegus laevigata</i> 'Pauls Scarlet | Scarlet hawthorn | 7m | | |  |  | | Clusters of scarlet-red flowers late spring. Stunning autumn colour. |
| <i>Cupressus sempervirens</i> 'Swanes Golden' | Golden pencil pine | 15m | | | | |  | Compact and slow growing. Distinctive narrow conical conifer. Hardy. |
| <i>Fagus sylvatica</i> 'Riversii' | River's purple beech | 12m | |  |  |  | | A large growing stately tree with deep purple, almost black foliage in spring. |
| <i>Fraxinus excelsior</i> 'Aurea' | Golden ash | 20m | | | |  | | A broadly-spreading medium-sized tree with golden-yellow autumn foliage. Hardy. |
| <i>Fraxinus ornus</i> (male plant only) | Manna ash | 10m | | | |  | | Compact tree. Fluffy white scented flowers in spring. Autumn tones of gold to purple. Hardy. |
| <i>Fuscospora solandri</i> | Black beech | 20m | | |  | |  | Long lived hardy tree, minimal leaf drop. Frost hardy. |
| <i>Fuscospora cliffortioides</i> | Mountain beech | 12m | | |  | |  | Graceful tree. Tolerates hard, infertile, poorly drained exposed sites. |
| <i>Ginkgo biloba</i> 'Autumn Gold' (male only) | Maidenhair tree | 8m | | | |  | | Upright & pyramidal form. Small fan-shaped golden green leaves turning brilliant gold in autumn. |
| Botanical Name | Common | Mature | Drought | Wind | Suitable | Deciduous | Evergreen | Description |

* Please note that trees listed in the Street Tree Species List are also suitable for parks and reserves.

| | name | height | tolerant | tolerant | Hanmer Springs | | | |
|---|------------------------|----------------------|---|----------------------|---|--|---|---|
| <i>Gleditsia triacanthos inermis</i> 'Skyline' | Green honey locust | 6m | | | |  | | Broadly conical crown. Dark green leaves turning yellow in autumn. |
| <i>Hoheria angustifolia</i> | Narrow leaved lacebark | 6m | | | | |  | Narrow, toothed leaves and small white flowers in summer. Attractive to bees. Hardy. |
| <i>Liquidamber styraciflua</i> 'Worplesdon' | Sweet gum | 7m | | |  |  | | Upright pyramidal form with maple-like leaves. Autumn foliage of yellow, orange & scarlet. Hardy. |
| <i>Liriodendron tulipifera</i> | Tulip tree | 10m | | | |  | | Handsome, fast growing shade or ornamental tree. forming a pyramidal crown. Hardy |
| <i>Malus floribunda</i> | Crab apple | 3m | | | |  | | White blossoms flushed with pink Sept - Oct followed by small red & yellow fruits. Hardy |
| <i>Nyssa sylvatica</i> | Tupelo, Black gum | 10m | | | |  | | Broadly conical tree noted for its bright red foliage in early autumn. Hardy |
| <i>Picea pungens</i> 'Glauca' | Blue Colorado spruce | 25m |  | |  | |  | Tall pyramidal form and stiff steel blue foliage. Hardy |
| <i>Pittosporum eugenioides</i> | Tarata Lemonwood | 12m | | | | |  | Quick growing tree with scented flowers. Attractive to bees. Frost tender when young. |
| <i>Platanus sp.</i> | Plane tree | 10m | | | |  | | |
| <i>Podocarpus totara</i> | Totara | 15m | | | | |  | Attractive specimen tree. Frost tender when young. |
| <i>Prunus sp</i> | Flowering cherry | 6-10m | | | |  | | Spring flowering, bird attractant. Aggressive roots and can sucker. Keep clear of paved areas. |
| <i>Quercus coccinea.</i> | Scarlet oak | 20m | | | |  | | Broadly conical tree with drooping branches. Brilliant scarlet foliage in autumn. Hardy |
| <i>Quercus ellipsoidalis</i> | Northern pin oak | 15m |  | | |  | | Spreading shade or specimen tree. Hardy |
| <i>Quecus palustris</i> | Pin oak | 20m | | | |  | | Leaves turn bright scarlet in autumn. Requires a damp site. Hardy. |
| <i>Sequoiadendron giganteum</i> | Giant Redwood | 45m |  | |  | |  | Very tall tree. Prefers well drained soils. Hardy. |
| <i>Taxodium distichum</i> | Swamp or bald cypress | 25m | | | |  | | Wet sheltered sites. Rusty red/gold leaves in autumn. Hardy |
| Botanical Name | Common name | Mature height | Drought tolerant | Wind tolerant | Suitable Hanmer Springs | Deciduous | Evergreen | Description |

* Please note that trees listed in the Street Tree Species List are also suitable for parks and reserves.

| | | | | | | | | |
|---------------------------|--------------------------|-----|--|---|--|--|--|---|
| <i>Tilia cordata</i> | Small leaved Linden lime | 15 | | | |  | | Compact, round headed tree. Ideal for pleaching. Hardy |
| <i>Tilia platyphyllos</i> | Large leaved Linden lime | 25m | | | |  | | Broadly columnar tree. Small flowers attractive to bees. Hardy |
| <i>Ulmus parvifolia</i> | Chinese elm | 15m | |  | |  | | Open growth habit. Beautifully barked tree. Hardy |
| <i>Ulmus dodoens</i> | Dutch hybrid elm | 20m | | | |  | | Deeply fissured bark and wide spreading branches. Dutch elm disease resistant. Hardy. |

* Please note that trees listed in the Street Tree Species List are also suitable for parks and reserves.

DRAWINGS

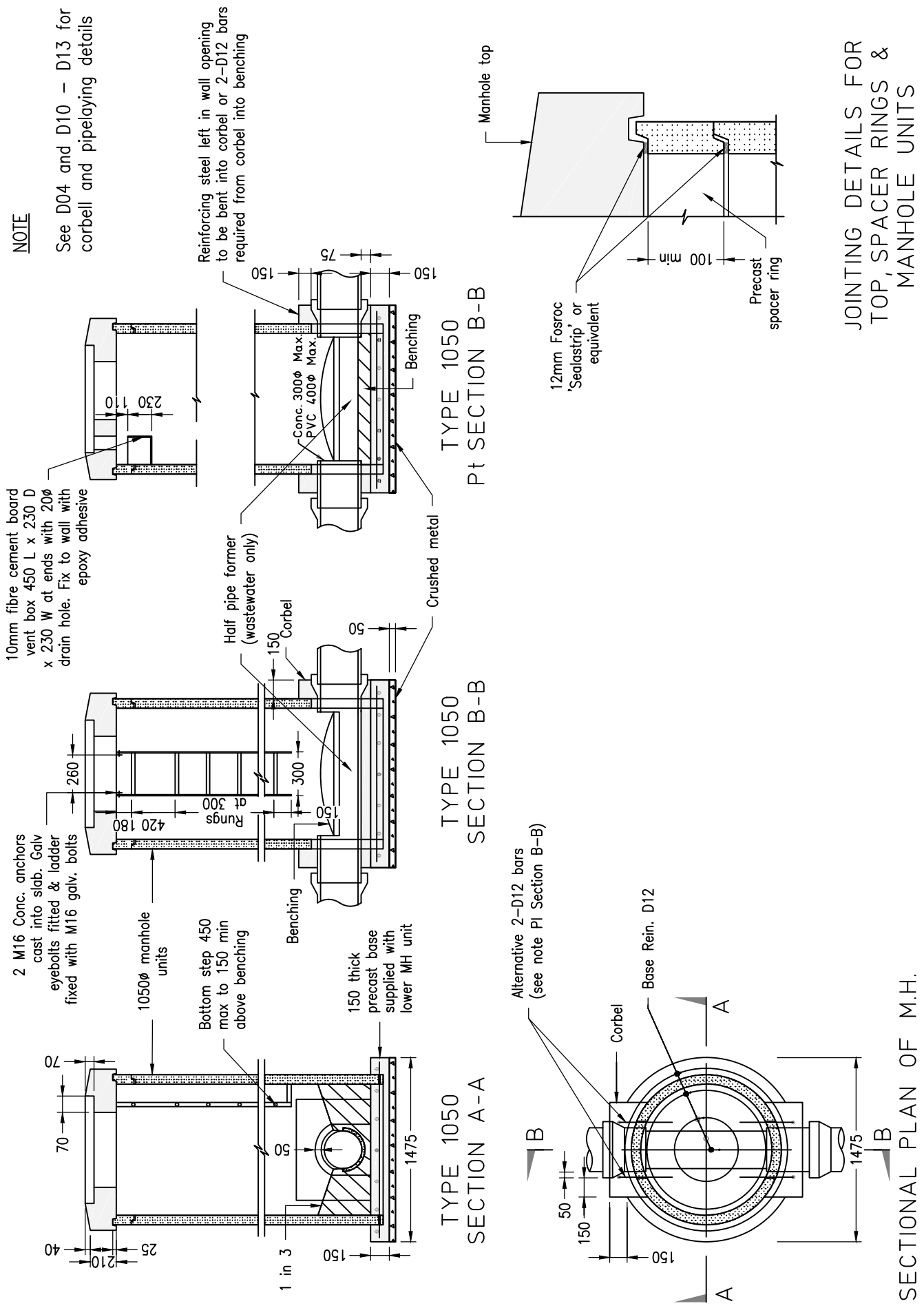
D01 PRECAST MANHOLES CIRCULAR
D02 MANHOLE BENCHING
D03 DROP MANHOLES
D04 CORBELS
D05 STANDARD CIRCULAR INSPECTION CHAMBER
D06 SIDE ENTRY SUMPS PRECAST KERB UNITS
D07 TOP ENTRY SUMPS
D08 CORNER SUMP
D09 SUBMERGED OUTLET
D10 PIPELAYING AT MANHOLES AND SUMPS
D11 PVC MANHOLE STARTERS AND FINISHERS
D12 PIPELAYING AT MANHOLES FOR PE PIPES
D13 PRESSURE PIPELAYING AT MANHOLES FOR PE PIPES
D14 PIPE PROTECTION
D15 PIPELAYING HAUNCHING DETAILS FOR CONCRETE PIPES
D16 PIPELAYING HAUNCHING DETAILS FOR FLEXIBLE PIPES
D17 SOFT GROUND FOUNDATION
D18 WATER STOPS
D19 DIRECT CONNECTIONS TO EXISTING PIPES
D20 DIRECT CONNECTION TO STORMWATER PIPES
D21 PIPELAYING JUNCTIONS OFF FACTORY MOULDED RISER
D22 TRENCH REINSTATEMENT
D23 HOUSE DRAIN INSPECTION BOX
D24 KERB ENTRY
D25 CUT PIPE ROCKWALL
D26 SOAKPITS
D27 RAINGARDENS
D28 DUAL PURPOSE RAINWATER TANK
D29 PRIVATE STORMWATER LATERAL OUTLET TO SWALE OR POND
D30 PRESSURE SEWER TRAFFICABLE BOUNDARY KIT
D31 PRESSURE SEWER FLUSHING POINT

L01 STREET TREE PLACEMENT
L02 TREE PLANTING

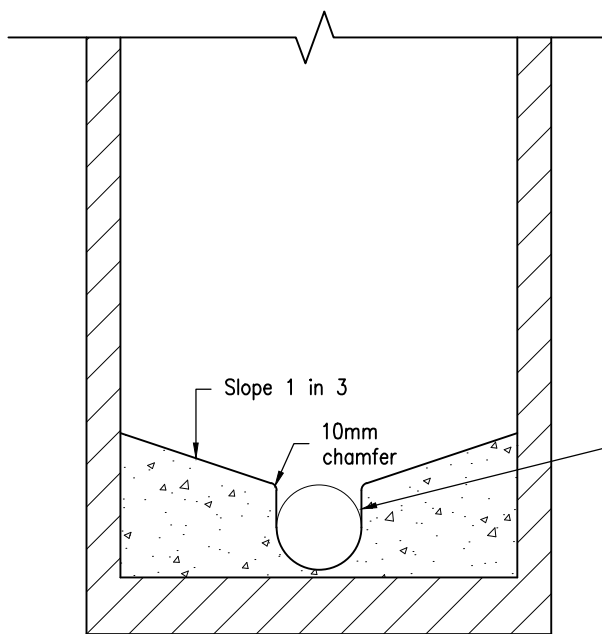
R01 STANDARD BERM
R02 STANDARD ROAD WIDTHS
R03 UNSEALED SHOULDER
R04 SUBSOIL DRAINS
R05 C.B.R PAVEMENT DESIGN CHART
R06 SCALA PENETROMETER CHART
R07 KERB AND FLAT CHANNEL
R08 MOUNTABLE KERB AND CHANNEL
R09 MOUNTABLE KERB
R10 KERB ONLY
R11 VEE CHANNELS
R12 MOUNTABLE KERB AT INTERSECTIONS
R13 URBAN VEHICLE CROSSINGS WITH EXISTING KERB AND CHANNEL
R14 COMMERCIAL VEHICLE CROSSING REINFORCING BEAM
R15 URBAN VEHICLE CROSSINGS WITH NO KERB AND CHANNEL

R16 URBAN VEHICLE CROSSING, UNCULVERTED THROUGH SWALE WITH SUBSOIL DRAIN
R17 URBAN VEHICLE CROSSING CULVERTED OVER SWALE
R18 RURAL VEHICLE CROSSINGS
R19 RIGHT OF WAY CROSS SECTIONS
R20 RIGHT OF WAY TURNING HEADS
R21 RIGHT OF WAY SERVICES TRENCH
R22 CUL-DE-SAC TURNING HEADS
R23 VEHICLE CROSSING SIGHT LINES
R24 VEHICLE CROSSING LOCATIONS
R25 MANOEUVRING PARKING SPACE DIMENSIONS
R26 FOOTPATHS AND BERMS
R27 PRAM CROSSING
R28 TYPICAL FOOTPATH MEANDER DETAIL

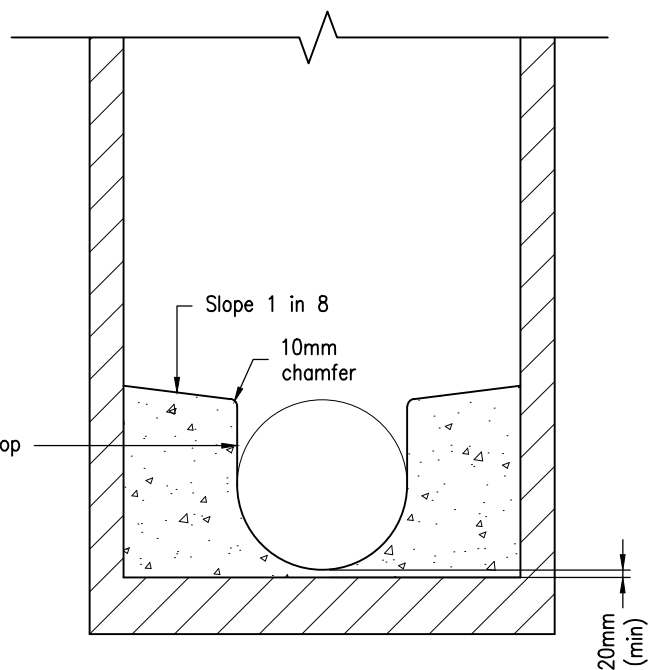
W01 TEE INTERSECTION EXAMPLE ONE WITH CUL DE SAC
W02 TEE INTERSECTION EXAMPLE TWO
W03 CROSS INTERSECTION
W04 LOT SERVICING ALONG FRONTAGES
W05 PIPELAYING BEDDING HAUNCHING AND SURROUND
W06 THRUST BLOCK LOCATIONS
W07 THRUST BLOCK DIMENSIONS
W08 PRECAST THRUST BLOCK
W09 VALVE AND HYDRANT COVERS
W10 PRECAST HYDRANT AND VALVE FRAMES
W11 50mm DIAMETER CONNECTION TO MAIN
W12 50mm DIAMETER SUBMAIN SUPPLY OFF FIRE HYDRANT
W13 FLUSH POINT (DEAD-END ON 50mm MAIN)
W14 WATER CONNECTIONS



JOINTING DETAILS FOR
TOP, SPACER RINGS &
MANHOLE UNITS



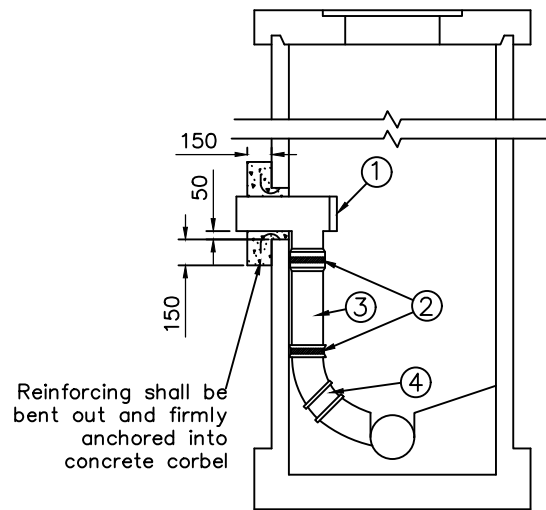
Pipes 150 ϕ – 300 ϕ



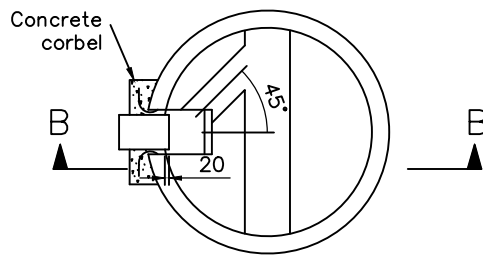
Pipes 375 ϕ – 750 ϕ

DROP INSTALLATION IN PRECAST MANHOLE

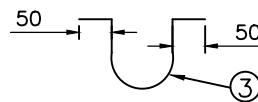
SECTION B-B



PLAN



STAINLESS STEEL STRAP

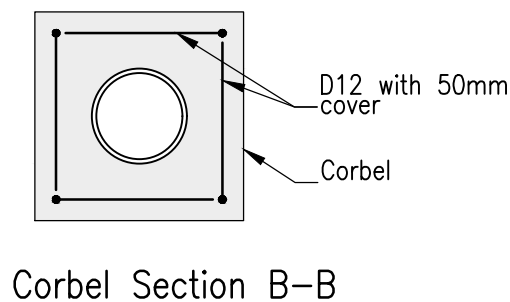
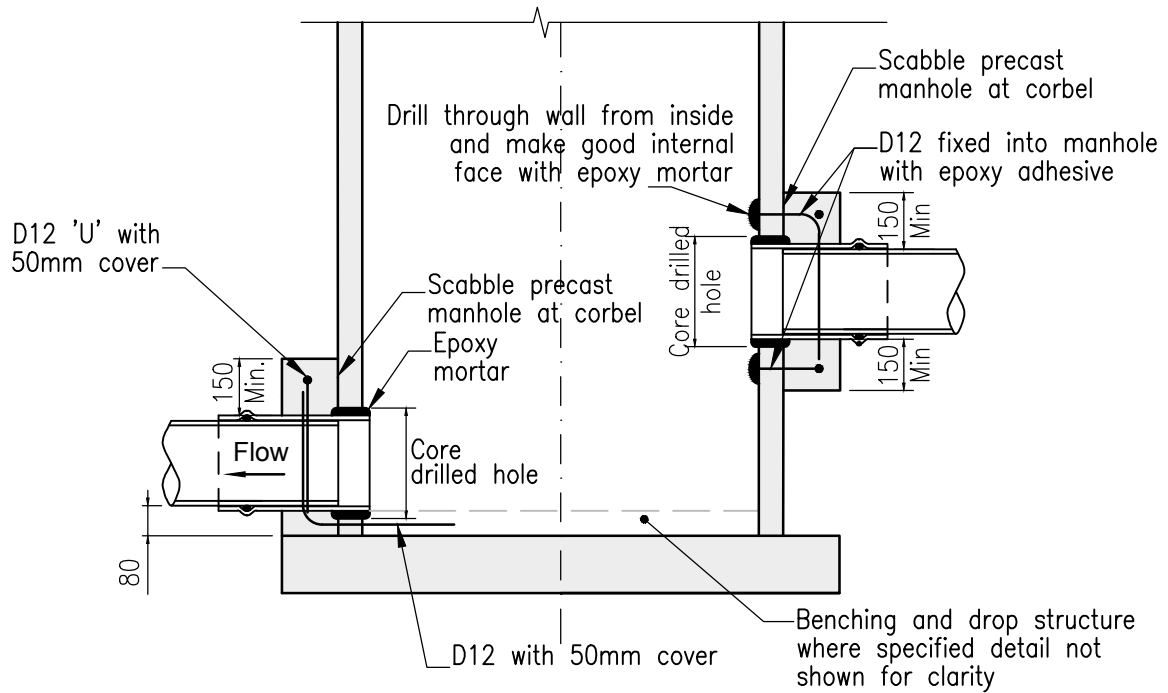
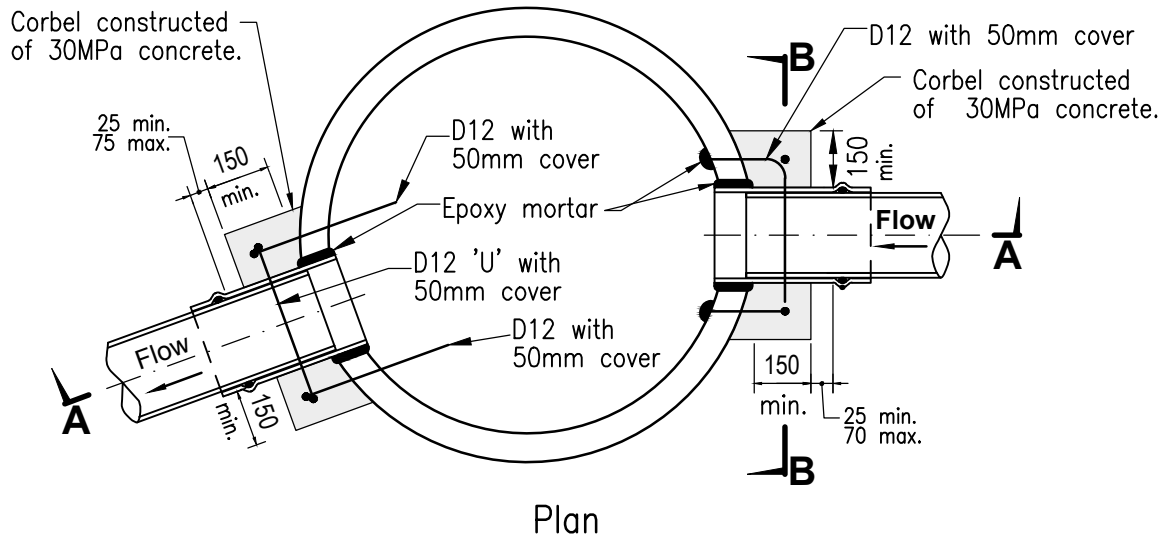


NOTES

1. Channeling in new manholes shall be vertical to top of main sewer and benching graded at 1 in 3 or 1 in 8 as applicable.
2. Benching and channeling in existing manholes shall be reformed in easy curves
3. In standard and precast manholes where the main sewer exceeds . 600 dia a channel shall be formed in the benching under the 150 dia sewer pipe (3). A 135 deg bend (4) shall not be used.
4. In existing manholes steps or ladders shall be relocated if required to permit access.
5. PVC fittings to be solvent jointed.
6. Opening for manhole starter and corbel shall be clear of any joint in precast manhole by at least 300mm minimum.

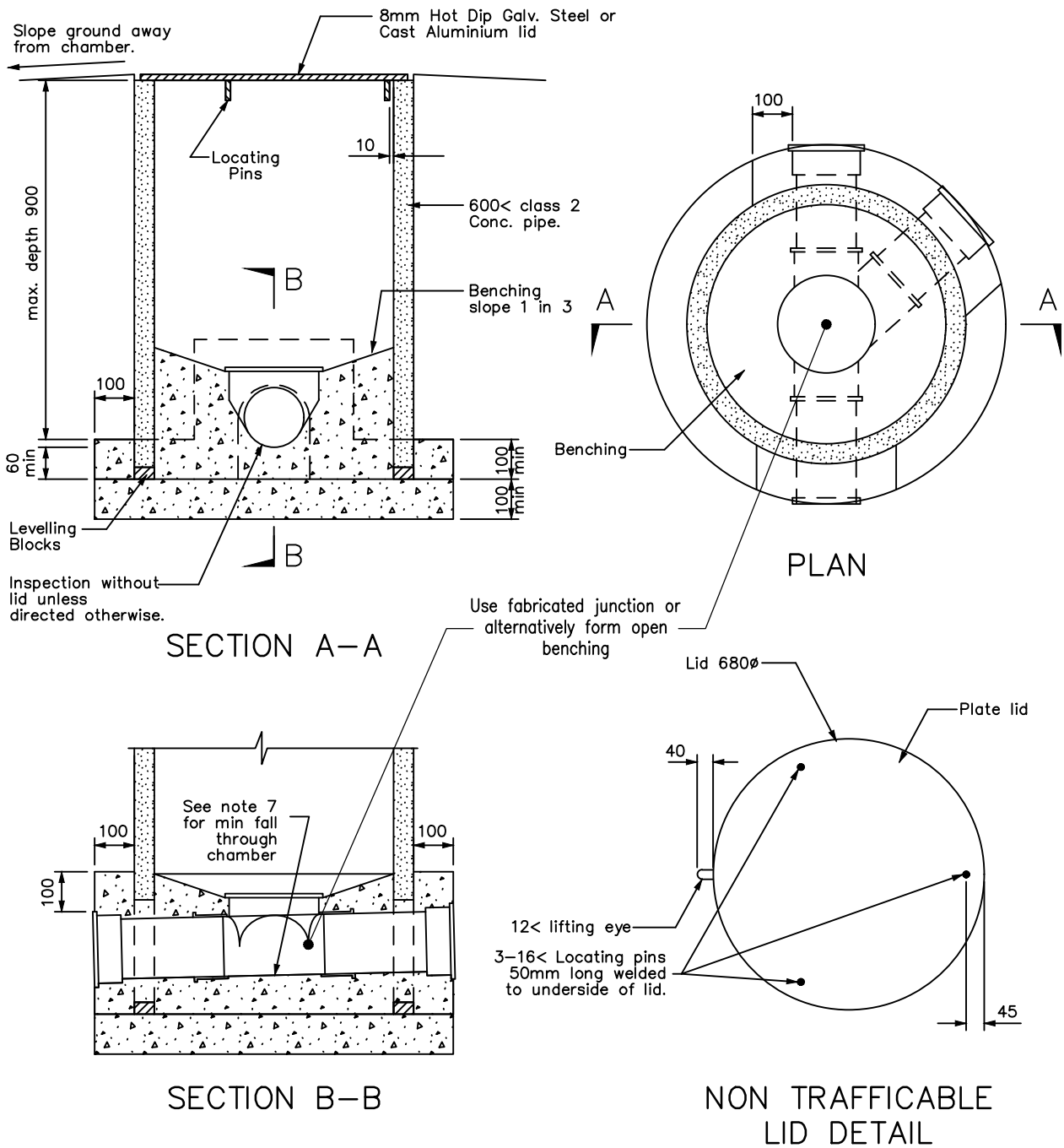
PARTS LIST

1. 150mm dia tee fitted with removable cap or similar.
2. 25mm wide 1.25 dia 316 stainless steel strap fixed to manhole wall with 2-38mm X 10 gauge stainless steel self tapping screws and rawplugs.
3. 150 diameter PVC sewer pipe.
4. 150 diameter sewer pipe 135 deg bend.



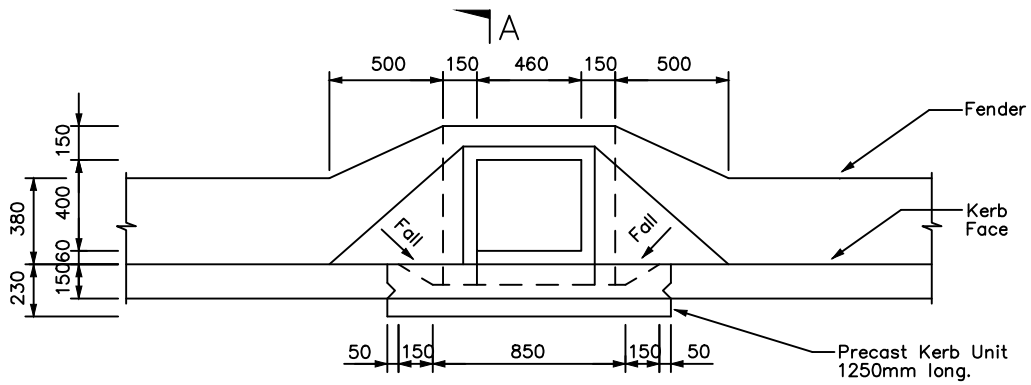
Notes:

1. D12 bars only required if directed by Engineer, otherwise bend manhole wall reinforcing into corbel.
2. See sheets D10 - D13 for pipe laying details.

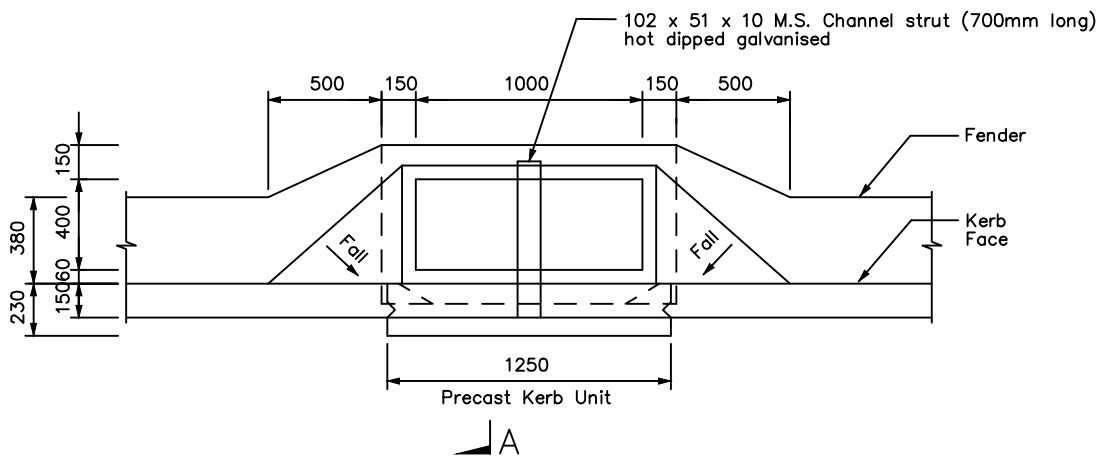


NOTES :

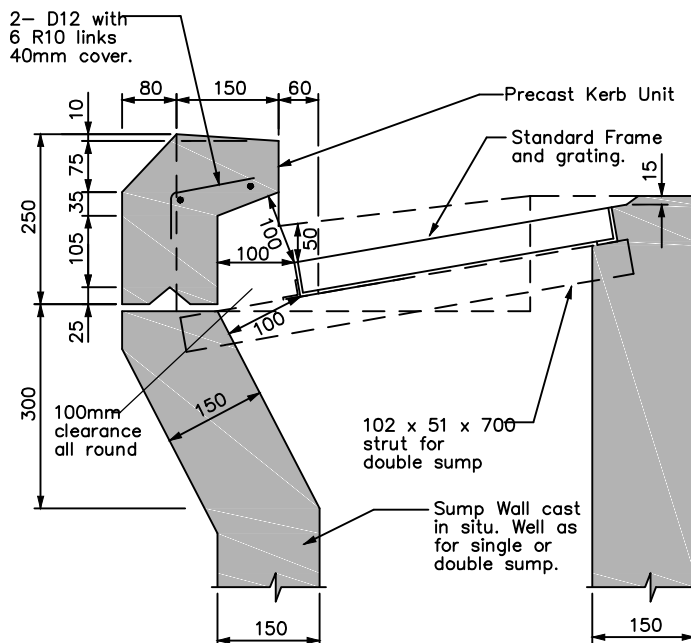
1. Inspection chamber lid as detailed shall not be subject to traffic loading. Heavy duty trafficable lids to be used in driveways and right of ways
2. A standard manhole shall be used when the depth exceeds 900mm.
3. Inspection chambers on drains connected to sanitary sewer shall be positioned so as to avoid the entry of surface water and grit.
4. Bends adjacent to the inspection chamber shall not be greater than 45°.
5. Steel lids shall be hot dip galvanised after fabrication. Lids shall be a good fit to avoid rocking, jamming or entry of stormwater
6. Short pipes as per sheet D10 required.
7. Minimum fall through chamber 10mm when using fabricated junction, 30mm when using open formed benching



PLAN – SIDE ENTRY SINGLE SUMP



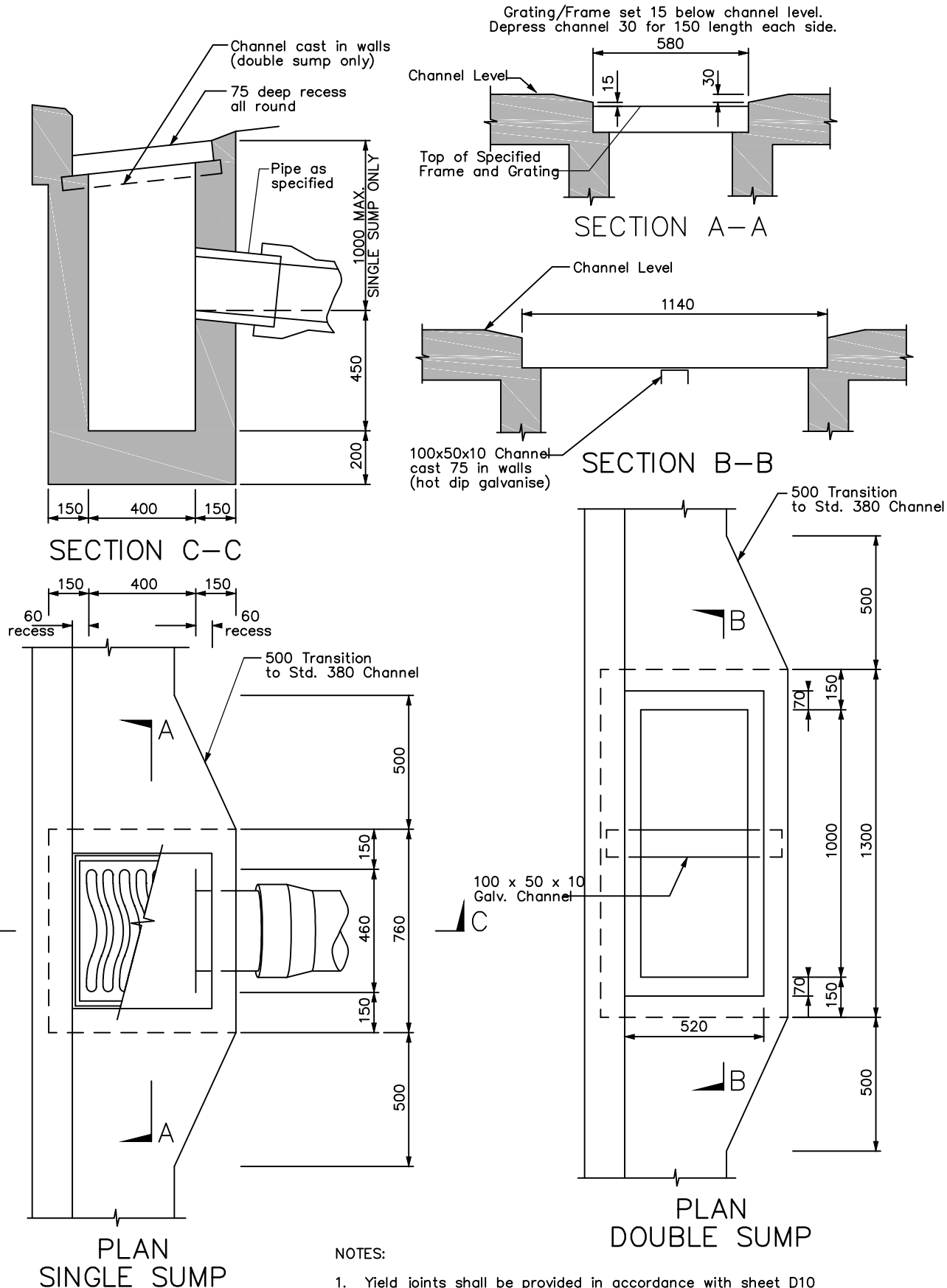
PLAN – SIDE ENTRY DOUBLE SUMP



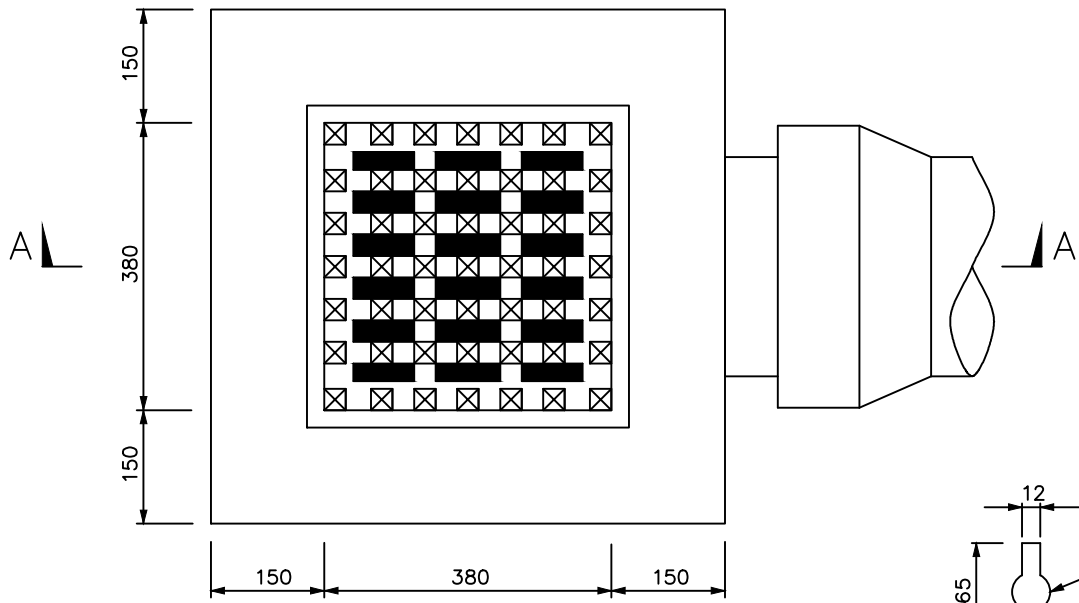
SECTION A-A

NOTES:

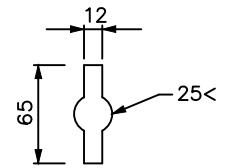
1. Concrete work to comply with NZS 3109.
2. All concrete to be 40 MPa.
3. Coat end faces of precast units with an approved epoxy tiecoat before jointing.
4. Use 50 x 50 x 8 Angle 700mm long (hot dipped galvanised) to support end of frame at K & F.C./K & D.C. junction.
5. Notes on Sheet D07 apply.



- NOTES:
1. Yield joints shall be provided in accordance with sheet D10
 2. General method of pipelaying, angle connections, corbels, etc. to be in accordance with sheets D04 and D10 - D12
 3. Concrete work to comply with NZS 3109.
 4. All concrete to be 40MPa.



PLAN

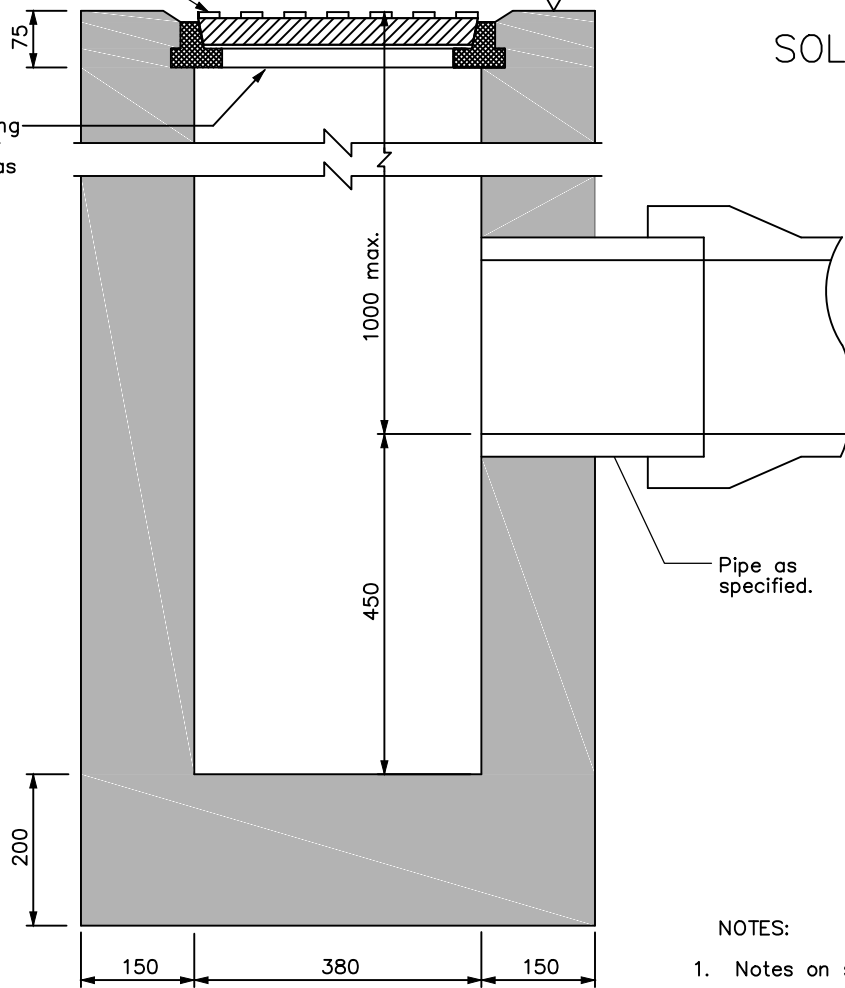


KEYWAY FOR SOLID PLATE

Top of grating 15mm below channel invert or grass areas (or flush with road surface where used in roadway).

Finished Sump top levels on plan given to this point

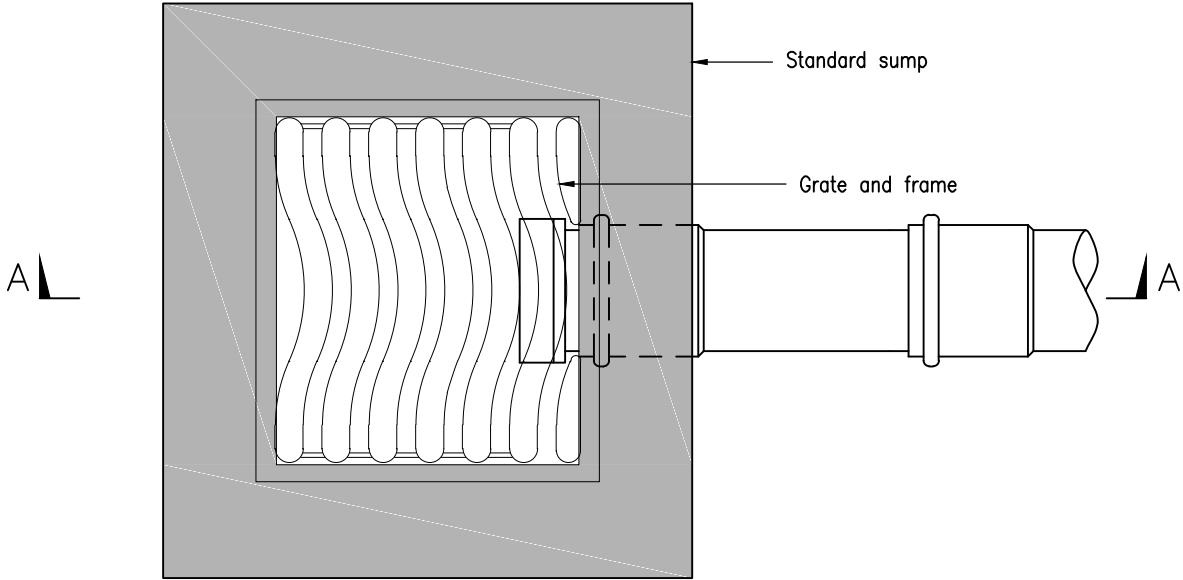
Standard type grating either solid plate or holes for drainage as specified.



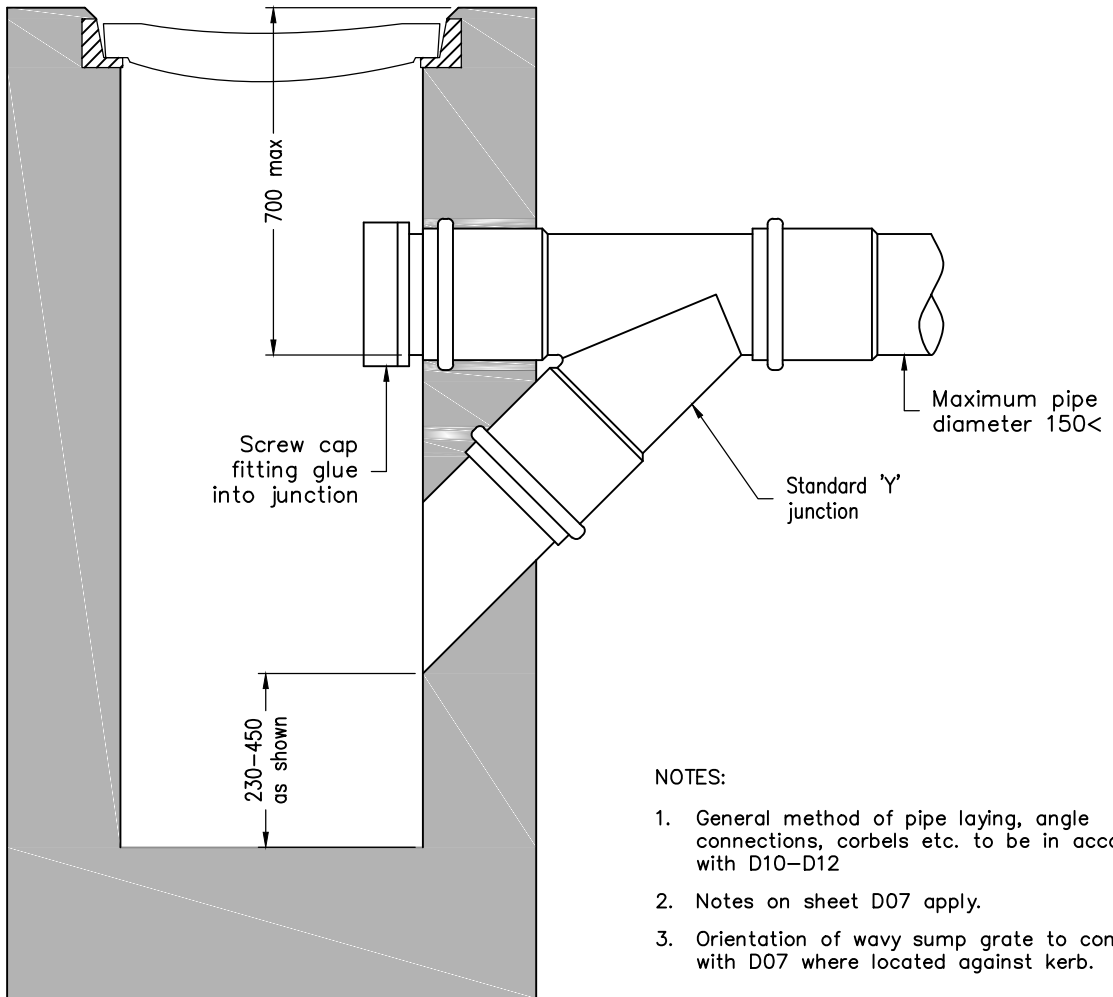
SECTION A-A

NOTES:

- Notes on sheet D07 apply.



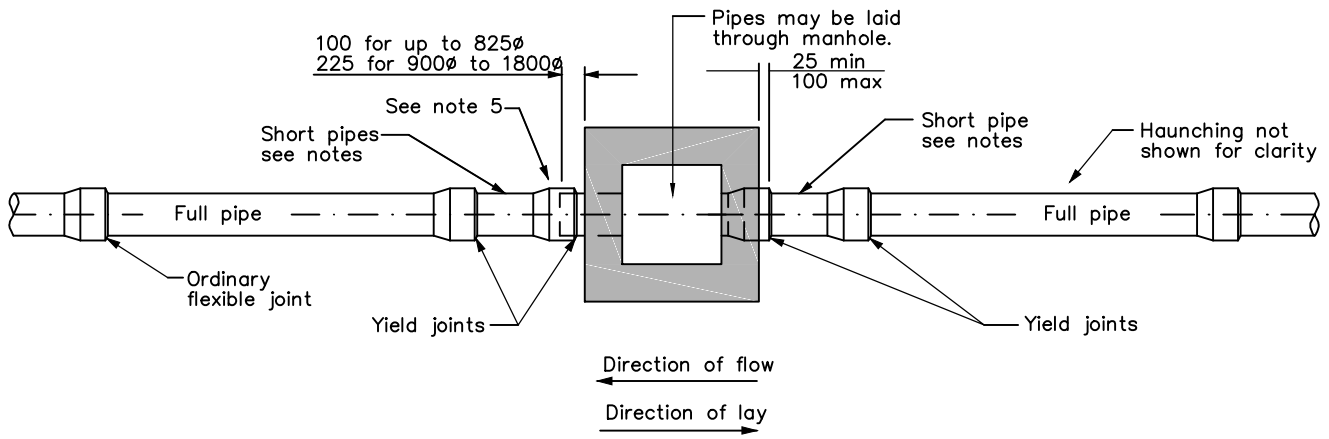
PLAN



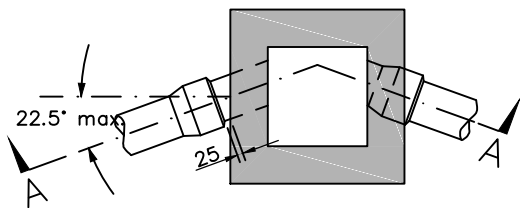
SECTION A-A

NOTES:

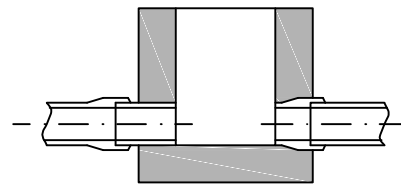
1. General method of pipe laying, angle connections, corbels etc. to be in accordance with D10-D12
2. Notes on sheet D07 apply.
3. Orientation of wavy sump grate to comply with D07 where located against kerb.



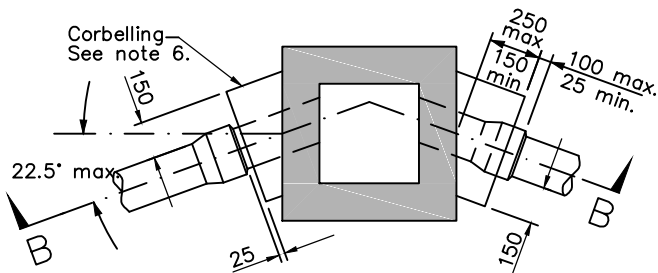
GENERAL METHOD OF PIPELAYING AT MANHOLES AND SUMPS



ANGLE CONNECTIONS

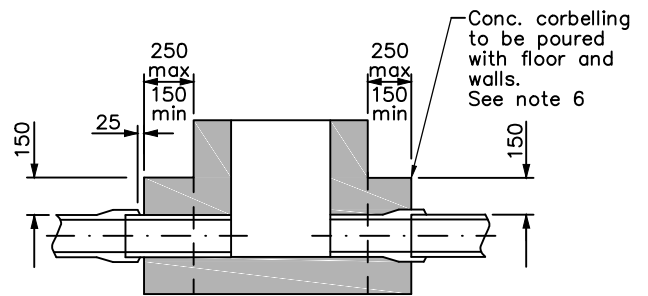


SECTION A-A



CORBEL DETAILS

Applies to straight & angle connections.
Angle connections will be permitted for
100< to 300< pipelines. Special design
required for pipes greater than 300<.



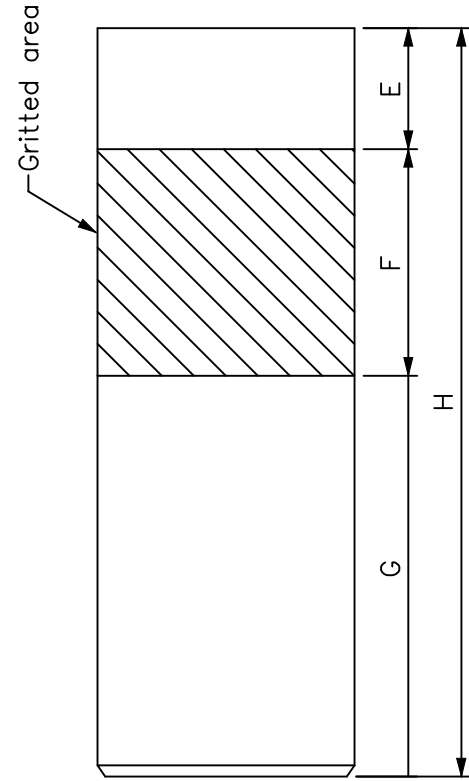
SECTION B-B

NOTES:

1. Pipelines that are concrete haunched or concrete surrounded shall have the concrete interrupted at each yield joint with softboard or equivalent.
2. Vertically cast short pipes shall be minimum of 500mm & maximum of 800mm long.
3. For reinforced concrete short pipes the following table shall apply.

| PIPE DIAMETER | MIN | MAX |
|---------------|------|------|
| 225 | 600 | 800 |
| 300 | 750 | 1000 |
| 375 | 900 | 1200 |
| 450 | 1100 | 1450 |
| 525 | 1300 | 1700 |
| 600 | 1500 | 1900 |
| 675 | 1700 | 2100 |

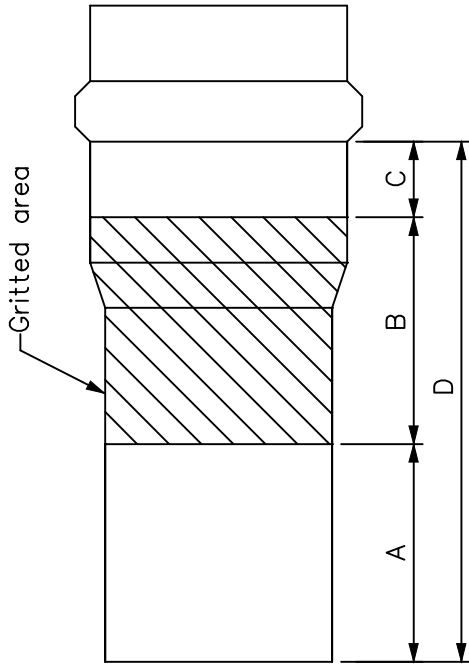
4. For PVC pipes use manhole starters as per D11. Short pipes to be 700–1000mm long.
5. This pipe may be double spigot pipe with a socket finisher in the manhole wall with Engineer's approval. Maximum length pipe 1300mm, minimum length 450mm.
6. Corbelling where suitable pipe lengths are not available shall only be used with the Engineer's approval. For corbelling on precast manholes see D04
7. Gibault joints shall not be used as yield joints unless approved by the Engineer.
8. Sumps do not require corbels.



| Pipe DN | E | F | G | H |
|---------|----|-----|-----|-----|
| 100 | 80 | 150 | 265 | 495 |
| 150 | 80 | 150 | 268 | 498 |
| 175 | 80 | 150 | 272 | 502 |
| 225 | 80 | 150 | 276 | 506 |
| 300 | 80 | 150 | 290 | 520 |

FOR STRAIGHT
THROUGH, 90° &
CIRCULAR
MANHOLES

FOR ANGLE
MANHOLES

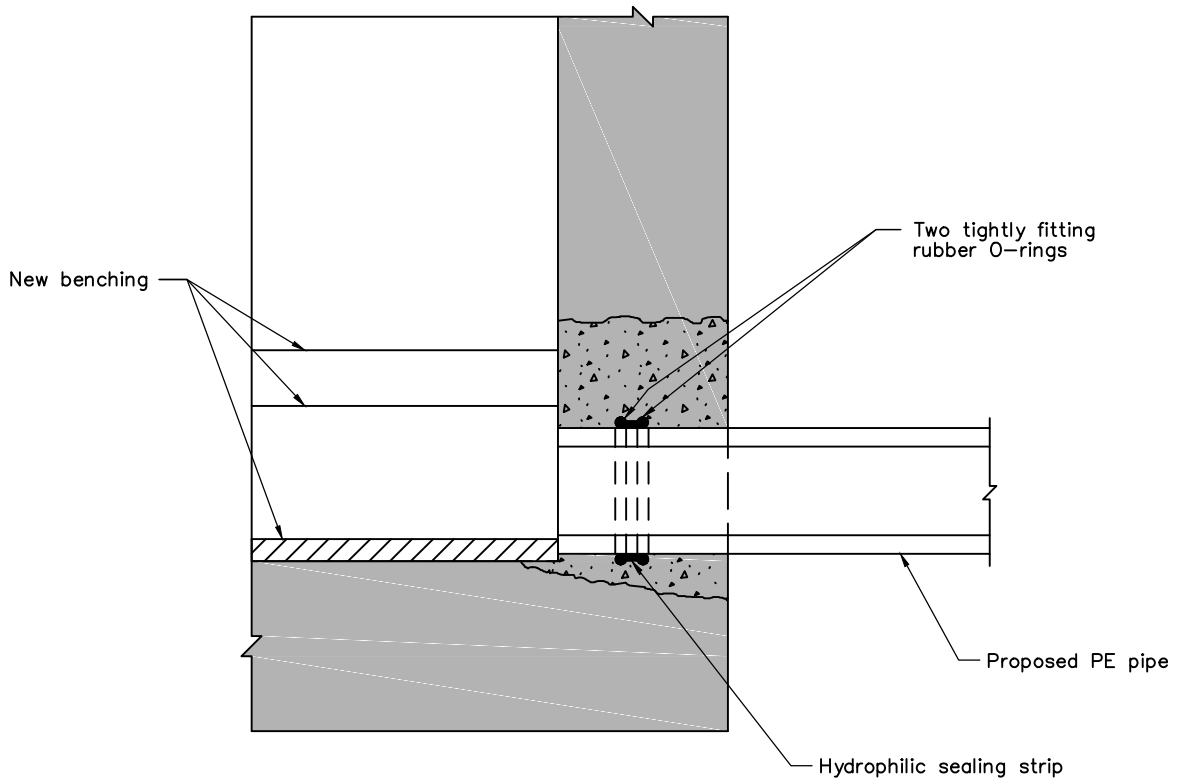
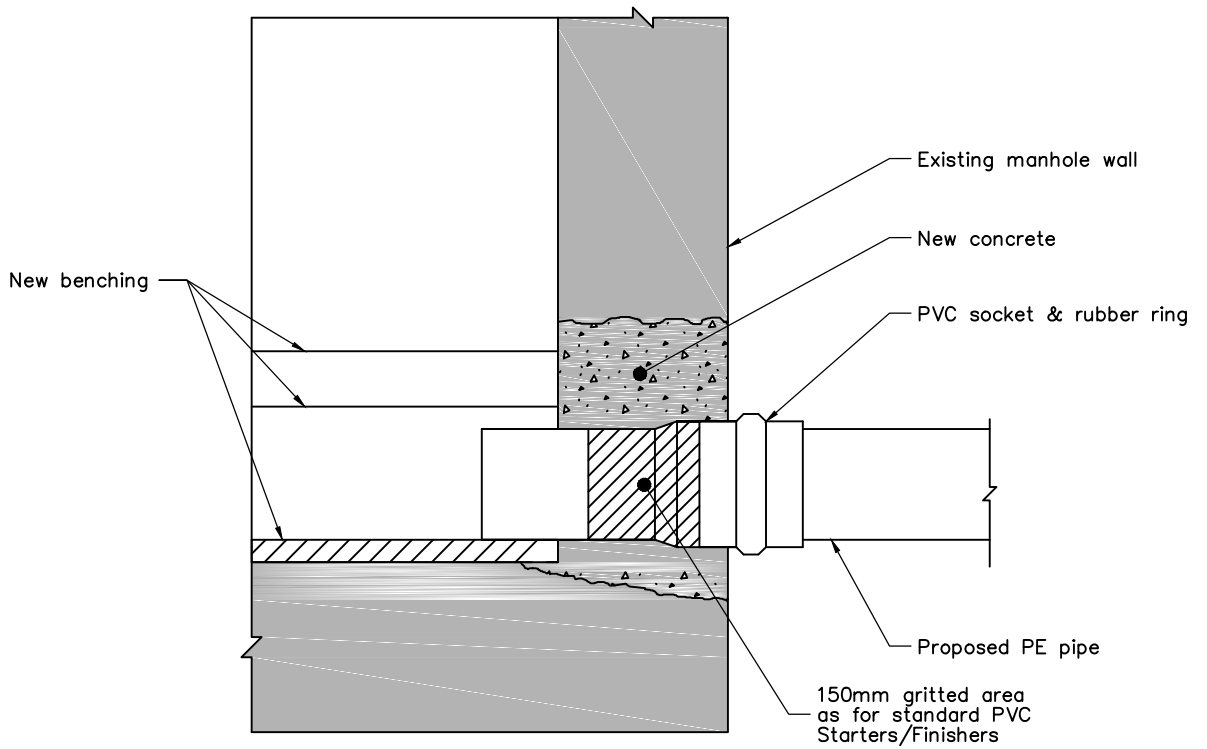


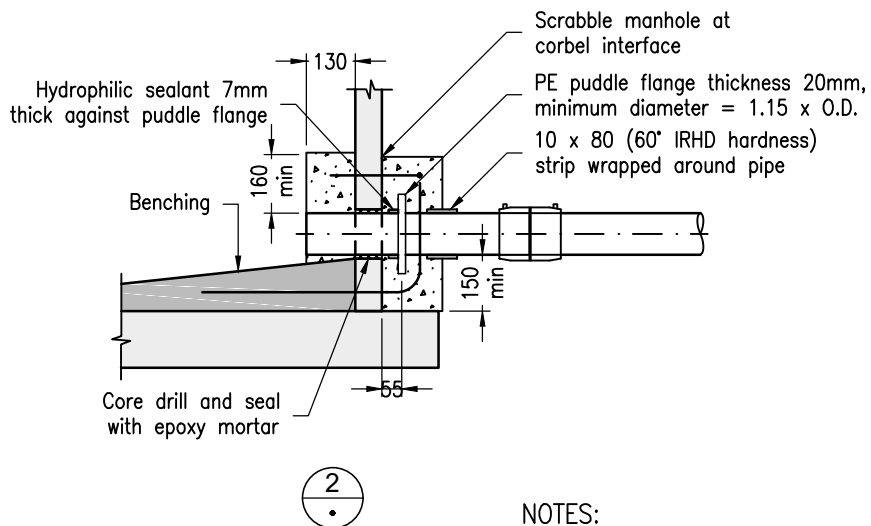
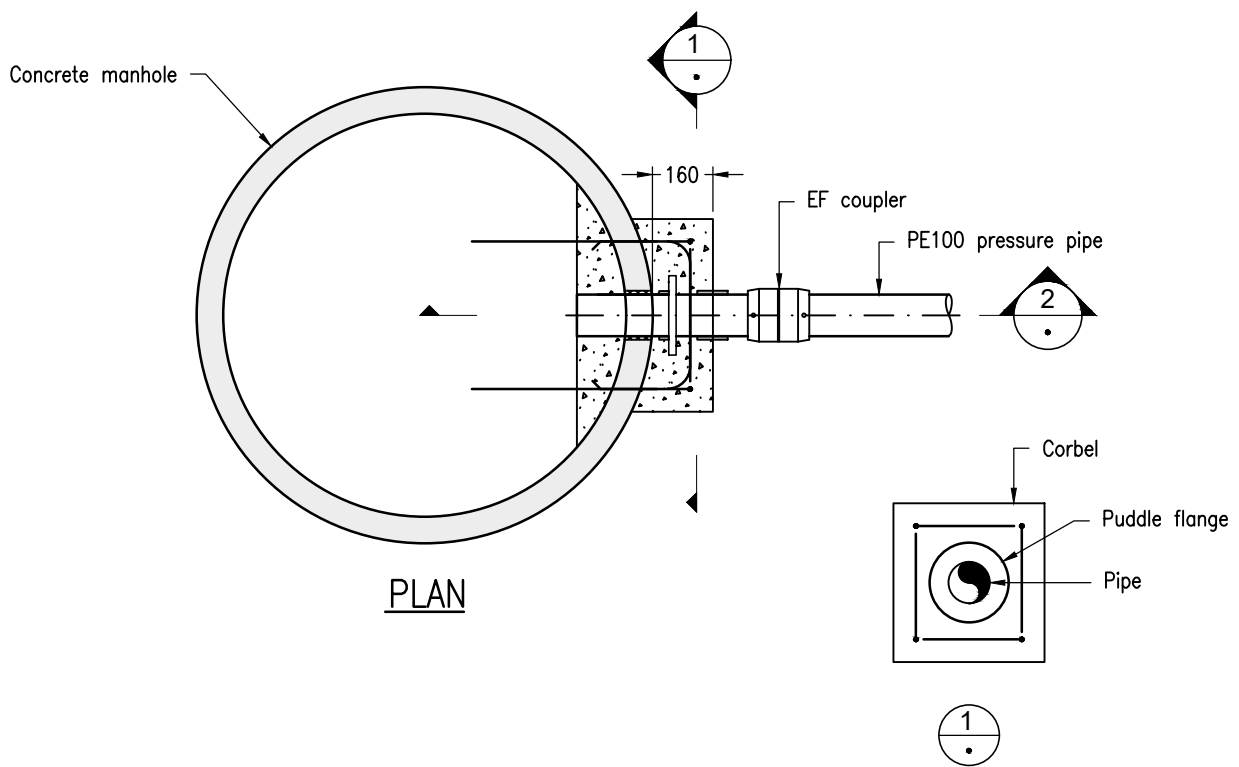
| Pipe DN | A | B | C | D |
|---------|-----|-----|----|-----|
| 100 | 144 | 150 | 50 | 344 |
| 150 | 129 | 150 | 50 | 329 |
| 175 | 113 | 150 | 50 | 313 |
| 225 | 95 | 150 | 50 | 295 |
| 300 | 82 | 150 | 50 | 282 |

| | | | | |
|-----|-----|-----|-----|-----|
| 100 | 130 | 200 | 100 | 430 |
| 150 | 130 | 200 | 100 | 430 |
| 175 | 100 | 200 | 150 | 450 |
| 225 | 130 | 200 | 150 | 480 |
| 300 | 170 | 200 | 150 | 520 |

MANHOLE STARTERS
(Outlet)

MANHOLE FINISHERS
(Inlet)

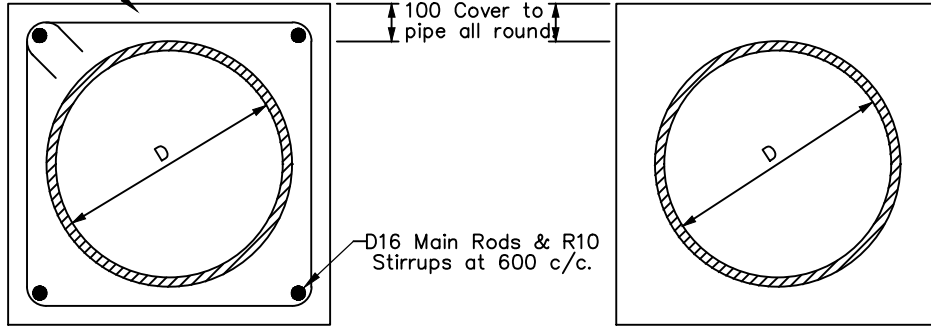




NOTES:

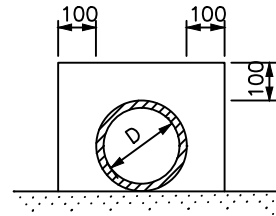
1. Prefabricated PE pipe and puddle flange unit to be same nominal diameter and SDR as pressure pipe.

50 cover to reinforcing all round.



**REINFORCED
CONCRETE SURROUND**
D=150 ϕ to 450 ϕ
TYPE A

**PLAIN
CONCRETE SURROUND**
D=150 ϕ to 450 ϕ
TYPE B



CONCRETE COVER
D=100 ϕ
TYPE D

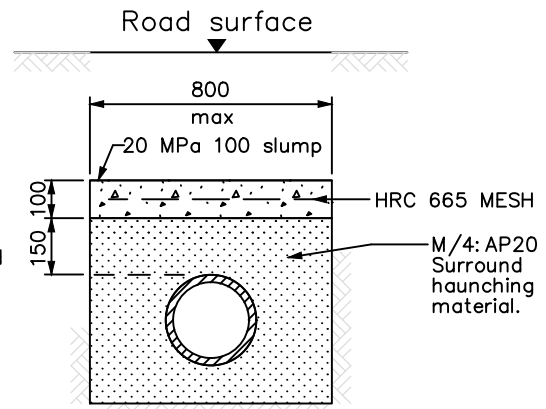
NOTES:

1. For concrete pipe diameters greater than 450mm or flexible pipe diameters greater than 300mm special design applies.
2. Concrete shall be 20 MPa 100 slump with a tolerance of +0,-20mm.
3. Type of surround shall be specified.
4. Concrete surround shall terminate at a pipe joint.
5. Contraction joints shall be formed at pipe joints by interrupting concrete with 12mm Softboard or equivalent and applying approved sealant to the pipe joint to prevent entry of concrete. Any reinforcing steel shall be stopped unhooked 50mm from joint.
6. Contraction joint spacing – maximum:

| | | |
|--|----------|----------------------------------|
| | R.C.R.R. | Ceramic Pipes or vertically cast |
|--|----------|----------------------------------|

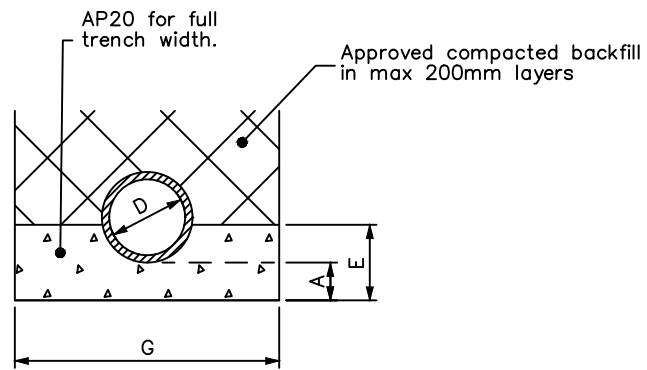
| | | |
|--------|------------|------|
| Type A | 10m | 3.2m |
| Type B | 5m | 1.6m |
| Type C | Engineer | 3.2m |
| Type D | to specify | 1.6m |

7. With flexible pipe Type E protection to be used unless otherwise specified.



CONCRETE PROTECTION SLAB
MAXIMUM PIPE SIZE 300<
TYPE E

NOTE: Suitable for soils with an allowable bearing pressure over 50KPa

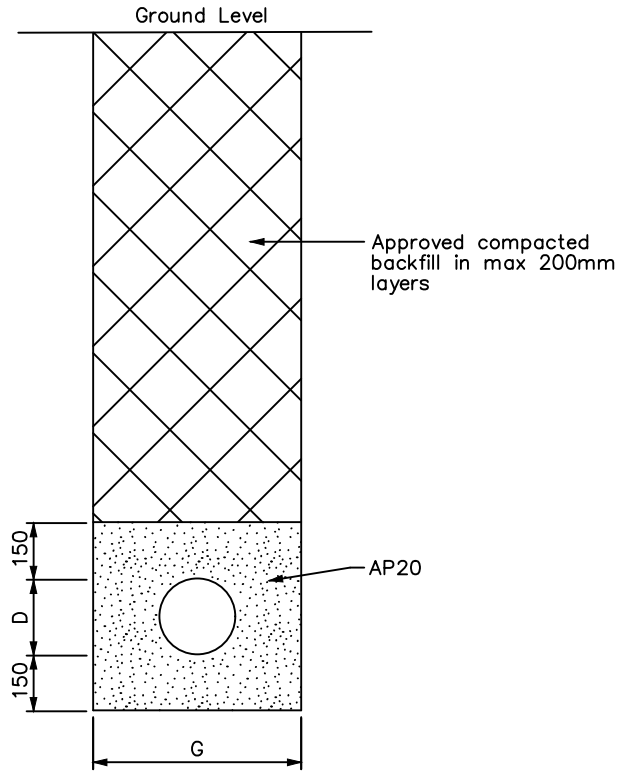


TYPE M
Metal Haunching

| PIPE < D | DEPTH A | E | G |
|-------------|------------|-----|------|
| 100 | 75 | 145 | 450 |
| 150 | 100 | 170 | 650 |
| 200 | 100 | 200 | 700 |
| 225 | 100 | 200 | 700 |
| 250 | 100 | 200 | 800 |
| 300 | 100 | 200 | 800 |
| 375 | 100 | 200 | 900 |
| 450 | 120 | 250 | 1000 |
| 525 | 120 | 250 | 1100 |
| 600 | 150 | 300 | 1200 |
| 675 | 150 | 300 | 1300 |
| 750 | 150 | 350 | 1300 |
| 825 | 150 | 350 | 1400 |
| 900 | 150 | 350 | 1500 |
| 975 | 150 | 350 | 1600 |
| 1050 | 150 | 400 | 1700 |
| 1200 | 150 | 400 | 1900 |
| 1350 | 150 | 450 | 2100 |
| 1600 | 150 | 450 | 2400 |
| 1800 | 150 | 500 | 2600 |
| 2100 | 150 | 500 | 2900 |

NOTES:

1. Lime stabilise haunching where the trench backfill is lime stabilised.



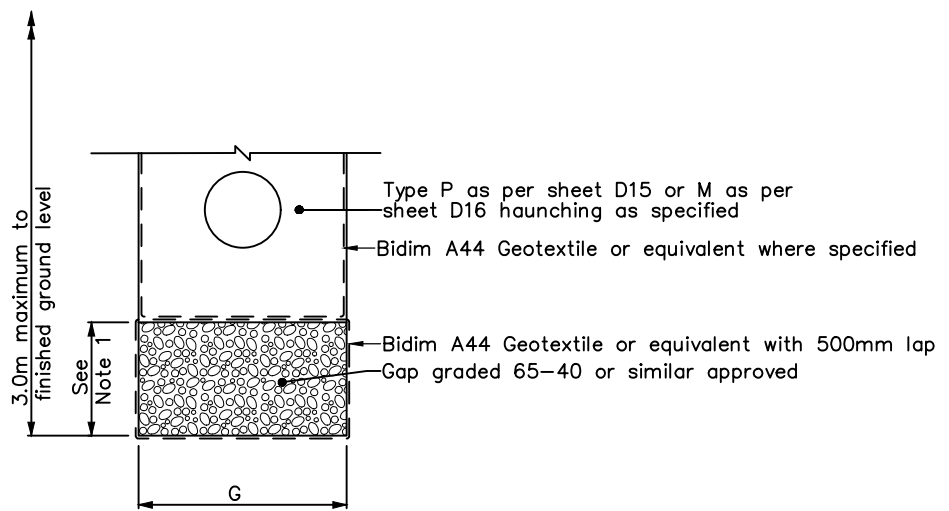
NOTE:

1. Where specified the haunching shall be fully wrapped in geotextile in accordance with AS/NZS 2566.2
2. Suitable for soils with an allowable bearing pressure over 50kPa.

TYPE P
Standard Haunching

| Nominal Pipe Diameter DN | Trench Width * G |
|--------------------------|------------------|
| 100 | 460 |
| 150 | 500 |
| 175 | 550 |
| 200 (pressure) | 575 |
| 225 | 600 |
| 300 | 700 |
| 375 | 800 |
| 475 | 1100 |

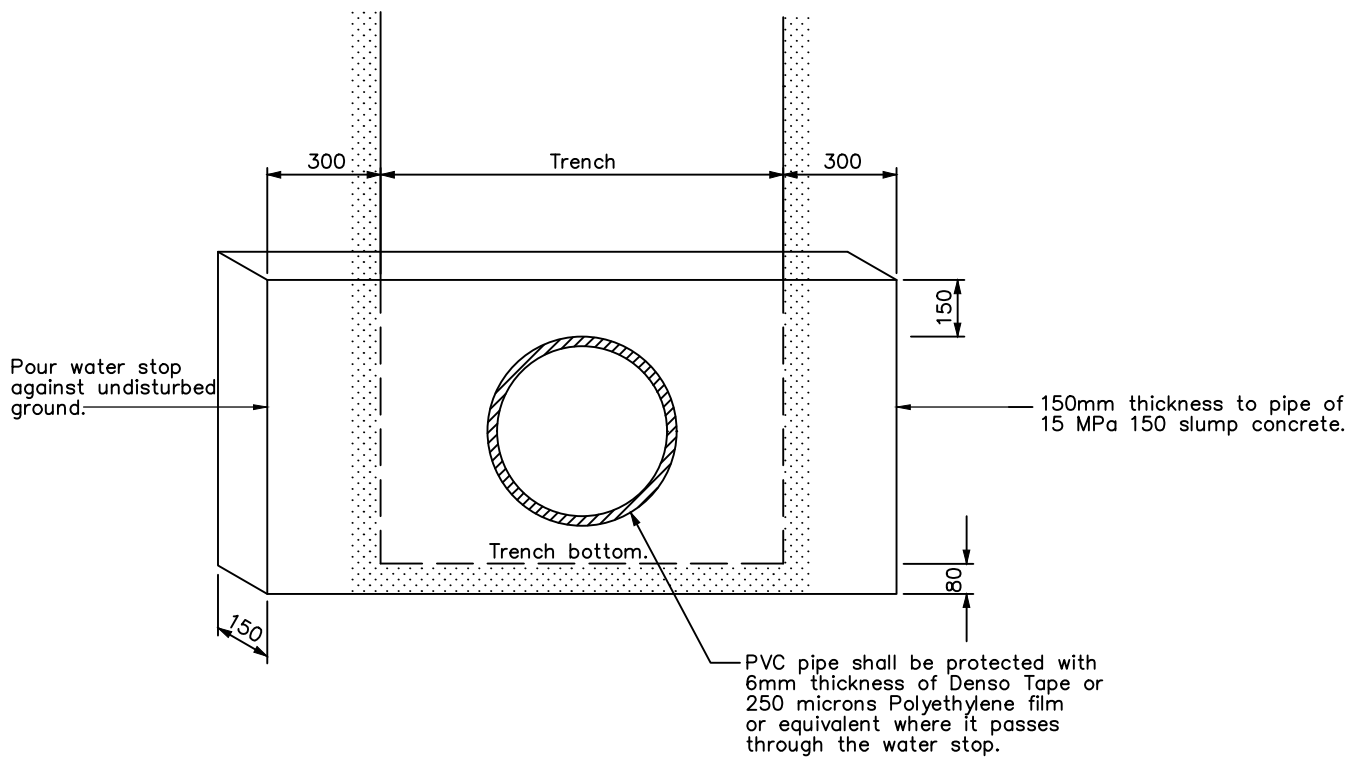
* G may be increased in very soft ground.



NOTE:

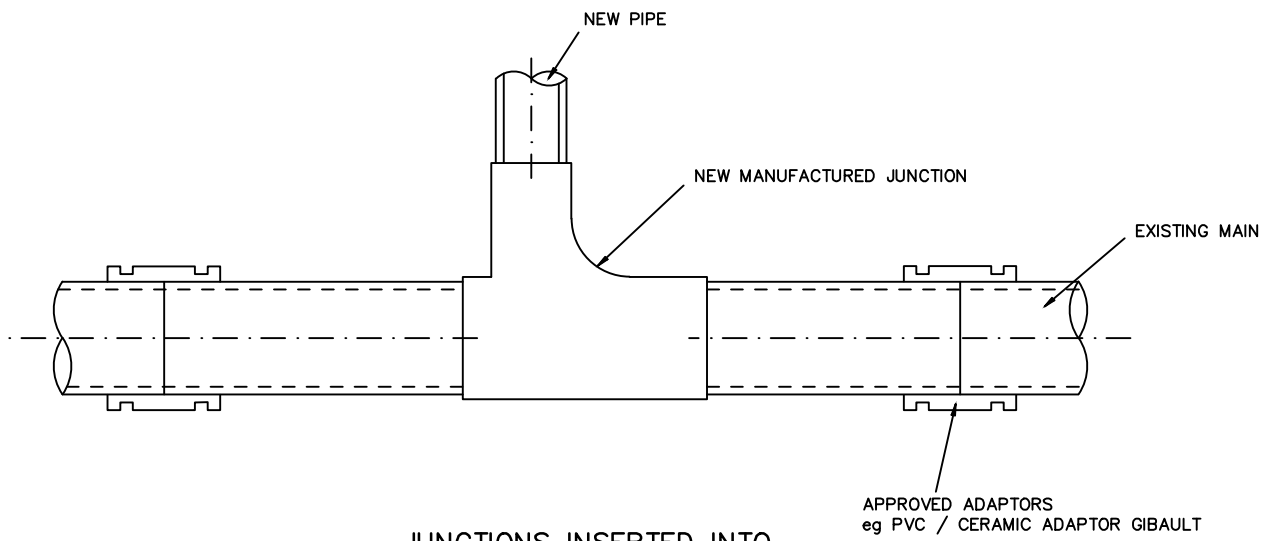
1. Extend soft ground foundation to subgrade with a safe bearing pressure $\geq 50\text{kpa}$, to a maximum depth of 0.9m

SOFT GROUND FOUNDATION

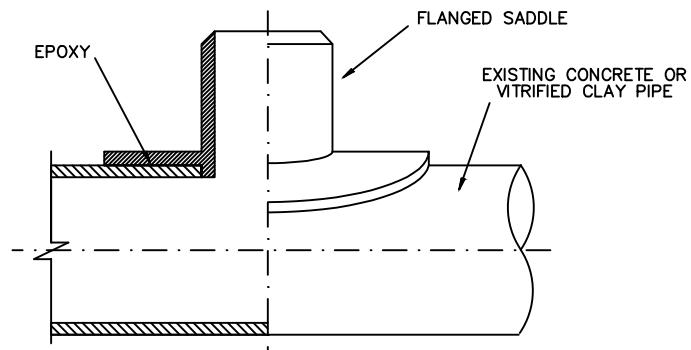


NOTES:

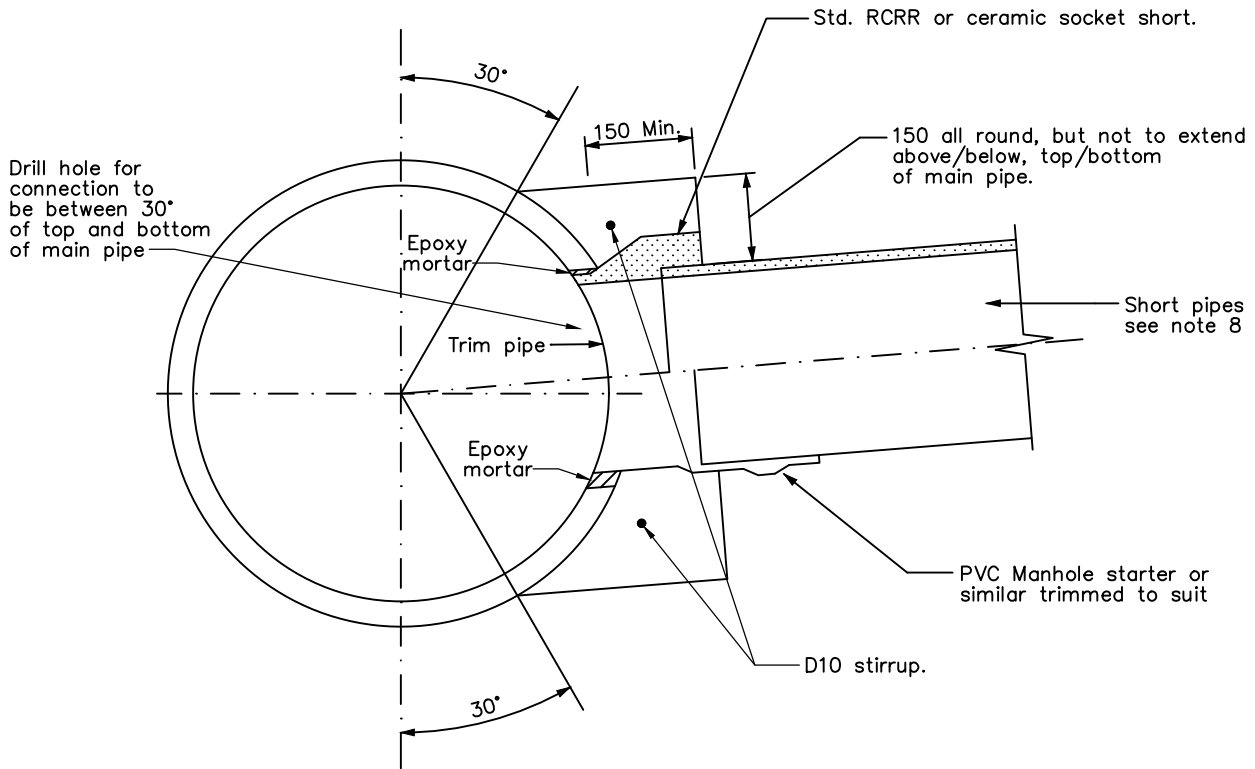
1. Locate waterstops abutting pipe collars on downhill side of joint



JUNCTIONS INSERTED INTO
EXISTING MAINS $<$ OR $=$ 300mm



VITRIFIED CLAY SADDLE
INSERTED
INTO EXISTING PIPE $>$ 300mm

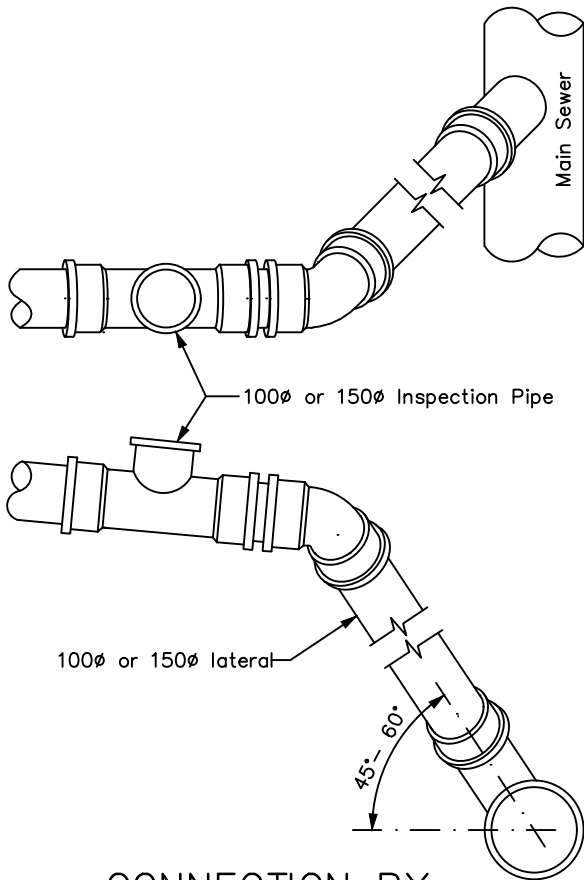


NOTES:

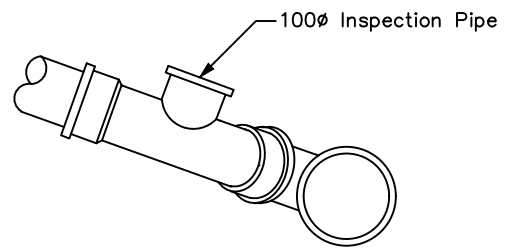
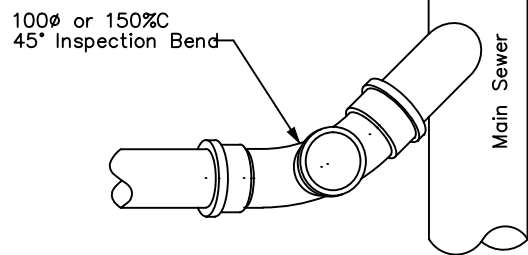
1. Special design required for :
main pipes other than reinforced concrete;
more than one connection per main pipe.
2. Direct connections of this type are not permitted
on plastic mains.
3. Outside edge of main pipe cut-in hole shall be not less
than 300mm from collar or end of pipe.
4. Maximum diameter of cut-in hole shall be less than two
thirds of the internal diameter of main pipe.
5. Epoxy mortar shall be applied strictly according to
the manufacturer's recommendations,
and shall be fully cured before the corbel is poured
and the sideline laid.
6. Main pipe backfill under sideline shall be
thoroughly compacted AP40 metal.
7. Main pipe surface shall be roughened and grout
coated before concrete corbel is poured.
8. Sidelines shall have yield joints in accordance
with D10
9. Sidelines shall be tested.
10. Direct connections must be approved by the Engineer,
and normally shall only be used where
the sideline is less than 10m long, and access for
cleaning the sideline is easily obtainable at the
upstream end. That is the sideline shall terminate
with a manhole or shallow sump, but not a deep sump.
11. Diameter of sideline pipe shall be less than
half the internal diameter of main pipe.

SQUARE RADIAL DIRECT CONNECTIONS:

| Nominal Sideline Diameter | Minimum Main Pipe Diameter |
|---------------------------|----------------------------|
| 100 | 225 |
| 150 | 375 |
| 200 | 450 |
| 225/250 | 525 |
| 300 | 675 |
| 375 | 825 |
| 450 | 975 |
| 525 | 1050 |
| 600/675 | 1350 |
| 750 | 1600 |
| 825/900 | 1800 |
| 975 | 1950 |
| 1050 | 2100 |



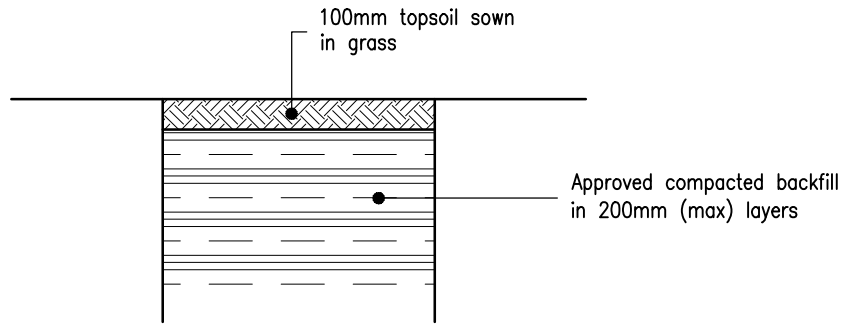
CONNECTION BY
RAMPED RISER



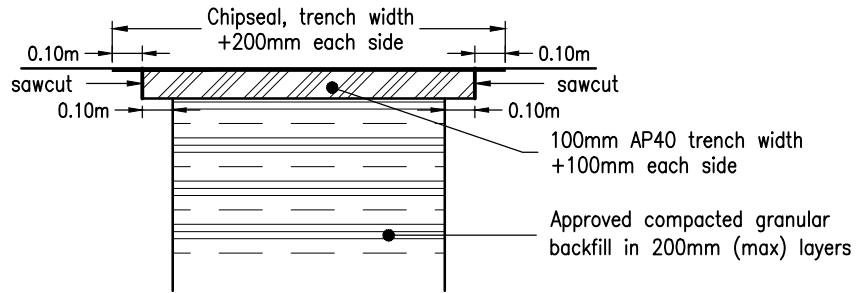
CONNECTION TO 45°
SIDE JUNCTION

NOTES:

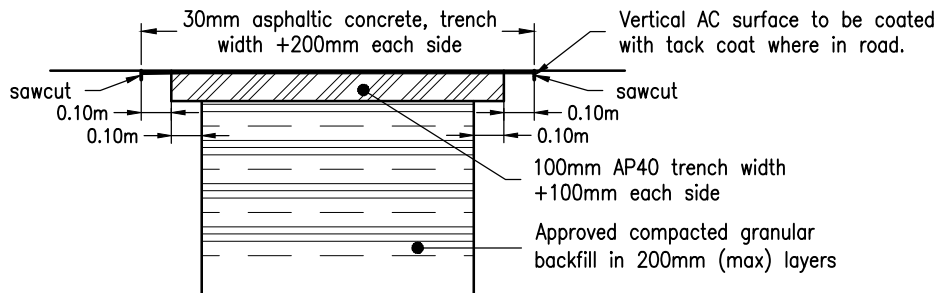
1. PVC pipes adjacent to concrete shall be wrapped with 6mm Denso tape or 250 microns Polyethylene film or equivalent.
2. Bottom of trench to be a stable and approved foundation.
3. Inspection points may be installed to allow pressure testing of the main.
4. Not to be used on main to main connections.



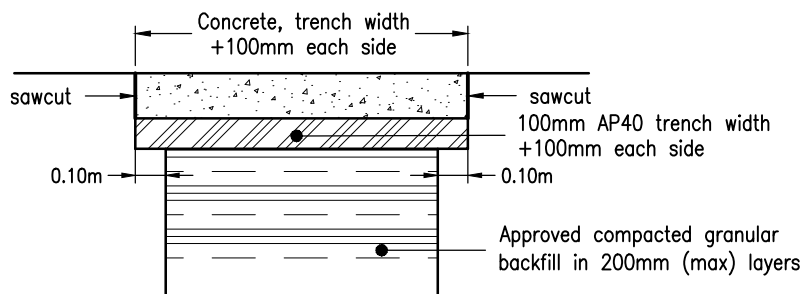
IN BERMS



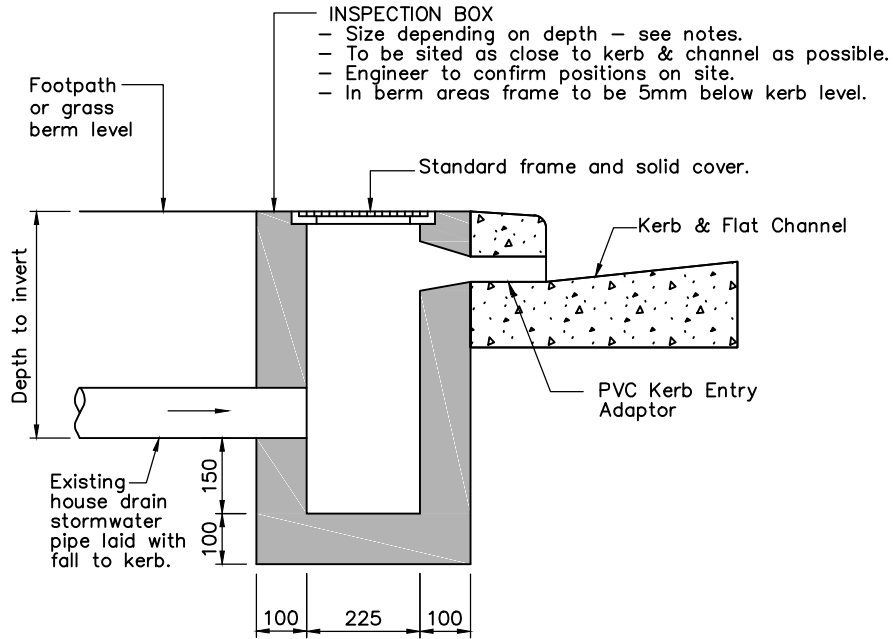
CHIP SEAL REINSTATEMENT



ASPHALTIC CONCRETE REINSTATEMENT

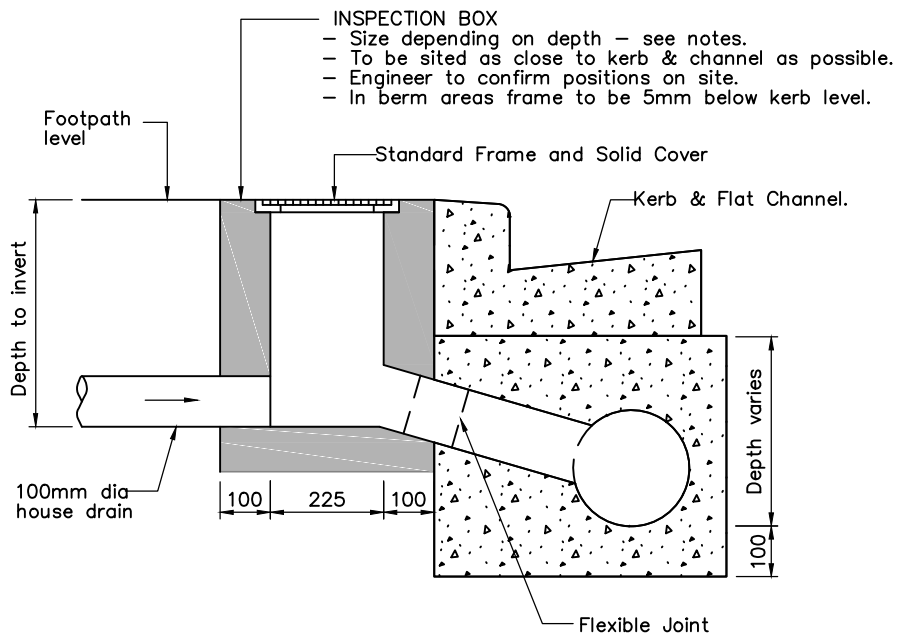


CONCRETE REINSTATEMENT



TYPE A

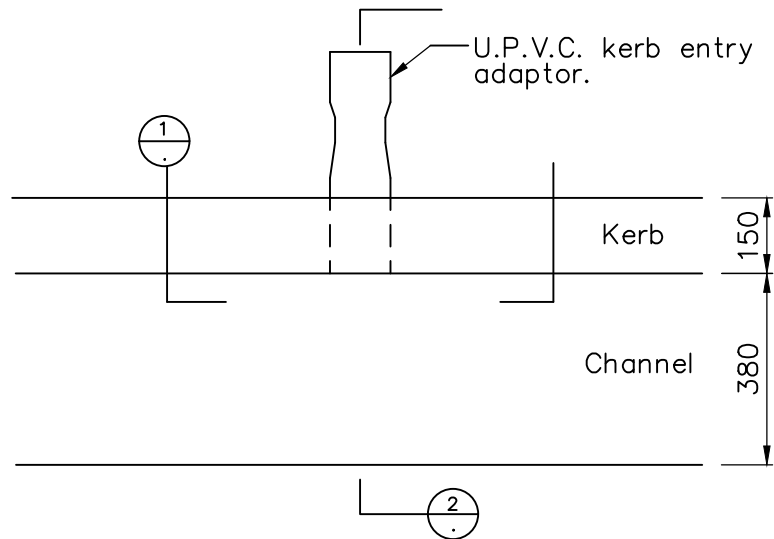
- All concrete to be 20MPa at 28 days



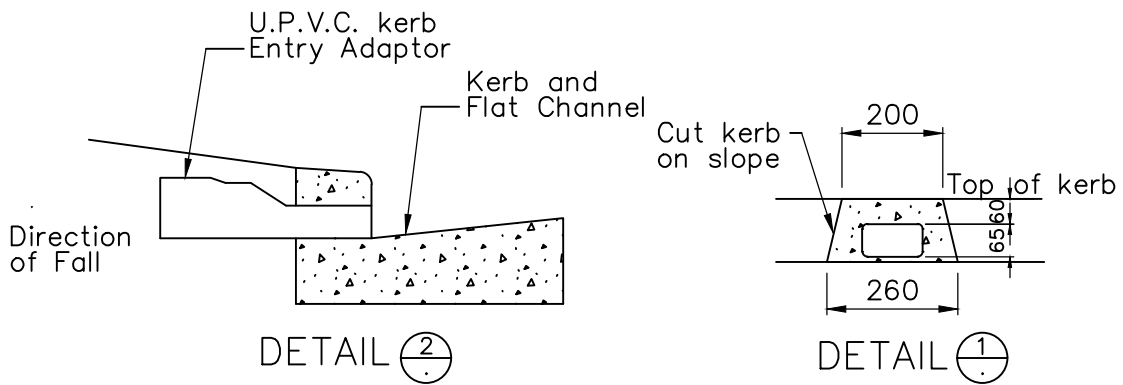
TYPE B

NOTES:

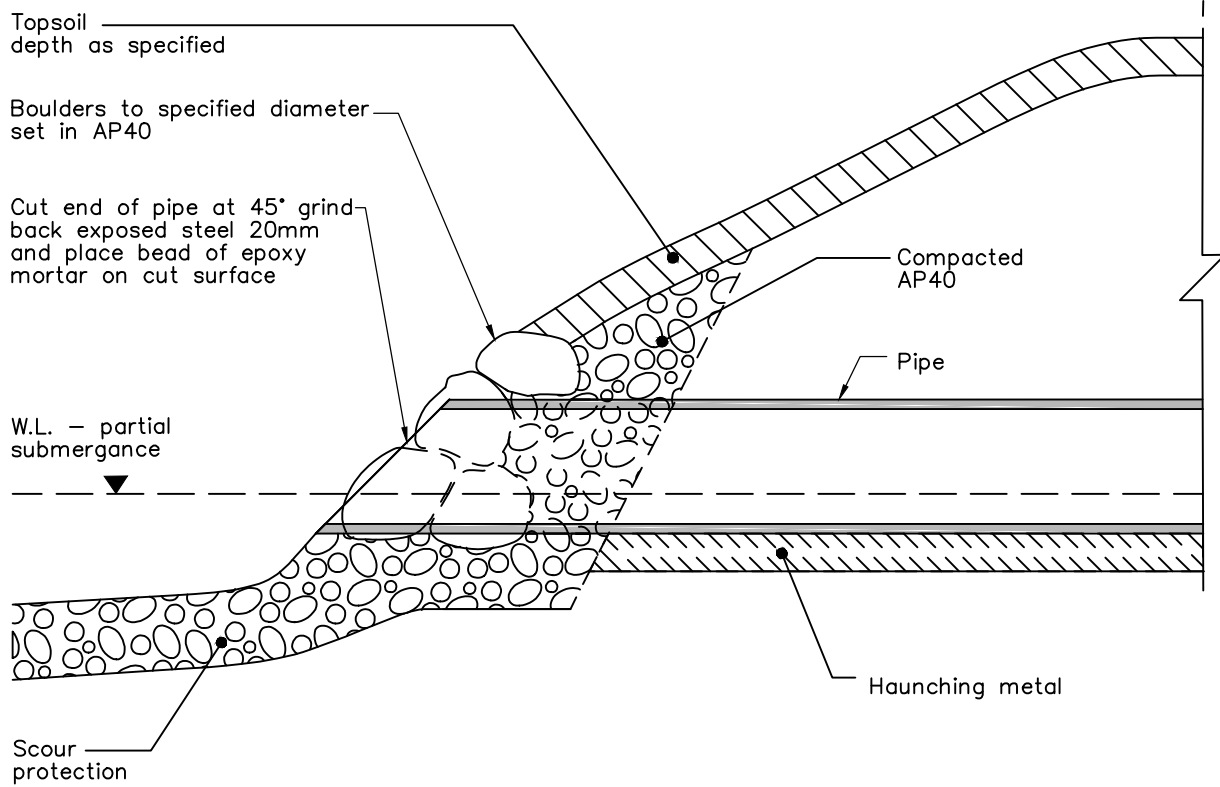
1. Use 225 x 125 Inspection box up to 350 depth to invert (lowest pipe),
Use 300 x 175 Inspection box over 350 depth to invert (lowest pipe) & up to 500 depth,
Use House drain sump over 500 depth to invert.



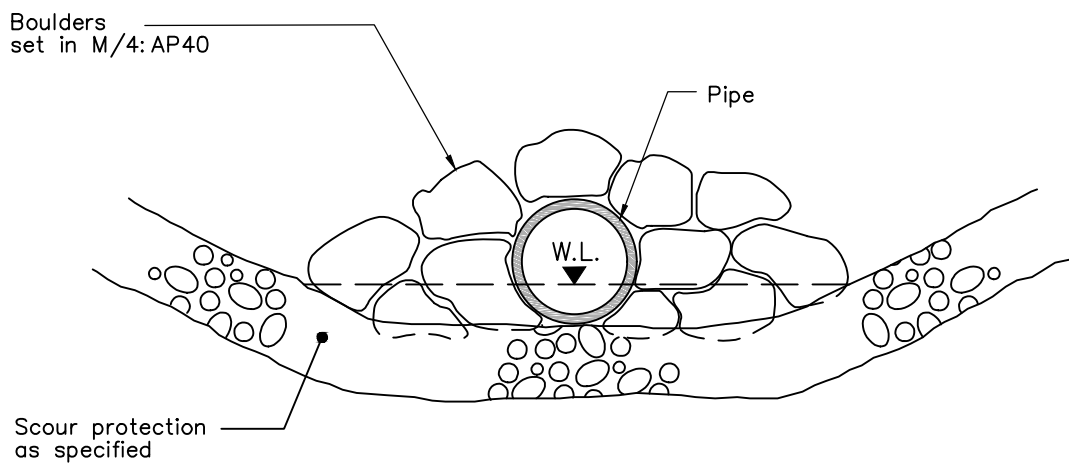
PLAN



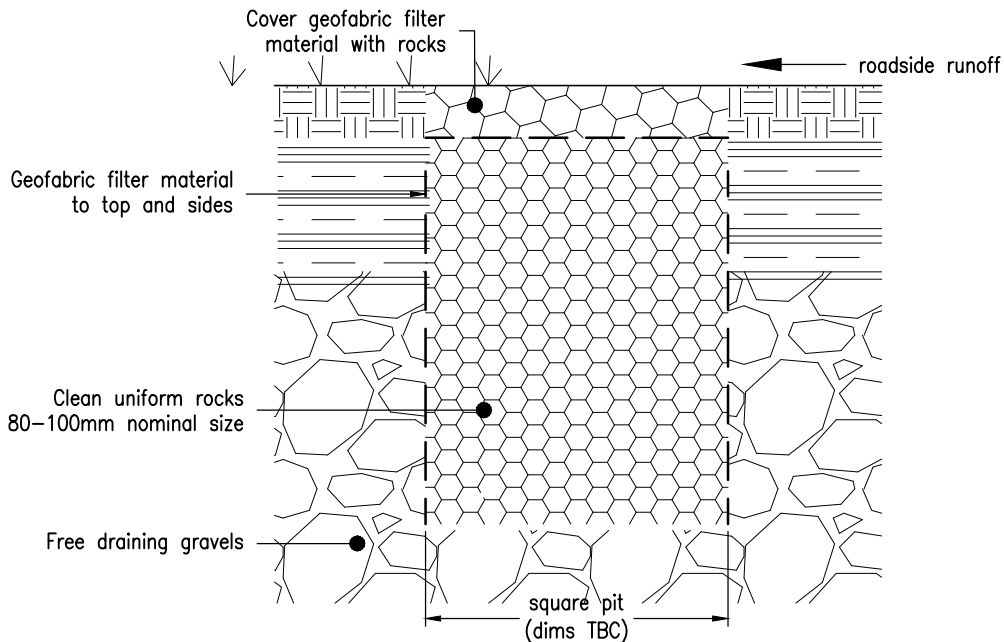
KERB ENTRY



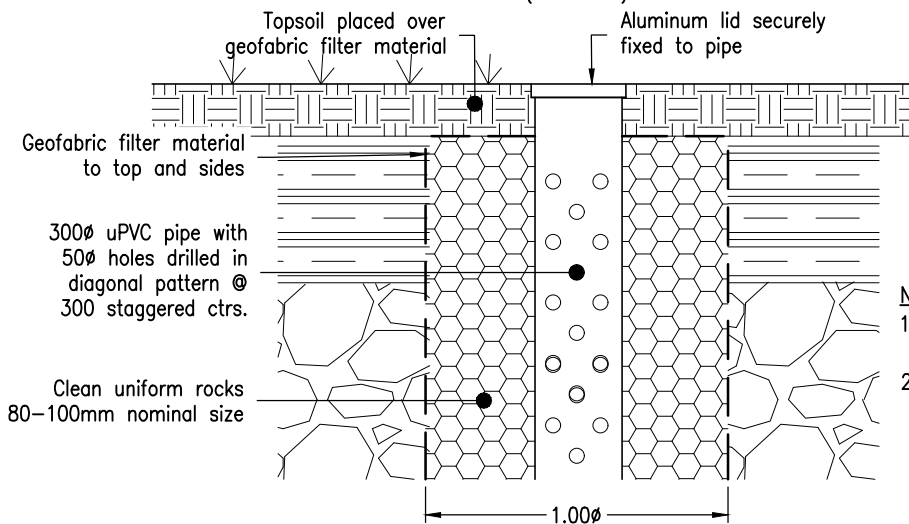
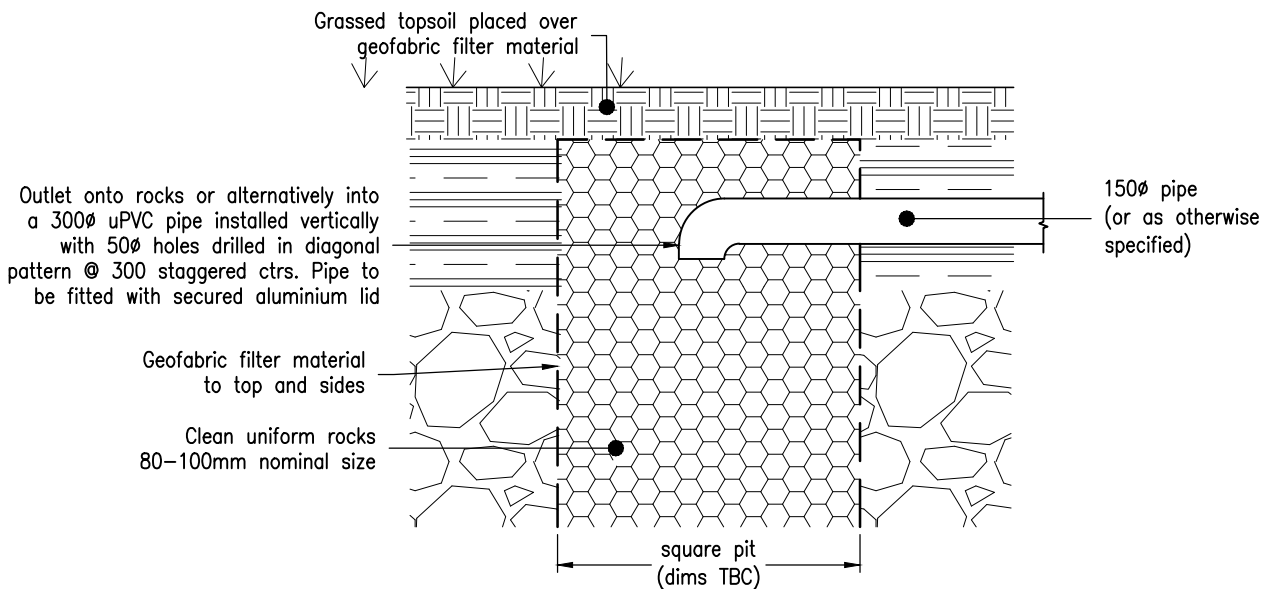
OUTFALL DETAILS



END VIEW



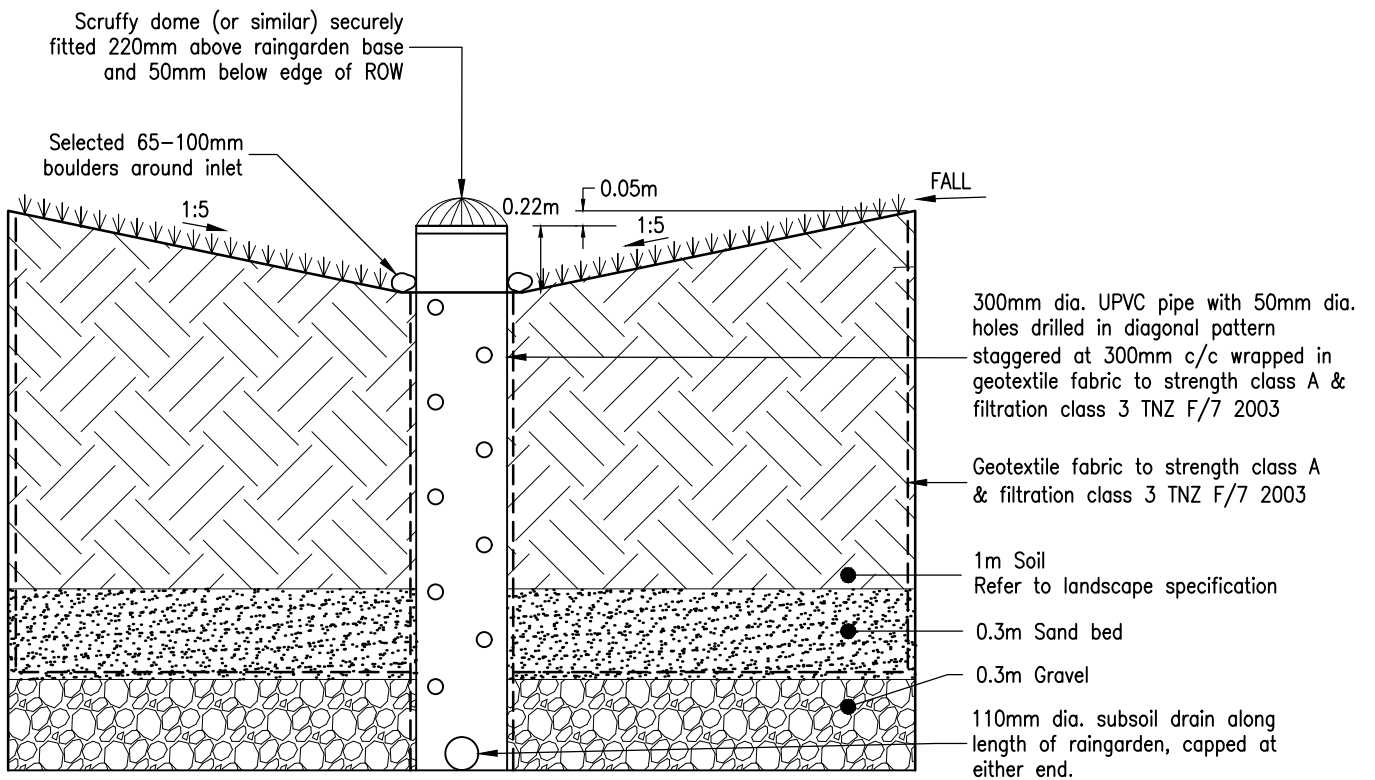
RURAL ROAD SOAKPIT



URBAN SOAKPITS

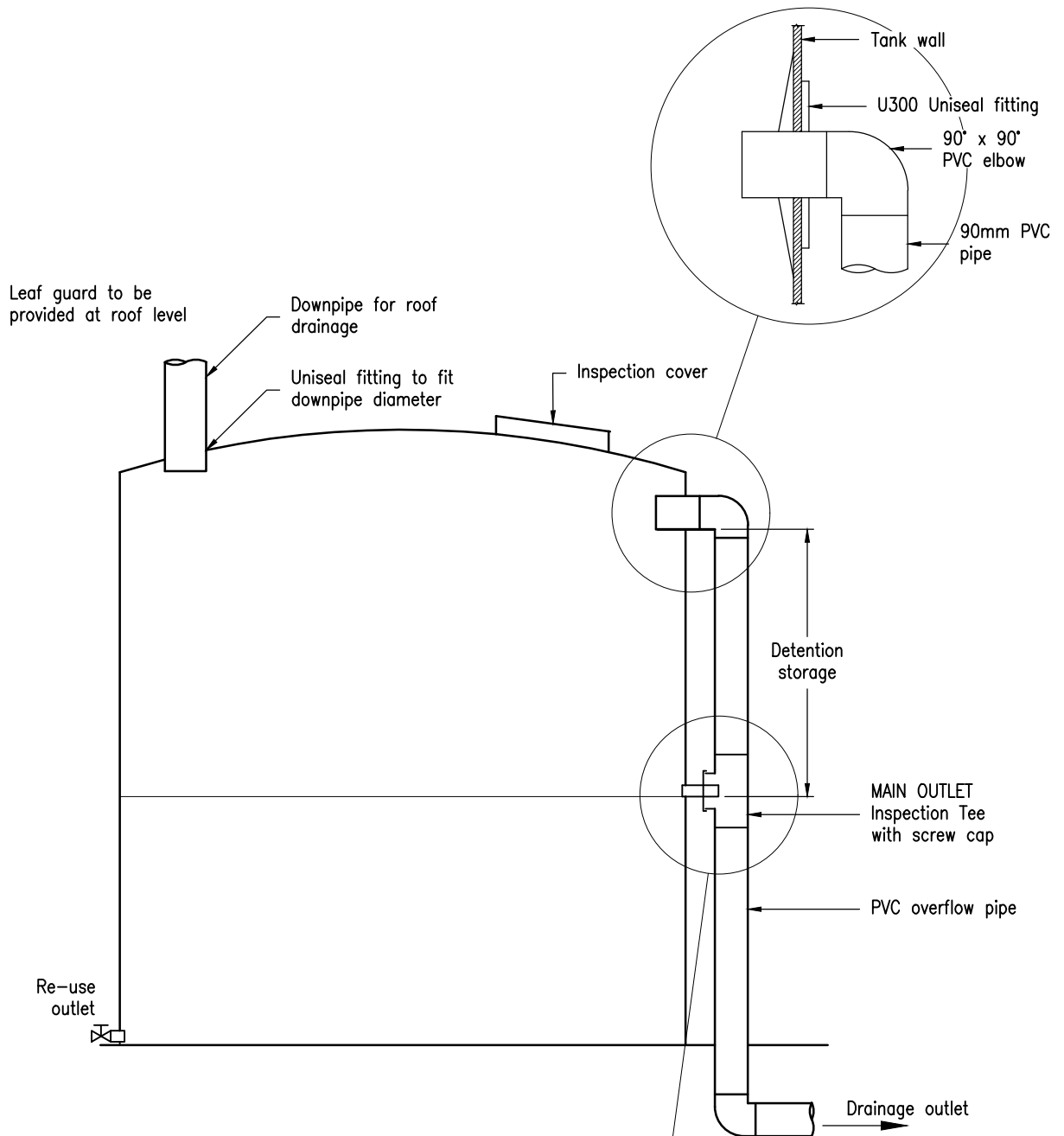
NOTES

1. Soakpits to be sized as per approved design.
2. Pre-entry sumps with submerged outlet as per D09 required for urban road soakpits and private soakpits draining non-roof areas



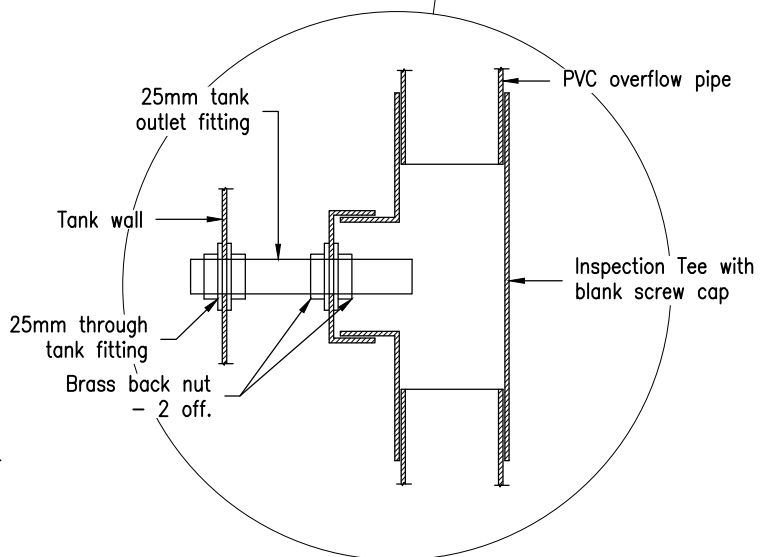
NOTES

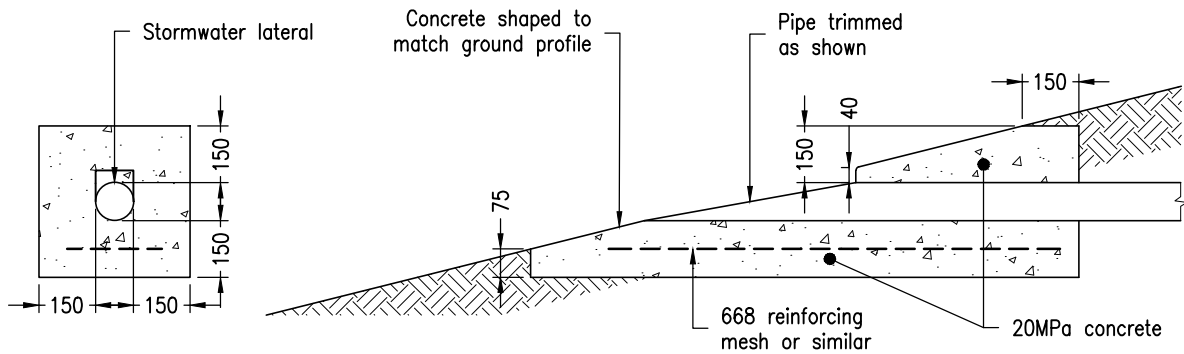
1. Raingardens to be sized as per approved design
2. Sited in private property only

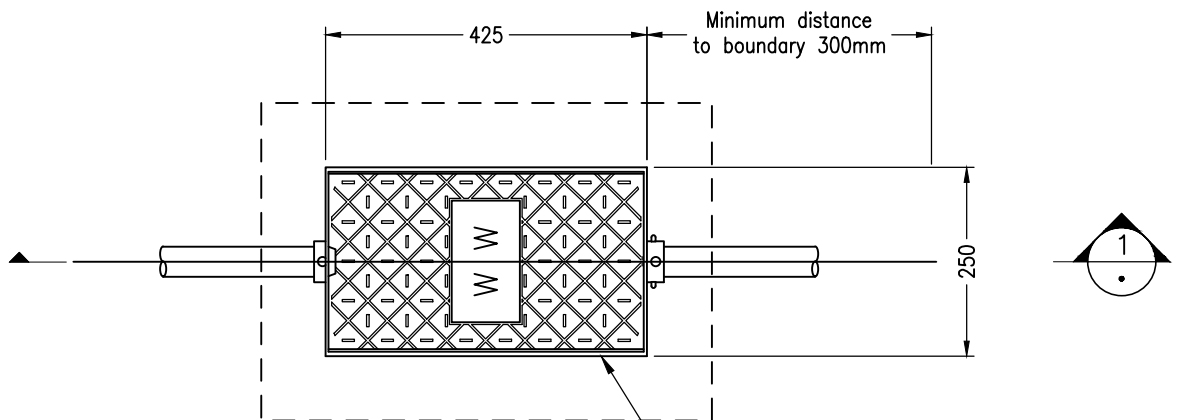


NOTES:

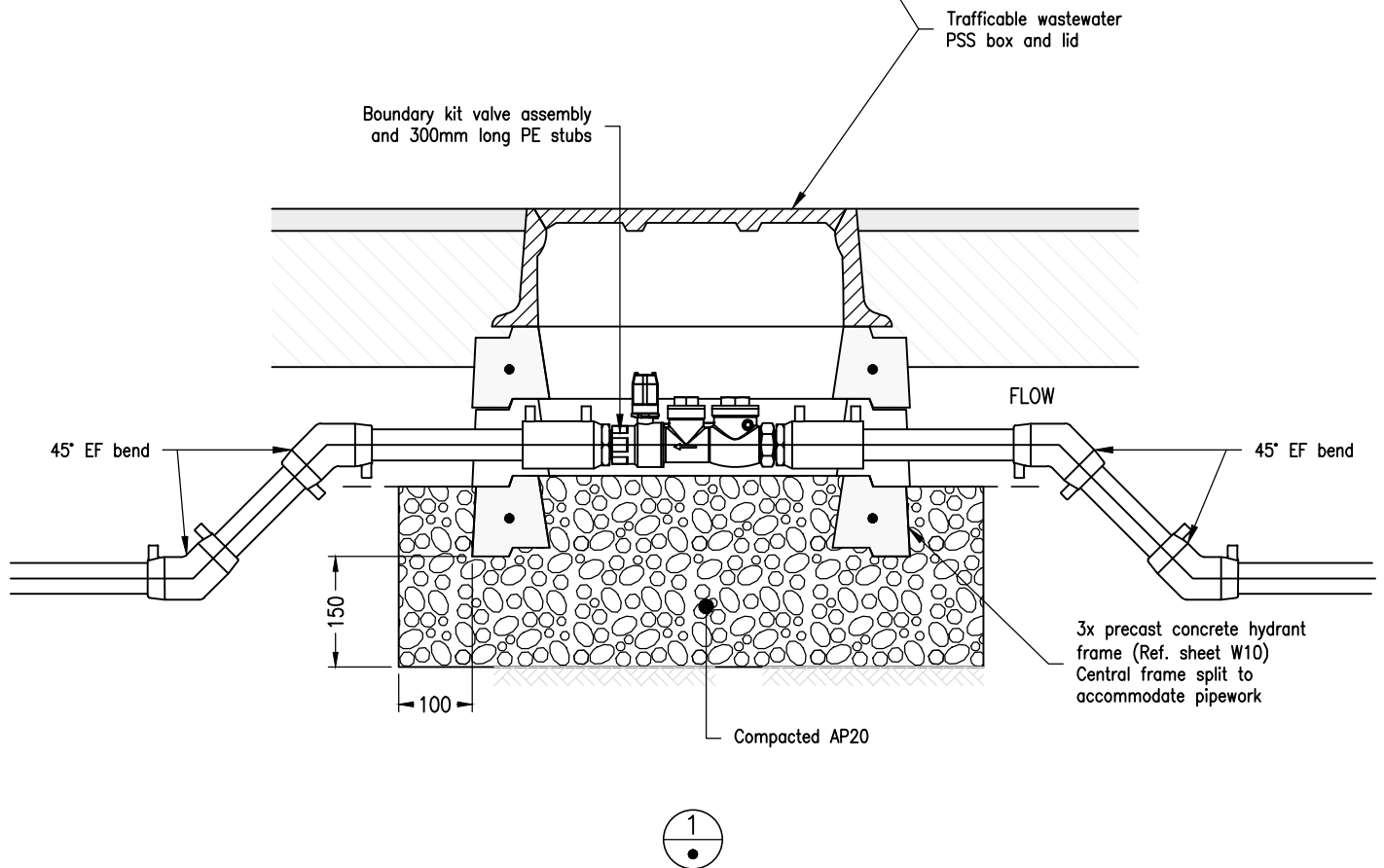
1. Ensure ground beneath tank footing matches suppliers specifications
2. Fit Uniseal in accordance with manufacturers specifications
3. Fit debris protection to roof drainage in accordance with manufacturers specifications
4. Holes drilled through tank wall to be in accordance with manufacturers specification
5. If not re-using water reuse outlet to be omitted and main outlet to be positioned at base of tank
6. For 10% AEP events 3m³ of detention storage per 100m² of roof area to be provided.
7. For 2% AEP events 6m³ of detention storage per 100m² of roof area to be provided.

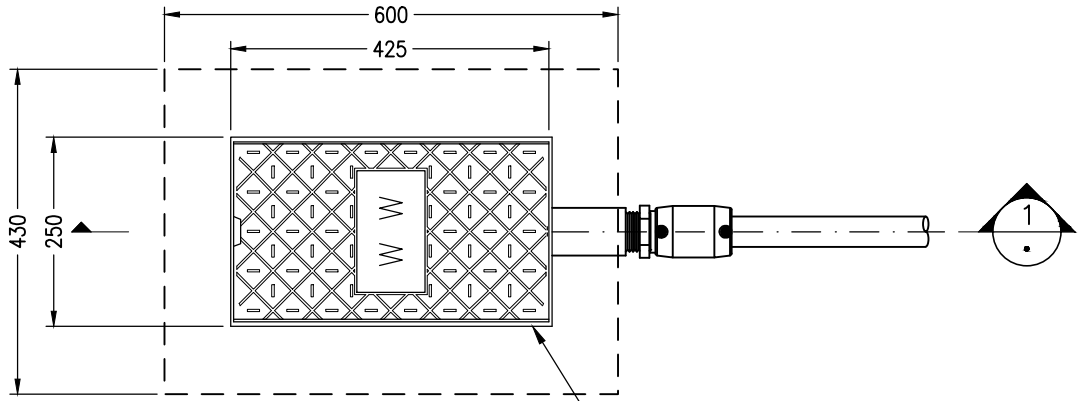






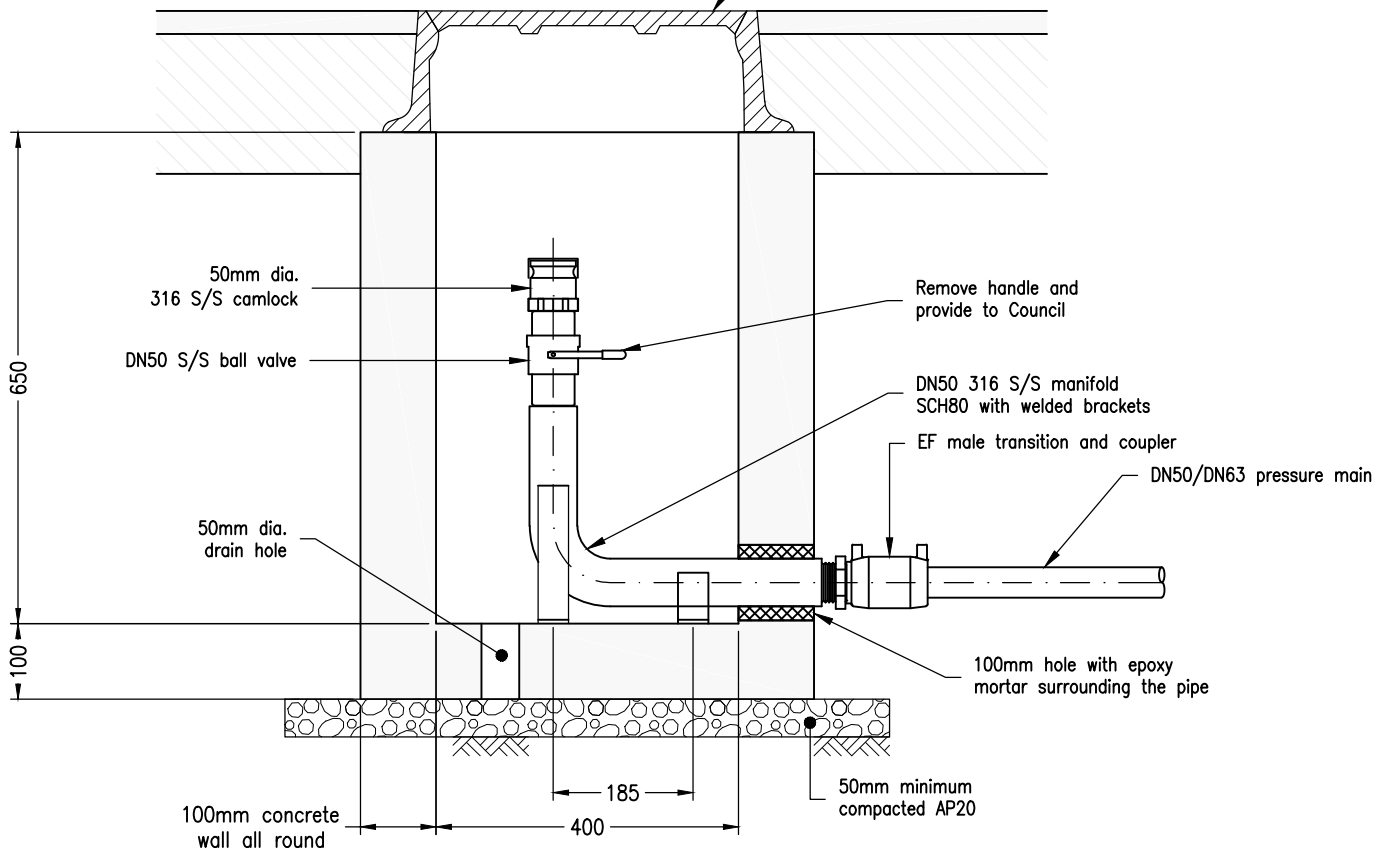
PLAN





PLAN

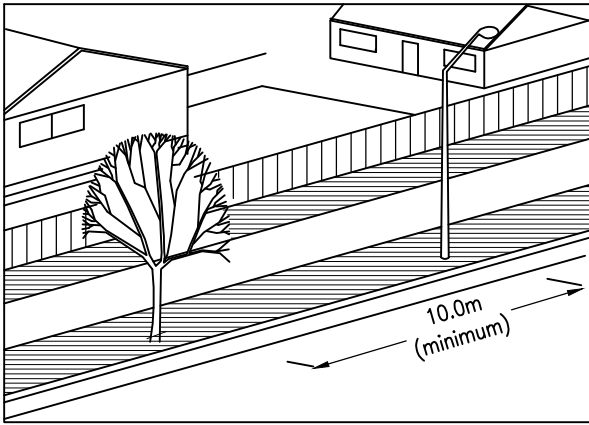
Trafficable wastewater PSS box and lid



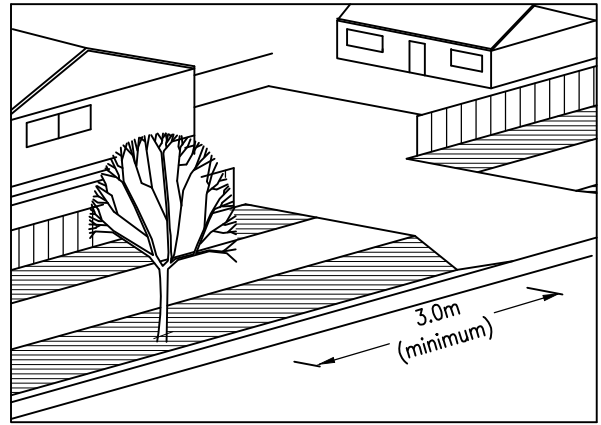
NOTES:

1. Concrete work to comply with NZS 3109.
2. All concrete to be 40MPa.

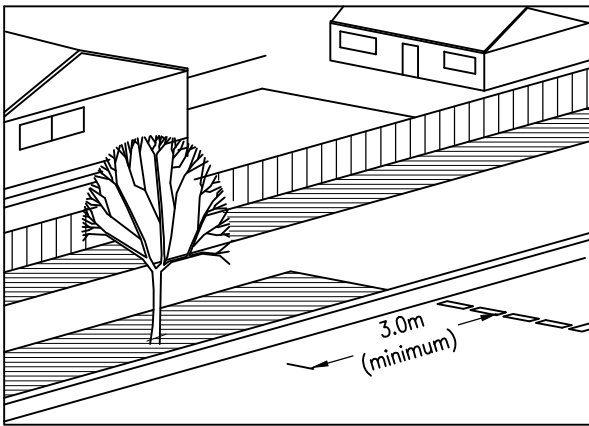




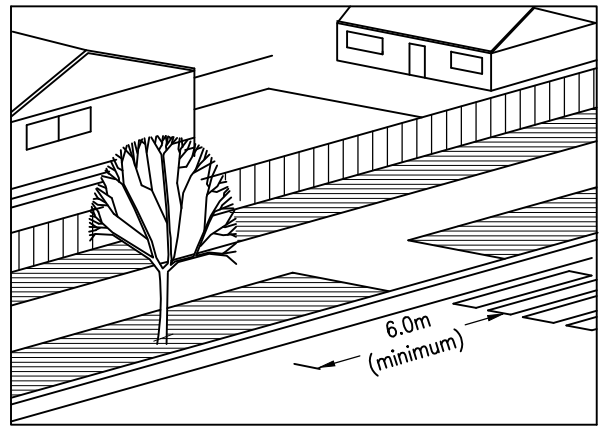
LIGHT STANDARDS
AND POWER POLES



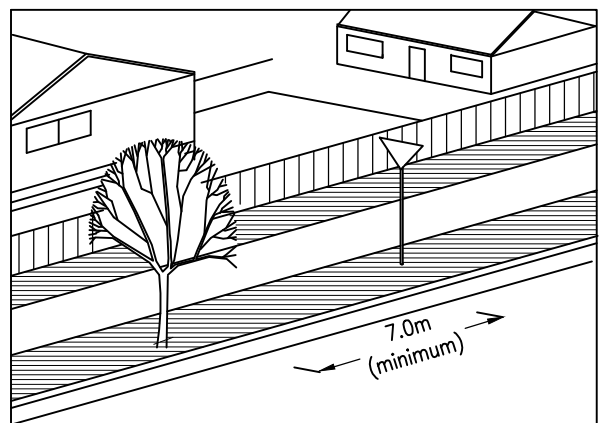
DRIVEWAYS



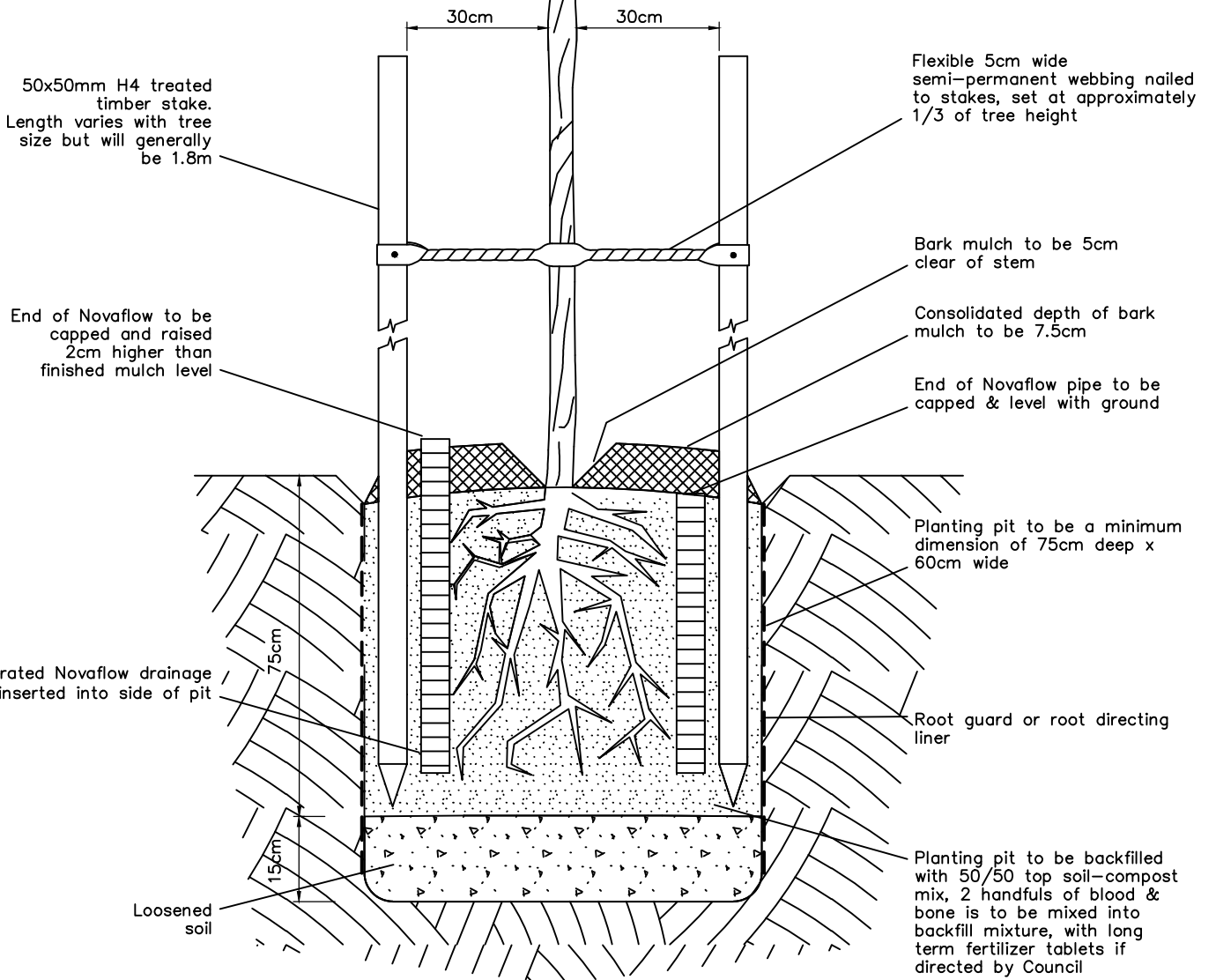
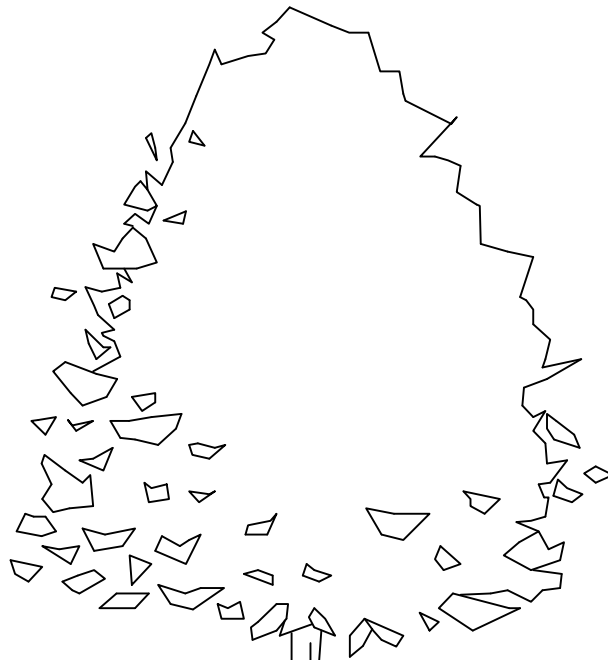
BUS STOPS

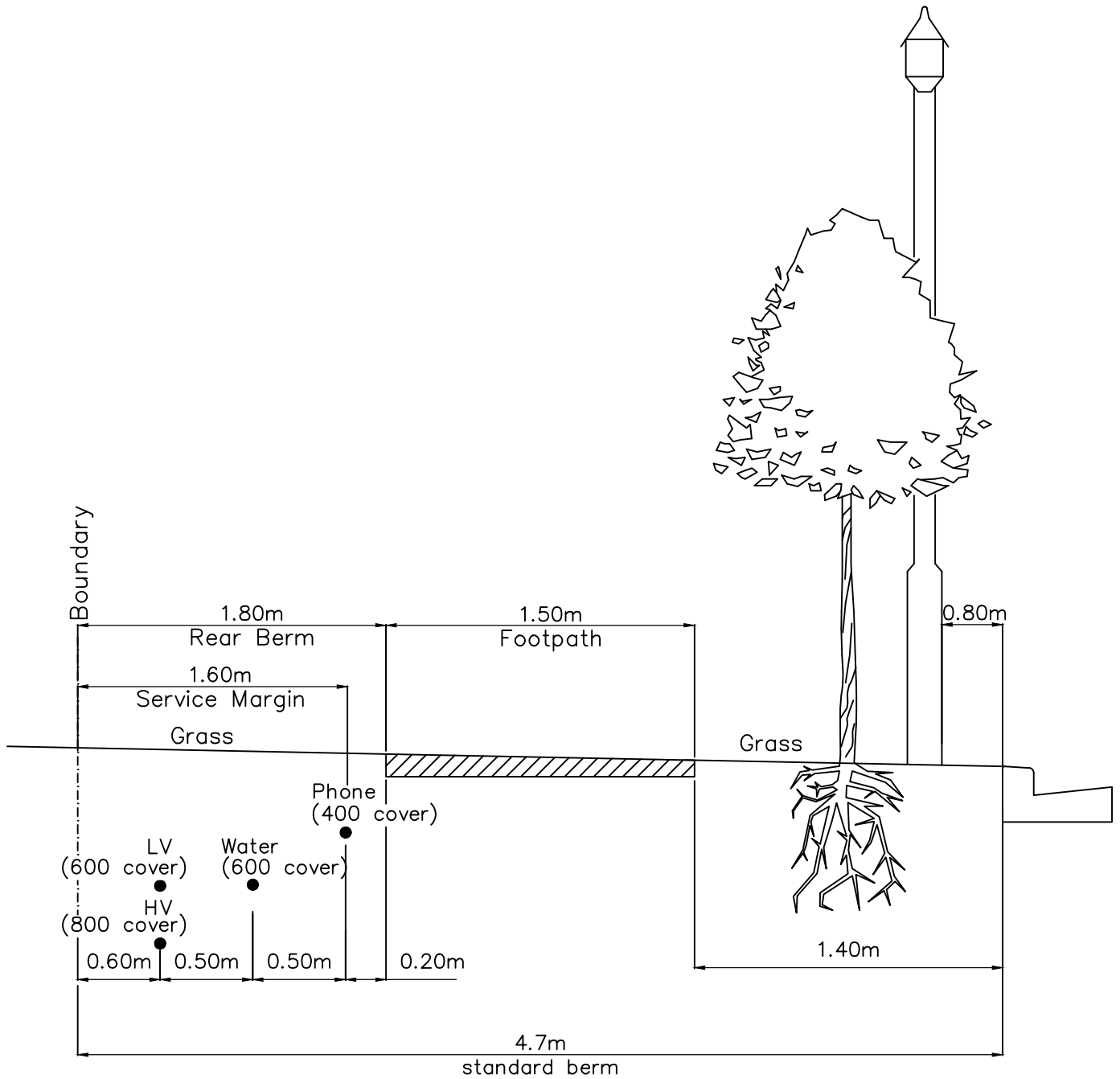


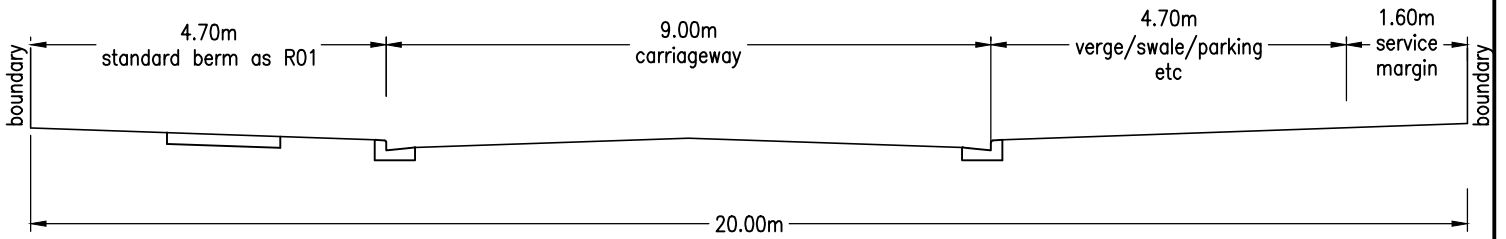
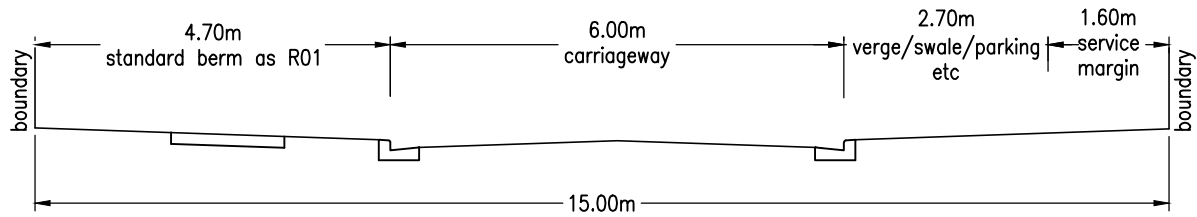
PEDESTRIAN CROSSINGS



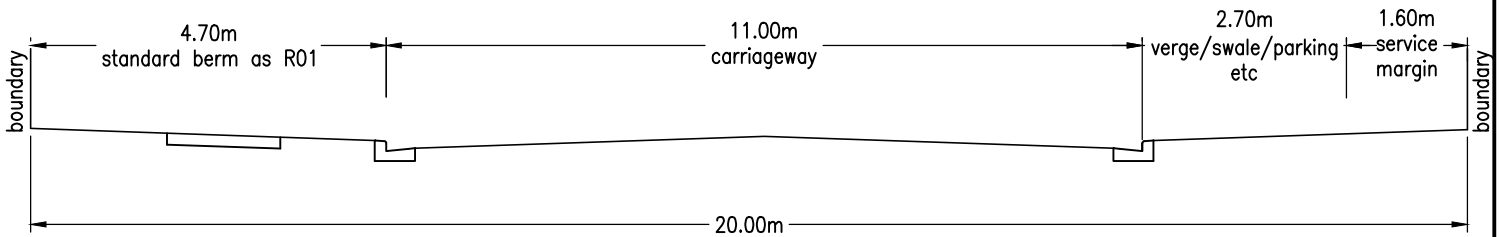
STREET SIGNS







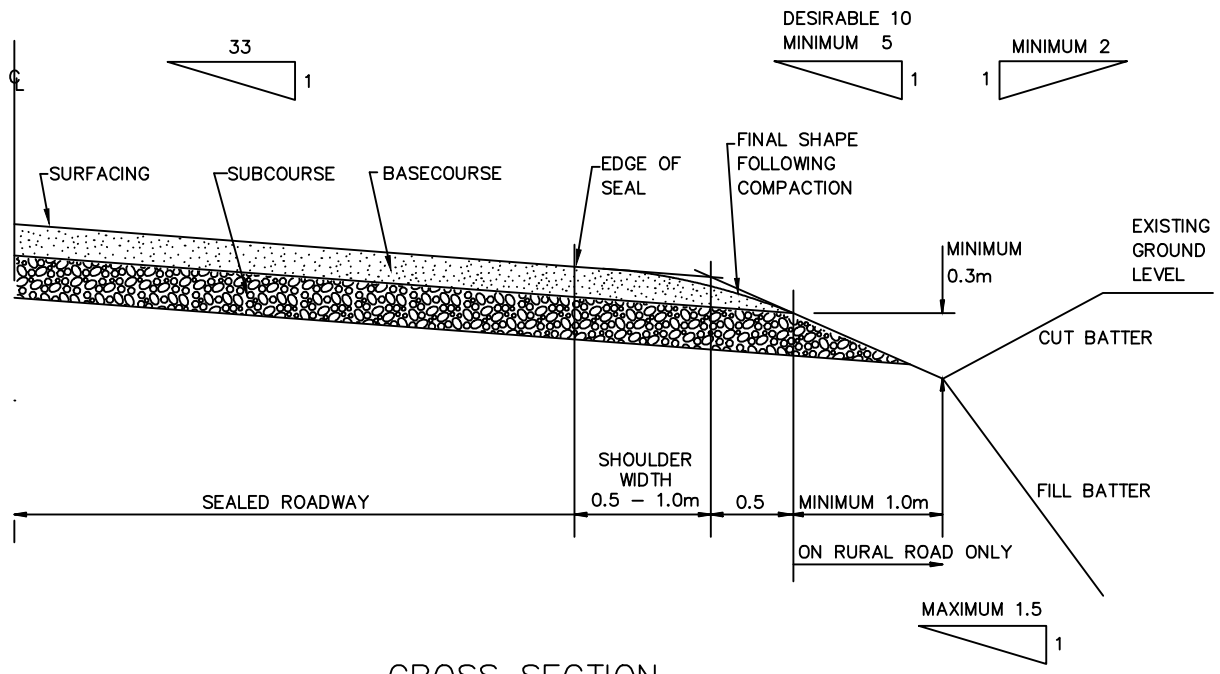
LOCAL ROAD



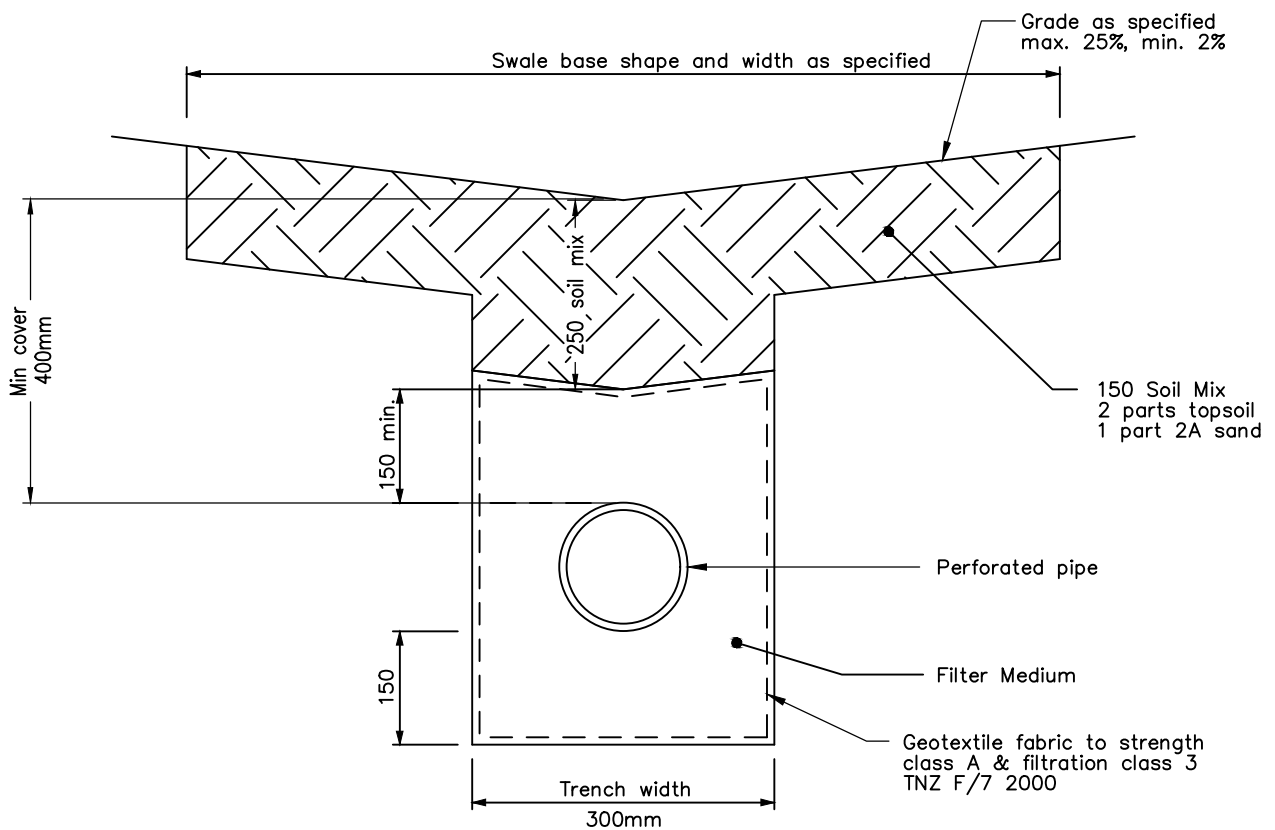
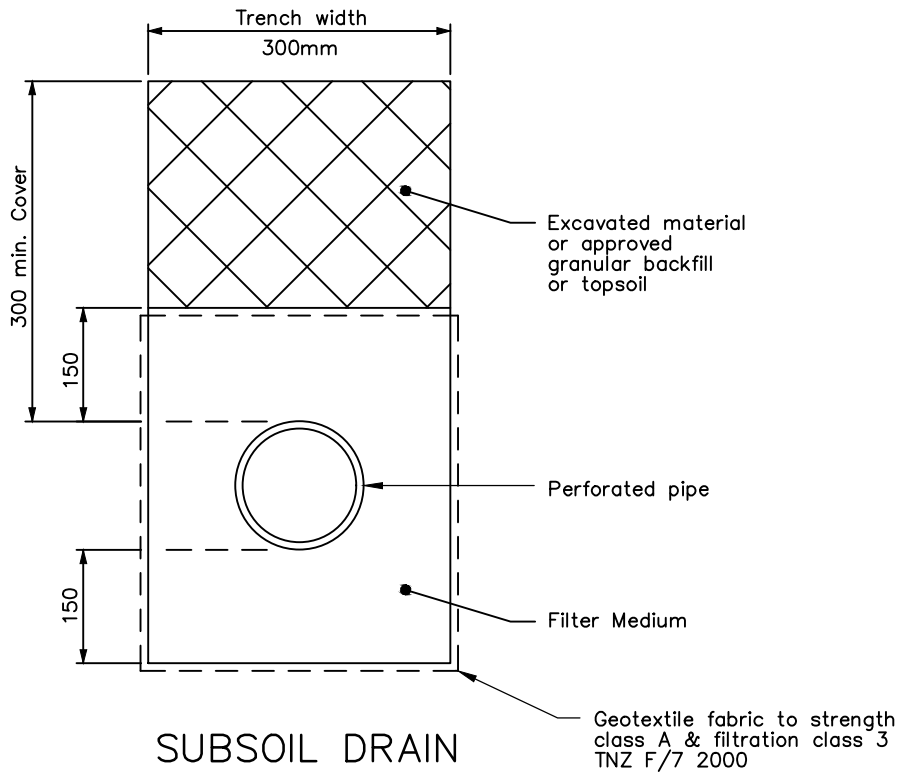
COLLECTOR / LOCAL THROUGH ROAD

Note:

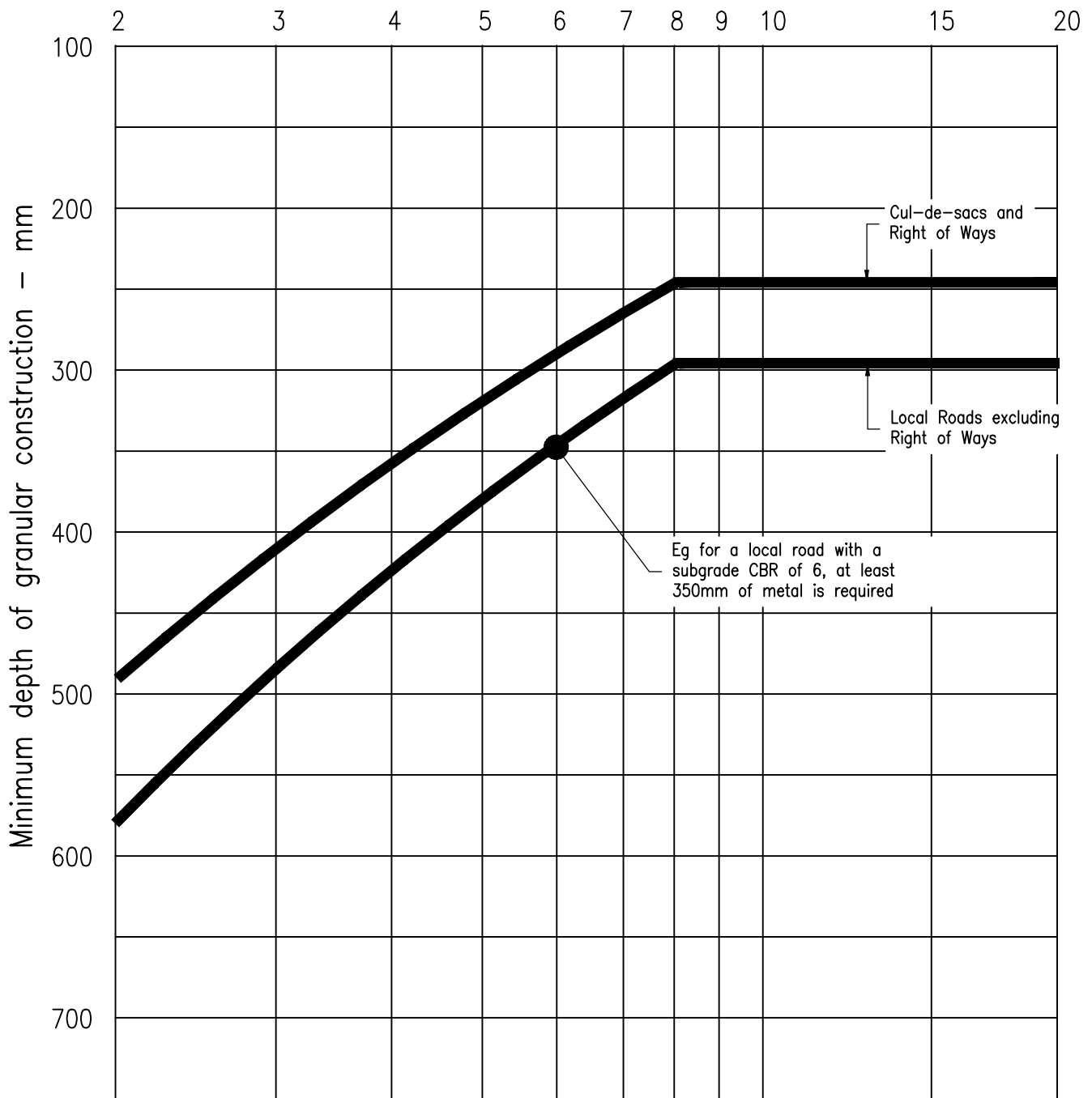
Where a white edgeline is used, this shall be 300mm min. from seal edge



CROSS SECTION

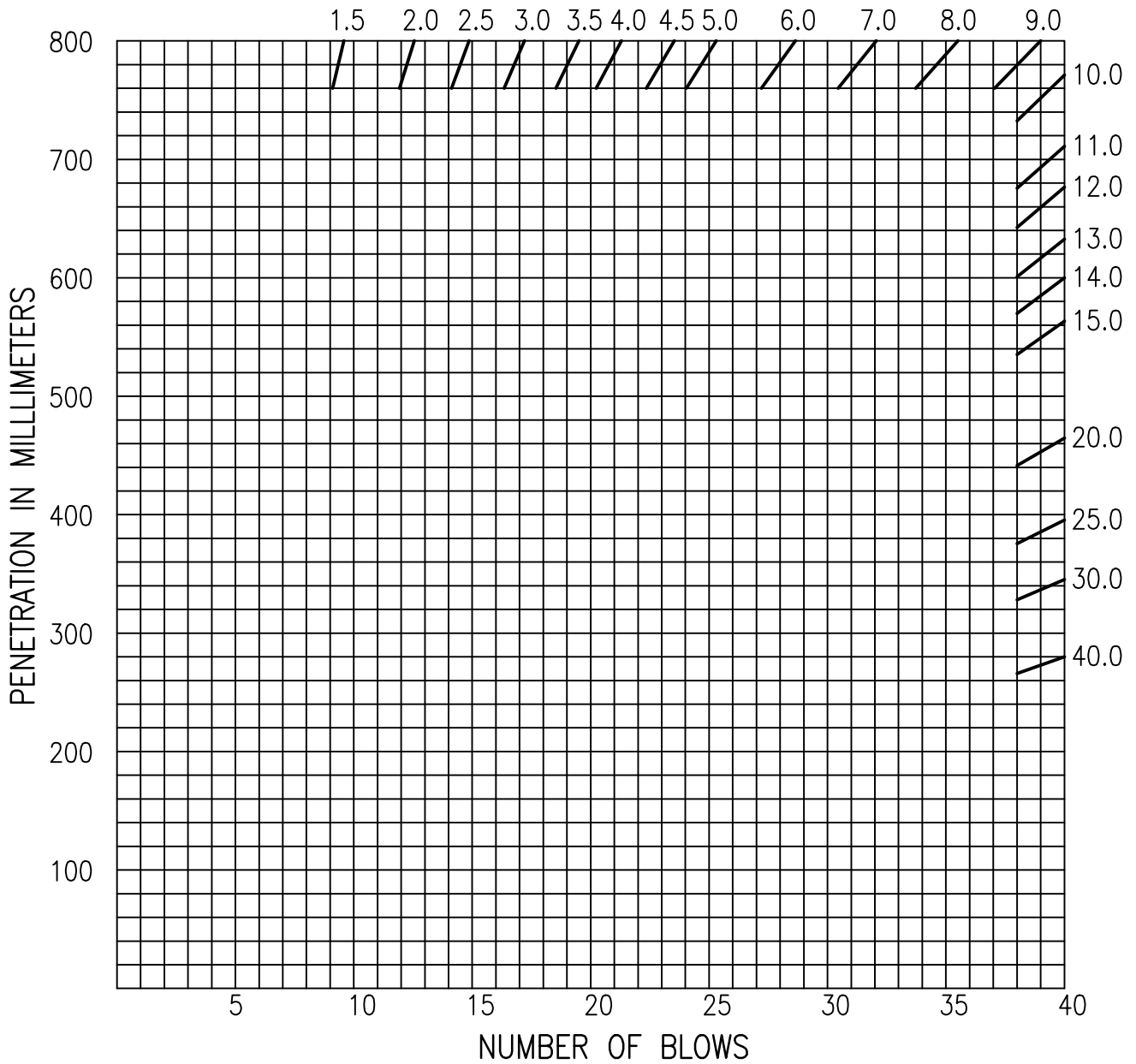


Effective Design CBR (%) for Metal Construction



NOTE:
 For use on Local Roads and Right of Ways
 in non-business/industrial areas only

Correlation of Scala Penetrometer Results With CBR

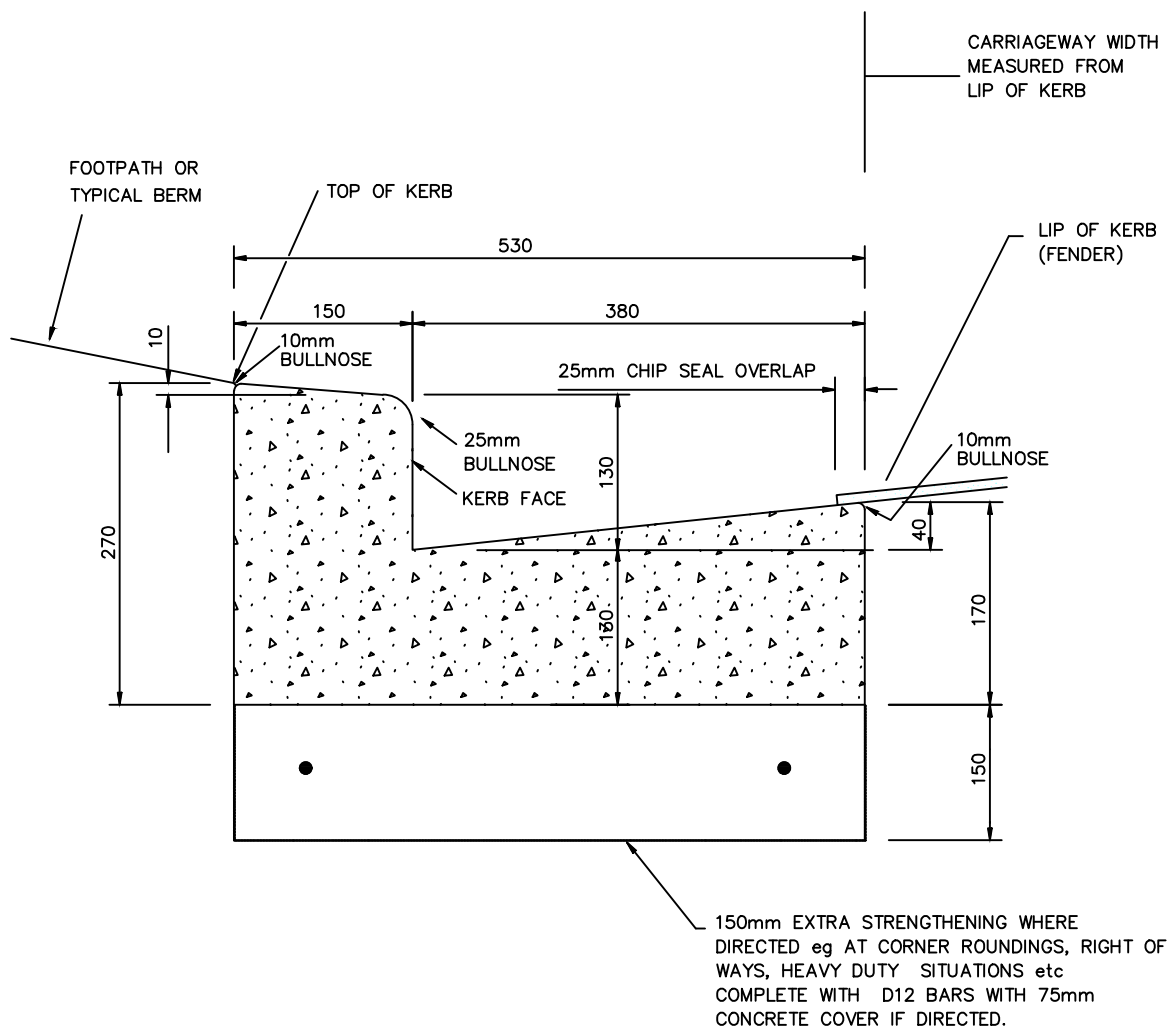


How to use:

1. Plot number of blows per 100mm of depth (penetration)
2. Extend line of best fit through plot points to find approximate CBR

NOTES

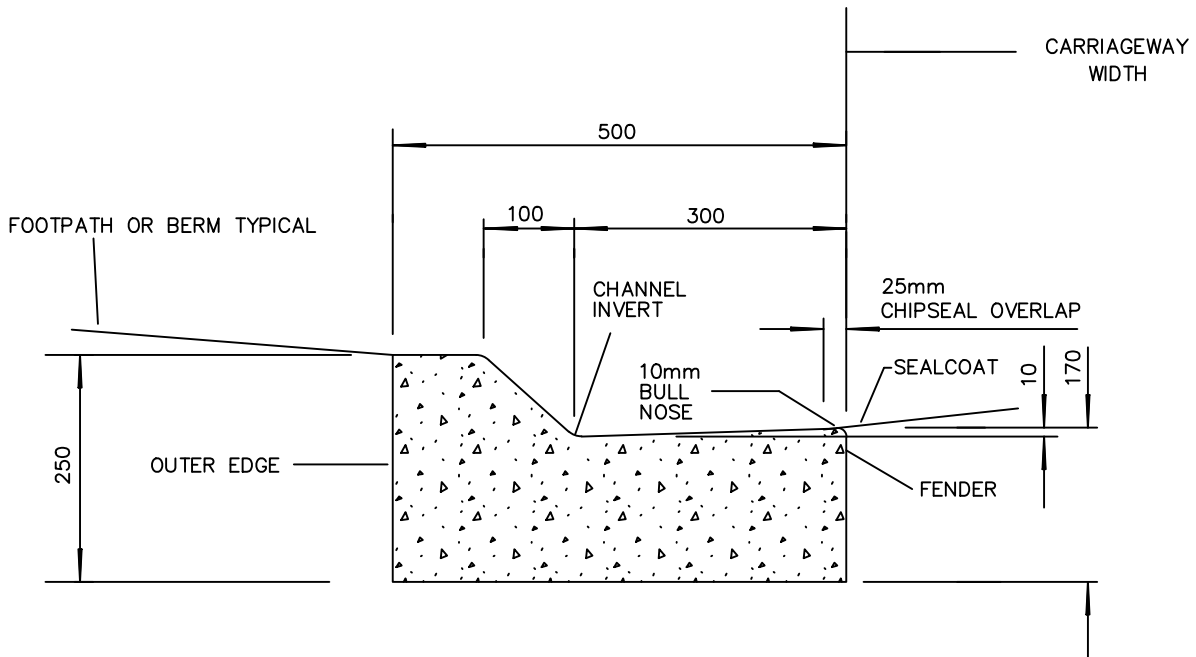
1. Concrete to comply with NZS 3109 : 1997.
2. Slump of concrete 50mm max.
3. Concrete to have a compressive strength of 20 Mpa at 28 days.
4. Kerb levels on plan given to kerb top.
5. Offsets given to kerb face.
6. Sealcoat finished 5mm above level of fender.



ELEVATION

NOTES

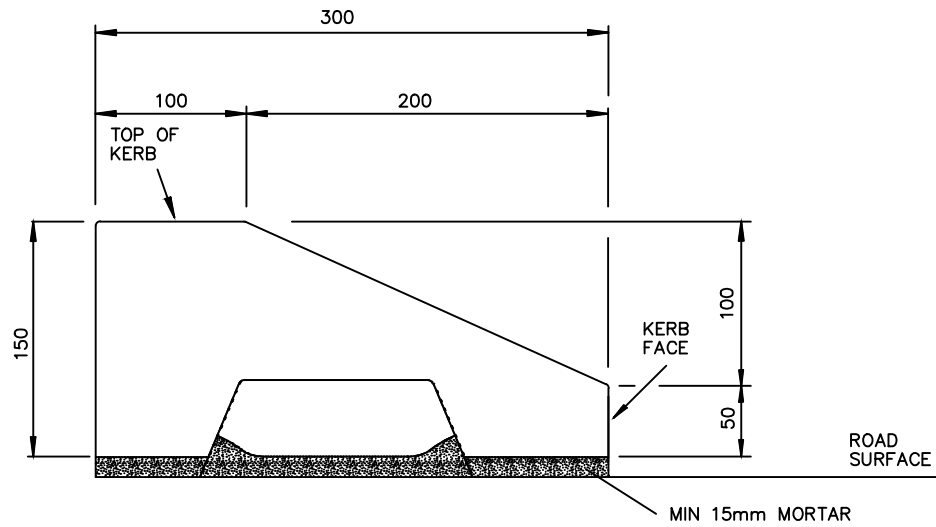
- 1 Concrete to comply with NZS 3109 : 1997.
- 2 Slump of concrete 50mm max.
- 3 Concrete to have a compressive strength of 20 Mpa at 28 days.
- 4 Offset given to channel invert.
- 5 Hotmix finished 5mm above level of fender.



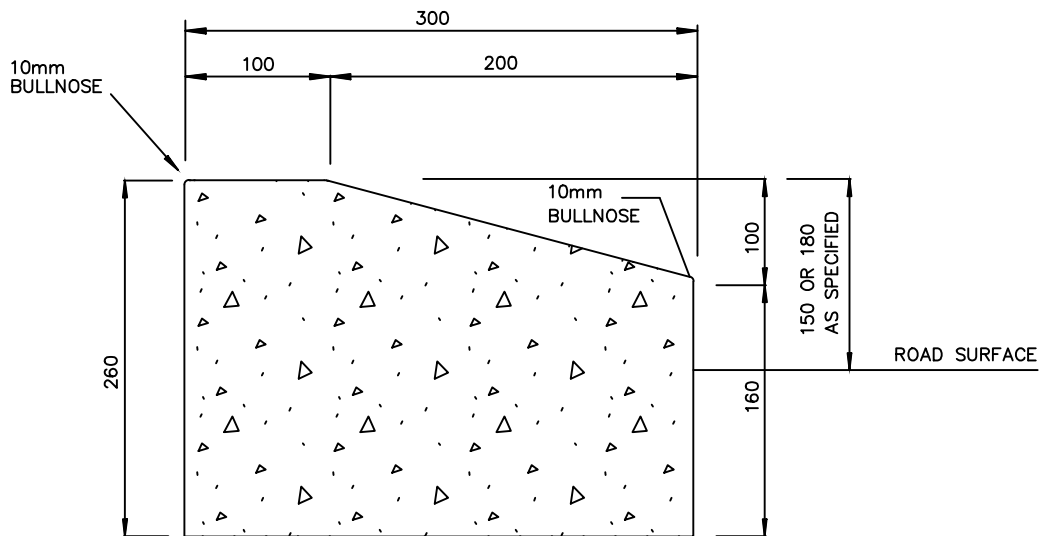
MOUNTABLE KERB AND CHANNEL

NOTES

- 1 Concrete to comply with NZS 3109 : 1997.
- 2 Slump of concrete 50mm max.
- 3 Concrete to have a compressive strength of 20 Mpa at 28 days.
- 4 Kerb levels on plan given to kerb top.
- 5 Offsets given to kerb face.
- 6 Length of block 600mm



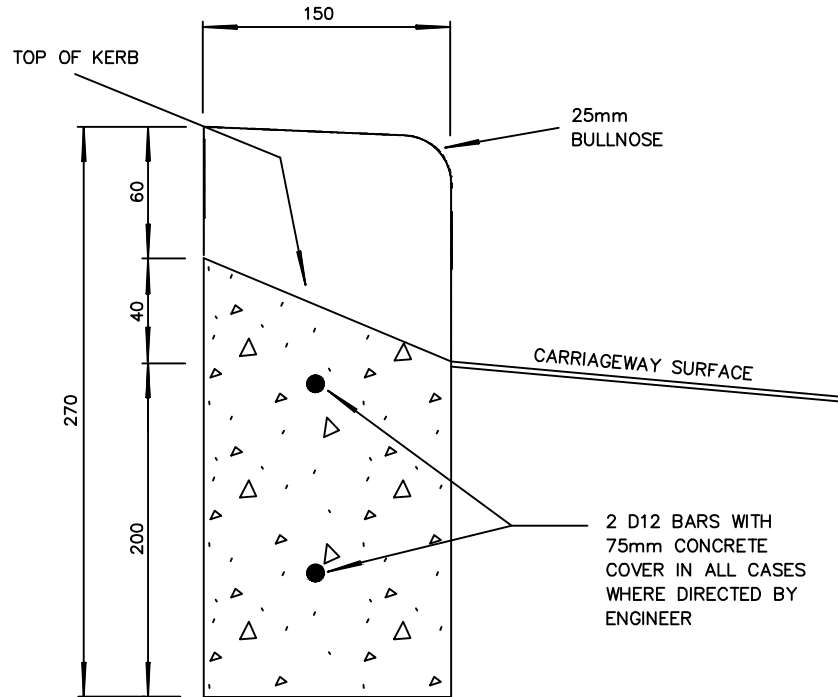
PRECAST MOUNTABLE KERB BLOCKS (TYPICAL)



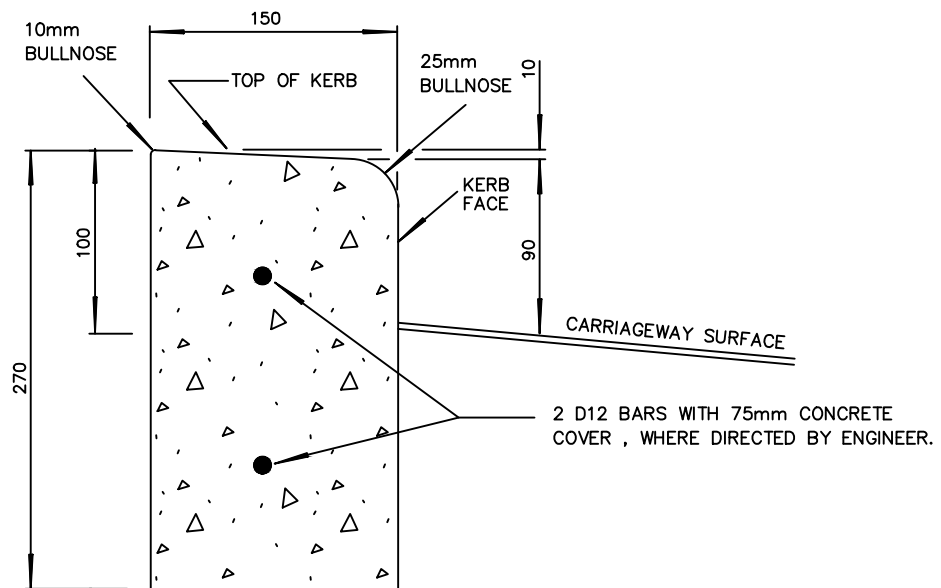
IN SITU MOUNTABLE KERB

NOTES

- 1 Concrete to comply with NZS 3109 : 1997.
- 2 Slump of concrete 50mm max.
- 3 Concrete to have a compressive strength of 20 Mpa at 28 days.
- 4 Kerb levels on plan given to kerb top.
- 5 Offsets given to kerb face.



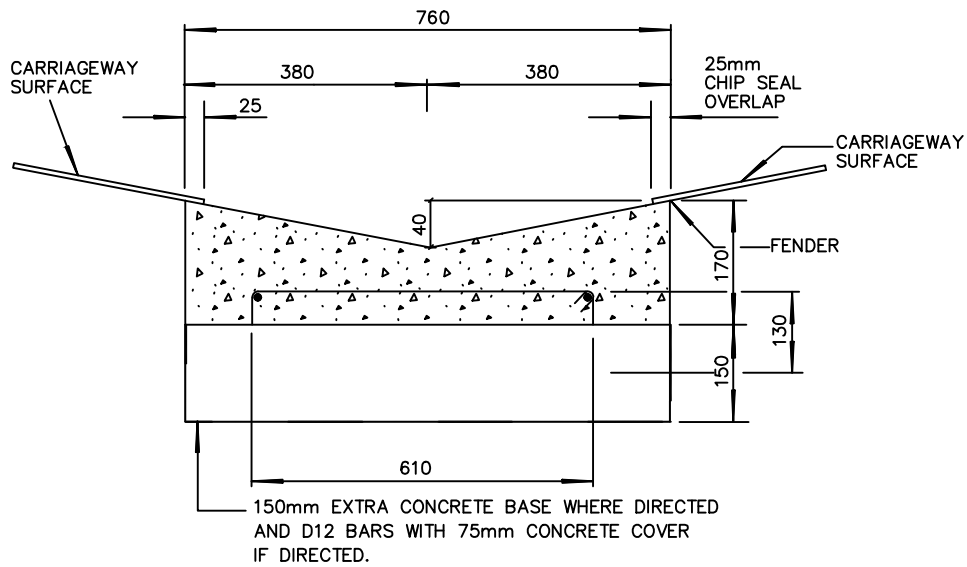
KERB ONLY – VEHICLE CROSSING



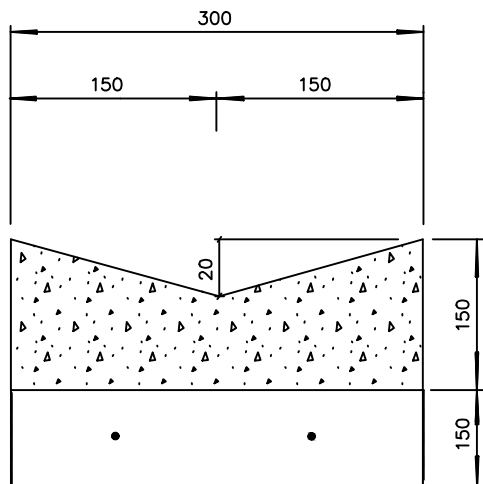
KERB ONLY

NOTES

1. Concrete to comply with NZS 3109 : 1997.
2. Slump of concrete 50mm max.
3. Concrete to have a compressive strength of 20 Mpa at 28 days.
4. Levels for Vee Channels given to fender.
5. Offsets on plans are measured to the invert of the channel.
6. Hotmix finished 5mm above level of fender.



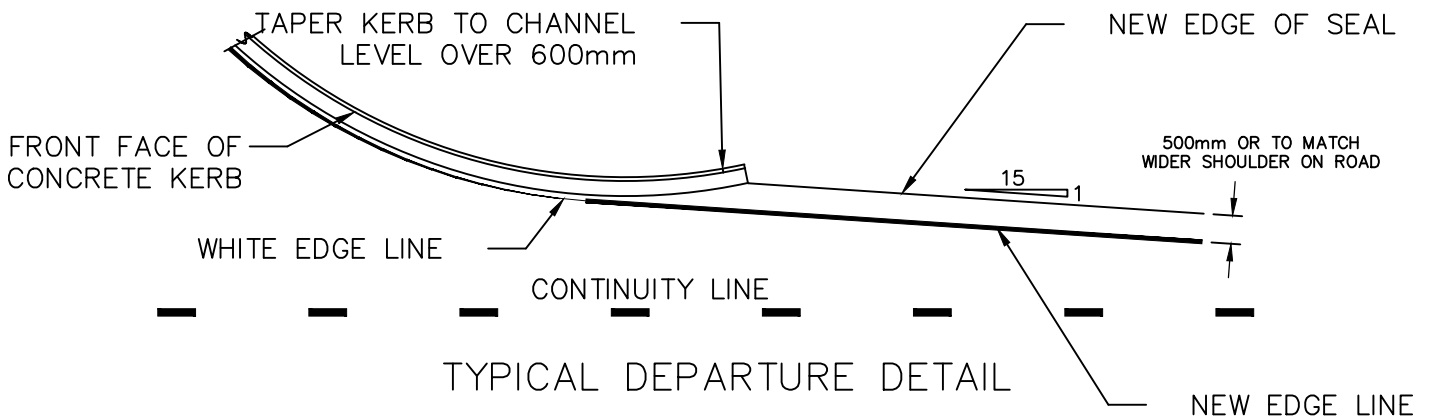
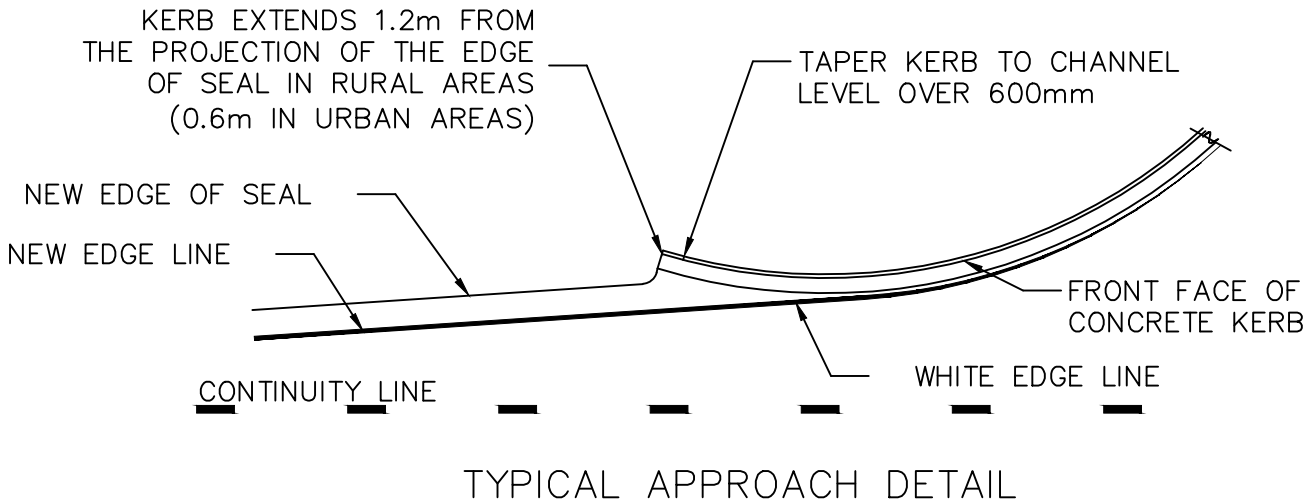
LARGE VEE CHANNEL
(NTS)

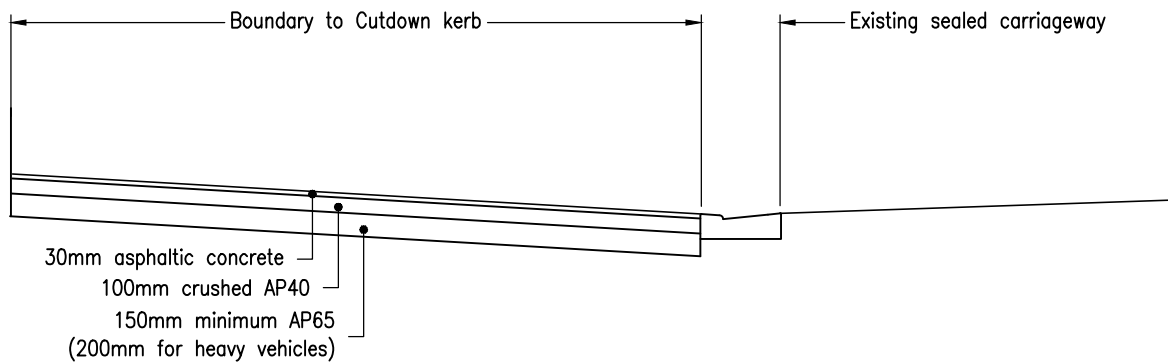


SMALL VEE CHANNEL
(NTS)

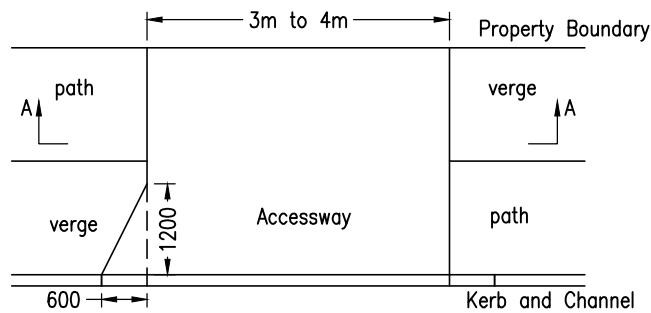
NOTES:

1. Tapers only required in rural areas.
2. Marking only required in rural areas if requested by Council

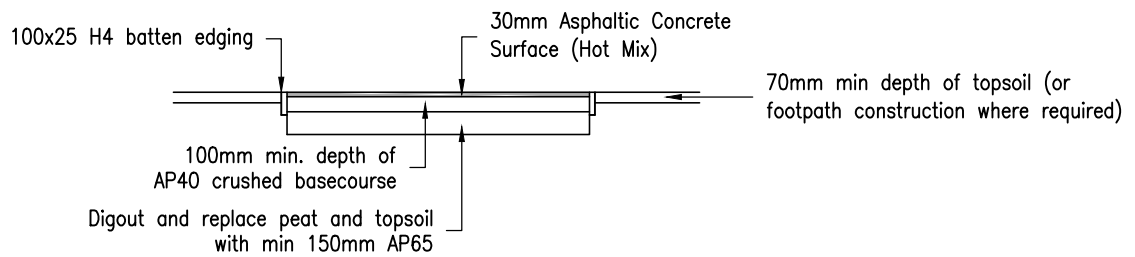




Typical Longsection



Typical Plan



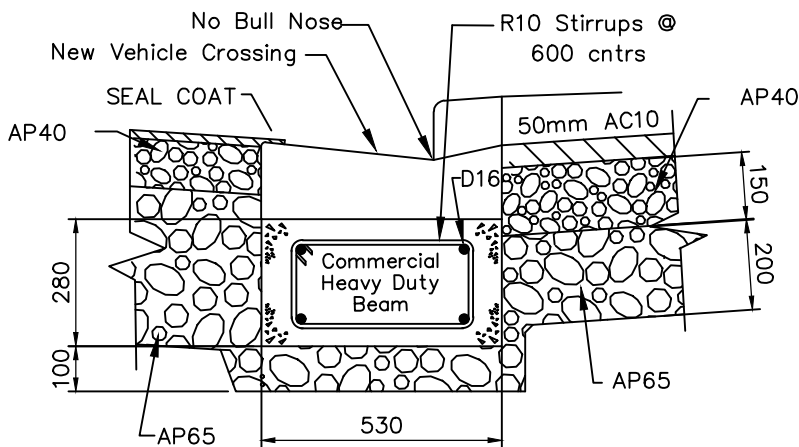
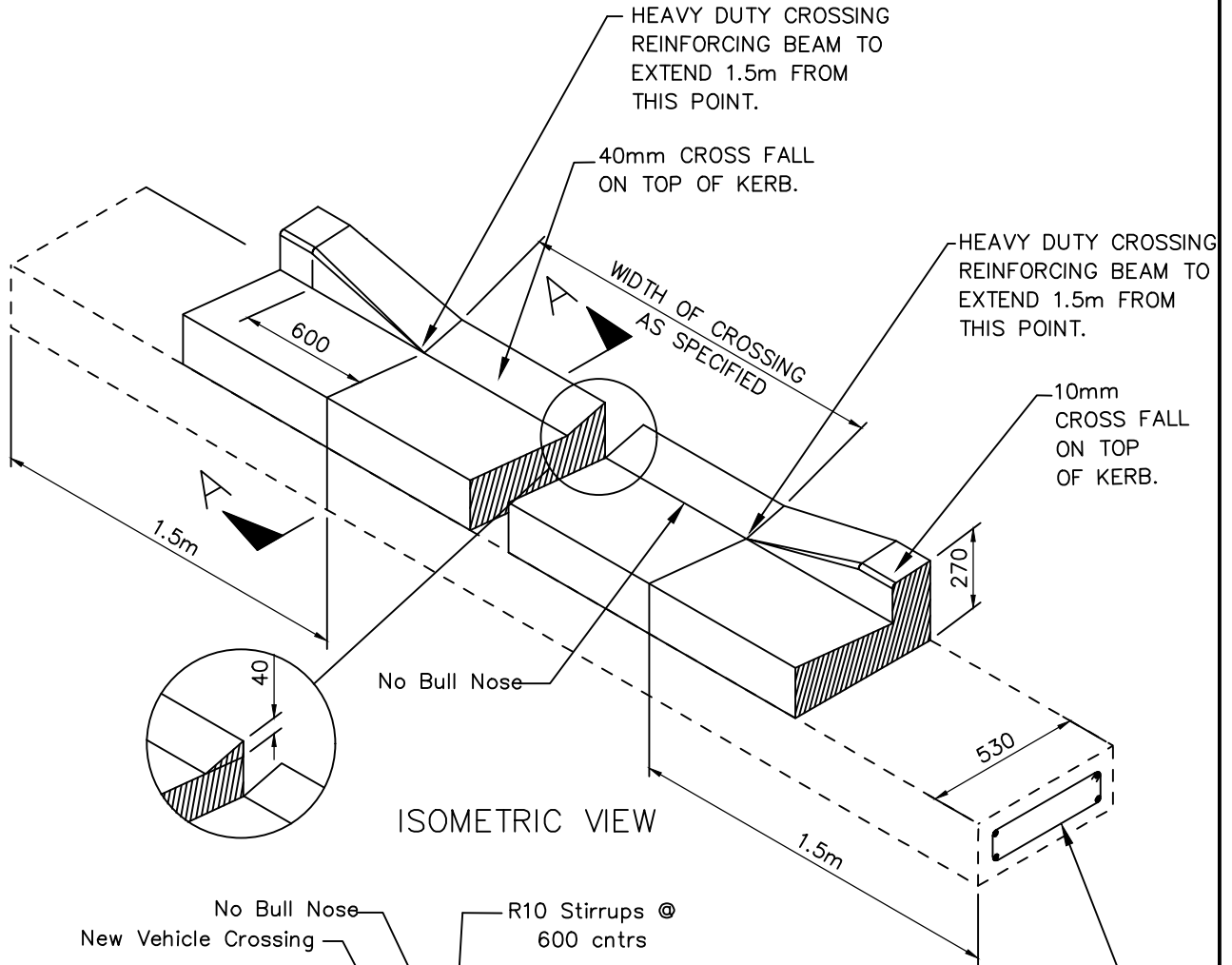
Cross Section A-A

NOTES

1. See notes on sheet R15
2. See also sheets R07 and R14 for kerb strengthening requirements for Right of Way crossing and commercial crossings

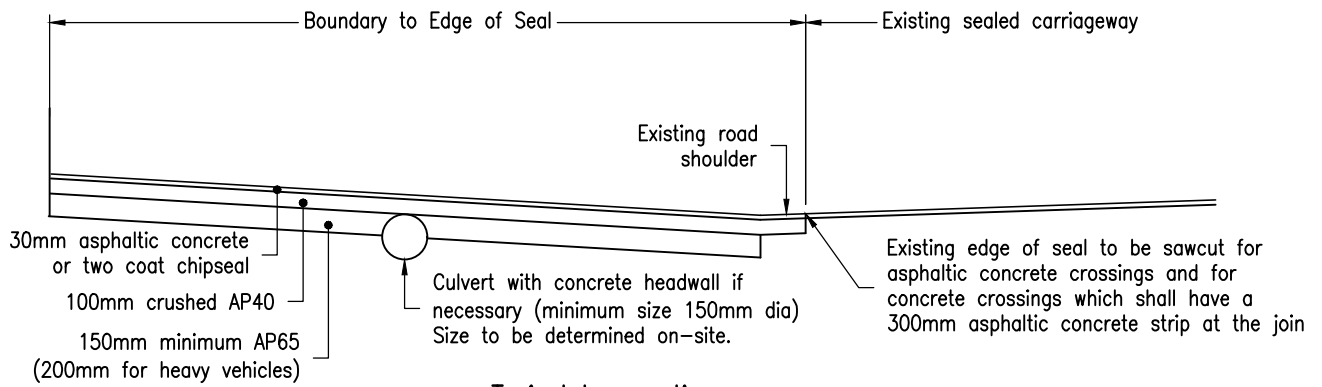
NOTES

1. Concrete to comply with NZS 3109 : 1997.
2. Slump of concrete 50mm max.
3. Concrete to have a compressive strength of 20 Mpa at 28 days.
Kerb levels on plan given to kerb top.
4. Offsets given to kerb face.
5. Minimum compacted depth of basecourse under kerb shall be 130mm or as otherwise approved by the Council.

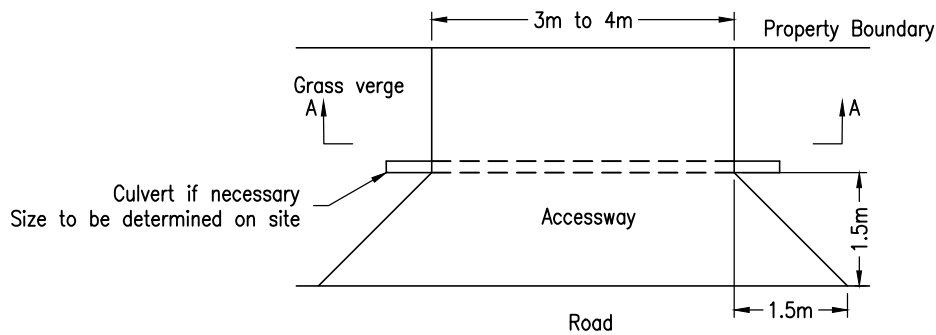


CROSS SECTION A-A
(FOR COMMERCIAL CROSSING ONLY)

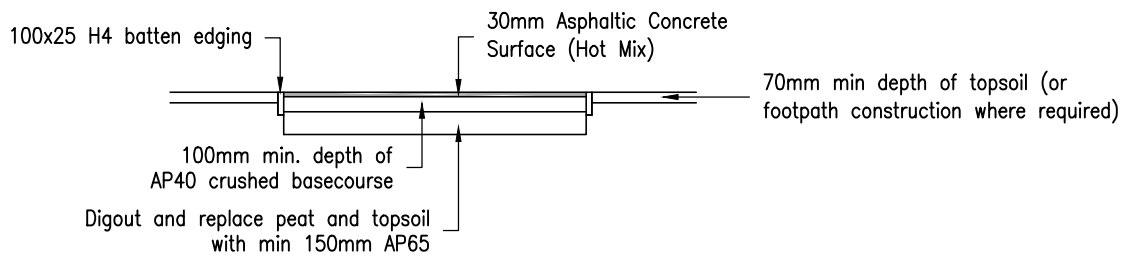
BEAM USED FOR
COMMERCIAL USE
ONLY



Typical Longsection



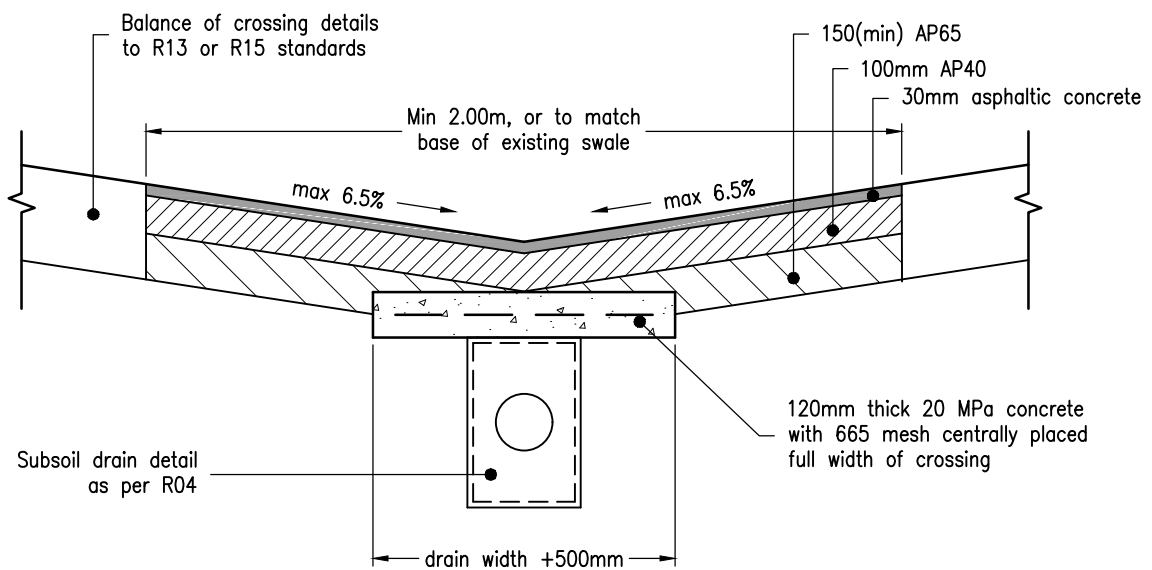
Typical Plan



Cross Section A-A

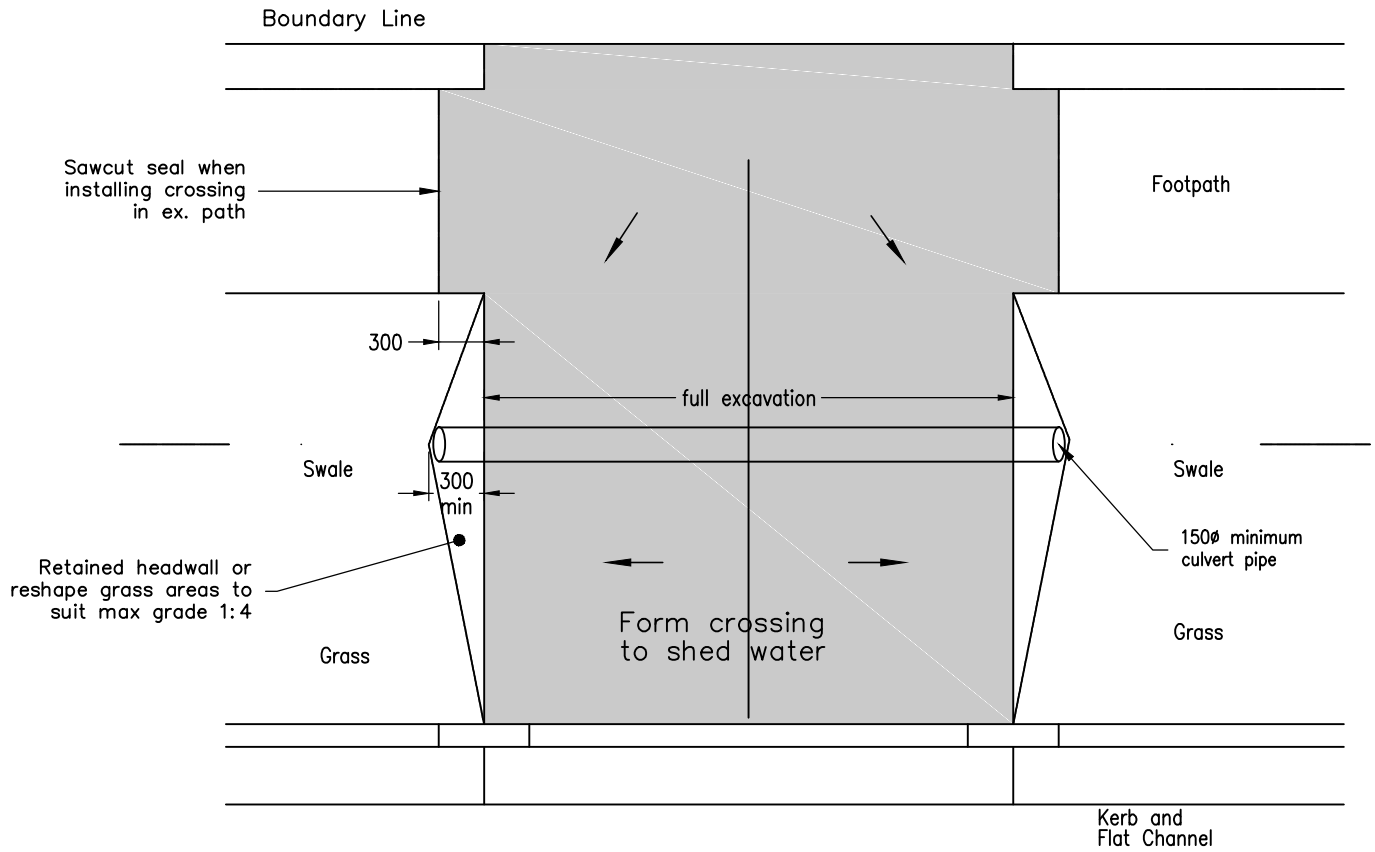
NOTES

1. See also sheet R17
2. Culvert pipes to be heavy duty and trafficable



NOTES

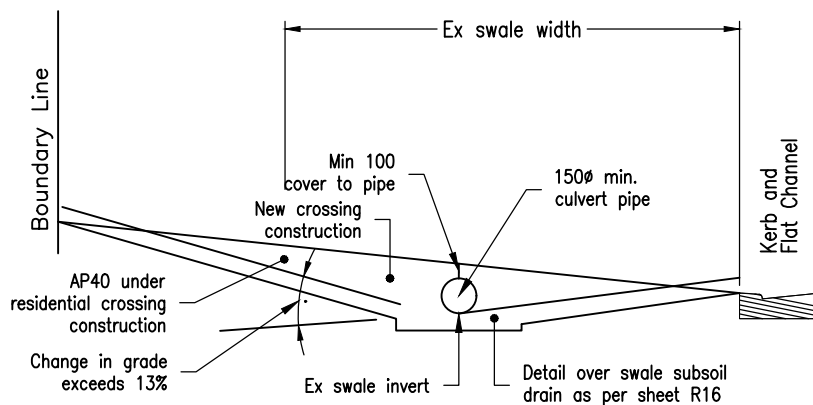
1. Concrete not required where no underswale drain exists. Use 120mm AP65 instead.
2. Shape & invert to match existing swale



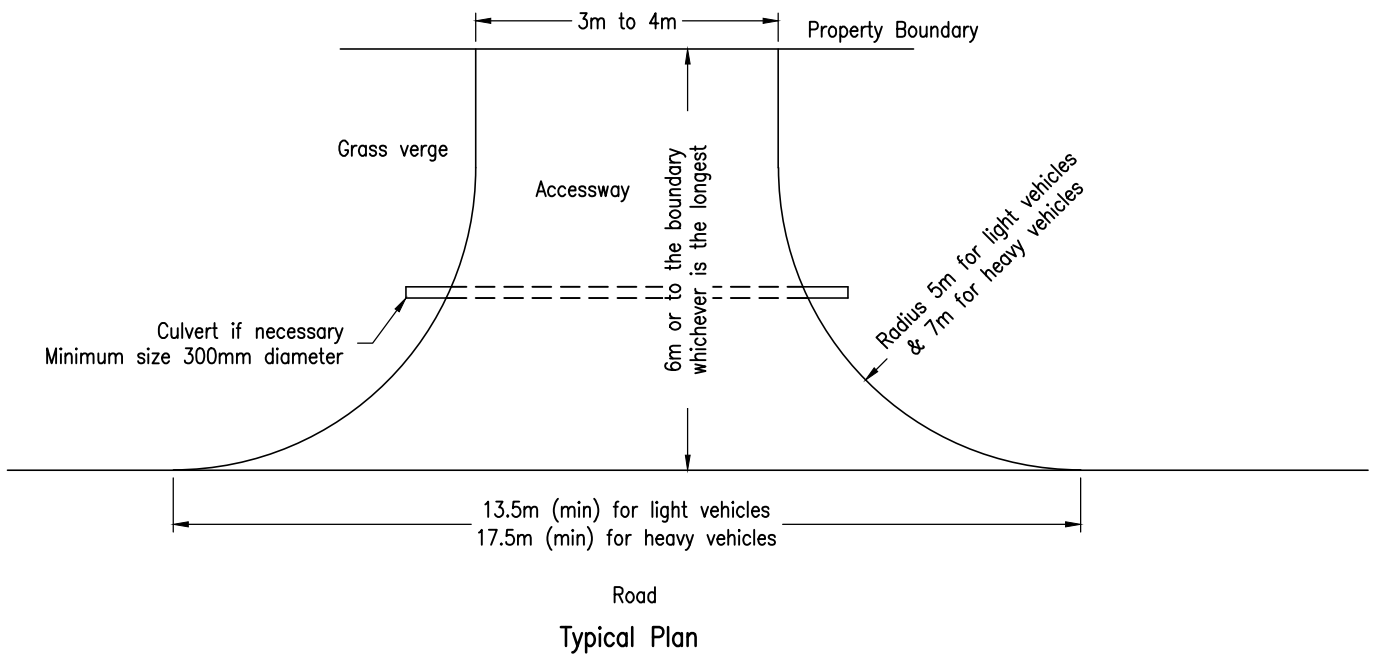
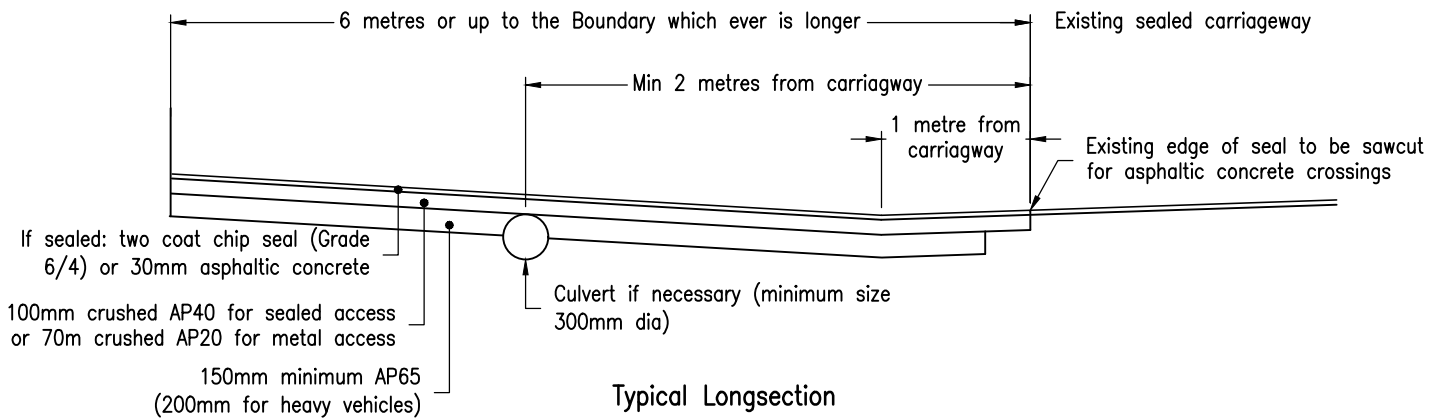
PLAN

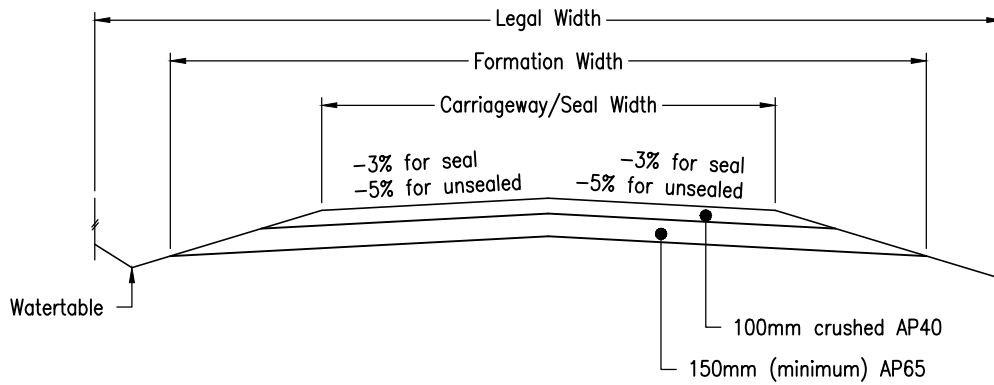
NOTES

1. Culvert materials to be heavy duty trafficable
2. See sheet R15 for pavement depths.

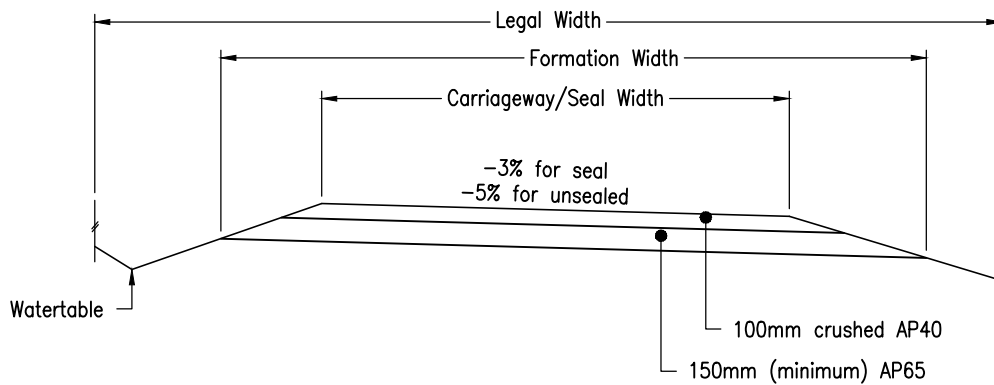


CROSS SECTION

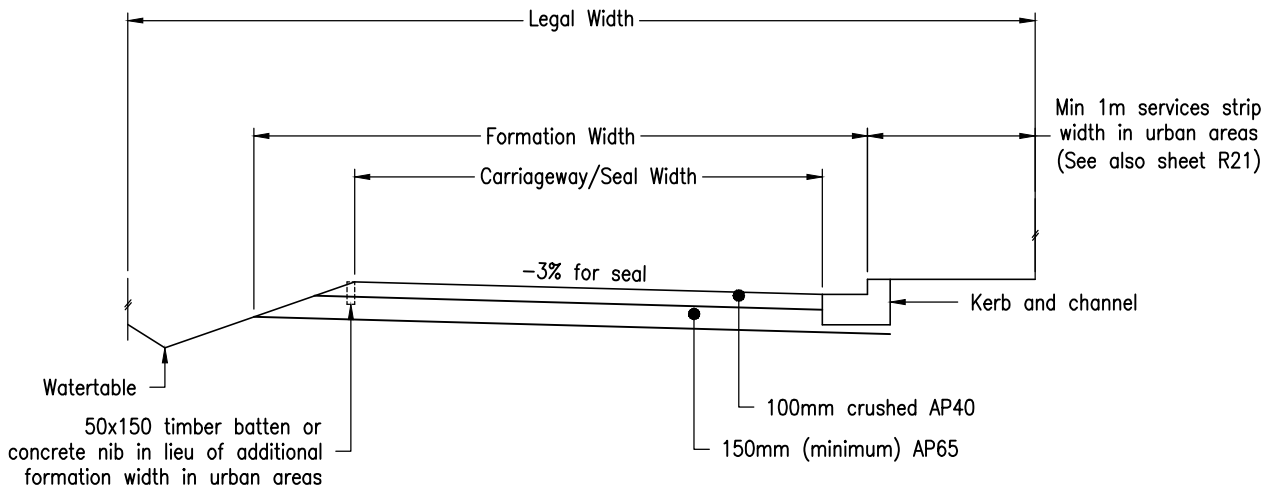




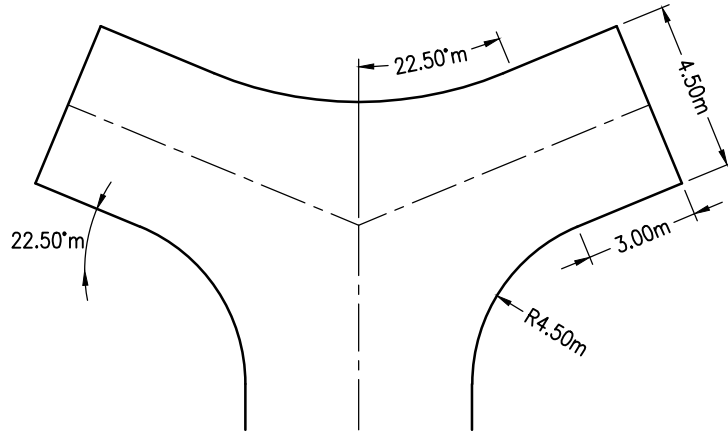
TYPICAL CROSS SECTION R.O.W.
(Normal Camber)



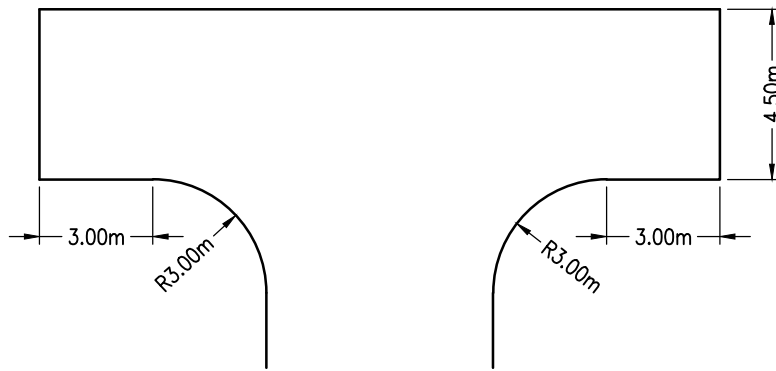
TYPICAL CROSS SECTION R.O.W.
(Single Crossfall)



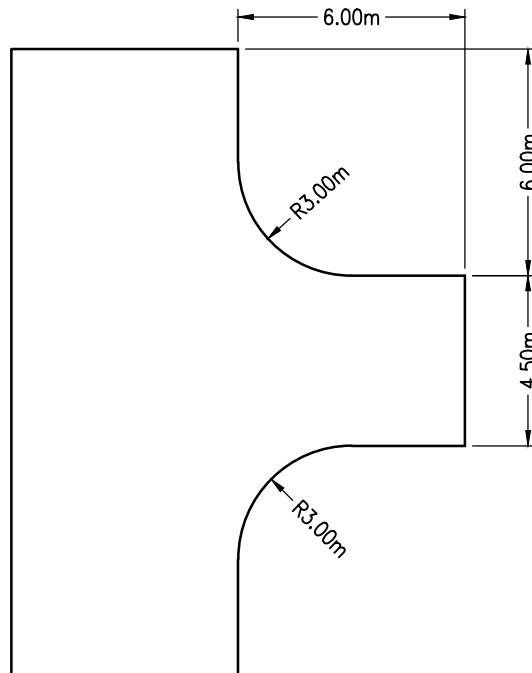
TYPICAL CROSS SECTION R.O.W.
(Alternative for more than 3 sections)



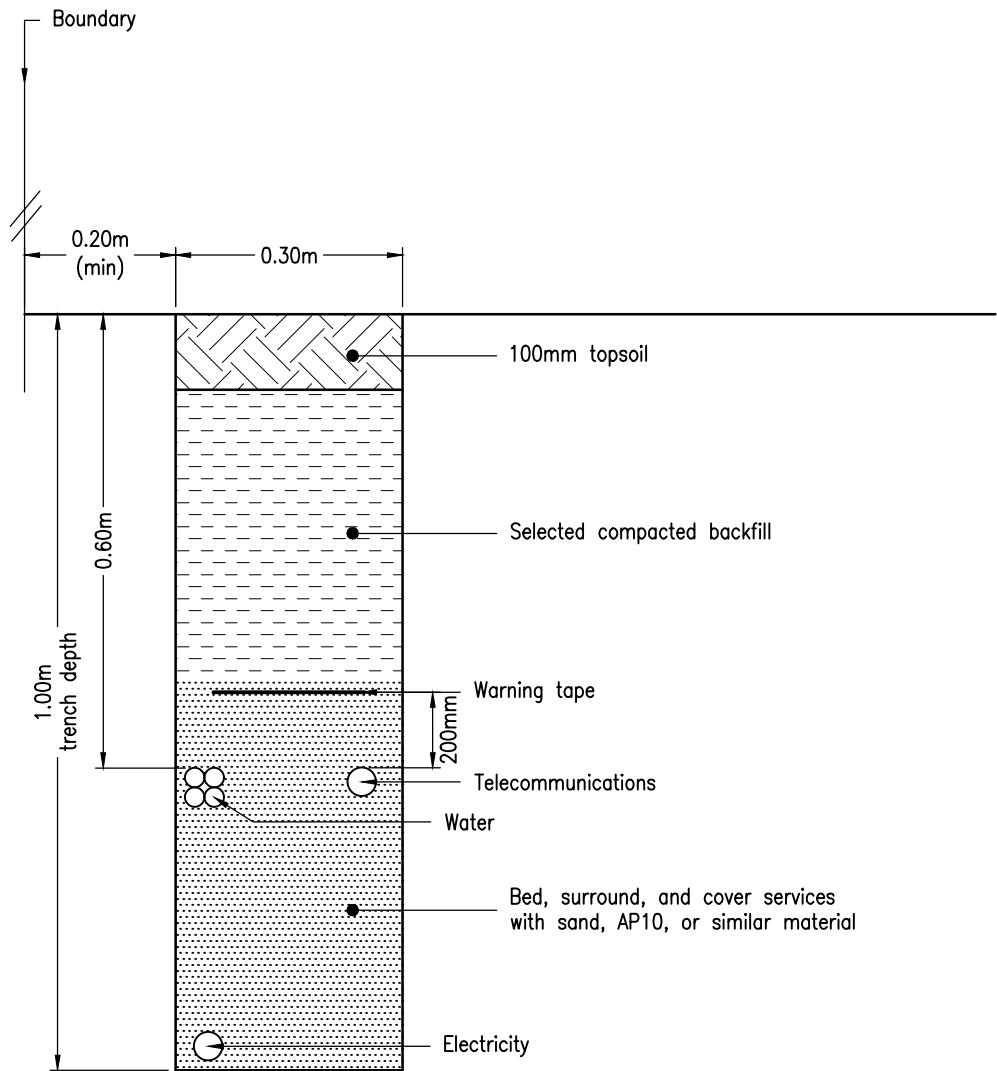
Y TURNING



T TURNING

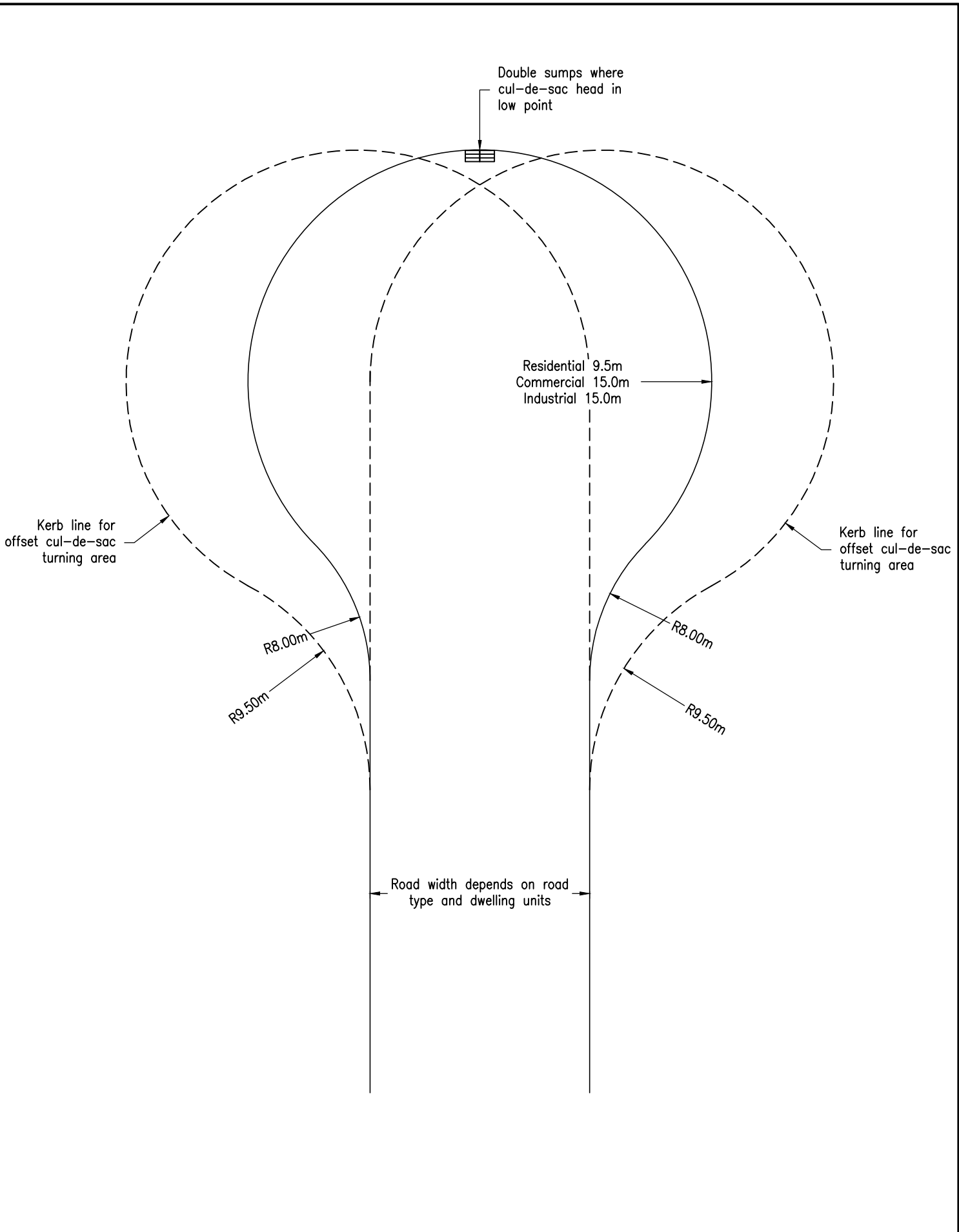


L TURNING

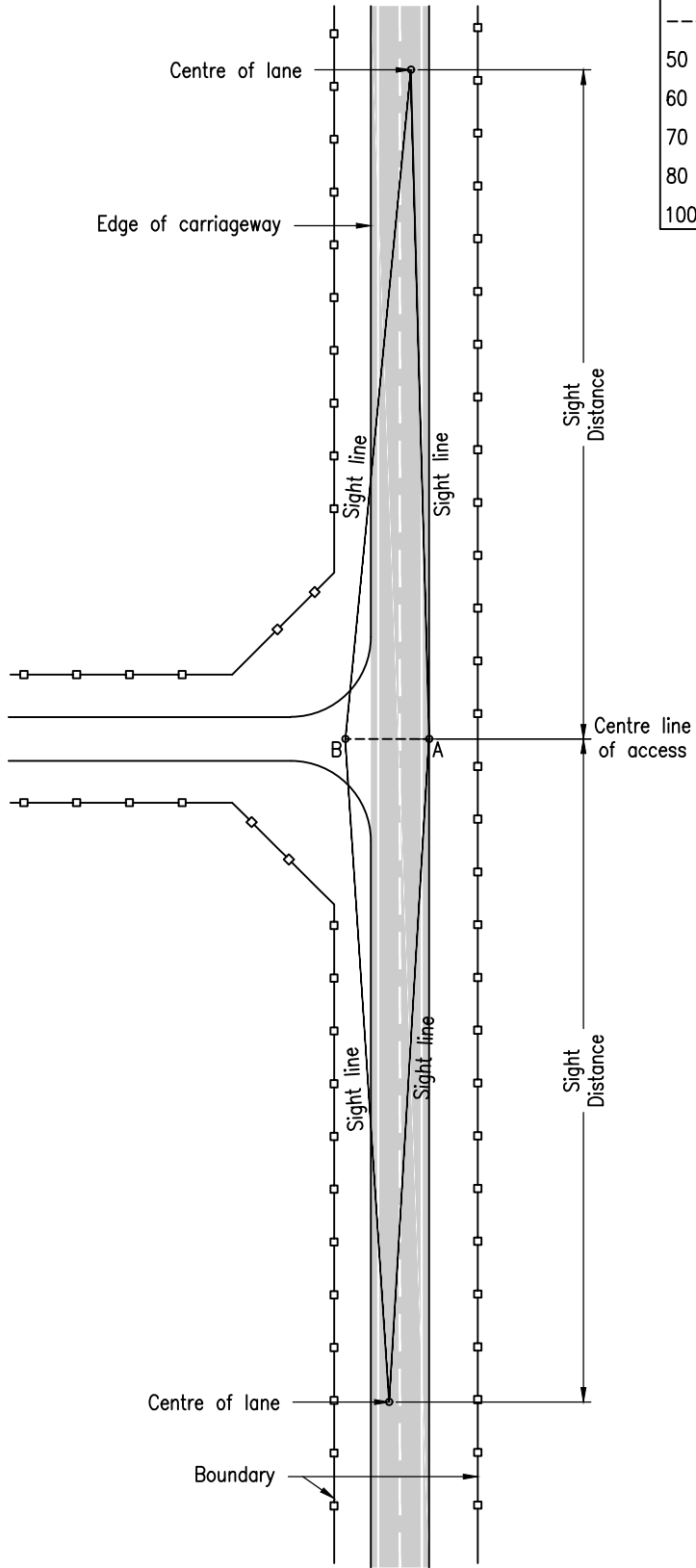


NOTES

1. Locate services clear of pavements and swales.
2. Services under pavements and kerbs to be ducted.
3. See also sheet R19.



| Posted Legal Speed Limit | Minimum sight distance (m) | | |
|--------------------------|----------------------------|----------------|----------------------------------|
| | Local Road | Collector Road | District/Strategic arterial road |
| 50 | 40 | 45 | 75 |
| 60 | 55 | 65 | 95 |
| 70 | 70 | 85 | 115 |
| 80 | 105 | 105 | 140 |
| 100 | 160 | 160 | 195 |



- Point A Edge of carriageway
- Point B 3.5 metres from edge of carriageway

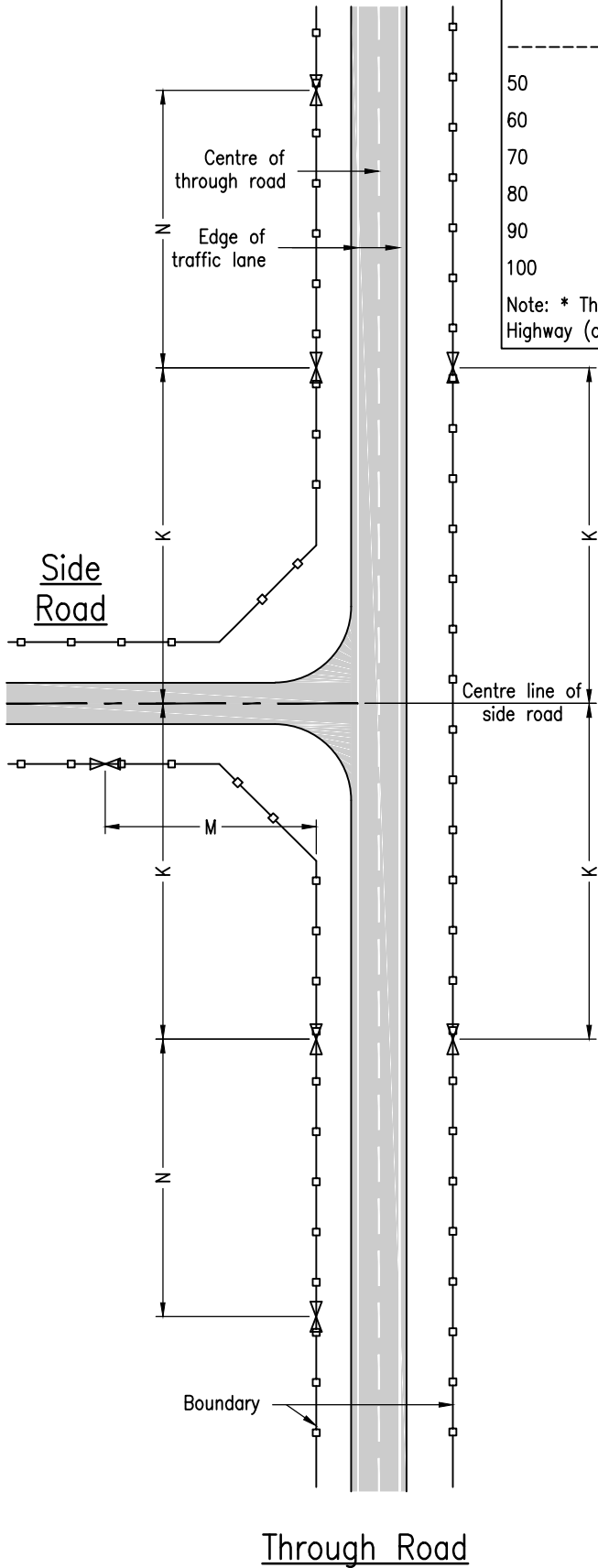
NOTES

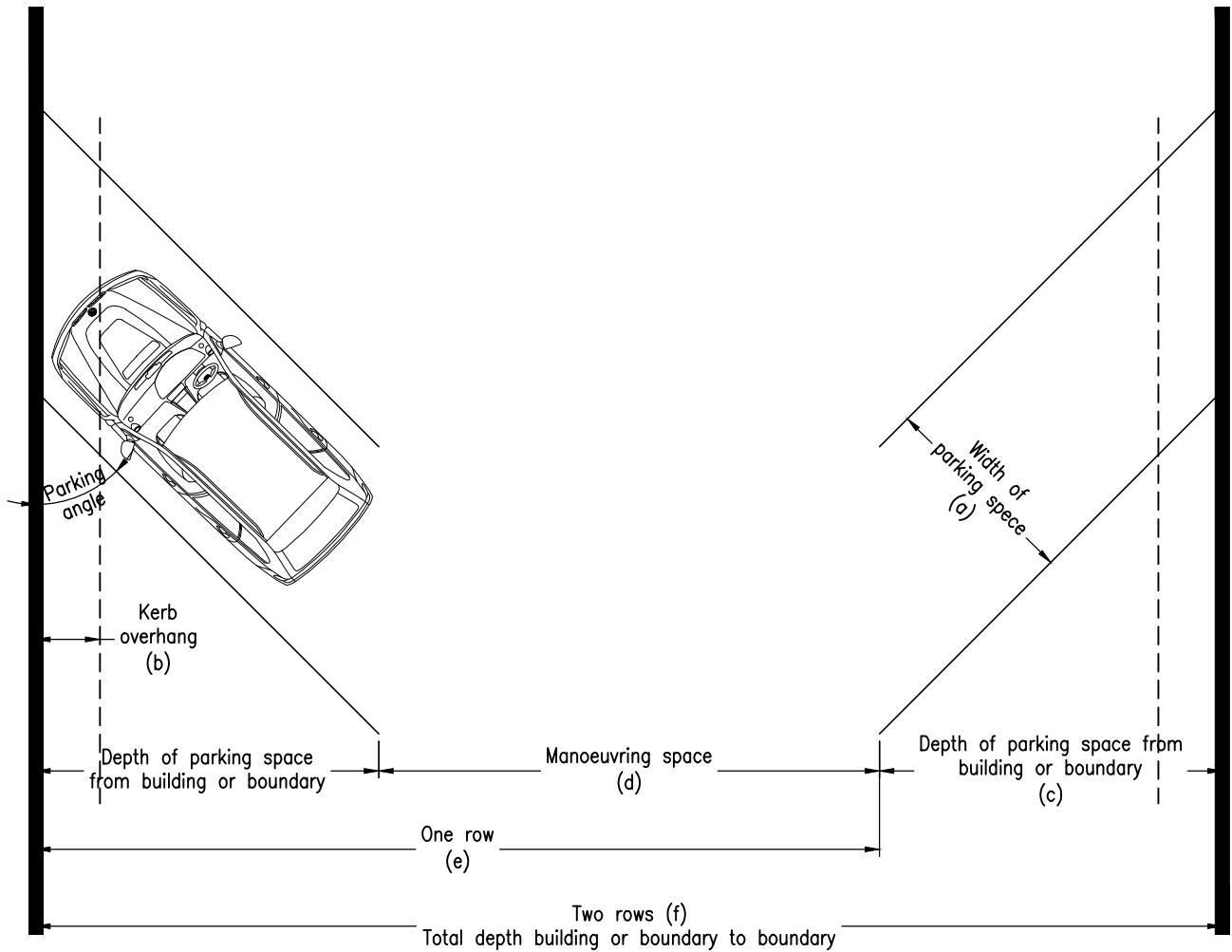
Site distances shall be measured from a point 1.15m (motorists eye level) above finished surface of the access crossing place and 1.15 above the road surface.

There shall be no obstructions to visibility inside the area bounded by the sight lines

| Posted Legal Speed Limit | Location of property relative to intersection | | Minimum spacing between adjacent property access (on same or opposite frontages) – distance N (m) |
|--------------------------|---|---------------------------------|---|
| | Minimum distance K(m) | Minimum side road distance M(m) | |
| 50 | 30 | 20 | – |
| 60 | 30 | 20 | – |
| 70 | 100 | 45 | 40 |
| 80 | 100 | 45 | 100 |
| 90 | 200 | 60 | 200 |
| 100 | 200 | 60 | 200* |

Note: * There will be no more than 5 individual accesses along any 1km section of State Highway (on both sides) measured 500m either side of a proposed access.





Manoeuvring and Parking Space Dimensions (all dimensions in metres)

| Parking angle | Width of parking space (a) | Kerb overhang (b) | Depth of parking space (c) | Manoeuvring space (d) | Total depth | |
|------------------|----------------------------|-------------------|----------------------------|-----------------------|-------------|--------------|
| | | | | | One row (e) | Two rows (f) |
| 90 degree | 2.7 | 1.0 | 5.0 | 6.6 | 11.6 | 16.6 |
| 60 degree | 2.7 | 0.8 | 5.4 | 3.5 | 9.7 | 13.9 |
| 45 degree | 2.7 | 0.7 | 5.0 | 3.5 | 8.5 | 13.5 |
| 30 degree | 2.5 | 0.7 | 5.0 | 3.8 | 8.8 | 13.8 |
| parallel parking | 6.6 | n/a | 2.5 | 3.0 one way | 5.5 | n/a |
| | | | | 5.5 two way | 8.0 | 10.5 |
| Notes: | | | | | | |

1. Spaces adjacent to walls or columns should be 300mm wider.

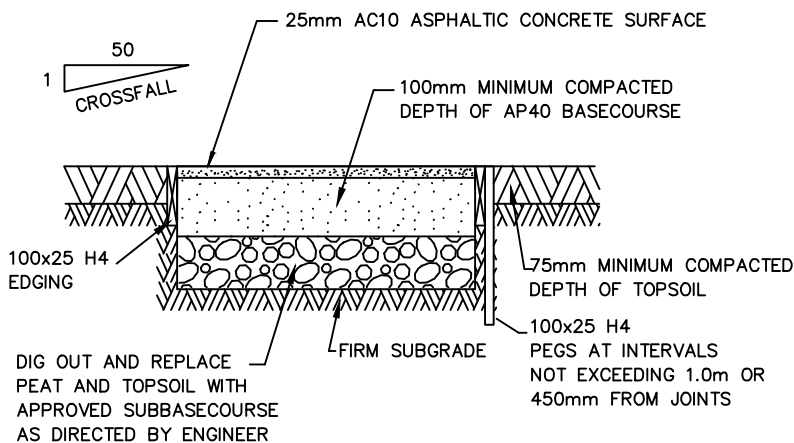
2. One-way traffic is assumed for angle spaces.

3. Carparks shall have a minimum height of at least 2.3m, except where special provision is made to divert over height vehicles, in which case the minimum height may be reduced to 2.1m.

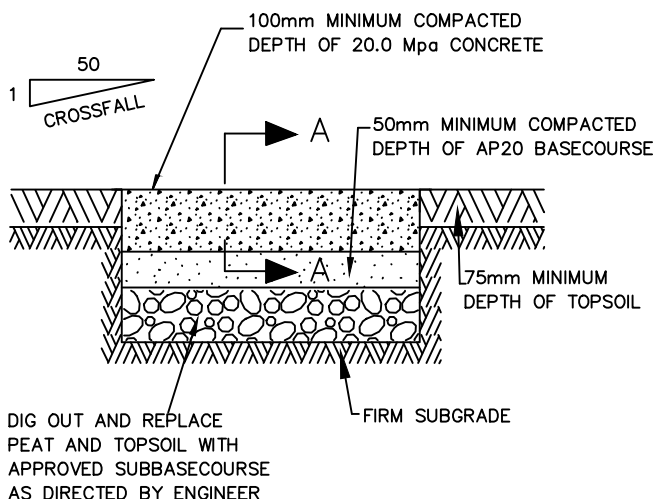
4. For all retailing and wholesale trading activities, the minimum parking space width shall be 2.6m.

NOTES

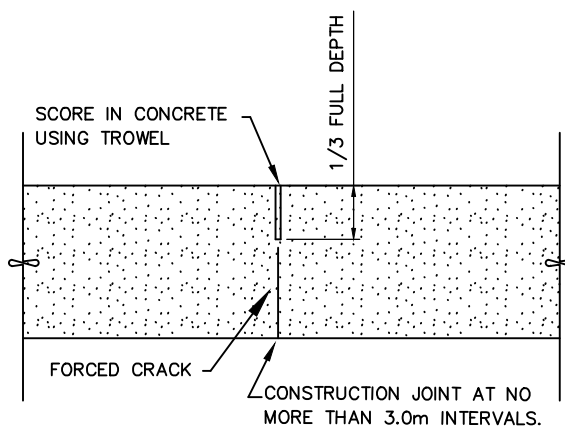
1. All concrete from special Grade Plant to comply with NZS 3104:2003 Specification for High & Special Grade concrete production
2. Max of 80mm concrete slump.
3. Min of 20.0Mpa concrete
4. Concrete construction to comply with NZS 3109:1997 Concrete Construction.
5. Asphaltic concrete to comply with TNZ M/1, P/9



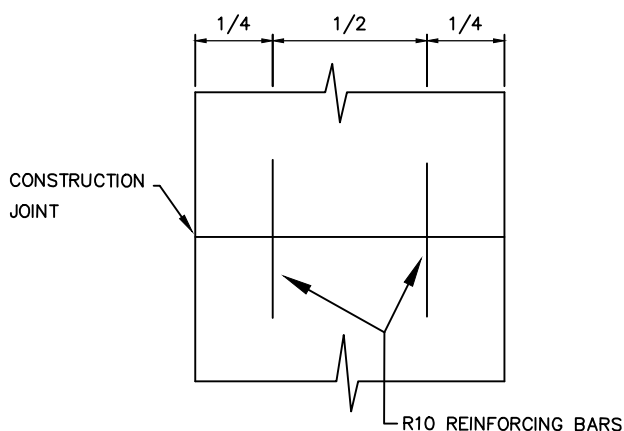
ASPHALTIC CONCRETE
CROSS-SECTION



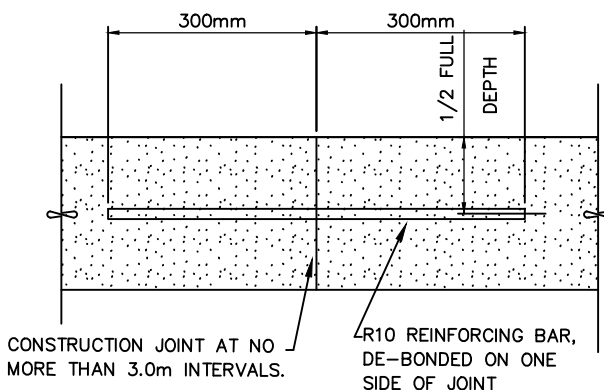
CONCRETE
CROSS-SECTION



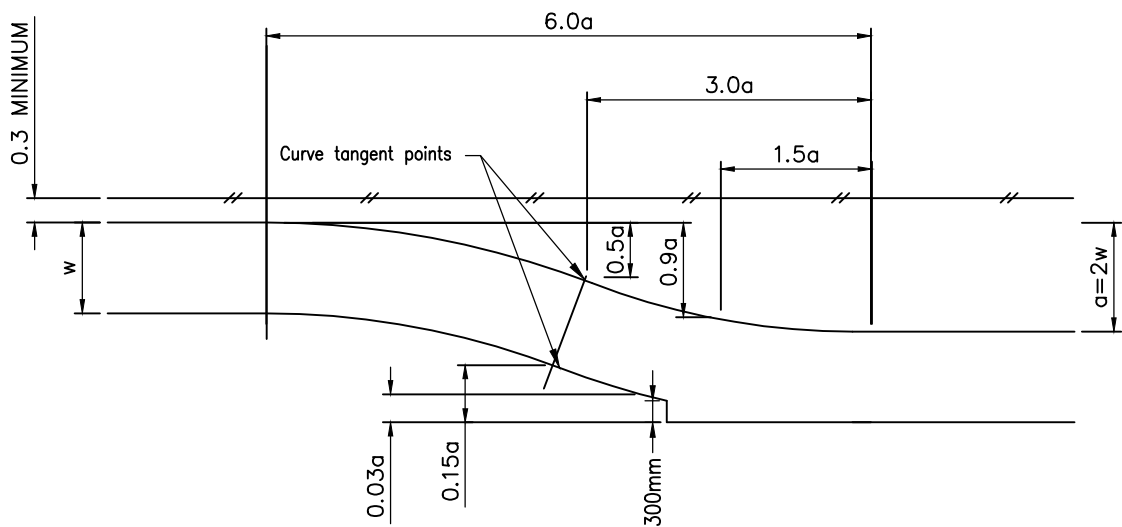
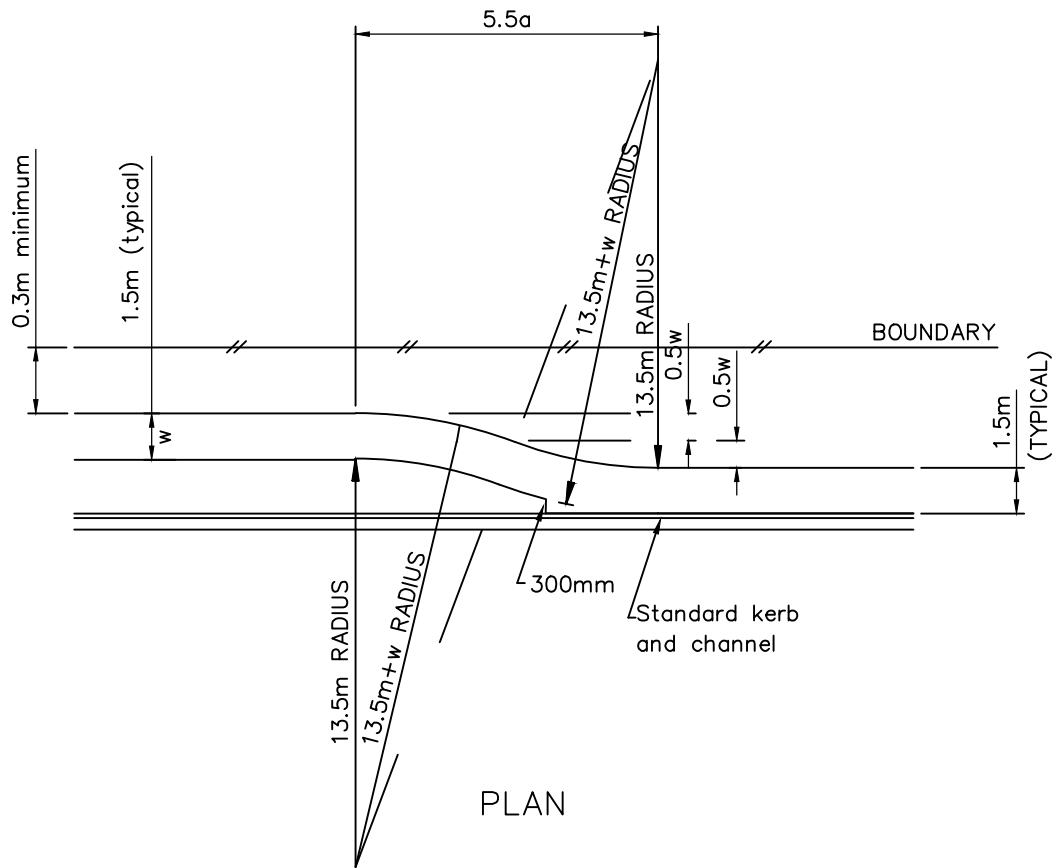
SECTION A-A
JOINT FOR CONTINUOUS POUR



CONCRETE FOOTPATH
PLAN

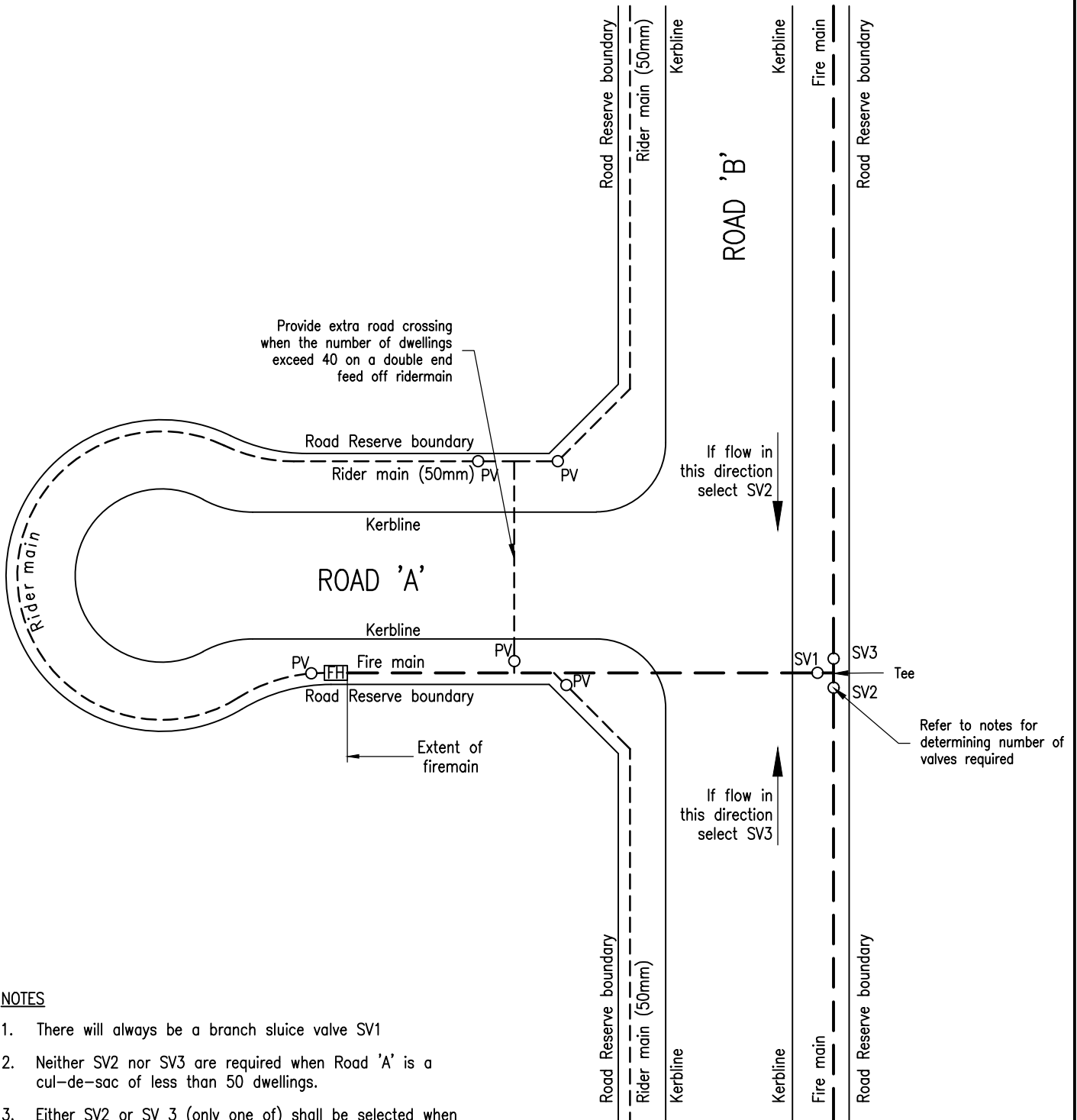


SECTION A-A
JOINT FOR END OF CONTINUOUS
POUR OR POUR IN ALTERNATE BAYS



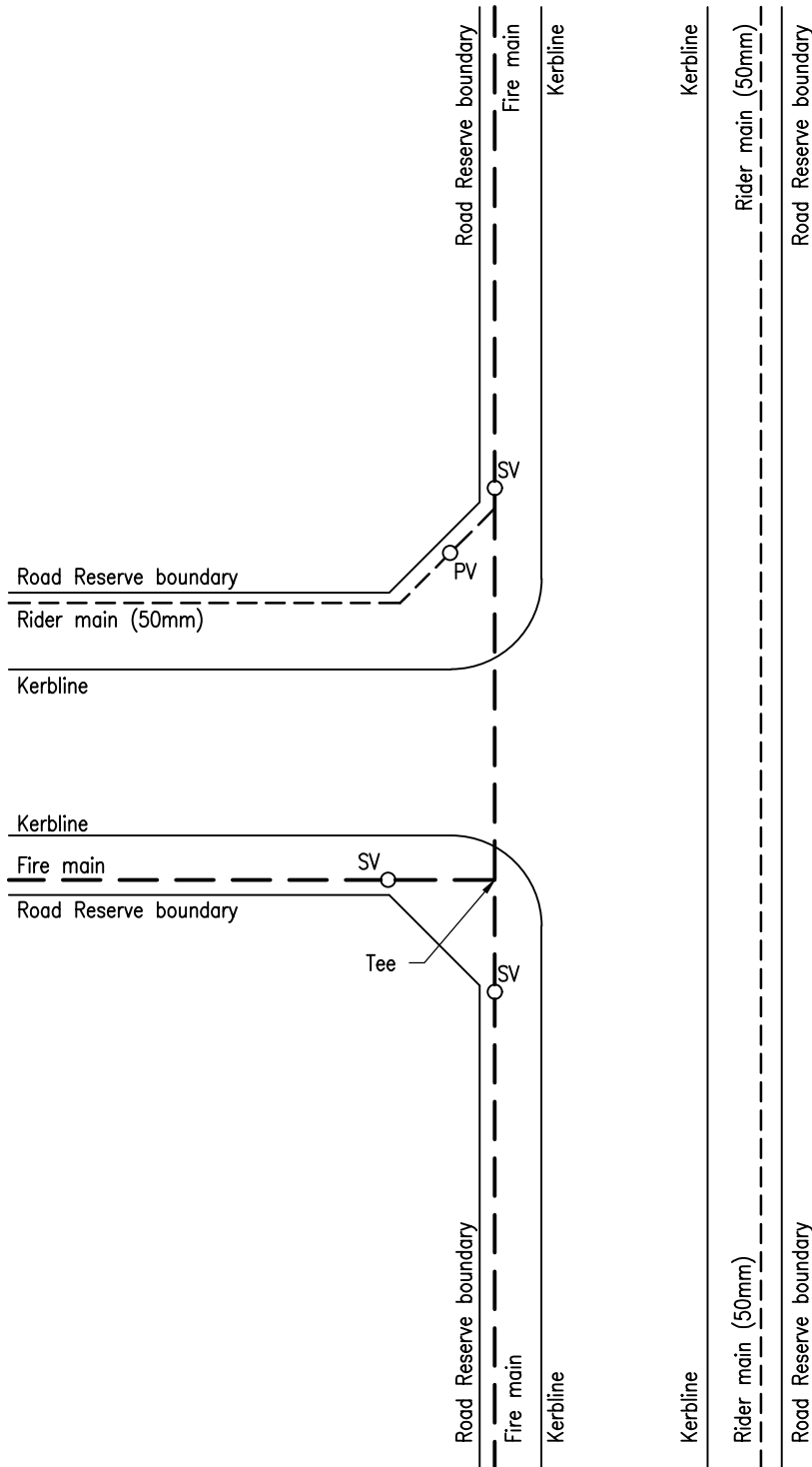
NOTES

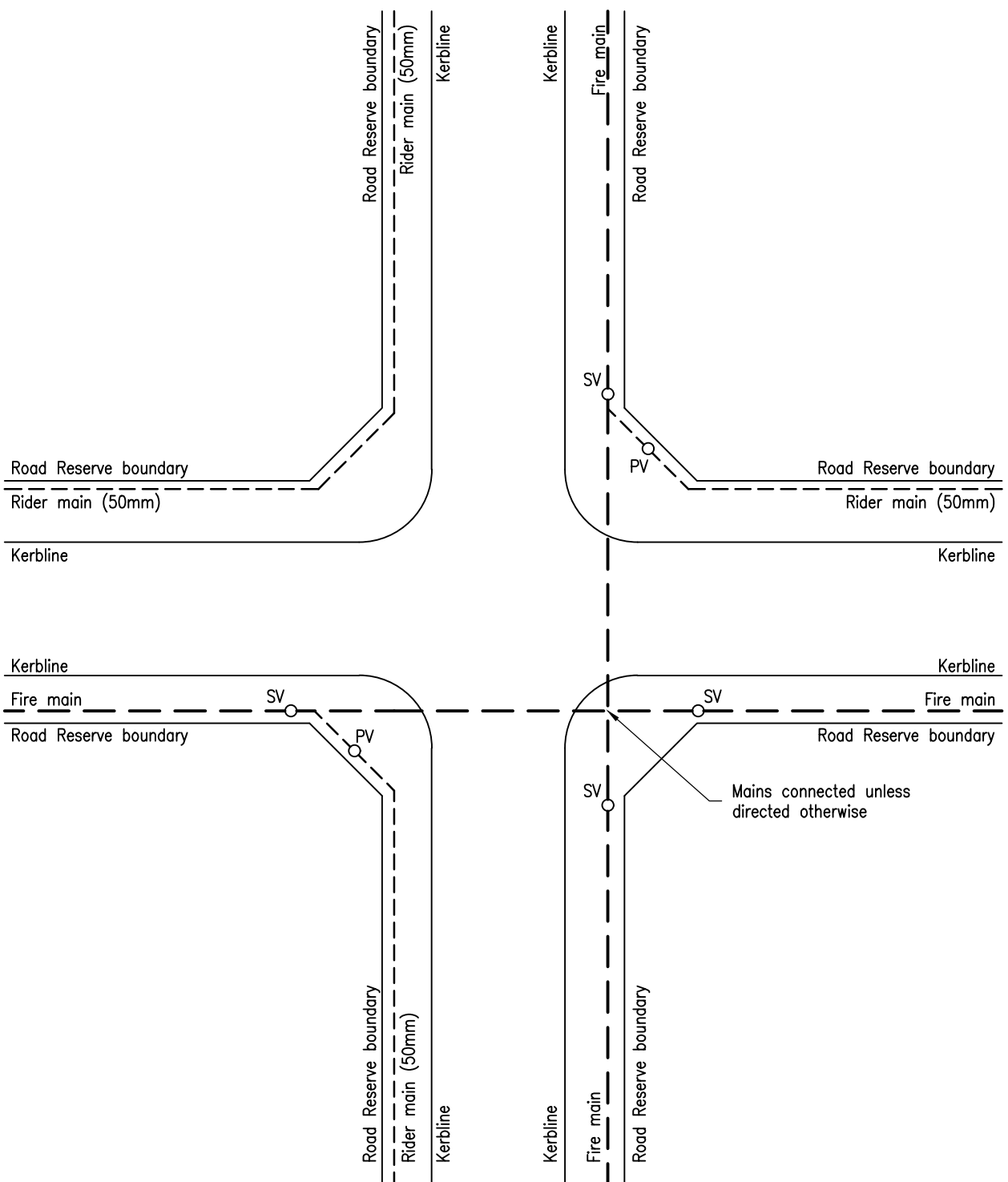
- w = footpath width
- Battens 100x25 H4 ground treated timber
- Pegs 100x25 H4 @ 600 spacings maximum through curves

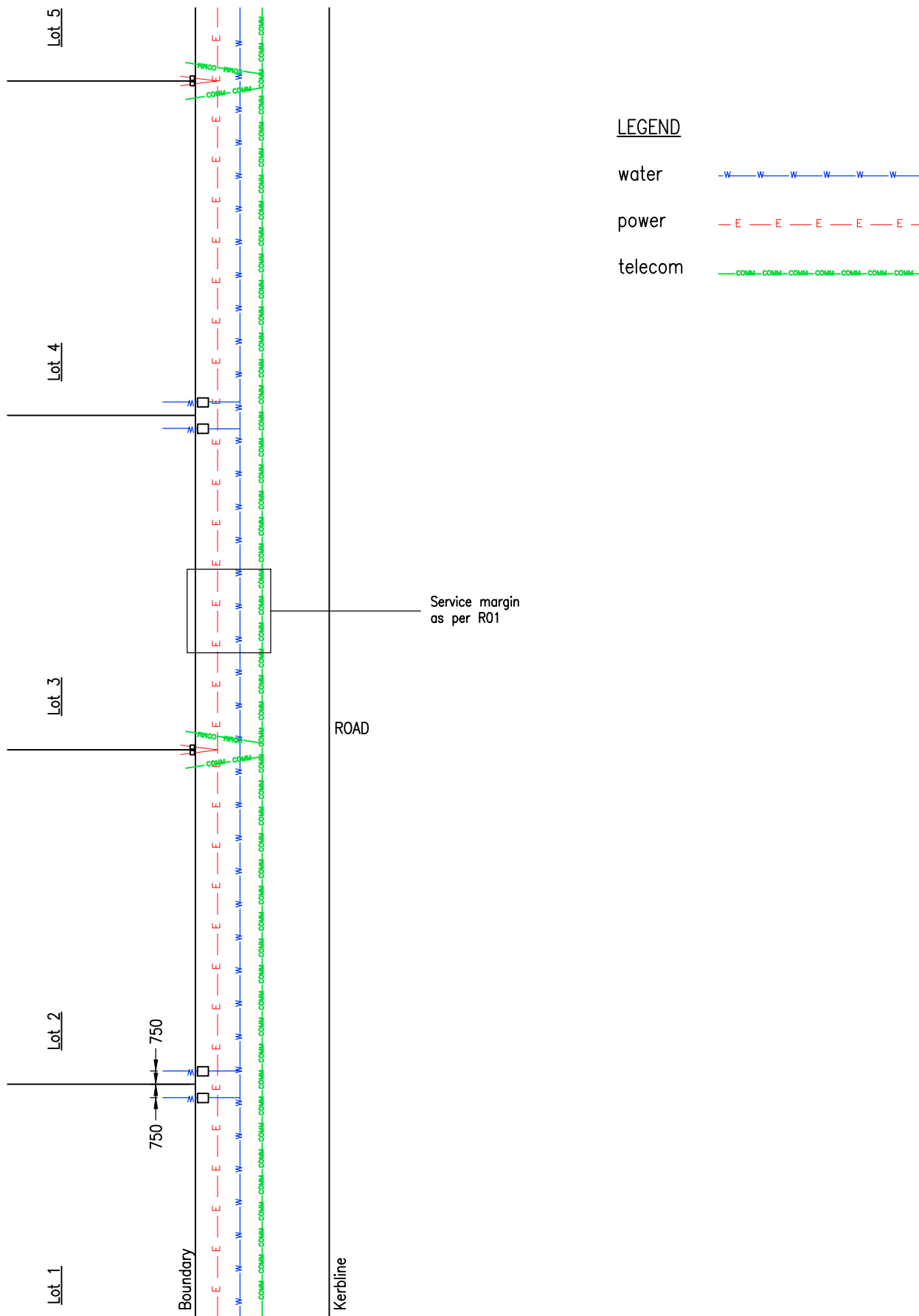


NOTES

1. There will always be a branch sluice valve SV1
2. Neither SV2 nor SV3 are required when Road 'A' is a cul-de-sac of less than 50 dwellings.
3. Either SV2 or SV 3 (only one of) shall be selected when Road 'A' is a cul-de-sac of 50 dwellings or greater or a through road, but its firemain is not a primary feed (which one is selected will depend on the flow direction - select the downstream valve).
4. Both SV2 and SV3 are selected when the firemain in Road 'A' is a primary feed to a large area.







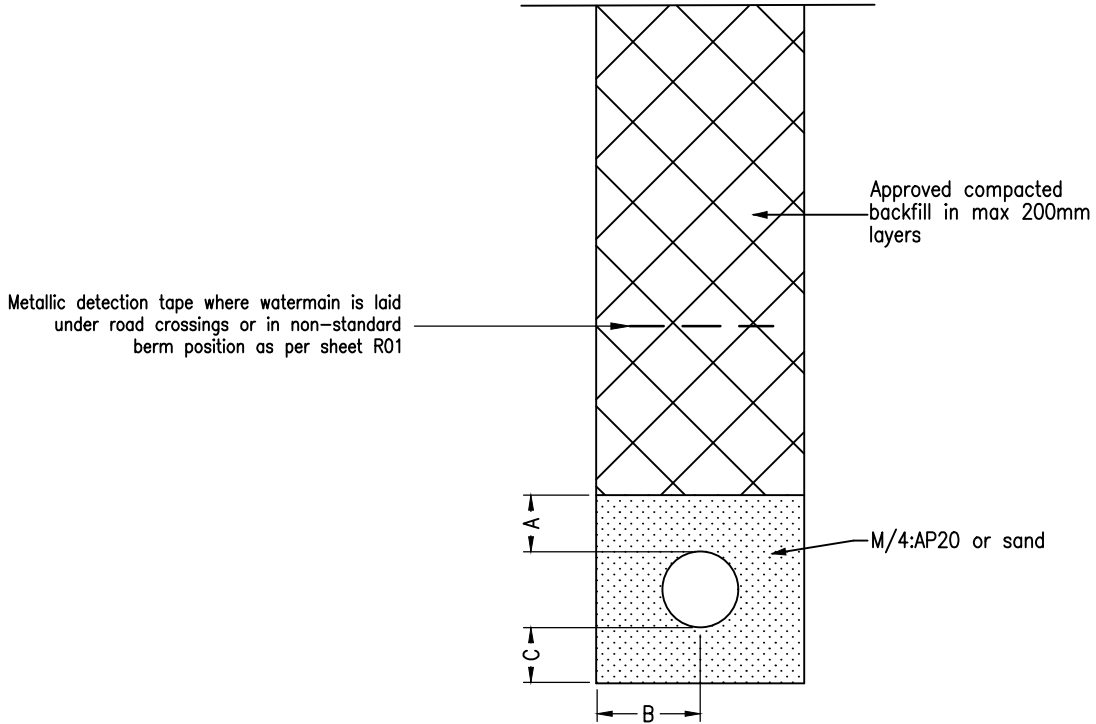
LEGEND

water — W — W — W — W — W — W — W —

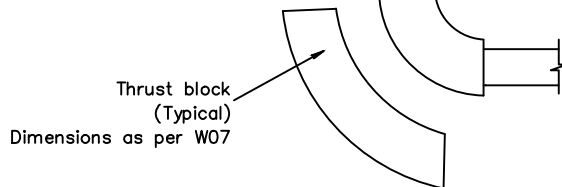
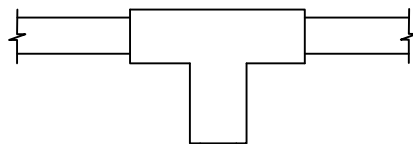
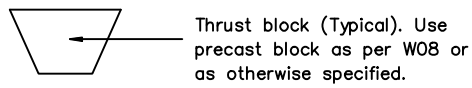
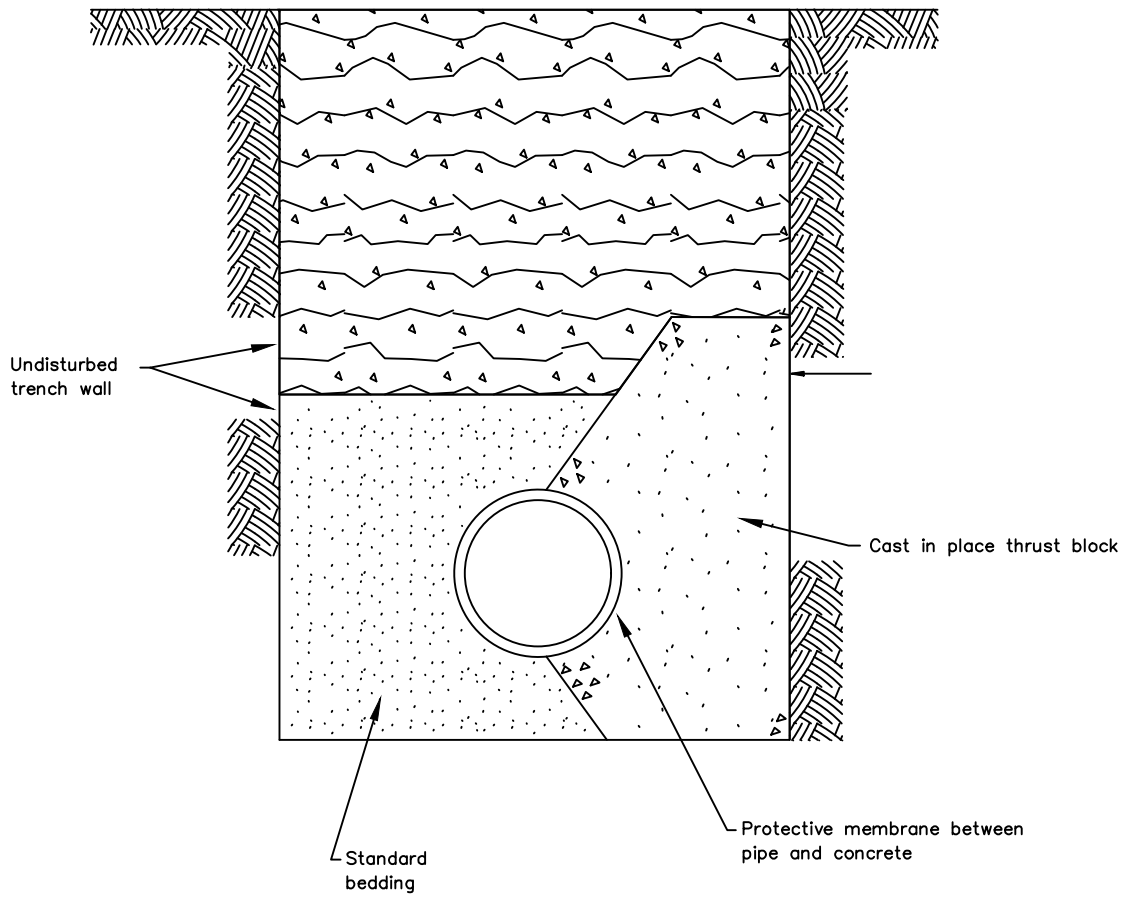
power — E — E — E — E — E — E — E —

telecom — COMM — COMM — COMM — COMM — COMM — COMM — COMM —

Refer to sheet D22 for trench
reinstatement details



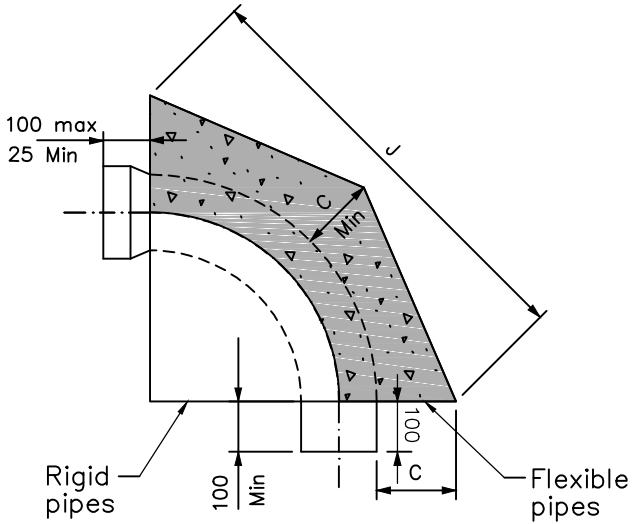
| Nominal Pipe Diameter | A | B | C |
|-----------------------|-----|-----|-----|
| < 150 | 100 | 100 | 100 |
| ≥ 150 < 300 | 150 | 150 | 100 |



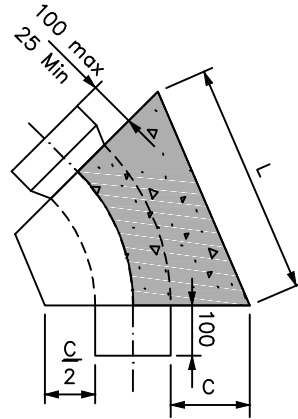
NOTE

THRUST BLOCKS SHALL BE DESIGNED TO RESIST MAXIMUM DESIGN RESULTANT FORCE AND INCLUDE FOR WATER HAMMER.

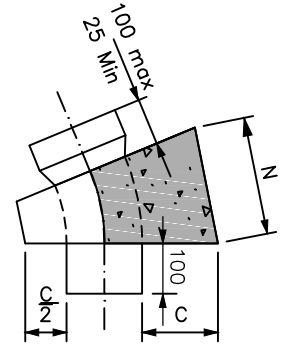
NOTE :Faces J, L & N to be poured against natural ground
See specification.



90° BEND



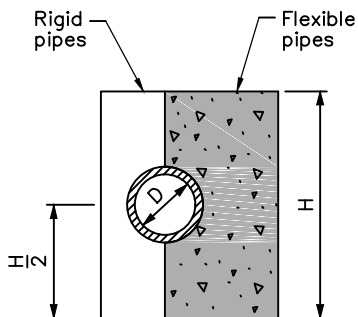
45° BEND



22½° & 11¼° BEND

| Diameter | Height | Cover | 90° Bend | 45° Bend | 22.5° & 11.25° Bend |
|----------|--------|-------|----------|----------|---------------------|
| NB (mm) | H (m) | C (m) | J (m) | L (m) | N (m) |
| 100 | 300 | 200 | 300 | 250 | 150 |
| 125 | 375 | 200 | 350 | 300 | 150 |
| 150 | 450 | 200 | 450 | 350 | 175 |
| 175 | 525 | 230 | 500 | 400 | 200 |
| 200 | 600 | 230 | 600 | 450 | 225 |
| 225 | 675 | 230 | 650 | 500 | 250 |
| 250 | 750 | 230 | 750 | 550 | 300 |
| 300 | 900 | 300 | 900 | 700 | 350 |

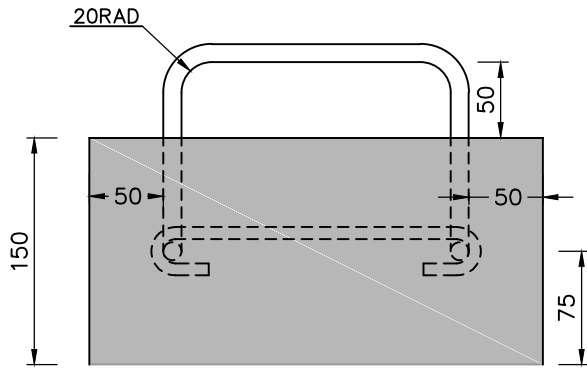
HORIZONTAL BENDS ONLY



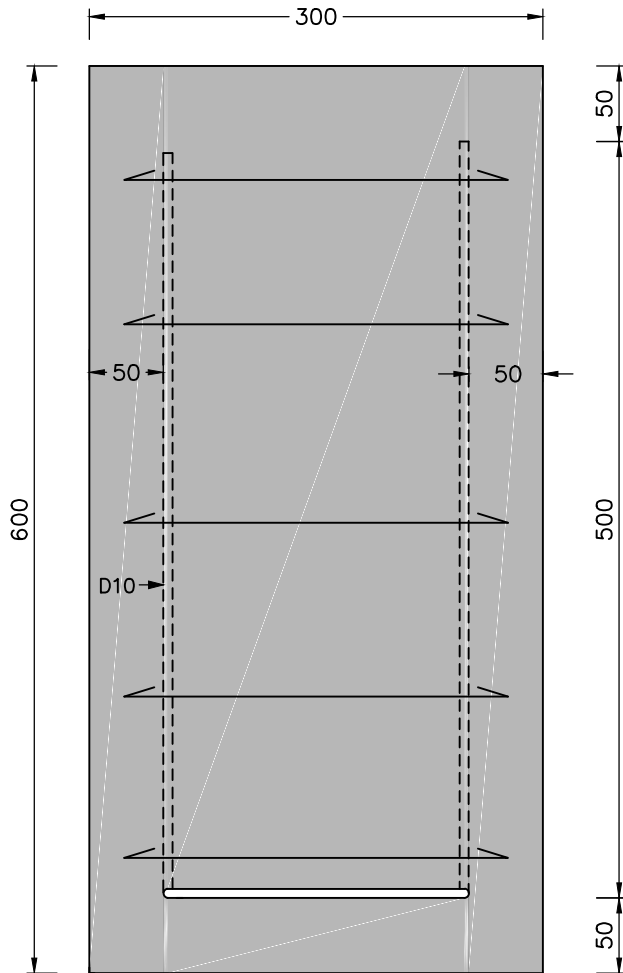
TYPICAL SECTION THROUGH THRUST BLOCK

NOTES:

1. Thrust block designed for a safebearing load of 50 kPa at pipeline pressure of 40 m head 390 kPa.
2. Thrust blocks in unsuitable soil require special design.
3. Concrete to be 17.5 MPa 150 slump unreinforced.
4. Do not use for upward thrust (special design only).
5. PVC pipes adjacent to concrete shall be wrapped with 6mm Denso tape or 250 microns Polyethylene film or equivalent.



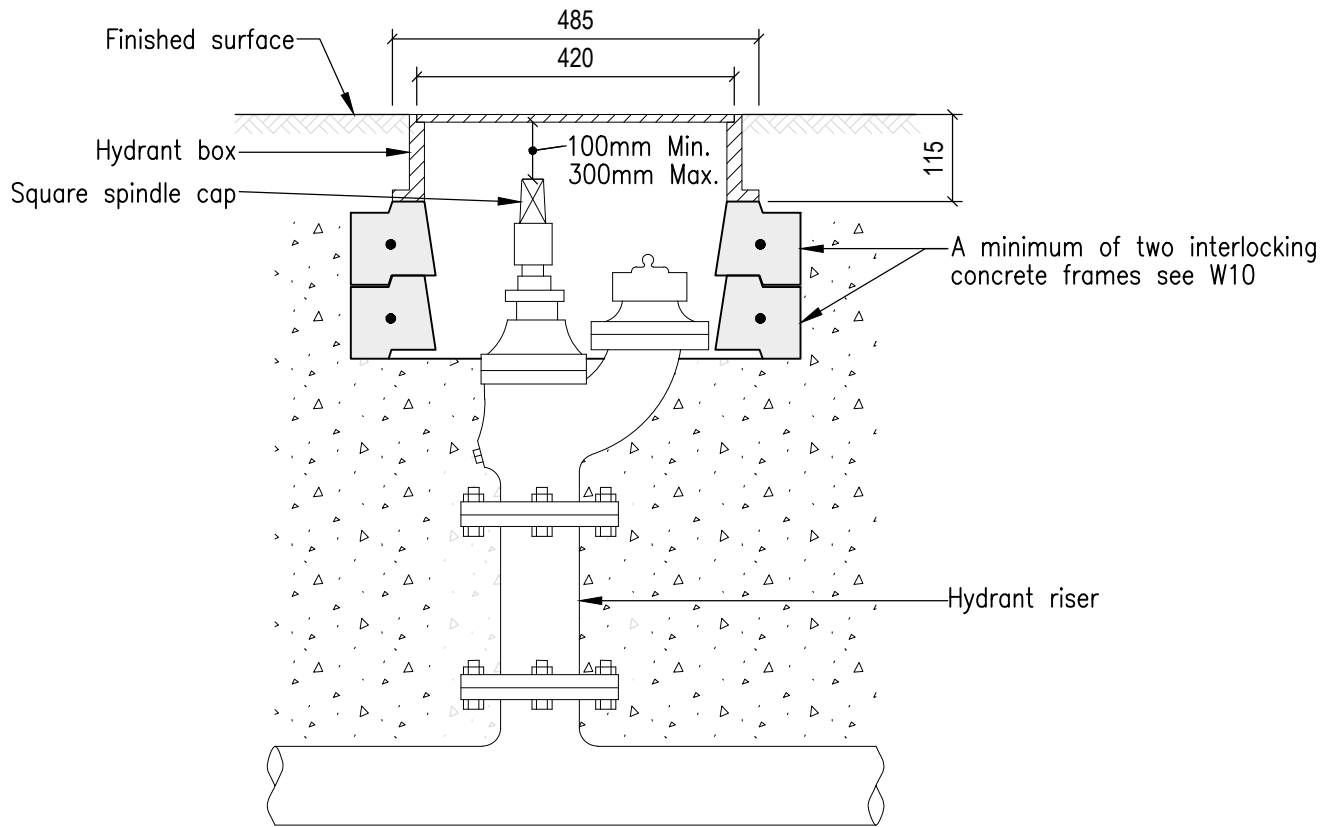
ELEVATION



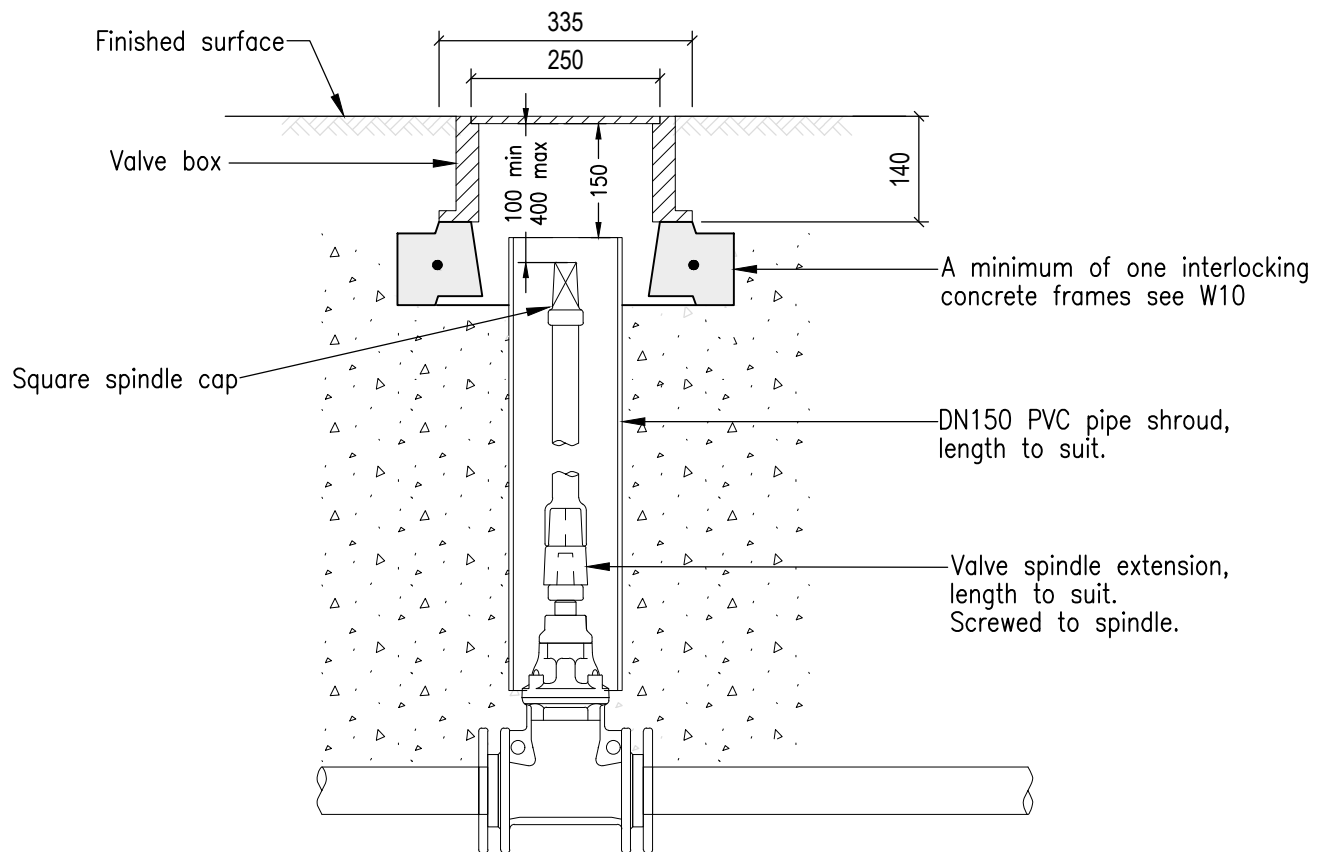
PLAN

NOTE

- Precast thrust blocks only to be used where:
- pipe dia is 200mm or less, and
 - maximum operating pressure is 700kPA, and
 - where at least 0.18m² of block is against undisturbed trench wall.



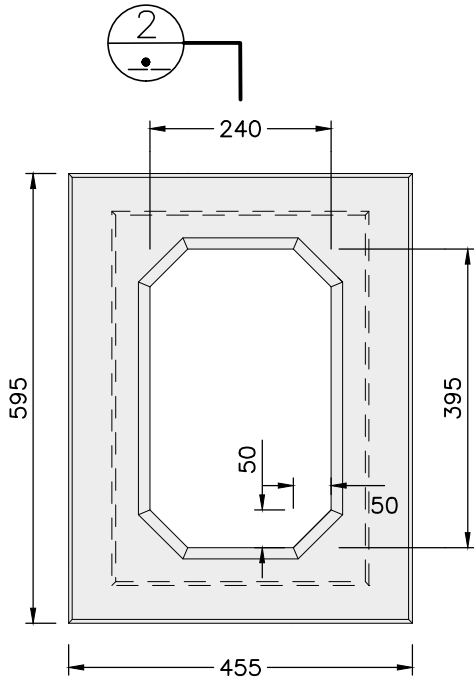
FIRE HYDRANT



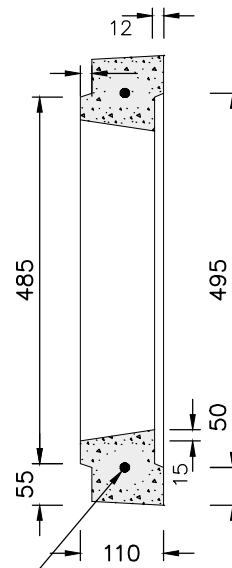
VALVE

NOTE:

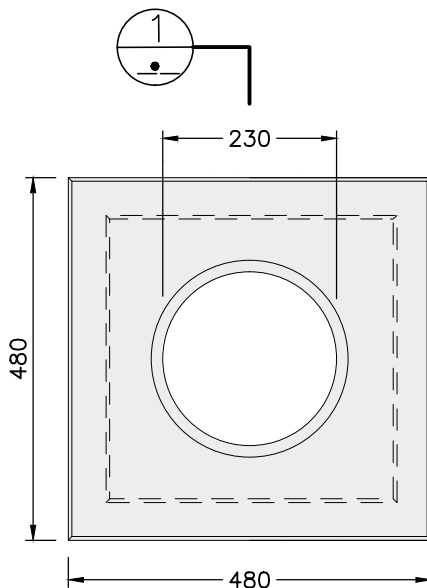
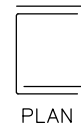
1. Where valve is for wastewater reticulation, fit triangular spindle cap on top of square spindle cap and maintain the same clearance to valve cover.



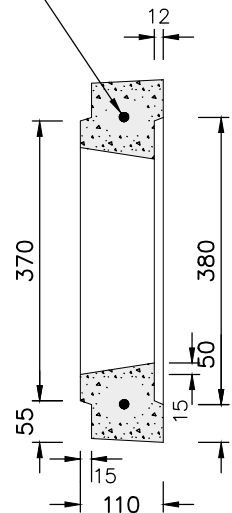
HYDRANT FRAME

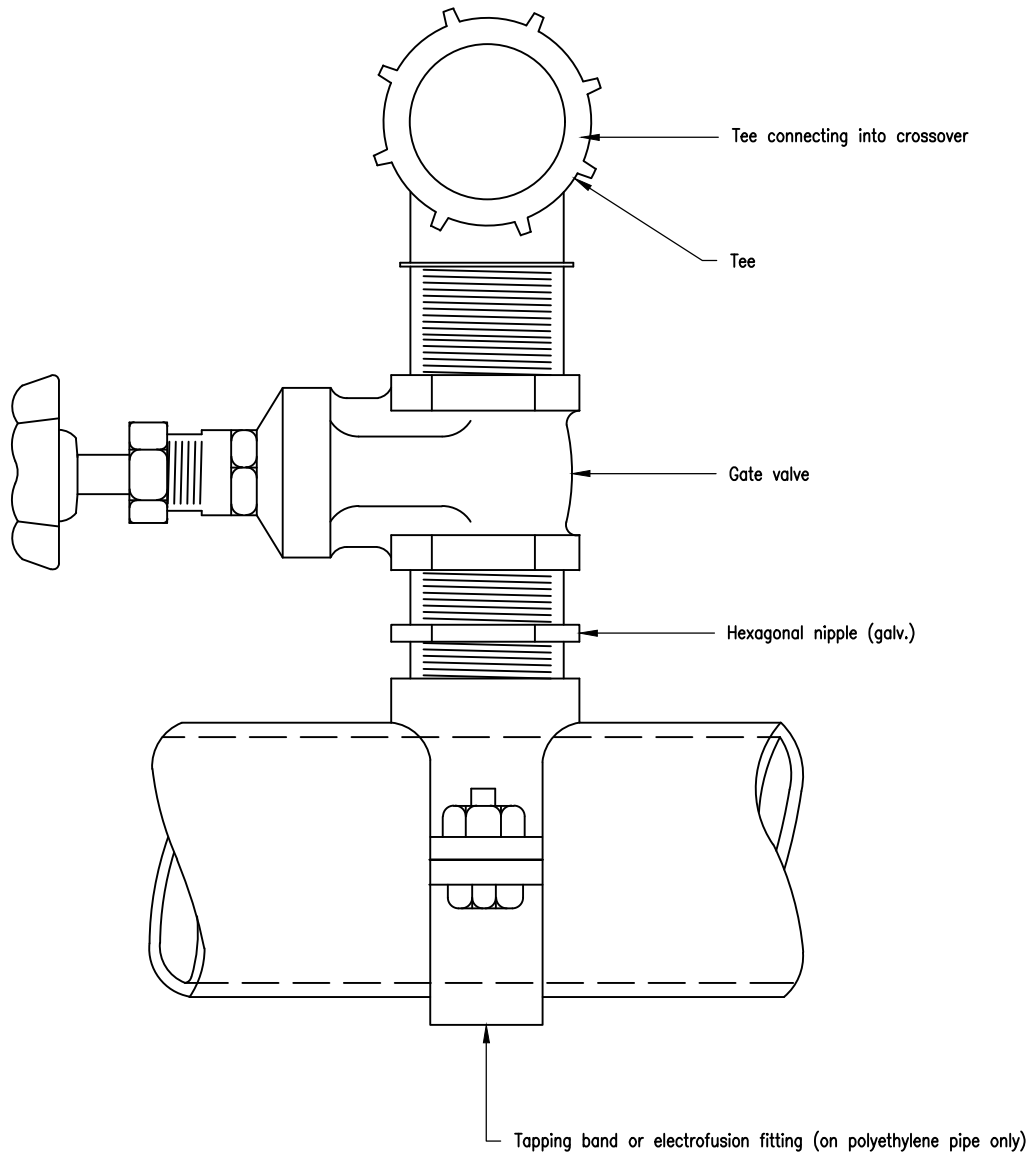


DH10 UBARS



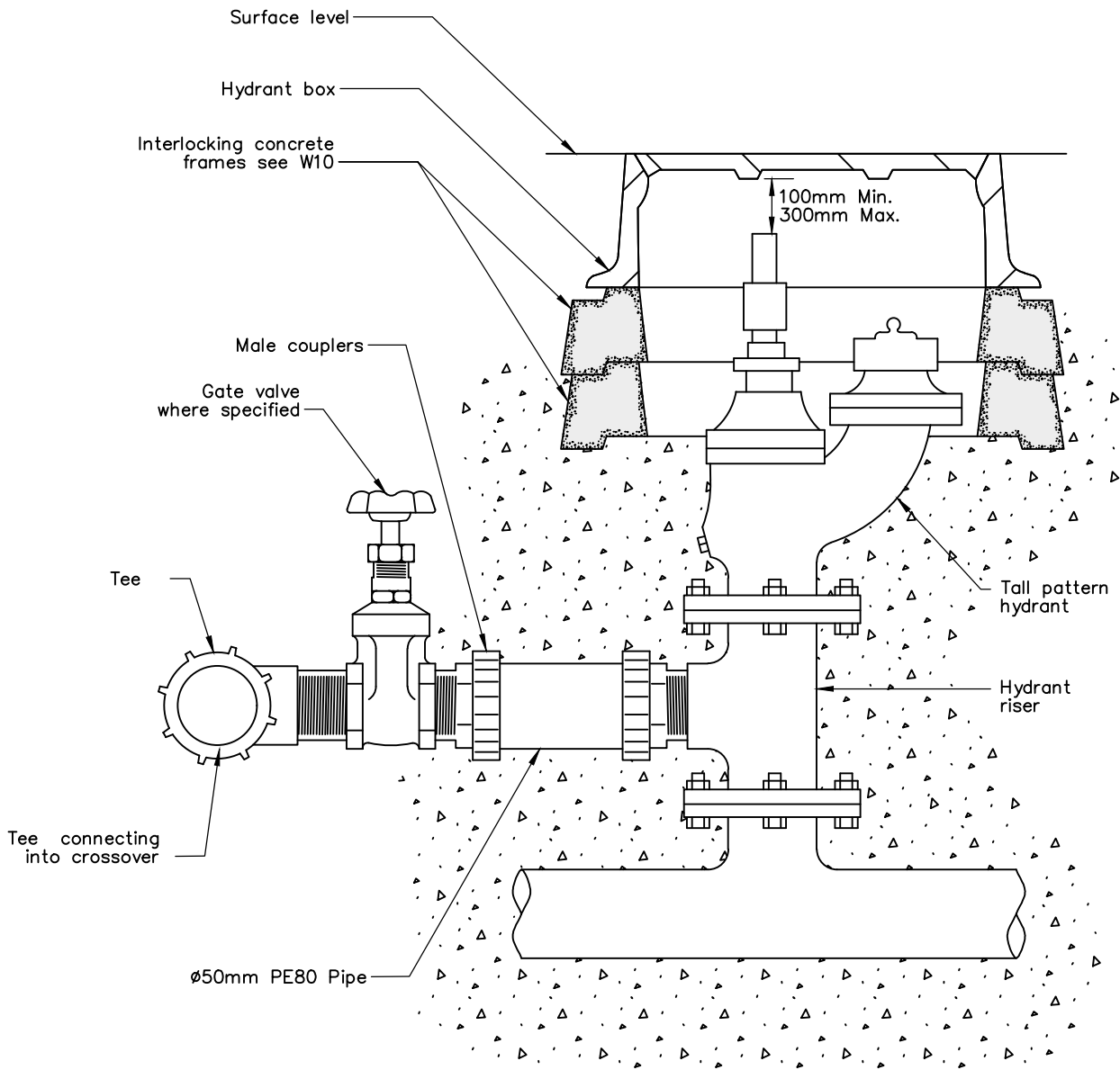
VALVE FRAME – (UPPER)





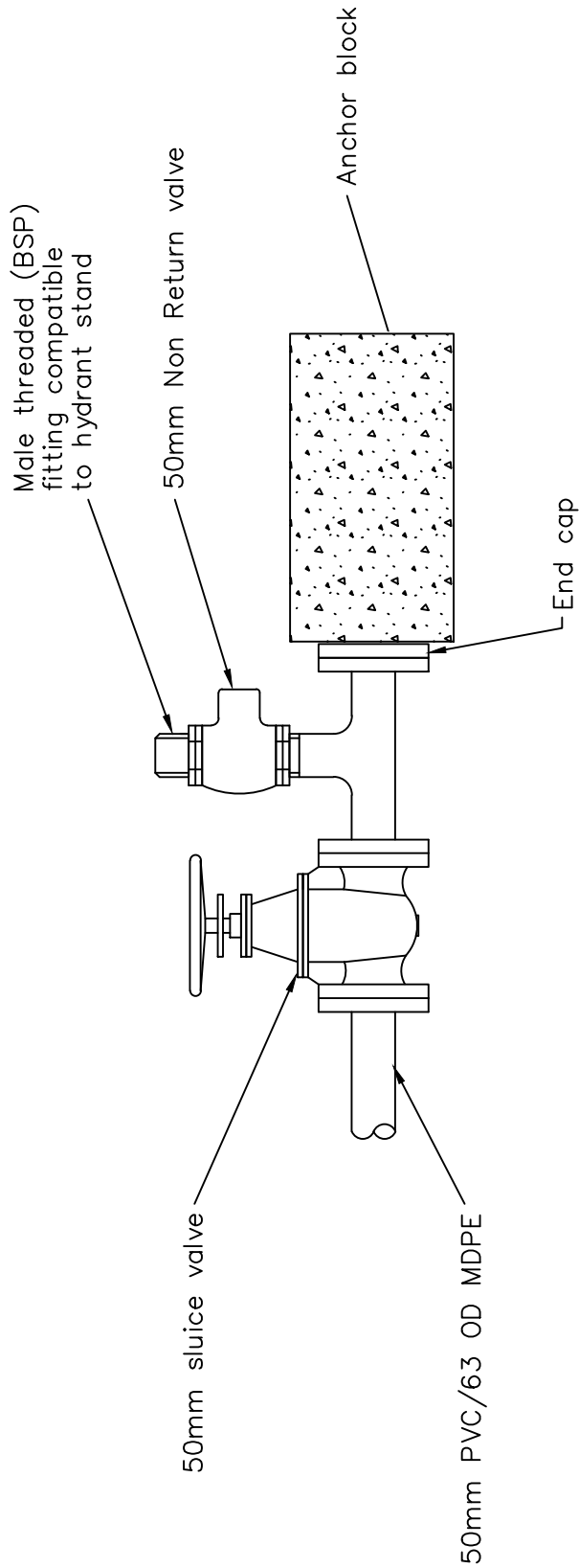
NOTES:

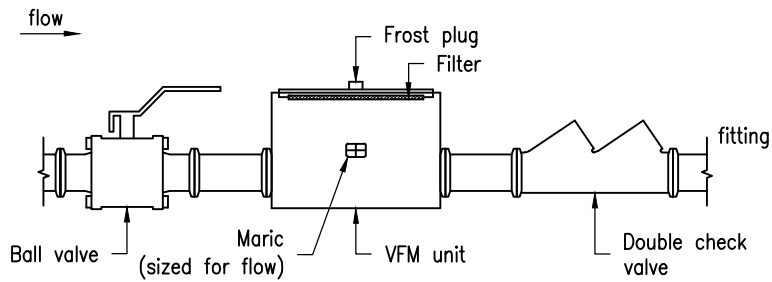
1. 100mm diameter mains shall have 32mm diameter tapped holes.
2. All larger mains shall have 50mm diameter tapped holes.



NOTES:

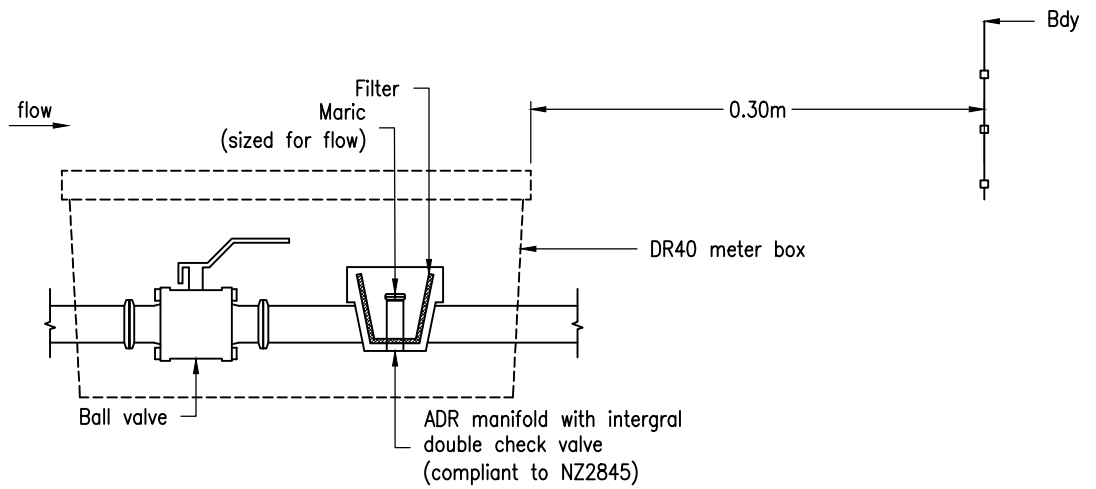
1. Gate valve shall be located outside hydrant frame.



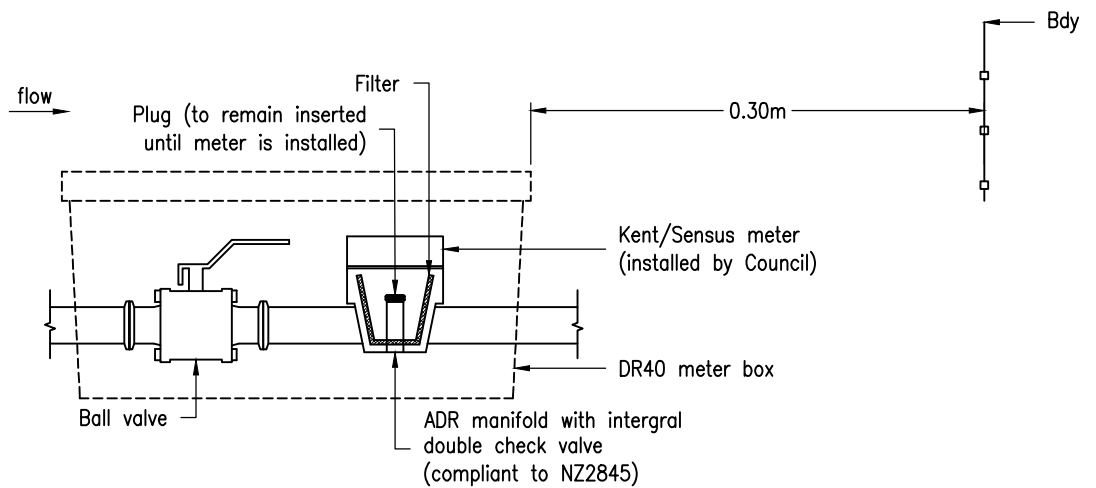


Note:
It is the owners responsibility to lag restrictors
and to ensure frost plugs are in place

ABOVE GROUND TANK MOUNTED
RESTRICTED CONNECTION



IN GROUND
Restricted Connection



IN GROUND
Metered Connection